

True/False:

1. One computer can only have one network card.

False: It may have more than one: e.g. one card for wired network, and one for wireless network.

2. Network card vendor assigns port number.

False: Port number is an 16-bit identifier assigned by app or OS.

3. All hosts in a LAN can share same physical communication media.

True.

4. Usually, router stores an entry for each individually IP address in its forwarding table.

False. One entry represents IPs with a common prefix.

5. A store-and-forward router starts forwarding the packet as soon as it gets packet's header.

False: The router waits to receive the entire packet before forwarding it, hence the store-and-forward name. This allows a router to enqueue packets if the output link is congested, and drop a packet if it has been corrupted.

Short Answer:

1. What are two operations in a key/value store?

Answer:

-- Put(key, value)

-- Get(key)

2. What is a protocol?

Answer: A protocol is an agreement on how to communicate. Includes:

a. Syntax: how a communication is specified & structured

b. Semantics: what a communication means

3. What does IETF mean?

Answer: Internet Engineering Task Force

4. What does RFC mean?

Answer: Request For Comments

5. What is network (interface) card/controller?

Answer: Hardware that physically connects a computer to the network

6. What is MAC address?

Answer: 48-bit unique identifier assigned by card vendor.

7. What is IP address?

Answer: 32-bit (or 128-bit for IPv6) address assigned by network administrator or dynamically when computer connects to network

8. How many layers in Internet Protocol? What main service does each layer provide?

Answer:

Five layers.

- Physical: send bits
- Datalink: Connect two hosts on same physical media
- Network: Connect two hosts in a wide area network
- Transport: Connect two processes on (remote) hosts
- Applications: Enable applications running on remote hosts to interact

9. Drawbacks of Layering

Answer:

- Layering can hurt performance
  - E.g., hiding details about what is really going on
- Headers start to get really big
  - Sometimes header bytes >> actual content
- Layer N may duplicate layer N-1 functionality
  - E.g., error recovery to retransmit lost data
- Layers may need same information
  - E.g., timestamps, maximum transmission unit size

Long Answer:

1. What are recursive query and iterative query in a distributed key/value store. What are their advantages and disadvantages in terms of performance.

Answer:

Recursive query: Having master to relay the request.

Iterative query: Master returns the node to requester, and let requester contact node containing data directly.

Recursive query:

Advantage:

- a. Faster, as typically master/directory closer to nodes
- b. Easier to maintain consistency, as master/directory can serialize puts()/gets()

Disadvantage: scalability bottleneck, as all “Values” go through master/directory

Iterative query:

Advantage: more scalable

Disadvantage: slower, harder to enforce data consistency

## 2. Compare TCP and UDP.

Answer:

- Datagram service (UDP)
  - No-frills extension of “best-effort” IP
  - Multiplexing/Demultiplexing among processes
- Reliable, in-order delivery (TCP)
  - Connection set-up & tear-down
  - Discarding corrupted packets (segments)
  - Retransmission of lost packets (segments)
  - Flow control
  - Congestion control