



## Student Assignment: ADA Software Model Checking

### Context

Nexperia's Equipment & Automation Technologies (E&A) department develops pick-and-place machines for the production of semiconductor products, such as transistors, diodes and ICs. The Bright project is a cooperation of Nexperia and ESI (TNO) addressing model-based systems engineering with Nexperia's pick-and-place machines as the carrying industrial case.

One of the topics being addressed in the Bright project is modelling and analysis of the software of the pick-and-place machines. This software involves distributed control software implemented in the ADA programming language. The control and coordination of the software's parallel processes is realised using signals and locks. The code's parallelism make it difficult to verify and validate all possible control flows, e.g. for deadlocks/livelocks.

### Assignment

The Bright project aims at formal verification and validation of the software. This student assignment targets a formal verification of the software's control and coordination flow using Nexperia's ADA codebase as a starting point. The aim is to develop a methodology to (1) automatically derive a formal model from the code and (2) apply model checking to the derived model, e.g. to prove the absence/existence of deadlocks/livelocks in the control and coordination flow.

The formal model can be derived from the code using execution traces and available tools, such as parsers creating Abstract Syntax Trees (ASTs). By appropriately filtering and combining ASTs, the relevant parts of the code are captured in the model, while less important parts are eliminated.

Ideally, the methodology to be developed includes automatic traceability from the derived formal model back to the code. This would allow Nexperia's software developers to relate found issues, if any, back to their code base.

The assignment will be carried out at Nexperia's E&A department in Nijmegen under supervision of ESI and Nexperia.

### Your profile

You are an MSc student Computer Science looking for a graduation assignment of 6-9 months. You have experience with formal methods and preferably static analysis. You think it is a challenge to work in a multi-disciplinary environment and like your graduation assignment to show the benefits of scientific system development methods in a high-tech organisation.

### Contact information

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