Agenda

- Introduction and Agenda Bashing
- Purpose
- What is the problem?
- Issues for QoS Routing: Bala Rajagopalan
- More QoS Routing Issues: Ross, Eric, Joel
- QOSPF: Eric
- Other Work
- Next Steps

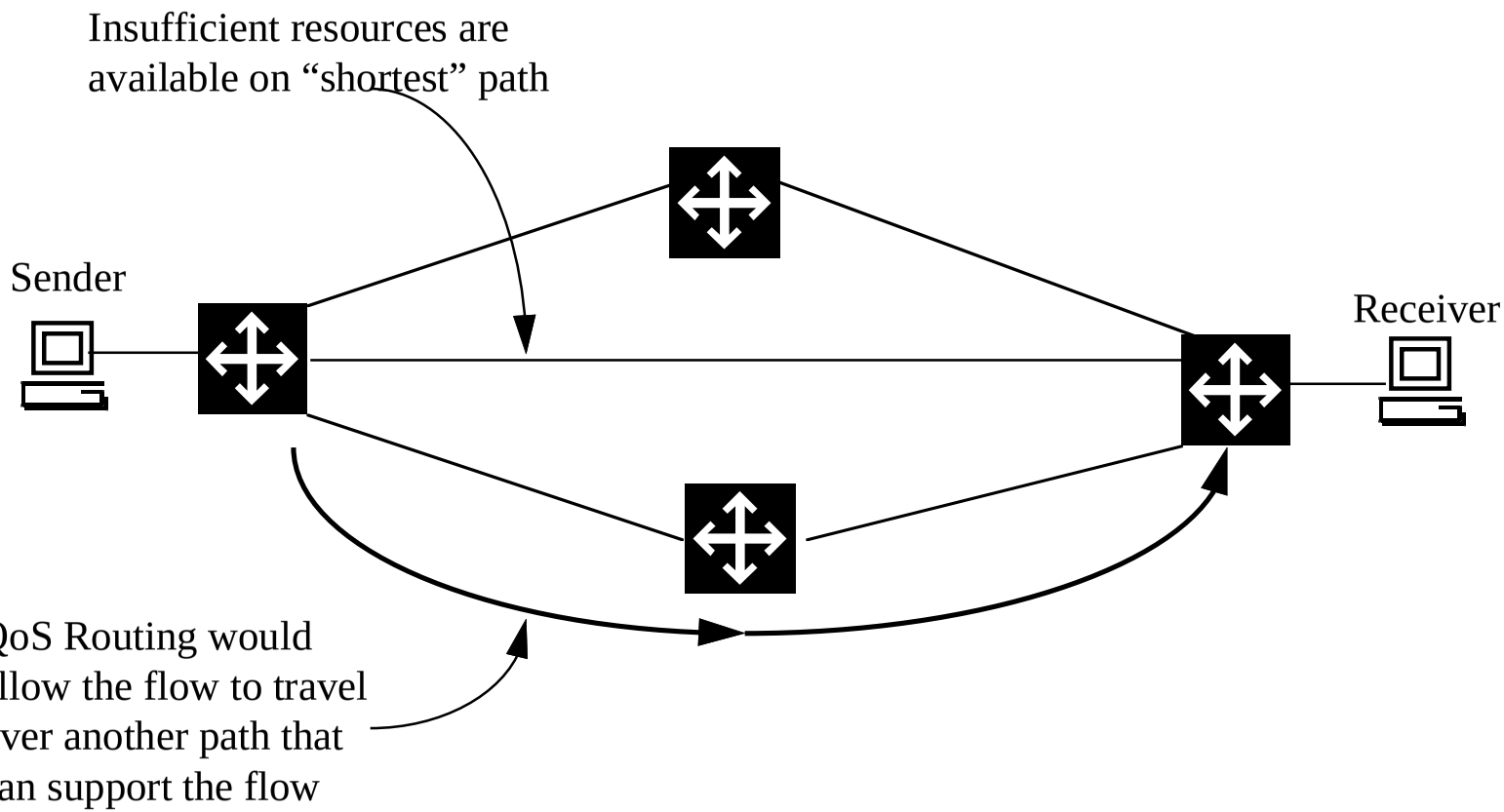
Purpose

- Discuss some of the issues related to Quality of Service (QoS) Routing
- Note some of the current work related to QoS Routing
- Determine if this work belongs in existing working groups
- Determine if a new WG should be created

What's the Problem?

- We could have QoS Signaling (RSVP, etc.) without QoS Routing but...
- If the topology has multiple paths between a source and destination and there are insufficient resources available on the "shortest" path, it would be nice to use resources that are available on other paths

Example


Insufficient resources are
available on “shortest” path
Sender
Receiver
QoS Routing would
allow the flow to travel
over another path that
can support the flow

More QoS Routing Issues

- Route Pinning
- “Avoiding your own shadow”
- Route management to avoid loops
- Multiple routes for multiple flows between the same source->destination pairs
- Heterogeneous QoS

Route Pinning

- Route / Resource stability
- Avoid instabilities based on “avoiding own shadow” issue
- Work with Explicit Routes
- Coordination with ATM (keep IP flow lined up with ATM SVC).

Route Stability

- Changes in routing can cause disruption to real-time applications
- If new routes become available, some applications may not want to relinquish the route that they already have
- Applications requesting resources should have the ability to ask for a path that does not change except on link failure
- It might make sense to consider a timer on route pinning to avoid convoluted routing that is possible by pinning a “transient” route

“Avoiding Your own Shadow”

- If a path is created that uses some amount of network resource, and advertisements announce resulting reduction in available resource, existing flows (which already have their resources reserved) shouldn’t avoid their current links
  - Think of what would happen if you try to energetically avoid your own shadow (drugs available for people, computers are more persistent)

Explicit (aka Source) Routing

- Retry after failure, using different route which avoids the point of failure
- Add new branch to an existing tree (meet sooner rather than later)
- Extensibility (if some routers support new service, but not all)
- Datagram re-route issues -- pinned route needs explicit routing
- Efficiency: ER needs to use route pining

Route Management to Avoid Loops

- If a QoS path does not match a best effort path and part of the QoS path fails such that packets from the QoS path flow to the best effort path, It is possible for a route loop to be created
- It may make sense to “tag” packets on the QoS path to note their “special treatment” and remove the tag should a packet be forwarded off the QoS path
- IPv6 Flow ID and IPv4 TOS bits are possible tagging mechanisms

Multiple Routes

- Routing usually deals with destination routes
- Multicast routing can use source->destination pair
- QoS signaling can use Source, Destination, Protocol, and Port
- Should routing use layer 4 information to distinguish flows?
- Forwarding tables can get very large!
- IPv6 Flow ID can also be used

Heterogeneous QoS

- RSVP allows different receivers to specify different QoS values for the same flow
- QoS routing must be able to calculate or handle the “variegated” trees possible

Other QoS Routing Work

- I-PNNI
  - ATM Forum
  - Layer 3 routing that uses ATM PNNI routing information
- Nimrod

Next Steps

- Are there WGs to address these issues?
- Is there sufficient interest for a QoSR WG?
- Need:
  - Charter
  - Mailing List
  - WG Chairs
  - Approval of AD and IESG