Quantum Bridge

EPON Technical Considerations

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Overview

Quantum Bridge

- Specifications of Outside Plant
- Interoperable Power Budgets
- Range Measurement and Compensation
- Anonymous Join and Security
- Upstream Traffic Control

Specifications of Outside Plant

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- OSP specifications restrict Network Operators
  - Potentially large impact on their Capital and Operations
  - These rules must be stable and evolvable
  - At minimum, Operators want an interoperable OSP
- Important parameters include
  - Minimum and Maximum Loss
  - Maximum Dynamic Loss
  - Maximum Reflectivity
  - Maximum Split Ratio (number of end stations)

Interoperable Power Budgets

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- Specification of OSP losses is not enough to insure interoperability between vendors
  - Vendor A: Bright Tx, Insensitive Rx
  - Vendor B: Dim Tx, Sensitive Rx
  - A into B causes overload, B into A causes errors
- Ranges must be defined for both Tx and Rx
  - Min and max power output for Tx
  - Sensitivity and Overload for Rx
- These ranges are related to (but not dictated by) the OSP specifications

Range Measurement and Control

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- Access distances do not permit normal CSMA-CD
  - PON is a star, not a bus
  - Round trip time is ~0.1 ms
- Media Access Control methods
  - Synchronous Guard time
  - Asynchronous Token-passing
  - Range and Compensate
  - Range and Manage

Anonymous Join and Security

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- End stations should be plug and play
  - MAC must have capability of picking up new end stations with unknown MAC addresses as they are installed
- Collision correction algorithm needed
  - Exponential back-off
  - Address mask-off
  - Photon ranging

- Desirable security features
  - Because of plug and play, MAC must provide some defense against impostor attacks
  - Downstream traffic is broadcast to all stations, and requires some level of cryptographic protection

Upstream Traffic Control

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- Downstream traffic is managed in ordinary way
  - All flows pass through the central station
  - Typical queuing and scheduling mechanisms work
- Upstream traffic has a unique characteristic
  - Incoming flows are queued at the end stations
  - Central station needs information on the amount of traffic waiting
- Following points must be considered
  - What kind of traffic management is desired?
  - How many flows, paths, classes are needed?
  - Is traffic described as bytes, slots, frames?
  - What does the word 'fair' mean?