



Software for Planetary Exploration

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Objectives

- > Recall SciSys software activity in UK-China Workshops
- To outline the role of such software for planetary exploration
- > To provide examples and possible areas for collaboration



SciSys: Who we are...

www.scisys.co.uk

- > Started in 1980
- > Software!!
- > UK & Germany
- > 450 staff
- Various markets (Energy, Environment, Media...)
- > and **SPACE**





SciSys: Recap on China-UK Workshop 2009

- > MoU with China
 - > microsats
 - > instruments
 - > exploration
- > Provided tutorials
 - > "On-Board Software"
 - "On-Board
 Data Handling
 with
 Spacewire"



Chinese Visitors at SciSys



Planetary Exploration: Software Challenges



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Approach: Use software in smarter ways





1: Modelling and Simulation (M&S)



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KEY: M&S is an "End-to-End" Process so treat it as such...





SciSys Example: ESA EAGLE



Entry And Guided Landing Environment Simulator

 Baseline M&S Tool for future ESA Exploration missions

[Designed, developed and maintained by SciSys]

- Mars, Lunar or NEO environments
- A SINGLE Framework various configurations
- Uses international standards allows new functionality to be added





SciSys Example: ESA EAGLE



Entry And Guided Landing Environment Simulator





SciSys Example: ESA EAGLE



Entry And Guided Landing Environment Simulator

- Validated models prepared by experts
- Early concept to hardware-inthe-loop
- > Will then become "operational simulator"
- > ESA keen to work with other Agencies
- **UK:** SciSys, Vorticity, Fluid Gravity, Tessela, Uni of Leicester...







On Board Software- Exploit improving avionics...



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SciSys Example: ESA "X-ROB" Programme

Three Targets

Three Robotic "Missions"







Robot-Robo





SciSys Example: ESA "X-ROB" Programme



SciSys Example: ESA "X-ROB" Programme

ESA Startiger: RAL-Space/SciSys "SEEKER"

Unaided navigation and target selection across a over 2 km test site
 Multiple sensors, platforms, software components



3: Operations

- Planetary Exploration extended ground command and data chain
 - Control Centre, Deep Space
 Networks, remote, multiple years
- Operations for science missions now a significant cost factor
- > New approaches:
- > ESA Lunar Satellite "Smart-1"
 - > "automated operations"
- > ESA Lunar Lander and Mars Rover
 - > "intelligent operations"
- > ESA Deep Space Networks
 - > "interplanetary internet operations"
- > UK: SciSys, Logica...





SciSys Example: Integrated Mission Control for Remote Operations

Mission "Demonstrations"

- Satellite Servicing; ISS Lunar Surface; Mars Orbit Mars Surface
- Technologies; requirements; performance; international standards...





Issues: Not technology but...

- Various "Standards"
- Latency/Connectivity
- Multiple Organisations
- Needs more "examples"...

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And its Not Just Space....





Summary

- It has been said that future planetary exploration missions will be "a million lines of code sitting on a power plug and put into space by a firework"...
- Advanced software certainly becoming an important factor in such missions
 - > early design and modelling onto operations...
 - > enhancing mission performance...
 - > seamlessly interconnecting space/ground systems
- Challenges Ahead!!! resources; verification; robustness; standards
- > **UK** champions these software approaches





Thank You For Your Attention

www.scisys.co.uk



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