Juniper JNCIA Cram Notes

1. Networking Fundamentals

1.1 Collision domains and broadcast domains

A collision domain is, as the name implies, a part of a network where packet collisions can occur. A collision occurs when two devices send a packet at the same time on the shared network segment. The packets collide and both devices must send the packets again, which reduces network efficiency. Collisions are often in a hub environment, because each port on a hub is in the same collision domain. By contrast, each port on a bridge, a switch or a router is in a separate collision domain. Each port of the switch belongs to a single collision domain. In case of switch, the collision domain is limited to each device and in a hub, the collision domain includes all devices connected to the hub.

A broadcast domain is a domain in which a broadcast is forwarded. A broadcast domain contains all devices that can reach each other at the data link layer (OSI layer 2) by using broadcast. All ports on a hub or a switch are by default in the same broadcast domain. All ports on a router are in the different broadcast domains and routers don't forward broadcasts from one broadcast domain to another.

1.2 Function of routers and switches

Router is a layer 3 device which works on network layer of OSI model which connects two different networks and it identifies network devices based on their IP addresses. The Routers are the devices used for connecting local network to the other local network/s. They are generally located at the gateway where two or more than two networks connect.

Switch is a layer 2 device which works on data link layer of OSI model, it communicates by using frames and it identifies network devices on the basis of MAC addresses or physical addresses.

System Switching Board (SSB) and Forwarding Engine Board (FEB) are the two different router models used for the control board functionality.

An aggregate route is the second form of a locally configured route within the JUNOS software.

Each router model uses a different name for the control board functionality. The possible names include:

Forwarding Engine Board (FEB): The Forwarding Engine Board is found in both the M5 and M10 platforms and integrates the circuit board with the FPC. Each router contains no more than one FEB, which is specific to either the M5 or the M10 chassis.
System Switching Board (SSB): The System Switching Board is found in the M20 platform. Each platform is configured to hold dual SSBs, but only one board is operational at any one time.

System Control Board (SCB): The System Control Board is found in the M40 platform. Each chassis contains no more than one SCB.

Switching and Forwarding Module (SFM): The Switching and Forwarding Module is found in the M40e and M160 platforms. Each M40e router can contain 2 SFMs, with only one operational at a time. The M160 router contains four SFMs working in parallel.

Memory Mezzanine Board (MMB): The Memory Mezzanine Board is found in the T320 and T640 platforms and is located on the FPC itself.

Each Routing and Control Board (RCB) consists of the following internal components:

CPU-Runs Junos OS to maintain the routing tables and routing protocols and handles these exception packets and performs the appropriate action.

EEPROM- Stores the serial number of the Routing Engine.

DRAM-Provides storage for the routing and forwarding tables and for other Routing Engine processes.

1.3 Optical network fundamentals - SONET/SDH, OTN

Synchronous Digital Hierarchy (SDH) is a CCITT standard for a hierarchy of optical transmission rates. Synchronous Optical Network (SONET) is a USA standard that is largely equivalent to SDH. Both are widely used methods for very high speed transmission of voice and data signals across the numerous world-wide fiber-optic networks.

SDH and SONET use light-emitting diodes or lasers to transmit a binary stream of light-on and light-off sequences at a constant rate. At the far end optical sensors convert the pulses of light back to electrical representations of the binary information.

The basic building block of the SONET/SDH hierarchy in the optical domain is an OC1; in the electrical domain, it is an STS-1. An OC1 operates at 51.840 Mbps. OC3 operates at 155.520

Mbps.
Optical Transport Network (OTN) technology represents both a technical leap forward in optical networking over SONET/SDH and a business opportunity for carriers and service providers alike.

OTN	**SONET/SDH**
Asynchronous mapping of payloads	Synchronous mapping of payloads
Timing distribution not required	Requires right timing distribution across networks
Designed to operate on multiple wavelengths	Designed to operate on multiple wavelengths
Scales to 100Gb/s (and beyond)	Scales to a maximum of 40 Gb/s
Performs single-stage multiplexing	Performs multi-stage multiplexing
Uses a fixed frame size and increases frame rate to match client rates	Uses a fixed frame rate for a given line rate and increases frame size as client size increases
FEC sized for error correction to correct 16 blocks per frame	Not applicable (no standardized FEC)

1.4 Ethernet Networks

Ethernet is a Layer 2 technology that operates in a shared bus topology. Ethernet supports broadcast transmission, uses best-effort delivery, and has distributed access control. Ethernet is a point-to-multi point technology.

In a shared bus topology, all devices connect to a single, shared physical link through which all data transmissions are sent. All traffic is broadcast so that all devices within the topology receive every transmission. The devices within a single Ethernet topology make up a broadcast domain.
Ethernet uses best-effort delivery to broadcast traffic. The physical hardware provides no information to the sender about whether the traffic was received. If the receiving host is offline, traffic to the host is lost. Although the Ethernet data link protocol does not inform the sender about lost packets, higher layer protocols such as TCP/IP might provide this type of notification.

Ethernet Access Control and Transmission: Ethernet's access control is distributed because Ethernet has no central mechanism that grants access to the physical medium within the network. Instead, Ethernet uses carrier-sense multiple access with collision detection (CSMA/CD). Because multiple devices on an Ethernet network can access the physical medium, or wire, simultaneously, each device must determine whether the physical medium is in use. Each host listens on the wire to determine if a message is being transmitted. If it detects no transmission, the host begins transmitting its own data.The length of each transmission is determined by fixed Ethernet packet sizes. By fixing the length of each transmission and enforcing a minimum idle time between transmissions, Ethernet ensures that no pair of communicating devices on the network can monopolize the wire and block others from sending and receiving traffic.

Collisions and Detection

When a device on an Ethernet network begins transmitting data, the data takes a finite amount of time to reach all hosts on the network. Because of this delay, or latency, in transmitting traffic, a device might detect an idle state on the wire just as another device initially begins its transmission. As a result, two devices might send traffic across a single wire at the same time. When the two electrical signals collide, they become scrambled so that both transmissions are effectively lost.

To handle collisions, Ethernet devices monitor the link while they are transmitting data. The monitoring process is known as collision detection. If a device detects a foreign signal while it is transmitting, it terminates the transmission and attempts to transmit again only after detecting an idle state on the wire. Collisions continue to occur if two colliding devices both wait the same amount of time before re transmitting. To avoid this condition, Ethernet devices use a binary exponential backoff algorithm.