Chapter 7

Conclusion

Recent developments in the field of optical communication technology have paved the way for a whole new generation of services and products. Steadily-increasing network capacity can barely keep up with the demand for more communication bandwidth. New applications such as voice-over-IP and video-on-demand are but two examples of what will characterise the communication networks of tomorrow.

Communication traffic and the management thereof have become extremely important topics. The establishment of new levels of reliability, through techniques known as protection and restoration, will continue to converge with the other management functions required to maintain acceptable levels of operation from a communication network. Concepts such as price elasticity of user demand have been identified as tools that can by employed for market manipulation. The business development challenge in optical networking technology is to ensure that the services are created that will require the high-technology infrastructure and extreme performance that characterises optical communication networks.

An integrated methodology was developed and presented for the design of wide-area WDM optical networks. The methodology aims to promote enhanced interaction between the various problem solving functions that have thus far operated in relative isolation. The definition of the three topologies: physical, logical, and virtual facilitate in the process of creating some common ground on which network designers and researchers can actively partake and interact within the same frame of reference.

The intra/inter-cluster traffic ratio promises to be a very useful tool in selecting the number and positions of the hub nodes on the various levels of the multi-level network model. This approach to decision-making promotes beneficial networking principles such as load balancing and hierarchical design. Two target intra/inter-cluster traffic ratios have been identified for use in determining the hub nodes of the backbone and regional levels of the multi-level network model. These target values are in the ranges 5-9 and 0.5-1.5 for the backbone and regional levels respectively.

Most conventional approaches to the design of wide-area optical networks assume hub nodes and their clusters to be known. A given demand matrix is then used to design the physical topology of the network and do the routing and channel assignment accordingly. The applicability of the clustering approach to the design of wide-area optical networks precedes this in the real-world design process, where the hub nodes and demand matrix have to be determined prior to the design of a physical topology or the routing and channel assignment. Following these steps, optimisation of criteria such as cost and performance would result in several iterations of the design process to converge to a solution that optimises the selected criteria. The proposed clustering approach to the design of wide-area optical networks addresses the establishment of a logical topology as well as identification of the hub nodes that are crucial to the design of a physical topology.

The introduced methodology can be a valuable tool to a network designer due to the increase objectivity that it provides to the design process and the reproducibility of the obtained results. These characteristics come at the cost of reliable statistics being required together with a lot of processing power and memory to satisfy the greedy nature of the clustering process with regards to system resources.