Challenge on Multicast

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Multicast Overview

- Why Multicast
  - Conserve bandwidth
  - Reduce network equipment load
  - Reduce server load
  - Reduce peering requirement
- Unicast would require that the source host send a duplicate packet to every receiver
- Multicast requires the source host to send a single packet and the network takes care of replicating the packet for multiple receivers
- Application
  - multimedia distribution, games, real time information, conferencing

Multicast Drawback

- Unreliable mechanism
  - sender does not know whether all receivers get the packet.
  - need application support
  - may require network design to provide redundant information
- Possibility of duplicate packet/stream
  - multiple path co-exist at some time
- Increase chance of network congestion

Protocols

- IGMP & IGMP Proxy
- PIM-SM, PIM-DM, PIM S/D
- DVMRP
- MOSPF
- MBGP
- Others..
  - MSDP
  - BGMP
  - MASC

Multicast Topology

- Multicast forwarding state is maintained in the form of (S,G) entries
  - (S,G) multicast entries are similar to unicast route entries
- Reverse Path Forwarding (RPF) check
  - Multicast protocols use RPF check to ensure that data is only accepted from the interface which leads to the best path back to the source
- Routing table has 2 views:
  - Unicast usable routes – these routes are learned via unicast routing protocols (RIP, OSPF, IS-IS, etc.) and then used for forwarding unicast data
  - Multicast usable routes – these routes are learned via unicast routing protocols (RIP, OSPF, IS-IS, etc.) and multicast routing protocols (DVMRP & MBGP) and then used for forwarding multicast data
- Not all of the routers in the network need to run multicast
  - Some portions of the network are completely isolated from multicast traffic
  - Connect isolated multicast segments by tunnelling through non-multicast capable routers using GRE, DVMRP tunnels

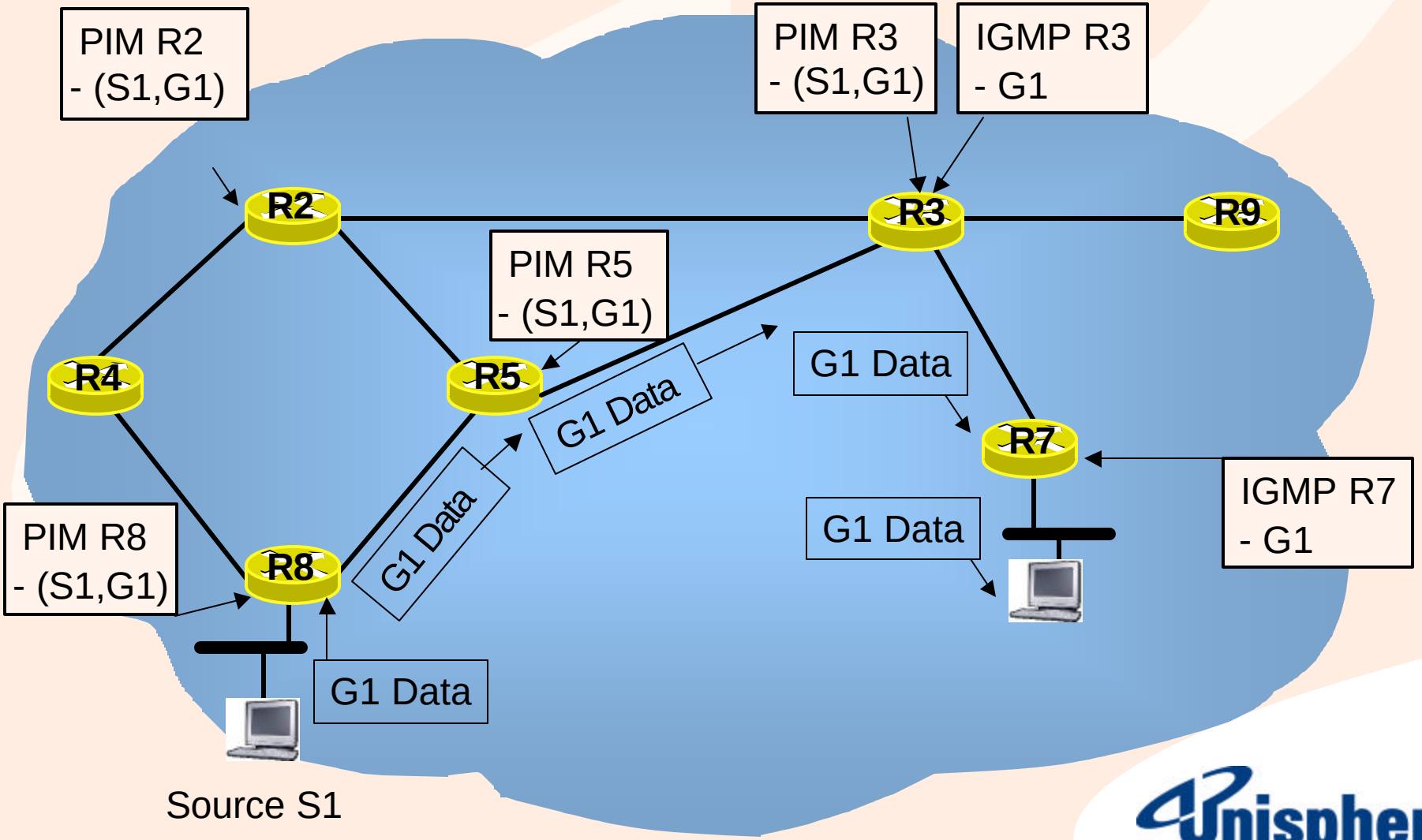
Sparse Mode vs Dense Mode Protocols

- Sparse mode
  - Focused on limited distribution
  - Hosts must explicitly send IGMP group joins to receive multicast data
  - Assumes that those who want data will request it (join)
  - Once you' ve joined, you must explicitly leave multicast group to stop receiving data
  - Routers maintain (source, group) state info
  - Rendez-vous point (RP) or core needed for learning sources
  - e.g. PIM SM

- Dense mode
  - Focused on wide distribution
  - Hosts must explicitly send IGMP group joins to receive multicast data (they get the 1st packet automatically)
  - Assumes that routers without local group members (local hosts that receive 1st packet but don't join) will complain (prune)
  - Once you' ve joined, you must explicitly leave multicast group to stop receiving data
  - State info maintained for each source at every router in the network
  - e.g. PIM DM, DVMRP

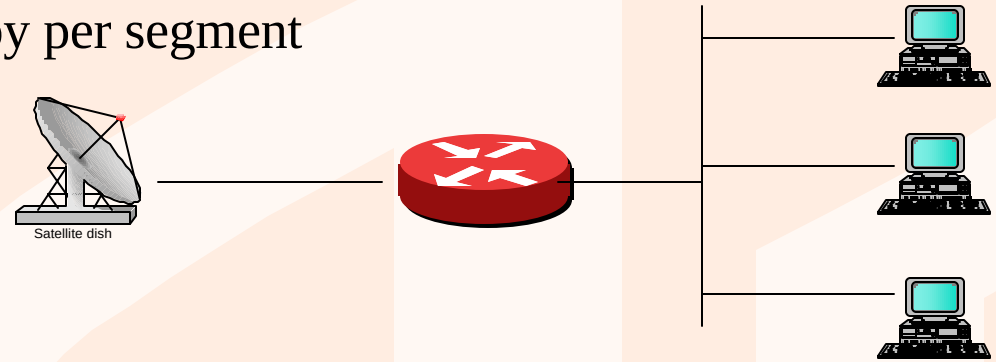
The aim is to build the distribution tree!

Example - PIM-DM/ IGMP Operation

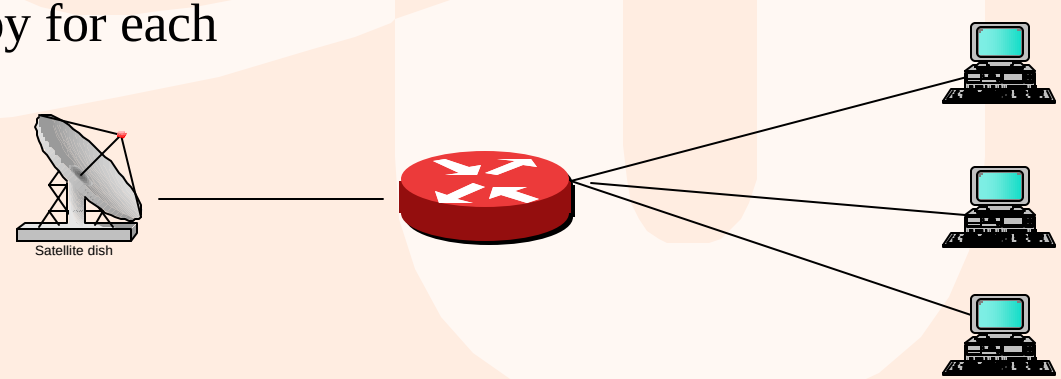


Challenge - Performance

- Broadcast Multiaccess environment - e.g. ethernet
  - one copy per segment



- Non-broadcast Multiaccess environment - e.g. xDSL, wireless, LL
  - one copy for each

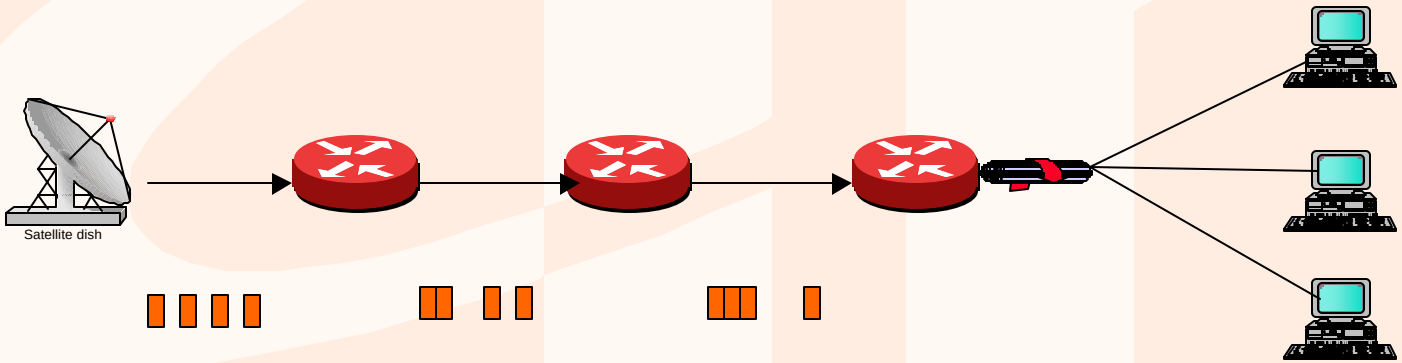


Challenge - Performance

- Traffic volume
  - video take 100kbps to 4Mbps bandwidth in practice
  - relatively huge number of subscriber in NBMA environment
- Buffer and Memory Management
- Software implementation for duplication of packet
- Hardware assisted duplication

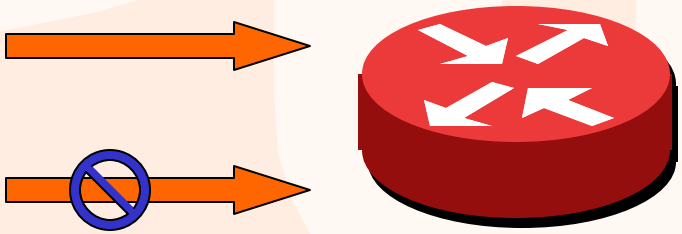
Challenge - Streaming Requirement

- Steady multicast stream
  - jitter cause instantaneous congestion
  - buffer requirement at client application
  - MTU



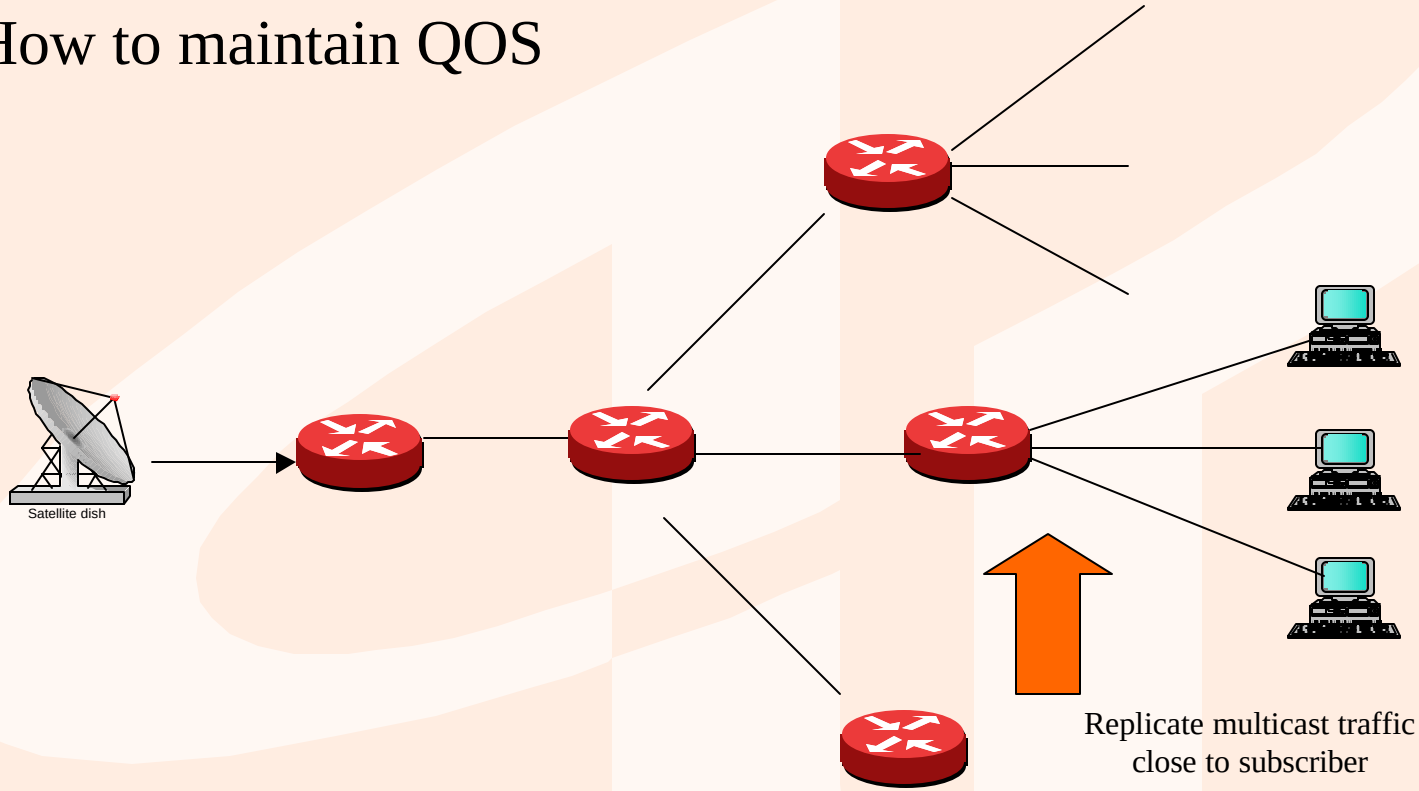
Challenge - Implementation issue

- Multicast does not support authenication
  - no authenication in IGMP. IGMP V3 only allow you to select source to join
  - encryption method - key distribution problem
  - use other method for the CAC control
- Traffic engineering issue
  - link redundancy & load sharing
  - multicast only accept one ingress interface



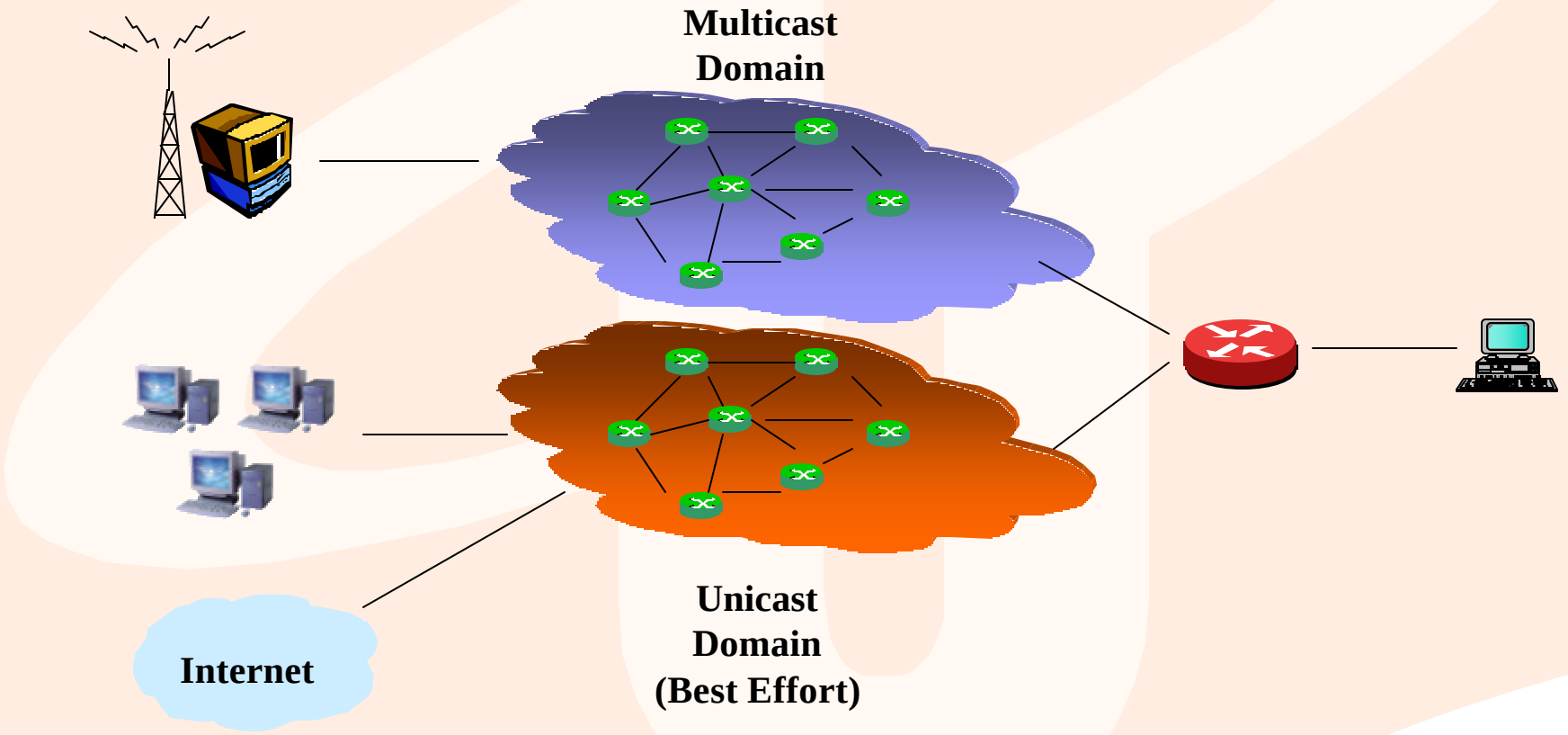
Quality of Service

- How to maintain QOS



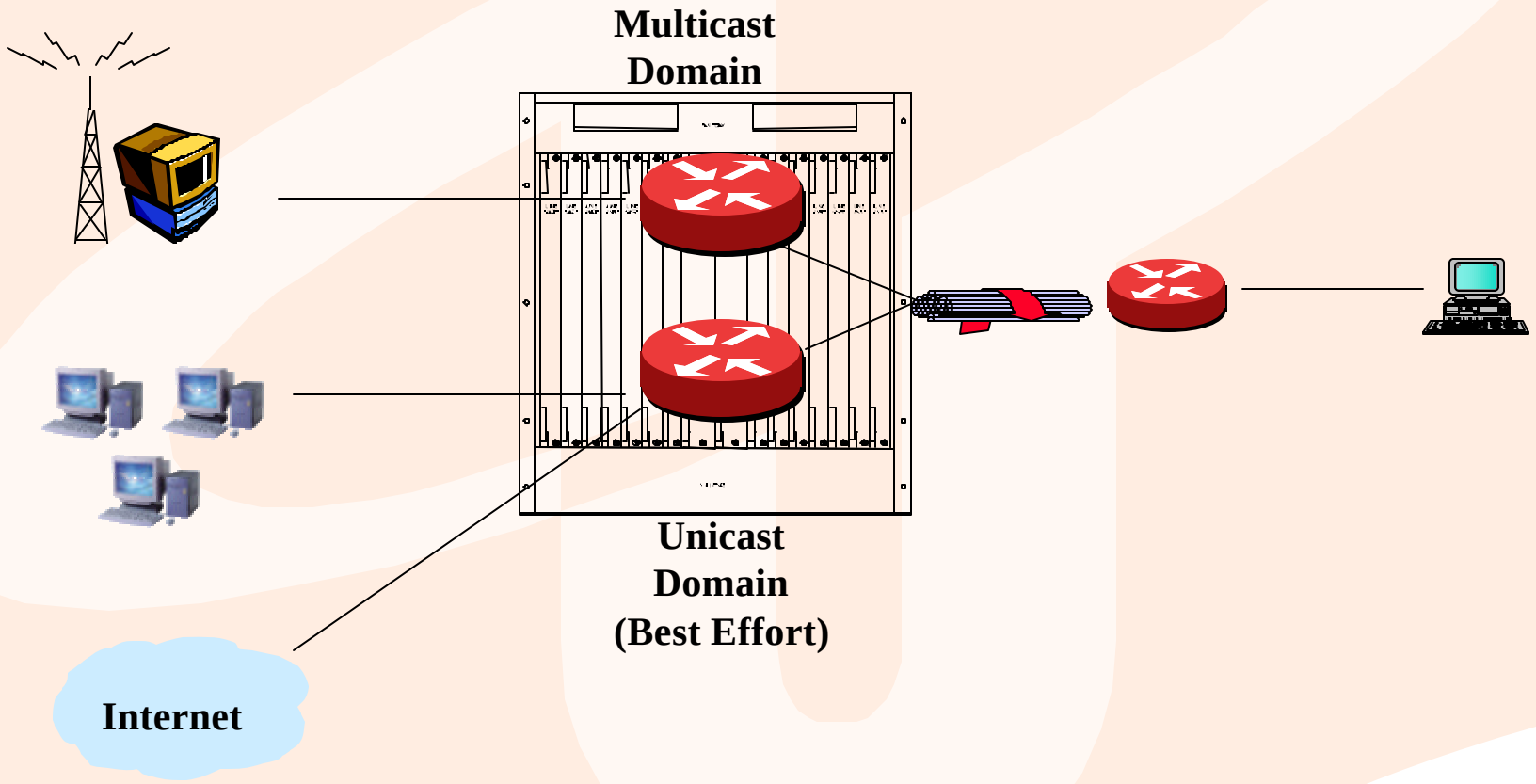
Quality of Service

- Separate the domains



Quality of Service

- via virtual router



Any Questions?