DRAFT

E-Enterprise/Exchange Network States' Retreat
Strategic Recommendations for E-Enterprise and the Exchange Network

Discussion Draft – March 7, 2018

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E-Enterprise/Exchange Network States' Retreat - Executive Summary

A group of state representatives from AR, AZ, CO, DE, MA, NH, NM, OK, and WY held a retreat in December 2017 to reflect on state priorities for E-Enterprise and the Exchange Network (EE/EN) and recommend actions to accelerate progress. States feel that we must apply transformative thinking to how we cooperate and more clearly articulate a vision for the future of the environmental protection enterprise.

State Priority Themes

States feel that EE/EN partners and governance need greater focus in our collective and individual efforts. We should do fewer things and do them well. To that end, states identified 6 broad priority themes on which to focus our attention for maximum results:

1. Drive **Permitting** process efficiency to improve environmental outcomes and customer experience
2. Enable efficient **Compliance Assurance and Inspections** through program innovations and advanced technology
3. Maximize the use of **Microservices and Web APIs in Architectural Design**
4. Harness **Citizen Science** to enhance agencies' monitoring capabilities and decision making
5. Build an interoperable **Network of Portals** that support seamless customer interactions with environmental agencies
6. Increase opportunities for **Collaborative Design and Development** of software, procurement processes, and shared services.

State Observations on Overarching Barriers to Progress

States used a LEAN management technique called "Five Whys" to uncover state perspectives on barriers that may be limiting our efforts to institutionalize EE/EN in our organizational cultures and operations.

1. **Need Greater Clarity on our Vision for the EE/EN Technology Architecture**
   We have not adequately articulated a vision of what we are trying to build from a technology perspective. When someone asks what we're building, we cannot easily show them or explain what it means to approach system or software development in the "E-Enterprise way".

2. **Rightsizing Collaboration and Playing to Our Strengths** –Stick to the rule of "No decisions about us, without us", but allow space for progress among individual segments of partners. We should also look to streamline governance to free up resources for project management and implementation.

3. **Ownership of Systems and Shared Services** – Our default approach for developing shared services is to build and house them on EPA infrastructure. That offers a clear path to development resources, but there may be other options that remove some institutional barriers to progress.

4. **Resource Imbalances** – States do not have significant sources of dedicated funding to implement EE/EN in a coordinated and collaborative way. Most available resources target individual rather than collective problems and states must overly rely on EPA to fund enterprise development.

5. **Need to Improve Project Management Capacity and Clarify Staff Roles** – EE/EN projects need dedicated project management resources. We should consider doing fewer things and doing them better. There is also a need for greater clarity on the responsibilities and relationships among the staff and contractor resources supporting governance and projects.

6. **Mutual Accountability and Shared Decision-Making in IT** – Commitment to joint decision-making and mutual accountability is a key underpinning of E-Enterprise. Early and meaningful state engagement is crucial when EPA makes decisions about data management and IT that affect states.

7. **Need Greater Emphasis on User Experience** – The "voice of the customer" needs to be more prominent in all work we do as EE partners. Software and services are often developed and operated with insufficient user engagement. That breeds mistrust and limits user uptake of products and services.

8. **Challenges in Spreading EE to Agency Cultures and Priorities –** We need to be more successful at communicating about E-Enterprise and deeply ingraining it in the cultures of our agencies. There is not enough awareness about the individual projects and how they contribute to a larger goal.

Strategic Recommendations to Accelerate Progress on EE/EN

1. States identified several projects that they believe should receive an immediate investment of resources from the ECOS/EPA Cooperative Agreement. These projects will address critical barriers and accelerate progress in three important priority areas:
   - **Technology Architecture** - Develop an EE/EN Technology Vision, Architecture and an Implementation Road Map
   - **Permitting Microservices** – Research the feasibility of streamlining permitting processes by building sharable software components that support common permitting functions.
   - **Identity Management** – Create developer guidance to encourage greater participation in the EE/EN Federated Identity Management system.

2. Empower key staff and governance groups to make decisions and take actions.

3. Study different models of developing and operating systems, software, and shared services for environmental co-regulators, including outsourcing functions to a third-party collaborative. Consider IT funding and procurement structures that ensure accountability, enable joint decision-making, and advance the shared vision of cooperative federalism.

4. Create visible metrics for tracking progress on EE/EN implementation. We need a tool that provides simple measurements of our progress to indicate how/where states are engaged.

5. Building on the work begun with the EE Partner Inventory project, states should undertake initiatives to encourage collaboration, reuse, knowledge transfer, and standardization.

6. Explore the relationship between Federalism and Data Management. Building on Principle 6 from the Cooperative Federalism 2.0 paper, the governance should conduct research to help us better understand how we may be able to propose revolutionary alternatives to data sharing while preserving important governmental functions satisfied by reporting to national systems.

7. Develop a more robust Change Management Strategy/Communications Plan. We are in the business of promoting change yet we have no management strategy to underpin it. We need more effective outreach to directors, middle managers, program staff, and state central IT offices.

Introduction

A group of state representatives from AR, AZ, CO, DE, MA, NH, NM, OK, and WY gathered at a retreat in December 2017 to reflect on our collective vision for the future delivery of environmental protection services and consider options for developing the technology roadmap that we must follow to achieve our vision. States captured observations about impediments to progress and developed a set of strategic recommendations aimed at accelerating and improving the management and adoption of E-Enterprise (EE) and the Exchange Network (EN).

In short, states feel that our rich history of collaboration with U.S. EPA and tribes has produced many successes. Our joint efforts to build the Exchange Network and E-Enterprise have laid a foundation for cooperative management and technology development, but we are being outpaced by changes in politics, public expectations and technologies. Together, we need to pivot, apply transformative thinking to how we cooperate, and more clearly articulate our vision for the future of the environmental protection enterprise.

Quick History

Over 20 years ago, EPA funded an aggressive program to support Agency-scale modernization of state IT systems, and those intensive efforts identified a large strategic gap between states, tribes, and localities on the one hand and EPA on the other in how information was managed and exchanged. The Exchange Network was born to fill this gap and better coordinate State, Tribal and EPA IT investments.

In 2012-2013, the States (through ECOS) and US EPA worked together to fundamentally change the state/federal dynamic by moving to a shared and collaborative governance model that would apply to all delegated and authorized programs and place greater emphasis on customer service, process modernization, shared services and advanced monitoring. Together, the States and EPA developed a Conceptual Blueprint for E-Enterprise for the Environment, and in September 2013 the ECOS President and the EPA Administrator signed the first Charter for the E-Enterprise governance structure. Since that time, the governance structure of E-Enterprise has been modified to fully engage the Tribes as co-participants. We have launched numerous projects to help demonstrate and instill E-Enterprise principles in the working culture of the States, Tribes and EPA.

E-Enterprise has gained further momentum as the result of an internal ECOS planning process that led to the publication in early 2017 of the "Cooperative Federalism 2.0" document, which is increasingly serving as a visionary blueprint for a national environmental enterprise in which states, tribes, locals and EPA all play important and complementary roles through a collaborative and shared governance approach.

Today's Challenges

At the present time, there are substantial pressures on US EPA and on the overall national environmental enterprise to simultaneously achieve multiple goals, including but not limited to: speeding up the processing of environmental permits, reducing the costs and complexity of environmental management and compliance, using technology effectively to support environmental and public health goals, engaging the public in the work of environmental protection, and achieving better and measurable overall environmental outcomes.

Concurrently, there are pressures from outside EPA to reduce overall federal spending and the federal workforce. Inside EPA there are efforts to reorganize and streamline numerous programs. The EPA 2018-2022 Strategic Plan includes a discussion of the role of technology and the importance of an enterprise-wide architecture in supporting programs' missions. States, tribes, and EPA must commit to developing a shared vision for how current and future technology developments and related expenditures can most effectively support a common agenda. States are individually spending significant sums on information technology when common solutions and alternative approaches may result in substantial savings.

Today's Opportunities

The states see a vital opportunity for E-Enterprise and the Exchange Network to lead the development of a shared, bold vision for how environmental protection is likely to evolve and how policy and technology developments can both drive and enable that vision. That vision can:

- Establish a long-term (10-20 years into the future) set of expectations and aspirations for how the work of environmental regulation will evolve and what lies out on the horizon;
- Incorporate and provide a roadmap for the desired role of technology in achieving that vision, to include a near-term (5 year) set of shared IT priorities and a longer-term (10-20 year) projection of IT needs and trends;
- Establish processes for shared priority-setting and decision-making among states, tribes and EPA on the future expenditure of federal funds on IT platforms and systems, including upgrades or replacements of legacy systems and the development of new systems, and the exploration of alternative governance and funding structures for the development, implementation and ongoing support of these IT systems;
- Include principles to guide all future work on the use of technology in support of the national environmental enterprise.

Outputs from the State Retreat

At their December retreat, state participants reflected on:

- Key trends and priority themes in environmental management and in technology;
- Alignment of those trends and themes with the Principles and Components expressed in the E-Enterprise Conceptual Blueprint;
- Impediments to progress on some specific EE/EN initiatives;
- Overarching barriers to EE/EN progress; and
- Strategic recommendations aimed at accelerating and improving the management and adoption of EE/EN.

Key Trends and State Priority Themes

States feel that EE/EN partners and governance need greater focus in our collective and individual efforts. We should do fewer things and do them well. To that end, states identified 6 broad priority themes on which to focus our attention for maximum results.

These are the themes in priority order:

1. **Permitting**
States have a strong collective desire to improve our permitting processes and increase their efficiency. We need to improve environmental outcomes and the customer experience in permitting activities. We will do this through a combination of program innovations, the application of advanced monitoring and information technology, and additional compliance assistance and specialized support. States also must do more to share their successes and their innovations. We need to prepare for the next generation of compliance which may include proactive permitting and self-certification enabled by information transparency and advanced monitoring (from phones to sensors to satellites).

2. **Inspections and Compliance Assurance**
States must take advantage of new tools and data collection approaches to allow for more efficient and targeted inspections where they are most needed. Using program innovations and advanced technologies we can better prepare inspectors by pulling relevant data into pre-inspection reports. We can use advanced monitoring equipment to supplement or replace inspections by identifying non-compliance automatically and remotely. Using information to perform targeted inspections where they are most needed will help improve environmental results and mitigate resource constraints.

3. **Maximizing the Use of Microservices and Web APIs in Architectural Design**
The E-Enterprise Conceptual Blueprint envisions a shared technology architecture that efficiently connects data, systems, and shared services across the environmental enterprise. States feel strongly that we should design the E-Enterprise architecture to maximize the use of microservices and web APIs to ensure agility, interoperability, and efficiency. Web APIs and microservices are essential for tying together the various components of our architecture, enabling access to pervasive open data from new sources such as citizen scientists and advanced monitoring equipment, and supporting new models for software development and data sharing. States feel that the EE/EN governance needs to reassert itself in this space and provide the leadership necessary to build a modern and interoperable architecture for E-Enterprise.

4. **Citizen Science**
Citizen scientists armed with sensors and other data collection devices have the potential to transform our work. If properly harnessed, citizen science can contribute more data to help agencies make better decisions and more efficiently monitor environmental conditions. Additional data, even if less accurate, can help to identify outliers in datasets--essentially performing a QA function. Citizen science can help inform and empower citizens and build relationships between agencies and citizens that can translate into more public support for the agency mission.

5. **Network of Portals**
States see significant value in a broad network of well-connected and interoperable portals and other interfaces that provide our users (regulated entities, the public and co-regulator staff members) with an improved and seamless customer experience when doing business with environmental agencies. To do this effectively, we need to develop a strong business case that includes a value assessment and level of effort. We also need to double down on the concept of user-centered design. A Network of Portals requires a federated system for Identity Management

and a clear strategy and standards for web APIs and microservices to ensure interoperability and a smooth user experience.

6. **Collaborative Design and Development**

   We need to improve our ability to develop collaborative approaches to software design, procurement, and joint development. EE/EN governance needs to significantly accelerate the transfer of know-how between and among states on program efficiencies. There are too many barriers to real collaboration and those are preventing us from realizing efficiencies for ourselves and for our customers. We are seeing great successes in some states and programs, but we need a next generation set of tools and approaches to validating and spreading these good ideas and accelerating state adoption. The Partner Inventory is in a position to help with this, but we also need to explore new approaches to collaboration and new models for developing and operating software and shared services.

Alignment with E-Enterprise Components

States compared these 6 themes to the E-Enterprise Principles and Components and found that they nest quite well within the original EE components identified in the Conceptual Blueprint. This was an important affirmation of the E-Enterprise vision and a reminder of the important ideas captured in the Blueprint. The priority themes may help us advance implementation of the EE Components with more focus.

States did identify some gaps in the EE Components and recommend some changes or extensions:

1. The Blueprint describes the E-Enterprise Portal as a single tool. In reality, states believe we should be building a Network of interconnected portals so that we meet the individual needs of states and their customers while providing a seamless user experience.
2. The component around Program Modernization and Streamlining misses the idea of innovation and does not emphasize the importance of collaboration and the development of soft infrastructure (such as the Partner Inventory) to accelerate cooperation and knowledge transfer.

Impediments to Progress on Specific EE/EN Initiatives

Participants at the state retreat acknowledged some dissatisfaction with the pace of progress toward completing EE/EN projects and institutionalizing E-Enterprise into the culture of states, tribes, and EPA. The group conducted a "Five Whys" exercise against four E-Enterprise initiatives or components including, Identity Management, Facility, Permitting, and Web API and Microservices Development. The goal was to consider each initiative, ask why progress has been slower than we would like, and identify common technical, organizational, management, and operational challenges that we think have been limiting our progress. States found this to be an extremely useful exercise and encourage EPA and tribes to conduct something similar.

1. **Identity Management**
   - We haven't identified sufficient resources to fully operationalize the system and grow participation. We need dedicated resources to bird dog problems and communicate with potential participants.

- Work on the system is currently being approached through a grant funded paradigm, which is a major impediment to progress. Available resources only allow a small number of states to engage intermittently.
- People don't fully understand the concept or its potential value. It is an enabling technology and not valuable in isolation so it is a more challenging story to tell. We need more robust user stories and a Return on Investment analysis to expand the number of participants.
- The design of the system is functional, but not necessarily optimized for user experience. The current solution was developed prior to fully understanding customer/user requirements.
- There are significant gaps in the documentation for the system. We need to bolster the documentation so that new users and developers have sufficient guidance to implement the system and join the trusted network.

2. **Facility**
   - While a small proportion of partners have implemented a solution to manage facilities across environmental programs designed for their unique needs (a.k.a. Master Data Management and a.k.a. Facility Integration), no partner has a solution to the various problems posed by EE/EN goals. That is, no solution is designed for use across the entire enterprise.
   - Regulatory definitions, data models, and characterization/attribution of records are different across environmental programs. Accommodating needs is difficult. Some of these differences are expected and necessary. Some of these differences are not and persist due to program-centric inertia.
   - It is difficult to define costs and benefits for individual partners, either SLTs or unique environmental programs. Without this, results may not be compelling enough to encourage partners to invest their time.
   - Usually, partners do not have anyone dedicated to this problem. The topic is considered secondary to other functions.
   - Use cases as envisioned are ambiguous. Where they exist at SLTs, solutions and the use cases the outcomes support are ambiguous. There is a documentation gap for both technical and general needs. Because of the breadth and depth of the topics included, many conflate unique facility topics into one singular conception which then fundamentally contradicts itself.

3. **Permitting**
   - Permitting often feels stuck because it is such a big topic with an undefined scope.
   - States have different ideas about how permitting is defined and what aspects of the process need improvement.
   - We place insufficient emphasis on permitting policy because everyone has a notion that there ought to be a shared technology solution that we need to develop. We tend to jump to technology and that's the wrong approach, in part because many states already have a technology solution and aren't willing to engage in a conversation about rebuilding it.
   - We need to work on policy about how to do permitting better but the scope of that is potentially huge and that prevents us from getting started
   - States are happy to participate in permitting discussions as long as it does not adversely affect them. That inhibits progress.

- Where we have made progress on permitting, there is still a lack of awareness because we fall short on outreach and knowledge transfer.
- A big area of opportunity may be to develop toolkits, principles, best practices, and Communities of Practice to help states collectively improve permitting processes and policy.

4. **Web API and Microservices Development**
   - We have robust standards, documentation, and tools around web services that support bulk exchanges of data with EPA national systems.
   - We have not identified a forward-looking strategy for adopting modern approaches to service development at the enterprise level. Web APIs and microservices should be the bedrock of interoperability for the EE/EN architecture, but we have not articulated a strategy or vision for building them in a cohesive manner.
   - We have not provided developers with guidance on how or where web APIs and microservices should be applied.
   - Vendors have a disincentive to build microservices because they can make it more difficult to lock customers into their systems.
   - Many states and programs already have an approach for providing data access and aren't eager to engage in a conversation about rebuilding it.

State Observations on Overarching Barriers to Progress

The "Five Whys" Exercise revealed important state perspectives on some of the critical factors that are impeding progress on specific EE/EN projects. More importantly, it opened up a dialogue about some more fundamental barriers that may be limiting our efforts to truly institutionalize EE/EN in our organizational cultures and operations. The following list documents some of the barriers which require attention by the EE/EN governance.

1. **Need Greater Clarity on our Vision for the EE/EN Technology Architecture**
   We have not adequately articulated a vision and a picture of what we are trying to build from a technology perspective. When someone asks what we're building, we cannot easily show them or explain what it means to approach system or software development in the "E-Enterprise way". States feel this is a very significant barrier to building a robust, coherent, and interoperable enterprise. The absence of a concrete architectural vision is impeding our progress in a number of important ways:
   - The governance cannot make fully informed decisions about how to prioritize and evaluate projects and work.
   - EPA programs and co-regulators cannot fully understand how to make investments in new technology and system modernizations in a way that is consistent with E-Enterprise and the Exchange Network. Gaps in our documentation and lags in our system of collaboration prevent us from answering basic practical questions from managers investing in technology. For example, states are writing RFPs for new e-permitting systems. What shared services should they anticipate using? How will they be able to integrate with those services? What is our collective vision for where permitting is going? How should they build that into their plans? Similarly, as EPA system owners plan for modernization, they do not have a target state to plan towards.

- We aren't targeting our resources as effectively as we otherwise could. With a clearly defined target state, grant programs could more easily align their funding priorities with work that supports the EE/EN vision. In addition, without a clearly defined target architecture, grant recipients do not have sufficient guidance on how to design and build a project in a way that is consistent with EE/EN. That lack of clarity inhibits our ability to eliminate siloed applications and promote more interoperable design patterns.
- We will continue to have difficulty with the Shared Services conversation because we have not yet agreed on our desired target state or on any standards to promote interoperability. We have identified a number of projects and shared services that we believe are important, but we do not have a clear enough vision for how they will work together. The shared services discussion is not taking place inside the context of a grander vision so the value of an individual service is less clear. A clear vision will help us better understand what shared services are of most value and how to make them interoperable across the enterprise.
- Without more leadership from the EE/EN governance on architecture design and development—particularly with respect to encouraging broader use of web APIs and microservices—we risk falling behind technologically and missing opportunities to enable interoperability and leverage emerging capabilities.

States, tribes, and EPA need to make this a top priority and identify a proposal to develop a shared technology vision/architecture for E-Enterprise and the Exchange Network.

2. **Rightsizing Collaboration and Playing to Our Strengths** – A commitment to collaborative federalism and joint decision-making is a core principle of E-Enterprise. Sometimes, however, we may limit our progress by failing to evaluate whether a given project or initiative is best served by an enterprise-level approach. In some cases, EPA, states, and tribes may need to more independently pursue opportunities that make business sense for their constituencies and operate within their technical and/or business constraints. We should be willing to consider ways to create space for EPA, states, and tribes to stay true to the principles of joint decision-making while pursuing an initiative independently that is actively managed outside the purview of joint governance. Stick to the rule of "No decisions about us, without us.", but allow space for progress among individual segments of partners. It may serve us well to use states as laboratories before attempting to solve massive enterprise-level problems all at once.

States also noted that our collective emphasis on collaboration, while well placed, can result in significant overhead. Maintaining the partnership requires significant time and resources, but we should evaluate whether there are opportunities to streamline governance to free up more resources for project management and implementation. There may be areas where certain governance responsibilities could be delegated to staff to ensure that the governance does not become a bottleneck or impediment to progress. Several governance members noted that the demands on their time can be difficult to manage. They also expressed a desire for greater connectivity to members of the EELC and more clarity about roles, responsibilities and priorities of the various governance groups.

3. **Ownership of Systems and Shared Services** – States acknowledged that our default development pattern for shared systems and services is to build and house them at EPA on EPA owned infrastructure. That approach is often the easiest path to funding and resources for project development and operations and maintenance. However, there may be other options that remove

some institutional barriers to progress. EPA contractors and the EPA IT environment place constraints on design. States are forced to assume a level of risk in relying on EPA hosted services and systems in an environment of declining resources and budgetary instability. State IT centralization and IT policies can be barriers to using EPA hosted tools and services. In addition, EPA assumes responsibility for long-term operations and maintenance obligations. Long-term funding of these services may pose real risks for EPA and state and tribal users. We need to find ways to safely explore other models of system development and ownership that may help to address some of these barriers. For example, software and system development/operations through a third party should be put on the table for evaluation.

4. **Resource Imbalances** – States do not have a significant source of their own dedicated funding to broadly operationalize EE and EN in a coordinated and collaborative way. Most available resources target individual rather than collective problems. This creates a scenario in which states are overly reliant on EPA for resources to support the development of the enterprise. Substantive state participation in projects is contingent on funding and our current approach relies too heavily on competitive grants through the EN Program. The overhead and delay associated with the application and award process is an impediment to progress and state engagement. Grants should also prioritize collaborative work that results in the development of more scalable solutions that can be shared across the enterprise.

5. **Need to Improve Project Management Capacity and Clarify Staff Roles** – EE/EN joint projects need dedicated project management resources. Our current projects would benefit from additional resources for management and coordination. Our current approach to governance and project staffing is not fully meeting our needs. States feel that we may benefit from additional focus. We should consider doing fewer things and doing them better.

   There is also a need for greater clarity on the roles, responsibilities, and relationships among the quad-chairs and the various staff and contractor resources that support EE/EN governance and projects. This uncertainty can slow progress and result in the governance groups devoting excessive time to issues that could be handled by staff. While lines of authority are inherently blurry when operating inside a partnership, we must identify appropriate opportunities to empower staff to make efficient use of our resources. Additionally, we must evaluate our need for an EE/EN Coordinator and determine whether to rehire, make adjustments to the position, or eliminate the role.

6. **Mutual Accountability and Shared Decision-Making in IT** – Commitment to joint decision-making and mutual accountability is a key underpinning of E-Enterprise. Early and meaningful state engagement is crucial when EPA makes decisions about data management and IT that affect states. There should be no decisions about us without us. This is not about control but about states having sufficient opportunities to influence key IT decisions. Achieving this level of collaboration is difficult and made more complicated by the fact that systems management and IT decision making is still very decentralized with offices operating independently. Under these circumstances it is difficult to maintain accountability or enable truly shared decision-making. OEI is not fully empowered to make unified decisions about technology for the agency. OCFO is also not fully empowered to make decisions about E-Enterprise. The absence of clear authority over management and IT investment decisions complicates efforts to instill a culture of mutual accountability and collaboration.

7. **Need Greater Emphasis on User Experience** – The "voice of the customer or user" needs to be a much more substantial consideration in all of the work we do as EE partners. Tools for customers in the public or for the regulated community should be built with additional engagement and input from those customers. In the context of Shared Services, states, tribes, territories, and locals are also customers. States generally do not have a positive view of EPA's track record of customer service in IT service delivery. Shared services and software are too often developed and operated without sufficient customer engagement and that breeds mistrust and limits participation and use of services. This is a significant barrier to furthering state interest in shared services.

8. **Challenges in Spreading EE to Agency Cultures and Priorities –** While EPA has made notable progress in spreading E-Enterprise through the agency, we all have additional work to do to further communicate about E-Enterprise and ingrain it deeply in the cultures of our agencies. There is not enough awareness about the individual projects and how they are contributing to a larger goal. It is also very difficult to convey the vision for E-Enterprise because it is difficult to define and, as described in issue 1, we have not described our technology vision in sufficiently specific terms. States' and Programs' self-interest remains a barrier to progress on Enterprise-level initiatives. State agency adoption of E-Enterprise priorities and technologies is also complicated by the trend toward centralization of IT services at the state level. Many state agencies have more limited control over their technology choices because IT resources and decisions have been consolidated in separate agencies. These agencies should be brought into the conversation as partners so they can better understand the business of environmental protection and the priorities of E-Enterprise. Change Management and Communications need to be a high priority for budgets and staffing plans. If we don't more actively build change management into our design, we will not get to where we want to go.

Strategic Recommendations to Move EE/EN Forward

The conversation at the state retreat directly and indirectly pointed to many potential ideas and activities to move E-Enterprise forward. States offer the following recommendations to help accelerate progress on EE/EN.

1. States have identified several projects that they believe should receive an immediate investment of resources from the ECOS/EPA Cooperative Agreement. These projects would help address critical barriers and accelerate progress in three important priority areas:
   a) **Technology Vision and Road Mapping** - Engage the assistance of an IT Strategy firm to help the EE/EN governance develop a forward-looking technology vision for EE/EN that describes our shared architecture and defines a roadmap for building it.
   b) **Permitting** – Research and document the feasibility of streamlining permitting processes by separating common permitting functions into reusable components and building microservices around those components to support shared permitting applications.
   c) **Identity Management** – Create developer guidance and ROI documentation to encourage greater participation in the EE/EN Federated Identity Management system—an important service underpinning other elements of the EE/EN architecture.

   Descriptions of each proposal are included as attachments to this document.

2. States believe that there are some underlying gaps and shortcomings in how states work together and with EPA and tribes. These gaps do not call into question the fundamental importance of the partnership, in fact they point to a need to re-amplify some parts of it. They do, however, point to issues with our organizational capacity, roles and responsibilities, and work patterns.

- The EE/EN governance should review how we staff and manage projects. There is a significant need for a dedicated staff person(s) to manage each project, keep them moving forward, and raise issues and barriers to the governance.
- The EE/EN governance should identify opportunities to delegate authority to streamline governance operations. The governance groups too often engage in work that is best suited to staff. We need to empower key staff to make decisions and take action.
- It may be valuable for EE/EN to engage in an exercise to lean governance operations.
- The EN Coordinator position should be revisited to identify whether the position description still aligns with needs of the partnership. Are there critical gaps in expertise that would help to move EE/EN forward more rapidly?
- Develop a staffing plan to help clarify needs, expectations, responsibilities, and lines of accountability

3. Commission the development of a study or white paper that would explore different models of developing and operating systems, software, and shared services for environmental co-regulators. This should include studying the feasibility of and creating a concept of operations around a third-party collaborative -- the National Institute for Environmental Program Management. Possible functions and characteristics of this organization could include:

- Managing an engagement process that ensures early, meaningful and comprehensive governmental and other end user engagement. This would ensure that the needs of governmental and regulated parties and other users are fully considered and integrated and that planning and development processes are transparent and agile. It would also obtain the "voice of customer" across co-regulators on priority areas for process improvement.
- Working on behalf of all the regulators to run and manage shared systems and services.
- Developing infrastructure to support alternative procurement and development mechanisms for open source, cloud-hosted software. This could include shared licenses for things like software testing and a pool of beta software testers to support early testing and course correction.
- Implementing an adaptive management approach that helps to ensure that the right services are being developed and effectively implemented and managed.
- Creating and maintaining an annual technology roadmap listing major system developments/migrations underway and their material impacts on state/EPA operations.
- Develop a more structured, next generation approach to providing EPA with input from states on process/system modernization that reduces the burden on EPA and minimizes surprises for states (SDWIS Prime).
- Develop and administer online and in-person training programs and curricula on how to implement lean/proactive user centered design, with online and in-person training courses.
- Leverage a comprehensive state inventory to provide both collaboration support and metrics on how we are doing.

EXAMPLES OF ALTERNATIVE & POTENTIALLY COMPLEMENTARY SYSTEM DEVELOPMENT MODELS

Model/Examples	Features	Pros/Cons	Questions
States individually build their own environmental data management and permitting systems (See, e.g., MA, CT, HI)	Self-contained, internally integrated; can be at individual agency or across all agencies of a state	**Pros:** Control of one's own destiny; not on anyone else's timetable **Cons:** May not be able to readily exchange information with other state or national systems; may not enable uniformity in regulatory approaches with other states	How could supporting services be built to enable individual states' systems to be inter-operable with other states' systems or with shared cloud-based systems? What incentives would encourage states to replace their own systems with shared, cloud-based systems?
States rely on systems built to serve multiple states and operated by EPA (See. e.g., SDWIS Prime)	Designed to accomplish regulatory functions determined by EPA, with input from states, to be important; development and operating costs are covered by EPA	**Pros:** States don't have to build or run their own systems; uniformity of data nationwide **Cons:** States' needs are not fully met; customization is difficult; uncertain long-term service commitment by EPA	How could supporting services be built to enable states to internally integrate their data under an EPA-hosted system?
Private sector developers spend their own capital to develop platforms and systems (e.g., cloud computing, SaaS, APIs)	Tools to meet specific market needs, typically where multiple users may be willing to enter into long-term contracts	**Pros:** Capital costs, development time and risk of failure initially incurred by private sector; can be customized **Cons:** Requires long-term contract/financial commitments; risk that developer ends support	Could states accomplish the same outcomes and benefits by working more closely together?
Third Party Non-profit Collaborative develops, implements and manages systems for States (e.g., National Association of Insurance Commissioners)	All potential system users have an equal voice in developing systems that all can use; a professional IT team serves the system support needs of all users; system could be	**Pros:** Shared governance produces uniform tools that can be used by any state at lower cost than self-built systems; **Cons:** System changes occur through a consensus process that may take longer than for self-operated systems	Could this model address many of the governance issues and needs that have impeded true reform and modernization of the environmental technology system marketplace? How could it be adapted

	potentially be funded by grants and/or user fees		to serve the needs of the environmental enterprise?
"Leapfrogging" through long-term collaborative processes to build "on the horizon" systems	The participants commit to work together starting immediately to develop and implement systems that won't be fully ready for use for another 5-20 years, with the goal of enabling many states to "leapfrog" to state-of-the-art systems through shared agile development.	**Pros:** States spend only the bare minimum needed to update existing systems based on current technology until "leapfrog" tools become available; States can participate fully in developing and owning "leapfrog" tools, thereby bypassing the need to constantly build, update and replace their own systems **Cons:** Participants collectively accept the risk of failure, which is mitigated through agile rather than waterfall processes; collaborative project management may increase development costs or time, and may not enable as much customization	Could this approach work alone or in combination with some or all of the other approaches to promote achievement of the States' bold future vision?

4. In researching the feasibility of alternative models of system development and operation, states support the consideration of IT funding and procurement structures that ensure accountability, enable joint decision-making, and advance the shared vision of cooperative federalism. For example:
   - Federal funds for IT infrastructure are considered "pooled funds," and their use is determined through a shared governance process and administered by a third party.
   - Funding is derived from direct Congressional appropriations, fees for filings and other electronic processing services, private and foundation contributions, or endowment revenues of a not-for-profit third-party administrator.
   - Procurement of software products and services occurs through consortia approaches that maximize the leverage of each participant's funds.

5. States recalled the effectiveness of the Exchange Network Data Flow Implementation Matrix in creating a highly visible set of metrics for tracking progress. We need an equivalent tool, built off of the EE components, that provides simple metrics to measure our progress and indicate how/where states are engaged. Some possible example goals/metrics might include:
   o For five core areas, achieve a 50% improvement in the percentage of EE community members who: a) know that there is a national plan for X (e-permitting) and b) think it's credible.

- o Within 3 years support 5 states in leapfrogging to 5 core EE systems or services to provide an improved user experience
- o Drop the costs associated with sharing regulatory data and public open data and improve data quality, timeliness and availability by 50% in 5 core areas.

6. After developing a clear technology vision for EE/EN, the governance should engage OEI in an effort to align EN grant program priorities with its shared priorities. That will increase the value of the EN grant program and allow it to more effectively encourage and evaluate applications that advance the shared vision of states, tribes, and EPA. A clear technical architecture can also provide much needed guidance to help teams design and build projects that align with EE/EN standards and best practices. The governance may also wish to consider the value of suggesting greater prioritization of collaborative work that results in the development of more scalable solutions that can be shared across the enterprise.

7. Building on the work begun with the State Inventory project, States should undertake initiatives to encourage collaboration, knowledge transfer, and standardization. We need more capacity for collaborative approaches to software design, procurement, and joint development. We need to significantly accelerate transfer of know-how between and among states on program efficiencies. There are too many barriers to real collaboration and those are preventing us from realizing efficiencies for ourselves and for our customers. We are seeing great successes in some states and programs, but we need a next generation set of tools and approaches to validating and spreading these good ideas and accelerating state adoption.
   - o Launch an effort to explore where and how process standardization has evolved in states. Over time, reducing state-to-state variability could enable much more powerful sharing of software and best practices. While every state is still unique, there may be room to push the limit on finding more core process improvements that could be shared.
   - o Identify and develop targeted sets of programmatic best practices documents to radically accelerate business practice modernizations and shared technology investment and adoption by states.
   - o Look for opportunities for states to "Leapfrog". Identify a handful of states that are at the very beginning of the modernization lifecycle and leapfrog them ahead by simultaneous adoption of best practices from multiple states.

8. Explore the relationship between Federalism and Data Management. Building on Principle 6 from the Cooperative Federalism 2.0 paper, the governance should conduct research to enhance our collective understanding of:
   - how delegation works in each program area;
   - how information flows support that authority; and
   - what core governmental functions are fulfilled by information flows that are "reported" into national systems?

This research can help us clarify state and EPA perceptions around the issue of "Systems of Record" and we can better understand how we may be able to propose revolutionary alternatives to data exchange while preserving important governmental functions that are satisfied by reporting to national systems at EPA. A core issue here is pushing data validation, stewardship, and

sophisticated QA as far upstream as possible rather than at the point of entry to an EPA national system.

9. We need a more robust Change Management Strategy/Communications Plan. We are in the business of promoting change yet we have no management strategy to underpin it. We need a marketing plan to help us target the right audiences with the right messages. We need much better outreach to directors, middle managers, and program staff. Change Management and related communications needs to be a high budget and staffing priority. Our current approach to communication simply is not working well. In general, we need more active communication and outreach. We should be conducting more open calls on ongoing projects and have updated fact sheets for every project in the portfolio. We need to identify dedicated staff resources who can own this responsibility. It cannot be performed effectively by a committee.

Attachment A

Proposed Project: Creating a Technology Vision and Roadmap for E-Enterprise and the Exchange Network

Project Overview

E-Enterprise and the Exchange Network seek to build a more modern, efficient, and effective Environmental Protection Enterprise. States, tribes, and EPA are striving to streamline processes, deliver access to trusted environmental information, and enhance productivity. The E-Enterprise Conceptual Blueprint established a set of principles and components that provide important guideposts for recasting the environmental enterprise. Driving further progress requires envisioning a target architecture that can guide our projects and modernization efforts. We cannot successfully create an interoperable enterprise without a clear and specific vision of what we seek to build. The EE/EN governance needs to further develop our technology vision and create a plan for achieving it.

States propose engaging the assistance of an IT Strategy firm(s) to help the EE/EN governance develop a forward-looking technology vision that describes our desired shared architecture and defines a roadmap for building it. The contractor will help lead states, tribes, and EPA through a robust effort to define our business needs, anticipate future opportunities, understand how technology is trending, and develop a technology vision and roadmap. The successful bidder(s) will have expertise in digital transformation, technology forecasting, enterprise architecture, technology road mapping, and cooperative IT governance.

This work will result in a unifying and forward-looking vision for our shared architecture that will clarify our goals, set partner expectations, and support technology planning, investment, and design decisions across enterprise partners.

Project Scope

This project will help states, tribes, and EPA tap into the expertise of third-parties to guide us through a process to develop a vision and roadmap for the shared elements of the E-Enterprise/Exchange Network federated architecture. This would entail a sustained engagement over 6-9 months to help us develop a comprehensive, forward-looking, and modern approach to enabling interoperability, data sharing, and shared software and services.

The contractor's work may include the following activities:

- Conducting research;
- Providing insight and advice on key technology trends and their implications for environmental management;
- Organizing and facilitating workshops to gather requirements and develop consensus around a technology vision and target architecture;
- Documenting recommendations, findings, and a target EE/EN architecture;
- Developing a plan for using advanced monitoring tools, artificial intelligence, Blockchain and other emerging technologies to achieve better environmental outcomes and greater productivity;

- Developing a technology roadmap or a tactical plan for achieving the architectural vision, driving implementation activities, and identifying funding and resource needs.

Some key questions to consider:

1. How should we be approaching data management inside our federated model given current and emerging technologies (cloud, AM, AI, big data, block chain, etc)?
2. What emerging technologies should we invest in and how might they influence and transform our business? (Build on the key technology trends identified below*)
3. What strategies should we pursue to enable interoperability throughout the enterprise?
4. How can we most effectively leverage and encourage the use of micro-services/APIs as foundational modules for more comprehensive systems that can be integrated with each other?
5. What architectures and design patterns offer durable approaches to enabling seamless interoperability among systems?
6. Where should we be defining standards for web APIs and microservices? Are there other approaches that we should consider?
7. Should we consider tighter standardization around data?
8. What data architecture can enable digital sharing in ways that support a multitude of current and projected future program management needs?
9. What are the key shared services that we need to build and how should they be designed to maximize uptake and reusability across enterprise partners?
10. How are other organizations and industries approaching challenges and meeting needs that are similar to ours?
11. Are there other successful models in the public or private sector that we could learn from?

This project will provide the EE/EN governance with the information necessary to develop a set of interlocking design documents, architectural specifications, and standards for our core technical components. These resources will provide critical guidance for developers so that they may integrate with EE/EN and its services and plan their IT investments in a way that is consistent with the EE/EN vision.

*Some Key Technology Trends and Their Implications for Our Work

Some Key Technology Trends	Evidence	Implications for our Agencies and Communities	Questions for States
Migration to cloud services Now for next 10 years	Cloud services architecture is now dominant, many EMS vendors moving clients to cloud as fast as legal/institutional barriers will allow	Once all data and software live in clouds, old rules of ownership and stewardship can be re-envisioned, and new forms of collaboration and re-use can be leveraged. Cloud migration will challenge traditional structures within EPA and OEI's role, as is already occurring in many States.	What if you no longer owned or developed software but focused on improving your staff and customer experiences? Could States collaborate on a more massive scale?

Attachment A

Advanced and pervasive monitoring Now for next ten years	The Internet of Things (IOT) continues to explode. Monitors compliant with EPA reference methods are dropping in price and size. Everything from cars to refineries now use numerous sensors to collect and stream data that is instantly analyzed and used to improve performance.	Advanced Monitoring (AM) offers cost savings that dwarf those achievable via simple digitization of current forms and processes. For example, eDMR saves a few %, but noDMR (i.e., no lab sample necessary) could save 50%.	How can we collaborate 10x better to accelerate adoption of these technologies into our management practices, even if doing so means new roles, and new risks?
Artificial Intelligence (AI) and Machine Learning (with help from "big data" and "data analytics") Within next 5 years	Fastest growing sector of the IT marketplace	We all talk about the evolution from paper to pdf, to digital form, to a digital process, to "wizards" like TurboTax. The next step, which is already happening in other sectors, is truly <u>smart</u> forms. Creatively applied, these technologies could enable entirely new ways of achieving compliance and enforcement.	What if a form was not just smart but was actually intelligent, and learned as it was used? What if regulatory applicability can be learned/modeled much better…how could that help industry or NGOs or governments? States and EPA stand no chance of obtaining and retaining the talent needed to help them harness this revolution unless they work together.
Blockchain (10+ years)	Blockchain is under active development in government, health and finance sectors	Permits/authorizations/notifications recordkeeping and reporting are core businesses, and these could all eventually be moved to blockchains where they can be instantly validated without a trusted intermediary or a single authoritative	Who can scout these opportunities for us? What options open up if we move to a cashless and

		computer. For example, a self-certification would be irrevocably and immutably published to a blockchain for instant dissemination and validation.	bankless economy of environmental services? What if permitting and reporting as traditionally implemented go away and are replaced by "smart contracts" (i.e., immutable distributed records, that can be seen and validated by all parties)?
Design Thinking and User-Centered Design	These approaches are already gaining favor in the private sector	These methodologies complement the efficiency lens of lean/agile by applying a laser focus on user journeys and experiences, and through a fanatical commitment to prototyping and testing as a means of joint learning	Could states and EPA establish shared labs for joint learning on user-centered design?

Attachment B

Proposed Project: E-Permitting Common Microservices

Project Overview and Purpose

The purpose of this project is to research, document, implement and test a prototype of electronic permits comprised primarily of microservices as a practical approach towards permit application, issuance and compliance. In this regard a microservice is component functionality that is independently structured, but when aligned with other microservices can be expanded into application actions. The desired architecture will use libraries or catalogs of microservices that are identified by breaking down services into isolated functions and constructing those operational functions in software.

The results of this work will allow the E-Enterprise community to construct and adapt permit transactions without substantial application development. The flexibility to reuse code supporting operational functions is paramount when implementing LEAN practices, adding corresponding customer benefits, responding to regulatory or legislative changes and reducing the costs associated with large scale application development and upgrades.

The project is guided by a team of representatives from several states that anticipate implementing E-Permitting services within the next 24 months. As a member of the team and the contracting agent for the project, the Environmental Council of the States (ECOS) is seeking bids from contractors to develop the feasibility of utilizing microservice-based applications.

Background
E-Enterprise partners seek to streamline permitting processes and leverage technology to enable state and federal customers to better understand how to complete authorizations for controlled activities and how to comply with regulations guiding those activities. The permitting process must also include dynamic services to present customers with information expanding their understanding of how the applicable regulations positively impact environmental conditions and support the sustainability of natural resources.

To support these goals the team seeks to examine the cost and functional opportunity of separating services into components organized around repeatable processes and business capabilities. The customer journey will then be crafted by connecting independent microservices that communicate through an enterprise service bus framework. The project team anticipates that while most permit processes will be pre-constructed, the solution should either initially or in subsequent phases, apply artificial intelligence to dynamically add microservices based on real-time analytics and/or business rules.

A considerable number of individual services are common across State and Federal programs. The E-Enterprise team envisions a shared catalog of services available for use by partner environmental programs.
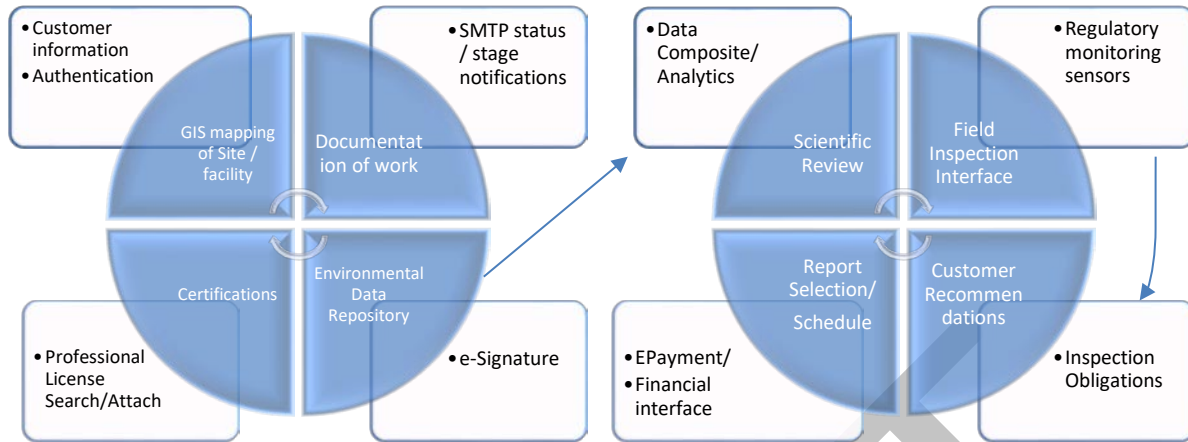
The common catalog presents an opportunity to re-use services and therefore has potential to:

- Save time and money by sharing technology;
- Standardize data and reporting;
- Provide a predictable and simplified customer experience;
- Reduce errors in form submissions;
- Reduce permit completion and review burden;
- Strengthen continuous improvement by streamlining application modifications.

Project Objectives

The project objectives are as follows:

Objective 1 - Identify and document common permitting components.

Tasks

- Document common permit components across three permit types. Selected permits must include a range of complexity such as
  a. simple transaction (i.e. fishing license)
  b. moderate transaction (i.e. septic permit)
  c. complex transaction (i.e. hazardous waste disposal permit)

- Identify existing common components and opportunities to standardize components across the selected permits as utilized in the three participating states (Delaware, XX, XX)

- Facilitate team discussion and document findings.

Objective 2 – Provide an actionable schematic for the development and implementation of a microservices or modular architecture for the common components.

Tasks

- Develop pattern language to assess the complexity and manageability of the proposed solution
- Estimate personnel and technology infrastructure necessary to support electronic permitting transactions with proposed solution.
- Provide technical system design templates and rough order magnitude project estimate to construct proposed environment.

Objective 3 - Deploy conceptual permitting applications using the proposed architecture.

Tasks

- Lead project and technical resources to complete the implementation of a proof of concept environment.

Conduct technical and UAT testing and provide associated documentation

Attachment C

Proposed Project: E-Enterprise Federated Identity Management Documentation

Brief Project Scope:

A production-ready Identity Management system requires additional resources to support partner implementation, outreach, and change management. This proposed project calls for engaging a contractor to provide technical writing services and business analysis services to address the following:

1. **Writing the Developer's Guide for the Identity Bridge** (Technical Writing)
    a. Add additional detail based on the integration work done by the grant project team
    b. Add sections to include set up and configuration for participation as an Identity Provider. The current guide only covers the information for integrating as a Relying Party
    c. Provide clearer examples of the roles and integration choices for a partner
    d. Provide instructions on traversal integration
    e. Provide a description of what work is required to link a partners existing identity management system to work with users that are authenticated with another Identity Provider within the system
    f. Provide a description of the registration and authorization requirements to participate and a Relying Party onto the trust network
    g. Provide a description of the user claims provided by Identity providers and how to process them in order to match users within their system

2. **Writing a Problem and Change Management document to be used to manage changes across the participating partner systems** (Technical Writing)
    a. Define roles and responsibilities for participating partners
    b. Document risks and key dependencies associated with the architecture
    c. Diagram and describe the technical architecture of the distributed system
    d. Describe the governance structure of EE and of the EE-FIdM and how they relate to each other
    e. Describe the process for submitting and addressing a problem with the system
    f. Describe the process for requesting and communication a change both technical and policy related with the system
    g. Diagram the incident reporting process
    h. Diagram the change management process

3. **Writing a Communications, Outreach and Technology Adoption Plan** (Business Analyst and Technical Writing)
    1. Include use case definition?

4. **Writing an ROI document to better understand cost savings and where they are likely to be realized within the Enterprise** (Business Analyst)

Producing and publishing these four documents will lay the ground work for a production Identity Management system that can support the Network of Portals concept and more seamless transactions for users across E-Enterprise partner systems. We will pursue a phased approach to this work and target the Developers' Guide first. We will assess progress and available resources to determine how to move forward on the remaining three documents.

Attachment C

Next Steps:

- Begin drafting an RFP to secure contractor support to produce the documents.
- Identify individuals inside CDX that can be available to participate as needed in the project to answer questions and provide information necessary for the contractor to produce the guidance documents.

State E-Enterprise Retreat

- In December 2017, state reps from AR, AZ, CO, DE, MA, NH, NM, OK, and WY gathered to reflect on state priorities for E-Enterprise and the Exchange Network

- Discussion topics
  - Priority themes in environmental management and technology
  - Overarching barriers to progress on E-Enterprise and Exchange Network
  - Strategic recommendations aimed at accelerating and improving the management and adoption of E-Enterprise and the Exchange Network

Priority Themes

- Drive Permitting process efficiency to improve environmental outcomes and customer experience

- Enable efficient Compliance Assurance and Inspections through program innovations and advanced technology

- Maximize the use of Microservices and Web APIs in Architectural Design

- Harness Citizen Science to enhance agencies' monitoring capabilities and decision making

- Build an interoperable Network of Portals that support seamless customer interactions with environmental agencies

- Increase opportunities for Collaborative Design and Development of software, procurement processes, and shared services.

Barriers to Progress

States engaged in a LEAN management technique called "Five Whys" to uncover some overarching impediments to progress

- Need greater clarity on our Vision for EE Technology Architecture

- Challenges in rightsizing collaboration and playing to our strengths

- Limited options for developing and operating shared systems and services

- Resource imbalances between states and EPA

- Need to improve project management capacity and clarify staff roles

- Difficulty operationalizing truly shared decision-making in IT

- Need greater emphasis on user experience

- Challenges in spreading EE to agency cultures and priorities

Projects for Immediate Investment

- **Develop EE Technology Vision, Architecture and Implementation Roadmap**

  Establish a common target for E-Enterprise partners, create a foundation for interoperability, and provide much needed guidance for our technology choices and system design decisions.

- **Micro Services for Permitting**

  Examine the cost and opportunity of separating common permitting functions into reusable components organized around repeatable processes and business capabilities.

- **Identity Management Documentation**

  Develop documentation and guidance for agencies implementing the E-Enterprise Federated Identity System—an important service for enabling seamless customer experiences across agencies and systems.

Longer Term Recommendations

- Evaluate staffing needs and empower key staff and governance bodies to make decisions and take actions.

- Explore the feasibility of using alternative models for developing and operating shared infrastructure, software, and services. This could include use of a 3rd-party collaborative.

- Consider IT funding and procurement structures that ensure accountability, enable joint decision-making, and advance the shared vision of cooperative federalism.

- Create visible metrics for tracking progress and measuring engagement

Longer Term Recommendations

- Align grant resources with activities that advance the E-Enterprise Technology Vision

- Build on the EE Partner Inventory to encourage state collaboration, knowledge transfer, and standardization.

- Building on principles of Cooperative Federalism, explore ways to propose revolutionary alternatives to data management.

- Develop a more robust Change Management Strategy/Communications Plan. We need more effective outreach to directors, middle managers, program staff, and state central IT offices.