

4.1.1 Forwarding and Routing: The Data and Control Planes

Study-Ready Notes

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Contents

1	4.1.1 Forwarding and Routing: The Data and Control Planes	2
1.1	Forwarding	2
1.2	Routing (Control Plane Function)	2

1 4.1.1 Forwarding and Routing: The Data and Control Planes

Two key functions of network layer, forwarding and routing, map directly to data and control planes respectively.

1.1 Forwarding

1. Definition

- Is the router-local action of transferring a packet from an input link interface to appropriate link interface within a single router.

2. Mechanism

- A packet arrives at a router's input link
- Router examines one or more fields in packet's header
- Uses header values to index into its forwarding table
- Value found in forwarding table entry indicates router's output link interface to which packet should be forwarded

3. Timescale Implementation

- Forwarding is fast (nanosecond) action that must be performed for every packet
- Therefore implemented in hardware

4. Analogy

- Forwarding is like a driver navigating a single highway interchange or roundabout
- Driver's decision (which exit ramp to take) is a local one, based on signs at that specific interchange and must be made quickly.

1.2 Routing (Control Plane Function)

1. Definition

- Routing is network-wide process that determines end-to-end paths (or routes) that packets take from a source host to a destination host

2. Mechanism

- Routing is accomplished by routing algorithms
- Such algos calculate paths that datagrams will follow

3. Timescale & Implementation

- Routing is complex calculation that happens on much longer timescale (seconds)

- Typically implemented in software

4. Analogy

- Routing is like planning the entire trip from PA to FL
- Before driving, you consult a map (routing algo) to choose best path
- Best path is sequence of road segments (links) connected by interchanges (routers)