

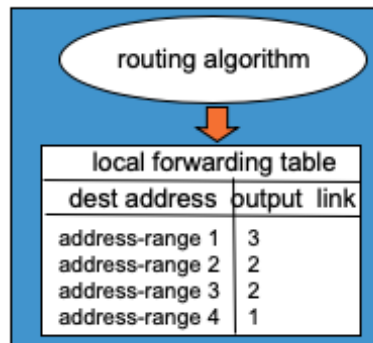
# Exploration: The Network Layer and Network Types

## Introduction

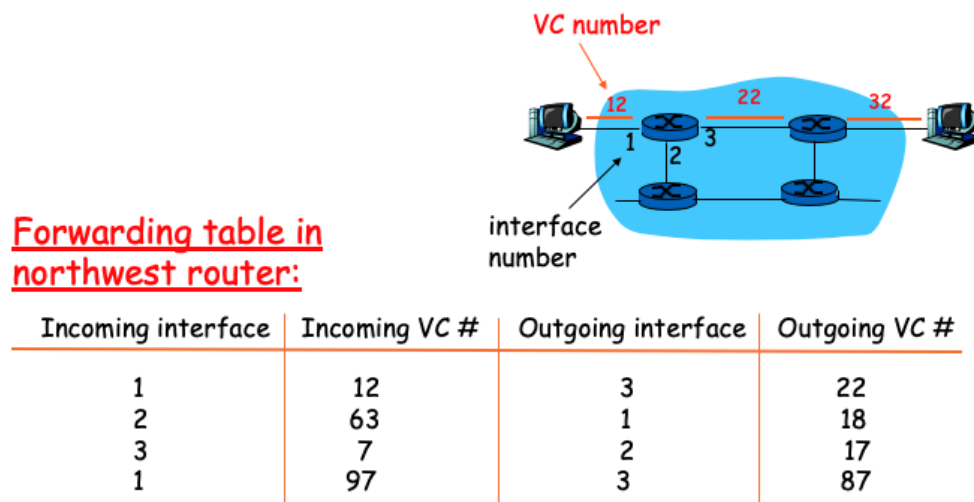


We begin the module with a discussion of the two different kinds of networks found in the Network Layer.

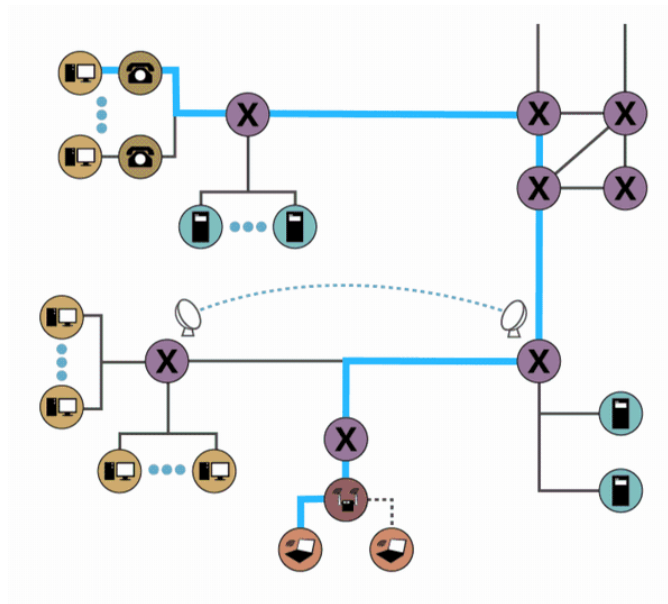
The datagram network, is the internet's connectionless service, which inherently has no guarantees for bandwidth, packet loss or packet ordering. To provide any of these things requires additional protocols such as TCP. The forwarding table for datagram networks is a fairly simple mapping of IP address range to output ports (see below).



By contrast, the virtual-circuit (VC) network is the network layer's "connected" service. It comes in different flavors, including Constant Bit Rate (CBR) and Available Bit Rate (ABR), which vary in their ability to provide bandwidth guarantees. Additionally, both of these VC network types can receive feedback from the internet core regarding congestion. The virtual circuit must be setup in advance, with every router in the path participating. Forwarding tables will contain incoming and outgoing VC ID to port mappings.



In practice, the VC network will act like a virtual circuit connection between any two hosts. Datagrams will be forwarded on the same path through the network core, allowing some level of bandwidth guarantee. It looks like this:



A virtual circuit network forwards packets along the same path for any two hosts.

For more on the different types of networks found in the Network Layer, be sure to view the video lecture, then test your knowledge with the Self-Check exercises.

## Video Lecture

Watch the following lecture then test your knowledge with the Self-Check below.

### Routing and Forwarding



## CS 372 Lecture

### The Network Layer:

- Routing and Forwarding
- Virtual circuit networks
- Datagram networks



**Note:** Many of the lecture slides are based on presentations that accompany *Computer Networking: A Top Down Approach*, 6th edition, by Jim Kurose & Keith Ross, Addison-Wesley, 2013.





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## Self-Check Exercises

Where do Network-layer protocols run?

- ☐ At the edge (host systems)
- ☐ In switches and hubs
- ☐ In the core (routers)
- ☐ Everywhere in the internet

The “first hop” router is the first router a datagram is passed to from the source host on the path to the destination host.

- ☐ True
- ☐ False

What is the purpose of the network layer?

 Turn

Card 1 of 5



 Reuse    Embed



## Resources

- **Virtual Circuit Network** [\\_\(https://www.sciencedirect.com/topics/computer-science/virtual-circuit-network\)\\_](https://www.sciencedirect.com/topics/computer-science/virtual-circuit-network)  
Walrand, Jean, and Varaiya. “Virtual Circuit Network - an Overview | ScienceDirect Topics.”
- **A Guide to Using Raw Sockets** [\\_\(https://opensourceforu.com/2015/03/a-guide-to-using-raw-sockets/\)\\_](https://opensourceforu.com/2015/03/a-guide-to-using-raw-sockets/)  
Saxena, Subodh. “A Guide to Using Raw Sockets.” Open Source For You (blog), March 21, 2015.
- **Cross-Platform packet sniffer in <1000 Lines of Code** [\\_\(https://github.com/c-bata/xpcap?source=post\\_page-----bab3b614bc03-----\)](https://github.com/c-bata/xpcap?source=post_page-----bab3b614bc03-----)