# Semantic Medical Devices Space

- A Middleware Framework for developing Plug-n-Play Ambient Intelligent Medical Devices and Sensors, with the capabilities of Context Awareness, Logical Reasoning, and Semantic Interoperability.

- A solution based on Semantic Web Services technology to provide a platform for a variety of intelligent applications for different healthcare scenarios.
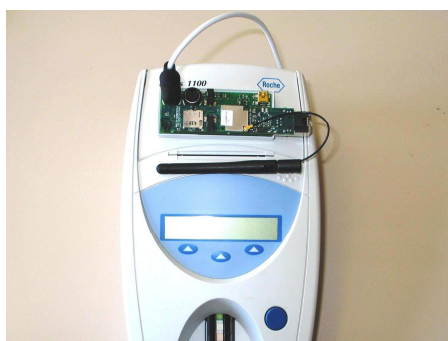
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In the present electronic healthcare era, the most widely used communication standards for the transmission of medical data from medical devices to Hospital Information Systems (HISs) or Laboratory Information Systems (LISs) include HL7, ASTM, DICOM and CEN/ISO/IEEE 11073, depending on the nature of the device. On the contrary, many medical devices use proprietary/vendor specific protocols to communicate with the HISs/LISs developed by the same vendor, which reduces the chances of interoperability of such medical devices with the HISs/LISs developed by some other manufacturer. Furthermore, the ad-hoc networking of medical devices with HISs/LISs or with other medical devices is not yet realized. **Semantic Medical Devices Space (SMDS)** is a solution to such limitations and alleviates the hurdles in achieving ad-hoc networking/communication of medical devices with HISs/LISs as well as with other medical devices in a plug-and-play fashion.

Philosophy of SMDS

Before two autonomous medical devices can interact with one another or with HIS/LIS, they need to know what interfaces each of them supports and what protocols or commands they understand. In an ambient intelligent environment, this cannot be known in advance. New medical devices may enter the environment at any time, and they need to interact with the existing medical devices and the HISs/LISs. The interaction must be based on common, well-defined terms and concepts in order to achieve true interoperability.

In order to cope with these challenges, we have developed an architecture called Semantic Medical Devices Space (SMDS) which alleviates the hurdles in achieving ad-hoc networking/communication of medical devices with HISs/LISs as well as with other medical devices in a plug-and-play

fashion. In addition, our framework supports the medical devices to deliver semantically enriched context-aware services for the interoperability. SMDS is a pervasive computing infrastructure that exploits Semantic Web and Web Services technologies to enrich the medical devices with ambient-intelligence and semantic-interoperability capabilities. The semantic descriptions of Web Services provided by the medical devices will enable them to discover, select, compose and invoke the services available locally in a hospital, laboratory and clinic or in a patient's home to accomplish the desired composite task.

Applications of SMDS

► **Hospital environments:**
SMDS can be used to realize the vision of smart hospitals/clinics. The real-time monitoring values of a patient are directly accessible to the authorized personnel everywhere, anytime on their PDAs in order to take timely decisions. Asset tracking, management and autonomous device-to-device communication can be implemented with the SMDS

► **Laboratories**
SMDS can be used to realize the vision of smart laboratories, which means that the laboratory automation solutions can be better improved in a decentralized fashion.

► **Telemedicine and Tele-homecare**

SMDS can be used for Tele-medicine and Tele-homecare purposes and can be scaled to provide ambient-assisted living to the elderly people (i.e. medication reminders, cognitive assistance, etc.), which means that such pervasive healthcare services are provided anywhere and anytime, whether the patient is staying at home or travelling.