P802.3dm draft outline, new Clause only

2xx Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer, and baseband medium, type 2.5G/100MBASE-T1-L, 2.5G/100MBASE-T1-H, 5G/100MBASE-T1-L, 5G/100MBASE-T1-H, 10G/100MBASE-T1-L, 10G/100MBASE-T1-H, 2.5G/100MBASE-V1-L, 2.5G/100MBASE-V1-H, 5G/100MBASE-V1-L, 5G/100MBASE-V1-H, 10G/100MBASE-V1-L, and 10G/100MBASE-V1-H

This is a draft proposal for how a Clause could be structured based on the P802.3dm project documents, including Objectives. This provides flexibility to have different requirements for the different speeds and cabling. Subclauses can be combined later if the requirements are the same, or the requirement can be put in the first subclause in the document and the one later in the document can refer back to it.

Due to the fact that we are limited to a maximum of five levels in the specification, the high speed and low speed requirements are in separate subclauses without a subsection above the pair. This is also the case for the coax and shielded balanced copper cabling.

2xx.1 Overview

May be added by Editor based on project details.

2xx.1.1 Nomenclature

May be added by Editor based on project details.

In order to efficiently describe the three PHYs, the nomenclature MultiG is used to abbreviate 2.5G/ 5G/10G when referring to the set of PHYs.

2xx.1.2 PHY/PMD types

I have included a table here to show the different PHYs to be defined and what all the characters that I am using in the names mean. These are subject to approval.

x/y x is the high transmit speed, y is the low transmit speed

T1 – single shielded balanced pair of conductors (SBP)

V1 – single coaxial cable (Coax)

L – device that transmits at the low speed and receives at the high speed

H – device that transmits at the high speed and receives at the low speed

PHY name	*Transmit speed*	*Receive speed*	Cable type
2.5G/100MBASE-T1-L	*100M*	*2.5G*	*SBP*
2.5G/100MBASE-T1-H	*2.5G*	*100M*	*SBP*
5G/100MBASE-T1-L	*100M*	*5G*	*SBP*
5G/100MBASE-T1-H	*5G*	*100M*	*SBP*

PHY name	*Transmit speed*	*Receive speed*	Cable type
10G/100MBASE-T1-L	*100M*	*10G*	*SBP*
10G/100MBASE-T1-H	*10G*	*100M*	*SBP*
2.5G/100MBASE-V1-L	*100M*	*2.5G*	*Coax*
2.5G/100MBASE-V1-H	*2.5G*	*100M*	*Coax*
5G/100MBASE-V1-L	*100M*	*5G*	*Coax*
5G/100MBASE-V1-H	*5G*	*100M*	*Coax*
10G/100MBASE-V1-L	*100M*	*10G*	*Coax*
10G/100MBASE-V1-H	*10G*	*100M*	*Coax*

2xx.1.3 Relationship of MULTIG/100MBASE-T1/V1-L/H to other standards

May be added by Editor based on project details.

2xx.1.4 Operation of MULTIG/100MBASE-T1/V1-L/H

Summary provided by contribution later in project

2xx.1.4.1 Physical Coding Sublayer (PCS) -H

2xx.1.4.2 Physical Coding Sublayer (PCS) -L

2xx.1.4.3 Physical Medium Attachment (PMA) sublayer -H

2xx.1.4.4 Physical Medium Attachment (PMA) sublayer -L

2xx.1.4.5 EEE Capability

May want to include and indicate there is no EEE Capability if it is decided this is not needed/required/desired.

2xx.1.4.6 Link Synchronization

2xx.1.4.7 Link Synchronization

2xx.1.5 Signaling, -H

2xx.1.6 Signaling, -L

2xx.1.7 Interfaces

2xx.1.8 Conventions in this clause

Standard text

2xx.2 MULTIG/100MBASE-T1/V1-H service primitives and interfaces, high speed channel

2xx.2.1 Technology Dependent Interface

2xx.2.1.1 PMA_LINK.request

The following 3 subclauses are found in almost all 2xx.2.1.1, 2xx.2.1.2, and 2xx.2.2.y subclauses. I did not repeat them to keep the document size reasonable and easier to follow.

2xx.2.1.1.1 Semantics of the primitive

2xx.2.1.1.2 When generated

2xx.2.1.1.3 Effect of receipt

2xx.2.1.2 PMA_LINK.indication

2xx.2.2 PMA service interface

2xx.2.2.1 PMA_TXMODE.indication

2xx.2.2.2 PMA_CONFIG.indication

2xx.2.2.3 PMA_UNITDATA.request

2xx.2.2.4 PMA_UNITDATA.indication

2xx.2.2.5 PMA_SCRSTATUS.request

2xx.2.2.6 PMA_PCSSTATUS.request

2xx.2.2.7 PMA_RXSTATUS.indication

2xx.2.2.8 PMA_REMRXSTATUS.request

2xx.2.2.9 PMA_PCSDATAMODE.indication

2xx.2.2.10 PMA_PCS_RX_LPI_STATUS.request
If EEE is supported.

2xx.2.2.11 PMA_PCS_TX_LPI_STATUS.request
If EEE is supported.

2xx.2.2.12 PMA_ALERTDETECT.indication
If EEE is supported.

2xx.3 MULTIG/100MBASE-T1/V1-L service primitives and interfaces, low speed channel

2xx.3.1 Technology Dependent Interface

2xx.3.1.1 PMA_LINK.request

2xx.3.1.2 PMA_LINK.indication

2xx.3.2 PMA service interface

2xx.3.2.1 PMA_TXMODE.indication

2xx.3.2.2 PMA_CONFIG.indication

2xx.3.2.3 PMA_UNITDATA.request

2xx.3.2.4 PMA_UNITDATA.indication

2xx.3.2.5 PMA_SCRSTATUS.request

2xx.3.2.6 PMA_PCSSTATUS.request

2xx.3.2.7 PMA_RXSTATUS.indication

2xx.3.2.8 PMA_REMRXSTATUS.request

2xx.3.2.9 PMA_PCSDATAMODE.indication

2xx.3.2.10 PMA_PCS_RX_LPI_STATUS.request
If EEE is supported.

2xx.3.2.11 PMA_PCS_TX_LPI_STATUS.request
If EEE is supported.

2xx.3.2.12 PMA_ALERTDETECT.indication
If EEE is supported.

2xx.4 Physical Coding Sublayer (PCS) functions,-H

2xx.4.1 PCS service interface (XGMII)

2xx.4.2 PCS functions

2xx.4.2.1 PCS Reset function

2xx.4.2.2 PCS Transmit function
Example of how to reference a requirement from a previous project: The PCS transmit function in high speed direction is as specified for MultiGBASE-T1 PHYs in 149.3.2.2.

2xx.4.2.2.1 Use of blocks

2xx.4.2.2.2 TBD transmission code

2xx.4.2.2.3 Notation conventions

2xx.4.2.2.4 Block structure

2xx.4.2.2.5 Control codes

2xx.4.2.2.6 Ordered sets

2xx.4.2.2.7 Idle (/I/)

2xx.4.2.2.8 LPI (/LI/)

2xx.4.2.2.9 Start (/S/)

2xx.4.2.2.10 Terminate (/T/)

2xx.4.2.2.11 Ordered set (/O/)

2xx.4.2.2.12 Error (/E/)

2xx.4.2.2.13 Transmit process

2xx.4.2.2.14 RS-FEC framing and RS-FEC encoder

2xx.4.2.2.15 Reed-Solomon encoder

2xx.4.2.2.16 PCS scrambler

2xx.4.2.2.17 TBD encoding

2xx.4.2.2.18 EEE capability
Only need if supporting EEE

2xx.4.2.3 PCS Receive function

2xx.4.2.3.1 Frame and block synchronization

2xx.4.2.3.2 PCS descrambler

2xx.4.2.3.3 Invalid blocks

2xx.4.3 Test-pattern generators

2xx.4.4 Side-stream scrambler polynomials

2xx.4.5 PMA training frame

This may be able to be a PAM2 signal that is the same for both low speed and high speed. If it is, this subclause would refer to 2xx.4.5.

2xx.4.5.1 Generation of symbol Tn

2xx.4.5.2 PMA training mode descrambler polynomials

2xx.4.6 LPI signaling

Only need if supporting EEE

2xx.4.7 Detailed functions and state diagrams

2xx.4.7.1 State diagram parameters

2xx.4.7.1.1 Constants

2xx.4.7.1.2 Variables

2xx.4.8 PCS management

2xx.4.9 MULTIG/100MBASE-T1/V1-L/H operations, administration, and maintenance (OAM

Only if OAM is used in high speed direction.

2xx.5 Physical Coding Sublayer (PCS) functions,-L

2xx.5.1 PCS service interface (MII)

2xx.5.2 PCS functions

2xx.5.2.1 PCS Reset function

2xx.5.2.2 PCS Transmit function

2xx.5.2.2.1 Use of blocks

2xx.5.2.2.2 TBD transmission code

2xx.5.2.2.3 Notation conventions

2xx.5.2.2.4 Block structure

2xx.5.2.2.5 Control codes

2xx.5.2.2.6 Ordered sets

2xx.5.2.2.7 Idle (/I/)

2xx.5.2.2.8 LPI (/LI/)

2xx.5.2.2.9 Start (/S/)

2xx.5.2.2.10 Terminate (/T/)

2xx.5.2.2.11 Ordered set (/O/)

2xx.5.2.2.12 Error (/E/)

2xx.5.2.2.13 Transmit process

2xx.5.2.2.14 RS-FEC framing and RS-FEC encoder

2xx.5.2.2.15 Reed-Solomon encoder

2xx.5.2.2.16 PCS scrambler

2xx.5.2.2.17 TBD encoding

2xx.5.2.2.18 EEE capability
Only need if supporting EEE

2xx.5.2.3 PCS Receive function

2xx.5.2.3.1 Frame and block synchronization

2xx.5.2.3.2 PCS descrambler

2xx.5.2.3.3 Invalid blocks

2xx.5.3 Test-pattern generators

2xx.5.4 Side-stream scrambler polynomials

2xx.5.5 PMA training frame

2xx.5.5.1 Generation of symbol Tn

2xx.5.5.2 PMA training mode descrambler polynomials

2xx.5.6 LPI signaling
Only need if supporting EEE

2xx.5.7 Detailed functions and state diagrams

2xx.5.7.1 State diagram parameters

2xx.5.7.1.1 Constants

2xx.5.7.1.2 Variables

2xx.5.8 PCS management

2xx.5.9 MULTIG/100MBASE-T1/V1-L operations, administration, and maintenance (OAM)

Only if OAM is used in low speed direction.

2xx.6 Physical Medium Attachment (PMA) sublayer, -H

I did not include all subclauses as they can vary with implementation. You can look at any PHY project that is similar to see which may be needed. Other subclauses may be added as baselines are chosen.

2xx.6.1 PMA functional specifications

2xx.6.2 PMA functions

2xx.6.2.1 PMA Reset function

2xx.6.2.2 PMA Transmit

2xx.6.2.4 PMA Receive function

2xx.6.2.6 PHY Control function

2xx.6.2.8 Link Monitor function

2xx.6.2.9 PHY Link Synchronization

2xx.6.2.10 Refresh monitor function

Only needed if EEE is implemented.

2xx.6.2.11 Clock Recovery function

2xx.6.5 State variables

2xx.6.6 State diagrams

2xx.7 Physical Medium Attachment (PMA) sublayer, -L

I did not include all subclauses as they can vary with implementation. You can look at any PHY project that is similar to see which may be needed. Other subclauses may be added as baselines are chosen.

2xx.7.1 PMA functional specifications

2xx.7.2 PMA functions

2xx.7.2.1 PMA Reset function

2xx.7.2.2 PMA Transmit

2xx.7.2.4 PMA Receive function

2xx.7.2.6 PHY Control function

2xx.7.2.8 Link Monitor function

2xx.7.2.9 PHY Link Synchronization

2xx.7.2.10 Refresh monitor function

Only needed if EEE is implemented.

2xx.7.2.11 Clock Recovery function

2xx.7.3 MDI, T1

2xx.7.3.1 MDI signals transmitted by the PHY

2xx.7.3.3 Signals received at the MDI

2xx.7.4 MDI, V1

2xx.7.4.1 MDI signals transmitted by the PHY

2xx.7.4.3 Signals received at the MDI

2xx.7.5 State variables

2xx.7.6 State diagrams

2xx.8 Physical Medium Dependent (PMD) sublayer, -T1

2xx.8.1 Test modes

2xx.8.1.1 Test fixtures

2xx.8.2 Transmitter electrical specifications

2xx.8.2.1 Maximum output droop

2xx.8.2.2 Transmitter linearity

2xx.8.2.3 Transmitter timing jitter

2xx.8.2.4 Transmitter power spectral density (PSD) and power level

2xx.8.2.5 Transmitter peak differential output

2xx.8.2.6 Transmitter clock frequency

2xx.8.3 Receiver electrical specifications

2xx.8.3.1 Receiver differential input signals

2xx.8.3.2 External noise rejection

2xx.8.4 MDI

2xx.8.4.1 MDI signals transmitted by the PHY

2xx.8.4.3 Signals received at the MDI

2xx.9 Physical Medium Dependent (PMD) sublayer, -V1

2xx.9.1 Test modes

2xx.9.1.1 Test fixtures

2xx.9.2 Transmitter electrical specifications

2xx.9.2.1 Maximum output droop

2xx.9.2.2 Transmitter linearity

2xx.9.2.3 Transmitter timing jitter

2xx.9.2.4 Transmitter power spectral density (PSD) and power level

2xx.9.2.5 Transmitter peak output

2xx.9.2.6 Transmitter clock frequency

2xx.9.3 Receiver electrical specifications

2xx.9.3.1 Receiver input signals

2xx.9.3.2 External noise rejection

2xx.7.4 MDI

2xx.7.4.1 MDI signals transmitted by the PHY

2xx.7.4.3 Signals received at the MDI

2xx.10 Management interface

2xx.11 Link segment characteristics, -T1

2xx.11.1 Link transmission parameters

2xx.11.1.1 Insertion loss

2xx.11.1.2 Differential characteristic impedance

2xx.11.1.3 Return loss

2xx.11.1.4 Coupling attenuation

2xx.11.1.5 Screening attenuation

2xx.11.1.6 Maximum link delay

2xx.11.2 Coupling parameters between link segments

2xx.11.2.1 Power sum alien near-end crosstalk (PSANEXT)

2xx.11.2.2 Power sum alien attenuation to crosstalk ratio far-end (PSAACRF)

2xx.12 Link segment characteristics, -V1

2xx.12.1 Link transmission parameters

2xx.12.1.1 Insertion loss

2xx.12.1.2 Differential characteristic impedance

2xx.12.1.3 Return loss

2xx.12.1.4 Coupling attenuation

2xx.12.1.5 Screening attenuation

2xx.12.1.6 Maximum link delay

2xx.12.2 Coupling parameters between link segments

I wasn't sure what the correct parameters are, so I just copied the T1 crosstalk titles for placeholders.

2xx.12.2.1 Power sum alien near-end crosstalk (PSANEXT)

2xx.12.2.2 Power sum alien attenuation to crosstalk ratio far-end (PSAACRF)

2xx.13 MDI specification, -T1

2xx.13.1 MDI connectors

2xx.13.2 MDI electrical specification

2xx.13.2.1 MDI return loss

2xx.13.3 MDI fault tolerance

2xx.14 MDI specification, -V1

2xx.14.1 MDI connectors

2xx.14.2 MDI electrical specification

2xx.14.2.1 MDI return loss

2xx.14.3 MDI fault tolerance

2xx.15 Environmental specifications

2xx.15.1 General safety

2xx.15.2 Network safety

2xx.15.2.1 Environmental safety

2xx.15.2.2 Electromagnetic compatibility

2xx.16 Delay constraints

2xx.17 Protocol implementation conformance statement (PICS) proforma for Clause 2xx