

Review of the 5 Criteria

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Outline

- Audience
- Purpose
- 5 Criteria
- Guidelines for responses
- Summary
- Successful examples

Audience

- The 5 criteria are drafted and approved by a study group
- They are reviewed and approved (individually) by the working group
- They are subject to review and approval by each and every other working group in 802
- They are reviewed and approved by the 802 executive committee

Purpose

- The 5 criteria are used to evaluate proposed projects
- They are used to filter out projects that are not appropriate for standardization in 802
- They are unique to 802
- They help perpetuate the “802 culture”

The 5 Critters



Broad
Market
Potential



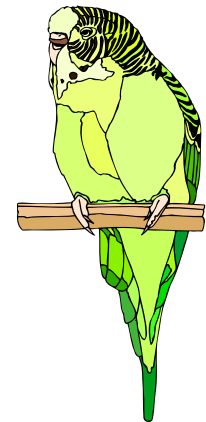
Compatibility



Distinct
Identity



Technical
Feasibility



Economic
Feasibility



Broad Market Potential

- 802 version:
 - a) Broad sets of applicability
 - b) Multiple vendors and numerous users
 - c) Balanced costs (LAN versus attached stations)
- 802.3 version:
 - Broad set(s) of applications
 - Multiple vendors, multiple users
 - Balance cost, LAN vs. attached stations



Compatibility

- 802 version:
 - a) Conformance with 802 Overview and Architecture
 - b) Conformance with 802.1D, 802.1Q, and 802.1f
 - c) Compatible managed object definitions
- 802.3 version:
 - Conformance with CSMA/ CD MAC, PLS
 - Conformance with 802.2
 - Conformance with 802 Functional Requirements



Distinct Identity

- 802 version:
 - 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
- 802.3 version:
 - Substantially different from other 802.3 specifications/ solutions
 - Unique solution for problem (not two alternatives/ problem)
 - Easy for document reader to select relevant spec



Technical Feasibility

- 802 version:
 - a) Demonstrated system feasibility
 - b) Proven technology, reasonable testing
 - c) Confidence in reliability

- 802.3 version:
 - Demonstrated feasibility; reports - - working models
 - Proven technology, reasonable testing
 - Confidence in reliability



Economic Feasibility

- 802 version:
 - a) Known cost factors, reliable data
 - b) Reasonable cost for performance
 - c) Consideration of installation costs
- 802.3 version:
 - Cost factors known, reliable data
 - Reasonable cost for performance expected
 - Total Installation costs considered

Guidelines for responses

- Pick either the 802 version or the 802.3 version - don't mix them
- Respond to each criteria on a separate slide
- Repeat the criteria verbatim at the top of each slide
- Respond to each point of the criteria

Guidelines for responses

- Be prepared to defend every word of the responses
- Responses must be specific
- Responses must be succinct
- Responses must be honest
- A project must satisfy all 5 of the criteria simultaneously

Summary

- The 5 criteria are an important output of a study group, along with the PAR and objectives
- Presentations should address the 5 criteria
- Be thorough and exercise due diligence

Successful examples

- 802.3ah EFM
- 802.3ae 10 Gigabit Ethernet
- 802.3z Gigabit Ethernet

Broad Market Potential

- a) **Broad sets of applicability**
 - b) **Multiple vendors and numerous users**
 - c) **Balanced costs (LAN versus attached stations)**
-

Residential and business subscriber access networks represent a new and very broad application space for Ethernet. The available market is estimated by third party analysts at greater than 40 million subscribers in the US and 150 million subscribers worldwide by 2005. The technology developed for access networks will have applications in other markets as well.

At the second EFM study group meeting, 121 individuals from 77 companies representing both vendors and users expressed their support for the project.

Ethernet equipment vendors and customers are able to achieve an optimal cost balance between the network infrastructure components and the attached stations.

Compatibility

- a) Conformance with 802 Overview and Architecture**
 - b) Conformance with 802.1D, 802.1Q, 802.1f**
 - c) Compatible managed object definitions**
-

As a supplement to IEEE Std 802.3, the proposed project will remain in conformance with the 802 Overview and Architecture with the possible exception of the peer to peer key concept for Ethernet over PON.

As a supplement to IEEE Std 802.3, the proposed project will remain in conformance with 802.1D, 802.1Q and 802.1f, though extensions to these standards may be proposed as additional work items.

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

Distinct Identity

- 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.**
-

There is no existing 802 standard or approved project appropriate for wire line access using the Ethernet access protocol and frame format, with the exception of certain combinations of operating speed and media defined in various supplements to IEEE Std 802.3. This project will expand that set to include new media.

While the proposed project includes a choice of physical media and operating speeds, it will specify only one solution for each media at a given operating speed range.

The proposed project will be formatted as a supplement to IEEE Std 802.3, making it easy for the document reader to select the EFM specification.

Technical Feasibility

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

Ethernet systems (comprising interface controllers, bridges, routers, management systems, and other devices) represent the most widely deployed networking technology in history. The proposed project will build on the vast array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.

The proposed project will, to the extent possible, re-use specifications developed by other standards bodies and develop new specifications in accordance with the rigorous standards of proof applied to 802.3 projects.

The reliability of Ethernet components and systems can be extrapolated in the target environments with a high degree of confidence.

Economic Feasibility

- a) Known cost factors, reliable data.**
 - b) Reasonable cost for performance.**
 - c) 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.

Ethernet consistently demonstrates the most attractive cost/performance ratio of any networking technology, at any operating speed. This fact is well established in the enterprise networking application space, and the goal of this project is to extend the same cost/performance advantage to the access application space.

Installation costs, as well as maintenance and operations costs, should be reduced when compared to competing technologies through a combination of higher manufacturing volume, broader competition, a broader labor pool, simpler configurations and a more optimal system architecture.

1. Broad Market Potential

Broad set(s) of applications

Multiple vendors, multiple users

Balanced cost, LAN Vs. attached stations

- **Rapid growth of network and internet traffic has placed high demand on the existing infrastructure motivating the development of higher performance links. Quantitative presentations have been made to the 802.3 HSSG indicating significant market opportunity.**
- **10 Gb/s 802.3 solution extends Ethernet capabilities providing higher bandwidth for multimedia, distributed processing, imaging, medical, CAD/ CAM, and pre-press applications by improving the performance of:**
 - LAN Backbone and Server and Gateway Connectivity
 - Switch aggregation
 - the MAN, WAN, Regional Area Network (RAN), and Storage Area Network (SAN)
- **140 participants attended the 10 Gigabit call-for-interest, representing at least 55 companies, indicate that they plan to participate in the standardization of 10 Gb/s 802.3. 139 Indicated that this is the right time to start. Attendance and interest has increased steadily since that time.**
- **This level of commitment indicates that a standard will be supported by a large group of vendors. This in turn will ensure that there will be a wide variety of equipment supporting a multitude of applications.**
- **Prior experience scaling 802.3 across the range of 1 to 1000 Mb/ s indicates that the cost balance between adapters, switches, and the infrastructure remains roughly constant. 10 Gb/s Ethernet should continue this trend.**

IEEE 802.3

High Speed Study Group

2. Compatibility with IEEE Standard 802.3

Conformance with CSMA/ CD MAC, PLS

Conformance with 802.2

Conformance with 802 FR

- The proposed standard will conform to the full-duplex operating mode of the 802.3 MAC, appropriately adapted for 10 Gb/ s operation. Half-duplex (CSMA/CD) operation will not be supported at 10 Gb/s.
- As was the case in previous 802.3 standards, new physical layers will be defined for 10 Gb/s operation.
- The proposed standard will conform to the 802.3 MAC Client Interface, which supports 802.2 LLC.
- The proposed standard will conform to the 802.1 Architecture, Management and Interworking.
- The proposed standard will conform with the 802 Functional Requirements Document (with the possible exception of Hamming distance).
- The proposed standard will define a set of systems management objects which are compatible with OSI and SNMP system management standards.

3. Distinct Identity

Substantially different from other 802.3 specs/ solutions
Unique solution for problem (not two alternatives/ problem)
Easy for document reader to select relevant spec

- **The proposed standard is an upgrade path for 802.3 users, based on the 802.3 MAC, running at 10 Gb/s.**
- **By adapting the existing 802.3 MAC protocol for use at 10 Gb/s, this proposed standard will maintain maximum compatibility with the installed base of over 600 million Ethernet nodes.**
- **The established benefits of the 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 10 Gb/s 802.3 will be extended in a manner consistent with the 802.3 MIB for 10 / 100 / 1000 Mb/s operation. Therefore, network managers, installers, and administrators will see a consistent management model across all operating speeds.**
- **Two PHY families will address two distinct application spaces, the LAN and the WAN.**
- **The proposed standard will be a supplement to the existing 802.3 standard, formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.**

4. Technical Feasibility

**Demonstrated feasibility; reports - - working models
Proven technology, reasonable testing
Confidence in reliability**

- **Technical presentations, given to 802.3, have demonstrated the feasibility of using the 802.3 in useful network topologies at a rate of 10 Gb/s.**
- **The principle of scaling the 802.3 MAC to higher speeds has been well established by previous work within 802.3. The 10 Gb/s work will build on this experience.**
- **The principle of building bridging equipment which performs rate adaptation between 802.3 networks operating at different speeds has been amply demonstrated by the broad set of product offerings that bridge between 10, 100, and 1000 Mb/s.**
- **Vendors of optical components and systems are building reliable products which operate at 10 Gb/s, and meet worldwide regulatory and operational requirements.**
- **Component vendors have presented research on the feasibility of physical layer signaling at a rate of 10 Gb/s on fiber optic media using a wide variety of innovative low cost technologies.**
- **10 Gb/s Ethernet technology will be demonstrated during the course of the project, prior to the completion of the sponsor ballot.**

5. Economic Feasibility

Cost factors known, reliable data
Reasonable cost for performance expected
Total Installation costs considered

- **Cost factors are extrapolated from the OC-192 component supplier base and technology curves.**
- **A target cost increase of 3X of 1000BASE- X with a ten-fold increase in available bandwidth in the full duplex operating mode will result in an improvement in the cost- performance ratio by a factor of 3. This cost model has been validated during both the 100 and 1000 Mb/s Ethernet deployment.**
- **Customers will in some cases be able to re-use fiber that has been installed in accordance with ISO/ IEC 11801, and in other existing fiber facilities.**
- **Installation costs for new fiber runs based on established standards are well known and reasonable.**
- **Network design, installation and maintenance costs are minimized by preserving network architecture, management, software, and structured cabling.**

1. Broad Market Potential

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

The fast growth of CPU speed is forcing the development of new LANs with higher bandwidth.

The following applications and environments will benefit from this capability:

- o Backbone, Server and Gateway connectivity
- o Higher Bandwidth for multimedia, distributed processing, imaging, medical, CAD/CAM, and pre-press applications
- o Aggregation of 100Mb/s switches
- o Upgrade for large installed base of 10/100 Ethernet

Multiple vendors and users have demonstrated interest by attending the Gigabit Ethernet tutorial (over 200 participants), attending the preliminary study group meeting (over 120), and enrolling in the higher speed E-Mail reflector (over 210).

81 participants representing at least 54 companies indicate that they plan to participate in the standardization of 1,000 Mb/s 802.3.

This level of commitment indicates that a standard will be supported by a large group of vendors. This in turn will ensure that there will be a wide variety of equipment to support a multitude of applications.

Higher-speed 802.3 solutions, which include scaled up versions of existing 802.3 topologies, have balanced cost. Prior experience with scaling 802.3 across the range of 1 to 100 Mb/s indicates that the cost balance between adapters, cabling, and hubs, remains roughly constant, provided that the operating speed can be achieved within the limits of current technology.

2. Compatibility with IEEE Standard 802.3

- o Conformance with CSMA/CD MAC, PLS
- o Conformance with 802.2
- o Conformance with 802 FR

The proposed standard will conform to the CSMA/CD MAC, with currently authorized extensions, appropriately adapted for 1000 Mb/s operation.

In a fashion similar to the 100BASE-T standard, the current physical layers will be replaced with new Physical Layers (PHY) as appropriate for 1,000 Mb/s operation.

The proposed standard will conform to the 802.2 LLC interface.

The proposed standard will conform with the 802 Functional Requirements Document (with the possible exception of Hamming distance).

The CSMA/CD access method will not support a 2 km network diameter at this speed while maintaining the current values in the MAC parameter table. This portion of the application space will be addressed at 1,000 Mb/s with the full duplex operating mode of 802.3.

3. Distinct Identity

- o Substantially different from other 802.3 specs/solutions
- o Unique solution for problem (not two alternatives/problem)
- o Easy for document reader to select relevant spec

The proposed standard is an upgrade for 802.3 users, based on the 802.3 CSMA/CD MAC, running at 1,000 Mb/s.

Maximum compatibility with the installed base of over 60 million CSMA/CD nodes is maintained by adapting the existing CSMA/CD MAC protocol for use at 1,000 Mb/s.

Established benefits of CSMA/CD and the 802.3 MAC include:

- o Optimistic transmit access method
- o High efficiency in full-duplex operating mode
- o Well-characterized and understood operating behavior
- o Broad base of expertise in suppliers and customers
- o Straightforward bridging between networks at different data rates

The Management Information Base (MIB) for 1,000 Mb/s 802.3 will maintain consistency with the 802.3 MIB for 10/100 Mb/s operation. Therefore, network managers, installers, and administrators will see a consistent management model across all operating speeds.

The proposed standard will encompass one Physical Layer solution for each specific type of network media (e.g. single mode fiber, multi-mode fiber, coaxial cable, balanced pair cable).

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

4. Technical Feasibility

- o Demonstrated feasibility; reports - - working models
- o Proven technology, reasonable testing
- o Confidence in reliability

Technical presentations, given to 802.3, have demonstrated the feasibility of using the CSMA/CD MAC in useful network topologies at a rate of 1,000 Mb/s.

Technical presentations given to 802.3 from multiple current vendors of Full Speed Fibre Channel components have demonstrated the feasibility of physical layer signaling at a rate of 1.06 GBaud on both fiber optic and copper media.

Many of these vendors have expressed support for an increase in the signaling rate to 1.25 GBaud, which would support a MAC data rate of 1,000 Mb/s.

The principle of scaling the CSMA/CD MAC to higher speeds has been well established by previous work within 802.3. The 1,000 Mb/s work will build on this experience.

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

Vendors of full speed Fibre Channel components and systems are building reliable products which operate at 1.06 GBaud, and which meet worldwide regulatory and operational requirements.

5. Economic Feasibility

- o Cost factors known, reliable data
- o Reasonable cost for performance expected
- o Total Installation costs considered

Cost factors are derived from the current Full Speed Fibre Channel component supplier base.

A reasonable cost increase (3X of 100BASE-FX) with a ten-fold increase in available bandwidth in the full duplex operating mode will result in an improvement in the cost/performance ratio by a factor of 3.33 for multi-mode fiber applications.

The provision for a half duplex operating mode using the 802.3 CSMA/CD MAC will permit the construction of very inexpensive repeating hubs.

Customers will in many cases be able to re-use their existing fiber that has been installed in accordance with ISO/IEC 11801. Installation costs for new fiber runs based on established standards are well known and reasonable.

Costs for coaxial based short run copper links are well established for full speed Fibre Channel.

While the cost model for the horizontal copper cabling is well established, the cost model for 1000 Mb/s physical layers which will operate on horizontal copper cabling has not yet been firmly established. Presentations have been given to the HSSG which suggest a cost multiple of 2X relative to 100BASE-T2.