

Sonet/SDH Virtual Concatenation for RPR

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- ❖ Introduction

- ❖ Summary on Sonet/SDH Virtual concatenation
- ❖ Impacts of virtual concatenation on the RPR MAC

- ❖ Conclusions

Introduction

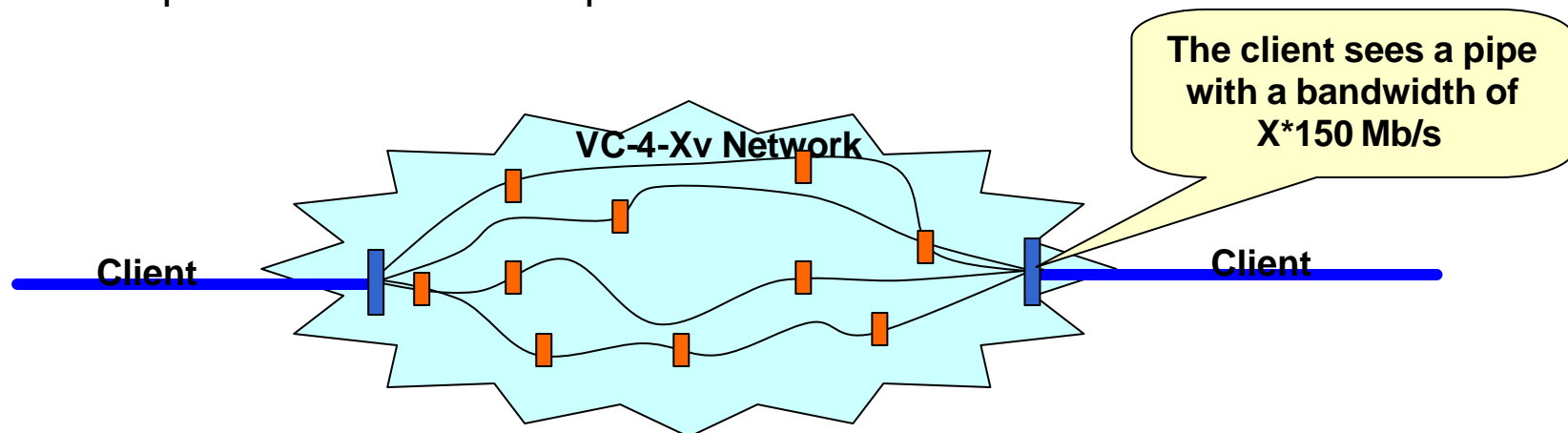


- ❖ Summarize the Sonet/SDH virtual concatenation feature
 - ◆ It is a new standard feature introduced by the latest G.707/2000
 - ◆ It allows for granular increment of Sonet/SDH path bandwidth

- ❖ Analyze the use of virtual concatenation in an RPR system based on Sonet/SDH PHY
 - ◆ Fully transparent to 802.17 RPR MAC operations
 - ◆ Supporting more granular ring upgrades
 - ◆ Supporting multiple physical links between adjacent nodes

Summary of Virtual Concatenation

- ❖ Virtual concatenation of Sonet/SDH Paths (VC-4 or STS-3c-SPE) is currently being defined in ITU-T G.707/2000
- ❖ Virtual concatenation is not restricted to the situation in which all the individual VCs are contained within a single Multiplex Section
 - ◆ The real potential flexibility of virtual concatenation occurs when each individual VC, forming the virtually concatenated VC, is routed over a number of different and independent Sonet/SDH paths





- ❖ A VC4-Xv (or STS-3c-Xv-SPE) provides a contiguous payload area of X VC-4 with a payload capacity (bandwidth seen by the upper layer) of $X \cdot 150$ Mb/s
 - ◆ Where the VC4-Xv signal is generated, its payload is then separated into X different VC4s
 - ◆ Where the VC4-Xv signal is terminated, the X different VC4s are combined together
- ❖ The Sonet/SDH layer is responsible to perform the realignment of the individual VC-4s that belong to a virtually concatenated group
 - ◆ Compensate for the differential delay experienced by the individual VC-4s
 - ◆ Know the individual sequence number of each VC-4

Virtual Concatenation in RPR



- ❖ **Without** virtual concatenation
 - ◆ RPR frames are encapsulated into GFP frames
 - ◆ GFP frames are then mapped into Sonet/SDH paths, the VC4 (STS-3c-SPE), or continuous concatenated paths, the VC4-Xc (STS-3Xc-SPE)
 - ❑ Possible values of X limited to 4, 16, 64, 192, ... (4x increments)

- ❖ The Sonet/SDH VC4 or VC4-Xc used by RPR may or may not be multiplexed, in the Sonet/SDH layer, together with other VC4s into an STM-N or STS-3N physical interface
 - ◆ **This multiplexing is completely transparent to the RPR MAC layer**

- ❖ The RPR MAC always sees a PHY with a bandwidth equal to X times 150 Mb/s



- ❖ **With** virtual concatenation
 - ◆ RPR frames are encapsulated into GFP frames
 - ◆ GFP frames are then mapped into Sonet/SDH virtual concatenated paths, the VC4-Xv (STS-3c-Xv-SPE)
 - ❑ All integer numbers for X are admitted
- ❖ All the Sonet/SDH VC4 (STS-3c-SPE) may or may not be multiplexed together, and optionally with other VC4s, into one or more STM-N or STS-3N physical interfaces
 - ◆ **This multiplexing is completely transparent to the RPR MAC layer**
- ❖ The RPR MAC always sees a PHY with a bandwidth equal to X times 150 Mb/s



- ❖ No difference at the RPR MAC layer between contiguous and virtual concatenation
 - ◆ All the complexity is managed by the PHY layer
- ❖ Sonet/SDH virtual concatenation allows for a more granular ring speed upgrades
 - ◆ Instead of 4x upgrades, all the speeds multiple of 150 Mb/s can be supported
- ❖ Sonet/SDH virtual concatenation allows for multiple physical links between adjacent nodes
 - ◆ RPR MAC is unaware of this
 - ◆ It can continue working with a dual counter rotating ring topology
- ❖ Sonet/SDH virtual concatenation is already defined and supported by Sonet/SDH vendors

Conclusions



- ❖ RPR solutions based on Sonet/SDH technology can benefit of the virtual concatenation feature in order to support
 - ◆ More granular ring speed upgrades
 - ◆ Multiple physical links between adjacent nodes

- ❖ Virtual concatenation and its benefits can be supported without impacting the RPR MAC layer
 - ◆ The RPR topology remains a dual counter rotating ring with link bandwidth of X times 150 Mb/s
 - ◆ The functionality is already defined and supported by Sonet/SDH vendors

- ❖ The functionality is out of the MAC – it belong to the PHY layer
 - ◆ The functionality is already defined and supported by Sonet/SDH vendors



- ❖ The IEEE 802.17 MAC Standard should also support any virtual concatenated Sonet/SDH path layer as a possible RPR PHY
 - ◆ It impacts only the Sonet/SDH PHY specification

- ❖ Virtual concatenation support is only a system vendor option