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**Cyras RPR Overview
and
A Steering Protection Algorithm**

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Outline

- Cyras RPR Overview
- Topology Discovery and L2 Protection
- Basic Frame Format



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RPR Overview (1)

- RPR with SONET Phy
- Frame Delineation
 - A Shim layer between Phy and MAC
 - HDLC Vs. Simple Data Link (SDL) used by GFP
- Topology Discovery and L2 Protection
 - within 50 millisecond
- Native L2/L3 packet over RPR
 - Hybrid frame aggregation, ethernet, IP, etc



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RPR Overview (2)

- Integration with MPLS to support SLA
 - Integration of restoration LSP tunnel with L2 protection
 - Explicit route support by MAC layer (using L2 topology Information)
- Expandable Frame Format
 - e.g. supporting MPLS Label
- 802.1D/1Q/1p integration
 - e.g. multiple priority levels.



■ Topology Discovery by Link State Algorithm

- Control Messages

- ◆ Link Alive Message

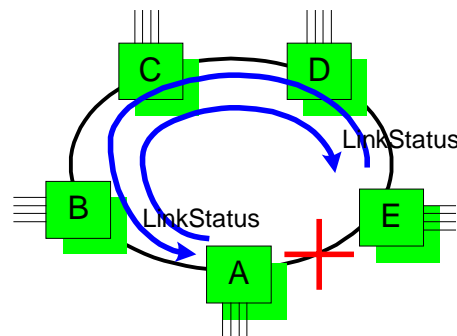
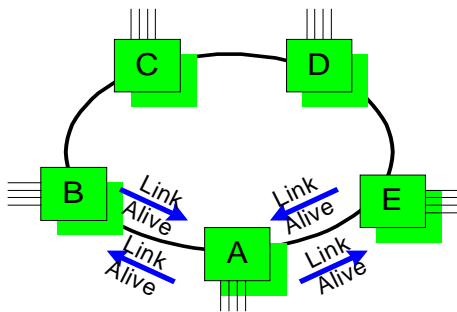
- Periodically between Neighbor Nodes
- Parameters: TTL=1, NodeMacAddress

- ◆ Link Status Message

- triggered by link status change and Broadcast to all nodes
- Parameters: TTL=MaxNodeCount, Link ID <NodeMacAddress, NeighborMacAddress>, Link Status, etc.

- Topology Calculation

- ◆ Dijkstra





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Steering based Protection

■ Protection Switch

- When – topology is changed
- Unicast frame is forwarded on *Shortest Path* with TTL=MaxRingNodeCount or MaxTtlValue(255)
- Multicast frame is forwarded on both sides of the ring with TTL=E and TTL=W, $E+W=\text{MaxNodeCount}$

■ Loop Prevention

- Strip a frame with TTL=0 or SourceMacAddress=NodeMacAddress
- No need for frame wrapping or ring ID information



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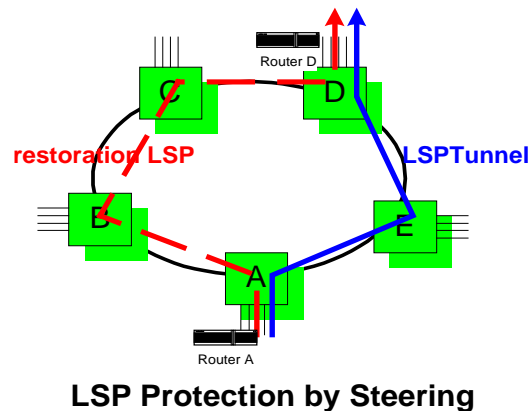
Wrapping or Steering

- BLSR like
- More states for state machine
- Special cares on prevention of frame loop and out-of-order frames
 - Wrapping twice on multicast frames
 - Ring ID for inner and outer ring
- No packet drop during PS
 - Added value during PS
- UPSR like
- Easy to implement
- Simplified on Loop Prevention and out-of-frame prevention
- Easy to support restoration LSP Tunnel
- Essential for L2 protection
- Dropping packet < 50ms
- Have to switch within 50ms
 - ring circumference >1000 Km (RTT is ~8 ms)

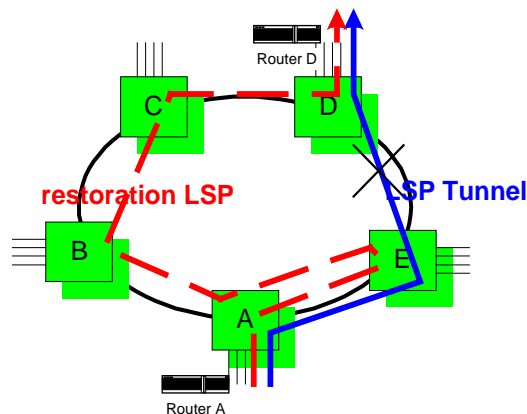


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LSP Restoration Tunnel in L2 Protection



LSP Protection by Steering



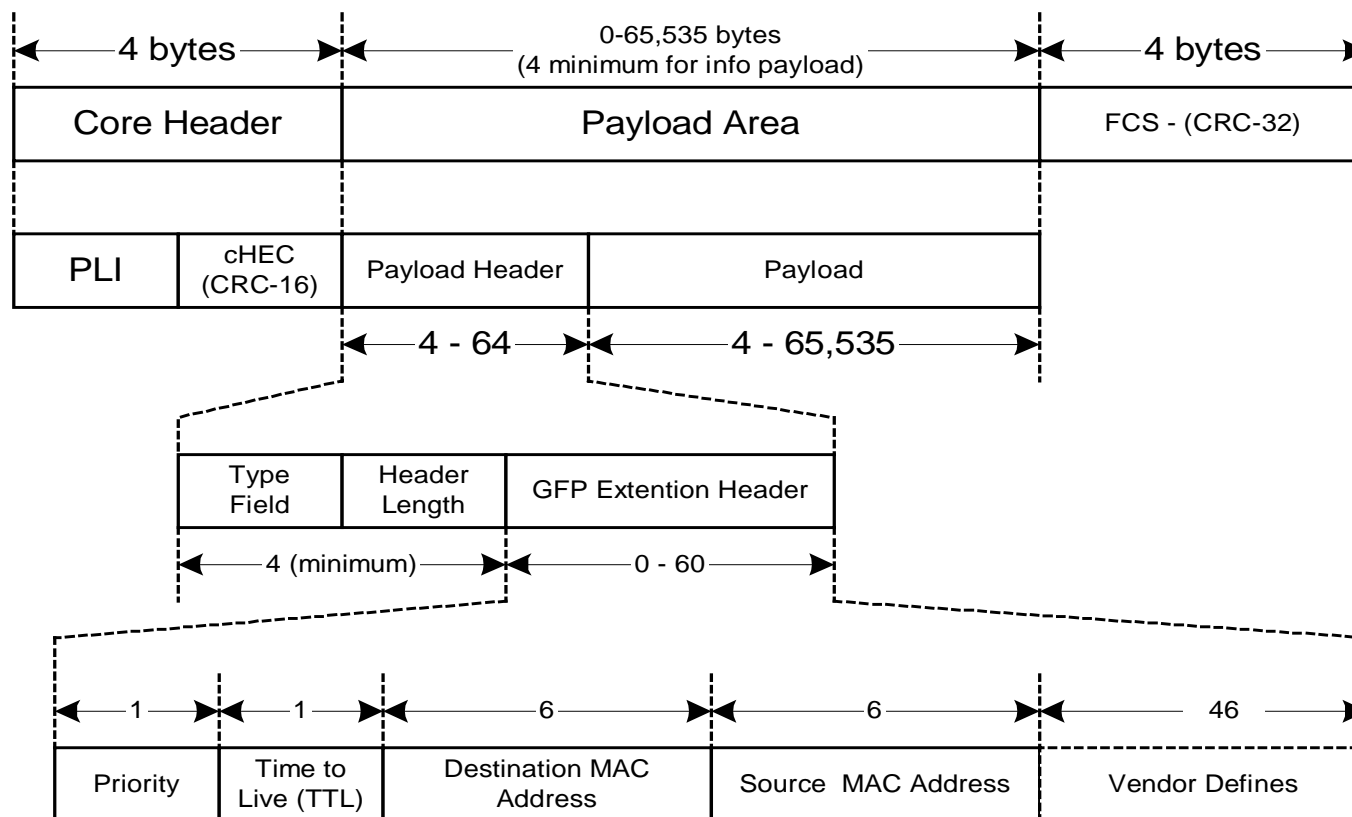
LSP Protection by Wrapping

- LSP Tunnel A-E-D
- Steering
 - Protection Tunnel A-B-C-D
- Wrapping
 - Protection Tunnel A-E-A-B-C-D
- Steering is easy for bandwidth reservation
- Wrapping needs extra bandwidth for guaranteed traffic



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Basic Frame Format



Based on T1X1 Generic Framing Procedure (GFP)