QoS + OSPF = QOSPF
What it means to RSVP

Eric S. Crawley

Bay Networks, Inc.

esc@baynetworks.com

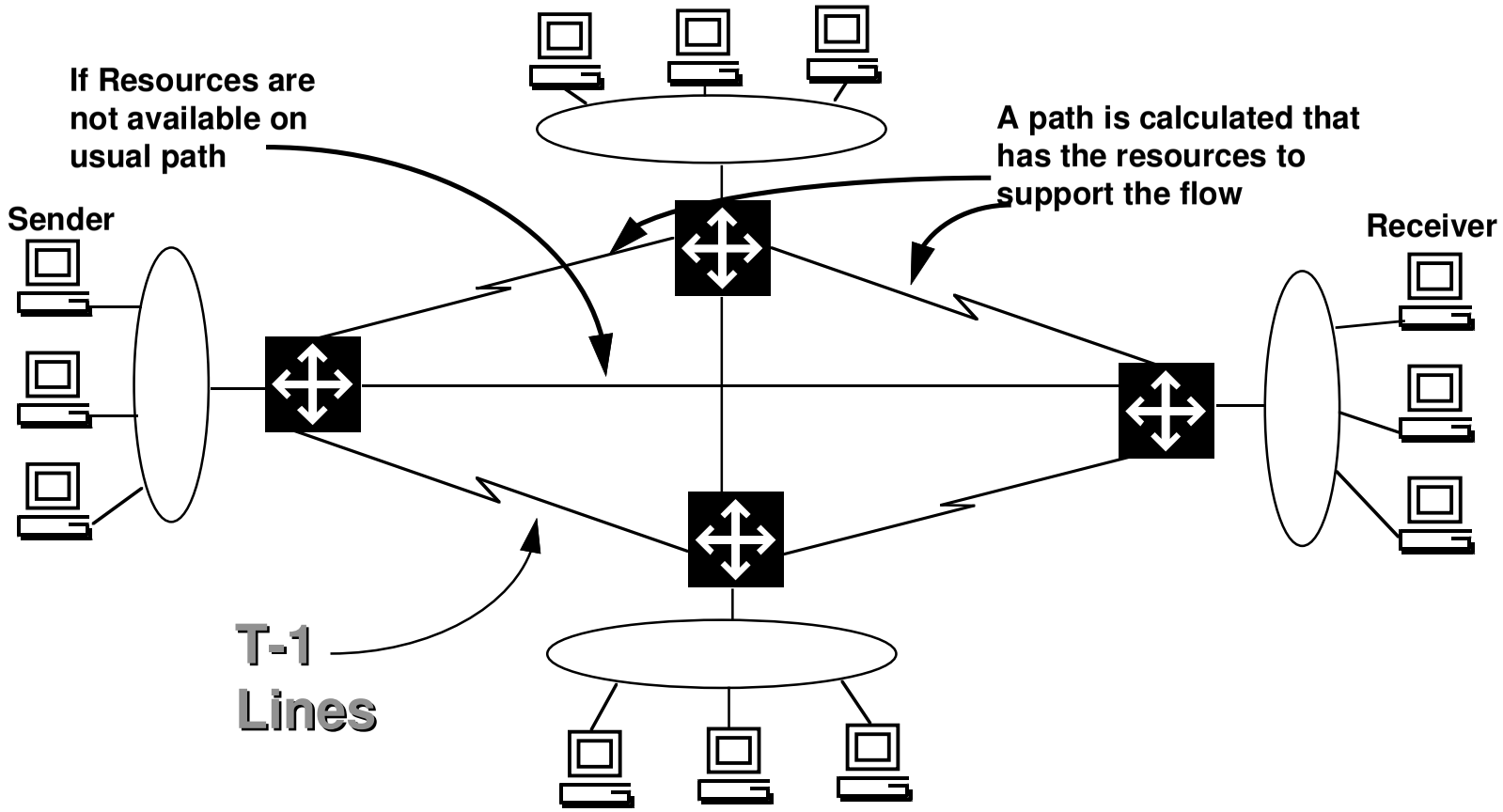
Overview

- The Challenge
- Protocol Overview
- Scaling Problems
- Possible RSVP Additions
- The Remaining Problems

The Challenge

- A customer asked us to combine MOSPF and RSVP to provide Quality of Service routing in a WAN environment
- The WAN was mostly T-1 links but sufficiently redundant that there were multiple paths between multicast sources and destinations
- The application closely matched the “Cable TV” type of environment
  - Single sender
  - Multiple receivers coming and going
  - Fast receiver JOIN times needed (< 2 sec)

Example Topology



Protocol Overview: Resource Advertisements

- New OSPF LSAs for advertising router link resources
  - Controlled Load Model used
    - Largest chunk of reservable BW
    - Largest buffer/burst reservable

Protocol Overview: Route Computation

- QoS Dijkstra calculation triggered by receipt of new RSVP PATH message
  - Using interface to routing for RSVP to indicate QoS needs for flow
  - Unicast or multicast destination
  - Multicast uses Group Membership LSAs for member list
  - QoS route computed for Source->Destination pair (all traffic for Source->Destination flows on same path)
- Only links with adequate resources are considered in route computation

Protocol Overview: Confirmation/ Recalculation

- Success on RESV triggers Opaque LSA indicating reservation on link for Source->Destination pair
- Recomputation could occur on RESV if resources different from PATH
- Routes may be pinned (e.g. not changed by new links or more resources becoming available)
- New resource LSAs (reserved and available) and topology changes cause recalculation favoring links currently reserved for flow

Why are Resource Reserved Advertisements Needed?

- Need to save tree state somehow
  - For adding new members and knowing what branches are currently in use
  - So new resource available advertisements don't affect paths currently in use (AKA "Stepping on your own Shadow")

Scaling Problems

- Resource Available LSAs can be sent out too frequently
  - Solution: Use watermarks and/or resource reserved > resource available comparisons
- Resource Reserved Advertisements are flooded for every link on source->destination path generated on receipt of RESV
  - Solution: Explicit Routing

Explicit Routing (EROSPF)

- A router, usually the source router, computes the QoS route path from source->destination
- The route computation is passed down the tree using opaque LSAs (Explicit Route Advertisements, ERAs)
- ERAs encode the route in such a way that no recomputation is necessary for each router along the path
- Routes can be broken up into multiple ERAs to avoid MTU limits
- Resource Reserved Advertisements need only be sent back to the computing/source router
- Flushing ERAs are used to remove routes

Possible RSVP Additions

- Route pinning flag so receivers can request a “pinned” route
  - Possible length of time to pin a route?
- Indication that a RESV differs from a PATH to help determine if recalculation is needed

Remaining Problems

- Unicast can possible suffer from route loops if packets “fall off” the QoS computed path
  - May need to tag or mark packets on QoS paths to note different treatment (TOS bits or Flow ID?)
  - If packets “fall off” QoS path mark is removed
- SE and WF filters cause an interesting set of resource reserved advertisements
- Need more experience, simulation, and real use

What Next?

- Want to talk/know more?

Come to the QoS Routing BoF

Friday, 0900-1130