EPON Protocol over Coax (EPoC) PHY Study Group

IEEE 802.3 Ethernet Working Group

19-July-2012

San Diego, CA

Reflector and web

- email reflector and archive established
  - stds-802-3-epoc@listserv.ieee.org
- Web page
  - http://www.ieee802.org/3/epoc/
- Private web area (for draft documents)
  - T.B.D.

Activities this week

- Met Tuesday and Wednesday 9:00 am to 6:00 pm
- 72 attendees
- Heard 20 presentations (including 3 in Chinese!)
- Objectives unchanged from May meeting
- Responded to comments from 802 EC members
- Modified responses to the Broad Market Potential, Compatibility and Economic Feasibility criteria to address comments from EC
  - Did not modify Distinct Identity or Technical Feasibility criteria
- Modified PAR to address comments from EC

Draft Objectives (1/3)

- Specify a PHY to support subscriber access networks capable of supporting burst mode and continuous mode operation using the EPON protocol and operating on point-to-multipoint RF distribution plants comprised of either amplified or passive coaxial media.
- 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.
- Define required plant configurations and conditions within an overall coaxial network operating model.

Draft Objectives (2/3)

- Provide a physical layer specification that is capable of:
  - A baseline data rate of 1 Gb/s at the MAC/PLS service interface when transmitting in 120 MHz, or less, of assigned spectrum under defined baseline plant conditions;
  - A data rate lower than the baseline data rate when transmitting in less than 120 MHz of assigned spectrum or under poorer than defined plant conditions;
  - A data rate higher than the 1Gb/s baseline data rate and up to 10 Gb/s when transmitting in assigned spectrum and in channel conditions that permit.
- PHY to support symmetric and asymmetric data rate operation.

Draft Objectives (3/3)

- PHY to support symmetric and asymmetric spectrum assignment for bidirectional transmission.
- PHY to support independent configuration of upstream and downstream transmission operating parameters.
- 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.
- PHY to have:
  - a downstream frame error ratio better than 10^-6 at the MAC/PLS service interface;
  - an upstream frame error ratio better than 5x10^-5 at the MAC/PLS service interface.

Broad Market Potential

A standards project authorized by IEEE 802 LMSC shall have a broad market potential. Specifically, it shall have the potential for:

I. Broad sets of applicability

II. Multiple vendors and numerous users

III. Balanced costs (LAN versus attached stations)

- Given the success of Data-Over-Cable Service Interface Specifications (DOCSIS®)-based services, service providers are looking for cost-effective, high performance means to provide higher data capacity, addressing their CapEx and OpEx, growing market competition and future-proofing their existing coaxial plant, while expanding service portfolios for business and residential customers.
- Service providers have seen unabated growth in both offered capacity and consumption of broadband IP services over the course of 15 years for residential, and recently, business services
- The proposed project would result in a new PHY with the widest possible applicability
- Interest and support from a worldwide array of operators, system vendors, optical and RF component manufacturers, and silicon suppliers has already been demonstrated at CFI and SG stages
- The proposed project will result in the use of the existing EPON architecture by extending its capabilities to support point-to-multipoint RF distribution plants comprised of either amplified or passive coaxial media.
- This approach will allow the project to optimize the cost balance between the network infrastructure components and attached stations in the cable network.

Compatibility

IEEE 802 LMSC defines a family of standards. All standards should be in conformance : IEEE Std 802, IEEE 802.1D, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 Working Group. In order to demonstrate compatibility with this criterion, the Five Criteria statement must answer the following questions.

a) Does the PAR mandate that the standard shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q?

b) If not, how will the Working Group ensure that the resulting draft standard is compliant, or if not, receives appropriate review from the IEEE 802.1 Working Group

I. Compatibility with IEEE Std 802.3
II. Conformance with the IEEE Std 802.3 MAC
III. Managed object definitions compatible with SNMP

- As an amendment to current IEEE Std 802.3, the proposed project will remain in conformance with the IEEE 802 Overview and Architecture, as well as the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q.
- The PAR for P802.3bn mandates that the amendment shall comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.
- Moreover, the proposed project will build on 1G-EPON and 10G-EPON architecture, extending coverage of Multi Point Control Protocol (MPCP) to amplified and passive coaxial media.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC, as defined in Annex 4A.
- The EPON Protocol over Coax (EPoC) PHY amendment will reuse the MAC Control and OAM as defined in the current IEEE Std 802.3 for EPON, with minimal augmentation if necessary, while developing new PHY specifications.
- The project will include a protocol independent specification of managed objects with SNMP management capability to be provided in the future by an amendment or revision to IEEE Std 802.3.1.

Distinct Identity

Each IEEE 802 LMSC standard shall have a distinct identity. To achieve this, each authorized project shall be:

I. Substantially different from other IEEE 802 LMSC standards

II. One unique solution per problem (not two solutions to a problem)

III. Easy for the document reader to select the relevant specification

IV. Substantially different from other IEEE 802.3 specifications/solutions.

- There is no existing 802 standard or approved project appropriate for operation up to 10 Gb/s over point-to-multipoint active and passive coax plants in symmetric and asymmetric configurations.
- The proposed project is an evolutionary extension of the coverage of Multi Point Control Protocol (MPCP) and OAM, specified for IEEE Std 802.3 EPON, onto coax medium.
- The solution will include a PHY specification.
- The proposed amendment to the existing IEEE Std 802.3 will be formatted as a set of new clauses and changes to existing clauses, making it easy for the document reader to select the relevant specification.

Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

I. Demonstrated System Feasibility

II. Proven Technology

III. Confidence in reliability

- Widely deployed data transport technology in the form of DOCSIS & Digital Video services demonstrates the capacity of coaxial networks to support multi-gigabit/second data rates over existing infrastructure when sufficient spectrum is allocated.
- Wideband communication techniques can provide necessary granularity and flexibility of bandwidth assignment in upstream and downstream.
- Millions of successfully deployed and operating 1G-EPON & 10G-EPON devices clearly demonstrate the reliability factor of MAC and PHY layers standardized by 802.3.
- Millions of Cable Modems deployed and operating demonstrate the reliability of high speed data over access cable plants.

Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:

I. Known cost factors, reliable data

II. Reasonable cost for performance

III. Consideration of installation costs

- The cost factors for EPON components and systems are well known and there is a broad and healthy industry ecosystem associated with these technologies.
- EPoC components are expected to be similar to those used in EPON, and Coax Network Units (CNUs) developed for RF networks should have comparable cost structure as EPON Optical Network Units (ONUs)
- The proposed project might introduce new cost factors which can be quantified and accounted for during the course of the project.
- EPON has been established as an attractive access technology in terms of cost/performance.
- This project is intended to bring these benefits to RF distribution plants comprised of either amplified or passive coaxial media.
- EPoC is expected to follow the same cost/performance trend line, established for all major Ethernet technologies developed by 802.3 in the past.
- Installation, maintenance and operations costs for the new technology are expected to be similar to those of DOCSIS equipment.
  - Optical Line Terminal (OLT) installation costs should be comparable to the DOCSIS Cable Modem Termination System (CMTS)
  - CNU installation costs should be comparable to the cable modem
  - New optical-to-RF equipment installation costs should be comparable to other hybrid fiber-coax amplifier or node installation costs

Draft PAR (IEEE P802.3bn)

- http://www.ieee802.org/3/epoc/P802_3bn_PAR_180712.pdf

Motion

- Approve the IEEE P802.3bn EPoC PHY Project Objectives

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY response to the Broad Market Potential criterion

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY response to the Compatibility criterion

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY response to the Distinct Identity criterion

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY response to the Technical Feasibility criterion

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY response to the Economic Feasibility criterion

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Approve the IEEE P802.3bn EPoC PHY PAR

- M: H. Frazier S: M. Laubach
- Technical (> =75%)
- Y: N: A:

Motion

- Extend the EPoC PHY Study Group until the next plenary session

- M: M. Laubach S: J. Salinger
- Procedural (> 50%)
- Anyone may vote
- Y:46 N:0 A:0

802.3:
M: H. Frazier on behalf of the SG
Procedural (> 50%)
Y: N: A: