States of Sustainability:

A Review of State Projects funded by the National Digital Information Infrastructure and Preservation Program (NDIIPP)

May 2012

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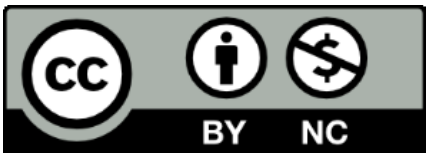
Lee, Christopher A. “States of Sustainability: A Review of State Projects funded by the National Digital Information Infrastructure and Preservation Program (NDIIPP).” Chapel Hill, NC: University of North Carolina, 2012.



Revision History

Final review draft distributed to all project partners	February 6, 2012
Final report completed	March 22, 2012
Final report published	April 2, 2012
Final report updated - two sentences revised to clarify PeDALS project licensing arrangements and implementation of LOCKSS	May 8, 2012

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Executive Summary

Preserving State Government Information is an initiative of the Library of Congress (LC) National Digital Information Infrastructure and Preservation Program (NDIIPP). In 2000, the U.S. Congress authorized an allocation of $100 million to LC for "a major undertaking to develop standards and a nationwide collecting strategy to build a national repository of digital materials." In April-May of 2005, LC sponsored a series of workshops involving all 50 states and three territories to discuss preservation of digital information from state governments. LC issued a Request for Expression of Interest (RFEI) on May 5, 2006, with responses due on June 15. On January 7, 2008, LC announced four projects, each involving multiple states: Persistent Digital Archives and Library System (PeDALS), A Model Technological and Social Architecture for the Preservation of State Government Digital Information (MTSA), Geospatial Multistate Archive and Preservation Project (GeoMAPP), and the Multi-State Preservation Partnership (MSPP). Although it is not one of the four NDIIPP state projects, the Kansas Enterprise Electronic Preservation (KEEP) project has also received NDIIPP funding through an arrangement with the MTSA project.

This report summarizes findings of a review of the NDIIPP state projects. The process has involved analysis of project deliverables and documentation, individual engagement with project participants at conferences and professional events, visits to the lead partner sites for all four projects, and monitoring of project activities and announcements.

Key Findings

Each of the NDIIPP state projects has benefited from a lead partner who already had a successful record of electronic records or digital preservation projects, and who had already established strong relationships with allied professionals. The lead partners have played a diversity of roles, which I have characterized in three broad categories:

- ***Digital Preservation Service Provider** - Development, maintenance and support of a centralized preservation environment where other parties can transfer resources (within the state or across states)*
- ***Digital Preservation Enabler** - Development, maintenance and support of software tools and systems that other institutions can install and run in their own environments*
- ***Digital Preservation Facilitator** - Convening of forums for discussion and interaction among interested professionals, support for development of communities of practice, local testing of technical approaches to share experiences with others, development and dissemination of guidance documents*

Building on a Diverse Set of Strengths

The stewardship of digital information is a complex and multifaceted endeavor. There is no single model or approach that will be successful in all states. Successful initiatives have attended to the specific opportunities, resources and constraints of their local environments. The NDIIPP states program has supported further advancement of efforts that were already underway in all of the lead states, efforts that were each taking different approaches given their local contexts; it also allowed many participating states to mobilize further resources within their own contexts.

Building Bridges across Professional Communities

The past two decades of work on electronic records management and digital preservation have revealed that the most successful initiatives are those that actively seek connections

and collaborations with allied experts and professionals. The NDIIPP states program was designed to involve–to the extent possible–both archivists and librarians from each of the participating states. This has reinforced digital preservation as an endeavor that is shared across both state records and state publications. However, many projects' accomplishments were only possible because of extensive interaction with professionals who are neither librarians nor archivists.

Persistence in the Face of Dramatic Changes and Challenges
During the course of the NDIIPP states projects, many states faced serious internal challenges, including significant budget cuts, staff turnover, major restructuring of parent institutions, restructuring of a key partner agency, and even a complete state government shutdown. Some of the above challenges resulted in readjustments and delays, and several partner states substantively reduced their involvement in the projects. However, none of the disruptions either shutdown or completely derailed the projects. Through the collective efforts of numerous players, the projects adapted to new realities and continued to pursue their stated goals. In the face of dramatic disruptions in state funding, personnel and other resources, the existence of the multi-year, multi-state NDIIPP projects often provide motivation and authority to carry on with the pursuit of digital preservation initiatives.

Beginning with Prototypes and Building Incrementally
Digital preservation is not a single task to be performed in a short amount of time. Progress generally comes from small victories that build on other small victories. NDIIPP state projects pursued incremental development in a variety of ways.

Focusing on Specific Content Types
Much of the success from the NDIIPP state projects has come from focusing on specific content types. Progress in digital preservation above the basic set of functions often comes from focusing on a limited set of materials, in order to better understand their associated characteristics, requirements, behavioral patterns, technological dependencies, genre conventions and institutional norms.

Adopting Modular and Decomposable Approaches
When engaging in design and modeling efforts that relate to large, complex systems, modularity can be extremely valuable. Professionals responsible for state digital information can pre-empt future costly and problematic system migration efforts by integrating the information into environments specifically designed to support long-term preservation, scalability and interoperability. Limiting the interdependencies between subsystems can also make a design more robust against disruptions from the environment, as well as supporting system evolution, sustainability and innovation.

Preparing for Formal Agreements and Flexibility of Arrangements
Many agencies are unaccustomed to interstate or interagency arrangements, and development of the required provisions can involve significant effort and delay. Project plans should allow for progress even while the parties involved are awaiting resolution of formal agreements. It can also be beneficial to have a backup plan in the case that formal approval is unsuccessful. In the face of limited state budgets, complex problems that require collective efforts, and the potential economic advantages of initiatives that span state boundaries, states' legal personnel are likely to become more accustomed to entering

into new institutional agreements, contracts and arrangements. The NDIIPP states project grants have contributed to this process by providing financial incentives for entities to establish formal relationships.

Implications and Recommendations for Other States
Professionals working in states across the country can benefit from identifying priorities in their own contexts for digital preservation in the next few years, looking at the advances of the state NDIIPP projects, picking up the ones that promise to advance one's own priorities, extending/adapting them, and then letting others know what one has learned in the process.

Recommendation 1 – Adopt Robust Strategies
State personnel with responsibility for digital preservation should cast their collaboration nets widely. Partnerships with chief information officers, software vendors, advocacy groups, and domain experts from data-intensive units of agencies can be just as important as partnerships with librarians and archivists. Someone who is a partner now may lose his/her job, shift to other duties or otherwise become unable to participate in further collaboration. Effective programs for digital preservation involve social networks that are robust and diverse enough to withstand shifts in state politics, finances and priorities.

Recommendation 2 – Continue to Look Outward
A fundamental factor for continuing success will be state government professionals continuing to look outward. Digital preservation is a highly dynamic arena, with frequent emergence of new projects, technologies, models and funding opportunities. Engagement in and monitoring of professional forums and events is a valuable way to learn about trends, innovations and opportunities. Outreach activities are also essential for informing and revising work practices and approaches. Interstate sharing of experiences and lessons can also help to determine which options and strategies are appropriate in a variety of contexts. Collaboration does not require conformity to a single approach across all states.

Recommendation 3 – Pick a Mode of Contribution and Act on It
In order to engage in collaborative work, it is important to have something valuable to offer the other collaborators. Contributions can take a variety of forms. Each role implies its own set of strategies and risk factors. Identifying which role one is likely to play in the collaboration can be an important step toward formulating a plan of action.

Implications and Recommendations for Funding Agencies
I suggest three main lessons for potential funders of future state digital preservation projects: multi-year projects are a major benefit in a state government context; alliances can bring legitimacy; and providing for multiple forms of participation is essential.

Appendices
This report includes several appendices to provide additional details, background and context. They include project summaries and timelines; descriptions of software used by project partners; and selective chronologies of previous electronic records and digital preservation activities in participating states.

Overview of the Four NDIIPP States Projects

Preserving State Government Information is an initiative of the Library of Congress (LC) National Digital Information Infrastructure and Preservation Program (NDIIPP). In 2000, the U.S. Congress authorized an allocation of $100 million to the Library of Congress for "a major undertaking to develop standards and a nationwide collecting strategy to build a national repository of digital materials" (P.L. 106-554). LC carried out a planning process in 2001-2002, which involved consultation with a variety of stakeholders. Congress approved a plan for NDIIPP in 2003,[1] and in 2004, the Library funded the first NDIIPP projects, in order to both preserve digital content and establish a network of preservation partners. In 2005, NDIIPP entered a partnership with the U.S. National Science Foundation (NSF), in order to fund and support a set of digital preservation research and development projects. NDIIPP has also entered into agreements and collaborations with a variety of other partners, and has sponsored many meetings involving NDIIPP partners and other interested parties.[2]

In April-May of 2005, LC sponsored a series of workshops involving all 50 states and three territories to discuss preservation of digital information from state governments. LC issued a Request for Expression of Interest (RFEI) on May 5, 2006, with responses due on June 15. The RFEI expressed the following goals:

1. Expand the network of digital preservation stakeholders to state and local institutions that are mandated to sustain digital government information, especially information important to national and state legislative policy makers. As a legislative federal agency charged with supporting Congress, LC is especially interested in shared commitments to preserve such content.
2. Further demonstrate collaborative efforts in two critical areas:
    a. Developing the underlying technical infrastructure necessary to sustain digital content, and
    b. Implementing broadly applicable standards, models, and best practices among stakeholders in a distributed digital preservation network.
3. Encourage models for multi-state storage of critical state and local government information for preservation, business continuity, and disaster recovery.
4. Support projects with concrete, demonstrable results that can be shared among network participants.[3]

On January 7, 2008, LC announced four projects ($2.25 million of total funding), each of which involves multiple states: Persistent Digital Archives and Library System (PeDALS), A Model Technological and Social Architecture for the Preservation of State Government Digital Information (MTSA), Geospatial Multistate Archive and Preservation Project (GeoMAPP), and the Multi-State Preservation Partnership (MSPP).[4] Although it is not one of the four NDIIPP state projects, the Kansas Enterprise Electronic Preservation (KEEP) project has also received NDIIPP states program funding through an arrangement with the MTSA project.

Table 1 - States Represented in NDIIPP States Projects[5]

States Participating in **No** Projects	15
States Participating in **One** Project	26
States Participating in **Two** Projects	10

The following are brief summaries of the four projects. For much more extensive documentation of all projects, including timelines of related activities and events, see Appendices A-J.

Geospatial Multistate Archive and Preservation Partnership (GeoMAPP)

GeoMAPP has focused on preservation of at-risk and temporally significant geospatial content. One of the project goals has been to demonstrate a network for transfer and replication of geospatial data within and between states. Partner states are Kentucky, Montana, North Carolina (lead partner), and Utah. The project also includes a wider set of Informational Partner states: Arizona, District of Columbia, Georgia, Illinois, Kansas, Maine, Maryland, Minnesota, Mississippi, New York, Texas, Wisconsin, and Wyoming. GeoMAPP has explored various methods and tools for preserving geospatial data and has generated detailed guidance for states to ingest and manage geospatial data. In August 2011, the project contracted with Applied Geographics and AECOM to help develop business planning resources. The project released the GeoMAPP Geoarchiving Business Planning Toolkit in December 2011.

A Model Technological and Social Architecture for the Preservation of State Government Digital Information (MTSA)

The MTSA project has been working with state legislatures, state archives, and state libraries to explore access to and preservation of legislative digital records. Participating states have been Arkansas, California, Illinois, Kansas, Minnesota (lead partner), Mississippi, Nebraska, North Dakota, Tennessee and Vermont. In recognition of the diversity of state contexts for dealing with legislative information, the project has explored a variety of technical approaches and architectures. The project has provided training and generation of guidance documents for states. It has included an investigation of an XML-native database environment for information from legislative systems, and a partnership with University of California Curation Center (UC3) to test the Merritt system for ingest and management of legislative materials, as well as their Web Archiving Service. A relatively late addition to the project has been the testing of Tessella's Safety Deposit Box (SDB) by several of the project's partner states: Illinois, Minnesota, Tennessee and Vermont. The MTSA project has also partnered with and channeled grant funds into the Kansas Enterprise Electronic Preservation (KEEP) project.

The goal of KEEP[6] is to build an enterprise-wide (all three government braches), trustworthy digital repository for Kansas government electronic records with long-term value. The system is being designed to support certification of authenticity for specific record sets on a fee basis. The team includes representatives from the Kansas Historical Society, state legislature, judicial branch, Attorney General's Office, and Division of Information Systems and Communications (DISC).[7] The project team aims to integrate KEEP with the Kansas Legislative Information Systems and Services (KLISS) system. Companies contracted to work on the KEEP project are: Imerge Consulting, Propylon, Alexander Open Systems (with EMC, Cisco, and VMWare). A major catalyst for the development of KEEP has been Kansas House Bill 2195 (2010) authorizing the State Archivist to set standards for maintaining the authenticity of electronic government records, certify systems for compliance with the standards, and serve as agent for authenticating records. KEEP has a funding model that is based on several resource streams: funds from IT projects that house records with retentions of 10 or more years, maintenance fees related to the quantity and format of the records in KEEP, and fees for authenticating records.

Multi-State Preservation Partnership (MSPP)

MSPP has built on the Washington State Archives digital archives environment to implement a centralized regional repository for state and local digital information. The Washington Digital Archives has had a strong focus on local records. Participating states are Alaska, California, Colorado, Idaho, Indiana, Louisiana, Montana, Nevada, North Carolina, Oregon, Tennessee, and Washington (lead partner). The project has included development of a component, called ArchiveThis!, for submission to the repository, and a component, called Auto Todd, that performs various ingest functions. Code for the project is written in the C# programming language and built on top of a Microsoft platform.

Persistent Digital Archives and Library System (PeDALS)

PeDALS has focused on two technical goals: (1) develop a curatorial rationale to support an automated, integrated workflow to process collections of digital publications and records, and (2) implement "digital stacks" using an inexpensive, storage network that can preserve the authenticity and integrity of the collections. It has also had a social goal: build a community of shared practice including a wide range of repositories and remove barriers to technology adoption by keeping costs low. Participating states have been Alabama, Arizona (lead partner), Florida, New Mexico, New York, South Carolina and Wisconsin. PeDALS products have included a repository system architecture based on BizTalk and LOCKSS, and the PeDALS Email Extractor (for Microsoft Outlook .pst files).

Study of the NDIIPP States Projects – Background and Approach

At the invitation of the project team, I had the opportunity to take part in the All Partners Meeting on December 8, 2008 in St. Paul, Minnesota of the "Model Technological and Social Architecture for the Preservation of State Government Digital Information" (MTSA) project. Discussions associated with that visit revealed opportunities to provide further external feedback on the project. Beginning in August 2009, I contracted with the project to help compare their efforts to other projects in other states, at the federal U.S. level and in other countries, both for purposes of benchmarking and to identify future opportunities for collaboration, resource sharing and joint sustainability. I reviewed and provided feedback on documents and products of the project.[8] On January 19-21, 2010, I participated in the MTSA All Partners meeting in Sacramento, CA, which allowed me to learn about the experiences and perspectives of project participants from across the country. I also made a project site visit to St. Paul on May 2-4, 2010, discussing project products, lessons and strategies for further activities.

During this same period, the Kansas State Historical Society (partner on the MTSA project) was engaged in discussions with Bob Horton at the Minnesota Historical Society about reallocating a portion of the NDIIPP funds from the MTSA project to support their work on the Kansas Enterprise Electronic Preservation (KEEP) System Project. On April 22, 2010, KEEP received NDIIPP funding through MHS to support the core policy framework and prototype development effort.[9] With the emergence of KEEP as an activity that was now closely associated with MTSA but also a distinct project, I conducted a KEEP site visit in Topeka, Kansas, on July 6-7, 2010. In late July 2010, Bob Horton and members of the NDIIPP team at the Library of Congress proposed that my external review activities be extended to cover all four of the state NDIIPP projects. On August 12, Horton and I met with the NDIIPP staff at LC responsible for the state projects – Bill Lefurgy, Butch Lazorchak, and Michelle Gallinger – to discuss arrangements for a

wider review of the four state projects. This work was kicked off at a session on October 1, 2010, at the Best Practices Exchange in Phoenix, Arizona. I gave a presentation called "Alternative Strategies for the Curation of Public Records: How Can States Learn from Each Other?" in which I laid out and elicited feedback on the rationale and plans for undertaking the study.

My review of the four NDIIPP state projects was guided by the following questions:

- What are the main factors that drove them to undertake the project?
- Who is involved and why?
- What were related activities and relationships of participating parties before the project?
- How does the project fit into missions, goals and plans of participating parties (i.e. what are their incentives for participating)?
- What are plans for advancing activities after the grant?
- Which of the products and lessons from the project are most and least likely to be applicable in other states?

As indicated above, the review of the four NDIIPP states projects formally began with the discussion at the Best Practices Exchange in October 2010. The process has involved analysis of project deliverables and documentation, individual engagement with project participants at conferences and professional events,[10] visits to the lead partner sites for all four projects,[11] and monitoring of project activities and announcements (mailing lists, public project web sites, online project spaces, newsletters and conference calls).

Observations and Lessons Learned

Each of the NDIIPP state projects has benefited from a lead partner who already had a successful record of working electronic records or digital preservation projects, and who had already established strong relationships with allied professionals. The lead partners have played a diversity of roles within their respective projects. Table 2 provides a general characterization of the main roles they have played.

Table 2 - Primary Roles of NDIIPP State Project Lead Partners

Role	Explanation	Lead Partners
Digital Preservation Service Provider	Development, maintenance and support of a centralized preservation environment where other parties can transfer resources (within the state or across states)	Kansas Historical Society (KEEP) – funded through MTSA sub-grant Washington State Archives (MSPP)
Digital Preservation Enabler	Development, maintenance and support of software tools and systems that other institutions can install and run in their own environments	Arizona State Library, Archives and Public Records (PeDALS)
Digital Preservation Facilitator	Convening of forums for discussion and interaction among interested professionals, support for development of communities of practice, local testing of technical approaches to share experiences with others, development and dissemination of guidance documents	Minnesota Historical Society (MTSA) North Carolina Center for Geographic Information and Analysis and State Archives of North Carolina (GeoMAPP)

The categories are presented for purposes of comparison of relative emphasis, rather than suggesting that any lead partner played only one role exclusively.

Building on a Diverse Set of Strengths

The stewardship of digital information in the public sector is a complex and multifaceted endeavor. Several decades of experience have revealed that there is no single model or approach that will be successful in all states. The most successful initiatives have been those that attend to the specific opportunities, resources and constraints of their local environments. The NDIIPP states program has supported the further advancement of fruitful efforts that were already underway in all of the lead states, efforts that were each taking somewhat different approaches given their local contexts.

Prior to the GeoMAPP project, the state of North Carolina had undertaken a variety of activities related to both electronic records and management of geographic information system (GIS) data. In 2002, the State Library of North Carolina was awarded an LSTA-funded statewide leadership grant for a project called "Access to State Government Information Initiative." The North Carolina Department of Cultural Resources formed the ArcLib Taskforce in November 2004 to address the issues of collecting, storing, and preserving digital state information (publications and public records) for permanent public access, and in 2005, they drafted a Digital Preservation Policy Framework. The State Archives of North Carolina and State Library of North Carolina have collaborated on the capture and management of state web sites. The North Carolina Geospatial Data Archiving Project (NCGDAP) was one of NDIIPP's initial grant projects and was a catalyst for discussion about preservation of state and local government geospatial content. The North Carolina State University (NCSU) Libraries, as lead institution in NCGDAP, had a history since the 1990s of collaboration with key geospatial organizations within the state. In 2000, NCSU Libraries began to acquire and preserve North Carolina state and local geospatial data. The involvement of the Center for Geographic Information and Analysis (CGIA) and NCSU in NCGDAP, along with strong interest and support from the state's Geographic Information Coordinating Council (GICC), catalyzed interest in preserving geospatial content in North Carolina prior to the GeoMAPP project. The State Library of North Carolina was a partner in Phase I of the NDIIPP-funded Exploring Collaborations to Harness Objects in a Digital Environment for Preservation (ECHO DEPository) project, which ran 2004-2007. In 2006, the State Library, with support from the State Archives, hosted the first Best Practices Exchange, a conference that has become an annual event focusing on management and preservation of digital state government information. The North Carolina Department of Cultural Resources also received a two-year grant in 2007 from the NHPRC for the Preservation of Electronic Mail Collaboration Initiative, which involved the North Carolina State Archives, Kentucky Department of Library and Archives, and Pennsylvania State Archives. North Carolina's history of collaboration among its archives and GIS professionals, and its work with institutions from other states, were major assets for GeoMAPP. The project was also able to build on existing national systems and resources for GIS data discovery and access: Ramona GIS Inventory, Geodata.gov, ArcGIS.com, and GeoCommons.

The Minnesota Historical Society (MHS) has been actively working to address electronic records issues for more than two decades. In 1990, MHS received a grant from the National Historical Publications and Records Commission (NHPRC) to fund a national planning conference on electronic records issues, and they have successfully administered many grant-funded electronic

records projects since then. Of particular relevance to MSTA is a three-year project beginning in 2005 that involved MHS, the Minnesota Office of the Revisor of Statutes (ROS), and Minnesota Legislative Reference Library (LRL) called "Preserving the Records of the E-Legislature" to explore and test the technologies available to preserve the electronic records of the Minnesota legislature. In 2006, the ROS staff carried out an analysis of their new bill drafting system (XTEND) using the Trustworthy Information System (TIS) Handbook, developed by MHS. MHS has played a leadership role in a variety of other activities throughout the state of Minnesota that bear on the long-term management of government digital assets, and has engaged in numerous interstate and national partnerships and collaborations.

The Kansas Historical Society (KSHS) began building an electronic records program in the mid-1990s, and they had worked with various structures within the state to make the case for laws, policies and procedures that would support the preservation of state electronic records. Their strong working relationship with the Department of Administration and Chief Information Technology Officer (CITO) of the legislative branch helped them to establish arrangements for the development of KEEP, as well as plans for financial sustainability of KEEP after the grant.

The MSPP project benefited from significant advocacy, outreach and capacity building efforts of the Washington State Archives. State Archives staff already had experience with ingesting and providing access to large numbers of records and had significant infrastructure to support collections of records from other states. They had worked through many of the issues associated with acquiring digital files (to that point, primarily from local and county government units in Washington), and they had established very favorable arrangements with the Microsoft Corporation for provision and support of software and annual security audits.

When they submitted their proposal for PeDALS, Arizona State Library, Archives and Public Records (ASLAPR) already had considerable experience and standing in the electronic records arena. The Arizona State Library and Archives established the Arizona 'Lectronic Records Taskforce (ALERT) in 2001, established "Electronic Recordkeeping System (ERS) Guidelines" in 2003, and has worked closely with the Arizona Memory project. The ASLAPR participated in two NDIIPP-funded projects: Exploring Collaborations to Harness Objects in a Digital Environment for Preservation (ECHO DEPository) and Web-At-Risk. Richard Pearce-Moses had engaged in numerous efforts to bring attention to electronic records issues, including the New Skills for a Digital Era Colloquium, which he initiated while serving as the president of the Society of American Archivists (SAA) in 2005-2006. These previous activities helped to build relationships with other states that served as an important foundation for PeDALS.
The level of capacity and experience with digital preservation across the other project partner states was quite varied. Some had long track records of working with electronic records and electronic publications, while others were relative neophytes. In general, the states participating in the NDIIPP state projects appear to be farther along with respect to electronic records programs than the overall population of U.S. states.[12] (See Appendix L for summaries of activities by states before they participated in the NDIIPP states project.) However, based on discussions with representatives from many of the partner states, it is clear that very few feel they have the capacity to address digital preservation challenges on their own.

Building Bridges across Professional Communities

The past two decades of work on electronic records management and digital preservation have revealed that the most successful initiatives are those that actively seek connections and collaborations with allied experts and professionals.[13] The NDIIPP states program was designed to involve – to the extent possible – both archivists and librarians from each of the participating states. This has reinforced digital preservation as a common endeavor that is shared across both state records and state publications. However, many of the projects' accomplishments were only possible because of extensive interaction with professionals who are neither librarians nor archivists.

The GeoMAPP project, for example, has benefited from active participation and interaction between both librarians/archivists and GIS professionals, representing the Kentucky Division of Geographic Information, North Carolina Center for Geographic Information and Analysis, and Utah Automated Geographic Reference Center. Over the course of several years, participants in this endeavor have established many common understandings of requirements, expectations, needs and system capabilities. This synthesis of different perspectives and areas of expertise is also reflected in various guidance documents and decision making tools that the project has produced.

According to the GeoMAPP team:

> Collaboration is a key component to establishing a unified approach to preservation. Frequent formal or informal interactions between data creators, data custodians, and archives staff gives those involved the opportunity to build familiarity with each discipline's jargon and workflows, share experiences, and learn about positive and negative data management experiences. A high level of collaboration helps to prevent the duplication of efforts and adds value when implementing policies and systems and creating generalized recommendations, best practices and standards.[14]

Within the MTSA project, the Minnesota Historical Society has engaged not only with archivists and librarians but also with revisers of statutes, open government advocates (Sunlight Foundation), software vendors (Syntactica, Tessella), digital curation service providers (California Digital Library) and national associations related to state information technology and public administration (National Association of State Chief Information Officers, National Conference of Commissioners on Uniform State Laws). This has allowed the project to investigate and document a variety of options for states to pursue. It has also provided the project team with valuable perspectives about what messages and proposed strategies are likely to resonate with decision makers across the country.

As a sub-grant recipient of NDIIPP funds through the MTSA project, KEEP has also built upon and further developed associations that span professional boundaries. The Kansas Historical Society has been the lead institution, and the expertise of KSHS staff has grounded development in fundamental archival concepts such as those of the OAIS Reference Model, as well as the requirements associated with Kansas records laws. However, archival expertise is not enough to ensure the success of a project like KEEP. The project team has included individuals with a wide range of relevant expertise in areas such as legislative information systems, software

development, government accounting standards, state auditing, and IT project management. A major factor in KEEP being incorporated into state information technology policies and procedures is that the Chief Information Technology Officers for all three branches of Kansas state government sit on the KEEP Steering Committee, where they have been able to discuss KEEP-related provisions before bringing them back to their respective constituencies.

One of the most important decisions of the PeDALS project was to hire a full-time programmer, Brian Schnackel, in October of 2009. His professional background was not in libraries or archives, but in private-sector software development and support. He had considerable experience with Microsoft environments, which allowed him to develop BizTalk applications and a tool to extract data from Microsoft email (PST) files. This was expertise not otherwise available to the PeDALS partners, and a great deal of discussion near the end of the project focused on way to ensure that Schnackel could stay on after the completion of the grant, in order to support the continuing activities of the partner states.

Building inter-professional connections can not only mobilize resources and expertise to one's advantage. It can also mobilize pre-existing agendas. The Business Case Working Group of the GeoMAPP project, for example, was able to tap into "existing state continuity of operations (COOP) activities that focus on securing data in the event of a disaster, because the goals of COOP overlap significantly with those of data preservation for cultural heritage purposes."[15] The project's contract with Applied Geographics and AECOM resulted in the GeoMAPP Geoarchiving Business Planning Toolkit, an extensive set of professional resources released in December 2011.[16] An insistence on talking with only a pre-selected set of known collaborators or focusing on a pre-selected set of known digital preservation talking points would have precluded such an opportunity.

The connections between the project leaders and entities outside of cultural institutions have possibly been even more important than those across cultural institutions. In principle, it is easy to see how collaboration across state archives and libraries can be an essential ingredient for building a nation-wide capacity for digital preservation at the state level. An important lesson from the state NDIIPP projects for other states and for potential funders of future projects is that alliances between librarians/archivists and members of other communities can be the most fruitful way to develop digital preservation capacity.

Persistence in the Face of Dramatic Changes and Challenges

During the course of the NDIIPP states projects, many states faced serious internal challenges, including significant budget cuts, staff turnover, major restructuring of parent institutions (Arizona), major restructuring of a key partner agency (Kansas), and even a complete state government shutdown (Minnesota). Table 3 summarizes the number of personnel and key state leadership changes related to the NDDIIP states projects that I have identified. The changes include retirements, leaves from positions and changes to job responsibilities of project personnel (including staff of companies contracted to do project work) that have precluded them from further project participation. Note that these numbers are based on information that I have been able to infer from project documentation and interviews with project personnel; it is likely that the actual numbers are higher due to personnel changes that were not brought to my attention.

Table 3 - Personnel and Leadership Changes[17]

Lead State Participant Changes	21
Other Key Personnel/Leadership Changes in Lead State	10
Other State Partner Changes	28
TOTAL	**59**

In addition to direct project personnel changes, other disruptions (not reflected in Table 3) resulted from the departure of other staff from a project participant's own institution, requiring the project participant to fill the void left by that person. Such second-order personnel disruptions were common across the state NDIIPP projects. For example, if a state library lost a web master or systems librarian, an existing staff member would have to take on some or all of the responsibilities of the departing staff member, leaving much less ability to contribute actively to the state NDIIPP project.

Some of the above changes resulted in readjustments and delays, and several partner states substantively reduced their involvement in the projects. However, none of the disruptions either shutdown or completely derailed the projects. Through the collective efforts of numerous players, the projects adapted to new realities and continued to pursue their stated goals.

Reliance on "soft money" through grants to fund a given type of activity is often considered a sign that the activity may not be legitimized or sustainable. A traditional goal of moving from "projects to programs" is to secure a stream of state general funds. However, the NDIIPP states projects have illustrated that grant funds – particularly when projects are funded for several years and involve multiple parties – can also serve as a catalyst for the sustaining of activities. In the face of dramatic disruptions in state funding, personnel and other resources, the existence of the multi-year, multi-state NDIIPP projects often provide motivation and authority to carry on with the pursuit of digital preservation initiatives.

Beginning with Prototypes and Building Incrementally

Digital preservation is not a single task to be performed in a short amount of time. Progress generally comes from small victories that build on other small victories. The GeoMAPP project team has recommended that geoarchiving efforts be based on a "phased approach" in which agencies "conduct a pilot program first— Test, validate, and sharpen your geoarchiving procedures using a small subset of data before starting full-scale production."[18] According to the MTSA team, "the project is in perpetual beta, [and] we will never be quite done as new options come along new avenues will be taken."[19]

Focusing on Specific Content Types

Much of the success from the NDIIPP state projects has come from focusing on specific content types. It is neither feasible nor beneficial to set the initial goal of preserving all state publications and records. There are a core set of essential functions that tend to be shared across content types, including integrity checks on bitstreams, replication of storage and assignment of persistent identifiers. However, progress in digital preservation above the basic set of functions often comes from focusing on a limited set of materials, in order to better understand their associated characteristics, requirements, behavioral patterns, technological dependencies, genre conventions and institutional norms.

By focusing on geospatial data, the GeoMAPP project was able to generate a substantial amount of guidance and documentation for use by other professionals. Rather than attempting to take on the preservation of all state digital assets, participants in the project could focus their energies on preservation, storage and business model issues that were of particular relevance to geospatial materials. GeoMAPP focuses also allowed the project team to provide several new records and several updates to existing records in the PROMON file format registry maintained by The National Archives in the UK.[20]

The MSPP project is based on the work of the Washington State Digital Archives, whose acquisitions to that point had been primarily digitized marriage records from local governments. Over time, they have extended this scope to include a variety of other types of digitized local government records, and more recently, some born-digital records, including audio files, email and Microsoft Office documents. By focusing on a relatively constrained set of record types, they have been able to establish robust and heavily used preservation and access environments. New record types can often involve further development or customization, but this increment of work is much lower than it would have been to build a new system from scratch.

The PeDALS project also began with digitized marriage records. The PeDALS system was based on the use of BizTalk, which is an environment that can be used to automate processes. The project worked with a company (Neudesic), who would develop new BizTalk workflows for each new record type. The PeDALS team learned that this arrangement would cost approximately $15,000 for each new acquisition type. They determined that providing BizTalk training to project partners and hiring a full-time in-house programmer would be more cost-effective. Later in the project, the team identified .PST email files as a common concern of all of the project partners, so the PeDALS internal software developer, Brian Schnackel, developed an application to extract content from PST files. Schnackel identified a common core of functions related to the acquisition of marriage certificates and PST files, which became the basic "PeDALS software." Project partners could then build further "PeDALS apps" on top of that foundation. Each new record type still requires a significant amount of work, but the project team benefits from the common core software, as well as processes and experiences gained from the additional of previous record types.

The KEEP system is designed to support Producers in converting records into one of the accepted set of formats for submission to the repository; accepted formats currently include PDF, PDF-A, XML, plain text, and ODF. These initial constraints reflect one of the main short-term goals of KEEP, which is to ingest legislative materials from the KLISS system. However, the KEEP documentation also allows for the flexibility of ingesting other types of content if necessary: "In some instances it may be appropriate to Ingest digital content in native legacy formats for which no software tools currently exist for normalizing them in archival preservation formats. In such instances the KEEP System will support the bit preservation (rendering will be accomplished by a compatible viewer) through media and device renewal until new tools are available that can normalize them into archival preservation formats."[21]

Adopting Modular and Decomposable Approaches

When engaging in design and modeling efforts that relate to large, complex systems, modularity can be extremely valuable.[22] In a modular design, there are relatively distinct elements (modules), which are tightly coupled internally but only loosely coupled externally. An essential

condition for modularity is that the interfaces between modules must be explicit, clear, and relatively simple. Professionals responsible for state digital information can pre-empt future costly and problematic system migration efforts by integrating the information into environments specifically designed to support long-term preservation, scalability and interoperability. Limiting the interdependencies between subsystems can also make a design more robust against disruptions from the environment.[23] Modularity also can allow both suppliers and consumers to "mix and match" components to meet their particular needs or perceived needs, and support system evolution, sustainability and innovation. [24] When the modules are part of a system based on open standards, "autonomous innovation can occur not only in one module, but also across several modules."[25]

According to Pete Watters, "The project team has attempted to build PeDALS to be modular. A repository could use pieces of the system, or adopt the system but change or swap out particular components." A risk factor that the project team has long recognized is the heavy dependence of the PeDALS system on BizTalk, which is a proprietary environment that is not ideally suited to many archival workflows and is also not widely supported in many small, public sector organizations. The PeDALS team has made laudable efforts to ensure that state partners can use BizTalk under favorable licensing arrangements, but this does not address the fundamental issue of dependence on the environment. The PeDALS development team has expressed an interest in moving toward an implementation that is more agnostic to the software used for archival workflows. New York has reportedly been investigating the use of Archivematica instead of BizTalk in order to implement workflows on top of a PeDALS private LOCKSS network for some records series. Another issue for PeDALS is the storage size limit of LOCKSS. While the LOCKSS system can use any file system, the PeDALS implementation of LOCKSS uses the ext3 file system which cannot accommodate very large digital collections. This posed a problem for one of the PeDALS partner states, who already had a collection of approximately 12 Terabytes when they joined the project. If states adopt the PeDALS system for digital collections that grow beyond a few Terabytes, they may need to address this underlying dependency.[26]

A concept that is closely related to modularity is "separation of concerns,"[27] which is the clear division of the functions of a computer programs or systems, so that they do not overlap. The MSPP project team has identified separation of concerns as one of the important factors in the design of the system that they provided to state partners.[28]

Preparing for Formal Agreements and Flexibility of Arrangements

A common issue across the NDIIPP state projects was the establishment of contracts with state entities. The MSPP was an arrangement that involved the Washington State Digital Archives hosting data and providing services to entities in other states. This often caused complications in the partner states; several of the states experienced long delays in finalizing their contracts, with one state's negotiation over a lengthy addendum to the base contract taking nine months to resolve. In the PeDALS project, New Mexico is an active participant, but establishing a formal Memorandum of Understanding (MOU) would have required legislative approval, which was not feasible; getting signed agreements between states on server sharing has also been one of the main challenges in realizing the PeDALS vision of replicating storage across partner sites. One of the states that the GeoMAPP project attempted to add as a full partner, Missouri, was

ultimately only able to join as an Informational Partner, because their state's legal personnel raised issues with the agreements required to join as a full partner.

An important risk management factor in projects that span multiple states and multiple state entities is the complication associated with establishing formal agreements. Many agencies are unaccustomed to interstate or interagency arrangements, and development of the required provisions can involve significant effort and delay. To the extent possible, project plans should allow for progress even while the parties involved are awaiting resolution of formal agreements. It can also be beneficial to have a backup plan in the case that formal approval is unsuccessful. In the face of limited state budgets, complex problems that require collective efforts, and the potential economic advantages of initiatives that span state boundaries, I believe that states' legal personnel are likely to become more accustomed to entering into new institutional agreements, contracts and arrangements. The NDIIPP states project grants have contributed to this process by providing financial incentives for entities to establish formal relationships.

In addition to complications associated with formal relationships, there is also the issue of variable levels of attention and participation from project partners over time. Pete Watters of the PeDALS project points out that often "partner involvement ebbs and flows" due to a variety of issues that partners are facing in their local contexts, and when they be afforded the opportunity to participate when they are "ready to contribute again." Similarly, the MSTA project team has suggested the importance of recognizing that "partners are often paying 'constant partial attention' (having so many things going on that you can't give full attention to any one of them) to all of their responsibilities."[29]

Relating State NDIIPP Projects to Library of Congress Goals

The Library of Congress expressed the following goals for the state NDIIPP projects (emphasis mine):

1. **Expand the network** of digital preservation stakeholders to state and local institutions that are mandated to sustain digital government information, especially information important to national and state legislative policy makers. As a legislative federal agency charged with supporting Congress, LC is especially interested in **shared commitments** to preserve such content.
2. Further demonstrate collaborative efforts in two critical areas:
    a. Developing the underlying technical **infrastructure** necessary to sustain digital content, and
    b. **Implementing** broadly applicable **standards, models, and best practices** among stakeholders in a distributed digital preservation network.
3. Encourage models for **multi-state storage** of critical state and local government information for preservation, business continuity, and disaster recovery.
4. Support projects with concrete, demonstrable **results that can be shared** among network participants.[30]

On the first point, NDIIPP has succeeded in considerably expanding the network of participants in its funded activities. Each of the four projects has involved many state entities that were not involved in any other NDIIPP projects.

The ability to cultivate shared commitments (first goal) and multi-state storage (third goal) was a bit more mixed. During the course of the NDIIPP state projects, several of the partners have been able to establish commitments of resources within their own states and institutions that are likely to advance the cause of preserving digital content. The states participating in GeoMAPP have successfully transferred data across state lines; the MSPP partners have transferred data into their digital archives spaces maintained by the Washington State Digital Archives; the PeDALS partners have demonstrated the feasibility of implementing LOCKSS, which can be used to replicate data across locations. However, establishing formal, long-term commitments to preserve content across states has been more difficult. In general, states have ended the projects with the understanding that they will remain solely responsible for the custody of their own materials. In other words, there was important progress on commitments, but not necessarily commitments to collectively preserve specific content.

Regarding the second goal, states have tested and implemented a variety of "standards, models and best practices." As for infrastructure, the MSPP project built upon and extended an architecture and facilities that were already in place at the Washington State Digital Archives; technical advances from the MSPP project related primarily to automating the process for non-Washington parties to submit new series of records. PeDALS has enabled several states to establish workflows for the ingestion of born-digital materials (using BizTalk to build workflows on top of LOCKSS); and the project has also developed a specialized tool for extracting data from PST files, which is an issue faced by many states and organizations. The KEEP project has developed an entirely new system, which is now operational, but still has many existing opportunities for further development. GeoMAPP and MTSA have advanced important elements of the sociotechnical infrastructure that will be required for preserving state digital materials; and several participating states have made significant progress in developing their own technical capacity. However, neither GeoMAPP nor MTSA focused the majority of their efforts specifically on "developing the underlying technical infrastructure necessary to sustain digital content."

Implications and Recommendations for Other States

Progress on digital preservation comes through incremental steps. Each of the NDIIPP state projects has accomplished numerous advances. My recommendation to professionals working in states across the country is to identify priorities in their own contexts for digital preservation in the next few years, look at the numerous incremental advances of the state NDIIPP projects, pick up the ones that promise to advance one's own priorities, extend/adapt them, and then let others know what one has learned in the process.

Recommendation 1 – Adopt Robust Strategies

State personnel with responsibility for digital preservation should cast their collaboration nets widely. Partnerships with chief information officers, software vendors, advocacy groups, and domain experts from data-intensive units of agencies can be just as important as partnerships with librarians and archivists. This lesson is closely related to the previous one about flexibility in the face of disruptive forces. Someone who is a partner now may lose his/her job, shift to other duties or otherwise become unable to participate in further collaboration. Effective programs for digital preservation will involve social networks that are robust and diverse enough

to withstand unexpected shifts in state politics, finances and priorities. The NDIIPP state projects provide numerous lessons for how to establish such networks. However, this does not mean that they have eliminated or mitigated all risks. In order to continue the progress from the projects, it will be essential for those in a position to fund digital preservation activities to recognize how feasible, valuable and indispensable these activities are to the operations of state government. I believe that there is substantial evidence in this report and in extensive documentation from the projects to make this case.

An important lesson from all of the NDIIPP state projects is to plan for sustainability in the face of continuous disruption; this is both possible and necessary. It requires resilience to staff turnover, flexible response to contractual complications, and willingness to adapt to the priorities and expectations of a changing political landscape.

The stewardship of state digital information requires "systems, institutions, and business models that are robust enough to withstand technological failures, changes in institutional missions, and interruptions in management and funding."[31] Professionals and organizations involved in this work should be cautious not to fall into a competency trap[32] of only being able to solve yesterday's problems. States should strive for "requisite variety"[33] in their repertoire of capabilities and the capacity to "absorb" innovations and new information.[34] This should include "robust design"[35] of systems, which is effective in the short-term but also sufficiently flexible to remain effective in a wide range of possible future contexts. They should actively monitor the environment for changes to both the ICT landscape and stakeholder needs/expectations. History suggests that the institutions responsible for information curation that are able to persist over long stretches of time are those that are able and willing to adjust their practices to fit changing funding models and use scenarios.[36]

Recommendation 2 – Continue to Look Outward

A fundamental factor for continuing success will be state government professionals – including those who have participated in the state NDIIPP projects—continuing to look outward. Digital preservation is a highly dynamic arena, with frequent emergence of new projects, technologies, models and funding opportunities. Engagement in and monitoring of professional forums and events is a valuable way to learn about trends, innovations and opportunities.[37] Outreach activities are frequently cited as important for advancing one's agenda, but they are also essential for informing and revising one's own work practices and approaches. As the GeoMAPP team has pointed out, "hitting the road" not only supports "sharing information that others may find valuable," but it also "can inform and improve your internal practices."[38]

Interstate sharing of experiences and lessons, like those presented in this report, can also help to determine which options and strategies are appropriate in a variety of contexts. "If an option appears to be effective in several, highly different scenarios, this implies that the option is robust. For options that are not robust, it is equally significant to understand under which circumstances they are not effective."[39] Collaboration does not require conformity to a single approach across all states; such conformity would be neither feasible nor beneficial. "Systems lacking diversity, in the extreme monocultures, are vulnerable to catastrophic failure."[40] Partnerships with academic and industry players can also open up new avenues for learning and collective action. And hiring of professionals who are not only willing but are genuinely excited about working across boundaries will be essential.

Recommendation 3 – Pick a Mode of Contribution and Act on It

Preservation of state digital resources requires collaboration. In order to engage in collaborative work, it is important to have something valuable to offer the other collaborators. Contributions can take a variety of forms. Earlier in this report, I characterized each of the projects in terms of the primarily role played by its lead partner. Table 4 elaborates some of the main risk factors and viable strategies for taking on each of the three types of roles.

Table 4 – Digital Preservation Roles and Associated Risks and Strategies

Role	Main Risk Factors	Strategies
Digital Preservation Service Provider	• Interruption in revenue streams to support operations	• Establish multiple funding mechanisms • Persuade high-level decision makers to advocate for the service[41] • Demonstrate and document clear value added by the service
	• Information loss or corruption	• Build incrementally starting with relatively well-understood processes and data types • Perform integrity checks at various points in the life of digital objects • Avoid single points of failure
	• Excessive system maintenance costs	• Avoid "scope creep" associated with system functionality • Adopt modular designs and open architectures
	• Service offerings that no do not meet market needs	• Monitor technical and user landscape for significant changes • Actively and frequently engage with the wider digital preservation community (industry, academic and public sector)
Digital Preservation Enabler	• Product offerings that do not meet current market needs	• Monitor technical and user landscape for significant changes • Actively and frequently engage with the wider digital preservation community (industry, academic and public sector)
	• Incompatibility with practices and tools already in use by intended user communities	• Adopt modular designs and open architectures • Survey (formally and informally) intended user groups to determine current practices and tools
Digital Preservation Facilitator	• Messages do not reach the right audiences	• Use multiple communication channels and packaging approaches • Attend meetings and contribute to professional forums, in order to gain standing
	• Messages do not compel audiences to act	• Assign facilitation duties to great communicators • Convey messages that involve all three elements of professional expertise: diagnosis, inference and treatment[42]

Although they are not mutually exclusive, each of the roles does imply its own set of strategies and risk factors. Identifying which role one is likely to play in the collaboration can be an important step toward formulating a plan of action.

Implications and Recommendations for Funding Agencies

The state projects can points to numerous ways in which they have met the fourth goal of having "concrete, demonstrable results that can be shared among network participants." I would point out, for example, the extensive guidance documentation generated by the MTSA and GeoMAPP projects. The PeDALS project has developed both open-source tools and configuration guidance that can be useful to other states. The KEEP Policy Framework may also serve as a starting point for system development efforts elsewhere. More importantly, as expressed above, many of the most important products of the NDIIPP state projects are alliances, shared experiences and strategic approaches.

I would suggest three main lessons for potential funders of future state digital preservation projects. First, multi-year projects are a major benefit in a state government context. As states have gone through major budget cuts, restructuring and turnovers in political leadership, a designated source of funds that spans several fiscal years can be extremely beneficial. Second, alliances can bring legitimacy. By joining forces under a common initiative, with backing by NDIIPP and the Library of Congress, many state agencies were able to draw much more attention to digital preservation issues than they could have otherwise. Finally, providing for multiple forms of participation is essential. Due to local legal and resources constraints, not all states can play the same roles or enter into the same formal agreements as all others. It will be wise for funding agencies to entertain a variety of interstate arrangements that best meet the situations of the states involved.

Acknowledgements

Financial support for the development of this report has come from the Library of Congress through NDIIPP. Several individuals from the Library of Congress have provided significant information, feedback and guidance: Erin Engle, Michelle Gallinger, Butch Lazorchak, and Bill Lefurgy. I would like to thank Sarah Houlditch-Fair, Candice La Plante, and Marty Gengenbach for helping me to compile and summarize information about the projects and other state activities. The NDIIPP state project review process grew out of a consultation with members of the MSTA project, and I would particularly like to thank Bob Horton, Carol Kussmann and Shawn Rounds from the Minnesota Historical Society for their valuable support.
Several individuals provided feedback, corrections and suggestions in response to drafts of this report: Alec Bethune, Cathi Carmack, Dan Dodge, Erin Engle, Kelly Eubank, Mark Flynn, Duncan Friend, Pam Greenberg, Bob Horton, Jennifer Jones, Carol Kussmann, Butch Lazorchak, Jennifer Lee, Bill Lefurgy, Glen McAninch, John Hyrum Martinez, Patricia Michaelis, Richard Pearce-Moses, Elizabeth Perkes, Victoria Reich, Shawn Rounds, Amy Rudersdorf, Tom Ryan, June Timmons, Matt Veatch, Pete Watters, Lynne Webb, and Bonita Weddle. The report is more accurate and informative, due to their numerous contributions.

I have appreciated the generosity of time and attention from individuals involved with all of the projects who have shared information and observations. These have included:

- GeoMAPP: Alec Bethune, Kelly Eubank, Glen McAninch, Mark Myers, Joe Sewash, and Lisa Speaker

- KEEP: Lori Ashley, Richard Case, Terri Clark, Charles Dollar, Duncan Friend, Don Heiman, Scott Leonard, Sean McGrath, Pat Michaelis, Jim Minihan, Tom Ryan, and Matt Veatch
- MSTA: Stephen Abrams, Tricia Cruise, Mark Evans, Isaac Holmlund, Bob Horton, Jennifer Jones, Carol Kussmann, Dan McCreary, Charles Rodgers, Shawn Rounds, and Robert Sharpe
- MSPP: Jim Corridan, Jerry Handfield, Justin Jaffe, Adam Miller, Bryan Smith, Harold Stoehr, June Timmons, and Dan Waterbly
- PeDALS: Richard Pearce-Moses, Linda Reib, Brian Schnackel, and Pete Watters

Appendices

A. GeoMAPP – Project Summary

Project title
Geospatial Multistate Archive and Preservation Partnership (GeoMAPP) [formerly the Multi-State Demonstration Project for Preservation of State Government Digital Information]

Brief project description
GeoMAPP focuses on the preservation of "at risk" and temporally significant digital geospatial content. Project objectives include exploring advanced methods to provide access to and ensure the long-term preservation of archived geospatial data; developing business planning tools and documentation to support the creation of materials to solicit or maintain sustainable funding for geoarchiving programs; engaging in outreach to local, state, and federal geospatial data creators and national GIS and archives bodies and industry to highlight the issues of data preservation; and documentation of best practices and lessons learned from technical explorations and outreach efforts.

Main factors that drove initiation of the project
Geospatial data layers containing information about land parcels, zoning, roads, and jurisdictional boundaries change regularly. The data are often at risk of being overwritten and lost when updates or changes are made. Major risk factors for geospatial data include data format dependencies and obsolescence; spatial database complexity, fragility and uncertainty surrounding digital cartographic representation; time-versioning of content; metadata unavailability or inconsistency; and the absence of a generally supported content packaging design for complex geospatial data.

GeoMAPP has aimed to identify common solutions and consolidated findings that could be shared with other states and localities to help address the challenges of designing, implementing and sustaining processes and systems to help preserve geospatial data for future use and analysis. The project team also saw GeoMAPP as an opportunity to engage with the Library of Congress and other participants in NDIIPP.

Project goals expressed in proposal
- Identifying geospatial content within each state that is temporally valuable or is "at-risk" of being lost when updates are made;
- Analyzing and providing recommendations on workflows in each state that affect the ability to preserve digital geospatial data;
- Exploring the challenges of building collaborative relationships across organizational units within each state and across state lines;
- Investigating technical challenges related to the inventory, appraisal, ingest, storage and preservation processes to ensure the long-term viability and accessibility of valuable digital geospatial data;
- Researching business planning materials and practices that could be used to justify the creation, expansion or maintenance of a sustainable geoarchive;
- Engaging relevant industry members from both the geospatial and archives communities to learn about products that could benefit the geoarchiving process and potentially encourage product changes that could benefit future archiving efforts;

- Conducting outreach with geospatial data creators as well as archives and geospatial leaders, providing demonstrable models, practices and tools that can be shared with other state, local and regional government entities.[43]

Participating parties

In addition to the partners listed below, the U.S. National Archives and Records Administration (NARA) has also provided important contributions to the GeoMAPP project. Brett Abrams and Don Chalfant at NARA have reviewed and provided feedback on project documents.

Table 5 - GeoMAPP Project Full Partners

Entity	Description	GeoMAPP Personnel
Kentucky The Kentucky GeoMAPP team is comprised of staff from the Department for Libraries and Archives (KDLA) and the Department of Geographic Information (DGI) which manages the Kentucky Geography Network (KYGEONET). Kentucky State University provided technical GIS training, consultation, and project assistance.		
Kentucky Department for Libraries and Archives (KDLA)	Holdings include Kentucky's city, county and state government records. The library is also a Congressionally designated depository for U.S. Government documents.	• Glen McAninch, Technology and Analysis Branch Manager • Mark Myers, Electronic Records Specialist for the Public Records Division • Skip Hunt, Information Technology Branch Manager
Kentucky Division of Geographic Information (DGI)	The DGI is part of Kentucky's Commonwealth Office of Technology (COT) and is responsible for maintenance of the Commonwealth's enterprise GIS services. The DGI manages the Kentucky Geography Network (KYGEONET), Kentucky's geospatial data clearinghouse. The Division has also established collaborations with all levels of government, "in order to promote the application of GIS through strategic planning, technical support, policy development, and administrative and technical support of the Geographic Information Advisory Council (GIAC)."[44]	• Kent Anness, GIS Manager • Kim Anness, GIS Analyst/Programmer • Kenny Ratliff- DGI Director (resigned in April 2008)
Kentucky State University	Kentucky State University's GeoSpatial Education and Analysis Program, funded by the U.S. Department of Agriculture, provides and supports GIS training and supports use and sharing of public GIS resources of Kentucky.[45]	Ken Bates, GIS Extension Specialist
Montana (Informational Partner from October 2009 to February 4, 2011; Full Partner from February 4, 2011 to the present)		
Montana State Library, Digital Library Division	The Montana State Library serves the information needs of Montana government agency management and staff, and aims to	Jennie Stapp, Digital Library Director

Entity	Description	GeoMAPP Personnel
	ensure that all Montana citizens have access to information created by the government. The Library provides a range of services, including mapping applications, reference services, statewide databases, and plant and animal field guides.[46]	
Montana State Library, Natural Resource Information System (NRIS)	NRIS is a program of the Montana State Library. It was established in 1985, and its "mission is to make information on Montana's natural resources easily and readily accessible. Serving government agencies, business and industry, and private citizens, NRIS operates a clearinghouse and referral service to link users with the best sources of information and service."[47]	• Evan Hammer, NRIS Manager • Gerry Daumiller, GIS Programmer/Analyst • Diane Papineau, GIS Programmer/Analyst
North Carolina (Lead Partner) The North Carolina team includes staff from the North Carolina State Archives Section and the North Carolina Center for Geographic Information and Analysis (CGIA). North Carolina State University (NCSU) Libraries played a technical advisory role, sharing lessons learned from their experiences with the North Carolina Geospatial Data Archiving Project (NCGDAP) and involvement with national geospatial organizations such as the Open Geospatial Consortium (OGC).		
North Carolina Center for Geographic Information Analysis (CGIA)	The CGIA is the lead agency for geographic information systems (GIS) services and GIS coordination for the State of North Carolina. When the CGIA began the GeoMAPP project, it was organizationally aligned with the state Department of Environment and Natural Resources, but in late 2009 the CGIA transitioned to the Office of Information Technology Services. CGIA provides GIS services to state and local governments as well as the private sector. "The mission of CGIA's Coordination Program is to facilitate and advance statewide (intergovernmental) geospatial coordination initiatives that result in cost-effective ways to create, access, and apply geographic data and technology. Results include assurances that reliable and high-quality data are current, and that tools are in place for decision-makers to access these data resources."[48]	• Alec Bethune, GIS Analyst • Jeffrey Brown, Project Manager, GISP • Zsolt Nagy, Program Manager (Statewide GIS Coordinator) and GeoMAPP Principal Investigator (start of project to August 2009) • Joe Sewash, Services Program Manager (GeoMAPP Principal Investigator, August 2009-Present)
State Archives of North Carolina	The North Carolina State Archives, a section of the Division of Historical Resources of the North Carolina Department of Cultural Resources which has the responsibility to preserve and make accessible records created by state and local government agencies in North Carolina. "It is the responsibility of the Archives and Records Section to promote	• Kelly Eubank, Electronic Records Archivist (GeoMAPP Co-PI) • Pamela D. Ingle, Electronic Records Branch • Megan Durden, Electronic Records Branch (resigned on November 2008)

Entity	Description	GeoMAPP Personnel
	and safeguard the documentary heritage of the State of North Carolina, particularly as it pertains to public offices. This is done by managing and collecting the records of state and local governments, and providing technical assistance to all agencies (including public universities) on the management of all their records... The agency provides assistance to citizens and governmental bodies in locating documents in the state archives, and it preserves those records of enduring value to the highest archival standards."[49]	• Mary Samouelian, Electronic Records Branch (February 2009 to May 2010) • Lisa Speaker, Electronic Records Branch (started October 2010)
North Carolina State University Libraries	The NCSU Libraries provide assistance in locating, selecting, and using GIS data resources, as well as providing access to data resources and GIS software.[50] Primary clientele of the Libraries are individual associated with the university, but they provide assistance to non-NCSU users "as resources permit."[51]	• Jeff Essic, Data Services Librarian • Steve Morris, Head of Digital Library Initiatives and Digital Projects Digital Library Initiatives
Utah The Utah GeoMAPP team is comprised of staff from the Division of Archives and Records Service and the Automated Geographic Reference Center (AGRC). AGRC manages the State Geographic Information Database (SGID), Utah's geospatial data clearinghouse. The Archives is a division within the Department of Administrative Services, while AGRC is part of the Department of Technology Services. Prior to kicking off the GeoMAPP effort, Utah was in the early stages of building an electronic records program.		
Utah State Archives and Records Services	The Utah State Archives and Records Service, a division within the Dept. of Administrative Services, manages records created by state and local governmental entities in Utah, and provides access to historical government records which are in its permanent collection.[52]	• Elizabeth Perkes, Electronic Records Archivist • Heidi Stringham, Archivist (participated in GeoMAPP from 2008-2009)
Utah Automated Geographic Reference Center (AGRC)	"The mission of AGRC is to encourage and facilitate the effective use of geospatial information and technology for Utah. The Utah Automated Geographic Reference Center (AGRC) provides a wide range of Geographic Information System (GIS) and other geospatial support services. AGRC strives to ensure a high level of coordination among Utah GIS users and effective, efficient use of GIS resources. Other services include stewardship of the State Geographic Information Database (SGID), facilitation of programs and activities to implement GIS technology across the state, and coordination of GIS policy development and	• Matt Peters, Manager of Application Development and Technology • Cindy Clark, SGID Administrator • Michael Foulger, Database Administrator • Dennis Goreham, Direct of AGRC (retired December 2008) • Spencer Jenkins, Director, AGRC (since March 2011)

Entity	Description	GeoMAPP Personnel
	implementation activities. AGRC also provides consulting services to federal, state, and local government and other organizations, including GIS analysis and application development, GIS training courses, and Internet Map Service development and hosting."[53]	

Table 6 - GeoMAPP Informational Partners[54]

Entity	Description	GeoMAPP Personnel
Arizona (since February 4, 2011)		
Arizona State Library, Archives and Public Records	The Arizona State Library, Archives and Public Records serves the information needs of Arizona citizens, providing access to unique historical and contemporary resources, including: Archives of historical records in Arizona; Museum on state government history and people of the state; Public records management program; Research and law library.[55] ASLAPR collects state agency publications and the permanently valuable records of the state and its political subdivisions, and is responsible for establishing records retention periods for the state and political subdivisions.[56]	Linda Reib, Electronic Records Archivist, History and Archives Division
Arizona State Cartographer's Office	The Arizona State Cartographer's Office is dedicated to improving access to GIS information and geospatial data. The Arizona State Cartographer's Office serves the Arizona GIS community by establishing a clearinghouse of information about data resources, developing web-based information services, improving access to GIS databases, preparing GIS policies and standards, coordinating the development of common projects, and providing support for the Arizona Geographic Information Council[57]	Gene Trobia, State Cartographer
District of Columbia (since October 2009)		
District of Columbia Office of Public Records	"The Office of Public Records Management, Archival Administration, and Library of Government Information was established in 1985 by DC Law 6-19 to collect, preserve, conserve, and service the official records of the District of Columbia government. The Office of Public Records consists of three divisions,	Ali Rahmann, Archivist

Entity	Description	GeoMAPP Personnel
	the District of Columbia Archives, District of Columbia Records Center, and the Library of Government Information. These repositories hold a wide array of documents that include administrative, architectural, engineering, fiscal, genealogical, historical, and legal records."[58]	
District of Columbia Office of the Chief Technology Officer	"The Office of the Chief Technology Officer (OCTO) is the central technology organization of the District of Columbia Government. OCTO develops, implements, and maintains the District's technology infrastructure; develops and implements major enterprise applications; establishes and oversees technology policies and standards for the District; provides technology services and support for District agencies, and develops technology solutions to improve services to businesses, residents and visitors in all areas of District government."[59]	Mario Field, GIS Data Team Lead
Georgia (since October 2009)		
Records and Information Management Services - Georgia Archives	"The mission of the Georgia Archives is to identify, select, preserve, and make accessible records that constitute Georgia's recorded history; to increase the efficiency of State Government through effective records management; and to improve the quality of records and archives management throughout the state."[60] "The Archives advises state agencies and local governments of appropriate records-keeping techniques and systems, provides training in a variety of records management topics, and guides agencies in the development and use of retention schedules. The Archives operates the State Records Center… The mission of the Records and Information Management Services Program is to promote the efficient administration and management of Georgia governments' records in compliance with the Georgia Records Act."[61]	Amelia Winstead, State and Local Government Services Manager
Information Technology Outreach Services Division, Carl	"Information Technology Outreach Services (ITOS) serves enterprises in the governmental, nonprofit, and service delivery sectors." "The Vinson Institute's	Eric McRae, Director

Entity	Description	GeoMAPP Personnel
Vinson Institute of Government, The University of Georgia (CVIOG-UGA)	Office of Information Technology Outreach Services (ITOS) is a leader in GIS innovation in Georgia and nationwide."[62]	
Illinois (since September 2010)		
Illinois State Geological Survey	The mission of the ISGS is "to provide the citizens and institutions of Illinois with earth science research and information that are accurate, objective, and relevant to our State's environmental quality, economic prosperity, and public safety."[63]	Sheena Beaverson, GIS Specialist
Kansas (since March 2011)		
Kansas Historical Society	"The Kansas Historical Society is the state agency charged with actively safeguarding and sharing the state's history to facilitate government accountability, economic development, and the education of Kansans. This is accomplished by collecting, preserving, and interpreting materials and information pertaining to state government and Kansas history."[64]	Matt Veatch, State Archivist
Kansas Information Technology Office	"The Kansas Information Technology Office (KITO) supports the statutory responsibilities of the Executive, Judicial, and Legislative Branch Chief Information Technology Officers (CITOs) and the Chief Information Technology Architect (CITA) by providing enterprise services across state government."[65] The Geographic Information Systems Policy Board is one of KITO's governing bodies.[66]	Ivan Weichert, Director Geographic Information Systems
Maine (since October 2009)		
Maine State Archives	The Maine State Archives collaborates with Maine's GeoLibrary Board on the GeoArchives records access project. The NHPRC funded the GeoArchives records access project in 2004 to "create standards in order to designate a select set of Maine State Geographic Information System (GIS) records as archival; develop, in partnership with the GeoLibrary, an internet-based GeoArchives system prototype, and implement it for a selected set of archival GIS records; and amend Archives Advisory Board, GeoLibrary, and Information Services Policy Board rules to recognize and enforce the	• David Cheever, State Archivist • Jeffrey Brown, Archivist

Entity	Description	GeoMAPP Personnel
	implementation of the new standard(s) and prototype throughout Maine government."[67]	
Maine Office of GIS	MEGIS provides technical support for Maine GIS data, estimates on custom mapping, and consultation on data and application development.[68]	Michael Smith, State GIS Manager
Maryland (since October 2009)		
Maryland State Archives	"As the historical agency for Maryland, the State Archives is the central depository for government records of permanent value."[69]	• Tim Baker, Deputy State Archivist • Kathryn Baringer, Deputy Director of Appraisal and Description • Kim Moreno, Director of Appraisal and Description • James Watson, Outreach Archivist
Maryland Department of Natural Resources	The Maryland Department of Natural Resources provides online access to a listing of various maps including, but not limited to: Land and Water Trails, State Parks, State Forests, Wildlife Management Areas, Water Quality maps, and interactive mapping such as MERLIN Online through the GIS Maps and Map Data portal. It also offers access to GIS data via a Data Download site or from an order form for data that is not available through the download site.[70]	Ken Miller, Geographic Information Officer
Department of Information Technology	The Department of Information Technology (DoIT) has policy responsibility for information technology matters across state agencies. DoIT coordinates, purchases and manages all telecommunications devices and systems used by state agencies.[71]	Kenneth M. Miller, Geographic Information Officer
Minnesota (since October 2009)		
Minnesota Historical Society	MHS is a non-profit institution established in 1849. It "collects, preserves and tells the story of Minnesota's past through museum exhibits, libraries and collections, historic sites, educational programs and book publishing."[72] MHS administers the state archives of Minnesota and operates 26 historic sites and museums.	Lesley Kadish, Curator for GIS and Digital Maps
Minnesota Department of Administration, Geospatial	MnGeo coordinates the development, implementation, support and use of geospatial technology, and offers technical services to state agencies and the statewide	Christopher Cialek, Minnesota GIS Clearinghouse Manager

Entity	Description	GeoMAPP Personnel
Information Office (MnGeo)	GIS community. MnGeo promotes an enterprise-wide approach to delivery of GIS technical service by its partners, and "offers guidance, training, and consulting to agencies needing extra help to improve their services by implementing GIS."[73]	
Mississippi (since February 2011)		
Mississippi Department of Archives and History	The Mississippi Department of Archives and History "collects, preserves, and provides access to the archival resources of the state, administers museums and historic sites, and oversees statewide programs for historic preservation, government records management, and publications."[74]	David Pilcher, Head of Electronic Records Section
Mississippi Geospatial Clearinghouse	The Mississippi Geospatial Clearinghouse (MGC) "provides access to a comprehensive spatial information warehouse of Geographic Information Systems (GIS) resources of Mississippi for use by government, academia, and the private sector. The goal of the MGC is to make the application of spatial information technologies within the State of Mississippi more efficient by reducing the duplication of spatial data production and enhancing distribution through effective cooperation, standardization, communication, and coordination."[75]	
Mississippi Department of Information Technology Services	Mississippi Department of Information Technology Services (ITS) "facilitates effective planning, deployment, and operation of information technologies for Mississippi State Government."[76]	Debra Brown, Emerging Technology Coordinator
Missouri (since July 2011)		
Missouri Spatial Data Information Service	MSDIS is "responsible for data storage and access, standardization of both digital and tabular data, creation of the data dictionary, compilation of metadata, and statewide GIS user information networks."[77]	• Tim Haithcoat, Director • Shannon White, Outreach Specialist
Missouri State Archives	"The Missouri State Archives is the official repository for state records of permanent and historical value. Its mission is to foster an appreciation of Missouri history and illuminate contemporary public issues by preserving and making available the state's permanent records to its citizens and their government."[78]	Nathan Troup, Archivist

Entity	Description	GeoMAPP Personnel
New York (since October 2009)		
New York State Archives	"The New York State Archives leads efforts, on behalf of all New Yorkers, to manage, preserve, ensure open access to, and promote the wide use of, records that support information needs and document the history, governments, events and peoples" of the state of New York.[79]	Jennifer O'Neill, State Agency Services Supervisor
New York State Office of Cyber Security and Critical Infrastructure Coordination	The New York State Office of Cyber Security and Critical Infrastructure Coordination is "responsible for Statewide policies, standards, programs, and services relating to cyber security and geographic information systems (GIS), including the Statewide coordination of GIS."[80]	Cheryl Benjamin, Chair, New York State Standards & Data Coordination Work Group
Texas (since October 2009)		
Texas State Library and Archives Commission	The mission of the Texas State Library and Archives Commission includes preserving the record of government for public scrutiny and securing and making accessible historically significant records and other valuable resources.[81]	Laura K. Saegert, Appraisal Archivist
Texas Natural Resource Information System	"TNRIS is a part of the Texas Water Development Board (TWDB) under the Water Resources Planning and Information division. The TWDB receives advice on the operation of TNRIS from the Texas Geographic Information Council (TGIC), a geographic data planning and coordination group serving state and regional government agencies in the State of Texas. TGIC also advises the Executive Director of the Department of Information Resources on statewide rules and guidelines for agency use of geographic information technologies."[82]	• James Scott, Director • Richard Wade, Team Lead
Wisconsin (since October 2009)		
University of Wisconsin-Madison	"The UW-Madison has been a major participant in and contributor to the emerging discipline of Geographic Information Science… [The UW-Madison] Spatial Information and Analysis Consortium (SIAC) arose from UW-Madison's response to the National Science Foundation call for the establishment of a National Center for Geographic Information and Analysis (NCGIA) in 1988. Since its formation by UW-Madison faculty in 1991, SIAC's primary mission	• Jaime Stoltenberg, Map and GIS Librarian • A.J. Wortley, Sr. Outreach Specialist at University of Wisconsin-Madison State Cartographer's Office

Entity	Description	GeoMAPP Personnel
	has been to provide coordination of those programs and activities that address the collection, management, analysis, and application of spatially-referenced information about natural, social, and cultural environments."[83]	
Wisconsin Department of Administration	The Division of Enterprise Technology "provides computer services to state agencies and local governments, and operates the statewide voice, data and video telecommunications network." The Division's Geographic Information Office "coordinates Wisconsin's geospatial information activities and provides geographic information systems (GIS) services to state agencies, service organizations and local governments."[84]	Curtis Pulford, Geographic Information Officer
Wyoming (since October 2009)		
American Heritage Center, University of Wyoming	The American Heritage Center (AHC) is the repository for the University of Wyoming's (UW) special collections and archives, including the university's rare books library and one of the largest manuscript collections in the U.S.[85] Its mission includes providing "a national model of collection development, management, and cataloging, statewide leadership on the complex issues surrounding electronic source material—their generation, assessment, preservation, and long-term utility—and broad leadership in state and regional cultural and historical activities."[86]	• Ben Goldman, Digital Programs Archivist • Laura Jackson, Assistant Archivist
Wyoming Geographic Information Science Center, University of Wyoming	The Wyoming Geographic Information Science Center (WyGISC's) mission is "to advance the knowledge and application of geographic information science and technology through research, education, and service. The Center's education, training and information and technology transfer activities further support the adoption and use of geospatial data and information technologies among a wide range of end-users in academia, government, business, and the general public."[87]	• Jeff Hamerlinck, Director • Jim Oakleaf, Technical Services Coordinator

Resources the parties committed to the project
Each Full Partner state has committed at least one staff member from both the archives and the GIS organizations to attend bi-weekly project meetings, travel to biannual face-to-face partner meetings and to participate in one or more technical working groups. Each Informational Partner has committed to have a state GIS and Preservation staffer attend bi-monthly Informational Partner meetings and reserve two hours per month to review project documentation.

Expected benefits of participating
The project is of interest to state geospatial coordination offices because moving content in an organized way across jurisdictional boundaries furthers state interests in national spatial data infrastructure, which supports many business processes requiring access to geospatial content.

Sub-award amounts are estimated on average to be $75,000-80,000 per state for each phase of the work (2007-2009 and 2010-2011), to be commensurate with the agreed scope of services. NCSU Libraries received a sub-award of approximately $30,000.

Related collaborations and relationships of the participating parties before the project
In 2001-2003, North Carolina collaborated with Delaware and Wyoming to investigate issues related to electronic records—web site capture and email. The State Archives of North Carolina has collaborated with the State Library of North Carolina since 2003 on the Library's Access to State Government Information Initiative (LSTA funds). In 2007-2008, North Carolina and Kentucky collaborated on the E-mail Collection and Preservation Tool discussed above.

Kentucky had an established working relationship between KDLA and DGI prior to the GeoMAPP project. KDLA has been working with DGI and its predecessor agency since 2005, including producing records retention schedules and records transfers.

Examples of state activities enabled by the grant

North Carolina: North Carolina State Archives purchased and staged a storage environment consisting of 15 terabytes of Storage Area Network (SAN) storage and 3 portable drives totaling 7 terabytes in anticipation of project data transfers. They also hired an archivist to work on the grant and do much of the research and processing work.

Kentucky: GeoMAPP allowed Kentucky to continue expansion of its electronic records program through the financial support, sharing of ideas/techniques, and development of best practices. KDLA (Kentucky Department for Libraries & Archives) had 1 terabyte of storage in place prior to the project to help store their snapshots of DGI's vector data, and project funds allowed this capacity to expand to more than 10 terabytes to handle extended vector holdings in addition to some raster imagery.

Utah: After joining GeoMAPP, Utah began a significant outreach program to engage county, state, and local agencies that were producing geospatial data. GeoMAPP has also enabled the Utah Archives and AGRC to extend their relationship with local data creators by supporting travel to localities and regional agencies across the state. During these visits, data were inventoried and added to the GIS Inventory, and targeted data were copied and

transferred to the SGID and the Archives. GeoMAPP allowed Utah to further develop their AXAEM system to ingest electronic records and metadata, integrate these records with other features of the system (including finding aid descriptions and retention schedules), and provide online search, downloading, integrity checking and format migration. While these features continue to be developed, Utah has ingested several thousand documents into their collection.

Decisions or commitments necessitated or enabled by the grant

Kentucky: Because of the previously established data exchange between DGI and the national inventory Geospatial One Stop, KDLA elected to work within the existing data exchange environment. Kentucky investigated loading the state data set into the smaller Ramona GIS Inventory produced by the National States Geographic Information Council (NSGIC), but this became impractical, because Ramona refused to provide a batch loading mechanism. The result was that Kentucky, like many other states, ultimately did not participate actively in the GIS Inventory.

North Carolina: The state's Geographic Information Coordinating Council (GICC) adopted recommendations from GeoMAPP's Long Term Archival and Access working group led by Ann Payne. The GICC also adopted a file naming schema, developed by GeoMAPP graduate student assistant Jon Breece, for more than 63,000 orthoimagery tiles.

Utah: The GeoMAPP project allowed the Utah State Archives to more actively identify individual electronic datasets and record them in a catalog database. The catalog functionality has expanded to address multiple formats including geospatial data. The archives staff has had ongoing discussions with its IT department about preserving email. The archives has also begun a pilot project with the state's Purchasing Division to classify agency e-mail messages and export them out of the existing proprietary e-mail system. As the project progressed, both agencies in Utah realized that the long-term plans for geoarchiving would benefit from the establishment of a formal agreement between the agencies. A Memorandum of Understanding (MOU) was signed between the Utah Division of Archives and Records Service and AGRC outlining each agency's responsibilities to preserve the long-term availability of geospatial data.

Changes in the standing of project participants within the state's governance structures or processes

In July 2010, the State Archives of North Carolina created the Electronic Records Branch to work across the archives and address the preservation of its digital assets.

Resources mobilized as a result of the project

North Carolina: Staff from the North Carolina State Archives secured support for their records management programs. In North Carolina's 2009 Legislative session, the General Assembly added an additional $5 fee on all deeds to be collected and sent to the Department of Cultural Resources to support Archives and Records Management. The North Carolina

Department of Cultural Resources Information Technology group (DCR-IT) allocated a small application server to the project to help run scripts and manage the data being transferred as part of the project. The NC Department of Cultural Resources also purchased 70 TB of storage and installed the storage in the Western Regional Archives (a service branch of the Office of Archives and History) in Asheville for data redundancy and disaster recovery.

Kentucky: Participation in GeoMAPP has helped catalyze discussion between KDLA (Kentucky Department for Libraries and Archives), DGI (Department of Geographic Information) and several regional agencies responsible for hosting local government data that charge for data access.

Cross-State:
Late in the project, GeoMAPP was able to draw from the expertise of Applied Geographics and AECOM to develop business planning resources. This contract began in August 2011, and the project released the GeoMAPP Geoarchiving Business Planning Toolkit in December 2011. The Toolkit includes the following:

- Geoarchiving Business Planning Process Map and Checklist
- Geoarchiving Business Planning Guidebook
- Geoarchiving Business Cost-Benefit Analysis Guidance
- Geoarchiving Cost-Benefit Analysis Tool
- Geoarchiving Use Case Guidance
- Geoarchiving Business Planning Bibliography

According to the GeoMAPP site:

> These tools encourage the collaboration of the GIS and archival professionals to prepare a business plan for establishing, sustaining, or extending an archival program that advances the long-term preservation of a state's valuable geospatial assets. The toolkit offers a process-oriented approach that presents checklists, planning questions, and tools to assist in characterizing both the costs and benefits related to a geoarchiving program, that can be assembled to produce a compelling business plan that is important to informing funding requests and justifying funding allocations.[88]

The GeoMAPP team proposed several enhancements to the RAMONA inventory including: periodic email reminders to inventory participants to update their inventory; additional holdings; inclusion of new fields in the data entry form such as "Layer Title," "Data Format", and a stand-alone archiving section for each dataset; and enhanced reporting functionality. Building on efforts that began with the NCGDAP project, the team submitted a list of these recommended enhancements to the stewards of the GIS Inventory tool, who have implemented several of the recommendations.

The GeoMAPP team also provided several new records and several updates to existing records in the PROMON file format registry maintained by The National Archives in the UK.[89]

Systems development and implementation - scope, architecture, and components

North Carolina:

Geospatial Architecture:

North Carolina's spatial data clearinghouse, NC OneMap, provides free public access – in the form of Esri shapefiles - to data created by state, local and federal agencies. Raster data is available in MrSID, JPEG, and IMG formats. In 2009, the site provided File Transfer Protocol (FTP) download access to more than 110 vector and 125 raster geospatial datasets. Metadata for NC OneMap's datasets comply with Federal Geographic Data Committee (FGDC) standards. If a metadata record is not included when data is submitted for posting, staff will create a new metadata record with input from the data creator. The OneMap team will also enhance or refine existing metadata records transferred with datasets when they are missing critical information with input from the data creator. Before data is posted it is also opened and checked to assess file validity, dataset projection and geographic extent.

Despite having a centralized repository, most geospatial data in North Carolina are produced, maintained and hosted by data creators situated in a variety of state and local governments agencies, thus giving North Carolina a fairly decentralized approach to providing access to its geospatial content. NC OneMap uses Web Map Services (WMS) to provide access to these remotely created and managed datasets via the Internet. In 2009, more than 350 geographic data layers were accessible using the NC OneMap viewer and NC OneMap had established relationships with more than 100 partners who shared data either directly or via WMS, including federal, state and local government agencies and academic institutions. More than 80% of these partners represent city or county government.

Inventory:

North Carolina's primary centralized inventory tool is the NC OneMap Inventory powered by the national RAMONA database. This database allows local and state agencies to enter information about their geospatial data into a central web-based interface that is national in scope and publicly accessible. The GIS Inventory/RAMONA database is divided into 18 data categories and more than 200 specific data layer types. From the information a user provides about a specific dataset, a starter Federal Geographic Data Committee (FGDC) metadata record is produced. The inventory tool also allows users the option of publishing information about their data to the Geospatial One Stop (GOS).

Access:

The North Carolina team cataloged the data ingested as part of the project into the Manuscript and Archives Reference System (MARS), the online union catalog for the State Archives of North Carolina which contains searchable descriptions of its holdings. The North Carolina Archives also created an Encoded Access Description (EAD) finding aid, which has been indexed by web search engines, including Google. The North

Carolina team also ran user tests to determine how well users could find the data and followed up with face-to-face interviews. This study provided input to the MARS development team and recommended enhancements for the next phase of the GeoMAPP project.[90] The State Archives provides access to a limited number of datasets through their digital collections (based on CONTENTdm),[91] where users can preview the material, view metadata, and download the datasets.

Data Transfer:

In anticipation of the transfer of data, the North Carolina team spent the first several months of 2009 focused on dataset selection and sizing. Based on the size estimates, the State Archives of North Carolina purchased and staged a storage environment consisting of 15 terabytes of Storage Area Network (SAN) storage and 3 portable drives totaling 7 terabytes. The team based the initial database sizing in part on the size of the total holdings (approximately 14 TB uncompressed) of NC OneMap. The Department of Cultural Resources Information Technology group (DCR-IT) also allocated a small application server to the project to help run scripts and manage the data. The North Carolina team planned to test two methods for moving data between CGIA and the State Archives. For smaller vector packages, the team decided to transfer data across a state Wide Area Network (WAN). For full system transfers and for imagery, the team sent portable hard drives by mail. All other types of data (vector, digitized maps and project files) have been transferred through a temporary FTP site.

To test the validation of both the intrastate and interstate data transfer, the North Carolina team installed file hash generators[92] (MD5 Summer, and md5deep) and BagIt utilities[93] on the GeoMAPP server and on a local desktop at CGIA. After reviewing each of the tools, the team decided to use BagIt for both intrastate and interstate data transfer, because it provided several useful validation and transfer features. The GeoMAPP team was able to contact the BagIt development team if they had questions about BagIt or feedback for future releases of the BagIt specification. The State Archives of North Carolina installed ArcGIS version 9.3 on several computers at the State Archives to view and validate the geospatial data.

Kentucky:

Geospatial Architecture:

The Commonwealth of Kentucky takes a fairly centralized approach for their geospatial holdings and hosts data for local, regional, state and federal entities on the Kentucky Geography Network (KYGEONET). All of the resources available through the KYGEONET feed the Commonwealth‘s Enterprise GIS Databases, KyRaster and KyVector, which are managed by the Division of Geographic Information (DGI). These databases are accessed by hundreds of GIS users in State Government on a daily basis. There are no formal agreements or legal mandates for data producers to provide their geospatial data to the KYGEONET. However, entities have chosen to contribute in order to expose their data and provide for “self-serve” access.

Geospatial data resources will only be ingested into the KYGEONET and Enterprise

Databases if they include a minimum set of FGDC-compliant metadata. Most data are submitted as ESRI shapefiles or file and tile-based image datasets. Transfer is by network shares, FTP, DVD/CD, and portable hard drives. One of the primary challenges the Kentucky team has faced in data acquisition has been that several regional agencies responsible for hosting local government data charge for access to the data. This restricted access has limited the archiving efforts, but participation in GeoMAPP has helped to catalyze discussion between KDLA, DGI and the data providers.

Inventory:

Prior to joining GeoMAPP, Kentucky had processes for inventorying and managing geospatial data through the state's centralized KYGEONET clearinghouse. The Kentucky clearinghouse is modeled off USGS's Geospatial One Stop (GOS) Portal and currently has 19 publishers who provide data created by local, university, state and federal agencies. Information about the datasets is also posted to the GOS portal for discovery and access.

Access:

Kentucky uses DSpace for its repository of state electronic assets, including GIS data, state publications, minutes or other electronic records. Kentucky chose to use DSpace for geospatial data that are both inside and outside the scope of KYGEONET, including PDF maps, scanned map images, dynamic geospatial files such as project files, and selected other shapefiles that are collected in the KYGEONET. These data are grouped together when appropriate and searchable by agency, title, date, subjects specified by data creators, and geographic name. Kentucky also plans to also use DSpace to reference database and image files in the archives that are only accessible using ESRI software and are currently only available to researchers through a research room workstation. Kentucky is still considering means of providing access directly to the database files through web mapping services.

Data Transfer:

While geospatial files had regularly been brought into the Kentucky State Archives before and during the early stages of the project, transfer of all of the files targeted by the grant for testing had to be delayed until after July 2009 when the State Archives purchased substantial additional data storage capacity using GeoMAPP funds. To validate that transfer of the datasets, the staff of Kentucky installed file hashing software including BagIt and MD5 Summer. Kentucky has used DVDs for interstate transfer of vector data (stored in ESRI file Geodatabases), project files, and digitized maps. They have also provide these same files and approximately 100 tiles of imagery for download through a file exchange website. All Kentucky vector databases (eight quarterly snapshots) and selective Kentucky raster data are copied to the archives by DGI via direct network connection using Robocopy, a file replication tool that hashes the files and verifies the transfer.

Utah

Geospatial Architecture:

Utah began the project with a fairly federated approach to managing their state's geospatial holdings. Relationships between AGRC and state agencies and local governments were traditionally formed on a project-by-project basis. AGRC has managed large road and parcel data collection efforts, which has allowed them to build relationships with county governments. These outreach efforts have encouraged participation.

AGRC hosts any public or private data that data producers are willing to share, including data from the local, federal or state level. The data focus has also shifted for the SGID from being project-driven to being more varied in type and focus. AGRC receives and ingests raster and vector datasets ensuring that metadata is both complete and FGDC compliant. With input from data providers, staff of AGRC enhance and refine existing metadata records transferred with datasets when they are missing critical information. The AGRC staff also open and check datasets to check file validity, dataset projection and geographic extent. Once the dataset and metadata record have been validated, they are provided to the public for unrestricted access through an FTP server.

The SGID is required to provide an accurate representation of all civil subdivision boundaries of the state. Each state agency that acquires, purchases, or produces digital geographic information data is required to inform AGRC about the existence of the data layers and their geographic extent and allow AGRC access to all data classified public. Additionally, the State Tax Commission annually delivers data relating to the creation or modification of the boundaries of political subdivisions. AGRC has also created a data sharing Memorandum of Understanding (MOU) with the federal government that has been accepted by 13 federal agencies.

Inventory:

In Utah, the State Geographic Information Database (SGID) had been established as a data repository to distribute all geospatial data created for Utah, but it did not have a formal means to track this content. After joining GeoMAPP, Utah began an active outreach program to engage county, state, and local agencies that were producing geospatial data. This outreach program afforded AGRC the opportunity to become more knowledgeable about what data were available (collecting more than 2000 datasets not in the SGID), and realized that it would be important to select and inventory these datasets to help with data management and the archiving process. Utah loaded each of the datasets discovered during their outreach efforts into the GIS Inventory and continues to use this system to inventory and track datasets around the state.

Access:

Utah presents finding aids for records in two different ways: Machine Readable Catalog (MARC) records and EAD finding aids. Both are generated by a custom application, APPX-based Archives Enterprise Manager (AXAEM), developed in part by staff from the Utah State Archives. Each GIS dataset within a series is entered into the database,

where specific metadata are recorded (scale, projection, datum, type of GIS file, file size), as well as a URL to the FTP server where the dataset and its full metadata can be downloaded. These details are included in the finding aids. Cataloging processes allow records to be searched by creating agency, title, subject, scope and content, and other descriptive note fields. The MARC record is uploaded (individually or as part of a batch) to the SirsiDynix Symphony commercial integrated library system. AXAEM has been integrated with the Solr search engine, and there are plans for all content within AXAEM (including electronic record metadata and text-based data) and the web site to be searchable through use of Solr. The EAD version is available on Utah's website both as a dynamically-generated XML file upon request by a browser and as static files posted to the web server and linked from other research guides. The dynamic version offers the most up-to-date information as archivists add new accessions and other corrections to the finding aid. The static version undergoes more peer review before it is published, and is more easily harvested by search engines. GIS records may be directly harvested through Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).

Data Transfer:

Utah's archiving process began to take form in June 2008 when AGRC entered into a partnership with the State Archives to purchase a new server to be located in the Richfield Utah Data Center and to share the AGRC's server in the Salt Lake City Data Center. There was not a set storage capacity at that time. Capacity was to be added as needed, with a limited storage set for imagery. The Utah team configured the server to house all the geospatial vector data and eventually all imagery submitted to the archives for retention.

The team has installed and used rsync on the AGRC's Salt Lake FTP server, so that data submitted to the Salt Lake server is replicated in a directory on the archives' FTP site in Richfield for permanent retention. Rsync uses a Secure Shell (SSH) connection to encrypts and de-encrypt the files and a checksum feature to ensure data integrity. For Interstate data transfer, Utah has made all of their data available through their FTP server

The Utah Archives tried to install BagIt on a desktop for the validation process, but could not get it to install properly. After several attempts at trying to configure it correctly, they decided not to use BagIt. The Utah team decided to try another free tool: Karen's Directory Printer. Use of this tool provided a spreadsheet of all the files that had been downloaded, their location, file type, number of files and bytes per folder, and MD5 hashes of files.

Project management – roles, responsibilities and coordination

The project was initially divided into the following phases: I - Project Management, II - Project Initiation, III - Business Case Development, IV - Knowledge Compilation and Exchange, V - Inventory of Existing Data and IT Capacity, VI - Finalize Requirements and Targeted Data Sets (for Intrastate Data transfer), VII - Interstate Transfer Demonstration, and VIII - Final Documentation. Roles and responsibilities for activities in each phase were outlined in a composite work plan. Partner-specific work plans were developed as partners were added. Tasks in the project work plan were divided among the working groups. Each working group

designated a team lead who was responsible for reporting group findings to the larger project, and interpreting and managing tasks assigned to the group. The GeoMAPP working groups included: Business Case, Inventory and Metadata, Appraisal and Access, Content Lifecycle and Data Transfer, Communications and Industry Outreach. Current efforts are now managed under: Administration, Outreach and Mentoring, Business Planning, Preservation/Data Transfer, and Storage/Access.

The North Carolina Center for Geographic Information and Analysis (CGIA) was responsible for project management, coordination, and contracts administration for GeoMAPP.

In late 2008, the project team "developed a consolidated work plan of all the items that they wanted to explore during the project along with proposed deliverables and corresponding deadlines. The group formed six cross-functional working groups with membership from each state to address critical areas of investigation for the project."[94]

The two project PIs helped provide strategic direction for the project with feedback from the state and working group leads. The management of the project work plan, coordination of meetings and oversight of the day to day operations of the project was managed by the project coordinator, Alec Bethune.

Communication within the project
GeoMAPP held an initial project half-day web conference session on April 7, 2009 to discuss team progress and prepare for potential project extension opportunities. Throughout the project, the partners engaged in collaborative team meetings, bi-weekly Project Conference Calls, and occasional face-to-face meetings – some of which involved data transfers, such as the Raleigh face-to-face in September 2009. The working groups have had conference calls approximately once per month, and working group activities and meetings have been the focus of the face-to-face partner meetings. The team also used email to support specific Working Group tasks.

In the first quarter of 2011, Informational Partners conference calls began using Go-to-Meeting along with the calls so members could look at material while discussing it.

Dissemination of products and information outside of the project
In addition to reaching out to state and local government data producers, the project also engaged other states' GIS and archives decision makers and thought leaders nationally through the project surveys and participation in national conferences. During the course of the project, the team has directly engaged with the following national organizations/events through either direct discussions or presentations at events:

- American Congress in Surveying and Mapping
- American Society of Photogrammetry and Remote Sensing
- Best Practices Exchange for Government Digital Information
- Council of State Archivists
- Esri International User Conference
- National Association of Government Archives and Records Administrators
- National Association of State Chief Information Officers
- National Digital Information Infrastructure and Preservation Program

- National States Geographic Information Council
- Open Geospatial Consortium
- Society for Imaging Science and Technology
- Society of American Archivists

The project has actively updated its web site with a variety of documents, including project deliverables, publications and presentation slides.[95] Project news and information about upcoming events are available to the general public via Twitter[96] and Facebook[97]. The project has also issued a quarterly newsletter, disseminated through the project web site and email using a mailing list to which anyone can subscribe.[98]

Project documents and tools that are available to the public include a System Inventory Template to assess technical infrastructure, an Intrastate Data Transfer Design outline, Geospatial FGDC metadata that will be beneficial to the long-term preservation of GIS datasets, Geospatial File Formats Quick Reference, a BagIt User Guide to support reliable inter-system geospatial data transfers, and GeoMAPP's Geoarchiving Glossary, a webpage providing brief definitions of terms that are used both on the GeoMAPP website and in project documentation.[99]

Types of digital content addressed
Critical information captured in geospatial datasets include aerial imagery, land records, transportation, regulatory data, demographics, marine and natural resources.

The GeoMAPP project specifically dealt with materials such as: local government datasets, orthoimagery, centralized data including framework datasets (e.g. statewide roads, municipal boundaries) and non-framework datasets, project files (source data, GIS and map outputs, and project documentation), a consolidated geospatial project unique to each partner state, and digitized products including scanned/digitized maps or aerial photographs.

Material collected and curated during the Interstate Data Transfer:

- **Kentucky**: The Kentucky Department for Libraries and Archives (KDLA) transferred approximately 10 GB of files to North Carolina and Utah, including orthoimagery, 12 thematic centralized datasets, two project files and scanned/georeferenced digitized maps.
- **Montana**: Montana conducted demonstration data transfer, guided by the consolidate findings and recommendations of the three original states' data transfer experiences.
- **North Carolina**: The State Archives of North Carolina prepared more than 15,000 files for data transfer, equivalent to 128.7 GB. This included compressed and uncompressed orthoimagery datasets, project files, digitized maps (both compressed and uncompressed digitized aerial photography), as well as five local and six centralized vector datasets.
- **Utah**: The Utah transfer set included three local government datasets, three sets of aerial National Agriculture Imagery Program (NAIP) imagery, 14 centralized vector datasets, project files, and USGS quadrangle maps (digitized maps).

Material collected and curated during the Intrastate Data Transfer:

- **Kentucky**: KDLA collected a wide variety of digital maps from the state of Kentucky, many of which are digitized historic maps. DGI collected periodic snapshots (2008–present) of the KyVector database. The database contains all the aerial images, topographic maps, digital elevation models, hillshade, SPOT satellite imagery, trucolor imagery, land cover imagery, slope, and other critical raster GIS base layers in the Kentucky system.[100]
- **North Carolina**: The North Carolina team targeted local government datasets such as parcels, streets, and zoning from two counties: Wake and Dare. Datasets targeted for collection from the counties and for inclusion in the demonstration archive include "at risk" regularly updated datasets such as parcels, zoning, boundaries, and street centerlines. The total size of the demonstration data holdings is almost 1 terabyte including: 2.6 GB of Local Government vector datasets, 33.4 GB of compressed Orthoimagery and 882 GB of uncompressed copies of the same imagery, 15.5 GB of Framework and Non-Framework Centralized vector datasets, 3.2 GB of Project Files, and 3.7 GB of Digitized Aerial Photos.
- **Utah**: The Utah team targeted local government data from Salt Lake and Davis Counties. The data from both counties include approximately 200MB each of parcel data sets, 18MB each of zoning data sets, and 2MB each of Municipality data sets. Other data collected: 586MB of Framework datasets, 129.5MB of Non-Framework datasets, 3 sets of FSA NAIP Imagery of the Salt Lake County, circa 1977, 1990, and 2006 at 200-300MB for each year, more than 1GB of project files (Drug Zone Free Law Analysis), and 110MB of scanned/georeferenced/digitized maps (selection of Salt Lake County 7.5-minute quadrangles).

Current and planned custodial responsibility (i.e. who has it and who will have it)

- **Kentucky**: The Archives is responsible for long-term preservation of snapshots of the KYVector database. Raster image files that are currently regenerated every two years are also to be kept permanently either by the Division of Geographic Information or by the archives. At the state level, image files will be maintained within the state system and transferred to the archives periodically. The Archives will only be responsible for preserving multiple copies when DGI either no longer has server space or no longer has a need to maintain the oldest images.
- **North Carolina**: Data submitted to the North Carolina State archives during the North Carolina Intrastate Data Transfer will be permanently retained within the repository. Draft disposition instructions created by the State Archives of North Carolina team as part of GeoMAPP include two options for permanent storage of the superseded data: Agencies may either transfer data sets to NC OneMap according to established procedures, complying with standards and procedures adopted by the North Carolina Geographic Information Coordinating Council, or, if retained in office permanently, the agency must comply with standards (for metadata, file naming, data sharing, and long-term preservation) and procedures adopted by the North Carolina Geographic Information Coordinating Council. This proposed disposition approach defines NC OneMap as the initial recipient for archived geospatial records. The NC OneMap team would be responsible for aggregating these local government datasets and then transferring them to the State Archives, acting as an intermediary between local governments and the State Archives.
- **Utah**: Data submitted to the Utah State Archives during the Utah Intrastate Data Transfer will be permanently retained in the Richfield facility. The Utah Division of Archives and Records Service and AGRC signed a Memorandum of Understanding (MOU) outlining each agency's responsibilities to preserve the long-term availability of geospatial data. The MOU specifies that a server, purchased and maintained by AGRC, will house geospatial data that has been exported from the SGID according to established retention schedules and transferred into the Archives' custody.

Value and potential usefulness of digital content addressed

Geographic Information Systems (GIS) are used for a variety of purposes, including analysis of climate change, demographic trends, and changes in land use. They are also used to create thematic maps that convey characteristics of a place. GIS data are fundamental to many contemporary societal issues. They can be used by citizens to promote government accountability and protection of their rights. Public officials and employees also use GIS data to make policy decisions, administer programs and assess outcomes. Major areas of application include modeling climate change, natural disaster planning and response, and crime enforcement and prevention. Longitudinal GIS data are essential for determining change and trends, but older data are at risk of loss if someone does not make a concerted effort to capture, manage and preserve them.

Plans for advancing project activities after the grant

The North Carolina State Archives is working with CGIA, Office of Information Technology Services and other state agencies on retention scheduling. The State Archives also plans to continue its work with CGIA on processes, procedures, and infrastructure for the transfer of

records to NC OneMap, and ultimately to State Archives for permanent preservation. The North Carolina team is hoping to test some of the existing and future business planning tools to develop documentation to support its long-term geoarchiving ambitions.

Mechanisms for sustaining project activities and products

North Carolina and Kentucky are regularly moving GIS data. Montana had less time to participate in GeoMAPP and conducted only one demonstration data transfer.

The project devoted significant effort in the second half of 2011 to scope and develop tools and templates that can be used by geospatial and archives organizations to develop business planning materials to seek funding for developing and maintaining geoarchives.

The GeoMAPP project has provided the foundation for further collaboration. For example, in North Carolina, the legislature authorized a deed recording fee which is allocated to supporting the state archives and digital collections; the State Archives of North Carolina and CGIA have committed to continuing joint efforts on Geoarchiving; and the State Archives now has two replicated SAN storage systems in place. The GeoMAPP partners have also expressed interest in seeking additional grant funding to continue the research, testing and implementation efforts.

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B. GeoMAPP – Timeline

	Influential Events and GeoMAPP Project Activities [Project Activities are in bold blue text.]
2002	The State Library of North Carolina initiates a program called Access to State Government Information Initiative (ASGII) to provide permanent public access to North Carolina State Government Information.
	As part of a three-state project with Wyoming and Delaware, the State Archives of North Carolina tests transferring its website into the Archives.
2003	The State Library of North Carolina surveys state agency staff to identify what electronic files are being produced and how they are being stored.
	The State Library of North Carolina obtains Statewide Leadership funding for an initiative supported by the Institute of Museum and Library Services (IMLS) under the provisions of the federal Library Services and Technology Act (LSTA) to advance its ASGII program. [ASGII receives funding every year thereafter.]
	May - Geographic Information Coordinating Council (GICC) expresses interest in preserving and providing access to superseded geospatial vision statement for development of NC OneMap.
2004	North Carolina Geospatial Data Archiving Project (NCGDAP), one of NDIIPP's initial grant projects, begins—paving way for GeoMAPP project
	March 1 –The National States Geographica Information Council (NSGIC)'s Random Access Metadata Tool for Online National Assessment (RAMONA) project begins, funded by the NOAA Coastal Services Center, developing an online survey to consolidate efforts to inventory GIS data collection activities at all levels of government.
	2004 - The three-year ($2.75M) Exploring Collaborations to Harness Objects in a Digital Environment for Preservation (ECHO DEPository) Project begins through NDIIPP funding and as a partnership between the University of Illinois at Urbana-Champaign, Online Computer Library Center (OCLC), Perseus Project at Tufts University, Vincent Voice Library at Michigan State University Library, and an alliance of state libraries from Arizona, Connecticut, Illinois, North Carolina, and Wisconsin.
	November - The State Library of North Carolina and State Archives of North Carolina establish a digital preservation task force composed of six of its staff.
	Druscilla Simpson of the North Carolina State Archives receives a one-year fellowship from the National Historical Publications and Records Commission (NHPRC) to investigate electronic mail preservation.
2005	The State Archives of North Carolina and State Library of North Carolina begin a collaboration with the Internet Archive, using the Archive-It service to harvest web content.
	September – The State Library of North Carolina and State Archives of North Carolina task force creates Digital Preservation Policy Framework (reviewed and approved by the Secretary of DCR in early 2006).
	Fall - North Carolina Clearinghouse (State Library) conducts a survey of all 24 of its Depository Libraries to learn how Depository Libraries worked with digital state government publications and how the Clearinghouse could incorporate digital state publications into their workflow.
2006	NCGDAP conducts Local Government Geoarchiving survey (first of two) that lays groundwork for GeoMAPP efforts.
	Early spring – The State Library of North Carolina secures permanent funding from the state legislature - including four positions and a small operating budget - for the Digital Information Management Program (DIMP) "to ensure long-term preservation and ready and permanent public access to born-digital and digitized publications produced by (or on behalf of) North Carolina state government."
	May - North Carolina State Legislature institutes a state employee hiring freeze, delaying the hiring of two of the DIMP positions until 2007.
	May 5 – Library of Congress releases Request for Expressions of Interest for "Multi-State Demonstration Projects for Preservation of State Government Digital Information."
	March 27-28 - First annual Best Practices Exchange conference in Wilmington, NC [funded through the State Library's ASGII grant and hosted by State Library of North Carolina and State Archives of North Carolina; many presentations by future GeoMAPP participants about their existing efforts, including many related to GIS preservation]
	June 15 – Response to Request for Expression of Interest submitted to Library of Congress

2007	March – An 18-month project funded by the NHPRC ($102,248) called Preservation of Electronic Mail Collaboration Initiative (EMCAP) begins, led by Kelly Eubank of North Carolina State Archives and involving Pennsylvania and Kentucky (including GeoMAPP participants Glen McAninch and Mark Myers)
	October 15 - NCGDAP and North Carolina State University submit project proposal and work plan to Library of Congress.
	November - Initial phase of GeoMAPP project begins: NC, KY, UT
	November - North Carolina Geographic Information Coordinating Council (GICC) creates the Archival and Long Term Access Ad hoc Committee to further investigate the issue of archiving geospatial data
	December 7 - administrative kick-off meeting hosted by LC in Washington DC for NDIIPP state projects
	December 18 - RAMONA GIS Inventory Tool (Conference Call)
2008	The State Library of North Carolina again (see 2003 survey above) surveys state agency staff to identify activities of state government information producers to ascertain how and in what format electronic files are being produced and how they are being stored and distributed.
	January 7 – Library of Congress announces four state projects ($2.25 million of total funding), including GeoMAPP.
	January 23-24 – Project kick-off meeting in Salt Lake City, UT
	Utah Archives produces business case for Electronic Records Management which is successfully adopted
	NCGDAP conducts Local Governement Geoarchving survey (second of two) that lays groundwork for GeoMAPP efforts
	February 18 - San Diego Supercomputing Center (SDSC) Demonstration (Conference Call)
	Spring - Under the GeoMAPP banner, North Carolina releases a State Agency Geoarchives Practices survey targeting state government GIS data creators.
	March 2 - the District of Columbia initiates a six-month "business process innovations" project of the Office of Public Records to "rethink the District's records and archiving practices," particularly with regard to electronic document management.
	April - Kenny Ratliff, Director of Kentucky Division of Geographic Information resigns
	April 3 – the NHPRC approves funding of $257,800 for Distributed Custodial Archival Preservation Environments (DCAPE), a project led by Richard Marciano (at the San Diego Supercomputer Center until August 1 2008 and now at the University of North Carolina) and including several GeoMAPP participants: Kelly Eubank (NC), Glen McAninch and Mark Myers (KY)
	April 22 - Kentucky Digital Government Summit in Lexington, KY [Demetrio Zourarakis and Glen McAninch present "Preservation of Geospatial Data"]
	May 21-24 – Best Practices Exchange in Helena, MT [Butch Lazorchak, Megan Durden, and Mark Myers present "GIS is from Mars, Archivists are from Venus: Linking State Government Geospatial Professionals and their Cultural Heritage Counterparts"]
	May 29-30 – Project Team Meeting in Raleigh, NC
	June – Subject area working groups are established.
	June – Communication tools are established (wiki, electronic mailing list, web site, conference call schedule).
	June- Kentucky Department for Libraries and Archives issues Edition 1 of the "Kentucky State Government Publications Handbook"
	Summer-Fall - GeoMAPP releases two national surveys targeting state government GIS leaders affiliated with the National States Geographic Information Council (NSGIC) and archives professionals with active membership in the Council of State Archivists (CoSA) and the National Association of Government Archives and Records Administrators (NAGARA). The NCGICC forms the Working Group for Archival and Long-Term Access -- headed by Ann Payne, and with participation by Kelly Eubank, Zsolt Nagy and Steve Morris -- submitting a report to the GICC in November 2011, which the GICC adopts to govern archiving GIS data in North Carolina.[101]

2008	July 7 – Kentucky GIS Conference
	July 8-10 – NDIIPP Partners Meeting in Arlington, VA [Zsolt Nagy and Kelly Eubank present "Geospatial Multistate Archive and Preservation Partnership: A Content Transfer, Demonstration, and Learning Project"]
	July 16 - The North Carolina legislature passes, through HB 2436, S.L. 2008-107,[102] appropriations to develop a detailed plan to implement the recommendations contained in the Geographic Information System Study, including a cost study to centralize the management of all GIS resources, projects, and – ideally – long-term preservation of the products of this undertaking by NC ITS [section 6.13].
	July 23-25 – Joint annual meeting of National Association of Government Archives and Records Administrators (NAGARA) and Council of State Archivists (CoSA) in Atlanta, GA [presentation about GeoMAPP at the CoSA board meeting on July 23]
	August 26-31 – Society of American Archivist Annual Meeting [SAA Electronic Records Section meeting focuses on NDIIPP State projects with talks about all four projects, including a presentation by Steve Morris for GeoMAPP]
	September 7-11 – National States Geographic Information Council (NSGIC) Annual Conference in Keystone, CO [Zsolt Nagy moderates a GeoMAPP session called "Preservation of Digital Geospatial Resources: A Team Climb" with presentations by Butch Lazorchak (LC), Steve Morris (NC), Matt Peters (Utah), Elizabeth Perkes (Utah), Kelly Eubank (NC), Ken Bates (KY)]
	Quarter 4 - Inventory Group begins work on the Inventory template. All states load Centralized State GIS data into the tool and perform assignment of category and keyword to each dataset. Centralized data from each state then loaded into appropriate categories for cross state analysis.
	October 21-24 – Project team meeting in Frankfort, KY
	November - Megan Durden resigns from Electronic Records Branch, North Carolina State Archives; Ed Southern retires from position as head Government Records Branch
	November - Archival and Long Term Access Ad hoc Committee formally presents the findings of its archiving geospatial data investigation to the North Carolina Geographic Information Coordinating Council (GICC)
	December - Utah Automated Geographic Reference Center (AGRC) and Archives produce initial draft of Business Plan for Archival Preservation of Geospatial Data Resources
	December - Dennis Goreham, Direct of Utah Automated Geographic Reference Center (AGRC) retires
2009	**January - Completion of project inventory and development of a draft generic business plan**
	January - team completes review of RAMONA GIS inventory tool which was submitted to the tool's developers at NSGIC; team completes a metadata comparison document
	January – Work plan ratified to track project tasks and to set deadlines for project activities; publication of GeoMAPP pamphlet called "Preserving America's Geospatial Footprints"
	February 1 - Results of the 2008 NC State Agency GeoArchives Survey are released.
	February - Mary Samouelian, Electronic Records Branch, North Carolina State Archives, begins work on GeoMAPP
	February 11 – GICC Meeting in Raleigh, NC [Ed Southern presents "Preserving North Carolina's Historical Footprints: an Update on Archiving NC GIS Data"]
	February 19-20 – NC GIS Conference -Raleigh, NC [Zsolt Nagy leads a panel discussion including Kelly Eubank, Steve Morris and Anne Payne]
	February 20-23 - American Congress on Surveying and Mapping (ACSM) spring meeting in Salt Lake City, UT
	March - Selection of datasets to be used for the demonstration portion of project; Inventory Group completes work on the Inventory template and populated the template with centralized and distributed data for all three states.
	March 2-5 - Coastal GeoTools '09 in Myrtle Beach, SC [Zsolt Nagy and Jeff Essic present "Next Generation Archives: The NC Geospatial Data Archiving Project"]
	March 9-13 - ASPRS - American Society for Photogrammetry and Remote Sensing (ASPRS) Annual Conference in Baltimore, MD [Cindy Clark and Butch Lazorchak present]

2009	March 31 – NDIIPP State Partners Meeting in Washington, DC
	May - Kick-off of the demonstration portion of the project with design and planning efforts for intrastate data transfer; sizing, selection and description of datasets to be used for the demonstration portion of the project and the creation and ratification of intrastate design plans for each state; Content Group begins testing BagIt
	April 7 – Half-day GeoMAPP Webinar
	May 4-7 – Archiving 2009 conference in Arlington, VA [poster by Butch Lazorchak and Mark Myers on building a business plan for preservation of state and local geospatial data resources]
	June- state complete intrastate design and begin building and testing their intrastate geo-repository systems to support transfer of data between state GIS and Archives organizations
	June 2 – NDIIPP States Metadata workshop (through the Web) [Cindy Clark, Glen McAninch, and Steve Morris present "Geospatial Multistate Archive and Preservation Partnership Metadata Comparison"]
	June 24-26 – NDIIPP Partners Meeting [two presentations by Alec Bethune, Matt Peters, and Glen McAninch: "GeoMAPP Business Planning: Developing Materials to Get Stakeholder Buy-In" and "GeoMAPP: Using Metadata to Help Preserve Geospatial Content"]
	July – Initial White Paper on Industry Engagement
	July 9-13 – ESRI User Conference in San Diego, CA [presentation by Jeff Essic from NCSU on geodatabase archival challenges; creation of the Data Preservation Special Interest Group]
	July 15-18 – NAGARA Annual Conference in Seattle, WA [Kelly Eubank, Glen McAninch, and Elizabeth Perkes present on "GeoMapp Multi-State Project: Capturing Earth's Footprint in a Changing World"]
	August – After serving as Statewide GIS Coordinator at the NC Center for Geographic Information and Analysis for more than six years, GeoMAPP's Principal Investigator, Zsolt Nagy leaves to become Project Manager at AECOM.
	August – Joe Sewash, Services Program Manager, replaces Zsolt Nagy as PI for GeoMAPP.
	August 12-15 – SAA/CoSA Annual Meeting in Austin, TX [presentations by Butch Lazorchak, Alec Bethune, Mark Myers, Elizabeth Perkes and Kelly Eubank: "Mash-up - Archivists and GIS Practitioners: Capturing Earth's Footprints in a Changing World"]
	August-October - North Carolina performs test case using CONTENTdm as access forum for geospatial data.
	September 2-4 – Best Practices Exchange in Albany, NY ["Geoarchiving 101: How to engage GIS Practitioners in the Archival Discussion" by Alec Bethune, North Carolina Center for Geographic Information and Analysis, and Butch Lazorchak, Library of Congress; "United We Stand, Divided We Fall: The Kentucky Archives/IT Experience" by Mark Myers, Kentucky Department for Libraries and Archives; "North Carolina's Experiences and Challenges with Transferring, Accessioning, and Accessing Geospatial Data" by Druscie Simpson, North Carolina State Archives, and Alec Bethune; "Kentucky Collaborates in the GeoMAPP Project: The Advantages and Challenges of Archiving in a State with a Centralized Geographic Information System" by Glen McAninch, Kentucky Department for Libraries and Archives; "North Carolina's Experiences and Challenges with Outreach and Records Management of Geospatial Data" by Ron Leach, William Brown, and Rebecca Paden, North Carolina Department of Cultural Resources]
	September 15-17 - GeoMAPP Face to Face in Raleigh, NC [significant interstate data transfer meeting between North Carolina, Kentucky and Utah via DVDs and hard drives during meeting]
	September – NC Center for Geographic Information and Analysis (CGIA) transitions from Department of Environment and Natural Resources to Office of Information and Technology Services
	October – Kickoff of Informational Partners Program with DC, Georgia, Maine, Maryland, Minnesota, Montana, New York, Texas, Wisconsin, and Wyoming added as informational partners
	October 28 – first Informational Partners meeting (via the Web)
	November 12-13 – Library of Congress GeoSummit in Washington, DC (Geospatial Data for the National Collection Initiative) [Alec Bethune, Steve Morris and Zsolt Nagy provided a primer on GeoMAPP and NCGDAP]

2009	**November 19 – second Informational Partners meeting**
	December – first phase of GeoMAPP ends
	December 29 – GeoMAPP Usability Study - Final Report released[103]
2010	**NDIIPP grant for GeoMAPP is extended**
	Quarter 1 – contract sub-awards established between CGIA and the participating partner agencies; four primary working groups (Business Planning, Outreach and Mentoring, Preservation and Data Transfer, and Storage and Access) appoint leads and finalize participant rosters; Preservation and Storage teams hold kickoff meetings; project begins developing an RFP to add two or three additional partners
	January - GeoMAPP article published in *Journal of Map and Geography Libraries*[104]
	February – NCGDAP project ends
	February 17-19 - ESRI Federal Users Conference in Washington, DC ["Mapped Today; Zapped Tomorrow? Preserving Government Digital Geospatial Data" by Butch Lazorchak from the Library of Congress, and Alec Bethune and Kelly Eubank from North Carolina]
	March 23 – Informational Partners Meeting
	April – GeoMAPP's four primary working groups formalize their leadership and rosters and begin meeting to investigate their work plan tasks; Kentucky begins initial evaluation into GeoCommons software; Utah and Kentucky provide their impressions; Kentucky provides Utah with DSpace system documentation and sample metadata from DSpace.
	April 26-30 - American Society for Photogrammetry and Remote Sensing (ASPRS) Annual Conference in San Diego, CA [Cindy Clark and Butch Lazorchak present]
	May - Mary Samouelian, Electronic Records Branch, North Carolina State Archives, leaves GeoMAPP project to take a position at Duke University.
	May 5 – Charlotte GIS Users Group meeting in Charlotte, NC [Alec Bethune and Mary Samoulian present and meet with Charlotte Metro staff to discuss data transfer to NC Archives]
	May 6 – North Carolina State Government GIS User Committee (SGUC) quarterly meeting [Alec Bethune and Kelly Eubank present]
	June - Project releases GeoArchiving Self-Assessment Tool.
	June 14-18 – The Open Geospatial Consortium Technical & Planning Committee Meeting in Silver Spring, MD [Steve Morris attends]
	Mid-year - Kentucky DGI and Utah AGRC implement ESRI's Geoportal Toolkit.
	June 15-17 - GeoMAPP Partners Meeting in Salt Lake City, UT
	Quarter 3 - Kentucky State Archives purchases additional data storage capacity with grant funds; staff installs BagIt and MD5 Summer to validate data transfers;[105] **testing into consolidated access tools begins with the upload of Utah data to the ArcGIS online and GeoCommons portals.**
	July 1 – NCGDAP project issues its final report.[106]
	July – State Archives of North Carolina creates the Electronic Records Branch to work across the archives and address the preservation of its digital assets.
	July – Illinois (GeoMAPP Informational Partner) passes a State Electronic Records Act, stating that "a record created in an electronic format is considered the same as and has the same force and effect as those records not produced by electronic mean," encouraging government agencies to employ electronic means of creating, maintaining and transferring records,[107] and establishing an Electronic Records Advisory Board, which includes the Illinois State Archives as part of the Office of Secretary of State.[108]
	July 12-16 – ESRI International Users Conference in San Diego, CA [three interactive sessions related to GeoMAPP: Butch Lazorchak and Alec Bethune presenting "Mapped Today; Zapped Tomorrow? Preserving Government Digital Geospatial Data"; Matt Peters and Mark Myers presenting "GeoArchiving 101: For Fun, Profit and Peace of Mind; "APPX-based Archives Enterprise Manager (AXAEM)"; the team also hosts a Data Preservation Special Interest group facilitated by Steve Morris and Joe Sewash]
	July 20-22 – NDIIPP Partners Meeting in Arlington, VA [Kelly Eubank (North Carolina) and Matt Peters (Utah) present on GeoMAPP]
	August - With funding from the NHPRC, the Georgia Historical Records Advisory Board (GHRAB) revises its *Preferred Practices for Historical Repositories: A Resource Manual and*

2010	*Self-Assessment Guide* (originally published in 1999), adding several new sections on digital materials and preservation.[109]
	August 10-15 – Society of American Archivists Annual Meeting in Washington, DC [GeoMAPP Panel at the Electronic Records Section Meeting including Joe Sewash, Butch Lazorchak, Kelly Eubank, Elizabeth Perkes and Mark Myers]
	August 26 – GeoMAPP Informational Partners Meeting: Access Solutions
	September – Illinois is added as an informational partner.
	September 16 – NC Arc Users Group Annual Meeting [plenary session GeoMAPP presentation by Kelly Eubank and Alec Bethune]
	September 28 – GeoMAPP Fall Partners Meeting in Phoenix, AZ
	September 29 – October 1 – Best Practices Exchange in Phoenix, AZ [Including GeoMAPP Partners Meeting, sessions devoted to GeoMAPP, and "Business Case for Geospatial archiving" by Joe Sewash; GeoMAPP team also hosted Michael Jones, creator of Google Earth]
	October - Lisa Speaker, Electronic Records Branch, North Carolina State Archives joins GeoMAPP project.
	October 13-15 – Kentucky GIS Conference in Frankfort, KY [DGI and KDLA staff in attendance]
	October 21 - GeoMAPP Informational Partners Meeting: Data Preservation Techniques (Web Conference)
	November – KDGI submits "Implementation of the ESRI ArcGIS Server GeoPortal Extension" report.
	November – Initial open source release of AXAEM,[110] developed in part by Utah State Archives (product announced on August 12)
	November 17-18 – Geosummit at Library of Congress (Joe Sewash and Steve Morris attend)
	December 2 – GeoMAPP Informational Partners Meeting: GIS Archival Business Planning (Web Conference)
	December 10 – GeoMAPP project invitation for bids (IFB)
	January 11 - GeoMAPP partners publish white paper on Utilizing Geospatial Metadata to Support Data Preservation Practices
2011	January 19-21 – ESRI Federal Users Conference [GeoMAPP presentation by Alec Bethune from N.C. CGIA and Butch Lazorchak from the Library of Congress]
	February – Mississippi is added as an informational partner.
	February 4 – Missouri and Montana is added as a new full GeoMAPP partners; Arizona added as Informational Partner.
	February 16-18 – North Carolina GIS Conference in Raleigh, NC [presentation on "Moving from 'Keeping Stuff' to Geoarchiving: Developing Dynamic Geospatial Data Archives" by Alec Bethune and Kelly Eubank]
	February 24 - GeoMAPP Informational Partners Meeting: Storage of Geospatial Data for Preservation (Web Conference)
	February 27- March 2 - National States Geographic Information Council meeting in Annapolis, MD [GeoMAPP presentations by Butch Lazorchak of the Library of Congress and Joe Sewash from North Carolina CGIA]
	March 8 - Library of Congress announces release of "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report" discussing all of the NDIIPP-funded projects and programs, including GeoMAPP
	March 8 – Kansas is added as an Informational Partner.
	April – Missouri steps down from partner status due to contractual complications.
	April 7-8 – NAGARA E-Records Forum in Austin, TX [GeoMAPP presentation by Glen McAninch]
	April 14 – Second version of "SAN Bagging: How to Install and Use the BagIt Library to Create and Validate Bags"[111]
	April 20-27 – GeoMapp produces a set of video tutorials about BagIt.
	May - New GeoMAPP brochure, "Preserving America's Geospatial Footprints"
	May 12 - GeoMAPP Informational Partners Meeting: Geospatial Data Formats (Web Conference)

2011	May 16-19 – IS&T Archiving conference in Salt Lake City, UT [Elizabeth Perkes presents a poster and paper by Perkes and Lisa Speaker on "Metadata Capture and Geospatial Records"]
	May 18 - North Carolina Legislature's GIS Day in Raleigh, NC [poster on "Preserving GIS Data with GeoMAPP"]
	May 25 – On behalf of the GeoMAPP project, North Carolina Center for Geographic Information and Analysis (NC CGIA) releases Invitation for Bids for "a consultant to support the GeoMAPP activity of developing business planning tools specific to the process of digital preservation of geospatial content"
	May 25 – North Carolina State Archives posts BagIt Tutorial: Part 1 – "Introduction to BagIt" to YouTube.[112]
	June 21-23 – GeoMAPP Partners Meeting at Montana State Library in Helena, MT
	July – Missouri becomes an Informational Partner.
	July 1 - GeoMAPP Geospatial Data File Formats Reference Guide
	July 7-8 - North Carolina cancels the May 25 IFB solicitation and posts a revised solicitation due to a procedural issue identified during the original evaluation period.
	July 11-15 – ESRI International User Conference in San Diego, CA [included Special Interest Group meeting focused on Data Preservation and GeoMAPP, with an associated presentation called "Dust Free Data: Developing Dynamic Geospatial Data Archives" by Alec Bethune, NC Center for Geographic Information and Analysis, and Evan Hammer, Montana State Library, and a later presentation called "Safe to Save? Archive Options for Geodatabases" by Jeff Essic, North Carolina State University Libraries]
	July 13 – North Carolina State Archives posts several more BagIt tutorial videos to YouTube on: installing BagIt and installing the Java Runtime Environment; creating and Verifying Bags; and retrieving, verifying, and unpacking bags[113]
	July 13-16 - NAGARA/CoSA Joint Annual Meeting in Nashville, TN [GeoMAPP team (Kelly Eubank from the North Carolina State Archives, and Mark Myers and Glen McAninch from the Kentucky Department for Libraries and Archives) involved in Archiving Files with Complex Formats – Geospatial Examples]
	July 19-21 - NDIIPP/NDSA Partners Meeting in Washington, DC [GeoMAPP access demo and poster presented by Lisa Speaker]
	July 28 - FGDC Users/Historical Data Working Group, Teleconference ["GeoMAPP Overview and Tool Introduction" by Alec Bethune]
	July 28 - GeoMAPP Informational Partners Meeting: Geospatial Data Archival Appraisal Web Conference
	August 17 - The GeoMAPP team officially welcomes Applied Geographics, Inc. and AECOM to assist in developing geoarchiving business planning tools (to be publicly available in early December).
	August 22-27 - Society of American Archivists Annual meeting in Chicago, IL [session called "Geospatial Preservation: The State of the Landscape" chaired by Butch Lazorchak and including a presentation by Steve Morris]
	September 21 – Publication of "Archival Metadata Elements for the Preservation of Geospatial Datasets"
	September 22-23 Face to Face Business planning meeting in Washington DC between the Business planning working group, the Library of Congress and the business planning contractors
	September 26-29 - National States Geographic Information Council 2011 annual conference in Boise, Idaho [geoarchiving session including Joe Sewash (North Carolina) and Evan Hammer and Stu Kirkpatrick (Montana)]
	October 6 – GeoMAPP Informational Partners Meeting: exploring processes and considerations when processing and preparing geospatial datasets for archival preservation and access
	November 2 – Final version of Geospatial Multistate Archive and Preservation Partnership (GeoMAPP): Best Practices for Archival Processing for Geospatial Datasets
	November 3-4 - From Theory to Practice: Accessing and Preserving Electronic Records and Digital Materials, conference in Raleigh, NC ["Developing a Business Planning Toolkit for

2011	Digital Preservation" by Joe Sewash and "Investigating Storage Architectures for Long-term Preservation: Channeling the Archival Data Deluge" by Alec Bethune]
	November 16 – GIS Day [Kentucky Dept. for Libraries & Archives participating in University of Kentucky event in Lexington, KY; North Carolina State Archives & NCCGIA participating in Wake County event in Raleigh, NC; Montana State Library participating in state capital event in Helena, MT]
	December 8 – GeoMAPP Informational Partners Meeting: introduce latest tools, explore lessons learned from GeoMAPP and what's next for geospatial archiving
	December – The GeoMAPP Geoarchiving Business Planning Toolkit is released.

C. MTSA – Project Summary

Project title
A Model Technological and Social Architecture for the Preservation of State Government Digital Information (MTSA) Project

Brief project description
Since late 2007, the Minnesota Historical Society (MHS) has collaborated with several state partners and the Library of Congress to explore practical means of preserving and providing access to digital legislative materials, including bills and committee reports. The project has emphasized collaboration with legislatures, state archives and libraries, and other interested organizations.

While the project team recognized from the start that the goals and deliverables would evolve over time as work progressed, the national economic crisis that began in 2008 had immediate impact on states' budget realities and sharply curtailed participation in new initiatives and related activities such as work proposed by MHS. Despite setbacks related to the explicit proposed deliverables, the project centered around several areas of activity throughout the grant period:

- Access: including development and testing of web-based tools for collecting and providing access to digital legislative content.
- Evaluation: assisting states in evaluating their capacity to work with legislatures and digital legislative content.
- Guidelines: developing and sharing informational resources on a variety of topics related to digital preservation and access.
- Preservation: analysis of several preservation options that would be appropriate to digital legislative content, including web harvesting and various repository models.
- Business cases: assisting states in analysis of their needs and capabilities to build support for preservation and access activities and systems.
- Promotion and dissemination: sharing information about the project activities and products through meetings, conferences, reports, and the project website.

Within the NDIIPP project, MHS has established many collaborations, including:

- Direct work with ten states (including Minnesota)[114]
- Development of a pilot XML-native database system for legislative documents with Syntactica[115]
- Development of a prototype XML wrapper and legislative metadata schema in coordination with Thomson Reuters and the Minnesota Office of the Revisor of Statutes[116]
- Work with the California Digital Library to explore the potential application of different digital archiving technologies, including:
    - The Merritt microsystem repository service[117]
    - The CDL Web Archiving Service (WAS)[118]
- Funding the development of an electronic preservation system for Kansas legislative information called Kansas Enterprise Electronic Preservation (KEEP).[119]
- Developing ways to increase access to government information with the Sunlight Foundation and OpenGovernment.org.[120]

- Participating in a prototype multi-tenancy release of Tessella's enterprise archival preservation system, Safety Deposit Box (v4).[121]

Main factors that drove initiation of the project
Participants in the Library of Congress Convening Workshops with the States identified many compelling issues associated with state government digital preservation. One was how to prevent the loss of the large body of digital content already "at-risk." The 170 state and territorial librarians, archivists and records managers in attendance considered legislative records among those most "at-risk." Another challenge was the lack of capability to develop and use collective resources to address common needs.

The National Conference of State Legislatures (NCSL) promotes information to improve quality, effectiveness, policy innovation and communication among state legislatures. NCSL has worked with the private sector to provide current legislative content to its members and was interested in the potential of the MSTA project to support preservation of and access to legislative content.

MHS had worked on numerous electronic records projects since the late 1990s and had established strong relationships with the Minnesota Revisor of Statutes Office, Minnesota Legislative Reference Library, and related national associations including NCSL and NASCIO. They had also provided extensive training on XML and metadata to state agencies and had worked with other parties to develop metadata guidance for state government. In 2005, Minnesota implemented XML-based Text Editor New Development (XTEND), an XML-based bill drafting system, which provided a useful occasion for considering new options for long-term preservation of the legislative materials.

Participating parties
MHS is the lead institution, responsible for overall administration of the project. The Revisor's Office is the principal records creator in the project. The Revisors Office also was involved in the development of the legislative metadata schema and metadata wrapper. Michele Timmons, Revisor of Statutes, was chair of the Uniform Law Commission (ULC)'s drafting committee and the enactment committee for the Uniform Electronic Legal Material's Act (UELMA).

MHS project staff worked with CDL and tested both Merritt and the CDL's Web Archiving Service, in order to explore existing preservation infrastructures and their potential for meeting the needs of state government. Working with the MTSA provided the CDL an opportunity to explore provision of digital curation services to parties outside of the University of California system, including state governments.

Participation of both the California State Library and California State Archives has involved exploration of informational and educational opportunities related to digital preservation. The California Legislative Counsel has come to the project with significant resources and a scope of responsibility that touches on both the state library and state archives. Diane Boyer-Vine also played a key role in the Uniform Law Commission (ULC)'s drafting committee and the enactment committee for the Uniform Electronic Legal Material Act (UELMA).[122] The NCSL's role in MTSA has included both education and promotion. They sponsored the publication on digital preservation for legislatures, provided multiple opportunities for presentations and

conference sessions on the project and its products. They are also strongly interested in UELMA.

Table 7 - MTSA Primary Partners

Entity	Description	Project Personnel
Minnesota Historical Society[123] (Lead Institution)	"The State Archives identifies, collects, and preserves the historically valuable records of state and local government in Minnesota." Materials preserved in the State Archives come from the Executive Branch of state government, including the constitutional officers and state departments, boards and commissions; the Legislative Branch, including the Minnesota Legislature and its committees, commissions and officers; and the Judicial Branch, including the Supreme and Appellate courts, district courts, and antecedent probate, municipal and justice of the peace courts. Local government records include material from Minnesota counties, cities, school districts, townships and regional government organizations.	• Shelby Edwards, Processing Archivist (joined MTSA project in January 2011) • Nancy Hoffman, Data Consultant (left in 2010) • Robert Horton, Principal Investigator, State Archivist, and Director, Library, Publications, and Collections, MHS (until November 2011) • Jennifer Jones, Head of Collections and Reference (MTSA project director starting in November 2011) • Carol Kussmann, Collections Assistant (beginning October 2008) • Charles Rodgers, Government Records Specialist • Shawn Rounds, Assistant Head of Collections (State Archivist as of November 2011) • Chris Welter, Collections Assistant (left September 2008)
Minnesota Office of the Revisor of Statutes[124]	The MROS is a legislative office that provides services to members of both houses of the legislature, constitutional offices, state agencies and departments.	• Isaac Holmlund, Systems Analyst/Programmer, Minnesota Office of the Revisor of Statutes • Tim Orr, Deputy Revisor for Information Services • Michele Timmons, Revisor (partner lead)
Minnesota Legislative Reference Library[125]	The Minnesota Legislative Reference Library is the repository of legislative committee records and the primary office involved in guiding legislative history research. Library staff members play a key role in the organization and management of the legislative web site.	• Julie Dinger, Reference Librarian • Leif Eischen, Information Systems Manager • Robbie LaFleur, Librarian • Elizabeth Lincoln, Deputy Director/Reference Librarian
California Digital Library[126]	The CDL was established to provide technical capacity to support research, teaching and learning at "the University of California libraries and the communities they serve," but they have recently explored offering their services to other parties. The (UC3) is a partnership	• Stephen Abrams, Manager, Digital Preservation Technology • Patricia Cruse, Director, UC Curation Center • Greg Janée (until leaving the CDL in 2011)

Entity	Description	Project Personnel
	that aims to bring "together expertise and resources of the CDL, the ten UC campuses, and the broader international curation community." UC3 provides digital curation services and expertise; develops and hosts digital curation and preservation repository services; develops and supports digital curation tools; and engages in digital curation outreach and community building efforts. They have developed and are hosting the Digital Preservation Repository (DPR) and Web Archiving Service (WAS). Their design philosophy is based on combining many lightweight tools and services, rather than building a single tightly-coupled system.	• John Kunze, Development Programmer • Tracy Seneca, Web Archiving Service Manager • Perry Willett, Project Manager, Digital Preservation (UC3)
California Legislative Counsel[127]	The California Legislative Counsel is the legal counsel to the state legislature. The Office of Legislative Counsel is a public agency that drafts legislative proposals, prepares legal opinions, and provides other services, including computer, data networking, and related customer services to the legislature. Among its responsibilities are drafting legislation, reviewing and analyzing statutory law, and providing information technology services to the state legislature, through the Legislative Data Center. The Legislative Counsel maintains "the official public [web] site for information on California law, pending legislation, bills, and other legislative publications."[128]	• Annie Anderson, Technical Lead for LDC Legal Services System • Bill Behnk, Coordinator for Legislative Information Systems • Diane Boyer-Vine, Legislative Counsel of California (partner lead) • Dragomir Cosanici, Supervising Librarian • Abby Cole • Linda Heatherly, California Legislative Council Law Librarian (retired and replaced by Cosanici) • Valerie O'Connor • Mendora Servin, Project Manager for e-Legislative Documents Archiving Project • Ben Stout, Software Engineer • Daniel Zavoiu, IT Lead
California State Archives[129]	The California State Archives is a division of the Office of the Secretary of State. It serves as "the repository of permanent government records and other materials that document California history." The Legislative Archives Program, Court Records Program and Governor's Records Program work with the three branches of Government to identify records of enduring value that should be preserved in the Archives. Included in its government records collection are legislative committee records, legislators and	• Chris Garmire, Electronic Records Archivist, California State Archives • Nancy Lenoil, State Archivist • Rebecca Wendt, Legislative Records Archivist, California State Archives

Entity	Description	Project Personnel
	governor's records, and videotapes of selected floor sessions and committee hearings.	
California State Library[130]	The California State Library is "the central reference and research library for state government and the legislature, and provides research to the legislature and the governor." The Library collects, preserves, generates and disseminates information related to the state; directs state and federal funds to support local public libraries and statewide library programs and services; and provides assistance to California's public libraries.	• Sabah Eltareb, Assistant Director of California Research Bureau • Kris Ogilvie, Digital Programs Consultant, California State Library • Linda Springer, Library Programs Consultant
National Conference of State Legislatures (NCSL)[131]	"NCSL serves legislators and staff of U.S. states, commonwealths and territories. NCSL provides research, technical assistance and opportunities for policymakers to exchange ideas on state issues."	• Jo Anne Bourquard, Group Director, Legislative Information Services • Pam Greenberg, Senior Fellow

The MTSA project has also involved several private sector partners. Thomson Reuters has worked with MHS and the MROS to develop metadata and packaging conventions for the transfer of legislative resources into a repository. Syntactica worked with MHS to develop a prototype system for managing legislative materials, built on top of an XML-native database called eXist. Tessella worked with the MTSA project to explore the possibility of state archives and state libraries using its Safe Deposit Box (SDB) product. Four states - Illinois, Minnesota, Tennessee, and Vermont - tested a "multi-tenancy" arrangement, in which all of the states shared a single SDB instance that was hosted and administered by Tessella. Sunlight Labs has worked with MHS to develop an access pilot within the OpenStates/OpenGovernment framework. Sunlight developed OpenGovernment Minnesota[132] on the model of its Open Congress site, which integrates legislative content with other pertinent content (e.g. news, campaign finance). MHS helped to define the types of content and additional functionality desired by state government users. MHS and Sunlight have also worked on a mobile application (based on an application designed for the state of Texas called TexLege[133]) that is open source and is freely available for adaptation by other states.

Table 8 - MTSA Private Sector Partners

Partner	Description	Relevant Personnel
Sunlight Labs[134]	The Sunlight Foundation is a nonprofit organization based in Washington, DC that was founded in 2006 with the goal of increasing transparency and accountability in the U.S. government. Sunlight Labs is an open-source development entity that is led by the Sunlight Foundation; it coordinates a distributed development community, but its paid staff are employees of the Sunlight Foundation.	James Turk, Developer and Open Source Coordinator
Syntactica[135]	Syntactica, a unit of ZH Computer Inc, develops software	Dan McCreary, Semantic

Partner	Description	Relevant Personnel
	to support activities over the Internet, and is based in Minneapolis, Minnesota.	Solutions Architect[136]
Tessella[137]	Tessella is a technology company in the United Kingdom in 1980 with U.S. branch offices now operating in Boston and Washington, DC. Over the past decade, Tessella has been actively developing software to support digital archiving, with several national archives as customers, most of them in Europe.	• Mark Evans, Digital Archiving Practice Manager • Mark Thuman, Associate Vice President
Thomson Reuters[138]	Thomson Reuters Corporation, formed through the Thomson Corporation's purchase of Reuters Group in 2008, is a large provider of information services, including many that focus on legal information. They have headquarters in New York and major operations in London and Eagan, Minnesota (about 13 miles from St. Paul, where MHS is located).	• Dan Dodge, Lead Data Architect • Jolene Sather, Manager, Information Architecture

Table 9 - MTSA State Partners

Entity	Description	MTSA Project Personnel
Arkansas		
Arkansas History Commission[139]	The Arkansas History Commission administers the State Archives of Arkansas, collects material related to the history of Arkansas, and encourages historical work and research.	• Mary Dunn, Archival Manager • Lynn Ewbank, Archival Manager, Access and Technology (left project due to retirement) • Jane Hooker, Archival Manager
Arkansas State Library[140]	The Arkansas State Library is "the information resource center for state agencies, legislators and legislative staff." It provides guidance and support for the development of local public libraries and library services and provides other educational, informational and cultural services to the citizens of Arkansas.	Mary Brewer, Deputy Director of Information Resources
Illinois		
Illinois Legislative Information System[141]	The Legislative Information System is the legislative support service agency that provides computer services and technical guidance to the General Assembly and its committees, commissions and agencies.	Tim Rice, Executive Director, Illinois Legislative Information System
Illinois State Archives[142]	The Illinois State Archives is the depository of public records of Illinois state and local governmental agencies that have "permanent administrative, legal, or historical research values."	Dave Jones, Director
Illinois State Library[143]	"The State Library maintains a library for State officials and employees, operates a Governmental Research Service, and	• Kathleen Bloomberg, Associate Director of Library Operations

Entity	Description	MTSA Project Personnel
	administers library services for state agencies."	• Andrew Bullen, Technology Coordinator • Connie Frankenfeld, Digital Programs Library (left project due to retirement) • Cherryl Walker
Kansas		
Kansas Information Technology Office, Legislative Branch[144]	"The KITO supports the statutory responsibilities of the Executive, Judicial, and Legislative Branch Chief Information Technology Officers (CITOs) and the Chief Information Technology Architect (CITA)."	
Kansas Historical Society[145]	The mission of the Kansas Historical Society is to "identify, collect, preserve, interpret, and disseminate materials and information pertaining to Kansas history in order to assist the public in understanding, appreciating, and caring for the heritage of Kansas." One of KSHS's charges is to run the Kansas State Archives.	• Scott Leonard (until departure from KSHS in July 2011) • Pat Michaelis, Director, Library and Archives Division • Matt Veatch, State Archivist and Assistant Director, Library and Archives Division
Kansas Legislative Administrative Services[146]	"Legislative Administrative Services provides administrative and technical support for the Kansas Legislature and general public, as directed by the Legislative Coordinating Council."	• Don Heiman (until retirement in August 2011) • Alan Weiss, Assistant Director for Applications, Computer Services
Kansas Legislative Computer Services[147]	The mission of the Kansas Legislative Computer Services is to provide technological resources and service for the Kansas legislature.	• Terri Clark, Data Center Manager • Dave Larson, Director of Computer Services • Sandy Sadowski, Web Specialist
Mississippi		
Mississippi Department of Archives and History[148]	The MDAH "collects, preserves, and provides access to the archival resources of the state, administers museums and historic sites, and oversees statewide programs for historic preservation, government records management, and publications."	• Julie Dees • Matthew Glover • David Pilcher, Head of Electronic Records Section • Julia Marks Young, Director of Archives and Records Services Division
Mississippi Legislative Budget Office[149]	The LBO "assists the Joint Legislative Budget Committee (JLBC) in the development of the State budget recommendation, as well as provides computer and technical support in the State Capitol."	• Rob Patterson, Director of Data Processing
Nebraska		
Nebraska's Clerk of	The Office of the Clerk of the Legislature is	• Diana Bridges, Legislative

Entity	Description	MTSA Project Personnel
the Legislature[150]	"the administrative arm of the Legislature," maintaining official records of all legislative business, including the Legislative Journal, bill indexes, committee hearing schedules, rosters, bill status information and legislative histories.	Records Historian • Richard Brown, Assistant Clerk
Nebraska Library Commission[151]	"The mission of the Nebraska Library Commission is statewide promotion, development, and coordination of library and information services. As the state library agency, the Commission is an advocate for the library and information service needs of Nebraskans."	• Devra Dragos, Director of Technology and Access Services • Beth Goble, Director of Government Information Services
Nebraska State Historical Society[152]	The Library / Archives Division of the Nebraska State Historical Society collects and preserves the documentary heritage of Nebraska, including books and other published works; newspapers; maps; photographs; government records; papers of individuals, businesses, organizations, and religious bodies; sound recordings, and moving images.	• Andrea Faling, Assistant Director for Library/Archives • Seth Doty, IT Infrastructure Support • Nick Hennecke, IT Infrastructure Support/Analyst Sr. • Gayla Koerting, Curator of Government Records
Nebraska State Library[153]	The Nebraska State Library serves "the Nebraska Supreme Court, the Nebraska Court of Appeals, attorneys within the State of Nebraska, members of the Nebraska Legislature and their respective staffs, members of other state agencies, pro se litigants, and interested members of the general public."	Marie Wiechman, Deputy Librarian
North Dakota		
North Dakota Information Technology Department[154]	"Established as a department in 1999, ITD's history dates from 1969 when it was first created as the Central Data Processing Division with the Office of Management and Budget. The division set up an electronic data processing center used by all state agencies except the institutions of higher education, Job Service, and the office of the Adjutant General. The Higher Education Computer Network (HECN) was funded after a 1969-70 interim legislative study. In 1981 the director of CDP was directed to supervise all executive branch agency data processing activities and to approve data processing equipment acquisitions."[155]	Kyle Forster, Enterprise IT Architect (until February 2011)[156]
North Dakota Legislative Council[157]	"The Legislative Management conducts studies through its committees and the Legislative Council staff provides a wide range	Marilyn Johnson, Research Librarian (until her retirement in September 2010)

Entity	Description	MTSA Project Personnel
	of services to legislators, other state agencies, and the public. Attorneys on the staff provide legal advice and counsel on legislative matters to legislators and legislative committees. The Legislative Council supervises the publication of the Session Laws, the North Dakota Century Code, and the North Dakota Administrative Code."	
State Historical Society of North Dakota[158]	The State Archives is "the official repository of the historic records of state and local government in North Dakota," including counties, municipalities, townships, school districts, and in all branches of state government.	Ann Jenks, State Archivist
Tennessee		
Tennessee Office of Legislative Information Systems[159]	The Tennessee Office of Legislative Information Systems is an office of the state's general assembly. The Office of Management Information Services (MIS) was created in 1986, then becoming the Office of Legislative Information Services in 1996 and the Office of Legislative Information Systems in 2010.	• Steve Kriegish, Director of Legislative Information Services • Tammy Letzler, Assistant Chief Clerk of the House of Representatives • Alan Whittington, Assistant Chief Clerk of the Senate
Tennessee State Library and Archives[160]	"The Tennessee State Library and Archives (TSLA), collects and preserves publications and records of historical, documentary and reference value, and promotes library and archival development throughout the state."	• Jami Awalt, Archives Development Program • Cathi Carmack, Director of Archival Technical Services • Wayne Moore, Assistant State Archivist • Todd Wallwork, Digital Librarian • Alan Whittington • Greg Yates, Coordinator of Legislative Recording
Vermont		
Vermont Department of Libraries[161]	The DOL "collects, organizes, and disseminates information and library materials to the three branches of State government, libraries across the state and the general public."	Sybil McShane, State Librarian (retired in June 2008)
Vermont Enterprise Project Management Office[162]	The EPMO was created in 2006 to support state government information technology projects. The EPMO serves the Department of Information and Innovation (DII) other state Project Management Offices (PMOs) and other executive branch units.	Darwin Thompson, Director (until July 2011), Deputy Commissioner of DII (July 2011-Present)
Vermont Legislative	The Vermont Legislative Council was created in 1971 "to provide support services to the	• Michael Chernick, Research Counsel

Entity	Description	MTSA Project Personnel
Council[163]	entire Legislature" including "legal research and drafting services, clerical support, operations management, copying and publication, information technology support, Web publication, and committee staff services."	• Duncan Gross
Vermont Legislative Joint Fiscal Office[164]	The JFO was created in 1973 to provide financial analyses to the House and Senate Appropriations Committees, the House Ways & Means Committee, the Senate Finance Committee, the House and Senate Transportation Committees, and the Joint Fiscal Committee. The Office also provides staff support to committees in a variety of fiscal areas including health care, education finance, institutions and general fiscal analysis.	• Rebecca Buck, Staff Associate, Senate Appropriations • Richard Reed, Budget Systems Program Manager, Vermont State Legislature
Vermont Office of the Chief Information Officer[165]	The CIO and Commissioner for the State of Vermont is responsible for managing the Department of Information and Innovation (DII), the Enterprise Project Management Office, the Chief Technology Officer/Enterprise Architect, the ERP Technical Services unit, the Webservices Director and the Enterprise Security Office.	• Thomas Murray, DII Commissioner and CIO (until November 2009)
Vermont State Archives and Records Administration[166]	The Vermont State Archives and Records Administration (VSARA) is a division within the Office of the Vermont Secretary of State. VSARA was created in 2008, through a merger of the Vermont State Archives and Division of Public Records, Department of Buildings and General Services. VSARA administers a statewide records management program. The Vermont State Archives is responsible for records having continuing value to the State of Vermont and its citizens.	• Tanya Marshall, Deputy State Archivist • Scott Reilly, Archivist • Gregory Sanford, Vermont State Archivist

Related activities: Minnesota Digital Library

A parallel and complementary set of activities in Minnesota at the time of the MSTA project were carried out by the Minnesota Digital Library.[167] The Minnesota Digital Library (MDL) attempts to establish common strategies and structures for preserving and providing access to materials from across the state and "considers establishing a shared digital preservation service a valuable initial goal."[168] The MDL was initiated in 2001. It was financially supported by the IMLS through Library Services and Technology Act (LSTA) funds through FY2009 and is now funded through a grant from Minnesota's Arts and Cultural Heritage Fund. MHS has been a key player in the MDL, which has involved digital preservation elements. There has been significant information sharing across the MSTA and MDL. The MDL has conducted a study of long-term preservation options for its content,[169] and it is one of the most promising mechanisms for sustainable management of digital content in the state, making it a likely focal point for

continuing work with the legislature. Minitex[170] is the administrative home of the Minnesota Digital Library. Minitex is a network of academic, public, state government, and special libraries in Minnesota, North Dakota and South Dakota (and reciprocity with Wisconsin libraries). Minitex is a joint program of the Minnesota Office of Higher Education and the University of Minnesota; it is funded by the Minnesota legislature and the Minnesota State Library Services. Minitex programs are coordinated through the University of Minnesota-Twin Cities Libraries.

Resources the parties have committed to the project
In its preliminary estimate, the Minnesota Historical Society projected a cost of $600,000 over 24 months, including "the cost of additional staff, expansion of technological capacity, meetings for partners and potential partners, education and outreach, hiring consultants and vendors. The project budget would meet all the costs of this effort, requesting only time and cooperation from the state partners and the NCSL."[171] All the partners indicated their willingness to commit to the project, contingent on the final plan and contract negotiated with the Library of Congress. The states, and any states added later, would look for additional funding from other sources – e.g., their own governments – to support the further development of capacity consequent to the project.

Main motivations and rationales for parties to participate
The 2007 Project Proposal emphasized that each state "has a different potential, with disparate resources, possible partners and mandates, suggesting that implementation in each state will proceed from what is universal towards what is particular."

The MTSA project focused on the preservation of 'at-risk' government records. While the Minnesota legislature staff, Reference Library, Revisor's Office and the bill drafting systems support daily workflow, their goal in this project was to focus on the general responsibility of libraries and archives, to preserve content over time. Motivations for states to participate all tend to relate to education and gaining further experience with available technologies. What follows are some selected discussions of motivations of particular state partners.

Illinois uses an XML bill drafting system. Their interests included "business case scenarios, web harvesting of government publications, authentication (chain of custody), and scalability."[172]

Kansas has been actively pursuing several activities within the realm of "e-Democracy." This has included development of a system called Kansas Legislative Information Systems and Services (KLISS) by Propylon. KLISS is designed to support a digital workflow for legislative processes and enhanced public access to associated documents. For many years, the Kansas Historical Society (KSHS) had been working with the state's IT governance entities to incorporate recordkeeping and long-term preservation provisions into agency IT project planning and administration. In 2003, KSHS and the Kansas State Library initiated Kansas State Publications Archival Collection (KSPACe), a system based on DSPACe to manage and provide access to digital state publications and documents. However, this system was not designed to support large-scale acquisitions or long-term preservation of records from state government. On February 5, 2009, the Information Network of Kansas (INK) Board awarded a grant of $175,000 to support development of the Kansas Enterprise Electronic Preservation (KEEP) system. On March 1, 2010, Governor Mark Parkinson of Kansas approved House Bill 2195 (introduced by

Representative Mike Burgess), which authorizes the State Archivist to develop standards for preserving and maintaining the authenticity of electronic government records and to certify records as being compliant with the standards. The KSHS was already a partner on the MTSA project, and the emergence of KEEP project provided a mechanism for further collaboration between MHS and the KSHS: the KSHS submitted a proposal for a $125,000 re-grant of NDIIPP funds through the MTSA to support development of KEEP.

Participants from Mississippi were eager to learn what other states are doing, particularly with respect to XML, which Mississippi had used in a limited capacity. The MDAH was also interested in updating their legislative retention schedules, and they believed that a comparison of other states' legislative retention schedules could assist in this matter.

The Tennessee State Library and Archives began audio recording the floor sessions of the Tennessee General Assembly in 1955. The program gradually expanded, and by the late 1980's all standing committees of the legislature were recorded. In 2006, the legislature ordered the expansion of the recording program to fully record the proceedings of the General Assembly, including all committees and subcommittees, and many special committees. The preservation of digital audio and video was one of TSLA's primary concerns in relation to legislative materials.

The Vermont partners were particularly interested in core metadata schemas, authenticity, accessibility, retrospective digitization, preservation, and web harvesting.

Expected benefits of participating

Previous work in Minnesota and California indicates that access was an effective catalyst for investment; by demonstrating immediate value to funding sources and to important constituencies, it becomes easier to justify and develop support for preservation. Consistent with the Library of Congress's vision for NDIIPP, the leaders of the MTSA project hoped to demonstrate the potential of a federated partnership, with state entities managing the identification and acquisition of legislative content, within a common framework of standards and shared services that support cost-effective and efficient preservation and enhanced access.

The MHS team is finalizing a "resource center" related to providing access to and preserving legislative materials. The goal is to provide guidance and resources on where to begin, what the main issues are, and external resources where users can explore the topics on their own.

Project results expressed in proposal

As indicated in the proposal to NDIIPP, the MTSA project has offered:

- Access: The MHS and CDL have developed and tested web-based tools for providing access to content from California and Minnesota with a focus on legislative content. MHS has also worked with the Sunlight Foundation to develop mechanisms for access.
- Evaluation: MHS staff worked with nine other states to evaluate their capacity to work with their legislatures.
- Guidelines and standards: Working with the states and the partners, MHS staff translated what they have learned during the project into a series of white papers.
- Preservation: There are a variety of preservation models under development, two under the aegis of the NDIIPP states initiative. Project staff consulted with a range of potential

preservation partners to determine how those options can shape the standards and procedures pertinent to this effort.
- Business Cases: Each state archives has to understand the context in which it acts in order to make effective decisions; the MHS staff have developed a business case template, along with a methodology for each state to develop its own.

Examples of activities enabled by the grant
The extension to the NDIIPP initiative has allowed MHS to engage in a pilot project with Tessella to hold digital preservation education consultancy sessions with a number of state legislative divisions. The state participants—MHS, Illinois State Library, Tennessee Department of State, and Vermont State Archives—have conducted a pilot evaluation of a multi-tenant deployment of Tessella's digital archiving solution, Safety Deposit Box. From May to September 2011, the states were able to test the system functionality, including active preservation in ways that were most relevant to their local needs and goals. Illinois wrote Perl scripts that used SDB's application programming interface (API) in order to automatically ingest materials; Minnesota examined ingest, access, search, preservation, metadata, reporting, documentation, and troubleshooting; Tennessee focused on curation of audio files and web crawling; and Vermont investigated testing and reporting.

The MSTA enabled involvement in and advancement of the effort to develop the Electronic Legal Materials, under the leadership of Michele Timmons from the Minnesota Office of the Revisor of Statutes. An indirect benefit of this activity was raising states' attention to the importance of authenticating online legislative materials. At the final All Partners meeting of the MSTA project on December 6-7, 2011, representatives of several states reported on their progress and strategies for approaching authentication. Mendora Servin of the Office of the Legislative Counsel of California gave a presentation about a system for authentication that her office had recently developing,[173] and she explained that this work would not have been considered a high priority in the state of California without the work of the MSTA project.[174]

Systems development and implementation
The MTSA project has not developed a single integrated system. Instead, it has investigated and documented a variety of technical components. These have include the following (see Appendix K for further details about each): eXist, oXygen and Lucene (as part of an application developed by Syntactica), BagIt (Library of Congress), Merritt (CDL), Web Archiving Service (CDL), Heritrix (Internet Archive), SDB (Tessella), and the Open States iOS Application (Sunlight Foundation).

Project management – roles, responsibilities and coordination
Project staff at the Minnesota Historical Society have coordinated the work and facilitated regular communication and interactions with and between state partners. This has included setup and management of a Basecamp[175] environment for sharing of documents; coordinating three all-partner meetings; and taking trips to hold meetings with each of the partner states. The MHS team explored a variety of technical and policy options for management of legislative materials and shared the results publicly.

MHS hosted the first and third all-partners meetings for the project in December 2008 and December 2011. The California Legislative Counsel hosted the second all-partners meeting in January 2010.

Project staff at the Minnesota Historical Society have coordinated the work and facilitated regulations communication with the state partners who have functioned primarily as an advisory board. Partners had a great deal of influence in shaping the policy framework and products. As Minnesota has developed products, the states have helped to evaluate their appropriateness and relevance in different environments. Partners had further involvement in specific activities related to their particular interests and needs.

Communication within the project

- Basecamp (37Signals) used to communicate within MHS and among partners.
- Emphasis on meetings, site visits, and other forms of direct contact.

Dissemination of products and information outside of the project

Publications, presentations, and other materials related to the project have been made available online. The MHS has emphasized education and promotion as essential components to the project, and have been very active in disseminating information about the project's findings. See the project timeline for an elaboration of external events and communities reached by the project.

Preliminary products were shared and reviewed through Basecamp. Once completed, project products have been freely available through the MHS web site. This content includes a number of white papers, slides and audio from presentations, and podcasts.

White Papers and resources produced through the project include:[176]

- Authentication White Paper Resources
- Best Practice Principles for Opening Up Government Information
- Business Case for Digital Preservation
- Cloud Computing
- Digital Audio Video White Paper and Resources
- Government Data Mashups White Paper
- Legislative Metadata Comparison
- Legislative History Resources
- Options for Improving Access to Legislative Records
- Project Podcast
- Preservation Options
- Record Inventory
- Records Retention Policies for Selected Legislative Records
- Retrospective Digitization White Paper and Resources
- Survey of Partner's Legislative Records on the Web
- Web Archiving and Evaluation
- Web Content Accessibility
- XML Native Database White Paper
- XML Usage Survey

As discussed above, the project also produced a metadata schema and reports on its technology-specific pilot projects, including eXist, Merritt, the Web Archiving Service and SDB. All of these products can be found on the project's web site.

The key audiences for this project are state archives, state libraries, legislators and legislative staff. However, much of the project-related information, including white papers, presentations, and other reports, have been made available online through the project website for general public access, and are likely to be useful to information professionals in a variety of environments. At the end of the project, MHS announced the availability of Center for Archival Resources On Legislatures (CAROL),[177] a new area of the MHS site that aggregates MTSA products and related resources.

Types of digital content addressed

- Legislative content from California and Minnesota[178]
  - The selection of content started with the appraisals carried out in the E-Legislature project, focusing on bills, acts, mandated reports and house and senate journals. The exact selection of content and the development of tools to enhance its value were reviewed and validated in conjunction with meetings and focus groups facilitated with the NCSL, which represents the primary audiences for the use of legislative content; legislators and legislative staff are also a key constituency and source of funding.
- Online content used in Web Archiving Service testing
  - The project focused on preserving and providing access to digital legislative information, including websites. The majority of testing was done on legislative websites from Minnesota with a focus on the documents that were most important, the bills, statutes, and rules from the Minnesota Office of the Revisor of Statutes.

Current and planned custodial responsibility

The MTSA project focused on education, testing, network building and outreach. Each participating state is responsible for custody of its own legislative materials.

Value and potential usefulness of content types addressed

- Legislative content for legislative histories
  - "A legislative history traces a bill through the process of becoming a law. The history tracks the progress and changes made to the bill during the legislative process. Materials are created and documents are edited at each step in the legislative process, and it is these materials that document the changes over time that are used to create the legislative history." "One reason for creating a legislative history is to research a current law before suggesting amendments. One would want to know if the desired change had previously been considered and if so, why and under what circumstances had it been removed. Another reason is to help establish legislative intent. When a law is written in such a manner that it could be interpreted in more than one way, reviewing documentation leading up to the passing of the bill could help show the original or legislative intent of the creators."[179]

- Government data can be used for mash-ups
  - A data mashup has come to describe the practice of combining two or more sets of data electronically to enhance current meaning or create new meaning, where the original data and the resulting product are all usually available on the Internet. The quantity, variety, and intrinsic value of government data make it suitable for use in mashups. Citizens and government entities have begun to ask for direct access to data, especially to the critical information that can improve decision making inside and outside of government.[180]
- Web Archiving Service
  - The World Wide Web (Web) consists of countless pages of publicly available content and information. Content on these pages is structured in different ways, comes in many formats and includes text, videos, and images as well as hyperlinks between pages and to content in other formats such as PDF or Word. By using search engines and navigating through linked content users can find just about anything they are looking for. However, web pages are constantly being updated, relocated, or removed and you may not always be able to go back to something you saw before. Web archiving is the process of capturing and preserving portions of the World Wide Web.[181]
- Audio/Visual Archiving
  - As it becomes harder to find equipment able to play reel-to-reel tapes, and as cassette tapes begin to disintegrate, many states are choosing to digitally record legislative sessions and are in turn offering online access to current and past legislative session recordings. Posting current and past legislative sessions online makes them accessible to a greater number of people, as more and more people have access to computers. [182]

Plans for advancing the activities after the grant

The MHS is looking into collaboration with the Minnesota Digital Library, in addition to other grant funding, as a way to sustain the project beyond the grant. MHS and MROS staff began discussions in January 2012 about MHS serving as a dark archive for the legislative content they are offering online, which could help the MROS to meet the requirements of UELMA.

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D. MTSA – Timeline

	Influential Events and MTSA Project Activities [Project activities are in bold blue text.]
1990	Minnesota Historical Society receives a grant ($39,785) from the National Historical Publications and Records Commission (NHPRC) to fund a national planning conference on electronic records issues.
1995	MHS receives a $10,000-grant from the NHPRC for an electronic records consultancy and training project.
1997	November - MHS receives a grant ($90,031) from the NHPRC for the Trustworthy Information System (TIS) project.
	California Digital Library is founded by the University of California.
1998	November - MHS begins working (until July 1999) with five agencies in Minnesota state government to apply the TIS criteria.
1999	December – MHS posts the TIS Handbook online.
2000	April - The state of Minnesota adopts the Uniform Electronic Transactions Act (UETA).
	June 12 – Minnesota's Office of the Secretary of State and MHS sponsor a workshop on UETA at the Minnesota History Center.
	May – MHS begins a collaboration with the META Group to investigate the role of metadata in the state's enterprise architecture (inspired by an Enterprise Architecture Immersion Workshop in April presented by META Group and sponsored by the Office of Technology).
	August – Minnesota's Recordkeeping Metadata Study Committee is formed at the recommendation of the Data Issues Group for Information Technology and the Minnesota Government Records and Information Network (MN GRIN) – first meeting was September 1.
	November - MHS receives a two-year grant of $150,546 from the NHPRC for its "Educating Archivists and Their Constituencies Project" to develop workshops on the eXtensible Markup Language (XML) and metadata as they apply to archival concerns about electronic records.
	December – The Recordkeeping Metadata Study Committee issues its final report.
2001	February – The Recordkeeping Metadata Development Committee (RMDC) is established in Minnesota based on the recommendation of the Recordkeeping Metadata Study Committee.
	August 1 – New Minnesota legislation creates an Electronic Real Estate Recording Task force, to include among other members (Minnesota Laws 2000, Chapter 391) "a representative of the Minnesota Historical Society and other state and local government archivists" [Bob Horton serves as a member].
	August 14-16 - At the invitation of Minnesota Academic Group for New Opportunities in Library and Information Access (MAGNOLIA) and with the support of the IMLS through Library Services and Technology Act (LSTA) funds, twenty-five librarians, archivists, and technologists met in Monticello, Minnesota, to discuss a coordinated collaborative digital library project, which would become the Minnesota Digital Library (MDL).
2002	Work begins on the two-year PERM (Preserving the Electronic Records Stored in a RMA) Project, funded ($160,590) by the NHPRC and including MHS as a partner with the State Archives of Michigan and San Diego Supercomputer Center (SDSC), following a two-year "Records Management Application (RMA) Pilot Project" funded by the NHPRC ($190,255) to the Michigan Department of Management Budget.
	MHS receives a 14-month grant of $105,400 from the NHPRC to examine the NHPRC's Electronic Records Research Agenda and to recommend a new agenda.
	With funding from the Andrew W. Mellon Foundation, the California Digital Library conducts a two-year cost-benefit review of technologies and approaches appropriate for the capture and curation of web-based documents of US state and federal governments.
	RMDC and Information Policy Council (IPC) complete the Minnesota Recordkeeping Metadata Standard (IRM 20).
2004	The three-year Web-At-Risk project is funded through NDIIPP, as a collaboration of the California Digital Library, University of North Texas, and New York University, to develop a Web Archiving Service.

2004	Work begins on a two-year project funded by the NHPRC ($242,500) called "Persistent Archive Testbed" - involving the San Diego Supercomputer Center (SDSC), Michigan Historical Center, Minnesota Historical Society, Kentucky Department for Libraries and Archives, and Ohio Historical Society - to test SDSC's data grid and persistent archives technologies using a variety of archival collections.
2005	MHS receives a grant from the Institute for Museum and Library Services (IMLS) of $244,500 to collaborate with Minnesota's Land Management Information Center (now the Minnesota Geospatial Information Center) to "provide Minnesota's teachers with the knowledge, curriculum, and tools to teach the state's new graduation standards for geography and history, using online digital resources and applications."
	MHS, Minnesota Office of the Revisor of Statutes (ROS), and Minnesota Legislative Reference Library (LRL) begin a three-year project with $264,887 from the NHPRC called "Preserving the Records of the E-Legislature" to explore and test the technologies available to preserve the electronic records of the Minnesota legislature (technological guidance and services are provided by the San Diego Supercomputer Center; the California State Archives, State Library, and Legislative Counsel also provide input and consider applicability of the project's products to the California context).
	ROS implements a new drafting and document management system called XTEND.
2006	March - Minnesota ROS staff conduct an analysis of XTEND based on the TIS Handbook.
	May 5 – Library of Congress releases Request for Expressions of Interest for "Multi-State Demonstration Projects for Preservation of State Government Digital Information."
	June 15 – Response to Request for Expression of Interest submitted to Library of Congress
	September - The Bush Foundation awards MHS a three-year grant of approximately $1 million to develop an infrastructure to manage, preserve, and provide access to digital content.
2007	MHS receives a two-year grant from the National Endowment for the Humanities (NEH) to participate in the National Digital Newspaper Program (NDNP) [this award and another in 2009 have provided $868,135].
	The Minnesota legislature directs the state's Chief Information Officer, Gopal Khanna, to undertake a study related to preservation of electronic documents.
	May - MHS tests use of Internet Archive's Archive-It service to capture web pages of the Minnesota Legislature including the Office of Revisor of Statutes pages containing the Statutes, Laws, and Rules.
	December 7 - administrative kick-off meeting hosted by LC in Washington DC for NDIIPP state projects
2008	January 7 – Library of Congress announces four state projects ($2.25 million of total funding), including MTSA.
	January - Basecamp partner sites are established.
	January 11 - National Conference of Commissioners on Uniform State Laws (NCCUSL) Scope and Program Committee recommends formation of a Study Committee on Authentication of Online Legal Materials [Bob Horton named an observer to the committee by Council of State Archivists and Society of American Archivists]
	January 15 – completion of "Preserving the Present: Creating, accessing and maintaining Minnesota's electronic documents," a report to the Minnesota state legislature
	January 25 - project kickoff meeting in St. Paul with Minnesota partners, some California partners, and National Council of State Legislatures (NCSL) staff
	January 28 – Minnesota state partners meeting, involving MHS, MROS, Legislative Reference Library and other legislative representatives
	January 31 – Minnesota Legislative Networking Group (LNET) meeting
	February - Project web site is established.
	February 5 – Illinois state meeting (conference call)
	February 22 – Second Minnesota partners meeting in St. Paul – to discuss possible development of a standard, minimum XML schema for legislative records (precipitated by the recent LNET meeting)
	March 25 - California partners meeting in Sacramento
	March 28 - Kansas partners meeting in Topeka
	April 14 - Vermont partners meeting in Montpelier

2008	April 24-26 - National Conference of State Legislatures (NCSL) Spring Forum [presentation by Bob Horton]
	May 20 - Mississippi partners meeting in Jackson
	May 30-31 - Temple University State Politics and Policy Conference in Philadelphia, PA [presentation about MTSA project goals]
	June – first version of project white papers on "Web Content Accessibility," "Authentication of State Online Primary Legal Material," and a table for comparing preservation options
	June 6 - MHS meets with representatives from the Minnesota Office of Revisor of Statutes (MROS), XMaLpha Technologies and Thomson Reuters to begin developing an XML schema for state legislative content.
	June 30 – The Minnesota Electronic Real Estate Recording Task Force issues its end report [Bob Horton of MHS serving on the Task Force].
	July – First version of white paper on "Options for Improving Access to Legislative Records"; first version of core XML schema for legislative records; second version of draft white paper on "Authentication of State Online Primary Legal Material"
	July 1 - Act 96 of 2008 takes effect, merging the Vermont State Archives and Division of Public Records, Department of Buildings and General Services, into one division called the Vermont State Archives and Records Administration (VSARA) within the Office of the Secretary of State.
	July 8-10 – NDIIPP Partners Meeting in Arlington, VA [presentation by Jennifer Jones and Shawn Rounds about the MTSA project]
	July 23-25 – Joint annual meeting of National Association of Government Archives and Records Administrators (NAGARA) and Council of State Archivists (CoSA) in Atlanta, GA [presentation about MTSA at the CoSA board meeting on July 23]
	July 23-25 – National Council of State Legislatures (NCSL) Annual Meeting in New Orleans [project presentation by Bob Horton]
	August – Second version of white paper on "Authentication of State Online Primary Legal Material"
	August 12-13 - Zepheira Semantic Web Technologies meeting, St. Paul
	August 18 – Tennessee partners meeting in Nashville – includes discussion of Tennessee's issues with audio and video materials, resulting in follow-on research conducted by MHS (see below)
	August 26-31 – Society of American Archivist Annual Meeting [SAA Electronic Records Section meeting focuses on NDDIIPP State projects with talks about all four projects – Bob Horton for the MTSA project]
	September - Chris Welter from MHS leaves the project.
	September – Second version of white paper on "Web Content Accessibility"
	September 12 - MHS meets MROS and Thomson Reuters, determining that creating a standardized XML schema for bill drafting systems is problematic and deciding instead to develop an XML wrapper for legislative information exchange, to contain a standard set of metadata elements and legislative data in original formats (e.g., Word, XML) and any other instances (e.g., PDF, HTML).
	October - Carol Kussmann from MHS joins the project.
	October – First version of white paper on "Options for Improving Access to Legislative Records"; second version of XML core schema (by Tim Orr of MROS and Dan Dodge of Thomson Reuters)
	October 29 - MHS meets again with MROS and Thomson Reuters to review a proposed crosswalk document to identify equivalent terms in various legislative metadata schemes and review a proposed XML core schema.
	November - Summary of state partner legislative resources; development of preliminary resources for business cases and gap analysis; documentation and comparison of partner issues and concerns
	November - eXist product demo by Dan McCreary and associated discussion
	December 8 - Meeting of all MTSA state partners in St. Paul
2009	**January – The first draft of XML wrapper schema is completed.**
	MHS receives a second two-year grant from the NEH through the National Digital Newspaper

2009	Program (NDNP).
	January 17 - February 23 - MHS again (see earlier efforts in 2007) tests Archive-It for capturing and providing access to Minnesota Statutes, Laws, and Rules pages and associated contextual information.
	January 29 – Completion of document called "Minnesota Legislative History Information and Instructions" and posting of associated resources from other states
	February – Meeting to scope the eXist database activity
	February - Survey of state use of digital audio and video in the legislature; "Comparison Chart of State Use of XML Bill Drafting Systems"
	March – White paper on "Retrospective Digitization of Government Records" and associated resource list
	March 6 – XML Schema Working Group meeting – discussion of addressing schemas within wrappers, possible development of a schema registry, and addition of a catalog ID element to allow for schema references in a the schema registry
	March 31 – NDIIPP State Partners Meeting in Washington, DC
	April – Posting of draft grid of "Digital File Preservation Options"
	April 2-5 – Annual Meeting of National Council on Public History (NCPH) in Providence, RI [Bob Horton on "Roundtable: Building the Digital Archive: Lessons Learned and Future Prospects"]
	April - NDIIPP approves extension of the MTSA grant into 2011, including addition of three more partner states: Arkansas, Nebraska and North Dakota.
	April 8-10 – National Conference of State Legislatures (NCSL) Spring Forum at Library of Congress in Washington, DC [Bob Horton on "Preserving Our Legislative Legacies"]
	May - First eXist training session for MHS staff
	May – White paper on "Digital Audio and Video" and associated resource list
	May 18 – Second Mississippi state meeting
	May 18 – Second Vermont state meeting in Middlesex, Vermont
	May 26 - OCLC Webinar: Imaging, Quality Control and Digital Infrastructure: Digitization
	June – Utah business plan conference call [involving participants from both the MTSA and GeoMAPP projects]
	June – Second eXist training session for Minnesota Reviser's Office and MHS staff
	June 5-6 - National Freedom of Information Coalition's 2009 Summit in Minneapolis, MN [attended by Robbie Lafleur (MLRL), Jennifer Jones and Nancy Hoffman (MHS)][183]
	June 7-9 – Project visits to St. Paul by John Kunze (California Digital Library) and Cal Lee (University of North Carolina)
	June 8 - 7th Annual Minnesota Digital Library Meeting in St. Joseph, MN
	June - Second version of white paper on "Options for Improving Access to Legislative Records"
	June – First rough cut of podcast about the project
	June – Partners metadata meeting through WebEx
	June 19 – Second California state meeting; conference call with new partner states (Arkansas, Nebraska, North Dakota)
	June 24-26 – NDIIPP Partners Meeting [Presentation by Shawn Rounds on "Metadata and Minnesota's Legislative Documents" about the legislative metadata schema developed by the XML Working Group]
	July – Identification of XML content for Minnesota access pilot; eXist demo for MROS staff; 2010 all-states meeting planning conference call
	July 13 – Second Tennessee partners meeting in Nashville
	July 15-18 – NAGARA Annual Meeting in Seattle, WA [presentation by Bob Horton on "NDIIPP: Preserving State Digital Legislative Records"]
	July 23 - Minnesota Digital Government Summit in St. Paul
	July 25-29 - Association of American Law Libraries (AALL) Annual Meeting in Washington, DC
	August - Revised work plan for extension of project
	August 4-5 – "National Strategy for Public Policy Content on the Web" at Library of Congress in Washington, DC ["State Legislative Records: Public Policy Content on the Web" by Bob Horton]
	August 10 – Second-year Illinois state meeting in Springfield

2009	August 12-15 – SAA/CoSA Annual Meeting in Austin, TX
	August 19 – Initial access pilot application meeting with Syntactica, including discussion of overall architecture and expected deliverables for eXist project
	August 20-21 – Meeting in St. Paul to welcome the three new partner states and to give them an overview of the project
	August 26 – MHS, MROS and Syntactica meet to discuss eXist system requirements.
	September 2-4 – Best Practices Exchange in Albany, NY
	September – Finalized podcast about project
	September 18 – Syntactica presentation of system architectures and general discussion to project team
	September 22-23 – Designing Storage Architectures for Digital Preservation (NDIIPP) in Washington, DC
	October – The State of Nebraska State Records Administrator publishes "Durable Medium Written Best Practices and Procedures (Electronic Records Guidelines)."[184]
	October – Second version of "Web Archive Evaluations"; project podcast posted online
	October 15 - 2009 Professional Development Seminar for the National Conference of State Legislatures (NCSL) Legislative Research Librarian Staff Section in St. Paul [presentation on MSTA project]
	October 1 – Syntactica attends project team weekly meeting and discusses user stories, application portfolio, roles and role-based access, authentication, and stress testing
	October 7 – Load/stress testing meeting for access pilot application with Syntactica
	November – Conference call with Kansas partners
	November 12 – Preliminary demonstration of eXist access pilot application to project team
	October 21-23 – Midwest Archives Conference 2010 Symposium in Dayton, OH
	December 3 – Nebraska partners meeting in Lincoln
	December – White paper on "XML Native Databases and Legislative Documents"; pilot eXist application
2010	**January 8 – XML Schema Working Group meeting – demonstration and discussion of the wrapper prototype**
	January – Minnesota Digital Library stakeholders meeting, including a presentation by John Wilkin, director of the HathiTrust. The report from the meeting concluded: "To move the discussion from the hypothetical to the practical, we should begin building a prototype. It should be collaborative, meeting the needs of the primary partners (MDL, UMN, MHS, Minitex) and extensible to other partners (e.g., MPR, TPT, county and local historical societies)."
	January 20 – All-partners meeting in Sacramento, CA
	February - Article about the XML wrapper written by two members of the XML Schema Working Group (Tim Orr and Isaac Holmlund) in the National Association of Legislative Information Technology's Winter 2010 Newsletter
	February 4 – Release of "Selecting a System Architecture: The Minnesota NDIIPP Project Experience"
	February 19 - Report on the initial development of the eXist XML native database as an access tool for state legislative information
	March - completion of MHS-NCSL brochure
	March - Meeting with California Digital Library (UC3) staff in Oakland, California; conference call to discuss UC3 Web Archiving Service
	April – Meeting with Kansas Partners in Topeka, Kansas
	April 8-10 - National Conference of State Legislatures (NCSL) in Washington, DC
	April - Creation of 2010-2011 work plan for activities with UC3
	April 27 – Meeting with North Dakota state partners in Bismarck, ND
	May - Evaluation of Phase I access application pilot with recommendations for follow-on development
	May 2-4 – Consultation visit to St. Paul by Cal Lee
	June 1-4 – IS&T Archiving 2010 in Den Haag, The Netherlands ["Move It or Lose It: Investigating Digital Curation Portability for Access to Government Information" by Christopher (Cal) Lee as

2010	consultant to project]
	June - eXist Pilot Project final report posted
	June 15 - Minnesota Partners update and planning meeting
	June 18 – Conference call with KEEP project (Kansas)
	June 18 – Document Authentication Workshop, Government Printing Office in Washington, DC [Bob Horton participating]
	June 24-29 – American Library Association Annual Conference in Washington, DC
	July - Meeting with Kansas partners in Topeka, Kansas
	July – Illinois passes a State Electronic Records Act, stating that "a record created in an electronic format is considered the same as and has the same force and effect as those records not produced by electronic mean," encouraging government agencies to employ electronic means of creating, maintaining and transferring records, [185] and establishing an Electronic Records Advisory Board, which includes the Illinois State Archives as part of the Office of Secretary of State. [186]
	July 20-22 – NDIIPP Partners Meeting in Arlington, VA ["Preserving Legislative Digital Records" by Bob Horton]
	July 28 – National Council of State Legislatures (NCSL) Legislative Summit 2010 in Louisville, KY ["XML Standards for Archiving Legislative Records" by Daniel Dodge, Thomson Reuters]
	August 10-15 - Joint Annual Meeting of CoSA, NAGARA, and SAA in Washington, DC
	August - NCSL announces publication of "Preserving Legislative Digital Records."[187]
	August 20 – XML Schema Working Group meeting - to discuss the wrapper prototype, recent changes made by Dan Dodge, address any concerns and determine next steps
	September – Web Archiving Service testing with UC3; participation in Archive-It webinar
	September 8-12 - Professional Development Seminar, American Society of Legislative Clerks and Secretaries (ASLCS) in Milwaukee, WI
	September 23 – XML Schema Working Group meeting - to discuss minor proposed changes to the wrapper schema; meeting in St. Paul for new and existing Minnesota state partners
	September 27-28- Designing Storage Architectures for Preservation Collections in Washington, DC
	September 28 – October 1 - Best Practices Exchange in Phoenix, AZ [Including a session devoted to the MTSA project]
	October – Christopher (Cal) Lee completes independent consultant report on eXist pilot project.
	October - Initial meeting with Tessella staff about project possibilities
	October 22 – Arkansas state partners meeting at Arkansas State Library in Little Rock
	November - Minnesota Digital Library tests transfer of data to the HathiTrust as a preservation environment for image files from Minnesota Reflections, the University of Minnesota and MHS
	November 19-21 - NCCUSL drafting committee meeting, Washington DC
	November – White paper on "Web Archiving" posted to the Web
	November 8/9 - Meeting with partners in Sacramento, California
	November 16/17 - Meeting with Library of Congress staff, Washington DC
	November 8 – Meeting between Bob Horton and CDL staff in Sacramento, CA
	December – Version two of white paper on "Web Content Accessibility"
	December – Conference call between MHS and California Digital Library to investigate relationships between use of Heritrix for web crawling and the other preservation and access objectives of the project
	Quarter 4 - Contract signed with Sunlight Foundation for access pilot within OpenStates / OpenGovernment framework
2011	**March - white paper on "Best Practice Principles for Opening Up Government Information"; white paper that describes and compares the Minnesota legislative metadata set with the Sunlight Foundation's metadata set**
	March 8 - Library of Congress announces release of "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report" discussing all of the NDIIPP-funded projects and programs, including MTSA

2011	**March 30 – Meeting between Tessella and MHS staff to discuss the goals and objectives of the NDIIPP/Tessella pilot project**
	March 31 - April 1 – Meeting in St. Paul involving Tessella and the state partners who are involved in the testing of Tessella's Safety Deposit Box (SDB): Illinois, Minnesota, Tennessee, and Vermont
	April 7-8 - E-Records Forum (NAGARA), Austin, TX ["A Review of State Government Digital Preservation" by Bob Horton]
	April-May - A representative from Tessella and representative from MHS travel to Illinois, Tennessee and Vermont to provide SDB training and information sharing (1.5 days per visit).
	April 22 – Dissemination of "Case Study: Exploration of the Current Merritt Preservation Repository"
	June 8 – Meeting in St. Paul with Minnesota state partners
	July 1 – The government of the state of Minnesota officially shuts down.
	July 12 - The Uniform Electronic Legal Material Act is approved today by the Uniform Law Commission (ULC) [drafting committee chaired by Michele Timmons, Revisor of Statutes for the State of Minnesota]
	July 19 – Meeting in Washington, DC between staff from KEEP, MTSA, Library of Congress and several other interested parties to discuss KEEP and possible NIEM standard for e-democracy
	July 19-21 - NDIIPP/NDSA Partners Meeting in Washington, DC
	July 21 – The government of the state of Minnesota resumes operations, after Governor Mark Dayton signs a new budget into law on July 20.
	August 8-10 - National Association of Legislative Technology (NALT) Legislative Summit in San Antonio, TX [Bob Horton presents at session on "Open and Accessible Legislative Documents"]
	August 27-29 – Hurricane Irene strikes the Eastern U.S., President Obama declaring a disaster for Vermont on September 1, with federal funding for four Vermont counties, including Washington county (location of the Vermont State Archives and Records Administration).
	August 31 – White paper called "Cloud Computing: An Introduction" (posted to web site in October)
	September 21-22 – Tessella project wrap-up meeting, with representatives from Tessella, Illinois, Minnesota, Tennessee and Vermont
	October – White paper on "Developing a Business Case for Digital Preservation" (posted to web site in November)
	October 20-22 - Best Practices Exchange in Lexington, KY [session on the states NDIIPP projects with Bob Horton, Christopher (Cal) Lee and Bill Lefurgy; "Inventory Project: Identifying and Preserving Minnesota's Digital Legislative Record" by Shelby Edwards]
	October 31 – Bob Horton leaves MHS and MSTA project to take a position at IMLS; Jennifer Jones becomes Project Director, and Shawn Rounds becomes Minnesota's State Archivist.
	November – White paper on "Authentication Methods" and Legislative Document Metadata Schema posted to project site
	December 7 – After completing public hearings and two rounds of comments, the California Secretary of State sends a proposed regulation on Trustworthy Electronic Document or Record Preservation to the state's Office of Administrative Law.[188]
	December - Basic information on XML posted to project site
	December - Inventory Project report posted to project site
	December - Report from Sunlight Foundation posted to project site
	December - Minnesota's final report on the Tessella Pilot Project posted to project site
	December - XSD document of metadata schema posted to project site
2012	**January - Authentication of Primary Legal Materials and Pricing Options white paper posted to project site**
	February - The SunLight Foundation makes the Open States application available through Apple's App Store.
	February 28 – The MTSA project releases the Center for Archival Resources On Legislatures

	(CAROL) on the MHS web site.

E. KEEP – Project Summary

Project title
Kansas Enterprise Electronic Preservation (KEEP) System

Brief project description
KEEP aims to develop and provide an enterprise-wide digital repository for Kansas government electronic records with long-term value. The digital repository will provide public access to authentic records and provide certification of authenticity for specific record sets on a fee basis. The project team places a high priority on the use of open source software.

The partnership for the prototype KEEP System Project includes all three branches of Kansas state government. The KEEP team includes subject matter and technical experts from the Kansas State Historical Society, the Kansas Legislature, the Kansas Judicial Branch, the Attorney General's Office, and the Division of Information Systems and Communications (DISC). The first records ingested into the prototype system will be the foundational documents for interpreting Kansas law — committee hearings from the Legislature, Supreme Court opinions and Attorney General's opinions. The prototype was designed to integrate with the Kansas Legislative Information Systems and Services (KLISS), which was under development at the same time. The prototype project included the development of a preliminary policy framework that can be enhanced over time.

Main factors that drove initiation of the project
The Kansas State Historical Society (KSHS) has been actively addressing electronic records issues since the mid-1990s. In 1996, with funds from the National Historical Publications and Records Commission (NHPRC), KSHS hired Margaret Hedstrom as a consultant to draft electronic records guidelines for Kansas state government. Three years later, KSHS received another grant from the NHPRC to test, revise and implement the electronic records guidelines, hiring Cal Lee as electronic records project archivist. This grant resulted in several more guidance documents (including a chapter on electronic records in the Kansas Statewide Technical Architecture, now called the Kansas Information Technology Architecture[189]), development of strong ties to the state's information technology management leadership, state IT project management certification for Matt Veatch of KSHS, formation of the Kansas Electronic Records Committee (ERC), and KSHS creating a full-time Electronic Records Archivist position.

In 2003, KSHS and the Kansas State Library developed Kansas State Publications Archival Collection (KSPACe), a system based on DSpace to manage and provide access to digital state publications and documents. KSHS, State Library, Legislative Computing Services, and Kansas Information Technology Office (KITO) carried out a digital preservation capability assessment of KSPACe in 2005; this assessment, along with a fit analysis by the Kansas ERC against national preservation standards, highlighted numerous requirements for a more robust statewide preservation repository. Kansas joined the Minnesota Historical Society (MHS), along with five other states, in their Response to Request for Expression of Interest to the Library of Congress for an NDIIPP state project called a "Model Technological and Social Architecture for the

Preservation of State Government Digital Information" (MTSA), which was funded and announced on January 7, 2006. The Kansas legislature then appropriated $150,000 to the KSHS in 2008 to begin a digital state archives project, and the Information Network of Kansas (INK) Board awarded a further grant of $175,000 to support development of KEEP on February 5, 2009.

A major project in Kansas that fed into the KEEP initiative is Kansas Legislative Information Systems Strategy (KLISS). Approved by the Kansas Legislative Coordinating Council in October 2004, KLISS is an effort to reengineer the state legislature's processes for drafting bills, managing legislative documents and providing public access to them. It was instigated by the Kansas Statehouse Renovation Project, which had begun in 1999. In December 2005, Kansas awarded the bid for developing KLISS to Propylon, an Ireland-based company founded in 1999 that specializes in systems for managing legislative and regulatory information. KLISS makes use of XML for encoding legislative content, is based on a variety of open-source components (Linux, Apache, ActiveMQ, MySQL, Django, OpenOffice, Subversion), and a web-based Representational state transfer (REST) architecture for transfer of data. When the Minnesota team for the MTSA project visited Topeka for a Kansas partners meeting, on March 28, 2008, several members of the KLISS team participated, including Don Heiman (Legislative Chief Information Technology Officer) and three employees of Propylon; a significant amount of the day's discussion was devoted to the KLISS project. In 2010, Kansas submitted a proposal to MHS to use NDIIPP funds to develop a core policy framework and prototype of KEEP, which resulted in $125,000 being allocated from NDIIPP on April 22, 2010. On January 28, 2011, Kansas submitted a proposal to MHS for additional NDIIPP funding for a KEEP-to-KLISS connector, and to evaluate a National Conference of Commissioners on Uniform State Laws (NCCUSL) model law related to authenticating legal documents. The grant was awarded on March 14, 2011.

Another important initiative was called Kansas Electronic Records and Information Management (KERIM). On May 8, 2008, KSHS and the Department of Administration convened a KERIM Dialogue, in which a group of state and local government decision-makers explored the challenges, risks and opportunities of managing electronic government records and information, and assessed the current state of electronic records and information management in Kansas and discussed collaborative approaches to addressing this important issue. John Carlin, former Kansas governor and archivist of the U.S., was the keynote speaker; former NARA CIO and Lockheed-Martin consultant L. Reynolds Cahoon facilitated the dialogue. The outcome was an agreement to develop an electronic records management roadmap for Kansas government. From September to December of 2008, the KERIM team met to develop a roadmap.

Several changes to Kansas state law and policy have also laid an important foundation for KEEP. In 1998, Kansas enacted Senate Bill 5 (SB5), establishing the Information Technology Executive Council (ITEC) to be responsible for information technology resource policies and procedures, project management methodologies, an information technology architecture, data management standards, and a strategic information technology management plan. The next year, Kansas established an Information Technology Advisory Board (ITAB) to the Executive Branch's Chief Information Technology Officer, Executive Branch (CITO) and the Information Technology Executive Council (ITEC). Kansas also established the Kansas Architectural Review Board,

which among other duties, review proposed programs and projects referred by the Chief Information Technology Architect (CITA) and makes recommendations related to their compliance with the state's IT architecture. In 2000, Kansas "Information Technology Policy 2400 Revision 2 - Project Approval" went into effect, requiring the branch CITO and head of a government entity to review and approve an IT Project Plan prior to starting a project with a cumulative cost of $250,000 or more, and review and approve all specifications for competitive acquisitions in such IT projects. The Kansas Legislature passed Senate Bill 380 and Senate Bill 605 in 2000, allowing state agencies to publish reports or publications to their web sites and retain electronic copies, rather than distributing and retaining paper copies. Finally, on March 1, 2010, the governor of Kansas approved House Bill 2195,[190] which authorized the State Archivist to develop standards for preserving and maintaining the authenticity of electronic government records and to certify records as being compliant with the standards. On April 22, 2010, the Kansas Information Technology Project Planning Guidelines (attachment to ITEC Policy 2400), included a new provision: "If the proposed system contains records with retention periods of ten or more years as approved by the State Records Board, Supreme Court Rule 108, or the Legislature, cost to provide ingestion of these records into the Kansas Electronic Preservation system when the system becomes operational is to be included here. (**Note: All funds identified for this purpose will be transferred at the start of each fiscal year to the Kansas State Historical Society's Records Management Fund**.)"[191]

Participating parties

The table below indicates various parties that have important associations with the KEEP initiative. In addition to the specific parties that have formal roles in KEEP, there are also many roles that are distributed across units of government. The Legislative and Judicial Branches of Government are responsible for identifying business considerations and practical requirements relating to managing and preserving electronic Kansas government records and to submit these considerations to the Electronic Records Committee for review and adoption. The Judicial and Legislative Branches also approve retention and disposition rules, recordkeeping plans for electronic records series, and recommendations from the State Archivist for maintaining the authenticity of records within their respective branches.

The director of each state government agency and the heads of all Branches, Boards, Commissions, Departments, and Divisions are responsible for ensuring the preservation of long-term electronic records through compliance with policies, procedures, and methodologies approved by the State Records Board and endorsed by the Information Technology Executive Council. The director of each state government agency and the heads of all Branches, Boards, Commissions, Departments, and Divisions are responsible for assigning sufficient resources to ensure that digital preservation issues are taken into account in the delivery of services to the citizens of Kansas. Organizational leaders may enter into agreements with the KSHS State Archives and Library Division for the transfer and storage of permanent records as well as non-permanent Kansas state government records that must be retained for ten years or longer. Branch Information Technology Officers (CITOs) provide leadership and direction for state entities and their IT investment. Each CITO is responsible for ensuring compliance with digital preservation policies and best practices in all systems and functions under his/her purview. Toward this end, each CITO designates a Digital Preservation Officer to serve on the Electronic Records Committee and to coordinate digital preservation initiatives, priorities, and

methodologies within their respective branch of government. CITOs advise the State Archivist of digital preservation requirements, changes in technologies, and other evolving issues in their operations.

Agency Records Officers are responsible for maintaining a liaison with the KEEP System, the retention and disposition authority, and the KSHS Archives and Library Division. Agency Records Officers are authorized to sign and submit state government records to the KEEP System.

Table 10 – Parties Related to the KEEP Project

Entity	**Role**	**Relevant Personnel**
Chief Information Technology Architect (CITA)	"The CITA publishes plans and standards under the auspices of ITEC. The CITA is responsible for incorporating KEEP System policies and requirements into the Kansas Information Technology Architecture, Strategic Information Management (SIM) Plan, and Kansas project management training curriculum and certification processes."	Bill Roth, CITA (until retirement in October 2011)[192]
Electronic Records Committee (ERC)[193]	The ERC, chaired by the State Archivist, is an advisory committee to the Information Technology Executive Council (ITEC). The ERC recommends and reviews policies, guidelines, and best practices for the creation, maintenance, long-term preservation of and access to Kansas state government electronic records.[194]	Membership is composed of legislative, judicial and executive branch agency representatives who have electronic records management and digital preservation domain knowledge and authority.
Information Network of Kansas (INK)	INK will support public access to the KEEP System and payment portal services. Kansas Network Consortium, Inc. (KIC) is responsible for collecting and distributing revenue for online KEEP System authentication services. INK will is also charged with collecting and analyzing "user feedback on the KEEP System, reporting results and public access requirements to the KSHS."	A ten-member board is composed of the Kansas Secretaries of State, Transportation and Revenue; the president of Kansas, Inc.; a representative from the Kansas Association of Libraries; and private Kansas citizens representing user groups.[195]
Information Technology Executive Council (ITEC)	ITEC is responsible for approval and maintenance of all enterprise information technology policies, IT project management procedures, the statewide technical architecture, and the enterprise strategic information management plan for all branches of government. ITEC supports the authority of the State Archivist in complying with the requirements of ITEC Guideline 2400A[196] and will facilitate implementation of KEEP System standards and policies of the Electronic Records Committee approved by the State Records Board.	ITEC is composed of up to 17 members from all three branches of state government, city government, county government, the Board of Regents, INK, and the private sector.[197]
Kansas Historical	KSHS encourages the effective and efficient	• Director, Archives and

Entity	Role	Relevant Personnel
Society (KSHS)	management of state government records and provides services and resources to preserve and enable access to long-term electronic records through the KEEP System.[198]	Library Division (Patricia Michaelis)[199] • State Archivist (Matt Veatch) [200]
KEEP System Operator[201]	The KEEP System Operator is responsible for operating system, network, and security services for the Repository including facility management and operational controls. Responsibilities include: • Establishing and operating all components of an infrastructure sufficient to ingest, authenticate, and provide access to state government electronic records with long-term value • Reporting on performance of operations in meeting its obligations as a Repository including potential risks • Planning and forecasting expenditures and resources necessary to maintain the viability of the KEEP System infrastructure	Kansas Historical Society
Legislative Computer Services[202]	Legislative Computer Services is a unit of Legislative Administrative Services, which "provides administrative and technical support for the Kansas Legislature and general public, as directed by the Legislative Coordinating Council."[203] Legislative Computer Services staff configured and managed the prototype infrastructure. Ongoing maintenance was then transitioned to OITS and KSHS in the fall of 2011.	• Mike Baker • Terri Clark, Data Center Manager, KEEP Co-Project Manager – Technical (until November 2011) • Dave Larson (retired in December 2011)
State Records Board	The State Records Board oversees "the permanent preservation of important state records and to provide an orderly method for the disposition of other state records."[204] HB 2195 augmented the authority of the State Records Board by requiring the State Archivist to prepare and present recommendations regarding preservation processes for maintaining the authenticity of electronic records.[205]	• Duncan Friend – Secretary of Administration representative • Lisa Mendoza – Attorney General representative • Patricia Michaelis – representative of KSHS director • Bill Sowers - State Librarian representative • Matt Veatch – State Archivist[206]

KEEP has a Steering Committee composed of the following individuals:

- Jennie Chinn, Executive Director, Kansas Historical Society (Chair)
- Don Heiman, Chief Information Technology Officer, Legislative Branch (until retirement on August 31, 2011)

- Joe Hennes, Chief Information Technology Officer, Executive Branch (May 2009 until retirement in late 2010)
- Dave Larson, Interim CITO, Legislative Branch (September 1-December 1, 2011)
- Jim Mann, Chief Information Technology Officer, Executive Branch (October 31 – November 8, 2011)
- Jim Miller, CITO, Legislative Branch (joined Steering Committee on December 9, 2011)
- Kelly O'Brien, Chief Information Technology Officer, Judicial Branch
- Bill Roth, Chief Information Technology Architect (until retirement in October 2011)
- Anthony Schlinsog, Chief Information Technology Officer, Executive Branch (interim beginning on November 14, 2011, permanent as of January 30, 2012; joined Steering Committee on December 9, 2011)
- Morey Sullivan, Division of Information Systems and Communication (DISC) (until retirement in summer 2011)
- Dennis Taylor, Secretary of Administration and Executive Branch CITO (holding CITO position January-November 2011)

There is also a Stakeholder Advisory Team composed of the following:

- Kathy Sachs, Kansas Secretary of State's Office
- Michael Smith, Kansas State Records Board
- Lynn Carlin, Kansas State University
- Bryan Dreiling, KITO
- Marilu Goodyear, University of Kansas
- Loren Westerdale, Jr., DISC
- Athena Andaya, Kansas Attorney General's Office
- Richard Vogt, Sedgwick Co.
- Robert Horton, Minnesota Historical Society (until leaving MHS on October 31, 2011)
- Christiane Swartz, Division of Health Care Finance, Kansas Department of Health and Environment (KDHE) [formerly the Kansas Health Policy Authority]

Duncan Friend, Director of Enterprise Technology Initiatives, Department of Administration, has also served as a key technical advisor throughout the KEEP project.

Table 11 - KEEP Business Partners

Entity	**Description**	**Associated Personnel**
Alexander Open Systems	Alexander Open Systems has provided elements of the technical infrastructure for KEEP.	• Mike Strain, Director of Storage • Mit Winter, Enterprise Account Manager
Cisco	Cisco has provided servers.	
EMC	EMC is supporting the use of both Centera (storage) and VMWare (virtualization).	• Aaron Kabler, District Manager
Imerge Consulting	Imerge supported development of the KEEP policy framework and developed test scripts for the prototype system.	• Lori Ashley, Senior Consultant, Tournesol Consulting • Charles Dollar, Senior

Entity	Description	Associated Personnel
		Consultant, Dollar Consulting • Jim Minihan, Partner
Propylon	Propylon has been responsible for developing the detailed design specification and developing the prototype KEEP system. They have a US office in Lawrence, Kansas.	• Fernando Ciciliati, Senior Developer (July 2011-Present) • Sean McGrath, Chief Technical Officer • John Harrington, Chief Operating Officer • Tom Ryan, KEEP Project Manager • Richard Case, Senior Developer (until July 2011)

Resources the parties have committed to the project
Prototype funding came from several sources:

- Kansas state general fund: $149,500
- Information Network of Kansas (INK) Board: $175,000
- Library of Congress (NDIIPP): $225,000 ($125,000 + $100,000)

There are plans for operational funding through a variety of channels: Ingest fees (ITEC Policy 2400A), storage and preservation fees, and possibly other associated service fees. The KSHS applied for another INK grant in December 2011 to help fund the production build (the proposal focus on public access and preservation planning modules for KEEP). The KSHS has committed to funding a records analyst position out of their current state general fund appropriation for at least two years and to allow a KSHS application developer (Matt Powell) to devote 50% of his time to KEEP activities at least through the production build and likely well beyond that.

Main motivations and rationales for each party to participate
The mission of the KEEP System is "to ensure reliable, long-term preservation and access by Kansas citizens to state government records retained for historical, legal, fiscal or administrative reasons, or for research purposes as foundations of government accountability, transparency, and public trust."[207]

The legal authority for the KEEP System is the Government Records Preservation Act, the Public Records Act, and the duties of the State Archivist. The Kansas State Historical Society (KSHS), through the Government Records Preservation Act (K.S.A. 45-401 through 45-413), has statutory responsibility to serve as the official archives for the state of Kansas and to undertake records management activities. All state agencies are also subject to this law. As discussed above, the KSHS has led the development of an electronic records program for the state since the mid-1990s, and the KSPACe project provided them valuable experience in establishing a repository for state materials. However, the State Archives still did not have the capacity to provide a long-term preservation environment for state publications and records. Recent legislation empowering the State Archivist to authenticate records and set standards for their care provided further impetus to develop KEEP.

Don Heiman, Chief Information Technology Officer of the Legislative Branch (retired in August 2011) was a strong advocate for "e-democracy" through widespread access to information related to both legislative and executive branch processes. Long-term access to digital state information falls within this scope. He built a strong working relationship with the KSHS while serving as the CITO of the executive branch and director of DISC. Based on many years of experience with accounting and auditing experience through the Department of Administration, Heiman had a substantial interest in creating a statewide repository that both supports authenticity of records and is supported by sustainable revenue streams.

The Information Network of Kansas (INK) was created through state legislation in 1990 to provide a variety of services to the state, including provision of "electronic access for members of the public to public information of agencies," exploring "ways and means of expanding the amount and kind of public information provided, increasing the utility of the public information provided and the form in which provided, expanding the base of users who access such public information and, where appropriate, implementing such changes," and exploring "technological ways and means of improving citizen and business access to public information and, where appropriate, implement such technological improvements." The INK Board funds grants for projects that support its mission.

Since its formation in 1999, Propylon has been developing and supporting information systems related to managing legislative and regulatory information. In 2005, they won the bid to develop KLISS. Through the KLISS project, Propylon has worked closely with the legislative CIO, other legislative staff and employees of DISC. Development of KEEP has the potential to expand Propylon's portfolio of offerings to include digital preservation.

Expected benefits of participating

Government units that transfer state records to KEEP can fulfill their legal obligations for the retention and preservation of the records. Ingest into KEEP can also support a variety of state services and objectives by providing long-term access to information. Don Heiman, Propylon, and others have projected that KEEP will provide the potential to perform valuable analytics on government information aggregated in the repository.

Related activities and relationships of the participating parties before the project

The KSHS has worked closely with the primary state IT policy entities – KITO office, KTARB, ITAB, ITEC – since the late 1990s. Duncan Friend from the Department of Administration has served on the Kansas ERC since its inception and the State Records Board since 1999. Propylon has been working with the state of Kansas since 2005, as developer of KLISS. The participation of Kansas in the MTSA project, led by MHS, provided the basis for requesting NDIIPP funds to support KEEP prototype development, the KLISS-KEEP connector, and associated activities.

Project results and outcomes

Project Results Expressed in Proposal	Related Activities
Be built on national and international standards for trustworthy digital repositories, including Open Archival Information System (ISO 14721:2003), Trustworthy Repositories Audit and Certification: Criteria and Checklist (TRAC),[208] and other relevant standards.	Fedora Commons represents the core of the KEEP System. The architecture makes use of REST standards in order to promote interoperability across the Internet.
Be designed and built with open source tools as feasible.	Numerous other open source tools and protocols provide specific elements of KEEP functionality including Linux, Apache, ActiveMQ, MySQL, Django, Subversion, JHOVE, DROID, and ClamAV.
House authentic electronic records in a variety of formats.	This is determined by the design of the system exporting records to KEEP.
Capture those records as close to the moment of creation as possible.	The IT project plan reviews and the development of connectors between agency systems and KEEP are designed to facilitate the capture of records early in their life cycle.
Capture as much descriptive, contextual, administrative, and preservation metadata automatically as possible on the records, and reliably link that metadata to the records.	The project plan reviews and KEEP connectors are designed to allow for agency system metadata to be identified and mapped to the KEEP core metadata schema in an automated manner.
Provide for future migration of the records to provide preservation and access over time, including migration of file formats.	This is dependent upon the pending INK grant proposal.
Maintain the records in a secure environment.	Current plans are for three submission methods: machine-to-machine KEEP connector via API; human submissions via a thick client tool; human submissions via a web tool. The API and thick client tool methods are not externally exposed on the Web, thereby decreasing the need for complex security measures. Web tool submissions will be limited to IP addresses on the state wide area network. For the web portal, Propylon is creating an Ingest user authentication system that is intended to meet OMB Memorandum 04-04 Level 2 security criteria via user name and password challenge.
Provide access to authorized users, with the ability to redact or restrict access based on statute or regulation.	The initial approach is to ensure that records transferred to KEEP that have access restrictions are accessible only to authorized staff from the submitting agency. The agency will administer any public access to the restricted records, and thus be responsible for any required redaction. The KEEP team may allow for ingesting of pre-redacted versions of records, if that becomes necessary in

Project Results Expressed in Proposal	Related Activities
	the future.
Provide a method for the State Archivist to certify the authenticity of the records in the system.	Current plans include a method for users to purchase an authenticated version of a record that includes the State Archivist's digital signature. There is not yet a detailed design for this functionality.
Support the development of fee-based funding sources to maintain the KEEP System and preserve authentic electronic records according to statutory retention periods.	As noted above, the financial sustainability model is based upon ingest fees and ongoing storage/preservation fees, although alternative options are under discussion.
Improve the efficiency and cost effectiveness of public access to authentic government records by implementing an enterprise-wide archives system.	This is dependent upon the pending INK grant proposal.
Interface with INK portal web applications and payment/deposit/reporting subsystems.	KEEP will use the Kansas.gov payment engine to process payments for authenticated records.

Activities enabled by the NDIIPP grant

The KEEP System prototype was supported by NDIIPP funding ($125,000) provided through the Minnesota Historical Society's "A Model Technological and Social Architecture for the Preservation of State Government Digital Information" NDIIPP grant. It has supported the development of the KEEP policy framework and KEEP prototype functional requirements and detailed design. Supplemental NDIIPP funding ($100,000) supported the development of a KLISS-KEEP connector, a draft submission agreement for KLISS records, an assessment of a National Conference of Commissioners on Uniform State Laws (NCCUSL) model law related to authenticating legal documents, and a response to a MHS-provided NDIIPP criteria/preservation matrix.

Changes in the standing of project participants within the state's governance

House Bill 2195 (now K.S.A. 45-414) – providing new responsibilities and authority for the State Archives - was passed by the Kansas Legislature and was signed into law on March 1, 2010. This was before the project team secured the additional funding from NDIIPP.

A significant change was the establishment of the State Archivist IT project plan review as a routine part of the CITO approval process. Agencies have begun to contact the State Archivist during the development of high-level project plans, and, in some cases, including the State Archivist in project planning activities. For example, the leaders of the Medicaid eligibility system project – now called the Kansas Eligibility and Enforcement System (KEES) – asked the State Archivist to participate in the vendor bid review process.

Resources that have been mobilized as a result of the project

Propylon hired a new business analyst and senior developer to work on the KEEP project. KSHS included a budget enhancement for KEEP in its 2012 budget request. The long-term goal is for KEEP to be financially sustainable, but some funding will be necessary until a sufficient fee fund is established to cover annual expenses.

The KSHS has committed to providing state general funds to support a KEEP records analyst and 50% of a KSHS application developer (Matt Powell) to KEEP.

Legislative Computer Services mobilized resources to support development of the KEEP prototype including significant contributions from Terri Clark, as KEEP co-project manager; a data center technician, who assisted with hardware installation and testing; and a testing specialist who performed the majority of functional testing of the KEEP prototype.

DISC – now called the Office of Information Technology Services (OITS) – mobilized network engineering resources to design the network configuration for the KEEP prototype system.

KEEP System

The following text characterizes KEEP as an overall system. For descriptions of many individual software tools used in KEEP, see Appendix K.

General description of scope, architecture, and components
The KEEP System is built on an OAIS (Open Archival Information System) model with six primary functions: Ingest, Archival Storage, Administration, Data Management, Preservation Planning, and Access. The scope of the KEEP System prototype included an initial ingest of foundational documents for interpreting Kansas law, including legislative committee meeting minutes, Supreme Court opinions, and Attorney General opinions. The KEEP production system will ingest records from Kansas state agencies, state Supreme Court and state legislature. The KEEP project has a pending proposal for a grant that would support the development of further public access and preservation planning functionality.

Components
KEEP has been developed by Propylon specifically for the project, though it makes extensive use of existing open-source components. Propylon has drawn from its development efforts on KLISS.

Licensing terms

The KSHS contract with Propylon includes these terms:

A. Grant of License. Subject to the terms and conditions of this Contract, Contractor hereby grants to KSHS and KSHS hereby accepts a perpetual, world-wide, nonexclusive, non-cancellable and irrevocable license (the "License") to use the KEEP Software and the Documentation in connection with the KSHS's authorized operations. The License allows KSHS to use and copy the KEEP Software and the Documentation solely for purposes of utilizing and managing the System. Customer may not take any of the following actions with respect to the KEEP Software or the Documentation:

1. Reverse engineer, decompile, disassemble, re-engineer or otherwise create, attempt to create, or permit, allow or assist others to create, the source code or the structural framework for part or all of the KEEP Software.

2. Cause or permit any use, display, loan, publication, transfer of possession, sublicensing or other dissemination of the KEEP Software, in whole or in part, to or by any third party without Contractor's prior written consent. Not withstanding the foregoing, KSHS may assign this contract and any or all rights hereunder to any of Customer's Kansas State affiliated entities upon written notice to Contractor but may not, without Contractor's prior written consent, otherwise assign, delegate, sublicense, pledge, or transfer this Contract or any of the rights hereunder.

The KEEP prototype uses the same OSS components as KLISS, including Linux, Apache, ActiveMQ, MySQL, Django, and Subversion. It also employs JHOVE, DROID, and ClamAV. A custom code thick client application written in Java, called "SIP Express," provides ingest zone workflow functionality. SIP Express is associated with a central metadata registry in order to perform validations that are specific to each Producer.

Plans to disseminate the component for use by others
The KEEP project can disseminate general design documents, but the terms of the contract with Propylon may prevent the dissemination of custom code or detailed design specifications developed by Propylon.

Specific skills/expertise required to develop and implement it
Further KEEP application development would also require a knowledge of the following: Java, Python, Django, Messaging (JMS, ActiveMQ or related), SVN (versioning software), MySQL, Netbeans, SWING or similar UI development skills, experience using Open Source technologies, Fedora Commons, Unix/Linux, Redhat, Ubuntu, and Windows Server.

Main hardware/software dependencies
The workflow engine of KEEP is called ActiveArc,[209] which has been developed by Propylon. It is built on top of Subversion, MySQL, ActiveMQ, Java and Python. It requires RedHat Enterprise Linux Server 6. The necessary RedHat software packages for KEEP are: Apache 2.2.3, MySQL 5.0.77, Subversion 1.4.2, and the GCC compiler. The current implementation of KEEP is also built on top of a Centera Governance Edition storage environment, which supports data integrity using content-addressable storage. KEEP currently is not using the product's retention management features but it may do so in the future. Propylon plans to add a feature to ActiveArc that will be called the Curator, to monitor retention periods and notify administrators when a disposition action is needed; the Curator may take advantage of Centera's retention management features.

Where it is being used
The KEEP system is being developed for the state of Kansas. There are not any specific plans for it to be used by other parties.

Project management – roles, responsibilities and coordination
The KEEP project has followed the State of Kansas project management methodology in planning and managing the project. Given the inter-agency and inter-branch nature of the

initiative, they elected to appoint co-project managers: Matt Veatch from KSHS to focus on policy and functional issues and Terri Clark from Legislative Computing Services to focus on technical issues. Since Clark's departure from the project in November 2011, Veatch has served as the sole project manager. Propylon's internal project manager, Tom Ryan, works directly with Veatch and the Kansas development team.

Coordinating project management responsibilities represented a key risk in executing the project. Until the departure of Terri Clark from the project in November 2011, there were two co-project managers who worked in different buildings, six miles apart and neither could devote more than 50% of his/her time to the project. In addition to weekly status meetings, coordinating project tasks required multiple phone calls and emails each week.

KEEP has involved weekly project team status meetings; monthly Steering Committee meetings; and a workshop for records officers.

Dissemination of products and information outside of the project
To date, KEEP has disseminated a project summary, background information, and status updates. The project's newsletter has provided bi-monthly updates on progress of the project, and the project team members have given several presentations (see timeline). They have disseminated version 1.0 of the KEEP Policy Framework,[210] slides from several presentations,[211] and the bi-monthly KEEP newsletter.[212] The KEEP team also plans to disseminate the following by Spring 2012: KEEP functional requirements document, prototype design specifications, a prototype project closeout report, the KEEP core metadata schema, and Ingest API documentation.

Scope of materials addressed by the project
The ultimate scope of KEEP is Kansas government electronic records with long-term value. The scope of the KEEP System prototype included an initial ingest of foundational documents for interpreting Kansas law, including legislative committee meeting minutes, Supreme Court opinions, and Attorney General opinions.

Initial ingest (prototype) material includes sample foundational documents for interpreting Kansas State Law, including Legislative Committee meeting minutes, Supreme Court opinions, and Attorney General opinions.

Planned custodial responsibility for content addressed
Planned custody will be with KEEP System. The prototype has integrated with the Kansas Legislative Information Systems and Services (KLISS). Only sample records were ingested into the KEEP prototype – KSHS/KEEP has yet to accept curatorial responsibility for any records. This will not occur until the KEEP Production system is deployed.

Plans for advancing the activities after the grant
The KEEP System Project team is "dedicated to building a consolidated, extensible digital archive for all state agencies."[213] Following completion of the prototype, development of a KEEP production system began in September 2011. The KEEP team is actively pursuing several funding streams to support KEEP. Options for sustainable funding include funds from IT projects that house records with retentions of 10 or more years, establishing maintenance fees

related to the quantity and format of the records in KEEP, grant funding for innovative enhancements, and fees for authenticating records. These revenue sources would support necessary staffing for the KSHS and DISC, digital preservation activities, and infrastructure replacement/upgrades. KSHS has submitted a grant proposal to INK for an additional $360,000 to support the development of public access and preservation planning functionality for KEEP.

Mechanisms for sustaining KEEP activities and products

In addition to the other mechanisms described above, Kansas has also been exploring rate setting for KEEP. The rate setting process is carried out in accordance with OMB Circular A-87 and appears as part of the annual statewide cost allocation plan (SWCAP). SWCAP filings are approved each year by the federal Department of Health and Human Services Office of Cost Allocation. Rates must be reviewed annually to ensure they are adequate for KEEP System sustainability. Fees may be based on:

- On demand records authentication services
- Storage of other electronic Kansas State Government records that must be retained for ten years or longer
- KEEP System pre-ingestion services including design of submission information packages
- Estimated digital preservation services under the authority of ITEC guideline 2400A
- KEEP System preservation planning and archival storage services
- Customized services

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F. KEEP - Timeline

	Influential Events and KEEP Project Activities [Project activities are in bold blue text.]
1990	Kansas legislature authorizes creation of the Information Network of Kansas, Inc. (INK) to "(a) provide electronic access for members of the public to public information of agencies via a gateway service; (b) develop a dial-in gateway or electronic network for access to public information; (c) provide appropriate oversight of any network manager; (d) explore ways and means of expanding the amount and kind of public information provided, increasing the utility of the public information provided and the form in which provided, expanding the base of users who access such public information and, where appropriate, implementing such changes; (e) cooperate with the division of information systems and communications in seeking to achieve the purposes of INK; (f) explore technological ways and means of improving citizen and business access to public information and, where appropriate, implement such technological improvements; and (g) explore options of expanding such network and its services to citizens and businesses by providing add-on services such as access to other for-profit information and databases and by providing electronic mail and calendaring to subscribers." (K.S.A. 74-9302)
1991	INK awards a network manager contract to Kansas Information Consortium, Inc. (now a subsidiary of NIC, Inc.).
1994	The Kansas legislature creates the Kansas Information Resource Council (KIRC), responsible for approving policies for the management of the state's information resources, providing direction and coordination for the application of the state's information resources, approval of major information technology and telecommunications projects, designation of ownership of information resources processes, development of a strategic information plan, and prescription of guidelines, standards, policies and procedures for equipment, information processing products or services (KSHS staff serve on an Internet task force and a data sharing task force sponsored by KIRC).
1996	With funds from the National Historical Publications and Records Commission (NHPRC), the Kansas State Historical Society (KSHS) hires Margaret Hedstrom as a consultant to draft electronic records guidelines for Kansas state government.
1998	KSHS issues "Digital Imaging Guidelines for State Agencies" adapted from "Guidelines for the Use of Digital Imaging Technologies for Long-Term Government Records in Alabama" developed by the Alabama Department of Archives and History
	Kansas enacts Senate Bill 5 (SB5), establishing the Information Technology Executive Council (ITEC) to be responsible for information technology resource policies and procedures, project management methodologies, an information technology architecture, data management standards, and a strategic information technology management plan.
1999	Kansas establishes an Information Technology Advisory Board (ITAB) to the Executive Branch's Chief Information Technology Officer, Executive Branch (CITO) and the Information Technology Executive Council (ITEC); Kansas also establishes the Kansas Architectural Review Board, which among other duties, reviews proposed programs and projects referred by the Chief Information Technology Architect (CITA) and makes recommendations related to their compliance with the state's IT architecture.
	KSHS receives a two-year ($74,996) grant from the NHPRC to test, revise and implement the electronic records guidelines, hiring Cal Lee as electronic records project archivist – resulting in several more guidance documents, development of strong ties to the state's information technology management leadership, state IT project management certification for Matt Veatch of KSHS, formation of the Kansas Electronic Records Committee (ERC), and KSHS creating a full-time Electronic Records Archivist position.
2000	INK launches a state web portal called accessKansas.
	October 26 – Kansas "Information Technology Policy 2400 Revision 2 - Project Approval" goes into effect, requiring the branch CITO and head of a government entity (branch, board, commissions, departments, divisions or state government agency) to review and approve an IT Project Plan prior to starting a project with a cumulative cost of $250,000 or more.[214]
	Fall – Pat Michaelis, State Archivist of Kansas, becomes member of the Kansas Information Technology Advisory Board (ITAB) [a role now played by Matt Veatch, current State Archivist].

2002	May 2 – Kansas Information Technology Executive Council (ITEC) approves "Managing Electronic Mail: Guidelines for Kansas Government Agencies" developed by the ERC and its E-Mail Task Force.
	Kansas Legislature passes Senate Bill 380 and Senate Bill 605 that allow state agencies to publish reports or publications to their web sites and retain electronic copies, rather than distributing and retaining paper copies.
2003	KSHS develops a template for state agencies to create electronic recordkeeping plans.
	Kansas State Historical Society (KSHS) and the Kansas State Library develop Kansas State Publications Archival Collection (KSPACe), a system based on DSpace to manage and provide access to digital state publications and documents.
	September – The Kansas Legislative Coordinating Council calls for an information services strategic plan, which was then produced by legislative CITO, Don Heiman, in collaboration with various parties within the legislature.
2004	January – Kansas ERC and Internet Task Force jointly issue "Guidelines for Managing Records on Kansas Government Agency Websites."
2005	Fall – KSHS, State Library, Legislative Computing Services, and Kansas Information Technology Office (KITO) carry out a digital preservation capability assessment of KSPACe; Kansas Electronic Records Committee (ERC) performs a fit analysis of KSPACe against national standards. This exercise highlights areas where the pilot project was successful, and identifies areas to build out when the archive was implemented.
	INK redesigns the state web portal and renames it Kansas.gov [kansas.gov e-commerce payment engine will be used by KEEP for processing payments for certified material].
	December - Kansas awards bid for developing Kansas Legislative Information Systems Strategy (KLISS) to Propylon.
2006	May 5 – Library of Congress releases Request for Expressions of Interest for "Multi-State Demonstration Projects for Preservation of State Government Digital Information."
	June 15 – Response to Request for Expression of Interest submitted to Library of Congress by Minnesota Historical Society for project called "Model Technological and Social Architecture for the Preservation of State Government Digital Information" (MTSA) with Kansas as one of the state partners.
2007	December 7 - administrative kick-off meeting hosted by LC in Washington DC for NDIIPP state projects
2008	January 7 – Library of Congress announces four state projects ($2.25 million of total funding), including "Model Technological and Social Architecture for the Preservation of State Government Digital Information" (MTSA) led by the Minnesota Historical Society (MHS) and including Kansas as a partner.
	January 25 – MTSA project kickoff meeting in St. Paul with Minnesota partners, some California partners, and National Council of State Legislatures (NCSL) staff
	May 7 - Kansas legislature appropriates $150,000 to the KSHS to begin a digital state archives project.
	March 28 – MTSA Kansas partners meeting in Topeka
	May 8 – KSHS and Department of Administration convene a Kansas Electronic Records and Information Management (KERIM) Dialogue; the major outcome is an agreement to develop an electronic records management roadmap for Kansas government.
	July 8-10 – NDIIPP Partners Meeting in Arlington, VA [Matt Veatch from KSHS attends]
	July 23-25 – Joint annual meeting of National Association of Government Archives and Records Administrators (NAGARA) and Council of State Archivists (CoSA) in Atlanta, GA [attended by Matt Veatch and Pat Michaelis]
	August 26-31 – Society of American Archivist Annual Meeting [SAA Electronic Records Section meeting focuses on NDDIIPP State projects with talks about all four projects – Bob Horton for the MTSA project]
	September-December – Kansas Electronic Records and Information Management (KERIM) team meets to develop ERM roadmap for Kansas government.

2008	December 12-13 – Ken Thibodeau and Fynette Eaton visit Kansas to share NARA ERA lessons learned with the KERIM team. Thibodeau and Eaton emphasize advantages of limited scope but tangible electronic records management successes.
	December 19 – KSHS establishes informal partnership with Don Heiman, Legislative CITO, to apply KSHS legislative appropriation to the development of a prototype trusted digital repository for Kansas government records. The Kansas Electronic Records and Information Management (KERIM) planning initiative is re-launched as the Kansas Enterprise Electronic Preservation (KEEP) System.
2009	**February 5 - The Information Network of Kansas (INK) Board awards a grant of $175,000 to support development of KEEP.**
	March 31 – NDIIPP State Partners Meeting in Washington, DC [Matt Veatch attends]
	April - NDIIPP approves extension to the MTSA grant into 2011
	April 28 – Mark Parkinson becomes new governor of Kansas, after Kathleen Sebelius leaves the position to become secretary of the U.S. Department of Health and Human Services.
	May 14 - CITO approves the KEEP high-level plan
	June 24-26 – NDIIPP Partners Meeting [Matt Veatch attends]
	August 12-15 – SAA/CoSA Annual Meeting in Austin, TX [Pat Michaelis attends]
	September – KEEP request for proposals is released, covering three areas of the project: developing a policy framework, completing a detailed design specification, and building a prototype of the archive system
	October - Five vendors respond to the RFP - Tessella, Alexander Open Systems with EMC, Thomson Reuters, Propylon and iMerge – three are considered for the policy framework and three are considered for building the prototype.
	November 24 – Conference call between Minnesota Historical Society and Kansas MTSA partners
	November 2009-January 2010 – KEEP Evaluation Committee negotiates with all five vendors who responded to the RFP, meeting with representatives from each firm to discuss suggested approaches and anticipated costs, with each vendor then submitting revisions to its technical and cost proposals based on information shared during the meetings.
2010	January 20 – All-partners MTSA meeting in Sacramento, CA
	March 1 – Governor Mark Parkinson of Kansas approves House Bill 2195 (An act concerning state records; relating to maintenance and certification of electronic records), which authorizes the State Archivist to develop standards for preserving and maintaining the authenticity of electronic government records and to certify records as being compliant with the standards.
	February-March – KEEP Evaluation Committee conducts final negotiations and recommends vendor selection to Procurement Negotiating Committee: iMerge for policy framework and quality assurance; Propylon for system design, building and testing; Alexander Open Systems for hardware
	March 1 – Kansas Legislature passes HB 2195 authorizing the State Archivist to "prepare and present recommendations, to be approved by the state records board, based on national and professional standards as determined by the state archivist, for preservation processes for maintaining the authenticity of electronic government records." The law also gives the State Archivist authority to "certify by an electronic signature any electronic government record maintained using preservation processes that meet national and professional standards for authenticity as determined by the state archivist and approved by the state records board."
	April 15-16 – MTSA project meeting with Kansas Partners, Kansas
	April 22 – KEEP project receives $125,000 from NDIIPP as a re-grant through the Minnesota Historical Society's Model Technological and Social Architecture for the Preservation of State Government Digital Information.
	April 26 – CITO approves a revised High-Level Plan for KEEP.
	May 21 - CITO approves KEEP Detailed Plan.
	June 1-4 – IS&T Archiving 2010 in Den Haag, The Netherlands ["Move It or Lose It: Investigating Digital Curation Portability for Access to Government Information" (mentioning KEEP) by Christopher (Cal) Lee as consultant to MTSA project]

2010	**June - Initial KEEP project schedule is established with an anticipated end date of December 30, 2010.**
	June 10 – After it clears all test scripts[215] created by IMERGE and all open bugs are resolved, Matt Veatch and Terri Clark accept the KEEP prototype system for the state and Tom Ryan accepts it for Propylon.
	June 11 – Purchase order issued for purchase of KEEP hardware from AOS (EMC storage and Cisco servers).
	June 18 - Project kickoff meeting and first meeting of Stakeholder Advisory Team
	June 30 – Contracts with iMerge and Propylon approved by Division of Purchases.
	July 6-7 - Cal Lee meets with KEEP team in Topeka to discuss KEEP policy framework and requirements outline.
	July 13 – KEEP policy framework workshop for state agency records officers and IT directors
	July 19 - Propylon creates a new business analyst position dedicated to KEEP within their company, hiring Tom Ryan as Business Analyst and Senior Developer.
	July 20-22 – NDIIPP Partners Meeting in Arlington, VA [Matt Veatch attends and meets with MTSA members]
	August 6 - A recast project plan is submitted for review by the Executive, Legislative and Judicial Branch Chief Information Technology Officers, with a new projected completion date of April 5, 2011.
	August 24 - KEEP Project web site is launched.
	August 31 - KEEP System Technical Subject Matter Expert (SME) briefing
	September 10 – Version 1 of "KEEP System Policy Framework" after five iterations with iMerge team (from June to September); first design meeting, with a focus on metadata requirements
	September 15 – KEEP Stakeholder Advisory Team meeting, including presentation about the draft Policy Framework; KSHS includes budget enhancement for KEEP in its FY 2012 budget request
	September 27 - KEEP infrastructure installation begins in Topeka and Wichita Off-site Data Center in Wichita
	September 30 – KEEP detailed requirements are accepted by project managers.
	September 28 – October 1 - Best Practices Exchange in Phoenix, AZ [Pat Michaelis gives presentation about KEEP]
	October 21 – Pat Michaelis gives presentation about KEEP to the Kansas Information Technology Executive Council (ITEC)
	November 18 – KEEP hardware installation in Topeka and Wichita data centers completed; KEEP Stakeholder Advisory Team meeting, including a briefing from Propylon on the detailed design specification for the KEEP prototype.
	November 30 - Propylon hires Richard Case as senior developer for the KEEP Project.
	December - Joe Hennes retires from his position as CITO of the Executive Branch.
	December - Kansas Information Technology Project Planning Guidelines (ITEC Policy 2400A), includes a new provision requiring high level project plans to include an electronic records retention statement and an approval letter from the State Archivist for systems containing records to be kept more than 10 years indicating that adequate provisions, including funding, have been made to insure that long-term records can be ingested into KEEP.
2011	January 10 – Sam Brownback becomes new governor of Kansas.
	January 28 – KSHS submits proposal to MHS for an additional NDIIPP re-grant.
	February 9 - Dennis Taylor is appointed as Kansas Secretary of Administration. He also takes on the additional role of CITO for the Executive Branch.
	February 11 – Cal Lee visits KEEP team in Topeka, with discussion focusing on detailed requirements and design documents.
	March 2 – Webcast: "i360Gov Proof Points: Trends in digital archiving of legislative records" [presenters include Don Heiman and Sean McGrath from the KEEP project; Matt Veatch answers questions through a webinar following the presentation]

2011	March 8 - Library of Congress announces release of "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report" discussing all of the NDIIPP-funded projects and programs, including the "Model Technological and Social Architecture for the Preservation of State Government Digital Information" project
	March 14 – KEEP receives an additional $100,000 from NDIIPP as a re-grant through the Minnesota Historical Society's MTSA project to develop a KLISS-to-KEEP connector; to draft a submission agreement for the transfer of KLISS records to KEEP; and to evaluate a National Conference of Commissioners on Uniform State Laws (NCCUSL) model law related to authenticating legal documents.
	April - Testing of KEEP system prototype begins, using IMERGE test scripts installed on Propylon hardware; metadata schema created for KS attorney general opinions and Supreme court opinions; schema agreed upon by KSHS, Propylon, and LAS for legislative committee minutes.
	April 28-30 – Annual Meeting of the Midwest Archives Conference in St. Paul, MN [talk by Pat Michaelis about KEEP in session called "Streams in the E-Record Workflow: Developing Elements of the Archival Process for Electronic Records of Historical Value"]
	June 10 – KEEP prototype system is accepted by project managers. During final testing all functional test scripts passed; system load test levels were acceptable; a limited failover test to the Wichita data center was performed successfully; and sample records from the three prototype producers (Attorney General's opinions, Supreme Court opinions, Legislative committee meeting minutes) were ingested successfully.
	June 30 – Propylon successfully demonstrates the KLISS-to-KEEP connector in a test environment. KSHS submits draft submission agreement and draft NCCUSL model law assessment to MHS.
	July 1 – The government of the state of Minnesota officially shuts down.
	July 19 – Meeting in Washington, DC between staff from KEEP, MTSA, Library of Congress and several other interested parties to discuss KEEP and possible National Information Exchange Model (NIEM) standard for e-democracy
	July 19-21 - NDIIPP/NDSA Partners Meeting in Washington, DC
	July 28 – Project plan for KEEP production system approved by the three branch CITOs (with projected completion date of April 2012).
	July - Richard Case leaves Propylon, Fernando Ciciliati is assigned as senior developer for KEEP production system.
	July 21 – The government of the state of Minnesota resumes operations, after Gov. Mark Dayton signs a new budget into law on July 20.
	July 22 – Scott Leonard leaves KSHS.
	August 1 – Don Heiman retires as legislative CITO for Kansas.
	September 1 - Dave Larson becomes Interim CITO of the Legislative Branch.
	October - Bill Roth retires as CITA for Kansas.
	October 20-22 - Best Practices Exchange in Lexington, KY [Matt Veatch and Pat Michaelis attend]
	October 31 - Kansas Governor Sam Brownback appoints Jim Mann to serve as CITO for the Executive Branch.
	November - Terri Clark, KEEP Co-Project Manager, leaves the project.
	November 7 – Governor Brownback issues Executive Order 11-46 that directs all non-Regents Executive Branch agency IT directors and staff to report directly to the executive CITO.
	November 8 – Jim Mann resigns as executive CITO.
	November 14 - Anthony Schlinsog takes over as interim executive CITO.
	December – Dave Larson retires and Jim Miller becomes CITO of the Legislative Branch.
	December 9 – KEEP Steering Committee meets. Anthony Schlinsog, Executive Branch CITO, and Jim Miller, Legislative Branch CITO, join the Steering Committee.
	December 13 - Jennie Chinn, executive director of KSHS and chair of the KEEP Steering Committee, testifies about KEEP to the Kansas legislature's Joint Committee on Information Technology (JCIT).[216]
	December - KSHS submits a proposal to the INK Board for $360,000 to advance further KEEP

2011	**work.**
	December 20 - CITOs of the three branches approve a revised KEEP project plan, reflecting recommendations of the steering committee to focus on ingest, archival storage and data management, with expanded access and automated planning/execution of preservation actions to be pursued later.
2012	January 26 – HB 2549 on "preservation of government records by public officials, including e-mail and texting" is introduced to the Kansas state legislature.[217]
	January 30 – Governor Brownback announces that Anthony Schlinsog, who had served as interim executive CITO since November 14, 2011, is now the state's permanent CITO for the executive branch.

G. MSPP – Project Summary

Project title
Multi-State Preservation Partnership (MSPP)

Brief project description
The Multi-State Preservation Partnership work plan focuses on the preservation and provision of access to records and documents from two types of institutions: state archives and state libraries. The project focused on the creation of a centralized regional repository for state and local digital records that built on the systems already developed at the Washington State Digital Archives. The project aimed to demonstrate a scalable approach to preserving and making available at-risk digital government public records. Content ingested into the archives as part of the project includes vital records, land ownership and use documentation, court records and Web-based state and local government reports.

The original project proposal provided for:

- A centralized regional repository to preserve and provide access to archival records and documents from multiple state archives and state libraries.
- Application of the existing Washington State Digital Archives Framework to two other stand-alone state archives to be located in the south (Georgia) and northeast (Maine). This part of the plan was dropped when the funding award was lowered to $800,000 instead of the ten million dollars requested in the proposal.
- Educational symposia and an online forum to share the experiences of participating institutions and advance the general knowledge of digital preservation issues. On September 21-24, 2010, representatives from nine states met to discuss the project and receive briefings at Microsoft headquarters in Redmond, WA and a large data center in Grant County, WA.
- A national advisory committee to meet regularly, in conjunction with the project participants, to review progress and make recommendations. A formal national advisory committee was not created due to the reduced funding award.

Main factors that drove initiation of the project
The initiation of this demonstration project was largely driven by the previous efforts and existing capacities of the Washington State Digital Archives. Planning for the Digital Archives began in March 2000, and in July 1, 2001 the Washington state legislature approved (to be implemented in early 2002) an additional dollar surcharge to the document recording fee collected by County Auditors, in order to fund the Washington State Digital Archives development, building, and operations. Site work began in June 2002 and construction on a new facility for the Digital Archives began in January 2003. In October 2004, the new archives facilities and associated digital archive system began operations, with software developed by Microsoft and EDS. By the time of the proposal for the MSPP, the Washington State Digital Archives had ingested and was managing several million records, and supporting a significant amount of user traffic. The collections within the archive were predominately marriage records from local government in the state of Washington. The MSPP project has extended the scope and offering of the archives by collaborating with libraries and archives in other states, to use the

Washington State Digital Archives infrastructure to ingest and manage their states' records. The original 5 states and 7 institutions expanded to 11 states and 14 institutions.

Participating parties

Entity	Description	Associated Personnel
Alaska (Educational Partner)		
Alaska Division of Libraries, Archives and Museums	The Alaska Division of State Libraries, Archives and Museums "offers library and information service to state agencies and the Legislature, provides for the orderly management of current state records, preserves non-current public records of permanent value for study and research, and operates the state museums."[218]	Daniel Cornwall, Head of Technical and Imaging Services
Colorado		
Colorado State Archives[219]	The mission of the Colorado State Archives is "to ensure the preservation of the state's permanent legal records and information and to promote their use by the citizens of Colorado." Records management, archives management and micrographics quality control are administrative functions provided to state and local government agencies in Colorado to ensure the preservation of Colorado's permanent legal and historical records. Information and research functions provide for citizen access to public records created by the legislative, executive and judicial branches of state government. The Colorado State Archives is the legal repository for selected historical and contemporary records and information generated by state and local governments in Colorado.[220]	Terry Ketelsen, State Archivist
Colorado State Library	The Colorado State Library is a division of the Colorado Dept. of Education. They support the development of "library-related policies, activities, and assistance for school, public, academic, and special libraries." The "staff provide consulting and training in areas such as 21st Century learning, strategic planning, library law, children's services, and state institutional library services," as well as managing several statewide electronic services. [221]	
Idaho		
Idaho State Historical Society[222]	The Idaho State Historical Society "preserves and promotes Idaho's cultural heritage."[223]	
Idaho Commission for Libraries[224]	"The Idaho Commission for Libraries (ICFL) is located in the Executive Branch of state government and is governed by the Board of Library Commissioners, which is appointed by the governor. The State Librarian, appointed by the Board of Library Commissioners (I.C. 33-2504), serves as the agency's chief executive officer and is charged with implementing the Board's policies	

Entity	Description	Associated Personnel
	and rules and with managing the operations of the agency."[225]	
Indiana		
Indiana State Archives and Libraries[226]	The Indiana Commission on Public Records (ICPR) assists state and local governments in the management of government records.[227] The Indiana State Archives "exists to provide for the protection of, and access to primary-source and historical documents, and those that contribute to Indiana's heritage"; it is the permanent repository of official records of Indiana state and local governments.[228] The Archives coordinates with the Indiana Commission on Public Records (ICPR), and the Oversight Committee on Public Records (OCPR). While the Indiana State Archives serves as the repository, the ICPR serves as an education and consultation arm of Indiana state and local government. They are also responsible for drafting policy and administrative rules regarding proper management of public records (including electronic records), which are then subject to a vote by the OCPR. The ICPR has published guidelines on accessioning digital content, establishing email retention policies, and other documents related to electronic records management.	Jim Corridan, Director and State Archivist, Indiana Commission on Public Records
Louisiana (Educational Partner)		
Louisiana State Archives[229]	The Louisiana State Archives, a division of the Louisiana Secretary of State's office, is "mandated to identify, to collect, to preserve, to maintain, and to make available those records and artifacts that enhance our endeavors to understand the dynamics and nuances of our state's remarkable history."[230]	Carrie Fager, Records Management Officer
Montana		
Montana Historical Society[231]	Roles and responsibilities of the Montana Historical Society include preserving "for future generations representative selections of all historic resources (art, records, books, photographs, oral histories, artifacts, journals, sites, buildings) important to an understanding of Montana History."[232]	Jodie Foley, State Archivist
Nevada		
Nevada State Library and Archives[233]	The Nevada State Library and Archives provides "full access to a range of information services that enhance the quality of life for all and center on creating an educated and enlightened citizenry while supporting the best interests of the state of Nevada. In support of this mission, the agency serves government, libraries, business, and citizens by providing a range of information services."[234]	
North Carolina		
State Library of North	The State Library of North Carolina is "the principal library of state government, we build the capacity of all	Amy Rudersdorf, Director of the Digital Information

Entity	Description	Associated Personnel
Carolina[235]	libraries in North Carolina, and we develop and support access to specialized collections for the people of North Carolina, including genealogy, North Caroliniana, and resources for the blind and physically handicapped."[236] The Library's Digital Information Management Program (DIMP) "identifies and promote solutions to ensure long-term preservation and ready and permanent public access to born-digital and digitized information produced by (or on behalf of) North Carolina state government."[237]	Management Program
Oregon		
Oregon State Archives[238]	The Oregon State Archives, a Division of the Oregon Secretary of State, "authorizes disposition of the public records of Oregon government, provides records management advice and assistance to state agencies and political subdivisions and operates the State Records Center which provides inexpensive storage for inactive state agency records." The State Archives also coordinates the work of the State Historical Records Advisory Board.[239]	Layne Sawyer, Archives Manager
Oregon State Library[240]	"The mission of the State Library is to provide quality information services to Oregon state government; provide reading materials to blind and print-disabled Oregonians; and to provide leadership, grants, and other assistance to improve library service for all Oregonians."	Robert Hulshof-Schmidt, Program Manager, Government Research Services (until December 2011)
Tennessee		
Tennessee State Library and Archives[241]	The Tennessee State Library and Archives (TSLA) "collects and preserves books and records of historical, documentary, and reference value, and promotes library and archival development throughout the state."[242] The Records Management Division is responsible by direction of the Public Records Commission (TCA §10-7-303) "to serve as the primary records management agency for state government, directing the disposition of all records, including electronic records and computer output microform records."[243]	• Cathi Carmack, Director of Archival Technical Services • Wayne Moore, Assistant State Archivist • Greg Yates, Coordinator of Legislative Recording
Washington (Lead Partner)		
Washington State Archives, Digital Archives[244]	The mission of the Washington State Digital Archives is to ensure "the preservation of electronic records from both state and local agencies that have permanent legal, fiscal, or historic value." [245]	• Kerry Barbour, Digital Archivist • Larry Cebula, Washington Digital Archives • Jerry Handfield, Project Leader and State Archivist • Justin Jaffe, Project Manager and Ingestion Coordinator (until June 2011) • Adam Jansen – Digital Archivist (until December

Entity	Description	Associated Personnel
		2007) • June Timmons, Chief Applications Architect
Washington State Library[246]	The State Library has been part of the Secretary of State since 2002. Its mission is to "collect, preserve, and make accessible to Washingtonians materials on the government, history, culture, and natural resources of the state; provide leadership and coordination of services to all libraries in the state of Washington; support the information needs of residents in state institutions and of the visually impaired; and serve as the primary source in the region for published information from the federal government."[247]	

Resources that parties have committed to the project
The Washington State Digital Archives has provided its data center (with both system and power redundancies), as well as associated preservation framework, software and expertise. The costs of the increased resource requirements required for this joint repository are shared among the project's participants.

Microsoft donated all the software licenses (estimated market price of $200,000) for the partners for the first two years. Officials from Eastern Washington University attended a major project meeting and supported the grant application. According to Jerry Handfield, Maryland and Indiana hosted meetings for partners and prospective partners.

Main motivations and rationale for the project
A major rationale for providing a shared online repository is that it will allow states of varying levels of technological capacity to provide online access to digital records without requiring users to travel to their repositories. The motivations for the Washington State Digital Archives are to expand their service offerings and preserve a wider range of potentially at-risk or difficult to access records and documents.

Jerry Handfield has expressed the following incentives to participate:[248] education and training; money and efficiency; preservation of electronic records; the mission of Secretaries of State to serve as keeper of the records; and access to public records and democracy. A major motivation for bringing in partners states is that centralization of electronic records can provide a single system for search of multiple record series.

Expected benefits of participating
Each of the states has its own web page associated with the MSPP project – based on the Washington State Digital Archives master page layout – that has its own URL to allow uniformity with institutional branding. Each institution can add content to the master page without modifying the header or the footer. There were no fees associated with the use of any record series during the duration of the project.

Project results expressed in proposal
As indicated above, each of the institutions has its own web page and URL to allow uniformity with institutional branding, based on a template provided by the Washington State Digital Archive. Partners have selected records series and documents for inclusion on the basis of their availability and historical and legal importance.

One of the primary goals of the project has been to make available the knowledge gained and lessons learned through this collaborative partnership. In 2008, a Sharepoint site was established by the project coordinator to facilitate discussion among partners. In 2010, there was an event for representatives from nine states, which included meetings at the Microsoft campus, a Microsoft data center and the Washington Digital Archives facilities.

Examples of activities enabled by the grant
Since the project began, the number of searches on the Washington State Digital Archives' website has increased from 71,000 per month in January 2008 to more than 350,000 per month in November 2010 (these numbers are not specific to NDIIPP partner content).

The digital archival infrastructure to cover these searches is possible because of the NDIIPP grant, which went to the purchase of hardware to host state partner electronic records. "I think we have a total of 14 different partners outside the state of Washington, and we are currently preserving electronic records from all of our state partners," Data Ingestion Coordinator Justin Jaffe said. "So we have all of our partner digital hard drives hosted in this facility here at this time."[249]

The Indiana Digital Archives, launched on August 12, 2008, is one of the most successful state partnerships in the MSPP. It has five main databases; death records, institution records (prisons, department of corrections, school for the deaf), military records, naturalization records grouped by county and a miscellaneous records category (foster children, public lands, negro registers, public safety). There are more than 2.5 million records in the Indiana Digital Archives, enabled by the MSPP.

In 2009, Tennessee joined the MSPP project as a limited partner in order to test use of an audio search tool development by Microsoft.

Decisions or commitments enabled or necessitated by the grant
Individual partners established agreements within their own states, in association with the decision to maintain the records of those states in the Washington Digital Archives.

The NDIIPP has allowed the state of Washington to partner with a larger set of states than would have been possible otherwise. A major contribution was the provision of software and services to states that often would not have been able to pay for such services. Project partners were able to learn about and make use of the Washington Digital Archives resources.

Resources that have been mobilized as a result of the project
The Washington State Archives created the full-time staff position of Ingestion Coordinator to address the diversity of formats and requirements associated with new acquisitions into the Digital Archives. Duties for this new position included adding agencies and collections, creating user accounts, managing users and access levels, managing collections, controlling ingestion, moving data to backup tape, and generating reports about records ingested. This was work that the grant coordinator could not address alone.

Washington State Archives staff also created AutoTodd during the grant period, which automates and supports a variety of ingestion tasks.

Systems development and implementation
The submission system for Data into the Washington Digital Archives is designed to support access and convenience while limiting the workload of the submitting agency. Record transfer occurs in two steps:

1. Initial capture hard drive is mailed to the Washington Digital Archives
2. Self-service records transfer to Digital Archives

In setting up a Record Series, the submitting institution completes the following steps:

1. Consultation
2. Transmittal Agreement (TA)
3. Transfer Information Plan (TIP)
4. Transfer
    1. "Archive This!" transfer tool
    2. Hard drive for large initial transfers
5. Ingestion
    1. Verify security
    2. Create report
    3. Copy data to backup
    4. Byte count
    5. Store security copy
    6. Ingest

Part 2: Self-service records transfers to Digital Archives

1. Tools
    1. ArchiveThis!
    2. Password-protected access to the records
2. Support

There are several interacting components to support the above processes. Applications are divided into three categories: transfer, ingest, and access.

- Transfer Applications
    - Archive This!
    - Web Indexing Portal
    - E-Pubs Portal
- Ingest Applications
    - Archive Utility To Optimize Transfer Of Digital Documents (AutoTODD)

- Access Applications
  - Digital Archives website
  - Wada Admin
  - Holding Electronic Records Tank (HERT)

ArchiveThis!

- Transforms a variety of data formats into one data format (called DA XML).
- Validates metadata and files.
- Transfers files to hard drive or to remote FTPS server and captures a digital fingerprint to ensure authenticity.
- Ensures that files are copied or uploaded in conformance with the Digital Archives directory structure conventions.

E-Pubs Portal

- Allows partners to log in and submit state publications.

Auto Todd

- Monitors incoming data
- Scans incoming data for viruses
- Verifies that new incoming data is the same on Digital Archives server as it was on the client
- Processes new incoming data
- Sends alerts based on process state
- Backs up data to remote storage area
- Tracks incoming data and its states throughout the ingestion system

Project management – roles, responsibilities and coordination

There was a state partners meeting in Seattle on July 14-15, 2009. One day of the meeting (on July 15) was held as a workshop at the NAGARA Annual Meeting.

The breakdown of work within the Washington Digital Archives team is presented in Table 12.

Table 12- MSPP Project Team Work Breakdown

Role	Name	Description
Application Developer	Randy Worrell	Web Indexing Portal development
Chief Applications Architect	June Timmons	Oversight of the development team
Database Administrator	Margie Kaiser	Database backups and administration
Ingestion Coordinator	Todd Henderson	Training, coordination of data, maintenance development

Role	Name	Description
Ingestion Coordinator	Justin Jaffe (until June 2011)	Management of users and access levels, manage collections, control ingestion, move data to backup tape; generation of reports on what was ingested; adding agencies and collections, creating user accounts
Lead Applications Developer	Adam Miller	Wrote the website interfaces for new record series
Lead Applications Developer	Dan Waterbly	Wrote a significant portion of the Ingestion 3.0 code
Network Administrator	Harold Stoehr	
Project Manager	Justin Jaffe (until June 2011)	Overall management of the NDIIPP project activities
Senior Database Developer	Bryan Smith	Database design and optimization

Dissemination of products and information outside of the project
The project has shared technical specifications, guidance and documentation with NDIIPP project partners, Washington State Digital Archives partners, Eastern Washington University, and Microsoft.

To the general public, the project has disseminated:[250]

- A project brochure
- Transfer agreement template
- Transfer information plan template
- Three user manuals: Audio Requirements, E-Publications Submission Portal, and Unique Reference Numbers
- Materials from the "Deep Inside the Digital Archives" event on September 21-24, 2010 and "Exploring the Cloud" event on December 16, 2010: event agendas and slides of talks

The project team also gave a variety of conference presentations. See the timeline document for details.

Scope of Materials Addressed by the Project
Material includes state record series selected by partner institutions for inclusion in the Digital Archives. The record series include:

• Audio Records • Auditor Records • Birth Records • Cemetery Records • Census Records • Corporation Records • Correspondence (email) • Court Cases • Death Records • E-Publications • Executive orders • Frontier Justice • Institution Records • Land Records • Map Records • Marriage Records	• Military Records • Minutes • Miscellaneous Family History Materials • Naturalization Records • Oaths of Office • Ordinances • Photographs • Plats and Surveys Records • Power of Attorney Records • Professional Licenses • Real Property Record Cards • Recorded Agreements and Contracts • Resolutions • Uniform Commercial Code Recordings

This work plan focuses on the preservation and provision of access to records and documents from state archives and state libraries. Participating state archives selected a single records series for inclusion on the basis of its historical and legal importance. The selected records series had to adhere to the Washington State Archives Digital format standard for record types already ingested, including Marriage, Land, Census, Birth and Death. These new records series were selected from maps, photos, audio and video files, legislative records, court records, as well as scanned and searchable images of records and rare texts.

The Digital Archives normalizes ingested files into a prescribed set of formats. Partner cannot recover copies of the records from the Digital Archives in their original format, nor can the Digital Archives provide an export of records to assist Partners with data recovery.

Current and planned custodial responsibility
Records in the State Partner's repository housed at the Washington Digital Archives are the property of the State Partners. Intergovernmental agreements signed by the partners state that, if a state partner decides to host and maintain its own records after completion of the project, the Washington Digital Archives will provide a copy of the most recent backup of the partner's data.

Value and potential usefulness of content addressed
Value and potential usefulness of the project includes the increased convenience and access to records in online digital format, reduction of the workload for agencies in records retrieval, and the application of additional processes to their data, including validation and normalization.

Participating partners also benefit from the robust infrastructure of the Washington State Digital Archives, which exposes their materials on the Web, supports heavy traffic and supports business continuity in the case of local data loss in the partner states.

Plans for advancing the activities after the grant

The next steps involve the attempt to build a self-sustaining consortium by finding additional partners to provide knowledge and resources. The project team is exploring a variety of funding sources. They submitted a Leadership Grant proposal to the Institute for Museum and Library Services (IMLS), which was not funded.

Mechanisms for sustaining the activities and products

The Washington State Digital Archives has its own mechanisms for sustaining its efforts, which are described above. In order for states to participate in the DA in the future, they would need to establish their own funding streams to pay for it.

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H. MSPP – Timeline

	Influential Events and MSPP Project Activities [Project activities are in bold blue text.]
2000	March – Washington State Digital Archives planning begins; State Archivist Phil Coombs meets with IT staffers to discuss possibilities of a digital archive.
	Sam Reed becomes Secretary of State for Washington (after serving five terms as Thurston County Auditor) and secures funding in 2001-2003 capital budget for a $14.3-million digital archives building in Eastern Washington.
2001	July - Phil Coombs dies, and F. Gerald Handfield is recruited from Indiana to become state archivist of Washington.
	Site of WA State Digital Archives shifts from Spokane to Eastern Washington University in Cheney, WA.
	Washington state legislature approves (to be implemented in early 2002) an additional dollar surcharge to the document recording fee collected by County Auditors, in order to fund the Washington Digital Archives development and operations.
2002	December – Capital financing of the WSDA is approved.
2003	January - Construction begins on archive building in Cheney.
	Adam Jansen is hired as lead technology developer.
	August – Washington Secretary of State publishes "Washington State Digital Archives Feasibility Study" and "Washington State Digital Archives Investment Plan"
2004	June - Microsoft and Electronic Data Systems (EDS) begin development of web interface and database design.
	October 4 – Grand opening of new archives facilities and digital archive system developed by Microsoft and EDS based on Microsoft SQL Server 2000 and BizTalk Server 2004, and developed using Visual Studio .NET 2003
	December - Pilot test for first phase of the Washington Digital Archives and first successful ingest
2006	January 25 – The state of Washington passes House Bill 2155 "to declare that the state library within the office of the Secretary of State should ensure permanent public access to public state government publications, regardless of the format, and prescribe the conditions for use of state publications in depository libraries"
	March 23 – Washington Secretary of State issues a press release celebrating Washington State Digital Archives having more than four million records.
	May 5 – Library of Congress releases Request for Expressions of Interest for "Multi-State Demonstration Projects for Preservation of State Government Digital Information."
	June 15 – Response to Request for Expression of Internet submitted to Library of Congress
2007	**November 1 – The MSPP project activities begin.**
	December – Adam Jansen leaves the Washington State Archives.
	December 7 - Administrative kick-off meeting is hosted by LC in Washington DC for NDIIPP state projects.
2008	January 7 – Library of Congress announces four state projects ($2.25 million of total funding), including MSPP
	Quarter 1 - Partner libraries and archives identified, websites completed (includes database creation and ingest capability) - Alaska, Idaho, Montana, Oregon
	March 12 - Idaho State Digital Archives web site is online.
	March 13 - Montana State Digital Archives web site is online.
	March 18-19 - project kickoff meeting in Cheney, WA
	July 1 – Idaho enacts Statute 33-2505, which establishes a digital repository for state publications within the Idaho Commission for Libraries, and providing for transfer of state publications to the repository rather than depositing 20 physical copies with the state library.[251]
	July 8-10 – NDIIPP Partners Meeting in Arlington, VA [Jerry Handfield, "The Power of 0101: A Slow Revolution" and "Digital Power"]

2008	July 23-25 – Joint annual meeting of National Association of Government Archives and Records Administrators (NAGARA) and Council of State Archivists (CoSA) in Atlanta, GA [presentation about MSPP at the CoSA board meeting on July 23]
	August 1 - Indiana State Digital Archives web site is online.
	MSPP project manager leaves and is replaced by Justin Jaffe.
	August 29 – SAA Electronic Records Section meeting focuses on NDDIIPP State projects with talks about all four projects [Justin Jaffe for MSPP]
	October 9-10 - Partner conference with Microsoft, Redmond, WA
	November 21 - Colorado State Digital Archives web site is online.
2009	**January - E-Publication portal for state partners to submit materials goes online.**[252]
	Quarter 1 - Oregon switches to Educational Partner due to budget cuts.
	Quarter 1 - Alaska switches to Educational Partner.
	March 31 – NDIIPP State Partners Meeting in Washington, DC [included MSPP presentation]
	April 2 - Governor Bill Ritter of Colorado issues Executive Order D 007 09 Establishing the Transparency Online Project (TOP), providing access to information about how the state uses taxes, fees and grants to provide goods and services.[253]
	Quarter 2 - North Carolina (State Library) and Nevada (State Library and Archives) are added as new state partners.
	May 15 - Transfer Information Plan (Demonstration Preservation Project 2007 – 2011) is created.
	June 24-26 – NDIIPP Partners Meeting ["Ingestion and Indigestion" by Kerry Barbour and Justin Jaffe]
	July 14-15 - State Partners Meeting in Seattle, WA
	July 15-18 – NAGARA Annual Meeting in Seattle, WA [includes a day-long workshop for MSPP partners, facilitated by Jerry Handfield; a session moderated by Handfield called "Partnerships and Preservation: Archives, Libraries, and the Library of Congress: National Digital Information Infrastructure and Preservation Program," including Stuart McKee from Microsoft as a speaker; session called "The Washington State Digital Archive: Five Years of Bringing the Past into the Future," with Jerry Handfield as moderator and talks by Larry Cebula, June Timmons, Harold Stoehr, and Adam Miller]
	August 12-15 – SAA/CoSA Annual Meeting in Austin, TX [Jerry Handfield presents at session on "Engaging Your Chief Information Officer in Records Retention and Access"]
	December 11 - North Carolina's MSPP site called "North Carolina State Publications Repository" goes online.
2010	**June 1 - Tennessee State Library and Digital Archives web site is online.**
	July 20-22 – NDIIPP Partners Meeting in Arlington, VA [Dan Waterby, "Digital Archives: We Have Apps for That!"]
	August -- The Oregon CIO Office (Department of Service Administration) releases the Oregon Data site to provide access to and interaction with government data sets and government documents.[254]
	August 10-15 - Joint Annual Meeting of CoSA, NAGARA, and SAA in Washington, DC [Jerry Handfield speaks at session on "High-Risk Disaster Preparedness and Response: Lessons for Us All"]
	September 21-24 - Deep Inside the Digital Archives Conference, Cheney, WA. (Eastern Washington State University and Microsoft) - representatives from nine states met to discuss the project and receive a briefing at Microsoft headquarters in Redmond, WA and a large data center in Grant County, WA, included "Deep Inside the Digital Archives" by June Timmons and Debbie Bahn and "Data Growth: Expect the Unexpected" by Bryan Smith]
	September 28 – October 1 - Best Practices Exchange in Phoenix, AZ [Including a session devoted to the MSPP and "Digital Archives and Financial Sustainability" led by Jim Corridan]
	December 16 - "Exploring a Cloud: The Other Washington's Consortium," Maryland State Archives, Anapolis, MD [presentation by June Timmons]
2011	March 8 - Library of Congress announces release of "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report" discussing all of the NDIIPP-funded projects and programs, including MSPP
	March 23 - "Exploring a Cloud: Transcending Boundaries," Indiana State Library, Indianapolis, IN [Presentation by June Timmons and Justin Jaffe]

2011	April 7-8 - E-Records Forum (NAGARA) in Austin, TX [Jerry Handfield, "A Review of State Government Digital Preservation"]
	April 13-14 - "DIGIN II: Digital Preservation Issues Conference," (ARMA Southwest) Albuquerque, NM [presentation by Daphne DeLeon (New Mexico) about MSPP]
	June – Justin Jaffe leaves the project.
	June 28 – Sam Reed announces that he will not run for re-election as Secretary of State for the state of Washington after serving three terms: 2000-2012.
	July 19-21 - NDIIPP/NDSA Partners Meeting in Washington, DC
	October 1 – the Nevada State Library and Archives merges with the Department of Administration, with the Nevada Department of Cultural Affairs (its previous parent institution) merging with a re-named Department of Tourism and Cultural Affairs

I. PeDALS – Project Summary

Project title
Persistent Digital Archives and Library System (PeDALS)

Brief project description
PeDALS had two technical goals: (1) to develop a curatorial rationale to support an automated, integrated workflow to process collections of digital publications and records, and (2) to implement "digital stacks" using an inexpensive, storage network that can preserve the authenticity and integrity of the collections. PeDALS also aimed to build a community of shared practice including a diversity of repositories and to remove barriers to adopting the technology by keeping costs low.

Main factors that drove initiation of the project
The project [originally called Beginning an Aggregated Government E-Records and Library Service Solution (BAGELSS)] was motivated by the assumption that, due to the large volume and diversity of electronic records being created by state government, traditional appraisal and acquisition practices must be transformed or augmented with automated, rules-based system. Experiences at the "New Skills for a Digital Era" Colloquium (2006), Best Practices Exchange conferences held in North Carolina (2006), Arizona (2007) and Montana (2008), and the DigCCurr conference (2007), reinforced the observation that knowledge and activities for preserving digital government information were "fragmented."

Also driving initiation of the project were observations and concerns relating to storage and metadata. The project has tested the LOCKSS (Lots of Copies Keep Stuff Safe) System as a potential inexpensive storage network. PeDALS activities have also been motivated by the desire to identify and codify a relatively small number of metadata elements for discovery, administration and preservation that can be applied to the majority of government records and publications.

Participating Parties

Table 13 - PeDALS Project Participating Parties

Entity	Description	Associated Personnel
Alabama (joined in late 2009)		
Alabama Department of Archives and History	ADAH is the repository for permanent records, including electronic records, created by state agencies.	• Iris Bailey, Information Services Section Head, Government Records • Tracey Berezansky, Assistant Director, Government Records • Mike Breedlove, Government Records • Drew Davis, Government Records • Christine Garrett, Government Records

Entity	Description	Associated Personnel
		Division Archivist (Partner Lead) • Alan Legleiter, Government Records • Alden Monroe, Collection Management Section Head, Government Records • Mark Palmer, Web Program Section, Government Records • Richard Wang, State Government Section Head, Government Records
Arizona (Lead Partner)		
Arizona State Library, Archives, and Public Records	The Arizona State Library, Archives and Public Records serves the information needs of Arizona citizens, providing access to unique historical and contemporary resources. ASLAPR collects state agency publications and the permanently valuable records of the state and its political subdivisions, and is responsible for establishing records retention periods for the state and political subdivisions. The Archives also deals with an increasing number of electronic records and anticipates changes in legislation to require preservation of these in original digital form.	• Deborah Andrew (PeDALS Assistant, May 2011-present) • Vinny Alascia, State Documents Librarian • Beth Aronson, Digital Librarian • Janet Fisher, Law and Research Library Director • Jerry Kirkpatrick, Records Management Specialist • Lisa Maxwell, Division Director • Sara Muth (Project Coordinator, project inception-August 2009) • Richard Pearce-Moses (Principal Investigator, project inception-June 2010) • Linda Reib, Electronic Records Archivist (Principal Investigator, October 2011-Present) • Brian Schnackel, Database/Application Developer (October 2009-present) • Melanie Sturgeon, Director, History and Archives Division • Pete Watters (Project Coordinator, August 2009-October 2011, Principal Investigator, June 2010-October 2011)

Entity	Description	Associated Personnel
		• GladysAnn Wells, Director and State Librarian (retired March 2011) • Jennifer Zimbal (PeDALS Assistant, project inception-May 2011)
Florida		
State Library and Archives of Florida	"Working in partnership with archivists, librarians, records managers, governmental officials, and citizens, the State Library and Archives of Florida seeks to assure access to materials and information of past, present, and future value to enable local libraries and agencies to provide effective information services for the benefit of the people of Florida."[255]	• Jim Berberich, Information Resources Manager • Gerard Clark, Archives Services Manager • Mark W. Flynn, Director, Florida Electronic Library (Partner Lead, until September 2011)[256] • Connie Garrett, Library Cataloging Administrator • Beth Golding, Archivist • Alan Nelson, Systems Project Administrator
New Mexico (joined in late 2009)		
New Mexico Commission of Public Records - State Records Center and Archives	"The mission of the Commission of Public Records is to preserve, protect and facilitate access to public records that are held in trust for the people of New Mexico; ensure rules promulgated by State agencies are published as prescribed in law and are accessible; advocate an understanding and appreciation of New Mexico history; and develop records management programs for State agencies."[257]	• Pete Chacon, Chief Information Officer [as of 2009] • Sandra Jaramillo, State Records Administrator [2009 to September 2011] • Angela Lucero, Records Management Division Director, (Partner Lead, September 2009 - May 2010, then left agency) • Felicia Lujan, Senior Archivist • John Martinez, Administrative Law Division Director (Partner Lead, May 2010-Present), State Records Administrator (September 2011-Present) • Cody Misplay, IT Database Administrator - December 2010 to present • Matthew Montano, Electronic Records Bureau Chief (left the agency in September 2011) • Melissa Salazar, Director,

Entity	Description	Associated Personnel
		Archives and Historical Services Division
New York (stepped back to observer status in fourth quarter of 2009)		
New York State Archives	The New York State Archives is part of the Office of Cultural Education within the State Education Department, with its main facility located in Albany and nine regional offices around the state. It manages and provides access to "more than 200 million documents that tell the story of New York from the seventeenth century to the present" and administers programs that reach out to state agencies, local governments and community organizations.[258]	• Heather Bolander-Smith, Archivist, Information Services • Sarah Durling, Specialist, Scheduling and State Agency Services • Maggi Gonsalves, Co-Coordinator, State Records Center • Monica Gray, Archivist, Collections Management • Maria McCashion, Archivist, Collections Management • Michael Martin, Electronic Records Archivist, Electronic Records Unit • Jennifer O'Neill, Coordinator, Scheduling and State Agency Services • Kathleen Roe, Director of Operations • Tom Ruller, Assistant to the Deputy Commissioner, Office of Cultural Education (formerly New York's PeDALS IT coordinator)[259] • Bonnie Weddle, Coordinator, Electronic Records (Partner Lead)
New York State Library	The New York State Library is part of the Office of Cultural Education, within the New York State Education Department. The Research Library "collects, preserves and makes available materials that support State government work." The Talking Book and Braille Library (TBBL) "lends braille and recorded books and magazines, and related equipment." The Division of Library Development "works in partnership with 73 library systems to bring library services to the millions of people who use New York's academic,	• Robert Dowd, Government Documents Librarian (project inception to December 2010) • Loretta Ebert, Research Library Director • Lynne Webb, Computer Applications, Electronic Government Documents

Entity	Description	Associated Personnel
	public, school and special libraries" and "administers State and Federal grant programs that provide aid for library services."[260]	
South Carolina		
South Carolina Department of Archives and History	The Department of Archives and History aims "to preserve and promote the documentary and cultural heritage of the state through archival care and preservation, records management, public access, historic preservation, and education."[261]	• Bryan Collars, Digital Collections Archivist (Partner Lead, May 2011-Present) • Matthew Guzzi, Electronic Records Archivist (Partner Lead March-April 2011, left agency) • Bill Henry, Electronic Records Consultant (Partner Lead from project inception to retirement, March 2011) • Nancy Piester, Electronic Records Consultant
South Carolina State Library	The South Carolina State Library is responsible for "public library development, library service for state institutions, service for the blind and physically handicapped, and library service to state government agencies."[262]	• Catherine Buck Morgan, Director, Division of Innovation and Technology (until June 2010, left library) • Elaine Sandberg, Government Documents Librarian • Laura Sponhour, [formerly] Project Manager (until December 2009, left library)
Wisconsin		
Wisconsin Historical Society	"The mission of the Wisconsin Historical Society is to help connect people to the past. The Historical Society is both a state agency and a non-profit membership organization. It has a statutory duty to collect and preserve historical and cultural resources related to Wisconsin and to make them available to the public."[263]	• Dennis Bitterlich, Electronic Records Consultant (resigned May 2010) • Peter Gottlieb, State Archivist (retired October 2010) • Sarah Grimm, Electronic Records Archivist (taking Bitterlich's place in March 2010) • Helmut Knies, Collection Development Coordinator (Partner Lead) • Jonathan Nelson, Collection Development Archivist • Abbie Norderhaug, Public Records Accessioner

Resources that parties committed to the project
There is not a specific financial commitment required of participating agencies, but it is expected that they commit the time of a records officer and IT personnel assistance to help identify appropriate records series, assist with records transfer into the system, help discover and transfer metadata into the system, and provide additional technical and administrative assistance. See personnel list above for the specific individuals involved. Partners also contributed staff time to the Core Metadata Committee, which included Richard Pearce-Moses and Linda Reib from Arizona, Beth Golding from Florida, Bonnie Weddle from New York, Bryan Collars and Matt Guzzi from South Carolina, and Jonathan Nelson from Wisconsin, who served as Committee Chair. Although she was not officially a member of the Core Metadata Committee, Lynne Webb from the New York State Library also provided substantive comments on the development of the Data Dictionary, and contributed to both the development of the Mapping Template and mapping examples of New York State Library documents to the PeDALS core metadata.

The PeDALS funding from NDIIPP included support for partner training. Florida, South Carolina, and Wisconsin sent staff to Columbia, SC for BizTalk training in September 2008, while Arizona staff participated in online BizTalk training.

South Carolina entered too late for funding under the original grant and paid its own expenses to join the project, receiving a one-time grant from the South Carolina General Assembly to purchase hardware and software. Library of Congress then approved additional funds for the project, which allowed South Carolina to become a fully-funded partner.

Expected benefits of participating
A goal of PeDALS was that, at the end of the project, each partner would have a functioning digital archives system. More broadly, the system is designed to be low-cost and highly automated, based on a storage network that is shared by multiple states. Another desired outcome is that states not implementing the system can adopt the PeDALS "shared practices" in their local contexts.

Related activities and relationships of the participating parties before the project
At the time the response to the state NDIIPP Request for Expression of Intent (RFEI) was submitted, Arizona State Library, Archives, and Public Records staff had taken leadership roles in five national and regional professional organizations and had served on NARA's Advisory Committee on the Electronic Records Archive (ERA), Government Printing Office (GPO) Advisory Panels. They had also participated in two LC/NDIIPP projects. The agency's Chief Technical Officer had helped develop a system that supported the exchange of information between local, state, and federal agencies, which paralleled the technical and social networking aspects of the PeDALS project. The agency had also received three IMLS National Leadership grants between 2000 and 2006. Many partner states had participated in an informal Government Information Locator Service (GILS) group prior to 2006, and Alabama had experience using LOCKSS prior to joining the project.

Project results expressed in proposal
The PeDALS proposal included two principal components: (1) implementation of a distributed network of interoperable digital repositories with at least six nodes and (2) creation of "a community of interest to develop a curatorial rationale and best practices to support the long-term preservation of state agency web publications and state records created in electronic recordkeeping systems."

More specifically, the following functionality was proposed for the PeDALS network: 1) automatic replication of content for emergency preparedness, 2) automatic or rapid failover for business continuity, 3) automatic, systematic checks on file integrity and error correction with an eye towards the use of digital signatures to demonstrate the authenticity of the records, and 4) high compliance with the Research Library Group (RLG) Checklist for a Trusted Digital Repository.

Examples of activities enabled by the grant
The project covered hardware and software costs, and the grant included $25,000 in staff support for each partner. The $25,000 sub-grants were made available to the partner states to offset costs in acquiring records or generating or cleaning up metadata. New Mexico, for example, hired a graduate student to assist with finding metadata for digitized photos. The grant has allowed partners to purchase hardware for LOCKSS clusters, pay for middleware/BizTalk training for partner staff, and hire a programmer as a resource shared between states. Prior to joining the project, several of the participating states did not have sufficient staffing and technical infrastructure to substantively address the curation of electronic records. The PeDALS project has provided states with opportunities for both learning and implementing working systems. States have also had the opportunity to develop records organizational structures appropriate to their own collections; for example, in early 2011, New Mexico added seven new records series to PeDALS.

Decisions or commitments necessitated or enabled by the grant
At the request of Library of Congress, Arizona investigated the use of external USB storage devices. Staff from LOCKSS and Iron Systems discouraged the use of external drives due to problems with throughput and drivers, and Arizona determined external drives were more expensive than internal drives.

In fact, the whole idea of using LOCKSS as a means of storage for large archival information packages might not have occurred to many of the partner states, whose IT staffs were more accustomed to redundant network storage appliances.

Another decision made by most partners was to employ BagIt as part of the process for transferring electronic records to their agencies. Disk drive images nearing 1 terabyte were delivered in Alabama that had been "bagged" by the originating office on a standard Windows PC. The process took nearly 11 hours, but the data arrived intact.

Changes in the standing of project participants within the state's governance
Wisconsin Historical Society experienced increased involvement in discussions concerning state administrative records through participation in PeDALS. PeDALS helped WHS to successfully make the case to agency heads for a new General Record Schedule for Administrative Records, which addresses a significant number of electronic records.

The Alabama Department of Archives and History has become more proactive in working with state agencies to get their electronic permanent records transferred to the Archives. ADAH has begun to work on pulling the pieces of its electronic records program together into a strategic plan with established procedures for accessioning, arranging/describing, providing access to, and preserving electronic records. Their electronic records program will be integrated with their non-electronic records program. PeDALS also helped to educate state agencies that electronic records are records, this is especially true for constitutional offices.

In Arizona, the state librarian presented information to at least one legislative committee showing the feasibility of preserving digital information by using PeDALS and the shift in costs that would result from the records' source to the repository. The library is anticipating a statutory change to permit born-digital information to be stored permanently without the additional expense of making copies in other media such as microfiche.

Resources mobilized as a result of the project
Richard Pearce-Moses worked with Michael Chacon of Microsoft licensing to allow the project to purchase software for all partners at the special educational discount, even if they did not otherwise qualify for that discount. This agreement is only for PeDALS partners. Extending the arrangement further would require Arizona to make the purchase on the behalf of the other states, which could present difficulties in negotiating arrangements between finance departments.

Systems development and/or implemented - scope, architecture, and components:
The Persistent Digital Archives and Library System (PeDALS), is a digital archive system that uses middleware to describe business rules from ingest to access. Design of PeDALS is based on the three types of packages in the Reference Model for an Open Archival Information System (OAIS): Submission Information Package (SIP) for ingest, Archival Information Package (AIP) for storage and management, and Dissemination Information Package (DIP) for making the content available to users.

PeDALS Architecture

Point of Ingest / Drop Box "Data-wrangler PC"
The POI/Drop Box serves two major functions: (1) receiving records that are submitted to the repository, and (2) quarantining of records, which includes scanning for viruses and identification of malware or other problems before processing begins.

Records can be deposited in the system through network transmission (FTP) or physical media (tape, disk). Records are organized hierarchically based on office of origin and records series. The middleware determines which business rules to execute based on the records' location within the hierarchy.

This components was developed within the project based on a Ubuntu workstation, but most partners now use an off-the-shelf Windows workstation that is taken off the network until the records have been vetted and are ready for ingest. The PeDALS Configuration and Management document includes detailed instructions for building this component. Each state selects its own antivirus software for this machine. Arizona previously used Kaspersky and now uses McAfee.

Middleware Server (BizTalk)
The middleware server hosts the rules and oversees their execution. It ties together all the other pieces through the processes listed below. This server can be entirely behind the primary firewall; repositories may want to install a secondary firewall between it and the POI/Drop Box.

This server, which should be fairly high-powered (64-bit dual-core Intel processor or equivalent with at least 8GB RAM) and run Windows Server 2008 R2:

- Listens to the admin manifest server. When it discovers records, it transfers the records off the drop box and initiates processing.
- Aids in validation of records[264], ensuring that all records sent by the office of origin (and only those records) were received without corruption.
- Creates an entry for each record in the accessions register database to support administration of the archives.
- Transforms the records in a submission information package (SIP) to an archival information package (AIP), including transforming and enhancing metadata[265] and adding signatures.
- Deposits the AIP and publishes the list of AIPs for ingest on the admin manifest server.
- For non-restricted records, creates an entry in the public Web Portal search database.
- For non-restricted records, creates a dissemination information package (DIP) and deposits it on the Web Portal Server.

This component was developed within the project using Microsoft BizTalk. BizTalk middleware rules were written by a consultant and staff programmers. BizTalk Server 2010 is proprietary software that requires a license for each processor on which the software is installed, though there is a free Developer Edition to be used solely for

development and testing. Microsoft offers licenses at a special rate for educational institutions; the PeDALS project negotiated with Microsoft to allow all project partners to obtain the software at the discounted rate, even if they would not normally have qualified as educational institutions. The PeDALS team plans to distribute the .msi files, schemas, documentation, and other associated files through CodePlex and SourceForge.

Administrative Catalog Server
This component was developed within the project using Microsoft SQL Server and written in C, C++ and C#. The Catalog Database maintains administrative, discovery and preservation metadata for all records ingested into the system. The information is stored in a Microsoft SQL Server database on a Windows server that is powerful enough to run Microsoft SQL Server 2005. The server is protected by firewalls from public access. The PeDALS Configuration and Management document includes detailed instructions for building this component. It requires an MS SQL Server License through Microsoft.[266]

Utility [LOCKSS Administration] and Manifest Server
The Utility Server holds configuration files and is used to sign plugins, both used by the LOCKSS cluster. The Manifest Server is a website (currently based on a Windows server running IIS 6 or 7) that holds records after processing by the middleware and exposes them to LOCKSS through a web interface. It also allows archivists to enter metadata at the provenance and series level for the records and provides a means for the archivists to check whether the BizTalk process ran correctly. Ingests are accepted through a web tool hosted on the manifest server. Both the utility and manifest servers need identical firewall security and are not very resource-intensive, so both servers are run on the same computer. The only requirement is that the server be able to run Microsoft Internet Information Services and have sufficient hard-disk space for multiple sets of records that may be waiting on ingest or vetting. The instructions are part of the public documentation that will be released with the code. Implementers need a basic understanding of PHP and how to implement it in an IIS Web server.

Note: One could potentially consolidate all three servers for additional savings. New Mexico and Alabama have consolidated the BizTalk and Manifest servers onto the same computer. Every state also has a virtual development environment in which all the above servers can run on the same guest machine. Arizona plans to virtualize its PeDALS "workflow" servers in 2012 or 2013.

LOCKSS Dark Archives Cluster
The PeDALS dark archives component is built using LOCKSS software. The LOCKSS software provides automatic integrity checking and error correction, distributes the content across machines that can be geographically dispersed, and is designed to be inexpensive.

LOCKSS keeps multiple copies of records on different servers. Each LOCKSS server frequently checks hash values of the files it holds. If the software discovers a discrepancy between the stored hash and the newly calculated hash, it polls other LOCKSS servers that have copies of the file in order to find an uncorrupted version that can be used to replace the corrupted version. PeDALS is designed to use seven servers, which is the minimum

number recommended by LOCKSS staff.

Servers in the cluster can be geographically dispersed to protect the records against loss due to disaster at a single location. Each partner has its own cluster. The ultimate goal is for each partner to store two of its own servers at two foreign partner locations, and host other partners' servers. Arizona is currently hosting a South Carolina LOCKSS box as proof of concept. At the time of this report, Alabama and Arizona were establishing hosting of each other's servers. Getting signed agreements between states on server sharing is one of the challenges in establishing these arrangements. Firewalls also must be configured to allow all of the servers to transfer data to/from each other, as well as with the LOCKSS Administration Server and the Manifest Server.

Web Portal / Public Catalog

The system provides public access through the Web using queries into the public catalog, which retrieves DIPs stored in a networked storage system. Each PeDALS partner maintains a separate Web site that provides access to the materials that it holds. The prototype, developed by the South Carolina Department of Archives and History, is browsable by Series Title and by Agency/Provenance, and has both Basic Search and Advanced Search capabilities. Advanced search fields include Item Title, Party to the Record, Geographic Location, Series Subject, Series Keyword, and Date Range.

This component was developed within the project by the South Carolina Department of Archives and History. It requires Microsoft IIS 6 or 7 and .NET Framework 3.5. The site was developed using Visual Studio 2008. A sample website is part of the code being made public. The technical documentation addresses how to customize the website. Installation requires familiarity with IIS and ASP.NET websites and C#.

Project management – roles, responsibilities and coordination

A management team led by ASLAPR has overseen the implementation. A project manager and grants administrator have overseen day-to-day operations, tracked progress, scheduled meetings, made reports, and performed other administrative functions. A curatorial team, led by the PI, includes representatives from each partner state. The responsibilities of the PeDALS Assistant, which included attending project meetings and recording meeting minutes, assisting in the setup and coordination of meetings and conferences, and helping track project expenses, were defined in the project assistant position description.

Staffing roles and responsibilities were presented to potential partners as follows: For local teams, archivists/librarians were responsible for negotiating to acquire content, describing acquisitions, mapping metadata, and providing quality control; PeDALS/BizTalk Admin were to be responsible for implementing rules and helping to develop code; IT was to be responsible for systems and network support; and the Partner lead was to be responsible for coordination and reporting. Project-wide, the Curatorial Committee was listed as being responsible for metadata mapping and iterative review of the Core Metadata standard, and the Tech Committee was listed as being responsible for developing the catalog and implementing business rules. Additional methods of coordination included the election of committee chairs and individuals volunteering for certain tasks such as documenting BizTalk coding.

Communication within the project
The project held a kickoff meeting in which partners were able to build personal, face-to-face relationships. Communication throughout the project included bi-weekly project conference calls, committee conference calls as needed, annual project meetings, and participation in the annual NDIIPP partners meetings.

The project set up various Internet-based collaboration tools, including a mailing list and a BaseCamp site, which the project used to share related news, literature suggestions, websites, BizTalk reports, and log iterations. Later in the project, participants used GoTo Meeting for simultaneous editing.

At the June 2009 Partners Meeting, partners acknowledged that web collaboration tools are useful, but they also emphasized the importance of face-to-face interaction in building a productive relationship. Bonnie Weddle noted "In New York State, some staffers who work on the PeDALS project have been to project meetings or have met at least some of the other people involved in the project. They are more firmly committed to the project and have a much clearer sense of its dynamics and trajectory than those who haven't met the other project participants face-to-face."[267]

Dissemination of products and information outside of the project:
During the course of the project, PeDALS has directly engaged with the following organizations/events through either direct discussions or presentations at events:

- American Association of Museums
- Association of Records Managers & Administrators
- Best Practices Exchange for Government Digital Information
- Chief Officers of State Library Agencies
- Council of State Archivists
- DigCCurr
- DIGIN - Digital Preservation Issues Conference
- Digital Curation Conference (Chicago)
- Digital Preservation Conference (New Mexico)
- Digital Preservation Management Workshop (Michigan)
- Library and Information Technology Association
- MAC Fall Symposium
- Microsoft BizTalk Server Roadshow
- National Association of Government Archives and Records Administrators
- National Digital Information Infrastructure and Preservation Program
- Private LOCKSS Networks (Boston)
- Society of American Archivists
- South Carolina Information Technology Directors Association Annual Conference

Information on PeDALS architecture, PeDALS Core Metadata Dictionary,[268] digital stacks, curatorial rationale, and more is available to the general public on the project website.[269] Some records ingested into PeDALS are available to the public through the Web. More sensitive

records, such as constituent emails, are available to the public from within the research or reading room at the archives.

Scope of materials addressed by the project:

Alabama	Email (Unspecified), Photographs from the Department of Agriculture and Industries.
Arizona	**Arizona Government Digital Collections (State Library, Archives, and Public Records)** Digital content from all branches of Arizona state government, including marriage certificates, civil case files, well reports, agency and legislative web pages, proceedings of the Arizona House and Senate, state agency publications, and e-mails of the state's governor. **Arizona State Agencies Web Publications (State Library)** Website collections of the Territorial and State Agency Publications Depository Program. Topics covered include Arizona history, law, and genealogy.
Florida	**Florida State Government Digital Collections** Audio recordings of Florida House of Representative debates, Florida Senate debates, and committee sessions. Photographs of Governor Bush, constituent correspondence, the Governor's weekly newsletters, analysis files from the Office of Policy and Budget, and press releases and statements. Rules of Civil Procedures, Rules of Judicial Administration, and Rules of Criminal Procedure.
New Mexico	The New Mexico Register (Public document), fish stocking reports, Governor speeches, Governor Executive Orders, Governor Photographs, Legislative Finance Committee Newsletters.
New York	Jurisdictional Determination Files (1973-2005) from Adirondack Park Agency, Jurisdictional Inquiry Unit; Investigation "D" ("Troopergate") Records (2007-2008), Albany County, Office of the District Attorney; Weekly Update, New York State Banking Department; DOH Medicaid Update, New York State Department of Health Office of Medicaid Management
South Carolina	**South Carolina State Government Digital Collections (Department of Archives and History)** State Senate journals, State House of Representatives journals, SC Code of Laws and Regulations, published opinions from the State Supreme Court, orders from the Public Service Commission, voter registrations from the State Election Commission, death certificate indexes from the Department of Health and Environmental Control, admission/discharge records from Department of Corrections, incorporation documents from the Secretary of State, trademark records from the Secretary of State, e-mail from the Governor's Office, Order of the Palmetto database from the Governor's Office, and meeting minutes of professional licensing boards from the Department of Labor, Licensing, and Regulation Special Subjects.
Wisconsin	**Wisconsin State Government Digital Collections** Correspondence from the Secretary of Natural Resources, correspondence from the Department of Workforce Development, employer record system employment data, Department of Workforce Development Public information news releases, minutes from the Department of Health and Family Services, selected speeches and public comments of Governor Tommy G. Thompson (1993–1996), selected speeches and public comments of Governor Scott McCallum (2001–2002), railroad maps, the index to building permit records, and bill-drafting files.

The PeDALS Email Extractor code, developed for the project by Brian Schnackel, is available through SourceForge.[270] "The PeDALS Project" by Richard Pearce-Moses was published in *Against the Grain* 21:2 in April 2009. Richard Pearce-Moses met and discussed PeDALS with Jane Zhang in December 2009. Zhang used PeDALS as one of her case studies investigating the concept of original order in the digital era.[271]

Current and planned custodial responsibility
Custodial responsibility will be with each PeDALS state partner for its own state's records.

Value and potential usefulness of content types addressed
According to Pete Watters:

> PeDALS has proven effective in dealing with uniform record series that have high-level metadata (indices, databases, spreadsheets) that can be used to identify and differentiate items. It also has been proven effective in providing additional storage for government publications, particularly in cases where there is only one digital copy available for access (a CONTENTdm repository does not check its copies for bit rot the way LOCKSS would, for example). It is not effective in dealing with heterogeneous records without metadata (the "retiring official's hard drive").

Plans for advancing the activities after the grant
At the March 2011 Partners Meeting, partners discussed the possibility of seeking grants for additional research and sharing costs of a PeDALS developer. Agreements have been drafted to allow for interstate server sharing, which binds the partner states in a loose confederation. Discussions have begun in Arizona to establish the sustainability of the state's PeDALS system. The current plan is to fund at least one full-time electronic archivist position and a software developer/systems architect position. The hope is that the developer would be able to provide some assistance to other states.

Mechanisms for sustaining PeDALS activities and products
The project plan has included investigation of administrative and economic factors necessary for a collaborative distributed network and development of a business model to sustain the network as a consortium after the grant. The pilot architecture specified that partners should plan to learn about BizTalk middleware and the SQL Server to ensure that the system could be maintained after the grant.

Four of the original partners have agreed to continue the project as a collaborative after funding ends. The March 2011 Partners Meeting provided an opportunity to discuss future collaboration. One product of the meeting was a standardized memorandum of agreement for states to share their LOCKSS networks.

The Microsoft Licensing agreement for BizTalk will continue after the grant, allowing partner archives implementing PeDALS system to obtain software at a significant discount. The Microsoft agreement stipulates that Arizona purchase the software on behalf of the current PeDALS partners. The licenses that have been purchased are for SQL Server 2008 Enterprise, BizTalk Server 2009 Standard, Windows Server 2008 R2. The licenses do not include automatic

upgrades (quality assurance), but they are not time-bound, meaning that they do not expire. Partners will have to purchase upgrades to later versions if they find this necessary. However, partners have discussed the development of potential code to eliminate the need for BizTalk, lowering this potential barrier to entry.

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J. PeDALS - Timeline

	Influential Events and PEDaLS Project Activities [Project activities are in bold blue text.]
2001	October - Library and Archives establish the Arizona 'Lectronic Records Taskforce (ALERT) to coordinate e-records activities in state and local government.
2003	January 2, 2003 – Version 2 of the "Arizona Electronic Recordkeeping System (ERS) Guidelines"
2004	The three-year ($2.75M) Exploring Collaborations to Harness Objects in a Digital Environment for Preservation (ECHO DEPository) Project begins through funding by the National Digital Information Infrastructure Preservation Program (NDIIPP) and as a partnership between the University of Illinois at Urbana-Champaign, Online Computer Library Center (OCLC), Perseus Project at Tufts University, Vincent Voice Library at Michigan State University Library, and an alliance of state libraries and archives from Arizona, Connecticut, Illinois, North Carolina, and Wisconsin.
	The three-year Web-At-Risk project is funded through NDIIPP, as a collaboration of the California Digital Library, University of North Texas, and New York University, to develop a Web Archiving Service [Richard Pearce-Moses of the Arizona State Library serving as a "project curator"].
2005	Spring 2005 – Publication of "An Arizona Model for Preservation and Access of Web Documents" by Richard Pearce-Moses, Director of Digital Government Information, Arizona State Library, Archives and Public Records, and Joanne Kaczmarek, Archivist for Electronic Records, University of Illinois at Urbana-Champaign Archives
	Summer 2005- Arizona State Library, Archives and Public Records uses OCLC's Web Archives Workbench to analyze and harvest the content of state agency websites according to the principles of the "Arizona Model."
	May 2005 – Development of *Arizona Memory* begins.
	May 2005 - Richard Pearce-Moses gives presentation about the Arizona Model to Library of Congress staff.
	2005- Richard Pearce-Moses begins his one-year term as president of the Society of American Archivists.
	August 2005 – With support from the NHPRC and Arizona State Library and Archives, the Society of American Archivists publishes *A Glossary of Archival and Records Terminology*, compiled and edited by Richard Pearce-Moses and an out-growth of his earlier work on the "Arizona Electronic Records Thesaurus."
	September 2005 - Arizona State Library, Archives and Public Records creates a metadata dictionary for use by the Arizona Memory project.
	November 28, 2005 – Arizona State Library, Archives and Public Records creates "Draft Sample for Permanent Electronic Records Assurance Statement."
2006	March – Arizona Memory is launched, based on CONTENTdm.
	May 5 – Library of Congress releases Request for Expressions of Interest for "Multi-State Demonstration Projects for Preservation of State Government Digital Information."
	May - Arizona State Library, Archives and Public Records' Law and Research Library add an Arizona State Agency Publications collection to the Arizona Memory site.
	May 27-28 - First annual Best Practices Exchange conference in Wilmington, NC [closing session led by Richard Pearce-Moses]
	May 31 – June 2, New Skills for a Digital Era Colloquium in Washington, DC [initiated by Richard Pearce-Moses and sponsored by the U.S. National Archives and Records Administration, Society of American Archivists, and Arizona State, Library, Archives and Public Records]
	June 15 – Response to Request for Expression of Interest submitted to Library of Congress.
	August – Richard Pearce-Moses gives his SAA Presidential Address: "Janus in Cyberspace: Archives on the Threshold of the Digital Era."
2007	April 18 - Arizona State Library, Archives, and Public Records begins using Archive-It to crawl content from the websites of Arizona state government agencies, boards, and commissions
	May 2-4 – Second Best Practices Exchange conference is held in Chandler, AZ [hosted by the Arizona State Library, Archives and Public Records; includes a presentation by Richard Pearce-Moses about the

2007	rationale behind PeDALS].
	November – PeDALS project activities begin.
	December - Internet-based collaboration tools set up: Dashboard (using BaseCamp), mailing list, and conference call service through Arizona State Library
	December 7 - Administrative kick-off meeting is hosted by LC in Washington DC for NDIIPP state projects.
2008	Quarter 1 - Theft at New York State Archives and hiring freeze in state of Arizona reduce time staff can spend on PeDALS.
	January 7 – Library of Congress announces four state projects ($2.25 of total funding), including PeDALS.
	January - Project web site is launched.
	January 16-18 - Kickoff Meeting in Phoenix, AZ; Metadata group established with Jonathan Nelson of Wisconsin Historical Society elected as committee chair
	February - States begin contacting records creators and identifying records series
	February 4 - PeDALS assistant Jennifer Zimbal hired
	February 29 – conference call in which three metadata subgroups are established: administrative, preservation and discovery metadata
	March 20 - PeDALS presentation by Pearce-Moses at Phoenix ARMA chapter
	Quarter 2 – Wisconsin Historical Society changes staff; New York draws additional staff into project; Project transitions from working intensively on the metadata scheme to focusing on technical issues; Pearce-Moses contacts BizTalk instructor David Lindsay, who offers to provide architecture recommendations.
	April 22 - David Lindsay delivers architecture recommendations
	April 25 – First meeting with Bryan Vincent Associates consultant, who PeDALS has hired for 20 hours of BizTalk expertise to review Lindsay's architecture and assist implementation of prototype system
	May 12 - PeDALS presentation by Bill Henry to staff, South Carolina Department of Archives and History
	Mid-May - First draft of metadata dictionary (effort led by Bonnie Weddle of New York)
	Mid-May: New York State Archives receives a wide-scale freedom of information request covering both paper and electronic records. As a result, key PeDALS staffers Bonita Weddle and Michael Martin scale back PeDALS activity.
	May 21-24 – Best Practices Exchange in Helena, MT [PeDALS presentation by Richard Pearce-Moses]
	June 8 - Digital Initiative (Dig In) Conference 2008, Albuquerque, NM ["Flatland to virtual: transcendence & the digital dimension" presented by Richard Pearce-Moses]
	June 24 - PeDALS presentation by Bill Henry to State Historical Records Advisory Board, South Carolina
	July - New York State Library's Systems Librarian leaves state service. Lynne Webb, a key PeDALS staffer, assumes some of his responsibilities.
	July 8-10 – NDIIPP Partners Meeting in Arlington, VA [presentation by Jerry Handfield called "The Power of 0101: A slow revolution"]
	July 23-25 – Joint annual meeting of National Association of Government Archives and Records Administrators (NAGARA) and Council of State Archivists (CoSA) in Atlanta, GA [PeDALS presentation by Melanie Sturgeon; presentation about PeDALS at the CoSA board meeting on July 23]
	July 24 - New draft of Memorandum of Agreement circulated
	August – Arizona and South Carolina implement prototype system
	August 6 - "PeDALS: A Guide for Wisconsin State Agencies" presentation by Peter Gottlieb, Helmut Knies, and Dennis Bitterlich to Wisconsin State IT Directors Council
	August 26-31 – Society of American Archivist Annual Meeting [SAA Electronic Records Section meeting focuses on NDDIIPP State projects with talks about all four projects – Richard Pearce-Moses for PeDALS]
	September – Arizona facilities move: network and data center move completed.
	September - New York State Library's Web Site Developer leaves. Lynne Webb, a key PeDALS participant, assumes some of her responsibilities.

2008	**September - BizTalk training in Columbia, SC for Florida, South Carolina and Wisconsin; BizTalk training online for Arizona**
	September 8 - PeDALS presentation by Bill Henry and Matt Guzzi to South Carolina Information Technology Directors Association, Annual Conference in Myrtle Beach, SC
	September 19 - PeDALS presentation by Bill Henry and Matt Guzzi to South Carolina Archives and History Commission
	October 1 - PeDALS presentation by Dennis Bitterlich to LIS 818 Accessioning and Appraisal, School of Library and Information Studies, University of Wisconsin – Madison
	October 2 - "Initial BizTalk Programming Development Objectives for PeDALS" presentation by Dennis Bitterlich to Wisconsin Historical Society Staff and Wisconsin State Employees
	October 16-19 – Library and Information Technology Association (LITA) National Forum in Cincinnati OH
	October 20-24 – PeDALS partners meeting in Phoenix, AZ
	November - Arizona facilities move: movement of collections completed
	November - Hardware and software ordered for prototype systems (Florida, New York and Wisconsin)
	November 7 - PeDALS presentation by Pearce-Moses to IT staff at Arizona State University
	December - Developer workstations purchased for all partners
2009	January 21 –Jan Brewer who served as Arizona Secretary of State since 2003, becomes governor of Arizona, replacing Janet Napolitano; Ken Bennett becomes new Secretary of State
	January – New York, which entered the project under the assumption that all BizTalk programming would be performed by a consultant, starts to question whether it will be able to install and configure PeDALS components.
	Sara Muth, Project Coordinator, must shift significant attention to ensuring compliance with the new Arizona administration's web site requirements.
	February - Pearce-Moses works with Michael Chacon of Microsoft Licensing to negotiate licenses for partners who would not otherwise qualify for special educational discount.
	March 3 – All Memoranda of Agreement (MOA) signed
	March 19-20 - Code-a-thon in Phoenix, AZ
	March 31 – NDIIPP State Partners Meeting in Washington, DC
	April – Florida conducts an electronic recordkeeping survey of 36 state agencies.
	April - *Against the Grain* 21:2 (April 2009) publishes "The PeDALS Project" by Richard Pearce-Moses; exploration of hardware and storage options for 16 TB LOCKSS servers with Tom Lipkis of LOCKSS; proposal developed for extension of PeDALS project
	Quarter 2 – Arizona and South Carolina ingest records as a proof of concept.
	April 1-3 – DigCCurr International Symposium in Chapel Hill, NC [presentation by Richard Pearce-Moses, "PeDALS: Persistent Digital Archives & Library System"]
	April 10 – Pearce-Moses works with the team of the MetaArchive project to purchase a server setup from Iron Systems that can overcome the LOCKSS default limit of 1 Terabyte of storage.
	Quarter 3 - Alabama and New Mexico join PeDALS as new partners.
	May – First iterative review of core metadata specification and committee formed to make revisions, chaired by Bryan Collars of South Carolina; invitations extended to COSA and COSLA to participate as observers
	May 3-8 – Digital Preservation Management workshop in Ann Arbor, MI [PeDALS presentation by Richard Pearce-Moses]
	June 2 - Presentation by Richard Pearce-Moses to potential partners
	June - States Initiative Metadata conference call: Arizona shares PeDALS Core Metadata dictionary with Washington State and offers to share database schema.
	June 24-26 – NDIIPP Partners Meeting in Washington, DC
	July 1 - Legislation is passed (effective October 1) to move Arizona State Library, Archives and Public Records from the Legislature to the Secretary of State.
	July-August – State Library, Archives and Public Records undergoes transition from operating within state legislature to being part of Secretary of State.

2009	July 15-18 – NAGARA Annual Meeting in Seattle, WA [PeDALS presentation by GladysAnn Wells and Lisa Maxwell]
	End of July - new consulting staff/programmer brought on board
	Sara Muth transitions from serving as PeDALS Project Coordinator to serving as webmaster for Arizona State Library, Archives and Public Records.
	August 12-15 – SAA/CoSA Annual Meeting in Austin, TX [PeDALS presentation by Richard Pearce-Moses]
	August 17 – Pete Watters becomes technical project manager for PeDALS.
	September 2-4 - Best Practices Exchange in Albany, NY [PeDALS presentation by Richard Pearce-Moses at session on "Distributed Digital Preservation: Three Working Examples"]
	September 22-23 - Designing Storage Architectures for Digital Preservation (NDIIPP) in Washington, DC
	September - Second major iteration of metadata review completed and posted to web site; project tests and begins use of BagIt for validation.
	Fall – All agency information technology services at State Library and Archives of Florida move to a state IT provider, hindering this partner's ability to install and configure PeDALS components.
	October 5 - Brian Schnackel hired as staff member at Arizona State Library, Archives and Public Records to continue PEDaLS development
	October – PeDALS email project begins.
	October - Arizona State Library, Archives and Public Records now part of Secretary of State
	October – Neudesic runs a four-day BizTalk training event for PEDaLS project staff.
	Q4 - New York State Library and New York State Archives step back to observer status
	October 19 – Project status conference call
	October 22 – Wisconsin site visit
	October 21-23 – Midwest Archives Conference 2010 Symposium in Dayton, OH
	November – Tom Ruller, formerly information technology coordinator for the New York State Office of Cultural Education and New York State's PeDALS IT coordinator, becomes Assistant to the Deputy Commissioner, New York State Office of Cultural Education.
	November 17-20 – PeDALS partner meeting in South Carolina
	December 31 – Florida publishes "Electronic Recordkeeping Strategic Plan: January 2010 – December 2012."[272]
2010	**January – Arizona team receives email records from partners and discovers scalability problems with PST parser.**
	January – New York State Archives receives another wide-scale freedom of information request covering both paper and electronic records, and key PeDALS staffers Bonita Weddle and Michael Martin devote less times to PeDALS as a result.
	January - Sarah Grimm takes over for Dennis Bitterlich at the Wisconsin Historical Society.
	Programmer who had done work on administrative catalog in PHP for PeDALS leaves State Library and Archives of Florida.
	February 19 – Microsoft publicly releases the specification for Outlook Personal Folders (.pst) File Format.[273]
	February – BizTalk code documentation is completed; based on the Microsoft specification, Brian Schnackel begins to create the PeDALS Email Extractor, which will later be released as open-source software.
	April 23 - "Curating the Digital Past: Lessons from the PeDALS Project" presentation by Richard Pearce-Moses at University of Arizona, Tucson, AZ
	May - Dennis Bitterlich – who had developed the administrative catalog database for PeDALS - resigns from position at Wisconsin Historical Society but continues to work with WHS as a consultant.
	May – Arizona marriage certificate ingests are completed.
	May 17-19 - Pete Watters attends Managing Electronic Records conference (Cohasset Associates) in Chicago, IL
	June 2010 – Richard Pearce-Moses leaves the project to take a position at Clayton State University, and Pete Watters becomes Principal Investigator for PeDALS.
	June - Ingests completed: AZ AT/OT Board email AIPs (DIPs in progress) and WI Railroad

2010	**Maps; grant proposal for further PeDALS work submitted to National Historical Publications and Records Commission (NHPRC)**
	June 13-18 - Brian Schnackel attends Digital Preservation Management Workshop in Cambridge, MA
	July 20-22 – NDIIPP Partners Meeting in Arlington, VA [Pete Watters presents on PeDALS email preservation]
	August - Sarah Grimm of Wisconsin Historical Society receives formal BizTalk training
	September 28 – October 1 - Best Practices Exchange in Phoenix, AZ [Including sessions devoted to PeDALS, "The Archival Email Message Challenge" by Brian Schnackel and "Preserving Email: The PeDALS Approach" by Richard Pearce-Moses and Pete Watters]
	Quarter 4 - Working public catalog running in isolated mode in South Carolina and Arizona
	October –Pete Watters and Brian Schnackel visit New Mexico to help install PeDALS software
	Pete Chacon, who had served as New Mexico technical lead for PeDALS is promoted to serve as the agency's Chief Information Officer (still involved with PeDALS).
	October - Dennis Bitterlich starts job as database administrator for Texas Department of State Health Services and is then unable to consult with PeDALS.
	October – Peter Gottlieb retires as state archivist of Wisconsin.
	October 25-26 - Private LOCKSS Networks: Community-based Approaches to Distributed Digital Preservation in Boston, MA [Richard Pearce-Moses speaking about PeDALS]
	November - NHPRC does not fund PeDALS grant proposal; project develops plan to keep four of the states – Alabama, Arizona, South Carolina, and Wisconsin – as active partners, with New Mexico participating without a formal agreement (because of complication in gaining necessary legislative approval).
	December - New Mexico State Records Center and Archives hires Cody Misplay as IT Database Administrator
	December – Robert Dowd, New York State Library Government Documents Librarian and active PeDALS contributor, is laid off as a result of a statewide workforce reduction.
	December – South Carolina business rules for ingest 1 completed; meeting with Ricc Ferante of Smithsonian Institution Archives, possibility for collaboration; meeting of PeDALS personnel with Jane Zhang of Simmons College, who will use PeDALS as a case study to investigate the concept of original order in the digital era; December project end date extended to April 2011.
	December 6-8 - 6th International Digital Curation Conference in Chicago, IL [Pearce-Moses, Watters among authors of paper presented that mentions PeDALS in archival education context.]
2011	**January-February - Partner states begin to distribute their servers among each other; problems with LOCKSS are fixed with help of LOCKSS technical staff, Iron Systems support, and testing and documentation by New Mexico's Cody Misplay.**
	January LOCKSS moves from OpenBSD to CentOS as default operating system, preventing LOCKSS from being installed onto new PeDALS server setup (addressed by PeDALS project by end of February)
	February – Library of Congress agrees to extend the PeDALS project deadline from April to the end of the 2011 calendar year.
	March – South Carolina project lead Bill Henry retires.
	March - GladysAnn Wells retires after serving as Director and State Librarian, Arizona State Library, Archives and Public Records since 1997.
	March 8 - Library of Congress announces release of "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report" discussing all of the NDIIPP-funded projects and programs, including PeDALS.
	March 23-25 - Partners meeting in Phoenix - draft MOA for sharing LOCKSS servers; frank discussion of the successes and failures of the project to date; possible collaboration and cost-sharing for next calendar year; changes to the PeDALS technology that might simplify the workflow; potential code to eliminate the need for BizTalk; demonstration of new template techniques
	April 7-8 – NAGARA E-Records Forum in Austin, TX. [Watters presents on PeDALS with other NDIIPP state project representatives]
	May 24 – American Association of Museums in Houston, TX [Helmut Knies presents on PeDALS]

2011	July 19-21 - NDIIPP/NDSA Partners Meeting in Washington, DC [no formal presentation]
	October – Pete Watters leaves the PeDALS project and Linda Reib replaces him as PI.
	October 20-22 - Best Practices Exchange in Lexington, KY [includes PeDALS Bird of a Feather meeting, led by Linda Reib and Brian Schnackel]

K. Software Tools and Components Used by Projects

The following applications and tools have been used by one or more of the NDIIPP states projects. Some are suites of software that draw from a variety of components, while others are small tools designed to perform specific functions. The list does not include low-level software such as operating systems and storage environments, though low-level software is often referenced within the dependencies section of a given entry.

ActiveMQ[274]

Description	Message broker that implements the Java Message Service 1.1 (JMS)
Developer/Provider	Apache Software Foundation
License terms	Open source (Apache, version 2)
Plans to disseminate for use by others	Freely available from Apache Software Foundation
Specific skills/expertise required to customize or implement	See Frequently Asked Questions[275]
Main hardware/software dependencies	Java environment (JDK 5.0 or later); tested on Windows, OS X, Linux and Solaris
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	Widely implemented elsewhere

ArcCatalog

Description	Geodatabase administration application in ESRI's ArcGIS suite
Developer/Provider	Esri
License terms	Proprietary[276]
Plans to disseminate for use by others	Others who wish to use this software must license it from Esri.
Specific skills/expertise required to customize or implement	See the ArcGIS Resource Center.[277]
Main hardware/software dependencies	Operating system: Windows 2000, Windows XP, Windows Server 2003, Windows Vista; "developer class" workstation with high-performance memory, processor and graphics card
Use within state NDIIPP projects	GeoMAPP state partners: North Carolina and Utah
Use by others	ArcGIS has an extensive user base.

ArchiveThis!

Description	Used for transfer of data to the Washington Digital Archives
Developer/Provider	Developed by the Washington Digital Archives and customized for the MSPP project
License terms	No defined licensing terms
Plans to disseminate for use by others	ArchiveThis! has been disseminated to all MSPP project partners as the ingestion portal for electronic records submitted to the Washington Digital Archives. There are

	no plans for further disseminate it.
Specific skills/expertise required to customize or implement	Revision to the tool would require programming experience in C#, implementation of Work Flow Foundation (WF), Windows Communication Foundation (WCF), Windows Presentation Foundation (WPF).
Main hardware/software dependencies	Windows OS, ASP.NET MVC, SQL Server 2008. Main processing distributed on sixteen quad core servers and two eight processor servers.
Use within state NDIIPP projects	Washington Digital Archives and some of the MSPP partners
Use by others	None

ArcGIS

Description	Suite of software for generation and management of GIS data
Developer/Provider	ESRI
License terms	Proprietary[278]
Plans to disseminate for use by others	Others who wish to use this software must license it from ESRI.
Specific skills/expertise required to customize or implement	For information about use of the software, see the ArcGIS Resource Center.[279] Python and ArcObjects programming are required for extensive scripting or custom tool development.
Main hardware/software dependencies	Operating system: Windows 2000, Windows XP, Windows Server 2003, Windows Vista; "developer class" workstation with high-performance memory, processor and graphics card
Use within state NDIIPP projects	GeoMAPP partners: North Carolina and Utah
Use by others	ArcGIS has an extensive user base.

Auto Todd (Archive Utility To Optimize Transfer Of Digital Documents)

Description	Performs a variety of ingest functions
Developer/Provider	Developed by the Washington Digital Archives and customized for use in MSPP
License terms	No defined license terms
Plans to disseminate for use by others	There are no plans to disseminate it outside of the Digital Archives.
Specific skills/expertise required to customize or implement	Skills and expertise to develop include programming experience in C#, implementation of Work Flow Foundation (WF), Windows Communication Foundation (WCF), Windows Presentation Foundation (WPF)
Main hardware/software dependencies	Windows OS, ASP.NET MVC, SQL Server 2008. Main processing distributed on sixteen quad core servers and two eight processor servers
Use within state NDIIPP projects	Washington Digital Archives
Use by others	None

AXAEM (APPX-based Archives Enterprise Manager)[280]

Description	"Content management system designed specifically for state and other archives responsible for managing records and collections" – "Features of Axaem include the ability to manage temporary records and permanent holdings; describe records using the DACS standard; generate retention schedules (general and specific); track microfilm and imaged records; identify creators and subjects through authority files; track patron questions; export MARC records; produce EAD and EAC output; and interface with your institution's website."[281]
Developer/Provider	Developed in part by staff from the Utah State Archives
License terms	In November 2010, the software developed specifically for AXAEM was assigned an open-source license (GPL version 2). The AXAEM software has not yet been publicly disseminated. According to Elizabeth Perkes of the Utah State Archives, public release is projected for Spring 2012. There is an online work space devoted to the application, which has yet to reflect much activity.[282] In order to run AXAEM, one must run its underlying APPX Runtime Environment, which is subject to the "APPX Supplemental License"[283] that is not compatible with the GPL. Those wishing to try a demonstration version of AXAEM can obtain a promotional license key from APPX, which allows one concurrent user and one "design right." Additional perpetual licenses are priced at $300 per user, $200 per Database Interface User Right (in order to interface with Oracle, D-ISAM, and DB2), and $1200 per design right (to create, modify, and maintain applications). APPX offers a variety of service packages, with different associated prices.[284]
Plans to disseminate for use by others	The Utah State Archives has indicated that the AXAEM software will be made available for download. See above for licensing information related to the underlying APPX software.
Specific skills/expertise required to customize or implement	APPX Software offers education for developers, and a network of consultants to support deployment or customization of AXAEM. Utah State Archives staff report that the barriers to use of APPX are relatively low, as evidence by Utah's "programmer" for AXAEM being "an archivist, not a programmer, by training."
Main hardware/software dependencies	APPX, the application engine used by AXAEM has client, server and database components. The client is designed to be lightweight and is written in Java. Utah's APPX engine and associated applications run on a Linux server. A separate Windows server provides access to a database of

	record locations in their permanent records room, which has an Automated Storage Retrieval System from HK Systems. Utah's implementation of AXAEM runs an Oracle database on the Linux server, SQL Server on the Windows server, and APPX's own native database called APPX/IO. Access to AXAEM is run through a Linux-based web server, which uses CGI scripts. APPX can run in Unix and Windows environments and (according to Elizabeth Perkes) on "the Amazon cloud." The client can also run on a Macintosh platform. APPX's documentation indicates that it has been run on "Red Hat and Novell Suse Linux variants, IBM AIX and HP/UX Unix variants, and a variety of Microsoft Windows and Windows Server variants."
Use within state NDIIPP projects	GeoMAPP partner: Utah State Archives
Use by others	The Utah State Archives is the only active user of AXAEM, but Elizabeth Perkes reports that are institutions are testing it.

BagIt Tools

Description	BagIt is a specification for the packaging of digital content for transfer. Content is packaged (the bag) along with a small amount of machine-readable text (the tag) to help automate the content's receipt, storage, and retrieval. A bag consists of a base directory containing the tag and a subdirectory that holds the content files. The tag is a simple text-file manifest that consists of two elements: (1) an inventory of the content files in the bag; and (2) a checksum for each file. Alternatively a bag can list URLs instead of simple directory paths and then a script can retrieve the files over the Internet, 10 or more at a time. In another optional file, users can supply metadata that describe the bag. The Parallel Retriever optimizes the retrieval of bags through parallelization, and produces a bag when given a file manifest and a "fetch.txt" file. VerifyIt verifies a bag manifest using parallel md5 processes. The Bag Validator validates a bag against the BagIt specification and checks for files in the manifest that are missing from the disk, files on the disk that are not listed in the manifest, and duplicate entries in the manifest.
Developer/Provider	Library of Congress, in coordination with the Web-at-Risk (NDIIPP) project
License terms	The BagIt Library (BIL) for the creation, manipulation and validation of bags is labeled as "public domain" by the Library of Congress.[285] The BagIt Transfer Utilities are released under an open source (BSD) license.

Plans to disseminate for use by others	BagIt Library (Java) and BagIt Transfer Utilities (Python and Unix shell) code are available through Sourceforge. [286] The GeoMAPP project has also created and posted to the Web a detailed BagIt User Guide and a shorter BagIt Quick Reference Summary.
Specific skills/expertise required to customize or implement	Unix skills to implement, Python language for further development
Main hardware/software dependencies	Java Runtime Environment and UNIX operating system
Use within state NDIIPP projects	PeDALS (to validate transfers starting in third quarter of 2009); GeoMAPP partners, PeDALS partners; California Digital Library/UC3 (used by MTSA project while testing Merritt)
Use by others	Use by a variety of repositories and initiatives[287]

BizTalk Server

Description	Environment designed to support automated of business processes
Developer/Provider	Microsoft
License terms	BizTalk Server 2010 is proprietary software that requires a license for each processor on which the software is installed, though there is a free Developer Edition to be used solely for development and testing. Microsoft offers licenses at a special rate for educational institutions; the PeDALS project negotiated with Microsoft to allow all project partners to obtain the software at the discounted rate, even if they would not normally have qualified as educational institutions.
Plans to disseminate for use by others	BizTalk Server is available for purchase from Microsoft; the PeDALS project plans to disseminate .msi files, documentation and schemas associated with their implementation.
Specific skills/expertise required to customize or implement	Writing rules in BizTalk requires a trained programmer; implementing a BizTalk Server requires expertise in setting up a Windows server
Main hardware/software dependencies	Server 2008 with Service Pack 2, Windows 7, Windows Vista with Service Pack 2, Microsoft Internet Information Services (IIS) 7.0 or 7.5. Other requirements: Microsoft Office Excel 2010 or 2007, Microsoft .NET Framework 4 and .NET Framework 3.5 SP1, Microsoft Visual Studio 2010 with Visual C# .NET. (required for BizTalk Server applications development and debugging; not required for production-only systems), SQL Server 2008 R2 or SQL Server 2008 SP1, SQL Server 2005 Notification Services with Service Pack 2, The Windows SharePoint Services adapter Web service requires SharePoint Server 2010,

	SharePoint Foundation 2010, Windows SharePoint Services 3.0 with Service Pack 1, or Microsoft Office SharePoint Server 2007. In order to install BizTalk RFID side-by-side with BizTalk Server, the following additional software components are required: Microsoft Message Queuing service (MSMQ), Microsoft Management Console (MMC) 3.0.[288]
Use within state NDIIPP projects	PeDALS
Use by others	The web site for the BizTalk Users Group[289] indicates that there are approximately 2900 members, and there are nine local chapters, three of them in the U.S. (Central Florida, South Florida and Georgia). The site does not indicate who any members are, so the current installed base is difficult to determine. Microsoft reports that there are more than 10,000 BizTalk customers, including 81% of the Fortune Global 100.[290]

ClamAV

Description	Antivirus engine
Developer/Provider	Team of developer led by Tomasz Kojm
License terms	Open source (GPL)
Plans to disseminate for use by others	Freely available online.[291]
Specific skills/expertise required to customize or implement	ClamAV can be run from a command line or a graphic user interface; integration with other applications can require programming expertise
Main hardware/software dependencies	"Linux, Solaris, FreeBSD, OpenBSD, NetBSD, AIX, Mac OS X, Cygwin B20 on multiple architectures such as Intel, Alpha, Sparc, Cobalt MIPS boxes, PowerPC, RISC 6000"
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	Widely used in Unix environments, including many mail servers

Django[292]

Description	Python web framework
Developer/Provider	Django Software Foundation[293]
License terms	Open source (BSD)
Plans to disseminate for use by others	Freely available online[294]
Specific skills/expertise required to customize or implement	Django is designed to be used by experienced software developers.
Main hardware/software dependencies	Python version from 2.4 to 2.7
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	DjangoSites lists several thousand sites that use Django.[295]

DROID (Digital Record Object Identification)

Description	Tool for batch identification of file formats
Developer/Provider	The National Archives (UK)
License terms	Open source (BSD)
Plans to disseminate for use by others	Freely available online[296]
Specific skills/expertise required to customize or implement	DROID can be run from a command line or a graphic user interface; integration with other applications can require programming expertise.
Main hardware/software dependencies	DROID can run on Windows, Unix/Linux and Mac OS X. DROID 6 requires Java 6 (tested on Java 6 update 17 and higher).
Use within state NDIIPP projects	DROID is used by KEEP (sub-grant received from MTSA project); and SDB (Tessella), which has been tested by the MTSA project.
Use by others	DROID is used by many institutions and projects.

Drools[297]

Description	Rule engine
Developer/Provider	Red Hat
License terms	Open source (Apache, Version 2)
Plans to disseminate for use by others	Freely available online.[298]
Specific skills/expertise required to customize or implement	See the Drools introduction document for the version being used.[299]
Main hardware/software dependencies	Java environment (Sun JRE 1.6 or greater on Windows and Unix/Linux, and Apple JRE 1.6 or greater on Mac OS X)
Use within state NDIIPP projects	Used by SDB (Tessella), which has been tested by the MTSA project
Use by others	As of February 12, 2012, the Drools user forum indicated that there were 1384 registered users.

DSpace[300]

Description	Software suite for management of digital collections
Developer/Provider	DSpace was originally developed through a partnership between Hewlett-Packard and the Massachusetts Institute of Technology (MIT). On 17 July 2007, HP and MIT announced the formation of the DSpace Foundation, a non-profit organization to lead and support the DSpace community. On 12 May 2009, Fedora Commons and the DSpace Foundation joined to form a non-profit organization called DuraSpace. DuraSpace now supports implementation and further development of both DSpace and Fedora.
License terms	Open source (BSD)
Plans to disseminate for use by	None of the NDIIPP state partners have plans to

others	disseminate any customizations to DSpace. The DSpace software is freely available through Sourceforge and the DSpace Subversion repository.
Specific skills/expertise required to customize or implement	See the DSpace "Quickstart Guide."[301]
Main hardware/software dependencies	DSpace can run in either Unix or Windows. Installation in Unix is more straightforward, because many of the required components are already part of standard Unix/Linux distributions. Required components include: Java JDK 5, Apache Maven 2.0.8 or later, Apache Ant 1.7 or later, a relational database (PostgreSQL or Oracle), a servlet engine (Jakarta Tomcat 4.x, Jetty, Caucho Resin or equivalent) and a Perl interpreter.
Use within state NDIIPP projects	GeoMAPP partners: Kentucky and Texas Digital Library Repository
Use by others	Numerous institutions; see the DSpace Registry.[302]

Esri GeoPortal Server[303]

Description	"Enables discovery and use of geospatial resources including datasets, rasters, and Web services"
Developer/Provider	Esri
License terms	Open source (Apache, version 2)
Plans to disseminate for use by others	KDGI has created a report titled "Implementation of the ESRI ArcGIS Server GeoPortal Extension." Geoportal installation, configuration, and customization documentation from KY, MT, UT will be consolidated into a whitepaper.
Specific skills/expertise required to customize or implement	Knowledge of configurations and architecture is needed for modification. Familiarity with geospatial metadata standards required. Java programming required for custom functionality.
Main hardware/software dependencies	The geoportal host environment can run on RedHat Enterprise Linux AS/ES 5, Windows XP SP2, Windows 2003 Server SP2, Windows 2008 Server Standard, Windows 2003 Server 64-bit, Windows 2008 Server Standard 64-bit, Windows 7 Ultimate, Professional Edition 32-bit, Windows Server 2008 R2. It requires a database (Oracle 10g, Oracle 11g, PostgreSQL 8.3 and 8.4, Microsoft SQL Server 2005 SP2 or SP3 Microsoft SQL Server 2008), a web application server, a full Java JDK (version 5 or 6) on the server hosting the geoportal web application, and access to ArcGIS Server services (ArcGIS Server map, locator, and geometry services for the geoportal search map and place finder). The geoportal requires an LDAP directory server. The Geoportal Server database can be deployed on the same server or a different

	server than the geoportal web application. Java JDK is recommended for Microsoft SQL Server 2008 deployments. The geoportal web application is based on Java Servlet technology, which requires the use of a Servlet container. The following software provide Java Servlet support and have been tested and verified to run the geoportal web application. For Geoportal Server version 0.9: Apache Tomcat 5.5.x (requires Java JDK 5), Apache Tomcat 6.0.x (requires Java JDK 6), Oracle WebLogic 10 MP1 and 10.3, Sun GlassFish 2.1, Servlet Exec AS 6.0. For Geoportal Server version 1.0: Apache Tomcat 6.0.24 and higher 6.x versions (requires Java JDK 6), Oracle WebLogic 11g, Sun GlassFish 3.0.
Use within state NDIIPP projects	GeoMAPP partners (implemented by Kentucky DGI and Utah AGRC in the fourth quarter of 2010)
Use by others	Abu Dhabi SDI GeoPortal, Australia E-NRIMS Digital Geographic Information, Austria Energeo Geoportal, Canada Nova Scotia, GeoNOVA Portal, Canada Saskatchewan GeoSask Portal, geoNorge, Geospatial One-Stop Geoportal, GRID Africa GeoPortal, Lombardia Italy Regional Airport, Malaysia GeoPortal, Mesoamerican Visualization and Monitoring System, Mississippi Geospatial Clearinghouse, Montana GIS Portal, New York State Department of Environmental Conservation, NOAA's National Climatic Data Center, Poland IKAR Geoportal, Portugal National System for Geographic Information (SNIG), Sweden Geodata Portal.

eXist[304]

Description	Database that stores data using an XML data model (i.e. a "native-XML" database) that supports index-based XQuery processing
Developer/Provider	Wolfgang Meier
License terms	Open source (LGPL)
Plans to disseminate for use by others	Source code (Java) is available through SourceForge. The final product of Syntatica's development on top of eXist was made available to MSTA partners in January 2010.
Specific skills/expertise required to customize or implement	Java, native-XML database architecture, XForms, XPath, XSLT, XQuery
Main hardware/software dependencies	eXist uses a unique binary data format that is not readable by other software. eXist can be used with Lucene to support search and indexing (can be customized to index specific parts of the XML as desired).
Use within state NDIIPP projects	Tested as part of prototype developed by Syntactica for the MTSA project
Use by others	eXist appears to have many users. As of February 5, 2012,

	SourceForge reported 339,265 downloads.

Fedora (Flexible Extensible Digital Object Repository Architecture) Commons

Description	Modular software architecture for developing digital repositories
Developer/Provider	Fedora was developed jointly by Cornell University Information Science and the University of Virginia Library. The Fedora Project is currently directed by Sandy Payette from Cornell and Thornton Staples from the University of Virginia, with support from the Andrew W. Mellon Foundation and the Gordon and Betty Moore Foundation. On 12 May 2009, Fedora Commons and the DSpace Foundation joined to form a non-profit organization called DuraSpace. DuraSpace supports implementation and further development of both DSpace and Fedora.
License terms	Open source (Apache, version 2)
Plans to disseminate for use by others	Freely available online[305]
Specific skills/expertise required to customize or implement	See the Fedora Commons Documentation page.[306]
Main hardware/software dependencies	Java SE Development Kit (JDK) 6; Database: Derby SQL Database 10.5.3 (bundled with installer, only for evaluation and development) or MySQL, Oracle, PostgreSQL and Microsoft SQL Server; Application Server: Tomcat 6.0.29 (preferred), Jetty or JBoss; Maven2 (for build environment)
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	The Fedora Commons Registry lists hundreds of projects that use the software.[307]

Heritrix

Description	Web crawler designed specifically for building large-scale collections of web content
Developer/Provider	Internet Archive
License terms	Open source (GNU Lesser General Public License 2.1)
Plans to disseminate for use by others	Freely available online[308]
Specific skills/expertise required to customize or implement	See the Heritrix User Manual.[309]
Main hardware/software dependencies	Must have Java Runtime Environment and at least Java version 5.0 installed; not tested, packaged, or supported on platforms other than Linux
Use within state NDIIPP projects	Web Archiving Service of the CDL and Tessella's SDB (both tested by the MTSA project); used by MHS for "Web Archiving Evaluation/Comparison" as part of MSTA project

Use by others	Internet Archive, Archive-It service and many other institutions that collect information from the Web

JHOVE (JSTOR/Harvard Object Validation Environment)[310]

Description	Tool for identification, validation and characterization of digital objects
Developer/Provider	JSTOR and Harvard University Library
License terms	Open source (LGPL)
Plans to disseminate for use by others	Freely available online[311]
Specific skills/expertise required to customize or implement	The default use of JHOVE is from a command line, though there is also a graphic user interface available. Configuration and use of JHOVE requires fairly detailed understanding of file format characteristics.[312]
Main hardware/software dependencies	Unix, Windows, or OS X platform; Java 2 Platform, Standard Edition (J2SE) 1.4
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project); California Digital Library's UC3 service and Tessella's SDB (both tested by MTSA project)
Use by others	Use of JHOVE is widely reported in the digital libraries and digital preservation literature. As of February 5, 2012, SourceForge reports 6,698 total downloads.

Karen's Directory Printer[313]

Description	Outputs the name, size, timestamps and filesystem attributes of files on a drive
Developer/Provider	Karen Kenworthy
License terms	The click-through agreement indicates that "this program and other associated files are the property of [the developer] Karen Kenworthy, and other copyright holders" and the application is freely available for "personal use only." One "may not sell or distribute these files to others, or incorporate them into any other product, without Karen's written permission." The source code (Visual Basic) is available for separate download. To use the "program at work, or as part of a business activity," one is instructed to pay for a site license, which ranges from $3 to $25 per seat. A CD can be purchased for $29.95 (includes shipping) that includes a variety of applications and a web update utility.
Plans to disseminate for use by others	There are no plans for the GeoMAPP team to disseminate the software. It can be obtained from the developer's site.
Specific skills/expertise required to customize or implement	Default use of the tool requires basic GUI skills. Selection of various parameters requires some familiarity with file system characteristics and file hashing.
Main hardware/software dependencies	Visual Basic 6.0 Runtime

Use within state NDIIPP projects	GeoMAPP partner: Utah State Archives
Use by others	Unknown

LOCKSS (Lots of Copies Keep Stuff Safe)

Description	Peer-to-peer, decentralized environment for ensuring the persistence of digital objects through replication and verification of multiple copies across multiple locations
Developer/Provider	Stanford University Libraries
License terms	Open Source (BSD)
Plans to disseminate for use by others	The LOCKSS software is freely available online.[314] The PeDALS Configuration and Management document includes detailed instructions for building this component.
Specific skills/expertise required to customize or implement	LOCKSS software is designed to be installed by repository personnel with relatively limited technical expertise. Membership in the LOCKSS Alliance provides regular updates of the LOCKSS software. Familiarity with the Linux command line is helpful.
Main hardware/software dependencies	The basic requirements for LOCKSS are an operating system (Unix-based) and run-time environment. Most LOCKSS installations use a CD that bundles the LOCKSS daemon with an operating system (previously OpenBSD and now CentOS). The LOCKSS team also supports running the daemon on RPM-based Linux distributions and on Solaris. The LOCKSS daemon can run in any environment with a Java VM 1.5 or above and a Unix-like file system. The hosting PC needs at least 1 GB of memory, a CD drive, and at least 250 GB of storage. The current CD distribution supports parallel (PATA) and serial (SATA) ATA and SCSI drives. Membership in the LOCKSS Alliance provides regular updates of the LOCKSS software.
Use within state NDIIPP projects	PeDALS
Use by others	LOCKSS is being used in both the global LOCKSS network and a variety of private LOCKSS networks (including PeDALS). LOCKSS documentation indicates that, as of fall 2008, there more than 200 libraries in the global network. Examples of other private LOCKSS networks include The Alabama Digital Preservation Network (ADPN), Council of Prairie and Pacific University Libraries (COPPUL) Consortium, Data Preservation Alliance for the Social Sciences (Data-PASS), Digital Commons - Berkeley Electronic Press, and the MetaArchive Cooperative Project.

Lucene (Apache)

Description	Search engine software
Developer/Provider	Apache Software Foundation
License terms	Open Source (Apache, version 2)
Plans to disseminate for use by others	Freely available online[315]
Specific skills/expertise required to customize or implement	Basic installation requires some Unix command-line skills. Further configuration and integration with other applications can require considerable Unix and programming skills.
Main hardware/software dependencies	Lucene is a java software library that can run on a variety of platforms, as long as they have a Java environment installed.
Use within state NDIIPP projects	MTSA in connection with the eXist native-XML database, testing of UC3 and testing of SDB (Tessella)
Use by others	Lucene has a large community of users

MD5deep[316]

Description	Tool for generating and comparing hashes (MD5, SHA-1, SHA-256, Tiger, or Whirlpool) of individual files, files within a directory or pieces of files
Developer/Provider	Jesse Kornblum
License terms	Public domain
Plans to disseminate for use by others	Freely available online[317]
Specific skills/expertise required to customize or implement	Proper use of the application requires an understanding of what md5 hashes are and what is implied by a change in md5 value.
Main hardware/software dependencies	Distributed as binaries for Microsoft Windows (7, Vista, XP, 2003, and 2000 are supported) and as source code
Use within state NDIIPP projects	GeoMAPP: North Carolina
Use by others	Md5deep is quite popular. As of February 5, 2012, SourceForge reports 393,956 downloads of md5deep and hashdeep.

MD5 Summer[318]

Description	Generates and verifies md5 hashes
Developer/Provider	Luke Pascoe
License terms	Open source (GPL)
Plans to disseminate for use by others	There are no plans for dissemination by the GeoMAPP team. The application can be downloaded freely from the md5summer web site.
Specific skills/expertise required to customize or implement	Proper use of the application requires an understanding of what md5 hashes are and what is implied by a change in md5 value.
Main hardware/software	MD5summer runs on Microsoft Windows 9x, NT, ME,

dependencies	2000 and XP. Its output file is compatible with the output of the Linux GNU MD5Sum and it will also read Linux generated files. The source code, available through the web site, is written in the Borland Delphi 7 language.
Use within state NDIIPP projects	GeoMAPP: Kentucky and North Carolina
Use by others	Unknown

Merritt Preservation Repository[319]

Description	Repository service based on a micro-services model
Developer/Provider	California Digital Library, University of California Curation Center (UC3) for use in the University of California community
License terms	Varies by individual component being used by Merritt. License for code developed specifically for Merritt is unknown.
Plans to disseminate for use by others	Not currently available for installation by outside parties. Instead, the CDL is exploring the provision of Merritt as a hosted service to parties outside of the University of California system.
Specific skills/expertise required to customize or implement	Required expertise depends on which micro-services are being invoked. Many require an understanding of a Unix environment.
Main hardware/software dependencies	Each micro-service component has different requirements.[320]
Use within state NDIIPP projects	Tested as part of the MTSA project
Use by others	University of California units

Metadata Parser[321]

Description	This program parses metadata, checking the syntax against the FGDC Content Standard for Digital Geospatial Metadata, and generating a textual report on any errors.
Developer/Provider	Peter Schweitzer of the USGS Geology Discipline
License terms	Public domain (federal government product). It is also provided as part of the ArcGIS suite.[322]
Plans to disseminate for use by others	Freely available online[323]
Specific skills/expertise required to customize or implement	Use of the tool requires basic command-line skills and the ability to determine the appropriate output format(s).
Main hardware/software dependencies	Runs on Linux/UNIX systems and Microsoft Windows (95 and up including XP). The source code, available through the USGS site, is written in C.
Use within state NDIIPP projects	GeoMAPP partners: Used by each of the GIS clearinghouses for validating completeness of FGDC CSGDM metadata records; some use by archives teams for validation of metadata before ingest into the archives.
Use by others	Unknown

MySQL[324]

Description	Relational database management system that is often used as the database layer in open source environments - part of the LAMP (Linux Apache MySQL PHP/Perl) stack
Developer/Provider	Oracle Corporation
License terms	MySQL is distributed under a dual license model. For commercial distributors "that combine and distribute commercially licensed software with MySQL software and do not wish to distribute the source code for the commercially licensed software under version 2 of the GNU General Public License (the 'GPL') must enter into a commercial license agreement with Oracle." Developers of "Free Open Source Software ('FOSS') applications under the GPL that want to combine and distribute those FOSS applications with MySQL software" can do so under the GPL. In order to develop and distribute software under a FOSS license other than the GPL, one can use GPL-licensed MySQL Client Libraries "under a FOSS Exception that enables use of the those [sic] MySQL Client Libraries under certain conditions without causing the entire derivative work to be subject to the GPL."[325]
Plans to disseminate for use by others	MySQL is available from Oracle. See Downloads[326] and How to Buy[327] pages.
Specific skills/expertise required to customize or implement	MySQL is a complete relational database system. Installation and configuration requires significant technical expertise.
Main hardware/software dependencies	MySQL can run in a variety of Unix and Windows environments. However, for a variety of reasons, "not all platforms are equally well-suited for running MySQL."[328]
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	MySQL has been widely adopted in a variety of environments. According to Oracle, it is "the world's most popular open source database" with more than 65,000 downloads per day.[329]

New Zealand Metadata Extractor[330]

Description	Extracts preservation-related metadata from digital files and outputs the metadata as XML; can be used through a graphical user interface or command-line interface
Developer/Provider	National Library of New Zealand
License terms	Open source (Apache, version 2)
Plans to disseminate for use by others	Available as open-source software from http://meta-extractor.sf.net and http://sourceforge.net/projects/meta-extractor/ (since 2007)
Specific skills/expertise required to customize or implement	Java and XML expertise are helpful for customizing the transformations

Main hardware/software dependencies	Written in Java and XML, with both a Microsoft Windows interface and a UNIX command line interface
Use within state NDIIPP projects	PeDALS (to generate preservation metadata for AIPs, starting in third quarter of 2009)
Use by others	National Library of New Zealand, Archivematica, various other institutions and products

OpenOffice

Description	Office suite, which can also be used for batch processing of files, such as file format conversions
Developer/Provider	Sun, then Oracle, and now Apache Software Foundation
License terms	Open source (LGPL, version 3)
Plans to disseminate for use by others	Freely available online[331]
Specific skills/expertise required to customize or implement	Use of the conversion functions through the user interface requires only the ability to select files. Invoking the functions through other applications requires the ability to write scripts or programs.
Main hardware/software dependencies	Java runtime environment 1.4.0_02 / 1.4.1_01 or newer; Java Access Bridge[332]
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project)
Use by others	Archivematica also uses OpenOffice for file conversion.[333]

Open States iOS Application

Description	The Open States iOS application provides mobile access to a variety of information sources collected by the Open States project that are related to legislators and legislative actions.
Developer/Provider	Sunlight Labs
License terms	Unknown
Plans to disseminate for use by others	The application is available as a free download through Apple's App Store.[334]
Specific skills/expertise required to customize or implement	Unknown
Main hardware/software dependencies	This application is based on the Open States API.[335] It runs on the iOS platform, which is used on iPhone, iPod Touch, and iPad devices. Sunlight Labs has built a similar application to run on the Android platform called Congress for Android, which provides access to information about legislation and legislators at the federal level, and they have indicated that they plan to develop an Android application for state information. Sunlight Labs also disseminates (under a BSD-style open-source license) python-openstates,[336] a library for interacting with the Open State Project API, which depends upon Python 2.4 or higher and Python Remote Objects (Pyro) 1.1 or higher.

Use within state NDIIPP projects	The MTSA project team worked with Sunlight Labs on their development and testing of this application.
Use by others	The Open States iOS application has only been available through Apple's App Store since February 2012. "The app does however derive from an existing Texas-specific application [TexLege] which has proven of tremendous use…"[337]

PeDALS Email Extractor

Description	Extracts content (messages, attachments and other elements) from Microsoft Outlook .pst files, retaining the folder structures
Developer/Provider	Brian Schnakel for the PeDALS project
License terms	Open source (GNU General Public License, version 3), copyright is owned by the Arizona, State Library, Archives and Public Records
Plans to disseminate for use by others	Freely available online[338]
Specific skills/expertise required to customize or implement	Installing the application requires only unzipping a file. The application runs through a graphic interface with a simple set of commands. Running it against a PST file requires only selecting the target file and an output folder. Error messages could be difficult for many users to understand. The Email Extractor only outputs the data to a folder, and the user must determine what to do with the exported data (email messages in XML and attachments in their original formats).
Main hardware/software dependencies	Written in C# targeting Microsoft's .NET Framework 2.0 using Visual Studio 2005; code can be modified using Microsoft Visual Studio 2005; requires Microsoft .NET Framework 2.0 to run
Use within state NDIIPP projects	PeDALS partners
Use by others	Specific use is not known. As of February 5, 2012, SourceForge reports 735 downloads of the software from 69 countries.

PeDALS System

Description	This is a multi-component system designed for acquisition and management of born-digital collections.
Developer/Provider	PeDALS Project
License terms	The LOCKSS software is freely available through an open-source (BSD) license. The Administrative Catalog Server is subject to the Microsoft SQL Server License. The New Zealand Metadata Extractor is freely available under an open-source (Apache) license. BizTalk Server 2010 is proprietary software that requires a license for each

	processor on which the software is installed, though there is a free Developer Edition to be used solely for development and testing. Microsoft offers licenses at a special rate for educational institutions; the PeDALS project negotiated with Microsoft to allow all project partners to obtain the software at the discounted rate, even if they would not normally have qualified as educational institutions. The BagIt Library (BIL) for the creation, manipulation and validation of bags is labeled as "public domain" by the Library of Congress. The BagIt Transfer Utilities are released under an open source (BSD) license. The Point of Ingest Drop Box is based on Ubuntu and its associated utilities. Ubuntu software is predominately covered by the GNU General Public License (GNU GPL) and GNU Lesser General Public License (GNU LGPL). However, the Ubuntu distribution does include various components that are subject to other licenses.
Plans to disseminate for use by others	Software has been shared with PeDALS partners and could be distributed to new partners, contingent upon provisions for the continuation of PeDALS services.
Specific skills/expertise required to customize or implement	See discussion of the various components in Appendix I.
Main hardware/software dependencies	See discussion of the various components in Appendix I.
Use within state NDIIPP projects	PeDALS partners
Use by others	None reported to date

Robocopy

Description	Command-line directory replication utility
Developer/Provider	Developed by Microsoft and bundled with Windows operating systems
License terms	Proprietary
Plans to disseminate for use by others	No plans
Specific skills/expertise required to customize or implement	Appropriate use of Robocopy requires an understanding of its main parameters and switches, as well as ability to use the Windows command line, though there are several graphic user interfaces that run on top of Robocopy.
Main hardware/software dependencies	Operating system: Windows NT 4.0 or later
Use within state NDIIPP projects	GeoMAPP partners: North Carolina, Kentucky and Utah
Use by others	Unknown

Rsync

Description	Synchronizes files and directories between locations
Developer/Provider	Originally developed by Andrew Tridgell and Paul Mackerras, and maintained by Wayne Davison
License terms	Open source (GPL)
Plans to disseminate for use by others	It is bundled with all major Linux distributions and can be downloaded for use in Mac and Windows operating systems.[339]
Specific skills/expertise required to customize or implement	Appropriate use of rsync requires an understanding of its main parameters and switches, as well as ability to use the Unix command line, though there are several graphic user interfaces that run on top of rsync.
Main hardware/software dependencies	Unix
Use within state NDIIPP projects	GeoMAPP partner: Utah
Use by others	Rsync is widely used by many organizations for a variety of purposes.

SDB (Safety Deposit Box)[340]

Description	Integrated suite of applications that make use of a workflow engine to support various digital curation functions, including several preservation functions
Developer/Provider	Developed by Tessella, with its origins in work with The National Archives of the UK, and further development through work with the EU PLANETS project and a variety of national archives as customers.
License terms	SDB is a proprietary system, though it incorporates a variety of open-source components and provides APIs for further development and a Drools environment that SDB customers could use to develop and customize their own workflows.
Plans to disseminate for use by others	SDB is a commercial product that is provided by Tessella.
Specific skills/expertise required to customize or implement	SDB provides relatively simple graphic user interfaces for customers to perform many of the core functions. Further customization or more advanced activities, such as metadata transformations, report generation or workflow definition require the ability to use SDB's more advanced interfaces – including APIs, workflow environment and reporting environment. Alternatively, SDB "tenancy" customers could potentially contract with Tessella to perform the further customization and development (such arrangements are yet to be defined or established).
Main hardware/software dependencies	SDB is designed to store files in a variety of commercially provided bulk storage systems accessed through a storage adapter. It must run on top of a relational database –

	usually Oracle, but also MySQL, or SQL Server (currently testing PostgreSQL). It can run on Linux/Unix and Windows operating systems. SDB uses a hibernate layer to abstract the software from any specific database management system. SDB code is Java-based. Potential state customers of SDB may use it through a "tenancy" in which Tessella hosts and runs the software on the server side; in this case, the primary software necessary on the client side is a web browser. Alternatively, a group of organizations could establish and administer their own multi-tenant system. There is a Submission Builder tool to create ingest packages and various internal functions for transforming and editing metadata. SDB provides an extensible workflow environment (using Drools), which can be used to implement various decisions, transformations, integrity checks, deletions and approvals. The internal data structures of SDB – stored in a relational database (usually Oracle) - are based on XIP (from the PLANETS project), supplemented with metadata based on user-supplied schemas. XIP can represent hierarchies of collections and records and associated preservation metadata. SDB can export to PREMIS for characterization and METS for packaging. SDB is designed to store files in a variety of commercially provided bulk storage systems accessed through a storage adapter. It includes a web-based interface for browsing and search, using Lucene as the default search engine. SDB includes an "enhanced version of PRONOM" and several file migration and characterization tools, including DROID, JHOVE, Stellent, and ImageMagick. SDB uses the open-source Jasper system for generating reports. User authentication is managed through an LDAP interface. SDB includes a web based interface to allow users to browse the collection and search for content. The built-in search engine is the open source Lucene which may index the metadata and/or the content. The SDB software is proprietary, but its main functions are accessible through both Java and SOAP APIs. Tessella indicates in its promotional literature: "The additional plug-in services added to the system by Tessella, users, and commercial or academic partners to perform additional workflow, preservation or integration tasks are generally open source…" It also supports the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) to allow movement of metadata between systems.

Use within state NDIIPP projects	Through the MTSA project, Tessella worked with the Minnesota Historical Society, Illinois State Library, Tennessee State Library and Archives, and Vermont State Archives to implement a "multi-tenant" deployment of SDB. Tessella ran a single instance of the software on a server with a separate "tenancy" for each state. The SDB was tested by the MTSA state participants primarily as-is, though Mark Evans of Tessella worked with the states to identify features or configurations that they would potentially find desirable if they were to use SDB in the future, several of which were incorporated into the pilot test.
Use by others	UK National Archives, Swiss Federal Archives, Malaysian National Archives, Dutch National Archives, Rotterdam Regional Archives, Wellcome Trust Libraries, National Archives of Estonia, Austrian State Archives, and FamilySearch International.

SQL Server

Description	Relational database server
Developer/Provider	Microsoft
License terms	Proprietary (though SQL Server Express Edition is a free, scaled-down version)
Plans to disseminate for use by others	Available from Microsoft
Specific skills/expertise required to customize or implement	Installation requires significant expertise about servers and databases
Main hardware/software dependencies	See Microsoft site for the fill list of dependencies[341]
Use within state NDIIPP projects	Washington State Digital Archives (MSPP), PeDALS
Use by others	SQL Server has a substantial user base.

SVN (Subversion)

Description	Version control system
Developer/Provider	Created by CollabNet Inc. in 2000 and now supported by the Apache Software Foundation
License terms	Open source (Apache)
Plans to disseminate for use by others	Freely available online[342]
Specific skills/expertise required to customize or implement	One can use SVN through a command line or a variety of graphic user interfaces. Basic use requires an understanding of the way file versions are stored (as sets of changes to a given document, rather than full copies of each version), as well as the difference between simple file system operations and updating and committing files to the SVN repository. Integration of SVN with other

	applications requires an understanding of its API.
Main hardware/software dependencies	Subversion is written in the C programming language and has an associated application programming interface (API); the main distribution of Subversion is through source code, though there are binary versions available for all major operating systems.
Use within state NDIIPP projects	KEEP (sub-grant received from MTSA project) for versioning of information within the repository
Use by others	Widely used for source code versioning and software configuration management[343] with SVN repository hosting available through various sites including Google Code and SourceForge

Vice Versa

Description	File synchronization, replication backup and comparison utility
Developer/Provider	TGRMN Software
License terms	Proprietary – pricing based on PLUS or PRO version and single vs. server license
Plans to disseminate for use by others	No plans by GeoMAPP partners
Specific skills/expertise required to customize or implement	Vice Versa is run through a graphic user interface. Use requires an ability to recognize and navigate file paths.
Main hardware/software dependencies	Windows 7, Vista, XP
Use within state NDIIPP projects	GeoMAPP partner: Kentucky
Use by others	Unknown

WAS (Web Archiving Service)

Description	Web-based service for capturing, managing and preserving information from web sites
Developer/Provider	California Digital Library through the Web-at-Risk project
License terms	WAS incorporates many components, which are subject to different licenses: Heritrix (GNU Lesser Public license (LGPL)), Hibernate (LGPL v2.1), Jargon, Jetty (Apache License, Version 2.0), JMX (Sun Community Source 2.3 and Sun Binary Code), MySQL (depending on use: GPL, GPL with FOSS Exception or OEM Commercial License), NutchWAX (LGPL), Restlet (several options: LGPL 3.0, LGPL 2.1, CDDL 1.0, or EPL 1.0), Storage Resource Broker (proprietary software but with source code readily available to academic organizations and government agencies), Tomcat (Apache License version 2), and Wayback (Apache License, Version 2.0) – see their individual documentation. License of the software developed specifically for the WAS is unknown.

Plans to disseminate for use by others	WAS is a hosted service provided only by the CDL
Specific skills/expertise required to customize or implement	For further development: Java, Ruby on Rails
Main hardware/software dependencies	Web Page: Javascript must be enabled in the user's browser. User must be able to install browser bookmarklets to use the "add sites while browsing" feature. Log in and password required. Back End: Infrastructure consists of Solaris 10 and Linux machines. The heaviest infrastructure demands are processing power for crawling, processing power for indexing, and storage. Other tools used are Heritrix, NutchWAX, Wayback Machine, MySQL and Storage Resource Broker.
Use within state NDIIPP projects	MSTA explored and tested the WAS multiples and summarized their experiences in "Web Archiving Evaluation/Comparison" and "Web Archiving White Paper"
Use by others	Units of the University of California system, and several other institutions[344]

L. Previous Electronic Records and Digital Preservation Activities - By State

This appendix provides information about activities within the twenty five states (and District of Columbia) that have participated in one or more NDIIPP states projects. The descriptions run up to the time of each state's participation in an NDIIPP states project. For most participating states, this is approximately January 2008, when the Library Congress formally announced the four NDIIPP states projects. However, some states became project partners at a later date. Kansas received funding for KEEP from NDIIPP though the MSTA project in April 2010.

Alabama

In 2006, the Institute of Museum and Library Services (IMLS) awarded a two-year National Leadership Grant to the Network of Alabama Academic Libraries (NAAL) and seven Alabama institutions: the Alabama Department of Archives & History, Auburn University, Spring Hill College, Troy University, the University of Alabama, the University of Alabama at Birmingham and the University of North Alabama. With IMLS funding, these seven institutions established a distributed digital preservation network, the Alabama Digital Preservation Network (ADPNet), for the state of Alabama using open-source LOCKSS software. Ongoing support for ADPNet is provided by its members. Apart from the LOCKSS Alliance fee, there are no dues or membership fees for ADPNet.[345]

Also in 2006, the Alabama Archives participated in the Internet Archives subscription service, Archive-It, to build, manage, and access a Web archive. Prior to establishment of the Archive-It program, ADAH established permanent retention for state and local agency Web sites. Based on the records disposition authorities for these entities, they were to save a copy of their Web sites annually, or as often as significant changes are made to their sites. Procedures for preserving this information for state agencies were developed and distributed by the ADAH.

Alaska

The Alaska State Publications Program, known by state law as the State Library Distribution and Data Access Center, was established in 1970 in order to acquire, describe, preserve and provide permanent no-fee public access to publications produced or funded by Alaska state agencies regardless of format. The State of Alaska is mandated by AS 14.56 to collect publications of state agencies. This mandate is format neutral, and the State Library has extended its depository program to include publications in digital form.

The Alaska state government's digital preservation initiatives began in 1995 with a $26,126 NHPRC grant (95-019) to support a two-year project coordinated through the Alaska State Historical Records Advisory Board in Juneau, AK. Building upon an Alaska state assessment report from 1984, working groups met "with members of various constituent groups to identify needs in one of five areas: electronic records, local government and Native records, records repositories, state government records, or statewide functions and services."[346] In 1997, the Alaska Department of Education, Alaska State Archives, received $10,000 from the NHPRC for an electronic records consultancy.

Alaska has been collecting "Internet Only" state publications since 1998, first through manual harvesting and in 2002 switching to Teleport Pro. In the summer of 2004, the State Library

switched to automated Web-harvesting software from the University of Illinois at Urbana-Champaign as a test-case in the IMLS-funded project, "Capturing Electronic Publications."

For publications cataloged during and after July 2005, the State Library prints one preservation copy of every received electronic state publication and stores one copy on its web server to serve to the public with a stable URL. Starting in January 2006, these publications were made available to institutions using LOCKSS (www.lockss.org) software. Launched in June 2005, the GPO Pilot Project used a private LOCKSS network to evolve the Federal Depository Library Program (FDLP)[347] and the International Exchange Service (IES) from print to online. As a charter member of the GPO Pilot Project, the Alaska State Library had a LOCKSS repository in place, which they have used to explore preservation and dissemination of state publications.[348]

In addition to continuing to use the LOCKSS repository to store copies of state government publications, they are currently a member of the Digital Federal Depository Library Program ("USDocs"), which uses a private LOCKSS network to replicate key aspects of the United States Federal Depository system. In 2008, the Alaska State Library also began archiving a large number of state agency and institutional web sites through a partnership with Archive-It.[349]

Since July 2004, electronic state publications have represented about half of all documents collected through the Alaska State Publications Program. To support this program, the State Library acquired Web-harvesting software from UIUC (Capturing Electronic Publications) and solicited agency submissions through a specific email address.

Starting in January 2006, these publications were made available to institutions using LOCKSS software. A number of institutions outside of Alaska are using LOCKSS to create local collections of Alaska state documents, and overtures are being made to libraries within the state depository system to join LOCKSS and build local collections. For the foreseeable future, the depository program will be focused on born digital documents and no digitization of state publications in paper will occur.[350]

Arizona

The Arizona State Library and Archives established the Arizona 'Lectronic Records Taskforce (ALERT) in 2001 to coordinate e-records activities in state and local government. On January 2, 2003, Arizona issued and disseminated its "Electronic Recordkeeping System (ERS) Guidelines."

In 2004, the three-year ($2.75M) Exploring Collaborations to Harness Objects in a Digital Environment for Preservation (ECHO DEPository) Project began through funding by the National Digital Information Infrastructure Preservation Program (NDIIPP) and as a partnership between the University of Illinois at Urbana-Champaign, Online Computer Library Center (OCLC), Perseus Project at Tufts University, Vincent Voice Library at Michigan State University Library, and an alliance of state libraries from Arizona, Connecticut, Illinois, North Carolina, and Wisconsin.

Also in 2004, the three-year Web-At-Risk project was funded through NDIIPP, as a collaboration of the California Digital Library, University of North Texas, and New York

University, to develop a Web Archiving Service, with Richard Pearce-Moses of the Arizona State Library serving as a "project curator."

Richard Pearce-Moses and Joanne Kaczmarek, Archivist for Electronic Records, University of Illinois at Urbana-Champaign Archives published "An Arizona Model for Preservation and Access of Web Documents" in Spring 2005. Arizona State Library, Archives and Public Records used OCLC's Web Archives Workbench to analyze and harvest the content of state agency websites according to the principles of the "Arizona Model."

Development of the *Arizona Memory* site began in May 2005, and the site was officially launched in March 2006 (based on CONTENTdm). In September 2005, the Arizona State Library, Archives and Public Records created a metadata dictionary for use by *Arizona Memory,* and shortly after the site went online, ASLAPR added an Arizona State Agency Publications collection.

Pearce-Moses served as president of the Society of American Archivists (SAA) in 2005-2006. With support from the NHPRC and Arizona State Library and Archives, the Society of American Archivists published *A Glossary of Archival and Records Terminology*, compiled and edited by Richard Pearce-Moses, an out-growth of his earlier work on the "Arizona Electronic Records Thesaurus." The New Skills for a Digital Era Colloquium – initiated by Pearce-Moses and sponsored by the U.S. National Archives and Records Administration, Society of American Archivists, and Arizona State, Library, Archives and Public Records – was held on May 31 - June 2, 2006 in Washington, DC.

On April 18, 2007, the Arizona State Library, Archives, and Public Records began using Archive-It to crawl content from the websites of Arizona state government agencies, boards, and commissions.

Arkansas

In 1999, the Arkansas state legislature passed Act no. 718: *The Electronic Records and Signatures Act*, to promote electronic government and commerce.[351] In 1999 the legislature also passed Act no. 1060, creating an Electronic Records Study Commission to explore public access to electronic records under the Freedom of Information Act, and to develop recommendations on how to amend FOIA to better serve the public. The outcome and findings of this commission are unknown, although in 2009 the state legislature passed Act no. 1477 to establish the Arkansas Electronic Records Study Commission to address the issue of bulk commercial access under FOIA. In 2011 the state legislature passed Act no. 742 to mandate reporting in electronic form by most large institutional bodies including state agencies, constitutional offices, the General Assembly and its committees, and state supported institutions of higher education. Other relevant state legislative actions include passage of Act no. 1203 of 1999, which funded the development of a statewide GIS framework and study of Arkansas spatial data infrastructure; and Acts no. 519 and 264 of 2005, amending and expanding earlier GIS legislation.[352]

The Arkansas State Library collects publications from state agencies in its role as the legislatively mandated, official state document depository and clearinghouse. In 2003, the State Library began a subscription to the OCLC Digital Archive, which provided a way to catalog,

harvest, ingest, store and preserve publications for immediate and long term access. As of February 2006, the Arkansas Digital Archive contained more than 1,500 state publications. The current state digital archive uses CONTENTdm. Also in 2006, the Arkansas History Commission was awarded an NHPRC grant to re-activate their State Historical Records Advisory Board.[353]

California

On September 18, 2000, California Governor Gray Davis signed Senate Bill 2067 (Chapter 569, Statutes of 2000), which amended existing Government Code section 12168.7. The purpose of the bill is to provide uniform statewide standards for storing permanent and nonpermanent documents in electronic media.[354] In June 2003, the State Library of California partnered with the Metropolitan Cooperative Library System (MCLS) in Pasadena to submit a successful proposal for Library Services and Technology Act funding to conduct a project on "Ensuring Access to California Digital Government Documents." The project held a conference on March 24-25, 2004, and generated "Managing and Sustaining a State Government Publications Program in California: A Report on the Existing Situation and Recommendations for Action" on August 30, 2004, authored by Judith Cobb and Gayle Palmer of OCLC. In 2005, the California State Library subscribed to the OCLC Digital Archive and worked with several of the California state depository libraries to set a cooperative system for selection, capture, description and permanent archiving of state publications, using the OCLC Digital Archive Tools.[355] In 2006, the California State Archives was awarded an NHPRC grant for $220,918 to develop the hardware and software infrastructure to preserve the state's geospatial records created by the California Spatial Information Library, in collaboration with the San Diego Supercomputer Center.

Colorado

The Colorado State Publications Library was established by the State Assembly in 1980 as part of the Colorado State Library in the Colorado Department of Education, and is charged with providing permanent public access to state documents, including born digital state publications, via digital formats.[356] This requirement is listed in Colorado state law 24-90-204(b), which states, "in the case of any publication produced in electronic form, including those made available through a public telecommunications network, an electronic copy or notification of the publication of such electronic copy shall be deposited with the center in a form specified by the center."

In 1997, the Colorado Historical Records Advisory Board (CHRAB) published a *Local and State Government Records Program Assessment*, based upon a survey of over 300 Colorado record clerks, officers, managers and archivists.[357] The findings of the survey indicated the need for more education and outreach in the area of electronic records management, in particular. This work was funded by a $50,800, 2-year project grant from NHPRC, to evaluate progress from a prior 1982 state assessment report (97-028). The 2001 strategic plan, *Ensuring the Documentary Heritage of the Centennial State: 2001-2006*, emphasized the need for information gathering, relationship-building, and education as its major goals regarding management of electronic information.[358]

District of Columbia

The Office of Public Records Management, Archival Administration, and Library of Government Information was established in 1985 by DC Law 6-19 to collect, preserve, conserve,

and service the official records of the District of Columbia government.

In 2003 the District of Columbia Government, Office of Public Records received a grant of $5,000 from the NHPRC in partial support of the District Board's work.

The Office of the Chief Technology Officer (OCTO) is the central technology organization of the District of Columbia Government. The District of Columbia Geographic Information System (DC GIS) is coordinated by the Office of the Chief Technology Officer (OCTO) and provides District agencies and the public a "one-stop shop" for geospatial data and enterprise applications. In February 2002, the District of Columbia GIS Steering Committee (GISSC) was created by *"Mayors Order 2002-27*.**"** The GISSC was established to optimize the development and promote effective usage of the District of Columbia Geographic Information System (DC GIS), and assist the Office of Chief Technology Officer (OCTO) in establishing and enforcing standards, policies, procedures, and protocols for the DC GIS.

In May 2005, OCTO GIS Manager developed the "*Strategic Plan for the DC GIS Office of Chief Technology Officer, FY 2005-2006*." It described GISSC's responsibilities, which included, among other things, working with DC agencies to establish responsibilities for specific GIS tasks, including maintaining essential data.

Florida

The Florida Historical Records Advisory Board received a 1989 grant from the NHPRC for $51,656 to study the issues surrounding information technology and the state's public records. In 1995, Florida International University Libraries began identifying and selecting state government assets for online access and/or digital preservation through an initiative called the Everglades Digital Library.

For several years in the early 2000s the Florida State Library hosted an eDocs program, which sought to discover State publications that are born digital and provides long term storage and public access to them.

In January 2006, the State Library and Archives of Florida established Florida Memory, which provides access to digitized materials.

In 2006, Section 257.05, Florida Statutes were amended to require all state agencies to provide the State Library and Archives with a list of all public documents produced, including electronic documents, by December 31 of each year. This inventory list was intended to enhance the State Library's depository and electronic document programs by providing a resource list of the public documents that would be part of the Florida Public Documents Program.

Georgia

The Georgia Government Publications database GALILEO (GeorgiA LIbrary LEarning Online) was developed in 1996[359] to provide full-text access to state publications from 1994-present. Since 2000 the University of Georgia Libraries, the official depository for Georgia government publications, has been collecting documents in electronic format from Georgia state agencies.

In 2003, Georgia Division of Archives and History received 17-month grant of $40,625 from the NHPRC to work with Southern Polytechnic University (SPSU), the Board of Regents of the University of Georgia, the Society of Georgia Archivists, the Georgia Records Association, and the Georgia State Historical Records Advisory Board to hire consultants to conduct a series of half-day training presentations on privacy/access issues and e-government, and to convene a working group to produce a white paper.

The Georgia Archives received an 18-month grant in 2005 from the NHPRC ($187,581) called "Preserving Georgia's Historical Data" for the migration of data from the Board of Pardons and Paroles' Executive Clemency Online Application and Verification System (ECOAVS) to serve as a lifecycle management model for the state.

In early 2007,[360] the State of Georgia Archives ran a test using Microsoft SharePoint Server 2007 for performing records management and archival tasks.

Idaho

In May 1998 the Idaho Department of Administration formed a Records Management Plan Task Force, charged with developing a records management policy, statute and plan for the state. Idaho Code Section 67-5752 gives the Director of the Department of Administration the responsibility of developing a statewide records management program. The resulting records management guide[361] includes information on electronic records retention and management.

In 2005, the Idaho State Library partnered with Nancy Bolt and Associates to assemble a task force in the exploration of new methods to increase access to Idaho public documents, including stakeholders from: Idaho State Library, Idaho State Department of Agriculture, Idaho State University Library, Office of the Governor, Office of Performance Evaluations, Department of Public Policy and Administration at Boise State University, Idaho Public Television, University of Idaho Library, Idaho State Historical Society, Idaho Transportation Department, Boise Independent School District, and Idaho State Journal. Following a series of meetings over the next month, a list of recommendations for the Idaho State Librarian was prepared and published in June 2006 under the title "Final Report of the Idaho State Library Task Force: A Study and Recommendations on Idaho State Public Documents."[362] Among the recommendations were suggestions for changing existing laws, establishing policies and standards for public records creators, and establishing systems for the preservation and continuing access of public records online.

In January 2008, the Idaho Supreme Court launched the Data Repository Web site to provide information on the status of trial court cases in all of the state's counties.[363]

Illinois

The Electronic Documents Initiative (EDI) was developed by Andrew Bullen of the Illinois State Library and Larry Jackson of the Graduate School of Library and Information Science at the University of Illinois, Urbana/Champaign and was implemented September of 2005.[364] This included development of a metadata generator. As of 1995[365] the State Library Act (15 ILCS 320/21) assigns the library responsibility for making agency information Web accessible; and 23 Illinois Administrative Code 3020.110 sets procedures for agency compliance.

The Electronic Archives project began in October 2001 with a National Leadership Grant from the IMLS to the Illinois State Library (ISL), the State Library of Ohio, the Illinois State Archives, and the Graduate School of Library and Information Science (GSLIS) at the University of Illinois, Urbana-Champaign (UIUC). This collaboration has resulted in development and implementation of an open-source website harvesting and archival system first called Preserving Electronic Publications (PEP) and now called Capturing Electronic Publications (CEP), which used by several states. The Illinois State Library and Electronic Archives project group at GSLIS also designed and implemented the Illinois Government Information (IGI) search engine. The project began in 2000[366], and in August of 2004 the IGI implemented a new search engine based on Swish-E (Simple Web Indexing System for Humans – Enhanced) technology."[367] Illinois also participated, with OCLC and several State Libraries, in the 'Echo DEPository' projected funded by NDIIPP.

Legislation passed in January of 2003 amended the State Records Act (5 ILCS 160) by defining public agency electronic records as public property, permitting their disposal only with the approval of the State Records Commission. The Records Management Section of the Illinois State Archives is responsible for assisting state and local government agencies with the disposal of records.[368] The legislation also made the creating agency responsible for maintaining records in usable, legible, and trustworthy formats for their entire retention period.[369]

Indiana

In 1994, the Indiana Commission on Public Records received $11,000 from the NHPRC to hire a consultant to work with the Commission's staff to develop a strategic plan for electronic records activities within the state.[370]

In February of 2006, Governor Mitch Daniels created the Indiana State Historic Records Advisory Board (SHRAB), as the central advisory body for historical records planning and preservation in Indiana, working with the Commission on Public Records and repositories throughout the state.

Kansas

The Kansas Historical Society (KSHS) has been addressing electronic records issues since the mid-1990s. In 1996, with funds from the National Historical Publications and Records Commission (NHPRC), KSHS hired Margaret Hedstrom as a consultant to draft electronic records guidelines for Kansas state government. Three years later, KSHS received another grant from the NHPRC to test, revise and implement the electronic records guidelines, hiring Cal Lee as electronic records project archivist. This second project resulted in several more guidance documents, development of strong ties to the state's information technology management leadership, state IT project management certification for Matt Veatch of KSHS, formation of the Kansas Electronic Records Committee (ERC), and KSHS creating a full-time Electronic Records Archivist position.

In 2003, KSHS and the Kansas State Library developed Kansas State Publications Archival Collection (KSPACe), a system based on DSpace to manage and provide access to digital state publications and documents. KSHS, State Library, Legislative Computing Services, and Kansas

Information Technology Office (KITO) carried out a digital preservation capability assessment of KSPACe in 2005. This assessment, along with a fit analysis by the Kansas ERC against national preservation standards, highlighted numerous requirements for a more robust statewide preservation repository.

Kansas joined the Minnesota Historical Society (MHS), along with five other states, in their Response to Request for Expression of Interest to the Library of Congress for an NDIIPP state project called a "Model Technological and Social Architecture for the Preservation of State Government Digital Information" (MTSA), which was funded and announced on January 7, 2006. The Kansas legislature then appropriated $150,000 to the KSHS in 2008 to begin a digital state archives project, and the Information Network of Kansas (INK) Board awarded a further grant of $175,000 to support development of KEEP on February 5, 2009.

A major project in Kansas that laid some of the foundation for the KEEP initiative is called Kansas Legislative Information Systems Strategy (KLISS). KLISS is an effort to reengineer the state legislature's processes for drafting bills, managing legislative documents and providing public access to them. KLISS makes use of XML for encoding legislative content, is based on a variety of open-source components, and a web-based Representational state transfer (REST) architecture for transfer of data. On January 28, 2011, Kansas submitted a proposal to MHS for additional NDIIPP funding for a KEEP-to-KLISS connector, and to evaluate a National Conference of Commissioners on Uniform State Laws (NCCUSL) model law related to authenticating legal documents. The grant was awarded on April 22, 2011.

Several changes to Kansas state law and policy have also laid important foundation and impetus for KEEP. In 1998, Kansas enacted Senate Bill 5 (SB5), establishing the Information Technology Executive Council (ITEC) to be responsible for information technology resource policies and procedures, project management methodologies, an information technology architecture, data management standards, and a strategic information technology management plan. In 2000, Kansas "Information Technology Policy 2400 Revision 2 - Project Approval" went into effect, requiring the branch CITO and head of a government entity to review and approve an IT Project Plan prior to starting a project with a cumulative cost of $250,000 or more, and review and approve all specifications for competitive acquisitions in such IT projects. The Kansas Legislature passed Senate Bill 380 and Senate Bill 605 in 2000, allowing state agencies to publish reports or publications to their web sites and retain electronic copies, rather than distributing and retaining paper copies. Finally, on March 1, 2010, the governor of Kansas approved House Bill 2195 (An act concerning state records; relating to maintenance and certification of electronic records), which authorized the State Archivist to develop standards for preserving and maintaining the authenticity of electronic government records and to certify records as being compliant with the standards. On April 22, 2010, the Kansas Information Technology Project Planning Guidelines, included a new provision requiring government units to transfer funds to KSHS to support the ingest of records with retention periods of ten or more years into KEEP.

Kentucky
Since 1958, the Kentucky Department for Libraries and Archives has been the state's central repository for records of continuing value and has been responsible for housing, preserving and making them available for research. In 1985, the KDLA received $143,869 from the NHPRC to develop an archives and records management program for machine-readable records in state government.

The Kentucky State Archives and Records Commission's Electronic Records Working Group (ERWG) was formed in 2002 and included representatives from the KDLA, the Governor's Office for Technology, and the Offices of the Attorney General and Auditor of Public Accounts. The focus of the ERWG was developing policies, guidelines, and recommendations for addressing electronic records issues.

In 2003, the Public Records Division (PRD) of the KDLA began collecting state agency publications and the minutes of state-level boards, commissions and legislative committees from 1996 to the current date in electronic form.

Kentucky was a participant in the NHPRC-funded ($242,500) Persistent Archives Testbed (PAT) project from 2003 to 2006 in collaboration with the San Diego Supercomputer Center, testing the persistent archives' ability to perform archival functions from appraisal to access using data grid technology.

The KDLA has been working with the Kentucky Division of Geographic Information (DGI) and its predecessor agency since 2005, including producing records retention schedules and records transfers.

KDLA created their Electronic Records Archives (E-Archives) in 2006 as a way of managing digital public records and making them available to the public.

Louisiana
In 1983, the Louisiana Historical Records Advisory Board (LHRAB) received $33,500 to analyze the current condition of historical records in the state, identify problems and frame potential solutions.[371] The 1986 final report of the LHRAB listed among its objectives that "[t]he state archives should pursue the possibility of a grant in order to implement the recommendations of the consultant's report on machine-readable records generated by state government." However, following the report and cessation of funding, LHRAB ceased to function. A newly appointed advisory board was established by Executive Order Number MJF 98-31, issued June 12, 1998, its members appointed by Governor Murphy J. Foster. A new LHRAB strategic plan (approved on October 2, 2003, and revised on July 13, 2005) included an objective to "Support the State Archives in developing an educational program designed to provide guidelines for managing records created and maintained by modern information technologies."[372] More recently, Secretary of State Jay Dardenne (elected November 2006) has encouraged initiatives to gain control of the management of machine readable records as state government continues to embrace modern information processing technology.[373]

The Louisiana State Senate has documents available online dating from 1995[374] and the Louisiana House of Representatives lists online publications from 1998 to the present[375] as well as a session history archive from 1997.[376] The Louisiana House of Representatives also makes available digitized video of all House Standing and Special Committee meetings and meetings occurring within the House Chambers, from 1999 to the present. Videos from 2003 onward are available online. Portions from 1999 to 2003 have been restored and posted online, with the rest available by request.[377]

In 1993 the U.S. Department of Education awarded Louisiana $2.4 million dollars to establish the Louisiana Library Network (LOUIS). This grant contributed to the further implementation of two separate government documents projects: the Louisiana Board of Regents awarded an LEQSF (Louisiana Education Quality Support Fund) grant to load the government document records for eleven LOUIS institutions, and Louisiana State University provided funding for their own government documents project. Eleven LOUIS universities that are government document depositories have added their government documents records to their respective catalogs. Each university has been asked to fill out a profile of the documents it owns and associated dates.

Marcive (the Louisiana Government Documents archive) is creating one cumulative union tape with records for each of these institutions. The LSU libraries have an ongoing "shipping list contract" with Marcive. This contract specifies that when any government document is shipped to LSU, the record for that item is added to a database of LSU government documents at Marcive. Marcive then ships a tape to LSU, and the tape is loaded into the LSU catalog. The LSU catalog is updated monthly through this process. The first group of government documents records included in the Marcive shipping list contract was loaded into the LSU catalog on November 1, 1995.[378]

LOUIS funds the Louisiana Digital Library, which includes the Louisiana State Documents Digital Archives collection. Louisiana law (§25:121, Public Documents Depository System, revised July 2002) requires that “state agencies submit copies of their publications to the Recorder of Documents for distribution to the 40 libraries of the Louisiana Document Depository Program.” This program preserves and assures the availability of state publications for use by the public throughout the state. Many publications are now issued only in electronic format and available only on state agency web sites, and “the primary goal of the Louisiana State Documents Digital Archives is to provide permanent electronic access to this web content.”[379]

Maine

In 1997, the Maine State Archives received an 18-month grant ($85,235) from the NHPRC to develop statewide policies and procedures for the identification and retention of permanently valuable electronic records. The Maine State Archives received a 16-month NHPRC grant ($99,624) in 2004 to collaborate with other state agencies that were creating the Maine Library of Geographic Information (GeoLibrary) to develop the Maine GeoArchives for preserving Geographic Information System (GIS) records of permanent value from both state and local agencies. In 2005, the Maine Secretary of State's Office, Archives, and State Office of Information Technology formed an E-mail Management task force to create a mechanism to retain and provide access to e-mail in conformity with Archives retention schedules. In 2006, the

NHPRC granted $32,200 to the Northern Maine Development Commission to provide workshops on electronic records preservation to local government employees in northern Maine.

Maryland

In 1999, the Maryland State Archives created an on-line resource, called *Archives of Maryland* online, to provide three levels of access to digitized historical constitutional, legal, legislative, judicial, and administrative materials: searchable copies, typeset copies, and manuscript originals. The Information Technology Fund of the State of Maryland provided initial funding for the *Archives of Maryland* online, and additional funding has come from annual appropriations and private contributions.

Minnesota

The Minnesota Historical Society (MHS) has been actively working to address electronic records issues for more than two decades. In 1990, MHS received a grant ($39,785) from the National Historical Publications and Records Commission (NHPRC) to fund a national planning conference on electronic records issues. This was followed by another grant for $10,000 from the NHPRC in 1995 for an electronic records consultancy and training project. In 1997, MHS received a two-year grant of $90,031 from the NHPRC to establish electronic records pilot programs with state agencies; MHS developed the Trustworthy Information Systems approach, worked with five state entities to apply the approach and produced the Trustworthy Information Systems Handbook. MHS received a two-year grant in 2000 of $150,546 from the NHPRC for its "Educating Archivists and Their Constituencies Project" to develop workshops on the eXtensible Markup Language (XML) and metadata as they apply to archival concerns about electronic records. In 2002, MHS received a 14-month grant of $105,400 from the NHPRC to examine the NHPRC's Electronic Records Research Agenda and to recommend a new agenda. In 2005, MHS received a grant from the Institute for Museum and Library Services (IMLS) of $244,500 to collaborate with Minnesota's Land Management Information Center (now the Minnesota Geospatial Information Center) to "provide Minnesota's teachers with the knowledge, curriculum, and tools to teach the state's new graduation standards for geography and history, using online digital resources and applications." That same year, MHS, the Minnesota Office of the Revisor of Statutes (ROS), and Minnesota Legislative Reference Library (LRL) begin a three-year project with $264,887 from the NHPRC called "Preserving the Records of the E-Legislature" to explore and test the technologies available to preserve the electronic records of the Minnesota legislature (technological guidance and services were provided by the San Diego Supercomputer Center; California State Archives, State Library, and Legislative Counsel also provided input and considered applicability of the project's product to the California context). In September 2006, the Bush Foundation awarded MHS a three-year grant of approximately $1 million to develop an infrastructure to manage, preserve, and provide access to digital content. In 2007, MHS also received a two-year grant from the National Endowment for the Humanities (NEH) to participate in the National Digital Newspaper Program (NDNP). In 2007, MHS tested use of Internet Archive's Archive-It service to capture web pages of the Minnesota Legislature including the Office of Revisor of Statutes pages containing the Statutes, Laws, and Rules.

MHS has played a leadership role in a variety of other activities throughout the state of Minnesota that bear on the long-term management of digital assets. In May 2000, MHS began a collaboration with the META Group to investigate the role of metadata in the state's enterprise

architecture. In August of that year, Minnesota's Recordkeeping Metadata Study Committee was formed at the recommendation of the Data Issues Group for Information Technology and the Minnesota Government Records and Information Network (MN GRIN), issuing its final report in December 2000. In February 2001, the Recordkeeping Metadata Development Committee (RMDC) was established, based on the recommendation of the Recordkeeping Metadata Study Committee, led by MHS staff. The standard was adopted in 2002. On June 12, 2000, shortly after the state's adoption of the Uniform Electronic Transactions Act (UETA), the Office of the Secretary of State and MHS sponsored a workshop on UETA at the Minnesota History Center. Bob Horton from MHS served on the state's Electronic Real Estate Recording Task force from its founding in 2001 through 2011, when Shawn Rounds assumed the role of State Archivist. MHS has played a key role in the formation and development of the Minnesota Digital Library, which was initiated in 2001. For several years, MHS staff have also actively participated in the ongoing development of and updates to the Minnesota state government's Enterprise Information Architecture.

Beyond the state of Minnesota, MHS has engaged in numerous partnerships and collaborations. This has included the two-year PERM (Preserving the Electronic Records Stored in a RMA) Project, funded ($160,590) by the NHPRC, which began in 2002. PERM included MHS as a partner with the State Archives of Michigan and San Diego Supercomputer Center (SDSC). The two-year project funded by the NHPRC ($242,500) in 2004 called "Persistent Archive Testbed" - involving the SDSC, Michigan Historical Center, MHS, Kentucky Department for Libraries and Archives, and Ohio Historical Society - tested SDSC's data grid and persistent archives technologies using a variety of archival collections.

MHS worked with the legislature because of the development and adoption of their XML bill drafting system and wanted to work with a branch of government that was producing a valuable set of records. Past project experience demonstrated that XML could be used to as a tool to help share information, content, and services. In 2005, the MHS, Minnesota Office of the Revisor of Statutes (ROS), and Minnesota Legislative Reference Library (LRL) began a three-year project with $264,887 from the NHPRC called "Preserving the Records of the E-Legislature" to explore and test the technologies available to preserve the electronic records of the Minnesota legislature (technological guidance and services provided by the San Diego Supercomputer Center; California State Archives, State Library, and Legislative Counsel also provided input and considered applicability of the project's product to the California context). In March 2006, the MROS staff carried out an analysis of XTEND using the TIS Handbook. This project set the stage for the business case for preserving and providing better access to Minnesota's legislative records.

Mississippi

In 1997, the Mississippi Department of Archives and History received a two-year grant of $171,887 from the NHPRC to establish an electronic records program in conjunction with the planned design of and move to a new state archives building.[380]

Mississippi has made several collections available through the website of the Mississippi Department of Archives and History.[381] While many are digitized collections, the collection called "Governor's Office: Administration of Ronnie Musgrove (1993-2004)" consists of email

correspondence between Governor Musgrove and his constituents. The Mississippi Library Commission also maintains a State Documents Online service, which provides full-text access to state publications.[382]

Missouri
In 2003, the Missouri State Archives received a two-year grant ($42,670) from the NHPRC to hire electronic records consultants to develop and conduct two presentations and seven workshops on electronic records issues – with one specifically focused on the Trustworthy Information Systems manual developed by the Minnesota Historical Society.

In July 2003, a team of professional librarians and paraprofessionals from the Reference Services Division of the Missouri State Library began work in earnest to develop the State Publications Access Program, which focused on implementing a central repository of state publications. The repository was established using OCLC's Digital Archive product. Legislation was drafted, introduced and passed during the 2004 legislative session to revise the statute covering the state publications program. This revision moved the program from a depository system to an electronic repository system.

Montana
In May 2005, the Montana State Library began a one-year pilot test of the OCLC Digital Archive for the acquisition and preservation of digital state publications.

That same year, the Secretary of State's Office received funding from the NHPRC ($30,005) for the one-year "Montana Electronic Records Project" to hire a consultant to survey the electronic records created by state agencies and develop a strategic plan for their creation, management, and preservation.

On April 2, 2007 Governor Brian Schweitzer signed a new law that revised the definition of state publications to more clearly include electronic documents, which sparked a variety of activities by the Montana State Library.

Nebraska
The Nebraska State Historical Records Advisory Board (SHRAB) published *Insuring Nebraska's Documentary Heritage: A Strategic Plan* in 1996, which identified issues associated with the growing presence of alternative formats for government records, but made no concrete recommendations about electronic records.[383] Some of this work was supported by an NHPRC grant for $13,739.[384]

Much of the action taken toward the management of electronic records in the Nebraska State Government grew from the passage of the Records Management Act (Nebraska Revised Statute 84-1214) in 1997.[385] This established that the State Archives of the Nebraska State Historical Society has the authority to acquire, in total or in part, any document, record, or material which has been submitted to the board for disposition or transfer when such material is determined to be of archival or historical significance by the State Archivist or the board.

The 1997 Records Management Act also invested the office of the Secretary of State with new powers, as the State Records Administrator and the head of the Nebraska State Records Board, overseeing and manages electronic access to and preservation of state government information, and assisting in the development of policies and procedures for state and local government records management and retention. Also in 1997, the State Records Board was given authority by the Nebraska State Legislature to create an online state government portal to provide electronic access to state services and information.[386] The State Government Publications Online website was also launched in 1997 to digitize and post key agency publications on the Commission web site.[387] That same year the Nebraska Library Commission published "Nebraska Laws Pertaining to Libraries and Library Operations" to summarize the effects of new statutes on state library operations.

In 1999, the State Records Board[388] began to award grants (funded through a portion of government portal user fees) to fund projects which enhanced access to public state government records. In 2005, to provide stable access for users, State Government Publications Online began downloading key publications from agency sites and linking to the downloaded versions.

In 2006, the Nebraska SHRAB released its second major strategic plan, *Preserving Our Past, Insuring Our History for the Future.*[389] This document highlighted the explosion of electronic records and information, and drafted a list of recommendations for action, including providing workshops to raise awareness, creating a state-wide plan to manage electronic content, and close work with the Nebraska Secretary of State to develop policies for local entities and state agencies.

In December of 2006, Salvador Barragan (then Curator of Government Records) presented "Public Records in the Digital Age" at the *Nebraska Digital Government Summit*, outlining the model provided by the Washington State Digital Archives as a viable method of preserving state government digital content.[390]

Nevada

An important step in Nevada's movement to address the management of electronic records came 1997 with the publication of *Preserving Nevada's Documentary Heritage: A Strategic Plan, 1997-2005,*[391] funded by a $55,993 two-year NHPRC grant. The report noted the problems posed to state retention schedules by electronic records. It also advocated of educational opportunities for records managers and encouraged coordination of resources and activity among state institutions and agencies, not only to preserve the information that has already been created, but also to proactively prepare for the growing body of electronic records that had not yet been created. This sentiment was reiterated in the strategic plan produced by this body in 2007, *Preserving Nevada's Documentary Heritage: A Strategic Plan, 2007-2011*,[392] which lists preservation of digital information among its top priorities for the next phase of the strategic plan.

In 2001 the Nevada Electronic Records Committee was established as a subcommittee of the State Records Committee. The Electronic Records Committee (ERC) "develops government-wide records management policies, standards and applicable guidelines for the creation, maintenance, long-term preservation of and access to electronic records created by Nevada state

government" (NRS 378.255 (1)). Since its creation, it has generated instructional documents for government offices on managing electronic information, including publications on developing agency email policies, the legal requirements for public electronic records, the lifecycle management of electronic records, and standards for sealing records and providing storage for optical digital formats.[393]

In 2005-2006, Daphne DeLeon of the Nevada State Library and Archives received an NHPRC research fellowship for work she conducted while at the New Mexico State Records Center and Archives to create an XML data model for common government records based on the Global Judicial XML Data Model.[394]

New Mexico

In 1997, the New Mexico Department of Transportation purchased FileNet as part of their Electronic Document Management System. This system was tailored and enhanced to allow staff to identify, describe, and preserve records. Metadata fields defined for the document were required to be completed before the record was accepted into the image repository.

In 1999, New Mexico's State Library implemented a Government Information Locator Service. This system was a search engine that allowed the public to search state agency websites to locate New Mexico government information. It also referred the public to the State Library Reference Desk and Ask-a-Librarian form if they did not find their information using the search engine. The state Library spent three years working with and educating state agencies to include correct metadata on state Web pages and online publications to ensure successful searches.

The New Mexico State Library developed their Digital Documents Program in 2003 when they began using OCLC's Digital Archive product to harvest, ingest and permanently digitally archive online state agency publications. An electronic document collection development policy was created with input from the 24 state depository libraries and the State Archives. These digitally archived state publications are accessible in their entirety through the state libraries and all of the state depository libraries' online catalogs in a variety of file formats. Agencies could file their publications by sending a URL to the state library's Documents Program or by sending an electronic document file to a designated state documents e-mail address. In the cases of filed, non-Web based electronic publications, the state library posted the documents on their intranet in order to digitally archive them before adding them to their online catalog.

In 2005 the New Mexico State Library engaged in outreach on the need for preservation of local government information, working with the 24 state depository libraries, which included 6 academic libraries. The NMSL held a workshop for training on the OCLC digital archive tool to harvest, ingest and preserve local government information.

As part of the State Library's Digital Archive Project, the New Mexico State Library began working with three other agencies in 2005 to identify their digital information that was not already web-based but that could be digitally ingested, archived and made accessible through the library's catalog. Information included images from an exhibit from the Museum of New Mexico, maps and surveys from the State Engineer's Office, documents from the Department of Agriculture and maps from the NM History Library.

Around 2006-2007, the New Mexico State Records Center and Archives (SRCA), along with the New Mexico Taxation and Revenue (TRD) and the New Mexico Human Services Department (HSD), became involved in a project to create an infrastructure for record creators to manage and preserve electronic government records. The goal of the Electronic Document Management System (EDMS) project was to implement an EDMS that leveraged existing experience in records management, document management storage systems, software, and processes within the SRCA, TRD and HSD. The project scope included the development of an enterprise model of best practices, processes and cost effective-technologies to manage and integrate documents. The model was designed to be extensible to all state agencies that might need imaging and document/content management services.

New York[395]

A report in 1984 about the conditions of historical records and archives in New York raised concerns about electronic records.[396] The New York State Archives and Governor's Office of Management and Productivity (MAP) initiated the Special Media Records Project in 1985, which lasted for two years. The project inventoried machine-readable records in several state agencies, conducted appraisals and issued a report. In 1987, records management functions were moved into the state archives, making it the State Archives and Records Administration (SARA), which produced a "Strategic Plan for Management and Preservation of Electronic Records in New York State Government" in 1988.

In 1989, the New York State Forum for Information Resource Management received $31,743 from the NHPRC to inventory automated databases and selected manual files in eight New York State agencies, to produce an automated database in the USMARC format and a sourcebook of information describing the databases and files, and to evaluate information management and policy issues. SARA established a Center for Electronic Records (CER) in 1990 and then, to provide guidance and assistance to local governments, an Information Technology Unit in 1992. The activities of the CER were bolstered by a grant of $185,398 from the NHPRC in 1992 to analyze information management practices in New York State agencies and investigate policies, procedures, and tools to support electronic records management and archival objectives (known as the "Building Partnerships" project).

The Center for Technology in Government (CTG) and State University of New York (SUNY) at Albany have also engaged in important electronic records projects. In 1994, the Research Foundation of SUNY-Albany received a two-year grant from the NHPRC ($132,027) to explore archival and records management issues related to two electronic recordkeeping systems – one for official policies and the other for human resource transactions - that were being developed for SUNY. The Research Foundation received $140,000 from NHPRC in 1996 for a two-year project to develop a system development model for incorporating recordkeeping considerations into the creation of applications. The NHPRC supported the Research Foundation to work with the New York State Archives on another two-year project ($381,332) called "Gateways to the Past, Present, and Future" to develop guidelines to support and promote long-term preservation of and access to public electronic records of value to secondary users. In 1996, with support from the NHPRC, the Society of American Archivists published a case study called "Prison Inmate Records in New York State: The Challenge of Modern Government Case Records" by Thomas D. Norris.

On September 28, 2004, New York State Governor George Pataki signed legislation that made permanent the funding for the Local Government Records Management Improvement Fund (LGRMIF) and the Cultural Education Fund (CEF). Under the previous law, both were scheduled to "sunset" on December 31, 2005.

North Carolina

The North Carolina State University (NCSU) Libraries have been collaborating with geospatial organizations across North Carolina since the 1990s. In 2000, NCSU Libraries began to acquire and preserve North Carolina state and local geospatial data.

The Access to State Government Information Initiative (ASGII) was established in December 2002 to research and find solutions for providing permanent public access to North Carolina state government information in all formats. The Initiative received a Statewide Leadership grant from the Institute of Museum and Library Services under the provisions of the federal Library Services and Technology Act (LSTA), as administered by the State Library of North Carolina. In 2004, the State Library of North Carolina, as part of the ASGII project, began building a repository of digital state publications.

In the summer of 2004 the North Carolina State Archives participated in a pilot project with Information Technology Systems (ITS) regarding the management of electronic records. Archives and Records, working with ITS, tested the management and preservation of electronic records using Documentum.

In 2004-2005, an NHPRC fellowship awarded to Druscilla Simpson of the North Carolina State Archives provided the genesis for an electronic mail preservation solution. Fellowship funds were used to develop a software application to capture electronic mail and transform it from its native format into an XML "preservation copy," and to push the XML out to HTML for access and viewing purposes.

From 2004 to 200s, the State Library of North Carolina and State Archives of North Carolina engaged in various activities to capture websites. This included testing the OCLC's Web Archives Workbench (as part of the NDIIPP-funded ECHO DEPository project),[397] Capturing E-Publications (CEP),[398] and the Archive-It service of the Internet Archives.[399] North Carolina served as one of the initial pilot participants in Archive-It in September-November 2005. Two important products of these activities have been the *North Carolina State Government Web Site Archives*[400] and a variety of associated guidance documents.[401]

The North Carolina Department of Cultural Resources formed the ArcLib Taskforce in November 2004 to address the issues of collecting, storing, and preserving digital state information (publications and public records) for permanent public access. The taskforce was made up of six staff from the State Library and State Archives. In 2005, they drafted the Digital Preservation Policy Framework to support a digital preservation program in state government. The framework formalized DCR's commitment to the permanent preservation of digital state government assets produced by the State of North Carolina. It was built upon two legislative mandates that require the State Library and State Archives to collect publications and records,

respectively. The framework identified the scope of information to be included in a state government preservation program, the principles on which a digital preservation would be built, the roles and responsibilities of different interested parties, and access to information in the preservation program.

The North Carolina Geospatial Data Archiving Project (NCGDAP), which ran from October 2004 to February 2010, was one of NDIIPP's initial grant projects and acted as a catalyst for discussion about the issues surrounding the preservation of state and local government geospatial content. One of the outcomes of NCGDAP was better communication with data producers about the value of preserving at-risk geospatial data.

In 2007 the North Carolina Department of Cultural Resources received a grant of $102,248 from the NHPRC to support a two-year effort, the Preservation of Electronic Mail Collaboration Initiative. The North Carolina State Archives, the Kentucky Department of Library and Archives, and the Pennsylvania State Archives worked in collaboration to test the e-mail preservation software in real time on a larger scale. They identified high level offices that produce archival correspondence and have high public interest within each participating state, such as the Governor's office or Secretary of State's office.

North Dakota

In March 1997, the Information Services Division of North Dakota formed an ad hoc committee, with representatives from 34 state agencies, to address the issues related to the management of electronic records. The goal of the Electronic Records Committee was "to draft guidelines for state agencies and county, city, and park district offices to use in the management of electronic records." The Electronic Records Committee consists of representatives from thirty-four state agencies. These guidelines are the collective outcome from many other organizations' products, including National Archives and Records Administration, State Historical Society of Wisconsin, Delaware Public Archives, Florida Department of State, Utah State Archives, and the Archives Office of Tasmania.

In September 1998, the North Dakota Legislative Council staff for the Information Technology Committee prepared and issued a document to clarify the role of electronically produced information as records. This legislative memo declared that records are not format dependent, but are instead "recorded information [...] in the possession or custody of a public entity or its agent and which has been received or prepared for use in connection with public business or contains information relating to public business" (Section 44-04-17.1).[402]

In 2006, The North Dakota State Historical Records Advisory Board published "Keeping History: Recommended Practices for North Dakota Historical Records Repositories."[403] Produced with NHPRC funding,[404] this document contains a section devoted to "Managing Electronic Records," and refers to established policies and practices for working with digital content. An updated version of North Dakota's "Electronic Records Management Guidelines," effective 2010, is available through the website of the Information Technology Department.[405]

Additionally, North Dakota has been very active in the management of Geographic Information Systems (GIS).[406] GIS was first implemented in 2000 through collaboration between the

Information Technology Department and GIS Technical Committee, with technological support provided by the Convergent Group from Denver, Colorado.[407] The North Dakota GIS website was introduced in 2002 as a portal to North Dakota geospatial data and information.[408]

Oregon

Oregon offers access to state, legislative, and governor's records through the website of the Oregon State Archives, under the Oregon Secretary of State. Working with the State Archives and Department of Administrative Services Information Resource Management Division, the Oregon State Library submitted HB 2118 to the 2005 legislative assembly. This law, requiring all agencies to provide the State Library with electronic copies of their depository publications, was signed by Governor Ted Kulongoski on May 13, 2005.[409] It resulted in the creation, in July 2006, of the Oregon State Electronic Document Repository.

Planning began for an Oregon GIS clearinghouse in 2004, though its exact online introduction date is unknown. The Geospatial Enterprise Office (GEO) coordinates with government agencies to develop and manage geographic information.[410] It communicates about Geographic Information Systems (GIS) issues with users, in addition to guiding development of Oregon's GIS data standards and serving as the state's point of contact for other organizations about geographic information and GIS. The GEO includes the Oregon Geospatial Data Clearinghouse (OGDC), which "is responsible for the Digital Spatial Data Library, and is a component member of the U.S. Census Bureau's State Data Center."

On May 29, 2007 the State CIO Council endorsed the Electronic Records Management System Community of Practice (ERMS CoP). This Community of Practice met through December 31, 2007. The work group was a collaborative undertaking between the Oregon State Archives (Secretary of State), and Information Technology Investment and Planning Section (Department of Service Administration). With the State Archivist serving as Chairperson of the work group, its goals included establishing a shared base of knowledge for future electronic records management systems across state agencies to avoid the formerly disparate use of proprietary records management systems.[411] The resulting products of this collaboration include Guidelines for Managing Electronic Records[412] and an ERMS Glossary of terms.

South Carolina

In 1996, the South Carolina Department of Archives and History received a grant of $21,700 from the NHPRC for a one-year project to plan and develop a state information locator system. The South Carolina Department of Archives and History received another two-year ($37,435) NHPRC grant in 2001 for its Electronic Records Training and Awareness Program to develop and conduct six workshops on electronic records issues. The NHPRC also funded a three-year grant ($162,315) to the South Carolina Department of Archives and History to move the Department's electronic records program from policy guidance to direct involvement with state agencies. It drew on the Trustworthy Information Systems manual developed by the Minnesota Historical Society and the Electronic Records Management guidelines developed by the Kansas State Historical Society. As part of an NHPRC-supported electronic records program development project, the Archives completed work on electronic records management guidelines for South Carolina state and local government in Spring 2005.

In January 2005 the South Carolina State Library sought legislators to write and sponsor a bill to amend Title 60-2 of the South Carolina Code of Laws to include electronic formats of publications in the list of publications collected by the State Library for inclusion in the State Documents Depository Program. The legislation passed and became law upon the signature of Governor Mark Sanford on March 22, 2005. The change in legislation allowed the State Library to collect agency publications that had been published in electronic format, and subsequent improvements to the Library's server capacity allowed them to catalog and save the publications to their servers.

Tennessee

In 2007-2008, the Records Management Division, together with the State Library & Archives, Office for Information Resources (OIR), and the Attorney General's office collaborated to create the eRecords Committee, which produced electronic records guidelines for the state of Tennessee. The Public Records Commission approved these guidelines in November 2008.[413] These guidelines provide agencies of the Tennessee government with retention schedules linked to recommended electronic media formats; technical standards to enable state-wide compatibility, authenticity, and security in electronic records; procedures for data migration; and assistance in implementing integrated life cycle records management from creation to retention and disposition.

Texas

On September 1, 2005, Texas Government Code, Chapter 441.102 established the Texas Records and Information Locator (TRAIL) program at the Texas State Library and Archives Commission "to allow electronic access, including access through the Internet, at the Texas State Library and other depository libraries to state publications that have been made available to the public through the Internet by or on behalf of a state agency."

In 2008, the University of North Texas, Denton received a grant of $300,337 from the NHPRC to support MetaArchive: A Sustainable Digital Preservation Service for Cultural and Historical Records.

Utah

The Utah State Archives first established electronic recordkeeping policies in 1998, but no active collection of electronic records took place at that time due to the cost of storage and the willingness of agencies to participate in transferring these records.

The Utah Government Information Locator Service (gilsUtah) was a project of the Utah State Library in cooperation with other Utah state agencies, 1999-2005, to develop standards, provides tools, and train agencies to make Utah government information more accessible and easier to retrieve. The project resulted in the creation and operation of an enterprise search engine UtahGov Search,[414] the gilsUtah metadata schema, controlled vocabularies, a client-side and a Web accessible metadata generators, and training for state agencies. The gilsUtah schema has been replaced by the use of Dublin Core (DCMI). The project was subsumed by the State Library's digital repository initiative.

From September 2004 to 2005, the Utah State Archives participated in Capturing Electronic Publications (CEP), a project to develop software for preserving state web sites. The software was developed by the Graduate School of Library and Information Science (GSLIS) at the University of Illinois, Urbana-Champaign (UIUC) in cooperation with the Illinois State Library (ISL), the State Library of Ohio, and the Illinois State Archives, under an Institute of Museum and Library Services (IMLS) National Leadership Grant. The software was used and managed by the Utah State Archives and Records Service to crawl state web domains to periodically capture and preserve entire web sites. Participating in this project provided the Archives with the opportunity to capture important state web sites before and during a change of state administration.

Utah State Library used the Web Archives Workbench (WAW) to discover and ingest publications on state Web sites for inclusion in the state publications Digital Library. Upon the program's release in the 3rd quarter 2006, the State Library hosted the program on local servers and collected the data locally.

On March 13, 2006, the State of Utah had a new law (Utah H.B. 41) empowering the State Library to manage a Digital Library for providing permanent public access to state and local government publications and requiring state and local governments to deposit digital copies of their publications.

The State Library initiated a pilot project in the first quarter of 2006 to collect digital state publications – first trying DSpace and then using SirsiDynix Horizon Digital Library (PTFS ArchivalWare). The Utah Government Publications Online, a.k.a. the Digital Library, was developed in 2006 as an online repository for providing public access to digitally-born government publications in one location, for preserving them over time, and for providing the public with full text accessibility.

Utah's Automated Geographic Reference Center (AGRC) managed large road and parcel data collection efforts, which provided opportunities to interact and build relationships with county governments. AGRC had begun work on the implementation of a continuity of operations plan (COOP) when it was introduced to GeoMAPP.

In 2007, the Archives received $100,000 from the State Legislature to produce a business case for the management of electronic records, which was published in 2008.[415] This document was used as a template for GeoMAPP's business planning tools.

Vermont

In 1994, the Vermont State Archives received a grant of $93,660 from the NHPRC to enhance the state archives' participation in the development and implementation of a Vermont Information Strategy Plan (VISP) for the state. During the 2003-2004 legislative session, the Vermont General Assembly created a municipal land records commission to "address the significant long-term and systemic managerial issues associated with public records," including whether such records should be stored and available in an electronic format. This study, paired with a Vermont court case in which the storage and delivery of public records in electronic formats paid a central role, led to the passage of Act 158 by the General Assembly in 2004. Act

158 included provisions for the completion of a "Legislative Council Staff Report on Public Records, Privacy, and Electronic Access in Vermont"[416] and a related Act 155 further dealt with the redaction of personal information in electronic public records to improve and increase access

An initiative that began in 2007 is "Information Strategies: Archives, Records, and Technology" (*i*START), a collaboration among the Archives, the Department of Information and Innovation (specifically with its Enterprise Project Management Office), and the Department of Buildings and General Services to adopt policies and standards-based guidelines to help agencies manage their records and information.

Washington

Demand for a digital archives in the state of Washington came in the 1990s from local and county officials who were generating born-digital records as early as 1995, and did not have the capacity to manage or preserve them locally. At the time, the State Archives also did not have the ability to preserve this content. Planning for the Washington State Digital Archives began in March 2000, with State Archivist Phil Coombs meeting with IT staffers to discuss possibilities. In January 2001, Sam Reed became Secretary of State for Washington (after serving five terms as Thurston County Auditor) and secured funding in the 2001-2003 capital budget for a $14.3-million digital archives building in Eastern Washington. In July 2001, Phil Coombs died, and F. Gerald Handfield, state archivist of Indiana, was recruited to become state archivist of Washington. On July 1, 2001, the Washington state legislature approved (to be implemented January 1, 2002) an additional dollar surcharge to the document recording fee collected by County Auditors, to fund the Eastern Archives Branch and the Washington Digital Archives building, development and operations. Site preparation began in June 2002, and construction began in January 2003 at the site in Cheney, Washington, on the campus of Eastern Washington University. In August 2003, the Washington Secretary of State published "Washington State Digital Archives Feasibility Study" and "Washington State Digital Archives Investment Plan."

In early 2004, Microsoft and Electronic Data Systems (EDS) began development of a web interface and database design. The grand opening of new archives facilities and the digital archive system developed by Microsoft and EDS (based on Microsoft SQL Server 2000 and BizTalk Server 2004, and developed using Visual Studio .NET 2003) was on October 4, 2004. The first successful ingest to the archive was in December 2004. On January 25, 2006, the state of Washington passed House Bill 2155 "to declare that the state library within the office of the secretary of state should ensure permanent public access to public state government publications, regardless of the format, and prescribe the conditions for use of state publications in depository libraries." By the time of the MSPP proposal, the Washington State Archives was actively acquiring and providing access to a substantial body of digital resources from local governments in the state of Washington (reached four million records by March 23, 2006).

Wisconsin

In June 1979, the University of Wisconsin – Madison received $34,595 from the National Historical Publications and Records Commission (NHPRC) for a project in cooperation with the State Historical Society to develop procedures to schedule, accession, and retrieve information from machine-readable records of Wisconsin state agencies. The next year, the State Historical

Society of Wisconsin received another $33,360 from the NHPRC for a second phase to develop an archival program for machine-readable public records in the state.
In 1993, Wisconsin Act 257 created the Electronic Records Program (ERP),[417] which ran until 1998. It stated that the Historical Society should do the following:

1. Assist state agencies in planning the archival management of electronic records.
2. Examine and evaluate options for the protection, preservation and accessibility of electronic records of permanent historical value.
3. Develop and periodically update procedures and a comprehensive plan for the management of electronic records of permanent historical value.
4. Submit a report and draft plan by June 30, 1995 to the governor, the Legislature, the Division of Information Technology Services and the Council on Information Technology in the Department of Administration and update the plan annually thereafter until June 30, 1998."

In 2005, the Wisconsin Historical Society, along with the Legislative Reference Bureau and the Division for Libraries, Technology, and Community Learning (State Library), explored archiving of websites related to manuscript collections using OCLC's Web Archive Workbench. The Wisconsin Digital Archive Pilot Project contracted with OCLC to use the Digital Archive to select, capture, catalog, and store digital government publications and websites.

In 2006, the Division for Libraries, Technology, and Community Learning worked with state government agencies to set standards for metatagging as well as training and consulting with agencies on metatagging web pages in order to improve access through web searching. The metadata also improved the ability of staff to catalog publications and sites for preservation.

Wyoming
As mandated by Wyoming Statute 9-2-1026.6(c), the Wyoming State Library administers a depository program for publications produced by Wyoming state government agencies. The Library actively seeks copies of such publications. State Library staff catalogs state publications for the WYLD statewide database, which is available at most libraries throughout Wyoming. This cooperative system was expanded with special supplementary funding provided by the Wyoming Legislature during 1996, and ongoing support is provided through the federal program, L.S.T.A., ongoing state funding, and local support from counties, community colleges, and school districts.

In 1999, Wyoming passed Executive Branch Electronic Mail Policy (Executive Department, Executive Order - 1999-4), which requires all executive branch agencies to treat e-mail which are transmitted as part of state business as a state record and that all state employees be trained in the policy.[418] In 2002, the state passed legislation providing procedures for the inspection and copying of public records maintained in an electronic format; limiting the release of investigative records and other records as specified; requiring public agencies to establish fees for release of public records as specified; authorizing free inspection; and providing for an effective date (WS 16-4-202).

In 2003, Wyoming State Archives (WSA) received a one-year grant ($29,830) from the NHPRC to hire a consultant to provide electronic records training for the WSA staff and help the WSA to develop a strategic plan for its electronic records program.

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[1] "Preserving our Digital Heritage: Plan for the National Digital Information Infrastructure and Preservation Program" (Washington, DC: Library of Congress, October 2002), http://www.digitalpreservation.gov/documents/ndiipp_plan.pdf.

[2] For more information about NDIIPP projects and activities, see "Initiatives," http://www.digitalpreservation.gov/about/initiatives.html; "Preserving Our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report," (Washington, DC: Library of Congress, January 2011), http://www.digitalpreservation.gov/multimedia/documents/NDIIPP2010Report_Post.pdf.

[3] Request for Expressions of Interest: Multi-State Demonstration Projects for Preservation of State Government Digital Information. Washington, DC: Library of Congress, May 5, 2006. http://digitalpreservation.gov/partners/documents/states_rfei_final.doc

[4] PeDALS and GeoMAPP are acronyms used by the projects themselves. MTSA and MSPP are acronyms that I have introduced for purposes of this report; they are not used by the projects themselves.

[5] This table Includes District of Columbia (no territories represented); it does not reflect any participation by entities in the state in other NDIIPP projects (see: http://www.digitalpreservation.gov/partners/partners_state.html.

[6] KEEP is not one of the four state NDIIPP projects. As explained elsewhere in this report, its NDIIPP support is based on a sub-award through the MTSA project, administered by the Minnesota Historical Society. Because of KEEP's distinct goals, activities and associated technologies, I have often separated discussion of KEEP from discussion of the MTSA project.

[7] DISC was temporarily renamed COMPACT and is now the Office of Information Technology Services (OITS). The change is an outgrowth of Executive Order 11-46, http://governor.ks.gov/frontpagenews/2011/11/29/executive-order-11-46. The state has not yet adopted the OITS label in most of its web pages and documentation. For purposes of consistency and simplicity, this report often continues to use the label DISC.

[8] See Christopher A. Lee, "Move It or Lose It: Investigating Digital Curation Portability for Access to Government Information," in *Archiving 2010: Final Program and Proceedings, June 1-4, 2010, Den Haag, The Netherlands, 7-12* (Springfield, VA: Society for Imaging Science and Technology, 2010).

[9] KEEP received a second NDIIPP award March 14, 2011 for a connector between KEEP and Kansas Legislative Information Systems and Services (KLISS), evaluation of the model law from the National Conference of Commissioners on Uniform State Laws (NCCUSL), and a draft submission agreement.

[10] Events in which I have engaged in discussions with project personnel have included the Best Practices Exchange conferences in 2010 (September 29 – October 1 in Phoenix, AZ) and 2011 (October 20-22 in Lexington, KY), DigCCurr Professional Institute Winter Session (January 5-6, 2011 in Chapel Hill, NC), "An Introduction to Digital Curation for Public Records Professionals" workshop and NAGARA Annual Meeting (July 15-16, 2011 in Nashville, TN), Make it Work: Improvisations on the Stewardship of Digital Information (NDIIPP and NDSA event on July 19-21, 2011 in Washington, DC), and the Society of American Archivists Annual meeting (August 22-27, 2011 in Chicago, IL).

[11] In addition to the site visits and partner meetings discussed in the previous section, I conducted a PeDALS visit to Phoenix, AZ, on January 27-29, 2011, a KEEP visit to Topeka, KS, on February 11, 2011, a MSPP visit to Cheney, WA on April 1, 2011, and two GeoMAPP visits to Raleigh, NC on December 15, 2010 and September 20, 2011. I also participated in the MTSA final All Partners meeting in St. Paul, MN on December 5-6, 2011.

[12] Preliminary results of a study conducted through the State Electronic Records Initiative (SERI) suggest that a substantial number of states in the U.S. have not established programs or capacity to address electronic records. See http://www.statearchivists.org/seri/index.htm.

[13] See e.g., Margaret Hedstrom, "Building Record-Keeping Systems: Archivists Are Not Alone on the Wild Frontier," *Archivaria* 44 (1997), pp. 44-71.

[14] Geospatial Multistate Archive and Preservation Program (GeoMAPP), Interim report: 2007-2009, March 2010, http://www.geomapp.net/docs/GeoMAPP_InterimReport_Final.pdf, p.4.

[15] Geospatial Multistate Archive and Preservation Program, "Interim Report: 2007-2009," March 2010, p.23, http://www.geomapp.net/docs/GeoMAPP_InterimReport_Final.pdf.

[16] Geospatial Archival Business Planning: GeoMAPP Geoarchiving Business Planning Toolkit, http://www.geomapp.net/publications_categories.htm#busplan.

[17] The changes include retirements, leaves from positions and changes to job responsibilities of project personnel (including staff of vendors contracted to do project work) that have precluded them from further project participation. Note that these numbers are based on information that I have been able to infer from project documentation, state government web sites, media coverage, and interviews with project personnel; it is likely that the actual numbers are higher due to personnel changes that were not brought to my attention.
[18] "GeoMAPP Key Findings and Best Practices," December 2011, http://www.geomapp.net/docs/GeoMAPP_ProjectFindings_BestPractices20111231.pdf.
[19] All Partners Meeting, Sacramento, January 2010.
[20] See PRONOM Release Notes, http://www.nationalarchives.gov.uk/aboutapps/pronom/release-notes.xml.
[21] KEEP Policy Framework, p.23.
[22] Richard Gauthier and Stephen Pont, *Designing Systems Programs* (Engelwood Cliffs, NJ: Prentice-Hall, 1970).
[23] Herbert A. Simon, "The Architecture of Complexity," *Proceedings of the American Philosophical Society* 106 (1962): 467-82.
[24] Richard N. Langlois and Paul L. Robertson, "Networks and Innovation in a Modular System: Lessons from the Microcomputer and Stereo Component Industries," *Research Policy* 21, no. 4 (1992): 297-313; Carliss Y. Baldwin and Kim B. Clark, *Design Rules. Vol. 1: The Power of Modularity* (Cambridge, MA: MIT Press, 2000).
[25] Urs von Burg, *The Triumph of Ethernet: Technological Communities and the Battle for the LAN Standard, Innovations and Technology in the World Economy* (Stanford, CA: Stanford University Press, 2001), p.42.
[26] According to David Rosenthal, "The largest LOCKSS boxes in use in PLNs [private LOCKSS networks] have about 16 terabytes of storage" ("LOCKSS: Lots Of Copies Keep Stuff Safe," http://www.lockss.org/locksswiki/files/NIST2010.pdf).
[27] For the initial expression of the idea of separation of concerns, see Edsger W. Dijkstra, "On the role of scientific thought," in *Selected Writings on Computing: A Personal Perspective*, 60-66 (New York: Springer-Verlag, 1982).
[28] Bryan Smith, "Data Growth: Expect the Unexpected," Washington State Digital Archives, Cheney, WA, September 2010, http://www.digitalarchives.wa.gov/State/Washington/StaticContent/LoCDocuments/DeepInsideTheDigitalArchives/BryanSmith_DataGrowth.pdf.
[29] All Partners Meeting Summary, Sacramento, CA, January 20, 2010, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/AllPartnersSummary01202010.pdf.
[30] Request for Expressions of Interest: Multi-State Demonstration Projects for Preservation of State Government Digital Information. Washington, DC: Library of Congress, May 5, 2006. http://digitalpreservation.gov/partners/documents/states_rfei_final.doc
[31] Margaret Hedstrom et al, "It's About Time: Research Challenges in Digital Archiving and Long-Term Preservation: Report on a Workshop on Research Challenges in Digital Archiving: Towards a National Infrastructure for Long-Term Preservation of Digital Information," National Science Foundation and Library of Congress, 2003, p.vii.
[32] Barbara Levitt and James G. March, "Organizational Learning," *Annual Review of Sociology* 14 (1988): 319-40.
[33] Karl E. Weick, *Sensemaking in Organizations* (Thousand Oaks, CA: SAGE Publications, 1995).
[34] Wesley M. Cohen and Daniel A. Levinthal, "Absorptive Capacity: A New Perspective on Learning and Innovation," *Administrative Science Quarterly* 35, no. 1 (1990): 128-52.
[35] Andrew B. Hargadon and Yellowlees Douglas. "When Innovations Meet Institutions: Edison and the Design of the Electric Light," *Administrative Science Quarterly* 46, no. 3 (2001): 476-501.
[36] Margaret Hedstrom and John Leslie King, "Epistemic Infrastructure in the Rise of the Knowledge Economy," In *Advancing Knowledge and the Knowledge Economy*, Brian Kahin and Dominique Foray, ed, 113-134 (Cambridge, MA: MIT Press, 2006).
[37] For example, see *D-Lib Magazine* (http:// http://www.dlib.org/), What's New in Digital Preservation (http://www.dpconline.org/newsroom/whats-new), Best Practices Exchange (http://www.bpexchange.org/), the International Conference on Preservation of Digital Objects (iPRES) (http://ipres-conference.org/ipres/), and various resources from National Association of State Chief Information Officers (NASCIO) (http://www.nascio.org/).
[38] Geospatial Multistate Archive and Preservation Program, "Interim Report: 2007-2009," March 2010, p.4, http://www.geomapp.net/docs/GeoMAPP_InterimReport_Final.pdf.
[39] Stijn Hoorens, Jeff Rothenberg, Constantijn van Orange, Martijn van der Mandele, and Ruth Levitt, "Addressing the Uncertain Future of Preserving the Past: Towards a Robust Strategy for Digital Archiving and Preservation," (Santa Monica, CA: RAND Corporation, 2007), p.76.

[40] David S. H. Rosenthal, Thomas Robertson, Tom Lipkis, Vicky Reich, and Seth Morabito, "Requirements for Digital Preservation Systems: A Bottom-up Approach." *D-Lib Magazine* 11, no. 11 (2005), http://www.dlib.org/dlib/november05/rosenthal/11rosenthal.html.
[41] Matt Veatch has indicated "finding a high level sponsor" as one of the main aspects of the KEEP project that could be particularly beneficial to other states.
[42] Andrew Delano Abbott, *The System of Professions: An Essay on the Division of Expert Labor* (Chicago: University of Chicago Press, 1988), 40.
[43] Geospatial Multistate Archive and Preservation Program (GeoMAPP). (2010, March). Interim report: 2007-2009. http://www.geomapp.net/docs/GeoMAPP_InterimReport_Final.pdf
[44] http://technology.ky.gov/gis/
[45] http://www.kysu.edu/landGrant/gis/
[46] http://msl.mt.gov/welcome.asp
[47] http://nris.mt.gov/about.asp
[48] http://www.cgia.state.nc.us/Default.aspx?tabid=66
[49] http://www.archives.ncdcr.gov/about.htm
[50] http://www.lib.ncsu.edu/gis/overview.html
[51] http://www.lib.ncsu.edu/gis/services.html
[52] http://www.archives.state.ut.us/
[53] http://gis.utah.gov/agrc
[54] The Informational Partners category began in October 2009.
[55]http://www.pedalspreservation.org/Partners/az.aspx
[56] "Response to Request for Expressions of Interest – Multi-State Demonstration Projects for Preservation of State Government Digital Information," June 15, 2006.
[57] http://sco.az.gov/
[58] http://os.dc.gov/os/cwp/view,a,1207,q,522721,osNav,|31374|.asp
[59] http://octo.dc.gov/DC/OCTO/About+OCTO/Who+We+Are
[60] http://sos.georgia.gov/archives/who_are_we/default.htm
[61] http://sos.georgia.gov/archives/who_are_we/rims/default.htm
[62] https://www.cviog.uga.edu/itos/about
[63] http://www.isgs.uiuc.edu/about-isgs/about.shtml
[64] http://www.kshs.org/p/mission-and-vision/10008
[65] http://www.da.ks.gov/kito/
[66] http://da.ks.gov/kito/gis/
[67] http://www.maine.gov/sos/arc/geoarchive.html
[68] http://megis.maine.gov/aboutus.asp
[69] http://www.msa.md.gov/msa/mdmanual/25ind/html/05arcf.html
[70] http://www.dnr.state.md.us/gis/
[71] http://doit.maryland.gov/about/Pages/AboutDoIThome.aspx
[72] http://www.mnhs.org/about/
[73] http://www.mngeo.state.mn.us/
[74] http://mdah.state.ms.us/admin/about.html
[75] http://www.gis.ms.gov/Portal/
[76] http://www.its.ms.gov/
[77] http://msdis.missouri.edu/
[78] http://www.sos.mo.gov/archives/
[79] http://www.archives.nysed.gov/a/about/about_mission.shtml
[80] http://www.dhses.ny.gov/ocs/
[81] http://www.tsl.state.tx.us/
[82] http://www.tnris.org/about
[83] http://www.siac.wisc.edu/index.php?option=com_content&view=article&id=2&Itemid=28
[84] http://www.doa.state.wi.us/index.asp?locid=155
[85] http://ahc.uwyo.edu/
[86] http://ahc.uwyo.edu/about/mission.htm
[87] http://www.uwyo.edu/wygisc/about_wygisc/
[88] http://www.geomapp.net/publications_categories.htm#busplan

[89] See PRONOM Release Notes, http://www.nationalarchives.gov.uk/aboutapps/pronom/release-notes.xml.
[90] http://www.geomapp.net/docs/20091229_Usability_Test_Final_Report.pdf
[91] http://digital.ncdcr.gov
[92] A hash is a string of characters that can be used to uniquely identify the bits in a file. The hash, which is usually much smaller than the file itself, can be used for file comparisons and integrity checks.
[93] See http://sourceforge.net/projects/loc-xferutils/. I have not determined whether the GeoMAPP team used the command-line BagIt library (BIL) or instead used Bagger, which provides a graphic user interface to BIL (http://sourceforge.net/projects/loc-xferutils/files/loc-bagger/).
[94] Geospatial Multistate Archive and Preservation Program, "Interim Report: 2007-2009," March 2010, p.22, http://www.geomapp.net/docs/GeoMAPP_InterimReport_Final.pdf.
[95] http://www.geomapp.net/presentations.htm
[96] http://twitter.com/geomapp
[97] http://www.facebook.com/pages/GeoMAPP/134679913217022
[98] http://tinyurl.com/22v7u47
[99] http://www.geomapp.net/using.htm
[100] Library of Congress. *Preserving our Digital Heritage: The National Digital Information Infrastructure and Preservation Program 2010 Report*, January 2011, p.83-4, http://www.digitalpreservation.gov/documents/NDIIPP2010Report_Post.pdf.
[101] http://www.ncgicc.com/Portals/3/documents/Archival_LongTermAccess_FINAL11_08_GICC.pdf
[102] http://www.ncga.state.nc.us/sessions/2007/bills/house/pdf/h2436v9.pdf
[103] http://www.geomapp.net/docs/20091229_Usability_Test_Final_Report.pdf
[104] Alec Bethune, Butch Lazorchak, and Zsolt Nagy, "GeoMAPP: A Geospatial Multistate Archive and Preservation Partnership," *Journal of Map and Geography Libraries* 6, no.1 (2010): 45–56.
[105] Kentucky has reportedly used a different program to transfer data internally. However, all GeoMAPP partners used BagIt to transfer between states, and North Carolina used it for intra-agency data transfers.
[106] Steven P. Morris, Zsolt Nagy, and Jim Tuttle, "North Carolina Geospatial Data Archiving Project: Final Report,"North Carolina State University Libraries and North Carolina Center for Geographic Information and Analysis, July 1, 2010, http://www.digitalpreservation.gov/partners/documents/ncgdap_final_report.pdf.
[107]http://www.ilga.gov/legislation/fulltext.asp?DocName=&SessionId=76&GA=96&DocTypeId=SB&DocNum=2630&GAID=10
[108] http://larchivista.blogspot.com/2010/08/illinois-electronic-records-act.html#uds-search-results
[109] http://www.sos.ga.gov/archives/who_are_we/ghrab/preferred_practices_manual.html
[110] http://www.axaem.com
[111] http://www.records.ncdcr.gov/erecords/Using_BagIt_ver2%202_generic_final_20110414.pdf
[112] http://www.youtube.com/watch?v=14ZPtYLtUYA
[113] All videos are available from the "ncarchives" YouTube channel, http://www.youtube.com/user/ncarchives.
[114] The ten collaborating states were Arkansas, California, Illinois, Kansas, Minnesota, Mississippi, Nebraska, North Dakota, Tennessee and Vermont.
[115] Syntactica developed the 'Uploader', 'Move Tool', and 'Index Advisor' applications to demonstrate how management functions could be performed by non-programmers. These applications allow users to manipulate data sets through a web interface; files can be uploaded or moved and the search rankings of a collection can be changed. The final product made available to partners in January 2010 was created using eXist, a native- XML database, and included seventeen proof-of-concept applications. XML-native databases can improve access to and use of text-based XML encoded information by providing full-text indexing and native storage. The developed applications used various combinations of XQuery functions and reports and XForms to increase system capabilities and overall ease of use. Since these were proof-of-concept applications, full functionality was not built into all of them. Applications were accessible via the database's web interface. The following programs were used to create and develop the database: eXist (native-XML database), oXygen XML Editor, and Mozilla Firefox (browser).
[116] See "Overview of XML Schema Working Group," http://www.mnhs.org/preserve/records/legislativerecords/xml1.htm.
[117] See "Exploration of the Current Merritt Preservation Repository," Minnesota Historical Society, April 22, 2011, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/MerrittTesting2011_000.pdf
[118] See "Web Archiving," http://www.mnhs.org/preserve/records/legislativerecords/WebArchiving.htm.
[119] http://keep.ks.gov/

[120] See "Sunlight Labs Work," http://www.mnhs.org/preserve/records/legislativerecords/Sunlight.htm.
[121] See "Tessella Pilot Project," http://www.mnhs.org/preserve/records/legislativerecords/Tessella.htm.
[122] At its annual conference on July 7-13, 2011, NCCUSL approved and recommended UELMA for enactment by states. At the time of this report, it has been introduced by one state legislature: Tennessee. The text of UELMA is available at http://www.law.upenn.edu/bll/archives/ulc/apselm/UELMA_Final_2011.htm.
[123] http://www.mnhs.org/ndiipp/
[124] https://www.revisor.mn.gov/
[125] http://www.leg.state.mn.us/lrl/
[126] http://www.cdlib.org/
[127] http://www.legislativecounsel.ca.gov/portal/site/OLCInternet/
[128] htpp://www.leginfo.ca.gov
[129] http://www.sos.ca.gov/archives/
[130] http://www.library.ca.gov/
[131] http://www.ncsl.org/
[132] http://mn.opengovernment.org/
[133] http://www.texlege.com/
[134] http://sunlightlabs.com
[135] http://www.zhcomputer.com/companies_syntactica.html
[136] McCreary left Syntactica in September 2010, but he was with the company during the period when the MSTA project was engaged with Syntactica as part of the XML-native database test.
[137] http://www.digital-preservation.com
[138] http://thomsonreuters.com/
[139] http://www.ark-ives.com
[140] http://www.library.arkansas.gov
[141] http://www.ilga.gov/commission/lis/
[142] http://www.cyberdriveillinois.com/departments/archives/archives.html
[143] http://www.cyberdriveillinois.com/departments/library/
[144] http://www.da.ks.gov/kito/CITO_LEGL.htm
[145] http://www.kshs.org
[146] http://skyways.lib.ks.us/government/las/
[147] http://skyways.lib.ks.us/government/las/Pages/compserv.html
[148] http://mdah.state.ms.us
[149] http://www.lbo.ms.gov/
[150] http://nebraskalegislature.gov/divisions/clerk.php
[151] http://www.nlc.state.ne.us
[152] http://www.nebraskahistory.org
[153] http://www.statearchives.us/nebraska.htm
[154] http://www.nd.gov/itd/
[155] http://www.nd.gov/itd/about-us/history
[156] Kyle Forster became IT Manager for the North Dakota Legislative Council in March 2011.
[157] http://www.legis.nd.gov/council/
[158] http://history.nd.gov
[159] http://www.legislature.state.tn.us/joint/staff/#lis
[160] http://www.tn.gov/tsla/
[161] http://libraries.vermont.gov
[162] http://dii.vermont.gov/pm
[163] http://www.leg.state.vt.us/CouncilMain.cfm
[164] http://www.leg.state.vt.us/jfo/default.aspx
[165] http://dii.vermont.gov/DII_Divisions/CIO
[166] http://vermont-archives.org
[167] http://www.mndigital.org
[168] MDL-HathiTrust Report, 2010, p.3.
[169] http://www.mndigital.org/projects/preservation/
[170] http://www.minitex.umn.edu

[171] "A Model Technological and Social Architecture for the Preservation of State Government Digital Information: Project Proposal Summary," January 7, 2008, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/NDIIPP-MHS_Summary.doc.
[172] "Preserving State Government Digital Information: All Partners Meeting Summary, December 8, 2008," Minnesota Historical Society, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/AllPartnersMinutes_000.pdf.
[173] Medora Servin, "California's Progress," Preserving State Government Digital Information: all Partners Meeting, St. Paul, MN, December 6, 2011, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/CaliforniaUpdateDec2011.pdf
[174] See "Preserving State Government Digital Information, NDIIPP / Final All Partners Meeting Summary, Tuesday December 6 – Wednesday December 7, 2011," St. Paul, MN: Minnesota Historical Society, 2011, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/AllPartnermeetingSummary2011_000.pdf.
[175] Basecamp is a web-based project-management environment developed by 37signals.
[176] All of the resources are available at http://www.mnhs.org/preserve/records/legislativerecords/.
[177] http://www.mnhs.org/preserve/records/legislativerecords/carol/
[178] Minnesota Historical Society, NDIIPP project proposal summary, 2007, p.3, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/NDIIPP-MHS_Summary_000.
[179] Minnesota Historical Society, Minnesota Legislative History and Instructions, 2009, http://www.digitalpreservation.gov/partners/documents/mn_legislative_history_whitepaper0209.pdf.
[180] Nancy Hoffman, "Mash-Ups Using Government Data: A White Paper," January, 2009, Minnesota Historical Sociey, Preserving State Government Digital Information, p.1, http://www.mnhs.org/preserve/records/legislativerecords/docs_pdfs/DataMashups1.pdf.
[181] Hoffman, p.1-2.
[182] Hoffman, p.3.
[183] http://www.nfoic.org/2009-foi-summit
[184] http://www.sos.ne.gov/records-management/pdf/Electronic%20Records%20Guidelines.pdf
[185]http://www.ilga.gov/legislation/fulltext.asp?DocName=&SessionId=76&GA=96&DocTypeId=SB&DocNum=2630&GAID=10
[186] http://larchivista.blogspot.com/2010/08/illinois-electronic-records-act.html#uds-search-results
[187] http://www.ncsl.org/issues-research/telecommunications-information-technology/preserving-legislative-digital-records.aspx
[188] http://www.sos.ca.gov/admin/regulations/proposed/tech/electronic-docs/
[189] http://www.da.ks.gov/kito/cita/KITA.htm
[190] AN ACT concerning state records; relating to maintenance and certification of electronic records; concerning electronic court documents; amending K.S.A. 45-406, 59-2967, 59-29a19, 59-29b67 and 75-3519 and K.S.A. 2009 Supp. 38-2305, 59-2971, 59-29a08 and 59-29b71 and repealing the existing sections.
[191] http://da.ks.gov/kito/itec/Policies/ITECITPolicy2400A.pdf (emphasis in original).
[192] At the time of this report, the Kansas CITA position is vacant. The position has been effectively merged with the responsibilities of the Executive Branch CITO, though the legislation calling for a CITA (KSA 75-7204) remains in effect.
[193] http://da.ks.gov/kito/itab/erc/
[194] Specific ERC duties related to KEEP include:

- Participating in preservation planning activities and submitting digital preservation policy, standards, acceptable file formats and best practices recommendations to the State Records Board and/or the Information Technology Executive Council for consideration.
- Assisting in the development of procedures related to Kansas government electronic records retention and access for the review of Information Technology Project Plans under the authority of ITEC Guideline 2400A.
- Reviewing recommendations developed by the State Archivist for preservation processes to ensure the authenticity of Kansas government electronic records prior to submission to the State Records Board for approval.
- Reviewing annual reports from the KEEP System Operator with regard to system performance issues, adequacy of the existing information technology infrastructure for supporting the KEEP System and projected operating and capital investment costs.
- Promoting use and expansion of the KEEP System among state entities

- Promoting education and awareness of digital preservation standards and practices across all branches of government.
- Participating in the preparation and review of proposed updates to relevant sections of the Kansas Statewide Technical Architecture.
- Participating in the preparation and review of proposed additions to the Strategic Information Management (SIM) Plan.
- Collaborating with the Kansas State Historical Society to identify and develop new records series entries to propose to the State Records Board for inclusion in the General Retention and Disposition Schedule.
- Reviewing recordkeeping plans for electronic records series that have been designated by the State Records Board as requiring long-term retention.

[195] http://www.kansas.gov/about/

[196] http://da.ks.gov/kito/itec/Policies/ITECITPolicy2400A.pdf

[197] For the current members of ITEC, see http://da.ks.gov/kito/itec/Members.htm.

[198] KSHS responsibilities related to KEEP include:

- Ensuring technical viability of the KEEP System through preservation planning, administrative oversight and monitoring of the KEEP System Operator.
- Managing access to permanent Kansas electronic records and ensuring compliance with the Kansas Open Records Act (KORA), other Kansas statutes, and federal law.
- Managing access to non-permanent Kansas government electronic records that have a retention period of ten years or more and ensure compliance with the KORA, other Kansas statutes, and federal law.
- Ensuring authorized retention and disposition rules are applied to non-permanent electronic records in the KEEP System and restricting access to the records based on written authorization and certified identification protocols.
- Providing access to records and/or executing holds on stored Kansas government electronic records upon the written request of the records producer in the event of a public records request, litigation or investigation.

[199]Michaelis provides executive oversight of the KEEP System. Specific duties include:

- Signing and providing oversight for legal agreements including memorandum of understanding with record Producers, submission agreements, and third party contracts.
- Ensuring financial sustainability and oversight of the KEEP System through approval of the three (3) year IT Management and Budget Plan submitted by the KEEP System operator.

[200]Veatch is responsible for all activities related to the digital preservation function of the KSHS. Specific duties Include:

- Chairing the committee that advises the State Records Board and the Information Technology Executive Council on digital preservation issues, requirements and standards.
- Preparing recommendations for preservation processes to maintain the authenticity of electronic Kansas government records and submitting to the Electronic Records Committee (ERC) for review and endorsement, and to the State Records Board for approval.
- Certifying the authenticity of electronic government records ingested and stored in the KEEP System (scheduled to be implemented in 2012).
- Identifying and developing digital preservation standards and best practices.
- Submitting to the ERC for review and Endorsement, and to the State Records Board for approval.
- Recommending fees for records authentication and other Repository services.
- Developing digital preservation cost models to determine the long-term storage costs that agencies will pay for storage of non-permanent Kansas government electronic records with an approved retention period of ten years or longer.
- Reviewing IT Project Plans to ensure long-term preservation requirements are adequately addressed.
- Administering the KEEP System Policy Framework by monitoring external trends and developments related to digital repositories, and by revising and updating the framework as needed to conform to national and international standards and best practices.
- Ensuring compliance by state agencies in all branches of government with KEEP System digital preservation standards and requirements through the standardization of Information Package designs for specific preservation methods and file formats and the promulgation of mandatory policies, procedures, standards and metadata requirements.

[201] Propylon served as the system operator during the development phase. As of the time of this report, the plan is for KSHS to serve as the system operator for the production system. KSHS will establish a Memorandum of

Understanding with the Office of Information Technology Services (OITS, previously called DISC) to engage in infrastructure planning, secure agency connectivity, and other support.
[202] http://skyways.lib.ks.us/government/las/Pages/compserv.html
[203] http://skyways.lib.ks.us/government/las/
[204] Under the authority of the Kansas Public Records Act (K.A.A. 75-3502 through 75-3504).
[205] The State Records Board also has statutory authority to:

- Approve Executive Branch retention and disposition rules
- Approve Execute Branch recordkeeping plans for electronic records series
- Approve recommendations from the State Archivist based on national and professional standards for preservation processes for maintaining the authenticity of electronic Kansas government records.
- Issue administrative regulations that support the KEEP System

[206] The State Records Board is composed of the attorney general, state librarian, secretary of administration, secretary of the state historical society, or their designated representatives, the state archivist, and other ex officio members. See: http://kslegislature.org/li/b2011_12/statute/075_000_0000_chapter/075_035_0000_article/075_035_0002_section/075_035_0002_k/.
[207] "KEEP System Policy Framework, Version 1.0," September 2010, http://keep.ks.gov/wp-content/uploads/2010/09/KEEP_Policy_Framework_accepted_ver1.0_web.pdf.
[208] "Trustworthy Repositories Audit and Certification: Criteria and Checklist," (Chicago: Center for Research Libraries; Dublin, Ohio: OCLC Online Computer Library Center, Inc., 2007), http://www.crl.edu/PDF/trac.pdf.
[209] Implementation of the prototype KEEP system was built partially upon a system from Propylon called LRMS (Legal and Regulatory Management Systems), but the production system is built upon other software.
[210] http://keep.ks.gov/wp-content/uploads/2010/09/KEEP_Policy_Framework_accepted_ver1.0_web.pdf
[211] http://keep.ks.gov/presentations
[212] http://keep.ks.gov/newsletters
[213] "Plan Project Implementation: Kansas Enterprise Electronic Preservation (KEEP)," filing with the Kansas Information Technology Office, May 11, 2010.
[214] KSHS involvement in reviewing the ERRS did not begin until May 2010 with the revision of ITEC Guideline 2400A to require a State Archivist approval letter for all IT projects.
[215] The following individuals contributed to the testing. From DISC: Bill Kelly, Justin O'Brien, Morgan Bailey, Jim Logan, and Dan Glotzbach; from Legislative Administrative Servics: Steve Roach, Mike Baker, Tim O'Neal, Arron Frost and Travis Rose; and from KSHS: Jesse DeGarmo and Craig Dannenberg.
[216] For Chinn's testimony, see http://keep.ks.gov/wp-content/uploads/2012/01/testimony-KEEP-Joint-Committee-on-Information-Tecnology-Dec-2011.pdf.
[217] http://www.kslegislature.org/li/b2011_12/measures/hb2549/
[218] http://lam.alaska.gov/about_lam/about_lam.html
[219] For the state archives, see http://www.colorado.gov/dpa/doit/archives/, and for Colorado's NDIIPP project digital archives site, see http://www.coloradodigitalarchives.org.
[220] Colorado Department of Personnel and Administration, Colorado State Archives, http://www.colorado.gov/dpa/doit/archives/aboutus.htm.
[221] http://www.cde.state.co.us/cdelib/AboutUs.htm
[222] For the Idaho State Historical Society, see http://history.idaho.gov, and for Idaho's NDIIPP project digital archives site, see http://www.digitalarchives.idaho.gov.
[223] http://history.idaho.gov/about.html
[224] http://libraries.idaho.gov
[225] http://libraries.idaho.gov/landing/about-us
[226] For the Indiana State Archives and Libraries, see http://www.statearchives.us/indiana.htm, and for Indiana's NDIIPP project digital archives site, see http://indiana.digitalarchives.in.gov.
[227] http://www.in.gov/icpr/2347.htm
[228] http://www.in.gov/icpr/2357.htm
[229] http://www.sos.la.gov/tabid/53/Default.aspx
[230] http://www.sos.louisiana.gov/tabid/53/Default.aspx
[231] For the Montana Historical Society, see http://montanahistoricalsociety.org, and for Montana's NDIIPP project digital archives site, see http://www.montanadigitalarchives.com.
[232] http://mhs.mt.gov/finduse/aboutus.asp

[233] For the Nevada State Library and Archives, see http://nsla.nevadaculture.org, and for Nevada's NDIIPP project digital archives site, see http://nevadadigitalarchives.org.
[234] See http://nsla.nevadaculture.org. The State Library and Archives were previously part of the Nevada Department of Cultural Affairs, but they moved to the Department of Administration on October 1, 2011.
[235] For the State Library of North Carolina, see http://statelibrary.ncdcr.gov, and for North Carolina's NDIIPP project digital archives site, see http://northcarolinadigitalarchives.org.
[236] http://statelibrary.ncdcr.gov
[237] http://statelibrary.ncdcr.gov/dimp/
[238] For the Oregon State Archives, see http://arcweb.sos.state.or.us, and for Oregon's NDIIPP project digital archives site, see http://www.digitalarchives.state.or.us.
[239] http://arcweb.sos.state.or.us/about.htm
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[241] http://www.tennesseedigitalarchives.org
[242] http://tn.gov/tsla/
[243] http://www.tn.gov/tsla/aps/vc/vc-management.pdf
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[245] Jerry Handfield and Larry Cebula, "Prairie dogs and terabytes: A brief history of digital archiving in Washington," Deep in the Digital Archives Conference, September 21 –24, 2010, http://www.digitalarchives.wa.gov/State/Washington/StaticContent/LoCDocuments/DeepInsideTheDigitalArchives/LarryCebula_PrairieDogsAndTerabytes.pdf.
[246] http://www.sos.wa.gov/library/
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[248] Jerry Handfield, "Digital Power," NDIIPP Partners Meeting, Arlington, VA, July 8-10, 2008, http://www.digitalpreservation.gov/news/events/ndiipp_meetings/ndiipp08/docs/session12_handfield.ppt.
[249] Doug Ault, "Eastern's archive building is first ever to house digital documents," *The Easterner*, November 11, 2010.
[250] See Library Of Congress Partnership – Documents, http://www.digitalarchives.wa.gov/StaticContent/locdocuments.
[251] See http://legislature.idaho.gov/legislation/2008/S1321.html and http://www.legislature.idaho.gov/idstat/Title33/T33CH25SECT33-2505.htm. The repository is now called "Stacks"; see http://libraries.idaho.gov/landing/stacks.
[252] See the E-Pubs User Manual, http://www.digitalarchives.wa.gov/State/Washington/StaticContent/LoCDocuments/Manuals/EPubsUserManual.pdf
[253] The same year, the Legislature enacted and the Governor signed House Bill 09-1288, which reinforced provisions of the Executive Order.
[254] See http://data.oregon.gov/. Development of Oregon Data began in 2009 with the Socrata software as a service platform, and was released the following year with access to geospatial datasets.
[255] http://www.pedalspreservation.org/Partners/fl.aspx
[256] Flynn became dean of Columbus State University Libraries on September 12, 2011.
[257] http://www.nmcpr.state.nm.us
[258] http://www.archives.nysed.gov/a/about/
[259] Tom Ruller was formerly employed by the New York State Archives, but his PeDALS participation has been based on his affiliation with the Archives' parent unit, Office of Cultural Education. All other individuals listed in this cell are affiliated with the New York State Archives.
[260] http://www.nysl.nysed.gov/general.htm
[261] http://scdah.sc.gov/aboutus/
[262] http://www.statelibrary.sc.gov/sc-state-library-history
[263] http://www.pedalspreservation.org/Partners/wi.aspx
[264] PeDALS began using BagIt to validate transfers in the third quarter of 2009.
[265] PeDALS began using New Zealand Metadata Extractor to transform and enhance metadata in the third quarter of 2009.
[266] https://www.microsoft.com/sqlserver/en/us/get-sql-server/how-to-buy.aspx
[267] Richard Pearce-Moses, Matthew R. Guzzi, Alan S. Nelson, Abbie J. Norderhaug, and Bonita L. Weddle, "Rowing in the Same Direction - Collaboration across Disparate Organizations Panel Discussions," NDIIPP Partners Meeting, Washington, DC, June 24-26, 2009.

[268] http://www.pedalspreservation.org/Metadata/PeDALS_Core_V3.2_2010-03-10.pdf
[269] http://www.pedalspreservation.org
[270] http://sourceforge.net/projects/pedalsemailextr/
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[272] http://dlis.dos.state.fl.us/recordsmgmt/pdfs/ElectronicRecordkeepingStrategicPlan2010-2012.pdf
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[282] http://redmine.axaem.com/
[283] http://www.appx.com/assets/asp/dynamic_generator.asp?pageid=968#SupplementalLicense
[284] http://www.axaem.com/node/40
[285] http://www.digitalpreservation.gov/partners/resources/tools/index.html
[286] http://sourceforge.net/projects/loc-xferutils/
[287] See: https://secure.wikimedia.org/wikipedia/en/wiki/BagIt#Use
[288] According to Pete Watters, most PeDALS partners have used a less up-to-date configuration, based on Windows Server 2008 R2, IIS 6, Excel 2003, .NET Framework 3.5, Visual Studio 2005, SQL Server 2005, and BizTalk Server 2006 R2 without RFID components.
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[291] http://www.clamav.net/
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[293] https://www.djangoproject.com/foundation/
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[297] http://www.jboss.org/drools/
[298] http://www.jboss.org/drools/downloads
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[307] https://wiki.duraspace.org/display/FCCommReg/Fedora+Commons+Registry
[308] https://webarchive.jira.com/wiki/display/Heritrix/
[309] http://crawler.archive.org/articles/user_manual/
[310] http://hul.harvard.edu/jhove/
[311] http://sourceforge.net/projects/jhove/files/
[312] Tutorial: Using JHOVE, http://hul.harvard.edu/jhove/using.html.
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[314] http://lockss.stanford.edu
[315] http://www.apache.org/dyn/closer.cgi/lucene/java/
[316] http://md5deep.sourceforge.net/
[317] http://sourceforge.net/projects/md5deep/
[318] http://www.md5summer.org
[319] http://merritt.cdlib.org/

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[321] http://geology.usgs.gov/tools/metadata/tools/doc/mp.html
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[323] http://www.fgdc.gov/metadata/geospatial-metadata-tools
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[334] http://itunes.apple.com/us/app/open-states/id500672932
[335] See http://openstates.org/api/. OpenGovernment.org is a web site that the Sunlight Foundation has also built on top of the Open States platform, providing access to state legislative information along with associated information from news aggregation services, social media, and partner organizations (e.g. Wikipedia entries, legislator contact information from Project Vote Smart and campaign finance information from the National Institute on Money in State Politics).
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[341] http://msdn.microsoft.com/en-us/library/ms143506.aspx
[342] http://subversion.apache.org/
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[344] See http://webarchives.cdlib.org/institutions.
[345] ADPNet is still in operation as of the writing of this report.
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[349] See http://www.archive-it.org/collections/1084.
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[351] Arkansas legislative acts concerning information technology can be found at http://www.dis.arkansas.gov/policiesStandards/Pages/legislation.aspx.
[352] Act 519: An act to make an appropriation to the Arkansas Soil and Water Conservation Commission for Arkansas' automated map system, 2005, ftp://www.arkleg.state.ar.us/ACTS/2005/Public/act519.pdf; Act 264: An act to amend § 15-21-503 concerning the Arkansas State Land Information Board, 2005, ftp://www.arkleg.state.ar.us/ACTS/2005/Public/act264.pdf. For a legislation related to GIS data that occurred during the course of the state NDIIPP projects, see also Act 244: An Act Concerning the Arkansas State Land Information Board, 2009, http://www.arkleg.state.ar.us/assembly/2009/R/Acts/Act244.pdf.
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