gmv
INNOVATING SOLUTIONS

UNIVERSIDADE LUSÓFONA

Welcome to the Masterclass

A SENIOR SOFTWARE ENGINEER'S JOURNEY TO THE SPACE INDUSTRY

What is cool?

What is trendy?

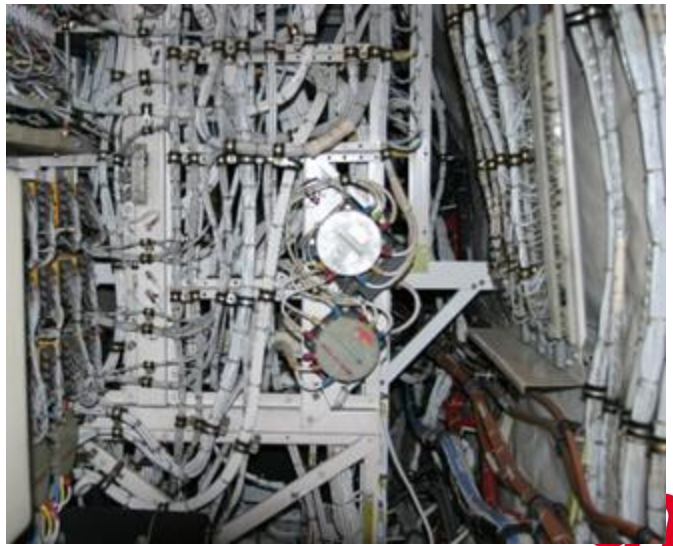
What my colleagues says is better?

Where is the money?

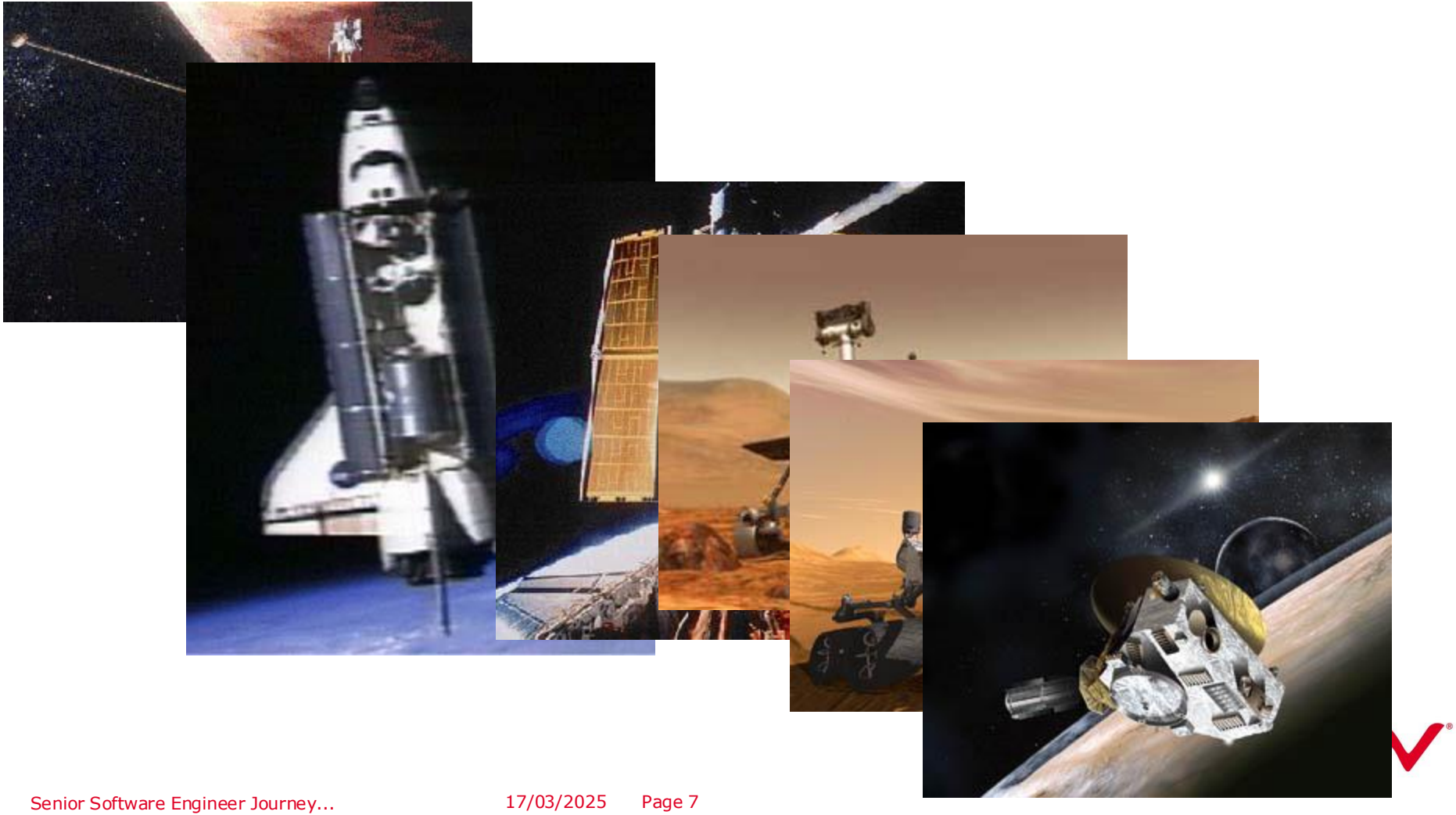

Lay's


BLIZZARD
ENTERTAINMENT


gmv
INNOVATING SOLUTIONS



Increased complexity



RAMS and Criticality

The rocket was on its first voyage after a decade of development costing $7.5 billion.

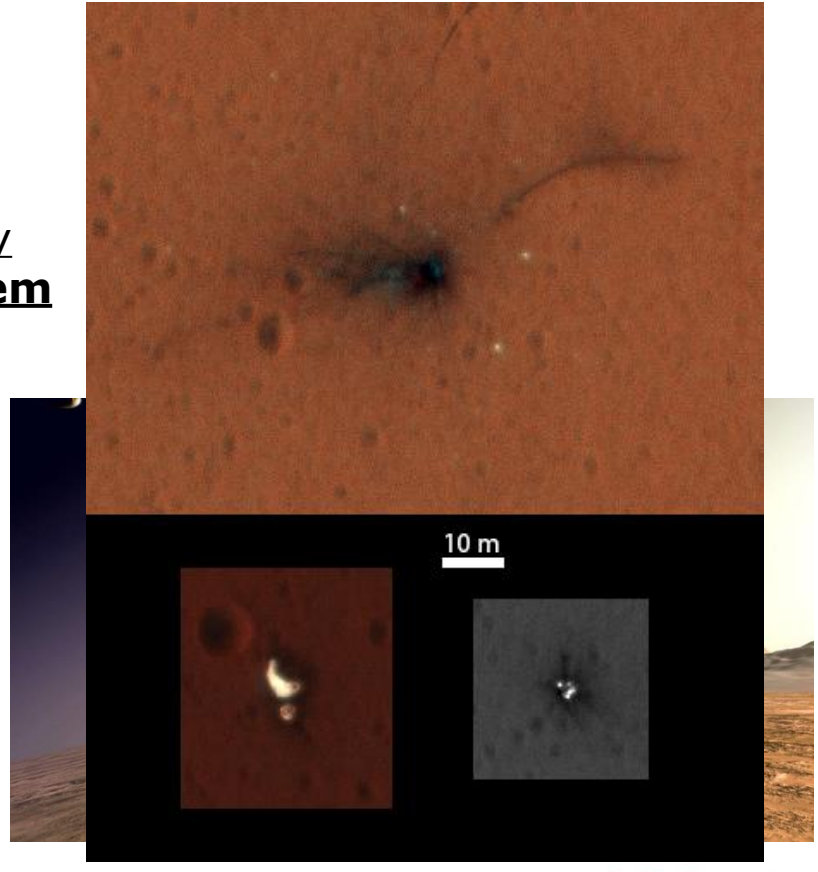
It turned out that the cause of the failure was a software error in the inertial reference system.

Specifically, a **64 bit FP number relating to the h-velocity was converted to a 16 bit** signed integer. The number was larger than 32,767 and thus the conversion failed.

Even today…

The lander deployed its parachute and then began spinning unexpectedly fast.
His **superfast** rotation briefly **saturated** Schiaparelli's spin-measuring **(IMU)**, which "resulted in a large attitude-estimation error by the **guidance, navigation and control-system software**,"

"This resulted in the early release of the parachute and backshell, a brief firing of the thrusters for only 3 seconds instead of 30 seconds, and the activation of the on-ground system as if Schiaparelli had landed."



What are Space Challenges?

– Increase in complexity

– Demand for reliable, available, maintainable and safe software systems (**RAMS**)

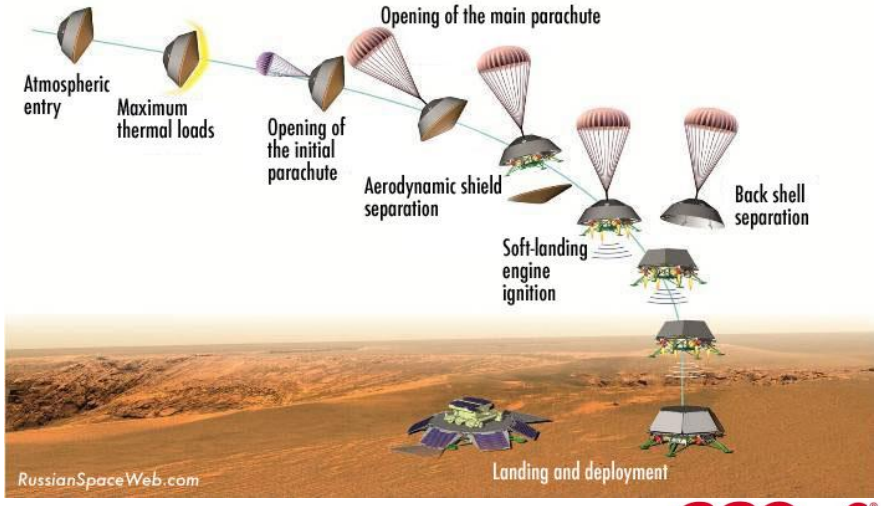
– Push for higher efficiency Rapid evolution in microprocessors

– Modern lifecycle approaches

– Concurrent software engineering

– Prototyping

– Open source



Background

GMV started with small participation in EU funded activities

One activity was the implementation of IMA

IMA solves problem of too many computers onboard.

IMA is software that virtualizes hardware

Boeing 787 with IMA

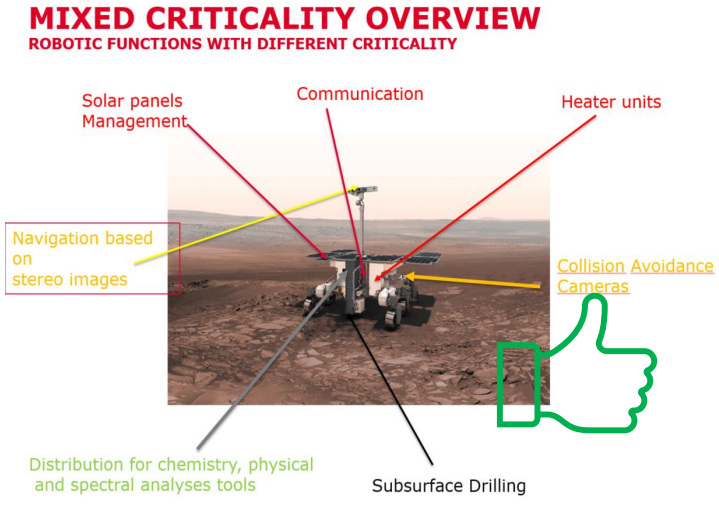
Boeing 747 no IMA

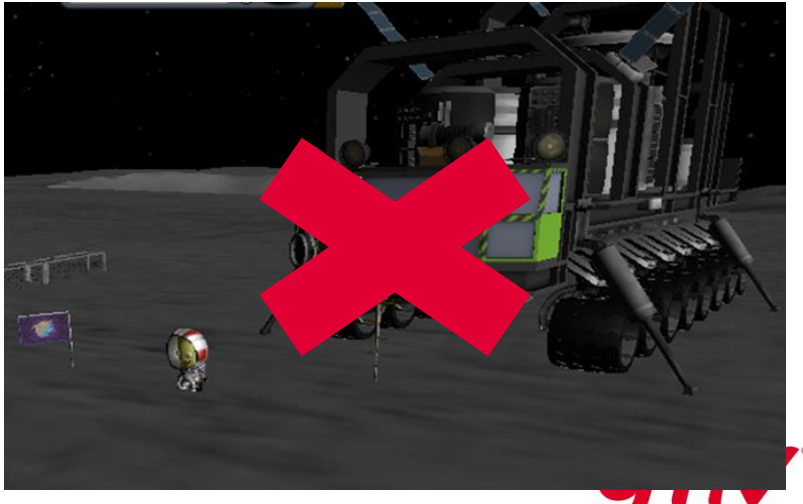
Into Space...

ESA invited to make technology transfer of IMA.

Air

Real-time hypervisor for safety-critical embedded space software



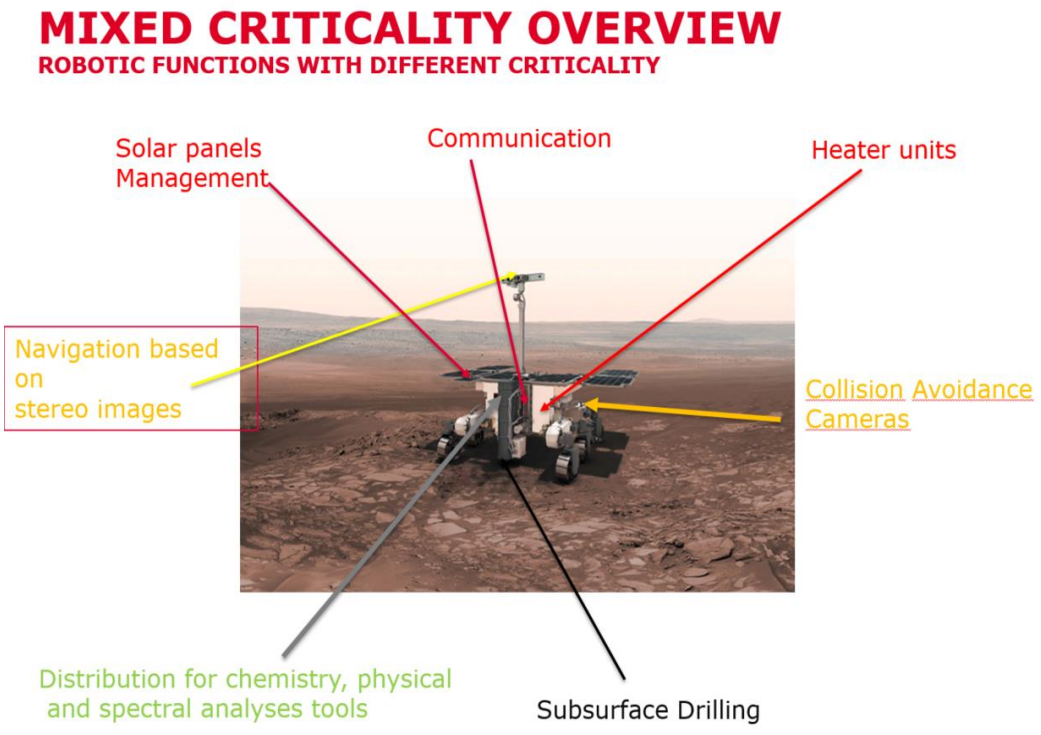


Air

Real-time hypervisor for safety-critical embedded space software

AIR with IMA ensures:

- Mixed criticality
- Less power consumption
- Hardware independence
- Real Time performance
- Open Source
- Scalability



Simulator phase

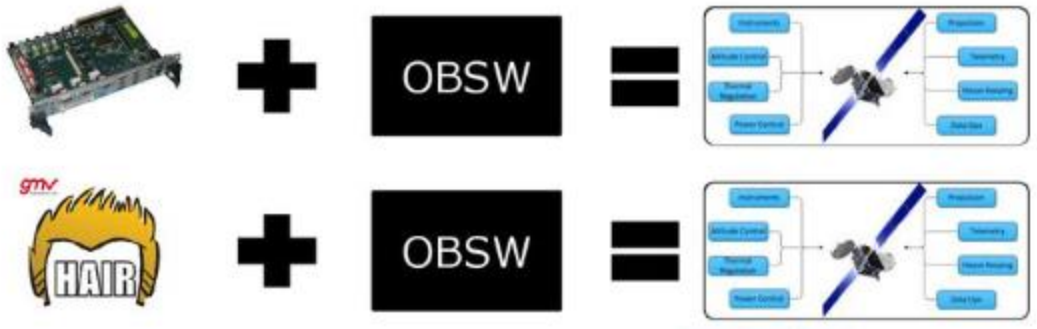
AIR supports major ESA satellite computers

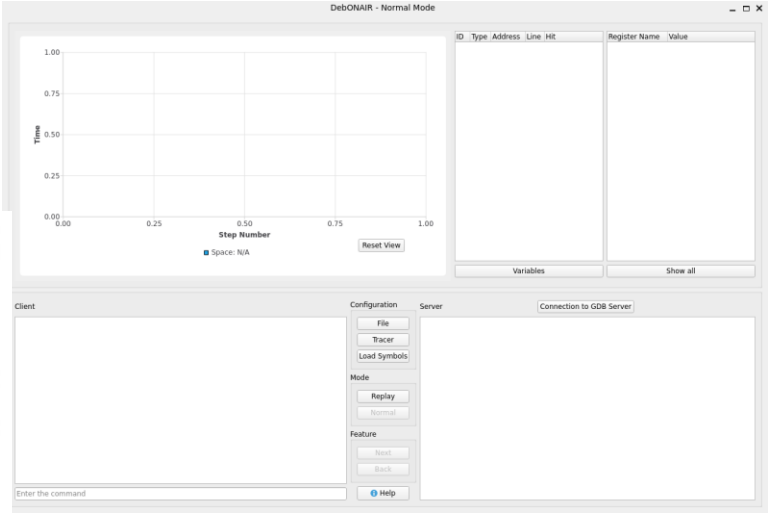
We became expert of those computers

We created computer emulators/debuggers running AIR

First was named **HAIR**

Latest is **DebONAIR**



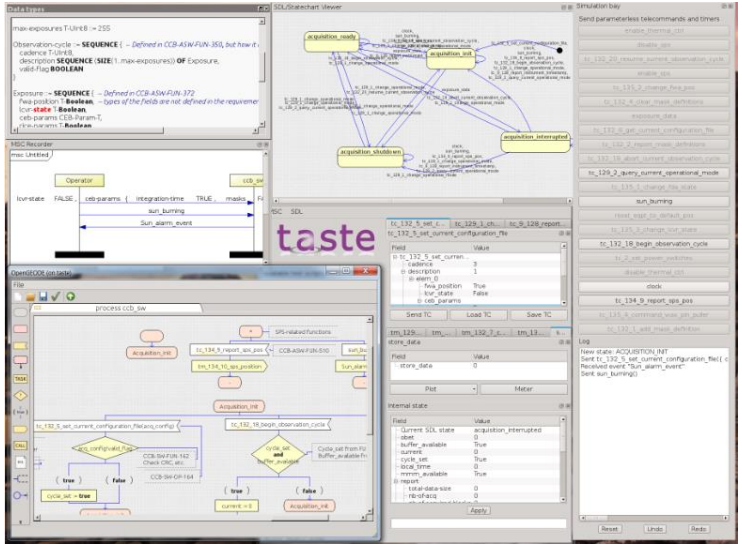


Model Based phase

ESA is pushing Model Based solutions to reduce time of development

AIR and HAIR are suitable for end to end solutions.

From a model it was able to generate software and run in a satellite computer



Space software model

Software running in satellite (HAIR)

Robotic phase (Today!)

Our model based solution with AIR are applicable to Space robotics

ESROCOS was created as a Space Robotic Operating System

EU is funding EROSS-SC and Schumman activities for future missions

Lunar Gateway (Future)

Software simulators of:

- IHAB (Lunar International habitation module)
- ERM (European r
- HLCS (HALO Luna

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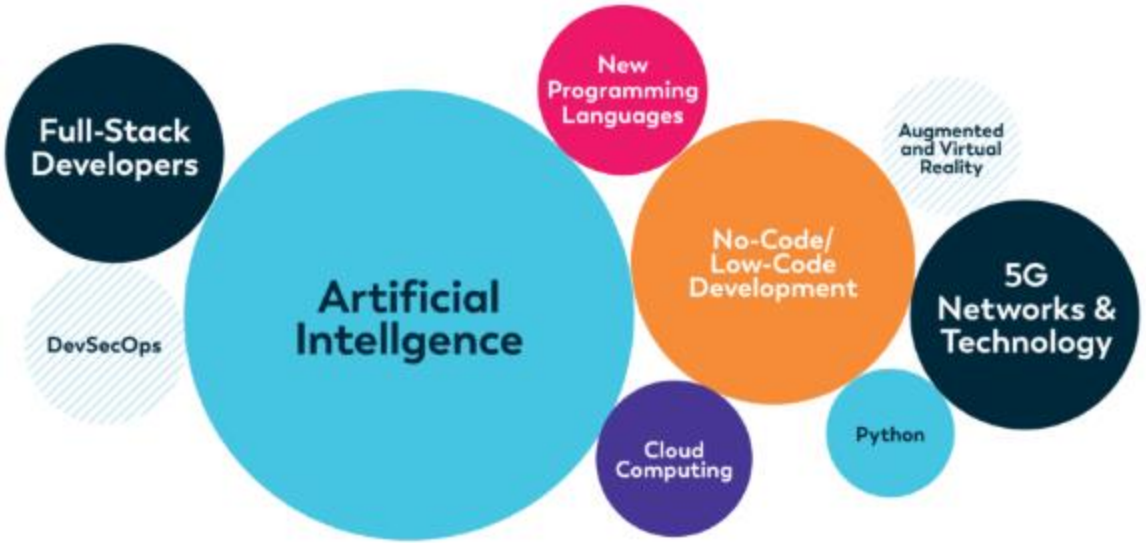


HOW
WE ARE GOING
TO THE MOON
NASA