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1 INTRODUCTION

1.1 Scope and Purpose of the Document

The scope of the present document is the Agile Data Center (ADC), where the Pre-Processing System (APS) shall run in order to gather from the AGILE Ground Segment the whole TM Data produced all along the AGILE Mission.

The main tasks of the APS shall be:

1) to archive the TM Data in the format they are made available by the Ground Segment (L0 TM Data);
2) to process the L0 TM Data Archive in order to create the L1 TM Data Archive which contains:
    - the Payload L0 TM Data which have passed the CRC error verification, and have been transformed into a set of files, sorted by Type/Subtype and rewritten in the FITS format
    - the Bus L0 TM Data which have passed the CRC error verification, and have been rewritten without any format transformation
3) to make available both the L0 TM Data Archive and the L1 TM Data Archive to the other ADC Subsystems.
4) To create the L0/L1 TM Permanent Archive on removable media.

1.2 Document Overview

The general description of the context where the APS shall operate is given in Section 3. The APS specific requirements are presented in Section 4.

1.3 Acronyms

AC	Anti-coincidence auxiliary subsystem
ADC	Agile Data Center
ASC	APID Sequence Counter
Calibration MGSE	Calibration Mechanical Ground Support Equipment
CCOE	Central Checkout Equipment
EGSE	Electrical Ground Support Equipment
GSE	Ground Support Equipment
Instrument SC	Instrument Science Console

IP	Integrated Payload
MCAL	Mini-calorimeter detector
PD	Photo Diode
PDHU	Payload Data handling Unit
APS	ADC Pre-Processing System
PSC	Packet Sequence Count
SA	X-Ray detector named Super-AGILE
ST	Silicon Tracker gamma-ray detector
TBC	To Be Confirmed
TBD	To Be Defined
TC	Telecommand
TE	Test Equipment
TM	Telemetry

2 APPLICABLE AND REFERENCE DOCUMENTS

2.1 Applicable Documents

AD [1] AGRTI-IC-CGS-002, “AGILE RTI Communication Interface Control Document”, Issue 09 September 2003

AD [2] Ground segment requirement document, AGRTI-RQ-TPZ-001

AD [3] Agile Science Management Plan, ASI ????

AD [4] Ground Segment Interface Control Document ????

AD [5] AGILE Satellite Telemetry and Telecommand Definition ????

AD [6] AGILE Payload Telemetry and Telecommand Definition ????

AD [7] AGILE Payload Level 1 Data Interface Control Document ????

2.2 Reference Documents

The following is a list of documents that are referenced within the text of this document:

RD [1] SNV047-PRO-002 Ed. 2 Rev. 1 – 21/03/03 Programma Agile – Proposta per la realizzazione del Segmento di Terra ed il Controllo di Missione per due anni : Proposta Tecnica-Manageriale.

RD [2] Gianotti F., Trifoglio M., DISCoS – a detector-independent software for the on-ground testing and calibration of scientific payloads using the ESA Packet Telemetry and Telecommands Standards, ADASS X Conference Proceedings, Boston 12-15 November 2000

RD [3] A.Bulgarelli, F.Gianotti, M.Trifoglio, AGILE-ITE-SD-001, ProcessorLib Programmers Guide, AGILE-ITE-SD-001, IASF Sez. di Bologna Report 349/02, September 2002

RD [4] A.Bulgarelli, F.Gianotti, M.Trifoglio, AGILE-ITE-SD-003 ProcessorLib Detailed Design Report, AGILE-ITE-SD-003, IASF Sez. di Bologna Report 351/02, September 2002

RD [5] Definition of the Flexible Image Transport System (FITS), March 29, 1999, NOST 100-2.0, NASA/Science Office of Standards and Technology

2.3 Document Priority

A priority in the applicability of documents is established as follows:

1. AGILE Scientific Requirements

2. P/L System Requirements

3. Current Document

4. Applicable Documents

5. Minutes of Meeting

In case of conflict among technical material contained in these documents, the highest rank document shall have the precedence.

3 GENERAL DESCRIPTION

3.1 Product perspective

The APS shall be developed by the same team which is in charge of producing the software for the Science Console of the AGILE EGSE, which shall be released and used in advance to the APS.

Given the high level of commonalities existing among the tasks that are required to the two systems, the APS shall be based on an extensive reuse of the Science Console software, and in particular of the existing modules and libraries developed by the AGILE Science Console team (see RD [2], RD [3] and RD[4]).

3.2 User characteristics

The APS shall be operated by the ADC staff which shall be in charge of the routine tasks to be carried out on the AGILE TM data.

3.3 General Constraints

The APS software shall be developed using the same development environment which shall be used for the AGILE Science Console. The APS target platform shall be directly compatible with the AGILE Science Console target platform.

3.4 Assumptions and dependencies

In the present document, the data acquisition and processing requirements assume that the Ground Segment shall make available the TM Source Packets to the APS, on contact by contact basis, as presented in Section 3.5.2 and Section 3.5.3.

In particular, it is assumed that the Ground Segment shall de-multiplex the Frames of Virtual Channel VC0 and VC1, shall extract the Source Packets from the Frames which pass the CRC control, and eventually, on contact by contact basis, shall produce:

- one file containing the Real Time TM Source Packets (L0 RT TM File)
- one file containing the Mass Memory TM Source Packets (L0 MM TM File).

As result of the above operations, each one of these files:

- shall be a byte stream of Source Packets, in the original on-board satellite format, without any additional header/trailer
- shall contain both the Bus APID and the P/L APID Source Packets;
- the Packet Sequence Count (PSC) of the Source Packets pertaining to a given APID shall remain sorted in the increasing order, i.e. in the same order they have been generated by the satellite OBDH
- shall not include Packets which did not pass the Transfer Frame CRC check.

The above assumptions guarantee that the TM data flow which shall be received by the ADC APS acquisition and processing software shall have the same characteristics of the TM data flow which shall be received by the Science Console acquisition and processing software.

3.5 Operational Environment

The APS shall be installed in the ASI Agile Data Center (ADC), which shall be in charge of all the scientific oriented activities related to the use of AGILE satellite data (see AD[3]).

The ADC shall interface the AGILE Ground Segment in order to gather the TM data received by the satellite at each pass over the TT&C Station.

This interface shall consist mainly of the TM files containing:

- the whole Satellite TM data received at each contact, which shall be transferred to ADC within the next contact, through the ASINet,
- the periodic backup of the whole TM, which shall be transferred on removable media (e.g. CDRom).
- the Auxiliary Data

The ADC / Ground Segment interface shall be defined in AD [4], which at time of writing is not available yet.

Nevertheless, it is assumed that the L0 TM files shall be a byte stream of Source Packets, without any additional header/trailer.

The definition of the TM Source Packets contained in the L0 TM Files shall be given in AD [5] and AD[6].

As shown in Figure 3-1, the external interfaces of the APS within the ADC shall consist of:

1. input data:
    a. L0 RT TM files (contact by contact)
    b. L0 MM TM files (contact by contact)
    c. L0 TM files (periodic backup)

    These data shall be made available to APS in the original format they shall be transferred at ADC.
2. output data:
    a. L0/L1 Consolidated Archive (On-line)
    b. L0/L1 Consolidated Archive (Off-line)

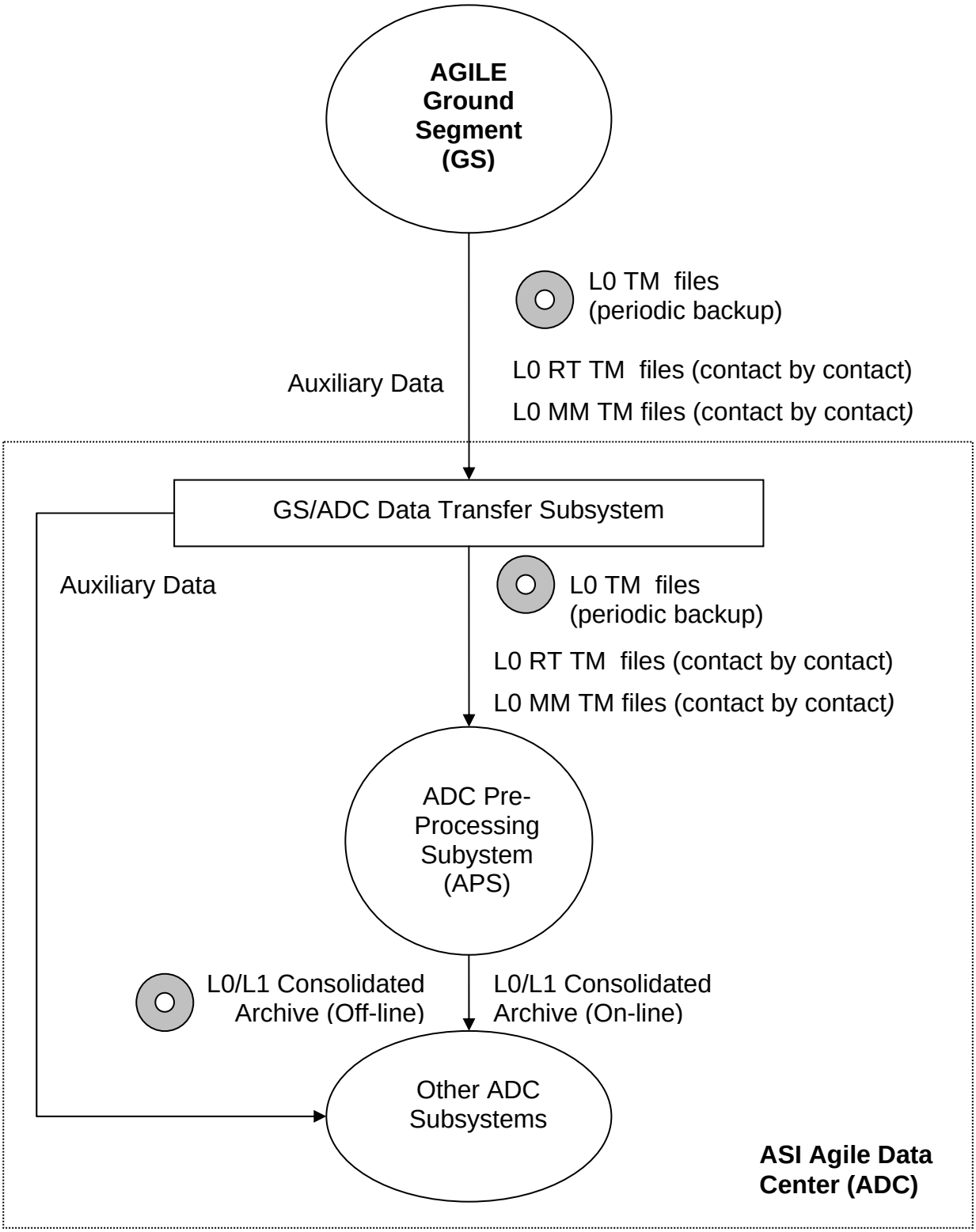

Figure 3-1 ADC Pre-Processing Context Diagram: External I/F

The system block diagram sketched in Figure 3-2 demonstrates the context the APS software shall operate in the ADC.

On contact by contact basis, ADC shall transfer the L0 TM files on a local system from where they shall be acquired by the APS via ftp.

APS shall archive the acquired data in the original format (L0 Data), and shall process the acquired data in order to perform the CRC verification and to transform the P/L TM into a set of files sorted and rewritten in a format more suitable for data analysis (L1 Data).

These operations shall generate about 5.5 Gbyte of L0/L1 Data per day (assuming 30 Mbyte of L0 Data per orbit, and 300 Mbyte of L1 Data per orbit).

At first, the L0/L1 Data shall be written on a Temporary Archive, which shall reside on the same computer running the above processing tasks. This archive shall be managed as a FIFO buffer where the L0/L1 data shall reside for a short time period (7-10 days).

Contact by contact, the L0/L1 Data shall be copied to the Consolidated Archive where they shall be available for on-line access by the ADC subsystems devoted to the other data analysis and archive tasks (i.e. monitoring of the correct functioning of the instruments, Quick-Look Analysis, routine data reduction to derive Standard Products, distribution and archiving of AGILE data). This archive shall be managed as a FIFO buffer where the L0/L1 data shall reside for a medium-long time period (6 months - 1 year).

Hence, for a short time period (7-10 days), the L0/L1 Data shall be available on both the Temporary and the Consolidated Archive, providing with the Temporary Archive a backup solution for the retrieval of the more recent L0/L1 data.

On routinely basis, during the Temporary/Consolidated overlapped period, the data shall be backed up from the Consolidated Archive into a removable media (e.g. DVD Rom) to form the Permanent L0/L1 TM Archive.

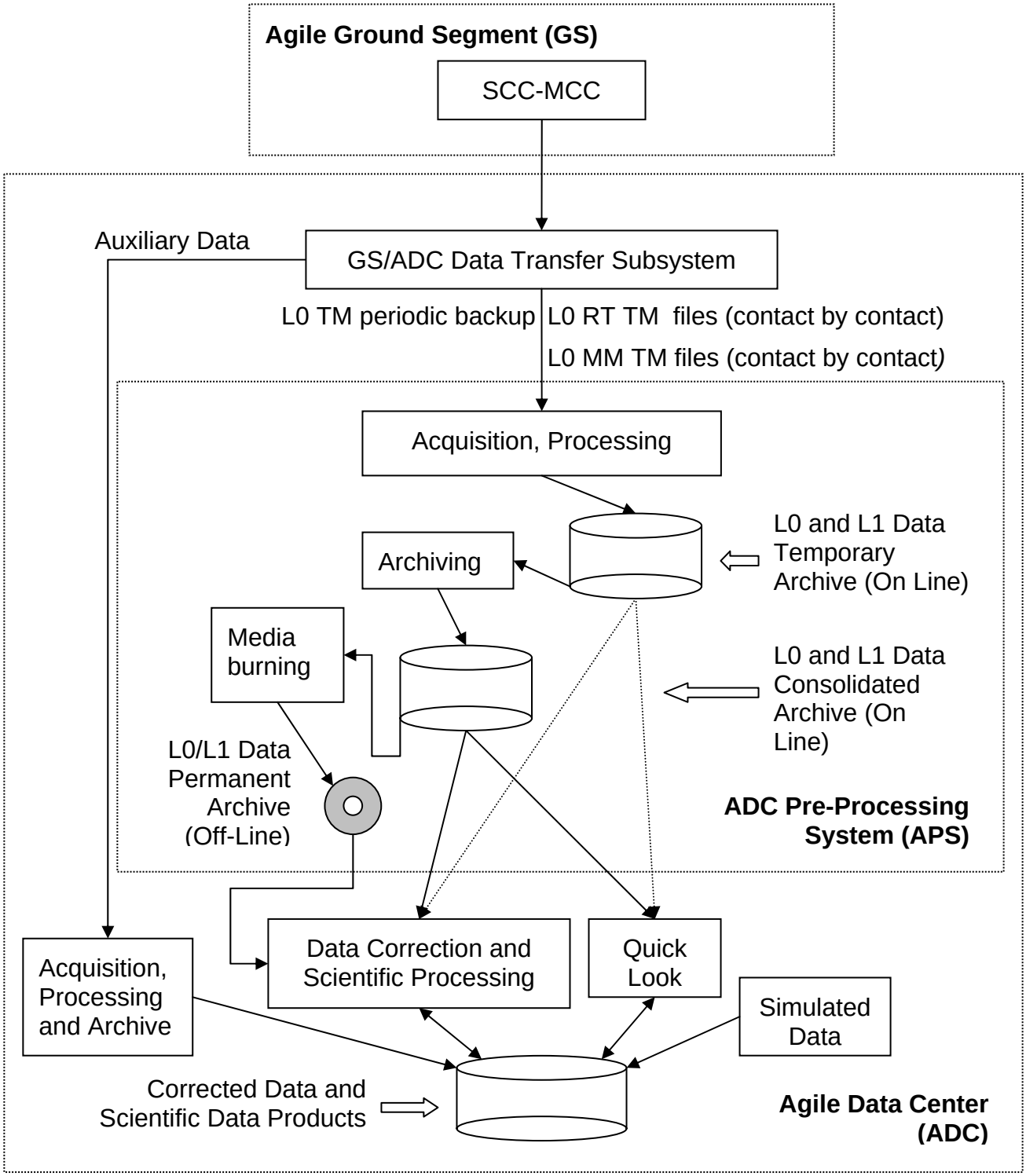

Figure 3-2 ADC Pre-Processing System (APS) block diagram

The main characteristics of the AGILE TM Data flow to be acquired and processed by the APS are summarized in the following subsections.

3.5.1 ON-BOARD TM DATA MANAGEMENT

During the non visibility period the TM Source Packets generated by the P/L and the Bus are saved into a FIFO Mass Memory Unit.

As specified in AD [1],

- the Mass Memory is capable of containing a minimum of 64 Mbytes.
- in order to guarantee the complete Mass Memory content download at each ground contact, the maximum amount of P/L telemetry data to be stored in Mass Memory during one orbit shall be: TBD Mbytes (AD [1] page 84).
  This shall be obtained calibrating the onboard P/L thresholds sending TC from the ground segment.
- The storage in Mass Memory of P/L data shall be interrupted in case the residual Mass Memory space becomes less than 6 Mbytes.

For the transmission to the TT&C Station, the TM Source packets shall be inserted into Frames belonging to two virtual channels:

- VC0, for Real Time data
- VC1, for Mass Memory dump data

The assignment to VC0 or to VC1 or to both VC0 and VC1 is performed by the OBDH S/W on the basis of the on board tables which define the VC assignments for each APID/Type/Subtype. These tables are modifiable by TC.

The transmission of the VC0 packets starts on the basis of the on board Contact Table. Hence, all VC0 packets transmitted before the SS&T / Satellite download link is established are lost.

The start of the VC1 packets transmission requires a TC from the TT&C Ground Station.

VC1 packets which are not downloaded during the contact, shall be downloaded at the next contact (TBC by CGS).

In this case, for the next orbit, the Mass Memory capacity is reduced by the amount of data left on board from the last orbit.

There is no automatic on-board procedure which reset the current content of the Mass Memory (TBC by CGS).

In case of need, the Mass Memory is reset by TC sent from ground (TBC by CGS).

The operation of the Communication S/S shall guarantee in nominal conditions a loss of Payload scientific data (both real time and mass memory data) lower than 1% (TBC).

The following sections analyses the TM fields which are relevant for the error detection and the data flow sorting operations to be performed on Ground on the received TM stream.

3.5.1.1 APID

As presented in AD [1], the AGILE TM Source Packets are generated by two Application Processes:

- the P/L Application Process
- the Bus Application Process

Hence, only two different values are foreseen for the APID field contained in the TM Source Packet Header:

- the P/L APID
- the Bus APID

3.5.1.2 PACKET TYPE AND PACKET SUBTYPE

For each APID, are foreseen a number of different types of Source Packet Data Field.

The type of data contained in the Source Packet Data Field is identified in the Source Packet Data Field Header by:

- the Packet Type
- the Packet Subtype

The P/L APID foresees about 25 different Type/Subtype combinations.

3.5.1.3 PACKET ERROR CONTROL

There are two error control fields:

- the Frame Error Control Word contained in the TM Transfer Frame Trailer
- the Packet Error Control Field of the Source Packet Header

As given in AD[1] page 49, since for AGILE mission there must not be used Reed-Solomon Coding for the TM data, a different standard procedure for the error coding has to be used, in order to be able to recognize errors in the data on the ground.

This is done by filling the above fields with the calculation of cyclic redundancy codes (CRC). This procedure does not give enough information to permit an error correction on the ground. **It is employed only in order to detect errors**.

It is noted that:

- the Frame CRC is used in both the APID Bus and the P/L Bus Transfer Frames
- the Packet CRC is used in the P/L APID Packets, but it is not used in the Bus APID TM Packets.

In addition, it is noted that, for the P/L generated packets, the verification on ground of the correctness of the Packet Error Control Field of the Source Packet Header is performed by setting the Packet Sequence Count, MM Page ID field, and MM Packet Counter field with all zeros. Indeed, these fields are preset to zero when the CRC is calculated by the P/L Application process, and afterwards they are set by the OBDH S/W with the actual values.

3.5.1.4 PACKET SEQUENTIAL COUNTERS

There are two packet sequential counters:

- The Packet Sequence Count (PSC) field (14 bit) of the Source Packet Header.
- The APID Sequence Counter (ASC) field (8 bit) of the Source Packet Data Field Header.

The packets are generated by the Application Process with their ASC. The ASC is generated separately by both the P/L and the Bus Application Processes.

The PSC field is preset by the P/L Application Process with all zeros.

The PSC field is preset by the P/L and the Bus Application Process with all zeros (TBC by CGS!!).

The final value of the PSC field is set by the Satellite OBDH S/W which generates the counter as follows (see AD [1] pag. 51):

- It dynamically increases.
- it will be counted separately modulo 16384 for each virtual channel (Real-Time or Dump) and for each APID.

The PSC counter is in charge of the OBDH S/W because, as mentioned in 3.5.1, the packets generated by the Bus and the P/L can be routed to the Real-Time channel, to the Dump one or to both ones.

The assignment and routing mechanism shown in Figure 3-3 is active all the time during the orbit. In particular, for each APID:

- the VC0 PSC is incremented also during the non visibility period, although the packets are discarded by the OBDH S/W;
- the VC1 PSC is incremented when the Mass Memory is full (TBC by CGS!!)

In the nominal case - i.e. all the Mass Memory is downloaded at every contact and no CRC error has been detected - the above mechanism leads to foresees that, **for each APID**:

- the VC1 PSC of the packet stream received on ground at each contact:
  - shall be contiguous among different contacts
  - shall increment for each new packet
- the VC0 PSC of the packet stream received on ground at each contact:
  - shall not be contiguous among different contacts
  - shall increment for each new packet
- the PSC shall not allow the identification of packets which are both in VC0 and VC1.

- The ASC shall not allow the identification of packets which are both in VC0 and VC1 (as it recycle time is too fast !).

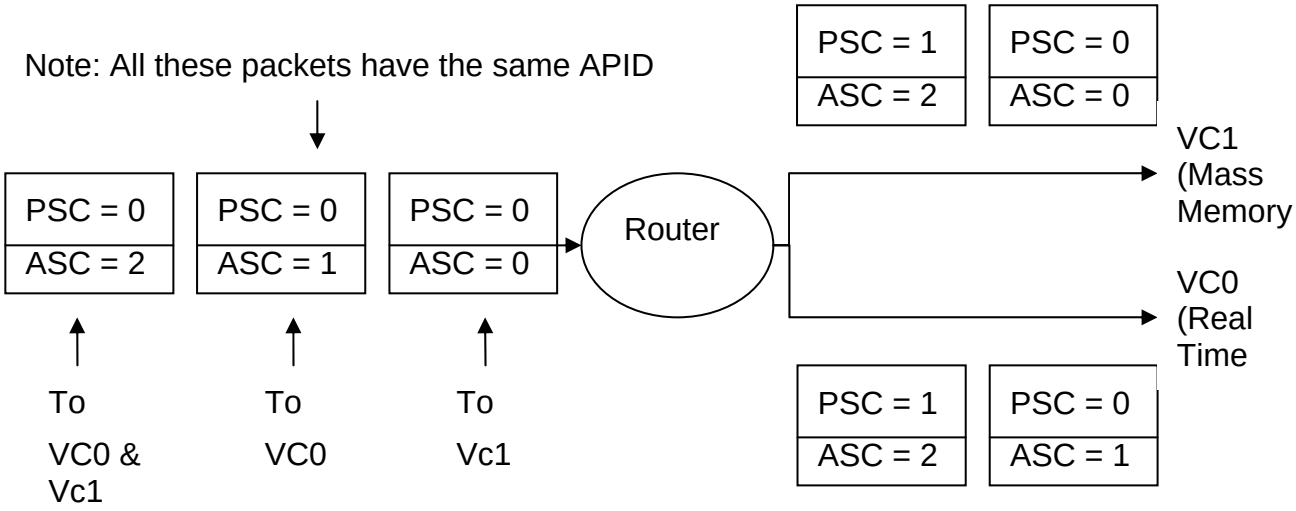

Figure 3-3 Routing rules for the Bus and the P/L generated packets

3.5.2 TT&C /SCC-MSC TM DATA FLOW

The following steps are identified:

1. During satellite visibility over the station:
   a) the TM shall be received at the TT&C from the satellite
   b) VC0 (Real-Time) TM shall be extracted and shall be sent to SCC
   c) VC1 (Mass Memory TM) shall be locally stored; to be sent to SCC at the end of the satellite pass.
2. At the end of the satellite pass
   a) the VC1 (Mass Memory TM) shall be sent to SCC.

The link budgets corresponding to the above steps is summarized in Table 3-1.

Step	Data	Data Amount (Mbit)	Link rate (Kbit/s)	Transfer time (s)	Transfer time (m)
	Real Time	6			
	Mass Memory	293			
1 a)	Real Time + Mass Memory	299	500	598	10
1 b)	Real Time	6	200	-	-
2 a)	Mass Memory	293	200	1465	24

Table 3-1 TT&C / SCC-MCC Data Transfer time budget

At TT&C Station, the following sorting, error detection and archive operations shall be performed by the Base Band equipment before data delivery to SCC:

- de-multiplex the Frames of different Virtual Channels
- verify the CRC in the Frame Error Control Word of the TM Transfer Frame Trailer
- archive locally the Frames (with an additional SCOS header which includes the Good/Bad flag resulting from the CRC control) into separated files:
  - **VC0 Transfer Frame TM file of contact *n***
  - **VC1 Transfer Frame TM file of contact *n***
- do not deliver to SCC the bad frames.

The overall elapsed time to be considered for step 2a) shall be dominated by the link rate, hence the time spent for the processing to be performed before the delivery to SCC is not taken into account (TBC by TPZ). The step 2a) data transfer shall be performed using ftp.

In case of TT&C / SCC link failure:

- step 1b) and step 2a) shall be postponed;
- the TT&C archive shall be able to contain up to 10 days of data;

3.5.3 SCC-MCC/ADC TM DATA FLOW

At SCC-MCC the following steps are identified (see RD[1] page 79):

1. During satellite contact *n* over the station:
   a) The VC0 (Real-Time) TM shall be received from the TT&C Station in near real time.
   b) At SCC, VC0 TM shall be automatically processed and archived by SCOS, which:
      i. shall extract the TM Source Packets from the Transfer Frames;
      ii. shall archive the TM Source Packets in the:
         - **Real Time TM Source Packets File of contact *n* (L0 RT TM File)**

      In the nominal case, the above operations shall be completed within TBD minutes since the end of satellite contact *n*.
   c) SCC shall extract from this TM data flow the P/L APID data and deliver these data to the archive located on the MCC workstation, for MCC purposes.
   d) In particolare sarà monitorata l'eventuale presenza, nella telemetria house-keeping, di allarmi relativi a "Gamma Ray Burst" e, nel caso, l'evento sarà notificato direttamente, tramite MCC, agli utenti incaricati di questa gestione al ADC (tramite ASINet). Questa notifica avverrà in tempo reale (< 5 min.) come richiesto da ASI a meno di problemi su ASINet che impediscano il collegamento con il centro di controllo (text extracted from RD [1]).
2. At the end of the satellite contact *n*:
   a) the VC1 (Mass Memory TM) shall be received from the TT&C Station, using ftp.
   b) At SCC, VC1 TM shall be automatically processed and archived by SCOS, which:
      i. shall extract the TM Source Packets from the Transfer Frames;

ii. shall archive the TM Source Packets in the:

- **Mass Memory TM Source Packets File of contact *n* (L0 MM TM File)**

In the nominal case, the above operations shall be completed within TBD minutes since the end of satellite contact *n*.

c) At completion of the archive operations, SCC-MCC shall make available the L0 RT TM file and the L0 MM TM file created at steps 1b) and 2b) above for the ftp transfer to ADC.

Each one of these files:

- shall be a byte stream of Source Packets, without any additional header/trailer
- shall contain both the Bus APID and the P/L APID Source Packets in the same order they have been originally inserted in the Transfer Frame by the Satellite OBDH (hence for each APID, the Source Packet are sorted by PSC).

The time required in order to transfer the data from SCC-MCC to ADC using the ASINet 256 Kbit/s link is given in Table 3-2.

Data	Data Amount (Mbit)	Link rate (Kbit/s)	Elapsed time (s)	Elapsed time (m)
L0 RT TM File (Bus+P/L)	6	256	23	0,4
L0 MM TM File (Bus+P/L)	293	256	1145	19,1

Table 3-2 SCC-MCC/ADC link budget

d) MCC shall keep a local archive related to the P/L data only. This archive shall be populated by specific tools devoted to extract the data from the general TM flow, as required by the MCC tasks (e.g. in order to generate the e-mail type-2 messages).

4 SPECIFIC REQUIREMENTS

This section presents the system requirements of the ADC Pre-Processing System (APS).

In this document, the requirements have been coded as follows:

[PP-NNNN-XXX-YYY], where:

PP	Pre-Processing Requirement	
NNNN	Progressive number, unique for each requirement	
XXX	One of the following classes:	
	SYS	Overall Pre-Processing
	DAC	Data Acquisition
	DPR	Data Processing
	DAR	Data Archiving
YYY	One of the following requirement classes:	
	FUN	Functional
	PER	Performance
	OPE	Operational
	TVA	Test & Verification

Each requirement indicates the verification methods, which is defined as:

Analysis [A]

This verification method implies use of analytical techniques (such as system engineering analysis, statistics, mathematical modeling, simulations) and shall be used to verify such requirements.

Review of Design [D]

This verification method may be used when approved design reports, technical descriptions, engineering drawings unambiguously show that the requirement is met.

Inspection [I]

Verification by inspection is only done when testing is insufficient or inappropriate. This method of verification is for those requirements that are normally performed by some form of visual inspection. This would include workmanship, labeling, envelope requirements etc.

Demonstration [M]

This verification method may be used when actual conduct can verify achievement of requirements such as service and access, transportability, human engineering features and processes hardware. A requirement which is of an operational or functional nature and is not quantified by a specific measurable parameter may be verified by demonstration.

Similarity [S]

This verification method may be used when there is proof that the item is similar or identical in design and manufacturing processes to another previously qualified to equivalent or more stringent criteria.

Test [T]

A requirement may be verified by test alone if the form of the specification is such that the requirement can be directly measured.

4.1 Capability Requirements

4.1.1 OVERALL REQUIREMENTS

PP-0010-SYS-FUN	APS input data	[D]

The APS input data shall consist of:

1) the whole Satellite TM data received at each contact, which shall be transferred to ADC within the next contact, through the ASINet, namely:
   a. Real Time TM Source Packets File of contact *n* (L0 RT TM File)
   b. Mass Memory TM Source Packets File of contact *n* (L0 MM TM File)
2) the periodic backup of the whole TM, which shall be transferred to ADC on removable media (e.g. CDRom).

PP-0020-SYS-FUN	APS tasks	[D]

The APS shall include the following main tasks:

1) **Data Acquisition,** which shall gather the new input TM files made available at ADC and store them into a local temporary area (Temporary Archive)
2) **Data Processing**, which shall access each new L0 TM file contained in the APS Temporary Archive in order:
   a) to verify and sort the Bus and the P/L TM Source Packets;
   b) to create a raw file containing the Bus TM Source Packets;
   c) to unpack the P/L TM Source Packets and save them on the Temporary Archive into a set of files rewritten in a different format.
3) **Data Archiving**, which shall take care of the following operations:
   a) Creation and maintenance of the L0/L1 Consolidated Archive;
   b) Maintenance of the Temporary Archive;
   c) Creation and maintenance of the L0/L1 Permanent Archive.

PP-0030-SYS-FUN	APS output data	[T]

The APS output data which shall be available to the other ADC Subsystems shall consist of the Consolidated Archive and the Permanent Archive containing:

a) the L0 Data
b) the L1 Data.

The Temporary Archive shall be accessible only in case of emergency (i.e. Consolidated Archive failure).

PP-0040-SYS-PER	APS performances [T]

The L0 Data available on a local APS storage device at time T_0 shall be processed and shall be available on the Consolidated Archive together the corresponding L1 Data within the times specified in Table 4-1.

Data of Contact *n*	Time
Whole L0 Data	T_0 + 5 minutes
L1 Data Subset (e.g. Burst related data)	T_0 + 10 minutes
Whole L1 Data	T_0 + 30 minutes

Table 4-1 APS performances

PP-0050-SYS-PER	Consolidated Archive capacity [T]

The L0/L1 Data on the Consolidated Archive shall remain accessible for the minimum period of 12 months.

4.1.2 DATA ACQUISITION REQUIREMENTS

PP-0200-DAC-FUN	Temporary Archive Location	[D]

The Temporary Archive shall be located on a storage device local to the APS subsystem.

PP-0210-DAC-FUN	L0 TM Files Acquisition	[D]

After each satellite contact *n*, the APS shall copy on the Temporary Archive the new L0 TM Files made available at ADC, namely:

a. Real Time TM Source Packets File of contact *n* (L0 RT TM File)

b. Mass Memory TM Source Packets File of contact *n* (L0 MM TM File)

PP-0220-DAC-PER	L0 TM Files size	[D]

The L0 TM files generated at each contact shall have the size given in Table 4-2

File	Average size (Mbytes)	Maximum size (Mbytes)
L0 RT TM	0.75 (TBC)	1 (TBC)
L0 MM TM	37.5 (TBC)	50 (TBC)

Table 4-2 L0 TM Files size

PP-0230-DAC-FUN	L0 TM Files Availability	[T]

The following mechanism shall be used by the APS in order to start timely the copy on a local APS storage device of new L0 TM files available at ADC:

a. TBD

PP-0240-DAC-FUN	L0 Temporary Archive Directory Structure	[T]

The Temporary Archive Directory tree shall be structured in order to provide:

a. One top directory for the L0 Data
b. One level-1 subdirectory for the TM Data
c. One level-2 subdirectory for each contact, which shall contain the TM files pertaining to the same contact *n*, i.e.
    i. L0 RT File
    ii. L0 MM File

PP-0250-DAC-FUN	L0 Temporary Archive File Naming	[T]

The name and the extension assigned to each TM file contained in the L0 Temporary Archive shall allow the identification of:

a. the data flow, i.e.:
    i. RT TM Data;
    ii. MM TM Data
b. the time reference, i.e.:
    i. Satellite Contact number
c. a progressive number, defined within the same Contact
d. the data level, i.e.:
    i. level L0

PP-0260-DAC-PER	L0 Temporary Archive capacity	[T]

The Temporary Archive shall be able to contain at least 10 days of L0 TM Data.

4.1.3 DATA PROCESSING REQUIREMENTS

PP-0400-DPR-FUN	Data Processing tasks	[D]

The APS shall access each L0 TM files of the Temporary Archive in order:

a. to filter out the TM Source Packets which do not pass the CRC verification;
b. to select the P/L TM Source Packet, extract the data and save them on Temporary Archive into a set of files, sorted by Type/Subtype and rewritten in the FITS format (L1 P/L Data);
c. to select the Bus TM data Source Packet and save them on Temporary Archive into a new file without any format transformation (L1 Bus Data).

PP-0410-DPR-FUN	L1 Temporary Archive Directory Structure	[D]

The L1 Temporary Archive Directory tree shall be structured in order to provide:

a. One top directory for the L1 Data
b. One level-1 subdirectory for the TM Data
c. One level-2 subdirectory for each contact, which shall contain the TM files pertaining to the same contact *n*, i.e.
    i. L1 RT Files
    ii. L1 MM Files

PP-0420-DPR-FUN	L1 Temporary Archive File Naming	[D]

The name and the extension assigned to each TM file contained in the L1 Temporary Archive shall allow the identification of:

a. the data flow, i.e.:
    i. RT TM Data;
    ii. MM TM Data
b. the time reference, i.e.:
    i. Satellite Contact number
c. a progressive number, defined within the same Contact
d. the data level, i.e.:
    i. level L1

PP-0430-DAC-FUN	L1 Temporary Archive Capacity	[D]

The Temporary Archive shall be able to contain at least 10 days of L1 TM Data.

4.1.4 DATA ARCHIVE REQUIREMENTS

PP-0600-DAR-FUN	Consolidated Archive creation	[T]

The APS shall copy under the Consolidated Archive top directory the files created in the Temporary Archive by the Data Acquisition task and the Data Processing task.

To this purpose, the APS shall be able to create under the Consolidated Archive top directory any required subdirectory.

PP-0610-DAR-FUN	Temporary Archive maintenance	[T]

The APS shall maintain the Temporary Archive by removing the files which have been copied on the Consolidated Archive and have expired the maximum permanence period.

PP-0620-DAR-FUN	Permanent Archive device	[D]

The Permanent Archive shall reside on removable media (e.g. DVD).

PP-0630-DAR-FUN	L0 Permanent Archive creation	[D]

The APS shall copy on the Permanent Archive removable media (e.g. DVD) the L0 Files pertaining to a set of contiguous contacts.

To this purpose, the APS shall be able to create in the Permanent Archive media any required subdirectory.

PP-0640-DAR-FUN	L0 Permanent Archive media content	[D]

The L0 files pertaining to a given contact shall not be split into different Permanent Archive media.

PP-0650-DAR-FUN	L1 Permanent Archive creation	[D]

The APS shall copy on the Permanent Archive removable media (e.g. DVD) the L1 Files pertaining to a set of contiguous contacts.

PP-0660-DAR-FUN	L1 Permanent Archive media content	[D]

The L1 files pertaining to a given contact shall not be split into different Permanent Archive media.

PP-0670-DAR-FUN	Consolidated Archive maintenance	[D]

The APS shall maintain the Consolidated Archive by removing the files which have been copied on the Permanent Archive and have expired the maximum permanence period.

4.2 Constraint Requirements

4.2.1 INTERFACE REQUIREMENTS

4.2.1.1 DATA FORMAT

PP-0800-SYS-FUN	Input Data file specifications	[T]

The naming and the layout of the L0 TM files shall be compliant with AD[4], AD[5], and AD[6].

PP-0810-SYS-FUN	Output Data: L0 Data file specifications	[T]

The input data files (L0 TM files) shall be archived in the Consolidated Archive as follows:

a) the file path and the file name shall be compliant to the specifications given in the present document.

b) the file content shall not be changed.

PP-0820-SYS-FUN	Output Data: L1 Bus Data file specifications	[T]

The L1 Bus Data files shall be archived in the Consolidated Archive as follows:

a) the file path and the file name shall be compliant with the specifications given in the present document.

b) the file shall contain the L1 Bus TM Source Packets extracted from the L0 TM Data and rewritten without any modification.

PP-0830-SYS-FUN	Output Data: L1 P/L Data file specifications	[T]

The L1 P/L Data files shall be archived in the Consolidated Archive as follows:

a) the file path and the file name shall be compliant with the specifications given in the present document.

b) the file layout shall be compliant with specifications given in the AD[7] Interface Control Document.

4.2.1.2 COMMUNICATION INTERFACES

PP-0900-SYS-FUN	LAN Communication	[D]

The APS computer shall communicate with the other ADC computers through the Local Area Network established within ADC.

PP-0910-SYS-FUN	Input Data Acquisition	[T]

The APS shall acquire the input data through the ftp protocol.

PP-0920-SYS-FUN	Temporary Archive access	[T]

The Temporary Archive shall be accessible through the ftp protocol.

PP-0930-SYS-FUN	Consolidated Archive access	[T]

The Consolidated Archive shall be accessible through the NFS protocol.

4.2.1.3 HARDWARE INTERFACES

PP-1000-SYS-FUN	System Platform	[D]

The system platform shall be based on a PC running the Linux Operating System.

PP-1010-SYS-FUN	LAN Network I/F	[D]

The APS computer shall be equipped with a Ethernet LAN 1000/100 Megabit I/F.

4.2.1.4 SOFTWARE INTERFACES

PP-1100-SYS-FUN	Development Software	[D]

The APS software shall be developed and maintained using the Linux standard tools (make, configure, gcc, CVS, Qt), the Qt and the Root libraries, and the IDE available under the Gnome and the KDE Desktop Environment (Anjuta, Kdevelop).

4.2.1.5 USER INTERFACES

PP-1200-SYS-FUN	TBD	[D]

TBD

4.2.2 ADAPTABILITY

PP-1400-SYS-FUN	TBD	[D]

TBD

4.2.3 AVAILABILITY

PP-1600-SYS-FUN	TBD	[D]

TBD

4.2.4 PORTABLITY

PP-1800-SYS-FUN	TBD	[D]

The APS software shall be portable to any Linux system providing the Linux standard tools (make, configure, gcc, CVS, Qt), the Qt and the Root libraries.

4.2.5 SECURITY

PP-2000-SYS-FUN	TBD	[D]

TBD

4.2.6 SAFETY

PP-2400-SYS-FUN	TBD	[D]

TBD

4.2.7 STANDARDS

PP-2600-SYS-FUN	TBD	[D]

TBD