IEEE 802.3
Higher Speed Study Group
Closing Plenary Report

San Francisco, CA
July 19, 2007

John D'Ambrosia, Chair
jdambrosia@ieee.org

IEEE 802.3 HSSG Organization

- **Study Group Chair:**
  - John D'Ambrosia (jdambrosia@ieee.org)
- **Web Master**
  - Frank Chang (ychang@vitesse.com)

- **"Reach" Ad Hoc Chair**
  - Andy Moorwood (amoorwood@extremenetworks.com)
- **"Fiber Optic" Ad Hoc Chair**
  - Dan Dove (dan.dove@hp.com)

Reflector and Web

- To subscribe to the HSSG reflector, send an email to:
  ListServ@ieee.org

  with the following in the body of the message (do not include "<>"):
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  end*

- Send HSSG reflector messages to:
  STDS-802-3-HSSG@listserv.ieee.org

- HSSG web page URL:
  http://www.ieee802.org/3/hssg/

Goals for this Week

- Hear presentations related to Objectives, PAR(s), and 5 Criteria

- Finalize:
  - HSSG Objectives
  - Number of recommended PAR

- Project Authorization Requests
  - Completion and Approval of "PAR A"
    - Project Authorization Request
    - 5 Criteria Responses
  - If there is new PAR, complete and approve :
    - Project Authorization Request (PAR)
    - 5 Criteria Responses

- Respond to liaison letter from ITU-T SG15

Presentations

Lew Aronson Chris Cole	Technical Feasibility of 4x10G and 10x10G Electrical Interfaces
Steve Trowbridge	How can 40 Gb Ethernet be designed to fit existing ODU3 transport?
Marcus Duelk Steve Trowbridge	40 GbE Transport
Robert Winter	Server Use Cases for 40GE and 100GE
Paul Kolesar	Cost analysis of 40G & 100G MMF variants, an update of kolesar_01_0507
John Jaeger Ilango Ganga	Proposal for 5 Criteria Responses
Dan Dove	Two Par Proposal
Ralf-Peter Braun	40GE/100GE - network Operator's View
Ted Woodward	Survey of Operators on 40 GE longer distance transport
Robert Hays	40G PHY Options
Robert Hays Gary Nicholl	Proposal for HSSG Objectives
Ilango Ganga	Link Aggregation in Server End Stations
Howard Frazier Mark Nowell	HSSG PAR Proposal
Ali Ghiasi	Advantage of Linear Interface for 4x and 10x Links
Ali Ghiasi	Higher Speed Copper Operation
Scott Kipp	SAN and NAS Bandwidth Requirements

Accomplishments

- Heard 16 presentations

- Adopted New Set of Objectives All: 105 / 6 / 8   802.3: 49 / 4 / 4

- Project Documentation
  - Approved PAR: All: 106 / 4 / 11   802.3: 52 / 2 / 7
  - Approved 5 Criteria Responses
    - Broad Market Potential: All: 105 / 1 / 8   802.3: 50 / 1 / 6
    - Compatibility: All: 103 / 0 / 9   802.3: 49 / 0 / 5
    - Distinct Identity: All: 98 / 0 / 13   802.3: 47 / 0 / 7
    - Technical Feasibility: All: 111 / 0 / 6   802.3: 56 / 0 / 3
    - Economic Feasibility: All: 105 / 0 / 9   802.3: 50 / 0 / 6

- Respond to liaison letter from ITU-T SG15

IEEE 802.3 HSSG
In Recognition of
July 2007 –
40th Anniversary of
Summer of Love

SNMP MIB

- IETF 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

SG Motion (1 of 3)

Move that the HSSG adopt the following objectives in replacement of existing HSSG objectives:

- Support full-duplex operation only
- Preserve the 802.3 / Ethernet frame format utilizing the 802.3 MAC
- Preserve minimum and maximum FrameSize of current 802.3 standard
- Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface
- Provide appropriate support for OTN
- Support a MAC data rate of 40 Gb/s
- Provide Physical Layer specifications which support 40 Gb/s operation over:
  - at least 100m on OM3 MMF
  - at least 10m over a copper cable assembly
  - at least 1m over a backplane
- Support a MAC data rate of 100 Gb/s
- Provide Physical Layer specifications which support 100 Gb/s operation over:
  - at least 40km on SMF
  - at least 10km on SMF
  - at least 100m on OM3 MMF
  - at least 10m over a copper cable assembly

All:	Yes - 105	No – 6	Abstain - 8
802.3 Voters:	Yes - 49	No – 4	Abstain - 4
Motion Passes			

SG Motions (2 of 3)

- **PAR**
  - Move that the HSSG adopt
    - HSSG_PARA_PAR_WD_0507.pdf with the PAR text from frazier_01_0707.pdf and grant editorial license to the HSSG Chair. (All: 106/4/11, 802.3: 52/2/7)

- **5 Criteria**
  - Move that the HSSG adopt the Broad Market Potential response in jaeger_01_0707.pdf. (All: 105/1/8, 802.3: 50/1/6)
  - Move that the HSSG adopt the Compatibility response in jaeger_01_0707.pdf. (All: 103/0/9, 802.3: 49/0/5)
  - Move that the HSSG adopt the Distinct Identity response in jaeger_01_0707.pdf. (All: All: 98/0/13, 802.3: 47/0/7)
  - Move that the HSSG adopt the Technical Feasibility response in jaeger_01_0707.pdf. (All: 111/0/6, 802.3: 56/0/3)
  - Move that the HSSG adopt the Economic Feasibility response in jaeger_01_0707.pdf. (All: 105/0/9, 802.3: 50/0/6)

SG Motions (3 of 3)

- Move that the HSSG:
  - Submit the project documentation to the 802.3 Working Group for approval.
  - Request that the 802.3 Working Group submit the project documentation to the 802 Executive Committee for consideration at the November 2007 Plenary Session.
  - Request that the 802.3 Working Group request that the LMSC Chair submit the PAR to NESCOM for consideration at the December 2007 meeting.
  - Results – All: 100 / 0 / 1, 802.3: 47 / 0 / 0

- Motion to approve nowell_01_0707 as a communication response to the ITU-T SG15.
  - Results - All: 101/ 0 / 3

- Move that:
  - The HSSG requests that IEEE 802.3 extend the Higher Speed Study Group.
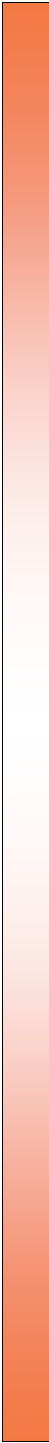 - Results - All: 104 / 0 / 1

Motion

- Move that 802.3 approve the HSSG objectives, as per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Mark Nowell

- 802.3 Voters (Y/N/A): 84 / 2 / 2
- Motion Passes

PAR - Title

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 40 Gb/s and 100 Gb/s Operation

PAR - Scope

Define 802.3 Media Access Control (MAC) parameters, physical layer specifications, and management parameters for the transfer of 802.3 format frames at 40 Gb/s and 100 Gb/s.

PAR - Purpose

The purpose of this project is to extend the 802.3 protocol to operating speeds of 40 Gb/s and 100 Gb/s in order to provide a significant increase in bandwidth while maintaining maximum compatibility with the installed base of 802.3 interfaces, previous investment in research and development, and principles of network operation and management. The project is to provide for the interconnection of equipment satisfying the distance requirements of the intended applications.

PAR - Need

The project is necessary to provide a solution for applications that have been demonstrated to need bandwidth beyond the existing capabilities. These include data center, internet exchanges, high performance computing and video-on-demand delivery. Network aggregation and end-station bandwidth requirements are increasing at different rates, and is recognized by the definition of two distinct speeds to serve the appropriate applications.

Broad Market Potential (1 of 2)

- **Broad sets of applications**
- **Multiple vendors and numerous users**
- **Balanced cost (LAN versus attached stations)**

■ **Bandwidth requirements for computing and core networking applications are growing at different rates, which necessitates the definition of two distinct data rates for the next generation of Ethernet networks in order to address these applications:**

  ❑ Servers, high performance computing clusters, blade servers, storage area networks and network attached storage all currently make use of 1G and 10G Ethernet, with significant growth of 10G projected in '07 and '08. I/O bandwidth projections for server and computing applications indicate that there will be a significant market potential for a 40 Gb/s Ethernet interface.

  ❑ Core networking applications have demonstrated the need for bandwidth beyond existing capabilities and the projected bandwidth requirements for computing applications. Switching, routing, and aggregation in data centers, internet exchanges and service provider peering points, and high bandwidth applications, such as video on demand and high performance computing environments, have demonstrated the need for a 100 Gb/s Ethernet interface.

Broad Market Potential (2 of 2)

- **Broad sets of applications**
- **Multiple vendors and numerous users**
- **Balanced cost (LAN versus attached stations)**

- **There has been wide attendance and participation in the study group by end users, equipment manufacturers and component suppliers. It is anticipated that there will be sufficient participation to effectively complete the standardization process.**

- **Prior experience scaling IEEE 802.3 and contributions to the study group indicates:**
  - ❑ 40 Gb/s Ethernet will provide approximately the same cost balance between the LAN and the attached stations as 10 Gb/s Ethernet.
  - ❑ The cost distribution between routers, switches, and the infrastructure remains acceptably balanced for 100 Gb/s Ethernet.

- **Given the topologies of the networks and intended applications, early deployment will be driven by key aggregation & high-bandwidth interconnect points. This is unlike the higher volume end system application typical for 10/100/1000 Mb/s Ethernet, and as such, the initial volumes for 100 Gb/s Ethernet are anticipated to be more modest than the lower speeds. This does not imply a reduction in the need or value of 100 Gb/s Ethernet to address the stated applications.**

Motion

- Move that 802.3 approve the HSSG Broad Market Potential Criterion per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 80 / 1 / 4
- Motion Passes

Compatibility

- **IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management, and Interworking 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.**

- As an amendment to 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.

- As an amendment to IEEE Std 802.3, the proposed project will follow the existing format and structure of IEEE 802.3 MIB definitions providing a protocol independent specification of managed objects (IEEE Std 802.1F).

- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.

- As was the case in previous IEEE 802.3 amendments, new physical layers specific to either 40 Gb/s or 100 Gb/s operation will be defined.

- By utilizing the existing IEEE 802.3 MAC protocol, this proposed amendment will maintain maximum compatibility with the installed base of Ethernet nodes.

Motion

- Move that 802.3 approve the HSSG Compatibility Criterion per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 80 / 1 / 4
- Motion Passes

Distinct Identity

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

- The proposed amendment is an upgrade path for IEEE 802.3 users, based on the IEEE 802.3 MAC.

- The established benefits of the IEEE 802.3 MAC include:
  - Deterministic, highly efficient full-duplex operation mode
  - Well-characterized and understood operating behavior
  - Broad base of expertise in suppliers and customers
  - Straightforward bridging between networks at different data rates

- The Management Information Base (MIB) for IEEE 802.3 will be extended in a manner consistent with the IEEE 802.3 MIB for 10 / 100 / 1000 / 10000 Mb/s operation.

- The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.

- Bandwidth requirements for computing and networking applications are growing at different rates. These applications have different cost / performance requirements, which necessitates two distinct data rates, 40 Gb/s and 100 Gb/s.

Motion

- Move that 802.3 approve the HSSG Distinct Identity Criterion per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 85 / 1 / 3
- Motion Passes

Technical Feasibility

- **Demonstrated system feasibility**
- **Proven technology, reasonable testing**
- **Confidence in reliability**

- The principle of scaling the IEEE 802.3 MAC to higher speeds has been well established by previous work within IEEE 802.3.

- The principle of building bridging equipment which performs rate adaptation between IEEE 802.3 networks operating at different speeds has been amply demonstrated by the broad set of product offerings that bridge between 10, 100, 1000, and 10000 Mb/s.

- Systems with an aggregate bandwidth of greater than or equal to 100 Gb/s have been demonstrated and deployed in operational networks.

- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

  - The experience gained in the development and deployment of 10 Gb/s technology is applicable to the development of specifications for components at higher speeds. For example, parallel transmission techniques allow reuse of 10 Gb/s technology and testing.

  - Component vendors have presented data on the feasibility of the necessary components for higher speed solutions. Proposals, which either leverage existing technologies or employ new technologies, have been provided.

- The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence. Presentations demonstrating this have been provided.

Motion

- Move that 802.3 approve the HSSG Technical Feasibility Criterion, per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 86 / 0 / 2
- Motion Passes

Economic Feasibility

- **Known cost factors, reliable data**
- **Reasonable cost for performance**
- **Consideration of installation costs**

- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.

- Presentations indicate that for the server market and computing applications the optimized rate to provide the best balance of performance and cost is 40 Gb/s. For the network aggregation market and core networking applications, the optimized rate offering the best balance of performance and cost is 100 Gb/s.

- In consideration of installation costs, the project is expected to use proven and familiar media, including optical fiber, backplanes, and copper cabling technology.

- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

Motion

- Move that 802.3 approve the HSSG Economic Feasibility Criterion, per 0707_hssg_closing_report.pdf

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Howard Frazier

- 802.3 Voters (Y/N/A): 85 / 0 / 4
- Motion Passes

Motion

- Move that 802.3 approve the HSSG PAR, per par_0707.pdf

  (http://www.ieee802.org/3/hssg/public/july07/par_0707.pdf)

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Ilango Ganga

- 802.3 Voters (Y/N/A): 82 / 0 / 3
- Motion Passes

Motion

- Move that the 802.3 Working Group submit the 802.3ba PAR and 5 Criteria to the 802 Executive Committee for consideration at the November 2007 Plenary Session.

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Ilango Ganga

- 802.3 Voters (Y/N/A): 81 / 0 / 3
- Motion Passes

Motion

- Move that the 802.3 Working Group request that the LMSC Chair pre-submit the 802.3ba PAR to NESCOM for consideration at the December 2007 meeting, remaining on the agenda subject to November 802 EC approval.

- Technical (>=75%)
- Moved by: John D'Ambrosia
- Second: Ilango Ganga

- 802.3 Voters (Y/N/A): 81 / 0 / 3
- Motion Passes

Motion

- Move that 802.3 approve and forward liaison (nowell_01_0707.pdf) to ITU-T SG15 (Ref: COM 15 – LS 165 – E) with appropriate edits by the Chair (or his appointed agent).

- Procedural (>50%)
- Moved by: John D'Ambrosia
- Second: Mark Nowell

- 802.3 Voters (Y/N/A):
- Motion Passes by voice vote without opposition

Motion

- Move that the HSSG requests that IEEE 802.3 extend the Higher Speed Study Group.

- (>50%)
- Moved by John D'Ambrosia on behalf of the Higher Speed Study Group
- Seconded by : N / A

- 802.3 Voters (Y/N/A): 70 / 0 / 0
- Motion Passes

Future Meetings

- ## September 2007 Interim
  - Tuesday through Thursday, September 11 – 13
  - Seoul, Korea

- ## November 2007 Plenary
  - Tuesday through Thursday, Nov 13 – 15
  - Hyatt Regency Atlanta
  - Atlanta, Ga, USA

Straw Poll

- Will you be attending the meeting in Korea?

    - Yes – 33
    - No - 40
    - Maybe – 21

Thank You!