1 Publishable summary

The ACTORS project is about tools and methodologies for design and implementation of robust embedded devices. The key to this is adaptivity with respect to available resources. The need for a more dynamic approach to resource management is driven both by more demanding use cases and more complex hardware, specifically multicore systems.

ACTORS is a project where the backgrounds of the partners are very diverse, creating both challenges and opportunities. We have world class experts in areas such as from real-time scheduling, video coding, control theory, compiler design, telecommunications and embedded software. The strength of the project is the ambition and desire to work across disciplines and create something greater than the sum of its parts. We set out to develop three demo applications, within telecom, control and image processing, demonstrating our tool chain for dataflow programming, as well as the theory and technology for implementing adaptive applications. We work closely with the MPEG/ISO standardization body on a specification language for the upcoming RVC standard. The RVC standard and the CAL programming language was promoted to international standard in December 2009. The dataflow programming tools developed are all released as open source and most parts are available at Sourceforge. The work on real-time scheduling for Linux is done in collaboration with the kernel developers and the scheduling community. The ambition is to contribute to the Linux kernel and gain acceptance for our work. So far things are looking quite promising and we were invited to the Linux Kernel Summit 2010, which is a closed, invitation only event. Inclusion in the mainline kernel is a prerequisite from many vendors for utilizing the technology developed in ACTORS. Simply using patches is not accepted.
The same reason goes for wider adopting of CAL. The successful standardization of CAL is crucial spreading the ideas and the language.

The main objective of the ACTORS project was to demonstrate that by thinking differently, embedded engineers can get more done with less effort. Adaptivity and encapsulation are the two key ingredients. Adaptivity is needed to create flexible and robust systems, and encapsulation, with respect to data dependency and resource utilization, is necessary to design and deploy real-time aware embedded software components.

The results from the first two years gave us a great platform to work from. The ACTORS project is built from three main themes:

- Adaptive Resource Management, i.e. design systems that are robust and flexible and that can adapt to changes in the environment. During the course of the project this is an issue that has received wide attention both in industry and academia. Resource management is key in designing power efficient, green devices that maximizes the quality given a limited resource budget.
- Dataflow programming for multicore. Given a reality where multicore systems are entering into all segments of computer systems, we need to better understand how to utilize the computation power. Current technologies, such as the C programming language and a thread based execution models, are a bad fit for embedded multicore systems. Within the ACTORS project we are developing tools and methodologies for programming parallel systems using dataflow techniques. The tools are released in open source as part of the OpenDF framework.
- Reservation based scheduling is a novel scheduling paradigm where CPU and network resources are divided according to allotted shares. This greatly simplifies system design and component integration. In the ACTORS we are developing a reservation based real-time scheduler for Linux running on multicore hardware.

Both technically and financially the project is on track.

The partners of the project are the following:

Beneficiary Number *	Beneficiary name	Beneficiary short name	Country
1(coordinator)	Ericsson AB	EAB	Sweden
2	Scuola Superiore Sant'Anna, Pisa	SSSA	Italy
3	TU Kaiserslautern	TUKL	Germany
4	Evidence	EVI	Italy
5	Ecole Polytechnique Fédérale de Lausanne	EPFL	Switzerland
6	Lund University	ULUND	Sweden
7	AKAtech SA	AKA	Switzerland