Graphical pre- and post-processing big-data front end for massively parallel optical communication simulations

Higher transmission speeds have in the past been achieved by increasing the bit rate per channel up to the current state of the art of 10 Gbit/s for the vast majority of installed systems with some commercial deployments of 40 Gbit/s. The modulation format of choice was on-off keying (OOK) for up to 10 Gbit/s with differential phase shift keying (DPSK) and differential quadrature phase shift keying (DQPSK) becoming more important for higher speeds. These formats allow for simple encoding and decoding limiting the amount of high-speed electronics needed. In addition, most installed wavelength division multiplexed (WDM) systems use the standard ITU grid [10] with a channel spacing of 50 GHz. Operators with such networks want to gradually grow the bandwidth of their networks by upgrading individual line cards on individual wavelength channels on an on demand basis without replacing the existing and already installed dark fibre optical network infrastructure. This means that next generation higher speed line cards must be compatible with today’s wavelength allocation schemes. Such a scheme requires new simulation techniques and approaches, which we propose to develop. As current modulation formats are fast approaching the end of their commercially useful life, it is now the right time to start this transition process [1].

In this project, we aim to move the field of optical communication systems to next generation modulation formats, using our recently developed large-scale parallel implementation. As a first step, the project will involve the efficient and user-friendly handling of large data sets, on input as well as on output of the simulation. A suitable graphical user interface, which allows to visually construct the system to simulate, including fibre sections, filters, amplifiers, transmitters and receivers, will need to produce XML configuration files. These are then piped into the simulation and large NetCDF-based outfiles are generated. These again need to be represented visually using the frontend to be built [2].

This project will give you a flavour of computational and numerical techniques in nonlinear physics and communications engineering, and so will be ideal for a student contemplating research in this area. A strong background in programming is recommended. For more information please contact Rudolf Roemer (R.Roemer@warwick.ac.uk) or see http://www.warwick.ac.uk/go/DisQS.