

Interim  
E-Enterprise for the Environment  
Digital Strategy  
V 2.0  
July 17, 2019

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## 1.0 Document Purpose

The E-Enterprise Digital Strategy (Strategy) represents a shared vision among E-Enterprise partners to better coordinate their IT systems, information and services. The Strategy incorporates a broad range of input from government practitioners, the public and private-sector experts. The implementation of the Strategy will result in increased collaboration in environmental data and system sharing among EPA, States and Tribes to better achieve environmental protection benefits.

## 2.0 Background

Today's environmental challenges increasingly require faster, leaner, more flexible, lower cost and technically savvy business and technology solutions. Transformations are happening in other sectors, but the environmental regulatory business model is still largely focused top-down (with EPA at the top), stove-piped by program (e.g., air, water), and predicated on information formats and episodic data flows structured by the paper forms on which they were originally based.

Environmental management agencies face multiple challenges that require innovative solutions, including:

- Providing permits and other required regulatory actions faster and in a more predictable manner.
- Streamlining mandatory reporting programs.
- Supporting operations on a steady or decreasing budget.
- Reducing costs to regulated entities.
- Improving data exchange.
- Supporting increased transparency about the environment and agency actions.

Simultaneously addressing these challenges requires that agencies change how they conduct their business. For instance, many agencies have implemented or are implementing lean management approaches to redesign their processes to deliver more with less. In many cases to fully achieve agency goals, complementary changes to the management of information are also required. The core functions of environmental management agencies depend on the effective collection, management, analysis and sharing of information and on making effective decisions based on that information; however, related information and IT-based services are fragmented across agencies, leading to redundancies in activities and frustrating interactions that are costly for agencies, regulated entities and the public.

This Strategy will enable E-Enterprise partners to coordinate their information and services in a manner that will reduce the delays, frustrations and costs that result from the limited coordination among current IT systems. Further, the Strategy will make information about the environment and regulated entities more transparent and accessible while also reducing costs. The Strategy will lead to sharing of resources and best practices and achievement of economies of scale in IT services that are currently not feasible.

## 3.0 Strategy Objectives

The Strategy sets out to accomplish three objectives:

- 1. Enable consumers of environmental data to access high-quality digital environmental information and services across organizational boundaries.**

We will rely on open data and open standards for sharing all non-sensitive (externally facing) data related to environmental protection domains. Partner agencies will make data (including structured databases and unstructured data in other forms such as text) available in human and machine-readable formats for use by all consumers including the public, recognizing that agencies will continue to control these data sets and this control will be different depending on the nature and sensitivity of the data. Consumers will be able to access data regardless of who owns its management.

- 2. Unlock the innovations and transformational capabilities from secure networks, shared services, platforms and cloud hosting to support multi-directional data flows, faster sharing of data and better predictive vs. reactive environmental approaches that environmental regulators will require in today's environment.**

Building on the legacy of the Exchange Network, we now have an opportunity to break free from the inefficient, costly and fragmented practices of the past; build a sound governance structure for digital services and shared hosting; and evolve the current enterprise.

This digital initiative will guide investments in connected platforms that will be critical to multi-directional data flows, faster sharing of data, and better predictive environmental approaches that environmental regulators need now.

- 3. Ensure that as environmental co-regulators adjust to this new digital environment, we use the opportunity to work collaboratively to modernize systems and processes in smart, secure and affordable ways.**

This will require more than IT improvements. Business process improvement will be critical to enable new digital solutions that achieve the customer-driven focus of this Strategy. Likewise, managing these intended transformations toward more shared environmental practices will require new governance practices among partners and effective communications about changes among both partners and consumers to achieve these outcomes.

## 4.0 Strategy Principles

To drive this transformation, the strategy is built upon three overarching principles:

1. An **“Information-Centric”** approach – Deliver content that can be tagged, shared, secured, mashed up and presented in the way that is most useful for the consumer of that information by moving from managing “documents” to managing discrete pieces of open data.
2. A **“Shared Platform”** approach – Helps us work together, both within and across agencies, to reduce costs, streamline development, apply consistent standards and ensure consistency in how we create and deliver information.

3. A **“Customer-Centric”** approach –Allow customers to shape systems and processes by implementing User-Centered Design (UCD) and focusing on business process improvement to influence how we create, manage and present data through websites, mobile applications, raw data sets and other modes of delivery.

These principles and their strategic actions are described in more detail in the sections below.

#### 4.1 Implement the Information-Centric Approach

To unlock the value of digital information, the E-Enterprise community needs to integrate information from multiple sources and deliver seamless access. Rather than thinking primarily about the final presentation—publishing web pages, mobile applications or brochures—an information-centric approach focuses on ensuring our data and content are accurate, available and secure. Providing structured and unstructured information (e.g., through web APIs) helps us architect for interoperability and openness and makes data assets freely available for use within agencies, between agencies, in the private sector or by citizens. In production, the information-centric approach ensures all partners follow the same “rules of the road” by using open standards. It also guides how we present information from mobile applications to websites.

The rich wealth of information maintained by the EPA and state and tribal partners is a national asset with tremendous potential value to the public, entrepreneurs and to our own government programs. This information takes many forms. Traditionally programs have architected systems (e.g., databases or applications) for specific uses at specific points in time. The tight coupling of presentation and information has made it difficult to extract the underlying information and adapt to changing internal and external needs. This has resulted in a duplication of efforts and the building of multiple systems to serve different audiences where a single system could suffice.

An information-centric approach decouples information from its presentation. It begins with the data or content, describing that information clearly, and then exposing it to other computers in a machine-readable format—commonly known as providing web APIs. In describing the information, we need to ensure it has sound taxonomy for searchability and adequate metadata to document authoritative source. Once the structure of the information is sound, various mechanisms can be built to present it to customers (e.g., websites, mobile applications and internal tools) or raw data can be released directly to developers and entrepreneurs outside the organization. This approach to opening data and content means organizations can consume the same web APIs to conduct their day-to-day business and operations as they do to provide services to their customers.

##### 4.1.1 Make Open Data, Content, and Web APIs the New Default

Adoption of open data and open data standards are fundamental to the sharing of data real-time among environmental regulators and the public and with regulated entities. The ability to predict environmental problems, rather than react to them as they occur is also enabled by real-time data collection systems developed with open data standards.

<i>Strategic Actions</i>
4.1.1.1 To lay the foundation for opening data and content efficiently, effectively and accessibly, regardless of source, E-Enterprise partners will identify where open data standards exist that would assist in implementing the architecture and develop plans to evaluate and adopt these standards. Where open data standards don't exist, development will be fostered.
4.1.1.2 E-Enterprise Partners will commit to use open industry standard approaches as the new default for exchanging environmental data across systems of record.

#### 4.1.2 Leverage High-Value Data and Content Available through Web APIs

Recognizing that change will not happen overnight, we need to adopt an efficient and cost-effective implementation strategy that will not place an undue burden on partners to transition all existing systems and information upfront. While the open data and web API policy will apply to all new systems and underlying data and content developed going forward, E-Enterprise will ask programs to bring existing high-value systems and information into compliance over time – a “*look forward, look back*” approach.

<i>Strategic Actions</i>
4.1.2.1 E-Enterprise Partners will develop a governance process for the individual partner and collective use of APIs that allows for individual agency needs to be met with consideration for collaboration across API platforms.
4.1.2.2 E-Enterprise Partners will develop consistent IT standards for all developers in support of environmental data exchange technologies based on existing guidance and best practices to ensure reuse and adoption of externally-facing investments.
4.1.2.3 E-Enterprise will develop a sandbox environment where known developers can test data exchange technologies.

## 4.2 Implement the Shared Platform Approach

To make the most use of our resources and “*innovate with less*,” we need to share more effectively, both across E-Enterprise partners and with the public. We also need to share capacities to build the systems and processes that support our efforts, and be smart about creating new tools, applications, systems, websites and domains. Ultimately, a shared platform approach to developing and delivering digital services and managing data not only helps accelerate the adoption of new technologies, but also lowers costs and reduces duplication. To do so we will use common standards and practices, leverage existing services and contracts, build for multiple use cases at once, participate in open source communities, leverage public crowdsourcing, develop effective shared governance, and launch shared government-wide solutions and contract vehicles.

Government agencies are missing out on opportunities to share ideas and resources within the digital services space. Cloud platforms are critical to more effective sharing of environmental data among environmental partners, collaboration on addressing environmental problems that require interactive modeling among multiple environmental agencies, and an improved ability to match computing resources with workloads.

The shift to a shared platform culture will require strong leadership at the E-Enterprise Leadership Council level. Partners must begin to look first to shared solutions and existing or new infrastructure when developing

projects. To alleviate the burden on individual agencies, prevent duplication and spur innovation, we must provide central support for the adoption of new technologies, development of better digital services, and strengthening of governance. Services provided through existing shared platforms such as the Exchange Network and other collaborative endeavors need to be reevaluated to maximize their contributions to the shared platforms of tomorrow.

#### 4.2.1 Implement Shared Services

There are common challenges that all agencies face in trying to deliver better digital services at a lower cost. Approaching these challenges from an enterprise perspective will enable agencies to focus their time and money on developing innovative, mission-facing solutions rather than re-inventing the wheel.

Identifying opportunities for sharing existing solutions at agencies and building new solutions for government-wide use requires strong leadership, coordination and support. To operationalize the principle of “build once, use many times,” EPA will expand its current efforts and establish robust support for shared services. EPA will support agencies lacking these capabilities, not supersede agencies’ existing capabilities, and function as a cooperative enterprise that draws on resources from across government and leverages the expertise of forward-leaning agencies.

<i>Strategic Actions</i>
4.2.1.1 Incentivize partners to develop and make available shared services that support environmental business processes.
4.2.1.2 Identify and Prioritize Core Shared Service Needs for the E-Enterprise Community and Identify areas that need leadership work to determine the best shared solutions.
4.2.1.3 E-Enterprise Partners will support investment in the core shared capabilities (e.g., federated identity management, API Management Platform, common facility identifier).
4.2.1.4 EPA, States, and Tribes will analyze the existing policies hindering development, adoption and implementation of Shared Services.

#### 4.2.2 Move to Cloud and Shared Hosting

Large commercial cloud vendors offer quickly accessible and scalable hosting. Cloud hosting can be leveraged to support Internet of Things or Shared Sensor Platform. Modeling as a shared resource can be instrumental to predict future problems rather than react to known ones when data eventually are compiled.

<i>Strategic Actions</i>
4.2.2.1 E-Enterprise will support investment in Cloud strategies to enable uses such as sensor-based data extraction, data publication and real-time analytics.
4.2.2.2 EPA will define cloud objectives and milestones through a Cloud Strategy signed by the CIO. New EPA investments and investment modernizations will default to cloud environments.
4.2.2.3 E-Enterprise will create and manage a framework for security architecture, authorization and other elements to enable EE services, interoperability and cohabitation across the Enterprise.

#### 4.2.3 Collaborate Across Organization Boundaries to Improve Delivery of Digital Services

Participating in integrated governance, funding and change management processes are mutual obligations of partners. We will establish new, clearer expectations and options for specific communication channels as well as transparency mechanisms to establish mutual accountability for their use.

New governance models will be needed to get all E-Enterprise partners bought in and investing in new digital approaches. Ongoing measurement will be needed to ensure that the environmental protection benefits outlined throughout are being achieved and that changes in digital components are not disruptive to those participating in these more highly interconnected initiatives.

<i>Strategic Actions</i>
4.2.3.1 E-Enterprise Leadership will establish a shared governance mechanism to oversee and implement this Strategy, an overall Architecture and an implementation Roadmap. This governance will also establish how changes to the Strategy and Architecture are managed to minimize disruptions as circumstances evolve, new technologies become available and lessons are learned.
4.2.3.2 E-Enterprise Partners will evaluate the opportunity to use Third-Party implementation models and outside vendors to manage parts of the Architecture where these approaches offer operational or cost advantages.
4.2.3.3 EPA will ensure that grant funding and other resources provided for IT investments are aligned to and support the E-Enterprise Architecture capabilities.
4.2.3.4 Partners will develop and report against metrics to assess program improvements that result from implementing the EE Architecture.

#### 4.3 Implement the Customer-Centric Approach

From how we create information, to the systems we use to manage it, to how we organize and present it, we must focus on our customers' needs. Putting the customer first means quality information is accessible, current and accurate at any time whether the customer is in the field, the lab, their desk or the classroom. It means coordinating across agencies to ensure when citizens and employees interact with government information and services, they can find what they need and complete transactions with a level of efficiency that rivals their experiences when engaging with the private sector.

Applying the customer-centric principle might lead us to do one or more of the following things:

- Conduct research to understand the customer's business, needs and desires.
- Make content more broadly available and accessible and present it through multiple channels in a program and device agnostic way.
- Make content more accurate and understandable by maintaining plain language and content freshness standards.
- Offer easy paths for feedback to ensure we continually improve service delivery.

The quality of digital services that we provide profoundly affects the customer experience that our employees and citizens have in working for and engaging with us (in addition to adding substantial environmental regulation efficiencies for environmental staff, regulated entities and the public). Digital services include the



delivery of digital information and transactional services (e.g., online forms, permit applications, pollutant discharge submissions) across a variety of platforms, devices and delivery mechanisms (e.g., websites, mobile applications and social media). Regardless of the form they take, these digital services must be designed and delivered with customer service in mind first and reflect the technologies used by today’s customers.

Customer-centric government means that agencies respond to customers’ needs and make it easy to find and share information and accomplish important tasks. It requires holding the partners to a high-standard of timely data, informative content, simple transactions and seamless interactions that are easily accessible. Partners will serve regulated entities, citizens, and EPA, State and Tribal users by designing systems and interfaces with them in mind. We must embrace the ability of new technologies to drive participation in the digital public square. To develop innovative, transparent, customer-facing products and services efficiently and effectively, E-Enterprise partners must also focus on the fundamentals of customer-centric design: measure how well we are providing meaningful services; focus our efforts on those interactions that have the most use and value; institutionalize performance measurement; and continuously improve services in response to those measurements.

#### 4.3.1 Absorb the Complexity of the Government

To change to a culture of customer service, our IT interfaces need to start absorbing the complexity of the Government on behalf of the citizen. Customers don't know — and don't care to know — how government is organized. Often our current approaches force users to go from agency website to agency website to get the full picture of what government has to offer on any subject.

#### 4.3.2 Deliver Better Digital Services Relying on User-Centered Design and Design Thinking

Practicing user-centered design (UCD) will involve more environmental partners and other users of the data from the beginning to determine the best approaches to maximize the usability of the data being collected. This is a key component in moving from paper-oriented data collection systems to systems that collect and provide the information needed today to solve environmental problems faster.

<i>Strategic Actions</i>
4.3.2.1 Partners will share lessons learned and outcomes from UCD practices and develop best practices and standards and a community of practice.
4.3.2.2 E-Enterprise community strongly recommends UCD as a required support function to all investment modernizations and new development efforts and will ensure transparency in the status of UCD in all major assets.

## 5.0 E-Enterprise Digital Architecture Version 1.0

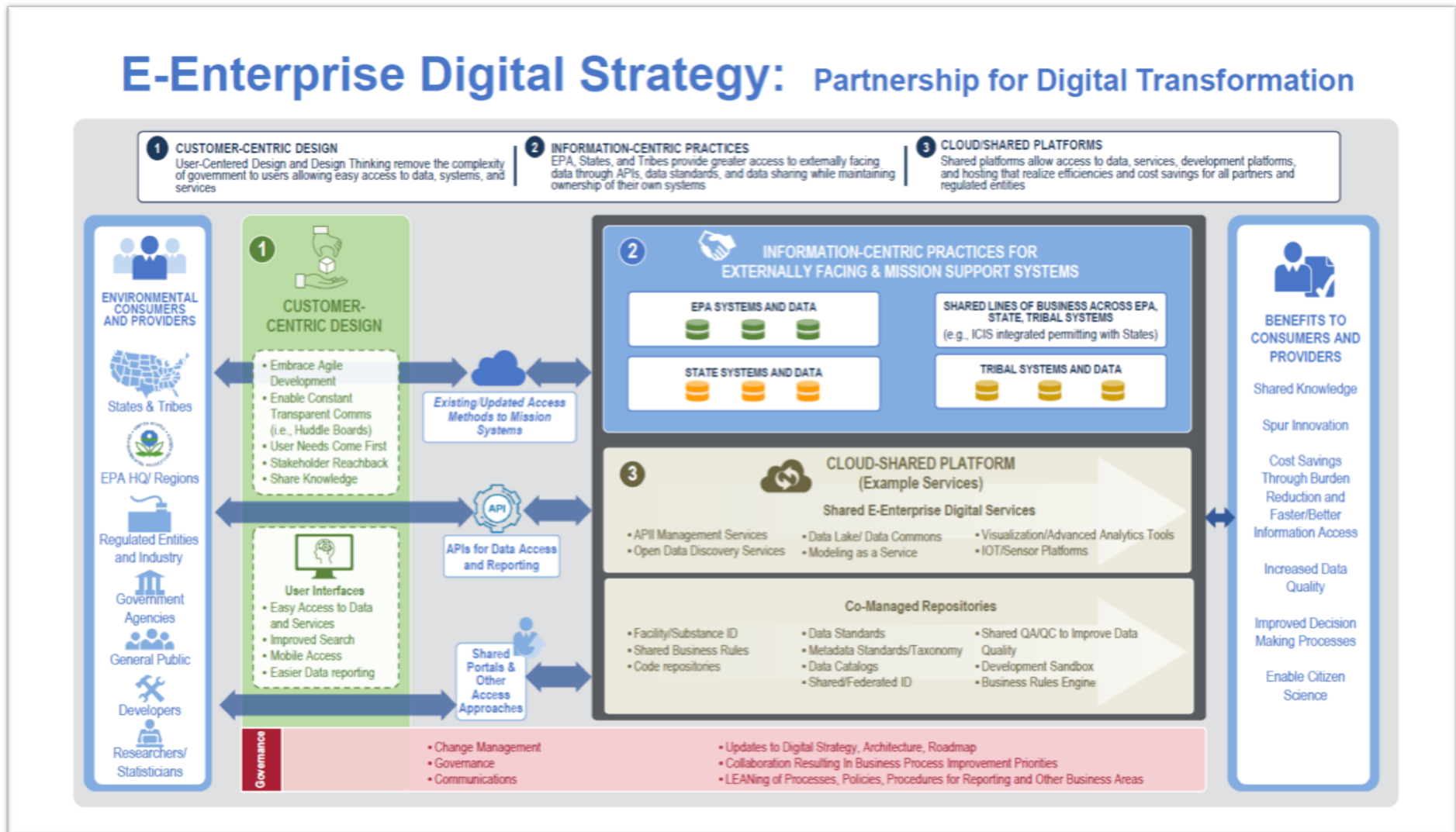
The E-Enterprise Architecture is designed to specify the core technical capabilities that allow partners to improve environmental protection. *Figure 1: E-Enterprise Digital Strategy Architecture V 1.0* provides an overview of the architecture and an initial list of core shared components. It is based on the following core premises:

- a) EPA, States and Tribes will manage their own agency architectures and systems.
- b) Some services (provided by EPA and others) are core and will be managed cooperatively.

Version 1.0 of the architecture focuses on the minimal set of core components that must or should be implemented by E-Enterprise as a community to achieve the economies scale, efficiencies and improved integration. Some components, such as identity management, must be implemented as a community to function effectively. Other components, such as data analytics, are included where the economies of scale and synergies are so compelling that they merit the overhead cost of building shared resources.

E-Enterprise partners will implement agile-based pilot projects to develop the major components of the architecture relying on teams of EPA, State and Tribal staff. These pilots will result in proofs of concepts that can be evaluated for more complete investment as their value is realized and lessons about future architecture learned.

Figure 1: E-Enterprise Digital Strategy Architecture V 1.0



## Appendix A: Innovative Digital Initiatives

The follow are three examples of improvements in Environmental Protection resulting from Innovative Digital Initiatives.

### Faster, More Efficient Permitting by States Integrating Local NPDES Permitting with EPA's ICIS System

EPA's Integrated Compliance Information System (ICIS) National Pollutant Discharge Elimination System (NPDES) Electronic Reporting Tool (known as NeT) allows reusability of components, saves the states the costs of developing and hosting their own systems, and reduces the reporting burden for the regulated community by creating a single system of record and standardizing the reporting experience. The system also uses a widget on the E-Enterprise Portal as a method of reporting permit status.

This tool is using a cloud platform to implement required NPDES electronic reporting programs. This modernization effort is maximizing cloud services provided by Microsoft Azure to better manage APIs and microservices being built for each permit and supporting business process. This architecture relies heavily on a subset of application management functionality, platform-as-a-service (PaaS) and automation for scaling and provisioning. One state has integrated their local Multi Sector General Permit (MSGP) reporting into NeT, and several states are in the pipeline to integrate multiple permits as well.

### Shared Identity Management

New Mexico, Wyoming, and North Dakota, working with EPA, implemented a pilot to leverage open standards and shared infrastructure to allow staff and regulated entities seamless access to designated data and resources in their partner agencies and the E-Enterprise Portal. This shared infrastructure provides enhanced environmental protection capabilities:

- Improved staff decision-making by providing peer-to-peer access to partner agency data, models and other resources.
- Reduced burden and improved customer experience for regulated entities by allowing them seamless navigation from partner to partner (including to/from the EE Portal) and the use of common, best-of-breed tools for their specific business needs.
- Better access to common shared EE resources, for example, as common modeling, workflow and other resources are deployed, staff (and regulated entities) can access them, enabling both economies of scale and sharing of the expertise and best-of-breed environmental practices embedded in these resources.

### Sensors Leading to Real-Time Water Quality Monitoring:

EPA's Office of Water Interoperable Watersheds Network project provides a platform to integrate real-time monitoring data from many different federal, state and local sensor projects. It demonstrates the power of open standards, cloud platforms and leveraging partnerships of both co-regulators and software providers to enable discovery and access of a variety of water quality data especially real time data from water quality sensors. The pilot also identified areas where more standards and technical design work is needed. The ability to discover and access these new types of distributed data sources at a large scale directly supports improved staff decision by enabling more rapid and simple access to more and new kinds of data in models and other analytic tools.

## Appendix B: Summary of Principles and Strategic Actions

The following table provides a summary of the Digital Strategy's principles and strategic actions.

Number	Principles and Supporting Strategic Actions
<b>4.1 Implement the Information-Centric Approach</b>	
<b>4.1.1</b>	<b>Make Open Data, Content, and Web APIs the New Default</b>
4.1.1.1	To lay the foundation for opening data and content efficiently, effectively and accessibly, regardless of source, E-Enterprise partners will identify where open data standards exist that would assist in implementing the architecture and develop plans to evaluate and adopt these standards. Where open data standards don't exist, development will be fostered.
4.1.1.2	E-Enterprise Partners will commit to use open industry standard approaches the new default for exchanging environmental data across systems of record
<b>4.1.2</b>	<b>Leverage High-Value Data and Content Available through Web APIs</b>
4.1.2.1	EE Partners will develop a governance process for the individual partner and collective use of APIs that allows for individual agency needs to be met with consideration for collaboration across API platforms.
4.1.2.2	EE Partners will develop consistent IT standards for all developers in support of environmental data exchange technologies based on existing guidance and best practices to ensure reuse and adoption of externally-facing investments.
4.1.2.3	E-Enterprise will develop a sandbox environment where known developers can test data exchange technologies.
<b>4.2 Implement the Shared Platform Approach</b>	
<b>4.2.1</b>	<b>Implement Shared Services</b>
4.2.1.1	Incentivize partners to develop and make available shared services that support environmental business processes.
4.2.1.2	Identify and Prioritize Core Shared Service Needs for the E-Enterprise Community and Identify areas that need leadership work to determine the best shared solutions.
4.2.1.3	E-Enterprise Partners will support investment in the core shared capabilities (e.g., federated identity management, API Management Platform, common facility identifier).
4.2.1.4	EPA, States, and Tribes will analyze the existing policies hindering development, adoption, and implementation of Shared Services.
<b>4.2.2</b>	<b>Move to Cloud and Shared Hosting</b>
4.2.2.1	E-Enterprise will support investment in Cloud strategies to enable uses such as sensor-based data extraction, data publication and real-time analytics.
4.2.2.2	EPA will define cloud objectives and milestones through a Cloud Strategy signed by the CIO. New EPA investments and investment modernizations will default to cloud environments.
4.2.2.3	E-Enterprise will create and manage a framework for security architecture, authorization and other elements to enable EE services, interoperability and cohabitation across the Enterprise.
4.2.2.4	EPA, States, and Tribes will analyze the existing policies hindering development, adoption and implementation of Shared Services.

Number	Principles and Supporting Strategic Actions
<b>4.2.3</b>	<b>Collaborate Across Organization Boundaries to Improve Delivery of Digital Services</b>
4.2.3.1	E-Enterprise Leadership will establish a shared governance mechanism to oversee and implement this Strategy, an overall Architecture and an implementation Roadmap. This governance will also establish how changes to the Strategy and Architecture are managed to minimize disruptions as circumstances evolve, new technologies become available and lessons are learned.
4.2.3.2	E-Enterprise Partners will evaluate the opportunity to use Third-Party implementation models and outside vendors to manage parts of the Architecture where these approaches offer operational or cost advantages.
4.2.3.3.	EPA will ensure that grant funding and other resources provided for IT investments are aligned to and support the E-Enterprise Architecture capabilities.
4.2.3.4	Partners will develop and report against metrics to assess program improvements that result from implementing the EE Architecture.
<b>4.3 Implement the Customer-Centric Approach</b>	
<b>4.3.1</b>	<b>Absorb the Complexity of Government</b>
<b>4.3.2</b>	<b>Deliver Better Digital Services Relying on User-Centered Design and Design Thinking</b>
4.3.2.1	Partners will share lessons learned and outcomes from UCD practices and develop best practices and standards and a community of practice.
4.3.2.2	Enterprise community strongly recommends UCD as a required support function to all investment modernizations and new development efforts and will ensure transparency in the status of UCD in all major assets.