

Lowering Cost of Science Delivery

Some Astrium Initiatives

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24/1/2007

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Case4Space

- 2006 effort by UKSpace trade organisation to explain the value of space to UK Government
- Highlighted success of space for PPARC and NERC science
 - History of delivering world class space science
 - And now an Earth system science-driven EO programme
- That success is based on making space-enabled science stand alongside all other means of science delivery
 - Ground-based astronomy, fundamental physics, airborne sensing, ship-based & in-situ networks

But are there ways to do things more cheaply?

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We can sometimes benefit from elements of re-use



Mars Express



Venus Express



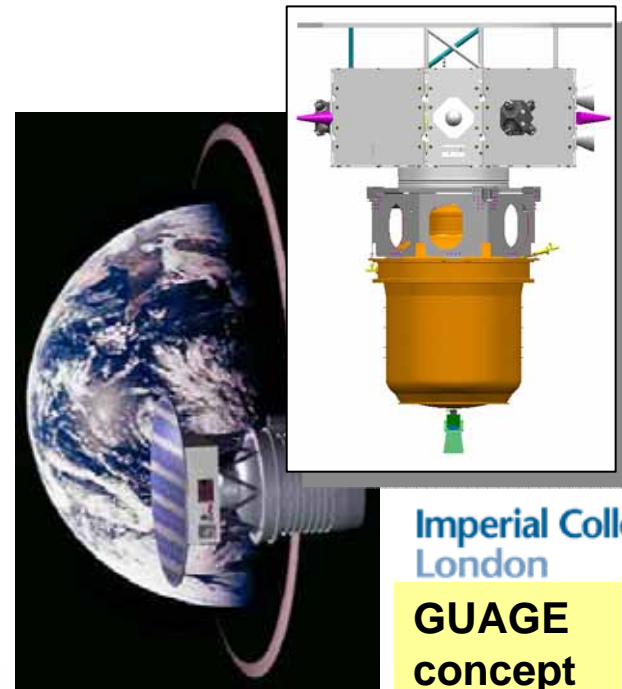
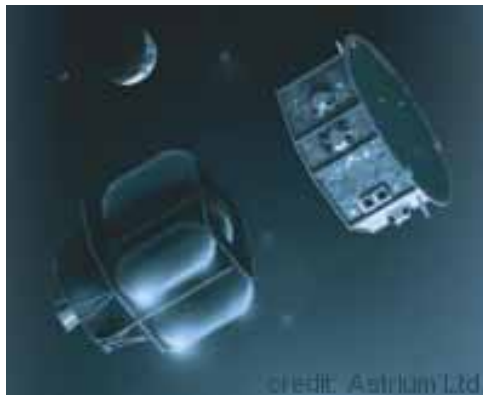
Rosetta

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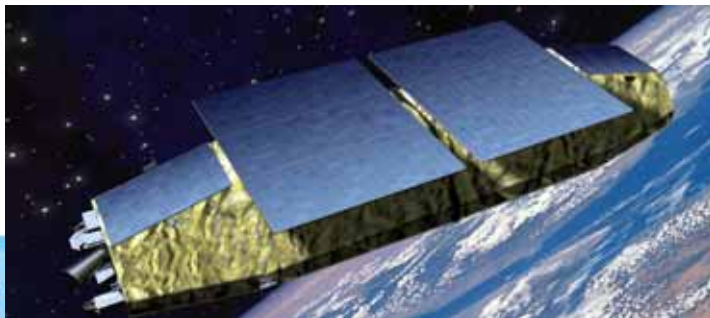
No time...

- ...to talk about potential platform re-use for Cosmic Vision

**LISA Pathfinder
(& Propulsion Module)**



- ...or to talk about proposed UK demonstrator AstroSAR-LITE



**AstroSAR-Lite UK
demonstrator is proposed to
MoD by Astrium & SSTL**



Resource-efficient payload processing

Contact: Ben Greene

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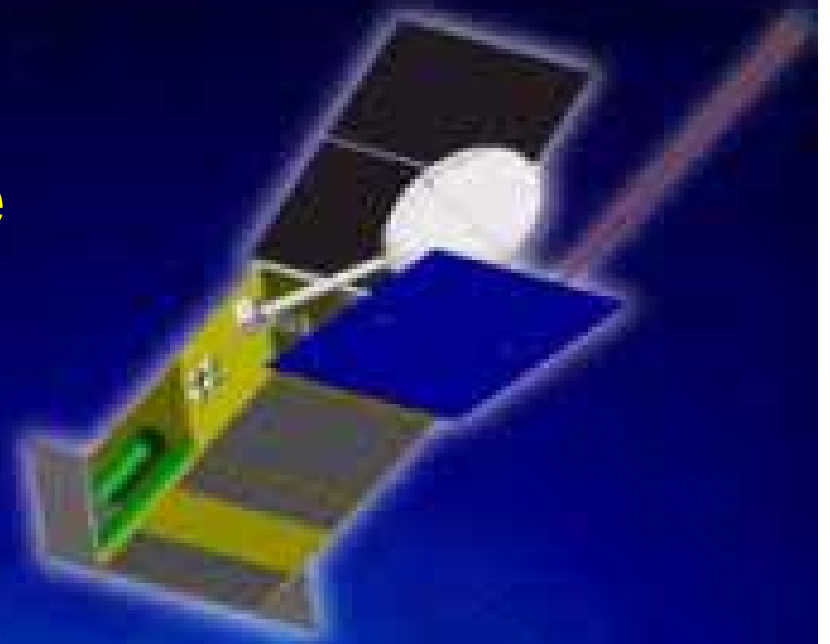
Resource-efficient payload processing architecture (PRISM)

- Reduced satellite resources for a given payload complement
- Enable multiple science teams to share processing resources.
- Provide architecture and development environment for science algorithms.

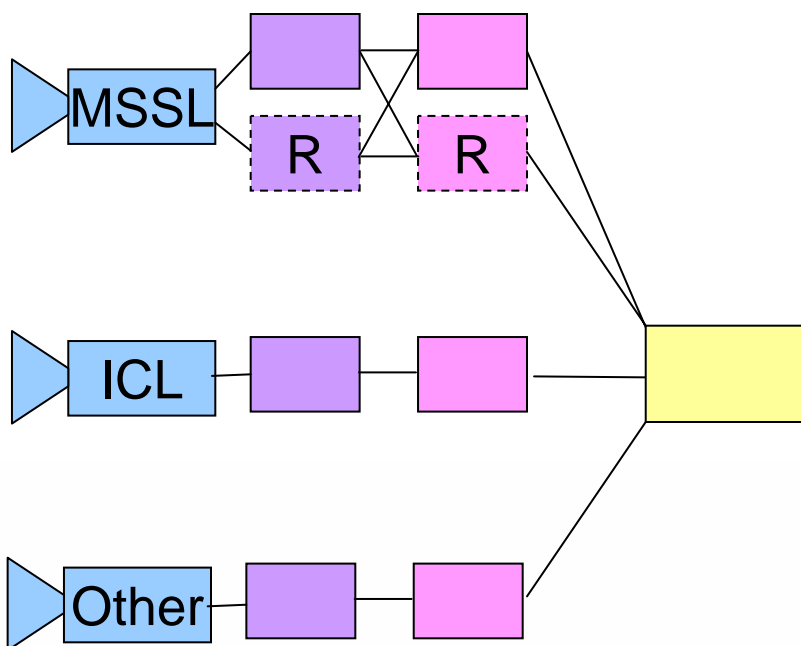
Why do it now?

- New processor capabilities are available.
 - Better performance: 10-200 times faster.
 - Underlying features: memory management.
 - No longer limited to single application per processor.
- UK infrastructure is available.
 - Unionics distributed architecture.
- Create technology in preparation for Cosmic Vision.

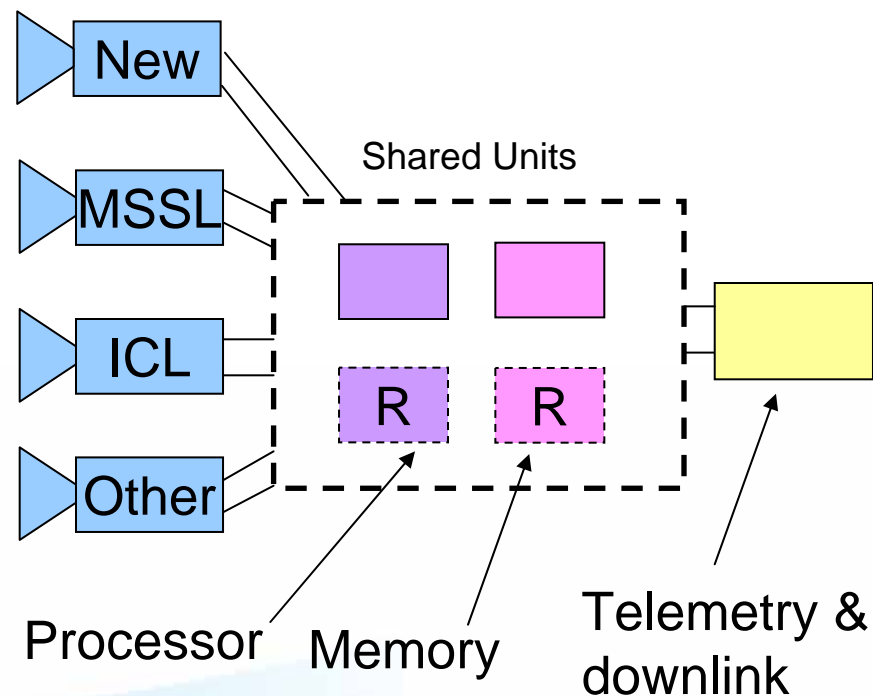
Solar Orbiter as reference



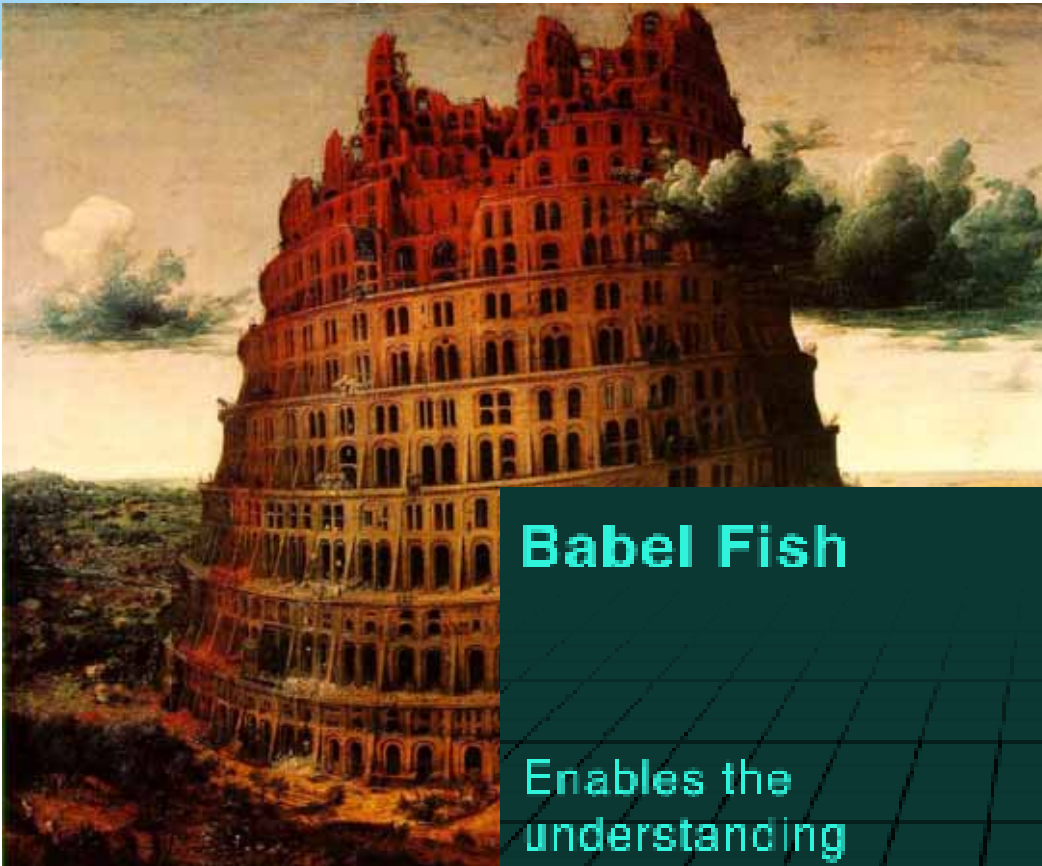
Conventional (complex science payloads)



Resource-efficient



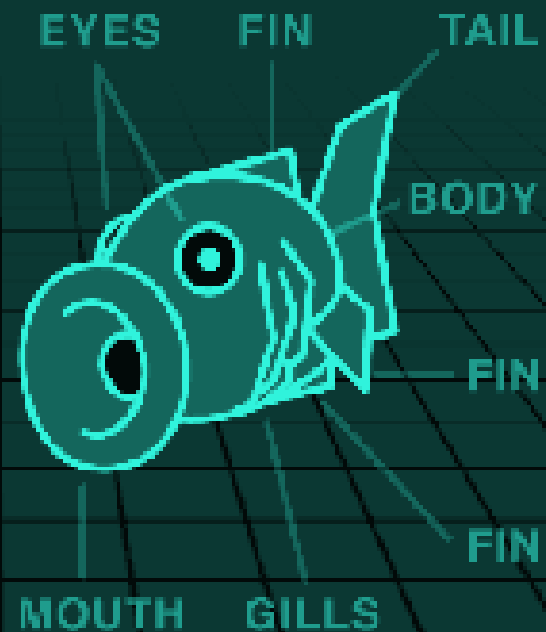
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Babel Fish

Enables the understanding of any language

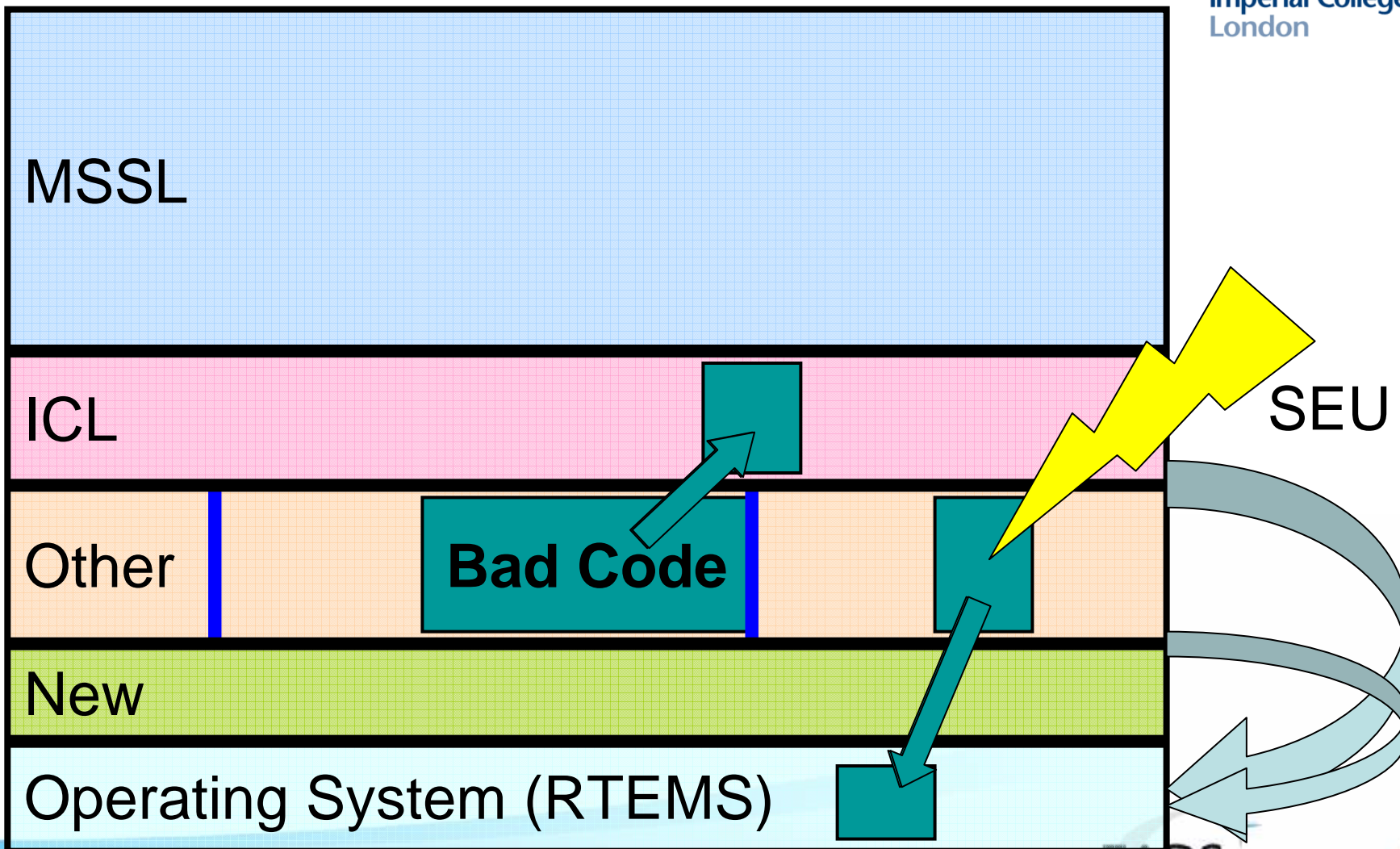
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What is PRISM about?

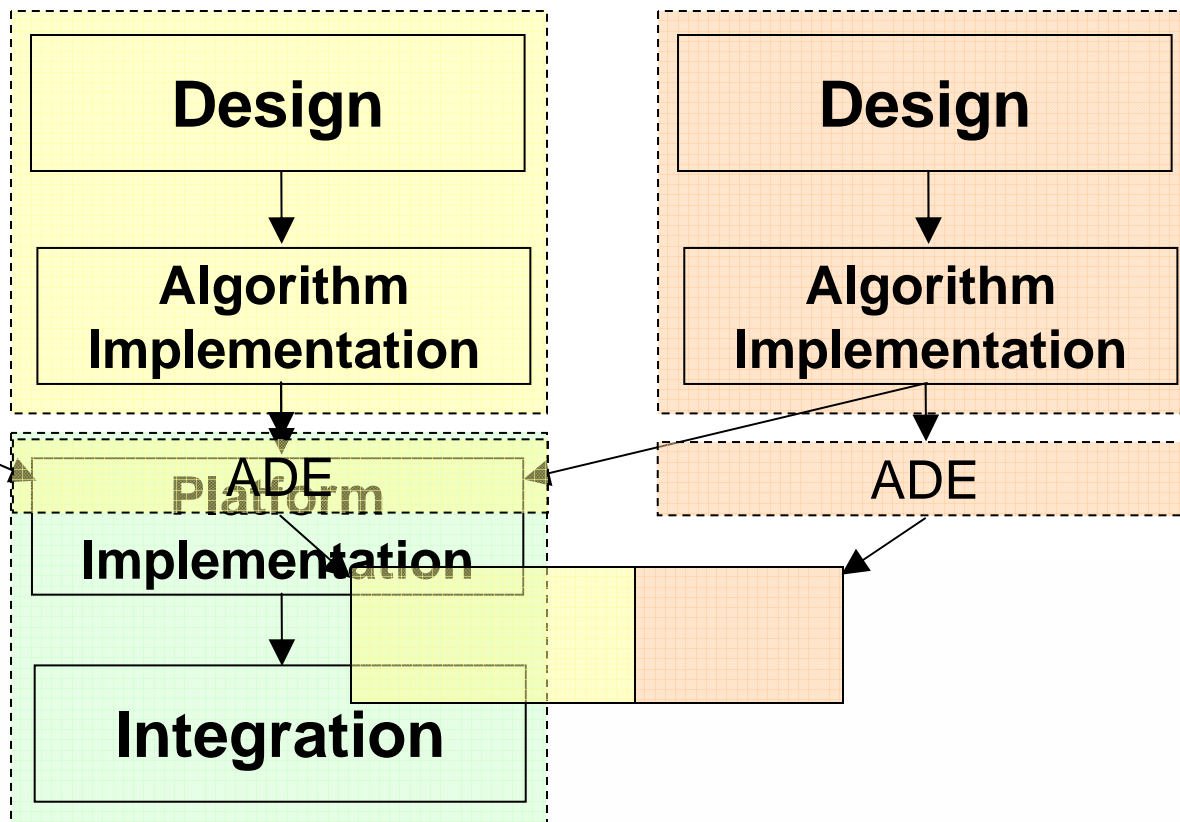
- **Step 1**
Create process segregation infrastructure.
- **Step 2**
Create application development environment.
- **Step 3**
Implement and demonstrate technology.

Step 1: Process Segregation



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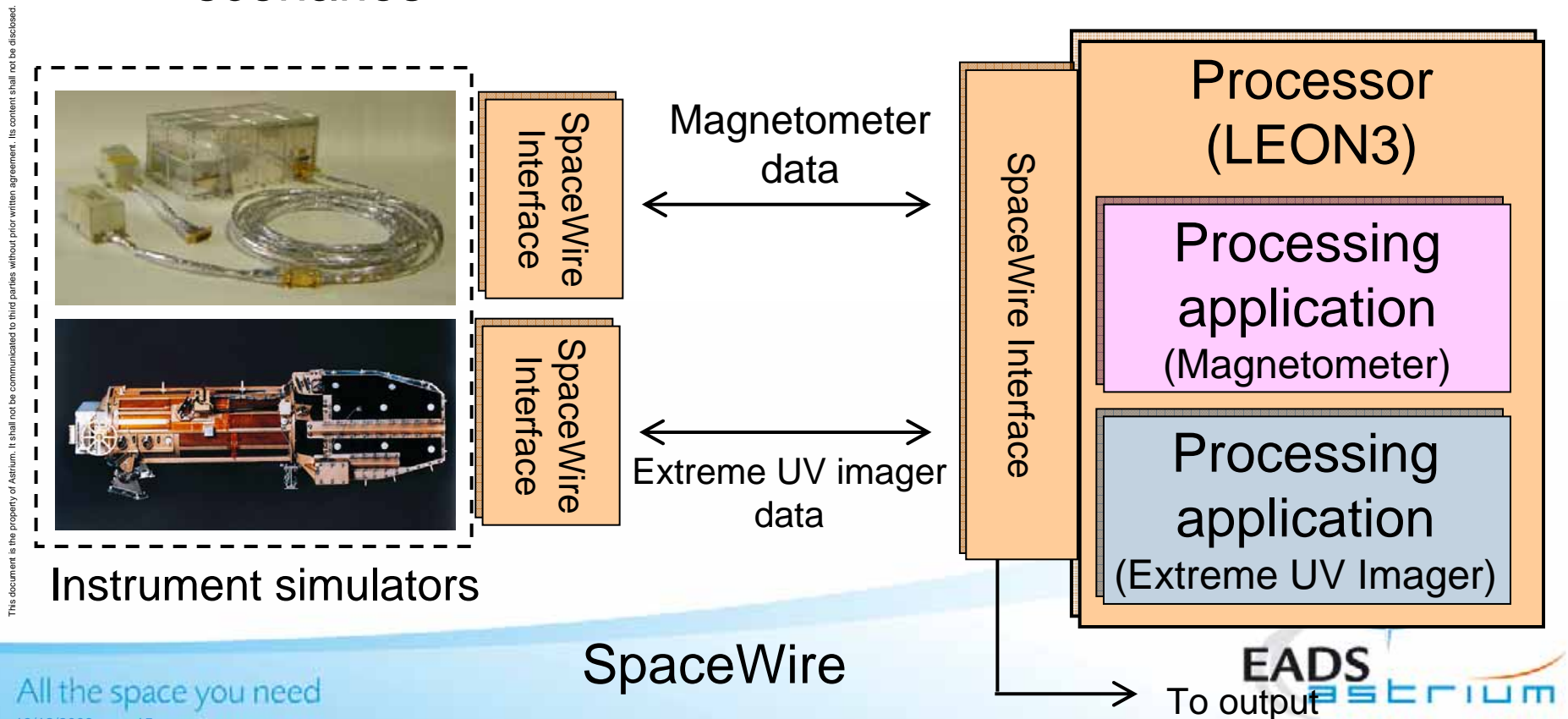
Step 2: Application development environment



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Step 3: Demonstrator

- Novel technology to be adopted for future space missions needs to be demonstrated in realistic scenarios.



Micropack

Rugged miniaturised sensor packs

Contact: Steve Eckersley

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The Micropack Programme Introduction

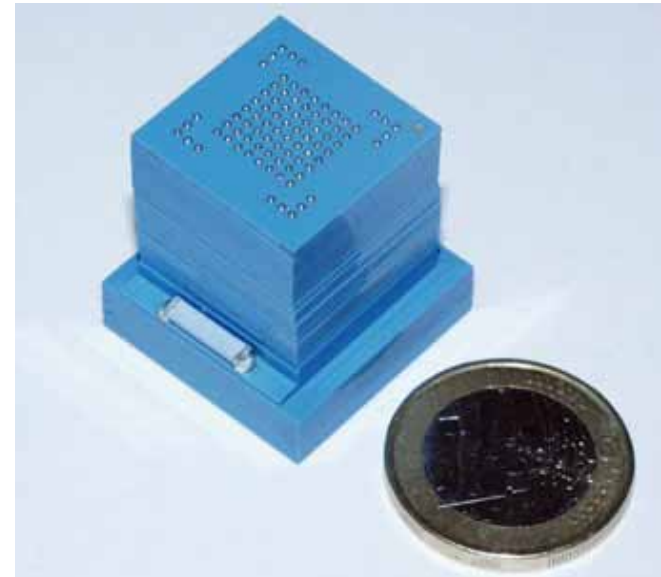
- Global MEMS market forecast to grow at phenomenal rate
 - MEMS can revolutionise the space industry
 - Can enable missions otherwise unfeasible
 - BUT - MEMS need packaging!

- For several years, EADS has been investigating issues of packaging MEMS devices (called 'micropacks')

- Micropacks include suites of COTS MEMS sensors, packaged into a 3D modular multi-layer ceramic package.

2004 miniaturised Micropack specifications

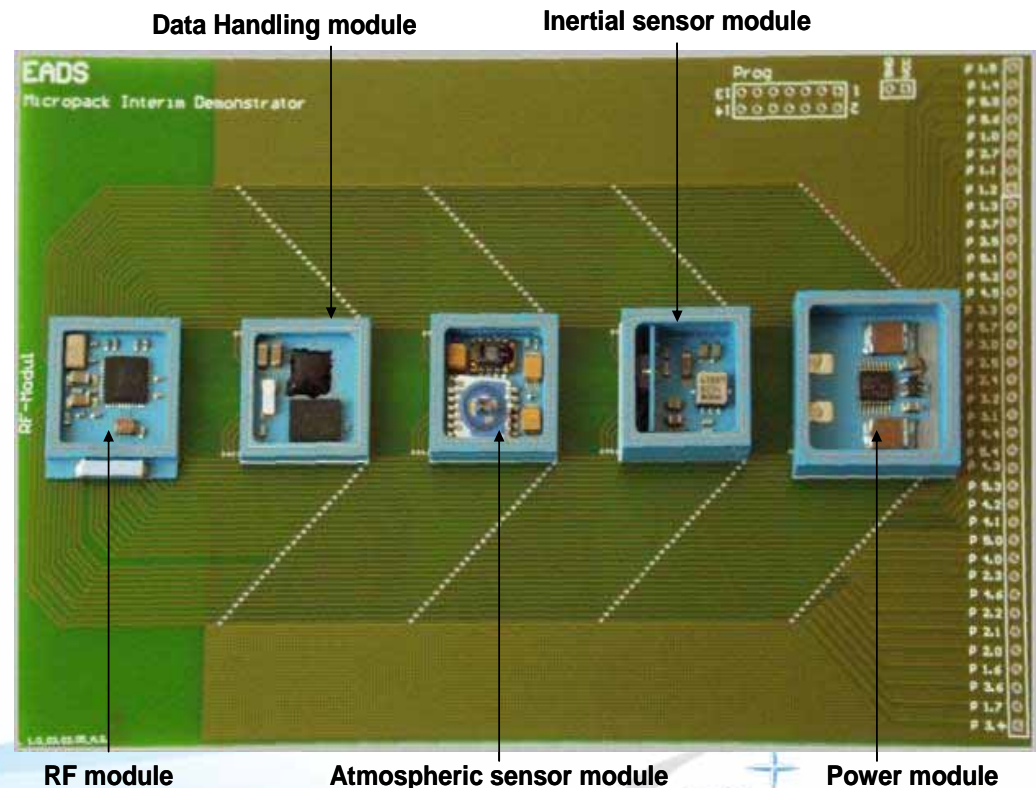
- Volume 20 x 20 x 25mm³,
- Mass is 25g,
- Power 8.5mW average,
- Operating Time 60h,
- Range 100m (more with power amplification)



Sensor-related data:	Range	Resolution
Acceleration Sensor	±2g (3-axis)	2mg
Humidity Sensor	0 - 100%	±0.5%
Pressure Sensor	300 -1100mbar	± 1.5mbar
Temperature Sensor	-40°C to 123.8°C	± 0.04°C

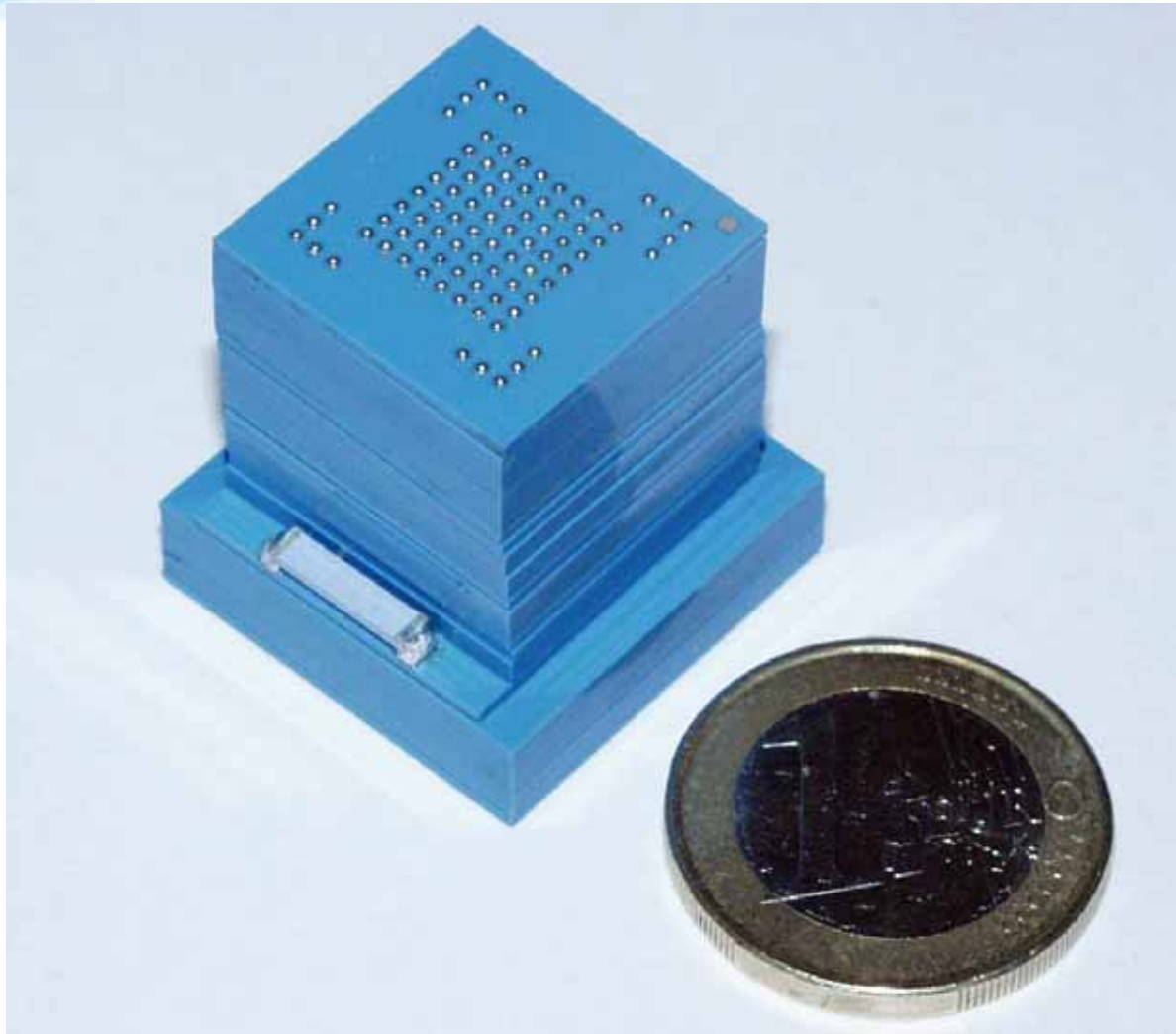
Current status

- At individual module level, micropack has been successfully tested using the Interim demonstrator (right)
- Work now focussed on manufacturing & closing of the modules & the stacking process.
- First prototype scheduled to be fully assembled and tested by early 2007.



Micropack space applications

- Primary or back-up IMU's
 - Asteroid Sample Return
- Sensors scattered over planetary surfaces
 - NASA multi-mission Sensor Webs concept
- Atmospheric sensor packages on rovers, planetary aerobots or sub-100g planetary microprobes
 - ExoMars Rover, Jupiter
- Sensor Packages on Solar Terrestrial Physics or Solar Sailing missions requiring mass critical micro/nanosats
 - Cross-scale or GeoSail
- Highly integrated multi-functional nano & picosatellites
 - Space Weather
 - Futuristic Solar Sailing missions as central hub of spacecraft



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