Commonwealth of Virginia
Enterprise Technical Architecture [ETA]

Platform Domain Report

Platform Domain Report Requirements: Version History

Revision	Date	Description
1.0	12-20-2003	Platform Architecture Report
1.1	03-03-2004	Platform Architecture Report
2.0	06-07-2006	Platform Architecture Report
3.0	01-15-2010	The Platform Domain Report has been substantially redone, reorganized and reformatted to make it consistent with the other domain reports. Only the requirements, technology component standard tables and recommended practices that have been added, changed, or rescinded are flagged as changes within the report. New principles: PLA-P-18 through 20 have been added New recommended practices: PLA-RP-39 through 41 have been added New requirements: PLA-R-36 through 41 have been added Recommended practices PLA-RP-01, 06, 07, 09, 10, 13, 14, 16, 18, 25, 32, and 37 have been deleted Requirements PLA-R-01, 04, 05, 09, 12, 14, 16, 26, 27, 28, 30, 34, and 35 have been rescinded Technology component standard tables PLA-S-14 and 15 have been rescinded The complete text of the rescinded requirements and technology component standard tables and deleted recommended practices can be found in Appendix A. All Desktop Productivity Tools content provided within the previous version of the Platform Domain Report was extracted into a separate Desktop Productivity Tools Topic Report to enhance the report updating and review process. The Glossary section was removed and combined with all other ITRM IT Glossaries to create a new separate document. The COV ITRM IT Glossary that may be referenced on the ITRM Policies, Standards and Guidelines web page at http://www.vita.virginia.gov/library/default.aspx?id=537
3.1	05-02-2023	Administrative update for accessibility.

Review Process

This requirements document was posted on VITA's Online Review and Comment Application (ORCA). All agencies, stakeholders, and the public were encouraged to provide their comments through ORCA. All comments were evaluated and individual commenters were notified of action(s) taken.

Standards and Agency Exceptions

These standards are incorporated within the COV Enterprise Architecture Standard (EA-225), and the requirements defined within this document are mandatory for Executive Branch agencies. Agencies deviating from these requirements must request an exception for each desired deviation, and receive an approved *Enterprise Architecture Exception* via Archer, prior to developing, procuring, or deploying such technology, or not complying with a requirement specified in this document.

Glossary

As appropriate, terms and definitions used in this document are in the COV ITRM IT Glossary. The COV ITRM IT Glossary is available on the ITRM Policies, Standards, and Guidelines web page at the VITA website: https://www.vita.virginia.gov/it-governance/glossary/cov-itrm-glossary/

Contents

Purpose

The intent of these requirements is to guide the purchase, design, implementation, and on-going operation of COV IT services and utilized technologies. For further information on the perspectives, please reference the most recent version of the Enterprise Technical Architecture (ETA) Requirements document.

Authority

- [Code of Virginia, §2.2-2007](#). Powers of the CIO
- [Code of Virginia, §2.2-2007.1](#). Additional duties of the CIO relating to information technology planning and budgeting
- [Code of Virginia, §2.2-2009(A)](#). Additional duties of the CIO relating to security of government information
- [Code of Virginia, §2.2-2012(A)](#). Additional powers and duties related to the procurement of information technology

Scope

This standard is applicable to all Executive Branch state agencies (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.

In addition to the requirements below all COV IT technology solutions comply with the standards found on the VITA [Policies Standards & Guidelines](#) page.

Executive Summary

The purpose of this document is to identify Commonwealth policies, standards, and recommended practices for personal computing, server, and utility service platforms to meet the business needs of executive branch agencies. Executive branch agencies are any agency, institution, board, bureau, commission, council, or instrumentality of state government in the executive branch listed in the *Appropriation Act*. The requirements/standards identified in this report will be included as requirements/standards in the COV ITRM Enterprise Architecture Standard.

The requirements and recommended practices within this report were created to assist agencies in meeting their needs while moving towards the future platform vision for the Commonwealth. For platforms, the future vision is a simplified architecture to support more uniform, higher quality, and more cost-effective services. Platform services may meet the needs of individual workers, centrally supported agencies, individual colleges, or centrally supported colleges. The document also defines strategic, transitional/contained, obsolescent/rejected, and emerging directions for technical platform components.

The audiences for the *Platform Domain report* are the business and technical leaders in state and local agencies and those involved in centralization and consolidation activities. This information provides direction to assist those who make technical decisions related to platforms and platform services in being responsive to changing business needs and services.

In general, the document provides assistance to executive branch agencies and their platform service providers by addressing three topics: personal computing devices, servers, and shared utility services.

Personal Computing Devices

The devices addressed are:

- Desktop and Notebook Personal Computers
- Personal Computer Operating Systems
- Displays
- PC Processors, Chipsets and Supported Interfaces
- Read/Write Devices
- Desktop-attached Printers, Copiers, Fax machines and Scanners
- Wireless Connectivity Devices
- Security Devices
- BlackBerrys, Smartphones and Push Email Services
- Surge Protection

The architectural guidance for personal computing devices continues to be one of strong central control for: hardware acquisition, desktop display replacement, operating systems (OSs), printers, wireless services, and desktop management. Implementing this guidance will result in:

- Centralized purchasing of personal computing tools
- Increased standardization of desktop and notebook software and hardware
- Fewer desktop printers
- Simple desktop printers treated as disposable items which are discarded rather than repaired
- Increased availability and use of time-saving devices (e.g., smartphones, Netbooks, etc.)
- Increased use of wireless devices and mobile services (e.g., Internet on trains and planes)
- Standardization of the replacement schedule (life cycle) of personal computing devices to maximize useful life while controlling escalation of support and other costs

Servers

The server types addressed are:

- [High-end](#) including OS
- [Midrange/low-end](#) including OS
- Consolidation platforms

The main architectural guidance for servers is resource optimization through consolidation of workload to fewer service platforms and limiting levels of complexity across all operating environments. Implementing this guidance will result in:

- Fewer servers (reducing the number of physical servers supports the Governor's "Greening of State Government" initiative)
- Fewer server locations
- More efficient utility services (e.g., for backup provision)
- More high-density solutions (e.g., virtual server use)
- Increased reliance on telecommunications (e.g., VPNs)
- Fewer operating systems across applications
- Scalable server solutions for utilities including email, web page serving, and storage
- Use of virtual servers for production services, development and some testing
- Managed decrease in the use of all platforms not in the architecture
- More consistent life-cycle management
- More standardized technology life cycles for hardware

Shared Utility Services
The services addressed are:

- Storage Utilities
- Print, Fax, Scan and Copy Devices
- Email Utilities, Related Communications Utilities, and Coordination Services
- Network (LAN/WAN) Control Utilities

Shared utility services are those networked activities that should be performed in a common way across all agencies for cost reduction and service improvement. Implementing architectural guidance on shared utility services will result in:

- Reductions in the number of utility and file servers
- Reductions in the number of sites that host utility services
- Common deployment of utility servers
- Increased use of shared storage systems
- A central directory for VITA served agencies
- A scalable, central email solution for VITA served agencies
- Improved services for print, fax, copy and scan needs for all employees who need these services

In general, the document provides assistance to executive branch agencies and their platform service providers by:

- Providing requirements and recommended practices for executive branch agencies related to the above topics
- Providing rationales and background information
- Providing web links of additional information resources for selected technologies (these links may be modified or deleted by those who maintain the websites during the life of this document)

Background

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.

Figure 1: Commonwealth of Virginia Enterprise Architecture Model
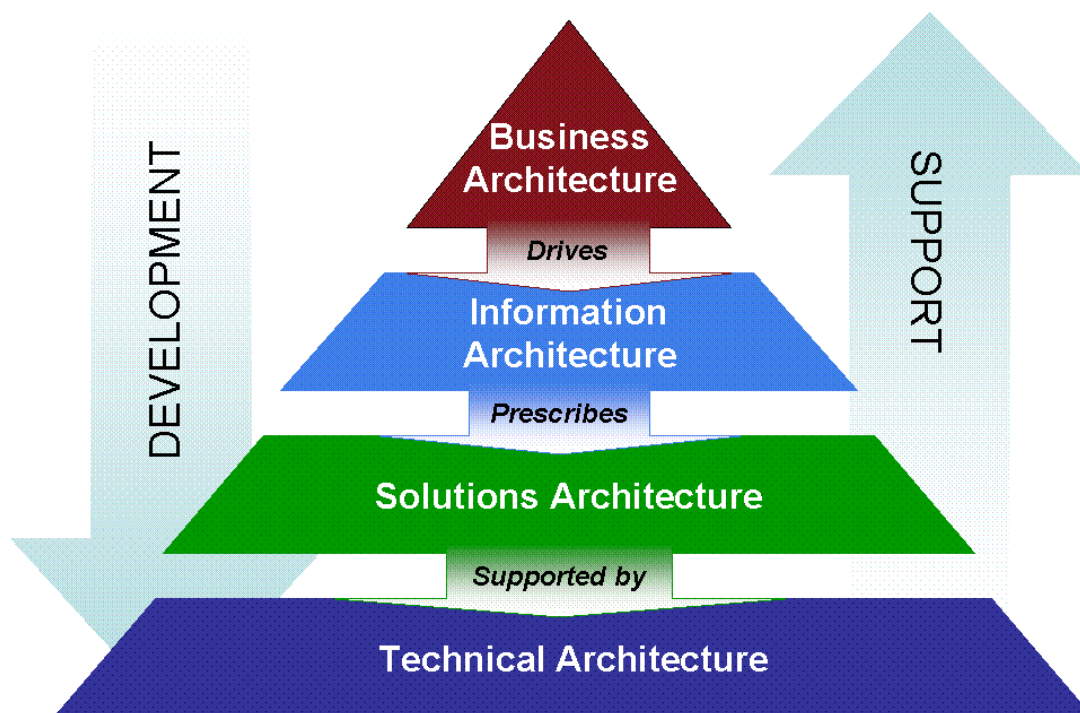
The Business Architecture drives the Information Architecture which prescribes the Solutions Architecture that is supported by the Technical (technology) Architecture.

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 distributed computing. The Enterprise Systems Management, Database, Application, 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.

Definition of Key Terms

This report is an Enterprise Technical Architecture domain report. Domain reports provide a comprehensive overview of important technical topics. They present three forms of architecture direction

for agencies that are planning or making changes or additions to their information technology:
- **Requirements** – statements that provide mandatory Enterprise Architecture direction.
- **Technology Component Standard Tables** – tables that indicate what technologies or products agencies may acquire at a particular point in time. The requirements are mandatory when acquiring a new or replacing an existing technology or product.
- **Recommended Practices**—statements that provide guidance, which is not mandatory

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

Technology Component Standard
Definitions

Strategic:

This technology is considered a strategic component of the Commonwealth's Enterprise Architecture. Strategic technologies define the desired "to-be" state of the Commonwealth.

Before any updated or new Strategic technology can be deployed it must complete a formal operational review. As part of this review, agencies or vendors that provide the services needed to deploy, maintain and/or support that technology must:

- Perform the appropriate testing
- Establish the needed technical support
- Follow a formal Change Management process
- Develop any required images
- Obtain the appropriate operational reviews and approvals

In addition to the operational review, customer agencies should also:
- Perform additional testing on impact to agency specific applications
- Assess impact on business processes
- Assess training needs

The decision to deploy a Strategic technology is a business decision that is made by the agencies or vendors that provide the services needed to deploy, maintain and/or support that technology and the customer agencies. Input from the operational and customer reviews should also be included when creating implementation plans for new or updated Strategic technologies.

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 Architecture Exception. The results of an evaluation or pilot test deployment should be submitted to VITA's Policy, Practice and Architecture Division for consideration in the next review of the Enterprise Architecture for that technology.

Transitional/Contained:

This technology is not consistent with the Commonwealth's Enterprise 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 Architecture Exception.

Obsolescent/Rejected:

Technology Component Standard
Definitions
This technology may be waning in use and support, and/or has been evaluated and found not to meet current Commonwealth Enterprise 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 must be included as part of the Agency's IT Strategic Plan.

Agency Exception Requests

Agencies that want to deviate from the requirements and/or technology standards related to the platform domain and contained in the COV ITRM Enterprise Architecture Standard may request an exception using the *Enterprise Architecture Change/Exception Request Form.* All exceptions must be approved prior to the agency pursuing procurements, deployments, or development activities related to technologies that are not compliant with the COV ITRM Enterprise Architecture Standard. The instructions for completing and submitting an exception request are contained in the current version of *COV ITRM Enterprise Architecture Policy*.

Platform Domain Report

This report addresses the Enterprise Technical Architecture Platform Domain.   Requirements and technology product standards introduced in this domain report will be incorporated into the COV ITRM Enterprise Architecture Standard and/or Policy. As appropriate, terms and definitions used in this document can be found in the COV ITRM IT Glossary which may be referenced on the ITRM Policies, Standards and Guidelines web page at http://www.vita.virginia.gov/library/default.aspx?id=537.

Overview

The Platform Domain Report includes:

- Overviews of three technical topics: personal computing devices, servers, and shared utility services (an overview of Desktop Productivity Tools appears in a separate Platform Domain Topic report)

- Principles, requirements, recommended practices, and technology standards. for executive branch agencies related to these topics

- Web links provide additional information resources for selected technologies

In 2003, when the General Assembly created VITA, it gave VITA considerable responsibility for computer infrastructure. Whenever VITA is referenced in a requirement, the requirement addresses a function for which VITA has been given responsibility such as server consolidation. Such services are provided to some executive branch agencies and/or localities, but not to all.

Concerning local governments and other public bodies, while they are not required to comply with a requirement unless the requirement is a prerequisite for using a VITA service or for participating in other state-provided service programs, their consideration of relevant requirements is highly recommended. This architecture was designed with the intent of encouraging its use in state and local service provision efforts.

Methodology

The platform domain team initially began its work by defining the platform domain, and by delineating the team's goals, objectives, and scope of work. Discussions included how the platform domain interfaces with other technical architecture domains, the present and future directions for platforms, and how often the information provided in this document is to be updated. The team also reviewed input from publications and individuals with specialized knowledge. The results of the team's efforts and deliberations are provided throughout this document. Update efforts review this work and provide modifications, additions and deletions as needed.

Platform Domain Definition

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, handhelds and other small intelligent devices), and peripheral devices (e.g., printers). Software is limited to operating systems and utility system software used to meet basic platform infrastructure needs. Software examples include Windows operating system 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 systems.

Objectives

Platform domain objectives include:

- Provide comprehensive coverage of trends, topics, issues, and critical information needs for personal computing, servers, and utilities to guide service providers and agency decision makers.

- Support requirements that will simplify and standardize platform approaches in Commonwealth executive branch agencies with the following goals in mind.

  - Provide a long-term target architecture vision with opportunities for short-term payoffs.

- Encourage platform acquisition practices within and across agencies that will result in a more homogeneous platform domain, improved support, and greater economies of scale.

- Improve citizen/customer services by improving infrastructure and its management in the Commonwealth.

- Influence standards-based requirements in areas such as solutions design, transmission interface selection, mobile computing technologies, where standards are evolving.

- Enable cost-effective central location and/or central management options for platforms for participating agencies.

- Recommend best practices for IT decision making for Commonwealth-wide efforts and for efforts of the Commonwealth's state and local agencies.

  - Enable the convergence of voice, video, image and data services in the Commonwealth.

  - Encourage well-planned solutions within and across agencies that meet business needs while protecting investments and reducing future expenditure escalation.

Platform Domain Scope

Requirements, technology standards, recommended practices and principals apply to those organizations within executive branch agencies that are responsible for supplying, managing, procuring and maintaining IT hardware, infrastructure related software, and operating systems. These organizations are hereafter referred to in the document as "Agencies with responsibilities for providing IT infrastructure".

The Platform Domain addresses the following technical topics and components:

- Personal Computing Devices
    - Desktop and Notebook Personal Computers
    - Personal Computer Operating Systems
    - Displays
    - PC Processors, Chipsets and Supported Interfaces
    - Read/Write Devices
    - Desktop-attached Printers, Copiers, Fax machines and Scanners
    - Wireless Connectivity Devices
    - Security Devices
    - BlackBerrys, Smartphones and Push Email Services
    - Surge Protection
- Servers
    - High-end servers including OS
    - Midrange/low-end servers including OS
    - Consolidation platforms
- Shared Utility Services
    - Storage Utilities
    - Print, Fax, Scan and Copy Devices
    - Email Utilities, Related Communications Utilities, and Coordination Services
    - Network (LAN/WAN) Control Utilities

Personal Computing Devices

Personal computing devices include a variety of hardware and operating system components for desktop computers, notebooks, handhelds and peripherals. The following components are included in this document.
- Desktop and Notebook Personal Computers
- Personal Computer Operating Systems
- Displays
- PC Processors, Chipsets and Supported Interfaces
- Read/Write Devices
- Desktop-attached Printers, Copiers, Fax machines and Scanners
- Wireless Connectivity Devices
- Security Devices
- BlackBerrys, Smartphones and Push Email Services
- Surge Protection

Desktops, Notebooks, and Peripherals

Desktops include all non-mobile personal computer hardware, operating system, and peripherals that might be provided as networked or stand-alone desktops. Desktops may be operated as fat or thin clients that access server based resources; operating system (OS) can be versions and/or variants of Apple (or Macintosh), MS Windows, and Linux software platforms. In addition, some desktops may be fitted with terminal emulators such as Citrix or Attachmate.

Notebooks include all computing devices that provide desktop functionality to a mobile worker in or out of the office. Notebook, pen tablet, netbook, and other form factors are included in this category. Notebook discussions may cover any of the components in desktops when differences should be noted or mobile computing options that are not relevant to desktops (e.g., specially designed mobile chipsets that conserve battery power).

Hardware for desktops and notebooks includes the CPU, I/O ports, network interfaces, communications buses, memory, storage, reader/writer, power supply, graphics, audio, integrated networking and controller components.

Operating systems are considered to be an integral part of the desktop or notebook computer. Plug-ins, help desk client, network client, and related software may also be included.

Personal computing peripherals include external monitors, docking stations, printers, speakers, headsets, cameras, media read/write devices and removable media. Personal printers are small, inexpensive, general use printers that are directly attached to one personal computer.

Handhelds

Handhelds include all smaller computing devices that typically provide specialized functionality. Typical devices today are smartphones. The smartphone meets nearly all the needs of a worker unless the worker spends hours rather than minutes using a computer. Limited function devices (e.g., inventory picking or function tracking computers) are not covered. Devices specifically excluded from consideration in this category are voice-only devices including single purpose telephones, cell phones, and communication radios.

Servers

Servers include the full range of devices from mainframe computers to small single-socket computers, which might function as single service-providers on a client-server network (e.g., file/print server, application server, database server, or web server). Excluded are hardware devices that function as both client and server in a peer-to-peer network, bridges, routers, and special function machines such as some VoIP call manager servers.

A server solution may include single servers, virtual servers, clusters, farms, frames of server blades (e.g., a blade chassis), and n-tier applications solutions. Server configuration capabilities, management options, and shared use options are important considerations in the discussion of servers. Servers may also be appliances or specially configured, single purpose devices that are regular servers but are specially configured. An example is a storage device.

Servers include hardware and software as follows: operating systems, processors, I/O ports/interfaces, communications buses, memory, storage, power, controller components, frames, and racks. The following server components are addressed:

- High-end servers including OS

- Midrange/low-end servers including OS

- Consolidation platforms

Shared Utility Services

Shared utility services include platform solutions that provide general technical services including printing, faxing, scanning, domain name services (and other network services), storage, backup, archiving, email and other similar solutions centrally. Shared utility services are defined in this report to support centralization and common handling of services that are currently implemented in many different ways using different practices across the served entities. The services addressed are those that require the least specific knowledge of agency business and provide the greatest opportunity for efficiencies and improved practices. The following shared utility services are addressed:

- Storage, archiving, backup and recovery devices and services

- Output servers and devices—print, fax, scan and copy servers and devices

- Messaging/email services (networked, mobile, audio, video, and data)

- Centralized network control services

Domain-Wide Principles, Recommended Practices and Requirements

The following principles, recommended practices, and requirements pertain to all components, in all situations and activities related to the platform domain. Component specific principles, recommended practices, and requirements are discussed below in the "Platform Domain Technical Topics" section.

Principles

Principles are guiding statements that influence the desired future enterprise. The following are platform domain-wide principles:

PLA-P-01		Platform choices will be based on technical standards that have been formally adopted by standards groups whenever possible.
PLA-P-02		The design of platform solutions will meet business needs for availability, reliability, speed, scalability, fault tolerance, and business continuity.
PLA-P-03		The use of TCO metrics is an important factor in making platform acquisition decisions.
PLA-P-04		Platform solutions balance uniformity with business efficiency and effectiveness goals.
PLA-P-05		Platform utilities are identified and centralized whenever it is practical and cost effective to do so.
PLA-P-06		The Platform Domain should enable the comparison of outsourced and in-sourced solutions for platform acquisition and management.
PLA-P-07		Security is an integral part of platform design and acquisition decisions.
PLA-P-08		Solutions design will address business continuity needs.
PLA-P-18		Platform solutions should aid in the transition to a centralized infrastructure model.
PLA-P-19		The number of platform types and OS running on them needs to be reduced. A simplified architecture enables the Commonwealth to effectively leverage cost saving based on volumes when making information technology purchases and to take advantage of the cost savings related to support simplification, skills transfer, and training.
PLA-P-20		The Commonwealth and its agencies should always evaluate and leverage viable alternatives when negotiating solutions and selecting technologies.

Recommended Practices

There are no domain-wide recommended practices.

Requirements

The following domain-wide requirements apply to all platforms.

PLA-R-40   *Agencies with responsibilities for providing IT infrastructure shall ensure that proposed hardware and software platform solutions comply with the current COV ITRM IT Information Security Standard (SEC501).*

PLA-R-02   Agencies _with responsibilities for providing IT infrastructure_ shall acquire platforms designed for ease of remote administration, diagnosis, and systems management.

Platform Domain Technical Topics

In this section, personal computing, server, and shared utility platforms technical topics are discussed in detail. Also described are component technologies, strategic practices, critical issues, requirements and recommended practices.

Personal Computing Devices

- Personal computing devices include:
- Desktop and Notebook Personal Computers
- Personal Computer Operating Systems
- Displays
- PC Processors, Chipsets and Supported Interfaces
- Read/Write Devices
- Desktop-attached Printers, Copiers, Fax machines and Scanners
- Wireless Connectivity Devices
- Security Devices
- BlackBerrys, Smartphones and Push Email Services
- Surge Protection

Commonwealth's Goals for the Personal Computing Devices

The Commonwealth's goals in selecting, acquiring, refreshing, deploying, and supporting personal computing devices are to:
- Meet workforce business needs
- Promote greater consistency in vendors, versions, images, and tool sets to reduce acquisition and support costs without eliminating competition advantages
- Have personal computing solutions that have sufficient penetration in the marketplace to ensure support staff availability
- Set life cycle length to maximize useful life while controlling escalation of support and other costs
- Ensure that customer value results from centralization of acquisition, support and architectural controls

Key Technology Changes for Personal Computing Devices

Software, hardware, and architectural changes in personal computing are having an impact on decision making. Most notable are Microsoft's changes over the last three years and Microsoft's planned changes including operating systems, product bundling, and product integrations.
Decision makers are very concerned about Microsoft operating system changes and users are concerned about the changes in office software. Three operating systems (Windows XP, Vista, and Windows 7) are in competition with one another through 2014 when Windows XP will no longer be supported.
Windows Vista continues to be unpopular in the business world and Windows 7 is being rolled out by Microsoft as an alternative.

Although some expected that virtual desktops, blade computing, application streaming, OS streaming and other architectural variations would have a big impact on present day personal computing, these and similar approaches to meeting user needs have not been implemented widely. Thin client approaches have been used successfully when jobs required predictable workloads of "terminal like" form-filling and for specialized applications that affect only a few users such as GIS databases and client access tools.

There are still many management, security, and networking issues to work out with most of these architectural options.

Hardware continues to demonstrate radical change with new processor architectures leading the list. Hardware also must be higher-end to accommodate the anticipated software changes. Also important are the ever increasing capabilities of handhelds or smartphones.

Principles

The following are guiding principles for Personal Computing Devices.

PLA-P-09   Uniform, high-quality productivity tools will be used to meet the business needs of the agencies and employees of the Commonwealth.

PLA-P-10   Mobile clients will use standards-based communications interfaces whenever possible.

PLA-P-11   Personal computing decisions should not add excessive risk to enterprise data and networks

PLA-P-12   Personal computer hardware and software selection strategies should be integrated to maximize cost savings opportunities.

Requirements

The following are requirements for Personal Computing Devices.

PLA-R-03   *Agencies with responsibilities for providing IT infrastructure shall Implement documented policies and procedures that control the acquisition, life cycle, security methods and techniques, connectivity and access methods, and ongoing maintenance support processes for personal computing devices.*

PLA-R-38   *Agencies with responsibilities for providing IT infrastructure shall establish personal computer base images that comply with strategic office productivity and security related software technologies as defined in the COV ITRM EA Standard. These base images must also meet the minimum security requirements as defined in COV ITRM Security Standards. Customer agencies can add to these images to meet agency-specific security needs. Any changes to the base image must be recorded in a configuration management database.*

PLA-R-39   *Agencies with responsibilities for providing IT infrastructure shall provide extensions to the base image to support business unit or departmental needs*

Rationale:
Increases uniformity while decreasing time and effort required to replace or deploy new systems.

Desktop and Notebook Personal Computers

Establishing an average number of years for desktops and notebooks (a range of years) that is acceptable for general refresh permits the design of a multi-year cycle that will allow for budgeting of hardware and deployment cost. The chosen number typically does not affect whether the individual's specific needs are met. It simply enables a periodic refresh for the majority of users, who have no specific refresh requirement. Agency-side costs include fees to providers, the reworking of applications, testing, staff training for software and OS changes, staff productivity decreases due to implementing changes, certain network infrastructure, personal printing supplies and more.

The present recommended replacement life cycle timeframe for desktop computers is four to five years and for notebook computers three and one half to five years. Gartner recommends having an available pool of 2 percent of the notebooks in use by mobile workers available for express shipping to the mobile worker to ensure next day availability to meet their needs. Gartner cautions that this same notebook pool should not be used for loans to those desktop users who need a notebook for a short period of time.

[1] Gartner, Best Practices for Notebook Hardware Maintenance, 15 March 2006, Leslie Fiering, ID Number: G00138283.

Requirements

The following is a requirement for the Desktop and Notebook Personal Computers component.

> <u>**PLA-R-13**</u>   <u>*Agencies with responsibilities for providing IT infrastructure shall adopt*</u>
> <u>*replacement life cycles of four to five years for desktop computers and*</u>
> <u>*three and one-half to five years for notebook computers.*</u>

Technology Component Standards

The following is a technology component standard for Desktop and Notebook Personal Computers.

Table PLA-S-06: Miscellaneous PC Components Technology Component Standard <u>Updated January 15, 2010</u>
Strategic:
Cardbus type PC Cards with parallel interface, DMA, and 32 bit path ExpressCard[1] —PCMCIA Cardbus replacement that provides high speed serial access embracing USB 2.0 and PCI-Express 2.0
Emerging:
Transitional/Contained:
PC Card with parallel interface and 16 bit path; PCI; PCI-X; AGP[2]
Obsolescent/Rejected:

Personal Computer Operating Systems

In general, the platform architecture recommends skipping releases of software when business reasons for making a change are inadequate. The agency-side costs for making a change include the costs of testing, staff learning time, staff training, business application changes, and in some cases, the costs of lost employee productivity due to software setup and learning curves slowing daily work.

Both technical and business staff should have input into the decision of whether to upgrade office software. Only when support discontinuation and security are issues (e.g., end of life cycle established by Microsoft) should providers and technical staff force an upgrade or software change.

Agencies who provide infrastructure services must replace operating system software on all machines, typically three to six months before the end-of-support date. End-of-support means no security patches and therefore, a higher level of vulnerability unless patches can be provided by a third party. When the service provider offers a new operating system (e.g., Vista SP2, Windows 7, or Atom) they should allow one year of advanced notice for planning and testing. Because agency-side costs are quite significant for a rollout, the notice is needed for both staff work planning and for budget estimation.

Upgrading software during the life of the computer or the operating system is not recommended. The basic assumption is that you are buying a tool that is to meet business needs for the life of the hardware.

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[2] This technology is now implemented throughout the market place.

[3] http://www.semiapps.com/System_Functions/Digital_Interface/PCI_PCI_Express/

The less you touch the tool, the less it costs to own and maintain. Of course, if business needs require additional functionality and that functionality is cost-effective, it should be added. However, the cost to all users and all operations must be considered.

Hardware should be designed and acquired for a particular image that will meet business needs for the entire life of the hardware. This, of course, does not exclude pushing out changes over the network for security, bug fixes and simple patches and upgrades that have little effect on agencies (e.g., an Adobe Acrobat Reader upgrade). However, such upgrades should be thoroughly tested before being rolled out.

To date, there has been little evidence of large enterprises in the US moving to Linux. Even though some suggest that Linux can be explored as an alternative to Windows for use by staff members who perform only data entry type tasks, the complications of having two desktop OSs can easily outweigh the cost savings. One example is that selected Commonwealth-wide applications that are based on commercial, off-the-shelf packages may not be designed to work with more than one client OS.

Recommended Practices

The following is a recommended practice for Personal Computer Operating Systems

> **PLA-RP-41**   Agencies with responsibilities for providing IT infrastructure should not upgrade operating systems software during the life of the computer unless they document a compelling business reason to do so or a compelling return-on-investment (RIO) that offsets all hard and soft costs for making the change.

Implications:
One concern about using this approach is that support staff may have to support two or three operating system versions. This can be an issue for small agencies but is not an important issue for a large, Commonwealth-wide support service. The organizing of personal computer support teams by OS/software version combinations rather than by agency can easily mitigate the effects of this problem. Dedicated teams also facilitate the tracking of problems by version of software and year of hardware and software.

Technology Component Standards

The following is a technology component standard for Personal Computer Operating Systems. This standard contains a recommended move from Windows XP directly to Windows 7. As a result of that recommendation, Windows XP Pro remains strategic, Windows Vista moves to Contained due to not being chosen for implementation, and Windows 7 is placed in emerging due to its not yet being adequately tested. It is expected that Windows 7 will move to strategic following the accumulation of adequate data from real business implementations. This is expected sooner than the usual two years following release. This decision was based on the unpopularity of Vista and the good reports on the beta and release code versions of Windows 7.

The recommendation to move Windows 7 to strategic as soon as adequate testing is completed means that agencies that provide infrastructure services and their customers will need to begin testing Windows 7 immediately. All agency and business-side applications will have to be tested, new interfaces written, hardware tested or replaced, peripherals tested or replaced, etc.

Because Microsoft will stop supporting XP in 2014, XP computers put into service after June 2009 will not have a full 5 years of support from Microsoft. This means that any PC that is used beyond the support end date will be need to be re-imaged.

Table PLA-S-01: PC Operating Systems Technology Component Standard
Updated January 15, 2010
Strategic:
Windows XP Pro (with tested Service Packs)
Note: Windows 7 may be tested immediately in its release code or RC version and will be moved to strategic as soon as adequate evidence exists
Macintosh OS X v10.x
Emerging:
Windows 7 (at the time of publication of this standard, W7 was in the earliest phases of its release cycle. Agencies who provide infrastructure services need to perform the assessment of W7 as a technology as well as their ability to deploy, manage, and support it)
Linux (e.g. Ubuntu)
Transitional/Contained:
Windows Vista (the strategy is to skip this OS to save cost)[3]
Windows 2000 Professional *(7-13-2010 is end-of-support)*
Macintosh OS 9.x
Obsolescent/Rejected:
Windows earlier than Windows 2000
Any home version of Windows

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[4] Gartner: Windows 7 Release Will Affect Vista Deployment Plans; 13 May 2009; Michael A. Silver and Stephen Kleynhans. Datamation: Nearly-50-of-IT-Shops-to-Skip-Windows-Vista; December 12, 2008; Stuart J. Johnston; http://itmanagement.earthweb.com/entdev/article.php/3790751/Nearly-50-of-IT-Shops-to-Skip-Windows-Vista.htm. Computer World: Windows 7: Why I'm Rolling It Out Early; By Shane O'Neill; May 18, 2009 04:44 PM; http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=Windows&articleId=9133206&taxonomyId=125&pageNumber=1

Displays

In the marketplace, 19 inch screens are becoming more common and have a low price. Gartner and others have suggested that the life cycle of a flat panel LCD can be 13.4 years on average[4] if the backlight does not fail). However, if there is an update or change to the operating system within the life cycle then the monitors in use must be checked for compatibility.

Requirements

The following is a requirement for Displays.

PLA-R-06	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. Agencies shall ensure separate computer/display acquisition pricing.

Rationale:

Because desktop displays have a longer life cycle than the computers they support, their replacement shall not be automatic at the time of a desktop replacement.

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[5] http://www.epa.gov/oppt/dfe/pubs/comp-dic/lca/Ch2.pdf or for the whole document and appendices, see http://www.epa.gov/oppt/dfe/pubs/comp-dic/lca/ The EPA compares 15" LCD and 17" CRT monitor on life cycle related issues in Chapter 2. Backlights may fail between 4.0 and 13.4

years depending on the manufacturer, but they are field replaceable. These data are fairly old but more recent data are not available. In the report, discussions with Dell officials indicate that most of their LCD backlights have the 50,000 hour life or a life that exceeds the 13.4 years.

Technology Component Standards

The following is a technology component standard for Displays.

Table PLA-S-02: Displays and Interface Components Technology Component Standard *Updated January 15, 2010*
Strategic:
Display Sizes
Note: Size requirements below specify only the minimum display size that is permitted for standard desktop use. High-end needs such as GIS *and special needs* are not addressed. *An agency may have larger display sizes.*
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.
Display life cycle
A desktop flat panel solution is to be used for its full life which may include backlight replacement.
Flat Panels
A flat panel is the standard recommended replacement for desktop displays.
Mouse
An optical USB mouse is the standard recommended replacement to be included with a desktop.
Keyboard
A USB keyboard is the standard recommended replacement to be included with a desktop.
Emerging:
OLED or Active Matrix OLED (AMOLED) displays (e.g., AMOLED in iRiver Clix Gen2)   *Light emitting diode displays are in higher use for small MP3/4 sized screens to large outdoor displays but still have not made a large impact in the personal computing space.*
Transitional/Contained:
Less than 17" flat panel for desktops
CRT (e.g., smaller displays may be appropriate for point of sale)
Mechanical Mouse
Obsolescent/Rejected:
CRT for desktop replacements

PC Processors, Chipsets and Supported Interfaces

Typically, the components of a computer are determined by the manufacturer with little choice on the part of the purchaser unless units are custom built. For personal computers, the Intel processors and chipsets dominate the market, but AMD and others offer equivalent business utility, often at a lower price. At present, with Office 2003 and Windows XP, most available processors and chipsets include features that exceed the needs of the typical office worker given the software they use and the way they work. A dual core processor may be helpful to users who have numerous applications running at the same time.

Most, if not all of the chipsets and processors currently on the market are fine for running operating system and productivity software, but they have some features that are unneeded by business users. Some will caution purchasers that the low-end items such as Intel's Celeron and AMD's Sempron, while they may meet business needs, may not actually be significantly cheaper due to price competition. The better processor may be the better buy because of this.

For both AMD and Intel, there are excellent mobile processors and mobile chipsets. The chipsets are designed for business management, graphics, connectivity, wireless mobility, video, speed, multitasking, energy use reduction, battery life and more. Each new generation adds functionality. The current push is to address mobility in time to take advantage of coming capabilities in the wireless world. For example, the latest models in development are called Intel Centrino Calpella and AMD Fusion. Intel is holding Calpella to enable the sales of older models that remain on shelves due to the sluggish economy. Calpella features are provided as an example in Table 1. Some features are clearly for gaming and multimedia needs that may have less business utility.

Most AMD and Intel processors are dual core technologies. The exception is the single core Atom processor by Intel, which has captured the present netbooks, handhelds and other small intelligent devices market. For regular notebooks and desktops, dual cores tend to have greater energy efficiency. As a result, the majority of business desktops and notebooks will be sold with dual core processors. For Intel, these will be Core 2 Duo models. For AMD, the processors will be Athlon X2. Both Intel 4 core and AMD three and four core processors are available in business desktop models, but they are beyond typical business needs.

Table 1: Future Intel Mobile Chipset Components and Features

Centrino	Future Calpella Platform[5]
Mobile chipset	An Intel Mobile Express series chipset with Intel's graphics technology that will allow for optimized decoding/encoding and editing/playback of H.264/MPEG-4 AVC video used in Blu-ray Discs and HD 1080p video, optimized for MPEG-2 (DVD) video playback and editing. • Intel QuickPath Interconnect support which directly connects to the CPU, removing the outdated FSB technology. • Direct connect to DisplayPort with DPCP as with its predecessor along with legacy support for HDMI (and HDCP), DVI, and VGA. • RAM supported for DDR3-800, DDR3-1066, DDR3-1333 and DDR3-1600 SO-DIMM. • Solid-state drive or Hybrid hard drives support.
Mobile processor	Processors - based on Intel Nehalem microarchitecture (codenamed **Gilo**) • an Intel processor (codenamed **Clarksfield**) 45nm for Quad Core version, 45-55W TDP. • an Intel processor (codenamed **Arrandale**) 32nm.
Mobile Wireless networks	Wireless Modules • an Intel WiFi Link (802.11 a/b/g/n) (codenamed **Puma Peak**) and WiMax (802.16) (codenamed **Kilmer Peak**)

One current feature of chipsets is connectivity to future network services. For example, in Table 1, both 802.11n WiFi and 802.16 WiMax are supported. Currently, chipsets tend to contain connectivity options based on standards that are not yet ratified by industry groups to date. Both AMD with its Fusion product and Intel with its Calpella product have delayed the completion and production of their new models until the 2010-2011 time frame. By then, the standards may be ratified.

Requirements
The following is a requirement for PC Processors, Chipsets and Supported Interfaces.

> ***PLA-R-07***   *Agencies with responsibilities for providing IT infrastructure involved in acquisitions and contracts shall establish minimum bid specifications for low-end personal computers to be used by the majority of the workforce. These specifications shall include the lowest of the currently available Intel, AMD, or comparable chipsets and components that will cost-effectively meet the anticipated processing needs for productivity software, typical business needs, special needs of the mobile worker, and/or needs related to life cycle requirements. Example: the future availability of various memory options (DDR SDRAM, DDR2, DDR3, etc.) if users' memory needs increase during the life cycle of their desktops or notebooks.*

Read/Write Devices

The devices addressed here are desktop and notebook devices that read from and write to transportable external media. "Writable" media for desktops and notebooks include floppies, CDs, DVDs, USB drives (which go by many names) and more.

The Commonwealth's workforce tends to use CD and DVD devices mainly for reading and USB drives for occasional writing. Also, a small percentage of users benefit from the advantages of using USB devices to transport data, documents and presentations securely to remote locations. Some mobile workers use USB devices for providing document backups. Writing to external media is rarely done by most workers

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[6] Taken from http://en.wikipedia.org/wiki/Centrino#Calpella_platform_.282009.29

due to the ease of using email or shared drives for transferring and accessing files. Even though external media is rarely used by the workforce, new computers tend to have multiple methods available for writing. Because all writing methods and media have been used to some degree, narrowing future directions for the state will be problematic for some. Meeting the reading and writing needs of those who most use external media is an important decision factor but providing some capabilities to all is also required.

As netbooks, handhelds and other small intelligent device form factors for notebooks become more popular, everyone relies more heavily on the USB drive for I/O. The size and weight competition in the market have resulted in the elimination of the relatively heavy and space-consuming CD/DVD drive. Those who need the CD/DVD capability must use an external DVD/CD drive. A typical requirement is loading software or accessing video/audio information.

Of the available external device writing options, USB devices have the best secure data transport solution for those needing security and no special software beyond that provided with the device is needed to use them. Also, USB flash drives have become inexpensive.

Even though DVD write standards have finally solidified for multimedia with Blu-ray in the winner's circle, many feel that a single standard will never exist on the low end. CD and DVD writing is done by only a small percentage of workers. However, reading capabilities are more useful. Most computer support providers use USB drives, network downloads, or network push outs for software changes to the agency standard image.

New state computers no longer have floppy drives and the workforce appears to have adjusted. They will also adjust if DVD and CD devices disappear as they have in opting for netbooks, handhelds and other small intelligent device form factor computers.

Some agencies require secure storage or off loading. Personnel who need these capabilities should use the security features available with certain USB drives and computer encryption capabilities.

Recommended Practices

The following is a recommended practice for Read/Write Devices.

PLA-RP-08   Desktop units and/or monitors on state contract should have front facing or easily accessible USB ports.

Rationale:

Easily accessible USB ports are an enabler for using USB key fobs for authentication, USB devices for storage, and other USB peripherals.

Requirements

The following is a requirement for Read/Write Devices.

PLA-R-08   Agencies with responsibilities for providing IT infrastructure involved in procurements and contracts shall include a CD/DVD reader with CD or DVD write capabilities when establishing minimum bid specifications for desktop and notebook personal computers.

Technology Component Standards

The following is a technology component standard for Read/Write Devices.

Table PLA-S-03: Read/Write Devices (Storage)   **Technology Component Standard**   *Updated January 15, 2010*
Strategic:
USB Flash Drives
USB drives typically store from 1 to 64 GB and may include security software options. With security software, they are the preferred choice for transporting sensitive files and information. These drives are recommended over CDs and DVDs for employee storage use.
A CD/DVD Combo Drives
CDs and DVDs remain popular for loading software and viewing multimedia, but are waning in popularity for storage, They have moved to external devices in the smallest form factor computers because they are not generally used but still may be required for loading software in certain cases.
External USB Hard Drives and DVD/CD drives
External drives are another option for mobile worker backups when connectivity is not available
Blu-Ray Drives (BD-R)
PC manufacturers now have blu-ray players in notebooks and desktops at prices around $150. However, they are not likely to be provided in the near future on a standard computer for the Commonwealth.
Emerging:
Blu-ray BD-RW (write technologies continue to be too costly for general use. When prices decrease, this technology may become common in personal computing)
(For enterprise storage use of Blu-Ray disks and DVDs, see the shared utility services technical topic)
Transitional/Contained:
Shared external *floppy drives* may be of transitional use to agencies.
Obsolescent/Rejected:
Zip Drive (Iomega)
Jaz Drive (Iomega successor to Zip Drive)
5 ¼ Floppy
3.5 Floppy Drive in a PC

Desktop-attached Printers, Copiers, Fax machines and Scanners

Some agencies tend to use large numbers of desktop-attached printers. In some cases, this usage pattern is because of continuous printing of confidential information or printing forms that require an ink signature from the customer who is in the worker's office. Others are used because a worker's job requires label printing or special document printing (e.g., certificates). As many as half of the printers presently in use across agencies are desktop attached. Agencies may want to reduce this practice as much as possible to achieve cost savings. Costs of desktop printers are high due to:

- Higher per page printing costs (two to four times as expensive)
- Increasing costs of supplies as the printers age
- Frequency of ordering supplies due to small sizes (more staff time)
- Buying desktop printers singly rather than in bulk (supporting numerous brands and models and not getting price advantages when printers are needed)
- Higher support costs (changing cartridges, fixing paper jams)
- Fixing broken printers when they are out of warranty instead of replacing them (high support costs associated with repairs)

Recommended Practices

The following are recommended practices for Desktop-attached Printers, Copiers, Fax machines and Scanners.

> ***PLA-RP-39***   *Agencies should reduce desktop-attached printer usage as much as possible. If agency personnel only occasionally need to print confidential documents, workgroup printers that enable security passwords for the printing of selected documents may be a viable alternative to permitting desktop printers.*

> ***PLA-RP-02***   *Agencies that use desktop-attached high-cost desktop printers, faxes, scanners and copiers should establish a policy for their acquisition, use, maintenance and replacement. To reduce costs, they should employ quiet, black and white laser printers with a low cost per page and a high consumer rating.*

> ***PLA-RP-40***   *Ink jet printers are appropriate for mobile users only and generally should not be used in offices.*

Technology Component Standards

The following is a technology component standard for Desktop-attached Printers, Copiers, Fax machines and Scanners.

Table PLA-S-04: Desktop Attached Printing Technology Component Standard *Reviewed January 15, 2010*
Strategic:
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
(Note: Desktop attached printers are strongly discouraged for most workers. See discussion in Utilities section.)
Emerging:
Transitional/Contained:
Desktop attached (non-mobile) ink-jet printers for black and white printing are to be phased out
(Note: Desktop attached printers are strongly discouraged for most workers. See discussion in Utilities section.)
Obsolescent/Rejected:

Wireless Connectivity Devices

Although use of wireless technologies for mouse and keyboard connections is becoming more popular, the more typical wireless connections in Commonwealth offices are for notebook connections to the local area network in conference rooms, PDA/smartphone connections to desktops, and Blackberry connections to servers. Wireless printing is rare.

Several technologies support device interfaces and device to network interfaces including modems, infrared connections (IrDA), Bluetooth (IEEE 802.15), and wireless network interface cards or chipsets (IEEE 802.11 or WiFi), and more. Bluetooth personal area network (PAN) interface technologies (radio frequency, 1-100 meter) are expected to eventually replace infrared (optical, half meter) connections because of the relative improvements in speed, distance interference, and flexibility.

The use of Bluetooth has increased drastically in recent years, and is especially popular in headset implementations for phones, wireless keyboards, mice, printers, and other uses. The WiMedia Alliance's multiband orthogonal frequency division multiplexing (MB-OFDM) version of ultra-wideband (UWB) was chosen for the new Bluetooth standard.

IEEE 802.11a, b and g products are available in one card or as an embedded chip both as single protocols and in combinations (e.g., one card provides a, b and g frequencies and transmission methods) for providing wireless connectivity. Network Interface Cards (NICs) and embedded chips should accommodate all three WiFi standards due to the need to access multiple networks and to constant changes in wireless networks to improve capacity or availability. A given wireless network could use all three standards. At present, 802.11n devices and G plus devices are proprietary and should not be used in Commonwealth networks. Ratification of 802.11n devices is expected in January of 2010, but network infrastructure replacement should be part of any move to these devices within Commonwealth networks. However, it may not be possible to buy computers or

other devices without the 802.11n protocol. The inclusion of this protocol along with 802.11 a, b, and c should not eliminate a device from consideration.

With a move towards anywhere connectivity, wireless interfaces have become a necessity. Agencies should have in place wireless use policies appropriate for their business. For example, the agency may want the user to send emails using encryption on all connections but may encourage the free use of public Internet access with a personal firewall installed.

Wireless security is beyond the scope of the Platform Domain, but agencies that choose to deploy wireless personal computing devices must consider the business needs and their security requirements. In some instances this will require discussions with wireless service providers and in other instances, with agency or VITA security personnel.

The cost of wireless computing is decreasing as use spreads making it very likely that wireless PANs, LANs and MANs will dominate future connectivity. For personal computing, this will mean wireless keyboards, monitors, mice, headsets, computers, and speakers in every office and wireless management of devices and software. Everything including power could be wireless. Now, wireless connections to Internet and entertainment on passenger computers are even provided on numerous airplanes.

Recommended Practices

The following are recommended practices for Wireless Connectivity Devices.

> ***PLA-RP-03***   *Agencies with responsibilities for providing IT infrastructure that procure computers should equip the standard notebook computer with a wireless interface (e.g., IEEE 802.11a, b, or g card or embedded capability) to enable state workers to take advantage of wireless connectivity provided in public spaces.*

> ***PLA-RP-04***   *Agencies with responsibilities for providing IT infrastructure should disable wireless connectivity capabilities by default and only allow enabling of them at time of use.*

> ***Rationale:***
> *This will minimize the unnecessary wireless poll signals as well as save on Dynamic Host Configuration Protocol (DHCP) issued IP addresses.*

Technology Component Standards

The following is a technology component standard for Wireless Connectivity Devices.

Table PLA-S-05: Miscellaneous Mobile Components Technology Component Standard _Updated January 15, 2010_
Strategic:

Receivers/transmitters for Local and Personal area networks (LAN & PAN) and mobile devices
    IrDA—infrared used on handhelds
    Bluetooth devices _2.1+EDR; 3.0_
    WiFi 802.11 (a+b+g)

Emerging:
WiMax Capable Devices _True Mobile 4G services from Sprint are supported by a few devices including Centrino 2, an IBM Thinkpad, and some Aircards. Devices supporting new mobile wireless WiMax standards and those in development will make this a reality in more locations if the economy permits progress. This means very high speed connectivity and data transfers in moving vehicles. Mobile 4G services are in place in the US in Baltimore (Sprint XOHM) with the next nearest (to Virginia) service to be in DC. There are no plans for services in VA at present, thus leaving this technology in the Emerging category for some time.[6] XOHM users have had some connectivity problems. IEEE ratification was expected in March 2009, but another RFC was created._ _802.11n WiFi Capable Devices_ _Provides next generation wireless with reduced distance degradation and better multimedia streaming at higher speeds; ratification of the standard expected in the Fall of 2009 (100 Mbs). Use of devices on the market requires infrastructure replacements that are not permitted until ratified. However, devices may have n capabilities built in (e.g., notebook chipsets) as long as it is not used._
Transitional/Contained:
PC Cards (PCMCIA) and internal devices (e.g., embedded in chipsets) that are not receiving all ratified standards including 802.11 a, b and g (to maximize wireless network design possibilities) _and soon, 802.11n_ Bluetooth devices, less than _version 2.1_
Obsolescent/Rejected:

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[7] Sprint's 4G Xohm WiMax: How fast is it?; By Brian Nadel; October 10, 2008 12:00 PM ET: Computer World. http://www.computerworld.com/action/article.do?command=viewArticleBasic&taxonomyName=Mobile+and+Wireless&articleId=9116844&taxonomyId=15&pageNumber=2

Security Devices

A variety of security devices are available to enhance network security or data security via improving authentication or access requirements by adding another layer. This is especially useful with mobile devices that are easily lost or that are targeted for theft.

Biometrics and smartcards are used for adding an authentication security layer for accessing both networked servers and personal computers. Smartcard and biometric methods typically require a reader that attaches to the personal computing platform in the form of a keyboard/reader combination or a separate reader. Several manufacturers including IBM and HP have added biometric readers to notebook offerings. Most workers do not activate biometrics as they lengthen the process for accessing the computer beyond the now required long boot up, accepting responsibility screen, hardware login, VPN login and login to other systems accessed. Key fobs are usually key ring or medallion objects and smartcards are in credit card form. Some key fobs provide pin accessible password tokens that are keyed into the system or application, some signal to a radio frequency (RF) reader that may be attached to a USB port and read by software. Depending on data sensitivity and risk issues, these devices may be useful.

BlackBerrys, Smartphones and Push Email Services

Two push email server competitors vie for the bulk of business-provided services. These are BlackBerry Enterprise Server and Microsoft's Exchange ActiveSync with System Center Mobile Device Manager. The operating systems are respectively, Research in Motion (RIM) with a 40% market share and Windows Mobile (Versions 6.1 (current)), 6.5 (late 2009 release) and 7.0 (early 2010 release)) with a 28 percent share.

Device competition in the consumer market for smartphones, which are supported by telecommunication providers, has a significant impact on the service development directions and product options chosen by the push email providers for business settings. The competition over is fierce with the debut of new models with each of the most popular operating systems. The most recently released Palm Pre and iPhone 3G S sport such features as multitasking, which is quite valuable (Palm), a slide-out physical keyboard, which would please BlackBerry customers (Palm), and a video-camera (iPhone), which could have limited business importance for some agency workers. The BlackBerry Storm 2 is expected soon. The BlackBerry Tour will be available soon as a device for both Sprint and Verizon.

The newest models of available smartphones including the Blackberry Storm typically have touch interfaces. Other consumer features and capabilities include GPS, Internet connectivity options including WiFi, cameras, video (30 fps) and audio recording, sliding keyboards, music, television, substantial storage (up to 32 GB), large screens, numerous applications, USB power/charging options, easy SIM swapping, geo-tagged photos (Symbian), built in compass for reorientation of GPS screens, and more. Perhaps most important to note is that users with these phones will prefer having secure options for adding business services to their phone rather than being forced to carry two devices. Internet-based email options of the future may provide the needed notifications and functionality.

Currently, for BlackBerry services, the best models may still be the QWERTY physical keypad models, which include the new BlackBerry Tour. User reports on BlackBerry Storm models are not glowing, even though some improvements have been released. Users miss the physical keyboard and find the interface sluggish and the virtual keyboard to be unacceptable. If RIM is the OS of choice, continuing to use the older hardware for a while longer awaiting the availability of the Tour may be the best option

Microsoft's push email services use two different servers plus Exchange server to support a variety of phones including Apple iPhone, some Nokias and Windows Mobile. Sales are dropping on Windows Mobile devices compared to last year's levels. Overall, critics agree that these devices

need substantial improvements. Having access to a variety of applications that work on the devices is a major consideration for consumers. Both Nokia and BlackBerry have added application store features

In consumer markets, smartphones will continue to capture growing shares of the communications device sales and will set the standard for business device choices. The present state of the economy has had an effect of slowing the purchase of personal and business smartphones. Consumer acquisition of smartphones will continue to grow, but at a slower rate over the next few years. Consumers will continue to favor the high-end devices similar to the iPhone and with WiFi. Growth in smartphone purchases in government will be slower and will favor the less capable devices

Surge Protection

All computers that are used to store valuable information should have some form of power surge protection when they are plugged in to electrical, cable, network or phone wiring. An example is a computer used by mobile workers who have no access to a VPN or server connection to store the day's work. Service entrance surge protection does not take the place of point-of-use surge protection. A surge can originate inside the building if lightning hits the building wiring or if other building appliances cause the surge. Alternate energy sources also do not eliminate the need. The following list of caveats is not comprehensive. More information can be found on the State Farm Insurance web site at the following listing:
http://www.statefarm.com/consumer/vhouse/articles/surgprot.htm

Some important considerations are as follows:

- A surge protector must be UL 1449, second edition rated, which means that it meets current Underwriter Laboratory's requirements for surge protector safety[7].
- A surge protector should be grounded and should never be used with a non-grounded extension cord
- A surge protector that will no longer conduct electricity if its protection capabilities have been destroyed by too many surges is recommended. A light typically only means that electricity is being conducted and not that the surge protection works. Surge protectors can wear out.
- You must use the jacks in the surge protector for phone and other electrical input to have full protection. No electrical input should go directly into your computer.
- The surge protector must have input and output for the connectivity you use. For example, different recommended jacks (RJ specifications) are used for phone (POTS), ISDN, DSL, T1, etc. (e.g., RJ11, RJ45, RJ48).
- Buy a surge protector with a warranty and keep the warranty.
- Remember to use a surge protector on your notebook. Notebook surge protectors are often small and have retractable phone or data line connection cords.
- The newer your equipment, the more sensitive it is likely to be to surges.

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[8] UL1449 has basic safety tests no different from most UL standards for safety. These tests include leakage current, dielectric withstand, insulation resistance, temperature rise and mechanical integrity tests such as impact, drop, crush and mold stress relief distortion for plastics among others. http://www.leviton.com/sections/prodinfo/surge/ul1449.htm

Recommended Practices

The following is a recommended practice for Surge Protection.

PLA-RP-12 Agencies should provide surge protection for personal computers and should protect against surges for all electrical inputs. A two stage surge protector is best. _Agencies should_ protect both at the service entrance and at the point of use.

Requirements
The following is a requirement for Surge Protection.

**PLA-R-15** _Agencies shall provide a surge protector that can protect from surges through electrical inputs including network, telephone and power lines to field workers who need to protect the data stored on their personal computers._

**Rationale:**
The term, "field worker" includes teleworkers, roadway inspectors, park rangers and similar workers who work outside of a networked office. Workers in networked environments typically have the needed data protection, data backups, and server UPS protections provided through their computing environments. Teleworkers typically store data continuously through Virtual Private Networks (VPNs) that connect to protected telecommunications and servers.

Servers

The platform domain addresses servers as single hardware devices and as configurations for utility service provision. Servers as hardware include the full range of computing devices from mainframe computers to small single-socket computers. Servers may support 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 hardware 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 considerations include sockets, processors, ports, interfaces, communications buses, and memory, storage, power, and controller components. Server software discussed in this section includes operating systems and similar management software. Other utility software such as email software is discussed in the utility section of this report. The following server components are addressed:

- High-end servers including OS
- Midrange/low-end servers including OS
- Consolidation platforms

Commonwealth's Strategies for the Server Architecture

A Commonwealth-wide strategic perspective should ensure the following enterprise architecture objectives:

- Reduce server platform operating cost across the enterprise
- Improve servers (and service delivery) performance quality for customers
- Provide a full range of platform capabilities to meet strategic and operational business requirements
- Implement storage consolidation methods; limit backup and recovery storage costs, reduce the risk of data loss, and ensure service restoration within defined recovery timelines
- Implement homogeneous server solutions across the enterprise (e.g., reducing the number of OSs, images, brands, management solutions, etc.)
- Utilize virtualization approaches where practical
- Ensure performance metrics for the total solution are factored into the decision making process
- Ensure reliability and availability for mission critical processes

The ability to grant exceptions to the requirement to only use "strategic" operating systems will be critical, especially for servers that support business applications that cannot be moved cost-effectively. Also, when agencies wish to adopt applications developed for other states, the agency may need an exception if the application has only been proven on one out-of-architecture platform. Agencies should only migrate from existing platforms when it is cost-effective to do so or when the manufacturer/vendor has scheduled the existing platform for obsolescence (i.e., plans to eliminate support).

Multiprocessors and 32 vs. 64 bit Processors

In recent years, physical limits in materials used in processors (i.e., silicon) have resulted in an end to the rapid upward trend in processing speeds (i.e., CPU GHz). These limits have resulted in a turn to other architectural redesign methods similar to what is done in the mainframe world to improve processing.

Now, multiprocessing, simultaneous dual threading, multiple direct connections to I/O and memory, and strategic use of cache are the main methods for improving processing capabilities in servers.

However, there are business side costs to taking advantage of these improvements. Now, it is extremely important to evaluate commercial off-the-shelf software (COTS) for its ability to take advantage of processor improvements (specific processors) that use multiple cores and simultaneous threading.

Actually, applications will have to have benchmarks based on total server hardware configurations as the drive and memory speeds will also come into play. For non-COTS, agency specific software, agencies needing performance improvements may have to rewrite existing software to enable use of new architectural designs.

Now, there are two issues of importance. Agencies that in the past have relied on hardware improvements to assist them with meeting the demands of increased utilization of software (e.g., due to steady growth in the number of customers served) can no longer depend on hardware for this. The growth will cause movement of bottlenecks from the hardware provider side of the equation (new hardware is needed) to the agency side.

The new, more capable hardware will only be of value if the software can use its capabilities. The software must be adjusted to improve parallelism and the ability to process simultaneous threads. This will be of increasing importance in the future as processors increase cores and threads and replace interconnection strategies.

Present competition between AMD and Intel for the processor market share show Intel with about 89 percent and AMD with 11 percent[8]. The strong competition between the two companies has resulted in both quality and price competition. Intel's strategy allows each core to handle multiple instructions at

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[9] IDC analyst Shane Rau. Reported in China Daily http://www.chinadaily.com.cn/world/2009-06/02/content_7964192.htm

once, but this is not useful to every application. AMD provides value in quality and cost, thus causing Intel to slowly lose market share in a dwindling market. Intel's latest processor is the eight core Nehalem EX which will be competing in 2010 with its own Xeon 7400. AMD competes with its six core Opteron. Future designs continue to increase cores and access times in the "x86" market and on the high-end machines.

Present application providers are scurrying to move from 32 bit to 64 bit processing without losing their current processing power and speed and Microsoft is in a race to go far beyond 64 bits to take advantage of the ever increasing cores, threads and resulting instances of simultaneous multiprocessing.

From an agency perspective, the question is whether any change will cause problems or result in an improvement. Upgrades of hardware, OS, or any other single software product used in the application can affect performance and the operations of business critical systems. Because of this, stepwise testing of changes is recommended whenever it is possible and not too costly to do so. For applications, those agencies with tiered systems will be in a better position to assess the separate affects of changes to hardware and/or operating systems for applications, middleware, databases, storage, and backup systems.

Those agencies that have been using Linux and UNIX will have a lesser challenge as those components of their application architectures can accommodate hardware changes without OS changes and application changes.

The difficulty from the perspective of an application is this: servers are no longer providing clock speed improvements which were helpful in extending application life. Now, server process increases are available for squeezing more efficiency out of the CPU. This method puts the burden of improved application functioning on the shoulders of the developer.

Each server socket has "server processes" in a number equal to the number of cores times the number of threads per core. This means that for the application to improve efficiency, it must be able to make simultaneous use of additional processes. The term used to describe this is simultaneous multithreading or SMT.

Both the operating system and the application software must be multithreaded. At present, Windows is not able to take full advantage of all the processors currently on the market. Because the number of processes per socket is expected to grow rapidly over the next few years, both operating systems and application software will have shortened life cycles, thus increasing agency costs.

Microsoft has announced that Windows Server 2008 is the last Windows OS that will permit downgrading to 32 bit addressing. This means that all agencies running Windows applications will have to upgrade their applications to accommodate 64 bit addressing by 2018 when Windows 2008 is at end of support. The R2 version of Windows 2008 is expected in 2010 and will have improved scalability to 256 simultaneous processes. However, the Hyper V will be more limited in scalability.

One final issue is the unknown landscape that will result from Oracle's 2009, third quarter acquisition of Sun including hardware, operating systems, the Sparc processor and more. Only speculation is possible at this point because Oracle will not release its roadmap until after the acquisition.

In summary, those agencies running applications, middleware, databases, or storage/backup systems on multi-processor servers (Windows, Sun, Fujitsu PrimePower, etc.) or on single processor servers have considerable change and uncertainty heading their way. Unfortunately, the agency-side changes to applications that may be required could be costly and difficult to accommodate during a recession. Over the next ten years, careful planning is required to sequence the changes to OS, applications and hardware to maximize business benefit.

Server Consolidation

Server consolidation is an architectural strategy that can control costs in situations where the enterprise will realize scalability, attain improved simplification of processes and enhance backup and recovery procedures.

Gartner suggests there are three consolidation approaches (basic definitions are from Gartner).

- The first type of consolidation, *logical consolidation*, leaves servers where they are and manages them centrally. The management software used for remote administration must handle well the types of servers in the current and envisioned future architecture.
- The second type, *physical consolidation*, requires moving agency server hardware to one or more central locations to be managed across groups of agencies or co-locating replacement hardware as existing servers become obsolete. In Virginia, this consolidation solution also requires effective telecommunications for getting the data and functions to the users in addition to an efficient central management process and procedures.
- The third type of consolidation, *rationalized consolidation*, requires using scale-up and scale-out consolidation platforms for the co-location (perhaps by type) of applications, databases, general storage, network functions, and utility functions (e.g., those network, application, or database functions that are handled commonly across agencies). Collocation of such applications might involve using hardware provisioning such as blade servers racks and utilize techniques such as server clustering, server partitioning, or server virtualization.

  Rationalized consolidation might include bringing together many different applications to one platform (e.g., all Oracle databases) or consolidating multiple instances of the same utility application such as email. Rationalized consolidation is the most risky and, therefore, requires particular attention to assessing risks and costs for the alternatives being compared.

To-Be Architecture

The Commonwealth's present server architecture is predominantly Microsoft and UNIX, with UNIX being used primarily for applications that require higher-end server capabilities. This will not change in the near future. The server architecture will continue to include Microsoft, UNIX (including HP-UX, AIX, Solaris and Linux) and the IBM z/OS mainframe. The Commonwealth's long-term architecture goals will:

- Reduce the number of servers
- Minimize the number of data centers
- Relocate critical servers from unsecured locations to secure data centers
- Limit the number of operating systems and versions
- Track planned retirement dates for applications and for server hardware
- Increase the use of Linux across the enterprise where appropriate

Principles

The following are guiding principles for Servers.

PLA-P-13   Server selection flexibility is vital to accommodate large-scale enterprise business strategy.

PLA-P-14   The server consolidation process should be efficient.

PLA-P-15   Server complexity should be reduced in a competitive manner.

Recommended Practices

The following are recommended practices for Servers.

> **PLA-RP-15**   *Agencies with responsibilities for providing IT infrastructure are encouraged to adopt ITIL-ICTIM (Information Technology Infrastructure Library – Information and Communication Technology Infrastructure Management) best practices to manage platform life cycles.*

> **PLA-RP-17**   *Agencies with responsibilities for providing IT infrastructure should leverage their business volumes and central control to pursue the costs savings and benefits of architecture simplification in platform procurement and scaling decisions.*

> *Rationale:*
> *Acquisitions of servers, appliances, blades, etc., and related hardware or software should be restricted to no more than two brands for a hardware type to promote price competition and simplifying the architecture. New contracts may be appropriate every one to two years. The competition should be based on the most procured size and type of server for an in-architecture operating system, but the award should extend to variations within the class (e.g., within the commodity class or low-end). Support, reliability, performance, and other needed qualities should be weighed appropriately. The advantage of having two brand selections is continued competition over the contract for performance and price. Areas of greatest savings should be addressed first.*

> **PLA-RP-19**   *Agencies with responsibilities for providing IT infrastructure should ensure that the maintenance support response-time is in line with business needs for all applications on each specific server.*

> **PLA-RP-20**   *Agencies with responsibilities for providing IT infrastructure should follow the OS manufacturer's specific systems setup policies and best practices.*

> **PLA-RP-21**   *Rack mounted servers should be used whenever possible. Blades may be more appropriate in some instances but should be considered on an application by application basis. Concerns about the proliferation of proprietary management systems should also be considered.*

Requirements

The following are requirements for Servers.

> **PLA-R-17**   *Agencies with responsibilities for providing IT infrastructure and/or service providers 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.*

> **PLA-R-18**   *Agencies with responsibilities for providing IT infrastructure shall migrate to either NAS (Network Attached Storage) or SAN (Storage Area Network) or combination whenever feasible and cost beneficial.*

> **PLA-R-19**   *Agencies with responsibilities for providing IT infrastructure shall not use OEM provided operating systems (OS) for x86 server hardware.*

> ***PLA-R-36***   *Agencies with responsibilities for providing IT infrastructure shall consider growth requirements over the server life to enable minimizing costs and reducing wasted capacity.*
>
> ***Rationale:***
>
> *Planning may enable acquisition of a small number of large capacity memory modules instead of a large number of smaller modules and may enable avoiding excess and underused server capacity.*
>
> ***PLA-R-37***   *The release version levels of all server operating systems shall have vendor or equivalent level support. This support shall include security update and hotfix support. The use of unsupported open source server operating systems shall be avoided.*

High-End Servers

High-end servers are defined as servers that may scale to more than 16 sockets in size and that use highly specialized architectures and processors. These mainframe-type servers typically cost more than $250,000 and have significantly greater capabilities in areas including reliability, availability, serviceability, security, privacy, business continuity provision, management consistency, and risk reduction. The operating systems such as zOS provide these characteristics. They are more scalable than midrange servers, which have similar characteristics (e.g., SMP/NUMA).

Technology Component Standards

The following is a technology component standard for High-End Servers.

Table PLA-S-08: High-End Servers Technology Component Standard *Updated January 15, 2010*
Strategic:

Software
    z/OS
    Solaris *
    HP-UX
    AIX
    Windows *(may not be keeping up with hardware advances)*
    Linux in virtual partitions
    Virtual Server OSs (e.g., zVM, VMware, strategic only for: supporting OSs that are in the desired future architecture (e.g., Linux, Windows, HP-UX and Solaris * *and for* use in building test environments
     Hypervisors are critical management tools for provider and agency-side cost reduction
Hardware
    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 an alternative to Sun* for the Solaris OS)
 	
* Note: Sun's Q3 2009 acquisition of Oracle may cause Sun's and Solaris' inclusion in "Strategic" to be reevaluated*

Emerging:

Software
    Windows Virtual Server 2008 R2
    Hyper V

Transitional/Contained:

Software
    Unisys OS2200
    VMS
    Unix other than Solaris, AIX, Linux, and HP-UX
    Virtual Server OSs used to support older versions of a strategic OS in cost-effective consolidation transitional plans
    OS 5i (formerly OS/400)
Hardware
    IBM ES9000 (9221)

Obsolescent/Rejected:

Software
    MVS XA
    MPE
    OS/400 (library OS)
    MVS OS/390

Midrange to Low-end Servers

Midrange to low-end servers typically cost $50,000 or less. The low-end servers would usually have one to four sockets, but with dual-core or quad core processors that are multithreaded, they are quite powerful. With the wide variety of configurations possible, these servers will be able to scale both up based on processors chosen and scale-out via cluster and mesh configurations. Typically, these servers run Linux and Windows.

A midrange computer may be described as a scaled-down version of a high-end server. However, with the changing processor architectures on the low end, the specialized management capabilities in the midrange are now more defining than the number of CPUs. However, Windows is less scalable, and so Linux and UNIX provide greater scalability in the midrange.

Although the midrange market still exists, there seems to be a practical division between high-end scale-up solutions and low-end scale-out possibilities. This is partly due to the competitive pricing of the high-end and partly due to processor changes and scalability improvements at the low-end.

However, because Windows is so dominant at the low-end the present day Windows server OS will have to change drastically to keep up with modern processor and hardware changes. Currently, the Windows OS is a significant bottleneck to low-end scalability. Planned changes in Windows to better accommodate multiprocessing and parallel processing will be extremely important but may also have a domino effect requiring changes in all the applications that run on Windows.

Technology Component Standards

The following is a technology component standard for Midrange/Low-end Servers.

Table PLA-S-09: Midrange/Low-end Servers Technology Component Standard *Updated January 15, 2010*
Strategic:

Software
    Windows Server 2003 family
    Microsoft Windows Server 2008 not including Hyper-V
    Unix (Solaris, AIX, HP-UX and Linux)
    Virtual Server OSs (e.g., VMware and zVM; *Xen Virtual Hypervisor*)
Examples
    Windows Server 2003*/2008 and Exchange 2007 servers* are especially appropriate for shared utility services including domain controller, file, print, email, etc.
    Linux may be an alternative for Web, database, and shared utility services
    Virtual servers and virtual machines aid in providing test environment setup
Hardware
    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
    Multicore processors will be used increasingly as a method of improving processing capabilities of server hardware, but without corresponding application changes to take advantage of multithreading and parallel processing, agencies may see application degradation rather than improvement when moved to new hardware.

Emerging:

Software
    Microsoft Windows Server 2008 with Hyper-V (still scalability issues; may meet certain needs well)
    Microsoft Windows Server 2008 R2

Transitional/Contained:

Software
    Windows 2000 *Advanced Server* family *(By June 2010, agencies should have completed migration of all business applications to a newer version. Migrations should be underway well before the support end date; extended support is presently scheduled for ending July 13, 2010)*
    Virtual Server OSs (e.g., VMware hypervisor, Integrity Virtual Machines, and in some cases, Windows 2003 Virtual Server R2) enable transition strategies for multiple versions of the same OS
    OS10 Server as a transitional OS for aiding in the use of Windows staff for Unix work due to the Windows-like user interface instead of command line

Obsolescent/Rejected:

Software
    NT
    Novell
    OSX

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.

Technology Component Standards

The following are technology component standards for Consolidation Platforms

Table PLA-S-10: **Consolidate by aggregation on midrange to high-end platforms** **Technology Component Standard** *Updated January 15, 2010*
Strategic:

Software
    Unix (HP-UX, Solaris, AIX and Linux)-- *(caution: Q3 2009 acquisition of Sun by Oracle)*
    z/OS
    Windows
Consolidation Examples:
    Appropriate for critical application and database tiers that require exceptional scaling, speed, transaction processing, reliability, etc.)
Hardware
    Exceptional partitioning and workload management are required for the server solution. Example platforms include but are not limited to: IBM Mainframe, IBM POWERx, Sun/Fujitsu* SPARC/UltraSPARC, Fujitsu/HP Itanium x (64) and AMD Opteron (64). *(caution: Q3 2009 acquisition of Sun by Oracle)*
 	
* Note: Sun's Q3 2009 acquisition of Oracle may cause Su/Fujitsu's' inclusion in "Strategic" to be reevaluated

Emerging:
Ongoing management improvements. Ongoing CPU improvements: Multicore expansion to 8, 12+ processors; power saving design changes; thread count increases; cache increases.
Transitional/Contained:
Obsolescent/Rejected:

Software
    MPE
    MVS OS 390
    Unisys OS2200
    VMS
    OS/400
    IBM ES9000 (9221)

Table PLA-S-11: Consolidate by Scaling Out Technology Component Standard *Updated January 15, 2010*
Strategic:
Software
Windows Server 2003*/2008*
Solaris*
HP-UX
AIX
Linux
Examples
(Note: clustering capabilities may come from other software such as MySQL Cluster which runs on most of the above operating systems.)
Clusters are appropriate for MS Exchange Server (e.g., an email farm): clustered low-end to low midrange solution on Windows Server 2003*/2008*.
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.
Appropriate for Web hosting: (e.g., on Windows Server 2003*/2008*, HP-UX, Solaris*, AIX or Linux)
Hardware
Typical solutions include farms/clusters using blades or servers in racks. Commodity servers are commonly employed. Other options are possible.
* *Note: Sun's Q3 2009 acquisition of Oracle may cause Solaris' inclusion in "Strategic" to be reevaluated*
Emerging:
Transitional/Contained:
Obsolescent/Rejected:
Software
Windows NT
Windows 2000

Table PLA-S-12: Consolidate using virtual tools **Technology Component Standard** *Updated January 15, 2010*
Strategic:
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.
* Note: Sun's Q3 2009 acquisition of Oracle may cause Solaris' inclusion in "Strategic" to be reevaluated
Emerging:
Software
Windows 2008 Hyper V (Virtual Server) (scaling issues)
Hardware
Intel and others are working to improve sub-processor partitioning capabilities
Transitional/Contained:
Software
Windows Virtual Server (still lacks scalability needed for many scale-out applications)
Permit virtual servers of older versions of supported OS in transitional efforts (may have some use here)
Obsolescent/Rejected:

Shared Utility Services

Shared utility services are defined in this report to promote centralization and common handling of networked services that are currently implemented in many different ways using different practices across the served agencies and customers.

The included shared utility services have been chosen from candidate services to be implemented first because they are expected to result in the best cost savings, service improvement and other benefits.

The Commonwealth has a large installed base of Microsoft related products ranging from individual computing software to enterprise level software solutions. UNIX, Novell and other operating systems are on a relatively small portion of servers, although they are providing mission-critical application and services.

Microsoft provides considerable well-tested guidance[9] for architecting and managing Microsoft environments. In the area of utility services, Microsoft provides guidance for reducing risks, reducing costs, and providing better management of resources.

Platform controls for networked utility services and devices, which may be provided in a common manner across agencies, will enable:

- Service consolidations
- Creation of more cost-effective services
- Simplification of the overall architecture across technical domains
- Easier provision of qualified platform and services staffs
- Improved customer access to quality services

The utilities defined and addressed here are as follows:

- Storage Utilities: including devices and services for general storage, archiving, backup and recovery
- Print, Fax, Scan and Copy Devices: Output servers and devices
- Email, Related Communications Utilities, and Coordination Services: Messaging with and initial focus on email services that could later be expanded to include other networked, mobile, audio, video, and data messaging services
- Network (LAN/WAN) Control Utilities control services: including initially server-based network utilities and foundation services such as directories, IP addressing, DHCP servers and DNS servers

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[1]0 A good example of Microsoft's guidance may be found in this older, but still relevant audio/slide presentation http://www.microsoft.com/seminar/shared/asp/view.asp?url=/Seminar/en/20030424vcon85/manifest.xml .

Principles

The following are guiding principles for Shared Utility Services.

PLA-P-16   Use of roadmapping techniques is encouraged as one method for limiting information technology risks and to defining transitioning activities in highly volatile and rapidly changing business and information technology environments.

PLA-P-17   Viable centralization, consolidation, access levels, and/or simplification for shared utility services including storage, firewall platforms, web servers, output servers, output devices, and related hardware and software should be facilitated.

Requirements

The following are requirements for Shared Utility Services.

PLA-R-20   *Agencies with responsibilities for providing IT infrastructure shall standardize deployment, management methods and procedures for shared utility services where possible.*

PLA-R-21   *Agencies with responsibilities for providing IT infrastructure shall consider Microsoft best practices as guides for standardizing Microsoft Windows services across agencies until alternative shared utility services are studied and alternative methods are put into place.*

Implications:

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. 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 IIS servers and may follow Microsoft best practices for their deployment. The alternative shared utility services below may have general benefit for agencies, but should be compared in cost and benefit analyses with other in-architecture options before proceeding. Example alternative shared utility services include:
- *Linux as a database OS (e.g., ESRI; Oracle RAC on Linux, MySQL clusters)*
- *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 Utilities

The term "storage system" encompasses the hardware, software, communications, networking, media, media controllers and management tools required to record data somewhere other than on a local PC and to index the data in a manner that allows it to be retrieved at a later time.

Storage provision must be approached as a utility service designed to decrease costs and reduce risks while maintaining or improving performance and data availability.

Other enterprise technical domains will address what management tools should be used (Systems Management Domain), what types of networking and protocols are restricted (Network Domain), what security tools are appropriate (Security Domain), and what middleware tools (Integration Domain) might be involved.

Commonwealth's Goals for a Storage Architecture

The Commonwealth's goal for storage is to have both local and central storage systems that are well planned, appropriately implemented and well managed. By conducting data storage capacity planning and identifying agency-wide storage requirements, an agency will be in a better position to match data retention and archival requirements with business requirements. The following list provides examples of goals for improving data storage systems:

- Increase storage reliability (e.g., address data availability and redundancy)
- Improve storage scalability (e.g., implement a solution that will overcome present software and solution limits)
- Improve service levels (e.g., improve response time and speed)
- Increase hardware utilization rates (e.g., lower storage costs by using a greater percentage of available capacity and implementing systems that can be managed with fewer human resources)
- Reduce the need for planned outages (e.g., enable hot-swapping, remove storage traffic from the LAN)
- Improve backup systems or disaster recovery (e.g., by central management and control of options)
- Improve file-serving speed (NAS)
- Improve block-servicing speeds
- Decrease I/O burden on hosts
- Improve network availability (e.g., create a separate storage infrastructure (SAN))
- Meet write-once, read many times (WORM) media needs of some legal documents (e.g., CDs/DVDs may be a good option for meeting these needs)
- Accommodate distance requirements
- Reuse skills of existing staff in providing systems improvements (e.g., NAS models can be implemented with existing network staff)
- Reduce management time
- Take advantage of management capabilities of more advanced systems and software (e.g., storage management software may provide environment management, virtual storage, metrics, off-site tape tracking, etc.)
- Take advantage of automation opportunities (e.g., server-less backup, business continuation volumes, data warehouse input, synchronous or asynchronous mirroring, snap shot, etc.)

Data Storage Planning

Storage planning metrics and reporting are very important for building services to meet agency needs across the many customer units (e.g., agencies for VITA, departments for universities, colleges for the Virginia Community College System (VCCS)) and locations. Good planning requires

looking at storage needs from both unit and enterprise perspectives. Every agency or other unit, small or large, needs to consider the following:

- Special needs of each business application or utility service (e.g., email) including permissible risks, performance, security, privacy, availability requirements, etc.
- Changing needs of applications (e.g., over time)
- Whether backup and disaster recovery systems are adequate
- How well storage traffic is being handled and will be handled in the future by the involved networks, connections, and network services used in transmitting data (e.g., local area networks (LANs), SCSI connections, wide area services (WANs) or special storage networks (SANs))
- Costs and benefits of storage, backup and recovery alternatives

Storage Parameters

Many factors come into play in choosing among storage solutions: present storage needs, anticipated storage growth, server locations, user locations, transmission needs, specialized service needs, and more. Storage planning also requires joint consideration of aggregate needs and Commonwealth-wide opportunities for improving services or reducing service costs through central solutions.

Data Types and Uses

Much of storage solution planning should be done by data type and data use patterns. Solution options may vary for different data types. Example data types include real-time databases used by widely distributed users, static data used by users in only one location, indexed image data accessed via the Internet, email, email attachments, web pages accessed via the Internet, and static online library reference systems. These data types require different approaches to storage and to backup and recovery. For example, static data may require offsite, accessible copies but may not require periodic backup.

Unneeded Data

Modern storage management software permits policy-driven archiving. This type of mechanism provides interesting possibilities for reducing storage systematically. Agencies with responsibilities for providing IT infrastructure that provide central storage should provide tools to help agencies, departments and other units in decreasing the amount of stored data they maintain.

Storage Solution Types

Each storage solution type is appropriate for some business needs and not for others.

- <u>Agencies with modest storage needs where central storage options with MPLS VPN access may be prohibitively expensive.</u> These agencies might benefit from LAN resident file servers and occasional SCSI attached DAS. In this instance, agencies with responsibilities for providing IT infrastructure might assist by selecting a solution (e.g., a canned NAS system), providing purchase, maintenance, remote management, and standardization of backup and recovery.
- <u>Agencies with high storage volumes mixed application servers (e.g., UNIX and Windows), or a need to share files across a mixed environment</u>: A central service might encourage use of NAS instead of file servers. These agencies may effectively use a combination of file servers, DAS and NAS in their environment, but simplification may be beneficial.
- <u>Agencies with large web-hosted applications requiring cache, large volumes of email, or databases that are accessed frequently.</u> These agencies may also benefit from NAS and NAS/DAS combined solutions.

- <u>Agencies with very large databases, heavy transaction processing, many data producing applications, many employees, and/or over-committed network resources.</u> These agencies may need to consider the installation of SANs or unified NAS/SAN options.

If telecommunications are affordable and remote storage meets business throughput needs, many agencies will benefit by using consolidated storage options (e.g., virtual remote storage). Multi-agency storage consolidations in locations of varying distances from the users, presentation servers, and application servers are now more cost effective and workable than they have been in recent years. Solutions such as MPLS VPNs and WAN acceleration services enable transmissions of data across WANS without suffering unacceptable delays that are often inherent in WAN but not in LAN solutions.

An agency may be able to reduce costs significantly by having short-term and archived solutions for the application. Planned disposal of the data at some point in time, whether user generated and managed or business application generated will help to reduce storage cost escalation.

Email storage is a significant and escalating cost for agencies. Colleges and universities are now taking advantage of free student email services offered by companies including Microsoft and Google. For storage related to other office applications including word processing, spreadsheet and presentation software, Google also provides free storage. However using a "free storage solution" may be prohibited due to State or Federal requirements because email may contain agency-confidential or PHI (protected health information).

Storage from a Central Perspective

The following are some possible areas for achieving cost savings in the provision of storage alternatives that meet business needs.

- Having common central planning data across agencies and applications
- Consideration of Microsoft tools and Microsoft best practices where feasible given the overwhelming use of Microsoft for both applications and databases
- Consideration of third-party add-ons to Microsoft systems when weak solutions are provided
- Consideration of virtual storage options
- Strategic choice of storage platform solutions (e.g., appropriate use of NAS devices, blades, and tapes)
- Ensuring that storage management software has specialized handling capabilities for storage associated with selected services with escalating storage needs such as email services or databases
- Centralizing or regionalizing data storage for data that is currently stored many times across the executive branch (e.g., certain map data, accident report data, customer data, or library reference data)
- Providing cost-saving options for customers that reduce costs while meeting business needs (e.g., storage options with levels of services such as backup frequency alternatives to accommodate data that changes only once annually versus data that changes every day)
- Providing well planned backup and recovery services as a utility
- Ensuring good toolset integration across management tools used
- Providing agencies with the information, reporting and tools they need to establish policy and policy implementation feedback mechanisms for storage controls to the fiscal unit level if possible
- Good storage management and provisioning

Central Services Hardware and Software

Most high end storage systems are end-to-end solutions with one or more high value capabilities. Hardware, software, interface, and tunneling capabilities change continuously. Within an enterprise, storage experts tend to make decisions about cost effective choices based on input from platform and application specialists that design, build and monitor the systems producing the stored data.

When purchasing systems, it is important that they meet needs across server platforms and utility services. However, it is also important not to eliminate special capabilities of the platforms when attempting to combine platform output. For this reason, hardware and software advances will only be discussed in relation to particular crucial, multiagency needs.

The ability to control growth of storage when possible and utilize less expensive storage solutions tends to be more a policy and training vs. hardware or software concern. Business requirements are critical to success in making hardware and software choices for central systems. Among the most important requirements are storage growth control and legal requirements demanding storage parameters

Recommended Practices

The following are recommended practices for Storage Systems.

> ***PLA-RP-24***   *Agencies with responsibilities for providing IT infrastructure should consider the full range of storage alternatives. NAS, SAN, DAS, file servers, NAS/SAN combinations may all be appropriate depending on storage volumes, LAN bandwidths, WAN throughputs, connectivity requirements, and other factors.*

> ***PLA-RP-26***   *Agencies with responsibilities for providing IT infrastructure that provide storage services should evaluate Linux as an operating system for storage solutions (e.g., in solutions such as backup).*

> ***Rationale:***
> *Linux is being explored worldwide as an alternative to Windows for selected uses and may provide cost savings.*

Requirements

The following are requirements for Storage Systems.

> ***PLA-R-22***   *Agencies shall perform periodic capacity and storage planning and provide those plans when requested to the agency with responsibilities for providing their IT infrastructure. The availability of planning data will improve storage, backup and disaster recovery solutions for the Commonwealth.*

> ***PLA-R-23***   *with responsibilities for providing IT infrastructure must offer capacity planning and storage planning services to assist supported agencies in determining their present and future requirements.*

PLA-R-24   Agencies shall consider all of their applications when conducting capacity planning and when developing a storage plan.

PLA-R-25   *Agencies with responsibilities for providing IT infrastructure that manage storage consolidation shall design consolidated storage solutions with for servers used by multiple applications within an agency, by multiple agencies, or managed as a group across agencies and applications.*

PLA-R-29   *Agencies with responsibilities for providing IT infrastructure shall consider the value of improved backup and recovery management, reduced backup and recovery costs, and improved backup and recovery service levels when developing storage management plans and costs. This very important benefit of server and storage consolidation must be included in cost comparisons.*

PLA-R-31   *Agencies with responsibilities for providing IT infrastructure shall include assessments of connectivity needs and options for the customer base when designing consolidated storage solutions.*

Rationale:
A consolidated solution often requires added connectivity. This connectivity may both increase costs and degrade throughput. The distance to the consolidation system and the costs of connectivity may be critical factors. Solutions including iSCSI, MPLS VPNs, WAFS, blade chassis, storage virtualization, and SAS are among the tools that may be beneficial in reducing total storage costs.

PLA-R-32   *Agencies with responsibilities for providing IT infrastructure when designing consolidated storage solutions must evaluate the cost-effectiveness of locally consolidated storage options for the physically co-located servers if central remote storage is cost-prohibitive.*

Technology Component Standards

The following is a technology component standard for Storage Systems.

Table PLA-S-13: Storage Interfaces **Technology Component Standard** *Updated January 15, 2010*
Strategic[10]:
FC—FIBRE Channel single or multimode up to 12.75 Gbps in each direction: Topologies—FC-AL (arbitrated loop), FC P2P (point to point), FC SW (switched); typically Remote FCIP)
FICON
SCSI
10/100/Gb Ethernet; 10/100/2Gb Ethernet
iSCSI
PCI Express
FC-IP
10GigE
SAS (Serial Attached SCSI)
InfiniBand (IB)
Emerging:
FCoE (Fibre Channel over Ethernet)
10 GB Ethernet
Transitional/Contained:
10/100 Ethernet
Obsolescent/Rejected:
ESCON, 17 Mbps (Mainframe)
Block/Parallel (distance limits and speed problems) 4.5 Mbps (Mainframe)

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[11]For example, these a re 2008 high end storage connectivity solutions: The Symmetrix 8000 series provides concurrent multi-host support for a wide range of open systems and mainframe platforms and operating systems with Ultra/Ultra2 SCSI, ESCON, FICON, and Fibre Channel (FC-AL or FC-SW) interfaces. Connect storage from virtually all UNIX, Windows2000/NT, Linux, mainframe, PC LAN, and AS/400 servers. http://www.sandirect.com/product_info.php?cPath=145_152&products_id=352

Print, Fax, Scan and Copy Devices

For networked print, fax, scan and copy services, the standardizing of hardware, software, supplies, deployment, management, and staff training all offer high potential savings when coupled with paper reduction efforts.

The Commonwealth can improve services to employees and agencies by providing better color printing, faster printing, more available printing, more accessible scan and fax services, and better agency-level reporting of service usage for improved policy setting and cost reduction.

While it is important on the one hand to have the services needed, it is also important to have controls. Policies within are a very critical part of controlling escalating and unnecessary output production. Also important is having solid alternative practices and tools including the use of media alternatives to paper libraries for those who have this need.

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, use of shared 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.

Minimum Service Levels

Recommendations presented here address minimum service levels including distance to service centers from individual offices and work stations, minimum on-site availability of services, and duplication of services when devices fail. These levels are proposed as best practices based on vendor recommendations, industry practices, and the perceived needs of knowledge-workers. Agencies and other customer groups may wish to modify these levels up or down based on actual work done or policies for use reduction.

Recommended Practices

The following are recommended practices for Print, Fax, Scan and Copy Devices.

PLA-RP-27   Agency employees should have access to networked print, fax, and scan services within *approximately* 100 feet of their work area.

PLA-RP-28   Agency employees should have office access to laser color printing, laser black and white printing, collating with stapling, and two-sided printing at a minimum in any office *with more than 20 users of PCs.* In small offices, business needs may dictate using services rather than having all capabilities in house.

PLA-RP-29   Agencies should deploy one or more multifunction document handling

PLA-RP-30   *Agencies with responsibilities for providing IT infrastructure who provide document handling devices should replace them every five years or more often if it is cost-effective to do so. Estimates of employee productivity loss due to device downtime should be included in the process for deciding when to replace.*

PLA-RP-31   *Agencies that support print, fax, scan and copy devices should implement a minimum service plan for networked document handling devices for all customer sites with options for customer additions and deletions.*

Implication:

The actual implementations should include consideration of whether a network exists in the location, whether high or low volumes of documents are handled due to business differences,

whether extra devices are required to reduce distances, whether savings on services will cover office reconfiguration, and other local considerations.

> **PLA-RP-33**   *Agencies should establish practices and policies to help control the escalation of printed output.*

Implication:

For example, the agency could address personal printer use, track and post printing growth, post color versus black and white price differentials, provide print-on-demand web libraries as an alternative to printing extra copies of documents and storing them, or encourage employee use of personal CD/DVD libraries of non-critical reference materials to reduce printing escalation and costs.

> **PLA-RP-34**   *Agencies should control the acquisition of copy and print supplies to reduce costs.*

Rationale:

When output device supplies are proprietary, better prices may be negotiated as part of the acquisition contract. Certainly, these highly variable costs should be included in the TCO of any equipment acquisition decision.

> **PLA-RP-35**   *Agencies with responsibilities for providing IT infrastructure should provide secure printing and scanning options to customers when they are cost-effective alternatives to agency use of desktop printers.*

> **PLA-RP-36**   *Agencies with responsibilities for providing IT infrastructure should track the need for specialized input and output devices including plotters and photo-capable printers for potential cost savings opportunities.*

Requirements

The following is a requirement for Print, Fax, Scan and Copy Devices.

> **PLA-R-33**   *Agencies with responsibilities for providing IT infrastructure shall manage and refresh as needed in a consistent, scheduled manner all customer-oriented input and output devices that are deployed as networked devices. These devices include document scanners, fax machines, copiers, and printers along with the servers that support them.*

Email Utilities, Related Communications Utilities, and Coordination Services

Historically, communications services such as email, BlackBerrys, calendaring, scheduling, conferencing, and other communications, coordination, and personal organization services were provided by individual agencies. Sometimes, the agencies used more than one product to address the email, calendaring and related needs. Typically, with the exception of phone contracts, the decisions were not made from an enterprise-wide perspective.

As the Commonwealth moves to enterprise approach in providing these services, comprehensive, unified messaging and communications plans will become increasingly crucial. Some communications elements that should be considered in this planning are:

- Email, multimedia attachments to email, and email hygiene (virus, spam, etc.)
- Instant Messaging (IM)/Short Message Service (SMS)/Internet Protocol (IP) Video/Voice over IP (VoIP) and Really Simple Syndication (RSS)
- Calendar with sharing

- Scheduling with multimedia attachments
- Video/VoIP/Email/IM with integration of contacts, voicemail and dialing
- Mobility Service and integration across voice/video systems
- Calendar, alarms, and tasks integrated with email
- Push email services
- Secure email services
- Unified communications across all systems
- Policy management, especially for storage of voicemail, email and attachments
- Policy management for the automated deletion of all communications
- Multi-person Audio/video conferencing integrated with contacts and email (e.g., missed calls)
- Integrating storage solutions across communications and applications with agency-established policy-driven capabilities

Most agencies use Microsoft Exchange as an email solution. Others solutions include IBM's Lotus/Domino, Sun One, Sendmail, and Google Mail (gmail). Recently, universities have deployed free student education email by providers including Google and Microsoft.

Microsoft is the de facto standard for email across non-higher education agencies and is the integration standard for agencies served by VITA. Exchange requires the use of Active Directory and this has significant and far-reaching implications for security, access, and application choices in the Commonwealth agencies served. Having a central directory and central identity management services are significant enablers of good communications solutions for VITA-served agencies.

Because storage will continue to escalate over time due to numbers of messages and increasing use of video and audio, appropriate storage for messaging must be placed high in the storage design list. New options will continue to be developed by the storage vendors and email solution providers.

Costs of these options should be broken down into service charge and agency controllable costs when performing comparative analyses. In the storage arena, especially for communications, agencies will have a great deal of control over how much storage will cost them. Agency policies and staff training are critical in changing what is stored and for how long. Note: agency policies need to comply with the *Virginia Public Records Act* and the appropriate General Schedule or Agency Specific Schedule approved by the Library of Virginia.

Exchange 2007 provides little improvement over Exchange 2003 for storage and storage management issues. In fact, there are few reasons to switch to Exchange 2007 other than the end-of-support date nearing and Exchange 2010 is coming soon. Exchange users must still rely on 3rd party vendors for usable solutions. Table 2 provides some suggestions for provider-side controls to help with storage reduction. Agency buy-in in the use of these controls is important.

Table 2: Provider-Side Cost reduction Options for Exchange Email Storage

Cost Reduction Action	Explanation	Relative Importance in Cost Reduction
Delete email based on user role	Agency heads and acting heads; legal or fiscal group; students; all others	Very significant differences in required email retention
Force deletion by date range (e.g., 3 years)	Overall reduction in storage escalation	Very significant
Control of user box size	Agency policy	Cost of negatives will far outweigh savings

On the agency side, many policy options are possible. These options do tend to be staff intensive, but if the agency keeps in mind the consequences of not controlling storage, staff use may seem less problematic. In fact, agencies should have clear policies about what should be saved and for how long, and staff should be trained in dealing with each electronic or paper record.

E-discovery for legal purposes is one of the driving forces for central storage and deleting unneeded records, whether email, files, email attachments, web pages or data. At present, there are federal rulings and Virginia laws that permit e-discovery of court case related emails and documents. Also, agreements among litigants can result in expensive manual and electronic searches for related records. A federal ruling in 2006[11] essentially made it necessary to archive for a reasonable amount of time or juries could make an assumption of incriminating evidence in electronic documents that had been destroyed.

Universities face unique problems. Administrative email and student email require separate planning and policy decisions. Many universities may benefit from using Google mail type solutions for students and other approaches for faculty and administrators.

Google is providing substantial messaging and communications integration to users. IM, email, calendaring, documents, photos, and more are well integrated. Emails can be initiated from within all applications and the user can also collaborate online with any document or share it on the Internet as read only. Substantial storage is also provided to users with options to pay for more if free storage limits are exceeded. Free services provided to universities and colleges include all these benefits.

An even better alternative may be to allow students to continue using their email of choice and to have a way to record two to five alternate contact methods for each student. Students are reluctant to use solutions provided by universities. Some use forwarding options to consolidate inboxes. Universities may wish to consider not offering student email or using a separate free service to reduce liabilities. For faculty and staff, they should implement policies for archiving that centralize and limit risk by providing reasonable and not eternal storage of email and attachments.

K-12 schools in Virginia are also trying application attached value-added email and storage alternatives specifically designed for young students such as Gagglemail. In addition to providing school services, Gagglemail also competes in the email storage arena.

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[10] http://www.edweek.org/dd/articles/2007/09/12/02email.h01.html

Some local school divisions are using specially designed storage services that allow the school or division to set storage policies for litigation purposes. In many cases, these storage services are less expensive that the installation of internal systems.

Requirements

The following is a requirement for Email Utilities, Related Communications Utilities, and Coordination Services.

> **PLA-R-41**   *Storage for email shall address business needs and Commonwealth and Federal document retention requirements. Examples: Virginia Public Records Act and Federal HIPAA requirements.*

Technology Component Standards

The following is a technology component standard for email.

Table PLA-S-16: Email Technology Component Standard *Updated January 15, 2010*
Strategic:
Microsoft 32 bit Exchange Server 2003 *Microsoft Exchange Server 2007 (weak value of upgrade without implementing Microsoft unified messaging)* *Email SAAS (e.g., Google, Microsoft, Yahoo, or similar email for college students)*
Emerging:
Microsoft Exchange Server 2010 (weak value anticipated without switching to Microsoft unified communications) *3rd Party solutions for email storage management policy implementation (Microsoft is still lacking in this area; this is a crucial part of email service provision)*
Transitional/Contained:
Microsoft Exchange Server 2000 (Extended support ends in 2011) Unsupported open source implementations *Non-Exchange for VITA served-agencies*
Obsolescent/Rejected:
Microsoft Exchange Server 5.5 and earlier

Network (LAN/WAN) Control Utilities

Network control utilities are those recurring services that should be managed as a common service. 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 centralization and standardization of look up and control services will become increasingly important.

Recommended Practices

The following is a recommended practice for Network (LAN/WAN) Control Utilities.

> **_PLA-RP-38_**   _Agencies with responsibilities for providing IT infrastructure should initiate common management and configuration practices for network utilities beginning with the key controls (e.g., IP address management, central directories) and then expanding to LAN/WAN services implemented on the greatest numbers of servers._
>
> **_Implication:_**
> _One central Active Directory should be a goal._

Appendix A: Rescinded Requirements and Technology Component Standard Tables and Deleted Recommended Practices

The following requirements were rescinded on January 15, 2010:

PLA-R-01: ~~VITA shall consider business security requirements up front when making decisions for all platforms from personal computing devices to enterprise servers.~~

PLA-R-04: ~~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: ~~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-09: ~~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-12: ~~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-14: ~~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-16: ~~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).

PLA-R-26: 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: 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: 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-30: 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-34: 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.

PLA-R-35: ~~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.~~

The following technology component standard tables were rescinded on January 15, 2010:

Table PLA-S-14: Disk Storage Hardware Technology Component Standard
Rescinded: January 15, 2010
Strategic:
~~External Controller-based RAID~~ ~~ATA Disks; SATA Disks~~ ~~Disks~~ ~~CDs (archive quality)~~
Emerging:
~~DVD (awaiting stable write standards) No DVD write option~~ *for enterprise storage systems* ~~is being recommended for the Commonwealth at this time.~~ ~~MEMS (microelectrico-mechanical system) probe device~~ ~~MAID~~
Transitional/Contained:
Obsolescent/Rejected:

Table PLA-S-15: Tape Technology Component Standard
Rescinded: January 15, 2010
Strategic:
~~LTO (linear tape open)~~ ~~SDLT (super digital linear tape)~~ ~~Virtual Tape (Disk)~~ ~~Magstar (IBM 3590; STK 9x40)~~
Emerging:
~~Terabyte tapes~~
Transitional/Contained:
~~36 track~~ ~~DLT (digital linear tape)~~ ~~AIT (advanced intelligent tape)~~
Obsolescent/Rejected:
~~9 track,~~ ~~18 track~~

The following recommended practices were deleted on January 15, 2010:

PLA-RP-01: ~~**Government-wide Technology Clearinghouse:** VITA should explore agency interest in sharing information technology business applicability, surveys, technology test results, test facilities, test plans, testing opportunities, test uses, and lessons learned. This sharing to promote reuse could be in the form of a clearinghouse. Coordination and communications could include all branches of state government. Possible homes for the Clearinghouse might be VITA, a university, a large agency (other than a university), or the Council on Technology Services (COTS). A university may be an especially appropriate host due to their education role, their ability to apply successfully for external funds, their own interest in publicizing internal research and development efforts, and their access to special test facilities. VITA may wish to request that COTS consider exploring these possibilities.~~

PLA-RP-06: ~~**Browsers –** At this time, not all Internet applications perform acceptably on Internet Explorer. Because of this, VITA and institutions of higher education should try to accommodate two browsers securely.~~

PLA-RP-07: ~~**Hard Drive Encryption –** Some agencies have a need to provide enhanced security to their mobile worker's computing devices. Hard drive encryption software may be particularly useful in meeting the needs of workers who store medical and personal information on their notebooks and PDAs.~~

PLA-RP-09: ~~**Guidance for Cost-Effective Matching of Toolsets to Workers –** VITA should provide guidelines to agencies for cost-effective pairing of workers and high-cost personal computing devices and services including notebooks, push email devices (Blackberries), smartphones, and projectors.~~

PLA-RP-10: ~~**Push Email –** There will soon be stronger and possibly more cost-effective options for push email. VITA should study the alternatives in the 2006-2007 timeframe. Change to a new system could be phased in as devices are replaced.~~

PLA-RP-13: ~~**Planning for Workload Types –** VITA should define platform consolidation strategies by workload type, e.g. email, database, applications, etc.~~

PLA-RP-14: ~~**Staff Planning for Servers –** For in-house staff and operations, to ensure continuous support of the Commonwealth's information technology infrastructure, VITA should track data on staffing, staff retirement plans, staff skills and staff retraining interests.~~

PLA-RP-16: ~~**Consider Application Total Costs –** When conducting cost-benefit analyses for an application, owning agencies should consider full costs of alternatives and not just up-front costs.~~

PLA-RP-18: ~~**Planning for the Common Good –** Individual agencies that provide server infrastructure and VITA should consider the agency's goals, the Commonwealth's goals, and Enterprise Architecture guidance when selecting among server solutions.~~

PLA-RP-25: ~~**Storage Reduction Assistance –** VITA should consider offering workshops or coordinating other assistance to help agencies plan for and implement storage reduction programs.~~

PLA-RP-32: ~~**Standard Set of Document Handling Devices:** The Commonwealth should standardize on document handling devices purchased during a particular year or other appropriate time period to increase volume purchasing discounts for equipment and supplies, reduce employee learning time and reduce internal support costs.~~

PLA-RP-37: ~~**Unified Communications.** VITA should gather data on current and projected communication needs of the workforce and use this information to establish a plan for unified communications across all served agencies.~~