

Auto-negotiation Selection

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Outline

- ▶ Overview
- ▶ Comparison
- ▶ Pros and Cons
- ▶ Summary

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Why?

- ▶ Communicate abilities over existing link
 - Enables self-sufficient blades
 - Provides information exchange (i.e. remote fault, capabilities)
 - Permits link bring-up within a Layer 1 exchange
 - Enhances plug-n-play capabilities
- ▶ Expected Ethernet feature
 - Ability to negotiate speed in a multi-speed device

Possibilities

- ▶ Based on Clause 28
 - Used with 10BASE-T, 100BASE-T & 1000BASE-T
 - To be used with 10GBASE-T
- ▶ Based on Clause 37
 - Used with 1000BASE-X
- ▶ Start fresh
 - Creating a new auto-negotiation is less appealing

Historical Perspective

▶ 802.3z

- Originally had 28; 37 handled configuration codes
- Adapted 37 to perform the functions of 28

▶ Why was 28 dropped?

- Concerns over optical FLP
- Permitted use of existing 1G FC SerDes
- Speed negotiation was not necessary

Moving Forward

- ▶ Auto-negotiation's tie to objectives
 - Need support of speeds and lanes
 - Flexibility for future standards efforts
- ▶ Compatibility
 - Both can be made compatible w/ existing XAUI or 1-lane 10G
 - Clause 28 can be compatible with 1-lane 1G
 - ▶ AN completes prior to bringing up PMA & PCS

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10,000 Foot View

▶ Clause 28

- Exchanges abilities
- Brings up link with maximum capabilities

▶ Clause 37

- Brings up link with minimum capabilities
- Exchanges abilities
- Brings up link with maximum capabilities

Assumptions

- ▶ State machines operate as they do today
 - No changes to Clause 28 or 37 state machines
- ▶ Base pages
 - New selector field for Clause 28 (as per 28.6)
 - Clause 37 adds capability bits
- ▶ SerDes-friendly FLP
- ▶ XAUI & 1-lane 10G can operate at 1G
 - To support 1000BASE-X PCS/PMA for Clause 37
- ▶ Gate count difference is negligible

Differences

▶ Clause 28

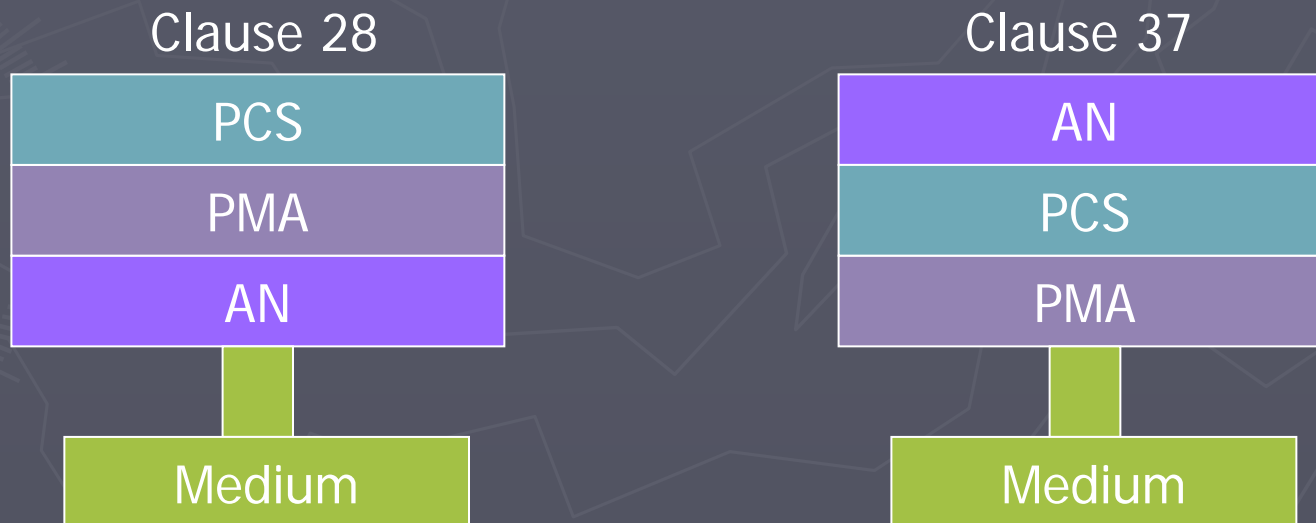
- Relies on exchange of info w/ link pulses
- Sits at the bottom of the Layer 1
- PMA, PCS do not run until AN is complete

▶ Clause 37

- Relies on PMA & PCS for exchange of info
- Sits near the top of the Layer 1
- PMA & PCS must re-sync & align once AN completes

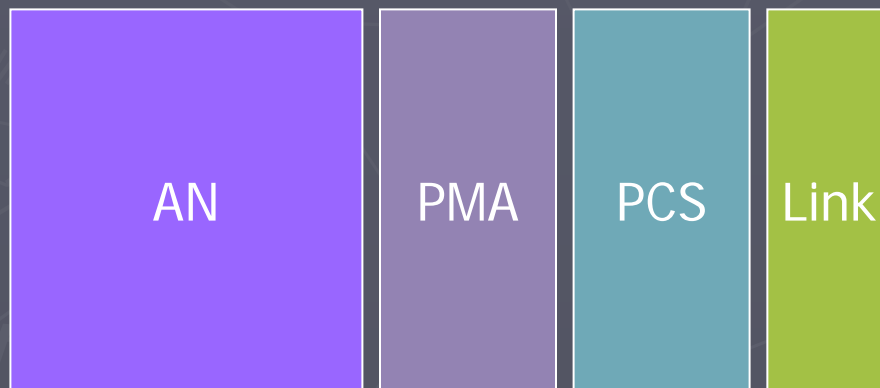
Layer Diagram

- ▶ Clause 28 AN sits at the bottom
 - Derives its own clock
- ▶ Clause 37 sits at the top
 - Uses recovered clock from PMA



Clause 28

- ▶ AN runs, then brings up PMA, PCS and link



Clause 37

- ▶ 1G PMA and PCS need to run for AN to operate
- ▶ AN runs, then brings up PMA, PCS and link



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Clause 37 Cons

- ▶ State machines changes would impact existing implementations
- ▶ Timer values and register sizes are hard-coded
- ▶ Dependent on operating PMA and PCS
- ▶ Future products will be required to support 1000BASE-X

Clause 37 Pros

- ▶ 1000BASE-X devices are good to go

Clause 28 Cons

- ▶ Requires a SerDes-friendly FLP

Clause 28 Pros

- ▶ Proven multi-speed capability
- ▶ Register sizes can be extended
- ▶ Auto-negotiation time is dependent on FLP
- ▶ Future products not required to support legacy devices
- ▶ Supports multiple signaling schemes

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- ▶ **Summary**

Summary

▶ Clause 37

- Inflexible 1000BASE-X design
- Constrains future implementations

▶ Clause 28

- State machines don't require modifications
- Enhancements to FLP, base page, next page are much easier
- Has shown very good future-proof capabilities

Final Thoughts

- ▶ The choice made for AN will affect future products
 - Flexibility will be extremely important
- ▶ Clause 28 is much more flexible
 - As witnessed with 10/100/1000

Thank you!

Questions?

