SEVENTH FRAMEWORK PROGRAMME
eHealth

GRANT AGREEMENT Nº: 287720/ARMOR

Advanced multi-paRametric Monitoring and analysis for diagnosis and Optimal management of epilepsy and Related brain disorders

Newsletter nº: 2 **October 2013**

ARMOR project

ARMOR combines clinical and basic neuroscience research with advanced data analysis and medical management tools for developing novel applications for the management of epilepsy.

ARMOR aims to offer ambulatory, diagnostic and long-term monitoring services achieving in-hospital quality standards, and addressing conventional "routine" clinic-based service purposes, at reduced cost in increased geographical availability, and with enhanced capability through multi-parametric data collection.

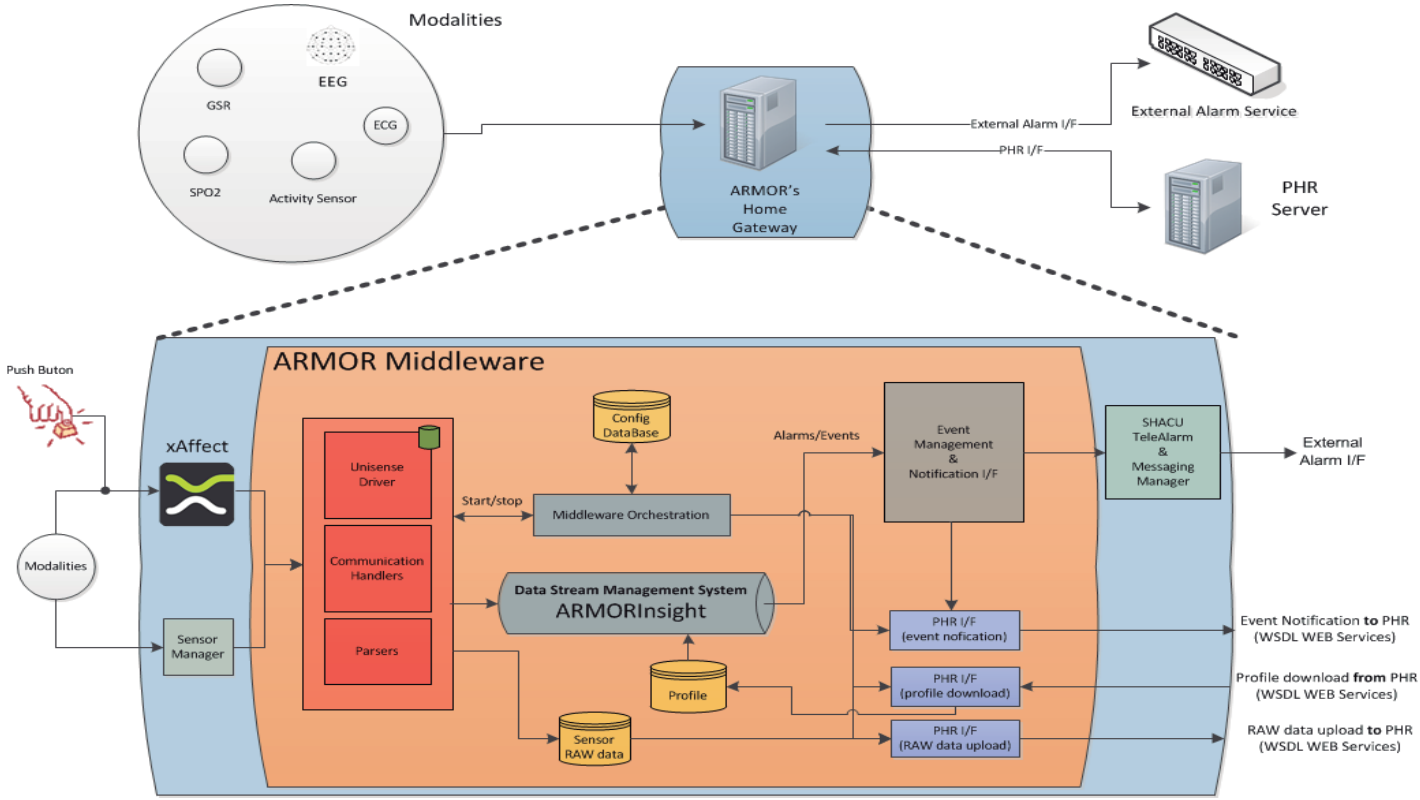
In ARMOR monitoring is expected to be flexible and optimized for each patient. It will be tested in several case studies and evaluated as a widely used ambulatory monitoring tool for seizures efficient diagnosis and management including possibilities for detecting premonitory signs and feedback to the patient.

ARMOR overview

Depending on the type of epilepsy, different brain and body parameters need to be assessed in order to have a better understanding of the patient's state of health and to adapt the medical treatment accordingly.

Therefore our goal is to develop a personalized system that assists in diagnosis, prognosis and treatment of the disease. Such system should fulfill the following criteria; it should be non-invasive, mobile, continuous and unobtrusive, whereas all possible security and privacy aspects should be taken into account.

The following picture shows an overview of the system and its components.



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ARMOR achievements and novelities

Several milestones towards the implementation of the final system have been achieved by the end of the second year.

Sensors

ARMOR sensor-related novelties compromise:

- Use of user-friendly and non-intrusive sensors for long-term monitoring and analysis of epilepsy-relevant data;
- Reduction of the number of sensors without losing critical information. Exploring relations between different medical measurements, which are processed and presented in a homogeneous way;
- Security of private or sensitive data. The ARMOR platform offers strong encryption not affecting the system's performance;
- Integration of ARMOR sensors with a hardware encryption module based on serial communication interface, which is independent on particular communication technology.

Middleware

The ARMOR middleware provides the necessary infrastructure to acquire & store locally and upload to a remote server (the PHR Server) sensor data. Important ICT middleware innovations include:

- Compression techniques which enable more information to be acquired and thus assist to better analysis while mitigating resource expenditure;
- Easy and fast transmission of data;
- Modular and easy to extend solution.

ARMOR data can provide real time alerts for critical situations, and be utilised to provide a data record.

Currently, the middleware is integrated with the rest of the available ARMOR platform components to provide a working prototype.

Services

The basic ARMOR services provide:

- Access to, management and processing of medical data;
- Real time alerts for critical situations by communicating necessary information to doctors and caregivers;
- Central storage of collected data;
- Storage and management of personal physiological measurements, treatments, prescriptions, etc., and group-based data management, into a Personal Health Record (PHR);
- Online and Offline analysis of collected data;
- Computer Assisted Diagnosis;

Towards the completion of the PHR, the following actions were made:

- PHR server has been set-up for ARMOR and is ready for validation testing with end users;
- Validation tests of WEB service interfaces for EEG data upload/download both automatic and manual between PHR and middleware;
- WEB service interfaces for accepting alerts by PHR from middleware have been deployed.

Data processing algorithms

Within ARMOR innovative algorithms are being developed to perform entire analysis of sensor data stored in the ARMOR platform. These are based on powerful machine learning algorithms, able to:

- detect critical events;
- identify seizures;
- identify information hidden in the medical signals

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Past events

ARMOR project was presented at **ERASMUS IRIS International Summer School**: Cellular Technologies & Services. IRIS took place at the premises of Technological Educational Institute of Western Greece, Computer and Informatics Engineering Department at Antirion, Greece, from 8th to 19th of July 2013. The technology being developed by ARMOR presented at a special session devoted to Medical Cyber Physical Systems. The students were able to experiment with real demonstrators and applying the ARMOR technology in practice. More details are available at http://iris.tesyd.teimes.gr.

IRIS Erasmus Intensive Programme

AAI Scientific Cultural Service Ltd (AAISCS) attended the annual "**Night of Researchers**" called "Science Rocks" this year held in Limassol, Cyprus on 27 September 2013. The event was organized by Cyprus Research Promotion Foundation (IPE). The AAISCS team presented their latest research, gave live-demos for ongoing projects, including ARMOR. Amongst the visitors were Mr. Vasilios Tsakalos (head of IPE) and Mr. Sandro Ricci from the Research Executive Agency of the European Commission.

Prof. Andreas Ioannides from AAISCS presented ARMOR project at the **First European MEG Society (EMEGS)** Teaching Course (Chiemsee, Germany on 11 September 2013) and at the **MICHELANGELO** Concertation Meeting (25th September 2013 in Brussels). The objective was to promote networking among projects in similar thematic area and to optimize the impact and dissemination of their outcomes.

Future events

ARMOR project has been selected for an exhibition stand at **ICT2013** in Vilnius on 6-8 November 2013. The ARMOR members in the stand will put to themselves different sensors (EEG, Activity, ECG, etc.). The ARMOR platform will acquire the information from the sensors, pre-process, encrypt and monitor the parameters in real-time. All the data captured will be sent to a database where ARMOR users will be able to consult real-time the values captured by sensors, as well as, anomalous situations. The demo will be performed also with the participation of visitors that agree to put the sensors. More than 4000 researchers, innovators, entrepreneurs, industry representatives, young people and politicians are expected in Vilnius.

Additionally AMROR will be presented on 5 November 2013 in Brussels in a **Workshop** that focusses on **eHealth projects** related to the brain. During this meeting each of the projects is invited to present a short summary of their work, objectives and achievements. The objective of the meeting is to share the experience, learn from the experience of others and provide an opportunity for networking.

ARMOR will also be presented at the **MEDICA 2013**; an international trade fair and congress for medical technology, electromedicine, laboratory equipment, diagnostics and drugs.

MEDICA®

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Partner news

Technological Educational Institute of Western Greece (TWG) (http://esda-lab.tesyd.teimes.gr) is specialized in the area of embedded system design. Its main research activities include mainly embedded systems for health monitoring, telecommunication applications, cryptography, multi-core systems and optimization techniques for high-end parallel applications.

Currently, TWG, through the Embedded System Design and Application Group, is participating as core partner and scientific coordinator at European project ALMA - Architecture oriented paraLlelization for high performance embedded Multicore systems using scilAb (http://www.alma-project.eu) which is funded by the European Commission under the contract 287733 (FP7-ICT-2011-7). It is also involved in national and international research projects developing innovative embedded technologies for monitoring elders and people with chronic diseases.

Embedded System Design & Applications Group is also particularly active in promoting the technology advances in well know conferences and fora. During the last years it has hosted and organized international conferences like the 3rd ACM International Mobile Multimedia Communications Conference on 2007 and the IEEE Computer Society Annual Symposium on VLSI on 2010. Recently, it organized a special session dedicated to the Trends in High Performance Embedded Architectures as part of 11th IEEE International Conference on Industrial Informatics, which will be held in Bochum (Germany) from 29th – 31st of July 2013, where ARMOR and ALMA projects were presented. From September 2nd to 4th Embedded System Design & Applications Group is co-chairing the 24th International Conference on Field Programmable Logic and Applications which will be held Munich, Germany (http://www.fpl2014.org).

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For more information about the ARMOR project visit us in www.armor-project.eu.