**566-DAPHNE-ICD-REV-002**

453 / Near Earth network project

Data Acquisition Processing and Handling Network Environment (DAPHNE) Standard Service and Interface Control Document

Original

**Effective Date: June 15, 2017**

Expiration Date: June 15, 2022





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Data Acquisition Processing and Handling Network Environment (DAPHNE) Standard Service and Interface Control Document

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Preface

This Document defines the standard services provided by the NEN Data Acquisition Processing and Handling Environment (DAPHNE) and its customer interface.

This document is under configuration management of the Goddard Space Flight Center (GSFC) Near Earth Network (NEN) Configuration Control Board (CCB) Code 453. This document will be updated by the Documentation Change Notice (DCN) process or by complete revision. Proposed changes to this document should be submitted to the Code 453 CCB along with supporting material justifying the proposed change. Comments, questions, or proposed changes concerning this document shall be addressed to:

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|  | |  | | |
|  | |  | | |
| **Document History** | | | | |
| **Document Number** | **Status/Issue** | | **Effective Date** | **CCR Number** |
|  | Original | | May 1, 2017 |  |
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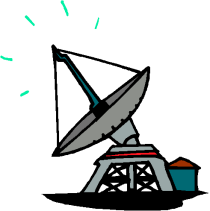
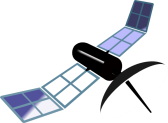
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# Scope

## Document Identification

This Document defines the standard services provided by the NEN Data Acquisition Processing and Handling Environment (DAPHNE) and its customer interface. See Figure 1‑1.

This document is intended for NEN users that require return link “store and forward services” from DAPHNE. All details related to control of DAPHNE by the NEN, input to DAPHNE or special accommodations needed for the Integration and Testing (I&T) phase will be documented separately.



Interface Described

**DAPHNE**

**Mission MOC**

**Receiver**

**Ka-band**

Standard Services

Described

[Figure 1-1](#Ref54425027) illustrates the scope of this ICD.

Figure 1‑1. Document Scope

## Document Organization

The outline of this document is:

1. Section 1 provides an overview of this document
2. Section 2 lists all referenced documents.
3. Section 3 defines the services and interface for the distribution of science data to the MOC.
4. Section 4 defines the detailed format of all data products exchanged between DAPHNE and the MOC.
5. Section 5 defines the communication protocols used to support the data transfers.
6. Section 6 defines the Security protocols used for DAPHNE.
7. Appendix A provides a list of configurable parameters.
8. Appendix B Mission Specific Interface Specification Addendum (Template)
9. Appendix C provides examples of ancillary files.
10. Abbreviation/Acronyms section provides an acronym list.

## Mission Context

NASA requires a robust communication network to conduct space missions. The NEN is one part of NASA’s communication network and provides direct space to earth communication links for a variety of space flight missions.

Science remote sensing missions have a growing demand for increase resolution leading to a corresponding exponential growth in data volume. The NEN is well suited to address this demand for missions operating in the “near earth” regime.

The typical NEN customer uses earth-orbiting satellites with high performance science instrument to map the earth or space. These missions control their satellite and distributes science data from its Mission Operations Center (MOC). Communications with the satellite can utilize the Near Earth Network (NEN) for the ground-to-space link while the NASA Integrated Service Network (NISN) transfers data on the ground between the mission facilities.

To date, command and control of these satellites have used S-band radio links due to their robust performance in difficult operational conditions. However, bandwidth is very limited in this heavily used band. To overcome this limitation science missions are migrating to higher radio frequencies to take advantage of the inherently larger bandwidths.

The downlink rates from the satellite to the ground station can be much higher than the ground networks can support in real time. To accommodate the slower ground network, data from a satellite overpass (contact) must be stored locally for a short time while being forwarded to the MOC. DAPHNE is one subsystem that performs this function for NEN ground stations.

One specific example of a customer NEN is planning for is the NASA-ISRO SAR (synthetic aperture radar) Mission (NISAR). NISAR will map the earth with a radar instrument from a polar LEO. The NISAR MOC will handle the command and control of the spacecraft. The mission will communicate control information using a S-band ground stations. NISAR will send science and housekeeping (HK) data to its MOC via NEN Ka-band ground stations located at the Alaska Science Facility (ASF) and Svalbard Norway. DAPHNE is the high-speed buffer interface between the ground station and the MOC. The MOC will forward the science data to the Science Operations Center (SOC) for processing and distribution.

# Reference Documents

NEEDS work

The following documents are referenced in this ICD: .

|  |  |
| --- | --- |
| Space Communications and Navigation (SCaN) Network System Requirements Document (SRD) Revision 3 | SCaN SRD |
| Near Earth Network (NEN) System  Requirements Document (SRD) | 453-SRD-NEN |
| Requirements Specification  for the Data Acquisition Processing and Handling Environment (DAPHNE) | 566-DAPHNE-REQT-Rev2 |
| CCSDS Blue Book |  |
| HDR interface document | TBR |
| MOC-Site Operations Agreement |  |
| NISN Service and Interface Document |  |
| NEN Configuration Management Procedures |  |
| SLE Vendor Specification | TBR |

The following documents provide the requirements flow down on which this ICD is based: NEEDS WORK

1. SCaN SRD
2. *NEN SRD*
3. *DAPHNE SRD*

If conflicts exist between this document and other referenced documents, the following order of precedence will apply:

1. SCaN
2. *NEN SRD*
3. *DAPHNE SRD*
4. (this document).

# Standard Services and Interface Overview

## DAPHNE Overview

##### 

DAPHNE is a store and forward data handling system built upon its predecessor the NEN Gateway (NENG) data distribution system. NENG has a long heritage of operations supporting Solar Dynamics Observatory (SDO), Lunar Reconnaissance Orbiter (LRO), Interface Region Imaging Spectrograph (IRIS), and Soil Moisture Active Passive (SMAP). Units are currently deployed to Wallops Flight Facility (WFF), McMurdo Ground Station (MGS), Alaska Satellite Facility (ASF) and White Sands Center (WSC).

DAPHNE system will initially be located at ASF. Other sites are being considered as well including Svalbard, Norway and Punta Arenas Chile as part of the NEN Ka-band Enhancement Project (KaEP). DAPHNE will also replace aging NENG units in operation and may be deployed to other ground stations in the future.

DAPHNE receives the high-speed data from NEN High Data Rate (HDR) receivers, which demodulates the radio signal, decodes, corrects errors and frame synchronizes the data. The data is input to DAPHNE over 10 Gbps Ethernet in accordance with the Interface Control Document for the HDR. DAPHNE will receive data from the NEN HDR currently the Viasat HDR3200 (TBR) but can be updated to interface with a variety of commercial receivers. NENG, its predecessor, interfaced with the Cortex HDR.

DAPHNE creates files from subsets of the received data places them in the Storage System (SS) until they can be forward to the MOC. The SS has limited capacity and can only retain data for a fixed time before it overflows. The files are forward to the MOC using TCP/IP over the NISN at the fastest rate that the ground network can provide.

DAPHNE is a software based system and can be upgraded to support a variety of data protocols and functionality. The system currently processes CCSDS protocols; specifically AOS frames carrying CADUs assigned Virtual Channel Identifier (VCID).

The received data is stored in files by Virtual Channel Identifier (VCID). Files are created at fixed but configurable intervals (e.g.1-minute) for each of the mission’s VCIDs ( e.g. IRIS used VCID 3 for science data and 2 for housekeeping data) during each pass. The length is referred to as the File Time Length (FTL).

DAPHNE can send files in priority order based on VCID.

Latency rates are configuration specific and are determined as part of the MISSION INTERFACE ADDENDUM.

Transmission from DAPHNE to the MOC is over NISN TCP/IP network. If data is lost in transmission the MOC can manually retrieve any file remaining in the SS with the “Self Service Mode” (SSM). This capability is provided in lieu of “retransmission”/playback functionality.

The DAPHNE storage system (SS) is a single fault tolerant Redundant Array of Independent Disks (RAID) system, with a configurable capacity of up to 27 (TBR) terabytes.

DAPHNE provides a checksum for the mission to check data quality in the form of a QAC file.

DAPHNE provides logging information to be used by the mission to audit data transfer from the spacecraft.

DAPHNE offers a SLE mode where specific VCs are sent to an external SLE conversion box and than forwarded to the final destination over a SLE link.

The specific format for each information type is defined later in section 4.

## Delivery of Science Telemetry

### Standard Services

DAPHNE will provide the following standard services to NEN customer missions

1. Automatic Delivery (AD): AD is the nominal operating mode where DAPHNE receives, processes, and delivers data files automatically to the MOC during and after an overpass. AD is implemented in conjunction with the normal scheduling of NEN services through the Networks Integration and Management Office (NIMO). No additional action by the mission is required to utilize AD. Each file is sent a single time using TCP/IP. The mission can and should perform data audits. DAPHNE provides both a list of delivered files (LDF) and quality information (QAC) to facilitate these audits by the mission.
2. Self Service Mode (SSM) file transfer: The customer MOC can manually request copies of any files stored in DAPHNE’s SS. Secure file transfer protocol (SFTP) is used for the transfer. The MOC implements this service by SFTP commands. The specific network location will be provided by NIMO prior to operations and is stated in the mission specific addendum. The form of the commands needed for SSM are below.
   1. Log into the remote server: sftp username@remote\_hostname\_or\_IP
   2. Download (or get) a file: get [-Ppr] remote [local]

Other SFTP commands are:

bye Quit sftp

cd path Change remote directory to 'path'

chgrp grp path Change group of file 'path' to 'grp'

chmod mode path Change permissions of file 'path' to 'mode'

chown own path Change owner of file 'path' to 'own'

df [-hi] [path] Display statistics for current directory or

filesystem containing 'path'

exit Quit sftp

get [-Ppr] remote [local] Download file

help Display this help text

lcd path Change local directory to 'path'

If problems occur with the SSM, the MOC should notify the NEN M&C. Alternate options to recover data files include a manual transfer from the DAPHNE repository or possibly replay from the NEN HDR. Both processes are labor intensive and are performed as operations and operator time permits. The MOC must make the associated request prior to the data retention timeout and data is deleted from memory.

### Science Telemetry Delivery Scenario

The operational scenario for the distribution of telemetry data to the MOC is based on the concept of generating telemetry data files separated by VCID. The files are limited in size for manageability. For each file the system generates a Quality and Accounting (QAC) file for each telemetry file. DAPHNE will store the files and attempt to deliver them.

To minimize overall latency to the MOC, DAPHNE sends each file automatically once. If the delivery fails, the MOC is responsible for retrieving the file using the Self Service Mode (SSM).

The Automatic Delivery scenario is summarized below:

#### Remote configuration prior to an overpass: NEN M&C will command DAPHNE to load a mission specific configuration to prepare for a satellite overpass.

* 1. The satellite overpass: starts and typically lasts 10 minutes for LEO.

#### NEN M&C commands DAPHNE to start AD operations. The operation is as follows:

#### DAPHNE attempts to receive telemetry data from the receiver interface.

* + 1. The NEN HDR receives and demodulates the radio signal, outputting data to DAPHNE. The HDR has a small buffer so the output to DAPHE is “near real time”. Note: It is understood that: **a)** AOS frame removal is the last formatting step typically performed by the receiver b) Data is sent to DAPHNE in the form of IP packets, and at the maximum rate the receiver, interface switch and DAPHNE can all support c) the NEN receiver will only forward AOS frames of data that are complete and without error.
    2. The received telemetry data is processed by parsing it into CCSDS virtual channels (VC) and creating associated telemetry (TLM) files each sized by the FTL.
    3. DAPHNE creates a QAC file for each TLM data file. The file provides the MD5 checksum for each TLM file. The user can confirm integrity of the data received with the checksum.
    4. The TLM and QAC files are buffered and sent to the customer’s server at the MOC using Secure Copy Protocol (SCP). Only one delivery attempt is made. Note: **The files corresponding to the highest priority VCs, specified by the mission, and received at the time, are sent first. The delivery is performed as quickly as possible, at the fastest rate both DAPHNE and the NISN data network can support (in “near real time” (NRT)).**
    5. VC data and QAC files are saved into the Storage System (SS).

#### VCs designated for SLE distribution are sent directly to an external SLE conversion box. The associated TLM and QAC files are maintained in the system like other files.

#### DAPHNE continues to implement steps i-vi above.

#### At the end of the overpass operation M&C sends the stop command. DAPHNE immediately stops receiving data. Note: To avoid loss or corruption of data, at the transition, M&C must assure that data is not being input when sending the stop command.

#### DAPHNE waits for the next command (“start” or “configure”) and will concurrently continue;

#### Saving files into the Storage System (SS).

#### Delivery of the files until all have been sent.

* + 1. DAPHNE sends a list of delivered files (LDF) to the MOC for mission accounting.
  1. Repeat a thru d for multiple follow-on overpasses
  2. DAPHNE autonomously deletes all files older than the agreed upon file retention time (FRT), specified in the MISSION INTERFACE ADDENDUM.

### Data Volumes

Supported data volumes and latency are mission dependent and both affect the final integrated system design. However, they are out of scope of this document, and must be mutually agreed upon as part of the MISSION INTERFACE ADDENDUM process. The maximum data rates, latencies and volumes DAPHNE is required to support is stated in the DAPHNE system requirements document “Requirements Specification for the Data Acquisition Processing and Handling Environment (DAPHNE)”.

### Fault Recovery

DAPHNE sends operational status reports to NEN M&C. The customer mission can request these reports through the NEN. There are no customer service functions in DAPHNE to address specific hardware, software, and network failures. The MOC should report any failures or discrepancies to the NEN M&C as soon as discovered.

# Data Format Specification

## Data Specifications

This section defines the format, transfer protocol, and naming conventions for the data items exchanged over the DAPHNE/MOC interface. These data items are listed in Table 4-1. DAPHNE directories are defined in Table 5-1.

Table 4‑1. Science Telemetry Products

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **File** | **Ext.** | **From/To** | **Description** | **Comments** |
| Science or Stored HK TLM File | .tlm | DAPHNE to MOC | 1 minute files of slightly varying length containing downlink data for a given VCID as contained in VCDU primary header. File Time Length (FTL) is configurable | DAPHNE “Pushes” to write directly to designated directory within MOC. |
| QAC | .qac | DAPHNE to MOC | Quality capsule accompanying each TLM file. There is a single QAC file for a like-named TLM file. | DAHNE “Pushes” to write directly to designated directory within MOC. |
| LDF | .ldf | DAPHNE to MOC | List of all files that DAHNE has delivered for a pass. | DAHNE “Pushes” to write directly to designated directory within MOC one per contact. |
| Telemetry file broken into AOS frames | .tlm | DAPHNE to SLE box to Customer destination | AOS frame segments of 1 minute files of slightly varying length containing downlink data for a given VCID as contained in VCDU primary header. File Time Length (FTL) is configurable. | DAPHNE “Pushes” frames to SLE conversion box that sends directly to the Customer destination. |
| QAC (SLE) | .qac | DAPHNE to SLE box to Customer destination | Associated QAC file sent via SLE | DAPHNE “Pushes” frames to SLE conversion box that sends directly to the Customer destination. |

## Science Telemetry Files

### User Data

The telemetry data is input from the HDR to DAPHNE with TCP/IP. Once the packet wrapper is removed the data is effectively a bit stream. Inside of the bit stream the mission uses CCSDS protocol defined in the CCSDS Blue Book, that send units of data called CADUs. Each CADU has several identifying properties defined in the header. Figure 4-1 illustrates the structure of the CCSDS CADU. CCSDS does allow some variation so the final mission CADU structure must be provided to NIMO for inclusion in the MISSION INTERFACE ADDENDUM.



Figure 4‑1. Telemetry Data Packet and VCDU Structure

### TLM Files

#### Generation

TCP/IP data networks have tools to efficiently transfer “files” within the network. To take advantage of these capabilities, DAPHNE generates telemetry files by concatenating all CADUS for each VCID in time sequence order. To keep file size manageable the number of CADUS per file is set to a predetermined time length referred to as the FTL or file time length. This time is agreed to and specified in the MISSION INTERFACE ADDENDUM. TLM files do vary slightly both in size and number of CADUs contained.

It is important to note that DAPHNE does not replace missing or corrupted CADUs it receives. This will result in sequence gaps in the VCDU\_Counter in the resulting TLM file. The mission is responsible for tracking and filling these gaps.

#### TLM File Naming Convention

The file naming convention for TLM files is:

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.tlm

where:

1. <STATION>: the station, e.g. ASF, or SGS
2. <MISSION>: the mission, e.g IRIS
3. VC: the <ID> prefix
4. <ID>: 2 decimal characters, 01-62, VCID of the data contained in the file as specified in the primary header VCID field
5. <YYYY>: 4 decimal characters, 2000-9999, the UTC year the file was created
6. <DOY>: 3 decimal characters, 001-366, the UTC day of year the file was created
7. <HH>: 2 decimal characters, 00-23, the UTC hour of day of the file was created
8. <MM>: 2 decimal characters, 00-59, the UTC minute of hour the file was created
9. <SS>: 2 decimal characters, 00-60, the UTC second of minute the file was created
10. .tlm: file extension for TLM file that contains only valid length CADUs.

Example: ASF\_IRIS\_VC03\_2013\_123\_23\_59\_59.tlm

#### Storage

As soon as a TLM file has been generated, DAPHNE places it in the Storage System and does a file transfer “Push” to deliver it to the mission site Point of Presence (POP). It is placed into a directory on the mission server as specified during the MISSION INTERFACE ADDENDUM e.g IRIS used neng2moc/tlm directory. It is the responsibility of the MOC to maintain this directory and make sure it does not overflow its capacity by removing files that are no longer needed.

## Quality and Accounting Files

### Generation

To allow the mission to check the quality of the TLM files quality information is created for each file and placed in a separate text file called Quality and Accounting or QAC files. The QAC file uses the American Standard Code for Information Interchange (ASCII) text file format.

### QAC File Structure

File contents are ASCII text in the form “keyword=value” with no white space. All arguments are fixed length fields with leading zero padding as necessary. All arguments will be followed by a line termination character (LF, line feed or new line, ASCII 0x0A). An example is shown in 6.2Appendix B. …..

Table 4-3 defines the key words to be used in the QAC file. Examples of QAC files with various gap configurations are provided in Appendix B.

Table 4‑3. QAC File Key Words

| **Keyword** | **Description** | **Argument** |
| --- | --- | --- |
| FILE\_CKSUM\_TYPE= | The TLM file checksum type. Currently SHA256 is supported | ASCII text, 3 characters, new line |
| FILE\_CKSUM\_VALUE= | The checksum value | ASCII text, variable decimal characters, new line |
| C5C5 | End of File (EOF) marker | ASCII text, 4 hexadecimal characters |

Note

The order of keywords in the file is not relevant.

### QAC File Naming Convention

The QAC file name is the same as the associated TLM file, with extension .qac instead of .tlm.

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.qac

where:

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS> is as described in paragraph 4.2.3.

Example: ASF\_IRIS\_VC03\_2013\_123\_23\_59\_59.qac provides quality information for ASF\_IRIS\_VC03\_2013\_123\_23\_59\_59.tlm

DAPHNE does a file transfer “Push” to deliver the file to the MOC and to write the QAC file to the mission server. QAC files can also be manually retrieved if necessary using the Self Service Mode.

In the event the SSM fails, QAC files can be requested directly from NEN ground station personnel. DAPHNE deletes the QAC files after the length of time agreed to and specified in the MISSION INTERFACE ADDENDUM.

QAC files associated with files sent via the SLE service are also sent over the SLE service.

## List of Delivered Files

### Generation

DAPHNE maintains a catalog of all files created for each pass in a file called “list of delivered files (LDF). The LDF lists all the files that have been created for the pass and their transmission status. The file is sent to the MOC after all files from a pass have been sent to the mission.

### LDF File Naming Convention

The LDF file name is as follows:

<STATION>\_<MISSION>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.ldf

where:

1. <STATION>: the station, ASF or WGS
2. <MISSION>: the mission, e.g. IRIS
3. <YYYY>: 4 decimal characters, 2000-9999, the UTC year the file was created
4. <DOY>: 3 decimal characters, 01-366, the UTC day of year the file was created
5. <HH>: 2 decimal characters, 00-23, the UTC hour of day the file was created
6. <MM>: 2 decimal characters, 00-59, the UTC minute of hour the file was created
7. <SS>: 2 decimal characters, 00-59, the UTC second of minute the file was created
8. .ldf is the file extension

Example: ASF\_IRIS\_2013\_123\_23\_59\_59.ldf

### LDF File Format

Table 4-4 is a list of files sent without the extension included.

Table 4‑4. LDF File Format

|  |  |
| --- | --- |
| **Keyword** | **Description** |
| Filename | The filename sent without the extension |
| C5C5 | Constant and recognizable ASCII string C5C5 (ASCII Hex) |
|  |  |

### Storage

DAPHNE does a file transfer “Push” to write the LDF to the mission server when the pass is complete.

DAPHNE stores the LDFs for an agreed upon time as specified in the MISSION INTERFACE ADDENDUM.

# Communications Protocols

## Delivery Address

The DAPHNE will deliver files to a predefined (configurable) host and directory for the MOC which is specified in the MISSION INTERFACE ADDENDUM. The delivery parameters will be kept in a database on DAPHNE and may be periodically changed, however it is not envisioned that this will be a real-time or automated process. Delivery parameter modifications will need to be coordinated with MOC personnel via phone or e-mail.

Self Service Mode destination location is selectable by the user from within SFTP.

## File Transfer Protocols

All TLM, QAC, and LDFs under the AD service will be automatically transferred by DAPHNE using scp. Scp includes encryption, the procedures for the exchange of encryption keys will be documented in the MOC-Site Operations Agreement.

VCs designated for SLE transmission will utilize the SLE protocol specified in the referenced SLE vendor specification (TBR). TLM and QAC data will be sent via SLE in AOS frames. The mission must reassemble the files from the AOS frames.

## Directory Structures

DAPHNE has a directory structure like that shown in Table 5-1, these are the locations that the mission should use for Self Service mode retrievals. DAPHNE will remove files older than the telemetry retention time (TRT) as necessary to maintain the directory.

When logging into the MOC machines, DAPHNE will initially expect to see a directory structure that is specified in the MISSION INTERFACE ADDENDUM and shown in Table 5-2 (IRIS example). The directory structure will be configurable. All directory names will be lower case. It is the responsibility of the MOC to maintain the MOC tlm, and ldf directories by removing old files as necessary.

Table 5‑1. DAPHNE Open Repository Directory Structure

|  |  |  |
| --- | --- | --- |
| **Directory** | **Location** | **Description** |
| /tlm/<DOY> | NENG | The open side of the DAPHNE which holds the TLM and QAC files for RT. DOY is the day of year subfolder. |
| /ldf/<DOY> | NENG | The open side of the DAPHNE which holds the LDFs for RT. DOY is the day of year subfolder. |

Table 5‑2. Initial MOC Directory Structure

|  |  |  |
| --- | --- | --- |
| **Directory** | **Location** | **Description** |
| neng2moc/tlm | MOC | DAPHNE puts all TLM and QAC files here. |
| neng2moc/ldf | MOC | DAPHNE puts LDFs here. |

# Physical Interface

## Ethernet

The connection from DAPHNE to the MOC is over the NISN WAN. Both DAPHNE and the MOC server connects to NISN using standard ETHERNET connectivity as detailed in the NISN service and interface document.

The SLE service also uses the NISN WAN.

## Security Measures

Security measures are handled within the design of DAPHNE and the NISN data networks to assure compliance with NASA Security Policy.

The scp and SFTP procedure fulfills NASA Security requirements. Access to the data using other techniques or alternate connections to the NISN network require special coordination with the NEN and NISN.

Operational security parameters are defined in the MISSION INTERFACE ADDENDUM.

Configurable Parameters

The items below will be configurable by the NEN Operations staff. The initial configuration is specified in the MISSION INTERFACE ADDENDUM template below. During operations these parameters are maintained in accordance with NEN Configuration Management procedures.

1. DAPHNE IP or reference to location where the IP is specified.
2. Primary and alternate MOC file delivery host Internet Protocol (IP) address.
3. VCID list and associated transmission priority.
4. File Time Length (FTL) ; Specified in seconds or in number of CADUs in a given file, this number determines TLM and QAC delivery interval. One VCID per file.
5. Telemetry file creation timeout. Length of time a TLM file may be open before forced closed.
6. File delivery timeout: Length of time a file delivery will be attempted before it is failed.
7. File Delivery Latency Timeout: How old a file can be and still be considered for real-time delivery.
8. MOC file delivery host telemetry directory.
9. LDF delivery/retrieval interval. Per pass is the default.
10. LDF delivery/retrieval time. Per pass is the default.
11. Telemetry retention time (TRT): How long TLM files can reside on the DAPHNE (e.g. 7 days).
12. Priority order for VCID file transmission during recovery from a NISN outage. The following are options to select: a) send strictly in VCID priority order, b) send in priority order for each pass. c) as specified.
13. Guidance for NISN bandwidth sharing for SSM usage during AD. The following are options to select: a) Prioritize SSM over near real time. c) SSM data is lowest priority and is sent last. C) As specified .
14. Supporting ground stations and abbreviations: Options are standard NEN ground stations and abbreviations.
15. TLM file name.

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.tlm

1. QAC file name.

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.qac

1. LDF file name.

<STATION>\_<MISSION>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.ldf

1. DAPHNE Storage System directory for Self Service Mode. This director is fixed and not configurable.
2. Whether DAPHNE will delete IDLE frames automatically.
3. SLE customer destination address.

DAPHNE Mission Specific Interface Specification (Template)

NEN/DAPHNE To \_\_\_\_\_\_\_\_\_\_\_\_\_ Mission Interface Specification (Template)

Template Version #xyz

Signature block

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

Document Reference Block

|  |  |
| --- | --- |
|  |  |
|  |  |
|  |  |

This interface specification is a mission specific addendum to the DAPHNE Standard Service and Interface Document controlled under NEN configuration management. The details of the parameters below are defined in that document. This document defines the specific interface parameters defined for the stated customer.

The physical interface is the standard NISN WAN. Mission specific parameters for the NISN WAN are contained in NIMO reference document xyz.

When information is considered operationally sensitive, the value is replaced with the stored location.

* DAPHNE IP: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_or reference to location where the IP is specified.
* Primary MOC file delivery host Internet Protocol (IP) address \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Alternate MOC file delivery host Internet Protocol (IP) address \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* VCID list and transmission priority order (1 is highest). Idle frames can automatically be deleted if specified. Circle all types that apply.
  + VCID \_\_\_\_ Priority \_\_\_\_\_­­­­­­­­­ Type Sci, Eng, HK, idle, SLE, other\_\_\_\_
  + VCID\_\_\_\_\_ Priority \_\_\_\_\_ Type Sci, Eng, HK, idle, SLE, other\_\_\_\_
  + VCID\_\_\_\_\_ Priority \_\_\_\_\_ Type Sci, Eng, HK, idle, SLE, other\_\_\_\_
  + VCID\_\_\_\_\_ Priority \_\_\_\_\_ Type Sci, Eng, HK, idle, SLE, other\_\_\_\_
  + VCID\_\_\_\_\_ Priority \_\_\_\_\_ Type Sci, Eng, HK, idle, SLE, other\_\_\_\_
* File Time Length (FTL) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ seconds
* Telemetry file modulus by VCID: Predefined number of CADUs in a given file, this number determines TLM and QAC delivery interval. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_#CADUs
* Telemetry file creation timeout. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ seconds
* Length of time a TLM file may be open before forced closed. \_\_\_\_\_\_\_\_\_\_\_\_\_seconds
* File delivery timeout: Length of time a file delivery will be attempted before it is failed. \_\_\_\_\_\_\_\_\_\_\_seconds.
* File Delivery Latency Timeout: How old a file can be and still be considered for real-time delivery.\_\_\_\_\_\_\_\_\_\_\_\_hours.
* MOC file delivery host telemetry directory. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* LDF delivery/retrieval interval. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_seconds or perpass
* LDF delivery/retrieval time. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_seconds
* Telemetry retention time (TRT): How long TLM files can reside on the DAPHNE (e.g. 7 days nominal).\_\_\_\_\_\_\_\_\_\_\_days
* Priority order for VCID file transmission during recovery from NISN outage. Circle one: a) send strictly in VCID priority order, b) send in priority order for each pass. c) as specified \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Guidance for NISN bandwidth sharing for SSM usage during AD. Circle one: a) Prioritize SSM over near real time. c) SSM data is lowest priority and is sent last. C) As specified \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Supporting ground stations and abbreviations: \_\_\_\_\_\_\_\_\_(\_\_\_), \_\_\_\_\_\_\_\_\_\_\_(\_\_\_), \_\_\_\_\_\_\_\_\_\_\_\_(\_\_\_), \_\_\_\_\_\_\_\_\_(\_\_\_).
* TLM file name. Fill in Station and Mission names below.

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.tlm

* QAC file name. Fill in Station and Mission names below.

<STATION>\_<MISSION>\_VC<ID>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.qac

* LDF file name. Fill in Station and Mission names below.

<STATION>\_<MISSION>\_<YYYY>\_<DOY>\_<HH>\_<MM>\_<SS>.ldf

* DAPHNE Storage System directory for Self Service Mode (not configurable): /tlm/<DOY>.
* Automatically delete Idle frames Yes\_\_\_\_ No \_\_\_\_.
* SLE data Customer Destination IP \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

QAC and LDF File Format Examples

**B.1 QAC File Example (Shows examples of fields; numeric values may not be correct)**

FILE\_CKSUM\_TYPE=md5

FILE\_CKSUM\_VALUE=47c78e50ffffc288995b4723b8915e0f

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**B.2 LDF File Example (Shows examples of fields; numeric values may not be correct)**

ASF\_IRIS\_VC03\_2011\_234\_22\_40\_40

ASF\_IRIS\_VC02\_2011\_234\_22\_40\_40

ASF\_IRIS\_VC02\_2011\_234\_22\_41\_40

ASF\_IRIS\_VC03\_2011\_234\_22\_41\_40

ASF\_IRIS\_VC02\_2011\_234\_22\_42\_40

ASF\_IRIS\_VC03\_2011\_234\_22\_42\_40

ASF\_IRIS\_VC03\_2011\_234\_22\_43\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_43\_41

ASF\_IRIS\_VC03\_2011\_234\_22\_44\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_44\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_45\_41

ASF\_IRIS\_VC03\_2011\_234\_22\_45\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_46\_41

ASF\_IRIS\_VC03\_2011\_234\_22\_46\_41

ASF\_IRIS\_VC03\_2011\_234\_22\_47\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_47\_41

ASF\_IRIS\_VC03\_2011\_234\_22\_48\_41

ASF\_IRIS\_VC02\_2011\_234\_22\_48\_41

C5C5

Abbreviations/Acronyms

| **Abbreviation** | **Definition** |
| --- | --- |
| AD | Automatic Delivery |
| ASCII | American Standard Code for Information Interchange |
| ASF | Alaska Science Facility |
| ASM | Attached Sync Marker |
| B/W | Bandwidth |
| CADU | Channel Access Data Unit |
| CCB | Configuration Control Board |
| CMO | Configuration Management Office |
| DDS | Data Distribution System |
| DMR | Detailed Mission Requirements |
| DSS | Data Storage Subsystem |
| EOF | End of File |
| FEP | Front-end Processor |
| FTL | File Transfer Length |
| Gbytes | Giga Bytes (1X109 Bytes) |
| GHz | Giga Hertz 1X109 Hz |
| HDR | High Data Rate (receivers) |
| HK | Housekeeping |
| Hz | Hertz (Cycles Per Second) |
| ICD | Interface Control Document |
| IM\_PDU | Instrument Multiplexing Protocol Data Unit |
| IONet | Internet Protocol Operational Network |
| IP | Internet Protocol |
| IRIS | Interface Region Imaging Spectrograph |
| JSOC-SDP | Joint Science Operations Center - Science Data Processing |
| LDF | List of Delivered Files |
| MBps | Mega Bytes Per Second |
| Mbps | Mega Bits Per Second |
| Mbytes | Mega Bytes |
| M&C | Monitor and Control |
| MOC | Mission Operations Center |
| MRD | Mission Requirements Document |
| NASA | National Aeronautics and Space Administration |
| NEN | Near Earth Network |
| NENG | Near Earth Network Gateway |
| NRT | Near Real Time |
| POP | Point of Presence |
| QAC | Quality and Accounting |
| RAID | Redundant Array of Independent Disks |
| SDO | Solar Dynamics Observatory |
| SSM | Self Service Mode |
| TBD | To Be Defined |
| TBS | To Be Supplied |
| Tbytes | Tera Bytes (1X1012 Bytes) |
| TLM | Telemetry |
| UTC | Universal Time Coordinated |
| VCDU | Virtual Channel Data Unit |
| VCID | Virtual Channel ID |
| WGS | Wallops Ground Station |
| WS1 | White Sands One |