Framing for Asymmetric Ethernet links

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Contributors

- Paul Fuller (Marvell)
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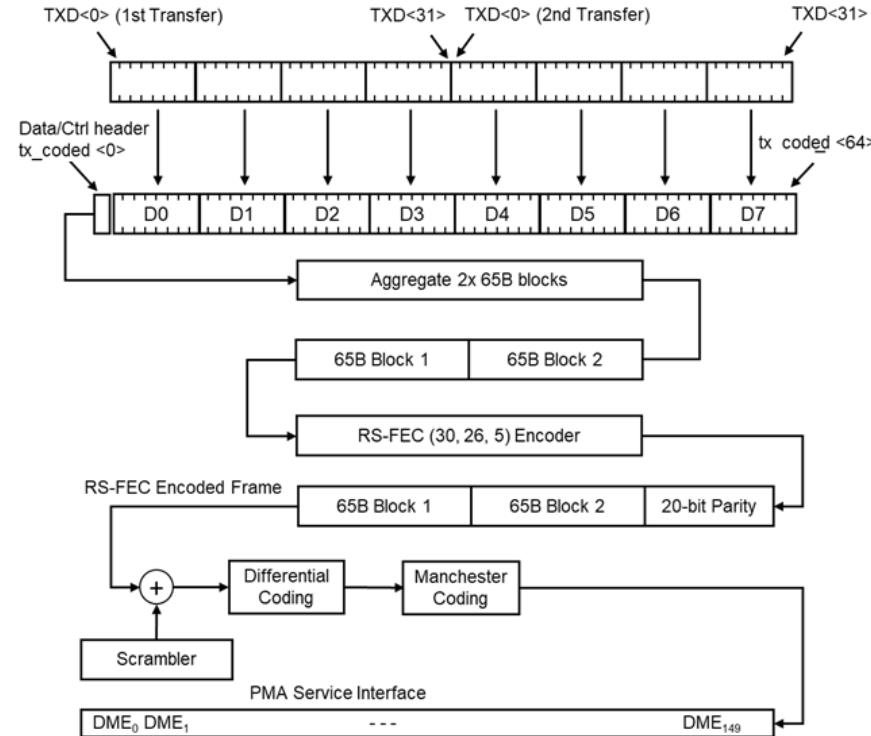- Alejandro Castrillon (Marvell)

Introduction

- ACT design has already shared in the last standard meeting

- High data rate (HDR) path framing matches the 802.3ch specification

- In this presentation, we go over the framing for both data mode and training in low data rate (LDR) path

- https://www.ieee802.org/3/dm/public/0924/jonsson_3dm_01_09_15_24.pdf

Framing objectives and assumption

- The framing that supports
  - FEC latency < 2us
  - Burst error correction > 50ns
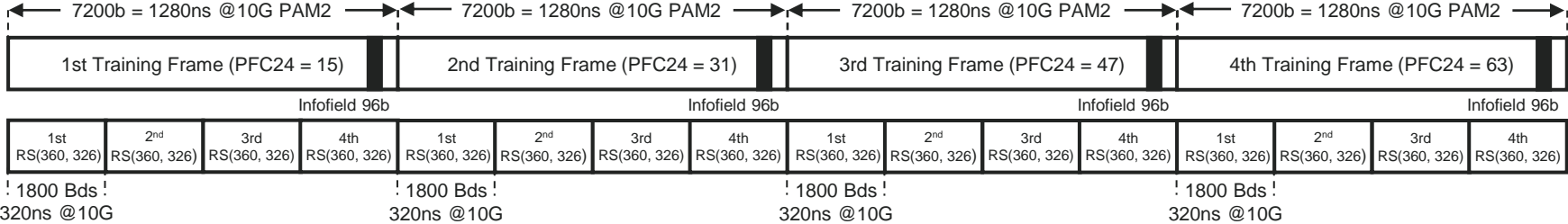- No OAM is needed for side channel (from switch to camera)

Low data framing data mode

- Symbol rate is 117.1875 MHz
- Differential Manchester encoding
- Correction of impulse noise errors lasting from 51ns (6 bits) to 85ns (10 bits).
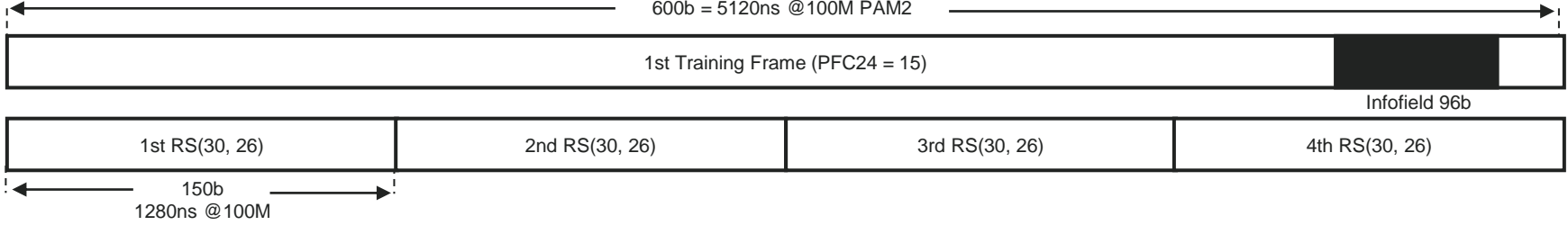- Decoding latency of approximately 1.5 us
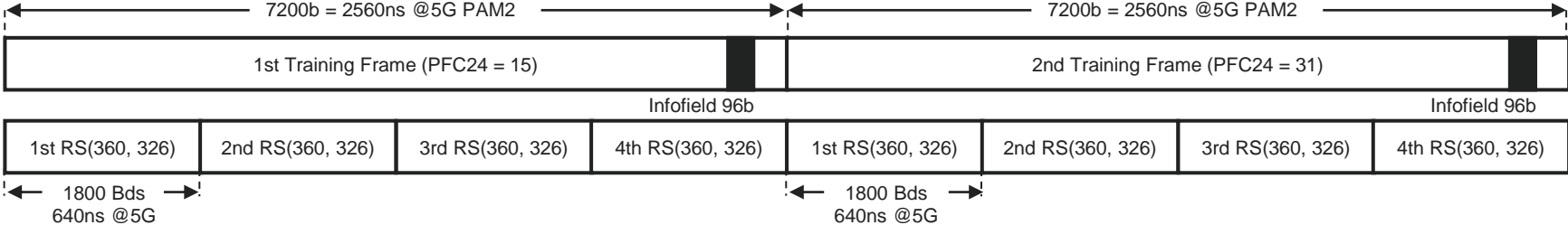
LDR vs 10G training frame

10G Training Frame

7200b = 1280ns @10G PAM2				7200b = 1280ns @10G PAM2				7200b = 1280ns @10G PAM2				7200b = 1280ns @10G PAM2			
1st Training Frame (PFC24 = 15)				2nd Training Frame (PFC24 = 31)				3rd Training Frame (PFC24 = 47)				4th Training Frame (PFC24 = 63)			
			Infofield 96b				Infofield 96b				Infofield 96b				Infofield 96b
1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)	1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)	1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)	1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)

1800 Bds
320ns @10G

1800 Bds
320ns @10G

1800 Bds
320ns @10G

1800 Bds
320ns @10G

100M Training Frame

600b = 5120ns @100M PAM2			
1st Training Frame (PFC24 = 15)			
			Infofield 96b
1st RS(30, 26)	2nd RS(30, 26)	3rd RS(30, 26)	4th RS(30, 26)

150b
1280ns @100M

LDR vs 5G training frame

5G Training Frame

← 7200b = 2560ns @5G PAM2 →	← 7200b = 2560ns @5G PAM2 →

1st Training Frame (PFC24 = 15)	■		2nd Training Frame (PFC24 = 31)	■	

Infofield 96b   Infofield 96b

1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)	1st RS(360, 326)	2nd RS(360, 326)	3rd RS(360, 326)	4th RS(360, 326)

← 1800 Bds 640ns @5G →   ← 1800 Bds 640ns @5G →

100M Training Frame

← 600b = 5120ns @100M PAM2 →

1st Training Frame (PFC24 = 15)	■	

Infofield 96b

1st RS(30, 26)	2nd RS(30, 26)	3rd RS(30, 26)	4th RS(30, 26)

← 150b 1280ns @100M →

LDR vs 2.5G training frame

2.5G Training Frame

7200b = 5120ns @2.5G PAM2

| 1st Training Frame (PFC24 = 15) | | Infofield 96b | |

| 1st RS(360, 326) | 2nd RS(360, 326) | 3rd RS(360, 326) | 4th RS(360, 326) |

1800 Bds
1280ns @2.5G

100M Training Frame

600b = 5120ns @100M PAM2

| 1st Training Frame (PFC24 = 15) | | Infofield 96b | |

| 1st RS(30, 26) | 2nd RS(30, 26) | 3rd RS(30, 26) | 4th RS(30, 26) |

150b
1280ns @100M
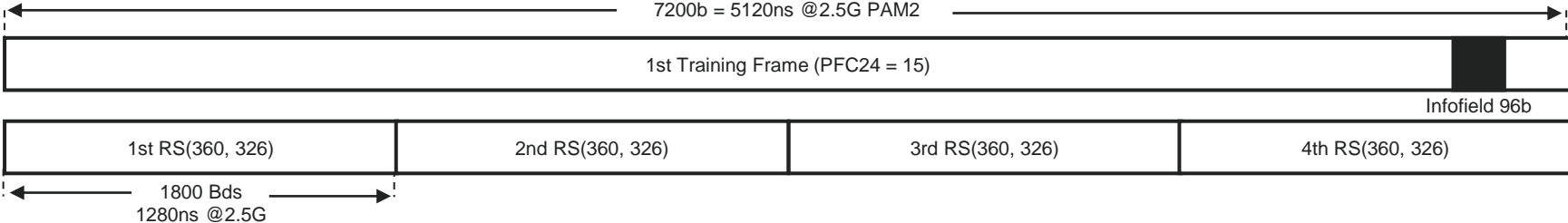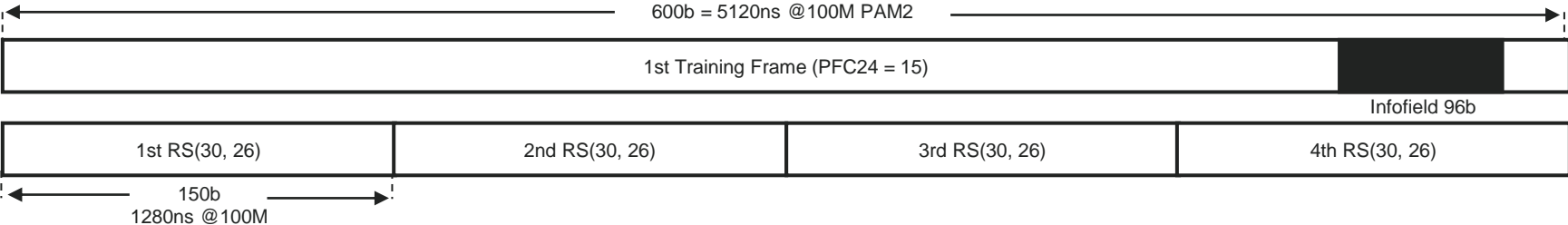
Conclusion

- High data rate (HDR) path framing matches the 802.3ch specification
- Low data rate path framing
  - FEC Latency = 1.5 us
  - 17% overhead
  - Burst error correction 51-85ns
  - No OAM from switch to camera
- The training frame in low data rate path is
  - independent of speed of HDR path
  - Aligned with framing of HDR path
- We welcome collaboration on framing in both data mode and training