



Student projects

fortiss, an institute associated with the Technical University of Munich, elaborates current research topics in the field of automation technology and embedded systems. Currently we are seeking students to support:

Development of a portable demonstrator

For controlling the model plant using microcontrollers, an appropriate hardware based on an Olimex STM32-P107-board and an I/O-converter-board has already been developed. As part of this work a small demonstration scenario should be developed and constructed. In order to use the setup as an evaluation kit / mobile demonstrator, it should fit together with the boards in a suitcase for easy transportation. Possible hardware for the demonstrator setup could be Lego, Fischer Technik or simple electrical components.

Helpful knowledge: handcraft skills, C/C++
Project type: Bachelor thesis, student job
Contact person: **Gerd Kainz** (kainz@fortiss.org)

Control station for automation system

For the operation and monitoring of our automation system a web-based graphical user interface for a tablet shall be developed. The GUI can be used to retrieve the state of the individual stations (e.g. stock, current mode of operation, production status) and to change the current operating mode (e.g. stop station). Therefore in all likelihood the Open Source project ScadaBR will be employed.

Helpful knowledge: Web 2.0, Java, GUIs, HTML5
Project type: Bachelor thesis, student job
Contact person: **Alois Zoitl** (zoitl@fortiss.org)

Evaluation of binary XML for efficient structured data exchange in resource constrained industrial control systems

Using XML for defining data has the great advantage that it is on the one hand side easy to read for humans but at the same time the structure can be deduced from the content. The latter allows that the structure can change and it still can be parsed and used by the different users without the need to adapt these. However a main problem of XML is that it has a large overhead (i.e. structure data versus payload data) and it requires many resources – memory and processing power – to parse. This is especially hindering the application of XML in small resource constrained industrial control systems.

An option to improve the situation can be to utilize binary encoding methods for XML. In this work existing binary encodings methods for XML (e.g., FastInfoset, WAP binary XML) should be evaluated and compared. The most suitable should be used to improve the download process of the open source environment 4DIAC, which is currently XML based. The performance and resource consumption improvements should be documented.

Helpful knowledge: XML, Java
Project type: Bachelor thesis, student job
Contact person: **Alois Zoitl** (zoitl@fortiss.org)

Optimizing the visualization of a production plan

For the production planning of workpieces on our model plant the employed production plans shall be visualized. The visualization serves as an indication of the availability of machines. Pictures of the production plans are currently used for this purpose. This visualization shall be improved and extended by additional functionalities. Therefore, various visualization methods and editors should be compared and a solution implemented.

Helpful knowledge: C/C++, GUIs
Project type: Bachelor thesis, student job
Contact person: **Nadine Keddiss** (keddiss@fortiss.org)

Visualization of production sequences and scheduling

For the production planning of workpieces on our model plant the employed production plans shall be visualized. The visualization should show what production steps (and their individual duration) are planned on which machine. In addition, the visualization should also be used to display running, completed, and pending operations.

Helpful knowledge: C/C++, GUIs
Project type: Bachelor thesis, student job
Contact person: **Nadine Keddis (keddis@fortiss.org)**

Scheduling production for adaptable manufacturing systems

Currently, the scheduling for production on our model plant is done using a breadth-first search algorithm. We want to evaluate different approaches for generating schedules for adaptable manufacturing systems. Therefore, a scheduling algorithm based on timed automata should be developed in the first step. There is an available tool called UPPAAL to generate sequences based on timed automata. This should be used as the starting point for the development and extended to fulfill the requirements of our model plant

Helpful knowledge: C/C++
Project type: Master thesis, student job
Contact person: **Nadine Keddis (keddis@fortiss.org)**

Evaluation & integration of an MES-solution

In Industrial Automation Manufacturing Execution Systems (MES) are used to manage product orders, resources, and production steps. Additionally, they are used to plan the production for a small range of time. For our model plant we want to evaluate available open-source MES-solutions and integrate one solution with our plant. Alternatively, our current implementation should be extended by a data-base and a user interface.

Helpful knowledge: Data-bases, GUI, C/C++, Java
Project type: Bachelor thesis, master thesis, student job
Contact person: **Nadine Keddis (keddis@fortiss.org)**

Integration of a 3D-simulation

Currently, there is a 3D-visualization of our model plant in CIROS. This visualization should be extended to include a simulation of the plant as well. CIROS is designed to support simulation. The programs for the machines in CIROS should be changed to include the generated program for our model plant.

Helpful knowledge: C/C++, PLC programming
Project type: Bachelor thesis, student job
Contact person: **Nadine Keddis** (keddis@fortiss.org)

Are you interested? Please send your application to the corresponding contact person which will be happy to answer any further questions.

fortiss is located just next to the U-Bahn-stop Nordfriedhof (line U6) 10 minutes from Marienplatz and 20 minutes from TUM Garching. We offer a relaxed working atmosphere, free drinks, a foosball table, and a good infrastructure.



We look forward to receiving your application!