


**Medienengineering /
Netzwerke**
Lehrstuhl für
Netzwerktechno-
logien und
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Teledienste




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Multicast

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Multicast Services What? Why?
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Single Send / Multi party Receive

Basics: Sending a single message to multiple receiver using a **single send** operation

- **One-to-N:** Single source, multiple receivers
- **N to M:** Multiple sources, multiple receivers
- Source **is/is not** receiver (part of multicast group)

Why: Save Resources

- Multicast saves lines, connections, traffic,
- Multicast enables services

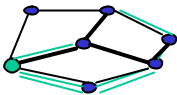
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Unicast versus Multicast



If the same data must be sent to multiple (N) receivers use

- **Unicast Transmission:** Send N copies from source along the shortest paths to the different receivers
- **Multicast transmission:** Send 1 copy from the source onto the multicast distribution tree. Data get duplicated inside the network wherever it forks



Graph ———
Multicasttree ———
UnicastPath ———

IP Multicast Routing Principles



Underlying Internet Service is a Unreliable datagram transmission

Steve Deering defined the receiver oriented method:

- Receivers can dynamically join and leave MC group
- Multicast address is assigned to a group of receivers
- Sender does not need to be member of group and does not know members of group
- Sender uses MC address as destination address
- Forwarding of MC diagrams is handled by MC routers inside the network
- Uses the underlying unicast routing algorithm
- Construct one MC distribution tree per sender

IP Distance Vector MC Routing



Router activities

Router checks if packet received on the interface that of the shortest path to source

- **No:** discard packet
- **Yes:** forward to all outgoing interfaces that have not been pruned (Prune state times out every minute)

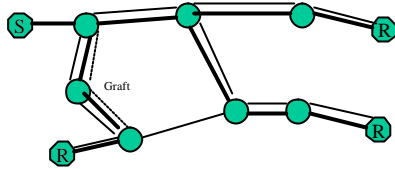
Grafting: Newly joining receiver is connected via graft

Pruning: (of broadcast tree)

Routers that don't have a receiver down-stream send a prune message upstream to stop receiving packet for that MC group



Add new receiver via graft; (departure via Prune)





Newly installed routers are MC capable
MC is not generally available:

- Interference with unicast (TCP) traffic
- Inter domain MC routing
- Congestion Control
- Charging Model

Availability:

- MC is available over satellites and cable
- One ISP (UUNet) is offering commercial MC
- Products are available (os-kernel support, software)
- services use MC like MBone



Goal: All packets delivered to all receivers

How to achieve **Reliability**

- Loss detection
- Loss recovery

Scalability to number of receivers

Heterogeneity of receivers

To be solved: Feedback Implosion

To be solved: Congestion control

Idea: Off-Load sender by performing as many functions as possible by receivers



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