

# Commonwealth of Virginia



**Information Technology Resource Management**

## **ENTERPRISE TECHNICAL ARCHITECTURE STANDARD**

**Virginia Information Technologies Agency (VITA)**

## ITRM Publication Version Control

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### Document Version History

Version Information Table		
Version	Date	Purpose of Revision
EA225-00	07/10/2006	Base Document (a compilation of new and revised enterprise technical architecture standards except for the security standards).
EA225-01	10/21/2007	Updates Preface Provides examples for ITRM Publication Version Control Updates and clarifies Section 6, Networking and Telecommunications. Updates and clarifies the personal computing portion of Section 7. This update removes the prohibition of DVD writers (see change in PLA-R-08) Clarification of the location of the security standards in Section 8 Updates links. Clarifies glossary entries

### Identifying Changes in Sections

- Take note of the Version Information Table entries above
- Note that page header dates vary throughout the document depending on when or if some portion of a particular section has been updated.

### Identifying Changes in Standard Statements

The following examples demonstrate how the reader may identify updates, changes, and deletions within the standard sections of this document beginning in Section 2.

**EXA -R-02 Technology Standard Example with No Change** – The text is the same. The text is the same. The text is the same.

**EXA -R-01 Technology Standard Example with Revision** – The text is the same. A wording change or clarification is made in this text for the particular update noted in the page header. The text is the same.

**EXA -R-03 Technology Standard Example of Deleted Standard** – This standard was rescinded on mm/dd/yyyy.

**EXA -R-04 Technology Standard Example of New Standard** – This standard is new on mm/dd/yyyy.

## Identifying Changes in Technology Component Standard Tables

The following examples demonstrate Technology Component Standard tables with updates, reviews without updates, and no review at the time.

<b>Table EXA-S-01: Example Table Change Technology Component Standard</b> <i>Updated: [page header date]</i>	
<b>Strategic:</b>	No change. No Change. <i>This is a change. This is a clarification. This is an addition</i>
<b>Emerging:</b>	No change in this bullet and second bullet moved to strategic
<b>Transitional/Contained:</b>	No change
<b>Obsolescent/Rejected:</b>	No Change
<b>Exception History:</b>	

<b>Table EXA-S-02: Example Table No Change Technology Component Standard</b> <i>Reviewed: [page header date]</i>	
<b>Strategic:</b>	No change
<b>Emerging:</b>	No change
<b>Transitional/Contained:</b>	No change
<b>Obsolescent/Rejected:</b>	No Change
<b>Exception History:</b>	

<b>Table EXA-S-03: Example Table Not Reviewed Technology Component Standard</b>	
<b>Strategic:</b>	Not reviewed since last publication
<b>Emerging:</b>	Not reviewed since last publication
<b>Transitional/Contained:</b>	Not reviewed since last publication
<b>Obsolescent/Rejected:</b>	Not reviewed since last publication
<b>Exception History:</b>	

## Preface

### Publication Designation

ITRM Standard EA225-01: Enterprise Technical Architecture Standard

### Subject

Enterprise technical architecture implementation

### Effective Date

October 29, 2007.

### Supersedes

ITRM Standard EA 225-00, July 10, 2006

### Scheduled Review:

The requirements identified in this standard for the technical domain components of the Enterprise Technical Architecture shall be reviewed on an annual basis.

### Value Statement

This document provides a consolidated list of requirements (in the form of a standard) from the eight domains that make up the Enterprise Technical Architecture of the Commonwealth. Provides a single source for Enterprise Architecture related requirements for use by agencies and their business partners.

### Authority

*Code of Virginia*, §2.2-2007 (Powers of the CIO)

*Code of Virginia*, § 2.2-2010 (Additional powers of VITA)

*Code of Virginia*, §2.2-2458 (Powers and duties of the Board [ITIB])

### Scope

This standard is applicable to all Executive Branch state agencies and institutions of higher education (hereinafter collectively referred to as "agencies") that are responsible for the management, development, purchase and use of information technology resources in the Commonwealth of Virginia. This standard does not apply to research projects,

research initiatives or instructional programs at public institutions of higher education.

### Purpose

This standard establishes direction and technical requirements which govern the acquisition, use and management of information technology resources by executive branch agencies.

### General Responsibilities

#### *The Chief Information Officer of the Commonwealth (CIO)*

- Directs the formulation and promulgation of ITRM standards

#### *The Virginia Information Technologies Agency (VITA)*

- Drafts the ITRM standard
- Updates the ITRM standard
- Uses requirements in the ITRM standard when establishing contracts, reviewing procurement requests, agency IT projects, developing services and managing services

#### *The Information Technology Investment Board (ITIB, the Board)*

- Approves the standard requirements or delegates approval to the CIO

#### *Executive Branch Agencies*

- Provide input during the development of requirements and the drafting of the standard
- Provide input for the review and updating of the standard
- Comply with the requirements established
- Use standards information in planning for the acquisition and modification of information technology resources
- Apply for exceptions when necessary

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## Section 1. Introduction

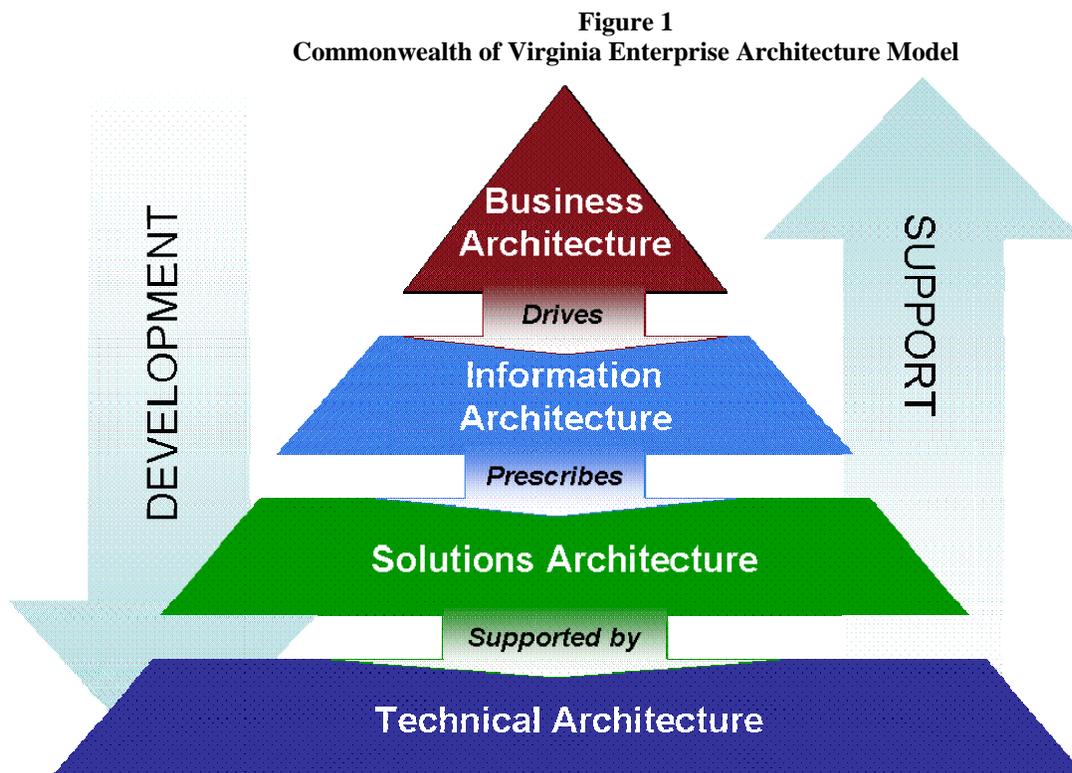
### *Overview*

The Commonwealth's Enterprise Architecture is a strategic asset used to manage and align the Commonwealth's business processes and Information Technology (IT) infrastructure/solutions with the State's overall strategy.

The Enterprise Architecture is also a comprehensive framework and repository which defines:

- the models that specify the current ("as-is") and target ("to-be") architecture environments,
- the information necessary to perform the Commonwealth's mission,
- the technologies necessary to perform that mission, and
- the processes necessary for implementing new technologies in response to the Commonwealth's changing business needs.

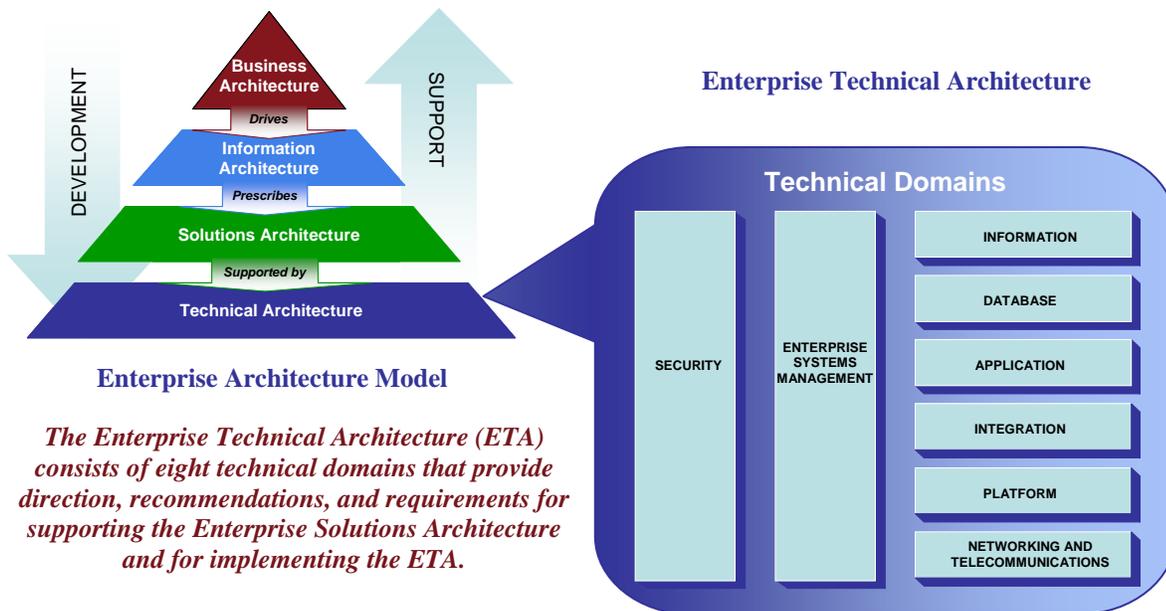
The Enterprise Architecture contains four components as shown in the model in Figure 1.



The Business Architecture drives the Information Architecture which prescribes the Solutions Architecture that is supported by the Technical (technology) Architecture.

The Enterprise Technical Architecture (ETA) shown in Figure 2 consists of eight technical domains that provide direction, recommendations and requirements for supporting the Solutions Architecture and for implementing the ETA. The ETA guides the development and support of an organization's information systems and technology infrastructure.

**Figure 2**  
**ETA Relationship to the Enterprise Architecture**



Each of the domains is a critical piece of the overall ETA. The Networking and Telecommunications and Platform Domains address the infrastructure base and provide the foundation for the distributed computing. The Enterprise Systems Management, Database, Applications, and Information Domains address the business functionality and management of the technical architecture. The Integration Domain addresses the interfacing of disparate platforms, systems, databases and applications in a distributed environment. The Security Domain addresses approaches for establishing, maintaining, and enhancing information security across the ETA.

The to-be Enterprise Technical Architecture envisioned for the Commonwealth will be one where the Commonwealth's citizens and other customers who wish to access Virginia services will do so by utilizing an Enterprise Portal via standard web browsers.

Where appropriate, these online government services will be developed, delivered and supported using a Service-Oriented Architecture (SOA) based on open and industry standard solutions. Selected legacy applications will be exposed to the SOA using web services.

The SOA will be supported by an Enterprise Service Bus that provides Orchestration and Choreography Services to the agencies.

Central integration and coordination will be managed by an Integration Competency Center (ICC) that supports agency needs such as: asynchronous message queuing and persistence.

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Large complex *mission critical* applications that need to be reliable, scalable, secure and highly available will be n-tiered and will utilize business rule and workflow engines.

Enterprise application software for the core government administrative business functions will be consolidated and the underlying business processes modernized. An Application Management Center of Excellence will service and manage the new enterprise applications that replace existing legacy and silo-based applications.

Data will be exchanged among systems, agencies, institutions of higher learning, localities, the federal government, and partners using Extensible Markup Language (XML) based standards such as the Global Justice XML Data Model and the National Information Exchange Model.

The number and types of software tools and products used by the Commonwealth will be decreased to reduce complexity. This will create the opportunity for agencies to refocus their current in-house IT resources to achieve higher levels of expertise on the fewer required products resulting in, among other benefits, a lower dependence on outside contractors.

Agency software applications and customer services will be delivered and supported by an IT infrastructure that will

- be responsive, agile, modular, scalable, reliable, secure, and highly available (24x7);
- utilize ITIL (IT Infrastructure Library) best practices ;
- have extensive and proactive technology refreshment;
- utilize a shared services model for technology delivery;
- have a single secure state-wide network and Intranet;
- have a state-of-the-art data center and back-up facility;
- consolidate agency servers in their most cost-effective locations;
- unify statewide electronic mail services;
- employ innovative procurements, supplier partnerships, and financing arrangements to fund, expedite, and ensure the performance of future initiatives;
- provide a statewide customer care center; and
- improve the cost performance of IT utilized by the Commonwealth.

**Rationale:**

Agencies can achieve the following benefits resulting from the Commonwealth's implementation of the ETA:

- better responsiveness to changing business needs and rapidly evolving information technologies;
- greater ease of software application integration and application interfacing;
- easier secure access to data and information to enable interagency collaboration and sharing;

- increased levels of application interoperability within the Commonwealth, with other states and municipalities, and with the Federal government;
- increased sharing and re-use of current information technology assets;
- faster deployment of new applications; and
- reduction in costs required to develop, support and maintain agency applications.

### ***Standard Inputs***

The requirements and technology component standard tables contained in this standard have been consolidated from inputs from the domain teams responsible for researching, providing recommendations, and developing the eight technical domains of the ETA.

### ***Definition of Key Terms***

All standards and requirements considered to be critical components for implementing the Commonwealth's ETA are included in this report.

A glossary of terms is included as Appendix A to assist you in understanding this standard.

The report presents three forms of technical architecture guidance for agencies to consider when planning or when making changes or additions to their information technology:

- Requirements – mandatory Enterprise Technical Architecture directions. All requirements are included within the ETA Standard.
- Technology Component Standard Tables - indicate what technologies or products agencies may acquire at a particular point in time. These are mandatory when acquiring new or replacing existing technology or products. All technology component standard tables are included within the ETA Standard.
- Recommended Practices - provided as guidance to agencies in improving cost efficiencies, business value, operations quality, reliability, availability, decision inputs, risk avoidance or other similar value factors. Recommended Practices are optional.

The following terminology and definitions are applicable to the technology component standard tables presented in this report:

#### **Strategic:**

This technology is considered a strategic component of the Commonwealth's Enterprise Technical Architecture. It is acceptable for current deployments and shall be used for all future deployments.

#### **Emerging:**

This technology requires additional evaluation in government and university settings. This technology may be used for evaluative or pilot testing deployments or in a higher education research environment. Any use, deployment or procurement of this technology beyond higher education research environments requires an approved *Commonwealth Enterprise Technical Architecture Exception*. The results of an evaluation or pilot test deployment should be submitted to the **VITA Technology Strategy and Solutions: Policy, Practice and Architecture Division** for consideration in the next review of the Enterprise Technical Architecture for that technology.

**Transitional/Contained:**

This technology is not consistent with the Commonwealth's Enterprise Technical Architecture strategic direction. Agencies may use this technology only as a transitional strategy for moving to a strategic technology. Agencies currently using this technology should migrate to a strategic technology as soon as practical. A migration or replacement plan should be included as part of the Agency's IT Strategic Plan. New deployments or procurements of this technology require an approved *Commonwealth Enterprise Technical Architecture Exception*.

**Obsolescent/Rejected:**

This technology may be waning in use and support, and/or has been evaluated and found not to meet current Commonwealth Technical Architecture needs. Agencies shall not make any procurements or additional deployments of this technology. Agencies currently using this technology should plan for its replacement with strategic technology to avoid substantial risk. The migration or replacement plan should be included as part of the Agency's IT Strategic Plan.

***Agency Exception Requests***

Agencies that desire to deviate from the requirements or the technology component standards specified in this report shall request an exception for each desired deviation and receive an approved *Enterprise Technical Architecture Change/Exception Request Form* prior to developing, procuring, or deploying such technology or not complying with a requirement specified in this report. The instructions for completing and submitting an exception request are contained within the *Commonwealth Enterprise Architecture Policy*.

## Section 2. ETA Applications Domain

The Commonwealth relies heavily on computer applications to support agency business operations. The agencies' business processes often must change in response to both legislation and new demands from citizens. Unfortunately, the Commonwealth's computer applications can not always respond to these changes in an effective and efficient manner because many current applications are either monolithic or two-tier client/server applications.

Many of the Commonwealth's current applications/solutions were developed independently using different languages and tools. The ability to communicate with other applications or systems or to adapt to changes in the business processes generally was not a design requirement. This architectural approach has adversely impacted the Commonwealth's business in three ways:

1. Additional cost and time needed to modify existing applications to support changing business requirements
2. Difficulty in integrating applications to share common services and data
3. Extra expense to develop, use, and maintain new applications because there is little reuse of code between applications

Application development tools, methodologies and technology are now available that can help address these problems. Examples include:

- Reuse of Code: Units of code previously duplicated in many applications can be packaged into components or services for reuse in different applications.
- Integration tools/Middleware: Shared software allows applications to communicate with each other, access data residing on different platforms, and access shared services.
- New User Interface Options: There is an expanding array of user interface options - including Web browsers, personal digital assistants (PDAs), and interactive voice response units (IVRs).
- N-tier Service-Oriented Architecture (SOA): In the n-tier SOA, applications are partitioned into discrete functional units called "services." Each service implements a small set of related business rules or function points. If a business rule must be modified to support changing business requirements, only the service that implements that business rule is impacted. The remainder of the application remains intact. The SOA comprises loosely coupled (joined), highly interoperable application services that interoperate over different development technologies. The services are very reusable because the interface definition is defined in a standards compliant manner.

The ETA Application Domain provides agencies with a foundation of development and support platforms, tools, processes, practices and requirements that can implement business processes and meet the Commonwealth's ever changing business needs.

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## ***Domain-wide Requirements***

The following domain-wide requirements pertain to all topics and components in the Application Domain:

- APP-R-01 Security, Confidentiality, Privacy and Statutes** – Agencies shall implement applications/solutions in adherence with all security, confidentiality and privacy policies and applicable statutes.
- APP-R-02 Software Tools Version/Release Support** – The version/release levels of all software tools used for development and support of Commonwealth and/or agency “*mission critical applications*” shall have vendor or equivalent quality level support available.
- APP-R-03 Disaster Recovery and Business Continuity Planning** – An assessment of business recovery requirements is mandatory when acquiring, developing, outsourcing, or making major enhancements to “*mission critical applications*”. Based on that assessment, appropriate disaster recovery and business continuity planning, design and testing shall take place.
- APP-R-04 Maintain Software Tools Inventory** – VITA shall collect data on agency (excluding higher education) use of software tools, maintain an up-to-date inventory, and perform research in order to create a more effective and efficient environment in support of the Application Domain.

## ***Enterprise System Design***

Enterprise System Design refers to a collection of technologies, practices, requirements and standards that can assist the agencies in the design of solutions that can meet the Commonwealth’s ever changing business needs.

## **Service Oriented Architecture (SOA): Implementation and Governance**

In a Service-Oriented Architecture (SOA) environment, nodes on a network make resources available to other participants in the network as independent services that the participants access in a standardized way. Unlike traditional object-oriented architectures, a SOA comprises loosely coupled (joined), highly interoperable application services. Because these services interoperate over different development technologies (such as Java and .NET), the software components become very reusable due to the virtue of the interface definition being defined in a standards compliant manner (Web Service Definition Language [WSDL]). This also encapsulates and hides the vendor/language specific implementation from the calling client/service. SOA provides a methodology and framework for documenting enterprise capabilities and supports both integration and consolidation activities.

SOA-based composite applications will enable the Commonwealth to integrate business-critical processes with existing applications and systems. To gain the agility, flexibility and efficiency that SOA enables, these services and composite applications must be accessible and controlled across the enterprise.

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The Commonwealth needs to implement a SOA as a foundation for Enterprise Applications and agency developed solutions for in-scope agencies. A key to successful implementation is SOA Governance.

SOA Governance is the ability to *ensure* that all of the independent efforts (whether in the design, development, deployment, or operations of a Service) come together to meet the enterprise SOA requirements

- APP-R-05**    **Implement SOA** – Agencies excluding higher education shall create and implement the centralized architectural review processes that are needed to support and control SOA implementation ensuring that all services built conform to standards, are interoperable, non-duplicative, and reusable where possible.
- APP-R-06**    **SOA Support of .NET and J2EE (Java Platform Enterprise Edition)** – The Commonwealth’s SOA for in-scope agencies shall support both .NET and J2EE Enterprise Framework Platforms.
- APP-R-07**    **SOA Center of Excellence Review of Developed Applications** – VITA, together with other executive branch agencies, shall create recommended practices and requirements to implement the SOA Center of Excellence enterprise level (state-wide excluding higher education) architectural design review and architectural governance of agency developed new applications that are large-scale, complex, use/create web services, or can potentially share business processes with other agencies.
- APP-R-08**    **SOA Center of Excellence Review of COTS (Commercial off-the-shelf)** – VITA, together with other executive branch agencies, shall create Enterprise level (state-wide excluding higher education) architectural review recommended practices and requirements to support agency’s review/selection and implementation of COTS based solutions that implement Enterprise-wide Applications or cross-cutting functions (such as accounting, facilities management or procurement).

## Enterprise Artifact Repository

Agencies should consider the reuse of existing applications and system components/artifacts first, as part of their systems acquire/develop decisions. To be successful, a state-wide library (repository) of reusable components and artifacts must be implemented and maintained.

Designers can build flexible, scalable, and extensible applications by using components as application building blocks, similar to building cars on an assembly line. Using previously built and tested components in different ways or with new components can accelerate the design, development, and delivery of new applications. Sharing of components across applications can also eliminate significant duplicate design and test efforts.

There are two strategies for reuse:

1. Opportunistic reuse: using assets that were not designed to be reused or are reused in a manner for which they were not designed

2. Systematic reuse: using assets which were purposefully designed, built, and managed to be reused

Systematic reuse has several advantages:

- Responsiveness: accelerates and streamlines project delivery
- Return on Investment (ROI): reduces solution delivery costs and provides only those assets that produce the best business advantage
- Quality: ensures that only quality assets will be reused

Both reuse strategies require an implemented Enterprise Artifact Repository with supporting practices and processes to be successful.

**APP-R-09 Implement Enterprise-wide Artifact Repository** – The Commonwealth shall select, deploy and maintain an Enterprise-wide Artifact Repository to support implementation of a SOA and create recommended practices and processes that support and encourage agency use of the Repository.

### ***Application Acquisition***

The choice of a systems acquisition method (buy/build decisions) should take into account the functional characteristics of the proposed systems. The agencies should first consider the reuse of existing applications and system components. If no components exist, purchased solutions (COTS) should be explored. Applications or systems that can provide automation of agency core business functions that have unique processes, yield competitive advantages, or have demonstrable cost savings and/or enhanced value should be the only candidates for in-house development by the Commonwealth.

### **Commercial off-the-shelf (COTS)**

Commercial off-the-shelf (COTS) is a term for software or hardware products that are ready-made and available for sale to the general public. They are often used as alternatives to in-house developments or one-off government-funded developments (government off-the-shelf [GOTS]). The use of COTS is being mandated across many government and business programs because they may offer significant savings in procurement and maintenance.

**APP-R-10 Evaluate COTS as Alternative** – Commercial off-the-shelf (COTS) solutions shall be evaluated and documented as part of an Alternatives Analysis of systems acquisition methods for all Enterprise-wide Applications and cross-cutting functions (such as accounting, facilities management or procurement).

**APP-R-11 COTS Documentation** – All “*mission critical*” COTS solutions shall have their application components and configurations fully documented.

## ***Development and Support Platforms***

The complexity, size, lifespan, and performance requirements of agency developed applications/solutions vary greatly. Development and Support Platforms provide the agencies with distinct approaches to address different application needs/ requirements.

These approaches can be implemented by the following development platforms:

- Enterprise Framework Platform – supports n-tier development of service-oriented architecture for large-scale or complex applications that need to support high-volume usage and/or long life spans.
- N-tier Visual-based Tool Development Platform – supports applications that are not large-scale, complex and do not require high-volume usage and/or long life spans. Generally developed by Business Analysts by using visual-based tools that provide automated code generation.
- Collaborative Platform – many business’ needs do not require scalable or highly available solutions. These needs often can be met by Workflow and Forms Automation tools.

## **Development Languages**

There have been thousands of different programming languages and new ones are created every year. Every language has its strengths and weaknesses. For example, FORTRAN was (and still is) a particularly good language for processing numerical data, but it does not lend itself very well to organizing large programs. Pascal was very good for writing well-structured and readable programs, but it is not as flexible as the C programming language. C++ embodies powerful object-oriented features, but it is complex and difficult to learn.

The Commonwealth will continue to use specialized development languages as required to meet special needs (example: FORTRAN for engineering applications). With the exception of these special needs applications, in-house development should use languages that are consistent with the creation of SOA n-tier solutions on Enterprise Framework Platforms such as .NET and J2EE.

<b>Table APP-S-01: Languages used in developing new large, complex applications anticipated to have high usage volumes and/or long life spans</b>	
<b>Technology Component Standard</b>	
<b>Strategic:</b>	Java, Visual Basic, C++, VB.NET Fortran (for engineering applications only)
<b>Emerging:</b>	
<b>Transitional/Contained:</b>	Cobol, Power Builder, PL/SQL, Delphi, MAPPER (BIS, Cool Ice)
<b>Obsolescent/Rejected:</b>	Assembler, C, Clipper, Basic, PL/1
<b>Exception History:</b>	

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## Coding Guidelines and Standards

Coding Guidelines and Standards (also called programming style or code convention) describe conventions for writing source code in a given programming language.

- APP-R-12 J2EE and .NET Guidelines** – The Commonwealth shall research and publish recommended practices supporting agency development of applications/solutions using J2EE and .NET Enterprise Frameworks.

## *Software Engineering*

Software Engineering is the application of best-practice processes and methods of design to the development and maintenance of software applications/solutions. Software engineering covers not only the technical aspects of building software systems, but also development management issues, such as testing, modeling and versioning.

- APP-R-13 Commonwealth Web and Accessibility Standards** – Public-facing and Web applications (Intranet and Internet) shall comply with Commonwealth Web and Accessibility Standards as applicable.
- APP-R-14 Public Web Applications Browser Independent** – Agency public-facing web-based solutions shall be browser independent (the functionality of the application can not be restricted to a single browser)
- APP-R-15 Maintain Application Code Documentation** – All newly developed applications shall have their code documented. This documentation shall be maintained throughout the product life cycle.
- APP-R-16 Accessible and Transferable Repositories** – All electronic repositories of source code, metadata, development artifacts, models, documentation, etc. shall have their contents accessible either by an export facility or direct access method. This ability is required to allow the repository contents to be transferred from one methodology or tool to another as needed.

## Reusable Components/Artifacts

A component is a loosely defined term for a software technology for encapsulating software functionality. Components must meet the following five criteria:

1. Multiple-use
2. Non-context-specific
3. Composable with other components
4. Encapsulated i.e., non-investigable through its interfaces
5. A unit of independent deployment and versioning

An artifact is a valuable, high quality software work product such as: documentation, analysis and design models, source code, interfaces, executable binaries, tools, processes, and test plans. To be successful, agencies must be able to search for existing applications, components and artifacts that have already implemented specific business processes.

- APP-R-17 Search for Existing Business Process** – The Commonwealth Enterprise Architecture shall evolve to incorporate a search feature that addresses the

customer's need to locate existing Commonwealth/ agency (excluding higher education) solutions that implement specific business processes.

## **Configuration Management**

Configuration Management is applicable to all aspects of software development from design to delivery. It focuses on the control of all work products and artifacts generated during the development process. Version Management (a subset of Configuration Management) refers to the tracking and controlling of file versions. It includes capabilities such as labeling, branching, merging, version content comparisons, and security and permission management. An initial step on the path to Configuration and Version Management is to implement a source code repository with supporting processes.

Code management is crucial to maintain application integrity through the development and maintenance lifecycle. Ideally, code management tools would integrate with defect tracking and application-build tools. The Commonwealth will be researching code management systems that can scale across the enterprise to foster an environment that supports reuse of shared components.

**APP-R-18 Source Code Repository** – All application source code shall be maintained in a repository using a formal process.

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## Section 3. ETA Database Domain

The Database Domain describes the technical components of the software systems that support storage and retrieval of data and the types of database software that will support applications. It includes the two topics of Database and Other Data Access Methods, and Data Management. Database and Other Data Access Methods addresses the components Hierarchical, Networked, Relational, and Object-oriented databases, and Other Data Access Methods. Data Management addresses the components Data Recovery and Backup, Data Dictionary, Database Administration, Enterprise Information Integration (EII), Database Design (Standards and Tools), and Data Modeling components.

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Database Domain.

- DB-R-01**      **Security, Confidentiality and Privacy Policies.** Production databases shall be implemented in adherence with all security, confidentiality and privacy policies and applicable statutes.
- DB-R-02**      **Support Tools Version/Release Levels.** The version/release levels of all databases and related tools used to develop or support Commonwealth and/or agency “*mission critical applications*” shall have vendor or equivalent level support.
- DB-R-03**      **Assess Business Recovery Requirements.** An assessment of business recovery requirements is mandatory when acquiring, developing, enhancing or outsourcing database solutions. Based on that assessment, appropriate disaster recovery and business continuity planning, design and testing shall take place.
- DB-R-04**      **Restrict Free-Form Data Entry/Update.** Data entry and update to production databases using direct database access shall be restricted, logged and reported to business owners or other appropriate staff. Production database owners shall provide written delegated authority for this type of access.

### *Database and Other Data Access Methods*

A database is a collection of information organized in such a way that a computer program can quickly select (access) desired pieces of data. A database management system (DBMS) is a software application providing management, administration, performance, and analysis tools for databases. The Database and Other Data Access Methods topic has Hierarchical, Networked, Relational, and Object-oriented (Object) components.

- DB-R-05**      **Minimize DBMS Number/Version.** Agencies shall minimize the number and versions of database management systems utilized.

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- DB-R-06 Support Connectivity.** Newly deployed database technologies shall support Java Database Connectivity (JDBC) and Microsoft connectivity technology (such as Open Database Connectivity (ODBC) or Object Linking and Embedding Database [OLEDB]).

### **Hierarchical Database**

A hierarchical database is a kind of database management system that links records together in a tree data structure such that each record type has only one owner, e.g. an order is owned by only one customer. Hierarchical structures were widely used in the first mainframe database management systems. However, due to their restrictions, they often cannot be used to relate structures that exist in the real world. See DB-S-01 Table below for component standards.

### **Networked Database**

A networked database is a database model conceived as a more flexible alternative to the hierarchical model. Where the hierarchical model structures data as a tree of records, with each record having one parent record and many children, the network model allows each record to have multiple parent and child records, forming a lattice structure. See DB-S-01 Table below for component standards.

### **Relational Database**

A relational database is a database model in which the database is organized and accessed according to the relationships between data items without the need for any consideration of physical orientation and relationship. Relationships between data items are expressed by means of tables.

- DB-R-07 Relational DBMS for New Applications/Solutions.** A Relational DBMS shall be used as the "Database and Other Data Access Method" for newly developed or acquired applications/solutions.
- DB-R-08 Support Security Using Database Access Controls.** The SQL implementation and relational database products shall support database security using the following database access controls: GRANT and REVOKE privilege facilities, the VIEW definition capabilities, and some Discretionary Access Control (DAC) mechanisms.

### **Object-oriented (Object) Database**

An object database (more correctly referred to as ODBMS or OODBMS for Object DBMS or Object Oriented DBMS, respectively) is a DBMS that stores objects as opposed to tuples (one row of a database table...one record) or records in a RDBMS (Relational Database Management System) or record-based DBMS. As data is stored as objects it can be interpreted only using the methods specified by its class. The relationship between similar objects is preserved (inheritance) as are references between objects. See DB-S-01 Table below for component standards.

### **Other Data Access Methods**

**Indexed Sequential Access Method (ISAM)** is a common disk access method that stores data sequentially while maintaining an index of key fields to all the records in the file for direct

access. The sequential order would be the one most commonly used for batch processing and printing (account number, name, etc.).

**Virtual Storage Access Method (VSAM)** is an IBM access method for storing data, widely used in IBM mainframes. It uses the B+tree method for organizing data.

See DB-S-01 Table below for component standards.

The following table provides strategic direction for agencies that are acquiring database and other data access method products.

<b>Table DB-S-01: Database and Other Data Access Methods Technology Component Standard</b>	
<b>Strategic:</b>	Microsoft SQL Server 2005, Microsoft SQL Server 2000 Oracle 9i or 10g DB2 Version 8.x MySQL (shall have vendor or equivalent quality level support if used for <i>Mission Critical Applications</i> )
<b>Emerging:</b>	EnterpriseDB CACHÉ Other Object-oriented (Object), Multidimensional, and Real Time Databases
<b>Transitional/Contained:</b>	IMS VSAM Adabas MAPPER, BIS, Cool Ice
<b>Obsolescent/Rejected:</b>	Desktop database products (Such as Microsoft Access, Lotus Approach, or Paradox, are considered desktop productivity tools. <i>They shall not be used for multi-user applications.</i> )  All Networked Databases All Hierarchical Databases not categorized as “Transitional/Contained” All versions/release levels of Database and Other Data Access Methods that do not have vendor or equivalent level quality support All other non-specified Database and Other Data Access Methods
<b>Waiver History:</b>	

### ***Data Management***

Data Management defines the set of capabilities that support the usage, processing and general administration of unstructured information. The Data Management topic has Data Recovery and Backup, Data Dictionary, Database Administration, Enterprise Information Integration (EII), Database Design (Standards and Tools), and Data Modeling components. Other than the Domain-wide requirements identified above, no specific requirements are identified for the Database Design (Standards and Tools) component.

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## Data Recovery and Backup

Data Recovery and Backup defines the set of capabilities that support the restoration and stabilization of data sets to a consistent, desired state.

- DB-R-09**      **Test Production Databases.** Production databases shall be periodically tested for recoverability according to requirements for their use and preservation.
- DB-R-10**      **Business/Recovery Strategies Shall Address Business Requirements.** All backup and recovery strategies shall address the business requirements of the data regarding availability, accuracy, and timeliness of data.
- DB-R-11**      **Backup Metadata.** Metadata (database schemas, structures, data definitions, etc.) shall be backed up along with the data.
- DB-R-12**      **Recover to Point-In-Time and Point-Of-Failure.** Production databases supporting *mission critical applications* shall be recoverable to a point-in-time and point-of-failure.
- DB-R-13**      **Define High Availability Strategy.** Databases requiring 24 x 7 availability shall have a high availability strategy such as failover, mirroring, and/or the use of online backups.
- DB-R-14**      **Production Databases.** Production databases shall be on different physical machines than the test and development databases.

## Data Dictionary

A Data Dictionary is a database about data and databases. It holds the name, type, range of values, source, and authorization for access for each data element in the organization's files and databases. It also indicates which application programs use that data so that when a change in a data structure is contemplated, a list of affected programs can be generated. The data dictionary may be a stand-alone system or an integral part of the DBMS.

- DB-R-15**      **Implement a Data Dictionary.** A Data Dictionary is required for any development that results in new databases and any enhancement activities that result in new tables being added to existing databases.

## Database Administration

Database administration is the process of establishing computerized databases and insuring their recoverability, integrity, security, availability, reliability, and performance.

- DB-R-16**      **Assign DBA (Database Administrator) Responsibilities.** Agencies shall formally assign the responsibilities for database administration.
- DB-R-17**      **Limit DBA Permissions.** Database permissions shall be granted at the minimum level required. Limit the members of the System or Database Administrators role to trusted DBAs. Create custom database roles, if required, for better control over permissions. Business data manipulation by DBAs shall not be permitted.

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- DB-R-18 Control Application Access and Passwords. Reset Default Access.** Production application programs or interfaces shall never be given System or Database Administration authority. Default accounts shall be changed. Production passwords shall be changed from test and development environments.
- DB-R-19 Limit Query/Reporting Database Access to Read-Only.** Direct production database access for ad-hoc queries and end-user reporting shall be read-only.
- DB-R-20 Evaluate and Apply Patches.** DBAs shall evaluate the latest service packs and security patches released by DBMS vendors. When the DBMS is utilized by a 3<sup>rd</sup> party application, all patches shall be certified by that application vendor before being applied. Security patches shall be applied and the other service packs and patches should be applied according to DBMS and related 3<sup>rd</sup> party application vendor recommendations as needed.
- DB-R-21 Monitor Databases for Planning and Availability.** Databases for *mission critical applications* shall be monitored proactively for capacity planning purposes and to maintain high availability.

### **Enterprise Information Integration (EII)**

**EII** is the industry acronym for **Enterprise Information Integration**. It describes the process of using data abstraction to address the data access challenges associated with data heterogeneity and data contextualization. Data is the foundation upon which the "Information Age" and critical components such as the burgeoning Web 2.0 and a future Semantic Web are being built. Uniform data access and uniform information representation are critical aspects of this journey.

An EII product offers virtualization of heterogeneous data where data takes the form of SQL, Extensible Markup Language (XML), Data-returning Web services, and other Universal Resource Identifier (URI) resources that may be referenced. Such SQL data is typically accessible via Open Database Connectivity (ODBC, Java Database Connectivity (JDBC), Active X Data Objects (ADO.NET), Object Linking and Embedding Database (OLEDB) APIs. XML is generally URI based, and is thus accessible via (Web-based Distributed Authoring and Versioning) WebDAV.

EII products enable loose coupling between homogenous-data consuming client applications and services and heterogeneous-data stores. Such client applications and services include desktop productivity tools (spreadsheets, word processors, presentation software, etc.), development environments and frameworks (J2EE, .NET, Mono, Simple Object Access Protocol [SOAP] or RESTian [Representational State Transfer] web services, etc.), Business Intelligence (BI), Business Activity Monitoring (BAM), Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Business Process Management (BPM) and/or Business Process Execution Language (BPEL), and Web Content Management.

- DB-R-22 Enterprise Information Integration (EII) Tool.** Agencies (excluding institutions of higher education) shall not purchase an EII tool without VITA approval.

## Data Modeling

Using modeling tools to describe (usually graphically) the attributes and tables (fields and records) of the organization of a database; it is often created as an entity relationship diagram. In many tools, the SQL code that defines the data structure (schema) in the database is automatically created from the visual representation.

**DB-R-23      Implement a Data Modeling Tool.** Agencies shall select and implement a consistent data modeling tool.

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## Section 4. ETA Information Domain

The Information Domain assists business and technical leaders in making sound decisions related to data warehouse design and acquisition of data warehouse, business intelligence, and other reporting tools and products. This domain also provides a framework for defining responsibility for data integrity and distribution. An effective Information Domain will enable the Commonwealth to leverage the most value from its data assets. This domain addresses the Reporting, Data Management, Business Intelligence, and Knowledge Management topics. Other than the Information Domain-wide requirements identified below, no specific requirements are identified for the Knowledge Management topic.

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Information Domain.

- INF-R-01 Security and Privacy** – All Information Domain IT systems, as listed above, shall be implemented in adherence with all security, confidentiality and privacy policies and applicable statutes.

Agencies should ensure that all of their mission critical applications are or can be adequately supported by the vendors of all hardware and software products used to support those applications. Software needs to be at a current and supportable release levels and support must be available from a reputable supplier that can be purchased as needed. Non-complying software tools and hardware require an approved Commonwealth Enterprise Technical Architecture Exception.

- INF-R-02 Software Tools Version/Release Support** – All software used to support Mission Critical Information/ Business Intelligence Applications shall be on version/ release levels that are fully supported by the vendor or third party and have traditional paid-for support available.

Currently no central repository exists in the Commonwealth that captures software tool use for the types of components found within the Information Domain. Maintaining an ‘as-is’ inventory is critical in moving the enterprise to a desirable ‘to-be’ state.

- INF-R-03 Maintain Software Tools Inventory** – The Commonwealth shall collect data on agency use of software tools, maintain an up-to-date inventory, and perform research in order to create a more effective and efficient environment in support of the Information Domain.

Many Information Domain activities involve the storage of artifacts by electronic means. These files, source code listings, reports, models, etc., need to be accessible and available today and in the future. In order to ensure that these artifacts remain accessible, they must either be in an open format or, at a minimum, the software tool which manages the artifact needs to have the ability to easily export the item to a format that is accessible and can be transported to other tools as needed.

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- INF-R-04**    **Artifact Accessibility** – All electronic repositories of Information/Business Intelligence source code, metadata, development artifacts, models, documentation, etc. shall have their contents accessible either by an export facility or by a direct access method. This ability is required to allow the repository contents to be transferred from one methodology or tool to another as needed.

### ***Reporting***

Requirements have been identified within the *Reporting* topic for the Ad Hoc End-User Reporting, Standardized/Canned Reporting, and Online Analytical Processing (OLAP) components. Other than the Information Domain-wide requirements identified above, no specific requirements are identified for the Standardized/Canned Reporting component.

#### **Ad Hoc End-User Reporting**

Ad hoc query provides the business analyst with the ability to pose specific questions to produce a result without needing the programming of a report by IT. The ad hoc nature of these queries implies a short shelf life where some situation is being researched or a new opportunity is being explored.

Following are requirements that all newly acquired Information/Business Intelligence ad-hoc reporting software tools must support.

- INF-R-05**    **Ability to share queries** – An ad hoc end-user tool shall be able to share an ad hoc query with others. This enables the reuse and efficient utilization of agency resources
- INF-R-06**    **Intuitive interface** – The tool used to build a report shall have an intuitive interface, with “point and click” features for adding elements, filtering data, and sorting the results, with no programming knowledge required.

#### **Online Analytical Processing (OLAP)**

OLAP tools view information in the form of cubes, or multiple dimensions and allow the user to drill down to lower levels of detail, and slice across different dimensions such as time or commodity. These tools are generally used by the business analyst in conducting research to answer business questions as part of the decision making process.

Following are requirements that all newly acquired Information/Business Intelligence OLAP software tools must support.

- INF-R-07**    **Drill-down capability** – OLAP tools shall have the ability to drill into the details of a cell in an OLAP cube by going to the source database.
- INF-R-08**    **OLAP Export** – OLAP tools shall have the ability to export the results to a standard spreadsheet format such as .csv or .xls.
- INF-R-09**    **Easy cube manipulation** – The interface to manipulate data in the cube shall have “point and click” and “drag and drop” features for analyzing the available data.

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## ***Data Management***

The *Data Management* topic is concerned with the components that affect the quality, management, meta-management, accessibility, and recovery of electronic data resources.

Requirements have been identified within the *Data Management* topic for the Data Standards and Data Classification (security and access) components.

### **Data Standards**

It is important to address the issues of data and data quality through the use of data standards. Data standards are important in the quest for data integration and consist of a framework used to classify or define data. These standards may include Data Element Naming, Database Object Naming, Metadata Requirements, Data Modeling, and Geo-Spatial Requirements.

Following are requirements that all newly acquired Information/Business Intelligence software tools must support.

- INF-R-10**     **Standard file formats** – Agencies shall ensure that all software tools or packages that create files or data stores do so in a format that is based on an underlying open or de facto standard or provides the capability to export to such a format.

### **Data Classification (security and access)**

Data must be classified according to its degree of sensitivity in a universally understandable manner. The degree of sensitivity can be determined by applying the appropriate state, local or federal laws or regulations to the data. Sensitivity levels are determined by the type of information that is in an automated system. The information that has the least amount of sensitivity might include things such as summary revenue and expense data for the Commonwealth. Data that is made generally available without specific custodian approval and that has not been explicitly and authoritatively classified as confidential is not considered sensitive. Highly sensitive information would include information that must be protected to meet state and federal Privacy Act requirements including data such as social security numbers, credit card numbers, criminal and medical histories, etc. It is also data whose loss, corruption, or unauthorized disclosure would be a violation of state and federal statutes, mandates and regulations. The term "in a universally understandable manner" implies there should be standard definitions for the different sensitivity classifications. In addition, the data needs to maintain its security classification as it traverses any physical or logical boundary such as an agency, computer-related device, network, or software application system.

- INF-R-11**     **Sensitivity classification** – Data that is sensitive shall be classified by the agency according to its degree of sensitivity in a universally understandable manner.
- INF-R-12**     **Security classification** – Data that requires a security classification shall maintain its security classification as it traverses any physical or logical boundary such as an agency, computer-related device, network, or software application system.

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## ***Business Intelligence***

Business intelligence (BI) is a broad category of application programs and technologies for gathering, storing, analyzing, and providing access to data to help enterprise users make better business decisions.

Requirements have been identified within the *Business Intelligence* topic for the Data Warehouse / Data Marts component. Other than the Information Domain-wide requirements identified above, no specific requirements are identified for the other Business Intelligence components: Operational Data Stores, Extraction, Transformation and Loading (ETL), Data Storage Structures, Data Mining, Demand Forecasting and Management, Balanced Scorecard, Decision Support and Planning, Business Analytics Suites, and Dashboards.

The phrase business intelligence (BI) may refer to

- 1) a set of business processes,
- 2) the technology used in these processes, or
- 3) the information obtained from these processes.

## **Data Warehouse / Data Marts**

A data warehouse is a database designed to support decision-making in an organization or enterprise. It is refreshed, or batch updated, and can contain massive amounts of data. When the database is organized for one department or function, it is often called a "data mart" rather than a data warehouse. The data in a data warehouse is typically historical and static in nature.

**INF-R-13 Read-only Data Warehouse** – Access shall be restricted to read-only for end users of the data warehouse.

**INF-R-14 Database Standard** – Data warehouses and data marts that use relational databases shall conform to all of the Requirements and Technology Product Standards for databases as defined above in Section 3: ETA Database Domain.

To ensure that data warehouse and data mart implementations are built to meet the current and future business needs of an agency, executive sponsorship and representation by the business community on the project is required. Without this leadership, business intelligence (BI) projects run the risk of not providing the anticipated rewards or even failing altogether.

**INF-R-15 Business community representation** – A representative of the business community shall be involved in the entire development life cycle of all BI projects.

**INF-R-16 Executive sponsorship** – Project sponsorship shall be obtained from one or more executives within the upper management of the related organization prior to initiating any Data Mart or Data Warehouse project.

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## Section 5. ETA Integration Domain

Integration Domain defines the functions that enable communications in a distributed system and defines the tools that improve the overall usability of an existing architecture made up of products from many different vendors on multiple platforms. Integration tools and products allow organizations to share data between disparate systems that do not communicate easily. Integration tools and products have been described as the software “glue” that allows distributed, multi-tiered applications to work in a world of global networks.

The ETA Integration Domain consists of the following topics: Database Integration, Message Integration, Transaction Process Monitor Integration and Services, Application Integration Middleware and Services, Enterprise Service Bus, and Service-Oriented Architecture.

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Integration Domain.

- INT-R-01 Security, Confidentiality, Privacy and Statutes.** Agencies shall implement integration applications/ solutions in adherence with all security, confidentiality and privacy policies and applicable statutes.
- INT-R-02 Software Tools Version/Release Support.** The version/release levels of all integration software tools shall have vendor or equivalent quality level support available.
- INT-R-03 Planning.** Before acquiring a central integration solution, agencies shall map their present integration sources and uses, and shall develop a plan in consultation with the Virginia Information Technologies Agency (VITA) Integration Competency Center (ICC) for migration to the central integration solution.
- INT-R-04 Integration Solutions.** Agencies shall use integration solutions that are scalable, extensible, and maintainable.
- INT-R-05 Defined Interfaces.** Agencies shall carefully define their interfaces and interface business requirements.
- INT-R-06 Testing Integration Modifications.** Integration tools and services shall be thoroughly tested. Consideration shall be given to the need to maintain a separate environment for testing modifications.
- INT-R-07 Shared Resource.** Before acquiring integration solutions, agencies shall contact the VITA ICC to determine if similar integration solutions exist that could be a shared resource across several agencies.

### *Database Integration*

Database tools and products enable applications to communicate with one or more local or remote databases. They do not transfer calls or objects. For example, database integration does not allow for two-way communication between servers and clients. Servers cannot initiate contact with clients, they can only respond when asked. The discussion of database integration

is broken into Directory Services, Metadata, Access Services, and related guidance. Guidance information may direct the reader to other domains once they become available.

## Directory Services

A directory may be described as a specialized database of lists. Directories serve a wide variety of functions in a computing environment and are used by applications including email, security, and naming services. Directory services are important as tools in the communications process and a decision about directory services is one of the most important foundational decisions an agency can make in planning a distributed architecture and integration strategy. Having a directory strategy is an integral part of promoting interoperability and, location transparency, and lowering future maintenance costs in a distributed environment.

Directory Services Requirements:

- INT-R-08 Directory Services.** Agencies shall employ Lightweight Directory Access Protocol (LDAP)-compliant directory services. This lays the groundwork for uniform decentralized lists that can be aggregated centrally for use by the Commonwealth.

<b>Table INT-S-01: Directory Services Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• LDAP, DNS &amp; GDS</li> <li>• Sun JDAP;</li> <li>• MS Active Directory (ADSI)</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• X.500 DAP</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• Novell NDS</li> </ul>
<b>Exception History:</b>	

## Database Metadata Services

Database metadata services are repositories of data about data. The purpose of the metadata repository is to provide a consistent and reliable means of access to data. The repository itself may be stored in a physical location or may be a virtual database, in which metadata is drawn from separate sources. Metadata may include information about how to access specific data, or more detail about it, among a myriad of possibilities.

Technology Component Standard INT-S-02 provides technology ratings for database metadata services. In general, the technologies listed as strategic are based on open standards.

<b>Table INT-S-02: Database Metadata Services Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• OMG's UML, MOF</li> <li>• MDC's XMI (XML, DTD, Schema)</li> <li>• OIM's exchange format XIF (XML)</li> <li>• Accessible, computer aided metadata documentation (e.g., ERwin modeling tool) and a metadata repository</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• Active metadata repository</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• Configurable metadata separate from application but proprietary to system.</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• Business rules and meaning hard coded into applications.</li> <li>• Hard copy only documentation of metadata.</li> </ul>
<b>Exception History:</b>	

## Database Access Services

Database access services refer to software applications that are designed to arrange and store data for ease and speed of search and retrieval.

<b>Table INT-S-03: Database Access Services Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• DB Adapters or Drivers: ODBC, JDBC, xDBC, OLE-DB (platform specific)</li> <li>• XML point to point contracts (e.g., for Schemas)</li> <li>• ODBC/SQL compliant gateways</li> <li>• XML messaging</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• OLE (replaced)</li> <li>• Screen Scrapers as a mainframe access</li> <li>• Non-ODBC/SQL compliant Gateways</li> <li>• Translators for non-standard SQL, XML, etc.</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Exception History:</b>	

## Message Integration

Message-Oriented Middleware also known as Message Brokers, MOM, and Messaging Broker, provides an interface between applications or application parts, allowing for the transmission of data back and forth intermittently. Messaging middleware is similar to an e-mail system that transfers messages between people, except that it sends information between applications. MOM

is typically asynchronous and peer-to-peer, but most implementations support synchronous message passing as well. In general, a message-oriented middleware has one of two architectures: the hub-and-spoke model or the network-centric bus model, also called the message-bus model. If the destination application is not available because of connection failure or because the application is busy, the middleware stores the data in a message queue until the application becomes available.

## Message Formats

In this section, the term “messages” will be used in the broadest sense to encompass transaction-based messages as well as entire file transfers. To many messaging systems, the format of the content of the message doesn’t matter as long as it has the understood envelope/wrapper or an operating system recognizable format. However, the format of the content is very important to the receiving operating system, application, or user. Format translations may be performed by integration products. Also included in this section are messages that are object-oriented. These messages are requests or replies that are issued or received by applications or databases.

<b>Table INT-S-04: Message Formats Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>XML and CSS (presentation style configurable by administrator for device types)</li> <li>7 bit ASCII; 8 bit ASCII; EBCDIC (translation)</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>None</li> </ul>
<b>Exception History:</b>	

## Message Transfers

Message transfers refer to software applications that are designed to provide for correct and reliable end-to-end data transport between communication partners.

<b>Table INT-S-05: Message Transfers Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• File and Data Requests/Replies               <ul style="list-style-type: none"> <li>○ FTP</li> <li>○ XML file transfer</li> </ul> </li> <li>• Presentation and Translation Services for Security               <ul style="list-style-type: none"> <li>○ Encryption/Decryption Services (A wide variety of encryption algorithms are strategic depending on security needs) e.g., Symmetric Encryption, DES, Triple DES, RC2, RC4</li> </ul> </li> <li>• Terminal Emulation               <ul style="list-style-type: none"> <li>○ APPC LU6.2</li> </ul> </li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• Presentation and Translation Services for Security               <ul style="list-style-type: none"> <li>○ Proprietary style layout separate from application</li> </ul> </li> <li>• Terminal Emulation               <ul style="list-style-type: none"> <li>○ SNA/SDLC (OSI level 2)</li> </ul> </li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• FTP whenever security required</li> </ul>
<b>Exception History:</b>	

## Messaging Integration

The recommended messaging protocols also known as email (electronic mail) protocols apply to mail messaging and/or other application-to-application messaging. Email is the exchange of computer-stored messages by telecommunication. Mail programs should support use of MIME (Multipurpose Internet Mail Extensions), be SMTP/ESMTP enabled (Simple Mail Transfer Protocol/Extended Simple Mail Transfer Protocol), and provide proxy through IMAP4/POP3 servers (Internet Message Access Protocol 4/Point of Presence 3). Mail programs that interface with Windows clients use Microsoft's MAPI (Messaging Application Programming Interface) interface. Middleware protocols used by mail applications and/or other applications include: LDAP, DNS (Domain Name System), SSL (Secure Sockets Layer), and additional security protocols.

### Message Integration requirements

- INT-R-09**    **Email Protocols.** Agency email messaging shall be SMTP and MIME compatible. Local governments are encouraged to follow this standard as well.
- INT-R-10**    **Emails.** The Message Transfer Agent (MTA) in email applications should be LDAP enabled.

<b>Table INT-S-06: Message Integration Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• IMAP</li> <li>• MAPI</li> <li>• SMTP/MIME</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• XSL (presentation style and content configurable by user)</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• X.400</li> <li>• POP3</li> <li>• VIM</li> <li>• CMC</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• Non-Internet compatible email</li> </ul>
<b>Exception History:</b>	

### ***Transaction Process Monitor Integration and Services***

Distributed transaction processing ensures transaction integrity for transactions that involve databases. Transaction processing is the independent execution of a set of operations on data in a relational database, which treats that set of actions as a single event. If any part of the transaction process fails, the entire transaction fails and all participating resources are rolled back to their previous state.

Transaction processing monitors and some web services software are critical to the 3-tier application client/server computing model because they facilitate writing of the programs that track transactions across multiple platforms. In the n-tier world, the application layer functions between the presentation layer on the PC and the data layer on the mainframe, Unix, or Windows-based systems. Historically some of the following services have been included in transaction processing monitor middleware: two-phase commits, failure/recovery, synchronization, scheduling, repeat attempts, business-rule-based transaction workflow services, message queuing resource managers, and load balancing. Perhaps the most significant feature of the TP monitor is its ability to funnel database requests.

Technology Component Standard INT-S-07 provides strategic open protocols and examples of mainframe programs used to define the typical work performed by transaction processing monitors. In general, those technologies listed as strategic are based on open standards.

<b>Table INT-S-07: Transaction Process Monitor Integration and Services Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• SOAP</li> <li>• WSDL</li> <li>• HTTP M-POST</li> <li>• CORBA</li> <li>• DCOM</li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• X/Open: XA interface (X/Open is the standard, XA is the interface)</li> <li>• STDL (structured transaction definition language)</li> <li>• DTP (distributed transaction processing)</li> <li>• CPI-C (common program interface for communications)</li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Exception History:</b>	
<b>Historical Note:</b> Two TP monitors were widely used in the mainframe world and then later transitioned to the client-server world. These were CICS (customer information control system) and ACMS (automated code management system)	

### ***Application Integration Middleware Servers and Services***

Application integration middleware provides interfaces to a wide variety of applications. Application integration middleware might be a service that enables running a legacy system through a thin-client browser or a service that enables the execution of multiple application functions from an integrated user interface. The methods used to achieve this integration include application program interfaces (API), remote procedure calls (RPC), and object request brokers (ORB).

Protocols and services related to application integration are noted in Technology Component Standard INT-S-08. In general, those technologies listed as strategic are based on open standards.

<b>Table INT-S-08: Application Integration Services Technology Component Standard</b>	
<b>Strategic:</b>	<ul style="list-style-type: none"> <li>• Object Request and Request Broker Protocols/Suites               <ul style="list-style-type: none"> <li>○ MS DCOM + (distributed common object model)</li> <li>○ OMG CORBA (common object request broker)</li> <li>○ J2EE/RMI, Java 2 Enterprise Edition (the distributed version) and Remote Method Invocation</li> <li>○ GIOP, General Inter-ORB Protocol and IIOP, Internet Inter-ORB Protocol (maps GIOP to TCP)</li> <li>○ POA, Portable Object Adapter</li> <li>○ ebXML</li> </ul> </li> <li>• Enterprise Application Integration Services (EAI)               <ul style="list-style-type: none"> <li>○ Use of Integration Servers/Services</li> </ul> </li> <li>• Remote Procedure Calls               <ul style="list-style-type: none"> <li>○ DCE RPC</li> <li>○ DCE secure RPC (integrated with DCE security protocols for authentication, protection level and authorization)</li> <li>○ Web Services</li> </ul> </li> <li>• Object and Application Interfaces               <ul style="list-style-type: none"> <li>○ IDL (interface definition language) stubs; MIDL (Microsoft); OMG IDL; DCE IDL</li> </ul> </li> </ul>
<b>Emerging:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Transitional/Contained:</b>	<ul style="list-style-type: none"> <li>• Remote Procedure Calls               <ul style="list-style-type: none"> <li>○ Suns' ONC+ RPC</li> </ul> </li> </ul>
<b>Obsolescent/Rejected:</b>	<ul style="list-style-type: none"> <li>• None</li> </ul>
<b>Exception History:</b>	
	<ul style="list-style-type: none"> <li>• None</li> </ul>
<p><b>Historical Note:</b> Fully utilizing Web Services is the recommended strategic direction when combined with an overall Service-Oriented Architecture (For a description of SOA, please see Appendix A of the ETA Application Domain Report [Example SOA Centralized Implementation and Governance Model]). Other methods, such as DCOM and CORBA are still used and recommended for specific scenarios.</p>	

## ***Enterprise Service Bus***

An enterprise service bus (ESB) is a Web-services-capable middleware infrastructure that supports communication and mediates application interactions. To be an ESB, a middleware subsystem must

1. implement program-to-program communication (always supporting Simple Object Access Protocol/Hypertext Transfer Protocol [SOAP/HTTP], and almost always supporting SOAP on message-oriented middleware [MOM] and plain MOM);
2. support other Web services standards (including Extensible Markup Language [XML] and Web Services Description Language [WSDL]);

3. be capable of service discovery, binding and virtualization (transparently substituting alternative service providers) and intelligent message routing;
4. have an extensible, intermediary-based architecture so that additional features can be plugged in; and
5. have an awareness of message schemas through the use of metadata.<sup>1</sup>

### ***Service-Oriented Architecture (SOA)***

SOA is a set of components which can be invoked, and whose interface descriptions can be published and discovered.<sup>2</sup> According to the W3C (World Wide Web Consortium), at a minimum SOA includes the following entities and requirements<sup>3</sup>:

Entities:

1. The *Service Provider* makes the service available with its *Service Contract* and advertises it on the *Service Broker*.
2. The *Service Consumer* finds the compatible *Service* and its *Service Contract* using the *Service Broker*.
3. The *Service Consumer* and the *Service Provider* interact.

See the *Applications Domain Report* for the *Service-Oriented Architecture* description and requirements.

### ***Service-Oriented Architecture Governance***

SOA Governance is the ability to ensure that all of the independent efforts (whether in the design, development, deployment, or operations of a Service) come together to meet the enterprise SOA requirements.<sup>4</sup> See the *Applications Domain Report* for the *Service-Oriented Architecture Governance* requirements.

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<sup>1</sup> Integration Suites and ESBs: Integration Technology for the Mainstream. Jess Thompson & Roy Schulte. Gartner Research.

<sup>2</sup> *Web Services Glossary* (<http://www.w3.org/TR/2004/NOTE-ws-gloss-20040211/#component>) [Read January 3, 2006]

<sup>3</sup> Web services in applications (w3c) (<http://www.w3.org/2003/Talks/0317-ws-intro/slide45-0.html>)

<sup>4</sup> SOA Governance (Source: **SOA Governance**, WebLayers, Inc. 238 Main Street, 4th Floor Cambridge, MA 02142)

## Section 6. ETA Networking and Telecommunications Domain

The networking and telecommunications standards address infrastructure and services architecture requirements for executive branch agencies in the Commonwealth of Virginia. These standards provide requirements that will assist agencies in meeting their current needs while moving towards the future vision for networking and telecommunications in the Commonwealth. For networking and telecommunications, the future vision is simple. Future networks will be highly integrated and will accommodate numerous end-to-end services that will coexist in this integrated infrastructure. Conceptually, the future network for participating agencies will be one network.

The networking and telecommunications architecture addresses two topics: facilities telecommunications infrastructure and telecommunications. Facilities telecommunications infrastructure addresses the cabling, pathways and documentation that are tied to a physical location (e.g., building, office space, outdoor space, or campus of buildings). Telecommunications addresses all other infrastructure and services, whether provided by the Commonwealth or by external service providers. Included in services are Local Area Networking (LAN), Wide Area Networking (WAN), and other telecommunications services (e.g., phone, data, multimedia).

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Network and Telecommunications Domain:

- NET-R-01    Networking and Telecommunications Changes Due to Agency Facility Changes.** Networking and telecommunications infrastructure requirements must be an integral part of agency office change plans, whether the changes involve moving, expansion, construction, renovation, or lease changes. Agencies served by VITA that are planning changes must involve VITA in the early planning to determine the lead time required to ensure the availability of business critical telecommunications *and networking* services. When state-owned or state-leased buildings are involved, agencies must also notify the Department of General Services, Division of Engineering and Buildings. To avoid delays and inflated expenses, agencies need to provide a six month advanced notice for minor changes and an eighteen month notice for major changes.
- NET-R-02    Inter-building Connections.** Agencies, except for institutions of higher education, which require network interconnections between two or more buildings, shall work with the Virginia Information Technologies Agency to determine a solution. The Department of General Services, Division of Engineering and Buildings shall be a participant in the discussion whenever Commonwealth owned or leased buildings are involved.
- NET-R-03    Single Pipeline Planning Data.** Agencies are required to report connectivity information and connection usage data when requested by the

Commonwealth's Chief Information Officer (CIO). Such reporting requirements must have pre-defined, decision-based uses.

### ***Facilities Telecommunications Infrastructure***

This topic addresses requirements for infrastructure that is typically used by an agency but not owned by the agency. When an agency is occupying a facility, it will have use of the building cabling, electrical systems, and access closets that together constitute much of the physical portion of the agency's premises networking and telecommunications solution. Facilities telecommunications infrastructure is currently limited to cabling plants and their documentation. In the future, wireless infrastructure may become a common part of the infrastructure typically provided as part of a facilities lease and remaining with the facilities at the termination of a lease.

**NET-R-04 Cabling Requirements.** Agencies must ensure the availability of standards-based structured cabling systems for all agency telecommunications in agency occupied space. Agencies must ensure the deployment of ANSI/TIA/EIA (American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance) standards-based designs, topologies, components, distances, installation methods, cable testing, and cable administration. All related minimum requirements or mandatory criteria that must be met (unless exceptions are noted in this document) are addressed in the following Commonwealth-adopted international standards (ANSI/TIA/EIA standards):

- **ANSI/TIA/EIA 568-B.1, Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements.** This standard addresses cabling infrastructure design, installation and field testing for horizontal cabling, backbone cabling, and work areas. It also covers requirements for telecommunications rooms, equipment rooms, and entrance facilities. This standard recommends the use of ANSI/TIA/EIA T568A, which specifies the wiring scheme to be used with the RJ-45 modular plug (8 position jack) and optionally allows use of T568B. The 568-B.1 standard is typically used in conjunction with the National Electric Code to provide an appropriate cable plant.

#### ***Exceptions***

*Agencies except for institutions of higher education shall ensure use of the ANSI/TIA/EIA T568A wiring scheme for RJ-45 modular plugs in agency occupied space and shall not use T568B. Agencies are required to use T568A consistently throughout their cabling plant. T568A provides backwards compatibility with both one-pair and two-pair USOC (Universal Service Order Code) wiring schemes.*

*Institutions of higher education, which prior to 1991 cabled their entire campus using the T568B wiring scheme (pin pair assignment), may continue using T568B without an exception. Other agencies require an exception for any new installation of*

*cabling using T568B except when the installation is accommodating the needs of existing users.*

*Agencies that have mixed T568A and T568B cabling plants are required to carefully document (see ANSI/TIA/EIA-606-A) the mixture and have clear rules for adding or partially replacing cabling in a building. In addition, an agency with a mixed plant must have a plan for switching to T568A as building cabling is replaced.*

*When an agency is replacing all horizontal cabling, the agency is required to implement the T568A standard.*

- **ANSI/TIA/EIA 568-B.2, Commercial Building Telecommunications Cabling Standard, Part 2: Balanced Twisted Pair Cabling Components.** Addresses specifications for horizontal four-pair cables and backbone multi-pair cables and components. All Category 6, Category 5e and Category 3 cable specifications and testing are addressed.

***Exception***

*Agencies must ensure a minimum of certified Category 5e cable when installing new or replacement telecommunications horizontal cabling in agency occupied space.*

- **ANSI/TIA/EIA 568-B.3, Commercial Building Telecommunications Cabling Standard, Part 3: Optical Fiber Cabling Components Standard.** Addresses multi-mode (50/125 $\mu$ m and 62.5/125 $\mu$ m) and single-mode fiber optic cabling components, transmission standards, and field testers.

***Exceptions***

*Agencies shall use 50/125 $\mu$ m multi-mode fiber optic cable for all new and replacement backbone building runs. Even though 62.5/125 $\mu$ m multi-mode cabling is permitted in this standard, agencies shall not install this cable type in agency occupied space.*

*For the devices connected to the backbone fiber system via 50/125 $\mu$ m multi-mode fiber, agencies shall provide a minimum of four fibers (two pairs) run to each device. This will enable the use of redundant connections for equipment that may be deemed critical at a later point (e.g., implementation of Voice over Internet Protocol, VoIP). Consideration should be given to having two dark fibers (one pair) for every four active fibers (two pairs) installed, this will provide adequate backup for critical equipment if a problem occurs on one of the active pair.*

- **ANSI/TIA/EIA 569-B, Commercial Building Standard for Telecommunications Pathways and Spaces.** This Standard addresses

specific pathway and space design and construction practices in support of telecommunications media and equipment within buildings.

Agencies are also required to implement all specifications in related addenda to ANSI/TIA/EIA 569-B for agency occupied office space that has an average office density (one office per 100 square feet). Pathway and room size requirements must be adjusted for higher and lower densities of telecommunications outlets or equipment than are expected in the average situation.

***Exception***

*None*

- **ANSI/TIA/EIA 606-A, Administration Standard for Commercial Telecommunications Infrastructure.** This standard specifies administration for a generic telecommunications cabling system that will support a multi-product, multi-vendor environment. It also provides information that may be used for design of administration products.

***Exception***

*When an agency alters its cabling plant, the agency must develop/maintain cable plant documentation that meets the minimum requirements of ANSI/TIA/EIA-606-A Class 3 administration as indicated in Clause 7 of the standard. In addition, agencies shall provide all cable plant documentation to the Department of General Services (DGS) central repository for cable plant documentation (see NET-R-05 ) using the documentation format (e.g., data names, data elements, data tables, data types, and/or spreadsheet column order) as specified by NET-R-05 and NET-R-06 below.*

- **J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.** The purpose of this standard is to enable the planning, design, and installation of a telecommunications grounding and bonding system which supports a multi-vendor environment and implements various system installation practices.

***Exception***

*None*

**NET-R-05 Department of General Services (DGS) Central Repository.** DGS shall provide a central repository for agency cable plant documentation (see NET-R-04, ANSI/TIA/EIA-606-A documentation). The DGS repository must be accessible to the Virginia Information Technologies Agency for planning purposes.

**NET-R-06 Cable Plant Data Formats.** The Department of General Services (DGS), Division of Engineering and Buildings, in conjunction with the Virginia

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Information Technologies Agency, shall provide a spreadsheet template (flat file) and optional database schema for use by agencies in providing required data to the DGS central repository. (See related requirements in NET-R-04 ANSI/TIA/EIA 606-A and NET-R-05).

### ***Telecommunications***

Telecommunications includes the hardware, software, services, and documentation related to electronic transmissions of data, voice, and multimedia content needed to conduct agency business. Components include telecommunications protocols, wired and wireless services, switches, routers and similar items. Also included are applications that provide end-to-end telecommunications services such as Voice over Internet Protocol (VoIP).

Local and wide area networks are the infrastructure, signaling and services that enable numerous practical office applications including receiving and sending email, saving documents and email, printing documents on office or workgroup printers, Voice over Internet Protocol (VoIP) telephoning, Blackberry email, always on Internet and more.

A local area network (LAN) is generally a private network. It is under the control of the owner and used by a set of related individuals and/or workgroups, typically within a single building or over a group of neighboring buildings.

A wide area network (WAN) is a geographically dispersed telecommunications network. A wide area network may be privately owned or rented, but the term usually connotes the inclusion of public networks including the public telephone system.

Telecommunications are services or applications that run on local and wide area networks. Telecommunications connect people, servers, applications tiers, businesses and more.

### **Protocols Requirements**

- NET-R-07 LAN Protocols.** Agencies modifying their LAN services must migrate to the minimum Virginia standard of IEEE 802.3 Fast Ethernet (100 Mbps Switched Ethernet) or to a higher bandwidth Ethernet service (802.3 Full duplex Fast Ethernet, 802.3ab Gigabit Ethernet over copper, 802.3ad, or 802.3z Gigabit Ethernet over fiber).
- NET-R-08 IP Access to LAN Nodes.** Agencies must ensure that each agency LAN node and LAN segment may be accessed using IP addressing. This mandatory requirement was to be met in December of 2003.
- NET-R-09 Routing.** Agencies must employ IP as the standard addressing protocol for all routed transmissions. Agencies establishing new and replacement connections to external business partners, local governments, and state agencies must employ IP addressing. If other protocols are used as a transitional strategy, when routed, these protocols must be tunneled through IP.

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## Switches, Routers and Similar Items Requirements

- NET-R-10 Network Hardware.** Agencies acquiring new network hardware (i.e. firewalls, routers, switches, etc.) must ensure that the devices are Simple Network Management Protocol (SNMP) compliant.
- NET-R-11 SNMP Use.** All agencies that manage networks must employ SNMP-compliant (Simple Network Management Protocol compliant) device management. SNMP is a protocol that enables management information for a network element such as a switch to be inspected by a remote manager.
- NET-R-12 Networking Devices.** Agencies and their network service providers who establish contracts for 500 or more of a single network device type (e.g., a particular router, switch or hub), must have validated performance and cost comparison data (e.g. price, quality, availability, service quality, reliability and support costs) for a second brand for the device type during a particular acquisition cycle. This data may be obtained from a small-dedicated network segment, a separate network, or from a third party (e.g. University, local government, etc.). The intent is that the Agencies or their service providers be able to use comparison results in acquisition and maintenance negotiations.
- NET-R-13 IP Addresses in the Enterprise Network.** Agencies served by any portion of the VITA enterprise network shall acquire IPv4 address space from VITA or gain VITA approval for using its own address space. Any served agency with its own address space must notify VITA of the address space renewal date. No served agency may increase their use of RFC1918 addresses *without also using route distinguishers* (i.e., VPN-IPv4 RD). Any served agency currently using the private address range (RFC1918) must record this use with VITA and prepare to discontinue this use when the served agency's network is integrated with other agencies' networks for the purpose of common management. Served agencies are required to *use only* registered IPv6 addresses assigned by VITA when they switch to IPv6. Also, VITA reserves the right to revoke and reassign address space as dictated by future network designs.

*Notes: An RFC is a document distributed as a request for comments. In many instances, RFCs are treated as industry standard recommendations. Many standards groups issue RFCs.*

*VITA must provide agencies with assurance that recorded IP address information will not be shared with anyone who may be required to divulge the information to the public.*

## Wired and Wireless Services Requirements

- NET-R-14 VoIP.** Agencies implementing VoIP must provide well-ventilated and air-conditioned premises wiring closets to protect investments and to ensure services.

## ***Technology Tables for Networking and Telecommunications***

The technology component standard tables below provide strategic technology and service directions for agencies that are acquiring technical components or services for local area networking, wide area networking or other telecommunications. Agencies *might be acquiring* these components via purchasing, space rental leasing, facilities construction or modification, or other acquisition methods. Both wired and wireless components and services are addressed. Subtopics are noted in table headings.

<b>Table NET-S-01: Wired Local Area Networks (LANs)</b> <b>Technology Component Standard</b> <i>Updated October 29, 2007</i>	
<b>Strategic:</b>	<p>IEEE 802.3 Fast Ethernet (100 Mbps Switched Ethernet)</p> <p>Higher bandwidth Ethernet service (802.3 Full duplex Fast Ethernet, 802.3ab Gigabit Ethernet over copper, 802.3ad, or 802.3z Gigabit Ethernet over fiber)</p> <p><i>10 Gigabit Ethernet LAN (little need but becoming highly cost effective—see FTTE-H)</i></p> <p><i>VoIP Centrex (cost reductions)</i></p> <p>Note: Category 5e LAN is the minimum required for enabling VoIP.</p>
<b>Emerging:</b>	
<b>Transitional/Contained:</b>	<p>Ethernet 10Mbps (IEEE 802.3)</p> <p>ATM 25 Mbps (LANE, an element of MPOA)</p> <p>Note: Category 5 LAN cable is transitional because VoIP is not supported.</p>
<b>Obsolescent/Rejected:</b>	<p>Token Ring (IEEE 802.4)</p> <p>AppleTalk</p> <p>All Other Non-Strategic Protocols</p>
<b>Waiver History:</b>	

<b>Table NET-S-02: Wireless Local Area Networks (WLANs)</b> <b>Technology Component Standard</b> <i>Reviewed October 29, 2007</i>	
<b>Strategic:</b>	
	Wi-Fi using Access Points Frequency Hopping Spread Spectrum (FHSS, IEEE 802.11) Direct Sequence Spread Spectrum (DSSS, IEEE 802.11 and 802.11b) Orthogonal Frequency Division Multiplexing (OFDM, IEEE, 802.11a used for Access Points)
<b>Emerging:</b>	
	WiMAX (802.16e) (security and other issues)
<b>Transitional/Contained:</b>	
	Infrared (Point to Point, IEEE 802.11)
<b>Obsolescent/Rejected:</b>	
<b>Waiver History:</b>	

<b>Table NET-S-03: Cabled Wide Area Networking (WAN) Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	<p>Data and VoIP example WANs</p> <ul style="list-style-type: none"> <li>Frame Relay T1 (128 Kbps-1.5 Mbps)</li> <li>ATM T1 (1.5 Mbps) with IMA (Inverse Multiplexing over ATM)</li> <li>Aggregated Frame Relay, i.e., 2, 3, or 4 T1s (3-6 Mbps)</li> <li>ATM DS3 ( 22-45 Mbps)</li> <li>ATM SONET (synchronous optical network) over OC3 (optical carrier) to OC12 ( 155-622+ Mbps)</li> <li>PoS (Packet over SONET)</li> <li>FRASI (FR to ATM Services Internetworking)</li> <li>xGb Ethernet (e.g., MAN, carrier backbone)</li> <li>LAN speed Ethernet interconnection over public backbone</li> <li>xDSL (128 Kbps—8 Mbps)</li> <li>Cable Modem (300 Kbps—10 Mbps)</li> <li>MPLS</li> </ul> <p><i>VoIP Centrex</i></p>
<b>Emerging:</b>	
<b>Transitional/Contained:</b>	<p>Data WAN</p> <ul style="list-style-type: none"> <li>Frame Relay 56 Kbps</li> <li>ISDN—narrow band (64—128 Kbps)</li> <li>Frame Relay DS3</li> </ul>
<b>Obsolescent/Rejected:</b>	
<b>Waiver History:</b>	

<b>Table NET-S-04: Mobile and Remote Access to Local Area Networks (LANs) Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	<p>Dial up (e.g., RAS)</p> <p>VPN (e.g., IP VPN)</p> <p>Blackberry Services</p> <p><i>Microsoft Exchange Direct Push Mail via SPS</i></p> <p><i>Other Blackberry Competitors (Good, Nokia, Sybase)</i></p> <p>Wi-Fi</p>
<b>Emerging:</b>	<i>Intel integrated wireless chipsets (Wi-Fi, WiMAX and HSDPA in one chipset)</i>
<b>Transitional/Contained:</b>	
<b>Obsolescent/Rejected:</b>	
<b>Waiver History:</b>	

<b>Table NET-S-05: Wireless Telecommunications (Voice, Image, Data, Conference, and Other Multimedia)</b> <b>Technology Component Standard</b> <i>Updated October 29, 2007</i>	
<b>Strategic:</b>	
	<p>VITA Negotiated Services (current and anticipated services provided below)</p> <p style="padding-left: 40px;">VoIP Service (using MPLS)</p> <p style="padding-left: 40px;">Digital Voice, Image, Data, Centrex and PBX</p> <p style="padding-left: 40px;">Digital Cellular Service: 800 MHz, CDMA, WCDMA, CDMA 2000, CDMA EV-DO, GSM/GPRS</p> <p style="padding-left: 40px;">PCS Service: (1900 MHz, personal communications services—Sprint, digital wireless)</p> <p style="padding-left: 40px;"><i>Cingular or</i> Ntelos Service: GSM/GPRS) this is not cellular but provides cell-type services at a different frequency; uses trimode phones (1900/800 MHz, analog and digital)</p> <p style="padding-left: 40px;">Nextel Service: 800 MHz iDEN; wireless telephone service (note: this is not cellular but is Enhanced Specialized Mobile Radio (ESMR)—2 way radio)</p> <p style="padding-left: 40px;">Analog Voice, Centrex, PBX (still strategic for some locations)</p> <p>Wi-Fi (802.11a,b,g)</p>
<b>Emerging:</b>	
	<p>VoIP Wireless (high mobility in building is a place to start—e.g., forensic lab, corrections, hospital)</p> <p>Video Conference over IP</p> <p>VoWLAN (802.11r)</p> <p>WiMAX (802.16e)</p> <p>WLAN (802.11n)</p> <p>High speed uplink and downlink, HSDPA</p> <p>QoS for voice/video 802.11e, WSM an WME</p> <p>Mesh Networks</p> <p>Wireless Video Conferencing</p> <p>Wireless PBX</p> <p>200 Mbps WLAN links</p> <p>IP Multimedia, IMS and SIP</p> <p>Fixed mobile convergence service</p>
<b>Transitional/Contained:</b>	
	<p>Analog Cellular (AMPS)</p> <p>Mobitex is currently a Cingular packet data service that uses MASC protocol and has a limited service area (9.6—19.6 Kbps)</p>
<b>Obsolescent/Rejected:</b>	
	<u>CDPD</u>
<b>Waiver History:</b>	

## Section 7. ETA Platform Domain

The Platform Domain addresses personal and business computing hardware systems and related software. The hardware platforms include servers, storage systems, server appliances, personal computing devices (desktops, notebooks, and hand-held computing devices), and peripheral devices (e.g., printers). Software is limited to personal computing software, operating systems and utility system software used to meet basic platform infrastructure needs. Software examples include Windows operating system, word processing software, email server software, storage directors, and server backup software. The Platform Domain addresses the hardware and software issues, requirements and recommended practices under three technical topics: personal computing, servers, and utility services.

In 2003, the General Assembly mandated that the Virginia Information Technologies Agency (VITA) consolidate information technology infrastructure (platforms and networks) and its management across executive branch agencies except higher education agencies. The General Assembly also placed procurement of information technology under VITA. Because of these changes, VITA is referenced here instead of agencies whenever the requirement addresses a consolidation-related strategy or information technology procurement strategies.

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Platform Domain:

- PLA-R-01 Security as a Platform Decision Factor:** VITA shall consider business security requirements up front when making decisions for all platforms from personal computing devices to enterprise servers.
- PLA-R-02 Remote Administration of Platforms.** Agencies shall acquire platforms designed for ease of remote administration, diagnosis, and systems management.

### *Personal Computing*

Personal computing devices include hardware, operating systems and/or productivity software for desktops, notebooks, handheld devices (e.g., personal digital assistants), and personal peripherals (e.g., personal printers). Productivity software includes common office software (e.g., word processing) and *utility software* (e.g., .pdf file readers).

- PLA-R-03 Centralized Personal Computing Decisions** – For agencies supported by VITA, VITA shall centralize personal computing decisions regarding what shall be procured, how frequently devices may be refreshed, how agency support is to be provided, what security methods are acceptable, and what methods of access (e.g., wireless push email systems for PDAs) may be used.
- PLA-R-04 Personal Computing Security Software** – VITA shall establish the minimum requirements or the starting point for the base image to be used on

personal computers that access VITA-controlled networks. Agencies will add to these images to meet agency-specific security needs. The VITA base image shall contain VITA-approved security software such as antivirus software.

Agencies that operate on networks not controlled by VITA must establish minimum personal computing security software for the business they conduct and the networks they use. This software must be provided as part of the agency's base image.

- PLA-R-05 Location-based Personal Computing Support** – VITA shall provide location-based personal computing support options for geographically dispersed agency groups when central services are inadequate to meet customer needs. Costs and benefits of various location-based service options must be evaluated.
- PLA-R-06 Personal Computing Desktop Displays** – Because desktop displays have a longer lifecycle than the computers they support, their replacement shall not be automatic at the time of a desktop replacement. Display replacement decisions for all agencies including administrative units of higher education must be based on customer business needs, support considerations, cost-of-ownership data, and hardware compatibility considerations. VITA and other agencies that provide for display acquisition shall ensure separate display acquisition pricing that is equivalent to joint display and tower acquisition pricing.
- PLA-R-07 Personal Computing Processors** – When establishing minimum specifications for bids for low-end personal computing acquisitions or seats to be used by the majority of the workforce, executive branch agencies involved in acquisitions and contracts shall require: the lowest of currently available Intel, AMD, or comparable chipsets and components that will cost-effectively meet anticipated processing needs for the proposed productivity software, typical business needs, special needs of the mobile worker, and/or needs related to lifecycle requirements such as future availability of various memory options (*e.g., memory is currently changing from DDR SDRAM to DDR2 and these types cannot be used together if users' memory needs increase during the lifecycle of their desktop or notebook*).
- PLA-R-08 Personal Computer Output Drives** – When establishing minimum bid specifications for personal computers, executive branch agencies involved in procurements and contracts shall include a CD/DVD reader with CD write capabilities. DVD *writers are discouraged but shall be* permitted. Any acquired DVD reader must read multiple formats. Floppy drives shall remain an option but their acquisition shall be discouraged.
- PLA-R-09 Personal Computer Base Images** – VITA shall develop starting point, typical base images for the most commonly needed desktop and notebook

computer configurations to reduce setup decision making and costs for agencies VITA supports. This shall include standard software *setup (e.g., for office products, security, and other software)* and system lockdown policies. Typically, agencies will add to these base images to accommodate agency-specific requirements.

**PLA-R-10 Productivity Software Needs** – VITA shall assess the productivity software needs for agencies it supports (e.g., percentage of the workforce that requires various combinations of the individual office software offerings including word processing, presentation, spreadsheet, and database software based on a workforce sample).

Needs information shall be gathered with the assistance of agencies and shall be used in estimating the costs of state-level personal computing alternatives (e.g., licensing with or without Access). The information shall be available to agencies for use in assessing the costs of modifying the desktop base image for those groups needing additional personal or agency-wide functionality.

**PLA-R-11 Minimum Productivity Software for Meeting Knowledge Worker Needs** – The Commonwealth’s target personal computing software architecture for new desktops and notebooks for all agencies including administrative units of higher education shall include: Microsoft Office (XP or 2003), Internet Explorer, and Adobe Acrobat Reader. (Note that Access is not to be included in the minimum base image for most workers.)

**PLA-R-12 Software Support for PDA Access** – VITA shall ensure that personal productivity software calendar information, tasks, contacts, and user files shall be accessible by using Personal Digital Assistant (PDA) capabilities on various communications devices used by employees. VITA shall accommodate standard access methods.

**PLA-R-13 Lifecycle for Personal Computers** – For replacement of personal computers, agencies including the administrative units of higher education shall use a lifecycle range of four to five years for desktop computers and three and one-half to five years for notebook computers.

**PLA-R-14 Software Upgrades** – Agencies shall not upgrade operating systems software or office productivity software during the life of the computer unless they document a compelling business reason to do so or a compelling return-on-investment that offsets all hard and soft costs for making the change.

**PLA-R-15 Surge Protection for Field Workers** – To protect computing equipment used by field workers and to protect the data stored on their equipment, agencies responsible for purchasing these computers and peripheral devices shall provide a surge protector to the employee that protects from surges through all electrical inputs including network, telephone and power lines. Printers and

other peripheral devices may also be protected through surge protectors. The term, “field workers” includes telecommuters, roadway inspectors, park rangers and similar workers who work outside of a networked office building. Workers who are in networked offices have the needed data protection, data backups, and uninterrupted power provided through file server protection.

**PLA-R-16**

**Teleworking Tools** – For any *teleworking* employee whose job requires the use of information technology tools, a minimum toolset, as determined by the agency, must be provided. The agency determines what tool set is necessary to enable the employee to do his or her job. If needed for the specific job and person, and not otherwise available in or near the off-site workplace, the following personal computing tools shall be provided for use in the employee's home office, a hoteling space, or a mobile office.

- mobile notebook (e.g., wireless connectivity within a notebook designed for mobile use),
- docking station with a separate display,
- keyboard and mouse,
- surge protector (e.g., for mobile use, for docking station, or other computer setup)
- connectivity to agency's LAN (e.g., VPN; secure, high-speed or other possible requirements as needed),
- file backup,
- output,
- email,
- voice and/or video conferencing,
- training,
- Internet services (e.g., appropriate Internet services when not available in the spaces used; wireless routers when wireless access is not available in the spaces used); and
- local and long distance voice services (e.g., VoIP, Skype, cellular, or other voice services if a needed service is not available in the spaces used).

The following technology component standards tables address the Personal Computing technology topic.

<b>Table PLA-S-01: PC Operating Systems Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	
	Windows XP Pro (with tested Service Packs)
<b>Emerging:</b>	
	<p>Unix alternatives as a replacement to Windows as a Commonwealth solution could be studied.</p> <p>Linux (kernel 2.6.13 on 9-8-05)<sup>5</sup> (Note: Commonwealth liabilities may be an issue depending on SCO Unix lawsuit outcomes.)</p> <p>Macintosh OS <i>X (Leopard)</i></p> <p>Solaris</p> <p><i>Windows Vista (If Windows continues as the OS of choice for the Commonwealth, the target date to move the Vista OS to Strategic would be approximately 5 years and 6 months prior to the termination of all Microsoft support. This would enable a full 5-year lifecycle on Windows XP hardware purchases. Using current Microsoft support discontinuation dates (April 8, 2014 for XP), the last date to purchase hardware that would be appropriate only for XP would be September 8, 2008.)</i></p>
<b>Transitional/Contained:</b>	
	Windows 2000 Professional
	Macintosh OS 9
<b>Obsolescent/Rejected:</b>	
	Windows earlier than Windows 2000
	Any home version of Windows
<b>Exception History:</b>	

<sup>5</sup> See [www.kernel.org](http://www.kernel.org) for latest kernel.

**Table PLA-S-02: Displays and Interface Components**  
**Technology Component Standard**  
Updated October 29, 2007

**Strategic:**

Displays

Note: These requirements specify only the smallest display size that is permitted for the standard desktop. High-end needs such as GIS and typical display sizes within agencies (often 19") are not addressed. Only minimums for employee comfort are addressed.

Minimum of a 17" diagonal specification for a CRT when CRTs remain in use for standard desktops. An example shape for a 4:3 aspect ratio, which has about a 17" diagonal measure or slightly smaller, is provided on the left below. (Approximate measurements are 11" high by 14.66" wide.



Minimum of a 17" diagonal specification for a flat panel display when a flat panel is used for standard desktops. An example shape and size is presented on the left above. A typical diagonal measure is exactly 17".

Minimum of a 20" diagonal specification for a widescreen flat panel display with a 16:10 aspect ratio. (Approximate measurements are 11" high by 16.5" wide.) An example shape is provided in the middle above.

Minimum of a 19" diagonal specification for a widescreen flat panel display with a 3:2 or 15:10 aspect ratio. (Approximate measurements are 10" high by 16" wide.) An example shape is provided on the right above.

(Note: A desktop CRT is to be used for 2 refreshes or its full life. A desktop flat panel solution is to be used for its full life which may include backlight replacement.)

A flat panel (not a flat screen) is the standard recommended replacement for desktop displays

A CRT is an optional special use display most often acquired for specialized graphics applications that require true color and high resolution

Optical Mouse

**Emerging:**

OLED or Active Matrix OLED (AMOLED) displays (e.g., AMOLED in iRiver Clix Gen2)

FOLED displays (roll-up OLEDs for transporting presentations)

**Transitional/Contained:**

Less than 17" CRT or 17" flat panel for desktops (e.g., may be appropriate for point of sale)

CRT for desktop replacements

Mechanical Mouse

**Obsolescent/Rejected:**

**Exception History:**

**Table PLA-S-03: Read/Write Devices (Storage)**  
**Technology Component Standard**  
*Updated October 29, 2007*

**Strategic:**

USB Flash Drives (Many names are used including Jump Drives, USB MSC Drives, and USB Keys ). These drives typically store from 32 MB to 64 GB and may include security software options. With security, these drives are the preferred choice for transport of sensitive files and information. These drives are recommended over CDs and DVDs for employee use.

A CD RW/ DVD ROM Combo Drive is the preferred device for installation on employee PCs. DVD ROM is recommended but not required. DVD writer installation and use is discouraged for long-term storage due to constantly changing write methods and the lack of agreed upon industry standards. Agencies may use DVD writers for short-term storage of files exceeding 700 MB (the capacity of a CD).

External USB Hard Drives are another option for mobile worker backups when connectivity is not available)

**Emerging:**

DVDs for long-term optical output for personal computer users.

DVD<sup>6</sup>: no single standards are agreed to for DVD authoring and no single standard is anticipated.

Examples of the many competing standards are provided below:

Blue and red laser write methods from competing camps are as follows:

DVD Forum camp (current DVD, blue laser)

Recordable: DVD-R; DVD-R(G); DVD-R(A).

Rewritable: DVD-RAM; DVD-RW

DVD+RW Alliance camp (current DVD, blue laser)

Recordable: DVD+R; DVD+R DL.

Rewritable: DVD+RW; DVD+MRW.

Blu-ray camp (Japan and movie industry and future DVD, blue laser)

BD-R, BD-RW

AOD/HD-DVD camp (movie industry and future DVD, red laser)

HD DVD-R, HD DVD-RW

EVD (China) or enhanced versatile disk

FVD (Taiwan) Finalized Versatile Disc has been developed by Taiwanese Opto-electronics & Systems Laboratories

(For enterprise storage use of DVDs, see the utility services technical topic.)

**Transitional/Contained:**

Floppy Drive (3.5") it is recommended that floppy drives not be installed as a base option for any standard PCs but purchase is not prohibited. Shared external devices may be of transitional use to agencies.

<sup>6</sup> DVD technology explanations and competition commentary: [http://en.wikipedia.org/wiki/Comparison\\_of\\_high\\_definition\\_optical\\_disc\\_formats](http://en.wikipedia.org/wiki/Comparison_of_high_definition_optical_disc_formats); <http://www-i4.informatik.rwth-aachen.de/~jakobs/Interop/Gauch.pdf> or a news listing such as PC World (see items marked news on the left), <http://www.pcworld.com/resource/browse/0,cat,1114,sortIdx,1,pg,1,00.asp> .

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<b>Table PLA-S-03: Read/Write Devices (Storage)</b> <b>Technology Component Standard</b> <i>Updated October 29, 2007</i>	
<b>■ Obsolescent/Rejected:</b>	
	Zip Drive (Iomega) <i>Jaz Drive (Iomega successor to Zip Drive)</i> 5 ¼ Floppy
<b>Exception History:</b>	

<b>Table PLA-S-04: Desktop Attached Printing Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	<p>Laser printing devices are required for non-mobile black and white printing uses in situations where a desktop attached black and white printer must be used</p> <p>(Note: Desktop attached printers are strongly discouraged for most workers. See discussion in Utilities section.)</p>
<b>Emerging:</b>	
<b>Transitional/Contained:</b>	<p>Desktop attached (non-mobile) ink-jet printers for black and white printing are to be phased out</p> <p>(Note: Desktop attached printers are strongly discouraged for most workers. See discussion in Utilities section.)</p>
<b>Obsolescent/Rejected:</b>	
<b>Exception History:</b>	

**Table PLA-S-05: Miscellaneous Mobile Components  
Technology Component Standard**  
*Updated October 29, 2007*

**Strategic:**

Modems (V.90, V.92<sup>7</sup>)

Receivers/transmitters for LAN, PAN and mobile devices

IrDA—infrared

Bluetooth devices (1Mbps, FHSS, 2.4 GHz) may have a short life; version 1.2 or higher

PC Cards (also called PCMCIA cards) and internal devices (e.g., embedded in chipsets)

Bandwidth combination devices for 802.11 (a+b+g)

Lithium Ion Battery

**Emerging:**

Devices supporting new wireless standards and those in development

802.11e ratified in September 2005 adds quality of service to 802.11a and b.

802.11i ratified in June 2004 adds security enhancements to wireless a, b and g transmissions

802.11n for next generation wireless with reduced distance degradation and better multimedia streaming at higher speeds; ratification of the standard expected in Spring 2009; (100 Mbs)

UWB—high speed PAN solution and synchronization solution

WiMAX Mobile<sup>8</sup>—portable high speed wireless for MAN (or last mile technology) in development (802.16e enables mobile device connections); to be adopted by digital peripheral makers; throughput and battery life are still issues. 802.16a WANs currently provide 70 Mbps over 31 miles using TDM/TDMA, between the 2GHz and 11GHz (licensed and unlicensed) frequency ranges); Testing begins in June 2007; IEEE ratification expected in March 2009; products flooding the market.<sup>9</sup>

1 Gbit WiMAX

Micro Fuel Cells<sup>10</sup>—a new technology to replace batteries

NAND Drives (solid state flash drives to replace hard drives)<sup>11</sup>

Intel Penryn CPU<sup>11</sup>

AMD Fusion CPU<sup>11</sup>

<sup>7</sup> V.92 supports quick connect, modem on hold, and 48K upstream transmission.

<sup>8</sup> Uses orthogonal frequency division multiplexing access (OFDMA) with subcarrier spectrum divisions using QAM or QPSK. Several Gartner articles address the place of WiMAX in future mobile networking: WiMAX will Complement Not Kill Wireless Fidelity, Robin Simpson and Ian Keene (addresses throughput and battery life issues); How Vendors are Approaching WiMAX, January 13, 2005, Jouni Foursman, Ian Keene, Jason Chapman, and Bettina Tratz-Ryan; Hype Cycle for Wireless, July 19, 2005, G00127662.

<sup>9</sup> Update: Testing of next-gen Wi-Fi standard to start in June--Final 802.11n ratification pushed back to March 2009; Computer World, Matt Hamblen, May 16, 2007.

<sup>10</sup> Have the potential to provide ten times the energy capacity of lithium ion batteries. According to Gartner: Hype Cycle for Wireless, July 19, 2005, G00127622, working prototypes are now available. Commercialization is expected between 2005 and 2007.

<sup>11</sup>The Top Five Computer Technologies You Need to Know About in '07, Computer World, George Jones, March 1, 2007 <http://computerworld.com/action/article.do?command=viewArticleBasic&articleId=9011969&pageNumber=5>

<b>Table PLA-S-05: Miscellaneous Mobile Components Technology Component Standard</b> <i>Updated October 29, 2007</i>	
<b>Transitional/Contained:</b>	
	Modems (V.34 and earlier) PC Cards (PCMCIA) and internal devices (e.g., embedded in chipsets) not receiving 802.11 a, b and g (to maximize wireless network design possibilities) Bluetooth devices, less than version 1.2 (interference issues are greater)
<b>Obsolescent/Rejected:</b>	
<b>Exception History:</b>	

<b>Table PLA-S-06: Miscellaneous PC Components Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	Cardbus type PC Cards with parallel interface, DMA, and 32 bit path <i>ExpressCard<sup>12</sup> —PCMCIA Cardbus replacement that provides high speed serial access embracing USB 2.0 and PCI-Express</i>
<b>Emerging:</b>	
<b>Transitional/Contained:</b>	PC Card with parallel interface and 16 bit path
<b>Obsolescent/Rejected:</b>	
<b>Exception History:</b>	

<sup>12</sup> This technology is now implemented throughout the market place. Agencies should its utility for their business uses.

<b>Table PLA-S-07: Productivity/Management Software Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	<p><i>Microsoft Office 2003 (for 4 and 5 year PC images through 9-2008)</i></p> <p>Internet Explorer (<i>highest evaluated and tested for the environment</i>); encourage exploratory use of a second browser such as Firefox</p> <p>Outlook (2002 with 2004 update or 2003)</p> <p>Adobe Acrobat Reader (and plug in—latest)</p> <p><i>Microsoft Access 2003</i></p> <p><i>Centrally selected antivirus software (presently McAfee) for VITA-served agencies (when initial selection and later changes have been announced)</i></p>
<b>Emerging:</b>	<p><i>Office 2007 (note: email client no longer included)</i></p> <p><i>Outlook and Outlook Express 2007</i></p> <p><i>StarOffice 8 (Currently available free for individuals at pack.google.com); StarSuite 8</i></p> <p><i>OpenOffice.org Suite 2.3 (especially for document conversion if security response time is equivalent to that of Office 2003)</i></p> <p><i>Mozilla Firefox 2 (Note: Firefox 2 with security updates is pre-approved for pilot projects or research purposes. Exception requests are not required for pilot use.)</i></p> <p>Open Source Browsers (e.g., Opera, <i>Opera Mini</i>)</p> <p><i>Centrally managed services clients for VITA when announced</i></p>
<b>Transitional/Contained:</b>	<p>Microsoft Office 2000 (<i>extended support ends July 14, 2009</i>) <i>Waiver required only on a new PC image</i></p> <p><i>Microsoft Office XP (extended support ends July 12, 2011) Waiver required only on a new PC image</i></p> <p>Access 2000 (<i>expanded support ends July 14, 2009</i>) <i>Waiver required only on a new PC image</i></p> <p><i>Access XP (extended support ends July 12, 2011) Waiver required only on a new PC image</i></p>
<b>Obsolescent/Rejected:</b>	<p>Microsoft Office '95 with Outlook</p> <p><i>Microsoft Office '97 with Outlook</i></p> <p><i>WinZip (compression now in Windows XP)</i></p> <p><i>Microsoft Office 2001 with Outlook Express 5; Microsoft Office v.x (Mac)</i></p>
<b>Exception History:</b>	

## Servers

Servers include the full range of computing devices from mainframe computers to small single-processor computers. Servers may provide file and print controls, business applications, databases, Internet presence, voice communications, email and other important functions for the enterprise. Most servers are part of a network. A server solution may include single servers, virtual servers, clusters, farms, frames of server blades (e.g., servers in a blade chassis), server

appliances, or n-tier applications solutions. Server and server solution capabilities, scalability, reliability, management options, and shared use options are important factors in decisions regarding servers. Server hardware and software include operating systems, processors, ports, interfaces, communications buses, memory, storage, power, and controller components.

SCO has filed lawsuits claiming violation of its intellectual property rights in Unix. *As of September 21, 2007, SCO also filed for Chapter 11 bankruptcy. The original lawsuit has been administratively closed pending the results of the filing. It may be reopened and continued following SCO's reorganization if reorganization of the company is permitted.*

A legal victory for SCO may affect Unix and Linux business applications, customer communications, and other server functions in the Commonwealth. Gartner has provided a consultation to the Commonwealth on this topic (February 7, 2006) and has indicated that the risk is relatively low. The Commonwealth currently has contracts with Fujitsu, IBM, HP-UX, and some additional small server providers but does not have contracts with all in-architecture Linux and Unix server providers. Existing Commonwealth contracts require suppliers to provide some level of indemnification. However, if SCO were to prevail in the courts, the Commonwealth may incur costs associated with replacement of infringing products with non-infringing ones. For future applications, agencies should consider whether their risk could be further decreased by taking steps such as those outlined in the following Gartner article: *SCO's Suit against IBM: an Update and Recommendations*, ID Number G00127209.

**PLA-R-17 Maintenance Agreements** – All agencies shall ensure that servers which support production are under a maintenance agreement for the planned life of the server. For x86 architecture, the planned life shall be a minimum of five years. Operating systems replacement plans and service level agreements for the applications supported by a server are important factors in establishing the server's planned life.

**PLA-R-18 File Servers** – All agencies shall examine consolidated storage alternatives whenever considering acquisitions of file servers and shall select the consolidation option when it is cost effective.

**PLA-R-19 OEM (Original Equipment Manufacturer) Operating Systems** – Agencies shall use volume licensing agreements in place of OEM provided options for operating systems acquisitions for X86 server hardware.

Note: OEM operating systems offer no upgrade path, and, in the case of Windows, each OEM license is tied to the hardware with which it was purchased

## Servers by Capability

The following Technology Component Standards are presented in Tables. The table heading indicates the particular server type. The terms high-end servers and midrange to low-end servers are used to describe types. High-end servers are defined as servers that may scale to more than 16 processors in size. These servers typically cost more than \$250,000 and have greater capabilities in areas including scalability, reliability, availability, serviceability, security, privacy,

business continuity provision, management consistency, and risk reduction. Midrange to low-end servers typically cost \$50,000 or less. These servers would usually have one to four processors, but could scale to 8 or 16 processors. When a midrange computer is a scaled-down version of a high-end server, it may cost substantially more than \$50,000, but it will also have many of the high-end platform capabilities. Over time, the gap between the high-end solutions and the midrange to low end solutions will continue to decrease.

<b>Table PLA-S-08: High-end Servers Technology Component Standard</b>	
<b>Strategic:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>z/OS</li> <li>Solaris</li> <li>HP-UX</li> <li>AIX</li> <li>Windows</li> <li>Linux in virtual partitions</li> <li>Virtual Server OSs (e.g., zVM, VMware, strategic only for:               <ul style="list-style-type: none"> <li>supporting OSs that are in the desired future architecture (e.g., Linux, Windows 2003, HP-UX and Solaris)</li> <li>use in building test environments</li> </ul> </li> </ul> <p>Hardware</p> <p>IBM, Sun, and HP platforms are strategic. Hardware alternatives to these platforms may be considered if they are fully compatible for running applications designed for strategic systems, provide equal or better performance for all application and architectural requirements, and introduce no problems to the Virginia architecture other than those that may be cost-effectively resolved. (Fujitsu, for example, is a proven alternative to Sun for the Solaris OS.)</p>
<b>Emerging:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>Windows Virtual Server R2 (2005)</li> </ul>
<b>Transitional/Contained:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>MVS OS 390</li> <li>Unisys OS2200</li> <li>VMS</li> <li>OS/400 (library OS)</li> <li>Unix other than Solaris, AIX and HP-UX</li> </ul> <p>Hardware</p> <ul style="list-style-type: none"> <li>IBM ES9000 (9221)</li> <li>Virtual Server OSs used to support older versions of a strategic OS in cost-effective consolidation transitional plans</li> </ul>
<b>Obsolescent/Rejected:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>MVS XA</li> <li>MPE</li> </ul>
<b>Exception History:</b>	

<b>Table PLA-S-09: Midrange/Low-end Servers Technology Component Standard</b>	
<b>Strategic:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>Windows Server 2003 family</li> <li>Unix (Solaris, AIX, HP-UX and Linux)</li> <li>Virtual Server OSs (e.g., VMware and zVM)</li> </ul> <p>Software Examples</p> <ul style="list-style-type: none"> <li>Windows Server 2003 family is especially appropriate for utility services including domain controller, file, print, email, etc.</li> <li>Linux may be an alternative for Web, database, and utility services</li> <li>Virtual servers and virtual machines aid in providing test environment setup</li> </ul> <p>Hardware</p> <p>Numerous manufacturers compete for low- to midrange-server hardware; narrowing the variety used by the Commonwealth at a point in time is important to reducing acquisition, maintenance and support across agency solutions.</p>
<b>Emerging:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>Windows Server 2008</li> <li>Windows Server 2003 family (64 bit applications)</li> <li>Xen Virtual Hypervisor</li> </ul>
<b>Transitional/Contained:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>Windows 2000 family (by June 2007, agencies should move off this version)</li> <li>Virtual Server OSs (e.g., VMware hypervisor, Integrity Virtual Machines, and in some cases, Windows Virtual Server R2) enable transition strategies for multiple versions of the same OS such as Windows NT through 2003 when used for one application</li> <li>OS10 Server may have use as a transitional OS. OS10 can be used with greater ease by staff who are transitioning from Windows responsibilities to Unix. OS10 has a Windows-like graphical interface instead of a command-line interface, which is typical for Unix servers.</li> </ul>
<b>Obsolescent/Rejected:</b>	<p>Software</p> <ul style="list-style-type: none"> <li>NT</li> <li>Novell</li> <li>OSX</li> </ul>
<b>Exception History:</b>	

### Single Agency and Multi-Agency Consolidation Platforms

Some servers and server solutions are used as consolidation platforms. A consolidation platform is typically a single high-end platform or a large aggregation of midrange or low-end platforms. Consolidation platforms are used to accomplish the following types of work more cost-effectively with improved backup, recovery, security, management, and business solution quality:

- Centralizing a distributed information resource such as GIS data, library digital documents for universities, customer data, library holdings, or other data. The centralized data are often of enterprise significance and/or reusable resources. The data are often duplicated multiple times across the enterprise prior to consolidation.
- Centralizing an application that is implemented in a duplicative rather than in a distributed manner such as centralizing numerous separate instances of email services (e.g., Exchange) and related directories (e.g., Active Directories).
- Centralizing a function that is implemented in many ways (numerous different applications) across agencies such as license provision, federal grant management, or hospital information systems.
- Providing one server that can be partitioned for running many applications for many agencies with limited and definable risk.
- Providing one server that runs many applications for a single large agency.
- Providing a central utility or service that does not require significant knowledge of the business but that can be tailored in checklist fashion to meet each agency's business needs such as storage, mirroring, backup and recovery, sign on, network management, etc.

The tables below address only servers relative to consolidation efforts.

<b>Table PLA-S-10: Consolidate by Aggregation on Midrange to High-end Platforms Technology Component Standard</b>	
<b>Strategic:</b>	
Software	<ul style="list-style-type: none"> <li>Unix (HP-UX, Solaris, AIX and Linux)</li> <li>z/OS</li> <li>Windows 2003 Server Family (Windows 2003 may not scale sufficiently depending on the use. )</li> <li>Consolidation Examples: Appropriate for critical application and database tiers that require exceptional scaling, speed, transaction processing, reliability, etc.</li> </ul>
Hardware	<ul style="list-style-type: none"> <li>Exceptional partitioning and workload management are required for the server solution. Example platforms include but are not limited to: IBM Mainframe, IBM POWER5, Sun/Fujitsu SPARC/UltraSPARC, Fujitsu/HP Itanium 2 (64) and AMD Opteron (64).</li> </ul>
<b>Emerging:</b>	
Windows Server 2008	
<b>Transitional/Contained:</b>	
<b>Obsolescent/Rejected:</b>	
Software	<ul style="list-style-type: none"> <li>MPE</li> <li>MVS OS 390</li> <li>Unisys OS2200</li> <li>VMS</li> <li>OS/400</li> <li>IBM ES9000 (9221)</li> </ul>
<b>Exception History:</b>	

<b>Table PLA-S-11: Consolidate by Scaling Out Technology Component Standard</b>	
<b>Strategic:</b>	
Software	<ul style="list-style-type: none"> <li>Windows Server 2003</li> <li>Solaris</li> <li>HP-UX</li> <li>AIX</li> <li>Linux</li> </ul>
Examples	<p>Clusters are appropriate for MS Exchange Server (e.g., an email farm): clustered low-end to low midrange solution on Windows Server 2003.</p> <p>Appropriate as a tier for single large or mirrored databases—e.g., Oracle real application clusters (RAC) running on HP-UX, AIX, Windows or Linux.</p> <p>Appropriate for Web hosting: (e.g., on Windows Server 2003, HP-UX, Solaris, AIX or Linux)</p>
Hardware	<p>Typical solutions include farms/clusters using blades or servers in racks. Commodity servers are commonly employed. Other options are possible.</p>
<b>Emerging:</b>	
	Windows Server 2008
<b>Transitional/Contained:</b>	
Software	<ul style="list-style-type: none"> <li>Permit Windows 2000 as a transitional strategy through June 2009)</li> </ul>
<b>Obsolescent/Rejected:</b>	
Software	<ul style="list-style-type: none"> <li>Windows NT</li> </ul>
<b>Exception History:</b>	

<b>Table PLA-S-12: Consolidate using Virtual Tools Technology Component Standard</b>	
<b>Strategic:</b>	
Software	Virtual Servers (via *Hypervisors, or Virtual Machine Software) zVM or VMware Permit virtual Windows, Solaris, AIX, HP-UX, or Linux machines or servers in scale-out solutions provided via zVM or VMware
Hardware	Typical solutions include low-end to high-end servers whose resources are divided and shared among the virtual servers which run natively within the multiple partitions. A *hypervisor is a controlling operating system or virtualization manager for the multiple virtual servers. The hypervisor enables the division of resources for a particular processor architecture. Each server partition may be running identical or different operating systems.
<b>Emerging:</b>	
Software	Windows Virtual Servers ( 2005 R2, System Center Virtual Machine Manager 2007)
Hardware	Intel and others are working to improve sub-processor partitioning capabilities
<b>Transitional/Contained:</b>	
Software	Permit virtual servers of older versions of supported OSs in transitional efforts (may have some use here)
<b>Obsolescent/Rejected:</b>	
<b>Exception History:</b>	

### ***Utility Services***

Utility services are defined to support centralization and common handling of networked services that are currently implemented in many different ways using different practices across the served entities. The requirements and recommended practices are intended to be useful to VITA, VCCS, or individual colleges and universities. The services addressed are those services requiring the least specific knowledge of agency business and providing the greatest opportunity for efficiencies and improved practices. Not all possible utilities are addressed here. The included shared utility services were chosen to be implemented first because they are expected to result in the best cost savings, service improvement and other benefits of possible candidates. Example utilities include: file and print services; email, text, video and voice messaging services; and storage, backup and recovery services.

- PLA-R-20 Utilities Generally** – VITA shall standardize the deployment and management methods used for Local Area Network (LAN) and other utility services (e.g., storage, communications, printing, and copying) across agencies it serves.

**PLA-R-21 Microsoft Utilities** – Most utility services that have been deployed within VITA-supported agencies are Microsoft Windows services. VITA shall consider Microsoft best practices as guides for standardizing these services across agencies until alternative utility services are studied and alternative methods are put into place. This requirement should not be construed to mean that only Microsoft Windows solutions shall be deployed for utilities, or that only Microsoft best practices should be used. Because Microsoft utility solutions are de facto standards in the Commonwealth, any alternatives considered should be analyzed using Microsoft utilities and Microsoft deployment recommendations as the base service to which alternatives may be compared. For example, the majority of web server deployments may use Windows IIS Servers and may follow Microsoft best practices for their deployment. The uses listed below may have general benefit for agencies, but should be compared in cost and benefit analyses with other in-architecture options before proceeding:

- Linux as a database OS (e.g., ESRI; Oracle RAC clusters on Linux)
- Linux for selected utilities including web hosting running on low-end servers or in soft partitions on midrange or high-end servers
- Linux for selected business applications proven on this platform
- Apache servers on Linux instead of IIS servers on Windows

### Storage System Solutions

Two important ways that agencies can meet business needs while reducing IT expenditures are implementing controls to reduce storage escalation and planning for the least costly storage solution for meeting each of several levels of business storage needs. For VITA, providing appropriate storage and backup alternatives is a core element of providing centralized server support. Storage provision must be approached as a utility service designed to decrease costs and reduce risks while maintaining or improving performance and availability. Comparing options requires combining the costs and benefits of changing from the current solution to a new service offering with the costs and benefits of the needed telecommunications, security, storage and backup solutions.

The term “storage system” will be used here to encompass the hardware, software, communications, networking, media, media controllers and management tools required to record data somewhere other than in local memory (e.g., RAM) and to index the data in a manner that allows it to be retrieved at a later time. Storage systems are not platforms, but they are the main user of platform hardware, communications interfaces, and storage media. Much of the opportunity available within the platform domain for cost reduction depends on careful design and deployment of storage systems.

The following requirements are applicable to Storage Systems.

**PLA-R-22 Storage and Capacity Planning Data** – VITA shall require that agencies it supports provide periodic capacity planning and storage planning data.

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Agencies not supported by VITA shall also perform capacity planning and storage planning. The availability of planning data will improve storage, backup, and disaster recovery solutions for the Commonwealth.

- PLA-R-23 Agency Assistance for Capacity and Storage Planning** – VITA shall offer capacity planning and storage planning services to assist agencies in determining their present and future requirements.
- PLA-R-24 Storage and Capacity Planning Scope** – Agencies shall consider all of their applications jointly when conducting capacity planning and when developing a storage plan.
- PLA-R-25 Consolidated Server Storage Planning** – For servers used by multiple applications within an agency, by multiple agencies, or managed as a group across agencies and applications, the agency managing the storage consolidation shall design storage solutions across the servers within adequately networked locations.
- PLA-R-26 Storage Consolidation** – Agencies shall use consolidated, single and multi-agency, networked storage solutions whenever the consolidated solution shows cost-effectiveness across an agency’s applications (i.e., meets business needs at an equal or lower total cost for the agency). For example, if the agency adds a small application that could use dedicated storage more cheaply than consolidated storage, the dedicated storage may not be used unless the agency-wide storage plan shows dedicated storage to be more cost-effective than consolidated storage.
- PLA-R-27 Policy-Based Storage Reduction Focus** – VITA shall work with the Library of Virginia to simplify retention requirements for electronically stored data such that automated, policy-based methods may be used to control storage growth. Specifically, efforts should simplify the deletion of stored files, emails (except emails from agency heads and Governor’s staffs), and other data that are not of historic value. Efforts would specifically enable the creation of VITA services for the deletion of old data, unused data, and data with no owner for agencies.
- PLA-R-28 Storage Reduction Preceding Migration** – When an agency changes its storage from application-based stores to central or consolidated stores, it must first consider what may be deleted prior to moving the remaining stores. This effort must be jointly conducted by the data-owning agencies and the centralization project staff.
- PLA-R-29 Backup Consolidation and Simplification** – VITA shall consider the value of improved backup and recovery management, reduced backup and recovery costs, and improved backup and recovery service levels when developing server management and storage management plans and costs for agencies.

This very important benefit of server and storage consolidation must be included in cost comparisons.

- PLA-R-30 Applications Offering Storage Consolidation Opportunities** – To reduce escalating storage costs, VITA shall consider the cost-effectiveness of alternate storage consolidation and storage reduction (e.g., policy deletion options for stored data) opportunities. When considering new utility services for central handling, VITA shall separately address storage consolidation and reduction for the service. Examples of utility services that would have large storage needs and/or growing storage needs are email services, backup, and Web hosting services.
- PLA-R-31 Connectivity and Consolidated Storage** – When designing consolidated storage solutions, agencies shall include assessments of connectivity needs and options for the customer base. A consolidated solution often requires added connectivity. This connectivity may both increase costs and degrade throughput. For many agencies, the distance to the consolidation system and the costs of connectivity are critical factors. Solutions including iSCSI, MPLS VPNs, WAFS, blade chassis, and SAS are among the tools that may be beneficial in reducing total storage costs.
- PLA-R-32 Storage Location Considerations** – When designing consolidated storage solutions, agencies shall include assessments of storage location. If central remote storage is cost-prohibitive, agencies providing storage must evaluate the cost-effectiveness of locally consolidated storage options for the physically co-located servers under their control.

The following technology component standards address Storage Systems.

<b>Table PLA-S-13: Storage Interfaces Technology Component Standard</b>	
<b>Strategic:</b>	<p>FIBRE Channel -FC, FC-AL (fiber channel arbitrated loop)</p> <p>FICON</p> <p>SCSI</p> <p>10/100/Gb Ethernet; 10/100/2Gb Ethernet</p> <p>iSCSI</p> <p>PCI Express</p> <p>FC-IP</p> <p>10GigE</p> <p>SAS (Serial Attached SCSI)</p>
<b>Emerging:</b>	<p>4x InfiniBand (IB)</p> <p>4Gb/sec FICON</p>
<b>Transitional/Contained:</b>	<p>10/100 Ethernet</p>
<b>Obsolescent/Rejected:</b>	<p>ESCON, 17 Mbps (Mainframe)</p> <p>Block/Parallel (distance limits and speed problems) 4.5 Mbps (Mainframe)</p>
<b>Exception History:</b>	

<b>Table PLA-S-14: Disk Storage Hardware Technology Component Standard <i>Updated October 29, 2007</i></b>	
<b>Strategic:</b>	<p>External Controller-based RAID</p> <p>ATA Disks; SATA Disks</p> <p>Disks</p> <p>CDs (archive quality)</p>
<b>Emerging:</b>	<p>DVD (awaiting stable write standards) No DVD write option <i>for enterprise storage systems</i> is being recommended for the Commonwealth at this time.</p> <p>MEMS (microelectrico-mechanical system) probe device</p> <p>MAID</p>
<b>Transitional/Contained:</b>	
<b>Obsolescent/Rejected:</b>	
<b>Exception History:</b>	

<b>Table PLA-S-15: Tape Technology Component Standard</b>	
<b>Strategic:</b>	
	LTO (linear tape open) SDLT (super digital linear tape) Virtual Tape (Disk) Magstar (IBM 3590; STK 9x40)
<b>Emerging:</b>	
	Terabyte tapes
<b>Transitional/Contained:</b>	
	36 track DLT (digital linear tape) AIT (advanced intelligent tape)
<b>Obsolescent/Rejected:</b>	
	9 track, 18 track
<b>Exception History:</b>	

## Print, Fax, Scan and Copy Devices

In recent years, network print, fax, copy and scan devices have become more capable, more multifunctional, and more cost effective. Color printing is more affordable and presents a great business tool for reaching customers and others with whom agencies communicate. In most offices, sharing workgroup devices is now considered to be common and desirable. For some business units, having access to high-speed printers and copiers that can collate and staple large numbers of documents when necessary is considered to be a necessity.

- PLA-R-33 Print, Fax, Scan and Copy Devices and Managing Servers.** VITA shall deploy and manage all customer-oriented input and output devices that are deployed as networked devices and which serve VITA-supported agencies. These devices include document scanners, fax machines, copiers, and printers along with the servers that support them. These devices shall be deployed in a consistent manner across all VITA-supported agencies.

## Email Utilities

The Commonwealth must provide voice, email, push mail, calendaring, contacts, and other services that are necessary to support the workforce and agency business requirements. The best solution is always the de facto solution, unless serious problems exist or costs are prohibitive. However, for the Commonwealth, it is also important that the de facto solutions be challenged

periodically. The Commonwealth needs to have a much more complete understanding of the needs of the workforce for each of the messaging and communications tools. This information will be important for establishing plans and putting a long-range roadmap in place to guide changes.

- PLA-R-34 Enterprise-wide vs. Agency-centric Email Solution Analyses.** VITA shall examine the feasibility, costs, and benefits of standardizing on Exchange as the future enterprise email solution. The study shall consider whether centralizing email is cost effective and whether standardizing on Microsoft Exchange or other enterprise solutions is cost effective. Until this study is conducted, Microsoft Exchange will be the solution VITA-served agencies shall employ when making changes.

<b>Table PLA-S-16: Email Technology Component Standard</b>	
<b>Strategic:</b>	32 bit Exchange Server 2003
<b>Emerging:</b>	64 bit Exchange Server; All other solutions that are appropriate for Commonwealth-wide services (e.g., solutions that should be evaluated including hosted applications).
<b>Transitional/Contained:</b>	Exchange Server 2000; Unsupported open source implementations.
<b>Obsolescent/Rejected:</b>	Exchange Server 5.5 and earlier
<b>Exception History:</b>	

### **VITA Network (LAN/WAN) Control Utilities**

Most requirements for networks are provided in the network domain. Network utilities, which are addressed here, are those recurring network control services that should be managed as a common service across all agencies served by VITA. Examples of network utility services are secondary Domain Name System (DNS) services, directory services, and Dynamic Host Configuration Protocol (DHCP) servers. As networks are combined across agencies to create one centrally managed network, the centralizing and standardizing of important look up and control services will become increasingly important.

The network domain envisions a unified future network for the Commonwealth. To enable that end, the platform domain establishes Microsoft Windows as the operating system for network control. The network domain also establishes IP as the critical network routing protocol and places VITA in charge of avoiding IP conflicts in routed communications. In addition, the network domain requires that VITA provide a DNS server on a separate network to be referenced when in-network DNS servers fail. Central utilities are viewed as the platform control vehicles that VITA may use to ensure that these central network controls come about.

**PLA-R-35** **Operating Systems for LAN/WAN Control Services:** Servers in VITA supported agencies that provide network-wide control services (e.g., domain design, secondary DNS provision, IP (Internet Protocol) addressing, and directory services) must use the same operating system to facilitate central management and central consolidation. Microsoft Windows is the target architecture standard for LAN/WAN control services for all VITA controlled networks.

## Section 8. ETA Security Domain

**The Security Standards are available on the VITA website. The following documents are ITRM Security Standards for state executive branch agencies.<sup>13</sup>**

- Data Removal from State Electronic Equipment Standard (SEC2003-02.1) (03/08/2004)
- IT Security Audit Standard (SEC502-00) (07/01/2006) (Compliance Date: 02/01/2007)
- IT Security Standard (SEC501-01) (07/01/2007)
- Use of Non-Commonwealth Computing Devices to Telework (SEC511-00) (07/01/2007)

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<sup>13</sup> The following link provides the security document listings. <http://vita.virginia.gov/library/default.aspx?id=537>

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## Section 9. ETA Enterprise Systems Management Domain

The ETA Enterprise Systems Management (ESM) Domain defines the operational aspects of IT services delivery and identifies generally accepted industry policies, practices, standards, and processes for administering, monitoring, and controlling hardware and software components of the infrastructure.

ESM activities include but are not limited to, network monitoring, monitoring servers, applications monitoring, net-flow analyzer, troubleshooting tools, helpdesk, assets management, storage management, wireless LAN management, event management, and performance management.

ESM processes focus on methods, techniques and procedures relating to IT service management (configuration management, event and state management, fault detection and isolation, performance measurement, patch management, vendor relationship management including Service Level Agreements (SLA), release management, change control, problem reporting, and hardware and software retirement).

ESM addresses three major topics, Service Delivery, Service Support, and Operations Management. The Service Support topic is further sub-divided into Supporting and Changing sub-topics.

### *Domain-wide Requirements*

The following domain-wide requirements pertain to all topics and components in the Enterprise Systems Management Domain.

- ESM-R-01 Authorized Access** – Agencies shall restrict access to any IT infrastructure resources including ESM tools in conformance with the Commonwealth’s security policies and procedures.
- ESM-R-02 Adhere to Information Technology Infrastructure Library Framework (ITIL)**. IT operational and services processes shall adhere to the ITIL framework best practices methodology.
- ESM-R-03 Security, Confidentiality, Privacy, and Statutes**. IT systems shall adhere to all security, confidentiality and privacy policies, and applicable statutes.

### *Service Delivery*

Service Delivery relates to managerial and procedural activities that operations management must support to meet customers’ business requirements. The management actions and activities associated with this core process are planning, administration, cost control, service options catalog, and customers’ service management.

- ESM-R-04 Service Level Agreement** - Agencies shall ensure that service delivery expectations are defined and documented in a Service Level Agreement (SLA). The SLA must include performance requirements and methods for measuring IT service delivery against performance targets.

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- ESM-R-05 Capacity Planning and Performance Monitoring Management** - Agencies with ESM responsibilities shall perform capacity planning and performance monitoring to ensure infrastructure resources are appropriately sized to meet current and planned workload demands.
- ESM-R-06 Financial Management for IT Service Management** - Agencies with ESM responsibilities shall implement accounting processes and procedures that identify and attribute costs for IT resources used to support the business processes. The process shall provide data in a timely manner for Total Cost of Ownership (TCO) analysis and reporting.
- ESM-R-07 IT Continuity Management** - Agencies with ESM responsibilities shall establish an IT disaster recovery plan that reflects SLA service delivery requirements. This risk-based plan shall incorporate the operating constraints of the business continuity plan. The plan shall address all critical applications, middleware, operating systems, hardware, and network connectivity elements. In addition, there shall be procedures to test the IT disaster recovery plan periodically and update the plan based on the test outcome or environment changes.

### ***Service Support***

Service Support is the connection between the other core processes. The primary role for Service Support is to be the communication channel between the customer and the IT service organization. There are two sub-processes, Supporting and Changing, by which customer's interactions take place. It is through these sub-processes that IT service personnel handle all customer-facing issues and problems.

### **Supporting**

The *Supporting* sub-topic is a set of process capabilities that are directly related to customer interactions with the IT service organization. Customer interactions can include reporting of problems and incidents, requests for service; and obtaining information about service events, actions, and opportunities that could improve individual productivity. The Service Desk is the single point of contact for all customer communications, tracking of customer contacts, and maintenance of a repository of customer data.

- ESM-R-08 Service Desk** - Agencies shall utilize a Service Desk facility that is staffed with properly trained personnel who can minimally respond to level 1- type problems, incidents, and events<sup>14</sup>. The Service Desk shall utilize an automated contact management tool and is the single point of contact for all IT service requests and services communications.
- ESM-R-09 Incident Management**<sup>15</sup> - Agencies with ESM responsibilities shall establish an Incident Management process and procedures. The process and procedures

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<sup>14</sup> Level 1-type problems, incidents, and events are user calls to the service desk that the service desk analyst can resolve directly with the user using prior experience and/or information accessed from a knowledge base.

<sup>15</sup> An incident is any event which is not part of the standard operation of a service and which causes, or may cause, an interruption to, or a reduction in, the quality of that service.

shall enable restoration of normal service operation as quickly as possible and minimize the impact on business operations. Procedures shall include steps to address actions such as incident detection, recording, classification, initial support, investigation, diagnosis, resolution, recovery, closure, ownership, monitoring, tracking, and communication.

**ESM-R-10 Problem Management<sup>16</sup>** - Agencies with ESM responsibilities shall institute procedures for problem handling. These procedures shall include steps for performing root cause analysis of incidents and correction of the error to the satisfaction of the customer.

## Changing

The *Changing* sub-topic is a set of process capabilities that ensure standardized methods and procedures are used for efficient and prompt handling of all changes, releases, and configuration actions in order to minimize the impact on service quality commitments, and consequently improve the day-to-day operations of the IT organization.

**ESM-R-11 Change Management** - Agencies with ESM responsibilities shall establish a Change Management process and institute procedures that provide for the analysis, implementation, and follow up of all environmental changes requested including those made due to problem resolution. The process shall support change initiation and control actions, support the ability to conduct impact assessments, handle changes in an automated manner including emergencies, document all changes in the configuration management database, demonstrate chain of custody for the change, and comply with release policies.

**ESM-R-12 Release Management** – Agencies shall establish a release management process. Process activities shall include procedures for hardware, license/version control across the infrastructure, rollout planning, communication protocols, and quality control of the process.

**ESM-R-13 Configuration Management** - Agencies with ESM responsibilities shall establish a cost effective automated Configuration Management process and procedures to control and identify all IT assets<sup>17</sup> (Configuration Item [CI]) and their physical locations. CIs must be documented in a Configuration Management Database (CMDB)<sup>18</sup>. The CMDB shall have the ability to create

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<sup>16</sup> A problem is a condition resulting from multiple incidents or a significant incident for which the cause is unknown but the impact is significant. Problem Management’s purpose is the detection, resolution, and prevention of future incidents.

<sup>17</sup> ITIL framework use the “lowest common denominator” principle for IT asset management. Configuration item is the term used to describe all components necessary for IT operations. Configuration Management activities include: (1) planning, (2) identification, (3) control, (4) status accounting, and (5) verification and audit. Any configuration item therefore is considered as an IT asset thus IT asset management is not treated as a separate function but instead handled as an integral part of the Configuration Management process.

<sup>18</sup> Many vendors’ product offerings view CMDB as the most important repository within ESM. While non-automated methods are an option, it is not a recommended practice. ESM tools that have the ability to perform “auto discovery” to capture, record, track, define relationships, and handle changes etc are the preferred option. Use of manual procedures will over time lose its usefulness and could become cost prohibitive.

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a parts list of every CI in the system, define the relationship of CIs in the system, track the current and historical status of each CI, track all Requests for Change (RFC) to the system, and verify that the CI parts list is correct and complete.

### ***Operations Management***

Operations Management is responsible for the day-to-day administration of all infrastructure components. Key tasks associated with this core process are highly technical in nature. They include installation; repairs; maintenance; jobs management; performance monitoring and data capture for reporting; and fault management to name a few. Operations Management, therefore, complements the Service Delivery process.

Operations Management includes Security Administration, Network Administration, Storage Management, Systems Administration, Services Monitoring and Control, Directory Services Administration, and Job Scheduling.

### **Service Monitoring and Control**

Service Monitoring and control consists of procedures and tools for proactive notification of events that may have severe consequences on the business. In addition, to the extent performance metrics are defined, monitoring of these metrics is important for SLA management and reporting.

**ESM-R-14 Metrics** - Agencies with ESM responsibilities shall implement operational performance metrics, data collection processes, and conduct regular reviews to ensure performance targets are on track and variations are addressed in a timely manner.

**ESM-R-15 Monitoring Capability** - Agencies with ESM responsibilities shall establish a system event monitoring console and institute systems performance alert thresholds to ensure systems faults are averted and corrective measures are taken to limit the chance of total systems failure.

**ESM-R-16 Monitoring and Control Tools** - Agencies with ESM responsibilities shall use Commercial-off-the Shelf (COTS) ESM tools that meet the goals of the International Standards Organization (ISO) 20000<sup>19</sup> and support performance metrics agreed to in SLAs. In the case where internally developed ESM tools<sup>20</sup> provide the best course of action, the tool shall comply with the ITIL process and appropriate dedicated staff resources(s) shall be assigned on a continuous basis to provide ongoing maintenance and updates.

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<sup>19</sup> International Standard Organization (ISO) 20000 (which replaces BS15000) defines the requirements for an IT Service Management System. It sets out the main processes to deliver IT services effectively. The standard supports all aspects of ITIL. Details for ISO 20000 can be accessed at <http://20000.fwtk.org/iso-20000.htm>

<sup>20</sup> Internally developed tools shall be engineered using Systems Development Life cycle (SDLC) methodology that complies with the Commonwealth's software development policy and standards.

- ESM-R-17 Network Administration** - Agencies with ESM responsibilities shall ensure that critical networking infrastructure devices such as routers, switches, hubs, PBX/call manager, voice mail server, and other direct attached data communications devices are Simple Network Monitoring Protocol (SNMP) capable. Devices shall be configured to capture of all events required by the SLA and the captured data shall be stored in a Management Information Base (MIB) repository. Procedures shall be integrated with the Service Monitoring and Control process.

## Storage Management

The Commonwealth data is vital to providing citizen services. Exercising strict data management controls necessitates having operating processes and procedures that ensure that the data is protected, retrievable, and recovered in a timely manner to meet business continuity requirements. Storage Management is concerned with data custody and control of the environment. Storage Management operational process consists of two major focus areas: (1) Data Backup, Restore, and Recovery Operations and (2) Storage Resource Management.

- ESM-R-18 Policies and Procedures** – Agencies with ESM responsibilities shall establish data storage and archival retention policies and procedures that meet operating business requirements, statute, and regulatory mandates. To the extent there are conflicting requirements, agencies shall address all conflicts with the appropriate mandating entity and document the resolution.
- ESM-R-19 Back-up and Recovery** – Agencies with ESM responsibilities shall ensure policies and procedures address back-up and recovery for all critical Commonwealth data and conduct testing of these procedures on a regular basis. Procedures shall address timing, frequency, and restore time objectives (RTO) that support the business continuity plan.
- ESM-R-20 Off-Site Retention** – Agencies with ESM responsibilities shall ensure critical back-up data files are rotated to an Off-Site location on a scheduled basis as defined in the back-up and recovery procedures. In addition, Off-Site locations shall comply with data security requirements as defined in the ETA security domain.
- ESM-R-21 Systems Administration** - Agencies with ESM responsibilities shall develop and maintain appropriate operations policies, procedures, and standards to ensure day-to-day management of the IT infrastructure environment. Developed policies, procedures, and standards shall comply with applicable ETA policies and standards.
- ESM-R-22 Job Scheduling** - Agencies with ESM responsibilities shall utilize an automated job scheduling system to control and organize workloads. Features should include, but are not limited to, parameters for execution time periods (daily, weekly, monthly, annually), execution length (start/finish), storage requirements, dependencies, and the ability to limit job execution bypass.

### ***Technology for Enterprise Systems Management***

Specific enterprise systems management tools are not addressed in this release of the ETA Standard. Future updates to this standard may address specific tool sets that support the requirements in this standard.

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## Section 10. Glossary

Following are Glossary entries pertaining to the Enterprise Technical Architecture. Additional glossary definitions can be found in the ITRM Technology Management Glossary located on the VITA website here:

<https://vita.virginia.gov/uploadedFiles/Library/GlossaryStandard2005final2.pdf>.

Some useful public glossaries can also be found at:

Wikipedia, the free encyclopedia at [http://en.wikipedia.org/wiki/Main\\_Page](http://en.wikipedia.org/wiki/Main_Page)

Loosely Coupled Glossary at <http://looselycoupled.com/glossary/azindex.html>

Whatis.com at <http://whatis.techtarget.com>

<b>10GigE</b>	10 Gigabit Ethernet Service
<b>8-, 16-, 32-, and 64-Bit Architectures</b>	A CPU is designed to carry out instructions on data that is in memory. The way it does this is significantly different for 8 bit and 64 bit architectures. The greater the number of bits, the more options there are that must be considered for how instructions are handled. Options include the complexity of the instruction set, the width of the data path, the number of registers, and the number of instructions that may execute per clock cycle. A program written for a 64-bit architecture may not be as fast as one written for a 32-bit architecture, but it may provide other advantages.
<b>802.11a card</b>	Wireless interface that provides up to 54 Mbps service using an Orthogonal Frequency Division Multiplexing (OFDM) modulation technique for signal transmission in the 5.5 GHz spectrum
<b>802.11b card</b>	Wireless interface that provides up to 11 Mbps service using Frequency Hopping Spread Spectrum (FHSS) modulation technique for signal transmission in the 2.4 GHz spectrum; also called WiFi. Interference from cordless phones and microwave ovens may be a problem.
<b>802.11g cards</b>	Wireless interface that provides up to 54 Mbps service using an Orthogonal Frequency Division Multiplexing (OFDM) modulation technique for signal transmission in the 2.4 GHz spectrum. Backwards compatibility is maintained with 802.11b. Interference from cordless phones and microwave ovens may be a problem
<b>ACMS</b>	A transaction processing monitor from Compaq that runs on the open VMS operating system.
<b>Active X</b>	Microsoft's answer to Java. Active X is a stripped down implementation of OLE designed to run over slow Internet links.
<b>ADSI</b>	Active Directory Service Interfaces (ADSI) abstract the capabilities of different directory services from different network vendors to present a single set of directory service interfaces for managing network resources
<b>Advanced Intelligent Tape (AIT)</b>	A form of magnetic tape and drive using AME developed by Sony for storing large amounts of data. An AIT can store over 50 gigabytes and transfer data at six

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	<p>megabytes/second (in February 1999). AIT features high-speed file access, long head and media life, the ALDC compression algorithm, and a MIC chip. (FOLDOC)</p>
<b>Agency</b>	<p>Any agency, institution, board, bureau, commission, council, or instrumentality of state government in the executive branch listed in the appropriation act. ETA requirements/standards identified in this report are applicable to all agencies including the administrative functions (does not include instructional or research functions) of institutions of higher education, unless exempted by language contained in a specific requirement/standard.</p>
<b>AMD Opteron</b>	<p>The AMD 8131 chipset, which improves connection speeds by employing two independent, high-performance PCI-X bus bridges, integrated with a high-speed HyperTransport technology tunnel. The tunnel function provides connection capability to other downstream HyperTransport technology devices, allowing greater system flexibility. (<a href="http://www.AMD.com">www.AMD.com</a>)</p>
<b>AMPS</b>	<p>Analog Mobile Phone Service or AMPS is defined in EIA/TIA-553 standards. In 2006, AMPS is still the most extensive wireless coverage available for nationwide service in the US. However, in 2002, the FCC made the drastic decision to no longer require A and B carriers to support AMPS cellular service as of March 1, 2008. Since the AMPS standard is analog technology, it suffers from an inherently inefficient use of the frequency spectrum. All AMPS carriers have converted most of their consumer base to a digital standard such as CDMA or GSM and continue to do so at a rapid pace. Digital technologies such as CDMA support multiple voice calls on the same channel, superior call quality, enhanced features such as two-way text messaging, voicemail indicator, internet, and GPS services; whereas, AMPS can only support one call per channel and a basic one-way short message service.</p> <p>AMPS cellular service operates in the 800 MHz FM band. In 1989, the Federal Communications Commission granted carriers an expansion from the current 666 channels to the now 832 (416 per carrier). The additional frequency was available in the upper 800 MHz band which also was home to UHF channels 70-83. This meant that these UHF channels could no longer be used for UHF TV transmission as these frequencies were to be used for AMPS transmission. (Adapted from Wikipedia.)</p>
<b>ANSI</b>	<p>A voluntary non-profit organization that coordinates and supports the U.S. voluntary consensus standards for industry.</p>
<b>API</b>	<p>Application Program Interface or Application Programming Interface.</p>
<b>APPC LU6.2</b>	<p>APPC allows user written programs to perform transactions in a Client-Server IBM network to access a CICS, in MVS "batch" through APPC/MVS, in VM/CMS, in AIX on the RS/6000, and on the AS/400</p>
<b>Appliance</b>	<p>Server hardware configured with server software and optimized for simple functions such as Web page serving.</p>
<b>ASCII</b>	<p>American Standard Code for Information Interchange. "Human readable text." The first 128 character codes of any of the ISO 8859 character sets is always identical to the ASCII character set</p>
<b>ASP</b>	<p>Active Server Page (Microsoft) A scripting environment for Microsoft Internet Information Server in which you can combine HTML, scripts and reusable Active X server components to create dynamic web pages.</p>
<b>Asynchronous Transfer</b>	<p>ATM (asynchronous transfer mode) is a dedicated-connection switching technology</p>

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<b>Mode (ATM)</b>	that organizes digital data into 53-byte cell units and transmits them over a physical medium using digital signal technology. Individually, a cell is processed asynchronously relative to other related cells and is queued before being multiplexed over the transmission path. Because ATM is designed to be easily implemented by hardware (rather than software), faster processing and switch speeds are possible. The pre-specified bit rates are either 155.520 Mbps or 622.080 Mbps. Speeds on ATM networks can reach 10 Gbps. (searchNetworking.com)
<b>ATA Disk –ATA (Advanced Technology Attachment)</b>	Is the official name that American National Standards Institute group X3T10 uses for what the computer industry calls Integrated Drive Electronics (IDE). An ATA disk is a serial drive used for data storage, which may be used in a disk array. It is cheaper than the technology typically used in RAID. Also, a type of drive controller.
<b>Athlon Chipset</b>	AMD microprocessor, delivered in mid-1999, was the first to support a 200 MHz bus. In March 2000, AMD announced the first 1 gigahertz PC microprocessor in a newer version of the Athlon. The current AMD Athlon XP 3000+ performs better than the Intel Pentium 4 3.06 GHz chip in office productivity (PWC audit).
<b>ATM/SONET</b>	Asynchronous Transfer Mode cells carried over Synchronous Optical Network packets.
<b>Authentication</b>	Authentication is the process of determining whether someone or something is, in fact, who or what it is declared to be. In private and public computer networks (including the Internet), authentication is commonly done through the use of logon passwords. Knowledge of the password is assumed to guarantee that the user is authentic. Logically, authentication precedes authorization (although they may often seem to be combined). (searchSecurity.com)
<b>B2G</b>	Business to Government. Refers to a business process involving electronic interaction of business partners.
<b>Backbone</b>	A high-speed computer network designed to interconnect lower-speed networks or clusters of dispersed user devices.
<b>Bandwidth</b>	The carrying capacity of a circuit, usually measured in bits per second for digital circuits or hertz for analog circuits.
<b>Base Image</b>	<p>This term is used in this report to indicate a starting point for a hard disk image that may be used as is or further modified to meet agency user needs with users placed in as large a group as possible based on commonality of requirements. All secretaries may have one base image and all programmers, another. The image is a copy of the configured operating system and software on the desktop, laptop or other device. Microsoft provides instructions for establishing, compressing and distributing such images:</p> <p>“Some organizations deploy a complete user system at one time, including Microsoft® Windows® software, device drivers, Microsoft Office 2003 applications, and custom settings. In this scenario, you install the entire system onto a test computer, and then you create an image of the hard disk to copy to users' computers. Installing Office with a complete user system is almost as fast as installing Office by itself. It is a particularly efficient way to configure new computers or to restore a computer to its original state. When you distribute the hard disk image to users, everything on the computer is replaced by your custom configuration, so users must back up any documents or other files they want to keep”</p>
<b>Blackberry</b>	A brand of personal digital assistant hardware; an email service; or the company that offers the hardware and service. The hardware/OS, which was originally a RIM

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	<p>product, is called a Blackberry and comes in a variety of form factors. Most notably, the Blackberry has a small keyboard for data input and offers standard personal information management capabilities. The Blackberry service is a live push email service, which may be controlled by a local server or a Blackberry company server.</p>
<b>Bluetooth</b>	<p>A computing and telecommunications industry specification that describes how mobile phones, computers, and personal digital assistants (PDAs) can easily interconnect with each other and with home and business phones and computers using a short-range wireless connection. Using this technology, users of cellular phones, pagers, and personal digital assistants such as the PalmPilot will be able to buy a three-in-one phone that can double as a portable phone at home or in the office, get quickly synchronized with information in a desktop or notebook computer, initiate the sending or receiving of a fax, initiate a print-out, and, in general, have all mobile and fixed computer devices be totally coordinated. Bluetooth requires that a low-cost transceiver chip be included in each device. The transceiver transmits and receives in a previously unused frequency band of 2.45 GHz that is available globally (with some variation of bandwidth in different countries). In addition to data, up to three voice channels are available. Each device has a unique 48-bit address from the IEEE 802 standard. Connections can be point-to-point or multipoint. The maximum range is 10 meters. Data can be exchanged at a rate of 1 megabit per second (up to 2 Mbps in the second generation of the technology). A frequency hop scheme allows devices to communicate even in areas with a great deal of electromagnetic interference. Built-in encryption and verification are provided. (serachMobileComputing.com)</p>
<b>Category 5e</b>	<p>Category 5e standard wiring. Also called Cat 5e.</p>
<b>CDPD</b>	<p>A wireless standard that provided two-way, 19.2 kbps packet data transmission over existing cellular telephone channels. A method proposed (1993) and developed by IBM and McCaw Cellular Communications, Inc. that was most recently owned by at&amp;t.) Replaced by Sprint PCS in 2004.</p>
<b>Chipset</b>	<p>Chipset is a group of integrated circuits designed to serve one or more related functions. It is manufactured and sold as a unit, for example, the input/output control chips of a motherboard. (Computeruser.com)</p>
<b>CICS</b>	<p>IBM mainframe application server that provides industrial-strength, online transaction management for mission-critical applications. On MVS/ESA, OS/390, VSE/ESA and z/OS. Thirty years old but repackaged to turn mainframes into Web servers.</p>
<b>CISC</b>	<p>Complex instruction set computer. A processor type in which each instruction can perform several low-level operations such as memory access, arithmetic operations or address calculations. For example, the Intel Pentium is a CISC design. (Modified from <a href="http://www.FOLDOC.org">www.FOLDOC.org</a>)</p>
<b>Cluster</b>	<ol style="list-style-type: none"><li>1) In a computer system, a cluster is a group of servers and other resources that act like a single system and enable high availability and, in some cases, load balancing and parallel processing. See clustering. [Clustering has been available since the 1980's with VAX and is called Sysplex in the IBM S/390 world.]</li><li>2) In personal computer storage technology, a cluster is the logical unit of file storage on a hard disk; it's managed by the computer's operating system. Any file stored on a hard disk takes up one or more clusters of storage. A file's clusters can be scattered among different locations on the hard disk. The clusters associated with a file are kept track of in the hard disk's file allocation</li></ol>

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	table (FAT). When you read a file, the entire file is obtained for you and you aren't aware of the clusters it is stored in. (Whatis.com)
<b>COM</b>	Component Object Model (Microsoft); also DCOM and DCOM+ for distributed systems
<b>Commercial off-the-shelf (COTS)</b>	Commercial off-the-shelf (COTS) is a term for software or hardware products that are ready-made and available for sale to the general public. They are often used as alternatives to in-house developments or one-off government-funded developments ( <a href="#">GOTS</a> ). The use of COTS is being mandated across many government and business programs, as they may offer significant savings in procurement and maintenance. Commercial off-the-shelf. <i>Wikipedia, The Free Encyclopedia</i> . Retrieved 18:10, January 11, 2006 from <a href="http://en.wikipedia.org">http://en.wikipedia.org</a>
<b>Common Internet File System (CIFS)</b>	Is a proposed standard protocol that lets programs make requests for files and services on remote computers on the Internet. CIFS uses the client/server-programming model. A client program makes a request of a server program (usually in another computer) for access to a file or to pass a message to a program that runs in the server computer. The server takes the requested action and returns a response. CIFS is a public or open variation of the Server Message Block Protocol ( <a href="#">SMB</a> ) developed and used by Microsoft. The SMB Protocol is widely used in today's local area networks for server file access and printing. Like the SMB protocol, CIFS runs at a higher level than and uses the Internet's TCP/IP protocol. CIFS is viewed as a complement to the existing Internet application protocols such as the File Transfer Protocol ( <a href="#">FTP</a> ) and the Hypertext Transfer Protocol (HTTP). CIFS lets you: <ul style="list-style-type: none"><li>○ Get access to files that are local to the server and read and write to them</li><li>○ Share files with other clients using special locks</li><li>○ Restore connections automatically in case of network failure</li><li>○ Use Unicode file names</li></ul> In general, CIFS gives the client user better control of files than the File Transfer Protocol. It provides a potentially more direct interface to server programs than currently available through the Web browser and its use of the HTTP protocol. CIFS is an Open Group standard, X/Open CAE Specification C209, and has been proposed to the Internet Engineering Task Force (IETF) as an Internet application standard. (Whatis.com)
<b>CORBA</b>	Common Object Request Broker Architecture. OMG's open, vendor-independent architecture and infrastructure that computer applications use to work together over networks.
<b>COTS</b>	Virginia's Council on Technology Services. COTS is a stakeholder-driven body, representing the interests and needs of the enterprise as a whole, including the Executive, Legislative, and Judicial branches of state government. The purpose of the Council is to advise the Chief Information Officer of the Commonwealth on the services provided by the Virginia Information Technologies Agency (VITA) and the development and use of applications in state agencies and public institutions of higher education ( <a href="http://www.vita.virginia.gov/councils/default.aspx?id=315">http://www.vita.virginia.gov/councils/default.aspx?id=315</a> ).
<b>CPI</b>	Common Program Interface. IBM's Systems Application Architecture API.
<b>CSS</b>	Cascading Style Sheets. An XML protocol used to control formatting of Web pages.
<b>DCE</b>	Distributed Computing Environment from Open Computing Group. Includes Remote Procedure Call (RPC), the Cell and Global Directory Services (CDS and GDS), the Security Service, DCE Threads, Distributed Time Service (DTS), and Distributed File Service (DFS).

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<b>DCOM +</b>	The Distributed Component Object Model. A set of Microsoft protocols that enable software components to communicate directly over a network.
<b>Digital Linear Tape (DLT)</b>	Is a form of magnetic tape and drive system used for computer data storage and archiving. A special compression algorithm, known as Digital Lempel Ziv 1 (DLZ1), facilitates storage and retrieval of data at high speeds and in large quantities. In the DLT drive, data is written on the tape in dozens of straight-line (linear) tracks, usually 128 or 208. Some cartridges can hold 70 gigabytes (GB) of data when compression is used. A variant of DLT technology, called SuperDLT, makes it possible to store upwards of 100 GB on a single cartridge. The SuperDLT drive can transfer data at speeds of up to 10 megabytes per second (Mbps). (searchStorage.com)
<b>DNS</b>	Domain name system. A general-purpose, distributed, replicated, data query service chiefly used for Internet communications for translating hostnames into IP addresses.
<b>Domain, Enterprise Technical Architecture</b>	The Enterprise Technical Architecture (ETA) is typically divided into logical groups of related technologies and components, referred to as “domains”. The purpose of a Domain Architecture is to provide a combination of domain principles, best practices, reusable methods, products, and configurations that represent “reusable building blocks”. Thus, the Domain Architecture provides the technical components within the Enterprise Architecture that enable the business strategies and functions. Note, the Conceptual Architecture serves as the foundation for the Domain Architectures, and ensures that they are aligned and compatible with one another. <sup>21</sup>
<b>DS3</b>	A signal with a transmission rate of 44.736 Mbps (672 voice channels) provided over T3.
<b>DSSS</b>	Direct Sequence Spread Spectrum. A method of providing wireless connectivity as specified in IEEE 802.11b.
<b>DTD</b>	Document Type Definition. An XML protocol for communicating tagging standards that will be used in an XML communication. The definition of a document type in SGML or XML, consisting of a set of mark-up tags and their interpretation.
<b>EAI</b>	Enterprise Application Integration. The use of technology to integrate the application programs, databases, and legacy systems involved in an organization's critical business processes.
<b>EBCDIC</b>	Extended Binary Coded Decimal Interchange Code. IBM's 8-bit extension of the 4-bit Binary Coded Decimal encoding of digits 0-9 (0000-1001).
<b>ebXML</b>	ebXML is a set of specifications that together enable a modular electronic business framework. The vision of ebXML is to enable a global electronic marketplace where enterprises of any size and in any geographical location can meet and conduct business with each other through the exchange of XML based messages. ebXML is a joint initiative of the United Nations (UN/CEFACT) and OASIS, developed with global participation for global usage
<b>EIA</b>	The Electronic Industries Alliance (EIA) is a non-profit organization that functions as an association of other organizations, one of which is TIA, EIA's communications arm. The EIA is certified by ANSI to develop standards. The EIA is well known for having produced certain electrical wiring and data transmission

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<sup>21</sup> COTS Enterprise Architecture Workgroup, “*Commonwealth of Virginia Enterprise Architecture – Common Requirements Vision*”, v1.1, December 5, 2000, p 26.

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	<p>standards. Standards are just one part of the organization’s mission, however. The EIA often jointly recommends standards with the Telecommunications Industry Association (TIA). An example standard put forth by both groups is EIA/TIA-232 (also known as EIA-232 and RS-232). This standard establishes how two devices communicate—for example, via the 9 and 25 pin connectors still commonly used on PCs along with USB connectors.</p>
<b>Emerging</b>	<p>Rating category used in this document to rate integration technologies. This technology requires additional evaluation in government and university settings. This technology may be used for evaluative or pilot testing deployments or in a higher education research environment. Any use, deployment or procurement of this technology beyond higher education research environments requires an approved <i>Commonwealth Enterprise Technical Architecture Exception</i>. The results of an evaluation or pilot test deployment should be submitted to the <b>VITA Strategic Management Services: Policy, Practice and Architecture Division</b> for consideration in the next review.</p>
<b>Enterprise</b>	<p>As used in this document and generally when discussing Enterprise Architecture topics, the <i>enterprise</i> consist of all Commonwealth of Virginia agencies as defined by the General Assembly.</p>
<b>ERwin</b>	<p>A database design and optimization tool from Computer Associates.</p>
<b>ESCON (Enterprise Systems Connection)</b>	<p>Is a marketing name for a set of IBM and vendor products that interconnect S/390 computers with each other and with attached storage, locally attached workstations, and other devices using optical fiber technology and dynamically modifiable switches called ESCON Directors. In IBM mainframes, the local interconnection of hardware units is known as channel connection (and sometimes as local connection to distinguish it from remote or telecommunication connection). ESCON's fiber optic cabling can extend this local-to-the-mainframe network up to 60 kilometers (37.3 miles) with chained Directors. The data rate on the link itself is up to 200 Mbps (million bits per second) and somewhat less when adapted to the channel interface. Vendor enhancements may provide additional distance and higher amounts of throughput. ESCON may be used for a SAN. (search390.com)</p>
<b>ESMR</b>	<p>Enhanced Specialized Mobile Radio (ESMR) is a wireless communication system in which numerous mobile/portable transceivers are linked in a network of repeaters. Each repeater has a range of approximately 5 to 10 miles. Operating frequencies are in the UHF (ultra-high-frequency) range, that is, between approximately 300 MHz and 3 GHz. Usually, the working band is near 900 MHz.</p> <p>ESMR can function like its fundamentally simpler cousin, SMR, but it can also offer features similar to those of a cellular telephone network. The PTT (push-to-talk), half-duplex mode can be used; in this case the operation resembles communications between old style two-way radios. Full-duplex mode can also be used, so either party can listen and talk at the same time. Interconnection with the telephone networks is commonly done. In addition to voice communication, an ESMR system can offer paging, wireless fax, and data transmission.</p> <p>ESMR systems use digital radio transmission. Spread-spectrum modes, such as frequency hopping, are common. In a well-designed ESMR system, connection is almost instantaneous, compared with the typical 15 to 20 seconds required to dial and set up a call in a public cellular network. The coverage of an ESMR system depends on the geographical distribution and needs of the users. Some systems are confined to single municipalities; others cover selected groups of metro areas; others operate over entire states or regions of a country.</p>

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	Examples of ESMR networks include Ericsson's EDACS (Enhanced Digital Access Communications System), Motorola's IDEN (Integrated Dispatch Enhanced Network), and the Sprint Nextel System. (Adapted from Whatis.com).
<b>ESMTP</b>	Extended SMTP. Initially defined in RFC 1869 and extended thereafter
<b>ETA</b>	The Enterprise Architecture has business and technical components. All of the technical components taken together are called the Enterprise Technical Architecture.
<b>Ethernet</b>	A local-area network (LAN) protocol that is specified in IEEE 802.3 and that uses CSMA-CD to provide 10 Mbps service over copper. Switched Ethernet provides faster service (e.g., 100 Mbps Ethernet, 10GigE). Gigabit (Gb) and 10 Gb Ethernet service are now possible. Gb Ethernet is used mainly for backbone services and wide area networking.
<b>Extensible</b>	Quality of a system that allows new features and functions to be added to it.
<b>Fabric</b>	n., A term used to reference a switching system such as a SAN system, an ATM system or a Frame Relay system. The term, fabric, is used to indicate the complex interplay of hardware and software in the switching process that may involve numerous paths. Switching fabric. adj., A member or element belonging to a defined network or switching system. A fabric element.
<b>FC-IP</b>	Fibre Channel Internet Protocol, a Fibre Channel Block wrapped in an IP packet.
<b>FHSS</b>	Frequency Hopping Spread Spectrum. A method of providing wireless connectivity as specified in IEEE 802.11.
<b>Fiber Channel Arbitrated Loop (FC-AL)</b>	<p>A fast serial bus interface standard intended to replace SCSI on high-end servers. FC-AL has a number of advantages over SCSI. It offers higher speed: the base speed is 100 megabytes per second, with 200, 400, and 800 planned. Many devices are dual ported, i.e., can be accessed through two independent ports, which doubles speed and increases fault tolerance. Cables can be as long as 30 m (coaxial) or 10 km (optical). FC-AL enables self-configuring and hot swapping and the maximum number of devices on a single port is 126. Finally, it provides software compatibility with SCSI.</p> <p>Despite all these features FC-AL is unlikely to appear on desktops anytime soon, partly because its price, partly because typical desktop computers would not take advantage of many of the advanced features. On these systems FireWire has more potential. (FOLDOC)</p>
<b>FICON (Fiber Connectivity)</b>	<p>Is a high-speed input/output (I/O) interface for mainframe computer connections to storage devices. As part of IBM's S/390 server, FICON channels increase I/O capacity through the combination of a new architecture and faster physical link rates to make them up to eight times as efficient as ESCON (Enterprise System Connection), IBM's previous fiber optic channel standard. FICON channel features include:</p> <ul style="list-style-type: none"><li>○ A mapping layer based on the ANSI standard Fibre Channel-Physical and Signaling Interface (FC-PH), which specifies the signal, cabling, and transmission speeds</li><li>○ 100 Mbps bi-directional link rates at distances of up to twenty kilometers, compared to the 3Mbps rate of ESCON channels at distances of up to three kilometers.</li><li>○ More flexibility in terms of network layout, because of the greater distances</li><li>○ Compatibility with any installed channel types on any S/390 G5 server</li></ul>

- Bridge feature, which enables support of existing ESCON control units
- Requires only one channel address
- Support for full-duplex data transfer, which enables simultaneous reading and writing of data over a single link-multiplexing, which enables small data transfers to be transmitted with larger ones, rather than having to wait until the larger transaction is finished (searchStorage.com)

**File Service**

The process of storing and retrieving files (as opposed to blocks of data).

**File Transfer Protocol (FTP)**

A client-server protocol that allows a user on one computer to transfer files to and from another computer over a TCP/IP network. Also, used to reference the client program that the user executes to transfer files. It is defined in STD 9, RFC 959. (FOLDOC)

**Firewall**

A dedicated gateway machine with special security precautions on it, used to service outside network, especially Internet, connections and dial-in lines. The idea is to protect a cluster of more loosely administered machines hidden behind it from crackers. The typical firewall is an inexpensive microprocessor-based Unix machine with no critical data, with modems and public network ports on it, but just one carefully watched connection back to the rest of the cluster. The special precautions may include threat monitoring, call-back, and even a complete iron box keyable to particular incoming IDs or activity patterns. Firewalls often run proxy gateways.

**FireWire**

A high performance serial bus (or IEEE 1394). FireWire is a 1995 Macintosh/IBM PC serial bus interface standard offering high-speed communications and isochronous real-time data services. 1394 can transfer data between a computer and its peripherals at 100, 200, or 400 Mbps, with a planned increase to 2 Gbps. Cable length is limited to 4.5 m but up to 16 cables can be daisy-chained yielding a total length of 72 m. It can daisy chain together up to 63 peripherals in a tree-like structure (as opposed to SCSI's linear structure). It allows peer-to-peer device communication, such as communication between a scanner and a printer, to take place without using system memory or the CPU. It is designed to support plug-and-play and hot swapping. Its six-wire cable is not only more convenient than SCSI cables but can supply up to 60 watts of power, allowing low-consumption devices to operate without a separate power cord. Some expensive camcorders have included this bus since autumn 1995. It is expected to be used to carry SCSI, with possible application to home automation using repeaters. (FOLDOC)

**Flash Memory**

A non-volatile memory device that retains its data after the power is removed. (www.crucial.com)

**Frame Relay**

A data communications interface that provides high speed transmission with minimum delay and efficient use of bandwidth. It does not have error detection or error control and it assumes that connections are reliable.

**FRASI**

Frame Relay to Asynchronous Transfer Mode (ATM) service internetworking

**GB, Gb**

Gigabyte, Gigabit

**GDS**

Global Directory Services, such as DNS and GDS (X.500), grew out of the computer industry's need to reference objects in distributed networks across an entire enterprise and worldwide.

**GIS**

Geographic Information System.

**GPRS**

General Packet Radio Services (GPRS) is a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users. The data rates will allow users to take part in video conferences and interact with multimedia Web sites and similar

applications using mobile handheld devices as well as notebook computers. GPRS is based on Global System for Mobile (GSM) communication and will complement existing services such circuit-switched cellular phone connections and the Short Message Service (SMS).

In theory, GPRS packet-based service should cost users less than circuit-switched services since communication channels are being used on a shared-use, as-packets-are-needed basis rather than dedicated only to one user at a time. It should also be easier to make applications available to mobile users because the faster data rate means that middleware currently needed to adapt applications to the slower speed of wireless systems will no longer be needed. As GPRS becomes available, mobile users of a virtual private network (VPN) will be able to access the private network continuously rather than through a dial-up connection.

GPRS will also complement Bluetooth, a standard for replacing wired connections between devices with wireless radio connections. In addition to the Internet Protocol (IP), GPRS supports X.25, a packet-based protocol that is used mainly in Europe. GPRS is an evolutionary step toward Enhanced Data GSM Environment (EDGE) and Universal Mobile Telephone Service (UMTS). (Modified from Whatis.com)

**GSM**

- 3) *Groupe Spéciale Mobile*—the European standards group for wireless connectivity.
- 4) Digital cellular telephone standard developed by the European Telecommunications Standards Institute's (ETSI) *Groupe Spécial Mobile*. Also used in some Middle Eastern countries and parts of Australia. The frequencies allocated to the service are divided into 200-kHz blocks, each of which supports eight simultaneous users (by using a form of [TDMA](#) that lets a handset transmit a few bytes of data or digitized voice, 217 times per second).

**High-end Servers**

In this report, defined as servers with a greater than 16 processor scale-up limit and typically costing more than \$250,000.

**Host**

The term "host" is used in several contexts, in each of which it has a slightly different meaning:

- 1) In Internet protocol specifications, the term "host" means any computer that has full two-way access to other computers on the Internet. A host has a specific "local or host number" that, together with the network number, forms its unique IP address. If you use Point-to-Point Protocol to get access to your access provider, you have a unique IP address for the duration of any connection you make to the Internet and your computer is a host for that period. In this context, a "host" is a node in a network.
- 2) For companies or individuals with a Web site, a host is a computer with a Web server that serves the pages for one or more Web sites. A host can also be the company that provides that service, which is known as hosting.
- 3) In IBM and perhaps other mainframe computer environments, a host is a mainframe computer (which is now usually referred to as a "large server"). In this context, the mainframe has intelligent or "dumb" terminals (or emulation) attached to it that use it as a host provider of services. (The server/client relationship is a programming model independent of this contextual usage of "host.")
- 4) In other contexts, the term generally means a device or program that provides services to some smaller or less capable device or program. (Whatis.com)

**HSDPA**

High Speed Downlink Packet Access (HSDPA) is a UMTS packet-based broadband data service feature of the WCDMA standard. HSDPA provides an improved

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	<p>downlink for the UMTS data service. It improves speed and system capacity by making better use of the bandwidth. Data transmission speeds are up to 8-10 Mbps over a 5 MHz bandwidth or more than 20 Mbps for systems that use multiple transmitters and receivers (Multiple Input Multiple Output or MIMO systems (802.11n)). The high speeds of HSDPA are achieved through techniques including 16 Quadrature Amplitude Modulation, variable error coding, and incremental redundancy. HSDPA use requires technology upgrades to sending and receiving devices in UMTS networks. This broadband service is provided by Cingular in limited locations in 2006.</p>
<b>HTML</b>	HyperText Markup Language – A subset of SGML. A W3C standard for formatting Web pages.
<b>HTTP</b>	HyperText Transfer Protocol. The protocol used on the World-Wide Web for the exchange of HTML documents. It conventionally uses port 80.
<b>HTTP MPOST and HTTP POST</b>	“A SOAP request can use HTTP's POST verb. In fact, however, the protocol requires that the first request to a server is made using M-POST. M-POST is a new HTTP verb defined using the HTTP Extension Framework ( <a href="http://www.w3.org/Protocols/HTTP/ietf-http-ext">http://www.w3.org/Protocols/HTTP/ietf-http-ext</a> ). If a request made using M-POST fails, the client can try again using a standard POST request. (In this case, future requests can also use POST because the server obviously doesn't support M-POST.) M-POST allows sending HTTP headers that can't be sent via the standard POST verb, providing more flexibility for SOAP users. Firewalls can even force the use of M-POST if desired, by simply refusing all HTTP POSTs with a content type of "text/xml-SOAP".
<b>Hub</b>	A LAN wiring concentrator that connects cables from numerous network devices. An intelligent hub can monitor and report on network activity, typically using SNMP.
<b>Hypertext</b>	Hypertext is text that contains links to other text
<b>Hyper-threading</b>	<p>A term used by Intel to describe multithreading functionality in a chipset that may be turned on and off. Some argue that an enterprise should turn the capability off until they are able to determine whether it results in a performance boost or drop for the type of processing they need. The following definition is from Intel:</p> <p>Hyper-Threading Technology allows two threads (or parts of a software program) to execute simultaneously on a single Pentium 4 processor. A Hyper-Threading Technology-aware operating system such as Microsoft Windows* XP Professional "sees" two virtual processors, instead of a single physical Pentium 4 processor. By using resources that might otherwise sit idle, the Pentium 4 Processor with Hyper-Threading Technology delivers noticeable performance increases over current software in a multitasking environment, no code modifications needed.</p>
<b>I/O</b>	Input/Output
<b>IANA</b>	The central registry for various "assigned numbers": Internet Protocol parameters, such as port, protocol, and enterprise numbers; and options, codes, and types. The currently assigned values are listed in the "Assigned Numbers" document STD 2. To request a number assignment, e-mail <iana@isi.edu>.
<b>IDL</b>	Interface Definition Language defined by OMG is a language for describing the interfaces of software objects. Various Vendors have their own version of IDL (e.g., MIDL by Microsoft).
<b>IEEE</b>	Institute of Electrical and Electronics Engineers, Inc. – A standards group for

	communications. <a href="http://www.ieee.org">www.ieee.org</a>
<b>IETF</b>	Internet Engineering Taskforce. A standards group that works on Internet architectural issues.
<b>IIOB</b>	Internet Inter-ORB Protocol. A protocol that defines a way for Remote Procedure vendor to map messages to the TCP network communication protocol.
<b>IMAP</b>	Internet Message Access Protocol. It permits a "client" email program to access remote message stores as if they were local.
<b>IMS</b>	The IP Multimedia Subsystem (IMS) is a next-generation network for carriers from the 3GPP that uses the IP protocol as its foundation. IMS supports data, video, SIP-based voice over IP (VoIP) and non-SIP packetized voice, such as H.323 and MGCP. IMS was designed to integrate with the PSTN and provide traditional telephony services such as 800 numbers, caller ID and local number portability. (Adapted from PCMag.com).
<b>InfiniBand (IB)</b>	InfiniBand is a switched fabric communications link primarily used in high-performance computing. Its features include quality of service and failover, and it is designed to be scalable. The InfiniBand architecture specification defines a connection between processor nodes and high performance I/O nodes such as storage devices. It is a superset of the Virtual Interface Architecture. (Wikipedia.org)
<b>Infrared</b>	Electromagnetic waves in the frequency range just below visible light corresponding to radiated heat.
<b>Integrated Services Digital Network (ISDN)</b>	A set of communications standards allowing a single wire or optical fiber to carry voice, digital network services and video
<b>Intel XEON</b>	The Intel® Xeon™ processor MP family is designed specifically for mid-tier servers performing key business functions such as collaboration, application serving, enterprise resource planning, and business intelligence. The Intel Xeon processor MP features <a href="#">Hyper-Threading</a> technology, Integrated Three-Level cache architecture and Intel® NetBurst™ microarchitecture. The Intel® Xeon™ Processor is designed for dual-processor server and workstation platforms. It does not have the three-level cache.
<b>Interface Repository</b>	Interface Repository. The interface repository is part of object-oriented integration. It contains the definitions of all the services that objects can provide. The definitions form the contract by which a client can invoke requests upon a server object.
<b>International Telecommunication Union (ITU)</b>	An intergovernmental organization through which public and private organizations develop telecommunications.
<b>Internet</b>	<ol style="list-style-type: none"><li>1) A wide area network connecting disparate networks world wide.</li><li>2) An international network of millions of web sites that uses TCP/IP.</li></ol>
<b>Internet Engineering Task Force (IETF)</b>	A large, open, international community of network designers, operators, vendors, and researchers concerned with the evolution of the Internet architecture and the smooth operation of the Internet. IETF is generally recognized as the standards organization for the Internet.
<b>Internet Protocol (IP)</b>	a communications protocol, which routes packets of data from one address on the Internet to another. IPv4 routes each packet based on a 32-bit destination address called an IP address (e.g., 123.122.211.111).

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<b>Internetworking</b>	A term used by Cisco, BBN, and other providers of network products and services as a comprehensive term for all the concepts, technologies, and generic devices that allow people and their computers to communicate across different kinds of networks. (searchNetworking.com)
<b>IP</b>	Internet Protocol. A network addressing protocol. Two versions are defined: IPv4 and IPv6.
<b>IP address</b>	An identifier for a computer or device on a TCP/IP network. Networks using the TCP/IP protocol to route messages based on the IP address of the destination. The format of an IP address is a 32-bit numeric address written as four numbers separated by periods. Each number can be zero to 255. For example, 1.160.10.240 could be an IP address. Within an isolated network, you can assign IP addresses at random as long as each one is unique. However, connecting a private network to the Internet requires using registered IP addresses (called Internet addresses) to avoid duplicates.
<b>IPv4</b>	Four octet 32 bit IP address in the form 255.255.255.255
<b>IPv6</b>	Sixteen octet 128 bit IP address. For a discussion and comparison with IPv4 see NCS <a href="http://en.wikipedia.org/wiki/Ipv6">http://en.wikipedia.org/wiki/Ipv6</a> .
<b>IrDA</b>	Infrared Data Association – is an industry-sponsored organization set up in 1993 to create international standards for the hardware and software used in infrared communication links. An IrDA port is an infrared port. In this special form of radio transmission, a focused ray of light in the infrared frequency spectrum, measured in terahertz, or trillions of hertz (cycles per second), is modulated with information and sent from a transmitter to a receiver over a relatively short distance. Infrared radiation (IR) is the same technology used to control a TV set with a remote control. Infrared data communication is playing an important role in wireless data communication due to the popularity of laptop computers, personal digital assistants (PDAs), digital cameras, mobile telephones, pagers, and other devices. Infrared communication involves a transceiver (a combination transmitter and receiver) in both devices that communicate. IR can be also be used for somewhat longer interconnections and is a possibility for interconnections within local area networks. The maximum effective distance is somewhat less than 1.5 miles and the maximum projected bandwidth is 16 megabits per second. Since IR is line-of-sight light transmission, it is sensitive to fog and other atmospheric conditions. (searchMobileComputing.com)
<b>iSCSI</b>	Internet Small Computer System Interface – a protocol for transmitting a SCSI block wrapped in an IP packet.
<b>ISO</b>	International Standards Organization.
<b>IT</b>	Information Technology
<b>ITIB</b>	Information Technology Investment Board – created by the General Assembly to perform “agency head” roles for the Virginia Information Technologies Agency.
<b>ITRM</b>	Information Technology Resource Management – identifier used to indicate official IT policies, standards, and guidelines permitted by the Virginia General Assembly for the control and management of IT resources in the Commonwealth.
<b>J2EE</b>	Java 2 Enterprise Edition. The distributed version of Sun’s Java platform with Enterprise JavaBeans™ (EJB™), JavaServer Pages™ (JSP™) and Java Servlet API component technologies.
<b>Java</b>	Portable language from Sun designed to run on any machine with a Java Virtual

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	Machine interpreter.
<b>Jaz Drive</b>	Iomega Corporation's drive, which takes removable one or two gigabyte disk cartridges that contain conventional hard disks.
<b>JDAP</b>	Java Directory Access Protocol --an implementation of the Lightweight Directory Access Protocol.
<b>JDBC</b>	Java Database Connectivity is a standard SQL database access interface. It comes with an ODBC bridge.
<b>LDAP</b>	Lightweight Directory Access Protocol. A protocol for accessing on-line directory services. LDAP was defined by the IETF to encourage adoption of X.500 directories. The Directory Access Protocol (DAP) was seen as too complex for simple Internet clients to use. LDAP defines a relatively simple protocol for updating and searching directories running over TCP/IP.
<b>Linear Tape Open (LTO)</b>	An open standard for a backup tape system, which provides formats for both fast data access and high storage capacity, developed jointly by Hewlett-Packard, IBM, and Seagate. IBM released the first LTO products in August, 2000. Like existing tape systems, LTO uses a linear multi-channel bi-directional format. LTO adds to existing technologies timing-based servo (a device that automates a process of error correction for a mechanism), hardware data compression, enhanced track layouts, and efficient error correction code. LTO was developed in two different formats - one for fast data access and another for greater storage capacity. The Accelis format uses 8mm-wide tape on a two-reel cartridge that loads at the mid-point of the tape to provide fast data access, specifically for read-intensive applications, such as online searches and retrieval functions. The Ultrium format uses a single reel of half-inch wide tape to maximize storage capacity, specifically for write-intensive applications, such as archival and backup functions. Early products using the Accelis format offer a 25 gigabyte capacity for uncompressed data, while Ultrium based-products offer a 100 gigabyte capacity. Both formats provide transfer rates of 10 - 20 Mbps. While these figures are not unheard of in other technologies, LTO specifications include plans for expected increases that will double current rates with each of the next three generations of products.
<b>Linux</b>	a Unix-like operating system that was designed to provide personal computer users a free or very low-cost operating system comparable to traditional and usually more expensive Unix systems. Linux has a reputation as a very efficient and fast-performing system. Linux's kernel (the central part of the operating system) was developed by Linus Torvalds at the University of Helsinki in Finland. To complete the operating system, Torvalds and other team members made use of system components developed by members of the Free Software Foundation for the GNU Project. Linux is a remarkably complete operating system, including a graphical user interface, an X Window System, TCP/IP, the Emacs editor, and other components usually found in a comprehensive Unix system. Although copyrights are held by various creators of Linux's components, Linux is distributed using the Free Software Foundation's copyleft stipulations that mean any modified version that is redistributed must in turn be freely available. (searchEnterpriseLinux.com)
<b>Load Balancing</b>	Load balancing means that requests from clients are distributed across available servers to achieve better utilization of computing resources. In general, load balancing can be based on network traffic, CPU load, relative power of the server, size of the server's request queue, a simple round robin method, or other mechanisms.
<b>Local Area Network (LAN)</b>	A private computer network generally on a user's premises and operated within a limited geographical area.

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<b>Loosely Coupled</b>	Architectures based on publish/subscribe communications can provide a lightweight and resilient foundation for applications that do not require tight coordination.
<b>MagStar</b>	A family of IBM proprietary tape equipment and products.
<b>MAN</b>	A Metropolitan Area Network (MAN) is a network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network (LAN) but smaller than the area covered by a wide area network (WAN). The term is applied to the interconnection of networks in a city into a single larger network (which may then also offer efficient connection to a wide area network). It is also used to mean the interconnection of several local area networks by bridging them with backbone lines. The latter usage is also sometimes referred to as a campus network. (Adapted from Whatis.com).
<b>MAPI</b>	Messaging Application Programming Interface. A protocol used to write components that connect to different mail servers, provide access to custom address books and provide rich storage facilities.
<b>MDC</b>	Meta Data Coalition
<b>Metadata (also Meta data)</b>	Data about data that makes the process of finding and using data easier.
<b>Metropolitan Area Network (MAN)</b>	See MAN.
<b>Midrange to Low-end Servers</b>	In this report, servers costing \$50, 000 or less are typical midrange to low-end servers. These servers would usually have one to four processors, but could have as many as 8 or 16 processors. When the midrange computer is a scaled-down version of a high-end server, it may cost substantially more.
<b>MIME</b>	Multipurpose Internet Mail Extensions. An official Internet standard that specifies how messages must be formatted so that they can be exchanged between different email systems.
<b>Mirroring</b>	Writing the same data in two locations.
<b>Mobile</b>	The ability to move around, it also refers to anything that can be moved around (or transported) and still functioning properly. It usually describes handheld devices, such as PDAs and cell phones (that is, mobile phones), but it can also refer to notebooks or other portable devices. (netlingo.com)
<b>Mobitex</b>	Mobitex is an open, international standard. It is a packet-switched, narrowband, data only technology suited for applications like interactive messaging, e-mails, telemetry, telematics/positioning, alarms and form-based applications. <a href="http://www.mobitex.com/">http://www.mobitex.com/</a> .
<b>MOM</b>	Message Oriented Middleware delivers messages from one software module to another. Modules do not have to execute on the same machine. Analogous to the US Mail. The mail is typically delivered when you're at work; you pick it up at your convenience.
<b>Monolithic Application</b>	An application that is entirely installed on one machine.
<b>Mozilla</b>	Mozilla was the original code name for the product that came to be known as Netscape Navigator, and later, Netscape Communicator. Later, it came to be the name of Netscape Communications Corporation's dinosaur-like mascot. Netscape Communications Corporation holds trademarks on the names Netscape, Navigator, and Communicator; it has not yet been decided what, if any, restrictions Netscape

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	<p>will place on the use of those names. Now, they use the name "Mozilla" as the principal trademark representing the Foundation and the official releases of internet client software developed through our open source project. This organization produced Firefox, Bugzilla, Camino (Mac browser), Thunderbird (email), Mozilla Suite, and is also working on a Calendaring solution. (adapted from Mozilla.org)</p>
<b>MPLS</b>	<p>Multiprotocol Label Switching (MPLS) is a communications technology for speeding up wide-area network traffic flow and making it easier to manage. This technology is typically a backbone technology provided by a carrier. MPLS involves setting up a specific path for a given sequence of packets, identified by a label put in each packet, thus saving the time needed for a router to look up the address to the next node for packet forwarding. MPLS is called multiprotocol because it works with the Internet Protocol (IP), Asynchronous Transport Mode (ATM), and frame relay network protocols. With reference to the standard model for a network (the Open Systems Interconnection, or OSI model), MPLS allows most packets to be forwarded at the layer 2 (switching) level rather than at the layer 3 (routing) level. In addition to moving traffic faster overall, MPLS makes it easy to manage a network for quality of service (QoS). (Adapted from Whatis.com).</p>
<b>MTA</b>	<p>Message Transfer Agent. The internal component of an e-mail delivery system, responsible for mail collection from and distribution to MUAs, and relay of mail between e-mail post offices. Also called e-mail server.</p>
<b>MUA</b>	<p>Mail User Agent. Primary entry and exit point for an e-mail system. Also called an e-mail client.</p>
<b>Multi-threading</b>	<p>Sharing a single CPU between multiple tasks (or "threads") in a way designed to minimize the time required to switch threads.</p>
<b>Naming Service</b>	<p>Naming service refers to the ability of application programs to locate application components offered by other applications in a distributed environment. Typical naming service should support registration of services in the naming service and their subsequent location through the naming service.</p>
<b>NDS</b>	<p>Netware Directory Services. A hierarchical, class-based directory structure for accessing network resources.</p>
<b>Network</b>	<ol style="list-style-type: none"><li>1) A configuration of data processing devices and software connected for information interchange.</li><li>2) A group of two or more computer systems linked together.</li></ol>
<b>Nonvolatile Memory</b>	<p>A memory that retains information if power is removed and then reapplied. SRAM or static random access memory and flash memory are examples of nonvolatile memory (<a href="http://www.crucial.com">www.crucial.com</a>)</p>
<b>N-tier</b>	<p>Describes a method of dividing an application into three or more physical or logical tiers to provide for ease of maintenance and flexibility. Any architecture that utilizes a 3-tier architecture, which componentizes one or more of the logical tiers is said to be n-tier. Typically this componentization occurs in the business rule tier, however this is not a requirement. An n-tiered application is designed to integrate a diverse collection of reusable, component based services into a unified system. The layers may operate in multiple configurations, using any number of physical systems. This architecture provides a flexible and scalable solution for meeting the State's current and future requirements.</p>
<b>Obsolescent</b>	<p>Rating category used in this document to rate integration technologies. This technology may be waning in use and support, and/or has been evaluated and found not to meet current Commonwealth Technical Architecture needs. Agencies shall</p>

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	not make any procurements or additional deployments of this technology. Agencies currently using this technology should plan for its immediate replacement with “strategic” technology to avoid substantial risk. The migration or replacement plan should be included as part of the Agency’s IT Strategic Plan.
<b>ODBC</b>	Open Data Base Connectivity. ODBC is based on Call-Level Interface and was defined by the SQL Access Group. Microsoft was one member of the group and was the first company to release a commercial product based on its work (under Microsoft Windows) but ODBC is not a Microsoft standard.
<b>OLE</b>	Object Linking and Embedding. The software capability that enables the creation of a compound document that contains one or more objects from one or more applications. Objects can be linked or embedded in the compound document. Changes to linked objects are reflected in the source and vice versa. Embedding objects breaks all links.
<b>OLED Displays</b>	Organic Light-Emitting Diode – Monochrome and color displays with no backlights and thus more power efficient. A display technology, pioneered and patented by Kodak, based on the use of organic polymer material as the semiconductor material in light-emitting diodes (LEDs). A polymer can be a natural or synthetic substance and macro or micro in size. Examples of organic polymers include proteins and DNA. OLED displays are used in cellular phones, digital video cameras, digital versatile disc (DVD) players, personal digital assistants (PDAs), notebooks, car stereos, and televisions. OLED displays are thinner and weigh less because they do not require backlighting. OLED displays also have a wide viewing angle up to 160 degrees even in bright light, and they use only two to ten volts to operate. New technologies that build on the OLED include FOLED (flexible organic light-emitting display), which promises to make highly portable, roll-up displays possible within the next few years.
<b>OLE-DB</b>	Microsoft's interface to data. OLE-DB is an open specification designed to build on the success of ODBC by providing an open standard for accessing all kinds of data.
<b>OMG</b>	Object Management Group. A consortium aimed at setting standards in object-oriented programming.
<b>ONC+ RPC</b>	Open Network Computing (Sun) Remote Procedure Call. A remote procedure call or function call protocol developed by Sun.
<b>Open Group</b>	The Open Group is a standards development and product approval consortium. “The Open Group's Mission is to offer all organizations concerned with open information infrastructures a forum where we can share knowledge, integrate open initiatives, and certify approved products and processes in a manner in which they continue to trust our impartiality.”
<b>Open Standards</b>	Standards that are available for all vendors to use in product development.
<b>Operational Data Store</b>	According to Bill Inmon, an operational data store (ODS) is a subject-oriented, integrated, volatile, current-valued, detailed-only collection of data in support of an organization's need for up-to-the-second, operational, integrated, collective information. (Wikipedia.com)
<b>ORB</b>	Object Request Broker. A software tool that enables the location of and access to objects in a distributed system.
<b>ORCA</b>	<u>O</u> nline <u>R</u> eview and <u>C</u> omment <u>A</u> pplication is a web based application managed by VITA to allow public comment and review of proposed policies, standards, and guidelines. ORCA may be accessed through the Commonwealth Project Management Web page or by pointing your Web browser to the URL

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	<a href="http://apps.vita.virginia.gov/publicORCA">http://apps.vita.virginia.gov/publicORCA</a> .
<b>OSI Reference Model</b>	Open System Interconnect seven layer model. A model of network architecture and a suite of protocols (a protocol stack) to implement it, developed by ISO in 1978 as a framework for international standards in heterogeneous computer network architecture. The OSI architecture is split between seven layers, from lowest to highest: 1 physical layer, 2 data link layer, 3 network layer, 4 transport layer, 5 session layer, 6 presentation layer, 7 application layer. Each layer uses the layer immediately below it and provides a service to the layer above. In some implementations, a layer may itself be composed of sub-layers.
<b>Packet</b>	A collection of payload data and transport information that is transmitted as a bundle across a network connection.
<b>PAN</b>	A Personal Area Network (PAN) or Wireless Personal Area Network (WPAN) is the set of transmission technologies used by a person for interconnecting devices they use in a home, in a workplace, in the car, in the gym, or in a mobile setting. Typically, a wireless personal area network uses one or more technologies that permit communication within about 10 meters - in other words, a very short range. One such technology is Bluetooth, which is the basis for IEEE 802.15. A PAN could interconnect all the ordinary computing and communications devices that many people have on their desk or carry with them today - or it could serve a more specialized purpose such as allowing the surgeon and other team members to communicate during an operation. (Adapted from Whatis.com).
<b>PBX</b>	Private Branch Exchange – a premises voice switch.
<b>PC Card</b>	PCMCIA device or slot.
<b>PCI</b>	Peripheral Component Interconnect – A standard for connecting peripherals to a personal computer or components within a computer, designed by Intel and released in 1993. PCI is supported by most major manufacturers. The technology is usually called a bus but is in fact a bridge.
<b>PCI Express (PCI X)</b>	Developed by the PCI-SIG industry group to extend the PCI bus to meet the present and future computing and communications interconnect requirements, PCI Express is suitable for both chip-to-chip and add-in card implementations. The packetized protocol and layered architecture of the standard enables attachment to copper, optical, or emerging physical signaling media.
<b>PCMCIA</b>	Personal Computer Memory Card International Association – A PC Card. An international trade association and the standards they have developed for devices, such as modems and external hard disk drives that can be plugged into notebook computers. A PCMCIA card is about the size of a credit card.
<b>PCS</b>	Sprint’s Personal Communications Services. It operates in the 1.9 MHz band. It is not a cellular service. (600mhz, 900mhz)
<b>PDA</b>	Personal Digital Assistant – A small hand-held computer typically providing calendar, contacts, and note-taking applications but may include other applications, for example a web browser and media player. Small keyboards and pen-based input systems are most commonly used for user input.
<b>PKI</b>	Public Key Infrastructure. A way to distribute security and encryption keys.
<b>POA</b>	Portable Object Adapter standard. An adapter that is written using IDL.
<b>POP3</b>	Post Office Protocol version 3. The most common protocol used by MUAs to retrieve mail from a central message store (messaging server). Most commercial Internet Mail post office products include a POP3 server. IMAP is typically a better

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	choice than POP3 for unified messaging.
<b>Productivity Software</b>	Software typically used by business professionals such as word processing, spreadsheets, presentation slides, web browsers, and plug ins. Also includes lesser used software such as personal database software, flowcharting, project management.
<b>Protocol</b>	A set of rules. For example, network protocols are rules that enable connectivity and communication.
<b>Protocol Stack</b>	A software subsystem that manages the flow of data on a communications channel according to the rules of a particular protocol, for example the TCP/IP protocol. Called a “stack” because it is typically designed as a hierarchy of layers, each supporting the one above and using the one below.
<b>PSTN</b>	The Public Switched Telephone Network (PSTN) is the worldwide voice communications system.
<b>Publish &amp; Subscribe</b>	<ol style="list-style-type: none"><li>1) To provide a source of information that users select from and then receive on a regular basis or when certain events occur. The service can be public or private, free or paid, and information can be provided via e-mail and the Web or by means of proprietary applications. For example, a stock trading application lets you select particular stocks, and those quotes are sent to you on either on a regular schedule or when there is a change in price.</li><li>2) Software or protocols that enable publishing and subscribing.</li></ol>
<b>Push Email</b>	Email service that sends new email to a device when it is received rather than waiting for the user to request store and forward email.
<b>QoS</b>	Quality of Service - The performance of a network service such as throughput, delay, and priority. Some protocols allow packets or streams to include QoS requirements (e.g., ATM).
<b>Quality of Service</b>	<ol style="list-style-type: none"><li>1) Reliable message delivery (no messages are lost in case of system failure).</li><li>2) Guaranteed message delivery (messages are delivered within a defined time limit, even in the case of network or system unavailability).</li><li>3) Assured message delivery (messages are delivered at most once).</li></ol>
<b>RAC (Real Application Cluster)</b>	A component of the Oracle 9i database product that allows a database to be installed across multiple servers. According to Oracle, RAC's shared disk method of clustering databases: increases scalability because servers can easily be added or subtracted to meet current needs, lowers costs because companies don't have to buy high-end servers, and improves availability because if one server fails, another can assume its workload. RAC's shared disk architecture is an unusual approach to database clustering. Most competing database products (such as Microsoft's SQL Server and IBM's DB2 for Windows and Unix environments) use the alternative, which is known as "shared nothing" architecture. Shared nothing architecture partitions data and only gives each server access to its own disk subsystem, while shared disk architecture gives all servers access to the entire database. This adds failover capacity to the database, because all servers have access to the whole database. Proponents claim that this capacity increases 9i's reliability and availability significantly. British Telecom, for example, reported that deploying the product enabled them to cut their failover time from a typical 20 minutes to between 10-60 seconds.
<b>RAID</b>	Redundant Array of Independent Disks – A method of organizing small format disk devices to drastically increase I/O bandwidth and improve data availability.
<b>Recommended Practices</b>	Are activities which are normally considered leading edge or exceptional models

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	for others to follow. They have been proven to be successful and sustainable and can be readily adopted by agencies. They may or may not be considered the ultimate “best practice” by all readers but for this place and time they are recommended practices and should be used and implemented wherever possible.
<b>Repository</b>	A repository is a collection of resources that can be accessed to retrieve information. Repositories often consist of several databases tied together by a common search engine.
<b>Requirements (ETA)</b>	Strategic components of the Commonwealth’s Enterprise Technical Architecture “Technical Component Standard” tables. Strategic components are acceptable components for current deployments and must be implemented and used for all future deployments. Also, the numbered policies and standards of the Enterprise Technical Architecture are requirements.
<b>Reusable Component</b>	A sub-object derived from an object or a class of objects by taking advantage of inheritance properties. The derived object inherits the instance variables and methods of the super class but may add new instance variables and methods.
<b>RMI</b>	Remote Method Invocation. A J2EE RPC.
<b>Router</b>	<ol style="list-style-type: none"><li>1) An attaching device that connects two LAN segments, which use similar or different architectures, at the reference model network layer.</li><li>2) (IRM) The combination of hardware and software that links LANs and WANs together.</li></ol>
<b>RPC</b>	Remote Procedure Call. An external form of communication that allows a client to invoke a procedure in a server.
<b>SAN</b>	A Storage Area Network (SAN) is a storage model typically characterized by a use of switching and transmission facilities that are separate from the local area network where the server of data to be stored and retrieved resides. The network communications for a SAN may include fibre channel, iSCSI, Ethernet or other technologies. The SAN also includes the storage management, storage device and storage access technologies.
<b>Scalability</b>	The ability to expand as higher and higher volumes occur due to high volume operations with a parallel engine.
<b>Scale-out server solution</b>	From an application standpoint (e.g., email), the scale-out solution increases resources to the application by adding servers to the cluster of real or virtual servers. The addition of servers increases the number of operating systems supporting the solution.
<b>Scale-up server solution</b>	<ol style="list-style-type: none"><li>1) From an application perspective, a scale-up solution is one that permits the adding of more resources to the application by adding resources from within a single platform and without increasing the number of operating systems used in supporting the application.</li><li>2) For the consolidation of multiple applications, the scale-up solutions will provide the ability to add resources to more than one application from within the platform without increasing the number of operating systems used in supporting the application.</li></ol>
<b>SCSI</b>	Small Computer System Interface
<b>SDLC</b>	<ol style="list-style-type: none"><li>1) Synchronous Data Link Control. An IBM/SNA communications protocol. HDLC, high level data link control was derived using SDLC. SDLC manages synchronous (i.e., uses timing bit), code-transparent, bit-serial communication which can be duplex or half-duplex; switched or non-switched; point-to-point,</li></ol>

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	multipoint, or loop.
	2) Systems development life cycle
<b>SDLT</b>	Super Digital Linear Tape – A variant of DLT technology, called SuperDLT, makes it possible to store upwards of 100 GB on a single cartridge. The SuperDLT drive can transfer data at speeds of up to 10 megabytes per second (Mbps). (searchStorage.com)
<b>Security Service</b>	Compared to monolithic environments, distributed systems create new challenges for the implementation of security. Integrated systems must provide authentication, auditing, authorization, and encryption services that allow a client to conduct a secure communication with a server.
<b>Segment</b>	1) vt. to isolate traffic on a LAN; 2) n., the LAN devices and media isolated
<b>Serial ATA device</b>	Serial Advanced Technology Attachment – A standard for connecting hard drives into computer systems that is based on serial signaling technology, unlike current IDE (Integrated Drive Electronics) hard drives that use parallel signaling. SATA has several practical advantages over the parallel signaling (also called Parallel ATA or PATA) that has been used in hard drives since the 1980s. SATA cables are more flexible, thinner, and less massive than the ribbon cables required for conventional PATA hard drives. SATA cables can be considerably longer than PATA ribbon cables, allowing the designer more latitude in the physical layout of a system. Because there are fewer conductors (only 7 in SATA as compared with 40 in PATA), crosstalk and electromagnetic interference (EMI) are less likely to be troublesome. The signal voltage is much lower as well (250 mV for SATA as compared with 5 V for PATA). SATA creates a point-to-point connection between devices. Transfer rates for SATA begin at 150MBps. One of the main design advantages of Serial ATA is that the thinner serial cables facilitate more efficient airflow inside a form factor and also allow for smaller chassis designs. In contrast, IDE cables used in parallel ATA systems are bulkier than Serial ATA cables and can only extend to 40cm long, while Serial ATA cables can extend up to one meter. (Whatis.com modified)
<b>Service- Oriented Architecture</b>	SOA is an architectural approach that presents a set of reusable software components that align with the agency’s business goals and the Commonwealth’s strategic objectives. The services are highly cohesive, loosely coupled, discoverable software components that are decoupled from hardware and network dependencies and that encapsulate the complexities of the underlying implementation.
<b>Service-Component Reference Model (SRM)</b>	Service component-based framework that can provide—independent of business function—a “leverage-able” foundation for reuse of applications, application capabilities, components, and business services.
<b>SGML</b>	Standard Generalized markup Language. HTML and XML are subsets of SGML.
<b>Simple Network Management Protocol (SNMP)</b>	A set of network communication specifications that cover all the basics of network management. It is a simple and expandable protocol designed to give the capability to remotely manage a computer network by polling, setting terminal values, and monitoring network events. It is comprised of three elements, an MIB, a manager, and the agents. The manager is located on the host computer on the network. Its role is to poll the agents and request information concerning the networks status. Agents run off each network node and collect network and terminal information as specified in the MIB.
<b>SIP</b>	Session Initiation Protocol (SIP) is a signaling protocol developed by the IETF. The

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	<p>SIP protocol has not yet been ratified as a standard. SIP is primarily used for voice over IP (VoIP) calls but also may be used for other communications including video, instant messaging, and gaming.</p> <p>SIP is a text-based protocol that is based on HTTP and MIME. SIP is used as one part of a protocol stack that is intended to provide seamless, continuous, end-to-end communications similar to what is provided by the PSTN. SIP is responsible for setting up and taking down the connection. SIP also provides services such as dialing a number, causing a phone to ring, and providing ring back tones or busy signals. SIP is included as part of the IMS subsystem.</p>
<b>SMB</b>	Server Message Block – Message protocol used by DOS and Windows to share files, directories and devices. (webopedia.com)
<b>SMTP</b>	Simple Mail Transfer Protocol. Documented in <a href="#">RFC 821</a> , SMTP is Internet's standard host-to-host mail transport protocol.
<b>SNA</b>	IBM's Systems Networking Architecture provides a structure for transferring data between IBM and a variety of other computing platforms.
<b>SNMP</b>	Simple Network Management Protocol. The Internet standard protocol, defined in STD 15, <a href="#">RFC 1157</a> , developed to manage nodes on an IP network.
<b>SOAP</b>	Simple Access Object Protocol. A minimal set of conventions for invoking code using XML over HTTP
<b>Sockets</b>	Virtual connections between processes. They can be of two types, stream (bi-directional) or datagram (fixed length destination-addressed messages). The socket library function creates a communications end-point or socket and returns a file descriptor with which to access that socket. The socket has associated with it a socket address, consisting of a port number and the local host's network address.
<b>SONET</b>	Synchronous Optical Network – A standard format for transporting a wide range of digital telecommunications services over optical fiber. SONET is characterized by standard line rates, optical interfaces, and signal formats.
<b>SQL</b>	Structured Query language. An industry-standard language for creating, updating, and querying relational database management systems.
<b>STDL</b>	Structured Transaction Definition Language. A high-level language for developing portable and modular transaction processing applications in a multi-vendor environment.
<b>Store and Forward</b>	A term used in message processing where a message is saved and then delivered.
<b>Strategic</b>	Rating category used in this document to rate integration technologies. This technology is considered a strategic component of the Commonwealth's Enterprise Technical Architecture. It is acceptable for current deployments and must be used for all future deployments.
<b>Switch</b>	Network device that filters, forwards, and floods frames based on the destination address of each frame. The switch operates at the data link layer of the OSI model. A fabric switch may have significant management and security functionality in addition to switching protocol choices. (modified Cisco definition)
<b>Synchronous</b>	This term has two distinct meanings in networking: 1.) a network communication, which requires a reply for completion or 2.) a type of network transmission that uses start bits and stop bits to establish precise clocking.
<b>Synchronous Optical</b>	SONET is the ANSI standard for synchronous data transmission on optical media.

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<b>Network (SONET)</b>	The international equivalent of SONET is synchronous digital hierarchy (SDH). Together, they ensure standards so that digital networks can interconnect internationally and that existing conventional transmission systems can take advantage of optical media through tributary attachments
<b>T1</b>	An AT&T term for a digital carrier facility used to transmit a DS1 formatted digital signal at 1.544 megabits per second or a 24 analog line equivalent. T1 transmission uses a bipolar Return To Zero alternate mark inversion line coding schemes.
<b>TCP</b>	Transmission Control Protocol. An <a href="#">OSI</a> layer 4 protocol
<b>TCP/IP</b>	1) Transmission Control Protocol over Internet Protocol. 2) The TCP/IP Suite of protocols.
<b>TDMA</b>	Time Division Multiple Access
<b>Technical Architecture</b>	In enterprise architecture, business and technical computing specifications are considered. The technical architecture includes specification for only technical dimensions or components. In Virginia's enterprise architecture, the technical domains include: integration, security, platform, networking and telecommunications, application, database, enterprise systems management, and information architecture.
<b>TIA</b>	Telecommunications Industry Association. A standards body. An association that sets standards for communications cabling.
<b>Token Ring</b>	An IEEE 802.5 standard for media access. Conflicts in the transmission of messages are avoided by the granting of "tokens" which give permission to send.
<b>Topic</b>	A topic is simply a logical subdivision of the domain. All components relevant to the Commonwealth's Technical Architecture are included within one if the identified topics.
<b>TP</b>	Transaction Processing
<b>Transitional</b>	Rating category used in this document to rate integration technologies. This technology is not consistent with the Commonwealth's Enterprise Technical Architecture strategic direction. Agencies may use this technology only as a transitional strategy for moving to a strategic technology. Agencies currently using this technology should migrate to a strategic technology as soon as practical. A migration or replacement plan should be included as part of the Agency's IT Strategic Plan. New deployments or procurements of this technology require an approved <i>Commonwealth Enterprise Technical Architecture Exception</i> .
<b>Utility Service</b>	In this report, the term is used to connote a function or activity typically provided by an IT unit, which may be separated from IT work requiring business knowledge, and which may be provided by a central enterprise service (in-sourced) or by an external business (outsourced). An example would be web site hosting. You can provide hosting and WC3 accessibility levels without knowing the business of the agency or understanding the content of the website.
<b>VIM</b>	Vendor Independent Messaging was a standard API for applications to integrate with e-mail on Windows 3.x, proposed by Lotus, Borland, IBM & Novell in the early 1990s. Its main competitor was Microsoft's MAPI, which was the eventual winner of the MAPI v. VIM war. (Wikipedia)
<b>Virtual Machine</b>	A software emulation of a physical computing environment. This could be a virtual PC or a virtual server. A virtual machine may be a fixed or variable configuration of a set of host computing environment resources plus OS and/or application software.

<b>Virtual Server</b>	See virtual machine. Not to be confused with a virtual Web server within this document.
<b>Virtual Storage</b>	The storage space that may be regarded as addressable main storage by the user of a computer system in which virtual addresses are mapped into real addresses. The size of virtual storage is limited by the addressing scheme of the computer system and by the amount of auxiliary storage available, not by the actual number of main storage locations. (www.ibm.com)
<b>Virtual Tape</b>	Virtual tape is the use of a special storage device that manages less-frequently needed data so that it appears to be stored entirely on tape cartridges when some parts of it may actually be located in faster, hard disk storage. The programming for a virtual tape system is sometimes called a virtual tape server (VTS). Virtual tape can be used with a hierarchical storage management (HSM) system in which data is moved as it falls through various usage thresholds to slower but less costly forms of storage media. Virtual tape may also be used as part of a storage area network (SAN) where less-frequently used or archived data can be managed by a single virtual tape server for a number of networked computers. A virtual tape system offloads from the main computer the processing involved in deciding whether data should be available in the faster disk cache or written onto a tape cartridge. The virtual tape system also can manage data so that more of the space on a tape cartridge is actually used. (searchStorage.com) IBM and Storage Technology are well-established vendors of virtual tape systems. Sutmyn Storage sells a product that provides a virtual interface to existing IBM and other systems.
<b>VITA</b>	The Virginia Information Technologies Agency. An agency of Virginia state government that is the Commonwealth's new consolidated, centralized information technology organization. VITA's responsibilities fall into three primary categories: Operation of the IT infrastructure, Governance of IT investments, and Procurement of technology.
<b>VoIP</b>	<p>Voice over Internet Protocol (VoIP) is a service that permits voice connections and the transmission of voice conversations using IP packets that are sent over public and private cabled infrastructure. A set of equipment and protocols is required to accomplish quality voice communications using VoIP. A major advantage of VoIP and Internet telephony is that it avoids the tolls charged by ordinary telephone service.</p> <p>VoIP derives from the VoIP Forum, an effort by major equipment providers, including Cisco, VocalTec, 3Com, and Netspeak to promote the use of ITU-T H.323, the standard for sending voice (audio) and video using IP on the public Internet and within an intranet. The Forum also promotes the user of directory service standards so that users can locate other users and the use of touch-tone signals for automatic call distribution and voice mail.</p> <p>Using VoIP, an enterprise positions a "VoIP device" at a gateway. The gateway receives packetized voice transmissions from users within the company and then routes them to other parts of its intranet (local area or wide area network) or, using a T-carrier system or E-carrier interface, sends them over the public switched telephone network.</p>
<b>VoWLAN</b>	Voice over Wireless LAN is an implementation of Voice over IP using wireless rather than wired infrastructure.
<b>VPN</b>	A virtual private network (VPN) is a network that uses a public telecommunication infrastructure, such as the Internet, to provide remote offices or individual users with secure access to their organization's network via layer two tunneling protocols

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	(L2TP).
<b>VPN</b>	<p>A Virtual Private Network (VPN) is a communications service that affords various levels of privacy over public or private infrastructure. Secure VPNs may use cryptographic tunneling protocols to preventing snooping, sender authentication to preventing identity spoofing, and message integrity (preventing message alteration) to achieve the privacy intended.</p> <p>Trusted VPNs do not use cryptographic tunneling. Instead, they rely on the security of a single provider's network to protect the traffic. Multi-protocol label switching (MPLS), layer 2 forwarding, and layer 2 tunneling are commonly used to build trusted VPNs.</p>
<b>WAFS</b>	Wide Area File Services – A storage tool for improving central data access speeds over WANs and the Internet.
<b>WAN</b>	<p>Wide Area Network</p> <ol style="list-style-type: none"><li>1) A network that provides communication services to a geographic area larger than that served by a local area network or a metropolitan area network, and that may use or provide public communication facilities. A WAN typically consists of multiple LANs that are linked together.</li><li>2) A data communications network designed to serve an area of hundreds or thousands of miles; for example, public and private packet-switching networks, and national telephone networks.</li><li>3) A computer network that links multiple workstations and other devices across a large geographical area.</li></ol>
<b>WCDMA</b>	Wide-band Code-Division Multiple Access (WCDMA) is a 3G technology that increases data transmission rates in GSM systems by using the CDMA air interface instead of TDMA. WCDMA is based on CDMA and is the technology used in UMTS. WCDMA was adopted as a standard by the ITU under the name "IMT-2000 direct spread". (Adapted from Wi-Fi Planet.)
<b>Web services</b>	A standardized way of integrating Web-based applications using open standard interfaces over an Internet protocol backbone. Used for businesses to communicate with each other and with clients, Web services allow organizations to communicate data without intimate knowledge of each other's IT systems behind the firewall.
<b>Wide Area Network (WAN)</b>	See WAN
<b>Wi-Fi</b>	Wireless Fidelity – a protocol specified in 802.11b from the Institute of Electrical and Electronics Engineers (IEEE), which is part of a series of wireless specifications together with 802.11, 802.11a, and 802.11g. WiFi refers to an over-the-air connection with a wireless client and a base station or between two wireless clients.
<b>WiMAX</b>	WiMAX is an acronym for Worldwide Interoperability for Microwave Access. WiMAX is a logo used by the WiMAX Forum for certifying product compatibility with the IEEE 802.16 standard. The 802.16 working group of IEEE specializes in point-to-multipoint broadband wireless access. IEEE 802.16 or WiMAX is a standard for wireless technology that provides high-throughput broadband connections over long distances. WiMAX can be used for a number of applications, including "last mile" broadband connections, hotspots and cellular backhaul, and high-speed enterprise connectivity for business. (Adapted from Whatis.com).
<b>WLAN</b>	Wireless Local Area Network

<b>X.400</b>	International Telegraph and Telephone Consultative Committee (CCITT), now known as the ITU Telecommunication Standardization Sector, completed the first release of the X.400 message handling system standard. The standard provided for the exchange of messages in a store-and-forward manner without regard to the user's location or computer system.
<b>X.500</b>	An ISO OSI Directory Service with an information model, a namespace, a functional model, an authentication framework, and a distributed operation model. X.500 directory protocol is used for communication between a Directory User Agent and a Directory System Agent. To allow heterogeneous networks to share directory information, the ITU proposed a common structure called X.500. However, its complexity and lack of seamless Internet support led to the development of Lightweight Directory Access Protocol (LDAP), which has continued to evolve under the aegis of the IETF. Despite its name, LDAP is too closely linked to X.500 to be "lightweight".
<b>XML</b>	Extensible Markup Language
<b>XSL</b>	Extensible Stylesheet Language