Proposal for 802.3bj Auto-Negotiation

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Key Message

- 802.3bj will take the same approach to Auto-Negotiation as 802.3ba
- 802.3ba specified the use of Clause 73 for its backplane and copper PHY types – it makes sense to do the same for 802.3bj

Assumptions

- 802.3bj will take the same approach to Auto-Negotiation as 802.3ba by using Clause 73
  - No changes to protocol or management register format
  - New technology ability bits will be added
- At least two new PHY types will be added by 802.3bj:
  - 100GBASE-KR4 for backplane
  - 100GBASE-CR4 for copper twin-axial cable
- Implementation of Auto-Negotiation will be mandatory for 100GBASE-KR4 and 100GBASE-CR4
- 802.3bj EEE (Energy Efficient Ethernet) will make use of AN next pages just like 802.3az
- FEC auto-negotiation is already adequately defined by Clause 73

Important Point

- The following slides indicate the parts of IEEE 802.3-2012 that will need to be revised
- If a two PHY approach is adopted for backplane, then wherever 100GBASE-KR4 is mentioned it will need to be replaced by 100GBASE-KR4p and 100GBASE-KR4n or whatever nomenclature is adopted and bit positions modified accordingly

Change Table 73-4 as follows to add extra technology ability bits:

Table 73–4—Technology Ability Field encoding

Bit	Technology
A0	1000BASE-KX
A1	10GBASE-KX4
A2	10GBASE-KR
A3	40GBASE-KR4
A4	40GBASE-CR4
A5	100GBASE-CR10
A6	100GBASE-KR4
A7	100GBASE-CR4
~~A6~~ A8 through A24	Reserved for future technology

Clause 30 changes

- 30.6.1.1.5 aAutoNegLocalTechnologyAbility
  - insert 100GBASE-KR4 and 100GBASE-CR4 after 100GBASE-CR10

Clause 45 changes

- 45.2.7.12 Backplane Ethernet, BASE-R copper status (Register 7.48)
  - Insert 100GBASE-KR4 and 100GBASE-CR4 bits into Table 45–172 and 45.2.7.12.2 Negotiated Port Type
- 45.2.7.13 EEE advertisement (Register 7.60)
  - Insert 100GBASE-KR4 and 100GBASE-CR4 bits into Table 45–173 and Table 45–174. Insert subclauses for the bit definitions as necessary

Clause 73 changes

- Change note at beginning of Clause 73 to read “Note that although the Auto-Negotiation defined in this clause was originally intended for use with Backplane Ethernet PHYs, it is also specified for use with 40GBASE-CR4, 100GBASE-CR10 and 100GBASE-CR4 PHYs.”
- Change last sentence in third paragraph of 73.3 to read “Technology-Dependent PHYs include 1000BASE-KX, 10GBASE-KX4, 10GBASE-KR, 40GBASE-KR4, 40GBASE-CR4, 100GBASE-CR10, 100GBASE-KR4 and 100GBASE-CR4.”
- Change Table 73-4 Technology Ability Field encoding to insert A6 for 100GBASE-KR4 and A7 for 100GBASE-CR4 (this is illustrated on slide 6)

More Clause 73 changes

- Change third paragraph in 73.6.4 to read “40GBASE-CR4 and 40GBASE-KR4 shall not be advertised simultaneously and likewise 100GBASE-CR4 and 100GBASE-KR4 as their physical interfaces are different.”
- Change last sentence of 73.6.5 FEC capability to read “The FEC function shall be enabled on the link if 10GBASE-KR, 40GBASE-KR4, 40GBASE-CR4, 100GBASE-CR10, 100GBASE-KR4 or 100GBASE-CR4 is the HCD technology (see 73.7.6), both devices advertise FEC ability on the F0 bits, and at least one device requests FEC on the F1 bits; otherwise FEC shall not be enabled.”

More Clause 73 changes

- Change last sentence in 73.7 Receive function requirements to read “The receive function incorporates a receive switch to control connection to the 1000BASE-KX, 10GBASE-KX4, or 10GBASE-KR, 40GBASE-KR4, 40GBASE-CR4, 100GBASE-CR10, 100GBASE-KR4 or 100GBASE-CR4 PHYs.”
- Change 73.7.1 DME page reception to read “To be able to detect the DME bits, the receiver should have the capability to receive DME signals sent with the electrical specifications of the PHY (1000BASE-KX, 10GBASE-KX4, 10GBASE-KR,40GBASE-KR4, 40GBASE-CR4, 100GBASE-CR10, 100GBASE-KR4 or 100GBASE-CR4). The DME transmit signal level and receive sensitivity are specified in 73.5.1.1.”

More Clause 73 changes

- Change last sentence of 73.7.2 Receive Switch function to read “During Auto-Negotiation, the Receive Switch function shall connect the DME page receiver controlled by the Receive state diagram to the MDI and the Receive Switch function shall also connect the 1000BASE-KX, 10GBASE-KX4, 10GBASE-KR, 40GBASE-KR4, 40GBASE-CR4, 100GBASE-CR10, 100GBASE-KR4 and 100GBASE-CR4 PMA receivers to the MDI if the PMAs are present.”
- Change Table 73–5—Priority Resolution to insert 100GBASE-CR4 at priority 1 and 100GBASE-KR4 at priority 2 and move the existing entries in the table down appropriately
- Insert appropriate variables for 100GBASE-KR4 and 100GBASE-CR4 into 73.10.1 State diagram variables

Clause 80 changes

- 80.2.6 Auto-Negotiation
  - Change the last sentence to read “Clause 73 Auto-Negotiation is used by the 40 Gb/s and 100 Gb/s backplane PHYs (40GBASE-KR4 and 100GBASE-KR4) and the 40 Gb/s and 100 Gb/s copper PHYs (40GBASE-CR4, 100GBASE-CR10 and 100GBASE-CR4).”

Clause 82 changes

- 82.6 Auto-Negotiation
  - Change the first sentence to read “The following requirements apply to a PCS used with a 40GBASE-KR4 PMD, 40GBASE-CR4 PMD, 100GBASE-CR10, 100GBASE-KR4 or 100GBASE-CR4 PMD where support for the Auto-Negotiation process defined in Clause 73 is mandatory.”

Summary

- 802.3bj auto-negotiation can use the same methods as 802.3ba
- This proposal describes the necessary revisions to IEEE 802.3-2012 to specify 802.3bj auto-negotiation