ICS 351: Today's plan

- wireless ad-hoc and mesh networks
- IPv6

wireless ad-hoc networks

- using the ad-hoc mode of 802.11, any machine ("node") may directly talk to any other node
- if nodes agree to forward data for each other, they can form a wireless ad-hoc network
- machines may move or go to sleep, so routing can be challenging
- also, the notion of a "link" is different for wired and wireless networks: successful wireless protocols take advantage of broadcasting
- generally machines should discover each other and automatically send data to the destination

wireless mesh networks

- a wireless mesh network consists of static wireless nodes
- possibly with some wired nodes coordinating to provide Internet access
- mobile nodes may obtain Internet access from nodes in a mesh network

IPv4 vs. IPv6

- IPv4 does not have enough addresses:
- o CIDR (netmasks) developed to deal with a shortage of IPv4 addresses
- o NAT developed to deal with a shortage of IPv4 addresses
- what if we had a very large number of IP addresses?
- what if we could assign these addresses automatically without using DHCP?

IPv6 addresses

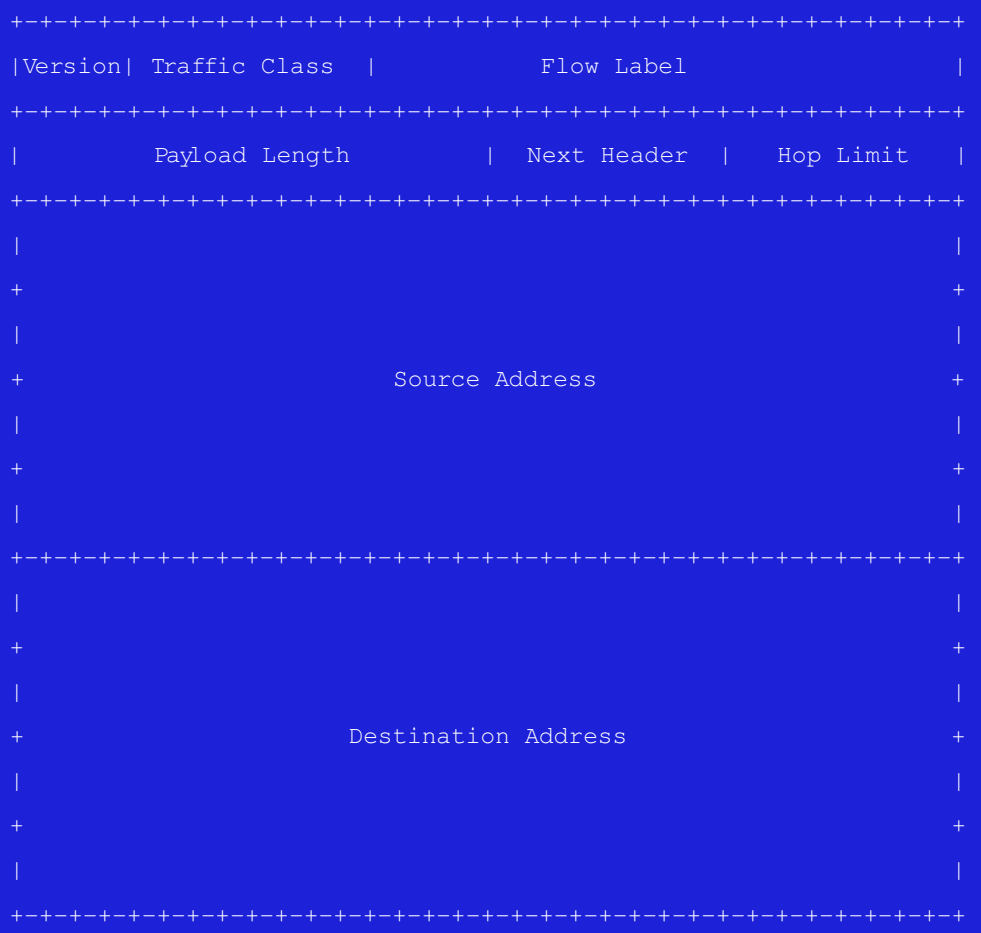
- IPv6 uses 128-bit addresses instead of the 32-bit IPv4 addresses
- these are written as 8 groups of 4 hex digits separated by colons: `1234:5678:0000:0000:0000:0008:9ABC:DEF0`
- leading zeros may be omitted: `1234:5678:0:0:0:8:9ABC:DEF0`
- a single sequence of all-zero groups can be omitted: `1234:5678::8:9ABC:DEF0`
- networks are followed by a slash to indicate the number of bits in the network number: `1234:5678/32`

Specific IPv6 addresses

- the loopback address is `::1`
- an interface with a MAC address automatically has a non-routable IPv6 address: `fe80::`48 bits of MAC address+16 inserted bits
- for example, with a hardware address of `00:01:03:a0:31:51`, my non-routable IPv6 address will be `fe80::201:3ff:fea0:3151` -- note the "u" bit is set to one to indicate universal scope
- globally routable unicast addresses have a network and subnetwork number in the most significant 64 bits
- `ffff::/8` addresses are multicast addresses

IPv6 header

* the IPv6 header is twice as big as the (minimal) IPv4 header, but simpler (from RFC 2460):



IPv6 details

- instead of IP header options, there may be extension headers
- fragmentation is only done by the sender, and path MTU discovery is required
- upper layer is now required to checksum.
- IPv6 routing is essentially the same as IPv4 routing (perhaps minus netmasks)
- when sent over Ethernet, the Ethertype field is 0x86DD instead of 0x800. (RFC 2464)
- Neighbor Discovery Protocol (NDP, RFC 2461) replaces both ARP and DHCP, uses IPv6 packets