
Part III - TECHNICAL ARCHITECTURE

Chapter 1 - INTRODUCTION



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Introduction

The Medicaid IT Architecture (MITA) Framework contains three interrelated architectures: Business Architecture (BA), Information Architecture (IA), and Technical Architecture (TA), shown in **Figure 1-1**. The business capabilities from BA define the data strategy of IA and design the business and technical services of TA. MITA uses all three architectures to develop a business-driven enterprise to provide consistency across the Medicaid Enterprise.

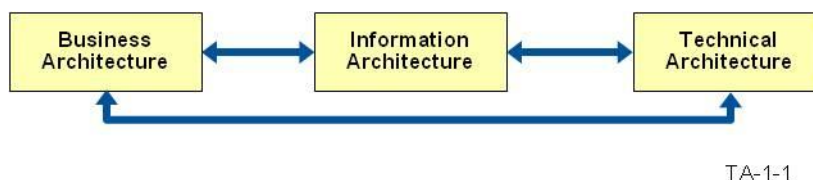


Figure 1-1. MITA Framework Relationship Diagram

The topics covered in this chapter include:

- ❖ Technical Architecture Seven Standards and Conditions
- ❖ Technical Architecture
- ❖ Technical Architecture Components
- ❖ Architecture Dependencies
- ❖ Technical Architecture Development
- ❖ Technical Architecture Benefits
- ❖ Using the Technical Architecture
- ❖ Next Steps in Developing the Technical Architecture

Purpose

The TA Framework describes the technical and application design aspects of the Medicaid Enterprise by leveraging industry standards and best practices. The Medicaid application is leading the move from an isolated environment to a shared health and human services entity, and is doing so while the technology options and application design methods continue to increase at an alarming rate. The TA Framework will assist state leadership in the creation and development of a sound strategy, along with a roadmap that will allow the States to gain an understanding of how to take advantage of the latest advancements in technology from an enterprise perspective.

It is crucial to define the terms “framework” and “standards” in writing as they pertain to the MITA Initiative, in order to achieve a consistent understanding of the terms being used. This is especially true when involving technology focused people involved in business related activities.

Since MITA originates from the early versions of the Federal Enterprise Architecture Framework (FEAF) and other popular Enterprise Architecture (EA) reference models, the MITA TA Framework is at a mid- to high-level of abstraction. As mentioned in the MITA BA and IA sections, when considering the three-layer breakdown of abstraction levels (Conceptual, Logical, and Physical), the MITA TA is at a logical abstraction level. The breakdown is as follows:

- ❖ **Conceptual** – Provides the business owners' view of the solution. A high-level rough picture identifying the most important components and business entities.
- ❖ **Logical** – Provides the system designers/architects view of the solution. A comprehensive picture identifying major components and relationships. This level does not specify vendor solutions or details that will impact flexibility regarding the application creation process.
- ❖ **Physical** – Providing the builders/software developer view of the solution. This is a detailed picture of how to implement the solution.

The topic of most interest surrounding the MITA Framework involves the desire to look to this material to provide specific solutions and to describe a process to achieve a certain level of commonality. The MITA Framework is neither a methodology to dictate a process for implementation nor a software programming framework (i.e., Java, .NET, Spring, etc.) to provide application-specific software or a collection of software libraries and a defined Application Programming Interface (API). Both framework types provide structure, but at different levels.

The Centers for Medicare & Medicaid Services (CMS) provide additional IT Architecture information via Guidance for Exchange and Medicaid Information Technology (IT) Systems (IT Guidance); and Enhanced Funding Requirements: Seven Conditions and Standards (a.k.a. Seven Standards and Conditions). States can obtain technical interoperability at the physical implementation level by collaborating with standards organizations to follow formal rules that govern the standards development process in establishing new standards. The MITA Framework expects to leverage the work of the States and established standards organizations. In order to be a standards organization from a development stance similar to the American National Standards Institute (ANSI), Council for Affordable Quality Healthcare (CAQH), Health Level Seven International (HL7), Organization for the Advancement of Structured Information Standards (OASIS), and Object Management Group (OMG), agencies should follow formal rules that govern the standards development process including voting, open membership and other fair practices. The MITA Framework expects to leverage the work established by the proven standards development organizations (See Part III, Chapter 6, Technology Standards for more details on standards organizations.) and does not intend to be in the position to create and maintain technical standards that may prohibit or stifle creativity, ingenuity, and advancement.

The bottom line is that the States, CMS, and vendors need to collaborate to provide further detail to the TA by doing the following:

- ❖ Create and maintain enterprise models.
- ❖ Create an infrastructure for information exchange.
- ❖ Identify common requirements (i.e., business and technical services).

- ❖ Develop implementation patterns.
- ❖ Identify and develop selected reusable components.
- ❖ Establish defined, common agreed-upon interfaces.

Scope

It is imperative that the States consider the BA and TA together. BA and TA connect and align through hardware, application, and connectivity mechanisms that originate from the BA. The BA and TA are different views of the integrated enterprise framework. Of similar nature, the TA and IA are dependent on each other, and States should coordinate changes to align with business and information needs.

Just as the BA business model has sub-groupings of business areas and processes, TA models have sub-groupings of Technical Service Areas (TSA) with Technical Service Classifications (TSC). (See Part III, Chapter 4, Technical Services for further details.) These sub-groupings allow the evaluation of the TA maturity level during the State Self-Assessment (SS-A), thereby providing an overall picture of the Medicaid Enterprise MITA maturity. Given the transformation potential of Information Technology (IT), it is important to view the TSA as interdependent. The MITA Framework embraces this best practice principle.

The technical architects are responsible for first understanding the BA and IA, and then creating and maintaining the TA to remain in alignment with the other two architectures. Solution architects, guided by the information and technical architectural methodologies, work with the business, information, and technical architects to maintain this alignment. This cooperation continues through design, development, and implementation of State Medicaid Enterprise operations.

As States evolve and begin aligning their technology with the MITA Framework, they will see a shift from traditional siloed methodologies to an enterprise approach that includes other Health and Human Service (HHS) related systems. This shift results in the engagement of interoperability concepts to replace outdated data warehouse and data distribution methods with data-sharing, Service-Oriented Architecture (SOA), and Cloud Computing concepts and practices.

A SOA is a set of principles and methodologies for designing and developing software in the form of interoperable services. These services are well-defined business functions built as software components that enable reuse for different purposes.

Background

States, territories, and the District of Columbia (hereinafter referred to as States) are responsible for their own individual State Medicaid Enterprise, and all entities are different in important ways. Differences include:

- ❖ Organizational structure, covered programs, and lines of business.
- ❖ Business rules, policies, and procedures affecting stakeholders.
- ❖ Relationships with other state and local agencies.
- ❖ Revenue sources.

- ❖ Location of business units.
- ❖ Workflow.
- ❖ Range of outsourcing.
- ❖ Technical solutions.
- ❖ Establishing defined common agreed-upon interfaces.

The States differ in their concept of an enterprise, the roles and responsibilities of one or more Chief Information Officers (CIOs), adoption of data and technical standards, and the use of legacy versus state-of-the-art applications. Given these differences, it is not possible or desirable, in the context of the MITA Framework, to develop a standalone business and technical model for each individual State Medicaid Enterprise. Rather, MITA establishes a national framework of common processes and enabling technologies to support improved program administration in all States.

The MITA Initiative began with the concept of designing Medicaid Management Information Systems (MMIS) using a SOA. The MITA three-part architecture framework (BA, IA, and TA) and with the business maturity model guide the planning of process improvement, technology, and infrastructure build-out to meet the changing business needs of the State Medicaid Enterprise.

Funding Requirements

The HHS CMS 42 CFR Part 433 Medicaid Program; Federal Funding for Medicaid Eligibility Determination and Enrollment Activities modified Medicaid regulations for Mechanized Claims Processing and Information Retrieval Systems effective April 19, 2011. The MMIS is a mechanized claims processing and information retrieval system used by the States for Title XIX of the Social Security Act (The Act); therefore, the guidance set forth in CMS 42 CFR Part 433 applies to the MMIS as well as the Medicaid eligibility determination and enrollment activities as set forth in the Affordable Care Act of 2010.

CMS expects States to meet the standards and conditions specified in §433.112(b)(10) through §433.112(b)(16). The standards and conditions are descriptive in nature; however, CMS recognizes that in order for the States to meet these standards and conditions, it is necessary to provide additional guidance that clearly articulates its criteria for meeting them in terms of timeliness, accuracy, efficiency, integrity, and performance measures for mechanized claims processing. In response to this need, additional guidance materials include:

- ❖ Enhanced Funding Requirements: Seven Conditions and Standards (a.k.a. Seven Standards and Conditions)
- ❖ Guidance for Exchange and Medicaid Information Technology (IT) Systems (a.k.a. IT Guidance)

CMS will continue to refine, update and expand this guidance in the future, based on feedback from stakeholders and with experience over time.

Technical Architecture Seven Standards and Conditions

The MITA team evaluated and incorporated the 42 CFR Part 433 Medicaid Program; Federal Funding for Medicaid Eligibility Determination and Enrollment Activities in the Technical Architecture for purposes of guiding the MITA stakeholders to apply the guidance to State Medicaid Enterprises.

Each of the architectures aligns with the Seven Standards and Conditions. By utilizing best practices, industry standards, and technological advancements, the processes, and planning guidelines that build the MITA framework provide a cohesive method for meeting State Medicaid objectives

Table 1-1 depicts the impact of the Seven Standards and Conditions on the MITA BA, IA, and TA.

Table 1-1. Correlation of Seven Standards and Conditions with MITA

Correlation of Seven Standards and Conditions with MITA Architectures			
Standards and Conditions	Business Architecture	Information Architecture	Technical Architecture
Modularity Standard	X	X	X
MITA Condition	X	X	X
Industry Standards Condition	X	X	X
Leverage Condition	X	X	X
Business Results Condition	X	X	X
Reporting Condition	X	X	X
Interoperability Condition	X	X	X

The TA includes:

- ❖ **Modularity Standard** – Uses a modular, flexible approach to systems development, including the use of open interfaces and an exposed API; the separation of business rules from core programming; and the availability of business rules in both human and machine-readable formats. The States commit to formal system development methodology and open, reusable system architecture.
- ❖ **MITA Condition** – States align to and advance increasingly in MITA maturity for business, architecture, and data.

- ❖ **Industry Standards Condition** – Ensures alignment with, and incorporation of, industry standards: the Health Insurance Portability and Accountability Act of 1996 (HIPAA) security, privacy and transaction standards; accessibility standards established under section 508 of the Rehabilitation Act, or standards that provide greater accessibility for individuals with disabilities, and compliance with federal civil rights laws; standards adopted by the Secretary under section 1104 of the Affordable Care Act; and standards and protocols adopted by the Secretary under section 1561 of the Affordable Care Act.
- ❖ **Leverage Condition** – States solutions should promote sharing, leverage, and reuse of Medicaid technologies and systems within and among States.
- ❖ **Business Results Condition** – Systems should support accurate and timely processing of claims (including claims of eligibility), adjudications, and effective communications with providers, beneficiaries, and the public.
- ❖ **Reporting Condition** – Solutions should produce transaction data, reports, and performance information that would contribute to program evaluation, continuous improvement in business operations, and transparency and accountability.
- ❖ **Interoperability Condition** – Systems must ensure seamless coordination and integration with the Exchange (whether run by the state or federal government), and allow interoperability with health information exchanges, public health agencies, human services programs, and community organizations providing outreach and enrollment assistance services.

Technical Architecture

This section provides an overview of the key features and benefits of the TA and serves as a background for the remaining sections. The TA is a consolidation of principles, models, and guidelines that form a template for the States to use in developing their own operating model to guide the evolution of their foundation for execution. Examples of principles and standards include interoperability, Cloud Computing (X as a Service - Axis), SOA, and EA. See Part III, Chapter 2, Technical Management Strategy and Part III, Chapter 5, Application Architecture, for a more detailed discussion of these principles and standards.

Medicaid systems require a rigorous and methodical approach to TA development because of interoperability requirements, the use of an Electronic Health Record (EHR), and developing standards. MITA supports this transformation by providing architecture and guidelines that offer a common reference point for each state to leverage when building its own State Medicaid Enterprise. The TA provides the overall guidance to support States individually and collectively in maintaining the standards.

Technical Architecture Components

The MITA TA contains the following components:

- ❖ Technical Management Strategy
- ❖ Business Services

- ❖ Technical Services
- ❖ Application Architecture (AA)
- ❖ Technical Standards
- ❖ Technical Capability Matrix (TCM)

These are living models that evolve with the MITA Framework life cycle. The MITA team tailored the level of detail in each model to meet the specific needs of the intended audience. **Figure 1-2** provides an overview of the components of the TA. See Part III, Chapters 2 through 7 for a more detailed description for each of these components.

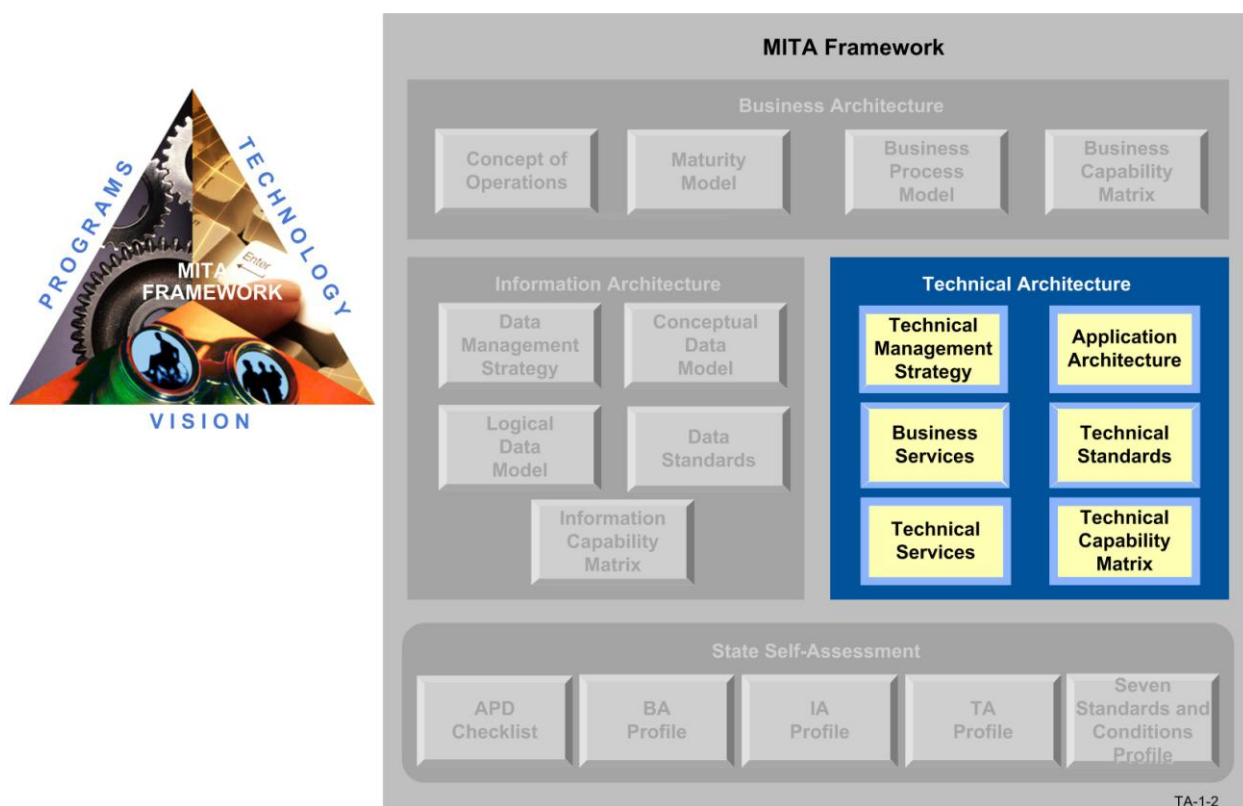


Figure 1-2. Technical Architecture in the Context of the MITA Framework

The six (6) TA components are an integrated architecture that provide standardization, data sharing, and interoperability.

1. **Technical Management Strategy** – Provides the background and process for expanding Medicaid systems to incorporate modern-day technologies into the Medicaid Enterprise. The involvement of sound software design architecture practices and technology advances such as Cloud Computing will provide the foundation for enhanced capabilities.

2. **Business Services** – Implements a business capability for a business process. It is a basic element in Cloud Computing and Service Adoption architecture. The goal of the TA is to specify business services that allow interoperable Medicaid business processes.
3. **Technical Services** – Consists of a detailed set of technical functions that collectively define the MITA technology infrastructure. Within a given TSC and corresponding TSA, the TA defines the technical software services.
4. **Application Architecture** – Provides the information necessary to develop enterprise applications using business and technical services.
5. **Technology Standards** – Consists of the Technical Reference Model (TRM) and a Standards Profile. The TRM is a list of technical services, either aggregated or broken down into levels, that specify the standards. The Standards Profile includes current, future, and emerging industry standards.
6. **Technical Capability Matrix** – Defines a set of high-level technical functions to enable the MITA business capabilities, and support the success of the Medicaid mission and goals, while meeting the MITA goals and objectives. The TCM supplements the Business Capability Matrix (BCM), and the Information Capability Matrix (ICM) in defining a benchmark for States to transform themselves in accordance with MITA principles. Each technical capability consists of one or more technical services.

The Conceptual Technical Architecture Model presents the high-level view of the MITA Initiative across the entire Medicaid Enterprise (see **Figure 1-3**). The diagram decomposes concepts in the Data Architecture, AA, and TA into specific services, architecture patterns, and standards, which States can use as a guideline.

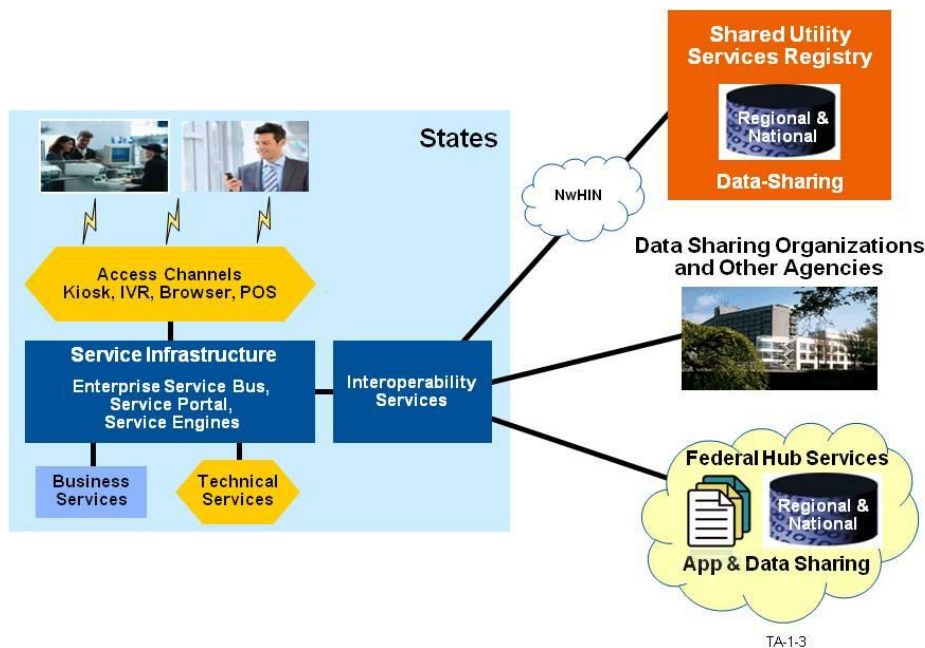


Figure 1-3. MITA Conceptual Technical Architecture Model

Architecture Dependencies

The interrelated BA, IA, and TA function together to provide the Medicaid Enterprise solution. The BA describes the business processes along with data input, data output, and required shared data. The IA provides the bridge between the business view of operations and the technical view of the data. The TA describes the technology enablers associated with different levels of maturity.

Business Architecture Link

The Business Process Model (BPM) requires a companion technical model. For example, the business process Determine Provider Eligibility lists a set of input data coming from the application (e.g., name, address, and other required data). The business capability for Determine Provider Eligibility at maturity level 1 requires that this data adheres to state requirements and is a manual process. At maturity level 3, an actor enters provider enrollment data in a single location, and state agencies share this data using an API. At maturity level 4, the State Medicaid Agency (SMA) shares enrollment data including credentialing information between interstate Medicaid and Medicare agencies.

Information Architecture Link

The TA requires a companion IA. The information model translates and defines the data needs of the BA into the specifications for the TA. The IA also provides the vision and guidance for information management to implement the technical functions and technical capabilities. The data portions of the service specification originate from the Logical Data Model (LDM).

The Conceptual Data Model (CDM), together with the LDM, comprises the Medicaid Enterprise Data Model Layer

The state describes the As-Is operations and To-Be environment data needs for its own State Medicaid Enterprise. Through a series of models, the architecture specifies key Medicaid Enterprise information necessary to execute the BA business processes. These elements include the principles, goals, access strategies, information, and applications to support the enterprise's business functions.

Technical Architecture Development

Early architects designed the MMIS primarily as a financial and accounting system and defined it as a single, integrated system of claims processing and information retrieval.

As more Medicaid functions (e.g., managed care, and data analysis) became automated, States added separate systems or, in some cases, hard coded the functionality into the MMIS. As a result, these dispersed systems do not necessarily communicate directly and often exchange information with difficulty. For example, Medicaid administrators cannot

retrieve an hourly-consolidated overview of all provider and beneficiary activity because of such fragmentation.

These special-purpose, “best-of-breed” systems may require multiple servers and user support systems (e.g., separate applications and call centers). Each separate platform may have its own unique and proprietary architecture, data standards, update cycles, and workflow requirements. This makes it increasingly difficult and expensive to maintain.

A dispersed data approach complicates data sharing between intrastate and interstate agencies. The lack of standardization requires extensive translation of data among States, which is a burdensome process. As a result, States share data occasionally often using a manual process. There are other challenges with a dispersed data approach. For example, end users should know which subsystem performs what function. States may require users to sign onto multiple systems to perform a single task, such as verifying eligibility and enrollment.

Figure 1-4 depicts how incorporating Enterprise Service Bus (ESB) technologies provides the foundation for TA development. This involves a process that focuses on defining common services that make up the SOA, including the following:

- ❖ Data and Access Services
- ❖ Integration Services
- ❖ Security and Privacy Services

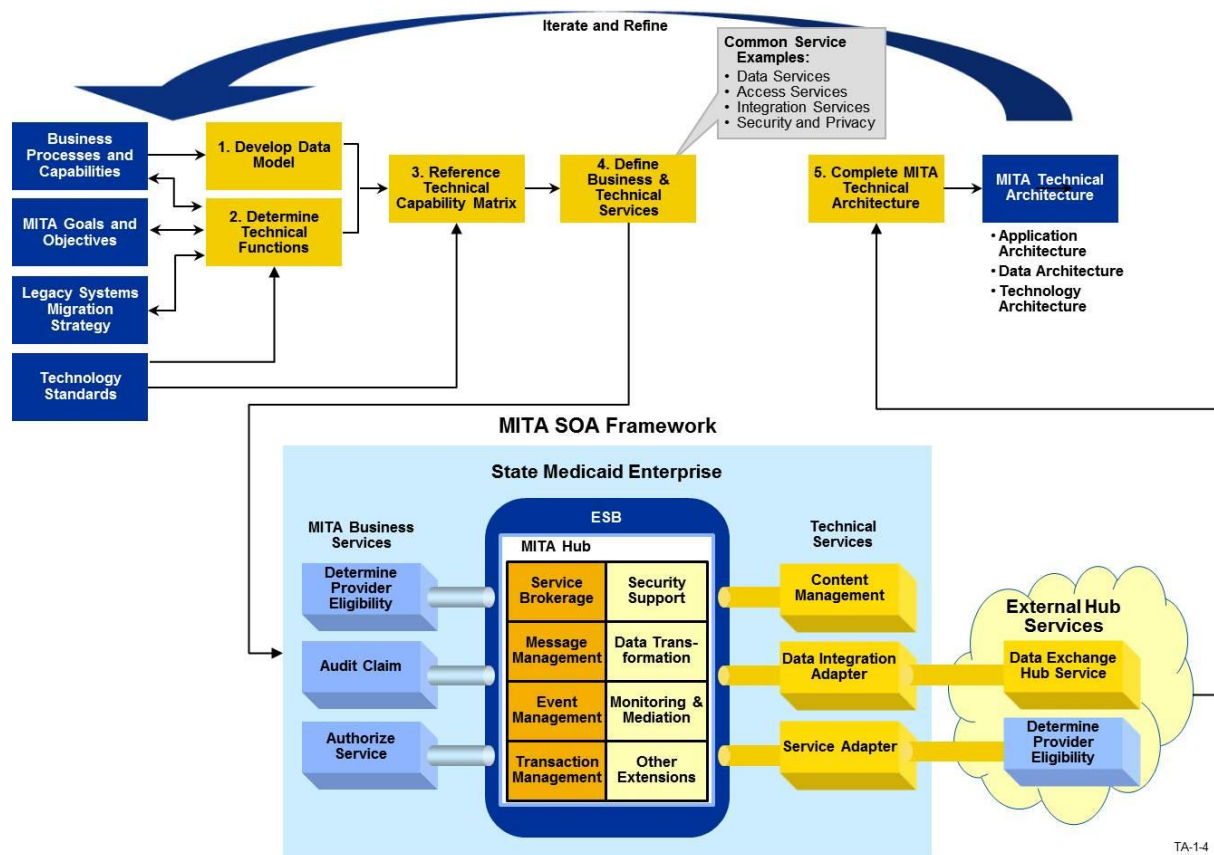


Figure 1-4. Developing the Technical Architecture

There are five (5) primary steps in the process for TA development.

- 1. Develop Data Model** – Successful data sharing is a key factor in the Medicaid Enterprise. Development of the data model focuses on identifying the data elements needed by the business processes to allow for the identification of standards. This will enable successful sharing within a single State Medicaid Enterprise as well as intrastate and interstate organizations.
- 2. Determine Technical Functions** – Determine the needs to enable the business services. This step involves gathering the business processes and capabilities, MITA goals and objectives (including whether to use Cloud Computing), current technology standards, and identifying possible legacy migration ramifications to derive a set of technical functions required for the process.
- 3. Reference Technical Capabilities Matrix** – Use the defined technical functions and specified data that provides one or more of the following:
 - A.** Enabling one or more business capabilities, e.g., forms management and workflow for automating provider enrollment.

-
- B. Realizing one or more MITA goals or objectives, e.g., enabling the MITA objective of promoting reusable components and modularity by using technical capabilities that are part of a SOA, such as the use of an ESB.
 - C. Enabling the transition of a legacy system or process to the MITA EA, e.g., the development of a wrapper for integrating a legacy mainframe application written in Common Business-Oriented Language (COBOL) and using an Integrated Database Management System (IDMS) database into the SOA.
4. **Define Business and Technical Services** – Users develop technical services by breaking down the technical capabilities into lower-level components necessary to support business processes.
5. **Complete Technical Architecture** – After completing the preceding activities, develop the remaining artifacts for the TA. The following describes the development of each artifact.
- A. The MITA Data Architecture
 - i. Architects analyze Data Services to define design patterns for providing each service. Examples of data management design patterns include designing a data hub that allows integration of data from multiple data sources.
 - B. The MITA AA
 - i. Architects design MITA AA as a SOA. The definition of the business and technical services is in Step 4 above. The completion of the AA consists of describing the SOA Framework for the integration, orchestration, and management of these services, including defining mechanisms such as the ESB and the service management engine.
 - C. The Medicaid EA
 - i. Since the architects have already developed the TCM and defined the technical services in previous activities, they will complete the following activities:
 - a. Develop the Standards Reference Model (SRM), which involves subdividing the technical services defined in Step 4 to levels where each of the subdivided, lower-level services can associate with a technical standard.
 - b. Assign standards to each technical service in the SRM.

States should pursue a service-based and cloud-first strategy for system development. States will identify and discuss how they will identify, evaluate, and incorporate commercially or publicly available off-the-shelf or open source solutions, and discuss considerations and plans for cloud computing.

Technical Architecture Benefits

A standards-based approach to building IT infrastructure facilitates the reuse of solutions and the integration of Commercial Off-the-Shelf (COTS) products to reduce IT costs of development for States and CMS. A SOA design reduces maintenance costs by simplifying the process of making changes. The State Medicaid Enterprise responds faster to statutory, programmatic, and technology changes because the SOA and services are adaptable and extensible.

A combination of the standards approach, services, security and privacy, and the hub architecture provides easier access to information. Increased data exchange and access improves fraud detection and investigation and helps detect health patterns (e.g., disease and bioterrorism) to improve health outcomes. States also improve investment decisions with better access to information and common performance standards. The TA also improves statistical analysis by utilizing data standards, performance standards, and enhanced data exchange. States use the TA to streamline their business processes, invest in appropriate resources, improve service to beneficiaries, and monitor patient safety and patient care to improve health outcomes.

Using the Technical Architecture

States will use the TA as a reference implementation model for its own State Medicaid Enterprise. As a reference document, the TA provides a conceptual view of the Medicaid technical enterprise and is a source for standardized solutions that specifies the details related to business and technical services, information needs, and the IT infrastructure. A state may use the TA as a source for Advance Planning Documents (APD) and Request for Proposal (RFP) creation.

Next Steps in Developing the Technical Architecture

The MITA Framework delivers the starter kit for a controlled state Medicaid transformation. MITA will always be a work in progress. CMS continues to collaborate with federal and state authorities, vendors, and data standards organizations to further develop and maintain the TA components. The CMS MITA team will continue to support state efforts by serving as a conduit for improvements to the MITA Framework that all States and vendors can access.

The MITA Framework and the TA are ever evolving so that the SMA can continuously improve the way it delivers services to beneficiaries and providers, account for outcomes, reward participants based on performance, and respond dynamically to requests for information.



TA-1-5