

Refresh Sequence / Resync Header Proposal

IEEE 802.3dm

January Interim, Phoenix

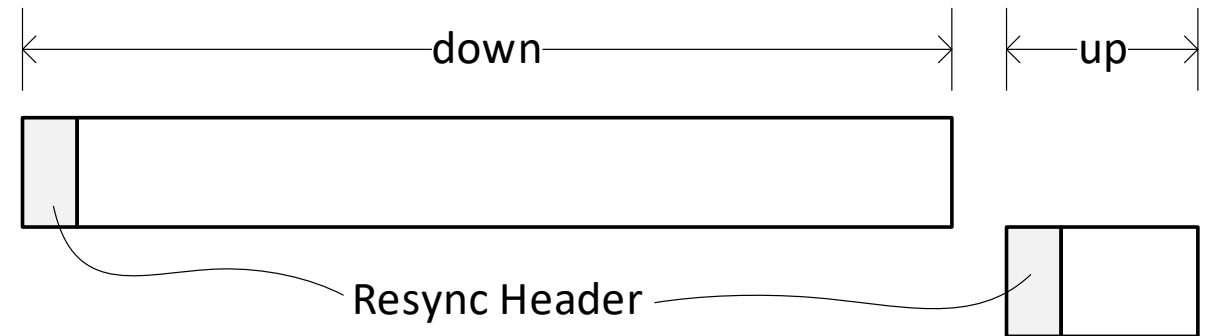
Conrad Zerna (Aviva Links Inc.)

Introduction

- Proposing resync header sequence
- Robust timing recover for every data burst

TDD Proposal - Coding and Data Rates

Dn Line Rate [Gbps]	Up Line Rate [Gbps]	Resync Header [ns]	IBG [ns]	Dn							Up							Target [ns]	Dn [ns]	Up [ns]	Total [ns]	Dn Payload per burst [bits]	Dn Data Rate [Gbps]	Up Payload per burst [bits]	Up Data Rate [Mbps]
				Per RS frame				Burst			Per RS frame														
				64/65 blocks	OAM bits	Payload bytes	Parity bytes	RS frames	Length [bits]	Length [ns]	64/65 blocks	OAM bits	Payload bytes	Parity bytes	RS frames	Length [bits]	Length [ns]								
3	3	189.333	104	15	1	122	8	25	26000	8666.67	15	1	122	8	1	1040	346.67	9600	8856.0	536.0	9600.0	24000	2.500	960	100.0
6	3	189.333	104	15	1	122	8	50	52000	8666.67	15	1	122	8	1	1040	346.67	9600	8856.0	536.0	9600.0	48000	5.000	960	100.0
12	3	189.333	104	15	1	122	8	100	104000	8666.67	15	1	122	8	1	1040	346.67	9600	8856.0	536.0	9600.0	96000	10.000	960	100.0

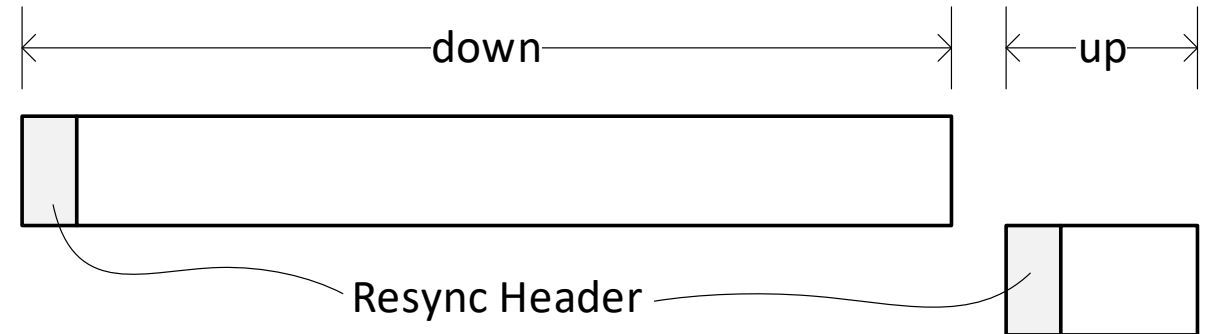


- All required MAC rates can be achieved with 3 and 6 GBaud
- Resync Header ... 189.333ns
- TDD proposal

https://iee802.org/3/dm/public/1124/Dalmia_Goel_3dm_01a_11112024.pdf

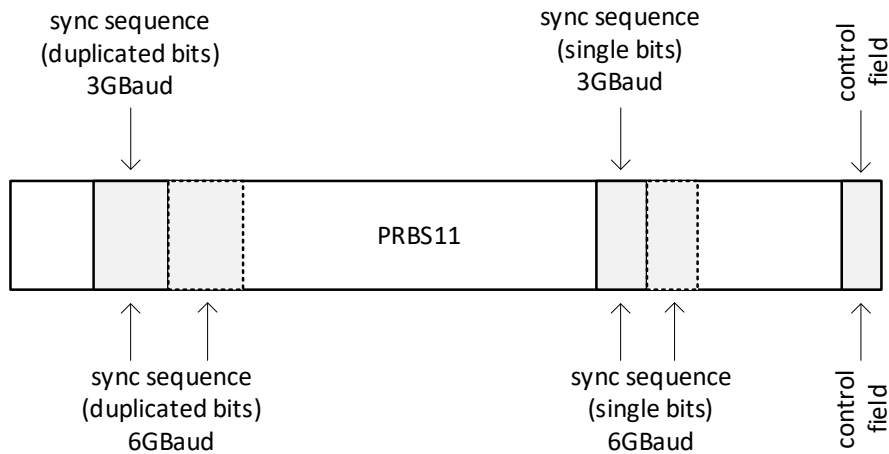
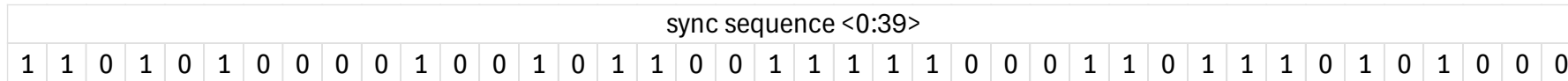
Resync Header

Dn Line Rate [Gbps]	Up Line Rate [Gbps]	Dn [GBaud]	Up [GBaud]	Dn [symbols]	Up [symbols]
3	3	3	3	568	568
6	3	6	3	1136	568
12	3	6	3	1136	568



- Resync Header ... same length for all rates/directions: 189.333ns
 - 71 bytes for 3GBaud
 - 142 bytes for 6GBaud
- Modulation is PAM2 always

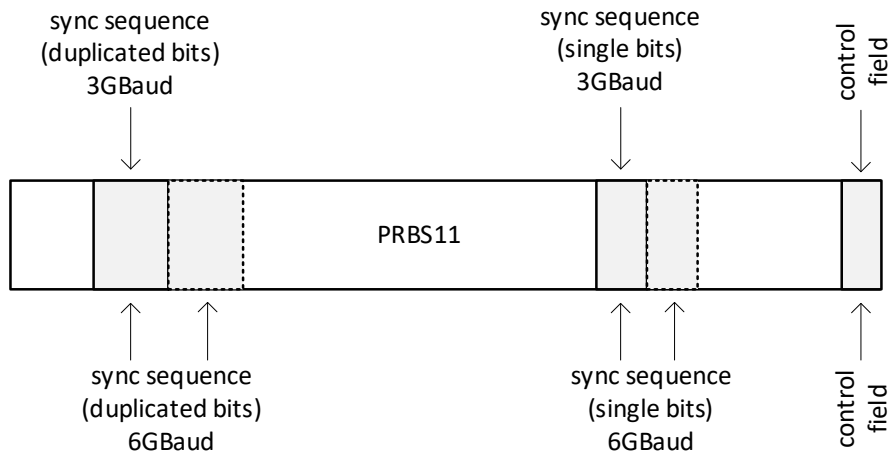
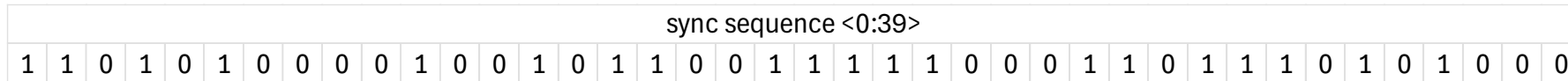
Resync Header



- Base pattern PRBS11, generator polynomial:

$$g(x) = x^{11} + x^9 + 1$$
 - Relatively high transition density (higher than scrambler) for timing recovery
 - Still wide PSD for low emissions
- Sync Sequence: 40 symbols
 - High contrast of sync sequence over PRBS11 (including polarity detection)
 - Fully DC-balanced
- Control field: precision time base message
 - Can also be shared with other purposes

Resync Header



- Sync Sequence:

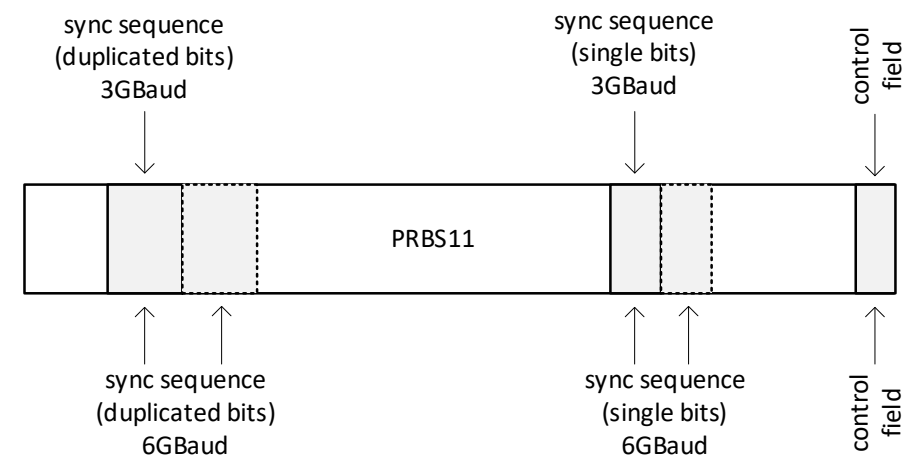
- First position: each bit duplicated, 80 symbols
 - Always detectable regardless of receiver sampling phase
- Second position: 40 symbols
- Insertions dithered with pseudo-random offset
 - Offset = 0..31
 - Avoid repeating patterns, no spikes/needles in PSD

GBaud	First sync sequence position	Second sync sequence position
3	n = 64 + 2*offset	m = 448 + offset
6		m = 976 + offset

Application to alternative TDD parameters

- For longer resync header or “refresh sequence”, only the position values would change

GBaud	First sync sequence position	Second sync sequence position	Header Length
3	$n = 64 + 2 * \text{offset}$	$m = 960 + \text{offset}$	1120
6		$m = 2080 + \text{offset}$	2240



Summary

- This presentation is a baseline proposal for Resync Header in any TDD scheme with 3 and 6 GBaud, complementing https://ieee802.org/3/dm/public/1124/Dalmia_Goel_3dm_01a_11112024.pdf
- Robust timing recovery
- Low emissions
- Polarity detection

Thank You!