EFFECTIVE AND INTEROPERABLE IMPLEMENTATION OF NIEM

Achieving effective and efficient governmental operations in typical and emergency situations relies heavily on sharing information between organizations across jurisdiction and domain boundaries. As a result, there are hundreds of thousands of government organizations that have a critical need to share information. Traditionally, these agencies have operated under significant autonomy, which has given them considerable control over their internal business process and technology choices. While this autonomy has allowed each agency to optimize process and technology to more effectively meet the unique challenges of its stakeholders and environment, the same autonomy has created a very diverse and heterogeneous information sharing environment. As a result, the only way to achieve efficient information sharing in this environment is through interoperability.

One of the main challenges to information sharing in a diverse, heterogeneous environment is the silos of information and functionality typical to this environment. Further, the systems responsible for the information and functionality are implemented using different technologies, networks, hardware and software. This usually results in information-sharing realized as point-to-point integration between disparate systems, which is extremely costly to implement, manage and maintain.

This paper presents an approach to architecting and implementing information sharing solutions that leverage the National Information Exchange Model (NIEM) as its main building block to promote interoperability. Additional benefits of this implementation approach are agility, scalability and cost efficiency through the leveraging of existing investments and the reuse of information sharing assets.

One of the first challenges of information sharing across domain and jurisdiction boundaries is the diversity of information government organizations collect and process. The traditional autonomy these organizations have had also leads to different business processes and a variety of interpretations of the information. NIEM resolves this challenge by creating a canonical data model, a data dictionary and markup language constructs that allow standardization of the meaning and structure of information for a single domain, as well as across domains. That is the first step to resolving the interoperability challenge. Consistently using NIEM for the purposes of information sharing allows government organizations to use a well-described and understood common vocabulary and data structure.

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The next step in defining an interoperable approach to information sharing requires a consistent way of constructing and documenting the messages exchanged between government organizations. A NIEM Information Exchange Package Documentation (IEPD) fulfills this requirement by establishing a well-defined IEPD structure and development lifecycle.

The IEPD Package Template provides a predefined folder structure and naming convention for the IEPD artifacts. The IEPD Package Template also contains files that can be used as templates for creating certain artifacts such as the IEPD catalog, IEPD metadata, IEPD main document, etc. The IEPD lifecycle begins with scenario planning and the analysis of high-level business requirements and goes through many stages before the final IEPD is assembled and published. The final task of the IEPD lifecycle is implementation. The approach to this task is critical for the success of the information exchange for which the IEPD was developed.
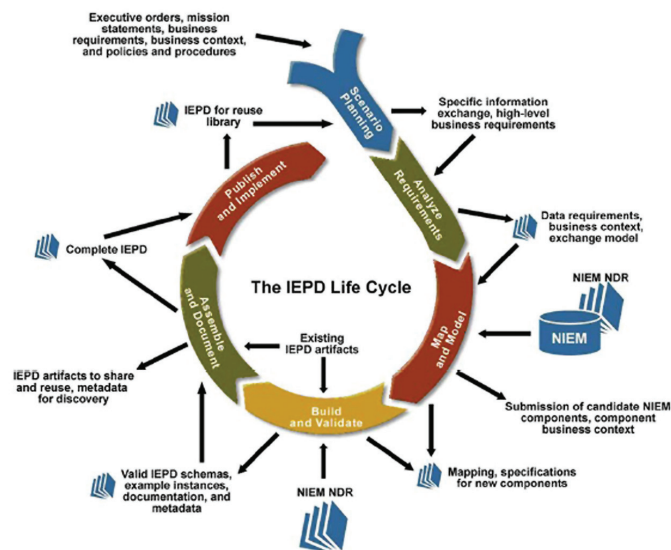
While addressing the data and message layer concerns is an important step in solving the interoperability puzzle, there are other significant challenges that should be considered. These challenges are best addressed by a complete information sharing architecture. While there are many information sharing architecture styles, industry and government best practices have established service-oriented architecture (SOA) as a strategy for overcoming interoperability challenges while providing the benefits of business agility and future scalability, among many others. This approach was endorsed by the Global Advisory Committee in its 2004 recommendation as the most effective architectural style for the national justice community. The architecture principles of SOA are especially applicable to cross-domain and cross-jurisdiction information sharing.

The benefits of service-oriented architecture are best described in a recent statement from some of the most renowned contributors to SOA development at http://www.soa-manifesto.org:

"Service orientation is a paradigm that frames what you do. Service-oriented architecture (SOA) is a type of architecture that results from applying service orientation. We have been applying service orientation to help organizations consistently deliver sustainable business value, with increased agility and cost effectiveness, in line with changing business needs.

Through our work, we have come to prioritize:

Business value *over technical strategy*
Strategic goals *over project-specific benefits*
Intrinsic interoperability *over custom integration*
Shared services *over specific-purpose implementations*
Flexibility *over optimization*
Evolutionary refinement *over pursuit of initial perfection*

That is, while we value the items on the right,
we value the items on the left more."

SOA, as defined by the Organization for the Advancement of Structured Information Standards (OASIS), is a paradigm for organizing and using distributed capabilities that may be under the control of different ownership domains. In the real world, organizations and people develop capabilities to solve problems or support solutions for their needs. Often, these capabilities solve the needs of other organizations and, as such, may be offered as services to those organizations with such needs. This can be logically extended into the distributed computing world as one computing agent providing the capabilities to support the needs of another computing agent.

SOA provides the framework to match needs and capabilities. The ability to bring the capability to bear is a service, which is a central concept in SOA. The entities that offer capabilities are service providers and the entities with needs that make use of the services are service consumers. Services are published in service directories that allow discoverability and visibility of the available services to potential service consumers.
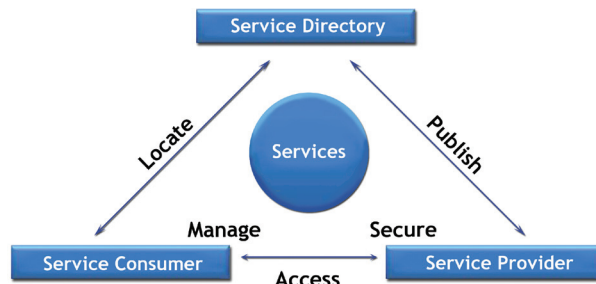
Many approaches and technologies can be leveraged to deploy architectures based on SOA principles, but the most common implementations use Web Services. The wide use of Web Services is mainly because Web Services use eXtensible Markup Language (XML) for communication, leverage open nonproprietary standards, and are both self-containing and self-describing. The above characteristics make Web Services very suitable for implementing interoperable, agile and scalable information sharing architectures. Applying SOA to resolve information sharing challenges is effectively leveraged by the Global Justice Reference Architecture (JRA), a technical implementation architecture that addresses the full range of information sharing use cases and provides a comprehensive blueprint for implementing interoperable data sharing services and capabilities. This dynamic interoperability strategy will help prevent incompatibilities and guide vendors and organizations on how to fit information sharing components together and facilitate communication and interoperability between disparate communities.

The Global JRA is composed of a set of specifications, guidelines and infrastructure requirements for implementing SOA in the justice and public safety environment. The JRA also provides guidance on how to leverage NIEM, the Global Federated Identity and Privilege Management (GFIPM) framework, the Business Process Modeling Notation (BPMN), the Justice Information Exchange Model (JIEM), and other industry and open standards and best practices in an SOA context, and aims to simplify the process of implementing SOA. It is very important to note that while developed for justice and public safety agencies, the JRA can be leveraged by agencies representing other domains.

An important key for realizing the benefits of service orientation is identifying and prioritizing the services to be implemented. Considering business drivers and objectives, performing business decomposition and interaction analysis early in this process is critical. Taking into account the technical constraints of the current implementation and deployment environment is an essential factor. A methodology for meeting these objectives is described in the JRA Guidance for Designing and Identifying Services (JRA-GIDS).

The JRA Web Services Service Interaction Profile (WS-SIP) demonstrates how to implement the information sharing requirements common for the criminal justice and public safety community, such as authentication and authorization, message integrity and confidentiality, reliability, etc., leveraging the Web Services standards. The rationale behind the WS-SIP is that just saying "Web Services" is not enough to ensure interoperability or even guarantee use of particular standards. There are many, sometimes conflicting, notions of what "Web Services" means. The WS-SIP addresses that problem by giving practitioners a specific "path" through the Web Services standards that ensures interoperability between consumers and providers who adopt Web Services for SOA implementation.

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Another key JRA artifact is the Service Specification. A Service Specification is a formal documentation of the capabilities made available through a specific service, including:

- The JRA-SSP is a collection of documents, templates and artifacts describing the above-mentioned aspects of a service and enables two of the main principles of service orientation—discoverability and visibility.

- The JRA-SSG presents in detail the elements of the JRA-SSP and guides consumers and providers in creating and utilizing the package. The JRA-SSG also defines the conformance requirements to be followed when developing JRA-SSPs.

JRA SSPs are similar to NIEM IEPDs in that they document the conceptual, logical and physical models of a service in the same way NIEM IEPDs document the conceptual, logical and physical models of the information comprising an exchange. Also, as with IEPDs, service specifications are a composite set of documentation, models, policies, contracts and schemas that together provide a clear view of the service's capabilities and its business and technical requirements. Furthermore, IEPDs and SSPs complement each other and work in tandem to describe a service. IEPDs are critical components of the JRA-SSP, since they are used as an integral part of the package to describe the information model of the service. One of the key advantages of applying the Global JRA is that it provides guidance for architecting information sharing solutions by leveraging and incorporating into a common framework a collection of industry and open standards. Provided below is an approach and a vision of how an organization can use a predefined set of standards, guidelines and artifacts to achieve interoperable, agile and scalable information sharing.
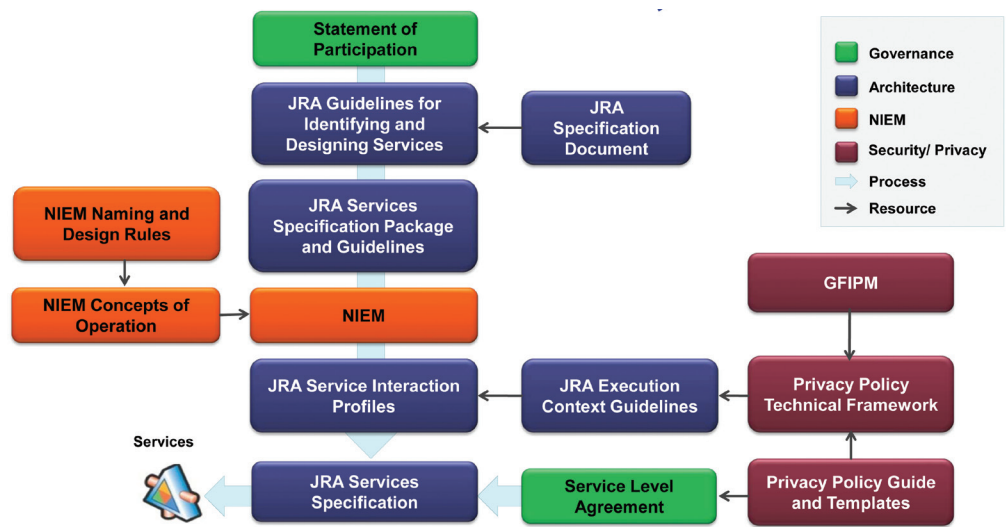
All of the artifacts presented in the diagram are available at http://www.niem.gov and http://it.ojp.gov.

Following this approach increases the interoperability, agility and scalability of the resulting information sharing systems. Another key benefit of this approach is that it promotes leveraging legacy systems and thus results in the reduction of information sharing costs. In addition, this approach enables service reuse and allows the use of the resulting services as enterprise assets, which has the potential of additional exponential cost savings as existing services are leveraged for new exchanges or tasks through reuse.
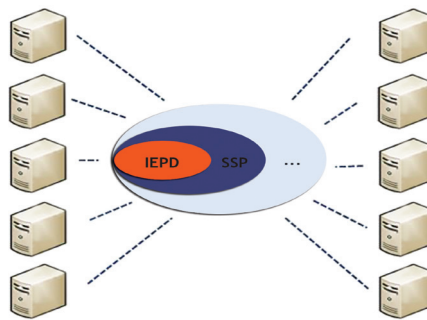
The content for this article was taken from the NIEM Practical Implementer's Course. For more information about this course or to refresh your knowledge, see www.niem.gov/training.php

References:
http://www.niem.gov - National Information Exchange Model
http://it.ojp.gov/globaljra - Global Justice Reference Architecture
http://www.soa-manifesto.org - SOA Manifesto

Additional technical implementation information can be found in the technical brief titled "Using NIEM with Web Services," available at http://www.search.org/files/pdf/WSandNIEM-IEPD.pdf

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