University of Victoria | Graduate Studies

PROGRAMME

The Final Oral Examination
for the Degree of

DOCTOR OF PHILOSOPHY
(Electrical and Computer Engineering)

Ilijc Albanese

2008	University of Roma Tre	M.Eng.
2005	University of Roma Tre	B.Eng.

"Periodical Data Structures for Bandwidth-intensive Applications"

Friday, January 2nd, 2015
10:00 AM
Engineering Office Wing, Room 430

Supervisory Committee:
Dr. Thomas E. Darcie, Department of Electrical and Computer Engineering, UVic (Supervisor)
Dr. Stephen W. Neville, Department of Electrical and Computer Engineering, UVic (Member)
Dr. Sudhakar Ganti, Department of Computer Science, UVic (Outside Member)

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Dr. Guoguang Wu
Department of Political Science, UVic

Abstract

Current telecommunication infrastructure is undergoing significant changes. Such changes involve the type of traffic traveling through the network as well as the requirements imposed by the new traffic mix (e.g. strict delay control and low end-to-end delay). In this new networking scenario, the current infrastructure, which remained almost unchanged for the last several decades, is struggling to adapt, and its limitations in terms of power consumption, scalability, and economical viability have become more evident.

In this dissertation we explore the potential advantages of using periodic data structures to handle efficiently bandwidth-intensive transactions, which constitute a significant portion of today's network traffic.

We start by implementing an approach that can work as a standalone system aiming to provide the same advantages promised by all-optical approaches such as OBS and OFS. We show that our approach is able to provide similar advantages (e.g. energy efficiency, link utilization, and low computational load for the network hardware) while avoiding the drawbacks (e.g. use of optical buffers, inefficient resource utilization, and costly deployment), using commercially available hardware.

Aware of the issues of large scale hardware redeployment, we adapt our approach to work within the current transport network architecture, reusing most of the hardware and protocols that are already in place, offering a more gradual evolutionary path, while retaining the advantages of our standalone system.

We then apply our approach to Data Center Networks (DCNs), showing its ability to achieve significant improvements in terms of network performance stability, predictability, performance isolation, agility, and good put with respect to popular DCN approaches. We also show our approach is able to work in concert with many proposed and deployed DCN architectures, providing DCNs with a simple, efficient, and versatile protocol to handle bandwidth-intensive applications within the DCs.

Awards, Scholarships, Fellowships

2010 – Fellowship, *University of Victoria*
2010 – 2011 – Fellowship Renewal, University of Victoria

Presentations

1. Ilijc Albanese; "*Power-efficient Electronic Burst Switching for Large File Transactions"* 2nd International Conference on Smart Grids and Green IT Systems (SMARTGREENS). Aachen, Germany, 9-10 May, 2013
2. Ilijc Albanese; "*Power-efficient Electronic Burst Switching for Large File Transactions"* 2nd International Conference on Smart Grids and Green IT Systems (SMARTGREENS). Aachen, Germany, 9-10 May, 2013
3. Ilijc Albanese; "Big File Protocol (BFP): a Traffic Shaping Approach for Efficient Transport of Large Files" IEEE 15th International Conference on High Performance Switching and Routing (HPSR 2014). Vancouver, Canada, 1-3 July, 2014.

Publications

1. I. Albanese, T. E. Darcie and S. Ganti. Power-efficient Electronic Burst Switching for Large File Transactions. In proceedings of the 2nd International Conference on Smart Grids and Green IT Systems (SMARTGREENS). Aachen, Germany, 9-10 May, 2013.

2. I. Albanese, T. E. Darcie and S. Ganti. Electronic implementation of optical burst switching techniques. In proceedings of the SPIE 8915, Photonics North 2013, 89150B (11 October 2013).

3. I. Albanese, Y. O. Yazir, S. W. Neville, S. Ganti, and T. E. Darcie. Big File Protocol (BFP): a Traffic Shaping Approach for E_cient Transport of Large Files, IEEE 15th International

Conference on High Performance Switching and Routing (HPSR 2014). Vancouver, Canada, 1-3 July, 2014.

4. I. Albanese, Y. O. Yazir, S. W. Neville, S. Ganti, and T. E. Darcie. Big File Protocol (BFP) for OTN and Ethernet Transport Systems, submitted to IEEE/OSA Journal of Optical Communications and Networking (JOCN) on August 12, 2014. Pending review.

5. I. Albanese, Y. O. Yazir, S. W. Neville, S. Ganti, and T. E. Darcie. Big File Protocol (BFP) for efficient quasi-deterministic data transfer in data centers, Submitted to IEEE Transactions on Cloud Computing (TCC) on November 24, 2014. Pending review.