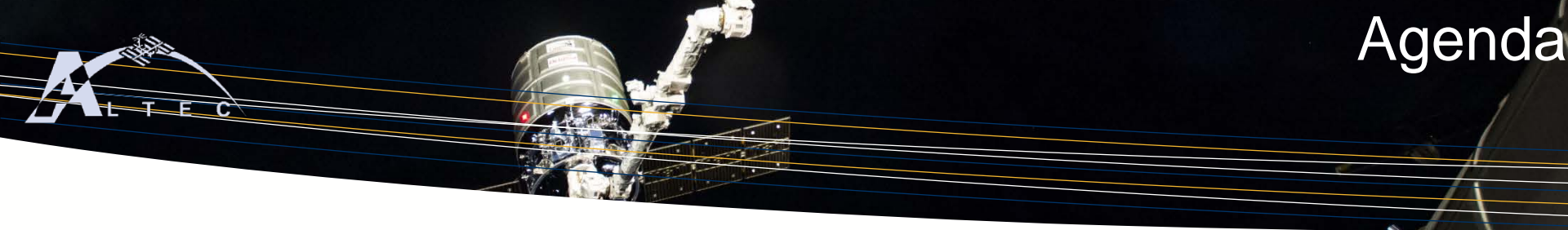
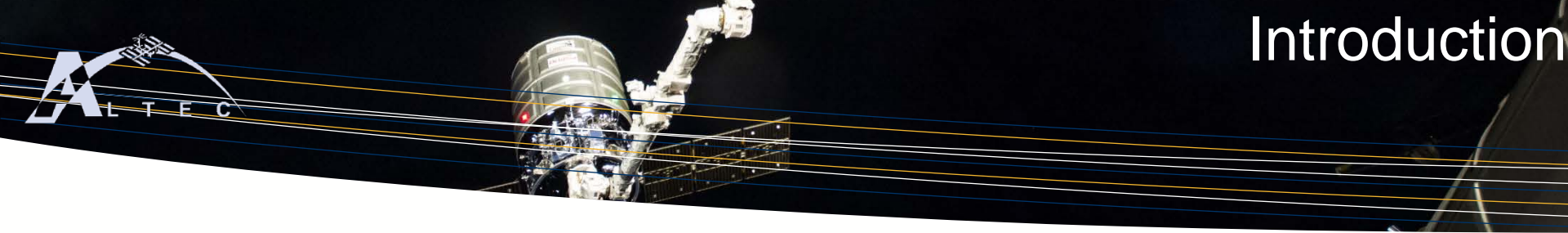




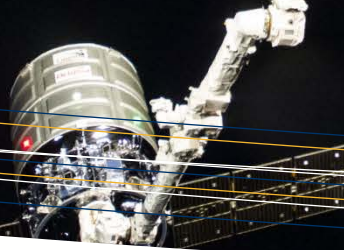
Oracle 12c multitenancy test activities carried out at ALTEC and INAF Trieste (OATs)



- Introduction
- Activities at ALTEC
- Activities at OATs
- Problems met
- Procedure executed
- Conclusion
- Q&A



- The aim of the test was moving a database from ALTEC to OATs
- To perform the activity Oracle Multitenancy technology was used
 - Multitenancy was introduced in Oracle 12c
 - A container database is created (CDB)
 - CDB: An oracle database installation that contains at like one PDB.
 - Inside CDB you can create one or more PDB (pluggable database)
 - PDB: portable collection of schemas, schema objects and nonschema objects that appears as a traditional Oracle database
 - All PDBs shares some structures of their CDB (example: UNDOTBS)

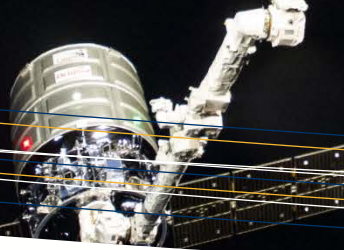


➤ An Oracle GRID and Oracle 12c RAC was installed

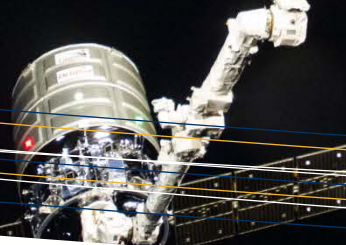
- Two virtual machines with Oracle Linux 6
 - 2 CPUs
 - RAM 6GBs
 - /u01 50GBs
- Oracle version: 12.1.0.5
- Database installed as CDB

➤ Diskgroups used:

- GRID: 6GB
- ASM_ORCL12_DATA: database data, 1TB fast disk
- ASM_ORCL12_BCK: database recovery area, 500GB slow disk
- ASM_ORCL12_ARCHIVE: archivelog, 200GB fast disk



- A PDB was created with a subset of initial GAIA Catalog
 - Tables:
 - SOURCECATALOGIDS: 908541 rows
 - MDBC3AUXDATAIGSLIGLSOURCE: 908541 rows
 - Data size: 2GBs
- A xml metadata descriptor was created to check compatibility between ALTEC Oracle CDB and OATs Oracle CDB and issue about version was found:
 - ALTEC Oracle CDB version: 12.1.0.2.5
 - OATs Oracle CDB version: 12.1.0.2.4
- New Oracle 12c sw installation was needed because source and destination container database have to share the same version
 - Oracle12c installed on ODA at OATs is: 12.1.0.2.4
 - CDB creation
 - Blocksize: 32K
 - Characterset: WE8MSWIN1252

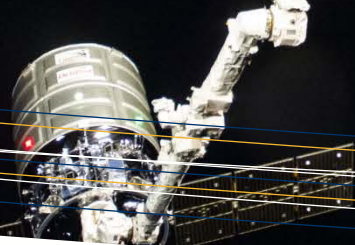


➤ New Oracle CDB creation needed

- New compatibility check were executed
 - Main problem was character set
 - To change character set a new CDB installation was needed.
- CDB creation
 - Blocksize: 8K
 - Characterset: AL32UTF8

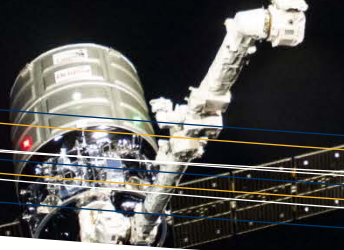
PDB NAME	CAUSE	MESSAGE	STATUS	ACTION
TSPDB	block size	system tablespace block size(32768) does not match configured block sizes	PENDING	configure the appropriate cache for this block size
TSPDB	Database CHARACTER SET	Character set mismatch: PDB character set WE8MSWIN1252. CDB character set AL32UTF8.	PENDING	convert the character set of the PDB to match the CDB or plug the PDB in a CDB with compatible character set

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PDB_NAME	TYPE	CAUSE	MESSAGE	STATUS	ACTION
TSCHARDB	WARNING	Parameter CDB	parameter processes mismatch: Previous 300 Current 1200	PENDING	Please check the parameter in the current CDB
TSCHARDB	WARNING	Parameter CDB	parameter memory_target mismatch: Previous 1904M Current 0	PENDING	Please check the parameter in the current CDB
TSCHARDB	WARNING	Parameter CDB	parameter db_32k_cache_size mismatch: Previous 16M Current 64M	PENDING	Please check the parameter in the current CDB
TSCHARDB	WARNING	Parameter CDB	parameter open_cursors mismatch: Previous 300 Current 1000	PENDING	Please check the parameter in the current CDB
TSCHARDB	WARNING	Oracle Opatch	Oracle opatch mismatch: opatch 19769480 is missing in the CDB	PENDING	Install the Oracle opatch in the CDB
TSCHARDB	WARNING	Oracle Opatch	oracle opatch mismatch: opatch 20299023 is missing in the CDB	PENDING	Install the Oracle opatch in the CDB
TSCHARDB	WARNING	Oracle Opatch	Oracle opatch mismatch: opatch 20831110 is missing in the CDB	PENDING	Install the Oracle opatch in the CDB

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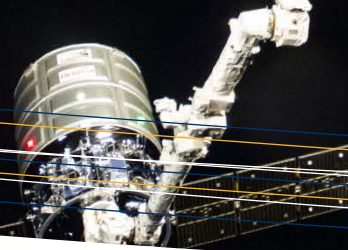


➤ After all checks were passed PDB was unplugged from ALTEC CDB:

- ALTER PLUGGABLE DATABASE TSCHARDB unplug '/home/oracle/TSCHARDB.xml';

➤ PDB datafiles were transferred at OATs

- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/DATAFILE/system.323.899840179
- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/DATAFILE/sysaux.322.899840179
- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/TEMPFILE/temp.324.899840185
- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/DATAFILE/users.325.899840217
- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/DATAFILE/catalogtbs.326.899892363
- +ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD/DATAFILE/indexcatalogtbs.327.899892389



- Created virtual machine, on ODA, with account for ALTEC users
- User account on Oracle database with DBA privileges
 - User can executed all checks on PDB to plug
 - User cannot plug and open database
 - These operations were executed by OATs personnel
- Created file system shared among virtual machine and Oracle database
 - In this file system were stored xml metadata and datafiles of PDB temporarily

➤ Compatibility checks executed using procedure:

- DECLARE
- compatible CONSTANT VARCHAR2(3) :=
- CASE DBMS_PDB.CHECK_PLUG_COMPATIBILITY(
 - pdb_descr_file => '/media/ODA_NFS/tschardb.xml',
 - pdb_name => 'TSCHARDB')
- WHEN TRUE THEN 'YES'
- ELSE 'NO'
- END;
- BEGIN
- DBMS_OUTPUT.PUT_LINE(compatible);
- END;
- /

➤ An initial parameter was set before trying to plug database

- alter system set db_32k_cache_size=1M scope=spfile;
- Command was executed by OATs personnel because sysdba privilege was needed

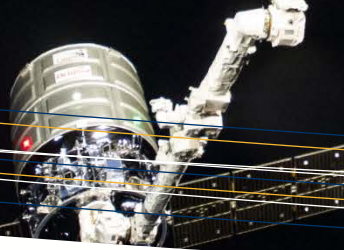
➤ Database was plugged and opened

- create pluggable database TSCHARDB using '/media/ODA_NFS/TSCHARDB.xml'
SOURCE_FILE_NAME_CONVERT =
('+ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD', '/media/ODA_NFS/PDB/ORCLCHDB/') *COPY_FILE_NAME_CONVERT =*
('/media/ODA_NFS/PDB/ORCLCHDB/DATAFILE/', '/u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_' , '/media/ODA_NFS/PDB/ORCLCHDB/TEMPFILE/temp.324.899840185', '/u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_temp');
- alter pluggable database TSCHARDB OPEN READ WRITE ;



➤ TSCHARDB datafiles

- CATALOGTBS /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_cat
alogtbs.326.899892363
INDEXCATALOGTBS /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tsc
har_indexcatalogtbs.327.899892389
SYSAUX /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_sysaux.3
22.899840179
SYSTEM /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_system.3
23.899840179
USERS /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_users.325.
899840217
- TEMP /u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_temp



➤ Compatibility problems

- Versions has to be the same

➤ Character set

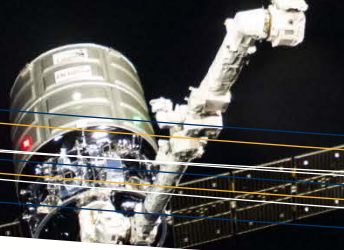
- You have to created a CDB with the correct character set or you have to convert data

➤ Blocksize

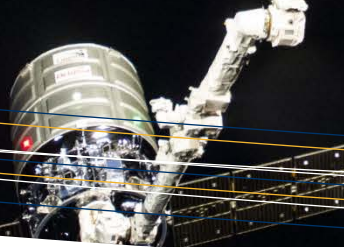
- It can be solved changed *db_XXK_cache_size* parameter

➤ Service request opened

- SR 3-11899468801 : CCP: Oracle 12c transport pluggable database
- SR 3-11934039108 : CCP: Oracle 12c pluggable db creation



- Generate XML PDB descriptor in source CDB:
 - BEGIN
 - DBMS_PDB.DESCRIBE(
 - pdb_descr_file => '/home/oracle/TSCHARDB.xml',
 - pdb_name => TSCHARDB);
 - END;
 - /
 - pdb_descr_file: metadata file name
 - pdb_name: pdb name
- Copy metadata file to a filesystem readable by destination CDB
- Execute compatibility in destination CDB using PDB metadata file:
 - SET SERVEROUTPUT ON
 - DECLARE
 - compatible CONSTANT VARCHAR2(3) :=
 - CASE DBMS_PDB.CHECK_PLUG_COMPATIBILITY(
 - pdb_descr_file => '/media/ODA_NFS/TSCHARDB.xml',
 - pdb_name => TSCHARDB)
 - WHEN TRUE THEN 'YES'
 - ELSE 'NO'
 - END;
 - BEGIN
 - DBMS_OUTPUT.PUT_LINE(compatible);
 - END;
 - /
 - pdb_descr_file: metadata file name
 - pdb_name: PDB name



- **View violations:**
 - `select NAME, TYPE, CAUSE,MESSAGE,status,action from PDB_PLUG_IN_VIOLATIONS where name='TSCHARDB' order by 1;`
 - name: name of PDB
- **Solve violations if highlighted**
 - Start from ERROR type
 - To solve violations you could have to modify some parameter in source and destination CDB
- **Unplug database from source CDB**
 - `ALTER PLUGGABLE DATABASE TSCHARDB UNPLUG INTO '/media/ODA_NFS/TSCHARDB.xml';`
- **Move datafiles composing PDB to a filesystem readable from destination CDB**
 - In our test we transferred filesystem using scp
 - Ex: `scp CATALOGTBS.326.899892363 afmulone@ia2-oracle-to.oats.inaf.it: /media/ODA_NFS/PDB/ORCLCHDB/`
- **Execute PDB plugging**
 - During plugging operation you can move from, copy from or maintain datafiles in location where datafiles were copied
 - In PDB metadata file you the list of datafiles used by PDB with the path used in the source CDB, to plug PDB correctly you have to substitute the original path with path where datafiles were copied
 - Command executed:
 - `create pluggable database TSCHARDB using '/media/ODA_NFS/TSCHARDB.xml' SOURCE_FILE_NAME_CONVERT = ('+ASM_ORCL12_DATA/ORCLCHDB/2822D039F2655801E053340A010AB2DD','/media/ODA_NFS/PDB/ORCLCHDB/') COPY FILE_NAME_CONVERT = ('/media/ODA_NFS/PDB/ORCLCHDB/DATAFILE/', '/u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_', '/media/ODA_NFS/PDB/ORCLCHDB/TEMPFILE/temp.324.899840185', '/u02/app/oracle/oradata/datinaf/inaf/INAF/datafile/t2_tschar_temp');`
- **Open PDB in read write mode**
 - `alter pluggable database TSCHARDB OPEN READ WRITE ;`

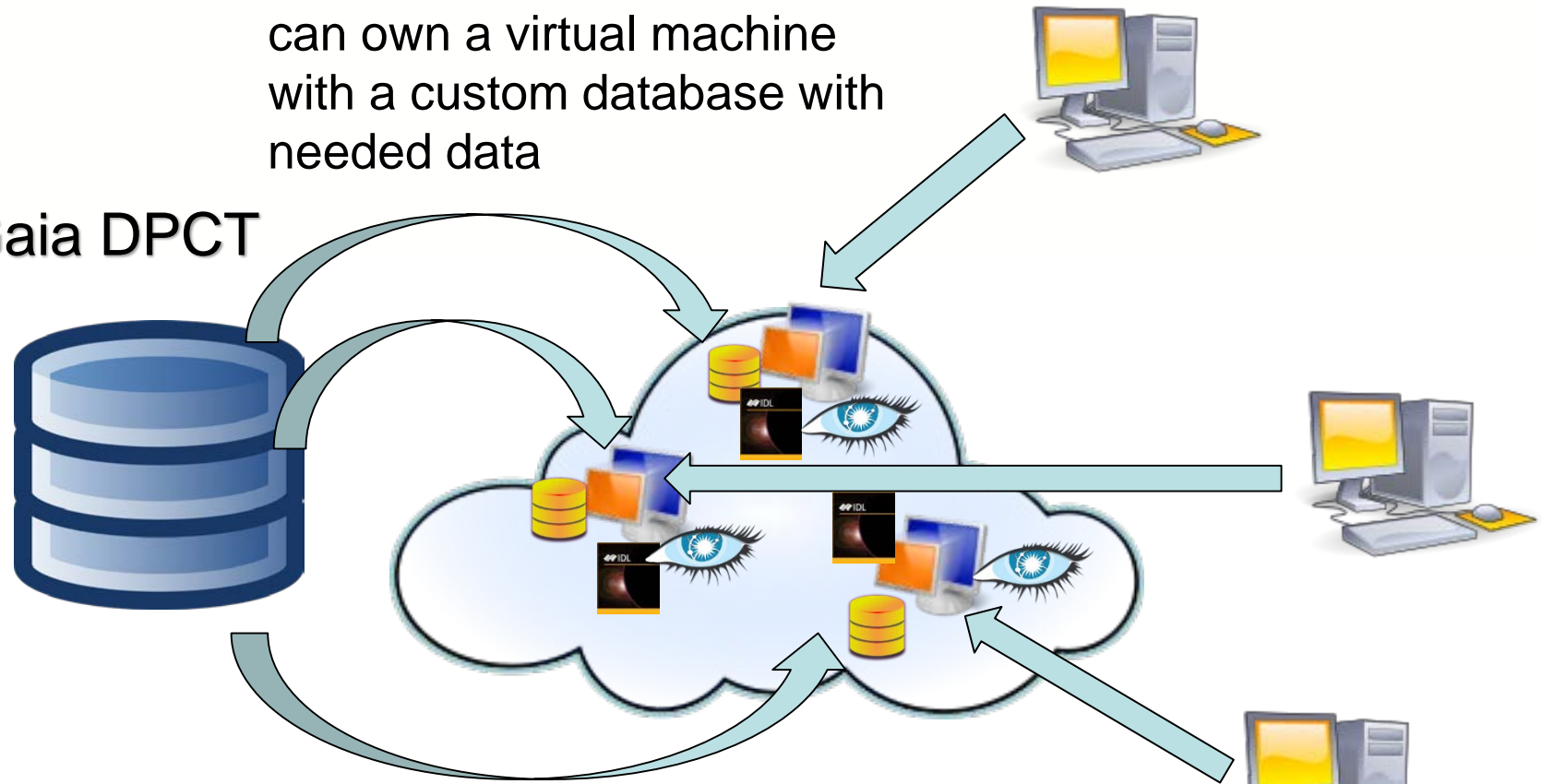


- Multitenancy allows DB exchange among multiples center
- There are constraints on:
 - Version
 - Charset
 - Blocksize
- It could be useful for on demand database foreseen at GAIA DPCT.
- GAIA data can be extracted and filled in pluggable databases that can be shared among scientific center

- In ALTEC we are deploying a cloud infrastructure and there a section will be dedicated to perform analysis of Gaia data for data exploitation scope. It foresees also Oracle databases.
- At the end of ALTEC cloud deployment, users can create his database, his virtual machine already configured with a set of tools that are ready to interact with the created or existing databases.
- The advantage of having Oracle database on cloud infrastructure dedicated to GAI-DPCT is that users in the available virtual machines can found a set of connectors ready to interact with database and perform effective data analysis.
 - Oracle – NoSQL Database (e.g. Cassandra)
 - Oracle – IDL + Data Mining
 - Oracle – Rstudio
- User has a database Oracle properly configured but does not have power and tool to lead his analysys can move database in ALTEC cloud and process data on it

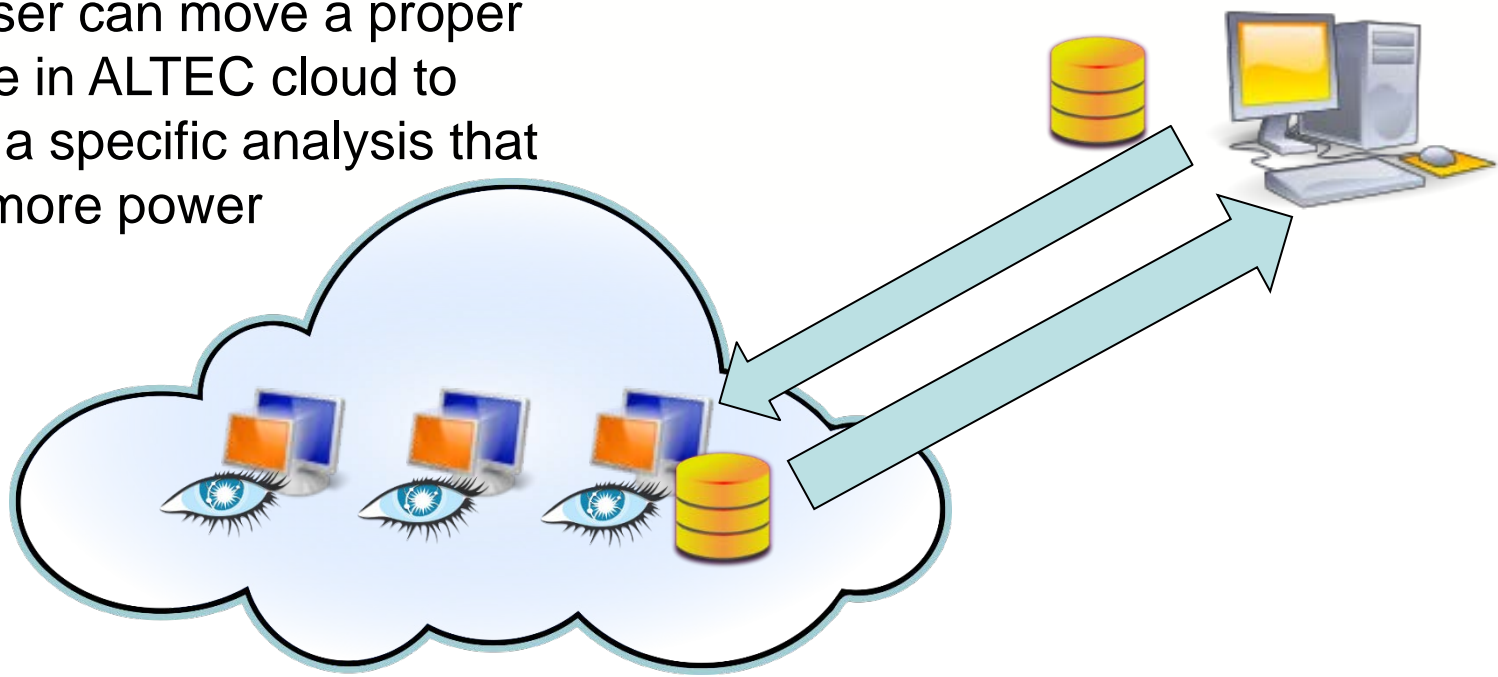
In ALTEC cloud DPCT user can own a virtual machine with a custom database with needed data

Gaia DPCT

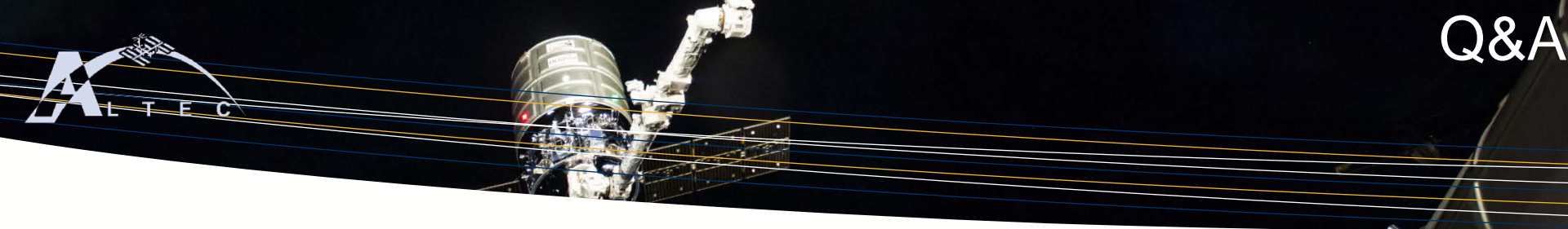


Virtual Machine are configured with a set of tool that can interact with database (ex: IDL, Cassandra)

DPCT user can move a proper database in ALTEC cloud to pursue a specific analysis that require more power



In ALTEC cloud DPCT user can create a cluster and execute analysis using preinstalled tool



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