

WE LOOK AFTER THE EARTH BEAT



Virtual Reality in Satellite Integration and Testing

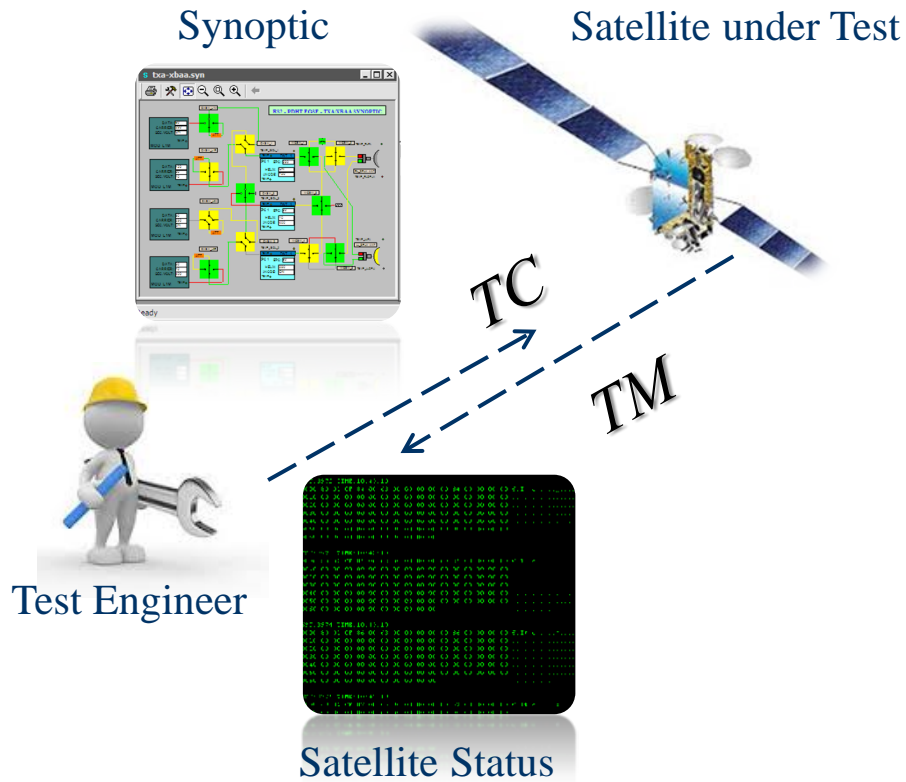
05/08/2015

Prepared by Valentina Paparo

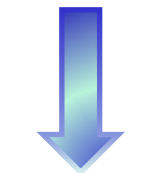
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ThalesAlenia
A Thales / Finmeccanica Company *Space*

- Introduction
 - Validation Process
 - Virtual Model for Assembly Integration
- EGSE SW MMI in TAS
 - Synoptic Display
- Virtual Reality in TAS
- Integration between Virtual Reality and EGSE
- Conclusion and Q&A

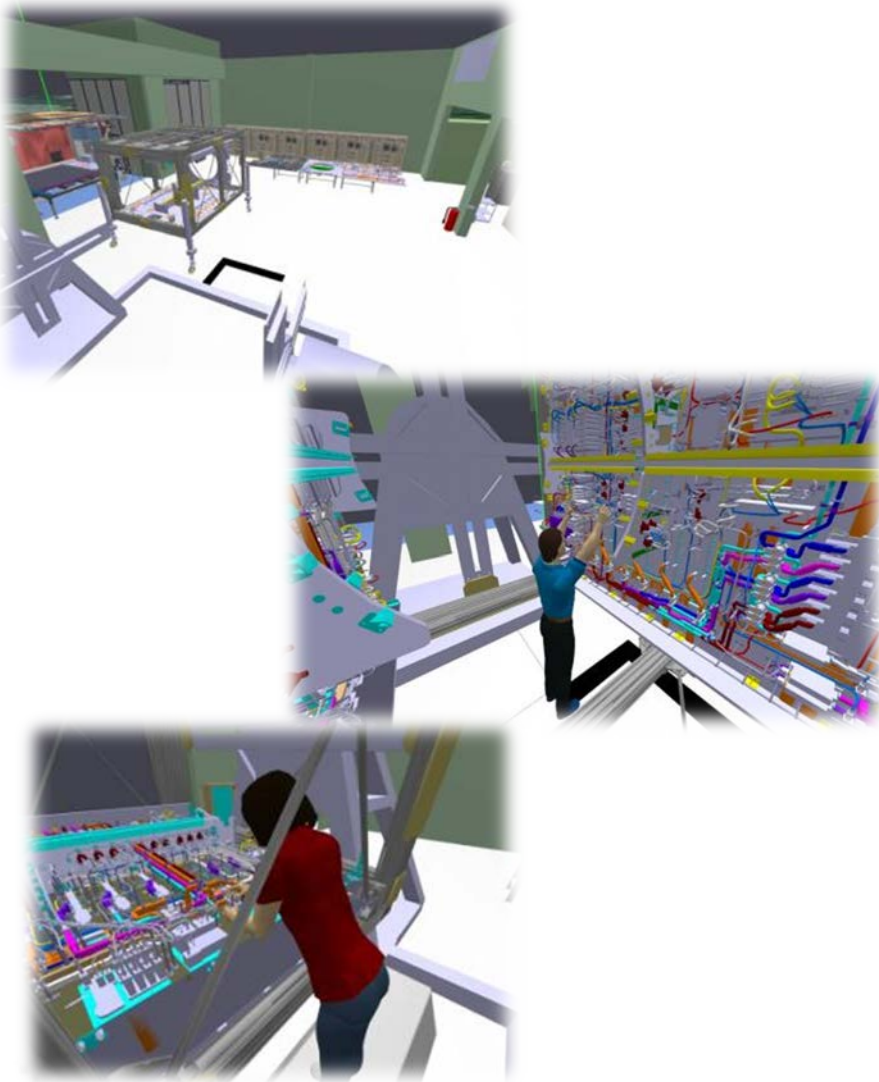


- An important part of validation process is made in a visual environment.
- This allows Test Engineers to represent the satellite using *synoptic*
- The synoptics are linked to telecommand and telemetry and display in real time the satellite status
- The synoptic is not always straightforward

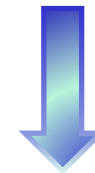


*Effort
&
Knowledge of the environment*

Virtual Model for Assembly Integration



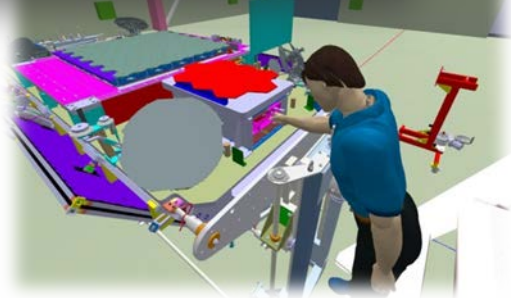
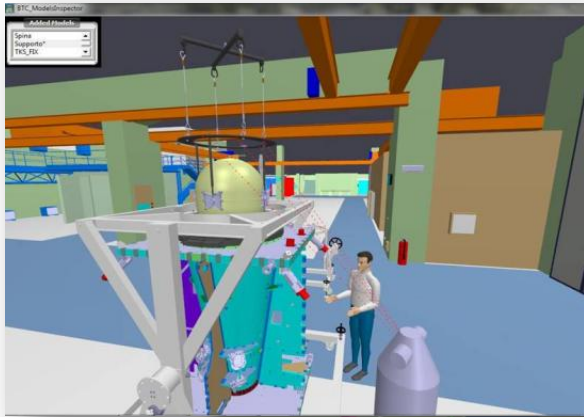
- Satellite mechanical layout (including harness) usign CAD program
- Detailed representation, at component level, of the satellite
- Modelling of the enviroment.



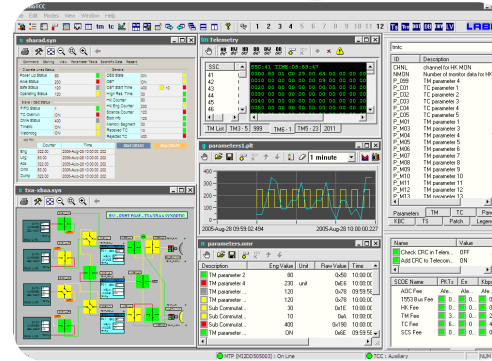
*Virtual Environment to Decriticize
and Support Mechanical Assembly
and Integration*

Advance Synoptic System

*Virtual Technology
+ CAD Model*



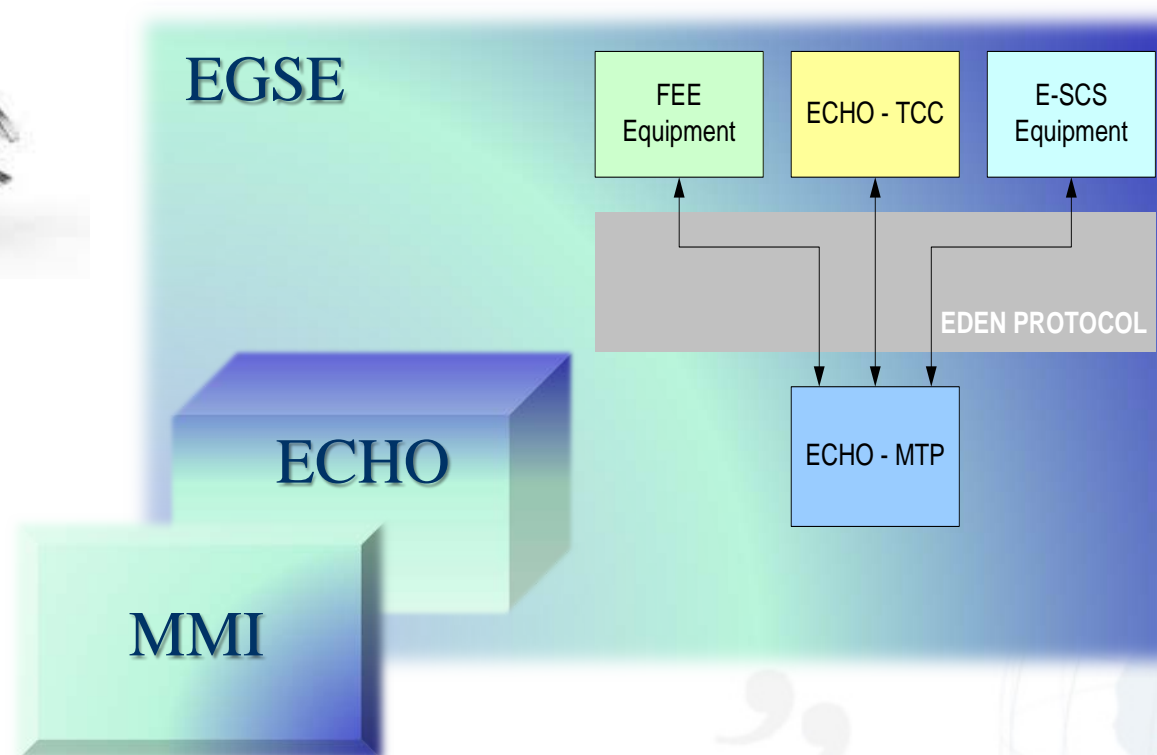
*Synoptic
& Validation Process
Technologies*



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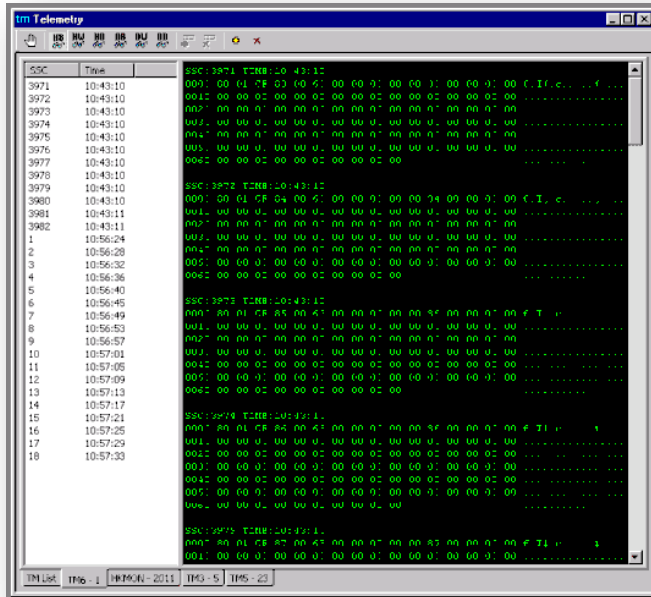
EGSE SW MMI in Thales Alenia Space

- The EGSE is based on elementary component joined together to build the complete system.
- ECHO: standard EGSE framework which provides the common checkout functions and includes the communication protocol
- The MMI, provides by ECHO, is based on the following concepts:



EGSE SW MMI in Thales Alenia Space

Raw Data Display

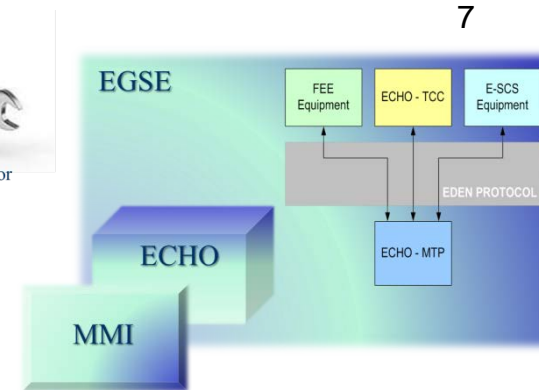


Parameter Display

Description	Eng V...	Unit	R..	Time	PRef	Status
TM parameter 8	142	CNT	8e	10:43:11	P_M08	GO
TM parameter 6	0.00	mm		01:00:00	P_M06	INHIBIT
TM parameter 4	4	unit		01:00:00	P_M04	INITIALIZED
Tm Packets from TmTc Fee	3982.00	Pkts		10:53:49	TfeTmP	GO
Tm Error from TmTc Fee	0.00	Pkts		10:53:49	TfeTmE	GO
Tc rate toTc Fee	0.00	bps		10:53:49	TfeTcR	GO

TM/TC data are presented in raw format

Raw data displayed as engineering parameter



Synoptic Display

- Fully under Operator Control
- Graphical Editor to draw the Unit Under Test
- Mapping between Parameters Values and Objects created

The screenshot shows a software interface with a table of discrete lines status and a 3D model of a satellite's thermal panels. The table has columns for 'Discrete Lines Status', 'General', and 'HK TM'. The 3D model is titled 'THERMAL X PANELS' and shows two panels, '- X PANEL' and '+ X PANEL', with various sensors and components labeled. A legend indicates symbols for THERMOCOUPLE, TELEMETRY, and CALROD THERMOCOUPLE. A 'SATTELLITE' legend at the bottom right lists 'SUN BUS PWR', 'BUS CURRENT', and 'BATTERY HOLD'. An 'OPEN' button is visible at the bottom of the 3D model.



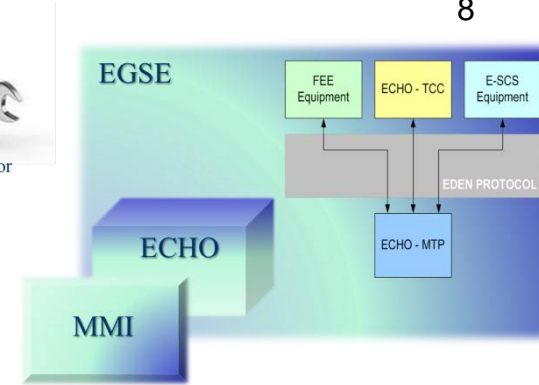
Requires operator experience
Hard to define general rules
for simple creation of complex object



Formalised Design Approach



AIV Operator

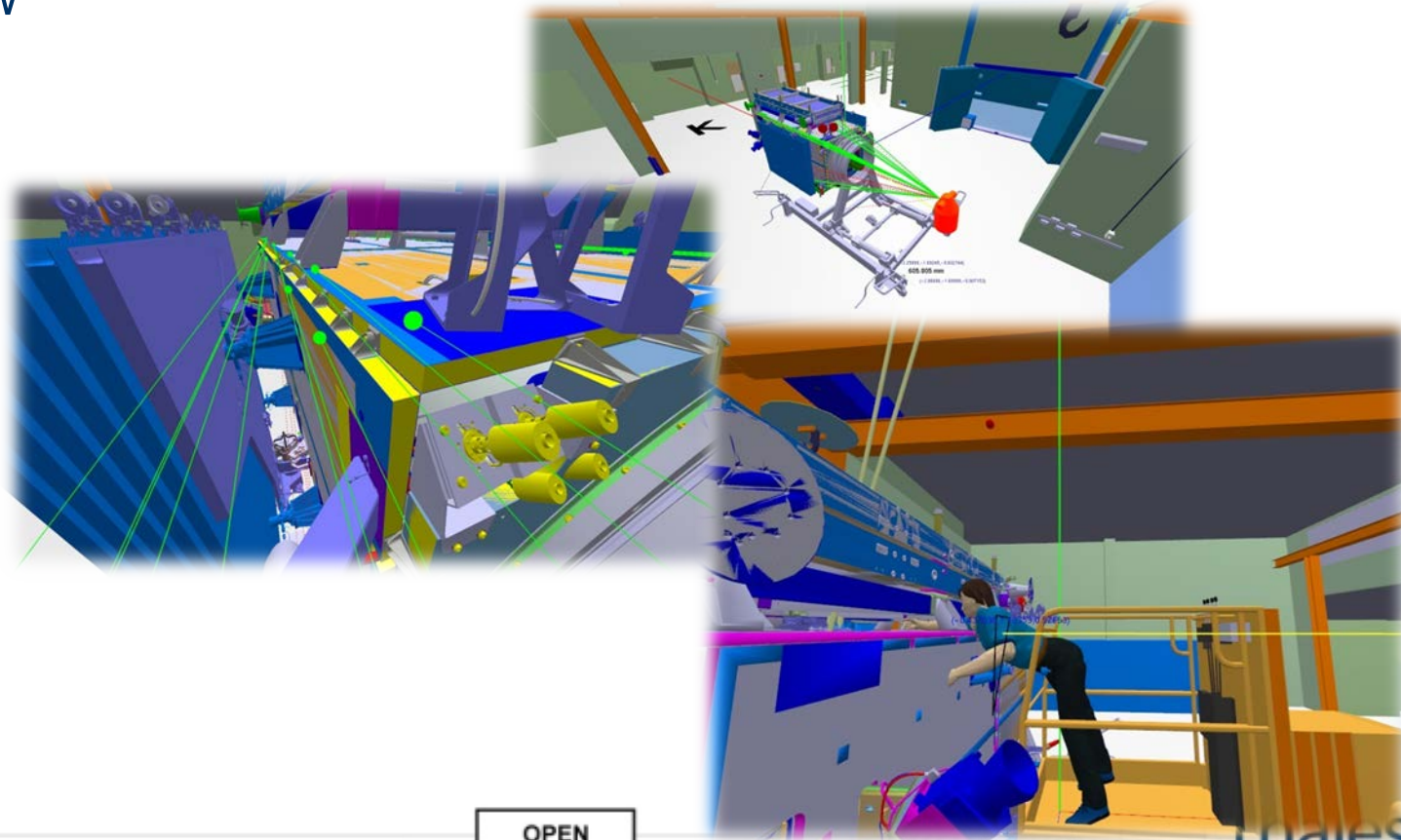


Virtual Reality in Thales Alenia Space

- Propetary Tool used Mechanical Integration Procedures
- Able to import CAD model , without simplification, created by the Engineering Team
- Offline integration between tool and laser scan during the alignment stage
- Realistic Environment Reconstruction
- Interaction through Human Interface Device
- Stereoscopic View



AIT Operator

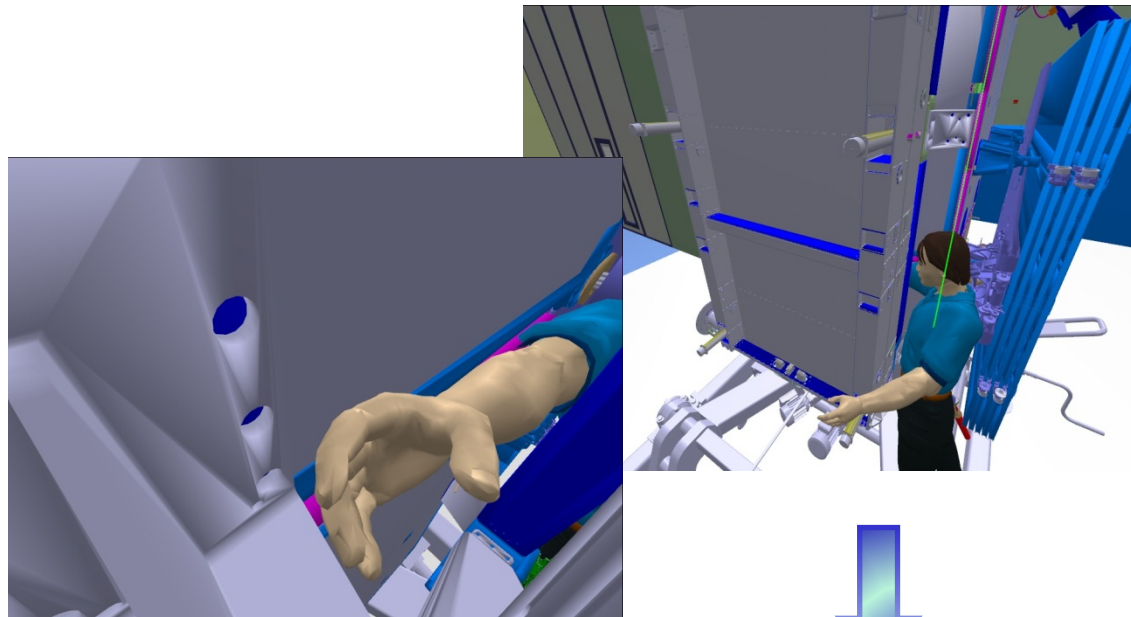


Virtual Reality in Thales Alenia Space

- Complex procedures could be rehearsed well in advance to the actual integration phase
- Easy verification of accessibility to the component



AIT Operator



Allows to assess the most critical steps and prepare, in a timely manner, workarounds or risk mitigation actions.

New User Interface for the Ground Support Equipment capable to:



AIT Operator



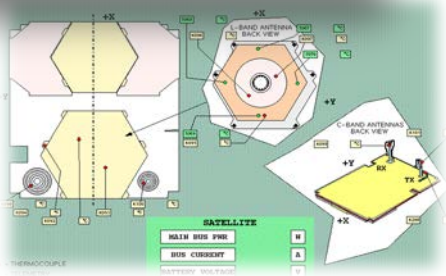
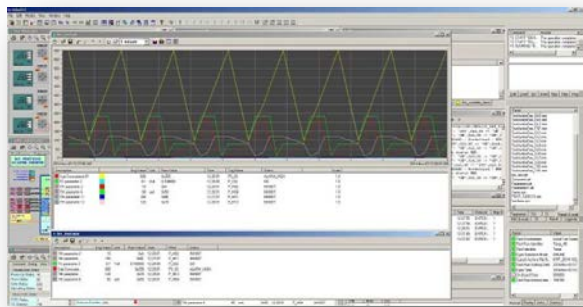
Test Engineer



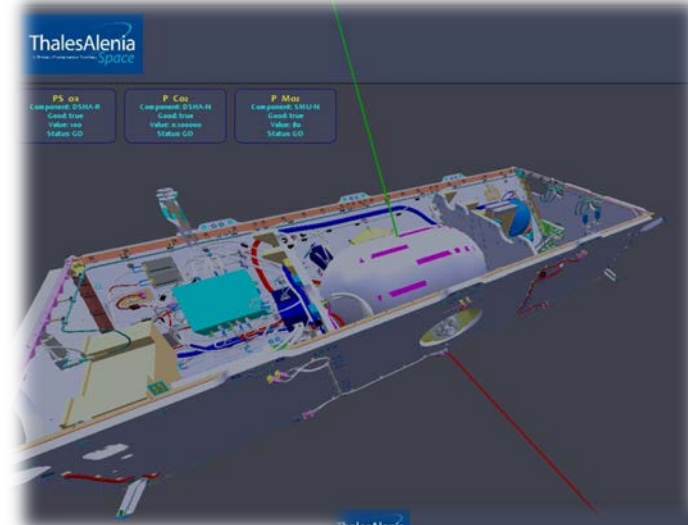
AIV Operator

- Connecting with the Monitoring System through a standard protocol yet remaining disconnected from the complexity associated to the measures;
- Adding or removing displayed parameters in real time from the display, as well as activating or deactivating objects, layers, components to configure the view
- Manage different levels of privileges, from observer to supervisors up to administrators.
- Saving one or more views (layouts) for each test and operator.

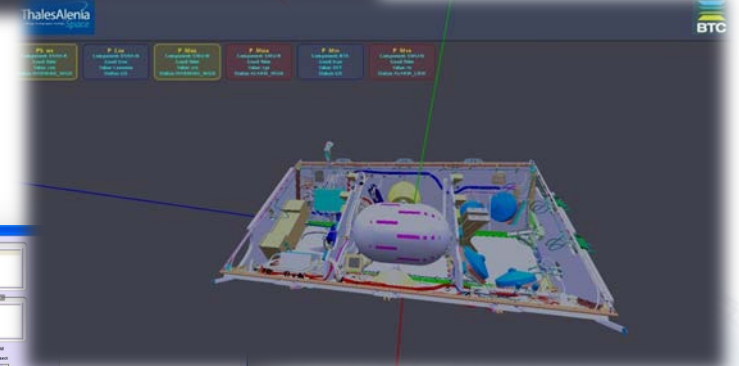
Integration Between VR and EGSE



UDP



Filtered
Displaying



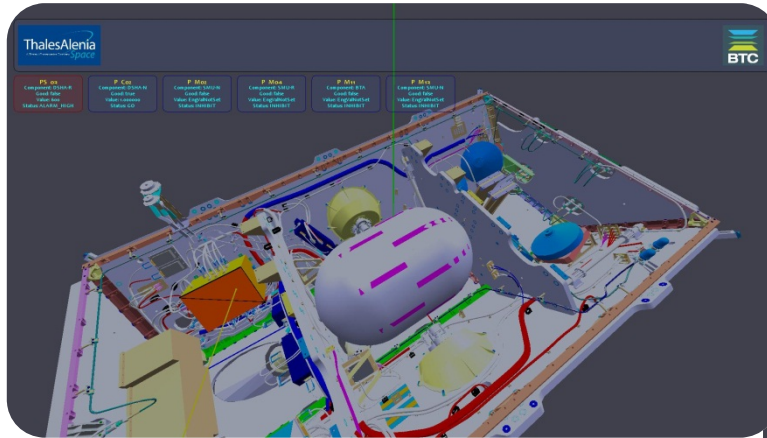
- Switch from Simple to Advance View
- Filtering Option
- Color Based Feedbacks



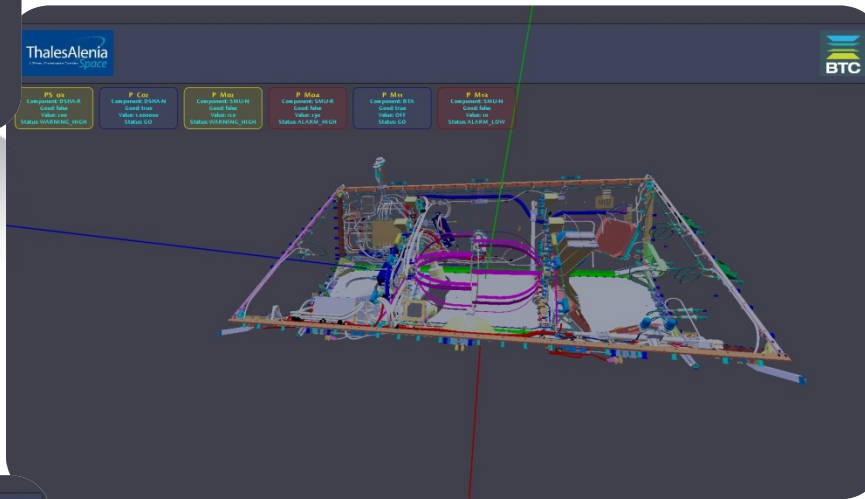
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Integration Between VR and EGSE

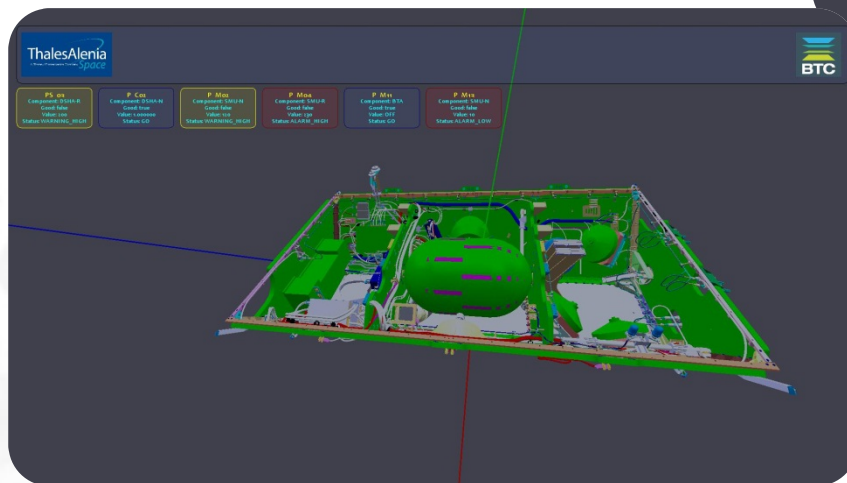
Event-driven processing that allows to perform all functions just by clicking on the screen



OpenGL + Qt Framework



Highlight a component on the CAD model and hide it



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Conclusion



AIT Operator



Test Engineer



AIV Operator



Quick Reaction to Failure Situation

*Usable by Heterogeneous group
of people at the same time and with
different skills*

*Change the Observed parameters
without recreating the synoptic*

Process Less Error Prone



Reduce the cost for Testing

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Thanks for your
Attention



Feel free to ask questions now or send them to:

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