National Aeronautics and Space Administration

Marshall Application Realignment System (MARS) Architecture

Practicum Report

12 June 2010

Architects: Andréa Belshe and Mandy Sutton

Organization: NASA Marshall Space Flight Center (MSFC)

Location: Alabama, USA

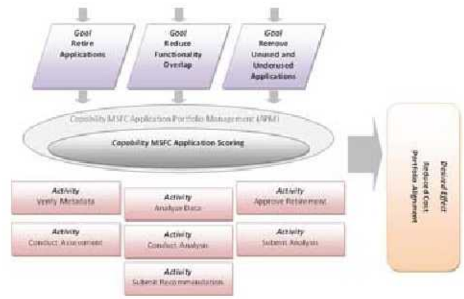
Summary

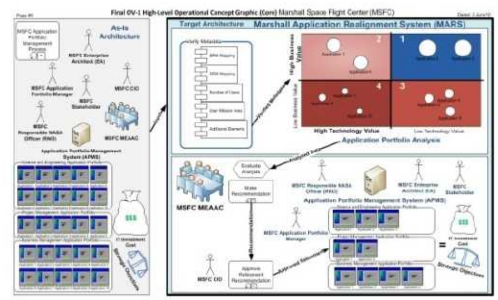
The Marshall Application Realignment System (MARS) Architecture project was established to meet the certification requirements of the Department of Defense Architecture Framework (DoDAF) V2.0 Federal Enterprise Architecture Certification (FEAC) Institute program and to provide added value to the Marshall Space Flight Center (MSFC) Application Portfolio Management process.

The MARS Architecture aims to: (1) address the NASA MSFC Chief Information Officer (CIO) strategic initiative to improve Application Portfolio Management (APM) by optimizing investments and improving portfolio performance, and (2) develop a decision-aiding capability by which applications registered within the MSFC application portfolio can be analyzed and considered for retirement or decommission.

The MARS Architecture describes a to-be target capability that supports application portfolio analysis against scoring measures (based on value) and overall portfolio performance objectives (based on enterprise needs and policies). This scoring and decision-aiding capability supports the process by which MSFC application investments are realigned or retired from the application portfolio.

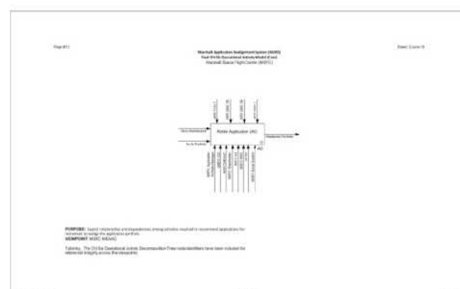
The MARS Architecture is a multi-phase effort to: (1) conduct strategic architecture planning and knowledge development based on the DoDAF V2.0 six-step methodology, (2) describe one architecture through multiple viewpoints, (3) conduct portfolio analyses based on a defined operational concept, and (4) enable a new capability to support the MSFC enterprise IT management mission, vision, and goals.

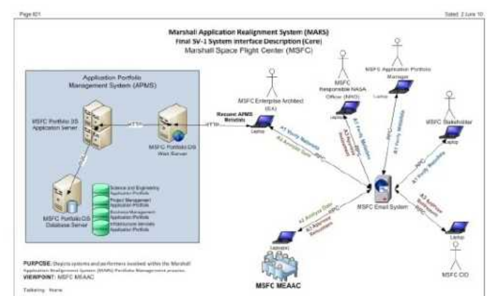




This report documents Phase 1 (Strategy and Design), which includes discovery, planning, and development of initial architecture viewpoints.

Phase 2 will move forward the process of building the architecture, widening the scope to include application realignment (in addition to application retirement), and validating the underlying architecture logic before moving into Phase 3.





The MARS Architecture key stakeholders are most interested in Phase 3 because this is where the data analysis, scoring, and recommendation capability is realized. Stakeholders want to see the benefits derived from reducing the steady-state application base and identify opportunities for portfolio performance improvement and application realignment.

The authors approached the development of MARS Architecture viewpoints in stages. The first stage focused on the capability and operational viewpoints. The second stage focused on developing a high-level system viewpoint and the standards and guidance that apply to the MARS Architecture, as well as two additional capability and operational viewpoints. The third stage focused on mapping operational and system viewpoints to ensure integration and to expose additional viewpoints needed to more fully describe the architecture.

Once the initial viewpoints were drafted, the authors revisited, refined, and "walked through" all viewpoint elements to ensure integration and referential integrity across viewpoints. The authors repeated these activities many times during the viewpoint development process – producing multiple iterations of each viewpoint.

More viewpoints are needed to further describe the MARS Architecture. The authors plan to develop these additional viewpoints in Phase 2, and integrate them with the viewpoints developed thus far.

The additional viewpoints provide information currently not represented in the existing viewpoints. This includes information about underlying data and data relationships; logic and business rules that underlie the concept of operations and behaviors; scenario and use case depictions; operational-to-system mappings; and performance measures.

The authors discovered early on in the process the challenges presented by developing different views of *one* architecture; mainly, viewpoints cannot be developed sequentially or in isolation, and no viewpoint is ever finished due to the need for continual integration cross-checks and follow-through.

The work presented in this report is representative of the work performed thus far to describe a target MARS Architecture. Future work will be documented as the MARS Architecture enters and exits each of the project review milestones described in this report.

The authors will report findings and recommendations at the completion of the MARS Architecture project.

About the authors: Andréa Belshe and Mandy Sutton are with Freedom Information Systems in Madison, AL. Ms. Belshe and Ms. Sutton are contractors on the Marshall Information Technology Services (MITS) contract at the NASA Marshall Space Flight Center (MSFC) near Huntsville, AL. Ms. Belshe and Ms. Sutton are members of the NASA MSFC Enterprise Architecture team in the MSFC Office of the Chief Information Officer (CIO).

Contents

Figures

Tables

Part 1
MARS Architecture Strategy and Design

1 Introduction

1.1 About the Environment

1.1.1 NASA

The National Aeronautics and Space Administration (NASA) is an agency of the United States (US) government. NASA is responsible for the nation's civilian space program and aeronautics and aerospace research. The NASA mission is to "pioneer the future in space exploration, scientific discovery, and aeronautics research."

NASA was established by the National Aeronautics and Space Act on 29 July 1958, thereby replacing its predecessor, the National Advisory Committee for Aeronautics (NACA). The Agency became operational on 1 October 1958. Since then, NASA has led US efforts for space exploration such as the Apollo missions to the Moon, the Skylab space station, the International Space Station (ISS), and the Space Shuttle.

Today, NASA conducts its work in four principal organizations called Mission Directorates:

- Aeronautics – pioneers and proves new flight technologies that improve our ability to explore and which have practical applications on Earth.
- Exploration Systems – creates capabilities for sustainable human and robotic exploration.
- Science – explores the Earth, solar system, and universe beyond; charts the best route of discovery; and reaps the benefits of Earth and space exploration for society.
- Space Operations – provides critical enabling technologies for much of the rest of NASA through the Space Shuttle, the International Space Station (ISS), and flight support.

For more than 50 years, thousands of people have been working to answer these questions: What's out in space? How do we get there? What can we learn in space (and from trying to get there) that will improve life on Earth? The work continues.

1.1.2 MSFC

Marshall Space Flight Center (MSFC) is one of NASA's Centers and is located near Huntsville; AL. MSFC supports the design, development, and operation of space systems the United States (US) needs to journey into Low Earth Orbit (LEO) and beyond.

MSFC is the civilian rocketry and spacecraft propulsion research Center for the US government. MSFC was the original home of NASA, and today MSFC is NASA's lead Center for Space Shuttle propulsion and its external tank; payloads and related crew training; International Space Station (ISS) design and assembly; and computers, networks, and information management.

MSFC supports the US space program in the following ways:

- MSFC provides the multi-disciplined engineering expertise behind propulsion and transportation systems such as the Space Shuttle (Payload Operations Center) and the Ares rockets (Ares I and Ares V).
- MSFC enables scientific discovery through development of hardware and instruments for projects including the Chandra X-ray Observatory, the GLAST Gamma-ray Burst Monitor, and Gravity Probe B.
- MSFC develops, integrates, and operates major components and systems on the International Space Station (ISS) and supports its operations 24/7.
- MSFC manages the Michoud Assembly Facility (MAF) in New Orleans, LA, which provides critical hardware components for the Space Shuttle.

MSFC also contains the Huntsville Operations Support Center (HOSC), a facility that supports Space Shuttle launch payload and experiment activities at the Kennedy Space Center (KSC) and ISS launch and experiment operations. The HOSC also monitors rocket launches from Cape Canaveral Air Force Station when an MSFC payload is on board.

1.1.3 Culture

MSFC has a complex organizational reporting and decision-making hierarchy. MSFC also has multiple strategic entities, function capabilities, and sub-function activities that support Agency and Center business missions and the delivery of services and products to external and/or internal business stakeholders.

MSFC has a diverse workforce with a complex mix of skills, professional backgrounds, designations, and reporting chains. The workforce includes people with general to highly specialized expertise in business, technology, and science; people with professional backgrounds in industry, the military, and civilian government; and designated civil servants, contractors, and other third-party service and product providers.

Any effort – especially an enterprise architecture effort – must align organizational culture, workforce culture, and social culture to balance business objectives, requirements, and cost; short-term needs, schedule imperatives, and strategic goals; mission safety, risk, and cost; and self interest, mutual interest, and collective actions with desired and “best” outcomes.

Cultural models might be helpful for the culture-to-desired outcome alignment need described above but architecture frameworks such as DoDAF V2.0 do not provide for a “culture viewpoint.” As stated in the *FEAC Institute DoD Architecture Framework 2.0 Guidebook*:

> “This would assume technical, systems, and data are at the same level as culture. If on the other hand, we consider Zachman’s primitives and each of the DoDAF products to be cultural artifacts we would search for the cultural as something that underlies the framework rather than is at the same level. This helps understand Melissa Cook (1997) finding how data is often managed in organizations is based on political and organizational culture matters rather than what an EA would discover makes the best sense for the enterprise."

1.2 Background

A portfolio is the collection of capabilities, resources, and related investments required to accomplish a mission-related or administrative outcome. Portfolio management activities include strategic planning, capital planning, governance, process improvement, performance measures, requirements generation, acquisition/development, and operations (from *DoD 8115.02*).

The NASA strategy for Improving IT management provides an approach for IT portfolio management. The goal of the NASA IT application portfolio strategy is to leverage a portfolio view of existing IT application assets throughout NASA with the objective of improving the performance of the individual assets within the portfolio as well as the performance of the portfolio as a whole.

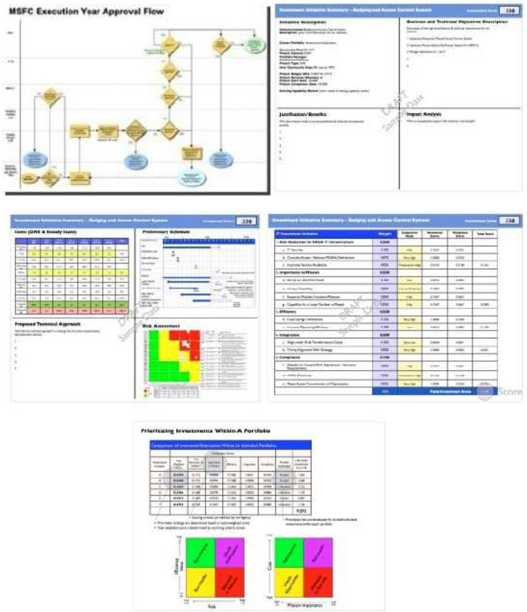
The NASA approach for IT portfolio management involves establishing and governing an Application Portfolio Management (APM) framework that provides the ability to do the following:

- Organize applications into relevant categories for decision making.
- Consistently evaluate the relative importance and performance of steady-state applications.
- Prioritize which assets require resources (people and dollars) in any given budget cycle.
- Answer the question: What things should I spend money on/or apply management cycles to in this budget cycle?

MSFC is a participating member of the NASA IT APM team working to implement and mature the framework for managing the application portfolio across the Agency. The Agency has defined four portfolios for IT applications: Science and Engineering applications, Project Management applications, Business Management applications, and IT Infrastructure applications.

Each year, the MSFC Chief Information Officer (CIO) issues strategic initiatives. In 2010, the MSFC CIO issued a strategic initiative to improve MSFC Application Portfolio Management (APM) by optimizing investments in the application portfolio and improving portfolio performance.

1.3 Problem and Need



MSFC has an established Application Portfolio Management (APM) process for initiating, assessing, prioritizing, and funding new application investments. This involves managing an investment "package" that includes a description of the investment, justification (with potential benefits), risk assessment, impact analysis, high-level requirements, proposed technical approach, lifecycle costs, investment scoring against predefined criteria, and a preliminary schedule.

The problem is MSFC sustains and continues to add application investments to its application portfolio but many of these investments do not provide the business and technology value required to effectively and efficiently support business processes and meet NASA and MSFC strategic objectives.

The MSFC APM process needs a capability by which new and existing investments can be assessed to ensure alignment with strategic goals, business objectives, and desired business outcomes.

The capability would support the analysis and decision-making processes used to derive the recommendations for application portfolio corrections and adjustments that keep the portfolio optimally aligned.

2 Architecture Intended Use

2.1 Purpose

The purpose of the Marshall Application Realignment System (MARS) Architecture is to: (1) address the NASA Marshall Space Flight Center (MSFC) CIO strategic initiative to improve Application Portfolio Management (APM) by optimizing investments and improving portfolio performance, and (2) develop a decision-aiding capability by which applications registered within the MSFC application portfolio can be analyzed and considered for retirement or decommission.

The MARS Architecture project was established to meet the certification requirements of the Department of Defense Architecture Framework (DoDAF) V2.0 Federal Enterprise Architecture Certification (FEAC) Institute program and to provide added value to the MSFC Application Portfolio Management process.

2.2 Key Stakeholders

The MARS Architecture has the following key stakeholders:

- MSFC Chief Information Officer (CIO)
- MSFC Planning, Policy, and Integration Office (PP&IO)
- MSFC Enterprise Architecture Advisory Committee (MEAAC)
- MSFC Application Portfolio Manager
- MSFC Enterprise Architect (EA)
- MSFC Responsible NASA Official (RNO)

2.3 Questions Addressed

The MARS Architecture addresses the following stakeholder questions:

- How can MSFC consistently evaluate the relative importance and performance of steady-state applications?
- How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?
- How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- How can MSFC determine the extent of overlapping functionality within its application portfolio?
- How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

2.4 Mapping of Stakeholder Questions to Stakeholders

Table 1 lists the questions associated with the MARS Architecture key stakeholders.

Table 1 Stakeholder Question to Stakeholder Mapping

Stakeholder Issues	MSFC CIO	MSFC Planning, Policy, and Integration Office	MEAAC	MSFC Application Portfolio Manager	MSFC Enterprise Architect	Responsible NASA Official
SQ-01: How can MSFC consistently evaluate the relative importance and performance of steady-state applications?	X	X	X			
SQ-02: How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?	X	X	X			
SQ-03: How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?			X	X	X	
SQ-04: How can MSFC determine the extent of overlapping functionality within its application portfolio?			X	X	X	
SQ-05: How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?			X	X	X	
SQ-06: How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?			X	X	X	X

3 Architecture Scope

3.1 Point of View

The MARS Architecture is approached from the viewpoint of the MSFC Enterprise Architecture Advisory Committee (MEAAC), which is a key stakeholder for the MARS Architecture.

The MEAAC directs, oversees, and approves the MSFC enterprise architecture design and operating configurations that affect MSFC IT investments in the MSFC IT portfolios. The MEAAC also reviews, approves, and controls changes to the baseline configuration of the MSFC enterprise architecture.

3.2 Boundaries and Constraints

3.2.1 Geographic Boundary

The geographical scope of the MARS Architecture is the NASA Marshall Space Flight Center (MSFC) near Huntsville, AL. Although MSFC is geographically dispersed and has an organizational relationship with the Michoud Assembly Facility (MAF) in New Orleans, LA, the MARS Architecture is geographically focused only on MSFC near Huntsville, AL.

3.2.2 Organizational Boundary

The organizational scope of the MARS Architecture is the MSFC Office of the Chief Information Officer (CIO) organization hierarchy, mission Lines of Business (LOB), and sub-functions.

3.2.3 Constraints

The MARS Architecture includes the MSFC Application Portfolio Management (APM) process and all MSFC applications that are registered in the authorized MSFC Application Portfolio Management System (APMS).

The MARS Architecture has the following constraints:

- Focuses only on describing a new business capability, and not on introducing new technology.
- Neither addresses nor applies to applications that are not registered in the APMS.
- Does not include or address the process by which applications are registered in the APMS.

- Focuses only on applications that are in a sustaining/operational lifecycle state, as defined by the MSFC Application Portfolio Management process.
- Focuses only on the operational application investments governed by NASA Procedural Regulation (NPR) 7120.7, NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements. The MARS Architecture neither addresses nor applies to operational application investments governed by NPR 7120.5, NASA Space Flight Program and Project Management Requirements.

Figure 1 shows the Application Portfolios addressed by the MARS Architecture and the applicable NASA guidance.

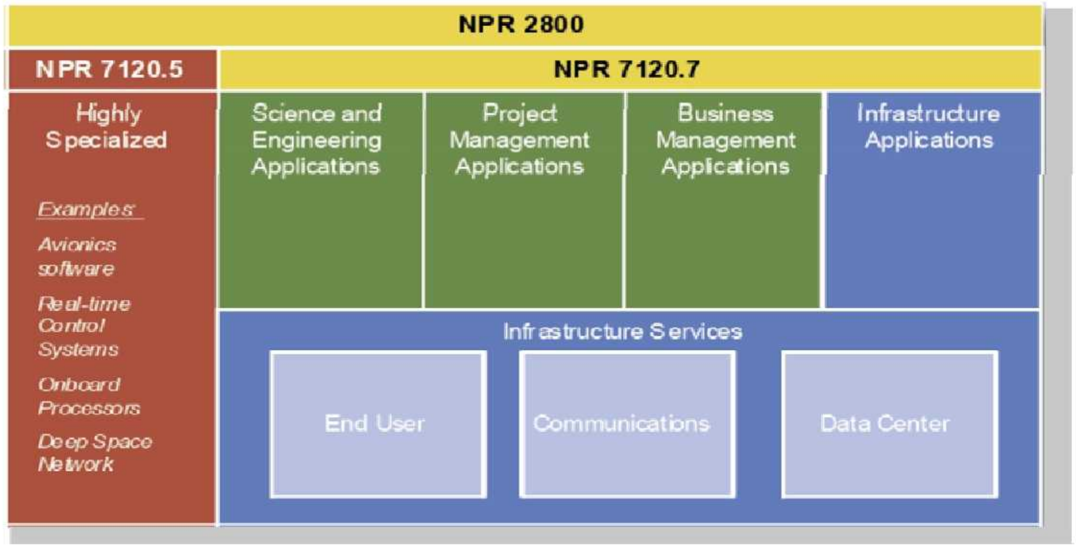


Figure 1 MSFC Application Portfolios

3.3 Architecture Timeframe

The MARS Architecture describes "to-be" target architecture.

4 Approach

The MARS Architecture describes a to-be capability that supports application portfolio analysis against scoring measures (based on value) and overall portfolio performance objectives (based on enterprise needs and policies). This scoring and decision-aiding capability supports the process by which MSFC application investments are realigned or retired from the application portfolio.

Score measures include:

- Cost of operation and maintenance
- Frequency of use
- Mission alignment
- Network use
- Number of users
- Primary functionality
- Retirement target date
- Risk rating
- Security compliance
- Years in use

The approach is to focus on aligning the MSFC application portfolio based on desired business outcomes that are driven by strategic goals, objectives, and business requirements.

4.1 Probable Analysis Methods

The probable analysis methods for the MARS Architecture include business case analysis, trade-off analysis, and performance analysis.

The MARS Architecture analysis method will likely use score measures to apply techniques such as Balanced Scorecard (BSC), Boston Consulting Group (BCG) or Boston matrix, and/or Growth-share matrix measurement and management. In Phase 2, which is outside the scope of this report, the MARS Architecture scoring logic will be modeled and the portfolio analysis approach will be derived.

5 Foundation

5.1 Guidance and Standards

5.1.1 Architecture Development Guidance

To the extent possible and practical, the MARS Architecture will follow the guiding principles for architecture development suggested in *DoDAF V2.0 Volume 1: Introduction, Overview, and Concepts Manger's Guide (May 2009)* and the *DoDAF V2.0 Volume 2: Architecture Data and Models Architect's Guide (May 2009)*.

5.1.2 Federal, NASA, and MSFC Guidance

The Federal Government issues numerous directives, guidelines, laws, mandates, policies, procedures, regulations, requirements, rules, and standards that apply to the development and delivery of government-funded end products and services to citizens. These also provide information and guidance for managing strategic plans, justifying Information Technology (IT) expenditures, measuring IT performance, integrating new technologies, and managing information resources. In addition, the Federal Government has issued laws, policies, and guidance specifically to establish the importance of using architecture to support decision-making activities.

NASA and MSFC also issue directives, guidelines, policies, procedures, requirements, and so forth to: (1) manage, develop, and deliver end products and services that support the Agency, Centers, and multiple lines of business, and (2) establish use of architecture to support decision-making activities.

5.1.3 MARS Architecture Standards

The Standards Profile (StdV-1) on page 96 lists the guidance and standards applicable to the MARS Architecture.

5.2 Capability Context

NASA defined core function areas that provide the capabilities to support its strategy to improve IT management at the Agency and Center levels. These include:

1. Governance and Policy
2. Enterprise Architecture
3. IT Security
4. Relationship Management
5. Resource Management

6. Innovation Management
7. Project Management
8. Service Management and Delivery
9. Performance Management

Function areas 1 through 3 help ensure compliance with Federal law and Agency policy. Function areas 4 through 6 help ensure alignment with Center and Agency mission needs. Function areas 7 through 9 help ensure the ability of the IT organization to execute on product and service delivery.

5.2.1 MSFC IT Management Mission

In this context, the MSFC mission is to maintain an MSFC enterprise-wide IT investment portfolio in alignment with Agency, Center, and Program mission and business needs; and ensure proper management of investments within the portfolio.

5.2.2 MSFC IT Management Vision

The vision is to improve performance of new and existing application portfolio investments using a consistent analysis approach, relative scoring criteria, and decision-aiding intelligence to: (1) ensure optimal alignment with MSFC business and technical objectives, and (2) reduce the total number of steady-state applications in the MSFC application portfolio.

5.2.3 Goals

The IT portfolio management goals are:

- Remove underused, unused, low business value, and low technology value applications.
- Reduce duplicated and overlapping functionality.
- Retire applications.

5.2.4 Initiatives

The MSFC CIO issues strategic initiatives each year. The 2010 initiative relative to the MARS Architecture is: “Improve MSFC Application Portfolio Management (APM) by optimizing investments in the application portfolio and improving portfolio performance.”

5.2.5 Execution

The MSFC Enterprise Architecture methodology focuses on conducting detailed architecture efforts for specific, prioritized architectural "segments." Segment architecture is a detailed architecture for a portion of the overall MSFC EA, where measurable results (performance improvement, cost reduction) can be achieved through implementation of an improved to-be target state.

Segment architectures focus on the IT portfolios as defined by the CIO and managed by the MSFC CIO. Each segment architecture addresses all architectural layers, from strategy to technology. This provides documentation of the business requirements and processes that drive the technology assets managed in the different IT portfolios. Integrating Enterprise Architecture documentation with the active governance and management of IT portfolios ensures that technology decisions align with business priorities.

5.3 Performance Measures

The MARS Architecture may be considered successful if one or more of the following occur as a result of the architecture effort:

- Adoption of the MARS capability into the MSFC Application Portfolio Management framework
- Validation that the MARS capability facilitates the desired effect (reduce MSFC application investment costs and better align applications with MSFC business and technology objectives)
- Tangible and deliverable MARS capability output (retire recommendation) that supports MSFC CIO objectives
- Reduction in the total number of applications sustained in the MSFC application portfolio from approximately 500 to a significantly lower number.

6 Initial Data Types Identified

The DoDAF Metamodel (DM2), which is based on ontological foundations, establishes a meta-vocabulary and provides for taxonomy and ontology relationships. The authors used the DM2 to help determine the DoDAF-described views needed to describe the MARS Architecture based on the data elements required to support the architecture purpose and scope, and to answer the key stakeholder questions.

The authors built an initial list of appropriate DoDAF views mapped to the DM2 data elements. This list contains the architecture data that must be collected, organized, correlated, and stored in the next phase of the MARS Architecture project. The authors will determine how to use this data to support the analysis.

The DM2 data elements are used consistently across MARS Architecture views to create an integrated architecture description. The following are initial DM2 data types for the MARS Architecture:

- Activity
- Capability
- Data
- Desired Effect
- Guidance
- Measure
- Organization
- Performer
- Resource
- Rules
- Standard
- System
- Vision

6.1 Mapping of Stakeholder Questions to Data Requirements and Architecture Viewpoints

Table 2 shows a mapping of questions addressed by the MARS Architecture, key stakeholders, DoDAF V2.0 data types, and DoDAF V2.0 viewpoints. This mapping helps to "connect-the-dots" and ensures the intersection of data and purpose.

Table 2 Question, Stakeholder, Data Type, and Viewpoint Mapping

Stakeholder Question	Key Stakeholders	Data Types	Viewpoints
SQ-01: How can MSFC consistently evaluate the relative importance and performance of steady-state applications?	• MSFC CIO • MSFC PP&I Office • MEAAC	• Activity • Capability • Desired Effect • Guidance • Measure • Standard • Vision	CV-1, CV-2, OV-1, StdV-1
SQ-02: How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?	• MSFC CIO • MSFC PP&I Office • MEAAC	• Activity • Capability • Desired Effect • Guidance • Measure • Standard • Vision	CV-1, CV-2, OV-1, StdV-1

Stakeholder Question	Key Stakeholders	Data Types	Viewpoints
SQ-03: How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?	• MEAAC • MSFC Application Portfolio Manager • MSFC EA	• Activity • Capability • Data • Desired Effect • Guidance • Measure • Organization • Performer • Resource • Rules • Standard • System	CV-2, CV-5, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1, StdV-1
SQ-04: How can MSFC determine the extent of overlapping functionality within its application portfolio?	• MEAAC • MSFC Application Portfolio Manager • MSFC EA	• Activity • Capability • Data • Desired Effect • Guidance • Measure • Organization • Performer • Resource • Rules • Standard • System	CV-2, CV-5, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1, StdV-1

Stakeholder Question	Key Stakeholders	Data Types	Viewpoints
SQ-05: How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?	• MEAAC • MSFC Application Portfolio Manager • MSFC EA	• Activity • Capability • Data • Desired Effect • Guidance • Measure • Organization • Performer • Resource • Rules • Standard • System	CV-2, CV-5, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1, StdV-1
SQ-06: How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?	• MEAAC • MSFC Application Portfolio Manager • MSFC EA • MSFC RNO	• Activity • Capability • Data • Desired Effect • Guidance • Measure • Organization • Performer • Resource • Rules • Standard • System	CV-2, CV-5, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1, StdV-1

7 Architecture Lifecycle

The MARS Architecture is a multi-phase effort to:

1. Conduct strategic architecture planning and knowledge development based on the DoDAF V2.0 six-step methodology
2. Describe one architecture through multiple viewpoints
3. Conduct portfolio analyses based on the operational concept
4. Enable a new capability to support the MSFC enterprise IT management mission, vision, and goals

7.1 Phase Roadmap

Figure 2 shows the MARS Architecture phase roadmap. This report documents Phase 1 (Strategy and Design), which includes discovery and planning activities, and development of the initial MARS Architecture viewpoints.

Phase 2 will move forward the process of building the architecture, widening the scope to include application realignment (in addition to application retirement), and validating the underlying architecture logic before moving into Phase 3.

The MARS Architecture key stakeholders are most interested in Phase 3 because this is where the data analysis, scoring, and recommendation capability is realized. Stakeholders want to see the benefits derived from reducing the steady-state application base and identify opportunities for portfolio performance improvement and application realignment.

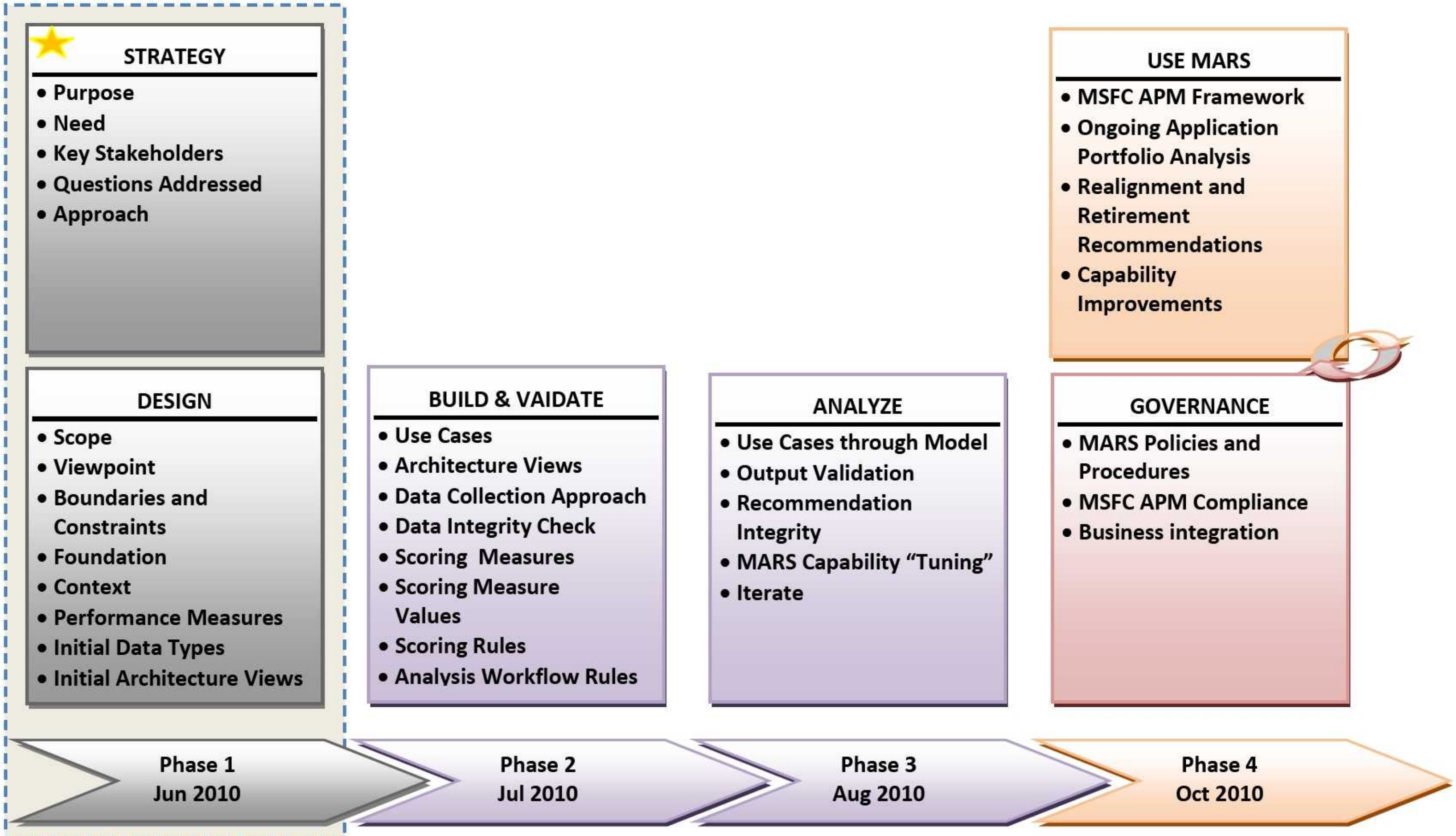


Figure 2 MARS Architecture Phase 1 though Phase 4

7.2 Architecture Reviews

The phases shown in Figure 2 align loosely to the NASA-prescribed program and project reviews documented in *NPR 7120.7: NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements.* These reviews offer an opportunity to add value to the architecture and to share knowledge by inviting key stakeholders and subject matter experts who can provide confirmation of the approach and/or recommend options. The reviews also offer an opportunity to organize, assess, and communicate critical data and information among providers, architects, and key stakeholders.

The authors intend to execute the project review milestones prescribed in NPR 7120.7 as part of the MARS Architecture lifecycle. Table 3 shows a mapping of MARS Architecture phases to the project review milestones documented in NPR 7120.7.

Table 3 Mapping of MARS Architecture Phases to NASA-prescribed Project Reviews

	MARS Architecture Phase			
Project Review	**Phase 1**	**Phase 2**	**Phase 3**	**Phase 4**
System Concept Review (SCR)	X			
System Requirements Review (SRR)	X			
Preliminary Design Review (PDR)		X		
Critical Design Review (CDR)			X	
Operational Readiness Review (ORR)				X

The System Concept Review (SCR) evaluates the scope, cost benefit analysis, and a recommended concept for the purpose of receiving approval to proceed to the next phase. It assesses the effect on the "as-is" and "to-be" enterprise architecture.

The System Requirements Review (SRR) examines the functional, technical, performance, and security requirements, and ensures that requirements and the selected concept will satisfy the objectives.

The Preliminary Design Review (PDR) demonstrates that the preliminary design meets requirements with acceptable risk and within the cost and schedule constraints, and establishes the basis for proceeding with detailed design. It confirms that the correct design option has been selected, interfaces have been identified, and verification methods have been described.

The Critical Design Review (CDR) confirms that the maturity of the design is appropriate to support proceeding with implementation, that it was developed in conjunction with stakeholders, demonstrates that the design meets detailed requirements, and identifies open design issues for the purpose of obtaining a decision to proceed with development and deployment.

The Operational Readiness Review (ORR) determines that the project is ready to "go-live." It confirms that requirements have been met; the functionality, performance, and security controls have been thoroughly tested; procedures are in place for operations; the users have been adequately trained; and, the organization responsible for operating and sustaining is ready to assume responsibility.

8 Architecture Viewpoints

8.1 Staged Development Process

The authors approached the development of MARS Architecture viewpoints in stages. The first stage focused on the capability and operational viewpoints. Once the initial viewpoints were drafted, the authors revisited, refined, and "walked through" all viewpoint elements to ensure integration and referential integrity across viewpoints.

The second stage focused on developing a high-level system viewpoint and the standards and guidance that applies to the MARS Architecture, as well as two additional capability and operational viewpoints. Once these viewpoints were drafted, the authors revisited, refined, and walked through all viewpoint elements again – iterating the viewpoints many times.

The third stage focused on mapping operational and system viewpoints to ensure integration and to expose additional viewpoints needed to more fully describe the MARS Architecture.

The authors discovered early on in the process the challenges presented by developing different views of *one* architecture; mainly, viewpoints cannot be developed sequentially or in isolation, and no viewpoint is ever finished due to the need for continual integration cross-checks and follow-through.

Throughout the architecture viewpoint development process, the authors used the established MSFC EA team practices for configuration management, data stewardship, and repository management. The authors created architecture products using Adobe Acrobat and Microsoft Excel, PowerPoint, Visio, and Word.

8.2 Viewpoint Build Order and Integration

Figure 3 shows the order in which the authors built the initial set of MARS Architecture viewpoints, and depicts the relationships between viewpoints. These relationships drove the architecture element validation, walk through, and iteration process.

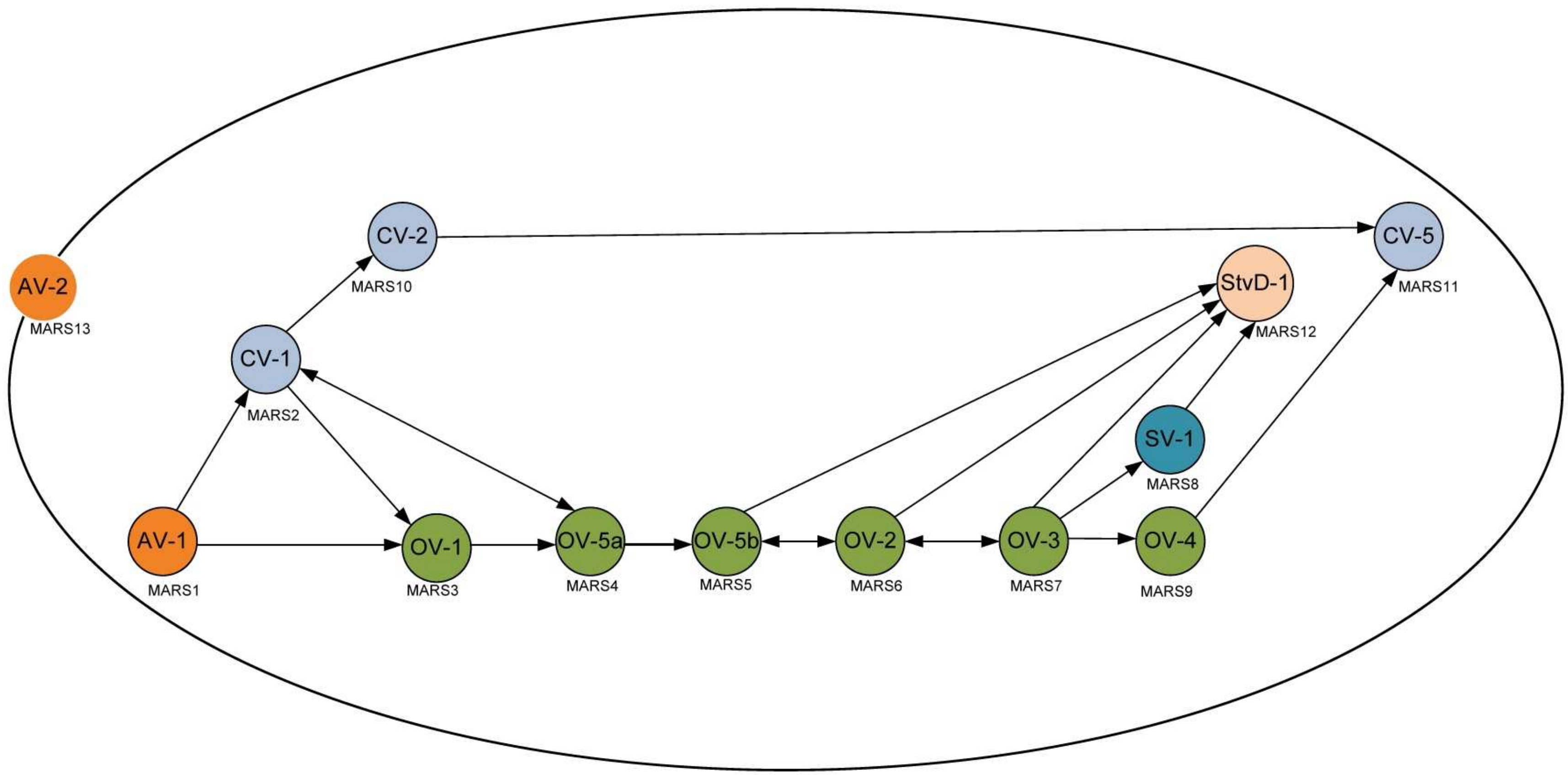


Figure 3 MARS Architecture View Build Order and Integration

8.3 Future Viewpoint Elaboration

Additional viewpoints are needed to further describe the MARS Architecture. The authors plan to develop these viewpoints in Phase 2, and integrate them with the viewpoints developed thus far.

The additional viewpoints provide information currently not represented in the existing viewpoints. This includes information about underlying data and data relationships; logic and business rules that underlie the concept of operations and behaviors; scenario and use case depictions; operational-to-system mappings; and performance measures.

The authors plan to add the following viewpoints to the MARS Architecture:

- Conceptual Data Model to represent high-level data concepts and their relationships (DIV-1)
- Logical Data Model to document the data requirements and structural business process (activity) rules (DIV-2).
- Operational Rules Model to describe activity (operational activity) and identify business rules that constrain operations (OV-6a).
- Event-Trace Description to describe operational activity (activity) and trace actions in a scenario or sequence of events (OV-6c).
- Capability to Operational Activities Mapping to show the required capabilities and the operational activities that those capabilities support (CV-6).
- Operational Activity to Systems Function Traceability Matrix to map system functions (activities) back to operational activities (activities) (SV-5a).
- Operational Activity to Systems Traceability Matrix to map systems back to capabilities or operational activities (activities) (SV-5b).

As the architecture work progresses, more viewpoints may be added.

The work presented in this report is representative of the work performed thus far to describe a target MARS Architecture. Future work will be documented as the MARS Architecture enters and exits each of the project review milestones described in this report.

Part 2
MARS Architecture Viewpoints

9 About the Viewpoints

This part of the report provides detailed information about the following MARS Architecture viewpoints:

1. AV-1 – Overview and Summary Information
2. CV-1 – Capability Vision
3. OV-1 – High-level Operational Concept Graphic
4. OV-5a – Operational Activity Decomposition
5. OV-5b – Operational Activity Model
6. OV-2 – Operational Resource Flow Description
7. OV-3 – Operational Resource Flow Matrix
8. SV-1 – System Interface Description
9. OV-4 - Organizational Relationships Chart
10. CV-2 – Capability Taxonomy
11. CV-5 - Capability to Organizational Development Mapping
12. StdV-1 – Standards Profile
13. AV-2 – Integrated Dictionary

For readers unfamiliar with DoDAF V2.0, the authors provide a description, along with purpose and audience information for each viewpoint. The information is based on guidance provided in the *DoD Architecture Framework Version 2.0 (DoDAF V2.0) Volume 2: Architectural Data and Models Architect's Guide*.

For readers familiar with DoDAF V2.0, the authors suggest skipping to the MARS Architecture-specific information provided for each viewpoint. This information includes tailoring applied, viewpoint, view discussion, view integration, and stakeholder questions addressed.

10 AV-1 Architecture Overview and Summary

10.1 DoDAF-described AV-1

10.1.1 Description

The AV-1 Overview and Summary contains the written summary information that executives or decision makers use to review the architecture description. Architects use the AV-1 while developing the various viewpoints to remain consistent with the overall architecture and to frame the context for the development of the architecture description.

The AV-1 provides to anyone reviewing the architecture description a quick reference point for the various viewpoints contained in the architecture, which allows a reviewer to quickly review the architecture and select a viewpoint for additional reading or research. The AV-1 includes assumptions, constraints, and limitations that may affect high-level decisions relating to the review and approval of the architecture. The AV-1 also includes a synopsis of findings, recommendations, and follow-up actions.

10.1.2 Purpose

The AV-1 servers as a planning guide in the initial phases of architecture development. Once the architecture description has been approved by the decision maker, the AV-1 provides the roadmap for the actual implementation of the architecture. It provides summary information concerning who, what, when, why, and how of the plan as well as a navigation aid to the viewpoints and models that have been created for the designers to use for implementation.

The AV-1 is used to:

- Define and scope the architecture effort
- Provide context to the architecture effort
- Summarize the findings from the architecture effort
- Assist search within an architecture repository

10.1.3 Audience

The AV-1 audience includes:

- Architecture sponsors
- Architecture participants
- Architecture stakeholders
- Architecture development team
- Architecture repositories

10.2 MARS Architecture AV-1

10.2.1 Tailoring Applied

The authors did not tailor the MARS AV-1.

10.2.2 Viewpoint

The viewpoint of the MARS AV-1 is the MEAAC.

10.2.3 View Discussion

The MARS AV-1 provides a quick reference and high-level overview of the Marshall Application Realignment System (MARS) Architecture. The MARS AV-1 includes information derived primarily from Steps 1 through 3 of the DoDAF V2.0 methodology. In a future version, the MARS AV-1 will also include a synopsis of MARS Architecture outcomes such as findings, recommendations, and opportunities for future work.

The authors will update the MARS AV-1 as the project progresses to ensure alignment between planned and actual architectural development. The authors will also complete the "Findings" section of the AV-1 after the project has been completed.

10.2.4 View Integration

The MARS AV-1 drives content and data elements for all of the MARS Architecture viewpoints. Likewise, all MARS Architecture viewpoint content and data elements must align with and validate against the MARS AV-1 content. For example, the MARS AV-1 is a written description of the architecture depicted in the MARS OV-1 High-level Operational Concept Graphic.

10.2.5 Stakeholder Questions Addressed

All stakeholders may refer to the MARS AV-1 for information about the MARS Architecture. The MARS AV-1 was not developed to address specific stakeholder questions but to address the purpose, scope, context, and overall architecture description.

Figure 4 MARS Architecture AV-1 Architecture Overview and Summary

Date: 12 June 2010	MARS Architecture AV-1 Architecture Overview and Summary	MARS-01

Architecture Project Identification

Name: Marshall Application Realignment System (MARS) Architecture

Architects: (in alphabetic order) Andrea Belshe and Mandy Sutton

Organization Developing the Architecture: National Aeronautics and Space Administration (NASA) Marshall Space Flight Center (MSFC)

Assumptions and Constraints: The MARS Architecture project was established to meet the certification requirements of the Department of Defense Architecture Framework (DoDAF) V2.0 Federal Enterprise Architecture Certification (FEAC) Institute program and to provide added value to the MSFC Application Portfolio Management (APM) process. This MARS Architecture project encompasses Phase 1 activity only and must be completed by 14 June 2010. High-level schedules for MARS Architecture project Phase 2 and beyond will be determined at the completion of Phase 1.

Approval Authority: MARS Architecture management team and Marshall Enterprise Architecture Advisory Committee (MEAAC)

Date Completed: The MARS Architecture project is in progress (Phase 1 completion target is 14 June 2010).

Level of Effort and Projected and Actual Costs to Develop the Architecture: The MARS Architecture project has limited allocated resources. The MARS Architecture project team consists of two architects. The MARS Architecture management team provides requirements, direction, and guidance as needed. Stakeholder organizations provide subject matter expertise, review input and feedback, facilities, materials, and access to systems as needed. Specific budget and cost information must be requested from the MSFC Financial Services organization due to its sensitive content.

Date: 12 June 2010	MARS Architecture AV-1 Architecture Overview and Summary	MARS-01
Scope, Architecture Viewpoints, and Artifact Identification		

Viewpoints and Artifacts Developed: The MARS Architecture project provides the following core DoDAF V2.0 viewpoints:

- AV-1 – Overview and Summary Information
- AV-2 – Integrated Dictionary
- OV-1 – High-level Operational Concept Graphic
- OV-2 – Operational Resource Flow Description
- OV-3 – Operational Resource Flow Matrix
- OV-5a – Operational Activity Decomposition
- OV-5b – Operational Activity Model
- SV-1 – System Interface Description
- StdV-1 – Standards Profile

The MARS Architecture project provides the following supporting DoDAF V2.0 viewpoints:

- CV1 – Capability Vision
- CV-2 – Capability Taxonomy
- CV-5 - Capability to Organizational Development Mapping
- OV-4 - Organizational Relationships Chart

Timeframe Addressed: The MARS Architecture timeframe is a To-be capability.

Organizations Involved: The MSFC Office of the Chief Information Officer (CIO) organization hierarchy, mission Lines of Business (LOB), and sub-functions.

Purpose and Viewpoint:

Background: The NASA strategy for Improving IT management at provides an approach for IT portfolio management. The goal of the IT application portfolio strategy is to leverage a portfolio view of existing IT application assets throughout NASA with the objective of improving the performance of the individual assets within the portfolio as well as the performance of the portfolio as a whole.

The MSFC CIO issued a 2010 strategic initiative to improve MSFC Application Portfolio Management (APM) by optimizing investments in the application portfolio and improving portfolio performance.

Need: MSFC has an established APM process for initiating, assessing, prioritizing, and funding new application investments. The problem is MSFC sustains and continues to add application investments to its application portfolio but many of these investments do not provide the business and technology value required to effectively and efficiently support business processes and meet NASA and MSFC strategic objectives.

The MSFC APM process needs a capability by which new and existing investments can be assessed to ensure alignment with business and technology objectives. The capability would support the analysis and decision-making processes used to derive the recommendations for application portfolio corrections and adjustments that keep the portfolio optimally aligned.

Approach: The MARS Architecture describes a to-be capability that supports application portfolio analysis against scoring measures (based on value) and overall portfolio performance objectives (based on enterprise needs and policies). This scoring and decision-aiding capability supports the process by which MSFC application investments are realigned or retired from the application portfolio.

Scoring include:

- Cost of operation and maintenance
- Frequency of use
- Mission alignment
- Network use
- Number of users
- Primary functionality
- Retirement target date
- Risk rating
- Security compliance
- Years in use

Probable Analysis Methods and Expected Outcome: The probable analysis methods for the MARS Architecture project include business case analysis, trade-off analysis, and performance.

Enterprise Questions Addressed: The MARS Architecture project addresses the following stakeholder questions:

- How can MSFC consistently evaluate the relative importance and performance of steady-state applications?
- How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?
- How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- How can MSFC determine the extent of overlapping functionality within its application portfolio?
- How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

Viewpoint: The MARS Architecture is developed from the perspective of the MEAAC.

Boundaries: The MARS Architecture project scope includes the MSFC Application Portfolio Management (APM) process and all MSFC applications that are registered in the authorized MSFC Application Portfolio Management System (APMS). The MARS Architecture project has the following constraints:

- Focuses only on describing a new business capability, and not on introducing new technology.
- Neither addresses nor applies to applications that are not registered in the MSFC APMS.
- Does not include or address the process by which applications are registered in the MSFC APMS.
- Focuses only on applications that are in a sustaining/operational lifecycle state, as defined by the MSFC Application Portfolio Management process.
- Focuses only on the operational application investments governed by NASA Procedural Regulation (NPR) 7120.7, *NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements*. The project neither addresses nor applies to operational application investments governed by NPR 7120.5, *NASA Space Flight Program and Project Management Requirements*.

Context

Mission: Maintain a MSFC enterprise-wide IT investment portfolio in alignment with Agency, Center, and Program mission and business needs; and ensure proper management of investments within the portfolio.

Vision: Improve performance of new and existing application portfolio investments using a consistent analysis approach, relative scoring criteria, and decision-aiding intelligence to: (1) ensure optimal alignment with MSFC business and technical objectives, and (2) reduce the total number of steady-state applications in the MSFC application portfolio.

Goals:

- Remove underused, unused, low business value, and low technology value applications.
- Reduce duplicated and overlapping functionality.
- Retire applications.

Doctrine, Policy, and Guiding Principles: See MARS Architecture viewpoint StdV-1.

File Formats and Tools Used

- Adobe Acrobat (pdf)
- Microsoft Excel (xlsx)
- Microsoft PowerPoint (ppt)
- Microsoft Visio (vsd)
- Microsoft Word (docx)

Findings

Findings will be provided after the MARS Architecture project has been completed.

11 CV-1 Vision View

11.1 DoDAF-Described CV-1

11.1.1 Description

The CV-1 Vision view defines the strategic context for a group of capabilities described in the architecture description by outlining the vision for a capability area over a bounded period of time. It describes how high-level goals and strategy are to be delivered in capability terms. Of key importance is the identification of goals, together with the desired outcomes and measurable benefits associated with them.

11.1.2 Purpose

The purpose of a CV-1 is to provide a strategic context for the capabilities described in the architecture description. It also provides a high-level scope for the architecture description that is more general than the scenario-based scope defined in an OV-1.

The intended use is communication of the strategic vision regarding capability development. Developing an architecture that includes the relationships necessary to enable a capability thread is essential to improving usability of architectures, as well as increasing the value of federation.

11.1.3 Audience

The CV-1 audience includes:

- Architecture sponsors
- Architecture stakeholders
- Architecture development team

11.2 MARS Architecture CV-1

11.2.1 Tailoring Applied

The authors “scoped down” the breadth of the MARS CV-1 to depict a piece of the whole CV-1 for NASA MSFC. The graphic depicts the one capability represented by MSFC Application Management (APM) and shows MSFC Application Scoring as a new capability within MSFC APM. This tailoring was practical because a full accounting of the MSFC or MSFC CIO enterprise capabilities was beyond the scope and time constraints of MARS Architecture Phase 1.

11.2.2 Viewpoint

The viewpoint of the MARS CV-1 is the MEAAC.

11.2.3 View Discussion

The MARS CV-1 depicts the strategic context for the MARS Architecture. It includes the overall MSFC IT investment mission, vision, goals, desired effect, and the relationship of the MARS Architecture capability to the goals. The MARS CV-1 also includes the high-level activities in the MARS OV-5a and OV-5b views.

11.2.4 View Integration

The MARS CV-1 set the high-level scope for the architecture description that was used to develop the remaining views. The MARS CV-1 was used along with the MARS AV-1 to define the MARS OV-1 that graphically depicts the textual AV-1 with the incorporation of the new MARS capability. The MARS CV-1 includes activities aligned with the MARS OV-5a and OV-5b.

The MARS CV-1 was used to set the vision that was refined within the MARS CV-2 Capability Taxonomy view.

11.2.5 Stakeholder Questions Addressed

- SQ-01 How can MSFC consistently evaluate the relative importance and performance of steady-state applications?
- SQ-02 How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?

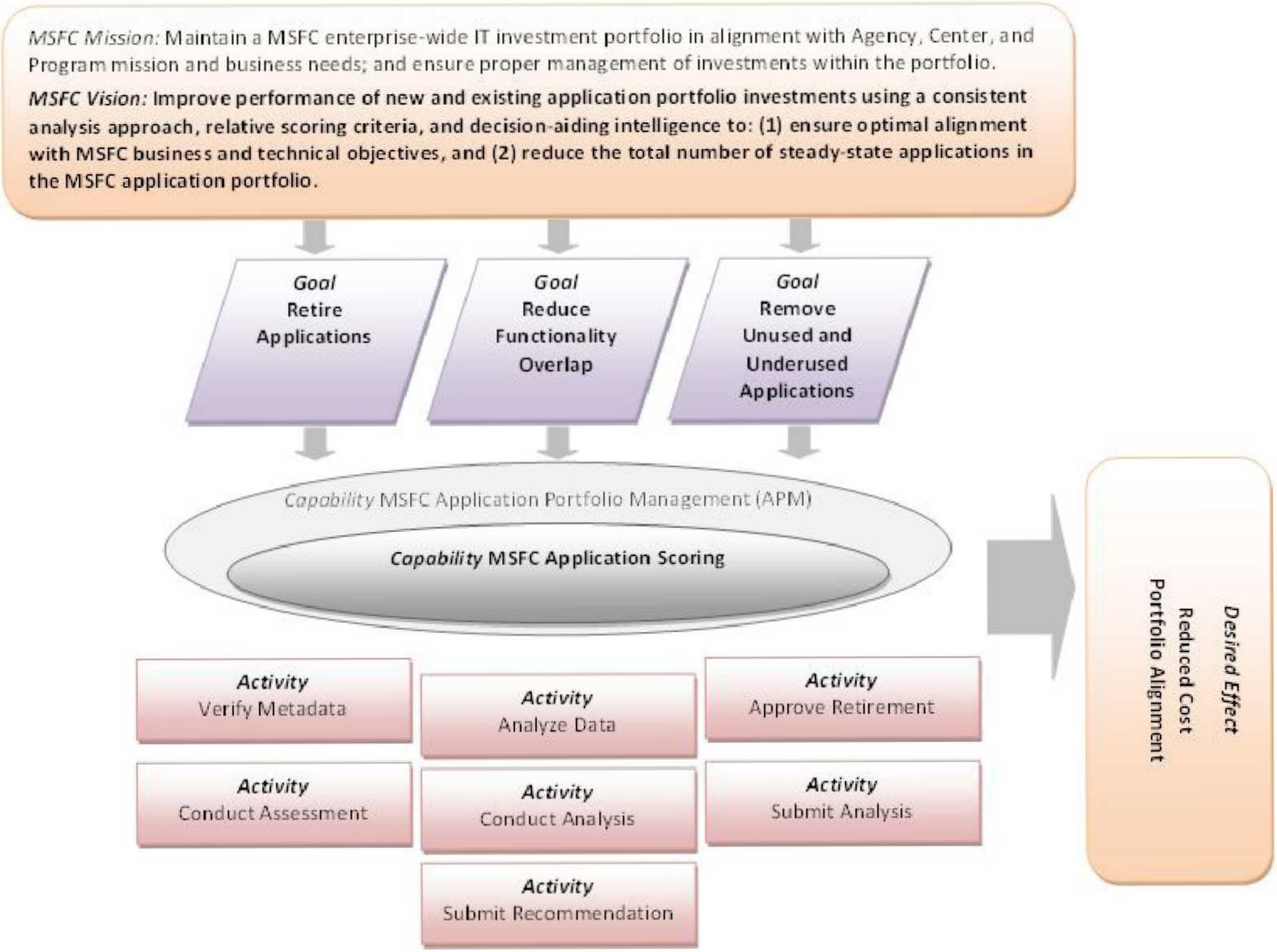


Figure 5 MARS CV-1 Vision

12 OV-1 High-level Operational Concept Graphic

12.1 DoDAF-Described OV-1

12.1.1 Description

The OV-1 High-level Operational Concept Graphic provides a graphical representation of the operational mission, concepts, scenario, functions, participants, organizations, and/or geographic locations of the architecture description. The graphic shows interactions between the architecture and its environment, and between the architecture and external systems. The OV-1 depicts what the architecture is about and the operational players (performers) and operations involved.

The OV-1 also provides the focus for future architecture discussion because it contains the key elements that are used within the architecture description. The graphic is accompanied with a textual description.

12.1.2 Purpose

The OV-1 purpose is to provide a quick, high level view of what the architecture is supposed to do by putting an operational situation or scenario into context for the decision makers and stakeholders of the architecture.

The intended use is to:

- Describes how the architecture accomplishes the objective
- Convey simply, ideas about operational players and operations
- Convey simply, geographical areas of operation
- Provide a tool for discussion and presentation

12.1.3 Audience

The OV-1 audience includes:

- Architecture sponsors/executives
- Architecture stakeholders
- Partners and external stakeholders

12.2 MARS Architecture OV-1

12.2.1 Tailoring Applied

The authors did not tailor the MARS OV-1.

12.2.2 Viewpoint

The viewpoint of the MARS OV-1 is the MEAAC.

12.2.3 View Discussion

The MARS OV-1 depicts the as-is situation and the to-be target capability that addresses the problem and need described in Problem and Need on page 6. The MARS OV-1 conceptualizes the MARS Architecture approach to derive the new capability by which MSFC application investments with low business value and low technology value can be identified and recommended for retirement, leaving the high business value and high technology value applications residing with the portfolios. The MARS OV-1 frames the MARS operational concept and highlights interactions within the architecture and with other external systems.

The key operational players (performers) that interact with the APM process and the APMS are shown on the graphic. The key operational players (performers) include:

- MSFC CIO – Chief Information Officer for MSFC, responsible for all Information Technology (IT) within the Center
- MSFC MEAAC – Responsible for reviewing and approving IT investments
- MSFC Responsible NASA Official (RNO) – Manages the actual application that are listed within the application portfolios
- MSFC Application Portfolio Managers – Manage the MSFC application portfolios
- MSFC Stakeholder – Uses the applications listed within the application portfolios
- MSFC EA – Responsible for Enterprise Architecture and Solutions Architecture for the Center. Supports the MEAAC with IT investment analysis.

The MARS OV-1 depicts the approach to conduct a portfolio analysis against scoring measures (based on value) and overall portfolio performance objectives (based on enterprise needs and policies). The MARS OV-1 shows the high level activities from the MARS OV-5a, A1 Verify Metadata, A2 Analyze Data, and A3 Approve Retirement. See OV-5a Operational Activity Decomposition Tree View for additional details.

12.2.4 View Integration

The high-level details of the operational concept depicted in the OV-1 are shown in the MARS OV-2, and the details of the information exchanged within the MARS OV-2 are documented in the MARS OV-3. See sections labeled OV-2 Operational Resource Flow Description View and OV-3 Operational Resource Flow Matrix View for additional details. The OV-1 also depicts the high-level operational activities depicted in the MARS OV-5a Operational Activity Decomposition Tree View.

12.2.5 Stakeholder Questions Addressed

- SQ-01 How can MSFC consistently evaluate the relative importance and performance of steady-state applications?
- SQ-02 How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?

MARS Architecture OV-1 High-Level Operational Concept Graphic

Dated: 12 June 2010

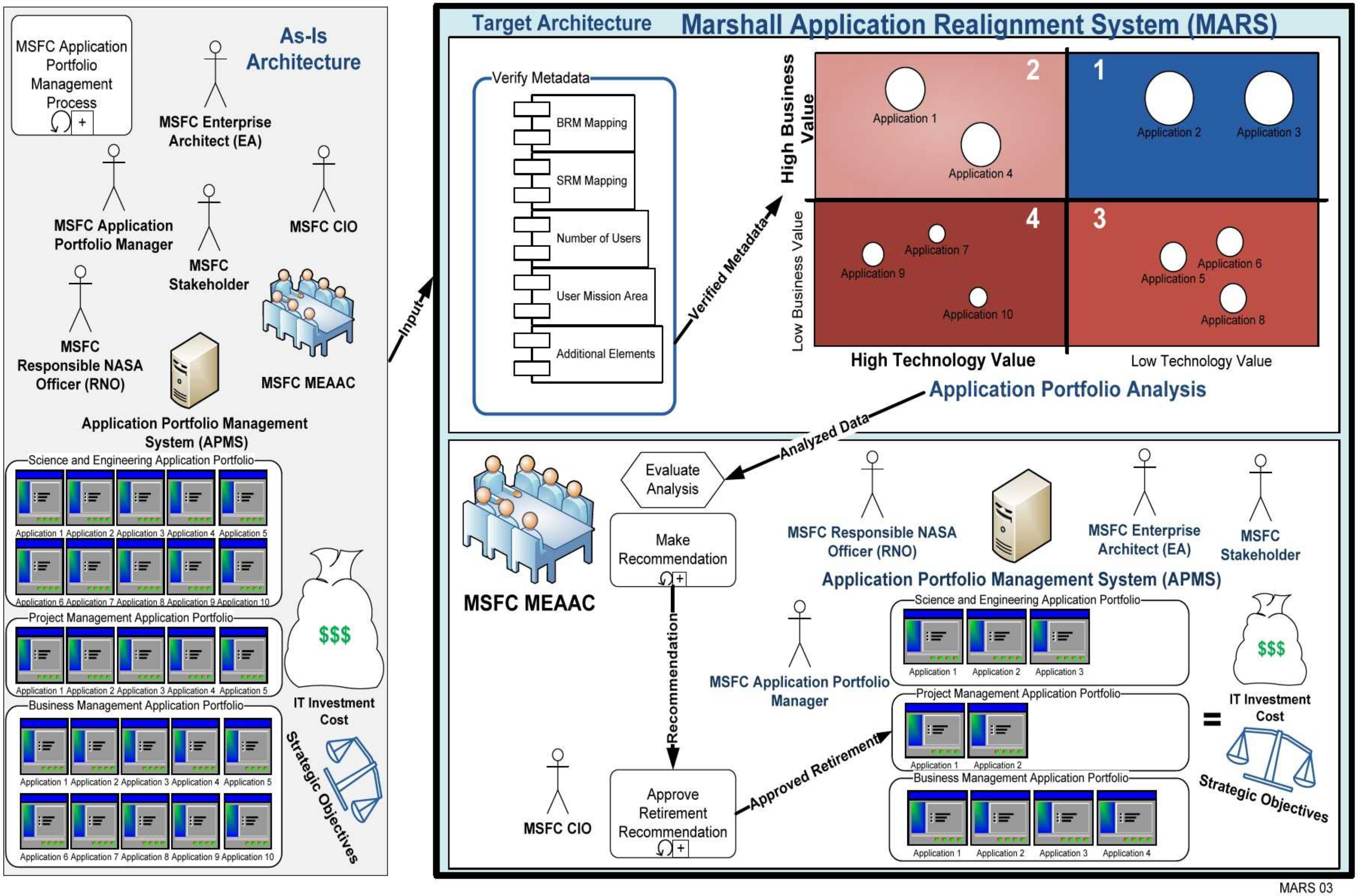


Figure 6 MARS OV-1 High-level Operational Concept Graphic

13 OV-5a Operational Activity Decomposition Tree View

13.1 DoDAF-Described OV-5a

13.1.1 Description

The OV-5a Operational Activity Decomposition Tree view (with the OV-5b) describes the operations that are normally conducted in the course of achieving a mission or a business goal with a specific scenario. The OV-5a clearly delineates lines of responsibility for activities when coupled with OV-2.

An operational activity is what work is required, specified independently of how it is carried out. To maintain this independence from implementation, logical activities and locations in OV-2 are used to represent the structure which carries out the operational activities.

The OV-5a focuses on operational activities, whereas the OV-2 focuses on operational activities in relation to locations or logical interactions between operational players (performers). Due to the relationship between locations and operational activities, these types of views should normally be developed together.

13.1.2 Product Guidance and Characteristics

The OV-5a shows the activities depicted in a tree structure and is typically used to provide a navigation aid for the OV-5b. This diagram is sometimes referred to as a Node Tree Diagram.

The OV-5a shows the hierarchical relationships among activities. The top box contains the overall activity of interest and is labeled A0. This overall activity is decomposed into sub-activities labeled A1, A2, A3, etc. These activities can be further decomposed if required to properly articulate the activities required to support the architecture.

The OV-5a is usually presented in one of two forms. One uses a columnar arrangement of the activities. The other uses a more tree-like appearance. The choice of which style to use may be made by the architect and depends on the number of boxes – breadth and depth of the hierarchy – to be presented and the prevailing practice of the architecture team.

Example Activity Hierarchy Diagram below shows the two formats in which an Activity Decomposition Tree is typically depicted. Both depictions show the same information but in different formats.

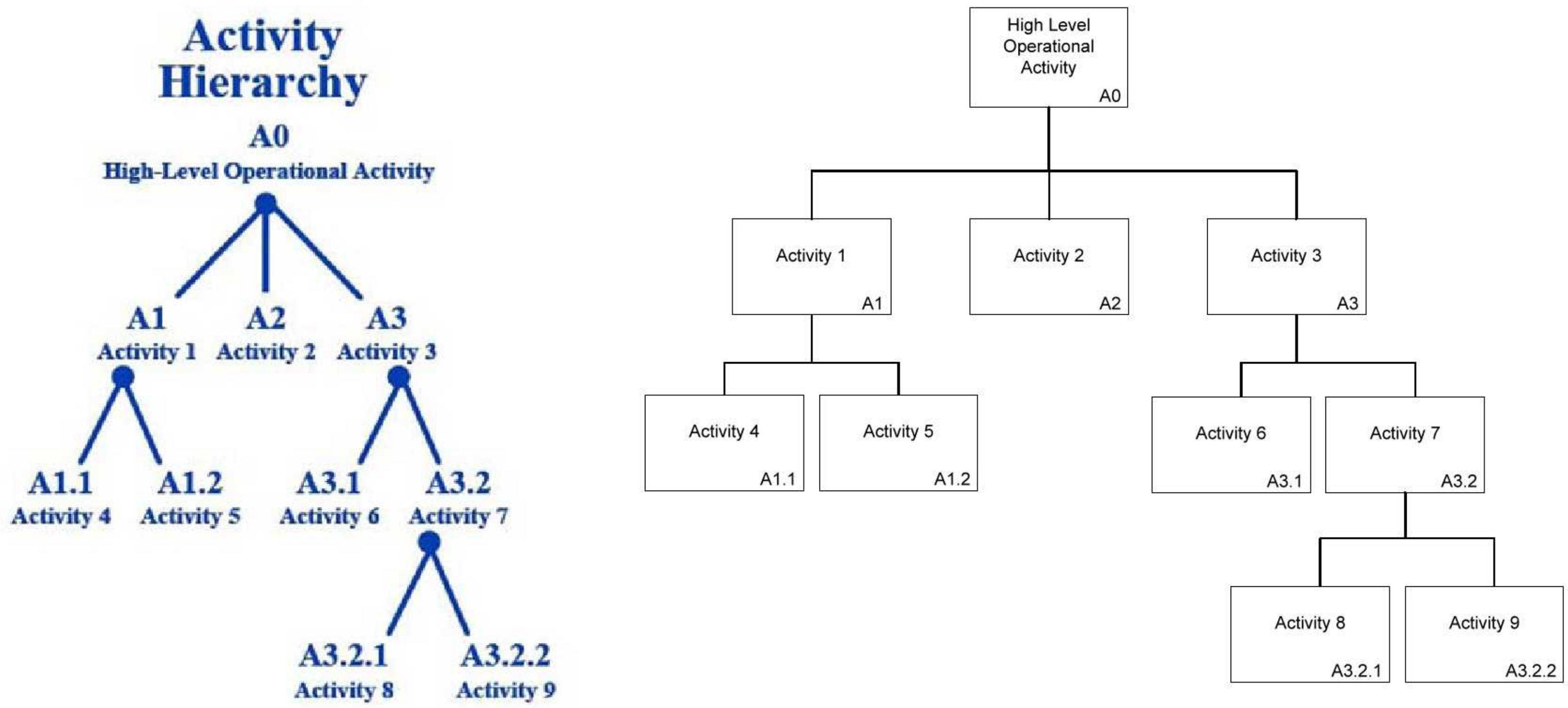


Figure 7 Example Activity Hierarchy Diagram

13.1.3 Purpose

The OV-5a purpose is to decompose the activities into the lowest level of decomposition necessary to properly depict the activities required to support the architecture description. The OV-5a diagram also provides the foundation of activity for other views and sets the boundaries for scope, purpose, and viewpoint.

13.1.4 Audience

The OV-5a audience includes business process managers who ensure that appropriate activities have been identified, or command and control personnel who confirm the operational activities. The audience also includes architects who use the OV-5a to create the OV-5b, which shows the activity and function details.

13.2 MARS Architecture OV-5a

13.2.1 Tailoring Applied

The authors tailored the MARS OV-5a by including the information exchanges identified within the activity description, which were later identified in the MARS OV-3. This integration was later added to the OV-5a to ensure the information exchanges tied back to the correct operational performers who were performing the operational activity information exchanges under the MARS Architecture.

13.2.2 Viewpoint

The viewpoint of the MARS OV-5a is the MEAAC.

13.2.3 View Discussion

The MARS OV-5a top-level activity is A0 Retire Application. This top-level activity is composed of *A1 Verify Metadata*, *A2 Analyze Data*, and *A3 Approve Retirement* activities.

- **A1 Verify Metadata** – this activity is decomposed into three sub-activities: *A1.1 Verify Metadata – RNO*, *A1.2 Verify Metadata – Application Portfolio Manager*, and *A1.3 Submit Application Portfolio Manager Metadata (IE7)*.
    - **A1.1 Verify Metadata – RNO**. This activity is composed of the metadata verification process for the RNO metadata that is obtained from the APMS to ensure that the data is correct, before an assessment is conducted. Once verified, the metadata will be scored using the business score, retirement score, and technology score, depicted on the MARS CV-2. The scoring is performed within the organizations by the operational performers shown on the MARS OV-4 view. The MARS CV-2 is the taxonomy of the MARS CV-1 capability Application Scoring.
    - **A1.2 Verify Metadata – Application Portfolio Manager**. The activity is composed of the metadata verification process for the MSFC Application Portfolio Manager metadata. This activity verifies the metadata that will be used to produce the MARS CV-1 capability Application Scoring. The activity is decomposed on the MARS OV-5a to show the individual activities performed as part of the verification.
    - **A1.3 Submit Application Portfolio Manager Metadata (IE7)** – Activity describes the steps necessary to package the stakeholder verified metadata that will be used to produce the MARS CV-1 capability Application Scoring, is ready for the next activity.
- **A2 Analyze Data** – is the activity where the actual analysis occurs and a retirement application listing is generated for review and final approval. The activity is decomposed on the MARS OV-5a to show the individual activities that is performed on the Stakeholder metadata for verification.

- **A2.1 Conduct Assessment (IE5)** – This activity is composed of the steps necessary to complete the summary assessment of the applications that are candidates for retirement.
- **A2.2 Conduct and Submit Initial Analysis (IE9)** – Activity contains the necessary steps to conduct the deep dive analysis of the metadata to compile the information to create the list of applications for retirement.
- **A2.3 Review Initial Analysis (IE10)** – This activity is the steps necessary for the MSFC Application Portfolio Manager to review the initial list of applications targeted for retirement to ensure that there is a valid list from the portfolio.
- **A2.4 Conduct and Submit Final Analysis (IE11)** – The activity describes the final updates to the analysis that contains the list of applications that are targeted for retirements before submitting the analysis for review by the MEAAC.

- **A3 Approve Retirement** – this is the activity where the initial retirement application listing is reviewed and formally approved, to initiate the actual retirement of the applications. The activity is decomposed on the MARS OV-5a to show the individual activities that are performs as part of their recommendation and approval of the list of applications targeted for retirement.
  - **A3.1 Submit Retirement Recommendation (IE12)** – Contains the activities necessary to review the analysis of potential applications targets for retirement before sending for approval.
  - **A3.2 Approve Recommendation (IE13)** – Contains the activities where approval occurs against the list of potential applications targeted for retirement.
  - **A3.3 Initiate Retirement (IE14)** – This activity is where the approved analysis that contains a list of application is communicated to the performer for action. The actual implementation of the retirement is out of scope for the MARS architecture.

13.2.4 View Integration

The MARS Architecture is integrated into the MARS OV-5b, which defines the interactions between the decomposed activities represented as functions on the OV-5b. The MARS Architecture is also dependent upon integration between the MARS CV-1 and the activities defined within the MARS OV-5a. The first level of OV-5a decomposition, shown in the diagram as *A1 Verify Metadata*, *A2 Analyze Data*, and *A3 Approve Retirement*, supports the new MARS CV-1 scoring capability.

The node identifiers are used on MARS OV-3 by incorporating the node identifiers into the activity description. The MARS OV-5a node identifiers are also used on the MARS OV-2.

This integration allows an architect to have full traceability between the MARS OV-2, the MARS OV-3, and their supporting activities previously defined within the MARS OV-5a. This gives the MARS Architecture a very tightly integrated operational viewpoint.

13.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

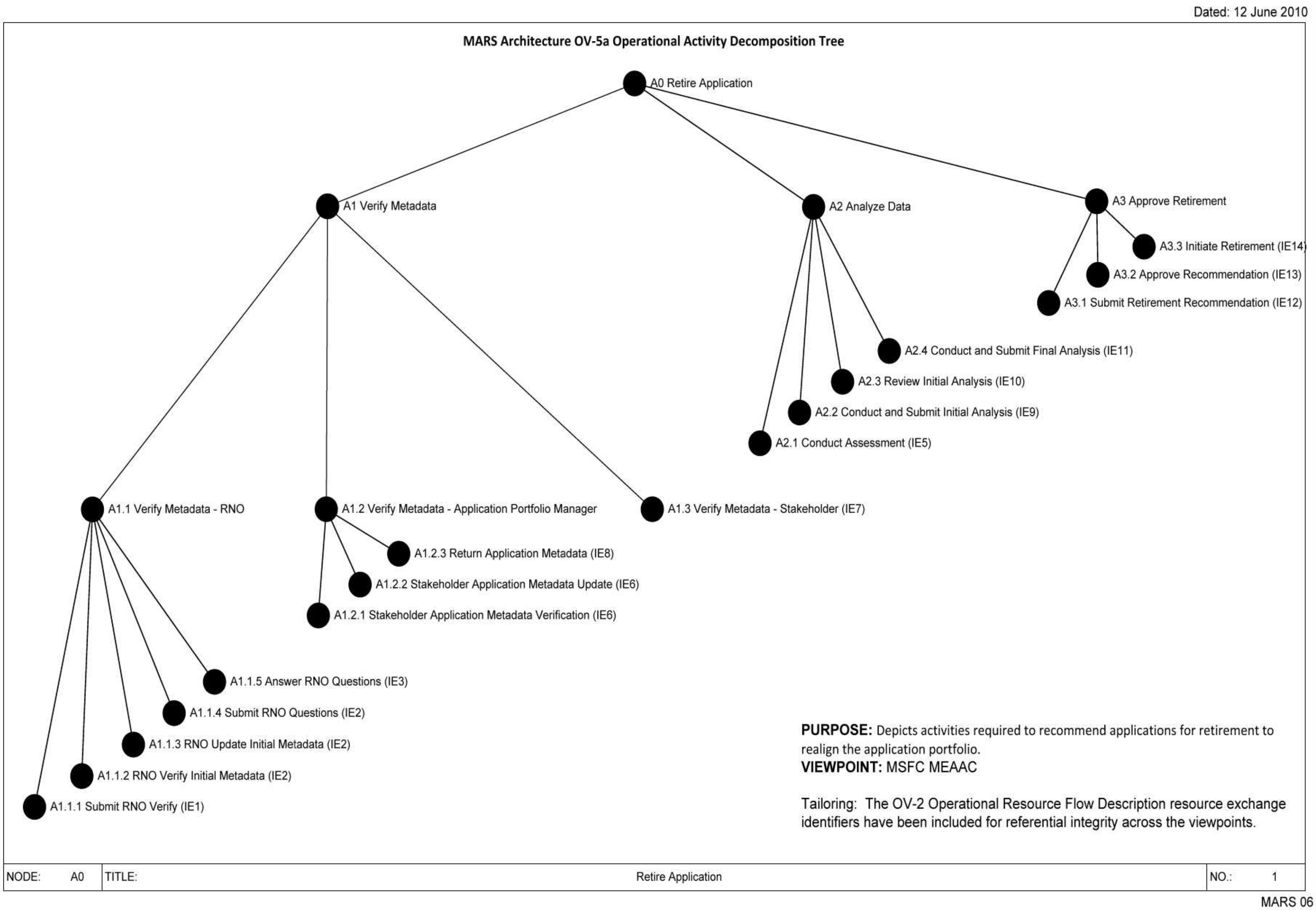


Figure 8 MARS OV-5a Operational Activity Decomposition Tree

14 OV-5b Operational Activity Model View

14.1 DoDAF-Described OV-5b

14.1.1 Description

The OV-5b Operational Activity Model view describes the operational, business, and defense portion activities associated with the architecture description, as well as the relationships or dependencies among the activities, resource exchange between the activities, and external interchanges with activities outside of the architecture description.

The OV-5b also describes input and output flows between activities, and to/from activities that are outside the scope of the architecture description. The OV-5b is expected to be used extensively for business modeling and can be depicted using techniques such as Business Process Modeling Notation (BPMN) swimlanes, Integration Definition for Function Modeling (IDEF0) models, or Unified Modeling Language (UML) Activity diagrams. (The authors chose the IDEF0 modeling technique to develop the MARS OV-5b view.)

14.1.2 Product Guidance and Characteristics

The Context Diagram shown below establishes the bounds for the model and depicts the major Inputs, Controls, Outputs, and Mechanisms (ICOMS) used to perform the activity. The diagram consists of a single box and its related ICOMS. It sets the general context and scope of what is being modeled and displays the purpose and viewpoint of the model. This diagram is labeled A-0 (A minus 0).

See figure labeled Example Context Diagram A-0 below that displays the example Context Diagram.

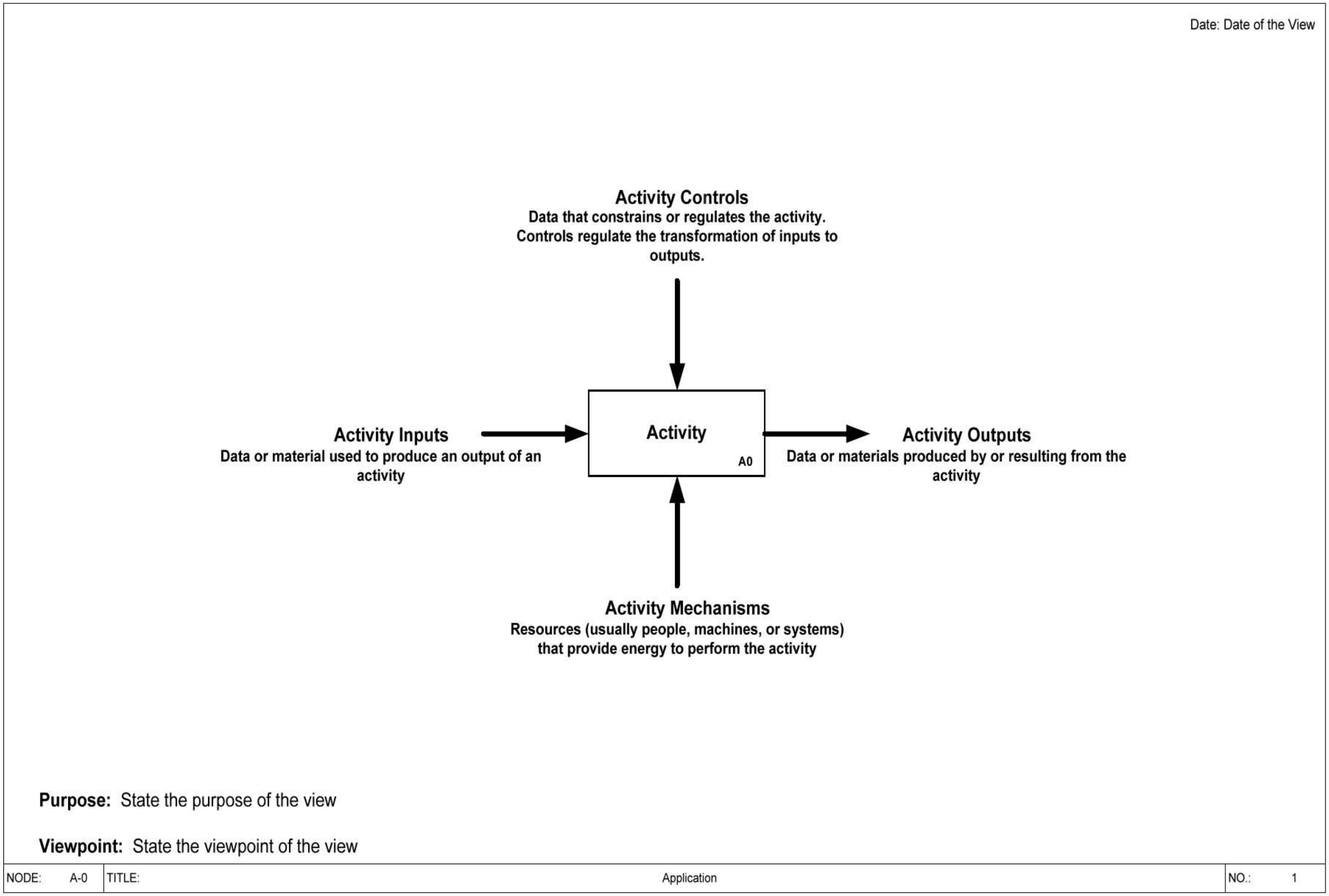


Figure 9 Example A0 Context Diagram

Decomposition Diagram – This diagram describes the components of an activity and their relationships to one another. The diagram also shows the flow of ICOMs among activities. A decomposition diagram shows only one level of decomposition below its parent on each page.

The first decomposition diagram of a model is labeled A0. The subsequent second level decomposition diagrams are labeled with the number of the box within A0 that they refine, e.g., A1 or A3. Third-level decomposition labels could be, for example, A11 for a box that refines A1 or A31 for a box that refines A3.

Using the IDEF0 modeling standard, *Federal Information Processing Standards (FIPS) Publication 183*, boxes are arranged upper left to lower right within a page. The order of boxes on the page does not imply a sequence of operation, but the interface lines depict the sequence. The view should contain between three and six functions on a single page. Additional pages should be used to provide detail for the functions that are essential to the architecture description.

The A0 page text description emphasizes the interaction among the high-level activities performed. Lower level decomposition diagram pages text emphasizes the interactions between the activities and how the activities support each other. The text can address input, output, control, or mechanism issues, who are involved in performing the activity, anomalies, what could change a process that approves the outputs, or other aspects of interest.

See figure labeled Example Decomposition Diagram of the A-0 Activity below to depict an example A0 function.

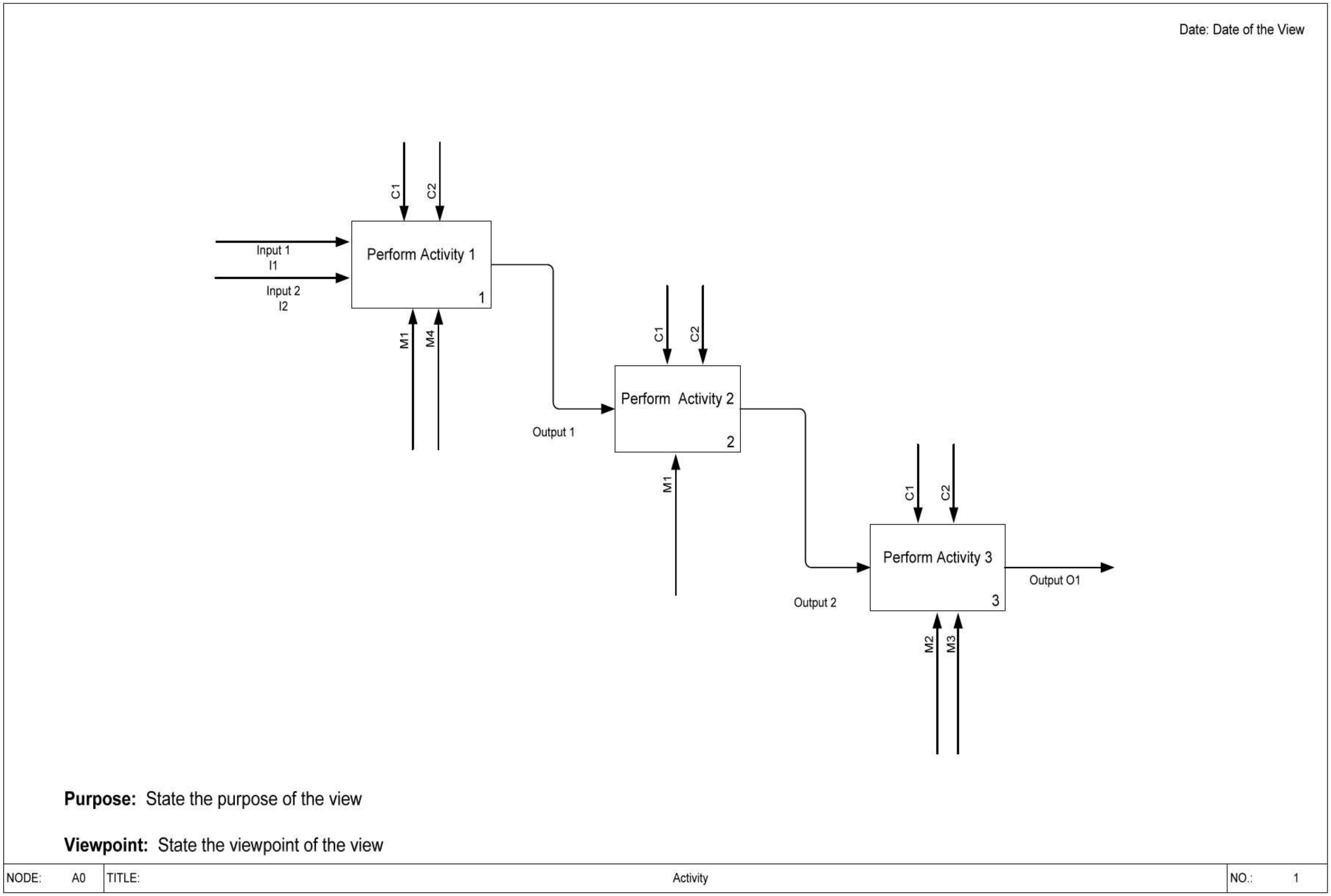


Figure 10 Example A-0 Activity Decomposition Diagram

14.1.3 Purpose

The OV-5b purpose is to depict critical activities as they are transforming inputs to outputs through activity sequences within the architecture. It also shows what operational performer is responsible for each activity, through the use of the activity mechanisms. The OV-5b provides the ability to perform redundancy analysis, streamlining activities, and reuse processes within architecture. It also provides the foundation of activity for other views and sets the boundaries for scope, purpose, and viewpoint.

14.1.4 Audience

The OV-5b audience includes:

- Operational business process managers
- Modeling and simulation personnel
- Business process reengineering personnel

14.2 MARS Architecture OV-5b

14.2.1 Tailoring Applied

The authors tailored the view by adding the MARS OV-5a node identifiers to each function's description. This allowed the authors to ensure referential integrity between the diagrams and to ensure the correct ICOMs were applied within the MARS OV-5b.

14.2.2 Viewpoint

The viewpoint of the MARS OV-5b is the MEAAC.

14.2.3 View Discussion

The MARS OV-5b view A-0 activity depicts relationships and dependencies among activities required to recommend applications for retirement to align the application portfolio by reducing the amount of applications within the portfolios that do not provide high business value and high technology value.

Figure MARS A-0 Retire Application Context Diagram depicts the two inputs of As-Is Architecture and the As-Is Portfolio that exist today within the MFSC Center. The input labeled "As-Is Architecture" is labeled I1 on the decomposed diagrams. This input symbolizes the existing applications that reside within the four application portfolios that will be processed through the MARS architecture to reduce the overall number of applications. The second input labeled "As-Is Portfolio" is the existing application portfolio environment that contains redundant and under used applications.

The diagram also depicts the four controls that provide the overarching requirements and directives that govern the process that are listed in the MARS StdV-1.

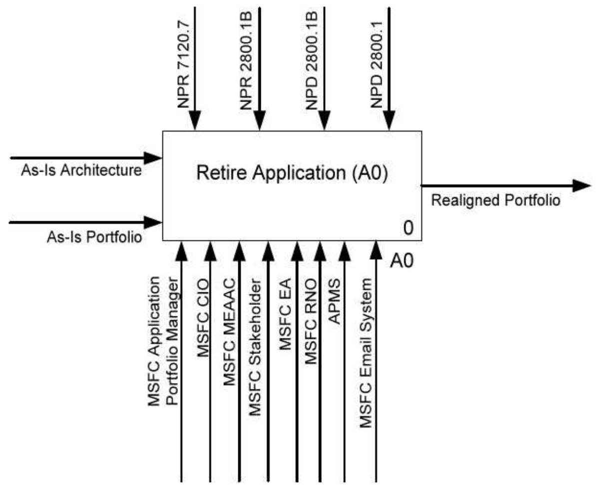
The eight mechanisms represent the operational performers and systems that support the process. The operational performers are presented within the MARS architecture in the section labeled OV-4 Organizational Relationships Chart View and the two systems (APMS and MSFC Email System) are presented in the MARS architecture in the section labeled SV-1 Systems Interface Description View.

The single output of the Retire Application (AO) function is a realigned portfolio that has have the MARS scoring capability applied and the overall amount of applications reduced.

See figure labeled MARS A-0 Retire Application Context Diagram below that depicts MARS A-0 Context Diagram.

Dated: 12 June 2010

MARS Architecture OV-5b Operational Activity Model



PURPOSE: Depicts relationships and dependencies among activities required to recommend applications for retirement to realign the application portfolio.
VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE: A-0	TITLE:	Retire Application	NO.:	1

MARS 05-1

Figure 11 MARS A-0 Retire Application Context Diagram

The next view is a decomposition of the OV-5b A-0 function. The A0 decomposed diagram shows the first level of relationships and dependencies required to recommend applications for retirement to realign the application portfolio and the information exchange between the activities within the *Retire Application (A0)* function.

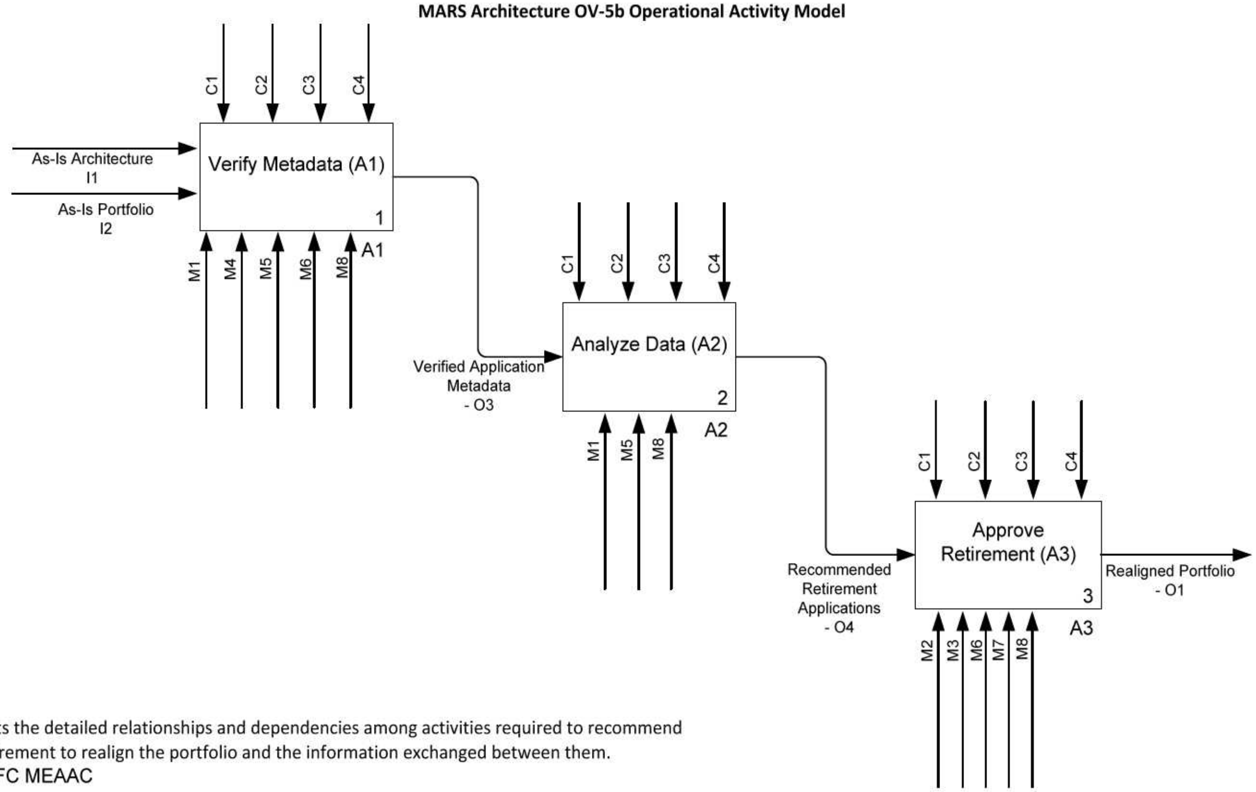
A0 Diagram: The A0 diagram has three child activities*, Verify Metadata (A1)*, *Analyze Data (A2)*, and *Approve Retirement (A3)* that compose the A-0 Retire Application parent function. The decomposed activities maintain the same set of controls that were previously defined within the parent function. The inputs, outputs, and mechanisms are described below with the decomposed functions.

- **Verify Metadata (A1)** – *The Verify Metadata (A1)* function receives the two inputs I1 and I2, has the four controls, described above, that provide the guidance for this activity. The decomposed child functions for this activity are depicted in A1 *Verify Metadata (A1)* child diagram. The output of this activity is verified application metadata, labeled output three (O3). Output three (O3) is the input for the next activity, *Analyze Data (A2)*. The *Verify Metadata (A1)* function uses the MSFC Application Portfolio Manager (M1), MSFC Stakeholder (M4), MSFC EA (M5), and MSFC RNO (M6) roles to verify the application metadata. All roles use the MSFC Email System (M8) to communicate the information exchanges. See section labeled **A1 Diagram Verify Metadata (A1)** for additional details.
- **Analyze Data (A2)** – The steps that compose the *Analyze Data (A2)* are detailed in the decomposed child diagram A2. The input for the function is the output from *Verify Metadata (A1)*, which is Verified Application Metadata – O3. The decomposed child functions for this activity are depicted in A2 *Analyze Data (A2)* diagram. The output for the *Analyze Data (A2)* activity is Recommended Retirement Applications. This is input for the next activity *Approve Retirement (A3)*. The *Analyze Data (A2)* function using the controls from the parent diagram A-0 Retire Application (A0). The mechanisms are the MSFC Application Portfolio Manager (M1), and MSFC EA (M5) roles that all support the functions necessary to analyze the previously verified metadata to produce a list of recommended applications to retire. All roles use the MSFC Email System (M8) to communicate information exchanges. See section labeled **A2 Diagram A2 Analyze Data (A2*)*** for additional details.
- **Approve Retirement (A3)** – The steps that compose the *Approve Retirement (A3)* are detailed in the decomposed child diagram A3. The final output for the parent process A-0 is shown on the A0 diagram again, Realigned Portfolio, O1. The input for this function is the output from *Analyze Data (A2)*, Recommended Retirement Applications – O4. The mechanisms are the MSFC CIO (M2), MSFC MEAAC (M3), and MSFC RNO (M6) roles that all support the approval of the recommended list of applications, and the implementation of the retiring applications. All roles use the MSFC Email System (M8) to communicate information exchange. The APMS system also supports this function. See the child diagram A3 for additional details and section labeled **A3 Diagram Approve Retirement (A3)** for additional details.

See figure labeled MARS OV-5b A0 Retire Application Diagram below to depict MARS A0 decomposition diagram functions.

Dated: 12 June 2010

MARS Architecture OV-5b Operational Activity Model



PURPOSE: Depicts the detailed relationships and dependencies among activities required to recommend applications for retirement to realign the portfolio and the information exchanged between them.
VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE:	A0	TITLE:	Retire Application	NO.:	1

MARS 05-2

Figure 12 MARS OV-5b A0 Retire Application Diagram

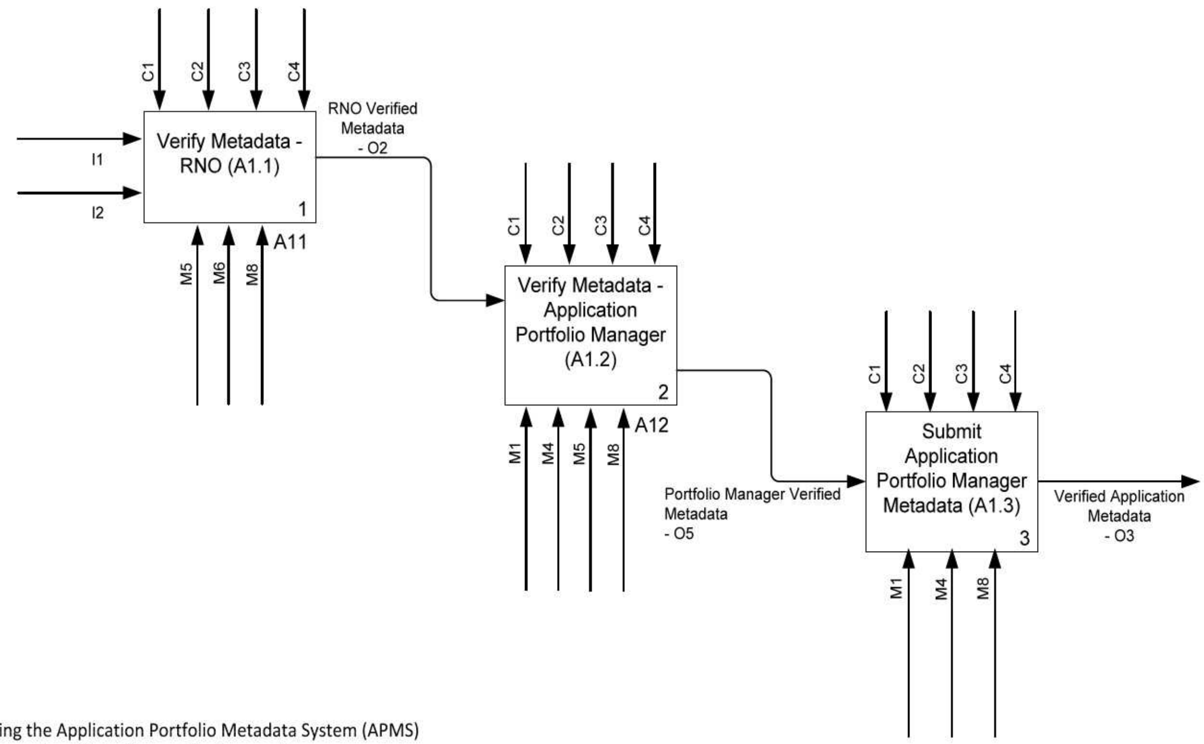
A1 Diagram Verify Metadata (A1): activity is composed of three activities that describe how the metadata is verified by the MSFC RNO, MSFC Application Portfolio Manager, and the MSFC Stakeholder. The decomposed activities within A1 *Verify Metadata (A1)* maintain the same set of controls that were previously defined within the parent function. The A1 *Verify Metadata (A1)* function is decomposed into a child diagram. The inputs, outputs, and mechanisms are described below with the decomposed functions.

- **A11 Diagram Verify Metadata RNO (A1.1)** – The first step in the process is *Verify Metadata – RNO (A1.1)*. The details of the function have been decomposed into a child diagram labeled A11. *Verify Metadata – RNO (A1.1)* details the steps that the MSFC RNO perform in order to verify the metadata. Input into the function is As-Is Portfolio and the As-Is Architecture. The output from the function is RNO Verified Metadata – 02. The mechanisms for the function are the MSFC EA (M5) and MSFC RNO (M6) roles. The MSFC Email System (M8) is also a mechanism used by the roles to transfer the metadata. See child diagram A11 for additional details (A11 Diagram Verify Metadata RNO (A1.1)).
- **A12 Diagram Verify Metadata – Application Portfolio Manager (A1.2)** – is the second function in the process. The details of the function are decomposed into a child diagram labeled A12 *Verify Metadata – Application Portfolio Manager (A1.2)*. The *Verify Metadata – Application Portfolio Manager (A1.2)* details the steps that the MSFC Application Portfolio Manager perform in order to verify the metadata. The input for the function RNO Verified Metadata – O2. The output for the function is Portfolio Manager Verified Metadata – O5. The mechanisms are MSFC Application Portfolio Manager (M1), MSFC Stakeholder (M4), and MSFC EA roles (M5). The MSFC Email System (M8) is also a mechanism used by the roles to transfer the metadata. See child diagram A12 for additional details (A12 Diagram Verify Metadata – Application Portfolio Manager (A1.2)).
- **A1.3 Submit Application Portfolio Manager Metadata (IE7)** – is the third function in the process. This function is not decomposed within the MARS architecture, so it does not contain a child diagram. This function depicts the activity where the stakeholder verified metadata is forwarded to the next step in the process, *Analyze Data (A2)*. The input to the function is the RNO Verified Metadata – O2. The output from this function is Verified Application Metadata – O3. The mechanisms are the MSFC EA (M5), MSFC RNO (M6), MSFC Stakeholder (M4), and the MSFC Application Portfolio Manager (M1). The MSFC Email System (M8) is also a mechanism used by the roles to transfer the metadata.

See figure labeled MARS OV-5b A1 Verify Metadata (A1) below to depict the functions that compose the A1 function, *Verify Metadata (A1)*.

Dated: 12 June 2010

MARS Architecture OV-5b - Operational Activity Model



PURPOSE: Depicts activity of verifying the Application Portfolio Metadata System (APMS) metadata is correct or updating of inaccurate data by the architecture performers.
VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE:	A1	TITLE:	Verify Metadata (A1)	NO.:	1

MARS 05-3

Figure 13 MARS OV-5b A1 Verify Metadata (A1)

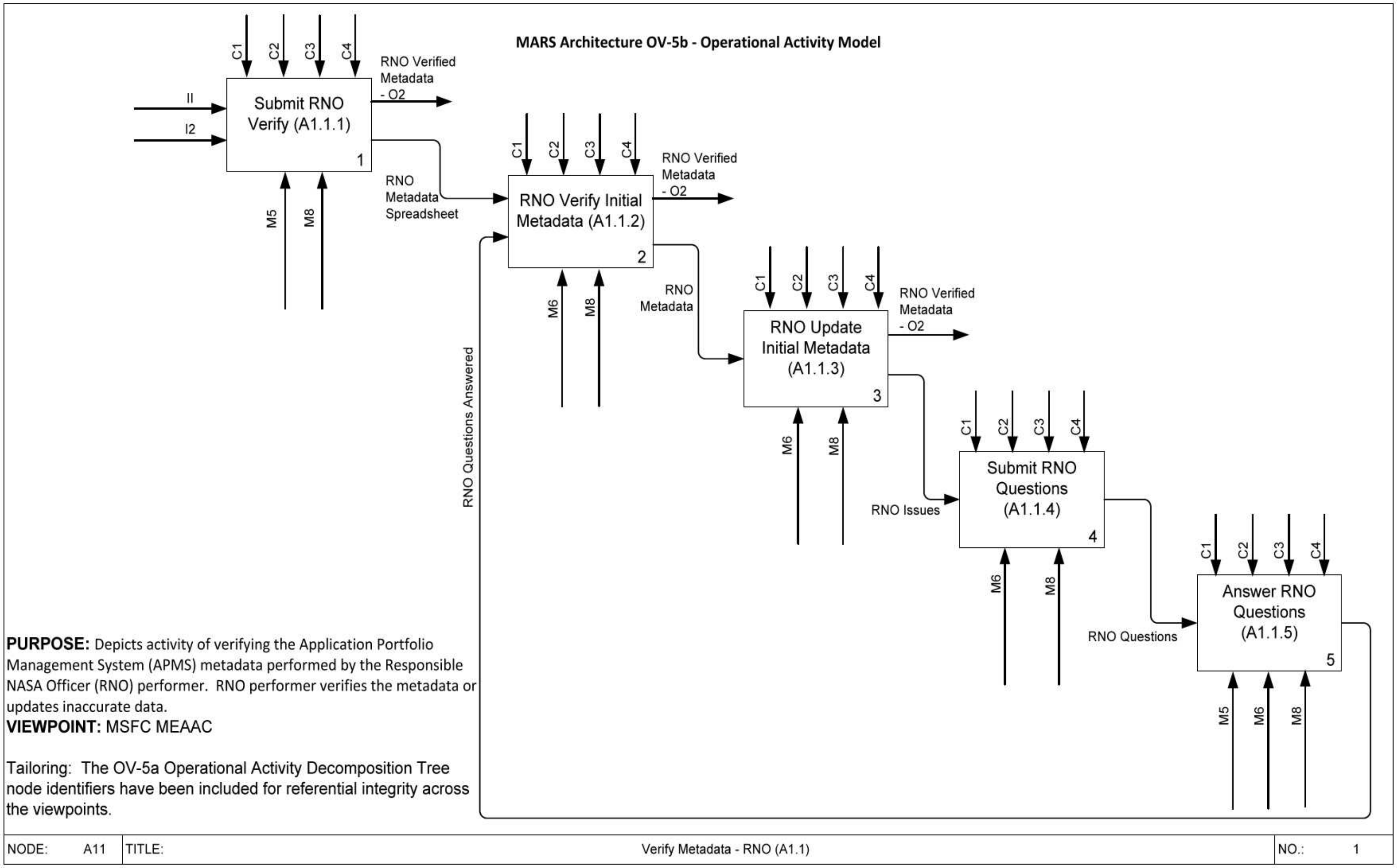
A11 Diagram Verify Metadata RNO (A1.1): Diagram A11 that depicts the decomposed functions of A1 *Verify Metadata - RNO (A1.1)* contains five functions. None of the functions on the diagram have been decomposed into child diagrams. All of the functions have the controls from the parent A0 diagram. The inputs, outputs, and mechanisms are described below with the decomposed functions.

- **Submit RNO Verify (A1.1.1)** – The first function is *Submit RNO Verify (A1.1.1)*. This is the function where the MSFC RNO metadata, gathered from the APMS system that is depicted in the MARS SV-1 System Interface Description, and the information is move to the step one of the A-0 Retire Application function, *RNO Verify Initial Metadata (A1.1.2)*. This function is where the metadata is received for later review. The input for this function is As-Is Portfolio and the as-IS Architecture. The output for the function is RNO Verified Metadata – O2 or the RNO Metadata Spreadsheet. The spreadsheet is the output if there are any changes that need to occur to the metadata. The mechanisms used in this function are the MSFC EA (M5) and the MSFC Email System (M8).
- **RNO Verify Initial Metadata (A1.1.2)** – The second function is *RNO Verify Initial Metadata (A1.1.2)*. This is the function where the metadata that the MSFC RNO received is actually reviewed for the correct content. The input to the function is the RNO Metadata Spreadsheet. This function has two outputs. One output, O2 occurs once the metadata is correct. If the metadata is not correct, then the RNO metadata moves as output to the function *RNO Update Initial Metadata (A1.1.3)*. The mechanisms used in this function are the MSFC RNO (M6) and the MSFC Email System (M8).
- **RNO Update Initial Metadata (A1.1.3)** – The third function is *RNO Update Initial Metadata (A.1.1.3)*. This is the function where the MFSC RNO updates the metadata if the received metadata was incorrect. If the MSFC RNO is able to update the metadata based upon the information received, then the metadata is moved as output RNO Issues to the next function *Submit RNO Questions (A1.1.4)*. If the MSFC RNO is able to update the metadata based upon the existing metadata or expert knowledge, then the metadata is move out as RNO Verified Metadata – O2 to step four. The input for the function is RNO Metadata. The mechanisms used in this function are MSFC RNO (M6) and the MSFC Email System (M8).
- **Submit RNO Questions (A1.1.4)** - The forth function is *Submit RNO Questions (A.1.1.4)*. This is the function where the MSFC RNO compiles and submits a list of questions to the MSFC EA based upon the incorrect metadata received. The MARS OV-3 Operational Resource Flow Matrix details the information exchange occurs between *Submit RNO Questions (A1.1.4)*, *Answer RNO Questions (A1.1.5)* performed by the MSFC EA and the output loop where the RNO Answered Questions are input to the *RNO Verify Initial Metadata (A1.1.2)* function. If the questions are not answered in the next function, *Answer RNO Questions (1.1.1.5)*, then the loop restarts at *RNO Verify Initial Metadata (A1.1.2)*. Once the questions are properly answered then the loop stops by the metadata moving out over RNO Verified Metadata – O2 to the next step described in A12 *Verify Metadata Application Portfolio Manager (A1.2)* function. The input for the function is RNO Issues. The mechanisms used in this function are MSFC RNO (M6) and the MSFC Email System (M8).

- **Answer RNO Questions (A1.1.5)** –The last function on the diagram is where the MFSC RNO Questions are answered by the MSFC EA. The input for the function is RNO Questions. The mechanisms used in this function are MSFC EA (M5), MSFC RNO (M6), and the MSFC Email System (M8). The output from this function loops back to *RNO Verify Initial Metadata (A1.1.2)* until the MSFC RNO questions are properly answered.

See figure labeled MARS OV-5b A11 Verify Metadata – RNO (A1.1) below to depict the functions that compose the A11 function, *Verify Metadata – RNO (A1.1)*.

Dated: 12 June 2010



MARS 05-4

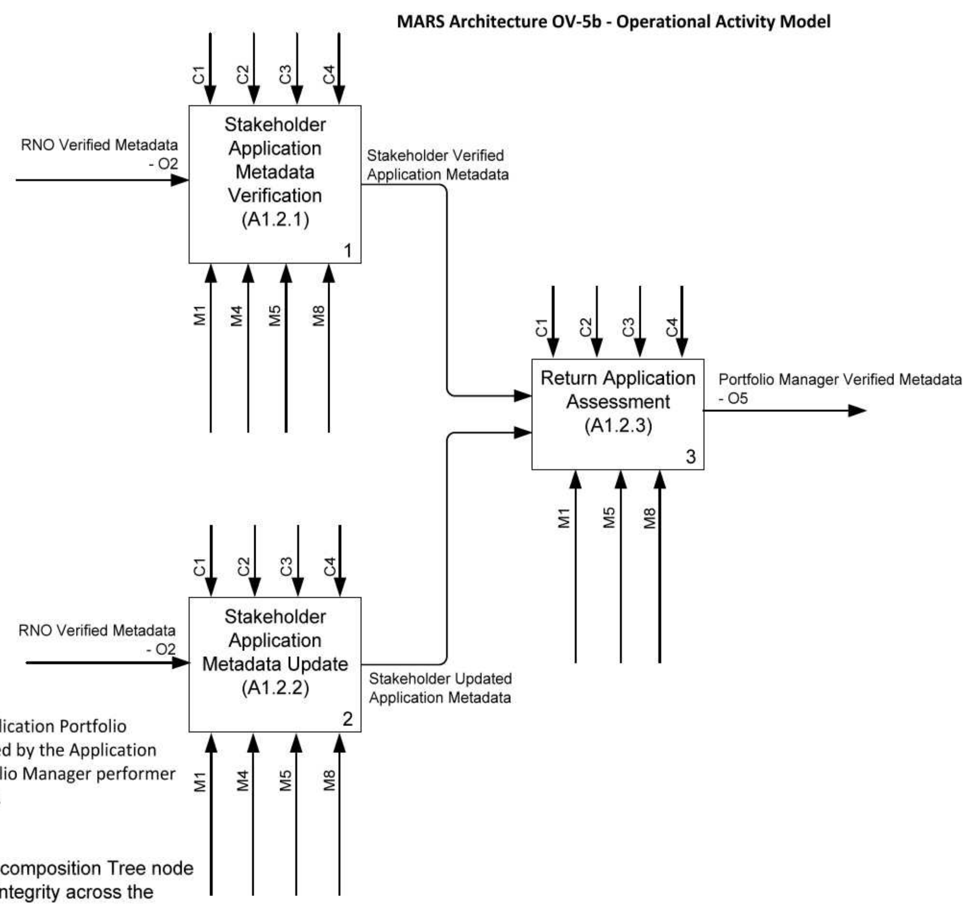
Figure 14 MARS OV-5b A11 Verify Metadata – RNO (A1.1)

A12 Diagram Verify Metadata – Application Portfolio Manager (A1.2): The diagram A12 depicts the decomposed functions of A1 *Verify Metadata Application Portfolio Manager (A1.2).* This function contains three sub-functions. None of the functions on the diagram have been decomposed into child diagrams. All of the functions on the diagram have the controls from the parent A-0 Context diagram. The inputs, outputs, and mechanisms are described below with the decomposed functions.

- **Stakeholder Application Metadata Verification (A1.2.1)** – The first function is *Stakeholder Application Metadata Verification (A1.2.1).* This is the function where the Stakeholder Verified Metadata is returned and verified by the MSFC Application Portfolio Manager for completeness. The input for the function is RNO Verified Metadata – O2. The output from the function portfolio Manager Verified Metadata – O5. The mechanisms used in this function are the MSFC Application Portfolio Manager (M1), MSFC Stakeholder (M4), and MSFC EA (M5) roles. The MSFC Email System (M8) is used by the roles to transfer the metadata.
- **Stakeholder Application Metadata Update (A1.2.2)** – The second function is *Stakeholder Application Metadata Update (A1.2.2).* This is the function where the Stakeholder Verified Metadata that has been updated is returned, changes reviewed and then the data verified by the MSFC Application Portfolio Manager for completeness. The input for the function is the RNO Verified Metadata – O2. The output from the function portfolio Manager Verified Metadata – O5. The mechanisms used in this function are the MSFC Application Portfolio Manager (M1), MSFC Stakeholder (M4), and MSFC EA (M5) roles. The MSFC Email System (M8) is used by the roles to transfer the metadata.
- **Return Application Assessment (A1.2.3)** – The third and last function is *Return Application Assessment (A1.2.3).* This is the function where the MSFC Application Portfolio Manager creates the final metadata package and confirms delivery of the metadata to the MSFC EA. The mechanisms used in this function are the MSFC Application Portfolio Manager (M1) and MSFC EA (M5) roles. The MSFC Email System (M8) is also a mechanism used by the roles to transfer the metadata.

See figure labeled MARS OV-5b A12 Verify Metadata – Application Portfolio Manager (A1.2) below to depict the functions that compose the A12 function, *Verify Metadata – Application Portfolio Manager (A1.2).*

Dated: 12 June 2010



PURPOSE: Depicts activity of verifying the Application Portfolio Management System (APMS) metadata performed by the Application Portfolio Manager performer. Application Portfolio Manager performer verifies the metadata or updates inaccurate data.
VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE: A12	TITLE: Verify Metadata - Application Portfolio Manager (A1.2)	NO.: 1

MARS 05-5

Figure 15 MARS OV-5b A12 Verify Metadata – Application Portfolio Manager (A1.2)

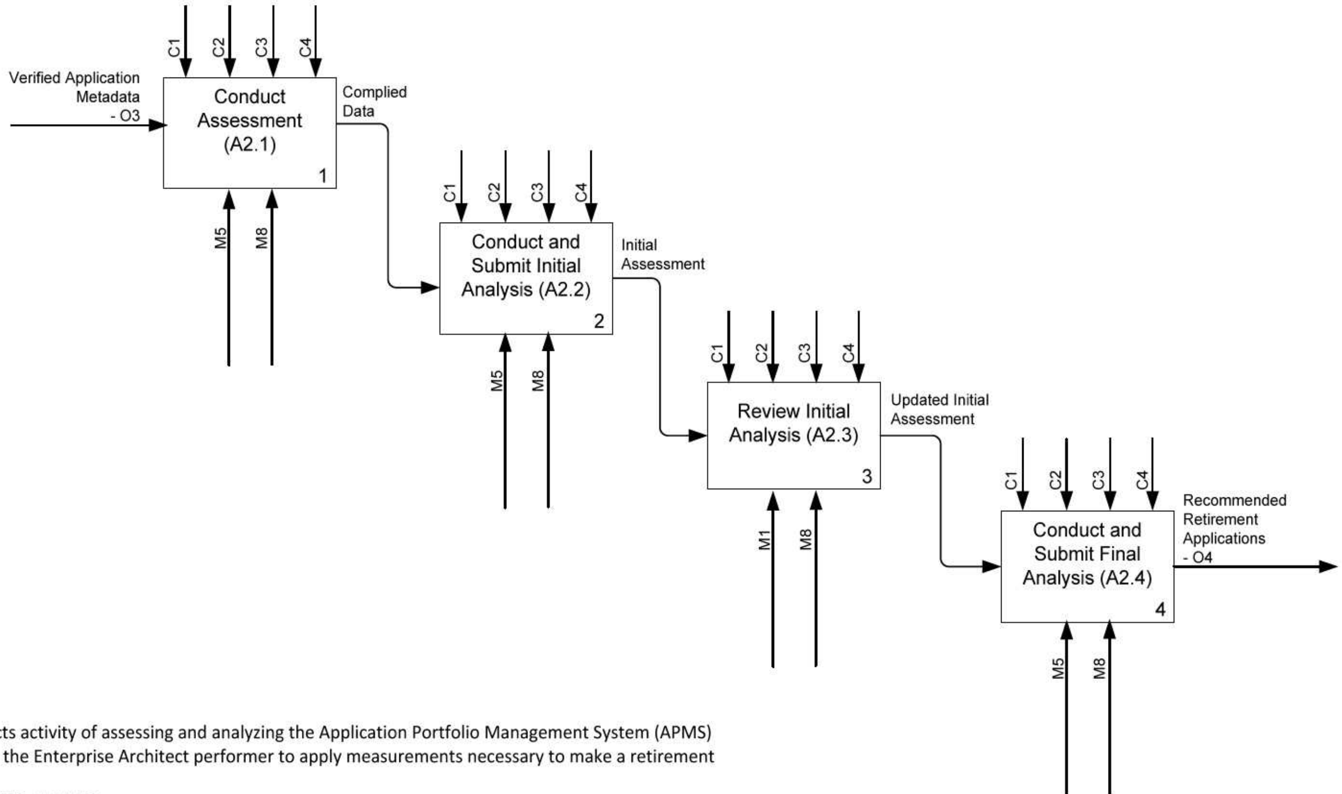
A2 Diagram A2 Analyze Data (A2*)*: activity is composed of four functions that describe how the metadata is analyzed by the MSFC EA to produce the list of application that are sent to the MSFC MEAAC to produce a recommendation. The decomposed functions within A2 *Analyze Data (A2)* maintain the same set of controls that were previously defined within the parent function, A-0. The A2 *Analyze Data (A2)* function is decomposed into a child diagram. The inputs, outputs, and mechanisms are described below with the decomposed functions. None of the functions are decomposed into child diagrams.

- **Conduct Assessment (A2.1)** – The first step in the function is *Conduct Assessment – RNO (A2.1)*. The function details the steps that the MSFC EA performs in order to verify the returned metadata and compare the metadata with the original metadata. This step also includes summary assessment of the returned metadata. The input for the function is Verified Application Metadata – O3. The output from this function is the Complied Data that has been summarized. The mechanisms for this function are MSFC EA (M5) role and the MSFC Email System (M8).
- **Conduct and Submit Initial Analysis (A2.2)** – The second step in the function is *Conduct and Submit Initial Assessment – RNO (A2.2)*. The function details the steps that the MSFC EA performs to actually perform the application analysis of applying new MARS Score Application Capability to the metadata in order to generate the list of potential retirement applications. The MARS Score Application capability combines the business score, retirement score, and technical score that is defined within the MARS CV-2 Capability Taxonomy to create the Application Portfolio Analysis depicted within the MARS OV-1 High-Level Operational Concept Graphic. The input to the function is Complied Data. After creating the initial analysis the MFSC EA, the output from this function is the Recommended Retirement Applications – O4. The mechanisms for this function are MSFC EA (M5) role and the MSFC Email System (M8).
- **Review Initial Analysis (A2.3)** – The third step receives the input from *Conduct and Submit Initial Analysis (A2.2)* where the MSFC EA provides the input into this function, Initial Assessment. The input for the function is Initial Assessment. This function is where the MSFC Application Portfolio Manager confirms that the targeted list of application are valid before submitting output from this function, the Updated Initial Assessment. The mechanisms for this function are the MSFC Application Portfolio Manager (M1) and the MFSC EA (M5) roles, and the MFSC Email System (M8) that provides the system interaction to exchange the analysis.
- **Conduct and Submit Final Analysis (A2.4)** – The last step is the MSFC EA performs any final updates to the analysis and then submits the Recommended Retirement Applications – O4. The input for the function is Updated Initial Assessment. The output from the function is Recommended Retirement Applications – O4. The mechanisms for this function are the MSFC EA (M5) role and the MSFC Email System (M8) which provides the system interface to submit the recommended list of applications.

See figure labeled MARS OV-5b A2 Analyze Data (A2) below to depict the functions that compose the A2 function, *Analyze Data (A2)*.

Dated: 12 June 2010

MARS Architecture OV-5b - Operational Activity Model



PURPOSE: Depicts activity of assessing and analyzing the Application Portfolio Management System (APMS) data performed by the Enterprise Architect performer to apply measurements necessary to make a retirement recommendation.

VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE:	A2	TITLE:	Analyze Data (A2)	NO.:	1

MARS 05-6

Figure 16 MARS OV-5b A2 Analyze Data (A2)

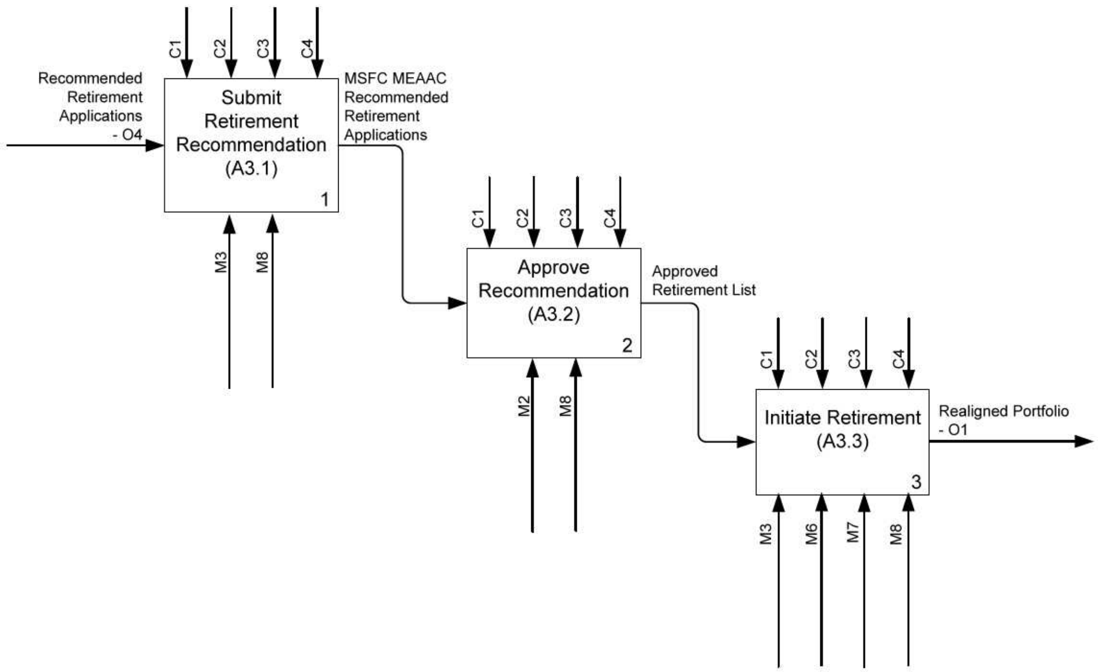
A3 Diagram Approve Retirement (A3): activity is composed of three functions that describe how the recommended retirement application list provided as output O4 by Analyze Data (A2) is reviewed by the MSFC MEAAC and the MSFC CIO for approval. The approval is then submitted to the MSFC RNO for implementation. The decomposed activities within A3 *Approve Retirement (A3)* maintain the same set of controls that were previously defined within the parent function, A-0. The A3 *Approve Retirement (A3)* function is decomposed into a child diagram. The inputs, outputs, and mechanisms are described below with the decomposed functions. None of the functions are decomposed into child diagrams.

- **Submit Retirement Recommendation (A3.1)** – The first step in the function is *Submit Retirement Recommendation (A3.1)*. The input to the function is the Recommended Retirement Applications – O4 received from the MSFC EA in function *Conduct and Submit Final Analysis (A2.4)*. The function details the steps that the MSFC MEAAC performs in order to approve the submitted list of Recommended Retirement Applications – O4 that were received as input. The output from the function is the MEAAC approved list of MSFC MEAAC Recommended Retirement Applications. The mechanisms for this function are MSFC MEAAC (M3) role and the MSFC Email System (M8) that provides the system interface to exchange the recommendation.
- **Approve Recommendation (A3.2)** – The second step in the function is *Approve Recommendation (A3.2)*. The function details the steps that the MSFC CIO performs in order to approve the submitted list of MEAAC Recommended Retirement Applications – O4 that were received as input. The output from the function is the MEAAC approved list of MSFC MEAAC Recommended Retirement Applications. The mechanisms for this function are MSFC MEAAC (M3) role and the MSFC Email System (M8) that provides the system interface to exchange the recommendation.
- **Initiate Retirement (A3.3)** – The third and final step in the function depicts the functions necessary for the Approved Retirement Applications – O4 that is communicated to the MSFC MEAAC and finally to the MSFC RNO for implementation. The input for the function is Approved Retirement List. The output for the function is the Realigned Portfolio – O1. The mechanisms for the function are the MSFC MEAAC (M3), MSFC RNO roles (M6), and the APMS (M7) and MSFC Email system (M8). Both systems provide the automation behind the communication and documentation of the list of applications to be retired.

See figure labeled MARS OV-5b A3 Approve Retirement (A3) below to depict the functions that compose the A3 function, *Approve Retirement (A3)*.

Dated: 12 June 2010

MARS Architecture OV-5b - Operational Activity Model



PURPOSE: Depicts executive decision making activity that finalizes the retirement recommendation to realign the portfolio performed by the MSFC Responsible NASA Officer (RNO) performer.
VIEWPOINT: MSFC MEAAC

Tailoring: The OV-5a Operational Activity Decomposition Tree node identifiers have been included for referential integrity across the viewpoints.

NODE:	A3	TITLE:	Approve Retirement (A3)	NO.:	1

MARS 05-7

Figure 17 MARS OV-5b A3 Approve Retirement (A3)

14.2.4 View Integration

The MARS OV-5b was integrated with the MARS OV-5a by appending the MARS OV-5a node identifier to the description of the function. This integration provides the MARS Architecture (and architects and reviewers) the ability to perform a quick reference between the two “companion” views.

The MARS OV-5b was also integrated with the MARS OV-2 by using the operational performers from the OV-2 as the mechanisms on the OV-5b. The function inputs and outputs are depicted on the MARS OV-3 as the information exchanges.

The MARS OV-5b was also integrated with the MARS SV-1 by using the resources on the SV-1 as mechanisms in the MARS OV-5b.

The MARS OV-5b was also integrated with the MARS StdV-1 Standards Profile. The technology that is used by the mechanism is defined within the MARS StdV-1 view.

14.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

15 OV-2 Operational Resource Flow Description View

15.1 DoDAF-Described OV-2

15.1.1 Description

The OV-2 Operational Resource Flow Description view emphasizes nodes (or node types) and the information exchanges between them within the context of the operational capability depicted in the OV-1. An operational node is a node that performs a role or mission. The OV-2 depicts the operational players (performers or organizations) with needlines between those operational nodes that represent a need to exchange information or resources.

The nodes can represent operational nodes within the architecture description or the external environment. Nodes within the architecture description are operational nodes that send information or receive information (or resources) from the architecture nodes. External operational nodes are operational nodes that send information to or receive information (or resources) from the architecture's nodes but are outside the scope of the architecture; and do not perform architecture activities. Nodes within a DoDAF view present a logical concept that represents activities, systems, organizations, persons, facilities, locations, materials, and installations that produce, consume, or processes data.

15.1.2 View Guidance and Characteristics

The OV-2 logical pattern need not correspond to specific organizations, systems, or locations. This allows resource flows to be established without prescribing the way the resource flows are handled and without prescribing solutions. The OV-2 is intended to be logical. It describes who or what; not how. The OV-2 provides a focus for the operational requirements that may reflect any capability requirements that have been articulated but within the range of operational settings that are being used for operational architecture.

The OV-2 describes to non-technical stakeholders how resources flow (or do not flow). The aim of the view is to record the operational characteristics for the community of anticipated users relevant to the architecture description and their collaboration needs, as expressed in needlines and resource flows.

Figure Example Operational Resource Flow Description below shows an example OV-2. The view shows three operational nodes (Node A, Node B, and Node C) that indicate the Information being exchanged between the architecture operational nodes (Type X, Y, and Z). The example also shows Node B exchanging information Type W with an external destination that is outside of the architecture description.

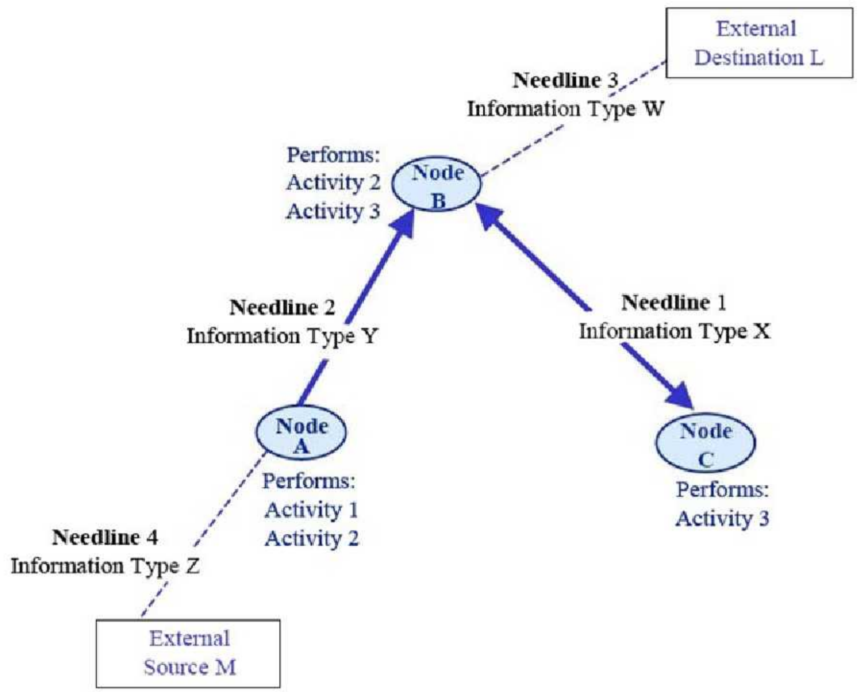


Figure 18 Example Operational Resource Flow Description

15.1.3 Purpose

The OV-2 primary purpose is to define capability requirements within an operational context. The OV-2 may also be used to express a capability boundary. The OV-2 may also be used to express a capability boundary.

The OV-2 intended uses include:

- Depict needs for information exchanges that support resource flows
- Depict key operational players (performers) and their interactions within the resource exchanges
- Indicate need for interfaces to support resource flows shown within the information exchange
- Summarize resource flows using needlines

15.1.4 Audience

The OV-2 has two audiences; one for the information flow and the other for resource flow.

The information flow audience includes:

- Systems interfaces developers
- Communications infrastructure personnel
- Service infrastructure personnel

The resource flow audience includes logistics personnel.

15.2 MARS Architecture OV-2

15.2.1 Tailoring Applied

The authors tailored the MARS OV-2 to include the operational activities and their node identifiers, which were decomposed within the MARS OV-5a (OV-5a Operational Activity Decomposition Tree View) and modeled in the MARS OV-5b (OV-5b Operational Activity Model View). Each activity shown in the OV-2 has the needline identified that is integrated into the MARS OV-3 described in section labeled OV-3 Operational Resource Flow Matrix View.

15.2.2 Viewpoint

The viewpoint of the MARS OV-2 is the MEAAC.

15.2.3 View Discussion

The MARS OV-2 depicts the operational key players (performers) within the MARS Architecture and the necessary information exchanged between each operational player (performer).

Table 4 MARS OV-2 Operational Node Requirements

Operational Role (Performer)	Performer Operational Activity Requirement	MARS OV-5A Nodes
MSFC CIO	Approve the retirement recommendation and exchanges the retirement approval with the MSFC RNO	A3.2 Approve Retirement (IE14)
MSFC MEAAC	Create the retirement recommendation for MSFC CIO approval and exchanges the recommendation with the MSFC CIO. The MSFC MEEAC receive analysis recommendation from the MSFC EA.	A3.1 Submit Retirement Recommendation (IE12)
MSFC Responsible NASA Officer (RNO)	Confirm the application metadata and communicates information exchange with the MSFC EA.	A1.1 Verify Metadata - RNO
MSFC Application Portfolio Managers	Confirm the application metadata and coordinate with the MSFC Stakeholder to ensure that the metadata is correct. Review MSFC EA preliminary analysis for completeness before analysis submitted to the MSFC MEAAC.	A1.2.3 Return Application Metadata and A2.3 Review Initial Analysis (IE10)
MSFC Stakeholder	Review and verify the application metadata provided by an information exchange with the MFSC Application Portfolio Manager. Update metadata is necessary before verification.	A1.2.1 Stakeholder Application Metadata Verification (IE6) and A1.2.2 Stakeholder Application Metadata Update (IE6)
MSFC EA	Perform analysis necessary to provide an analysis summary to the MSFC MEAAC. MSFC EA exchanges the metadata with the MSFC RNO, MSFC Portfolio Manager, and then exchanges the completed assessment to the MSFC MEAAC.	A2.1 Conduct Assessment (IE5), A2.3 Conduct and Submit Initial Analysis (IE8), and A2.4 Conduct and Submit Final Analysis (IE11)

15.2.4 View Integration

The MARS OV-2 was integrated into the MARS OV-3 as described in Tailoring Applied above. See section labeled OV-3 Operational Resource Flow Matrix View for additional information.

The MARS Architecture also shows the integration between the MARS OV-5a by adding the MARS OV-5a operational node identifiers to the node activities shown on the OV-2. See sections labeled OV-5a Operational Activity Decomposition Tree View and OV-5b Operational Activity Model View.

The needlines established in the MARS OV-2 are realized by system resources and their interactions depicted in the MARS SV-1. See section labeled SV-1 Systems Interface Description View for additional details regarding the MARS SV-1 view.

15.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

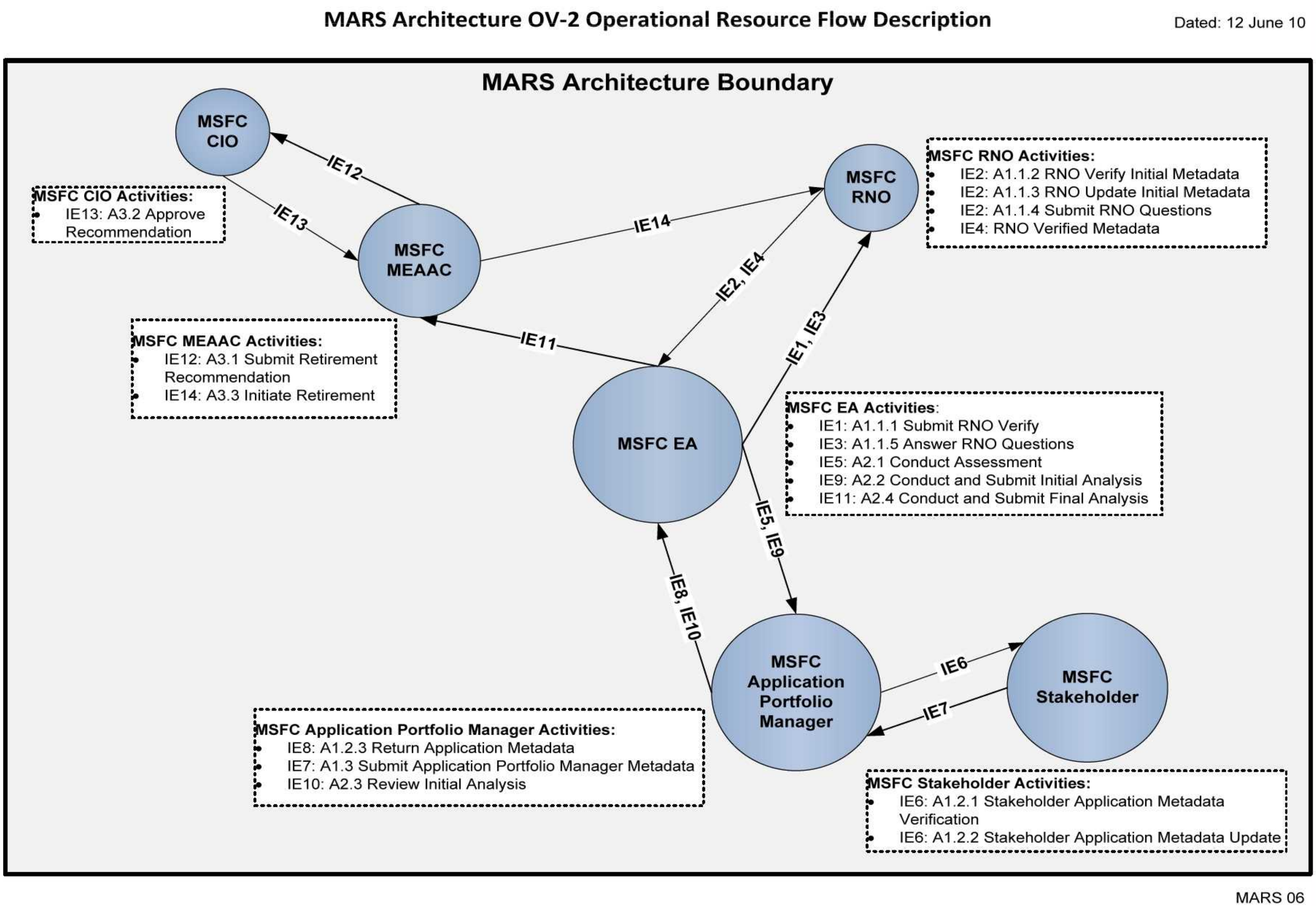


Figure 19 MARS OV-2 Operational Resource Flow Description

16 OV-3 Operational Resource Flow Matrix View

16.1 DoDAF-Described OV-3

16.1.1 Description

The OV-3 Operational Resource Flow Matrix addresses operational resource flows exchanged between operational activities and locations. The OV-3 identifies the resource transfers that are necessary to support operations to achieve a specific operational activity. The OV-3 is constructed from the information contained in the OV-2.

The OV-3 emphasizes the logical and operational characteristics of the resource flows being exchanged, with focus on the resource flows crossing the capability boundary. The OV-3 is not intended to be an exhaustive listing of all the details contained in every resource flow of every operational activity and location associated with the architecture description. The OV-3 is intended to capture the most important aspects of selected resource flows and there is not always a one-to-one mapping of OV-3 resource flows to OV-2 operational resource flow description needlines.

The OV-3 information can be presented in tabular form and the DoDAF V2.0 Volume II does not prescribe column headings for an OV-3 matrix. Most OV-3 matrixes show the needline identifier, information provider, and consumer of the information exchange as a minimum list. The matrix details information exchanges and identifies who exchanges what information, with whom, why the information is necessary, and how the information exchange must occur. The matrix should also contain the key attributes of the associated resources and the triggering event.

16.1.2 Purpose

The OV-3 purpose is to define interoperability requirements. The OV-3 also ties together role, activity, and resource flow between the key architecture description operational performers that are fulfilling the architecture description mission. The OV-3 can also help define the agreements that can be created between different organizations about timeframes in which the exchanges need to occur to fulfill the mission objective or capability.

16.1.3 Audience

The OV-3 audience includes:

- Operational analysts
- Communications analysts
- Supply logisticians

16.2 MARS Architecture OV-3

16.2.1 Tailoring Applied

The authors did not tailor the MARS OV-3 since DoDAF V2.0 does not prescribe the column headings in an OV-3.

16.2.2 Viewpoint

The viewpoint of the MARS OV-3 is the MEAAC.

16.2.3 View Discussion

The authors indicated in the MARS OV-3 the needline identifier, the information element (what is being exchanged), the provider (who provides the information exchange element), the consumer (who is receiving the information exchange element), the transition information (what is being exchanged, how the information element is being exchanged, when the exchange occurs or the triggering event), and the performance attributes (why the information is being exchange and what the exchange is measured against).

The authors appended the MARS OV-5a node identifiers to the activities and ensured that the MARS OV-4 roles were listed as the provider and consumer of the information exchange.

The MARS OV-3 shows the required interaction with the APMS shown in the section labeled SV-1 Systems Interface Description View to perform the information exchanges. After the metadata is retrieved, the MARS OV-3 shows verifying the metadata with the MSFC RNO (Needlines IE1-IE4), to verifying the metadata with the Application Portfolio Manager (Needlines IE6-IE8), to conducting and submitting the analysis to the MEAAC (Needlines IE-9 – IE12). Finally, the OV-3 shows the MSFC CIO approval (IE-13) and the process of initiating the retirement with the MSFC RNO (Needline IE14).

Each needline describes how the operational performer described in the MARS OV-2 will exchange the information element and the triggering event that causes the exchange. See section labeled OV-2 Operational Resource Flow Description View for additional details on the MARS OV-2 view.

16.2.4 View Integration

The authors used MARS OV-5a decomposed activities to define the activities that required the information exchanges shown on the MARS OV-3. The authors also used the defined inputs, outputs, mechanisms, and controls within the MARS OV-5b to help define the types of information exchange between the activities.

For additional information on the MARS OV5a, see the section labeled OV-5a Operational Activity Decomposition Tree View and section labeled OV-5b Operational Activity Model View for the OV5b view.

16.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

Figure 20 MARS OV-3 Operational Resource Flow Matrix

MARS Architecture OV-3 Operational Resource Flow Matrix

	Information Element (What)	Provider (Who)		Consumer (Who)		Transition Information (What) (How) (When)			Performance Attributes (Why)	
Needline Identifier	Description (Activity)	Sender Entity (role)	Sender Node Activity	Receiving Entity (role) (Who)	Receiving Node Activity	Information Element Type (Verbal, email)	Mechanism	Triggering Event	Timeliness	Frequency
IE1	A.1.1.1 Submit RNO Verify	MSFC Enterprise Architect	MSFC EA	MSFC Responsible NASA Official (RNO)	MSFC RNO	spreadsheet	email	spreadsheet received	within 8 hours of spreadsheet receipt	once @ spreadsheet receipt
IE2	A1.1.2 RNO Verify Initial Metadata	MSFC Responsible NASA Official (RNO)	MSFC RNO	MSFC Enterprise Architect	MSFC EA	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE2	A1.1.3 RNO Update Initial Metadata	MSFC Responsible NASA Official (RNO)	MSFC RNO	MSFC Enterprise Architect	MSFC EA	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE2	A1.1.4 Submit RNO Questions	MSFC Responsible NASA Official (RNO)	MSFC RNO	MSFC Enterprise Architect	MSFC EA	verbal	meeting	spreadsheet received	during meeting	many until questions answered
IE3	A1.1.5 Answer RNO Questions	MSFC Enterprise Architect	MSFC EA	MSFC Responsible NASA Official (RNO)	MSFC RNO	verbal	meeting	spreadsheet received	during meeting	many until questions answered
IE4	RNO Verified Metadata	MSFC Responsible NASA Official (RNO)	MSFC RNO	MSFC Enterprise Architect	MSFC EA	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt

	Information Element (What)	Provider (Who)		Consumer (Who)		Transition Information (What) (How) (When)			Performance Attributes (Why)	
Needline Identifier	Description (Activity)	Sender Entity (role)	Sender Node Activity	Receiving Entity (role) (Who)	Receiving Node Activity	Information Element Type (Verbal, email)	Mechanism	Triggering Event	Timeliness	Frequency
IE5	A2.1 Conduct Assessment	MSFC Enterprise Architect	MSFC EA	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE6	A1.2.1 Stakeholder Application Metadata Verification	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	MSFC Stakeholder	MSFC Stakeholder	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE6	A1.2.2 Stakeholder Application Metadata Update	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	MSFC Stakeholder	MSFC Stakeholder	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE7	A1.3 Submit Application Portfolio Manager Metadata	MSFC Stakeholder	MSFC Stakeholder	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE8	A1.2.3 Return Application Metadata	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	MSFC Enterprise Architect	MSFC EA	spreadsheet	email	spreadsheet received	within 8 hours of spreadsheet receipt	once @ spreadsheet receipt
IE9	A2.2 Conduct and Submit Initial Analysis	MSFC Enterprise Architect	MSFC EA	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt
IE10	A2.3 Review Initial Analysis	MSFC Application Portfolio Manager	MSFC Application Portfolio Manager	MSFC Enterprise Architect	MSFC EA	spreadsheet	email	spreadsheet received	within 40 hours of spreadsheet receipt	once @ spreadsheet receipt

	Information Element (What)	Provider (Who)		Consumer (Who)		Transition Information (What) (How) (When)			Performance Attributes (Why)	
Needline Identifier	Description (Activity)	Sender Entity (role)	Sender Node Activity	Receiving Entity (role) (Who)	Receiving Node Activity	Information Element Type (Verbal, email)	Mechanism	Triggering Event	Timeliness	Frequency
IE11	A2.4 Conduct and Submit Final Analysis	MSFC Enterprise Architect	MSFC EA	MSFC Enterprise Architecture Advisory Committee (MEAAC)	MSFC MEAAC	Report	email	Completed analysis	within 16 hours of final meeting	once @ completed analysis
IE12	A3.1 Submit Retirement Recommendation	MSFC Enterprise Architecture Advisory Committee (MEAAC)	MSFC MEAAC	MSFC Chief Information Officer	MSFC CIO	Report	meeting	Completed Recommendation	within 16 hours of analysis receipt	once @ completed recommendation
IE13	A3.2 Approve Recommendation	MSFC Chief Information Officer	MSFC CIO	MSFC Enterprise Architecture Advisory Committee (MEAAC)	MSFC MEAAC	Report	meeting	Approval	Within 40 hours of report receipt	once @ completed decision
IE14	A3.3 Initiate Retirement	MSFC Enterprise Architecture Advisory Committee (MEAAC)	MSFC MEAAC	MSFC Application Portfolio Management System (APMS)	MSFC RNO	Workflow	process	CIO Approval	Within 40 hours of approval	once @ completed decision
									Dated:	12-Jun-10

17 SV-1 Systems Interface Description View

17.1 DoDAF-Described SV-1

17.1.1 Description

The SV-1 System Interface Description view depicts system locations required to support organizations/human roles represented by operational performers on the OV-2. The SV-1 also identifies the interfaces between systems to other systems or between systems and location combinations.

The SV-1 links the operational and system architecture views by depicting how resources are structured and interact to realize the logical architecture specified in an OV-2. The SV-1 represents the realization of a requirement specified in an OV-2 operational performer.

A system resource flow is a simplified representation of a pathway or network pattern, usually depicted graphically as a connector (i.e., a line with possible amplifying information such as network protocol). The SV-1 depicts all system resource flows between systems that are of interest within the architecture description.

The benefit of an SV-1 is its ability to show the architecture operational performers and how they interact with the systems shown on the SV-1. The structural and behavioral viewpoints in the OVs and SVs allow architects and stakeholders to quickly ascertain which functions are carried out by operational performers and which by systems for each alternative specification and to carry out trade analysis.

17.1.2 Purpose

The SV-1 purpose is to show resource structure, i.e., identify the primary sub-systems, operational performers and activities (functions), and their interactions. The SV-1 contributes to an understanding of the structural characteristics of the capability.

The SV-1 intended use includes:

- Define system concepts
- Define system options
- Capture system resource flow requirements
- Plan capability integration
- Manage system integration
- Plan operation (capability and performer definition)
- Relate system locations and systems-to-operational performers

- Identify cross-organizational interfaces (key interfaces)
- Support system acquisition
- Determine needs for system interoperability
- Provide a high-level view of all interfaces required by a architecture scope

17.1.3 Audience

The SV-1 audience includes:

- System architects
- Major system requirements personnel
- System analysts

17.2 MARS Architecture SV-1

17.2.1 Tailoring Applied

The authors tailored the MARS SV-1 by annotating the system interface with the network protocols that transverse the network and also identifying the first level of operational activities specified with the MARS OV-5a. The authors also depicted the operational performers on the graphic that were defined in the MARS OV-2.

17.2.2 Viewpoint

The viewpoint of the MARS SV-1 is the MEAAC.

17.2.3 View Discussion

The MARS SV-1 decomposes the APMS into its three systems:

- The MSFC Portfolio Data Store (DS) Web Server that provides the web connectivity to the users of the system
- The MSFC Portfolio DS Application Server that runs the application portfolio application software that interfaces with the MSFC Portfolio DS Web Server and the MSFC Portfolio DS Database Server to retrieve data
- The MSFC Portfolio DS Database Server that host the actual database that contain the four application portfolios

The SV-1 also depicts the key performers within the MARS Architecture: the MFSC EA, MSFC RNO (RNO), MSFC Application Portfolio Manager, MSFC Stakeholder, MFSC MEAAC, and the MSFC CIO. All operational performers use their laptops to connect via the network to the APMS.

17.2.4 View Integration

The MARS SV-1 depicts the key performers within the MARS Architecture. Each system interface has been labeled with the MARS OV-5a top-level of decomposed activities that show what operational activity the operational performer is using the systems to perform. This ties together the operational activities, operational performers, and required systems in one view.

The MARS OV-3 uses the systems specified in the SV-1 to perform the information exchanges. The technical standards required by the systems are specified in the MARS StdV-1.

17.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

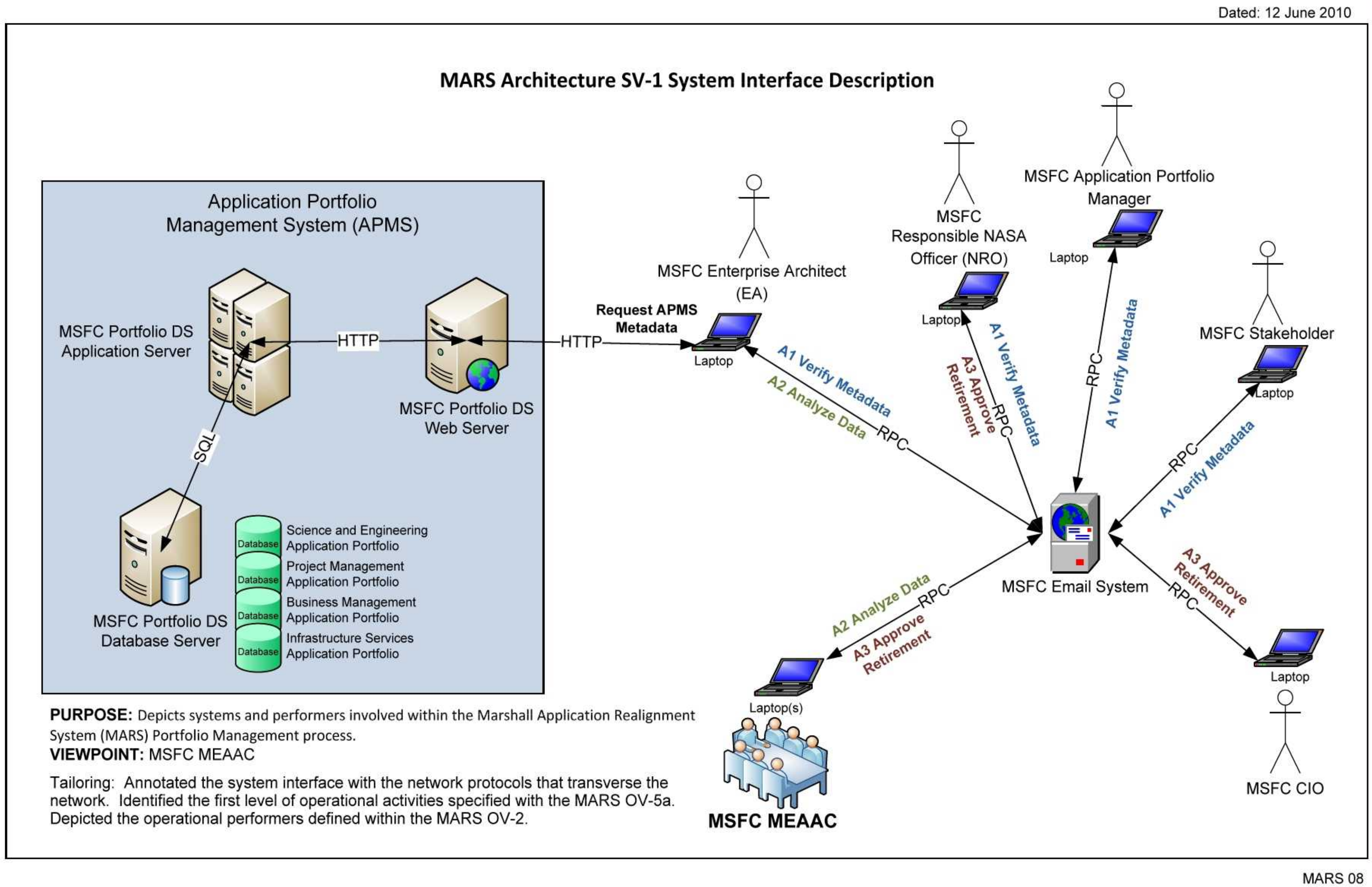


Figure 21 MARS SV-1 System Interface Description

18 OV-4 Organizational Relationships Chart View

18.1 DoDAF-Described OV-4

18.1.1 Description

The OV-4 Organizational Relationship Chart view shows organizational structures and interactions. The OV-4 can be role based or based on the actual organization structure.

A role-based OV-4 shows the architecture relationships between organizational resources. The key relationship is shown on the graphic and how the organization fits into a larger enterprise organization or parent organization. The OV-4 may also show the roles each organizational resource has, and the interactions between those roles, i.e., the roles represent the functional aspects of organizational resources.

18.1.2 Purpose

The purpose of an "actual" OV-4 is to show the structure of a real organization at a particular point in time. It is used to provide context to other parts of the architecture such as the AV-1 and the CV views.

The purpose of a role-based OV-4 is to support:

- Organizational analysis
- Definition of human roles
- Operational analysis
- Identification of architecture stakeholders and process owners
- Illustration of current or future organization structures

18.1.3 Audience

The OV-4 audience includes:

- Architecture sponsors
- Architecture stakeholders
- Architecture development team

18.2 MARS Architecture OV-4

18.2.1 Tailoring Applied

The authors tailored the MARS OV-4 by choosing to depict the existing organization view of MSFC and how MSFC is part of a larger NASA organization. The authors also chose to show the roles involved within the MARS Architecture.

18.2.2 Viewpoint

The viewpoint of the MARS OV-4 is the MEAAC.

18.2.3 View Discussion

The MARS OV-4 shows the MSFC organization and what organizations are involved in the MARS Architecture. The table below highlights the organization, the role, and a brief description of the duties within the MARS Architecture. The table below contains the MARS OV-2 view node identifiers within the parentheses in the description field to relate the description to the information exchanges performed by the roles and what part of the MSFC Organization performs the role.

Department (MARS OV-4)	Role (MARS OV-2)	Description (MARS OV-5a)
Office of the Chief Information Officer (CIO)	MSFC CIO	Approves the recommendation to retire selected low business and technology value applications. (A3.2)
CIO – Planning, Policy & Integration Office	MSFC MEAAC MSFC EA	MSFC MEAAC – submits the retirement recommendation (A3.1) and initiates the approved retirement recommendation (A3.3)
CIO – IT Security Office	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).
CIO – Application, Web, and Multimedia Services Office	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).
CIO – Network, Telecom, and Desktops Services Office	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).
CIO – NEACC Business Process and Application Services Office	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).
CIO NEACC Application Development and Software Assurance Office	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).

Department (MARS OV-4)	Role (MARS OV-2)	Description (MARS OV-5a)
Office of the Chief Financial Officer	MSFC RNO	Updates the metadata (A1.1.3) or submit's questions for clarification (A1.1.4) before verifying the metadata (A1.1.2).
Shuttle Propulsion Office	MSFC Application Portfolio Manager	Coordinates with the stakeholders to verify (A1.2.1) or update (A1.2.2) the metadata. Returns the verified metadata to the MSFC EA (A1.2.3). Role also reviews the initial analysis about the applications that are being recommendation for decommission (A2.3).
Ares Project Office	MSFC Application Portfolio Manager	Coordinates with the stakeholders to verify (A1.2.1) or update (A1.2.2) the metadata. Returns the verified metadata to the MSFC EA (A1.2.3). Role also reviews the initial analysis about the applications that are being recommendation for decommission (A2.3).
Science and Mission Systems Office	MSFC Application Portfolio Manager	Coordinates with the stakeholders to verify (A1.2.1) or update (A1.2.2) the metadata. Returns the verified metadata to the MSFC EA (A1.2.3). Role also reviews the initial analysis about the applications that are being recommendation for decommission (A2.3).
Engineering Directorate	MSFC Application Portfolio Manager	Coordinates with the stakeholders to verify (A1.2.1) or update (A1.2.2) the metadata. Returns the verified metadata to the MSFC EA (A1.2.3). Role also reviews the initial analysis about the applications that are being recommendation for decommission (A2.3).
Safety and Mission Assurance Directorate	MSFC Application Portfolio Manager	Coordinates with the stakeholders to verify (A1.2.1) or update (A1.2.2) the metadata. Returns the verified metadata to the MSFC EA (A1.2.3). Role also reviews the initial analysis about the applications that are being recommendation for decommission (A2.3).

Figure 22 MARS OV-4 Organization, Role, and Description Table

See Figure MARS OV-4 Organization Relationship Chart below for the MSFC Organizational Relationship Chart and the depiction of the key operational performers involved within the MARS architecture. The MARS OV-2 view can be found in section labeled OV-2 Operational Resource Flow Description View and the section labeled OV-5a Operational Activity Decomposition Tree View contains the details for the activities.

18.2.4 View Integration

The authors overlaid the MARS OV-4 on the MARS OV-2 to depict that roles are exchanging information within the MARS Architecture. The overlay resulted in the new construction of both the functional activities along with the organizational physical characteristics that are performing the activities. This overlay of activities and roles to organization allow the MSFC organization to better understand how their organization will interact as part of the new application scoring capability being introduced as part of this project.

The authors also integrated the MARS OV-4 with the MARS CV-5. The MARS CV-5 shows the organization along the Y axis and the detailed capabilities defined in the MARS CV-2 along the X axis. Within the cell intersection of the X and Y axis, the authors color coded the cell indicating which MARS CV-2 score will be integrated into that organization. Additional details about the use of the MARS CV-5 can be found in section labeled CV-5: Capability to Organizational Development Mapping View. For additional details on the use of the MARS CV-2 see section labeled CV-2: Capability Taxonomy View.

Due to the tight integration between the MARS views, the architecture reviewer can trace the performers depicted in the MARS OV-4, back to their operational roles depicted in the MARS OV-2, back to the activities depicted in the MARS OV-5a. See section labeled OV-2 Operational Resource Flow Description View operational roles and see section labeled OV-5a Operational Activity Decomposition Tree View contains the details for the operational role activities.

Finally, the authors integrated the MARS OV-4 with the MARS SV-1. The authors depicted the organization roles on the view showing the system resource that the operational performer is using, and how the system resources interact with other systems contained within the MARS Architecture. For additional details on the use of the MARS SV-1, see section labeled SV-1 Systems Interface Description View.

18.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

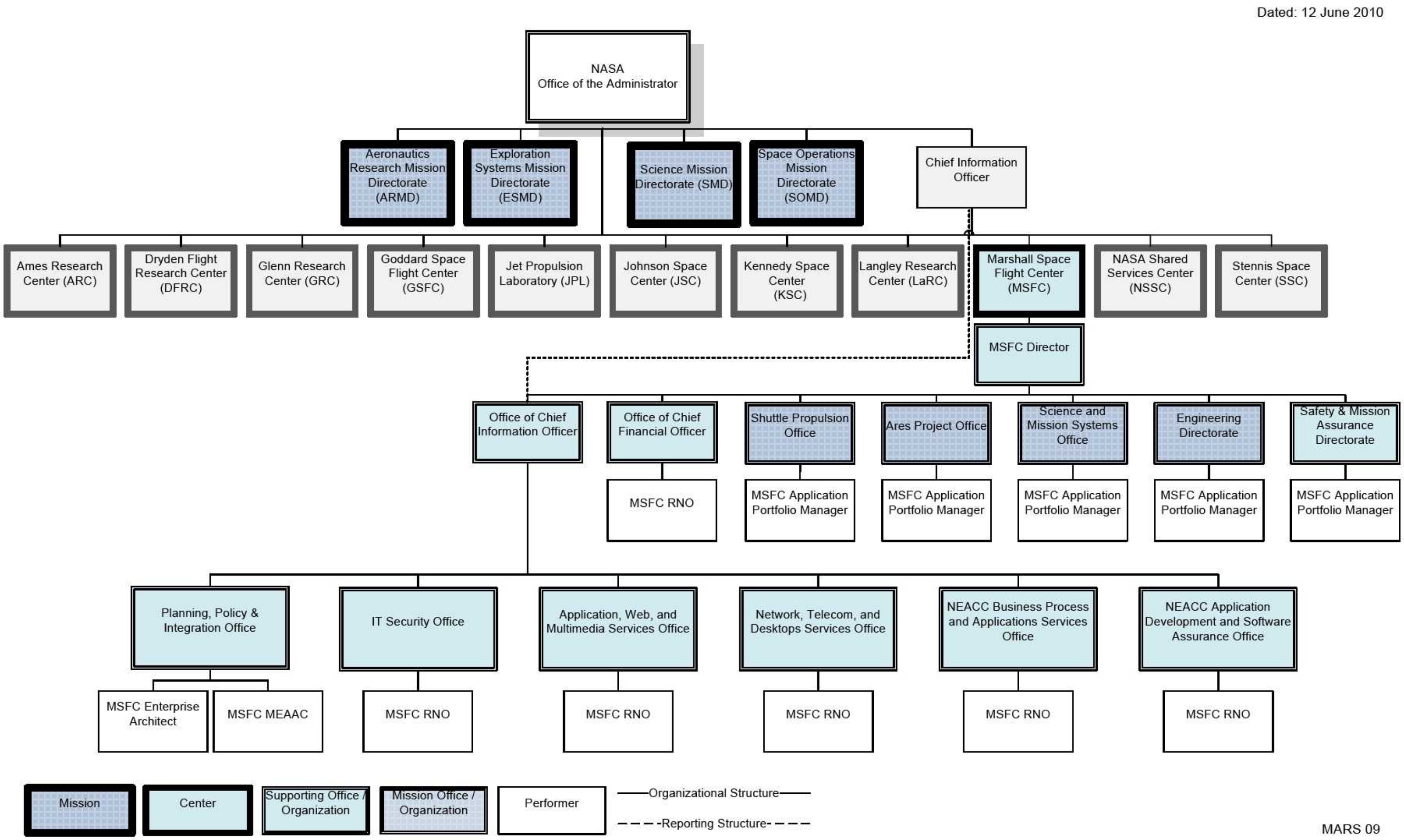


Figure 23 MARS OV-4 Organization Relationship Chart

19 CV-2 Capability Taxonomy View

19.1 DoDAF-Described CV-2

19.1.1 Description

The CV-2 Capability Taxonomy view presents a hierarchy of capabilities. The view specifies the capabilities that are referenced throughout the architecture description. The CV-2 does not specify how a capability is to be implemented but depicts a hierarchy of capabilities, with the most general at the root and most specific at the leaves. At the leaf-level, capabilities have a measure specified, along with an environmental condition for the measure. The CV-2 is used to capture and organize the capability functions – required for the vision set out in the CV-1 Vision.

The CV-2 has no mandated structure although the architectural data must be able to support the representation of a structured/hierarchal list. This structure may be delivered using textual, tabular, or graphical methods.

19.1.2 Purpose

The CV-2 purpose is to support the following:

- Identification of capability requirements
- Capability planning (capability taxonomy)
- Codifying required capability elements
- Capability audit
- Capability gap analysis
- Source for the derivation of cohesive sets of user requirements
- Providing reference capabilities for architectures

19.1.3 Audience

The CV-2 audience includes:

- Architecture sponsors
- Architecture stakeholders
- Architecture development team

19.2 MARS Architecture CV-2

19.2.1 Tailoring Applied

The authors did not tailor the MARS CV-2 (since DoDAF does not prescribe a format for the view) but the authors did include environmental factors associated with MSFC for context.

19.2.2 Viewpoint

The viewpoint of the MARS CV-2 is the MEAAC.

19.2.3 View Discussion

The MARS CV-2 depicts the capability hierarchy in terms of three score sub-types: business, retirement, and technology. The MARS CV-2 includes score capability attributes, which represent the measures used to produce MSFC application scores. The authors plan to describe these measures in detail when the MARS AV-2 is updated in Phase 2.

19.2.4 View Integration

The MARS CV-2 depicts the decomposition of the MARS CV-1 Score Application capability. The MARS CV-2 was used to define the business score, retirement score, and technology score measures that were depicted along the X axis of the MARS CV-5. This allows the integration of the capability vision, the measurement scores, and the MSFC Organizations that are participating within the MARS Architecture to provide the capability.

19.2.5 Stakeholder Questions Addressed

- SQ-01 How can MSFC consistently evaluate the relative importance and performance of steady-state applications?
- SQ-02 How can MSFC reduce its overall application portfolio base, and thereby reduce future data center and infrastructure costs?
- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

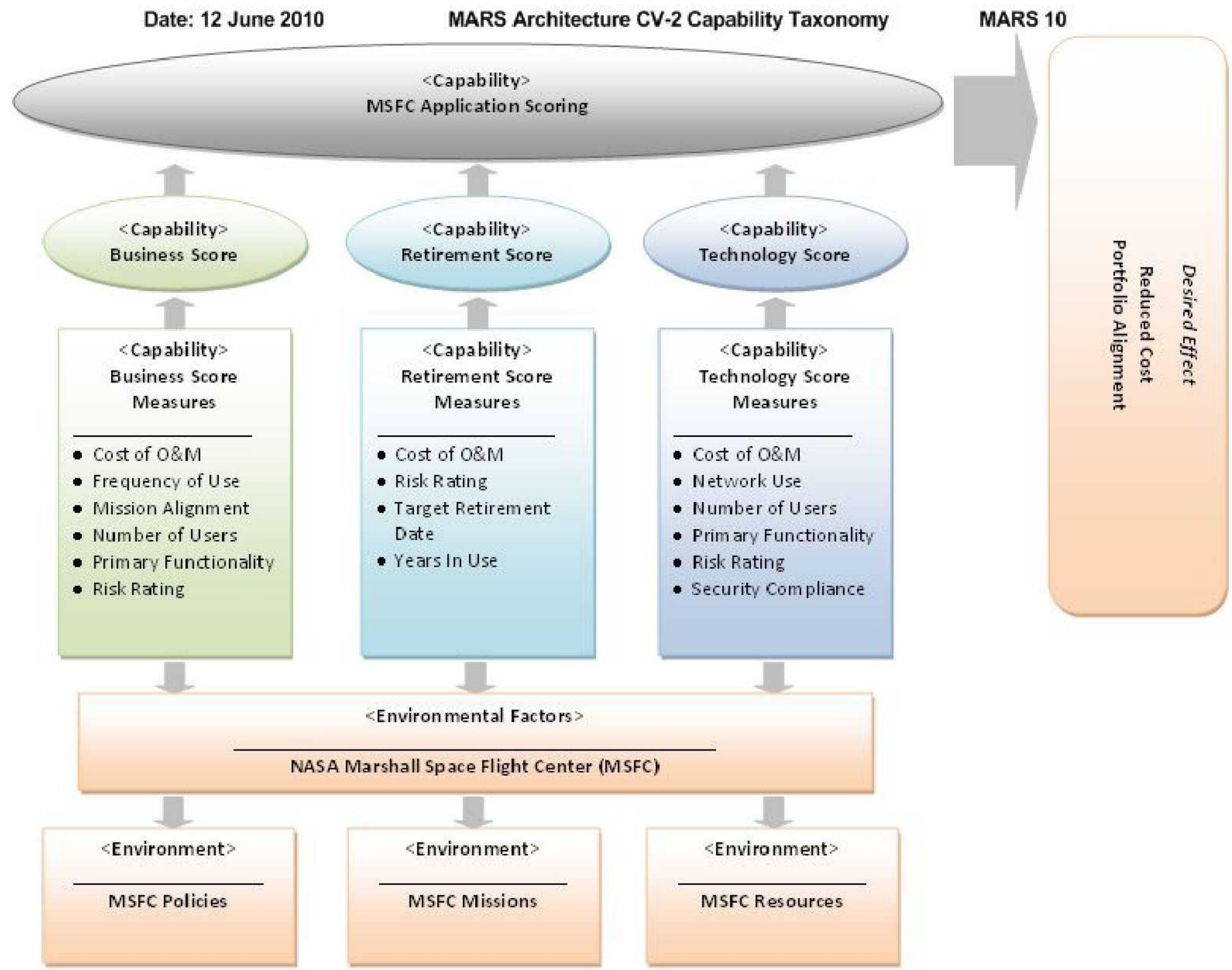


Figure 24 MARS CV-2 Capability Taxonomy

20 CV-5 Capability to Organizational Development Mapping View

20.1.1 DoDAF-Described CV-5

20.1.2 Description

The CV-5 Capability to Organizational Development Mapping view addresses the fulfillment of capability requirements. The CV-5 is used to support the capability management process; in particular, to assist the planning and fielding of an architecture. The CV-5 shows deployment of capabilities to specific organizations. If a particular capability is to be used by a specific organization during that phase, it should be shown on the CV-5, mapped to the organization. The CV-5 also shows interactions between them by indicating a reference point where the capability and the organization touch.

The CV-5 is usually based on a tabular representation, with the appropriate organizational structure represented by one axis, and the capabilities by the other axis. Graphical objects representing capabilities or resources can be placed in the relevant positions (intersections) relative to these axes.

20.1.3 Purpose

The CV-5 purpose is to support the following:

- Fielding planning
- Capability integration planning
- Capability options analysis
- Capability redundancy/overlap/gap analysis
- Identification of deployment level shortfalls

20.1.4 Audience

The CV-5 audience includes:

- Architecture sponsors
- Architecture stakeholders
- Architecture development team

20.2 MARS Architecture CV-5

20.2.1 Tailoring Applied

The authors tailored the MARS CV-5 as follows:

- Included an X axis depicting the scoring indicators that are used to produce the three scores that comprise the new sub-capabilities:
  - Business Score
  - Retirement Score
  - Technology Score
- Mapped the organizational role (performer) that participated in *A1 Verify Metadata*, *A2 Analyze Data* and *A3 Approve Retirement* top level MARS OV-5a activities.
- Added color coding to indicate which capability measure applies to the organizational performer implementing the capability.

20.2.2 Viewpoint

The viewpoint of the MARS CV-5 is the MEAAC.

20.2.3 View Discussion

The MARS CV-5 depicts the MSFC Organizations that are stakeholders within the MARS Architecture along the Y axis and the measures that produce the Score Application capability (Business Score, Retirement Score, and Technical Score) along the X axis. At the intersection of the organization and the measure, the authors color coded the capability that the MSFC Organization will produce and combine with the other scoring measures on the MARS CV-2. This allows the MARS Architecture to apply a scoring measure to a group of applications to recommend low business and low technology value applications for retirement.

See figure labeled MARS CV-5 Capability to Organizational Mapping below to review the integration of the capabilities that have been decomposed into the MARS CV-2 view and the MSFC Organization that participate in the production of the capability.

20.2.4 View Integration

The MARS CV-5 was integrated with the MARS CV-2 by detailing the CV-2 scores that the measures will produce and the MARS OV-4 view that depicts the MSFC Organization and MSFC's location within the NASA enterprise organization.

20.2.5 Stakeholder Questions Addressed

- SQ-03 How can MSFC determine the extent of underused, unused, low business value, and/or low technology value applications in its application portfolio?
- SQ-04 How can MSFC determine the extent of overlapping functionality within its application portfolio?
- SQ-05 How can MSFC determine the cost to maintain an application in its application portfolio versus what it costs to retire or decommission it?
- SQ-06 How can MSFC determine the extent of applications in its application portfolio that are still active past their target retirement dates?

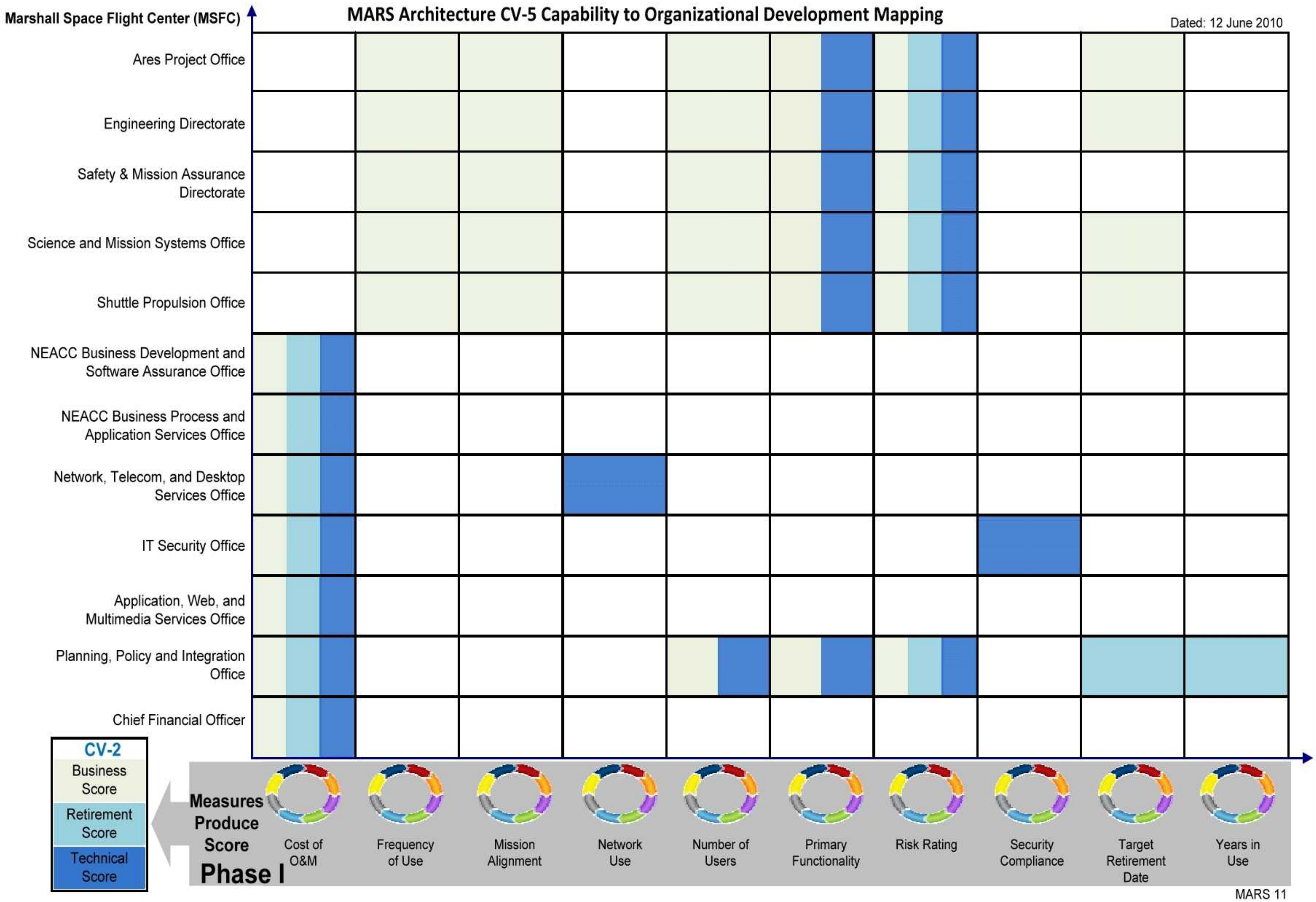


Figure 25 MARS CV-5 Capability to Organizational Mapping

21 StdV-1 Standards Profile

21.1 DoDAF-described StdV-1

21.1.1 Description

The StdV-1 Standards Profile defines the technical, operational, and business standards, guidance, and policy applicable to the architecture being described. The StdV-1 also documents the policies and standards that apply to the operational or business context. The DoD Information Technology Standards and Profile Registry (DISR) is an architecture resource for technical standards that can be used in the generation of the StdV-1.

In DoDAF V2.0, the StdV-1 is generalized to incorporate all applicable standards for architecture. It collects the various systems standards rules that implement and sometimes constrain the choices that can be made in the design and implementation of architecture.

21.1.2 Purpose

The StdV-1 purpose is to delineate standards, rules, and conventions that apply to architecture implementations. It provides information to guide architecture implementers in making standards choices. And, it guides procurement in requirements that mandate standards use.

21.1.3 Audience

The StdV-1 audience includes:

- MARS Architecture performers and key stakeholders
- System implementers
- Program managers

21.2 MARS Architecture StdV-1

21.2.1 Tailoring Applied

Because the MARS Architecture does not focus on a Department of Defense enterprise or on a technology, the authors tailored the MARS StdV-1 so it includes both guidance and standards pertinent to the Enterprise Architecture Practice at MSFC. The authors also included guidance associated with IT investments and portfolio management. The authors did not incorporate references to service areas contained in the DoD Information Technology Standards and Profile Registry (DISR) into the MARS StdV-1 because it did not seem “fit for purpose” to the MSFC enterprise.

21.2.2 Viewpoint

The viewpoint of the MARS StdV-1 is the MEAAC.

21.2.3 View Discussion

The MARS StdV-1 lists guidance and standards applicable to the MARS Architecture. This version of the MARS StdV-1 is not intended as an exhaustive or complete list of sources; the list is provided to support Phase 1 of the MARS Architecture and will be modified as the project progresses.

21.2.4 View Integration

The MARS StdV-1 is integrated with the MARS Architecture operational and system viewpoints, in particular MARS OV-5b, OV-2, OV-3, and SV-1.

21.2.5 Stakeholder Questions Addressed

All stakeholders may refer to the MARS StdV-1 for information about the guidance and standards that apply to the MARS Architecture. The MARS StdV-1 was not developed to address specific stakeholder questions but to address the business policy, guidance, and technical standards that apply to and constrain the MARS Architecture.

Figure 26 MARS Architecture StdV-1 Standards Profile

Date: 12 June 2010	MARS Architecture StdV-1 Standards Profile MARS 12
Guidance, Policy, and Standards	**Description**
Clinger-Cohen Act of1996. Public Law 104-106, section 5125, 110 Stat. 684 (1996)	Recognizes the need for Federal Agencies to improve the way they select and manage IT resources and states, "information technology architecture, with respect to an executive agency, means an integrated framework for evolving or maintaining IT and acquiring new IT to achieve the agency's strategic goals and information resources management goals." Chief Information Officers are assigned the responsibility for "developing, maintaining, and facilitating the implementation of a sound and integrated IT architecture for the executive agency"
E-Government Act of 2002	Calls for the development of Enterprise Architecture to aid in enhancing the management and promotion of electronic government services and processes.
Federal Information Processing Standard (FIPS) Publication 183 Integration Definition For Function Modeling (IDEF0)	This standard describes the modeling language (syntax and semantics) which supports the IDEF0 technique for developing structured graphical representations of a system or subject area. Use of this standard permits the construction of IDEF0 models comprising system functions (actions, processes, and operations), functional relationships, and the data and objects that support systems analysis and design, enterprise analysis, and business process re-engineering.
Federal Information Processing Standard (FIPS) Publication 184 Integration Definition For Information Modeling (IDEF1X)	This standard describes the IDEF1X modeling language (semantics and syntax) and associated rules and techniques, for developing a logical model of data. IDEF1X is used to produce information models which represent the structure and semantics of information within an enterprise.
General Accounting Office Enterprise Architecture Management Maturity Framework (EAMMF)	"Outlines the steps toward achieving a stable and mature process for managing the development, maintenance, and implementation of enterprise architecture." Using the EAMMF allows managers to determine what steps are needed for improving architecture management.

Date: 12 June 2010	MARS Architecture StdV-1 Standards Profile MARS 12
Guidance, Policy, and Standards	**Description**
Government Accounting Office (GAO) Information Technology Investment Management (ITIM): A Framework for Assessing and Improving Process Maturity	The ITIM framework is a maturity model composed of five progressive stages of maturity that an agency can achieve in its IT investment management capabilities. These maturity stages are cumulative; that is, in order to attain a higher stage of maturity, the agency must have institutionalized all of the requirements for that stage in addition to those for all of the lower stages. The framework can be used both to assess the maturity of an agency's investment management processes and as a tool for organizational improvement. The latest ITIM incorporates comments from earlier drafts; GAO's experiences in evaluating several agencies' implementations of investment management processes and the lessons learned by these agencies; and the importance of enterprise architecture (EA) as a critical frame of reference in making IT investment decisions.
IMSB-Plan-2800.1: MSFC Center IT Governance and Organizational Alignment Plan	Each NASA Center was tasked with producing a plan that describes how it will implement IT governance and organizational realignment under the Agency IT management strategies identified in the December 2007 release of the Agency's "Strategy for Improving Information Technology (IT) Management at NASA" by the NASA Office of the Chief Information Officer. This document outlines the approach that MSFC will use to implement the key strategies.
ISO/IEC 9075-2:2008	ISO/IEC 9075 defines the SQL language. The scope of the SQL language is the definition of data structure and the operations on data stored in that structure. ISO/IEC 9075-1:2008, ISO/IEC 9075-2:2008 and ISO/IEC 9075-11:2008 encompass the minimum requirements of the language. Other parts define extensions. ISO/IEC 9075-2:2008 defines the data structures and basic operations on SQL-data. It provides functional capabilities for creating, accessing, maintaining, controlling, and protecting SQL-data. Both static and dynamic variants of the language are proved. In addition to direct invocation, bindings are provided for the programming languages Ada, C, COBOL, Fortran, M, Pascal, and PL/I.

Date: 12 June 2010	MARS Architecture StdV-1 Standards Profile MARS 12
Guidance, Policy, and Standards	**Description**
MPD 2800.1: Management of Information Technology Systems and Services at MSFC	The purpose of this document is to implement the NASA strategic policy for managing information technology and to establish organizational authority and responsibilities that govern the acquisition, management and use of IT products, services, and support contracts at MSFC.
MSFC Enterprise Architecture Management Plan	This document identifies and describes the objectives, performance requirements, resources, controls, and supporting plans and procedures required to satisfy goals of the MSFC Enterprise Architecture (EA). This document also provides a structure for MSFC EA support to Center EA Management, collaboration on Agency-level EA activities, NASA Mission Directorate alignment, and Center EA development.
NPD 1001.0: NASA Strategic Plan	This document describes the strategic goals of NASA. Every activity that an EA performs should be aligned with a NASA strategic goal, thus an understanding of the goals is needed.
NPD 2800.1B: Managing Information Technology	This document provides the policy for ensuring that information technology and information resources are acquired and managed in a manner that implements the policies, procedures, and priorities of the Agency and the Federal Government.
NPR 2800.1B: Managing Information Technology	This document establishes requirements and responsibilities for information technology management relative to the policy set forth in NPD 2800.1B.
NPR 7120.7: NASA Information Technology and Institutional Infrastructure Program and Project Management Requirements	This document establishes the requirements by which NASA will formulate and execute information technology and institutional infrastructure programs and projects, consistent with the governance model contained in the NASA Governance and Strategic Management Handbook (NPD 1000.0).
Office of Management and Budget (OMB) Circular A-130	"Establishes policy for the management of Federal information resources"6 and calls for the use of Enterprise Architectures to support capital planning and investment control processes. Includes implementation principles and guidelines for creating and maintaining Enterprise Architectures.

Date: 12 June 2010	MARS Architecture StdV-1 Standards Profile	MARS 12

Guidance, Policy, and Standards	**Description**
OMB Enterprise Architecture Assessment Framework (EAAF)	Serves as the basis for enterprise architecture maturity assessments. Compliance with the EAAF ensures that enterprise architectures are advanced and appropriately developed to improve the performance of information resource management and IT investment decision making.
OMB Federal Enterprise Architecture Reference Models (FEA RM)	Facilitates cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across Federal Agencies. Alignment with the reference models ensures that important elements of the FEA are described in a common and consistent way. The Dodd Enterprise Architecture Reference Models are aligned with the FEA RM.
RFC 1831 Remote Procedure Call Protocol Version 2 - August 1995	This document describes the ONC Remote Procedure Call (ONC RPC Version 2) protocol as it is currently deployed and accepted. "ONC"stands for "Open Network Computing."
RFC 2060 Internet Message Access Protocol - Version 4rev1 Email IMAP	The Internet Message Access Protocol, Version 4rev1 (IMAP4rev1) allows a client to access and manipulate electronic mail messages on a server. IMAP4rev1 permits manipulation of remote message folders, called "mailboxes", in a way that is functionally equivalent to local mailboxes. IMAP4rev1 also provides the capability for an offline client to resynchronize with the server. IMAP4rev1 includes operations for creating, deleting, and renaming mailboxes; checking for new messages; permanently removing messages; setting and clearing flags; [RFC-822] and [MIME-IMB] parsing; searching; and selective fetching of message attributes, texts, and portions thereof. Messages in IMAP4rev1 are accessed by the use of numbers. These numbers are either message sequence numbers or unique identifiers.

Date: 12 June 2010	MARS Architecture StdV-1 Standards Profile	MARS 12

Guidance, Policy, and Standards	Description
RFC 2616 Hypertext Transfer Protocol -- HTTP/1.1	The Hypertext Transfer Protocol (HTTP) is an application-level protocol for distributed, collaborative, hypermedia information systems. It is a generic, stateless, protocol which can be used for many tasks beyond its use for hypertext, such as name servers and distributed object management systems, through extension of its request methods, error codes and headers. A feature of HTTP is the typing and negotiation of data representation, allowing systems to be built independently of the data being transferred. HTTP has been in use by the World-Wide Web global information initiative since 1990. This specification defines the protocol referred to as "HTTP/1.1", and is an update to RFC 2068.

22 AV-2 Integrated Dictionary

22.1 DoDAF-Described AV-2

22.1.1 Description

The AV-2 Integrated Dictionary contains definitions of terms used in the architecture. It consists of textual definitions in the form of a glossary, a repository of architecture data, their taxonomies, and their metadata – including metadata for tailored views associated with the architecture views developed. Metadata are the architecture data types, possibly expressed in the form of a physical schema. (In this document, architecture data types are referred to as architecture data elements.)

22.1.2 Purpose

The AV-2 purpose is to:

- Provide a central repository for data and metadata
- Consolidate multiple viewpoint definitions
- Remove ambiguity from the architecture description and provide a common language for communicating with stakeholders
- Promote integration, aggregation, and semantic intersections

22.1.3 Audience

The AV-2 audience includes:

- Architecture view users
- Architecture view reviewers
- Data administrators
- Architecture sponsors
- Architecture participants
- Architecture stakeholders
- Architecture development team
- Architecture repositories
- Enterprise repository managers

22.2 MARS Architecture AV-2

22.2.1 Tailoring Applied

The authors did not tailor the MARS AV-2.

22.2.2 Viewpoint

The viewpoint of the MARS AV-2 is the MEAAC.

22.2.3 View Discussion

The MARS AV-2 contains definitions of terms used in the MARS Architecture. It includes full and abbreviated term names, text definitions, sources (where applicable), architecture elements, and cross-references to architecture viewpoints where used.

The authors constrained the scope of the integrated dictionary for Phase 1 of the project to those terms deemed most essential for audience interpretation of the viewpoints and architecture descriptions. The integrated dictionary will mature as the MARS Architecture project progresses.

22.2.4 View Integration

This version of the MARS AV-2 is a working draft and is included for representative layout and expected content only. The authors will walk through each viewpoint to extract terms and metadata to ensure accuracy, consistency, and completeness across the MARS Architecture.

22.2.5 Stakeholder Questions Addressed

All stakeholders may refer to the MARS AV-2 for information about the MARS Architecture. The MARS AV-2 was not developed to address specific stakeholder questions but to facilitate consistent and clear interpretation of MARS Architecture terminology, data elements, and associated cross-referencing.

Figure 27 MARS Architecture AV-2 Integrated Dictionary

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
Activity	A	To be defined in Phase 2.	Activity	OV-2, OV-3, OV-5a, OV-5b, SV-1
Analysis	none	To be defined in Phase 2.	Activity	CV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Application	none	The use of information resources (information and information technology) to satisfy a specific set of user requirements (reference OMB A-130). Also, a set of computer commands, instructions, and procedures used to cause a computer to process a specific set of information. Applications do not include operating systems, generic utilities, or similar software that is normally referred to as "system software. *(Source: MPD2800.1D, Management of Information Technology Systems and Services)*	System	All
Application Metadata	none	To be defined in Phase 2.	Resource	OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Application Portfolio	none	See definition for *portfolio*.	Resource	AV-1, CV-1, OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Application Portfolio Management	MSFC APM	The centralized management of one or more portfolios, which includes identifying, prioritizing, authorizing, managing, and controlling projects, programs and other related work, to achieve specific strategic business objectives. *(Source: Practice Standard for Work Breakdown Structures – Second Edition)*	Process	AV-1, CV-1, OV-1

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
Application Portfolio Management System	MSFC APMS	The application inventory management system that supports the MSFC Application Portfolio Management (APM) process. The system allows authorized users to enter data about applications and to map applications to Federal Enterprise Architecture (FEA)-based Reference Models and MSFC-defined Application Portfolios. The system also provides analysis and reporting tools.	System	OV-1, OV-3, OV-5a, OV-5b, SV-1
Assessment	none	To be defined in Phase 2.	Activity	CV-1, OV-2, OV-3, OV-5a, OV-5b
Capability	none	To be defined in Phase 2.	Capability	AV-1, CV-1, CV-2, CV-5
Cost of Operations and Maintenance (O&M) Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Data	none	To be defined in Phase 2.	Data	OV-5b
Desired Effect	none	To be defined in Phase 2.	Desired Effect	CV-1, CV-2
Frequency of Use Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Guidance	none	To be defined in Phase 2.	Guidance	OV-5a, OV-5b, StdV-1
Hypertext Transfer Protocol	HTTP	To be defined in Phase 2.	System Function	SV-1
Information Exchange	IE	To be defined in Phase 2.	Resource Flow	OV-2, OV-3, OV-5a, OV-5b
Measure	none	To be defined in Phase 2.	Measure	CV-2, CV-5
Mission Alignment Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
MSFC Application Portfolio Manager	none	The person who serves as the primary point of contact for each of the defined IT portfolios, integrating requirements across organizations and projects/programs. The Portfolio Manager maintains visibility of existing investments and proposals for new investments across the portfolio. (*Source: MPD2800.1D, Management of Information Technology Systems and Services at MSFC*)	Performer, Stakeholder	AV-1, CV-5, OV-1, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1
MSFC Chief Information Officer	MSFC CIO	The person responsible for the overall strategic direction, management, implementation, usability and performance of information and computer technologies at MSFC. (*Source: MPD2800.1D, Management of Information Technology Systems and Services at MSFC*)	Performer, Stakeholder	AV-1, OV-1, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1
MSFC Enterprise Architect	MSFC EA	The person who analyzes and documents the MSFC IT applications, business, and technology infrastructure in its current and future states, which serves to help integrate over-arching MSFC strategy, business, and technology perspectives, project objectives, and high-level performance goals. (*Source: MSFC Enterprise Architecture Management Plan*)	Performer, Stakeholder	AV-1, CV-5, OV-1, OV-2, OV-3, OV-4, OV-5a, OV-5b, SV-1
MSFC Enterprise Architecture Advisory Committee (MEAAC)	MEAAC	The group that directs, oversees, and approves the MSFC enterprise architecture design and operating configurations that affect MSFC IT investments in the following MSFC IT portfolios: Engineering applications, Science applications, Project Management applications, Business Management applications, IT Infrastructure applications, and IT Infrastructure Services. The MEAAC reviews, approves, and controls changes to the baseline configuration of the MSFC enterprise architecture. (*Source: MPD2800.1D, Management of Information Technology Systems and Services a MSFC*)	Performer, Stakeholder	AV-1, OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
MSFC Planning, Policy, and Integration Office	MSFC PP&IO	The organization that provides strategic integration, policy planning, and Knowledge Management services for MSFC. This includes: • Continuous Risk Management • Customer Requirements Analysis • Customer Satisfaction and Surveys • Customer Service Requests • Customer Support Center • Enterprise Architecture • Innovation Management • Integrated Communications Planning • IT Governance • IT Policy • IT Portfolio Management • Organizational Scorecard • Project Management • Directives Management • Records Management • Forms Management (*Source: MSFC Office of the CIO internal web site*)	Stakeholder	AV-1, CV-5, OV-1, OV-4
MSFC Portfolio Data Store	MSFC Portfolio DS	The database in which data about registered MSFC applications resides.	System	OV-2, OV-3, OV-5a, OV-5b, SV-1
MSFC Portfolio DS Application Server	none	To be defined in Phase 2.	System	SV-1
MSFC Portfolio DS Database Server	none	To be defined in Phase 2.	System	SV-1

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
MSFC Portfolio DS Web Server	none	To be defined in Phase 2.	System	SV-1
MSFC Stakeholders	none	To be defined in Phase 2.	Performers, Stakeholders	AV-1, CV-5, OV-1
Network Use Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Number of Users Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Organization	none	To be defined in Phase 2.	Organization	CV-5, OV-4
Performer	none	To be defined in Phase 2.	Performer	OV-1, OV-2, OV-3, OV-5b, SV-1
Portfolio	none	A collection of projects or programs and other work that are grouped together to facilitate effective management of that work to meet strategic business objectives. The projects or programs of the portfolio may not necessarily be interdependent or directly related. *(Source: Practice Standard for Work Breakdown Structures – Second Edition)*	Resource	AV-1, CV-1, OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Primary Functionality Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Remote Procedure Call	RPC	To be defined in Phase 2.	System Function	SV-1
Resource	none	To be defined in Phase 2.	Resource	CV-5, OV-1, OV-2, OV-3, OV-4, OV-5b, SV-1

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
Responsible NASA Official	RNO	The NASA civil servant responsible for establishing the rules for appropriate use and protection of the data/information within a system. The system owner retains that responsibility even when the data/information is shared with other organizations. (*Source: MSFC Application Inventory Module (AIM) online reference*)	Performer, Stakeholder	AV-1, CV-5, OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Retirement	none	To be defined in Phase 2.	Process	AV-1, CV-1, OV-1, OV-2, OV-3, OV-5a, OV-5b, SV-1
Risk Rating Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Rules	none	To be defined in Phase 2.	Rules	future
Scoring Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Security Compliance Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Standard	none	To be defined in Phase 2.	Standard	StdV-1
Submittal	none	To be defined in Phase 2.	Activity	CV-1, OV-5a, OV-5b
System	none	To be defined in Phase 2.	System	OV-3, SV-1
System Exchange	SE	To be defined in Phase 2.	System Function	OV-2, OV-3, OV-5a, OV-5b
Target Retirement Date	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5
Verification	none	To be defined in Phase 2.	Activity	CV-1, OV-2, OV-3, OV-5a, OV-5b
Vision	none	To be defined in Phase 2.	Vision	CV-1

Date: 12 June 2010		MARS Architecture AV-2: Integrated Dictionary		MARS 13
Term	**Abbreviation or Acronym**	**Definition**	**Role in Architecture**	**Views Where Referenced**
Years In Use Measure	none	To be defined in Phase 2.	Resource	AV-1, CV-2, CV-5

Part 3
Reference

24 Abbreviations and Acronyms

Short Form	Long Form
APM	Application Portfolio Management
BCG	Boston Consulting Group
BRM	Business Reference Model
BSC	Balanced Scorecard
CDR	Critical Design Review
CIO	Chief Information Officer
DISR	DoD Information Technology Standards and Profile Registry
DM2	DoDAF V2.0 Metamodel
DoD	Department of Defense
DoDAF	Department of Defense Architecture Framework
EA	Enterprise Architecture
FEA	Federal Enterprise Architecture
FEAC	Federal Enterprise Architecture Certification
FEAF	Federal Enterprise Architecture Framework
GAO	Government Accounting Office
IT	Information Technology
ITIM	Information Technology Investment Management
MARS	Marshall Application Realignment System
MEAAC	MSFC Enterprise Architecture Advisory Committee

Short Form	Long Form
MSFC	Marshall Space Flight Center
NASA	National Aeronautics and Space Administration
OMB	Office of Management and Budget
ORR	Operational Readiness Review
PDR	Preliminary Design Review
PP&IO	Planning, Policy, and Integration Office
RNO	Responsible NASA Official
SCR	System Concept Review
SQ	Stakeholder Question
SRR	System Requirements Review

25 Bibliography

- *Department of Defense Instruction 8115.02, Information Technology Portfolio Management Implementation*, 30 October, 2006
- *DoD Architecture Framework Version 2.0 (DoDAF V2.0) Volume 1: Introduction, Overview, and Concepts Manager's Guide*, 28 May 2009
- *DoD Architecture Framework Version 2.0 (DoDAF V2.0) Volume 2: Architectural Data and Models Architect's Guide*, 28 May 2009
- *Federal Information Processing Standard (FIPS) Publication 183 Integration Definition For Function Modeling (IDEF0)*, 21 December 1993
- Federal Information Processing Standard (FIPS) Publication 184 Integration Definition For Information Modeling (IDEF1X), 21 December 1993
- *IMSB-Plan-2800.1: MSFC Center IT Governance and Organizational Alignment Plan*, 4 April 2008
- NASA web site (http://www.nasa.gov)
- *The FEAC Institute DoD Architecture Framework 2.0 Guidebook DoDAF V2.0*, baseline version draft, 2010
- The FEAC Institute DoDAF V2.0 Certification Program class materials (course slides, virtual library references)

National Aeronautics and Space Administration

Marshall Space Flight Center