What Photonics Can Do for Switching in Transparent Optical Networks

(Keynote)

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Transparent optical networks, based on WDM technology, are considered as the most promising candidates for future high capacity communication networks because of their scalability and energy efficiency. In such networks, switching functions will be carried out directly in the optical domain so that high speed optical signals will traverse the network without any optical-to-electrical conversion. Different switching paradigms can be applied, such as optical circuit switching OCS, optical burst switching OBS and optical packet switching OPS, offering different switching granularities and performance. A number of challenges are associated with each of the switching paradigm. This talk will highlight some of these challenges and review pros and cons of using photonic technology for switching in communication networks.

The optical circuit switching (OCS) is based on a course switching granularity (mostly at wavelength level). It provides end-to-end optical channels (lightpaths) between source and destination nodes. The basic function of OCS network is solving routing and wavelength assignment (RWA) problem, i.e. finding a suitable physical path for each lightpath request and assigning an available wavelength to it. A suitable OCS node architecture and technology can significantly improve network performance [1].

On the other hand, switching in OPS networks should be done on per packet basis providing high switching granularity, which in turn gives a potential for better resource utilization compared with OCS. However, several fundamental problems need to be solved in order to implement OPS networks. In particular, packet contention at the OPS nodes needs to be efficiently handled in order to guarantee required network performance [2-4]. However, lack of flexible optical memory makes the contention resolution in optical domain very difficult.

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References

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