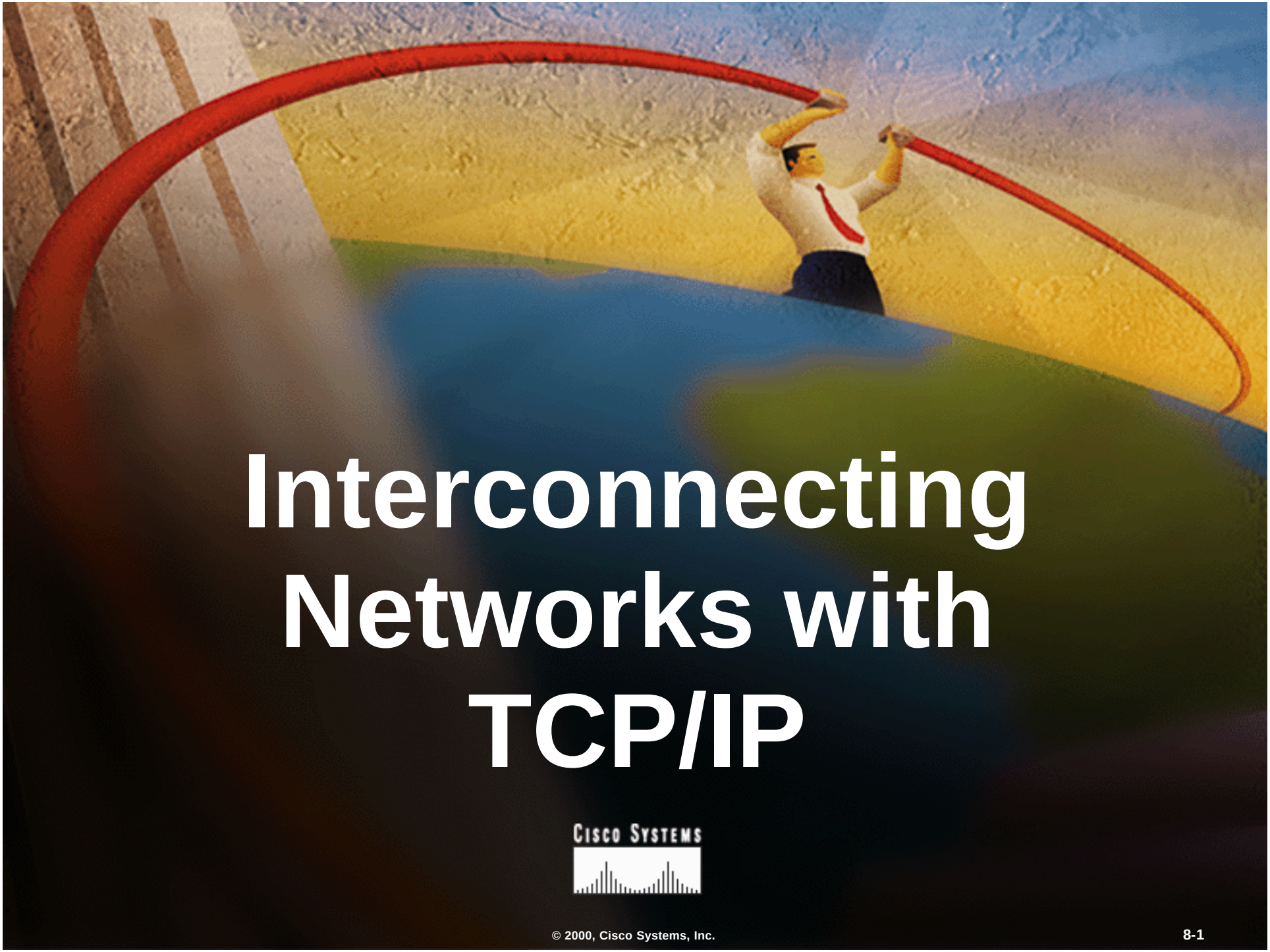


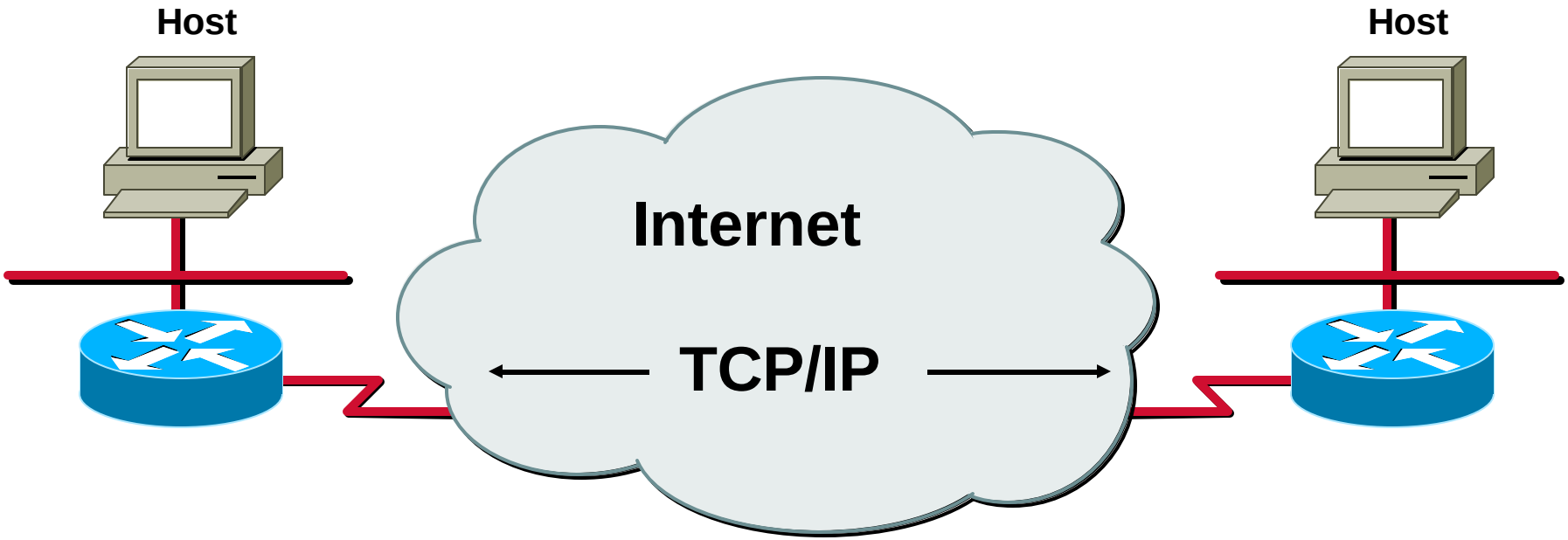
Interconnecting Networks with TCP/IP

Objectives

Upon completion of this chapter you will be able to perform the following tasks:

- **Identify the IP protocol stack, its protocol layer functions, and commonly used IP protocols**
- **Identify IP address classes, IP addresses, IP subnet masks, IP network numbers, subnet numbers, and possible host numbers.**
- **Configure IP addresses and subnet masks on a router interface and optionally configure a host table.**
- **Interconnect the VLANs with a layer three device such as a router on a stick.**

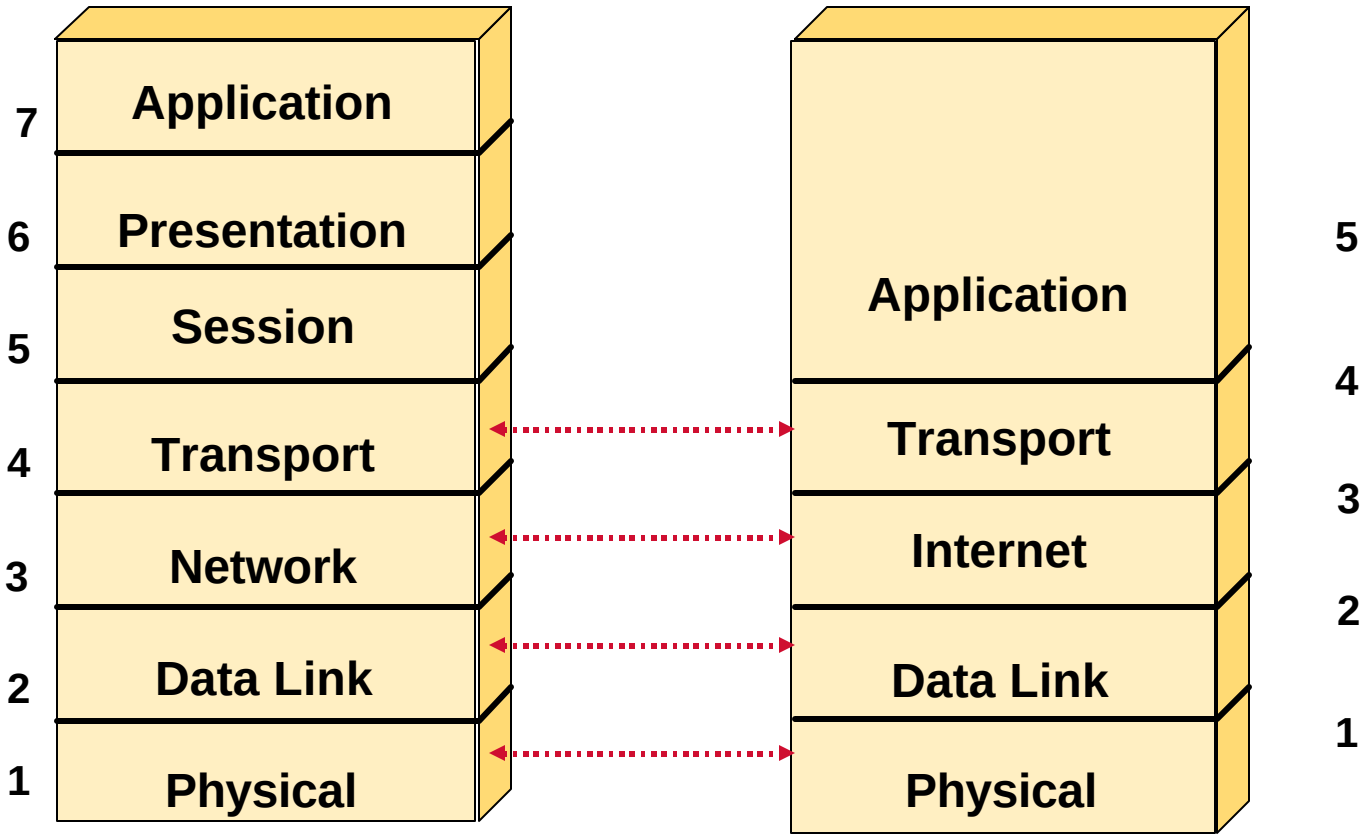
Introduction to TCP/IP



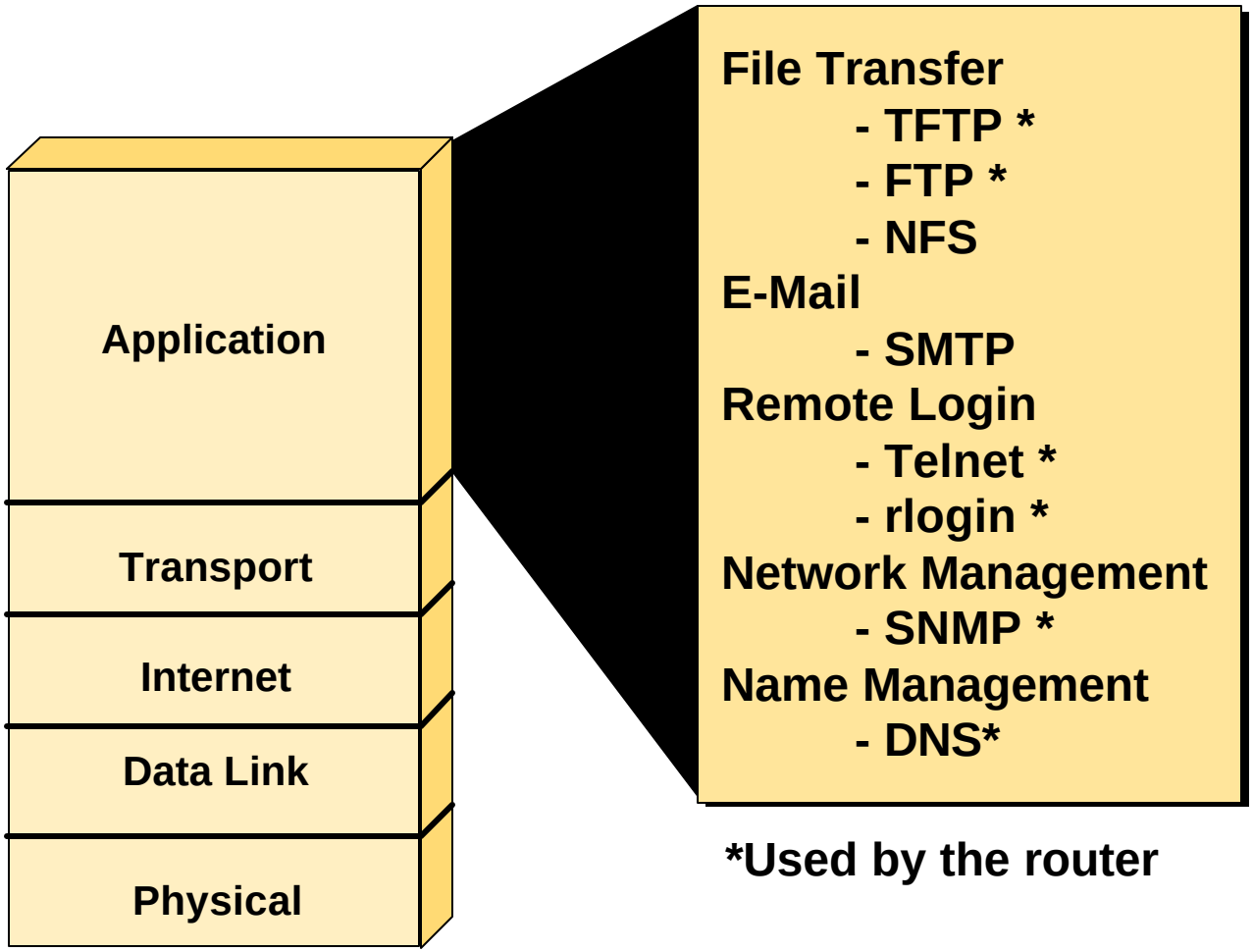
Early protocol suite

Universal

TCP/IP Protocol Stack

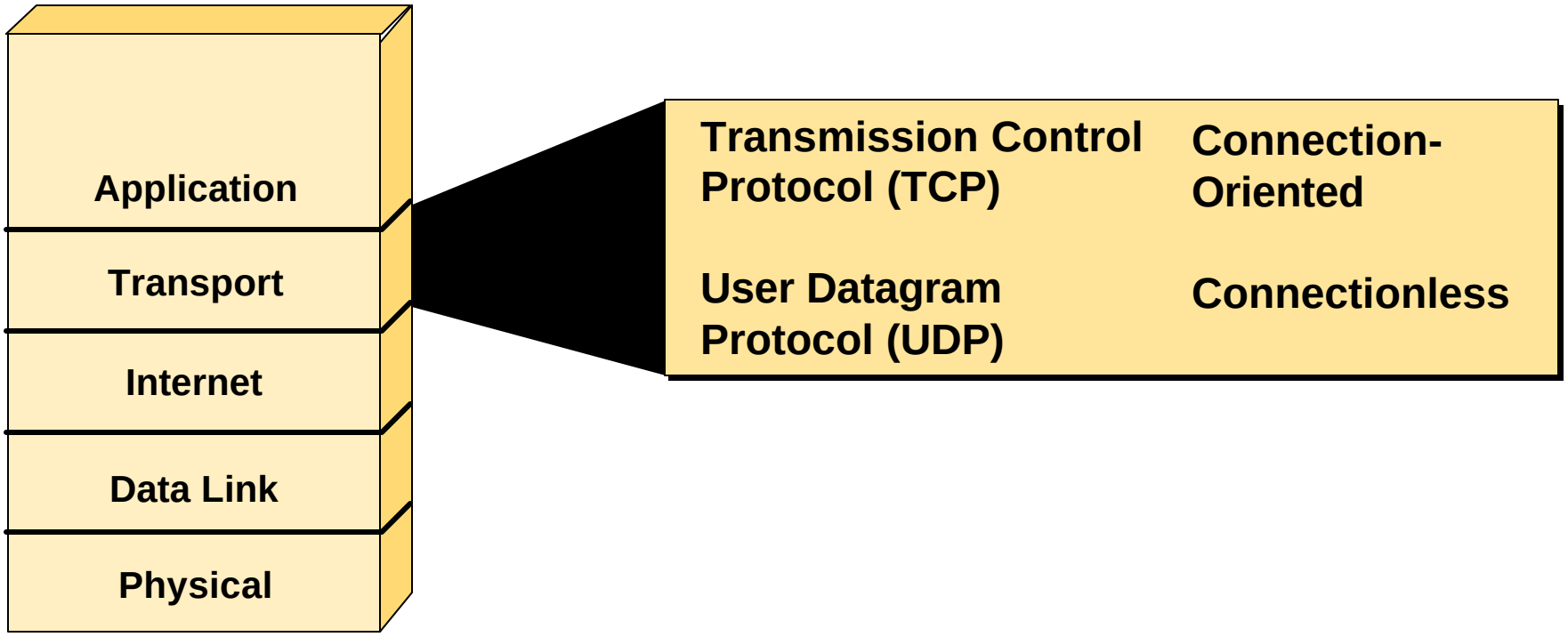


Application Layer Overview



*Used by the router

Transport Layer Overview



Transmission control protocol

Transmission control protocol Services:·
Resource Utilization (multiplexing)·
Connection Management (establishing) ·
Flow Control (Buffering / Windowing) ·
Reliable Transport (positive acknowledgment / error checking)

Connection Management

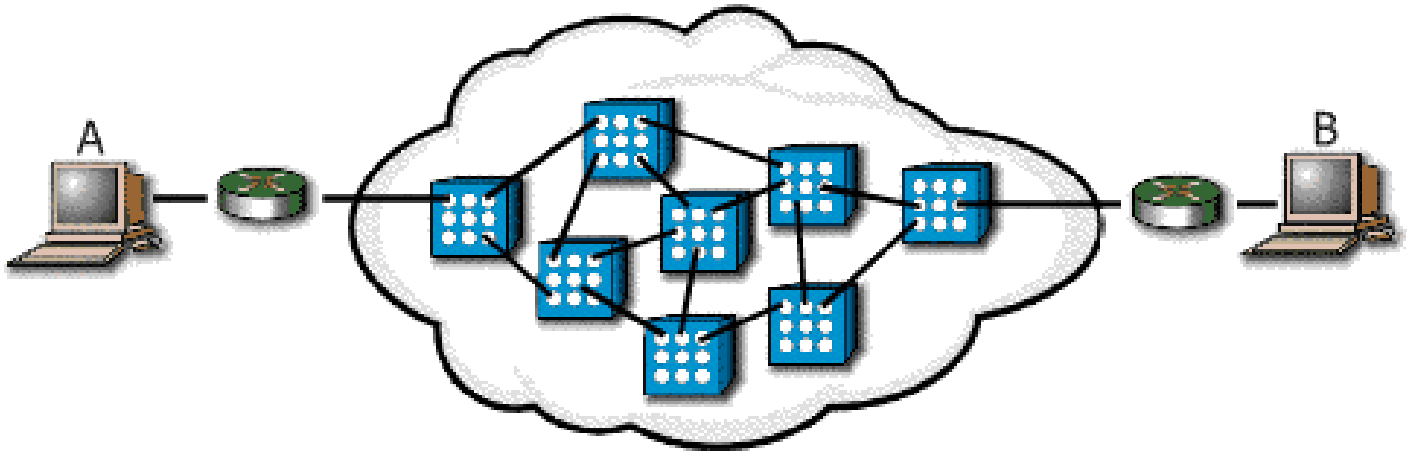
The Transport Layer is responsible for establishing, maintaining and terminating connections between devices on a network. This Connection-Oriented Service has three phases:

Connection-Establishment

Data-Transfer

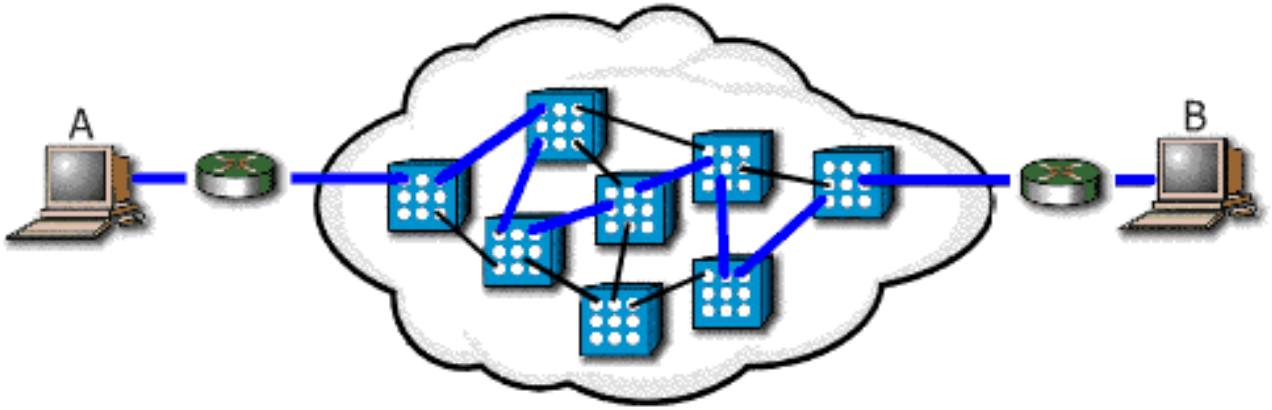
Connection Termination

Connection-Establishment



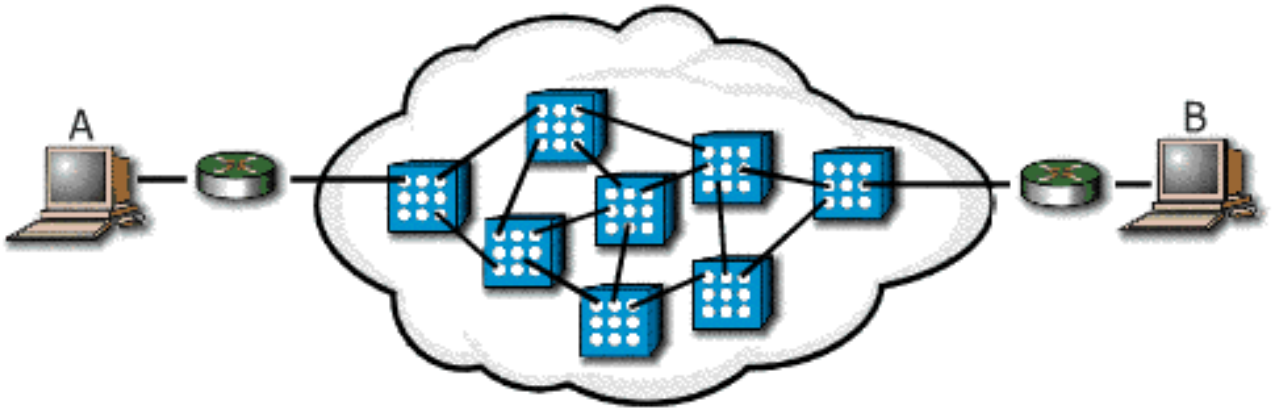
Phase 1 - Connection-Establishment: The source and destination negotiate a connection with a three-way handshake and a simple path between the two is determined.

Connection-Establishment



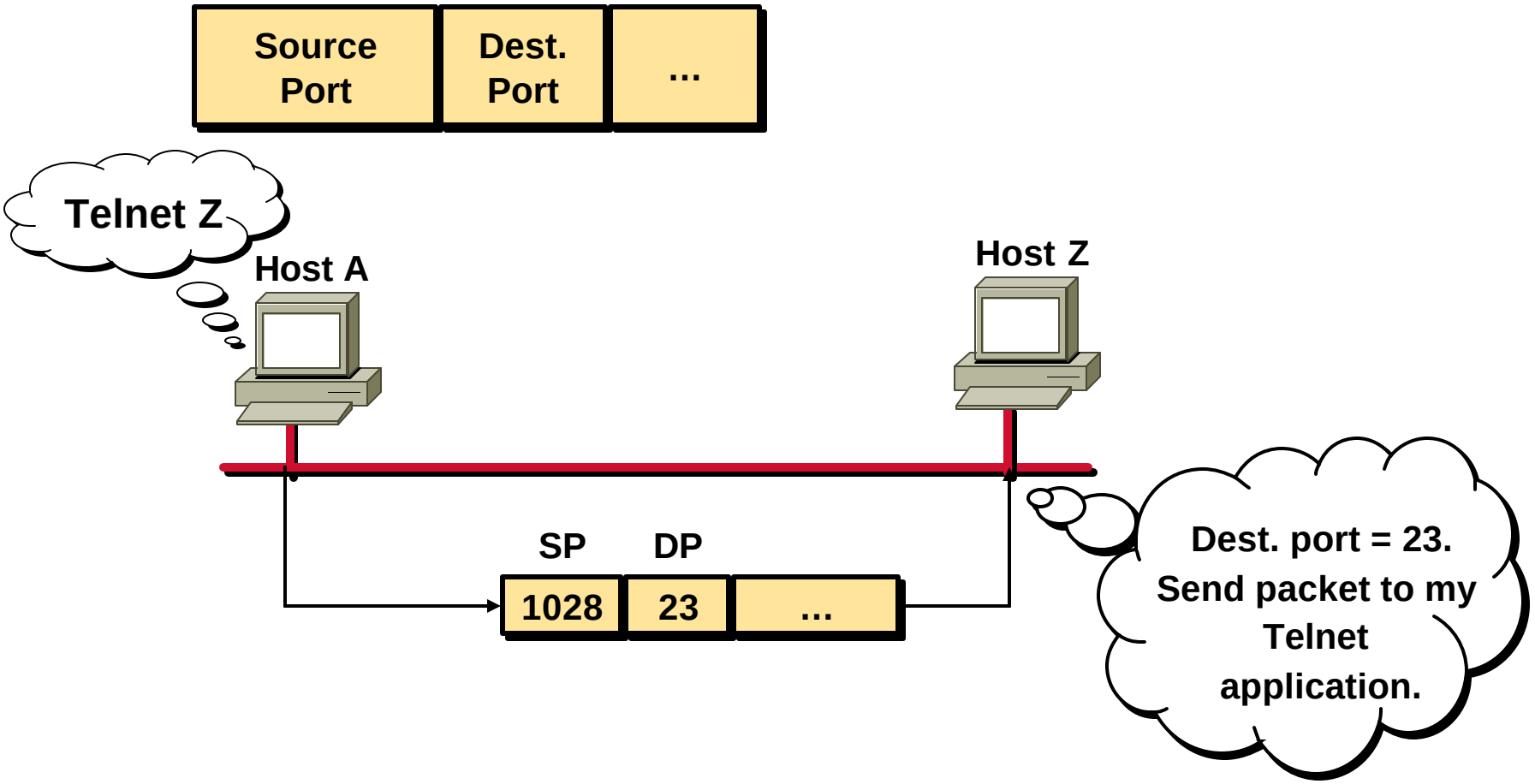
Phase 2 - Data-Transfer: Data is transmitted along the designated path of the network, arriving at the destination in the order it was sent.

Connection-Establishment

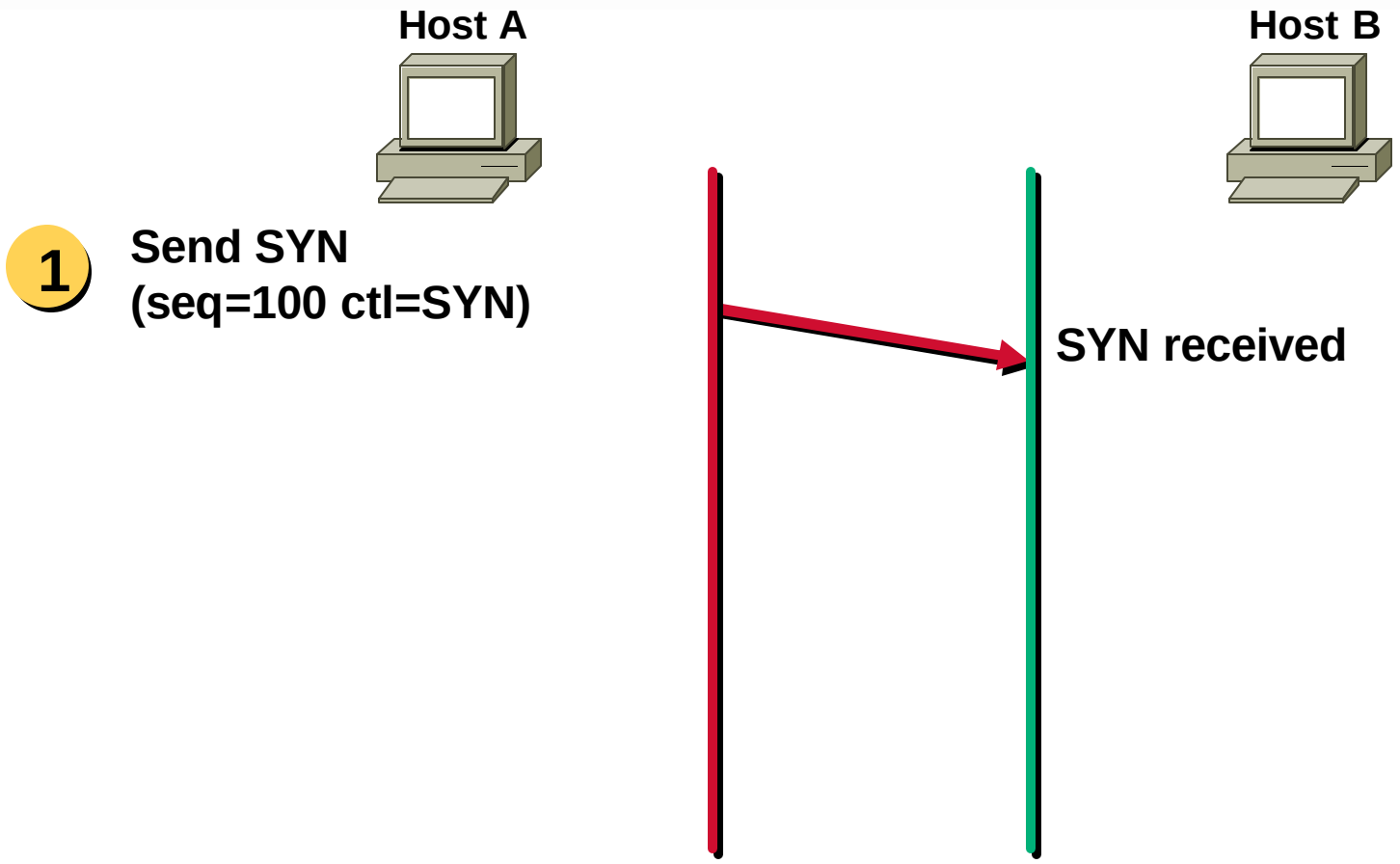


Phase 3 - Connection-Termination: The connection between the source and the destination is terminated when it is no longer needed. If they require additional communications after termination, another connection must be established.

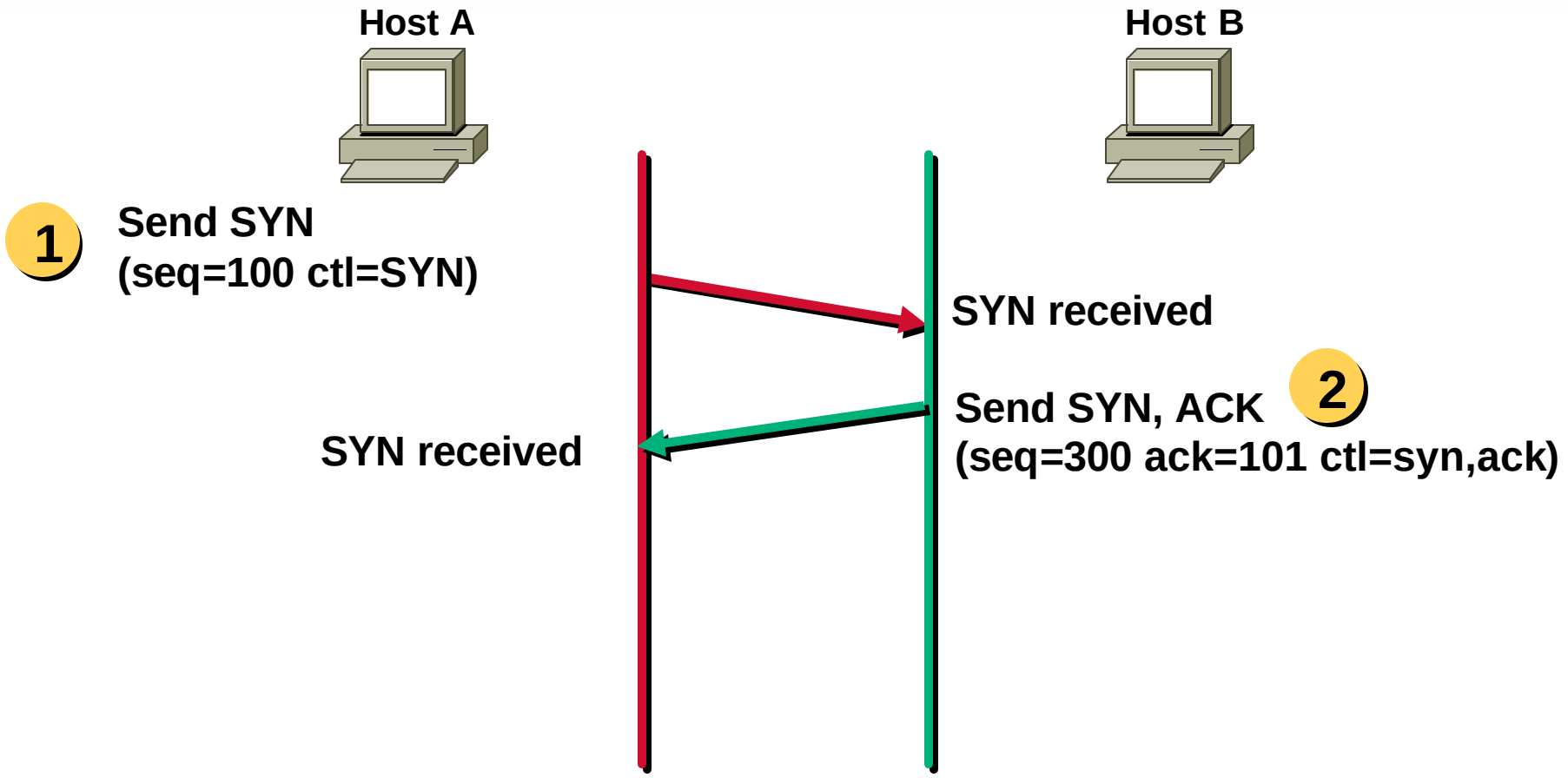
TCP Port Numbers



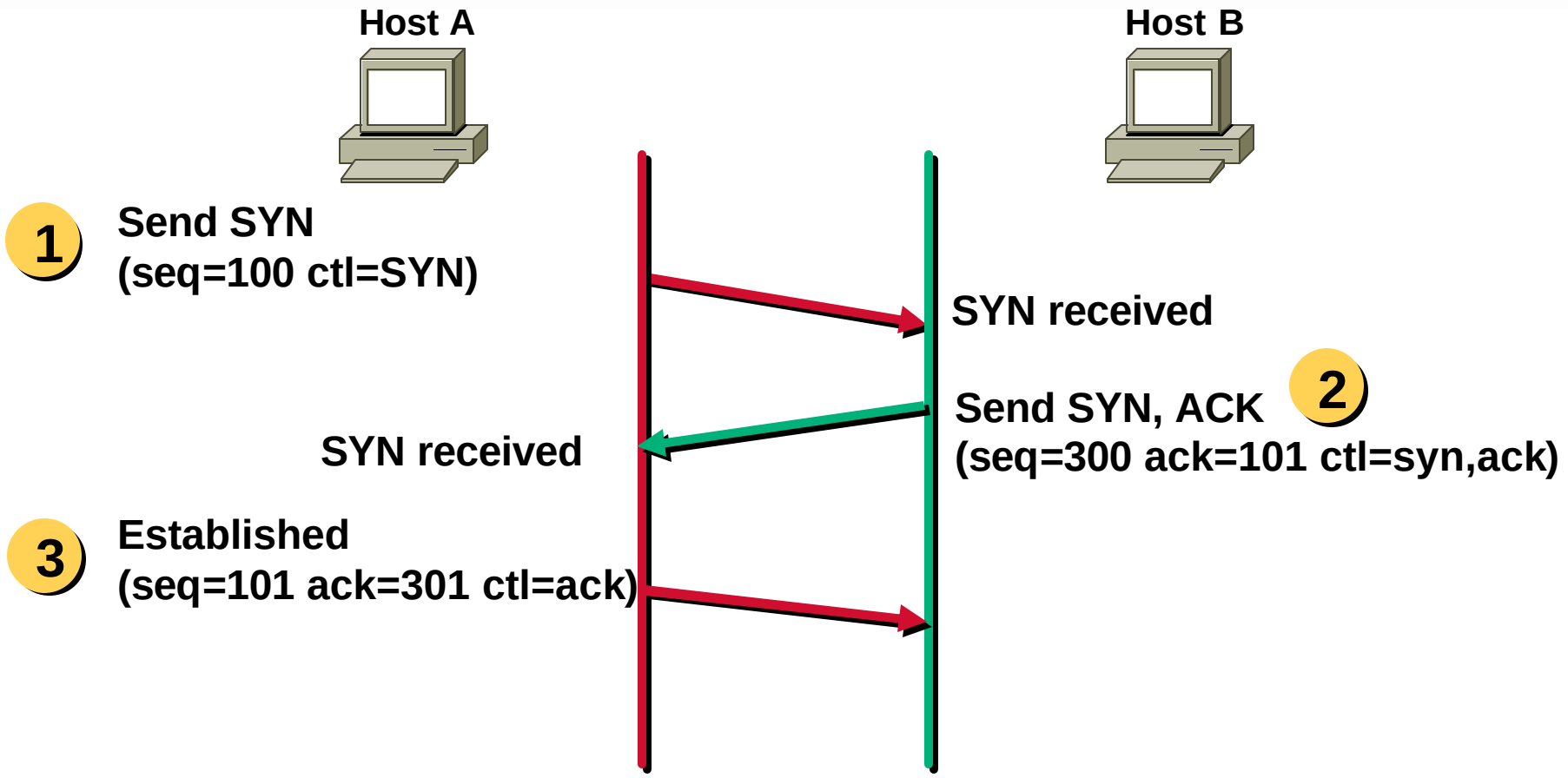
TCP Three Way Handshake/Open Connection



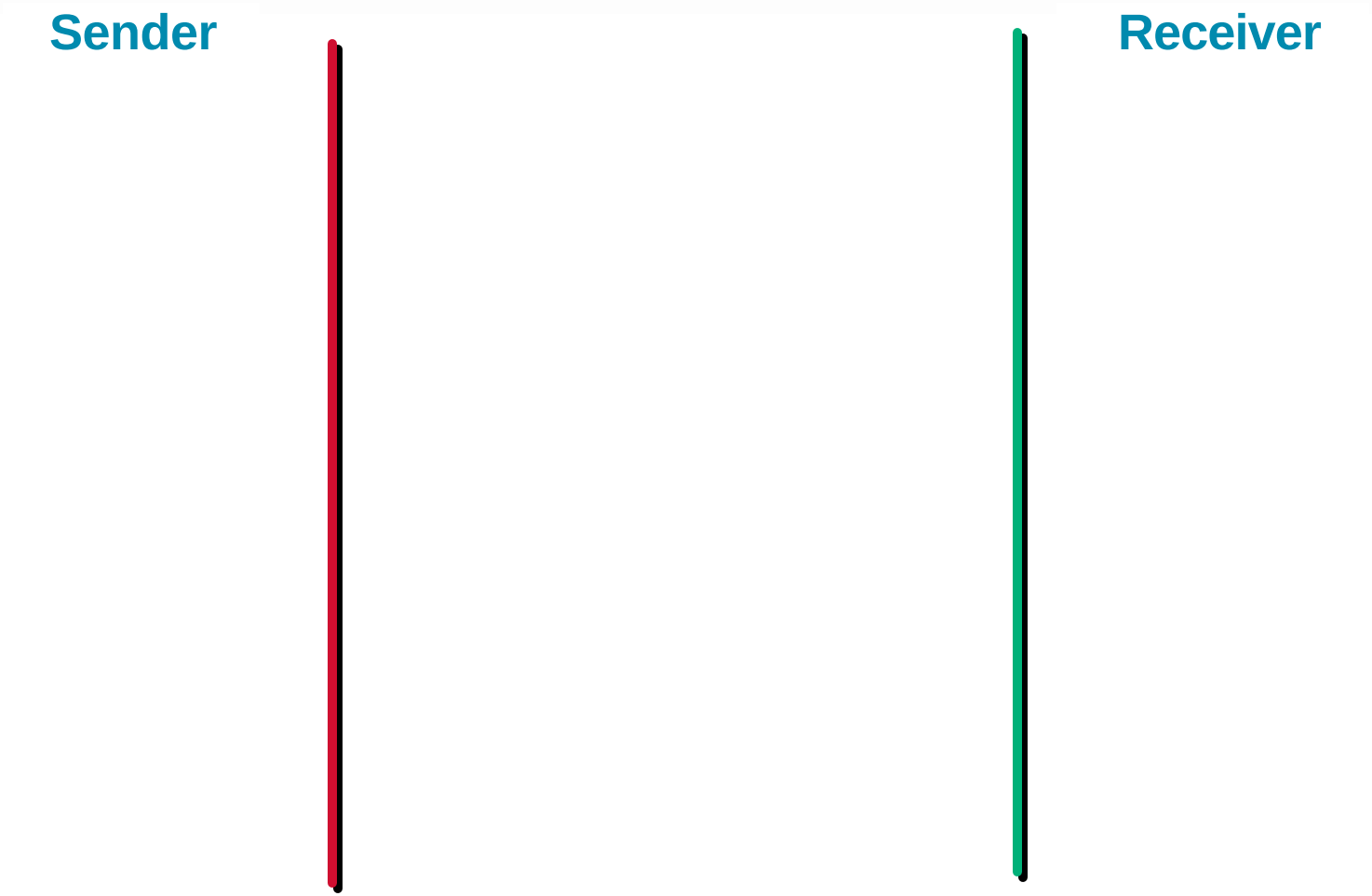
TCP Three Way Handshake/Open Connection



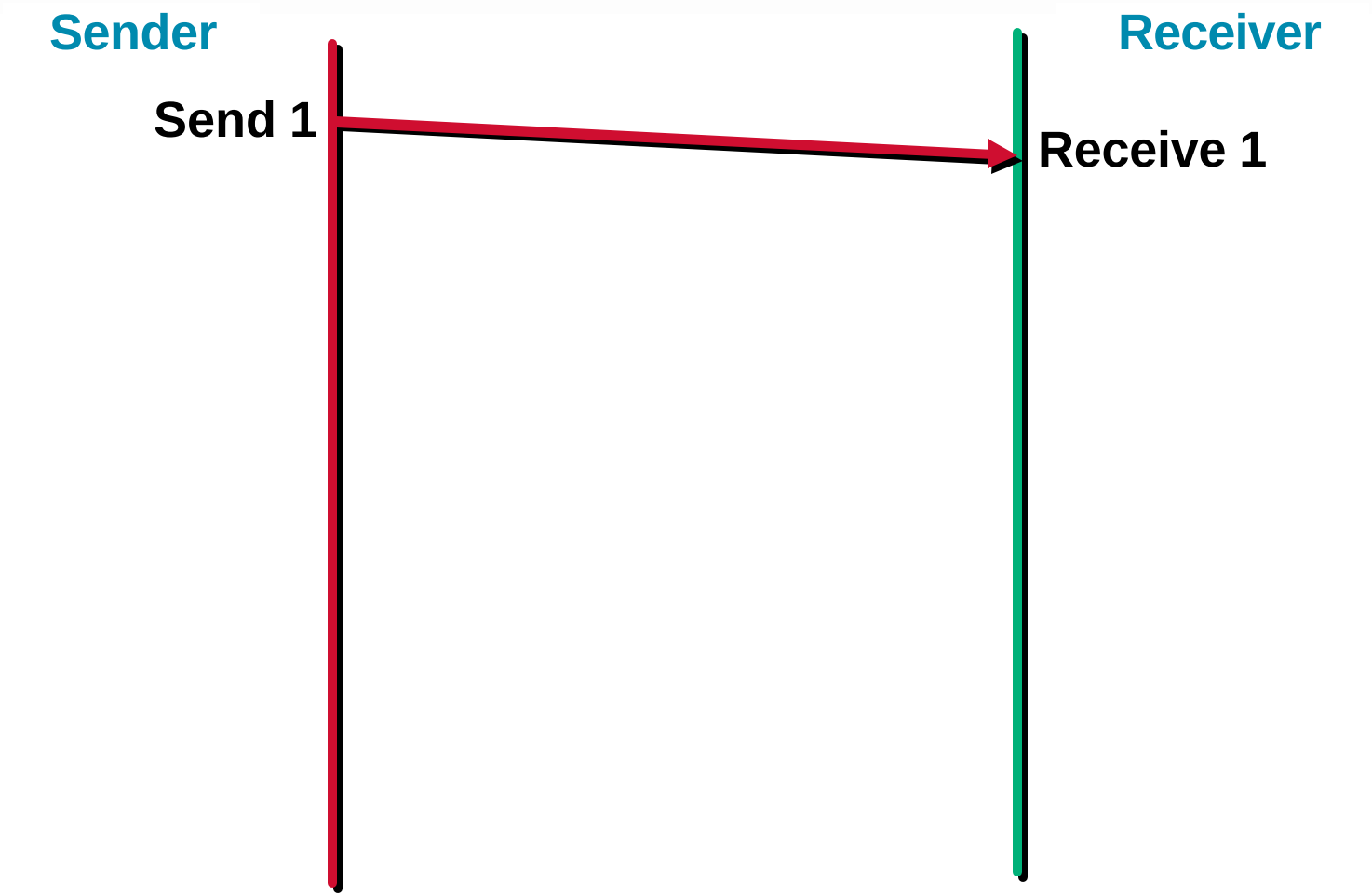
TCP Three Way Handshake/Open Connection



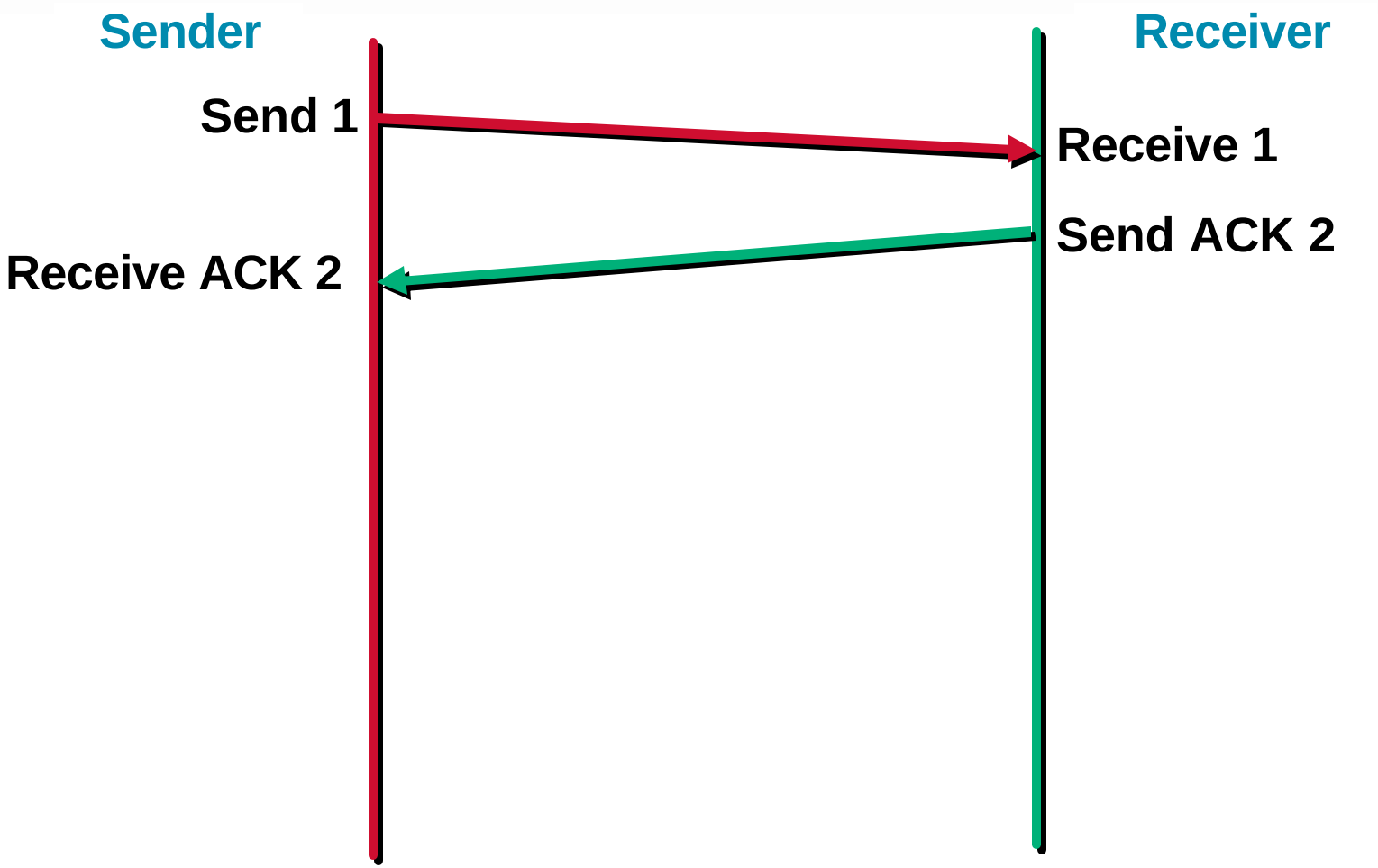
TCP Simple Acknowledgment



TCP Simple Acknowledgment

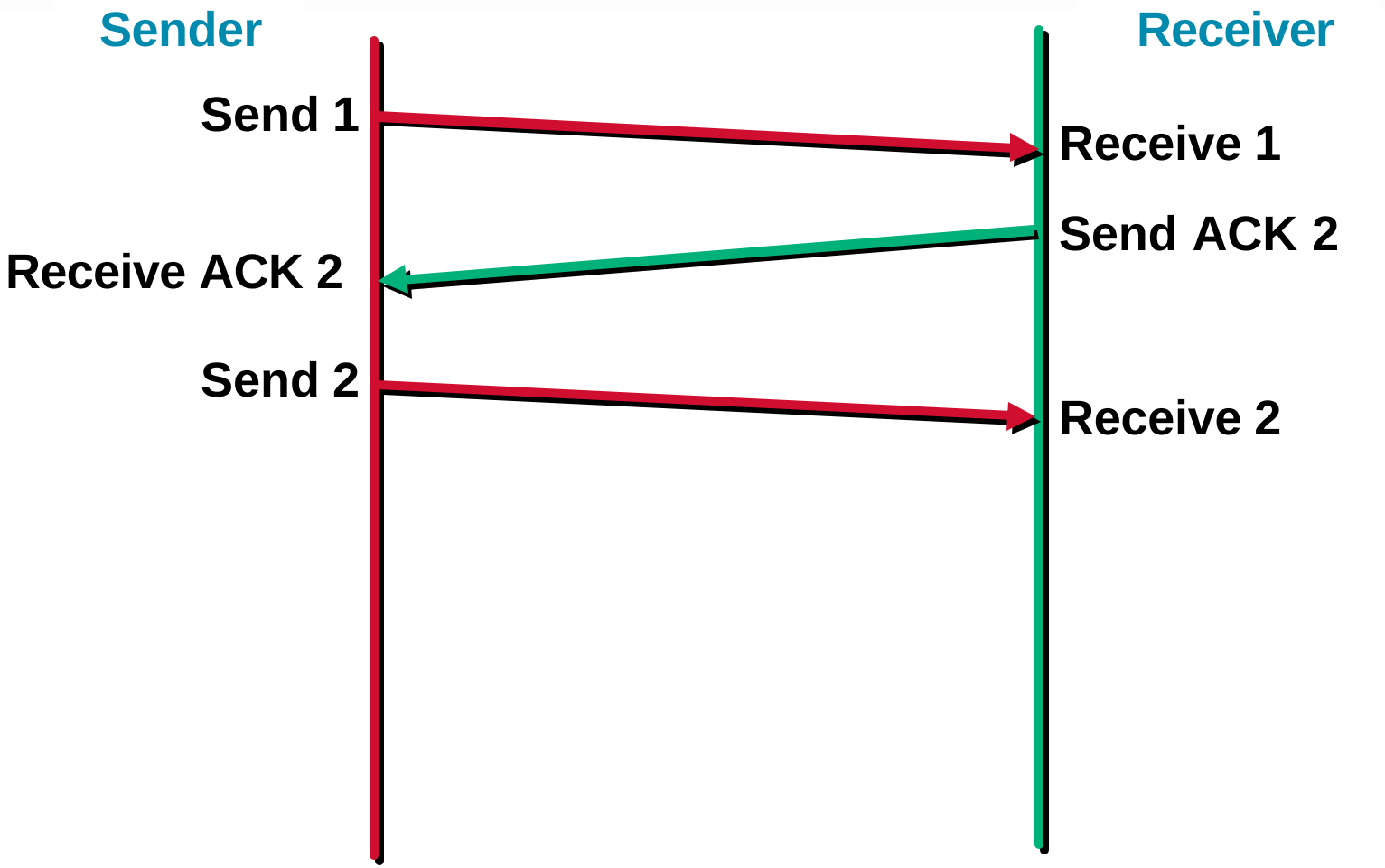


TCP Simple Acknowledgment



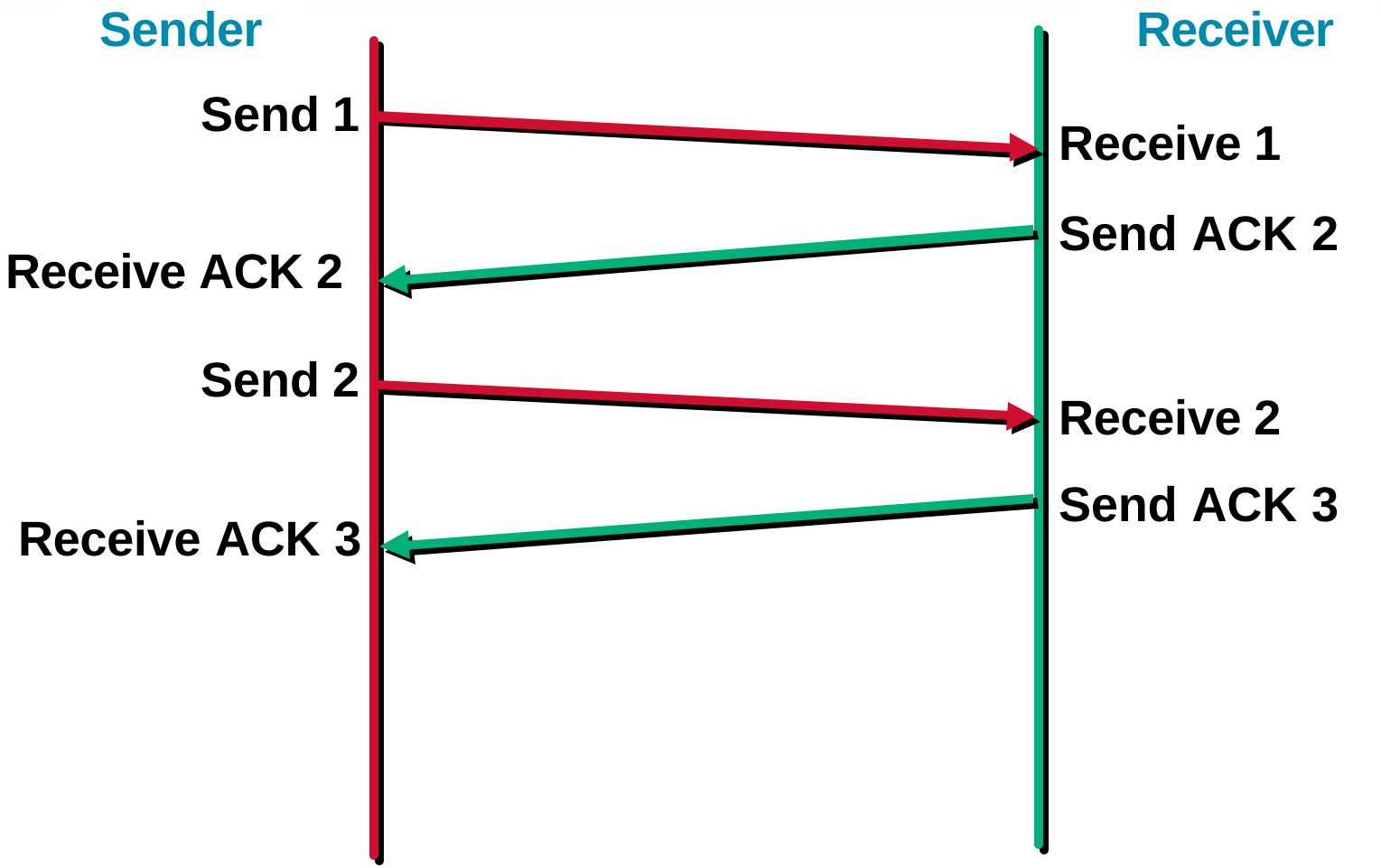
Window size = 1

TCP Simple Acknowledgment



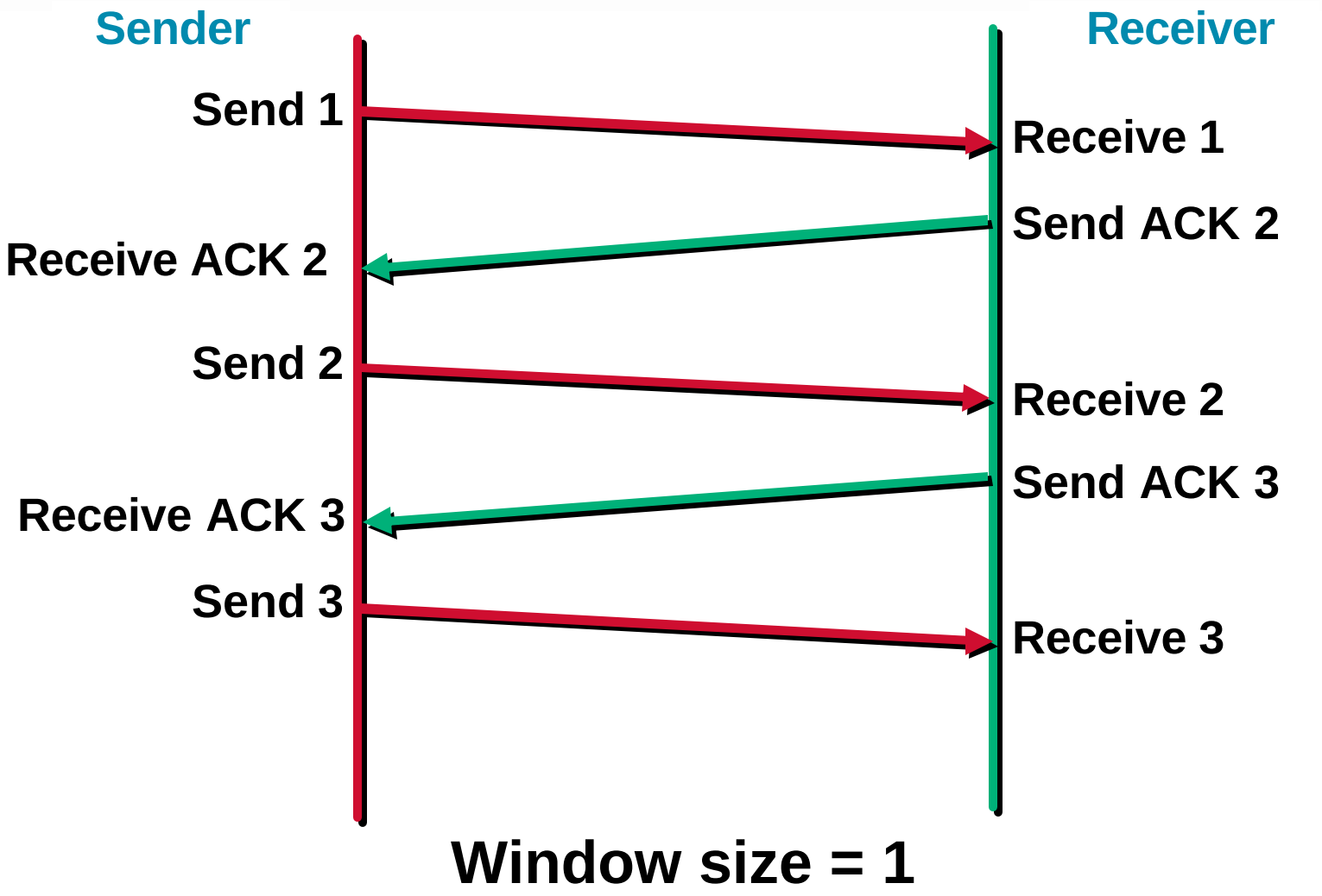
Window size = 1

TCP Simple Acknowledgment

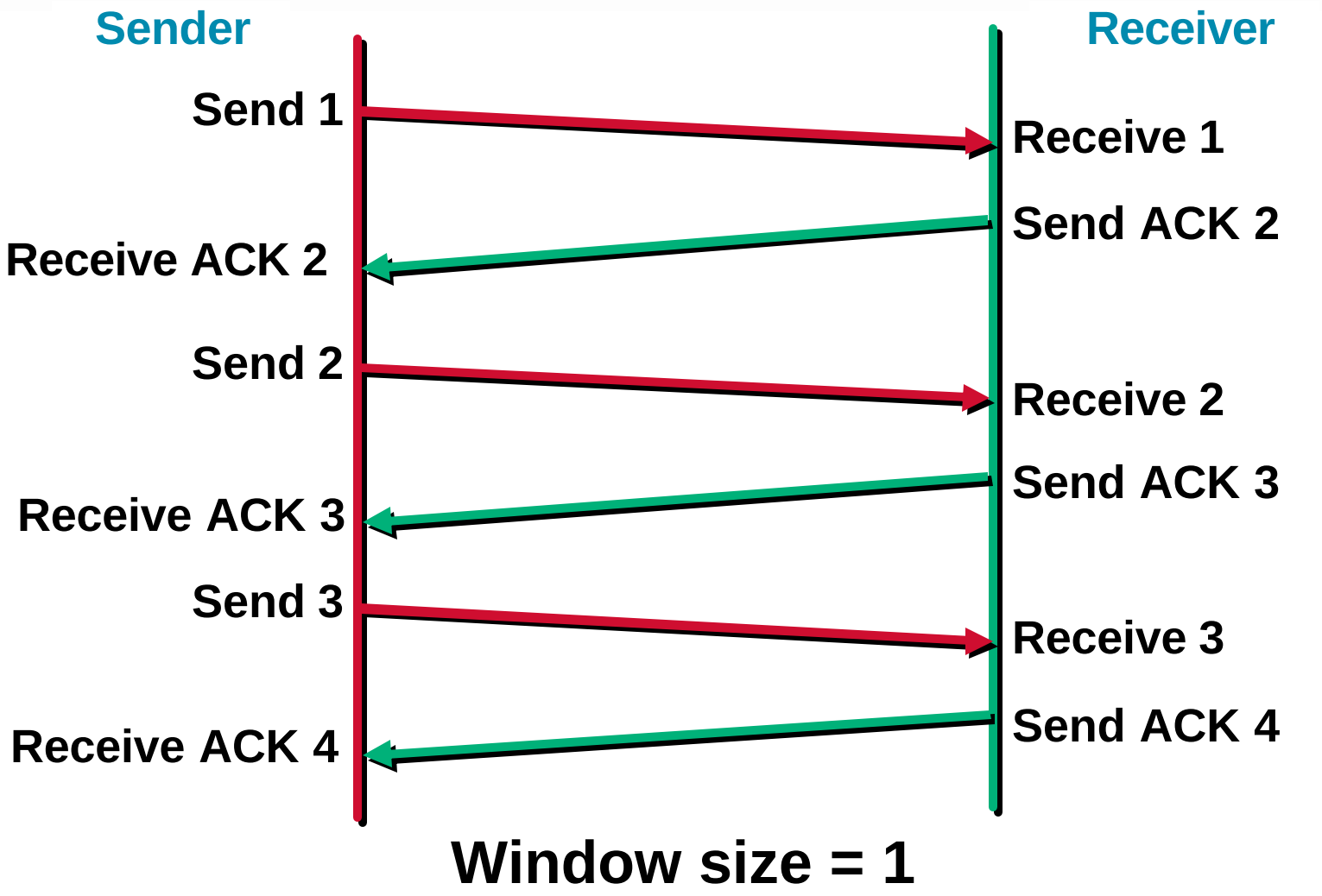


Window size = 1

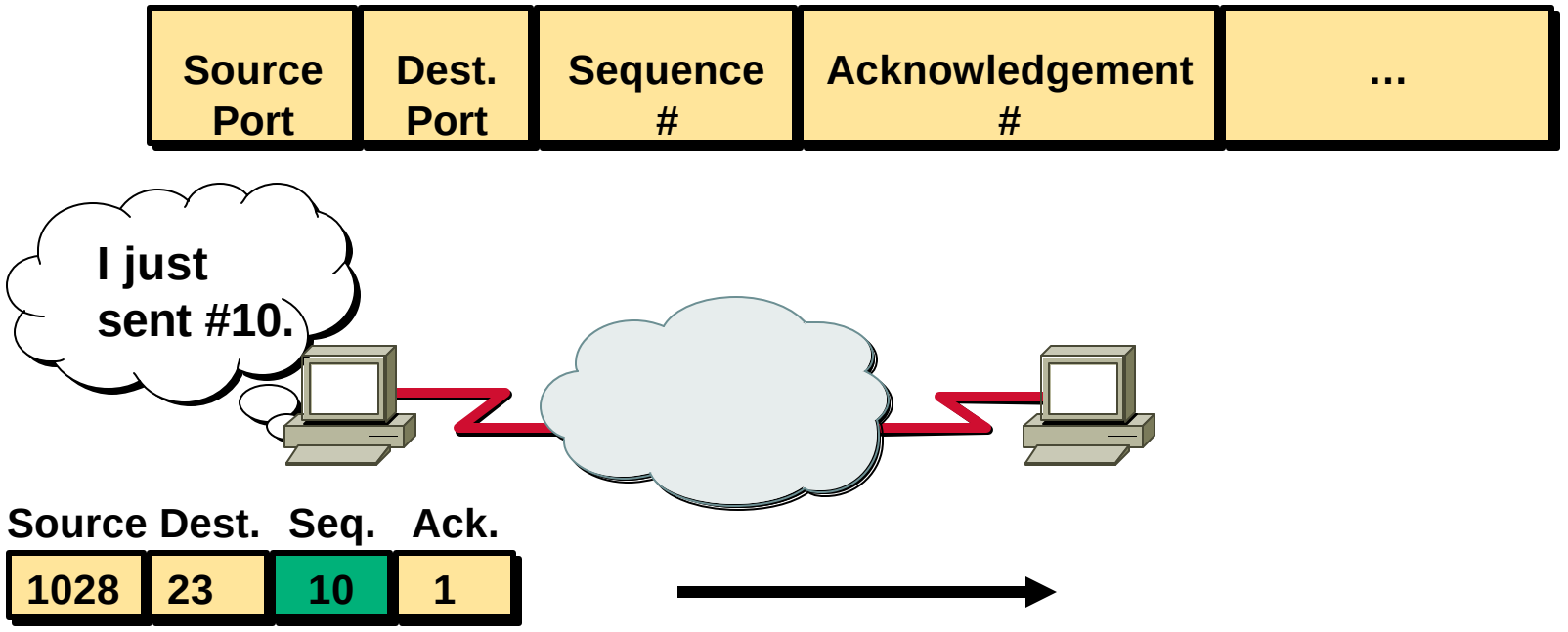
TCP Simple Acknowledgment



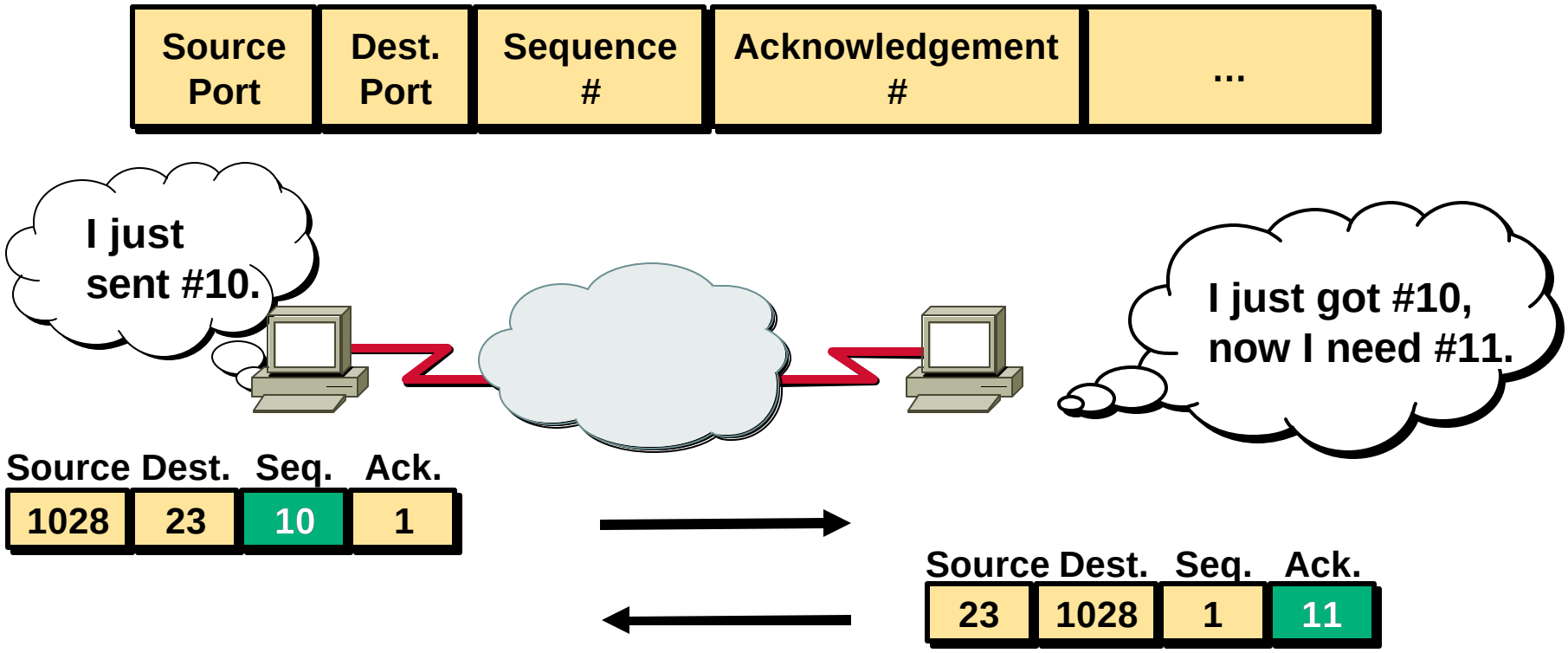
TCP Simple Acknowledgment



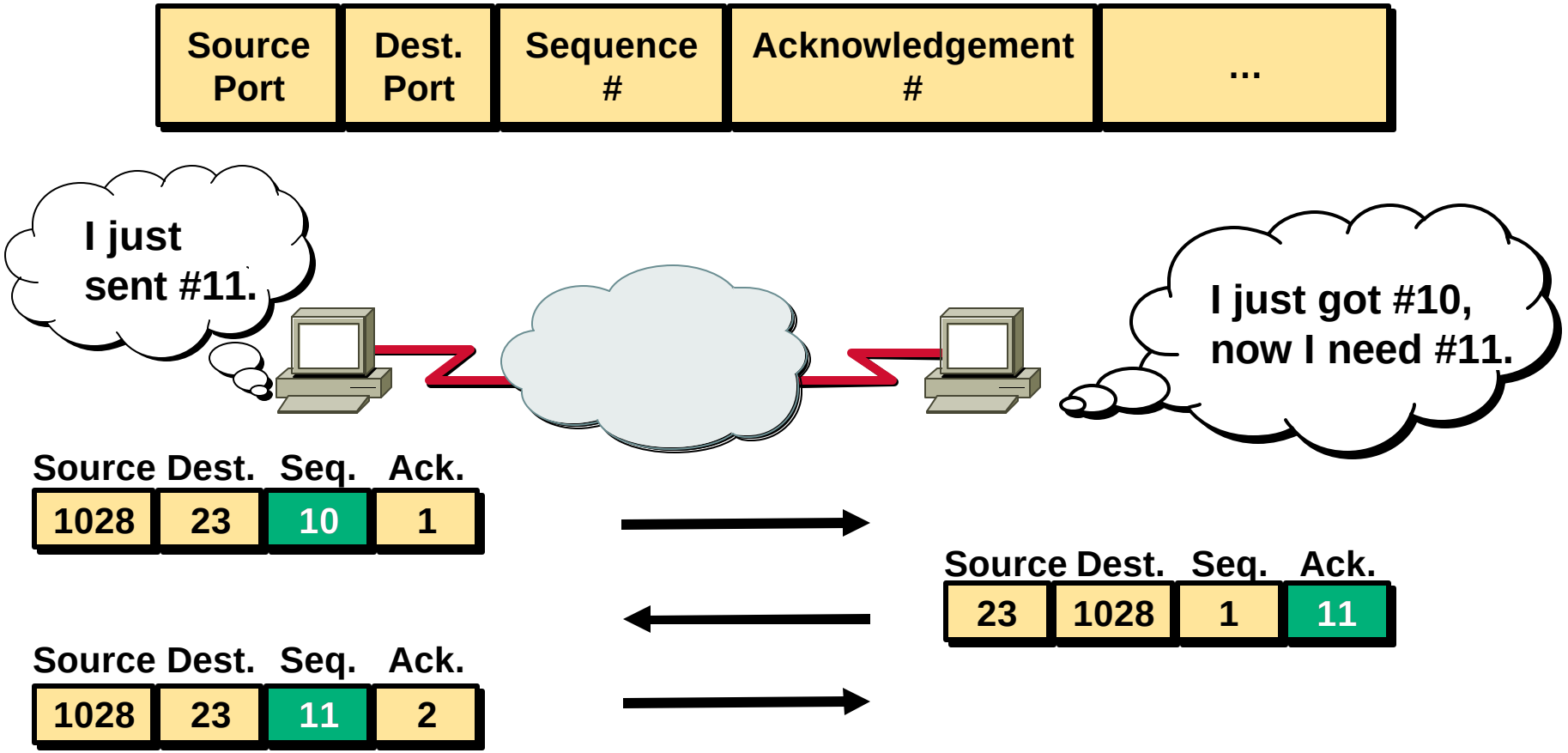
TCP Sequence and Acknowledgment Numbers



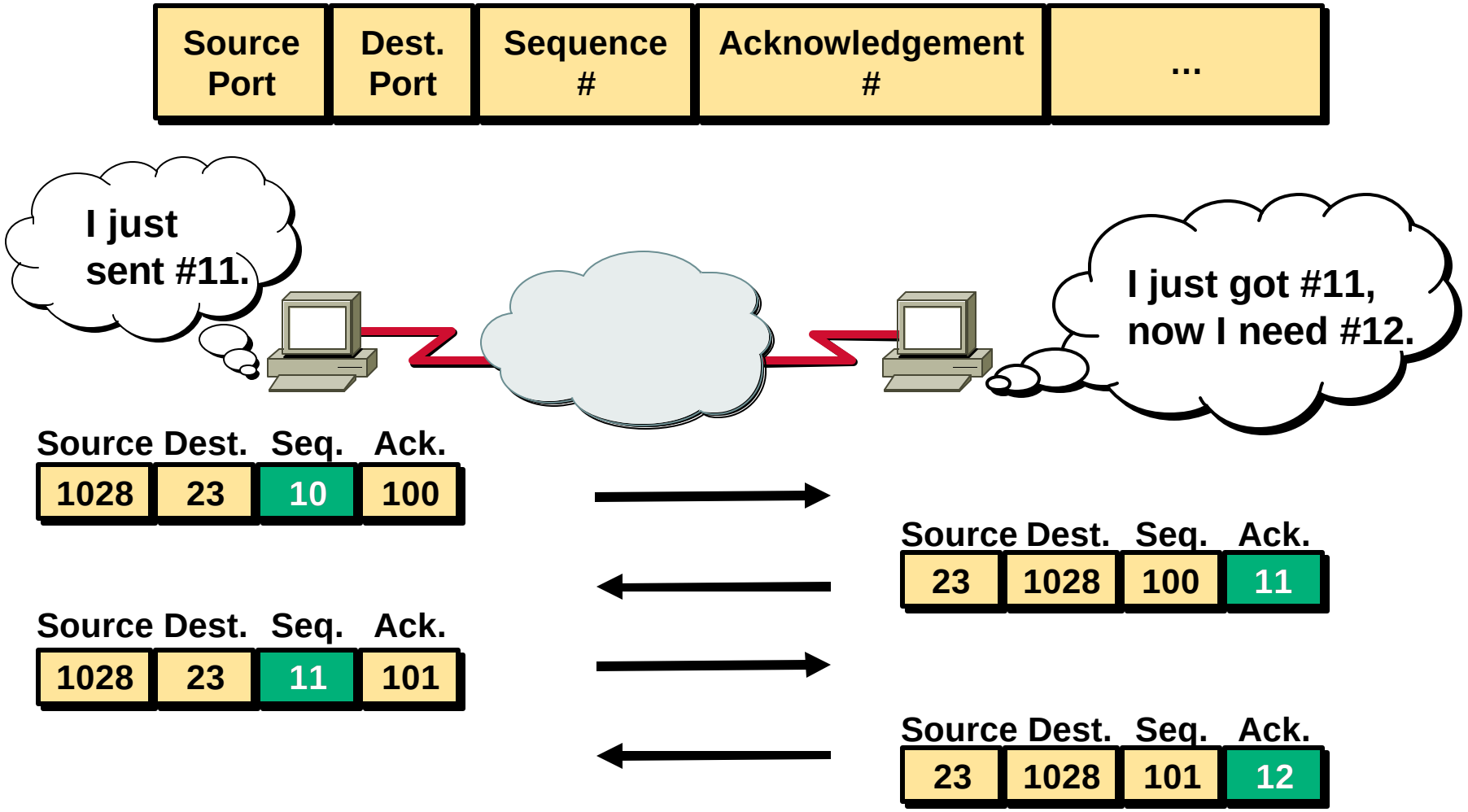
TCP Sequence and Acknowledgment Numbers



TCP Sequence and Acknowledgment Numbers

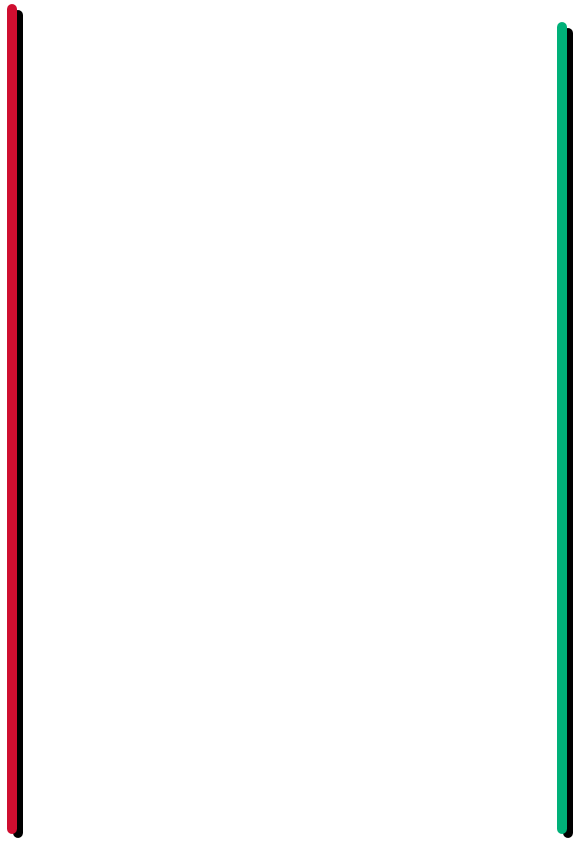


TCP Sequence and Acknowledgment Numbers



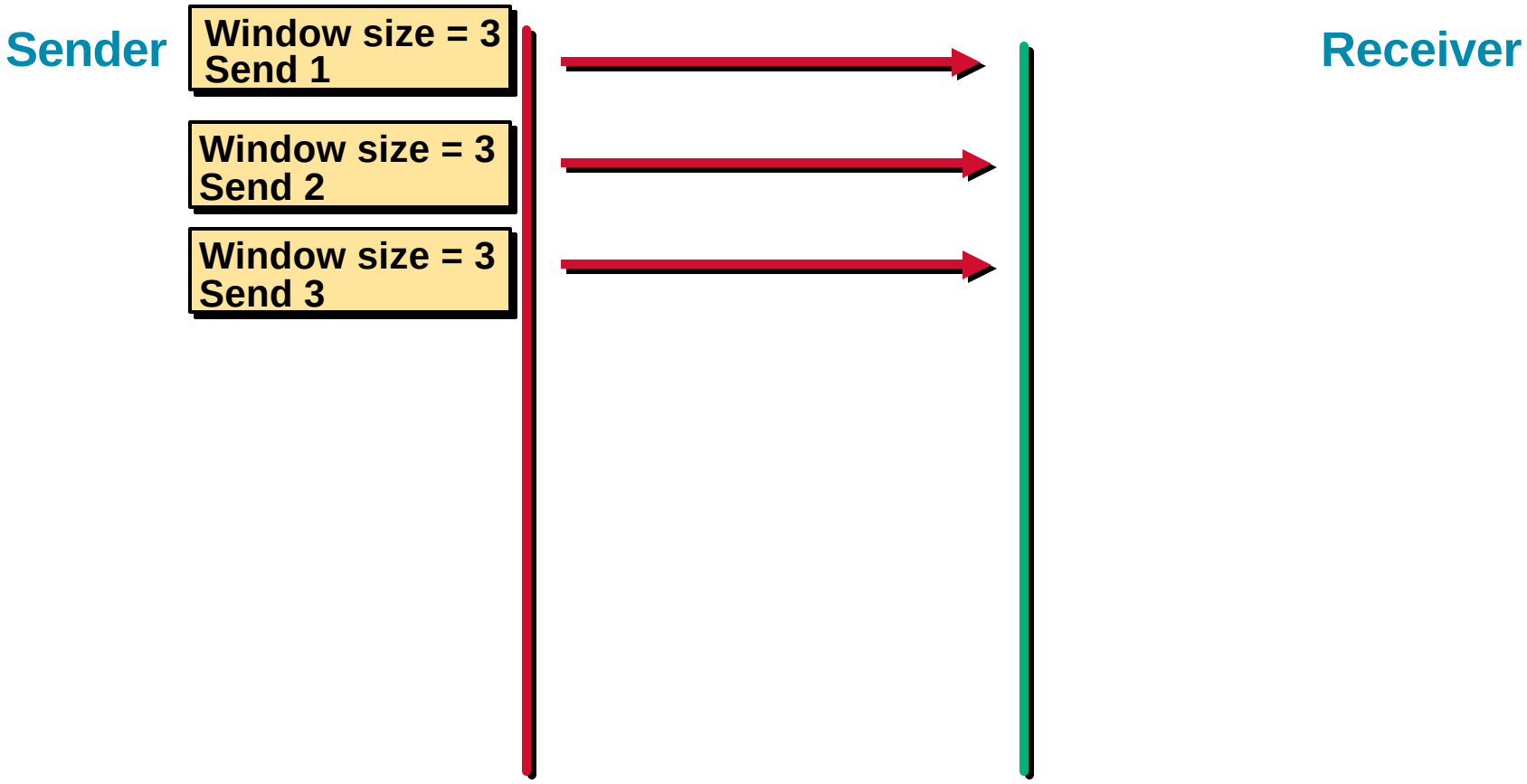
TCP Windowing

Sender

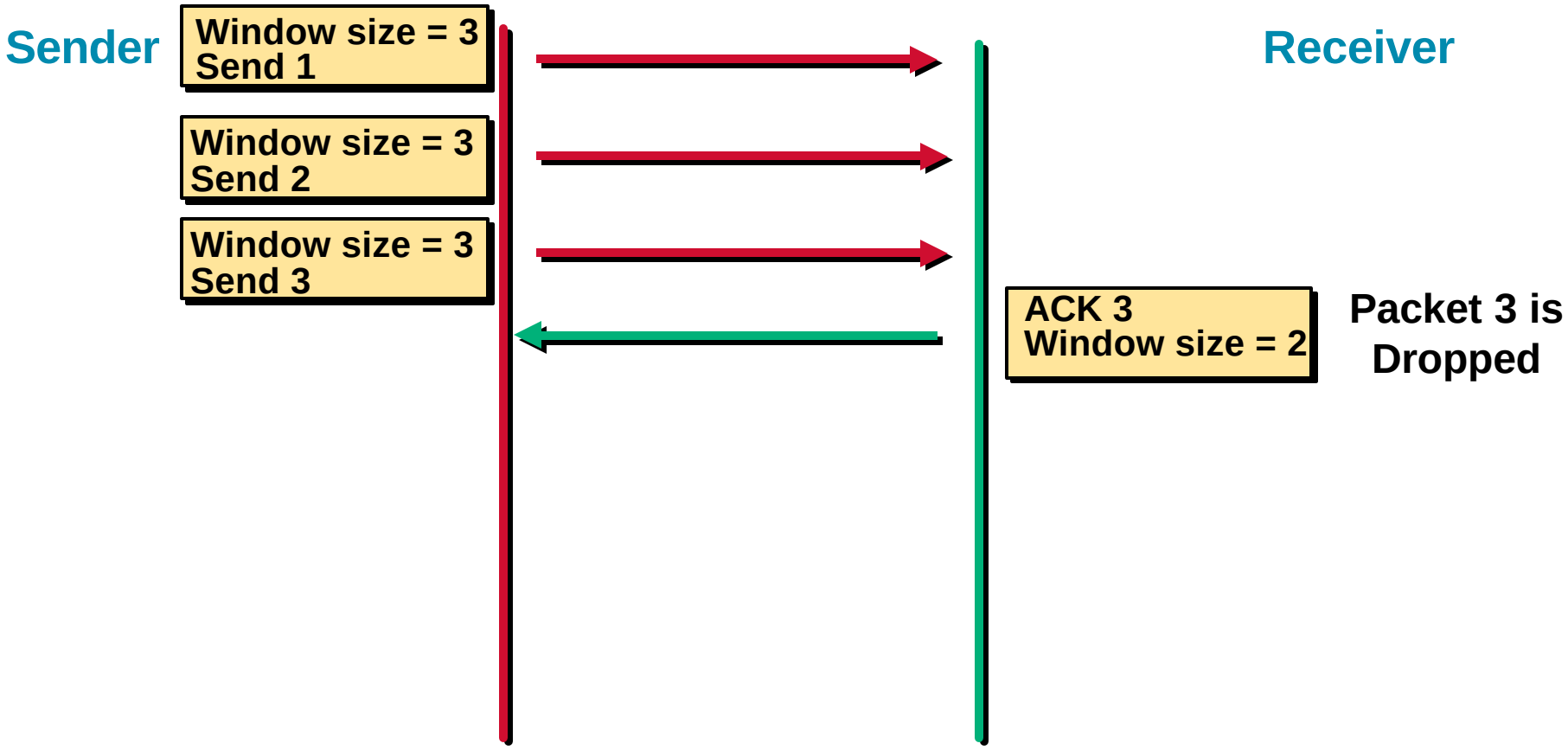


Receiver

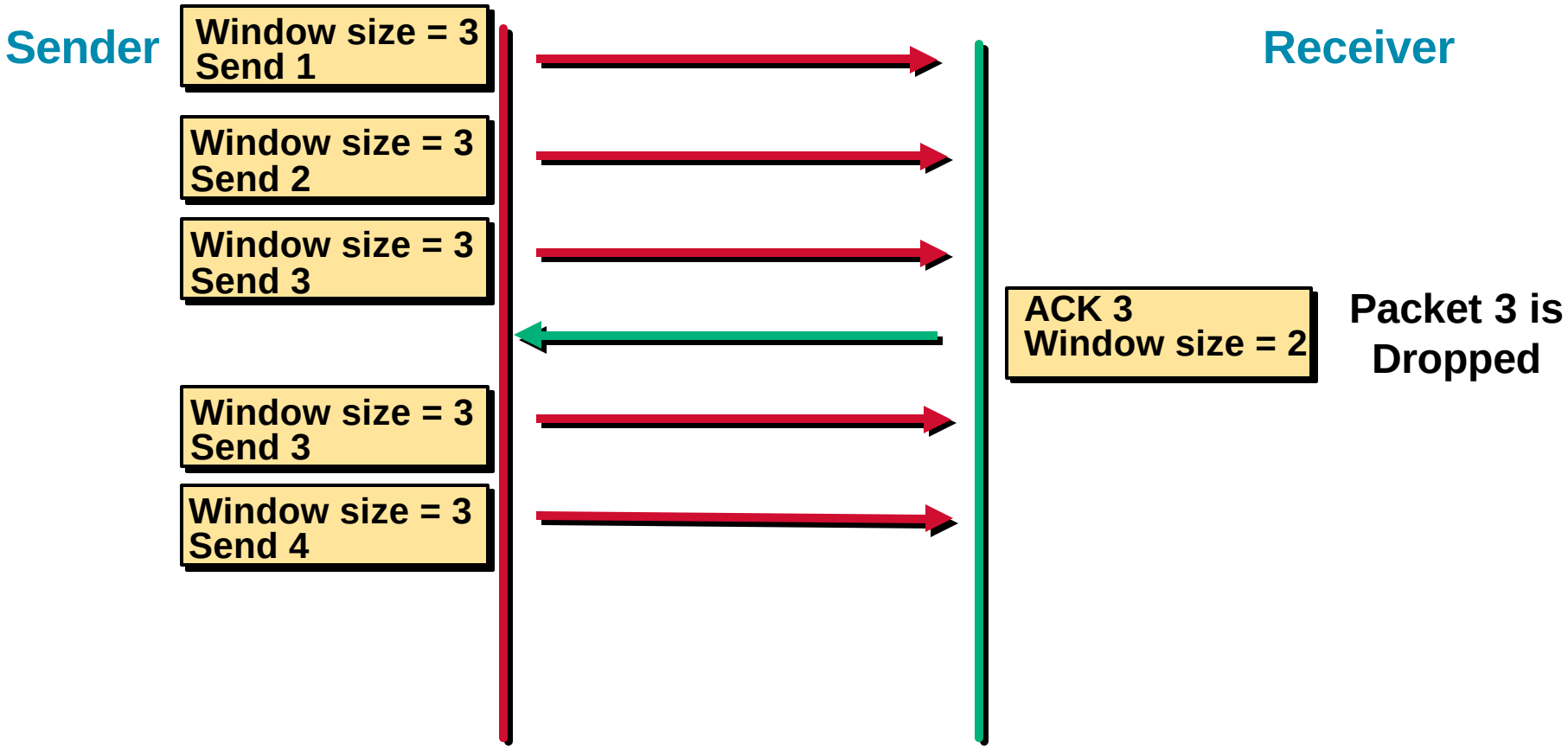
TCP Windowing



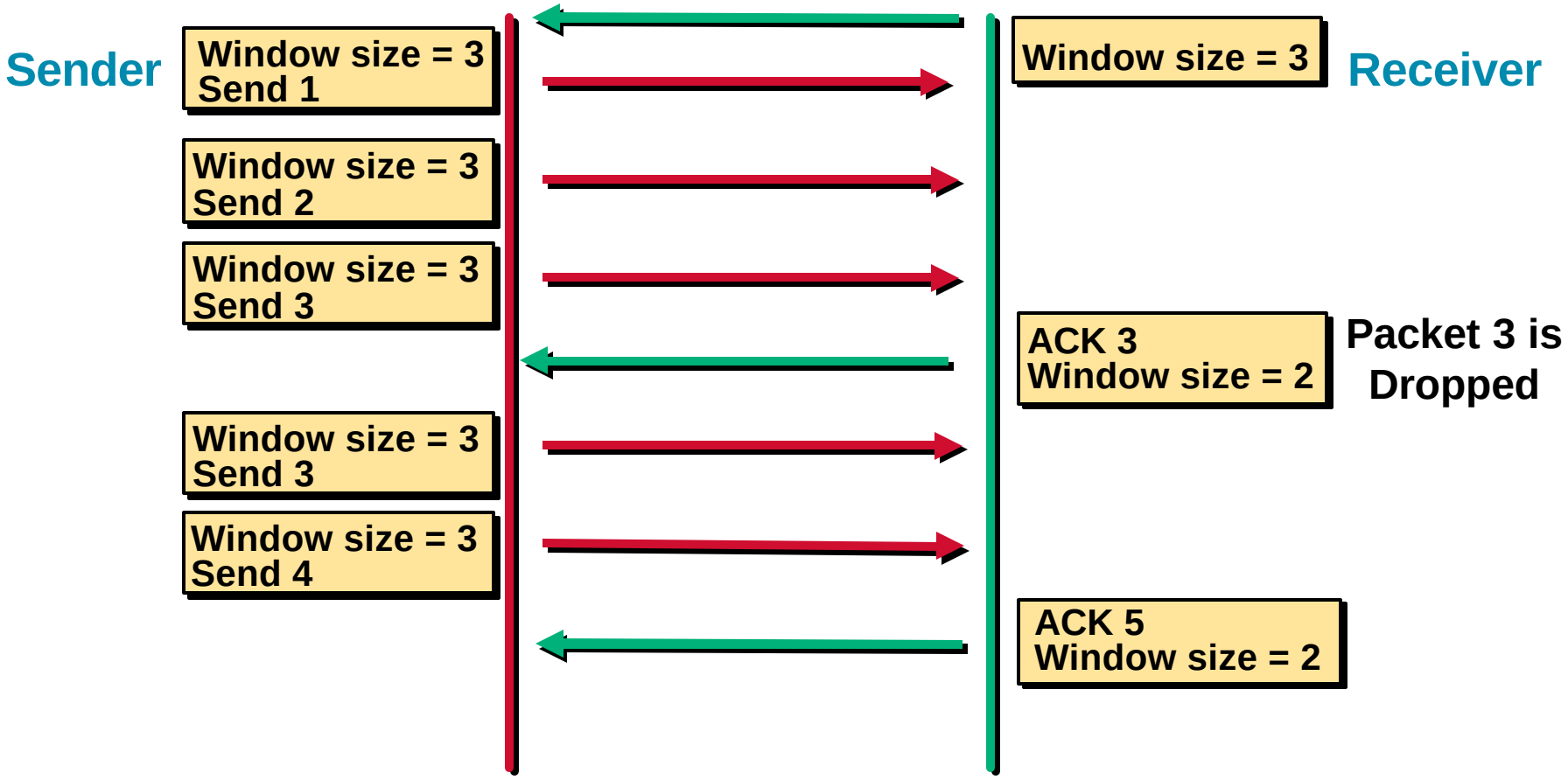
TCP Windowing



TCP Windowing



TCP Windowing



udp

UDP is a TCP/IP Transport Layer protocol designed for applications that provide their own error recovery process. It trades reliability for speed.

UDP is simple and efficient, but not reliable.

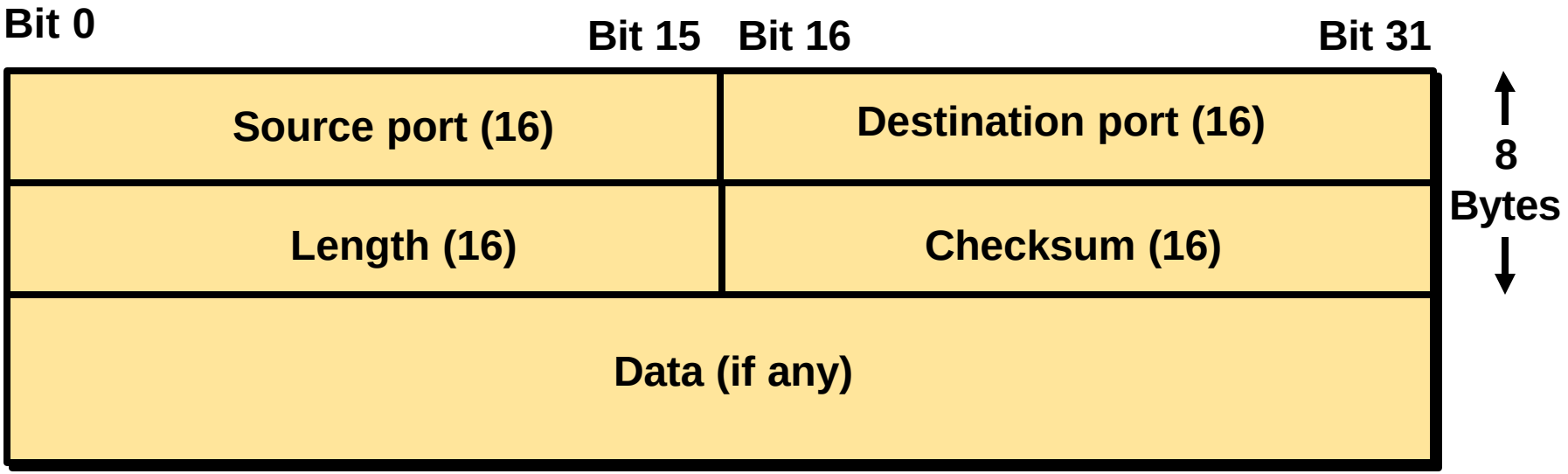
UDP is connectionless and unacknowledged.

UDP depends on upper layer protocols for reliability.

Although UDP is responsible for transmitting messages, no software checking for segment delivery is provided at this layer.

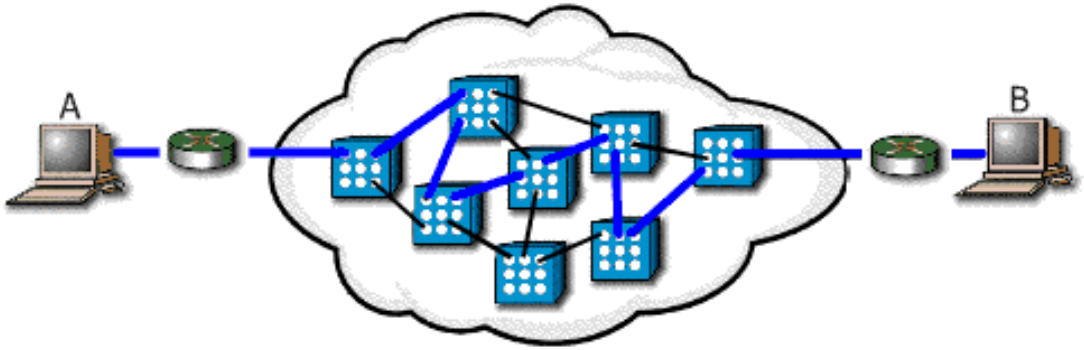
The UDP header length is always 64 bits. Examine the field definitions of the UDP segment below by moving your mouse over each area. (View info without mouseover):

UDP Segment Format



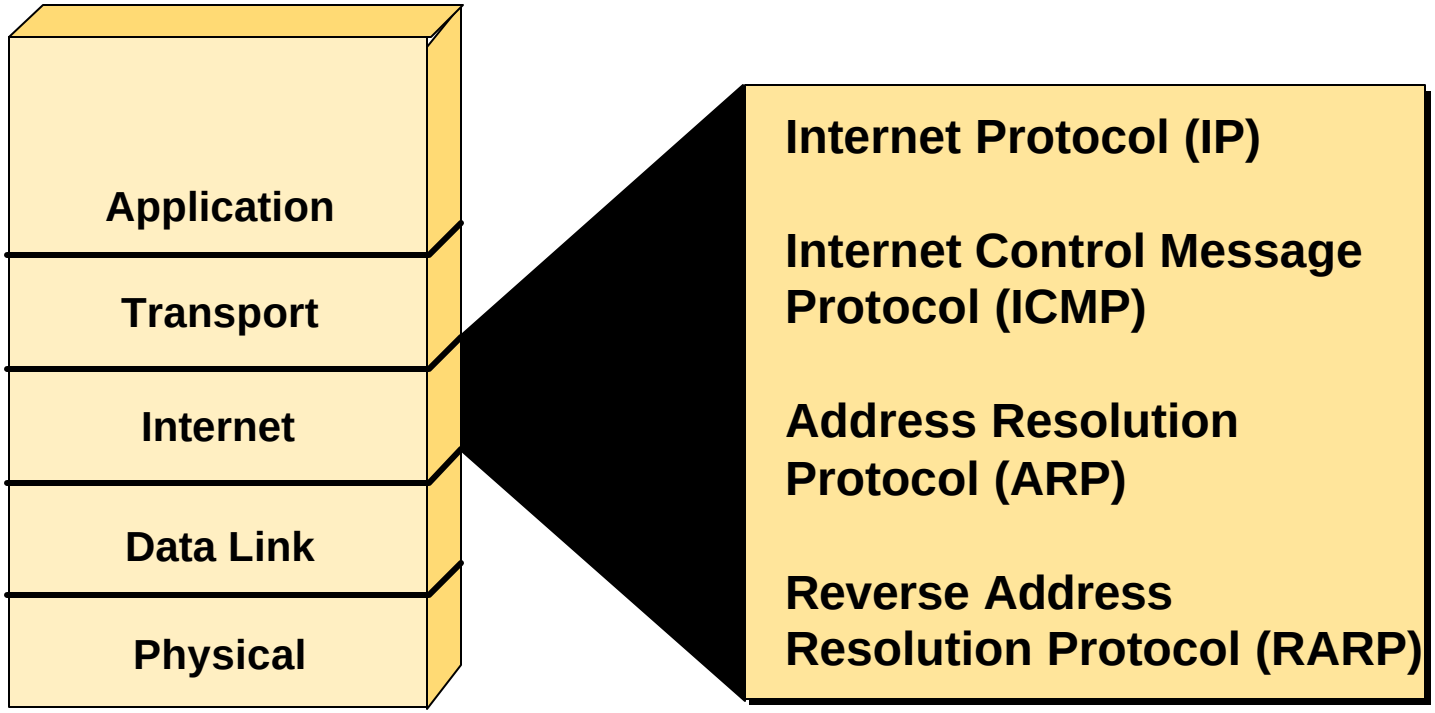
No sequence or acknowledgment fields

UDP data transferring



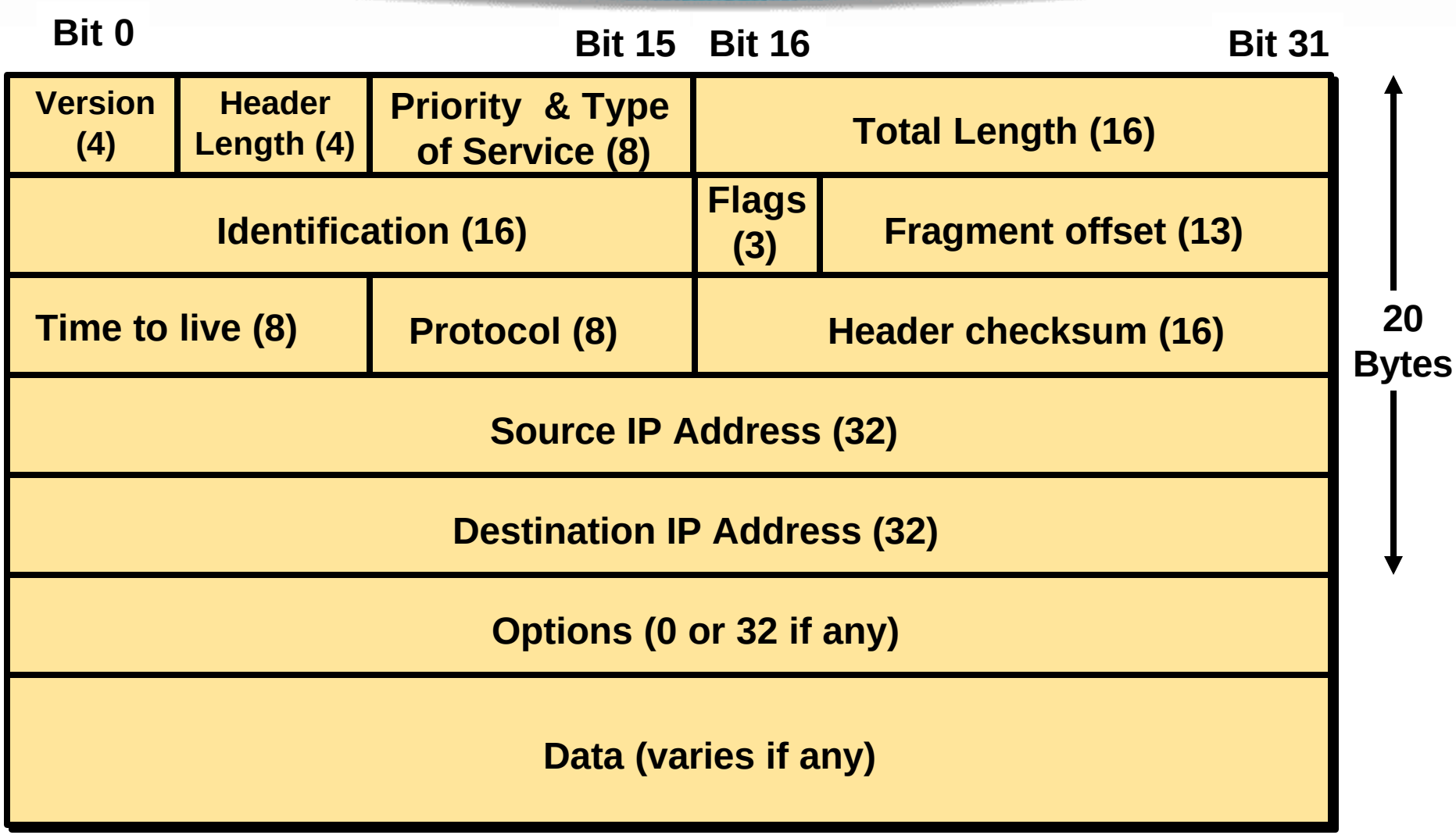
Data is transmitted along the designated path of the network, arriving at the destination in the order it was sent.

Internet Layer Overview

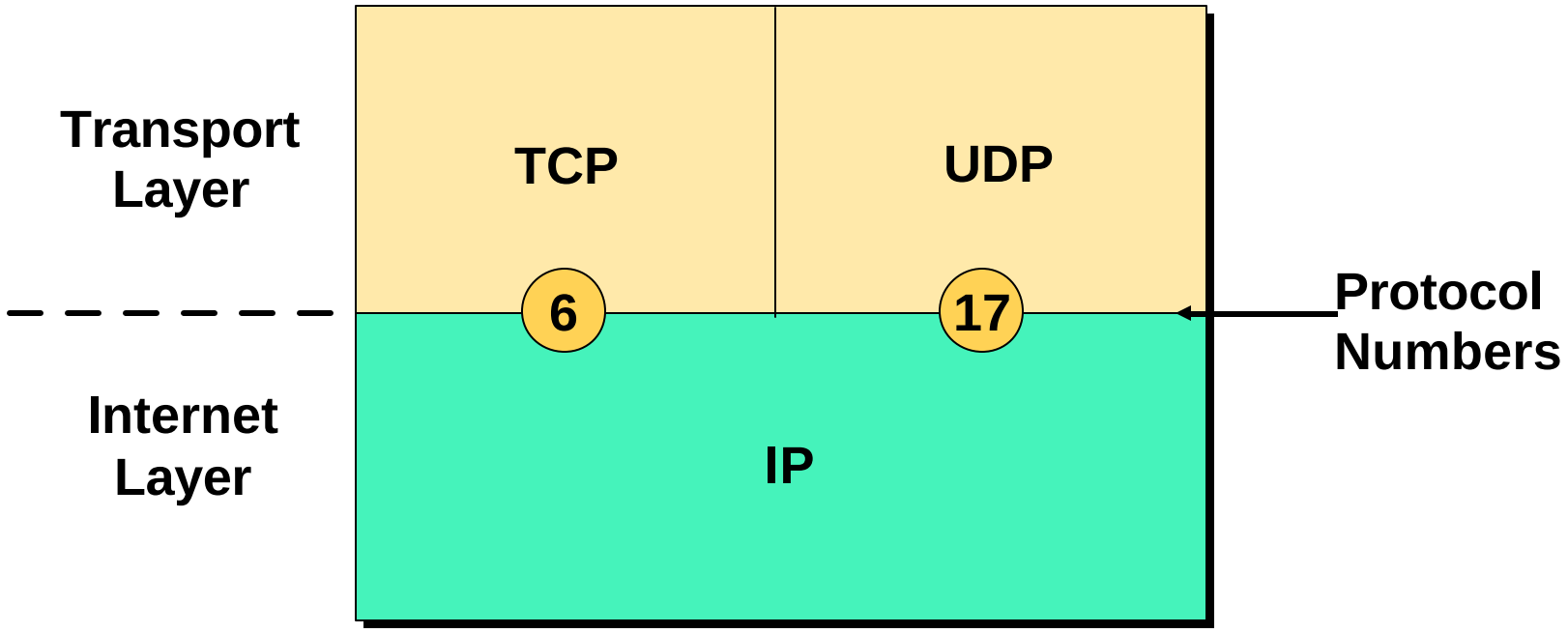


OSI network layer corresponds to the TCP/IP internet layer

IP Datagram

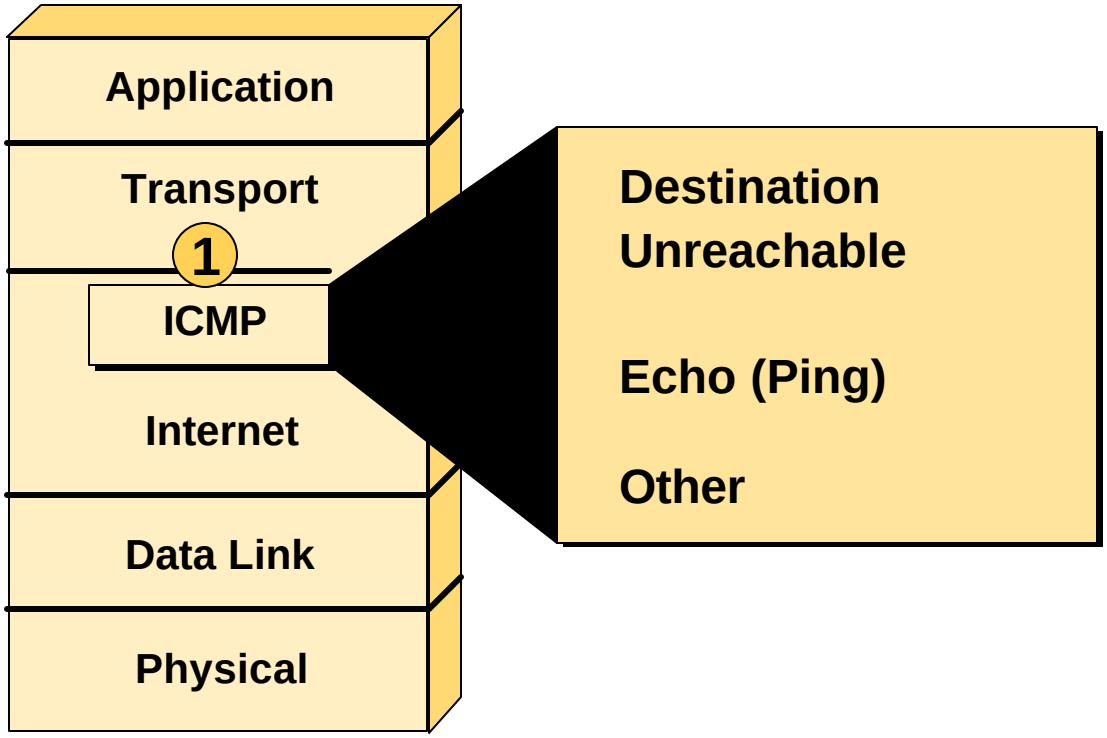


Protocol Field



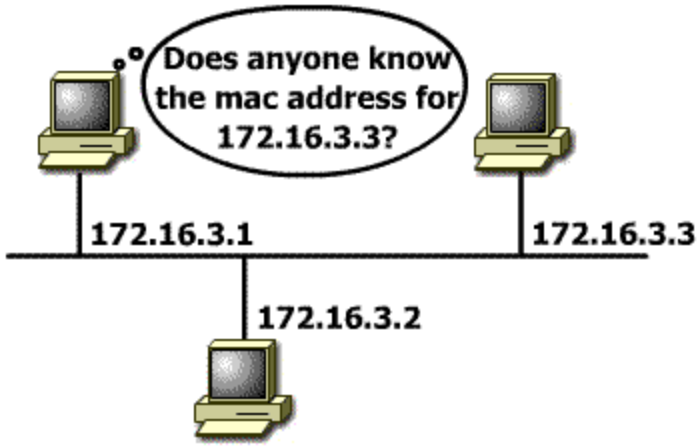
Determines destination upper-layer protocol

Internet Control Message Protocol



Address Resolution Protocol

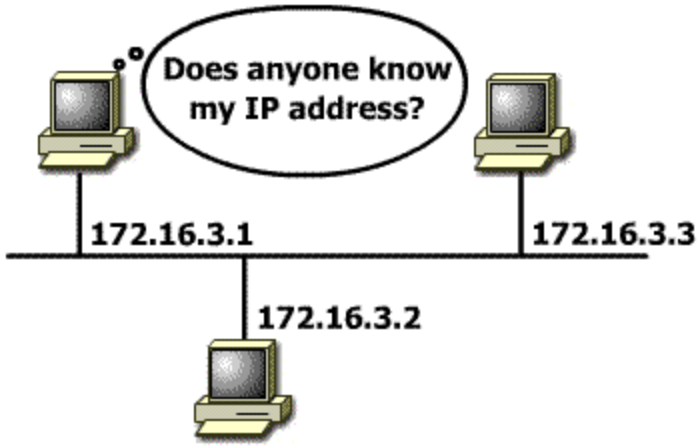
Used to resolve or map a known IP address to a MAC sublayer address to allow commnication on a multi-access medium such as Ethernet. To determine a destination address for a datagram, the ARP cache table is checked. If the address is not in the table, ARP sends a broadcast looking for the destination station. Every station on the network receives the broadcast.



Reverse ARP

On the local segment, RARP can be used to initiate a remote operating system load sequence. ARP and RARP are implemented directly on top of the data link layer.

Dynamic Host Configuration Protocol (DHCP) is a modern implementation of RARP. DHCP provides a mechanism for allocating IP addresses dynamically so that addresses can be reused when hosts no longer need them. For more information on DHCP, refer to the Building Cisco Remote Access Networks (BCRAN) course.



Do not delete