MPLS-TP Shared Ring Protection (MSRP)

draft-cheng-mpls-tp-shared-ring-protection-04

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Essentials of MSRP

- Ring tunnel structure
  - Specify the data plane of ring tunnel

- Ring protection mechanisms
  - Protection ring tunnels
  - Wrapping, short-wrapping, steering, interconnected ring

- Section layer OAM
  - Minimize the number of OAM entities

- Ring Protection Switching (RPS) protocol
 - Coordinate the protection operation

Ring Tunnels

- Ring tunnels established based on exit nodes
- Shared by all services leaving the ring from the same node
- Labels of ring tunnel are provisioned via management plane, control plane is optional
- Data plane of the working ring tunnels are not closed ring
- For each exit node, 2 pairs of ring tunnels are established for ring protection
  - clockwise working, protected by
  - anti-clockwise protection

  - anti-clockwise working, protected by
  - clockwise protection
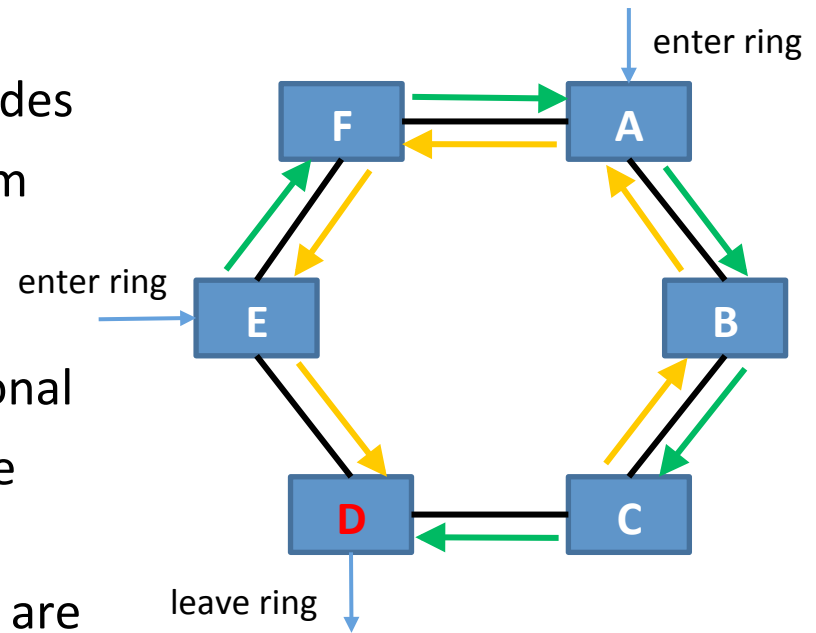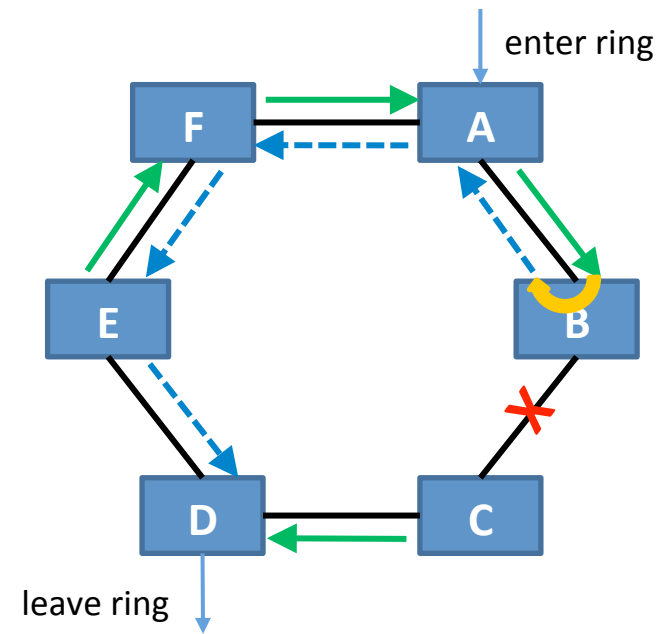

clockwise and anti-clockwise working tunnels for node D

Why 4 Tunnels?

- Loop prevention
  1. Traffic on clockwise working tunnel
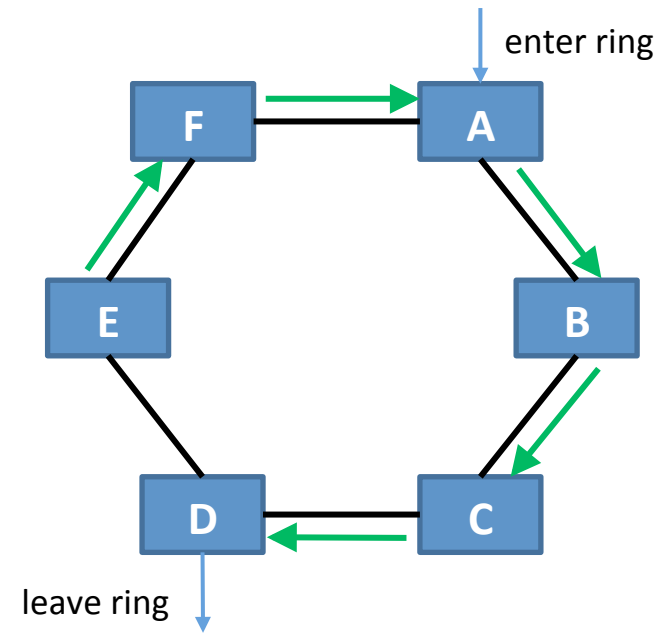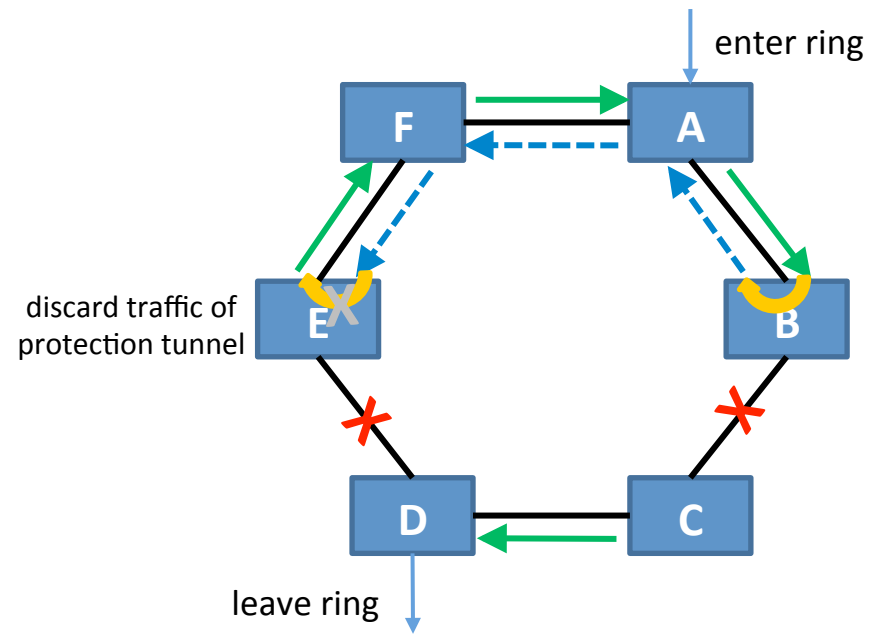
enter ring

leave ring

Why 4 Tunnels?

- Loop prevention

    1. Traffic on clockwise working tunnel

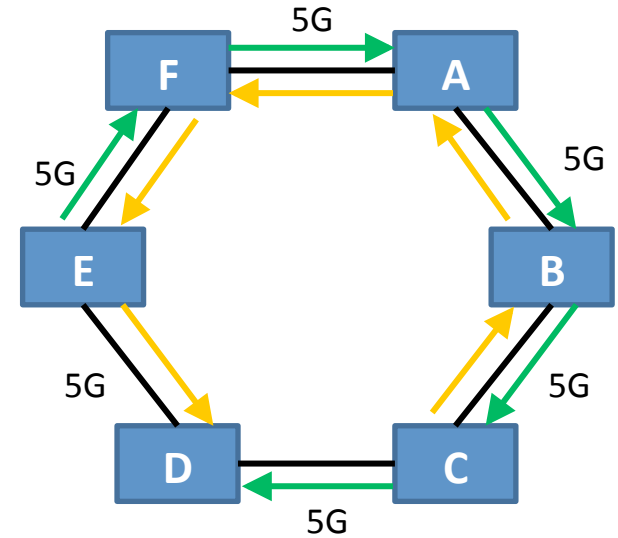   2. B switches traffic onto anticlockwise protection tunnel

Why 4 Tunnels?

- Loop prevention
    1. Traffic on clockwise working tunnel
    2. B switches traffic onto anticlockwise protection tunnel
   3. E discards the traffic received on a protection tunnel

Why 4 Tunnels?

- Bandwidth management
  - Independent and clear bandwidth planning for working and protection
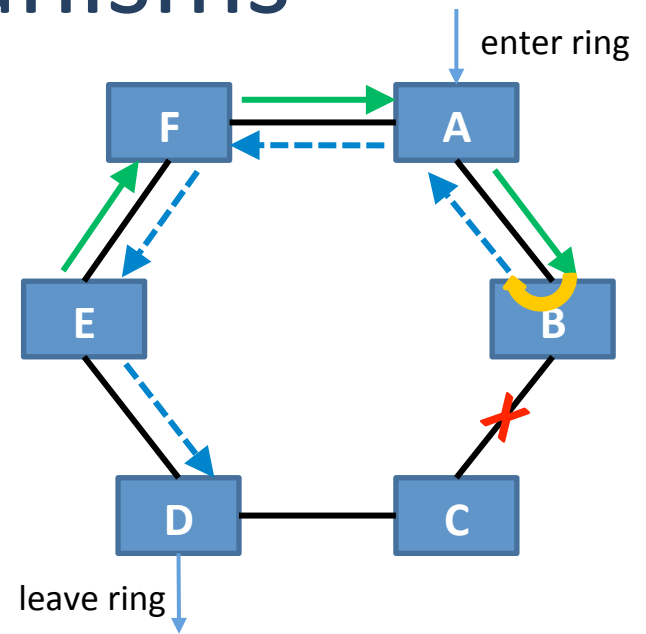
Ring Protection Mechanisms

- Wrapping
  - Protection tunnel needs to be a closed ring

  - Nodes adjacent to the failure execute traffic switching
    - B switches traffic to protection tunnel
    - C switches traffic back to working tunnel

  - Traffic detour on both sides
    - Not recommended

enter ring

leave ring
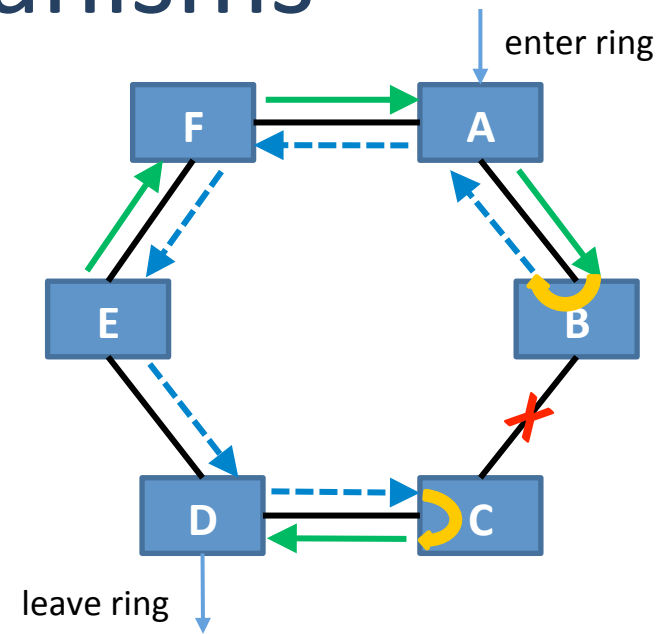
Ring Protection Mechanisms

- Short wrapping
  - Protection tunnel has same structure as working tunnel

  - Node first detecting the failure switches working tunnel traffic onto the protection tunnel

  - Traffic leaves the exit node without detouring to the downstream of the failure (C)

Ring Protection Mechanisms

- Steering
  - When ingress node is aware of the failure, it can switch traffic to the protection tunnel directly

  - Avoid traffic detour between ingress and the node detects the failure

  - Extra time for failure report propagation

enter ring

failure report

leave ring
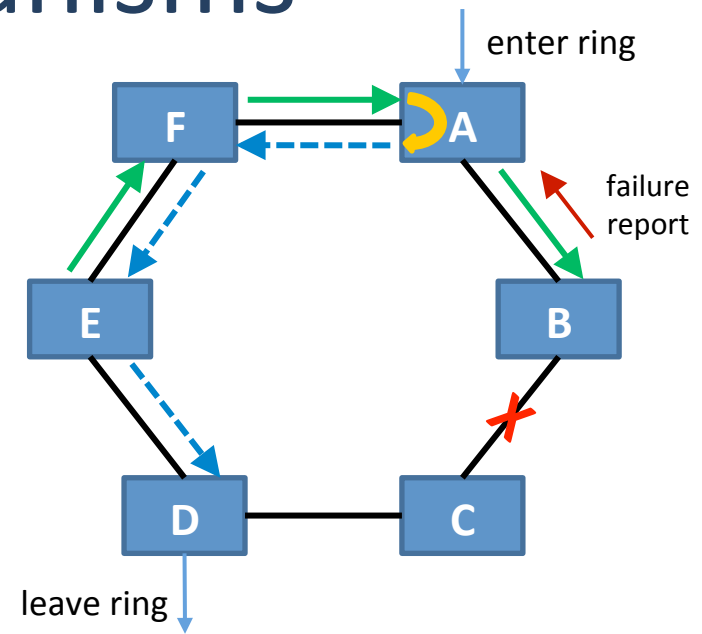
Section Layer OAM

- Monitor the connectivity between each two adjacent nodes

- Minimize the amount of OAM entities in ring topology
  - Compared with LSP level OAM
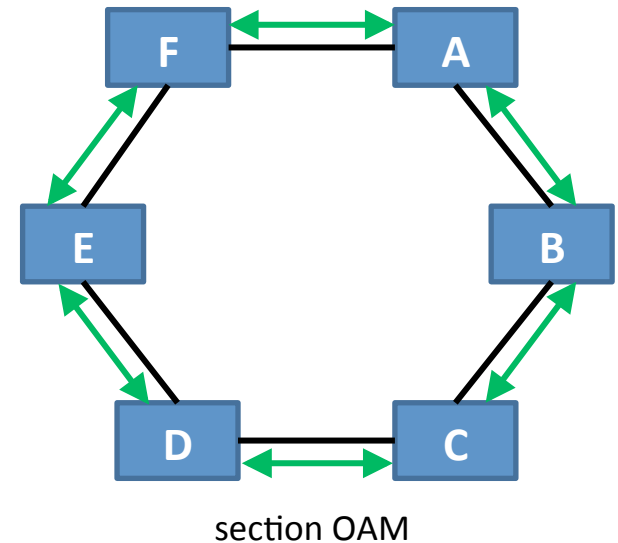
section OAM

RPS Protocol

- Failure detected by section OAM triggers ring protection switching protocol
  - Each node sends RPS messages periodically in both directions

- RPS messages
  - A new G-ACH channel type

- RPS state machine
 - Refer to the draft for more details
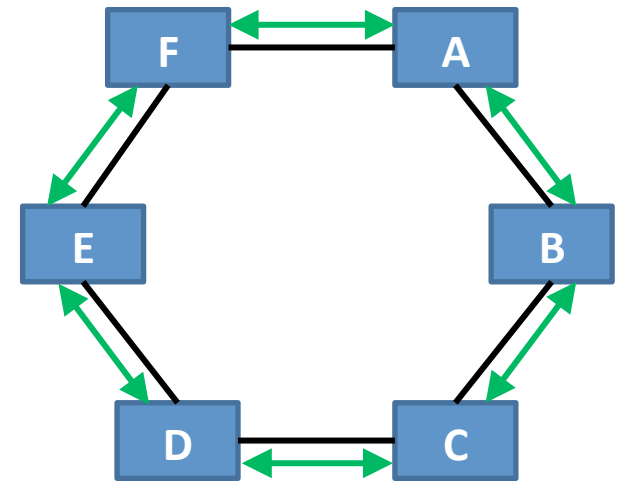
RPS messages on ring

History of Document

- -00, presented in IETF85, Nov. 2012

- -01, adds short-wrapping, Jul. 2013

- -02, adds RPS protocol, presented in IETF90, Jul. 2014

- -03, fixes some typos, Jul. 2014

- -04, presented in IETF92, Mar. 2015

Changes in -04

- Re-organize statements for better readability

- Editorial changes

- Draft is getting stable, and this solution has been deployed in real networks

Laboratory Test
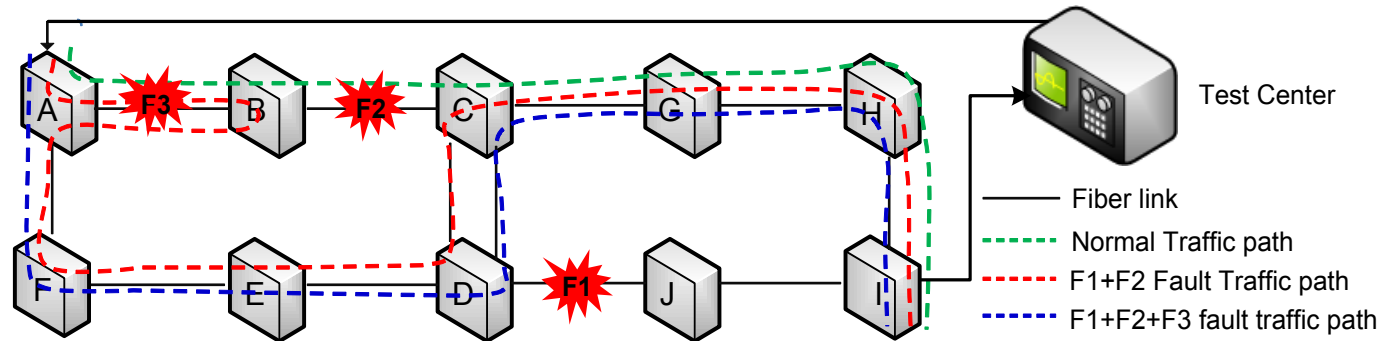
Test Steps	Fault scenarios	Packet loss	Packet rate (packets/s)	Traffic Path	Switching time (ms)
Initial	normal	0	100000	A-B-C-G-H-I (green line)	N/A
Step 1	F1+F2	2693	100000	A-B-A-F-E-D-C-G-H-I (red line)	26.9
Step 2	F1+F2+F3	4396	100000	A-F-E-D-C-G-H-I (blue line)	43.9
Step3	Restore F3	6	100000	A-B-A-F-E-D-C-G-H-I	0.06
Step4	Restore F2	7	100000	A-F-E-D-C-G-H-I	0.07
Step5	Restore F1	0	100000	A-B-C-G-H-I	0

- Test results show that the switching time of the ring protection was less than 50 ms, and the restoring switch time was ignorable (less than 0.1ms).

Field trial

Linear APS
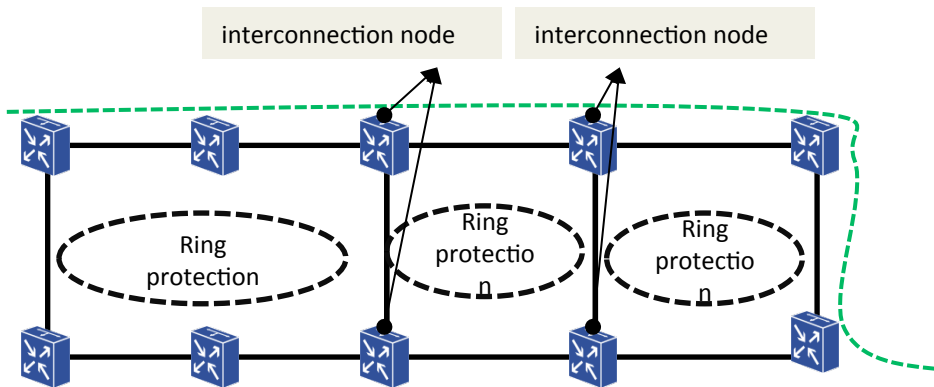

Ring protection cooperate with linear APS
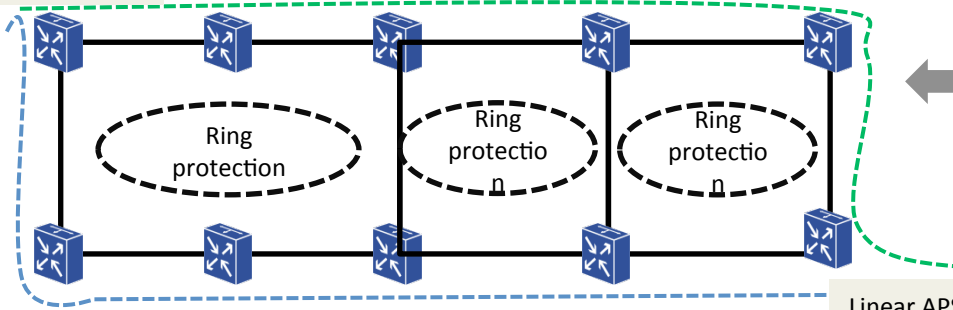
1. Using ring protection to protect link and non interconnection node failure.
2. Using linear APS to protect interconnection node failure.

Linear APS

Configration	Ring proetction	Linear proetection
OAM period	3.3ms	3.3ms
APS holdoff time	0	100ms

interconnection node   interconnection node

Interconnected Ring protection

item	Test result （200 Tunnel configuration）
Interconnected Ring switching time	**23ms~37ms**
ring protection cooperate with linear APS	ring protection switching time：**26ms~35ms** Linear APS switch time(interconnection node failure): **118~133ms**
Upgrade from linear protection to ring protection	Step1: establish runnel for each node using NMS. Step 2: Move all work tunnel to the ring. Step 3：Delete linear APS and protection tunnel. If using Interconnected ring mechanism. Operation time : **less then 10min**

Using interconnected ring protection technique to protect all link and node failure

Next Steps

- Solicit feedbacks from WG

- Ready for WG adoption?