

# CompTIA Server+™ 2005 Examination Objectives

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## Introduction

The skills and knowledge measured by this examination are derived from an industry-wide job task analysis (JTA) and have been validated by Subject Matter Experts from around the globe.

A typical Server+ candidate should have at least 18 to 24 months hands-on experience installing, configuring, diagnosing and troubleshooting. In addition, candidates are encouraged to have at least one other IT certification such as CompTIA A+, or Network+ certifications. However these are not required.

This examination blueprint includes weighting, test objectives and example content. Example topics and concepts are included to clarify the test objectives but are not comprehensive listing of the content of this examination.

The exam is in the conventional linear format. You will have 90 minutes to complete the exam.

The table below lists the domains measured by this examination and the approximate extent to which they are represented.

Domain		% of Examination
1.0	General Server Hardware Knowledge	30%
2.0	Installation	11%
3.0	Configuration	13%
4.0	Upgrading	13%
5.0	Proactive Maintenance	6%
6.0	Environment	3%
7.0	Troubleshooting and Problem Determination	18%
8.0	Disaster Recovery	6%
Total		100%

## Domain 1.0 General Server Hardware Knowledge

### 1.1 Know the characteristics, purpose, function, limitations, and performance of the following system bus architectures.

- PCI Bus Mastering
- PCI Hot swap
- PCI-Express
- PCI-X
- Hierarchical PCI Bus
- Peer PCI Bus
- I2O – Intelligent Input-Output
- Hot Plug PCI
- PCI Expansion Slots
- PCI Interrupts
- EISA

### 1.2 Know the characteristics of adapter fault tolerance.

- adapter load balancing
- adapter teaming

### 1.3 Know the basic purpose and function of the following types of servers.

- Server types include:
  - Server as a Gateway
  - Server as a Router
  - Server as a Bridge
  - Firewall Server
  - Proxy Server
  - Database Server
  - Client/Server
  - Application Server
  - Mail Server
  - FTP Server
  - SNA Server
  - RAS Server
  - File and Print Server
  - Fax Server
  - DNS Server
  - WINS Server
  - DHCP Server
  - Web Server
- Description of the following hardware types, including module types, basic spec, limitations and requirements (especially power and cooling)
  - Blade servers
  - Tower servers
  - Rack-mount servers

### 1.4 Know the function of the following application server models.

- Dedicated Application
- Distributed Application
- Peer to peer application

**1.5 Know the characteristics of the following types of memory and server memory requirements.**

- Memory types
  - EDO
  - SDRAM
  - DDR
  - DDR-2
  - RAMBUS
- Memory Interleaving
- ECC vs. Non ECC vs. Extended ECC
- Unbuffered vs. buffered vs. registered
- Hardware compatibility list
- Memory caching

**1.6 Know differences between different SCSI solutions, their advantages, and their specifications.**

- SCSI-1, 2, & 3
- SCSI Bus Width (Narrow and Wide)
- SCSI Bus Speed (Fast and Ultra, Ultra Wide, Ultra 2, Ultra 160, Ultra 320, iSCSI, SAS)
- SCSI connectors, cables, termination (passive, active, multi-mode)
- SCSI IDs and LUNs
- Single Ended Devices
- Low Voltage Differential (LVD)
- High Voltage Differential (HVD)
- BUS lengths
- Multi-tasking
- Multi-threading
- Disconnect and reconnect

**1.7 Know differences between different ATA (IDE) solutions, their advantages, limitations, and specifications.**

- ATA 33
- ATA 66
- ATA 100
- ATA 133
- Serial ATA
- SATA
- SATA II (SATA II v1.2)
- Ultra DMA
- Cabling and connectors
- Master/slave/cable select (CSEL)
- Jumper settings

**1.8 Know the features and benefits of fibre channel hardware.**

- Storage arrays
- Disk drives
- Adapters
- Cables, connectors, GBICs, SFP GBICs
- Single – and Multi-mode
- 1 Gbit, 2 Gbit, 10 Gbit
- bus lengths

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- point-to-point vs. switched vs. LOOP
- 1.9 Know the features and benefits of iSCSI and FCIP.**
- Storage arrays
  - Adapters
  - Cables, connectors
  - 1 Gbit, 2 Gbit, 10 Gbit
  - bus lengths
- 1.10 Know the features and capabilities of the following RAID levels, when they apply, and how each relates to fault tolerance or high availability: (non-proprietary).**
- RAID 0
  - RAID 1
  - RAID 3
  - RAID 5
  - RAID 5+1
  - RAID 0+1
  - RAID 1+0
  - RAID 5+0
  - Zero Channel RAID
  - Differences between hardware RAID and software RAID and the advantages of one over the other.
- 1.11 Know the characteristics of hot swap drives and hot plug boards.**
- 1.12 Know the features, advantages, and disadvantages of multiprocessing.**
- 1.13 Know the attributes, purpose, function, and advantages of clustering, scalability, high availability and fault tolerance.**
- 1.14 Understand the processor subsystem of a server.**
- Multiprocessing systems
    - What they are
    - How they differ from dual-processor systems
  - 64-bit Server Environments
    - What they are
    - Why and when they are important
    - What are the different architectures
- 1.15 Know the basic specifications of and differences between SAN and NAS.**
- Block and file

## Domain 2.0 Installation

- 2.1 Conduct pre-installation planning activities.**
- Activities include:
    - Plan the installation.
    - Verify the installation plan.
    - Verify hardware compatibility with operating system.
    - Verify power sources, space, UPS and network availability.
    - Verify network protocols, naming conventions, domain names.
    - Verify that all correct components and cables have been delivered.

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- Supporting knowledge includes:
  - How to get drivers and BIOS updates
  - Cables and connectors required
  - UPS sizes and types
  - Server power requirements
  - Power issues (stability, spikes, etc.)
  - BTUs for the UPS and associated equipment
  - Server storage issues (rack requirements, rack sizes)
  - Uses of the common server types (desk server, rack mount server, vs. blade server) and the pros and cons of each

## 2.2 Install hardware using best practices.

- Hardware includes:
  - Boards
  - Drives
  - Processors and power modules
  - Memory
  - Internal cable
  - Internal fans
- Installation activities include:
  - Mount the rack installation (if appropriate)
  - Cut and crimp network cabling
  - Install UPS (depending on environment)
  - Verify SCSI ID configuration and termination
  - Install external devices (e.g. keyboards, monitors, subsystems, modem rack, etc.)
  - Verify power-on via power-on sequence
- Supporting knowledge includes:
  - Physical infrastructure requirements (e.g., proper layout of equipment in the rack, adequate air flow, etc.)
  - SCSI cabling, termination, and hot plug configuration
  - Basic understanding of network cabling and connector types
  - Cable management
  - KVM implementation
  - Rack mount security
- Characteristics of common network interface protocols
  - Ethernet
  - Fast Ethernet
  - Gigabit Ethernet

## 2.3 Develop the server management plan (in-band and out-of-band management).

## Domain 3.0 Configuration

### 3.1 Check/upgrade BIOS/firmware levels (system board, RAID controller, hard drive, etc.).

### 3.2 Configure RAID.

- Activities include:
  - Use manufacturer's tool to configure the array
  - Testing (simulate a failure)

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- Supporting knowledge includes:
  - Familiarity with OCE
  - Characteristics of fail over and spare drive types (i.e., cold, hot, warm, dedicated and global)
  - Characteristics, purpose, and function of RAID cache including when to turn off write caching
  - How to calculate storage capacity
  - Functionality of RAID controller battery

## **3.3 Install NOS.**

### **3.4 Configure external peripherals.**

- Peripherals include:
  - Ups
  - Backup device
  - Data storage subsystems
- Supporting knowledge includes:
  - Proper layout of equipment
  - Requirements of the server installation environment (UPS, network availability, space, power)
  - SCSI cabling and termination
  - Fibre channel cabling
  - Know available cable types for peripheral devices
    - Firewire
    - USB
    - Serial ATA

### **3.5 Install NOS and driver updates to design specifications.**

- Activities include:
  - Obtain update
  - Ensure that there is a backup and recovery plan
  - Make sure that the old drivers are available for reinstallation
  - Lab testing
  - Installation
  - Testing
- Supporting knowledge includes:
  - Know how to obtain OS updates
  - Why updates might be needed
  - How updates can be used
  - How to decide whether an update is necessary

### **3.6 Install service tools (SNMP, backup software, system monitoring agents, event logs, etc.).**

- Service tools include:
  - SNMP
  - Backup software
  - System monitoring agents
  - Event logs
- Supporting knowledge includes:
  - Identity, purpose, and function of service tools
  - How to set up SNMP
  - How system monitoring software and MIBs. are implemented on hardware
  - Purpose of event logs

## 3.7 Perform server baseline.

- Supporting knowledge includes:
  - Purpose and types of baseline
    - Processor utilization
    - Page file
    - Disk utilization
    - Memory utilization
    - Network utilization
  - Conditions under which different baselines might be useful
  - When baselines should be updated

## 3.8 Document the configuration.

- Supporting knowledge includes:
  - Document contents:
    - What components are in the box
    - Where components are located in the box
    - What updates have been applied
    - Warranty information
    - Baseline
    - Server configuration information (e.g., BIOS information, RAID levels used, what drives were put into what arrays, server network information)
    - Install date

## 3.9 Implement the server management plan (OS-dependent and OS-independent components).

- Plans typically include:
  - Server management software installation
  - Availability
  - Server change management requirements
  - Security plan
  - Remote management hardware
- Supporting knowledge includes:
  - Purposes and function of server management tools

## Domain 4.0 Upgrading

### 4.1 Perform backup.

- Activities include:
  - Update the ERD/recovery disk (if applicable)
  - Verify backup
- Supporting knowledge includes:
  - When full backups might be necessary
  - How to select the appropriate type of backup
    - Differential
    - Appended
    - Copy
    - Full

### 4.2 Add processors.

- Activities include:

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- On single processor upgrade, verify compatibility
- Verify N+1 stepping
- Verify speed and cache matching
- Perform BIOS upgrade
- Perform OS upgrade to support multiprocessors
- Ensure proper ventilation
- Perform upgrade checklist, including:
  - Locate/obtain latest drivers, OS updates, software, etc.
  - Review FAQs, instruction, facts and issues
  - Test and pilot
  - Schedule downtime
  - Implement ESD best practices
  - Confirm that upgrade has been recognized
  - Review and baseline
  - Review FAQs, instruction, facts and issues
  - Test and pilot
  - Schedule downtime
  - Implement ESD best practices
  - Confirm that upgrade has been recognized
  - Review and baseline
  - Document upgrade
- Supporting knowledge includes:
  - What it means to verify stepping

## 4.3 Add hard drives.

- Activities include:
  - Verify that drives are the appropriate type
  - Confirm SCSI termination and cabling
  - For ATA/IDE drives, confirm cabling, master/slave and potential cross-brand compatibility
  - Verify connections on serial ATA drives
  - Upgrade mass storage
  - Make sure the RAID controller can support additions
  - Add drives to array
  - Replace existing drives
  - Integrate into storage solution and make it available to the operating system
  - Perform upgrade checklist, including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - Available types of hard drive array additions and when they are appropriate
    - Expansions
    - Extensions
  - What “hot-swappable” means
  - Difference between a RAID partition and an OS partition
  - Importance and use of maintenance logs and service logs (documentation)



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## 4.4 Increase memory.

- Supporting knowledge includes:
  - Verify hardware and OS support for capacity increase
  - Verify memory is on hardware/vendor compatibility list
  - Verify memory compatibility
    - Speed
    - Brand
    - Capacity
    - EDO
    - DDR
    - RAMBUS
    - ECC/hon-ECC
    - SDRAM/RDRAM
  - Perform upgrade checklist including
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
  - Verify that server and OS recognize the added memory
  - Perform server optimization to make use of additional RAM (BIOS and OS level)
- Supporting knowledge includes:
  - Number of pins on each type of memory
  - How servers deal with memory pairings
  - Importance and use of maintenance logs and service logs (documentation)

## 4.5 Upgrade BIOS/firmware.

- Activities include:
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - When BIOS/firmware upgrades should be performed
  - How to obtain the latest firmware
  - Be aware that most hardware companies include self-installing installation applications for their components
  - Implications of a failed firmware upgrade
    - Multi-BIOS systems
    - Firmware recovery options available
    - Backup flashing (when applicable)
    - Failed flash implies inoperable device
  - Issues surrounding multi-BIOS systems (how to properly upgrade, etc.)
  - Need to follow manufacturers flash instructions
  - Importance and use of maintenance logs and service logs (documentation)

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## 4.6 Upgrade adapters (e.g., NICs, SCSI cards, RAID, etc.).

- Supporting knowledge includes:
  - Perform backup
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - Available bus types
    - PCI-X
    - PCI –Express
    - Hot swap PCI
    - PCI (bus architecture, bus speed)
    - EISA
  - Implementation of hot swappable PCI in servers
  - Implications on the array of changing RAID controller types
  - Characteristics of SCSI
    - Levels
    - Cabling
    - Termination
    - Signaling
  - Importance and use of maintenance logs and service logs (documentation)

## 4.7 Upgrade peripheral devices, internal and external. Verify appropriate system resources (e.g., expansion slots, IRQ, DMA, etc.).

- Peripheral devices include:
  - Disk drives
  - Backup devices
  - Optical devices
  - KBM devices
- Resources include:
  - Expansion slots
  - IRQ
  - DMA
  - SCSI Ids
  - Expansion cards
- Activities include:
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - Potential effects on performance of adding devices
  - Importance and use of maintenance logs and service logs (documentation)
  - Validation via hardware compatibility list, tips, documentation and FAQ's.

## 4.8 Upgrade system monitoring agents.

- Activities include:
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - Purpose and function of the following Management Protocols
    - SNMP
    - DMI
    - IPMI 1.5 & 2.0
  - Function of monitoring agents
  - Dependencies between SNMP and MIBs
  - Importance and use of maintenance logs and service logs (documentation)

## 4.9 Upgrade service tools (e.g., diagnostic tools, EISA configuration, diagnostic partition, SSU, etc.).

- Service tools include:
  - RAID utility
  - SCSI utility
  - System configuration utility
  - External storage utility
- Activities include:
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime
    - Implement ESD best practices
    - Confirm that upgrade has been recognized
    - Review and baseline
    - Document upgrade.
- Supporting knowledge includes:
  - Most utilities are vendor specific
  - Importance and use of maintenance logs and service logs (documentation)

## 4.10 Upgrade UPS.

- Activities include:
  - Firmware updates
  - Battery replacement
    - Battery disposal
  - Determine physical requirements
  - Determine load requirements
  - Verify whether UPS supports hot swap replacement
  - Perform upgrade checklist including:
    - Locate/obtain latest drivers, OS updates, software, etc.
    - Review FAQs, instruction, facts and issues
    - Test and pilot
    - Schedule downtime

- Implement ESD best practices
- Confirm that upgrade has been recognized
- Review and baseline
- Document upgrade.
- Supporting knowledge includes:
  - Some UPS support hot swap battery replacement
  - Some UPS support smart cabling
  - What can be upgraded
    - UPS MIBs
    - Management card
    - Management software
  - Importance and use of maintenance logs and service logs (documentation)

## Domain 5.0 Proactive Maintenance

### 5.1 Perform regular backup.

- Activities include:
  - Update the ERD/recovery disk (if applicable)
  - Verify backup
- Supporting knowledge includes:
  - When full backups might be necessary
  - How to select the appropriate type of backup
    - Differential
    - Appended
    - Copy
    - Full
- Importance and use of maintenance logs and service logs (documentation)

### 5.2 Create baseline and compare performance.

- Activities include:
  - Regular comparisons to the original baseline
  - Verify backup
- Supporting knowledge includes:
  - Importance and use of maintenance logs and service logs (documentation)

### 5.3 Adjust SNMP thresholds.

### 5.4 Perform physical housekeeping.

- Activities include:
  - Periodic checks for dust buildup
  - Cable management

### 5.5 Monitor, maintain and follow the server management and service plan.

- Activities include:
  - Follow change management protocol

## Domain 6.0 Environment

### 6.1 Recognize and report on physical security issues.

- Activities include:
  - Limit access to server room and backup tapes
  - Ensure physical locks exist on doors
  - Establish anti-theft devices for hardware (lock server racks)

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- Supporting knowledge includes:
  - Fundamentals of server security (Importance of physically securing a server)

## 6.2 Recognize and report on server room environmental issues.

- Issues include:
  - Temperature
  - Humidity
  - ESD
  - Power surges
  - Back-up generator
  - Fire suppression
  - Flood considerations

## Domain 7.0 Troubleshooting and Problem Determination

### 7.1 Perform problem determination

- Activities include:
  - Problem isolation
    - Determine whether the problem is hardware or software related
    - Use questioning techniques to determine what, how, when.
    - Identify contact(s) responsible for problem resolution
    - Use senses to observe problem (e.g., smell of smoke, observation of unhooked cable, etc.)
    - Bringing it down to base
    - Removing one component at a time

### 7.2 Use diagnostic hardware and software tools and utilities.

- Activities include:
  - Perform shut down across the following OSs: Microsoft Windows NT/2000/2003, Novell NetWare, UNIX, Linux
  - Select the appropriate tool
  - Use the selected tool effectively
  - Replace defective hardware components as appropriate
  - Identify defective FRUs and replace with correct part
  - Interpret error logs, operating system errors, health logs, and critical events
  - Use documentation from previous technician successfully
  - Locate and effectively use hot tips (e.g, fixes, OS updates, E-support, web pages, CDs)
  - Gather resources to get problem solved:
    - Identify situations requiring call for assistance
    - Acquire appropriate documentation
- Supporting knowledge includes:
  - Know common diagnostic tools
    - PING
    - IPCONFIG
    - TRACEROUTE
    - FDISK
    - Basic hard disk tools
    - TELNET
  - NOS shutdown procedures
    - Novell NetWare
    - Microsoft Windows NT/2000/2003
    - UNIX/Linux

- Importance and use of maintenance logs and service logs (documentation)

## 7.3 Identify bottlenecks.

- Bottlenecks include:
  - Processor
  - Bus transfer
  - I/O
  - Disk I/O
  - Network I/O
  - Memory
- Activities include:
  - Run performance tool and compare against baseline
- Supporting knowledge includes:
  - How to run performance tools and compare against baseline
    - Processor utilization
    - Page file
    - Disk utilization
    - Memory utilization
    - Network utilization

## Domain 8.0 Disaster Recovery

### 8.1 Read and follow the disaster recovery plan.

- Activities include:
  - Find, read, and implement the recovery plan
  - Confirm and use off site storage for backup
  - Participate in testing of disaster recovery
- Supporting knowledge includes:
  - The need for redundancy (e.g., hard drives, power supplies, fans, NICs, processors, UPS)
  - Ability to read and comprehend a disaster recovery plan.
  - Types of backup hardware and media
    - DAT
    - SDAT
    - DLT
    - Super DLT
    - Optical backup device
    - AIT
    - LTO
    - Disk to disk
    - Libraries vs. stand-alones
  - Identify types of backup and restoration schemes
    - Grandfather schemes
    - Differential and incremental backups
  - Concept of hot, cold and warm sites.