3rd UCAAT User Conference on Advanced Automated Testing

ETSI World Class Standards

Sophia Antipolis, French Riviera
20-22 October 2015

TESTING THE INFRASTRUCTURE THAT SUPPORTS SPACE EXPLORATION

Presented by Eduardo Gómez

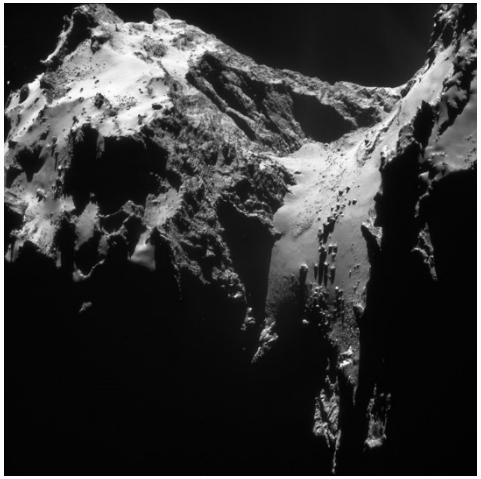
esa

INTRODUCTION

The European Space Agency

Mission control at Darmstadt
(ESA/L. Guilpain - CC BY-SA IGO 3.0)

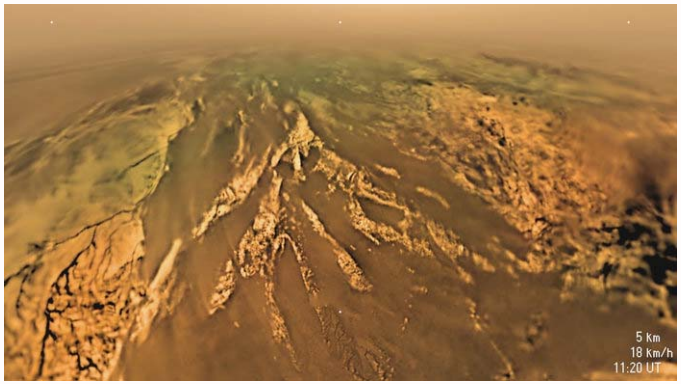
Lisa Pathfinder
(ESA–P. Sebirot, 2015)



Close-up of comet 67P
(ESA/Rosetta/Navcam – CC BY-SA IGC

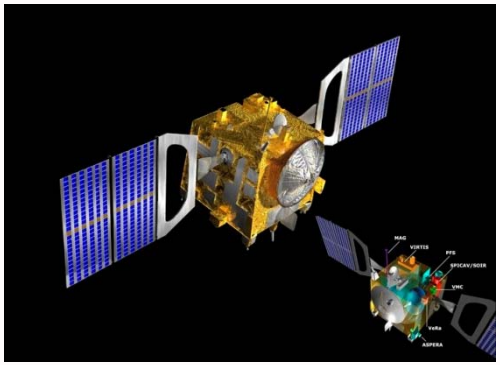
Malargüe tracking station
(ESA/D. Pazos - CC BY-SA IGO 3.0)

Ariane 5
(ESA/CNES/ARIANES
PACE-Optique Video du CSG, S. Martin)

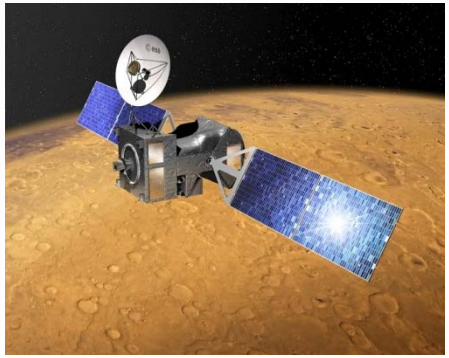


Titan as seen by Hygens
(ESA/NASA/JPL/University of Arizona)

Reusing technology

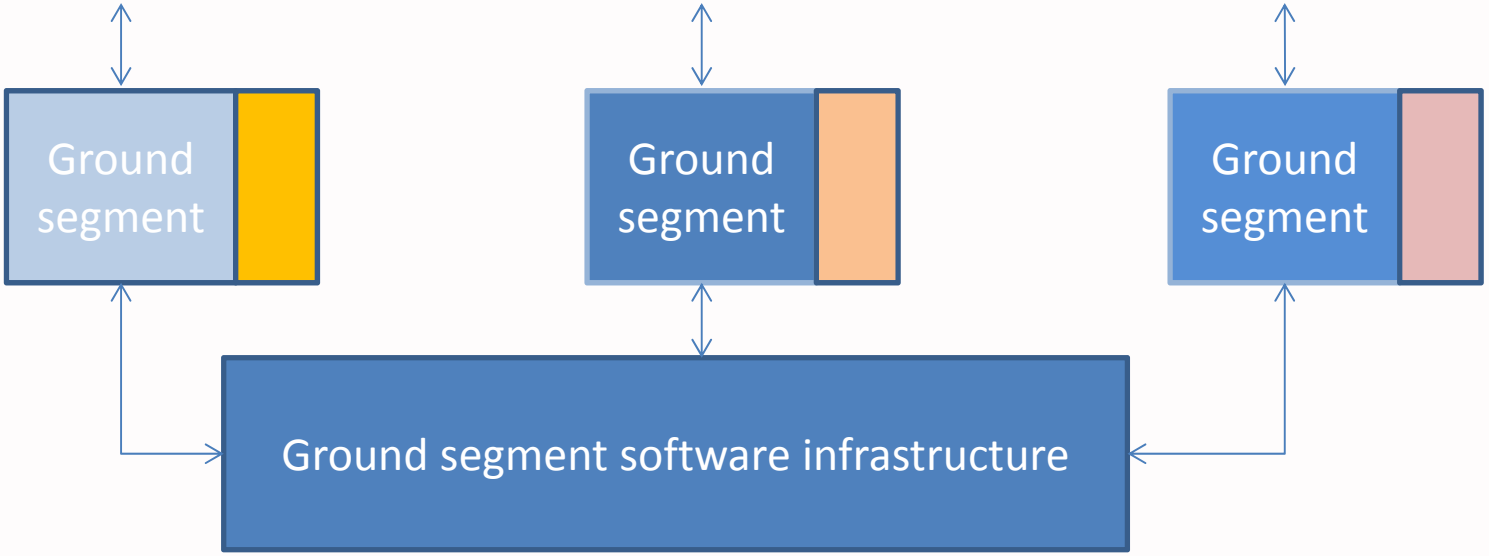


Venus express



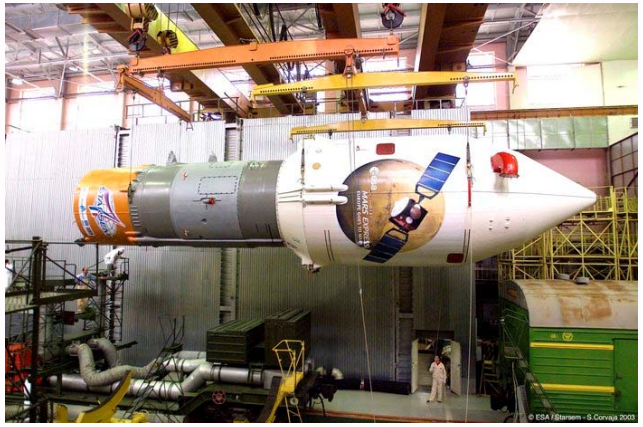
Mars express

Rosetta



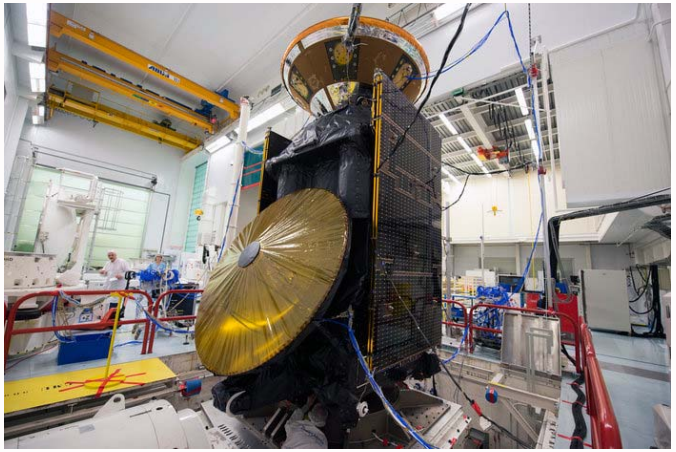
TESTING NEEDS

Evolution of the GS Sw infrastructure



Launch: 2003
Downlink: 230 kbps
Daily data volume: 1~5 Gb
Operating system: Solaris
Platform: Sun Sparc
User interfaces: C++ toolkit

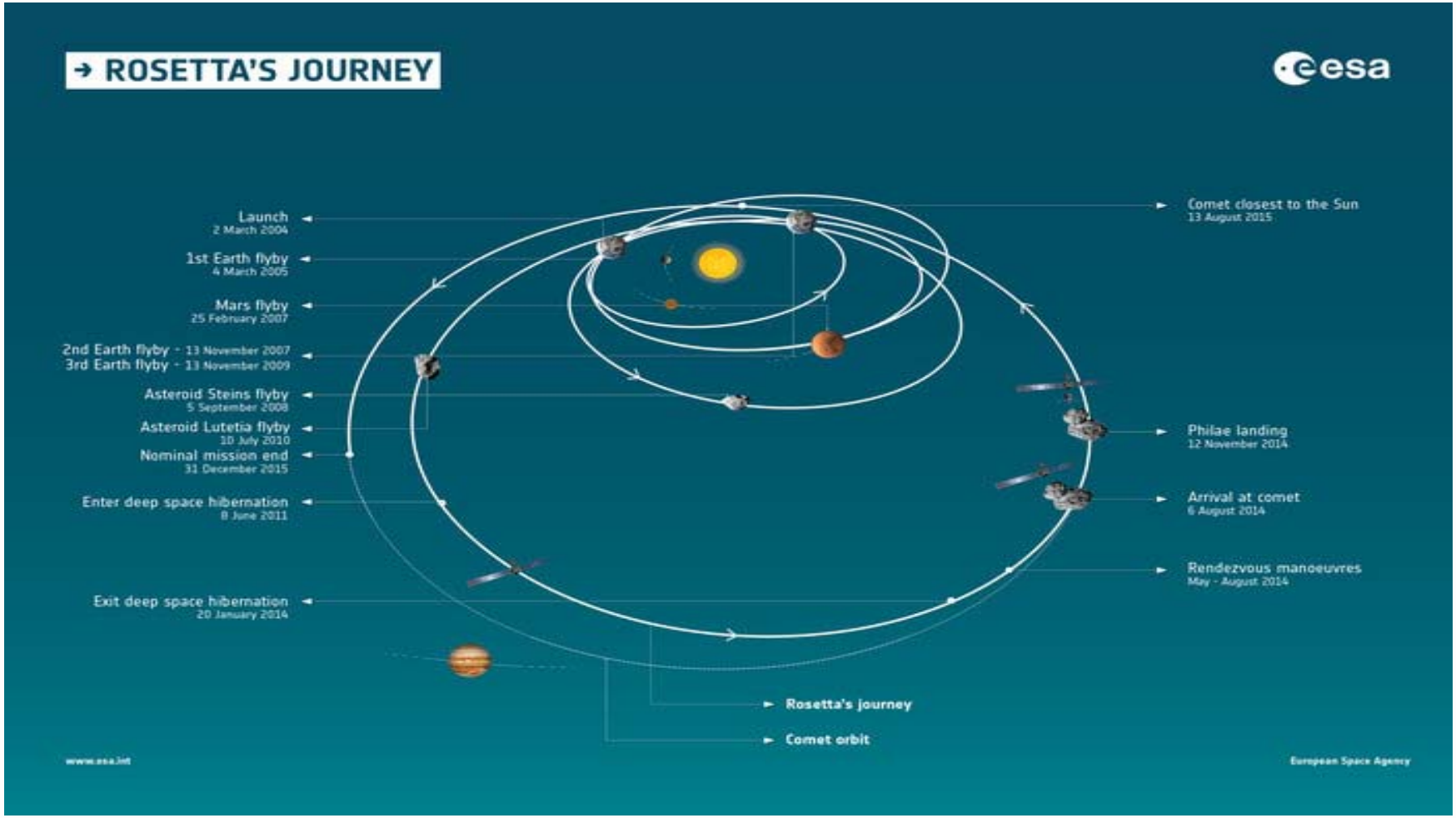
Mars Express preparing for launch (copyright ESA/STARSEM-S.Corvaja)



Launch (expected): 2016
Downlink: 697 kbps-2146 kbps
Daily data volume: 1.7~92 Gb
Operating system: Suse Linux Enterprise Server
Platform: virtualised
User interface: Java SWT

Exomars vibration testing (copyright ESA-S.Corvaja)

Ground Segment sw infrastructure testing



Rosetta's journey (ESA)

The challenge

Add test automation to a system…

…that was not designed for test automation…

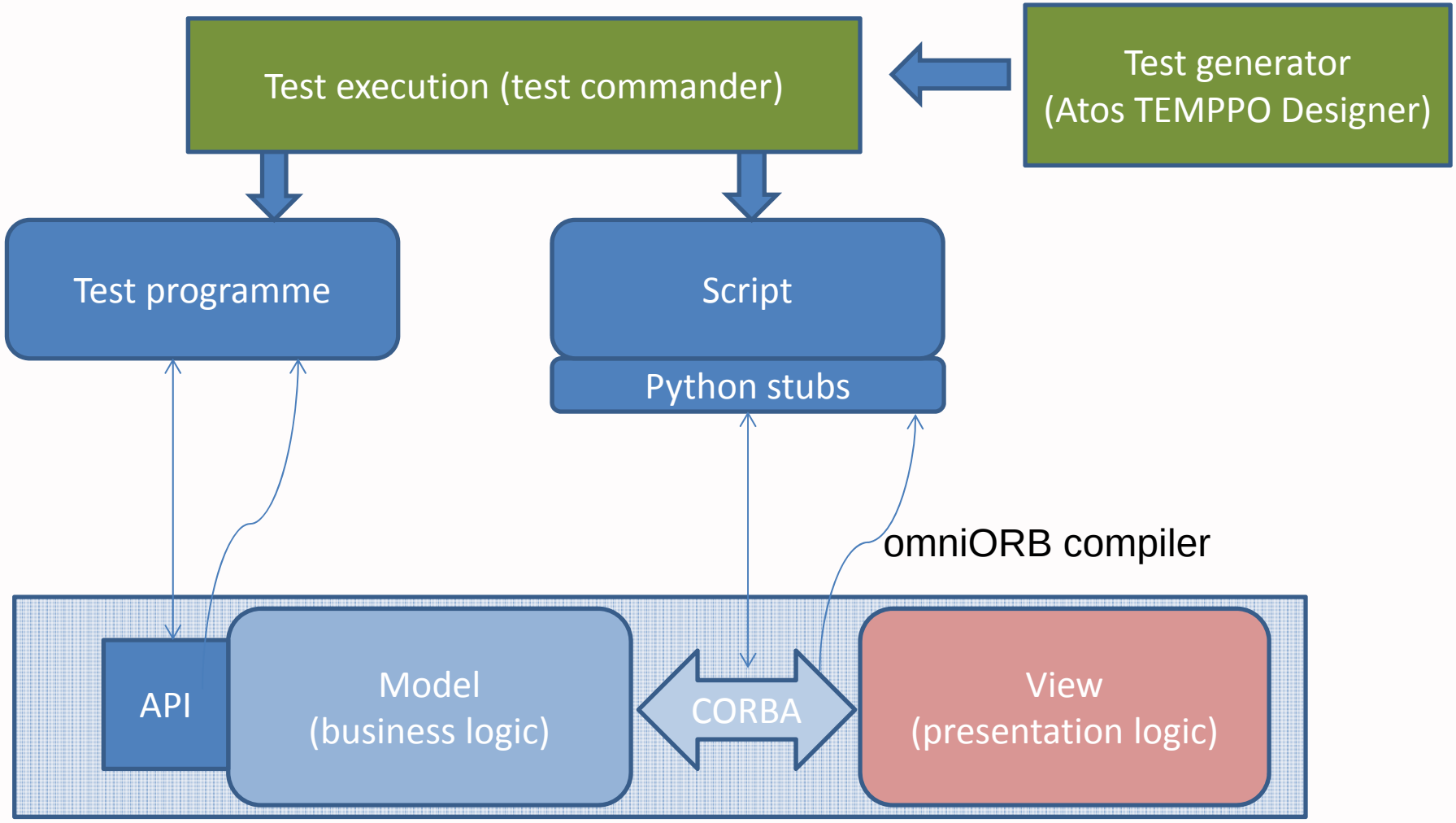
…and evolve

3rd UCAAT User Conference on Advanced Automated Testing

ETSI World Class Standards

TEST AUTOMATION

Test automation: accessing the software under test



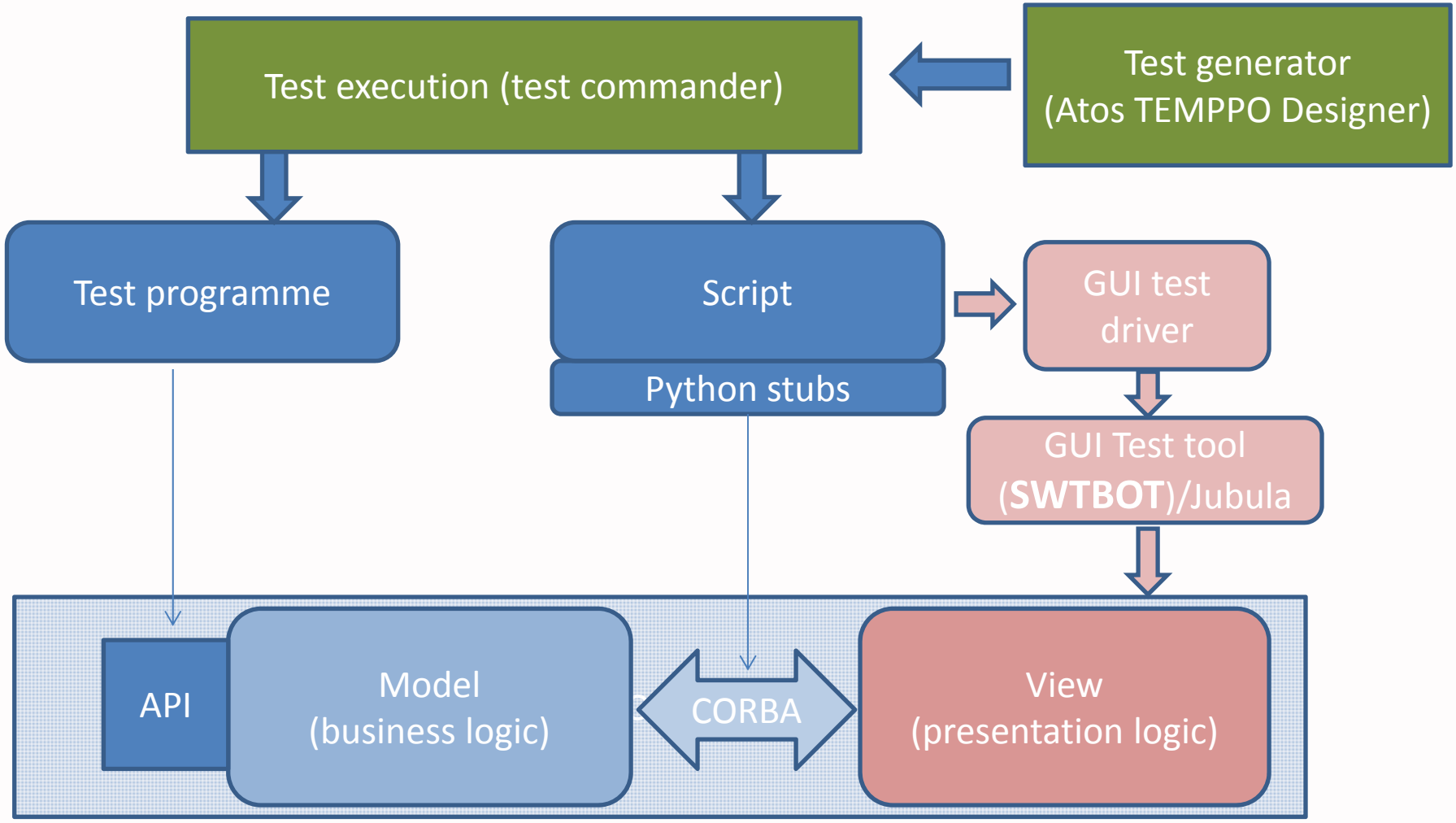
Test automation: Basic tools

Atos TEMPPO Designer (formerly IDATG)

ESA's Test Commander

Sync tool

Test automation: accessing the GUI



Test automation: GUI recorder

severity

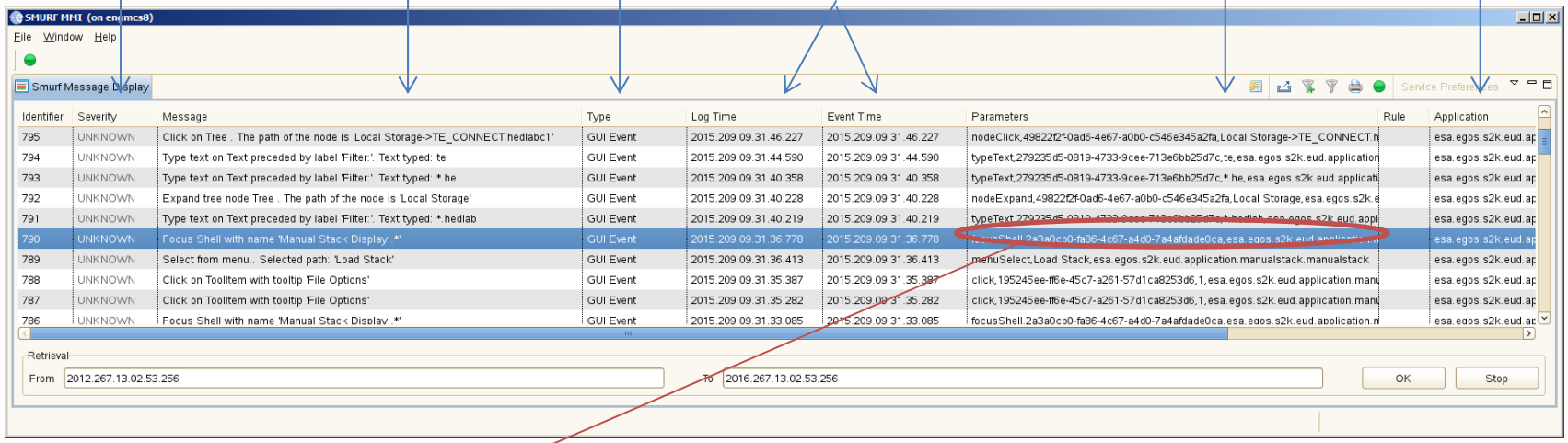
Human readable text

Type of event

time

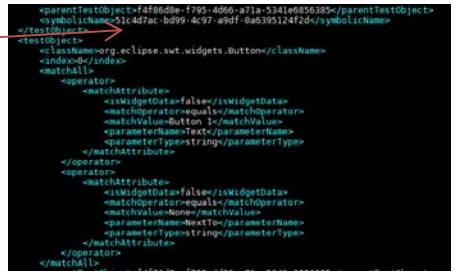
parameters

application

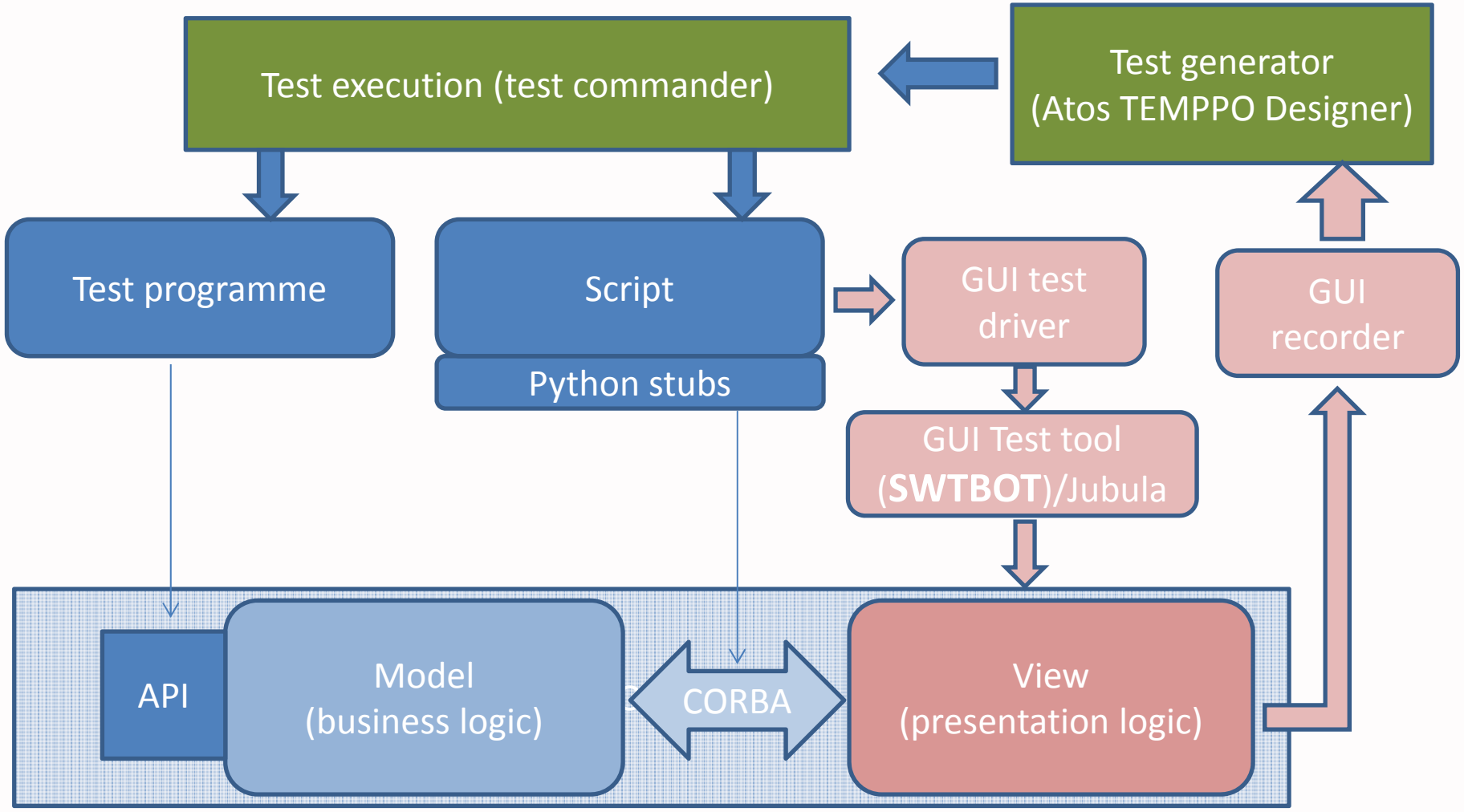


Object map (automatically generated)

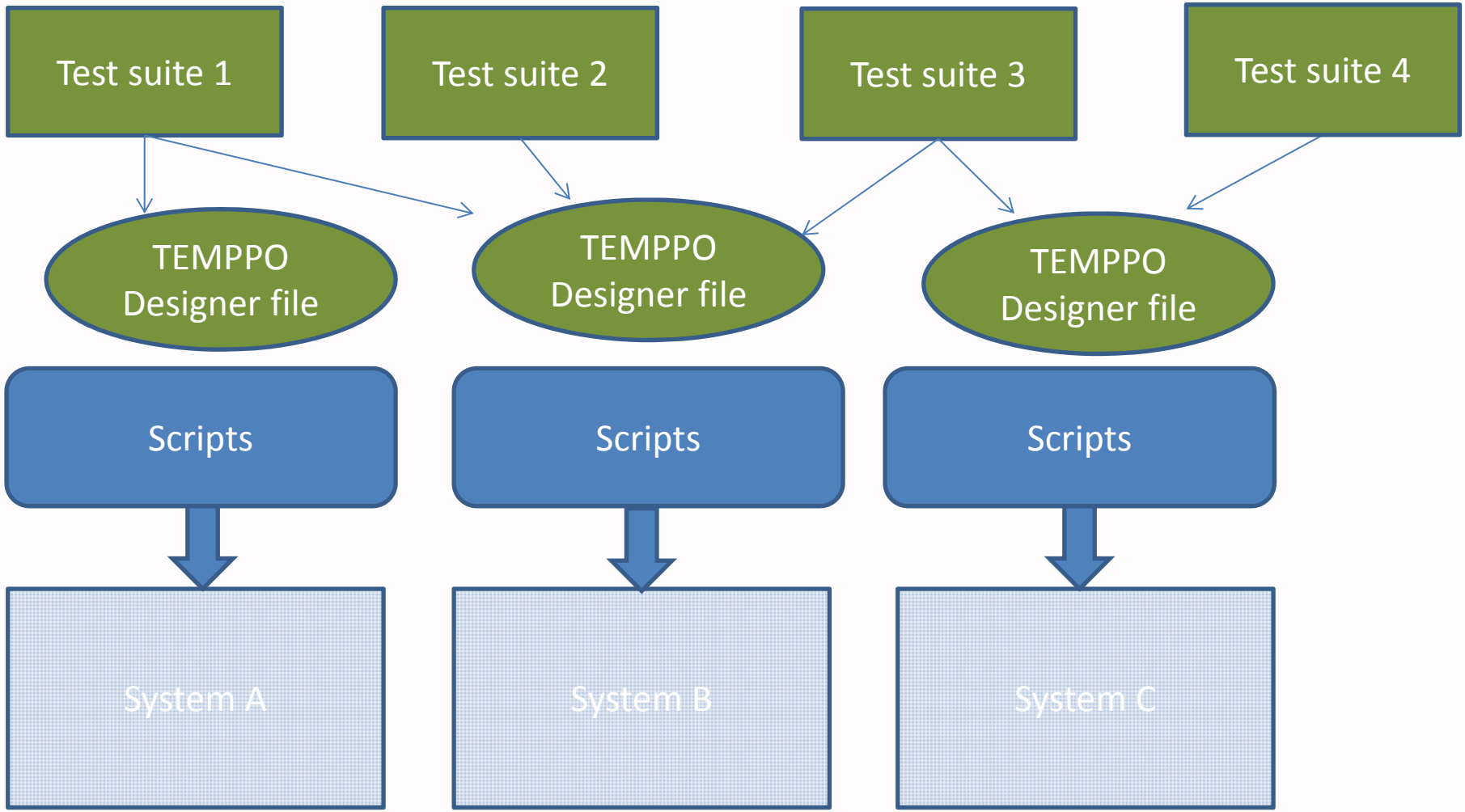
focusShell,2a3a0cb0-fa86-4c67-a4d0-7a4afdade0ca,esa.egos.s2k.eud.application.manualstack.manualstack



Test automation: full cycle



Scalability



CONCLUSIONS

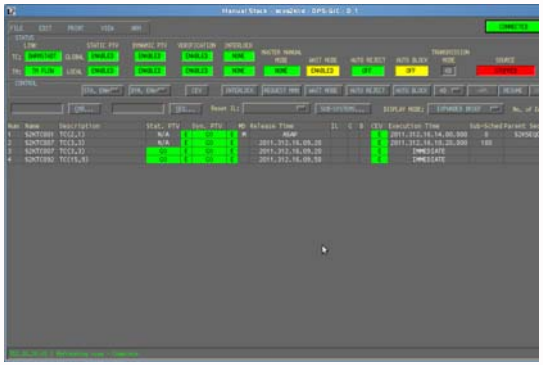
Summary: test automation a posteriori

- Design and plan a strategy
- Use existing tools and languages where possible
- Expand the tools when needed
- Establish collaboration with the vendors
- Enforce integration with existing systems
- Beware of scalability problems
- Listen to the stakeholders
- Start small, but…
- **Think big**

Questions?

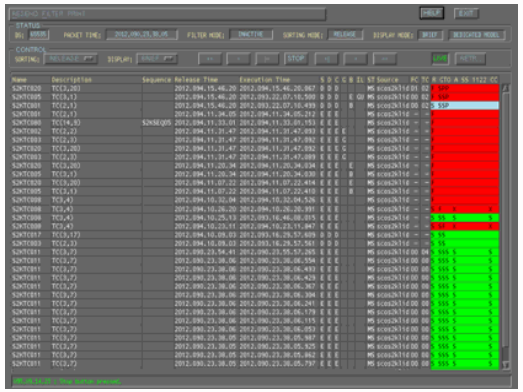
Thanks for your attention!

Testing example: pass operations



Manual stack

Telecommand history display

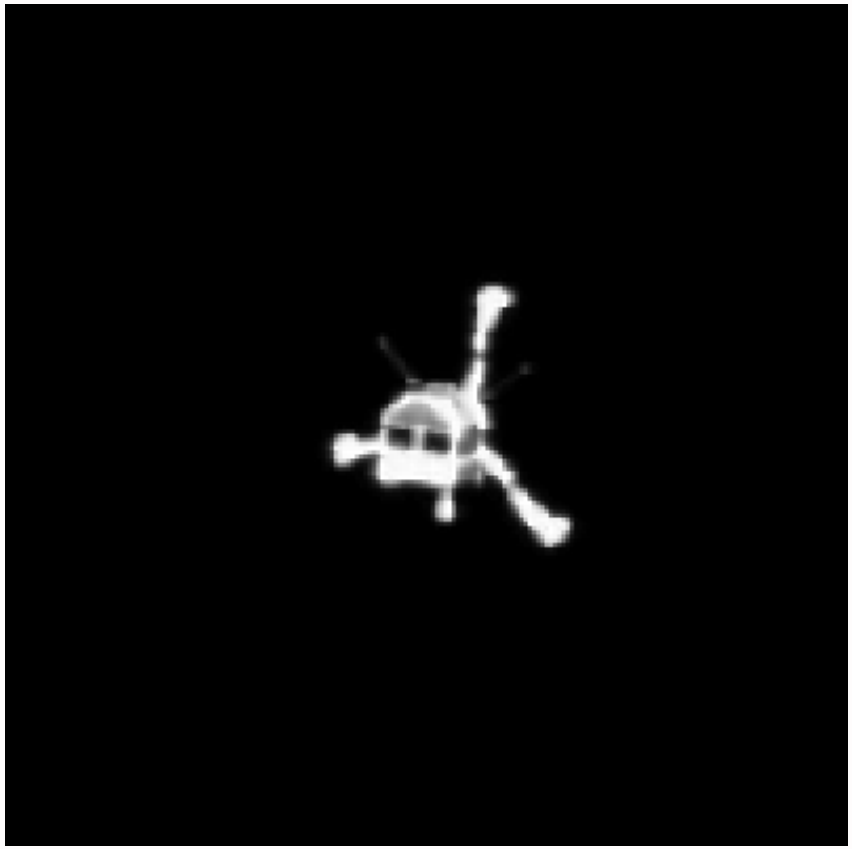


Time-tagged Commands are send in previous pass

Status is received during Current pass

Network interface
Ground station back-end
Frequency conversion equipment
Spacecraft simulator (running on-board software)

Critical manoeuvres example



Philae descent over comet 67P

(ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA)

Image of asteroid Lutetia

(Besse et al (2014); image: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA)

Test automation: integration in SDE