

PHOTONIC SERVICES

The Photonic Service (PS) is the most general purpose of the services offered by the optical network. It provides fully transparent, all-optical connectivity between locations in the network. Such a point-to-point connection created across the network is described only

by the physical path along which the light travels through the network and by allocated bandwidth. As a result, the service can meet the strictest criteria, especially time constraints such as latency and jitter.

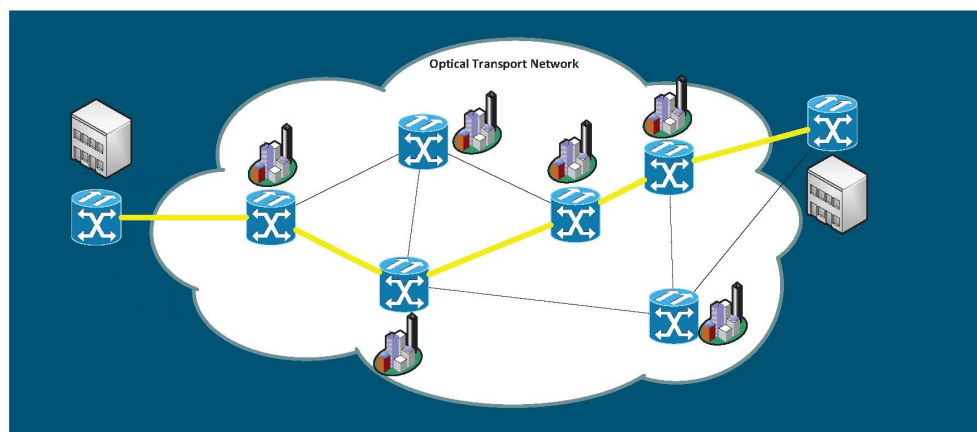


Figure 1:
End-to-End
Photonic
Service

An example of a PS crossing a network with several optical add-drop multiplexers is shown in Figure 1 above. It is critical for performance that the light passes through the network transparently, without optical-electrical-optical (OEO) regeneration anywhere in the network. The fact that OEO regeneration is not allowed brings one limitation to PSs: the total optical reach is limited to several thousand kilometres. This is caused by the absence to date of a way to regenerate the optical signal without use of OEO. The problem can be solved in some cases by using specialized OEO regenerators,

but this strongly depends on each individual application.

PSs can be implemented in networks that use dark fibres, dark channels or Alien waves. PSs are a more general type of service than Lambda Services. While Lambda Services are used for transfer of data over multivendor networks, PSs may carry even non-standard signals.

PHOTONIC SERVICES | 2

Advantages

Modulation format transparency

Because of strict network requirements, PSs can carry advanced, highly specialised and scientific applications that are difficult or impossible for traditional network protocols like IP or Ethernet.

Lowest possible latency

Latency is the total transmission delay between end points and is mainly caused by the reduced speed of light in the optical fibre. The latency is approximately 5 μ s for 1 km of

fibre. The latency variation is usually called jitter and has its source in OEO regeneration and electronic switching sites on the PS path. OEO is therefore forbidden along the PS path, except in very special cases.

Minimal jitter

Jitter is negligible, as there is no OEO along the path. This is a mandatory attribute for applications such as time transfers.

Examples of Applications

Certain demanding applications, especially in scientific fields, are not feasible with the services commonly offered by ISPs. These applications have hard real-time constraints and the penalty for not meeting them could be significant; for example, an entire experiment could fail or a human life be endangered. They therefore require the level of performance guaranteed by PSs.

Examples of such applications include:

- Remote real-time instrument control
- Telesurgery
- Ultra-stable frequency transfer
- High-accuracy time transfer – comparison of atomic clocks
- 4k video broadcasting, CAVE to CAVE
- Interactive human collaboration