EBERHARD/ROEMER **MSc**

MPOCSS - Massively parallel optical communication system simulator

Research objectives:

- To simulate non-linear processes in optical fibre channels using the non-linear Schroedinger equation
- To investigate the possibility of porting existing Fourier method-based codes onto modern massively parallel computing hardware and/or GPU-CUDA architectures
- To implement suitable error correcting codes and next generation modulation formats

Background:

The Digital Economy has been one of the strongest growth markets over the past decade and with high definition video on demand, online gaming, e-health and other bandwidth hungry applications on the horizon will continue to do so for the foreseeable future. Access networks are currently being upgraded to "very high speed digital subscriber lines" (BT Infinity) and "fibre to the home", which will bring more of the benefits of high speed networking to ever more people living in the UK. It has already changed our way of life forever. Its impact is only really comparable to the industrial revolution. The driving force behind this success story is the availability of networks with vast amounts of high quality affordable bandwidth. The most prominent example of such a network is of course the Internet itself. However, for this new economy to continue to thrive an ever increasing amount of bandwidth at decreasing costs is needed. With customer access speeds currently increasing significantly, the bottleneck is once again shifting to the backbone networks and creates demand for bandwidth upgrades.

Deliverables:

To simulate such upgraded backbone networks and assess their performance it is necessary to model all components in these networks as accurately as possible. These models then need to be implemented in a way suitable to run on massively parallel hardware like multicore and GPGPU based clusters. Of particular interest is the implementation of forward error correction (FEC) using techniques like Reed-Solomon and Low Density Parity Check codes. In addition, next generation modulation formats like coherent optical orthogonal frequency division multiplexing (CO-OFDM) will also be needed. These topics provide scope for challenging and highly research linked projects at MSc level with a clear perspective for future PhD level work. The students will be embedded into a group of leading researchers in the field and gain first hand knowledge of cutting edge research work.

Future directions:

The supervisors, together with Warwick 2 engineers and massive support from leading communication engineering companies, have recently submitted a large scale EPSRC proposal for PDRA and PhD funding. A copy of the proposal, which sets out tasks for future research work in the area can be obtained from either supervisor upon request.

For further information, see http://www.warwick.ac.uk/go/DisQS (RA Roemer) or http://www.aston.ac.uk/~eberhama/ (MA Eberhard).