

Extracts from Wireshark Measurements

1) Absence of SDLC Response Following a Synchronization Request

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000			SDLC		20 U F, func=RD
2	9.702524			SDLC		20 U F, func=RD
3	19.605113			SDLC		20 U F, func=RD

Comment:

This extract from the measurement file “*No SDLC Response*” highlights that, in the absence of a response from the Slave to the SDLC synchronization request, the Master repeatedly retransmits the request after the expiration of the timer

T_{out_sdlc_m} ≈ 10 s.

2) SDLC Retransmission After FRMR Rejection

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000			SDLC		20 U F, func=RD
2	0.000319			SDLC		20 U F, func=FRMR
3	0.001700			SDLC		20 U F, func=RD
4	0.002046			SDLC		20 U F, func=UA
5	0.002415			SDLC		20 U F, func=SNRM
6	0.002705			SDLC		20 U F, func=UA
7	0.004049	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0

Comment:

As shown in the extract from the file “*Wrong_CS*”, during the resynchronization phase, the Master sends a new SDLC connection request. However, the Slave retains its previous **NRM** state.

Upon receiving the **RD** frame, the Slave rejects the request by sending an **FRMR** frame and then transitions to the **NDM** state.

In this case, the Master sends a **DISC** frame again (noted as RD in the measurements) in order to properly re-establish the SDLC connection. The Slave responds with an acknowledgment, allowing the procedure to complete and Bitbus communication to resume.

3) Absence of Software Response Following a Bitbus Communication Attempt

No.	Time	Source	Destination	Protocol	Length	Info
158249	812.890509	DTE	1	BITBUS		38 I P, N(R)=4, N(S)=4
158250	812.890890			SDLC		20 S F, func=RR, N(R)=5
158251	812.892357			SDLC		20 S F, func=RR, N(R)=4
158252	812.892654			SDLC		20 S F, func=RR, N(R)=5
158253	812.894058			SDLC		20 S F, func=RR, N(R)=4
158254	812.894353			SDLC		20 S F, func=RR, N(R)=5
158255	812.895761			SDLC		20 S F, func=RR, N(R)=4
158256	812.896065			SDLC		20 S F, func=RR, N(R)=5
158257	812.897463			SDLC		20 S F, func=RR, N(R)=4
158258	812.897766			SDLC		20 S F, func=RR, N(R)=5
158259	812.899224			SDLC		20 S F, func=RR, N(R)=4
158260	812.899481			SDLC		20 S F, func=RR, N(R)=5
158261	812.900885			SDLC		20 S F, func=RR, N(R)=4
158262	812.901226			SDLC		20 S F, func=RR, N(R)=5
158263	812.902589			SDLC		20 S F, func=RR, N(R)=4
158264	812.902887			SDLC		20 S F, func=RR, N(R)=5
158265	812.904287			SDLC		20 S F, func=RR, N(R)=4
158266	812.904606			SDLC		20 S F, func=RR, N(R)=5
158267	812.906006			SDLC		20 S F, func=RR, N(R)=4
158268	812.906308			SDLC		20 S F, func=RR, N(R)=5
158269	812.907704			SDLC		20 S F, func=RR, N(R)=4
158270	812.908008			SDLC		20 S F, func=RR, N(R)=5
158271	812.909589			SDLC		20 S F, func=RR, N(R)=4
158272	812.909890			SDLC		20 S F, func=RR, N(R)=5
158273	812.911292			SDLC		20 S F, func=RR, N(R)=4
158274	812.911601			SDLC		20 S F, func=RR, N(R)=5
158275	812.913001			SDLC		20 S F, func=RR, N(R)=4
158276	812.913295			SDLC		20 S F, func=RR, N(R)=5
158277	812.914703			SDLC		20 S F, func=RR, N(R)=4
158278	812.915008			SDLC		20 S F, func=RR, N(R)=5
158279	812.916407			SDLC		20 S F, func=RR, N(R)=4
158280	812.916717			SDLC		20 S F, func=RR, N(R)=5
158281	812.918114			SDLC		20 S F, func=RR, N(R)=4
158282	812.918434			SDLC		20 S F, func=RR, N(R)=5
158283	812.919848			SDLC		20 S F, func=RR, N(R)=4
158284	812.920150			SDLC		20 S F, func=RR, N(R)=5
158285	812.921573			SDLC		20 S F, func=RR, N(R)=4
158286	812.921875			SDLC		20 S F, func=RR, N(R)=5
158287	812.923324			SDLC		20 S F, func=RR, N(R)=4
158288	812.923626			SDLC		20 S F, func=RR, N(R)=5
158289	813.910111			SDLC		20 U F, func=RD
158290	813.910433			SDLC		20 U F, func=FRMR
158291	813.911825			SDLC		20 U F, func=RD
158292	813.912116			SDLC		20 U F, func=UA
158293	813.912532			SDLC		20 U F, func=SNRM
158294	813.912825			SDLC		20 U F, func=UA
158295	813.914032	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0

Comment:

According to the extract from the measurement file “*No Bitbus Response*”, we observe that at

t = 812.890509 s (Frame No. 158249), the Master sends a software request for a Bitbus exchange.

After the timeout expiration defined as:

$$T_{out_M} = t(\text{Frame No. 158288}) - t(\text{Frame No. 158249}) \\ = 812.923 - 812.890 = 0.03 \text{ s} = 30 \text{ ms}$$

corresponding to approximately **0.032 s**, no response is received.

The Master then enters a reinitialization phase lasting approximately **1 s**, corresponding to **T_{reset}** as modeled in UPPAAL.

After this reinitialization phase, a new resynchronization phase is initiated in order to start a new frame exchange.

Absence of Response to a Link Request

No.	Time	Source	Destination	Protocol	Length	Info
5	0.002481	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
49	9.306568	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
91	19.109086	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0

Comment :

In the measurement file *"No Link Response"*, after successfully establishing an SDLC connection, a test was performed with:

$$T_{polling} = 0.002 \text{ s (2 ms)}$$

to send a link request.

After three successive attempts, each marked by a timeout expiration

T_out_sdmc_m \approx **10 s**, the system reports a Bitbus communication error to the user.

The absence of response following an unlink attempt follows almost the same logic, as shown in the file *"No Unlink Response"*, where the three unlink attempts correspond to frames No. 427, No. 847, and No. 1225.

Master Reaction After Receiving an Incorrect Checksum

No.	Time	Source	Destination	Protocol	Length	Info
1	0.000000			SDLC		20 U F, func=RD
2	0.000319			SDLC		20 U F, func=FRMR
3	0.001700			SDLC		20 U F, func=RD
4	0.002046			SDLC		20 U F, func=UA
5	0.002415			SDLC		20 U F, func=SNRM
6	0.002705			SDLC		20 U F, func=UA
7	0.004049	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
8	0.004349			SDLC		20 S F, func=RR, N(R)=1
9	0.006004			SDLC		20 S F, func=RR, N(R)=0
10	0.007329	1	DTE	BITBUS		68 I P, N(R)=1, N(S)=0
11	1.020258			SDLC		20 U F, func=RD
12	1.020545			SDLC		20 U F, func=FRMR
13	1.021954			SDLC		20 U F, func=RD
14	1.022255			SDLC		20 U F, func=UA
15	1.022674			SDLC		20 U F, func=SNRM
16	1.022964			SDLC		20 U F, func=UA
17	1.024272	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
18	1.024608			SDLC		20 S F, func=RR, N(R)=1
19	1.026270			SDLC		20 S F, func=RR, N(R)=0
20	1.027591	1	DTE	BITBUS		68 I P, N(R)=1, N(S)=0
21	2.040514			SDLC		20 U F, func=RD
22	2.040798			SDLC		20 U F, func=FRMR
23	2.042261			SDLC		20 U F, func=RD
24	2.042572			SDLC		20 U F, func=UA
25	2.042985			SDLC		20 U F, func=SNRM
26	2.043274			SDLC		20 U F, func=UA
27	2.044585	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
28	2.044915			SDLC		20 S F, func=RR, N(R)=1
29	2.046562			SDLC		20 S F, func=RR, N(R)=0
30	2.047881	1	DTE	BITBUS		68 I P, N(R)=1, N(S)=0
31	3.060778			SDLC		20 U F, func=RD
32	3.061060			SDLC		20 U F, func=FRMR
33	3.062487			SDLC		20 U F, func=RD
34	3.062781			SDLC		20 U F, func=UA
35	3.063187			SDLC		20 U F, func=SNRM
36	3.063493			SDLC		20 U F, func=UA
37	3.064790	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0
38	3.065121			SDLC		20 S F, func=RR, N(R)=1
39	3.066789			SDLC		20 S F, func=RR, N(R)=0
40	3.068116	1	DTE	BITBUS		68 I P, N(R)=1, N(S)=0
41	4.081057			SDLC		20 U F, func=RD
42	4.081318			SDLC		20 U F, func=FRMR
43	4.082732			SDLC		20 U F, func=RD
44	4.083057			SDLC		20 U F, func=UA
45	4.083447			SDLC		20 U F, func=SNRM
46	4.083734			SDLC		20 U F, func=UA
47	4.085100	DTE	1	BITBUS		38 I P, N(R)=0, N(S)=0

As shown in the extract from the file *“Wrong_CS_detected_by_Master”*, after receiving a frame containing an incorrect checksum value, the Master enters a reinitialization phase.

This explains the resynchronization attempt observed at:

$$t = 1.02 \text{ s}$$

This value corresponds to the sum of the timers:

$$T_{polling} + T_{reset} = 0.02 + 1 \text{ s}$$