



AGENDA

1. The EGC-CC based ACCEPTO solution
2. Securing the EGC-CC deployment in AIRBUS
3. Trusting the EGC-CC Conceptual Data Model
4. Preparing for the EGS-CC automation concepts
5. Conclusion

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The EGC-CC based ACCEPTO solution
The AIRBUS Space baseline for all future programs


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EGS-CC, the convergence solution for all Airbus Space applications


ARIANE 6
The new generation
for launchers



AIRBUS SAFRAN
LAUNCHERS


+

Eurostar Neo,
The new generation
for telecom satellites

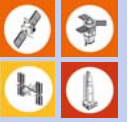


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EGS-CC




Prepare for the
future
institutional and
commercial
programs



Major objectives and motivation

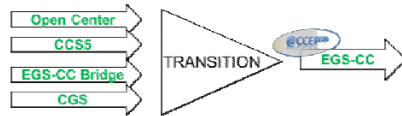
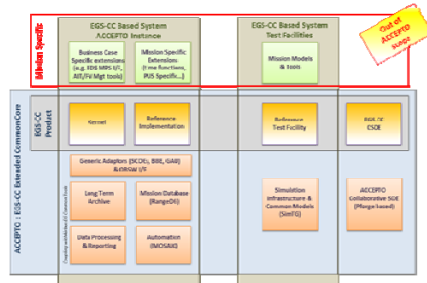
- Enable the modernization of legacy EGSE CCS and MCS systems for satellites, launchers and orbital systems
- Opportunity for a single test product line for all AIRBUS Space systems and facilities (SVF, EFM, payload and instruments benches, PFM)
- Ensure required lifetime for long duration programs (ENeo, Astrobus NG, MetOp-SG, A6)
- Shared maintenance costs across the EGS-CC user community

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ACCEPTO, The AIRBUS EGS-CC integration solution

- EGS-CC is not a complete ready to use M&C system
- The ACCEPTO project aims at providing this extended SW suite which allows the realization of the tests and operations applications for Satellites, Orbital Systems and Launchers. It integrates EGS-CC with:
 - Mission Database (RangeDB)
 - Data Archiving & Analysis (TELMA-Dynaworks)
 - Simulation Infrastructure (SimTG)
 - Automation (MOSAIC):
 - Generic EGS-CC adaptors (SCOEs, BBes...)



- The AIRBUS DS objective to move to one single CCS (i.e. EGS-CC) for future projects on all sites has been fully committed internally by AIT, OPS and engineering teams

Securing the EGS-CC deployment in AIRBUS

Early adoption and buy in for pilot projects

Rational for securing the EGS-CC deployment

The EGS-CC context

- EGS-CC is a complex system to be developed by a hugely distributed consortium with a very challenging schedule and a lot of stake holders!
- EGS-CC the European Ground System – Common Core is under development and several Integration Releases have been delivered for early usage by the EGS-CC integrators. EGS-CC is not yet stabilized.
- ACCEPTO, The AIRBUS Space EGS-CC deployment project, has started to iteratively integrate the Common Core together with the other AIRBUS Space internal standard products and is facing unavoidable issues.

This is our responsibility to manage the risks originated from EGS-CC

- AIRBUS Space pilot projects EUROSTAR Neo and ARIANE6 cannot be endangered by the EGS-CC risks' realization -> Need for an ACCEPTO risk mitigation updated path.
- EGS-CC readiness for operations and risks management shall optimized the overall costs and schedule impact; In particular, refactoring of pilot projects end-users artefacts shall be avoided.
- On another hand, early involvement of the AIRBUS Space end-users is a key success factor to establish an adapted and user friendly common core product which takes benefit from lessons learned and facilitates the internal buy-in

Managing the EGS-CC risk: The ACCEPTO Bridging path principle

Major drivers for the Bridging roadmap

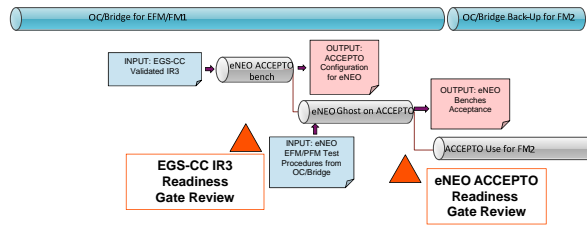
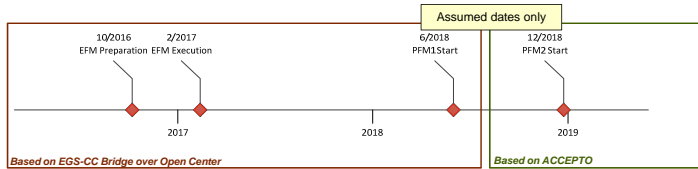
- No propagation of EGS-CC delivery delays on the pilot programs' development.
- Early practice by end-users of the EGS-CC tailoring capabilities (M&C definitions, Automated Procedures Language and User Defined Displays) allowing feedback to the EGS-CC engineering team.
- Insure sufficient representativeness of the EGS-CC/ACCEPTO validation for targeted programs.
- Significantly restrict (suppress) end-users artefacts' refactoring when switching to the EGS-CC core

The Bridging path major drivers

- Starting of the pilot projects operational tasks using a robust and well mastered solution for the Monitoring and Control framework (Open Center) enriched with the capability to develop and execute "EGS-CC like" end-users artefacts (APPG procedures, UDD displays, data definition according to EGS-CC CDM).
- Drive SRDB (RangeDB) data population in line with the EGS-CC CDM concepts and offer access to the induced new capabilities for Automated Procedures and User Defined Displays preparation and run
- Iteratively develop and use (Agile approach) EGS-CC APPG and UDD bridges with the Open Center core
- Validation based on the ghost replay of real pilot programs validated use cases (e.g. replay of EFM procedures without changes on the SRDB content –M&C data definitions)

The EUROSTAR NEO CCS Bridging path

1. EFM and If needed PFM1 based on the EGS-CC Bridge over OPEN CENTER (AP natively developed in EGS-CC language)
2. EGS-CC Ghost Validation reusing real eNEO test cases and test procedures (eNEO SimAIT).
3. PFM for FM1 or FM2 switch to ACCEPTO baseline if Ghost validation successful and system stable.
4. OC/Bridge is the available Back-Up solution for FM2 PFM in case ACCEPTO/EGS-CC not stable enough



Trusting the EGC-CC Conceptual Data Model
 Anticipating The EGS-CC CDM validation through a
 concrete AIRBUS realisation

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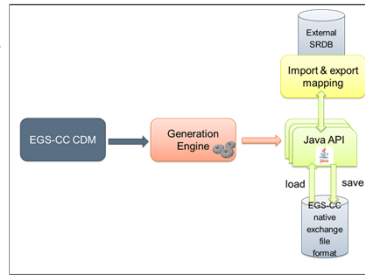
Validating the EGS-CC CDM through the Range DB exporter

Motivation for early validation of the CDM

- EGS-CC CDM E2E validation not completed in Phase B
- Experience revealed that exporting the of M&C data definitions from an SRDB to a M&C system is cumbersome and takes time to stabilize

Methodology

- Use of the promoted Java EGS-CC exchange API hiding the exchange format syntax complexity
- Population of the pilot projects RangeDB SRDB databases as per EGS-CC concepts (as far as feasible)
- Early verification of the EGS-CC CDM completeness and validity by achieving the export of a flight proven data definition collection through the EGS-CC exchange format.

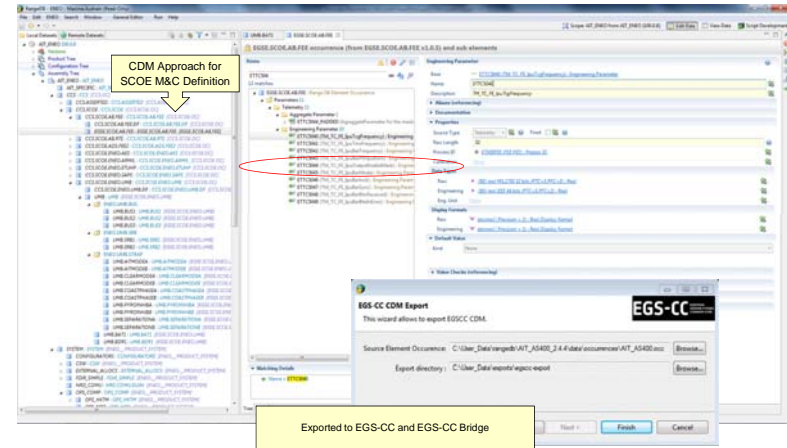


M&C data definition exchange using a model based EGS-CC Java API

Major outcomes

- This early validation based on a concrete realization and using a mature Monitoring and Control data set allowed to discover very soon EGS-CC CDM issues which might have had significant impact on the EGS-CC integration and validation in a later phase.
- Lesson learned on SRDB data population practices to better benefit from new EGS-CC concepts already supported by RangeDB

RangeDB model maps to the EGS-CC CDM: Exporter ready





Preparing for the EGS-CC automation concepts

Early adoption by the AIRBUS end-users of the EGS-CC java based language approach (APPG)

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The challenging introduction of a new automated procedure language

Reminder about some EGS-CC rational

- Ability to securely share projects tailoring data across lifecycle -> Include the control automated procedures

The EGS-CC Automated Procedure language trade-off

- Based on Java8: Existing widely used language which is supported by numerous existing and mature tools (e.g. Eclipse IDE)
- Need for a simplified usage guideline over Java as being intended for non-software programmers, and also maintain procedures exchange capability
- EGS-CC APPG (Automated Procedure Programming Guide) is the resulting specification for EGS-CC automation and automated procedures preparation tools.

Need for an early availability of EGS-CC APPG

- Anticipate end-users training and adaptation to new concepts induced by EGS-CC APPG
- Deliver the EGS-CC APPG ready to use at the beginning of the pilot programs EUROSTAR Neo and ARIANE6 in order to avoid a future refactoring of the procedures when switching to the EGS-CC framework.
- End-users assessment of the completeness of the defined APPG guideline for the manufacturing applications (satellite functional validation and AIT) through an appropriate prototyping of the EGS-CC APPG -> early detection of APPG issues and feedback to EGS-CC engineering

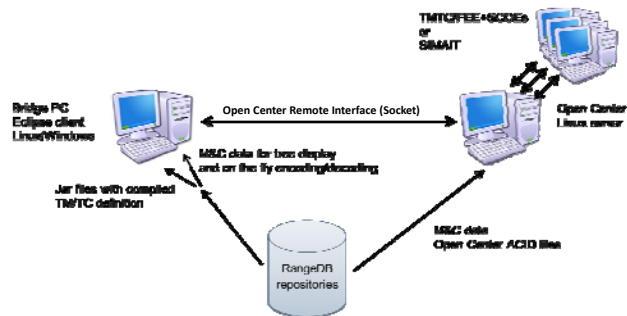
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The EGS-CC Bridge high level architectural concept

- This approach is currently followed for both pilots cases (EUROSTAR NEO and ARIANE6) to allow starting early validation activities using Open Center. Teams will develop procedures in EGS-CC language and validate the project M&C data managed in RangeDB using the full EGS-CC CDM semantic power
- It allows easy switch to a full EGS-CC based solution – No M&C definition reformatting nor procedure conversion is needed
- Bridge to EGS-CC Migration activities are limited to a re-run of the ghost validation



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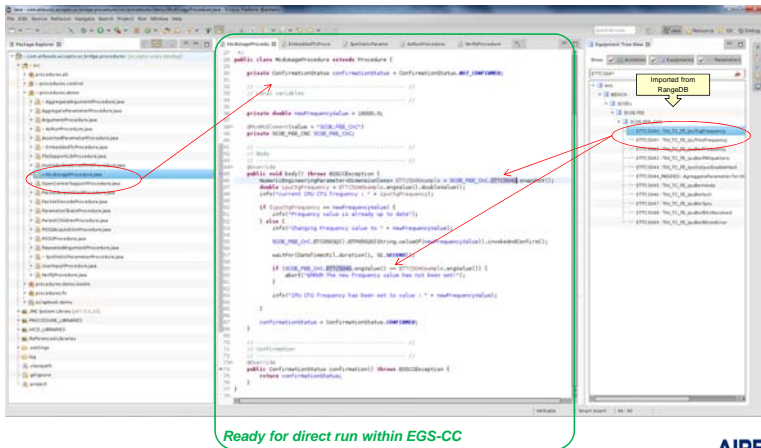
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APPG Bridge: Easy and secured insertion of commands

The screenshot shows an IDE window displaying code for the APPG Bridge. The code is in a Java-like language and includes a class named 'AppgBridge' with a 'Procedure' method. The code is annotated with red circles and arrows. One red circle highlights a line of code: 'private final int frequency = 10000;'. Another red circle highlights a line of code: 'private void setFrequency() { ... }'. A green box highlights the entire code block, with a green arrow pointing to the text 'Ready for direct run within EGS-CC'. A yellow box highlights a comment: 'Imported from subproject'. The IDE interface includes a menu bar, a toolbar, and a project explorer on the left.

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APPG Bridge: Powerful parameter access through object approach



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Conclusion and Way forward

- Insuring a nominal development schedule for the key pilot programs
 - EGS-CC is an ambitious project with a very challenging schedule and is obviously exposed to risks of delays.
 - AIRBUS had to manage the associated risks mitigation plan and has established an alternative secured strategy: the Bridging path based on the EGS-CC Bridge over the highly mature Open Center product.
 - Early verification/validation of key EGS-CC elements (Data Model - CDM, Procedure Language – APPG, Monitoring Displays – UDD) in order to feedback lessons learned to the EGS-CC project.
- Early adoption of EGS-CC concepts by end-users
 - Offering the EGS-CC Automated Procedures preparation and execution capabilities in the EGS-CC Bridgeover OC to avoid refactoring of procedures when deploying EGS-CC.
 - Early preparation of the future EGS-CC end-users through the Bridge and better evaluation of new capabilities offered by the EGS-CC CDM and APPG
- Maintaining the EGS-CC convergence objective for test and operation facilities
 - Early development of RangeDB to EGS-CC and validation with real operational data sets
 - Direct reuse of end-users EGS-CC Bridge developed artefacts when switching to the EGS-CC core
 - More efficient EGS-CC operational validation based on ghost replay of real EUROSTAR NEO tests already validated on the EGS-CC Bridge solution
 - The replacement of the legacy solutions by EGS-CC will be authorized only when the full maturity and robustness of the common core is demonstrated

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Thanks for your attention!
Any questions?
