

# ARTES application for mobility funding

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**Complementary funding for industrial mobility of PhD students is sought from ARTES, in total amounting to 400kSEK, divided into 200kSEK per years for two years.**

In 1998 a proposal for a three year project “*Integrated Real-time Computer and Control System Architectures*” was submitted to NUTEK for the Complex Technical Systems Program, subprogram System Architecture. The project is a cooperation between Mechatronics at Machine Design at KTH, Volvo Technological Development Corporation, Automatic Control at LTH, and Computer Engineering at CTH. In the proposal, funding amounting to 2MSEK/year (three PhD students) was sought from NUTEK. Volvo in addition agreed to provide funding of 1MSEK/year providing the funding was granted from NUTEK.

In January 1999 NUTEK decided to support the project (project no. P11762-1) with funding for one year amounting to 1,278,000SEK, with an equal amount provisionally approved for the following year.

Due to this reduction, compared to the original proposal, additional funding is required to carry out the project. The revised project plan provided in enclosure one describes how the project partners intend to carry out the project according to the original budget. KTH, LTH, and CTH provide funding from other sources for project management and post-doc researchers taking part in the project. Additional funding is sought from ARTES for the mobility of PhD students to Volvo.

The approach in the project is to combine theoretical research with industrial research and development. The framework for and integration of the theoretical studies within the project is provided by a case study, thus constituting a very essential part of this project.

*The case study* concerns modeling, simulation and analysis of an electrical brake and stability system for trucks and buses. The application is a distributed real-time and safety-critical control system. The case study provides insight into a realistic industrial application giving possibilities to study a number of interesting aspects such as system requirements, industrial constraints, conceptual design, the possibility to evaluate theoretical results etc. During the first year of the case study the focus will be on ABS and active yaw control functions. During the second year, these functions will be combined with continuous damping control which requires an extension of the system dynamics models. The effects of coexistence between these functions will be studied (see enclosure one for more info.).

The actual implementation of the case study includes mobility such that the three PhD students of the project will be working part time (seven weeks per year) at Volvo. *The funding from ARTES is thus sought to cover expenses associated with the mobility including traveling, accommodation, and allowance.*

The focus of the project is on an integrated and interdisciplinary approach to the design of architectures for real-time computer control systems. By architecture we here refer primarily to features that determine the interactions between components. In this project, policies for triggering, scheduling, synchronization, communication, error detection and handling will be studied. The interactions with Volvo are strengthened by the mobility of PhD students to Volvo and a case study. The themes of the project are (I) The investigation of timing requirements and in particular tolerances with respect to performance and robustness, (II) The relations between computer system policies and controller design including the investigation of event-triggered sampling and effects of choosing particular execution strategies, and (III) The investigation of ‘services’ for communication and scheduling that appropriately support the control applications.

**Enclosure one:** Revised Project Plan (NUTEK project no. P11762-1) - “*Integrated Real-time Computer and Control System Architectures*”. Martin Törngren, Mats Andersson, Björn Wittenmark, Jan Torin and Jan Wikander

**Enclosure two:** Case study specification, April 1999. Mats Andersson, Vilgot Claesson, Magnus Gäfvert, Martin Sanfridsson

**Reference:** *Integrated Real-time Computer and Control System Architectures* - Original proposal, 18/12 1998. Martin Törngren, Mats Andersson, Björn Wittenmark, Jan Torin and Jan Wikander.