Peer-to-Peer

15.2.1

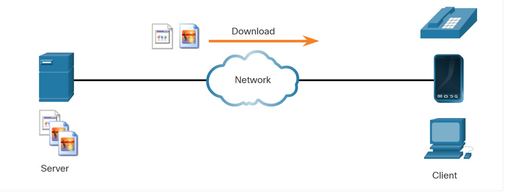
Client-Server Model

In the previous topic, you learned that TCP/IP application layer protocols implemented on both the source and destination host must be compatible. In this topic you will learn about the client/server model and the processes used, which are in the application layer. The same is true for a peer-to-peer network. In the client/server model, the device requesting the information is called a client and the device responding to the request is called a server. The client is a hardware/software combination that people use to directly access the resources that are stored on the server.

Client and server processes are considered to be in the application layer. The client begins the exchange by requesting data from the server, which responds by sending one or more streams of data to the client. Application layer protocols describe the format of the requests and responses between clients and servers. In addition to the actual data transfer, this exchange may also require user authentication and the identification of a data file to be transferred.

One example of a client/server network is using the email service of an ISP to send, receive, and store email. The email client on a home computer issues a request to the email server of the ISP for any unread mail. The server responds by sending the requested email to the client. Data transfer from a client to a server is referred to as an upload and data from a server to a client as a download.

As shown in the figure, files are downloaded from the server to the client.



15.2.2

Peer-to-Peer Networks

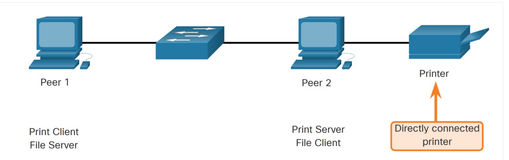
In the peer-to-peer (P2P) networking model, the data is accessed from a peer device without the use of a dedicated server.

The P2P network model involves two parts: P2P networks and P2P applications. Both parts have similar features, but in practice work quite differently.

In a P2P network, two or more computers are connected via a network and can share resources (such as printers and files) without having a dedicated server. Every connected end device (known as a peer) can function as both a server and a client. One computer might assume the role of server for one transaction while simultaneously serving as a client for another. The roles of client and server are set on a per request basis.

In addition to sharing files, a network such as this one would allow users to enable networked games or share an internet connection.

In a peer-to-peer exchange, both devices are considered equal in the communication process. Peer 1 has files that are shared with Peer 2 and can access the shared printer that is directly connected to Peer 2 to print files. Peer 2 is sharing the directly connected printer with Peer 1 while accessing the shared files on Peer 1, as shown in the figure.

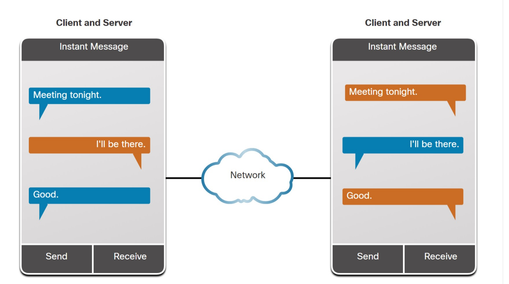


15.2.3

Peer-to-Peer Applications

A P2P application allows a device to act as both a client and a server within the same communication, as shown in the figure. In this model, every client is a server and every server is a client. P2P applications require that each end device provide a user interface and run a background service.

Some P2P applications use a hybrid system where resource sharing is decentralized, but the indexes that point to resource locations are stored in a centralized directory. In a hybrid system, each peer accesses an index server to get the location of a resource stored on another peer.



Both clients can simultaneously send and receive messages.

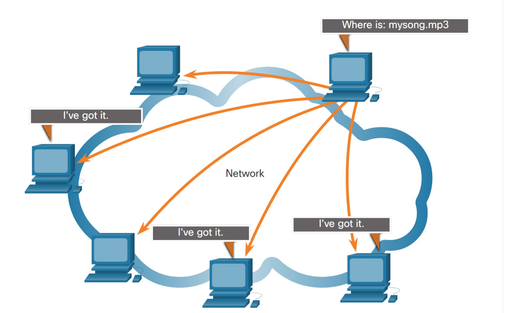
15.2.4

Common P2P Applications

With P2P applications, each computer in the network that is running the application can act as a client or a server for the other computers in the network that are also running the application. Common P2P networks include the following:

- BitTorrent
- Direct Connect
- eDonkey
- Freenet

Some P2P applications are based on the Gnutella protocol, where each user shares whole files with other users. As shown in the figure, Gnutella-compatible client software allows users to connect to Gnutella services over the Internet, and to locate and access resources shared by other Gnutella peers. Many Gnutella client applications are available, including µTorrent, BitComet, DC++, Deluge, and emule.



Gnutella P2P applications search for shared resources on multiple peers.

Many P2P applications allow users to share pieces of many files with each other at the same time. Clients use a torrent file to locate other users who have pieces that they need so that they can then connect directly to them. This file also contains information about tracker computers that keep track of which users have specific pieces of certain files. Clients ask for pieces from multiple users at the same time. This is known as a swarm and the technology is called BitTorrent. BitTorrent has its own client. But there are many other BitTorrent clients including µTorrent, Deluge, and qBittorrent.

Note: Any type of file can be shared between users. Many of these files are copyrighted, meaning that only the creator has the right to use and distribute them. It is against the law to download or distribute copyrighted files without permission from the copyright holder. Copyright violation can result in criminal charges and civil lawsuits.

15.2.5

Check Your Understanding - Peer-to-Peer

Check your understanding of peer-to-peer by choosing the BEST answer to the following questions.

1. True or false? The peer-to-peer networking model requires the implementation of a dedicated server for data access.

   - ○ True
   - ◉ False

2. True or false? In a peer-to-peer network environment every peer can function as both a client and a server.

   - ◉ True
   - ○ False

3. Which peer-to-peer application allows users to share pieces of many files with each other at the same time?

   - ○ Hybrid
   - ○ Gnutella
   - ◉ BitTorrent

4. Which of the following is a feature of the Gnutella protocol?

   - ◉ Users can share whole files with other users.
   - ○ Users can share pieces of files with other users.
   - ○ Users can access an index server to get the location of resources shared by other users.

Check
Show Me
Reset