Protocol Decoder

User Guide

Version 1.14

	Name(s)	Date
Approved by:	Greg Louâpre	31-Oct-2024

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Revision History

Date	Version	Description	Author
17-Jun-2015	1.0	Initial version	Airtel
06-Jul-2015	1.1	Updated for release PDEC_A	Airtel
11-Dec-2015	1.2	Updated to support decoding AVLC logs	Airtel
27-Oct-2016	1.3	Updated for release PDEC_B2	Airtel
25-Nov-2016	1.4	Updated for release PDEC_B3	Airtel
15-Nov-2017	1.5	Updated for release PDEC_B6	Airtel
05-Sep-2019	1.6	Updated for release PDEC_B8	Airtel
25-Jun-2020	1.7	Updated for release PDEC_C1 (eng2)	Airtel
15-Apr-2021	1.8	Updated for release PDEC_C1	Airtel
16-Jul-2021	1.9	Updated for release PDEC_C2	Airtel
27-Feb-2023	1.10	Updated for release PDEC_C3	Airtel
14-Sep-2023	1.11	Updated for release PDEC_C4	Airtel
20-Sep-2023	1.12	Updated for release PDEC_C4p1	Airtel
18-Dec-2023	1.13	Updated for release PDEC_C4p2	Airtel
31-Oct-2024	1.14	Updated for release PDEC_C4p5	Airtel

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1 Introduction

1.1 Purpose

The purpose of this document is to provide the User Guide for the Protocol Decoder.

1.2 Scope

This document covers the Protocol Decoder ATN Ground/Ground logs and ATN Air/Ground logs.

1.3 References

[RD1] EUR Doc 028 - EUR NSAP Address Registry, ICAO

[RD2] TRS1157/TW/4/1/63 - The Link 2000+ XML Based ATC Information Exchange Format (LISAT), 1.8, Eurocontrol, 12-Sep-2014

[RD3] GOLD (Global Operations Data Link Document), Second Edition, ICAO, 26-Apr-2013

[RD4] ED-229A - Interoperability Requirements Standard for Baseline 2 ATS Data Communications (Baseline 2 Interop Standard), EUROCAE, Mar-2016

[RD5] ED-231A - Interoperability Requirements Standard for Baseline 2 ATS Data Communications, ATN Baseline 1 Accommodation (ATN Baseline 1 – Baseline 2 Interop Standard), EUROCAE, Mar-2016

2 Purpose of Software

Figure 1 below presents the ATN functional model:

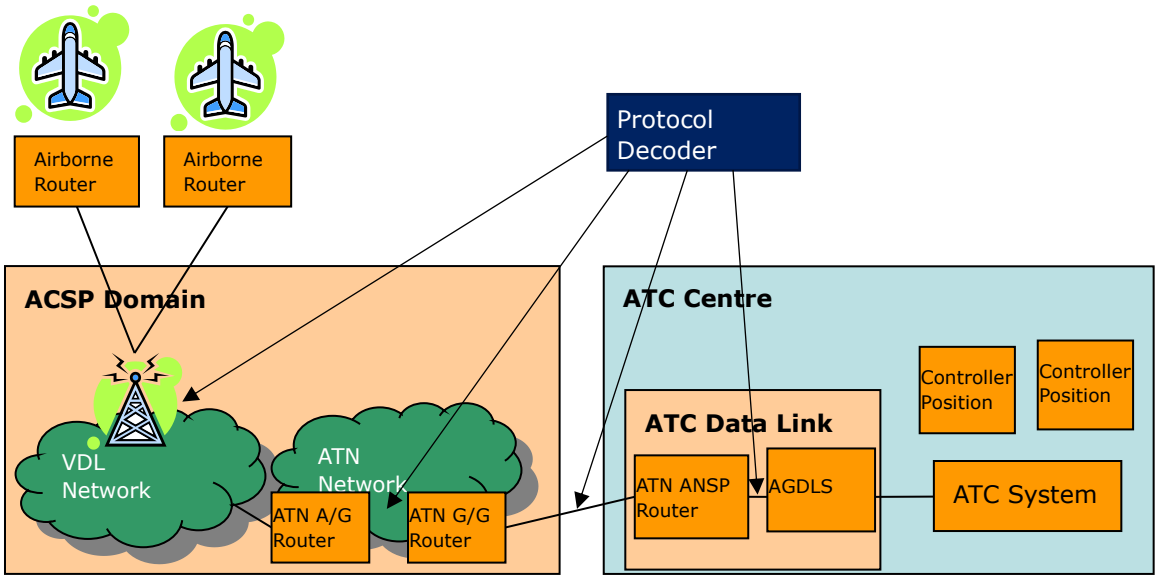

Figure 1: ATN Functional Model

The Protocol Decoder is a post-processing tool that allows parsing of logs captured by the different components of an ATN Network including: ATN Routers, AGDLS and VDLM2 Ground Stations.

It is a protocol analyser for CLNP PDU logs from the Airtel ATN Router product. The protocol decoder allows the decoding of CLNP logs captured by ATN G/G Routers, ATN Access Routers and AGDLS systems. The tool decodes and reassembles the CLNP PDUs and selects the PDUs that contain CM/CPDLC uplink/downlink data. To do this, it decodes the TP4 and then the CM/CPDLC application data.

It also decodes ASE logs captured by an AGDLS system and VDLM2 logs captured by VDLM2 Ground Stations.

The main features of the Protocol Decoder are:

- Parsing of VDLM2 Ground Station (DVIP) logs
- Parsing of VDLM2 VMON AVLC logs
- Parsing of CLNP logs
- Parsing of ASE logs
- Filter options to control the output generation (time, aircraft, airline, different protocol layers)
- Generation of PDU output file with information for CLNP, IDRP, TP4 and CM, CPDLC, ADS-C data
- Generation of LISAT compliant output file
- Generation of GOLD Data Record files
- Decoding of CPDLC messages into human readable English
- Decoding of ATN B1 and ATN B2 CPDLC messages

3 Decoding Logs

The Protocol Decoder allows decoding different log formats. This is done in two steps:

1. Decoding of the log using the dedicated log decoder for each type of log
2. Generating LISAT and GOLD files from the generated files in Step 1 using the CM/CPDLC Decoder

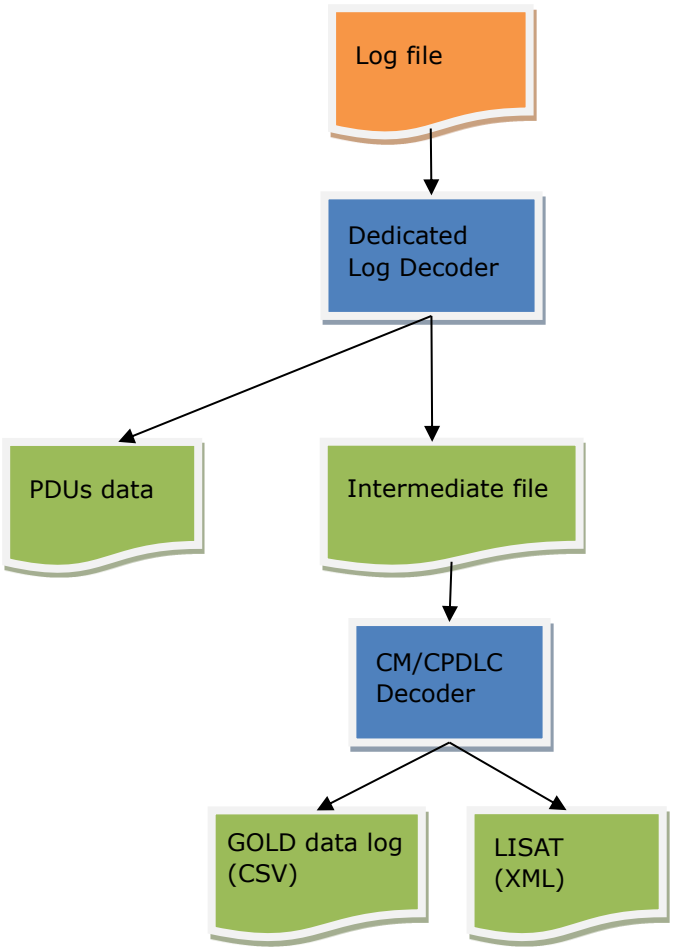

Figure 2: Decoding logs

3.1 Decoding the log files

3.1.1 Decoding a CLNP log

The following figure shows the files used when decoding a CLNP log:

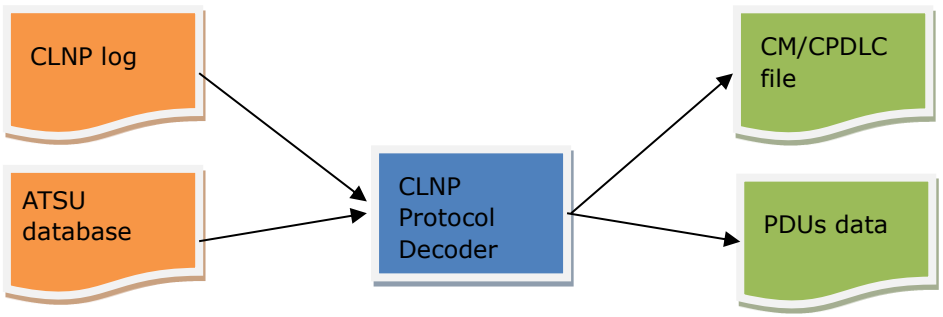

Figure 3: Protocol Decoder for CLNP logs

The CLNP logs can be one of the following:

- Airtel ATN G/G Routers, ATN Access Routers and AGDLS systems log files
- *tcpdump* of CLNP PDUs (see `--acg` option in 5.1.1)

The ATSU database provides a mapping between ATN Addresses and ATC Ground Facility Designators.

3.1.2 Decoding an ASE log

The following figure shows the files used when decoding an ASE log:

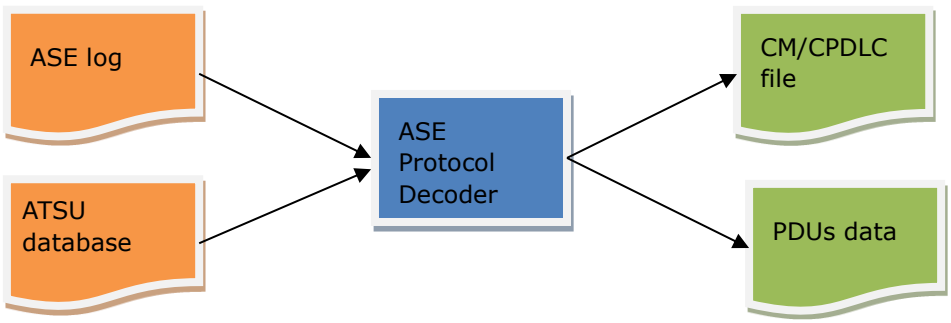

Figure 4: Protocol Decoder for ASE logs

The ASE logs are captured by Airtel AGDLS systems.

3.1.3 Decoding an AVLC log

The following figure shows the files used when decoding an AVLC log:

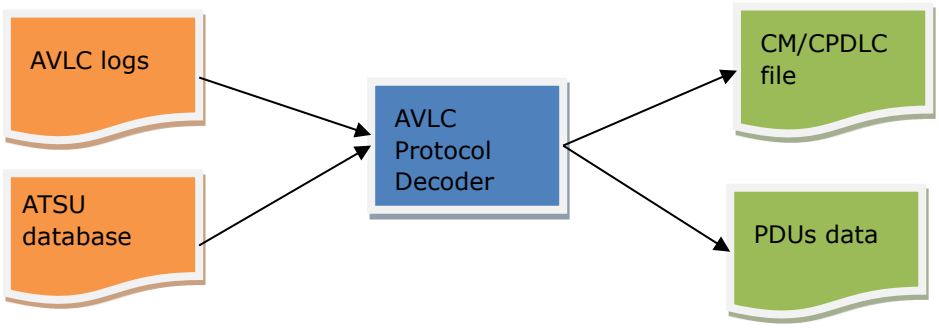

Figure 5: Protocol Decoder for AVLC Logs

The AVLC logs can be one of the following:

- AVLC logs captured by Airtel ADS VDL system
- VMON logs are captured by Airtel VDL MONitor (see `--vmon` option in 5.3.1)
- UPX logs are captured by Eurocontrol MOON network (see `--upx` option in 5.3.1)

The ATSU database provides a mapping between ATN Addresses and ATC Ground Facility Designators.

3.1.4 Decoding a DVIP log

The following figure shows the files used when decoding a DVIP log:

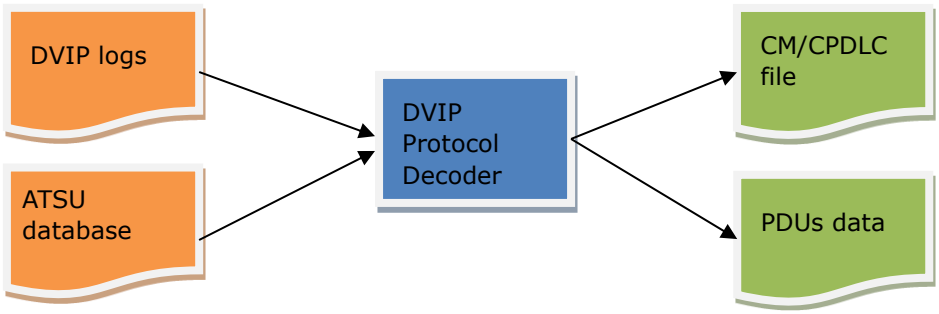

Figure 6: Protocol Decoder for DVIP Logs

The DVIP logs are captured by VDLM2 Ground Stations.

The ATSU database provides a mapping between ATN Addresses and ATC Ground Facility Designators.

3.2 Generating LISAT and GOLD files

The following figure shows the files used when decoding the generated CM/CPDLC files to generate LISAT and GOLD files:

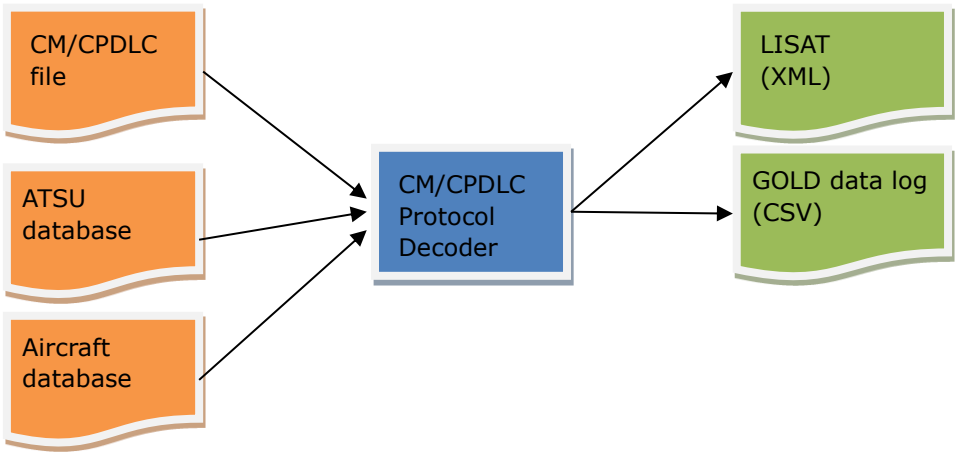

Figure 7: Protocol Decoder for CM/CPDLC intermediate files

The Intermediate CM/CPDLC files are generated by the Protocol Decoder (see sections above).

The ATSU database provides a mapping between ATN Addresses and ATC Ground Facility Designators.

The Aircraft database should be provided by the customer to provide information mapping aircraft ICAO-24-bit addresses to aircraft types.

4 Installation

4.1 Protocol Decoder Software Installation

The Protocol Decoder is provided as a compressed `tar` archive file:

Component	Description	Package
Protocol Decoder	Provides the Protocol Decoder Software	`Airtel_PDEC_EXE_<release>_<OS>.tgz`

Table 1: Protocol Decoder Software Packages

The `<Release>` is the Protocol Decoder release (for example `A2`) and `<OS>` is the Linux distribution and version (for example RHEL8).

To install the software, extract the contents as required onto the target platform. This can be done by changing to the install directory and running a command like the following:

```
tar zxvf <path_to_tarfile>/Airtel_PDEC_EXE_<release>_<OS>.tar.gz
```

This creates the Airtel_ PDEC_EXE_<*release*>_<*OS*> directory structure in the install directory. For convenience, a symbolic link can be made as follows:

```
ln -fsT <install_dir>/Airtel_PDEC_EXE_<release>_<OS> $HOME/Airtel_PDEC
```

4.2 Installation Directories

bin	**Contains the binary files**	
	`pdec_clnp`	CLNP log decoder (see 3.1)
	`pdec_ase`	ASE log decoder (see 3.1.2)
	`pdec_avlc`	AVLC log decoder (see 3.1.3)
	`pdec_dvip`	DVIP log decoder (see 3.1.4)
	`pdec_intermediate`	LISAT and Gold file generator (see 3.2)
data	**Configuration files**	
	`atsu.csv`	Mapping between ATN NSAP and ATC Ground Facilities. Extracted from [RD1].

Table 2: Protocol Decoder Directory Structure

5 Protocol Decoders

5.1 CLNP Protocol Decoder

5.1.1 Command Line interface

To run the CLNP log Protocol Decoder utility, run the following command:

```
$HOME/Airtel_PDEC/bin/pdec_clnp
```

The CLNP Protocol Decoder binary provides the following command line arguments:

```
$HOME/Airtel_PDEC/bin/pdec_clnp <INPUT OPTIONS> [<GENERAL OPTIONS>] [<OUTPUT FILE OPTIONS>]
                                [<PROTOCOL OPTIONS>] [<FILTER OPTIONS>] [<CONFIGURATION OPTIONS>]
```

Input options are:

```
  -i <CLNP log file>            decodes a CLNP log file
  -s <database>                 mapping between ATN CLNP NSAP and facility (see 5.7.2)
      --acg                     decode CLNP log file as ACG file
```

General options are:

```
  -h, --help                    prints help message
      --debug                   prints additional debug information
      --appasn1                 prints CM and CPDLC ASN.1
      --full                    prints the original PDU in output file
```

Output file options are:

```
      --pcap                    indicates that PCAP file is generated
      --nointermediate          indicates that intermediate file is not generated
      --csv                     indicates that a csv file with transport and application
                                information is generated
      --prefix=<prefix>         prepends <prefix>_ to the generated files
      --lisat                   indicates that a lisat file containing transport packets
                                should be generated
      --append                  indicates that the output is going to be appended if pdus file
                                already exists
      --cmbc                    indicates that the CM output is backward compatible with versions
                                up to PDEC_B8
```

Protocol options are (more details in 5.1.1.1):

```
      --noclnp                  indicates that CLNP information should not be printed
      --noidrp                  indicates that IDRP PDUs should not be printed
      --notp4                   indicates that TP4 PDUs should not be printed
      --noapplication           indicates that Application PDUs should not be printed
      --application             indicates that Only Application PDUs should be printed
```

Filter options are (more details in 5.6):

```
  -c, --aircraft=<icao>         filter for an aircraft 24-bit ICAO Address
  -r, --airline=<icao>          filter for an airline prefix
  -f, --from=<time>[1]          filter for a start time
  -t, --to=<time>[1]            filter for an end time
  -a, --atsu=<facility>         filter for a ground facility
```

Configuration Options are:

```
  -w, --duidwindow=<size>       CLNP DUID window size for aircraft reset detection (Default is 4)
  -d, --flightiddelay=<delay>   FlightId Delay to keep flightId before reset (Default is 3600s)
```

[1] *The time format is HH:MM:SS*

For example, to only output the application data:

```
$HOME/Airtel_PDEC/bin/pdec_clnp –i ggr.info --application
```

To read from standard input, use the input file name "-". For example, invoke the following command:

```
tail -f ggr.info|$HOME/Airtel_PDEC/bin/pdec_clnp -i -
```

5.1.1.1 PDU Protocol Options

The following options indicate what information is printed, when decoding a CLNP log:

Option	CLNP PDU	IDRP PDU	TP4 PDU	ACSE	Application
`--noclnp`	*Ignore*	CLNP IDRP	CLNP TP4	CLNP TP4 ACSE	CLNP TP4 *Application*[2]
`--noidrp`	CLNP	*Ignore*	CLNP TP4	CLNP TP4 ACSE	CLNP TP4 *Application*[2]
`--notp4`	CLNP	CLNP IDRP	*Ignore*	*Ignore*	*Ignore*
`--noapplication`	CLNP	CLNP IDRP	CLNP TP4	*Ignore*	*Ignore*
`--application`	*Ignore*	*Ignore*	*Ignore*	CLNP TP4 ACSE	CLNP TP4 *Application*[2]

Table 3: PDU Protocol Options

5.1.2 Input Log Files

The CLNP Protocol Decoder can decode any of the following input files:

File	Description
`CLNP log`	CLNP log generated by an ATN Router or by an ATN End System Lower Layer process. Appendix A.1 provides an example of a CLNP log file
`ACG log`	*`tcpdump`* output file containing CLNP PDUs Appendix A.2 provides an example of an ACG log file

Table 4: CLNP Protocol Decoder Input log files

[2] *Application refers to CM, CPDLC or ADS*

5.1.3 Output Files

The CLNP Protocol Decoder generates the following output files:

File	Description
`pdus.txt`	Decoded PDU file in text format
`pdus.csv`	Decoded PDU file in csv format
`output.pcap`	PCAP file containing the CLNP PDUs sent/received.
`intermediate_<XXXX>.csv`	Intermediate file generated after parsing a CLNP Log or ASE Log that contains CPDLC data. This file is then used as input to generate the LISAT and GOLD format If the ATC Ground Facility is defined in the ATSU file, the *<XXXX>* is replaced with the name of the ATC Ground Facility, e.g. intermediate_LIRR.xml for Rome ACC

Table 5: CLNP Protocol Decoder Output Files

Note: If the **--prefix** *<prefix> option is used, the output files are prepended with <prefix>_*

5.1.3.1 PDU Text Format

The following information is printed for each line of the PDU Text output log:

Line /Protocol	Data	Description
PDU	PDU data	Only present, if the `--full` option is used. Displays the input line containing the PDU. Example: `ACGS: ROUTER CLNS_DT_PDU 2014/12/02 09:32:25.235 RCVD 142 ipcircuit 814E01289C008E000014470027818365750011455400014544 4C5447310014470027C18365750040000B000145444C54413100000100 00008EC301D6C50DC00606042B1B000004010F0160CD010E850040010000 0001000000000300BF9192783AFAADF406548FB797AE811101005A0BB80D 470027C18365750040000B000101010E00080606042B1B0000000001`
General	Line number	Displays the following information: • Line Number • RCVD/SENT • Time • Circuit name Example: `Line 1. RCVD. Time: 09:32:25.235. Circuit: ipcircuit`

Line /Protocol	Data	Description

CLNP	CLNP Format	Displays:
		• PDU Type
		• source
		• destination
		• DUID
		Example:
		`CLNP DT source: 470027C18365750040000B000145444C54413100 destination: 4700281836575001145540001454 44C54473100 DUID:155`
		`CLNP DT source: 47002741455A590040768B000053414142000001 destination: 4700278183444500115555000154455354000501 DUID:49 (Fragmented DT MS offset:0 total_length:1101)`
		`CLNP ER source: 470027C18365750040000B000145444C54413100 destination: 4700281836575001145540001454 44C54473100 Reason:0x81 DUID:970`
		`CLNP ERQ source: 470027C18365750040000B000145444C54413100 destination: 4700281836575001145540001454 44C54473100 DUID:203`
		`CLNP ERP source: 470027C18365750040000B000145444C54413100 destination: 4700281836575001145540001454 44C54473100 DUID:204`
		`CLNP Invalid PDU 0x814E01259C007A19731447002781834742000154`

IDRP	PDU Type	Displays the following information:
		• PDU Type
		• Sequence number
		• Ack number
		• Credit offered
		• Credit available
		For OPEN PDUS, displays the following additional information:
		• source RDI
		• hold time
		• max PDU size
		For UPDATE PDUs, displays the following additional information:
		• List of removed prefixes
		• List of advertised prefixes
		• Route ID being added
		• Prefix being added
		Example:
		`IDRP OPEN_PDU_RCVD SEQ=3 CDT_OFF=4 CDT_AVAIL=0 4700270153495400000001 HoldTime=90 MaxPDUsize=3000`
		`IDRP OPEN_PDU_SENT SEQ=1080 ACK=308268 CDT_OFF=4 CDT_AVAIL=2 4700270158414100000002 HoldTime=90 MaxPDUsize=3000`
		`IDRP KEEPALIVE_PDU_SENT SEQ=2787 ACK=937784 CDT_OFF=4 CDT_AVAIL=4`
		`IDRP UPDATE_PDU_SENT SEQ=3319 ACK=36481 CDT_OFF=4 CDT_AVAIL=1 UNF=4 ROUTE-ID=2083,2620,2086,2623`
		`IDRP UPDATE_PDU_RCVD SEQ=308214 ACK=1064 CDT_OFF=4 CDT_AVAIL=2 UNF=0 ADV=ROUTE-ID=208958 LOCAL-PREF=0 RD-PATH=RD-SEQ1=47002741434647003C6466,4700270153495400000001 RD_HOP_COUNT=2 CAPACITY=13 NLRI=47002741434647003C6466`
		`IDRP CEASE_PDU SEQ=1080 ACK=308268 CDT_OFF=0 CDT_AVAIL=2`

Line /Protocol	Data	Description

TP4	PDU Type	Displays the following information:
		• PDU Type (CR, CC, DR, DC, DT, AK)
		• Length
		• Credits (where present)
		• Destination Reference (where present)
		• Source Reference (where present)
		• Called T-Selector (where present)
		• Calling T-Selector (where present)
		• Reason (where present)
		• TPDU number (where present)
		• End of Transmission (where present)
		Example:
		`TP4 CR LI:44,CDT:1,SRC-REF:0x0841, Called T-Selector:636D,Calling T-Selector:434D`
		`TP4 CC LI:40,CDT:1,DST-REF:0x0841,SRC-REF:0x0001, Called T-Selector:636D,Calling T-Selector:434D`
		`TP4 DR LI:12,DST-REF:0x0001,SRC-REF:0x0841,REASON:128`
		`TP4 DC LI:11,DST-REF:0x0841,SRC-REF:0x0001TP4 DT LI:10,DST-REF:0x0842,TPDU-NR:128,EOT:1`
		`TP4 DT LI:10,DST-REF:0x05EE,TPDU-NR:1,EOT:0 (Fragmented DT length:1012)`
		`TP4 AK LI:10,CDT:2,DST-REF:0x0842,YR-TU-NR-NR:2`
		
		Note:
		PDEC allows the detection of legacy CPDLC
		
		Example:
		`CLNP DT source: 47002741454A5500440CBF000053414142000001 destination: 4700278183495400015252018F45535044000101 DUID:2394`
		`TP4 DR LI:10,DST-REF:0x05F2,SRC-REF:0x0000,REASON:128 - WARNING: LEGACY CPDLC!`

SE	PDU Type	Displays the following information
		• PDU Type
		Example:
		`SE SCN`
		`SE SAC`
		`SE SCNC`
		`SE SACC`
		`SE SRF`
		`SE SFN`
		`SE SDN`
		`SE SDT`
		`SE SAB`
		`SE SRFC`
		`SE SUD`

Line /Protocol	Data	Description

ACSE	PDU Type	Displays the following information
		• PDU Type
		Example:
		`ACSE AARQ or ACSE AARQ icao=407573` (if 24-bit ICAO aircraft address is present)
		`ACSE AARE`
		`ACSE RLRQ`
		`ACSE RLRE`
		`ACSE ABRT`
		
		Note:
		PDEC allows the detection of legacy CPDLC
		
		Example:
		`CLNP DT source: 470027818349540001525201 8F45535044000101 destination: 47002741454A5500440CBF000053414142000001 DUID:22065`
		`TP4 CR LI:43,CDT:1,SRC-REF:0x05F2,Called T-Selector:16,Calling T-Selector:6370`
		`SE SCN`
		`ACSE AARQ - WARNING: LEGACY CPDLC!`

Line /Protocol	Data	Description

CM	PDU Type	Displays the following information
		• PDU Type
		• Flight ID
		• ICAO
		• Applications (where present)
		• Result (where present)
		
		Example : without use of --cmBC (default)
		`CM Logon Req flight=EIN1235 icao=414637 - CPDLC (v1), ADS (v1), CPDLC (v2) – ADEP=EGPH ADES=EPK`
		`CM Logon Rsp flight=EWG583 icao=3C56EC - accepted - CPDLC (v2), ADS (v1)`
		`CM Logon Rsp flight=EWG583 icao=3C56EC – rejected`
		
		Example: with --cmBC
		`CM Logon Req flight=SAS635 icao=4780AA - CPDLC`
		`CM Logon Rsp flight=SAS635 icao=4780AA – accepted`
		`CM Contact Req`
		`CM Contact Rsp - contactSuccess`
		
		Note:
		PDEC allows the detection of misconfigured aircraft when there is a mismatch between the following fields:
		• CLNP 24-bit ICAO address,
		• ACSE AARQ 24-bit ICAO address,
		• CM Logon Request 24-bit ICAO address
		
		Example:
		`CLNP DT source: 470027414E41580`**`47A585`**`000100000000000101 destination: 4700278183434800015353010145534745303101 DUID:163`
		`TP4 DT LI:10,DST-REF:0x1DC3,TPDU-NR:0,EOT:1`
		`SE SCN`
		`ACSE AARQ icao=`**`47A595`**
		`CM Logon Req flight=NAX62H icao=`**`47A585`**` - CPDLC`
		`WARNING: AirframeIdent misconfiguration!`

CPDLC	PDU Type	Displays the following information
		• PDU Type
		• CPDLC Message Id
		• CPDLC Message Reference
		• CPDLC Message Types
		Example:
		`CPDLC Downlink Msg flight=SAS635 icao=4780AA`
		`CPDLC 2013/01/30 09:11:52 MIN ( 0) MRN (-1) LACK DM99 DM99 CURRENT DATA AUTHORITY`
		
		`CPDLC Uplink Msg flight=SAS635 icao=4780AA`
		`CPDLC 2013/01/30 09:11:58 MIN ( 0) MRN ( 0) NOLACK UM227 UM227 LOGICAL ACKNOWLEDGMENT`
		
		`CPDLC Invalid PDU flight=4Y1107 icao=384D7A`

Line /Protocol	Data	Description

ADS	PDU Type	Displays the following information:
		• PDU Type
		• Flight ID
		• ICAO
		• Contract Type (where present): All, Demand, Event, Periodic
		• Reason (where present)
		
		Example:
		`ADS Contract Req flight=4Y1234 icao=38077A type=Periodic`
		`ADS Contract contract_number(1) rate(00:04:00) extended_projected_profile_modulus speed_schedule_profile_modulus`
		
		`ADS Accepted flight=EIN1235 icao=414637 type=Event`
		`ADS Report 2020/11/05 10:57:59 baseline contract_number(1) position(0:33:058 -10:11:043 level(30))`
		
		`ADS Positive ACK flight=EIN0001 icao=400000 type=Periodic`
		`ADS Positive Acknowledgement contract_number(13) type(Periodic)`
		
		`ADS Report flight=4Y1234 icao=38077A type=Periodic`
		`ADS Report 2019/11/15 05:58:04 contract_number(1) position(0:17:490 0:25:374 level(3400)) extended_projected_profile`
		
		`ADS Reject flight=EIN0001 icao=400000 type=Event`
		`ADS Reject ADS-service-unavailable`
		
		`ADS Non Compliance flight=EIN0002 icao=400001 type=Event`
		`ADS Non Compliance contract_number(4) contract_details_not_supporting(event)`
		
		`ADS Abort Req flight=EIN0001 icao=400000`
		`ADS Cancel Contract Req flight=4Y1234 icao=38077A type=All`
		`ADS Cancel Positive ACK flight=4Y1234 icao=38077A type=All`
		`ADS Provider Abort Ind flight=4Y1234 icao=38077A reason=0`
		`ADS User Abort flight=4Y1234 icao=38077A reason=0`
		`ADS User Abort Ind flight=4Y1234 icao=38077A reason=0`
		
		`ADS Invalid PDU flight=4Y1107 icao=384D7A`

Table 6: PDU Text Format

Note: Invoking the Protocol Decoder with the --debug option prints and decodes the ACSE, CM, CPDLC and ADS data.

Appendix C.1 provides an example of a PDU text output file.

5.1.3.2 PDU CSV Format

The following information is printed for each line of the PDU CSV output log:

Line/Protocol	Description
SYSTEMDATE	Date that data was recorded Format: `DD/MM/YYYY`
SYSTEMTIME	Time that data was recorded Format: `HH:MM:SS.SSS`
ACC/Router	Area Control Center extracted from atsu.csv file
FlightIdentifier	Aircraft's Flight ID
AirframeIdent	Aircraft's ICAO ID In case of any IDRP messages exchanged between an AGR and an aircraft, the AirframeIdent is extracted from the ATN address In case of IDRP UPDATE messages exchanged between ATN routers, the AirframeIdent is extracted from the ATN address embedded in the IDRP UPDATE message containing an additional route for a specific aircraft. If there is no additional route, the AirframeIdent remains empty. In case of any other IDRP messages exchanged between ATN routers, the AirframeIdent remains empty.
Msg_Date	CPDLC Date message was sent Format: `DD/MM/YYYY`
Msg_Time	CPDLC Time message was sent Format: `HH:MM:SS`
Air_Gnd	Direction of the message: • ATN_GND indicates the message is an uplink • ATN_AIR indicates the message is a downlink
MSG_Type	Type of message. It can be any of the following: • `CM Contact Request` • `CM Contact Response` • `CM Logon Request` • `CM Logon Resp. (+ve)` • `CM Logon Resp. (-ve)` • `CM Abort Request` • `CM Abort Indication` • `CM Provider Abort` • `CPDLC end-request` • `CPDLC end-rejected` • `CPDLC end-response` • `CPDLC message` • `CPDLC Provider Abort` • `CPDLC start-confirmed` • `CPDLC start-rejected` • `CPDLC start-request` • `CPDLC User Abort` • `ADS Report Periodic` • `ADS Report Event` • `ADS Report Demand`

Line/Protocol	Description
	• ADS Contract Request Periodic • ADS Contract Request Event • ADS Contract Request Demand • ADS Positive ACK Periodic • ADS Positive ACK Event • ADS Positive ACK Demand • ADS Reject Periodic • ADS Reject Event • ADS Reject Demand • ADS Non Compliance Periodic • ADS Non Compliance Event • ADS Non Compliance Demand • ADS Cancel Contract Req All • ADS Cancel Contract Req Periodic • ADS Cancel Contract Req Event • ADS Cancel Positive ACK All • ADS Cancel Positive ACK Periodic • ADS Cancel Positive ACK Event • ADS Cancel Negative ACK All • ADS Cancel Negative ACK Periodic • ADS Cancel Negative ACK Event • ADS User Abort • ADS Provider Abort • ADS Accepted Periodic • ADS Accepted Event • ADS Accepted Demand • TP4 CR • TP4 CC • TP4 DR • TP4 DC • TP4 AK • CLNP ERQ • CLNP ERP • CLNP ER • CLNP Invalid Note: In the case of a TP4 DT the CM, CPDLC or ADS message type is provided instead
UM/DM	CPDLC Uplink or Downlink Message Number
UM/DM CONCAT	Second CPDLC Message in case of concatenations
MIN	CPDLC Message Index Number
MRN	CPDLC Message Reference Number
ACK	CPDLC Logical Acknowledgement: 1: Requires Acknowledgement 0: No Acknowledgement required
Description	CPDLC, CM or ADS Application Description, or CLNP ER PDU reason for discard. Details the contents of the CPDLC/CM/ADS message.
ADEP	Aerodrome of Departure ICAO Code
ADES	Aerodrome of Destination ICAO Code
LI	TP4 Length Indicator

Line/Protocol	Description
CDT	TP4 Credit
DST-REF	TP4 Destination Reference
SRC-REF	TP4 Source Reference
CLASS/EOT/REASON	TP4 Class Type/End of TSDU mark/Disconnect Reason
TPDU-NR	TP4 TPDU Number Field
NTPDU-NR	TP4 Sequence Number Response
DUID	CLNP Data Unit Identifier
SrcNsap	CLNP source NSAP address or Area Control Center if entry is present in atsu.csv file
DstNsap	CLNP destination NSAP address or Area Control Center if entry is present in atsu.csv file
ContractNumber	ADS Contract Number
Position	ADS Report Position Format: "<latitude> <longitude> <level>", with level optional Example: `52:33:580 -10:11:430 level(300)`
FOM	ADS Report FigureOfMerit. Format: "<estimated-position-uncertainty> <multiple-navigational-units-operating> <aais-availability>" Example: `8 TRUE TRUE`
Rate	ADS Periodic Report Rate
IDRP_SEQ	IDRP Sequence Number
IDRP_ACK	IDRP ACK Number
IDRP_CDT_OFFRD	IDRP Credit Offered
IDRP_CDT_AVAIL	IDRP Credit Available
CircuitID	Circuit name on which data was sent or received
Version	CM/CPDLC/ADS version
ASN1Message	The full ASN.1 decoding of the PDU
CLNP-PDU	The CLNP PDU in hexadecimal format

Table 7: PDU CSV Format

Appendix C.2 provides an example of a PDU CSV output file.

5.1.3.3 CM/CPDLC Intermediate File Format

The CM/CPDLC Intermediate file is generated after parsing a CLNP Log or ASE Log that contains CPDLC data. This file is then used as input to generate the LISAT and GOLD format

Field	Description	Example
date	Date captured in the log	`2014/12/02`
time	Time captured in the log	`09:33:14.222`
ICAO	The 24-bit address in ICAO Doc4444 Format (alphanumerical character, in six hexadecimals)	`40000B`
ADM	The aircraft operator extracted from the NSAP address	`UAL`
direction	UPLINK or Downlink	`UPLINK`
type	Application type: CM, CPDLC, PMCPDLC, ADS	`CM`
DATA	Application data payload (PER ASN1 encoded data)	`040458040000`

Table 8: CM/CPDLC File Format

Appendix C.3 provides an example of a CM/CPDLC Intermediate output file.

5.2 ASE Protocol Decoder

5.2.1 Command Line interface

To run the ASE log Protocol Decoder utility, run the following command:

```
$HOME/Airtel_PDEC/bin/pdec_ase
```

The ASE Protocol Decoder binary provides the following command line arguments:

```
$HOME/Airtel_PDEC/bin/pdec_ase <INPUT OPTIONS> [<GENERAL OPTIONS>] [<OUTPUT FILE OPTIONS>]
                               [<FILTER OPTIONS>]
```

Input options are:

-i <*gndes.info log*>	decodes an ASE log file
-n <facility>	name of Ground Facility Designator.
-s <database>	mapping between ATN CLNP NSAP and facility (see 5.7.2)

General options are:

-h, --help	prints help message
--debug	prints additional debug information
--appasn1	prints CM and CPDLC ASN.1
--full	prints the original PDU in output file

Output file options are:

--nointermediate	indicates that intermediate file is not generated
--prefix=<*prefix*>	prepends <*prefix*>_ to the generated files
--append	indicates that the output is going to be appended if pdus file already exists
--cmbc	indicates that the CM output is backward compatible with versions up to PDEC_B8

Filter options are (more details in 5.6):

-f, --from=<*time*>[3]	filter for a start time
-t, --to=<*time*>[3]	filter for an end time
-a, --atsu=<*facility*>	filter for a ground facility

For example:

```
$HOME/Airtel_PDEC/bin/pdec_ase –i gndes.log
```

To read from standard input, use the input file name "-". For example, invoke the following command:

```
tail -f gndes.log |$HOME/Airtel_PDEC/bin/pdec_ase -i -
```

[3] *The time format is HH:MM:SS*

5.2.2 Input Log File

The ASE Protocol Decoder can decode the following input file:

File	Description
`ASE log`	ASE log generated by an AGDLS system. It contains ASE PDUs. Appendix A.3 provides an example of an ASE log file

Table 9: ASE Protocol Decoder Input log file

5.2.3 Output Files

The ASE Protocol Decoder generates the same output files as described in 5.1.3

5.3 AVLC Protocol Decoder

5.3.1 Command Line interface

To run the AVLC log Protocol Decoder utility, run the following command:

```
$HOME/Airtel_PDEC/bin/pdec_avlc
```

The AVLC Protocol Decoder binary provides the following command line arguments:

```
$HOME/Airtel_PDEC/bin/pdec_avlc <INPUT OPTIONS> [<GENERAL OPTIONS>] [<OUTPUT FILE OPTIONS>]
                                [<PROTOCOL OPTIONS>] [<FILTER OPTIONS>] [<CONFIGURATION OPTIONS>]
```

Input options are:

-i <*AVLC log*>	decodes an AVLC log file
--vmon	decode AVLC log file as VMON file[4]
--upx	decode AVLC log file as UPX file[5]

General options are:

-h, --help	prints help message
--debug	prints additional debug information
--appasn1	prints CM and CPDLC ASN.1
--full	prints the original PDU in output file

Output File Options are:

--pcap	indicates that PCAP file is generated
--nointermediate	indicates that intermediate file is not generated
--prefix=<prefix>	prepends <prefix>_ to the generated files
--append	indicates that the output is going to be appended if pdus file already exists
--cmbc	indicates that the CM output is backward compatible with versions up to PDEC_B8

Protocol options are:

--noavlc	indicates that AVLC information should not be printed
--decodeAoaText	indicates that the AOA free text value should be printed
--no8208	indicates that 8208 information should not be printed
--nolref	indicates that LREF information should not be printed
--noclnp	indicates that CLNP information should not be printed
--noidrp	indicates that IDRP PDUs should not be printed
--notp4	indicates that TP4 PDUs should not be printed
--noAoA	indicates that AOA PDUs should not be printed
--noapplication	indicates that Application PDUs should not be printed
--application	indicates that only Application PDUs should be printed
--decodeLine=<*line number*>	indicates that the particular line should be decoded differently
--decodeProtocol=<*protocol*>	indicates that protocol <*protocol*> should be used to decode the <*line number*> line. Available options are: GND_CM,GND_CPDLC,AIR_CM,AIR_CPDLC

[4] *A VMON file is the format used by Airtel's VMON product*

[5] *A UPX file is the format used in EUROCONTROL's MOON network*

```
--decodeFile=<decode file>   A CSV file containing a list of which lines should be decoded
                             with which protocols.
```

Filter options are (more details in 5.6):

```
-f, --from=<time>[6]              filter from a start time
-t, --to=<time>[6]                filter to an end time
```

Configuration Options are:

```
-w, --duidwindow=<size>       CLNP DUID window size for aircraft reset detection (Default is 4)
-d, --flightiddelay=<delay>   FlightId Delay to keep flightId before reset (Default is 3600s)
```

For example:

```
$HOME/Airtel_PDEC/bin/pdec_avlc –i frame.log
```

To read from standard input, use the input file name "-". For example, invoke the following command:

```
tail -f frame.log|$HOME/Airtel_PDEC/bin/pdec_avlc -i -
```

5.3.2 Input Log Files

The AVLC Protocol Decoder can decode any of following input files:

File	Description
AVLC log	AVLC log generated by Airtel ADS VDL system. It contains VDLM2 frames. Appendix A.4 provides an example of an AVLC log file
VMON log	Logs generated by VMON system. It contains VDLM2 frames. Appendix A.5 provides an example of a VMON log file
UPX log	Log File format used in Eurocontrol MOON network

Table 10: AVLC Protocol Decoder Input log files

5.3.3 Output Files

The AVLC Protocol Decoder generates the same output files as described in section 5.1.3

[6] *The time format is HH:MM:SS*

5.4 DVIP Protocol Decoder

5.4.1 Command Line interface

To run the DVIP log Protocol Decoder utility, run the following command:

```
$HOME/Airtel_PDEC/bin/pdec_dvip
```

The DVIP Protocol Decoder binary provides the following command line arguments:

```
$HOME/Airtel_PDEC/bin/pdec_dvip <INPUT OPTIONS> [<GENERAL OPTIONS>] [<OUTPUT FILE OPTIONS>]
                                [<PROTOCOL OPTIONS>] [<FILTER OPTIONS>] [<CONFIGURATION OPTIONS>]
```

Input options are:

-i <*DVIP log*>	decodes a DVIP log file
--old	decodes the DVIP file following ICD v1

General options are:

-h, --help	prints help message
--debug	prints additional debug information
--appasn1	prints CM and CPDLC ASN.1
--full	prints the original PDU in output file

Output File Options are:

--pcap	indicates that PCAP file is generated
--nointermediate	indicates that intermediate file is not generated
--prefix=<prefix>	prepends <prefix>_ to the generated files
--append	indicates that the output is going to be appended if pdus file already exists
--cmbc	indicates that the CM output is backward compatible with versions up to PDEC_B8

Protocol options are:

--dvip	indicates that DVIP information should be printed
--noavlc	indicates that AVLC information should not be printed
--decodeAoaText	indicates that the AOA free text value should be printed
--no8208	indicates that 8208 information should not be printed
--nolref	indicates that LREF information should not be printed
--noclnp	indicates that CLNP information should not be printed
--noidrp	indicates that IDRP PDUs should not be printed
--notp4	indicates that TP4 PDUs should not be printed
--noAoA	indicates that AOA PDUs should not be printed
--noapplication	indicates that Application PDUs should not be printed
--application	indicates that only Application PDUs should be printed
--decodeLine=<*line number*>	indicates that the particular line <*line number*> should be decoded differently
--decodeProtocol=<*protocol*>	indicates that protocol <*protocol*> should be used to decode line <*line number*>. Available options are: GND_CM,GND_CPDLC,AIR_CM,AIR_CPDLC
--decodeFile=<*decode file*>	A CSV file containing a list of which lines should be decoded with which protocols.

Filter options are (more details in 5.6):

```
-f, --from=<time>[7]              filter from a start time
-t, --to=<time>[7]                filter to an end time
```

Configuration Options are:

```
-w, --duidwindow=<size>       CLNP DUID window size for aircraft reset detection (Default is 4)
-d, --flightiddelay=<delay>   FlightId Delay to keep flightId before reset (Default is 3600s)
```

For example:

```
$HOME/Airtel_PDEC/bin/pdec_dvip –i dvip.log
```

To read from standard input, use the input file name "-". For example, invoke the following command:

```
tail -f dvip.log|$HOME/Airtel_PDEC/bin/pdec_dvip -i -
```

5.4.2 Input Log File

The DVIP Protocol Decoder can decode the following input file:

File	Description
DVIP log	DVIP log generated by VDLM2 GS. Appendix A.6 provides an example of an ICD v2 DVIP log file Appendix A.7 provides an example of an ICD v1 DVIP log file

Table 11: DVIP Protocol Decoder Input log file

5.4.3 Output Files

The DVIP Protocol Decoder generates the same output files as described in section 5.1.3

[7] *The time format is HH:MM:SS*

5.5 CM/CPDLC Intermediate Protocol Decoder

The CM/CPDLC Intermediate Protocol decoder is used to generate LISAT and GOLD files

5.5.1 Command Line interface

To run the intermediate file Protocol Decoder utility, run the following command:

```
$HOME/Airtel_PDEC/bin/pdec_intermediate
```

***IMPORTANT**: The ASE, AVLC, CLNP or DVIP Protocol Decoder **MUST** be run prior to running this utility in order to generate the CM/CPDLC intermediate files used as input.*

The intermediate file Protocol Decoder binary provides the following command line arguments:

```
$HOME/Airtel_PDEC/bin/pdec_intermediate <INPUT OPTIONS> [<GENERAL OPTIONS>]
                                        [<OUTPUT FILE OPTIONS>] [<FILTER OPTIONS>]
                                        [<CONFIGURATION OPTIONS>]
```

Input options are:

```
  -i <file>                 decodes an intermediate log file
  -n <facility>             name of Ground Facility Designator.
  -s <database>             mapping between ATN CLNP NSAP and facility (see 5.7.2)
  -d <database>             mapping between Aircraft Address and Aircraft Type (see 5.7.1)
```

General options are:

```
  -h, --help                prints help message
      --debug               prints additional debug information
      --appasn1             prints CM and CPDLC ASN.1
      --full                includes records with empty flightId in LISAT file
```

Output file options are:

```
      --nolisat             indicates that LISAT file is not generated
      --nogold              indicates that GOLD file is not generated
      --prefix=<prefix>     prepends <prefix>_ to the generated files
```

Filter options are (more details in 5.6):

```
  -r, --airline=<icao>      filter for an airline prefix
  -f, --from=<time>[8]      filter from a start time
  -t, --to=<time>[8]        filter to an end time
  -a, --atsu=<facility>     filter for a ground facility
```

Configuration Options are:

```
  -e, --emptyflightid=<flightId>    FlightId to be used in case of flightId which cannot
                                    be determined from the logs.
```

For example:

```
$HOME/Airtel_PDEC/bin/pdec_clnp –i ggr.info
$HOME/Airtel_PDEC/bin/pdec_intermediate –i intermediate_XXXX.csv
or
HOME/Airtel_PDEC/bin/pdec_ase -i gndes.info --prefix=EVRR
```

[8] *The time format is HH:MM:SS*

```
$HOME/Airtel_PDEC/bin/pdec_intermediate -i EVRR_intermediate.csv
```

To read from standard input, use the input file name "-". For example, invoke the following command:

```
tail -f intermediate_XXXX.csv|$HOME/Airtel_PDEC/bin/pdec_intermediate -i -
```

5.5.2 Input Log File

The CM/CPDLC Protocol Decoder can decode the following input file:

File	Description
CM/ CPDLC Intermediate log file	Intermediate file generated after parsing an ASE, AVLC, CLNP or DVIP log that contains CPDLC data. This file is then used as input to generate the LISAT and GOLD formats. It is described in section 5.1.3.3

Table 12: CM/CPDLC Protocol Decoder Input File

5.5.3 Output Files

The CM/CPDLC Protocol Decoder generates the following output files

File	Description
lisat_<*XXXX*>.xml	LISAT file for an ATC Ground Facility. If the ATC Ground Facility is defined in the ATSU file, the <*XXXX*> is replaced with the name of the ATC Ground Facility, e.g. lisat_LIRR.xml for Rome ACC. If the input log contains data for more than one ATC Ground Facility, then one file will be created for each ATC Ground Facility.
gold_<*XXXX*>.csv	GOLD file format. If the ATC Ground Facility is defined in the ATSU file, the <*XXXX*> is replaced with the name of the ATC Ground Facility, e.g. gold_LIRR.csv for Rome ACC. If the input log contains data for more than one ATC Ground Facility, then one file will be created for each ATC Ground Facility

Table 13: CM/CPDLC Protocol Decoder Output Files

5.5.3.1 LISAT File Format

The Protocol Decoder can generate the XML LISAT format [RD2].

The following table presents the different elements described in LISAT standard:

Element	Notes
atc-message	Provided from Airtel ATN CLNP logs using the Protocol Decoder conversion tool
sector-transition	It is the responsibility of ANSP to provide this information in a separate xml document
position-reports	The reports given in the Position Reports are obtained from surveillance data. It is the responsibility of ANSP to provide this information, if available

Table 14: LISAT Elements

It is the responsibility of ANSP to provide these generated `xml` documents to LISAT Central Reporting Office.

The following command can be used to reformat the LISAT file.

```
xmllint --format  lisat_XXXX.xml
```

Appendix C.4 provides an example of a LISAT output file.

Note: The LISAT file will only contain valid entries according to the XML LISAT format [RD2]. If an intermediate file record contains insufficient information, such as an empty *flightId*, it will be skipped with a warning message such as:

```
Trace(0x2), ProtocolDecoder, Skipping record as flight ID unknown for ICAO 0x31FF04 - 2015/06/24 09:47:22.34222
```

5.5.3.1.1 Full LISAT File option

As records with empty flightIds are not included in the LISAT format by default, it means the file does not contain the full recorded traffic.

The command line interface `--full` option allows to generate LISAT files containing records with empty flightIds.

Furthermore, the command line interface `--emptyflightId=<flightId>` option allows replacing all empty flightIds with a specified value, e.g. UNK00000. If this option is not used, the output should **only** be used for traffic analysis and not provided to LISAT Central Reporting Office as they would be rejected.

5.5.3.2 GOLD File Format

The following data points are required per GOLD [RD3] to enable Required Communication Performance analysis (e.g. measuring the round-trip times) and provide sufficient information for problem analysis.

Ref	Label	Description	Airtel Notes
1	ANSP	The four-letter ICAO designator of the facility (e.g. NZZO).	Extracted from Logon Request
2	Aircraft address (ATNB1)	The 24-bit address in ICAO Doc4444 Format (alphanumerical character, in six hexadecimals) *Note: Extracted from CM application message*.	Extracted from Logon Request
3	Aircraft type designator	The ICAO aircraft type designator (e.g. B744). *Note: Extracted from ANSP database using aircraft registration as key.*	Recovered from aircraft database using the ICAO 24-bit address as key
4	Operator designator	The ICAO designator for the aircraft operating agency (e.g. UAL). *Note: Extracted from ANSP database using aircraft registration as key. If ANSP database does not contain that mapping (or is not available) then ADM field from the intermediate log file is used.*	Recovered from aircraft database using the ICAO 24-bit address as key
5	Date	In YYYYMMDD format (e.g. 20081114). *Note: Extracted from ANSP system data recording time stamp, synchronized to within 1 second of Universal Time Coordinated (UTC).*	Extracted from CLNP logs.
6	MAS RGS	Designator of the RGS that MAS downlink was received from (e.g. POR1). *Note: This is a 3 or 4 letter designator extracted from the ACARS header DT line.*	Empty as information not available from ATN link
7	OPS RGS	Designator of the RGS that the operational response was received from (e.g. AKL1). *Note: This is a 3 or 4 letter designator extracted from the ACARS header DT line.*	Empty as information not available from ATN link

Ref	Label	Description	Airtel Notes
8	Uplink time	The timestamp on the uplink CPDLC message sent by the ANSP in HH:MM:SS format (e.g. 03:43:25). *Note: Extracted from ANSP system data recording time stamp, synchronized to within 1 second of UTC.*	Extracted from CLNP logs. It will be the timestamp in the ATCMessageHeader
9	MAS/LACK receipt time	The ANSP timestamp on receipt of the MAS/LACK in HH:MM:SS format (e.g. 03:43:35). *Note: Extracted from ANSP system data recording time stamp, synchronized to within 1 second of UTC.*	Extracted from CLNP logs. It will be the timestamp of the reception of the CLNP PDU from the Service Provider containing the LACK message (if LACK is received)
10	MAS/LACK roundtrip time	In seconds (#9-#8) (e.g. 10).	Calculated from #9 and #8. Value will be set to -1 if no LACK is received
11	Aircraft FMS time stamp	In the operational response messages in HH:MM:SS (e.g. 03:44:15). *Note: For FANS 1/A, extracted from the ATCMessageHeader timestamp in the decoded operational response message. See RTCA DO-258AEUROCAE ED-100A section 4.6.3.3.*	Extracted from CLNP logs. It will be the timestamp in the ATCMessageHeader for the downlink response.
12	ANSP timestamp on the receipt of the operational response	In HH:MM:SS (e.g. 13:44:45). *Note: Extracted from ANSP system data recording time stamp, synchronized to within 1 second of UTC.*	Extracted from CLNP logs. It will be the timestamp of the reception of the CLNP PDU from the Service Provider containing the operational response.
13	Operational message roundtrip time	From sending uplink (#8) to receipt of operational response (#12) in seconds (e.g. 80).	Calculated from #12 and #8. Value will be set to -1 if no operational response is received.
14	Downlink response transit time	In seconds (#12-#11) (e.g. 30).	Calculated from #12 and #11. Value will be set to -1 if no operational response is received.
15	Uplink message elements	All uplink message element identifier preceded by U encapsulated between quotation marks with a space between each element (e.g. "U118 U80") *Note: Extracted from the decoded operational uplink that initiated the transaction.*	Extracted from CLNP logs (#8). It will be the list of uplink messages identifiers in the uplink message.

Ref	Label	Description	Airtel Notes
16	Downlink message elements	All downlink message elements encapsulated between quotation marks with a space between each element if required (e.g. "D0") *Note: Extracted from the decoded operational downlink.*	Extracted from CLNP logs (#11). It will be the list of downlink messages identifiers in the downlink response message.
17	ACTP	Actual communication technical performance in seconds (e.g. 35). *Note: Truncated to whole seconds.*	
18	ACP	Actual communications performance in seconds measured as the difference between time uplink sent (#8) to operational response received (#12) (e.g. 80).	Calculated from #8 and #12.
19	PORT	Pilot Operational Response Time = ACP (#18) - ACTP(#17) (e.g. 45). *Note: Implementers should allow for negative values where the operational response is received before the MAS as per Figure D- 3 above. When graphing PORT negative values should be counted as 0.*	Calculated from #18 and #17.

Table 15: CPDLC Data Collection Points

The Protocol Analyser tool generates a CSV file with the 19 fields identified in the above table.

The CPDLC Data Record format complies with GOLD [RD3] section D 2.2.4.

Limitations:

- Uplink time (#8) is the time of the reception of the CLNP PDU in the router.
- Downlink time (#10 and #12) is the time of the reception of the CLNP PDU in the router.
- Only Uplink messages requiring an operational response are used.

Appendix C.5 provides an example of a GOLD output file.

5.6 Summary of Filtering Options

All Protocol Decoder have common output filtering options. The table below shows a short summary of these filters and the expected format of the parameters' values:

Filter Option	Parameter Format	Example
Aircraft: `-c` or `--aircraft`	A 24-bit ICAO aircraft address. The address should be specified as a six-character hexadecimal string.	`-c 22aa22` `-c 123456`

Airline:
`-r` or `--airline`
	A three-character airline code.
	The characters that cannot be entered from the keyboard can be passed as hexadecimal values when \x (backslash x) escape sequence is used.
	When a backslash needs to be passed to the airline code it also must be escaped with another backslash.
	Please note that a backslash is also the escape character in the Linux shell. Therefore, it is best to surround the airline code with single quotation characters.
		`-r BAW`
		`-r ’\x42AW’`
		`-r ’\x42\x41\x57’`
		`-r ’\\AW’`

From time:
`-f` or `--from`
To time:
`-t` or `--to`
	The time of day specified as HH:MM:SS
	where:
	HH – hours
	MM – minutes
	SS – seconds
		`-f 12:12:20`
		`-t 20:01:00`

ATSU: `-a` or `--atsu`	A four-character ATC Ground Facility Designator. Note that the mapping between NSAP and the ATSU code needs to be defined in the ATSU database file (see section 5.7.2 below).	`-a LAAA` `-a UUUD`

Table 16: Summary of Filtering Options

5.7 Database Input Files

5.7.1 Aircraft Database File

The Aircraft database file is a CSV file that maps between ICAO 24-bit addresses and Aircraft Type.

This is used in the generation of the GOLD file.

The following table presents the different elements in the file:

Element	Notes
ICAO	This is the 6 hexadecimal character representation of the ICAO
Aircraft Type	This is a plain text field. The Aircraft Type must not contain a comma. The value is inserted directly into the GOLD file.

Table 17: Aircraft Database File Fields

Appendix B.1 provides an example of an Aircraft Database File

5.7.2 ATSU Database File

The ATSU database file is a CSV file that maps between NSAP address and the ATSU Ground Facility.

The following table presents the different elements in the file:

Element	Notes
NSAP	This is the 40 hexadecimal character representation of the ATN NSAP address.
ATSU Ground Facility	This is the four-character ATC Ground Facility Designator.

Table 18: ATSU Database File Fields

Appendix B.2 provides an example of the ATSU Database File provided as part of the delivery as per section 4.2

Appendix A Protocols Log File Examples

A.1 CLNP Log File

```
ACGS: ROUTER CLNS_DT_PDU 2014/12/02 09:32:25.235 RCVD 142 ipcircuit
814E01289C008E000014470027818365750011455400014544 4C5447310014470027C1836575004000B000145444C544
1310000010000008EC301D6C50DC00606042B1B000004010F0160CD010E850040010000000100000000300BF9192783A
FAADF406548FB797AE811101005A0BB80D470027C1836575004000B000101010E00080606042B1B0000000001

ACGS: ROUTER CLNS_DT_PDU 2014/12/02 09:32:25.235 SENT 185 ipcircuit
814E01289C00B9000014470027C1836575004000B000145444C5441310014470027818365750011455400014544 4C544
731000001000000B9C301D6C50DC00606042B1B000004010F0160CD010E85006B010000000100000010303CB3F41EBDC
D70DCC7F56856930FA943901005A0BB80B4700278183657500114554070108010A0109010E00080606042B1B000000020
80E00080606042B1B000000020A0E00080606042B1B00000002090E00080606042B1B0000000001
```

A.2 ACG Log File

```
Log started at: 2015-06-15 07:31:29.57219

2015-06-15 07:54:14.429069 from localhost
0000  81 4E 01 24 9C 00 7B 13   AD 14 47 00 27 81 83 49   .N.$..{.  ..G.'..I
0010  54 00 01 52 52 01 8C 45   53 52 4D 00 01 01 14 47   T..RR..E  SRM....G
0020  00 27 C1 83 49 54 00 31   FF 04 00 01 00 00 00 00   .'..IT.1  ........
0030  00 01 01 00 03 00 00 00   7B C3 01 D6 C5 0D C0 06   ........  {.......
0040  06 04 2B 1B 00 00 04 01   0F 01 12 CD 01 08 2C E1   ..+.....  ......,.
0050  00 00 08 41 40 C0 01 0A   C2 02 63 6D C1 02 43 4D   ...A@...  ..cm..CM
0060  87 02 00 06 C6 01 00 85   02 03 E8 F2 04 00 05 7E   ........  .......~
0070  40 C3 02 1B 15 08 04 45   51 29 6B                  @......E  Q)k

2015-06-15 07:54:16.332117 from localhost
0000  81 4E 01 28 9C 00 77 00   00 14 47 00 27 C1 83 49   .N.(..w.  ..G.'..I
0010  54 00 31 FF 04 00 01 00   00 00 00 00 01 01 14 47   T.1.....  .......G
0020  00 27 81 83 49 54 00 01   52 52 01 8C 45 53 52 4D   .'..IT..  RR..ESRM
0030  00 01 01 00 01 00 00 00   77 C3 01 D6 C5 0D C0 06   ........  w.......
0040  06 04 2B 1B 00 00 04 01   0F 01 12 CD 01 08 28 D1   ..+.....  ......(.
0050  08 41 00 01 40 C0 01 0A   C2 02 63 6D C1 02 43 4D   .A..@...  ..cm..CM
0060  87 02 00 06 85 02 03 E8   F2 04 00 05 7E 40 C6 01   ........  ....~@..
0070  00 08 04 92 38 60 D8                              ....8`.

2015-06-15 07:54:17.588870 from localhost
0000  81 4E 01 24 9C 00 59 08   FB 14 47 00 27 81 83 49   .N.$..Y.  ..G.'..I
0010  54 00 01 52 52 01 8C 45   53 52 4D 00 01 01 14 47   T..RR..E  SRM....G
0020  00 27 C1 83 49 54 00 31   FF 04 00 01 00 00 00 00   .'..IT.1  ........
0030  00 01 01 00 04 00 00 00   59 CD 01 08 C3 01 D6 C5   ........  Y.......
0040  0D C0 06 06 04 2B 1B 00   00 04 01 0F 01 12 0A 61   .....+..  .......a
0050  00 01 00 08 04 27 66 61   68                        .....'fa  h
```

A.3 ASE Log File

```
airtel-srv GNDES ASE_PDU 2014/12/11 13:42:08.494 DOWNLINK 102
00000030783431343633337A045494E3132333582859EC593398B266D7060D95D402828C6F000100004141303101636D01
160060C1B2BA8050518DE000200008282606202E0DA0000C183657500A0A31BC000400010504C0C40585922C9895E2C79
93095A9B00

airtel-srv GNDES ASE_PDU 2014/12/11 13:42:41.114 UPLINK   24
00000030783431343633337A045494E313233351A40058020
```

```
airtel-srv GNDES ASE_PDU 2014/12/11 13:43:20.734 UPLINK   35
9C706D88470027C183657500414637000100004141303101803078343134363337160 0

airtel-srv GNDES ASE_PDU 2014/12/11 13:43:20.740 UPLINK   29
4600003078343134363337A045494E31323335C03B402004063099E000

airtel-srv GNDES ASE_PDU 2014/12/11 13:43:20.955 UPLINK   11 AC30783431343633371600

airtel-srv GNDES ASE_PDU 2014/12/11 13:50:05.461 DOWNLINK 102
0000003078343134363337A045494E3132333582859EC593398B266D7060D95D402828C6F000100004141303101636D01
160060C1B2BA8050518DE000200008282606202E0DA0000C183657500A0A31BC000400010504C0C40585922C9895E2C79
93095A9B88

airtel-srv GNDES ASE_PDU 2014/12/11 13:50:11.943 UPLINK   24
0000003078343134363337A045494E313233351A40058020

airtel-srv GNDES ASE_PDU 2014/12/11 13:50:20.637 UPLINK   35
9C706D88470027C183657500414637000100004141303101803078343134363337160 0

airtel-srv GNDES ASE_PDU 2014/12/11 13:50:20.640 UPLINK   29
4600003078343134363337A045494E31323335C03B402004063099E000

airtel-srv GNDES ASE_PDU 2014/12/11 13:50:20.877 UPLINK   11 AC30783431343633371600
```

A.4 AVLC Log File

```
; ADS VDL Conversion v1.1
; ----------------------
;
;Field          Format / Example     Comment
;
;Date           YYYY/MM/DD
;Time           HH:MM:SS.SSS         24 hour local time
;CRC            B/G
;SQP            -98                  Signal Strength (dBm) -27 to -98 in 5 db steps. As per ARINC
750 Sec A10.4.7
;SQI            6                    Figure of Merit (0-15). Combined signal purity & signal
strength, where 0 – bad 15 – excellent
;Source         1234567              27 bit hexadecimal address
;Destination    567890A              27 bit hexadecimal address
;C/R bit        0/1
;A/G bit        0/1
;h bit          ‘’/0/1               No data if h bit is not present
;r bit          ‘’/0/1               No data if r bit is not present
;Frame Type     INFO, CLE, APO       Abbreviated Frame Type / XID Sub-type
;Frame Length   100                  Decimal
;Content        94341C1AB2…        Hexadecimal format
;Line Term.                          Carriage Return & Line Feed
;
2014/03/25,15:40:37.541,B,-
98,7,14BAA52,5744E97,0,1,,,INFO,107,D68AB8E850742A4BA81BFF621E28F64000028500590200000002000000050
303D3C41238F4179F36A645B646F1708FD50000004CC002000A0000000200800600 1E040018168E004E82A890B2009654
A1801A081222803E00010D010181402C5867002741544879004BAA50
2014/03/25,15:40:37.541,G,-
97,1,524CE97,14BAA50,0,1,,,AOA,28,52742A0A94C8B8E98AFFFF0132AE5443AD4A52D031DF7FDA83069D7F
2014/03/25,15:40:37.541,G,-97,1,524CE97,14BAA50,1,1,,,RR,9,52742A0A96C8B8E9C1
2014/03/25,15:40:37.541,B,-98,10,14BAA50,525CE97,1,1,,,RR,9,96E8B8E852742A0BC1
2014/03/25,15:40:37.541,G,-97,1,524CE97,14BAA50,1,1,,,RR,9,52742A0A96C8B8E9E1
2014/03/25,15:40:37.541,G,-
97,1,524CE97,14BAA50,0,1,,,INFO,48,52742A0A94C8B8E9EC1BFF863E28F6401D8585001E04000000070000000304
037F7FF1B0EE9EC350B48CF5993083C8E1
2014/03/25,15:40:37.541,G,-98,2,14BAA50,524CE97,1,1,,,RR,9,96C8B8E852742A0BE1
```

```
2014/03/25,15:40:37.541,G,-
97,0,524CE97,1896180,0,1,,,AOA,28,32A4C20094C8B8E942FFFF0132AEC1B6AD4545C1B3DF7FC78381587F
2014/03/25,15:40:37.541,B,-98,0,0000000,0000000,0,0,,,FREQ,4,00006124
2014/03/25,15:40:37.541,G,-
97,1,524CE97,14BAA0C,0,1,,,INFO,48,52742A3094C8B8E9C21BFFCC3E28F6401D2A85001E04000000080000000604
032E3844951E7240F9A19CAE241775843F
2014/03/25,15:40:37.845,G,-97,1,524CE97,14BA8F5,1,1,,,RR,9,52748AAE96C8B8E901
```

A.5 VMON Log File

```
2013-12-13,02:01:24.724,29.984228,N,95.328254,W,-
92,0510359A,01FFFFFF,GSIF,F2FEFEFE1402D659AF8280001C0109383838353A31393933020200010303208480050207D8060207D8F00023000156040120C3044B494148C406000000000000C504FC020000C7020004C80312CC47

2013-12-13,02:01:45.611,29.984228,N,95.328254,W,-
90,0510359A,01FFFFFF,GSIF,F2FEFEFE1402D659AF8280001C0109383838353A31393933020200010303208480050207D8060207D8F00023000156040120C3044B494148C406000000000000C504FC020000C7020004C80312CC47

2013-12-13,02:01:55.680,29.984227,N,95.328260,W,-
95,01AA8C10,0510359A,INFO,1602D658B054180922FFFF0132AECE3737B9D3CB1534B6B002CDB0B3C14F4FB5323137432C522CB032B0312CB53231372CCB49C1C82CCB43D6C72CB93738342C83B1FB7F

2013-12-13,02:01:56.387,29.984227,N,95.328260,W,-92,0510359A,01AA8C10,RR,B25418081602D65941

2013-12-13,02:01:57.660,29.984227,N,95.328260,W,-
91,0510359A,01AA8C10,INFO,B25418081402D65942FFFF0132AECE3737B9D3CBB0DF7F468359A77F

2013-12-13,02:01:58.628,29.984227,N,95.328260,W,-96,01AA8C10,0510359A,RR,1602D658B254180941

2013-12-13,02:02:00.900,29.984227,N,95.328260,W,-
91,0510359A,01A42BA9,XID,B208EA941602D659BF8280001C0109383838353A31393933020200010303208480050207D8060207D8F00029000156010100030105040120C3044B494148C406000000000000C504FC020000C7020004C80312CC47

2013-12-13,02:02:02.224,29.984227,N,95.328260,W,-91,0510359A,01A42BA9,RR,B208EA941602D65921

2013-12-13,02:02:03.269,29.984227,N,95.328260,W,-
95,01AA8C10,0510359A,INFO,1602D658B054180944FFFF0132AECE3737B9D3CB15B3323102CDB034C14F4FB5323137432C522CB032B0322CB53231372CCB49C1C82CCB43D6C72CB937B9322CB92C32B64C2F2CC452D92C2F2CC452D92CB0B0B0B0B02C2C2CB02C31B02C2C2CB32C2C2C342C2C2C382C2C2C382C2C2CB62C2C2CB3B92CB02C2C2CB02CB02C31372CB02CB02CB02CB02C2C31382CB02CB02CB02CB9B3B0B02CB031B63834B02CB0B3B034B6372C43B6433483CD8F7F
```

A.6 DVIP ICD v2 Log File

```
Apr  3 16:07:27 vgc1-LIEA-dlp0 DVIL: dvip_tcpdump: verbose output suppressed, use -v or -vv for
full protocol decode
Apr  3 16:07:27 vgc1-LIEA-dlp0 DVIL: listening on vlan10, link-type EN10MB (Ethernet), capture
size 65535 bytes
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL: 1428077248.578518 IP 192.168.0.2.11500 > 192.168.0.20.50846:
tcp 3
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0000:  4500 0037 ef87 4000 4006 c9d2 c0a8 0002
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec c69e 101a 5af4 27fe aebe
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0020:  8018 2000 19d7 0000 0101 080a 0000 4345
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0030:  0001 ced7 7400 00
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL: 1428077248.585582 IP 192.168.0.6.11500 > 192.168.0.20.54859:
tcp 3
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0000:  4500 0037 263e 4000 4006 9318 c0a8 0006
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec d64b 8f7a c254 2775 6c3f
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0020:  8018 2000 a0d2 0000 0101 080a 0000 08de
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0030:  0001 ced9 7400 00
```

```
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL: 1428077248.595462 IP 192.168.0.2.11500 > 192.168.0.20.50846:
tcp 6
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0000:  4500 003a ef8e 4000 4006 c9c8 c0a8 0002
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec c69e 101a 5af7 27fe aebe
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0020:  8018 2000 34d7 0000 0101 080a 0000 4345
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0030:  0001 cede 5500 0300 00f3
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL: 1428077248.599903 IP 192.168.0.6.11500 > 192.168.0.20.54859:
tcp 6
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0000:  4500 003a 2642 4000 4006 9311 c0a8 0006
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec d64b 8f7a c257 2775 6c3f
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0020:  8018 2000 bbd2 0000 0101 080a 0000 08de
Apr  3 16:07:28 vgc1-LIEA-dlp0 DVIL:    0x0030:  0001 cee0 5500 0300 00f3
```

A.7 DVIP ICD v1 Log File

```
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL: 1435138442.266722 IP 192.168.0.3.11500 > 192.168.0.20.34425:
tcp 20
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0000:  4500 0048 bca4 0000 4006 3ca4 c0a8 0003
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec 8679 e26d 510b cd05 f6be
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0020:  8018 2000 a141 0000 0101 080a 0031 a328
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0030:  1828 1fab 5400 1101 4390 a684 930e 71ff
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0040:  9e00 ba02 0200 0000
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL: 1435138442.661127 IP 192.168.0.3.11500 > 192.168.0.20.34425:
tcp 4
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0000:  4500 0038 bca7 0000 4006 3cb1 c0a8 0003
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec 8679 e26d 511f cd05 f6be
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0020:  8018 2000 d8d4 0000 0101 080a 0031 a328
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0030:  1828 2038 7500 0103
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL: 1435138442.669245 IP 192.168.0.2.11500 > 192.168.0.20.51485:
tcp 4
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0000:  4500 0038 4f54 0000 4006 aa05 c0a8 0002
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0010:  c0a8 0014 2cec c91d d085 e58d ccb4 61cf
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0020:  8018 2000 22ac 0000 0101 080a 022c 2807
Jun 24 09:34:02 vgc1-LIRA-dlp0 DVIL:    0x0030:  1828 1fa0 7500 0101
```

Appendix B Database File Examples

B.1 Aircraft Database File

```
31FF04,A320
478353,A330
4780AA,A340
4783A8,B737
478320,B747
47834C,MD10
```

B.2 ATSU Database File

```
4700278183414C000141410101000004553303101,LAAA
4700278183445A000141410101000004553303101,DAAA
4700278183414D000144440101000004553303101,UDDD
4700278183415400015656010100004553303101,LOVV
4700278183415A000142420101000004553303101,UBBB
4700278183425900014D56010100004553303101,UMMV
4700278183424500014255010100004553303101,EBBU
4700278183424100015342010100004553303101,LQSB
4700278183424700015352010100004553303101,LBSR
4700278183485200015A4F010100004553303101,LDZO
4700278183435900014343010100004553303101,LCCC
4700278183435A000141410101000004553303101,LKAA
4700278183444B0001444B010100004553303101,EKDK
4700278183454500015454010100004553303101,EETT
4700278183657500014459000100004747313101,EDYY
4700278183464900014553010100004553303101,EFES
4700278183465200014343014345532D42445801,LFBB
4700278183465200014343014345532D524D5301,LFEE
4700278183465200014343014345532D41544801,LFFF
4700278183465200014343014345532D41495801,LFMM
4700278183465200014343014345532D42535401,LFRR
4700278183474500014747010100004553303101,UGGG
4700278183444500014444010045444747000101,EDGG
4700278183444500014444010045444D4D000101,EDMM
4700278183444500014444010045445555000101,EDUU
4700278183444500014444010045445757000101,EDWW
4700278183475200014747010100004553303101,LGGG
4700278183475200014D44010100004553303101,LGMD
4700278183474C0001474C010100004553303101,BGGL
4700278183485500014343010100004553303101,LHCC
4700278183495300015244010100004553303101,BIRD
4700278183494500014457010100004553303101,EIDW
4700278183494500015 34E010100004553303101,EISN
4700278183494C00014C4C010100004553303101,LLLL
4700278183495400015252018D45534252000101,LIBB
4700278183495400015252018E45534D49000101,LIMM
4700278183495400015252018F45535044000101,LIPP
4700278183495400015252018C4553524D000101,LIRR
4700278183 4B5A000141410101000004553303101,UAAA
4700278183 4B5A000143430101000004553303101,UACC
4700278183 4B5A000149490101000004553303101,UAII
4700278183 4B5A000154540101000004553303101,UATT
4700278183 4B470001464D010100004553303101,UCFM
4700278183 4C560001525201010000 4553303101,EVRR
4700278183 4C540001564301010000 4553303101,EYVC
```

```
47002781834D5400014D4D010100004553303101,LMMM
47002781834D4100014D4D010100004553303101,GMMM
47002781834E4C000141410101000004553303101,EHAA
47002781834E4F000142440101000004553303101,ENBD
47002781834E4F00014F42010100004553303101,ENOB
47002781834E4F00014F53010100004553303101,ENOS
47002781834E4F000153560101000004553303101,ENSV
4700278183504C000157570101000004553303101,EPWW
...
4700270153495400000001000100004553303101,SITATEST
```

Appendix C Output File Examples

C.1 PDU Text File

```
Line 2. SENT. Time: 09:06:41.31493.
       CLNP DT source: 4700278183495400015252018C4553524D000101 destination:
470027C18349540031FF04000100000000000101 DUID:5
       TP4 CR LI:44,CDT:1,SRC-REF:0x0002,Called T-Selector:1600,Calling T-Selector:706D
       SE SCN
       ACSE AARQ
       CPDLC Start Req
Line 3. RCVD. Time: 09:06:46.961549.
       CLNP DT source: 470027C18349540031FF04000100000000000101 destination:
4700278183495400015252018C4553524D000101 DUID:13
       TP4 CC LI:40,CDT:1,DST-REF:0x0002,SRC-REF:0x0F42,Called T-Selector:1600,Calling T-
Selector:706D
       SE SAC
       ACSE AARE
       CPDLC Start Rsp (accepted) flight= icao=31FF04
Line 4. SENT. Time: 09:06:46.961999.
       CLNP DT source: 4700278183495400015252018C4553524D000101 destination:
470027C18349540031FF04000100000000000101 DUID:6
       TP4 AK LI:10,CDT:1,DST-REF:0x0F42,YR-TU-NR:0
Line 5. RCVD. Time: 09:06:55.959090.
       CLNP DT source: 470027C18349540031FF04000100000000000101 destination:
4700278183495400015252018C4553524D000101 DUID:14
       TP4 DT LI:10,DST-REF:0x0002,TPDU-NR:0,EOT:1
       CPDLC Downlink Msg flight= icao=31FF04
       CPDLC 2015/06/24 09:06:41 MIN ( 0) MRN (-1) LACK   DM99
       DM99 CURRENT DATA AUTHORITY
Line 6. SENT. Time: 09:06:55.959411.
       CLNP DT source: 4700278183495400015252018C4553524D000101 destination:
470027C18349540031FF04000100000000000101 DUID:7
       TP4 AK LI:10,CDT:2,DST-REF:0x0F42,YR-TU-NR:1
Line 7. SENT. Time: 09:06:58.96224.
       CLNP DT source: 4700278183495400015252018C4553524D000101 destination:
470027C18349540031FF04000100000000000101 DUID:8
       TP4 DT LI:10,DST-REF:0x0F42,TPDU-NR:0,EOT:1
       CPDLC Uplink Msg flight= icao=31FF04
       CPDLC 2015/06/24 09:06:57 MIN ( 0) MRN ( 0) NOLACK UM227
       UM227 LOGICAL ACKNOWLEDGMENT
```

C.2 PDU CSV File

```
SYSTEMDATE;SYSTEMTIME;ACC/Router;FlightIdentifier;AirframeIdent;Msg_Date;Msg_Time;Air_Gnd;MSG_Typ
e;UM/DM;UM/DM CONCAT;MIN;MRN;ACK;Description;ADEP;ADES;LI;CDT;DST-REF;SRC-
REF;CLASS/EOT/REASON;TPDU-NR;NTPDU-
NR;DUID;SrcNsap;DstNsap;ContractNumber;Position;FOM;Rate;IDRP_SEQ;IDRP_ACK;IDRP_CDT_OFFRD;IDRP_CD
T_AVAIL;CircuitID;VERSION;ASN1Message;CLNP-PDU
19/08/2019;00:18:18.061;LSAG;WZZ1180;0x471F89;;;ATN_AIR;CM Logon Request;;;;;;ADEP: GCTS, ADES:
EPKT;GCTS;EPKT;10;0;0xC5F2;;1;0;;1042;47002741575A5A00471F8900005341414200000 1;LSAG;;;;;;;;;dummy
cir;v1;"CMAircraftMessage {
   cmLogonRequest {
      aircraftFlightIdentification = 'WZZ1180'
      cMLongTSAP {
         rDP = 0x41575a5a00
         shortTsap {
            aRS = 0x471f89
```

```
            locSysNselTsel = 0x00005341414200000101
         }
      }
      groundInitiatedApplications[0] {
         aeQualifier = 22
         apVersion = 1
         apAddress {
            longTsap {
               rDP = 0x41575a5a00
               shortTsap {
                  aRS = 0x471f89
                  locSysNselTsel = 0x00005341414200000116
               }
            }
         }
      }
      airportDeparture = 'GCTS'
      airportDestination = 'EPKT'
   }
}
";0x814E01269C00A575F614470027818343480001535301014553474530310114470027415 75A5A00471F89000053414
142000001041200000A5CD0108C301D6C50DC00606042B1B000004010F01100AF0C5F2800804DF8FCAFCE80200201042
B1B0301020AC6C060A72FC2400281B2135AF6AD3162E1820ABAD2D0051C7E240000A6828284000002020 02C0041575A5A
00A38FC4800014D0505080000045A3C3A94E2D09750
19/08/2019;00:18:18.068;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
AK;;;;;;;GCTS;EPKT;10;1;0x006D;;;;1;41366;LSAG;47002741575A5A00471F8900005341414200000 1;;;;;;;;;d
ummycir;;;0x814E01639C00590000144700274157 5A5A00471F89000053414142000001144700278183434800015353 0
10145534745303101A19600000059CD0108C50DC00606042B1B000004010F0110C301C00A61006D010804A42733FD
19/08/2019;00:18:18.234;LSAG;WZZ1180;0x471F89;;;ATN_GND;CM Logon Resp. (+ve);;;;;;Not
Maintained;GCTS;EPKT;10;0;0x006D;;1;0;;41367;LSAG;47002741575A5A00471F89000053414142000001;;;;;;;
;;dummycir;v1;"CMGroundMessage {
   cmLogonResponse {
      groundOnlyInitiatedApplications[0] {
         aeQualifier = 22
         apVersion = 1
      }
   }
}
";0x814E01639C00690000144700274157 5A5A00471F89000053414142000001144700278183434800015353010145534
745303101A19700000069CD0108C50DC00606042B1B000004010F0110C301C00AF0006D800804EF3800E7E2021001042B
1B030120843C0800B000
19/08/2019;00:18:18.935;LSAG;WZZ1180;0x471F89;;;ATN_AIR;TP4
AK;;;;;;;GCTS;EPKT;10;2;0xC5F2;;;;1;1043;47002741575A5A00471F8900005341414200000 1;LSAG;;;;;;;;;du
mmycir;;;0x814E01269C0059EB1814470027818343480001535301014553474530310114470027415 75A5A00471F8900
0053414142000001041300000059CD0108C301D6C50DC00606042B1B000004010F01100A62C5F2010804A60808F9
19/08/2019;00:18:18.974;LSAG;WZZ1180;0x471F89;;;ATN_AIR;TP4
DR;;;;;;;GCTS;EPKT;12;0;0xC5F2;0x006D;0x80;;;1044;47002741575A5A00471F89000053414142000001;LSAG;;
;;;;;;;dummycir;;;0x814E01269C005CA25A1447002781834348000153530101455347453031011447002741575A5A0
0471F8900005341414200000104140000005CCD0108C301D6C50DC00606042B1B000004010F01100C80C5F2006D800804
C4ADF33C01
19/08/2019;00:18:18.980;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
DC;;;;;;;GCTS;EPKT;11;0;0x006D;0xC5F2;;;;41368;LSAG;47002741575A5A00471F89000053414142000001;;;;;
;;;;dummycir;;;0x814E01639C005A0000144700274157 5A5A00471F89000053414142000001144700278183434800 01
535301014553474530310 1A1980000005ACD0108C50DC00606042B1B000004010F0110C301C00BC0006DC5F208042324B
7E5
19/08/2019;00:18:20.113;;;;;;ATN_GND;IDRP
KEEPALIVE;;;;;;;;;;;;;;;;51050;4700270153495400000001000 1080020FFBA4500;4700278183434800015353010
149534348303100;;;;;114;111;4;16;dummycir;;;0x814E0128BC006CD3AE1447002781834348000153530101495 34
34830310014470027015349540000000100 01080020FFBA4500C76A0000006CC301D6C50DC00606042B1B000004010F01
60CD010E85001E04000000720000006F0410AB3F0E843F33EF5F6F50EF46C1F001D4
```

```
19/08/2019;00:18:23.399;LSAG;WZZ1180;0x471F89;;;ATN_GND;CPDLC start-
request;;;;;;;GCTS;EPKT;43;10;0x0000;0xC5F3;0x40;;;41369;LSAG;47002741575A5A00471F890000534141420
00001;;;;;;;;;dummycir;v1;;0x814E01639C0097000014470027415754A5A00471F89000053414142000001144700027
818343480001535301014553474530310 1A19900000097CD010BC50DC00606042B1B000004010F0101C301C02BEA0000C
5F340C102656DC20116C0010A0804D6562E08C30278A4C60100850203E887020003F20400057E40E80200301042B1B030
1020AC6C0A324E041C00011608BC8104F7265318
19/08/2019;00:18:24.412;LSAG;WZZ1180;0x471F89;;;ATN_AIR;CPDLC start-
confirmed;;;;;;;GCTS;EPKT;39;1;0xC5F3;0x006E;0x40;;;1045;47002741575A5A00471F8900005341414200000 1
;LSAG;;;;;;;;;dummycir;v1;;0x814E01269C0088496614470027818343480001535301014553474530310114470027
41575A5A00471F89000053414142000001041500000088CD010BC301D6C50DC00606042B1B000004010F010127D1C5F30
06E40C0010AC20116C102656D87020003850203E8F20400057E40C6010008046736D046F0021001042B1B030100045CC1
04F7265318
19/08/2019;00:18:24.423;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
AK;;;;;;;GCTS;EPKT;20;10;0x006E;;;;0;41370;LSAG;47002741575A5A00471F8900005341414200000 1;;;;;;;;;
dummycir;;;0x814E01639C0063000014470027415754A5A00471F89000053414142000001144700278183434800015353
0101455347453031 01A19A00000063CD010BC50DC00606042B1B000004010F0101C301C0146A006E000804AB086C348C0
80000000000000001
19/08/2019;00:18:25.192;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:23;ATN_AIR;CPDLC
message;99;;0;;1;DM99 CURRENT DATA
AUTHORITY;GCTS;EPKT;10;0;0xC5F3;;1;0;;1046;47002741575A5A00471F8900005341414200000 1;LSAG;;;;;;;;;
dummycir;v1;"ATCDownlinkMessage {
   header {
      messageIdNumber = 0
      dateTime {
         date {
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
            }
            seconds = 23
         }
      }
      logicalAck = required
   }
   messageData {
      elementIds[0] {
         dM99NULL = <null>
      }
   }
}
";0x814E01269C0069DD0F144700278183434800015353010145534745303101144700274 1575A5A00471F89000053414
142000001041600000069CD010BC301D6C50DC00606042B1B000004010F01010AF0C5F3800804BEEC630600A6C64D900B
BC8092E063202E8C0542
19/08/2019;00:18:25.199;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
AK;;;;;;;GCTS;EPKT;10;10;0x006E;;;;1;41371;LSAG;47002741575A5A00471F8900005341414200000 1;;;;;;;;;
dummycir;;;0x814E01639C0059000014470027415754A5A00471F89000053414142000001144700278183434800015353
0101455347453031 01A19B00000059CD010BC50DC00606042B1B000004010F0101C301C00A6A006E010804D5C24218
19/08/2019;00:18:25.373;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:25;ATN_GND;CPDLC
message;227;;1;0;0;UM227 LOGICAL
ACKNOWLEDGMENT;GCTS;EPKT;10;0;0x006E;;1;0;;41372;LSAG;47002741575A5A00471F8900005341414200000 1;;;
;;;;;;dummycir;v1;"ATCUplinkMessage {
   header {
      messageIdNumber = 1
      messageRefNumber = 0
      dateTime {
         date {
```

```
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
            }
            seconds = 25
         }
      }
      logicalAck = notRequired
   }
   messageData {
      elementIds[0] {
         uM227NULL = <null>
      }
   }
}
";0x814E01639C006A0000144700274157 5A5A00471F8900005341414200000114470027818343480001535301014553
4745303101A19C0000006ACD010BC50DC00606042B1B000004010F0101C301C00AF0006E800804D10EA6C800A733279020
1779012641C6404A47C098
19/08/2019;00:18:26.312;LSAG;WZZ1180;0x471F89;;;ATN_AIR;TP4
AK;;;;;;;GCTS;EPKT;10;2;0xC5F3;;;;1;1047;47002741575A5A00471F8900005341414200000 1;LSAG;;;;;;;;;du
mmycir;;;0x814E01269C005927E41447002781834348000153530101455347453031011447002741575A5A00471F8900
0053414142000001041700000059CD010BC301D6C50DC00606042B1B000004010F01010A62C5F3010804C83A08A4
19/08/2019;00:18:26.320;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:25;ATN_GND;CPDLC
message;183;;2;;1;UM183 CURRENT ATC UNIT
LSAG,GENEVA,CONTROL;GCTS;EPKT;10;0;0x006E;;1;1;;41373;LSAG;47002741575A5A00471F890000534141420000
01;;;;;;;;;dummycir;v1;"ATCUplinkMessage {
   header {
      messageIdNumber = 2
      dateTime {
         date {
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
            }
            seconds = 25
         }
      }
      logicalAck = required
   }
   messageData {
      elementIds[0] {
         uM183FreeText = 'CURRENT ATC UNIT LSAG,GENEVA,CONTROL'
      }
   }
}
";0x814E01639C008C0000144700274157 5A5A00471F8900005341414200000114470027818343480001535301014553
4745303101A19D0000008CCD010BC50DC00606042B1B000004010F0101C301C00AF0006E810804A828B73C00A817A33027
6845DE4049902DC8E1D5A54A2CEA8820D48682ACE935104CA7063AC8F16745AD056439F3AA529F308102451D1C
19/08/2019;00:18:26.321;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:25;ATN_GND;CPDLC
message;160;;3;;1;UM160 NEXT DATA AUTHORITY
```

```
LSAZ;GCTS;EPKT;10;0;0x006E;;1;2;;41374;LSAG;47002741575A5A00471F89000053414142000001;;;;;;;;dumm
ycir;v1;"ATCUplinkMessage {
   header {
      messageIdNumber = 3
      dateTime {
         date {
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
            }
            seconds = 25
         }
      }
      logicalAck = required
   }
   messageData {
      elementIds[0] {
         uM160Facility {
            facilityDesignation = 'LSAZ'
         }
      }
   }
}
";0x814E01639C006F00001447002741575A5A00471F89000053414142000001144700278183434800015353010145534
745303101A19E0000006FCD010BC50DC00606042B1B000004010F0101C301C00AF0006E8208047F7E6D8400A808E32AE8
65DE4049902822653836880835578900
19/08/2019;00:18:26.427;LSAZ;;0x4072C7;;;ATN_AIR;TP4
AK;;;;;;;;;10;1;0xC474;;;;0;237;47002741455A59004072C700005341414200000;LSAZ;;;;;;;;;dummycir;;;
0x814E01239C0059822C1447002781834348000153530101455 35A48303101144700274145 5A59004072C700005341414
200000100ED00000059CD010BC301D6C50DC00606042B1B000004010F01010A61C474000804697B4778
19/08/2019;00:18:26.436;LSAZ;;0x4072C7;;;ATN_GND;TP4
AK;;;;;;;;;20;10;0x003F;;;;0;50601;LSAZ;47002741455A59004072C700005341414200000;;;;;;;;;dummycir
;;;0x814E01639C00630000144700274145 5A59004072C700005341414200000114470027818343480001535301014553
5A48303101C5A900000063CD010BC50DC00606042B1B000004010F0101C301C0146A003F00080498ED16598C080000000
000000001
19/08/2019;00:18:27.120;LSAG;WZZ1180;0x471F89;;;ATN_AIR;TP4
AK;;;;;;;GCTS;EPKT;10;2;0xC5F3;;;;3;1048;47002741575A5A00471F89000053414142000001;LSAG;;;;;;;;;du
mmycir;;;0x814E01269C005953B7144700278183434800015353010145534745303101144700274157 5A5A00471F8900
0053414142000001041800000059CD010BC301D6C50DC00606042B1B000004010F01010A62C5F303080473D36CF9
19/08/2019;00:18:27.340;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:26;ATN_AIR;CPDLC
message;100;;1;3;0;DM100 LOGICAL
ACKNOWLEDGMENT;GCTS;EPKT;10;0;0xC5F3;;1;1;;1049;47002741575A5A00471F89000053414142000001;LSAG;;;;
;;;;;dummycir;v1;"ATCDownlinkMessage {
   header {
      messageIdNumber = 1
      messageRefNumber = 3
      dateTime {
         date {
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
```

```
            }
            seconds = 26
         }
      }
      logicalAck = notRequired
   }
   messageData {
      elementIds[0] {
         dM100NULL = <null>
      }
   }
}
";0x814E01269C006A90571447002781834348000153530101455347453031011447002741575A5A00471F89000053414
142000001041900000006ACD010BC301D6C50DC00606042B1B000004010F01010AF0C5F3810804A004129600A7264F3043
2EF2024D419081ADCE1E64
19/08/2019;00:18:27.346;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
AK;;;;;;;GCTS;EPKT;10;10;0x006E;;;;2;41375;LSAG;47002741575A5A00471F8900005341414200000 1;;;;;;;;;
dummycir;;;0x814E01639C00590000144700274157 5A5A00471F8900005341414200000114470027818343480001535 3
0101455347453031 01A19F00000059CD010BC50DC00606042B1B000004010F0101C301C00A6A006E0208042B8F74C2
19/08/2019;00:18:27.521;LSAG;WZZ1180;0x471F89;19/08/2019;00:18:26;ATN_AIR;CPDLC
message;100;;2;2;0;DM100 LOGICAL
ACKNOWLEDGMENT;GCTS;EPKT;10;0;0xC5F3;;1;2;;1050;47002741575A5A00471F8900005341414200000 1;LSAG;;;;
;;;;;dummycir;v1;"ATCDownlinkMessage {
   header {
      messageIdNumber = 2
      messageRefNumber = 2
      dateTime {
         date {
            year = 2019
            month = 8
            day = 19
         }
         time_ {
            hoursminutes {
               hours = 0
               minutes = 18
            }
            seconds = 26
         }
      }
      logicalAck = notRequired
   }
   messageData {
      elementIds[0] {
         dM100NULL = <null>
      }
   }
}
";0x814E01269C006ABC2A144700278183434800015353010145534745303101144700274157 5A5A00471F89000053414
142000001041A0000006ACD010BC301D6C50DC00606042B1B000004010F01010AF0C5F3820804E43460D200A7264F3082
2EF2024D419083E0059740
19/08/2019;00:18:27.527;LSAG;WZZ1180;0x471F89;;;ATN_GND;TP4
AK;;;;;;;GCTS;EPKT;10;10;0x006E;;;;3;41376;LSAG;47002741575A5A00471F8900005341414200000 1;;;;;;;;;
dummycir;;;0x814E01639C00590000144700274157 5A5A00471F8900005341414200000114470027818343480001535 3
0101455347453031 01A1A000000059CD010BC50DC00606042B1B000004010F0101C301C00A6A006E030804805CA66D
...
19/08/2019;00:27:04.062;LSAZ;TOM5BK;0x4067EF;;;ATN_GND;TP4
CR;;;;;;;LCLK;EGTE;44;10;0x0000;0xC47A;0x40;;;50636;LSAZ;47002741544F4D004067EF000100000000000101
;;;;;;;;;dummycir;;;0x814E01639C007B00001447002741544F4D004067EF0001000000000001011447002781834 34
80001535 3010145535A48303101C5CC0000007BCD0108C50DC00606042B1B000004010F0101C301C02CEA0000C47A40C1
02636DC202434DC0010A0804E6911B1FC3029D0CC60100850203E887020006F20400057E40
```

```
19/08/2019;00:27:05.101;LSAZ;TOM5BK;0x4067EF;;;ATN_AIR;TP4
CC;;;;;;;LCLK;EGTE;40;1;0xC47A;0xD216;0x40;;;473;47002741544F4D004067EF00010000000000000101;LSAZ;;;
;;;;;;dummycir;;;0x814E011F9C00774C41144700278183434800015353010145535A48303101144700274154 4F4D00
4067EF00010000000000010101D900000077CD0108C301D6C50DC00606042B1B000004010F010128D1C47AD21640C0010
AC202434DC102636D87020006850203E8F20400057E40C6010008049CEBB073
19/08/2019;00:27:05.111;LSAZ;TOM5BK;0x4067EF;;;ATN_GND;TP4
AK;;;;;;;LCLK;EGTE;20;10;0xD216;;;;0;50637;LSAZ;47002741544F4D004067EF00010000000000000101;;;;;;;;;
dummycir;;;0x814E01639C00630000144700274154 4F4D004067EF000100000000000010114470027818343480001535 3
010145535A48303101C5CD00000063CD0108C50DC00606042B1B000004010F0101C301C0146AD21600080455AA44098C0
800000000000000011
19/08/2019;00:27:05.111;LSAZ;TOM5BK;0x4067EF;;;ATN_GND;CM Contact
Request;;;;;;LFEE;LCLK;EGTE;10;0;0xD216;;1;0;;50638;LSAZ;47002741544F4D004067EF00010000000000000101
;;;;;;;;;dummycir;v1;"CMGroundMessage {
   cmContactRequest {
      facilityDesignation = 'LFEE'
      address {
         rDP = 0x8183465200
         shortTsap {
            aRS = 0x014343
            locSysNselTsel = 0x014345532d524d5301636d
         }
      }
   }
}
";0x814E01639C00890000144700274154 4F4D004067EF000100000000000010114470027818343480001535 3010145535
A48303101C5CE00000089CD0108C50DC00606042B1B000004010F0101C301C00AF0D2168008047A33C146E80200301042
B1B0301020AC6C0A324E04680001010A02F484C8D162C0C1A329004050D0E02868AA65AA49AA602C6DA0
19/08/2019;00:27:06.329;LSAZ;TOM5BK;0x4067EF;;;ATN_AIR;TP4
AK;;;;;;;LCLK;EGTE;10;2;0xC47A;;;;1;474;47002741544F4D004067EF00010000000000000101;LSAZ;;;;;;;;;dum
mycir;;;0x814E011F9C00590FB914470027818343480001535 3010145535A48303101144700274154 4F4D004067EF000
100000000000010101DA00000059CD0108C301D6C50DC00606042B1B000004010F01010A62C47A010804D1958BAA
19/08/2019;00:27:12.677;LSAZ;TOM5BK;0x4067EF;;;ATN_AIR;CM Contact
Response;;;;;;successful;LCLK;EGTE;10;0;0xC47A;;1;0;;480;47002741544F4D004067EF00010000000000000101
;LSAZ;;;;;;;;;dummycir;v1;"CMAircraftMessage {
   cmContactResponse = contactSuccess
}
";0x814E011F9C006C85171447002781834348000153530101455 35A48303101144700274154 4F4D004067EF000100000
00000010101E00000006CCD0108C301D6C50DC00606042B1B000004010F01010AF0C47A800804A4C836D0E3021029042B
1B03002000D20010F011208108
19/08/2019;00:27:12.684;LSAZ;TOM5BK;0x4067EF;;;ATN_GND;TP4
AK;;;;;;;LCLK;EGTE;10;10;0xD216;;;;1;50643;LSAZ;47002741544F4D004067EF00010000000000000101;;;;;;;;;
dummycir;;;0x814E01639C00590000144700274154 4F4D004067EF000100000000000010114470027818343480001535 3
010145535A48303101C5D300000059CD0108C50DC00606042B1B000004010F0101C301C00A6AD216010804486092B0
19/08/2019;00:27:12.688;LSAZ;TOM5BK;0x4067EF;;;ATN_GND;TP4
DR;;;;;;;LCLK;EGTE;12;0;0xD216;0xC47A;0x80;;;50644;LSAZ;47002741544F4D004067EF00010000000000000101;
;;;;;;;;dummycir;;;0x814E01639C005B000014470027415 44F4D004067EF000100000000000010114470027818343 48
000153530101455 35A48303101C5D40000005BCD0108C50DC00606042B1B000004010F0101C301C00C80D216C47A80080
442A243EC
```

C.3 Intermediate CM/CPDLC File

```
LINENUMBER,DATE,TIME,FLIGHTID,ICAO,ADM,DIRECTION,APPLICATION,DATA
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7,2015/06/24,09:06:58.96224,,31FF04,CSA,UPLINK,CPDLC,80009ADD23720E30
9,2015/06/24,09:06:59.134897,,31FF04,CSA,UPLINK,CPDLC,4126B748DC816E410EAD2A5167544106A434156749A
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14,2015/06/24,09:08:12.828933,,31FF04,CSA,UPLINK,CPDLC,4226B74900016E1F0E844990D04E9F510499C82AD3
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C.4 LISAT

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  <docheader>
    <title>Airtel LISAT file</title>
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direction="down" result="accepted"/>
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C.5 GOLD

```
ANSP,Aircraft address,Aircraft type,Operator,Date,MAS RGS,OPS RGS,Uplink time,MAS/LACK receipt
time,
MAS/LACK round trip time,Aircraft FMS time stamp,ANSP receipt operational response time,
Operational round trip time,Downlink response transit time,Uplink message elements,
Downlink message elements,ACTP,ACP,PORT
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Appendix D Definitions, Acronyms and Abbreviations

Acronym	Definition
AA	Abort Accept (SPDU code)
AARE	Associate REsponse (ACSE)
AARQ	Associate ReQuest (ACSE)
AB	ABort (SPDU code)
ABRT	ABoRT (ACSE)
AC	AcCept (SPDU code)
ACARS	Aircraft Communications Addressing and Reporting System
ACC	Area Control Centre
ACG	Air/ground Communications Gateway
ACK	logical ACKnowledgement
ACP	Actual Communication Performance
ACSE	Association/Application Control Service Element
ACTP	Actual Communication Technical Performance
ADEP	Aerodrome of DEParture ICAO Code
ADES	Aerodrome of DEStination ICAO Code
ADM	Aircraft operator
ADP I/F	ADaPtation InterFace
ADS	Automatic Dependence Surveillance
A/G	Air to Ground
AGDLS	Air to Ground Data Link Server
AK	AcKnowledgement (PDU)
ANSP	Air Navigation Service Provider
AOA	ACARS Over AVLC
ASE	Application Service Element
ASN1	Abstract Syntax Notation One
ATC	Air Traffic Centre
ATN	Aeronautical Telecommunication Network
ATSU	Air Traffic Service Unit
AVLC	Aviation VHF Link Control
CC	Connection Confirmation (PDU)

Acronym	Definition
CDO	Connect Data Overflow (SPDU code)
CDT	CreDiT
CLNP	ConnectionLess-mode Network Protocol
CM	Context Management (application)
CN	ConNect (SPDU code)
CNF	CoNFirmation
CPDLC	Controller Pilot Data Link Communications application
CR	Connection Request (PDU)
CSV	Comma Separated Values
DA	Destination Address (PDU field)
DAL	Destination Address Length (PDU field)
DC	DisConnection indication (PDU)
DM	Downlink Message
DN	DisconNect (SPDU code)
DR	Disconnection Request (PDU)
DRF	Data Recording Facilities system
DST	Destination
DT	Data Transfer (PDU)
DUID	Data Unit IDentifier (PDU field)
DVIP	Digital Video Integrator and Processor
EOT	End Of Transmission
ER	Error Report (PDU field)
ERP	Echo RePly (PDU field)
ERQ	Echo ReQuest (PDU field)
EUROCAE	EUROpean organization for Civil Aviation Equipment
FANS-1/A	Future Air Navigation Systems for Boeing-1 and Airbus-A
FMS	Flight Management System
FN	FiNish (SPDU code)
G/G	Ground to Ground
GND	GrouND
GOLD	Global OperationaL dataLink Document

Acronym	Definition
G-PAT	GOLD Performance Analysis Tool
GS	Ground station
ICAO	International Civil Aviation Organization
ICD	International Code Designator
IDRP	Inter Domain Routing Protocol
LACK	Logical ACKnowledgement
LI	Length Indicator (PDU field)
LISAT	Link 2000+ XML based ATC Information Exchange Format
LT	LifeTime (PDU field)
MAS	Message ASsurance
MD	Multicast Data (PDU)
MIN	Message Index Number
MOON	a Eurocontrol network
MRN	Message Reference Number
MS	More Segments (PDU field)
NL	NulL (SPDU code)
NLPID	Network Layer Protocol IDentifier (PDU field)
NPAI	Network Protocol Address Information
NR	Number
NS	Network Service
NSAP	Network Service Access Point
NTPDU	Number of Transport Protocol Data Unit
OA	Overflow Accept (SPDU code)
OPS	OPerationS
OS	Operating System
OSI	Open Systems Interconnection
PCAP	Packet CAPture
PDEC	Protocol DECoder
PDU	Protocol Data Unit
PICS	Protocol Implementation Conformance Statement
PORT	Pilot Operational Response Time

Acronym	Definition
PR	PRepare (SPDU code)
QoS	Quality of Service
RF	ReFuse (SPDU code)
RGS	Remote Ground Station
RLRE	ReLease REsponse (ACSE)
RLRQ	ReLease ReQuest (ACSE)
RTCA	Radio Technical Commission for Aeronautics, inc.
SA	Source Address (PDU field)
SAB	Short ABort (SPDU code)
SAC	Short AcCept (SPDU code)
SACC	Short AcCept Continue (SPDU code)
SAL	Source Address Length (PDU field)
SCN	Short ConNect (SPDU code)
SCNC	Short ConNect Continue (SPDU code)
SDN	Short DisconNect (SPDU code)
SDT	Short Data Transfer (SPDU code)
SE	Security Exchange
SEQ	Sequence
SFN	Short FiNish (SPDU code)
SL	Segment Length (PDU field)
SN	SubNetwork
SNAcP	SubNetwork Access Protocol
SNDCF	SubNetwork Dependent Convergence Function
SNDCP	SubNetwork Dependent Convergence Protocol
SNICP	SubNetwork Independent Convergence Protocol
SNPA	SubNetwork Point of Attachment
SO	Segment Offset (PDU field)
SP	Segmentation Permitted flag (PDU field)
SRC	SouRCe
SRF	Short ReFuse (SPDU code)
SRFC	Short ReFuse Continue (SPDU code)

Acronym	Definition
SUD	Short Unit Data (SE type)
TP4	Transport Protocol class 4
TPDU	Transport Protocol Data Unit
TSDU	Transport Service Data Unit
UM	Uplink Message
UPX	file format used in Eurocontrol MOON network
UTC	Universal Time Coordinated
UTF-8	Unicode Transformation Format 8-bit
VDL	VHF Data Link
VMON	VDL MONitor
XML	eXtensible Mark-up Language