10GBASE BR20 FEC issues and possible solutions

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How did we get here?

- The BR20 budget is 0 to 15 dB, which is rather wide
- The original budget for BR20 used a no-FEC sensitivity
  - This made the Tx power relatively high
  - This in turn made the Rx overload even higher
  - The optical module people complained
- The solution to this problem was to use RS FEC to make the sensitivity better (lower power), thus a lower Tx power, and a lower Rx overload power
  - The optical module people were happy
  - But it leaves us with a plumbing problem: the interfaces are different

The plumbing problem

- For 10GBASE-R PHYs
  - PCS service interface is the XGMII 32 bit wide interface (Cl.46/49)
  - The PMA service interface is the XSBI 16 bit wide (Cl.51)
  - The PMD service interface is serial (Cl.52)
- For 25GBASE-R PHYs
  - PCS service interface is the 25GMII 32 bit wide interface (Cl.107)
  - RS-FEC service interface is serial (Cl.108)
  - PMA service interface is serial (Cl. 109)
  - PMD service interface is serial (Cl.114)

What are the possibilities?

- There are three (as far as I can see)
  - Figure out the plumbing problem
    - This is the current plan of record
  - Revert to not using FEC (adjusting optical levels up)
    - This neglects the overload problems that some vendors claim
  - Use Cl.74 FEC, (adjusting levels up, but not as much)
    - This might “split the difference”, but Cl.74 opens up a new idea (slide 6)

Solutions to the plumbing problem

- Annex 109C gives us some hints on how to fix this
  - Make a taller stack of sublayers:
    - Clause 49 PCS (serves XGMII, uses XSBI)
    - Clause 41 PMA (serves XSBI, uses serial)
    - Clause 108 FEC (serves serial, uses serial) – need to add 10G operation
    - Clause 109 PMA (serves serial, uses serial) – need to add 10G operation
    - Clause 158 PMD (serves serial, uses optical)
  - Alternatively, use the 25G PCS, but at 10G:
    - Clause 107 PCS (serves XGMII, uses serial) – need to add 10G operation
    - Clause 108 (add 10G), 109 (add 10G), 158 as above

Why not use Drano?

- If we look at Cl.74 (the other FEC), we see language like
- **74.4 Inter-sublayer interfaces**
  An FEC service interface is provided to allow the FEC sublayer to transfer information to and from the PCS. An abstract service model is used to define the operation of this interface. For 10GBASE-R, the FEC service interface directly maps to the PMA service interface of the PCS defined in Clause 49 and the lower FEC sublayer interface maps to the service interface provided by the serial PMA sublayer defined in Clause 51. For 25GBASE-R, the FEC service interface is an instance of the inter-sublayer service interface defined in 105.4, as is the PMA service interface defined in 109.2. For 40GBASE-R and 100GBASE-R, the FEC service interface is an instance of the inter-sublayer service interface defined in 80.3 as is the PMA service interface defined in 83.2.
- In other words: use whatever interface works
- Applying this approach in our case would give us
  - Clause 49 PCS (serves XGMII, uses XSBI)
  - Clause 108 FEC (serves XSBI, uses XSBI) – need to add 10G operation and XSBI
  - Clause 51 PMA (serves XSBI, uses serial)
  - Clause 158 PMD (serves serial, uses optical)
- This seems the simplest and most self-contained method

Conclusion

- The several comments on the “plumbing problem” are valid issues – we must solve them definitively
- It looks like modifying Clause 108 RS-FEC to include 10G operation and the use of XSBI interfaces both top and bottom is the simplest and self-contained solution
  - This would be in the style of Clause 74, so there is clear precedent for how to do this
- Seek the discussion of the group to consider the solutions