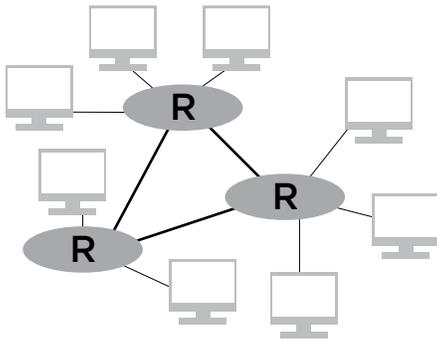


Overview

In order for computers to communicate across the Internet, they need a standard set of rules—or **protocols**—to dictate how the communication should happen and how the data should get from one place on the Internet to another. Without these standard ways of communicating information, computers would not be able to guarantee that the receiver would get the information or that the receiving computer would know what to do with it. Two important protocols deal with this: the Transmission Control Protocol—also known as TCP—and the Internet Protocol—or IP. These are often collectively known as TCP/IP.

Key Terms

- protocol
- IP
- router
- IP Address
- packet
- TCP
- port



Internet Protocol

Recall that the Internet Protocol (**IP**) defines how information is transferred from one computer to another. It is structured as a web of connected **routers** (labeled as “R” in the diagram to the left), which are devices that help send information from one computer to another. Data will often need to pass through multiple routers to get from the sender’s computer to its destination. Each router is programmed with a set of instructions (stored in a “routing table”) that determine the direction in which the data must be sent so that it reaches its final destination.

IP Addresses

Just as homes need addresses so that mail can be delivered from one house to another, computers need addresses as well so that routers know where information is being sent from and where information should be sent to. These addresses are known as **IP Addresses**, and they take the form **#.#.#.#**, where each # stands for a number in the range 0 to 255. When a user types a web address (like google.com) into their web browser, a Domain Name System (DNS) server translates the web address to an IP address (like **172.217.0.46**).

Transmission Control Protocol

Instead of sending all of the data that one computer wants to send to another as one big packet, information on the Internet is sent in smaller data **packets**. The Transmission Control Protocol (**TCP**) is responsible for breaking up data into ordered packets. Since there is no guarantee that data packets will arrive at the destination at the same time, or even in the correct order, TCP labels each packet with the order it should go in. This way, the receiving computer can reassemble the packets in the right order.

TCP can also ask for the retransmission of lost data packets. Additionally, it assigns data a **port** number that indicates what type of internet service the data should be used for. For instance, SMTP (email) uses port 25, while HTTP (normal web browsing) uses port 80.

In summary, to get data across the Internet, TCP first breaks it down into smaller packets. Then TCP labels each packet with a port and packet number, IP tells the packet its destination, and the data is transmitted via routers which eventually direct the packet to its final destination.

