Multicast

Algorithmen und Programmierung V
Netzprogrammierung

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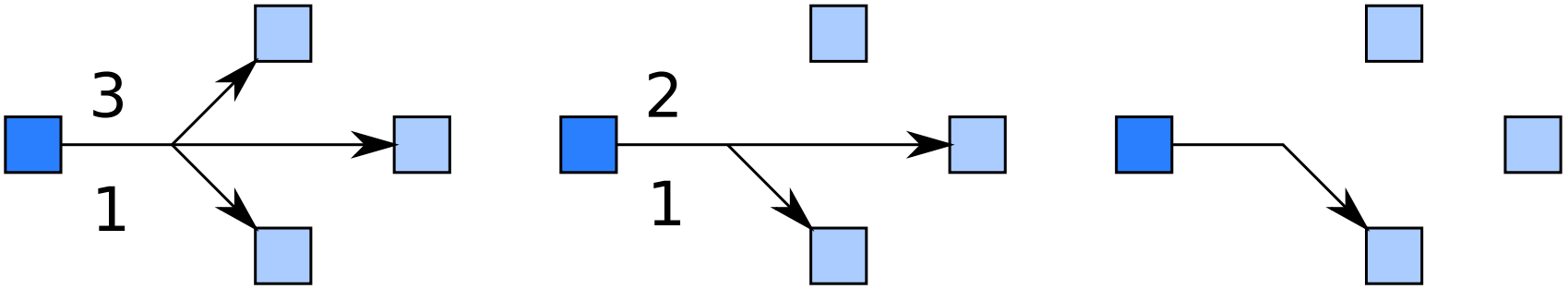
Concepts



Sending information on a network:

- $1 : *$ Broadcast
- $1 : n$ Multicast
- $1 : 1$ Unicast
- $1 : ?$ Anycast

Multicast

True broadcast and multicast:

- no redundant packets
- may require spanning tree

Multicast can live on different layers:

- data link layer (Ethernet)
- networking layer (IP)
- application layer (e.g., Overcast)

Connection-oriented vs. not, reliable vs. not.

Internet Protocol Multicast

Unreliable service based on UDP

Internet Group Management Protocol (IGMP)

- group membership management
- connect client to local multicast router

Protocol Independent Multicast (PIM)

- routing protocol (without topology discovery)
- sparse-mode most common
- other modes: dense, bidirectional, source-specific

Internet Protocol Multicast

Can be viewed as a multicast variant of UDP

- each destination address identifies a group of hosts
- available range is 224.0.0.1–239.255.255.255
- receivers join the group
- senders send to the group address
- all receivers receive, if things go well

Here is an explanation of the range choice:

- 0, class A addr
- 1, 0, class B addr (30)
- 1, 1, 0, class C addr (29)
- 1, 1, 1, 0, multicast addr (28)

Multicast Addresses

Some well-known multicast groups (off-limits)

224.0.0.1	all-hosts group (try pinging it, once)
224.0.0.2	all-routers group
224.0.0.5	OSPF routers
224.0.0.∗	local purposes (not routed)
239.∗.∗.∗	administrative scoping

Mapping to Ethernet Frames

Mapping of IP multicast addresses to Ethernet addresses

- Ethernet frame has 48 bits
- 01-00-5e-∗-∗-∗ (lowest 23 bits) reserved for multicast
- IP multicast has 28 bits
- 32:1 mapping, imperfect filter

Limiting the Distribution

Time-to-live (TTL)

- field in IP header with added significance in multicast
- router interfaces can be assigned TTL threshold
- forward & decrement TTL only if TTL $>$ threshold

TTL thresholds and associated scopes

0	same host
1	same subnet
<32	same site, org or department
<64	same region
<128	same continent

Interpretation is fuzzy...

Leaving and Joining

Per-host membership not per-process

- Leave group but remain bound on port receives packets if other processes on same host are still joined