【Grant-in-Aid for Scientific Research (S)】
Science and Engineering (Engineering)

Title of Project : Data-Centric New Generation Photonic Networking

Ken-ichi Sato
(Nagoya University, Graduate School of Engineering, Professor)

Research Project Number : 26220905　Researcher Number : 00377805
Research Area : Engineering
Keyword : Photonic Networks

【Purpose and Background of the Research】

Network flattening is advancing because of the advent of hyper-giant content holders and the growth of CDNs (Contents Delivery Networks) and cloud computing services. Self-supply by content providers like Google is generating, on average, 7-8% of the Internet traffic around the world. According to a traffic forecast, metro traffic (traffic that traverses only the metro) will surpass long-haul traffic in 2014, and it is expected to grow nearly twice as fast as long-haul traffic. The metro traffic increase is also substantiated by the increase in datacenter installations in metro and the traffic among them and by the penetration of CDNs as well. This trend will clearly direct the need to create new networks where such cutting-edge technologies are exploited as; high-speed digital coherent transmission of more than 100 Gbps, flexible grid frequency allocation, spatial division multiplexing, and cost-effective large-capacity optical networking technologies that minimize expensive OEs and EOs and greatly reduce electrical power consumption through the use of router cut-through. This project investigates the enabling technologies that include new optical transport node systems and develops related high performance optical devices.

【Research Methods】

This research conducts following investigations.
(1) Flexible ultra-large capacity photonic node architecture: New transport scheme that minimizes impairment stemming from large number of optical transparent node transmission, and the new node architecture will be developed.
(2) Flexible coherent transmission technologies: A new optical switching mechanism that enables extraction of any optical channels without using optical filters, and analytical evaluations of optical cross talk effects in large scale optical switches will be developed.
(3) Elastic optical path networking technologies: Develop a method that maximizes transmission distances and frequency utilizations in elastic optical path networks where optical channels with various attributes are flexibly accommodated.

【Expected Research Achievements and Scientific Significance】

Compared to the conventional electrical routings, significant cost and electrical power consumption reductions will be achieved through technologies developed here, which will support sustainable advances in future communications networks.

【Publications Relevant to the Project】

- K. Sato, “Prospects of future photonic networking technologies,” IEICE Trans. on Commun., vol. J96-B, No. 03, pp. 220-232, March 2013. (in Japanese)
- K. Sato, “Challenges and opportunities of photonic networking technologies,” The 18th OptoElectronics and Communications Conference/Photonics in Switching 2013, PS/OECC 2013, WQ1-1, Kyoto, June, 2013.
- K. Kikuchi,, “Adaptive equalization techniques in digital coherent optical receivers,” IEICE Trans. on Commun., vol. J96-B, No. 03, pp. 212-219, March 2013. (in Japanese)
- M. Jinno, H. Takara, B. Kozicki, Y. Tsukishima, Y. Sone, and S. Matsuoka, “Spectrum-Efficient and Scalable Elastic Optical Path Network: Architecture, Benefits, and Enabling Technologies,” IEEE Commun. Mag., 47, I66-73 (2009).

【Term of Project】 FY 2014-2018

【Budget Allocation】 154,500 Thousand Yen

【Homepage Address and Other Contact Information】

http://www.nuee.nagoya-u.ac.jp/labs/satolab/index2.html