

SUMMARY OF Ph.D. DISSERTATION

School School of Science for Open and Environmental Systems	Student Identification Number	SURNAME, First name Shimizu, Sho
Title Efficient data transport technologies for next generation backbone network		
Abstract <p>The backbone network traffic generated by the Internet continues to grow rapidly due to the emergence of many new broadband access services such as VoIP, P2P, video sharing like YouTube, and grid computing. WDM technologies can allow the backbone network to support the explosive growth in bandwidth demands. However, many of the new applications require different communication topologies and multi-layer operation, such as WDM, TDM, and packet layer. To fully support these and yet-to-be introduced services, new highly efficient communication network schemes are needed. This dissertation identifies efficient data transport technologies for the next generation backbone networks.</p> <p>There are four requirements for next generation backbone network to handle rapidly increasing traffic volume and support emerging applications: 1) high speed and large capacity, 2) scalability, 3) traffic engineering capability, and 4) application frameworks for large data distribution. Topics to satisfy these requirements are investigated in Chapter 3 -- 6. This dissertation is organized as follows.</p> <p>Chapter 1 describes the background of this dissertation and clarifies its purpose and position.</p> <p>Chapter 2 illustrates fundamental technologies for next generation backbone network and previous works related to the above requirements.</p> <p>Chapter 3 focuses on high speed and large capacity transport. A novel wavelength assignment scheme for a wavelength-routed network with wavelength converters of limited range is proposed. It reduces the total number of wavelength conversions needed and the number of wavelength converters. Consequently, it makes wavelength-routed networks cost effective.</p> <p>Chapter 4 focuses on the scalability issue of the next-generation layer-2 network. The VLAN tag-swap-based wide area layer-2 network architecture is proposed for the scalable next generation layer 2 networks in this chapter.</p> <p>The computational complexity of path calculation in traffic engineering is the focus of Chapter 5. The new approach of parallel shortest path search is proposed to realize sophisticated traffic engineering. The proposed approach uses dynamically reconfigurable processors (DRPs), and takes full advantage of their parallelism.</p> <p>Chapter 6 focuses on an application framework for large data distribution, and introduces a new solution to the replica placement problem that is found in content delivery networks. The solution, which takes the form of application level technology, is specifically designed to achieve the efficient distribution of large volume contents. The proposed replica placement solution can generate all replica placement patterns at extremely high rates due to DRP parallelism. Optimal replica placement, which means the minimum number of replicas, can be obtained within reasonable time. The proposal is expected to trigger the emergence of exciting new cost-effective services based on large volume content distribution.</p> <p>Chapter 7 draws this dissertation to its conclusion with a useful summary of the advances raised herein.</p>		