

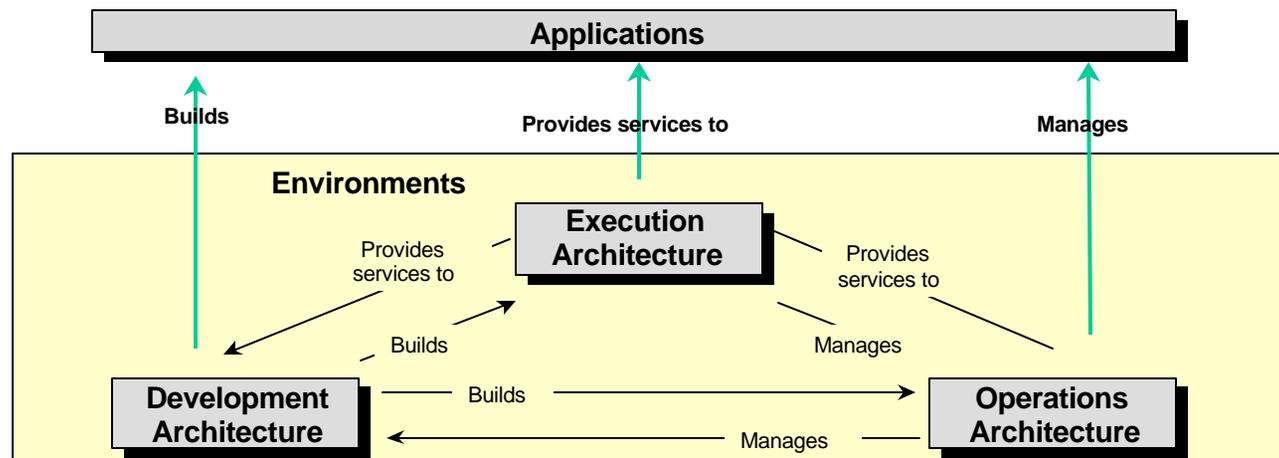
Contents



Department
of
Education

The execution, operations, and development environments have unique relationships and interactions with each other. (See the diagram below.) The main deliverable (4.1.1) has presented recommendations for the development and operations environments. Deliverable 4.1.2 has presented the execution recommendations. This appendix for document 4.1.1, therefore, will present the architectural details for only the development and operations environment. The details behind each framework is presented, describing the logical decomposition and their definitions. The logical decomposition and definitions enable an understanding of all the technical services which need to be considered for the development of an environment, specifically for SFA, the data warehouse, internet, and integration architectures.

- The **Execution Architecture** is comprised of run-time services required when an application executes.
- The **Operations Architecture** is a combination of tools, support services, procedures, and controls required to keep a production system up and running efficiently.
- The **Development Architecture** is the environment for one or several systems development projects as well as for maintenance efforts.

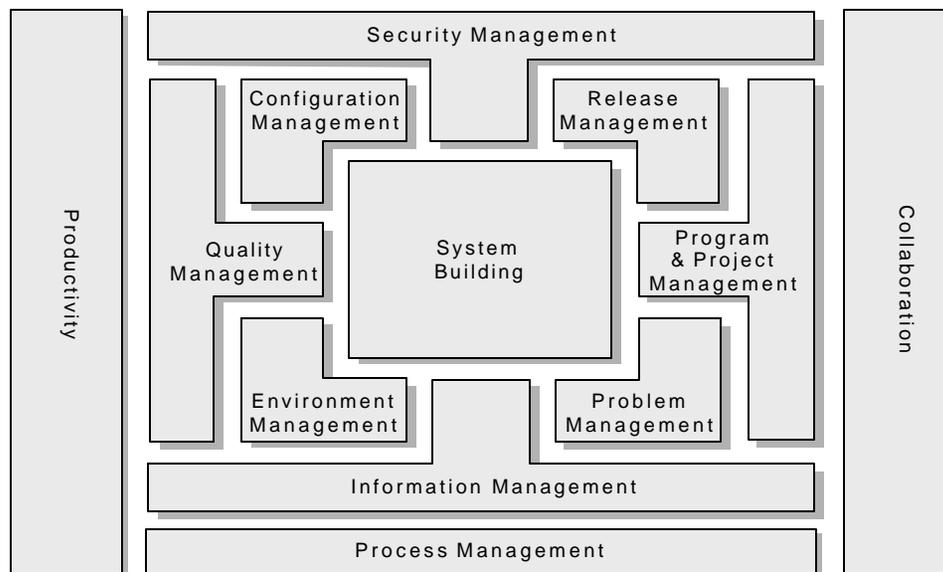


The Development Environment is an environment built to support the tasks involved in the analysis, design, construction, and maintenance of business systems, as well as the associated management processes.



*Department
of
Education*

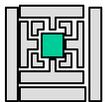
The services in the Development Architecture Framework represent the reference set of services that may be required in an Development Architecture. The framework is a logical, not physical, representation of a Development Environment, allowing the framework to be described in terms of architectural service layers, architectural groupings, and technical services. (See slide A-6 for a complete logical representation). The framework can be used to describe at a high level how different development architecture layers interact and, therefore, can be used as a completeness check for a Development Architecture design.



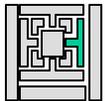


Department
of
Education

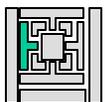
Development Framework Services - Architectural Service Definitions



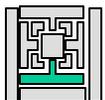
System Building - System Building tools comprise the core of the Development Architecture and are used to design, build, and test the system. All the system building tools must be integrated and share development objects appropriately.



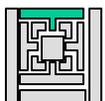
Program and Project Management - focuses on the continuous oversight needed to support the delivery of business capability through multiple projects and releases.



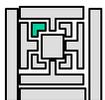
Quality Management - The objective of these tools is to ensure that, early in the life of a program, program leadership explicitly defines what quality means for the program, and is able to implement it.



Information Management - used to share a common repository of development objects, design documents, source code, test plans and data.



Security Management - used to provide the components that make up the security layer of the final system, and may provide required security controls to the Development Environment.

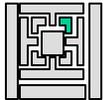


Configuration Management - used to ensure that consistency between components and a given environment is maintained over time as components are changed.

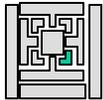


Department
of
Education

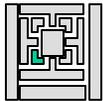
Development Framework Services - Architectural Service Definitions cont.



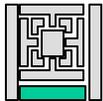
Release Management - used to help plan design and development effort, measure progress towards delivery goals, and interface with the change control system.



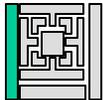
Problem Management - used to help track each system investigation request - from detection and documentation to resolution .



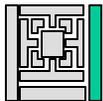
Environment Management - used to aid in the operations of the Development Environment.



Process Management - used to enforce the correct sequencing of tasks and tools.



Productivity - a family of tools that are generally required across the board, (often known as Office Automation Tools).

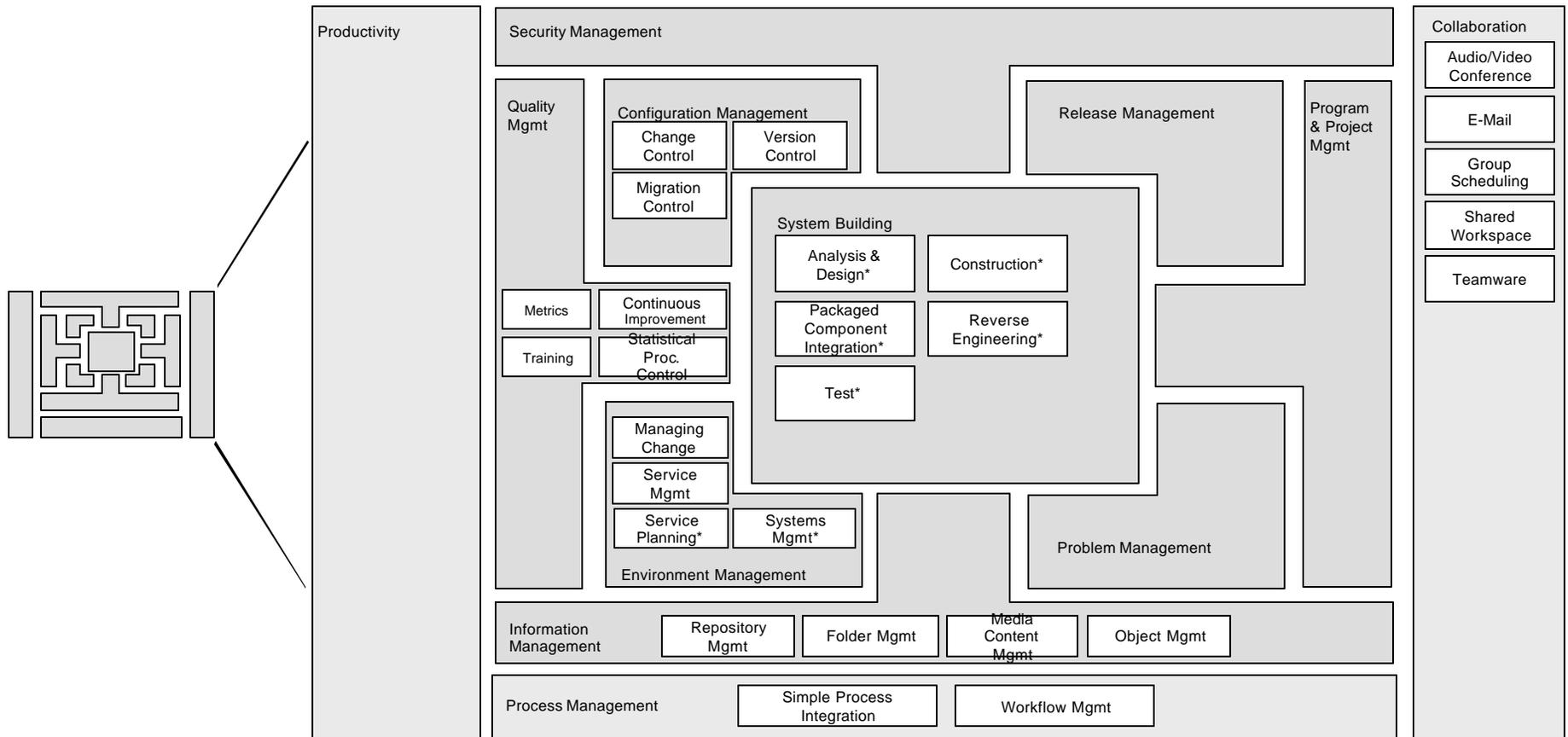


Collaboration - used to maintain communication between project team members.

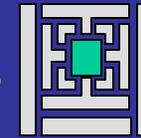
The Development Architecture Framework is comprised of the following architectural services, architectural groupings, and technical services, which are re-usable across multiple applications.



Department
of
Education



Development Framework Services - Technical Service Definitions



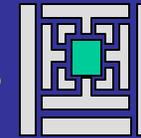
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
System Building	Analysis & Design	Application Logic Design	Provides the capability to graphically depict the logic of the application	X	X	X
		Communication Design	After the fundamental communication paradigms have been chosen, each exchange must be designed to allow for the detailed design of each module and to lay the basis for more refined performance modelling	X	X	
		Component Modeling	Covers both designing components from scratch and customizing and integrating packaged software	X	X	X
		Data Modeling	Defines relationships among data entities	X	X	X
		Database Design	Provides the capability to graphically depict the database design for the system	X	X	X
		Event Modeling	Provides the capability to graphically depict the events and associated responses for the system	X	X	
		Object Modeling	Provides the facility to model objects			
		Performance Modeling	Supports the analysis of performance over the network	X	X	X
		Presentation Design	Provides the capability to graphically depict the presentation layer of the application, such as screens, windows, reports, and dialog flow	X		X
		Process Modeling	Provides the capability to graphically depict the business functions and processes being supported by a system	X	X	X
		Reuse Support	It is during analysis and design that really large savings can be obtained by re-using existing solutions	X	X	X
		Usability Testing	Ensures the final system is usable	X	X	X
Prototyping	Enables the developer to capture user requirements in the format of the user interface: screens, windows, and reports	X	X	X		

Development Framework Services - Technical Service Definitions



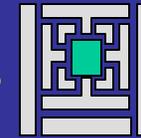
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
System Building	Reverse Engineering	Data Name Rationalization	Enforces and applies uniform data naming standards throughout a system	X	X	X
		Extraction	Provides the developer the capability to reuse selected portions of a legacy system	X	X	
		Graphical Representation	Enables the structure, flow, and data usage of a legacy system to be viewed and navigated graphically			
		Interactive Navigation	Identify requirements for a new system from the functionality and design of a legacy system	X	X	X
		Repository Population	Loads the information from the extraction tool into the development repository		X	X
		Restructuring	Enables the developer to rebuild a legacy system, rather than replace it			
	Construction	Source Code Editor	Enables language-sensitive source code creation and modification	X	X	X
		Source Code Debugger	Provides the capability to unit test a program	X	X	X
		Generation	Automated tools which generate application components	X	X	X
		Compiler/Linker/Interpreter	A compiler/linker/interpreter converts source code to executable code	X	X	X
		Code/Object Libraries	Provide the developer with ready-made components	X	X	X
		Media Content Creation	Provides facilities to create and manipulate media content			
		QA Utilities	Verify the quality of completed code	X	X	X

Development Framework Services - Technical Service Definitions



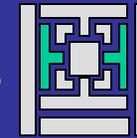
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
System Building	Testing	Emulation	Emulates components that are part of the target environment but are not in the development environment	X	X	X
		Performance Management	Supports the testing of the application's performance	X	X	X
		Problem Management	Help track each system investigation request - from detection and documentation to resolution	X	X	X
		SIR Management	Helps track each system investigation request from problem detection through documentation resolution	X	X	X
		Test Coverage Management	Used to document which parts of each program have been executed during the test	X	X	X
		Test Data Management	Allows developers to create and maintain input data and expected results associated with a test plan	X	X	X
		Test Data Manipulation	Enables direct editing of data values in files and databases, and allow developers to build or convert test data from existing sources	X	X	X
		Test Execution	Support and automate the conduct of system tests	X	X	X
		Test Planning	Provides the capability to define and maintain the relationship between components of a test plan	X	X	X
	Test Result Comparison	Utilities used to compare expected and actual results	X	X	X	

Development Framework Services - Technical Service Definitions



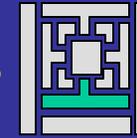
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Program & Project Management		Planning	Creation and maintenance of timelines, milestones, etc.	X	X	X
		Scheduling	Schedule specific tasks with specific budgets to specific persons	X	X	X
		Tracking	Tracks (registers) progress and actual duration	X	X	X
		Reporting	Reports projected and actual durations for project tasks	X	X	X
Quality Management		Statistical Process Control	Used to analyze the results obtained with the measurement tools			
		Continuous Improvement	Used to analyze and improve the development processes	X	X	X
		Metrics	Provide operational definitions of quality attributes, giving a measure of process quality and product quality			
		Training	Provides methods to apply a standardized training approach to a large group of people			

Development Framework Services - Technical Service Definitions



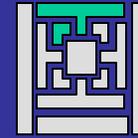
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Information Management		Repository Management	The key information management tool. The repository should be open, extensible, integrated and scalable	X	X	X
		Folder Management	It is not always practical to store all information in the same repository. It may therefore often be most practical to populate the repository with place-holders for entities which reside outside the repository. With this scheme the place-holder serves			
		Object Management	Provides capabilities for viewing objects, their methods and attributes, and the dependencies between these objects			
		Media Content Management	Methods for storing and managing media content range from simple folder management techniques to multimedia digital asset management systems, capable of indexing and manipulating numerous multimedia data types			

Development Framework Services - Technical Service Definitions



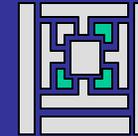
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Security Management			Provides the components that make up the security layer of the final system, and may provide required security controls to the development environment. While some of these tools may be considered as nothing more than security-specific Packaged Components	X	X	X
Configuration Management		Change Control	Controls requests for changes to the application source code	X	X	X
		Migration Control	Controls multiple versions of source code, data, and other items as they are changed, tested, and moved from the development environment into the production environment	X	X	X
		Version Control	Controls access to source code as it is developed and tested, and allows multiple versions to be created, maintained, or retrieved	X	X	X

Development Framework Services - Technical Service Definitions



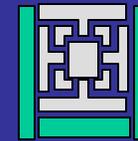
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Release Management			Offers planning, monitoring and project interdependency management functions. Ideally, the Release Management system should also be integrated with workflow support, the repository, and the project/program management system	X	X	X
Problem Management			Helps track each system investigation request from detection and documentation to resolution (for example, Problem Tracking, Impact Analysis, Statistical Analysis)	X	X	X
Environment Management		Service Management	Supports the various aspects of supporting and managing the interface with the developers	X	X	X
		Managing Change	Supports the various aspects identifying and managing change in the development environment, the key tool is the Data & Software Distribution which enables automated distribution of data and software to the workstations and servers in the development envi			
		Systems Management	Supports the various aspects of supporting and managing the operation of the distributed system	X	X	X
		Service Planning	Planning required to anticipate and implement changes to the other areas: service management, systems management, managing change,			

Development Framework Services - Technical Service Definitions



Department
of
Education

KEY
 X - Architecture requires the technical service
 <blank> - Architecture does not require the technical service

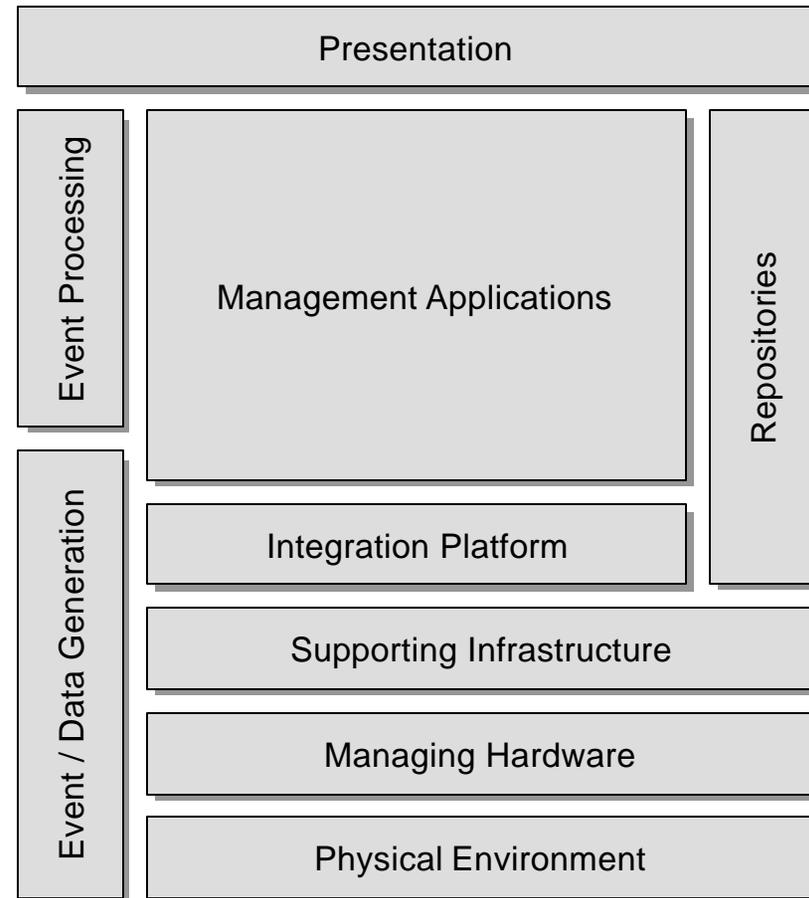
Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Process Management		Simple Process Integration	Concerns the integration of a limited sequence of tasks, for an individual, according to a prescribed development methodology			
		Workflow Management	Addresses the problem of complex processes which require the participation of multiple groups. Provides the ability to define, manage, and execute automated business processes through an electronic representation of the process, both in terms of what has			
Productivity			Typically packaged as integrated suites of software, provides the basic functionality required to create documents, spreadsheets, and simple graphics or diagrams. More recently, the ability to access the Internet and browse electronic documentation has be			
Collaboration		E-Mail	Provides the ability to electronically send and receive messages and documents	X	X	X
		Teamware	Provides the ability to capture and share project information in common-access, structured databases.			
		Audio/Video Conference	Audio and video conferencing tools allow individuals in different locations to communicate simultaneously			
		Group Scheduling	These tools help to centrally manage the personal schedules of a group of people	X	X	X
		Shared Workspace	These systems include electronic whiteboarding and application sharing			

The Operations Environment is a combination of tools, support services, procedures, and controls required to keep a production system up and running efficiently.



Department
of
Education

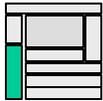
The service in the Operations Architecture Framework represent the reference set of services that may be required in an Operations Architecture. The framework is a logical, not physical, representation of an Operations Environment, allowing the framework to be described in terms of architectural service layers, architectural groupings, and technical services. (See slide A-18 for complete logical representation). The framework can be used to describe at a high level how different operations architecture layers interact and, therefore, can be used as a completeness check for an Operations Architecture design.



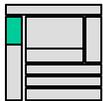


Department
of
Education

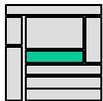
Operations Framework Services - Architectural Service Definitions



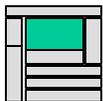
Event/Data Generation - interacts with all the managed components in the execution and development environments to obtain the required management information.



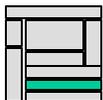
Event Processing - manipulates the raw data obtained in the event/data generation layer into a more workable form.



Integration Platform - provides a common platform for the operational architecture.



Management Applications - tools which are used to manage the system and include capacity planning tools, performance management tools, license management tools, systems monitoring tools, scheduling tools, help desk tools, etc.



Managing Hardware - all hardware directly used to manage the environment, including all staging components.



Department
of
Education

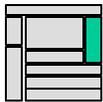
Operations Framework Services - Architectural Service Definitions cont.



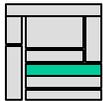
Physical Environment - includes all the support indirectly involved in maintaining and managing the distributed environment.



Presentation - provides the interface between the manager(s) of the system and management data generated by the system.



Repositories - contain all the management data generated or used during the management process.

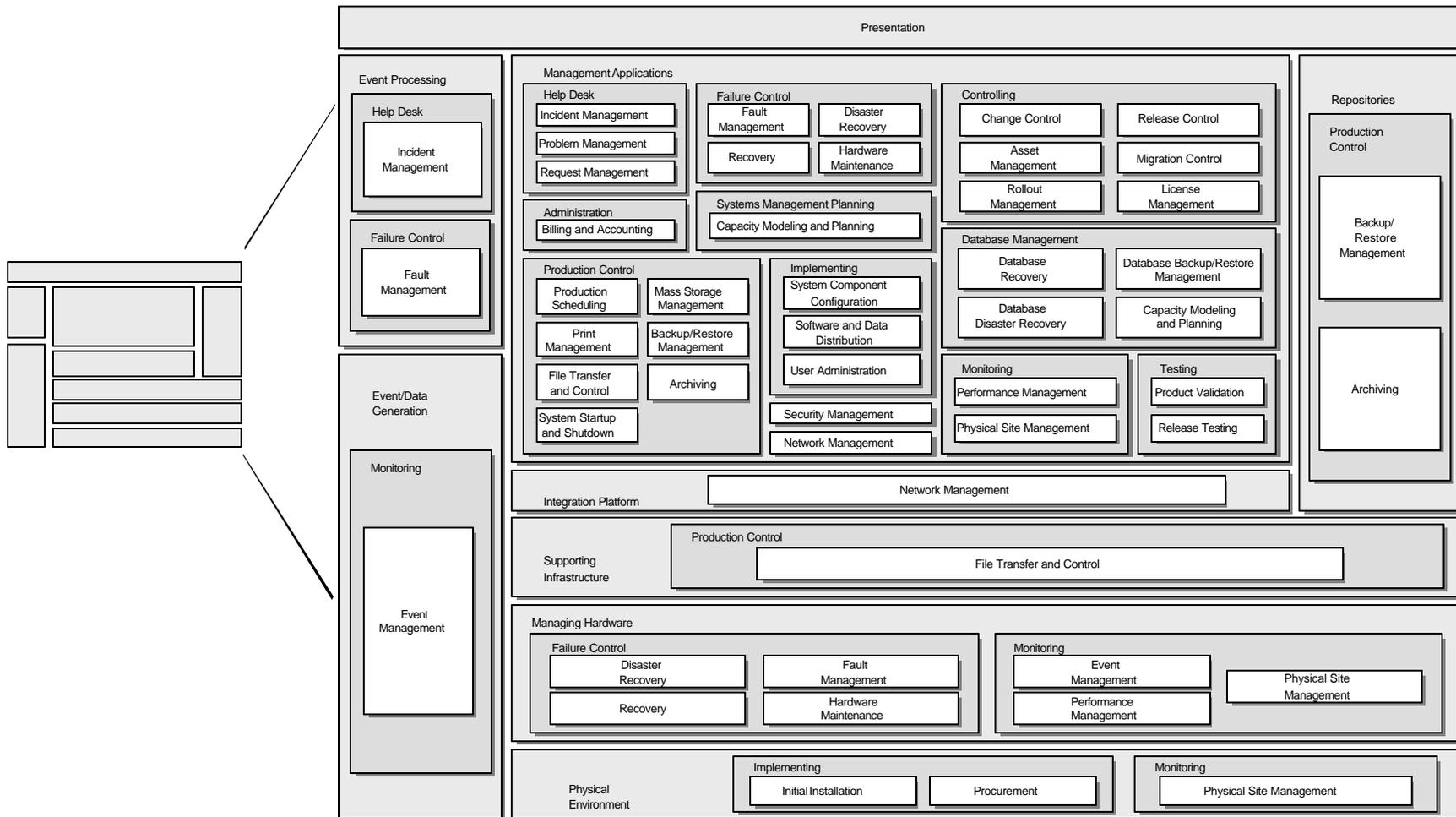


Supporting Infrastructure - the subset of operating systems, utilities, languages, and protocols used to support the management of the system.

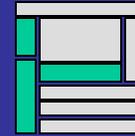
The Operations Architecture Framework is comprised of the following architectural service layers, architectural groupings, and technical services, which are re-usable across multiple applications.



Department
of
Education



Operations Framework Services - Technical Service Definitions



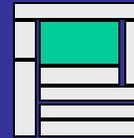
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Event/Data Generation	Monitoring	Event Management	Event Management receives, logs, classifies and presents event messages on a console(s) based on pre-established filters or thresholds	X	X	X
Event Processing	Help Desk	Incident Management	Provides the interface between the users of the system and those operating and maintaining the system when an incident arises	X	X	X
	Failure Control	Fault Management	Define, diagnose, and correct faults	X	X	X
Integration Platform		Network Management	Network & Systems Management Planning is responsible for the planning activities involved in running the day-to-day operations and maintenance of the production systems	X	X	

Operations Framework Services - Technical Service Definitions

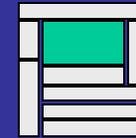


Department
of
Education

KEY
 X - Architecture requires the technical service
 <blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures			
				Internet Processing	Integration Broker	Data Warehouse	
Management Applications		Network Management	Responsible for the planning activities involved in running the day-to-day operations and maintenance of the production systems				
	Administration	Billing and Accounting	Gathers the necessary accounting information for calculating actual costs, determines chargeback costs based on pre-defined algorithms and bills users for service rendered				
	Controlling		Change Control	Responsible for coordinating and controlling all change administration activities within the distributed environment			
			Asset Management	Ensures that all assets are registered within the inventory system and that detailed information for registered assets is updated and validated throughout the assets lifetime			
			License Management	Ensures that software licenses are being maintained throughout the distributed system and that license agreements are not being violated			
			Migration Control	Ensures that the proper updates are received from development	X	X	X
			Release Control	Release Control is concerned with delivering a release on-time based upon the release schedule	X	X	X
		Rollout Management	Concerned with delivering new sites or services to existing sites on-time based on the rollout schedule	X	X	X	
	Database Management		Capacity Modeling & Planning	Ensures that adequate resources will be in place to meet the SLA requirements	X	X	X
			Database Backup/Restore Management	Process of providing point-in-time backup and recovery for logical database restores	X	X	X
			Database Disaster Recovery	Process of recovering the database entities following a catastrophic failure	X	X	X
			Database Recovery	Process of providing recovery of database entities following a logical or physical database failure	X	X	X

Operations Framework Services - Technical Service Definitions



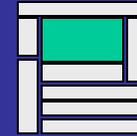
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Management Applications	Failure Control	Disaster Recovery	Re-routes the system resources to a secondary, stable configuration until the primary resources can be restored	X	X	X
		Fault Management	Define, diagnose, and correct the fault	X	X	X
		Hardware Maintenance	Maintains all of the components within a distributed system to protect the investment of the organization	X	X	X
		Recovery	Manages all of the actions needed to restore service delivery after a system failure	X	X	X
	Help Desk	Incident Management	Provides the interface between the users of the system and those operating and maintaining the system when an incident arises	X	X	X
		Problem Management	Utilizes the skills of experts and support groups to fix and prevent recurring incidents by determining and fixing the underlying problems causing those incidents	X	X	X
		Request Management	Coordinating and controlling all activities necessary to fulfill a request from either a user, vendor, or developer	X	X	X
	Implementing	Software & Data Distribution	Sends out the correct version of the release package to the distribution locations and updates the locations with the contents of the release package	X	X	X
		User Administration	Handles the day-to-day tasks involved in administering users on the system	X	X	X
System Component Configuration		Provides a mechanism to configure equipment which has configuration parameters to set and to manage the inter-relationships between configured components within the system				

Operations Framework Services - Technical Service Definitions

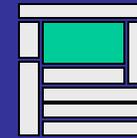


Department
of
Education

KEY
 X - Architecture requires the technical service
 <blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Management Applications	Monitoring	Performance Management	Ensures that the required resources are available at all times throughout the distributed system to meet the agreed upon SLAs			
		Physical Site Management	Monitors the central and distributed sites environmental and regulatory levels			
	Production Control	Archiving	Saves and stores information across the distributed environment, either centrally or in distributed locations	X	X	X
		Backup/Restore Management	Considers all of the back-up and restorations that need to take place across the distributed system for master copies of data	X	X	X
		File Transfer & Control	Initiates and monitors files being transferred throughout the system as part of the business processing	X		
		Mass Storage Management	Involves those activities related to the handling of various types of centralized and distributed storage media including the monitoring and controlling of storage resources and their usage			X
		Print Management	Monitors all of the printing done across a distributed environment and is responsible for managing the printers and printing at both central and remote locations	X	X	X
		Production Scheduling	Determines the requirements for the execution of scheduled jobs across a distributed environment			
		System Startup & Shutdown	Performs the activities required for the startup or shutdown of the entire system, or portions of the system depending upon the identified requirements			

Operations Framework Services - Technical Service Definitions



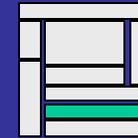
Department
of
Education

KEY

X - Architecture requires the technical service
<blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Management Applications		Security Management	Controls both physical and logical security for the distributed system	X	X	X
	System Management Planning	Capacity Modeling & Planning	Ensures that adequate resources will be in place to meet the SLA requirements, keeping in mind operational requirements which may require additional capacity	X	X	X
	Testing	Product Validation	Tests potential hardware and software for the distributed environment prior to procurement to determine how well a product will fulfill the requirements identified	X	X	X
		Release Testing	Receives the proper version of a release package and tests the release of the upgrade in a test environment	X	X	X

Operations Framework Services - Technical Service Definitions

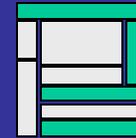


Department
of
Education

KEY
 X - Architecture requires the technical service
 <blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Managing Hardware	Failure Control	Disaster Recovery	Re-route the system resources to a secondary, stable configuration until the primary resources can be restored	X	X	X
		Hardware Maintenance	Maintains all of the components within a distributed system to protect the investment of the organization	X	X	X
		Fault Management	Maintains all of the components within a distributed system to protect the investment of the organization	X	X	X
		Recovery	Manages all of the actions needed to restore service delivery after a system failure	X	X	X
	Monitoring	Event Management	Receives, logs, classifies and presents event messages on a console(s) based on pre-established filters or thresholds	X	X	X
		Performance Management	Ensures that the required resources are available at all times throughout the distributed system to meet the agreed upon SLAs	X	X	X
		Physical Site Management	Monitors the central and distributed sites environmental and regulatory levels	X	X	X

Operations Framework Services - Technical Service Definitions



Department
of
Education

KEY
 X - Architecture requires the technical service
 <blank> - Architecture does not require the technical service

Arch Service Layer	Architecture Grouping	Technical Service	Technical Service Description	Architectures		
				Internet Processing	Integration Broker	Data Warehouse
Physical Environment	Implementing	Initial Installation	Prepares the physical location for the rollout of a new site or service	X	X	X
		Procurement	Responsible for ensuring that the necessary quantities of equipment are purchased and delivered on-time to the appropriate locations			
	Monitoring	Physical Site Management	Monitors the central and distributed sites environmental and regulatory levels	X	X	X
Presentation		N/A	Provides the interface between the manager(s) of the system and management data generated by the system	X	X	X
Repositories	Production Control	Backup/Restore Management	Considers all of the back-up and restorations that need to take place across the distributed system for master copies of data	X	X	X
		Archiving	Saves and stores information across the distributed environment, either centrally or in distributed locations	X	X	X
Supporting Infrastructure	Production Control	File Transfer & Control	Initiates and monitors files being transferred throughout the system as part of the business processing	X	X	X