IEEE 802.3 Energy Efficient Ethernet Study Group

Closing Plenary Report

San Francisco, CA
July, 2007

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Reflector and Web

Energy Efficient Ethernet

- We have a reflector set-up:
- To subscribe to the EEESG reflector, send your request to:
  ListServ@ieee.org

  with the following in the body of the message (do not include "<>"):
  subscribe stds-802-3-eeesg <yourfirstname> <yourlastname>
  end
- Send EEESG reflector messages to:
  stds-802-3-eeesg@listserv.ieee.org
- For complete instructions on reflector usage, subscription, and unsubscription:
  http://www.ieee802.org/3/eeesg/reflector.html
- EEESG web page URL:
  http://www.ieee802.org/3/eeesg/

Goals for this Meeting

- Energy Efficient Ethernet Overview – Tutorial
  - Monday at 6:30 PM in Grand Ballroom A
  - www.ieee802.org/802_tutorials
- Address comments on Objectives, 5 criteria and PAR
  - Refine objectives
  - Hear tutorial on 802.1 Audio Video Bridging (AVB)
  - Hear presentations on EEE impact on upper layers
    - Working towards consensus on transition time value
- Request 802.3 WG Approval of PAR, 5 Criteria and Objectives
- Request extension

EEE Study Group Report

Energy Efficient Ethernet

- Tutorial – over 186 attendees
- Heard 7 presentations
  - Physical Layer Considerations for Link Speed Transitions
  - 0BASE-T Possibilities
  - Update on Technical Feasibility of EEE with 10GBASE-T
  - Review of PAR, Critters, and Objectives
  - AVB Considerations for EEE
  - Transition Outages and Internet Transport Protocols
  - Energy Efficient Ethernet Transparent – not invisible
- Since we received no WG comments
  - We made no changes to PAR, critters, or objectives

SNMP MIB Issue

Energy Efficient Ethernet

- Since the IETF is no longer doing SNMP version of IEEE MIB
  - Request guidance from 802.3 WG on policy for how task forces address the need for SNMP MIB

EEE PAR - Title

Energy Efficient Ethernet

IEEE Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks – Specific Requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Media Access Control Parameters, Physical Layers and Management Parameters for Energy Efficient Ethernet

EEE PAR - Scope

Energy Efficient Ethernet

The proposed standard will include a symmetric protocol to facilitate transition to and from lower power consumption in response to changes in network demand. The transition will not cause loss of link as observed by higher layer protocols. The project will also specify PHY enhancements as required for a selected subset of PHY types to improve energy efficiency.

EEE PAR - Purpose

Most Ethernet links have significant periods of low utilization or no utilization for application data traffic. This project will take advantage of this to provide energy savings in the PHY and enable energy savings in the system which will deliver reduction in total cost of operation.

EEE PAR - Need

Energy Efficient Ethernet

Market pressure and legislative action worldwide is demanding improvements in energy efficiency of networked systems. Energy costs are a major component of operating cost. Energy Efficient Ethernet (EEE) features will be explicitly or implicitly required by a significant fraction of Ethernet edge connections in the future. Energy consumption and efficiency will become a major factor in the choice of network solutions, especially in data centers. EEE capabilities will be important as Ethernet becomes an enabler for low duty cycle, consumer class applications. EEE capabilities will enable new system level energy management techniques that will save energy beyond the network interface. EEE will address interface changes required to improve energy efficiency.

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Objectives document per 0707_eeesg_close_report.pdf

M: M. Bennett
S: W. Diab

Technical (>75%)

802.3 voters: Y:79 N:2 A:3

Motion Passes

Objectives 1 of 2

Energy Efficient Ethernet

Define a mechanism to reduce power consumption during periods of low link utilization for the following PHYs
– 100BASE-TX (Full Duplex)
– 1000BASE-T (Full Duplex)
– 10GBASE-T
– 10GBASE-KR
– 10GBASE-KX4

• Define a protocol to coordinate transitions to or from a lower level of power consumption

• The link status should not change as a result of the transition

• No frames in transit shall be dropped or corrupted during the transition to and from the lower level of power consumption
(All of the above modifications approved 5/29/07 All: 11/1/0, 802.3: 10/1/0)

Objectives 2 of 2

Energy Efficient Ethernet

- The transition time to and from the lower level of power consumption should be transparent to upper layer protocols and applications (Modified 5/30/07 All: 7/0/1, 802.3: 5/0/1)
- Define a 10 megabit PHY with a reduced transmit amplitude requirement such that it shall be fully interoperable with legacy 10BASE-T PHYs over 100 m of Class D (Category 5) or better cabling to enable reduced power implementations. (Approved 5/30/07, All: 5/0/3, 802.3: 4/0/2)
- Any new twisted-pair and/or backplane PHY for EEE shall include legacy compatible auto negotiation (approved 3/15/07: All 4/1/7)

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Broad Market Potential Criterion per 0707_eeesg_close_report.pdf

M: M. Bennett
S: H. Barrass

Technical (>75%)

802.3 voters: Y:75 N:1 A:8

Motion Passes

Broad Market Potential

Energy Efficient Ethernet

- Broad set(s) of applications
- Multiple vendors, multiple users
- Balanced cost (LAN vs. attached stations)

Market pressure and legislative action worldwide is demanding improvements in energy efficiency of networked systems. Energy costs are a major component of operating cost. EEE features will be explicitly or implicitly required by a significant fraction of Ethernet edge connections in the future.

Energy consumption and efficiency will become a major factor in the choice of network solutions, especially in data centers. EEE capabilities will be important as Ethernet becomes an enabler for low duty cycle, consumer class applications.

EEE capabilities will enable new system level energy management techniques that will save energy beyond the network interface. EEE will address interface changes required to improve energy efficiency.

Ethernet equipment vendors and customers are able to achieve an optimal cost balance between the network infrastructure components and the attached stations.
(Adopted 4/18/07 All: 11/0/0)

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Compatibility Criterion per 0707_eeesg_close_report.pdf

M: M. Bennett

S: D. Law

Technical (>75%)

802.3 voters: Y:78 N:1 A:6

Motion Passes

Compatibility

Energy Efficient Ethernet

- IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management, and Inter-working documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q, and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.

  •Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.

It is expected that Energy Efficient Ethernet will conform with the 802 Overview and Architecture and remain compatible with 802.1D, 802.1Q and 802.1f. The project will work with 802.1 to address any extensions to these standards if required and to encourage their work to take advantage of the features that this project will provide.

As an amendment to IEEE Std 802.3, the proposed project will follow the existing format and structure of 802.3 MIB definitions.

Incompatibility with legacy PHYs (e.g. operational conditions and media types) will be addressed in terms of market relevance. The proposed standard will include a 10 Mb/s PHY that may not support full 100m of category 3 cable. (Adopted 5/30/07 All: 6/0/2, 802.3: 8/0/0)

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Distinct Identity Criterion per 0707_eeesg_close_report.pdf

M: M. Bennett

S: D. Law

Technical (>75%)

802.3 voters: Y:81 N:1 A:4

Motion Passes

Distinct Identity

Energy Efficient Ethernet

a) Substantially different from other IEEE 802 standards
b) One unique solution per problem (not two solutions to a problem)
c) Easy for the document reader to select the relevant specification

This project will provide capabilities that are specifically for IEEE 802.3 links and IEEE Std 802.3 does not address energy efficiency. For example, there is no mechanism to allow a change of PHY speed without dropping link and renegotiation.

We may introduce specifications to optimize existing PHYs. Where appropriate, these optimized PHYs will only be accessed through EEE.

The proposed project will be formatted as a amendment to IEEE Std 802.3, making it easy for the document reader to select the EEE specification. (Adopted 5/30/07 All: 8/0/1, 802.3: 8/0/0)

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Technical Feasibility Criterion per 0707_eeesg_close_report.pdf

M: M. Bennett
S: W. Diab

Technical (>75%)

802.3 voters: Y:77 N:0 A:8

Motion Passes

Technical Feasibility

a) Demonstrated system feasibility
b) Proven technology, reasonable testing
c) Confidence in reliability

Energy efficiency techniques based on reducing capabilities to lower power consumption have been broadly deployed and used. The technology to be utilized in the realization of the EEE PHY will rely heavily on previous 802.3 standards.

The study group expects the proposed standard to use existing PHYs where possible. When necessary to meet the objectives, the proposed standard may include modified PHYs.

The control mechanism will build upon well known simple protocols.

The latency variation introduced by EEE is expected to be transparent to most upper layer protocols. EEE will define control, status, and management so that other protocols can be informed of the state of EEE.

Confidence in the energy saving effectiveness and system feasibility of selected proposals will be demonstrated through simulation of typical applications and usage; in conjunction with input from higher layer networking experts.
(Adopted 5/30/07 All: 8/0/0, 802.3: 7/0/0)

Motion

Energy Efficient Ethernet

- Move that 802.3 approve the EEE Economic Feasibility Criterion per 0707_eeesg_close_report.pdf

M: M. Bennett
S: W. Diab

Technical (>75%)

802.3 voters: Y:82 N:0 A:3

Motion Passes

Economic Feasibility

Energy Efficient Ethernet

a) Known cost factors, reliable data
b) Reasonable cost for performance
c) Consideration of installation costs

EEE will not materially impact component or installation costs, and may provide cost savings opportunities.

While EEE is within IEEE 802.3, the creation of EEE provides opportunities for energy savings beyond the PHY, potentially of much greater magnitude than the PHY itself.

The control mechanism will use similar functions to those already included in most Ethernet equipment and therefore will not add any significant cost.

The energy savings achieved will result in lower operating costs.
(Adopted 5/30/07 All: 8/0/0, 802.3: 7/0/0)

Motion

- 802.3 WG approve the 802.3az, Energy Efficient Ethernet, PAR (http://grouper.ieee.org/groups/802/3/eee_study/eee_par.pdf) and request EC approval for submittal to NesCom for consideration at the September meeting.

M: M. Bennett

S: J. D'Ambrosia

Technical (>75%)

802.3 voters: Y:81 N:1 A:4 Motion Passes

Motion

- The 802.3 Working Group extend the Energy Efficient Ethernet Study Group

M: Mike Bennett – on behalf of the EEESG

Passed by voice

Future Meetings

Energy Efficient Ethernet

- September 2007 Interim
  - Week of September 10th
  - Hotel Shilla, Seoul, Korea
  - More info: http://grouper.ieee.org/groups/802/3/interims/seoul_1_0907.html
  - Note: we will have 3 full days
  - plan on working on technical proposals for TF

- November 2007 Plenary
  - Week of November 11
  - Hyatt Regency
  - Atlanta, Georgia USA

- Future meeting information at:
  - http://www.ieee802.org/meeting/index.html

Thank You!