Model Checking Routing Protocols
(Research Internship Offer in Computer Science/Engineering)

Summary

Wireless Mesh Networks (WMNs) are a promising technology that is currently being used in a wide range of application areas, including Public Safety, Transportation, Mining, etc. Typically, these networks do not have a central component (router), but each node in the network acts as an independent router, regardless of whether it is connected to another node or not. They allow reconfiguration around broken or blocked paths by “hopping” from node to node until the destination is reached. Unfortunately, the current systems often do not live up to the expectations of end users in terms of performance and reliability, as well as ease of deployment and management.

In cooperation with Macquarie University (Sydney, Australia) and Queensland University (Brisbane, Australia), NICTA explores and develops new adaptive network protocols and mechanisms for Wireless Mesh Networks that can overcome the major performance and reliability limitations of current systems. To support the development of these new protocols, the project also aims at new Formal Methods based techniques, which can provide powerful new tools for the design and evaluation of protocols and can provide critical assurance about protocol correctness and performance. Close collaboration with industry partners ensures the use-inspired nature of the project.

Research Question and Tasks

Model checking is a technique for automatically verifying correctness properties of finite-state systems in general and WMNs in particular: given a model of a WMN routing protocol, a model checker like UPPAAL (http://www.uppaal.org/) can test automatically whether this model satisfies a given specification.

In order to enable this, both the model and the specification are formulated in some precise mathematical language. But even if a precise description of a protocol is given e.g., in process algebra, this description is usually not accepted by a model checker. This is due to incompatibility of different languages.

The project’s work should therefore include the implementation of a translation software from a process algebra language to a model description accepted by UPPAAL. After this has been finished, the software should be tested on several case studies. Moreover, the software could be extended to produce input for other model checkers.

The ideal applicant should have experience in programming and, ideally, he/she took a course on model checking, but this is not mandatory.

General Information

NICTA (National ICT Australia) is Australia’s Information and Communications Technology (ICT) Centre of Excellence. It is an independent company in the business of research, commercialisation and research training. With over 700 people, NICTA is the largest organisation in Australia dedicated to ICT research.

The internship is integrated in the NICTA project Mesh protocols (http://www.nicta.com.au/research/projects/mesh_protocols/). The team behind Mesh protocols is a highly motivated group with different backgrounds (e.g., formal methods and network engineers), working at different institutes (NICTA, Queensland University and Macquarie University), and with different levels of experience (from young
researchers to professors). The successful applicant will work in the Software Systems Research Group. He/She will work together with Prof. Rob van Glabbeek, A/Prof. Annabelle McIver, Dr. Peter Höfner and Dr. Ansgar Fehnker.

Sydney is the largest and most populous city in Australia. It is located on Australia’s south-east coast of the Tasman Sea. With an approximate population of 4.5 million in the Sydney metropolitan area the city is the largest in Oceania. Sydney also ranks among the top 10 most livable cities in the world according to Mercer Human Resource Consulting and The Economist.

Unfortunately, NICTA, as the host institute, cannot offer further financial scholarships.

**Contact Information**

If you have any questions concerning the internship, please do not hesitate to contact us:

Peter Höfner  
Office E521, 223 Anzac Parade,  
Kensington NSW 2052  
T +612 8306 0561  
F +612 8306 0405  
email: peter.hoefner@nicta.com.au