IEEE 802.17 RPR Working Group

PICS, Conformance Test Points, and Optional Compatibility Interfaces

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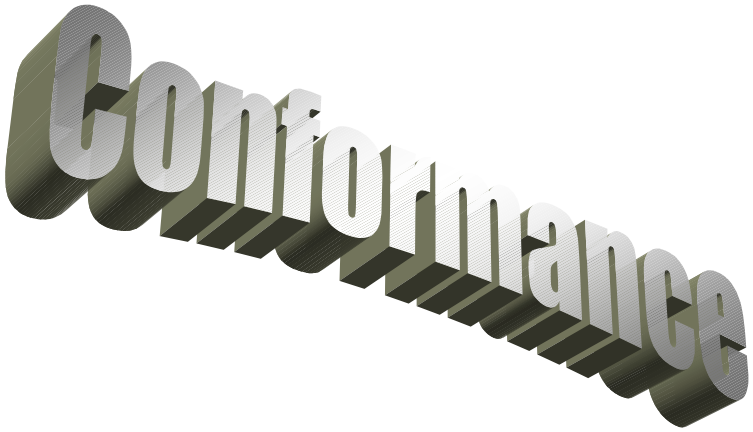
Goals of 802 WGs



Compatibility

Interoperation

Multivendor Support

Tools

- PICS tables
- Compatibility Interfaces
- System Conformance Test Points

What is a PICS?

- A "PICS" is a Protocol Implementation Conformance Statement
  - A tabular proforma that describes all the things that an implementation must contain in order to be compliant to the standard
- Every 802 standard **must** have at least one set of PICS proforma
  - In many cases, each normative Clause or Annex has a separate set of PICS tables (easier to manage in a complex standard such as 802.17)
- Each entry in the PICS tables corresponds to a specific requirement
  - PICS entries cover both mandatory and optional requirements
- PICS table entries are created using a particular "language" and notation
  - See 802.3-2000 Clause 21; 802.11-1999, Annex A; 802.1Q-1998, Annex A; etc.
- PICS tables are expected to be filled out by implementers
  - Any supplier of an implementation that is claimed to conform to an 802 standard (or part thereof) must complete the PICS proforma for that standard (or part thereof)
  - Completed PICS proforma must be supplied on request to users of implementation

Who Uses the PICS?

- Protocol implementers
  - Used as a checklist for ensuring complete conformance to the standard
- People who acquire (purchase) implementations of protocols
  - To determine, in detail, the optional protocol features present in the implementation
  - To verify that an implementation actually conforms to the stated protocol(s), by checking the completed PICS proforma from the vendor against the conformance requirements of the standard
- Users of the implementations
  - To ensure interoperation between two implementations
  - Incompatible PICS usually means implementations that fail to interwork
- Conformance testers
  - To provide a basis for selecting tests to be used to determine conformance of an implementation to the standard

Components of a PICS

- Introductory boilerplate
  - Implementation and supplier information
  - Protocol standard supported
  - Date of completion
- List of major capabilities and options
  - Interfaces
  - Optional capabilities
  - Gross functionality
- Tables of entries for specific functions
  - For example:
    - Transmit functions
    - Receive functions
    - Management functions

A.4 PICS proforma for IEEE Std 802.1D-1998

A.4.1 Implementation identification

Supplier	
Contact point for queries about the PICS	
Implementation Name(s) and Version(s)	
Other information necessary for full identification—e.g., name(s) and version(s) of machines and/or operating system names	
NOTE 1—Only the first three items are required for all implementations; others appropriate in meeting the requirement for full identification. NOTE 2—The terms Name and Version should be interpreted appropriately to correspond with a supplier's terminology (e.g., Type, Series, Model).	

A.4.2 Protocol summary, IEEE Std 802.1D-1998

Identification of protocol specification	IEEE Std 802.1D-1998, Information technology—Telecommunications and information exchange between systems—Local and metropolitan area networks—Common specifications—Part 3: Media Access Control (MAC) Bridges
Identification of amendments and corrigenda to the PICS proforma which have	Amd. :

Example PICS entries

51.10.4.2 PMA transmit functio

Normative function or feature

Conformance level: (M) Mandatory, (O) Optional, etc.

Item	Feature	Subclause	Value/Comment	Status	Support
PT1	Serialization and transmission of datagroup	51.3.1		M	Yes [ ]
PT2	order of transmission	51.4.1	bit xsbi_tx<15> shall be transmitted first	M	Yes [ ]
PT3	PMA_TX_CLK	51.4.1	PMA_TX_CLK derived from PMA_TXCLK_SRC	XSBI:M	Yes [ ] N/A[ ]
PT4	LVDS electrical compliance	51.5	conformance to TIA/EIA644 LVDS specifications and to Table 51–5	XSBI:M	Yes [ ] N/A[ ]
PT5	transmit electrical specifications	51.6	electrical and timing specifications	XSBI:M	Yes [ ] N/A[ ]

PICS Item Number

Cross-reference to clause

What an implementation must do to conform

Implementer's Checkboxes

Generating PICS Entries

- Every normative statement in the standard, whether mandatory or optional, must have a corresponding PICS entry
  - The word "shall" denotes a normative statement (more about this later)
- The PICS "language" is used to indicate the level of conformance
  - Mandatory items are denoted by "M"
  - Optional items are denoted by "O"
  - Items that must be implemented if an optional capability is provided are denoted by "*item*:M"
  - Etc.
- Cross-references are made to the body of the standard
  - Each PICS entry must provide a reference to the normative statement it codifies

The PICS tables must be in place before we go to Sponsor Ballot!

About “shall” & “may”

- The usage of “shall”, “may”, “should”, etc. is codified in the IEEE 2000 Style manual (Clause 13)
- The word “shall” has special meaning in IEEE standards
  - “shall” **always** indicates a mandatory requirement that must be strictly followed; automatically triggers an “M” PICS entry
  - “must”, “will”, … not used synonymously with “shall” (generally avoided)
- The word “may” also has special meaning
  - “may” denotes an optional capability or function; triggers an “O” PICS entry
  - Words such as “can” shall not be substituted
- Every use of “shall” or “may” is attached to a PICS entry
  - This is now generally enforced within 802 groups at Sponsor Ballot
  - The one-to-one correspondence is required, and checked

All non-normative usages of “shall” have to be eliminated
All normative statements have to use “shall” or “may”

What is a Compatibility Interface?

- A compatibility interface is defined to allow different vendors to supply devices implementing different parts of the protocol
  - It may be specified at the electrical (signals) or physical (connectors) level
  - The interface typically separates two distinct sublayers in the protocol
- Compatibility interfaces are typically optional
  - Some system/device vendors may choose to integrate the functions on both sides of the compatibility interface into a single device or system
  - Protocol should not limit implementation flexibility
- Example of compatibility interface: GMII in 802.3
  - The GMII allows a PHY (transceiver) vendor to supply devices independently of a MAC vendor
  - The GMII is optional; many implementations do not include it

Compatibility Interfaces in P802.17

- 802.17 compatibility interfaces are all currently between the MAC and the PHY
  - Different compatibility interfaces for Ethernet and SONET/SDH PHYs
  - Ethernet: XGMII & XAUI (10GE), GMII (GigE)
  - SONET/SDH: SPI-3 (155–622 Mb/s), SPI-4.1 and SPI-4.2 (622–9953 Mb/s)
  - Interfaces specified at the electrical (signal) level
- All of the 802.17 compatibility interfaces *should be* optional
  - Implementers should be permitted to integrate PHYs into 802.17 MACs
  - However, this does not seem to be clearly brought out in the standard
- An implementation may not support an optional compatibility interface
  - If it's not present, it's not exposed and can't be used for conformance testing

What is a System Conformance Test Point?

- This is a point at which any implementation of a standard can be externally tested for conformance to the standard
  - At this point, the external attributes and behavior of the implementation must be completely specified by the standard (directly, or by reference to other stds)
  - Specifications include:
    - Physical: electrical/optical signaling, connectors, …
    - Coding and transmission order
    - Logical frame structure, transactions, …
- A conformance test point must be accessible to third-parties
  - Must be an "exposed interface" of some kind
  - Must not require private or proprietary information of any kind
  - Normally, present on the system implementation itself

The Need for System Conformance Test Points

- Users of protocol implementations
  - Substantiate suppliers' claims of protocol conformance
  - Ensure that their equipment will interoperate with those of other users
  - Localize interoperability problems to specific devices or systems
- Independent test labs (and test equipment vendors)
  - Certify conformance of devices or systems to particular standards

Standards that cannot be easily tested for conformance tend to increase legal budgets at the expense of marketing budgets! ☺

Example of System Conformance Test Points

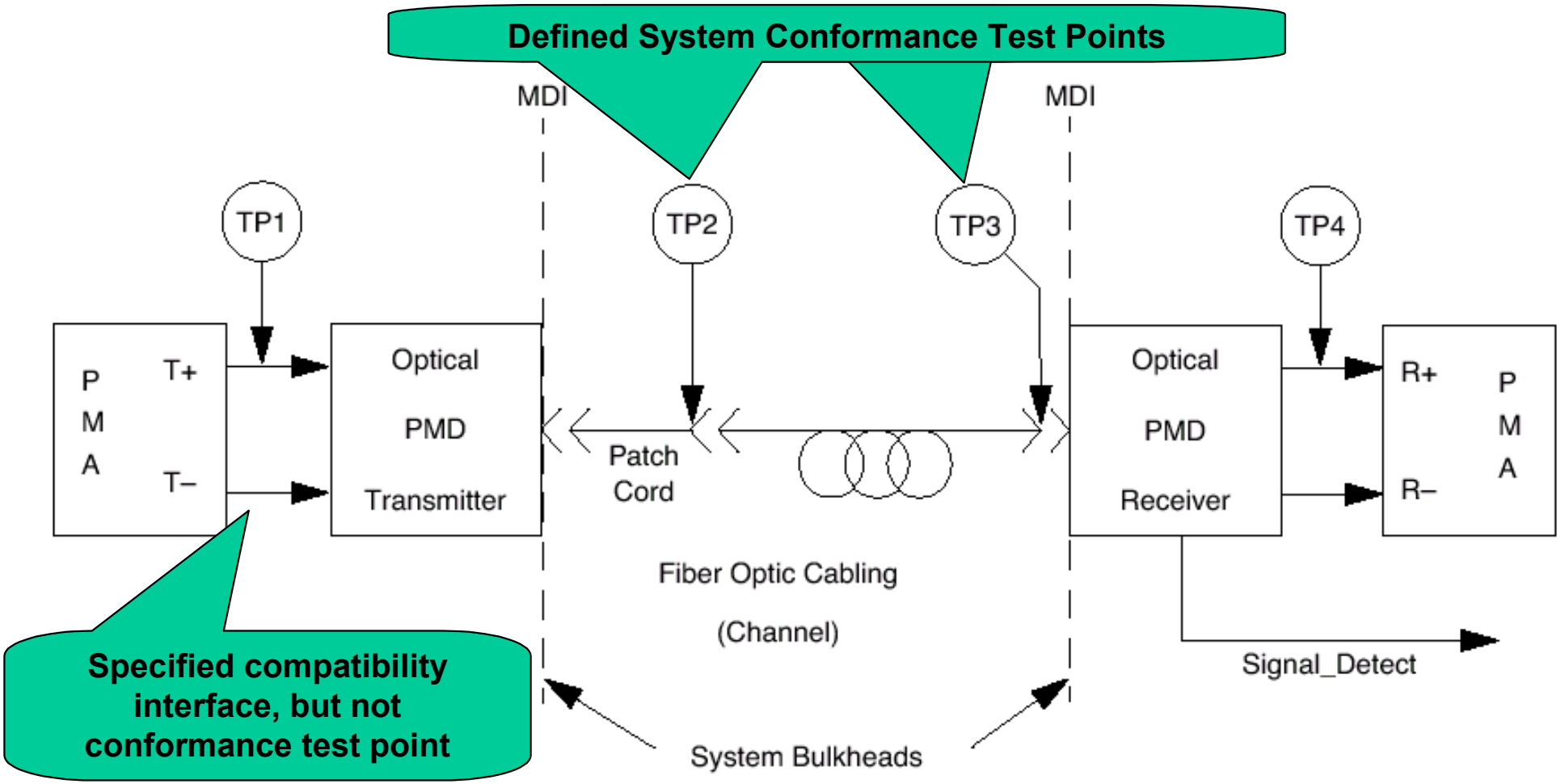


Figure 38–1—1000BASE-X block diagram

Conformance Testing and P802.17

- The 802.17 system conformance test points are currently provided by the specified PHYs
  - The standard specifies behavior all the way to the physical medium
    - MAC specified directly
    - PHYs specified by reference
  - A specific implementation may therefore be tested for conformance at the physical medium interface
  - This can be done by a third party, and solely by reference to the standard
- The optional compatibility interfaces are not suitable as the only means of system conformance testing
  - They may not be present in all implementations
  - They may not be externally visible