



Agenzia Spaziale Italiana



SDC-IT-PROD: Realizzazione e attività del centro verso la fase operativa

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on behalf of SDC-IT-PROD Team



Agenda

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SDC-IT-PROD – Introduction

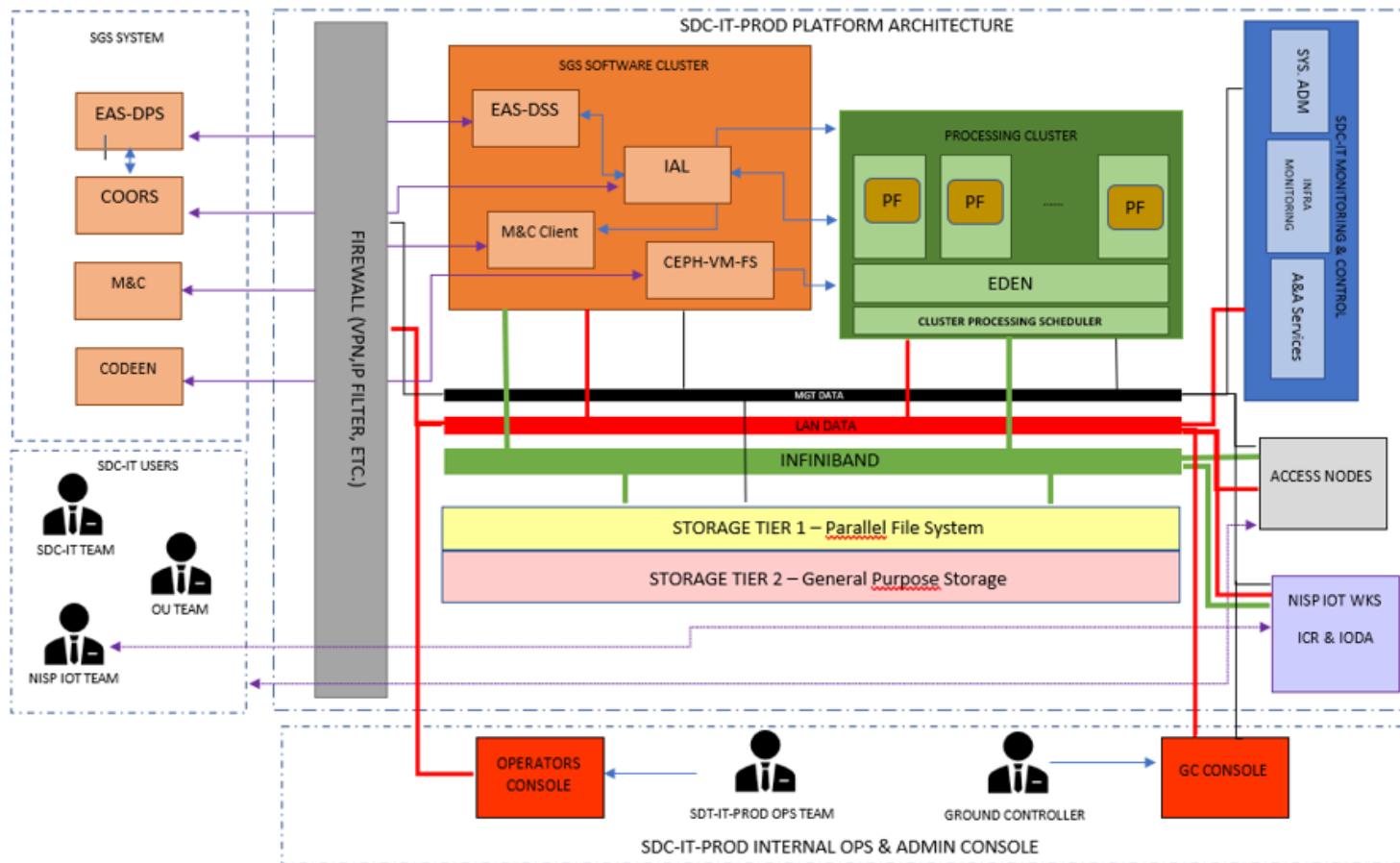


- SDC-IT-PROD is the platform provided by ASI for:
 - the validation of the SGS data system and Processing Functions before the launch
 - the preparation of scientific mission operations before the launch
 - the execution of the scientific mission operations after the launch and in the post flight phase.
- ALTEC was the contractor awarded by ASI to define and implement the SDC-IT-PROD platform.
- ALTEC renewed the Industrial Contract with ASI in June 2022 for a duration of 30 months.
- It consists two infrastructures both located in Turin at the ALTEC premises:
 - SDC-IT-INT: its purpose is to integrate and test SGS data systems and verify and validate PF release (NIR, SIR or MER)
 - SDC-IT-OPS: operational infrastructure dedicated to the SGS mission data processing starting from PV.



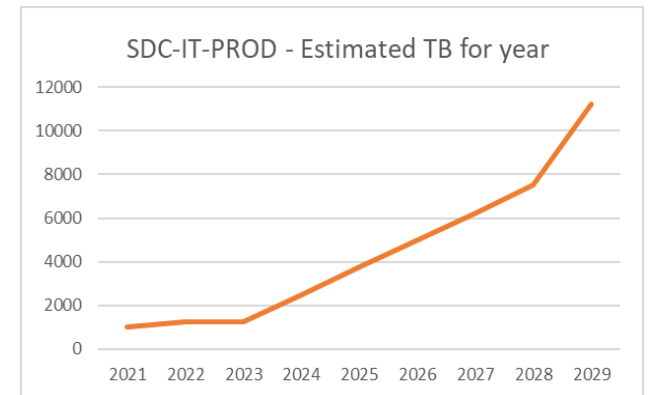
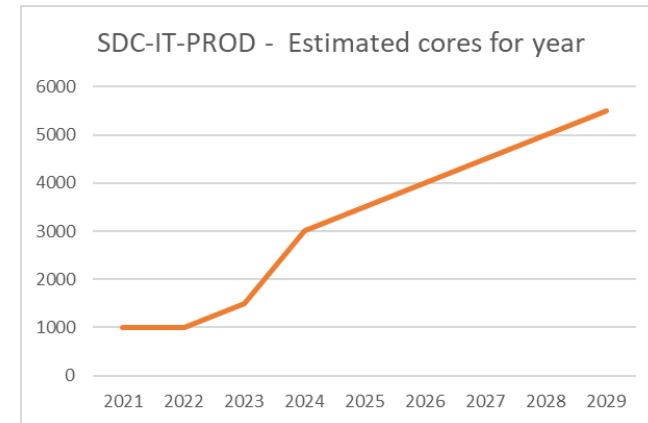
SDC-IT-PROD Architecture

- The SDC-IT-PROD architecture is designed to have a HPC and HTC platform providing services and performance suitable for the Euclid SGS.



SDC-IT-PROD – First OPS Infra Conf.

- SDC-IT-OPS infrastructure has been procured in Q3(2022) and installed in Q4 (2022).
- Integration is ongoing and test campaign to verify the platform will be in few months before the launch.
- The infrastructure will scale up along the operations phases (see charts for cores and storage estimations).
- The Procurement Plan, for next platform evolution, is available and maintained by the ALTEC Team.



SDC-IT-PROD – First OPS Infra Conf.



- **768 physical cores (12 nodes)**
- **Storage Tier 1 : 760 TB** high performance provided by Lustre Appliance
- **Storage Tier 2: 2.2 PB** high capacity provided by the HPE ZeroWatt and managed with HPE DMF
- **InfiniBand up to 200 Gbps**
- **Internet link up to 10 Gbps**
- **Management Cluster (2 VMWare Nodes + MSA Storage)**
- **2 SGS Nodes, IOT Nodes and 2 Access Nodes**



SDC-IT-PROD – I&T Infrastructure



- SDC-IT-INT installed and configured in 2021 and upgraded in 2022.
 - **448 physical cores**
 - **Storage Tier 1 : 700 TB** high performance provided by Lustre Appliance
 - **Storage Tier 2: shared with the OPS infrastructure**
 - **InfiniBand up to 200 Gbps**
 - **Internet link up to 10 Gbps**
- SGS Infra-System Tests execution to support IAL, DSS and M&C systems evolution.
- PFs execution to verify and validate new scientific software release and the whole SGS data processing.
- It will be used in operations to verify any software upgrades before moving to production and for troubleshooting.



Operations Preparations

- SDC-IT-PROD is/will be involved in all SGS System Test Campaigns and ORs before the launch.
 - SC8 Wide Production and Deep Field and subsequent result analysis (2021).
 - Execution of the first Operational Rehearsal (OR).
 - Performance Verification Rehearsal #1 (Sept – Oct 2022) and #2 (April 2023).
 - IT 9 (Feb 2023 TBC)
 - SOVT-2 (Feb 2023 TBC)
 - SPV3:50 deg² up to LE3 (April - May 2023)
 - SGS Infrastructure Tests: IAL, DSS and Monitoring & Control updates.
- SDC-IT-PROD verified and validated through dedicated **system test campaign.**
- **Operations Team composition and training** for SGS Data Processing and IOT Support. Integration of the SDC-IT-PROD Ops Team in the SGS Ops Team.
- Operations products preparation in terms of procedure and tool.
- **Ops validation process** will be performed and completed before the reception of the first OPS data → SDC-IT-PROD OPS team is ready for the mission.
- Client area setup with workstations for operators and ground controller; **Mission Control Room**

SDC-IT-PROD – Support Tasks to IOT



- SDC-IT-PROD is the support processing center for the Instrument Operation Team (IOT) of NISP providing:
 - **Computation, network and storage resources** through two servers configured to maximize availability and reliability.
 - **Remote access** only to the NISP IOT Team through VPN over Internet.
 - **Access to the Instrument Commanding Request Tool (ICRTool)** needed to prepare and submit NISP telecommand.
 - **Access to the Instrument Operations Data Analysis (IODA)** tool for checking NISP instrument health and performing first look analysis.
 - **Long term archiving** and backup of ICRTool and IODA data.
 - **Operations Support** to monitor and maintain IOT workstation and tools nominal behaviour and data flow feeding from/to SGS and SOC.



SDC-IT-PROD – Data Center Access



- SDC-IT-PROD will soon provide remote access and resources to the SDC-IT Dev. Team for the following objectives:
 - Have a **direct access to data products** generated in the SDC-IT-PROD;
 - **Verify the correct behaviour of the PF software** on the data acquired daily, through direct access to the PPOs executed in the SDC-IT-PROD;
 - **In case of errors or anomalies** recognised in production, having the possibility of **re-launching the PPOs** in SDC-IT-INT and accessing the intermediate data in order to be able to retrieve information on the individual analysis steps;
 - **Develop and verify data product validation software**, especially in cases where access is needed not only to metadata but also to data referenced by data products;
 - **Support** scientific software integration and test in case of **PF evolution and update** is needed.
 - Provide an EDEN **environment configured with data analysis tools** to enable data products exploration and scientific analysis.



PF Validation Activities

- Objectives are the following:
 - **continuous integration and validation of PF** before scientific software release;
 - standard validation approach based on understandable pass/fail criteria addressing result evaluation.
- **PF Validation is a validation framework** developed to support the validation of SIR and NIR PF.
- **NIR and SIR validation pipeline** (NIR_Testing, SIR_Validation) have been **integrated within the validation framework** and have been executed many times in the last year supporting the PF teams before PV-1.
- The interaction between the scientific teams and the PF_Validation SW engineer is consolidated. PF_Validation, NIR_Testing and SIR_Validation SW evolution is traced using redmine development roadmaps and the tool updates are handled using the GitLab Merge Request mechanism.
- Last SW released:
 - PF_Validation 2.1.0: https://gitlab.euclid-sgs.uk/SDC-IT/PF_Validation
 - NIR_Testing 1.2.0: https://gitlab.euclid-sgs.uk/PF-NIR/NIR_Testing
 - SIR_Validation 3.0.0: https://gitlab.euclid-sgs.uk/PF-SIR/SIR_Validation

LE1 Processing Function

- The LE1 NISP Processor aims to generate level 1 products starting from the raw data of NISP instrument. It will be run within a Docker container at SOC.
- The output products are compliant with the Common Data Model and consist of three different FITS products, referenced by an XML file:
 - **SCI** FITS file: containing the scientific image and quality data
 - **HK** FITS file: containing the housekeeping data such as rawlines, digital TLM, analog TLM, and errors data
 - **ENG** FITS (depending on the instrument mode): containing engineering data
- The latest version is **3.0.1**, which is compliant with the Data Model 9.0.2 and allows the processing of all NISP instrument modes.
- Version 3.1 is currently under development, scheduled for release in February (SOVT 2).
- LE1 NISP Processor was successfully validated by INAF-OATs exploiting dataset acquired on instrument ground test campaign.
- LE1 NISP Processor was successfully exercised in SVT-1.3 and SVT-2. NISP LE1 data products ingested into the EAS.
- Software maintenance to prepare operations.

Conclusion and Acknowledgment

- The project is well set up. However, with launch on a Falcon9 vehicle expected at the beginning of July 2023, we need to proceed promptly and, possibly, without particular hitches.
- SDC-IT-PROD is an advanced scientific data centre based on HPC and HTC technologies.
- The project is funded by the ASI contract 2022-10-I.0 “Attività industriali per la realizzazione del Science Data Center della missione Euclid”, 06/06/2022.
- We gratefully acknowledge ASI and INAF, for the constructive cooperation and the support in setting up the project.



THANK YOU !

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