

MPLS-TP Shared Ring Protection (MSRP) Mechanism

draft-cheng-mpls-tp-shared-ring-protection-02

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Presenter :

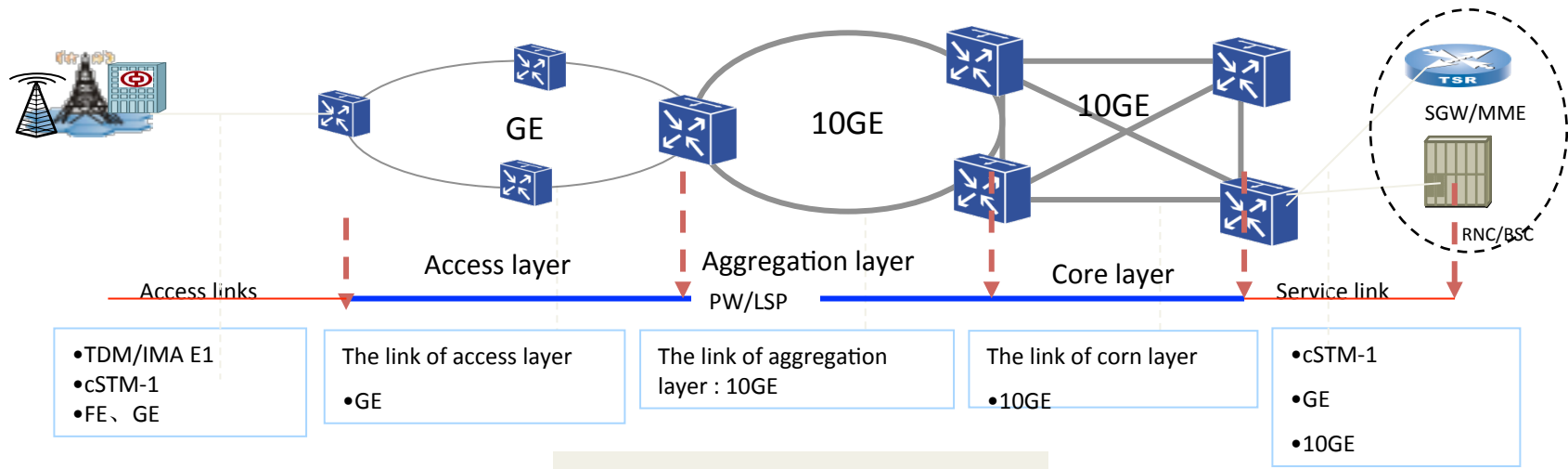
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Why Need Ring protection solution

- Ring topology is deployed worldwide, which can use minimized fiber resource to provide physical two tours.
- Traditional transport networks (such as SDH) are constructed with ring topology, so that network infrastructure such as fiber/power supply/machine rooms are deployed for ring topology.
- Maintenance engineers are familiar with ring topology based operation.



CMCC PTN network architecture

Requirements of the Ring protection

- **“Multiple failures” recovery**

Multiple links or nodes failures are caused by single event, Such as:

- ✓ Multiple links of rings are using fibers in one cable or pipeline, and which is cut off
- ✓ network migration/network cutover in different rings at the same time

Ring protection should cover following possible failures scenarios

- ✓ Multiple failures in single ring
- ✓ Multiple failures in connected rings

- **Simplify configuration and maintenance**

- ✓ protection configurations should be independent of service number
- ✓ Minimize the management elements

- **Simplify the hardware requirements**

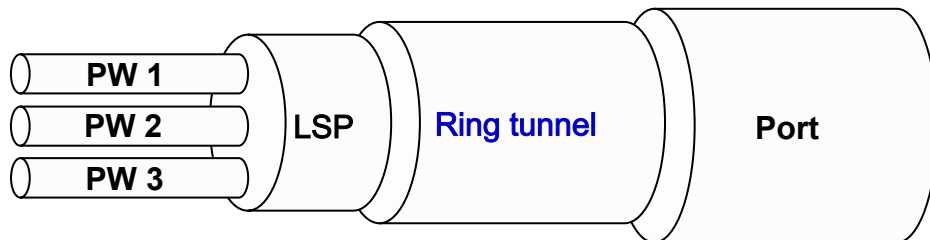
- ✓ Minimize the number of OAM entities
- ✓ Minimize the number of elements of recovery
- ✓ Minimize the number of labels required

- **Linear protection using in field, operators require smooth migration from linear protection to ring protection without service impacted.**

- ✓ Simple Wrapping solution required

“Ring tunnel ” in MSRP

- A logical ring tunnel is introduced for both working LSP and protection LSP
 - to minimize the number of labels for protection paths,
 - to minimize the number of recovery elements in the network, and
 - to optimize the number of control and management transactions necessary,.
- Once the ring tunnel is established , the configuration, management and protection of the ring are all based on the ring tunnel.
 - One port can carry more than one ring tunnel;
 - One ring tunnel can carry several LSPs.

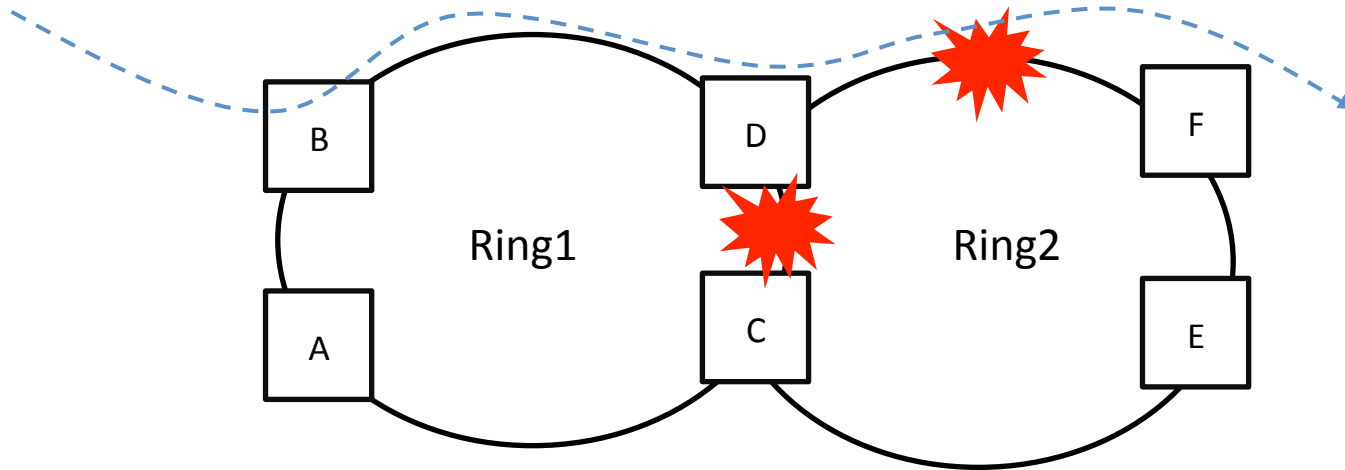


The logic ring tunnel in MSRP

Ring tunnel label
LSP label
PW label
Payload

Label stack used in MSRP

Why need wrapping ring protection



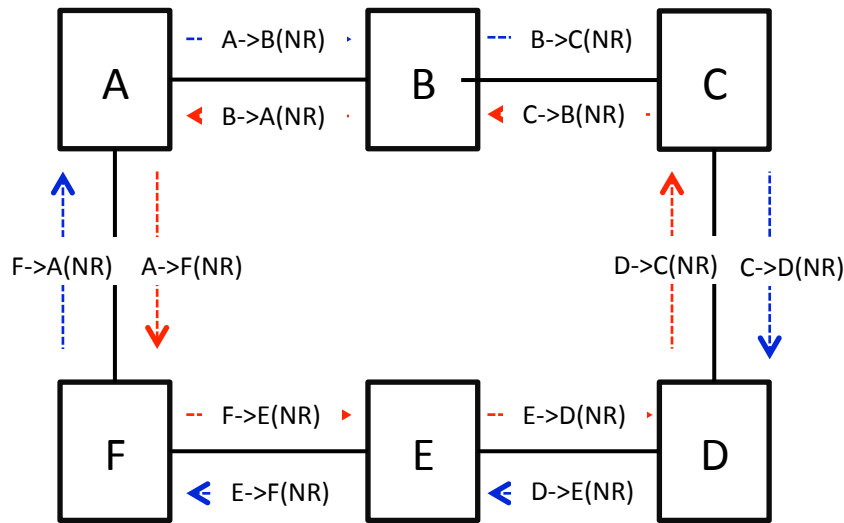
interconnected ring protection scenarios

- Steering ring protection is hard to meet interconnected ring topology recovery requirement. When failure occurred as the figure show above, Steering ring protection need to notify failure information and topology to source node(as Node B). It need to introduce complex protocols.
- When using wrapping ring protection, the switching action only execute in failure detected node(as Node D). It is simple to implement in the network devices then steering ring protection.
- SDH networks often using MSP wrapping protection to improve network survivability.

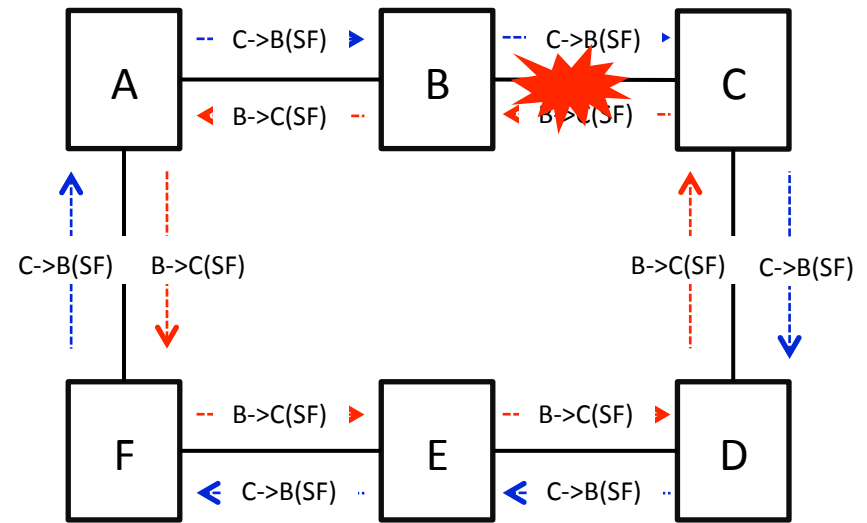
Scope

- Differences from version 01
 - RPS protocols is added
- Differences from version 00
 - short wrapping is added as an optimized wrapping solution
 - to improve latency and bandwidth efficiency in some cases (e.g. the destination/exit node is far from the defect)
 - an interconnected ring protection mechanism is added
 - To recover from interconnection node failure.

RPS Protocols communication



RPS communication
(No Failure in the rings)



RPS communication
(failure between nodes B and C)

- **When no protection switches are active on the ring:** Each node MUST dispatch periodically RPS requests to the two adjacent nodes, indicating No Request (NR);
- **When a node determines that a protection switching is required:** it MUST send the appropriate RPS request in both directions; A destination node is a node that is adjacent to a node that identified a failed span. When a node that is not the destination node receives an RPS request and it has no higher priority local request, it MUST transfer the RPS request as received;

Ring node RPS states

➤ Idle state :

- ✓ A node is in the idle state when it has no RPS request and is sourcing and receiving NR code to/from both directions.
- ✓ Each node in Idle State MUST dispatch periodically RPS requests to the two adjacent nodes, indicating No Request (NR);

➤ Switching state :

- ✓ A node not in the idle or pass-through states is in the switching state.
- ✓ A node in the switching state MUST source RPS request to adjacent node with its highest RPS request code in both directions when it detects a failure or receives an external command.
- ✓ A node in the switching state MUST terminate RPS requests flow in both directions.

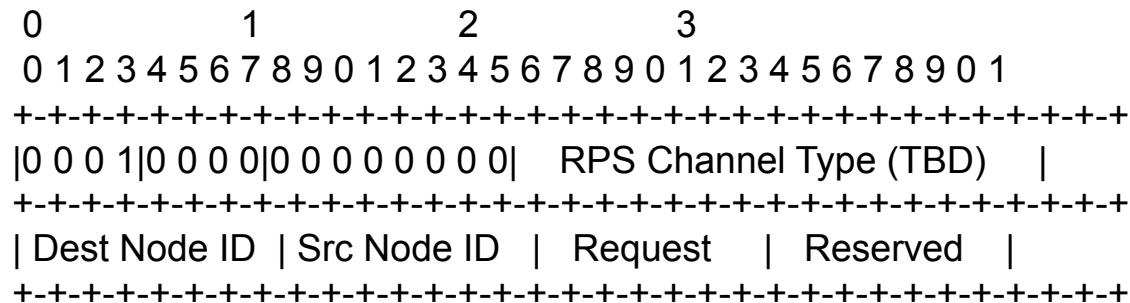
for all protection switch requests, except EXER and LP, the node in switching state MUST execute the switch.

➤ Pass-through state :

- ✓ A node is in the pass-through state when its highest priority RPS request is a request not destined to or sourced by it.

RPS Protocols messages

- The MSRP protection operation MUST be controlled with the help of **the Ring Protection Switch Protocol(RPS)**. The RPS messages SHALL be sent over the G-ACh as described in [RFC5586].
- RPS is dedicated to Ring protection and it requires a new A-Ch channel type.

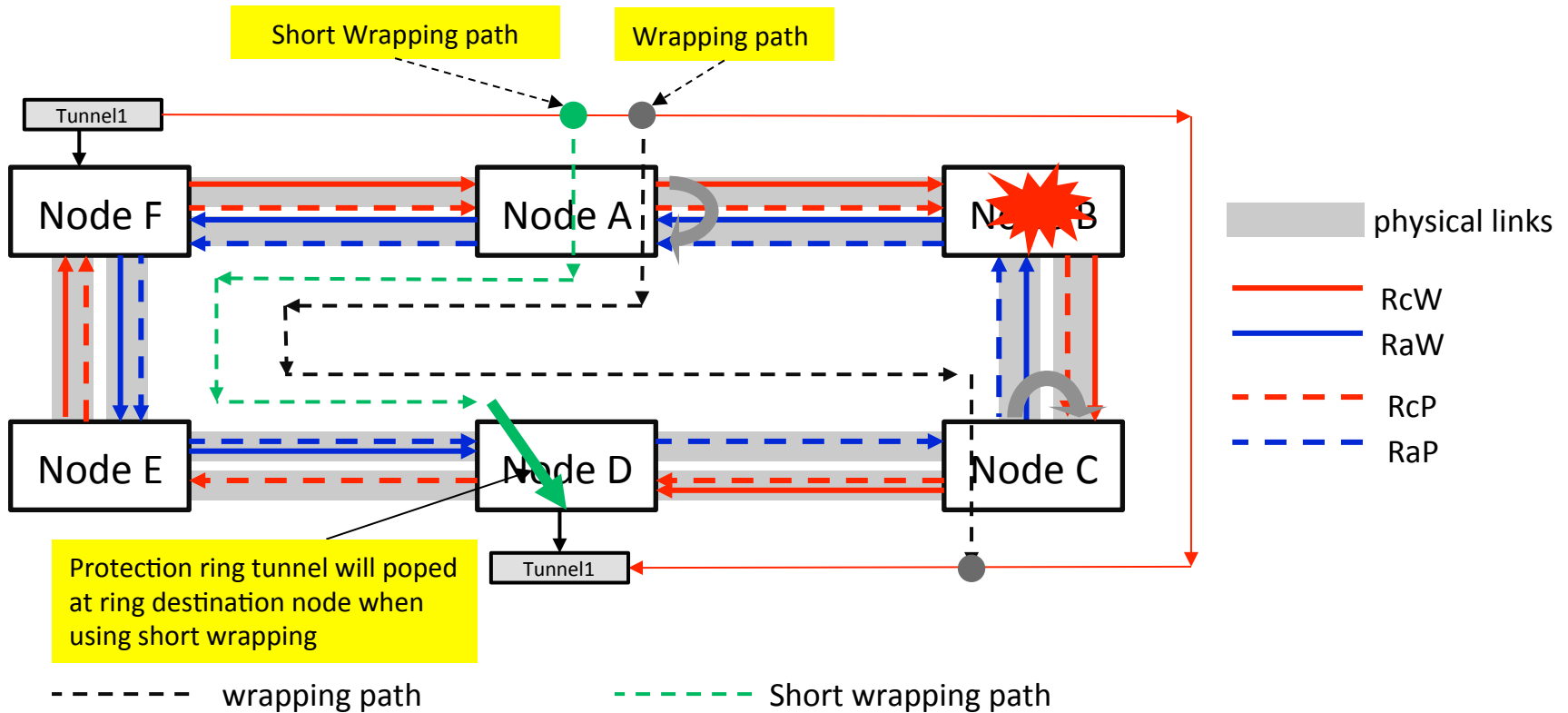


- **Destination Node ID:** The destination node ID MUST always be set to value of a node ID of the adjacent node. Valid destination node ID values are 1-127.
- **Source node ID:** The source node ID MUST always be set to the value of the node ID generating the APS request. Valid source node ID values are 1-127.
- **RPS request code:** A code consisting of four bits which carry RPS requests;

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P2P short wrapping solution



Short Wrapping v.s Wrapping (Node D as an exit node)

- **Wrapping:** Protection switching happens at neighbouring nodes of the failure (Service is received from the working path at the exit node) . See the black line in the figure.
- **Short Wrapping:** Protection switching occurs at the up-stream neighboring node of the failure and the exit node (Service is received from the protection path at the exit node).

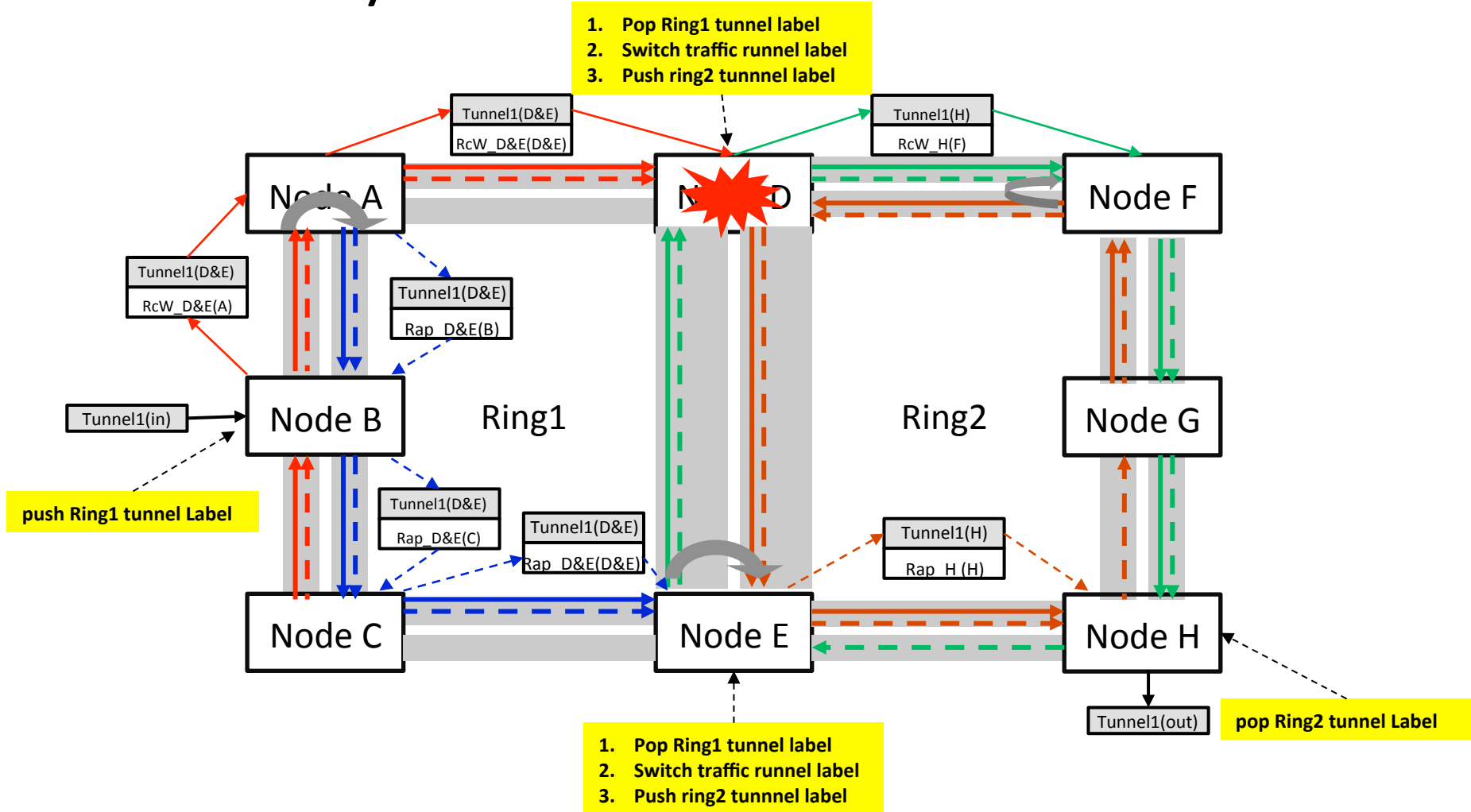
Interconnected ring protection mechanism

- **Interconnected rings will be regarded as two independent rings.** Each ring runs protection switching independently. Failure in one ring only triggers protection switching in itself and does not affect the other ring.

- For protected interconnection node in dual-node interconnected ring, **the service LSPs in the interconnection nodes should use the same Forward table.** So either interconnection node can process service LSP if another node failure.

- Two interconnection nodes can be managed as a virtual interconnection node group. Each ring assigns ring tunnels to the virtual interconnection node group. **The interconnection nodes in the group should terminate the same interconnected ring tunnels.** Ring tunnels to the virtual interconnection node group will be established by each rings :
 - one clockwise working ring tunnel to the virtual interconnection node group;
 - one anticlockwise protection ring tunnel to the virtual interconnection node group,
 - one anticlockwise working ring tunnel to the virtual interconnection node group;
 - one clockwise protection ring tunnel to the virtual interconnection node group.These ring tunnel will terminated at all nodes in virtual interconnection node group.

Recovery from Interconnection node failure



Recovery from Interconnetcion node failure (Node D failure)

① NodeD and NodeE should deal with the same traffic LSP label. Tunnel1 will process correctly in any node of NodeD and NodeE ;

Next Step

- Any enhancement based on the feedbacks from the group