

JASON Report Task Force

Final Report

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Introduction and Executive Summary

The 2013 JASON Report ("A Robust Health Data Infrastructure") is highly critical of the status and trajectory of healthcare interoperability, and recommends a major shift in the US health exchange paradigm. It concludes that MU Stages 1 and 2 have not achieved meaningful interoperability "in any practical sense" for clinical care, research, or patient access due to the lack of a comprehensive nationwide architecture for health information exchange. It points to the lack of an architecture supporting standardized APIs, as well as EHR vendor technology and business practices, as structural impediments to achieving interoperability.

JASON recommends that healthcare interoperability be reoriented away from "siloes legacy systems" toward a centrally orchestrated interoperability architecture based on open APIs and advanced intermediary applications and services. In particular, the report recommends an urgent focus on creating a "unifying software architecture" to "migrate" data from these legacy systems to a new centrally orchestrated architecture to better serve clinical care, research, and patient uses. This architecture would be based on the use of "public" APIs for access to clinical documents and discrete data from EHRs, coupled with enablement of increased consumer control of how data is used.

The JASON Task Force (JTF) strongly agrees with JASON's call for an orchestrated interoperability architecture based on open APIs as the foundational approach for nationwide health information exchange. The JTF also agrees with JASON's observation that current interoperability approaches -- based on complex, health-care unique, document-oriented standards and business frameworks -- are functionally limited and need to be supplemented and perhaps eventually replaced with more powerful, API-based models. The JTF thus also agrees with JASON's recommendation that MU Stage 3 be used as a pivot point to begin the transition to an API-based interoperability paradigm.

Though the JTF does agree with the main thrust of the JASON Report, we do take issue with several of its findings and recommendations. First, JASON does not accurately characterize the very real progress that has been made in interoperability, especially in the last 2 years. Second, JASON's description of current generation clinical and financial systems does not accurately portray the broad range of functionality of these systems, or the innovation occurring on those platforms. Third, the report addresses software engineering and architecture aspects of interoperability but explicitly does not examine policy, legal, governance, and business barriers to health information exchange. Yet, the report recommends aggressive timelines for change that would be difficult to achieve when taking into account policy, legal, governance, and business barriers. Fourth, the software architecture recommended by JASON assumes a high degree of centralized orchestration, however, the report does not describe the source, structure, and process for achieving such orchestration.

The JTF recommends that Meaningful Use Stage 3 include certification and incentives for inclusion of a Public API in Certified EHR Technology (CEHRT). Loosely coupled Data Sharing Networks (DSNs) in a Coordinated Architecture would support these API implementations with legal and business frameworks and supporting network-level infrastructure.

We believe that Meaningful Use Stage 3 and associated certification will be important drivers in the long transition to a Public API-based health information exchange model. To the extent that query capabilities are included in MU Stage 3, we are at an awkward moment in standards development: Older standards

such as XDS/XCA are mature but inherently limited, whereas newer API-based standards are not yet ready for large-scale adoption. We believe it would be detrimental to lock the industry in to older standards, and thus, we recommend that ONC mobilize an accelerated standards development process to ready an initial specification of FHIR for certification to support MU Stage 3.

We do not anticipate that this specification would preclude the use of other existing standards to meet MU requirements. The simple goal is to make such a FHIR specification available to vendors and providers along with other existing functional specifications so as to offer a viable opening to those who would invest in new standards, while at the same time not penalizing those who are already investing in capabilities based on existing standards.

If MU Stage 3 is to be leveraged, various accommodations have to be made by private and public actors. On the private side, standards development needs to be more highly focused and accelerated than it has in the past, and the industry has to take more accountability for resolving interoperability barriers without government intervention. On the public side, MU Stage 3 should be focused on interoperability to signal to the market the importance of the issue and to allow vendors and healthcare providers to focus resources appropriately.

Given the long-term nature of this transition, we would not expect nor recommend that current interoperability activities be halted or delayed in anticipation of an API-based framework. Even with its limitations, the current framework for document-based exchange offers opportunities to improve the quality, safety, efficiency, and affordability of care and will live in parallel with the growth of an API-based approach for some time to come. These recommendations are focused on providing a meaningful spark to what will undoubtedly be a long industry-wide transition.

Assessment and Recommendations

The JASON Task Force (JTF) reviewed the JASON Report through eight task force calls and two public hearings. We have divided our conclusions into an assessment of the report, and specific recommendations to the Office of the National Coordinator (ONC) based on our assessment.

Assessment

Our assessment of the JASON Report is based on workgroup deliberations and fact-finding through two public hearings conducted on July 29 and August 5. A list of the participants in the hearings as well as a detailed list of our findings from the hearings is contained in the Appendix.

The JTF has 5 principal findings regarding the Jason Report:

- 1. The JASON Report's conclusions regarding the state of interoperability do not adequately characterize the progress that has been made in interoperability in recent years. However, we agree with JASON's fundamental proposition that the industry is not yet positioned to achieve the level and depth of health information exchange needed to support patients and healthcare providers in the future.**

- a. The JASON Report found that “meaningful interoperability” is virtually non-existent in the US, and concludes that there is “no rational access” between organizations for clinical care or research.
- b. Timing of the JASON Report
 - i. One limitation of the report is that considerable time has elapsed since the report was undertaken. JASON first received its charge from AHRQ approximately 24 months ago (fall 2012), conducted its investigation in early 2013, and published its report in November 2013. Of particular significance is that JASON’s evaluation was conducted 6-9 months prior to the launching of Meaningful Use Stage 2 in the market (October 2013 for hospitals, and January 2014 for ambulatory physicians). Thus, JASON based all of its conclusions on the results to date of Meaningful Use Stage 1 requirements, which, by design of the program, focused primarily on EHR adoption rather than interoperability.
- c. Recent changes in interoperability drivers
 - i. Since the initiation of the JASON report, there has been a significant change in the interoperability climate in the US. Demand for interoperability has grown dramatically in the last 18 months, driven by MU Stage 2 interoperability requirements as well as simultaneous growth in value-based contracting and accountable care organizations (ACOs). These new business models have spurred focused demand for interoperability to drive population health management, care management, and analytics to support clinical decision support, quality measurement, and predictive risk.
 - ii. The supply-side is responding to meet this demand with the incorporation of Direct protocols in EHR systems to enable secure sending and receiving clinical information between clinical settings, as well as nascent but growing adoption of capabilities to query and retrieve information from other settings through a wide variety of networks such as single vendor networks, vendor consortia, “private” provider-driven networks, and “public” provider- and payer-collaborative networks at the national, regional, state, and local levels.
 - iii. In the years since the JASON report was first given its charge, there has been measurable positive change in the interoperability capabilities available in the market, and an even larger positive change in the trajectory of interoperability progress. That said, while directional progress has indeed accelerated, we agree with JASON that the goals of interoperability are still not close to being achieved. Particularly in the realm of data-level access, most data gathering is happening through bespoke interfaces one EHR at a time or among multiple EHRs sold by the same vendor and installed in a coordinated fashion.

2. While the JTF agrees with the JASON call to catalyze faster progress in interoperability, we disagree with the JASON assertion that such progress can be achieved by replacing existing core clinical and financial systems.

- a. JASON Report assessment of current industry

- i. A fundamental tenet of the JASON report is that current EHR and financial systems need to be replaced in order to meet the goals of their proposed software architecture.
 - ii. JASON also characterizes the current market as not conducive to innovation and entrepreneurship due to the dominance of “stovepipe legacy systems”, concluding that current market is not open to entrepreneurs and new entrants and that current EHR and financial system vendors are not innovating themselves
 - b. View of EHR is too narrow
 - i. JTF believes that this view of current systems is too narrow – EHRs perform an ever expanding set of functions beyond basic capture and storage of clinical notes and data, such as CPOE, CDS, and workflow orchestration
 - ii. Many of the functions highlighted in the JASON software architecture are performed by EHR systems today, albeit not universally or uniformly (e.g., UI applications, Semantics and Language Translation, Search and Index Functionality, published APIs)
 - c. Vendors starting to deploy APIs
 - i. Many vendors already support APIs, and have numerous third-party “apps” integrated into workflows
 - ii. However, JTF acknowledges JASON concern that current APIs are vendor-proprietary which could reduce the market opportunity for entrepreneurial developers and perhaps lead to vendor lock-in
 - d. Evolutionary progress over revolutionary change
 - i. We believe that innovation and entrepreneurialism are best promoted by focusing on interoperability goals and open architecture through standardized APIs, rather than on the internal software design of core clinical and financial systems
 - ii. Accelerating evolutionary progress – rather than trying to engineer revolutionary bottom-up change in software design – is the only feasible path forward in such a fragmented market and dynamic technological and business environment
 - e. JASON Report view of APIs
 - i. The term API is a very broad term that generally describes software that allows different application programs to interact with each other for specific purposes.
 - ii. In the JASON context, “public APIs” are critical interfaces that are standards-based with published specifications to enable extraction of data and data representations from “legacy” EHR systems for use by other applications in the JASON architecture.
 - iii. While the JTF does not agree with the stark distinction that JASON draws between “legacy” and future systems, we do strongly agree with JASON on the need for universal availability of Public APIs to automate access to clinical documents and clinical data elements within appropriate legal and business frameworks

3. JASON proposes an aggressive timeline for enacting fundamental change in the current interoperability paradigm, however, their timelines assume that this is solely a software engineering problem and do not take into account highly complex interdependencies with non-technical factors, such as business, legal, policy, and cultural factors, which are more challenging barriers to rapid change.

- a. Technical barriers, though challenging, are eclipsed by the policy, legal, business, and socio-technical barriers to greater interoperability
- b. JASON acknowledges the importance of these non-technical factors, but explicitly leaves them out of the scope
- c. Yet, JTF believes that highly aggressive timelines such as those proposed by JASON cannot be developed without consideration of these important, rate-limiting, non-technical factors
- d. More formalized structures and processes for market coordination of technical, policy, legal, business, and socio-technical need to evolve to support more rapid progress
- e. This is especially true for use cases related to consumer and research access, which are still nascent

4. JASON proposes an essentially regulatory approach to compelling change across the industry. However, growth in demand for interoperability and the inherent complexity of the market suggest that market-oriented approaches, rather than top-down regulation, are likely to be more effective.

- a. Market demand for interoperability is growing rapidly and the supply-side is beginning to respond through rapid innovation by existing vendors and the influx of new entrants.
 - i. One of the main drivers of this growth is value-based purchasing (ACOs, hospital readmission penalties, rising consumer expectations, rising standards of care)
- b. A barrier to maximizing the power of MU Stage 3 is the long cycle required to get a technical standard included as part of federal certification.
 - i. For example, MU Stage 3 begins in approximately 24 months, yet that may not be enough time to get any standards-based data-level APIs incorporated under current processes
- c. As the MU program ramps down, the importance of effectively orchestrating other federal levers will be critical success factors in providing some channels for standardization

5. JASON architecture requires top-down orchestration, however, they do not articulate the source and nature of such orchestration

- a. The JASON report an architecture that would utilize APIs to extract data from current legacy systems to support four levels of functionality: "medical records data, search and index functionality, semantic harmonization, and user interface applications. These interfaces would allow the architecture to be populated from the legacy systems until the time when all data and functionality are fully contained within the architecture."
- b. The planning and operational foundation to make all such functions ubiquitously and uniformly available presumes a high degree of top-down design and implementation and operational direction
- c. Such tight synchronization would require a much higher degree of coordination of public and private levers than exists today, and could perhaps require new regulatory authority

Recommendations

The JTF has developed specific recommendations based on our deliberation of the findings and recommendations of the JASON Report. We have the following recommendations:

1. **ONC and CMS should align the MU program to focus on expanding interoperability through the use of Public APIs**

a. Need for transition

- i. The current path towards interoperability is based on standards and approaches that are functionally limited and unique to health care. Healthcare industry needs to transition to exchange based on contemporary and scalable architectural principles via development and use of a more comprehensive set of Public APIs.
- ii. There is currently no industry- or government-led plan or effort focused on all of the standards, governance, and incentive activities need to achieve ubiquitous adoption of standardized Public APIs
- iii. This transition will not be easy because there are currently many demands on healthcare providers and vendors. Shifting the industry will require concentrated development work by vendors, flexibility in government incentive programs, and ecosystem maturation across the industry.

b. Importance of MU Stage 3 and associated certification

- i. ONC and CMS have or may get various levers for incentivizing adoption of Public APIs for use in DSNs.
- ii. Although MU policy levers have diminished in impact, MU Stage 3 remains a strong influence and MU certification is the only currently established program to influence widespread adoption of open API specifications.
- iii. Thus it is very important that HITECH incentive requirements stake out an initial position that begins the industry-wide introduction of a Public API.

c. Need to focus MU by sharply limiting breadth of MU requirements in return for focused requirements targeting interoperability

- i. Recent experience with MU Stage 2 and 2014 Edition Certification shows that overly broad and complex requirements can tax vendor and healthcare provider capacity
- ii. Narrowing the focus of MU Stage 3 and associated certification will both send a strong signal to the market on the importance of interoperability, and allow healthcare providers and vendors to concentrate development resources on Public API implementation

d. Three complementary HITECH levers should be orchestrated:

- i. ONC should add certification of the Core Services of the Public API to the set of standards associated with CEHRT.
 1. This should be done in a manner that accommodates more rapid evolution of Core Data Services than has been possible with previous certification approaches. Start with certification of simple services and then expand certifications as market experience matures.
- ii. ONC and CMS should find ways to encourage vendors to grant third-party access to Public APIs based on agreed upon fair business and legal conventions

- iii. CMS should include in the requirements for MU Stage 3 incentives that healthcare organizations allow third-party access to documents and data through the CEHRT's Public API according to agreed upon trust frameworks and data sharing contracts.
 - 1. MU Stage 3 should encourage reciprocal exchange by providing incentives for sending or receiving
- e. Timing is critical
 - i. JASON recommended that ONC develop a plan for an API-based architecture within 12 months, however, eleven months have already elapsed, and the remaining MU Stage 3 timeline is shorter than 12 months.
 - ii. ONC should immediately leverage the FACAs to solicit and provide feedback from the market and other government agencies to validate and further flesh out these recommendations
 - iii. ONC should immediately contract with an SDO or other recognized, operationally active industry consortium to accelerate focused development of initial Public API and Core Data Service and Profile specifications for inclusion in MU Stage 3 and associated certification
 - iv. Leveraging MU Stage 3 will require acceleration of standards definition and technical development on the private side, and adjustment of the MU Stage 3 rule-making process on the public side, including the potential need for delay or staggering of MU Stage 3 incentives, to account for the time needed to standardize and then implement the Core Data Services of the Public API.

2. The JTF recommends that a market-based exchange architecture be defined to meet the nation's current and future interoperability needs based on the following key concepts:

- a. Coordinated Architecture. A loosely coupled architecture, patterned on Internet principles, with sufficient top-down coordination to ensure that a robust and efficient market-driven ecosystem of interoperability will emerge.
- b. Public API. A standards-based API that is to be implemented with certain obligations and expectations governing "public" access to the API.
- c. Data Sharing Network (DSN). An interoperable data sharing arrangement whose participants have established the legal and business frameworks necessary for data sharing. In this document, the data sharing networks designated by "DSN" are those that conform to the coordinated architecture and use the public API. This could include, but is certainly not restricted to, existing networks such as those run by vendors or providers or health information exchange organizations. (Note: Our use of the term "HIE" is generic in nature and refers to general interoperability functions and should not be confused with health information exchange organizations, which are often called "HIEs" or "health information exchanges".)
- d. Core Data Services. Fundamental, standards-based data services that implementations of the Public API are expected to provide.
- e. Core Data Profiles. Data profiles that describe the content and format of the data exposed by the Core Data Services, including definitions and cardinality of data attributes, and value sets for coded fields.

3. The nationwide exchange network should be based on a Coordinated Architecture that "loosely couples" market-based Data Sharing Networks

a. The Coordinated Architecture

- i. We do not recommend that the government attempt to create a single, top-down architecture for nationwide interoperability. We recommend instead that nationwide interoperability be founded on the principle of loose coupling that has proven to be scalable and flexible to current and future implementation heterogeneity.
- ii. A nationwide approach to interoperability should tap into the dynamism of the market to accomplish important societal healthcare objectives without stifling the ability of market players to continue to innovate to meet clinical and business interoperability needs.
- iii. The Coordinated Architecture should be modeled after the principles that have allowed the Internet to scale – a core set of tightly specified services that enable multiple heterogeneous ecosystems to emerge.
- iv. We do not envision the Coordinated Architecture being an entity or an actual infrastructure implementation but rather a set of standards and principles based on internet-style patterns and building blocks (such as ReSTful APIs, HTTPS, OAUTH, DNS, etc).

b. Leverage and build upon existing networks and exchanges

- i. There are already operating health exchange networks in the market today of differing levels of maturity and functionality. However, they utilize disparate architectures and standards for exchange. Any approach to a nationwide architecture needs to allow for certain network-specific differences and be responsive to future market needs for interoperability.
- ii. We expect that many existing networks would take advantage of the Public API to enhance or replace existing capabilities.

c. The Role of Data Sharing Networks.

- i. HIE networks create business and technical solutions that allow independent entities to interact with each other to perform specific interoperability functions. These networks must now be adapted to create business and technical solutions that allow such interoperability functions to be performed using a more comprehensive set of services, via the Public APIs.
- ii. Networks that adopt Public APIs for health information exchange would be designated as Data Sharing Networks (DSNs) in the Coordinated Architecture. There are two key DSN roles that the Coordinated Architecture should address:
 1. *Within the DSN*, facilitating exchange among entities by leveraging the Public APIs. This has a technical component (e.g., what technologies are used to identify patients or authenticate users across entities?), and a policy component (e.g., what data or documents are accessible through a Public API, and what are the allowed purposes for data or documents accessed through a Public API?)

2. *Across DSNs*, providing definitions and standards for services to be used to bridge across different DSNs, when this is deemed necessary. This will have cross-network technical components (e.g., which standards and protocols are used for different DSNs' patient-matching or authentication technologies to interact with each other?), and policy components (e.g., how are "out of network" entities authorized, and what data or documents are accessible to authorized "out of network" entities?)
- iii. It is important to clarify that clinical and financial systems that expose the Public API will have the ability to exchange data without needing a DSN, however, the DSNs provide important supporting policy, legal, and technical infrastructure necessary for routine exchange, much as trust arrangements among HISPs support Direct implementations today. A DSN does not necessarily have to be an entity or an actual infrastructure implementation but could rather be any arrangement that creates an ecosystem to support Public API-based exchange.
- iv. DSNs would not be limited to clinician-to-clinician exchange. We would expect that DSNs will include those formed around existing networks as well as novel and nascent networks that facilitate entities sharing a wide array of focused needs, such as research, administrative transactions, patient-accessible transactions, ACOs, etc.

4. The "Public API" should enable data- and document-level access to clinical and financial systems in accordance with Internet-style interoperability design principles and patterns

a. Role of the Public API

- i. The Public API comprises two components
 1. an implementation of certain technical standards (the "API")
 2. an agreement to meet certain obligations governing "public" access to the API
- ii. What makes an API a "Public API" is a set of conventions defining "public" access to the API
 1. A "Public API" does not imply that data is exposed without regard to privacy and security.
 2. An API provides the technical means for access to EHR data, however, there are legal and business considerations that must be addressed before any given healthcare provider and/or vendor would allow another party to use the API to access information.
 3. What is "public" in a "public API" is that the means for interfacing to it are uniformly available, it is based on non-proprietary standards, it is tested for conformance to such standards by trusted third parties, and there are well-defined, fairly-applied, business and legal frameworks for using the API.

b. FHIR as the Public API Technical Standard

- i. Current exchange APIs (such as XDS/XCA) allow access to structured and unstructured documents, but do not allow direct access to individual data elements. There is currently no widely accepted healthcare industry API that provides discrete data-level access to EHR data.

- ii. A healthcare Public API needs to enable access to both clinical documents (e.g., referral summary, discharge summary, etc.) and discrete data elements (e.g., medications, labs, problems, etc.)
- iii. The JTF believes that HL7 FHIR (accompanied by FHIR profiles) is currently the best candidate API approach to data-level and document-level access to healthcare data. (See the Technical Appendix for details.)

5. Core Data Services and Profiles should define the minimal data and document types supported by all Public APIs.

a. Role of Core Data Services

- i. The Coordinated Architecture and Public APIs could take years to completely span the full range of healthcare data, so the JTF recommends starting with more narrow data services for an initial set of high-value use cases
- ii. The main function of Core Data Services is to provide read and write access to the most important clinical data elements found in most clinical and financial HIT systems. Note that Core Data Services may also include necessary authorization/authentication specifications for key use-cases. See the Technical Appendix for more details.
- iii. Core Data Services might initially be developed in the following five key areas, which are aligned with the target areas identified in the JASON Report:
 1. Clinician-to-clinician exchange (including ancillary service providers)
 2. Consumer access
 3. "Pluggable" apps – for consumers and for clinicians
 4. Population health and research
 5. Administrative transactions

b. Role of Core Data Profiles

- i. The Core Data Services will be made operational by Core Data Profiles, which will tightly specify the data elements (required and optional) used by each of the Core Data Services, so that data formats, codes and value-sets can be shared and understood by both sending and receiving entities.
- ii. Rather than trying to build complex, monolithic semantic translation/normalization services such as suggested by JASON, which are very difficult to build at scale and are tightly coupled to specific systems, the JTF believes that it is much more feasible for clinical data holders to implement local mappings to and from strictly defined Core Data Profiles.
- iii. The initial Core Data Profiles should focus on Clinician-to-Clinician exchange and Consumer Access which are high value and relatively feasible.
 1. Clinician-to-clinician exchange is a top priority to support care improvement and is the foundation for all other interoperability. The Public API will expand on the document-centric capabilities that exist in the market today, as was recommended by JASON.

2. Consumer access to discrete clinical data is a natural extension of the current document-centric "View Download and Transmit" and Blue Button patient portal functions. Consumer-facing Public APIs can leverage already existing patient authentication and user management processes to enable a new ecosystem of patient-centered applications that use the Public API to access the patient's data. There is a growing and active community of entrepreneurial developers in the mHealth and "pluggable app" space who are not constrained by legacy software issues and who thus could be a leading driver of real-world technical/ecosystem innovation and adoption.
3. We expect that widespread adoption of the Public API will enable other use-cases, which will likely proceed in the market in parallel to the above high-priority items. These uses could include improved semantically mapped data flows for population health and research, as well as "pluggable apps" for clinician users.

6. ONC should assertively monitor the progress of exchange across Data Sharing Networks and implement carefully crafted, non-regulatory steps to catalyze the development of DSNs and the Coordinated Architecture.

- a. Need for market ecosystem to support Public APIs
 - i. Recent market experience with Direct makes clear that implementing a technical standard is not enough
 - ii. Technical standards must be embedded in a market ecosystem of reasonable and customary practices in order to work seamlessly across all settings
- b. Regulatory solutions are unlikely to be effective
 - i. ONC and CMS do not at present have clear regulatory authority over the activities of data sharing networks
 - ii. Developing and imposing strong regulatory authority would be complex and difficult to calibrate given the large number of disparate and heterogeneous emerging networks (e.g., vendor-driven, transaction-specific HIEs, private HIEs, collaborative HIEs, etc)
- c. Leveraging local governance
 - i. Data Sharing Networks will already have governance in place for their own network activities,
 - ii. Alignment of these governance mechanisms to support loose coupling is a much higher leverage and feasible approach than top-down regulatory directives
 - iii. Attempts to supersede or displace existing DSN governance models could interfere with the currently rapid growth in local, regional, and national exchange networks
- d. Coordination by a critical mass of exchange networks may soon be achievable
 - i. Market coordination has historically been difficult in healthcare due to the high fragmentation of healthcare providers and vendors
 - ii. However, current market trends point to the possible emergence of a critical mass of operational health exchange networks with growing national market presence, which could make market-based coordination more feasible than it has been in the past

- iii. Such market-based coordination has developed in many other industries where a critical mass of organizations form collaborative governance and operating principles
- e. Federal government *should* take the following key steps to help the industry overcome competitive and coordination barriers
 - i. Transparency. Aggressive and ongoing public monitoring of the pace of development and use of network mechanisms through collection of API usage data and development of an adoption evaluation framework to facilitate Public API-based exchange
 - ii. Guidance. Issuing authoritative, ongoing guidance to provide industry-wide direction and benchmarks, and to encourage specific actions for the development of DSNs and the Coordinated Architecture
 - iii. Organization. Convening existing exchange networks (i.e., prospective DSNs) to catalyze adoption of the Public API and development of industry-based governance mechanisms
- f. Federal government *should* take the following steps to motivate adoption of Public APIs
 - i. Incentive alignment. Aligning incentive programs and existing regulatory processes to stimulate use of the Public APIs, such as ACO contracts, LTPAC regulation, lab regulation, etc
 - ii. Federal operational alignment. Requiring federal healthcare entities to adopt the Public APIs in their technology procurement activities and day-to-day market interactions, such as Medicare/Medicaid, DoD, Veterans Administration, Indian Health Services, NASA, etc.
- g. Federal government *may* choose to take the following steps to enable orchestration of Core Services across the DSNs
 - i. DSN bridging standards. Developing standards for vendor-neutral, cross-DSN bridging to fully enable the narrow set of robust transactions required for the loosely coupled architecture (such as patient identity reconciliation, authorization/authentication, key management, etc)
 - ii. Nationwide shared services. Developing standards for, and ensuring deployment of, universally necessary shared services that are highly sought after and thus would facilitate DSN alignment, such as public use licensed vocabularies, and perhaps nationwide healthcare provider and entity directories, etc.
- h. The government *may* choose to consider direct regulation of DSNs in the event that the market does not develop effective coordination mechanisms
 - i. As noted earlier, such actions would involve a significant increase in the government's regulatory authority over health information exchange activities, which would have the risk of unintended consequences that could slow market progress
 - ii. Any such increase in regulatory authority should be carefully considered through evaluation of reasonable and meaningful benchmarks and specifically calibrated to address any remaining barriers that the market has failed to overcome

Appendix A: Technical Details

Coordinated Architecture

1. The Coordinated Architecture should follow these high level architectural patterns:
 - a. The architecture should be based on loosely coupled systems that leverage the core building blocks that have allowed the Internet to scale. These Internet building blocks may include (but are not limited to) IP, HTTPS, OAuth2, and DNS
 - b. The architecture will leverage the Public API (as defined below) and other services, to create a loose coupling of heterogeneous systems.
 - c. The architecture should be designed to support asynchronous upgrades by allowing for a reasonable degree of “version skew” during rolling upgrades as standards evolve. See below for details.
 - d. Respect Postel’s principle (send conservatively; receive liberally)
 - e. Support use-case appropriate, standards-based authentication and authorization technologies which should be implemented using best practice encryption and key management.
2. The architecture should anticipate that multiple Data Sharing Networks (DSN) will use the Public API. These DSNs may address different use-cases, or may reflect different business drivers in heterogeneous settings.
 - a. Typically, a DSN will create the proper legal and business framework in which actual interchange is accomplished using the Public API. DSNs may also chose to address network-specific infrastructure such as identity management, key management, consent and preference tracking
 - b. DSNs will also address the necessary legal agreements around data use and licensing (e.g., DURSA, etc.)
 - c. If the emergence of multiple DSNs becomes a barrier to interoperability, then network bridging agreements and services may be needed, and should be addressed as part of the Coordinating Architecture process.
3. The various DSNs may enable the Public API to be used for patient care, but should not be limited to patient care. The Public API should also be used to address consumer access to their health data, cross-provider population health aggregation, as well as to enable the research community in service of the learning healthcare system.
 - a. Various users of the Public API should seek to reuse the Core Profiles as much as possible, but should allow for necessary profile variations by domain of usage, since data needs and access patterns may vary
1. The Public API should also be exposed in support of “apps”, “modules” and other mechanisms that encourage innovation around “pluggable” extensions to baseline clinical and financial systems.
 - a. The JTF believes that support for “pluggable applications” is a key aspect of interoperability, and should be considered an important interoperability target of the Coordinated Architecture and the Public API.

2. The Coordinated Architecture should start with simple goals and technical standards, but should anticipate emerging higher functions (e.g., follow the “Internet Hourglass” pattern wherein a small number of homogenous core standards can be expanded to address many heterogeneous uses.)
3. Future cross-DSN orchestrated services may be needed. Initially, cross organization interoperability is best addressed by the emerging Data Sharing Networks, though over time it may make sense to create cross-DSN connections via network-to-network bridges. Cross-DSN services could include:
 - a. Identity management (healthcare providers and patients, and other endpoints)
 - b. Authentication, authorization, key management
 - c. Consent and privacy preferences
 - d. Directories and data indexing services (for example, in supporting Internet-like search services)
 - e. Complex orchestration and transactions services (SOA)

Public API Definition

An implementation of the Public API will have the following characteristics:

1. Shall support all of the Core Data Services and Core Data Profiles, as long as the Data Service is relevant for the implementing module or service that exposes the Public API
 - a. For example, a module implementing only eRx would not need to expose services that are not part of electronic prescribing functions.
2. Shall support public documentation for the exposed Core Data Services and associated Core Data Profiles
 - a. May support exposure of Custom Data Services and/or Custom Data Profiles as extensions of the core data services.
 - i. If custom data services are exposed that go beyond the Core Data Services, the implementation shall follow the underlying standard’s regular method for exposing extension services and extension profiles, where possible.
 - ii. Extended services should not duplicate services that are already defined in the underlying data service standard. Use the standard-based services where possible.
 - iii. Custom extensions should support public documentation of the custom services and custom profiles
3. In addition to supporting the Core Data Services and Profiles, an implementation of the Public API:
 - a. Shall enable access to and use of the Core Services in a way consistent with the Public API Operating Rules and Guidelines as defined above.
 - b. Should be validated against rigorous certification tests
 - c. The Core Data Services and Core Data Profile certification tests should be closely coordinated with the entities that are responsible for the Core definitions. This is to

ensure that there is no mismatch between the standards and the certification tests of the standards.

- d. Should be accompanied by an implementer-provided “sandbox” that enables testing by external entities (with proper access)

Core Data Services

1. Core Data Services will include both read and write access to data, as specified by the corresponding Core Data Profiles.
2. The JTF considers FHIR and FHIR Profiles to be an emerging exemplar of this pattern, and recommends strong consideration of FHIR as the basis for the Core Data Services and Core Data Profiles
3. The JTF believes that the approach of using Profiles to define on-the-wire “semantics by contract” makes best sense for rapid development of the Coordinated Architecture. By constraining the Core Service data elements to match specific Profiles, the degree of semantic mismatch can be dramatically reduced. Core Data Profiles will define the optional and required data elements and the codification of those elements for specific use cases. These profiles are key to a loosely coupled architecture.
4. Core Data Services will include access to both clinical documents (e.g., CCDA, discharge summary, etc.) and discrete clinical data elements (e.g., problems, medications, allergies, etc.)
 - a. It may be necessary to define a few core data services that are not strictly focused on data access. For example, healthcare-specific profiles for OAuth2 could be considered for Core.
5. Expanded Core Data Services should be carefully versioned such that implementations can identify which version of the Core Services is supported
 - a. Versioning should support reasonable levels of forward and backward compatibility in order to allow for rolling upgrades across the Data Sharing Networks
 - b. When standards are updated, the overall network must permit bilateral interoperability between a node that has updated to the new feature or requirement and one that has not
 - c. Nodes that have installed the update must continue to receive and process actions using the old version, although they may not be able to perform new functions enabled by the update
 - d. Standards should specify a method whereby nodes on the old version can accept transactions from a node on the new version and provide all the functionality contemplated in the old version.
 - e. Bilateral inter-version compatibility should be maintained for a period of time specified in governance.

Appendix B: Listening Session Description

Day 1 (31 July 2014)

1. Exchange Service Providers
 - a. David Horrocks, Chesapeake Regional Information System for our Patients (CRISP)
 - b. Ted Kremer, Rochester RHIO
 - c. Jitin Asnaani, CommonWell Health Alliance
 - d. Eric Heflin, Healthway
2. Research
 - a. William Tierney, Regenstrief Institute
 - b. Sarah Greene, Patient-Centered Outcomes Research Institute (PCORI)
 - c. Landen Bain, CDISC
 - d. Gwen Darien, Cancer Support Community
3. Standards
 - a. Grahame Grieve, Fast Healthcare Interoperability Resources (FHIR)
 - b. Thomas Beal, openEHR
 - c. Steve Emrick, National Library of Medicine (NLM)
 - d. Stan Huff, Healthcare Services Platform Consortium

Day 2 (5 Aug 2014)

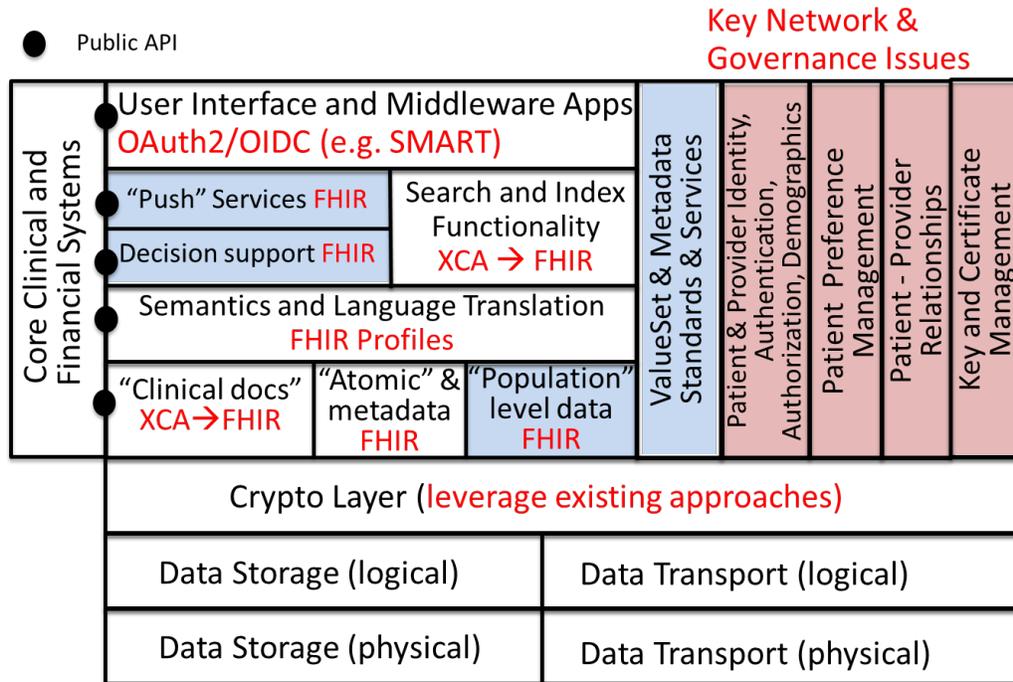
4. Consumer-facing ecosystems
 - a. Ali Emami, HealthVault
 - b. John Mattison, Kaiser
 - c. Kevin Riddleberger and Patrick Leonard, iTriage
 - d. Gordon Raup , Datuit
 - e. Anil Sethi, Glimpse
5. Vendor APIs
 - a. Charles Parisot, EHRA
 - b. George Cole, Allscripts
 - c. Carl Dvorak, EPIC
 - d. Ryan Hamilton, Cerner
6. App Providers
 - a. Dave Vockell, Lyfechannel
 - b. Tim Michalski, Point of Care Decision Support
 - c. Nate Weiner, Avhanahealth
 - d. Chris Burrow and Steve Mickelsen, Humetrix
 - e. Denis Coleman, AppMedicine
 - f. Jonathan Baran, healthfinch

Appendix C: JASON Task Force Membership

Member Name	Organization	Role
David McCallie	Cerner	Co-Chair
Micky Tripathi	MA eHealth Collaborative	Co-Chair
Deven McGraw	Manatt	Member
Gayle Harrell	Florida State Legislator	Member
Larry Wolf	Kindred Healthcare	Member
Troy Seagondollar	Kaiser	Member
Andy Wiesenthal	Deloitte	Member
Arien Malec	RelayHealth	Member
Keith Figlioli	Premier, Inc.	Member
Wes Rishel		Member
Larry Garber	Reliant Medical Group	Member
Josh Mandel	Boston Children's Hospital	Member
Landen Bain	CDISC	Member
Nancy J. Orvis	FHA/DoD	Ex Officio
Tracy Meyer	FHA/ONC	Ex Officio
Jon White	HHS	Ex Officio

Appendix D: Possible Implementation Pathway for Public API

The following diagram maps current standards and approaches to JASON-specified gaps.



The following table identifies current standards and services that would form the foundational building blocks for a Public API

Category	Pathway or Approach
Base standard for Public API and Core Data Services	- FHIR
Document access	- Initially continue XCA/CCDA, phase over to FHIR
Authorization/Authentication	- EHR-to-EHR: Network-specific (OAUTH?) - Consumer access via tethered portal: OAuth2/OIDC (i.e., updated Blue Button Pull, SMART on FHIR)
Semantics	- Use FHIR Profiles for initial phase. In later phases explore tying Profiles to specific Clinical Models - National Value Set repository (NLM) for core profile value sets

Category	Pathway or Approach
Modularity	<ul style="list-style-type: none"><li data-bbox="756 254 1333 285">- SMART on FHIR for EHR and Portal “apps”<li data-bbox="756 317 1365 390">- Complex transaction orchestration through SOA modules
Population health data	<ul style="list-style-type: none"><li data-bbox="756 426 1146 457">- FHIR bundles, FHIR pub/sub