

What information is used by a process running on one host to identify a process running on another host?

- IP Address and Port number are used by a process running on one host to identify a process running on another host. IP Address identifies the destination host on the network. Port number identifies the specific process running on the host. Together, the IP address and port number forms a socket, which uniquely identifies a process communication over a network.

List the four broad classes of services that a transport protocol can provide. For each service class, indicate if either UDP or TCP (or both) provides such a service.

1. Reliable data transfer: Ensures data arrives at the destination without errors, in the correct order, and without duplications. Only **TCP** provides this service through 3-way handshake.
2. Throughput: Deals with the rate at which data can be sent. Neither **TCP** nor **UDP** provides guaranteed throughput.
3. Timing: Some applications require low delays like telephone communication or streaming. Neither **TCP** nor **UDP** provides guaranteed timing as network delays can occur in both
4. Security: Protecting data from unauthorized access. Neither **TCP** nor **UDP** provides guaranteed security.

Consider an e-commerce site that wants to keep a purchase record for each of its customers. Describe how this can be done with cookies.

- Cookies is one of the most common ways an e-commerce site keeps a purchase record for each of its customers. First the site assigns a unique ID to the user. Then the site creates a cookie containing the user's ID and stores it on the user's computer. Then, when the user makes a purchase, the site uses the ID in the cookie to associate the purchase with the specific user's record in the database. These records can be retrieved and displayed on the user's account along with the corresponding purchase history.

Describe how Web caching can reduce the delay in receiving a requested object. Will Web caching reduce the delay for all objects a user requests or for only some objects? Why?

- Web caching is the process of storing a copy of frequently accessed web objects on servers closer to the users. Since the cached servers are closer to the users, it reduces the distance the request has to travel and fetch the object from. This significantly reduces the delay in receiving a requested object. Since we have cached frequently accessed web objects, this reduces the load on the origin server, making it faster to respond to requests it does receive.
- The Web caching doesn't reduce the delay for all the objects a user requests. It only reduces the objects that are cached and stored in the cache servers. Caching is only done for frequently requested objects, if it were to be done for every object, then it would lose its importance and will not be very effective.

True or false?

1. A user requests a Web page with some text and three images. For this page, the client will send one request message and receive four response messages. - **False**
2. Two distinct Web pages (for example, www.mit.edu/research.html and www.mit.edu/students.html) can be sent over the same persistent connection. - **True**
3. With nonpersistent connections between the browser and the origin server, it is possible for a single TCP segment to carry two distinct HTTP request messages. - **False**
4. The Date: header in the HTTP response message indicates when the object in the response was last modified. - **False**
5. HTTP response messages never have an empty message body. - **False**