

BINARY SPACE

RELIABLE SPACE SYSTEMS

Definition of the Packet Front-End Link Protocol

All information is subject to change without notice and does not represent a commitment on the part of **BINARY SPACE**.
Release 1.01 (September 1999)

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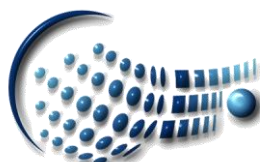
A. Acceptance

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Document Change Log

Issue	Revision	Date	Affected	Reason for change
1	1	September 1999	All	New document



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1. Introduction

This document provides a description of the **Packet Front-End Link Protocol** (PFLP) that **BINARY SPACE** uses with its products, besides other protocols, in order to communicate with EGSE or ground segment equipment. It operates on top of the TCP/IP protocol suite, a de-facto standard for this kind of communication.

SatView™ can be configured to act as a PFLP client (direct mode) or server (emulation mode) or both (daisy-chain).

2. Protocol Specification

The PFLP is a simple generic protocol used by ESA and the industry to exchange data between devices in a heterogeneous environment. In this document it is adapted to define the reception of telemetry source packets from a TT&C front-end only.

2.1. Stages

The three stages of PFLP involve the transfer of messages through the TCP/IP sockets:

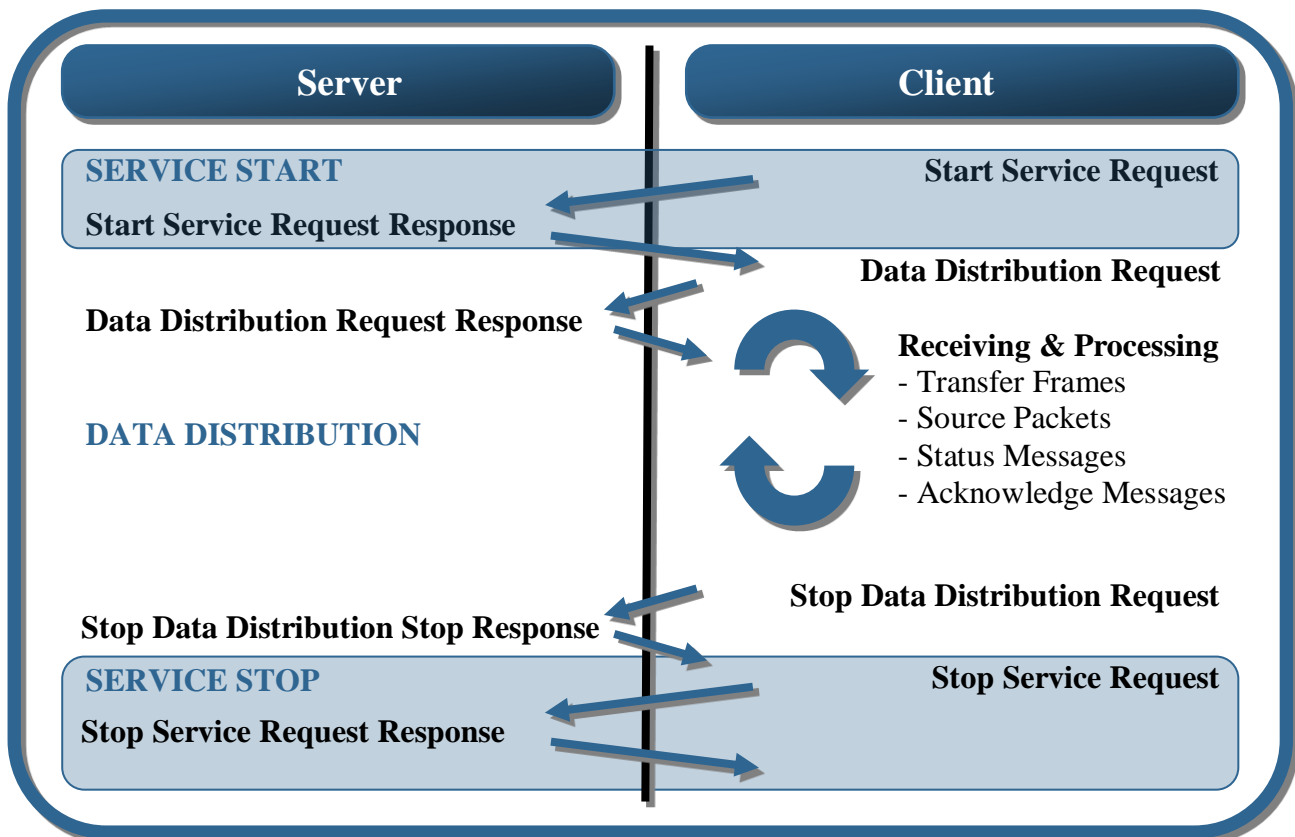
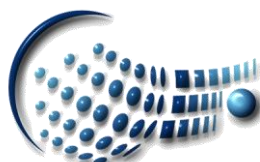


Figure 2.1-1 PFLP Stages



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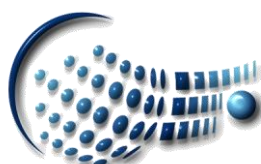
Stage	Description
SERVICE START	The client asks for the availability of the service.
DATA DISTRIBUTION	Data is distributed between client and server.
SERVICE STOP	The service is stopped upon request of a client.

An acknowledgment message is sent by the server after the reception of any message in which such a confirmation is requested by the client. Status messages on the other hand are transmitted periodically after a certain time-out and in case of anomalies.

2.2. Message Structure

All data exchanged between client and server is based on predefined messages which have a common header:

Bytes	Field	Description						
0	Message Identification	Identification of the message						
1-3	Remaining Length	Length of the message excluding the first 4 bytes						
4	Trailer Presence	Reserved (= 0x00)						
5-7	Trailer Offset	Reserved (= 0x00)						
8	Protocol Version	0x10						
9	System Identification	0...255 <u>Comments:</u> Used in messages returned by the server only						
10-11	Message Sequence Count	0...65535 <u>Comments:</u> A separate counter is used for every connection Used in messages returned by the server only						
12	Data Quality Indication	Quality of the telemetry data returned in the data message						
13	Sequence Quality Indication	Indicates the correctness of the data message sequence						
14	Message Acknowledgment Request	Implies the transmission of an acknowledgment message						
15	CDS Time Code Flag	0x41						
16-23	CDS Time Code	Filled with the telemetry data time <u>Comments:</u> Used in messages returned by the server only <u>Format:</u> Epoch is January 1 st , 1958 <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Day</td> <td style="text-align: center;">ms</td> <td style="text-align: center;">µs</td> </tr> <tr> <td style="text-align: center;">Bytes 1-2</td> <td style="text-align: center;">Bytes 3-6</td> <td style="text-align: center;">Bytes 7-8</td> </tr> </table>	Day	ms	µs	Bytes 1-2	Bytes 3-6	Bytes 7-8
Day	ms	µs						
Bytes 1-2	Bytes 3-6	Bytes 7-8						



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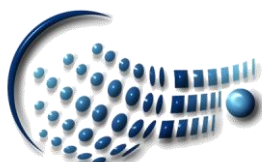
2.3. Start Service Messages

A client can request a service by sending the corresponding start service request message to the server which will reply by a start service request response containing either an acceptance or rejection flag. Also the endianness can be compared by providing a predefined mask and, when required (big endian), the server will rearrange the bytes to fit the byte order of the client.

Bytes	Field	Description
0	Message Identification	0x10
1-3	Remaining Length	0x2A
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	Not used
10-11	Message Sequence Count	Not used
12	Data Quality Indication	Not used
13	Sequence Quality Indication	Not used
14	Message Acknowledgment Request	0x00 (Off) or 0x01 (On)
15	CDS Time Code Flag	Not used
16-23	CDS Time Code	Not used
24-39	Client Description	Not used
40-41	Service Identification	0x0010 for TM (= Telemetry Data) 0x0020 for TC (= Telecommand Data)
42-45	Endianness	0x01020304 (little endian) 0x04030201 (big endian)

The server on the other side answers with a start service request response message:

Bytes	Field	Description
0	Message Identification	0x11
1-3	Remaining Length	0x2A
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	0x00
13	Sequence Quality Indication	0x00
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	<i>CDS Time</i>
24-39	Server Description	<i>Description of the server unit</i>



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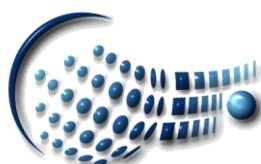
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40-41	Service Identification Answer	0x0000 (= Service granted) 0x0010 (= Reserved) 0x0020 (= Endianity not supported) 0x0050 (= Protocol error)
42-45	Endianity	0x01020304

2.4. Data Distribution Messages

Once a service is accepted by the server, the client has to request the data to be transmitted by a data distribution request message. If the requested data can be provided by the server or not is indicated with a data distribution request response message:

Bytes	Field	Description								
0	Message Identification	0x20								
1-3	Remaining Length	0x1E								
4	Trailer Presence	0x00								
5-7	Trailer Offset	0x00								
8	Protocol Version	0x10								
9	System Identification	Not used								
10-11	Message Sequence Count	Not used								
12	Data Quality Indication	Not used								
13	Sequence Quality Indication	Not used								
14	Message Acknowledgment Request	0x00 (Off) or 0x01 (On)								
15	CDS Time Code Flag	Not used								
16-23	CDS Time Code	Not used								
24-25	Request Identification	0x0001 (= Start data distribution)								
26-27	Service Level	0x0000 (= Telemetry Source Packet) 0x0020 (= Transfer Frame)								
28-29	Number of Filters	0x0001								
30-33	Filter	<table border="1"> <thead> <tr> <th>Bytes</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>30</td> <td>1 (= Specific APID from any VCID) 2 (= Specific APID from a specific VCID) 3 (= Any APID from a specific VCID) 4 (= Any APID from any VCID)</td> </tr> <tr> <td>31</td> <td>VCID (= Virtual Channel Identifier)</td> </tr> <tr> <td>32-33</td> <td>APID (= Application Identifier)</td> </tr> </tbody> </table>	Bytes	Description	30	1 (= Specific APID from any VCID) 2 (= Specific APID from a specific VCID) 3 (= Any APID from a specific VCID) 4 (= Any APID from any VCID)	31	VCID (= Virtual Channel Identifier)	32-33	APID (= Application Identifier)
Bytes	Description									
30	1 (= Specific APID from any VCID) 2 (= Specific APID from a specific VCID) 3 (= Any APID from a specific VCID) 4 (= Any APID from any VCID)									
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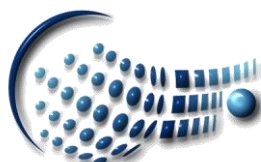
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The corresponding response from the server looks as follows:

Bytes	Field	Description
0	Message Identification	0x21
1-3	Remaining Length	0x1A
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	0x00
13	Sequence Quality Indication	0x00
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	<i>CDS Time</i>
24-25	Request Identification	0x0001 (= Start data distribution)
26-27	Request Result	0x0000 (= Request accepted) 0x0001 (= Request rejected)
28-29	Reason	0x0000 (= None) 0x0010 (= System not ready) 0x0020 (= Data not supported) 0x0030 (= Service level not applicable) 0x0040 (= Incorrect filter) 0x0050 (= Bad request identification)

The same mechanism is used to stop the distribution of data i.e. the client issues a stop data distribution request message:

Bytes	Field	Description
0	Message Identification	0x22
1-3	Remaining Length	0x16
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	Not used
10-11	Message Sequence Count	Not used
12	Data Quality Indication	Not used
13	Sequence Quality Indication	Not used
14	Message Acknowledgment Request	0x00 (Off) or 0x01 (On)
15	CDS Time Code Flag	Not used
16-23	CDS Time Code	Not used
24-25	Reason	Not used



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As reply to a stop data distribution request message an associated stop data distribution request response message is returned by the server:

Bytes	Field	Description
0	Message Identification	0x23
1-3	Remaining Length	0x16
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	0x00
13	Sequence Quality Indication	0x00
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	<i>CDS Time</i>
24-25	Request Result	0x0000 (= Request accepted)

2.5. Status/Acknowledge Messages

Special messages are available to pass device status information to a client or to acknowledge the correct receipt of those. Status messages can be generated cyclically at a fixed interval or in case of anomaly situations. They look as outlined in the following table:

Bytes	Field	Description
0	Message Identification	0x57
1-3	Remaining Length	0x14
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	<p>Bit 0 PM Demodulator 0 Not locked or not used 1 Locked</p> <p>Bit 1 PSK Demodulator 0 Not locked or not used 1 Locked</p> <p>Bit 2 Bit Synchronizer 0 Not locked 1 Locked</p> <p>Bit 3 Viterbi Decoder 0 Not locked or not used 1 Locked</p> <p>Bit 4/5 Frame Synchronizer Status</p>



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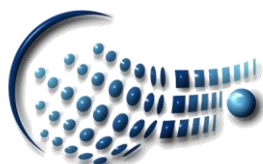
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		00 Search 01 Control 11 Lock Bit 6/7 Reed-Solomon and CRC 00 Errors detected by CRC 10 Errors cannot be corrected by RS 01 No RS or CRC error 11 Errors detected and corrected by RS
13	Sequence Quality Indication	0x00 (= Sequence correct) 0x10 (= Sequence error)
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	CDS Time

Some messages issued by the client can request an acknowledge message in order to verify the correct reception by the server. In such a case the following response is sent to clients:

Bytes	Field	Description
0	Message Identification	0x42
1-3	Remaining Length	0x16
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	0x00
13	Sequence Quality Indication	0x00
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	CDS Time
24-25	Data	0xAA55



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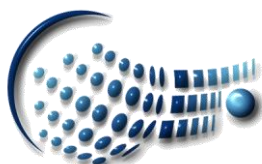
2.6. Stop Service Messages

A service can be terminated by a client when no data distribution was requested or after the data distribution was stopped. A stop service request message has the following content:

Bytes	Field	Description
0	Message Identification	0x60
1-3	Remaining Length	0x16
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	Not used
10-11	Message Sequence Count	Not used
12	Data Quality Indication	Not used
13	Sequence Quality Indication	Not used
14	Message Acknowledgment Request	0x00 (Off) or 0x01 (On)
15	CDS Time Code Flag	Not used
16-23	CDS Time Code	Not used
24-25	Reason	Not used

The server confirms a stop service request message by a corresponding stop service request response:

Bytes	Field	Description
0	Message Identification	0x61
1-3	Remaining Length	0x16
4	Trailer Presence	0x00
5-7	Trailer Offset	0x00
8	Protocol Version	0x10
9	System Identification	<i>Identification of the server unit</i>
10-11	Message Sequence Count	<i>Filled and incremented</i>
12	Data Quality Indication	0x00
13	Sequence Quality Indication	0x00
14	Message Acknowledgment Request	0x00
15	CDS Time Code Flag	0x41
16-23	CDS Time Code	<i>CDS Time</i>
24-25	Result	0x0000 (= Service ended successfully) 0x0010 (= System error) 0x0020 (= Rejected)



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3. Implementations

SatView™ currently implements the TM Source Packet service only. On request however, the TM Transfer Frame interface as well as all TC related services can be implemented too.

3.1. ENERTEC TT&C 3801

Up to this time, the only brand supported via this interface is the ENERTEC TT&C 3801.

3.2. ENERTEC TT&C 3801 Emulation

By design, any SatView™ workstation can act as an ENERTEC TT&C 3801 device by emulating such equipment and hence act as a server for other workstations.

This mode too is limited to the TM Source Packet service at the moment.

A. Appendix

This document has been read and accepted by ESA.



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