Time Sync for Aerospace

Continued…

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Objective

- **Review DP approach to Time Synchronization**
- **Seek input from group**

Time Synchronization Requirements for Aerospace

Lost of discussion on the use of Time Sync for aerospace – particularly around availability and integrity.

See contributions on DP home page.

Objectives for today:

1. Continued validation of the proposed approach by the group
2. AS Clarifications
    1. PTP instances for Bridges
    2. PTP domain and clock identity
3. Example design patterns being considered

Time Synchronization Requirements for Aerospace

Fault Tolerance

Tolerate multiple (typically 2) simultaneous arbitrary faults in end stations, bridges, links, GMs

Under faulty conditions, a correctly operating end station shall maintain the target max time error relative to the correctly operating GM. If unable to maintain the max time error, the correctly operating end station shall detect an erroneous time sync state.

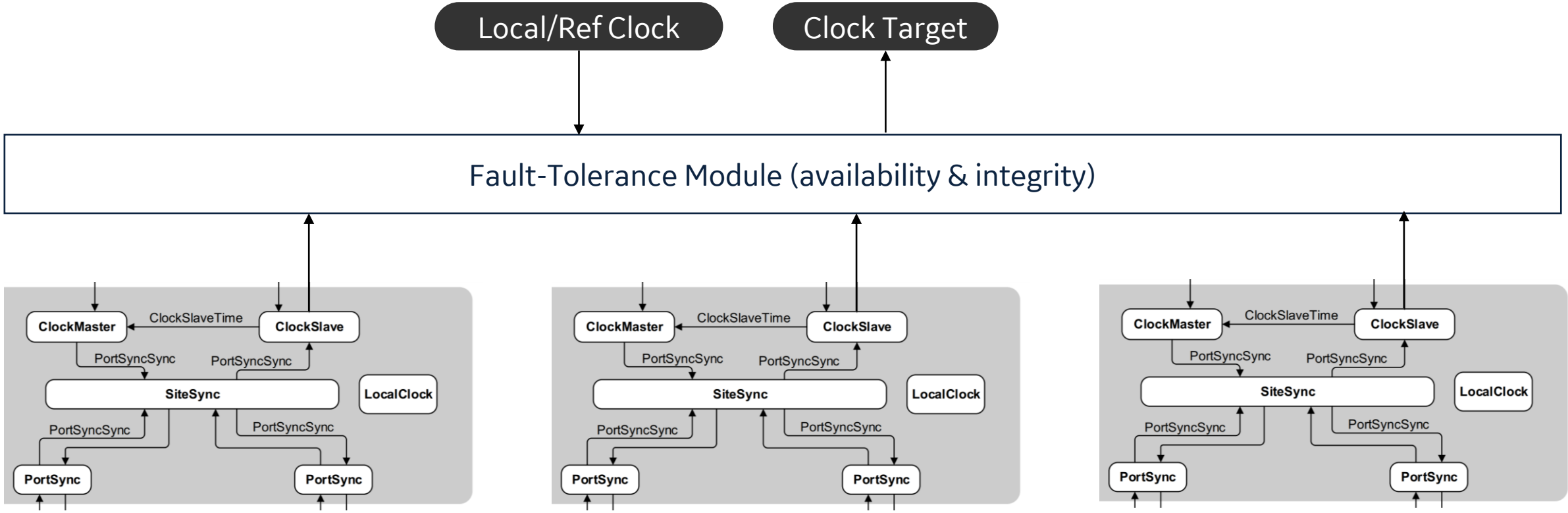
Availability:

- Reception of a time value at a given PTP receiver (instance)
- Deals with loss of SYNC/FOLLOW_UP message due to link, bridge, end station, and GM faults/failures

Integrity:

- Correctness of a time value received at a given PTP receiver (instance)
- Deals with error in the SYNC/FOLLOW_UP message due to arbitrary faults in the link, bridge, end station, and GM

Proposed Solution at End Stations and Bridges



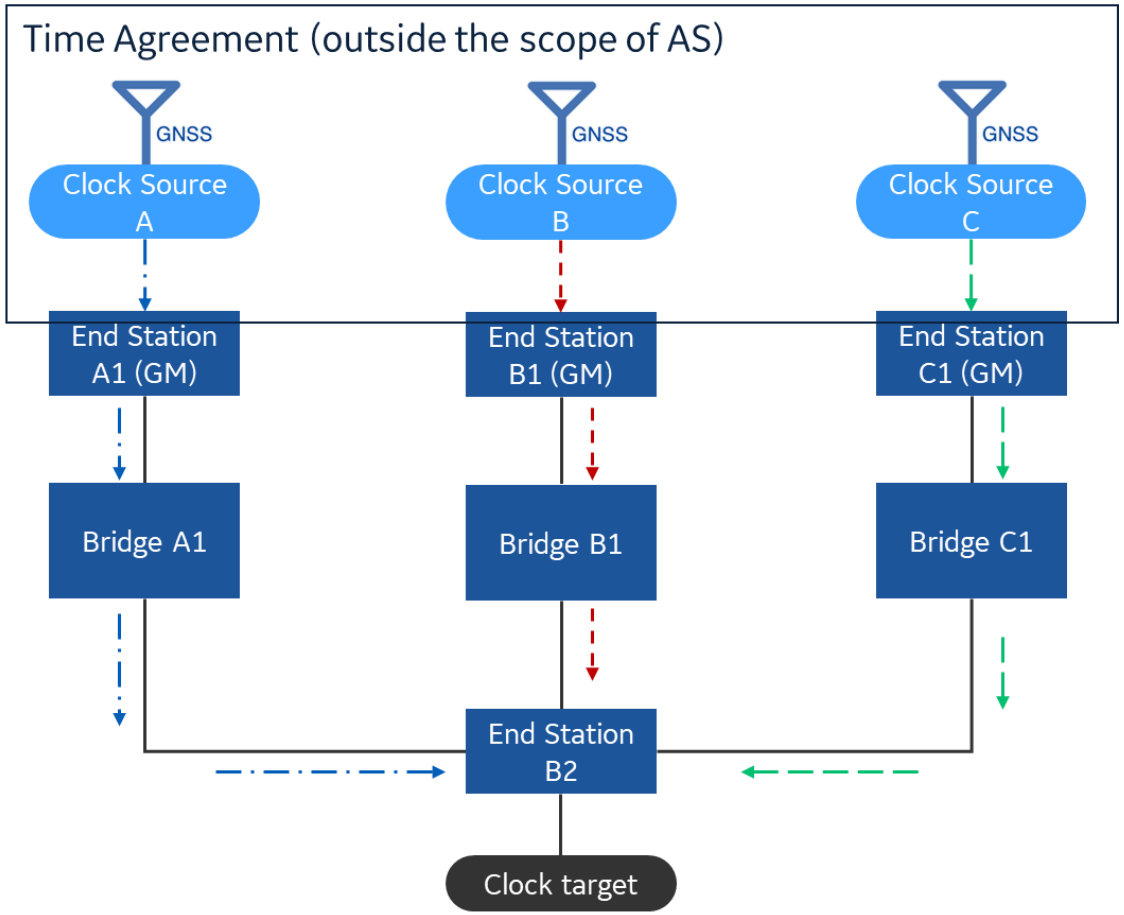
1. Fault-tolerant module as an application function. Defines structure, interfaces, and a default selection algorithm(s). Applies to both end stations and bridges.
2. Devices shall support at least 2 domains and should support 4 domains. A quality local clock may serve as an additional time reference for integrity calculations

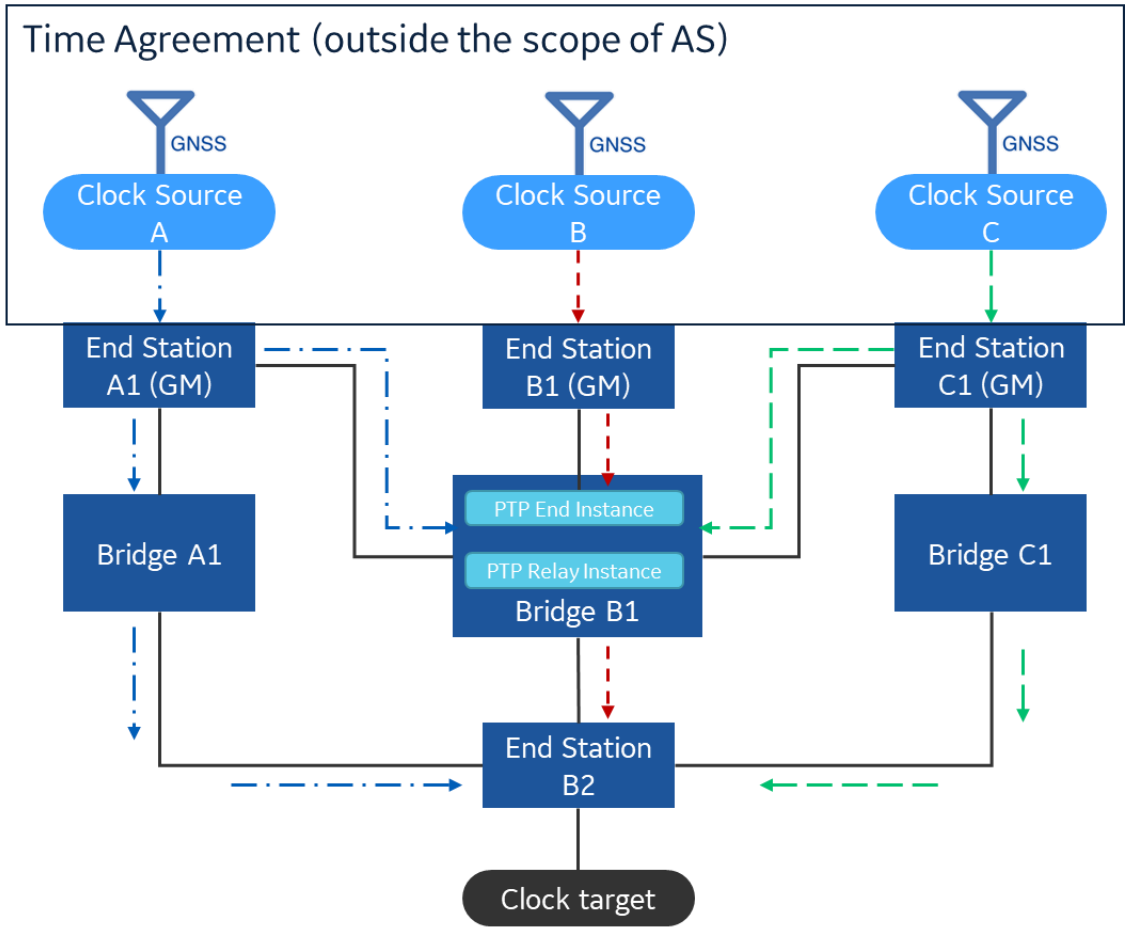
Example Design Patterns

Domain 1 Sync Tree

Domain 2 Sync Tree

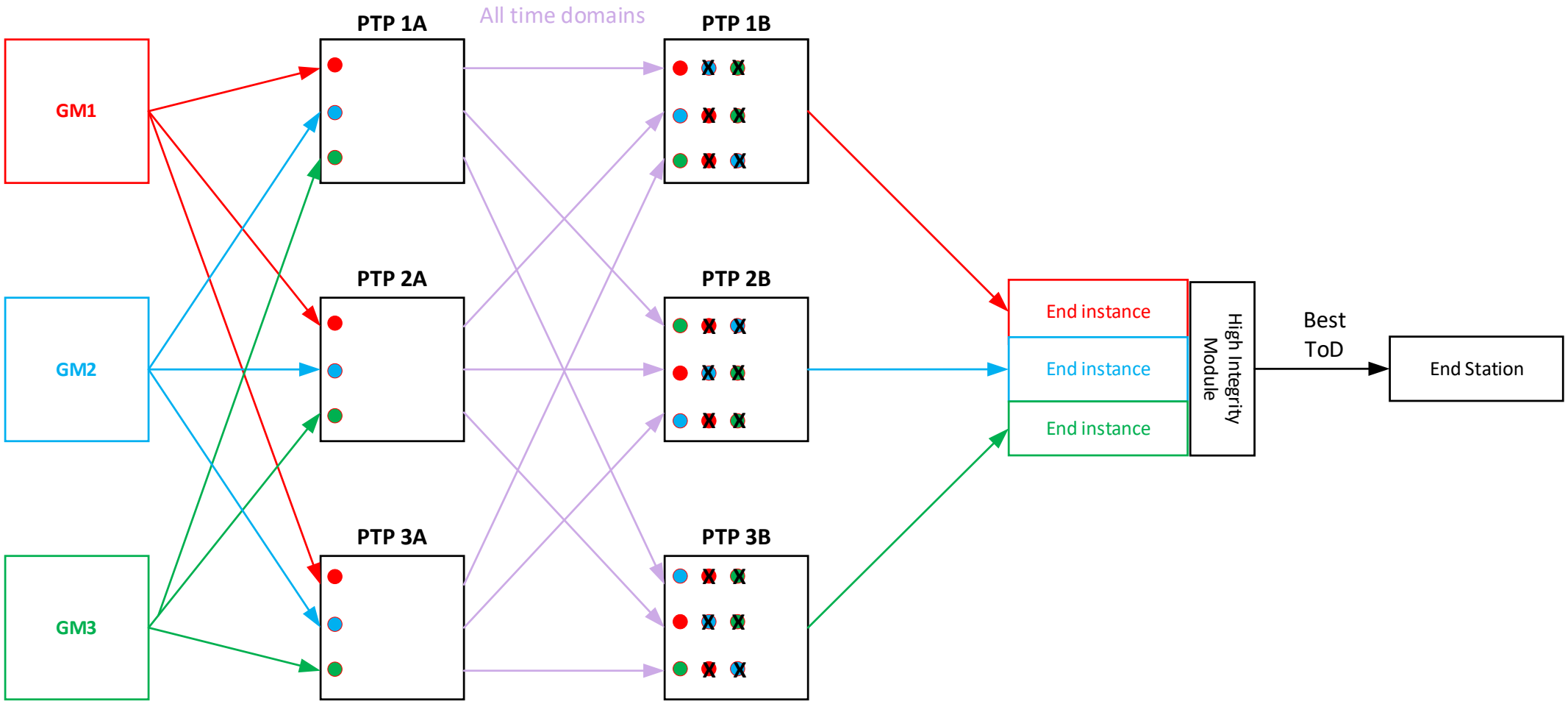
Domain 3 Sync Tree





Question: Do Bridges need PTP end instance to acquire high integrity time sync in order to drive TAS?

Example Design Patterns



Credit: Example produced by Richard Tse

Summary

- Time from one clock source distributed over redundant paths and/or by redundant GMs could improve the availability of time from that source (at receiver devices)
  - *Same idea as hot standy (ASdm), but not limited to only two GMs/domains*
  - *Term for a time aware system with multiple PTP end instances?*

- Time from different clock sources could improve the integrity of time (at receiver devices)

- In aerospace clock source matters - two GMs distributing time from one source is not the same as two GMs distributing time from different sources.

- Aerospace profile is trying to define an application layer fault-tolerant module that would allow users to address high availability, high integrity, or both.

- Comments?