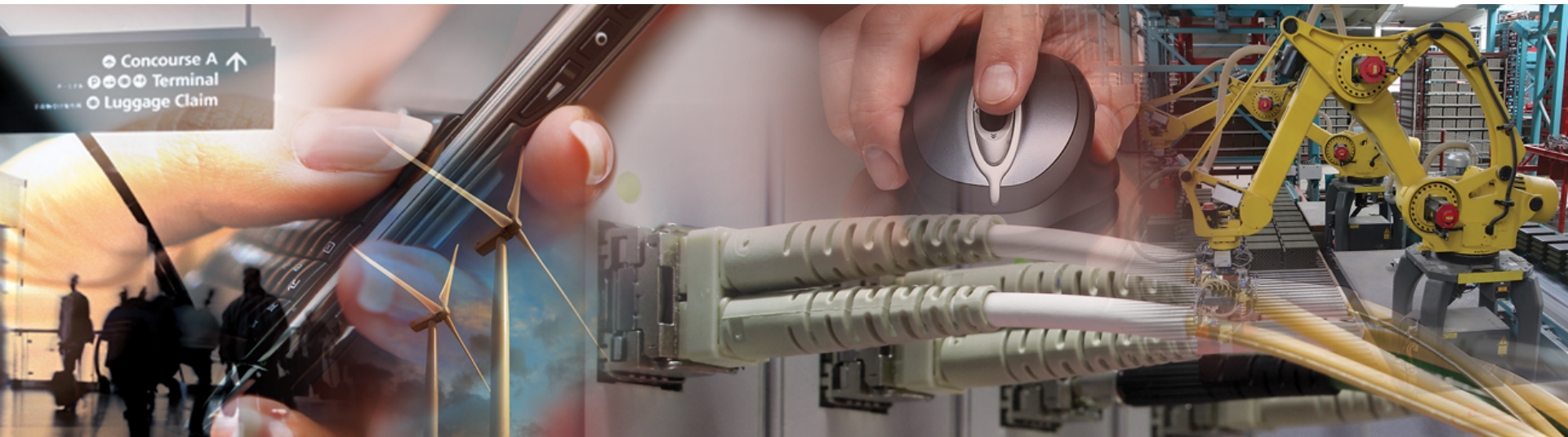# AutoNeg for 25G

Jeff Slavick

Current Draft

- **Clause 111 (25G-KR) mandates RS-FEC**

- **Clause 110 (25G-CR) has optional FEC and optional RS-FEC**

  - Optional can indicate either presence or usage

Option A – Enable Current Draft

- **25G-CR**
  - Mandate CL74 implementation, AN use
  - Optional CL108 implementation, AN use
- **25G-KR**
  - Mandate CL108 implementation and transmission
- **25G-RSFEC_REQ (CI 108)[1]**
- **25G-FEC_REQ (CI 74) [1]**
- **25G-RSFEC_ABILITY (CI 108) [1]**

[1] Only needed for 25G-CR negotiation.

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Option B – Add CL74 to 25G-KR

- **25G-CR**
  - Mandate CL74 implementation, AN use
  - Optional CL108 implementation, AN use
- **25G-KR**
  - Optional CL74 implementation, AN use
  - Mandate CL108 implementation, AN use when CL74 present
- **25G-RSFEC_REQ (CI 108)**
- **25G-FEC_REQ (CI 74)[1]**
- **25G-OPTIONAL_FEC_ABILITY**
  - Based on which PHY type is advertised indicates which optional FEC is present. Effectively stating both FEC engines are present.

[1] Could re-use existing FEC_REQ bit and define 10G enables FEC only when both ABIILTY and REQ are set.

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Option C – Current Draft with CR-S and CR-L

- **25G-CR-S**
  - Mandate CL74 implementation, AN use
- **25G-CR-L**
  - Mandate CL108 implementation and transmission
- **25G-KR**
  - Mandate CL108 implementation and transmission
- **25G_FEC_REQ (CI 74)[1,2]**

[1] Only needed for 25G-CR-S negotiation.

[2] Could re-use existing FEC_REQ bit and define 10G enables FEC only when both ABIILTY and REQ are set. Plus there is no 10G-CR in IEEE, so there's no multi-use of the bit during the same AN process.

Option D – Add CL74 KR and CR-S and CR-L

- **25G-CR-S**
  - Mandate CL74 implementation, AN use
- **25G-CR-L**
  - Mandate CL108 implementation and transmission
- **25G-KR**
  - Optional CL74 implementation, AN use
  - Mandate CL108 implementation, AN use when CL74 present
- **25G-RSFEC_REQ (CI 108)**
- **25G-FEC_REQ (CI 74)[2]**
- **25G-FEC_ABILITY (CI 74)[1]**

[1] Only needed for 25G-KR negotiation.

[2] Could re-use existing FEC_REQ bit and define 10G enables FEC only when both ABIILTY and REQ are set.

Option E – Add CL74 KR, CR-S, CR-L, KR-S, KR-L

- **25G-CR-S**

  - Mandate CL74 implementation, AN use

- **25G-CR-L**

  - Mandate CL91 implementation and transmission

- **25G-KR-S**

  - Mandate CL74 implementation, AN use

- **25G-KR-L**

  - Mandate CL91 implementation and transmission

- **25G-FEC_REQ (CI 74)[1]**

[1] Could re-use existing FEC_REQ bit and define 10G enables FEC only when both ABIILTY and REQ are set.

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Option F – Add CL74 KR, CR-S, CR-L, KR-S, KR-L

- **25G-xR-S**

  - Mandate CL74 implementation, AN use

- **25G-xR-L**

  - Mandate CL91 implementation and transmission

- **AN-Cables**

  - Indicate negotiating for Copper Cables (CR) instead of backplane (KR)

- **FEC_REQ (Cl 74)[1]**

[1] Re-use existing FEC_REQ bit, since 10G enables FEC only when both ABIILTY and REQ are set.

Summary of Options

- **Option A – Current baseline**
  - 5 new bits in base page.
  - FEC latency:
    - KR 200/250ns
    - CR 0, 100ns, 200/250ns

- **Option B – Add CI74 to 25G-KR**
  - 5 (4) new bits in base page.
  - FEC latency:
    - KR 0?, 100ns, 200/250ns
    - CR 0, 100ns, 200/250ns

- **Option C – Add separate CR-S, CR-L PHYs**
  - 4 (3) new bits in base page.
  - FEC latency:
    - KR 200/250ns
    - CR-S 0,100ns
    - CR-L 200/250ns

- **Option D – Add separate CR-S, CR-L PHYs, Add CI74 to KR**
  - 6 (5) new bits in base page
  - FEC latency:
    - KR 0?, 100ns, 200/250ns
    - CR-S 0, 100ns
    - CR-L 200/250ns

- **Option E – Add separate CR-S,CR-L,KR-S,KR-L PHYs, Add CI74 to KR**
  - 5 (4) new bits in base page
  - FEC latency:
    - *R-S 0, 100ns
    - *R-L 200/250ns

- **Option F – Add separate *R-S,*R-L PHYs, Add CI74 to KR, Add C v. K**
  - 4 (3) new bits in base page
  - FEC latency:
    - *R-S 0, 100ns
    - *R-L 200/250ns

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Option A – Baseline

Priority decoding

IF KR

Use CL108 RS-FEC

Else // CR

IF either RSFEC_REQ and both RSFEC_ABILITY

use CI 108 RS-FEC

else IF either FEC_REQ -> use CI74 FEC

else no FEC

Option B – 2 PHY types, FEC/RSFEC optional

Priority decoding

    IF both have OPTIONAL_ABILITY set {

        IF either RSFEC_REQ -> use CI 108 RS-FEC

        else IF either FEC_REQ -> use CI74 FEC

        else no FEC

    } else {

      IF CR // CL74 always available

        IF either FEC_REQ -> use CL74 FC

        else no FEC

      IF KR

        Use CL108 RS-FEC

    }

Option C – 2 CR PHY types, KR only RSFEC

Priority decoding

IF KR

Use CL108 RS-FEC

else IF CR-L

Use CL108 RS-FEC

else // CR-S

IF either 25g_FEC_REQ -> use Cl74 FEC

else no FEC

Option D – 2 PHY types, FEC/RSFEC optional

Priority decoding

IF CR-L

Use CL108 RS-FEC

else {

IF CR-S
IF either FEC_REQ -> use CL74 FEC

else no FEC

} else { // KR

IF either RS-FEC_REQ -> use Cl108 RSFEC

else IF either (FEC_ABILITY == 0) -> use Cl108 RSFEC

else IF either FEC_REQ -> use CL74 FEC

else noFEC

Option E – 4 PHY types

Priority decoding

IF KR-L or CR-L

Use CL108 RS-FEC

else // KR-S or CR-S

if either FEC_REQ -> use Cl74 FEC

else no FEC

Option F – 4 PHY types

Priority decoding

IF AN-Cables Local == AN-Cables Remote { // have legal HCD

    IF xR-L

        Use CL108 RS-FEC

    else // xR-S

        if either FEC_REQ -> use CI74 FEC

        else no FEC

} else

        no HCD

Backup

- **Next few slides are examples of negotiations and resolutions for options B,C,E,F**

Option B – AN example

	0	1	2	3	4	5	7
10G-KR	1, 1	1, 1	1, 1				
40G-KR4	1, 0	1, 1	0, 1				
100G-KR4	1, 0	1, 0	0, 0				
25G-KR	1, 1	1, 1	1, 1				
40G-CR4				1, 0	1, 0	1, 0	0, 0
100G-CR10				1, 0	0, 0	0, 0	0, 0
100G-CR4				1, 0	1, 0	1, 0	0, 0
25G-CR				1, 1	1, 1	1, 1	1, 1
FEC_REQ	0,1	0, 0	0, 0	1, 0	0, 0	0, 0	
FEC_ABL	1,1	1, 0	1, 0	1, 0	0, 0	0, 0	
25RSFEC_REQ	0,0	0, 0	0, 0	0, 0	0, 1	0, 0	0, 0
25FEC_REQ	1,0	1, 0	0, 0	1, 0	0, 1	0, 0	1, 0
25FEC_ABL	1,0	1, 1	1, 1	1, 1	1, 1	0, 1	0, 1
	25G + Cl108	40G	25G noFEC	25G + Cl74	25G + Cl108	25G noFEC	25G + Cl74

x, y in each column is the base page bits set by local device and remote link partner

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Option C – AN example

	0	1	2	3	4	5	6
10G-KR	1, 1	1, 1	1, 1				
40G-KR4	1, 0	1, 1	0, 1				
100G-KR4	1, 0	1, 0	0, 0				
25G-KR	1, 1	1, 1	1, 1				
40G-CR4				1, 0	1, 0	1, 0	1, 1
100G-CR10				1, 0	0, 0	0, 0	0, 0
100G-CR4				1, 0	1, 0	1, 0	0, 0
25G-CR-L				1, 0	1, 1	1, 0	1, 1
25G-CR-S				1, 1	1, 1	1, 1	1, 1
FEC_REQ	0,1	0, 0	0, 0	1, 0	0, 0	0, 0	0, 0
FEC_ABL	1,1	1, 0	1, 0	1, 0	0, 0	0, 0	0, 0
25FEC_REQ	1,0	1, 0	0, 0	1, 0	0, 1	0, 0	0, 0
	25G + Cl108	40G	25G noFEC	25G-S + Cl74	25G-L +Cl108	25G-S +noFEC	40G

x, y in each column is the base page bits set by local device and remote link partner

Option E – AN example

	0	1	2	3	4	5	6
10G-KR	1, 1	1, 1	1, 1				
40G-KR4	1, 0	1, 1	0, 1				
100G-KR4	1, 0	1, 0	0, 0				
25G-KR-L	1, 1	1, 1	1, 0				
25G-KR-S	1, 1	1, 1	1, 1				
40G-CR4				1, 0	1, 0	1, 0	1, 1
100G-CR10				1, 0	0, 0	0, 0	0, 0
100G-CR4				1, 0	1, 0	1, 0	0, 0
25G-CR-L				1, 0	1, 1	1, 0	1, 1
25G-CR-S				1, 1	1, 1	1, 1	1, 1
FEC_REQ & ABILITY	0,1	0, 0	0, 0	1, 0	0, 0	0, 0	0, 0
25FEC_REQ	1,0	1,0	0, 0	1, 0	0, 1	0, 0	0, 0
	25G-L + CI108	40G	25G-S noFEC	25G-S + CI74	25G-L +CI108	25G-S +noFEC	40G

x, y in each column is the base page bits set by local device and remote link partner

Option F – AN example

	0	1	2	3	4	5	6
10G-KR	1, 1	1, 1	1, 1				
40G-KR4	1, 0	1, 1	0, 1				
100G-KR4	1, 0	1, 0	0, 0				
25G-xR-L	1, 1	1, 1	1, 0	1, 0	1, 1	1, 0	1, 1
25G-xR-S	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1
40G-CR4				1, 0	1, 0	1, 0	1, 1
100G-CR10				1, 0	0, 0	0, 0	0, 0
100G-CR4				1, 0	1, 0	1, 0	0, 0
AN-CABLES	0, 0	0, 0	0, 0	1, 1	1, 1	1, 1	1, 1
FEC_ABILITY	0, 1	0, 0	0,0	1, 0	0, 0	0, 0	0, 0
FEC_REQ	0, 1	0, 0	0, 0	1, 0	0, 0	0, 0	0, 0
25FEC_REQ	1, 0	1, 0	0, 0	1, 0	0, 1	0, 0	0, 0
	25G-L + CI108	40G	25G-S noFEC	25G-S + CI74	25G-L +CI108	25G-S +noFEC	40G

x, y in each column is the base page bits set by local device and remote link partner