



*GBASE-T Auto-Negotiation Proposal

2.5/5GBASE-T Ad Hoc - April 2015

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Objectives

- ▶ **Propose an Auto-Negotiation scheme to unify 2.5/5/25/40GBASE-T**

IEEE Current Status

▶ **Message page 9 used for 10GBASE-T and will be extended for 40GBASE-T**

- **Yellow** – can be shared for 2.5 / 5 / 10 / 25 / 40GBASE-T
- **Blue** – Need 3 bits per speed (Need 12 new bits)
- **Tan** – Only 8 bits left

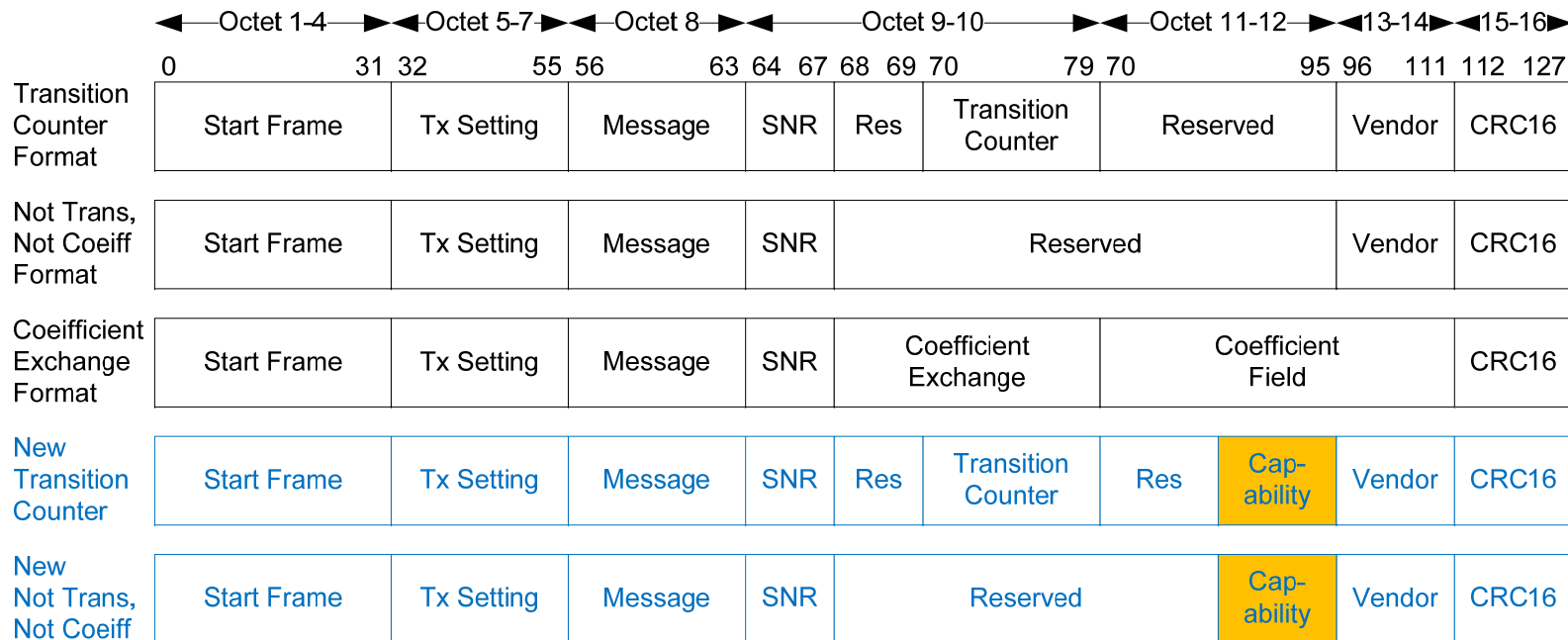
D0-10	M0-10	Message Code = 9	D34	U18	PHY Short Reach
D11	T	Toggle	D35	U19	Fast Retrain
D12	Ack2	Acknowledge 2	D36	U20	PMA Training Request
D13	MP	Message Page = 1	D37	U21	Reserved
D14	Ack2	Acknowledge	D38	U22	100BASE-TX EEE
D15	NP	Next Page	D39	U23	1000BASE-T EEE
D16-26	U0-U10	Master/Slave Seeds	D40	U24	10GBASE-T EEE
D27	U11	10GBASE-T Master/Slave manual	D41	U25	Reserved
D28	U12	10GBASE-T Master/Slave config	D42	U26	Reserved
D29	U13	Port Type	D43	U27	Reserved
D30	U14	1000BASE-T Full Duplex	D44	U28	Reserved
D31	U15	1000BASE-T Half Duplex	D45	U29	Reserved
D32	U16	10GBASE-T Ability	D46	U30	Reserved
D33	U17	LD Loop Timing	D47	U31	Reserved

Options for IEEE Specification

- ▶ **Option 1: Add new message page**
 - Allocates more bits
 - Longer Auto-Negotiation time
- ▶ **Option 2: One bit advertised capabilities for all speeds**
 - i.e. if EEE advertised, then all advertised speeds must be capable of EEE
 - i.e. Same for fast retrain
- ▶ **Option 3: Make optional capabilities mandatory for given speed**
 - i.e. EEE is mandatory, fast retrain is mandatory
- ▶ **Option 4: Make use of extra bits already available somewhere else**
 - 1000BASE-T1 (802.3bp) does this
 - See next page

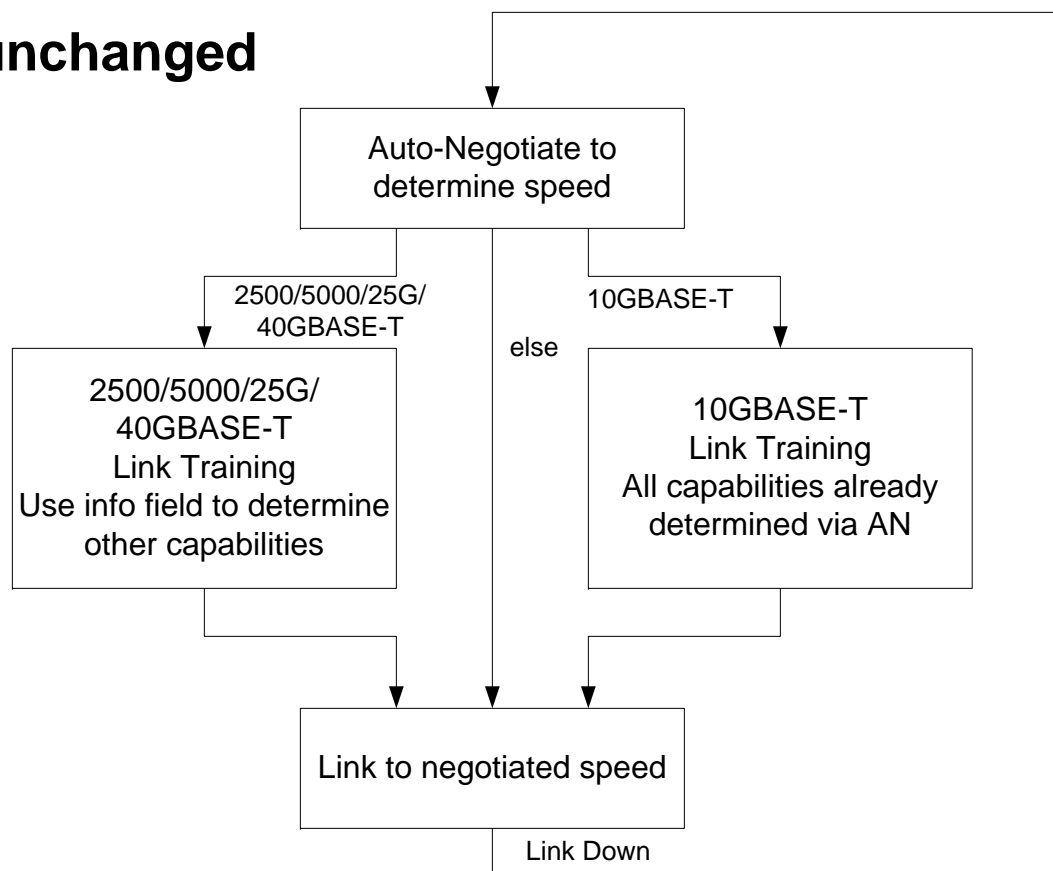
Option 4: Don't Pollute Auto-Negotiation Space

- ▶ **Use Auto-Negotiation to advertise only speed**
 - 2500BASE-T, 5000BASE-T, 25GBASE-T, 40GBASE-T
 - EEE, fast retrain capabilities not exchanged during Auto-Negotiation
- ▶ **Exchange optional capabilities during training InfoField exchange**
 - Octet 12 used to exchange EEE, fast retrain capabilities
 - Octet 12 valid only during PMA_PBO_Exch state when Message<7:6> = 01



General Flow

- ▶ First step - determine speed
- ▶ Second step – determine other capabilities
- ▶ Keep 10GBASE-T unchanged



Octet 12 Format

- ▶ **Octet 12 valid when Message<7:6> = 01. Otherwise reserved**
 - Octet 12 must hold consistent value during exchange else behavior undefined
- ▶ **Oct12<4:0> = Reserved**
- ▶ **Oct12<5> = Fast Retrain**
 - 0 = Fast Retrain not supported
 - 1 = Fast Retrain supported
- ▶ **Oct12<6> = THP Bypass Request in PMA_Coeff_Exch state**
 - 0 = Local device requests link partner not to bypass THP during fast retrain
 - 1 = Local device requests link partner to bypass THP during fast retrain
- ▶ **Oct12<7> = EEE Ability**
 - 0 = EEE not supported
 - 1 = EEE supported
- ▶ **EEE ability is enabled if both PHYs advertise EEE Ability**

Fast Retrain Options

- ▶ **Device requests link partner's transmitter to behave a certain way during retraining.**
- ▶ **THP bypass request = 0**
 - link partner THP not bypassed in the PMA_Coeff_Exch state during fast retrain
 - Current IEEE specified method for 10GBASE-T
- ▶ **THP bypass request = 1**
 - link partner THP bypassed in the PMA_Coeff_Exch state during fast retrain
 - Allows for better/faster retraining in some implementations
- ▶ **Possible for one PHY to request one method and the other PHY to request other method**

IEEE Message 9 proposed mapping

- ▶ Only use 4 out of 8 reserved bits (yellow)
- ▶ Only 10GBASE-T has EEE and Fast Retrain bits
- ▶ Loop Timing, no short reach assumed for 2.5, 5, 25, and 40G

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D28	U12	xGBASE-T Master/Slave config	D42	U26	25GBASE-T Ability
D29	U13	xGBASE-T Port Type	D43	U27	5000BASE-T Ability
D30	U14	1000BASE-T Full Duplex	D44	U28	2500BASE-T Ability
D31	U15	1000BASE-T Half Duplex	D45	U29	Reserved
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Summary

- ▶ **Scheme allows 2.5 / 5 / 10 / 25 / 40GBASE-T to remain on Page 9**
 - No new page needed
 - Retains per speed flexibility on optional capabilities
 - Decouples optional capabilities from Auto-Negotiations
 - Keeps spare bits available for future BASE-T speeds

- ▶ **Info Field allows future expansion of optional capabilities independent of Auto-Negotiation**

THANK YOU