



Topology Discovery

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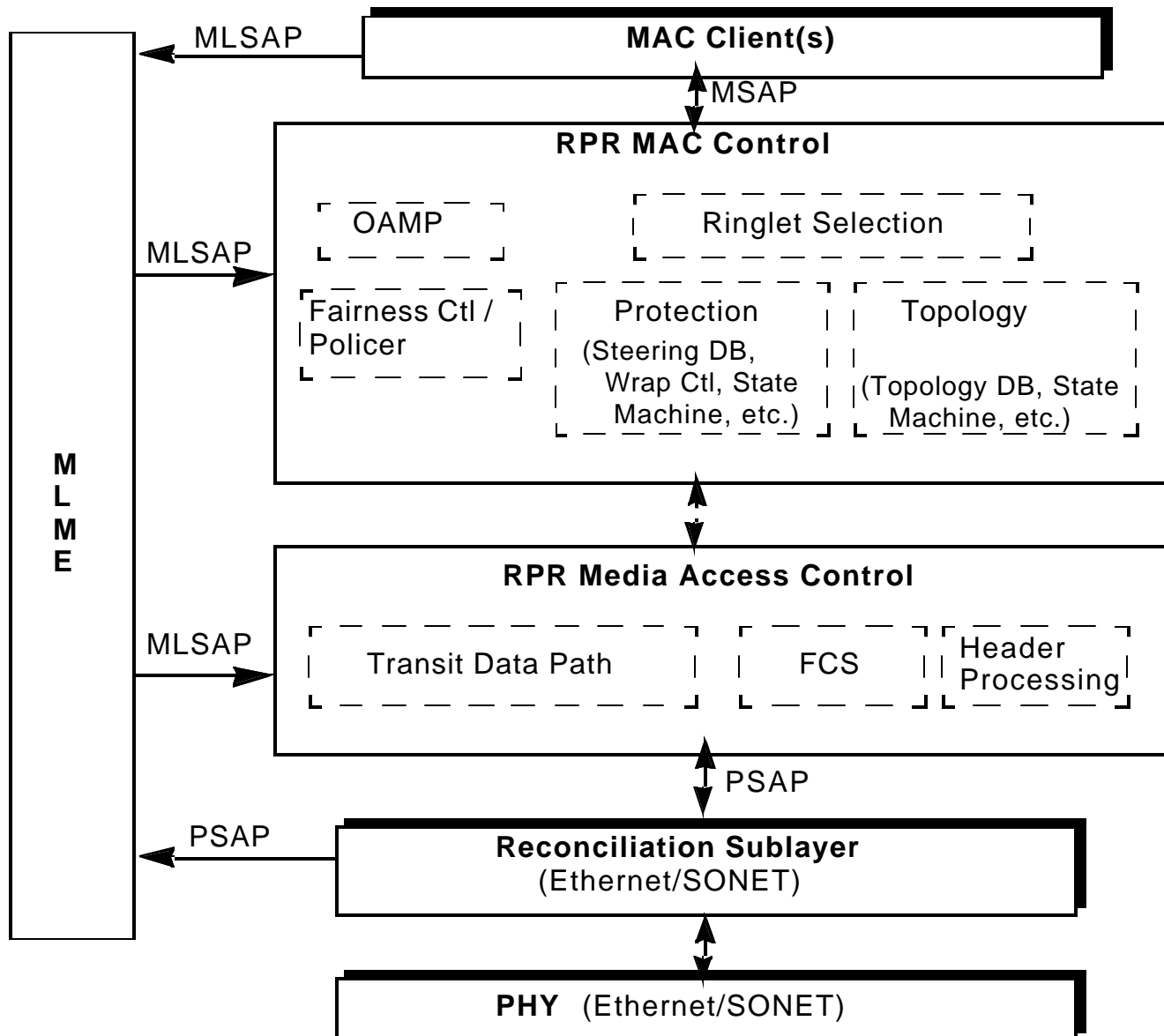
Contents

- Requirements
- Topology Discovery Protocol
- Topology Discovery Frame Format
- Topology Discovery Packet Process
- Conclusions



Requirements

- Support 63 nodes, scalable up to 256 nodes
- Without a mater node
- Plug and play for RPR ringlet operation
 - Ring topology
 - Node' attribute
- Quick convergent time





Topology Discovery Protocol

- Triggered by
 - While a node joins the ring
 - Local fiber failure detection
 - Remote protection message received
 - Timer out for receiving its originated topology packet back
 - Periodically
- Topology packets
 - Hop by hop unicast packet
 - Append nodes attribute one by one



Topology Frame Format

2 OCTETS	RPR HEADER(TYPE=0x5)
6 OCTETS	DESTINATION MAC ADDRESS
6 OCTETS	SOURCE MAC ADDRESS
2 OCTETS	PROTOCOL=RPR Control
2 OCTETS	HEADER CHECKSUM
1 OCTET	CONTROL VERSION(0x0)
1 OCTET	CONTROL TYPE(0x1)
2 OCTETS	CONTROL TTL
2 OCTETS	TOPOLOGY LENGTH
6 OCTETS	ORIGINATOR's MAC ADDRESS
2 OCTETS	MAC TYPE
6 OCTETS	MAC ADDRESS
nn OCTETS	OTHER MAC BINDINGS
4 OCTETS	FCS



Topology Frame Format(Cont)

- Control Version
 - The version number is zero
- Control Type
 - The control type value for topology discovery is zero
- Control TTL
 - The control layer hop-count. Default is 255
- Topology Length
 - The length of topology message starting with the first MAC Type/Address binding
- Originator MAC address
 - Node's globally unique MAC address



Topology Frame Format(Cont)

- MAC type

Bit	Attribute
0	Single transit buffer(0)/Dual transit buffer
1	Ring Identifier(1 or 0)
2	Wrapped node(1)/Unwrapped node(0)
3	Wrap protection capable(1)
4-6	Usage message version
7-13	Weight
14 -15	Reserved



Topology Packet Process

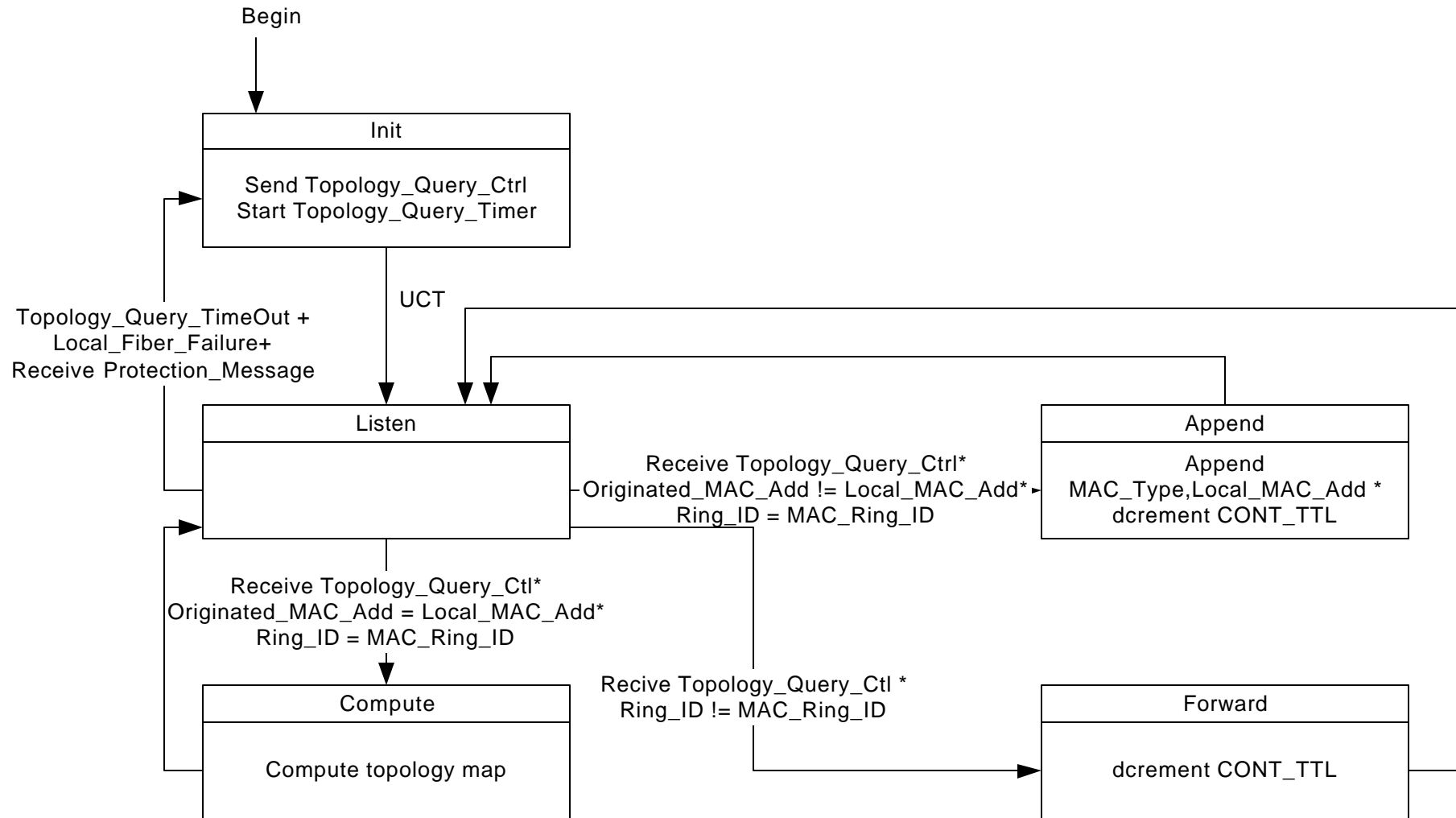
- If ring identifier of packet is matched with RPR MAC
 - If the packet is originated by the node
 - Strip the packet from ring and compute the topology map
 - If it is consistent with last one, update topology
 - Else
 - Decrement control TTL by one
 - If control ttl is zero, strip the packet from ring
 - Else append node's MAC address, type
 - If fiber OK, forward the packet to downstream node
 - Else forward to opposite ringlet



Topology Packet Process

- Else
 - Decrement control TTL by one
 - If the control TTL is zero, strip the packet from ring
 - Else
 - If fiber OK, forward the packet to downstream node
 - Else forward to opposite ringlet

State Transition





Convergent Time

- Span propagation delay+Node process delay
 - 255 nodes, 200km circumference
 - $1\text{ms}(\text{propagation delay}) + 255 \text{ } 1\text{ms}(\text{ process delay}) = 256 \text{ ms}$



Conclusions

- Field deployment verification
- Convergent time is less than second
- Standard should have a simple efficient topology discovery protocol