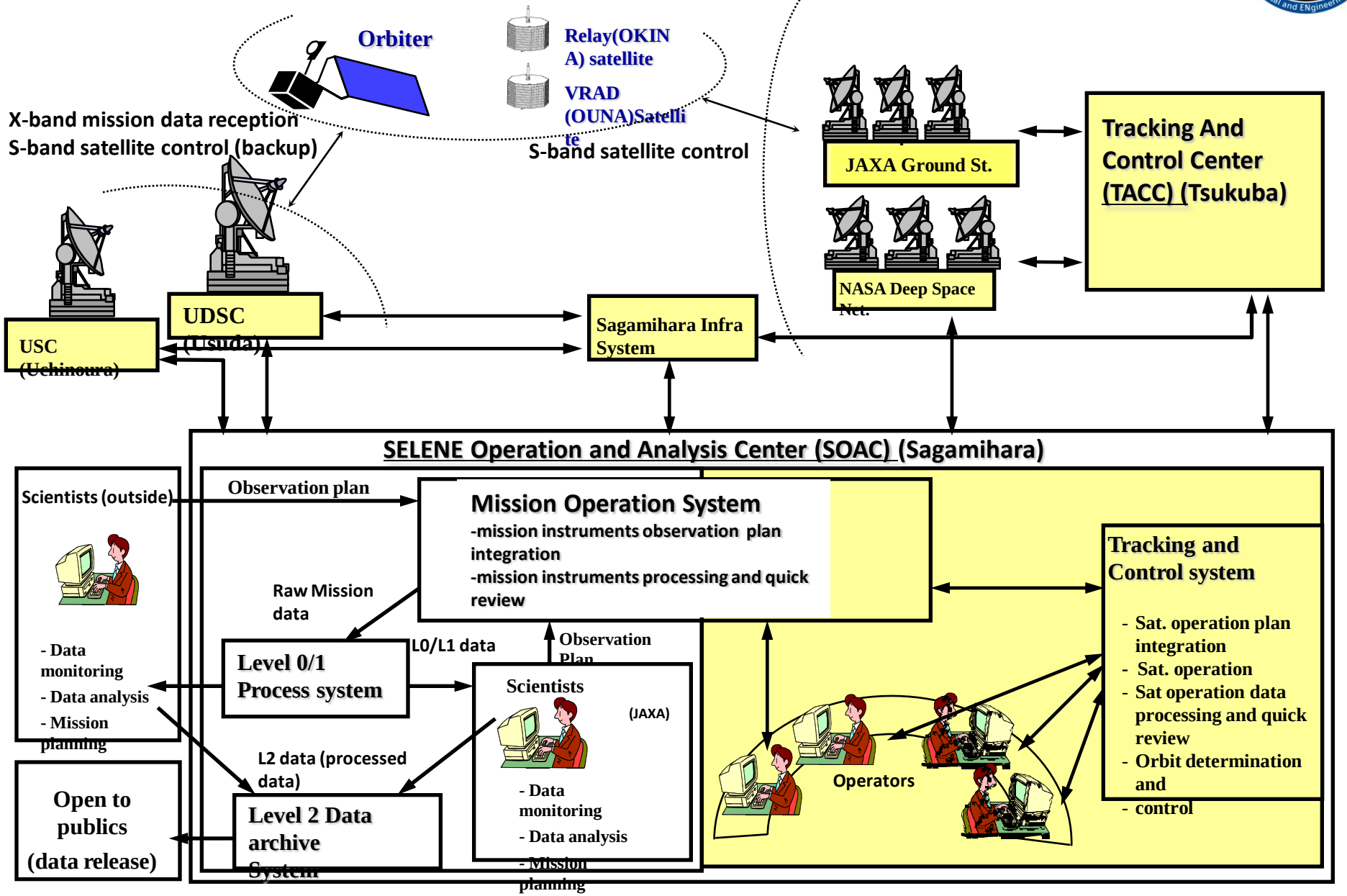
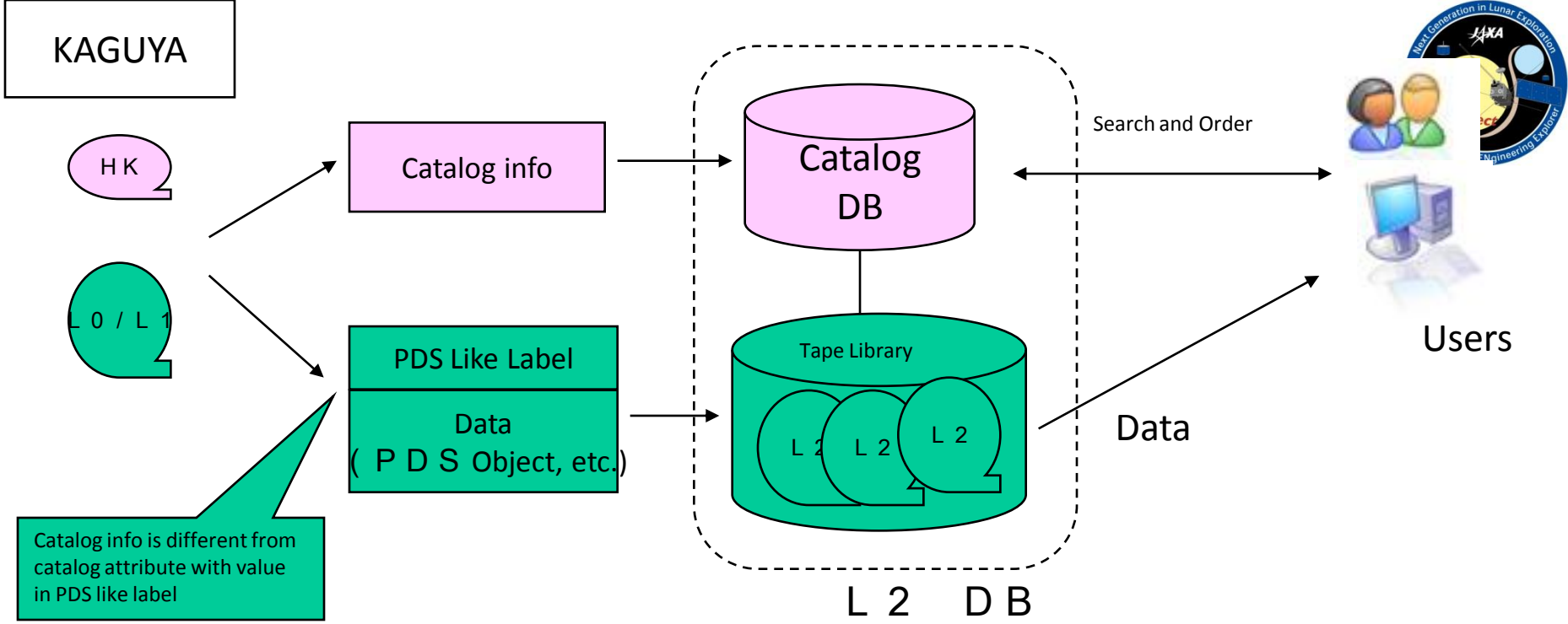
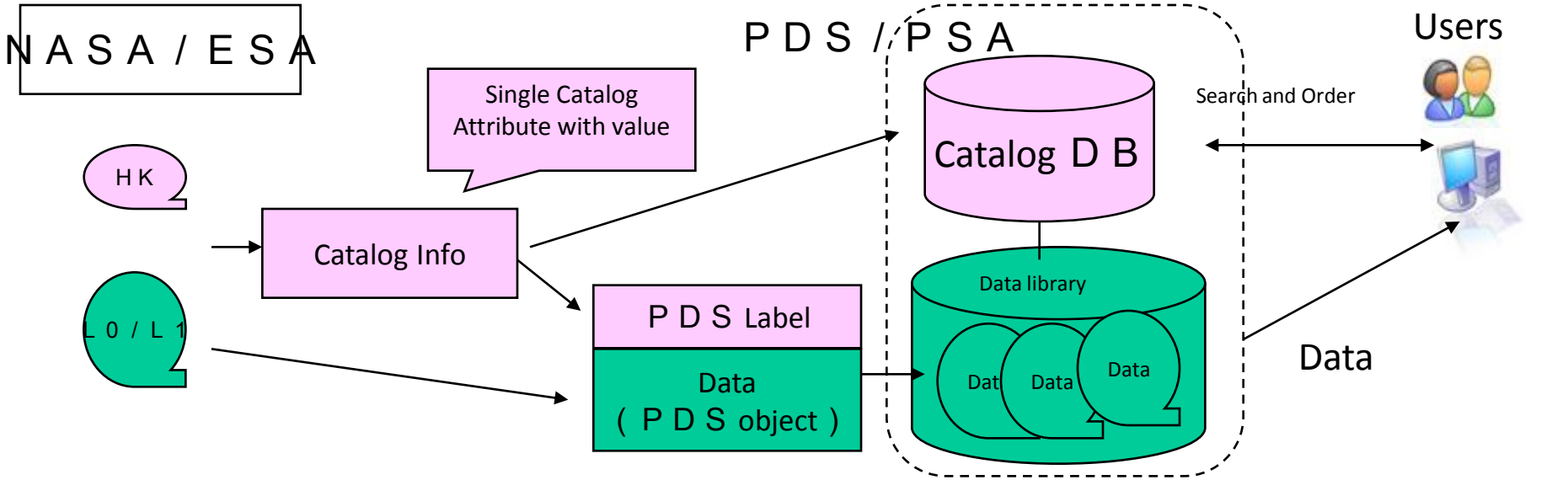
KAGUYA Ground System and PDAP experiment

SELENE (KAGUYA) Operation

SELENE operations are performed at SELENE Operation and Analysis Center (SOAC) at the JAXA Sagamihara Campus.




KAGUYA
HK
L0/L1
Catalog info
PDS Like Label
Data
(PDS Object, etc.)
Catalog info is different from catalog attribute with value in PDS like label
Catalog DB
Tape Library
L2
L2
L2
L2 DB
Search and Order
Data
Users


NASA/ESA
PDS/PSA
Single Catalog Attribute with value
HK
L0/L1
Catalog Info
PDS Label
Data
(PDS object)
Catalog DB
Data library
Data
Data
Data
Search and Order
Data
Users

Interoperability Tasks

1. Solving Issue

SELENE catalog (metadata) in PDS like label in L2 Data is slightly different from catalog for search and order in catalog DB (some keyword (attribute) and value definition are different).

2. Task

- Need to develop

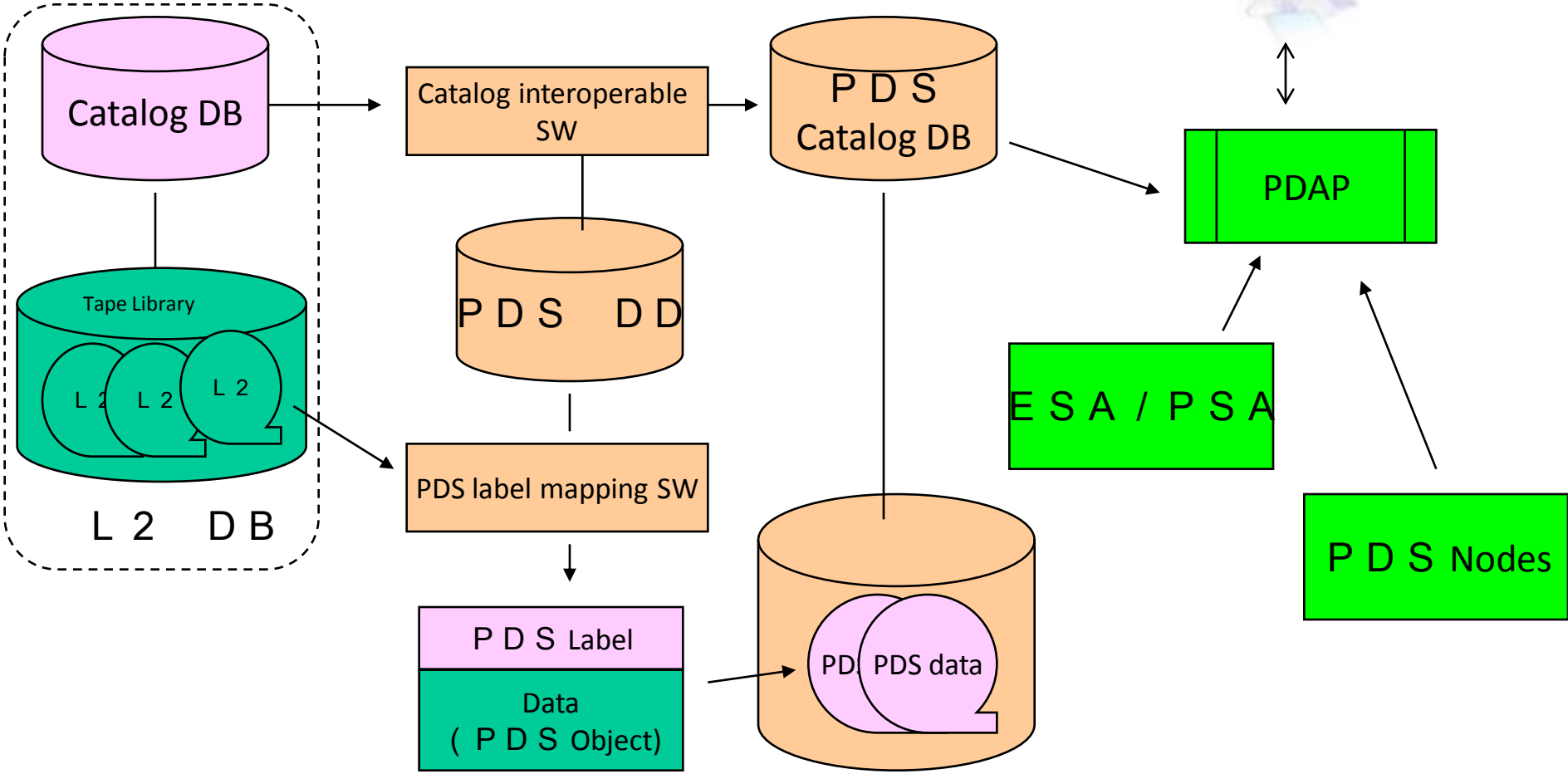
(1) Catalog interoperability software to interconnect between catalog DB archived in PDS nodes / ESA PSA and SELENE L2 data base through PDAP (Planetary data access protocol proposed by PDS/PSA).

(2) PDS label development software to translate SELENE PDS like label to PDS compatible PDS label which is detached to L2 data as PDS label.

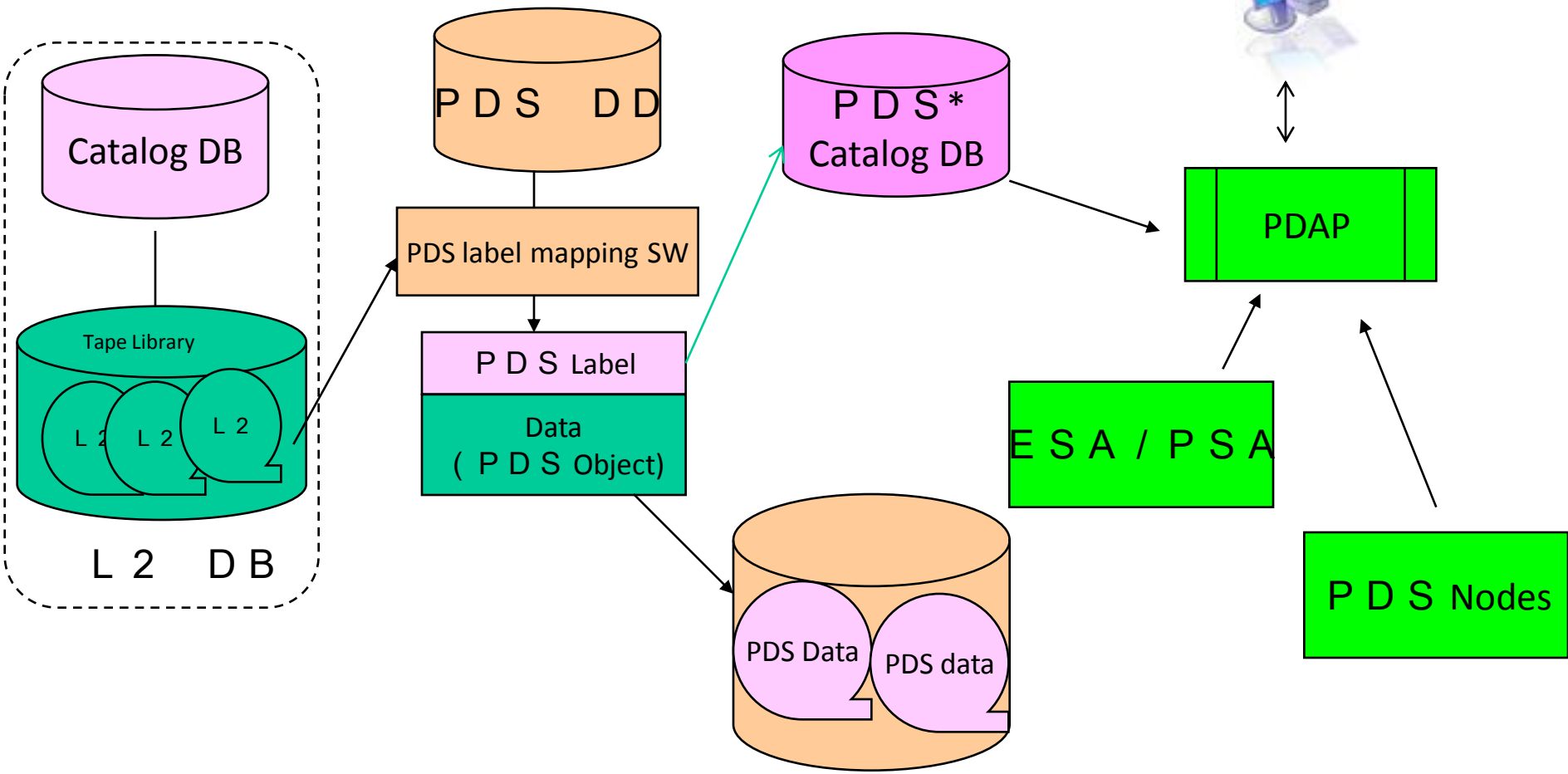
- Need to prepare

(1) Interoperable catalog system with PDS labeled L2 data archive

KAGUYA (SELENE) Interoperable System Idea 1
- PDS compatible catalog DB from L2 DB -



SELENE Interoperable System Idea 2
- PDS compatible catalog DB from L2 Products -



* Minimum catalog DB extracted from PDS label information (misison / instrument Name, date, location, geophysical parameter…)
* Extracted with JAXA's defined metadata with XML format from PDS label to import to PDS catalog DB to support multi missions in JAXA

KAGUYA PDAP Experiment

- Finish the prototyping of interoperable system for SELENE LISM L2 product with PDAP (option 2) on March, 2008
  - Metadata object mapping between SELENE catalogue and PDS label object
  - GUI I/F study for catalogue search

- Compile system requirement for interoperable catalogue system with PDAP including security, authentication/authorization, etc.

PDAP experiment (Oct, 07 – Feb, 08)

1. Database design of PDS compatible catalogue for LISM L2 data

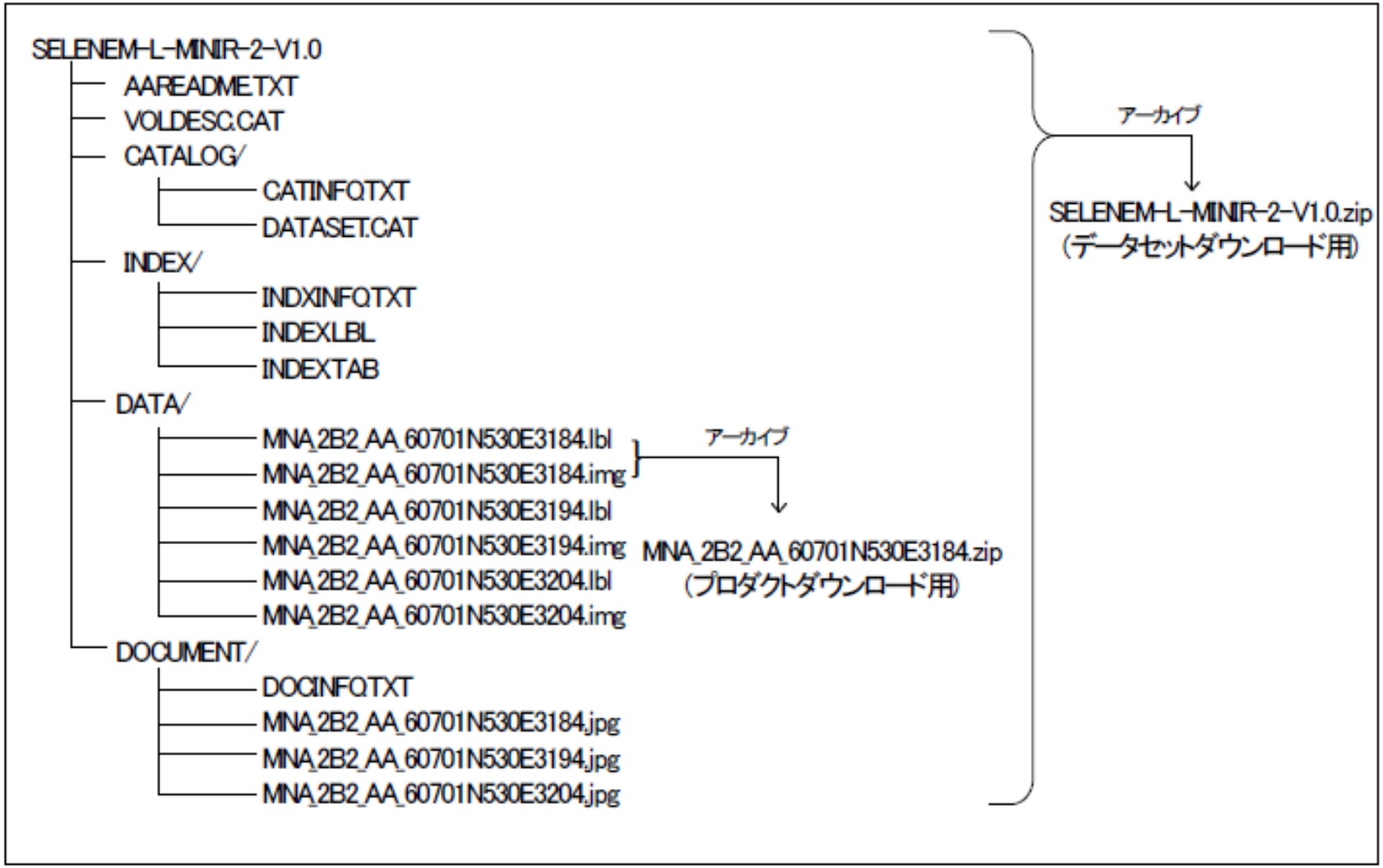
- List up catalogue items to establish compatibility / interoperability with ESA/PSA and NASA/PDS

2. Develop search system with GUI for catalogue DB search by PDAP

- Customize exsiting user I/F GUI for EO remote sensing to adopt lunar remote sensing (only minor modification)

3. Evaluation of prototype database and search system

LISM L2 Product dataset design
- PDS like format -



Mandatory search result items for PDAP retrieving

Item	Content	Remark
DATA_SET_ID	データセット ID	
PRODUCT_ID	プロダクト ID	RESOURCE_CLASS=PRODUCT の場合
DATA_SET_NAME	データセット名	RESOURCE_CLASS=DATA_SET の場合
MISSION_NAME	ミッション名	
START_TIME	観測開始時刻	
STOP_TIME	観測終了時刻	
CENTER_LONGITUDE	中心経度	RESOURCE_CLASS=IMAGE の場合
CENTER_LATITUDE	中心緯度	RESOURCE_CLASS=IMAGE の場合
FOOTPRINT	座標情報	RESOURCE_CLASS=IMAGE の場合 ※１
DATA_ACCESS_REFERENCE	データ参照先	※２
ICON_ACCESS_REFERENCE	アイコン参照先 （オプション）	RESOURCE_CLASS=PRODUCT の場合 ※３
RETURN_TYPE	応答表示タイプ	
RESOURCE_CLASS	検索対象クラス	
REFERENCE_FORMAT	－	※４　詳細不明
PUBLISHER	－	
CONTRIBUTOR	－	
PUBLISHING_DATE	－	
RIGHTS	－	

Link with browse data (URL link)

Don’t know how to use those

Don’t understand why they are mandatory? 「Planetary Data Access Protocol Version 0.3] are not well defined

PDS DB (catalogue table) of KAGUYA for PDAP

項目	内容	備考
PRODUCT_ID	プロダクト ID	
DATA_SET_ID	データセット ID	
DATA_SET_NAME	データセット名	
MISSION_NAME	ミッション名	
INSTRUMENT_TYPE	観測機器タイプ	
INSTRUMENT_NAME	観測機器名	
TARGET_TYPE	観測対象タイプ	
TARGET_NAME	観測対象名	
START_TIME	観測開始時刻	※１
STOP_TIME	観測終了時刻	※１
CENTER_LONGITUDE	中心経度	※２
CENTER_LATITUDE	中心緯度	※２
UPPER_LEFT_LONGITUDE	左上経度	※３
UPPER_LEFT_LATITUDE	左上緯度	※３
UPPER_RIGHT_LONGITUDE	右上経度	※３
UPPER_RIGHT_LATITUDE	右上緯度	※３
LOWER_LEFT_LONGITUDE	左下経度	※３
LOWER_LEFT_LATITUDE	左下緯度	※３
LOWER_RIGHT_LONGITUDE	右下経度	※３
LOWER_RIGHT_LATITUDE	右下緯度	※３
DATA_SET.DATA_ACCESS_REFERENCE	データ参照先	
PRODUCT.DATA_ACCESS_REFERENCE	データ参照先	
ICON_ACCESS_REFERENCE	アイコン参照先	

※１ RESOURCE_CLASS=DATA_SET のとき、START_TIME 及び STOP_TIME の出力は、同じ DATA_SET_ID をもつPRODUCT の START_TIME 及びSTOP_TIME を参照し、最も早い START_TIME 及び最も遅い STOP_TIME とする。
※ ２ 入力されたLONGITUDE 、LATITUDE の範囲内に、CENTER_LONGITUDE 又は CENTER_LATITUDE があるとき、検索にヒットしたものとして出力される。
※ ３ 入力されたLONGITUDE 、LATITUDE の範囲内に、CENTER_LONGITUDE 又は CENTER_LATITUDE があるとき、検索にヒットしたものとして、FOOTPRINT フィールド に以下のフォーマットで出力される。
POLYGON(UPPER_LEFT_LONGITUDE:UPPER_LEFT_LATITUDE, UPPER_RIGHT_LONGITUDE:UPPER_RIGHT_LATITUDE, LOWER_LEFT_LONGITUDE:LOWER_LEFT_LATITUDE, LOWER_RIGHT_LONGITUDE:LOWER_RIGHT_LATITUDE)

Item mapping between PDS label and KAGUYA LISM L2 Product PDS label

データベース登録項目	PDS ラベル項目	LISM プロダクトラベル項目	備考
PRODUCT_ID	PRODUCT_ID	PRODUCT_ID	
DATA_SET_ID	DATA_SET_ID	(DATA_SET_ID)	※1
DATA_SET_NAME	DATA_SET_NAME	(DATA_SET_ID)	
MISSION_NAME	MISSION_NAME	MISSION_NAME	
INSTRUMENT_TYPE	INSTRUMENT_TYPE	(INSTRUMENT_NAME)	※2
INSTRUMENT_NAME	INSTRUMENT_NAME	INSTRUMENT_NAME	
TARGET_TYPE	TARGET_TYPE	-	※3
TARGET_NAME	TARGET_NAME	TARGET_NAME	
START_TIME	START_TIME	START_TIME	
STOP_TIME	STOP_TIME	STOP_TIME	
CENTER_LONGITUDE	CENTER_LONGITUDE	SCENE_CENTER_LONGITUDE	
CENTER_LATITUDE	CENTER_LATITUDE	SCENE_CENTER_LATITUDE	
UPPER_LEFT_LONGITUDE	(UPPER_LEFT_LONGITUDE)	UPPER_LEFT_LONGITUDE	※4
UPPER_LEFT_LATITUDE	(UPPER_LEFT_LATITUDE)	UPPER_LEFT_LATITUDE	
UPPER_RIGHT_LONGITUDE	(UPPER_RIGHT_LONGITUDE)	UPPER_RIGHT_LONGITUDE	
UPPER_RIGHT_LATITUDE	(UPPER_RIGHT_LATITUDE)	UPPER_RIGHT_LATITUDE	
LOWER_LEFT_LONGITUDE	(LOWER_LEFT_LONGITUDE)	LOWER_LEFT_LONGITUDE	
LOWER_LEFT_LATITUDE	(LOWER_LEFT_LATITUDE)	LOWER_LEFT_LATITUDE	
LOWER_RIGHT_LONGITUDE	(LOWER_RIGHT_LONGITUDE)	LOWER_RIGHT_LONGITUDE	
LOWER_RIGHT_LATITUDE	(LOWER_RIGHT_LATITUDE)	LOWER_RIGHT_LATITUDE	
DATA_SET. DATA_ACCESS_REFERENCE	(DATA_SET_ID)	(DATA_SET_ID)	※5
PRODUCT. DATA_ACCESS_REFERENCE	(PRODUCT_ID) (DATA_SET_ID)	(PRODUCT_ID) (DATA_SET_ID)	
ICON_ACCESS_REFERENCE	(PRODUCT_ID) (DATA_SET_ID)	(PRODUCT_ID) (DATA_SET_ID)	

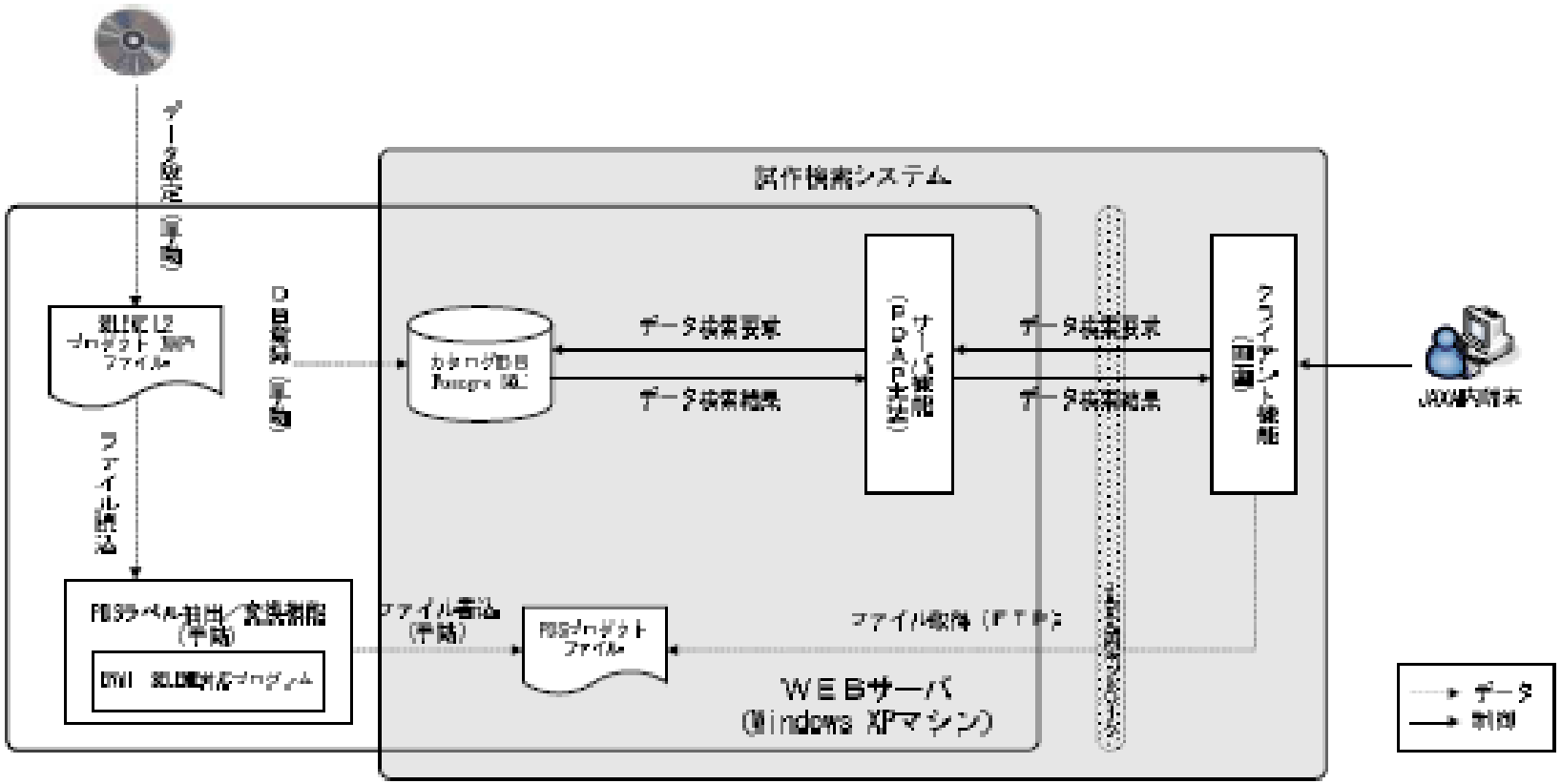
Most label items can be easily mapped with some value format translation

Example of KAGUYA LISM catalogue DB contents

項目	データ型（バイト）	値1	値2	値3
PRODUCT_ID	Char(40)	TC1W2A0_01DSH60701_404_1101	TC1W2A0_01DSH60701_688_0101	TC1W2A0_01DSH60701_903_3101
DATA_SET_ID	Char(40)	SELENEM-L-TC1-2-V1.0	SELENEM-L-TC1-2-V1.0	SELENEM-L-TC1-2-V1.0
DATA_SET_NAME	Char(60)	SELENE-M Moon Terrain Camera 1 2 V1.0	SELENE-M Moon Terrain Camera 1 2 V1.0	SELENE-M Moon Terrain Camera 1 2 V1.0
MISSION_NAME	Char(60)	SELENE	SELENE	SELENE
INSTRUMENT_TYPE	Char(30)	TERRAIN CAMERA	TERRAIN CAMERA	TERRAIN CAMERA
INSTRUMENT_NAME	Char(60)	TERRAIN CAMERA 1	TERRAIN CAMERA 1	TERRAIN CAMERA 1
TARGET_TYPE	Char(20)	SATELLITE	SATELLITE	SATELLITE
TARGET_NAME	Char(30)	MOON	MOON	MOON
START_TIME	Timestamp	2006-07-01 00:11:00.000000	2006-07-01 00:11:00.000000	2006-07-01 00:11:00.000000
STOP_TIME	Timestamp	2006-07-01 00:11:11.381500	2006-07-01 00:11:11.381500	2006-07-01 00:11:11.381500
CENTER_LONGITUDE	Numeric(32)	318.413374	319.413374	320.413374
CENTER_LATITUDE	Numeric(32)	52.845756	52.845756	52.845756
UPPER_LEFT_LONGITUDE	Numeric(32)	317.951276	318.951276	319.951276
UPPER_LEFT_LATITUDE	Numeric(32)	53.129456	53.129456	53.129456
UPPER_RIGHT_LONGITUDE	Numeric(32)	318.849773	319.849773	320.849773
UPPER_RIGHT_LATITUDE	Numeric(32)	53.144829	53.144829	53.144829
LOWER_LEFT_LONGITUDE	Numeric(32)	317.983302	318.983302	319.983302
LOWER_LEFT_LATITUDE	Numeric(32)	52.545118	52.545118	52.545118
LOWER_RIGHT_LONGITUDE	Numeric(32)	318.867874	319.867874	320.867874
LOWER_RIGHT_LATITUDE	Numeric(32)	52.559907	52.559907	52.559907
DATA_SET.DATA_ACCESS_REFERENCE	Char(512)	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0.zip	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0.zip	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0.zip
PRODUCT.DATA_ACCESS_REFERENCE	Char(512)	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/data/TC1W2A0_01DSH60701_404_1101.zip	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/data/TC1W2A0_01DSH60701_688_0101.zip	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/data/TC1W2A0_01DSH60701_903_3101.zip
ICON_ACCESS_REFERENCE	Char(512)	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/document/TC1W2A0_01DSH60701_404_1101.jpg	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/document/TC1W2A0_01DSH60701_688_0101.jpg	http://***/pdap_sample/pds/SELENEM-L-TC1-2-V1.0/document/TC1W2A0_01DSH60701_903_3101.jpg

検索キーワード

PDAP test bet system



Search protocol contents

1. Request text format

http://URL?KEYWORD_01=VALUE_01&
KEYWORD_02=VALUE_02&・・・ &KEYWORD_NN=VALUE_NN

2. Respone format (XML(VOTABLE) or HTML)

“FIELD” タグは、“RESOURCE_CLASS” キーワードの設定値に応じて、有効キーワードが設定される。

```
<?xml version="1.0" ?>
<VOTABLE version="1.1">
        <RESOURCE type="results">
                <DESCRIPTION>JAXA PDAP Service</DESCRIPTION>
                <INFO name="QUERY_STATUS" value="OK" />
                <TABLE>
                        <FIELD ID="DATA_SET.DATA_SET_ID" ucd="DATA_SET_ID" utype="pds:DATA_SET.DATA_SET_ID" datatype="char" arraysize="char" />
                        <FIELD ID="DATA_SET.DATA_SET_NAME" ucd="DATA_SET_NAME" utype="pds:DATA_SET.DATA_SET_NAME" datatype="char" arraysize="char" />
                        <FIELD ID="DATA_SET.MISSION_NAME" ucd="MISSION_NAME" utype="pds:DATA_SET.MISSION_NAME" datatype="char" arraysize="char" />
                        <FIELD ID="DATA_SET.DATA_ACCESS_REFERENCE" ucd="DATA_ACCESS_REFERENCE" datatype="char" arraysize="char" />
                        <FIELD ID="DATA_SET.START_TIME" ucd="START_TIME" utype="pds:DATA_SET.START_TIME" datatype="char" arraysize="char" />
                        <FIELD ID="DATA_SET.STOP_TIME" ucd="STOP_TIME" utype="pds:DATA_SET.STOP_TIME" datatype="char" arraysize="char" />
                        <FIELD ID="RESOURCE_CLASS" ucd="RESCLASS" datatype="char" arraysize="char" />
                        <DATA>
                                <TABLEDATA>
                                        <TR>
                                                <TD>SELENE_Moon_TC-1_Level2B</TD>
                                                <TD><![CDATA[ SELENE_Moon_TC-1_Level2B ]]></TD>
                                                <TD><![CDATA[ SELENE ]]></TD>
                                                <TD><![CDATA[ ./data/SELENE_Moon_TC-1_Level2B.zip ]]></TD>
                                                <TD>2007-07-01 00:11:00</TD>
                                                <TD>2007-07-01 00:11:11</TD>
                                                <TD>DATA_SETS</TD>
                                        </TR>
                                          ・
                                          ・
                                          ・
                                        データ数分繰り返す。
                                </TABLEDATA>
                        </DATA>
                </TABLE>
        </RESOURCE>
</VOTABLE>
```

“FIELD” タグに対応した設定値

図 3-3 レスポンス電文出力イメージ（VOTABLE）

Input keyword for testbed

入力キーワード	カタログ DB 設定項目	備考
DATA_SET_ID	DATA_SET_ID	
PRODUCT_ID	PRODUCT_ID	
INSTRUMENT_TYPE	INSTRUMENT_TYPE	
INSTRUMENT_NAME	INSTRUMENT_NAME	
TARGET_TYPE	TARGET_TYPE	
TARGET_NAME	TARGET_NAME	
START_TIME	START_TIME	
STOP_TIME	STOP_TIME	
RETURN_TYPE	ー	カタログ DB を検索するためのキーワードではない。 （PDAP の振る舞いを定義）
RESOURCE_CLASS	ー	カタログ DB を検索するためのキーワードではない。 （PDAP の振る舞いを定義）
LONGITUDE	CENTER_LONGITUDE	
LATITUDE	CENTER_LATITUDE	

Snap shot of testbed for search

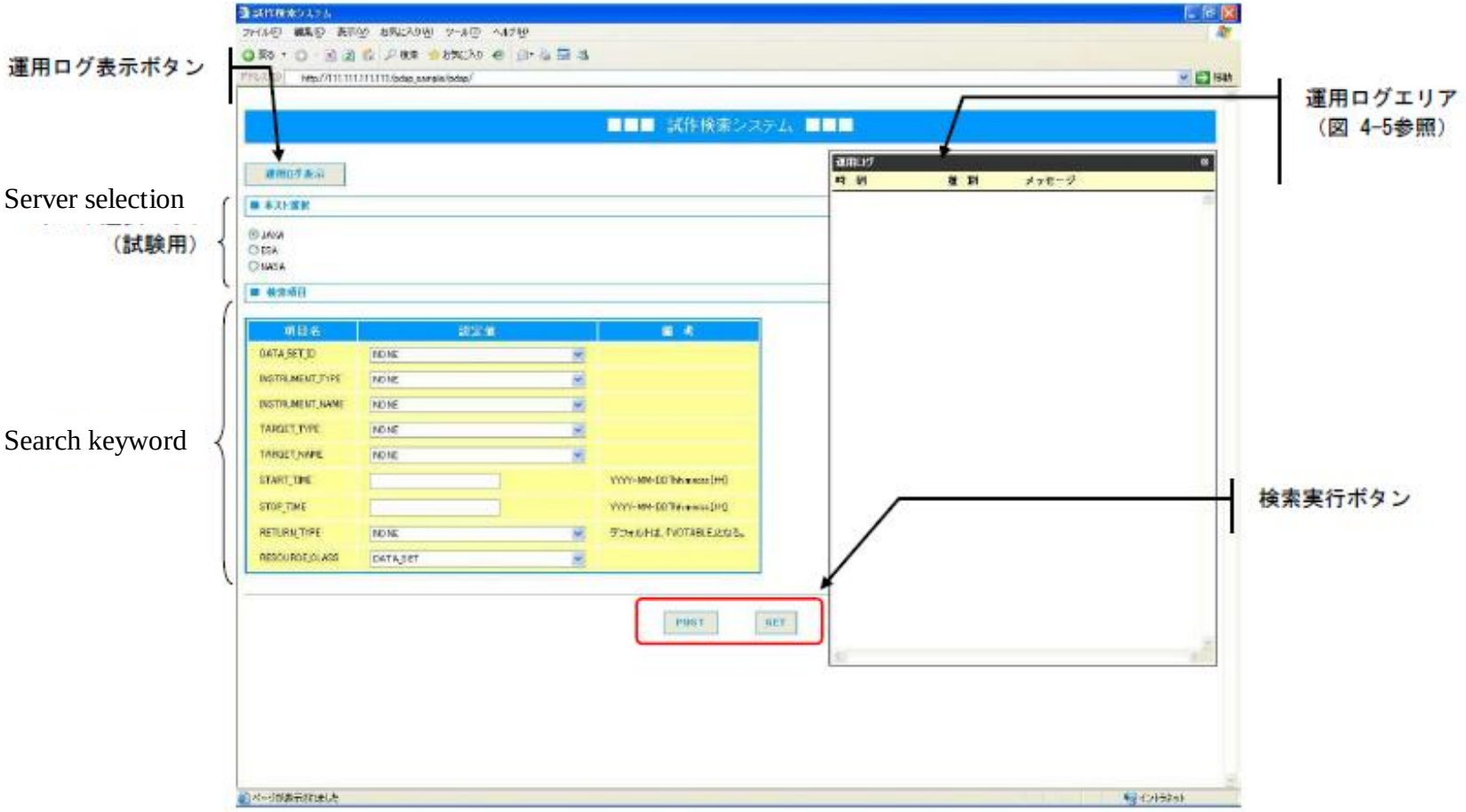


図 4-4 画面レイアウト（初期表示画面）

Output items

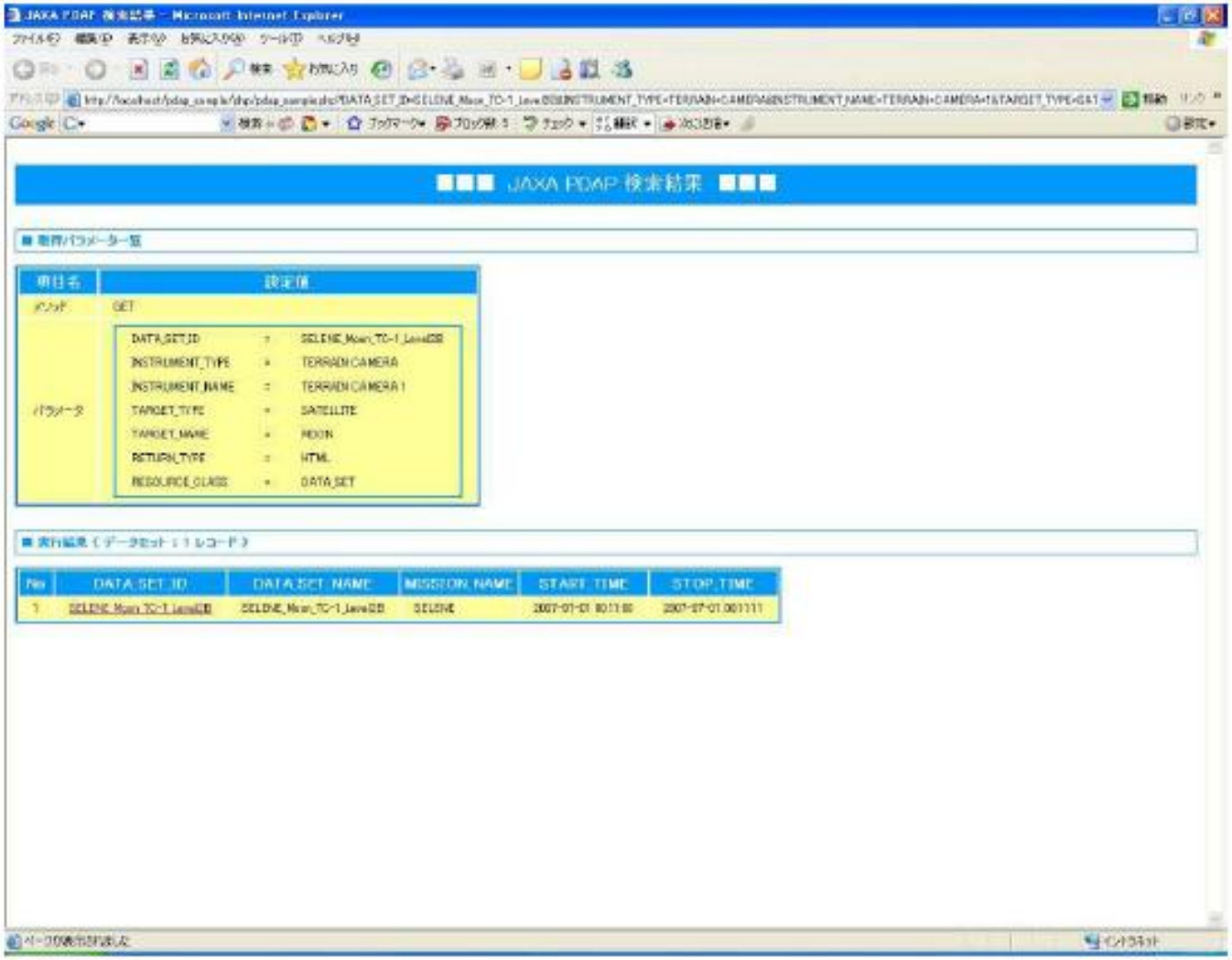
出力キーワード	カタログ DB 設定項目	備考
DATA_SET_ID	DATA_SET_ID	
DATA_SET_NAME	DATA_SET_NAME	
PRODUCT_ID	PRODUCT_ID	
MISSION_NAME	MISSION_NAME	
DATA_ACCESS_REFERENCE	DATA_SET.DATA_ACCESS_REFERENCE PRODUCT.DATA_ACCESS_REFERENCE	
FOOTPRINT	UPPER_LEFT_LONGITUDE UPPER_LEFT_LATITUDE UPPER_RIGHT_LONGITUDE UPPER_RIGHT_LATITUDE LOWER_LEFT_LONGITUDE LOWER_LEFT_LATITUDE LOWER_RIGHT_LONGITUDE LOWER_RIGHT_LATITUDE	“POLYGON” として設定。
CENTER_LONGITUDE	CENTER_LONGITUDE	
CENTER_LATITUDE	CENTER_LATITUDE	
START_TIME	START_TIME	
STOP_TIME	STOP_TIME	
ICON_ACCESS_REFERENCE	ICON_ACCESS_REFERENCE	
RESOURCE_CLASS	ー	カタログ DB を検索するためのキーワードではない。 （PDAP の振る舞いを定義）

Snap shot for results

Search Keyword

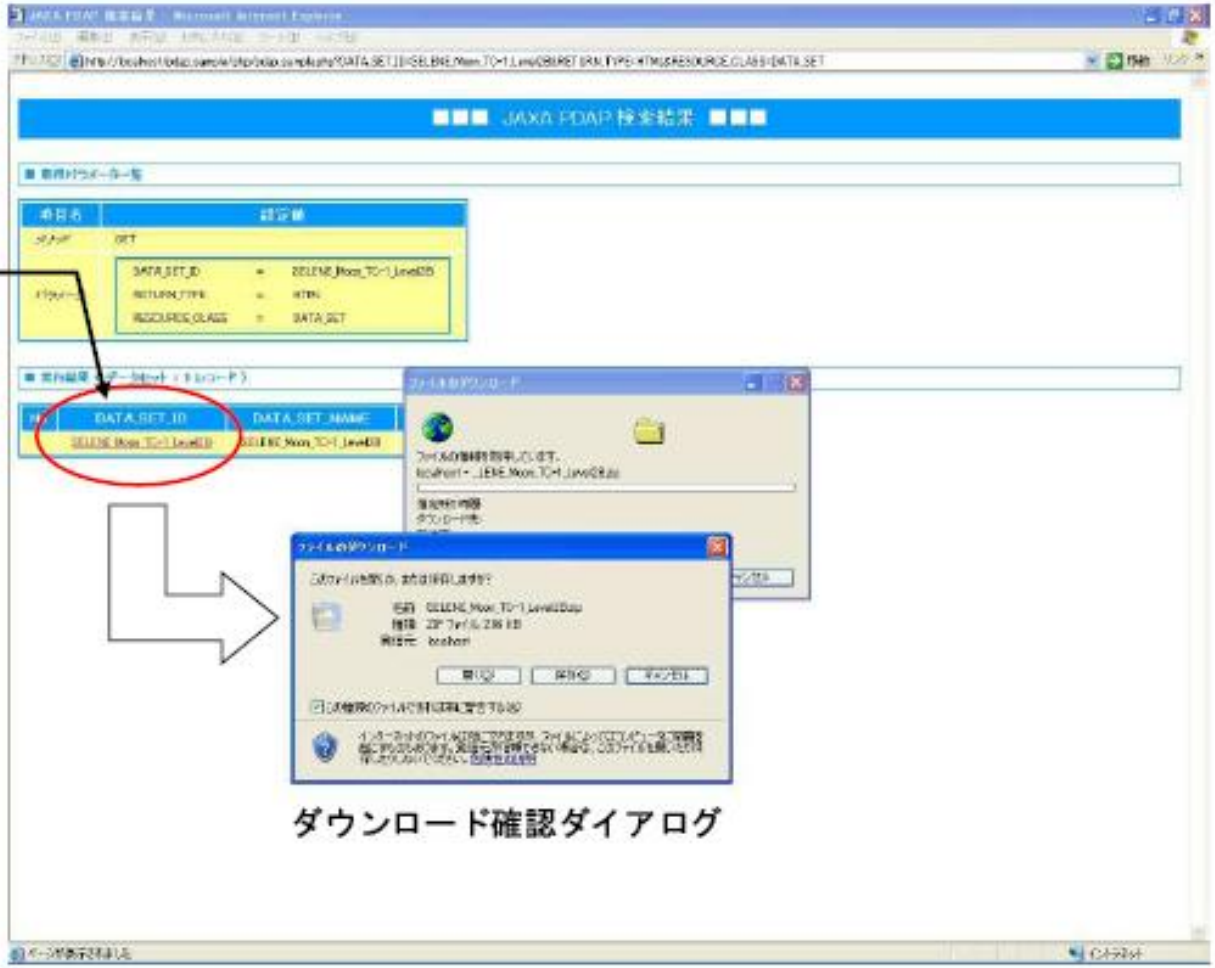
（試験用）

Results



Snap shot for results #2

Product download



Summary

- By using Planetary Data Access Protocol Version 0.3, SELENE project succesfully developed and evaluated testbed catalogue system of SELENE LISM L2 product
- Also confirmed the accessibility to JPL PDS system with our GUI I/F of testbed

- Still remained issues
  - Need refrain of PDAP version 0.3 (such as why do we need rights as mandatory?)
  - Need authentication / authorization process to protect data rights
  - May need revise PDAP to improve system performance to retrieve expected huge database (adding hit number search as pre-search and polling DB servers status...)
- But, SELENE system is ready to join some testbed activity with PDAP if IPDA wants