Resolution of issues around RF signaling and proposed unidirectional mode

Report to 802.3ah

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Problems to be solved

- Some objectives and expectations not seen to be met in current draft
  - Monday's presentation gives one view of the issues
    - Backwards compatibility
    - Market, naming, procurement issues
    - Applicability to non-access networks
- D3.1 not self-consistent with respect to
  - whether unidirectional capability is mandatory or optional
  - and in what PHYs
    - E.g. D3.1 cl.57 and cl.58 do not agree
  - Inconsistency likely to cause document maintenance problems

Solution

- Unidirectional capability is OPTIONAL for almost any PHY
  - Capability indicated via clause 22 register
  - Enabling capability controlled via clause 22 register
  - Exceptions:
    - Downstream P2MP which needs capability to transmit unidirectional
    - Some PHYs cannot have the capability
- Unidirectional capability is REQUIRED for OAM to use remote fault indication
  - All other OAM features independent of this capability
  - OAM, as independent of the PHY, already works this way
- MINOR changes to 56, 57, 58, 59, 60, 65, 66, 67

Features and benefits

- Removes internal contradiction in D3.1
  - Cleaner document, more self contained
- Better layering
  - OAM options not generally tied to PHY type or port name
- Better consistency across port types
  - No categorization into “old” and “new” PHY types
  - Good for interoperability and backwards compatibility
- Keeps functionality as in D3.1
  - No changes to state machines or similar
- Meets objectives
- No changes to names
- Supports 802.3ah’s schedule

Implementation of solution

- Create option in 66:
  - Unidirectional-capable
  - Not unidirectional-capable
    - Which is identical to clause 24 PMA/PCS, clause 36 PMA/PCS, clause 46 RS, as appropriate
      - Also created text in 66.2 for a 1000BASE-X PMA for housekeeping so 66.2 includes PMA/PCS (not just PCS)
    - Major capability added to PICS
      - Changes to state machines for unidirectional mode conditioned on this major capability
- PMDs in 58, 59 connect to ONLY Clause 66
  - No need to connect to Cl.24, Cl.36, or Cl.46 because those are included by reference in Cl.66, and Cl.66 is IDENTICAL to those clauses when unidirectional capability is not enabled or available
  - Clause 56 will also state that non-unidirectional-capable options in clause 66 are identical to clause 24 or 36 PMA/PCS, or clause 46 RS, as appropriate
- PMDs in 60 connect to Cl.65

Implementation of solution – detail 1/7

- 22.2.4.1.12 and 22.2.4.2.8, Unidirectional enable
  - Appear not to need a change
  - Info in two bits described is all OAM layer needs to know: it doesn't need to understand PHY types or clause 66 options
  - Bit 0.5, unidirectional enable, can be used to switch off use of RF OAMPDUs – allows compatibility with not-unidirectional-aware far end DTE
    - Correct bugs in MF38, MF39 and MF45 status

Implementation of solution – detail 2/7

- 56.1.3
  - Second and fourth sentences: change “24” and “36” to “66”
  - Table 56-2 Change heading of right most column to “1000BASE-X PCS, PMA”
- 56.1.5
  - Add sentence:
- “When unidirectional operation is not enabled, the sublayers in Clause 66 are precisely the same as their equivalents in Clause 24, Clause 36 and Clause 46.”

Implementation of solution – detail 3/7

- 57.1.2, Operations, Administration, and Maintenance (OAM) Summary of objectives and major concepts
  - a2) Physical layer devices using Clause 66 may support unidirectional operation that allows OAM remote fault indication during fault conditions.
  - a4) Physical layer devices other than those listed above do not support unidirectional operation allowing OAM remote fault indication during fault conditions. Some physical layer devices have specific remote fault signaling mechanisms in the physical layer.
- 57.2.12 Unidirectional OAM operation
  - Change reference “67.6.1” to “Clause 66”.
- 57.7.2.3 Major capabilities/options
  - Value/comment for UNI: “requires support for unidirectional operation as defined in Clause 66”

Implementation of solution – detail 4/7

- 58.1 To refer to 66.1 PMA
  - Delete reference to clause 24 PMA
- 59.1 To refer to 66.2 PMA instead of clause 36 PMA
  - Need not mention PCS at all? Subject of separate comment 558
  - Editorial: delete first PICS entry as no “shall” in text
- 60.1 Change “the appropriate 1000BASE-X PMA of Clause 66” to “the appropriate 1000BASE-X PMA of Clause 65”
- 60.10.3
  - Editorial: delete first PICS. Note comment 558 re PICS and “shall”

Implementation of solution – detail 5/7

- 65.1.2 Principle of operation
- Change last sentence “The OLT shall operate in unidirectional mode as defined in Clause 66.2.2.” to “The PCS of the OLT shall operate in unidirectional mode as defined in ~~Clause~~ 66.2.2.”

Implementation of solution – detail 6/7

- 66, Extensions … for unidirectional transport
  - Introduce non-unidirectional-capable options: insert first sentence and word:
    - In the absence of unidirectional operation, the sublayers in this clause are precisely the same as their equivalents in Clause 24, Clause 36 and Clause 46. Otherwise, this…"
- 66.1.2, 66.2.2, 66.3.2
  - Change "has the ability" to "may have the ability"
- 66.2.1
  - Delete "changes to". Delete "These are changes to the existing 1000BASE-X PCS for legacy ethernet as described in Clause 36." Similarly for 66.1.1, 66.3.1.
- 66.2.2 Create text for a 1000BASE-X PMA
  - To simply reference existing Clause 36 PMA. Change PICS G1: add "and PMA"
    - Allows whole of EFM optical PHYs to be specified in 58-60, 66
- 66.4.3 Major capabilities/options
  - Add new major option: unidirectional capability (PUNI)
  - All PICS except H1, G1, LF1 become e.g. HUN*PUNI:M
    - Allows 6 possibilities: 3 rates * unidirectional capable or not

Implementation of solution – detail 7/7

- 67.6.1 Unidirectional links

Up to 2004, compliant 100 Mb/s, 1000 Mb/s and 10 Gb/s implementations were not able to encode and transmit data while one direction of the link was non-operational. Some physical layer devices have the optional ability to encode and transmit data while one direction of the link is non-operational.

For 100BASE-X and 1000BASE-X, this capability is indicated by the management register bit 1.7, The Unidirectional OAM Ability can be found in Table 22-8 and the feature may be enabled via the management register bit 0.1 Unidirectional OAM Enable found in Table 22-7. This ability bit should be set used only when the OAM sublayer is present and enabled or for a 1000BASE-PX-D PHY. Otherwise, MAC Client frames will be sent across a unidirectional link potentially causing havoc with bridge and other higher layer protocols. The feature should not be enabled for 1000BASE-PX-U PHYs in service, to avoid simultaneous transmission by more than one ONU.

Red = strikeout

That’s all!