RTEMS Application Spotlight

Herschel Space Telescope

RTEMS (http://www.rtems.com) is an Open Source RTOS providing a powerful development and run-time environment that promotes the production of efficient real-time embedded applications.

Features:

- Scalable Architecture
- Modified GPL License
- Multiple APIs - Classic, POSIX
- Event-driven multitasking
- Priority-based, preemptive scheduling
- Responsive Interrupt Management
- Optional Rate Monotonic Scheduling
- Priority Inheritance and Ceiling Protocols
- Intertask communication and synchronization
- Homogeneous and heterogeneous multiprocessor systems
- Reentrant ANSI C Library
- Add-on libraries including Python, Lua, and Tcl
- High performance BSD TCP/IP Stack
- Protocols: TCP, UDP, BOOTP, ARP, ICMP
- Servers: FTPD, HTTPD, TELNETD
- Clients: DHCP, NTP, DNS, TFTP

Processors Supported:

M680x0	ix86	Coldfire	ARM
M683xx	Pentium	MIPS	Blackfin
PowerPC	SuperH	SPARC	H8
NIOS2		SPARC64	

Available Services:

- Training
- Standard Support
- Legacy Support
- RTEMS Application Assistance
- Board Support Package Development
- Application Design and Development
- Ports to New Architectures
- System Architecture Design

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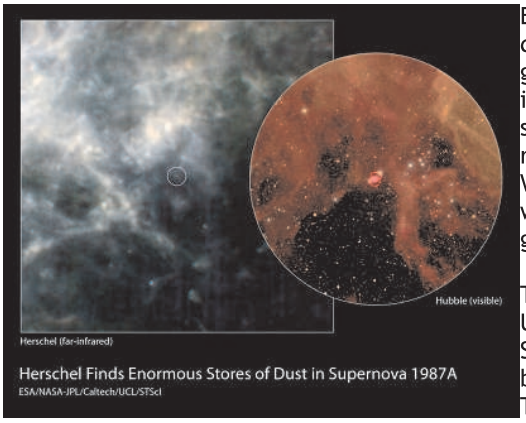
The Herschel Space Telescope is the fourth cornerstone mission in the ESA science program. Launched 14 May 2009, Herschel is the largest space telescope of its kind when launched. Herschel's 3.5-metre diameter mirror will collect long-wavelength infrared radiation from some of the coolest and most distant objects in the Universe. Herschel will be the only space observatory to cover the spectral range from far-infrared to sub-millimeter wavelengths.

Herschel has already contributed to our knowledge of the universe. It discovered the first comet containing water that is similar in isotopic composition to that in Earth's oceans. It has also been used to learn that most of the stars ever formed in the history of the Universe have done so quietly not with stars merging generating star bursts.

Also, infrared instruments need to be cooled down to temperatures very close to absolute zero (-273.15°C), otherwise their own infrared emission would spoil the observations. Opaque objects, those surrounded by clouds of dust, are another speciality for infrared telescopes: the longer infrared wavelengths can penetrate the dust, allowing us to see deeper into such clouds.

However, Earth's atmosphere acts as an 'umbrella' for most infrared wavelengths, preventing them from reaching the ground. A space telescope is needed to detect this kind of radiation invisible to the human eye and to optical telescopes. Astronomers have long dreamed of a telescope able to collect light from very distant galaxies and observe objects completely enshrouded by dust, as forming stars and galaxies are certainly dusty.



ESA's Herschel mission has been designed specifically to achieve these goals. With its ability to detect far-infrared light, it will let astronomers see, for the first time, dusty and cold regions that have been hidden so far. With its 3.5-metre mirror, Herschel will mark the beginning of a new generation of 'space giants'.

The Herschel Spacecraft Management Unit (SMU) was built by Saab Ericsson Space. The SMU's Processor Module is built around a SPARC V7 processor, the TSC695F, and custom I/O ASIC.

References:

- Herschel Home Page
  - http://sci.esa.int/science-e/www/area/index.cfm?fareaid=16
- Saab Ericsson SMU Home Page
  - http://public.ccsds.org/sites/databases/Lists/CCSDSProducts/Attachments/30/Spacecraft_Management_Unit_Saab.pdf
- RTEMS Herschel Wiki Page
  - http://www.rtems.com/wiki/index.php/Herschel
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