Technical Architecture Guide

Establish the evolving technical blueprint and accompanying guidelines to manage the integration and interoperability of the old with the new across the HS Agency

This guide defines the key activities, artifacts, and roles that are necessary to create and maintain a Technical Architecture for the HS Agency. The HS Agency's Technical Architecture guides the HS Agency's activities for the definition, purchase, creation, modification, integration, deployment, operation, and retirement of the technical infrastructure and the supported applications. It affects both technical management and engineering practices in use within the HS Agency.

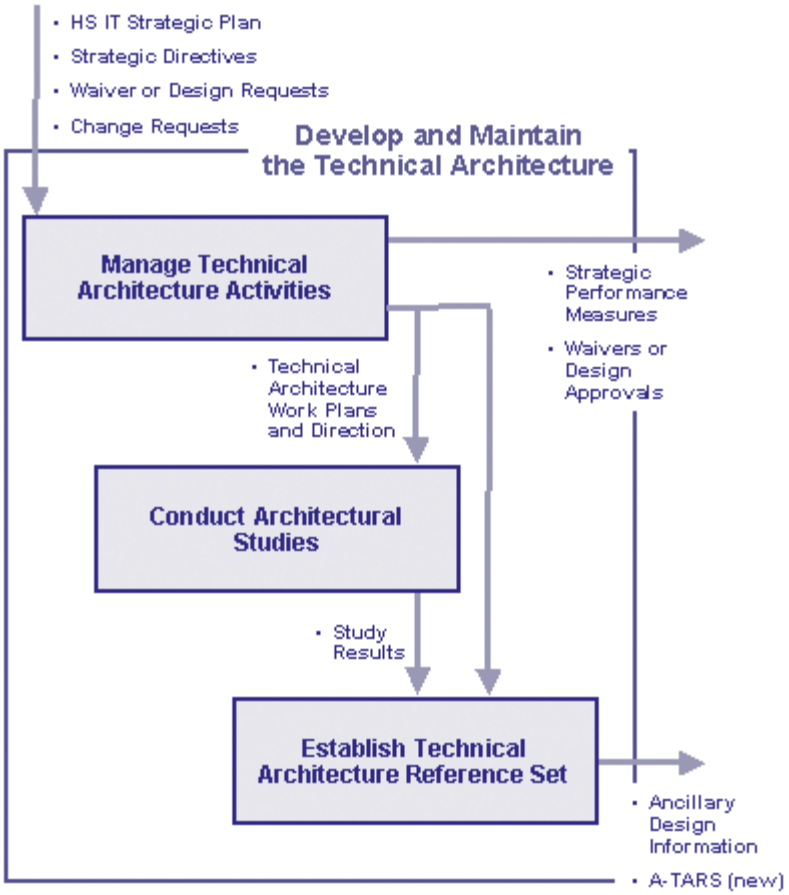
The Technical Architecture is described in a comprehensive set of reference materials, called the A-TARS. The A-TARS provides guidance for system design and development staff during all phases of the application systems life cycle. This includes the standard technologies and practices needed to support three typical environments: business (HS programs such as TANF, development (software engineering and management practices), and operations (administration and support).

See the Organization of the IT Planning and Management Guides for the relationship of the Technical Architecture processes described in this guide with those of the other guides. Background on the fundamental concepts and principles upon which the approach is based is also available. For information on how to customize this guidance view the Application of the IT Planning and Management Guides pages .

Technical Architecture Background

Processes

This guide defines the key activities, artifacts, and roles for the HS Agency Technical Architecture development, maintenance, and oversig ht processes. The activities are illustrated in the figure and described in the text below.



- **Manage Technical Architecture Activities** - This part of the Technical Architecture process establishes the Architecture Team and the management structure for architecture-related activities. Oversight and use of the Technical Architecture are also the responsibility of these activities.
- **Conduct Architectural Studies** - These activities pursue engineering tradeoffs and other studies to obtain information necessary for making Technical Architecture decisions.
- **Establish the Technical Architecture Reference Set** - These activities create and maintain the individual architectural descriptions, ensure their integration, and transition them into use.
    - **Describe Technology Boundaries** - These activities characterize the external user and automated entities and their interaction across the Agency's Technology Boundaries.
    - **Establish Agency System Properties** - These activities establish the essential system-wide characteristics that will guide all design decisions.
    - **Establish Agency Technical Reference Models** - These activities create and update the Agency's Technical Reference Model describing the technical elements to be incorporated into the Agency's systems.
    - **Describe Integrated Technology Blueprint** - These activities describe the system and application architectures.
    - **Describe Technology Elements** - These activities describe the elementary building blocks that are used to compose the Agency's application systems.
        - **Describe Services** - These activities define the functionality to be reused across the HS Agency's systems.

- **Describe Data Sources and Business Rules** - These activities establish the top-level design and technologies used for the HS Agency-Wide data sources, messages, and business rule processing.
- **Describe Platforms, Equipments, and Packaged Solutions** - These activities define the platform configurations, including major equipment and pre-packaged solutions that are used across the Agency.
- **Describe Networking** - These activities describe the networking configurations to allow interoperability across the Agency.

- **Develop Technical Guidelines** -These activities establish the guidelines on technology management and engineering practices that are used across the Agency.
- **Integrate, Review, and Release the A-TARS** - These activities compile the individual descriptions into a consistent set and transition them into use.

Technical Architecture Guide Resources - A consolidated set of items that can be used to implement the activities defined in this guide are listed in the consolidated resources.

Technical Architecture Background

This Guide describes a customizable process that can be used to guide the evolution of the technology in use within the HS Agency. Principles and concepts upon which that process is based are described in this background material. This builds upon the key principles that apply across the IT Planning and Management Guides.

Underlying conceptual models

Building Architecture

The architectural approach adopted for this guide is influenced by concepts associated with the construction industry. In that context, highly trained and skilled individuals, the architects and engineering specialists, apply their creative and engineering talents to design buildings and oversee the entire construction life cycle. In some cases, the architect's responsibility may extend beyond initial occupancy, such as continual responsibility for public buildings, like the U.S. Capitol (see AOC 2001).

Architects ensure that the building they design meets its intended use and satisfies all applicable building codes governing the building and construction processes. This includes life-cycle concerns, such as development or lifetime maintenance costs; construction timeframes to meet occupancy needs; and environmental factors, such as snowfall or hurricane threats. An understanding of the environment is key to producing aesthetically pleasing, serviceable, and long-lived buildings. A building should maintain its essential character, yet adapt over time to handle emerging needs. It is the architect's responsibility to understand how the building will be used and provide for a range of uses-the building's function. This includes parameters on the construction process.

The architect translates needs into a design description. Others use that description to create and maintain the building. These descriptions take the form of building plans (or blueprints) where the overall form of the building is accurately portrayed. These descriptions show the key entities of a building, such as walls, windows, beams, joists, columns, and stairs. Composite relationships between entities are described in different interrelated views, such as framing, electrical, mechanical, grading, roofing, or foundation. These different views are organized to suit different stakeholder needs. Stakeholders vary and may include the customer-developer, occupant, county inspector, lender, and the

construction trades, such as plumbers, framing carpenters, concrete, electrical, painter, roofing system fabricator, among many others.

When a detailed design decision is important to a stakeholder, then a detailed *out-of-context* description is developed and organized within the plans. An example of such detail may be a handrail that gives a home the essential character required for a contemporary style, a paint color for a traditional early American style, or a particular make of appliance for a gourmet kitchen. When specific processes or guidelines are to be followed, those are also called out in the architect's instructions, such as erecting barriers to control soil erosion during excavation.

The design reflected in the architect's plans is prepared to satisfy best commercial practices and to adhere to local and other building codes. The design process embraces conventions so that available basic building blocks can be used to keep costs reasonable (e.g., standard counter heights, door sizes, ceiling heights, or bathroom fixtures). The contractors and construction team have some flexibility to apply their judgment and expertise to create the building, guided by the decisions reflected in the building plans. Flexibility is necessary to allow for cost and time efficiencies, such as leveraging supplier discounts and availability of materials.

The architect is involved throughout the construction process to advise and oversee, ensuring that the plans are appropriately interpreted and the envisioned building is realized. The plans therefore guide, they are descriptive rather than prescriptive.

Summarized, the essential characteristics of architecture are:

- It depends on a highly creative and skilled team of individuals with technical and management knowledge. Individuals may specialize in different parts of the building or design process.
- It is life-cycle-oriented. Architects solicit the needs of all stakeholders and are involved in the entire design, construction, and optionally, the maintenance of the building.
- It requires the architects to understand the larger environments in which the building will be created and used, so its form follows its function.
- The architects consider both the building they are designing and the processes to produce and maintain it.
- The plans assume a set of building conventions and standards, commercially available parts are used, and custom parts are designed only when needed.
- The design is described in construction plans that are meant to be directly used by other stakeholders.
- The construction plans describe the entities of interest in many viewpoints, stressing one aspect over another, yet all views are interrelated.
- The descriptions in the plans are not of uniform detail, some are more detailed than others to ensure the design element reflects the architect's intentions.
- The plans do not over constrain; some flexibility is built in for making decisions to reduce cost, schedule, and other factors.
- Inspectors can check the resultant building against the plans and verify that it is a reasonable production.

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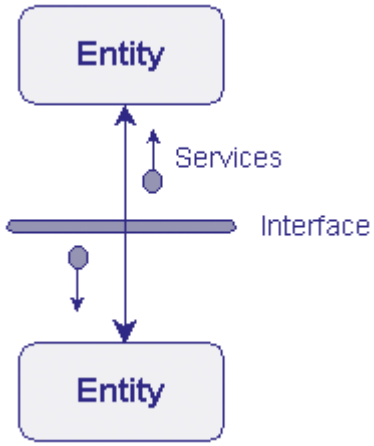
Technical Architecture

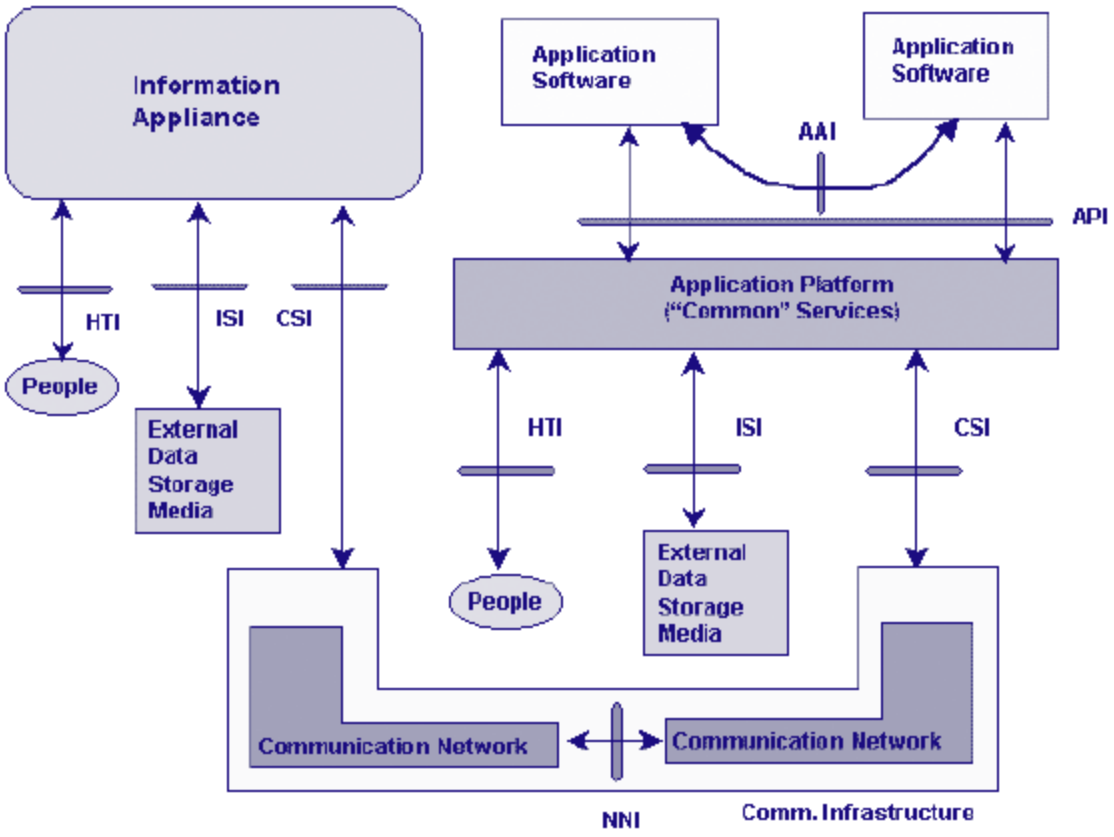
Architecture within the context of this Guide also implies a creative and disciplined process of design and technical management, generating a set of specifications to guide construction and maintenance of automated systems. The scope for the technical architecture is the HS Agency, which consists of a set of interoperating automated information systems. The technical architecture entails describing the services that collaborating entities provide one another across interfaces (see figure). For the HS Agency's technology, this consists of the following:

- The technology-related entities that are defined or managed at the HS Agency level, such as computers, applications, data, networking, business policies, and people
- The interfaces between these entities
- The services provided by the entities across the interfaces

Although the model in the entity figure appears simplistic, it captures the essence of good IT architecture. The key is the appropriate identification and definition of the entities that are of concern to the HS Agency; not every detail can be specified and controlled. The architects focus on identifying and characterizing the entities and their essential characteristics, allocating functionality and encapsulating essential behaviors behind interfaces. This encapsulation and the relationships between entities are key to establishing a robust structure that can adapt to changes, either anticipated or unforeseen.



There are many types of technology-related entities that an HS Agency may wish to define and manage. The elaborated figure shows a logical partitioning of the entity and interface types, adapted from (Shultz 1995).



Types of technology-related entities are:

- Application Software. These are computer programs that provide services to a real-world process, such as an HS program, operations, or technology development process. Applications are assumed to be distributed across many computer processing platforms. Application software may be either custom-developed, configured from a tailorable set of preexisting functionality, or purchased and used as is. Data associated with the application, such as initialization parameters, is assumed to be part of the application software entity.
- Application Platform. This is defined as the computer processing resources upon which the applications are deployed and used. The platform provides *common* services to the (distributed) applications. Platforms may be specialized for specific roles, such as user interaction, application logic execution, or data access and storage.
- **People / Users.** These are the human or automated external end users that interact with the applications. Users access the application-provided services within a real-world setting, such as a county facility (e.g., office access to an intranet) or at home (e.g., dial-up access through an ISP). The setting defines the usage environment or context in which the application is accessed and used.
- **External Data Storage Media.** These media include any technology to persist data, such as memory cards, magnetic disks, tape, DVDs, or paper reports. The media format, reliability, and size (or change in size) may be of concern to the architect.
- **Communication Network.** The network is the composition of communications media and services generally under the control of a single provider organization. The network transfers information between computer platforms and/or information

appliances and includes technology such as LAN, wireless, infrared, and satellite. The communications infrastructure is a set of networks viewed as a single entity by the network user.

- Information Appliances. The underlying software in these devices is not directly visible or configurable by the end user. This includes a fast-growing list of items such as Web-enabled cell phones, personal digital assistants, electronic books, and networked data storage devices.

Interface types include the following:

- **Application-to-Application.** This is an interface through which an application program may use the capabilities exposed by another application (e.g., accessing a spreadsheet application's objects from a custom application written in a scripting language).
- **Application Program.** Programmers build applications that access common, underlying services that are not application specific through this type of interface. Each type of platform may have different application-provided services and interfaces.
- **Human Technology.** This is the interface by which external entities (e.g., people) interact with the IT resources. The type of interface may depend on the assumed tacit level of knowledge and capabilities of the users, such as internationalization, multilingual, or accessibility features for persons with disabilities (see PL 1998).
- **Information Storage.** Information may be stored to provide access to permanent data sources that may or may not be removable, including the secure creation, read, update, retention, or deletion of data.
- **Communication Service.** This allows access between application programs residing on the same or remote platforms. It may include datagram, connection-oriented, remote procedure, or transaction processing services.
- **Network-to-Network Interface.** This is the exchange of communication connectivity services across networks, such as data exchange, quality of service, network management, and service charging.

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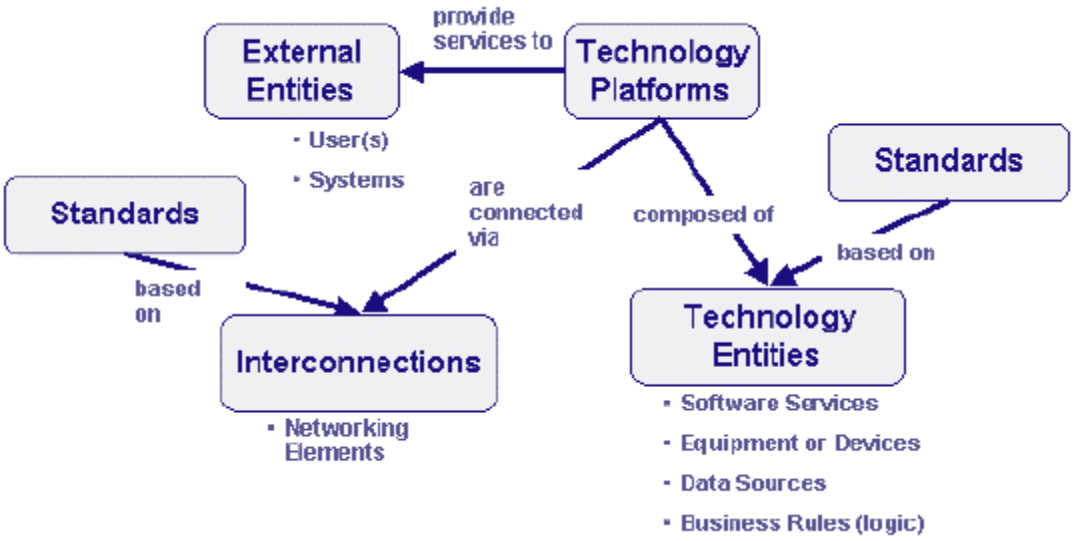
Architectural elements

Each user of this guide needs to establish the type of elements they wish to define and control for their HS Agency. The fundamental types of technology elements and their relationships are depicted in the figure. The essential characteristics of these elements should be described to promote consistency in their implementation. Note that standards are used as a basis for defining the elements, discussed in The role of standards in the architecture process.



Like the views and the detailed breakouts of a construction architect's building plans, the HS Agency technical architects build descriptions that show how the individual technology elements are aggregated and arranged. The two types of composite descriptions showing how the individual elements work together are:

- **System Architecture**

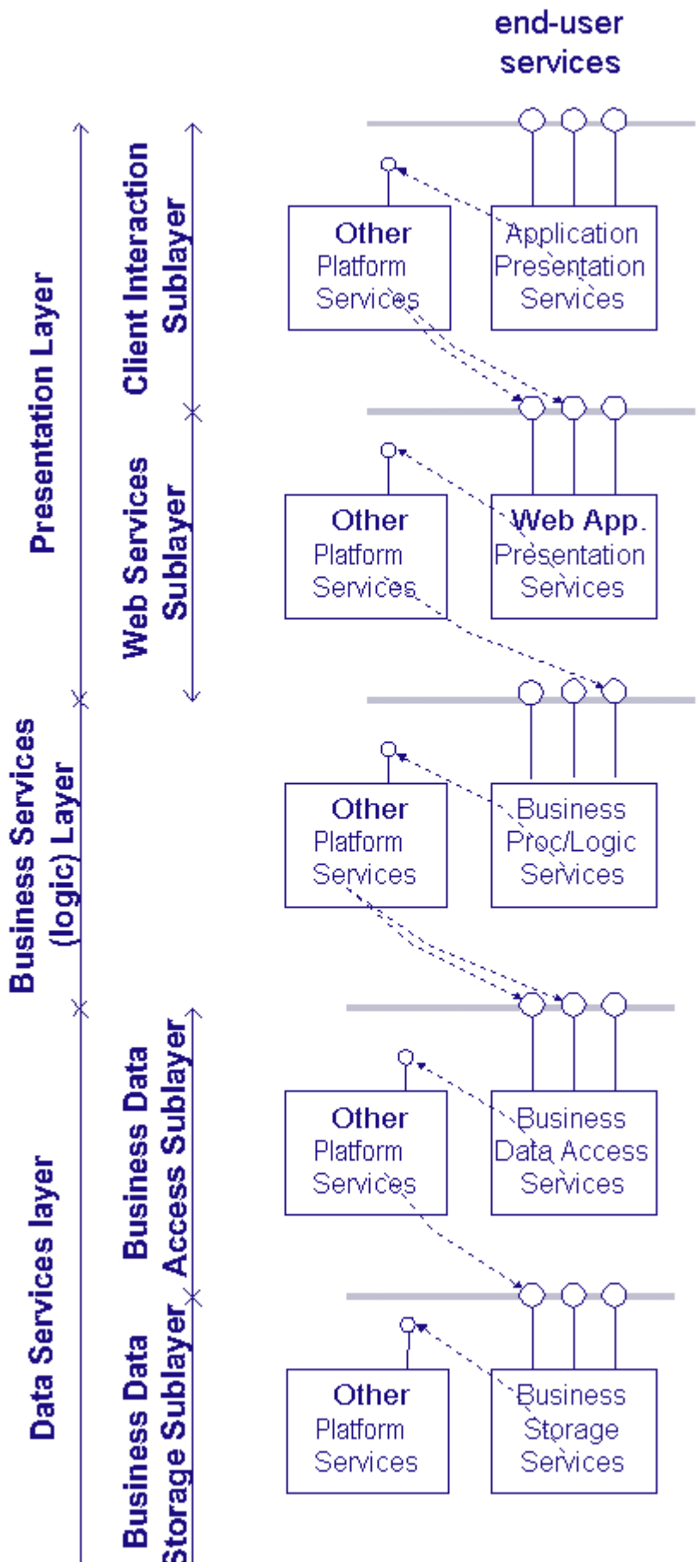
The *System* in the context of these guides is the ensemble of technical platforms that interoperate to provide common and HS program-unique services *across* the HS Agency programs and divisions. This is a wide (enterprise) view of system, broader than a single computer system dedicated to a single function. Beside working together within the HS Agency, platforms also interoperate with automated systems external to the HS Agency.

The arrangement of automated platforms and their interconnections is the system architecture. It is usually represented diagrammatically, such as with a block diagram. This diagram corresponds in concept to the *floor* plans of the construction architect. It defines the major building blocks and how they relate. Detailed specifications for the items in the system architecture can then be provided (in detailed breakouts). The system architecture will evolve as computer platforms and their function or interconnections change as new applications are deployed, others are retired, and IT advances. The system architecture will guide the highest level of technical evolution by defining what the overall technology arrangement will look like for each plateau.

- **Application Architecture**

The architecture approach of this guide assumes a distributed application model. In a distributed environment, an application is partitioned into distinct functional units in which each part may execute on a separate, networked platform. This allows for deploying specialized platforms for each type of function. The number and processing capability of the platforms can be adjusted to allow application throughput to economically scale up or down based on processing demand. This multitier application layering (n-tier) establishes the overall model for an application's structure- its application architecture.

The figure illustrates a simple logical partitioning concept for a Web-based application environment in which the application functionality at one level uses the services of a lower level, reading top to bottom. Many application models can be provided for each tier depending on the mix of legacy and new application design techniques in use at any one time.


end-user services
Presentation Layer
Client Interaction Sublayer
Web Services Sublayer
Business Services (logic) Layer
Data Services layer
Business Data Access Sublayer
Business Data Storage Sublayer
Other Platform Services
Application Presentation Services
Other Platform Services
Web App. Presentation Services
Other Platform Services
Business Proc/Logic Services
Other Platform Services
Business Data Access Services
Other Platform Services
Business Storage Services

The tier types in the figure are:

- **Presentation (Client side).** This portion of the application is the front end of an automated application, handling all user interaction and interaction with the external world. The formatting, display, and input logic are usually placed on (or downloaded to) the client platform, where it is close to the input/output devices. The programs on this platform make requests for information resources on the back end. Client processing may be very robust and contain many features (a Win32 -based application or "thick client") or require minimal support (a Web browser-based application or "thin client"). The form factor of the platform such as the screen size of a Web-enabled cell phone may play a critical role in designing information to be displayed and manipulated by the end user.

- **Presentation (Server side).** Some user interface processing such as navigation, validating inputs, and tailoring output to usage environments may be managed more efficiently on a centralized processor rather than downloading or installing on the presentation client. For example, transcoding may be used to transform data into content suitable for a mobile device's small screen, low resolution, and limited communications speed. Security services, such as a firewall to ensure appropriate user access, also may be implemented. Server-side scripting may be needed for a robust, user-interactive experience.

- **Business Logic.** This implements the back-end portion of the application logic associated with handling *real-world* processes and manipulating their objects. Rules associated with how the business is run and how the information can be manipulated are enforced here. The business logic tier maintains integrity over business data transformations.

- **Data Access.** This portion of the application hides the data storage format and access mechanisms from the business logic that manipulates the data. This layer maintains the integrity, accuracy, completeness, consistency, and security of the stored data. It may provide common data processing services such as analytical functions, image, video, or geographic data manipulation.

- **Data Storage.** This portion of the application handles physical access to data sources, replication, availability, recovery, protection, and other low-level functionality (e.g., RAID). Data sources can have any format (e.g., spreadsheets, relational databases, flat files, video, and voice).

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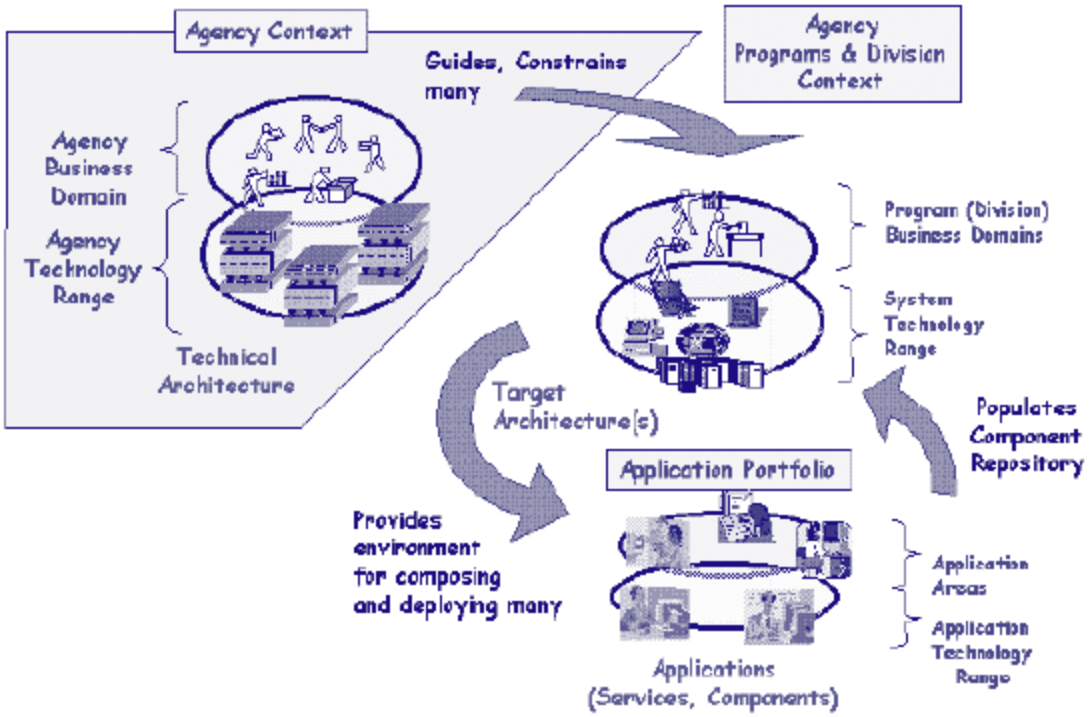
Solution delivery life-cycle using an HS Agency-wide technical architecture

Each user of this guide needs to adapt the processes described within it to fit their own usage environment. This implies integrating this guidance into existing technology design and delivery processes. Project staff must establish how the resultant technical architecture descriptions will be *used* and *maintained* across the HS Agency scope. The processes described by this guide assume the usage model illustrated in the figure below.



Within the HS Agency context (i.e., enterprise) the HS Agency-wide business domain is characterized, and the technology required to support it today and into the future is determined. The main source of input is the IT Strategic Plan as well as any HS Agency-wide business process design decisions. The result of the technical architecture processes is a set of documentation describing the Agency Technical Architecture.

The technical architecture documentation is used to coordinate a set of technology projects across the HS Agency programs and divisions. It constrains and guides choices in developing, assembling, and using existing, new, or commercial products to meet specific (program) requirements. Contractors, vendors, or internal HS Agency IT development resources can be tasked to implement all or a portion of the HS Agency's Technical Architecture. Existing applications and data, new HS Agency-unique applications, or vendor-preferred products can be chosen and adapted to create the target architecture. The target is a specific set of interoperating platforms on which the applications will be delivered and executed.

Solutions that address specific business application requirements are delivered by populating the target with applications. Applications are composed from engineered or purchased packaged application solutions and/or application-specific components. As applications and their constituent parts are added to the target environment, they enrich the suite of services available and become a means to compose additional applications. All applications are structured in accordance with the application architectures established by the Agency Technical Architecture.

The architecture approach allows for delaying implementation decisions until necessary and provides flexibility to choose products to fit within the structure. The architects control the HS Agency's Technical Architecture; the automated solutions design teams control the target architectures; and programmers or solution providers control the composition of specific applications.

When advantageous, an HS Agency may *standardize* on products, as in the case of proprietary standards or preferred applications (e.g., office productivity suites). The architecture framework allows for an HS Agency to support this choice, to use the

architecture relationships to determine the impact of the decision and to assess the long-term effect on the HS Agency. The framework also allows for restricting building on proprietary features of vendor products, as some features may circumvent HS Agency-approved standards. Defining an HS Agency technical architecture makes the rationale for selecting and using products visible for an analysis of risk or benefit, such as vendor lock-in or rapid time-to-deployment to be made.

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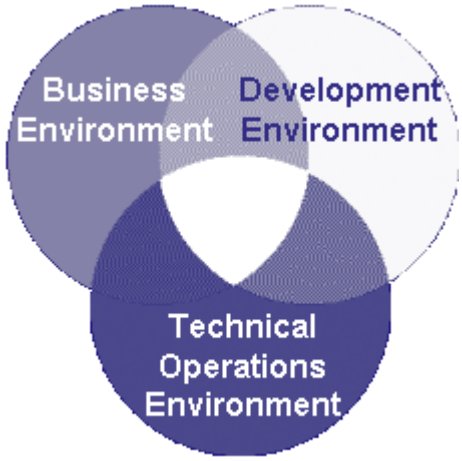
The three primary environments of interest

The approach takes a broad enterprise focus. This implies that the definition of technology in use throughout the Enterprise takes into consideration all the environments of interest (see Figure).



This assumes the following three generic types of environments:

- *Business.* This is the environment in which business users interact with the applications to provide the HS Agency's core value-added services or enable key business processes. The information technology is used in a business setting by business users to obtain, produce, and deliver products and services on behalf of the HS Agency's customers, suppliers, business partners, and oversight authorities. The environment may be segmented to include organizational subsets, such as personal/individual, workgroups (e.g., teams), departments (e.g., functional organizations such as a specific program), small service units (e.g., caseworkers), HS Agency-wide (e.g., hundreds of users, core databases, and data warehouses), and extended-agency/global setting (e.g., local, county, regional, partner, or international access). Users can be employed by the HS Agency, by partners, or be the clients themselves.
- *Development.* This is the environment in which the applications and underlying infrastructure (or parts) are acquired, developed, integrated, tested, and deployed. Individuals interact in this environment to provide technology for the business users, other developers (e.g., custom tools), and operators (e.g., system management and administration tools). This includes both creation and maintenance activities. The environment may be segmented for development specialties (e.g., programming, test, and integration) or maintenance activities (e.g., field maintenance and post-deployment help centers).
- *Technical Operations.* This is the environment in which the existing applications are runtime configured, operated, and administered. This environment considers the

technology to run the business as well as support the development environments. Individuals manage user access, help-desk inquiries, data administration and backup, installation and configuration of applications, licensing, network administration, and other functions.

These environments may overlap in time and space. For example, a citizen may access HS Agency provided services over the Internet using a home PC. They may take responsibility to install, configure, and manage downloaded applications on their computer. Each activity is different and requires distinct services, skills, and knowledge. Within the HS Agency, these support activities may be more formally defined and distributed across specialized professionals, such as a support staff. When dealing with platforms that are not accessible to the HS Agency support staff, remote help may need to be provided.

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The role of the agency technology architect

The Technical Architecture Team has full responsibility for establishing and maintaining the HS Agency Technical Architecture descriptions and ensuring acceptable implementation. Members of the team have composite expertise in all relevant technology areas under consideration within the HS Agency. The term architect implies one or more technical individuals on this team. The Chief Architect is the central figure in coordinating and providing technical expertise to the team. Architects serve as technical leaders and stewards of the technology in use within the HS Agency.

The primary role of the architect is to create descriptions that others consult to build the HS Agency's automated solutions. As long as the description provides adequate guidance, they can take any useful form, such as models, reference implementations, prototypes, or narrative documentation. The descriptions are not uniform in level of detail. Some parts may be addressed generally (where any reasonable solution will do), and some parts may be very detail-oriented (such as an API or data element). Architects determine which technology choices are best left to the projects and which should be managed by the HS Agency.

Architects are generally responsible for the following:

- Leading the use of technology to meet enterprise business objectives as provided for in the IT Strategic Plan.
- Eliciting, interpreting, translating, and consolidating individual business needs into a consistent use of technology; guiding the business planners in identifying and applying technology in a cost-effective way; communicating and obtaining management buy-in to realize the technical vision.
- Conceptualizing the unifying structure for the automated systems and their constituent parts, conveyed in system and application architectures.
- Identifying, organizing, and specifying the entities, interfaces, and services across and within the processing platforms for each of the primary environments of interest.
- Providing consultation, coordination, and oversight of the implementation of the technical architecture by advising and reviewing individual system fabrication projects. This includes overseeing the purchase of compliant products. This may lead to establishing a group that arbitrates interface disputes to ensure interoperability and integration, such as an Interface Control Working Group.
- Overseeing reference implementations, such as out-of-context prototypes for parts

of the architecture. These exemplify how elements may be constructed, aggregated, and used. These prototypes are available for experimentation. Not all essential characteristics of a robust application are available in the reference implementation (e.g., reliability, scalability, availability, and maintainability). Reference implementations may be used to develop test suites for project-specific implementations.

- Ensuring that the elements they specify can be implemented cost-effectively and have the necessary properties (e.g., scalability, reliability, security, and maintainability). Architects are familiar with the various construction techniques and tools (although they may not be as skilled as one who works in a particular field, such as a highly skilled professional programmer).
- Organizing the application architectures for change; noting what changes are possible; indicating the interfaces, services, and protocols that will isolate changes; and ensuring that the mechanisms to manage change are life-cycle-oriented. They consider the useful life-time of the entities they specify and how they will adapt over time, until they are retired.

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The role of standards in the architecture process

The process to produce and maintain an Agency Technical Architecture involves standardization of HS Agency-wide technology products and processes. Product standardization results in HS Agency consensus on the selection of common technologies and their properties, as well as where they can be deployed in the HS Agency. Process standardization results in the establishment of HS Agency-wide conventions for activities to acquire, develop, and operate the technology resources. The benefit is reducing unnecessary variation and managing changes where the HS Agency as a whole may benefit.

The philosophy of standardization in this guide is based on that of the Internet community, which states the following in RFC 2026:

In general, an Internet Standard is a specification that is stable and well-understood, is technically competent, has multiple, independent, and interoperable implementations with substantial operational experience, enjoys significant public support, and is recognizably useful in some or all parts of the Internet.

The Agency Technical Architecture therefore is the basis of standardization within the HS Agency; it represents agreement on the technical elements and how they will be used. It should reflect voluntary agreement and consensus by those that will be subject to it. This includes those producing the Agency Technical Architecture, as well as the IT project development and business program staff. If all parties abide by these agreements, then the HS Agency as a whole will benefit. Buy-in is achieved by involving the appropriate stakeholders throughout the process, by forming and officially chartering the architecture teams, and encouraging the architects to promote active participation of all stakeholders.

HS Agency internal or external conventions determine the basis for defining the technology elements. These conventions are the *base standards* that the HS Agency can adapt as the foundation upon which it specifies technology. Depending on the reach of the HS Agency, the source of the base standards should be considered, such as the following (adapted from Shulz 1995:

- *International Standard.* These standards are formally developed and successfully balloted outside the United States, using an approach that may vary greatly from

the U.S. approach. International implies a scope of ballot that is global (e.g., ISO/IEC and IETF.

- *U.S. National Standards.* These standards are formally developed and successfully balloted inside the United States, from formal or voluntary standards organizations, using a variety of procedures and following basic ANSI guidelines (e.g., IEEE and NIST).
- *Regional Standards.* These standards are formally developed and successfully balloted outside the United States, using an approach that may vary greatly from the U.S. approach. Regional implies a scope of ballot limited to a specific part of the world (e.g., European and North American).
- *Federal or State Standards and Regulations* - These are promulgated by a Federal, State, or other regulatory body.
- *Public Specifications.* These include any specification that establishes some consensus without formal balloting, usually a proprietary specification that becomes widely adopted in the marketplace.
- *De Facto Standards.* These are proprietary specifications that are widely adopted in the marketplace, based on marketplace success, and are made available by the developer of the technology in a public (free) or private (license) agreement.
- *Consortia Specifications.* These are specifications produced by consortia or associations, usually in an environment where collaboration is important to share costs or achieve critical mass, although not unanimous consensus, in the market (e.g., W3C and OMG).
- *Private or Proprietary Specifications.* These are developed within an organization and may be protected by intellectual property restrictions or agreements prior to use. They include specifications that are unique to and only used within an Enterprise (e.g., inter-system data interfaces within the HS Agency).

The lifetime of a base standard is limited. Base standards may be emerging, mainstream, or in decline - on their way to being withdrawn (e.g., FIPS 1971). The HS Agency should determine its preferred precedence, which may not be uniform across all technology areas. The following guidelines are recommended for giving precedence to certain standards (Shultz 1995).

- Approved standards maintained by accredited international standards development organizations
- Approved standards maintained by accredited regional bodies
- Approved standards maintained by accredited national bodies
- Draft standards maintained by accredited international bodies
- Draft standards maintained by accredited regional bodies
- Draft standards maintained by accredited national bodies
- Approved (not draft) specifications (widely adopted, but not formal standards) developed or maintained in an open forum
- Specifications developed by a closed forum, such as in-house

The technology definitions in the Agency Technical Architecture are defined on top of adopted base standards. Because HS Agency technology must align with that of the external environments in which the HS Agency operates, the base technology standards

are selected as a foundation of interoperation and integration.

In some cases, project staff could easily standardize on a vendor product for a particular function, such as an office suite for generating documents. However, by selecting a vendor early in the design process, the HS Agency limits further choice, such as selecting a more cost-effective product from another vendor when it later becomes available. The architecture approach in this guide recommends that the architects describe the underlying technical need- such as "document interchange," using HTML - based document interchange. Architects would describe only the document exchange technical services in the Agency Technical Architecture (e.g., based on the HTML 4.01 base standard). The architects would adapt the base standard to the HS Agency needs, such as describing how deprecated language elements will be handled or how conventions for accessibility (PL 1998) will be integrated. This obtains the functional goal (document exchange) while decoupling from a vendor implementation. Selection of a cost-effective solution now becomes a commercial consideration for the IT projects and the HS programs.

The following specific HS Agency elements are defined following a process of adoption, adaptation, and tailoring of existing base standards to fit the needs of the HS Agency:

- *Adoption.* Guided by the HS Agency's TRM, the architects identify the types of technology that should be included in the HS Agency's application systems. They then determine the basis for the technology elements by considering published internal or external standards based on the reach of the enterprise (global, regional, or local) and its threshold for technology risk (an early or late adopter). A candidate set of base standards is selected.

- *Adaptation.* A published standard may address a large constituency, such as an international community that the HS Agency may not have as part of its external environment. The published specification also may recommend good practices that are not essential for conformance with the specification. The architects consider the requirements necessary for conformance as well as the non-normative parts of the published standard. The architects establish the HS Agency's interpretation. The architects determine what parts are necessary, optional, or discouraged for implementation within the HS Agency. This application of the base standards then becomes the foundation for defining the technology elements of the Agency Technical Architecture, which will be used via tailoring.

- *Tailoring.* The technical architecture descriptions are the basis of standardization within the HS Agency. Tailoring implies IT projects making adjustments to the descriptions based on unique needs. The Agency Technical Architecture descriptions indicate options to be exercised and portions that apply under different circumstances. For example, vendors may have added proprietary extensions to a published standard, such as the Document Object Model (W3C 2001), or there may be known limitations with using certain features of an existing standard (e.g., lack of explicit error handling). The architects control when and how these concerns are addressed. The goal is not to prohibit extensions or modifications arbitrarily, but to establish the appropriate checks and balances on their use. These resultant technology descriptions then become the operational basis applied on the program or project, derived from the Agency technical Architecture.

The guidelines provide language conventions that architects follow to document the elements in the technical architecture. Those conventions indicate the degree of freedom users have when applying the Agency Technical Architecture descriptions.

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The Role of an HS Agency-wide Technical Reference Model

Application systems continue to grow in size and complexity. They can no longer be built from scratch by teams of programmers working for years. Off-the-shelf infrastructure and packaged solutions are available. Elements that make up the Enterprise systems must have an orderly arrangement. IT projects can use this arrangement to identify, select, and integrate parts into the HS Agency's IT assets.

A TRM aids in organizing the Agency Technical Architecture's descriptions and promotes communications among the stakeholders. It represents early decisions on the technology that will (or will not) be included in the HS Agency's automated systems. It serves as an outline to establish common concepts and enumerate the technology parts based on an analysis of a technology or business domain. It is descriptive, not prescriptive, in that it identifies and describes the types of things that *may* be in the Agency Technical Architecture. It is not a physical partitioning. It influences the way the architects and others view, select, and arrange parts. As it is a high-level abstraction of the technology elements, which can be used to identify assets that can be reused across application systems.

The reference model helps the architect answer the questions:

- What type of parts should be in the HS Agency's automated systems?
- How should they be cataloged?

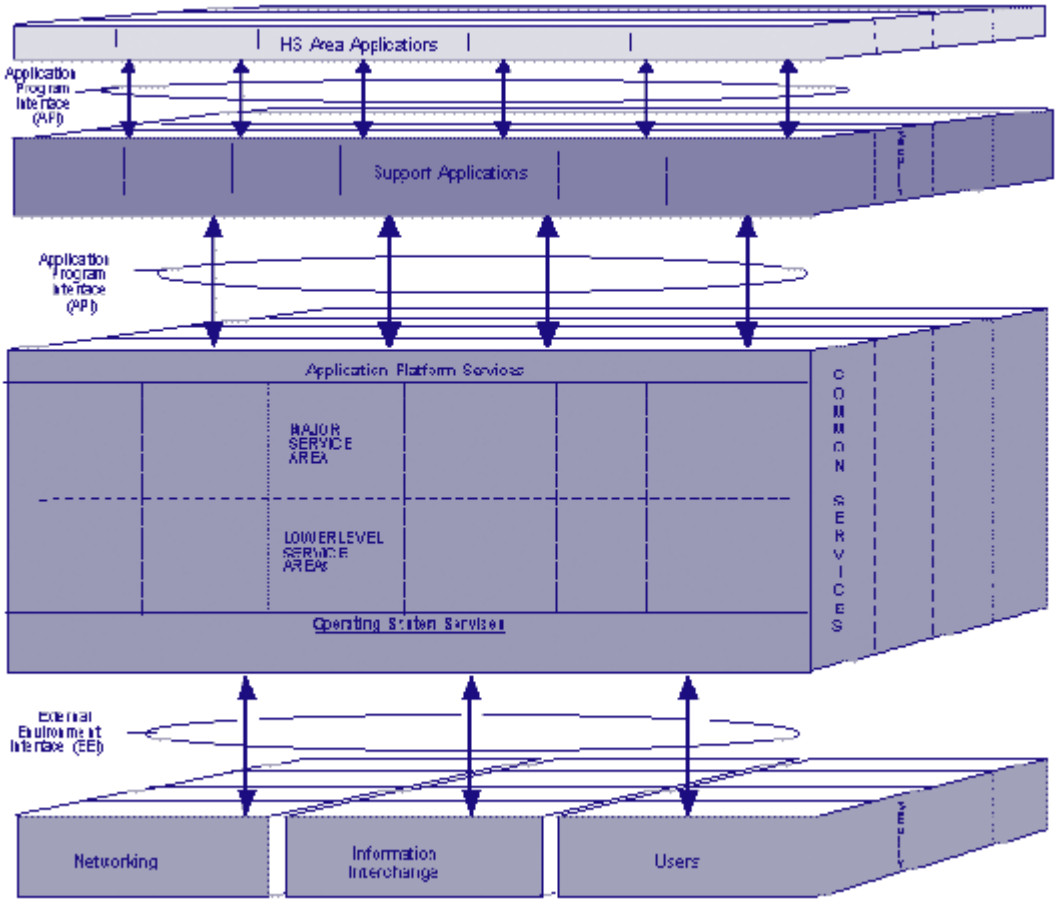
Architects evolve a reference model for their HS Agency, compiled from other available models. Technologies, standards, and vendor (or HS Agency internal) products can be organized against the model. In this sense, the model serves as a taxonomy. Each HS Agency classifies the parts of its architecture differently to suit the way it views the technology elements and its style of application partitioning.

A conceptual framework for organizing the TRM is shown in the model figure. The elements in this model are organized into the following categories:

- *HS Area Applications.* These are elements specific to the HS Agency program missions, such as supporting interactive interviewing, eligibility determination, case management, and many others.
- *Support Applications.* These elements are essential to performing the HS Agency program but are typically based on a generic implementation that is tailored and adapted for use. This includes common facilities such as word processing, calendar management, and email.
- *Application Platform Services.* These elements provide the environment for the applications to interact and use the computing platform. These can include prepurchased packages, individual services, or components to support user interface processing, programming support, data management, data interchange, multimedia, and so forth. Each type of platform may require different application platform services because the application (or part) that is hosted on a platform will require different capabilities.
- *Common Services.* This category represents ubiquitous services that are used across application areas, providing fundamental services. This includes security, systems management, or application distribution.
- *Operating System Services.* When necessary to specify them, elements at this level can be included, such as kernel operations, clock, programming shells, or process management. Note that higher-level services may abstract these and provide some

portability of applications across operating systems. Unless the upper layers are specifically accessing these low-level services, they need not be included in the model.

- *Networking, Information Exchange, and Users.* These represent the external entities that will interface with the automated systems.



Top

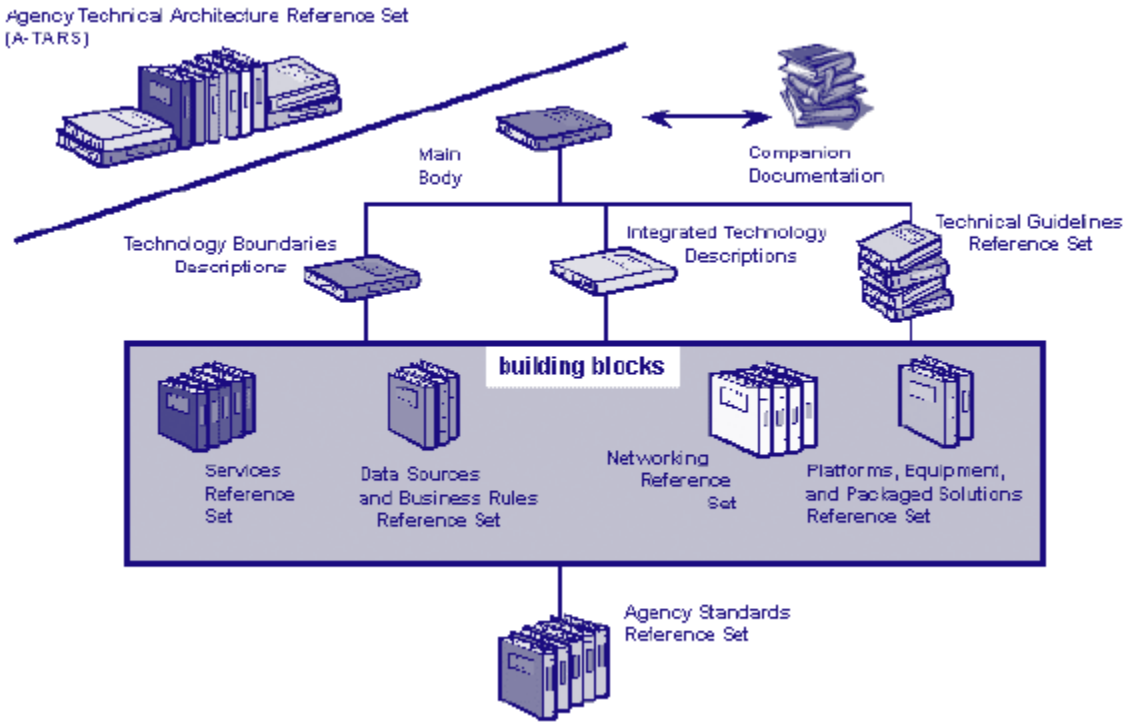
Documenting the HS Agency technical architecture

Just as the construction architect's design of a building is reflected in a set of building plans and accompanying specifications, the Agency Technical Architecture must also be recorded in an effective manner. The means by which this is done is the A-TARS. Throughout the guides, the term Agency Technical Architecture refers to the abstract design information, while the term A-TARS refers to its written description.

The A-TARS is a collection of engineering data and guidelines, consulted primarily by designers when building or maintaining a system. Ideally, it is readily available, well organized, and in a form that someone can easily reference and *use.* It possesses a *reference* look and feel, with minimum tutorial or additional information. It assumes the reader has the appropriate level of understanding. When needed, background information for training can be separately included. The means by which the ATA is rendered depends highly on each State's IT situation. The representation should be optimized for clarity, brevity, and ease of use to ensure that users find, interpret, and apply the guidelines consistently. For example, service interfaces can be partially described using type

libraries.

The A-TARS described in this guide does not assume a particular implementation. The logical arrangement of the A-TARS is shown in the figure. The activities in this guide create or modify information in this logical structure. An HS Agency implementing an A-TARS can adapt it by modifying, adding, combining, or removing sections. Project staff may increase or decrease the degree of rigor for the descriptions, from applying formal notations such as UML to using narrative descriptions. The need for precision in the descriptions should be driven by the users of the A-TARS and the need to ensure conforming implementations.



The portions of the guides are:

- *Main Body.* This is the highest-level description of the Agency Technical Architecture, tying together all the other sections. It introduces and references general background information and items that are common across all the sections that make up the technical architecture descriptions. This is the entry point for all users of the A-TARS and contains discussions describing the essential properties, usage of the A-TARS, overall applicability of the guides, documentation conventions, glossary, general references, change notices, and approvals.
- Technology Boundaries Descriptions. This portion of the A-TARS identifies and describes the use of technology platforms by external entities. This forms the highest-level description of overall technical business needs for the HS Agency. This is where entities in the three usage environments interact with the technology.
- *Integrated Technology Descriptions.* This portion of the A-TARS identifies and describes how the technology elements work together. The application architectures and the system architectures are portrayed. This is similar in concept to the plan views for a building, showing all the architectural elements and how they are arranged. Items in these descriptions can refer to further specifications in the other parts of the A-TARS, as needed.
- Building Blocks. This portion of the A-TARS is the collection of the low level parts

and sub-assemblies that are referenced from the Integrated Technology Descriptions. These are the fundamental units that will be built or purchased to construct the integrated solutions. It contains:

- *Services Reference Set.* This portion of the A-TARS is a set of loosely coupled descriptions, capturing the design descriptions for a suite of commonly deployed services. These are organized against the TRM.
- Data Sources and Business Rules Reference Set. This portion of the A-TARS is a set of descriptions defining the essential characteristics of: the HS Agency-wide data sources and associated storage and retrieval technologies; data management practices; and HS Agency-wide common business policies, procedures, rules and associated processing technology.
- Networking Reference Set. This portion of the A-TARS is a set of loosely coupled descriptions of the common network media, interfaces, protocols and networking guidelines (e.g., addressing). It describes the connectivity and interoperability between processing elements.
- Platforms, Equipment, and Packaged Solutions Reference Set. This portion of the A-TARS is a set of loosely coupled descriptions that define the common configurations, equipments (devices) and packaged solutions used by the HS Agency. These subassemblies are the specialized platforms (e.g., types of servers, client platforms or information appliances) that are the major building blocks. Existing legacy systems to be integrated into the Agency Technical Architecture are also described here.

- Agency Standards Reference Set. This portion of the A-TARS consolidates the list of HS Agency base standards and how they have been adapted. These are the foundation for the Agency Technical Architecture descriptions. These can be consolidated into one place, or distributed across the other parts of the A-TARS, as needed.

  The use of the term *reference set* implies a collection of documentation related to all or a portion of the architecture. This collection can be thought of as a *notebook* of information optimized for *reference* to quickly answer designers and developer questions. The Technology Boundaries and the Integrated Technology Boundaries portions of the A-TARS show how the elements detailed in the reference sets work together. This allows some ability to identify and separately control changes to the overarching organization and the individual elements. This is intended to minimize change impact, such as adding a new service description or data sources, while keeping the application architecture fixed.

- *Technical Guidelines Reference Set.* This portion of the A-TARS consolidates the set of overarching guidelines that are to be followed across the HS Agency. This may include process as well as product guidelines. The TRM and tutorial information may be described here.

- *Companion Documentation.* These are separately evolving documents that are considered a significant influence on the overall A-TARS documentation set. They may address other parts of the overall HS Agency design and implementation, such as the business process. The A-TARS should be consistent with these documents.

Additional general guidelines on applying the IT Planning and Management Guides can be found in the Application of the IT Planning and Management Guides.

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Controlling the use and interpretation of the A-TARS

The contents of the A-TARS may not uniformly apply to all portions of the HS Agency at all times. Provide information in the main body of the documentation to describe the circumstances in which each portion does or does not apply.

It may be necessary to *grandfather* specific technologies or practices, showing how they can be treated in a uniform way with emerging technologies. Services may be defined to bridge or isolate declining technologies when and where they are in use.

The HS Agency must clearly establish the degree of compliance expected to the HS Agency Technical Architecture. Consistent terminology should be used when describing the technical elements. The degree of compliance for an element of the Agency Technical Architecture (adapted from RFC 2026) is defined as follows:

- *Required.* An element of the Agency Technical Architecture is essential and must be implemented to achieve minimal compliance with the architecture.
- *Recommended.* An element of the Agency Technical Architecture is not essential, but it is highly recommended that the element be implemented as defined. Not following the recommendation may lead to less flexibility in the future or additional cost to evolve. Projects are expected to make this tradeoff when initially planned. It may be necessary to revisit the project funding and implement the recommendation if it has long-term benefits.
- *Elective.* An element of the Agency Technical Architecture is optional when it applies only to a portion of the HS Agency technology in special circumstances. It is up to each IT Project Manager to evaluate and determine when and how to apply the element during development.
- *Limited Use.* A limited-use element of the Agency Technical Architecture is appropriate only in unique circumstances. This may apply to emerging (e.g., early releases or drafts of standards) or declining technology (e.g., preexisting vendor standards). IT Project Managers may require explicit permission to implement the technology on their project.
- *Not Recommended.* Not every possible item can or must be fully specified in the Agency Technical Architecture. The Agency Technical Architecture can narrow choices by explicitly excluding some items. The IT Project Managers will require explicit permission to use one of the *not recommended* technologies.

Within each description, architects should use a consistent language to make it clear how specific items should be handled. Consider the following definitions, from RFC 2119:

- *MUST, REQUIRED, or SHALL.* These are absolutely essential; they cannot be negotiated.
- *MUST NOT or SHALL NOT.* This is an absolute prohibition of an implementation that cannot be negotiated.
- *SHOULD or RECOMMENDED.* These items in the description can be ignored after explicit consideration. The impact of ignoring the recommendation should be assessed. A cognizant architect must be advised and concur with the alternative (one of the architects responsible for the technical description in which the phrase occurs).
- *SHOULD NOT or NOT RECOMMENDED.* These phrases imply that the normal course

of action should be *not* to implement the item. Under certain circumstances, the item can be implemented after an assessment. A cognizant architect must be advised and concur with the selection (one of the architects responsible for the technical description in which the phrase occurs).

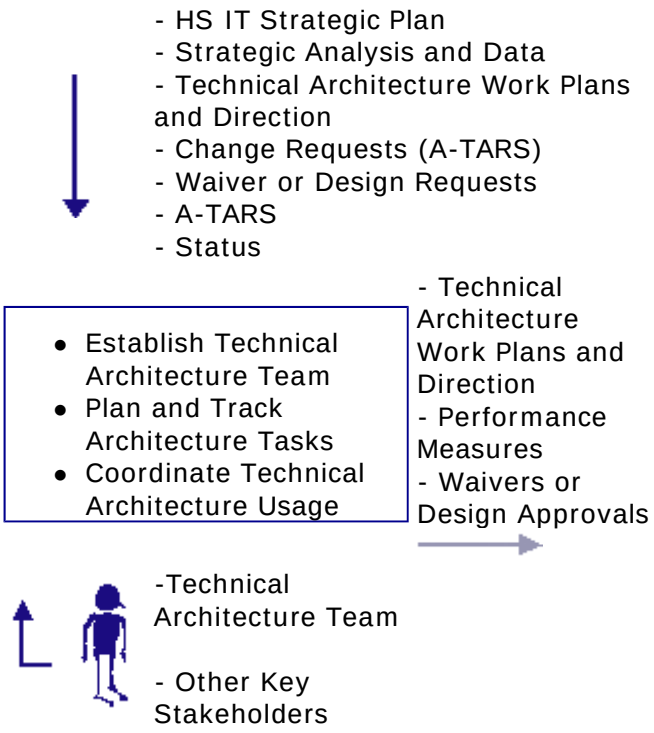
- *MAY or OPTIONAL.* These choices are left to each IT Project Manager.

Because the contents of the A-TARS evolve over time, the architects may identify areas that will be addressed but are incomplete at the time of publication. This may manifest itself as the use of TBD (To Be Defined) statements. IT projects using information marked *TBD* must coordinate with the architects before implementing. This allows for publication of the A-TARS to be taken out of the critical path of a project. The architects can participate with an IT project to define the Agency Technical Architecture element concurrent with its implementation. The A-TARS descriptions then reflect best practices. A description in the A-TARS when in draft or other unapproved form may be used at risk by the IT projects.

General responsibility to ensure conformance to the A-TARS descriptions should be established for each fabrication or maintenance IT project. A project quality assurance function would have overall responsibility to provide mechanisms to determine conformance. The IT Project Managers should invite key architects to participate on the design team and attend project technical reviews.

Manage Technical Architecture Activities

Form the architecture project, manage its tasks, and provide life-cycle oversight of the Technical Architecture's usage.



Introduction

The HS Agency's Technical Architecture development and oversight activities are managed as an ongoing project within the HS IT Division. The architecture project is staffed with a Core Team of experienced technologists, has its own dedicated resources, and its activities are formally managed. The Chief Architect acts as the leader-manager for the team, supported by a facilitator and others to ensure proper planning, coordination, and monitoring of architecture-related tasks.

In addition to the management of the A-TARS development and maintenance actions, its use must be coordinated across the HS Agency. The architects serve as reviewers and advisors to the IT projects. They coordinate with others when there is a change in strategy or requests for exceptions to the Technical Architecture, and when oversight of a project's design-related decisions is necessary.

TANF Example:

In many States, the TANF eligibility system has served as the basis or core for other HS-related systems. Because of the critical nature of the interrelationships of systems, architectural changes to the TANF system also affect the interface and capabilities of the other systems.

To properly provide for the critical interface operations, the impact on the Child Support, Child Welfare, Child Care, and other existing systems merits

consideration. Both current and planned technical architectural needs must be considered when establishing the Architecture Team.

Typical broad-based HS systems that will incorporate all or parts of TANF, Child Support Enforcement, Child Care, Child Welfare, and others will have a funding basis that merits planning and consideration from the Architectural Team. Funding may come from multiple Federal sources.

The inherent danger in failing to consider dependency systems other than TANF is that the Architectural Team could have a narrow view, resulting in a bounded architecture plan and perspective that omits the flexibility needed to broaden to the entire HS Agency, remaining polarized on the TANF Division's needs.

Current functional operations, including program and technical, are critical for the Architectural Team. Including all critical stakeholders in the Enterprise concept allows for increasing the potential to adapt to planned or unforeseen changes.

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Activities

Consolidated guidelines are available to perform the following key activities:

1. **Establish Technical Architecture Team.** To establish the Architecture Team, the IT Division Manager assembles and empowers individuals that will be responsible for guiding all Agency-wide, technology-related decisions. This includes:
    - Establishing a core technical and management team. Responsibility and design authorities are delegated to the Chief Architect, and a Core Team of 3 to 5 senior technical individuals is established. Adequate resources should be provided, initially to help form the team and do the necessary planning, and later to execute the Technical Architecture Work Plans.
    - Establishing the mechanisms to temporarily extend the Core Team. This includes adding expertise to the team when needed. Individuals are provided appropriate team orientation as they assist in performing studies, consulting, or preparing portions of the A-TARS.
    - Establishing technical working groups to interface with other technology-related groups within and outside the HS Agency. This may include a Technical Architecture Change Control Board or interface control working groups.

2. **Plan and Track Technical Architecture Tasks.** These are traditional planning and management activities applied to the Technical Architecture activities. The actions to be performed include:
    - Establishing formal plans that describe the products of the Architecture Team, the timetable for release, and the resources required. These plans help coordinate the Technical Architecture activities with those of the IT projects. The team works with the IT program planners and the HS programs to determine the plateaus and how the Technical Architecture will evolve over time.
    - Tracking progress against the documented plans and making adjustments, as needed. This may require rescheduling activities or changing activity performance, such as augmenting the team with additional expertise or tools. These plans are the basis of communicating progress to the HS Agency leadership, HS programs, and the IT projects. All commitments between the

Architecture Team and others are recorded and coordinated using these plans, such as levels of support for the IT projects.

3. **Coordinate Technical Architecture Usage.** The core Architecture Team has responsibility to ensure that the descriptions in the A-TARS are appropriately implemented. This technical oversight responsibility involves:
    - Acting as advisors to the projects and actively participating in the project technology design and implementation decisions. The A-TARS descriptions are not prescriptive and require interpretation, which the architects must provide (see the background on use of the descriptions).
    - Attending design reviews to provide technical oversight to IT project designs and technical practices.
    - Reviewing and approving IT project requests for waivers from A-TARS descriptions. The specific needs and short-term objectives and constraints imposed on the IT projects are traded off against the longer-term needs of the HS Agency to allow for effective use of the A-TARS.
    - Managing change requests through a formal change submission, review and control process, such as an Architecture Change Control Board.

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Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. The Chief Architect and senior technical staff are the primary individuals responsible for these activities. The Chief Architect acts as the overall management and technical authority for the team, while a Facilitator assists as the team administrator. The team membership consists of a relatively stable Core Team and a highly dynamic Extended Team.
- Other Key Stakeholders. These individuals or groups participate or have a vested interest in the establishment, approval, or oversight of the Technical Architecture activities. This may include IT Division Management, the IT project management, and the IT Decision Makers, among others. Stakeholders also include those technical or management staff that use the architecture products, file waivers, change requests, or otherwise interact with the Technical Architecture Team.

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Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- HS IT Strategic Plan. This is the foundation for the detailed Technical Architecture work plans. All actions in the work plans must be consistent with the higher-levels goals, principles, and initiatives of the Strategic Plan.
- Strategic Analysis and Data. This information augments the HS IT Strategic Plan by providing further insight into the strategic direction. This includes an understanding of the current state of the IT within the HS Agency, such as the inventory and its analysis described by the Analyze the Situation activities.
- Technical Architecture Work Plans and Direction. These plans are the main product of these activities, updating the previous version, if it exists. They are used to guide

the execution of all architecture-related activities. These plans are the means for coordinating the Technical Architecture Team members with one another, the IT projects, and other external groups. These plans are the basis of measuring actual progress against the plans and are updated as needed.

- Change Requests. Individuals file requests to modify descriptions in the A-TARS. These requests are evaluated and used to establish tasks to maintain the A-TARS.
- Waivers or Design Approvals. IT projects file waivers to be relieved from binding A-TARS requirements. The projects also must receive formal approval where design decisions must be coordinated between the project and the Technical Architecture Team.
- Performance Measures. Measures are periodically reported to HS Agency executive management. These measures address Technical Architecture tasks and performance against appropriate measures of the IT Strategic Plan.
- Status. Progress and issues in developing the descriptions are collected from the other Technical Architecture activities and used to update the actual achievements against the work plans.

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Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

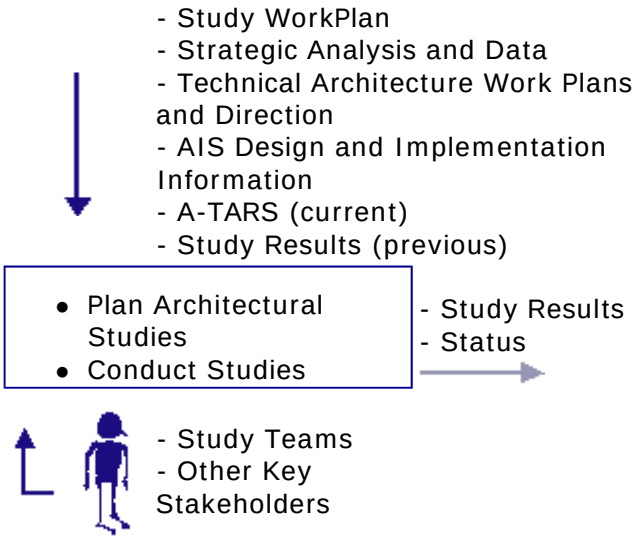
Consolidated Guidance: Forming the Technical Architecture Team
Guidelines on forming the Technical Architecture Team, describing their authorities, and defining Core and Extended Team member roles. 7-30-01

Consolidated Guidance: Architecture Project Management
Guidelines for planning and managing the Technical Architecture tasks. 8/17/01

Consolidated Guidance: A-TARS Users
Typical users of the A-TARS and the key sections they may reference to help establish the stakeholders. 9-21-01

Conduct Architectural Studies

Conduct engineering investigations to gain insight into tradeoffs and reduce design risks.



Introduction

Developing an Agency-wide Technical Architecture involves making technical decisions that have significant impact on the direction of the Agency's IT. Those decisions carry significant risk. One source of risk is a lack of understanding of a technology or its application. These activities provide a means to manage these risks by performing investigations to better understand the implications of a design decision.

The primary result of performing these studies is the knowledge gained from each study. Studies are performed with sufficient discipline and focus to ensure that they articulate and explore the issues and produce and disseminate reliable results as quickly and efficiently as possible.

TANF Example:

Because of the significant investment and risk of large-scale projects, some States have opted to participate in various types of "proof of concept" activities to validate that a particular type of technology will work in a specific environment. Some States have engaged one or more contractors to come to their site, for a short period of time and of minimal cost, to develop a sample application of a larger project. The vendor(s) in this activity build the application and deploy a small remnant of the larger planned project to demonstrate, in a "real life" situation, that their solution works. This gives the State a true barometer to measure the technology as the best choice for inclusion in the Technical Architecture.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Plan Architectural Studies.** Studies are formally defined, objectives are set, and sufficient resources and technical expertise are made available. Two actions critical to initiating the study and ensuring appropriate visibility into its execution are:
    - Establish a Study Team once the area to be investigated is determined. An individual should be delegated the responsibility for planning and executing the study. This is the Study Lead. The Chief Architect makes the assignment. The Study Lead can then scope the study and plan its execution. If special skills are required, the Study Lead should identify additional qualified individuals to participate.
    - Establish a documented and approved study plan that addresses the main objective of the study, the resources required, timeframe, and the expected outcome. Other specialists on the Study Team can participate in the planning as needed. The time-box methodology (McConnell 1996) is recommended for studies to ensure that they remain focused and return a result quickly.

    The Chief Architect reviews and approves the study plan. The Chief Architect should obtain commitment for any resources required, such as from the HS program or IT project. These commitments are in the study plan.
2. **Conduct Studies.** Time and accuracy are the biggest concerns in performing the study. Once the Study Team begins, individuals stay focused until either the objective is meet, time runs out, or it becomes evident that the study should be abandoned. Once the study is concluded, the results should be quickly communicated to those needing the information. An informal briefing documenting the outcome can be used. A simple study results paper can be prepared to document the study. Final and intermediate results or other study byproducts are saved as appropriate for later use.

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Study Team. These individuals consist of a Core Team of technical experts that perform the study and Extended Team Members, who may be needed when a study requires interacting with individuals from the HS program. The Study Lead has responsibility for the study.
- Other Key Stakeholders. These individuals support the study, are subjects of the study, or use the study results.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- Study Work Plan. Each study is formally planned and managed with its own work plan. Status is against this plan (effort, schedule, resources, cost).
- Strategic Analysis and Data. The analysis and data collected during the IT strategic planning activities may be used as a basis of study assumptions.
- Technical Architecture Work Plans and Direction. The study work plan is integrated into these plans to ensure that the results (with the desired confidence level) are

available when needed to make technology decisions.

- AIS Design and Implementation Information. This information may be used as a basis of the study. This may also include development or production resources which may be necessary to support a study, such as timing studies on a production system to gauge reserve.
- A-TARS. The appropriate part of the existing, draft, or future release of the A-TARS may be used as a basis of the study.
- Study Results. This is the main product of these activities, updating the previous results, if they exist. The study results should provide sufficient confidence to make the technology decisions that the study is trying to resolve.
- Status. Progress and issues in pursuing the studies are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

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Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Checklist for planning and conducting an architectural study.
An initial set of items to consider to establish and perform a study. 7-23-01

Establish Technical Architecture Reference Set

Describe the Agency-wide Technical Architecture in a set of documentation that system designers and developers can readily access and use.

Overview

- Figure 1. Establish A-TARS Top-level processes

Activities

- Describe Technology Boundaries
- Establish Agency System Properties
- Establish Agency Technical Reference Models
- Describe Integrated Technology Blueprint
- Describe Technology Elements
- Develop Technical Guidelines
- Integrate, Review, and Release the A-TARS

Overview

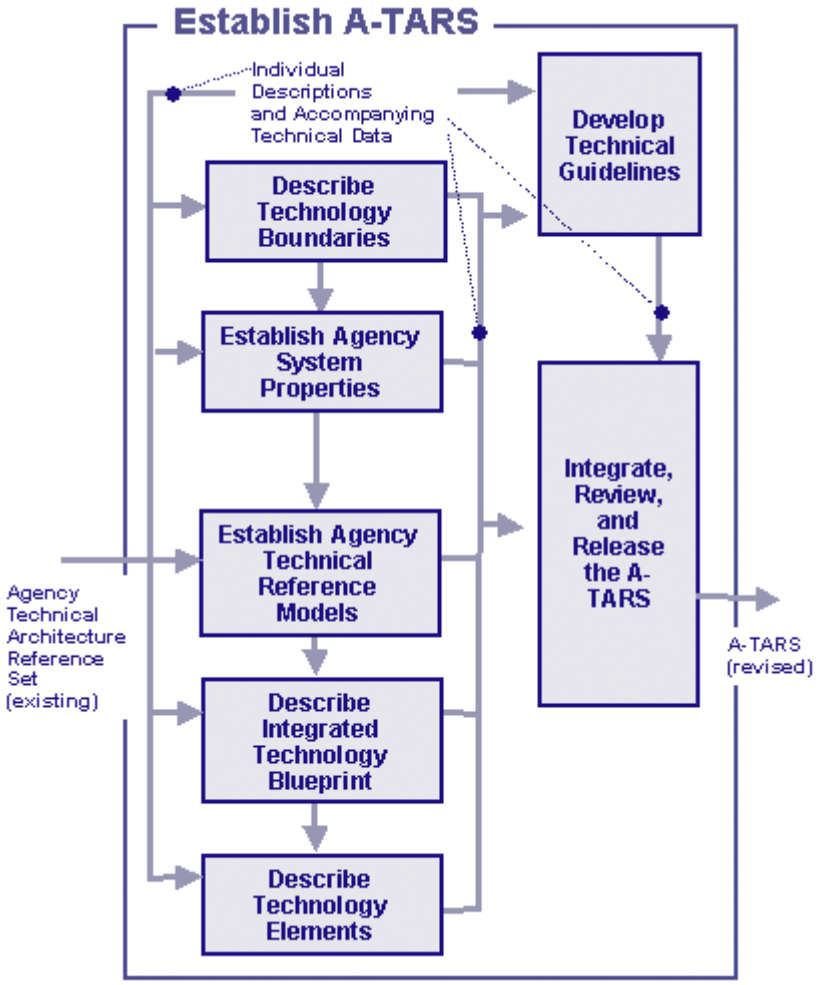
These engineering activities create and maintain the individual design descriptions and ensure that they integrate with one another. This results in a release of the A-TARS, describing the essential characteristics of the Agency systems and the associated engineering and management practices. Information on the A-TARS can be found in the background portion of the guide.

Key activities and their relationships are shown in the figure below. Each set of activities corresponds to producing or updating a portion of the A-TARS. The process is highly iterative; an A-TARS product that is used to guide a later process step may require changes as more detail is added to the A-TARS sections. For example, the Technology Boundaries Descriptions are fundamental to all the architecture processes, but as new technologies are considered, the boundaries may be adjusted to leverage these opportunities.

Each step in the engineering process incrementally releases one or more drafts that are used as the basis of the other activities, which in turn will feed back changes to improve the drafts. The first three activities (describing the boundaries, properties, and the Technical Reference Model), can be highly interactive because decisions on one may affect assumptions another makes. For example, an end-user goal analysis may indicate the types of application-level services to be provided, leading to the definition of the application level services in the TRM. Analysis done when building the TRM may identify overlooked end-user capabilities, which can provide opportunities to add, modify, or change those end-user goals.

A release of the A-TARS occurs when the elements produced by the activities are consistent with one another. A release of the A-TARS may correspond to one or more plateaus.

The Architecture Team has primary responsibility to perform these activities.



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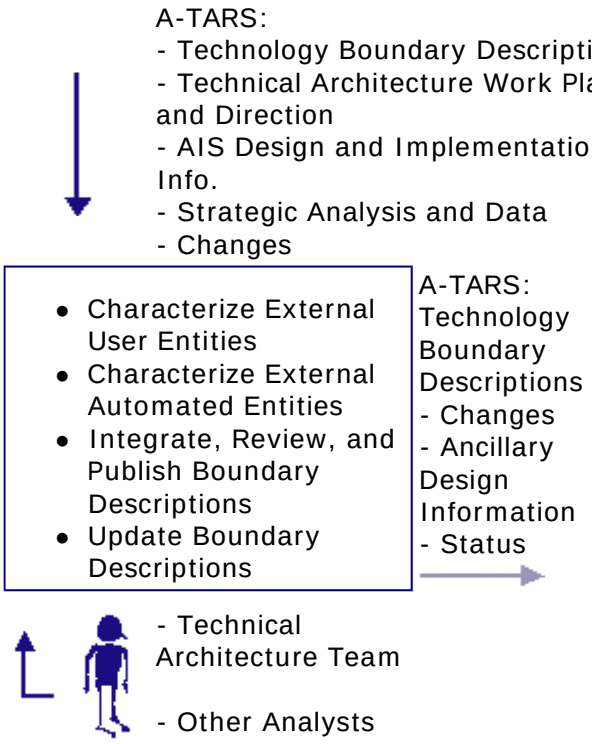
Activities

Developing the A-TARS involves the following key activities:

1. Describe Technology Boundaries. Establish the types of technologies and capabilities needed to support current and future users and external systems.
2. Establish Agency System Properties. Establish the essential characteristics and principles guiding the design decisions.
3. Establish Agency Technical Reference Models Identify and organize the types of technical elements to be incorporated into the HS Agency's systems.
4. Describe Integrated Technology Blueprint Describe how the architectural elements work together at the application and systems levels.
5. Describe Technology Elements. Describe the elementary building blocks that are used to build applications. These activities are further decomposed for each technology specialty area into which the building blocks are separated.
6. Develop Technical Guidelines. Provide guidelines on technology management and engineering practices that are used across the HS Agency.
7. Integrate, Review, and Release the A-TARS. Compile the descriptions into a consistent set of descriptions and transition them into use.

Describe Technology Boundaries

Establish the types of technologies and the range of capabilities needed to support users and external systems.



Introduction

These activities create the Technology Boundaries Descriptions. That portion of the A-TARS describes the external entities and their interaction across the Enterprise's Technology boundaries - the points where users or external systems access the HS Agency-automated applications. Settings in which the interactions take place for the environments are addressed. The interacting entities and their usage goals are described. The relationships between the external entities, their settings, the interaction platforms they use, and usage goals are established.

The architectural approach is an *outside-in* approach, starting with an understanding of existing and future real-world entities. The goal of these activities is to document an understanding of the range of current and future technology needs and expectations. The boundary descriptions provide the basis for later Technical Architecture design activities, determining the capabilities of the interaction platforms and interfaces. This analysis therefore establishes the assumptions for the other Technical Architecture design decisions. This can range from the types of technologies that must be included in the TRM, to the arrangement of the processing nodes and networking, even the types of application and lower-level services and equipments needed.

TANF Example:

A typical example would be replacing the existing TANF eligibility system. A significant part of a newly evolved system must consider the constant interaction of the system with other HS systems, for example, Child Support

Enforcement or Child Welfare. The future plans or needs for the systems other than TANF and their plans for replacement, addition, or modification, could have a significant impact on the technology selected for the TANF system. Project staff need to ensure flexibility in implementing and interfacing with systems outside of TANF. If a State wants to implement a new Child Care system, which must interface with the existing TANF system, then the technology for both systems should be planned to make them compatible.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Characterize External User Entities.** These actions describe the technology capabilities needed from the current or future end user perspective. An end-user is any individual that may access the automated applications. The following types of information are collected:
   - Descriptions of each of the usage environments
   - Essential characteristics of the end users
   - Locations where the end users will access the systems
   - End-users goals
   - The types of interaction platforms used
2. **Characterize External Automated Entities.** These actions build on the analysis of the external automated systems and their major interfaces performed during the analysis of the situation activities. The technical aspects of the interfaces that will continue to be maintained, are new, or will be replaced or discarded are considered. Guidance comes from the strategic initiatives in the IT Strategic Plan. The following types of information are collected:
   - Characteristics of the external system
   - Characteristics of the settings in which the external systems operate
   - Characteristics of the interfaces
   - Information-sharing goals and limitations
3. **Integrate, Review, and Publish Boundary Descriptions.** The effort to collect the boundary descriptions may be spread across many specialized teams, each one exploring a separate usage environment. These actions consolidate their inputs and produce a coordinated description of all the boundary information. When necessary, ancillary material such as notes, glossary, or references can be included.

   The descriptions should be reviewed across teams and consolidated, as appropriate. The review should include checking for consistency with the Strategic Plan. When selecting individuals to participate in the review, consider including those that will use the documentation, such as the other Technical Architecture Core Team members. This helps ensure that the boundary descriptions meet their needs. Peer review techniques as identified in (CMU SEI 1995) can be used to conduct these reviews.

   The descriptions can be packaged as a separate document and released independently of the other A-TARS elements, if needed.

4. **Update Boundary Descriptions.** These actions keep the descriptions of the boundaries current and adjust dependent A-TARS elements accordingly. The boundary descriptions are a main source of input to the other parts of the A-TARS. Dependencies need to be considered if significant change is made to the boundary description. The need to update dependent descriptions should be limited to situations where new types of external entities are introduced, previous classes of external entities are no longer significant, or the type of capabilities existing entities need significantly changes.

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. These individuals are responsible for producing the boundary descriptions, either as authors or technical managers. They are members of the Core or Extended Technical Architecture Team. They are knowledgeable in the types of interactive platforms, external systems, and how they can be used.
- Other Analysts. These individuals support the definition of the boundaries, either as authors or Subject Matter Experts. They are familiar with the users, their capabilities, and their information needs. These individuals have business process analysis, modeling, or other skills. These specialties may be obtained from within the HS Programs or external (consultants), as needed.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key part is used:
    - Technology Boundary Descriptions. These descriptions are the main product of these activities, updating the previous version, if it exists.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other Technical Architecture tasks and the IT projects.
- AIS Design and Implementation Info. An understanding of the existing technology is used when defining the boundaries, especially if the legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed design information for backward compatibility and existing capabilities.
- Ancillary Design Information. Information associated with the definition of the boundaries is retained, as needed (e.g., models, scenarios, business processes documentation, and business plans).
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system applications into the overall Technical Architecture.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also

can be generated, such as updates to the TRM, integrated descriptions, data stores, services, equipment, or networking.

- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

Top

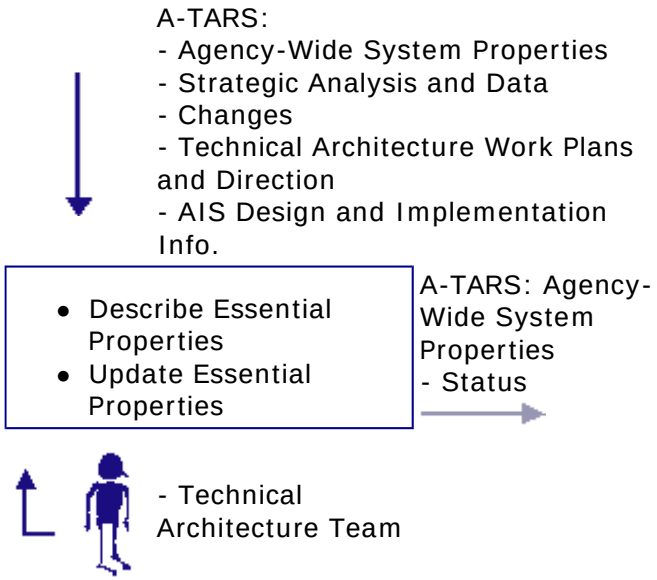
Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance. Describing the Boundaries
Guidance for developing descriptions of the external end users and automated systems.
7-27-01

Establish Agency System Properties

Establish the essential system-wide characteristics that will guide all design decisions.



Introduction

The A-TARS describes a set of elementary building blocks that are incorporated into the HS Agency systems. It also describes how the elements are arranged to create applications and automated systems. To provide uniformity across the elements, global properties are established. Properties reflect basic assumptions about the nature of the application system, such as how long it should operate before failure, what constitutes a failure, how much it should cost per user to maintain, how secure is secure enough, and what is the usability.

These properties constrain and influence design choices that architects and designers make when designing all or part of the HS Agency systems. They must incorporate features into the design to address these critical characteristics. As individual descriptions in the A-TARS are produced, they are checked for consistency with these properties.

These activities explicitly recognize the possibility that these properties, once established, will change - it is only a matter of when. As the environments in which the systems change, the essential properties must keep pace. For example, a system built to serve users within the confines of the HS Agency office complex needs different scalability characteristics once it's available to anyone on the World Wide Web. Likewise, the need for security, privacy, and integrity characteristics of the automated systems will change as the systems are moved to the Internet.

TANF Example:

The function and data linking between TANF, Food Stamps, Medicaid, and Children's Health Insurance Program (CHIP) systems affects the way business (eligibility) rules are defined, managed, and executed. Technology design approaches should help isolate and allow for assuring the accuracy and performance of TANF eligibility rules, within the broader context of the other

programs. Individual and cross-program rules must be easily and accurately tested. Mechanisms incorporated into the application systems must therefore make sure that rules cannot be inadvertently corrupted. Integrity and accuracy of the shared data requires that rules be separately verified and their interaction understood. These data integrity and accuracy properties will guide the design of the shared data entities and associated rule processing logic.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Describe Essential Properties.** These actions create the initial list of properties. Sources of characteristics can be obtained by:

   - Consulting the HS IT Strategic Plan
   - Reviewing weaknesses or strengths of existing technology assets compiled during the Scan HS IT Division Environment activities, especially their quality attributes
   - Holding discussions with the HS program staff
   - Reviewing analysis generated during the Describe Technology Boundaries activities
   - Surveying vendor offerings

   Properties can be documented in the main body portion of the A-TARS because properties apply across all the design elements. The Chief Architect and other experienced individuals are responsible for identifying and documenting these properties. Because these may be significant technical cost drivers, they should be reviewed by key stakeholders, such as IT Decision Makers, individuals representing the HS Programs, and the IT Project Teams.

   Once the properties are in draft form, they can be released to the other members of the Architecture Team to begin their analysis and design activities (see the activities described in the Establish Technical Architecture Reference Set). All portions of the A-TARS are reviewed against the properties to identify issues that may compromise obtaining that property (e.g., an application architecture design that is not easily maintainable).

2. **Update Essential Properties.** These actions maintain the property descriptions once they have been released for use within or external to the Architecture Team. Updates may occur after the first draft of the properties is released to the Architecture Team or after formal releases of the A-TARS. When these properties change, the configuration of the Technical Architecture descriptions that depend on them must be identified and evaluated for impact. Deployed systems, applications, or practices that are related to a property must also be evaluated (e.g., security practices). Change actions can be planned for the architectural elements, the deployed systems, and management and engineering practices. This implies a general ability to trace between the property descriptions; the other elements of the A-TARS; and the systems, applications, and practices that are based on them. An approach that may help identify change areas is to consult design and implementation peer review data (CMU SEI 1995). Checklists can be used to specifically address the essential properties during these reviews, providing an indication of the sensitivity of the element to changes in the property (e.g., how often HS program business rules change and the impact and time to make those changes).

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. Senior members of the Core Team or individuals with experience in the operational characteristics of the existing systems define the properties. They experience should enable them to establish practical values for the properties based on realistic operational needs and what is reasonable to expect from vendors and the HS Agency system development process.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key part is used:
    - Agency-Wide System Properties. These descriptions are the main product of these activities, updating the previous version if it exists. The properties can be documented in the main body of the A-TARS.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of what practices to integrate into the guidelines and those to omit as legacy systems are retired.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also can be generated.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other Technical Architecture tasks and the IT projects.
- AIS Design and Implementation Info. An understanding of the existing system characteristics helps to establish practical values. An analysis of the current inventory from the Analyze the Situation activities also helps.
- Status. Progress and issues in developing the properties are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

Top

Additional Resources

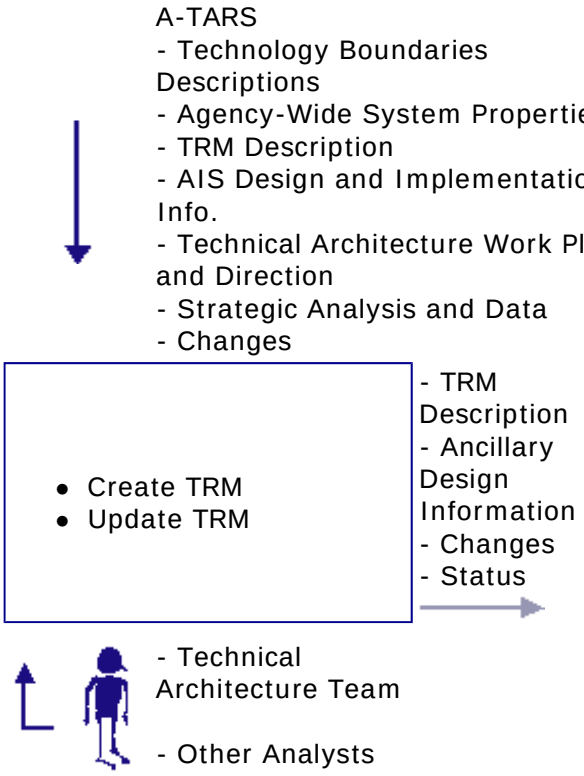
Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Establishing Global System Properties

Provides some initial guidance on establishing the properties and design issues. 7-25-01

Establish Agency Technical Reference Models

Identify and organize the types of technical elements to be incorporated into the HS Agency's systems.



Introduction

These activities create and update the Agency's TRM descriptions. This portion of the A-TARS identifies and organizes the types of technology elements that are the basis of the HS Agency's automated systems. The TRM becomes the basis on which the technology descriptions in the A-TARS are organized (see background).

The TRM reflects the technology position of the HS Agency, identifying those technologies that are emerging, in wide use, or in decline. This guides architects in selecting technologies when creating the A-TARS descriptions. A technology in decline may find itself hidden behind an abstraction layer that allows it to be replaced with a newer technology. This allows the HS Agency to mange its technical direction and new technology adoption risks, as technology to meet new needs surfaces, or legacy systems are retired.

TANF Example:

The TRM can initially be structured around the HS Agencies current business processes and the automated applications and platforms in use by the Agency. Candidate items to consider were identified during the IT Strategic Planning Analyze the Situation activities, when the baseline and assessment of the current IT inventory was created. IT Strategic Plan migration decisions will determine what items to include or exclude for consideration.

The TRM is a logical model, and should not have specific vendor platforms or applications identified. It should identify the essential characteristics, of which an existing vendor solution is one of possibly many solutions. As many states have established "preferred" platform or application product lists, the categories in the TRM can therefore be built by abstracting these to specify the essential characteristics required of those items. For example, automated functions to support the caseworker can be identified and allocated to the top-level of the TRM (Functional User, Application Specific Services).

Vendor products already in the State inventory that provide generic office productivity tools can also be abstracted. and allocated to a lower level of the TRM (Common End-user, application support services) such as word processing). For example, Word processing applications establish the need for document production and exchange. HTML 4.0 support can be specified as the technology format for cross organizational document exchange, while any vendor product that can read and write these formats is acceptable.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Create the TRM.** The architects perform actions to identify and describe the types of technology elements that the HS Agency must address. They create top-level categories (e.g., application, platform, or networking) and identify the suite of services needed in each area, decomposing, as necessary, to identify individual technology elements.

   The TRM co-evolves with the activities to establish the Technology Boundaries, the overarching Agency Systems Properties, and the Integrated Technology Blueprint. Drafts of the TRM can be released early, although the TRM should not be considered complete until the three mentioned items are reasonably stable. The Technical Architecture Work Plans can be updated as elements in the TRM are identified. Subteams can be formed to complete the descriptions the TRM identifies, such as for the individual descriptions in the Describe Services activities.

   The TRM can be documented as part of the guidelines portion of the A-TARS and integrated into the overall design and organization of the A-TARS.

2. **Update the TRM.** The TRM must be maintained to reflect the technologies in use within the HS Agency. The TRM depends on the boundaries and the system property descriptions and is a main source of input to help identify and organize the other parts of the A-TARS. This makes the TRM a key link between technology needs and the creative technical design process.

   The descriptions in the TRM summarize technology areas and therefore should be fairly stable, changing only if the technology areas they identify significantly change. The higher-level parts of the TRM should change less frequently than the lowest levels. Changes generally reflect:

   - Adding new technologies for use in the HS Agency, such as migrating to wireless or peer-to-peer computing technologies, or major shifts in the business functions supported
   - Withdrawing technologies that are no longer in use, such as retiring a legacy system and its unique technologies or removing the need for a business function if a service is no longer offered

By establishing what technologies the HS Agency can consider, the architects can influence when emerging technologies can be incorporated into the HS Agency-wide systems or when to retire technologies from use. The absorption rate depends on the level of technology risk the organization wishes to undertake, such as being an early adopter. Technologies can be withdrawn as systems that depend on those technologies are designated for retirement or replacement.

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. These individuals are responsible for producing the TRM, either as authors or technical managers. A member of the Core Team has the lead for these activities and involves experts to detail the TRM technology areas.
- Other Analysts. These individuals support the technology definitions by providing application domain knowledge for the functional-user/business-area application-specific services.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
    - Technology Boundaries Descriptions. The descriptions of the usage environment guide the decisions about the types of end-user services provided and the types of technologies required at the application or lower levels.
    - Agency-Wide System Properties. These properties are used to guide the selection of the types of technologies, such as those that will promote or detract from a achieving a property.
    - TRM Description. These descriptions are the main product of these activities, updating the previous version if it exists. It can be used as an application and system architecture independent (logical) index into the service descriptions.
- AIS Design and Implementation Info. An understanding of the existing technology is used when defining what types of technology should be incorporated into the systems, especially if legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed design information, such as existing application and lower-level services.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of the activities, coordinating the teams with each other as well as with other individuals developing or maintaining other portions of the A-TARS.
- Ancillary Design Information. Information associated with the TRM is retained, as needed. This information may be used to produce guidelines or add insight into why some technologies were selected or not selected.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system applications into the overall

Technical Architecture.

- Changes. Changes provided to these activities represent those things in the current TRM that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the boundary, integrated descriptions, services, data stores, equipment, or networking.
- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

Top

Additional Resources

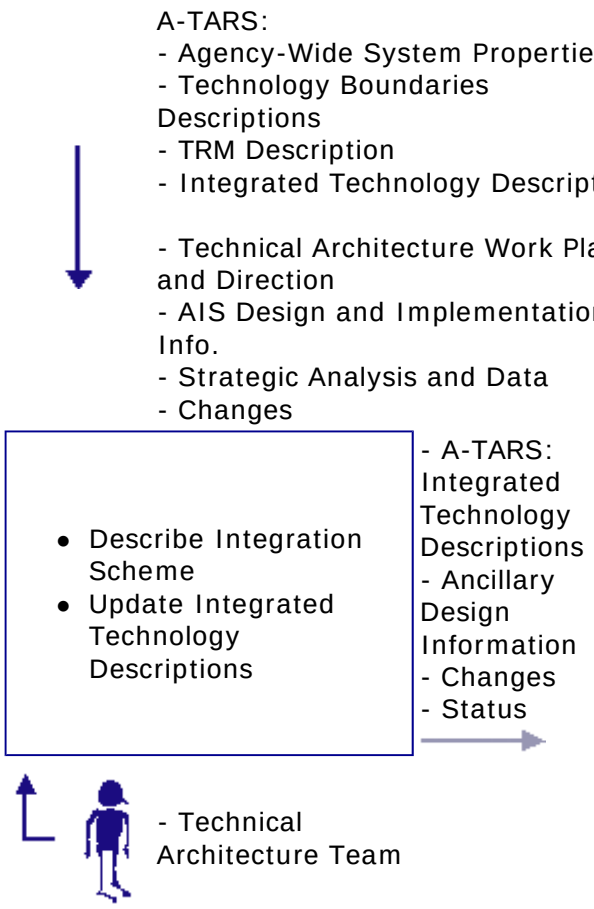
Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Technical Reference Models
Guidance for developing descriptions for a TRM, including sources for examples and a sample top-level TRM organization. 7-30-01

Consolidated Information: Standards Organizations
A list of some organizations that promote or verify IT-related standards. 7-30-01

Describe Integrated Technology Blueprint

Describe how the technology elements will work together at the application and systems levels.



Introduction

These activities create and maintain the highest-level design of the HS Agency's systems: the Integrated Technology Descriptions portion of the A-TARS. These descriptions serve as the context for how technology elements are integrated across the HS Agency. Similar in purpose to the construction industry's use of blueprints, these descriptions identify the IT architectural elements, the functionality and other properties required of them, and their arrangement. This includes computer platform configurations and their function, connections and access paths, and data sources and data exchange.

The highest-level contextual view (the system architecture) is portrayed. Generally, top-level design diagrams identify the types of:

- Computer processing nodes (clusters of computers or individual platforms such as servers or legacy systems)
- Enterprise-wide data stores and communications devices (e.g., switches and routers)

- Network links (e.g., LANs or point-to-point)

The architect's key design concerns are the allocation of functionality to processing elements, the identification of key interfaces and access paths, and the essential properties of key components and the composite system (e.g., reliability, maintainability, performance, scalability). Different arrangements may be necessary based on the environments of interest and the setting in which the equipment is used.

In addition to the highest level contextual view, models for partitioning the applications are also provided. These out-of-context views detail the application's structure - the applicaton's architecutre. The structuring can be based on many strategies, such as centralized host-based, n-tier layering, or peer-to-peer. Techniques such as using components or Web service -based approaches can be employed. Application architecture descriptions at the HS Agency level provide guidance to the application designers for partitioning and allocating functionality and identifying the service interfaces for each part of the application. This may include application layers such as presentation, business logic, data access, or data storage.

Parts of the applications are allocated across the platforms in the contextual descriptions, each part providing services to other parts, or to external users and automated systems. For example, the client presentation logic can execute on the client PC platform or a handheld device, business rule logic can execute on an application server, data access and storage can reside on a data server, and so forth.

As the contextual and application -level descriptions are elaborated, design activities to detail the elemental building blocks can be initiated. The contextual and application design descriptions are therefore used to index these elemental building blocks. Each type of building block is further described in other parts of the A-TARS, by activities that Describe Services, Describe Data Source and Business Rules, Describe Platforms, Equipments, and Packaged Solutions, or Describe Networking. For example, the API and behavioral characteristics for a data access service used by the business logic layer (executing on a data access/store server platform) can be specified in the services portion of the A-TARS.

TANF Example:

The highest level contextual view (the system architecture) may be portrayed in many States as one or more diagrams denoting an existing Mainframe and the statewide SNA, Frame Relay, or ATM backbone networks. These diagrams may depict the central processing in a computer center and the various regions with routers, hubs, etc. External systems that the Mainframe may access, or provide services to, may also be shown. As necessary, the desktops in use in a multi-office distributed platform environment may be indicated. The position of critical switching equipment may also be included.

An analysis of items noted in these diagrams would be the basis of specifying the generic system architecture descriptions. The essential technical characteristics of these items and their relationships would be abstracted to describe the types of computer systems, their characteristics, and interconnections envisioned for the future, based on the IT Strategic Plan. For example, a common front-end may be envisioned, where applications will be integrated across back-end systems with access through a common portal. If the strategy is to retain the Mainframe, then the new role for the Mainframe would therefore be defined. The essential characteristics of the mainframe platforms, such as amount of DASD required, or network throughput via the ISP would be specified. The Architects would concentrate on the System-level interfaces.

The application-level models (application architectures) could be deduced

from the design documentation of existing applications. New models, such as those defined using the J2EE platform could also be included. This would show how existing and new applications are structured. Guidelines on how to migrate portions of the existing applications and associated data to a new application architecture could be prepared.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Describe Integration Schemes.** These actions build the descriptions by iteratively performing the following:
    - **Establish Application Models.** At the center of the design process are decisions governing the logical partitioning of functionality within the applications (the application arhcitecture). These application design models determine how the application will be decomposed and packaged, the underlying technologies to use for each portion, and how the application parts will interact with one another. The application models and the distribution schemes identify the services to be provided and the capabilities of the platforms needed to support each portion of the application (e.g., data access services that hide the data store platforms from an application's business logic).
    - **Establish System Models.** As the design structure of the application materializes, decisions on how parts of the application will be physically deployed and interact across the processing elements are made. This is the contextual view, the system architecture. Agency-wide data stores are identified. Specialty platforms and their functional assignments are defined, such as client-based browser, Web servers, application services, mail servers, integration servers, data servers, and a host of others. Existing legacy systems that will be retained will be incorporated into the integrated design. Strategies such as Enterprise Application Integration may be considered to extend the lifetime of existing systems. The design at this level takes into consideration the overall system properties needed, such as reliability, maintainability, and scalability.
    - **Define Architectural Plateaus.** Intermediate steps (plateaus) may be necessary. The architects should define the intermediate plateaus that will be achieved, including any scaffolding, adapter, or integration technologies. This requires coordinating with the Planning and Managing the Technical Evolution activities to determine what technologies will be in place to support the initiatives called out in the HS IT Strategic Plan. The application and system architectures for the next plateau are defined in detail, while the following plateaus are outlined in sufficient detail to show the overall evolutionary path. They, in turn, will be detailed as the HS Agency business and technology matures.
    - **Identify Building Blocks.** As the application and system designs unfold, the individual elements needed to support them will be identified. Specialists can then be assembled and assigned to elaborate each element. This requires coordinating with the Manage Technical Architecture Activities to incorporate element definition activities into the Technical Architecture Work Plans and Directions.
    - **Integrate, Review, and Publish Draft.** As the application and overall system structures become defined, they can be reviewed and released for others on the Architecture Team to use. They are used to guide the

elaboration of the individual elements, helping to assure they integrate. As elements are detailed, changes of the integrated descriptions can be made, as needed. The integrated descriptions and the accompanying element descriptions are released together as part of the activities to Integrate, Review, and Release the A-TARS.

When necessary, the team members can Conduct Architectural Studies to determine design parameters, such as expected performance.

2. **Update Integrated Technology Descriptions.** The integrated technology descriptions serve as a blueprint to the rest of the A-TARS. These descriptions must therefore be kept consistent with the lower-level building block descriptions. This occurs when either the application or system structures change or the underlying elements change as new technologies become available or are retired, such as moving from component to Web service derived application models. Changes must be evaluated, and the appropriate portions of the A-TARS must be identified and modified.

Top

Roles and Responsibilities

The key roles and their responsibilities for these activities are:

- Technical Architecture Team. These individuals are responsible for producing the integrated design descriptions. The team members must have firsthand experience with the application models and system design structures they propose. Outside experts (consultants) or individuals from the project teams can be enlisted to provide this experience. The Chief Architect has a significant responsibility in determining, reviewing, and approving the design approaches.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
  - Agency-Wide System Properties. These properties are used to guide the design. They must be satisfied for the design to be approved.
  - Technology Boundaries Descriptions. The descriptions of the usage environment guide the design of the types of platforms, their capabilities, and the interconnectivity needed.
  - TRM Description. This description guides the decisions on the application and system structure by indicating the types of technologies that need to be considered.
  - Integrated Technology Descriptions. These descriptions are the main product of these activities, updating the previous version (if it exists). Draft descriptions are used by the Technical Architecture Team to identify the elementary building blocks to be elaborated.
- Technical Architecture Work Plans. These work plans guide the execution of these

activities, coordinating the individuals performing these activities with other Technical Architecture tasks and the IT projects.

- AIS Design and Implementation Info. An understanding of the existing technology is used when defining the application or system architectures, especially if the legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed design information, such as interface documentation.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system applications into the overall Technical Architecture.
- Changes - Changes provided to these activities represents those things in the current integration descriptions that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the services, data stores, equipment, or networking.
- Ancillary Design Information - Information associated with the design is retained, as needed, such as results of architectural studies that trade off design approaches. This information may be used to produce guidelines that users of the integrated descriptions can reference.
- Status. Progress and issues in developing the integrated descriptions are forwarded to the Manage Technical Architecture activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

Top

Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Describing the Integrated Technology
Some general guidelines on preparing and managing the descriptions. 9/04/01

Describe Technology Elements

Describe the elementary building blocks that are used to compose the Agency's application systems.

Overview

- Figure

Activities

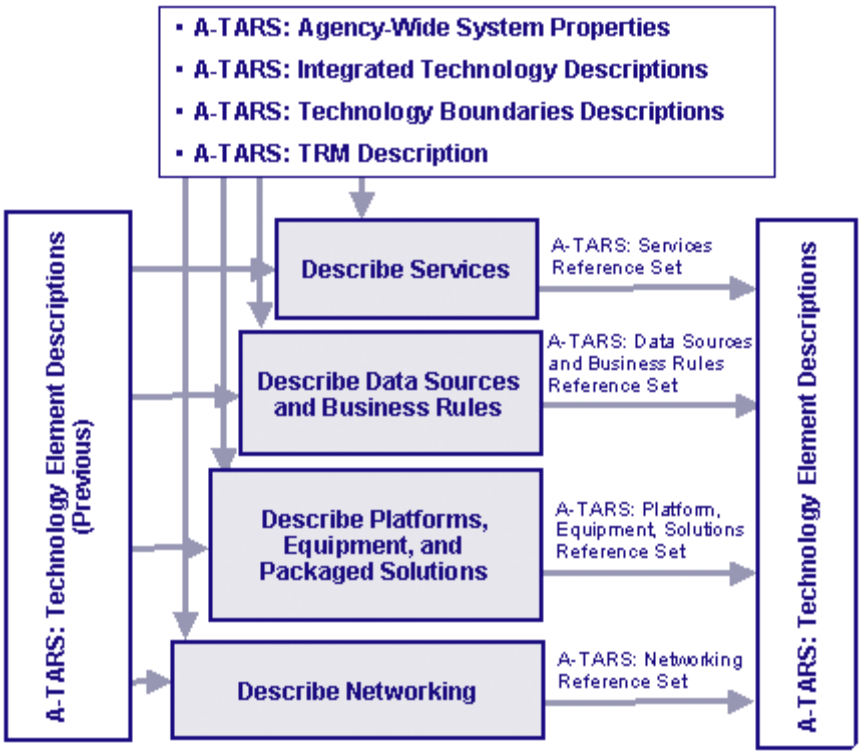
- Describe Services
- Describe Data Sources and Business Rules
- Describe Platforms, Equipments, and Packaged Solutions
- Describe Networking

Overview

The architecture approach defines building blocks that can be used to address HS Agency-wide automation needs. This establishes uniformity in common entities and allows for reuse. The following general types of building blocks are specified:

- Software services
- Data sources
- Business rules
- Processing equipment and associated devices
- Internetworking

These items are specified as technology elements that, when implemented, provide (directly or indirectly) the application services to external user entities or systems. The relationships between the items are created by the Integrated Technology Blueprint activities.



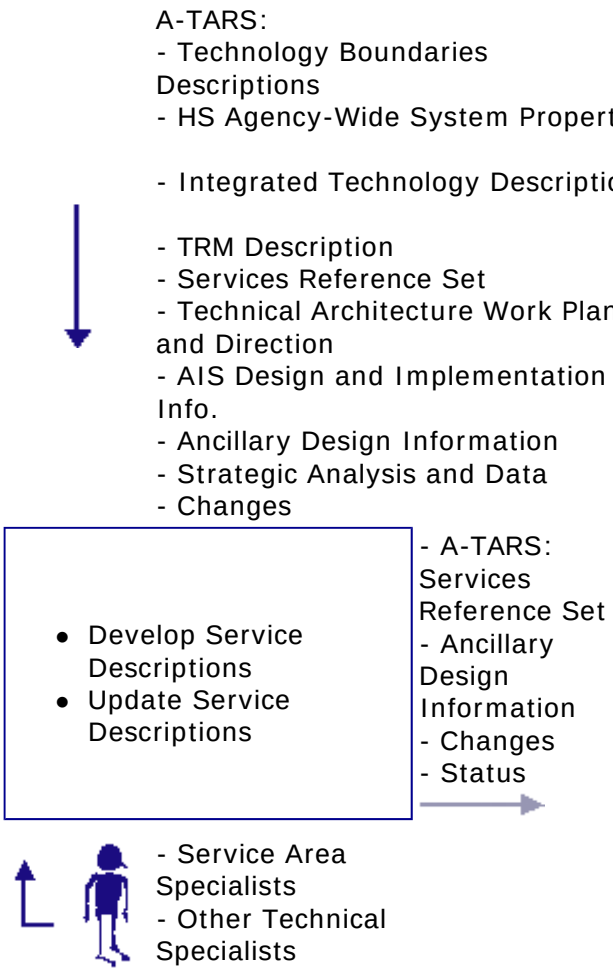
Top

Activities

1. Describing the technology elements involves the following key activities:
    1. Describe Services. Define the services that can be reused across the AHS agency's systems.
    2. Describe Data Sources and Business Rules. Establish the top-level design and technologies for the HA Agency-wide data sources and business rule processing.
    3. Describe Platforms, Equipment, and Packaged Solutions. Define the platform configurations, including major equipments and prepackaged solutions that are used across the HS Agency.
    4. Describe Networking. Describe the networking configurations to allow interoperability across the HS Agency.

Describe Services

Define the functionality to be reused across the HS Agency's systems.



Introduction

These activities create and update the Services Reference Set descriptions. This portion of the A-TARS specifies the elementary services on which the HS Agency's distributed applications are composed. The elementary services are partitioned according to the application architectures. Services, when implemented, will be allocated to processing nodes. They are accessed in accordance with the system architecture, as noted in the Describe Integrated Technology Blueprint activities.

Software that implements the services is packaged to allow services to be reused across the HS Agency. This may include deploying services as stand-alone application executables, components, Web-based services, procedure/function/class libraries, or providing them by commercially purchased solutions or through service providers (e.g., Application Service Providers.

The service definition provides the service interfaces, execution behavior, reference implementations, and other information essential for consistently procuring, building, and deploying common, reusable, and interoperating services. The services are organized

according to service areas in accordance with the enterprise TRM.

TANF Example:

States are embracing the web as a core technology to implement electronic government for their citizens. Applications may be accessible across the internet, or restricted to an intranet where only trusted functional users may invoke them. This implies making the existing rich set of applications web-enabled. Conventions for establishing this application architecture and the details of the application interfaces would therefore be documented in this portion of the A-TARS. This would allow for the applications to be used to build rich, web-enabled applications (e.g., mapping HTTP requests to CICS communications area format for the programs, and converting application output back into HTML).

In addition to application level services, common services that are used to integrate applications will have their APIs defined. For example, assuming an application is to be provided to support electronic passing of alerts from a child welfare worker to a TANF worker (e.g., when a child that is part of a TANF case is taken into foster care). A messaging technology may be needed to enable the alert application to send the alert message (either via email or electronic message queuing to an alert receiving/processing application). The application interface to this alert program could be defined, along with the APIs for the underlying common services. This may include the email API (e.g, MAPI), or asynchronous message queuing, such as that provided by the Java Message Service API. With these APIs defined, programmers can build applications to use the application or lower level (common) services, reasonably isolated from the specific implementations.

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Activities

Consolidated guidelines are available to perform the following key activities:

1. **Develop Service Description.** These actions build descriptions of the services by performing the following:
   - Review the boundary descriptions, the TRM, the application architecture, and the system architecture to identify the types of services, the functionality they should provide, and how they will be packaged (e.g., as a.dll or.exe file). The Technical Architecture Work Plans and Direction guide which portion of the architecture will be elaborated for each plateau.
   - For each unit of functionality that is encapsulated, a service description will be developed. The Service Area Specialists identify the standards on which the service will be defined. This may include existing HS Agency assets, such as reused software application modules. Architectural Studies may be necessary to investigate and identify the best approaches for defining a service.
   - A description of the service is produced, detailing the interfaces and the behaviors a user needs to understand to build and use an implementation of it. These users are primarily other IT application developers.
   - Create reference implementations to reduce design risk, when needed. These can be used to indicate how the service can be implemented and used and to confirm that it can satisfy the properties indicated by the Establish AGency Systems Properties activities. The reference implementations may help remove ambiguity in the definitions and provide a basis of generating functional tests for implementations. The reference implementation may not

exhibit all the properties of a robust implementation of the services, such as error recovery.
- Compile, review, and publish drafts and final versions of each description. Formal technical reviews such as peer reviews (CMU SEI 1995) can be used to review the descriptions. The individual descriptions should be placed under a version control process to track changes.

2. **Update Service Descriptions.** As technologies, standards, and APIs from vendors evolve, the items described in this guide will change. New services will be defined, existing interfaces adapted, and some services retired when no longer needed, such as those that act as connectors to a legacy system that will be retired. Changes may ripple through to other parts of the A-TARS and should be evaluated. Changes to the description must be evaluated, dependencies between definitions made, and changes synchronized between this and other parts of the A-TARS. A versioning scheme and maintenance approach to allow for multiple versions of the service interfaces and implementations to exist should be described in the Guidelines.

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Roles and Responsibilities

The key roles and their responsibilities for these activities are:

- Service Area Specialists. These individuals are responsible for producing the service descriptions, either as authors or technical managers. They are members of the Core or Extended Technical Architecture Team. They are knowledgeable in the areas that each service addresses.
- Other Technical Specialists. These individuals support the definition of the services, either as authors or Subject Matter Experts, or produce reference implementations and prototypes. These specialties may be obtained from within the IT Division or external (consultants), as needed.

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Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
  - Technology Boundaries Descriptions. The descriptions of the usage environment guide the decisions about the end-user services provided and the environment and platform capability to deliver them.
  - Agency-wide System Properties. These properties are used to guide the design of the services, such as performance or scalability.
  - Integrated Technology Descriptions. These descriptions provide the context for the services, showing how they relate to one another at the application and system level. These descriptions guide the definition of the individual services.
  - TRM Description. This description guides the identification of the required services. It can be used as an application and system architecture independent index into the service descriptions.
  - Services Reference Set. These descriptions are the main product of these

activities, updating the previous version, if it exists.

- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other Technical Architecture tasks and the IT projects.
- AIS Design and Implementation Info. An understanding of the existing technology is used when defining the services, especially if the legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed design information, such as interface documentation.
- Ancillary Design Information. Information associated with the design is retained, as needed (e.g., results of architectural studies such as performance appraisals). This information may be used to produce guidelines that users of the descriptions can reference for additional understanding.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system applications into the overall Technical Architecture.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the TRM, boundary, integrated descriptions, data stores, equipment, or networking.
- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

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Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources page portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Describing the Common Services
Guidance for organizing and describing the services. 9-01-01

Consolidated Guidance: Technical Reference Models
Guidance for developing descriptions for a TRM, including sources for examples and a sample top-level TRM organization.7-30-01

Consolidated Information: Standards Organizations
A list of some organizations that promote or verify IT-related standards. 7-30-01

Describe Data Sources and Business Rules

Establish the top-level design and technologies used for the HS Agency-Wide data sources, messages, and business rule processing.

A-TARS:
- Technology Boundaries Descriptions
- Agency-Wide System Properties
- Integrated Technology Descriptions

- TRM Descriptions
- Data Sources and Business Rules Reference Set
- AIS Design and Implementation Info.
- Ancillary Design Info.
- Technical Architecture Work Plans and Direction
- Strategic Analysis and Data
- Changes

- Develop Data Source and Technology Descriptions
- Develop Business Rule and Technology Descriptions
- Integrate, Review, and Publish Descriptions
- Update Data and Rule Descriptions

- A-TARS: Data Sources and Business Rules Reference Set
- Ancillary Design Info.
- Changes
- Status

- Data or Business Rules Specialists
- Other Technical Specialists

Introduction

These activities create and update the Data Sources and Business Rules Reference Set descriptions. This portion of the A-TARS specifies the characteristics of two highly dependent elements:

- The definition of the HS Agency-wide persistent data stores, storage formats, messages, and related access and storage technology
- The definition of the business rules and rule-processing technology needed to maintain the validity of this data

The goal of these activities is to help address the *tower of Babel* problem by providing normalization of data types and meanings, to enable HS Agency-wide data elements to be exchanged and used across applications. The specific HS Agency-wide data models, data formats, message formats, and rules are assumed to be either described in this portion of

the A-TARS or referenced in external companion documentation (e.g., HS Agency or program-specific data models, message formats, and rule books). The technologies that will be used to store and process the data are also described, such as use of relational databases, logic encoding in programs, database triggers, rule engines, or other techniques. Depending on the application architecture selected, these activities may be coupled with the design and definition of data access services defined in the Describe Services

TANF Example:

Typical TANF systems maintain significant amounts of data, often scattered amongst different record types and data stores. This data can be owned by different HS Programs and systems (e.g., client-person files, demographics, payment-benefits histories, job and educational services, Medicaid records). Case data is seldom purged, as users generally don't want the data to "disappear" if an inactive case reactivates.

A continuously growing set of data complicates data management, compounded by legacy technologies that may not be able to effectively organize and access very large sets of data. Architects will need to focus on the data stores, addressing the consolidation and integrity of replicated entities, and the most appropriate data storage and access technologies that can be used to manage the data stores.

The TANF programs also have some unique considerations for defining and managing the business rules under which the applications operate. Using the PROWRA as an example, the deadline for when a state must implement a new law can occur before final detailed regulations are published. The business rules therefore may change when the regulations are finalized, many months after first implementation. This requires state applications to quickly react to changing rules, adjusting the business logic encoded in COBOL source code in the legacy systems. Business Analysts must convey the detailed understanding of the regulations and where they apply to programmers that transform them into COBOL statements. Architects will need to address how to manage changing rules when defining how they should be expressed and interpreted within the automated applications.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Develop Data Source and Technology Descriptions.** Describe the data sources and the data storage and retrieval technology by performing the following:
   - Describe the data sources identified in the Integrated Technology Descriptions. The data sources characterized during the inventory built during the Analyze the Situation activities can provide initial detail. This may require building high-level data models to consolidate the data descriptions, as well as using XML Schemas, DTDs or custom electronic message formats. The data source description may assume relational or nonrelational data sources. This includes recommended data storage formats for any data store, such as video, sound/music, or compound documents, as necessary to enable sharing across the HS Agency.
   - Describe the message formats to be used to exchanged data within and external to the Agency systems, as identified in the System Architecture and

the boundaries described by the Describe Technology Boundaries activities.
- Describe data access technologies and how they will be used, such as relational, object-oriented, or multidimensional analysis support services (which may be described in the Services Reference Set).
- Create reference implementations or perform studies to demonstrate or analyze critical aspects of the data storage or its access.
- Produce guidelines to elaborate on the life-cycle management of the data, such as administrative processes, description (modeling notation), or records retention and destruction.

2. **Develop Business Rule and Technology Descriptions.** Describe the Agency-wide rule repositories and the associated rule processing technology by performing the following:

    - Establish a set of descriptions that identify and describe the assumptions and guidelines for applying common business policies, guidelines, and practices. This is the basis for consistently defining and applying the rules and conventions across the Agency. Provide specific rules or reference their location. The inventory compiled during the strategic planning Analyze the Situation activities can provide initial details.
    - Describe the rule processing technologies and how they will be used. This may address declaring and encoding rules for use in a business logic component using COBOL, within database triggers, or using rule engines. The approaches taken may have implications for the practices and tools used to define and generate and execute the rules.
    - Create reference implementations or perform studies to demonstrate or analyze critical aspects of the specification.
    - Produce guidelines to elaborate the life-cycle management of the rules, such as who maintains the rule repositories and notations to define them.

3. **Compile, Review, and Publish Descriptions.** Prepare the documentation for release by holding peer reviews (CMU SEI 1995). Individuals that will use the descriptions, as well as those defining the data access services, should attend.

4. **Update Data and Rule Descriptions.** The descriptions of the data and rule processing technology are adjusted with dependent A-TARS elements accordingly. This requires an evaluation of the changes and their impact on other parts of the A-TARS, such as modification of data access services, developer tools, existing data store content, migration of data stores from one technology to another, and changes in the business processes that use or modify the data.

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Data or Business Rules Specialists. These individuals are responsible for producing the data and business rules descriptions, either as authors or technical managers. They are members of the Core or Extended Team. They are generally familiar with the HS Agency programs and the information processed, working as business analysts and database administrators.
- Other Technical Specialists. These individuals support the definition of the data, rules, and associated technology, either as authors or Subject Matter Experts. Individuals from the Agency programs may participate, as well as experts in the

various data or rule processing technologies.

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Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS - The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
  - Technology Boundaries Descriptions. The descriptions of the usage environment guide the identification and definition of the external business and design entities and the information exchanged with external systems.
  - Agency-Wide System Properties. These properties are used to guide the selection and design of the data and rule processing technologies, such as growth or transaction rates.
  - Integrated Technology Descriptions. These descriptions provide the context for the definitions, identifying the stores and access paths as well as external interfaces and message exchanges.
  - TRM Description. This description guides decisions on the application and system structure by indicating the types of technologies that need to be considered.
  - Data Sources and Business Rules Reference Set. These descriptions are the main product of these activities, updating the previous version, if it exists.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the teams with each other as well as with other individuals developing or maintaining other portions of the A-TARS.
- AIS Design and Implementation Info. An understanding of the existing databases and technology is used when defining the data store and rule processing technologies. Existing systems provide a source of detailed design information, such as data models, rules, data access and rule programming conventions, and message and interface definitions that will be the basis of these definitions.
- Ancillary Design Information. Information associated with the design is retained, as needed (e.g., results of architectural studies such as transaction rates or growth models). This information may be used to produce some guidelines that users of the integrated descriptions can reference for additional understanding.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy systems technologies into the overall Technical Architecture.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the TRM, boundary, integrated descriptions, services, equipment, or networking.
- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other Technical Architecture and IT project activities.

Top

Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

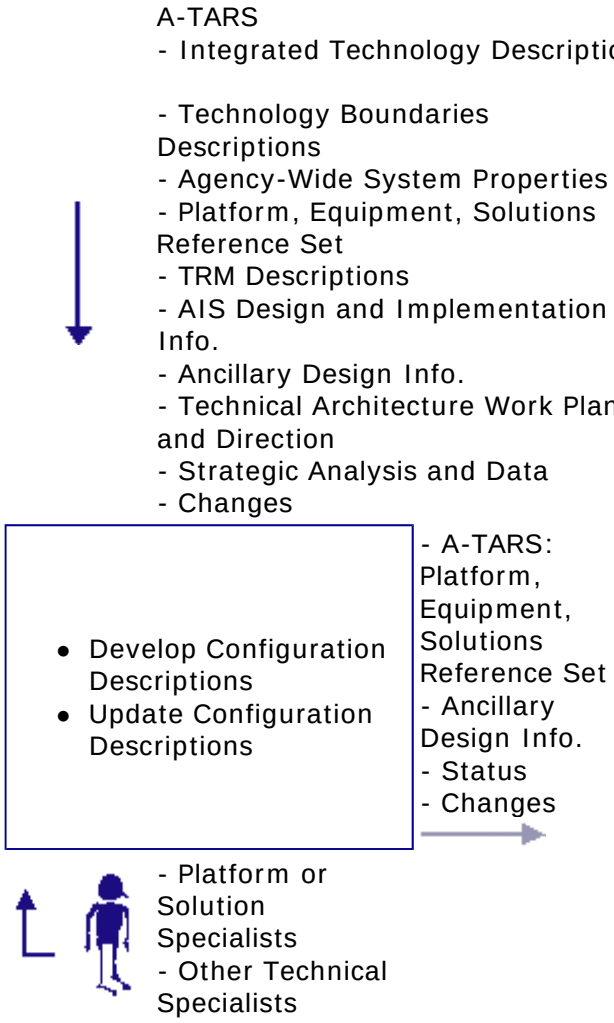
Consolidated Guidance: Describing the Data Stores and Related Technologies
Guidance for organizing and describing the data and data access and storage-related technologies. 9-18-01

Consolidated Guidance: Technical Reference Models
Guidance for developing descriptions for a TRM, including sources for examples and a sample top-level TRM organization. 7-30-01

Consolidated Information: Standards Organizations
A list of some organizations that promote or verify IT-related standards. 7-30-01

Describe Platforms, Equipments, and Packaged Solutions

Define the platform configurations, including major equipment and pre-packaged solutions that are used across the Agency.



Introduction

These activities create and update the Platform, Equipment, and Solutions Reference Set. This portion of the A-TARS establishes the requirements, assumptions, and guidelines for configuring the main types of platforms, associated equipment, and packaged solutions. These building block items may be commercially available, already in the HS Agency inventory, or will be built to requirements established by these descriptions. These items are the major subassemblies that are used as common reusable elements from which the Agency IT systems can be composed.

These items are described based on the context established in the technology boundaries and the integrated technology descriptions. Those descriptions identify configurations and how they will be used within each environment. A Web server, for example, could be identified in the integrated technology descriptions, along with the services it provides. Descriptions presented in the Platform, Equipment, and Solutions Reference Set would

detail that server in terms of the major elements, such as devices, or prepackaged software it should have (e.g., processor, memory, disk storage, or operating system). The information in the Platform, Equipment, and Solutions Reference Set allows the architects to manage the proliferation of configurations and plan overall acquisition and expected lifetimes to address technology upgrading and obsolescence.

> **TANF Example:** Over decades, a State HS Agency can accumulate a large and eclectic collection of computing platforms, equipment and software applications. These items can number in the tens of thousands, from a few mainframes, to hundreds of specialty servers, and thousands of desktops, printers, and 3270 terminals, all from different vendors and manufacturers. Adding to this mix is networking equipments (routers, switches) and suites of application and non-application specific software packages (e.g., e-mail, office suites, network management tools). Each one of these items must be maintained, requiring highly skilled and knowledgeable support staff, either within the Agency or outsourced. Multiple funding sources across many HS programs may have paid for these equipments, complicating the ability to upgrade items in unison.
>
> The maintenance of these items consume a significant part of the IT budget. These equipments cannot be easily replaced, as changing one piece may involve upgrading others, such as swapping out controllers to update DASD devices - requiring the re-sysgen/IPL of systems. One may even need to retire or replace systems when they can no longer scale. In many cases newer technology may be more cost effective, but inertia and the budget processes may make it easier to pay more to maintain older equipment, than purchase newer, more cost effective items.
>
> The Architects will establish definitions for common platforms, equipments and applications in this portion of the A-TARS. This will allow them to gain control and manage the proliferation of items and influence their operational lifetime. Architects specify key characteristics, and indicate which items are to be introduced (sunrise) or should be retired (sunset). This helps the HS programs budget for the lifecycle management of these items by gauging when they should budget for upgraded items.
>
> Many state agencies already manage the lifecycles of some of their key IT platforms consistent with this portion of the A-TARS. One example where change occurs frequently is the user workstations. For example, end user workstation configurations (CPU, disk, or screen size) are specified for typical usage scenarios (eligibility worker or "power user" workstations). Procurement groups then use this information to set minimum criteria for obtaining discount and volume pricing from competing vendors. Express or preferred products lists and purchase agreements are then available for the HS programs to use to refresh their inventory.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Develop Configuration Descriptions.** These actions build descriptions of the platforms, unique equipment and devices, or prepackaged solutions by performing the following:
    - Specify the platform configurations for each of the processing entities

identified in the boundaries and the integrated descriptions. The configuration descriptions address the key characteristics of the platforms to ensure that conforming items can provide the required functional capabilities and meet the criteria established in the system properties (see: Establish Agency Systems Properties activities). This covers programmable as well as non-programmable information appliances.

- Specify the key equipment or devices that will be integrated into a platform when needed, such as minimum hard disk size or use of legacy devices (e.g., parallel port printers).
- Specify key prepackaged solutions that will be included in the platform configurations, when necessary. These reflect underlying assumptions about the capability of the platform and services available without having to specify each service separately. Guidelines on how to use the solutions as a basis for developing other applications should be provided (e.g., use of application-to-application interfaces).
- Produce guidelines for selecting, configuring, and using the platforms, equipment, or prepackaged solutions. These guidelines can be consolidated and published with the other technology guidelines (see Develop Technical Guidelines activities).
- Compile, review, and publish drafts and final versions of the descriptions. Formal technical reviews, such as peer reviews (CMS SEI 1995), can be used to review the descriptions. The individual descriptions should be placed under a version control process to track changes.

2. **Update Configuration Descriptions.** As the business grows-performance or other limits are reached, new technologies become available, standards evolve, or products from vendors change-the items described in this guide will change. Some items will be retired from the inventory, others added. Changes may ripple through to other parts of the A-TARS and should be evaluated (e.g., a network API no longer being supported by vendors). Changes to the description must be evaluated, dependencies between definitions made, and changes synchronized between this and other parts of the A-TARS.

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Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Platform or Solutions Specialists. These individuals are responsible for producing the configuration descriptions, either as authors or technical managers. They are members of the Core or Extended Team. They should have firsthand experience using and developing applications for items similar to what they are describing.
- Other Technical Specialists. These individuals support the definition of the configurations, either as authors or Subject Matter Experts. Individuals from the IT projects may participate, as well as experts in using or applying the various technologies.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional

Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
  - Technology Boundaries Descriptions. The descriptions of the usage environment guide the decisions about the end-user platforms and equipment needs as well as any commercially or Agency-unique products to be accessed.
  - Agency-Wide System Properties. These properties are used to guide the design or selection of the configurations, such as reliability, availability, and throughput.
  - Integrated Technology Descriptions. These descriptions provide the context for defining the configurations, showing how they relate to one another at the application and system level. The items in the Integrated Technology Descriptions should reference the configurations (e.g., Agency functional worker-client platforms)
  - TRM Description. This description guides the identification of the configurations, especially when considering commercially available products to implement elements of the TRM. Solutions can be organized against the TRM, as needed.
  - Platform, Equipment, and Solutions Reference Set. These descriptions are the main product of these activities, updating the previous version, if it exists.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other technical architecture tasks and the IT projects.
- AIS Design and Implementation Info. An understanding of the existing technology is used when establishing these descriptions, especially if the existing legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed implementation information for using existing IT assets.
- Ancillary Design Information. Information associated with the descriptions is retained, as needed (e.g., results of architectural studies such as performance appraisals). This information may be used to produce some guidelines that users of the descriptions can reference for additional understanding.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system elements into the overall technical architecture.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the TRM, boundary, integrated descriptions, services, data stores, or networking.
- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other technical architecture and IT project activities.

Top

Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Describing the Platforms, Equipment, and Solutions

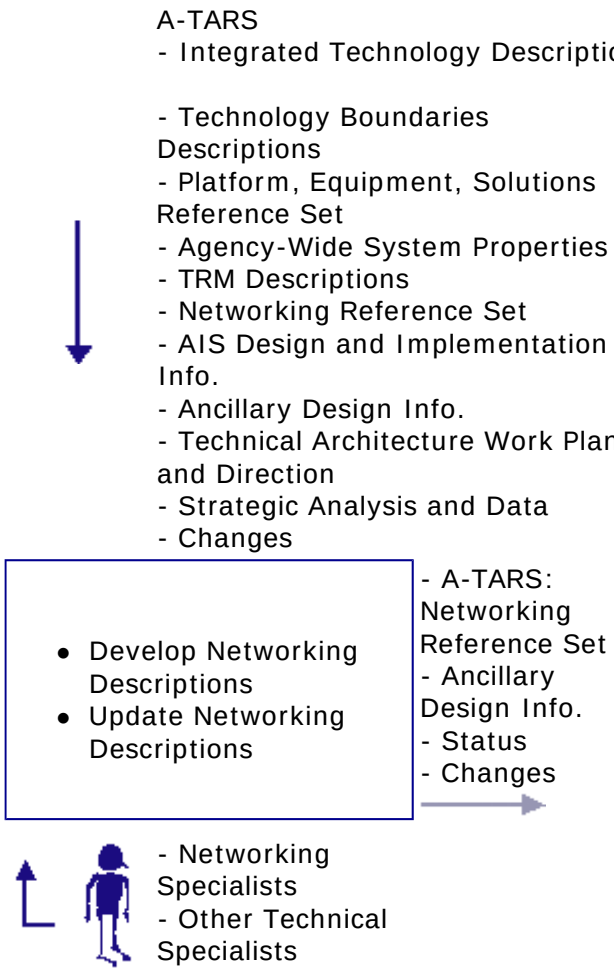
Guidance for organizing and describing the configurations. 9-18-01

Consolidated Guidance: Technical Reference Models
Guidance for developing descriptions for a TRM, including sources for examples and a sample top-level TRM organization. 7-30-01

Consolidated Information: Standards Organizations
A list of some organizations that promote or verify IT-related standards. 7-30-01

Describe Networking

Describe the networking configurations to allow interoperability across the Agency.



Introduction

These activities create and update the Networking Reference Set descriptions. This portion of the A-TARS describes the network design and specifies essential characteristics, assumptions, and guidelines for networking the Agency computing platforms within and across Agency boundaries. This is the foundation for interoperability between the computing platforms and the basis of managing and evolving the network applications.

The network design evolves with other parts of the A-TARS. The Technology Boundaries Descriptions and the Integrated Technology Descriptions provide the big picture for the network design and are adjusted to harmonize with network design concerns, such as security or performance. The Platform, Equipment, and Solutions Reference Set provides detail on the existing computing platforms capability and is updated as networking equipment and the capability of the attached computers are upgraded.

> **TANF Example:** Most state HS Agencies rely on a state-wide telecommunications and networking organization to provide access to the state network backbone. State-level requirements and conventions may be

imposed on the HS Agency for security (e.g., who owns the firewall to access the network), IP addressing (blocks of addresses for publicly accessible nodes), and statewide services such as e-mail. This may effect all layers of the network design (application through physical connections). This can be a significant challenge when tens of thousands of users may be affected, spread across hundreds of remote sites. Network management issues such as the ability to quickly identify, diagnose, and correct network related problems across several providers is a priority as states move to 24x7 access on the internet.

Architects will have to address interoperability with external entities not only at the networking level, but at the application level. For example, FTP based file transfer to exchange health care provider information via batch updates may give way to online access via a service interface. Also, as more information is exchanged electronically with external service providers, technologies to ensure privacy and authenticity of a communication or document will be incorporated into the network design (i.e., nonrepudiation). Architects will therefore have to form cross organization working groups and manage cross organizational interfaces.

Top

Activities

Consolidated guidelines are available to perform the following key activities:

1. **Develop Networking Descriptions.** These actions build the network design and specify essential characteristics by iterating through the following actions:
    - Evaluate the networking capability required of the applications for each type of platform, consulting the Integrated Technology and Technology Boundaries descriptions. This establishes the objectives of the network that must be optimized, such as bandwidth, response times or security.
    - Determine the logical infrastructure requirements to provide the desired objectives, such as the current or expected capability of the platforms (e.g., legacy computers, terminals), locations, and organizational (data ownership/sharing) considerations. This helps define network segments, routes, and types of links required.
    - Select the technologies to use based on the understanding of the distributed application needs and the platforms, such as use of LAN or WAN technologies and protocols. This includes identifying the network-specific services (e.g., DNS) by considering the items in the TRM.
    - Create descriptions of the network topologies, equipment, and networking conventions. These will add detail to the items identified in the Integrated Technology descriptions.
    - Create reference implementations to reduce design risk when needed, such as the ability to satisfy the properties indicated by the Establish Agency Systems Properties activities. The reference implementations may help remove ambiguity in the definitions, and provide the basis for generating functional tests for implementations. The reference implementation may not exhibit all the properties of a robust implementation.
    - Compile, review, and publish drafts and final versions of each description. Formal technical reviews, such as peer reviews (CMU SEI 1995), can be used to review the descriptions. The individual descriptions should be placed under a version control process to track changes. The descriptions should be reviewed in context of the other parts of the A-TARS, most notably the

Integrated Technology, Technology Boundaries, and Platform, Equipment, and Solutions Reference Set descriptions. In particular, the technical limitations of the networking should be addressed, such as maximum throughput.

2. **Update Network Descriptions.** Over time, the networking descriptions will undoubtedly change due to changes in the business needs and associated applications, user expectations, emerging technologies (IPv6), and retirement of legacy protocols and systems. Changes can affect any portion of the OSI stack (ISO/IEC 1994. Changes to the description must be evaluated, dependencies between definitions made, and changes synchronized.

Top

Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Networking Specialists. These individuals are responsible for producing the network design descriptions, either as authors or technical managers. They are members of the Core or Extended Technical Architecture Team. They are knowledgeable in the areas that the networking design addresses.
- Other Technical Specialists. These individuals support the definition of networking, either as authors or Subject Matter Experts, or produce reference implementations and prototypes. These specialties may be obtained from within the IT Division or external (consultants), as needed.

Top

Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. The previous version of the A-TARS (if it exists) is used to determine the scope of the changes for an iteration of these activities. The following key parts are used:
    - Integrated Technology Descriptions. These descriptions provide the context for the networking descriptions, showing the processing elements, the applications services they should provide, and their connectivity.
    - Technology Boundaries Descriptions. The descriptions of the external platforms and the usage environment guide the decisions about networking capabilities available (e.g., dial-up networking, DSL, cable modem), the needs of the types of applications expected to be executed (e.g., video), and environmental concerns (e.g., security).
    - Platform, Equipment, and Solutions Reference Set. The capability and cost of platforms and equipment to support the networking design serve as constraints. Requirements for new, modified, or retired capabilities necessary to support the network design are represented as changes that will be used to adjust the descriptions in the Platform, Equipment, and Solutions Reference Set.
    - Agency-wide System Properties. These properties are used to guide the networking design, such as performance, security, or scalability.
    - TRM Description. This description guides the identification of the network technology required, particularly at the application level.

  - Networking Reference Set. These descriptions are the main product of these activities, updating the previous version, if it exists.

- AIS Design and Implementation Info. An understanding of the existing technology is used when defining networking, especially if the legacy systems will be retained in the next version of the A-TARS. This provides a ready source of detailed design information, such as existing networking equipment and protocols.
- Ancillary Design Information. Information associated with the design is retained, as needed, such as results of architectural studies. This information may be used to produce guidelines that users of the descriptions can reference for additional understanding.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other technical architecture tasks and the IT projects.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of technology and the integration of legacy system applications into the overall technical architecture.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also can be generated, such as updates to the TRM, boundary, integrated descriptions, services, data stores, or equipment.
- Status. Progress and issues in developing the descriptions are forwarded to the managment activities to ensure coordination between these activities and other technical architecture and IT project activities.

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Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources page portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: Describing the Network Design
Guidance for organizing and describing the network descriptions. 9-18-01

Consolidated Guidance: Technical Reference Models
Guidance for developing descriptions for a TRM, including sources for examples and a sample top-level TRM organization. 7-30-01

Consolidated Information: Standards Organizations
A list of some organizations that promote or verify IT-related standards. 7-30-01

Develop Technical Guidelines

Provide guidelines on technology management and engineering practices that are used across the Agency.

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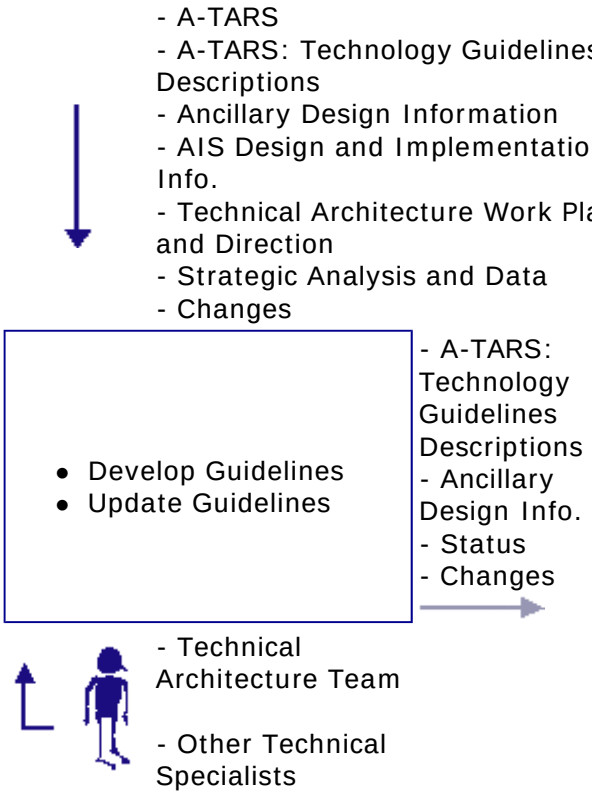

Introduction

These activities create and update the Technical Guidelines Reference Set, a place to put Agency-wide technology management and engineering practices and keep them up-to-date. These practices apply to individuals using as well as developing the A-TARS. Tutorial and background information can be provided, when needed. This guidance promotes consistency in the application of the A-TARS, establishing a formal channel to communicate effective Agency-wide practices across the IT projects.

The intent for the A-TARS documentation is that it be packaged and used as reference material. The authors of each section will therefore assume an appropriate level of skill and knowledge by their users. Any assumptions about those skills and knowledge may identify gaps where guidance should be provided. The guidelines in this reference set provide a means to close that gap. This guidance may be used as a basis of training A-TARS users and developers.

Projects (or A-TARS developers) will adapt and tailor these guidelines to their specific situations. Quality assurance functions will provide confidence that these are being appropriately implemented.

> **TANF Example:** The State HS Agency can be subject to a diverse set of guidelines, originating from many different and uncoordinated sources. Typical to most States for TANF is the influence of State elections and choices

made in the TANF State plan. This plan outlines the scope of TANF and identifies selections that will be implemented by the State.

Another source of critical guideline would be the TANF regulations published by HHS/ACF for utilization in the TANF organization. In some cases, crucial "Dear Colleague" letters may contain requirements and conventions pertinent to the technical process. These sources should be analyzed and interpreted for each organization, with guidance provided in the technical architecture guideline descriptions as appropriate.

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Activities

The following key activities are performed:

1. **Develop Guidelines.** These actions create the guidelines for technical management and engineering life-cycle activities and work-product conventions. Examples of activity-based guidelines are those that cover configuration management, planning, tracking, analysis, design, programming, test, certification, security, or data administration practices. Examples of product conventions are coding standards, modeling notations, or Web authoring guides (such as 508 guidelines (see PL 1998)). These guidelines may take the form of policies, procedures, templates, handbooks, presentations, or any other useful form. The guidelines are developed by iterating through the following actions:
    - Compile specialty guidelines that address unique aspects of the A-TAR sections. The need for this guidance can be identified during peer reviews (CMU/SEI 1995) of the various A-TARS descriptions as they are completed. The types of users of the descriptions should be identified and judgments should be made on the assumed level of knowledge and skills needed to apply the description. When a gap is determined between current and new skills and knowledge, a task for producing or updating guidelines can be initiated. Having typical users of the description participate in its review may help identify the guidance needed. Keeping a technical glossary and identifying new terms that are being introduced into the Agency may also help identify areas needing guidance.
    - Develop cross-specialty guidelines for information that is not unique to a particular part of the A-TARS. This may include engineering and management practices for life-cycle activities or specific work products. Coordination among the developers and users of the A-TARS can help identify where overarching guidance is needed.
    - Develop or identify educational materials or training courses where further detailed knowledge can be obtained to use the A-TARS. Additional training may be necessary when a significant knowledge or skills gap exists. This may involve identifying vendors for traditional classroom-based courses, using Internet or computer-based courses, or developing the courses using an in-house training center. In-house development will most likely be needed for process-related skills, as details of procedures will be unique to each organization. Orientation events (briefings) can also be produced as part of the deployment of a release of the A-TARS.
    - Compile, review, and publish drafts and final versions of the guidelines. Formal technical reviews, such as peer reviews (CMU SEI 1995), can be used to review the guidelines. Typical users of a description can participate to determine whether the guidelines are appropriate to their needs. The individual descriptions should be placed under a version control process to

track changes.

2. **Update Guidelines.** Guidance will continually change. New technologies and approaches will be incorporated into the Agency's inventory, others may be retired. Engineering practices will change as new, more effective techniques are used. The skills and knowledge of the users of the A-TARS will also change. The guidelines must adapt to reflect these changes. As changes are made to the A-TARs, the impact on the guidelines should be evaluated, dependencies should be identified, and changes should be synchronized.

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Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. Individuals participating in the development of the descriptions in the other portions of the A-TARS may help author these guidelines, such as those that defined the Services Reference Set providing descriptions on the modeling notation used (UML). These individuals may come from the Core or Extended Team.
- Other Technical Specialists. These individuals support the generation of the guidelines where they have specific expertise, such as programmers for authoring programming guidelines, Web content designers for accessibility guides, or technical editors and publication specialists. These specialties may be obtained from within the IT division or external (consultants), as needed.

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Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources.

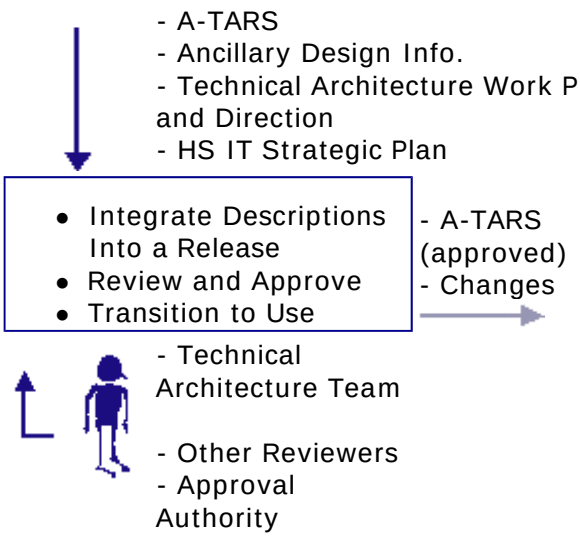
- A-TARS. Draft or final descriptions of all sections of the A-TARS are used to provide source material for the guidelines that are documented in these technology guideline descriptions.
    - Technology Guidelines Descriptions - These descriptions are the main product of these activities, updating the previous version, if it exists.
- AIS Design and Implementation Info. An understanding of the existing engineering and management practices is used when establishing the consolidated guidelines.
- Ancillary Design Information. Information associated with the rationale for the guidelines is retained, as needed. This information may provide background for training users of the guidelines.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other technical architecture tasks and the IT projects.
- Strategic Analysis and Data. The strategic direction, specifically the decisions to keep, replace, renovate, or build on existing IT assets, guides the choice of what practices to integrate into the guidelines and those to omit as legacy systems are retired.
- Changes. Changes provided to these activities represent those things in the current A-TARS descriptions that must change. Changes for other parts of the A-TARS also

can be generated, such as updates to the TRM, boundary, integrated descriptions, services, data stores, networking, or equipment. Those changes would be necessary if practices that affect their description changed (e.g., change in notations).

- Status. Progress and issues in developing the descriptions are forwarded to the management activities to ensure coordination between these activities and other technical architecture and IT project activities.

Integrate, Review, and Release the A-TARS

Compile the individual descriptions into a consistent set and transition them into uses.



Introduction

These activities integrate the descriptive materials from the other Technical Architecture activities and assemble them into a complete release of the A-TARS. This is a final check to ensure that the individual descriptions are consistent with one another; to gauge technical progress against the strategic IT direction; and to formally approve, release, and transition a version of the A-TARS into use. Actions to support the release are initiated, including the need to train and advise the users of the A-TARS. Actions also are established to check adherence to the A-TARS and to address inevitable defects in the descriptions through a formal change control process. All this takes place while the next version of the A-TARS is underway.

A major release of the A-TARS should be timed to met the HS Agency's program needs. Major releases can occur as the technical architecture is adjusted to address the plateaus. Computer systems, applications, and practices may be significantly changed, such as migrating from one technology base or another. Minor maintenance releases can be periodically released, as needed. These generally correct defects in the A-TARS descriptions, improve them to make them easier to use, or introduce other less global changes. Each IT project has to indicate which version of the A-TARS they are using and maintain plans to evolve with the A-TARS. This is key to reducing the risk of a large legacy migration steps. This allows for transforming large leaps into a more manageable set of small, evolutionary steps controlled by evolving and releasing the A-TARS descriptions.

> **TANF Example:** In a typical TANF organization, the CIO or MIS Director would be responsible for a release of all or part of the Technical Architecture. Each release should be coordinated with the technical heads of the Network Support Division, Equipment and/or System Support, Help Desk, Procurement, and other functions affected by each release. These individuals should have been involved throughout the design processes leading to the release. It is critical that all major players accountable for delivery of technology services support each release and its timing.

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Activities

The following key activities are performed:

1. **Integrate Descriptions.** These actions assemble the individual architecture descriptions into a coherent and consistent release. This includes identifying and marking changes; adding front matter (e.g., Table of Contents and executive overviews); and producing cover letters, approval pages, and other items to form a complete documentation reference set. This may include:
    - Compiling and consolidating the list of standards into the Agency Standards Reference Set. This places the list of all standards in one convenient place. The relevant version of all referenced standards should be made available to anyone needing them.
    - Compiling and consolidating reserved technical terms across the descriptions in a glossary.
    - Performing technical editing across all sections.
    - Marking changes from previous versions and creating versioning information, as needed.
    - Placing the release under configuration management control.
2. **Review and Approve.** These activities perform a formal technical and management review of the release. Individual descriptions are assumed to have gone through appropriate technical reviews (CMU/SEI 1995) to ensure technical accuracy. This review is concerned with integration and assumptions across elements of the A-TARS as well as issues in transforming them into use. This may include:
    - Selecting individuals for review that represent the authors, users, HS program, and IT Division management perspectives. The release Approval Authority or designee should actively participate in the review.
    - Distributing the materials and providing ready access to reference materials. Providing a checklist of what to review and noting whether there are some concerns that must be addressed.
    - Reviewers should review the materials separately, providing comments to the Architecture Team's Facilitator. Individual comments should be consolidated and then reviewed with the entire group. From that review, the consolidated list of issues can be agreed upon and actions scheduled to address them. Issues should be provided to the original authors for consideration and changes should be made, as needed. The Facilitator should coordinate any follow-up. Issues should focus on what is incorrect in the document set, not suggest improvements. A decision on the release should be solicited from the Approval Authority, such as:
        - Release when issues are incorporated; no further review required.
        - Schedule another round of review when changes are incorporated.
    - Initiate planning to transition the A-TARS into use. This includes when to phase the release into the IT projects, public announcements, training, establishing advisors to the projects, and technical oversight responsibilities. These plans should be initiated and agreed to by the release Approval

Authority.

- The release is formally endorsed by the Approval Authority.

3. Transition to Use. Once the A-TARS is approved, individuals are provided assistance in using it. This may include:
   - Publishing the A-TARS where all stakeholders can easily access it.
   - Holding communications events to describe the release and how it will be used. This may include announcements, training sessions, or orientation briefings.
   - Advising and working with the projects on any detailed transition plans.
   - Having members of the Technical Architecture Team consult with the projects.

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Roles and Responsibilities

The key roles and their responsibilities are as follows:

- Technical Architecture Team. The review and approval process should be managed by the team Facilitator. Individuals that have produced descriptions should participate as technical reviewers, as appropriate. They are responsible for looking across the descriptions to uncover technical inconsistencies.
- Other Reviewers. These are significant stakeholders in the use or enforcement of the A-TARS, such as key members of the IT Project and HS Program teams.
- Approval Authority. Minimally, the Chief Architect, the Agency Decision Makers, and the IT Manager must endorse each release. Others can be added, as needed, to ensure that the A-TARS is put into effect, where needed.

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Artifacts

The following information is used or produced by these activities. Templates, examples, and checklists for identifying and documenting items are available through the Additional Resources section at the end of this page.

- A-TARS. This is an approved release of the A-TARS, updating the previous version, if it exists. The previous version is used to identify the changes made to each release.
- Ancillary Design Information. Information associated with the design is retained for each release. This includes any trade studies or notes that can be archived for later use, if needed.
- Strategic Analysis and Data. Progress in achieving the strategic direction should be furthered with each release. This reviews alignment with the strategic direction and identifies any need to change that direction.
- Changes. Changes are generated for portions of the descriptions that must be modified before release. The notion of changes also implies the need to go back and reconsider the strategic direction as the technical architecture evolves.
- Technical Architecture Work Plans and Direction. These work plans guide the execution of these activities, coordinating the individuals performing these activities with other technical architecture tasks and the IT projects.
- Status. Progress and issues in reviewing and approving the descriptions are forwarded to the management activities to ensure coordination between these

activities and other technical architecture and IT project activities.

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Additional Resources

Items that can be used to perform these and other activities are consolidated in the Resources page portion of the IT Planning and Management Guides. Resources specific to this activity are cataloged below.

Consolidated Guidance: A-TARS Users
Identifies the types of users and the part of the A-TARS that will be of interest. 9-21-01