MTR100033

MITRE TECHNICAL REPORT

MITRE

An Information Architecture Framework for the USAF

Managing Information from an Enterprise Perspective

Mary Ann Malloy, PhD
Edward V. Masek
Robert W. Miller, PhD
Daniel G. Winkowski
March 2010

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
MAR 2010		**00-00-2010 to 00-00-2010**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
An Information Architecture Framework for the USAF: Managing Information from an Enterprise Perspective	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **The MITRE Corp,7515 Colshire Dr,McLean,VA,22102**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

Like other U.S. Department of Defense (DoD) organizations, the U.S. Air Force (USAF) is managing information, but in a disjoint fashion focused on system and technical architectures. In this paper we describe an information architecture framework (IAF) to guide the creation of information architectures for managing USAF information assets from an enterprise perspective. The IAF was generalized from common components found within leading enterprise architecture frameworks in use today, adding fidelity to guide architecture developers when addressing the information view. We show through examples how information architecture elements fit into IAF and relate it to other USAF architecture efforts.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**21**	

This page intentionally left blank

MTR100033

MITRE TECHNICAL REPORT

MITRE

An Information Architecture Framework for the USAF

Managing Information from an Enterprise Perspective

Mary Ann Malloy, PhD
Edward V. Masek
Robert W. Miller, PhD
Daniel G. Winkowski
March 2010

Sponsor: SAF/XC
Dept. No.: E142
Contract No.: FA8721-10-C-0001

Project No.: 03106HA0-EA

Abstract

Like other U.S. Department of Defense (DoD) organizations, the U.S. Air Force (USAF) is managing information, but in a disjoint fashion focused on system and technical architectures. In this paper we describe an information architecture framework (IAF) to guide the creation of information architectures for managing USAF information assets from an enterprise perspective. The IAF was generalized from common components found within leading enterprise architecture frameworks in use today, adding fidelity to guide architecture developers when addressing the information view. We show through examples how information architecture elements fit into IAF and relate it to other USAF architecture efforts.

This page intentionally left blank.

Executive Summary

Like other organizations within the U.S. Department of Defense (DoD), the U.S. Air Force (USAF) is managing information right now, but in a disjoint fashion focused on system and technical architectures. Migration to the net-centric vision, grounded in the principles of service-oriented architecture (SOA) vice system architecture, has fundamentally changed how things get done and who are the responsible participants. In practice we must address information sharing challenges, including – but not limited to – quality, consistency, ownership, stewardship, pedigree, data at rest and data in flight.

Now more than ever the USAF needs an information architecture to describe the information assets it manages; this information architecture must be constructed from an enterprise perspective to ensure ongoing and emerging efforts are synchronized in a holistic, complementary fashion. In the context of this paper, "enterprise" refers to the USAF, and "information asset" refers to information having value that is both owned and managed. (It should be noted that we interpret the latter term differently from the Federal Enterprise Architecture which emphasizes the physical aspects of managed assets and treats data and information assets interchangeably.)

Enterprise Architectures (EAs) typically define an agreed set of constructs that can be used to express architecture concepts, and a language to communicate them to the various enterprise stakeholders. Quite simply, an Enterprise Information Architecture (EIA) provides a means to describe and manage information consistently so it can be accessed, understood, compared, shared and composed in a coordinated, integrated manner across the enterprise at every hierarchical level.

From the analyst and developer's perspective, "framework" is used to add a methodology and categorization scheme for organizing and relating subsets of the architectural content relevant to the information view so that this view can be understood and manipulated more easily. An added benefit is facilitating the construction of as much or as little of relevant architectures as is needed to support strategic decision-making, thereby conserving limited resources.

Thus we describe a framework to guide the creation of information architectures to support managing USAF information assets from an enterprise perspective: an Information Architecture Framework (IAF). We don't assign the moniker "Enterprise" to this framework because it is intended for use for *any* information architecture development effort within the USAF Enterprise.

The IAF we developed is depicted in the figure below. It was generalized from common components found within the information architecture view across the leading EAFs in use today. It also was built to be consistent in structure and content with the AF Architecture Framework (AF AF), extending it to provide added fidelity and to guide architecture developers when addressing the information view. In addition, this paper walks through some examples to relate specific information architecture elements to their respective positions in the framework. This serves as a sufficiency check on the IAF and it also helps relate the framework to other USAF architecture efforts.

This paper is a precursor to establishing an AF Information Architecture practice. As the practice evolves it will be empirically proven in real-world use cases then formally documented as practitioners guidance. Topics for future exploration include the details of the high-level IAF,

the application of the IAF in support of a methodology for information lifecycle management, and how the IAF supports fit-for-federation (guidelines and practice that support the interaction of separate, but related architectures.)

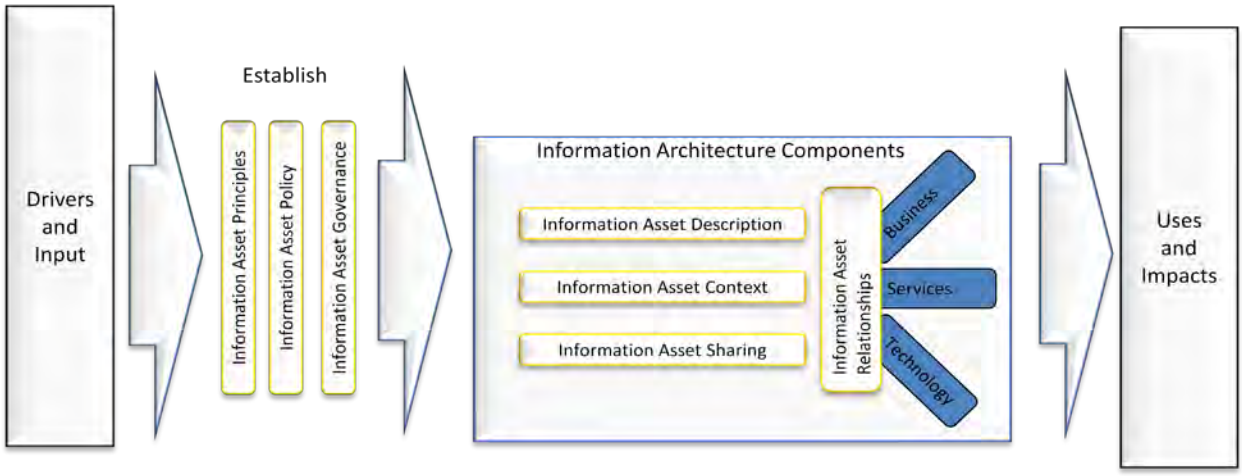

Table of Contents

List of Figures

List of Tables

1 Introduction

We manage information because there is value in doing so and, just as importantly, undesirable consequences if we don't. The value is that information is essential to minimizing risk during decision-making and to performing actions. Like other organizations within the U.S. Department of Defense (DoD), the U.S. Air Force (USAF) is managing information right now, but in a disjoint fashion focused on system and technical architectures.

Migration to the net-centric vision, grounded in the principles of service-oriented architecture (SOA), is fundamentally changing how things get done and who are the responsible participants. Many enterprises mistakenly believe that SOA will hide and resolve all their information management issues. In reality, SOA in practice elevates the need to address the existing challenges regarding information including; quality, consistency, ownership, stewardship, shareability, data at rest, and data in flight, to name just a few.

Now more than ever the USAF needs an information architecture to describe the information assets it manages; this information architecture must be formulated from an enterprise perspective to ensure ongoing and emerging efforts are synchronized in a holistic, complementary fashion. This paper describes a framework to guide the creation of information architectures in support of managing USAF information assets from an enterprise perspective.

2 An IAF for the USAF

2.1 Background

Multiple descriptions and definitions of enterprise architecture (EA) and information architecture exist in the literature. As discussed in Appendix A, in terms of EA, information architecture focuses in on information assets and how they relate to processes and needs. Incorporating a framework adds a categorization scheme to organize and relate the content and views, and also enables an incremental development approach. Thus, an Enterprise information architecture framework (IAF) specifies how to describe the design, planning, implementation and governance of information architectures across the enterprise. We don't use the "Enterprise" moniker in this term because the framework is intended for use for *any* information architecture development effort across all levels of the USAF Enterprise.

Over half of all EA efforts today use one of seven frameworks. Appendix B summarizes our analysis of commonalities shared across them in terms of architecture perspectives and generalizations based on the architectural elements these frameworks treat in the information view. This material provides the rationale for the information architecture framework (IAF) presented below.

2.2 A high-level view of the IAF

From the common information architecture elements that are addressed in the leading EAFs, we generalized the IAF proposed in Figure 1. This framework was depicted in such a way as to ensure its traceability to the AF Architecture Framework (AF AF),[1] extending it to provide added

[1] AF Chief Architect's Office. United States Air Force Enterprise Architecture: Air Force Architecture Framework, version 3.0 (TBD)

fidelity and to guide architecture developers when addressing the information view. In addition, Appendix C substantiates that the IAF sufficiently captures the information architecture elements found during our survey of leading frameworks.

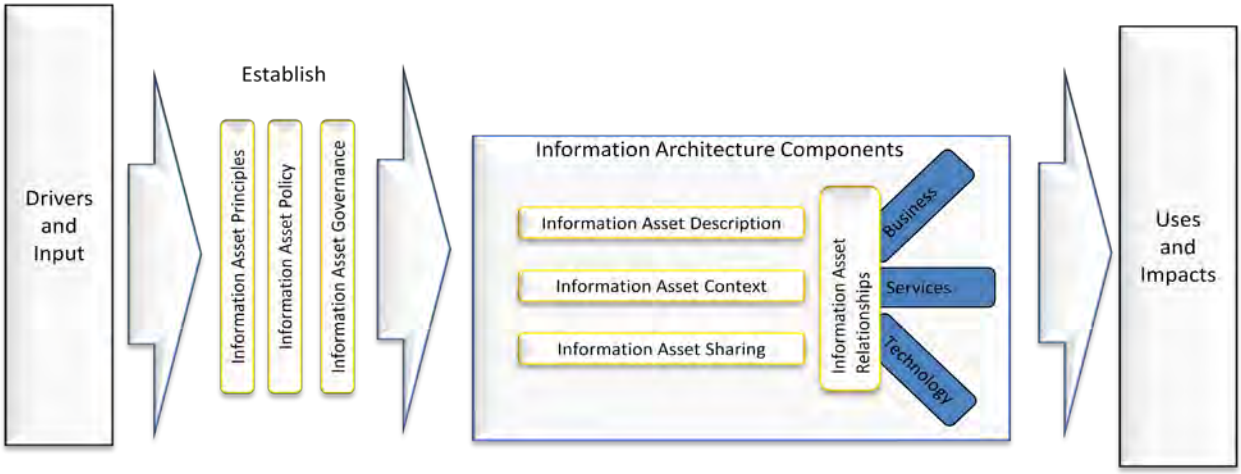

Figure 1. IAF -- High-level view

In this figure it's important to note that the IAF places a particular emphasis on information assets. An asset is a resource having value that is both owned and managed. It follows that an *information asset* is information having value that is both owned and managed.[2] Since not all information has equal value, the framework's focus is on assets that are deemed to have enterprise significance and that are necessary to support the enterprise business strategy or to achieve effective business change.

Also in this figure, "Information Architecture Components" refer to groups of information architecture elements. The framework describes information assets in terms of three concepts: description, context and sharing.

2.2.1 Information asset description

"Information Asset Description" covers structured, semi-structured, and unstructured information assets **that have direct business value**. Descriptions involve defining both information assets and the relationships among them. In addition, descriptions require both structural and semantic metadata for completeness. Example artifacts include glossaries, entity relationship models, subject categorization schemes, and taxonomies that participate materially in business operations. These artifacts provide the means to discover and share information consistently throughout the enterprise.

2.2.2 Information asset context

"Information Asset Context" refers to the non-definitional accompanying factors/considerations related to the effective establishment or employment of an information asset. Examples include stewardship practice; characteristics of information quality, currency, and security; schemes describing the circumstances under which information assets are deemed authoritative; and

[2] It should be noted that we interpret the term "information asset" differently from the Federal Enterprise Architecture [FEA] Data Reference Model, which emphasizes the physical aspects of managed assets and treats data and information assets interchangeably.

semantic descriptive mechanisms through which an information asset may be effectively managed or employed.[3]

2.2.3 Information asset sharing

Finally, "Information Asset Sharing" is concerned with the considerations necessary for an information asset to be used by consumers other than the original producer. Specifically, it addresses the exchange of and access to information assets. Exchanges require information to be packaged appropriately. Exchange standards such as those for result sets returned from a text search (including rank, synopsis, and URL), Electronic Data Interchange (EDI) message structure, or import/export formats between applications are examples. Access considerations refer to the information characteristics of the interface through which access to information is achieved. Examples include REST-based standards for constructing parameterized URL encodings to describe a search, Application Programming Interface (API) or query languages such as SQL-92.

2.2.4 Information asset relationships

"Information Asset Relationships" refers to linkages between components within the information layer and the three remaining layers (business, services and technology), as well as relationships between architectural components within the information layer itself. The nature of these relationships is described briefly in Tables 1 and 2. These tables suggest key questions the information architecture descriptions must address.

Table 1 focuses on those questions related to describing relevant information assets within the information view, the means for exchanging and sharing them, and how their effective employment will be accomplished. Artifacts examples are also provided.

Table 1. Information Asset Description, Sharing and Context Questions

	Description	***Sharing***	***Context***
Information Asset	What are the major information business objects, their definition and relationships? Artifact examples: Business object glossary, entity relationship models.	What are the information sharing and access standards to be used by producers and consumers? Artifact examples: MLD-STD 6016, Blue Force Tracking COI schema	What supplementary information describes the establishment and management of assets? Similarly what standards will be used to describe characteristics of the asset in relationship to the other views? Artifact examples: Asset governance tracking templates, COI charters, asset stewardship best practices, data quality vocabulary standards.

Table 2 takes a slightly different viewpoint; its perspective is depicted in Figure 2. This table details how the information view relates to the other enterprise views (business, services and

[3] Note that this definition is somewhat narrower that the Federal Enterprise Architecture Data Reference Model definition of *data context*; however, as detailed later under "Information asset relationships," the IAF's explicit consideration of relationships between the information layer and the three remaining layers (i.e., business, services, technology) results in a broader treatment.

technology) from the perspective of an information asset, in terms of description, sharing and context. It suggests key questions the architecture descriptions must respond to in these dimensions with respect to how assets drawn from the information view relate to others within the remaining views. This table also lists illustrative artifact examples.

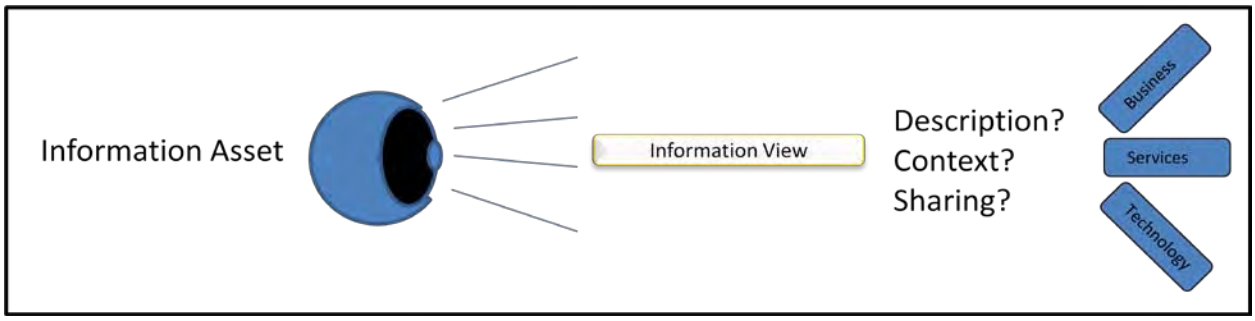

Figure 2. IAF - Perspective of Table 2 (inter-view relationships)

Table 2. Inter-view Relationships, from an Information Asset Perspective

Information View Relationship to…	***Information Asset Description***	***Information Asset Sharing***	***Information Asset Context***
Business View	How does each asset map to the business processes to create an information flow? Artifact examples: Asset to process cross reference.	What are the information sharing exchange structures used in the business process? How do the information assets map into these structures? Artifact examples: Information exchange structure cross reference to business processes. Information asset cross reference to exchange structures.	Which assets are deemed to be authoritative at each point in a business process? What is the organizational ownership of assets? What asset quality requirements are required in each process? Artifact examples: Asset to process cross reference of attributes.
Service View	How does each asset map to a set of services? Which assets describe services to support service based operations? Artifact examples: Asset to service cross reference. UDDI service taxonomy.	What exchange structures are provided by each service? What grammar is used to query a service? How must an information asset be mediated/translated to conform to a service? Artifact examples: Sharing exchange structure to service interface mapping. Asset to service interface translation matrix.	How are Service Level Agreements (SLAs) described? Is there a service categorization scheme? How are query access points described? Is there a vocabulary to describe data fidelity loss for service interfaces? Artifact examples: SLA Template. Asset to service cross reference of attributes.

Information View Relationship to…	*Information Asset Description*	*Information Asset Sharing*	*Information Asset Context*
Technology View	How does each asset map to a system or location? Given the variety of information assets and associations with the other views, what technology constraints result? Artifact examples: Requirement for a content management system for documents. Inputs to a TV-1.	Which systems and technologies support transport between producer and consumer processes? What technology requirements and constraints affect implementation? Artifact examples: Definition of a mediation view between physical store and services.	How is each asset mechanized and its characteristics implemented? What technologies or constraints support this? Artifact examples: Security characteristics selection criteria. Tools for interpreting business rules (e.g., regarding authoritative source metadata).

3 Walk-through example

Let's walk through a notional example to illustrate the application of the IAF in terms of the information architecture components that underlie an operational data sharing solution, and how they can be related through the IAF.

In-flight reporting by aircraft is part of the process of dynamic situational awareness. The standard INFLIGHTREP message is used to report mission results and/or information of tactical or intelligence value. Reporting includes activity sighted, sighting location, the aircraft call sign, the mission, and the reported sighting time.

Once again, we begin in Table 3 by describing some major information assets relevant to in-flight reporting, the means for exchanging and sharing them, and some factors relevant to their effective employment. Then Table 4 relates in-flight reporting information assets (information view) to assets within the remaining enterprise views (business, services and technology) in terms of description, sharing and context.

Table 3. Information Asset Details for In-Flight Reporting

	Description	*Sharing*	*Context*
Information Asset	Major business objects include models for Aircraft, DateTime, GeospatialPosition, Mission, and TextDescription. Additionally, a battlespace event taxonomy exists to describe event types.	1. MLD-STD-6040 (which defines the INFLIGHTREP) is a standard for information sharing. 2. The W3C XML Schema standard is a used to describe the results from a web service call. 3. Cursor on Target (CoT) is used for sharing battlespace events.	Vocabularies are needed to describe Geospatial position precision and Time accuracy. Tracking of data asset stewards, message sponsors, and message configuration management processes must be established.

Table 4. Inter-view Relationships for In-Flight Reporting

Information View Relationships to…	Information Asset Description	Information Asset Sharing	Information Asset Context
Business View	The noted business objects (Aircraft, DateTime, GeospatialPosition, Mission, TextDescription) are associated with the process of monitoring the battlespace for dynamic events. These same business objects participate in other processes as well (e.g., Target Execution).	The INFLIGHTREP is standard exchange structure for sharing this information. The asset mapping to exchange structure fields are: Aircraft maps to Aircraft_Call_Sign; DateTime maps to Time_of_Sighting; GeospatialPosition maps to Activity_Location; Mission maps to Mission_Number; and TextDescription maps to Activity.	Pilots issuing INFLIGHTREPs are presumed to provide authoritative data for all fields. The C2 Node (e.g., AWACS, CAOC) is the organizational owner of the operational information assets. The USAF GCIC/RIN is sponsor of the INFLIGHTREP message. The USMTF CCB is the configuration manager of MIL-STD-6040. DateTime must be accurate to the nearest second. Geospatial position must be accurate, at minimum, to the nearest LAT/LONG minute.
Service View	These assets map into a variety of services. Voice formatted in flight reports (INFLIGHTREPs) are manually processed for data entry. The battlespace awareness service provides publication and subscription services for basttlespace events.	Service (1) records voice formatted INFLIGHTREPs to an internal DB. Service (2) produces CoT messages. Subscriptions are established using the CoT vocabulary. Translation tables record the mappings between the fields of an INFLIGHTREP and the internal DB as well as from the internal DB to the CoT message structure.	Service (1) is categorized using the term MANUAL DATA ENTRY and Service (2) is categorized using the term AUTOMATED. A data fidelity propagation table tracks transmit to retrieve data loss across service interfaces. Service 2 uses SLA template SLA-89-C.
Technology View	INFLIGHTREPs are produced by the pilot to be sent via RF communications. INFLIGHTREPs stored in DBs require relational database technology to implement the information asset physical data models.	INFLIGHTREPs are sent via RF (e.g. HAVEQUICK radio) and manually transferred to networked storage for network sharing. A CoT routing capability is required to deliver CoT messages to subscribers.	INFLIGHTREP is secret NOFORN and security is provided via encryption protocols. Tools for profiling and tracking data quality of services are required. Configuration management tools for managing exchange standards are required.

4 USAF IAF related to other efforts

As stated earlier, the IAF was built to be consistent in structure and content to the AF AF. Additionally, the IAF is complementary to established EAFs. The IAF fills gaps in the information view at a level of detail beyond what other EAFs typically capture. For example, unlike the Federal Enterprise Architecture's emphasis on the physical aspects of managed assets, the IAF addresses the conceptual and logical as well as the physical dimensions of information. Pursuant to the net-centric data strategy, through the establishment of communities of interest, DoD has initiated many near-term efforts to expose the necessary properties of information assets, such as taxonomies, ontologies and related models. The IAF supports recognizing the relative contributions of these efforts to the totality of architecture elements and products required to flesh out the information layer.

5 Summary and way-ahead

This paper discusses the role of information architecture to ensure that USAF information is described consistently, so it can be accessed, understood, compared, shared and composed in a coordinated, integrated manner across the Enterprise. It describes an Information Architecture Framework (IAF) in support of managing USAF information from an enterprise perspective. This framework is intended for use for any information architecture development effort within the USAF Enterprise.

The incorporation of a framework adds a classification scheme for organizing and relating subsets of the architecture content relevant to the information view. In addition, a framework enables the application of an incremental development approach to architecture descriptions in a coordinated fashion, leading to a consistent, integrated whole. An added benefit is facilitating the construction of as much or as little of relevant architectures as is needed to support strategic decision-making, thereby conserving limited resources.

We surveyed the information perspective of several leading EAFs to derive some generalizations of the architectural elements that they associate with the information view. We used that analysis to establish sufficiency of coverage for the framework described in this paper. We also looked at an operational data sharing example to illustrate application of the IAF. These analyses served to confirm the IAF provides a foundation that captures the architecture elements needed in practice, and they helped relate the IAF to other USAF and DoD architecture efforts.

This paper is a precursor to establishing an AF Information Architecture practice. As the practice evolves it will be empirically proven in real-world use cases then formally documented as practitioners guidance. Topics for future exploration include the details of the high-level IAF, the application of the IAF in support of a methodology for information lifecycle management, and how the IAF supports fit-for-federation (i.e., guidelines and practice that support the interaction of separate, but related, architectures.)

Appendix A Architecture from an enterprise perspective

A.1 Architecture from an enterprise perspective

A good working definition of "enterprise" is any organization or group of organizations that has a common set of goals or principles or a single "bottom line." For example, an enterprise can be a corporation, a single department, a government entity, or a network of geographically remote organizations. In this paper, the "enterprise" we refer to is the USAF.

Because enterprises tend to be large and complex, the discipline of Enterprise Architecture (EA) is broad and multi-faceted. Its ultimate purpose is to inform, guide and constrain strategic decision-making for the enterprise, for example business operations efficiency or selecting information technology investments.

To deal with this scale and complexity, EAs typically define an agreed set of constructs that can be used to express architecture concepts, and a language to communicate them. As illustrated in Figure A-1, most EAs include complementary projections of their content called views (e.g., business, information, services, technology), where each view culls out those subsets of the total architecture content that are meaningful to various groups of stakeholders.

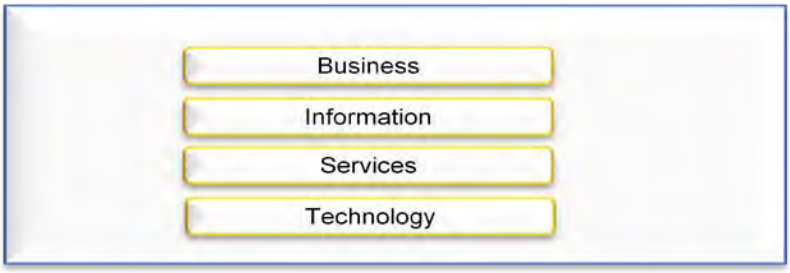

Figure A-1. EA Views

A.2 Information architecture from an enterprise perspective

As with EA, multiple descriptions of information architecture exist in the literature, each with their respective proponents. These range from very narrow to all-encompassing. Whether focused generically on information sharing environments or specifically on intranets or online communities, most information architecture definitions converge on the attributes, structures and interrelationships among data and information assets. In terms of EA, information architecture focuses in on information assets and how they relate to processes and needs. Information architecture specifies principles, technologies and models which link the information view to the business, services and technology views of the architecture. For example, information architecture provides policies and rules for designing and implementing effective information sharing services.

Enterprise information architecture (EIA) is distinct from information architecture in the following ways. It:

- addresses the entire lifecycle of information.
- focuses on semantic infrastructure versus project-specific details (to enable broader horizontal integration).
- supports delivering integrated capabilities and information across the enterprise with reduced complexity.

In short, EIA ensures that information is being described consistently so it can be managed, accessed, understood, compared, shared and composed in a coordinated, integrated manner across the enterprise.

A.3 The value added by framework

An EA Framework (EAF) incorporates a categorization scheme used to organize and relate the content and views associated with EAs. Categorization is used in many disciplines to bin like things into groups so that they can be understood and manipulated more easily. Typical architecture frameworks address how architecture content is organized both in terms of structures and hierarchies. In terms of views or products, the framework may address which stakeholders use them and in what circumstances.

In addition, a framework enables the application of an incremental development approach to architecture descriptions in a coordinated fashion, leading to a consistent, integrated whole. An added benefit is facilitating the construction of as much or as little of relevant architectures as is needed to support strategic decision-making, thereby conserving limited resources.

Effective EAFs share a number of characteristics, among them:

- A top-down approach that fosters an *architecture driven out of the business strategy*.
- *Support for abstraction* that allows complex details to be "factored out." For example, descriptions might be supported in multiple levels, progressing from less to more extensive, specialized details at subsequent level.
- A robust set of *organizing principles* and a well-developed language for communicating them.
- An associated *process or methodology* for instantiating an EA from the framework.
- Advice on *governance*.

An Information Architecture Framework (IAF) also is a categorization scheme, but its focus is on organizing and relating the content associated with the *information view* of an architecture. Typically, an IAF:

- provides a methodology for describing information assets.
- shows how the architecture components (building blocks) interrelate.
- establishes a common vocabulary for describing information architecture products.
- recommends relevant products for documenting information architecture.

So, an Enterprise IAF specifies how to describe the design, planning, implementation and governance of information architectures across the enterprise. We don't use the "Enterprise" moniker in this term because the framework is intended for use for *any* information architecture development effort across *all levels* of the USAF Enterprise.

Appendix B Survey of current EA practice

Over half of all EA efforts today use one of the following seven frameworks:

- Zachman
- Department of Defense Architecture Framework (DoDAF)
- Extended Enterprise Architecture Framework (E2AF)
- Computer Integrated Manufacturing Open Systems Architecture (CIMOSA)
- The Open Group Architecture Framework (TOGAF)
- Federal Enterprise Architecture Framework (FEAF)[4]
- Gartner.[5]

Taken as a whole, these EAFs exhibit many differences in specific details such as evolutions, purpose, scope, principles, structures and approaches; however, there are some common themes across them. For example, each framework can be characterized in terms of:

- type / orientation (e.g., framework, process, reference model);
- categorization / focus (e.g., activities and flow, collaboration, components, methodology, change);
- planning / use: (e.g., products, communication, process, planning, implementation).

It's also possible to derive some generalizations based on the architectural elements these frameworks treat in the information view. We evaluated the information architecture aspects of the surveyed EAFs. Our analysis identified commonalities shared across the EAFs. These are grouped in Table B-1 together with representative examples.

Table B-1. Grouped Information Architecture elements, with examples

Framework	Views -context -conceptual -logical -physical Methodology Categorization Reference Activities/process
Drivers (input)	Requirements Strategy Standards [meta-] Models Principles Integration Classification Design

Sharing	Query Interface Vocabulary Value Interoperability Rules Exchange format
Management	Governance Ownership Stewardship Policy Politics Organization

[4] Key details about the first six EAFs are summarized in Schekkerman, Jaap. How to survive in the jungle of Enterprise Architecture Frameworks. Victoria, BC: Trafford Publishing, 2004.

[5] Details about Gartner's EAF can be found in the article Gartner's Enterprise Architecture Process and Framework Helps Meet 21st Century Challenges, Retrieved September 24, 2008, from http://www.gartner.com/it/products/research/asset_129493_2395.jsp

Classification	Representation Syntax Semantics Relations / properties Taxonomy Definition Format Quality / attribute Pedigree Security

Physical / Resource	Asset Repository Stores Database Webpage Producer Consumer Asset location Network
Uses / Impact (output)	Employment Gaps Change

Appendix C Acronyms

AF AF	Air Force Architecture Framework
API	Application Programming Interface
CDM	conceptual data model
CIMOSA	Computer Integrated Manufacturing Open Systems Architecture
DoDAF	Department of Defense Architecture Framework
E2AF	Extended Enterprise Architecture Framework
EA	Enterprise Architecture
EDI	Electronic Data Interchange
EIA	enterprise information architecture
FEA DRM	Federal Enterprise Architecture Data Reference Model
FEAF	Federal Enterprise Architecture Framework
IAF	Information architecture framework
REST	Representational State Transfer
SOA	service-oriented architecture
SQL	Standard Query Language
TOGAF	The Open Group Architecture Framework
USAF	United States Air Force
URL	Uniform Resource Locator