MPLS-TP Shared Mesh Protection

draft-cheung-mpls-tp-mesh-protection-04

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Taesik Cheung and Jeong-Dong Ryoo (ETRI)

Yaacov Weingarten and Nurit Sprecher (NSN)

Daniel King (Old Dog)

Main Points of Solution

- Build on existing linear protection
  - Protection switching action (re-use linear protection)
  - Coordination action (defined in this draft)
- One LSP for each protection path
  - There is no shortage of labels
  - Each LSP has end-to-end OAM/PSC channel
- Parallel control of protection segments
  - Minimize coordination processing time
- Immediate traffic switch
  - Rapid failover as fast as linear protection

Principle of Operation

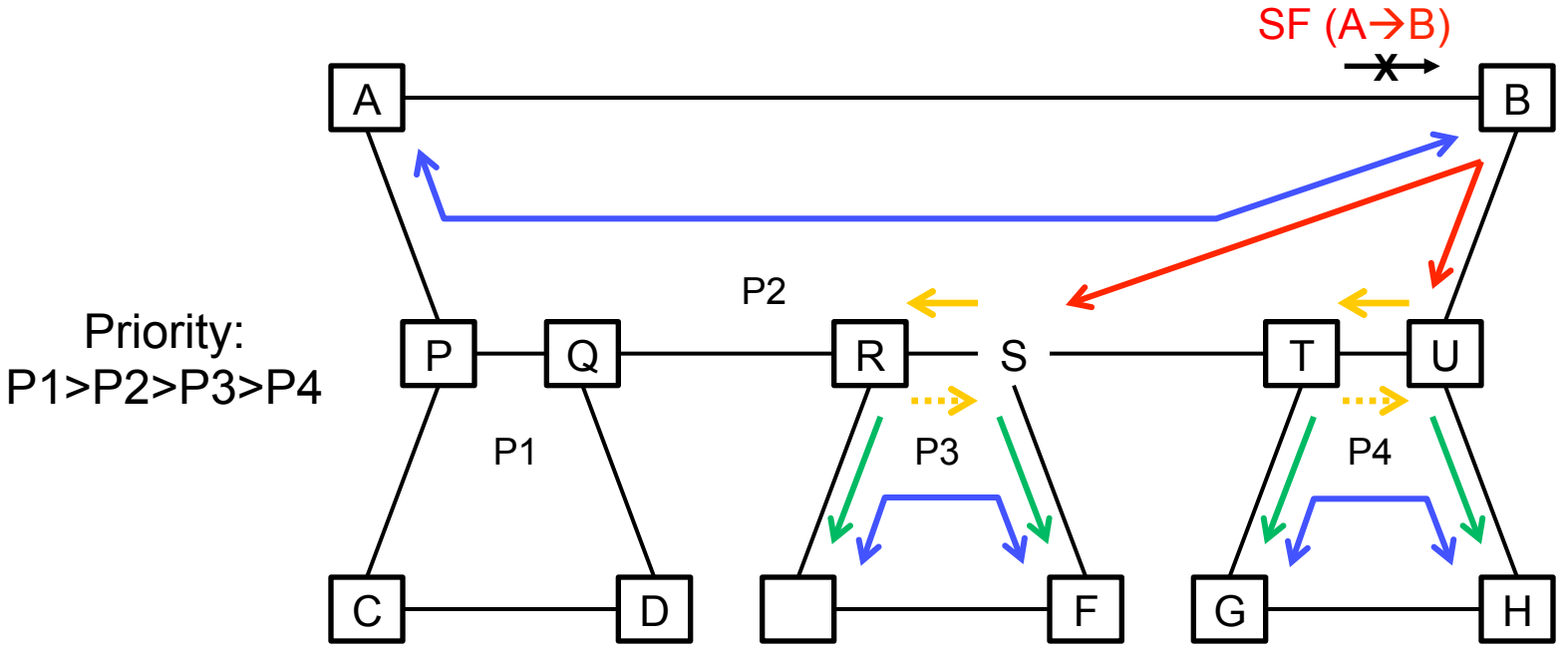
- End node detecting failure initiates protection
  - Informs Protection Switching (PS) Event to SEN
  - Starts linear protection
- SEN coordinates use of shared resource
  - Informs Resource Allocation (RA) Notification to SSN
  - Blocks low priority protection LSP and sends Lockout (LO) Request to the corresponding end node (For equal priority, waits for reply from SSN)
- SSN coordinates use of shared resource
  - Blocks equal or low priority protection LSP and sends LO Request (uses Protection ID for tie-break)
  - Replies RA Ack to SEN

Block operation will be added in version 05.

Protocol Messages

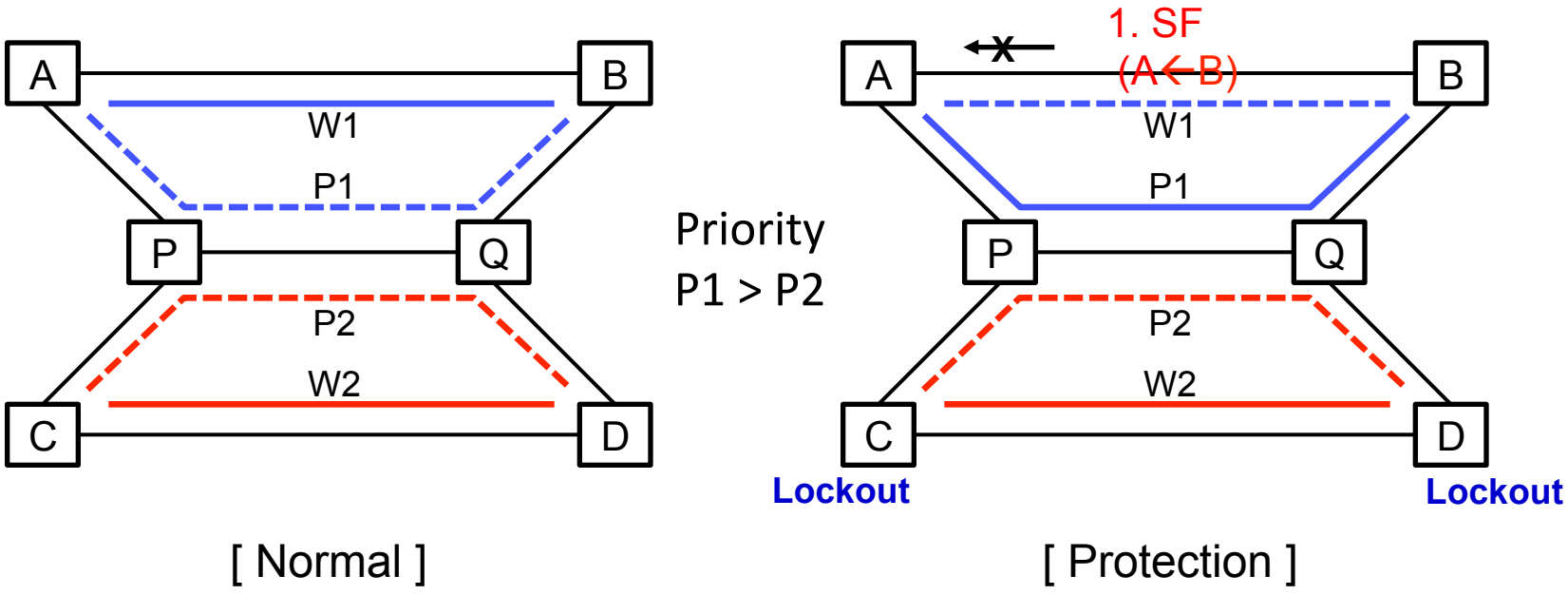
- Blue: Linear protection protocol messages
- Red: PS Event (EN → SEN's)
- Orange (solid): RA Notification (SEN → SSN)
- Orange (dotted): RA Ack (SSN → SEN)
- Green: LO Request (SEN/SSN → EN)

Define another message to unblock:
LO Ack (EN → SEN/SSN)



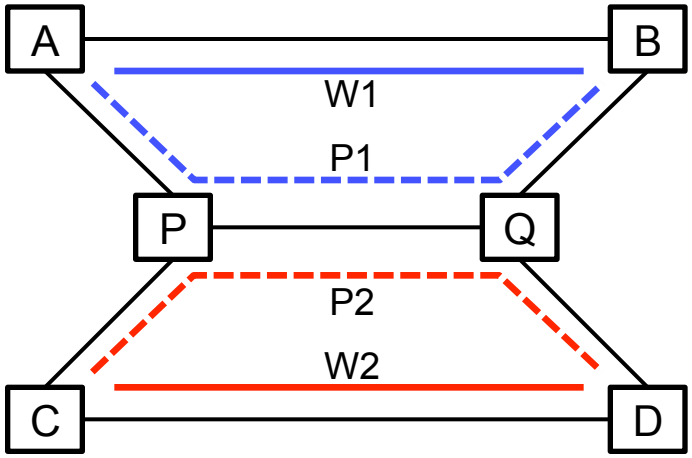
Example 1 (SF at high priority LSP)

- Procedures
  - A detects SF, sends PS Event to P and starts linear protection.
  - P blocks P2, sends LO Request to C and RA Notification to Q.
  - Q blocks P2 and sends LO Request to D (and replies RA Ack to P).
  - C and D go to Lockout state.



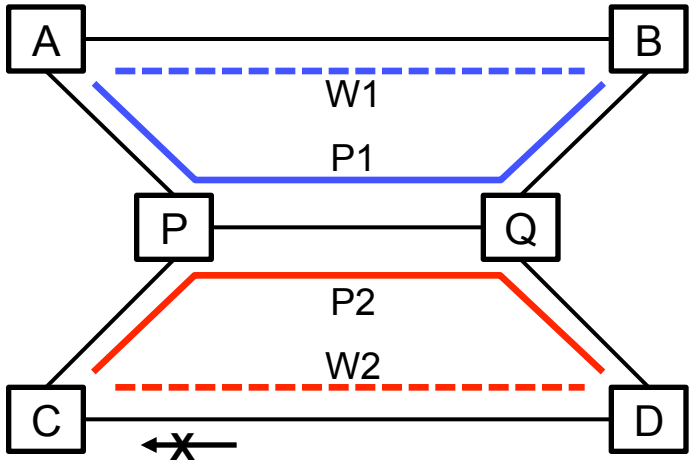
Example 2 (SF at low priority LSP)

- C detects SF, sends PS Event to P and starts linear protection.
- P does nothing.



[Normal]

Priority
P1 > P2

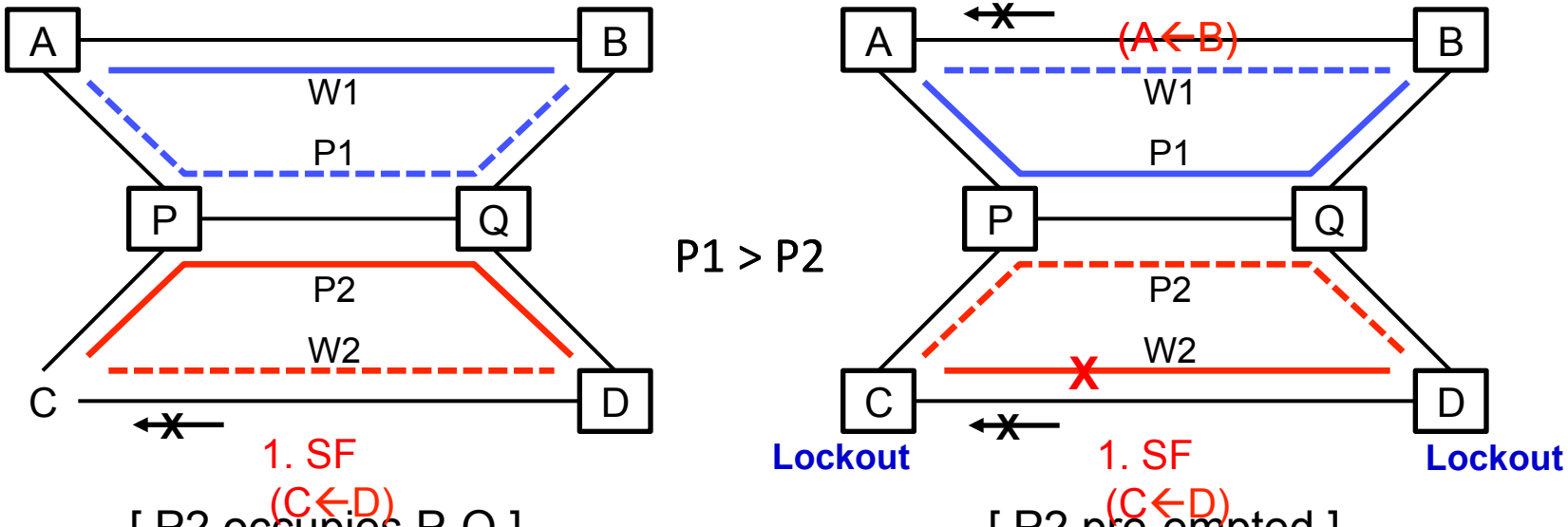


(C←D)

[Protection]

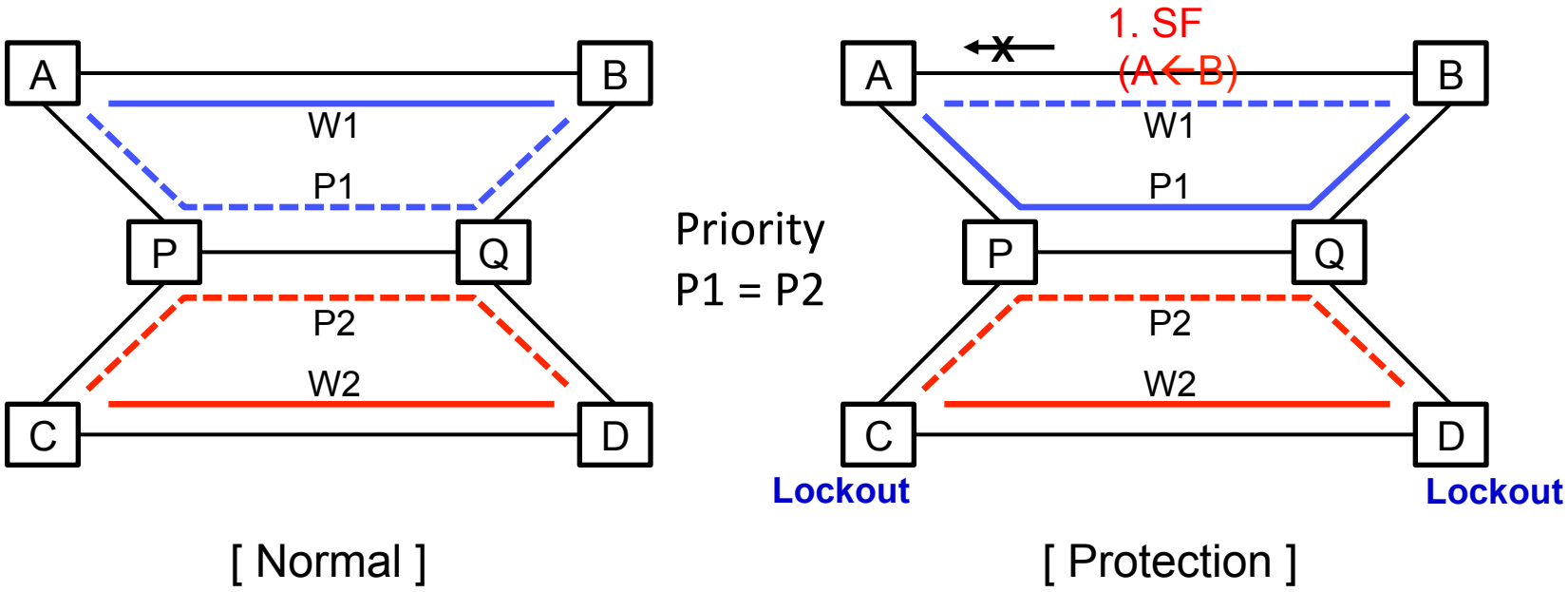
Example 3 (Pre-emption)

- A detects SF, sends PS Event to P and starts linear protection.
- P blocks P2, sends LO Request to C and RA Notification to Q.
- Q blocks P2, sends LO Request to D (and replies RA Ack to P).
- C and D go to Lockout state. (return to the failed W2)



Example 4 (Equal priority)

- Procedures (First come, first served)
  - Q blocks P2, sends LO Request to D
  - P blocks P2 and sends LO Request to C, and replies RA Ack to P.
  - C and D go to Lockout state.



Example 5 (Race condition)

- B detects SF, sends PS Event to Q and starts linear protection.
- C detects SF, sends PS Event to P and starts linear protection.
- Q and P sends RA Notification to each other and wait for reply.
- P blocks P2, sends LO Request to C and replies RA Ack to Q.
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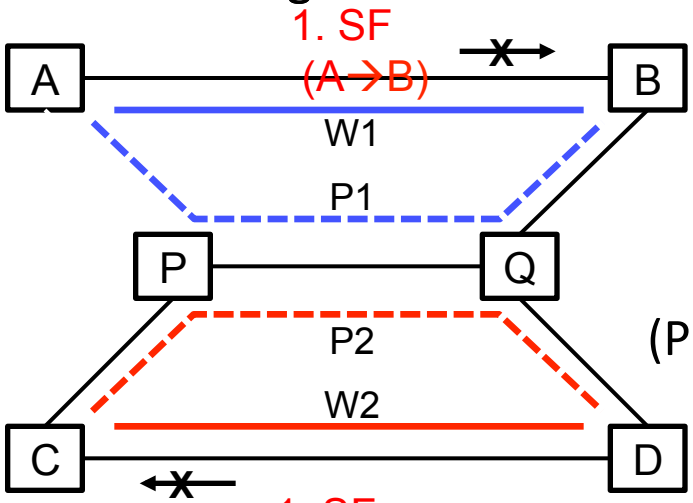
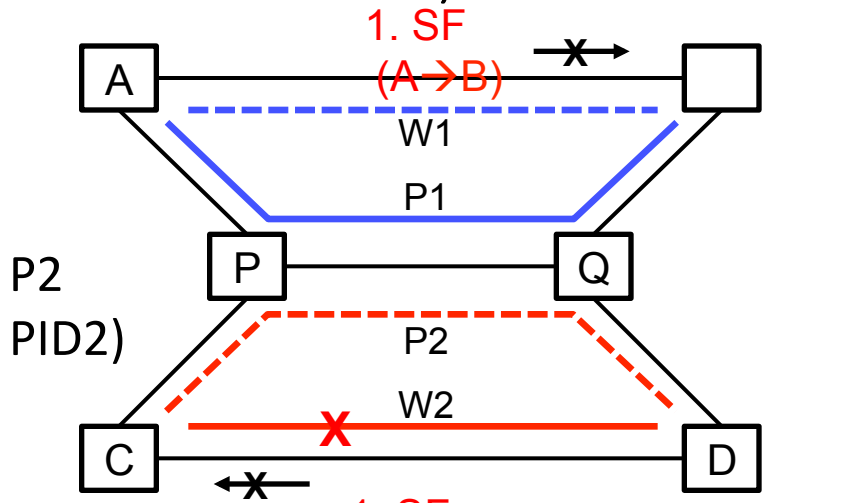
- C and D go to Lockout state. (return to the failed W2)



[Simultaneous Failures]

P1 = P2
(PID1 > PID2)



[P2 pre-empted]