

Open Justice Broker Concept Paper

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As anyone knows who has tried to do it: Automating justice information flows and integrating justice systems are complex, difficult undertakings. The governance, policy, and business process issues are challenging enough, and then projects must deal with the complex set of national and industry standards and technologies involved in an information sharing system.

For several years, the national justice community has been working on making justice integration less challenging. Efforts like the Global Justice Information Sharing Initiative (Global) and the National Information Exchange Model (NIEM) have documented best practices—some in the form of standards and models—of what has proven effective in implementing justice information sharing. These efforts have resulted in a series of standards and guidelines to assist implementers in building their solutions.

However, each implementation must still approach the building of standards-conformant integrated justice systems from the ground up. First, projects must select basic infrastructure technologies from a wide range of vendors. But basic infrastructure products, like message brokers and middleware solutions, do not support justice business processes or community standards out of the box, so the next daunting step is to design information flows, specify exchanges, implement support for privacy and security policies, and “wire” exchanges up to partner agency systems.

The technical tasks of selecting infrastructure and implementing exchanges and automated information flows require a deep level of technology expertise that many jurisdictions find difficult to attract and maintain. Public sector technology staff are often already oversubscribed, and hiring new staff is difficult in strained economic times. Middleware infrastructure vendors’ consultants have deep knowledge in their products, but often lack general knowledge of industry standards and generally have little understanding of the justice business. Consultants with expertise in justice information sharing often lack deep knowledge of middleware technologies.

And while each jurisdiction is unique in some ways, the information flows and exchange contents are quite similar. The requirements on

the basic infrastructure components are very similar as well, regardless of the specific goals of each project. Much of the underlying support for enforcing privacy and security policy requirements is the same. These similarities create a great opportunity for implementing the justice community standards in an off-the-shelf solution that jurisdictions can share and continue to evolve collaboratively. If accomplished in a true collaborative fashion, practitioners can ensure that the future of the platform aligns with their operational requirements and needs—that is, accomplishing the long-standing best practice of the business requirements driving the technology solution. In addition, there is an opportunity for jurisdictions to pool their resources and foster, develop, and maintain technical experts with the adequate depth of knowledge in the shared solution as well as the underlying justice business processes.

This opportunity is strengthened by the emergence over the past few years of highly reliable, robust, standards-compliant basic infrastructure platforms, as open source products. These platforms offer a viable, low-cost foundation for building a common justice information sharing platform that can grow under the collaborative ownership of its users.

In other words, the time is right for the justice community to build upon its history of collaborative standards development, by collaborating again on an implementation of those same standards. The purpose of this paper is to describe a justice information sharing platform—called the **Open Justice Broker** (OJB)—that accomplishes this goal. The paper presents the OJB concept in three key areas:

1. **Features:** What the OJB does (p. 2)
2. **Function:** How the OJB works (p. 5)
3. **Benefits:** Why the OJB is useful, valuable, and worth paying for (p. 8)

The intended audience of this document is justice practitioners and senior technology leaders who are responsible for implementing policies, systems, and architectures for information sharing in their jurisdictions. Its goal is to provide this audience with enough information about the OJB concept for practitioners to determine if the OJB would support their missions, and to solicit suggestions for improvement of the concept.

Features: What the OJB Does

The OJB is a technological capability that manages the transmission of information (data) between business partners, ensures proper application of policy rules such as security, privacy, and reliable delivery, and supports the routing, transformation, and validation of information as it transits the system. The OJB will be “pre-configured” with the principal justice information sharing standards:

- Workflows as defined in the Justice Information Exchange Model (JIEM)
- Message structures as defined by the National Information Exchange Model (NIEM) and Information Exchange Package Documentation (IEPDs) for individual exchanges
- Message transmission, routing, transformation, and validation as defined by the Justice Reference Architecture (JRA)
- Privacy and access control as defined by the Global Federated Identity and Privilege Management (GFIPM) initiative

While the broker will implement these standards “out of the box”, it will also be completely customizable to local needs.

The foundation of the OJB would consist of open source software components¹, including a web services engine and enterprise service bus (ESB). All of these components are available under open source software licenses, which grant users access to the source code as well as executable versions of the components; they are available at no licensing cost via download from the project websites. The components are applications and libraries built on the Java 2 Standard Edition (J2SE) platform, which allows them to run on virtually any computing platform or operating system in existence today. All of the components have an active, robust development community with strong involvement by non-profit and for-profit organizations, including many of the leaders from web services standards bodies. The components conform to the relevant guidance in the JRA. These components are, in short, more standards-compliant and just as reliable, secure, and robust as equivalent offerings available from major software vendors.

The combination of open source licenses and a J2SE-based component model results in the most open, least proprietary architecture for these components, maximizing their “fit” in the wide range of state, local, and tribal information technology environments, and eliminating any dependence on a particular vendor, computing platform, or operating system.

The ESB and web services components both contain support for clustering and failover, allowing them to scale as needed to handle large volumes of information exchange, and enabling a wide variety of deployment strategies. Failover support allows the components to meet the high availability and reliability requirements common to integrated justice scenarios. The components support robust security, relying on the inherent security of the J2SE platform, as well as application-specific security that controls access to the components’ functionality.

¹ Several viable and full-featured open source web services and enterprise service bus components are now available from industry. A final choice of specific components will be an initial goal of the OJB development effort.

The OJB ESB

The OJB ESB component supports what the JRA calls “intermediary” capabilities; these are software components that receive messages and apply business rules or policies to them. While it is possible to develop an intermediary that does virtually anything, the most common intermediaries in integrated justice (and recognized by the JRA) are:

- Transformers, that change the format of an incoming message to a different format required by a downstream recipient or process; this can include removing information from a message if necessary
- Routers, that examine the contents of a message and apply business rules or policies to determine where the message should go next
- Validators, that check the contents of a message against edits or other business rules to determine its validity and integrity
- Loggers, that keep a record of messages (including select information contained in the message, if necessary) sent through the system

The OJB will support the ability of jurisdictions to develop their own intermediaries of these four types, or in fact of any kind of intermediary that the underlying ESB supports. However, one of the chief benefits of the OJB will be that it will ship pre-configured with a set of intermediaries that implement the common justice information flows documented in the JIEM Adult Felony Reference Model. In addition, the OJB will expose the “entry points” to these workflows as services that conform to the JRA, and whose information models consist of GJXDM or NIEM “reference IEPDs” that the national justice community has developed over the past several years². As the community develops additional reference models, service specifications, or IEPDs, they will become candidates for incorporation into the OJB’s off-the-shelf workflows.

Packaged Capabilities

The OJB ESB will contain pre-built, configurable capabilities that meet critical, common justice information sharing requirements. These capabilities will expand over time as user demand dictates.

- The OJB will incorporate an open source implementation of the components identified in the Extensible Access Control Markup Language (XACML) standard, version 2.0. This component will allow OJB users to specify machine-executable privacy policies, in accordance with the Global Federated Identity and Privilege Management (GFIPM) specification. There are two principal open source XACML implementations; further research will determine which of these would be the better option for OJB, and whether any customization/integration work would be required.

² Most of the reference IEPDs in existence today (May 2009) are GJXDM IEPDs, not NIEM IEPDs. (There are some notable exceptions, such as N-DEX and the Suspicious Activity Report (SAR) IEPD.) Hopefully, the GJXDM IEPDs will migrate to NIEM over time. For members that wish to use NIEM IEPDs, and where none are available, the migration could be an effective use of members’ staff share (see below).

- The OJB will include a subscription/notification capability³. This will include:
 - A web application that allows justice practitioners in the jurisdiction to register for notifications that the jurisdiction enables; this will include allowing users to register their contact information. The detailed design of this application still needs to be determined.
 - A capability to interface with existing user directories, such as Active Directory or LDAP, to avoid having users re-enter their contact information
 - A capability allowing administrators to configure intermediaries that recognize events triggering notification
 - Intermediaries to handle notification
 - Conformance with the WS-Eventing standard.
- Intermediaries to handle transformation between GJXDM IEPs and NIEM IEPs.
- The OJB will include a generic federated query capability.
- The OJB will include geographic information capabilities, including geocoding and transforming messages into XML-based GIS standards such as KML.

Partner Connectivity

The OJB will include software components that reside in each partner agency's environment, for the purpose of interfacing with the agency's internal systems. These components represent a sort of "gateway" that translates between the standards-conformant protocols and formats of the OJB and the agency- and vendor-specific protocols of the internal agency environment. These components (called "adapters" and "connectors", in conformance with the Global JRA) will often be "one-off" components, to the extent agencies in particular jurisdictions have custom-built or unique systems. However, over time, the OJB should also develop an inventory of standard, pre-built adapters and connectors designed to interface with common off-the-shelf systems (such as police records management systems, prosecution case management systems, court case management systems, etc.)

The adapters and connectors at each agency communicate directly with the OJB ESB, where the execution of business logic of integration and information sharing (including policy enforcement) takes place.

³ It is a design goal to leverage the benefits of the Law Enforcement Exchange Specification (LEXS) to support a flexible, extensible, and reusable subscription/notification mechanism. While this capability would also support other message meta-structures beyond LEXS as dictated by user demand, LEXS makes it much easier to build a generic subscription/notification capability.

Function: How the OJB Works

A principal goal of the OJB is to serve as a functional reference implementation of the Global JRA. As such, it transmits data between partners over existing data networks in conformance with the web services standards specified in the JRA. It also implements standards, where appropriate, for the definition and deployment of intermediaries (the “business logic” components that reside in the ESB and route, transform, and validate information as it flows through the system, while also enforcing privacy and security policies.)

This section provides more detail on how the OJB works. It necessarily requires some discussion of the underlying technologies, standards, and protocols. Consequently it is intended for more technology-savvy readers.

The OJB ESB

The ESB portion of the OJB will typically reside in a central location, often hosted by a central technology organization in the state, county, municipality, or tribal community that operates it. It requires network connectivity to each of the partner agencies (specifically, the service and consumer containers that reside at each partner location).

Standard information flows and structures as specified by IEPDs will be “pre-packaged” and “pre-configured” in the ESB.

The OJB Service and Consumer Containers

The OJB will include service and consumer containers. These containers reside at the partner agencies in the jurisdictions—the locations where line-of-business systems like records management and case management systems reside—and are responsible for sending and receiving messages to/from the OJB ESB. (The service container is on the receiving side of a message exchange, while the consumer container resides on the sending side.) The messages that the containers send and receive will conform to the JRA Web Services Service Interaction Profile (WS-SIP), and will fully support all the JRA service interaction requirements specified in the SIP, including security (authentication, authorization, integrity, confidentiality, non-repudiation) and reliable delivery. The containers’ reliable delivery mechanisms will conform to the requirements of the WS-ReliableMessaging standard, and will include database persistence of messages in transit for maximum failure recovery capabilities. The containers will support both synchronous and asynchronous message exchange, and will fully support the WS-Addressing standard as required by the WS-SIP. The containers will also support both the SOAP with Attachments specification required by the WS-SIP, as well as the emerging Message Transmission Optimization Mechanism (MTOM) standard; these standards improve the performance of sharing binary information common to many justice information sharing scenarios, such as photos and biometric data.

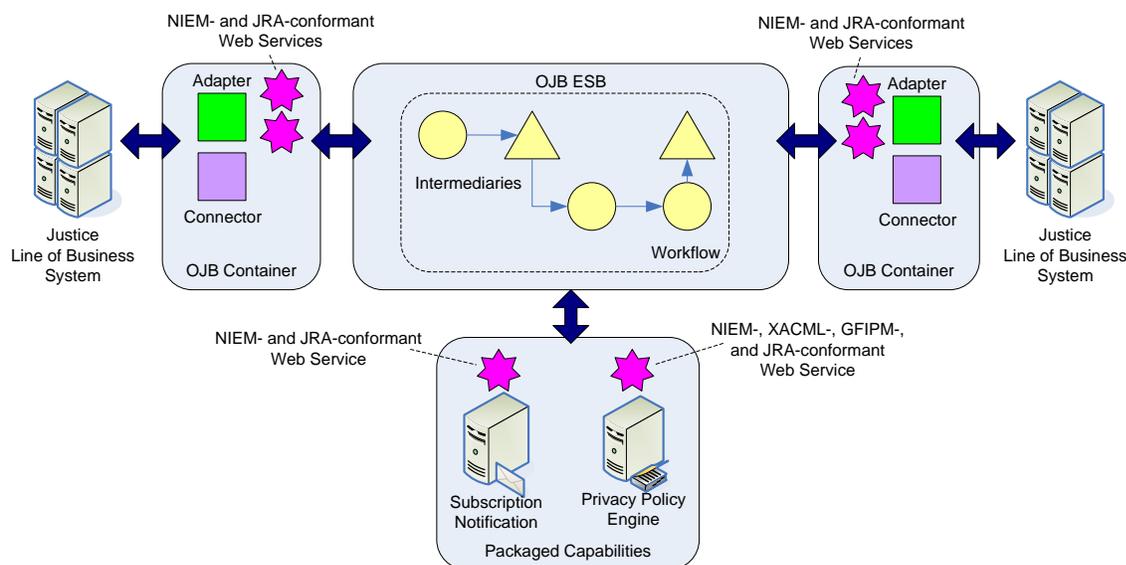
Note that for both the ESB and Containers, the OJB does not include hardware or investments in network connectivity. In most cases, jurisdictions will be able to reuse existing hardware for initial deployments of the OJB; in cases where this is not possible, the necessary hardware is modest in cost (a low-end server class machine will be adequate for initial implementations).

Adapters and Connectors

The service and consumer containers will host adapters (on the service side) and connectors (on the consumer side) that “service-enable” the functionality in line-of-business systems. As the OJB cooperative develops or acquires adapters from the primary justice line-of-business system vendors, it will make these adapters available to the cooperative members. Over time, and consistent with member needs, the OJB will contain a set of pre-built, generic adapters that provide access to national standard services, such as N-DEX.

Note that the OJB will not be guaranteed to include the specific adapters and connectors that a particular member needs, though over time, as more members join, the expectation is that more adapters will be available for reuse from other members. This is not a disadvantage of the OJB approach—jurisdictions would need to invest in building or buying adapters and connectors for their systems if they purchased and deployed a generic commercial broker as well. The OJBC provides a forum in which members can seek reuse opportunities for adapters and connectors; the OJB cooperative staff will also develop expertise in building adapters and connectors that are tailored to the common justice integration workflows.

Development of adapters and connectors, and negotiation with line-of-business system vendors regarding development of these components, would be an effective use of a member’s staff share (see below).



Support and Maintenance

Justice practitioners gain access to the OJB by joining the Open Justice Broker Cooperative (OJBC), which includes payment of an annual membership fee. The exact amount of the membership fee has yet to be determined, but the target amount is approximately what a jurisdiction would pay for annual support and maintenance on a “generic” commercial middleware solution—that is, the middleware software only, without any built-in support for justice workflows, exchanges, and capabilities. The rationale behind this target is for practitioners to leverage the low cost of open source software and sharing of components with other jurisdictions to reduce the expense of the basic capability, while investing their resources in customization, connectivity, and other activities of direct benefit to their initiative or project.

The annual membership fee covers the following services, in addition to providing access to the OJB components described above.

- Access to .25 FTE of an expert technical resource that can assist with any task(s) related to planning, implementation, and support of the OJB, as well as implementation of specific information exchanges on the OJB
- Access to any updates, including exchanges, workflows, policies, etc. that are developed in other jurisdictions and shared with the cooperative
- A voice in the future direction of the Cooperative

The sharing of expert staff resources via the Cooperative is an important and unique aspect of the OJB approach. The OJB staff will have expert-level knowledge of the foundation web services and ESB components, service-oriented architecture, web services standards, and justice community standards; as such, the staff will be well-positioned to provide critical guidance on each member jurisdiction's information sharing projects. The staff will also have deep business knowledge and expertise, and will understand the broader business and policy implications of information sharing. The staff will serve as an important conduit of best practices and reusable components across participating jurisdictions.

The membership fee will include one staff share, equal to .25 FTE of an expert resource. It will be a goal of the Cooperative to support jurisdictions with larger projects requiring more than .25 FTE of a staff share. Strategies for supporting this will be a topic of further research as the Cooperative is established.

Benefits: Why the OJB is Useful, Valuable, and Worth Paying For

The service offering would go a long way towards solving two problems common to integrated justice initiatives: the high cost and lengthy implementation cycles of solutions.

Saving Members Money

The OJB will save cooperative members money. The annual membership fee is approximately what a member would pay to a vendor for annual maintenance of a low-end integration platform. However, implementing a proprietary justice broker has additional costs that cooperative members would not have to pay, such as:

- An up-front licensing cost, which could be anywhere from a few hundred thousand dollars to over one million dollars
- Consultant or staff time and expenses to implement intermediaries and define service specifications, rather than reusing (and perhaps modifying) the components built into the OJB
- High consultant fees or staff recruitment difficulties inherent in using a proprietary broker or integration platform (proprietary solutions generally have fewer consultants available on the open market, and it is very difficult to find skilled staff)
- Incurring the costs of lower productivity by utilizing staff and/or contractor technicians that lack expertise in SOA, the JRA, NIEM, GFIPM, XACML, and the other standards incorporated in the OJB
- Expense involved in either acquiring proprietary subscription/notification and policy enforcement (XACML) implementations, rather than using the built-in capabilities of the OJB

In addition to the savings for any single cooperative member, as a group, the members will save money overall by pooling their resources and experiences, and sharing the outcomes of their projects. For instance, if one member develops and deploys a set of privacy rules in XACML, other members could (with the original member's permission) bring those rules into their own installation of the OJB and reuse them. As members develop adapters or intermediaries, they can automatically share those with other members. Over time, and across the entire cooperative, the members will see significant savings of development resources from reusing each others' work.

Finally, surplus cooperative revenue above costs is returned to the members via the cooperative, for their benefit, consistent with the ends (goals and objectives) they have established.

Saving Members Time

The service offering will also accelerate the nationwide implementation of integrated justice. Membership in the cooperative gives a member full access to all the intermediaries and workflows inherent in the JIEM Adult Felony Reference Model; this will represent a reusable, default implementation of the entire justice information flow. In addition, the OJB will include pre-built service specifications that conform to JRA and NIEM standards, so jurisdictions do not need to build NIEM IEPDs and web services descriptions from scratch. (Members should, however, expect to review these specifications and make any changes dictated by local requirements.) The OJB will also accelerate the adoption of privacy best practices, by providing a ready-to-deploy implementation of XACML that in turn enables quicker adoption of the GFIPM standard.

The Metcalfe Effect⁴

The proposed cooperative creates a beneficial “network effect”, in that the more members join, the more all members benefit. This is similar in principle to the core value proposition of the Internet (and in fact any shared data network), first recognized by Robert Metcalfe, the inventor of Ethernet and an Internet pioneer.

The network effect arises from several features of the business model:

- The effort required to maintain the OJB (including the ESB, containers, common intermediaries, and service specifications) will be relatively constant, regardless of the number of members. Thus, with each new member, a fairly steady (fixed) cost will be spread across a larger number of members, increasing the per-member benefit. This will either reduce the number of staff required to support the cooperative, or focus cooperative staff on higher value-add activities (such as direct consulting with members to support their implementation of OJB), or both—the cooperative membership will have control over this choice.
- As more members join, the cooperative increases the depth and breadth of its experience with using the OJB. The number of intermediaries and service specifications will grow; the number of adapters and connectors (and therefore, the range of line-of-business systems that can easily “plug in”) will increase. The cooperative staff will play a strong role in spreading these best practices and lessons learned across the membership.

The implication of this positive network effect is that members will have a strong incentive to encourage new members, who will in turn want to attract further members, and so on. The bigger the cooperative grows, the more attractive it will be to join, which will then make the cooperative grow larger, and so on. This represents a business model that will grow very quickly once it takes root.

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⁴ http://en.wikipedia.org/wiki/Metcalfe%27s_Law