SONET Multiplexing

The multiplexing principles of SONET are:

- **Mapping –** A process used when tributaries are adapted into Virtual Tributaries (VTs) by adding justification bits and Path Overhead (POH) information.
- **Aligning –** This process takes place when a pointer is included in the STS Path or VT Path Overhead, to allow the first byte of the Virtual Tributary to be located.
- **Multiplexing –** This process is used when multiple lower-order path-layer signals are adapted into a higher-order path signal, or when the higher-order path signals are adapted into the Line Overhead.
- **Stuffing –** SONET has the ability to handle various input tributary rates from asynchronous signals. As the tributary signals are multiplexed and aligned, some spare capacity has been designed into the SONET frame to provide enough space for all these various tributary rates. Therefore, at certain points in the multiplexing hierarchy this space capacity is filled with "fixed stuffing" bits that carry no information, but are required to fill up the particular frame.

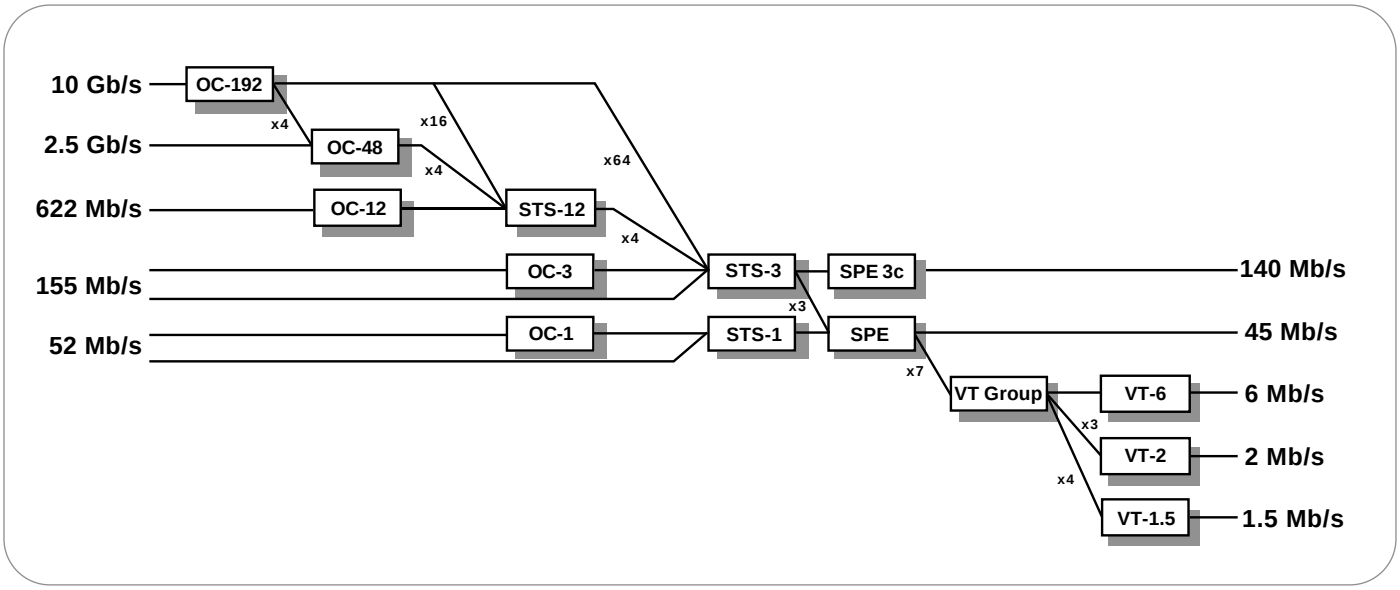
One of the benefits of SONET is that it can carry large payloads (above 50 Mb/s). However, the existing digital hierarchy signals can be accommodated as well, thus protecting investments in current equipment.

To achieve this capability, the STS Synchronous Payload Envelope can be sub-divided into smaller components or structures, known as Virtual Tributaries (VTs), for the purpose of transporting and switching payloads smaller than the STS-1 rate. All services below DS3 rate are transported in the VT structure.

Figure 18 illustrates the basic multiplexing structure of SONET. Any type of service, ranging from voice to high-speed data and video, can be accepted by various types of service adapters. A service adapter maps the signal into the payload envelope of the STS-1 or virtual tributary (VT). New services and signals can be transported by adding new service adapters at the edge of the SONET network.

Except for concatenated signals, all inputs are eventually converted to a base format of a synchronous STS-1 signal (51.84 Mb/s or higher). Lower speed inputs such as DS1s are first bit- or byte-multiplexed into virtual tributaries. Several synchronous STS-1s are then multiplexed together in either a single- or two-stage process to form an electrical STS-N signal (N = 1 or more).

STS multiplexing is performed at the Byte Interleave Synchronous Multiplexer. Basically, the bytes are interleaved together in a format such that the low-speed signals are visible. No additional signal processing occurs except a direct conversion from electrical to optical to form an OC-N signal.



▶ ***Figure 18.*** *SONET multiplexing hierarchy.*