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5.1.11 Hot standby redundancy for time synchronization

(add at the end of the Clause 5.1.11)

Two domains shall be used to implement the hot standby redundancy for the "Working Clock", and this mechanisms shall provide strictly linear increasing monotonic time (no time jumps, no frequency steps) in case of device or link failures.

For the "Global time" - one domain is sufficient – no redundancy is needed.

5.1.11.1 Overview

(add at the beginning of the Clause 5.1.11.1)

Two domains are used for the Working clock, whereas the one domain is configured as a Primary Domain (PD – e.g., Domain A), and the other domain is configured as Secondary Domain (SD - e.g., Domain B)

Each domain has one active GM, and at least two devices with GM capability. BMCA within one domain can select the GM within the respective domain.

GM in the Primary Domain is denoted as PD-GM, and GM in the Secondary Domain is denoted as SD-GM. No device may act as a GM in multiple time domains (i.e. only one PTP instance in a device can act as a GM capable)

GM in the Secondary Domain (SD-GM) synchronizes to the GM in the Primary Domain (PD-GM).

Slaves in both domains use both time domains to synchronize its working clock, by using an averaging algorithm based on the clock correction from primary and Secondary Domain.

Following Roles are possible:

- PD-GM: Primary Domain GM
- SD-GM: Secondary Domain GM
- Slave – in any domain (with or without GM capability)

In case that PD-GM fails:
- in meantime the SD-GM is free running
- slaves from both domains are synchronizing to the clock from Secondary Domain
- BMCA is used to select the new GM in Primary Domain - (becoming the PD-GM)
- Once the new PD-GM gets elected:
  - slaves are synchronizing to both domains
  - SD-GM synchronizes to the new PD-GM

In case of "old" PD-GM re-integrates
- It will change the role to slave

In case that SD-GM fails:
- slaves from both domains are synchronizing to the clock from Primary Domain
- the BMCA is used to select the new GM within Secondary Domain
- Once the new SD-GM gets elected:
  - slaves are synchronizing to both domains

- SD-GM synchronizes to the new PD-GM

5.1.11.4.1.1

(replace this clause with the following)

State of the 60802_System for this hot standby depend on the Role of the device.

The variable is an enumeration that takes one of the following values for a **Slave**:
- *INIT*: Initialization after the 60802_System powers on and is enabled. In this state, the system is waiting for PTP Instances to synchronize and the role of the devices is defined.
- *REDUNDANT_SYNC*: Slave PTP Instances are synchronized to both domains. Time synchronization continues to meet the requirements of IEC/IEEE 60802. Time synchronization is redundant.
- SINGLE_SYNC: Slave PTP Instance are synchronized to one active GM (the GM in the other domain is not active). Time synchronization continues to meet the requirements of IEC/IEEE 60802. Time synchronization is not redundant.
- FREE_RUNNING: Slaves are not synchronized to none of the domains. The 60802_System is adjusting phase/frequency of its local time using the data stored in REDUNDANT_SYNC or SINGLE_SYNC state, but that local time will eventually drift relative to other time-aware systems. During FREE_RUNNING state, time synchronization might not meet the requirements of IEC/IEEE 60802

The variable is an enumeration that takes one of the following values for a **SD-GM**:
- INIT: Initialization after the 60802_System powers on and is enabled. In this state, the system is waiting for PTP Instances to synchronize and the role of the devices is defined.
- SINGLE_SYNC: SD-GM Instance is synchronized to the PD-GM. Time synchronization continues to meet the requirements of IEC/IEEE 60802. Time synchronization is redundant.
- *FREE_RUNNING*: SD-GM Instance is not synchronized to the PD-GM. Time synchronization continues to meet the requirements of IEC/IEEE 60802. Time synchronization is not redundant.

The variable is an enumeration that takes one of the following values for a **PD-GM**:
- INIT: Initialization after the 60802_System powers on and is enabled. In this state, the system is waiting for PTP Instances to synchronize and the role of the devices is defined.
- *FREE_RUNNING*: PD-GM Instance is operational and free running. SD-GM can be synchronized to the PD_GM, and slaves can be synchronized to both domains.