

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

Submission Title: Panasonic 802.15.7r1 Proposal

Date Submitted: January, 2016

Source: Hideki Aoyama, Mitsuaki Oshima
Panasonic Corporation
contact: aoyama.hideki@jp.panasonic.com

Abstract: Panasonic 802.15.7r1 Proposal

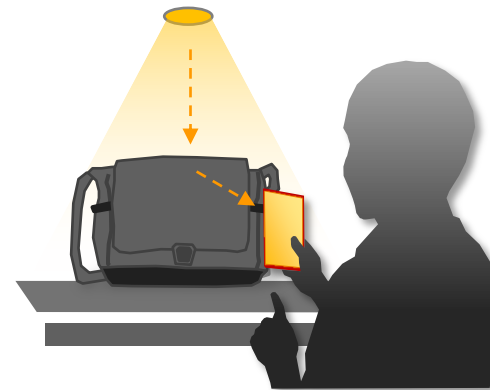
Purpose: Call for Proposals Response

Notice: This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

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

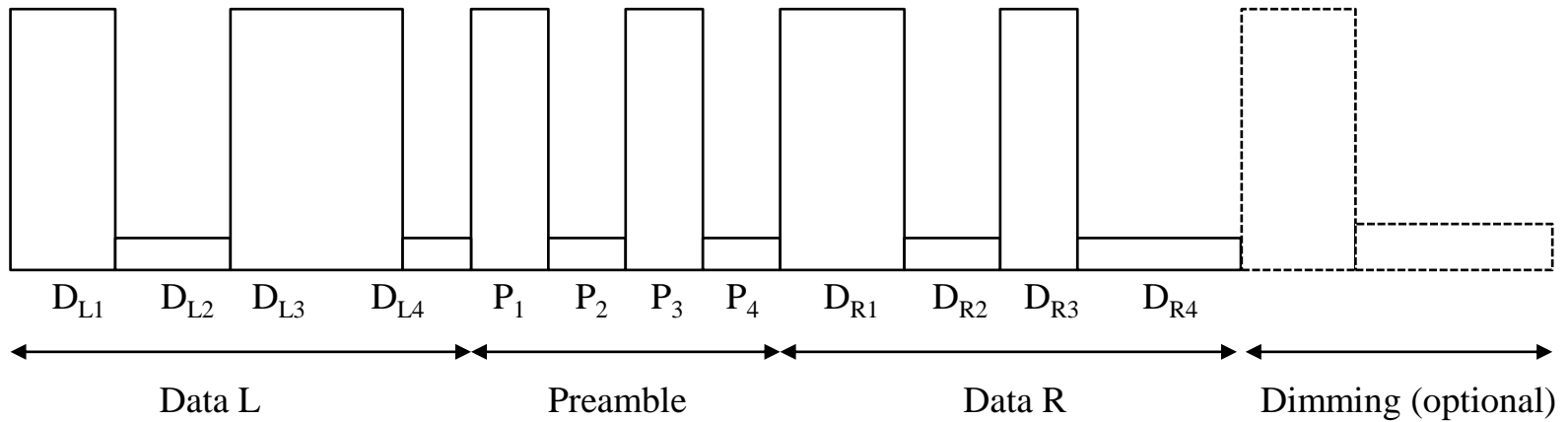
for ID broadcast mode

for low luminance mode

Mode 3

for unidirectional data transfer mode

Mode 1



Modulation [us]

$$(P_1, P_2, P_3, P_4) = (100, 90, 90, 100)$$

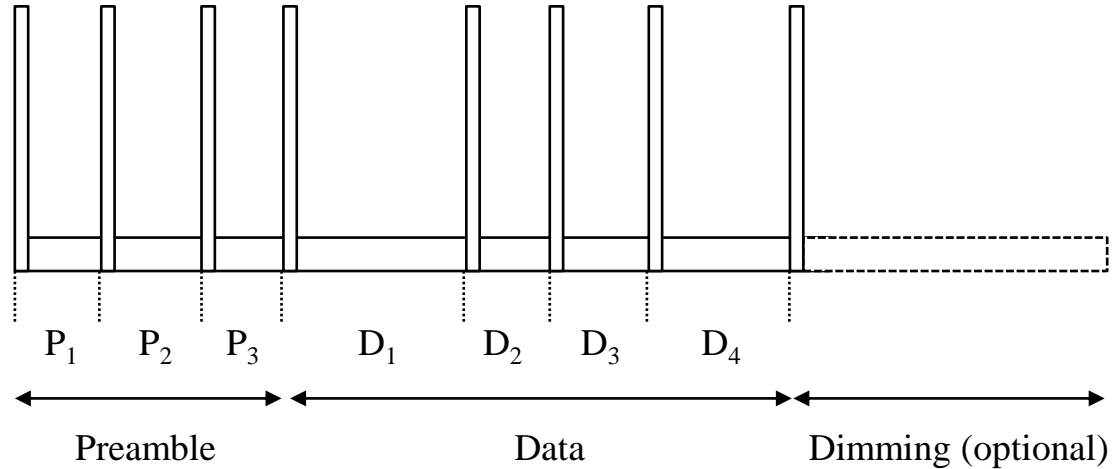
$$D_{Ri} = 120 + 30 \times w_i \quad (i \in 1 \sim 4, w_i \in 0 \sim 7)$$

$$D_{Li} = 120 + 30 \times (7 - w_i)$$

A transmitter can send either or both of Data R and L.

Throughput: 5.5 kbps

Mode 2



Modulation [us]

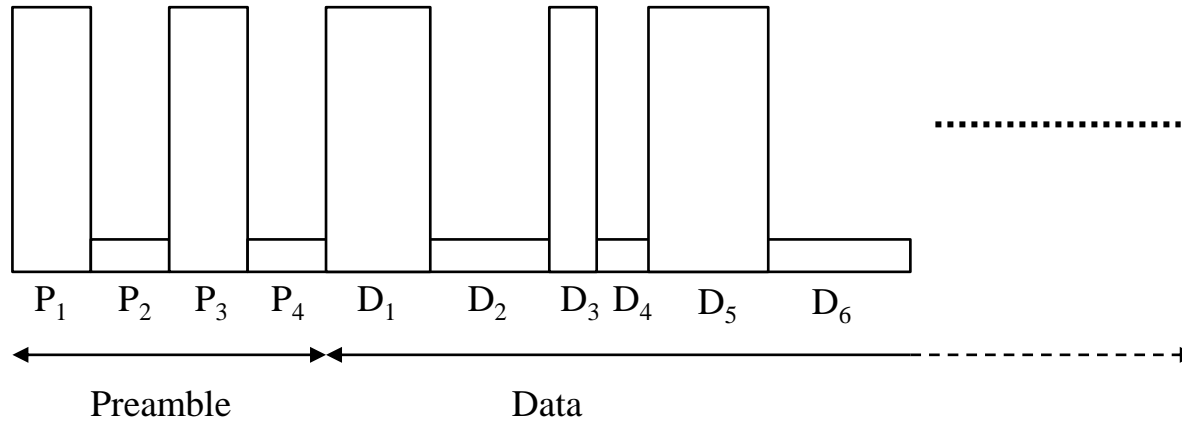
$$(P_1, P_2, P_3) = (160, 180, 160)$$

$$D_i = 180 + 30 \times w_i \quad (i \in 1 \sim 4, w_i \in 0 \sim 7)$$

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

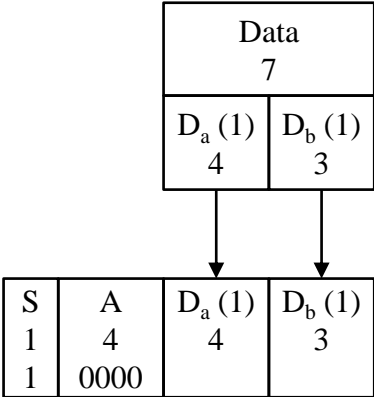
	bit 1	bit 2	bit 3			
w_1	=	(	D_{a1}	S	D_{b1})
w_2	=	(	D_{a2}	A_1 / D_{a7}	D_{b2})
w_3	=	(	D_{a3}	A_2 / D_{a6}	D_{b3})
w_4	=	(	D_{a4}	A_3 / D_{a5}	A_4 / D_{b4})

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

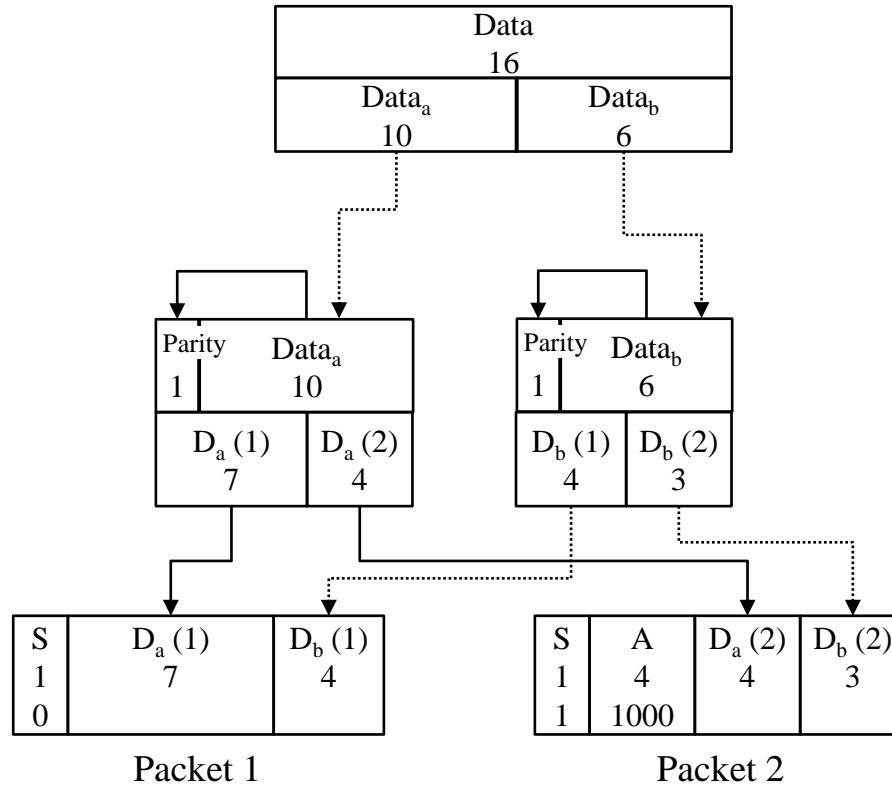


Packet 1

Packet Division (2)

Division (2)

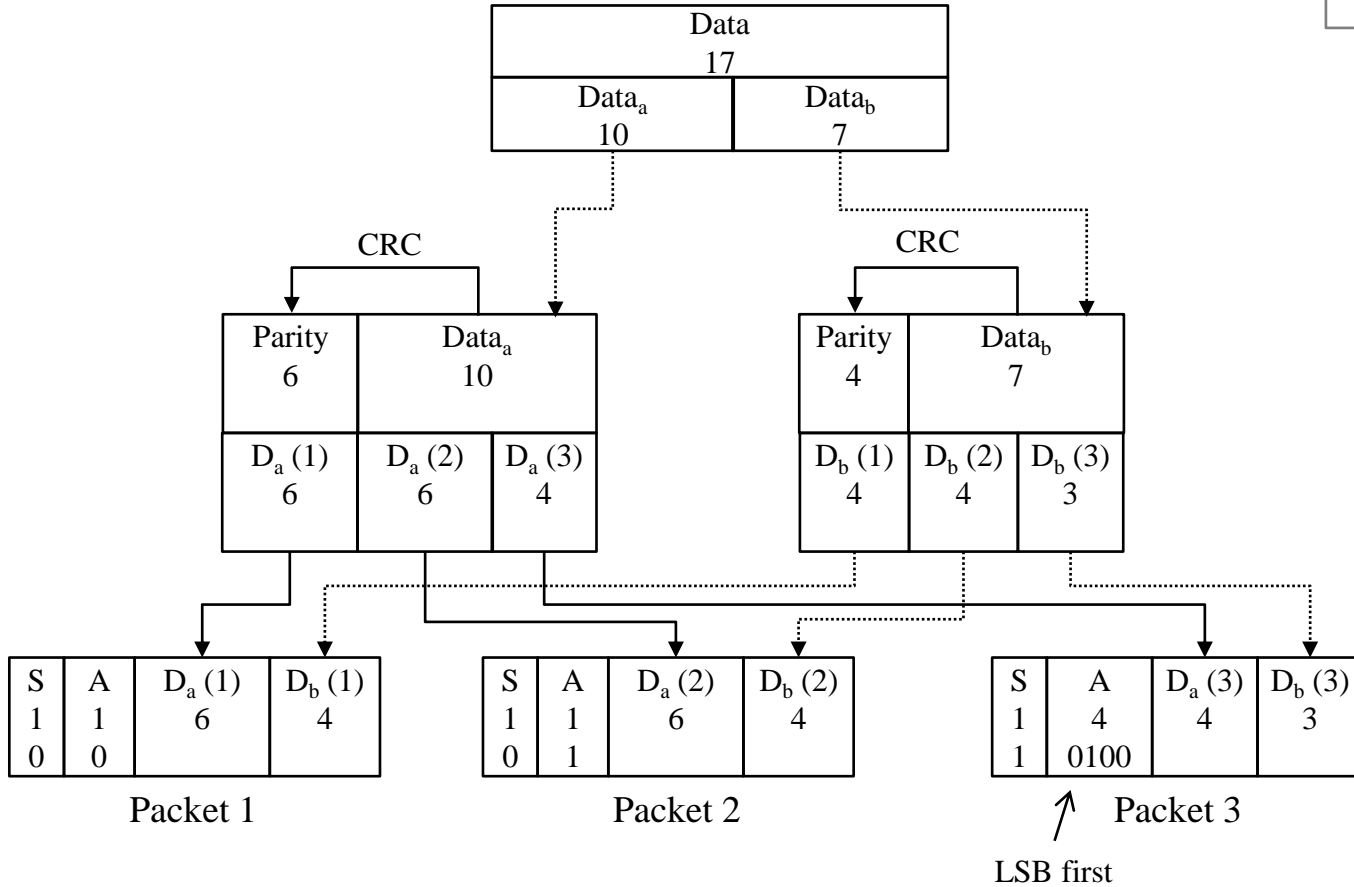
label
bit size
value



Packet Division (3)

Division (3)

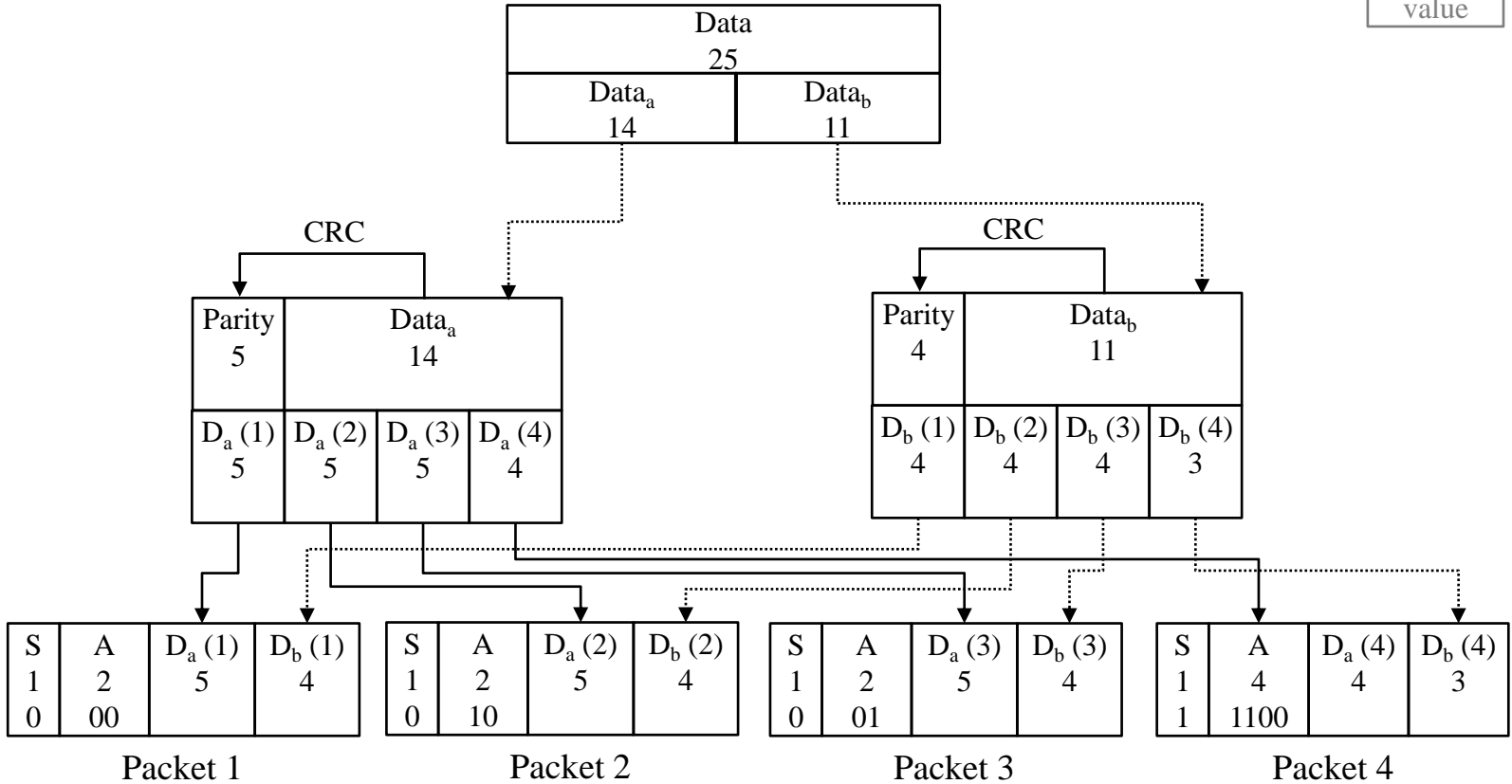
label
bit size
value



Packet Division (4)

Division (4)

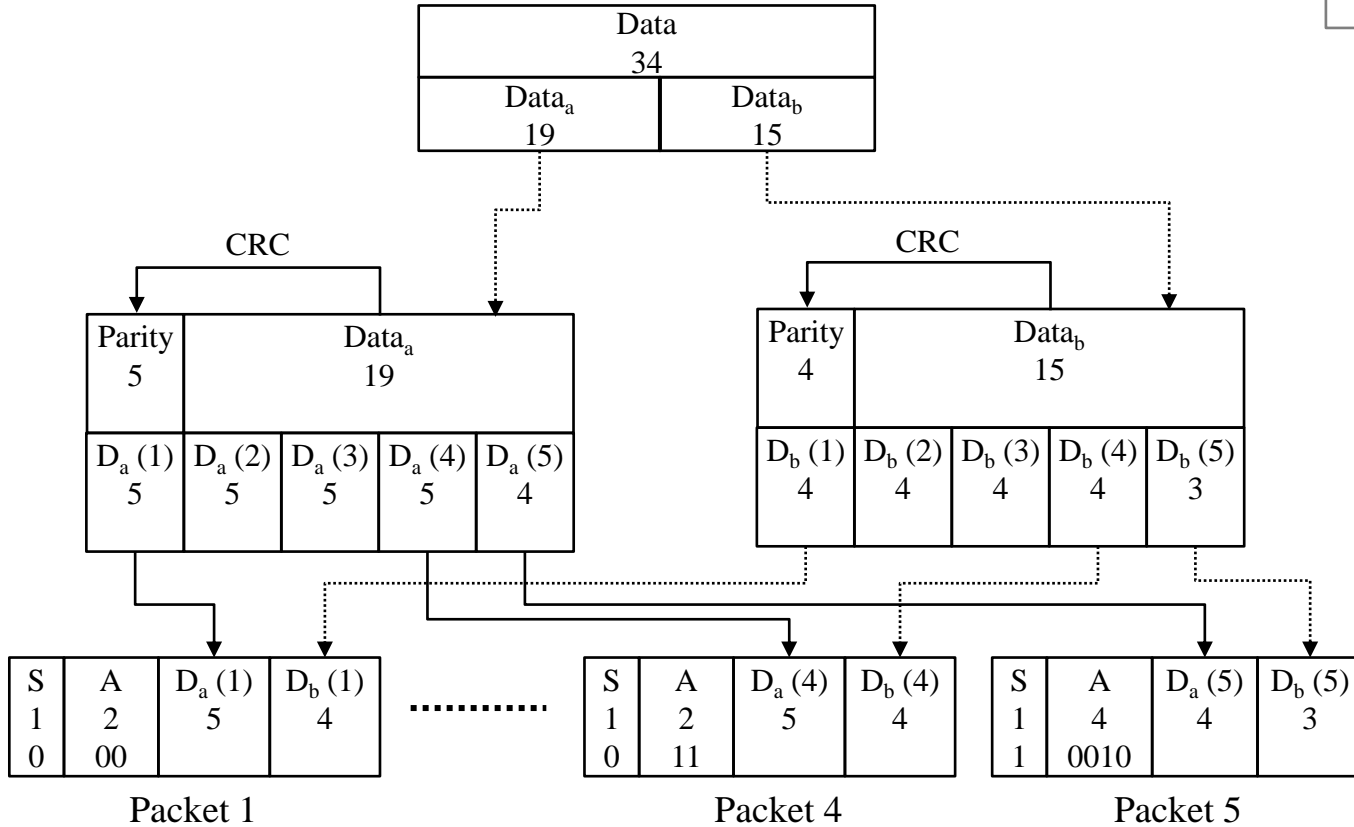
label
bit size
value



Packet Division (5)

Division (5)

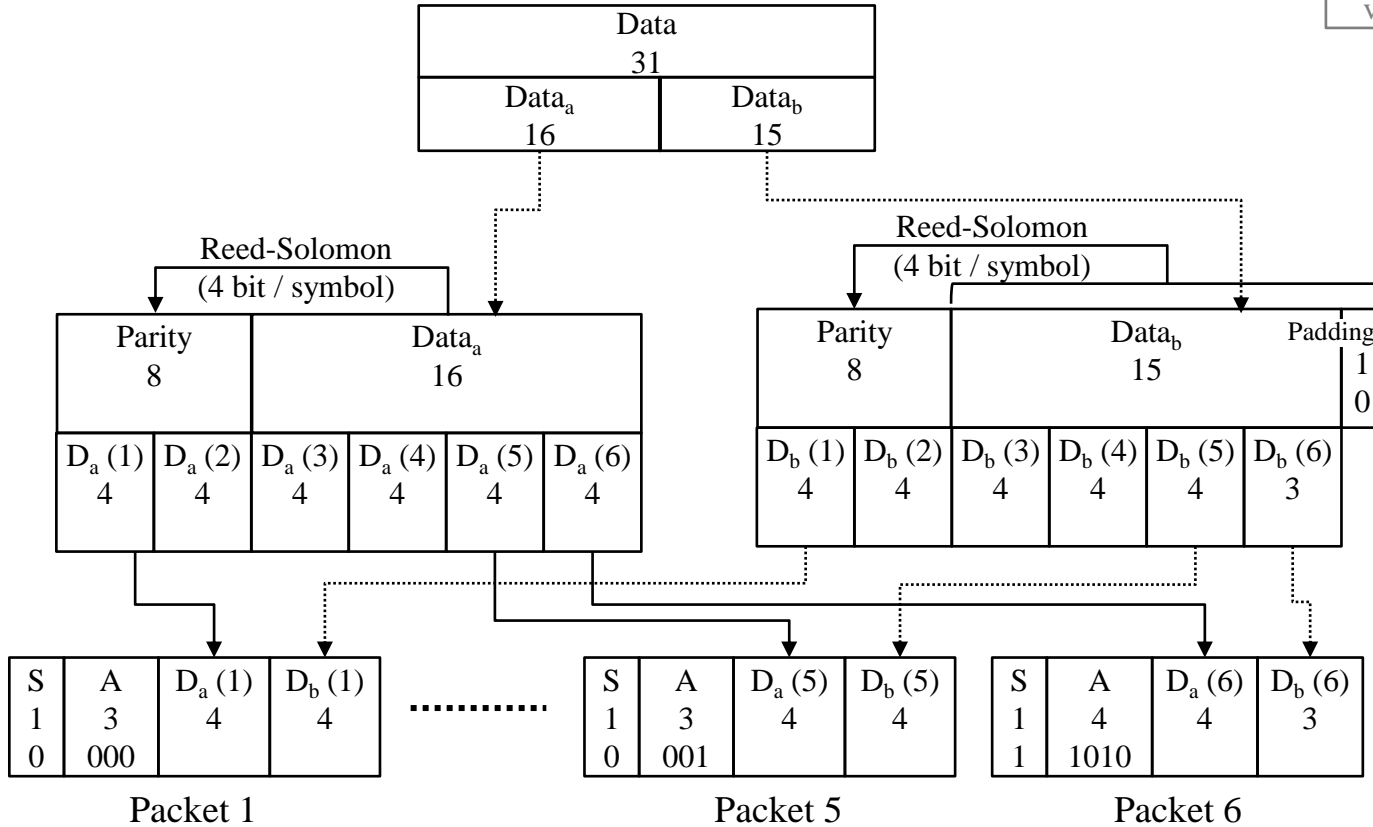
label
bit size
value



Packet Division (6, 7, 8)

Division (6)

label
bit size
value



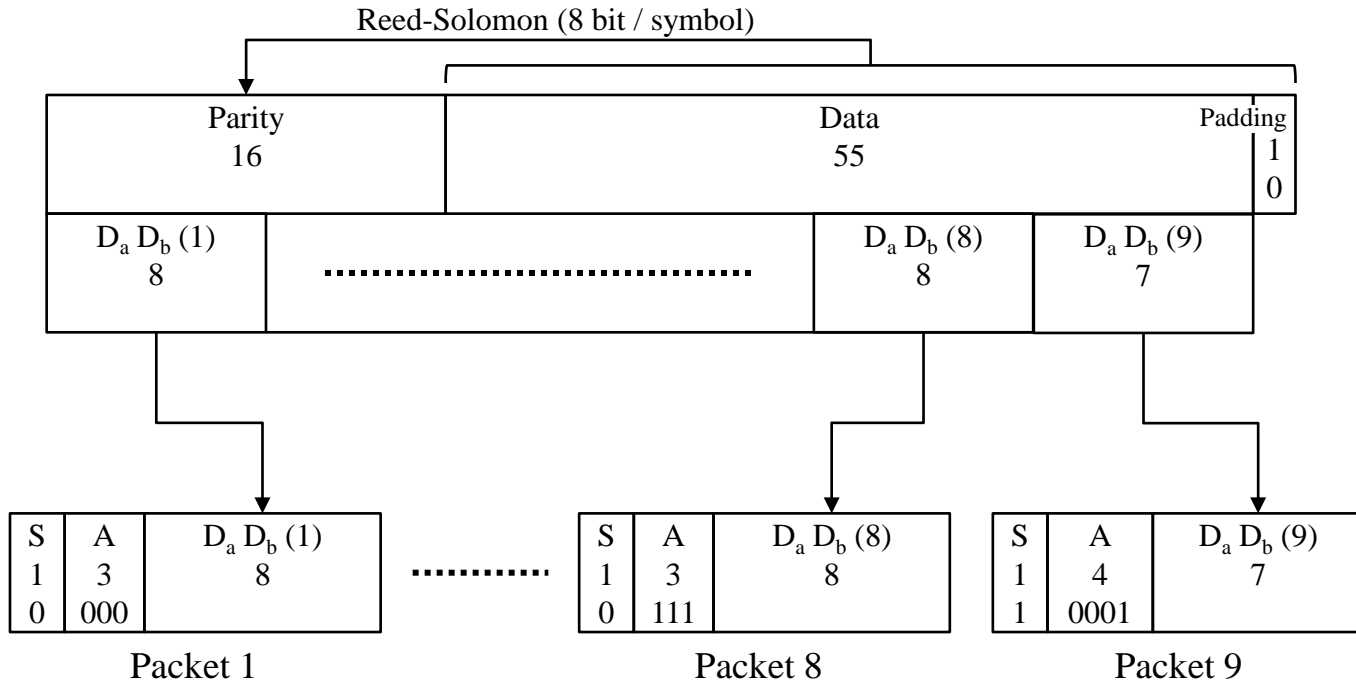
Division (7, 8)

Same manner as Division (6)

Packet Division (9)

Division (8)

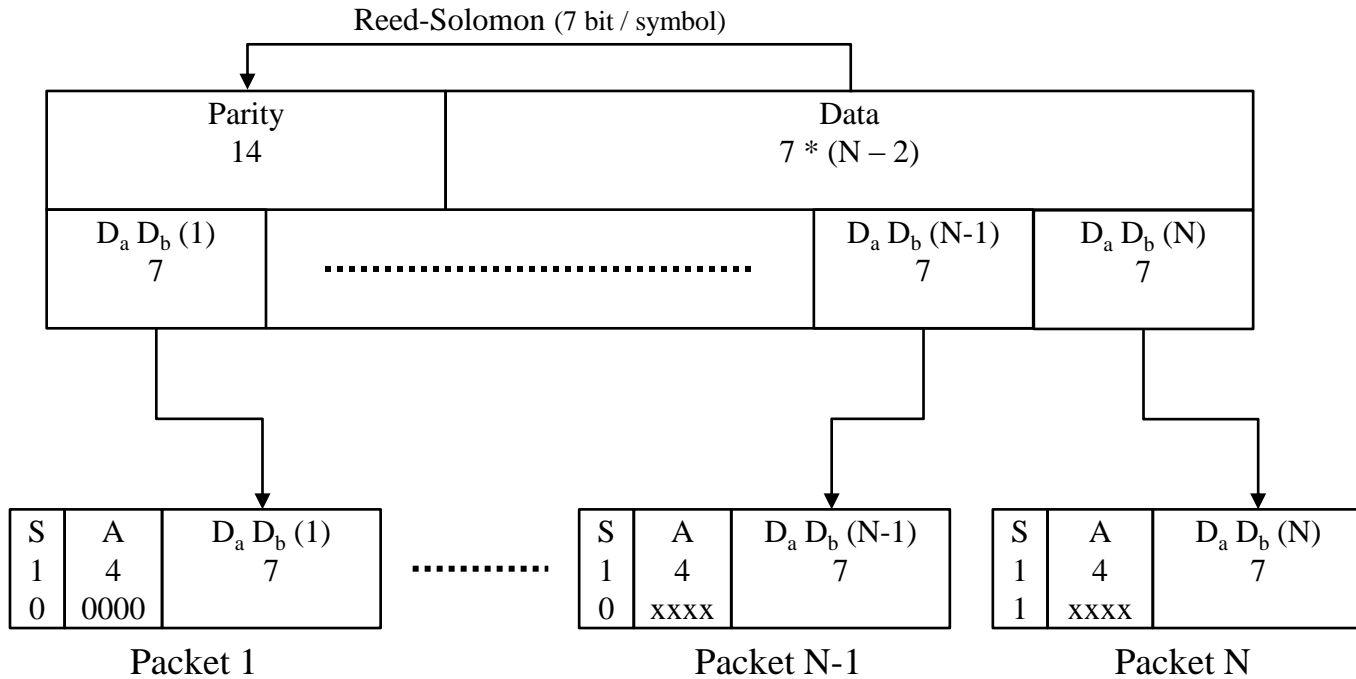
label
bit size
value



Packet Division (10-16)

Division (N = 10-16)

label
bit size
value



Packet Division Summary

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