CHAPTER 1

Introduction

This chapter provides an overview of the Media Server and other functional subsystems in the Controller system.

The Controller subsystems are described in the following sections.

Controller Subsystems

The Controller platform includes the following subsystems:

- Application Server—runs the messaging applications.
- Media Server—provides Time Division Multiplexing (TDM) and Real time Transport Protocol (RTP) media transport (streaming).
- Call Control Gateway—processes SS7, SMDI, and SIP signaling.
- Database Server—runs a standard Relational DBMS (RDBMS) engine to perform database transactions. The data is stored in the NAS Server.
- Directory Server—provides LDAP Directory Server functions.
- VPIM/UMP Gateway—provides the gateway function between Controller and an external messaging platform for VPIM, and between the Controller and an external E-mail server for UMP.

- OMAP Server—performs tasks related to Operation, Maintenance, Administration, and Provisioning of the Controller.
- NAS Server (hardware and software)—provides secured storage space for Controller applications.

Most subsystems require a dedicated processor card. This is dictated by the capacity and performance requirements of the system. Each subsystem can be scaled up or down to meet varying requirements.

Figure 1-1 shows the overall Controller software architecture.

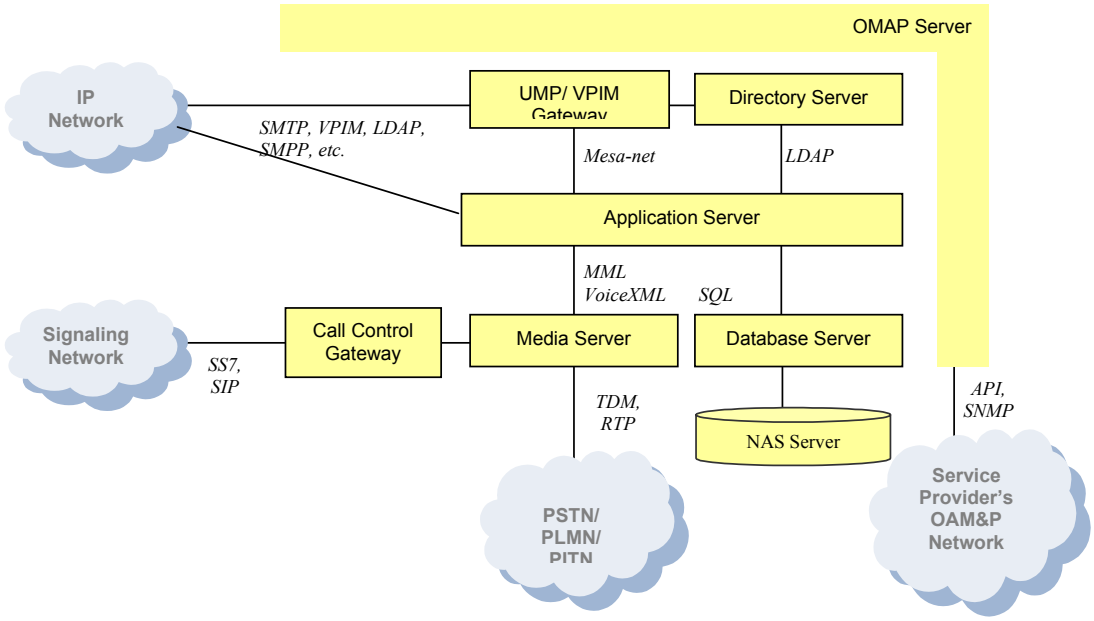

Figure 1-1 Controller Software Subsystem Architecture

The Controller software subsystems are described in the following sections.

Application Server

The Application Server runs the messaging applications, such as VoiceRecord, FaxSend, and MWI, on the Controller. It is the main control point of the system. The Application Server coordinates the functions of the Media Server, Database Server, VPIM/UMP Gateway, Directory Server, and so on.

For example, the Application Server controls the Media Server to process all of the media connections, such as the TDM lines to the PSTN/PLMN switches and RTP connections to the destination Session Initiation Protocol (SIP) user agent.

Media Server

The Media Server is dedicated to real-time processing of high volume media traffic.

The Media Server provides the network interface and media processing capability for the Controller. The Media Server provides both PSTN network connectivity (T1/E1 interface) and IP network connectivity (10/100Base-T Ethernet interface). PSTN protocols supported include both channel associated signaling and common channel signaling. Channel Associated Signaling (Wink Start, Loop Start, Ground Start, DID, Feature Group D (FGD), and MFC R2) is supported directly on the Media Server. FGD signaling is derived from Wink Start signaling. The Media Server connects to one or more Call Control Gateways to provide Signaling System 7 (SS7), Simplified Message Desk Interface (SMDI), and Session Initiation Protocol (SIP) connectivity.

The Media Server controls Time Division Multiplexing (TDM) channels on the E1/T1 telephony interface, and Real time Transport Protocol (RTP) ports on the Ethernet connections. It provides the Digital Signal Processing (DSP) resources for media processing, such as DTMF/tone detection and generation, record, playback, and encoding. It also processes the Channel Associated Signaling (CAS), also known as In-band signaling, on T1 and E1 connections.

The Media Server supports monitoring, error logging, and FAX delivery and retrieval. The Media Server also processes meta-data to play the prompts, which are physically located in the NAS Server.

For a small system, there can be up to four hosts in a system, each supporting up to four T1/E1 spans. The entire Media Server cluster can support up to 16 T1/E1 spans (480 E1 ports maximum).

A large system can support 240 ports (10 T1 or 8 E1) per Media Server, up to a maximum of twelve hosts (2880 ports maximum).

Redundancy

Multiple Media Servers in a network function as a single network element. A single point code can be used for all Media Servers in a system. Also, a single trunk group can be used for all Media Servers in a system.

Each Media Server operates independently. If one Media Server experiences failure, the ports served by that Media Server become inoperable. However, other Media Servers in the system remain fully operational.

Figure 1-2 shows an example of a Media Server and its components.

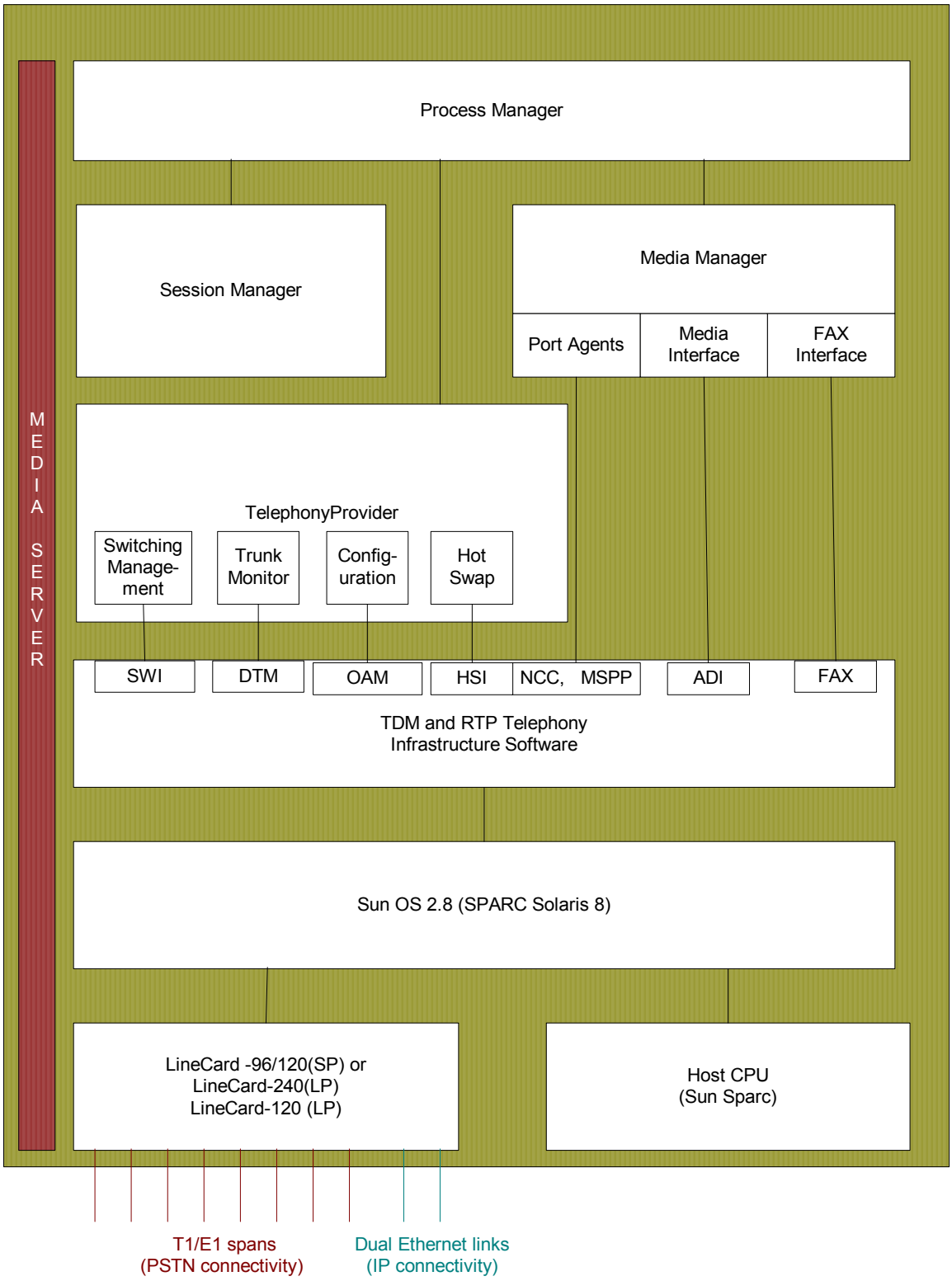

Figure 1-2 Media Server Components

Media Server Call Handling

This section describes how the Media Server handles inbound and outbound calls.

Inbound Call Handling The Media Server first checks the circuit group of the new calls, and then identifies the Application Servers associated with the circuit group.

The mapping software, which resides in the Media Server, selects an Application Server suitable for the call.

After selecting the Application Server, the Media Server routes the call. This load balancing of inbound calls distributes the calls evenly among the Application Servers.

Inbound Call Scenario Example

A sample inbound call scenario is illustrated in Figure 1-3 and summarized below in the order of the sequence of events.

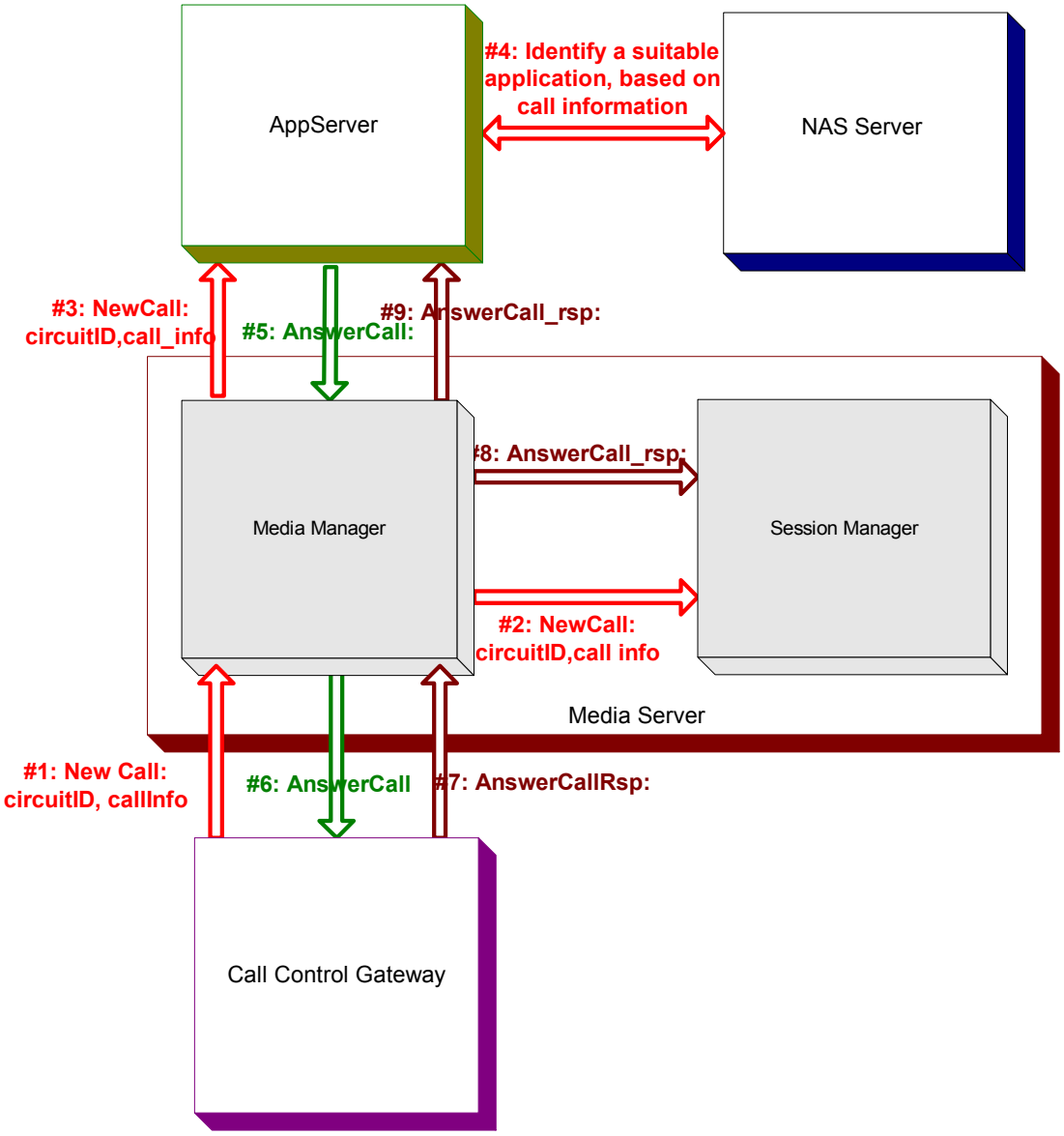

Figure 1-3 Example Inbound Call Scenario

- The Media Manager detects an incoming call (#1: `NewCall:circuitID`, call info.).
- The Media Manager informs the Session Manager of the new inbound call and forwards the call information. The Session Manager updates the circuit status and activates the circuit (#2: `NewCall:` circuitID, call info.).

- The Media Manager sends a NewCall event, along with the call information, to the Application Server (#3: `NewCall:` circuitID,call info.).

- The Application Server verifies the call details and routes the call to a suitable application instance (#4:Identify a suitable application based on call information).

- The application requests the Media Server to answer the call (#5: `AnswerCall`).

- The Media Manager answers the call (or makes a request to the Call Control Gateway for SS7/SIP circuits to answer the call) (#6: `AnswerCall`).

- When the call is answered, the Media Manager receives a notification (from the Call Control Gateway for SIP/SS7 calls) (#7: `AnswerCallRsp:`).

- The Media Manager sends the response to the Session Manager (#8: `AnswerCall_rsp`).

- The Media Manager sends the response to the Application Server (#9: `AnswerCall_rsp`).

Outbound Call Handling The Application Server is responsible for the load balancing of outbound calls. The Media Server supports cross-chassis (cross-host) MVIP/H.110 switching for bridging applications.

Multi-host switching is not currently supported. For EasyAnswer/Transfer to Attendant features, make sure you have configured outbound/bidirectional circuits for each Media Server host.

For normal outdial applications, such as message delivery, in-band MWI, and so forth, the Application Server selects the Media Server for outbound call placement.

However, if the selected Media Server does not have outbound circuits, it rejects the outbound request with an ALL_CIRCUITS_BUSY error. The Application Server then selects another available Media Server to continue the outbound call.

The Media Server supports configurable hunt sequences for outdial circuits. This can be set individually for each circuit group, depending on user requirements.

Outbound Call Scenario Example

A sample outbound call scenario is illustrated in Figure 1-4 and summarized below in the order of the sequence of events.

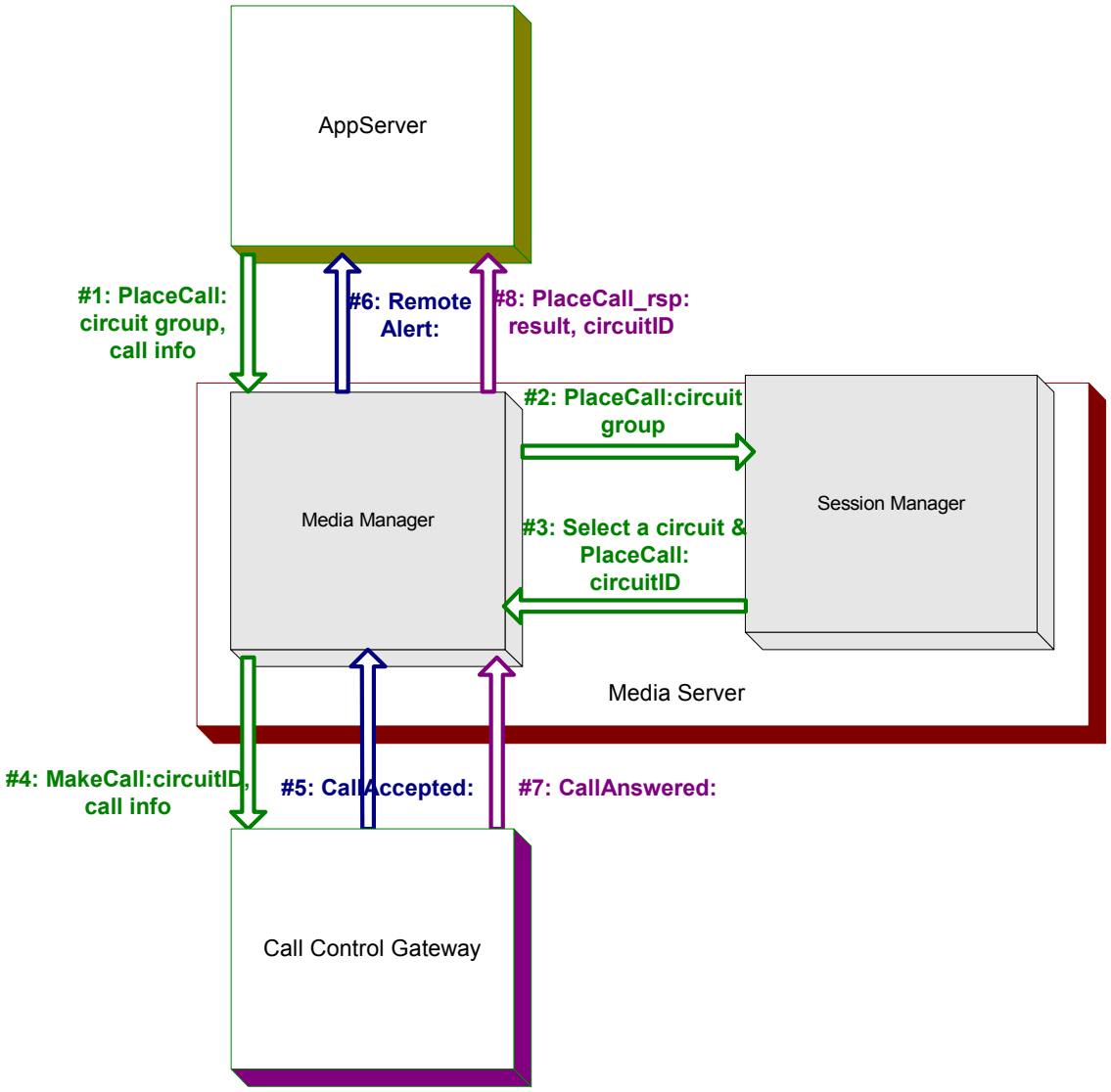

Figure 1-4 Example Outbound Call Scenario

- The Application Server requests the Media Manager to place a call (provides circuit group and call details) (#1: `PlaceCall:` circuit group, call info.).

- The Media Manager requests the Session Manager to select a circuit (#2: `PlaceCall:` circuit group).

- The Session Manager selects a port suitable for out-dial application. An out-dial circuit is selected from a circuit group, based on any of the configured circuit selection algorithms for that group. The application can specify the circuit group. If the application does not specify a group, the Session Manager selects a circuit from the default out-dial group (configurable). The Session Manager responds back to the Media Manager with the ID of the circuit selected (#3: Select a circuit and `PlaceCall:circuitID`).

- The Media Manager issues the out-dial request and routes the request to the appropriate Call Control Gateway for SS7/SIP circuits (#4: `MakeCall:circuitID`, call info.).

- The Media Manager receives notification that the call is accepted (from the Call Control Gateway for SIP/SS7 circuits) (#5: `CallAccepted`).

- The Media Manager sends a `RemoteAlert` event to the Application Server (#6: `RemoteAlert:`).

- The Media Manager receives notification from the line that the call is answered (from the Call Control Gateway for SIP/SS7 circuits) (#7: `CallAnswered:`).

- The Media Manager returns a `PlaceCall` response to the Application Server (#8: `PlaceCall_rsp:` result, circuitID).

Call Control Gateway

The Call Control Gateway processes all SS7, SDMI, and SIP signaling. It interacts with the switches and/or Signaling Transfer Points (STP) in the PSTN/PLMN on SS7 SCCP/TCAP and ISUP signaling protocols.

The Call Control Gateway also inter-operates with the SIP proxy/redirect servers in the SIP network. It serves as a Signaling End Point (SEP) in the SS7 network and a User Agent (UA) in the SIP network.

Database Server

The Database Server is a relational Database Management System (RDBMS) engine. It provides a standard Structured Query Language (SQL) interface to the Application Server for various database transactions.

In addition to voice and FAX messages, the Database Server stores and processes configuration data, including mailbox profile records and meta-data for

prompts. In a small system, this subsystem is usually configured to run on the same processor as the Application Server.

Data is stored in the NAS Server.

Directory Server

The Directory Server provides the directory server functions to Controller applications based on the industry standard Lightweight Directory Access Protocol (LDAP).

Information required for inter-system messaging or interoperability, such as the UMP, VPIM, EAW, and MMP applications, is stored and maintained in the format defined by SS8 Networks' LDAP schema, which enables backward compatibility. One Directory Server can support multiple Controllers.

VPIM/UMP Gateway

The VPIM/UMP Gateway provides gateway functions for UMP and VPIM applications, such as exchanging messages with external e-mail servers and transcoding different audio formats. One VPIM/UMP Gateway can be shared by more than one Controller.

OMAP Server

The OMAP Server processes all Operation, Administration, Maintenance, and Provisioning (OAM&P) tasks on the system. It communicates with each subsystem of the Controller, and several external network entities, such as the billing system, provisioning system, and network management system.

The OMAP Server also provides the administrative interface for the following services:

- Alarming—Allows applications to generate alarm messages and notify system administrators when immediate action is required. This is done through SNMP traps.
- Error Logging—Allows applications to log important events and errors for troubleshooting and maintenance.
- Tracing—Allows ad-hoc troubleshooting.
- Process Management—Allows the system to maintain proper process states and helps simplify startup and shutdown processes.

- Clustering Support—Allows the system to share information among distributed CPUs (Inter Processor Communication (IPC), shared memory, and so on).

- Security management—Provides maximum protection to the system without sacrificing performance.