THE OPTICAL NETWORK CONTROL PLANE

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Abstract

Just a few years ago, the phrase "optical internet" meant little more than a few WDM fibers whose wavelengths were serving as a link layer to interconnect routers via add/drop multiplexors. By comparison, today multiwavelength reconfigurable optical switches are readily available, enabling for the first time, the development of large-scale high speed optical networks operating at rates in excess of 10 Gbps. In such networks, IP routers and ATM switches that are connected to an optical core can respond to changing bandwidth needs of applications by dynamically establishing lightpaths on-demand. Modern optical switches fall into one of two broad classes (i) those with opto-electronic fabrics and (ii) those which are all-optical. Opto-electronic switches have the advantage of being easier to manage, and offer attractive features such as sub-rate grooming and in-band signaling. In contrast, all-optical switches require more sophisticated monitoring and adaptive control mechanisms, but yield bit-rate independence and transparent access to the full raw capacity of the optical channel. The future success of both types of optical switches depends largely on their performance and ability to be scalably deployed. In this context, we describe the design of an optical network control plane, with particular emphasis on the difficult issues in optical network management, and lightpath signaling and routing.

Keywords: Optical networks, control plane, routing, signaling, management.

1 Network Management

Network management functions can be broadly partitioned into the two classes of monitoring and control.

1. *Network Monitoring.* Network monitoring is the term used to describe passive management functions which cause minimal interference in the network's state. The main goal of such is to collect data and analyze it to extract useful information about the status of network Typical data collected includes static information regarding

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