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**DEGREE:** Philosophiae Doctor  
**FACULTY:** Mathematics and Natural Sciences  
**DEPARTMENT:** Informatics  
**AREA OF EXPERTISE:** Networking, IO Virtualization  
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**DISSERTATION TITLE:** *Dynamic Reconfiguration In Interconnection Networks*

Wei Lin Guay is a senior software engineer at Oracle Corporation, Norway. He is also a final year PhD student at Simula Research Laboratory and the University of Oslo. The area of his research interests are dynamic reconfiguration, IO virtualization, fault tolerance and routing for high performance interconnection network.

Interconnection networks are widely deployed as the communication fabric in different systems, ranging from internal networks in clusters to the wide area networks in public clouds. In the event of rerouting due to failure of networking components, congestion control, and migration of jobs, the underlying network characteristic of a system must be reconfigured. As the large networks in clusters and enterprise environments are becoming too complex to manage on an individual system-by-system basis, self-managing and self-configuring networks are a requirement in future systems. In this thesis, we study dynamic reconfiguration and our contributions are in three different contexts.

The first contribution is a fault tolerant mechanism that can dynamically reconfigure the characteristic of the interconnection networks when a fault happens. In this methodology, network traffic is not required to be stopped during the reconfiguration, enabling a fault tolerant mechanism that is transparent to the applications.

The second contribution is a congestion control mechanism that can reconfigure the route dynamically to alleviate the negative effects of head-of-line blocking. This methodology provides a framework, with only using virtual lanes, that can improve the network performance in the presence of hot-spots.

The third contribution is a methodology enabling dynamic reconfiguration of a high-speed networking device, that is attached to a virtual machine (VM), during live migration. In this method, the reconfiguration of the underlying hardware managed resources of the high-speed networking device is performed dynamically when a VM is migrated. The on-going network operations of the high-speed networking device can be resumed after the live migration without any manual configuration.