

University of Oxford
Computing Laboratory
Software Engineering Research Group

Applications are sought for a fully-funded EPSRC CASE studentship supported by QinetiQ in the area of **verified and trustworthy service orientation**. The project sets out to improve the security and reliability of web services and related technologies through automated reasoning and code generation tools.

The intention of the CASE scheme is to give the student an opportunity to work closely with the industrial partner. During the course of their studies, the student will spend three months working on site at QinetiQ. The company will help in providing direction for the research, motivated by known and emerging problems, and case studies where appropriate. In turn, QinetiQ will also help to find ways to exploit the results of the project.

Project Summary

The rise of *web services* — pieces of program logic which communicate over wide-area networks using protocols akin to those of the world-wide web (HTTP, SOAP, WSDL) — has promoted an architectural style normally called *service orientation*, [Singh & Huhns] whose implications significantly outstrip the particular implementation technologies presently associated with web services.

Service orientation implies a particular care in programming to defined interfaces, separation of concerns, reusable components, and message-based loose coupling. Because collaborating services may reside within different administrative domains, particular care must be taken with access control and authorization, and with data integrity and confidentiality. The ‘contract’ between a service provider and its consumer is therefore a much broader artifact than a mere description of input and output data formats.

Some elements of such contracts are already present in the world of *model driven software engineering*. We have a robust technology [Davies et al.] which allows developers to describe a high level model of data and operations, and tools to deliver a functioning database, with those operations exposed as SOAP services, and a fully-generated user interface for interactions.

Meanwhile, the technologies of *Trusted Computing* [Mitchell] are making possible *remote attestation* wherein the identity and integrity code running on a third party host can be strongly guaranteed from a distance. There are substantial technical challenges to be overcome in making such a facility practical, but a key part will be to have a reliable means of specifying behaviour at the right level of abstraction, and generating as much as possible of the implementation code automatically, to avoid scope for the inadvertent introduction of vulnerabilities.

The aim of this project is to explore how well-established techniques for modelling, verification, and code generation can be used to describe and deliver rich functionality in a service-oriented context. At present, the most promising approach appears to be to attach richer specifications of functionality to WSDL documents, and to describe the tools necessary to transform such descriptions into suitable models and thence into code. Even if such a development environment can be constructed, a significant gap remains to be filled in that interesting functionality arises not from single service interactions but from longer-running interaction of several services, in a context where messages may be lost, or services disappear and reappear from time to time. Modelling must take account of these and allow nevertheless for verified functionality and security properties.

This is a broad programme of work: there is an opportunity to take it in a more theoretical or a more practical direction, depending on the skills and interests of the student.

Selection Criteria

Candidates must satisfy the usual requirements for doctoral study at Oxford:

<http://web.comlab.ox.ac.uk/oucl/prospective/dphil/dphil-criteria.pdf>

Applicants should have a strong background in software engineering or computer science and should have a BSc or MSc degree in an appropriate discipline. They should be strongly motivated to conduct original research and with the personal skills required to work closely with our industrial collaborator.

Applicants MUST meet the EPSRC eligibility requirements which state that you must have a relevant connection to the UK, generally established by 3 years residence. On-site working at QinetiQ will also require obtaining clearances, which may be based upon nationality.

How to Apply

The deadline for applications is 16th July 2007. Interviews for qualified candidates will follow soon afterwards, if necessary. To apply you need to download the University's application form from:

<http://www.admin.ox.ac.uk/postgraduate/apply/forms>

You will need to submit references and a transcript with your application. It is also required to submit a research proposal: in this proposal, please elaborate on the reasons why you are interested in this project, and the research questions you find most exciting and important to address within the scope of the project.

Please submit your application to:

Mrs. Julie Sheppard
Secretary for Graduate Studies
Oxford University Computing Laboratory
Wolfson Building
Parks Road
Oxford OX1 3QD
United Kingdom

AND NOT TO THE ADDRESS ON THE APPLICATION FORM

Further Information

For informal enquiries and further details, please contact Dr. Andrew Martin by email at andrew.martin@comlab.ox.ac.uk.

Further Reading

Munindar P. Singh and Michael N. Huhns, *Service-Oriented Computing: Semantics, Processes, Agents*, Wiley 2005.

Jim Davies, James Welch, Alessandra Cavarra, and Edward Crichton. On the generation of object databases using Booster. In *Proceedings of the 11th IEEE Conference on the Engineering of Complex Computer Systems (ICECCS 2006)*. IEEE Computer Society, 2006.

Chris Mitchell (ed), *Trusted Computing*, The Institution of Electrical Engineers, 2005.