# Physical Network Design/Topology

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Logical layout
Physical layout is usually a star
Considerations
• One node transmits, all receive (broadcast)
• Only a single node can transmit at a time
• Addressed by link-layer encryption or different topology

So, the first one we’re going to talk about at Layer 2 is a bus network. We’re talking about the logical layout of a bus. Consider this to be just these four computers here. They’re connected to the same network segment. They’re connected to the bus. Typically, when we find these in the real world, the physical layout of these is a star network, meaning that each computer, each NIC as an endpoint rather than them all being connected like this. And they’re all connect centrally to a hub or a switch, which then inside of it implements a bus network.
Okay, there's some considerations to take into account here. And that's that when we're talking on a bus, we're talking on the same communication medium, meaning that when one NIC, when one computer, is sending a signal, no one else can send a signal. Otherwise, we'll have what's called a collision. So, when one node transmits on a bus network, all other nodes receive. And only a single node can transmit at a time.

**Dual-Ring**

**Dual-Ring**

Same physical and logical layout
Commonly implemented as Fiber Distributed Data Interface (FDDI)
Considerations
• High availability and good failure protection

**034 The next network topology we'll talk about is a dual ring. This has the same physical and logical
layout. So, there's no difference between the two. It's commonly implemented as a fiber distributed data interface. And as the picture shows, it's a more resilient version of a ring network where if there is a cut in one of the rings, it doesn't necessarily affect the transmission of those endpoints because it can just transmit in the other ring.

**Star**

Physical layout
Logical layout may be ring or bus
Considerations
- Failure in one node doesn't affect the others
- Failure of the central device will affect the others

*A star network, this is talking about the physical network layout with all nodes being endpoints on that network. And then in the center, this is what we talked about when we talked about hubs earlier in this*
module, that a hub implements a star network physically, but inside of the actual piece of hardware, inside the hub, it’s a bus network.

In this type of network, a failure in one node doesn’t necessarily affect the others. But a failure of the central device will affect the others.

**Extended Star**

**Extended Star**

**Physical layout**

Logical layout may be ring or bus

Commonly implemented in Ethernet network

**Considerations**

- Must have redundancy (multiple paths)
- Core area usually contains servers
- Outer nodes are usually workstations
where we have critical nodes that have a bigger impact to our business if they fail. So, in this example, if the switch here or the hub, if this one were to die, then the other five computers on this network would still be able to talk, and it wouldn’t be an issue.

**Hybrid**

A combination of physical and logical topologies
Used to take advantage of benefits of different topologies

**037** And last, we have a hybrid network. This is basically just an amalgamation of many different types of networks just thrown together to get stuff working. This is typically what you’ll find in practice is that networks really, while they were conceived one way, they’re
implemented and actually done in the real world a different way. So, almost every network I've ever seen has been a hybrid network of some stars and some buses and some extended stars and whatever else. So, there's quite a few different kinds of networks.

And lastly-- next to lastly, we'll talk about the mesh network. As

**Mesh**

**Mesh**

Same logical and physical layout
Full mesh – each device is connected to every other device
Partial mesh – critical devices are interconnected

Considerations
- Limited scalability
- Very fault tolerant

**038** As you can imagine, we start to get a lot of cables when we talk about mesh network, especially if we're using a closed loop circuit here because each host has to physically connect to
every other host. And it creates quite a bit of cabling if that’s how you have a full mesh network set up.

In a partial mesh network such as the example on the left, each device is connected to every other-- each device is connected to every other device-- or excuse me, critical devices are interconnected, not each device is connected to every other device. But mesh networks are very fault tolerant.

**Wireless**

Wireless

Can achieve mesh topology by overlapping access points

Usually supplement wired topologies due to flexibility

Considerations

• Wireless traffic can be intercepted
• Without controls, any node can use the wireless access point

**039 And lastly, wireless networks, we can achieve an actual mesh topology by overlapping access**
points. And some things to understand when implementing a wireless network is that traffic can very easily be intercepted here. And so, traffic can be intercepted and decrypted if it is encrypted.

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