

# COMP309

## Web-based Technology

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# Client-Server Architecture

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- A *server* is a piece of hardware or software which provides a “service” that is needed by one or more clients (users of the service). Its sole purpose of existence is to wait for (client) requests, respond to those clients (provide the service), and then wait for more requests.
- *Clients*, on the other hand, contact a server for a particular request, send over any necessary data, and then wait for the server to reply, either completing the request or indicating the cause of failure.
- The server runs indefinitely, continually processing requests; clients make a one-time request for service, receive that service, and thus conclude their transaction (see Figure 1).

# Client-Server Defined

The **client-server** programming model is a distributed computing architecture that segregates information users (clients) from information providers (servers).

- A **client** is an application that needs something like a web page or IP address from a server. Clients may contact a server for this information at any time. Clients are information users.
- A **server** is an application that provides information or resources to clients. It needs to be always up and running, waiting for requests from clients.

# Client-Server Defined

- Client applications communicate only with server applications and vice versa. Clients do not communicate directly with other clients.

Figure 1

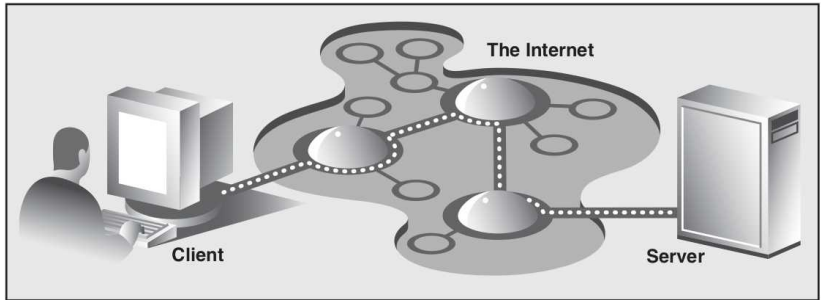


Figure 1

- An alternative to the client-server architecture is the **Peer-to-Peer** (P2P) architecture.
- In these architectures two or more hosts communicate directly with each other.

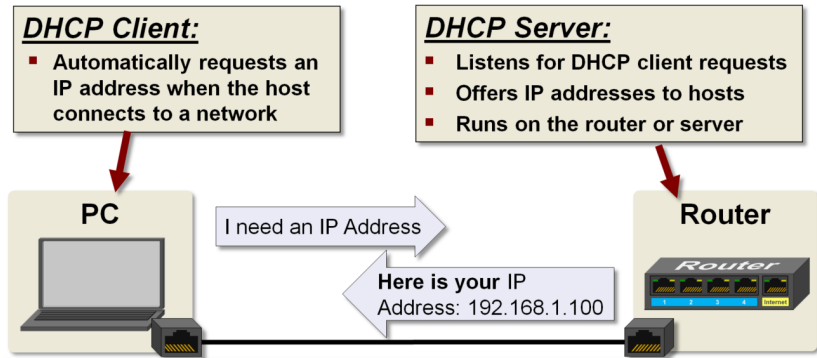
## Example: DHCP Client Server

- Here is a very common example of the client-server programming model.
- The **dynamic host configuration protocol** (DHCP) is the application responsible for requesting and offering IP addresses.
- A DHCP client automatically requests an IP address from a DHCP server when a network is detected.
- A DHCP client could request a new IP address at any time, so the DHCP server must always be active and ready to respond to client requests.



- The DHCP server application typically exists in a router, but may also be found running on a network server for larger networks.

# Example: DHCP Client Server



# Hardware Client/Server Architecture

Examples:

- Print(er) servers: They process incoming print jobs and send them to a printer (or some other printing device) attached to such a system. Such a computer is generally network-accessible and client computers would send it print requests.
- File server: These are typically computers with large, generalized storage capacity, which is remotely accessible to clients. Client computers mount the disks from the server computer as if the disk itself were on the local computer.

# Software Client/Server Architecture

In general, these are all designed to run forever.

Examples:

- Web server: The most common example of software server. The job of such a server is to accept client requests, send back Web pages to (Web) clients, that is, browsers on users' computers, and then wait for the next client request.
- Database servers: These are another kind of software server. They take client requests for either storage or retrieval, act upon that request, and then wait for more business.

# Bank Tellers as Servers?

- One way to imagine how client/server architecture works is to create in your mind the image of a bank teller who neither eats, sleeps, nor rests, serving one customer after another in a line that never seems to end.
- The line might be long or it might be empty on occasion, but at any given moment, a customer might show up.

# Bank Tellers as Servers?

- The teller is, of course, the server that runs in an infinite loop; each customer is a client with a need that must be addressed.
- Customers arrive and are handled by the teller in a first-come-first-served manner. Once a transaction has been completed, the client goes away while the server either serves the next customer or sits and waits until one comes along (see Figure 2).

# Bank Tellers as Servers?

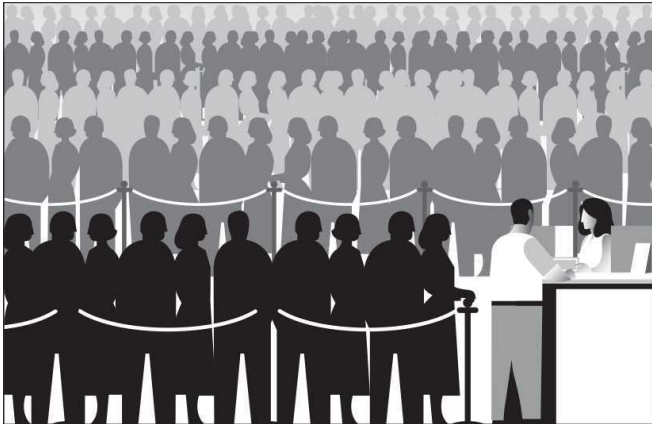


Figure 2

# Internet Server vs Local Network Server

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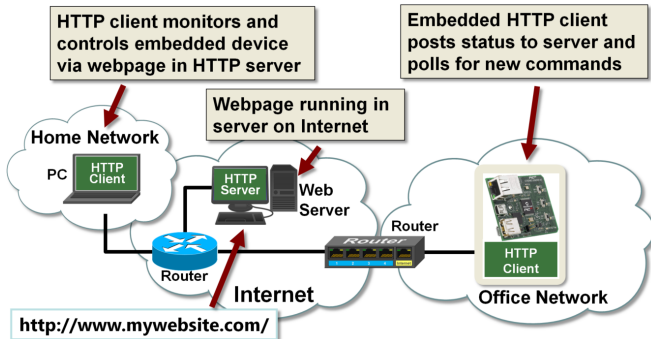
# Internet Server

- Accessing an HTTP server on the Internet is effortless.
- You may need to enter a username or password for some sites, but it really couldn't be easier.
- In this example, the webpage that controls and displays the current state of the board runs on an HTTP server in the Internet. The embedded HTTP client posts its current status to the server and polls for new commands.

# Internet Server

- A web browser on a PC or smartphone can monitor and control the embedded device via the webpage in the HTTP server.
- The server may be implemented on a shared web hosting service from a company like godaddy.com, or may be implemented in the cloud, which is a service of decentralized servers from companies like Amazon, Google, or ioBridge.
- These service providers will allow you to choose a website name so your webpage can be easily accessed.

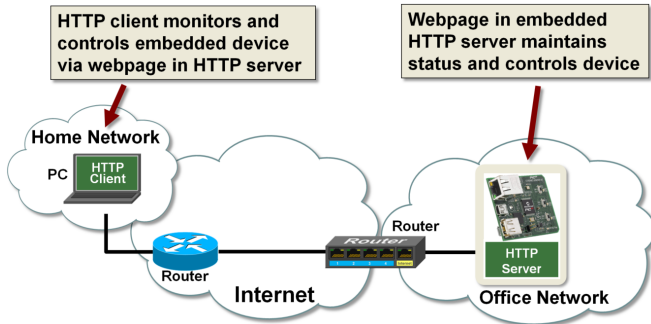
# Internet Server



# Local Network Server

- Instead of locating our HTTP server on the Internet, we could instead locate it on a local network. In this case, the webpage that controls and monitors the embedded device is actually running on the embedded device.
- Just as in the previous case, a web browser on a PC or smartphone can monitor and control the embedded device via the webpage running in the embedded HTTP server.

# Local Server



# Test

Let's install and test a webserver (Perhaps later?).

See you next week, God willing 🙏