

Optical CDMA as a Contention Resolution in OBS Networks

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Optical burst switching (OBS) is a new WDM technology that retains some of the advantages of optical packet switching, yet is being more practical and realizable in the near future. OBS normally uses one-way reservation protocols, e.g., Just-In Time and Just-Enough-Time, with immediate transmission in which the data burst follows a control packet without waiting for an acknowledgment. One-way reservation protocols offer data transmission at high rates. However, the possibility of a burst blocking also increases. Burst blocking occurs when one or more bursts are destined to go out simultaneously of the same output port of a core node. Traditional solutions for this blocking are by wavelength conversion, deflection routing, and optical buffering.

Direct-sequence optical code-division multiple-access (DS-OCDMA) has been suggested as a contention resolution technique in OBS/WDM networks. Indeed, two or more bursts can be destined to the same output port at the same time and still can be recovered at the receiver. Of course there is a limitation to the number of users to be transmitted on same port on the same time. Indeed as this increases, the multiple access interference would increase causing more interference and hence faulty detection.

Recently, we have proposed the implementation of spectral-amplitude-coding optical code-division multiple-access (SAC-OCDMA) in the optical layer of OBS networks instead of WDM. The main idea in the newly proposed system (OBS/SAC-OCDMA) is to increase the number of available resources (codes) for reservation instead of the more limited resources (wavelengths) when using OBS/WDM. Both all-optical code converters and all-optical multiple-access interference cancellers are proposed in our system. Our results reveal that a considerable improvement in the performance of each core node in the system is achieved by using SAC-OCDMA instead of WDM in the optical layer underneath an OBS based MAC layer. We also conclude that a slight increase in the employed number of code converters enhances the overall system performance noticeably.