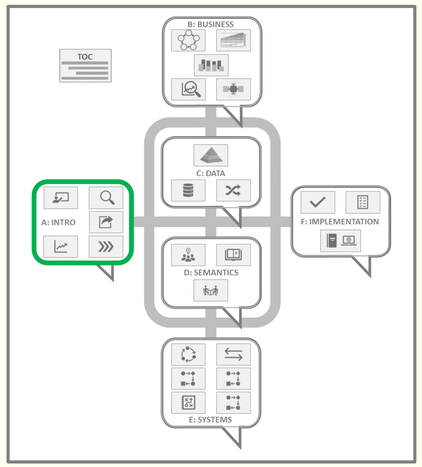
i-VA Blueprint Version 1.0
Section A - Introduction and Table of Contents



i-VA Blueprint

Navigating the Blueprints

At a Glance:

This page explains the framework of the i-VA Blueprint

- Each page is specific to a theme or purpose
- The "Anchor Graphic" depicts the **key point**
- The **Left Panel** provides relevant context
- The **Bottom** provides explanatory detail, exceptions, or supplemental information
- The **Right Panel** provides reference information
- The **Bottom Right** icons help navigate

Why Produce the i-VA?

- **Discovery** of relevant materials and guidance is difficult given VA's size and complexity
- Even when aware of an artifact, it can be difficult to **locate** it
- It is not always clear how different references are meant to **fit together**
- Projects need **specificity** at lower levels than the VAEA and Segment Architectures sometimes provide
- It provides a **targeted focus** on just what needs to be done, as well as where to learn more.

How to Use the i-VA Blueprint

The i-VA Blueprint was created to bring together VA guidance impacting VA programs and projects.

- Use navigation tools (Table of Contents, Page "Navigator") to find content relevant to a need
- Each section is focused on a "theme", with successive pages delving deeper into that theme
- The artifact is intended as a reference document, and not generally read cover-to-cover
- The i-VA helps users to make informed decisions, but does not necessarily provide **the** answer
- **Set 18 months in the future, the i-VA helps you make project and acquisition decisions for activities planned or underway**

i-VA Blueprint Intended Use

Project Teams
- Provides guidance on how to select standards for use
- Provides a consolidated point-of-reference for technical assets
- Defines metadata to assist in interop tradeoff decisions
- Identifies proven practice patterns

VA Leadership
- Improves delivery confidence on interop concerns
- Provides consistent guidance to project teams
- Enhances technical transition management / versioning
- Aligns with existing governance

Governance
- Elaborates specificity for current technical ambiguities
- Designed to extend existing assets (VA EA)
- VAIL provides accountability and executive visibility
- Stewarded by neutral body to harmonize agency needs

Strategy
- Guidance is aligned with industry strategic roadmaps
- Provides convergence across VHA, VBA, NCA
- Differentiates between current, transition, future state

What the *i*-VA Blueprint is

A guide and a technical reference to support VA project teams in implementing information systems and processes that are highly interoperable:

- Identifies relevant HIT standards
- Catalogs and classifies APIs
- Defines key terms, practice patterns, tradeoffs
- Convergence point of program and project guidance, with reference links to further reading (FHIR, HL7, terminology; VA guidance such as VA EA, VHA Business Architecture etc.)
- Based on Enterprise Architecture approach and industry best-practices

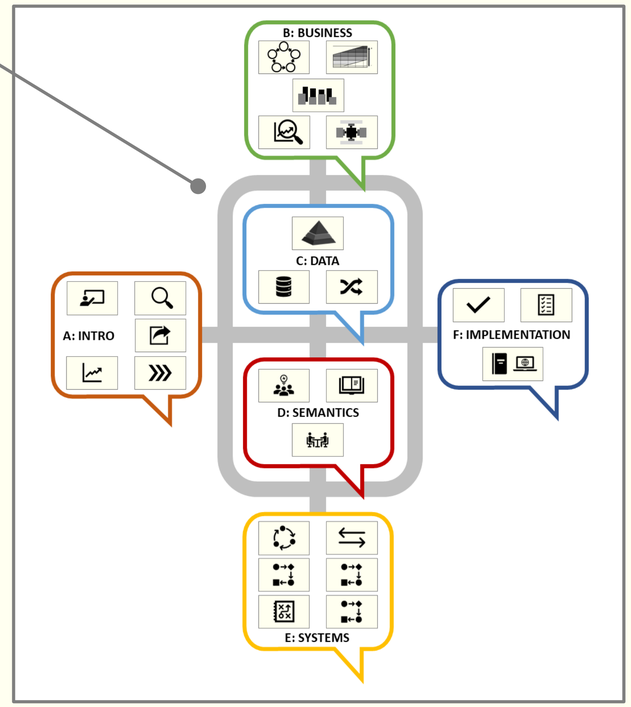
Why It Matters

- Pragmatic guidance targeted to support project teams
- Intended to underpin VA EA and VHA Business Architecture
- Facilitates discovery and appropriate use of existing agency and industry assets
- Helps project teams make informed decisions
- Contextualizes guidance for assets/ standards in the TRM
- Tools to advance interoperability across and beyond VA
- Supportive of existing governance processes

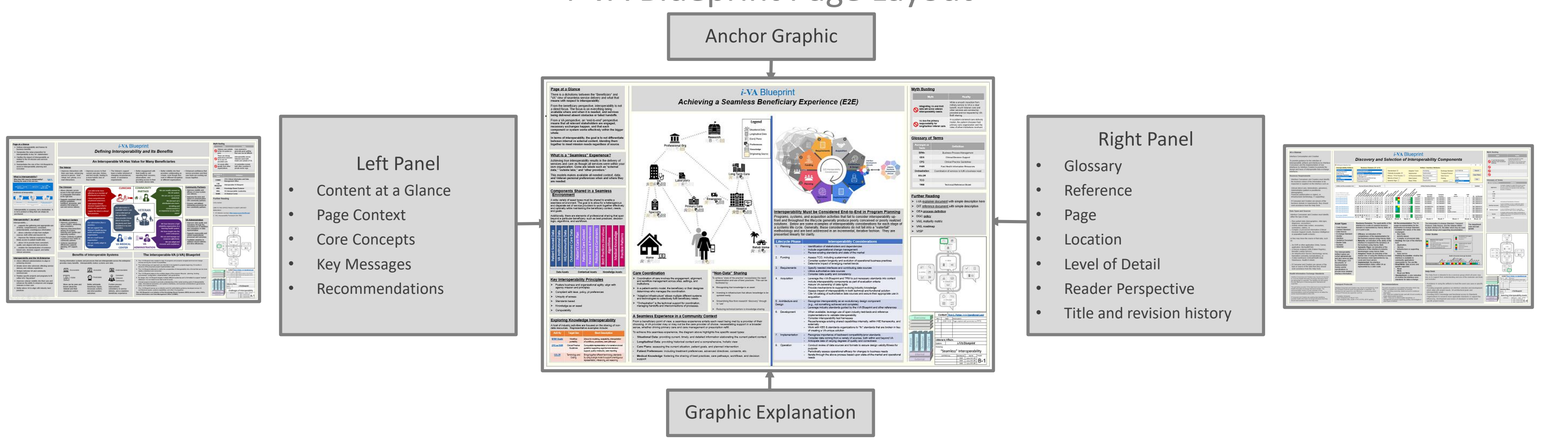
i-VA "Navigator" by Intended Use

References listed in order of decreasing relevancy. Key citations are in **BOLD.**

- **PRIMER / Overview [A-2**, A-4, A-5]
- **Acquisition Planning [A-2,** A-5, A-3, A-4]
- **Architecture**
  - Requirements Traceability [**B-1**]
  - Design Patterns [**E-4**]
  - System Architecture [B-5, E-4, A-4, C-1]
- **Data Design [C-2**, D-3]
- **Governance and Compliance [**E-5, B-3, B-4]
- **Learning Health System [C-3 ,** A-5, C-1]
- **Maturity [B-2**, B-4, B-3]
- **Policy [B-1,** A-4, A-3, C-1]
- **Program Management [A-5**, E-1 , B-1, B-4]
- **Quality Management [A-4**, A-5, B-2, B-1]
- **System Design**
  - Data Design [**C-2**, D-3]
  - Interface/API Design [**E-3**, B-5 , C-1, D-3]
  - Integration Design [**F-1**, E-2]
  - Requirements Traceability [**B-1**, A-4, B-5]
- **Standards**
  - Information Standards [**D-3**, C-1 , D-2, D-1]
  - Knowledge Representation Standards [**C-3**, C-1]
  - Process Engineering Standards [**C-3**, B-5, E-4]
  - APIs [**E-5**, E-3, E-2, C-1]



i-VA Blueprint Page Layout



Myth Busting

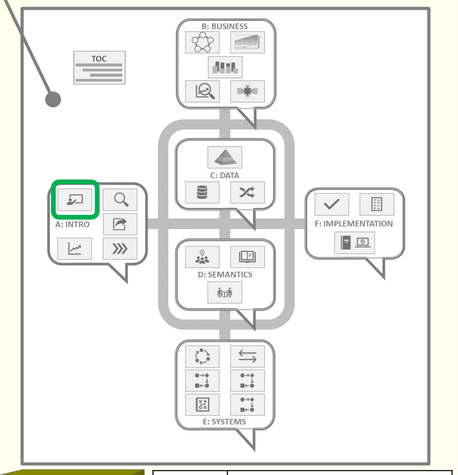
On each page of the i-VA, this space will present common misconceptions about the topic being discussed, and key take-away guidance, context, or clarifications.

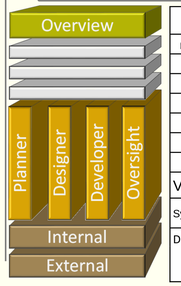
Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
EA	Enterprise Architecture
FHIR™	Fast Healthcare Interoperability Resources
HIT	Health Information Technology
HL7	Health Level Seven – an interoperability standards development organization
ICT	Information and Communication Technology
i-VA	Interoperable VA Blueprint
NCA	National Cemeteries Administration
TRM	VA Technical Reference Model
VAIL	VA Interoperability Leadership
VBA	Veterans Benefits Administration
VHA	Veterans Health Administration

Further Reading

1. i-VA explainer document with simple description here
2. OIT reference document with simple description
3. OEA process definition
4. DGC policy
5. VAIL Maturity Matrix
6. VAIL Roadmap
7. VISP,





Contact: VHA Knowledge-based Systems

Rev:	Date:	Description:

Veterans Affairs

System: *i*-VA Blueprint

Drawing: Navigating the Blueprints

PAGE A-1

i-VA Blueprint

Executive Summary Overview

Interoperability and Its Benefits

Page at a Glance

- Defines interoperability and frames its business benefits
- Designates the value proposition for interoperability to key VA stakeholders
- Clarifies the impact of interoperability as related to the VA mission and services provided
- Substantiates the role of the i-VA Blueprint to assist in interoperability planning and execution

What is Interoperability?

What does VAIL mean by *interoperability*? Meeting the needs of the end-user...

Interoperability is a combination of conditions that enable the **right information** to **securely** reach the **right person** at the **right time** in **the best manner** to make an informed decision and **take an action**.

Beneficiaries of interoperability:

Interoperability is a journey, not a destination. It is not a product or thing that can simply be acquired.

Interoperability? So what?

Interoperability….

- …supports the gathering and appropriate use of timely, comprehensive, consistent, understandable, unambiguous information.
- …allows collection of data from multiple sources, both within and beyond VA.
- …improves Veteran experiences through timely access to patient data, context, preferences.
- …allows VA to provide more consistent, quality care aligned with best practices.
- …enables the standardization of evidence-based care, decision support, and better clinical outcomes.

Interoperability and Appropriate Use

- Standards-based interoperability provides consistent information representation and unambiguous semantics that set the context for:
  - what information is needed, how it is reliability understood, and how it is appropriately and ethically actioned as outlined in "Ethics Principles for Access to and use of Veteran Data". *(see Further Reading)*

Interoperability and the VA Enterprise

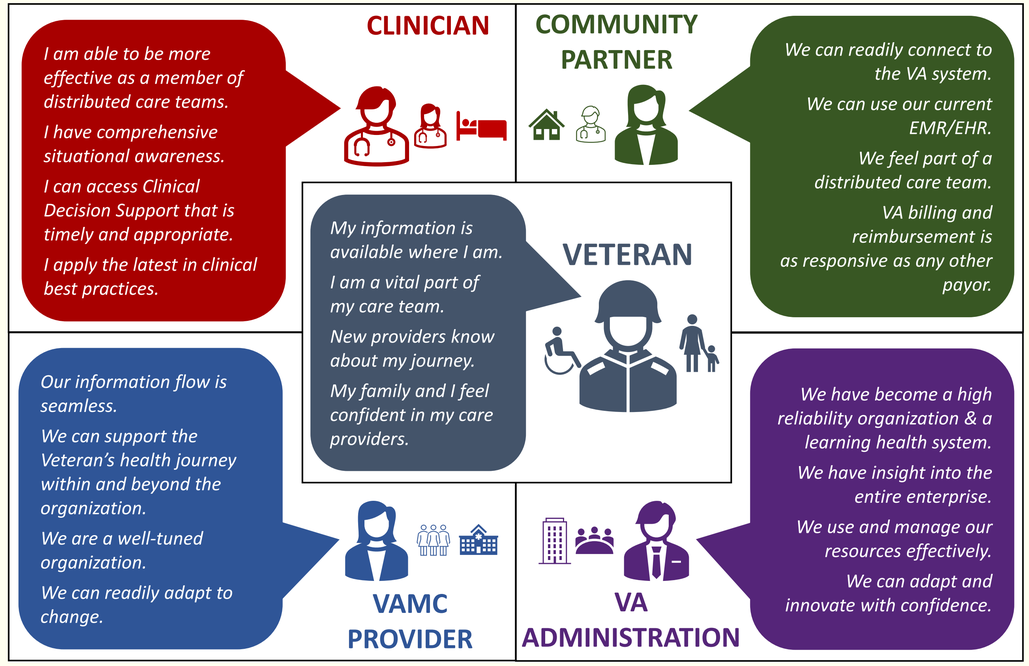
- Allows different administrations to align in achieving mission
- Breaks down silos adversely affecting service delivery and veteran experience
- Bridges between VA and community services/care
- Relates specific projects and programs to fit within VA's "big picture"
- Improves veteran visibility into their care and enhances the ability to empower and engage Veterans in their care
- Better allows VA to align with industry best practices

The Veteran

- Improves interactions with their care team, enhancing person to person, "chat", virtual, text, phone, or e-mail interactions.
- Improves access to their current care plan, history, and test results, leading to a more holistic view of their health.
- The Veteran's support team is better informed of changing circumstances, needs, or assistance requirements.
- Better engagement with their health by self-reporting their concerns, observations, and providing access to their bio-metric device data.
- Better visibility into their providers collaborating as a team, even though they work in different disciplines or different organizations
- Enhanced confidence that service providers and their care team are working out issues together.

The Clinician

- Allows clinicians secure access to the right amount of comparable information at the right time.
- Supports consistent clinical practice guidelines, workflows, processes, and analytics that empower care and service delivery.



Community Partners

- Improves visibility and efficacy of cross-system care delivery.
- Improves the ease and speed of communication with community partners.
- Ensures well-defined onboarding processes for new community partners.

VAMC Providers

- Improves consistency across VAMCs, enhancing data consistency.
- Improves interconnections among VA systems, reducing user burden and improving workflow.
- Fosters continuity in patient experience from VAMC to community partners.
- Achieves operational efficiencies (capacity planning, KPI support, etc.).

VA Administration

- Improves data quality and operations through the consistent use of identifiers and consistency in data representation.
- Supports measurable and valued organizational processes and outcomes.
- Facilitates analytics to optimize service delivery and drive efficiencies.

Benefits of Interoperable Systems

Having information systems and processes that are interoperable across the enterprise provides many benefits. Interoperability makes systems and data:

- Discoverable
- Accessible
- Understandable
- Visible
- Predictable
- Consistent
- Coherent
- Continuous

More can be seen and known about the Veteran and their situational context.

Better anticipate beneficiary needs, necessary actions, and drive positive outcomes.

Fosters process improvement, consistency in service delivery, and a seamless beneficiary experience.

Introducing the "Interoperable VA" Blueprints (*i*-VA)

- The i-VA Blueprint was created to help VA programs and projects navigate technical and design choices
- The methodology and approach are intended to be applied to projects beginning 18 months in advance of the proposed project implementation date.
- The i-VA Blueprint attempts to clarify the complexities of interoperability into a format that can be more readily understood and consumed.
- The i-VA Blueprint aligns to the multiple stages of the program lifecycle: planning, funding, requirements, acquisition, etc..
- By design, the i-VA Blueprint targets multiple different audiences and is formatted to support "tactical" reference. It is not meant to be read cover-to-cover.
- A broad scope is included to promote understanding of the varied working parts of interoperability (data, informational semantics, and systems interfaces), and business considerations (governance, policy, and implementation).
- The i-VA Blueprint serves as a collection point for authoritative guidance developed across VA (architectural assets, systems capabilities, and other VA programs).

The i-VA Blueprint is an initiative of the Knowledge Based Systems (KBS) division within VHA's Clinical Informatics and Data Management Office (CIDMO).

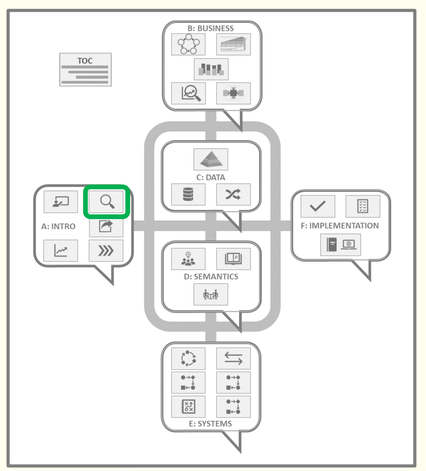
Myth Busting

Myth	Reality
Veteran care outside of the VA system is poor.	Care received is generally good; getting that care can be difficult.
There are strong distinctions between VA & non-VA provided care.	Interoperability serves Veterans seen both inside and outside of VA.
VA is organizational-ly unique and differs greatly from other institutions.	VA has many similarities both with other countries' healthcare systems & with private sector orgs.

Acronym or Term	Definition
CIDMO	VHA Clinical Informatics and Data Management Office
KBS	Knowledge Based Systems
VAIL	VA Interoperability Leadership
VAMC	VA Medical Center

Further Reading

1. VA Veterans Journeys (http://vaww.va.gov/chio/hfe.asp)
2. VAIL Interoperability Framework
3. Ethics Principles for Access to and Use of Veteran Data



Overview

Planner | Designer | Developer | Oversight

Internal

External

Contact:	VHA Knowledge-based Systems	
Rev:	Date:	Description:

Veterans Affairs

System: ***i*-VA Blueprint**

Drawing: Executive Summary

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i-VA Blueprint

Current-State Interoperability: A VHA Exemplar

Business Capabilities and Supporting Interoperability

At a Glance

- The VHA Business Architecture highlights how VA today supports business needs through direct integration between systems, leveraging capabilities grown organically over time.
- Thoughtful dissecting of capabilities and mapping of current-state solutions fosters a better understanding and thoughtful transition toward authoritative data sources, reusable APIs, a smooth evolution into future-state interoperability.

Important Interoperability Concepts

Integration versus Interoperability

- Integration creates tight coupling of systems
- Interoperability creates and maintains loose coupling of systems

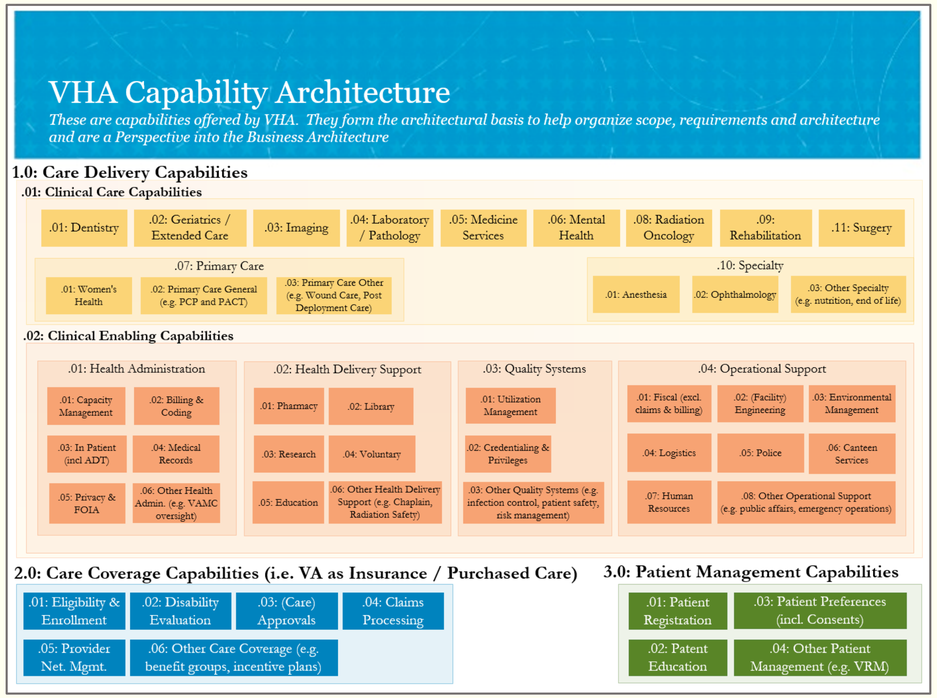
Tight Coupling	Loose Coupling
Each system must know things about the other system	Each system only needs to know about the interface
Useful only to a pair of systems	Usable by multiple systems
Change may require changing multiple internal components in both systems	Change usually only affects the interface
Testing is complex	Testing is simplified and readily repeatable
Integration with multiple other systems greatly increases system complexity potential for errors	The number of participants in the exchange can scale readily

Impacts and Benefits of Business Architecture

- Provides clarity of responsibilities and activities within the business organization
- Identifies candidates for shared services / leveraged capabilities
- Assists in identification of authoritative sources of data
- Differentiates core from enabling functions
- Relates VA-internal to community-provided functions / capability alignment
- Fosters alignment between business and technical portfolios

DoD, VHA, and EHR Modernization

Update Planned Early FY2022



VHA Capability Architecture

This business architecture diagram shows, at a high level, the three primary sets of business capabilities that existing information systems in VHA need to support:

1. Care Delivery
2. Care Coverage
3. Patient Management

Information systems that support the business architecture of VHA often need to interact (requesting or providing information) with other systems components and data assets, for example those:

- in other clinical departments
- in other facilities
- that support Patient Management
- In other administrations, such as Veterans Benefits Administration to assess eligibility for services
- In partnering community-based health services

In order to request from or provide information to other information systems, those systems need to interoperate technically. This is accomplished in various ways, each of which has its inherent strengths and weaknesses.

VHA Interoperability Current State

Interoperability among VA applications and systems is in a transition phase. There are several **items to note**:

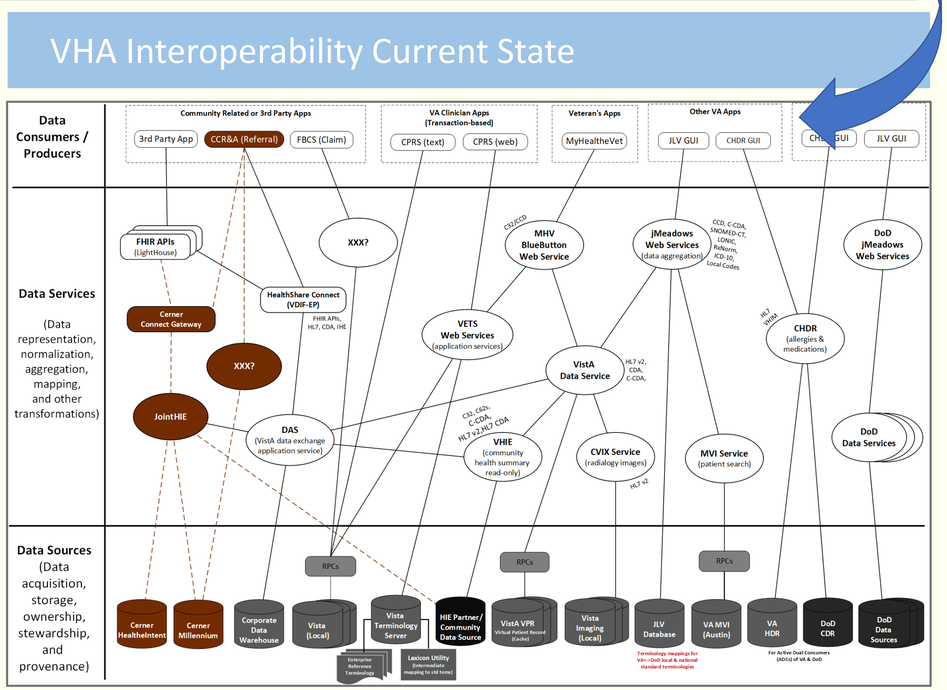
- Introduction of data services as intermediating layer in lieu of direct application access to data sources
- Simplification/consolidation of data sources and storage
- Diagram illustrates co-existence of legacy and emerging architectural elements
- Diagram focused on VA / DOD interoperability; Limited attention to contracted and community care providers

Noting that this is "As Is", there are **future implications**:

- Phasing-out of legacy infrastructure
- Redundancies exist due to long-term transition to EHRM
- Atrophy of direct "application-to-application" interfaces
- Gaps will exist between EHRM and VISTA CPRS functionality. These will need to be addressed.

Key Observations:

- **The interoperability focus is not protocol-based.** Multiple transport protocols (FHIR, HL7 2.x, CDA, etc.) are employed.
- **Data representational format not addressed on this diagram** (data type and meaning is essential)
- **Current-state does not address exchange of business knowledge, clinical knowledge, or business processes.**



Myth Busting

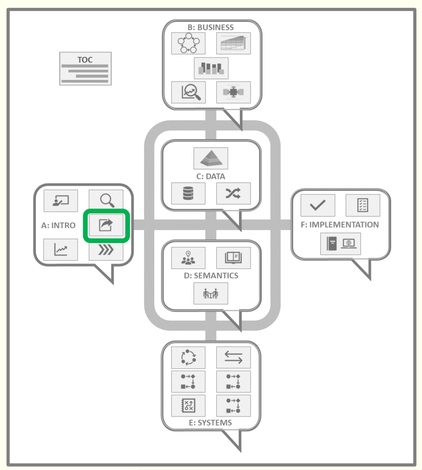
Myth	Reality
There is little relationship cross-over between business & technical arch	Business ownership determines authoritative sources, data needs, shared components, and systems interface requirements.
The need for architecture has been usurped by EHRM	While EHRM is fulfilling VA's need for an EHR platform, business architecture provides a cohesive vision for how VA services and systems come together.

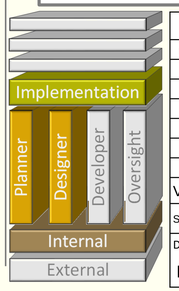
Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
CDA	Clinical Document Architecture
DoD	Department of Defense
EHRM	Electronic Health Record Modernization
FHIR	Fast Healthcare Interoperability Resources
HL7	Health Level Seven
VISTA CPRS	Veterans Health Information Systems and Technology Architecture Computerized Patient Record System

Further Reading

1. VHA Business Architecture
2. Link to Veteran Personas / HFE





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System: *i*-VA Blueprint

Drawing: Interoperability Current State

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i-VA Blueprint

Interoperability Challenges

Page at a Glance

- Absent investments in standardization, systems and programs are siloed, non-comparable, and the content not effectively sharable. The result is a boundary-filled system and adverse impacts on veteran experiences.
- Injecting interoperability design into project planning and execution results in better flow among VA projects, improved engagement and sharing with external partners, broader alignment with industry, and more adaptable and durable solutions.
- This i-VA document serves as a launch-point to discover relevant content intended to lessen the learning-curve and facilitate decision-making.

The Need for End to End (E2E) Interoperability

- Interoperability is **often not considered until after funding commitments and timelines** have been set
- Interoperability cannot be considered "in micro". It is essential that we look not just at one process or system at a time, but how that system connects with others.
- Discrete efforts to include interoperability requirements must be considered in the product/services acquisition
- Standards and interface development lifecycles are not typically considered in project design, development, and implementation timelines and should be
- Best practices in interoperability related project management needed to ensure thorough and consistent interoperability interfaces development across the organization.
- System testing often fails to account for interoperability testing. Moreover, testing plans often don't consider the impact of bad data across the wire

Incorporating Interoperability Thinking: Exemplar Changes to a Program Lifecycle

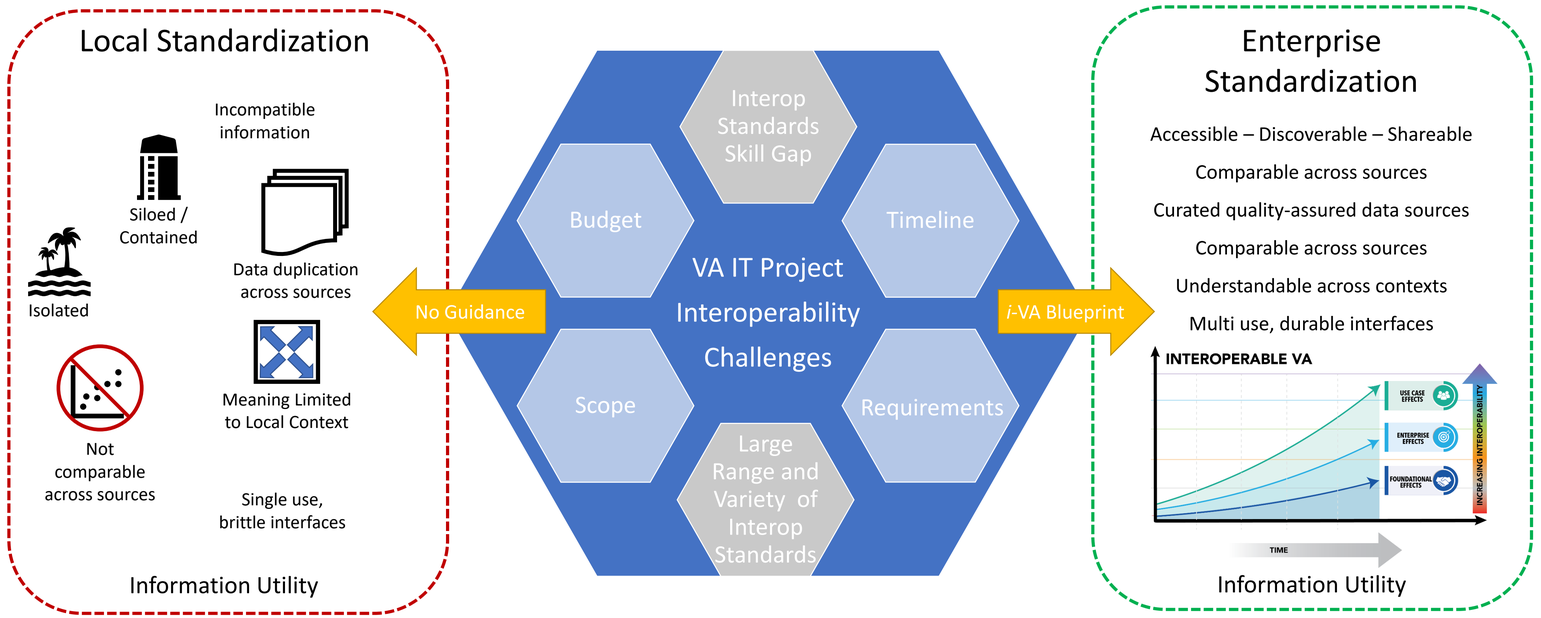
Change	Impact
Perform standards due-diligence on cross-system dependencies	Assess interactions with interfacing systems with an eye toward use of standards.
Take a pro-active posture based upon estimated system longevity	Often system interfaces are based upon current "as is" state without regard for total lifecycle. Design can support API evolution over time if done thoughtfully
Anticipate changes to data, data format, and interface protocol over time	When these elements are considered inviolate, systems and interfaces are brittle. Designing for adaptation is more flexible and interoperable.

Primary audience:

- Project teams implementing interoperable information systems
- Both VA internal teams and teams of external partners connecting their systems with VA

Secondary audiences:

- VA
  - Service Providers
  - Strategists and planners
  - Architects and Designers
  - Organizational oversight and governance
- Standards Development Organizations (SDOs)
- Community Partner organizations



Challenges With Project-Based Interoperability

- Recognize that there the apparent tension between mission requirements and interoperability requirements is a false flag
  - This can be a misconception. Many interoperability requirements directly tie to Veteran needs that are not well represented or explored.
  - Note impacts on total costs of ownership vs. short-term time-to-market pressure.
  - Interoperability requirements are often viewed as a project "tax"
- Interoperability skills can be niche and are nuanced
  - There are stark differences in capability between standards implementation experience vs. standards engagement experience.
  - Leverage available VA expertise around standards, including VHA CIDMO Knowledge-based Systems (KBS), VAIL, and other offices.
- Good reference examples can be difficult to find
  - Note that many industry efforts have open-source reference implementations that can be leveraged at no-cost, illustrating best-practices and helping educate
  - VA is a member of several leading standards bodies and industry consortia, from which we can draw best-practices and tap industry expertise.

The Risks of Not Doing

- Projects not following standards custom-create interfaces that result in added integration burden and sustainment cost
- Failure to leverage authoritative sources results in data representation, currency, or semantic concerns, specifically:
  - Information is duplicated
  - Information is siloed or inaccessible when and where it is needed
  - Informational semantics is incompatible for other purposes
  - "Brittle" interfaces that are easily broken after-the-fact

Benefits of Standards-Based Interoperability

The utility of information gathered across many VA systems is greatly enhanced when

- Consistent standards are applied to the identification, representation, semantic content, and the transmission of data across and outside of VA.
- Information about the Veteran or the services they receive is discoverable, accessible, comparable and shareable for many other forms of services the Veteran is entitled to
- Authoritative data sources are known and accessible through the application programming interfaces their custodians provide
- APIs are durable, adaptable, and reusable for many purposes.

Impacts to the Enterprise

- Improved consistency, data, and process flow within the organization, and across Administration
- Alignment with industry providers, fostering a more consistent beneficiary experience with VA as a part of their broader support ecosystem
- Enhanced agility and ability to adapt to ever-present change

Myth Busting

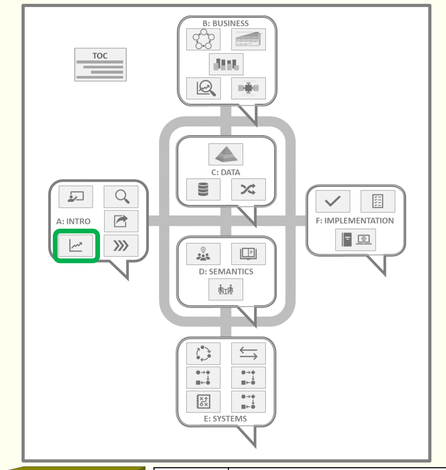
Myth	Reality
FHIR is solving our interoperability needs.	FHIR brings a modern web stack to healthcare and is a powerful tool, but does not "solve" interoperability by itself.
Using standards is difficult and adversely impacts project timelines	While possibly true in the short term, benefits from available reference implementations, broad industry adoption, and reduced sustainment costs outweigh short-term gains.

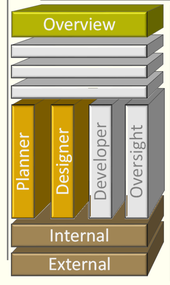
Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
CIDMO	Clinical and Data Management Office
FHIR	Fast Health Interoperability Resources
i-VA Blueprint	Interoperable-VA Blueprint
KBS	Office of Knowledge Based Systems
VAIL	VA Interoperability Leadership

Further Reading

1. KBS Intranet site
2. VAIL Intranet site





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System:	*i*-VA Blueprint	
Drawing: Interoperability Challenges		PAGE A-4

i-VA Blueprint

Achieving a Seamless End-to-End (E2E) Beneficiary Experience

Page at a Glance

There is a dichotomy between the "Beneficiary" and "VA" view of seamless service delivery and what that means with respect to interoperability.

From the beneficiary perspective, interoperability is not a direct focus. The focus is on everything being available where and when it is needed, and services being delivered absent obstacles or failed handoffs.

From a VA perspective, an "end-to-end" perspective means that all relevant stakeholders are engaged, necessary exchanges happen, and that each component or system works effectively within the bigger whole.

In terms of interoperability, the goal is to not differentiate between internal vs external content, blending them together to meet mission needs regardless of source.

What is a "Seamless" Experience?

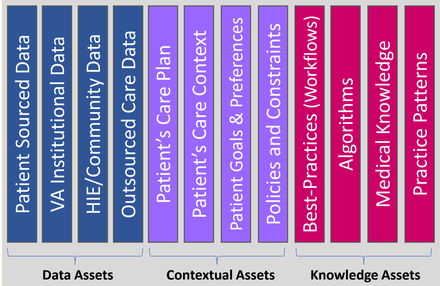
Achieving true interoperability results in the delivery of services and care as though all services were within your own organization. Gone are labels such as "external data," "outside labs," and "other providers."

This models makes available all needed context, data, and Veteran personal preferences when and where they are needed.

Components Shared in a Seamless Environment

A wide variety of asset types must be shared to enable a seamless environment. The goal is to allow for a heterogenous and disparate set of service providers to work together effectively and optimally while maintaining the beneficiary context, needs, and goals.

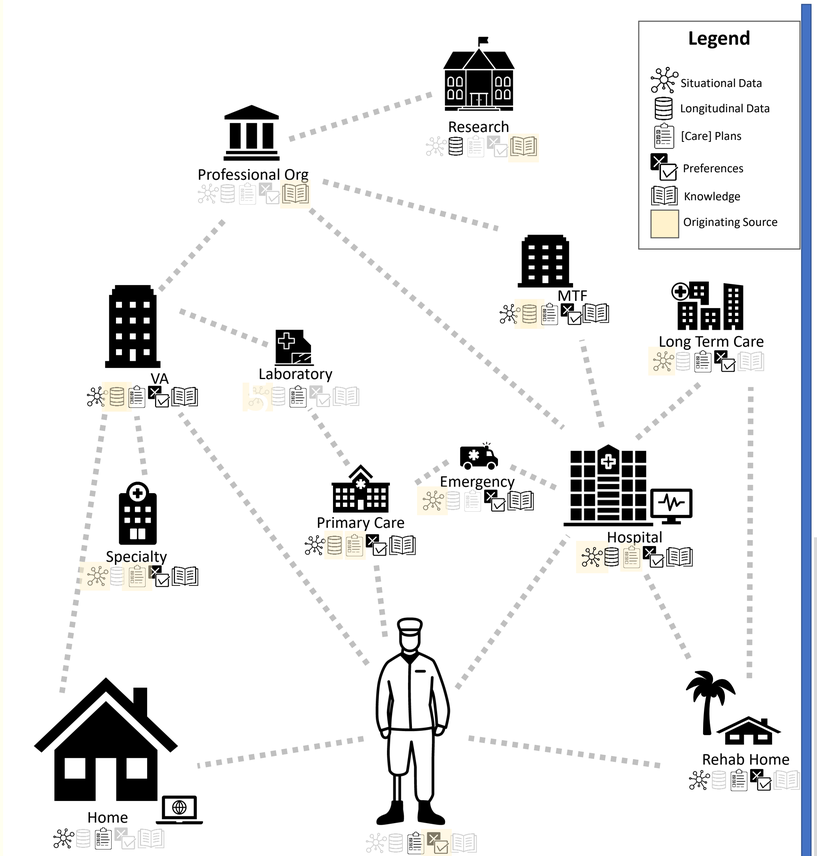
Additionally, there are elements of professional sharing that span beyond a particular beneficiary, such as best practices, decision logic, algorithms, and workflows.



Patient-oriented Sharing

- Beneficiary wellness and health maintenance happens substantially beyond one institution
- The preferences, goals, and needs of the patient must span their encounters and interactions across locations and institutions of care
- The datagraph below depicts the mean number of health system visits patients during one year. This illustrates the importance of engaging individuals in their wellness

Health System Encounter



Care Coordination

- Coordination of care involves the engagement, alignment, and workflow management across sites, settings, and institutions.
- In a patient-centric model, the beneficiary or their designee determines who manages the coordination.
- "Adaptive Infrastructure" allows multiple different systems and technologies to collectively fulfil beneficiary needs.
- "Orchestration" is the technical support for coordination, managing handoffs and interconnections of processes.

"Non-Data" Sharing

To achieve "state of the practice" necessitates the rapid dissemination and use of best practices. This can be facilitated by:

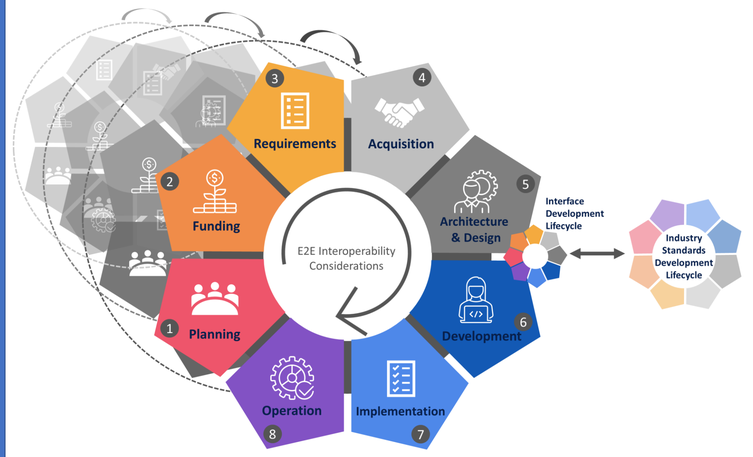
- Recognizing that knowledge is an asset
- Investing in infrastructure that allows knowledge to be updated easily
- Streamlining flow from research "discovery" through to "use"
- Reducing technical barriers to knowledge-sharing

A Seamless Experience in a Community Context

From a beneficiary point of view, a seamless experience entails each need being met by a provider of their choosing. A VA provider may or may not be the care provider of choice, necessitating support in a broader sense, whether driving primary care and care management or prescription refill.

To achieve this seamless experience, the diagram above highlights five specific asset types:

- **Situational Data:** providing current, timely, and detailed information elaborating the current patient context
- **Longitudinal Data:** providing historical context and a comprehensive, holistic view
- **Care Plans**: assessing the current situation, patient goals, and planned intervention
- **Patient Preferences**: including treatment preferences, advanced directives, consents, etc.
- **Medical Knowledge**: fostering the sharing of best practices, care pathways, workflows, and decision support



Interoperability Must be Considered End-to-End in Program Planning

Programs, systems, and acquisition activities that fail to consider interoperability up-front and throughout the lifecycle generally produce poorly conceived or poorly realized solutions. Below are some examples of interoperability considerations for each stage of a systems life cycle. Generally, these considerations do not fall into a "waterfall" methodology and are best addressed in an incremental, iterative fashion. They are presented linearly for clarity.

Lifecycle Phase	Interoperability Considerations
1. Planning	- Identification of stakeholders and dependencies - Include organizational change management - Review existing standards and state of the market
2. Funding	- Assess TCO, including sustainment costs - Consider system longevity and evolution of operational business practices - Determine impact of emerging market trends
3. Requirements	- Specify needed interfaces and contributing data sources - Utilize authoritative data sources - Consider data quality and consistency
4. Acquisition	- Leverage the i-VA Blueprint and TRM to put necessary standards into context - Include interoperability components as part of evaluation criteria - Assure VA ownership of data rights - Provide mechanisms to support evolving industry knowledge - Assess impact of interoperability in both technical and functional solution - Cite VA catalog of authoritative data sources and assure their appropriate use in acquisition
5. Arch. and Design	- Recognize interoperability as an evolutionary design component (e.g., not something achieved and complete) - Leverage industry standards guided by the i-VA Blueprint and other references
6. Development	- When available, leverage use of open industry test-beds and reference implementations to validate interoperability - Consider interoperability test harnesses - Reuse/leverage existing shared capabilities internally, within HIE frameworks, and externally - Work with KBS & standards organizations to "fix" standards that are broken in lieu of creating a VA-unique solution
7. Implementation	- Recognize importance of backward compatibility/prior standards - Consider data coming from a variety of sources, both within and beyond VA - Anticipate data of varying degrees of quality and correctness
8. Operation	- Conduct review of data sources and formats to assure design validity/fitness for purpose - Periodically assess operational efficacy for changes to business needs - Iterate through the above process based upon state-of-the-market and operational needs

Myth Busting

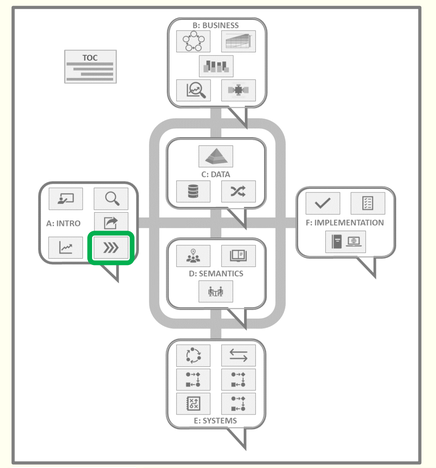
Myth	Reality
Integrating VA and DoD data will solve veteran interoperability needs.	While a smooth transition from military service to VA is a clear benefit, much Veteran care and other services are community-provided and not impacted by VA-DoD sharing.
VA has the primary responsibility for longitudinal Veteran care.	In a patient-centered care delivery model, the patient chooses their primary care organization and the roles of other institutions involved.

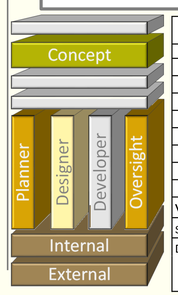
Glossary of Terms

Acronym or Term	Definition
MTF	Military Treatment Facility (DOD)
CDS	Clinical Decision Support
CPG	Clinical Practice Guidelines
E2E	End-to-End
FHIR	Fast Health Information Resources
Orchestration	Coordination of services to fulfil a business need
SOLOR	
TRM	Technical Reference Model

Further Reading

- i-VA explainer document with simple description here
- OIT reference document with simple description
- OEA process definition





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Veterans Affairs

System: *i*-VA Blueprint

Drawing: "Seamless" Interoperability

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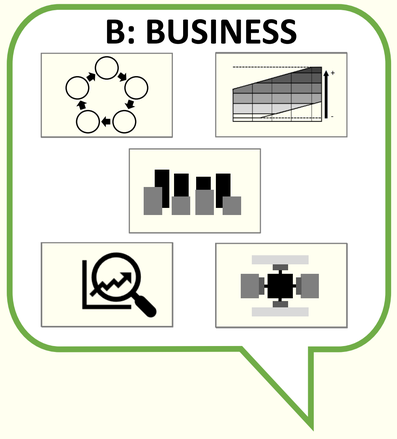
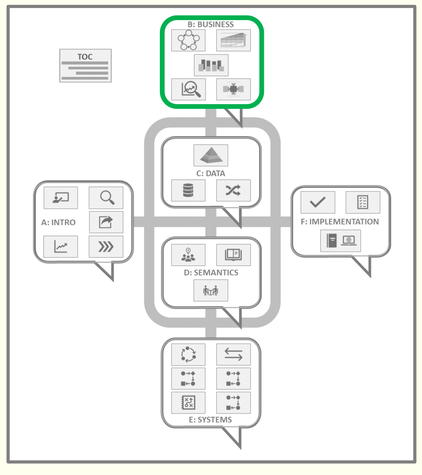
i-VA Blueprint Version 1.0
Section B – Business and Policy Considerations





i-VA Blueprint

Interoperability Goals and Business Drivers

At a Glance:

Interoperability requirements are driven from many sources: legislative, programmatic, marketplace, and expectation-driven. There is a cascading relationship among these factors, necessitating traceability and "connectivity" among the different influencers.

At the core is the Veteran expectation of seamless delivery, realized in part through unfettered sharing within and beyond VA.

Key Influencing Sources

The following documents are key interoperability drivers impacting VA. This is a representative list:

- Mission Act
- EHR Modernization
- VA Strategic Plan
- VA Interoperability Strategic Plan
- 21st Century Cures Act
- ONC Final Rule
- CMS Interoperability and Patient Access (final rule)

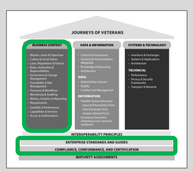
How "Enterprise Interoperability" Manifests

- Consideration in use case development and expressed functional need
- Traceability and realization of functional requirements in technical solutions
- Specification of platform and technology support elements in authoritative guidance (e.g., TRM)
- Accurate representation of usage context of interoperability components (VA EA, i-VA, etc.)
- Pull-through of functional and technical requirements into acquisition activities
- Personnel awareness, technical training, and ongoing programmatic support for interoperability topics

Interoperability Policy Considerations: Key Concepts

- Interoperability requires more than technology:
  - business processes,
  - policy
  - governance
- Capabilities mature over time
- Points of interoperability and data subject domains can be discovered early in the BA process.
- Interoperability is not a direct function, it is an enabler of other functions
- Interoperability should be planned and engineering into a solution, not "bolted on"
- Consider business capabilities and functions with interoperability in mind
- Interoperability changes over time, as do standards. Plan for maturation and evolution.

Relationship to VAIL Framework

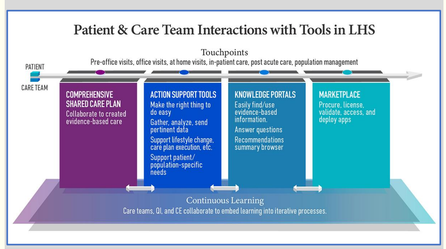


Primary Focus on:
-Business Context
-Enterprise Standards
-Compliance

Note that business and policy drivers have traceability throughout all phasis of planning and implementation.

Interoperability Across the Care Continuum

- Interoperability needs and requirements particularly manifest when we look at patient-specific needs
  - Supporting patient care delivery at different locations
  - Supporting care processes across healthcare organizations
  - Bringing best-practice and clinical guidance to points-of-care
  - Care coordination
  - Care Planning
  - Patient Preferences
- Achieving a "learning health system" is substantially predicated on effective data and knowledge sharing
- Both patients are care teams will have interactions with EHR at multiple stages across a care journey
- Critical to achieving this effectively is interoperable solutions, sharable content, and ubiquitous access
- AHRQ has been advancing industry blueprints for knowledge sharing [see diagram]



Policy Spotlight: 21st Century Cures

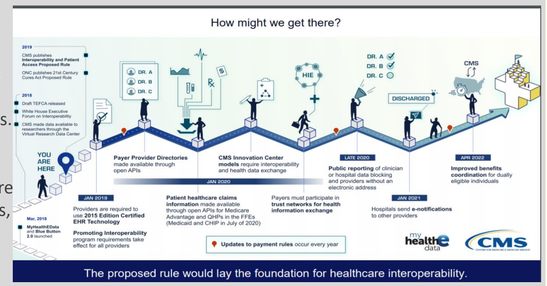
21st Century Cures Act:
Interoperability, Information Blocking, and the ONC Health IT Certification Program

- Established several core requirements impacting HIT interoperability
  - Prohibition on Information Blocking
  - Established requirements for API access
  - Mandated FHIR
- Prohibited restrictions and requirements to use proprietary interfaces to get to data
- Created provisions to assure patient access to their own data
- Established SMART as a universal API access path
- Informed by public comment, the Cures Final Rule was adopted in 2020

Progression toward Interoperability: Applying US Guidance

This diagram illustrates how interoperability foundational components build upon one another to advance our capabilities.

While payer-focused, advancing value-based care improves health outcomes, wellness, and patient benefits.



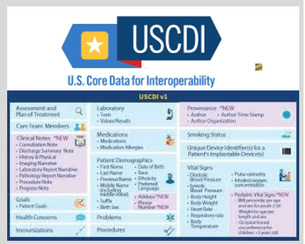
What is USCDI and Why does it Matter?

US Core Data for Interoperability *(USCDI, or "US Core")*
- Set of data elements forming the backbone for data sharing
- Includes data elements, definitions, data types
- Stewarded by ONC working closely with HL7

Defines canonical set of profiles and data elements that must be supported by EHR applications in the US

Defines and describes requester and responder roles

Workgroup defined by government and industry appointees



Myth Busting

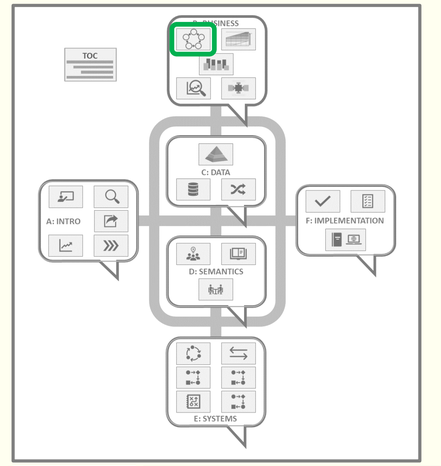
Myth	Reality
Interoperability can be added to a system post-implementation	While interoperability can be added post-implementation, many of these needs stem from base requirements and have ubiquitous impact across all aspects of programs and systems.
Interoperability features are "nice to have" but not mission-critical to our program.	With huge numbers of veterans receiving services and care in the community either directly or outsourced from VA, interoperability is increasing as a primary driver to mission and program success.

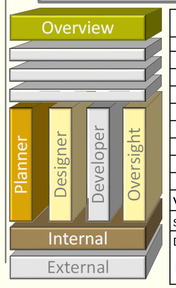
Glossary of Terms

Acronym or Term	Definition
LHS	Learning Health System
AHRQ	Agency for Healthcare Research and Quality
US Core USCDI	Core data set for health data interoperability

Further Reading

- Mission Act
- AHRQ Evidence-based Care Initiative (ACTS)
- US Core (USCDI)
- VA Strategic Plan
- VA Interoperability Strategic Plan
- 21st Century Cures Act





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Drawing: Interoperability Goals and Drivers

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i-VA Blueprint

Interoperability "Maturity"

Introducing the Interoperability Framework and Maturity Model

Page at a Glance

The VAIL Interoperability Framework and Maturity Model explores multiple key dimensions of team and institutional capabilities expected at stratified levels of maturity.

By enumerating expectations and representative skills and behavior, it allows projects and offices to determine their current state and to improve their overall efficacy and impact, by:

- Assessing current support for interoperability across the VA offices and departments that have an enabling role.
- Guiding strategic planning, the definition of goals, and the realization of intended outcomes.

Interoperability Framework

Interoperability is an overarching discipline that manifests in several different areas.

Data and Information: Considers the meaningful exchange of information across systems and organizations. When speaking of interoperability, this is generally the implied area of focus.

Business Interoperability: Considers operational needs, policies, culture, and other capabilities that must interoperate to fulfill mission objectives.

Systems and Technology: Considers the IT and other technical elements of interoperability, such as transport protocols and infrastructure.

Shared Tenets: Considers a foundation of principles, standards, and governance. These are represented by the foundation in the Interoperability Framework diagram.

Interoperability Maturity Model (IMM)

The Interoperability Maturity Model was developed by the VAIL team to serve both as a reference and tool for the assessment and advancement of institutional, program, and project capabilities. It is loosely based on the Software Engineering Institute's Capability Maturity Model (SEI CMM), which defines the layers of the model.

There are several items of note in the IMM diagram:

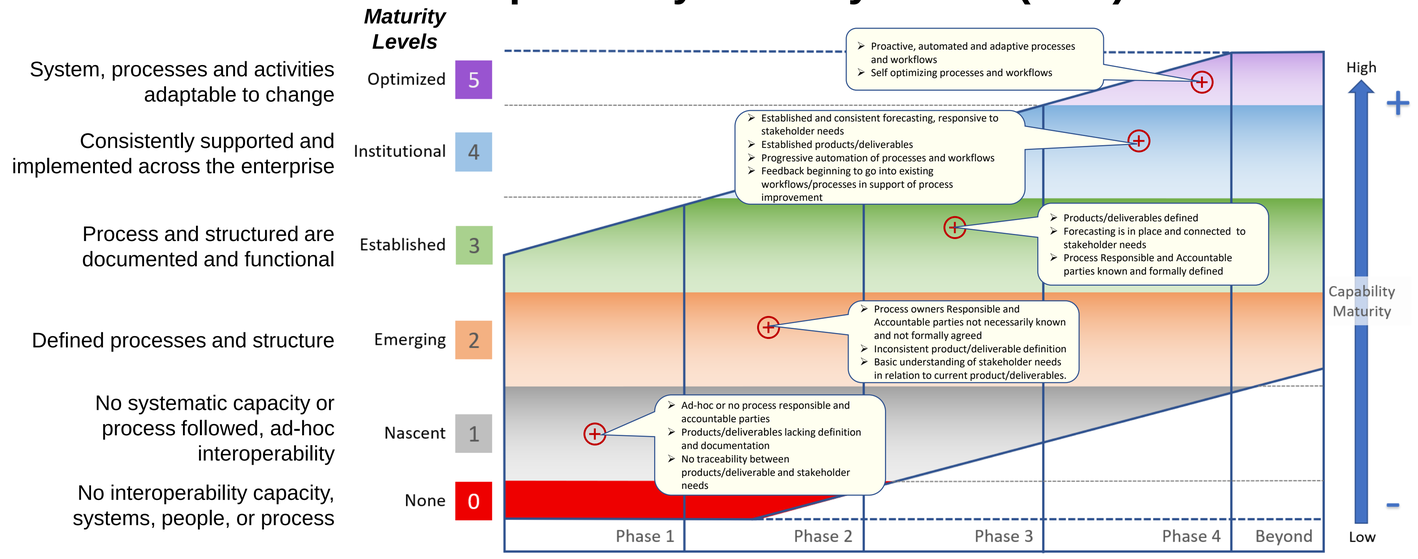
- Phases (along the bottom) are not strictly bound to time but reflect an overall progression as capabilities mature.
- There is an expectation that as capabilities grow, the minimum viability within the organization advances. The result is that the "floor" of capability continues to elevate.
- There is no expectation that reaching the Optimized maturity level (Level 5) is necessary for all functions.
- Although considered independently, there are cross-topic dependencies among each of the dimensions of the IMM.
- The IMM pairs with a detailed assessment checklist that elaborates on each of the topics and can be used to evaluate program maturity.

Interoperability Framework

Explaining the Framework

- The framework identifies three core areas that serve as "pillars" of interoperability
  - Business Context
  - Data and Information
  - Systems and Technology
- Each pillar has identified capabilities enumerated into sub-areas and supported by a maturity model
- The pillars are "supported" by crosscutting concerns, such as interoperability principles, standards, and compliance programs
- While pillars address specific elements of interoperability, there are cross-dependencies among the topics, driven by business and operational needs

Interoperability Maturity Model (IMM)



Example: Business Pillar > Processes and Workflow Maturity Criteria

What is within the Interoperability Maturity Model Diagram?

- Stratification of interoperability maturity, designated as levels of increasing capability
- Characteristics indicative of interoperability capability for each maturity level
- Progression over time showing impact on an organizational journey
- Specific indicator points within the graphic with exemplar behaviors or indicators
- Elevating "floor" over time indicating advancement of the market and increasing expectations

Rationale for considering Interoperability Maturity

- Veterans expect seamless experiences across VA programs, as well as VA- and non-VA services, something achievable only through effective interoperability
- What is expected of an "interoperable" system changes over time: We need to remain aligned to support advancements in technology and in the marketplace
- Skillsets and processes need to mature to keep pace with emerging best-practice
- Objective understanding of our capabilities allows for thoughtful investment in skills, tools, and technologies to meet business challenges
- Programs have interdependencies necessitating interoperability and sharing

Myth Busting

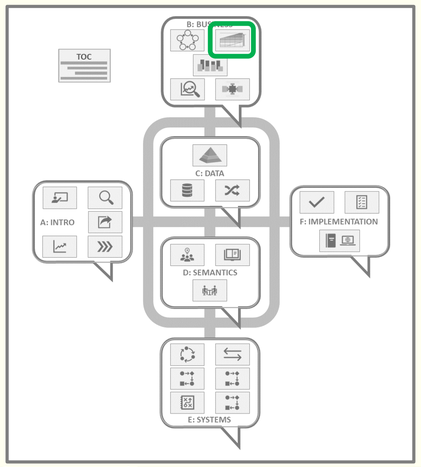
Myth	Reality
Maturity models are largely academic exercises.	A maturity model is intended to accurately assess your project and better understand what is necessary to mature it.
A project timeline is too tight to waste time on something that doesn't directly benefit the work.	Use of a maturity model may appear counterintuitive, but identification of a key skillset gap or shortfall may substantially benefit project delivery and avert project risk.

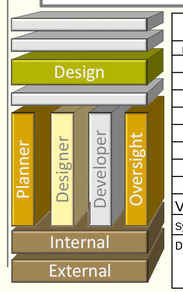
Glossary of Terms

Acronym or Term	Definition
CMMI	Capability Maturity Model Integration
E2E	End-to-End
IMM	Interoperability Maturity Model
VAIL	VA Interoperability Leadership

Further Reading

- VAIL Maturity Model
- VAIL Assessment Methodology
- VAIL Interoperability Strategic Plan
- VAIL Assessment Change Control Board





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Drawing: Interoperability Maturity

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i-VA Blueprint

Improving Organizational Interoperability Maturity

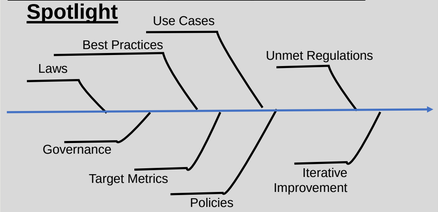
Page at a Glance

- Leveraging the Interoperability Maturity Model provides a roadmap for improving the Business, Data, and Systems/Technical capabilities to interoperate. Each strata presents challenges and is represented by illustrative examples.
- Effective use of these approaches will improve capability and capacity but will not hit an arbitrary “ideal” target.

Important Concepts

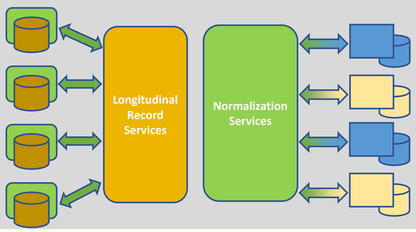
- Interoperability Maturity is a subset within organizational change management.
- The purpose of a maturity model is to advance capabilities and identify improvement opportunities.
- There is no expectation that an organization should fall within “Optimized - Level 5” for everything. Assess cost vs. benefit.

Business Interoperability Transition Spotlight

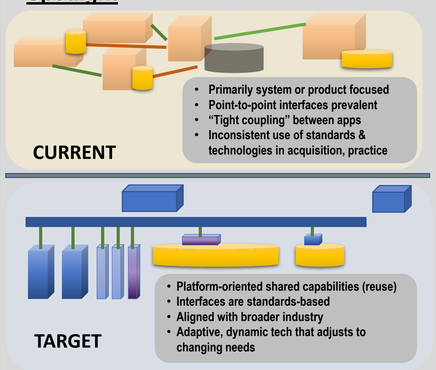


Data Interoperability Transition Spotlight

Data evolves from independent sources and disparate representations toward a canonical set of types, terminologies, and support services leveraged across Enterprise systems.



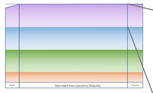
Technical Interoperability Transition Spotlight

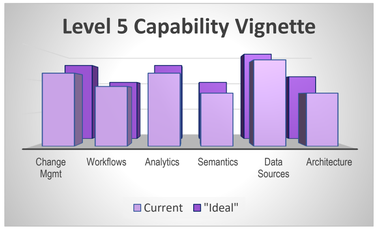


Organizational Challenges/Level 5

- Seamless availability and use of both internal and community-sourced data.
- Continuous agility and effective adoption of emerging best practices.
- Seamless “swappability” of technology solutions and components.
- Reducing time from research to practice.
- Ability to apply and positively impact population-based wellness and outcomes.

Optimized 5





Activity Highlights

Business
- Culture and emphasis on incremental services delivery and quality improvement
- Seamless experience driven by beneficiary preferences and engagement

Data
- Analytics-driven quality improvement based upon longitudinal and contextual data

Systems
- Business needs supported via dynamic chaining of technology platform components, including AI/ML
- Infrastructure to support HRO

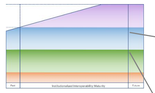
Capabilities Realized

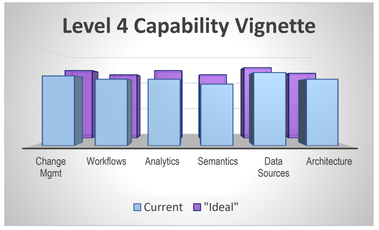
- Capacity exists to adopt improvement initiatives rapidly and effectively.
- Conformance to interoperability standards at a sector level; “inter-organizational interoperability”.
- Shared data assets loosely coupled to applications, available at point-of-need.
- Substantial organizational agility in adopting new business practices and workflow models.
- Dynamic use and orchestration of IT based on situation and context.
- Seamless beneficiary experience across systems, sources, technologies.

Organizational Challenges/ Level 4

- Assuring consistency in adoption of policies, processes, and IT across an enterprise.
- Advancing ‘late-adopters’ to reach capacity of organizational baseline.
- Elevating and sufficiently staffing governance and compliance activities.
- Pivoting emphasis from capability development toward capability improvement.
- Strengthening operational efficacy with external/collaborating organizations.

Institutional 4





Activity Highlights

Business
- Systematic measurement in place to identify and remediate interop problems
- Established, consistent approaches for org change management and adoption

Data
- Consistently incorporate data best-practices into acquisition activities
- Adjust data use and policy based upon deployment experiences

Systems
- IT governance assures authoritative APIs and system source utilization
- Use of and planned roadmap maintaining currency with industry standards

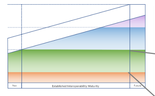
Capabilities Realized

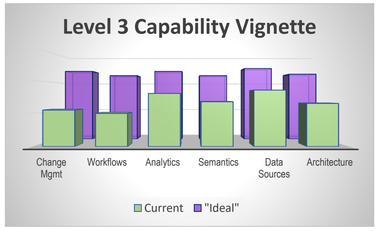
- Uniform methodologies for E2E interop planning, execution, and implementation.
- Architecture patterns with interoperability addressed explicitly.
- Conformance to sector standards within the enterprise, with consistency in structured concept representation.
- Ubiquitous use of consistent data representations and shared semantics.
- IT portfolio aligned with business needs and without sharing barriers across systems.

Organizational Challenges/Level 3

- Transforming data into targeted set of representations and semantics.
- Providing infrastructure to support consistency and quality in care across sites.
- Aligning IT to better support business workflows and process improvement.
- Atrophy use of non-authoritative data sources; eliminate unplanned redundancy.

Established 3





Activity Highlights

Business
- Instituting policy to promote and advance interoperability consistently across Enterprise
- Promote culture of sharing and reuse

Data
- Data mapping, ETL, and scrubbing activities underway
- Metadata mgmt improving to include provenance for internal and external data

Systems
- Transition out of direct data access and point-to-point interface to APIs underway
- Select project use of industry software constructs (ref. implementations, profiles)

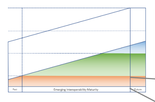
Capabilities Realized

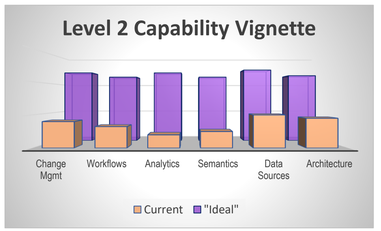
- Selective, growing use of standards-based interfaces and representations.
- Info services provide read access to external systems and mobile apps.
- Institutional culture recognizes need to use authoritative sources
- Conformance assurance largely rests on project team; growing governance
- Progressive project-based conformance to sector standards for interfaces and terminology.
- Limited consistency in data semantics.

Organizational Challenges/Level 2

- Reliance on legacy point-to-point interfaces.
- Inconsistent data representation and meanings.
- Duplicative data sources contain inconsistent data.
- Workflow and processes not well supported by IT; focus on work-arounds.
- Organizational change management is arduous and labor intensive; non-agile.

Emerging 2





Activity Highlights

Business
- Identify key stakeholders, their needs, and policy implications or barriers
- Identify and address resource and skillset gaps

Data
- Identify authoritative data sources, owners
- Determine preferred coding systems, terminologies, data types
- Determine data quality gaps, concerns

Systems
- Define preferred interface protocols
- Leverage use of industry standard APIs
- Establish governance program, oversight

Capabilities Realized

- Growing availability of interoperability guidance influencing implementation and acquisition activities.
- Information being exchanged in select circumstances, generally via paired systems exchanging information.
- Use of proprietary interfaces or interfaces based on locally modified standards.
- Awareness of data consistency and duplication efforts; formative work to establish authoritative sources and representations.

Myth Busting

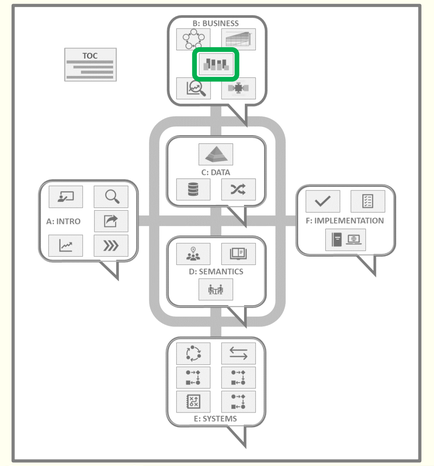
Myth	Reality
The challenge in organizational transformation is getting to an ideal state.	Each capability needs to be determined separately, and “ideal” is not always the right target.
The principal focus in achieving interoperability is the exchange of data.	While data has been an early, dominant focus, the need for business and technical interoperability is just as prevalent.

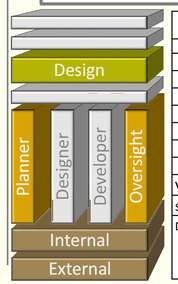
Glossary of Terms

Acronym or Term	Definition
AI	Artificial Intelligence
API	Application Programming Interface
ETL	
E2E	End-to-End
ML	Machine Learning
RPC	Remote Procedure Call
HRO	High Reliability Organization

Further Reading

- Capability Maturity Model – Integration
- VAIL Interoperability Maturity Model
- VAIL Interoperability Framework





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System:	***i*-VA Blueprint**	
Drawing: Applying the Interoperability Maturity Model		PAGE B-3

i-VA Blueprint

Assessing and Maturing Enterprise Interoperability

At a Glance

This page describes:

- The VAIL approach to describing the various stages of the Interoperability Maturity Model
- How the maturity model is used to assess current support for interoperability across the VA offices and departments that have an enabling role
- How the maturity assessment guides strategic planning and the definition of goals, and the realization of outcomes.

VAIL Maturity Assessment Concept

To enable the right information and services to securely and reliably reach the right person at the right time in the best manner…

- Interoperability ties IT capabilities together across the VA enterprise to serve the Veteran most effectively
- Measuring maturity helps gauge how well VA is accomplishing the objective of more effective service
- Maturity assessment considers the business and organizational environments, data and systems
- Assessment process identifies areas for action
- Periodic reassessment confirms what areas have been improved and what gaps remain

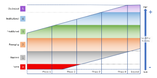
Interoperability Maturity Assessment Criteria

- Based on a modified CMMI approach
- Each pillar of the interoperability framework has many elements that need to be assessed
- Assessment is a facilitated Q&A process to determine current state of support for interoperability
- Criteria for each level of maturity (1 through 5) for each interoperability element is applied.

Maturity Evaluation - Launch Point for Planning

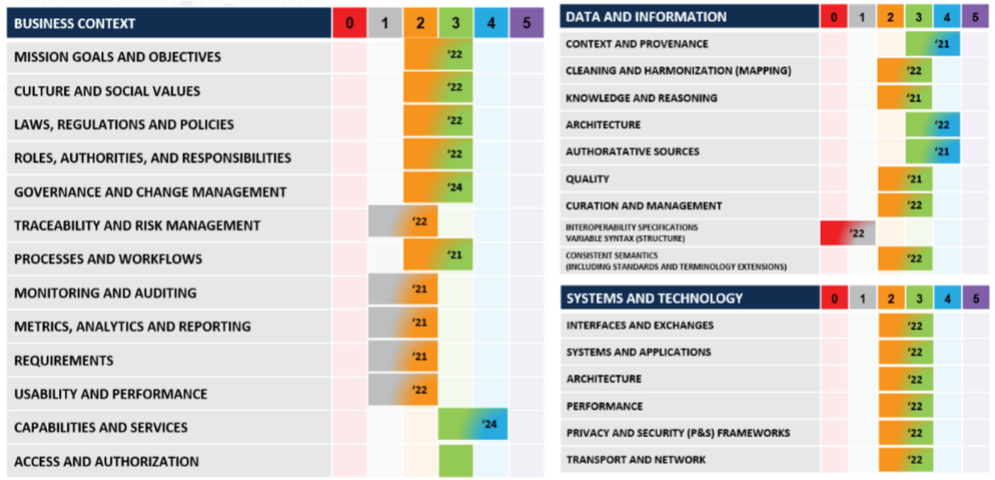
- Maturity levels and recommendations are the basis of the assessor's report
- Recommendations are made to help the program advance interoperability for each framework element
- Findings and recommendations are shared with the OTI team and the business owner
- If a roadmap is to be built, it will be based on recommendations
- Interoperability SMEs work with business owner to determine what will be put onto the roadmap and in what fiscal year each milestone will be met

Assessment Approach



1. Use Case Assessment Intake
2. Use Case Engagement and Information Gathering
3. Interviews and Data Collection
4. Analysis and Maturity Level Scoring
5. Sustainment & Closing
6. Reassessment

- Outlined is a stepwise process for assessing program interoperability maturity
- Objective is to determine current, state, identify improvement opportunities
- While illustrated linearly, the re-assessment step results in an iterative refinement approach
- Goal is to enhance interoperability across programs



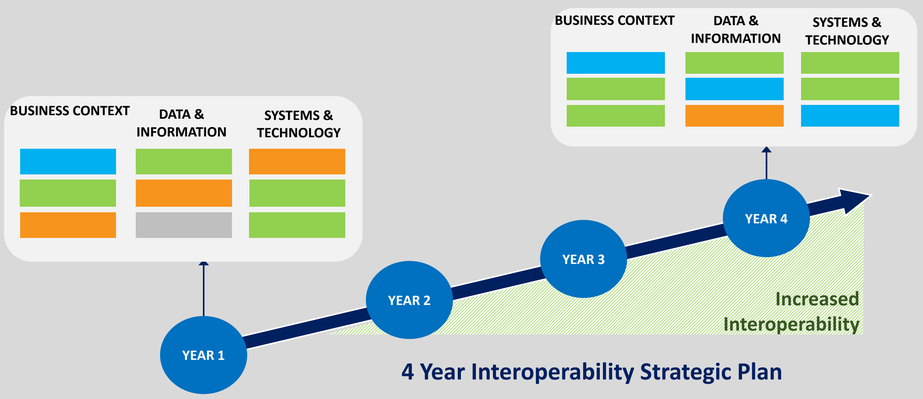
Assessment Findings Explained

- Major categories of consideration align to the VAIL Maturity Framework
- Each topic/theme elaborates the corresponding Framework pillar and is scored
- The scoring bar indicates the starting "position", intended target state, and anticipated date
- Note that target transition state varies in time & maturity

Interoperability Maturity Questions - Samples

- **Business processes and foundation**: What *supporting elements* for interoperability are in place? (documents, processes, and culture)
- **Process Depth:** How *thoroughly* do the supporting elements reinforce the development of interoperable workflows and products?
- **Process Uniformity:** How *consistently* are these supporting elements used? Are they applied at the outset of projects or attempt to be retrofitted later?
- **Success Gauges:** How *satisfactory* are the outcomes? Can they be measured? Do they meet the need?
- **Continuous Improvement:** How well do the program's interoperability processes meet current and adapt to meet evolving needs? Does an improvement process exist? Does the organization adopt and contribute best practices to the enterprise?

Maturity Assessment Guides Strategic Planning



- The strategic plan illustrates the evolution from current state (Year 1) to target state (Year 4)
- Color indications depict advancement progress toward intended interoperability maturity
- This depiction can be annotated to include key enabling activities or milestones

Myth Busting

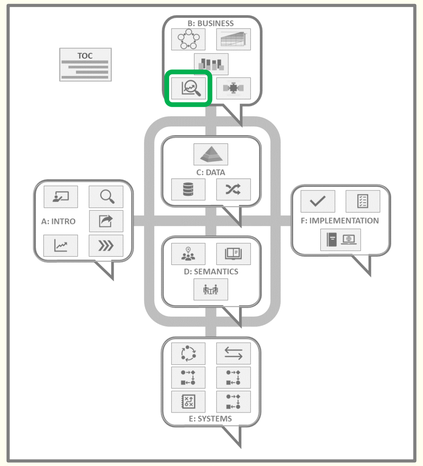
Myth	Reality
The principal value of interoperability assessments is as part of an enterprise Governance activity	While governance and advancing consistent delivery is a legitimate use-case, Interoperability Assessments allow projects to identify risk areas impacting product efficacy & program delivery.
The ideal target state for maturity activities should be "Level 5" so as to optimize VA delivery.	While Level 5 sounds ideal, achieving that necessitates substantial investments which may not be required or cost-effective. It is reasonable to selectively target areas for optimal delivery.

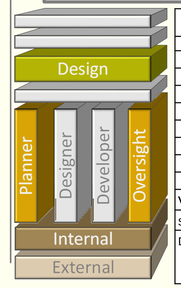
Glossary of Terms

Acronym or Term	Definition
VAIL	VA Interoperability Leadership
CMMI	Capability Maturity Model Integration

Further Reading

- VAIL Maturity Model
- VAIL Assessment Methodology
- VAIL Interoperability Strategic Plan
- VAIL Assessment Change Control Board





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i-VA Blueprint

Capabilities, Services, and Components

Functional Interoperability, Service Design, and APIs

Page at a Glance

- Using VHA as an example, this page illustrates the concepts of business capability decomposition and traceability to shared services.
- Based upon key interoperability concepts such as *separation of concerns, service orientation*, and *orchestration*, this page depicts how Veteran services relate to IT and support services, and how APIs and delegation allow for services to work together to fulfill business needs.
- Existing capabilities can be exposed via APIs serving as a façade. One capability can support multiple APIs, thus multiple formats or versions

Important Interoperability Concepts

- **Cohesion** brings like functions together into one service.
- **Interoperability-oriented design** encourages the use of standards any time systems "talk" or "touch".
- **Separation of Concerns** is an approach to modularizing a system or problem into pieces, each of which has shared interests, objectives, and purpose.
- **Orchestration** is the process of chaining together services or functions together to deliver business value. This can be done the same way each time (static) or adapted based on need (dynamic).

What are shared services?

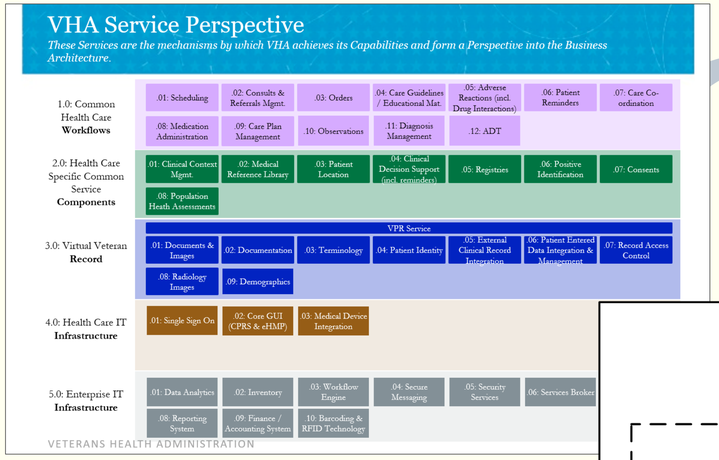
- Shared services are common functions that can be leveraged across business units and programs.
- They reduce costs by fostering reusability of investments, also improving delivery consistency
- They are accessed via an interface (or API) which binds the services to a service contract.
- Services that use standards-based APIs enhance interoperability by making it easier to invoke by service consumers, and can be readily replaced with better performing alternatives.

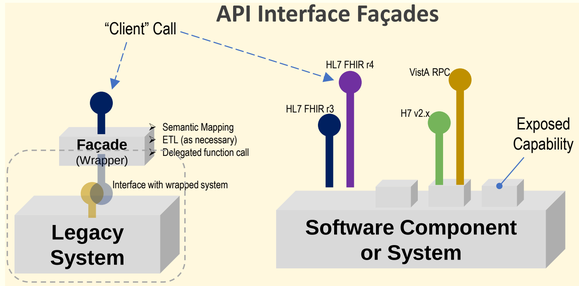
Service Structure and Composition

- Typically, several variants of a service are implemented, classified both by the nature of their work and the way they fulfill it.
- Implementing services behind an API allows the underlying system to be adapted or changed without adversely impacting business consumers of that service
- Services are accessed via an API which may be publicly accessible or have a restriction on who may call it.
- The API receives incoming requests and delegates responsibility to parts within the service or to other support services.
- Composite services break requests into smaller pieces and leverage smaller support services to fulfil needs.
- The process of chaining together and managing multiple services working together is *orchestration*.

Service Design Best Practices

- Typically, services are most effective when they do one thing (or a very small number of related things).
- This singular focus allows services to be fine-tuned, optimized, and composable into an integrated set of platform capabilities
- Data is the "cargo" of a service. The service should be the Authoritative Source of the data in its control, and all updates should be managed by the service. This promotes data integrity and consistency.
- Services should be designed to work together.
- Micro-services follow this same approach but are very limited in scope and generally highly scalable.
- Legacy applications can be "wrapped" to appear as services (i.e., one system can be "hidden" behind multiple service interfaces). This is particularly useful for legacy modernization approaches.



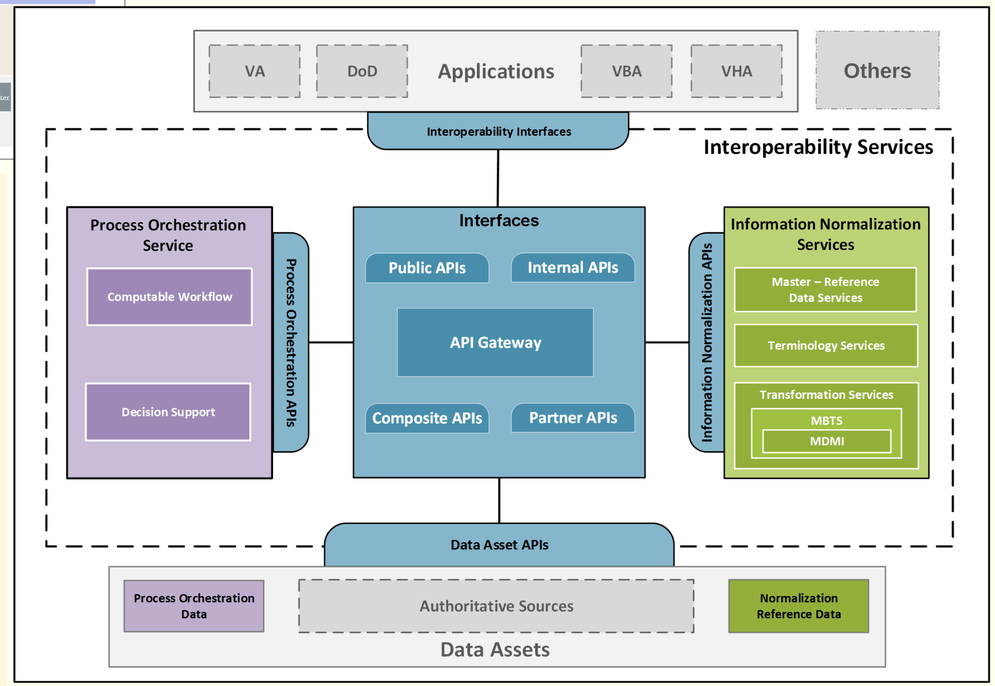


The above illustrates a pattern for exposing specific functional capabilities, making them accessible to Enterprise consumers is a façade. A few items of note:

- One component can provide multiple capabilities/functions
- There can be more than one interface into a capability
- Interfaces may be proprietary or standards-based (e.g., FHIR)
- Multiple versions of an API can be supported concurrently
- APIs can be native to a component, or disintermediated via a "wrapper" layer

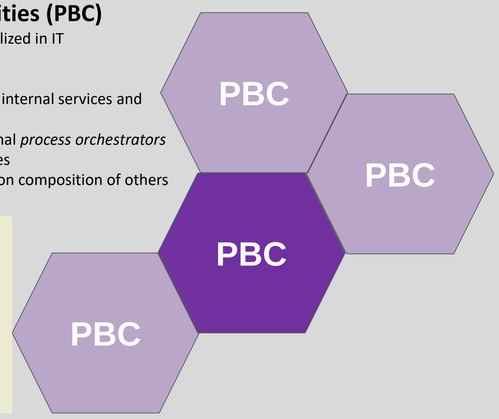
Items to Note

- VA Services often relate to multiple distinct capabilities
- The way VA systems interact with services is via a [systems] interface, which exposes the capabilities and what is being shared
- Services and capabilities can be chained together to solve complex needs
- "Orchestrating" services can dynamically adjust complex chains based upon situational need
- Service can be composed into "bigger" functions, or broken apart into smaller component parts as needed
- Legacy applications can be "exposed" as services (e.g., an approach that can be leveraged for EHRM)



Packaged Business Capabilities (PBC)

- Allows for business functions to be realized in IT
- Each function is "cohesive" in nature
- Capabilities are Composable
- Capabilities are autonomous and have internal services and requisite data
- Functionality exposed allows for external *process orchestrators*
- APIs exposing the functional capabilities
- New services can be created based upon composition of others



Implications

- Business capabilities can be dynamically restructured to adapt to changing needs
- Can use 3rd party orchestration
- Enhances maintenance possibilities due to encapsulated functionality
- Dynamic scalability based upon each capability
- Clearer line-of-sight between business and technology

How are PBC's used?

- Business capabilities provide fulfillment services of the functions they support
- In most cases a business need or use-case is satisfied by chaining together PBCs into a value-chain, calling them in some sequence realize a set of capabilities
- In some cases, a specific PBC is used to meet a direct business need (e.g., 1:1)
- The "chaining" of these calls in a sequence is a *choreography*, and that choreography is managed by an *orchestrator*.
- Choreographies can be reusable to fulfil like needs, documented as *patterns*.

How are PBC's created?

- PBCs may be realized as new components or by exposing collections of existing functions "wrappered" into a capability
- PBCs are accessed via API's that shield external "callers" from the internals of service delivery (e.g., "black-box")
- PBCs themselves may be composites, with several internal services, data, and functions used in concert to fulfil their packaged capability
- Legacy systems can be packaged, with internal capabilities exposed via an API to form a packaged capability

Myth Busting

Myth	Reality
Business capabilities are best supported by one system or IT service component.	Traceability between business capabilities and shared services is advantageous. There should be no expectation that this is a 1:1 relationship. Use of multiple support services to support business capabilities is appropriate and should be expected.
With a drive toward COTS acquisition, the role of IT services is no longer necessary.	The use of COTS is not inconsistent with services. In fact, cloud services are service-based and many integrated suites are exposing shared services via APIs.

Glossary of Terms

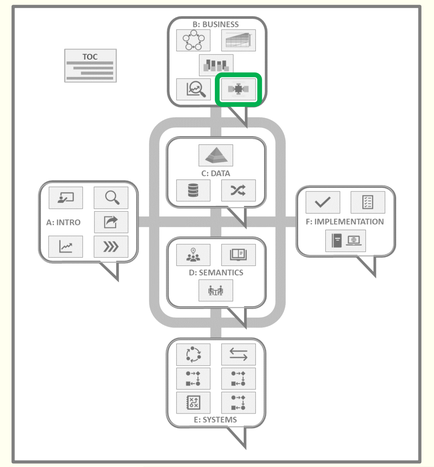
Acronym or Term	Definition
ADT	Admission, Discharge, Transfer
API	Application Programming Interface
COTS	Commercial off-the-shelf
CPRS	Computerized Patient Record System
eHMP	eHealth Management Platform
GUI	Graphical User Interface
MBTS	Model-Based Transformation Services
MDMI	Model-Driven Message Interoperability
RFID	Radio-frequency identification

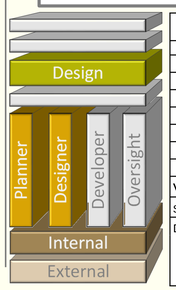
Further Reading

Link to Gartner Composable Architecture here

Link to OIT Health Portfolio Technology Office here

Link to VHA Business Architecture / Services Capabilities





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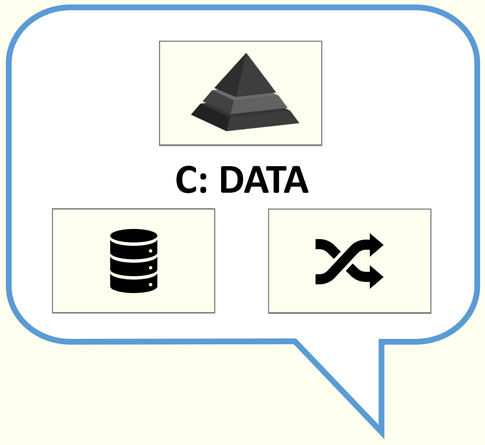
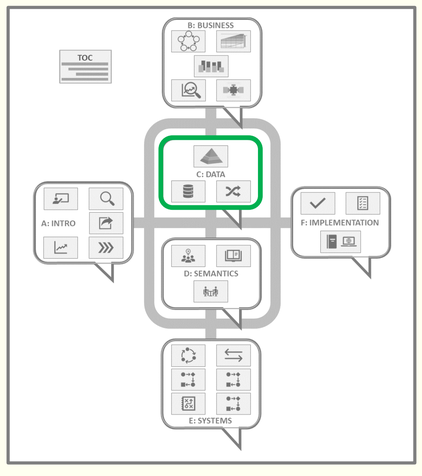
Section C – Interoperable Assets





i-VA Blueprint

Introduction to Interoperable Assets

At a Glance

- Information and knowledge are assets that must be leveraged, just like systems and technologies
- Managing these distinctly from IT allows the organization the change and adapt as needed
- It is important to draw on **authoritative sources** to maintain data integrity and consistency in use
- Use of industry representations allows unfettered sharing, fosters reuse, and promotes quality

Data as an Enterprise Asset

- Data about a patient belongs to the patient, not the VA. We are trusted stewards.
- Increasingly patient data comes from outside the VA, or from the patient themselves. Data sourced from within VA is often "siloed" in one program or system.
- Unplanned data duplication fosters data quality issues, data inconsistency, and redundant work
- Context is frequently essential for data to be consumable and useful. Understand when data is "composite" (City & State; systolic AND diastolic)
- **Information Semantics** define how data is represented so maintain consistency and durability of meaning
- Use of established data standards (e.g., terminologies, value sets, etc.) help maintain consistent meaning and data use across VA and with community providers of services to veterans.

Authoritative VA Data Assets

Taken from the Data Steward Authoritative Data Source Guide

- **Authoritative sources** of data should be used to assure current, timely, and accurate information
  - Sourced from responsible program office or designated system
  - Recognized "System of Record"
  - Applied use of established data standards, formats
  - Leverages Enterprise Master Identity Data, Reference Data
- Planned duplication of data (e.g., caching) is okay, so long as data integrity is maintained
- Data "due diligence" includes:
  - Identifying what data assets are required
  - What presently exists
  - Efficacy analysis of the extent it meets needs
  - Implications of reuse
  - What new data is needed, and the breadth of its potential use
- The VA Systems Inventory system (VASI) contains a comprehensive listing of existing systems and associated data assets. Access it here >
- The Business Reference Model (BRM) provides a comprehensive model and listing of existing information systems capabilities and services VA Systems Inventory (VASI). Access it here >
- The VA Business Information Model (BIM) defines core business concepts and helps identify ownership and reuse potential. Access it here >
- The Interface Control Document Catalog also provides a listing of the available interfaces for existing assets. Access it here >

Data Assets [Instance Data]		
Data Role	**Type of Data**	**System Source**
Ref. Data	Reference Data / Lookup Tables	VistA Cerner
Ref. Data	Medical Images, DICOM	VistA Imaging
Patient Context	Patient self-entered data	MyHealtheVet
Direct Care	Patient Instance Data	VistA
Direct Care	Patient Instance Data	Cerner Millennium
Quality Mgmt	Allergies & Medications	CHDR
Direct Care	Patient Instance Data	HIE (community)
Direct Care	Patient Instance Data – Joint DoD Medical Record	Joint Legacy Viewer (JLV)
Analytics	Longitudinal Records; Data Lake	Cerner HealtheIntent
Analytics	Population	Corporate Data Warehouse

Non-Data Assets [Knowledge and Process Data]		
Knowledge / Process Role	**Type of Asset (Format)**	**Source(s)**
Support LHS	Reference Data / Lookups	File 200
Coding	Medical Vocabulary, Terminology	SNOMED, RxNORM, others
Coding	Knowledge Assertions [Medical]	SNOMED, Clinical Professional Orgs, Licensed Knowledge
Decision Support	Clinical Decision Support Rules	FEHRM, Clinical Organizations, Licensed content
Process Mgmt	Business Rules	HL7, Prof. Societies, Licensed Content
Quality Mgmt / Quality Improvement	Care Pathways, Workflows, Practice Guidelines	Clinical Societies, COTS, Licensed Content
Quality Mgmt / Quality Improvement	Clinical Evidence	CDW, NIH, ORD, Research Institutions

Industry Formalism	Data – Direct Use	Reference Knowledge	Process Enablement
BPM+	◦	◒	●
BPMN	◦	◒	●
CDA	●	◦	◦
CPG on FHIR	◒	◒	◒
CQL	◒	●	◒
DICOM	●	◦	◦
FHIR	●	◒	◒
HL7 2.x	●	◒	◦
KNART	◦	●	◒
RDF	◦	●	◒

Types of Data Assets

- Transactional data – process oriented
- Category data, resource data, event data
- Master Identity Data
- Master Reference Data
- Metadata

The way data is represented has profound implications on its usability for decision support, inferencing, and automation.

*For more detail, please visit the i-VA section on **Information Semantics**.*

Types of Knowledge Assets

- Decision Logic, such as Logic Tables
- Concept interrelationships, e.g. ontologies
- Patient Evaluation Rules
- "Computable" expressions of medical evidence

Knowledge assets express our understanding of medicine and other content in a way that can be consumed by people and machines. Treatment of knowledge as distinct assets supports its independent evolution, and better allows IT to support constant changes.

For more detail see the Seamless Experience journey, and the i-VA References

Types of Process Assets

- End-to-End Business Processes
- Clinical Practice Guidelines
- Coordination of Care / Care Plans
- Orchestration of Care Activities

Process assets represent workflows, practice guidelines, care pathways, and best practices. These assets consider human activities, automatable processes, and the interaction between human and machine.

These can be represented in a host of formalisms, from natural language through to computable graphic languages such as BPMN, BPM+ , and CPG on FHIR.

Accessing Assets

- Best practice is to isolate access via a formally defined interface
- Standards-compliant interfaces/APIs reduce vendor lock-in risk
- Interfaces define both **what** content is available/provided, as well as **how** that content can be accessed

By isolating asset access behind and interface, this becomes a control point preventing "brittle" systems from failing when something changes. Data specifications define the type, format, and representation of the data/knowledge payload. Behavioral specifications define how the interface works.

Please visit Section E for more detail.

Interop Design or Implementation Characteristic	Interop IMPACT	Risk	Neutral	Benefit
Leveraged use of enterprise authoritative data sources				X
Use of formal data representations consistent with enterprise semantics (see Info Semantics section)				X
Duplication of reference data for performance enhancement			X	
Native use of COTS knowledge and decision logic		X	X	
Use of formally expressed business knowledge / business rules (e.g., computable)				X
Ingest of 3rd party data in native formats		X	X	
Ingest of 3rd party data adapted to standardized format				X
Leveraged use of prior-version of VA-accepted terminology		X	X	
Direct access to database from existing VA system		X		
Access to VA authoritative system via published authoritative API				X

Myth Busting

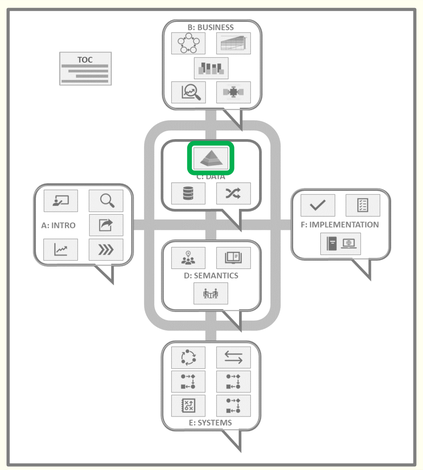
Myth	Reality
⊘ Interoperability is focused on data sharing.	While historically the predominance of interop work has been data-oriented, there are business reasons to share knowledge and processes needed to delivery appropriate care
⊘ Best-practice is to pull data directly from a data source.	So long as the source is authoritative, and the established access method is used, this practice is fine. Direct access to databases, particularly from other systems, should generally be avoided.

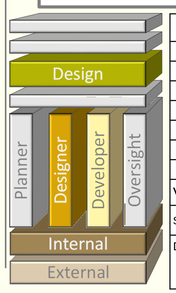
Glossary of Terms

Acronym or Term	Definition
VASI	VA Systems Inventory
BRM	VA Business Reference Model
BIM	VA Business Information Model
OEI	VA Office of Enterprise Integration
DGC	VA Data Governance Council
LHS	Learning Health system
API	Application Programming Interface

Further Reading

1. Data Steward Authoritative Data Source Guide
2. 2021-01 VA Data Strategy
3. VA DGC policy
4. VA Systems Inventory system (VASI)
5. VA Business Reference Model (BRM)
6. VA Business Information Model (BIM)
7. VA Interface Control Document Catalog
8. DAMA Data Management Body of Knowledge 2





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System:	*i*-VA Blueprint		
Drawing: Intro to Interoperable Assets			PAGE C-1

i-VA Blueprint
Data Access and Sharing

At a Glance

- This page defines the characteristics of data that is authoritative, suitable, and necessary for sharing across the VA enterprise and with VA's community-based service providers
- Provides insight into what the implications are for the use of different data sources
- Cites the types of Reference data and identifies authoritative sources
- Provides examples from VHA of different data standards appropriate for sharing and accessing Veteran's health data for a range of purposes and contexts

Key Concepts

- While data about Veterans may be distributed across the VA enterprise, as well as with community service providers, not all data sources can be considered equally authoritative
- What makes data authoritative depends upon:
  - The nature of the source
  - The closer the data capture is in time and the location of an encounter with the Veteran the more accurate it should be
  - The purpose for which the data was gathered in that encounter
  - How the data was gathered
  - How consistently structured the data is across sources
  - How consistently enterprise master identity and reference data is used across the VA
  - How reliably and readily data can be accessed
- To simplify access while ensuring the integrity and appropriate use of authoritative data sources, data custodians should define and make available the APIs necessary to share or receive information in their data source

Value of Reference Data to the Enterprise

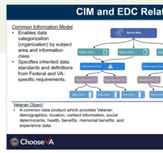
- Managing Master Data and facilitating its accessibility and reuse across the enterprise:
  - reduces risks of data redundancy
  - allows correlation of data across sources, creating a consistent coherent picture of past and present
- Ensures higher data quality data across the enterprise
  - Essential in providing a seamless experience to the veteran
  - Helps ensure a current and coherent picture of the Veteran's circumstances and services
  - Essential for the effective and efficient operation of the organization and evaluation of outcomes and progress toward operational goals

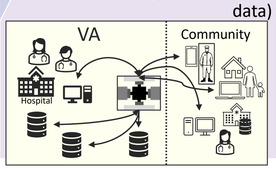
Identity, Reference, and Knowledge Assets as a Service

- Just as with instance data, enterprise identity, reference, knowledge, and process-related information should be provided as a data service using published APIs

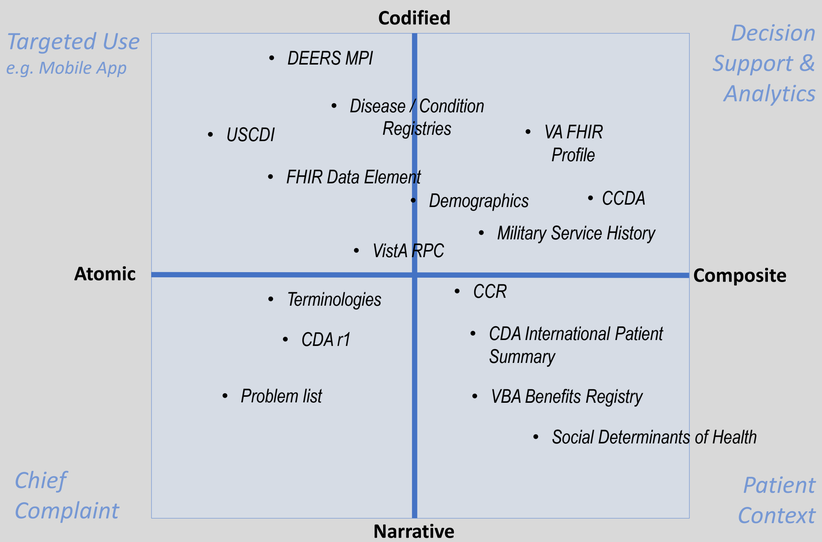
Interoperable "Instance" Data

Use and Representation	Semantics	Access
• Instance data is transactional • Qualities of authoritative data are also needed for interoperability • Consistent use of identifiers across the enterprise • Standardization of key data content and representation ensuring consistency, understandability • Planned intention to share relevant data with other systems, programs • Redundancy is deliberate, thoughtful, drawn from authoritative sources • Information models assure consistency and context	• Semantically-consistent data is suited for analytics, inferencing, decision-making • Information systems can ingest information without altering meaning or losing accuracy • Automated processes can reliably act on it • Data is accessible to other information systems without negatively impacting the function, performance or integrity of the source information system(s) • Use Standard coding systems and terminologies to maintain meaning	• Data can be drawn from variety of internal or external sources • It is critical to leverage authoritative sources • Access to data should be through published APIs • Data should only be provided when compliant with data use policy (e.g., policy enforcement points) • Planned Duplication is okay considering currency and quality implications • Note that preferred data sources are not always internal – Context matters (e.g., community care, referrals, patient-sourced data)





Different Data Standards for Different VHA Purposes



Choosing a Data Source

Nature of Source	Authoritative	Enterprise Defn	Codeset(s) Used	Data Sharable	API Access Path	Context Provided	Posture	Implications
Transactional System *(System of Record, normalized data)*	✓	✓	✓	✓	✓		✓	• Preferred Source; secondary only to shared services
Transactional System *(System of Record, unnormalized)*	✓	✗	✗	✓	✓		✓	• Use with caution • Need ETL to use
Transactional System (System of Record, direct access)	✓	✗			✗		✓	• Establish proxy interface • Limit direct access • Monitor for volatility
Transactional System *(System of Record, Policy constraints on Sharing)*	✓						✓	• Assess policy, ethics impacts; • Utilize policy enforcement point to limit sharing
Transactional System *(NOT System of Record)*	✗						✗	• Do not use as a primary data source
Enterprise Shared Service *(Authoritative)*	✓	✓		✓	✓		✓	• Ideal, Preferred Source
Analytics Platform	✗	✓	✓	✓		✓	✓	• Use as secondary source • Not intended for transactional use
Corporate Data Warehouse	✗	✓	✓	✓	✓		✓	• Not authoritative • Comprehensive view
VHIE/VDIF	✓	✓		✓	✓	✓	✓	• Limited control of externally sourced data

Bold indicates high-impact consideration factor.

"Reference" Data

Reference Topic	Reference Impact/Implication	Auth. References
➢ Veteran Identity	➢ Assures accurate identity management, consistency across systems	➢ Master Veteran Index
➢ Facility/Location Lookup	➢ Allows for performance analytics and performance management; administrative oversight, business operations	➢ <to be added>
➢ Medical References / Clinical Coding	➢ Common terms allows for health analytics, clinical decision support, quality management; In some cases provides support for billing reimbursement	➢ Terminology Svcs APIs
➢ Reference Values/ Codes	➢ Provides information form which to populate pop-up lists and selection tables	➢ Master reference data APIs

Myth Busting

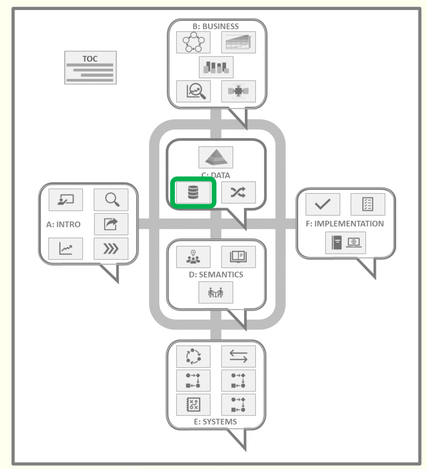
Myth	Reality
Community-sourced or externally provided data is of suspect quality and utility.	The standards-based API's VA publishes for requesting data from external sources, along with provenance, helps ensure data is consistent in format and meaning and reliably actionable.
I don't need to share my data.	The custodian of data about a veteran's health the services they receive cannot anticipate why or when that data is needed. Where that data is that is relevant-for-sharing, they cannot withhold it.
Exposing an API to access my data is all that is needed for effective sharing.	APIs provide by VA for data access must be conformant with industry standards in format and meaning and use shared identifiers in order to be useful and effective.
VA Internal Data is higher quality than external sources.	Lack of internal data standardization within VA risks data being considered unreliable by external users.

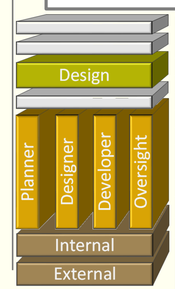
Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
Normalized	Data that follows a consistent format, structure, and use of unique identifiers for entities and concepts
FHIR	Fast Healthcare Interoperability Resources
VHIE	Veterans Health Information Exchange

Further Reading

1. i-VA Blueprint Section D - Informational Semantics
2. Data Governance Council resources
3. DMBOK 2 definitions of Master Data and Interoperabilty





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Drawing: Data Access and Sharing

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i-VA Blueprint

Sharing Knowledge and Process Assets

Page at a Glance

- Business operations necessitate the ability to receive, adopt, and apply organizational and industry knowledge in a timely and accurate fashion
- Accurate interpretation of business knowledge depends upon its precise expression, furthered by the use of formalisms and industry standards
- There are emerging tools that can directly consume and apply knowledge
- Separating knowledge from the systems that execute that knowledge allows for improved business agility; opportunity to apply best-practices
- Several standards and industry initiatives are in place and underway working in this space. The challenge is using each piece appropriately in a cohesive strategy
- AHRQ has published a roadmap illustrating how pieces fit

Why focus on Knowledge and Process Interoperability?

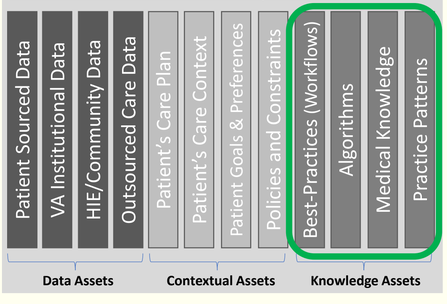
So much of industry attention goes to data sharing, but critical to healthcare delivery is the intersection of data, process, and knowledge. As business and clinical operations perform their workflows, they apply processes that often need to be shared within and outside of the institution, and are reliant upon timely data, business rules, and [where appropriate] industry knowledge and best practices being applied.

The ability to share those non-data assets is essential to providing a beneficiary experience allowing for each beneficiary interaction to meeting their needs, and to allowing for optimal delivery and VA's keeping pace.

Implications of Knowledge-as-an-Asset

- Elevating knowledge to being managed as assets allows it to be discoverable, portable, and sharable
- This separation allows knowledge to evolve independently from underlying technologies
- Like any digital asset, this approach allows for versioning, update, and asset management
- Knowledge assets are intellectual property, and as such can be licensed
- Emerging are industry repositories for knowledge discovery, dissemination, and distribution

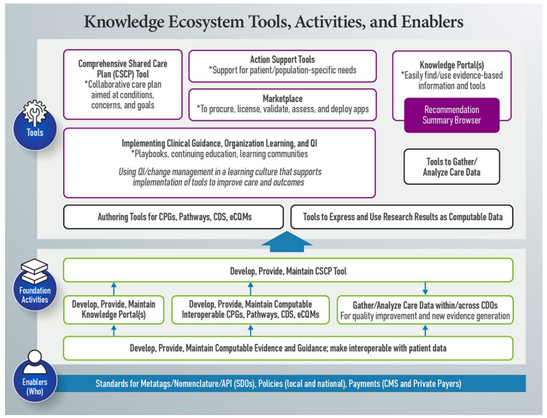
Orientation around knowledge sharing



Exploring Knowledge Interoperability

A host of industry activities are focused on the sharing of non-data resources. Representative examples include:

Activity	Target Use	Short Description
BPM+ Health	Workflow portability	Allows for modeling, swapability, interoperation of workflows, processes, case pathways
CPG on FHIR	Clinical Practice Guidelines	Computable representation of a narrative clinical guideline supporting cognitive and decision support, quality measures, case reporting
SOLOR	Terminology and Coding	Brings together different terminology standards by using a single model to support unambiguous representation, inferencing, and reasoning.



Concept Expression

Terminologies ♦ Ontology ♦ Coding Systems ♦ Vocabulary

- Structured reference data used for lookup, consistency of meaning, discovery of related concepts
- Formal representations enable decision support, inferencing, and analytics

Rules and Algorithms

Business Rules ♦ Business Logic ♦ Decision Support

- Allows for systems to adapt and evolve based on emerging practices
- De-couples medical knowledge from the platforms that support it
- Enhances potential to apply insights from AI and Machine-Learning (ML)

Processes and Workflows

End to End Process ♦ Business Process ♦ Practice Guideline

- These expressions capture business requirements, assure traceability through the technology stack, and document best-practices
- When expressed via graphical languages, these are human- and machine-readable

Stratified Logic Model

HL7 has embraced a layered conceptual model to describe strata of decision logic. Details available here

Knowledge Level	Description	Example
L1	Narrative	Guideline for a specific disease that may be written in the format of a peer-reviewed journal article
L2	Semi-structured	Flow diagram, decision tree, or other similar format that EXPLICITLY describes or expresses logic constructs that are interpretable by non-SME 'computable logic developer' for constructing L3, BUT are also expressed in a manner sufficient for domain SME to review and validate
L3	Structured	Standards-compliant Specification for CDS that explicitly encodes computer interpretable logic including data model(s), terminologies (concepts, value sets), logic expressions in a computable language sufficient for implementation- often across a broader set of local implementations
L4	Executable	Manifestation of the logic (typically in a user interface) that is used in a local execution environment (e.g. CDS interventions running live in a local production EHR environment) or available via web services

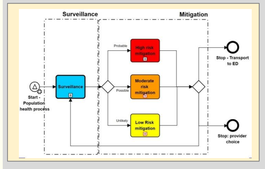
Knowledge Levels with Examples (Michaels, U.S. Centers for Disease Control and Prevention, 2019; Adapted from: Boxwala, AA, et al.. A multi-layered framework for disseminating knowledge for computer-based decision support. J Am Med Inform Assoc 2011(18) i132-i139)

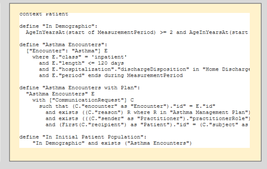
About the "Learning Health System"

- Within health care, there is strong interest in achieving the "Learning Health System" [LHS]. While oversimplified, the LHS embodies:
  - A culture of continuous improvement
  - The ability to rapidly and effectively adapt to emerging best practices
  - Achievement of High Reliability (e.g., consistent, quality delivery)
  - Science, informatics, incentives, and culture are aligned
- Key to enabling the LHS is the availability, dissemination, and use of knowledge
- The landscape to express "knowledge" is complex and diverse, from evidence to discovery to rules/algorithms to processes to performance measures

Spotlight on Process Modeling and Care Pathways

Multiple industry standards initiatives are focused on the authoring and sharing of clinical guidance and process models. The purpose of these is to allow for knowledge "portability" – enabling it to be managed as an asset. Common among the approaches are use of formal languages, computer-interpretability, and tooling support. Exemplars follow.





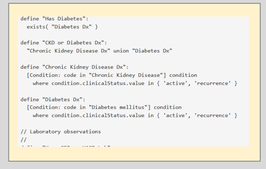
```
context patient

define "In Demographic":
  AgeInYearsAt(start of MeasurementPeriod) >= 2 and AgeInYearsAt(start

define "Asthma Encounters":
  ["Encounter": "Asthma"] E
    where E."class" = 'inpatient'
      and E."length" <= 120 days
      and E."dischargeDisposition" in "Home Discharge
      and E."period" ends during MeasurementPeriod

define "Asthma Encounters with Plan":
  "Asthma Encounters" E
    with ["CommunicationRequest"] C
      such that C."encounter" as "Encounter"."id" = E."id"
        and exists ((C."reason") R where R in "Asthma Management Plan")
        and exists ((C."sender" as "Practitioner")."practitionerRole"
        and (first(C."recipient" as "Patient")."id" = (C."subject" as

define "In Initial Patient Population":
  "In Demographic" and exists ("Asthma Encounters")
```



```
define "Has Diabetes":
  exists( "Diabetes Dx" )

define "CKD or Diabetes Dx":
  "Chronic Kidney Disease Dx" union "Diabetes Dx"

define "Chronic Kidney Disease Dx":
  [Condition: code in "Chronic Kidney Disease"] condition
    where condition.clinicalStatus.value in { 'active', 'recurrence' }

define "Diabetes Dx":
  [Condition: code in "Diabetes mellitus"] condition
    where condition.clinicalStatus.value in { 'active', 'recurrence' }

// Laboratory observations
//
```

BPM+ Health Benefits:

- Based on broadly used BPMN std
- Off-the-shelf tools available
- Suitable for multiple styles of workflow (directed, event driven)

Implications

- Suited to functional and technical audiences
- Precise semantics allows models to be simulated and executed
- Complementary to FHIR

CQL Benefits

- Broad adoption, particularly by payer community
- Used in CQI initiatives to express quality indicators
- Closely integrates with FHIR

Implications

- Assertive language well suited to technical implementation
- No visual element makes it poor for functional reviewers

CPG on FHIR Benefits

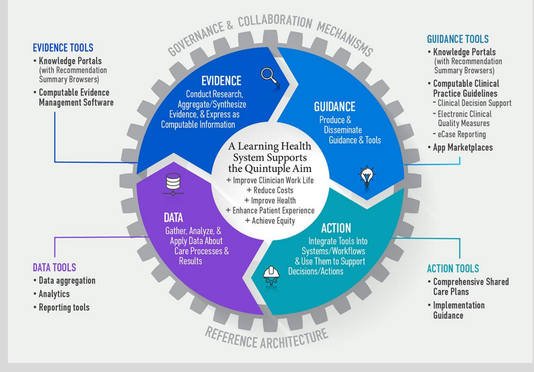
- Strong alignment with FHIR
- Narrative is precise, computable but suitable for human review

Implications

- Assertive language well suited to technical implementation
- Well suited for use in clinical decision support

AHRQ Evidence-based Care Transformation Support (ACTS) Initiative

AHRQ has been instrumental in developing a "Learning Health System Concept Demonstration" to illustrate how an integrated knowledge ecosystem can serve as a key enabler in realizing a Learning Health System. The objective is to bring together multiple different initiatives, approaches, and technologies that complement one another and are part of mobilizing knowledge to be more accessible, consumable, and available when and where it is needed as part of care delivery, population health, and other health related efforts. Visit their website.



ACTS-Identified Knowledge Ecosystem Tools and Enablers
Comprehensive Shared Care Plan
Action Support Tools
Marketplace
Authoring Tools: for Clinical Decision Support, Practice Guidelines
Expression of Computable Research Results
Data Analytics Tools
Knowledge Portals
Metatag Standards
API's
National and Local Policies
Aligned Payment Incentives

Myth Busting

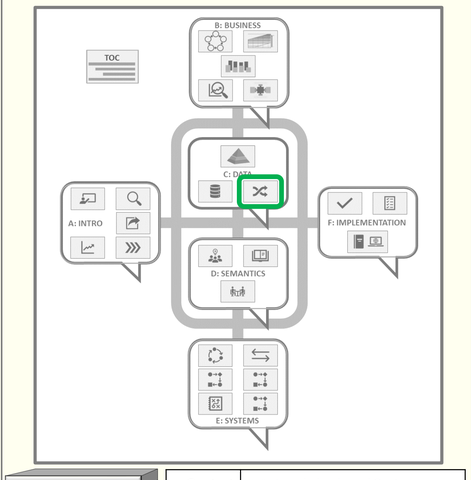
Myth	Reality
Achieving interoperability is predicated on the effective sharing of patient data.	Patient data sharing is a pillar of interoperability, but it is not sufficient. Keeping pace with changing medical practice requires rapid adoption & exchange of emerging knowledge.
By using modern systems and software, we are keeping up with the "state of the practice" of medicine.	While vendors and products invest in care pathways and workflows, innovation happens from multiple sources. When that knowledge is expressed interoperability, it can be updated more readily

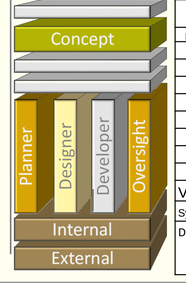
Glossary of Terms

Acronym or Term	Definition
BPM+	Business Process Management
CDS	Clinical Decision Support
CPG	Clinical Practice Guidelines
FHIR	Fast Health Information Resources
Orchestration	Coordination of services to fulfil a business need
SOLOR	SNOMED, LOINC, RxNORM (http://solor.io)
TCO	Total Cost of Ownership
TRM	Technical Reference Model

Further Reading

- AHRQ ACTS
- BPM+ Health
- Clinical Quality Language (CQL)
- CPG on FHIR
- Learning Health System





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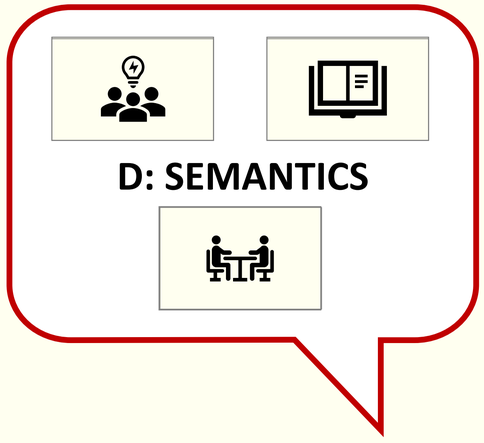
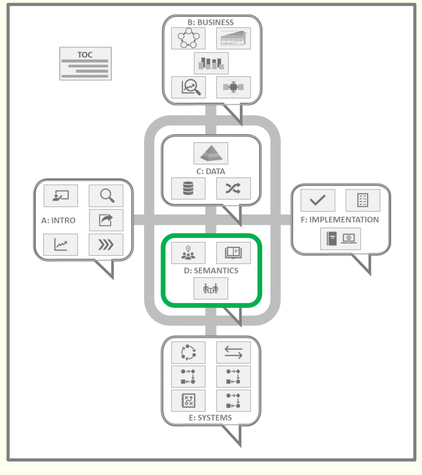
i-VA Blueprint Version 1.0
Section D – Informational Semantics





i-VA Blueprint

Informational Semantic Interoperability

At a Glance:

What is meant by Informational Semantics.

Why it is important to the veteran and their service providers.

What role it plays in achieving interoperability.

Set the stage for what project teams need to know.

The Importance of Consistent Meaning

- In order to effectively and safely support care of Veterans, and improve service outcomes
- It is necessary for humans and information systems to work effectively together (interoperate).
- Safety and efficacy require consistent and unambiguous meaning of concepts and observations (informational semantics)
- Especially when exchanging information between people or between systems across VA and with external service providers
- Exchange of semantically clear and consistent information is required across the enterprise for
- Analysis and insight
- Innovative research
- Effective decision support

Recognizing Semantic Boundaries

Define "semantic boundary" and the importance or recognizing when information is crossing those boundaries:

- context for understand may be lost
- words used in different operational contexts may have different meaning
- information may be represented at different levels of detail and precision in different operational contexts

Building Blocks of Informational Semantics

- **Concepts Based on Standard Terminologies**: The enterprise manages concepts and value sets as "VA standardized domains" from a number of terminologies e.g. in healthcare: SNOMED CT, LOINC, RxNorm, etc.)
- **Context:** Necessary for safe and appropriate interpretation and processing of the information
- **Computable Provenance**: Knowing origin and authorship provides authority to information used for treatment

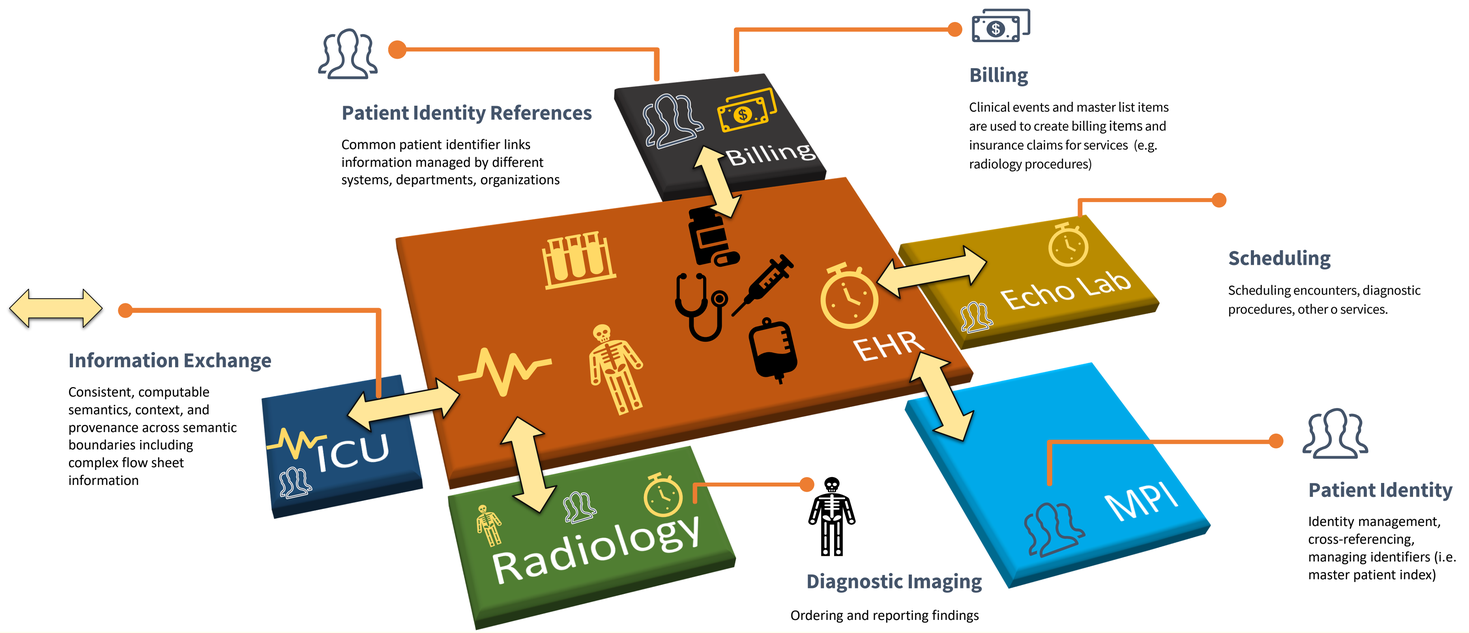
US Core Data for Interoperability (USCDI)

The foundational data elements that are shared across systems are specified by the Office of National Coordinator (ONC) for Health IT:

i-VA Blueprint

Informational Semantic Interoperability

Informational Semantics: Ensuring that information exchanged across the enterprise, regardless of how it is exchanged, is consistently understood and is actionable by persons and Information systems.



Standards-based information semantics specify the **meaning** of information exchanged across systems and organization boundaries to ensure the reuse of information and deliver Veteran care and best outcomes.
National law and regulations govern the choice of reference terminology used to convey consistent semantics across the enterprise and beyond, with community providers:

- In healthcare, LOINC, SNOMED CT, RxNorm are the primary clinical terminologies to support treatment, payment, research, clinical decision
- Terminologies are readily useable
- Provided to applications via drop-down lists, allowable value sets, and look-up functions
- By using established terminologies, the meanings of data are retained over time, making them durable

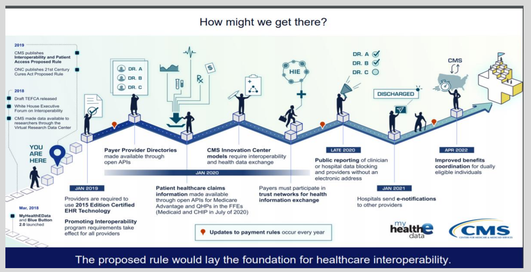
Consistent, Computable Information Semantics are **necessary** for interoperability

- **Within the enterprise and with external partners**: A system's semantics need to be consistent with other systems in the enterprise and beyond
  - A pre-requisite to seamless care, good clinical outcomes, and quality care for Veterans
  - Ensures information can be shared across systems and with community care
- **Is Processable by Systems**
  - without human intervention
  - Information flows across system boundaries to support treatment, payment, operations, and research

Cross-Enterprise interoperability and CMS regulatory requirements

Provenance
- Authoring provider
- Originating organization
- diary systems and organizations (i.e. Health Information Exchanges)

Context
- Circumstance (timing, purpose) for performance or request
- Data necessary to interpret the concepts in order to safely and effectively support decisions and computable processes



Semantic Interoperability Myth #1

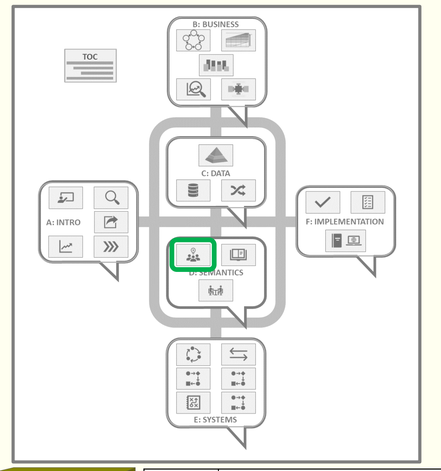
Myth	Reality
"The latest standard-based protocol will automatically lead to semantic interoperability"	Standard-based exchanges are preferable to proprietary solutions or vendor lock-in but the semantics of the data are more important to successful interop than the choice of standard or protocol
"C-CDA will solve all our transition-of-care problems"	Without high-quality implementation guidance technology and standards don't lead to interoperability
"FHIR will definitely solve all our problems because it's better than…"	Without consistent information semantics, the sender and receiver will misinterpret information regardless of standard / format / protocol
"FHIR APIs will solve all our interoperability problems because anyone can implement it without any health IT experience"	Exchanging inconsistent info more easily will lead to the wrong invalid medical decisions as providers rely on information systems rather than provider-to-provider communication

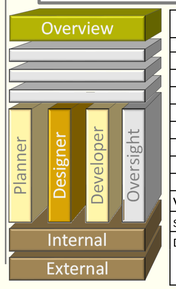
Glossary of Terms

Term	Definition
C-CDA	Consolidated Clinical Document Architecture
Cures Act	21st Century Cures Act
FHIR	Fast Healthcare Interoperability Resources
LOINC	https://loinc.org/
MPI	Master Patient Index
RxNorm	https://www.nlm.nih.gov/research/umls/rxnorm/index.html
SNOMED CT	https://www.nlm.nih.gov/healthit/snomedct/index.html
USCDI	US Core Data for Interoperability

Further Reading

1. CMS Cures Act Final Rule
2. CMS Provider Burden, Patient Access, and Interoperability Roadmap:
3. USCDI
4. Ethics Principles for Access to and Use of Veteran Data





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Drawing: Informational Semantics			PAGE D-1

i-VA Blueprint

Maturing Informational Semantics Across VA and Beyond

At a Glance:

Information semantics has reached a level of maturity that allows the enterprise to record and reuse consistent, interoperable information….

That preserves its meaning and context across semantic boundaries and can be used for research, analysis, billing, and outcome analysis.

A semantically interoperable system-of-systems must meet enterprise requirements and also meet national regulatory requirements and certification criteria applicable to health IT software (e.g. EHR systems)

Relevant Audiences

Information semantics maturity in i-VA follows CMMI approach and recognizes the importance of accurate and complete information

- Precise coded concepts using reference terminology defined by national regulation and best-practices
- Contextual information that provides the details necessary to process and interpret information across semantic or system boundaries
- Improve the quality of information by introducing enterprise governance processes for improvements of semantics, context, and provenance at the right level of granularity

Key Concepts

Information semantics applies to any type of information exchange regardless of format, protocol, or approach (APIs, transaction documents).

- Terminology: in the context of interoperability, terminology represents the set of code systems, value sets, and other constructs that govern the meaning of information in such a way
- National regulatory requirements are driving the standardization

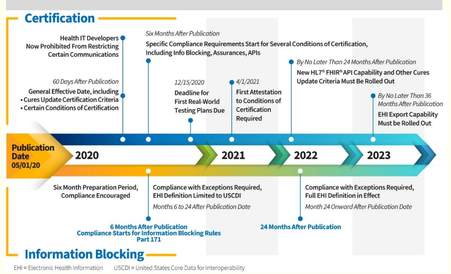
Drivers for Semantic Maturity

VA information maturity must respond to the regulatory requirements included in ONC Interoperability Rule that mandates the use

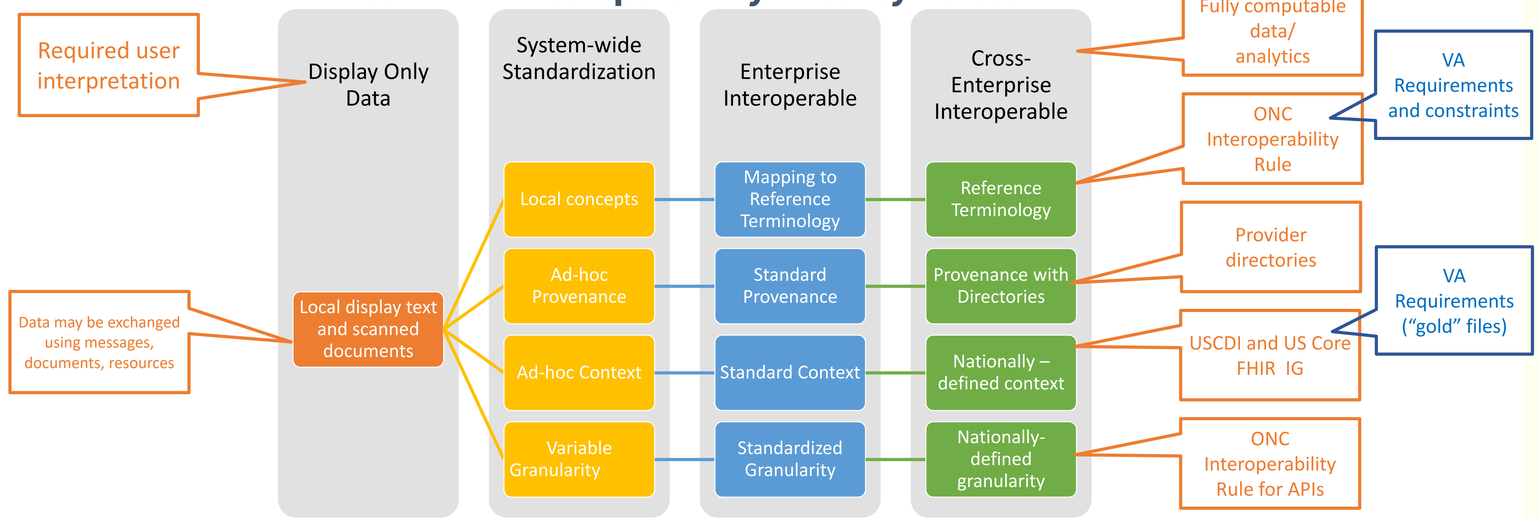
Health IT products including EHR systems will be certified according to criteria published by the ONC in conjunction with CMS updates to payment and reimbursement rules.

Therefore the health IT, including VA, DoD, and its industry partners must align with overarching interoperability drivers mandated by CMS in collaboration with ONC. This affects products like Cerner's.

Certification and Regulatory Milestones



Semantic Interoperability Maturity Across VA



Maturing Use of Coded Data and Terminology

Limited use of codes and coded data

- Reliance on locally-defined terms, text labels, abbreviations
- Terminology maps used to send/receive/interpret data
- Human/expert interpretation needed for safe data
- Standards-based concepts used for key data elements
- Terminology maps optional for nationally-required terminology use (ONC)

Local codes used to address identified gaps in mandated standards (e.g. SNOMED CT, LOINC)

- Standard-based terminology based on latest ONC Interoperability Standards Advisory (ISA). vocabulary, code sets, terminology standards.

Local codes apply national code systems and value sets, current with ONC ISA (no gaps).

- Only standards-based codes used for information exchange
- **Consistent use of national standards re: terminology**
- Reuse and contribute to VA standardized terminology
- Able to support and adopt new concepts (e.g. COVID-19, CMS Rules Changes)

Agile processes to adopt and create new terminology extensions based on research, outcomes, clinical practice, and evolving workflows

Maturing Information Granularity

Information provided in format selected by sender, one-size-fits-all.

- No adjustments for intended use (e.g., summary health records).
- Granularity is either too coarse (excessive aggregation) or too fine-grained
- Contextual elements missing, stripped, or necessitating human interpretation.

Standards-based data granularity to ensure that system users have access to the most accurate view of Veteran’s data using industry best-practices and reference terminology.

Information can be processed correctly (transactions, documents, distinct resources, APIs).

- Meets national guidance and interoperability rules
- Interfaces determined in advance at “design time”; Consumers can choose relevant granularity by interface

Data can be provided in form and format needed by requester;

Data conduits capable to adapt to changing needs (dynamic representation)

Maturing Information Provenance

Text-based provenance information

- Based on local provider and organization identity
- Provenance requires human interpretation

Structured provenance

- Based on enterprise identifiers
- Using national guidance for
- Partial computability of provenance information

Standards-based, computable provenance

- Follows national guidance on patient-generated, locally, and externally authored information
- Provider and organization identify validated by using enterprise registries

Seamless processing of provenance across enterprise

- Seamless support for patient and provider generated information
- Provider and organization identify validated by using national registries

Maturing Information Context

Text descriptions convey relevant context about the data
(e.g. related info, reason, frequency, occurrence)

Contextual requires human interpretation.

- Hybrid use of free-text and structure to represent information context; both standardized and local representations used.

Unstructured/text-based context requires human interpretation.

- Context conveyed using structured representation and standard concepts.

Context can be processed automatically; suitable for clinical decision support and automation

Agile process to enhance contextual information and improve outcomes based on industry drivers

Context enriched from sources outside the system or enterprises.

Semantic Interoperability Myths

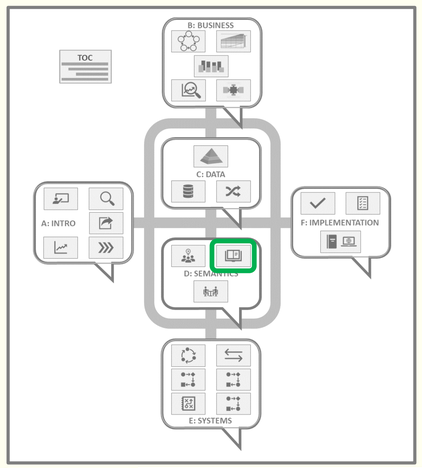
Myth	Reality
“With the right software tools, middleware, and technology we will have semantic interoperability across our organization”	Software tools allow an enterprise to accelerate the design and deployment of interoperability solutions, but they don’t guarantee data quality and semantic consistency without explicit governance
“Our enterprise service bus is so great it will solve all our interoperability needs”	Transforming and cleansing of data is limited by quality and completeness of source systems (“garbage in, garbage out”)
“We can integrate any system even if it doesn't use standard semantics or protocols and even if don’t know that they support all the data needed because we have the greatest interface tools”	The quality and semantic information exchange by systems cannot be improved by software tools, standards, or technology (see Myth #1) FHIR implementers have access to open-source APIs and reference implementations (HAPI FHIR server) unlike HL7 V2, CDA before…

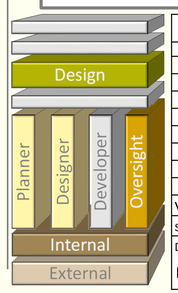
Glossary of Terms

Acronym	Definition
CMMI	Capability Maturity Model Integration
FHIR US Core IG	FHIR US Core Implementation Guide that meets USCDI data requirements
ISA	Interoperability Standards Advisory
LOINC	https://loinc.org/
RxNorm	Normalized names for drugs, links to vocabularies
SNOMED CT	https://www.nlm.nih.gov/healthit/snomedct/index.html

Further Reading

1. VAIL Interoperability Maturity Model
2. ONC Interoperability Rule: Health IT Certification Program: https://www.healthit.gov/topic/certification-ehrs/about-onc-health-it-certification-program
3. Annual Interoperability Standards Advisory (ISA) Publication: https://www.healthit.gov/isa/
4. FHIR Registry of US-realm Implementation Guides: : http://hl7.org/fhir/registry/
5. FHIR US Core: https://www.hl7.org/fhir/us/core/





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Veterans Affairs		
System:	*i*-VA Blueprint	
Drawing: Informational Semantics Maturity		PAGE D-2

i-VA Blueprint

Standardizing on Concept Representation

At a Glance:

- Projects and systems across VA must ensure they exchange standards-based, semantically interoperable data sets must reuse and leverage national best-practices and guidance
- The needs of the VA enterprise to remain consistent with industry best-practices, national regulations (e.g. ONC Interoperability Rule), 21st Cures Act, and US Core Data for Interoperability (USCDI)

Relevant Audiences

Project teams:

- Implementers
- Project and product managers
- Business analysts

Information semantics and consistency has an outside effect on the ability of system users to their work effectively, to be efficient and to deliver outstanding outcomes to Veterans.

Key Concepts

Interoperability rules influence how terminology standards

- ONC Interoperability Standards Advisory (ISA)
- National guidance for terminology identifies code systems and value sets applicable across domains.
- VA Enterprise standardized clinical domains identify those semantic domains that have been optimized for Veteran care and are necessary to facilitate cross-enterprise semantic interoperability.

Approach

Projects are expected to proceed in a systematic workflow:

A. Information semantics including coded data elements are identified and analyzed in the context of the project's overall requirement to ensure they serve Veterans needs

B. Project teams can seek guidance from the KBS team and reuse existing vocabulary guidance from VA and from the Office of National Coordinator for Health IT and CMS via Interoperability Standards Advisory

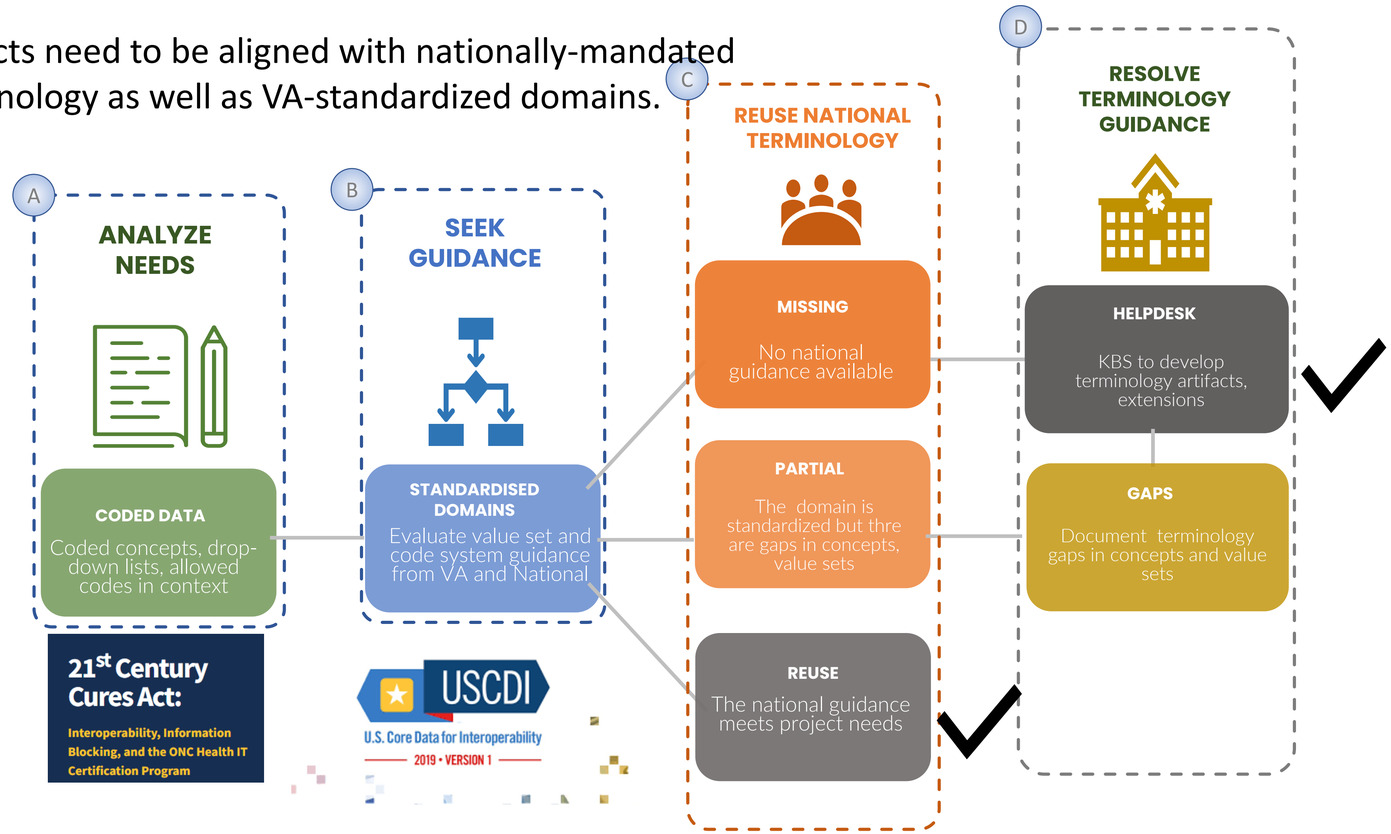
C. It is preferred that project teams reuse National and VA standardized terminology, if available but it's possible that Veteran care may require additional terminology guidance.

D. If the terms and concepts required to meet the projects are included in standards and already subject of VA standardization, the KBS Terminology team will use methodology, architecture, and SOPs to fill the remaining gaps

Engagement with ONC re: USCDI to address missing standards

Interoperability is determined by internal and external drivers. If a project identifies that
If VA projects discover additional data elements necessary for Veterans health, social history, etc., ONC provides ONDEC (ONC New Data Element and Classes) submission process.

Projects need to be aligned with nationally-mandated terminology as well as VA-standardized domains.

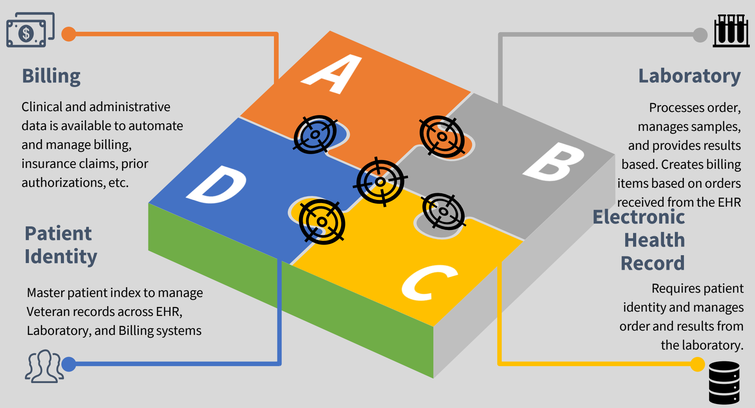


Interoperability Requires Standardized Terminology Domains

Each project is expected to use information from existing systems to reuse information:

- For example, identify information must be standardized across semantic boundaries
- Point-of-care information must be used for financial and other management functions.

Consistency and dependency across semantic boundaries



Reuse National and VA-wide guidance

Types of guidance available:

- VA guidance on standard domains
  - Terminology
  - Master data sets "gold files"
- US guidance
  - ISA is updated on a yearly basis and the specification versions are advanced using SDVAP
- KBS assistance/guidance
  - Terminology
  - Standards
  - Engagement

Resolve gaps in terminology, guidance, and data elements

If a project identifies new data elements that are necessary for VA/Veterans, they have two choices:

- Maintain the data elements in "gold" data sets
- Submit new data elements to ONC using ONDEC process

Veteran safety issues take priority over other concerns/reasons to submit new content to ONC due to the complexity of submission justification and documentation requirements.

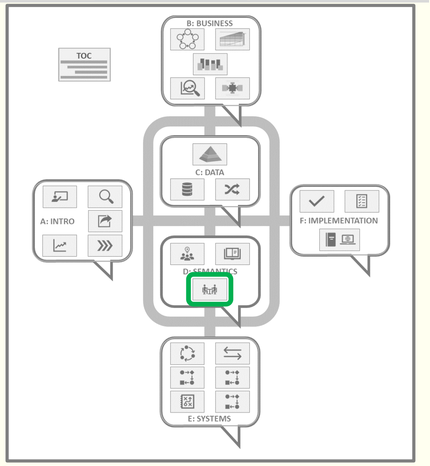
Myth	Reality
"There is no standard terminology for my project; therefore, I need to use locally-defined concepts."	Standards can be extended and enhanced to meet patient needs. Projects must be aligned with nationally-mandated terminology as well as VA-standardized domains.
"The problem with standards is that there are so many to choose from."	Meaningful Use and the ONC Interoperability rule provide guidance on the use of specific value sets and code systems. Choice of terminology is not helpful for interoperability across the VA (or any other provider organization). Therefore, regulations are working to be more specific and prescriptive for coded data.
"If a concept doesn't' exist in a standard code system, it must not be relevant."	Standard terminology is intended to evolve to meet the needs of clinicians and administrators. Therefore, they intended to grow over time as medical and regulatory requirements change. The requirements dictate terminology not the other way around/

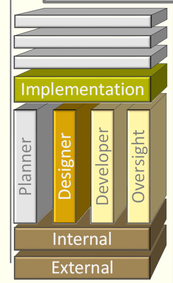
Glossary of Terms

Acronym or Term	Definition
CMS	Center for Medicare and Medicaid Services
Cures Act	21st Century Cures Act
ISA	Interoperability Standards Advisory issued yearly by ONC
KBS	VHA Office of Knowledge-based Systems
ONC	Office of National Coordinator for Health IT
ONDEC	ONC New Data Element and Classes
USCDI	US Core Data for Interoperability

Further Reading

1. ONC Vocabulary Guidance: https://www.healthit.gov/isa/section-i-vocabularycode-setterminology-standards-and-implementation-specifications
2. VA standardized domains
3. CIDMO Clinical Practice Guidelines
4. Standards Version Advancement Process (SDVAP): https://www.healthit.gov/isa/standards-version-advancement-process
5. ONC New Data Element and Class (ONDEC) process: https://www.healthit.gov/isa/ONDEC





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Drawing: Concept Representation

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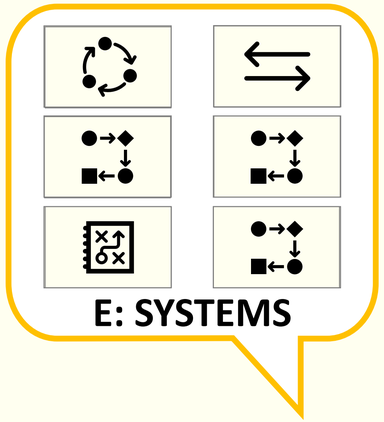
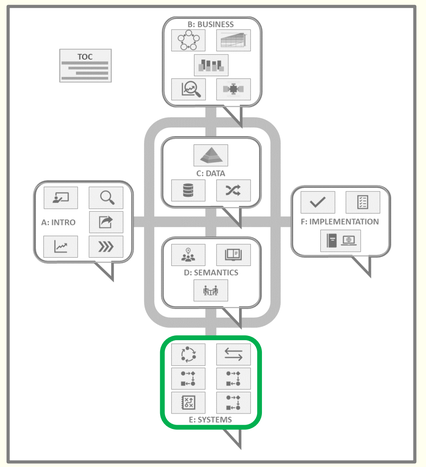
i-VA Blueprint Version 1.0
Section E – Systems Design and Implementation





i-VA Blueprint

Systems Interfaces (API) Overview

At a Glance

The selection and development of systems interfaces, though seemingly straightforward, actually depends upon a number of complex interdependencies. This page explores those relationships, and helps inform decision-making resulting in highly-interoperable APIs.

Of particular note:

- Projects, programs, interfaces, and standards each have systems lifecycles affecting the work
- Use of a standards-based APIs fosters interoperability by reducing the need for one-offs
- All of the above are moving targets, with each moving at potentially different paces
- Consumers of the interfaces (APIs) may not keep pace with ongoing change. Version management and backward compatibility is key
- While a simplistic view, APIs comprise two pieces: the interface protocol itself, and the information passing over that protocol.

TBD

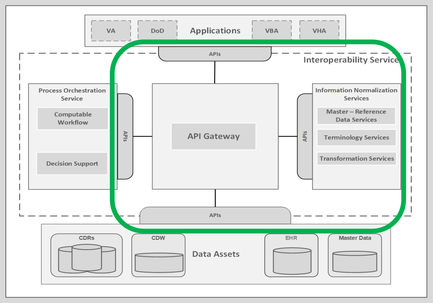
Proposed amendments for 2022 Q1

Add text or graphic to convey:

- Time-dependencies;
- Forward looking evaluation points such as: project planning, procurement, business planning, design to assess, monitor and adjust plans based on readiness of inputs (interfaces and standards); and.
- Need to spawn a parallel process to ensure needed interfaces and standards are created even when a fallback approach is taken; and
- Plan for integration of the better interface during a maintenance cycle.

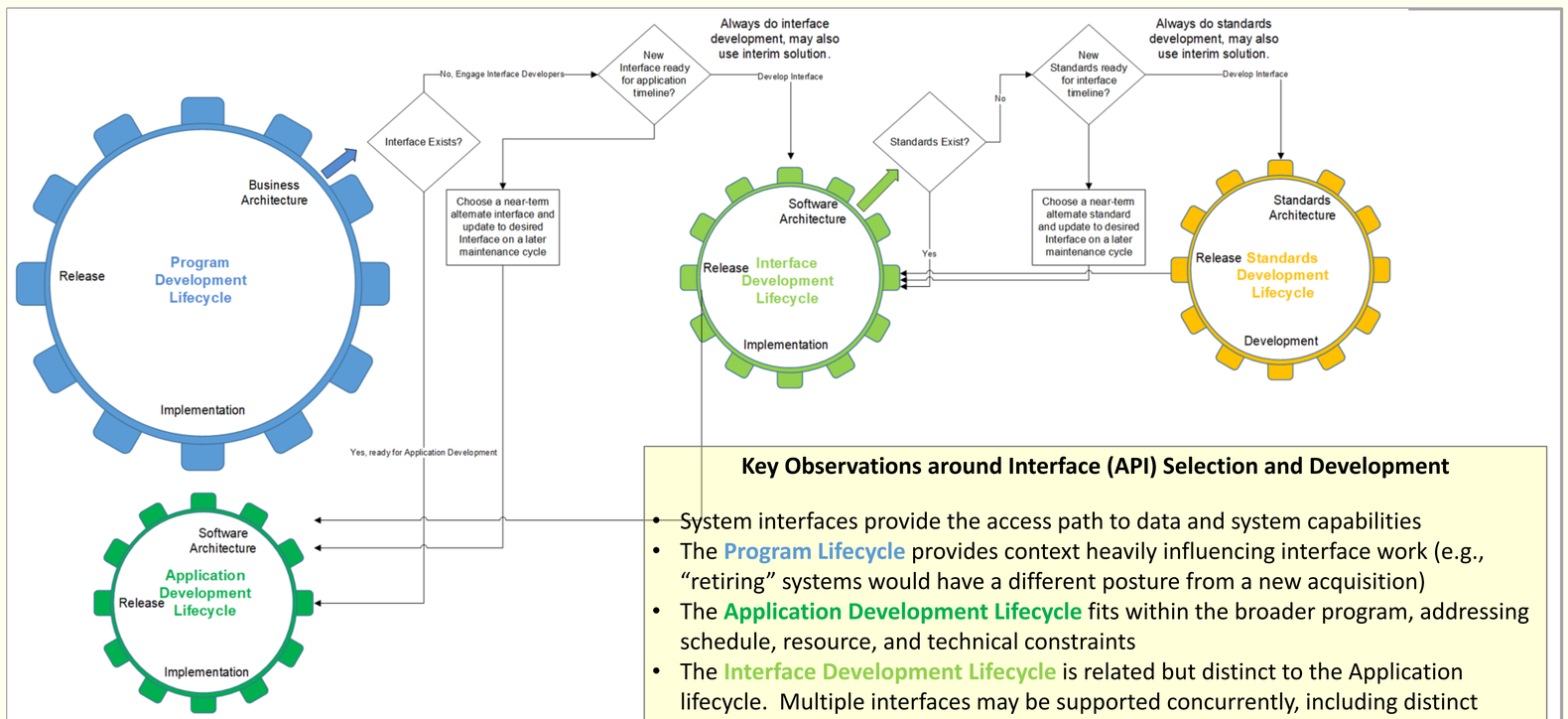
Conceptual Architecture Diagram

Maturity Level 3



Services Tier Considerations

- Applications (Presentation Layer) - context for lines (down and up)
- What is in semantic normalization services is described in the Info Semantics pages (not the lines) - Inclusion of Semantic Norm Services here talks about the lines
- Business services and semantics normalization services are facades to the applications/services which provide the interfaces (APIs) to access the logical services



Key Observations around Interface (API) Selection and Development

- System interfaces provide the access path to data and system capabilities
- The **Program Lifecycle** provides context heavily influencing interface work (e.g., "retiring" systems would have a different posture from a new acquisition)
- The **Application Development Lifecycle** fits within the broader program, addressing schedule, resource, and technical constraints
- The **Interface Development Lifecycle** is related but distinct to the Application lifecycle. Multiple interfaces may be supported concurrently, including distinct versions.
- **The Standards Development Lifecycle** evolves with industry and is a moving target

Interface / API

An interface is a computing endpoint with defined:

- Content models for information exchange;
- Protocol for exchanging content; and,
- Behaviour which the endpoint is expected to conduct including expectation of the input, output, and error content models.

High Level Considerations

High level considerations which are directly applicable or of which awareness is needed to guide application, service and interface developer to consume and produce interoperable and reusable interfaces.

- Standards Life Cycle,
- Terminology Bindings,
- Content Models,
- Interface/API Standards, High-Level Considerations for Transport Protocols

API Gateway

- Illustration of and considerations for interfaces and applications existing in an API gateway mediated environment.
- Guidance and considerations for design or access to interfaces given the API Gateway(s)
- Gateways: internal, external community, external partner

Localization

Profiling – guidance for localizing information exchange specifications
Valuesets – localizing terminology – fit-for purpose
Codesets - and creation/management of local codes and concepts
Extensions – additional data for use case

Addressing Six Categories of Information Exchange

Pragmatic interoperability considerations and guidance by usage context.

Gov, DOD, VA internal, Community, Devices, internal services

- Commonalities across the categories
- Differences in categories
- Inside the firewall and without
- Legacy to legacy
- Legacy to community care providers
- Clinical versus payor versus back-office interfaces

High Level List of Standards / Standards Families by Business Domain

The table following relates different topics/domains of interest to standards types suited to those domains. This is elaborated in more detail on E-4.

Schedule of CHI Standards

Domain	CHI Adopted Standard
Messaging Standards	Health Level 7 (HL7) Version 2.3
Retail pharmacy transactions	NCPDP SCRIPT
Instrument Data Exchange	IEEE 1073
Imaging (intra-agency)	DICOM
Laboratory Results Names	LOINCLab
Test Order Names	LOINCLab
Result Contents	SNOMED CT
Medications	
Federal Drug Terminologies	(FDA, NLM, VA)
Demographics	Health Level 7 (HL7) Version 2.4 and higher
Immunizations	CVX and MVX codes from HL7 Version 2.3.1
Units	HL7 Version 2.4+
	CHI Recommended Standard
Interventions/ Procedures	SNOMED CT
Clinical Encounters	Health Level 7 (HL7) Version 2.4 and higher
Diagnosis/ Problem List	SNOMED CT
Medical Devices/Supplies	No recommendation.
Anatomy/Physiology	SNOMED CT
Population Health	No recommendation
History and Physical	Defer
Nursing	SNOMED CT
Genes and Proteins	Human Gene Nomenclature (HUGN) for genes. No recommendation for Proteins
Text-Based Reports	HL7 CDA Release 1.0- and higher
Disability	Future Work
Financial/ Payment	(Billing HIPAA) HIPAA approved code sets
Chemical (UMLS)	Conditional: EPA Substance Registry System

Myth Busting

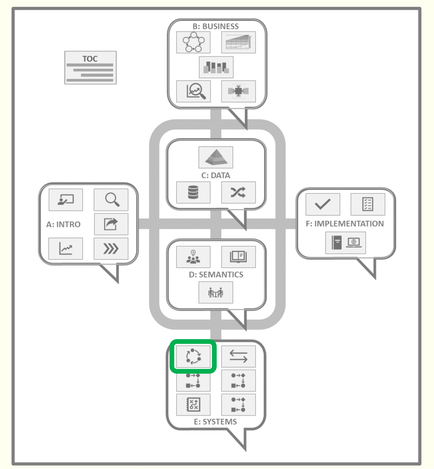
Myth	Reality
VA-specific or native APIs are faster to implement and give us more control.	While historically this has been true, increasingly third party applications, websites, and systems interact with VA. Creating custom interfaces increases integration burden and reduces interoperability
The requirements tell me all I need to know.	Requirements are frequently imprecise or incomplete, necessitating the need for additional domain expertise either within or available to the team.
"We can figure this out during development."	Standards and terminology changes take time. Mitigate risks by addressing standards readiness early to meet project timelines.

Glossary of Terms

Acronym or Term	Definition
System Interfaces	Callable endpoints or APIs (Application Programming Interfaces) which provide services or system functionality.
Application Layer	User-facing and system-embedded applications which provide a defined functionality to record, support or monitor healthcare delivery.
Business Interoperability Layer	Application agnostic service applications which provide defined business functions
Semantic Normalization Layer	Services which transform data from a domain specific form to a domain agnostic form
Master Data Management Layer	Services to retrieve or persist data.

Further Reading:

2022 Q1 To be added



Overview
Planner
Designer
Developer
Oversight
Internal
External

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System: *i*-VA Blueprint
Drawing: Systems Interfaces Overview
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i-VA Blueprint

API Consumers' Viewpoint

At a Glance

- Application/Service Builders – Interface Consumers
- To provide the guidance and considerations for application and service developers who are consumers of VA public and private interfaces.

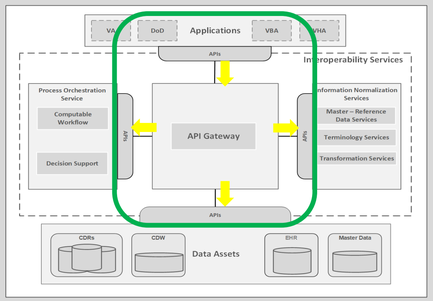
Audience

Project teams looking for interfaces and artifacts which they can consume to make their applications/systems interoperable and reusable.

Builders of:

- business services
- infrastructure services supporting business services; and
- backend data services (persistence layer)

Application Access Services



Localization

Profiling – guidance for localizing information exchange specifications

Valuesets – localizing terminology – fit-for purpose

Codesets - and creation/management of local codes and concepts

Extensions – additional data for use case

Needs

Owner of an application service domain to provide their APIs and supply/review guidance.(Perhaps also their API dependencies)

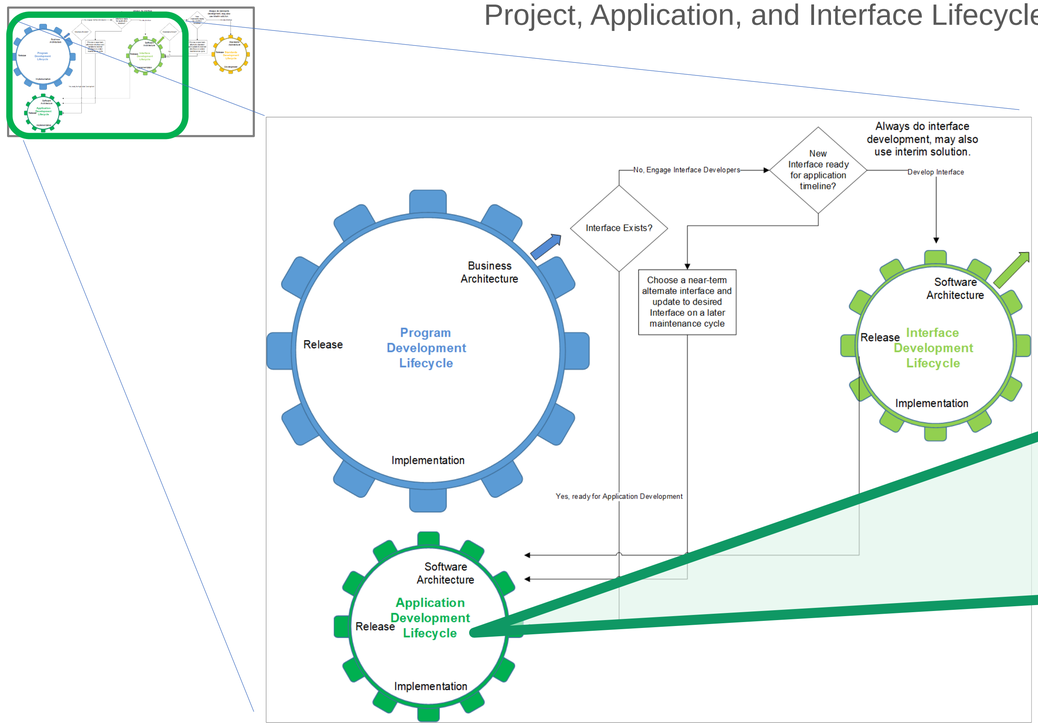
Infrastructure owner to supply list of approved transports and Further Reading.

Business/infrastructure owner to provide guidance on existing initiatives to determine what is possible at print +18-24 months.

TRM support to provide Further Reading. Reference API 'product pages' for D4 details.

Need to consider application lifecycle diagram requirements and linkage to guidance.

Project, Application, and Interface Lifecycles



Selecting and Consuming APIs

- API protocols have different qualities, strengths, and weaknesses. Be mindful of intended use and fitness for purpose as you assess alternatives.
- Note that some systems and services expose multiple APIs. When possible, use the newest version
- Consider the long-term (sustainability). Prefer APIs based on open standards to proprietary alternatives
- Several factors go into selecting the API of choice for content retrieval and/or capability invocation
  - Determining the authoritative source(s)
  - Considering the comprehensiveness and completeness of the data
  - Addressing usability of the format

Authentication

(API gateway, service, external application)

All application/service etc. authentication and authorization should be managed by the API gateway which may rely on communication with other services or applications to complete (e.g. OAUTH).

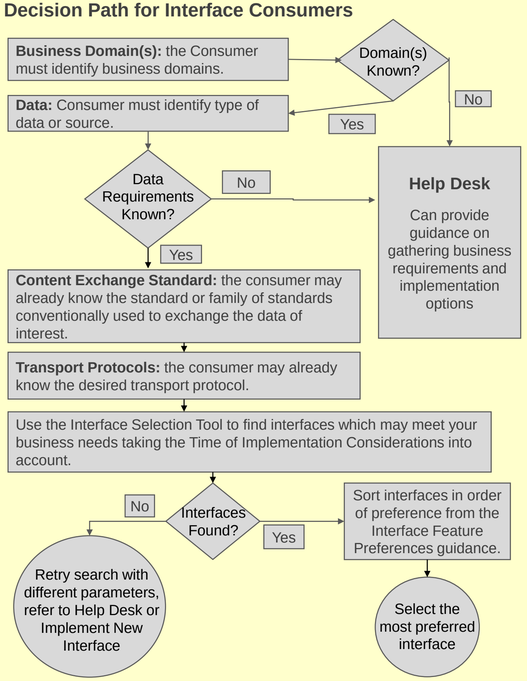
Time of Implementation Considerations

The guidance provided here is intended to reflect the implemented reality as at January 1 2022. Should the Interface Consumer or Creator be implementing significantly in advance of that date then the following applies:

If the interface is planned for deprecation then consider the deprecation date relative to your implementation and planned refresh cycles;
For interfaces which are planned/in development consider the project timeline relative to your implementation;
Assume the maturity of interfaces which are not yet in production to be one level less mature than indicated in the VA Posture and selection tools.

The user may always refer to the Help Desk personnel who may be able to provide further insights and point-in-time guidance.

Decision Path for Interface Consumers



Interface Feature Preferences

When multiple interfaces are available to support a business need the following guidance dimensions may assist the user in selecting the most appropriate interface:

- Interfaces which support standardized terminologies are Preferred;
- The interface which provides the minimum of information which meets the business need is Preferred;
- The Interface which is implemented and not set for removal or is planned to be available within the user's implementation timetable is Preferred;
- The most preferred existing specification according to the VA Posture is Preferred;
- The interfaces for which authorization can be obtained are Preferred;
- Standardized interfaces are Preferred;
- Interfaces using Data sources which are not slated for removal are Preferred; and
- Interfaces sources which can support the appropriate breadth of the current and anticipated future needs are Preferred.
- Interfaces which have been designed to be reusable enterprise-wide are Preferred;

The user may always refer to the Help Desk personnel who may be able to provide further insights and fresher guidance.

Myth Busting

Myth	Reality
If I can't find the interface we need we should just create one for our needs.	The project may need to create a new interface, but interoperability requires that usage considerations go beyond the project.
The standards most projects are using should work for my project too.	Meeting the business requirements should come first. Sometimes to meet new requirements newer standards are required and someone must be first to adopt.
Getting changes into existing standards is too hard, better to develop our own.	This should not be a barrier if interoperability is a goal. Standards experts in VA can assist in liaison with standards development organizations.

Glossary of Terms

Acronym or Term	Definition
API	Application Programming Interface
System Interfaces	Callable endpoints or APIs (Application Programming Interfaces) which provide services or system functionality.
Application Layer	User-facing and system-embedded applications which provide a defined functionality to record, support or monitor healthcare delivery.
Business Interoperability Layer	Application agnostic service applications which provide defined business functions
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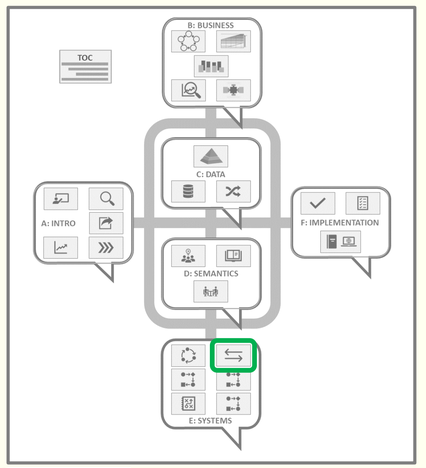
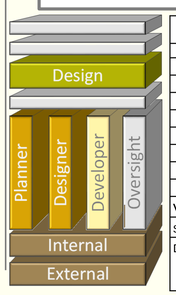
Master Data Management Layer	Services to retrieve or persist data.

Further Reading:

2022 Q1 To Be Added





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Rev:	Date:	Description:

Veterans Affairs

System: ***i*-VA Blueprint**

Drawing: Interface Consumers Viewpoint

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i-VA Blueprint

API Creators' Overview

At a Glance

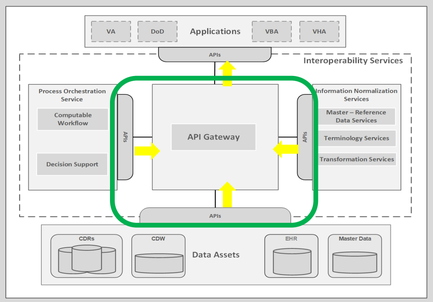
- Computation Interop Services Layers
- To provide the guidance and considerations for the definition of interfaces to support services and service end-points to support applications, inter-service information exchange, and retrieval and persistence with data stores.

Service Interface Design Considerations for Interoperability and Reuse

- Authentication and Authorization
- API Gateways / Firewalls / Load Balancing
- Service/API listing and features (standard, protocol, payload size, lifecycle status, etc.)
- Enterprise Service Bus
- Service Discovery (non-public)
- Design for:
  - VA rather than local/project needs;
  - Domain/topic not just project use case;
  - Community of use not just VA needs.
- Business Activity Monitoring / Audit
- Analytics / Business Intelligence / Service Monitoring (these exist but we won't elaborate in the IA)
- Short-circuiting for performance (both pathway and things like caching)
- Data store to data store transformation services

Interoperability Services

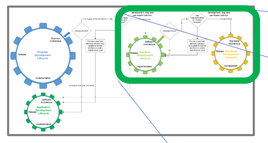
Conceptual Target State



Business services and semantics normalization services are facades to the applications/services which provide the interfaces (APIs) to access the logical services.

Needs

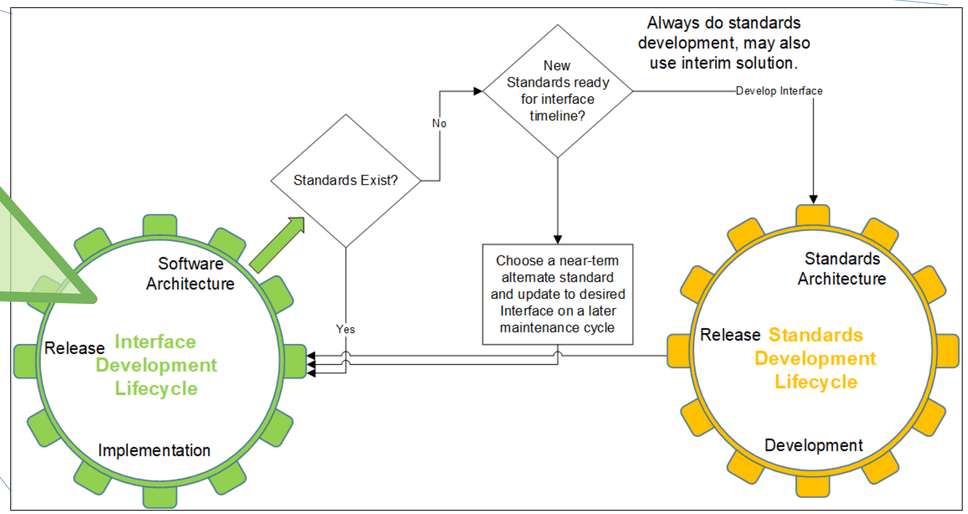
- Owner of a service domain to provide their APIs and supply/review guidance.
- Infrastructure owner to supply API gateways diagram and/or guidance and review materials.
- Infrastructure owner to supply list of approved transports and Further Reading reference materials.
- Business/infrastructure owner to provide guidance on existing initiatives to determine what is possible at print +18-24 months.
- TRM support to provide Further Reading API 'product pages' See here.



Interface and Standards Development

Creating and Exposing APIs

- Creating an API stems from the need to share an authoritative function or data
- Interface protocols should be chosen based on current, planned, and anticipated consumer needs
- Whenever possible, APIs should be based on open, industry standards
- Note that the "same" data might be exposed via multiple APIs and channels
- Support for multiple versions concurrently is appropriate, especially for backward compatibility
- Opt-in to new and emerging standards based on policy, adoption, and need
- Conduct periodic review to right-size API portfolio: update to support new capabilities & retire old as appropriate



Industry Standards and VA Recommended Usage

Health Information Exchange Standards

	HL7 V2	v2.3	v2.4	...	v2.9	v2.10	HL7 CDA	CDA 1.0	CDA 2.0	CDA 2.1	HL7 FHIR	DSTU 1	STU 3	R4	R5	...	ASC X12	4010	5010	6020	7030	...
VA Recommendation					*	*			*				*	*	*				*			

Departmental Usage	Reporting
Department A	2020-02-01
Department B	2019-07-12
Department C	2020-02-01

Maturity Color Legend

- Preferred
- Use Judiciously (e.g. maintenance)
- Not Recommended
- Emerging or under development
- * VA has a development role

Standards Development Lifecycle

- Add Standards Development Lifecycle diagram and relate to the interaction with standards development, selection, maintenance.
- Provide relative timing considerations to support selection of standards giving project development needs vs standards development process requirements and typical timing.

Decision Path for Interface Creators

Gather Requirements: gather the interface business, data, exchange standards and transport protocol requirements.

Review Existing: Use the Interface Selection Tool to find interfaces which may meet your business needs or inform any new interface implementation.

Sort interfaces: In order of preference from the Interface Feature Preferences guidance.

Design Interface: the Creator should consider: the business requirements; Interface Preferences; the Time of Implementation Considerations; and, the Interface Implementation Preferences in the design.

Interoperable Design Achieved? — No → **Help Desk**: Can provide guidance on gathering business requirements and implementation options

Interoperable Design Achieved? — Yes → Test and Deploy Interface

Interface Implementation Preferences

When implementing interfaces Creators must consider pragmatic approaches which support the design of robust, long-lasting interfaces which may support the needs of many to minimize the creation of multiple similar interfaces all of which require maintenance, such as:

- Interfaces which are reusable enterprise-wide are Preferred over interfaces which meet only single use case or local needs;
- Granular interfaces are Preferred over less granular interfaces;
- Service hosted interfaces are Preferred over application hosted interfaces;
- Interfaces which self-select the appropriate data source are Preferred over data-source dependent interfaces;
- Standards-based interfaces are Preferred over proprietary interfaces;
- For community-supporting interfaces: interfaces which are devoid of VA-specific features are Preferred over interfaces which require VA-specific features; and
- Interfaces which require normalized terminology on both the inputs and outputs are Preferred.

The user may always refer to the Help Desk personnel who may be able to provide further insights and fresher guidance.

Myth Busting

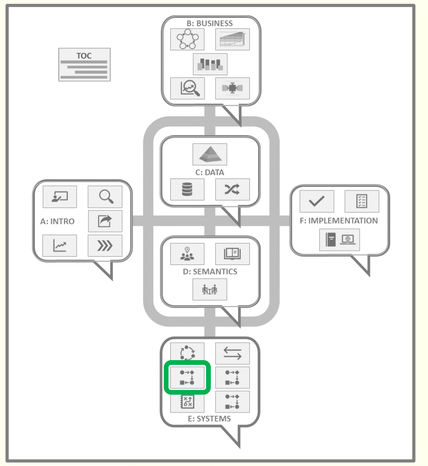
Myth	Reality
It is faster to create and easier to maintain proprietary exchanges we design.	While the first design may be faster, standards draw on the experience of the community and tend to be more robust.
All applications need their own data access APIs.	Understanding the information needs can allow for the creation of APIs which service multiple applications.
A small number of APIs yields an efficient management system.	Information usage is use-case specific, understanding information exchange usage is key to designing an efficient system.

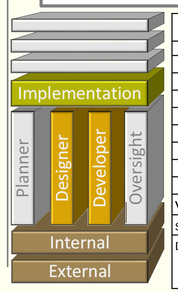
Glossary of Terms

Acronym or Term	Definition
ASC X12	Accredited Standards Committee X12
C-CDA	Consolidated Component Document Architecture
FHIR	Fast Healthcare Interoperability Resources
HL7	Health Level Seven (Standards Development Organization)

Further Reading:

2022 Q1 To Be Added





Contact: VHA Knowledge-based Systems

Rev:	Date:	Description:

Veterans Affairs

System: *i*-VA Blueprint

Drawing: Interface Creators' Overview

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i-VA Blueprint

Platforms and Patterns

At a Glance

- The ability to leverage common components and packaged capabilities across use cases fosters business and IT agility
- Platforms are technical infrastructure pieces designed to fit together and which can be used in concert
- Patterns are reusable, proven designs to address specific problems or challenges.

About Platforms

- Platforms are a set of underlying infrastructure capabilities that can be leveraged across systems and programs
- Key to platforms is their integrative nature; components complement one another
- Platform components serve as "building blocks" to compose more complex capability offerings
- Platform capabilities are exposed via APIs
- Coordination among discrete capabilities to fulfil workflow is called orchestration

What is a "Design Pattern"

A *Design Pattern* is a repeatable approach to solving a known class of problem. It draws from implementation experience to relate proven approaches to the problems they solve.

Construct of a Pattern

Name: Short Name makes for easy referencing of a pattern and facilitates communication/understanding

Intent: Characterizes the goal or design purpose of the pattern; the gestalt of the approach.

Problem: Illustrates the principal purpose of the pattern; the nature of problem it solves

Solution: Explains what the pattern is, how it is constructed, where it was discovered, how it is used

Consequences: Considerations to keep in mind when using a pattern: known issues, tradeoffs, etc.

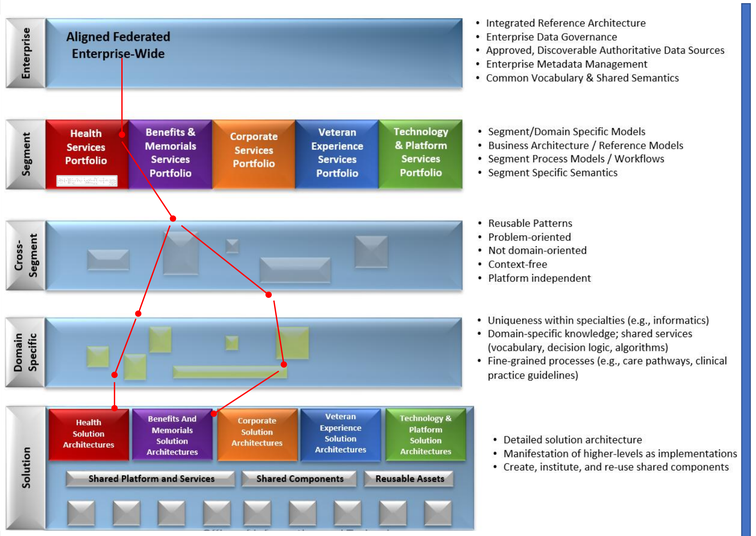
VA Pattern Catalog Inventory

Below are a list of pattern names and types that are available in the VA Pattern Catalog. Visit the website here for more details. This list is a representative sample but not complete.

Pattern Name	Pattern Type
	Integration Pattern
	Design Pattern
	Business Pattern
	…

Pattern Name	Pattern Type
	Integration Pattern
	Design Pattern
	Business Pattern

Update Planned Early CY2022



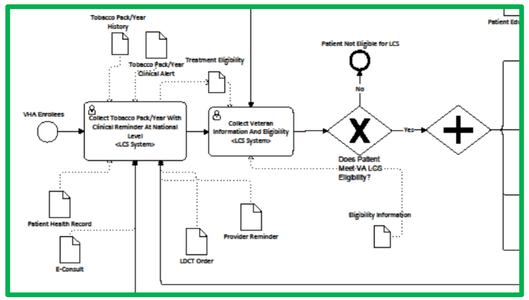
- Integrated Reference Architecture
- Enterprise Data Governance
- Approved, Discoverable Authoritative Data Sources
- Enterprise Metadata Management
- Common Vocabulary & Shared Semantics

- Segment/Domain Specific Models
- Business Architecture / Reference Models
- Segment Process Models / Workflows
- Segment Specific Semantics

- Reusable Patterns
- Problem-oriented
- Not domain-oriented
- Context-free
- Platform independent

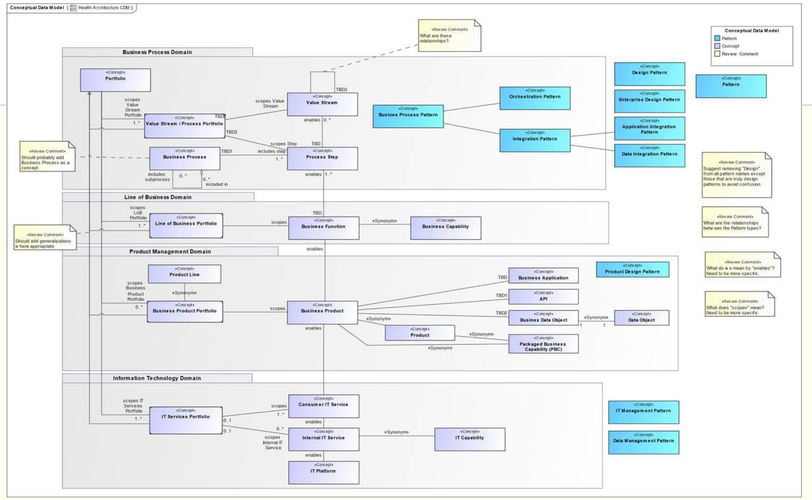
- Uniqueness within specialties (e.g., informatics)
- Domain-specific knowledge; shared services (vocabulary, decision logic, algorithms)
- Fine-grained processes (e.g., care pathways, clinical practice guidelines)

- Detailed solution architecture
- Manifestation of higher-levels as implementations
- Create, institute, and re-use shared components



TRAVERSING THE ARCHITECTURE

- Business documents end-to-end process flows
- Each step relates to business functions or activities to be performed
- Fulfillment is done via either one or multiple capabilities supported by IT services
- Coordination among multiple capabilities is done via orchestration
- Patterns define common approaches for specific problem types



CONSIDERATION FACTORS – APPLYING PATTERNS

- Assess business requirements to understand needs and context
- Business patterns identify thematic problems and high-level solution factors to consider (known issues, approach styles, implantation considerations)
- Identify relevant enabling capabilities (e.g., Packaged Business Capabilities) involved in service fulfillment/delivery
- Review technical patterns to select and determine coordination requirements
- Apply orchestration techniques to coordinate among components as part of delivery/fulfillment
- Assess implications and mitigate against identified delivery risks
- Review the VA Pattern Catalog for potential candidates; survey existing implementations for examples and lessons-learnt

Pattern Name	Description	Use Case Examples	Implication
Event / Condition / Action (ECA) [behavioral]	A pattern that is comprised of 3 parts, this is typically used as part of "event-driven architecture". A triggering event signals the invocation of some rule or decision, evaluated as the "condition" [a logical test proving true/false], followed by some action invocation.	• Biopsy result indicates necessity to commence cancer treatment	Implications are identification of event triggering conditions maps directly to business process.
Publish/Subscribe [communications]	Publish and Subscribe Service pattern allows for services, components and systems to broadcast awareness and allow registered subscribers to receive notification that events of interest have occurred, prompting subsequent action.	• Inform care team members of change in a patient status • Notify patients of an unplanned clinic closing (e.g., weather event)	Fire and forget; committing systems need knowledge of consumers.
Orchestrator [behavioral]	Generally used for applications that involve multiple steps and workflows, the orchestrator pattern allows for the navigation among what are generally independent activities into a coordinated set of actions. [Adapted from O'Reilly/Hands-on Software Architecture]	• Care coordination • Something closed loop (roundtrip/referral)	De-couples process logic from the service layer and provides workflow as an exposed manageable artifact.
Façade [component]	This pattern introduces an intermediating layer, forcing a "separation of concerns" between requesting and fulfilling system components. This layer allows for intermediation, shielding the requester from changes and details that might occur within the fulfillment component.	• Adding support for a new HL7 FHIR API atop a legacy system	Provides a mechanism for long-term system evolution.
Registry [behavioral/communications]	A service that is referred to for finding specific resources; generally one major benefit of a registry is its dynamic nature and de-coupling of key operational information.	• Disease registries • Service catalog - location/redirection	Component services can be less tightly coupled, and discovery driven.

Myth Busting

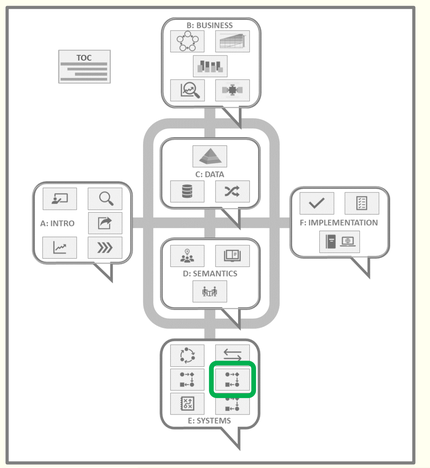
Myth	Reality
Patterns are specific to a product or implement-ation technology.	Patterns are often applied at multiple levels. For example, middleware patterns may bring together disparate technologies in the fulfillment of a business need.
Pattern is a generic term for a common approach or style.	Yes and no. While "pattern" can mean a generic approach, there are broadly accepted industry pattern templates that span solutions and vertical market sectors.

Glossary of Terms

Acronym or Term	Definition
ADS	Authoritative Data Source
ECA	Event/Condition/Action
Orchestration	Coordination of flow among service or system components to fulfill a need/use-case
PBC	Packaged Business Capability. Reference here.

Further Reading

1. VA Patterns Catalog
2. Industry Pattern Catalog reference here



Contact: VHA Knowledge-based Systems

Rev:	Date:	Description:

Veterans Affairs

System: *i*-VA Blueprint

Drawing: Platforms and Patterns

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i-VA Blueprint

Discovery and Selection of Interoperability Components

At a Glance:

Selection of an appropriate technical interface between systems depends upon several contextual factors and variables. This page helps programs determine based upon domain, quality factors, potential standards, intended use, and data source.

Links are provided to the VA interface catalog, key selection guidance, and order of precedence to assist in selecting standards.

Business Requirements

Interface Consumers and Creators must identify the business nature of the information to be requested or supplied via the interface such as:

- Clinical (direct care, telemedicine, genomics),
- Administrative (patient or practitioner demographics,
- Financial (authorization or claims), or
- infrastructural (terminology, IT supporting).

If Consumer and Creators are unsure of the business domain or requirements, they should seek assistance from KBS.

Data Types and Sources

Effective use of interfaces is predicated on identifying the type of data being both provided and consumed:

- Raw patient data (demographics, vital signs, diagnoses, encounters),
- Activity related data (orders, encounters, summaries, claims), or
- Complex or processed information (Clinical Decision Support results, Business Intelligence or population health extracts)

or they may know the source of that data, such as:

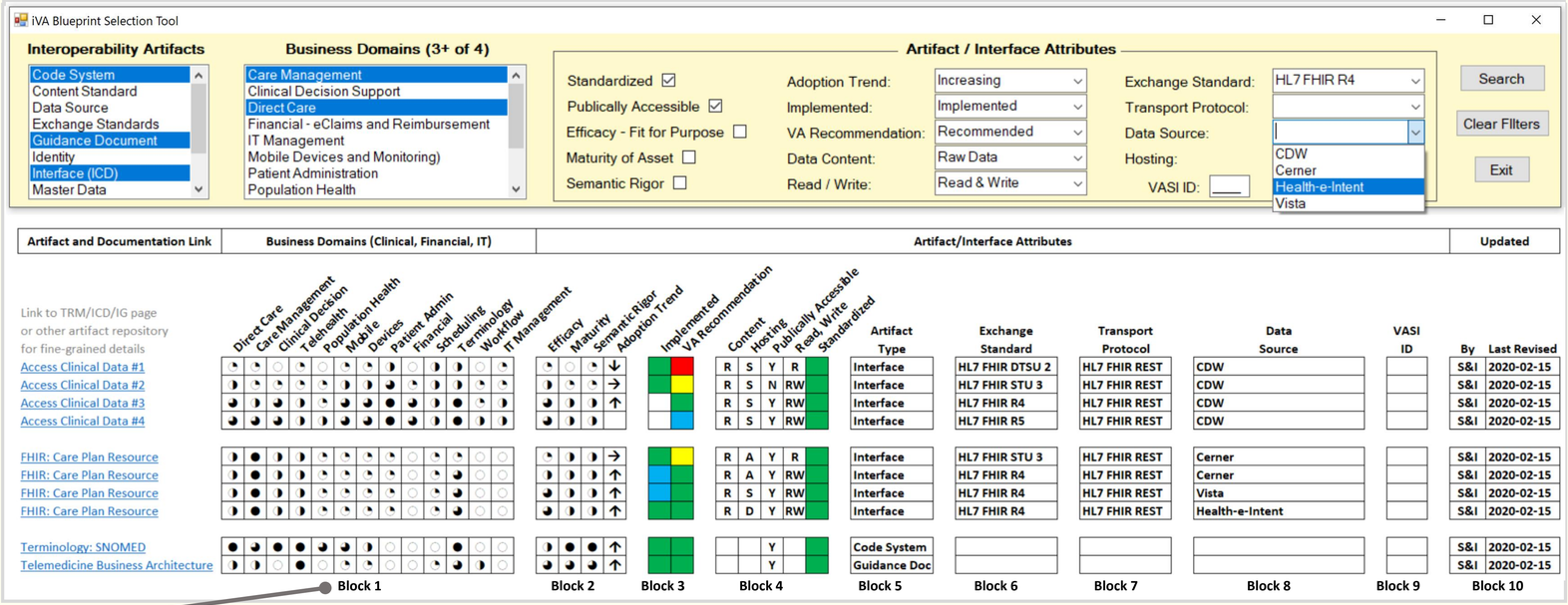
- An EHR or other application (Vista, Cerner, application, MyHealthEVet)
- A Service endpoint (IAM (Patient Registry), Benefits Lookup Service),
- An Infrastructure Service (terminology server, translation (semantic normalization)), or
- A data warehouse (Clinical/Health Data Warehouse, Health-E-Intent)

- If Consumer and Creators are unsure of the type or source of the data then they should seek assistance from the Help Desk.

Health Information Exchanges

Health Information Exchanges (HIEs) are regional and national infrastructure to allow for data sharing across organizations. Whether emerging capabilities, such as Qualified Health Information Networks (QHINs) or HIE's, these frameworks are based upon industry HIT standards.

The building-block standards and specific standards profiles (e.g., tailored versions of standards to specific use cases) are included in the selection tools provided here. See TEFCA, VHIE, HIE, Sequoia Project, etc..



Block 1: Business Domains

Indicates qualitative applicability of the interface for identified business domains depicted by "Harvey Balls".

Block 2: Interface "Qualities"

Efficacy: an indication of the completeness of the implementation for the business purpose using Harvey Balls.

- **Maturity:** an indication of the ability of the interface to respond to the dynamics of the business.
- **Semantic Rigor:** an indication of the adherence of the interface to industry terminologies.
- **Adoption Trend:** indication of the market acceptance of the interface based upon implementation trend, indicated as stable, increasing, or decreasing

Block 3: Implementation Status

- **Implemented:** the interface implementation status within VA (e.g., internal "uptake")
- **VA Recommendation:** The VA usage recommendation for the Information Exchange Standard.

Implemented Color Legend
Implemented
Deprecation planned
Deprecated
Planned or in development

Block 4:

Content: nature of data exchanged:

- **R**aw Data,
- **A**ctivity-based,
- **C**omplex or processed data.

Hosting: the type of the interface host:

- **A**pplication,
- **S**ervice,
- **I**nfrastructure/supporting Service,
- **D**ata service

Publicly Accessible: Indicator as to whether the interface is available to non-VA entities [**Y**es / **N**o]

Read/Write: flag indicating each data access permission availability [**R**ead/**W**rite/Read+Write: **RW**]

Standardized: a color indication of whether the interface uses standards for data exchange.

Block 5: Artifact Types

Identifies the nature and format of the artifacts described. Values include:

- Code System
- Content Std
- Data Source
- Exchange Std
- Identity
- Interface
- Guidance Document
- Master Data
- Systems
- ValueSet

Block 6: Standards

Identifies the relevant interface standard

Standardized Color Legend
Standards-based
Proprietary

Block 7: Protocol

Identifies the transport protocol supported as technical binding, and which are supported, such as:

- Proprietary transport
- Local (LLP, MLLP, TCP)
- Web Transports (WSI, SOAP, HTTP, HTTPS, SFTP, ebXML)

Block 8: Data Source

Indicates the system or repository hosting the data content being exposed via the interface being described.

This allows consumers to determine appropriate authoritative sources and which ones to use based upon need/circumstance.

Block 9: VASI ID

The VASI system maintains an inventory of enterprise interfaces with extensive detail around their technical specifications.

When designated this allows for consumer lookup of the interface requested.

Block 10: Metadata

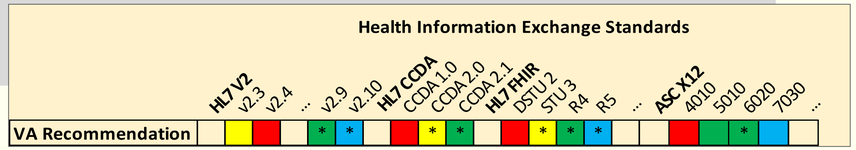
Designates the organizational entity and last revision dates for each asset included.

Summary Recommendations

- Selecting an appropriate interface is predicated on intended use, longevity, product lifecycle state, and consuming applications
- Standards cited as "preferred" indicate desirable selections for new, emerging, or long-lived capabilities
- This guidance is intended to complement existing VA authoritative sources, such as the TRM
- Concurrent support for multiple APIs using different standards and/or version is particularly effective for transition
- Contact VA KBS for assistance

Maturity Color Legend
Preferred
Use Judiciously (e.g. maintenance)
Not Recommended
Emerging or under development
* VA has a development role

Health Information Exchange Standards



Myth Busting

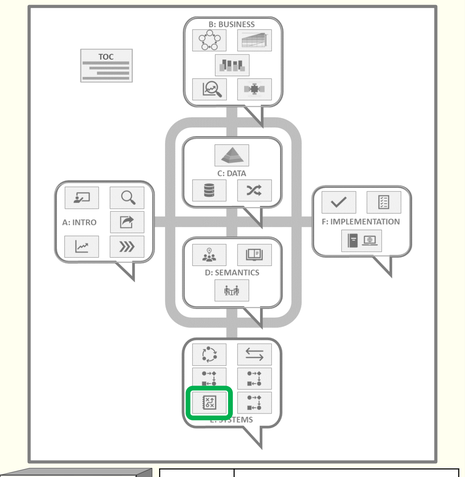
Myth	Reality
If I can't find the interface standard I need I should just build one.	Consult the Help Desk or other expertise within VA as not everything you need may have been documented or easily finable with VA.
If I find something with the selection tool it is what we should implement.	Consideration should be given to the fit of the API located to the project requirements as well as the lifecycle stage of the API.

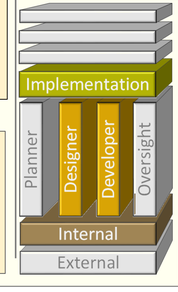
Glossary of Terms

Acronym or Term	Definition
Application	A program designed to support the business needs of a user or all of the activities associated with a business purpose, for example an EHR, EMR, Web Browser, or Database.
Interface Consumer	A person building a service or application which utilizes one or more interfaces to accomplish its business purpose.
Interface Creator	A person building an interface to support the business needs of other services and applications.
Service	A program which provides defines functionality to support other services and applications by exposing interfaces (AKA APIs).
TRM	Technical Reference Model

Further Reading

- VHA Office of Knowledge-based Systems
- VA Systems Inventory system (VASI)





Contact: VHA Knowledge-based Systems

Rev:	Date:	Description:

Veterans Affairs
System: *i*-VA Blueprint
Drawing: Selecting Interoperability Assets
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i-VA Blueprint

Security and Privacy Considerations

At a Glance

- Engage in standards development efforts and advocate for VA's privacy and security requirements
- Monitor emerging and nascent healthcare IT technologies with emphasis on security and privacy aspects.
- Monitor emerging and nascent security and privacy technologies with the emphasis on the application in healthcare IT.
- Interoperability as a cross-cutting concern across all the efforts.
- Focus on formulating requirements and implementation guidance.

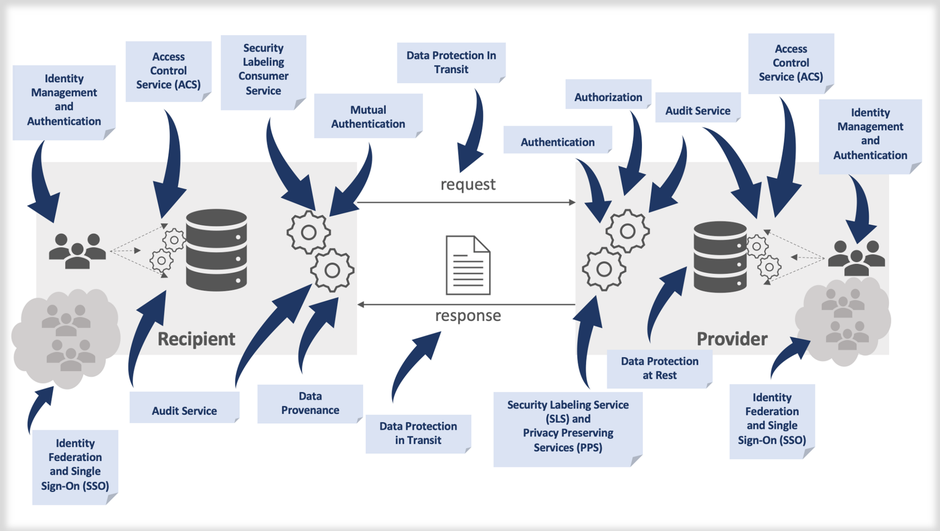
Target Audience

- Executives looking for high-level briefing on privacy and security technologies and requirements.
- Technical staff drafting requirements for acquisition.
- Internal developers and implementers.
- External Implementers and vendors.

Key Concepts

- **Security:** Protection against unauthorized access and disruption. Confidentiality, integrity, and availability of data and services.
- **Access Control:** Protective service ensuring data and services are only accessible to authorized entities.
- **Privacy:** Individual right to protection and exercise control control over how it is processed and used. While security and access control technologies are often used to protect privacy, privacy requirements are much broader and include requirements to record and provide access to information; for example, patient's right to access their health record and record of release.
- **Security Label:** Metadata tags used to associate security attributes with a specific information object as part of the data structure for that object. For example, a confidentiality mark indicating a data object contains *restricted* information.
- **Data Segmentation for Privacy (DS4P):** marking information using security labels based on the level of privacy protections required according to overarching policies and regulations. Processing information by enforcing the appropriate privacy protections (based on policies) for each segment of the data.
- **Security Labeling Service (SLS):** A service that determines and assigns security labels to data objects based on applicable rules such as security and privacy policies, patient consent, and business workflow requirements.
- **Identity Management and Authentication:** a set of technologies and processes to onboard users, issue credentials for them, maintain their identity and attributes, and ensure that they can be identified suing their credentials.
- **Audit Service:** a set of processes and services that define what events in the system should be tracked and recorded in order to ensure accountability and tracking.
- **Provenance:** The record and timeline of the processing and changes to a data object; for example, the detailed metadata about the creation, transformation, and updates of a data object.

The Big Picture



Data Segmentation for Privacy Example: FHIR

- Security labels on individual resources and resource collections.
- **Inline security labels** enable recording a security label on a portion of a FHIR resource via an extension. This extension provides a powerful mechanism to assign security labels at the sub-resources level and at various levels of granularity.
- **Data Segmentation Metadata** defined by FHIR DS4P IG provides the tools to record additional metadata about security labels.
  - The **display extension** enables a provider to record the requirement for the consumer to display specific privacy or security marks on any rendering of the resource in print or in electronic user interfaces.
  - The **Security Label Basis extension** enables a provider to record the policy or regulation based on security label assigned.
  - The **Related Artifacts** extension enables a provider to record related artifacts (e.g., a patient consent or a provenance) that provide additional justification or explanation for the assignment of the security label.
  - The **Classifier extension** enables a provider to record the identity of the entity (e.g., person, organization, software service) who has determined and assigned the security label.

Security Labels

Confidentiality	Classifying a resource according to its level of sensitivity	**Unrestricted, Normal, Very Restricted**
Policy	Conveying a mandate, obligation, requirement, rule, or expectation relating to its privacy.	**HIPAA Right of Access Directive, GDPR consent**
Sensitivity	Categorizing the value, importance, and vulnerability of a resource.	**STD, HIV**
Compartment	Indicating that access and use is restricted to members of a defined community or project.	**Care Team, Research Project**
Integrity	Conveying the completeness, veracity, reliability, trustworthiness, and provenance of a resource.	**Anonymized, Digitally Signed**
Provenance	Conveying the provenance of the resource as asserted or reported.	**Patient Reported, Clinician Asserted**
Trust	Conveying the basis for trusting the source.	**Trust Accreditation, Trust Agreement**
Purpose of Use	Conveying the reason for performing one or more ops on information.	**Treatment, Pymt, Operation, Research**
Purpose of Use	Conveying the reason for performing one or more operations on information of purpose of use at a general level.	**Coverage, Patient Requested, Emergency Treatment**
Obligation	Conveying the mandated workflow action that an information custodian, receiver, or user must perform.	**Encrypt, mask, comply with policy**
Refrain	Conveying prohibited actions the receiver is not permitted to perform.	**No disclosure, reuse without consent,**
CUI Privacy Mark	Conveying a displayed mark, required to be rendered to indicate that the electronic or hardcopy information is protected as CUI.	**CUI, SP-CUI**
Sec. Label Mark	Conveying a displayed mark rendered as specified.	**Draft, Confidential**
Sec. Authz Policy	Conveying specific permissions used for access control.	**Authorization policy, Delegation policy**

Privacy and Security for Emerging Technologies

FHIR Bulk Data Access

- Authorization requirements to control whether a client's request for bulk import or export should be permitted.
- Filtering requirements to control, at a more fine-grained level, what will appear in the results of an export, or accepted in an import operation, based on the details of the permissions granted to a client.
- Transformation requirements to apply functions on imported or exported resources to modify and transform their content such as de-identification.
- Provenance requirements for recording and consumption of provenance information in an export or import operation.

FHIR Subscription

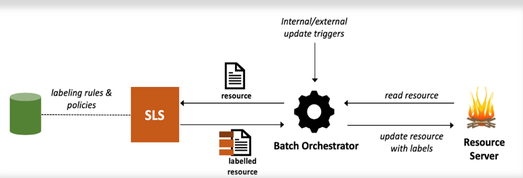
- Requirements for access control over subscription management functions.
- Requirements to ensure Recipient's Consent
- Requirements to ensure sustained and authorization throughout the lifetime of the subscription
- Requirements for managing revocation of authorization
- Requirements to invoke Security Labeling and Privacy Preserving Services
- Requirements to ensure the authenticity of notifications

FHIR Sub-Resource Access (e.g., GraphQL, FHIRPath)

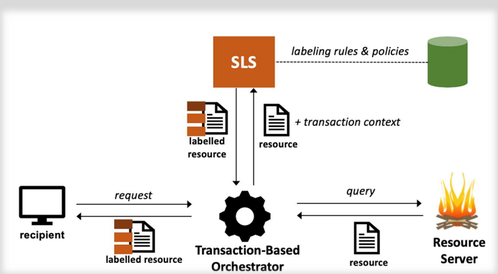
- Authorization requirements to control whether sub-resource access should be permitted at all, based on policies, request context, and the client's credentials and granted clearances.
- Requirements for assigning security labels to outgoing data objects resulting from fulfilling a sub-resource access,
- Requirements for filtering and redaction requirements to optionally remove certain values from collections based on the client's clearances and policies.
- Provenance requirements to ensure the capabilities for tracking and recording the provenance for the data objects created by sub-resource access.

Security Labeling Service Implementation Models

- Batch labeling for data at rest or bulk-imported data



- Transaction-Based on-the-fly labeling



Myth Busting

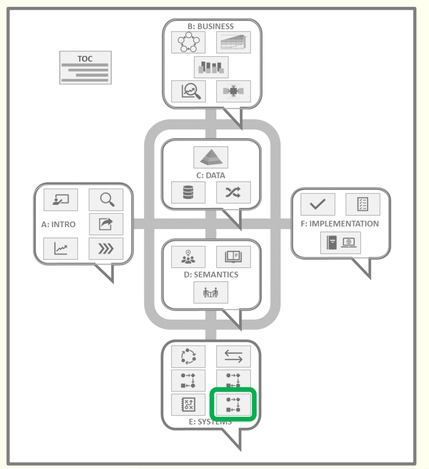
Myth	Reality
OAuth and FHIR will bring security/vulnerability.	OAuth and FHIR are simply specifications. The devil is in the details of how they are implemented, configured, and deployed. FHIR and OAuth per se will not necessary introduce security or vulnerability.
Security Labeling leads to information blocking	Information blocking is a result of policy decisions; security labeling is a policy-neutral technology. For example, security labels can be as informative for a consumer without withholding any information.
Data Segmentation can jeopardize patient safety by enabling patients to hide information from a clinicians	Security labeling does not equate with unfettered patient control over all the information. The extent of patient's control is still subject to policies. Clinical Decision Support systems can alert clinicians to break the glass when patient safety concerns arise. Lack of control over sharing can also jeopardize patient safety by diminishing patient's trust and willingness to confide sensitive information. Clinicians are not the only users of healthcare data and others such as payers and researchers are also consumers.

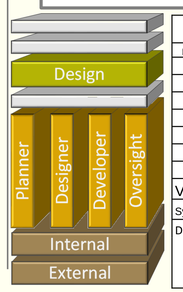
Glossary of Terms

Acronym	Definition
DS4P	Data Segmentation for Privacy.
FHIR	Fast Healthcare Interoperability Resources
SLS	Security Labeling Service

Further Reading

1. VHA-Sponsored Security and Privacy Papers





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System: *i*-VA Blueprint

Drawing: Security and Privacy Considerations

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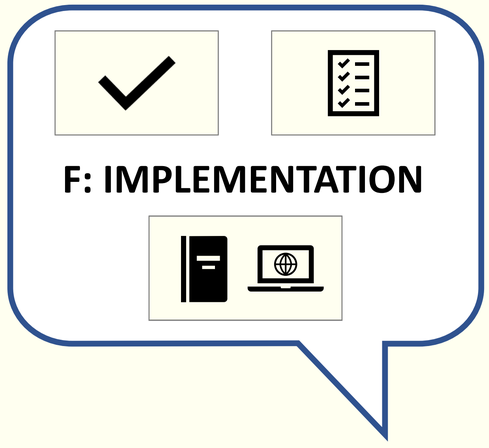
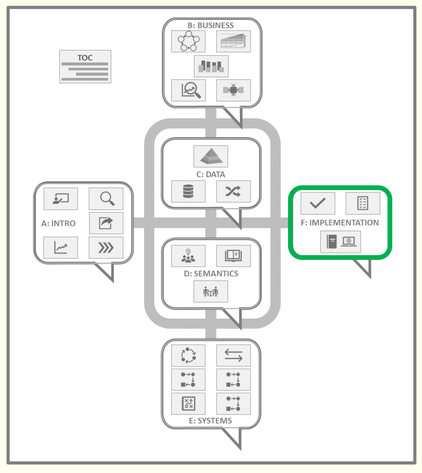
i-VA Blueprint Version 1.0
Section F –References and Case Studies





i-VA Blueprint

Example Application of Interface Selection Process

At a Glance

Example of timing and types of project decisions made by application builders in their use of interoperable interfaces, the Interface Selection Tool, and Help Desk to support these projects.

Key takeaways

- Consider whole project needs early, including interdependencies
- Seek guidance from existing VA expertise
- Reuse, and encourage reuse and interoperability

Reference Use Cases

Evolution of the i-VA Blueprint's Implementation section will include numerous examples of the kinds of interoperability decisions made during application development.

These examples highlight the interdependency of the project development lifecycle with other interface and standards development lifecycles.

These dependencies and the lead time for these activities should be considered in:

- Project team planning and resourcing
- Setting realistic timelines for incorporating standards-based interoperability
- Determining what interoperability subject matter experts need to be engaged or consulted

Example Problem

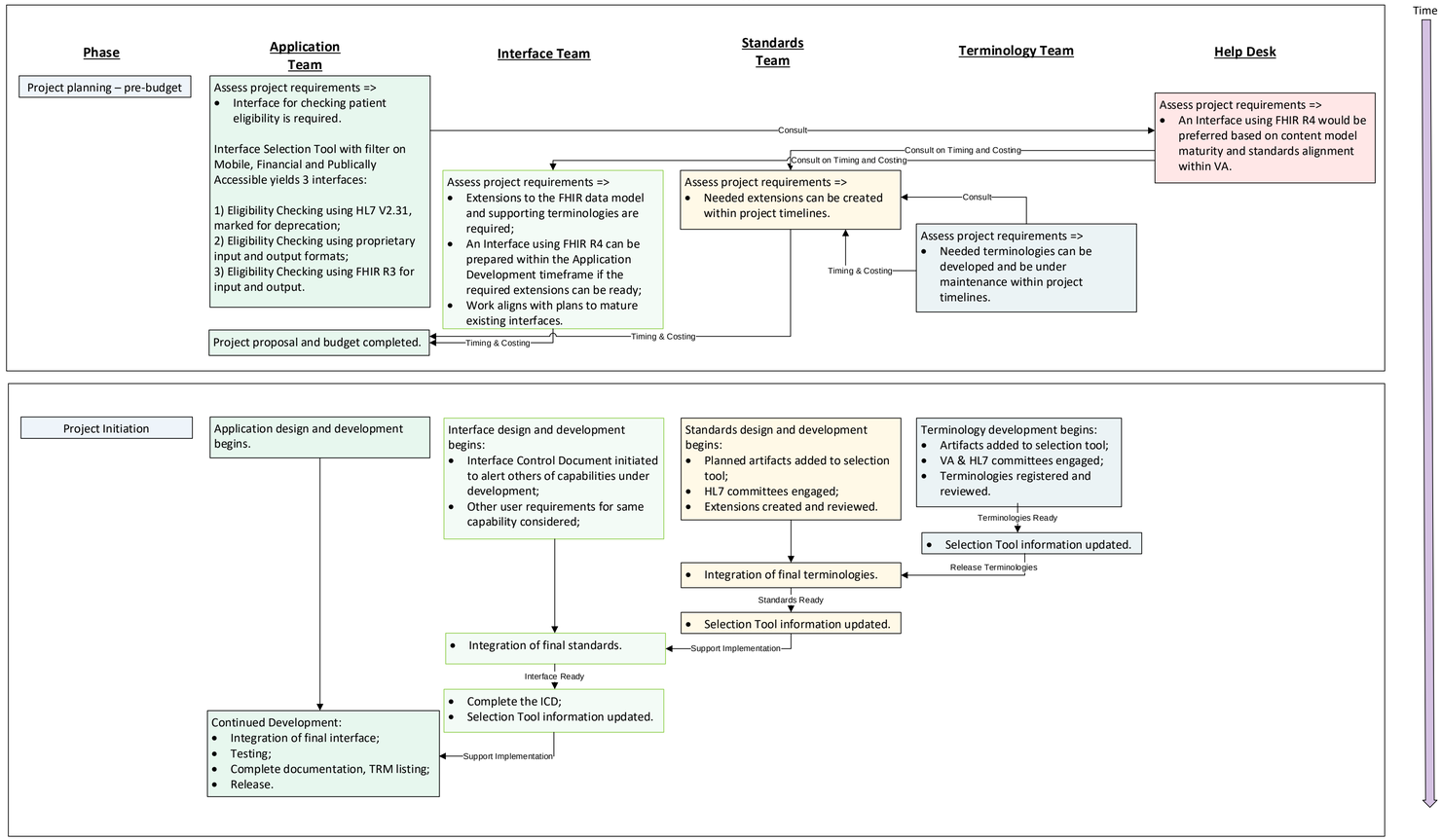
Who: The Hematology Team

What: Develop mobile application to provide support and case management information for Veterans with End Stage Renal Disease.

Challenge: During program planning it was determined an Interface is missing to support the app, which could provide patient demographics to check on program eligibility.

Solution: The chart illustrates the use of the Interface Selection Tool, Help Desk, and coordination among VA teams to select, develop and mature systems within VA.

Hematology application – single new interface required



Sections UNDER REVISION

Myth Busting

Myth	Reality
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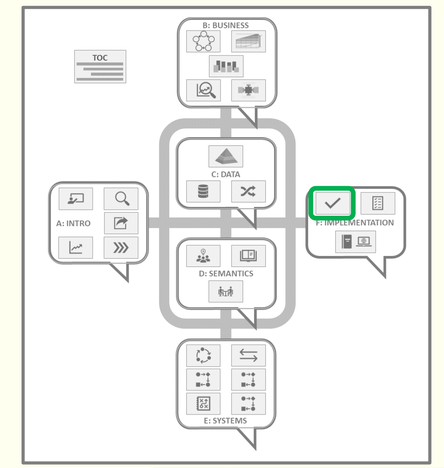
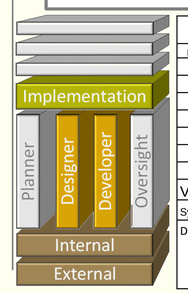
Glossary of Terms

Acronym or Term	Definition

Further Reading

1. To Be Added





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System: *i*-VA Blueprint

Drawing: Interface Selection Example

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i-VA Blueprint

i-VA Use Case – PsychTools Project

At a Glance

Another example where i-VA Blueprint interoperability perspectives can be applied to a real-world project.

Key Takeaways

- PsychTools defines real, use case for application of the i-VA Blueprint
- Shows how different aspects of interoperability are addressed and deployed to support the application and it goals

About the Psychotherapy Tools Project (PsychTools)

OVERVIEW: Web application to help clinicians deliver mental health care to support improved veteran outcomes under direction of Dr. Chris M. Crowe.

GOALS:

- Streamline and simplify the psychotherapy session and documentation.
- Use AI to discover patterns and possible suicidal warnings, increasing the chance to save lives.
- Ensure patient information and status moves with the patient wherever they go.
- Ensure new providers have context and Clinical Decision support tools needed for the psychotherapist to use current best-practices and achieve optimal outcomes for the Veteran.

Note: Application design is being iterated with users and collaboration with Human Factors Engineering.

Use Case Outline

The Office of Mental Health and Suicide Prevention – Psychotherapy section is developing PsychTools, a digital decision support system for psychotherapy care delivery teams.

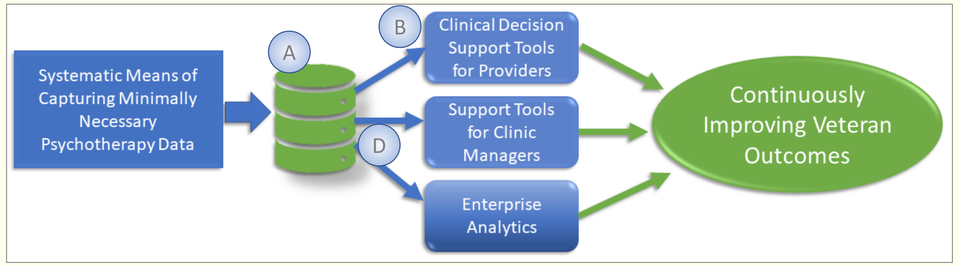
Focused on addressing:

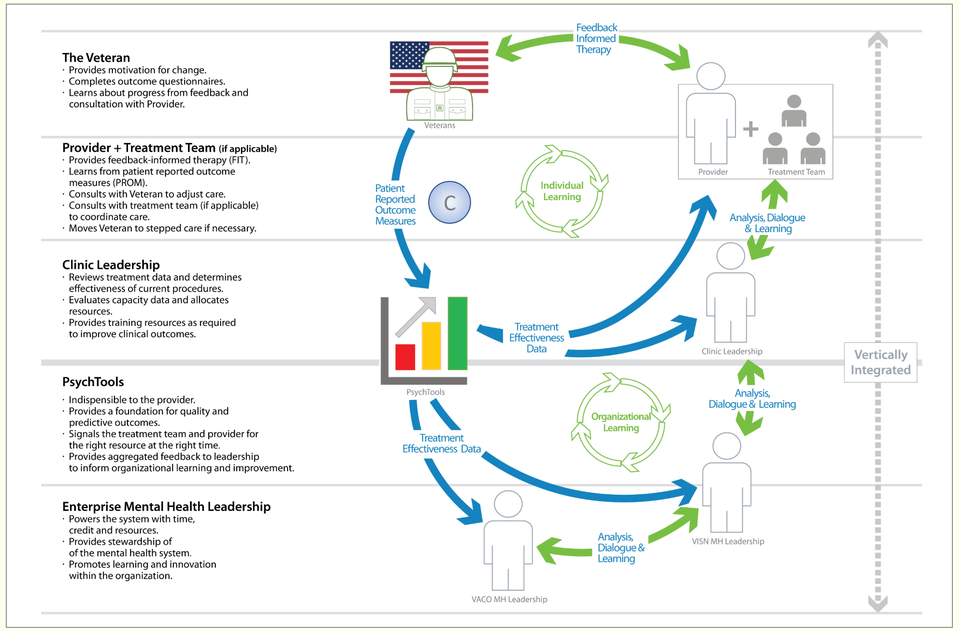
- Data availability
- Maximizing Veteran benefit
- Driving continuous improvement in treatment
- Giving safe performance feedback to psychotherapist
- Supporting critical resource allocation decisions

Application of i-VA Principles, Process and Methodology

The i-VA team will simulate how the eventual Blueprint processes, tooling, and standards selection would apply to the project.

Care Quality System





i-VA Perspective

A

- Data may be distributed across a number of sources
- A standards-based API can be developed and a guide developed for data sources to map to implement
- There is an HL7 FHIR standard for presenting forms and capturing the data

i-VA Perspective

B

- Benchmarks and guidelines drive clinical decision support

i-VA Perspective

C

- Information semantics needs identified for terminologies and related contextual data or metadata
- Review of existing standards and selection for use or request for addition

i-VA Perspective

D

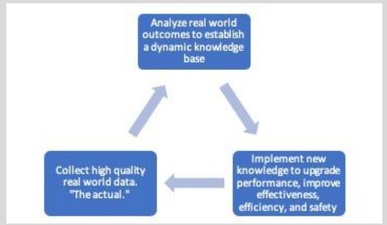
- Identification of key interoperability points requiring timeliness
- Identification of needed information change
- Matching to existing API or design for new

i-VA Perspective

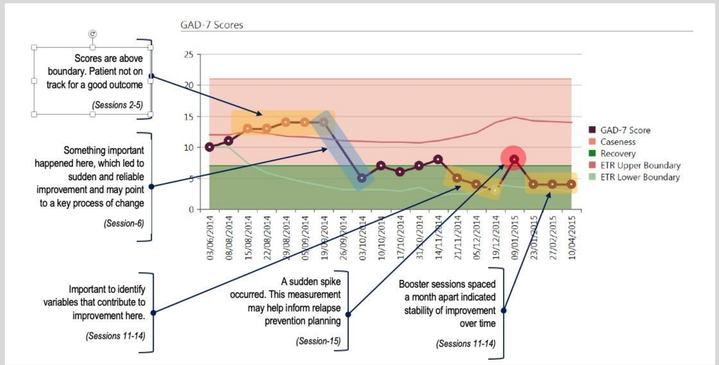
E

Etc., etc.

Compare Outcomes to Benchmarks to support Learning Cycle



Identify Data Events that affect outcomes



Myth Busting

Myth	Reality
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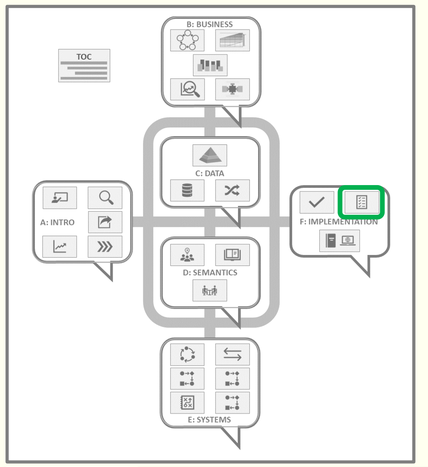
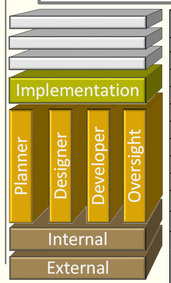
Glossary of Terms

Acronym or Term	Definition
PROM	Patient Reported Outcome Measures
EPB	Evidence Based Practice
FIT	Feedback Informed Therapy
PsychTools	A suite of vertically integrated tools that help Veterans and clinicians achieve desired clinical outcomes.
PLDR	Participatory Learning, Design and Research

Further Reading

1. To Be Added





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i-VA Blueprint
References

About

The interoperable VA (*i*-VA) Blueprint is an initiative of the Knowledge Based Systems (KBS) division within the VHA Clinical Informatics and Data Management Office (CIDMO).

The Goal

The *i*-VA Blueprint's goal is to promote a consistent enterprise-level approach to interoperability for the U.S. Department of Veterans Affairs (VA) that is proactively aligned with industry interoperability trends and best practices. A specific objective is to allow IT projects that are implementing information systems to have ready access to organizational interoperability resources and the insight needed to effectively use them.

The Approach

Led by the KBS team, the Blueprint references existing operational, definitional, architectural assets, and existing systems capabilities from across VA. This material is integrated with current and emerging terminology and systems interface standards as a Blueprint to guide Blueprint teams in implementing information systems that are interoperable at an enterprise level.

Bringing much needed clarity on how to achieve working interoperability in VA, this "first-stop source" provides guidance that will enhance and streamline the technical and semantic interoperability of information flow across and between VA, its partners, and community-based service providers.

A Living Document

The i-VA Blueprint is not a static document. The field of standards-based interoperability is continually changing and advancing, and the VA's interoperability capabilities and enablers are maturing as well.

After its initial release, the Blueprint will be updated on a recurring basis, reflecting new knowledge and practical feedback from the teams implementing interoperable systems.

The KBS team will be acting as the steward for the maintenance of the document, working with other VA organization teams to ensure their authoritative content on interoperability assets and enablers is appropriately contextualized, featured, and refreshed in the document.

Support, Suggestions, and Improvements

The KBS Standards and Interoperability team is available to support project teams in the application of this work. Should you have need for assistance, have suggestions for improving this work, please contact them at: i-VA_Blueprint_Support@va.gov

Dedication

In the early 2000's, VHA undertook a program to internally modernize its VistA EHR system into a platform-oriented solution, based upon "modern" standards at that time, and component-based architecture. The program was known as HealtheVet.

The VHA Chief Architect conceived of an alternative to what historically had been tomes of architectural guidance, supplementing those artifacts with a set of "Blueprints" modeled after Construction Documents as would be found on a job-site for building construction – "classic" architecture.

*These "Blueprints for Health**e**Vet" formed the inspiration for the i-VA Blueprint. This work is dedicated to **Jim Demetriades**, the father of the original set of VA Blueprints.*

Consolidated Glossary of Terms [Based on real estate and relevancy]

Acronym or Term	Definition
ADS	Authoritative Data Source
ADT	Admission, Discharge, Transfer
AHRQ	Agency for Healthcare Research and Quality
AI	Artificial Intelligence
API	Application Programming Interface
Application	A program designed to support the business needs of a user or all of the activities associated with a business purpose, for example an EHR, EMR, Web Browser, or Database.
Application Layer	User-facing and system-embedded applications which provide a defined functionality to record, support or monitor healthcare delivery.
ASC X12	Accredited Standards Committee X12
BIM	VA Business Information Model
BPM+	Business Process Management
BRM	VA Business Reference Model
Business Interop Layer	Application agnostic service applications which provide defined business functions
C-CDA	Consolidated Clinical Document Architecture
CDA	Clinical Document Architecture
CDS	Clinical Decision Support
CIDMO	VHA Clinical Informatics and Data Management Office
CMMI	Capability Maturity Model Integration
CMS	Centers for Medicare & Medicaid Services
COTS	Commercial off-the-shelf
CPG	Clinical Practice Guidelines
CPRS	Computerized Patient Record System
Cures Act	21st Century Cures Act
DGC	VA Data Governance Council
DS4P	Data Segmentation for Privacy.
E2E	End-to-End
EA	Enterprise Architecture
eHMP	eHealth Management Platform
EHRM	Electronic Health Record Modernization
EPB	Evidence Based Practice
ETL	Extract Transform & Load
FHIR US Core IG	FHIR US Core Implementation Guide that meets USCDI data requirements
FHIR™	Fast Healthcare Interoperability Resources
FIT	Feedback Informed Therapy
GUI	Graphical User Interface
HIT	Health Information Technology
HL7	Health Level Seven (Standards Development Organization)
HRO	High Reliability Organization
ICD	Interface Control Document
ICT	Information and Communication Technology
IMM	Interoperability Maturity Model
Interface Consumer	A person building a service or application which utilizes one or more interfaces to accomplish its business purpose.
Interface Creator	A person building an interface to support the business needs of other services and applications.
ISA	Interoperability Standards Advisory
i-VA Blueprint	Interoperable-VA Blueprint
KBS	Knowledge Based Systems
LOINC	Logical Observation Identifiers Names and Codes
Master Data Management Layer	Services to manage and access core enterprise data that describes objects around which business is conducted.
MBTS	Model-Based Transformation Services
MDMI	Model-Driven Message Interoperability
ML	Machine Learning
MPI	Master Patient Index
MTF	Military Treatment Facility (DOD)
NCA	National Cemeteries Administration
NLM	National Library of Medicine
Normalized	Data that follows a consistent format, structure, and use of unique identifiers for entities and concepts
OEI	VA Office of Enterprise Integration
ONC	Office of National Coordinator for Health IT
ONDEC	ONC New Data Element and Classes
Orchestration	Coordination of services to fulfil a business need
PLDR	Participatory Learning, Design and Research
PROM	Patient Reported Outcome Measures
PsychTools	A suite of vertically integrated tools that help Veterans and clinicians achieve desired clinical outcomes.
RFID	Radio-frequency identification
RPC	Remote Procedure Call
RxNorm	Standard clinical drug vocabulary produced by the National Library of Medicine (NLM) mapping National Drug Codes (NDCs) and standard nonproprietary names of medications
Semantic Normalization Layer	Services which transform data from a domain specific form to a domain agnostic form
Service	A program which provides defines functionality to support other services and applications using APIs
SLS	Security Labeling Service
SNOMED CT	https://www.nlm.nih.gov/healthit/snomedct/index.html
SOLOR	Project to harmonize health terminology standards
System Interfaces	Callable endpoints or APIs (Application Programming Interfaces) which provide services or system functionality.
TCO	Total Cost of Ownership
TRM	VA Technical Reference Model
USCDI	US Core Data for Interoperability
VAIL	VA Interoperability Leadership
VAMC	VA Medical Center
VASI	VA Systems Inventory
VBA	Veterans Benefits Administration
VHA	Veterans Health Administration
VHIE	Veterans Health Information Exchange
VISTA CPRS	Veterans Health Information Systems and Technology Architecture Computerized Patient Record System

Consolidated Reading List

Reference	URL
(Industry) Pattern Catalog	
2021-01 VA Data Strategy	https://www.va.gov/oei/docs/VA_Data_Strategy.pdf
2022 Q1 Gather materials and provide links	
2022 Q1/Q2 iVA Blueprint Selection Tool Requirements Document	
21st Century Cures Act	https://smarthealthit.org/21st-century-cures-act/
AHRQ Evidence-based Care Initiative (ACTS)	https://covid-acts.ahrq.gov/display/PUB
Annual Interoperability Standards Advisory (ISA) Publication:	https://www.healthit.gov/isa/
Capability Maturity Model – Integration	https://cmmiinstitute.com/
CIDMO Clinical Practice Guidelines (TBD)	
CMS Cures Act Final Rule	https://www.cms.gov/Regulations-and-Guidance/Guidance/Interoperability/index
CMS Provider Burden, Patient Access, and Interoperability Roadmap:	https://www.cms.gov/Regulations-and-Guidance/Guidance/Interoperability/index
DAMA Data Management Body of Knowledge 2	https://technicspub.com/dmbok/
Data Governance Council Policy	https://www.va.gov/oei/about/data-governance-analytics.asp
Data Steward Authoritative Data Source Guide	
Ethics Principles for Access to and Use of Veteran Data	https://www.oit.va.gov/about/ethical-data-use/
FHIR Registry of US-realm Implementation Guides:	http://hl7.org/fhir/registry/
FHIR US Core:	https://www.hl7.org/fhir/us/core/
Gartner Composable Architecture	
i-VA explainer document	
KBS Intranet site	https://vaww.va.gov/chio/kbs.asp
Mission Act	https://missionact.va.gov/
OEA process definition	
OIT Enterprise Architecture	https://www.ea.oit.va.gov/EAOIT/index.asp
OIT Health Portfolio Technology Office	
ONC Interoperability Rule: Health IT Certification Program:	https://www.healthit.gov/topic/certification-ehrs/about-onc-health-it-certification-program
ONC New Data Element and Class (ONDEC) process	https://www.healthit.gov/isa/ONDEC
ONC Vocabulary Guidance:	https://www.healthit.gov/isa/section-i-vocabularycode-setterminology-standards-and-implementation-specifications
Standards Version Advancement Process (SDVAP)	https://www.healthit.gov/isa/standards-version-advancement-process
US Core (USCDI)	https://www.hl7.org/fhir/us/core/
USCDI	https://www.healthit.gov/isa/united-states-core-data-interoperability-uscdi#uscdi-v2
VA Business Information Model (BIM)	
VA Business Reference Model (BRM)	
VA DGC policy	https://www.va.gov/oei/about/data-governance-analytics.asp
VA Interface Control Document Catalog	
VA Interoperability Strategic Plan	
VA Patterns Catalog	https://www.oit.va.gov/library/recurring/edp
VA Strategic Plan	
VA Systems Inventory system (VASI)	https://vaww.ea.oit.va.gov/enterprise-architecture/va-systems-inventory
VA Veterans Journeys	https://vaww.va.gov/chio/hfe.asp
VAIL Assessment Change Control Board	
VAIL Assessment Methodology	
VAIL Interoperability Framework	
VAIL Interoperability Maturity Model	
VAIL Intranet site	
VAIL Interoperability Maturity matrix	
VAIL Roadmap	
VASI	VA Systems Inventory
Veteran Personas / HFE	
VHA Business Architecture	https://dvagov.sharepoint.com/sites/VHABA/SitePages/Home.aspx
VHA Sponsored Security and Privacy Papers	https://confluence.hl7.org/display/SEC/Veterans+Health+Administration+Sponsored+Security+and+Privacy+Papers

Acknowledgements

While not an exhaustive list, the producers of this document would like to thank the following individuals and organizations for their substantial and material contributions to the work. Contributors appear in random order.

Organizations
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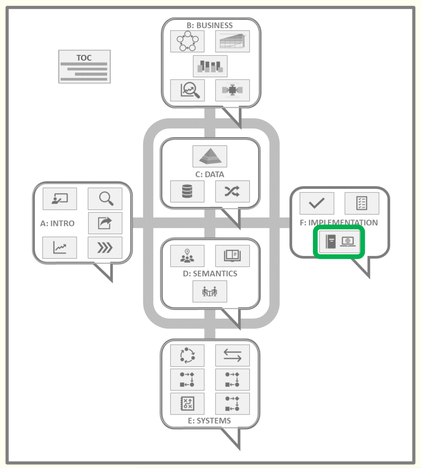

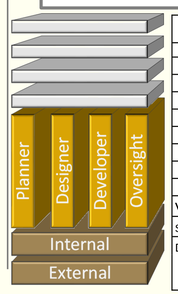

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Drawing: References

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