

Network Layer

by peterl

transport layer: TCP, UDP

routing protocols

- path selection
- RIP, OSPF, BGP

IP protocol

- addressing conventions
- datagram format
- packet handling conventions

forwarding table

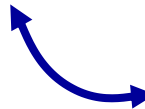
ICMP protocol

- error reporting
- router “signaling”

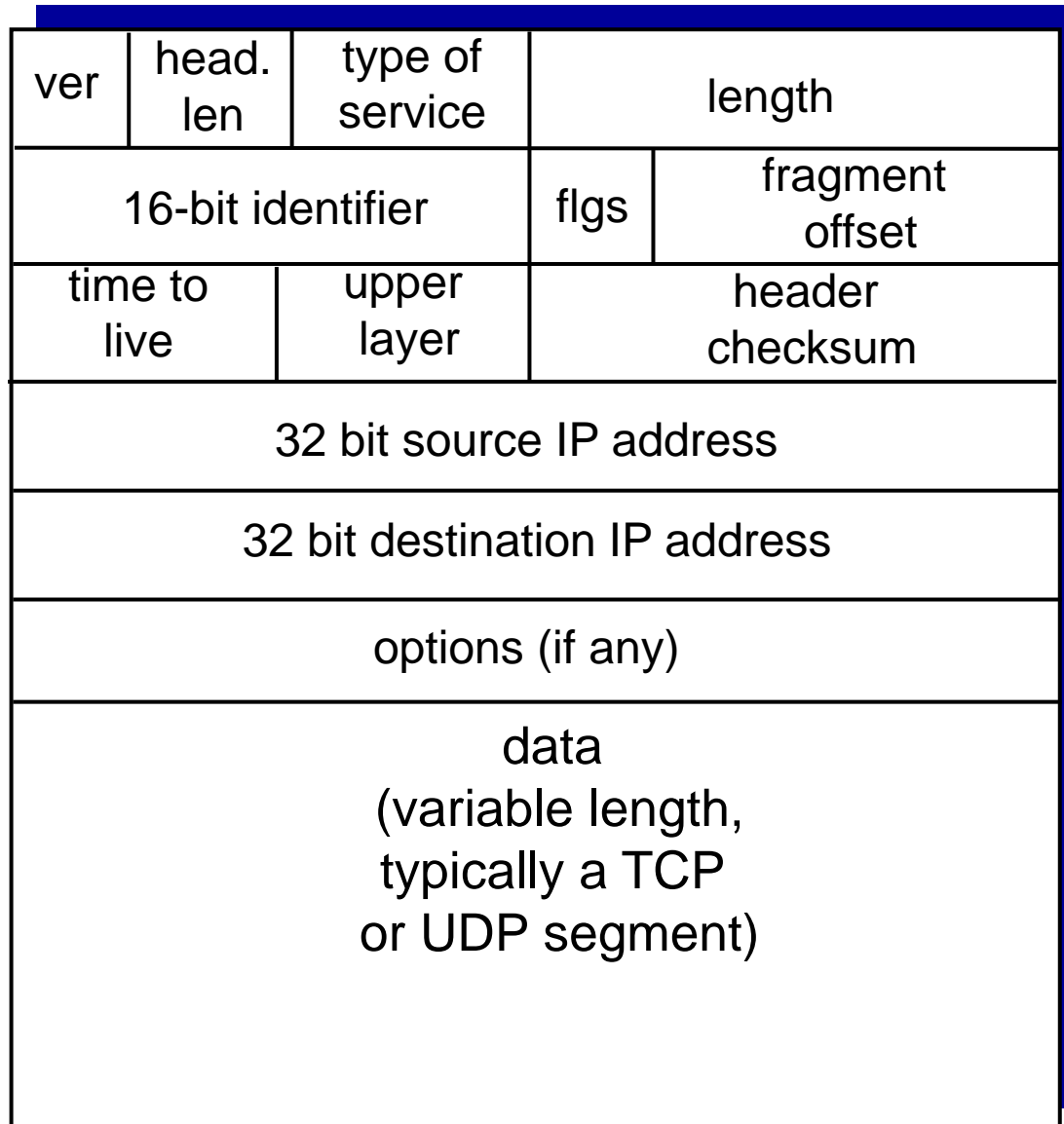
link layer

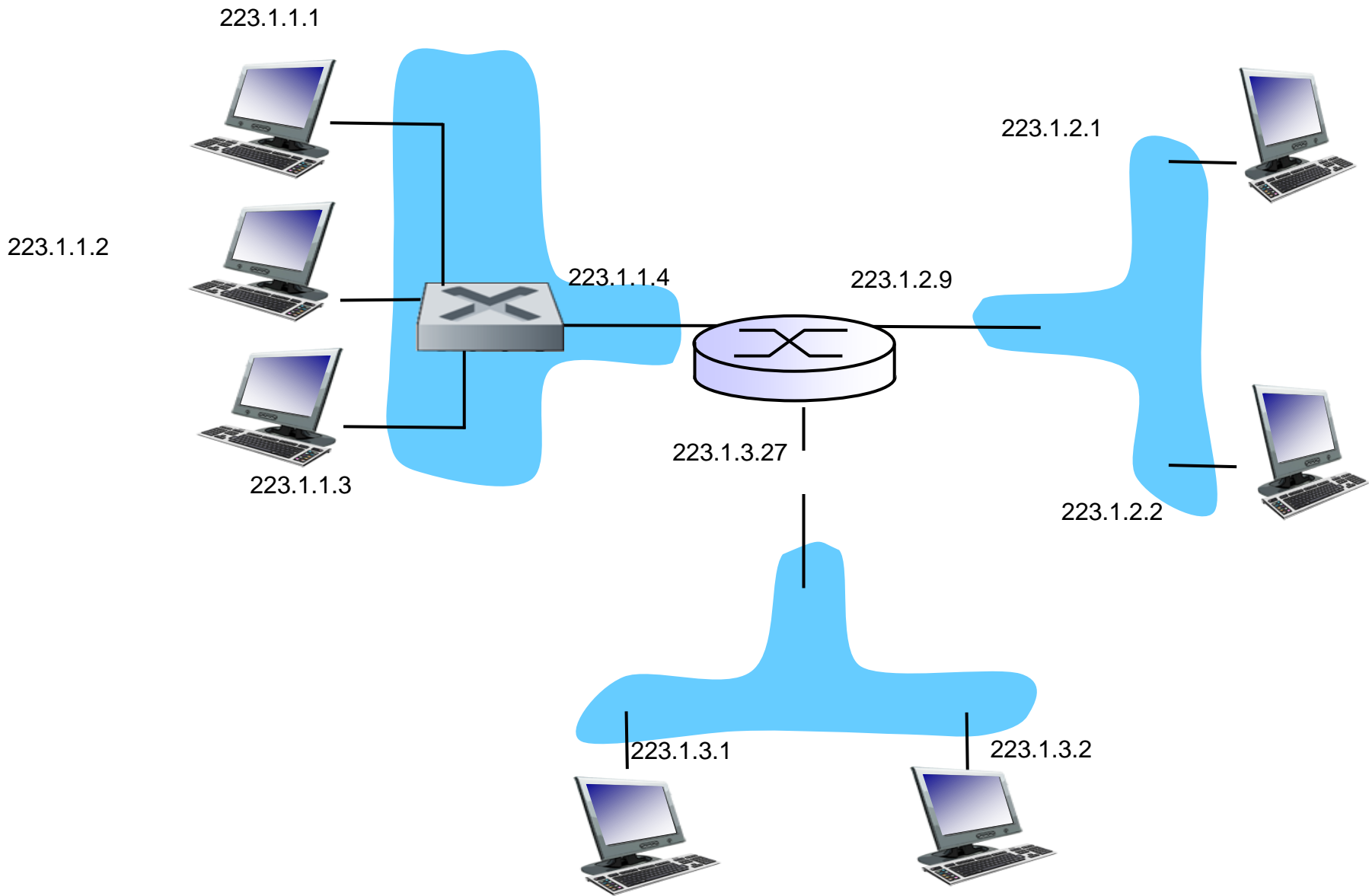
physical layer

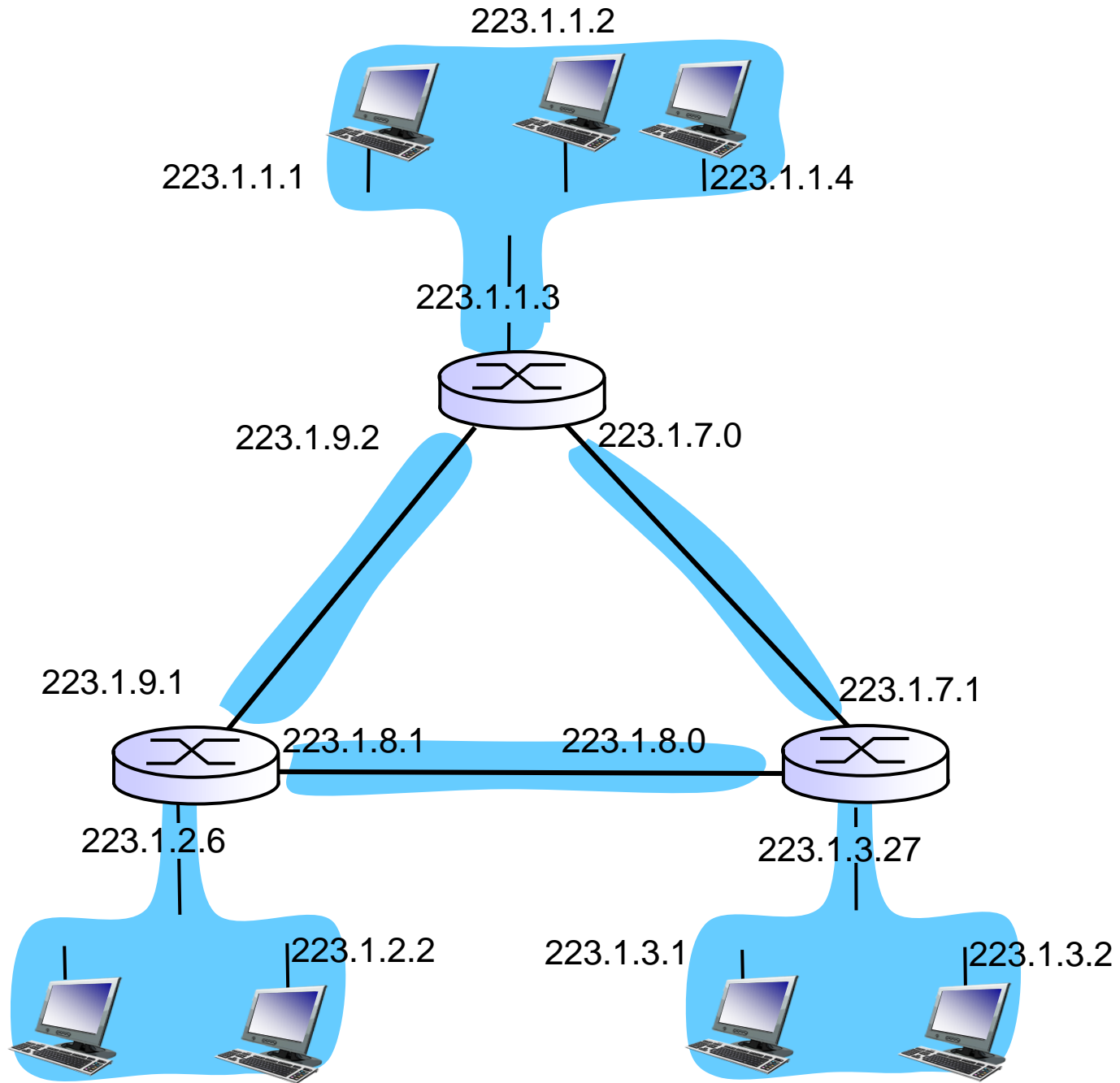
network layer



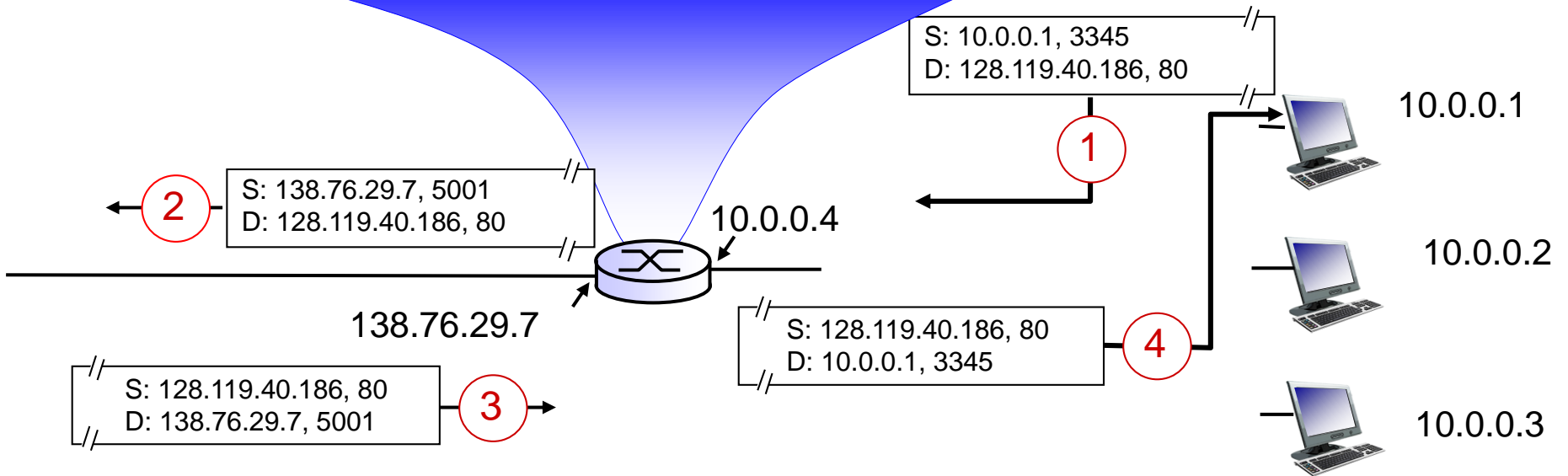
32 bits



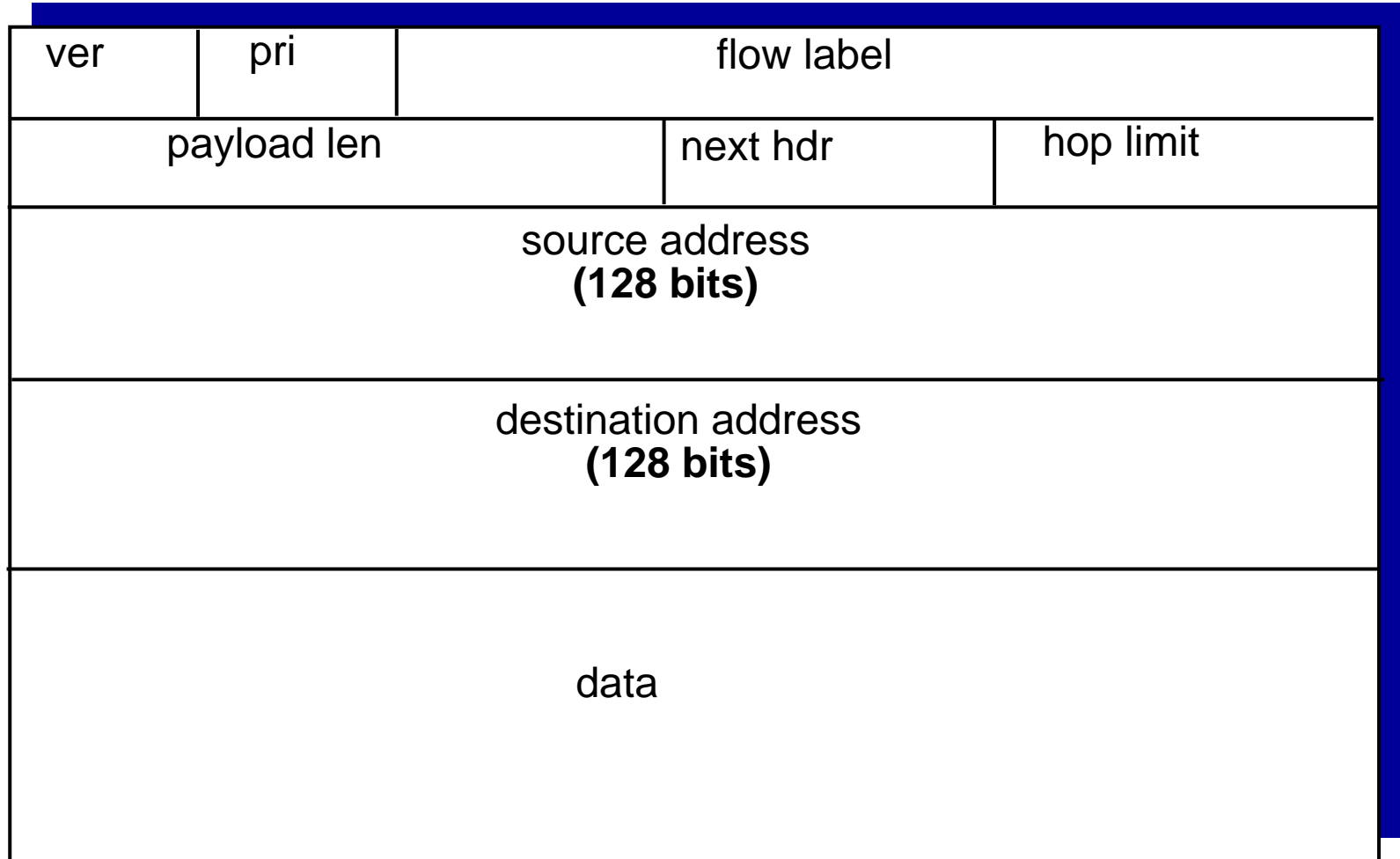




| NAT translation table | |
|-----------------------|----------------|
| WAN side addr | LAN side addr |
| 138.76.29.7, 5001 | 10.0.0.1, 3345 |
| | |



IP version 6



← 32 bits →

Datalink Layer

Purpose

- ❖ understand principles behind link layer services:
 - error detection, correction
 - sharing a broadcast channel: multiple access
 - link layer addressing (IEEE 802.xx)
 - Framing (Header)
 - local area networks: Ethernet, VLANs
- ❖ instantiation, implementation of various link layer technologies (Ethernet, fast-Ethernet, Wifi, ppp)

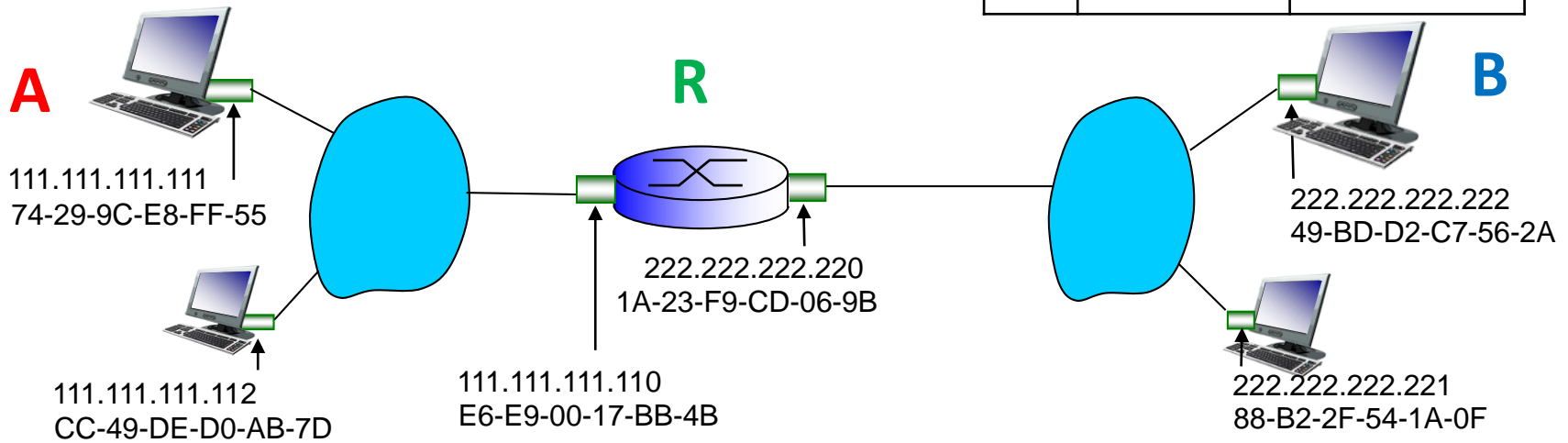
Addressing

- Most protocols => IEEE 802.x standards
 - Media Access Control (MAC) address:
 - function: *used 'locally' to get frame from one interface to another physically-connected interface (same network, in IP-addressing sense)*
 - 48 bit MAC address (for most LANs) burned in NIC ROM, also sometimes software settable
e.g.: 1A-2F-BB-76-09-AD

Address Resolution Protocol (ARP)

| | SRC | DEST |
|-----|-------------------|-------------------|
| IP | 111.111.111.111 | 222.222.222.222 |
| MAC | 74-29-9C-E8-FF-55 | E6-E9-00-17-BB-4B |

| | SRC | DEST |
|-----|-------------------|-------------------|
| IP | 111.111.111.111 | 222.222.222.222 |
| MAC | 1A-23-F9-CD-06-9B | 49-BD-D2-C7-56-2A |



A : arp-broadcast 'Who have 111.111.111.110 ?

Only R: reply 'I have 111.111.111.110' – which mean on MAC E6-E9-00-17-BB-4B

A: make frame with IP dest 222.222.222.222 and MAC dest E6-E9-00-17-BB-4B

R: arp-broadcast 'Who have 222.222.222.222 ?

Only B: reply 'I have 222.222.222.222' – which mean on MAC 49-BD-D2-C7-56-2A

R: make frame with IP dest 222.222.222.222 and mac dest 49-BD-D2-C7-56-2A