Network Overview

Background—Traditional PSTN Equipment

Traditional telephone services are engineered and offered over the public switched telephone network (PSTN) via plain old telephone service (POTS) equipment at customer premises. The PSTN is managed and owned by telephony service providers using Class 5 central office (CO) switches and Class 4 tandem switches to provide basic subscriber services, as well as some enhanced service features. The overall network consists of the following switches:

- Class 5 switches, providing individual subscriber interfaces
- Class 4 access tandem switches, providing interoffice trunk interfaces
- Class 4 end office switches for long distance services

Long distance service providers connect to local service providers via specific equal-access interfaces. Signaling between offices is based on one of the following methods:

- In-band multifrequency (MF) signaling
- Signaling System 7 (SS7), common channel signaling (CCS) standard

The majority of PSTN equipment today transports SS7 signaling. An example of a traditional local carrier PSTN network is shown in Figure 1-1.
Voice Over Packet Gateways

Class 5 CO switching equipment is designed around a PSTN switch fabric, and equipped with subscriber interfaces such as:

- Analog copper loops
- ISDN interfaces
- Digital loop carrier (DLC)

A Class 5 end office provides call processing as well as enhanced voice service features. A Class 4 tandem office provides basic call control and interoffice signaling, typically SS7.

Voice Over Packet Gateways

Traditional data services are offered over dedicated packet networks, separate from the PSTN-based voice networks. Packet networks are based on IP routers, ATM switches and frame relay switches. These data networks have grown quickly to support the increasing demand for data transmission. Systems have been put in place to transport voice and associated call signaling over the data network using tunneling methods.

A large number of gateway types—for example, H.323 VoIP gateways and gatekeepers—have been developed and deployed over packet networks such as IP/ATM networks. (See Figure 1-2.)
Packet/PSTN Network Convergence

As an alternative to maintaining two different types of networks (PSTN for voice, and packet networks for data), the solution is to bring PSTN-parity voice functionality to the data networks. These next-generation networks are based on the following requirements:

- Provide PSTN-parity voice services
- Seamlessly integrate with Web content
- Permit the end user to configure and customize services in a flexible manner via Web access

Neither traditional PSTN equipment nor the current VoIP gateway systems offer these integrated voice/data services.

Cisco BTS 10200 Softswitch In the Packet Network

Telecommunications innovations have resulted in a migration from voice telephony to packet-based networks. Cisco Open Packet Telephony (OPT) helps service providers support the requirements of both the traditional and new markets, as well as deliver new services. The Cisco BTS 10200 supports the use of OPT technology to deploy PSTN-parity voice functionality on the network. The Cisco BTS 10200 provides next-generation integrated voice and data switching solutions for packet networks. It is a standards-based solution that provides advanced call control and service intelligence to both telephony and packet networks.

The Cisco BTS 10200 provides the major functions performed by traditional Class 4 and Class 5 switching systems. Class 4 and 5 switches are large systems whose functionality can be partitioned into two main areas, each with several subsystems:

- Bearer path for ingress (entry into) and egress (exit from) the network
  - Ingress I/O subsystem
  - Egress I/O subsystem
- Switching control
  - TDM switching fabric and call processing engine
  - Signaling system interface
  - Operations Support System (OSS) interface

In the Class 4 and 5 systems, the call processing engine interfaces with the other subsystems as follows:
Cisco BTS 10200 Functions

The Cisco BTS 10200 provides the following functions:

- Call control intelligence for establishing, maintaining, routing and terminating voice calls through the IP or ATM network via media gateways, while seamlessly operating with circuit-switched networks
- PSTN-parity routing mechanisms for voice calls including local access and transport area (LATA), interLATA, international, operator services, and emergency services routing
- Call processing, subscriber services and features, billing support and carrier class availability/reliability for subscribers and trunks connected to media gateways
- Key voice handling features, such as call waiting, call holding, call transferring, multiline hunting and caller identification
- Traffic measurements, such as call-completion counters, resource status and congestion information
- Event reports, including user provisioning of report filters
- Redundant hardware and software fail-safes to provide reliable and outage-free operation
- PSTN and intelligent network features for IP or ATM network subscribers
- Control of announcement servers
- Communication with existing OSS and network management systems (NMS) to support fault, configuration, accounting, performance, and security (FCAPS) functions
- SS7 signaling, and interoperability with legacy PSTN equipment
- Interoperability with PBX equipment via ISDN-PRI and CAS protocols
- Generation of triggers allows service providers to offer enhanced services using external service platforms (consistent with the ITU CS-2 call model)
- Enhanced Centrex services (virtual office) for business subscribers, including telecommuters and mobile workers
- Dial offload—Dial offload involves intercepting Internet traffic at inbound Class 5 locations and carrying this traffic over the packet network (instead of the PSTN) to the Internet service providers (ISP).
- Call control functions for the H.323-based gateways and end points

Note

The H323 feature flag is set to off in this release.
• Call control functions for tandem applications
• Call control functions for SIP-enabled networks

Call Types Supported

The Cisco BTS 10200 supports the following types of calls:

- PSTN-to-PSTN Network calls—The Cisco BTS 10200 supports PSTN-to-PSTN network calls in conjuction with PSTN media gateways. A PSTN-to-PSTN call originates and terminates within a PSTN network without converting to a packet network. These are called PSTN-on-net calls.

- PSTN-to-Packet Network calls—The Cisco BTS 10200 supports PSTN-to-packet calls, which are calls that originate on a PSTN network and terminate on a packet network. These are often called off-net calls.

- Packet-to-PSTN Network calls—The Cisco BTS 10200 supports packet-to-PSTN calls. A packet-to-PSTN call is one that originates on a packet network and terminates on a PSTN network. These are called off-net calls.

- Packet-to-Packet calls—The Cisco BTS 10200 supports packet-to-packet calls. An IP-to-IP call is one that originates on an IP Network and terminates on an IP network. These are called IP-on-net calls. An ATM-to-ATM call (ATM-on-net call) originates and terminates on an ATM network.

- PSTN to Packet to PSTN calls—The Cisco BTS 10200 supports PSTN to packet to PSTN calls. This call originates on an ingress PSTN circuit and travels over a packet network to terminate on an egress PSTN port.

- MGCP-H.323 bridge—Long distance traffic is bridged directly between MGCP and H.323 networks. There is no need for H.323 call signaling data to be terminated at adjacent media gateways before converting them to MGCP messages or other signaling protocols.

Note

The H323 feature flag is set to off in this release.

- MGCP-SIP bridge—Traffic is bridged directly between MGCP and SIP networks. There is no need for SIP call signaling data to be terminated at adjacent media gateways before converting them to MGCP messages or other signaling protocols.

Cisco BTS 10200 Role in the TMN Model

This section describes the role of the Cisco BTS 10200 in the Telecommunications Management Network (TMN) model. Based on the basic ITU-T TMN model, shown in Figure 1-3, the Cisco BTS 10200 is involved in the NE Layer and NE Management Layer.
The role of each TMN layer is described below.

The **Business Management Layer (BML)** contains the following elements:
- Network planning
- Intercarrier agreements
- Strategic planning
- Enterprise-level management

The **Service Management Layer (SML)** contains the following elements:
- Customer interface
- Service provisioning
- Account management
- Customer-complaint management
- Integrated faults, billing, and QoS

The **Network Management Layer (NML)** contains the following elements:
- End-to-end network view
- All data aggregated to the network view
- Physical entity awareness

The **Network Element Management Layer (NEML)** contains the following elements:
- Subnet management
- Element management
- Reduced workload on NML
- Common NEs aggregated in a network

The **Network Element Layer (NEL)** contains the following elements:
- Performance data generation
- Self-diagnostics
- Alarm monitoring and generation
- Protocol conversions
- Billing generation