Full-Mesh Photonic Network System (AWG-STAR)

Full-mesh network systems are attractive for use in future communication services because they can be used to achieve a flexible network architecture that allows such functions as simultaneous transmission and reception using different information protocols. We have established a full-mesh network system with a very simple structure by using WDM technology and a cyclic-frequency arrayed-waveguide-grating (AWG) router.

We use the cyclic-frequency AWG router to send WDM signals through an input port to an output port. Each input port sends its signal to predetermined output port corresponding to the signal wavelength, and no two signals of the same wavelength as one output port are sent from different input ports. Therefore, as the number of input and output ports is the same as the number of wavelengths, we can achieve a full-mesh connection.

The configuration of our full-mesh network with this cyclic-frequency AWG router (AWG-STAR) consists of one cyclic-frequency AWG connected to nodes with specific-wavelength light-transmission and reception modules arranged in the shape of a star. Using this single system enables us to install communication nodes that use operating signals with any protocol or frame by assigning wavelengths based on this principle, even when the signals are analog or when the transmission rates are different. We can also apply this system to a high-speed Internet and various mass network services such as supercomputer connections.

The system has the following additional features. It can raise wire speed between nodes by using WDM. It is capable of multicast connections for cyber-communities. It can be easily upgraded or extended. It can achieve high-speed routing without the limitation imposed by electronic devices, and it is suitable for real-time transmission of live TV broadcasts.

We will develop a wavelength-on-demand/bandwidth-on-demand AWG-STAR with a self-healing system.

(Photonics Laboratories)

Common Digital Data Broadcast and IP Communication System

One of the key features of the digital satellite broadcasting service launched in December 2000 is its ability to broadcast digital data. To ensure a low degree of reliability and offer users the convenience downloading data whenever they want, a carrousel transmission scheme was adopted that partitions data into blocks and repeatedly sends the data. Meanwhile, multimedia satellite communication systems employ an IP transmission scheme and are capable of highly reliable data delivery.

Now a new satellite communications system has been developed based on a digital satellite broadcasting technology that exploits the strengths of both IP and carrousel transmission schemes: IP transmission is used by multimedia satellite systems to provide dependable data delivery, while carrousel transmission is used to support a digital satellite broadcasting service to several million large-scale users that is reliable and has the added convenience of allowing users to download their data anytime they want.

Since the same hardware can support both transmission schemes, the system was largely implemented through software development. A carrousel conversion program was developed for the transmit side that converts data to the carrousel transmission format, while a tuner program was developed for the receive side that enables PCs to handle both transmission schemes.

In addition, the carrousel conversion program that was developed in implementing this system was also used to construct a contents verification system that can be applied to affordable digital satellite broadcasting. NTT Group have all expressed interest in adopting this new system.

Upcoming work will focus on developing and deploying new services that exploit the features and advantages of both the IP and carrousel transmission schemes.

(Service Integration Laboratories)