Requirements for 802.1Qay protection switching

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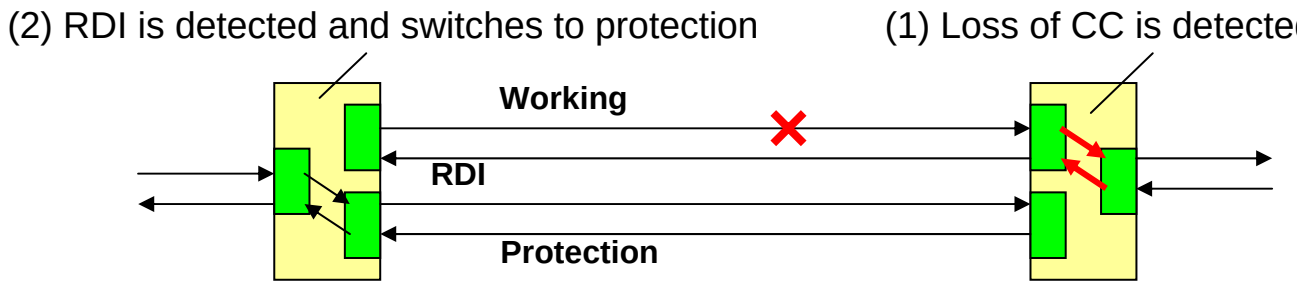
Requirements to PBB-TE protection switching

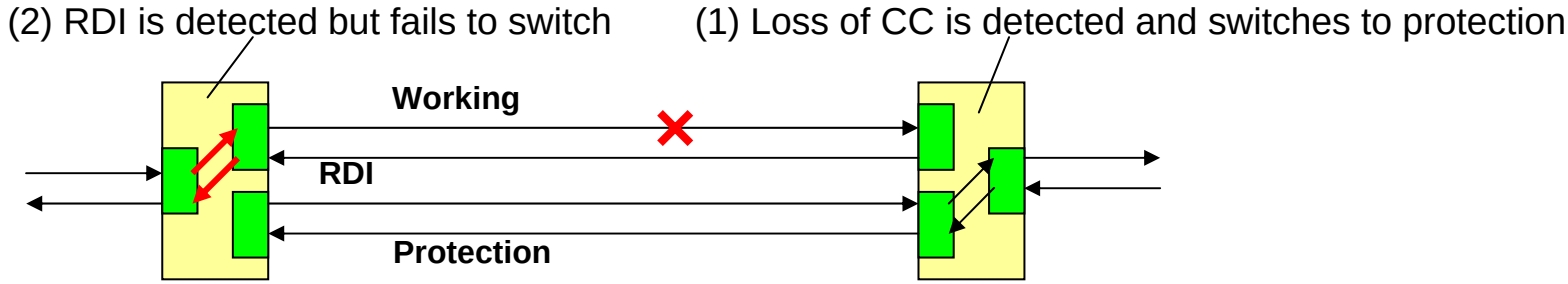
- Requirements identified by ITU-T Rec. G.8031 include the followings:
  - *A mismatch between the bridge/selector positions of the near end and the far end should be detected.*
    - *The bridge/selector mismatch for the local network element should be detected and reported.*
    - *The bridge/selector mismatch should be cleared by a network operator.*
  - *Operator requests such as lockout of protection, forced switch and manual switch commands should be supported.*
  - *Prioritized protection between Signal Fail (SF) and operator requests should be supported.*
- In addition, applicability to NNI/multi-domain case (lines between carriers/providers) can also be a basic requirement.

Mismatch of bridge/selector positions of near end and far end (1)

- Mismatch can happen when:
  - The near end fails to switch over but it sends RDI to the far end due to a hardware malfunction
  - The near end detects a defect and switch but the far end fails to switch even it receives RDI



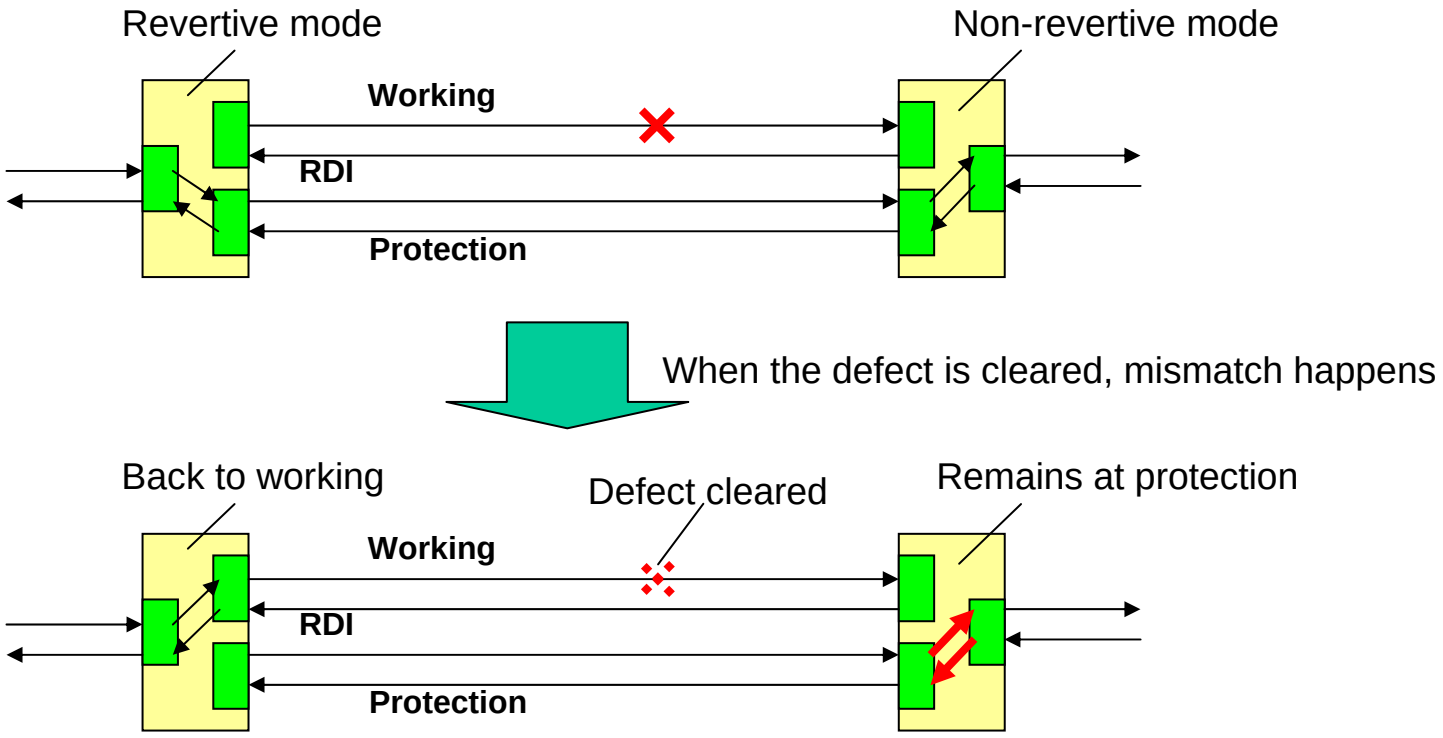
Case A: Switching failure at the near end



Case B: Switching failure at the far end

Mismatch of bridge/selector positions of near end and far end (2)

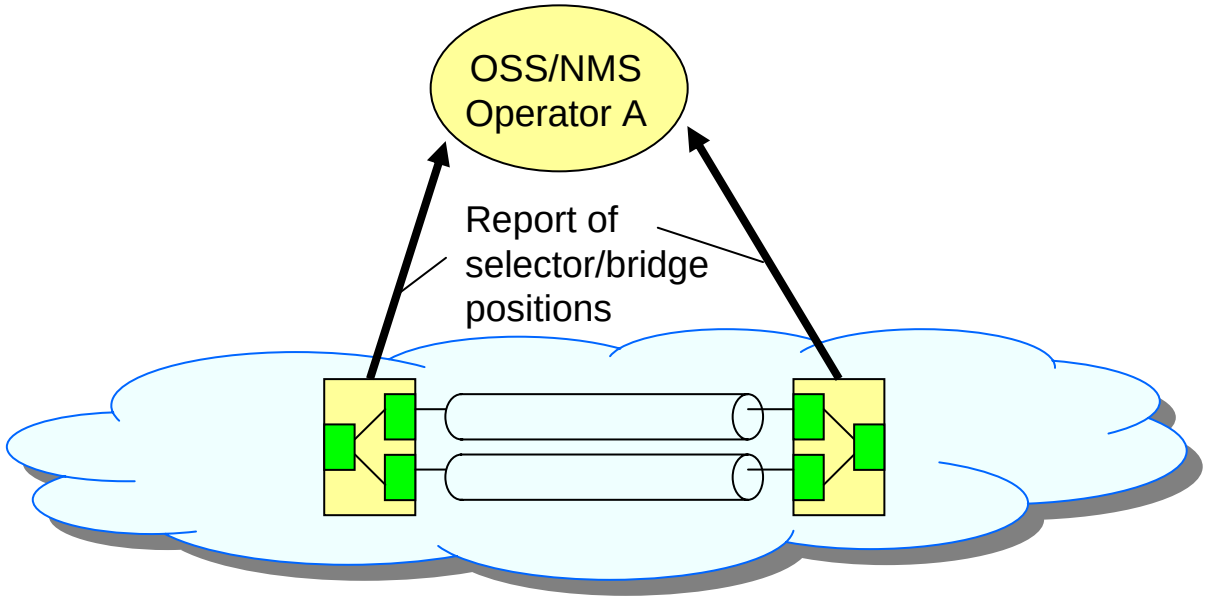
- Mismatch can also happen when the near end is set up in revertive mode and the far end is set up in non-revertive mode by mistake.



Mismatch due to a mistake in configuration of revertive/non-revertive mode

Detection of mismatch (single domain case)

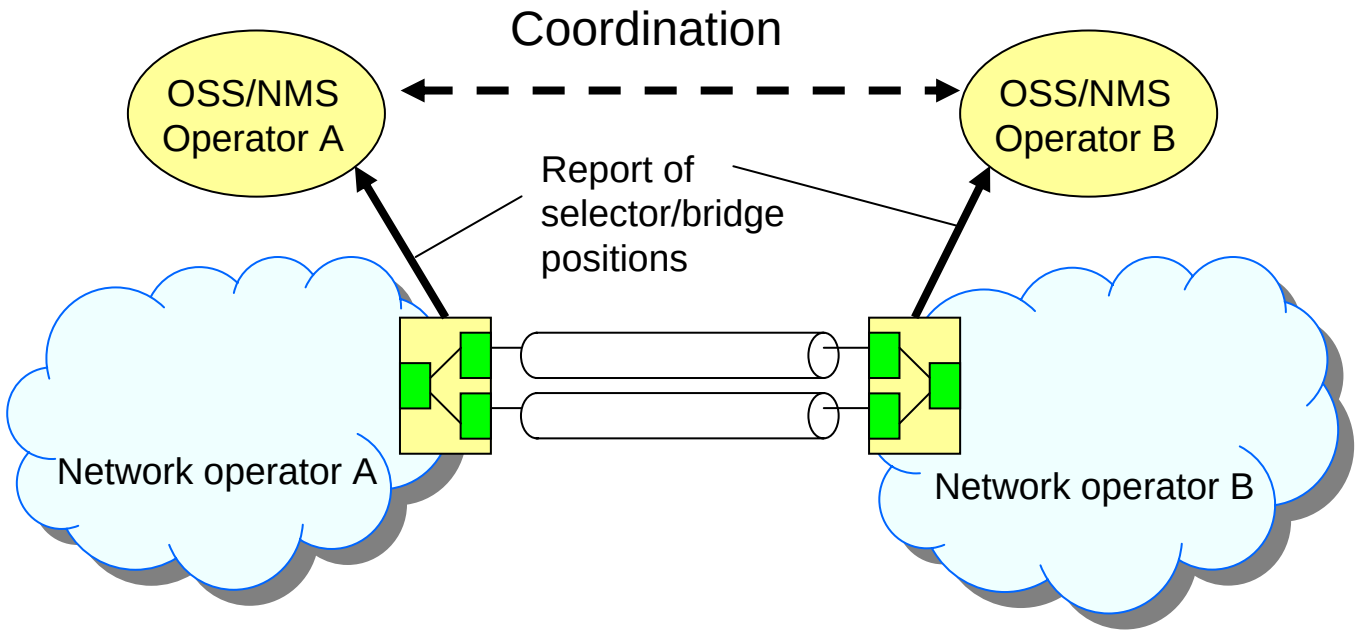
- APS can detect a selector/bridge position mismatch because it exchanges the selector/bridge positions between the near end and the far end.
- Without APS, OSS/NMS could compare the selector/bridge positions and detect a mismatch.
- These solutions (with or without APS) are different methods to solve one problem. OSS/NMS solution may not be simpler or more cost effective.



Detection of mismatch by OSS/NMS (without APS, single domain)

Detection of mismatch (multi domain case)

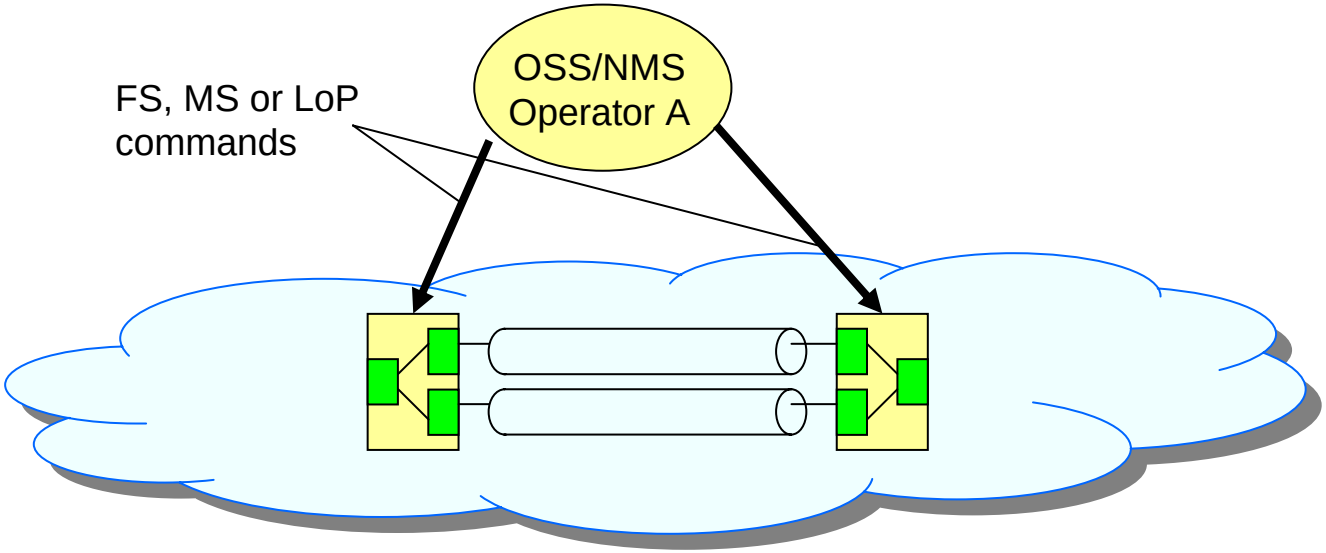
- In the multi domain case, OSS/NMSs at the near end and at the far end need to be coordinated to detect the mismatch. In this case, OSS/NMS solution (i.e. without APS) may be more complex.



Detection of mismatch by OSS/NMS (without APS, multi domain)

Operator commands without APS (single domain case)

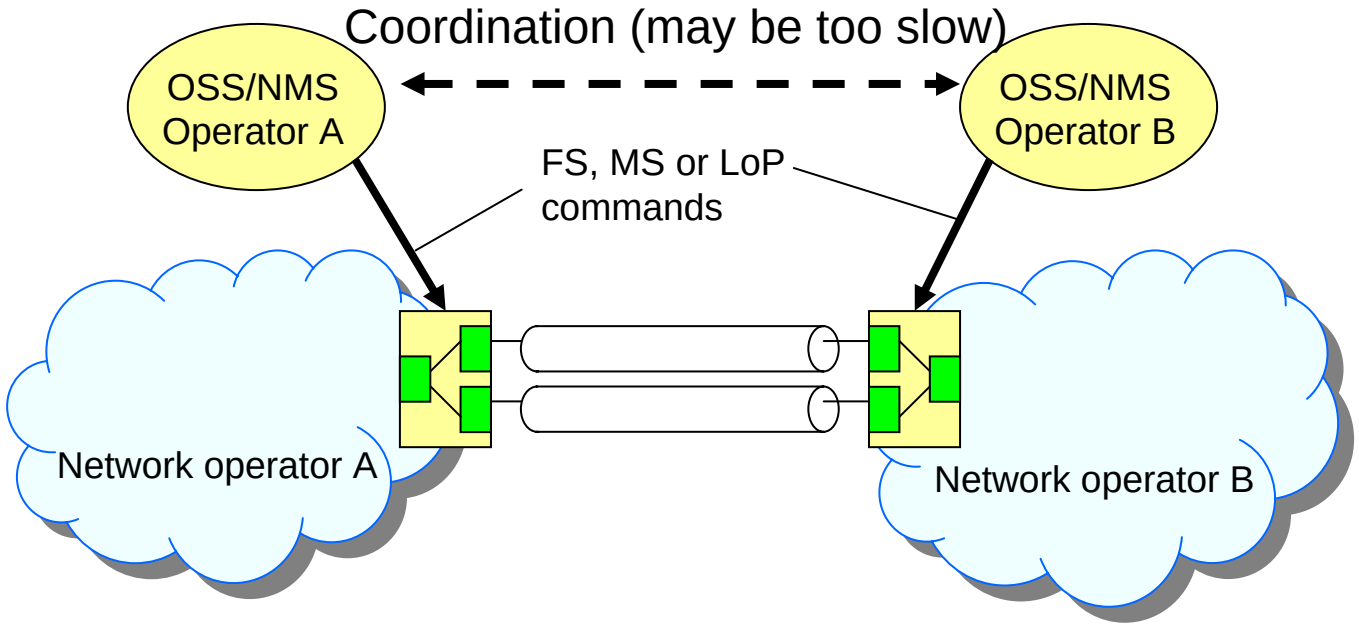
- Without the APS, OSS/NMS could instruct both ends to switch for administrative commands (manual switch, forced switch or lockout).
- OSS/NMS needs to handle several abnormal situations (e.g., one end fails to switch due to some hardware errors). It may not be simpler or more cost effective than the APS solution.
- It should be noted that the OSS/NMS may be too slow to synchronize the both ends and thus it may not be acceptable (e.g., interruption time may be too long when MS or FS is conducted).



Administrative commands by OSS/NMS (without APS, single domain)

Operator commands without APS (multi domain case)

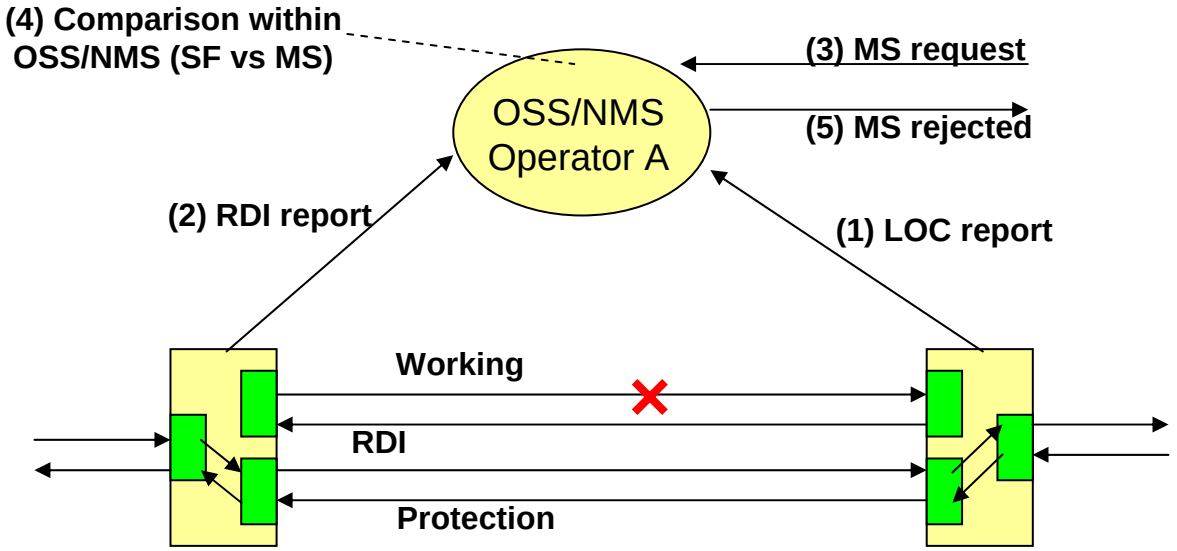
- Without an APS, coordination between two OSS/NMSs is necessary to synchronize both ends for manual switch, forced switch or lockout.
- OSS/NMS solution may be even slower to synchronize the both ends and thus it may not be acceptable (e.g., interruption time may be too long when MS or FS is conducted).



Administrative commands by OSS/NMS (without APS, multi domain)

Contention between operator commands and defect status (single domain case)

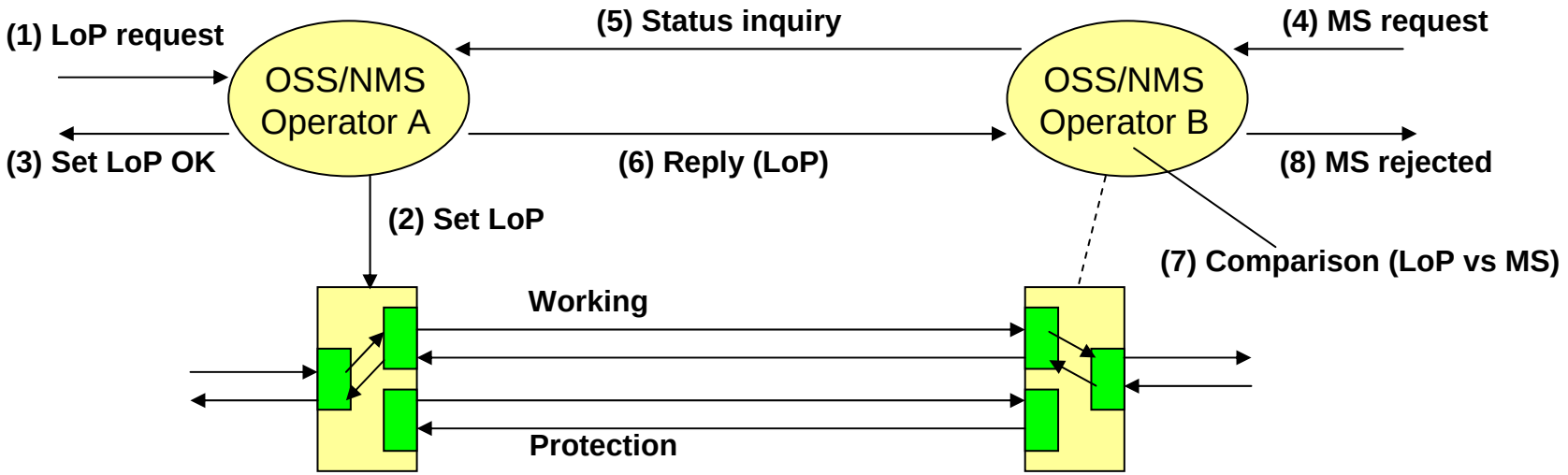
- If there is a contention between operator commands (MS, FS or LoP) and local/remote request/defect status, the one with the highest priority should be selected.
- Contention can be addressed in the bridges at both ends with the APS protocol or by comparison within the OSS/NMS.
- OSS/NMS could handle administrative commands taking care of the priorities as the APS does but it is equivalent to using APS. OSS/NMS needs to handle several abnormal situations (e.g., one end fails to switch due to some hardware errors when an MS command has been issued). It may not be simpler or more cost effective than the APS solution.



Contention handling by OSS/NMS (without APS, single domain)

Contention between operator commands and defect status (multi domain case)

- In this case, coordination between OSSes/NMSes is necessary for priority comparison to resolve contention without the APS.
- OSS/NMS solution (i.e., without APS) needs to conduct APS-like priority comparison. This solution may be more complex since two OSSes/NMSes under different operator's control need to communicate/coordinate.



Contention handling by OSS/NMS (without APS, multi domain)

Summary and proposals (1)

- For the single domain case (i.e., both ends are under the control of the same OSS/NMS), requirements listed in this presentation can be met with or without APS.
- OSS/NMS solution (i.e., solution without APS) needs to conduct APS-like process within the OSS/NMS. It may not be simpler or may not be more cost effective. It is an alternative solution.
- It should be noted that OSS/NMS solution may be too slow for protection switching activities and thus it may not be acceptable (e.g., interruption time due to MS or FS can be too long).
- For the multi-domain case, solution without APS requires coordination between OSS/NMS at both ends. It may be difficult (e.g. from the security viewpoint) because these OSSes/NMSes belong to different carriers.

Summary and proposals (2)

- Even if the current scope of 802.1Qay is limited to single domain case only, it is envisaged that the expansion to multi domain case be required in the near future. As such, the solution used by 802.1Qay should be future proof.
- It should be avoided creating/using two (or more) standards to solve one problem because:
  - It confuses the industry
  - It may cause interoperability problems
  - It may increase the implementation cost to cope with two (or more) standards
- One possible way is to use a mechanism which is compatible with (i.e., subset of) G.8031.