802.1ASdm
Hot Standby Split function

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IEEE 802.1 TSN

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Agenda

- Review concept of split function presented by Rodney Cummings
- Review current 802.1ASdm solution
- Present a proposed solution to address the split function

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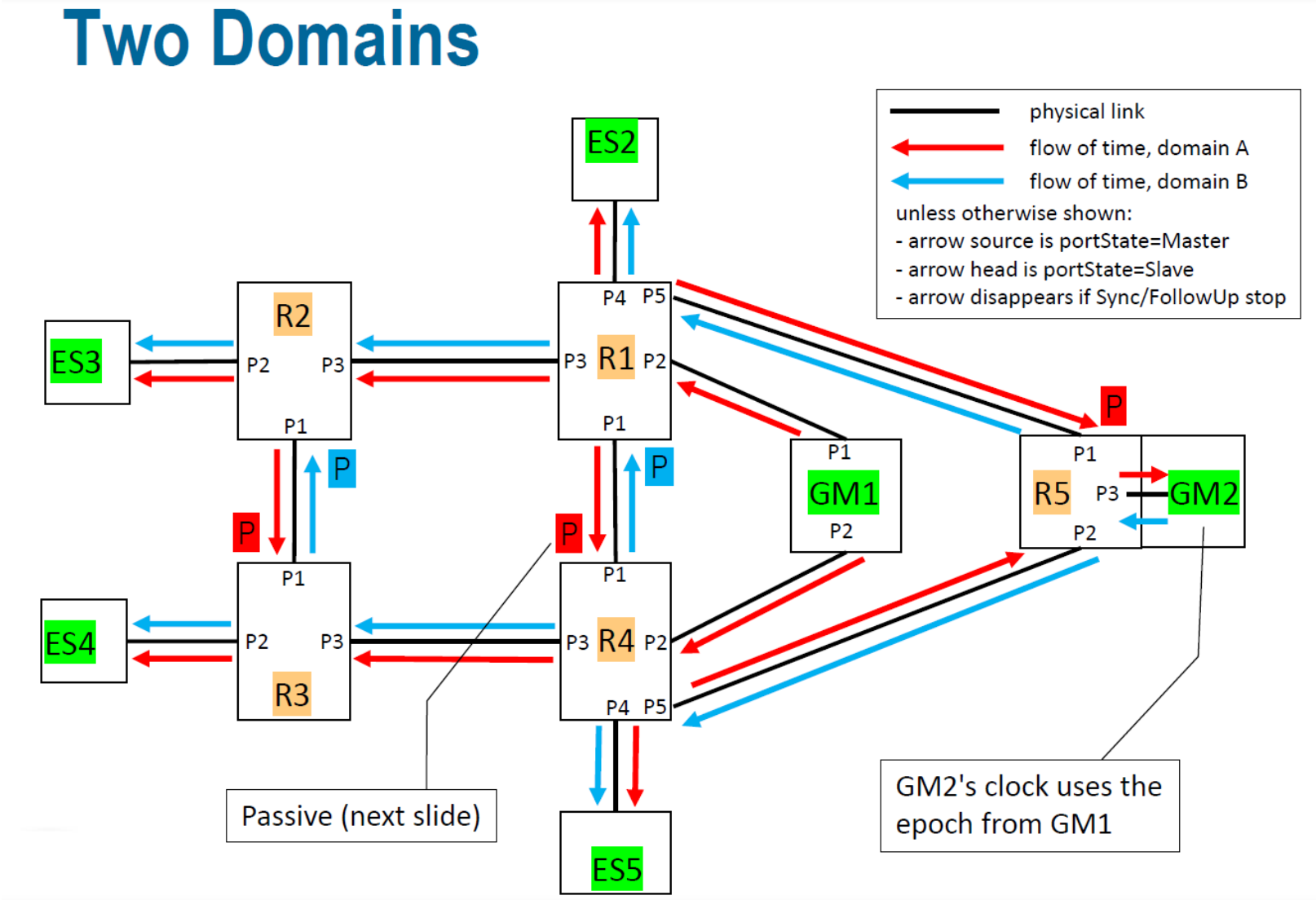
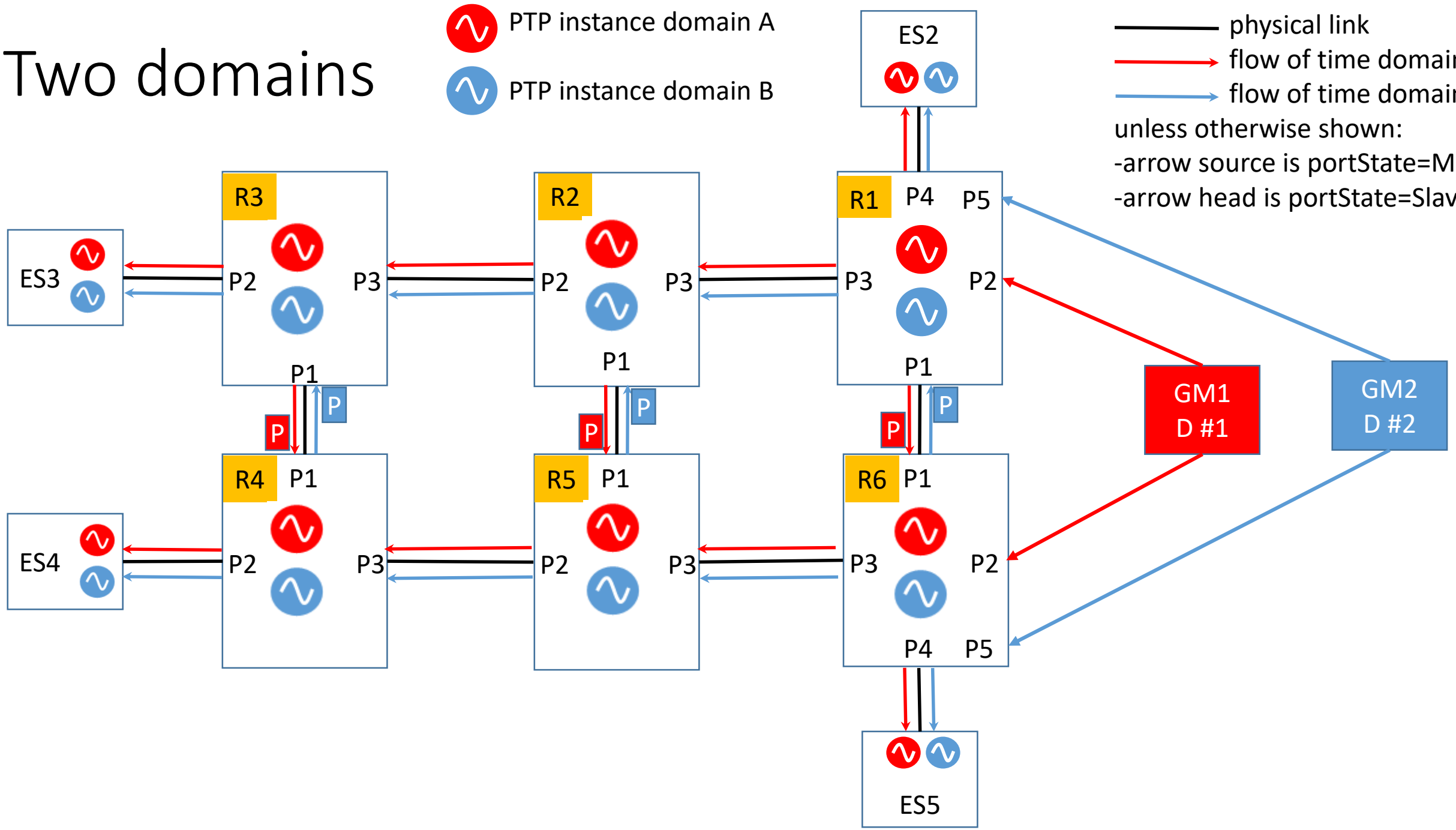
Two Domains Hot Standby

- Two domains hot standby presented by Rodney Cummings in March 2020 (https://www.ieee802.org/1/files/public/docs2020/dm-cummings-as-4-domains-0320-v04.pdf)

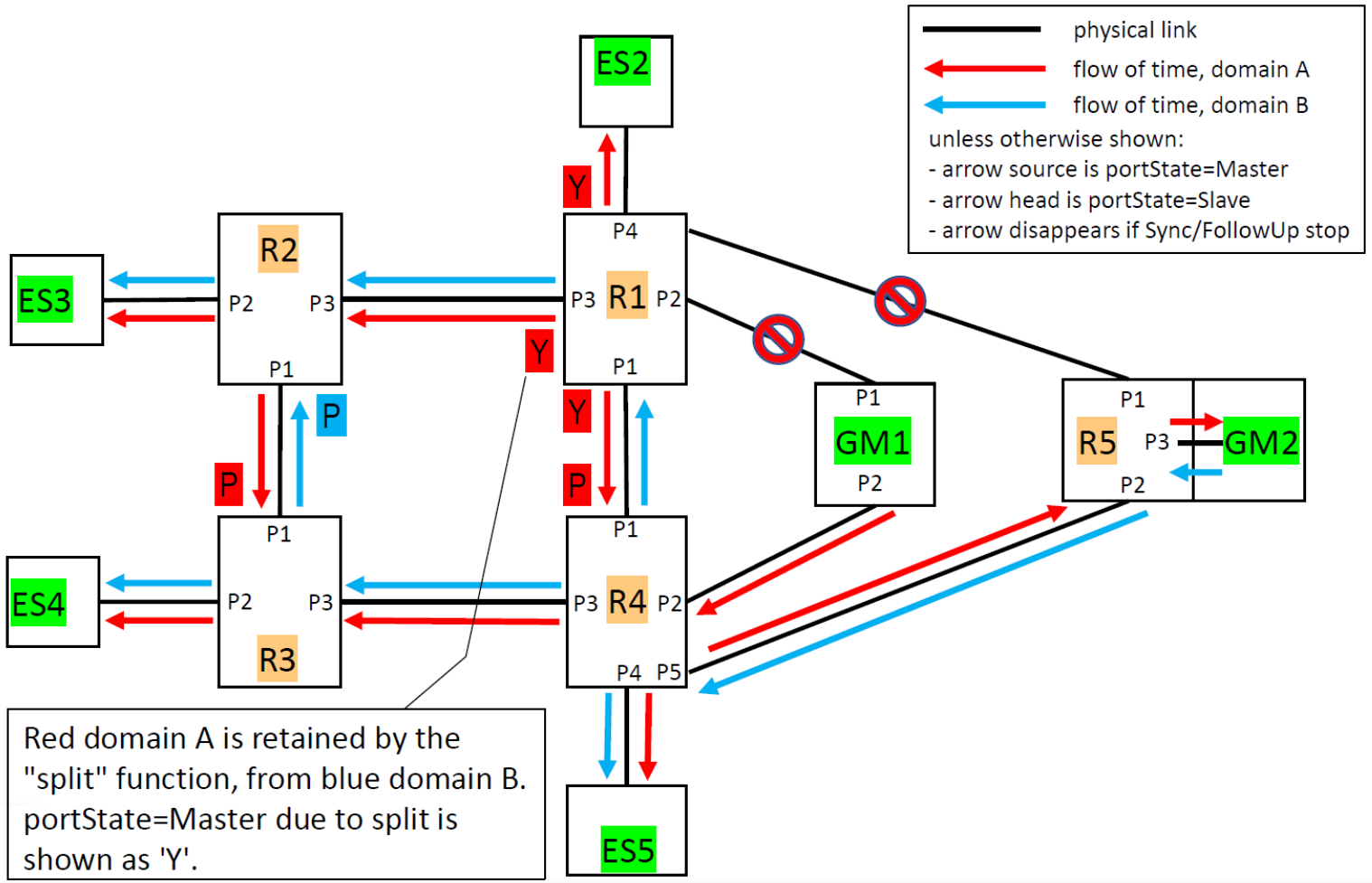


Two domains

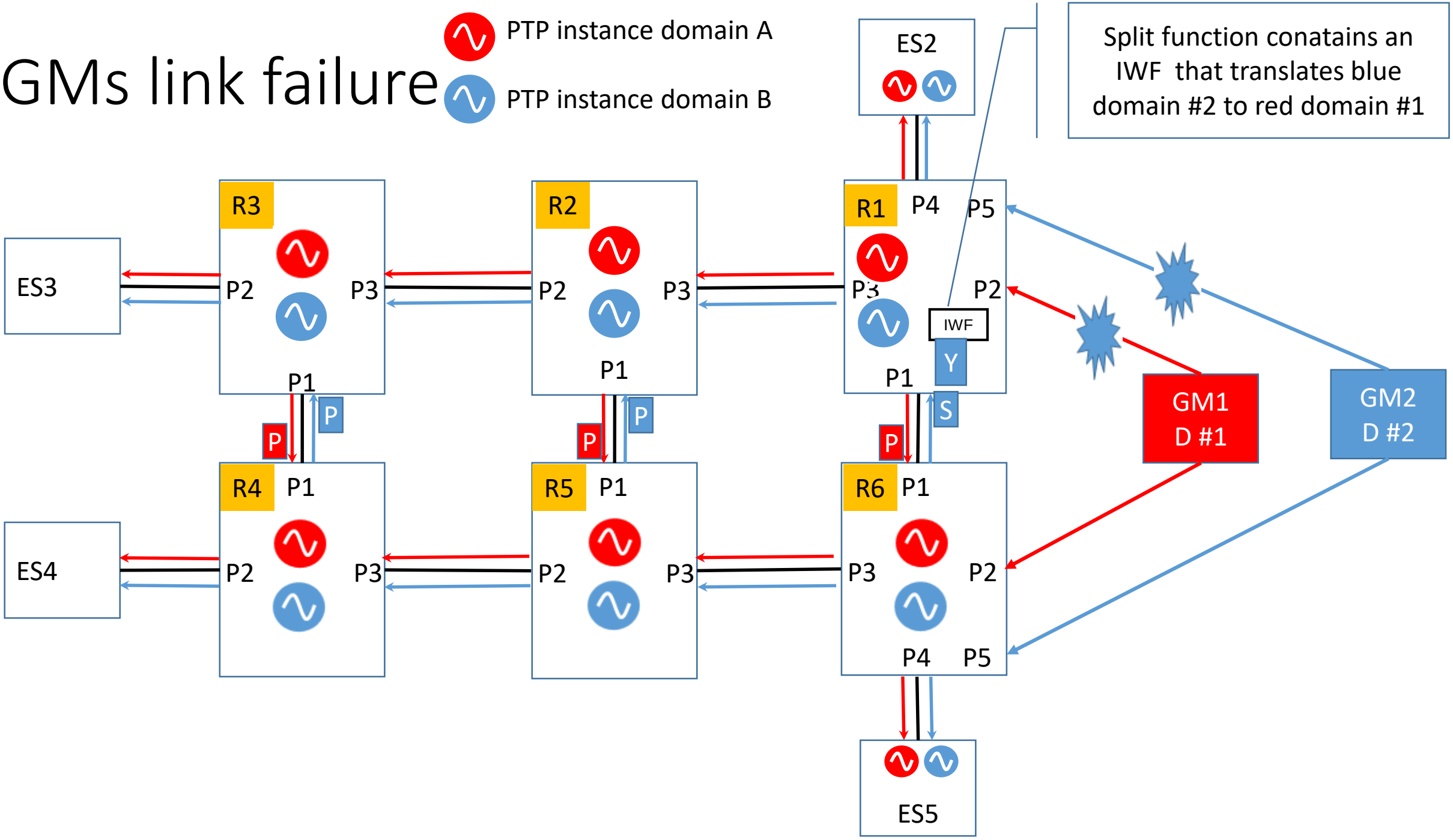

PTP instance domain A
PTP instance domain B
physical link
flow of time domain A
flow of time domain B
unless otherwise shown:
-arrow source is portState=Master
-arrow head is portState=Slave
ES2
ES3
ES4
ES5
R1
R2
R3
R4
R5
R6
P1
P2
P3
P4
P5
P
GM1
D #1
GM2
D #2

“Split” Function

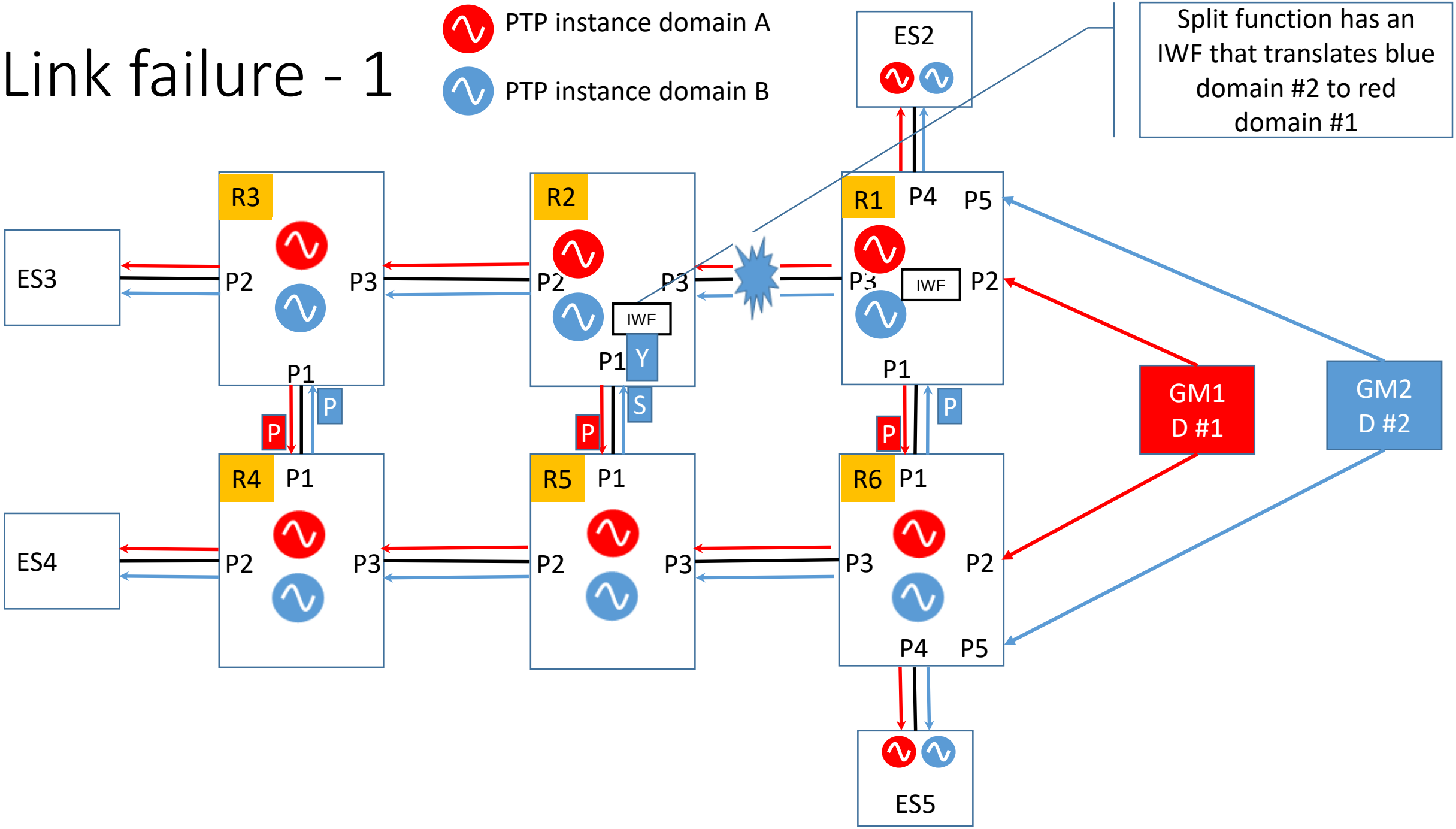
Other Two Links Fail: Mitigated



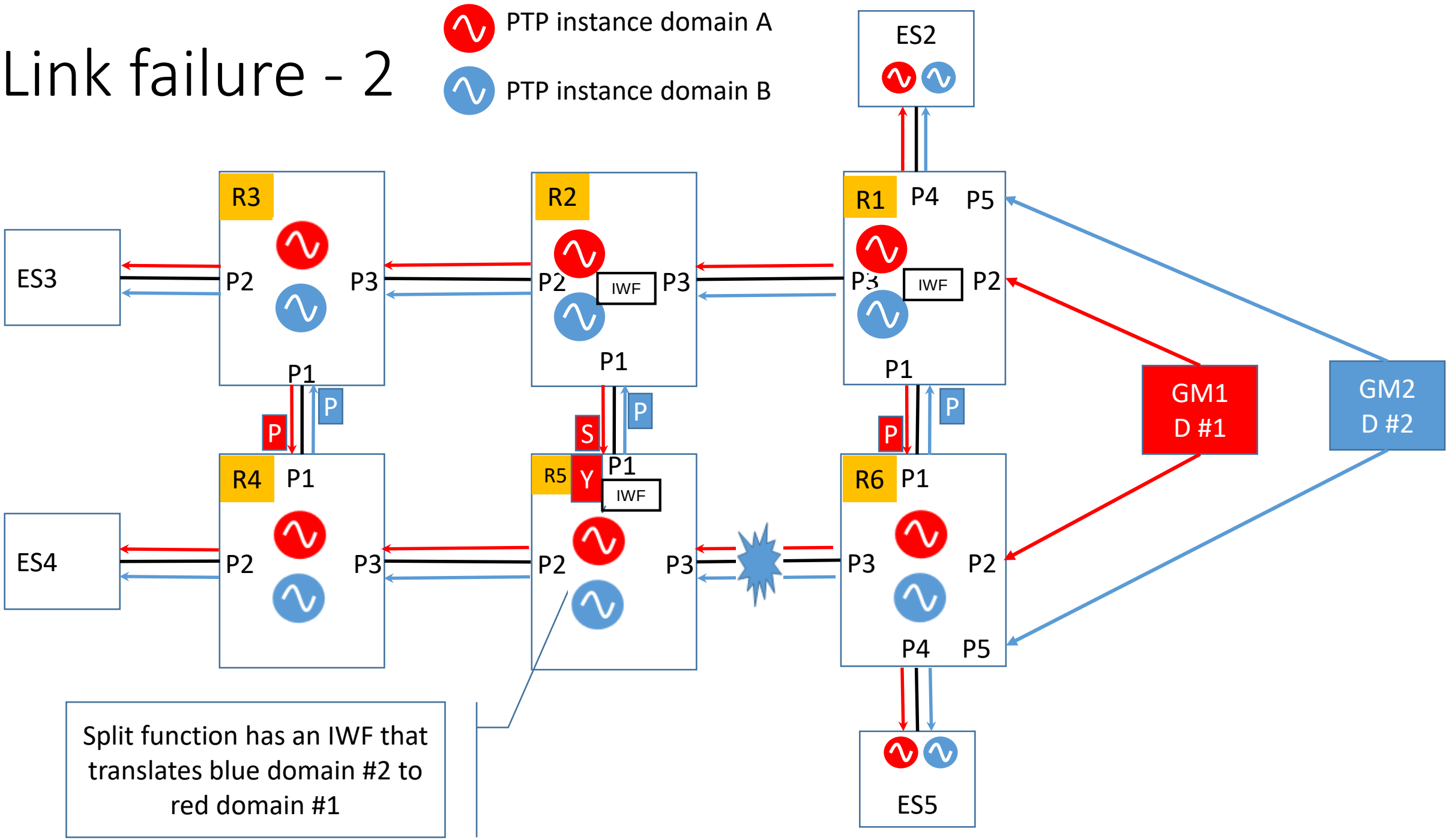
GMs link failure



Link failure - 1



Link failure - 2



Current solution from 802.1ASdm

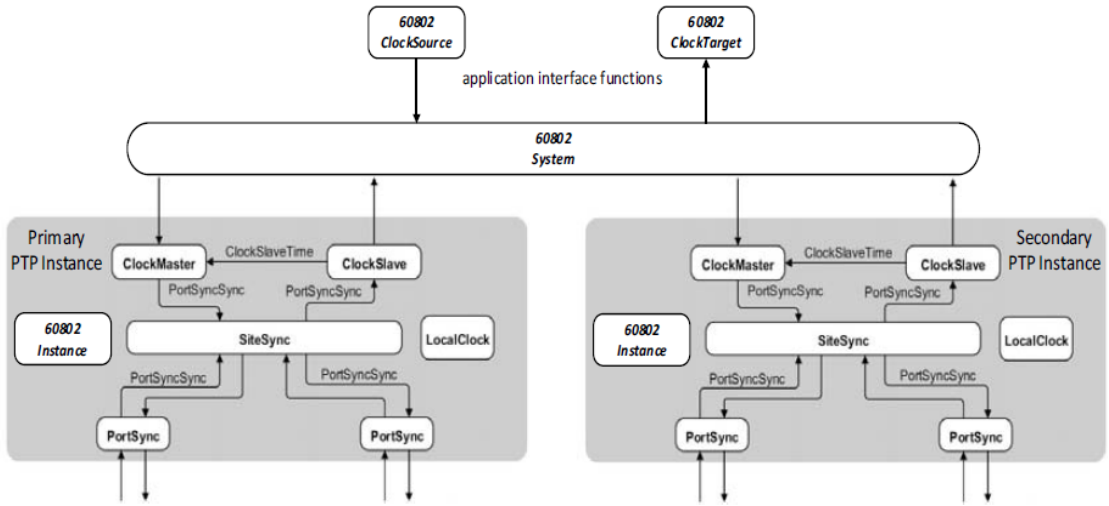


Figure 17-1—Model of hot standby redundancy for time synchronization

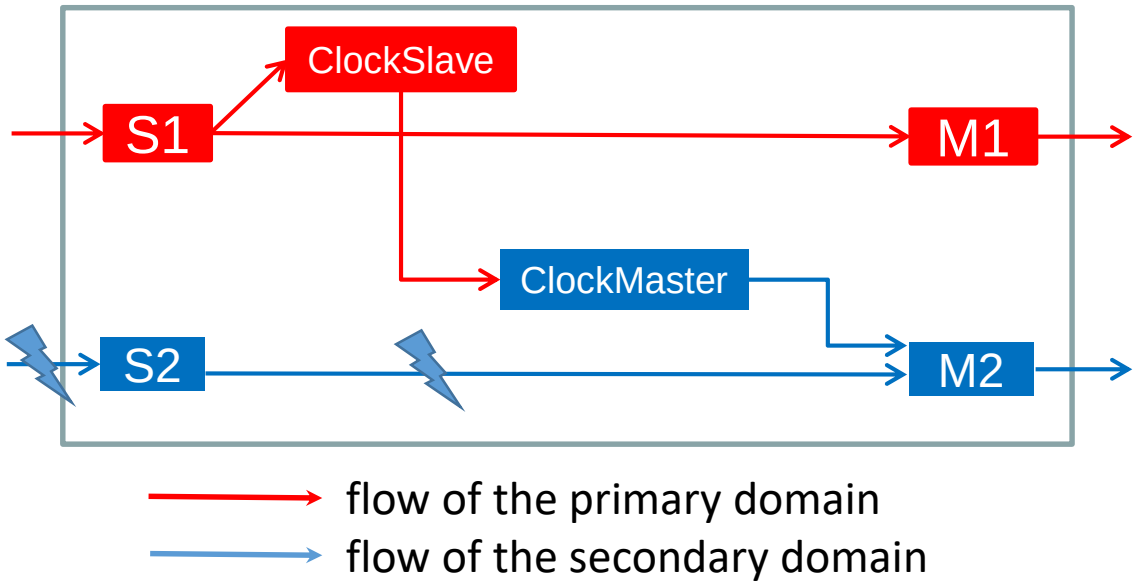
- The current solution assumes that there are always two domains running simultaneously
- One domain is considered the primary domain and the other one is considered secondary domain
- IF the primary domain fails, then the time-aware system immediately changes to use the secondary domain
- Annex Z states that there is a need to incorporate the “split” functionality

Current solution from 802.1ASdm D0.2

17.12.2 Secondary grandmaster in REDUNDANT state

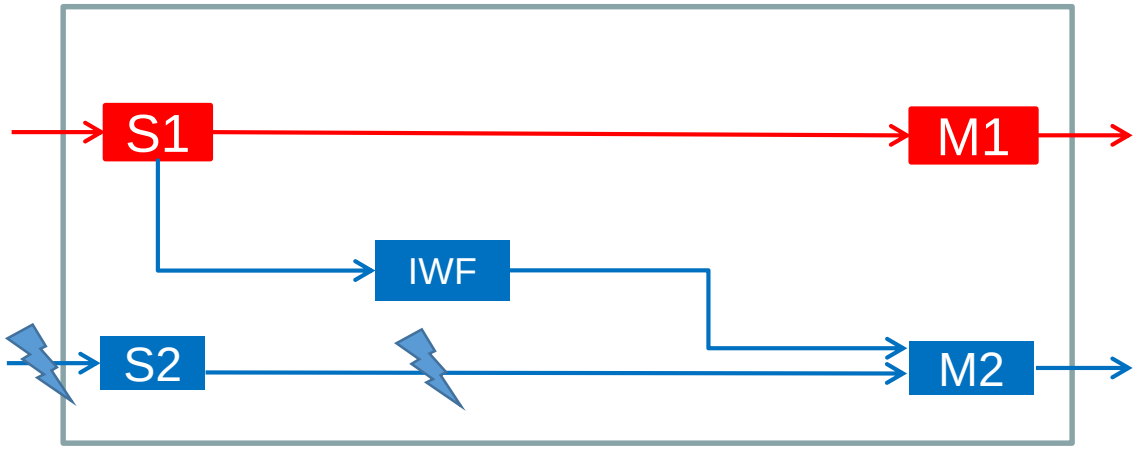
When the secondary PTP Instance is grandmaster (i.e., no external port in SlavePort state), and HotStandbySystemState is REDUNDANT, the HotStandbySystem shall transfer phase from the ClockSlave of the primary PTP Instance to the ClockMaster of the secondary PTP Instance (see). By using phase from the primary PTP Instance, the secondary grandmaster can maintain continuity in the event of a fault in the primary grandmaster.

- A general model is created based on the above text.



- The red domain is the primary one, and the blue one is the secondary one.
- When S2 is lost, the ClockMaster of the secondary domain will receive time from the ClockSlave of the primary one.
- So, the HotStandbySystem needs to have ClockSlave and ClockMaster functions for each domain.

Alternative solution for HotStandbySystem to address Split Function



flow of the primary domain

flow of the secondary domain

- Interworking function (IWF) translates from one domain to another
- When the SLAVE port of the secondary domain is failed, the IWF will translate from primary to secondary
- The IWF may only need to translate the domain number, and other data set members can be maintained.
- Then, for the PTP Relay Instance the ClockSlave (need clock filter or PLL) and ClockMaster functions may not be required

sent by S1 port

```
MDSyncReceive {
        domainNumber,
        followUpCorrectionField,
        sourcePortIdentity,
        logMessageInterval,
        preciseOriginTimestamp,
        upstreamTxTime,
        rateRatio,
        gmTimeBaseIndicator,
        lastGmPhaseChange,
        lastGmFreqChange
}
```

```
PortSyncSync    {
        domainNumber,
        localPortNumber,
        syncReceiptTimeoutTime,
        followUpCorrectionField,
        sourcePortIdentity,
        logMessageInterval,
        preciseOriginTimestamp,
        upstreamTxTime,
        rateRatio,
        gmTimeBaseIndicator,
        lastGmPhaseChange,
        lastGmFreqChange
}
```

IWF

- Change the domainNumber of PortSyncSync to the value of the secondary domain

received by M2 port

```
MDSyncSend    {
        domainNumber,
        followUpCorrectionField,
        sourcePortIdentity,
        logMessageInterval,
        preciseOriginTimestamp,
        upstreamTxTime,
        rateRatio,
        gmTimeBaseIndicator,
        lastGmPhaseChange,
        lastGmFreqChange
}
```

Thank you!