Study guide by ExamNotes.net

Exam 640-410

Exam Notes For CCNA WAN Switching

Abstract:

"This certification exam measures your ability to implement, administer, and troubleshoot Cisco WAN Switches and WAN protocols. This Exam Notes Study Guide is to aid you in your studies, guide you to additional study information and focus your studies."

Test Information:

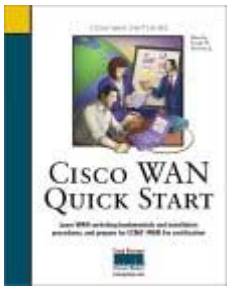
Exam	640-410
Time Limit	120 minutes
Passing Score	68%
Questions	70
Testing Format	Not Adaptive and you cant mark for review
Certification	**CCNA (WS)**

Free Resources And Links:

Please Visit all links and Use the FREE resources available.

CCIE WAN Switching Info	Cisco WAN Switching Documentation Home
Frame Relay Resource Center	ATM Tutorial and Resources
Wan Quick Start	Tech Tips Forum
Internetworking overview	Global Knowledge Info
Cisco WAN Certifications	ATM internetworking paper from Cisco Systems
CCNA WAN Switching info	Cisco Troubleshooting Assistant
WAN Tech Guide Forum	Cisco Solutions
Frame Relay WAN Switch paper	Installing Cisco WAN Switches
Lucent WAN info	Dial up Frame Relay
3Com WAN info	MGX 8850 Configuration Cookbook

Recommended Books:



Note: This is the best book out so far that covers what you need to know for this exam – I highly recommend starting with this. It will also go over everything you need to know in good detail.

Study Tips:

As With anything else – This is sure to be a tough test. DO not rely on one study resource or Braindumps. Look over the objectives; go through the labs and practice.

Do not use this guide, or any other guide as your sole study resource. Use it as a quick review of essential topics.

- Always use a study guide in conjunction with another set of training materials and real world experience if you can get it.
- There are currently not many study materials to be had for this exam as of now - but please visit the links above and throughout the exam notes.
- Two courses cover the tested objectives

The exam will consist mainly of the installation, configuration, monitoring and troubleshooting of Cisco WAN switches: BPX 8600 series, IGX 8400 series, and the MGX 8220 and 8800 concentrators and it is highly recommended that you have hands on experience with the above hardware.

You will need to know your WAN technologies inside out: ATM, Frame Relay and digital voice, T1, E1 (Most Covered in the Study Guide)

Go over you Electrical and ESD safety precautions

Make sure you have a good grasp on the content for this exam - this is a Tough Exam. Make sure you have prepared properly. It has also been rated as being tougher than the standard CCNA because of the tested objectives. If you are looking to only get the CCNA credentials for job advancement or to use as a stepping stone – the other CCNA is considerably less difficult.

Objectives and Measured Skills

- Install IGX, BPX, and Axis devices.
- Perform setup configuration.
- Troubleshoot installation problems.
- Replace defective devices.
- Perform upgrades to firmware and software for StrataCom, IGX, BPX, and AXIS switches.
- Identify Cisco WAN systems and their key functions.
- Identify devices on a network drawing.
- Describe the functions of StrataView Plus and StrataView Lite network management software.
- List installation tool requirements.
- Perform a formal site survey.
- Unpack and inspect Cisco WAN devices.
- Identify equipment-mounting options.
- Install StrataView Lite on your laptop computer.
- Identify features and functions of the IGX cards.
- Describe the steps to install an IGX switch in a rack.
- Describe how each component is installed in the IGX 8 switch.
- Identify features and functions of the IGX cards.
- Install an IGX switch in a rack.
- Install each component in an IGX switch.
- Inventory installed cards and power supplies.
- Log in to the system, and identify software revision, card types, revisions, and status.
- Monitor environmental characteristics, and use online help.
- Configure the node name, system date and time, and local time zone.
- Display and modify control/auxiliary port configuration.
- Identify the IP addresses of the node.
- Identify features and functions of the BPX cards.
- Install a BPX chassis in a rack.
- Install each component in a BPX switch.
- Identify features and functions of the AXIS cards.
- Install an AXIS chassis in a rack.
- Install each component in an AXIS shelf.
- Identify normal and abnormal boosting sequences.
- Configure an AXIS shelf.
- Identify devices and connection options in network configuration drawings.
- Connect StrataCom WAN devices into a functioning wide-area network.
- Locate software and firmware files for upgrades.
- Upgrade the software in IGX and BPX nodes.
- Upgrade the firmware in IGX, BPX, and AXIS nodes.
- Describe how an active processor updates a standby processor.
- Describe what to do when the active processor fails.
- Upgrade an IPX node from PCC modules to NPC modules.
- Diagnose and repair hardware failures in the IGX, BPX, and AXIS systems.
- Diagnose alarm conditions in the IGX, BPX, and AXIS systems.

Visit the site and look over the objectives. **Click Here**

Note: These Exam Notes will briefly go over the WAN protocols and related technologies. Please visit the links and Download all related information for use as free study aids and please read at least one book or have relevant experience on this technology.

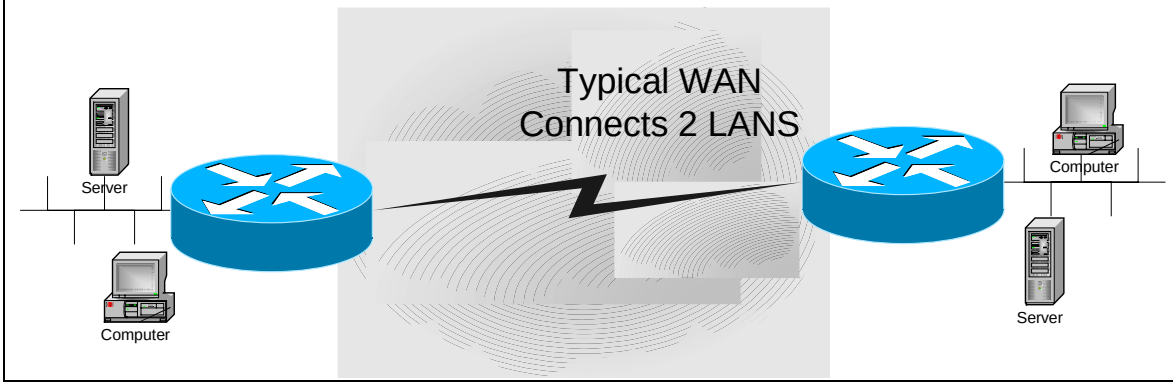
WAN Switching Exam Notes

WAN Wide Area Networking

What is a WAN? By Cisco

- A WAN is a data communications network that:
  - Covers a relatively broad geographic area
  - Uses transmission facilities provided by common carriers, like telephone companies (Telco's)
  - The cloud is where the Telco exists (the CO)

Typical WAN scenario:



- WAN technologies function at the lower three layers of the OSI reference model:
  - *The physical layer*
  - *The data link layer*
  - *The network layer*

OSI Model:

Application
Presentation
Session
Transport
Network
Datalink
Physical

- A point-to-point link:
  - Will provide a single, pre-established WAN communications path from the customer premises through a carrier network, such as a telephone company or TELCO, to a remote network
  - Is a leased line and its established path is permanent and fixed for each remote network reached through the carrier facilities
- Point-to-point links are for the private use of the customer when the carrier reserves them for such private use
- These links accommodate two types of transmissions:
  - Datagram transmissions - composed of individually addressed frames
  - Data-stream transmissions - composed of a stream of data for which address checking occurs only once
- Circuit switching: is a WAN switching method in which a dedicated physical circuit is:
  - Established through a carrier network for each communication session
  - Maintained through a carrier network for each communication session
  - Terminated through a carrier network for each communication session
- Circuit switching accommodates two types of transmissions:
  - Datagram transmissions
  - Data-stream transmissions.
- Circuit switching operates much like a normal telephone call and is used extensively by Telco's
- Packet switching:
  - A WAN switching method where network devices share a single point-to-point link to transport packets from a source to a destination across a carrier network
  - Uses Statistical multiplexing to enable devices to share these circuits
- Examples of packet-switched WAN technologies are:
  - Asynchronous Transfer Mode (ATM)
  - Frame Relay
  - Switched Multimegabit Data Service (SMDS)
  - X.25

ATM

How to Configure ATM by Cisco

- Asynchronous Transfer Mode
  - Is an International Telecommunication Union- Telecommunication Standardization Sector (ITU-T) standard for cell relay
  - Information for multiple service types, such as voice, video, or data, is conveyed in small, fixed-size cells (53 Byte)
  - 53 Byte = 48 Payload + 5 header
  - ATM networks are connection oriented
  - Provides very scalable bandwidth from a few megabits per second to many gigabits per second
- ATM is a cell-switching and multiplexing technology that combines the benefits of:
  - **Circuit switching** - guaranteed capacity and constant transmission delay
  - **Packet switching** - flexibility and efficiency for intermittent traffic
- ATM is more efficient than synchronous technologies, such as time-division multiplexing (TDM) due to its asynchronous nature
- With TDM, each user is assigned to a time slot, and no other station can send in that time slot
- If a station has a lot of data to send, it can send only when its time slot comes up, even if all other time slots are empty.
- If, however, a station has nothing to transmit when its time slot comes up, the time slot is sent empty and is wasted.
- Because ATM is asynchronous, time slots are available on demand with information identifying the source of the transmission contained in the header of each ATM cell

Multiplexing

- Multiplexing:
  - To combine multiple signals both analog or digital for transmission over a single line or media –

Signal A	Signal B	Signal C	Signal D	Signal A	Signal B	Signal C	Signal D

Note: Each signal gets a time slot

- Multiplexing methods:
  - **FDM** - Frequency Division Multiplexing - each signal is assigned a different frequency
  - **TDM** - Time Division Multiplexing - each signal is assigned a fixed time slot in a fixed rotation
  - **STDM** - Statistical Time Division Multiplexing - time slots are assigned to signals dynamically to use bandwidth better
  - **WDM** - Wavelength Division Multiplexing - each signal is assigned a particular wavelength and used on optical fiber

For great information on MUX – Click here

Three types of ATM services exist:

- Permanent virtual circuits - **PVC**
- Switched virtual circuits - **SVC**
- Connectionless service

PVCs and SVCs

- A PVC allows direct connectivity between sites.
- A PVC is similar to a leased line
- Advantages
  - A PVC *guarantees* availability of a connection
  - Does not require call setup procedures between switches
- Disadvantage
  - PVCs include static connectivity and manual setup
- An SVC is created and released dynamically stays up as long as data is being transferred between end points
- It is similar to and can be modeled after a telephone call
- Dynamic call control requires a signaling protocol between the ATM endpoint and the ATM switch
- Advantage
  - SVCs include connection flexibility and call setup that can be handled automatically by a networking type of device
- Disadvantage
  - The extra time and overhead it takes in setting up the connection

ATM Virtual Connections

- ATM networks are fundamentally connection oriented
- A virtual channel must be set up across the ATM network prior to any data transfer
- A virtual channel is roughly equivalent to a virtual circuit
- Two types of ATM connections exist
  - Virtual paths - are identified by virtual path identifiers
  - Virtual channels - are a combination of a VPI and a virtual channel identifier
- A virtual path is a bundle of virtual channels and are switched transparently across the ATM network on the basis of the common VPI
- All VCIs and VPIs have only local significance across a particular link and are remapped at each switch
- A transmission path is a bundle of VPs

ATM Switching Operations

- The basic operation of an ATM switch
  - The cell is received across a link on a known VCI or VPI value.
  - The switch looks up the connection value in a local translation table to determine the outgoing port of the connection and the new VPI/VCI value of the connection on that link
  - The switch then retransmits the cell on that outgoing link with the appropriate connection identifiers
  - VCIs and VPIs values are remapped as needed at each switch

For more information on Switching technologies – Go here

FRAME RELAY

- Frame Relay is a WAN protocol that operates at the physical and data link layers of the OSI reference model

OSI Model: FRAME RELAY OPERATIONS

Application
Presentation
Session
Transport
Network
Datalink
Physical

- Frame Relay originally was designed for use across Integrated Services Digital Network (ISDN) interfaces but is used now over many other technologies
- Frame Relay is a packet-switched technology
- Packet-switched networks will allow end points to dynamically/manually share the network medium and the available bandwidth together
- With this technology - Variable-length packets are used for more efficient transfers and are more flexible
- Packets are switched between network segments until the destination is reached and provided through Statistical multiplexing techniques that can control network access in a switched packet network
- Advantage
  - It is more flexibility and provides more efficient use of bandwidth
- Frame Relay is a Layer 2 protocol suite (Faster – less reliable)
- X.25 provides error checking services at Layer 3 (Slower – more reliable)

Frame Relay Virtual Circuits

- Frame Relay provides connection-oriented data link layer communication
- A Frame Relay virtual circuit is a logical connection created between two DTE devices across a Frame Relay packet-switched network
- Virtual circuits provide a bi-directional communications path from one DTE device to another
- They are uniquely identified by a data-link connection identifier (DLCI) which can be pronounced as *"dell see"*
- A number of virtual circuits can be multiplexed into a single physical circuit for transmission across the network
- This capability often can reduce the equipment and network complexity required to connect multiple DTE devices
- A virtual circuit can pass through any number of intermediate DCE devices (switches that comprise this course of study for CCNA WS) located within the Frame Relay Packet Switched Network
- Frame Relay virtual circuits fall into two categories

    - Switched virtual circuits - SVCs
    - Permanent virtual circuits - PVCs

Switched Virtual Circuits (SVCs)

- Switched virtual circuits (SVCs) are **temporary** connections used in situations requiring only periodic data transfer between DTE devices across the Frame Relay network
- A communication session across an SVC consists of four operational states:

Call Setup	The virtual circuit between two Frame Relay DTE devices is established
Data Transfer	Data is transmitted between the DTE devices over the virtual circuit
Idle	The connection between DTE devices is still active, but no data is transferred. If an SVC remains in an idle state for a defined period of time, the call can be terminated
Call Termination	The virtual circuit between DTE devices is terminated

- After the virtual circuit is terminated, the DTE devices must establish a new SVC if there is additional data to be exchanged
- This introduces latency into your operations – note above in my chart that you have 2 added step compared with the chart below.

Permanent Virtual Circuits (PVCs)

- Permanent virtual circuits (PVCs) are permanently established connections used for frequent and consistent data transfers between DTE devices across the Frame Relay network
- Communication across a PVC does not require the call setup and termination
- PVCs always operate in one of the following two operational states:

Data Transfer	Data is transmitted between the DTE devices over the virtual circuit
Idle	The connection between DTE devices is active, but no data is transferred. Unlike SVCs, PVCs will not be terminated under any circumstances due to being in an idle state

- DTE devices can begin transferring data whenever they are ready because the circuit is permanently established
- Because you have 2 less steps – there will be less latency and better speed performance from lack of call setup and termination

Data-Link Connection Identifier (DLCI)

- Frame Relay virtual circuits are identified by data-link connection identifiers (DLCIs)
- DLCI values typically are assigned by the Frame Relay service provider
- Frame Relay DLCIs have local significance, which means that the values themselves are not unique in the Frame Relay WAN
- Two DTE devices connected by a virtual circuit, for example, may use a different DLCI value to refer to the same connection
- Routers can map a DLCI to an IP Address

FRAME RELAY WAN Switching White Paper (Must Read)

SMDS

- Switched Multimegabit Data Service (SMDS) is:
  - High-speed
  - Packet-switched
  - Datagram-based
  - Used for communication over public data networks
- SMDS can use:
  - Fiber-based media
  - Copper-based media
- SMDS supports speeds of:
  - 1.544 Mbps over Digital Signal level 1 – DS1
  - 44.736 Mbps over Digital Signal level 3 – DS3
- SMDS data units are large enough to encapsulate:
  - IEEE 802.3 frames
  - IEEE 802.5 frames
  - FDDI frames

SMDS Network Components

- SMDS networks provide high-speed data service
- The SMDS carrier sometimes provides intermediate nodes
- Carrier equipment generally consists of high-speed WAN switches that must conform to certain network equipment specifications

In Depth Information on SMDS – Click Here

Difference between ATM and SMDS – Click Here

X.25

- X.25 is an ITU-T protocol standard
- X.25 is designed to operate effectively regardless of the type of systems connected to the network
- It is typically used in the packet-switched networks of common carriers, such as Telco's

OSI Model: X.25 OPERATIONS

Application
Presentation
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X.25 Devices and Protocol Operation

- X.25 network devices fall into three general categories
  - Data terminal equipment - DTE
  - Data circuit-terminating equipment - DCE
  - Packet switching exchange - PSE
- DTE - Data terminal equipment – They are end systems that communicate across the X.25 network which are usually terminals, PC's, or other hosts and are located on the customers premises
- DCE - Data circuit-terminating equipment - are communications devices, such as modems and packet switches that provide the interface between DTE devices and a PSE and are generally located at the carrier
- PSEs are switches that compose the bulk of the carrier's network
- They transfer data from one DTE device to another through the X.25 PSN
- The PSE will be where the CCNA WS is focused on

X.25 Virtual Circuits

- A virtual circuit is a logical connection created to ensure reliable communication between two network devices
- A virtual circuit denotes the existence of a logical, bidirectional path from one DTE device to another across an X.25 network
- Physically, the connection can pass through any number of intermediate nodes, such as DCE devices and PSEs
- Multiple virtual circuits (logical connections) can be multiplexed onto a single physical circuit (a physical connection)
- Virtual circuits are demultiplexed at the remote end, and data is sent to the appropriate destinations
- Two types of X.25 virtual circuits exist:

Switched	Temporary connections used for sporadic data transfers and require that two DTE devices establish, maintain, and terminate a session each time the devices need to communicate
Permanent	Permanently established connections used for frequent and consistent data transfers

PVCs:

- Do not require that sessions be established and terminated
- DTEs can begin transferring data whenever necessary
- The session is always active – where Switched needs a setup and termination

Note: The basic operation of an X.25 virtual circuit begins when the source DTE device specifies the virtual circuit to be used (in the packet headers) and then sends the packets to a locally connected DCE device

- PSEs (switches) pass the traffic to the next intermediate node in the path that may be another switch or the remote DCE device
- When the traffic arrives at the remote DCE device, the packet headers are examined and the destination address is determined
- The packets are then sent to the destination DTE device
- If communication occurs over an SVC and neither device has additional data to transfer, the virtual circuit is terminated

Switching Hardware

You **must** have **experience or training** in the following hardware.

- BPX 8600 Series
- IGX 8400 Series
- MGX 8220 (AXIS)
- MGX 8230
- MGX 8240
- MGX 8250
- MGX 8260
- MGX 8850 1
- MGX 8850 2

Please make sure you have had some type of exposure to this hardware. It is critical to your success at becoming a WAN certified CCNA. This set of study notes was meant to begin your studies. The entire WAN Switch hardware line is very large, complicated and you will need a full book or Hands on experience to get accustomed to using the Cisco Line of WAN Switching hardware.

Please view this highly detailed document on CCNA WAN Switching and Hardware: Here

Last Notes:

Remember – this is a study guide used to aid your studies. It is only a beginning of the mass amount of information you will need to acquire to tackle this one. Please use the Cisco Web Site – Most exam related information can be found there. Good Luck. This is a very technical exam. Please prepare to the best of your ability. Between this document and all available free resources that I added within – You should have a great starting point to focus you studies.

"Feel free to Email me with any in depth Questions - I will gladly help if I can."

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