Dalton Murray

**Chapter 8 questions**

**Question 1: How does a layer 2 switch differ from a router?**

Layer 2 switches operate in the data link layer address to allow them to forward packets between different network segments, they also learn addresses “by reading the source and destination addresses” (FitzGerald, J. p. 220).

Routers operate in the network layer, and they connect two different TCP/IP subnets. (FitzGerald, J. p. 221). On top of this, routers also get rid of the data link layer packet, they “process the network layer packet” (FitzGerald, J. p. 221) and routers forward messages which need to be sent to other networks with the basis of their network layer address (FitzGerald, J. p. 221).

This shows the difference between a layer 2 switch and a router is the layer which they operate on, as well as their overall function, routers also generally operate more slowly than a switch because it has to do more processing on each individual message.

**Question 2: How does a layer 2 switch differ from a VLAN?**

Layer 2 switches assist in managing traffic on a LAN, on top of this they work within the data link layer address, this allows them to forward packets between different network segments (FitzGerald, J. p. 220).

VLANs, also known as Virtual Local Area Networks, are networks that have computers connected to them and are assigned a LAN segment by software instead of hardware (FitzGerald, J. p. 227).

The difference between a layer 2 switch and a VLAN is that VLANs assign computers connected to them assigned LAN segment by software instead of hardware whereas a layer 2 switch assigns the LAN segment by hardware. VLANs are also implemented on top of a switch software wise, which then allows them to break down the switch into separate LANs, making them a Virtual LAN.

**Question 3: How does a router differ from a VLAN?**

VLANs, which are also known as Virtual Local Area Networks, are networks that have computers connected to them and are assigned a LAN segment by software instead of hardware (FitzGerald, J. p. 227).

Routers operate in the network layer, and they connect two different TCP/IP subnets. (FitzGerald, J. p. 221). On top of this, routers also get rid of the data link layer packet, they “process the network layer packet” (FitzGerald, J. p. 221) and routers forward messages which need to be sent to other networks with the basis of their network layer address (FitzGerald, J. p. 221).

Specifically, the differences between them are that a router is within the network layer, a VLAN is within the data link layer which is put on top of a layer 2 or higher switch. On top of this, VLANs segment computers connected to them while a router performs many other functions such as forwarding messages and processing network layer packets.

**Question 5: Under what circumstances would you use a routed backbone?**

Routed backbones “move packets along the backbone on the basis of their network layer address” (FitzGerald, J. p. 224). Simply put, this means that a routed backbone will transfer packets through the backbone of a network with the network layer address. Routed backbones are also sometimes referred to as a subnetted backbone or a hierarchical backbone.

Specifically, routed backbones are often used when connecting different buildings within the same campus backbone network (FitzGerald, J. p. 224) which is one of the circumstances I would use a routed backbone. It is also possible to generalize this further, as they are not limited to campuses and use them for businesses which has multiple buildings. On top of all of this, routed backbones, despite a slower speed than switched backbones, prevents broadcast traffic moving between different parts of the network which if is a requirement may also be a use case (FitzGerald, J. p. 235).

**Question 6: Under what circumstances would you use a VLAN backbone?**

VLAN backbone, also known as Virtual Local Area Network backbone, are often faster than more traditional backbones, they also can manage the flow of traffic better compared to traditional backbone types (FitzGerald, J. p. 227). On top of better flow of traffic management, and faster speeds, a VLAN backbone allows you to put computers in which are in different geographic locations in the same subnet which allows for better control of the network as well as management (FitzGerald, J. p. 227). With VLAN backbones, there is a larger downside, however, in that they are often more expensive than other backbone types and are typically found in larger businesses/networks compared to small networks (FitzGerald, J. p. 227).

**Question 7: Explain how routed backbones work**

Routed backbones, sometimes referred to as a subnetted backbone or a hierarchical backbone, work by moving packets through the backbone with their layer 3 address, or their network layer address (FitzGerald, J. p. 224). Routed backbones also assist in broadcast messages, such as ARPs, and prevents the message from being sent outside of a network segment, whereas, a switched backbone allows the message to be sent to every computer in a network (FitzGerald, J. p. 225). This allows routed backbones to be more efficient in this case compared to switched backbones. On top of this, routed backbones very clearly segment each part of the network which is connected to the routed backbone and each individual segment has their own subnet addresses (FitzGerald, J. p. 226).

**Question 10: What are the key advantages and disadvantages of routed and switched backbones?**

The key advantages of routed backbones are as follows: clearly segment parts of the network, each segment of the network has its own subnet addresses, and broadcast messages are limited to their own subnets and cannot go to other parts within the network (FitzGerald, J. p. 226).

The key disadvantages of routed backbones are as follows: routers within the network have an imposed time delay resulting in routed backbones sometimes being slower, and secondly, routers may often be more expensive than switches and have a higher requirement of time and management to ensure they are working how intended (FitzGerald, J. p. 226).

The key advantages of switched backbones are as follows: they are usually all placed in the same place which allows for easier maintenance as well as flexibility in upgrading, they are also often rack-mounted which has its own key advantages such as the ability to easily move computers from one LAN to another (FitzGerald, J. p. 221).

The key disadvantages of switched backbones are as follows: they often require more cabling as everything is placed in the same room, despite the advantages of everything being in the same general place they if all the computers are connected to the same switch it can result in multiple problems such as capacity if all the computers are high-traffic and can result in a bottleneck (FitzGerald, J. p. 221).

**Question 13: Explain how single-switch VLANs work**

Single-switch VLANs operates only within one switch and not more than one. The computers which are plugged into the switch are assigned to a VLAN using software, instead of hardware, and functions essentially the same as having physically different LAN segments or subnets this results in the computer thinking it’s on a physically different segment despite it being connected to the same physical switch (FitzGerald, J. p. 227).

**Question 14: Explain how multi-switch VLANs work**

Multi-switch VLANs are very similar to single-switch VLANs however utilize multiple switches to put the VLANs on top of, allowing us to create subnets more easily and VLANs across multiple buildings (FitzGerald, J. p. 227). From the book, it states “this enables us to create subnets based on *who* you are, rather than *where* you are; we have an accounting subnet and a marketing subnet, not a Building A and a Building B subnet” (FitzGerald, J. p. 227). This I believe is the largest difference between single-switch VLANs and multi-switch VLANs.

**Question 15: What is IEEE 802.1q?**

IEEE 802.1q is a standard for specifying a priority code. The standard/protocol 802.1q is also one of the VLAN tagging protocols which are frequently used (FitzGerald, J. p. 229). For 802.1q to work, it inserts a field into the VLAN frame header which allows it to identify it (IEEE 802.1Q).

**Question 17: How can you improve the performance of a BN?**

There are a multitude of ways to improve the performance of a backbone network, one of the most obvious ways to do so is by switching to a backbone network type which suits your needs better, as it is often easy for a network to grow and not worry about the performance of the backbone until it is too late and has had a noticeable decrease in performance.

The checklist which the book gives on how to improve the performance of a backbone network is as follows:

“ Increase Device Performance

* Change to a more appropriate routing protocol (either distance vector or link state)
* Increase the devices’ memory

Increase Circuit Capacity

* Upgrade to a faster circuit
* Add circuits

Reduce Network Demand

* Change user behavior
* Reduce broadcast messages

“ (FitzGerald, J. p. 233).

In summary, the best ways to improve performance of a backbone network is to determine what is first the problem, and then solve that problem. The most common fixes are to make sure you’re on an appropriate routing protocol for your network, increase device memory, upgrade your circuits to faster ones, add circuits, help teach users better ways of handling things/change user behavior, and to reduce broadcast messages sent across the network.

**Question 19: What are the preferred architectures used in each part of the backbone?**

The preferred architectures used in each part of the backbone is as follows: for the distribution layer is the switched backbone which can be either rack-mounted or through usage of a chassis switch or a VLAN for larger organizations, for the core layer a routed backbone, it is also recommended to use gigabit Ethernet speeds for the backbone (FitzGerald, J. p. 232). Despite this, there isn’t really a single-best layout and depends on use cases. However, the ideal network will likely consist of a combination of layer 2 and VLAN switches along with possible redundant/backups in case something fails such as a switch (FitzGerald, J. p. 233).

**Question 20: Some experts are predicting that Ethernet will move into the WAN. What do you think?**

I believe the use of the Ethernet protocol is already in the WAN, that is if we are discussing specifically the usage of the Ethernet protocol within the WAN. The WAN most often uses PPP, HDLC, ATM ISDN Synchronous serial Broadband, and Authentication Compression Multilink protocols (Richardson, S.) then I believe that the WAN already in a sense uses Ethernet protocols, at least in some way. For a computer to be connected to a LAN it used to likely use an Ethernet card which uses Ethernet protocols which then can allow it to connect to the WAN/the Internet. If we’re only talking about the actual protocol’s WANs use, then I believe the Ethernet protocol is used within the WAN as PPPoE exists among other things. Although, I do not believe that the use of the Ethernet protocol is the most effective in the WAN, I predict that in the future there will be a better combination of protocols for the WAN, though, I do not believe it is possible to say that the use of Ethernet is not already existent within the WAN. Do I believe that the usage will expand? With time it will expand, however, I believe that there are already better alternatives which can be adapted which will result in less use or less need for it to be within the WAN.

References:

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Dalton Murray