

Time Integrity and Availability Network Path Examples



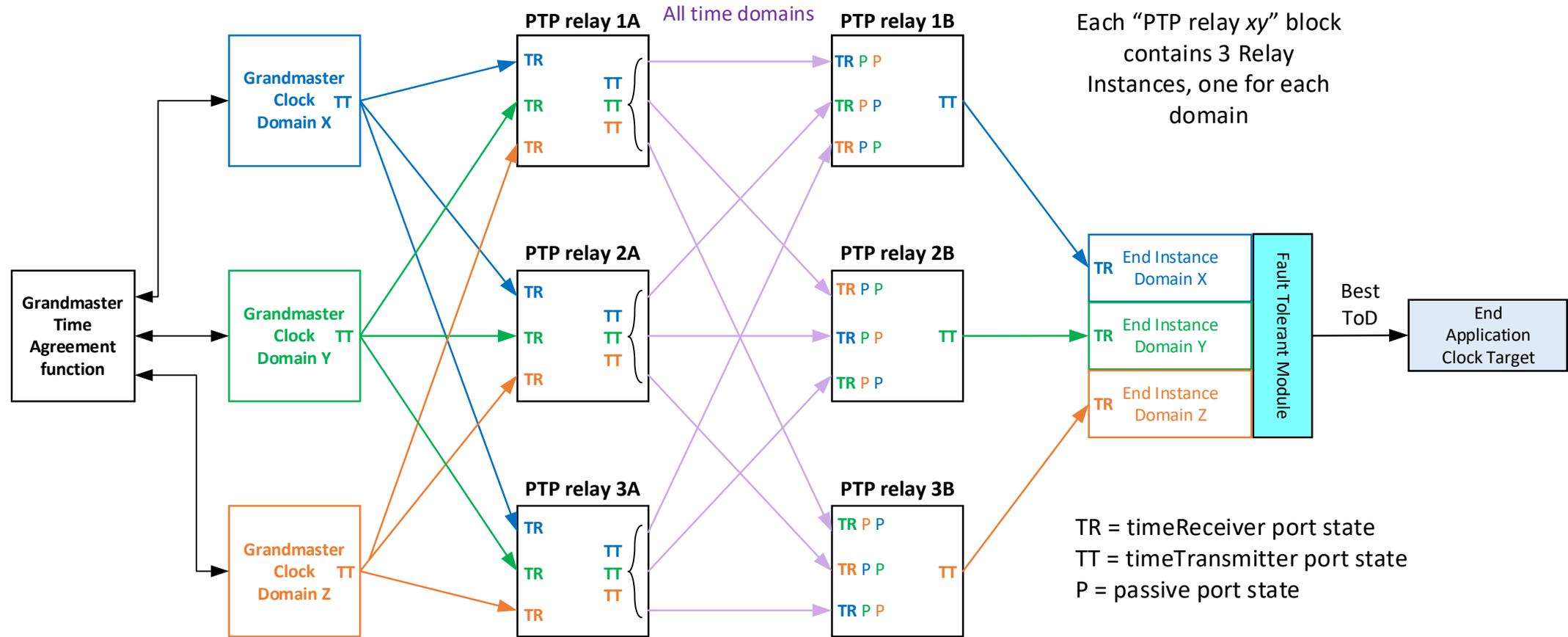
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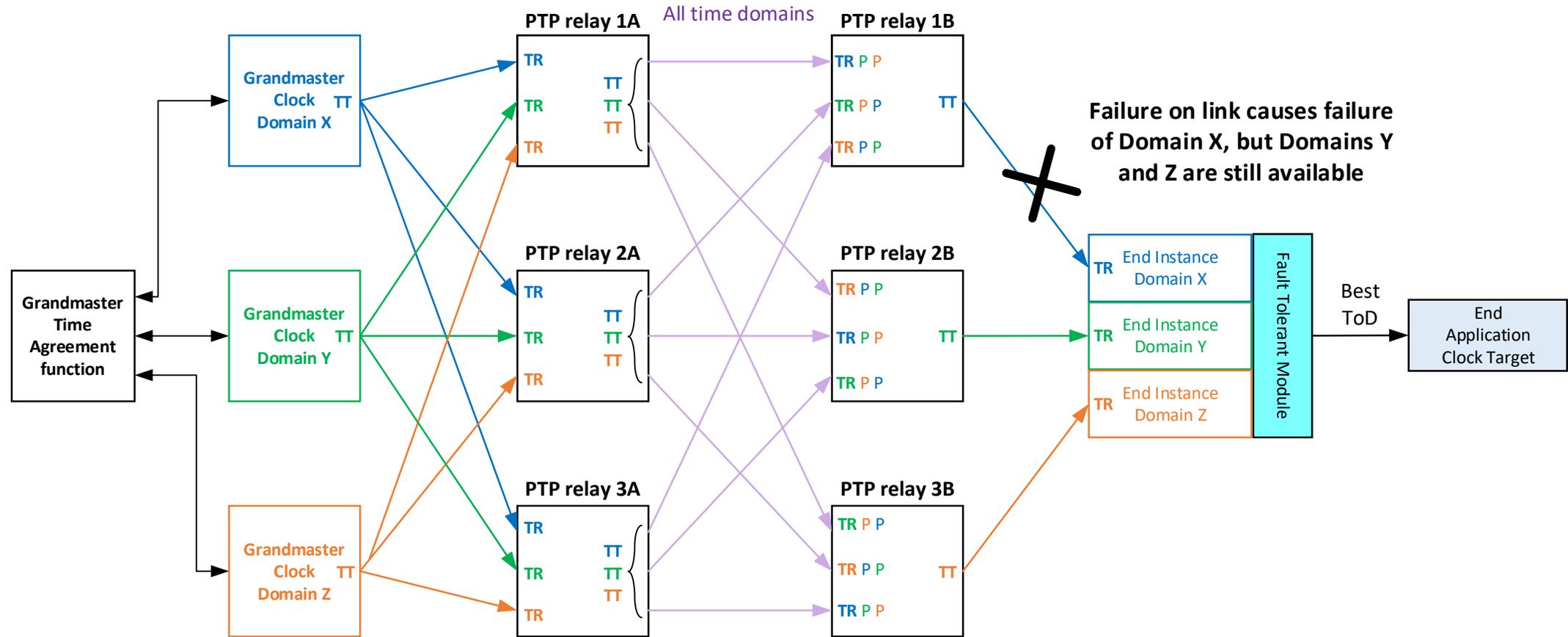
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April 12, 2023

3 Time Domains with Independent Paths



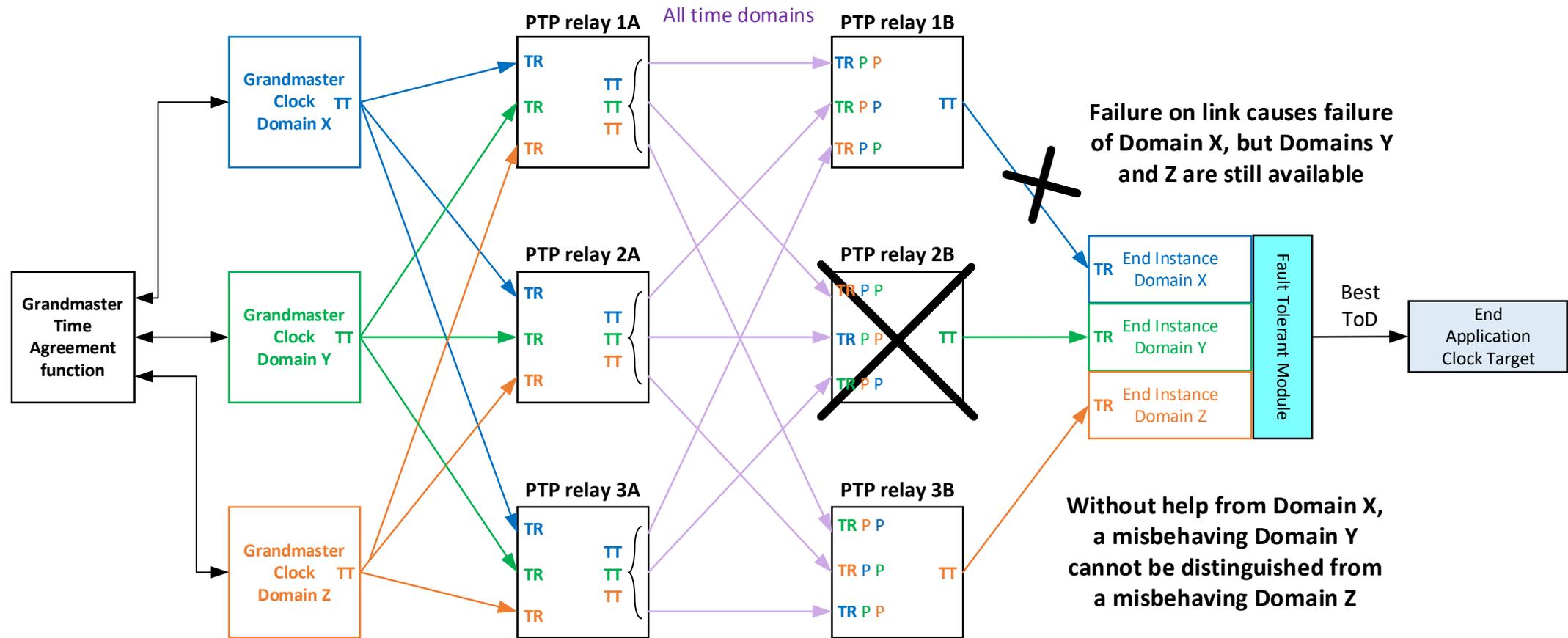
- Every device receives all 3 time domains.
- Different TR port is selected for each time domain, ensuring each time domain comes from a different level device and, thus, providing integrity and availability protection.
- End Station gets time from 3 time domains (via 3 End Instances), which are processed by a Fault Tolerant Module

3 Time Domains, Independent Paths, 1 Failure



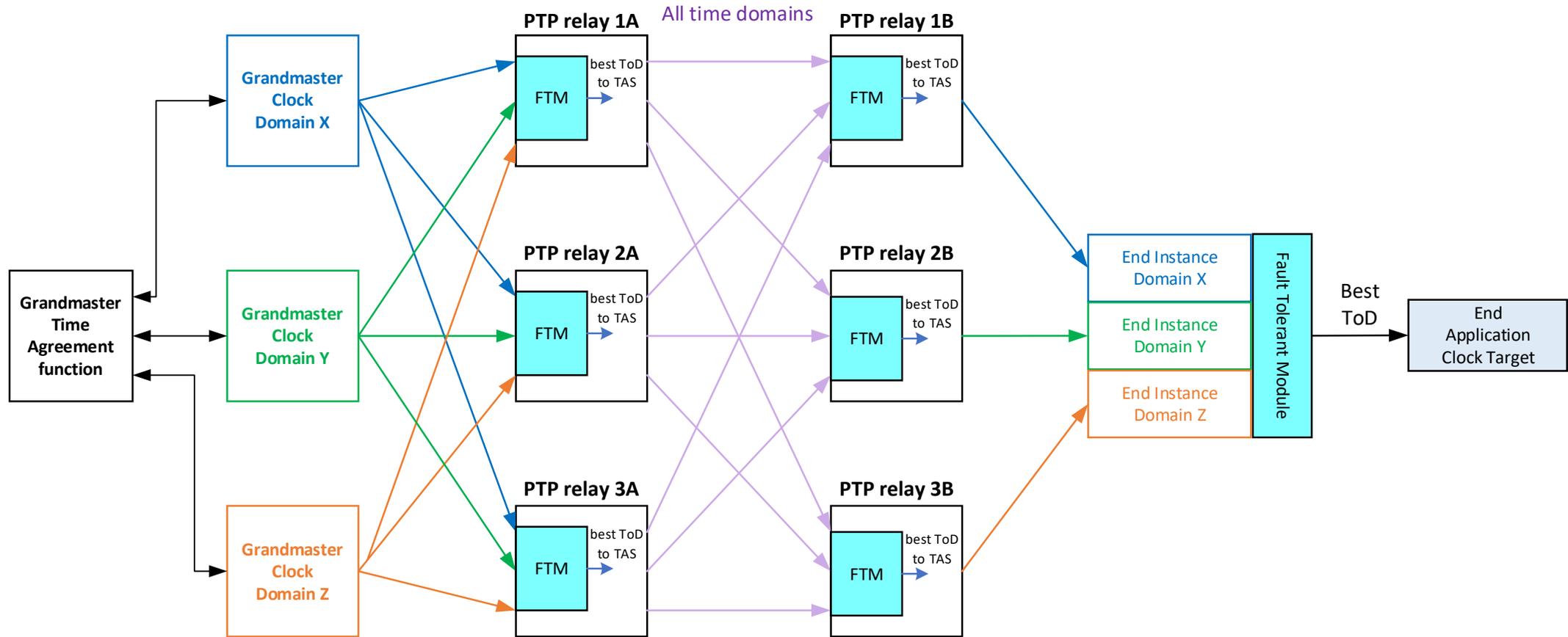
- End Application is “fail operational” (i.e., can still operate properly after 1 failure)

3 Time Domains, Independent Paths, 2 Failures



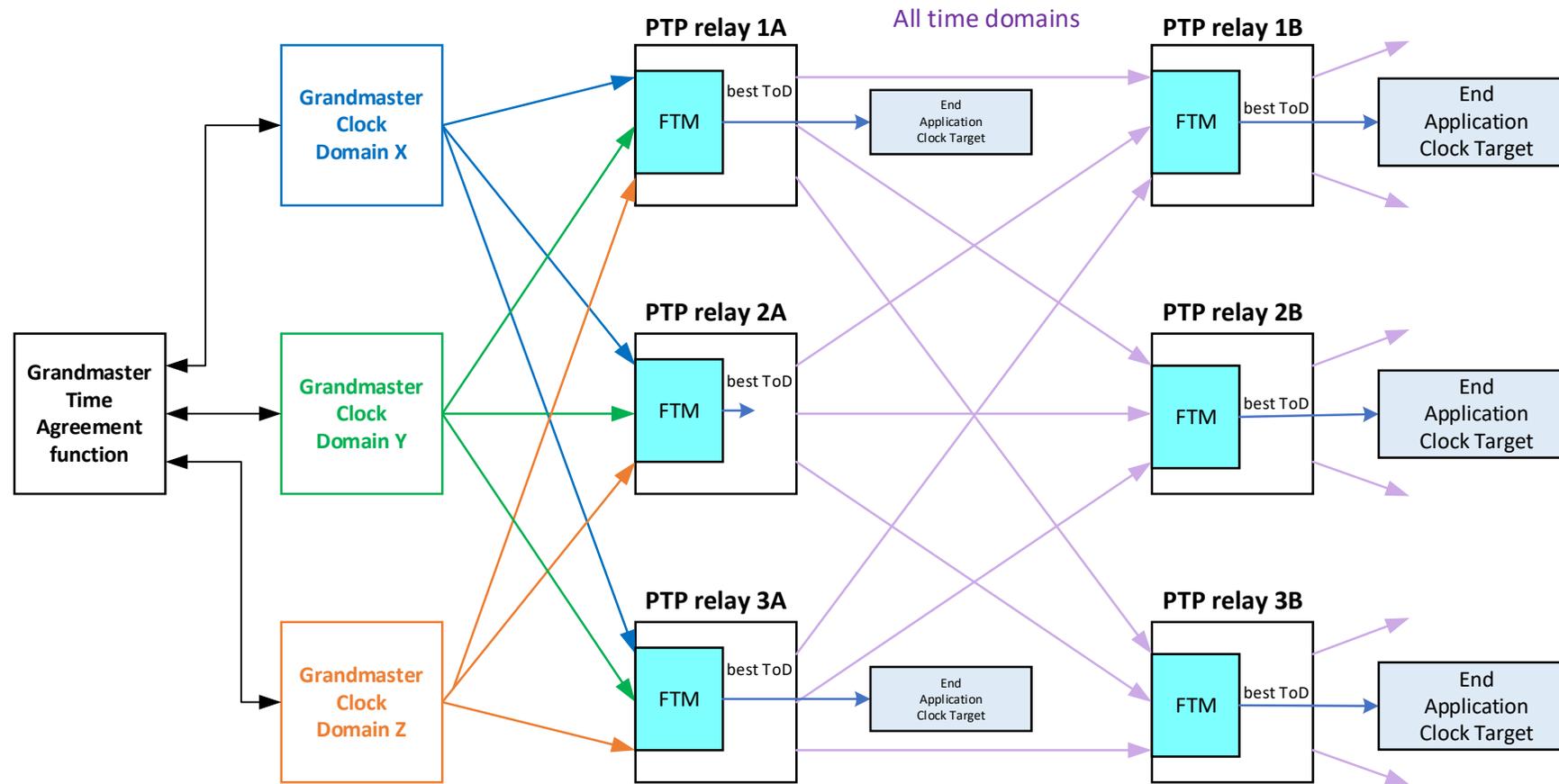
- After one failure, this End Application is “fail stop” (i.e., another failure can be detected, but cannot be overcome)

Fault Tolerant Module in Relay Instances



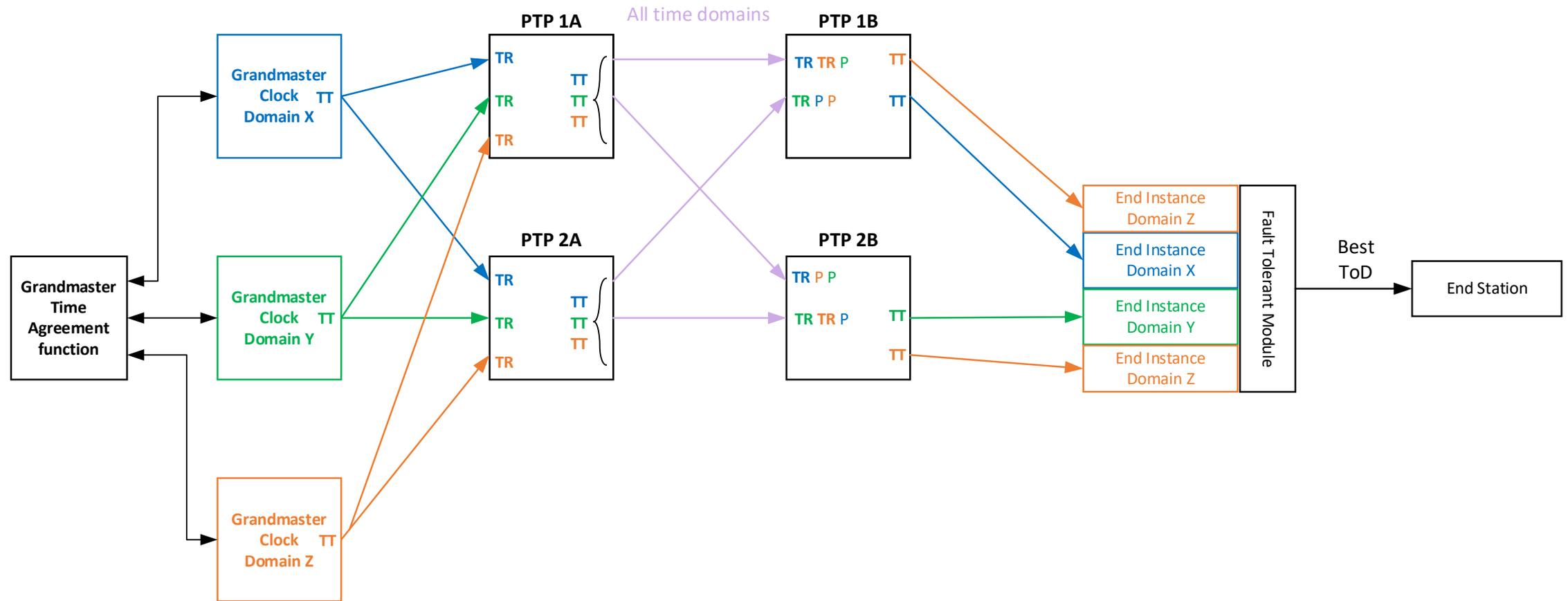
- Relay Instances need to recover the ToD for their Time Aware Shapers
- FTM is also present in Relay Instances to protect the ToD used by their Time Aware Shapers

End Applications Attached to Relay Instances



- FTM of Relay Instance provides the same integrity and availability protection that it did for End Instances of earlier examples
- End Applications can attach to FTM of Relay Instances

3 Time Domains, Dependent Paths



- Independent paths not available for all 3 time domains
- Additional End Instance could be used to add back some degree of fault protection
 - Enhances availability (2 instances) *and* integrity (independent network paths) for Domain Z



Thank You