RPR Topology Discovery Proposal

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Proposed Draft Text

- clause10_topology_jl.pdf

Goals

- Simple
- Tolerant of message loss
- Cause minimal overhead
- Determine/validate connectivity and ordering of stations on the ring
- Ensure all stations on the ring have a uniform and current image of the topology
- Immediate reaction to changes

Goals, continued

- Operate without any master station on the ring
- Operate independently of and in the absence of any management systems
- Support dynamic addition/removal of stations (and ringlets) to/from the ring
- Detect mis-cabling between stations
- Provide means of sharing additional information between stations
- Scalable from 1 to 100’s of stations

Algorithm Basics

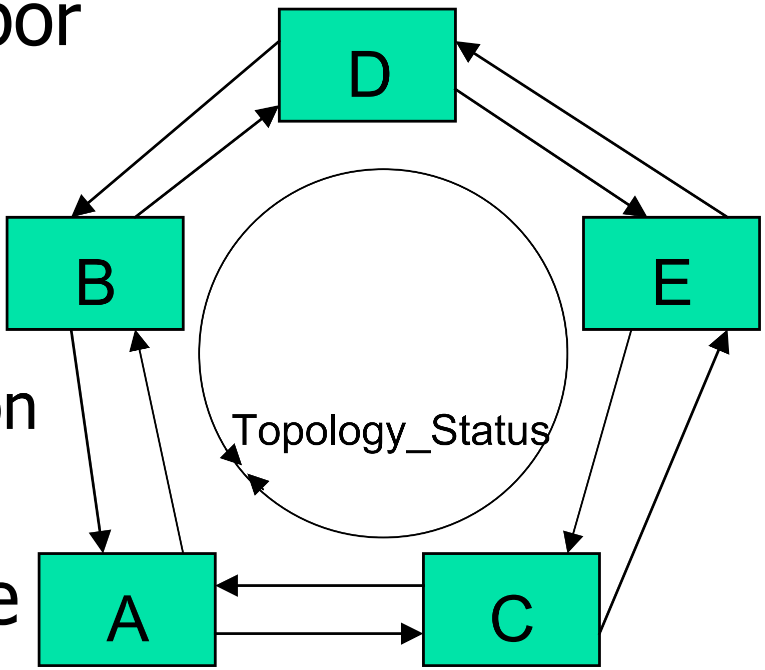
- Each station broadcasts local topology
  - Broadcast periodically, with back off
- Each station announces itself to neighbor
  - One hop “broadcast” periodically, with back off
- Single state state machine, with 5 Events
  - Startup
  - Station status change
  - New neighbor
  - Neighbor and status message timer pops

Information Sharing

- RPR Topology Image used by other algorithms
  - Steering portion of protection algorithm uses Topology Image to know when steering is needed
  - Fairness algorithm uses Topology Image to know where congestion is being experienced (when used with Type 2 messages)
- Several algorithms use station capabilities

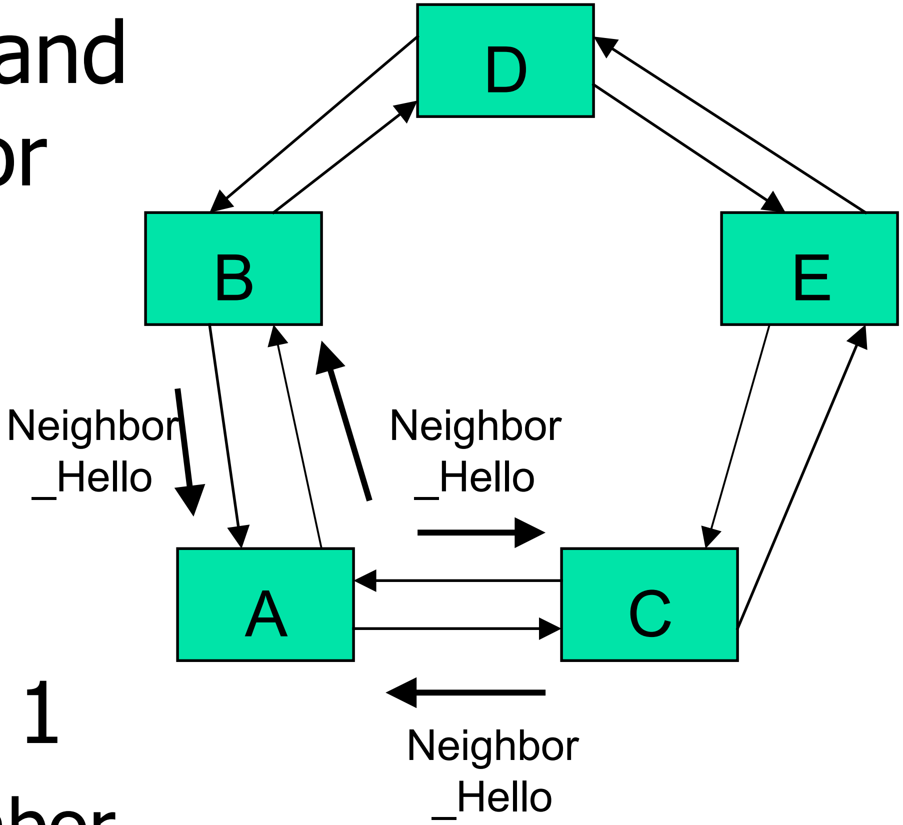
Topology_Status Control Message

- Reports changes in neighbor identity
- Key fields
  - Neighbor MAC addresses
  - Source station image version
- Broadcast on each ringlet with TTL = Max_Ring_Size
  - Removed by source



Neighbor_Hello Control Message

- Reports presence and identity of neighbor station
- Key field
  - Ringlet ID
- Broadcast on each ringlet with TTL = 1
  - Removed by neighbor



State Machine Details, 1

- Startup
  - Trigger
    - Start of state machine
  - Actions
    - Set the local station_image_version to 0
    - Send a Neighbor_Hello on each ringlet
    - Start the Neighbor_Hello_Timer
    - Broadcast a Topology_Status message on each ringlet
    - Start the Topology_Status_Timer

State Machine Details, 2

- Station status received
  - Trigger
    - A Topology_Status message is received
  - Actions
    - If ringlet_id in message matches ID of ringlet on which message was received, then continue.*
    - If station_image_version is higher, then continue.
    - Update local topology image with remote info
    - Broadcast a Topology_Status message on each ringlet (if remote station is new)

State Machine Details, 3

- Neighbor Hello Received
  - Trigger
    - Neighbor_Hello message received
  - Actions
    - If the SA in the Neighbor_Hello is different from the stored neighbor address, then continue
    - Increment local station_image_version
    - Broadcast Topology_Status message on each ringlet

State Machine Details, 4

- Topology_Status_Timer Pop
  - Trigger
    - Topology_Status_Timer Pop
  - Actions
    - Send a Topology_Status on each ringlet
    - Start the Topology_Status_Timer

State Machine Details, 5

- Neighbor_Hello_Timer Pop
  - Trigger
    - Neighbor_Hello_Timer Pop
  - Actions
    - Send a Neighbor_Hello on each ringlet
    - Start the Neighbor_Hello_Timer

Timers

- Topology_Status_Timer
  - Started at initial start of topology discovery algortihm
  - Reset when local topology changes
  - Initial value of 2 ms*
  - Increases by factors of 2 up to 1000 ms
- Neighbor_Hello_Timer
  - Started at initial start of topology discovery algortihm
  - Initial value of 2 ms*
  - Increases by factors of 2 up to 1000 ms

Optimizations

- Station_Image_Version
  - Starts at 0
  - Incremented upon each change in local status
  - Independent value for each station
  - Quick check to see if status has changed from locally stored status
- Reset Topology_Status_Timer only on receipt of Topology_Status from new station

Possible Combinations

- Combination with protection algorithm
  - Topology and protection both giving status of some sort for neighbor links
  - Topology updates needed 3 orders of magnitude less often than protection updates
- Combination with fairness algorithm
  - Topology and fairness both giving status of some sort for neighbor links
  - Topology updates needed 3 orders of magnitude less often than fairness updates