Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: Panasonic 802.15.7r1 Proposal

Date Submitted: January, 2016

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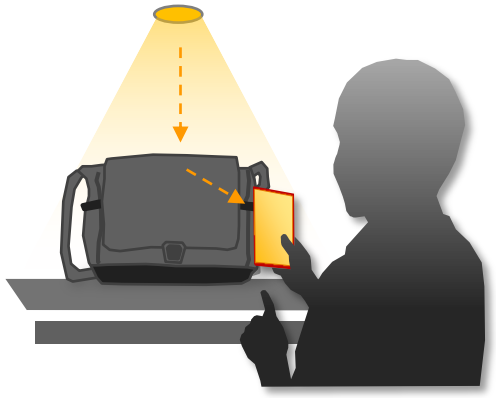
Abstract: Panasonic 802.15.7r1 Proposal

Purpose: Call for Proposals Response

Requirements (Our Target)

- Flicker free:
  average luminance must be constant
- On-Off modulation:
  signal must be modulated with monochrome On and Off state of luminance (Off state may not be zero luminance) so as to use most of LED devices as transmitters



Purposes of Communications

- ID broadcast
  - Tx sends an ID repeatedly
  - Rx receives the ID in a blink of an eye
- Unidirectional data transfer
  - for ROI image sensor

Modes

Mode 1

for ID broadcast mode

Mode 2

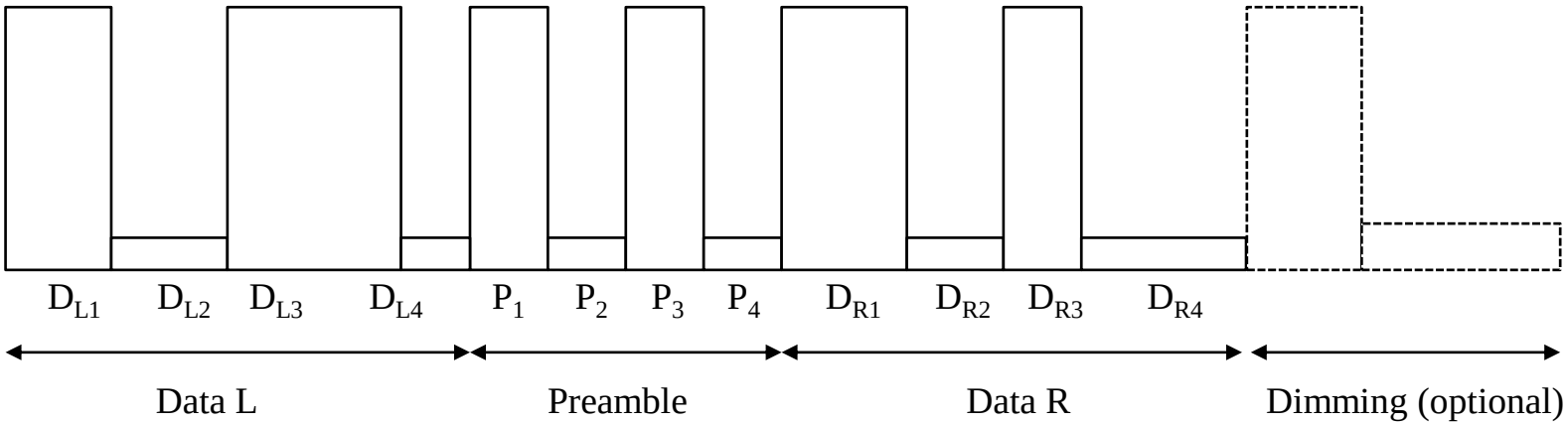
for ID broadcast mode

for low luminance mode

Mode 3

for unidirectional data transfer mode

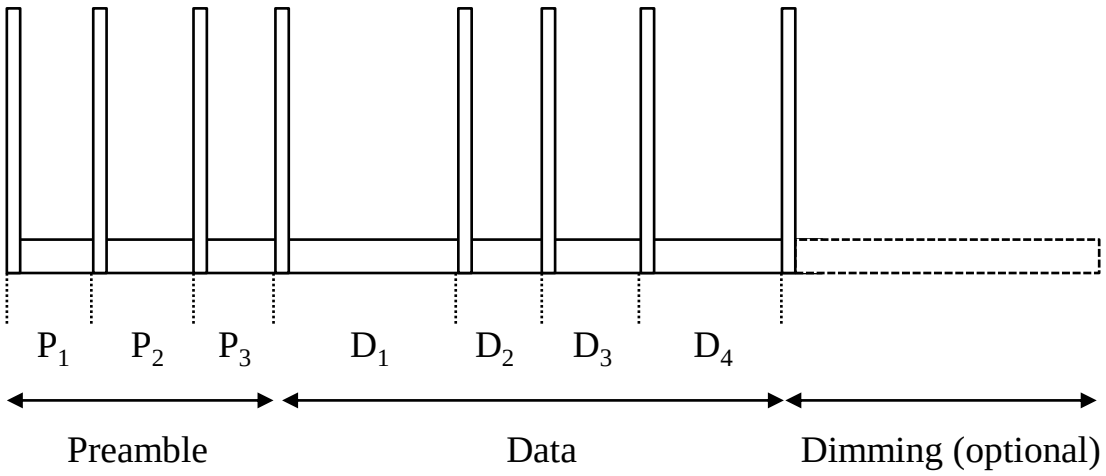
Mode 1



Modulation [us]
(P_1, P_2, P_3, P_4) = (100, 90, 90, 100)
$D_{Ri} = 120 + 30 \times w_i$ (i ∈ 1∼4, w_i ∈ 0∼7)
$D_{Li} = 120 + 30 \times (7 - w_i)$

A transmitter can send either or both of Data R and L.
Throughput: 5.5 kbps

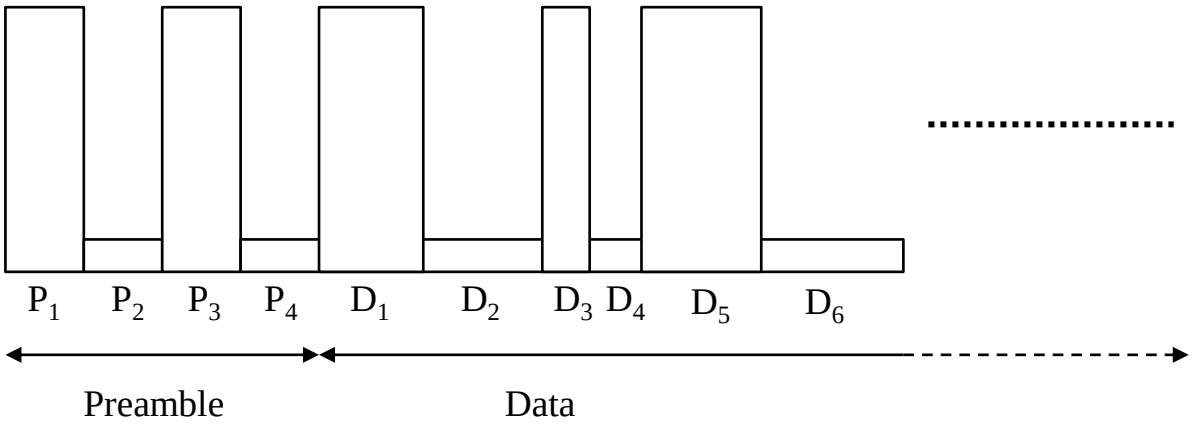
Mode 2



Modulation [us]
(P_1, P_2, P_3) = (160, 180, 160)
$D_i = 180 + 30 \times w_i$ ($i \in 1 \sim 4$, $w_i \in 0 \sim 7$)
Pulse width < 10

Average throughput: 7.3 kbps

Mode 3



Modulation [us]

$(P_1, P_2, P_3, P_4) = (50, 40, 40, 50)$

$D_{2i-1} + D_{2i} = 100 + 20 \times x_i$

$(i \in 1 \sim N, x_i \in 0 \sim 7, D_{2i} > 50\ D_{2i+1} > 50)$

Average throughput: 16 kbps

Packet Modulation for ID Broadcast

Packet Modulation

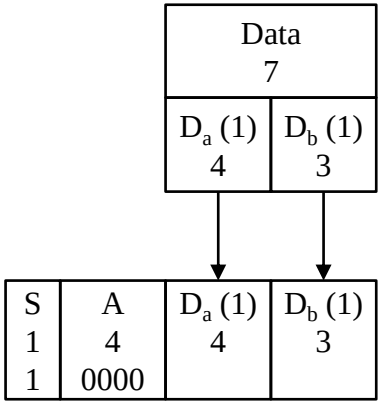
			bit 1	bit 2	bit 3	
w_1	=	(	D_{a1}	S	D_{b1}	)
w_2	=	(	D_{a2}	A_1 / D_{a7}	D_{b2}	)
w_3	=	(	D_{a3}	A_2 / D_{a6}	D_{b3}	)
w_4	=	(	D_{a4}	A_3 / D_{a5}	A_4 / D_{b4}	)

A	:	Address	0-4 bit
D	:	Data	4-7 + 3-4 bit
S	:	Stop bit	1 bit

Packet Division (1)

Division (1)

label
bit size
value

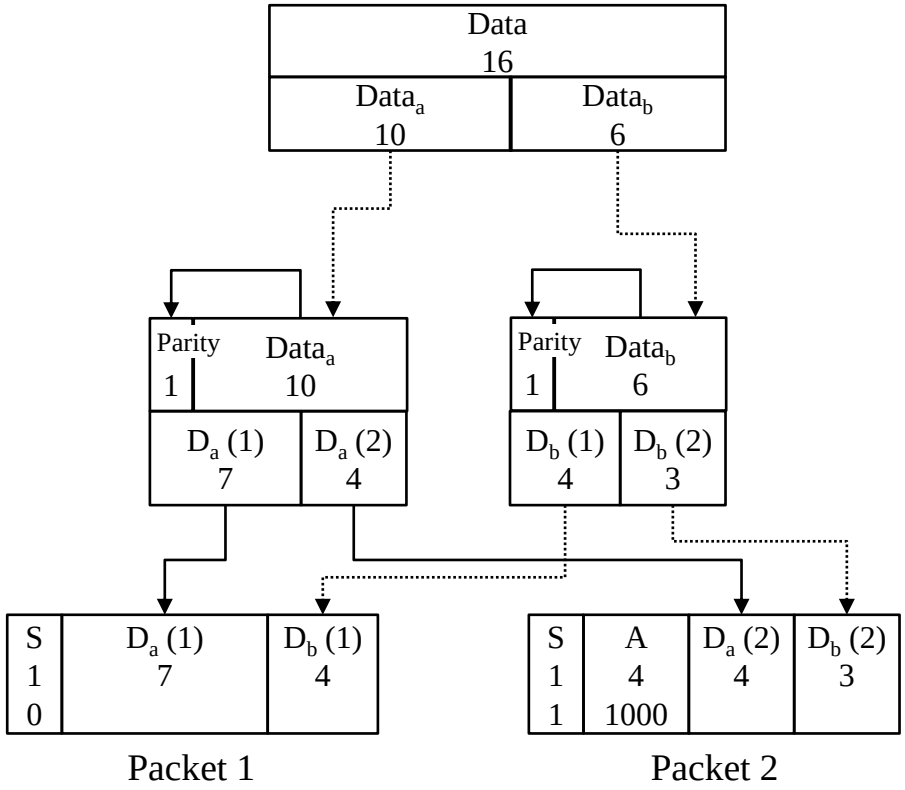


Packet 1

Packet Division (2)

label
bit size
value

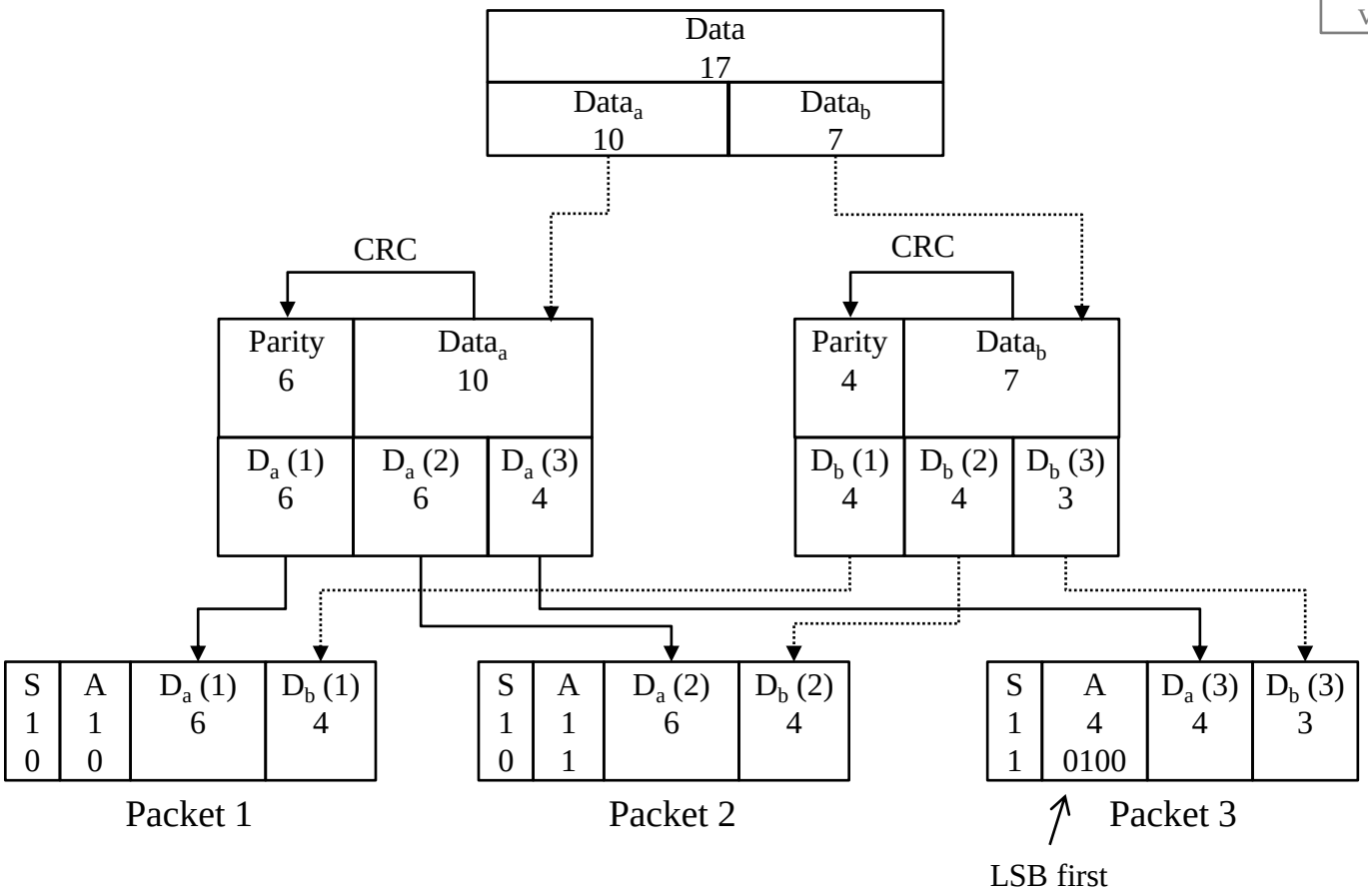
Division (2)



Packet Division (3)

label
bit size
value

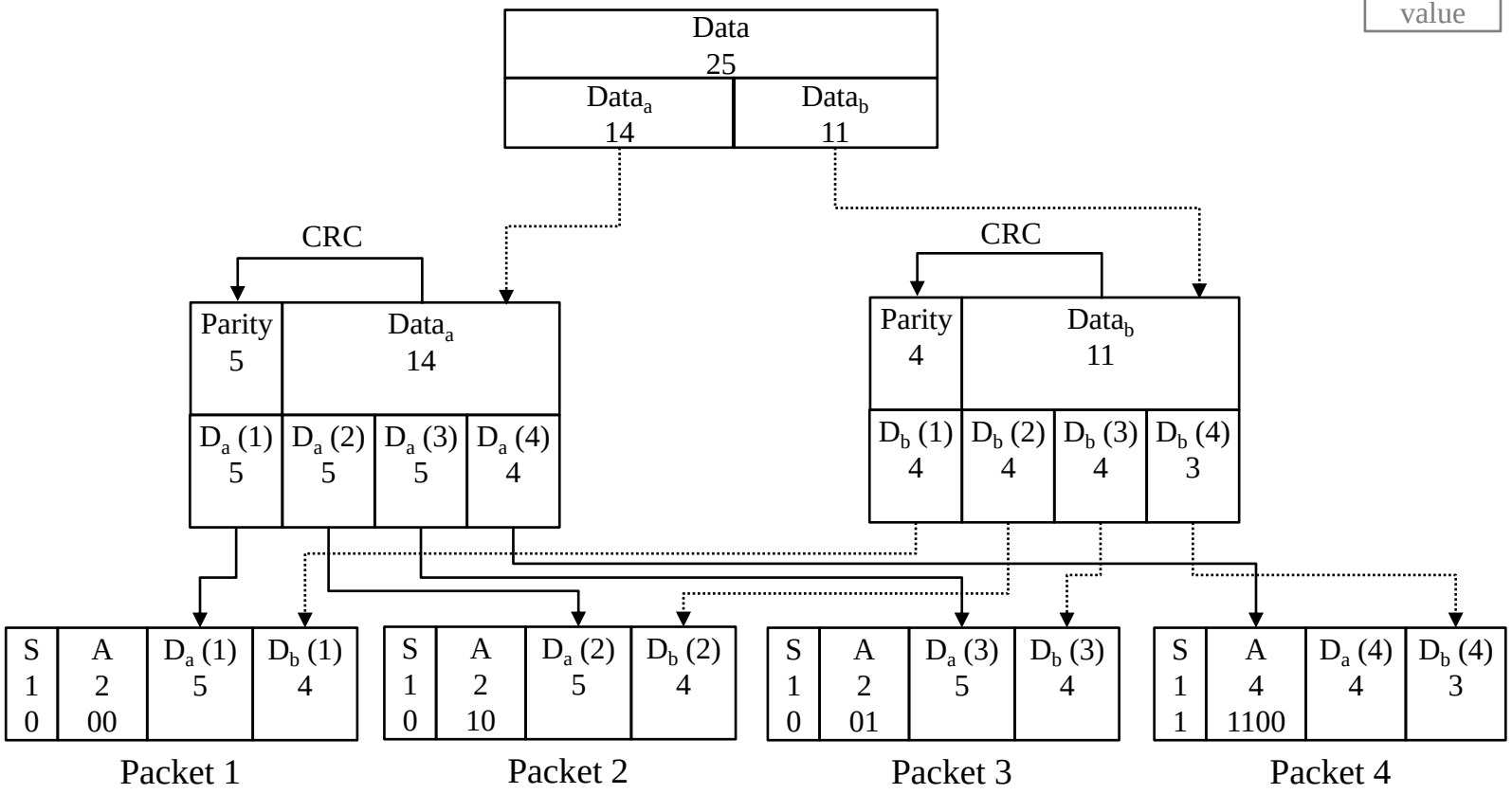
Division (3)



Packet Division (4)

label
bit size
value

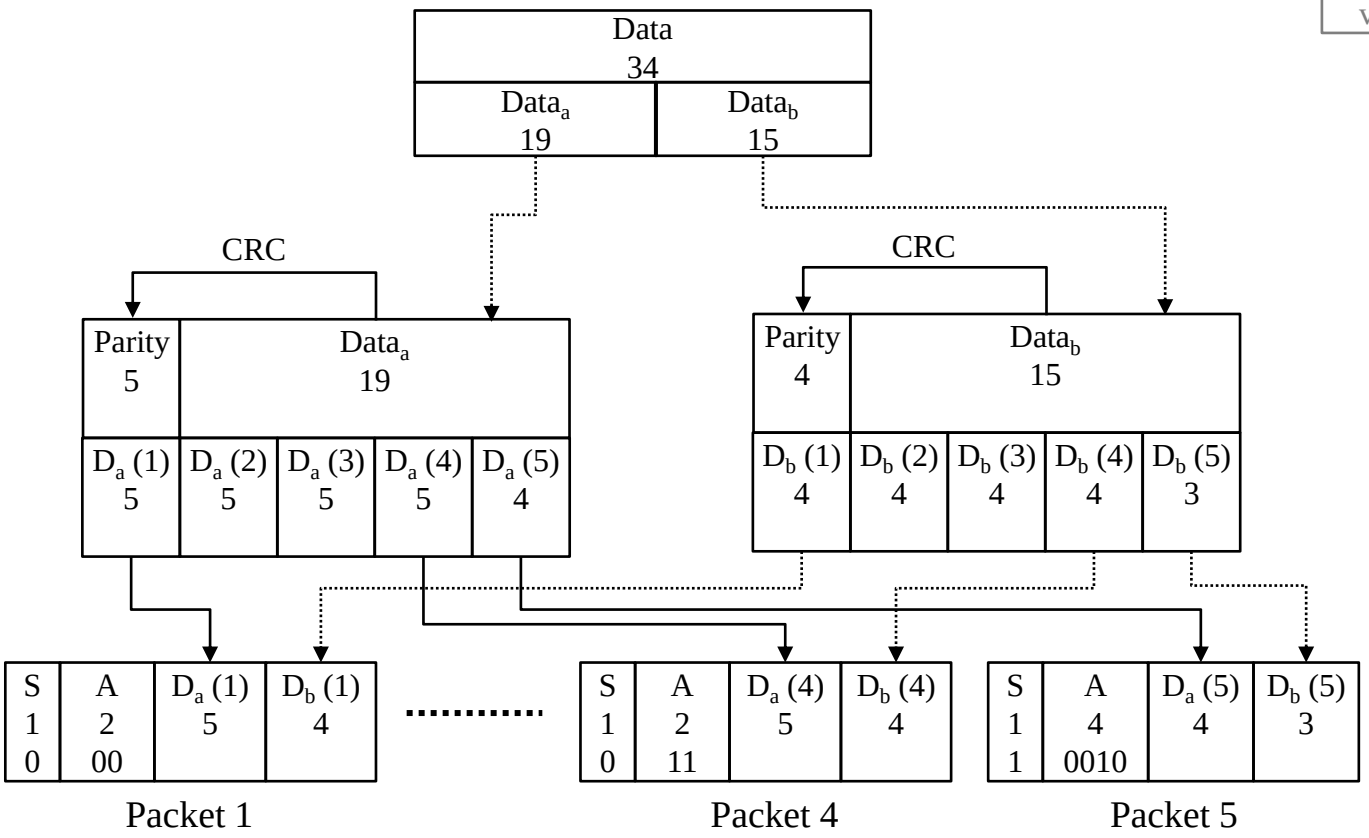
Division (4)



Packet Division (5)

label
bit size
value

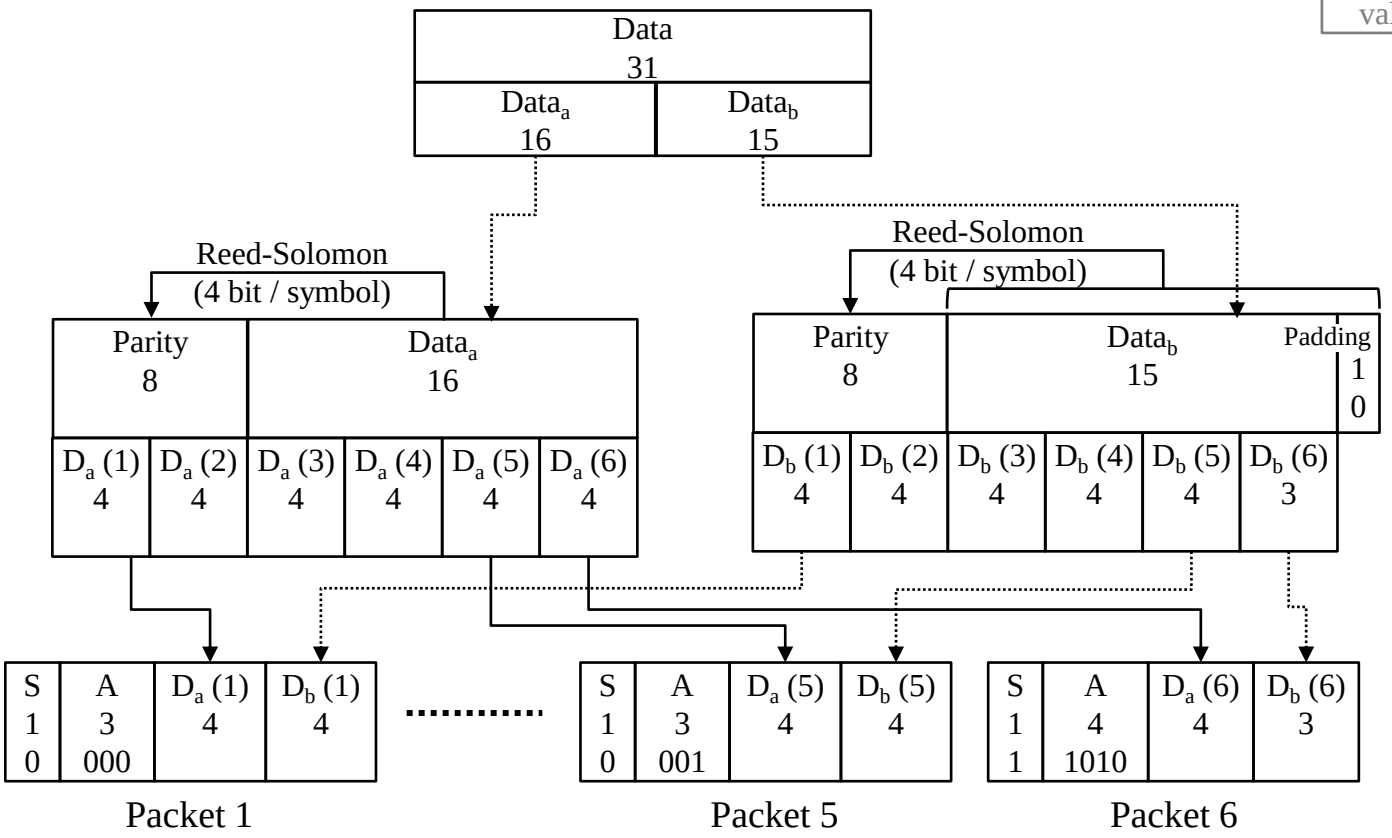
Division (5)



Packet Division (6, 7, 8)

label
bit size
value

Division (6)



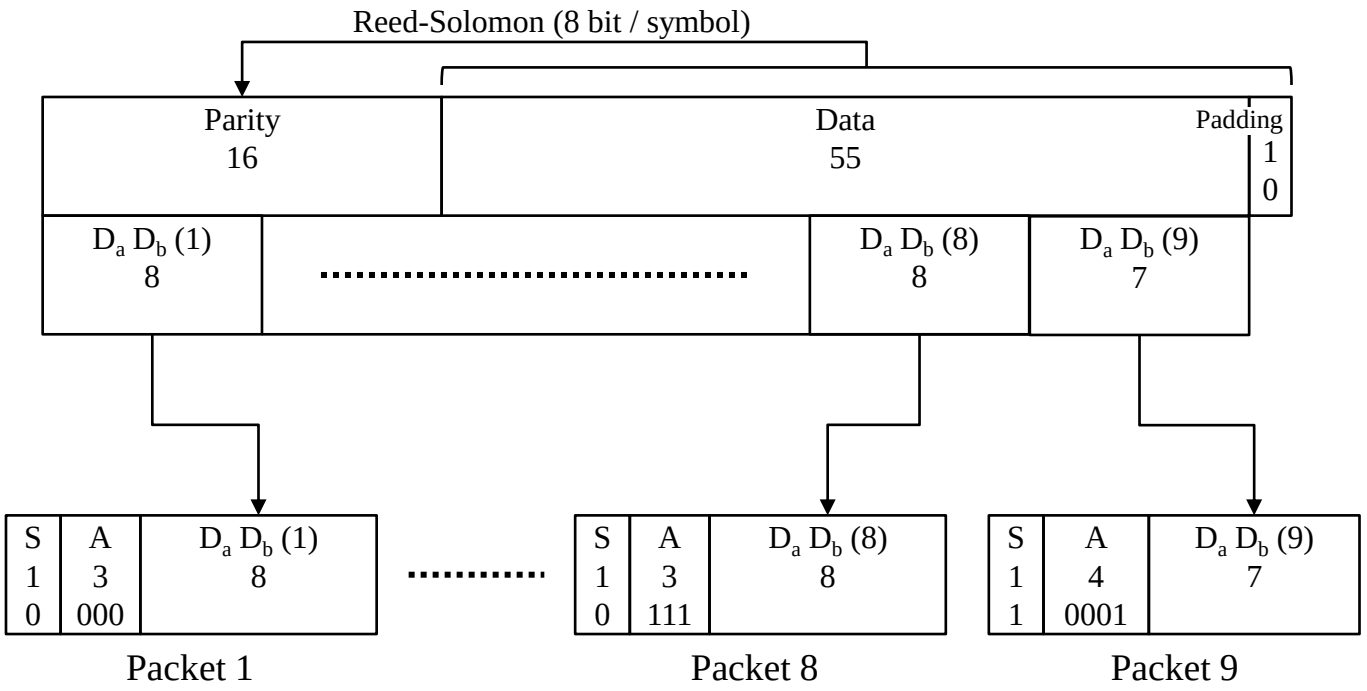
Division (7, 8)

Same manner as Division (6)

Packet Division (9)

Division (8)

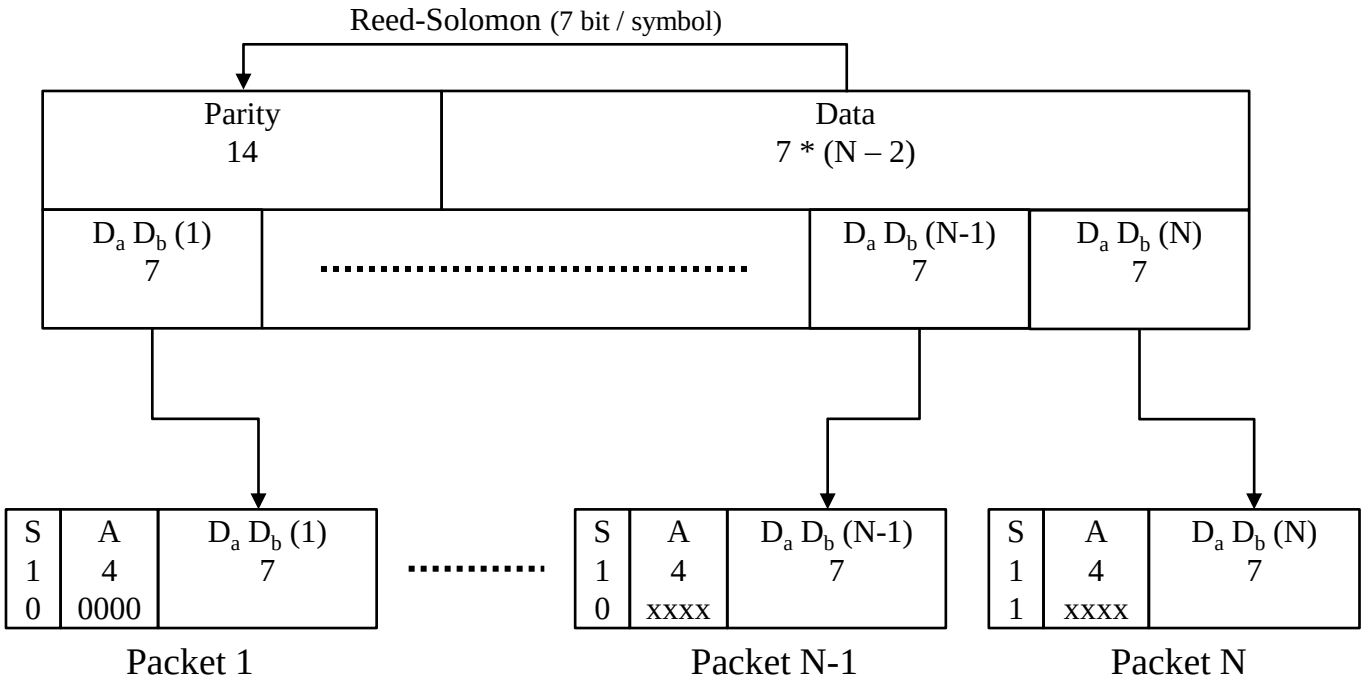
label
bit size
value



Packet Division (10-16)

label
bit size
value

Division (N = 10-16)



Packet Division Summary

Packet Division	Data Size [bit] Short mode	Full mode	Error Check Code
1	4	7	-
2	10	16	Parity bit (1 + 1)
3	10	17	CRC (6+4)
4	14	25	CRC (5+4)
5	19	34	
6	16	31	Reed-Solomon (2 * 4 bit + 2 * 4 bit)
7	20	39	
8	24	47	
9	-	55	Reed-Solomon (2 * 8 bit)
10	-	56	Reed-Solomon (2 * 7 bit)
11	-	63	
12	-	70	
13	-	77	
14	-	84	
15	-	91	
16	-	98	