100GET-E3: Open Issues for Cost-efficient Multilayer Carrier Ethernet Transport Networks

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The immense success of Internet applications and services has led to a traffic increase of 50% to 200% each year. In order to reduce costs and to fulfill their customer's requirements network operators have to transform their transport infrastructure. When analyzing transport technologies, it becomes obvious that shifting traffic to lower layers is beneficial both from a capital as well as from an operational expenditure point of view. In addition to a transparent transmission of data using DWDM technology at speeds of 2.5Gbps, 10Gbps and 40Gbps, transmission speeds of 100Gbps will be needed in near future. Besides improvement in physical transmission, new network architectures have to be developed that fulfill the requirements of future transport networks. In particular, carrier-grade transport networks have to guarantee Quality-of-Service (QoS). Fast and efficient resilience mechanisms to recover from link and network element failures have to be deployed and efficient and predictable traffic-engineering mechanisms to fine-tune data flows have to be available. More and more important, various operation, administration, and maintenance (OAM) features for the configuration and monitoring of the network as well as mechanisms to secure network operation have to be provided. Additionally, a high degree of scalability is needed to handle different traffic types and user separation inside the network. This scalability in terms of address space, maximum transmission speed, and maximum transmission distance becomes an important issue for next generation transport networks.

Carrier Ethernet Transport – The intelligent combination of packet based technologies with optical switching seems to be the best solution to solve the challenges of future transport networks. The project 100GET-E3 – part of the 100GET Celtic initiative – therefore develops new 100Gbps transmission technologies and investigates new network architectures for future transport networks. The project develops new multilayer optimization approaches to find the best split of service aware functionalities and service agnostic cost-efficient lower layer switching. Especially, the combination of IP functionality at the border of the network, simplified connection-oriented packet based transport technology using Carrier Ethernet such as PBB-TE or MPLS-TP, optical switching such as ODU switching, and DWDM transport are investigated. In addition, multilayer traffic-engineering and resilience approaches as well as new multicast mechanisms are analyzed and extended. To facilitate the operation of future transport networks, new intra- and inter-domain routing and OAM mechanisms are developed that allow traffic-engineering and enable QoS guarantees on an end-to-end basis.