NATIONAL UNIVERSITY OF SINGAPORE

School of Computing

PH.D DEFENCE - PUBLIC SEMINAR

Title: **Protocols for Quantum Networks**

Speaker: Mr Md Tanvirul Islam

Date/Time: 20 April 2016, Wednesday, 03:00 PM to 04:30 PM

Venue: MR1, COM1-03-19

Supervisor : Dr Norman Hugh Anderson, Associate Professor, School of Computing

Abstract:

Recent scientific breakthroughs and technological advancements have demonstrated the feasibility of various quantum computing and quantum cryptographic tasks. Most of these works are focused on computation involving up to two parties where the parties are connected via a direct quantum link. However, for computations involving more than two parties the nodes have to be connected in a network. Because of the quantum nature of the communication involved, the architecture of these networks and protocols to operate them are completely different from the classical networks. Therefore, many building blocks of the classical networks do not translate to the quantum networks and require novel solutions of their own. Moreover, since the field is relatively new, these building blocks have mostly remained unaddressed so far.

In this thesis we study how our existing knowledge of the two party quantum protocols can be extended and used to build scalable multiparty quantum networks. To be more specific, we give the first fault tolerant protocols for reference frame agreement among $n>2$ nodes in both synchronous and asynchronous quantum networks. We also study quantum routing using entanglement swapping and design efficient routing protocols for this architecture. The design and analysis techniques developed during our study of these problems provide us with valuable insights and practical tools for further advancements towards implementing a quantum Internet.