EPoC
Proposal for Project Objectives

IEEE 802.3 EPOC Study Group
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Introduction to OBJECTIVE 1

1. We like EPON
2. We have coaxial cable
3. Let's make them work together

OBJECTIVE 1 - adopted

- Specify a PHY to support subscriber access networks using the EPON protocol and operating on point-to-multipoint RF distribution plants comprised of all-coaxial cable or hybrid fiber/coaxial media.

Introduction to OBJECTIVE 2

1. We have EPON gear today

2. We want to use it to "light" our coaxial plant

3. Let's do it with no _required_ "OLT system" hardware changes

4. Let's do it so we could operate an optical EPON PHY in the same MAC (scheduling) domain as the new Coax PHY

OBJECTIVE 2 - adopted

- Maintain compatibility with 1G-EPON and 10G-EPON, as currently defined in IEEE Std. 802.3 with minimal augmentation to MPCP and/or OAM if needed to support the new PHY.

Introduction to OBJECTIVE 3

1. The PHY is going to have to deal with unfriendly stuff on the coaxial plant

2. Use the information in available specifications and standards as a baseline to design against

OBJECTIVE 3 - deleted

- The baseline coaxial cable plant operating characteristics for the PHY, except frequency plans and modulation formats, shall be defined. The definition shall be in the manner of accepted international specifications for transmission of digital signals over coaxial cable networks, including:
  - RF Channel Assumptions (Section 5.2) found in DOCSIS 3.0 PHY (CM-SP-PHY3.0)
  - European Modifications (Annex B.5.2) found in DOCSIS 3.0 PHY (CM-SP-PHY3.0)
  - SCTE40-2011
  - GY/T 135-1998 有线电视系统物理发泡聚乙烯绝缘同轴电缆技术要求和测量方法修订征求意见稿
  - Cable television system physical foam polyethylene dielectric coaxial cable technical requirements and methods of measurement
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  - GY/T 137-1999 有线电视系统分支器、分配器技术要求和测量方法修订征求意见稿
  - Cable splitter, splitter, technical requirements and methods of measurement

Introduction to OBJECTIVE 4

1. We want a PHY that works as efficiently as possible over a wide range of assigned spectrums (BW and Fc) and a wide range of plant conditions.
2. We want at least 1Gbps when we assign 120MHz of spectrum and the plant conditions are as described in OBJECTIVE 3
3. If we assign more than 120MHz, please go proportionately faster.
4. If plant conditions are better than expected, please go faster.
5. If we don't have 120MHz of spectrum to assign, please go proportionately slower.
6. If plant conditions are worse than expected, please
   a. don't just stop working
   b. go slower when no change to assigned spectrum is made
   c. And allow us to allocate more spectrum to compensate
7. BTW – We want the baseline performance to work in cable networks meeting the downstream conditions in the specifications and standards listed in Objective 3

OBJECTIVE 4 – not considered

- Provide at least one physical layer specification that is capable of operating at :
  - A baseline data rate of at least 1 Gbps at the PHY service interface when transmitting in 120 MHz of assigned spectrum under baseline plant conditions;
  - data rates lower than the baseline rate when transmitting in less than 120 MHz of assigned spectrum or when plant conditions prevent a higher data rate;
  - data rates higher than the baseline rate and up to 10 Gbps when transmitting in more than 120 MHz of assigned spectrum or when plant conditions support a higher data rate;

Introduction to
OBJECTIVE 5, 6, and 7

1. We will not typically be able to assign the same amount of spectrum in both upstream and downstream, nor will conditions be the same in both.

2. Let us adjust the data rate to match our constraints.

3. Don't tie the upstream and downstream configurations to one another

OBJECTIVE 5 - adopted

- PHY to support symmetric and asymmetric data rate operation.

OBJECTIVE 6 - adopted

- PHY to support symmetric and asymmetric spectrum assignment for bidirectional transmission.

OBJECTIVE 7 - adopted

- PHY to support independent configuration of upstream and downstream transmission operating parameters.

Introduction to OBJECTIVE 8

1. Other signals (digital and analog) are likely to be on the coax network.

2. Don't break them, please.

OBJECTIVE 8 - adopted

- PHY to operate in the cable spectrum assigned for its operation without causing harmful interference to any signals or services carried in the remainder of the cable spectrum

Introduction to OBJECTIVE 9

1. 10^-12 seems to be the baseline for most of 802.3.

2. Let's stick with it.

OBJECTIVE 9 – not considered

- PHY to have a BER better than or equal to 10^{-12} at the PHY service interface.

Distance Objective?

- PHY to operate at a distance of at least X.Y km in unamplified coaxial networks
  - Does distance matter?
    - Yes. Passive plants will care due to power attenuation.
    - No. Amplified plants don't care since the signal can be amplified an indefinite number of times (theoretically)
    - Yes. RTT is an important parameter for the DBA scheduler.
    - No. The RTT value is not specified in 802.3.
  - Specify a distance for passive plants only?
    - Problem: Propagation varies with frequency and cable types (varying dielectrics, center conductor diameter, and shield radius).
    - Problem: We should not leave the RTT totally unbounded (EPON implicitly bounds RTT)
  - Conclusion:
    - Specify a power budget – applies equally to passive and amplified networks
    - Specify a distance for timing purposes that is compatible with current implementations of EPON (20km-30km) and HFC networks (50-55km)
  - Leave this for the TF to decide

APPENDICES

References

- http://www.cablelabs.com/cablemodem/specifications/specifications30.html

- http://www.cablelabs.com/specifications/CM-SP-PHYv3_0_110-111117.pdf

- http://www.scte.org/documents/pdf/Standards/SCTE_40_2011.pdf