Multicast Routing over ATM

draft-crawley-mcast-rout-over-atm-00{.ps, .txt}

Eric S. Crawley

esc@baynetworks.com

Overview

- Why?
- Definitions
- ATM VC usage
- Futures that can impact multicast routing
- Next Steps

Why?

- MARS provides mapping of multicast addresses to ATM addresses but doesn’t address how the current crop of multicast *routing* protocols should deal with ATM
- There are more features available in ATM and simply emulating a multicast subnet may not be enough
- There are some interesting problems that come up when dealing with VCs and short cuts

Data Plane and Control Plane

- Control plane for multicast routing protocol messages
  - JOIN, Prune, etc. messages
  - DVMRP routes
  - Primarily pt-to-pt VCs
- Data plane for multicast data
  - Primarily pt-to-mpt VCs
- In IPATM or NBMA environments data plane and control plane messages can travel over different VCs

Dense Mode

- Receivers densely clustered
- Implies broadcast & prune models
- Data sent to nets with no receivers prior to pruning
- DVMRP & PIM-DM
- Suited to campus LAN environments

Sparse Mode

- Receivers sparsely distributed
- Data sent only to interested receivers
- Explicit network state for multicast overlay tree
- PIM-SM, CBT, & MOSPF

Shared Trees and Source Trees

- Source trees
  - Tree from individual sender to receivers
  - Tree rooted at each sender
- Shared trees
  - Tree shared between multiple senders
  - Tree rooted in the network
- Trade off number of hops vs. scaling

Forwarding Decisions

- Reverse Path Forwarding
  - Upon arrival, a multicast packet is checked to see if it arrived on the expected interface
  - Used in DVMRP and PIM
  - Decision on packet arrival means some transmissions may be wasted

Forwarding Decisions (2)

- Explicit or Forward Path
  - Packets are sent out interfaces with explicit state
  - Loop free topology assumed so checking upon arrival is not needed
  - Used in CBT and MOSPF

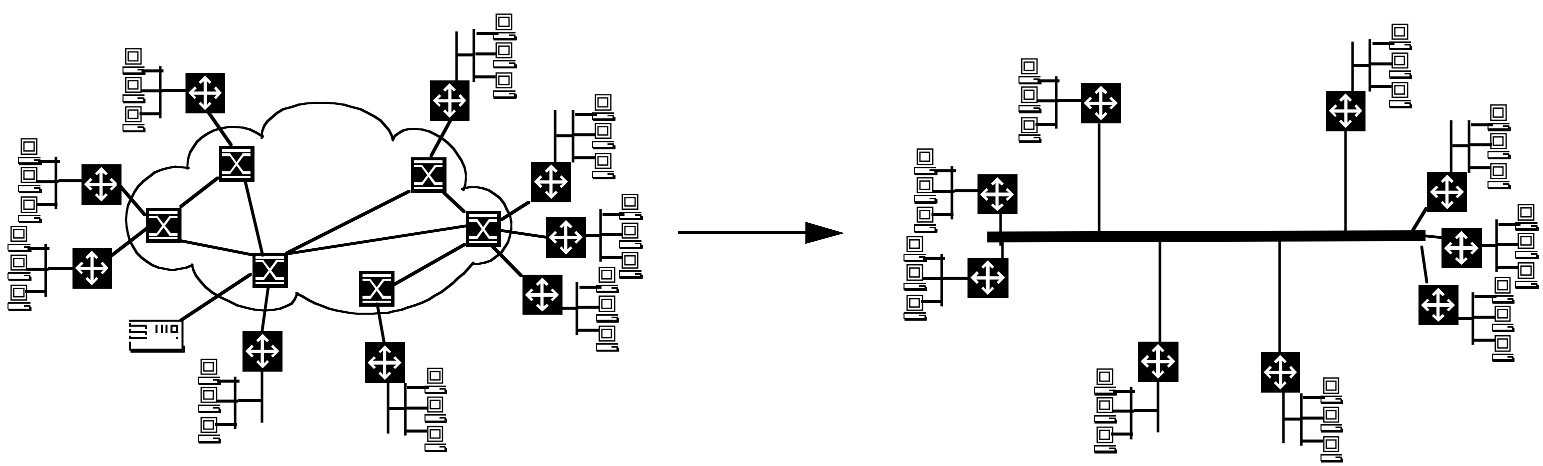
ATM Subnet Multicast

- MARS makes an ATM LIS look like a multicast capable subnet
- MARS is an IGMP equivalent to the ATM LIS
- MARS may not be needed if all LIS end points are routers
- Multicast Servers (MCS) can also be used to distribute multicast packets on LIS while saving VCs

MARS Model

This....

Looks like this to multicast routing



ATM Hosts

- Must use MARS or run a multicast routing protocol to participate in multicast on ATM LIS
- Is there a way to use IGMP? (LANE?)
- Any solutions must consider directly attached ATM hosts

Short Cut Routing

- draft-rekhter-pim-atm-00.txt discusses use of short cuts with PIM-SM and CBT
- Must be ***extremely*** careful of routing loops in multicast
- Criteria for decision on when to set up short cuts is a local decision
- Need to consider additional state needed for short cuts

Considerations for ATM VC Usage

- Permanent Virtual Circuits (PVCs)
  - Emulate point-to-point synchronous links
  - Router does all packet copying
- Switched Virtual Circuits (SVCs)
  - Dynamic setup
  - Time to setup VCs must be considered
  - Control messages may be sent over different VCs from data

Considerations for ATM VC Usage (2)

- Point-to-Multipoint VCs
  - Lets the ATM network replicate data
  - Need to manage sets of pt-to-mpt VCs for multiple multicast groups
- VC Fanout
  - Work within the limits of ATM devices

Considerations for ATM VC Usage (3)

- VC Management
  - Need management and aggregation for scaling
  - Local Decisions?
  - May need to send data on pt-to-mpt to more destinations than are interested
- ATM Hard State vs. Soft-State Protocols
  - Hard state may allow reduction in soft state refresh intervals

ATM Futures that Impact Multicast Routing

- Leaf Initiated Join
  - Need to find root of ATM pt-to-mpt along with unique identifier for VC
- Variegated Point-to-Multipoint
  - Different QoS on branches
- Group Addressing
  - Closer map to IP multicasting?

QoS Routing

- ATM PNNI has QoS information
- Routing decisions could make use of it
- Multicast routing for QoS may be easier than unicast

Next Steps

- Work Items for IDMR/IPATM?
  - Impact of control plane messages on different path from data plane
  - Dense mode protocols in ATM SVC environment
  - Use of IGMP in IPATM multicast environment
  - Impact of short cut routing in IP multicasting over ATM

Next Steps (2)

– Impact of multicast servers
– Evaluate need for standardization or guidelines for VC management for IP multicast
– Soft state refresh in hard state ATM environment
– Integration of new ATM features for IP multicast over ATM
– Multicast QoS routing in ATM