OHB FLEXIBLE MISSION CONTROL: MULTI MISSION CONTROL CENTER

GROUND SYSTEM ARCHITECTURES WORKSHOP

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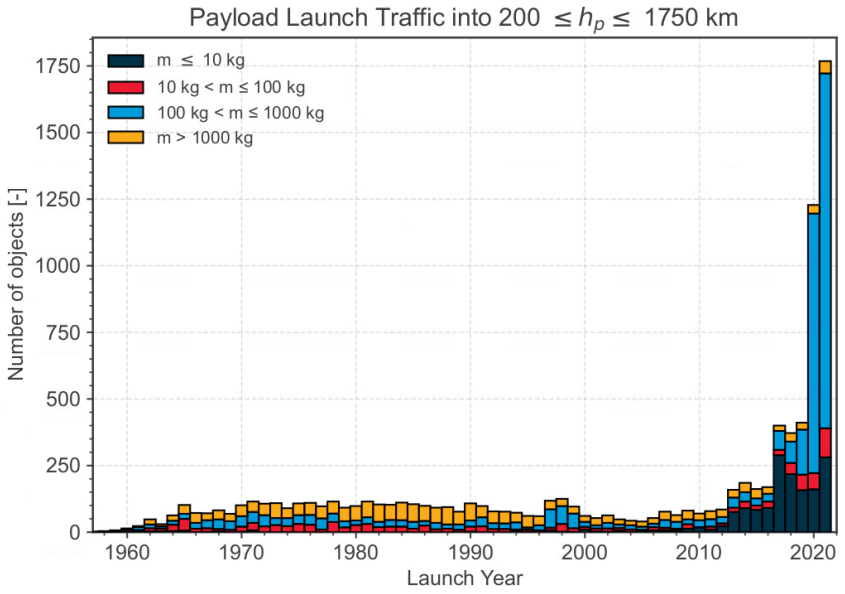
AGENDA

1. Context
2. Concept
3. Backend Infrastructure
4. Front-End Infrastructure
5. Mission Activities

CONTEXT

The growing space industry drives the need for flexible services around satellite operations.

- Satellite constellations are getting more and more popular
- New technologies are developing fast, also because of New Space
- Dedicated control centres are operational and in use since many years, however not re-usable due to sensitivity
- Requests from customers (commercial and institutional)
- This required to analyse the requirements of different mission concepts also as potential future missions and consolidate them into a Multi-Mission Control Centre
- The OHB group in Bremen is setting up a new modern centre led by OHB-Digital Connect, specialized in up and downstream ground segments and operations
- OHB group development and flight experience from system integration of LEO, GEO and MEO satellite based solutions, and the operations thereof are incorporated in the design of this centre intended to provide services from a multi-mission perspective

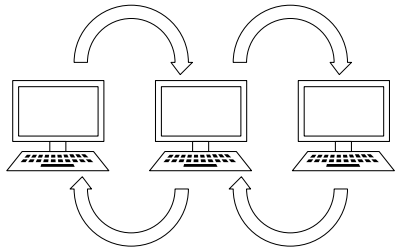


Source: ESA's Space Environment Report 2022

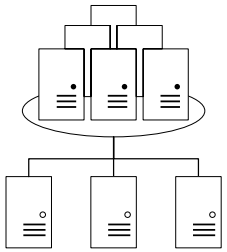
CONCEPT

- Needs identified driven from RFI’s and RFP’s
- Mainly unclassified missions such as commercial telecom missions, scientific missions (i.e., hyper spectral satellites) and others
- Can also be configured for classified missions for governmental purposes
- For single satellite missions up to small constellations
- The requirements and design cover:

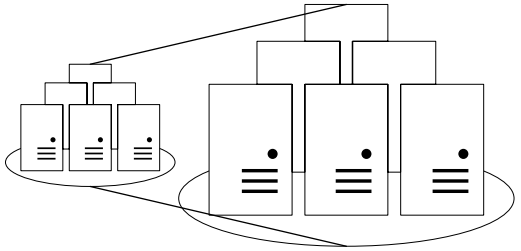
Flexibility



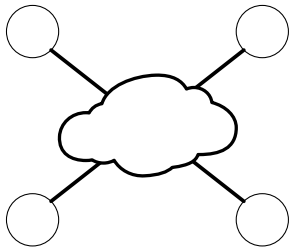
Modularity



Scalability

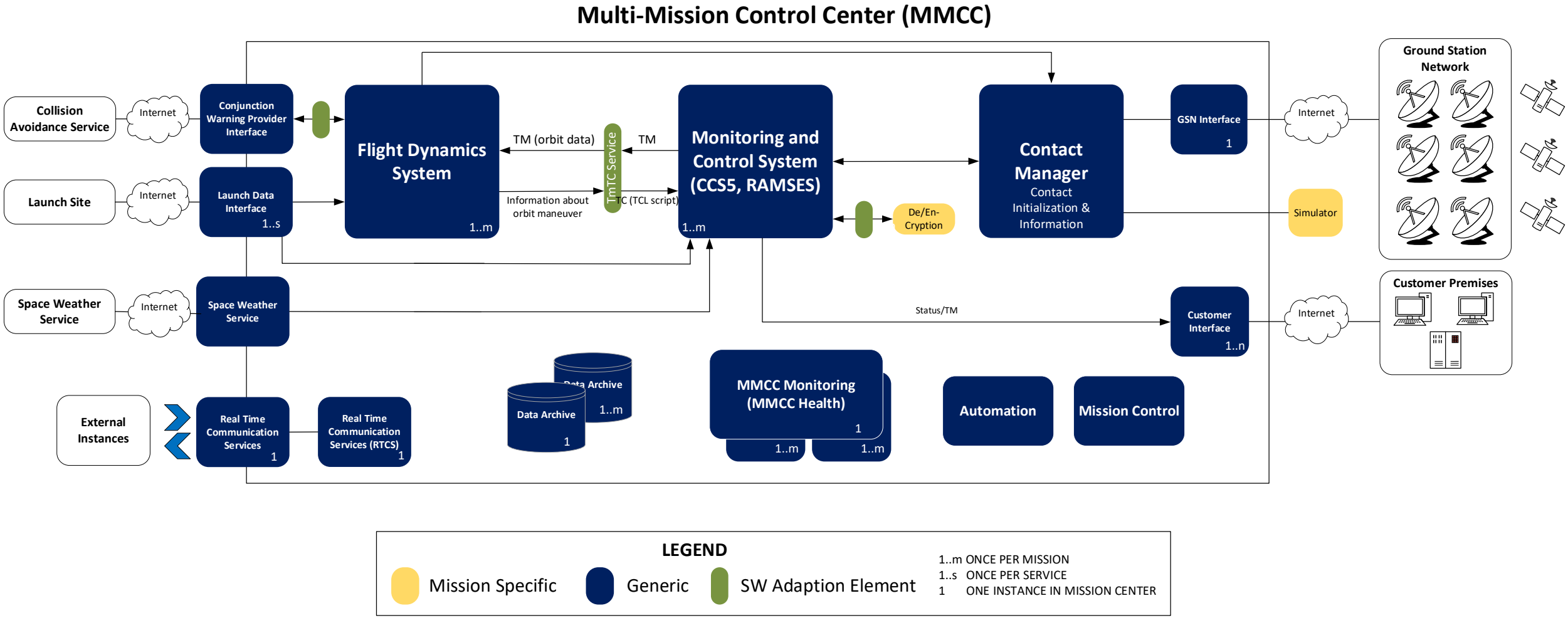


Wide Connectivity

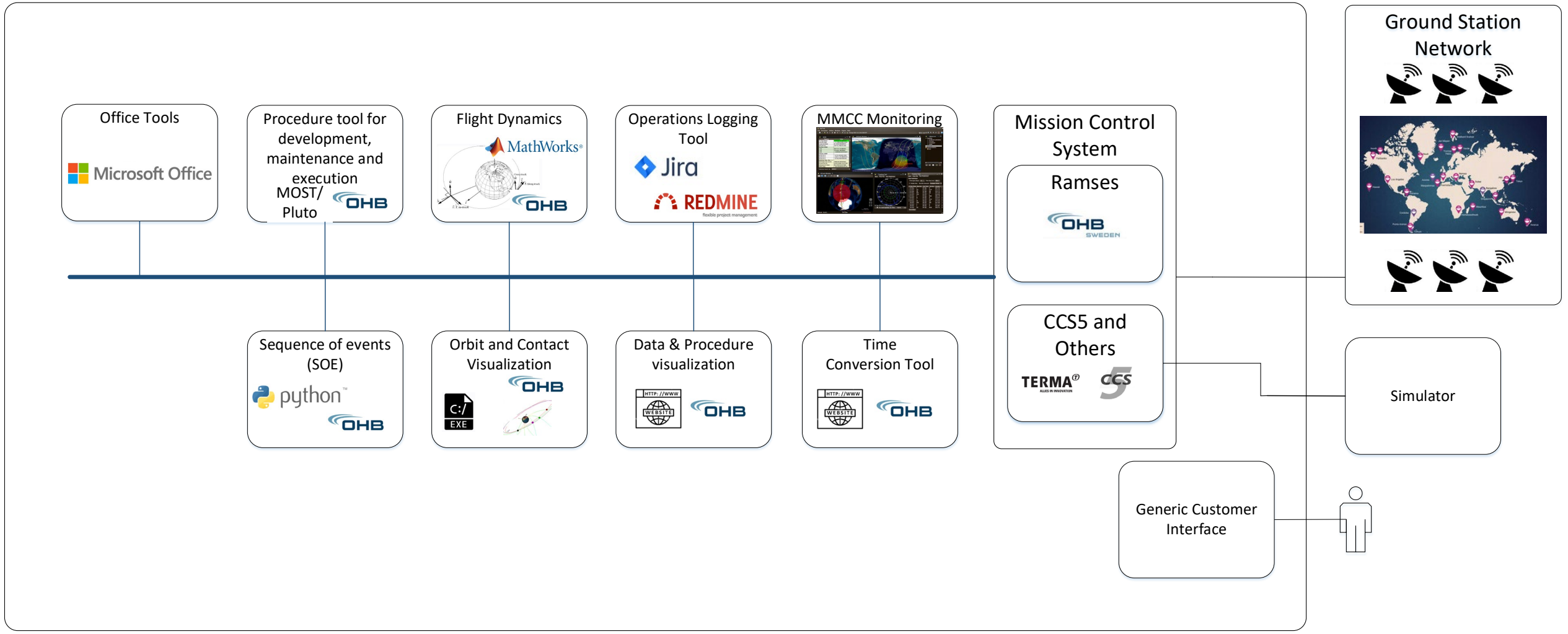


CONCEPT

OVERALL ARCHITECTURE



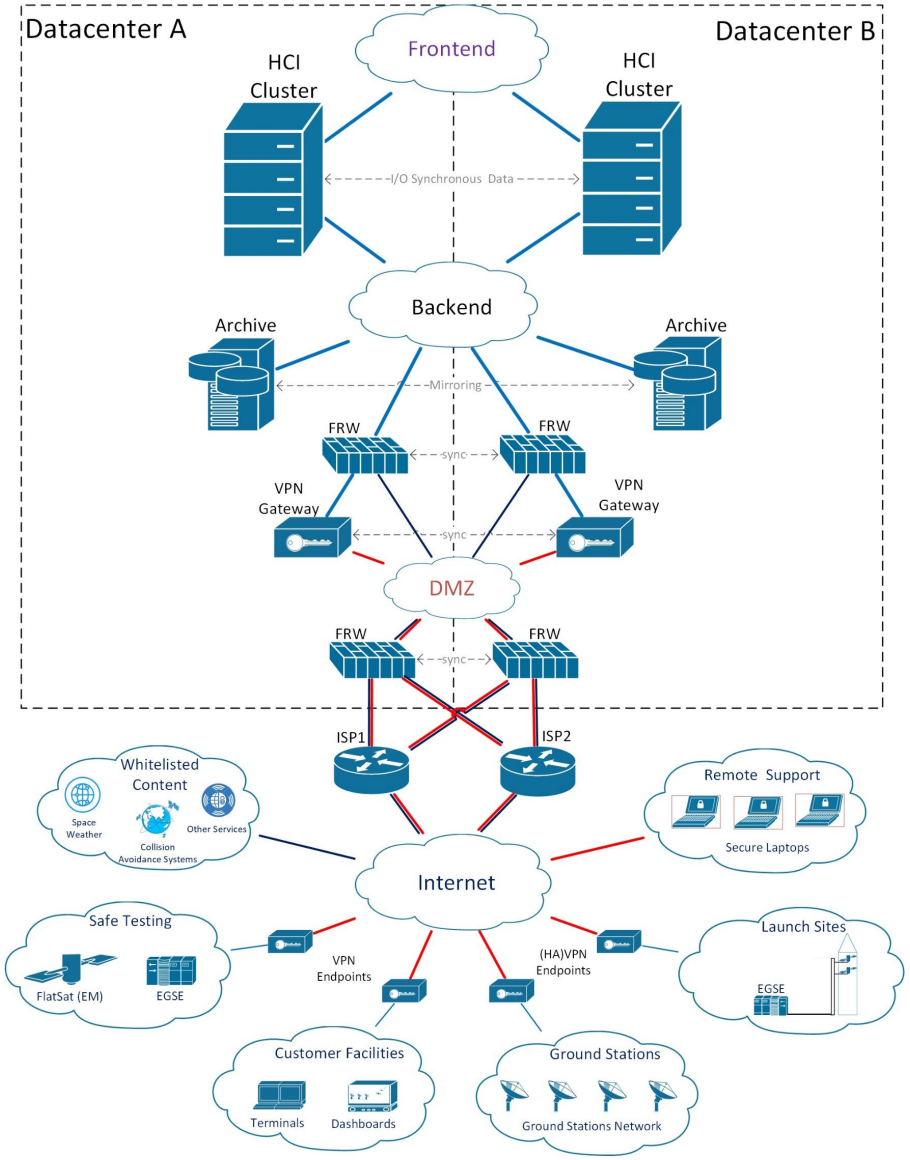
CONCEPT



Sources of logos on last slide

BACKEND INFRASTRUCTURE

- High availability architecture with redundant components and paths
- Hyper-Converged Infrastructure (HCI) with Virtual Machines (VM) and container-based applications support
- Active/Active (HCI) Clusters with synchronous I/O of data between two datacenters
- Dedicated and scalable resource pools (compute, storage and network) for each mission
- Infrastructure as Code (IaC) processes for rapid deployment and improved infrastructure consistency via automation tools
- Available templates for common services such as directory, monitoring, auditing, file-shares and several other services
- Flexible interconnectivity options (IPSec, MPLS, eVPN etc.) to remote sites
- Design takes restricted mission requirements into account

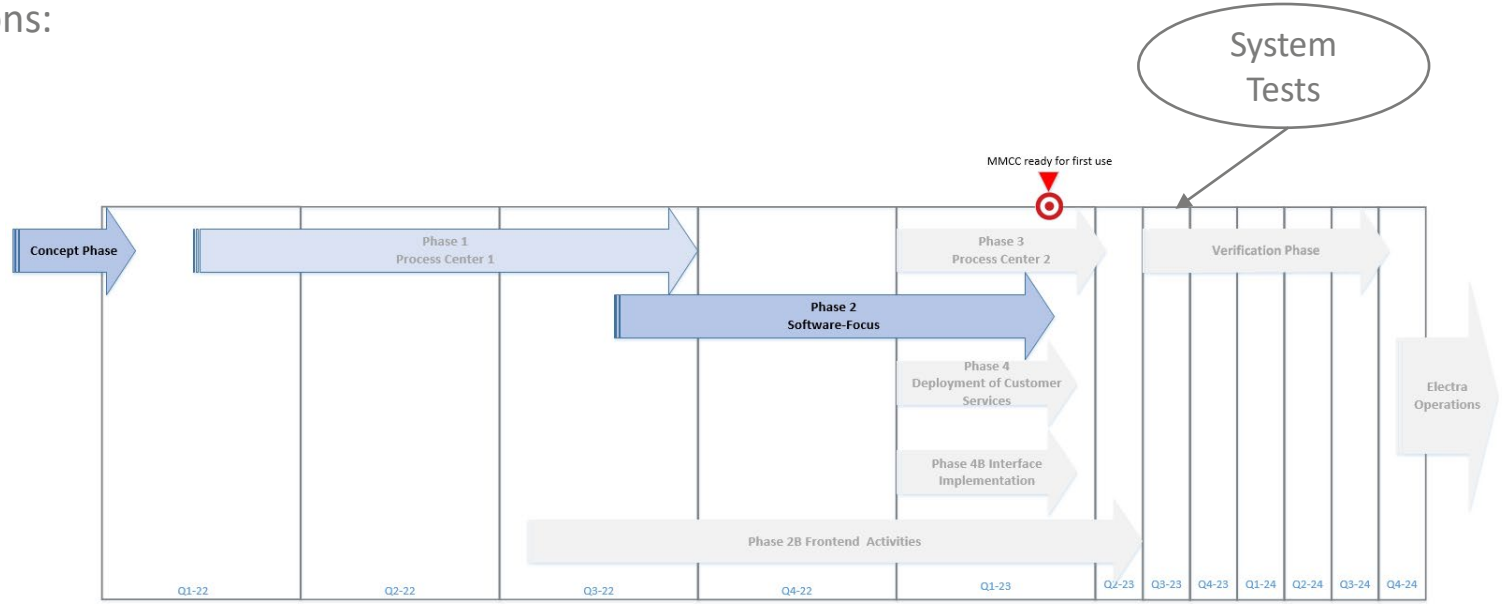


FRONT-END

- 15 operator terminals
  - Configurable to be thin or fat clients
  - Able and flexible to realise several projects in parallel
- Able to reach full virtual capabilities
- Uniform hardware/software (console) installations
  - Flexible roles
- Dedicated network
- Side offices – also connected to dedicated network
  - Room scalability and flexibility for mission needs
- Fully flexible data dashboards on the video wall
- Remote secure satellite monitoring and safe testing on engineering model

MISSION ACTIVITIES

- The MMCC has been designed, procured (step wise) and realised to support up to five missions in parallel with one in a critical phase (i.e., LEOP)
- Usage for a Telecommunications mission reached CDR status reviewed by ESA.
- Lessons learned from current OHB-DC control centers have flown into the design and Technology selection.
- Considered projects: GEO OHB-System Electra based Telecommunication, MEO/LEO Telecom constellations , LEO Earth Observation
- Realisation is done independent of any future missions:
  - To allow generic implementation
  - To be able to quickly prepare Operations
  - Trade Off re-use/adapt AIT to OPS or re-write
- Currently Pilot Projects are under planning for 2024
- EGS-CC and other core processing systems -> Future



SOURCES

- ESA'S ANNUAL SPACE ENVIRONMENT REPORT, ESA Space Debris Office, April 2022, Issue 6.0
- Python logo, https://www.python.org/
- Terma and CCS5 logo, https://www.terma.com/products/space/satellite-control-systems/
- OHB Sweden logo, https://www.ohb-sweden.se/
- Jira logo, https://www.atlassian.com/de/software/jira
- Redmine logo, https://www.redmine.org/projects/redmine/wiki/Logo
- Microsoft Office logo, https://learn.microsoft.com/en-us/microsoft-365/cloud-storage-partner-program/online/branding
- Satellite monitoring, https://www.gano.name/shawn/JSatTrak/
- C exe icon, https://www.onlinewebfonts.com/icon/442876
- MathWorks logo, https://www.mathworks.com/products/matlab.html

Thank you

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