Internet Protocol - Routing Packets

Anthony E. Nocentino
ENTERPRISE ARCHITECT @ CENTINO SYSTEMS
@nocentino www.centinosystems.com

Course Overview

Network Topologies and the OSI Model

Internet Protocol –
Addressing and Subnetting Fundamentals

Internet Protocol –
ARP and DNS Fundamentals

Internet Protocol - Routing Packets

Routing Packets with Linux

Investigating TCP Internals

Troubleshooting Network Issues

Module Overview

Internet Protocol

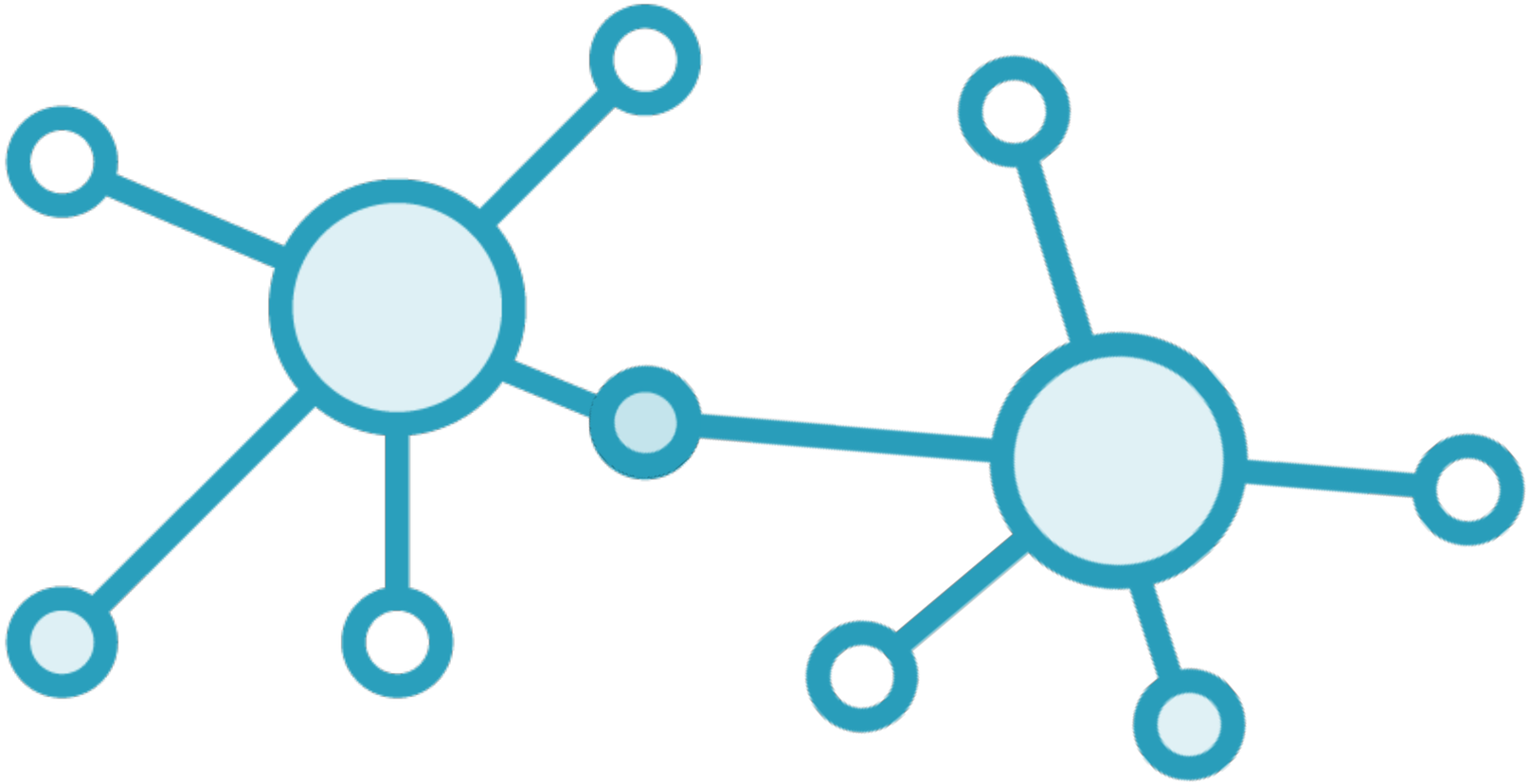
IP Packet Structure

IP Routing Decision Process

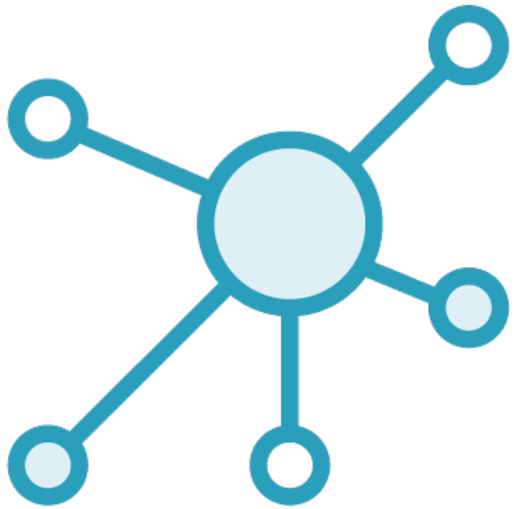
Time to Live

The Default Route

How a Data Moves Through an Internet



Internet Protocol



Connects networks

Connectionless

Routers connect networks!

Routers forward packets

Routers and hosts define routing tables that define what to do with the packet

Source, destination are defined, but the network determines the path

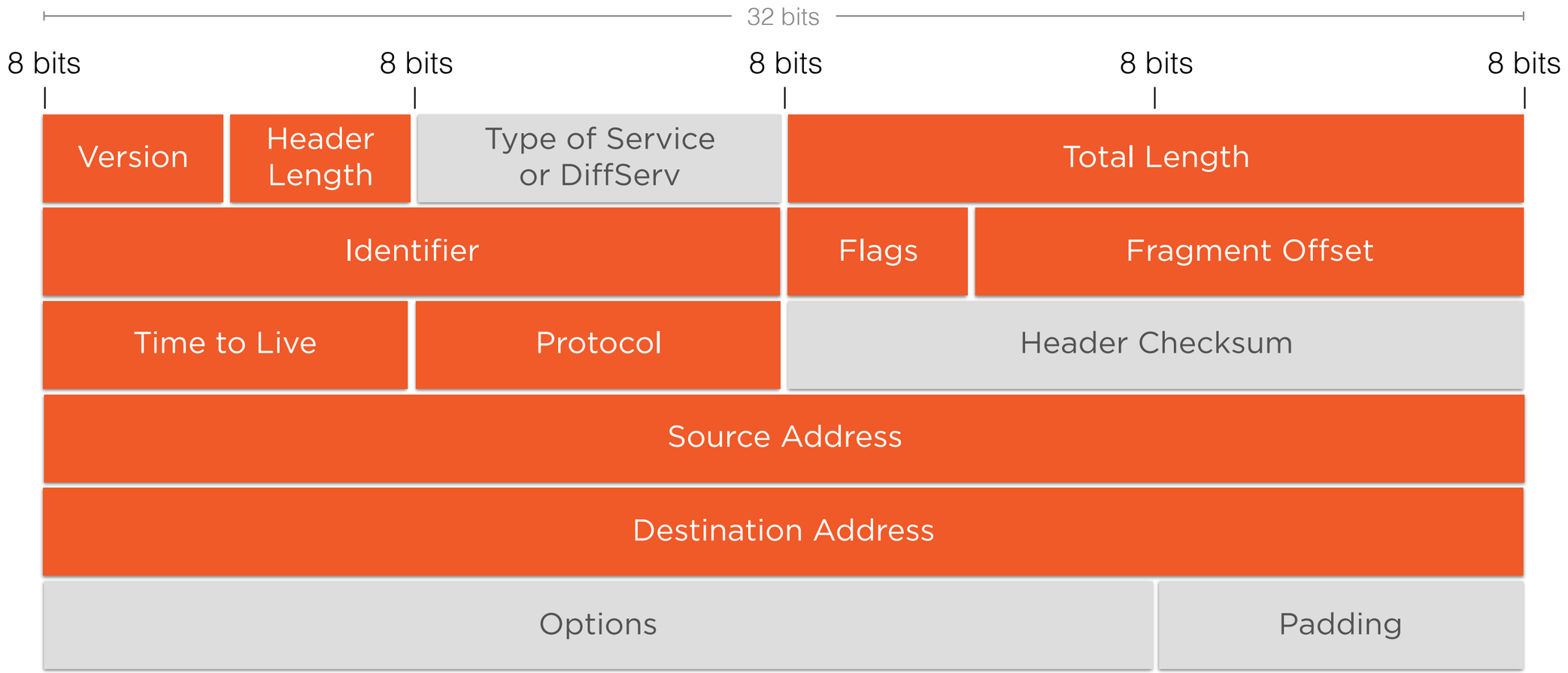
IP Packet Structure

Two parts - header and actual data

Encapsulated in the layer 2 frame

Can be fragmented and reassembled (remember MTU) by routers or hosts

IP Packet Header



Demo

- Explore an IP packet in wireshark
- Explore a routed packet with wireshark
- Explore a fragmented sequence in wireshark

IP Routing Decision Process

Check the destination address in the IP header

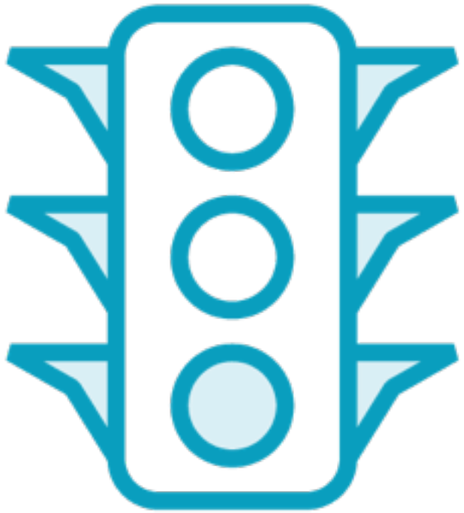
Compare that with the network mask to determine if the destination is on a remote network

If it's local deliver it on the directly connected interface

If it's not local, look up a specific route in the local routing table

If it's not local and not in the routing tables, send it to the default route

The Default Route



A route used as a destination for traffic with an undefined route

When defined on a host, it's generally the network gateway (local router)

Time To Live (TTL)

Defined in the header

The number of routers the packet is allowed to pass through

Prevent malfunctions like loops

If exceeded, the router that sets the TTL to 0 replies to the sender with an error

This is the basis of how `traceroute` works

Demo

- Follow a route with traceroute
- Examine a unreachable network with TTL
- Examine the default route

https://tools.ietf.org/html/rfc791

A **name** indicates what we seek.

An **address** indicates where it is.

A **route** indicates how to get there.

RFC 791 - Internet Protocol

https://tools.ietf.org/html/rfc791

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What's Next!

Routing Packets with Linux

References

- **Internetworking with TCP/IP Vol. 1** by Douglas Comer - http://amzn.to/29X7dyT