Solution Architecture Framework Toolkit

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Health and Human Services Agency, Office of Systems Integration

Revision History

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Table of Contents

1 INTRODUCTION 1
1.1 PURPOSE 1
1.2 BACKGROUND 1
1.3 EA ROLES AND RESPONSIBILITIES 1
1.3.1 SA Role 2
1.3.2 Sponsor's EA Role 3
1.3.3 EAO Role 3
2 SOLUTION ARCHITECTURE METHODOLOGY 3
2.1 SOLUTION ARCHITECTURE LIFE CYCLE 4
2.2 PROJECT SOLUTION ARCHITECTURE LIFECYCLE DELIVERABLES 4
2.3 SOLUTION ARCHITECTURE DELIVERABLE VALIDATION 5
2.4 THE CONCEPTUAL PHASE 5
2.5 THE LOGICAL PHASE 7
2.6 THE PHYSICAL PHASE 8
2.7 THE MONITOR AND UPDATE PHASE 10
2.8 THE TRANSITION PHASE 10
3 SAF TOOLKIT COMPONENTS 10
3.1 SAF TOOL COMPOSITION 10
3.2 SAF TOOLS 11
4 REFERENCES 11
4.1 OSI EA WEBSITE 12
4.2 ACRONYMS 12
4.3 DOCUMENT MAINTENANCE 12

List of Figures

Figure 1: Relationships between Project Office, OSI EAO, and Sponsor EA Program 2
Figure 2: SAF Toolkit Deliverables by Life Cycle Phase 4
Figure 3: SAF Toolkit Workflow 5
Figure 4: The Conceptual Phase Models Relationship to Plans and PMLC Documents 7
Figure 5: The Logical Phase Models Relationship to SDLC Analysis Phase and Procurement Documents 8
Figure 6: The Physical Models Being Used to Create the Detailed Design Specifications 9

1 INTRODUCTION

1.1 Purpose

The Office of Systems Integration (OSI), Enterprise Architecture Office (EAO) developed the Solution Architecture Framework (SAF) Toolkit as a guide to assist solution architects (SAs) assigned to and supporting a project team. The SAF Toolkit provides SAs with the means for creating project solutions that are leveraged appropriately across the enterprise's business activities and technical infrastructure to ensure effectiveness and value to the project sponsor. This Toolkit allows SA's to create a consistent set of deliverables that model the solution's business, data, service, and technical infrastructure to address the project sponsor's business needs and furnish the "blue prints" needed by the project's development team.

1.2 Background

The SAF Toolkit consists of a methodology, a series of templates, instructions, and examples of completed models to facilitate the development of an architected solution and the architecture deliverables required for the project effort. The SAF Toolkit is an important part of Enterprise Architecture (EA) implementation as it obtains and considers information from a project sponsor's EA program, along with their business strategy and relevant drivers to create a solution within the project scope. The SAF Toolkit helps the SA provide a project solution that is aligned within the context of the enterprise's business activities, management of data, service delivery approach, and technology use. This alignment ensures that the project solution indentifies opportunities for sharing across the appropriate community of interest and helps sponsors avoid unnecessary redundancy and cost.

1.3 EA Roles and Responsibilities

The project SA needs to understand their role in relation to the Project Office, the Sponsor's EA office, and OSI's EA office. This understanding facilitates interaction and exchange of information to ensure the project solution aligns with the Sponsor's EA program direction and fits within the context of their enterprise. Figure 1 illustrates the relationship between the various offices.

The Sponsor EA Program specifies the standards and direction for their enterprise's current and future states. The OSI EA Office provides the methodology and tools to aid the project SA in creating models to identify a solution that is consistently defined and aligned to the Sponsor's EA program. If appointed during the Initiation phase of the Project Management Life Cycle (PMLC), the SA may begin work on the conceptual models. Otherwise, the EA program should aid in defining these models. While the Project Team is following the PMLC's Planning and Executing Phases the SA is completing SAF deliverables in parallel to support project activities during each phase. This same approach holds true during the System Development Life Cycle (SDLC) Requirements Analysis and Design phases. The SA works closely with members

of the project staff to ensure that efforts are not duplicated. In many cases, the resulting solution architecture deliverables are used or referenced in SDLC and PMLC deliverables. The SA also determines the opportunities that exist to help achieve the sponsoring EA program's future state.

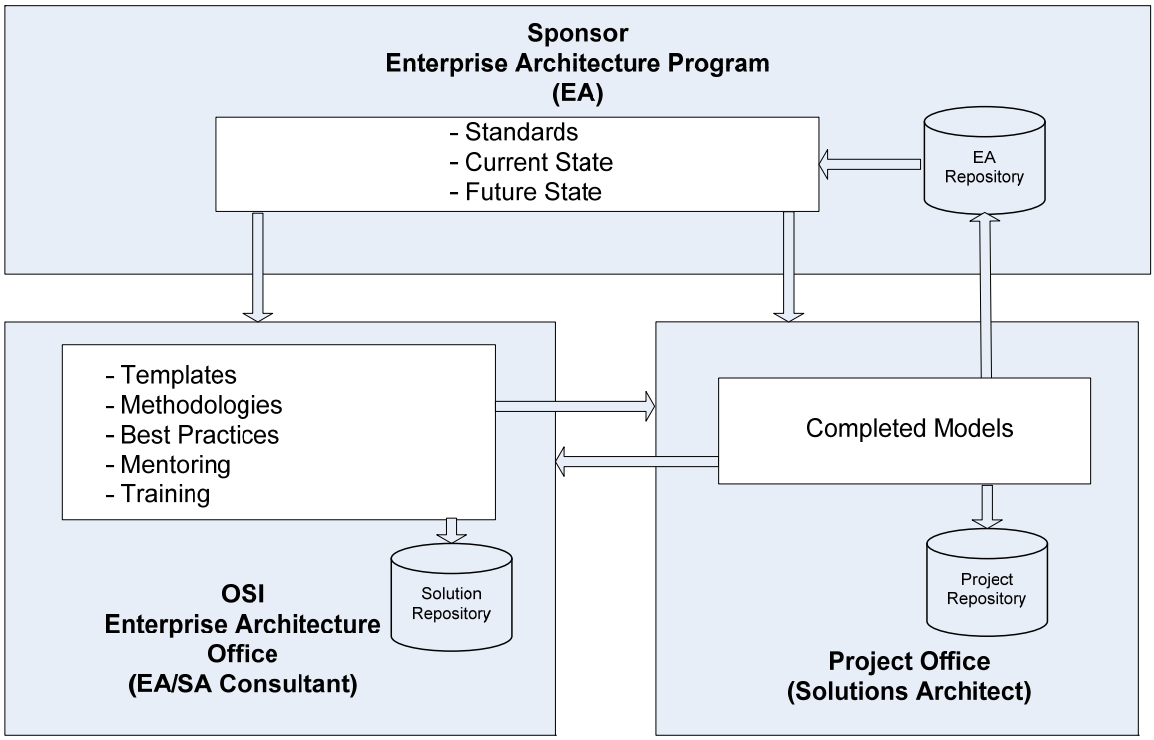

Figure 1: Relationships between Project Office, OSI EAO, and Sponsor EA Program

1.3.1 SA Role

The Solution Architect (SA) is responsible for using the SAF toolkit methodology to create or oversee the completion of SAF models. The Project Office should obtain a SA prior to the Requirements Analysis phase of the SDLC and preferably, during the Initiating phase of the PMLC. This allows the SA to aid in the creation of key deliverables such as the Project Concept Statement, Feasibility Study Report (FSR), and/or Advance Planning Document (APD).

The SA normally reports to the project director and/or manager and interacts with the project team members, the business Subject Matter Experts (SMEs), the project sponsor, and the customers receiving the business service. For this document, a business service is defined as a logical set of business processes performed on a continual basis to carry out the sponsor's identified Sub-function (as defined in the Business Architecture Model template).

The SA also interacts with the sponsor's enterprise architects to obtain EA information relevant to the project effort. Initially the SA uses the Sponsors EA information and the SAF Toolkit to identify and understand the sponsor's

business before determining what is needed in the technical environment. This approach allows the SA to help ensure that the project effort will be highly successful. Upon delivery and implementation of the project solution, the SA provides relevant EA information back to the department and/or agency EA program so that the sponsor can update their EA repository. Project solution architecture deliverables are provided to OSI's EA Office.

1.3.2 Sponsor's EA Role

The SA interacts with the sponsor's EA program and Enterprise Architects in a number of ways. During the planning and design of the solution, the sponsor's Enterprise Architects provide both current and future state information that involves the sponsor's business, data, service (solutions), and technology to the project SA. The current state provides an overview of what currently is managed by the department or agency while the future state information provides the department or agency vision of the targeted state to be managed. This EA information helps the SA ensure alignment with state, agency, and/or departmental business plans and technology direction and identify requirements or standards that the project should employ as part of the solution. This information also helps the SA determine what re-use opportunities exist to support the development of a project solution.

1.3.3 EAO Role

The EAO provides both a Solution Architecture consulting service and a SAF Toolkit to support the project's SA. OSI's EA staff supports project offices by mentoring the SA in the use of the SAF Toolkit and providing information about federal, state and departmental standards and future state, when the sponsor's EA Program information is insufficient or unavailable to address the project office need. The EAO maintains a solution architecture repository consisting of solution architecture models (completed SAF templates) and lessons learned collected from previous project efforts. This repository is made available for use by SAs working on other projects. This information is also used by OSI's EAO to ensure that best practices contained in the SAF Toolkit are refined for use by future projects.

2 Solution Architecture Methodology

The SA employs a progressive methodology based on a Solutions Architecture Life Cycle (SALC). The methodology begins with development of conceptual models of the solution based on the enterprise's business activities and drivers, progresses to the creation of logical models that define the data, services (application) and technologies required, and culminates in physical models that further define the solution prior to development. The solutions architecture methodology is synchronized to produce these models in conjunction with the PMLC and SDLC phases described by OSI's Best Practices (see http://www.bestpractices.osi.ca.gov/default.aspx). Use of this methodology

ensures proper sequencing of SA activities and availability of solution models in support of the project effort. The models created by the Solution Architect represent a set of blueprints provided as solutions architecture deliverables so that the project team can acquire or develop a solution.

2.1 Solution Architecture Life Cycle

The Solution Architecture Life Cycle (SALC) consists of five phases. These include the Conceptual, Logical, Physical, Monitor and Update, and the Transition Phases. Each phase consists of specific SA activities that generate (or maintain) a set of solution architecture deliverables in the form of models that define the project solution. Figure 2 illustrates the five phases of the SALC and the SAF Toolkit models (solution architecture deliverables) in relationship to the PMLC and SDLC. Completed models are used as input to help generate various PMLC and SDLC deliverables.

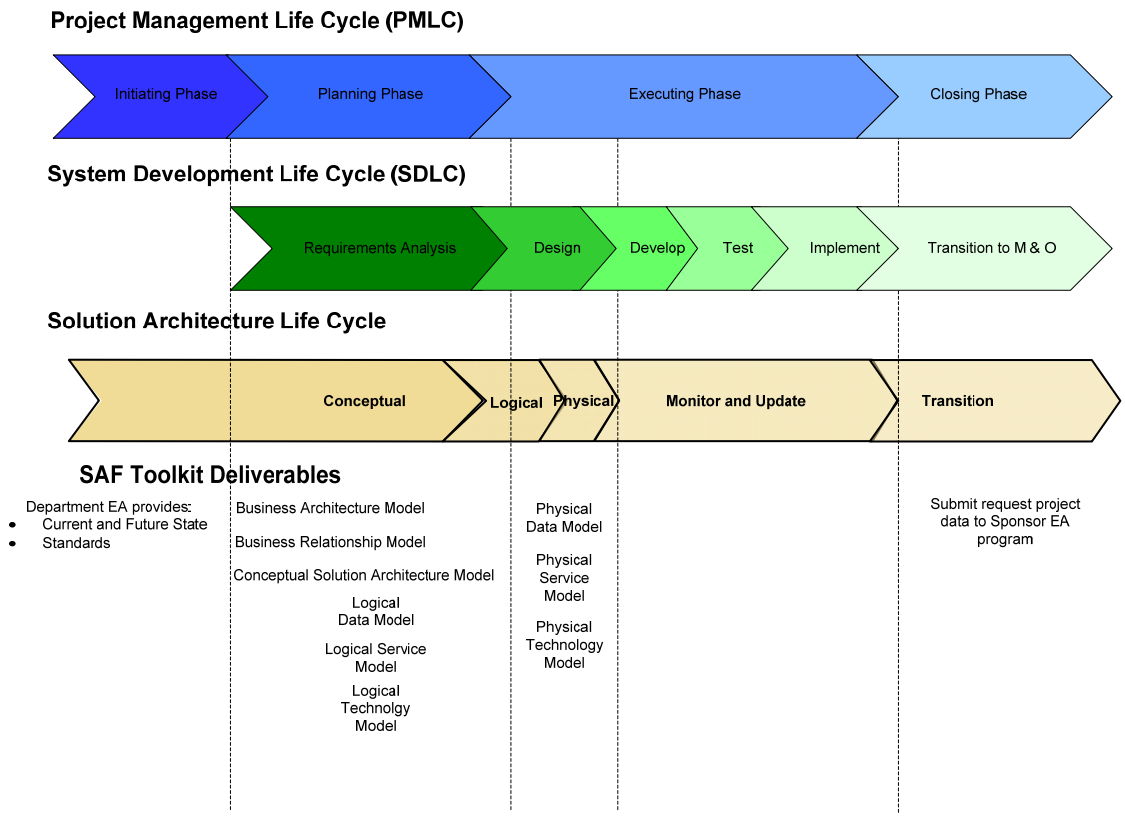

Figure 2: SAF Toolkit Deliverables by Life Cycle Phase

2.2 Project Solution Architecture Lifecycle Deliverables

The SA uses the SAF Toolkit methodology and tools to produce a set of architectural deliverables. The various tools included in the SAF Toolkit provide

templates and instructions that are used to create a set of models that describe the project's solution conceptually, logically, and physically. Information gathered and entered into a template during one phase is carried forward to become a key input to the models developed during the next phase of the SALC. For example, the Logical Data Model (LDM) is refined to create the Physical Data Model (PDM). The PDM is then provided to the development team as a detailed blueprint for implementing the database design. Figure 3 depicts the high level work flow that the SA uses for generating the set of models that describe the project solution.

The SAF Toolkit templates are not only used to create models of the solution, but they also help the SA determine what information needs to be extracted from the sponsor's EA program. Template instructions cause the SA to consider which of the sponsor's business, performance, data, service, and technology components and standards should be used as part of the project's proposed solution.

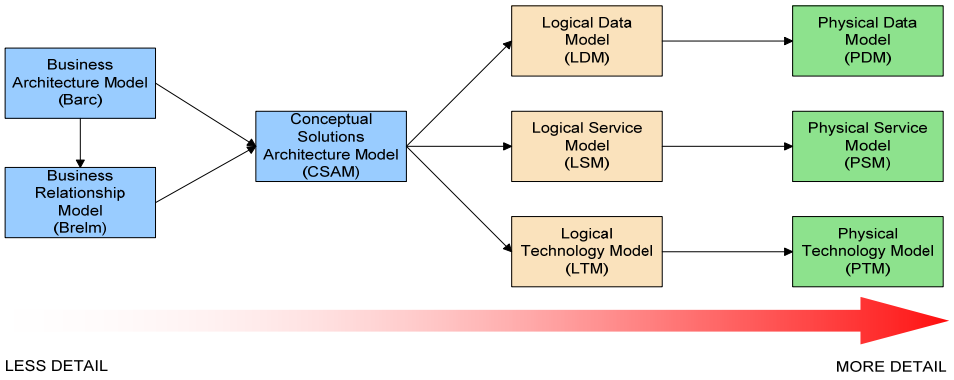

Figure 3: SAF Toolkit Workflow

2.3 Solution Architecture Deliverable Validation

The SA submits completed solution architecture deliverables (models) to the project's IV & V team for verification and validation. This team is the principle reviewer of the output of SALC. After IV&V review, the SA provides finished models to the rest of the project team and forwards completed models to the OSI EAO along with the IV & V findings.

2.4 The Conceptual Phase

The Conceptual phase initiates the SALC. The SA uses the SAF Toolkit's Business Architecture, Business Relationship, and Solutions Architecture Conceptual Solution templates and instructions to guide development of a set of conceptual models of either the proposed solution or the alternatives being considered and evaluated. These models identify the department's business based on the Business Reference Model, the business relationships involved,

and culminate in development of an overall conceptual solution by taking into account the agency and sponsoring Department's plans, project portfolio, and EA program information.

The key actions associated with this phase are to:

- Ensure alignment within the business area and identity the business service (or services) being addressed
- Identify the business partners and relationships involved in providing the business service
- Create an overall model of the proposed solution and alternative solutions required to interact with business partners and deliver the business service to the customer.
- Provide input to the sponsor's business case as expressed in the Project Concept Statement, FSR, and Economic Analysis Worksheet (EAW).

At this point, the project is either developing or has an approved Project Concept Statement and may have an initial project charter. Other documents, such as the ITCP and strategic plans may also be available. These documents help define the actual business problem that the solution must address and forms the basis for identifying and evaluating alternatives for the proposed solution. As such, they are considered inputs to the Conceptual Phase of the SALC. If the Project Concept Statement has not been developed, the conceptual models can be used to aid in the creation of that document. Figure 4 shows how the conceptual models are used in conjunction with the PMLC and planning documents.

The Business Architecture component of the toolkit helps ensure that the SA's proposed solution aligns with the California, Agency, and Departmental Business Reference Models. The solution identified at the conceptual level also identifies the business services the solution needs to provide to the customers and what mechanisms are involved in service delivery. The deliverables from this phase of the SA life cycle include the Business Architecture Model (BArc), the Business Relationship Model (BRelM), and the Conceptual Solution Architecture Model (CSAM). The CSAM is particularly useful for establishing the solution's business, functional, and technical requirements. The Sponsor's Performance Reference Model also provides the SA with information concerning the level of performance being sought by the system which is incorporated into the CSAM to further define system requirements. Solution architecture deliverables from the Conceptual Phase are used as inputs required for creation of the Project Concept Statement, an FSR or APD, the Master Project Management Plan, and/or acquisition deliverables

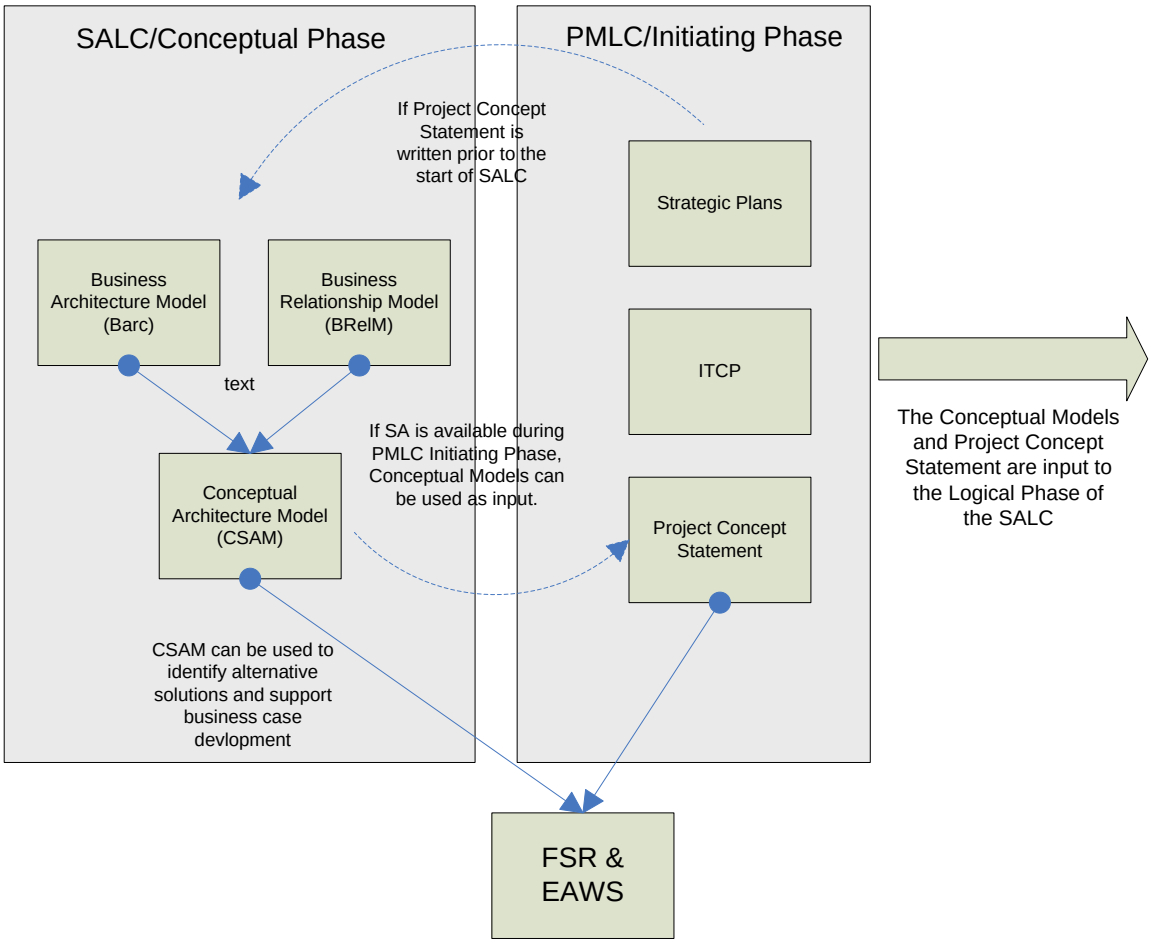

Figure 4: The Conceptual Phase Models Relationship to Plans and PMLC Documents

2.5 The Logical Phase

The objective of this phase is to move from a conceptual to a logical expression of the solution of the business service solution, supporting data and technology models. Using the project's deliverables from the Conceptual Phase as well as business, data, and technical information from the Sponsor's EA program, the SA works with the other project team members (SMEs and business customers) to create the logical models required for the solution. The deliverables from this phase of the SALC include the Logical Data Model (LDM), the Logical Service Model (LSM), and the Logical Technology Model (LTM). These models form the basis for the initial design of the data model, service model, and technology infrastructure needed for the solution. Collectively, these models are used as

input to the SDLC Requirements Analysis phase deliverables including the System Requirement Specification and the Software Requirements Specification. Figure 5 illustrates how the logical models relate to the Software and System Requirements Specifications during the Requirements Analysis Phase of the SDLC and how these documents relate to the creation of the specification portion of the procurement documents (the RFP).

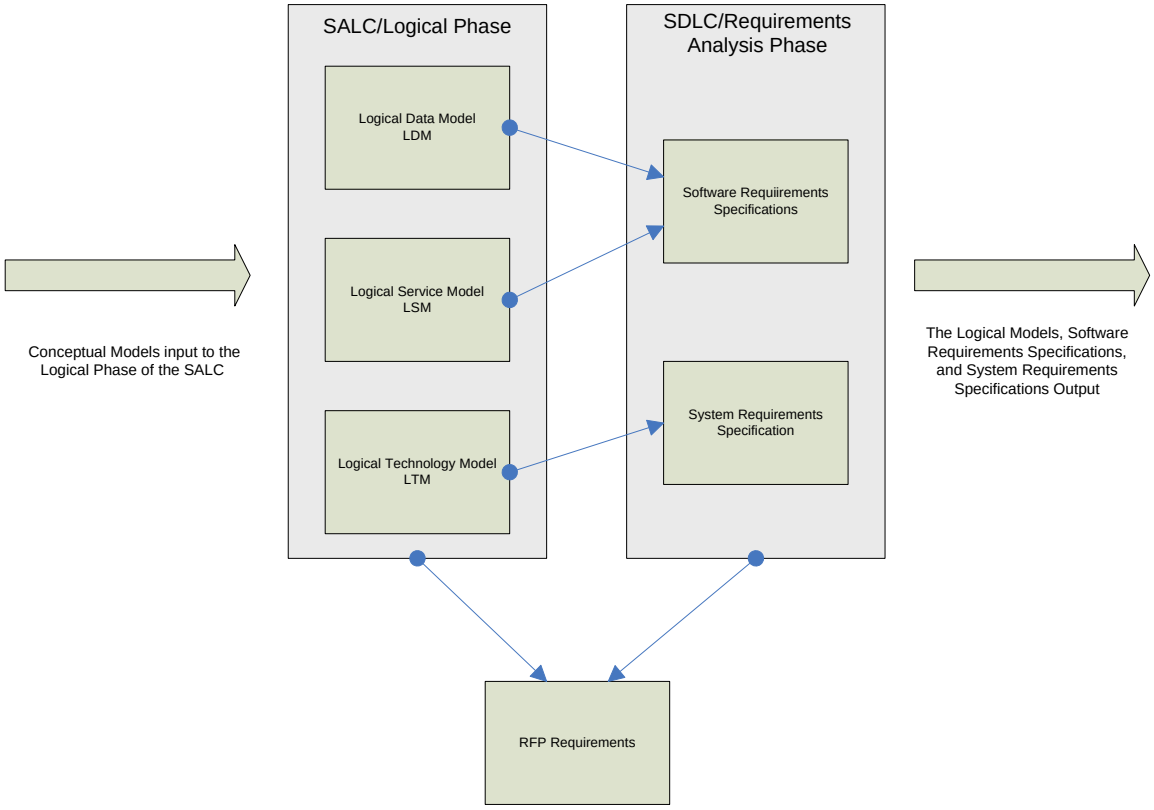

Figure 5: The Logical Phase Models Relationship to SDLC Analysis Phase and Procurement Documents

2.6 The Physical Phase

The primary focus of this phase is to extend the description and definition of the solution to the physical level. The SA or designated members of the project team use logical models and other project deliverables as inputs to create the physical models of the solution in terms of the service system, data, and technology. These models identify the specific data components, service standards, and technologies required to implement the logical design. The SA takes into account the logical models, the agency's future state direction, and the standards or components defined by the sponsor's EA program to determine what is

included in these physical models. The physical service, data, and technical models in conjunction with the System Requirements Specification and Software Requirements Specification serve as the development team's blueprints for creating the detailed design needed to produce the solutions application components, the data base, hardware suites, and infrastructure environments. The deliverables from this phase of the life cycle include the Physical Data Model (PDM), the Physical Service Model (PSM), and the Physical Technology Model (PTM). Figure 6 shows how the physical models, in conjunction with the SDLC software and system requirements are used by the development team to produce the Detailed Design Specifications that close out the Design phase of the SDLC.

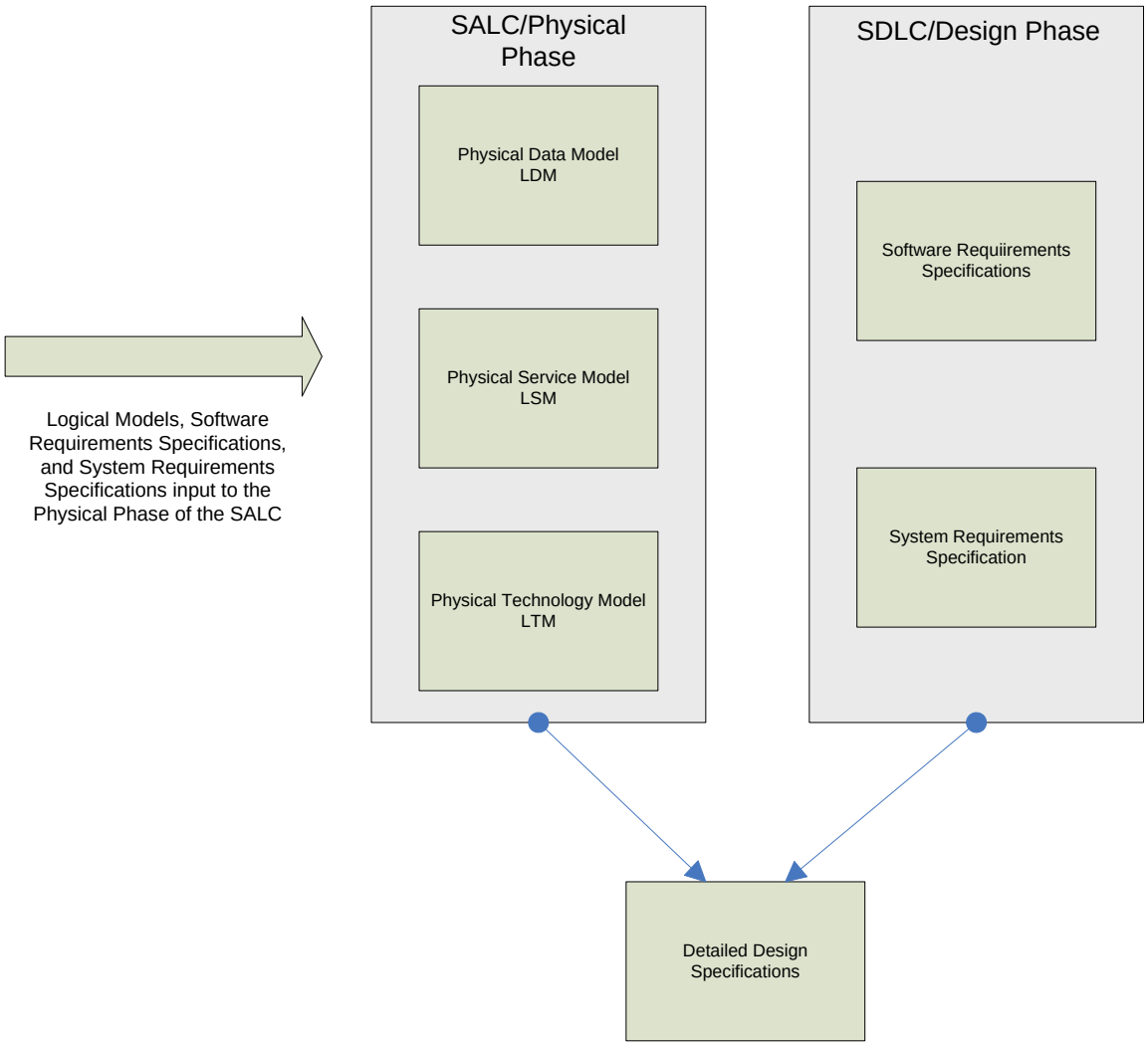

Figure 6: The Physical Models Being Used to Create the Detailed Design Specifications

2.7 The Monitor and Update Phase

During this phase, the project SA's main focus is on monitoring the development team efforts and maintaining the project's solution architecture deliverables based on the results from development and testing activities. The SA participates in key project events during this phase, such as the critical design review, code reviews, integration test plan reviews, and reviews test results to determine if any changes to the project's solution architecture deliverables are required. This phase corresponds to the Development and Test phases of the SDLC.

2.8 The Transition Phase

Once the project solution has been delivered to the customer, the SA completes the SA life cycle by reporting architecture information to the Sponsor's EA Program Office, OSI's EAO, and turning over a set of the project's solution architecture deliverables to the organization responsible for maintaining the solution during the maintenance and operations. The M&O organization is responsible for updating the solution architecture deliverables as needed during this phase of the system life cycle. The SA forwards a set of the models to OSI's EAO and contacts the sponsor's EA Program Office to determine their EA reporting requirements. This SALC phase corresponds to Transition to M&O phase of SDLC and the Closeout Phase of the PMLC.

3 SAF TOOLKIT COMPONENTS

3.1 SAF Tool Composition

The SAF Toolkit provides a set of tools that the SA uses for creating the project's SA deliverables (models) to define the required solution. Each tool is comprised of processes, instructions and templates that the SA uses to generate a specific SA deliverable required in support of the project's PMLC, Acquisition life cycle, or SDLC phases.

Tool composition descriptions are:

- **Instructions** – provides the guidance necessary to complete the template associated with the tool.
- **Template** – is a pre-formatted document that the SA modifies to reflect the solution being developed.
- **Completed Model Sample** – serves as a real world example of an approved EA document produced from using a template.
- **Diagrams** – provided in addition to the instructions to aid the SA in generating the level of detail needed to complete the model. These diagrams can be modified to accommodate a new solution.
- **Read me file** – provides a list of the contents of the zip file associated with a tool and indicates the documents (if any) that should be completed prior to completing this phase. It also lists the deliverables associated with the completion of the model.

3.2 SAF Tools

The tools contained within the SAF Toolkit are listed below in the order that they are normally completed. Detailed information about each tool can be obtained from the links provided.

- Business Architecture Model Template (BArc) based on the California Business Reference model (CalBRM) and extended by EAO that describes business services.
- Business Relationship Model Template (BRelM) is a description of the proposed solution's relationship with other business entities.
- Conceptual Solution Architectural Model Template (CSAM) provides a conceptual view of the proposed solution and how it will meet business requirements defined for the proposed solution.
- Logical Data Model Template (LDM) provides a non-technology view on how data is collected, maintained, and distributed.
- Logical Service Model Template (LSM) provides a non-technology view of the application components.
- Logical Technology Model Template (LTM) provides a non-technology view of the communication and security requirements.
- Physical Data Model Template (PDM) provides a physical description of how the data will be defined, stored, accessed, and archived, as well as ownership of the data. The PDM defines the data as it will be implemented in the solution.
- Physical Service Model Template (PSM) is the physical design of the application and services to be implemented.
- Physical Technology Model Template (PTM) provides a physical design of the architecture to be implemented. This will include the supporting infrastructure (network, protocols, etc.), equipment (servers, mainframes, etc) and supporting software (middleware, operating systems, etc).

4 REFERENCES

A detailed description of the OSI Solution Architecture Framework can be found on the OSI Intranet site (http://osiintranet.osi.ca.gov/EAO/EAO%20Documents/OSISolutionArchitectureFramework.pdf).

The solutions architect can find the toolkit components by following the SDLC Requirements Analysis link (http://www.bestpractices.osi.ca.gov/system_development/requirements.aspx) and the SDLC Design link (http://www.bestpractices.osi.ca.gov/system_development/design.aspx).

The SAF Toolkit components relevant to the phase will be found on the right side of the page in the Documents section. Clicking on the link will open the zip file that contains the component toolkits.

4.1 OSI EA Website

For guidance on the OSI's enterprise architecture program, refer to the Enterprise Architecture Office (EAO) website: http://intranet.osi.ca.gov/policy_EA.htm.

4.2 Acronyms

BArc	Business Architecture
BRelM	Business Relationship Model
CSAM	Conceptual Solution Model
CalBRM	California Business Reference Model
EA	Enterprise Architecture
EAO	Enterprise Architecture Office
IV & V	Independent Verification and Validation
LC	Life Cycle
LDM	Logical Data Model
LSM	Logical Service Model
LTM	Logical Technology Model
M&O	Maintenance and Operations
OSI	Office of Systems Integration
PDM	Physical Data Model
PMLC	Project Management Life Cycle
PSM	Physical Service Model
PTM	Physical Technology Model
SA	Solution Architect
SAF	Solution Architecture Framework
SALC	Solution Architecture Life Cycle
SDLC	Systems Development Life Cycle
SME	Subject Matter Expert

4.3 Document Maintenance

This document will be updated as needed and will be reflected in the revision history log. The revision history log will reflect the incremental update of the version number and the date, the owner making the change, and the change description.

The completed models need to be vetted through SMEs, the sponsor and stakeholders, and IV &V reviews. The models may need modification during the life cycle of the project to reflect business or system changes. When the project

enters the maintenance and operations (M&O) phase, the completed models are to be delivered to the EAO for inclusion in the EA repository.