A satellite view of Earth at night, showing the curvature of the planet and numerous city lights glowing against the dark background of the night sky. The lights are concentrated in the central and lower-left portions of the frame, with a bright blue glow from the sun or moon visible at the top edge of the horizon.

FP – EGS-CC Integration Support ADS (ESA Contract No. 4000131932/20/NL/AS/vr)

Final Presentation

DEFENCE AND SPACE

December 2021

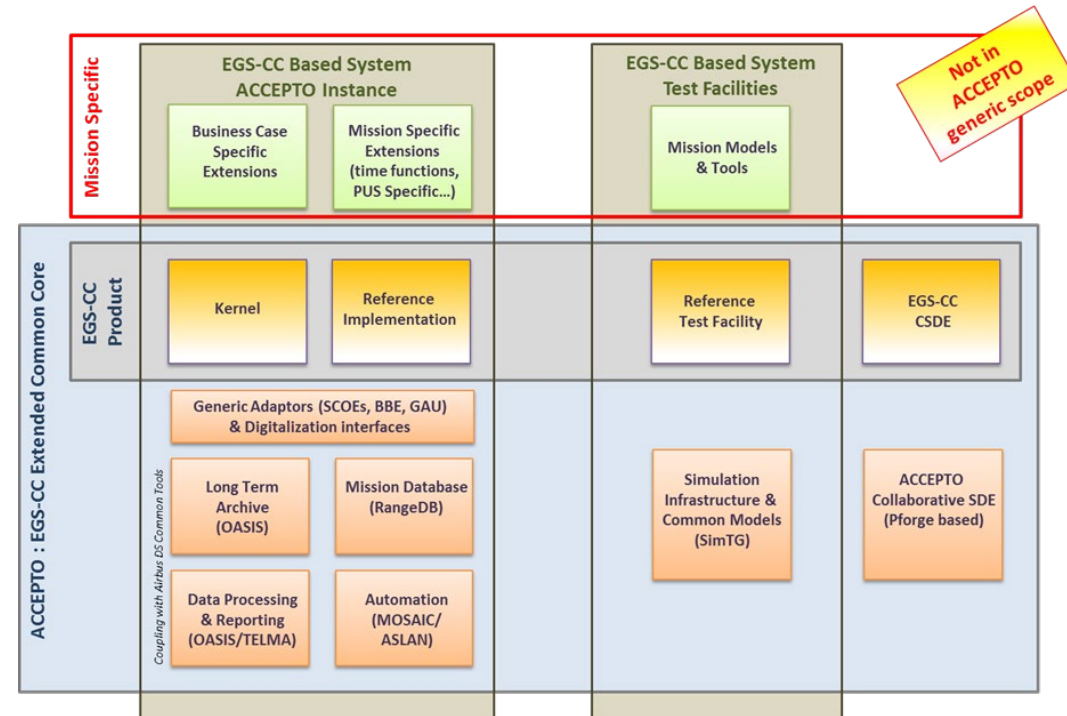
AIRBUS

AGENDA

- Background of the study context
- Study objective and work Logic
- Project management and coordination with EGS-CC
- EGS-CC Engineering and validation Support
- EGS-CC Deployment and ACCEPTO Integration
- Lessons Learned
- Conclusions

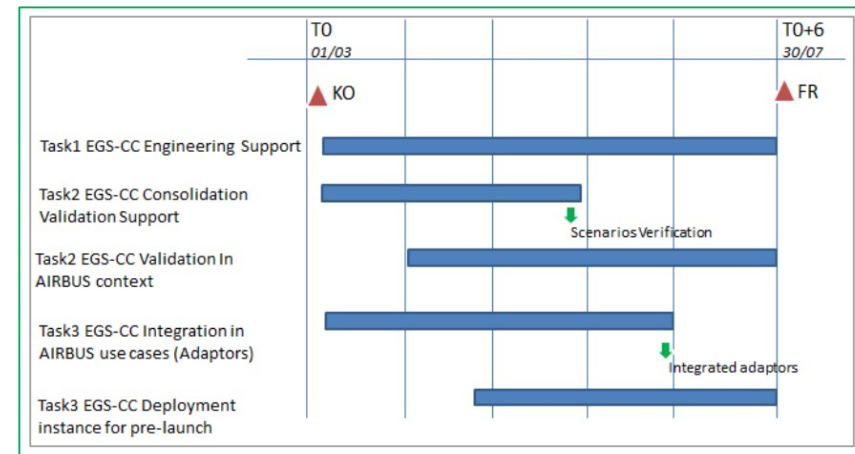
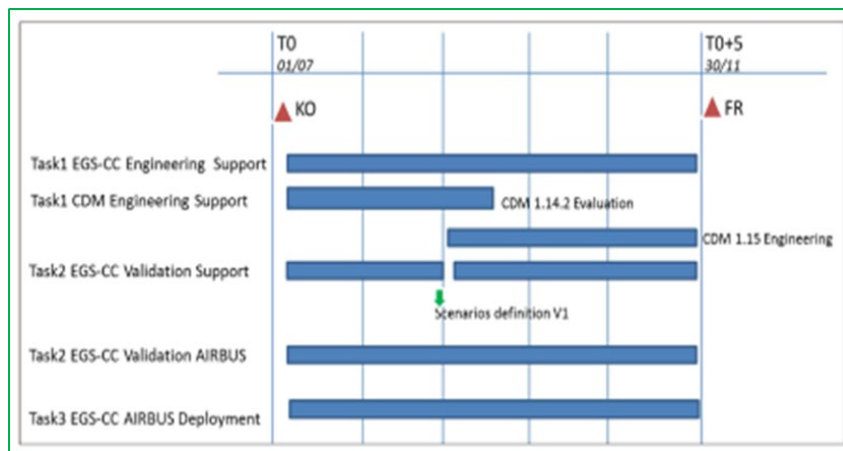
Background of the study context

- Since several years major European space agencies and primes agreed to develop the EGS-CC, a common Monitoring & Control core for pre and post-launch ground systems. AIRBUS is supporting the definition and engineering of the EGS-CC, but also support/advise the development which is covered by a number of SMEs
- In parallel of the EGS-CC development, AIRBUS is running the ACCEPTO project which aims at integrating and validating the EGS-CC within the AIRBUS pre and post launch applications based on real project data (e.g. NEOSAT)
- The AIRBUS integration problematic is very closed to the ones which are addressed in the ESTEC Software Systems Lab. Thus, experience and lessons learned can be widely shared between the two organizations



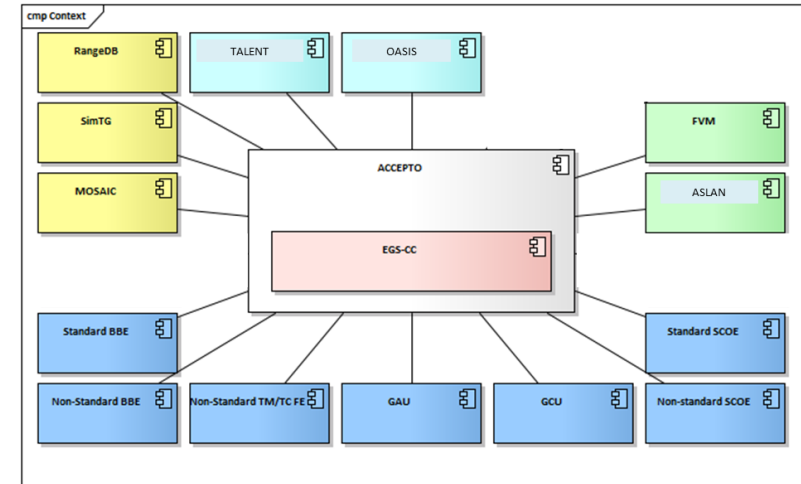
Study objective and work Logic

- The objective of this activity is to verify the interoperability of the EGS-CC with the relevant building blocks of the ADS infrastructure and as such, provide potential inputs to the definition of the ESTEC EGSE Reference Facility, in terms of EGS-CC integration approach and supported interfaces, problems encountered, lessons learned.
- For that purpose statement of work (and extension CCN-1) included 3 tasks:
 - **EGS-CC Engineering Support:** Insure adequate definition and design of the EGS-CC with a specific focus on the Automation component refactoring
 - **EGS-CC Validation Support:** EGS-CC validation support, ADS validation with real data.
 - **EGS-CC Operational deployment and Validation:** Based on a typical ADS EGSE application for FV/AIT preparation using a spacecraft/EGSE simulator (with SCOE I/F models)



Project management and coordination with EGS-CC

- ACCEPTO Project Management coordination with EGS-CC is key for the organization of the ACCEPTO development and integration tasks. Contribution to the EGS-CC design and feedback is key:
 - EGS-CC Technical boards (SET, CCB)
 - Phase CD (FAR, Delta FAR) reviews.
 - Consolidation (MTR, FAR) reviews.
- EGS-CC Integration into ACCEPTO raised a number of technical topics (bugs, design issues) to be escalated at EGS-CC product level. Short loop between ACCEPTO and EGS-CC is key:
 - EGS-CC Integration boards (SIT, CCB)
 - EGS-CC CDM workshops (Addressing model updates and documentation refactoring)
 - EGS-CC AUT refactoring: Specification (APPG 2.0) and full Agile/devOps development process
 - System Composition Tool: Tiger Team (Agile Approach)
- ACCEPTO system validation is closely linked to the EGS-CC system validation. Basing the system validation on user representative scenarios is more efficient:
 - EGSC-CC System Validation: Scenarios preparation and As Run verification
 - EGS-CC Validation Engineering: Scenarios improvement (enhanced URs coverage).
 - EGS-CC Performances: Tiger Team and definition of pre-launch system scenario



EGS-CC Engineering and validation Support

Major links to EGS-CC Engineering and Validation material (requires specific ESA credentials)

- **EGS-CC Engineering and Validation:**



- EGS-CC Wiki (Confluence):

<https://csde.esa.int/confluence/display/EGSCCC/EGS-CC+Consolidation+Home>

- EGS-CC Boards (JIRA):

<https://csde.esa.int/jira/projects/EGSCCB/summary>

- Scenario Based Validation specification resulting in the procedures:

<https://csde.esa.int/confluence/pages/viewpage.action?pageId=82545126>

- AIRBUS leading role for 5 scenarios : Session SOB Management, Preparation Activity, SCOE, Automation, System Performance (Pre Launch use case)



- **CDM engineering support:**

- The resulting version 1.14.2 is located at

<https://csde.esa.int/confluence/display/EGS/Conceptual+Data+Model+-+CDM>

- EGS-CC CDM documentation refactoring is located in the EGS-CC Knowledge Base at

<https://csde.esa.int/confluence/display/EGSCCC/CDM+Consolidation+Review>

- **Airbus validation performed with real dataset (e.g. NEOSAT)**

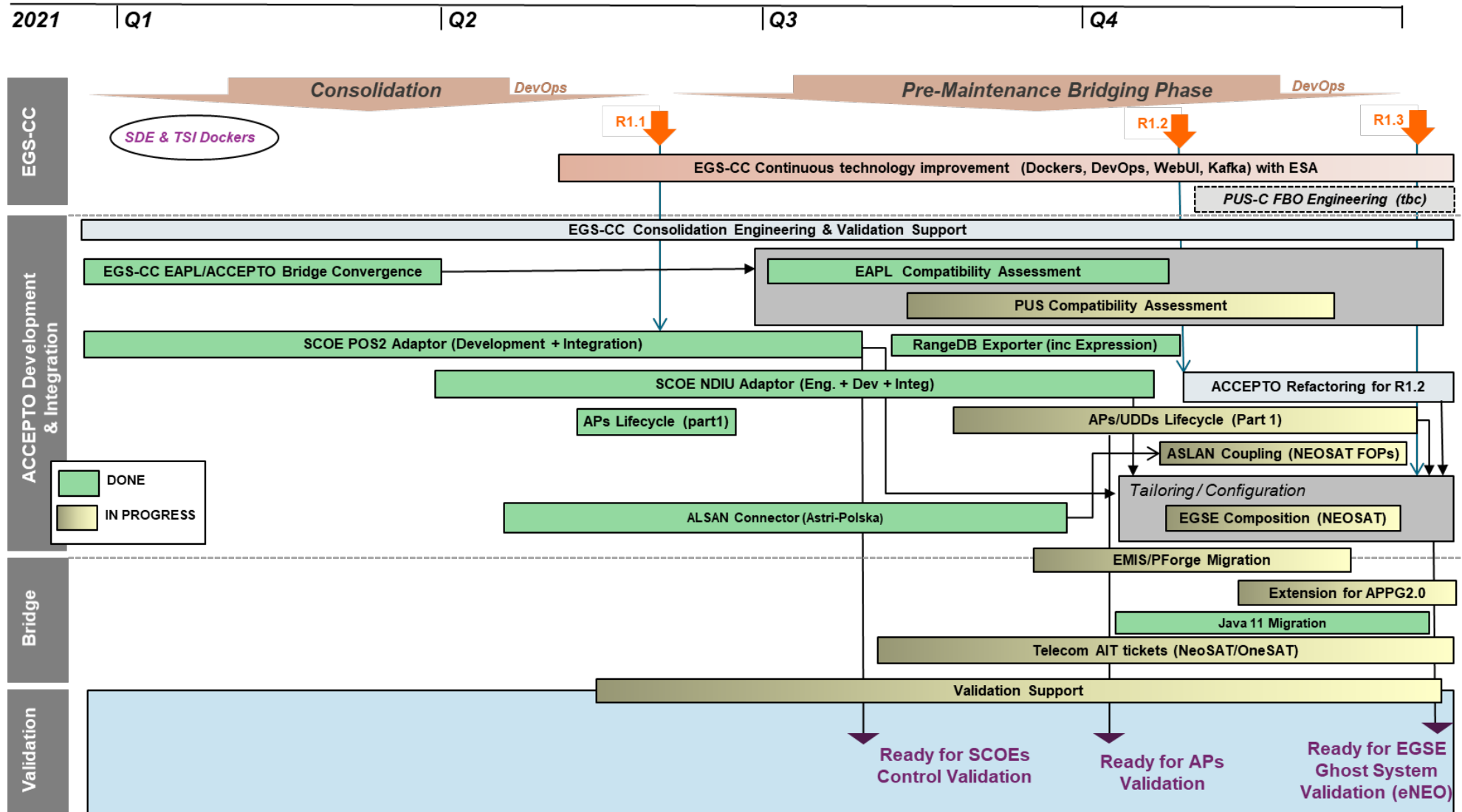
- **Specific URV data set (and associated python simulator) was completed and delivered to EGS-CC to allow further testing and validation for the development team (reproduce issues)**

EGS-CC Deployment and ACCEPTO Integration

- EGS-CC SW Deployment has been achieved with two different approach, among which Docker based deployment:
- Interfacing EGS-CC/ACCEPTO with AIRBUS Spacecraft Database: RangeDB. Based on interface libraries generated from the EGS-CC CDM model
- Developing new EGS-CC Adaptors components (i.e. AIRBUS EGS-CC components)
 - Airbus has already developed 3 specific adaptors:
 - FEECP used for interfacing SCOEs in Orbital applications, based on the CNC Adaptor
 - POS2 used for interfacing some SCOEs in Telecom applications,
 - NDIU used for interfacing TM/TC FEE at frame level based on the SLE Adaptor design
 - Full inclusion of these adaptors in an EGS-CC instance using the composition tool (SCT) is pending.
- **ASLAN (Specific AIRBUS FOPs Editor/Executor) Coupling with EGS-CC:**
 - Based on the EGS-CC JSBridge REST/Web socket API developed for EGS-CC WebUI integration
- **User and Integration Tailoring Data Life Cycle (UNITAD)**
 - In ACCEPTO the preparation environment (i.e. for APs) is covered by the AIRBUS Bridge (EAPL)
 - The UNITAD process (and tool suite) support the AIRBUS users to integrate smoothly these artifacts with the proper level of abstraction into the SOBs (aggregation with M&C and SW tailoring data)
 - Development of the toolset is in progress

EGS-CC Deployment and ACCEPTO Integration – Status

- EGS-CC Deployment in AIRBUS is performed in the context of the ACCEPTO (2021 Roadmap)



Major Lessons Learned

- The design development of additional EGS-CC component (e.g. external system adaptors) is quite complex and requires a huge knowledge investment prior to any implementation. In order to facilitate and make EGS-CC an attractive baseline we shall:
 - **Maintain and reinforce the EGS-CC design and system concept description (KB) consistent with the actual SW**
 - **Prepare and maintain a Developer Guide to support EGS-CC extensions and new components design, development and integration**
- The deployment of an EGS-CC based system requires huge effort for configuration, tailoring and composition. In order to allow any organization to prepare an EGS-CC based system for a given mission we shall:
 - **Improve the System Composition Tool (in progress)**
 - **Maintain and reinforce the description of the EGS-CC composition process (KB), including configuration and tailoring details for each component aligned with the actual SW.**

Conclusion

- **EGS-CC Engineering Support**
 - Intensive support in several EGS-CC engineering domains, efficiency reinforced by the community new working mode (Agile, DevOps, Collaborative and fully connected)
- **EGS-CC Validation Support**
 - Significant progress and innovation in the validation concept (automatic system scenarios), full scenario implementation needs to be completed but the approach is fully validated.
- **EGS-CC Deployment and Ops validation**
 - AIRBUS has made significant progress in the integration of EGS-CC in its applications and use of operational data from a real project.
 - The mastering of the EGS-CC product by AIRBUS member has increased
 - Further steps is still to be achieved with a more complete EGS-CC functional perimeter (R1.3/R1.4), a wider coverage of the system testing and improved performances

EGS-CC R1.3 shall confirm the ACCEPTO readiness to enter the industrialization phase mainly based on shadow validation (e.g. NEOSAT, COPENICUS) and also to verify that all ACCEPTO supporting processes (Inc. EGS-CC support) are at the expected level of service