

California Information Technology Council
Enterprise Architecture and Standards Committee

California Enterprise Architecture Framework

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1. Executive Summary

To facilitate the transformation of California to a citizen-centric, results-oriented, and cost effective government, the California Information Technology Council, chaired by the State Chief Information Officer chartered the Enterprise Architecture and Standards Committee. The Enterprise Architecture and Standards Committee was charged as follows: "Adopt a Statewide Enterprise Architecture Methodology and Technology Standards. The state will define a strategy for the adoption of statewide enterprise architecture and the implementation of statewide technology standards in support of enterprise data sharing and statewide systems interoperability." The California Enterprise Architecture Framework is one of the deliverables from this effort.

Enterprise Architecture is "a strategic information asset base which defines the business, the information necessary to operate the business, the technologies necessary to support the business operations, and the transitional processes necessary for implementing new technologies in response to the changing business needs." The California Enterprise Architecture will enable information technology decisions that are driven by the business needs of the state in the delivery of services. Enterprise architecture improves business-technology alignment, statewide service delivery, security, statewide data sharing, and enterprise-wide integration. Also, enterprise architecture lowers costs and more effectively uses state resources.

The California Enterprise Architecture Framework offers an end-to-end process to initiate, implement, and sustain an enterprise architecture program. The framework contains eight components that move the enterprise from the current to the target environment and identifies six key architecture products across four architecture domains - business, data, application and technology.

This framework was developed using criteria such as leveraging work already performed by other groups, compatibility with existing departmental enterprise architecture programs as well as the Federal Enterprise Architecture Framework, and using principles to make fully supportable and consistent decisions. The following Enterprise Architecture Principles represent the criteria used to consider potential investment and architectural decisions.

- Business Drives Information Technology
- Enterprise Focus
- Common Business Solutions
- Data is an Enterprise Asset
- Secure Enterprise Information
- Compliance with Statewide Standards
- Compliance with Law

Lastly, the framework provides an implementation strategy. The strategy utilizes a segment approach that promotes the incremental development of architecture products. This approach focuses on major business areas and is more likely to succeed because the effort is more narrowly defined. This approach provides quick value but also helps gain support for longer-term architecture product development. With the parallel efforts defined in the California State Information Strategic Plan (new state portal, information security, 21st Century Project, etc.) this approach will facilitate the coordination between the Enterprise Architecture development and ongoing projects.

2. Introduction

Enterprise architecture establishes a roadmap to achieve the state's mission through optimal performance of its core business processes within an efficient information technology environment. Simply stated, enterprise architecture is a blueprint for systematically and completely defining an organization's current (baseline) or desired (target) environment. Enterprise architecture is essential for evolving information systems, developing new systems, and inserting emerging technologies that optimize their mission value. This is accomplished in logical or business terms (e.g., mission, business functions, information flows, and systems environments) and technical terms (e.g., software, hardware, communications).

If defined, maintained, and implemented effectively, this blueprint will assist in optimizing the interdependencies and interrelationships among the state's business operations and the underlying information technology that support operations. Experience has shown that without a complete and enforced enterprise architecture, the state runs the risk of buying and building systems that are duplicative, incompatible, and unnecessarily costly to maintain and integrate.

Enterprise architecture must be developed, implemented and maintained effectively to be useful and provide business value. This framework is intended to assist the state in defining, implementing, and maintaining the enterprise architecture. It describes major enterprise architecture program management areas, beginning with suggested organizational structure and management controls, a process for development of a baseline and target architecture, the major products to be delivered, and development of an implementation strategy.

For purposes of this document, *enterprise* is defined as those agencies, departments, boards, bureaus and commissions within the Executive Branch of California government. However, the California Information Technology Council and the State Chief Information Officer may choose to expand the scope of the California Enterprise Architecture to include entities in other branches, cities, and counties.

2.1. Background

The California Information Technology Council was set up to improve the effective and efficient management and oversight of the application of information technology to the operations of California's Executive Branch of government. The California Information Technology Council established the Enterprise Architecture and Standards Committee to review analysis, reports and propose policies and provide recommendations to the California Information Technology Council on technical and operational issues for statewide information technology implementation, coordination and integration.

The Enterprise Architecture and Standards Committee researches and recommends actions that will promote California Enterprise Architecture and Standards. The primary goals are:

- To develop a statewide enterprise architecture that will standardize and consolidate the state's information technology infrastructure and management to enable a more citizen-centered, customer focused government that efficiently and strategically manages its technology investments to achieve desired business outcomes.
- To guide the consolidation, acquisition, maintenance and operations of information technology (IT) systems to make sure they are available, secure, cost effective, and interoperable in response to key business drivers. The enterprise architecture will facilitate statewide technology governance, lower costs and improve the reliability and performance of the state's IT systems and infrastructure.

For 2004 and 2005, the Enterprise Architecture and Standards Committee has pursued one main objective that will help guide the actions taken in other IT Strategic Plan objectives:

- Adopt a Statewide Enterprise Architecture Methodology and Technology Standards. The state will define a strategy for the adoption of a statewide enterprise architecture and the implementation of statewide technology standards in support of enterprise data sharing and statewide systems interoperability.

The Enterprise Architecture and Standards Committee did extensive research in the area of enterprise architecture. There were presentations by major vendors and departments who had developed enterprise architecture. Research was done in the areas of the work done by the California Performance Review and other state and federal agencies.

2.2. Purpose

This document provides a framework for California to initiate, develop, use, and maintain the enterprise architecture. This framework offers an end-to-end process to initiate, implement, and sustain an enterprise architecture program, and describes the necessary roles and associated responsibilities. This framework is not a one-time event but offers the opportunity for continuous improvement. As California uses enterprise architecture to improve the business of government, the framework must be refined from lessons learned.

3. Enterprise Architecture in the State of California

This section defines enterprise architecture, describes the vision and benefits, segments, and the selection principles used to create the California Enterprise Architecture Framework.

3.1. Enterprise Architecture Defined

The State of California adopts the following Federal Chief Information Officers Council definition of enterprise architecture, as referenced in the Federal Enterprise Architecture Framework:

“A strategic information asset base which defines the business, the information necessary to operate the business, the technologies necessary to support the business operations, and the transitional processes necessary for implementing new technologies in response to the changing business needs.”

3.2. Enterprise Architecture Vision and Benefits

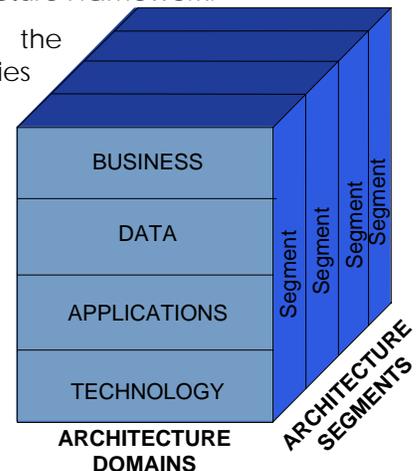
This section identifies the vision and the benefits of implementing the California Enterprise Architecture.

Vision

To enable better information technology decisions that are driven by the business needs of the state in the delivery of services.

Benefits

- Improves alignment of information technology with the state’s missions, goals, and objectives.
- Improves statewide service delivery and business operations.
- Lowers costs and improves security, reliability and performance of the state's information technology infrastructure.
- Improves statewide data sharing and systems interoperability.
- More effective use of state resources thereby enabling consistent, effective delivery of services to the employees, citizens, and businesses of California.
- Improves enterprise-wide integration resulting in fewer occurrences of duplicate infrastructure, information silos, and application redundancy.



3.3. Enterprise Architecture Segments

The State of California will implement enterprise architecture using a segment approach. A segment is a targeted line of business that typically slices through all four architecture domains. Developing enterprise architecture across all lines of business would take too long to provide benefit. A segment approach promotes the incremental development of enterprise architecture. This approach focuses on lines of business (e.g., security or common financial systems) and is more likely to succeed because the effort is more narrowly defined. This approach provides quick value but also helps gain support for longer-term architecture product development. Section 6.0 discusses the development of segments as part of the overall implementation strategy.

3.4. Enterprise Architecture Framework Selection Principles

The following selection principles were developed to guide the creation of the California Enterprise Architecture Framework:

- Creates a structure that allows departments already implementing enterprise architecture to integrate with the California Enterprise Architecture effort, thereby optimizing what the departments have implemented to date.
- Leverages work already performed by other groups such as the California Performance Review.
- Includes involvement by many departments to encourage collaboration, buy-in and synergy.
- Maintains compatibility with the Federal Enterprise Architecture Framework.

- Aligns with the California Technology Governance Structure.
- Utilizes principles as a way to make fully supportable and consistent information technology investment decisions.
- Provides both short-term improvements that provide quicker value and longer-term improvements that provide more substantial value over time.
- Realistic and can be used for decision-making. It is not just “shelf ware”.
- Ability to measure the value of enterprise architecture.

3.5. Enterprise Architecture Interfaces

The following figure defines the interfaces between enterprise architecture and other processes such as strategic planning, investment management, system engineering, and project management. Moving from left to right, California government provides strategic direction. The output from strategic planning drives enterprise architecture product development in segments. Enterprise architecture then guides information technology projects and non-project activities. These projects, non-project activities and acquisitions create the desired actual information technology infrastructure that enables the delivery of services to customers. There is also recognition that customers will provide input to the government that will affect strategic direction.

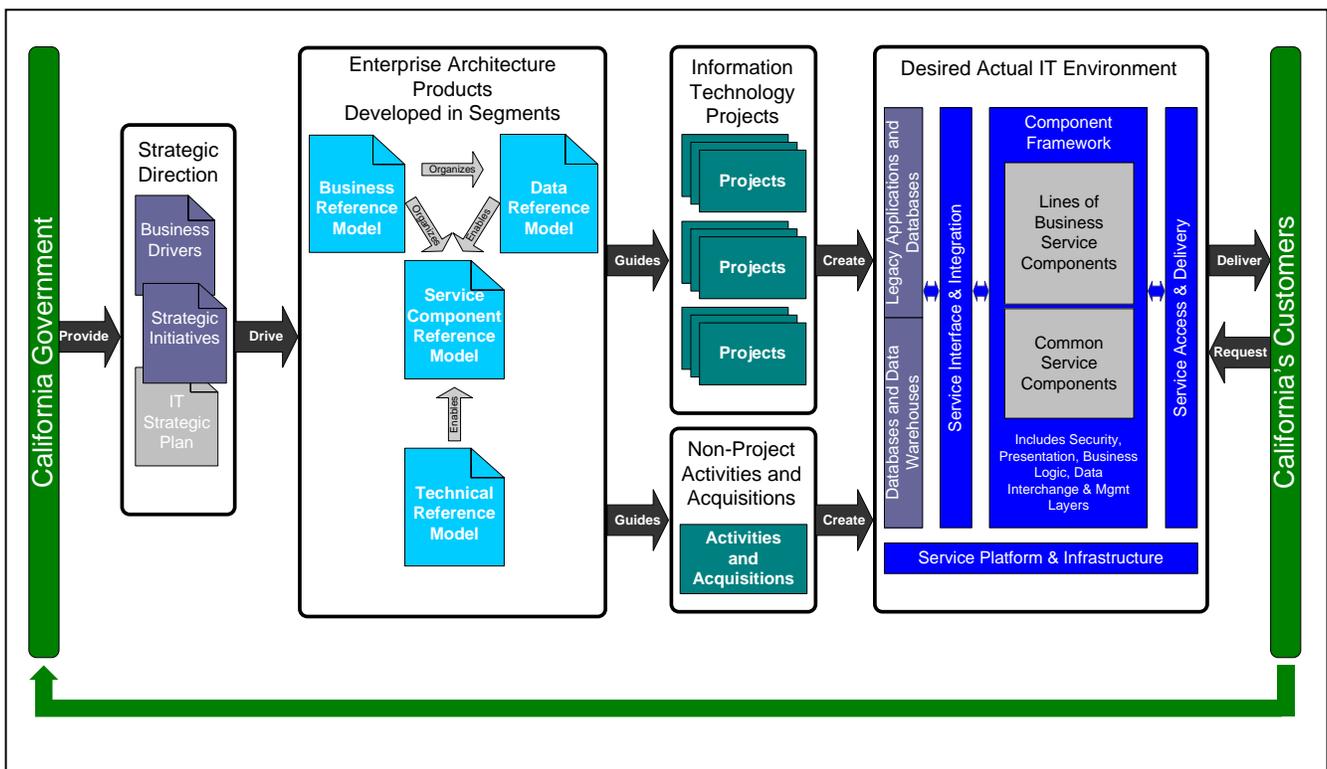


Figure 1 – California Federated Model from Strategic Initiative to Service Delivery

4. Enterprise Architecture Governance

This section describes the proposed governance structure for development and maintenance of California’s enterprise architecture products and the associated segments. (See Section 3.3 for more information about segments.) It is imperative that architecture products be business driven with support from information technology staff. This section of the California Enterprise Architecture Framework will evolve as each part of the governance structure is developed and implemented.

Each identified segment will establish a steering committee, review board and up to four business driven architecture teams. The work of the teams will be organized and led by the Chief Business Architect and a Chief Technical Architect selected by the State CIO. Figure 2 illustrates the organizational structure.

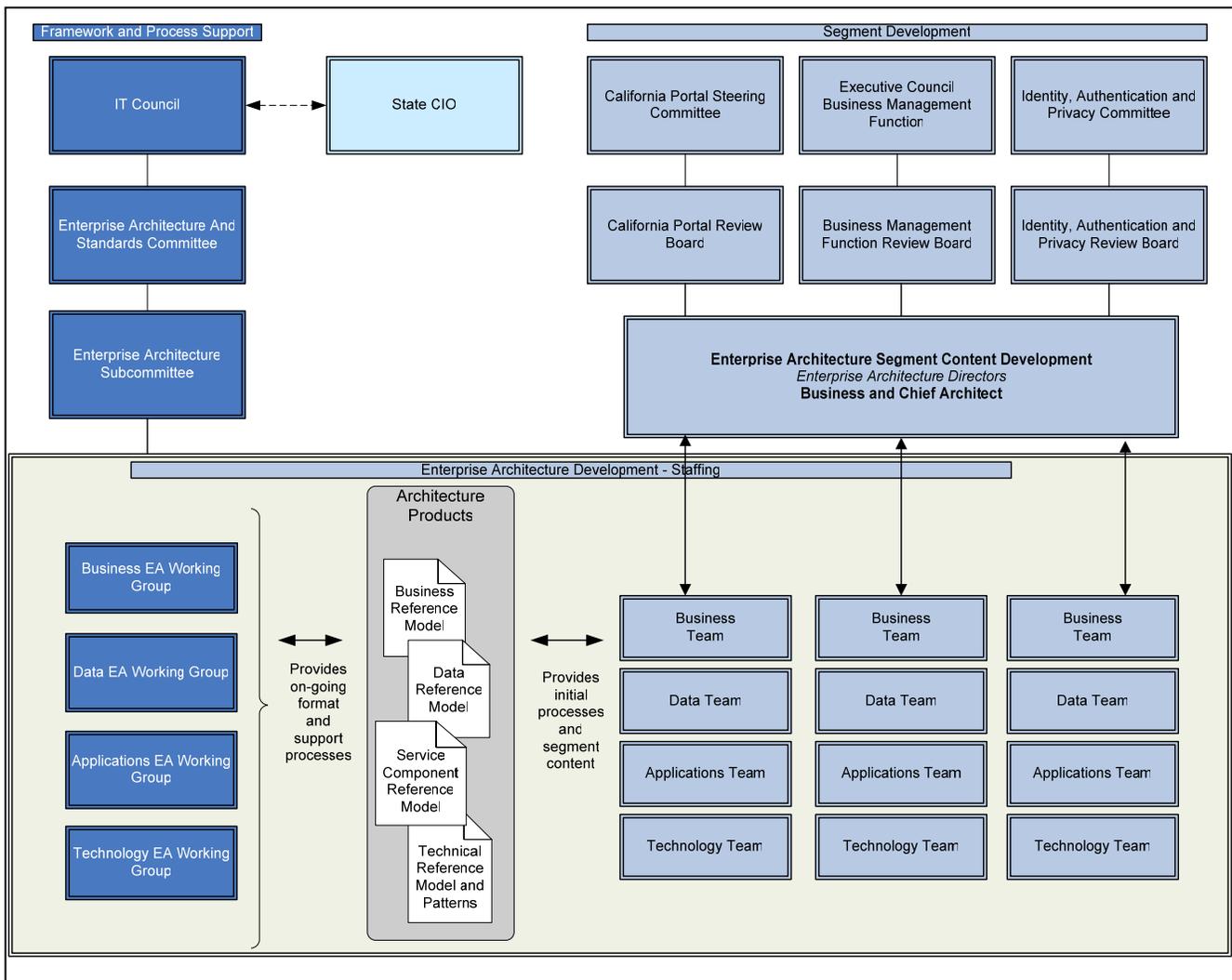


Figure 2 – California Enterprise Architecture Governance

Segment Steering Committees

For each segment, a steering committee will be created. The steering committee will be charged with oversight and visioning of enterprise architecture for a segment. Committee membership will be at the director level or higher (with attendance at meetings by designees allowable). The State CIO will chair the steering committees, but will not have voting rights.

Enterprise Architecture Role

- Develops the segment vision.
- Approves all Enterprise Architecture products for a given segment.
- Establishes a review board for that segment.

Segment Review Boards

The review board for each segment will review all enterprise architecture product content and ensure that all work is completed in order to achieve the segment vision as developed by the steering committee. They will monitor and review all work performed by the individual segment teams.

Segment Teams

The segment teams will provide segment related content to the enterprise architecture products. The review boards sponsor the segment teams. Each team will be comprised of staff-level employees with various skill sets depending on the architecture domain. The work of the teams will be organized and led by the Chief Business Architect and a Chief Technical Architect selected by the State CIO.

State Chief Information Officer

Senior advisor to the Governor with full responsibility and authority for statewide technology vision, strategic planning and coordination, technology policies and standards for secure technology solutions, technology architecture, technology acquisition, project management and defining a streamlined technology project review and approval process.

Enterprise Architecture Role

- Provides strategic direction to the Enterprise Architecture and Standards Committee.
- Advocates and educates information technology stakeholders (Agency heads, Legislature, Governor's office) on enterprise architecture and its benefits.
- Markets the benefits of enterprise architecture via collaborative forums.
- Obtains participatory commitment from state executives.
- Selects members of the California Information Technology Council, and the Chair of the Enterprise Architecture and Standards Committee.

California Information Technology Council

Chartered in March of 2004, the California Information Technology Council advises the State Chief Information Officer on matters related to information technology in the California Executive Branch, including the development of statewide information technology strategic plans and the adoption of enterprise-wide information technology standards and policies.

The California Information Technology Council's organizational structure has an Executive Committee and eight subject-matter committees: Strategic Business & Information Technology Services, Information Technology Policies, Enterprise Architecture and Standards, Enterprise Applications, Information Technology Security, Data Center Operations, Information Technology Acquisitions and Information Technology Human Resources.

Enterprise Architecture Role

- Charters the Enterprise Architecture and Standards Committee.
- Ensures alignment with the California State Information Technology Strategic Plan.
- Reviews and approves all enterprise architecture policies and deliverables.

Council Composition

The California Information Technology Council's membership represents stakeholders in the Executive Branch's Information Technology program, including members from several constitutional offices, the state's support agencies (Department of Finance, Department of General Services, Department of Personnel Administration and the state data centers), Agency Information Officers, departmental Chief Information Officers, the judiciary and local and federal governments.

Enterprise Architecture and Standards Committee

The Enterprise Architecture and Standards Committee was created by the California Information Technology Council to promote California Enterprise Architecture and Standards. The primary goals are to develop a statewide enterprise architecture that will standardize and consolidate the state's information technology infrastructure and management to enable a more citizen-centered, customer focused government that efficiently and strategically manages its technology investments to achieve desired business outcomes. Also, the Enterprise Architecture and Standards Committee will guide the consolidation, acquisition, maintenance and operations of information technology systems to make sure they are available, secure, cost effective, and interoperable in response to key business drivers.

Enterprise Architecture Role

- As the Steering Committee for the California Enterprise Architecture, develops strategy, performs planning and allocates resources.
- Sponsors and charters the Enterprise Architecture Subcommittee.
- Reviews and recommends all enterprise architecture policies and deliverables.
- Works with other California Information Technology Council committees for alignment and consistency with the California Enterprise Architecture.

Committee Composition

Members are derived from the California Information Technology Council and are representatives from the business and technical community from various organizations within the state as recommended by the Chief Information Officer and the Enterprise Architecture and Standards Committee Chair.

Enterprise Architecture Subcommittee

The Enterprise Architecture Subcommittee is accountable to the Enterprise Architecture and Standards Committee, which reports to the California Information Technology Council. The Enterprise Architecture Subcommittee manages the enterprise architecture process and directs the Enterprise Architecture Working Groups.

Enterprise Architecture Role

- Creates and maintains the California Enterprise Architecture Framework and principles.
- The Subcommittee charters, sponsors, and oversees the work of the Enterprise Architecture Working Groups, including the coordination between the groups.
- Reviews and presents architecture policy and deliverables for review by the Enterprise Architecture and Standards Committee.
- Works with other California Information Technology Council subcommittees and working groups.
- Provides education on enterprise architecture.

Team Composition

Members consist of key information technology and business staff from various departments and agencies, and key information technology stakeholders. Members are volunteers who are selected by the Enterprise Architecture Subcommittee Chair and Vice-Chair.

Enterprise Architecture Working Groups

The Enterprise Architecture Working Groups are accountable to the Enterprise Architecture Subcommittee. The Enterprise Architecture Working Groups assist the Chief Business Architect and Chief Technical Architect on an as-needed basis to provide on-going support to the segment teams regarding format of deliverables and process issues.

Enterprise Architecture Role

- To assist the segment teams and the Chief Business Architect and Chief Technical Architect with regard to the format of deliverables and process and standards issues that may arise during development of the deliverables.

Team Composition

- Members include technical experts from information technology and business staff from various agencies and departments.
- Teams should include cross-technical skills (network, data, application, infrastructure, security, etc.) in order to assess the impact of developments on other elements of the architecture.

5. The California Enterprise Architecture Framework

Based on the Federal Enterprise Architecture Framework, the California Enterprise Architecture Framework promotes shared development for common processes, interoperability and sharing of information among state agencies. This framework provides an organized structure and a collection of common terms by which state agencies and departments can align their respective enterprise architectures.

The following sections will discuss the California Enterprise Architecture Framework, the principles to be used for information technology decision-making, and the architecture products to be created.

5.1. Enterprise Architecture Framework

The California Enterprise Architecture Framework contains eight components needed for developing and maintaining the architecture. One component, Architecture Drivers, is external to the framework and the other seven are internal. As shown in Figure 3, the framework flows from left to right and represents the continuous process of the California Enterprise Architecture.

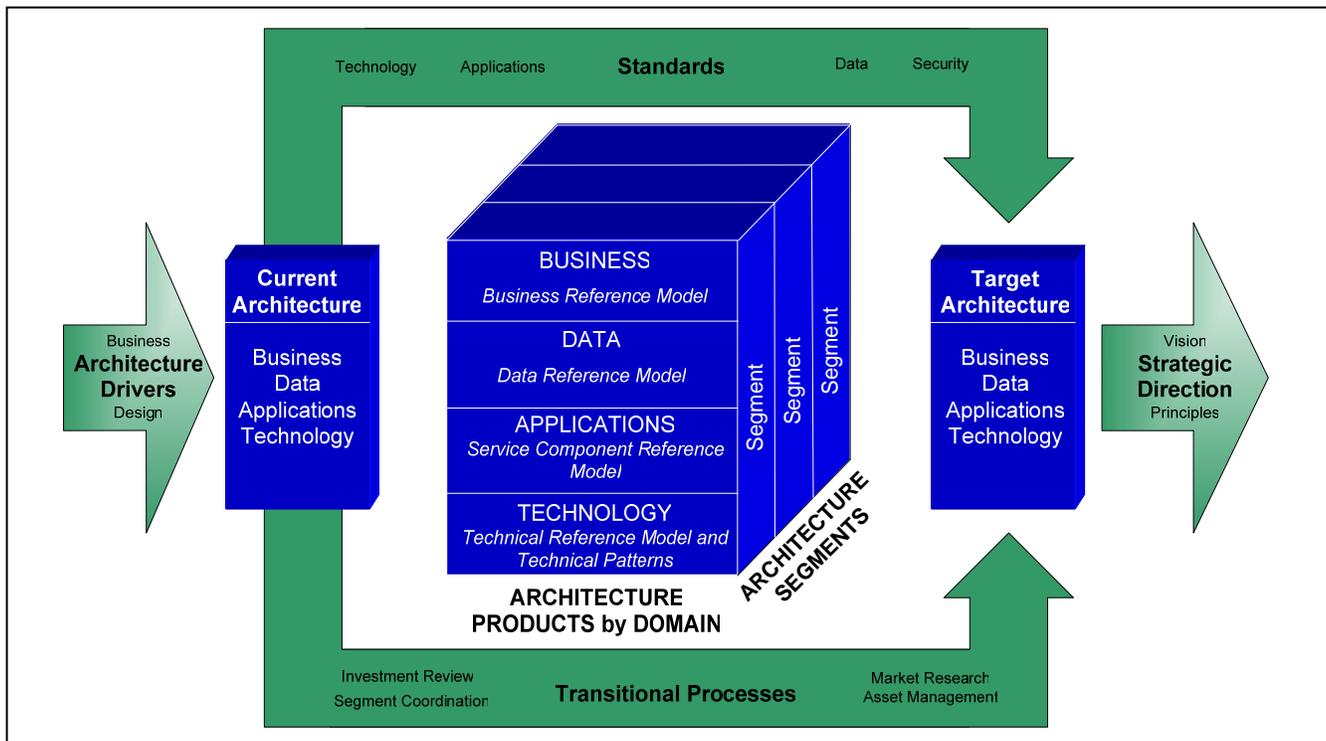


Figure 3 – California Enterprise Architecture Framework

Architecture Drivers – Represent an external stimulus that causes the California Enterprise Architecture to change. The California State Information Technology Strategic Plan is a key architecture driver for the state.

There are two types of architecture drivers.

- Business Drivers – Redefine core state business needs.
- Design Drivers – Represent revolutionary ways of meeting state business needs.

The relationship between business and design is push/pull; the business pushes design (i.e., new developments in data, applications, and technology) and design pulls business to new levels of service delivery in support of business operations.

Current Architecture – Represents the current state or baseline for the enterprise.

- Current Business Architecture – Defines the current business needs being met by the current design.
- Current Data Architecture – Defines what data is in place to support the business (i.e., data models).
- Current Application Architecture – Defines what applications and service components are in place to manage the data and support the business functions (i.e., application models).
- Current Technology Architecture – Defines what supporting technology is in place to provide an environment for applications that manage the data and support the business functions (i.e., technology models).

Target Architecture – Represents the desired future state or "to be built" for the enterprise within the context of the strategic direction.

- Target Business Architecture – Defines the future business needs of the enterprise.
- Target Data Architecture – Defines the data needed to support the business (i.e., data models).
- Target Applications Architecture – Defines the applications and service components needed to manage the data and support the business functions (i.e., applications models).
- Target Technology Architecture – Defines the supporting technology needed to provide an environment for applications that manage the data and support the business functions (i.e., technology models).

Architecture Products (and Services) – Provide the documentation and the basis for managing and implementing changes in the state. The products are the artifacts that describe, using appropriate notations, the detail specifications from which the applications and technology will be designed and implemented or purchased and installed. The services use the products for recommendations to information technology decision makers. Services will be more clearly defined as enterprise architecture matures. The specific products will be discussed in Section 5.3.

- Business Products – Model the emerging business needs prompted by the business drivers that facilitate understanding of business functions, information inputs, processes, and products.
- Data Products – Model the data required to support the emerging business needs that will aid in understanding data structures.
- Application Products – Model the applications and service components required to support the emerging business needs that will aid in understanding applications.
- Technology Products – Model the technology required to support the emerging business needs that will aid in understanding supporting technologies.

Architecture Segment – Focuses on a subset or a specific business area within the enterprise. Segments are often an event-driven process, such as grants, that cross the enterprise and have commonality of process, data, components, and technology. Each architecture segment is composed of a current and target architecture, limited in scope by the focus of the segment.

Transitional Processes – Implement the changes needed to move from the current architecture to the target architecture. Examples include the following:

- Investment Management Review – Provides architecture information to support the investment review decision process.
- Segment Coordination – Coordinates the integration of the segment architectures into the enterprise architecture.
- Market Research – Performs periodic market scans to analyze and identify new and advancing technologies with potential benefits to business processes.
- Asset Management – Manages all enterprise architecture-based infrastructure assets.
- Procurement Practices – Aligns procurement activities with the architecture and other transitional processes.
- Architecture Governance – Coordinates the effort to avoid confusion, misunderstanding, and rework.

Standards – Contain guidelines and best practices (some of which may be made mandatory). Some standards may be proven, while others are evolving. This component also includes configuration options for implementing the standards. Examples include the following:

- Security Standards – Apply to all levels of security from routine to classified.
- Data Standards – Apply to data, meta data, and related structures.
- Applications Standards – Apply to application software.
- Technology Standards – Apply to the operating systems and platforms.

Strategic Direction – Guides the development of target architectures. The strategic direction incorporates the vision, a succinct and strategic statement describing the targeted end state for the architecture in five years, principles for guiding the architecture evolution, and goals and objectives for managing information technology and determining progress towards the vision.

5.2. Enterprise Architecture Principles

The following principles represent the criteria against which potential investment and architectural decisions are weighed.

Principle #1 Business Drives Information Technology

Rationale Information technology direction will be driven by what the business needs to serve their customers. Business events represent the essential activities that define the boundaries of a good information technology environment. Without knowing the business, the information technology infrastructure may be over or under built which can result in excessive technical complexity, cost and delays. This principle will foster an atmosphere where the information environment changes in response to the needs of the business, rather than having the business change in response to information technology changes. Technology changes provide an opportunity to improve the business process and hence, change business needs.

- Implications*
- Minimize unintended effects on business due to information technology changes.
 - Build what we need, not what we want.
 - Easier to identify technical impacts when business events change.
 - Must include the business and its perspective in the process.

Principle #2 Enterprise Focus

Rationale Information management decisions will consider the impact and maximize the benefit to the state as a whole. Decisions made from a statewide perspective have greater long-term value than decisions made from any particular organizational perspective.

- Implications*
- A governance structure must be implemented that will support statewide investment decision-making.
 - Achieving maximum statewide benefit will require changes in the way we plan and manage information. Technology alone will not bring about this change.
 - Some organizations may have to concede their own preferences for the greater benefit of the entire state.
 - Information management initiatives should be conducted in accordance with the statewide plan. Individual organizations should pursue information management initiatives that conform to the blueprints and priorities established by the state.

Principle #3 Common Business Solutions

Rationale Development of common solutions used across the state is preferred over the development of similar or duplicative solutions that are only provided to a particular organization. Duplicative solutions are expensive and proliferates conflicting data.

Implications

- Organizations will not be allowed to develop solutions for their own use that are similar or duplicative of a statewide solution. In this way, expenditures of scarce resources to develop essentially the same capability in marginally different ways will be reduced.
- Applications components should be shared across organizational boundaries.
- May require changes to legislation and government code to guide separate departments to act in a unified manner.
- A common technology and organization infrastructure will be needed to support common business solutions.

Principle #4 Data is an Enterprise Asset

Rationale The state will coordinate interagency and intergovernmental data collection and management, to improve data sharing capabilities and reduce costs of acquiring and managing data. To enable the work of government, agencies need to combine data across systems; agencies need to share data with other agencies; users need to access information and services from varied sources; and businesses and governments need to interface. Government work demands interoperability.

Implications

- Laws and statutes must be considered when sharing data across organizational boundaries.
- Data and information used to support statewide decision-making will be standardized to a much greater extent.
- Data standards and quality must be utilized across the enterprise.

Principle #5 Secure Enterprise Information

Rationale Enterprise information will be secure from unauthorized access, modification, or destruction. Hacking, viruses, and terrorism increasingly threaten the state's systems. Government has a responsibility to maintain the public's trust in its systems from unauthorized access and to protect data integrity and confidentiality. Secure systems ensure the continuity of the state's business. Systems and data must be secured with security best practices and with security assessments being conducted on a regular basis.

Implications

- Loss of public trust if not done correctly.
- Must identify, publish, and keep applicable policies current.
- Security must enable not impede business.
- It is extremely costly to repair systems that have been compromised.
- Security must be designed into systems from the beginning; it cannot be added later.
- Information must be safeguarded against inadvertent or unauthorized alteration, sabotage, disaster, or disclosure.

Principle #6 Compliance with Statewide Standards

Rationale Compliance with statewide standards will facilitate interoperability and consistency across solutions. Use of proven technology will simplify software design, reduce application development time, facilitate learning, improve systems maintenance and support, and promote information-sharing among organizations within the state, and thus reduce total cost of ownership.

Implications

- A process must be established for setting, reviewing and revising standards periodically, and granting exceptions. The process must be fast enough to support business and design drivers.
- Standards will be followed unless there is a compelling business reason to implement a non-standard solution.
- Information technology policy and procedures must be tied directly to this principle.
- Fewer products and configurations simplify the information technology environment.

Principle #7 Compliance with Law

Rationale Enterprise information management processes comply with all relevant laws, policies, and regulations. Statewide policy is to abide by laws, policies, and regulations. This will not preclude business process improvements that lead to changes in policies and regulations.

Implications

- The state must be mindful to comply with laws, regulations, and external policies regarding the collection, retention, and management of data.
- Changes in the law and changes in regulations may drive changes in our processes or applications.

5.3. Enterprise Architecture Products

This section defines a set of interconnected models that support making better information technology-related decisions inside and in-between state departments and agencies. The models or products describe state operations and its information technology environment in an explicit and manageable way. Since government operations are not static, these products must be updated periodically to reflect new realities and changing directions.

Many products are based on models described within the Federal Enterprise Architecture Framework (FEAF). The FEAF identifies both the underlying structure of each model and often the actual content of the model itself. The various Enterprise Architecture Working Groups and the Enterprise Architecture Subcommittee will review and revise both the content and some of the underlying structure of the models to represent the state accurately.

The California Enterprise Architecture includes the adoption of the federal products listed below—both structure and content—as a baseline in order to speed up and reduce the cost of developing these products from scratch. Once adopted, the various Enterprise Architecture Working Groups and the Enterprise Architecture Subcommittee will review and revise both the content and possibly the underlying structure of the models to represent the state accurately.

Business Reference Model (BRM)

The BRM is a framework for describing business operations of the State of California independently of the agencies that performs them. The BRM provides a foundation for identifying cross-agency redundancies and/or initiatives and makes a clear connection of the more technical models to the business operations they support.

The BRM will categorize business operations into a useful, multi-level structure appropriate to making effective statewide decisions. The BRM can identify the core business operations that collectively embody the purpose of state government in the eyes of its stakeholders as well as the support functions necessary for the state to effectively deliver those core business operations.

Benefits of the BRM:

- Helps identify and prevent redundancies or gaps in business operations and systems; this could drive down costs by an order of magnitude.
- Improves communication and understanding between government operations and information technology.
- Helps answer the question "Why do we need this technology?"

Data Reference Model (DRM)

This model describes the data and information that support the state's business operations from a statewide perspective. The DRM must define a structure that each data element must have in order for users to understand the element, must classify each data element into its business context using the BRM, and must specify how this data element should be exchanged between state agencies. Various agencies need to use and can benefit from exchanging information about data elements such as state employees, route locations, facilities, permits, and taxpayers. The DRM supports data sharing, improves data quality, and helps ensure data is relevant to business needs.

Like the BRM, the DRM is a critical tool to evaluate potential redundancies and gaps in business operations and systems. While issuing a campsite use permit and issuing an oversized vehicle transportation permit may both be considered a permit function in the BRM, it may not be appropriate to combine systems supporting those functions because the large differences in the data collected and other factors. Conversely, multiple systems that have a similar function in the BRM (e.g., emergency response) and need similar data elements (traffic accident data) have a higher potential for sharing or integration.

Benefits of the DRM:

- Drives down costs by eliminating redundant data collection activities and storage across agencies.
- Increases data quality.
- Better data and information supports better decision-making.
- Reduces conflict by clearly identifying data ownership and responsibilities.

Service Component Reference Model (SRM)

The SRM is a framework that classifies and catalogs existing and proposed service components in a manner that is independent of business organization and supports the reuse of applications, components, and business services. These services provide the functionality and execution of business processes, which in turn sustain the BRM sub-functions.

The Federal government defines a service component as "a self contained business process or service with predetermined functionality that may be exposed through a business or technology interface." Components have many sizes, from a small chunk of a single application to suites of applications crossing many lines of business and organizations.

Like the Federal government, this SRM will classify components of all types into at least three layers. The *Service Domains* is the highest layer and organizes services and capabilities from a business perspective. The next layer–*Service Types*–describes a business-oriented service. The SRM's final layer is the *Component* layer where the actual components are listed.

The SRM will map how each component links to elements listed in the other reference models such as the business functions this component supports (BRM), who is impacted by the component, what core data does the component use or generate (DRM), and what style or set of patterns does it use (see section on Information Technology Patterns below for details). This mapping ensures the needs of the business drive all of the technology elements (i.e., software, hardware, and data).

Benefits of the SRM:

- Allows services to be shared across agencies and governments driving down costs.
- Responds to business needs faster by combining pre-existing components together instead of creating solutions from scratch.
- Reduces risks on projects since components are proven.
- Provides an important link between the different models in a way that is understandable to many kinds of stakeholders.
- Helps identify redundant existing or proposed applications.
- Helps define the scope of statewide enterprise application projects.
- Identifies opportunities to explore component reuse and integration thereby reducing costs.
- Supports review of information technology investments.

Technical Reference Model (TRM)

The TRM is a framework that identifies and organizes standards, specifications, and technologies that support and enable the delivery of the state's business services and capabilities. The TRM also identifies where each standard or technology is in its lifecycle—if the technology is cutting edge, end of life, etc.

Benefits of the TRM:

- Reduces costs and technical complexity by identifying redundant standards or technologies.
- Simplifies information technology purchasing.
- Helps identify and smooth technology migration.
- Supports the information technology standards process.

Information Technology Patterns

An information technology pattern identifies how a set of technology elements listed in the TRM should interact and deploy to best deliver particular types of applications or systems. Since applications have a limited number of "styles" in which they can be implemented, a pattern such as "E-Business", "Divisional Workflow", or "Three Tier Transaction" would define how technology elements such as servers, routers, firewalls, and databases will work together to best meet the needs of the system. Patterns are often graphical in nature and can exist at a conceptual level or at detailed physical level with particular models or actual devices shown. Patterns are often pre-tested and pre-costed. A pattern identifies how it can be tailored, reused or combined with other patterns as new systems or business scenarios are proposed.

Also, the Technical Enterprise Architecture Working Group would develop and maintain a method to categorize and organize the individual patterns and help classify the "style" of applications / components identified in the SRM.

Benefits of Information Technology Patterns:

- Reduces costs and technical complexity by reusing patterns and technology components.
- Reduces project risk through earlier and better cost estimates and scope definition.
- Ensures individual standards work in a larger technology context.
- Ensures standards are relevant. If a standard/technology is never used in a pattern, perhaps it is not needed.
- Helps identify which applications are impacted by a change in the TRM.

Information Technology Standards Process

This process develops and maintains statewide information technology standards in the areas identified in the TRM and for Information Technology Patterns. It will identify the steps of the new process, roles and responsibilities, deal with exception scenarios, and develop the forms/templates to implement the process. The process will be principle-driven to ensure that standards are developed as smoothly as possible and that decisions are consistently applied and defensible.

Benefits of Information Technology Standards:

- Reduces costs and technical complexity by identifying redundant standards or technologies.
- Simplifies information technology purchasing and training needs.
- Helps identify and smooth technology migration.
- Improves communicating technology trends and issues that affect the state.

6. Implementation Strategy

The State of California will implement enterprise architecture using a segment approach. Developing all products across all lines of business would take too long to provide benefit. A segment approach promotes the incremental development of architecture products. This approach focuses on lines of business (e.g., security or common financial systems) and is more likely to succeed because the effort is more narrowly defined. This approach provides quick value but also helps gain support for longer-term architecture product development.

Architecture drivers and dependencies will determine the selection of the segments and products to be developed. Examples of drivers that influence enterprise architecture could be legislation, executive orders, and/or the California State Information Technology Strategic Plan. Segment selection should focus on statewide and interdepartmental issues. Architecture drivers not only affect the selection of segments but may also affect the implementation strategy of the California Enterprise Architecture as a whole. Specifically, it could change the governance structure, principles, architecture products, and architecture services.

When appropriate, the Enterprise Architecture and Standards Committee and related Teams will coordinate their efforts with other teams working on complimentary efforts.

Principles-based decision-making will be used throughout the implementation and maintenance of the California Enterprise Architecture. Principles reduce conflict by focusing discussions away from specific organization or technology preferences and allow fully supportable and consistent statewide decisions.

California Enterprise Architecture implementation needs to bring in more departments to increase buy-in. It is also important to bring in additional expertise by including those organizations that already have implemented enterprise architecture.

A detailed implementation plan will also consider funding, policy, metrics, communication, risk, quality, and education.

6.1. Examples of Segments

To illustrate the concept of segments and their relationships to architecture drivers and products, the following table shows the segments and products that could be developed to support objectives in the California State Information Technology Strategic Plan.

Information Technology (IT) Strategic Plan Objectives
Mapped to Segments and Enterprise Architecture Products

<i>IT Strategic Plan Goals/Objectives</i> →	<i>Segment</i> →	<i>Enterprise Architecture Products</i>
Goal 1, Objective 2 – Develop a New State Portal	portal technology	Service Component Reference Model
		Technical Patterns
		Technical Reference Model
Goal 1, Objective 3 – Leverage Services Between State Agencies, Federal and Local Government	e-services	Business Reference Model
Goal 2, Objective 1 – Continue Efforts to Implement Enterprise-Wide Applications Already Started	e-procurement human resources and payroll	Business Reference Model
		Service Component Reference Model
Goal 3, Objective 1 – Adopt Statewide Security Standards	security	Standards Process
		Technical Patterns
		Technical Reference Model

IT Strategic Plan Goals/Objectives ➔	Segment ➔	Enterprise Architecture Products
Goal 4, Objective 1 – Adopt a Statewide Enterprise Architecture Methodology and Technology Standards		Standards Process
Goal 4, Objective 2 – Consolidate Technology Infrastructure Services	data center consolidation	Business Reference Model
		Data Reference Model
		Service Component Reference Model
		Technical Reference Model
Goal 4, Objective 3 – Pursue Enterprise-Wide Procurements		Standards Process

Figure 4, is an example of how the Portal Teams can develop the architecture to support e-government. The Business Team will identify the lines of business that relate to e-government, the Data team will document the common data needs, the Applications Team will develop the common service components and the Technical Team will specify the technical infrastructure.

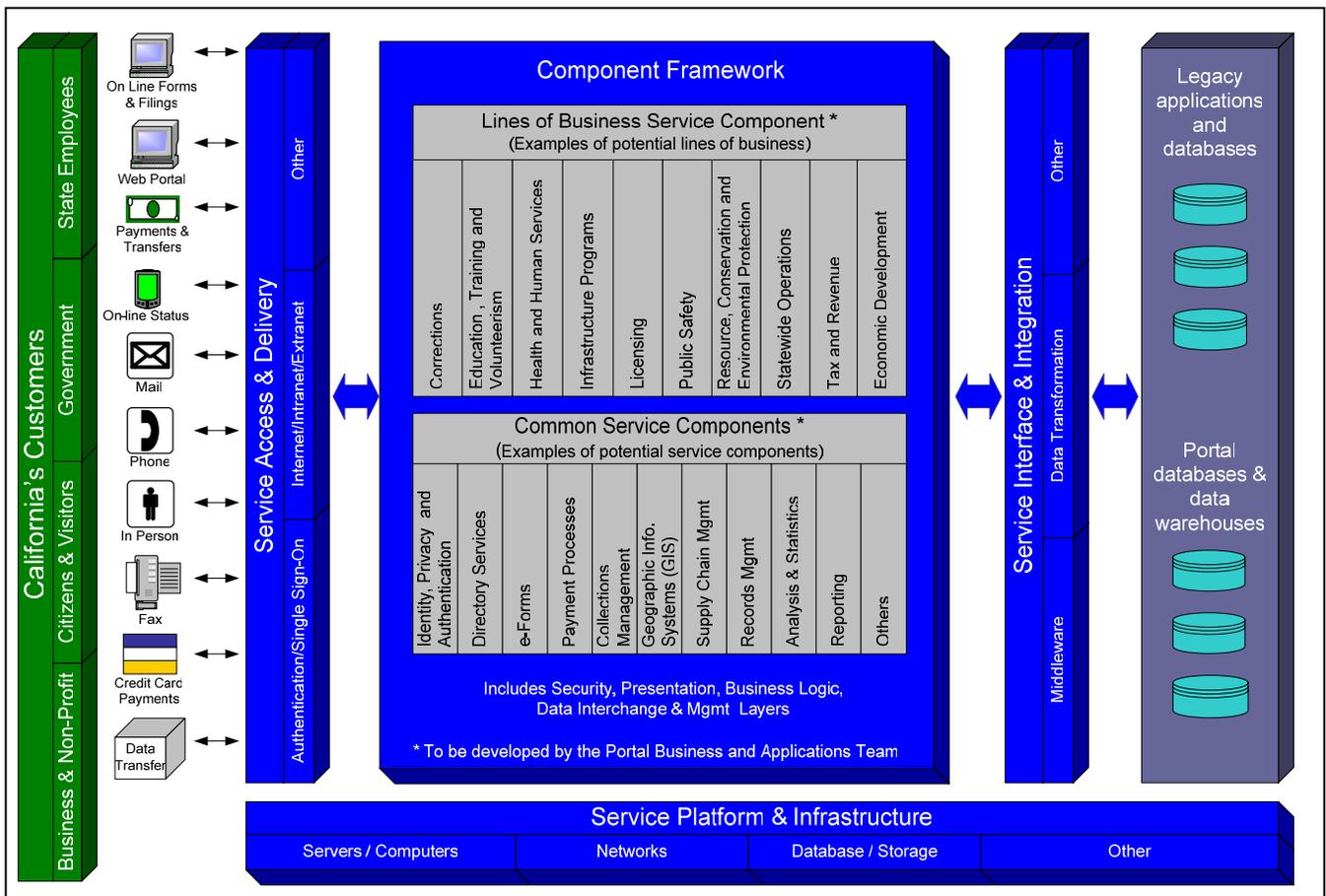


Figure 4 – California Federated E-Government Architecture Example

7. Glossary

Application Architecture – Defines the major applications or service components needed to manage data and support business functions.

Application Products – Model the applications and components required to support the emerging business needs that will aid in understanding applications.

Architecture – A set of design artifacts, or descriptive representations, that is relevant for describing an object such that it can be produced to requirements (quality) as well as maintained over the period of its useful life (change). [John Zachman & adopted by the Federal Chief Information Officer Council]

Architecture Drivers – The external component of the California Enterprise Architecture Framework representing an external stimulus, which causes the enterprise architecture to change. Architecture drivers consist of two sub-components: business and design drivers.

Architecture Product – The structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time. Architecture products include Business Models, Data Models, Application Models and Technology Models. [IEEE STD 610.12 and adopted by Federal Chief Information Officer Council]

Architecture Segment – Focus on a subset or a specific business area within the enterprise. It can be considered to be an event-driven process, such as grants, that crosses the enterprise and has commonality of process, data, components, and technology. Each architecture segment is composed of current and target architectures, limited in scope by the focus of the segment.

Architecture Services – The services use the products for recommendations to information technology decision makers. Services will be more clearly defined as enterprise architecture matures.

Business Architecture – Defines business processes, information flows, and information needed to perform business functions.

Business Drivers – A type of architecture driver that identifies the strategic business needs an information technology environment must support.

Business Products – Model the emerging business needs prompted by the business drivers that facilitate understanding of business functions, information inputs, processes and products.

Business Reference Model (BRM) – A function-driven framework for describing the business operations of the state government independent of the agencies that performs them. The Business Reference Model provides an organized, hierarchical construct for describing the day-to-day business operations. [Federal Enterprise Architecture Program Management Office]

California Enterprise – Defined as those agencies, departments, boards, bureaus and commissions within the Executive Branch of California government. However, the California Information Technology Council and the State Chief Information Officer may choose to expand the scope of the California Enterprise Architecture to include entities in other branches, cities, and counties.

California Enterprise Architecture – A blueprint to assist in optimizing the interdependencies and interrelationships among the state's business operations and the underlying information technology that support these state operations.

California Enterprise Architecture Framework – An organizing mechanism for managing development, maintenance, and facilitated decision-making of the California Enterprise Architecture. The framework provides a structure for organizing state resources and for describing and managing state enterprise architecture activities.

Current Architecture – Represents the current state or baseline for the enterprise. In terms of the California Enterprise Architecture Framework, the current architecture includes business, data, application, and technology.

Data Architecture – Consists of among others, data entities, which have attributes and relationships with other data entities. These entities are related to the business functions.

Data Products – Model the data required to support the emerging business needs that will aid in understanding data structures.

Data Reference Model (DRM) – Describes the data and information that support the state's business operations from a statewide perspective.

Design Drivers – A type of architecture driver that identifies a technology change that could represent revolutionary ways of meeting state business needs.

Enterprise – An organization supporting a defined business scope and mission. An enterprise is comprised of interdependent resources (people, organizations, and technology) that should coordinate their functions and share information in support of a common mission (or set of related missions). [Treasury Enterprise Architecture Framework]

Enterprise Architecture – A strategic information asset base, which defines the business, the information necessary to operate the business, the technologies necessary to support the business operations, and the transitional processes necessary for implementing new technologies in response to the changing business needs. [Federal Enterprise Architecture Framework]

Enterprise Architecture Principles – Represent the criteria against which all potential investment and architectural decisions are weighed.

Federal Enterprise Architecture Framework (FEAF) – The Federal Enterprise Architecture Framework is an organizing mechanism for managing development, maintenance, and facilitated decision-making of the Federal Enterprise Architecture. The framework provides a structure for organizing federal resources and for describing and managing Federal Enterprise Architecture activities.

Federated Enterprise Architecture- Defines common or shared architecture standards across autonomous program areas, enabling state government entities to maintain diversity and uniqueness, while providing interoperability. [Federal Enterprise Architecture Framework]

Framework – A logical structure for classifying and organizing complex information. [Federal Enterprise Architecture Framework]

Goals and Objectives – Part of the strategic direction describing opportunities to accomplish the vision.

Information Management – The planning, budgeting, manipulating, and controlling of information throughout its life cycle. [Federal Chief Information Officer Council]

Information Technology Patterns – Identifies how a set of technology elements should interact and be deployed to best deliver particular types of applications or systems.

Line of Business – The purpose of government in functional terms and the support functions the government must conduct in order to deliver services to citizens.

Methodology – A documented approach for performing activities in a coherent, consistent, accountable, and repeatable manner. [Treasury Enterprise Architecture Framework]

Principles – Statements that guide design decisions, serve as a tiebreaker in settling disputes, and provide a basis for dispersed, but integrated, decision-making.

Reference Model – A framework for understanding significant relationships among the entities of some environment, and for the development of consistent standards or specifications supporting that environment. A reference model is based on a small number of unifying concepts and may be used as a basis for education and explaining standards to a non-specialist. [Federal Chief Information Officer Council]

Segment – A targeted line of business that typically slices through all four architecture domains.

Segment Approach – Promotes the incremental development of architecture products. This approach focuses on lines of business (e.g., security or common financial systems) and is more likely to succeed because the effort is more narrowly defined.

Service Component – A self-contained business process or service with predetermined functionality that may be exposed through a business or technology interface. [Federal Enterprise Architecture Program Management Office]

Service Component Reference Model (SRM) – A business-driven, functional framework that classifies Service Components with respect to how they support business and/or performance objectives. The SRM is structured across horizontal service areas that, independent of the business functions, can provide a leverageable foundation for reuse of applications, application capabilities, components, and business services. [Federal Enterprise Architecture Program Management]

Standards – A set of criteria (some of which may be mandatory), voluntary guidelines, and best practices to guide behavior or decisions.

Strategic Direction – Guides development of the target architecture. The strategic direction incorporates the vision, a succinct and strategic statement describing the targeted end state for the architecture in five years, principles for guiding the architecture evolution, and goals and objectives for managing it and determining progress towards achieving the vision.

System – A collection of components organized to accomplish a specific function or set of functions. [IEEE STD 610.12]

Target Architecture – Represents a desired future state or "to be built" for the enterprise within the context of the strategic direction. In terms of the California Enterprise Architecture Framework, the target architecture includes business, data, application, and technology.

Technical Reference Model – A framework used to identify and organize the standards, specifications, and technologies that support and enable the delivery of the state's business services and capabilities.

Technology Architecture – Defines the technology environment for the enterprise showing actual hardware and systems software at the nodes and lines and their systems software, including operating systems and middleware.

Technology Products – Model the technology required to support the emerging business needs that will aid in understanding supporting technologies.

Transitional Processes – These processes support migration from the current architecture to the target architecture. Examples include: investment management review, segment coordination, market research, asset management, procurement practices and architecture governance.

Vision – A succinct and strategic statement describing the targeted end state for the architecture in five years. The vision provides strategic direction and is used to guide resource decisions, reduce costs, and improve mission performance.

8. References

Documents

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Web Sites

1. California State Chief Information Officer, California Information Technology Council, Committees <http://www.cio.ca.gov/ITCouncil/Committees/Committees.html>

9. Document History

Release	Description	Date
1.0 Draft	Initial draft from the Enterprise Architecture and Standards Committee presented to the IT Council.	April 4, 2005
2.0 Draft	Draft that incorporated feedback from the IT Council.	June 16, 2005
1.0 Final	Final version approved by the IT Council at the July 15, 2005 meeting.	July 15, 2005