InSight (NSYT)

Software Interface Specification

SIS Title: *InSight Context and Deployment Cameras (ICC/IDC) PDS Archive Bundle*

Project Version: Final **Release Date:** May 2, 2019

JPL Doc ID: JPL D-55604

Prepared by: Jordan Padams, Cristina De Cesare

Custodian: Cristina De Cesare

Mission Reference: InSight

The research described in this document was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

InSight
InSight Context and Deployment Cameras

PDS Archive Bundle
Software Interface Specification

Version 1.2

May 2, 2019

Custodian:

____________________________________ ____________

Cristina De Cesare Date

PDS Imaging Node

Approved:

____________________________________ ____________

Justin Maki Date

InSight Co-Investigator for ICC/IDC

____________________________________ ____________

Hallie Abarca Date

InSight MIPL Systems Engineer

____________________________________ ____________

Sue Lavoie Date

PDS Imaging Node Manager

TABLE OF CONTENTS

DOCUMENT CHANGE LOG

Version	Change	Date	Affected portion
0.1	Initial draft	8/22/14	All
0.2	Updated Custodian/dates/etc. Updated wording used throughout.	9/29/15	All
0.3	Update to directory structure, lid formation, and other updates per Peer Review comments	10/23/17	All
1.0	Updated Custodian/dates/etc. Updated bundle directory structure. Updated Collections, Data Organization, LID formation.	8/2/18	All
1.1	Updated copyright information, clarified wording per Peer Review comments. Updated bundle directory structure diagrams.	1/9/19	Title page Sections 1.2, 2.2, 3.4.2 Table 3 Appendix B
1.2	Updated dates. Updated applicable document versions. Removed references to context collection. Updated LID formation section. Updated bundle directory structure diagrams. Removed appendix C.	5/2/19	Title page Sections 1.3, 3.2, 3.3, 3.4.2 Appendix B Appendix C

TBD ITEMS

Item	Section(s)	Page(s)
All red text in this document	All	

ACRONYMS AND ABREVIATIONS

Acronym	Meaning
ASCII	American Standard Code for Information Interchange
EDR	Experiment Data Record
HTML	Hypertext Markup Language
ICC	Instrument Context Camera
IDA	Instrument Deployment Arm
IDC	Instrument Deployment Camera
IDS	Instrument Deployment Subsystem
IM	Information Model

InSight	INterior exploration using Seismic Investigations, Geodesy and Heat Transport
JPL	Jet Propulsion Laboratory
LID	Logical Identifier
LIDVID	Versioned Logical Identifer
MIPL	Multimission Instrument Processing Laboratory
NASA	National Aeronautics and Space Administration
NSYT	Abbreviation for the InSight Project
PDS	Planetary Data System
PDS4	Planetary Data System Version 4
SEIS	Seismic Experiment for Interior Structure
SIS	Software Interface Specification
SOL	Mars Solar Day
TBD	To Be Determined/Delivered
URN	Uniform Resource Name
VICAR	Video Image Communication And Retrieval
XML	eXtensible Markup Language

GLOSSARY

Many of these definitions are taken from Appendix A of the PDS4 Concepts Document, https://pds.nasa.gov/datastandards/documents/concepts. The reader is referred to that document for more information.

Archive – A place in which public records or historical documents are preserved; also the material preserved – often used in plural. The term may be capitalized when referring to all of PDS holdings – the PDS Archive.

Attribute – A property or characteristic that provides a unit of information. For example, ‘color’ and ‘length’ are possible attributes.

Basic Product – The simplest product in PDS4; one or more data objects (and their description objects), which constitute (typically) a single observation, document, etc. The only PDS4 products that are *not* basic products are collection and bundle products.

Bundle Product – A list of related collections. For example, a bundle could list a collection of raw data obtained by an instrument during its mission lifetime, a collection of the calibration products associated with the instrument, and a collection of all documentation relevant to the first two collections.

Class – The set of attributes (including a name and identifier) which describes an item defined in the PDS Information Model. A class is generic – a template from which individual items may be constructed.

Collection Product – A list of closely related basic products of a single type (e.g. observational data, browse, documents, etc.). A collection is itself a product (because it is simply a list, with its label), but it is not a *basic* product.

Data Object – A generic term for an object that is described by a description object. Data objects include both digital and non-digital objects.

Description Object – An object that describes another object. As appropriate, it will have structural and descriptive components. In PDS4 a ‘description object’ is a digital object – a string of bits with a predefined structure.

Digital Object – An object which consists of real electronically stored (digital) data.

Identifier – A unique character string by which a product, object, or other entity may be identified and located. Identifiers can be global, in which case they are unique across all of PDS (and its federation partners). A local identifier must be unique within a label.

Label – The aggregation of one or more description objects such that the aggregation describes a single PDS product. In the PDS4 implementation, labels are constructed using XML.

Logical Identifier (**LID**) – An identifier which identifies the set of all versions of a product.

Versioned Logical Identifier (LIDVID) – The concatenation of a logical identifier with a version identifier, providing a unique identifier for each version of product.

Manifest - A list of contents.

Meshes – Also known as terrain models, meshes are high level products containing geometric description of the surface consisting of triangles, with image texture attached to each triangle.

Metadata – Data about data – for example, a 'description object' contains information (metadata) about an 'object.'

Object – A single instance of a class defined in the PDS Information Model.

PDS Information Model – The set of rules governing the structure and content of PDS metadata. While the Information Model (IM) has been implemented in XML for PDS4, the model itself is implementation independent.

Product – One or more tagged objects (digital, non-digital, or both) grouped together and having a single PDS-unique identifier. In the PDS4 implementation, the descriptions are combined into a single XML label. Although it may be possible to locate individual objects within PDS (and to find specific bit strings within digital objects), PDS4 defines 'products' to be the smallest granular unit of addressable data within its complete holdings.

Tagged Object – An entity categorized by the PDS Information Model, and described by a PDS label.

Registry – A data base that provides services for sharing content and metadata.

Repository – A place, room, or container where something is deposited or stored (often for safety).

Version Identifier (VID) – Consist of major and minor components separated by a "." (M.n), and identify a specific version of a product.

VICAR – Image processing system created and maintained at the JPL Multimission Image Processing Lab (MIPL). VICAR is used to create most of the image products in this archive. VICAR is available open source; see https://www-mipl.jpl.nasa.gov/vicar_open.html .

XML – eXtensible Markup Language.

XML schema – The definition of an XML document, specifying required and optional XML elements, their order, and parent-child relationships.

XML Schematron – A set of rules used to validate an XML document.

1 Overview

1.1 Purpose and Scope

This software interface specification (SIS) describes the format and content of the InSight Context and Deployment Cameras (ICC/IDC) Planetary Data System (PDS) data archive bundles in which data products, documentation, and supporting material are stored. This document is intended for the scientists who will analyze the data, including those associated with the project and those in the general planetary science community.

The specifications in this document apply to the archive bundles for the raw and the higher level products for the ICC/IDC cameras. For details about those products, including how the ICC/IDC instrument acquires data, and how the data are processed, formatted, labeled, and uniquely identified, see the InSight Camera EDR and RDR SIS (Applicable Document 6)

1.2 SIS Contents

This SIS discusses standards used in generating the data products and software that may be used to access the products. The data structure and organization are described in sufficient detail to enable a user to locate desired data products and their associated files within the archive bundle.

Appendices include a list of cognizant persons involved in generating the archive.

1.3 Applicable Documents

1. Planetary Data System Standards Reference, version 1.11.0, Oct. 1, 2018.
2. Planetary Data System (PDS) 4 Data Dictionary Document, Abridged, version 1.11.0.0, Sept. 23, 2018.
3. Planetary Data System (PDS) PDS4 Information Model Specification, version 1.11.0.0, Sept. 23, 2018.
4. Data Provider's Handbook, Archiving Guide to the PDS4 Data Standards, version 1.11.0, Oct. 1, 2018.
5. InSight Archive Generation, Validation and Transfer Plan, JPL D-75289, Aug. 22, 2017.
6. InSight Camera Experiment Data Record (EDR) and Reduced Data Record (RDR) Data Products Software Interface Specification" (NSYT-PLD001), version 3.2, Dec. 3, 2018.

The PDS4 Documents 0 through 4 are subject to revision. The most recent versions may be found at http://pds.nasa.gov/pds4. The ICC/IDC PDS4 bundles specified in this SIS have been designed based on the versions current at the time, which are those listed above.

1.4 Audience

This document serves as an Archive Bundle SIS, describing the structure and content of the archive in which the data products, documentation, and supporting material are stored. It does not describe the format and content of ICC/IDC data products in detail – that information is addressed in the Camera EDR and RDR Data Products SIS (Applicable Document 6). This SIS is intended to be used both by the instrument teams in generating the archive, and by data users wishing to understand the format and content of the archive. Typically these individuals would include scientists, data analysts, and software engineers.

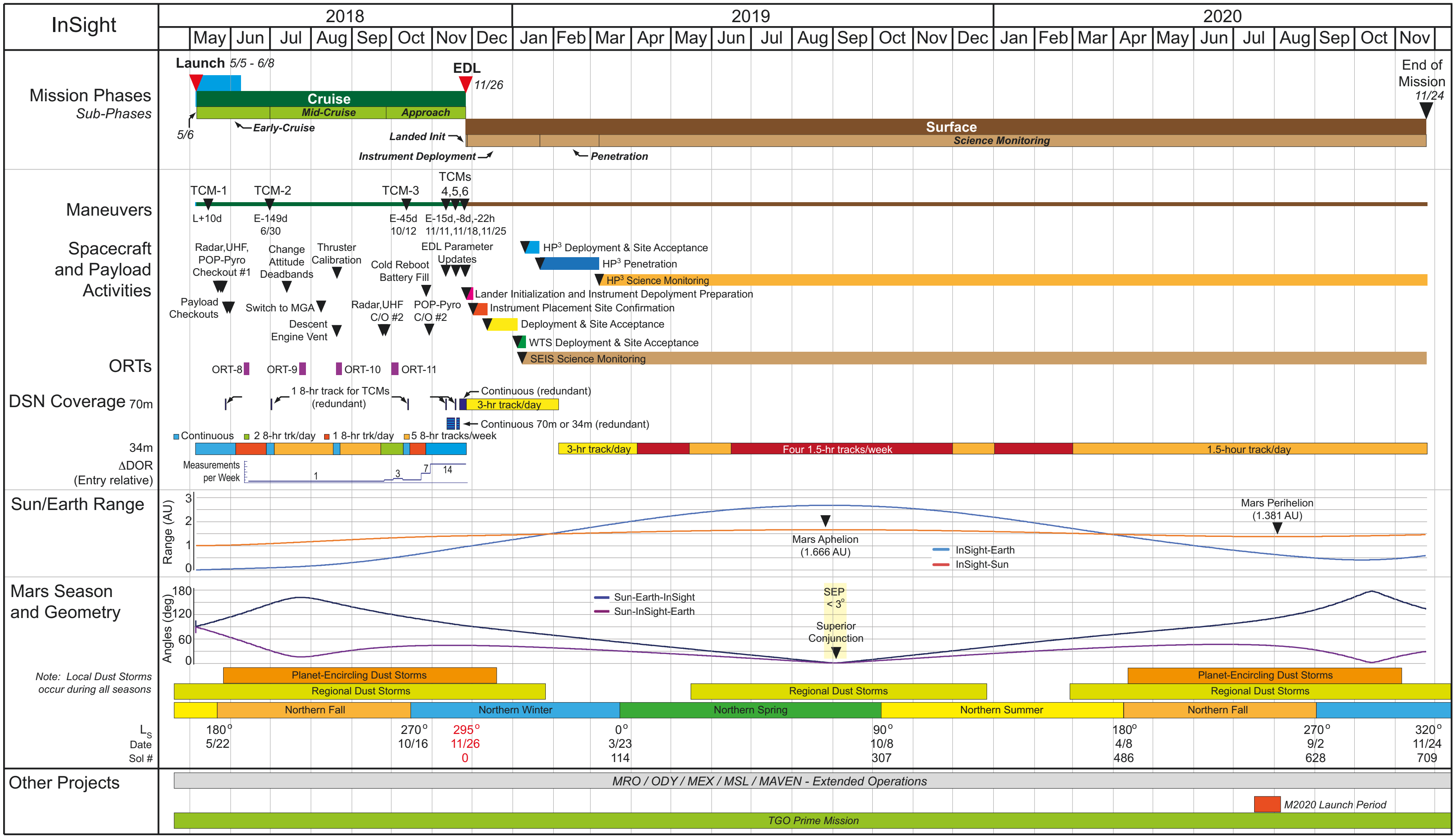
1.5 InSight Mission

InSight launched on May 5, 2018, placing a geophysical lander on Mars on November 26, 2018, to study its deep interior. The Surface Phase consists of three stages, Instrument Deployment, HP^3 Penetration, and Science Monitoring. It ends after one Mars year plus approximately 40 sols. The project timeline is shown in Figure 1.

The science payload comprises two instruments: the Seismic Experiment for Interior Structure (SEIS) and the Heat-Flow and Physical Properties Probe (HP^3). SEIS and HP^3 are placed on the surface with an Instrument Deployment System (IDS) comprised of an Instrument Deployment Arm (IDA), Instrument Deployment Camera (IDC), and Instrument Context Camera (ICC).

See the InSight Cameras SIS for more details on the Instrument Deployment Camera and Instrument Context Camera, and the products produced by those cameras.

Figure 1



InSight
2018
2019
2020
May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov
Mission Phases
Sub-Phases
Launch 5/5 - 6/8
EDL 11/26
End of Mission 11/24
Cruise
Mid-Cruise
Approach
5/6
Early-Cruise
Landed Init
Surface
Science Monitoring
Instrument Deployment
Penetration
Maneuvers
TCM-1
TCM-2
TCM-3
TCMs 4,5,6
L+10d
E-149d 6/30
E-45d 10/12
E-15d,-8d,-22h 11/11,11/18,11/25
Spacecraft and Payload Activities
Radar,UHF, POP-Pyro Checkout #1
Change Attitude Deadbands
Thruster Calibration
EDL Parameter Updates
Cold Reboot Battery Fill
Payload Checkouts
Switch to MGA
Descent Engine Vent
Radar,UHF C/O #2
POP-Pyro C/O #2
HP3 Deployment & Site Acceptance
HP3 Penetration
HP3 Science Monitoring
Lander Initialization and Instrument Deployment Preparation
Instrument Placement Site Confirmation
Deployment & Site Acceptance
WTS Deployment & Site Acceptance
SEIS Science Monitoring
ORTs
ORT-8
ORT-9
ORT-10
ORT-11
DSN Coverage 70m
1 8-hr track for TCMs (redundant)
Continuous (redundant)
3-hr track/day
Continuous 70m or 34m (redundant)
Continuous
2 8-hr trk/day
1 8-hr trk/day
5 8-hr tracks/week
34m
3-hr track/day
Four 1.5-hr tracks/week
1.5-hour track/day
ΔDOR (Entry relative)
Measurements per Week
1
3
7
14
Sun/Earth Range
Range (AU)
Mars Aphelion (1.666 AU)
Mars Perihelion (1.381 AU)
InSight-Earth
InSight-Sun
Mars Season and Geometry
Angles (deg)
Sun-Earth-InSight
Sun-InSight-Earth
SEP < 3°
Superior Conjunction
Note: Local Dust Storms occur during all seasons
Planet-Encircling Dust Storms
Regional Dust Storms
Northern Fall
Northern Winter
Northern Spring
Northern Summer
Northern Fall
Ls
Date
Sol #
180° 5/22
270° 10/16
295° 11/26 0
0° 3/23 114
90° 10/8 307
180° 4/8 486
270° 9/2 628
320° 11/24 709
Other Projects
MRO / ODY / MEX / MSL / MAVEN - Extended Operations
M2020 Launch Period
TGO Prime Mission

2 ICC/IDC Data Products

2.1 Data Product Overview

The ICC/IDC raw and derived products are described in detail in the InSight Camera EDR and RDR Data Products Software Interface Specification (Applicable Document 6).

2.2 Data Processing Levels

Data processing levels mentioned in this SIS refer to PDS4 processing levels. Table 1 provides a description of these levels along with the equivalent designations used historically in other systems, particularly when describing data products for cameras on landed/rover missions.

PDS4 processing level	PDS4 processing level description	NASA Level (used in PDS3)
Telemetry	Telemetry data with instrument data embedded. PDS does not archive telemetry data.	
Raw	Original data from an instrument. If compression, reformatting, packetization, or other translation has been applied to facilitate data transmission or storage, those processes are reversed so that the archived data are in a PDS approved archive format. Often called EDRs (Experimental Data Records).	0
Partially Processed	Data that have been processed beyond the raw stage but which have not yet reached calibrated status. These and more highly processed products are often called RDRs (Reduced Data Records).	1A
Calibrated	Data converted to physical units, which makes values independent of the instrument. Often called RDRs.	1B
Derived	Results that have been distilled from one or more calibrated data products (for example, maps, gravity or magnetic fields, or ring particle size distributions). Supplementary data, such as calibration tables or tables of viewing geometry, used to interpret observational data should also be classified as 'derived' data if not easily matched to one of the other three categories. Often called RDRs.	2+

Table 1: Data processing level definitions

3 ICC/IDC Archive Organization, Identifiers and Naming Conventions

This section describes the basic organization of the ICC/IDC raw, partially processed, calibrated and derived data archived under the PDS4 Information Model (IM) (Applicable Documents 0 through 4), including the naming conventions used for the bundle, collection, and product unique identifiers.

3.1 The ICC/IDC Bundle

The highest level of organization for a PDS4 archive is the bundle. A bundle is a set of one or more related collections which may be of different types. A collection is a set of one or more related basic products which are all of the same type. Bundles and collections are logical structures, not necessarily tied to any physical directory structure or organization.

The complete InSight ICC/IDC archive is organized into a single bundle described in Table 2. The bundle is organized further into the collections described in Table 3.

Bundle Logical Identifier	PDS4 Processing Level	Description
urn:nasa:pds:insight_cameras	Raw, partially processed, calibrated and derived	ICC and IDC Data Bundle

Table 2: ICC/IDC Bundle

3.2 Collections in the ICC/IDC Bundle

Collections consist of basic products all of the same data type. The ICC/IDC Bundle includes the data collections listed in Table 3 (below). These collections include both scientific and non-scientific data products.

Collection Logical Identifiers	Collection Type	Description
urn:nasa:pds:insight_cameras:browse	Browse	“Quick look”, possibly compressed versions of the science data products. The browse versions of data products are not science quality.
urn:nasa:pds:insight_cameras:calibration	Calibration	Calibration reports and files needed for calibration of camera data
urn:nasa:pds:insight_cameras:data	Data	Collection of scientific data products. See Scientific Data Collection Organization section for a description of how the data will be organized into sub-directories.
urn:nasa:pds:insight_cameras:document	Document	Contains documents which are useful for understanding and using the data. This collection includes the Camera EDR and RDR Data Product SIS (Applicable Document 6), and any additional documentation the InSight team wishes to include. Documentation files are PDF-A, plain text or HTML format to be PDS-compliant. While responsibility for the individual documents varies, the primary mission documentation collection is maintained by the PDS Geosciences node.
urn:nasa:pds:insight_cameras:miscellaneous	Miscellaneous	This collection includes the Apache Velocity templates used to generate the PDS4 labels from the VICAR header labels.
urn:nasa:pds:insight_cameras:xml_schema	XML_Schema	XML schemas and related products used to generate and validate PDS4 labels in the ICC/IDC bundle.

Table 3: Collections in the ICC/IDC Bundle

3.3 Data Organization

The `data` directory contains all files from the `data` collection. These are organized by sol, category, and instrument. The `data` directory organization directly mirrors the operational directory structure, which facilitates use of operations tools on the PDS archive, as well as the creation and validation of the archive. See Appendix B for the full directory structure of the bundle, outside of the `data` directory.

```
.. data/
.... sol/
...... <sol_number>/
........ mipl/
.......... <category>/
............ <instrument>/
```

Where "`sol_number`" is the same as the SOL field in the product filenaming convention specified in the InSight Camera SIS. The "sol_number" is a 4-digit, zero-filled, decimal number (e.g. 0001).

"`mipl`" is a constant and is present in order to make the structure match the operational file system (it is the name of the subsystem generating the products).

"`category`" is either `edr` or `rdr`, where `edr` contains all Raw data products and `rdr` contains all Partially Processed, Calibrated, and Derived products (see Section 2.2 for more information on data processing levels).

For single-frame images, "`instrument`" is either `icc` or `idc`. For mosaic or mesh products, "`instrument`" is either `mosaic` or `mesh` since the product may contain data from both cameras. Source products for mosaics and meshes are described in the PDS4 label. The InSight products that belong to each of these processing levels are described in the "Product Identifier" section of the InSight Camera SIS (Applicable Document 6). See Appendix B for an outline of the InSight Cameras Bundle.

3.4 Products in the ICC/IDC Bundle

A PDS product consists of one or more digital objects and an accompanying PDS4 label file, which provides identification and description information for labeled objects. Documents are also considered products, and have PDS4 labels just as data products do. In addition, collections and even the bundle are considered products and have PDS4 labels.

3.4.1 Logical Identifiers

Every product in PDS is assigned an identifier, which allows it to be uniquely identified across the system. This identifier is referred to as a Logical Identifier (LID). A LIDVID (Versioned Logical Identifier) includes product version information, and allows different versions of a specific product to be referenced uniquely. A product's LID and VID (Version Identifier) are defined as separate attributes in the product label. LIDs and VIDs are assigned by PDS and are formed according to the conventions described in the LID Formation and VID Formation sections below. The uniqueness of a product's LIDVID may be verified using the PDS Registry and Harvest tools.

3.4.2 LID Formation

LIDs take the form of a Uniform Resource Name (URN). LIDs are restricted to ASCII lower case letters, digits, dash, underscore, and period. Colons are also used, but only to separate prescribed components of the LID. Within one of these prescribed components dash, underscore, or period are used as separators. LIDs are limited in length to 255 characters.

InSight ICC/IDC LIDs are formed according to the following conventions:

- Bundle LIDs are formed by appending a bundle specific ID to the base ID:

  urn:nasa:pds:<bundle ID>

  Example: urn:nasa:pds:insight_cameras

  The <bundle ID> must be unique across all PDS data archive bundles.
- Collection LIDs are formed by appending a collection specific ID to the collection's parent bundle LID:

  urn:nasa:pds: <bundle ID>:<collection ID>

  Example: urn:nasa:pds:insight_cameras:data

  Because the collection LID is based on the bundle LID, the only syntactic condition is that the <collection ID> must be unique across the bundle. Thus collection LIDs are unique across PDS. Collection IDs correspond to the collection type (e.g. "browse", "data", "document", etc.).

- Basic product LIDs are formed by appending a product specific ID to the product's parent collection LID:

  urn:nasa:pds: <bundle ID>:<collection ID>:<product ID>

  Because the product LID is based on the collection LID, the only additional syntactic condition is that the <product ID> must be unique across the collection.

  For the InSight Cameras `data` and `browse` collections, the <product ID> is generated as follows:

  - Convert the product filename to lowercase.
  - Remove the version number if present (last character of filename, before extension).
  - Remove the .VIC or .IMG extension for images only.

  Note that non-image files and .PNG files in the `browse` collection retain their extension to preserve uniqueness across multiple file types using the same base name (e.g. mosaic ancillary files or mesh OBJ files).

  For example:

Filename = D031L0005_596977368EDR_F0101_0060M1.VIC

LID = urn:nasa:pds:insight_cameras:data:d031l0005_596977368edr_f0101_0060m

Filename = D031L0005_596977368CPG_F0101_0060M1.obj

LID = urn:nasa:pds:insight_cameras:data:d031l0005_596977368cpg_f0101_0060m.obj

For the `calibration` collection, the same rules apply, except there is no version number to remove.

For the remaining collections, the <product ID> is set to be the same as the data file name, with or without the extension, depending on the collection.

3.4.3 VID Formation

Product Version IDs consist of major and minor components separated by a "." (M.n). Both components of the VID are integer values. The major component is set based on the operations pipeline version ID assigned to the product. This value is extracted from the last character of the VICAR product filename. Using this versioning ensures the PDS VID is consistent with the version used in operations processing, and preserves traceability of science products created during operations (before the archive is published). Because of this, the version delivered and archived in the PDS will be increasing in number but may not be contiguous, and there may not be a version 1. The minor component is initialized to a value of "0" and resets to "0" when the major component is incremented. The PDS Standards Reference (Applicable Document 1) specifies rules for incrementing major and minor components.

3.4.4 File Naming Convention

The file naming convention for ICC/IDC data products is described in the File Naming section of the InSight Camera SIS (Applicable Document 6).

3.4.5 PDS4 Labels

Each ICC/IDC product has an accompanying PDS4 label. PDS4 labels are ASCII text files written in the eXtensible Markup Language (XML). Product labels are detached from the files they describe. There is one label for every product. A product, however, may consist of one or more data objects. The data objects of a given product may all reside in a single file, or they may be stored in multiple separate files, in which case the PDS4 label points to all the files. An example of this in InSight is mesh products, which consist of a tuple of (.obj, .mtl, .png) files, with a single (.xml) label file. A PDS4 label file usually has the same name as the data product it describes, but always with the extension ".xml". In the case of images (.VIC or .IMG) and documentation/bundle files, ".xml" will replace the filename extension (e.g. PRODUCT_A.VIC will have the label file PRODUCT_A.xml). For most other files, the ".xml" is appended (e.g. PRODUCT_A.obj has the label PRODUCT_A.obj.xml). The `calibration` collection has special rules, see Appendix B in the InSight Camera SIS (Applicable Document 6).

The ICC/IDC image data files are in VICAR format with attached VICAR labels. The metadata found in these VICAR labels are used as the inputs to generate the PDS4 labels, which are detached

XML files. The images are thus simultaneously valid as both VICAR (data file only) and PDS4 (data file plus label) products. Because the VICAR label is used to generate the PDS4 label, the semantic contents of the two labels are identical.

Documents are also considered products, and have accompanying PDS4 labels.

For the InSight mission, the structure and content of PDS labels will conform to the PDS master schema and Schematron based upon the PDS Information Model (Applicable Document 3). In brief, the Schema is the XML model that PDS4 labels must follow, and the Schematron is a set of validation rules that are applied to PDS4 labels. In addition to the PDS master schema documents, there are discipline- and mission-specific XML schema and Schematron documents, which provide additional governance over the products in this archive. The PDS Validate Tool should be used to validate the structure and content of the product labels. In brief, the Schema is the XML model that PDS4 labels must follow, and the Schematron is a set of validation rules that are applied to PDS4 labels.

A list of the XML Schema and Schematron documents associated with this archive are provided in Table 4, and in the `xml_schema` *collection.*

XML Document	Steward	Product LID
PDS Core Schema/Schematron	PDS	urn:nasa:pds:system_bundle:xml_schema:pds-xml_schema
InSight Mission Schema/Schematron	Geosciences Node	urn:nasa:pds:system_bundle:xml_schema:insight-xml_schema
Imaging Dictionary Schema/Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:img-xml_schema
Geometry Dictionary Schema/Schematron	Geosciences Node	urn:nasa:pds:system_bundle:xml_schema:geom-xml_schema
Cartography Dictionary Schema/ Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:cart-xml_schema
Processing Information Dictionary Schema/ Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:proc-xml_schema
Display Information Dictionary Schema/Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:disp-xml_schema
Mission Information Dictionary Schema/Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:msn-xml_schema
Surface Mission Information Dictionary Schema/Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:msn_surface-xml_schema
Surface Imaging Dictionary Schema/ Schematron	Imaging Node	urn:nasa:pds:system_bundle:xml_schema:img_surface-xml_schema

Table 4: ICC/IDC Schema and Schematron documents

4 ICC/IDC Archive Bundle Product Formats

Data that comprise the ICC/IDC raw data archive are formatted in accordance with PDS specifications (see Applicable Documents 0 through 4). This section provides details on the formats used for each of the products included in the archive.

4.1 Science Data Product Formats

The telemetry, raw, partially processed, calibrated and derived data products are described in the InSight Camera EDR and RDR Data Products SIS (Applicable Document 6).

4.2 Document Product Formats

Documents in this archive are provided as PDF/A (www.pdfa.org/download/pdfa-in-a-nutshell) or as plain ASCII text if no special formatting is required. Figures that accompany documents are provided as TIFF, GIF, JPEG, or PNG files. HTML versions of some documents are provided in addition to the PDF/A version.

4.3 Calibration Product Formats

Products in the Calibration collection include documents (PDF/A or plain ASCII text), and image files, similar in format to the science data products.

4.4 Browse Product Formats

Products in the Browse collection do not contain any scientifically useful information that is not found in the Data collection, and conform to a well-documented standard in current use (PNG). This data is not archival data, and thus may become outdated.

Appendix A Support staff and cognizant persons

InSight ICC/IDC			
Name	**Affiliation**	**Phone**	**Email**
Justin Maki	InSight Co-I for ICC/IDC	818-354-6227	Justin.Maki@jpl.nasa.gov
Hallie Abarca	InSight/MIPL Systems Engineer	818-354-1817	Hallie.E.Gengl@jpl.nasa.gov
Robert Deen	InSight/MIPL Development Lead	818-354-7492	Bob.Deen@jpl.nasa.gov

PDS Imaging Node			
Name	**Affiliation**	**Phone**	**Email**
Sue Lavoie	Imaging Node, Co-I	818-354-5677	slavoie@jpl.nasa.gov
Cristina De Cesare	Imaging Node, Mission Interface	818-354-5642	Cristina.M.DeCesare@jpl.nasa.gov

Table 5: Archive support staff

Appendix B Bundle Directory Structure

This section provides a simple outline of the bundle directory structure.

```
insight_cameras
├──── browse
|    └── sol
|        └── <sol_number>
|            └── mipl
|........ ..... .....    └── <category>
|                    └── <instrument>
├──── calibration
├──── data
|    └── sol
|        └── <sol_number>
|            └── mipl
|                └── <category>
|                    └── <instrument>
├──── document
├──── miscellaneous
├──── xml_schema
```

For example:

```
insight_cameras
├──── browse
|   └── sol
|       └── 0001
|           └── mipl
|              └── edr
|........ ..... .....└── icc
|                 └── idc
|              └── rdr
|........ ..... .....└── icc
|                 └── idc
├──── data
|   └── sol
|       └── 0001
|           └── mipl
|              └── edr
|                 └── icc
|                 └── idc
|              └── rdr
|                 └── icc
|                 └── idc
|                 └── mesh
|                 └── mosaic
├──── document
├──── miscellaneous
├──── xml_schema
```