

# GMPLS-based Backup Multiplexing for Survivable IP-over-WDM Networks

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## **Abstract:**

The explosive growth of IP data traffic poses important emerging bandwidth requirements on today's networks. The WDM technology is playing a major role in the expansion of our networks by dividing the tremendous bandwidth of a fiber into many wavelengths, with each wavelength offering the capacity of a few gigabits per second.

As WDM technology matures, the survivability of IP-over-WDM networks becomes a challenging topic. As a result of the high volume traffic carried by IP-over-WDM networks, any failure may have severe consequences. Such a failure, whether it is a fiber cut or a node crash, could significantly downgrade the services to the worst extent. This is the reason why survivability is clearly a crucial requirement in IP-over-WDM networks. Survivability refers to the network ability to reconfigure or reestablish the traffic transmission upon any failure.

To guarantee the network survivability, the WDM layer is configured redundantly by over-provisioning the network capacity, and the IP layer recover network failures by rerouting the affected traffic on the over-provisioned spare capacity. To effectively combine WDM recovery and IP recovery, Generalized Multiprotocol Label Switching (GMPLS) plane provides the mechanisms of failure notification, signaling, resource locating, resource reservation, and disconnected traffic switching. To efficiently assign the spare resource for failure recovery, GMPLS-based backup multiplexing is proposed to share the backup resource among disjoint primary paths. As long as only single failure occurs in one recovery process, such a multiplexing greatly increases the carried traffic in the network and the network-wide bandwidth utilization. To guarantee the QoS in IP-over-WDM networks, a priority-based backup multiplexing is further proposed to provide different classes of recoveries for different traffics. The backup resource for higher priority traffic is immediately available after the failure occurs, while the recovery of lower priority traffic may have some tolerable delay.