Chapter 4.1   Overview of Network Layer

4.1.1   Overview

- The network layer transports segments from the sending to the receiving host.

- On the sending side, segments are encapsulated into datagrams.

- On the receiving side, the segments are delivered to the transport layer.

- The network layer protocols in *every* host and router.

- The router examines header fields in every IP datagram that passes through it.

- The network layer has *two key functions*:

    - **Forwarding**: Packets are moved from the router's input to its appropriate output.

    - **Routing**: Determines the route taken by packets from its source to destination.

4.1.2   Data Plane and Control Plane

- The **data plane**:

    - Is a forwarding function.

    - Is a local, per-router function.

    - Determines how datagrams arriving to the router's input port is forwarded to its output port.

- The **control plane**:

    - Is a network-wide logic.

    - Determines how datagrams are routed between routers along end-end paths from the source to destination host.

    - There are two approaches to the control plane:
        * *Traditional routing algorithms*, which is implemented in routers.
        * *Software-defined networking (SDN)*, which is implemented in remote servers instead.

- In a **per-router control plane**, individual routing algorithms components in *every router* interact in the control plane.

- In a **logically centralized control plane**, a distinct controller interacts with local control agents (CAs). The controller is usually remotely located.

4.1.3   Network Service Model

- Networks have certain *service models* for transporting datagrams from a sender to the receiver.

- For example, the service could guarantee delivery (within a certain time) for individual datagrams.

- It could also guarantee in-order delivery, or delivery using the minimum required bandwidth, etc..