The EGS-CC based Mission Control Infrastructure at ESOC

Mauro Pecchioli

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Introduction

- At ESOC Mission Control applications are developed on the basis of a common infrastructure supporting all categories of missions
- The EGS-CC is being developed in the context of a European wide initiative with the ambition to:
    - Support all types of space systems
    - Support all mission phases
    - Support all mission categories
- ESA is leading the EGS-CC initiative and also playing the role of the ‘Integrator’
- At ESOC the “EGOS-CC” Project has been set-up to cover the adoption of the EGS-CC as the basis for the future generation ground data system infrastructure supporting mission operations execution

Main objectives

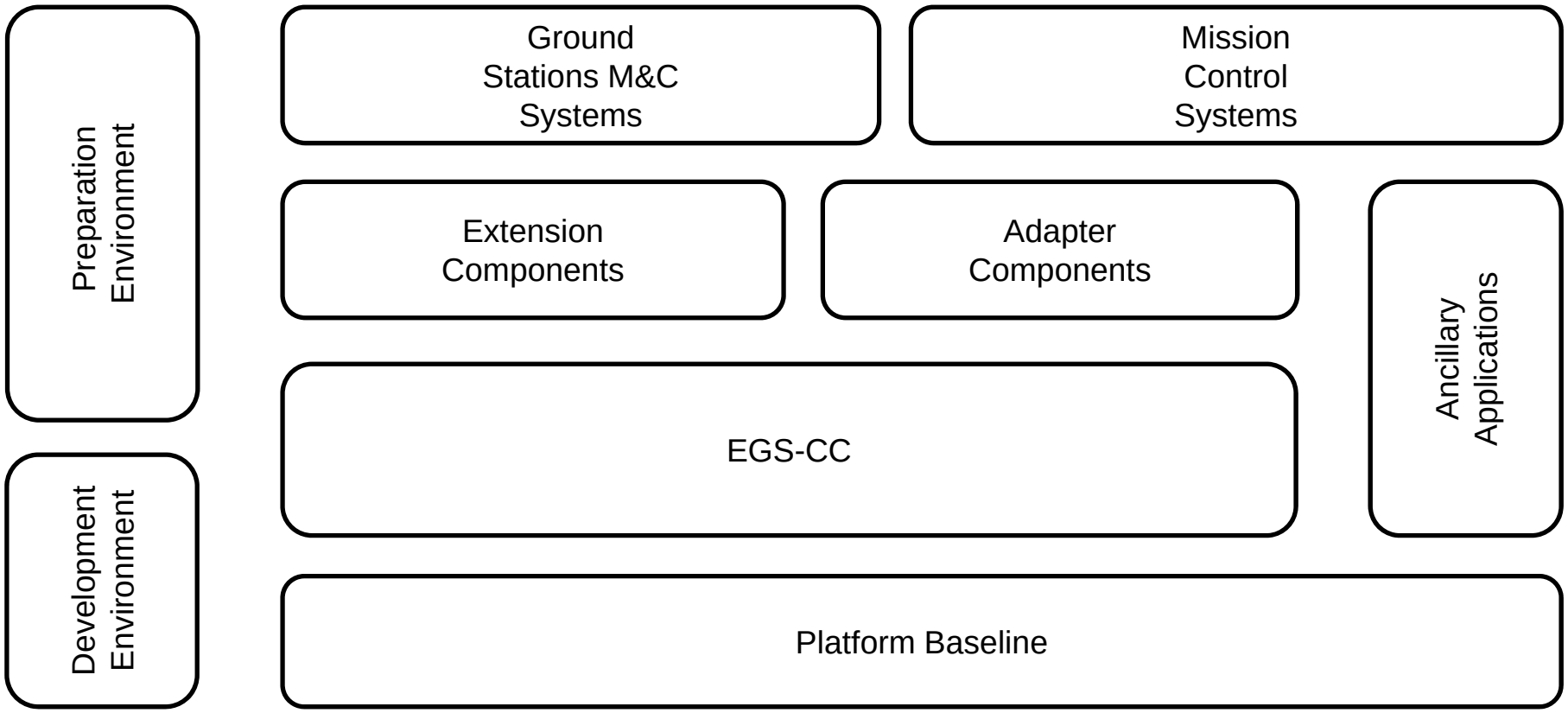
- Tackle long-term obsolescence of the current generation Mission and G/S Network Control ground data systems infrastructure
- Leverage on the EGS-CC as a European level initiative to minimise Cost of Ownership of the next generation M&C Ground Data Systems Infrastructure at ESOC
- Enable long term reduction of development and maintenance costs of the ground data systems infrastructure and of the dedicated systems relying on it
- Provide the users communities with an efficient environment to prepare and execute operations using modern technologies
- Rationalise the organisation/architectures of the target systems to enable clean split of responsibilities for development/integration/validation/maintenance
- Promote/enable cross-fertilisation of concepts/solutions with other European EGS-CC stakeholders
- Promote/enable cross-fertilisation of concepts/solutions between the Missions and G/S Network operations domains

A ‘disruptive’ change

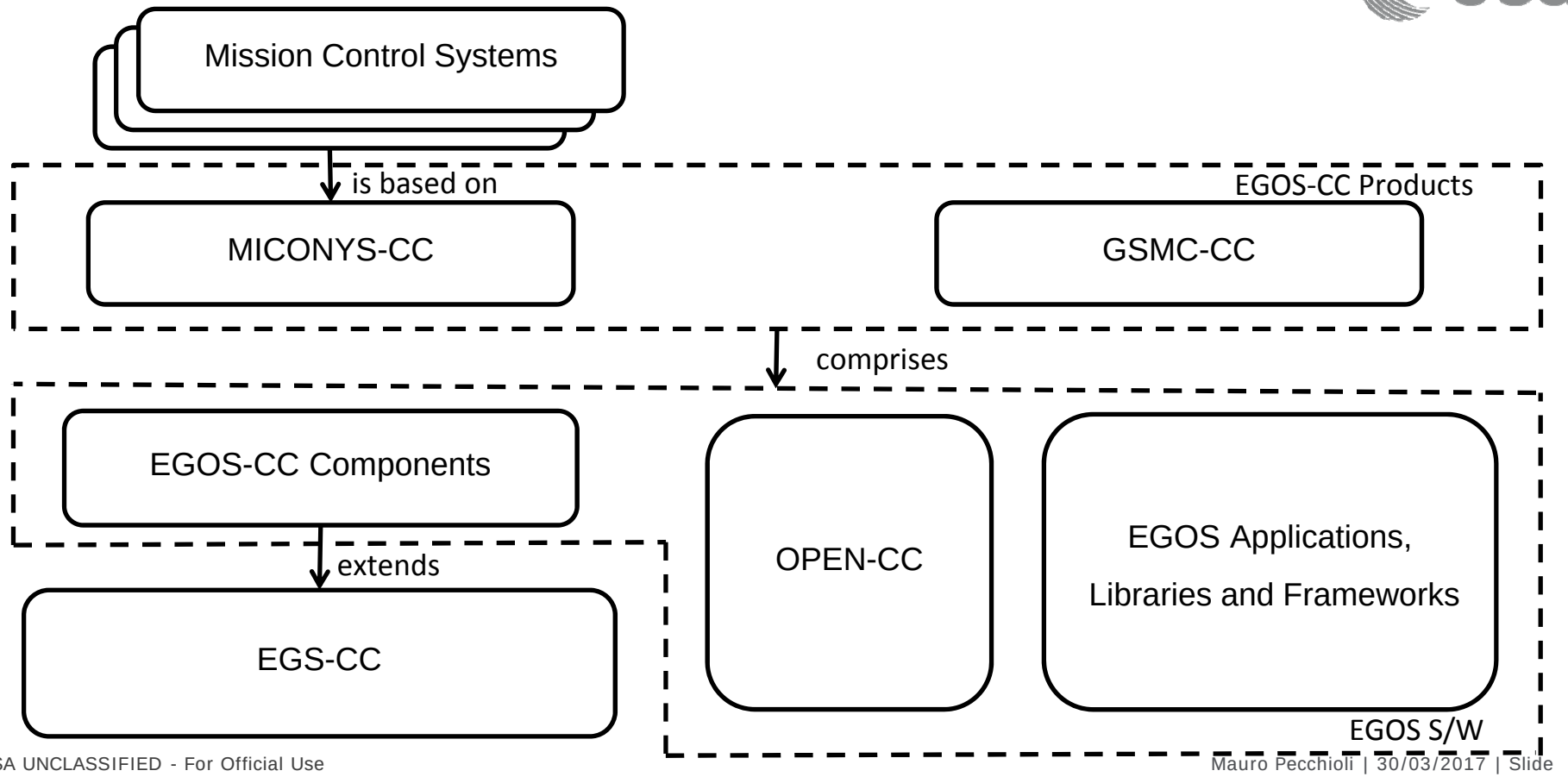
The EGS-CC adoption at ESOC will be ‘disruptive’ in many respects, namely:

- Engineering culture
- Terminology
- Engineering support tools and associated processes (e.g. model based engineering, white-box testing, automated validation)
- Technology stack (e.g. no C++, no CORBA, no SQL)
- Development and maintenance approach of M&C systems (EGS-CC as a 3rd party product)
- M&C Data definitions exchange and lifecycle
- External interfaces (with other ground systems)
- Commonality/cross-fertilisation between missions and ground station teams
- Approach to operations (higher level of abstraction, native automation support, new data model for tailoring data, provision of a consistent preparation environment)

EGOS-CC Implementation model



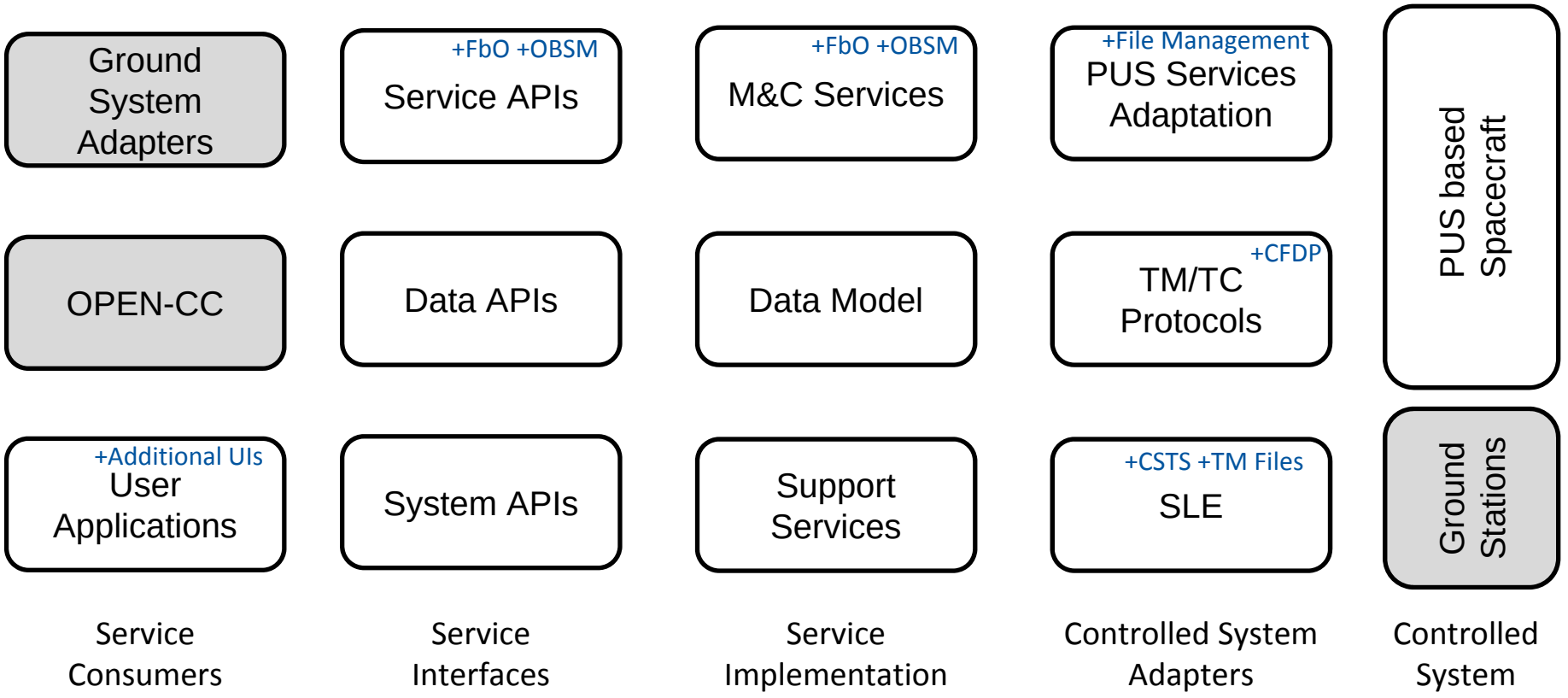
EGOS-CC Products implementation



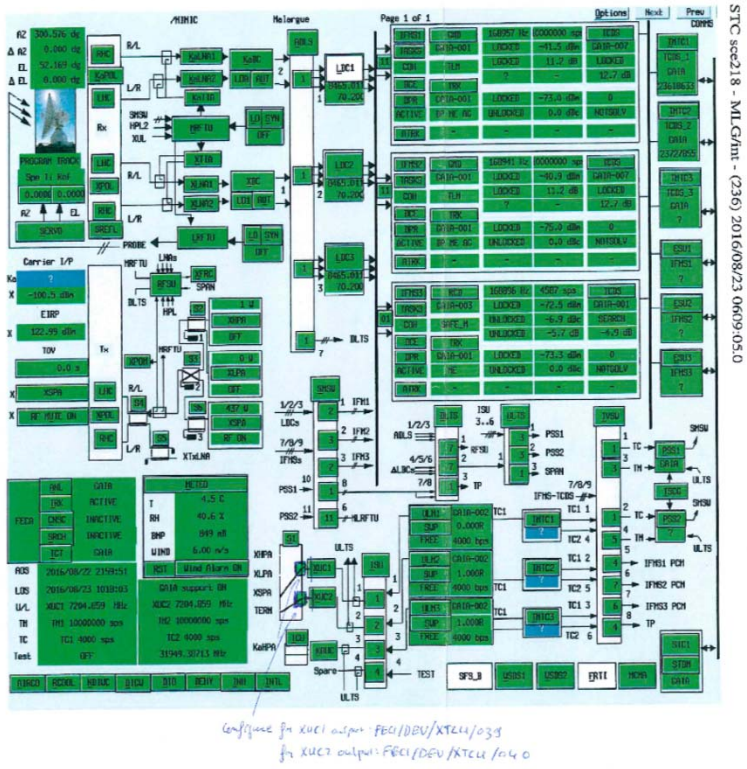
EGOS-CC Development principles

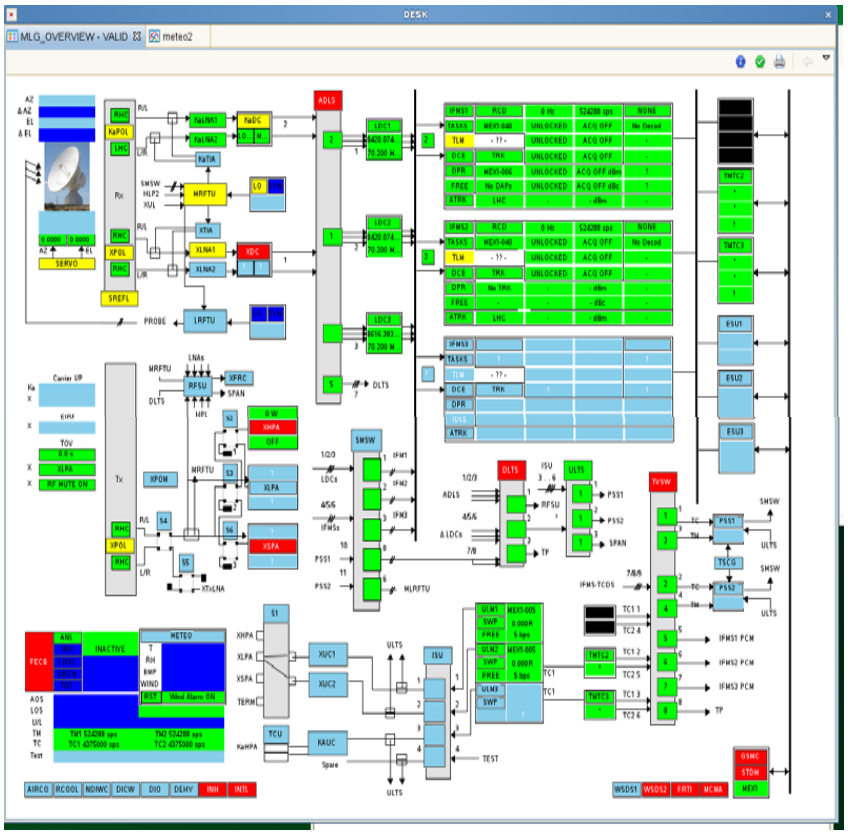
- Full adoption of EGS-CC at all levels
    - Concepts/Terminology/Methodologies
    - (Design and data) Models
    - Technologies and Tooling
- Extensions designed/implemented as ‘EGS-CC like’ components:
    - Additional ‘services’
    - Adapters towards the controlled system
    - Adapters towards the (legacy) ground systems
- EGS-CC deliverables re-used as 3rd Party Product (no modification)
- Parallel EGS-CC/EGOS-CC development, integration and validation
- Emphasis on ‘operations services’ design, based on ‘operations/engineering’ collaboration
- Cross-fertilisation between mission and network operations wherever possible

EGS-CC Extensions for MICONYS-CC



Trying to ‘emulate’ the old system?





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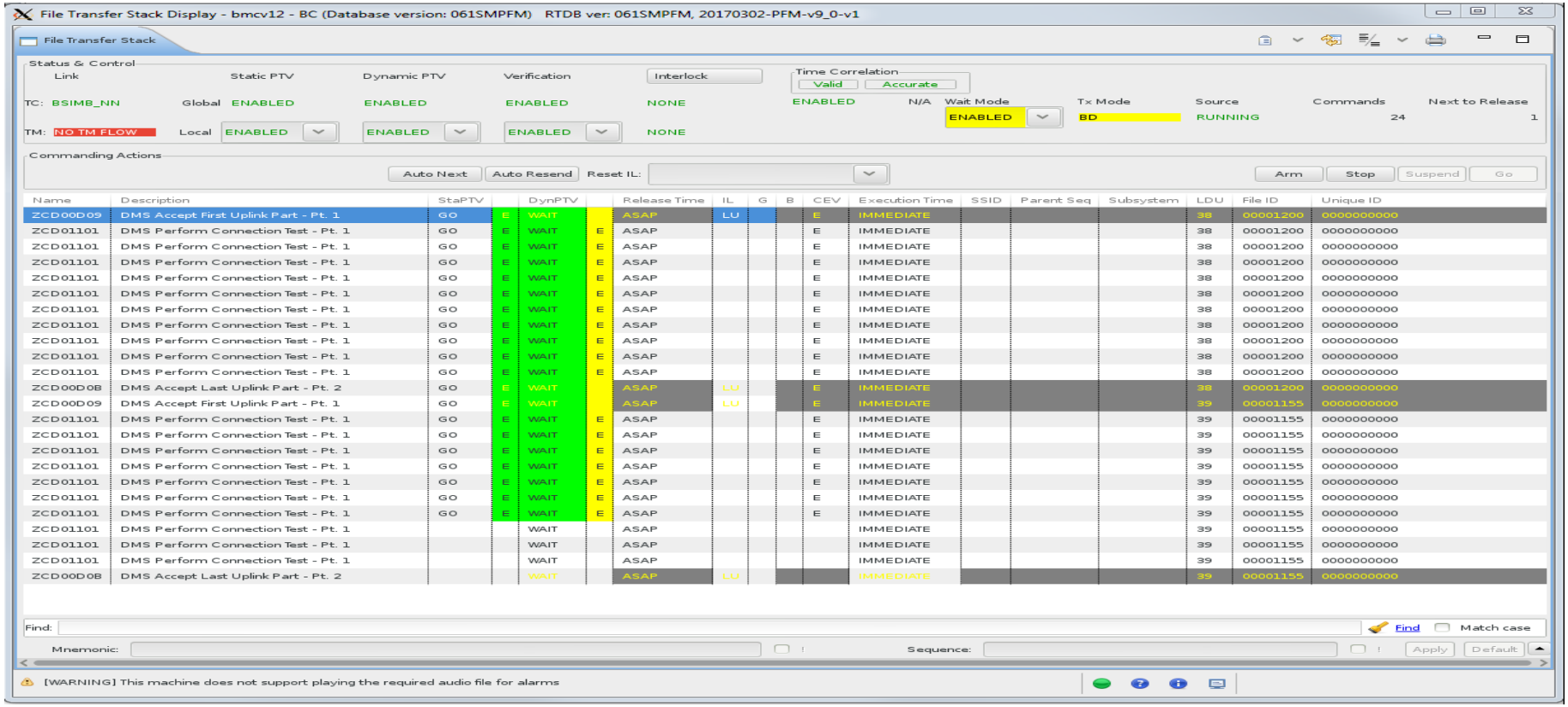
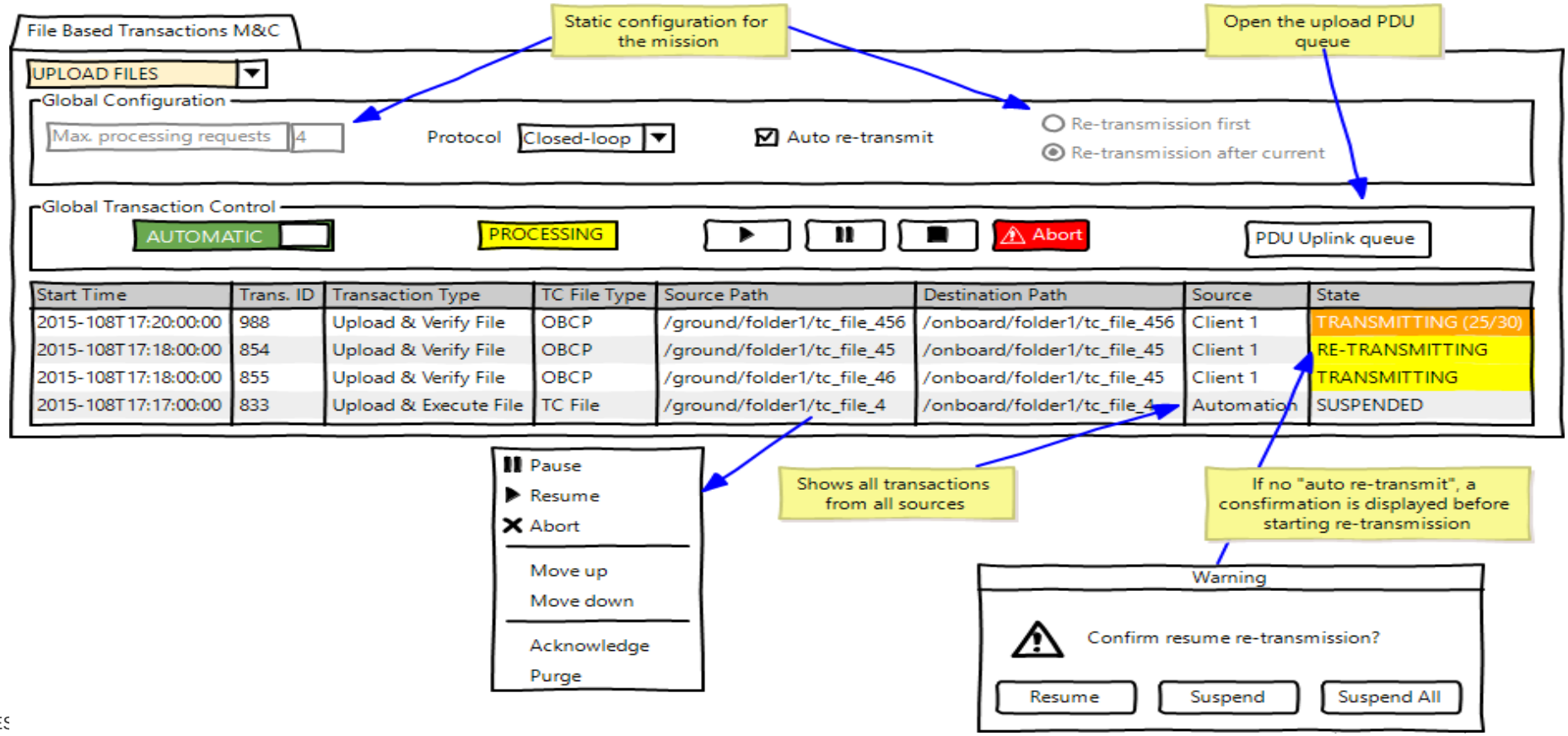
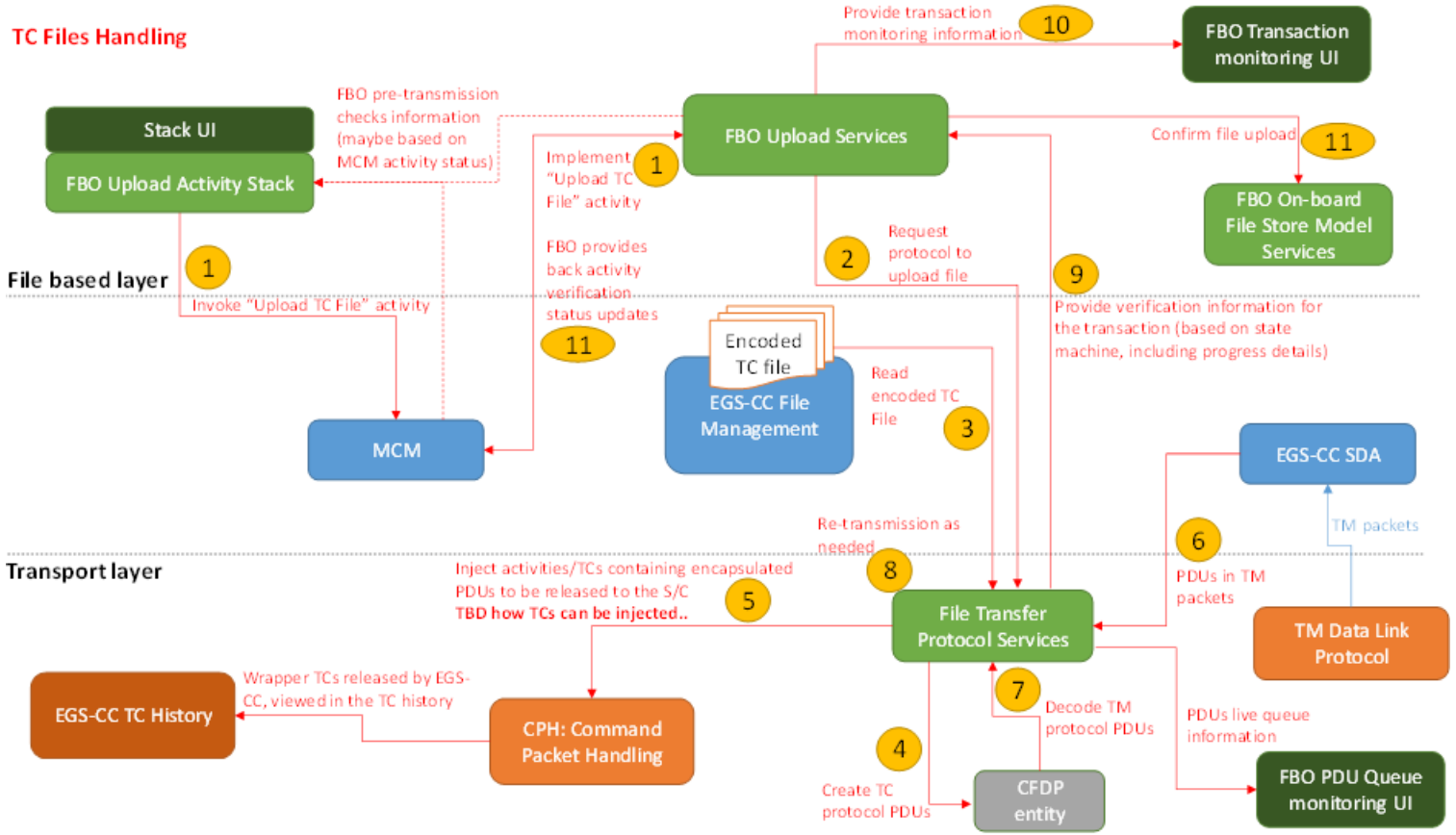


Or rather rethinking it?



Example of FbO Extensions (TC Files)



EGOS-CC Validation principles

- Incremental validation taking place at different levels but not necessarily in series:
  - White-box testing (implementation verification)
  - Level-0 components requirements based testing
  - Functional validation of the integrated system (scenario based)
  - Operational validation (in a representative environment)
  - Integrated ground segment (interfacing with real ground systems)
- Validation taking place at the lowest possible level meeting the validation objective
- Test Profiles (consisting of all soft artefacts in addition to the S/W installations) shared as much as possible across levels
- Validation responsibility mirroring the usage responsibility
- Distinct responsibilities between specification, implementation and verification
- Independent lifecycle for each validation scenario

Take-away

- The EGOS-CC Project at ESOC aims at developing and demonstrating the new generation (EGS-CC based) mission control ground data system infrastructure
- The Project covers the full lifecycle, up to operational demonstration
- Current target pilot application is the Juice Mission Control System
- Schedule is very tight, so ‘parallelism’ is a must
- This initiative is seen as an opportunity to rationalise the engineering practices to develop/manage M&C applications and also to harmonise the mission and network operations domains
- The ‘360 degree’ effort to introduce a new generation of operations support system is considerable in many respects and shall not be underestimated
- Trying to ‘emulate’ the old systems can only lead to degradation/dissatisfaction
- Key to success will be the EGS-CC itself but also the motivation and commitment of the EGOS-CC stakeholders to consider new (engineering and operational) approaches

End of presentation

M. Pecchioli, A. Walsh, ESA/ESOC

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