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PREPARED BY: M. TRIFOGLIO, A. BULGARELLI, F. GIANOTTI

CHECKED BY:

SUBSYSTEM MANAGER: **DATE:**

APPROVED BY:

SUBSYSTEM LEADER: **DATE:**

PRINCIPAL INVESTIGATOR: M. TAVANI **DATE:**

PAYLOAD MANAGER: A. ZAMBRA **DATE:**

PAPM: **DATE:**

CONFIGURATION: B. SCHENA **DATE:**

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CHANGE RECORD

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1 INTRODUCTION

1.1 Scope and Purpose of the Document

The TM PPS Pipeline shall be run at ASDC in order to acquire, archive and process every VC0 and VC1 Raw TM file received from the Ground Segment at the end of each satellite contact. To this purpose, the TM PPS Pipeline shall be installed on both the Primary and the Backup PPS computers available at ASDC.

For each L0 file the Pipeline shall generate a set of FITS Files (L1 File) which shall be archived and made available to the ASDC Processing Pipeline.

It shall be possible to run the Pipeline either in on-line mode or in off-line mode.

In the former, the Pipeline shall process the L0 files as soon as they are available at ASDC.

The latter is mainly foreseen in order to perform the re-processing of the L0 files related to a set of Contact Numbers using a specific build version of the Pipeline.

The present document provides the basic information required in order to retrieve, install, configure, and test the build release TMPPS001 of the TM PPS Pipeline.

The current release represents the software prototype which demostrates the basic architecture and functionalities of the Pipeline.

1.2 Document Overview

Chapter 2 gives an overview of the Pipeline. The software environment required for the prototype installation and test is presented in Chapter 3.

Chapter 4 and 5 detail the operations to be performed in order to install and test the prototype.

1.3 Acronyms

AC	Anti-coincidence auxiliary subsystem
AOCC	AGILE Operation & Control Center
ASDC	Agile Science Data Center
ASC	APID Sequence Counter
AUX	Auxiliary Data
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
L0	Level-0
L1	Level-1
MCAL	Mini-calorimeter detector

PD	Photo Diode
PDHU	Payload Data handling Unit
PPS	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] A.Bulgarelli, F.Gianotti, M.Trifoglio, AGILE-ITE-SR-007, "AGILE Science Console and Pre-Processing Software Requirement Document", IASF Sez. di Bologna Report 378/03

AD [2] M.Trifoglio, A.Bulgarelli, F.Gianotti, AGILE-ITE-SR-009, "AGILE Data Center Pre-Processing System (APS) Requirements", IASF Sez. di Bologna Report 383/03.

AD [3] Ground segment requirement document, AGRTI-RQ-TPZ-001

AD [4] Ground Segment Interface Control Document CCE-ICD-001-180.320, Issue 4.1, 12/12/2005

AD [5] AGILE RTI COMMUNICATION ICD AGRTI-IC-CGS-002, Issue 2.0, 15 Jan. 04

AD [6] AGILE Scientific Data Center – TM Pre-Processing System ICD, AGILE-ITE-ID-007, Issue 01, INAF/IASF Bologna Report 443/06

2.2 Reference Documents

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-002, PacketLib Detailed Design Report, AGILE-ITE-SD-002, IASF Sez. di Bologna Report 350/02

RD [4] A.Bulgarelli, F.Gianotti, M.Trifoglio, PacketLib Reference Manual, INAF/IASF Sez. di Bologna Report 411/05

RD [5] A.Bulgarelli, F.Gianotti, M.Trifoglio, AGILE-ITE-SD-001, PacketLib Programmer's Guide, AGILE-ITE-SD-001, INAF/IASF Sez. di Bologna Report 410/05

RD [6] A.Bulgarelli, F.Gianotti, M.Trifoglio, AGILE-ITE-SD-001, ProcessorLib Programmer's Guide, AGILE-ITE-SD-001, IASF Sez. di Bologna Report 349/02

RD [7] 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,

RD [8] 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 TM PPS PIPELINE

3.1 System Overview

The Pipeline consists of two main components:

- the **Pre-Processing Engine**: a set of Perl Scripts which implement the state machine that configure and sequence the Pipeline operations and invoke the Pre-Processing Tasks ;
- the **Pre-Processing Tasks:** a set of C and C++ programs which have been derived from the Provider task and the Processor tasks developed for the AGILE EGSE Science Console.

After the startup and initialisation phase, the Engine waits for the synchronization files in the Prime and Backup ftp Areas (IDLE status).

Once a synchronization file is detetected, it changes its status to "running", and and extracts the corresponding L0 file from the compressed L0 file, which should be available in the same ftp Area.

In case no other version of the same L0 compressed file is available in the Temporary Archive, both the compressed and uncompressed L0 files are moved to the Temporary Archive and the L0 file is submitted to the Pre-Processing Tasks.

Otherwise, it is evaluated whether it is worth to reprocess the L0 file.

In on-line mode, the new L0 file is discarded if the old L0 file has already been processed successfully. If not, either the old or the new version is processed, and the new version is preferred only in case it is bigger than the old version.

In off-line mode the processing is always carried out on the new version, and the old version is discarded.

From the byte stream of each L0 file to be processed, the Pre-Processing Tasks identify and sort by APID/Type/Subtype the variuos TM packets, and for each of them create the L1 file containing the TM packet data arranged in FITS format.

Once the Pre-Processing Tasks have been completed, the Pre-Processing Engine proceeds to the Archiving operations: The the original compressed L0 file is kept, the uncompressed L0 file is discarded, the L1 files are compressed. All these files are copied from the Temporary Archive to the Consolidated Archive.

The completion of these Pre-Processing and Archiving operations for the given L0 file is notified by creating the corresponding synchronisation file in the Synch Area.

3.2 Limitations of the current release

As already mentioned, this release is representative of the basic architecture and functionalities of the TM PPS Pipeline specified in AD[2] and AD[6].

With respect these documents, the following major limitations are identified:

- The CVS Repository for the Open Source External Libraries has not been implemeted yet. For the time being, the present document provides the information required to retreive these libraries from the Internet network.
- The mirror of the CVS Repository for the TMPPS software has not been setup at ASDC yet. For the time being, the present document provides the information required to retreive this software from the *asdc* repository of the CVS Server installed on *gtb.iasfbo.inaf.it,* IASF-Bologna.
- The Data Base TM_PPS and TM_ADC Data Bases are missing, waiting for a better definition of the mechanism which shall coordinate the two PPS computers for the trasferring of the files from the Temporary Archive to the Consolidated Archive;
- The CNT synchronisation file is missing, waiting for a better definition of the criteria which define the conditions for the file creation.

3.3 Installation Overview

From the installation point of view, the TMPPS Pipeline consist of:

- **TM PPS Installation software**: Scripts which define the required Shell environment variables and automate the software installation.
- **External Software**: Open Source C/C++ Libraries and Open Source Perl Modules retrievable from Internet.
- **TM PPS Pipeline software**: Perl Modules and scripts, Bash Shell Scripts, C/C++ programs and Libraries which have been developed specifically for the TMPPS Pipeline.

The TMPPS software is retrievable from the *asdc* repository of the CVS Server installed on *gtb.iasfbo.inaf.it,* IASF-Bologna.

Each version is identified by a given CVS tag of the form "*TMPPSxxx*". In the present document it is assumed that the version to be installed is assigned to the Bash Environment variable $TMPPS_VERSION.

The following sections presents the operations to be carried out to install the present version of the TMPPS Pipeline from scratch, i.e.:

- the operations to be performed by the *System Administrator* in order to setup:
  - suitable groups and users
  - suitable directories for the archiving of the TMPPS incoming and the outcoming data files.
- the operations to be performed by the *TMPPS Administrator* in order to install under the */usr/local_tmpps/* directory the software to be accessible by all the TM PPS Users, namely:
  - the TMPPS Installation Scripts
  - the External software
- the operations to be performed by the *TMPPS User* in order to:
  - modify the .bashrc file to obtain the required environment setup
  - install under the Home directory the TM PPS Pipeline software.

In the current CVS setup of the *asdc* repository:

- the TMPPS Admnistrator has read/write access
- the TMPPS Users have read only access.

Once the above installation is completed, it is possible to test the Pipeline by simply feeding the ftp Area with the Data Files provided with the present release.

4 SOFTWARE INSTALLATION

4.1 System Administrator's operations

This section presents the minimum setup to be provided by the System Administrator for the installation and test of the current release. Further details are given in the System Configuration section of the document AD[6].

4.1.1 USER GROUPS

- Define the groups:

  ftp

  iasfbo

4.1.2 FTP USERS

- Define the user:

  tm_ftp:ftp

- Create and setup the ftp area:

  mkdir -p ~tm_ftp/tmpps/ftp_area/Prime

  mkdir -p ~tm_ftp/tmpps/ftp_area/Backup

  chown -R tm_ftp:ftp ~tm_ftp/tmpps

  chmod -R 770 ~tm_ftp/tmpps

4.1.3 PRE-PROCESSING USERS

- Define the users:

  tmpps:iasfbo tmpps:ftp (TMPPS Administrator)

  gs:iasfbo gs:ftp (TMPPS User)

4.1.4 SYSTEM SOFTWARE

Linux Suse 9.2 , 32 bit installation (updated until 15/09/2006), with a standard installation for what concerns:

gcc

perl installed under */usr/lib/perl5/*

4.1.5 DISC ACCESS

- Create the directory for the External software:

  mkdir -p /usr/local_tmpps

  chown -R tmpps:iasfbo /usr/local_tmpps

- Create for the TMPPS user the data root directory for the archiving of the TMPPS incoming and the outcoming data files., e.g.:

mkdir -p /data2/gs
chown gs:iasfbo /data2/gs

4.2 TMPPS Administrator's operations

4.2.1 TMPPS INSTALLATION SCRIPTS

- login as *tmpps* user
- define the required TMPPS release version to be installed, e.g.:

  export TMPPS_VERSION="TMPPS001"
- login into the CVS Repository

  export CVSROOT=":pserver:$USER@gtb.iasfbo.inaf.it:/home/repository/cvs/asdc"
- install the installation scripts:

  cd /usr/local_tmpps

  cvs co -d etc -r $TMPPS_VERSION BUILD_ASDC_TMPPS/etc

  This operaration shall retrieve the files:

  etc/install_tmpps.sh the script for the installation of the TMPPS software

  etc/profile_tmpps the script for the setup of the Bash Environment variables
- modify the $HOME/.bashrc file in order to automate the execution of the profile_tmpps file, i.e. add the statement:

  test -f /usr/local_tmpps/etc/profile_tmpps && . /usr/local_tmpps/etc/profile_tmpps

  (note the dot after &&).

4.2.2 CPAN MODULES

The Pre-Processing Engine requires the following specific CPAN Modules:

- Module::Build
- *POE*
- *Module::Starter*
- *Module::Starter::PBP*
- *Archive::Zip*

For the time being, these modules should be retrieved from the Internet network using the *cpan* program as follows. It is assumed that they are backward compatible with the version which was available at the time of writing.

- Login as *tmpps* user.
- In case the *~/.cpan* directory exists, verify that the ~/.cpan/CPAN/MyConfig.pm defines:
  'makepl_arg' => q[PREFIX=/usr/local_tmpps/perl],
  'make_arg' => q[-j3], *(this in case of a dual processor system)*
  'make_install_arg' => q[UNINST=1],
  Hence, run the cpan program:
  ~> perl -MCPAN -e shell
- Otherwise, run the program which creates the *.~/cpan* directory and the above configuration file, i.e.;

  > perl -MCPAN -e shell

  This shall allow you to define the *'makepl_arg'* and *'make_install_arg'* above, i.e.:

  .....

  Every Makefile.PL is run by perl in a separate process. Likewise we
  run 'make' and 'make install' in processes. If you have any
  parameters (e.g. PREFIX, LIB, UNINST or the like) you want to pass
  to the calls, please specify them here.
  If you don't understand this question, just press ENTER.
  Parameters for the 'perl Makefile.PL' command?
  Typical frequently used settings:
  PREFIX=~/perl non-root users (please see manual for more hints)
  Your choice: [] PREFIX=**/usr/local_tmpps/perl**

  .....

  .....

  Parameters for the 'make' command?
  Typical frequently used setting:
  -j3 dual processor system
  Your choice: [] **-j3**
  Parameters for the 'make install' command?
  Typical frequently used setting:
  UNINST=1 to always uninstall potentially conflicting files

Your choice: [-j3] **UNINST=1**

.....

- Using the cpan program, install the Build module, which is required to proceed with the installation of the remaining CPAN Modules:

  cpan> ***install Module::Build***

- Using the cpan install command, install the remaining CPAN Modules listed above.
- Confirm the installation of any additional CPAN Module identified by the cpan program.

4.2.3 OPEN SOURCE LIBRARIES

The TMPPS software requires the following Open Source libraries:

- *cfitsio*
- *ftools*
- *ncurses*
- *qt*

For the time being, these libraries should be retreived from the Internet network.

They have to be installed by the TMPPS Administrator under the directory tree:

/usr/local_tmpps

The present Pipeline version has been developed and tested with the versions listed below. Hereafter are shown also the symbolic links to be created.

```
tesp87:/usr # ls -lia local_tmpps/
total 7
547542 drwxr-xr-x   7 tmpps   iasfbo     264 Jul 13 11:24 .
    65 drwxr-xr-x  15 root    root       440 Jul 14 09:06 ..
665738 lrwxrwxrwx   1 tmpps   iasfbo      12 Jul 13 11:24 cfitsio -> cfitsio3006/
497505 drwxr-xr-x   4 tmpps   iasfbo    6272 Jul 13 11:19 cfitsio3006
665739 lrwxrwxrwx   1 tmpps   iasfbo      35 Jul 13 11:24 ftools -> lheasoft/i686-pc-linux-gnu-libc2.1/
661689 drwxr-xr-x   5 tmpps   iasfbo     280 Jul 13 11:22 lheasoft
647942 drwxr-xr-x   7 tmpps   iasfbo     168 Jul 13 11:20 ncurses
665737 lrwxrwxrwx   1 tmpps   iasfbo      18 Jul 13 11:23 qt -> qt-x11-free-3.3.3/
539843 drwxr-xr-x  17 tmpps   iasfbo     808 Jul 13 11:21 qt-x11-free-3.3.3
```

4.3 TMPPS User's operations

Once the system has been setup as detailed above, any TMPPS User shall be able to install the TM PPS Pipeline software under the home directory.

The installation procedure is presented hereafter.

4.3.1 ENVIRONMENT SETUP

- login as TMPPS user (e.g.: gs)
- modify the $HOME/.bashrc file in order to automate the execution of the profile_tmpps file, i.e. add the statement:

  test -f /usr/local_tmpps/etc/profile_tmpps && . /usr/local_tmpps/etc/profile_tmpps

  - *(note the dot after &&).*

4.3.2 INSTALL THE TM PPS SOFTWARE

- login as TMPPS user (e.g.: gs)
- set the $TMPPS_VERSION env. variable to the TMPPSxxx Build Release to be installed:

  export TMPPS_VERSION="TMPPS001"

- execute the installation script:

  /usr/local_tmpps/etc/install_tmpps.sh $TMPPS_VERSION

This is a three-step procedure. At at each step, the procedure shall ask your confirmation before proceeding.

- Step 1: CVS checkout of TMPPS Build Module

  This module contains the Makefile to be used in the other steps in order to checkout, compile and install all the TMPPS Software Modules.

  The Build module is checked out to the directory $HOME/BUILD_ASDC_TMPPS.$TMPPS_VERSION directory (saving the old one if any)

- Step 2: CVS checkout of Pre-Processing Engine and Pre-Processing Tasks

  This step performs the checkout of all the required Modules under the *Project* subdirectory of the directory created at the previous step

- Step 3: Installation of Pre-Processing Engine and Pre-Processing Tasks

  This step compile all the modules checked out in the previous step, installs all the binaries and the required files under the $HOME/local.$TMPPS_VERSION (saving the old one if any), and points this directory with the symbolic link $HOME/local.

4.4 TMPPS Pipeline Software Configuration

4.4.1 PRE-PROCESSING ENGINE CONFIGURATION

In order to define the root directories where the Pipeline shall create the data directories foreseen in AD[6], the TMPPS User should include in the *.bashrc* file the definition of the following environment variables:

$TMPPS_FTP_ROOT

$TMPPS_TEMP_ROOT

$TMPPS_CONS_ROOT

The $TMPPS_FTP_ROOT variable should be set to the $HOME directory of the tm_ftp user, i.e.:

export TMPPS_FTP_ROOT="~tm:ftp"

If the above variables have not been defined by the user, at startup they are set by the Pipeline to the default value:

"/data2/$USER"

Before running the Pipeline, the TMPPS User should verify that the root directories defined by the above variables exist and give write access to the User.

At run time, the setting of the data directories foreseen in AD[6] is derived from the above variable as follows.

- $TM_FTP = $TMPPS_FTP_ROOT/tmpps/ftp_area
- $TM_SCR_FTP=$TMPPS_TEMP_ROOT/tmpps/scratch_ftp
- $TM_TMP=$TMPPS_TEMP_ROOT/tmpps/tmp_archive
- $TM_SCR_TMP=$TMPPS_TEMP_ROOT/tmpps/scratch_tmp
- $TM_CON_L0=$TMPPS_CONS_ROOT/tmpps/cons_archive
- $TM_CON_L1=$TMPPS_CONS_ROOT/tmpps/cons_archive
- $TM_CON_LG=$TMPPS_CONS_ROOT/tmpps/cons_archive
- $TM_SYN=$TMPPS_CONS_ROOT/tmpps/sync_area

No other specific configuration is required for the present release.

It is noted that all the configurable parameters are specified in the files:

- $HOME/local/perl/bin/config.SC
- $HOME/local/perl/bin/config.GS

The former is specific to the L0 files generated by the Science Console during the Payload and Satellite AIV. This is the file used for the testing of the present release.

The latter is not used yet. It shall be finalised as soon as L0 file generated by the Ground Segment shall be available.

4.4.2 PRE-PROCESSING TASKS CONFIGURATION

No specific configuration is required. At startup, the TMPPS software makes sure that the string assigned to BASE_DATA_DIR in the file:

~/local.$TMPPS_VERSION/DISCoSConf/ base_data_dir_conf.dat

is the same string assigned to **tm_tmp_root** in the Pre-Processing Engine configuration file, with and addional trailing "/", e.g.:

BASE_DATA_DIR = /data2/gtb/tmpps/tmp_archive/

tm_tmp_root: /data2/gtb/tmpps/tmp_archive

5 RUNNING THE PRE-PROCESSING PIPELINE

As already mentioned, once the installation procedure has been completed, the build version of the Pre-Processing Pipeline specified during the installation is available under the specific *local.$TMPPS_VERSION* subdirectory tree of the TMPPS User home directory and is pointed by the $HOME/local simbolic link.

In order to test the Pipeline:

- login as TMPPS user
- run the Pre-Processing Engine as follows:

~> tmpps.pl SC

At startup, the Pipeline shall create the data directories mentioned in the previous section and wait for the data files in the Ftp Area.

The Data directory of the distribution contains the test files which should be transferred to the Ftp Area.

In order to simulate the on-line operations:

- the $TMPPS_FTP_ROOT variable should point to the home directory of the tm_ftp user
- the file transfer should be performed using an ftp client.

Reduced tests can be performed by copying the data files to $TMPPS_FTP_ROOT/Prime (or Backup) , e.g.:

cp /home/gs/BUILD_ASDC_TMPPS.$TMPPS_VERSION/Data/*.dat.gz /data2/gtb/tmpps/ftp_area/Prime

cp /home/gs/BUILD_ASDC_TMPPS.$TMPPS_VERSION/Data/*.dat.ok /data2/gtb/tmpps/ftp_area/Prime

Once available in the Ftp Area, the data files shall be processed automatically by the Pipeline which shall populate the Temporary Archive and the Consolidated Archive.