

# **EPON Protocol over Coax (EPoC) PHY Study Group**

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IEEE 802.3 Ethernet Working Group

15-March-2012

Waikoloa, HI

# Reflector and web

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- email reflector and archive established
  - [stds-802-3-epoc@listserv.ieee.org](mailto: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

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- Met Tuesday and Wednesday 9:00 am to 6:00 pm
- 65 attendees
- Heard 22 presentations
- Adopted 6 objectives
- Adopted text of 5 Criteria responses “as a basis for further work”
- Working towards PAR approval in July

# Objectives (1/4)

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- 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.
  - Y: 45 N: 0 A: 0

# Objectives (2/4)

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- 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.
  - Y:41 N:0 A:2

# Objectives (3/4)

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- PHY to support symmetric and asymmetric data rate operation.
  - Y: 40 N: 0 A: 1
- PHY to support symmetric and asymmetric spectrum assignment for bidirectional transmission.
  - Y: 42 N: 0 A: 0
- PHY to support independent configuration of upstream and downstream transmission operating parameters.
  - Y: 44 N: 0 A: 0

# Objectives (4/4)

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- 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
  - Y: 43 N: 0 A: 0

# Broad Market Potential (I)

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## **“Broad sets of applicability”**

- The proposed project would result in a new PHY with the widest possible applicability
- Given the success of DOCSIS-based services, service providers are looking for cost-effective, high performance means to provide higher data capacity, addressing their growing CapEx and OpEx, market competition and future-proofing their existing coaxial plant, while expanding service portfolios for business and residential customers.
- Service providers have seen an unabated growth in both offered capacity and consumption of broadband IP services over the course of over 15 years for residential and recently business services



# Broad Market Potential (II)

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**“Multiple vendors and numerous users”**

**“Balanced costs (LAN versus attached stations)”**

- Interest and support from a worldwide array of operators, system vendors, optical and RF component manufacturers, and silicon suppliers has already been achieved
- The proposed project will result in the use of the existing EPON architecture-by extending its capabilities to support point-to-multipoint access networks using mixed fiber-optic and coaxial cabling technologies
- This approach will allow the project to optimize the cost balance between the network infrastructure components and attached stations in the cable network
  - Y: 42 N: 0 A: 0

# Compatibility (I)

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## ...“Compatibility with IEEE Std 802.3”

- 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.
- Moreover, the proposed project will build on 1G-EPON and 10G-EPON architecture, extending coverage of EPON Multi Point Control Protocol (MPCP) to mixed outside plant, comprising optical fiber and coaxial cable.

# Compatibility (II)

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## **“Conformance with the IEEE Std 802.3 MAC”**

### **“Managed object definitions compatible with SNMP”**

- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC, as defined in Annex 4A
- EPoC 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 specifications for PCS, PMA and PMD layers.
- The project will include a protocol independent specification of managed objects with SNMP management capability, provided by IEEE Std 802.3.1-2011.
  - Y: 40 N: 0 A: 1

# Distinct Identity

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**“Substantially different from other IEEE 802 standards”**

**“Substantially different from other IEEE 802.3 specifications/solutions”**

**“One unique solution per problem (not two solutions to a problem)”**

**“Easy for the document reader to select the relevant specification”**

- There is no existing 802 standard or approved project appropriate for operation at up to 10 Gb/s over point-to-multipoint mixed outside plant comprising fiber-optic cabling and coaxial cabling topologies, in symmetric and asymmetric configurations.
- The proposed project is an evolutionary extension of the coverage of EPON Multi Point Control Protocol (MPCP) and MAC, specified for IEEE Std. 802.3 EPON, onto hybrid fiber-coax networks
- New PHY will be designed for operation at the data rate of up to 10 Gbit/s in symmetric and asymmetric configurations
- 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.

## Slide 12

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- 1 We'll have to get back to this  
Salinger, Jorge, 3/14/2012

# Technical Feasibility (I)

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**“Demonstrated System Feasibility”**

**“Proven Technology”**

**“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.
  - Y: 43 N: 0 A: 0

# Economic Feasibility (I)

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## “Known cost factors, reliable data”

- 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 CNU's developed for RF networks should have comparable, or perhaps lower over time, cost structure as EPON ONU's
- The proposed project might introduce new cost factors which can be quantified and accounted for during the course of the project.
- EPON cost evolution should be directly related to future EPoC cost trends under comparable volumes.

# Economic Feasibility (II)

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## “Reasonable cost for performance”

- EPON has been established as an attractive access technology in terms of cost/performance, capable of operating at 1 Gbps and 10 Gbps speeds.
- This project is intended to bring these benefits to RF access networks comprising a combination of fiber and coax cable.
- EPoC is expected to follow the same cost/performance trend line, established for all major Ethernet technologies developed by 802.3 in the past.
- The resulting PHYs will combine a proven, well-known point-to-multipoint network architecture of EPON with mixed outside plant comprising fiber and coax cable to address known cost/performance limitations of other access technologies.



# Economic Feasibility (III)

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## “Consideration of installation costs”

- Installation costs, as well as maintenance and operations costs for the new technology, are expected to be similar when compared with DOCSIS equipment.
  - OLT costs are generally lower than DOCSIS CMTS costs, but installation costs should be comparable
  - CNU costs are expected to be similar to DOCSIS cable modem costs, and installation costs should be comparable
  - Additional outside plant equipment costs should be comparable to other hybrid fiber-coax equipment capital and installation costs
- A combination of high equipment production volumes, broader competition, and simplicity thanks to reuse of EPON protocols and system-level operating principles should further contribute to reduction of equipment and installation costs, especially as compared to existing DOCSIS equipment costs
  - Y: 42 N: 0 A: 0

# Motion # 1

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[Request that the IEEE 802.3 Working Group]

- Extend the EPoC PHY Study Group until the next plenary session
- M: K. Noll      S: J. Salinger
- Procedural (> 50%)
- Anyone may vote
- Y:43 N:0   A:0

802.3:

M: H. Frazier on behalf of the SG

Technical ( $\geq 75\%$ )

Y:   N:   A:

# Motion # 14

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[Request that the IEEE 802.3 Working Group]

- Authorize the EPoC PHY Study Group to pre-submit a draft PAR and a draft set of 5 Criteria responses to the IEEE 802 EC for consideration at the July plenary session, subject to review and final approval by the IEEE 802.3 Working Group at the July plenary session

- M: M. Hajduczenia S:A. Brown

- Technical ( $\geq 75\%$ )

- Anyone may vote

- Y: 44 N: 0 A: 0

802.3:

M: H. Frazier on behalf of the SG

Technical ( $\geq 75\%$ )

Y: N: A:

# Future meetings

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- Interim Study Group meeting
  - Week of May 14
  - Minneapolis, MN
  - 2 days
  
- Potential interim Study Group meeting
  - Week of June 6
  - Beijing, PRC
  - 2 days
  - # who would probably attend \_\_\_\_\_