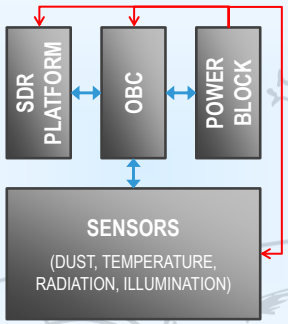
SWIPE objectives

A) Understand the complexities and needs inherent to a planetary exploration mission.

B) Develop efficient hybrid satellite-MANET routing algorithms for a planetary WSN scenario.

C) Perform multi-sensor data processing and fusion.

D) Develop the sensor node.



High-level SWIPE node diagram.

E) Perform extensive tests in high-fidelity environments.

SWIPE Consortium

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SWIPE

Space WIreless sensor networks for Planetary Exploration

Seventh Framework Programme

THEME: SPA.2012.3.1-01
Bringing terrestrial SME research into the space domain

Grant agreement no.: 312826

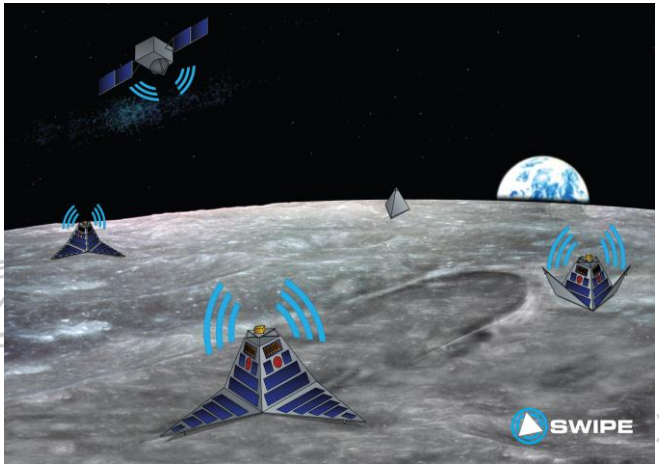
SWIPE

In order to prepare for manned missions to other planets, it is necessary to monitor permanently the surface environment and have a clear notion of its conditions.

SWIPE intends to bring hybrid satellite-*ad hoc* networks to space.

In planetary exploration missions, satellite networks are the only solution to provide remote connectivity. Current expectations dictate that satellites will be seen not only as a component of an alternative routing path but also as part of a unique (really integrated) system.

Wireless Sensor Networks (WSNs) are made of spatially distributed autonomous sensors, which cooperate to monitor a certain physical or environmental condition and pass their data through a network to a central processing location. These *ad hoc* networks, motivated by military applications, are used in industry for process and machine health monitoring and appear to be a promising tool in several areas like catastrophe evaluation, fire monitoring, environmental experiments and in other distributed sensing applications.

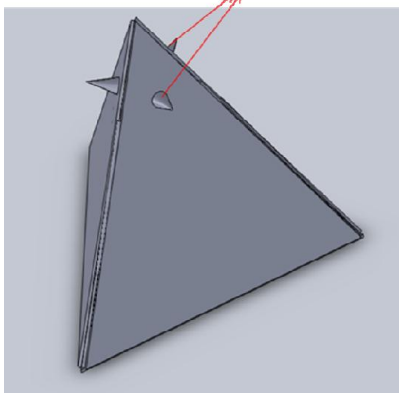


Hybrid WSN-satellite network and SWIPE concepts.

Hundreds or thousands of small wireless sensors could be dropped from a satellite orbiting the planet onto the surface to assure a uniform and sufficient coverage. These autonomous sensors would then create their own *ad hoc* network while some of them, equipped with satellite communication capabilities, would establish a link between the WSN and the satellite. Data gathered from the sensors would be processed and sent to the satellite and later to Earth.

SWIPE will define this mission scenario in detail, as well as mission and system requirements, and will also perform system level design of the three different

Surface temperature probes



Micro-meteorological station (folded).

communication segments involved: within the sensor network, between the sensor network and the relay satellite and between the satellite and Earth.

SWIPE's main goal is to design and develop three node prototypes, focused on two main areas, communications and the sensor itself, together with simple power and control units. Three prototypes are needed to validate the *ad hoc* networking concept. The whole system will finally be integrated and evaluated in laboratory and also in one field test on an Earth-analogue (e.g., Rio Tinto basin in Spain), which will be chosen according to the mission scenario. There will also be extensive research in novel multi-sensor data processing and data fusion techniques.