Cl 73 AN Baseline Proposal and Future Considerations

Kent Lusted, Intel Corporation

Jeff Slavick, Broadcom

Supporters

- Adee Ran, Cisco
- Arthur Marris, Cadence

Clause 73 Auto-Negotiation Process

- Provides mechanism for links to negotiate the fastest common rate that both sides advertise.
- Useful for plug-and-play linking up
- Backplane and copper cable assembly support only

Problem Statement

- The 3df Task Force needs to support at least 5 new Ethernet PHY types:
    - "800G-R8"
    - "1600G-R8"
    - "200G-R1"
    - "400G-R2"
    - "800G-R4"
  - New FEC modes, as required (Exact number is TBD)

- The IEEE 802.3 Auto-Negotiation link codeword Base page for Backplane and Copper Cable Assembly (Clause 73) does not have enough free bits
  - See https://www.ieee802.org/3/df/proj_doc/objectives_P802d3df_220317.pdf

AN73 Base Page – After 3ck

- 3 bits are left unassigned in the base page

- Need to advertise at least 5 more PHYs (that we know of right now)

Table 73–4—Technology Ability Field encoding

Bit	Technology
...	
A15	200GBASE-KR4 or 200GBASE-CR4
A16	100GBASE-KR1 or 100GBASE-CR1
A17	200GBASE-KR2 or 200GBASE-CR2
A18	400GBASE-KR4 or 400GBASE-CR4
~~A16~~A19 through A21~~A22~~	Reserved

AN73 Message Base Page, see Figure 73-6

D0	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15
S0	S1	S2	S3	S4	E0	E1	E2	E3	E4	E5	C0	C1	RF	ACK	NP

D16	D17	D18	D19	D20	D21	D22	D23	D24	D25	D26	D27	D28	D29	D30	D31
T0	T1	T2	T3	T4	A0	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10

D32	D33	D34	D35	D36	D37	D38	D39	D40	D41	D42	D43	D44	D45	D46	D47
A11	A12	A13	A14	A15	A16	A17	A18	A19	A20	A21	F4	F2	F3	F0	F1

[A19:A21] remain open after 3ck

Suggested Approach

- Phase 1 - Now: Update Clause 73 AN Link codeword Base page to support the eight-lane 800GbE PHY type
  - Follow the 802.3by/cd/ck approach of not distinguishing between the Backplane and Copper Cable Assembly PHYs during AN.
    - The same SerDes generally supports both Direct Attach Copper (DAC) and Backplane (BP)
    - Implementations know if the Port is DAC or BP so they can take care of all the necessary SerDes setup before starting AN to configure the appropriate PMD operation
  - FEC mode is generally non-negotiable for these PHYs
    - Exception: Cl 91 vs. Cl 161 for 100GBASE-CR1

- Phase 2 - later: Define extensible solution for remaining PHY types
  - No 200G/lane backplane objectives are adopted at this time

Phase 1 - Now:
eight-lane 800GBASE-CR8 and
800GBASE-KR8

Phase 1: (page 1 of 2)

Starting from P802.3ck

- In Figure 73-1, update to add 800GMII

- In CL 73.5.1, update the second paragraph to add references to the new 800GBASE-CR8 and 800GBASE-KR8 clauses

- In 73.6.4, update Table 73-4 Technology Ability Field encoding to:
  - Bit A19 = 800GBASE-KR8 or 800GBASE-CR8
  - Bit A20 through A21 = Reserved

- In 73.6.4, change the first sentence of the last paragraph to "The fields A[21:20] are reserved for future use."

- In Table 73-5, update Priority Resolution to insert "800GBASE-KR8 or 800GBASE-CR8" as priority 1 and renumerate the table accordingly

Phase 1: (Page 2 of 2)

- In 73.10.1, add new entry into the variable list: "800GR8; represents the 800GBASE-KR8 or 800GBASE-CR8 PMD"

- In the single_link_ready entry in 73.10.1, add "link_status_[800GR8] = OK in the appropriate place

- In Table 73-7 Timer min/max value summary, append "800GBASE-KR8 or 800GBASE-CR8" to the link_fail_inhibit_timer case that contains "400GBASE-KR4"

- Modify Table 45-388 Backplane Ethernet, BASE-R copper status 2 register bit definitions to include an entry for "800GBASE-KR8 or 800GBASE-CR8"

Proposed Straw Polls:

- I would support the Clause 73 changes for eight-lane 800GbE proposed in lusted_3df_elec_01_220502 slides 8-9
- Y, N, A

Phase 2 – Later:

- If you have an interest in the Phase 2 of AN73, please reach out to Kent and Jeff.

Thanks!

Reference

Annex 73A

(normative)

Next page message code field definitions

This Annex defines the Next Page message code fields for devices using Clause 73 Auto-Negotiation. The message code field of a message page used in Next Page exchange shall be used to identify the meaning of a message. Table 73A–1 identifies the types of messages that may be sent. As new messages are developed, this table will be updated accordingly.

The Message code field uses an 11-bit binary encoding that allows 2048 messages to be defined. All message codes not specified are reserved for IEEE use or allocation.

Table 73A–1—Message code field values

Message code	M 10	M 9	M 8	M 7	M 6	M 5	M 4	M 3	M 2	M 1	M 0	Message code description
1	0	0	0	0	0	0	0	0	0	0	1	Null Message
5	0	0	0	0	0	0	0	0	1	0	1	Organizationally Unique Identifier Tagged Message
6	0	0	0	0	0	0	0	0	1	1	0	AN device Identifier Tag Code
10	0	0	0	0	0	0	0	1	0	1	0	EEE Technology Message Code. EEE capability is advertised using unformatted message code field in the Message Next Page (see 73A.4).