OAM&P Requirements for RPR

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Introduction

- OAM&P Definitions
- IEEE 802.17 functional model

Scope of the presentation

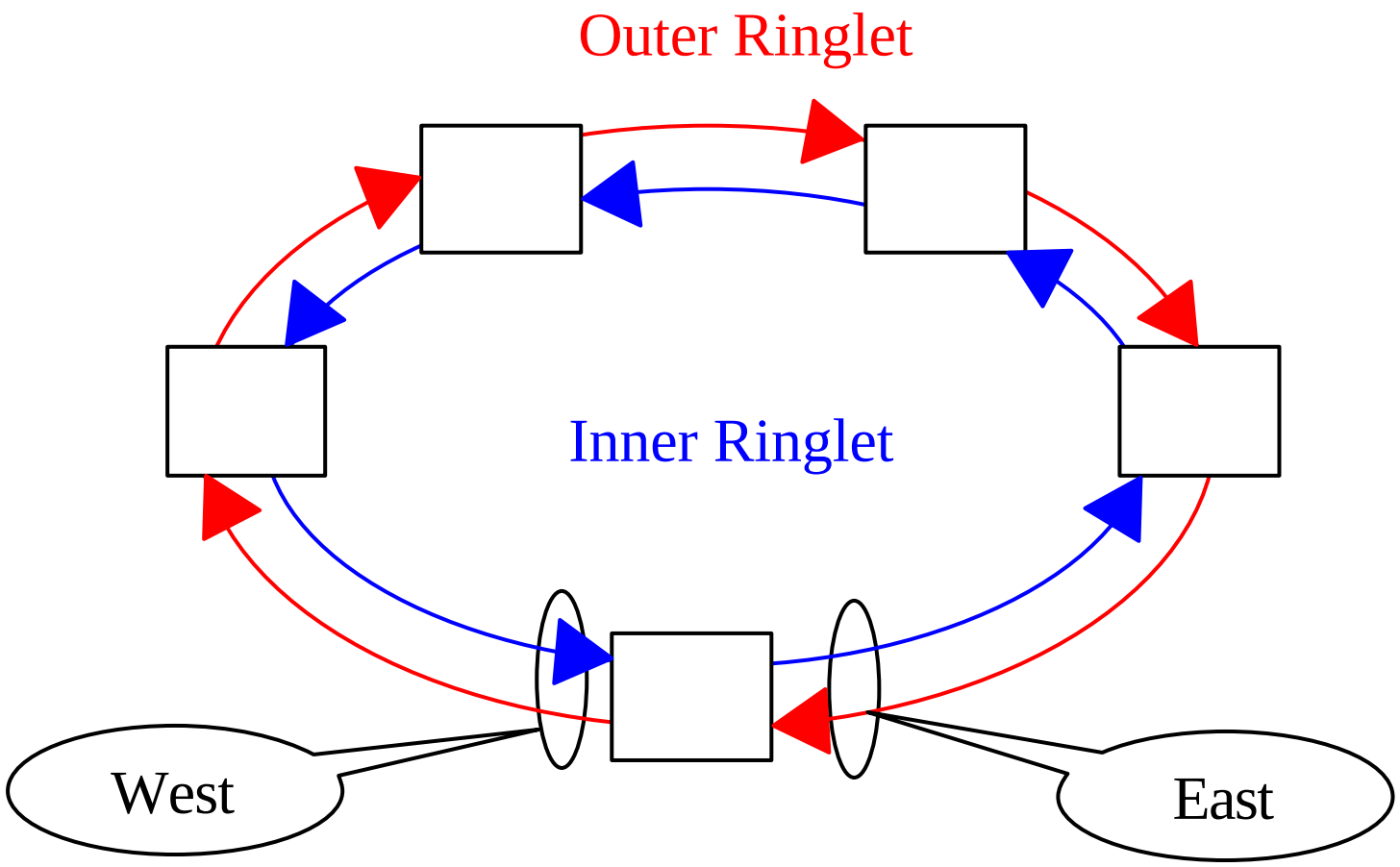
- **First attempt** to analyze some OAM&P requirements that are relevant for the IEEE 802.17 standard activity
  - Reusing existing PHYs means also reusing the already defined OAM&P requirements for those PHYs
  - Only MAC related OAM&P requirements should be defined by IEEE 802.17
  - Other requirements are in the scope of the upper layers

- Hypothesis – Sonet/SDH interfaces are using the GFP encapsulation mechanism
  - The HDLC/PPP case, if supported, has analogous OAM&P requirements

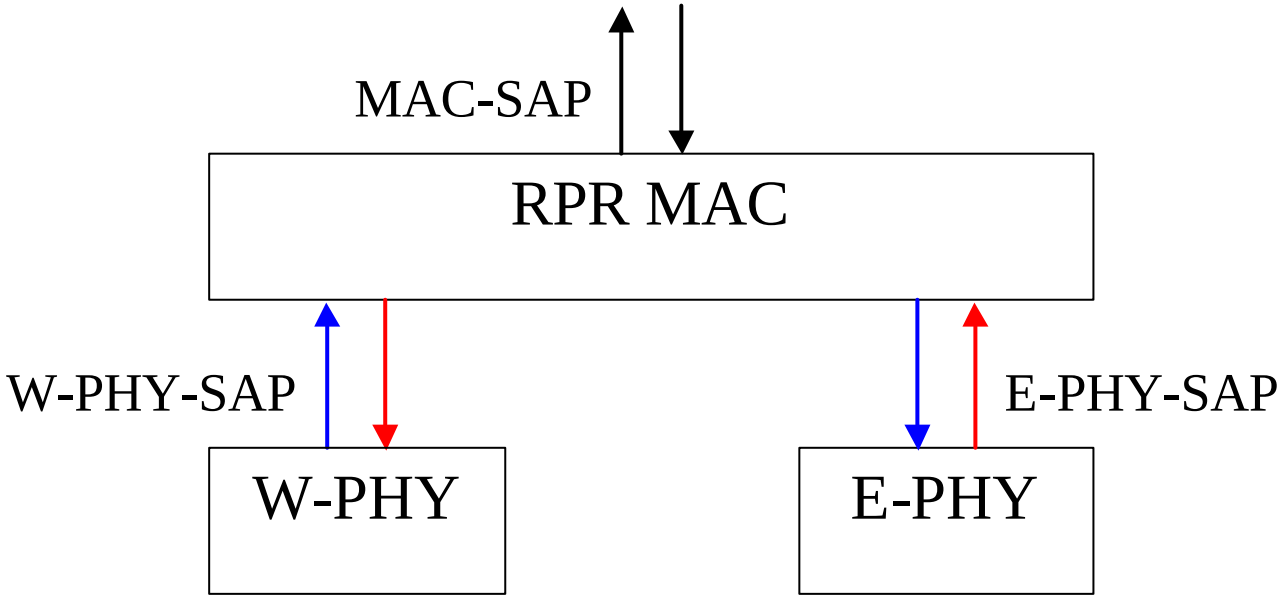
OAM&P Definitions

- *OAM&P – Operations, Administration, Maintenance & Provisioning*
- Configuration Management
  - NE configuration (provisioning)
  - Configuration check and report
- Fault Management
  - Fault indication retrieval and processing
  - Production of alarm indications and alarm handling
- Performance Management
  - Quantitative performance monitoring for system performance control and report
  - Performance and quality report
- Some in-band OAM mechanism can be defined to support fault and performance management

IEEE 802.17 Ring View



IEEE 802.17 Functional Model



- Three interfaces
  - Two span interfaces (east and west PHYs) ⇨ Medium dependent OAM&P
    - Ethernet span interfaces when using IEEE 802.3 PHYs
    - GFP span interfaces when using Sonet/SDH PHYs with the GFP encapsulation method
  - RPR interface (MAC) ⇨ Medium independent OAM&P

In-band OAM

PHY dependent requirements

- Sonet/SDH PHYs
  - IEEE 802.17 should reuse the existing in-band OAM functionality (**G.783**)
- Ethernet PHYs
  - The 1GbE and 10GbE LAN IEEE 802.3 standard has no in-band OAM functionality
  - The 10GbE WAN IEEE 802.3 standard (10GBase-W) is defining some OAM functionality similar to the OC-192c Sonet/SDH

MAC requirements

- No additional in-band OAM functionality is required in the RPR ***MAC*** layer

- Some additional OAM functions are required in the upper layers to support services over RPR
  - They are outside the scope of the IEEE 802.17 MAC
  - They depend on the upper layer that is used to offer services over an RPR network

Configuration Management

Interface activation/deactivation

- Each interface can be activated/deactivated for administrative purposes
- The RPR interface is a stacked interface over the two span interfaces
  - It can be activated only if at least one of the underlying span interface is active
- Each span interface can be activated/deactivated separately
  - The MAC can send packets only to activated span interfaces
  - A span interface can be deactivated only if either the RPR interface or the other span interface or both are still active
  - Ethernet span interfaces are the lowest level interfaces
    - They can be activated at any time
  - GFP span interfaces are stacked over Sonet/SDH interfaces
    - They can be activated only if the underlying Sonet/SDH interface is active

Operational State

- Each interface has its own operational state that can be used for maintenance purposes
- The operational state of span interface is medium dependent
  - These conditions are already defined in the relevant standard recommendations (IEEE 802.3, G.783 and G.gfp)
- The RPR interface is down when deactivated and/or both the underlying span interfaces are down, and up in all the other cases

RPR MAC Configuration

- It should be possible to read the RPR MAC address for maintenance purposes
  - It is always fixed by the vendor
- It should be also possible to configure and monitor the auto-configuration (e.g. topology discovery) protocol
  - The protocol can be monitored for maintenance purposes
  - It should be possible to disable the support of some features even if supported by all the NEs on the ring
- The detailed requirements depend on the mechanism that will be used by IEEE 802.17

RPR MAC Configuration – 2

- It should be possible to configure and monitor the protection switching mechanism

- These are traditional requirements to configure protection mechanisms and are quite independent on the mechanism that is used
  - It should be possible to monitor, for maintenance purposes, the state of the protection switching
  - It should be possible to activate/deactivate the protection switching
  - It should be possible to activate/deactivate the usage of the Signal Degrade as a switching criteria
  - An hold-off timer (HOT) should be set for each span interface
    - It depends on the type of media we have between two adjacent nodes
  - A wait to restore timer (WTR) should be set
  - It should be possible to force a switching event for operational purposes

Fault Management

Fault Management

- GFP span interfaces – the fault management is already defined in the relevant recommendations (G.783 and G.gfp)
  - Note – G.gfp is still under development by ITU-T (and T1X1)
- Ethernet span interfaces – the fault management is already defined in the relevant recommendations (IEEE 802.3)
  - Only the PHY requirements are relevant for the IEEE 802.17
- No faults are foreseen in the RPR layer

Performance Management

PHY dependent requirements

- Sonet/SDH PHYs
  - IEEE 802.17 should reuse the existing PM defined in the relevant recommendations (G.783 and G.gfp)
  - Note – G.gfp is still under development in ITU-T (and T1X1)
- Ethernet PHYs
  - IEEE 802.17 should reuse the existing PM defined in the relevant specifications (IEEE 802.3)

RPR Interface Statistics

- The following implementation independent statistics should be kept by an RPR interface
  - Frames/octets inserted on the ring (by the upper layer)
  - Frames/octets delivered to the upper layer
  - Frames stripped because originated by the node itself (source stripping)
  - Frames discarded because of the TTL expiration
  - Frames addressed to the node discarded because of a bad FCS [*TBC*]
  - Frames addressed to the node discarded because of an unknown or unsupported protocol

RPR Interface Statistics – 2

- The following statistics, whose meaning is implementation dependent should be kept by an RPR interface
  - Frames addressed to the node discarded even if no error is detected (e.g. because of input buffer congestion)
  - Frames originated by the node discarded even if no error is detected (e.g. because of output buffer congestion)
  - Frames passing-through the node discarded even if no error is detected (e.g. because of transit buffer congestion)

- In some implementations the previous counters (or some of them) can always be equal to 0

Conclusions

Conclusion and Requirements

- IEEE 802.17 shall re-use the already defined OAM&P requirements for the existing PHYs
  - These requirements are medium dependent
- IEEE 802.17 shall define the OAM&P requirements affecting the MAC layer
  - Some requirements have been identified in this presentation as a basis for an on-going discussion
  - Some new requirements can arise during the detailed specification of all the MAC mechanisms