

WE LOOK AFTER THE EARTH BEAT

# *Euclidem*

## Demonstrator of the Euclid Mission File Management Service (FMS) & CCSDS File Delivery Protocol (CFDP)

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- Validation of the MMU File Management Service (FMS) concept as tailored and deployed for the Euclid mission.
- Validation of the CCSDS File Delivery Protocol (CFDP) as tailored and deployed for the Euclid mission.
- Identification and characterization of a set of mission-specific FMS and CFDP parameters allowing:
  - Configuration of the FMS.
  - Tuning of CFDP behaviour for balancing all the factors contributing to the overall performances and on-board resources sizing.
- Evaluation of the CFDP performances for single and concurrent file uplink and downlink operations.

# EucliDem Purposes – FMS & CFDP Mission Reference Needs

<i>Files</i>	<i>Source Filestore</i>	<i>Destination Filestore</i>	<i>Link</i>	<i>Notes</i>
Spacecraft HK TM, OBSW Images, OBSW Patches, OBCPs	MMU	Ground	K-band for file data PDUs X-band for directive PDUs	K-band is nominally used for downlinking files using CFDP Class 2 transfers. When K-band is available, the X-band (more reliable) is used to transmit the directive PDUs.
Spacecraft HK TM, OBSW Images, OBSW Patches, OBCPs	MMU	Ground	X-band for file data PDUs X-band for directive PDUs	X-band is used for downlinking of these files only in contingency situations or during LEOP, when the usage of the K-band is not yet allowed. The files downlink is performed according to the CFDP Class 2 requirements.
Science Data	MMU	Ground	K-band for file data PDUs X-band for directive PDUs	K-band is nominally used for downlinking files using CFDP Class 2 transfers. When K-band is available, the X-band (more reliable) is used to transmit the directive PDUs.
OBSW Images, OBSW Patches, OBCPs	Ground	MMU	X-band for file data PDUs X-band for directive PDUs	X-band is used for uplinking files using CFDP Class 1 transfers.





- EucliDem specification and development started on **15 Sep 2013**.
- EucliDem incremental deliveries have been provided since **1 Dec 2013**.
- EucliDem 1.0 full release delivered to TASI-TO on **31 Jan 2014**.
- EucliDem is being used at TASI-TO for setting up a set of representative mission scenarios.
- EucliDem is being used at TASI-RM for:
  - executing the validation tests
  - measuring the CFDP on-board logic performances
  - improving the graphical representation of the results

- Emulates the Ground system filestores user(s).
- Emulates the Ground CFDP User and Entity.
- Implements the on-board File Management Service (PUS 140).
- Implements the on-board CFDP User and Entity.
- Implements a minimal set of PUS services for supporting the execution of the main demonstrator on-board functions:
  - PUS 1 – PUS TC and PDU TC verification and dispatching service
  - PUS 3 – Housekeeping TM for FMS and CFDP status cyclic reporting
  - PUS 5 – Events reporting for FMS and CFDP functions
  - PUS 14 – Telemetry forwarding for the FMS, CFDP and supporting services
- Emulates the science data acquisition from up to 5 input ports.

## ➤ On-board Directories Management

- TC[140,1] – Create Directory
- TC[140,2] – Delete Directory
- TC[140,3] – Rename Directory
- TC[140,4] – Lock Directory
- TC[140,5] – Unlock Directory
- TC[140,6] – Report Root Contents
- TM[140,7] – Root Attributes Report
- TM[140,8] – Directory Attributes Report
- TC[140,9] – Report Directory Contents
- TM[140,10] – Directory Contents Report

root

directory 1

file 1.1

...

file 1. $m_1$

...

directory  $n$

file  $n.1$

...

file  $n.m_n$

# EucliDem Main Functions – File Management Service

## ➤ On-board Files Management (not related to CFDP)

- TC[140,20] – Create File
- TC[140,21] – Delete File
- TC[140,22] – Open File (*allows to set a link to an input port for storing the science data*)
- TC[140,23] – Close File
- TC[140,24] – Rename File
- TC[140,25] – Lock File
- TC[140,26] – Unlock File
- TC[140,27] – Seek File
- TC[140,28] – Read File Data
- TM[140,29] – File Data Report
- TC[140,30] – Write File Data
- TC[140,31] – Compute File Checksum
- TM[140,32] – File Checksum Report

root

directory 1

file 1.1

...

file 1.m<sub>1</sub>

...

directory n

file n.1

...

file n.m<sub>n</sub>



## ➤ On-board Files Management (related to CFDP)

- TC[140,50] – Copy File
- TC[140,51] – Suspend Copy Operation
- TC[140,52] – Resume Copy Operation
- TC[140,53] – Cancel Copy Operation
- TC[140,54] – Set Default Downlink Band
- TC[140,55] – Set X-band Link Status
- TC[140,56] – Set K-band Link Status
- TC[140,57] – Set Inter-PDU Time Gap for X-band Downlink
- TC[140,58] – Set Inter-PDU Time Gap for K-band Downlink
- TC[140,59] – Set Metadata-PDU Time Gap Downlink

## ➤ Packet Stores & Input Ports Management

- TC[140,40] – Associate Packet Set to Packet Store
- TC[140,41] – Start Storing in Packet Store
- TC[140,42] – Stop Storing in Packet Store
- TC[140,43] – Reset Packet Store Association to Packet Set
  
- TC[140,70] – Suspend Acquisition from Input Port
- TC[140,71] – Resume Acquisition from Input Port
- TC[140,72] – Stop Acquisition from Input Port
  
- During the storing of Spacecraft TM (coming from CDMU) and science data (coming from instrument input ports), the closure of file and opening of new ones is automatically managed when the maximum file size is reached.

# EucliDem Main Functions – File Delivery Protocol

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- The CFDP has been selected for supporting the file uplink and downlink operations.
- The files uplink is performed according to the «Class 1 – Unreliable Delivery» protocol in X-band.
- The files downlink is performed according to the «Class 2 – Reliable Delivery with Deferred NAK» protocol:
  - The *Nominal File Downlink* takes place in X-band (for the directive PDUs) and in K-band for the file data PDUs.
  - The *X-band Only File Downlink* takes place only in X-band (for both the directive PDUs and the file data PDUs). From the Operational point of view, this case does not apply to the downlink of science data.
- The demonstrator supports concurrent uplinks and downlinks (the current default is 10 + 10).

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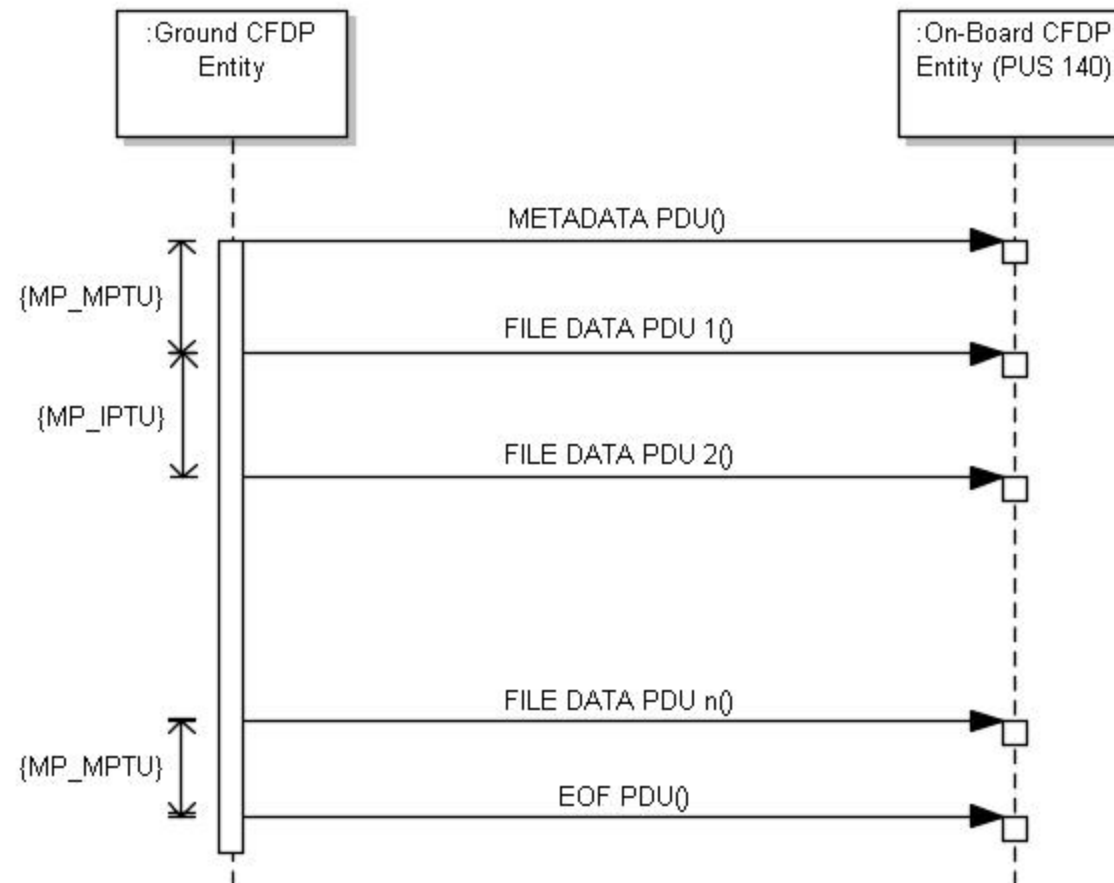
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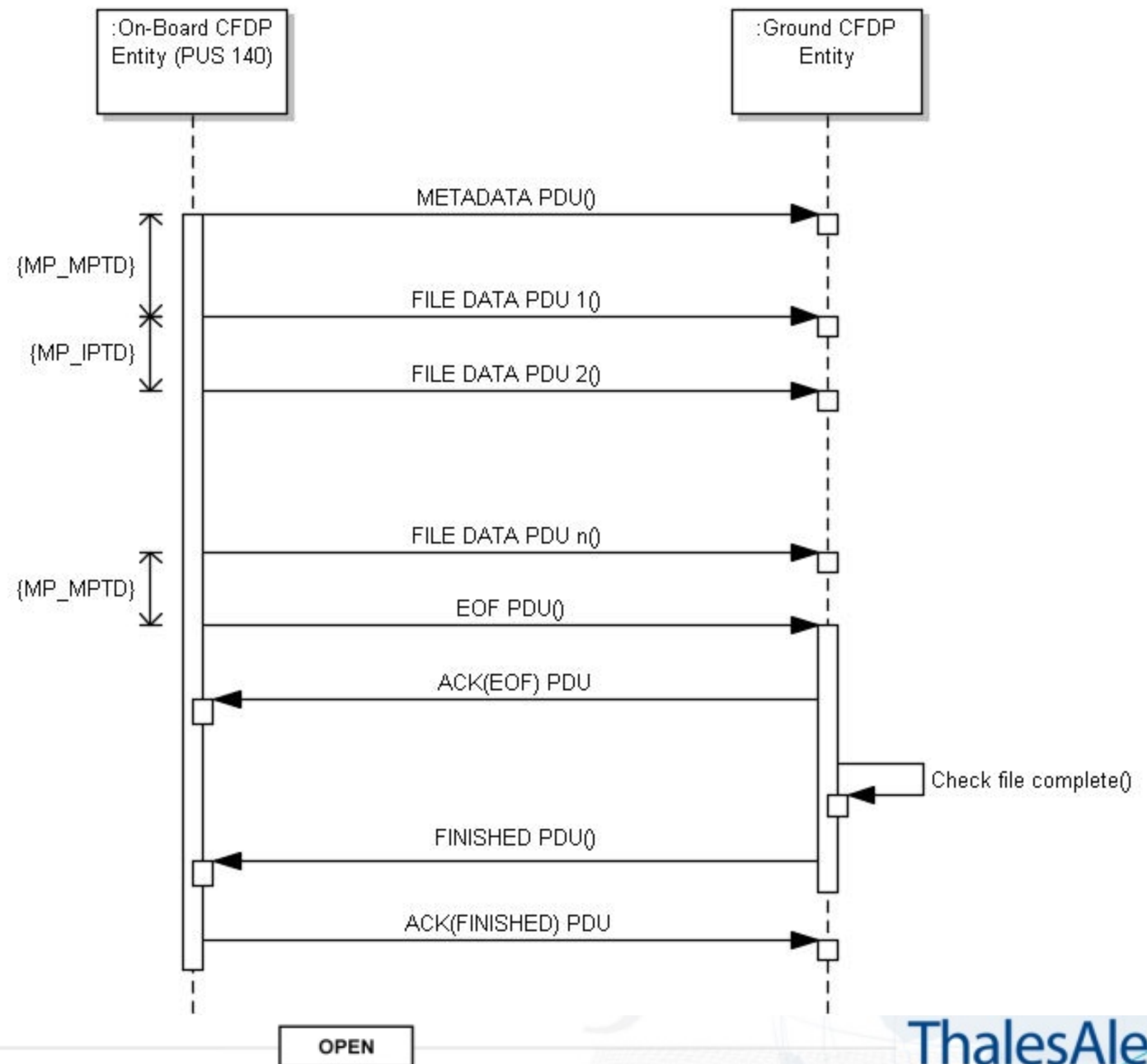
# Euclidem Main Functions – File Delivery Protocol

## Class 1 Uplink Operation



# EucliDem Main Functions – File Delivery Protocol

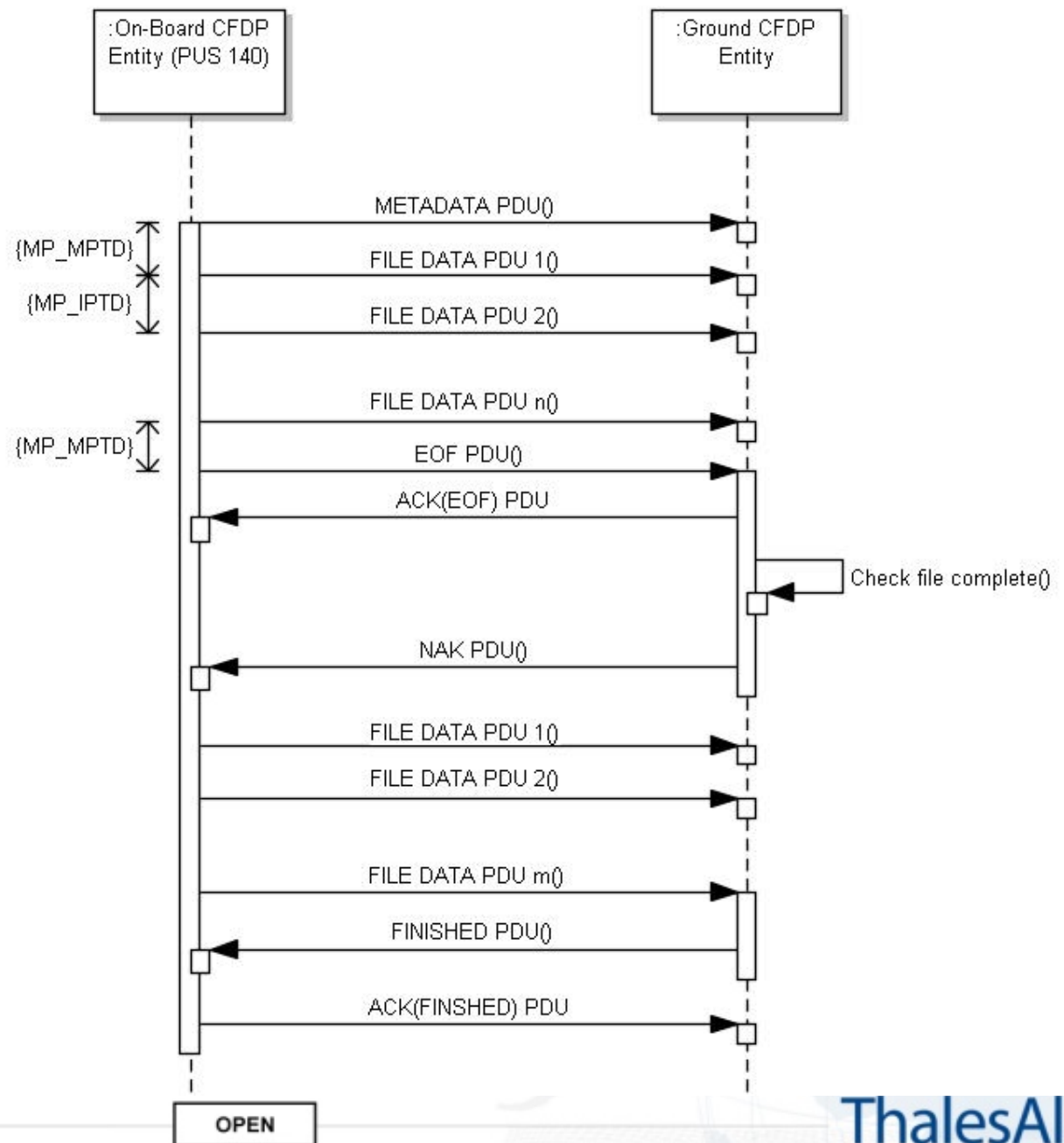
## Class 2 Downlink Operation (no data loss)





# Euclidem Main Functions – File Delivery Protocol

Class 2 Downlink  
Operation (data loss  
& retransmission)



- Allows the definition of a mission scenario by means of a commands script which can contain:
  - Commands which imply the uplink of telecommands (e.g., creation of an on-board directory)
  - Commands which allow the management of the Ground filestore
  - Commands which allow the control of the demonstrator
  
- The execution of a command script (demonstrator session) can:
  - Start from scratch (thus, assuming that the Ground filestore and on-board filestore are empty)
  - Start from the Ground filestore and on-board filestore resulting from the execution of at least one previously executed demonstrator session

- Allows the injection of ground-to-space and space-to-ground links failures for exercising the non nominal cases of the CFDP protocol
- Embeds the actual on-board software (based on TASI design) for FMS, CFDP Class 1 receivers, CFDP Class 2 senders
- Maps the on-board MMU filestore onto the Windows filesystem by means of an adaptation layer allowing the abstraction of the on-board software with respect to the actual memory support

# EucliDem Characteristics – Dynamic Configuration Parameters

<i>Mission Parameter</i>	<i>Acronym</i>	<i>Unit Of Measure</i>	<i>Default Value</i>
<b>X-band Uplink Rate</b>	<b>MP_XBUR</b>	<b>Kbps</b>	<b>8</b>
<b>X-band Downlink Rate</b>	<b>MP_XBDR</b>	<b>Kbps</b>	<b>512</b>
<b>K-band Downlink Rate</b>	<b>MP_KBDR</b>	<b>Kbps</b>	<b>75622</b>
<b>CDMU-to-MMU PUS TM Packets Bandwidth</b>	<b>MP_SPWR</b>	<b>Kbps</b>	<b>512</b>
<b>CDMU-to-MMU PUS TC Packets Bandwidth</b>	<b>MP_BTCR</b>	<b>Kbps</b>	<b>20</b>
<b>CDMU-to-MMU PDU TC Packets Bandwidth</b>	<b>MP_BPCR</b>	<b>Kbps</b>	<b>50</b>
<b>MMU-to-CDMU PUS TM Packets Bandwidth</b>	<b>MP_BTMR</b>	<b>Kbps</b>	<b>20</b>
<b>MMU-to-CDMU PDU TM Packets Bandwidth</b>	<b>MP_BPMR</b>	<b>Kbps</b>	<b>200</b>
<b>Inter-PDU Time Gap for Uplink</b>	<b>MP_IPTU</b>	<b>Sec</b>	<b>10</b>
<b>Inter-PDU Time Gap for Downlink in K-Band</b>	<b>MP_IPKD</b>	<b>Sec</b>	<b>0</b>
<b>Inter-PDU Time Gap for Downlink in X-Band</b>	<b>MP_IPXD</b>	<b>Sec</b>	<b>10</b>
<b>Metadata-PDU Time Gap for Downlink</b>	<b>MP_MPTD</b>	<b>Sec</b>	<b>10</b>
<b>Metadata-PDU Time Gap for Uplink</b>	<b>MP_MPTU</b>	<b>Sec</b>	<b>20</b>

# Euclidem Characteristics – Static Configuration Parameters

<i>Mission Parameter</i>	<i>Acronym</i>	<i>Unit Of Measure</i>	<i>Default Value</i>
<b>Maximum File Name Length</b>	<b>MP_MFNL</b>	<b>Bytes</b>	<b>32</b>
<b>Maximum Directory Name Length</b>	<b>MP_MDNL</b>	<b>Bytes</b>	<b>32</b>
<b>Maximum Directories Number</b>	<b>MP_MDIN</b>		<b>16</b>
<b>Maximum Files Number</b>	<b>MP_MFIN</b>		<b>128</b>
<b>Maximum File Size</b>	<b>MP_MFLS</b>	<b>Bytes</b>	<b>(4×1024<sup>3</sup>) - 1</b>
<b>Maximum File Segment Size in Uplink</b>	<b>MP_MFSU</b>	<b>Bytes</b>	<b>226</b>
<b>Maximum File Segment Size in Downlink</b>	<b>MP_MFSD</b>	<b>Bytes</b>	<b>65522 - 2</b>
<b>Maximum Telecommand Packet Size</b>	<b>MP_MTCS</b>	<b>Bytes</b>	<b>248</b>
<b>Maximum Telemetry Packet Size</b>	<b>MP_MTMS</b>	<b>Bytes</b>	<b>65542</b>
<b>Maximum Concurrent File Uplinks Number</b>	<b>MP_MUPN</b>		<b>10</b>
<b>Maximum Concurrent File Downlinks Number</b>	<b>MP_MDWN</b>		<b>10</b>
<b>Inactivity Monitor Timer for Uplink</b>	<b>MP_IMTU</b>	<b>Sec</b>	<b>120</b>
<b>Inactivity Monitor Timer for Downlink</b>	<b>MP_IMTD</b>	<b>Sec</b>	<b>120</b>
<b>Maximum File Block Size (for basic read and write operations)</b>	<b>MP_MFBS</b>	<b>Bytes</b>	<b>32</b>
<b>Ack PDU Timeout</b>	<b>MP_ACKT</b>	<b>Sec</b>	<b>12</b>
<b>Finished PDU Timeout</b>	<b>MP_FINT</b>	<b>Sec</b>	<b>12</b>
<b>Latest File Data PDU Timeout</b>	<b>MP_LFDT</b>	<b>Sec</b>	<b>5</b>



- The Demonstrator emulates the behaviour of the Ground Segment and of the Space Segment, with specific reference to the FMS and CFDP functions.
- The Ground Segment model allows the control of the overall demonstrator and emulates the behaviour of the Ground CFDP User and of the Ground CFDP Entity. It also includes the Ground filestore.
- The Space Segment model emulates the behaviour of the On-board CFDP User and of the On-board CFDP Entity. The MMU hosts the on-board filestore.

# EucliDem Example Scenario - Definition

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- The scenario assumes empty Ground and on-board filestores.
- Creation of the “OBCPs” directory of the Ground filestore and creation of 4 dummy OBCP images. They will be uplinked and copied into the “OBCPs” directory of the MMU filestore.
- Creation of the “OBSW\_Images” directory of the Ground filestore and creation of 2 sample OBSW images. They will be uplinked and copied into the “OBSW\_Images” directory of the MMU filestore.
- Creation of the “Science” directory of the Ground filestore. This directory is left empty and, at the end of the demonstrator session, will contain the science data acquired from the NISP and VIS instruments.
- Start the acquisition of the NISP and VIS data from the respective input ports and stop it after 400 seconds (after this period, a set of files will be present in the “Science” directory of the on-board filestore).
- Start the concurrent downlink of the NISP data and the uplink of the 4 OBCP images and of the 2 OBSW executables.
- Suspend and resume the NISP data downlink.
- At the end of the NISP data downlink, start the VIS data downlink.

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# EucliDem Example Scenario – Command Script (part 1 of 2)

	1 CREATE_GROUND_DIRECTORY	OBCPs						
	2 CREATE_GROUND_FILE	OBCPs	Configure_STR_Assembly	4096				
	3 CREATE_GROUND_FILE	OBCPs	Configure_GYRO_Assembly	2048				
	4 CREATE_GROUND_FILE	OBCPs	Configure_CRS_Assembly	10230				
	5 CREATE_GROUND_FILE	OBCPs	Perform_Payloads_EQSOL	1510				
Creation of the on-board filestore OBCPs directory (TC[140,1]).	6 CREATE_ONBOARD_DIRECTORY	OBCPs						
	7 CREATE_GROUND_DIRECTORY	OBSW_Images						
	8 CREATE_GROUND_FILE	OBSW_Images	OBSW_NM_3_24	200000				
	9 CREATE_GROUND_FILE	OBSW_Images	OBSW_SM_2_52	150000				
Creation of the on-board filestore OBSW images directory (TC[140,1]).	10 CREATE_ONBOARD_DIRECTORY	OBSW_Images						
	11 CREATE_GROUND_DIRECTORY	Science						
	12 CREATE_ONBOARD_DIRECTORY	Science						
	13 CREATE_ONBOARD_FILE	Science	NISP_Data	2000000000				
Creation of the on-board filestore science data directory and of 2 empty files with maximum allowed size (TC[140,1], TC[140,20]).	14 CREATE_ONBOARD_FILE	Science	VIS_Data	1000000000				
	15 OPEN_ONBOARD_FILE	Science	NISP_Data	APPEND_MODE	INPUT_PORT_03	CLOSE_AND_CREATE		
	16 OPEN_ONBOARD_FILE	Science	VIS_Data	APPEND_MODE	INPUT_PORT_04	CLOSE_AND_CREATE		
	17 WAIT	400						
	18 STOP_INPUT_PORT_ACQUISITION	INPUT_PORT_04						
	19 STOP_INPUT_PORT_ACQUISITION	INPUT_PORT_03						
Stop the acquisition of the science data after 400 seconds (simulated time).								

Creation of the Ground filestore OBCPs directory.

Creation of the Ground filestore OBSW images directory.

Creation of the Ground filestore science data directory.

The instrument files are open and associated to the respective input ports. When the maximum allowed length is reached, new files are open without data loss.



# Euclidem Example Scenario – Command Script (part 2 of 2)

Start the downlink of the NISP science data.



```
20 DOWNLINK_FILE Science NISP_Data Science
```

```
21 SET_INTER_PDU_UPLINK_TIME_GAP 1
```

```
22 SET_META_PDU_UPLINK_TIME_GAP 5
```

Start the concurrent uplink of the OBCPs and of the OBSW images.



```
23 UPLINK_FILE OBCPs Configure_STR_Assembly OBCPs
```

```
24 UPLINK_FILE OBCPs Configure_GYRO_Assembly OBCPs
```

```
25 UPLINK_FILE OBCPs Configure_CRS_Assembly OBCPs
```

```
26 UPLINK_FILE OBCPs Perform_Payloads_EQSOL OBCPs
```

```
27 UPLINK_FILE OBSW_Images OBSW_NM_3_24 OBSW_Images
```

```
28 UPLINK_FILE OBSW_Images OBSW_SM_2_52 OBSW_Images
```

```
29 WAIT 15
```

```
30 SUSPEND_DOWNLINK 1
```

```
31 WAIT 15
```

```
32 RESUME_DOWNLINK 1
```

Suspend and resume the NISP science data downlink.



Start the downlink of the VIS science data.



```
33 WAIT 300
```

```
34 DOWNLINK_FILE Science VIS_Data Science
```

```
35 WAIT 300
```



# Euclidem Example Scenario – Session Log (part 1 of 3)

Euclidem logging started.

```

2.00 : SPACE      :: STORAGE_MANAGER  :: Start storing from INPUT_PORT_03
2.13 : SPACE      :: STORAGE_MANAGER  :: Start storing from INPUT_PORT_04

402.38 : SPACE    :: STORAGE_MANAGER  :: Stopped storing from INPUT_PORT_04
402.50 : SPACE    :: STORAGE_MANAGER  :: Stopped storing from INPUT_PORT_03

402.63 : SPACE    :: C_2_SENDER       :: Downlink started. (C2S 1, TSN: 1)

402.75 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 1)
402.88 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 2)
403.00 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 3)
403.13 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 4)
403.25 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 5)
403.38 : GROUND   :: CFDP_USER        :: Uplink started. (TSN: 6)

409.00 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 11%
409.50 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 14%
410.38 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 11%
410.63 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 22%
411.13 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 29%
412.25 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 33%
412.75 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 44%
413.63 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 22%
413.88 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 44%
414.38 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 59%
415.50 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 55%
415.75 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 3 at 11%
416.00 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 74%
416.88 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 33%
417.13 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 66%
417.63 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 89%

418.63 : GROUND   :: C_2_RECEIVER     :: Downlink suspended (C2R: 1 , TSN: 1)
418.75 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 77%
419.25 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 4 at 100%

419.25 : SPACE    :: C_2_SENDER       :: Downlink suspended (C2S: 1 , TSN: 1)

420.13 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 44%
420.38 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 88%
421.88 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 2 at 99%
423.13 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 55%
423.50 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 3 at 22%
426.00 : EUCLIDEM :: MISSION_STATUS   :: Uplink with TSN 1 at 66%

426.25 : SPACE    :: C_1_RECEIVER     :: Uplink terminated (TSN: 4)
    
```

← Science Data are gathered and stored in the Science directory of the MMU filestore.

← The first file downlink and all the uplinks are started and will proceed concurrently.

← Suspension of the on-going downlink acknowledged by both sender and receiver.



# EucliDem Example Scenario – Session Log (part 2 of 3)

```
428.88 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 1 at 77%
430.25 : SPACE      :: C_1_RECEIVER   :: Uplink terminated (TSN: 2)
430.63 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 33%
431.75 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 1 at 88%
433.88 : GROUND    :: C_2_RECEIVER   :: Downlink Resumed (C2R: 1 , TSN: 1)
434.13 : SPACE      :: C_2_SENDER     :: Downlink Resumed (C2S: 1 , TSN: 1) ||
434.50 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 1 at 99%
437.25 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 44%
442.13 : SPACE      :: C_1_RECEIVER   :: Uplink terminated (TSN: 1)
443.63 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 55%
449.13 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 10%
449.88 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 66%
456.13 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 77%
462.38 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 88%
468.63 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 3 at 99%
470.38 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 20%
475.50 : SPACE      :: C_1_RECEIVER   :: Uplink terminated (TSN: 3)
491.50 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 30%
494.00 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 6 at 10%
512.75 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 40%
518.50 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 5 at 10%
533.88 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 50%
555.13 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 60%
568.25 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 6 at 20%
576.38 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 70%
597.50 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 80%
617.50 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 5 at 20%
618.75 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 90%
639.88 : EUCLIDEM  :: MISSION_STATUS  :: Downlink with TSN 1 at 100%
643.63 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 6 at 30%
650.50 : SPACE      :: C_2_SENDER     :: Downlink terminated
651.00 : GROUND    :: C_2_RECEIVER   :: Downlink terminated OK (TSN: 1) ||
717.63 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 5 at 30%
717.88 : EUCLIDEM  :: MISSION_STATUS  :: Uplink with TSN 6 at 40%
```

Resume of the on-going downlink acknowledged by both sender and receiver.

Termination of the first downlink.

# Euclidem Example Scenario – Session Log (part 3 of 3)

```
734.38 : SPACE      :: C_2_SENDER      :: Downlink started. (C2S 1, TSN: 2)
755.38 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 10%
766.00 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 20%
776.63 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 30%
787.25 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 40%
792.13 : EUCLIDEM    :: MISSION_STATUS  :: Uplink with TSN 6 at 50%
797.75 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 50%
808.38 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 60%
816.63 : EUCLIDEM    :: MISSION_STATUS  :: Uplink with TSN 5 at 40%
819.00 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 70%
829.63 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 80%
840.25 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 90%
850.75 : EUCLIDEM    :: MISSION_STATUS  :: Downlink with TSN 2 at 100%

861.38 : SPACE      :: C_2_SENDER      :: Downlink terminated
861.88 : GROUND      :: C_2_RECEIVER    :: Downlink terminated OK (TSN: 2)

867.50 : EUCLIDEM    :: MISSION_STATUS  :: Uplink with TSN 6 at 60%
916.75 : EUCLIDEM    :: MISSION_STATUS  :: Uplink with TSN 5 at 50%
941.75 : EUCLIDEM    :: MISSION_STATUS  :: Uplink with TSN 6 at 70%
1015.75 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 5 at 60%
1016.00 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 6 at 80%
1091.38 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 6 at 90%
1092.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1115.88 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 5 at 70%
1142.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1165.63 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 6 at 100%

1171.00 : SPACE      :: C_1_RECEIVER    :: Uplink terminated (TSN: 6)

1192.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1214.88 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 5 at 80%
1242.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1292.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1315.00 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 5 at 90%
1342.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1392.38 : EUCLIDEM   :: MISSION_STATUS  :: waiting for pending operations
1414.00 : EUCLIDEM   :: MISSION_STATUS  :: Uplink with TSN 5 at 100%

1419.00 : SPACE      :: C_1_RECEIVER    :: Uplink terminated (TSN: 5)
```

|| ← Start of the second downlink.

|| ← Termination of the second downlink.

|| ← The demonstrator session does not terminate if there are on-going file transfer operations.

-----  
Mission terminated nominally.  
Euclidem logging stopped.

Euclidem execution time:  
1517.47 seconds  
Euclidem simulated time:  
1419.25seconds

# EucliDem Example Scenario – Ground/On-board Directories

The figure consists of six screenshots of a file explorer interface, arranged in a 2x3 grid. Each screenshot shows a directory tree on the left and a file list on the right. Blue arrows indicate the flow of data from ground directories to on-board directories.

- Top Left:** Shows the 'Scenario 1' directory structure. The 'Ground\_Filestore\_Root' directory is expanded, showing sub-directories 'OBCPs', 'OBSW\_Images', and 'Science'. The file list on the right includes 'Configure\_CRS\_Assembly' (10 KB), 'Configure\_GYRO\_Assembly' (2 KB), 'Configure\_STR\_Assembly' (4 KB), and 'Perform\_Payloads\_EQSQL' (2 KB).
- Top Right:** Shows the same directory structure, but the 'Onboard\_Filestore\_Root' directory is expanded. The file list on the right is identical to the top-left screenshot.
- Middle Left:** Shows the 'Scenario 1' directory structure. The 'Onboard\_Filestore\_Root' directory is expanded, showing sub-directories 'OBCPs', 'OBSW\_Images', 'Packet\_Store\_1', 'Packet\_Store\_2', 'Packet\_Store\_3', and 'Science'. The file list on the right includes 'OBSW\_NM\_3\_24' (196 KB) and 'OBSW\_SM\_2\_52' (147 KB).
- Middle Right:** Shows the same directory structure, but the 'Ground\_Filestore\_Root' directory is expanded. The file list on the right is identical to the middle-left screenshot.
- Bottom Left:** Shows the 'Scenario 1' directory structure. The 'Science' sub-directory under 'Onboard\_Filestore\_Root' is expanded, showing 'NISP\_Data' (1,953.124 KB) and 'VIS\_Data' (976.562 KB).
- Bottom Right:** Shows the same directory structure, but the 'Ground\_Filestore\_Root' directory is expanded. The file list on the right includes 'NISP\_Data' (1,953.124 KB) and several 'VIS\_Data' files with specific IDs: 'NISP\_Data\_000000F060' (1,327.772 KB), 'VIS\_Data' (976.562 KB), 'VIS\_Data\_000000F640' (976.562 KB), 'VIS\_Data\_0000007C20' (976.562 KB), and 'VIS\_Data\_0000017041' (272.314 KB).

17/02/2014

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WE LOOK AFTER THE EARTH BEAT



*Euclidem*

Thanks for Your Attention

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17/02/2014

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