CHAPTER 2

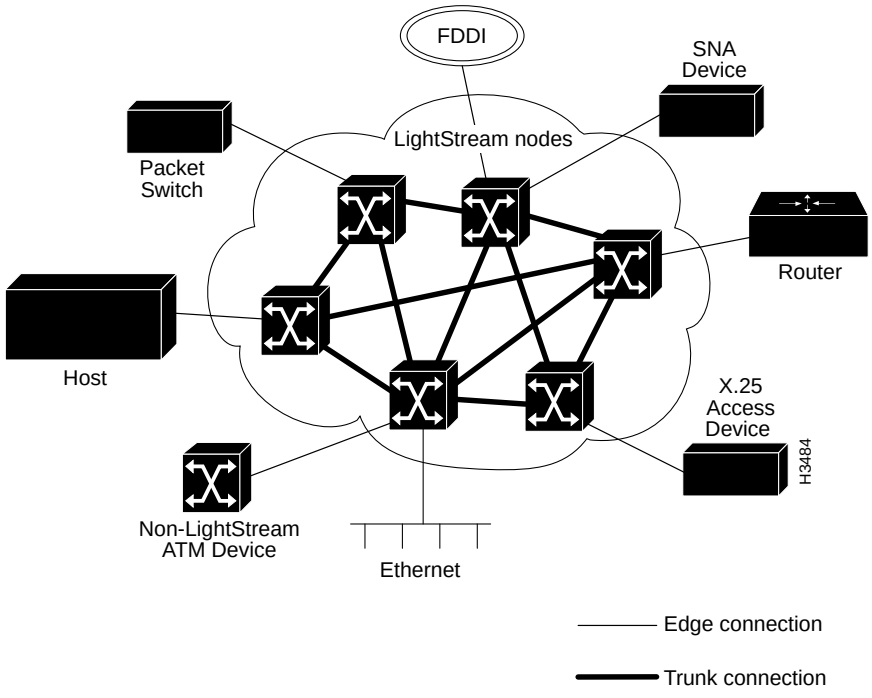
Configuration Basics

This chapter begins with a brief description of a network of LightStream 2020 multiservice ATM switches (LS2020 switches). It then discusses configurable objects in the order that you encounter them as you configure an LS2020 node. For instance, it describes chassis and line cards first because you must configure them before you can configure ports on the line card. It then describes configuration items (such as PVCs and bridging) that can be defined only after ports have been configured.

Network Overview

LS2020 switches are connected to one another by trunk connections. Edge connections link LS2020 nodes to devices outside the LS2020 network backbone (see Figure 2-1).

Figure 2-1 An LS2020 Network



For edge connections, the LS2020 switch provides

- Frame forwarding
- Frame relay
- ATM UNI (on DS-3 and OC-3c links)
- Constant bit rate (CEMAC)
- Transparent and translation bridging for Ethernet and FDDI LANs

For trunk connections, the LS2020 switch provides

- T1 trunk
- Low-speed trunk
- T3 or E3 (2, 4, or 8 ports)
- OC-3c (multimode or single mode)

Physical Components

This section describes only the physical components of an LS2020 switch that have configurable attributes. For a description of all switch components see the *LightStream 2020 Hardware Reference and Troubleshooting Guide*.

Chassis

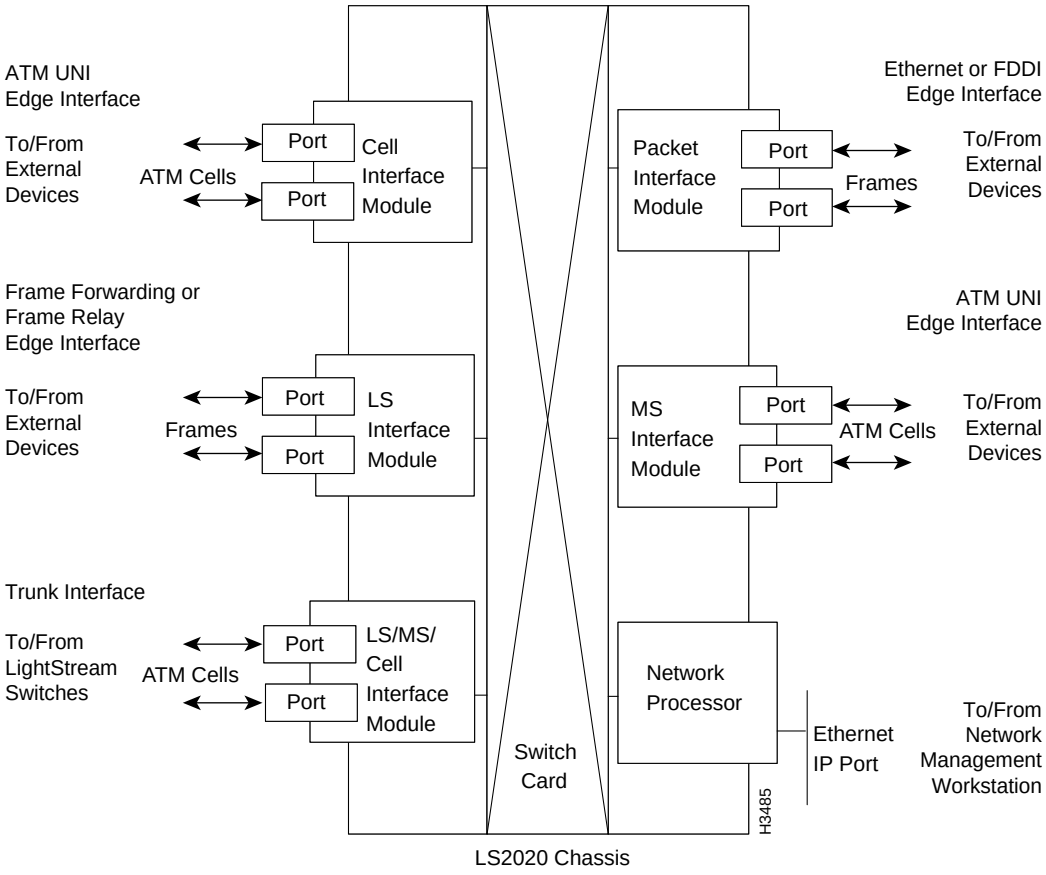
The chassis is the basic configurable unit. Attributes associated with the chassis include chassis ID number, name, physical location, and line cards.

Each LS2020 chassis contains

- One active network processor (NP)
- A set of interface modules (each interface module consisting of a line card and an appropriate access card)
- One active switch card that connects the line cards to each other and to the NP

Backup NP and switch cards may also be present. Figure 2-2 shows a logical block diagram of these components. Each component is described in one of the following sections.

Figure 2-2 Logical Diagram of an LS2020 Node



Network Processor Cards

The NP is the principal computational and storage device in an LS2020 node. Each node has one or two NPs. In a system with two NPs, one is primary (active) and the other is secondary (backup). The secondary NP automatically becomes active if the primary NP fails. One NP occupies slot 1, and the other, if present, occupies slot 2. Each NP is connected to a floppy disk drive (for loading software such as LS2020 application programs) and to a hard disk (for storage of the applications, configuration, and other data).

Configuration attributes associated with an NP include IP addresses and SNMP agent attributes.

Interface Modules

An interface module includes a line card and an access card, which work together to transfer data. A line card provides higher layer data transfer functions. An access card provides the active logic for the physical layer interface for each port (line drivers/receivers, etc.). Each line card, therefore, is associated with an access card that determines the physical layer interface supported for its ports, such as OC-3c, T3, or EIA/TIA-449. In most cases, various access cards are available for each line card.

Note EIA/TIA-232 and EIA/TIA-449 were known as recommended standards RS-232 and RS-449 before their acceptance as standards by the Electronic Industries Association (EIA) and Telecommunications Industry Association (TIA).

Table 2-1 shows currently available line cards and their associated access cards.

Table 2-1 Available Interface Modules

Line Card	Access Card	Number of Ports
Low-speed line card (LSC)	Low-speed access card (LSAC)	8
Medium-speed line card (MSC)	T3 medium speed access card (T3 MSAC)	2
	E3 medium speed access card (E3 PLCP MSAC)	2
	E3 medium speed access card (E3 G.804 MSAC)	2
Cell line card (CLC)	OC-3c single-mode access card (OC3AC SM)	1 or 2
	OC-3c multimode mode access card (OC3AC MM)	1 or 2
	T3 access card (T3AC)	4 or 8
	E3 access card (E3AC)	4
Packet line card (PLC)	FDDI access card (FAC)	2
	Ethernet access card (EAC)	8
	Fiber Ethernet access card (FEAC)	8
	T1 Circuit emulation access card (CEMAC)	8
	E1 Circuit emulation access card (CEMAC)	8
	Serial access card (SAC)	8

Most interface modules can operate as either edge or trunk modules. (The exceptions are the FDDI, Ethernet, fiber Ethernet, and CEMAC modules, which can operate only as edge modules.) Edge modules help transfer data between the LS2020 switch and external devices. Trunk modules help transfer data between LS2020 switches.

Settings in the switch's local configuration database, which are read at power-up, determine whether an interface module operates as a trunk or an edge. The configuration dictates the firmware and software to be used; the hardware is identical, whether the module is used as a trunk or as an edge.

Table 2-2 shows the services and physical layer interfaces that the edge modules support. Table 2-3 shows the services and physical layer interfaces that the trunk modules support.

Configurable attributes at the card level are name and type. After you specify these attributes, the configurator allows you to configure port-level attributes for the individual ports.

Table 2-2 Edge Module Services

Edge Module	Service	Physical Layer Interface
LSC with LSAC	Frame relay or frame forwarding	EIA/TIA-449, V.35, X.21, T1, E1[1]
MSC with MSAC CLC with T3AC—4 or 8 port	ATM UNI	T3
MSC with MSAC CLC with E3AC—4 port		E3
CLC with OC3AC SM—1 or 2 port CLC with OC3AC MM—1 or 2 port		OC-3c
PLC with FAC	FDDI	MIC Multimode Dual attach station
PLC with EAC	Ethernet	AUI, 10BaseT
PLC with FEAC	Fiber Ethernet	10BaseFL (FOIRL)
PLC with CEMAC	Clear channel	T1 E1
PLC with SAC	Frame relay or frame forwarding	EIA/TIA-449, V.35, X.21, T1, E1[1]

1. T1 and E1 interfaces may require external DSU/CSUs.

Table 2-3 Trunk Module Services

Trunk Module	Service	Physical Layer Interface
LSC with LSAC	Low-speed trunk	T1, E1[1]
MSC with MSAC CLC with T3AC—4 port	Medium-speed trunk	T3
MSC with MSAC CLC with E3AC—4 port		E3
CLC with OC3AC SM—1 port CLC with OC3AC MM—1 port		OC-3c
PLC with SAC	Serial trunk	T1, E1[1]

1. T1 and E1 interfaces may require external DSU/CSUs.

Virtual Channel Connections

Virtual channel connections (VCCs) connect source and destination hosts across an LS2020 network. Each VCC is associated with a software-selected route through the network. Route definition is based on the service requirements of the VCC. All traffic associated with that VCC follows the same route.

A frame relay or ATM UNI source host can be connected to multiple destination hosts and can have multiple connections with the same destination host. Similarly, an FDDI or Ethernet source can have multiple connections to one or more LAN hosts. However, a frame forwarding host can have only

one connection to another device. The frame forwarding service provides a virtual wire between the two end systems. Each of the connections mentioned here has a separate VCC in each direction: from Node A to Node B and from Node B to Node A.

The LS2020 node establishes VCCs in either of two ways—by provisioning or by implicit setup. These methods are described in the following subsections.

Provisioning

You must provision for VCCs for the following line cards when the cards are configured as edge connections:

- LSC
- MSC
- CLC
- PLC (SAC interfaces only)

Provisioning requires that you define the endpoints of VCCs by configuring them manually through the PVC configurator. All VCCs set up in this way are permanent virtual circuits (PVCs). They are considered permanent for four reasons:

- They are created through a network management action.
- They are automatically created as soon as the resources for the path through the network exist.
- They remain in existence until some resource in the path goes down or until they are expressly deleted through a network management action.
- If a resource goes down, they are re-established by software as soon as possible.

You can provision for a PVC before the network is brought online or while the network is operating. When you provision for a PVC, you specify the ports where it begins and ends. You also set a number of VCC attributes:

- Virtual channel identifiers (VCIs)
- Data link connection identifiers (DLCIs)—used for frame relay circuits only
- Bandwidth allocation attributes, such as insured and maximum data rates

The PVC configurator allows you to configure PVC attributes for both ends of the PVC at the same time.

Implicit Setup

The PLC uses implicit VCC setup for LAN traffic. Implicit setup occurs when the PLC determines that a VCC with the desired characteristics does not exist between two endpoints. When this happens, the PLC works with the NP to establish a VCC to the destination and then routes the data across it. Although you do not provision for this type of VCC, you still need to configure the PLC and its port-level attributes. For other kinds of traffic, you must provision for PVCs.

VCCs that are set up implicitly on the PLC are not considered permanent for two reasons:

- They are created as needed—that is, when traffic for the VCC is received.
- They are removed by software if they are not used for a specified period of time.

For traffic on PLC serial interfaces, you must provision VCCs using the PVC configurator.

Bridging

The LS2020 switch operates as a fully compliant IEEE 802.1d-1990 bridge. The switch supports translation and transparent bridging for Ethernet-to-FDDI, Ethernet-to-Ethernet, and FDDI-to-FDDI connections. The PLC and associated access cards provide interfaces to FDDI and Ethernet LANs.

Using the node configurator (CFG), you can configure spanning tree bridge and static bridge filtering attributes for each LS2020 node.

VirtualStream Virtual LAN Internetworking

If you purchased the VirtualStream software option for an LS2020 network handling LAN traffic, you can use the virtual LAN internetworking (VLI) services to separate network management, administration, performance, and scalability from the physical aspects of the network. Through VirtualStream, the LS2020 switch allows you to partition network devices according to the problem you are trying to solve.

There are four configurable VirtualStream services for handling LAN traffic:

- Workgroups provide access control and are used when organizations require administrative subdivision of their members into distinct communities of interest. These communities of interest, the workgroups, use restricted access rights to provide privacy for their members. The workgroup also limits the effect of organization-specific activity, so that members of other workgroups are not affected. You configure workgroups using the VLI configurator.
- Application-Specific Quality of Service (AS/QoS) traffic profiles let you define ATM types of service for LAN flows. You configure traffic profiles using the CFG configurator.
- The High Performance Multicast Service (HPMS), also called multicast groups, lets you use ATM point-to-multipoint virtual circuits for wire-speed delivery of multicast traffic to arbitrary and geographically distributed groups of LAN ports. You configure multicast groups using the CFG configurator.
- Custom filters let you use Boolean expressions to tag LAN flows to block, forward, or associate traffic with multicast groups and traffic profiles. Header fields that can be used in filters include MAC layer, TCP/IP, and IPX. You configure custom filters using the CFG configurator.

The VirtualStream services work with one another and with the bridging software to control LAN traffic, as shown in Figure 2-3. LAN traffic can be affected by one or more VirtualStream services, or it may use the bridging service only.

Figure 2-3 Bridging and VirtualStream Services Handle LAN Traffic