

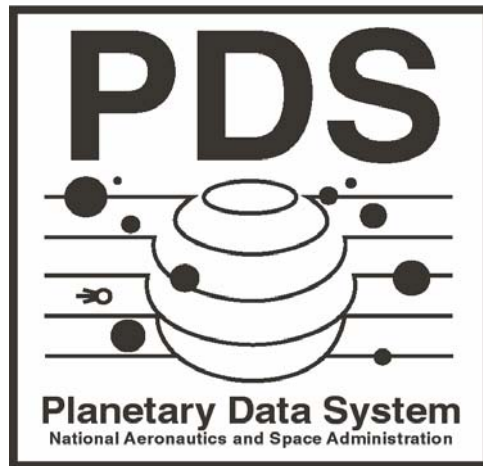
# **Planetary Data System**

## **Archive and Delivery Tracking**

### **Use Cases**

**DRAFT**

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Jet Propulsion Laboratory  
Pasadena, California

JPL D-xxxxx

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# 1 Introduction

The purpose of this document is to capture use cases which describe tracking the status of data from its delivery by the data providers through the PDS to the deep archive, NSSDC. Tracking is differentiated into delivery tracking, primarily tracking data from the data provider to the PDS and archive tracking, the tracking of data within the PDS archive. The archive tracking function includes making an inventory of all files and ensuring that all files delivered are accounted for and available to the community. Within the PDS, files are components of collections. These collections include data products, data deliveries and data sets.

A key concept introduced in these tracking use cases is the delivery escrow. This concept allows the provider to start a delivery however the receiver does not have to accept the delivery until certain delivery criteria have been checked. The receiver can choose to reject a delivery.

Tracking files is one part of maintaining the integrity of the archive and understanding the status of deliveries both to PDS and the NSSDC. Recently, PDS used the Cassini Archive Tracking System (CATS) as a tool for tracking product deliveries from Cassini instrument teams to the PDS nodes. As a result of this experience, PDS decided to repurpose the CATS software for the Phoenix mission to tracking deliveries from Phoenix instrument teams in a manner similar to Cassini. In addition, the PDS Management Council approved the level 3 requirement 2.2.2 for tracking which states, "PDS will track the status of data deliveries from data providers through the PDS to the deep archive."

PDS has been also developing a set of related use cases for *Data Integrity*. While the Data Integrity use cases focused on *file corruption*, the use cases defined for tracking will focus on tracking of files. However the *Data Integrity* use cases will be referenced from this document when appropriate.

## 2 Related Documents

- [1] Planetary Data System Data Integrity Use Cases Document, October, 2006,
- [2] Planetary Data System Data Integrity Requirements Document, November, 2006,
- [3] Planetary Data System Level 123 Requirements, August, 2006,

# 3 Definitions

The following definitions are used in the use case Sequences.

1. **Actors.** An actor is a person, organization, or external system that plays a role in one or more interactions with your system
2. **Archive Manifest** - For the purpose of archive tracking, the Archive Manifest is a list of files and will include at a minimum the filenames, checksum, and checksum type originally provided in the delivery manifest. Other possible attributes includes product id, delivery id, data set id, directory path, product type, and search keywords.
3. **Cognizant** – An individual who is to be informed of actions by the system.
4. **Data Consumer** - Entities that receive data from PDS.
5. **Data Product** – A data product label and one or more data objects. A data product consists of not only the product label file, but all files that comprise each data object.
6. **Data Product Label** – One or more data object descriptions.
7. **Data Provider** - Entities that submit data to PDS.
8. **Data Set** – A data set is a collection of product together with ancillary data and documentation. A data set is organized as one or more archive volumes.
9. **File** – A computer file is a piece of arbitrary information, or resource for storing information, that is available to a computer program and is usually based on some kind of durable storage.
10. **Delivery Manifest** – For the purpose of delivery tracking, the Delivery Manifest is a list of files that includes at least the file names, checksums, and checksum type. Other possible attributes includes product id, delivery id, data set id, directory paths and product type.
11. **Manifest** - A manifest is a list of items. For the purpose of tracking, the manifest is a list of files and will include at a minimum the filenames, checksum, and checksum type. (See Archive Manifest and Delivery Manifest).
12. **Product Collection** – A product collection is a set of data products collected for a specific purpose.
13. **PDS Node** – Any PDS node including Discipline Nodes, Data Nodes, and the Engineering Node. The Discipline Nodes include both science and support nodes.
14. **Physical Media** – Any computer system device used for short or long term storage of data including but not limited to optical media, tape, and magnetic disk.
15. **Use cases.** A use case describes a sequence of actions that provide something of measurable value to an actor.
16. **Volume** – Any organized collection of files that reside on physical media for the purpose of near term storage, online access, data submission, electronic distribution, or long-term archive. Note that this definition includes the PDS archive volume.

# 4 Actors

An actor is a user who is involved in any step of the life cycle of a PDS data product from data ingestion to data usage. The following actors are referenced or implied in the PDS archive tracking use cases.

- **PDS Node**
  1. Discipline Nodes
  2. Data Nodes
  3. Engineering Node
  
- **National Space Science Data Center (NSSDC)**
  
- **Data Provider**
  1. Planetary Scientist
  2. Campaign
  3. Experiment
  4. Mission Flight Project
  5. Instrument Team
  
- **Data Consumer**
  1. Planetary Scientist
  2. Mission Flight Project
  3. Mission Operations
  4. Educator
  5. General Public
  
- **Cognizant**
  1. Project Scientist
  2. DAWG Chair
  3. Instrument PI
  4. PDS Lead Node
  5. PDS Management
  6. Project Management
  7. Any other actor wishing to know the status of some item in a tracking system.

# 5 Requirements

The following existing level three requirements relate to tracking PDS data and are referenced in the use cases defined in Section 5.

- 2.2.2 PDS will track the status of data deliveries from data providers through the PDS to the deep archive
- 2.4.5 PDS will track the status of each peer review
- 2.5.2 PDS will implement procedures for accepting archival data
- 2.6.3 PDS will integrate the catalog with the system for tracking data throughout the PDS
- 2.9.1 PDS will accept and distribute only those items which are not restricted by the International Traffic in Arms Regulations (ITAR)



# 6 Delivery Tracking Use Cases

Each use case describes one or more high level scenarios where one actor (user) or a group of actors impact data delivery tracking. In this document, "delivery tracking" encompasses the tracking of files associated with data deliveries from any data provider through the PDS to the deep archive. In this section, "tracking system" will mean "delivery tracking system". These use cases are suggested by several level one, two, and three PDS requirements. These use cases will subsequently aid in the formulation of level 4 and 5 data tracking requirements.

## 6.1 UC-1 Data Provider Delivery to the PDS

**Description:** The PDS tracks the delivery of data from a data provider ensuring the integrity of the delivery.

**Actors:** Data Provider, PDS Node, Cognizant

**Sequences:**

1. The Data Provider and the PDS Node agree on a set of delivery schedules and the files associated with each delivery and update the tracking system. The entire collection of data could be provided in a single delivery.
2. The Data Provider transfers the data to the PDS Node.
3. The PDS Node verifies the delivery and updates the tracking system with the status.
4. All Cognizants are notified of relevant transactions

### 6.1.1 UC-1.1 Data Provider and PDS Node agree on Delivery Parameters

**Description:** A Data Provider and a PDS Node develop a delivery plan which is then used to configure the tracking system

**Actors:** Data Provider, PDS Node

**Sequences:**

1. A Data Provider working with the PDS Node compile a delivery plan which includes at least provisional schedules, key groupings defining each delivery (e.g. product type, orbit number, etc), approximate number of products in each delivery, approximate size of each delivery, a level of compliance to PDS standards, version of PDS data dictionary, local data dictionaries, individuals who should be inform of data tracking transactions, and notification schedule. For many data providers such as a mission, this information is available from the Archive Data Management Plan and Interface Control Documents (ICD). The delivery plan for data being provided from telescopic or laboratory experiments

or as derived data from science analysis can be prepared jointly by the data provider and the PDS Node. The entire collection of data could be provided in a single delivery.

2. The PDS Node configures / updates the tracking system with the information relevant to each of the defined deliveries.

### **6.1.2 UC-1.2 Data Provider Transfers Data to a PDS Node**

**Description:** A Data Provider transfers data to a PDS Node.

**Actors:** Data Provider, PDS Node, Cognizant

**Sequences:**

1. The Data Provider produces or collects the files.
2. The Data Provider prepares a delivery manifest for the files to be transferred to the PDS Node.
3. The Data Provider readies the files and delivery manifest for transfer.
4. The Data Provider updates the tracking system to indicate a pending delivery event, notifying the PDS Node that the data delivery is ready for transfer to begin.
5. The transfer of the files and delivery manifest between the Data Provider and the PDS node occurs. Possible mechanisms for this transfer include the Data Provider uploading, the PDS Node downloading, or the Data Provider mailing disks.
6. The data provider in the transfer will notify the data receiver when the transfer is complete.
7. The PDS Node ensures that all files have been transferred, using the delivery manifest.
8. The PDS Node ensures that all files transferred have not been corrupted, using the delivery manifest. (application of DI UC-1)
9. If the transfer was successful, the PDS Node updates the tracking system status for the delivery to “RECEIVED” and a notification is sent by the tracking system to all Cognizants indicating the result of the transfer.
10. If the transfer was deemed to not be successful, the PDS Node updates the tracking system status for the delivery to “UNSUCCESSFUL” and a notification is sent by the tracking system to all Cognizants indicating the result of the transfer and requesting a retransmission of either the whole or parts of the delivery.

### **6.1.3 UC-1.3 PDS Node ACCEPTS or REJECTS the Delivery**

**Description:** A PDS Node determines whether the data is acceptable according to the negotiated delivery parameters and either ACCEPTS or REJECTS the delivery.

**Actors:** Data Provider, PDS Node, Cognizant

**Sequences:**

1. The PDS Node determines whether the data delivery is acceptable according to the negotiated delivery parameters. (Note: Possible reasons for rejection include the delivery

not being PDS compliant, ITAR restricted, not useable to the science community (e.g., poor calibration, etc), ...)

2. The PDS Node updates the tracking system that the data delivery was either ACCEPTED, INCOMPLETE or REJECTED.
3. If the data delivery was ACCEPTED, then the PDS Node preserves the delivery manifest, and a notification is sent by the tracking system to all Cognizants indicating the result of the delivery.
4. If the data delivery was INCOMPLETE then a notification is sent by the tracking system to all Cognizants indicating the result of the delivery including a note describing the problem and its solution.
5. If the data delivery was REJECTED then a notification is sent by the tracking system to all Cognizants indicating the result of the delivery and describing the problem.

## **6.2 UC-1 Data Provider Withdraws a Delivery from the PDS**

**Description:** A Data Provider withdraws a delivery that has been previously delivered to the PDS.

**Actors:** Data Provider, PDS Node, Cognizant

**Sequences:**

1. The Data Provider notifies a PDS Node that it wishes to withdraw a delivery from the PDS.
2. The PDS Node updates the tracking system that the data delivery has been WITHDRAWN.
3. All Cognizants are notified of the change in status.

## **6.3 UC-3 Data Node Termination**

**Description:** A Data Node is to dissolve and the responsibility for archiving and distributing the data pass to a permanent PDS Node.

**Actors:** Data Node (Data Provider), PDS Node

**Sequences:**

1. The Data Node assumes the role of Data Provider and UC-1 is applied.

## **6.4 UC-4 Data Tracking Reporting at a PDS Node**

**Description:** A PDS Node periodically reports on data deliveries .

**Actors:** PDS Node

**Sequences:**

1. The PDS Node uses the tacking system to periodically check on the progress of data deliveries.
2. The PDS Node prepares Data Delivery tracking reports and periodically submits them to PDS Management.

## **6.5 UC-5 Cognizant Checks Status of a Delivery**

**Description:** A cognizant checks the status of a delivery using the tracking system

**Actors:** Cognizant

**Sequences:**

1. The cognizant opens a GUI and logs into the tracking system.
2. The cognizant sees a list of past, current, and future deliveries based on their permissions.
3. The cognizant is able to see the status of past deliveries including whether each delivery was RECEIVED, ACCEPTED, REJECTED, or WITHDRAWN.

## **6.6 UC-6 Tracking System Notifies Users of Scheduled Events**

**Description:** The Tracking System automatically notifies users of scheduled events.

**Actors:** Cognizant, Tracking System

**Sequences:**

1. The tracking system identifies scheduled events.

2. The tracking system notifies all Cognizants of scheduled events.

## 7. Archive Tracking Use Cases

Each use case describes one or more high level scenarios where one actor (user) or a group of actors impact data archive tracking. In this document, "archive tracking" encompasses the tracking of files in the PDS archives, specifically at the PDS Nodes. In this section, "archive system" will mean "archive tracking system" and is required to continue the tracking function from the delivery of the data through to the submission of the data to the NSSDC. These use cases are suggested by several level one, two, and three PDS requirements. These use cases will subsequently aid in the formulation of level 4 and 5 data tracking requirements.

### 7.1 UC-1 PDS Node Creates and Adds Data Set to Archive Tracking System

**Description:** A PDS Node tracks all files in its archive repository by data set.

**Actors:** PDS Node, Engineering Node, Data Provider

**Sequences:**

1. The PDS Node, after ACCEPTing a data delivery from a Data Provider and in preparation for making the data ready for distribution, prepares a local node archive manifest
2. The PDS Node updates its local archive tracking system.
3. The PDS Node prepares and submits information about the data set to the Engineering Node for tracking of data sets.
4. The PDS Catalog is updated with the data set information.

### 7.2 UC-2 Data Transfer between PDS Nodes

**Description:** A PDS Node transfers files to another PDS Node.

**Actors:** PDS Node, Engineering Node

**Sequences:**

1. The transferring-Node prepares a delivery manifest of the files to be transferred using its archive tracking system.
2. The transferring-Node readies the files and delivery manifest for transfer.

3. The transferring-Node notifies the receiving-Node that the data delivery is ready for transfer.
4. The transfer of the files and delivery manifest between the PDS Nodes occurs. Possible mechanisms for this transfer include one PDS Node uploading the data, the other PDS Node downloading the data, or the source PDS Node sending disks or data bricks.
5. The active actor in the transfer will notify the inactive actor when the transfer is complete.
6. The receiving-Node confirms that all files have been transferred, using the delivery manifest.
7. The receiving-Node confirms that all files transferred have not been corrupted, using the delivery manifest. (application of DI UC-4)
8. The receiving-Node updates its local archive tracking system.
9. The receiving Node prepares and submits information about the data set to the Engineering Node for tracking of the data sets.
10. If necessary, such as when the curating node has changed, the PDS Catalog is updated

## **7.3 UC-3 PDS Node Submits Data to NSSDC for Preservation**

**Description:** A PDS Node delivers Data to the NSSDC for long term preservation.

### **7.3.1 UC-3.1 PDS Node and NSSDC agree on Delivery Parameters**

**Description:** A PDS Node and the NSSDC develop a delivery plan which is then used to configure the tracking system

**Actors:** NSSDC, PDS Node

**Sequences:**

1. The PDS Node works with NSSDC to define a delivery schedule and associated contents.
2. The PDS Node updates the tracking system to indicate the anticipated contents of the delivery and the associated schedule.

### **7.3.2 UC-3.2 PDS Node Transfers Data to NSSDC for Preservation**

**Description:** A PDS Node Transfers Data to the NSSDC for Preservation

**Actors:** PDS Node, NSSDC, Cognizant

**Sequences:**

1. The PDS Node creates a Data Set or other data collection.
2. The PDS Node requests and receives an NSSDC ID from the NSSDC for this delivery.
3. The PDS Node prepares an Archive Information Package (AIP) for delivery to the NSSDC. The NSSDC AIP manifest is prepared from a PDS archive manifest. (Note: It may be necessary to partition a Data Set into one or more AIPs. - The AIP is currently planned for use as the packaging interface.)
4. The PDS Node updates the tracking system to indicate a pending delivery event, notifying the NSSDC that the data delivery is ready for transfer to begin.
5. The transfer of the files and delivery manifest between the PDS Node and the NSSDC occurs. Possible mechanisms for this transfer include the PDS Node uploading the AIP, the NSSDC downloading the AIP, or the PDS Node sending disks or data bricks that contain the AIP.
6. The active actor in the transfer will notify the inactive actor when the transfer is complete.
7. The NSSDC ensures that all files have been transferred, using the AIP manifest.
8. The NSSDC ensures that all files transferred have not been corrupted, using the AIP manifest. (application of DI UC-3).
9. If the transfer was successful, the PDS Node updates the tracking system status for the delivery to "RECEIVED" and a notification is sent by the tracking system to all Cognizants indicating the result of the transfer. (Note: The NSSDC notifies the PDS Node of the status.)
10. If the transfer was deemed to not be successful, the NSSDC notifies the PDS Node and the PDS Node updates the tracking system status for the delivery to "UNSUCCESSFUL" and a notification is sent by the tracking system to all Cognizants indicating the result of the transfer and requesting retransmission.

**7.3.3 UC-3.3 NSSDC ACCEPTS or REJECTS the Delivery**

**Description:** The NSSDC determines whether the data delivery is acceptable according to the negotiated delivery parameters and either ACCEPTS or REJECTS the delivery.

**Actors:** NSSDC, PDS Node, Cognizant, Engineering Node

**Sequences:**

1. The NSSDC determines whether the data delivery is acceptable according to the negotiated delivery parameters.
2. If the data delivery was ACCEPTED, then the NSSDC notifies the PDS Node of the results, the PDS Node updates the tracking system that the data delivery was ACCEPTED, and a notification is sent by the tracking system to all Cognizants indicating the result of the delivery.
3. If the data delivery was ACCEPTED, PDS Engineering updates the PDS Catalog with the NSSDC ID for this delivery.



4. If the data delivery was REJECTED, then the NSSDC notifies the PDS Node of the results, the PDS Node updates the tracking system that the data delivery was REJECTED, and a notification is sent by the tracking system to all Cognizants indicating the result of the delivery and describing the problem.

## 7.4 UC-4 Data Preservation at NSSDC

**Description:** The NSSDC maintains data delivered from the PDS conformant to a PDS/NSSDC MOU.

**Actors:** NSSDC

**Sequences:**

1. The NSSDC maintains the AIPs and their manifests of all PDS data that have been successfully submitted to the NSSDC.
2. The NSSDC checks that the files are not corrupted and are resident in the NSSDC.
3. The NSSDC periodically reports the status to PDS management conformant to a PDS/NSSDC MOU.

## 7.5 UC-5 Data Inventory Reporting at a PDS Node

**Description:** A PDS Node periodically reports on the integrity of all files in their inventory

**Actors:** PDS Node

**Sequences:**

1. The PDS Node uses the archive tacking system to periodically check that all products and constituent files reside and are accessible from the PDS Node. (DI UC-5)
2. The PDS Node prepares {Data Set, Delivery, Data Product, File} accounting reports and periodically submits them to PDS Management.