

Chapter 4.4 Generalized Forward and SDN

4.4.1 Overview

- Each router contains a *flow table* that is computed and distributed by a *logically centralized* routing controller.

4.4.2 OpenFlow

4.4.2.1 Data Plane Abstraction

- **Flow** is defined by header fields.
- **Generalized forwarding** is a set of simple packet-handling rules:
 - **Pattern:** Match values in a packet's header fields.
 - **Actions:** Drop, forward, and modify *matched packets* or send them to the controller.
 - **Priority:** Disambiguate overlapping patterns.
 - **Counters:** #bytes and #packets.

4.4.2.2 Flow Table Entries

- OpenFlow has three sections for entries (more details on **slide 4-62**):
 - **Rule:** A set of rules for the link layer, network layer, and transport layer (such as *IP source, IP destination, etc...*)
 - **Action:** What to do with attached packet that matches provided rules.
 - **Stats:** The packet itself and a byte counter.
- Examples can be seen on **slides 4-63 and 4-64**.

4.4.2.3 OpenFlow Abstraction

- **match+action** unifies different kinds of devices.
- Router:
 - *Match:* Longest destination IP prefix.
 - *Action:* Forward out a link.
- Switch:
 - *Match:* Destination MAC address.
 - *Action:* Forward or flood.
- Firewall:
 - *Match:* IP addresses and TCP/UDP port numbers.
 - *Action:* Permit or deny.

- NAT
 - *Match*: IP address and port.
 - *Action*: Rewrite address and port.