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HUAWEI

U-SYS SoftX3000 SoftSwitch System
Technical Manual – System Description

V300R003

U-SYS SoftX3000 SoftSwitch System

Technical Manual

Volume	System Description
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About This Manual

Release Notes

The manual applies to U-SYS SoftX3000 SoftSwitch System V300R003.

Related Manuals

The related manuals are listed in the following table.

Manual	Content
U-SYS SoftX3000 SoftSwitch System Technical Manual-System Description	It provides an overall introduction to the SoftX3000, including product features, applications, and technical specifications.
U-SYS SoftX3000 SoftSwitch System Technical Manual-System Principle	It details on the hardware architecture, component interworking mechanism, and subsystems of alarm, billing, and clock in the SoftX3000.
U-SYS SoftX3000 SoftSwitch System Hardware Description Manual	It details the features and technical specifications of the hardware components of the SoftX3000, including cabinets, frames, boards, cables, and cabinet internal components.
U-SYS SoftX3000 SoftSwitch System Technical Manual-Services and Features	It covers various services and functions supported by the SoftX3000, including voice services, supplementary services, IP Centrex services, multi-media services, value added services, dual homing functions, charging functions, IPTN functions, remote network access functions, and so on.
U-SYS SoftX3000 SoftSwitch System Hardware Installation Manual	It details the installation procedure of the SoftX3000 hardware components, and matters needing attention during the installation process.
U-SYS SoftX3000 SoftSwitch System Software Installation Manual	It covers the detailed procedure of installing the SoftX3000 software, including BAM server, emergency workstation, and client, focusing on the key points that might cause installation failure.
U-SYS SoftX3000 SoftSwitch System Routine Maintenance Guide	It guides the maintenance engineers to perform daily maintenance, monthly maintenance, and yearly maintenance tasks on the SoftX3000.

Manual	Content
U-SYS SoftX3000 SoftSwitch System Emergency Maintenance Manual	It guides the maintenance engineers to perform recovery operations in the case of emergencies, such as congestion of global service, AMG, and TMG, and failure of host and BAM.
U-SYS SoftX3000 SoftSwitch System Part Replacement Guide	It guides the maintenance engineers on how to replace hardware components of the SoftX3000, such as boards, fan frame, LAN Switch, and hard disk.
U-SYS SoftX3000 SoftSwitch System Operation Manual-Configuration Guide	It guides the engineers how to configure various data in the SoftX3000, including configuration steps, preparations, database table referencing relationships, and command parameters.
U-SYS SoftX3000 SoftSwitch System Operation Manual-Configuration Examples	It guides the engineers how to configure various data in the SoftX3000, including networking example, configuration script, key parameters and debugging guidance.
U-SYS SoftX3000 SoftSwitch System Operation Manual-Performance Measurement	It guides the engineers how to work on performance measurement tasks and analyze measurement results.
U-SYS SoftX3000 SoftSwitch System Operation Manual-GUI Guide	It guides the engineers how to use the GUI on various clients of the SoftX3000, including operations on menus and navigation tree. In addition, it introduces the operations on TableBrowse.
U-SYS SoftX3000 SoftSwitch System BAM User Manual	It guides the engineers how to install and use the software related to the BAM, including remote maintenance software, anti-virus software, system customized software, and so on.
U-SYS iGateway Bill User Manual	It elaborates on the functioning principle of the iGateway Bill. Also, it teaches you on how to install, maintain, and operate the product.

Organization

This manual introduces the product characteristics, system architecture, interfaces signaling and protocols, OAM system, services and functions, networking and applications, reliability and security design, technical specifications and environmental requirements of SoftX3000.

There are ten chapters in the manual.

- **Chapter 1 System Introduction** profiles the trends and importance of evolution of SoftX3000, a packet-based Next Generation Network from traditional circuit-based telecom network.
- **Chapter 2 System Architecture** introduces both the hardware structure and the software structure of SoftX3000.
- **Chapter 3 Interfaces, Signaling and Protocols** presents the various physical interfaces and signaling and protocols utilized in SoftX3000.
- **Chapter 4 OAM System** details the operation administration and maintenance system of SoftX3000 in the aspects of functions, man-machine language, terminal system, network management, and charging.
- **Chapter 5 Services and Functions** provides more information about the services and functions that are currently implemented in SoftX3000.
- **Chapter 6 Networking and Applications** focuses on the system networking and typical applications of SoftX3000.
- **Chapter 7 Reliability and Security Design** presents the reliability measures and security design of SoftX3000.
- **Chapter 8 Technical Specifications and Environmental Requirements** lists the technical specifications and environmental requirements of the system – SoftX3000 taking into account the actual conditions of Huawei-developed system.
- **Chapter 9 Compliant Recommendations and Standards** lists the ITU-T Recommendations and IETF Standards that the product complies with.
- **Chapter 10 Acronyms and Abbreviations** collects the definitions of terms and acronyms that are used in this manual.

Intended Readers

The manual is intended for the following readers:

- NGN network planning experts
- NGN network administrators
- NGN system engineers

Conventions

The manual uses the following conventions:

I. General conventions

Convention	Description
Arial	Normal paragraphs are in Arial.
Boldface	Headings are in Boldface .

Convention	Description
Courier New	Terminal Display is in Courier New.

II. Mouse operation

Action	Description
Select	Press and hold the primary mouse button (left mouse button by default).
Click	Select and release the primary mouse button without moving the pointer.
Double-Click	Press the primary mouse button twice continuously and quickly without moving the pointer.
Drag	Press and hold the primary mouse button and move the pointer to a certain position.

III. Symbols

Eye-catching symbols are also used in the manual to highlight the points worthy of special attention during the operation. They are defined as follows:



Caution: Means reader be extremely careful during the operation.



Note: Means a complementary description.

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Chapter 1 System Introduction

1.1 Introduction to U-SYS Solution

Developed by Huawei Technologies Co., Ltd., U-SYS SoftX3000 SoftSwitch System (hereinafter referred to as SoftX3000) adopts advanced software and hardware technologies and owns abundant service provisioning capabilities and powerful networking capabilities. The U-SYS solution is used in the network control layer of the next generation network (NGN). In addition, if cooperating with the UMG8900, the SoftX3000 can be used as circuit switch equipment (C&C08 EV) or video interworking gateway equipment (VIG8920).

1.1.1 Overview of U-SYS Solution

NGN is a service-driven network, which realizes a relatively independent service system by separating service from call control, as well as call control from bearer, thus enabling service independent of network. NGN employs open and integrated network architecture.

With abundant service provisioning capabilities, NGN is able to provide a variety of services, such as voice, data and multimedia services, or integrated services. Depending on the U-SYS solution proposed by Huawei, NGN comprises four planes, namely edge access, core switching, network control and service management. The network architecture is shown in Figure 1-1.

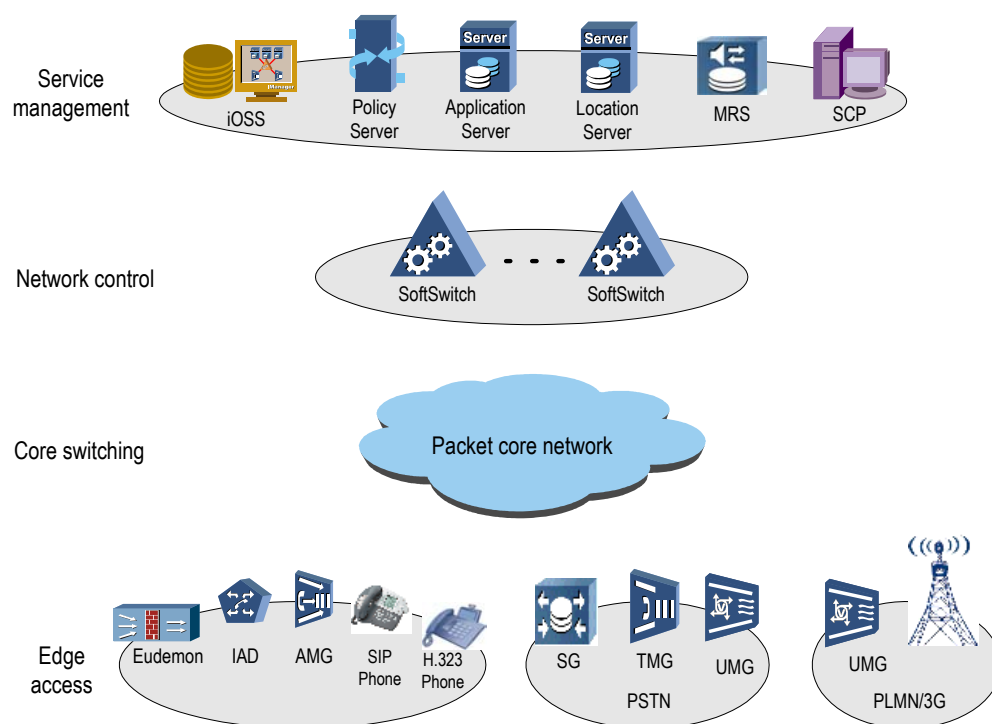


Figure 1-1 U-SYS solution proposed by Huawei

1.1.2 Network Components

I. Edge Access Layer

Edge access layer is used to connect subscribers and terminals to the network by a variety of means and convert the original information format to the suitable one that can be transferred over the network.

- Integrated Access Device (IAD) : It is a type of subscriber access device used in the NGN architecture. It introduces data, audio, video and other services of the subscribers to the packet-based network. Each IAD provides a maximum of 48 subscriber ports.
- Access Media Gateway (AMG) : It provides subscribers with a diversity of service access, such as analog subscriber access, Integrated Services Digital Network (ISDN) access, V5 access and x Digital Subscriber Line (xDSL) access.
- SIP Phone: It is a type of multimedia terminal device supporting the Session Initiation Protocol (SIP).
- H.323 Phone: It is a type of multimedia terminal device supporting the H.323 protocol.
- Eudemon: It is an IP gateway developed by Huawei, which is generally deployed at the portal of residential network and enterprise network, or at the convergence layer of metropolitan area network (MAN). Eudemon can be used as a

state-inspection firewall, or as a gateway which provides traversal of private network and QoS.

- Signaling Gateway (SG) : It is located at the interface layer of the Signaling System No. 7 network and the Internet Protocol (IP) network, achieving the signaling conversion function between the public switched telephone network (PSTN) and the IP network.
- Trunk Media Gateway (TMG) : It is resident between the circuit switched network and the IP packet switched network. It provides functions of format conversion between pulse code modulation (PCM) signal streams and IP media streams.
- Universal Media Gateway (UMG) : It converts the media stream and signaling between different formats. It can act as a built-in SG or AMG. It can connect a variety of devices including PSTN exchange, private branch exchange (PBX), access network, network access server (NAS) and base station controller (BSC).

II. Core Switching Layer

Core switching layer adopts the packet technology, and is composed of the devices distributed over the backbone network and the MAN, such as router and layer-3 switch. It is used to provide subscribers with a uniform and integrated transmission platform with high reliability, Quality of Service (QoS) assurance and a large capacity.

III. Network Control Layer

Network control layer is responsible for implementing call control. Its core technology is soft switching, which is used to achieve basic real-time call control and connection control functions.

SoftSwitch: As the core equipment of NGN, SoftSwitch mainly implements call control, media gateway access control, resource allocation, protocol processing, routing, authentication, and charging functions, and provides subscribers with basic voice services, mobile services, multimedia services and Application Programming Interfaces (APIs).

IV. Service Management Layer

Service management layer is mainly used to provide supplementary value added services and operation support based on established calls.

- iOSS is the acronym of integrated Operation Support System, which includes two parts: Network Management System (NMS) for managing the NGN network elements in a centralized way, and integrated charging system.
- Policy Server: It is used to manage the policies of the subscribers, such as Access Control List (ACL), bandwidth, traffic, and QoS.
- Application Server: It is responsible for generating and managing logics of various value added services and intelligent network services, and providing innovation

platform for developing third-party services by means of open APIs. As a physically separated component, Application Server is independent of the SoftSwitch equipment resident on the network control layer. This contributes to the separation of service from call control and is beneficial to the introduction of new services.

- Location Server: It is used to dynamically manage the routes between the SoftSwitch equipment in NGN, indicate reachability of the destinations of calls, ensure the best efficiency of the call routing table, prevent the routing table from being oversized and impractical, and abate the complexity of routes.
- Media Resource Server (MRS) : It is used to enable the media processing functions in the basic and enhanced services. The functions include service tone provision, conference service, Interactive Voice Response (IVR), recorded announcement and advanced tone service.
- Service Control Point (SCP) : It is the core component of the traditional Intelligent Network (IN), and is used to store subscriber data and service logics. According to the call events reported by Service Switching Point (SSP), SCP starts an appropriate service logic, retrieves the service database and the subscriber database based on the started service logic, and then sends proper call control instructions to the corresponding SSP to instruct the SSP how to perform next, thus realizing various intelligent calls. That is the main function of SCP.

1.1.3 Major Technical Features

I. Open and Distributed Network Architecture

NGN has an open and distributed network architecture where service is separated from call control and call control is separated from bearer. Thus service is independent of network. Through open protocols and interfaces, a variety of services can be provided flexibly and rapidly, and individual subscribers can customize their own service features without considering the network structure and the terminal type of the bearer services.

II. High-Speed and Packet Switched Core Bearer

The packet switched core bearer network speeds up the integration of the telecommunication network, computer network and cable TV network. Meanwhile, the high-speed core bearer network supports a diversity of services including voice service, data service and video service.

III. Independent Network Control Layer

The network control layer, that is, SoftSwitch, employs an open and independent control platform to isolate call control from media gateways. The independent network control layer implements by software the basic call control functions including call

routing, management control and signaling interworking, so that service suppliers can customize bearer services and control protocols. The network control layer also provides open APIs to facilitate a third party to provide services in a rapid, flexible and efficient way.

IV. Internetworking and Gateways

NGN can interwork with PSTN, Public Land Mobile Network (PLMN), 3rd Generation (3G), IN, Internet and other networks by means of access media gateway, trunk media gateway and signaling gateway. The interworking enables NGN to inherit all services from the original networks efficiently.

V. Diversified Access Modes

Ordinary subscribers can access the network through intelligent packet voice terminals and multimedia terminals. Enterprise subscribers and corporate subscribers can be connected to the network through access media gateways and integrated access devices, which fully meets the requirements of individual subscribers for voice, data and video services.

1.2 Location of SoftX3000

As a large-capacity and high-performance SoftSwitch product, SoftX3000, which is of the telecommunication equipment of the second category (that is, it is in the center equipment room and with no subscriber cable interface), is applicable to the network control layer of NGN and implements call control and connection management of voice, data and multimedia services based on the IP network.

Note:

- The telecommunication equipment of the first category is the equipment providing telecommunication cables. It includes the transmission equipment connecting the sender and receiver, the switching equipment connected with the transmission equipment, and appendix equipment of the two kinds of equipment.
 - The telecommunication equipment of the second category is the one which does not belong to the equipment of the first category.
-

SoftX3000 owns abundant service provisioning capabilities and powerful networking capabilities. On the way of the development and integration of the traditional PSTN to NGN, SoftX3000 can be used as an end office (C5 office), tandem office (C4 office), toll office, gateway office, SSP and so on.

- Used as an end office (C5 office), SoftX3000 is fully compatible with all service capabilities of PSTN exchanges and supports a variety of protocols including Media Gateway Control Protocol (MGCP), H.248, V5, Digital Subscriber Signaling No. 1 (DSS1), SIP and H.323. Traditional PSTN telephone terminals, ISDN terminals, MGCP packet terminals, H.248 packet terminals, SIP packet terminals and H.323 packet terminals can be connected to SoftX3000 which is capable of a diversity of service provision such as voice, data and multimedia.
- Used as a tandem office (C4 office) or toll office, SoftX3000 supports the traditional PSTN signaling, such as Signaling System No. 7 (SS7), R2 signaling, DSS1 signaling and V5 protocol. Coordination with SG, TMG, UMG and other gateways enables SoftX3000 to own various access networking capabilities and trunk networking capabilities.
- SoftX3000 supports black and white lists, call authentication, call interception, and so on. SoftX3000 can act as a gateway office.
- SoftX3000 supports the Message Transfer Part (MTP) and the Message Transfer Part 3 – User Adaptation Layer (M3UA), which enables SoftX3000 to serve as an integrated signaling gateway.
- SoftX3000 supports the Intelligent Network Application Protocol (INAP), so it can be used as an SSP in the IN system.
- SoftX3000 supports the H.323 protocol and can function as a gatekeeper (GK) or gateway (GW) in the Traditional voice over IP (VoIP) network.
- SoftX3000 supports SIP, and can act as a SIP server.
- SoftX3000 supports RAS, Q.931, and H.245 and can work as a video interworking gateway (VIG) together with the UMG8900 of Huawei.

1.3 Product Features

1.3.1 Abundant Service Provisioning Capabilities

SoftX3000 not only inherits the various service capabilities from the traditional PSTN and IN, but also provides value added services on the basis of the NGN architecture. SoftX3000 has abundant service provisioning capabilities as follows:

- Completely inherits voice service capabilities from Huawei C&C08 Switch, which enables SoftX3000 to provide basic voice services and supplementary services.
- Proposes an optimized IP Centrex solution and supports IP Centrex subscribers, IP console and wide area Centrex services.
- Supports the T.38 and T.30 protocol and provides high-quality IP fax and modem services.
- Supports multimedia communication protocols including SIP and H.323 to provide videophone, program sharing, electronic whiteboard, and videoconferencing services.

- Supports INAP. In cooperation with SCP intelligent platform, SoftX3000 fully inherits the traditional IN services, such as Card Calling Service (CCS), Advanced Prepaid Service (APS), Family Free Phone (FFPH) service, and Virtual Private Network (VPN) service.
- Supports SIP. In cooperation with SIP application server and third-party's or virtual carrier's application server, SoftX3000 provides subscribers with diversified value added services, third-party services or customized services, such as Unified Communication (UC) service.
- Supports Mobile Application Part (MAP). In cooperation with smart location register (SHLR), SoftX3000 provides a smart network with traditional IN services, IN subscription, RingBack Tone service (RBT), Multiple Subscriber Number (MSN) service, and Number Portability (NP) service.

1.3.2 Powerful and Flexible Networking Capabilities

SoftX3000 provides open and standard protocol interfaces. SoftX3000 not only supports a variety of NGN signaling protocols including MGCP, H.248, SIP, SIGTRAN, but also supports a number of traditional PSTN signaling systems such as SS7, R2, DSS1 and V5. SoftX3000 has powerful and flexible networking capabilities.

- Supports both MGCP and H.248 as the media gateway control protocols, is able to interconnect with IADs, AMGs, TMGs and UMGs, and allows access to MGCP packet terminals and H.248 packet terminals.
- Supports SIP and SIP-T, is able to interwork with other softswitches and SIP application servers, and allows SIP packet terminals to access directly.
- Supports H.323, is able to interconnect with traditional VoIP gateways and Multipoint Control Units (MCUs), and allows H.323 packet terminals to access directly.
- Supports V5.2 protocol, DSS1 signaling and R2 signaling. Cooperation with UMG enables the access of PBX, NAS, access network devices and Base Station Controllers.
- Supports MTP, Telephone User Part (TUP) and ISDN User Part (ISUP), is able to interconnect with Signaling Points (SPs) and Signaling Transfer Points (STPs) resident in the SS7 network, and provides No. 7 trunks to interconnect with PSTN exchanges when working together with TMG and UMG .
- Supports Signaling Connection Control Part (SCCP), Transaction Capabilities Application Part (TCAP), and INAP, provides Service Switching Function (SSF), and so can be used as an SSP in the IN.
- Supports the Message Transfer Part 2 – User Adaptation Layer (M2UA) protocol, and is able to directly interconnect with a TMG with built-in signaling gateway functions.

- Supports Simple Traversal of UDP Through Network Address Translators (STUN), a Network Address Translation (NAT) protocol, to enable enterprise networks to pass through NAT devices such as firewalls and access the NGN.
- Supports the Simple Network Management Protocol (SNMP) and Man Machine Language (MML) interfaces to access the network management center.
- Supports the File Transfer Protocol (FTP) and the File Transfer Access and Management Protocol (FTAM) to access the billing center.

1.3.3 Large Capacity and High Integration

As advanced hardware and software design technologies are employed, SoftX3000 not only has a modularized hardware architecture, but also owns a high processing capability and a large capacity on the carrier-class level.

- The maximum busy hour call attempt (BHCA) value of a single service processing module is 400 k. Each module supports up to 9,000 Time Division Multiplexing (TDM) trunks or equivalent 50,000 subscribers.
- At the full configuration, SoftX3000 supports a maximum of 40 service processing modules; the BHCA value of the whole system is 16,000 k; SoftX3000 supports a maximum of 360,000 TDM trunks or equivalent 2,000,000 subscribers.
- SoftX3000 is also characterized by high integration. At the full configuration, only 5 cabinets are needed. The operation power consumption of the cabinets is less than 12 kW.

1.3.4 High Reliability

For the purpose of guaranteeing the high reliability of the system, a number of protective measures are taken in the hardware design, software design, system overload control and charging system of SoftX3000.

- Hardware design: adopts active/standby mode, load sharing and redundancy configuration for the boards and optimizes fault detection and isolation techniques of the boards and the system to improve the maintainability of the whole system.
- Software design: adopts hierarchical modularized architecture with protective performance, error tolerance capability and fault monitoring function.
- System overload control: provides 4-level overload restrictions, dynamic code adjustment mode and traffic control to fully ensure the reliability of the system.
- Charging system: iGWB Server developed by Huawei is employed as SoftX3000 charging gateway. iGWB Server adopts dual-system hot backup and is configured with Hot RAID5 hard disk array to implement dual backup and mass storage of bill data.

Depending on a reliable prediction method, the Mean Time Between Failures (MTBF) of SoftX3000 reaches 53 years and the yearly interruption time of the system is only 0.89 minutes on average.

1.3.5 High Security

I. Overview of Security in SoftX3000

NGN is an open and distributed network where open protocols and interfaces enable it to interwork with various NGN network components. Networking applications over NGN are very flexible. However, this openness also results in inevitable network security issues as IP network is characterized by seamless connection.

For the purpose of ensuring the security of the network and all authorized subscribers, SoftX3000 is structured with a perfect security design against malicious attack, illegal registration, anonymous calling, wiretapping, stealing accounts and other illegal acts.

II. Security in Networking Applications

- Protocol interfaces that are not in use can be closed.
- Supports the complete Internet Protocol SECurity extensions (IPSec) protocol.
- Prevents the system from Denial of Service (DoS) attacks.

III. Security in Protocols and Communications

Supports the security of the protocols and the encryption processing of the protocol packets, including MGCP, H.248, SIP and H.323.

IV. Security in Data

- Supports the real-time data backup mechanism between the active and standby boards.
- Supports the mechanism of automatically backing up the database of the active processing unit to a flash memory.
- Supports the automatic backup mechanism of the bills.

V. Security in Subscribers

- Supports certification and authentication on all the devices attempting to access SoftX3000.
- Supports encryption and ciphering of certification information.

VI. Security in the Aspect of Operations and Maintenance

- Supports dual-certification login security management pertaining to both account and workstation IP address.
- Supports multi-level subscriber authority management.

1.3.6 Smooth Expansion Capability

SoftX3000 is designed with a smooth expansion capability in the aspects of hardware design and system processing capability, with the potential expansion requirements of the customers taken into account.

- Hardware design: Open Standards Telecom Architecture Platform (OSTA) is the hardware platform of SoftX3000. The platform has a modular overlap structure. By expansion of processing frames in the mode of building blocks (frames are interconnected through LAN Switch), 1 to 18 frames can be configured freely and the customers' requirements for smooth expansion can be satisfied.
- System processing capability: The BHCA value of SoftX3000 is up to 16,000 k. Enough space is reserved for future service expansion, so increasing service or expansion requirements of the customers can be satisfied.

1.3.7 Optimized Charging Capabilities and Bill Management Functions

SoftX3000 has optimized charging capabilities. SoftX3000 not only supports to charge voice, data and multimedia services with several charging modes and bill types, but also provides optimized bill management functions. The main features are as follows:

- Supports multiple charging modes based on call duration, bearer capability, time segment, time category, or chargeable party (calling, called or third party).
- Supports charging of supplementary services.
- Supports charging of prepaid card.
- Supports to charge Centrex groups.
- Supports quota restricted calling and timed restriction.
- Supports a variety of bill types, such as detailed bill, subscriber charging meter bill, trunk charging meter bill, charging meter statistical bill, trunk occupation duration statistical bill, alarm bill, failure bill, complaint bill and intelligent bill.
- Supports bill restricted calling functions.
- Supports to store bills depending on respective modules, services and time.
- Supports the automatic backup, dumping, sorting and format conversion functions of bills.
- Supports standard FTP and FTAM charging interfaces.
- Supports segmented bill in long-duration calls.
- Supports IN bills with precision of 100 ms.
- Supports no billing for extremely-short calls (less than three seconds).
- Supports querying of recent bills (by dialing 180).

1.3.8 Excellent Traffic Measurement Functions

SoftX3000 provides excellent traffic measurement (traffic statistics) functions and supports multiple measurement indices and flexible measurement tasks. SoftX3000

adopts lists and graphics to display the performance data in real time, for the purpose of fully reflecting the traffic loading information and running and operation of the equipment.

- SoftX3000 has traffic measurement and record functions. A maximum of 256 statistical tasks can be registered and conducted at the same time.
- The traffic measurement item can be scheduled and the testing time can be preset, so that the measurement can be started and stopped at the specified date and time automatically. The scheduled measurement item can also be cancelled.
- For the scheduled traffic measurement item, the system supports more than 4 statistical durations every day. The statistical tasks can be automatically output to different terminals and the network management center.
- Several traffic measurement items can be combined according to your requirements. Items can be measured individually or together at a time.
- One statistical task has up to 32 measurement items.
- A maximum of 1000 measured objects can be supported, such as destination signaling code and media gateway.

1.3.9 Convenient and Practical Operation and Maintenance

SoftX3000 provides convenient and practical operation and maintenance functions as follows:

- Flexible and diversified management modes. SoftX3000 adopts a distributed structure based on Client/Server, providing multiple maintenance modes such as Graphical User Interface (GUI) and MML command line. SoftX3000 supports simultaneous access to the equipment by multiple local and remote clients. The related network management network can be constructed flexibly depending on the factors including the network structure, the management requirements and the investment scale.
- Visualized graphical user interface. SoftX3000 provides operation and maintenance interfaces by using the unique navigation tree technology. In this way, many MML features and GUI advantages are reserved: It is visualized, simple and quick to operate, easy to access NMS, easy to memorize. In addition, vivid graphic network component topology view and equipment panel view are provided, thus visualized operation is provided.
- Optimized call tracing, signaling tracing, interface tracing and message interpretation functions. A signaling analysis tool software which is independently developed by Huawei is built in to offer customers with powerful fault analysis and location capabilities.
- Real-time fault management capability. The system receives and displays network equipment fault report in real time, so that the maintenance personnel can diagnose the fault source rapidly and precisely and take proper measures to recover the system from the abnormal service.

- Online software patching, online debugging, remote maintenance and dynamic data setting.

Chapter 2 System Architecture

2.1 Hardware Architecture

2.1.1 Introduction to OSTA Platform

The OSTA platform is adopted in SoftX3000 as the hardware platform. The OSTA platform has both the shared resource bus and the Ethernet bus, and enables SoftX3000 to be in good universality and high reliability. This is applicable to the exchange and transfer of variable-length data packets of the SoftSwitch equipment.

The OSTA platform is structured in a standard frame which is 19 inches wide and 9U high. Front boards and back boards are installed as shown in Figure 2-1.

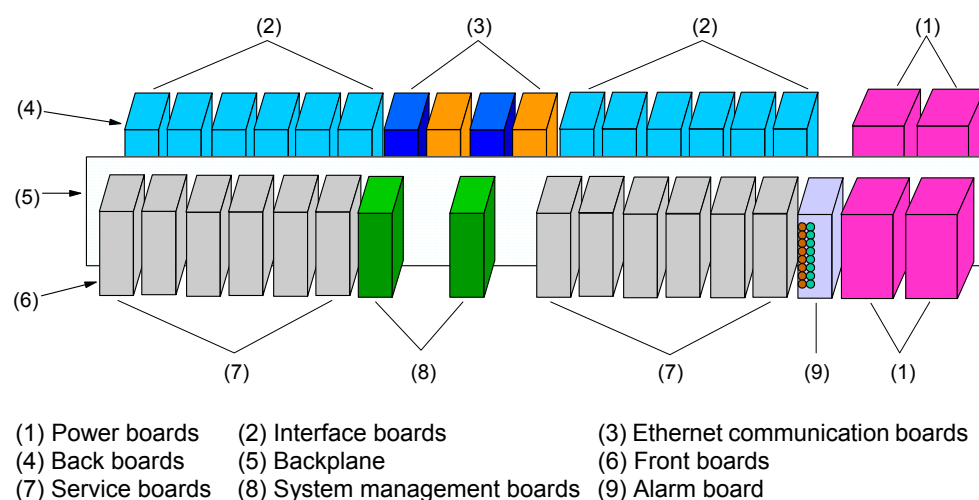


Figure 2-1 Overall structure of the OSTA frame

In the OSTA frame, front boards include service boards, system management boards and alarm boards; back boards are interface boards and Ethernet communication boards. Power boards can be installed either at the front or at the back. That front-back installation mode separates the functions of the front boards from the back boards, which simplifies the board design and orients the board functions towards unification. Therefore, the complexity of the hardware can be minimized and the reliability of the system can be improved. In addition, the board installation mode also widens the universality of the boards and enhances the flexibility of the system configuration.

In SoftX3000, all frames can be used universally in the aspect of the hardware. Each frame is designed in the width of 21 standard board slots. System management boards,

Ethernet communication boards, alarm boards and power boards (occupying the width of 2 standard board slots) must be configured in the fixed slots of the frame, occupying the width of 9 standard board slots. The remaining 12 slots are used for service boards and interface boards.

2.1.2 Physical Architecture

I. Overview of Physical Architecture

SoftX3000 is physically composed of three parts:

- OSTA frame
- Back Administration Module (BAM)
- iGWB (billing gateway)

The OSTA frames construct the host of SoftX3000, implementing the functions of service processing and resource management. The BAM and the iGWB constitute the background of SoftX3000, implementing the functions of operation and maintenance and bill management.

The physical structure of SoftX3000 is illustrated in Figure 2-2.

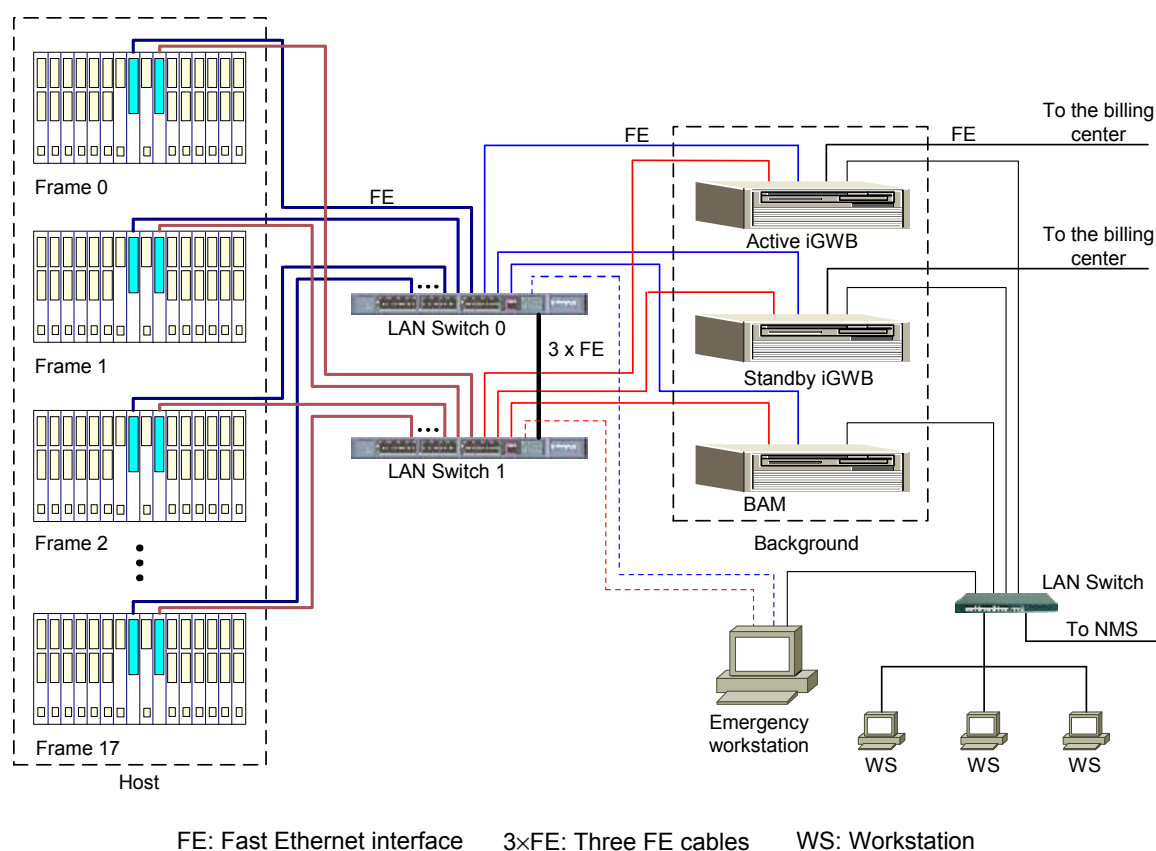


Figure 2-2 Physical structure of SoftX3000

II. Inter-Device Communication

- Communication between the frames is achieved through the internal Ethernet. Every frame is connected to the LAN Switches 0 and 1 through two network cables.
- Communication between the frames and the BAM/iGWB is achieved through the internal Ethernet. The BAM and the iGWB are connected to the LAN Switches 0 and 1 through two network cables.
- The BAM and the iGWB are connected to a hub through a network cable respectively. The workstations communicate with the BAM and the iGWB using the TCP/IP protocols by means of client/server.

III. Capacity Features of System

In the actual applications, the capacity of the system depends on the number of configured OSTA frames ranging from 1 to 18, which fully meets the requirement of smooth expansion. For example, the configuration of one frame achieves the application of 9,000 TDM trunks or equivalent 50,000 subscribers; the standard configuration with a physically separate MRS achieves the application of 360,000 TDM trunks or 2,000,000 subscribers.

2.2 Logical Architecture

2.2.1 Overview of Logical Architecture

From the functional point of view, the hardware structure of SoftX3000 is logically composed of five modules:

- Line interface module
- System support module
- Signaling processing module
- Service processing module
- Backend administration module

Figure 2-3 shows the details of logical architecture.

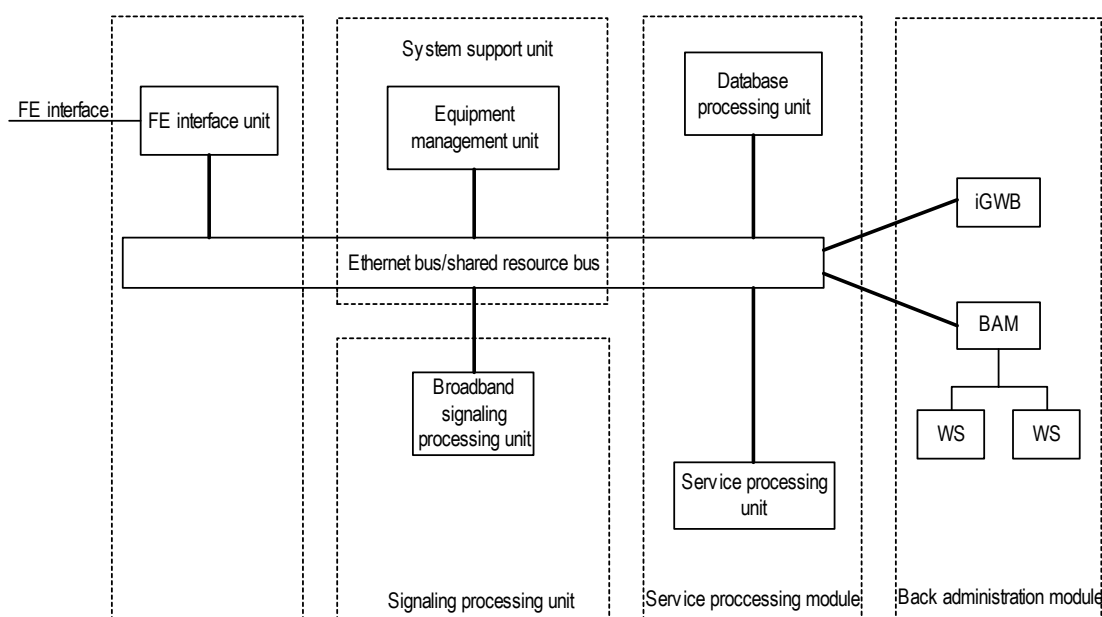


Figure 2-3 Logical hardware architecture of SoftX3000

2.2.2 Line Interface Module

The line interface module provides the Fast Ethernet (FE) interface to meet the system networking requirements. Refer to Chapter 3 for more information on the interfaces.

2.2.3 System Support Module

The system support module implements the following functions:

- Software loading
- Data loading
- Equipment management
- Equipment maintenance
- Inter-board communication
- Inter-frame communication

2.2.4 Signaling Processing Module

The signaling processing module provides the lower layer processing functions pertaining to signaling or protocols, such as the processing of MTP, SIGTRAN, TCP/UDP, H.248/MGCP protocols.

2.2.5 Service Processing Module

The functions of the service processing module are as follows:

- Implements the processing of layer 3 and higher protocols required for service features including MTP3, MTP3B, M3UA, TUP, ISUP, SCCP and TCAP.
- Provides application-layer call control functions and achieves service logics.
- Provides central database functions. Centralized resource data including inter-office trunk resources, context and termination dynamic table and MGW resource description table provides the query service of call resources for service processing.

2.2.6 Back Administration Module

The back administration module (BAM) consists of the BAM, the iGWB and workstations. It is responsible for providing a number of maintenance and management interfaces such as man-machine interface, network management interface, and billing interface. It mainly implements the functions of operation and maintenance and bill management.

2.3 Software Architecture

2.3.1 Overview of Software Architecture

The software system of SoftX3000 is composed of host software and terminal Operation Administration and Maintenance (OAM) software, as shown in Figure 2-4.

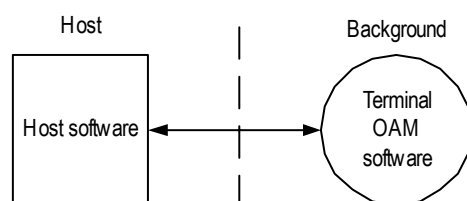


Figure 2-4 Software architecture of SoftX3000

2.3.2 Host Software

I. Overview of Host Software

Host software runs on the main processor of SoftX3000. It is designed to implement the following functions:

- Signaling and protocol adaptation
- Call processing
- Service control
- Charging information generation

Along with the terminal OAM software, the host software can also perform a number of operations on the host as a response to the command from the maintenance personnel, such as:

- Data management
- Equipment management
- Alarm management
- Traffic measurement
- Signaling trace
- Bill management

The host software consists of five parts:

System support subsystem, database subsystem, signaling processing subsystem, media gateway control subsystem and service processing subsystem. Its overall structure is shown in Figure 2-5.

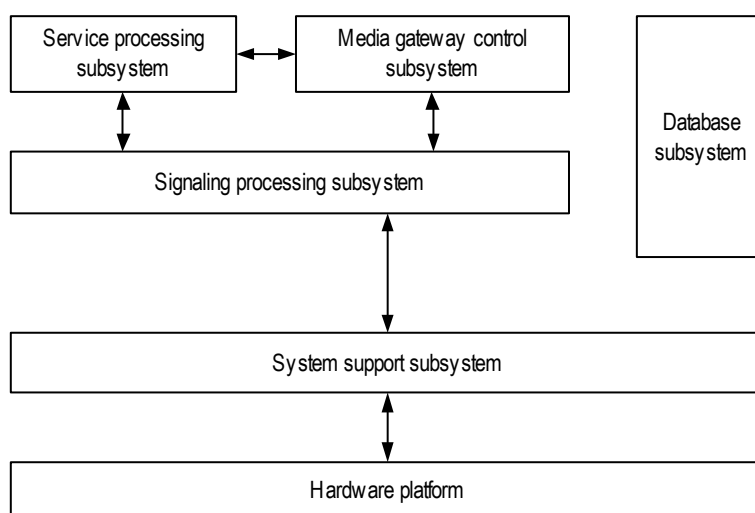


Figure 2-5 Overall structure of SoftX3000 host software

II. System Support Subsystem

The system support subsystem adopts the distributed object-oriented programmable realtime architecture (DOPRA) platform of Huawei.

As the software support platform of SoftX3000, it screens different operating system interfaces at the lower layers and provides unified VOS APIs for upper-layer applications.

In addition, the system support subsystem also provides upper-layer applications with the realization mechanisms of maintenance operations, alarm management, traffic measurement, call/signaling tracing, data backup, board switchover, online loading and other functions.

III. Database Subsystem

The database subsystem provides a centralized database management platform where all data required for system running are managed, including:

- Hardware data
- Protocol data
- Routing data
- Service data

The database subsystem provides messages or APIs for the service processing subsystem, the signaling processing subsystem and the media gateway control subsystem, used for query, addition, deletion and other operations.

IV. Signaling Processing Subsystem

The signaling processing subsystem is mainly responsible for implementing bearing and processing of various signaling or protocols, such as:

- SS7 signaling
- Call control signaling
- Signaling transport protocols
- Network routing protocols

V. Media Gateway Control Subsystem

The media gateway control subsystem provides the following features:

- Managing and maintaining the gateways
- Managing and maintaining the bearer resources on the gateways.

VI. Service Processing Subsystem

The service processing subsystem is used to implement the variety of services provided by SoftX3000, such as:

- Basic voice services
- Supplementary services
- IP Centrex services
- Multimedia services

2.3.3 Terminal OAM Software

I. Overview of Terminal OAM Software

The terminal OAM software runs on the BAM, the iGWB and the workstations. Along with the host software, it supports maintenance personnel to implement the functions of

data management, equipment management, alarm management, traffic measurement, signaling tracing and bill management on the host.

The terminal OAM software adopts the client/server model and consists of three parts: BAM server software, billing gateway software and client software. The BAM server software is installed in the BAM; the billing gateway software is installed in the iGWB. Both are considered Server. The client software is installed in workstations which are considered Client.

II. BAM Server Software

The BAM server software runs on the BAM. With communication server and database server integrated, the BAM server software forwards the operation and maintenance commands from all workstations to the host, and directs the response or operation results of the host to the corresponding workstation. It is the core of the terminal OAM software.

The BAM server software runs on Windows 2000 Server and uses SQL Server 2000 as the database platform. Through multiple parallel service processes, such as maintenance process, data management process, alarm process and traffic measurement process, main functions of the terminal OAM software can be achieved. The layered relationship among the BAM application program, the operating system and the database platform is illustrated in Figure 2-6.

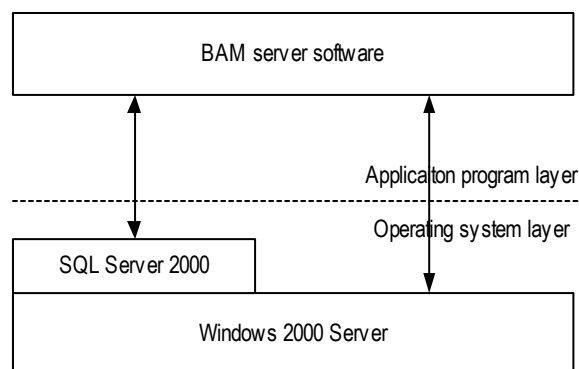


Figure 2-6 The layered relationship among the BAM software

III. Billing Gateway Software

The billing gateway software runs on the iGWB. As the core component of the whole bill management system, the billing gateway software stores and backs up all bills generated by the service processing modules of SoftX3000 in physical disks for billing purposes. The billing gateway software also provides billing interfaces to the billing center, supporting the FTP or FTAM protocol.

IV. Client Software

The client software runs on the workstations. It connects to the BAM and iGWB servers as a client in the client/server mode and provides subscribers with MML-based service graphic terminals.

Through workstations, maintenance functions including data maintenance, equipment management, alarm management, traffic measurement, call/signaling tracing, bill management and report functions can be achieved.

Workstations can be located either locally or remotely. An example is a workstation which logs in the BAM server through a Wide Area Network (WAN) by means of dialup access.

Chapter 3 Interfaces, Signaling and Protocols

3.1 Physical Interfaces

3.1.1 Overview of FE Interface

SoftX3000 only supports FE interfaces. The quantity and purpose of the interfaces are shown in Table 3-1.

Table 3-1 The description of FE interfaces

Location	Maximum quantity	Function
Host	4	Provides bearer channels for IP-based service signaling or protocols, such as SIP, SIP-T, H.323, M2UA, M3UA, V5.2 – User Adaptation Layer (V5UA), ISDN Q.921 – User Adaptation Layer (IUA), and STUN.
Background	3	Provides bearer channels for TCP/IP-based network management or file transfer protocols, such as SNMP, MML, FTP, and FTAM.

The three FE electrical interfaces provided by the BAM and the iGWB of the background are used for network management and billing networking.

3.1.2 Specifications of FE Interface

Table 3-2 lists the specifications of the FE electrical interfaces

Table 3-2 Specifications of FE electrical interfaces

Item	Parameter
Compliant recommendation or standard	IEEE 802.3u
Transfer rate	10/100Mbit/s self-adaptation
Transferable distance	100 m
Frame format	10BASE-T / 100BASE-TX
Interface type	RJ-45
Nominal impedance	100 Ω

3.2 Signaling and Protocols

SoftX3000 provides open and standard protocol interfaces and supports a number of signaling and protocols, thus achieving interconnection or interworking with a variety of devices. SoftX3000 has powerful and flexible networking capabilities. Main signaling and protocols supported by SoftX3000 are shown in Table 3-3.

Table 3-3 Main signaling and protocols supported by SoftX3000

Protocol	Purpose	Compliant recommendation or standard
MGCP	Media gateway control protocol, used for SoftX3000 to control the media gateways and also to access MGCP packet terminals.	IETF, RFC2705, Media Gateway Control Protocol (MGCP) Version 1.2
H.248	Media gateway control protocol, used for SoftX3000 to control the media gateways and also to access H.248 packet terminals.	IETF, RFC3015, Megaco Protocol Version 1.0 (H.248)
SIP	Session initiation protocol, used for the interconnection between SoftX3000 and other softswitches or SIP application servers and also to access SIP multimedia packet terminals.	IETF, RFC3261, Session Initiation Protocol (SIP)
SIP-T	The extension protocol of SIP, used for the transparent transfer of ISUP signaling.	IETF, RFC3372, Session Initiation Protocol for Telephones (SIP-T)
H.323	IP call and multimedia communication protocol, used for the interconnection between SoftX3000 and GKs, GWs, or MCUs in the traditional H.323 network and also to access H.323 multimedia packet terminals.	ITU-T, H.323, Packet-based multimedia communications systems
SIGTRAN	SCTP, used to provide the reliable data packet transfer service for the adaptation protocols of IP-based Switched Circuit Network (SCN) signaling.	IETF, RFC2960, Stream Control Transmission Protocol (SCTP)
	M2UA: used for the interconnection between SoftX3000 and TMGs/UMGs with built-in signaling gateway functions.	IETF, RFC3331, SS7 MTP2 User Adaptation Layer (M2UA)
	M3UA: used for the interconnection between SoftX3000 and SGs.	IETF, RFC3332, SS7 MTP3-User Adaptation Layer (M3UA)

Protocol	Purpose	Compliant recommendation or standard
SIGTRAN	V5UA: used for the interconnection between SoftX3000 and UMGs with built-in V5 signaling gateway functions.	IETF, draft-ietf-sigtran-v5ua-03, V5.2-User Adaptation Layer (V5UA)
	IUA: used for the interconnection between SoftX3000 and UMGs with built-in DSS1 signaling gateway functions.	IETF, RFC3057, ISDN Q.921-User Adaptation Layer (IUA)
SS7	MTP: used for the interworking between SoftX3000 and the SS7 signaling network so that SoftX3000 can be interconnected to SPs or STPs in the SS7 signaling network.	ITU-T Q.701 to Q.707
	TUP: used for the interworking between SoftX3000 and the PSTN so that SoftX3000 can provide TUP trunks through TMG to interconnect with PSTN exchanges.	ITU-T Q.721 to Q.725
	ISUP: used for the interworking between SoftX3000 and the PSTN so that SoftX3000 can provide ISUP trunks through TMGs and achieve the interconnection with PSTN exchanges.	ITU-T Q.761 to Q.764, Q.730
	SCCP: used to bear the INAP protocol so that SoftX3000 can be interconnected to SCPs in the IN through the SS7 signaling network.	ITU-T Q.711 to Q.716
	TCAP: used to provide the applications of SoftX3000 and SCPs with a number of functions and procedures which are not application specific, so that SoftX3000 can support the applications pertaining to IN services.	ITU-T Q.771 to Q.775
	MAP: used to support the interworking between SoftX3000 and SHLR to provide the “smart network” service.	ETS 300 523, 557, 589, 590

Protocol	Purpose	Compliant recommendation or standard
SS7	INAP: used to define the information streams between the functional entities of the IN so that SoftX3000 can support the Service Switching Function (SSF), the Call Control Function (CCF), the Specialized Resource Function (SRF) and the Call Control Access Function (CCAF) and act as the SSP over the standard IN architecture.	ITU-T Q.1218, Q.122x, Q.123x ITU-T X.208, X.209
R2	A type of inter-office channel associated signaling, used for the interworking between SoftX3000 and exchanges of old mode so that SoftX3000 can provide R2 trunks through UMGs.	ITU-T, Q.400 to Q.499
DSS1	ISDN subscriber network signaling, used for the interworking between SoftX3000 and NASs or PBXs so that SoftX3000 can provide Primary Rate Interfaces (PRIs) through UMGs.	ITU-T I.430, I.431, Q.921, Q.931
V5	Subscriber network signaling, used for the interworking between SoftX3000 and the V5 access network or base station controllers so that SoftX3000 can provide V5.1/V5.2 interfaces through UMGs.	ITU-T G.964, G.965
STUN	Used to support the interconnection between SoftX3000 and STUN Servers (built in the BSGI board of SoftX3000).	IETF, draft-ietf-midcom-stun-02, Simple Traversal of UDP Through Network Address Translators (STUN)
IPSec	Used to protect the security of communications between SoftX3000 and the gateways under its control, such as IADs, AMGs, TMGs and UMGs.	IETF, RFC2401, Security Architecture for IP (IPSec) IETF, RFC2402, IP Authentication Header (IPSec) IETF, RFC2406, IP Encapsulating Security Payload (IPSec) IETF, RFC2411, IP Security Document Roadmap (IPSec)

Protocol	Purpose	Compliant recommendation or standard
SNMP	Used to support the interconnection between SoftX3000 and NMS devices (iManager N2000) so that SoftX3000 can provide network management interfaces (SNMP interfaces).	IETF, RFC1157, Simple Network Management Protocol (SNMP)
FTP	Used to support the interconnection between SoftX3000 and billing centers so that SoftX3000 can provide FTP interfaces.	IETF, RFC0959, File Transfer Protocol (FTP)
FTAM	Used to support the interconnection between SoftX3000 and billing centers so that SoftX3000 can provide FTAM interfaces.	ISO, ISO8571, File Transfer Access and Management Protocol (FTAM)

Chapter 4 OAM System

4.1 Introduction to the OAM System

4.1.1 Basic Functions of OAM

I. Overview of OAM

Operation Administration and Maintenance (OAM) refers to the various tasks required to be performed by the operator on the SoftSwitch system which has been put in use. The purpose of OAM is to ensure the normal running and operation of the system so as to provide high-quality telecommunication services for subscribers.

SoftX3000 provides MML-based man machine operation environments in a graphic way where a number of OAM functions can be achieved. The OAM functions include maintenance management, data management, alarm management, charging and bill management, trace management, signaling analysis, traffic measurement, environment and power supply monitoring.

II. Maintenance Management

Maintenance management provides multiple maintenance control methods such as query, display, switchover, reset, isolation, block and activation. By using these maintenance control methods, efficient management and maintenance operations can be performed on the hardware components, system resources, signaling links, clock links and physical ports of the SoftSwitch system, as well as the gateways and terminals under its control.

III. Data Management

Data management provides multiple database operation methods such as addition, deletion, modification, query, storage, backup and restoration. By using these database operation methods, efficient management and maintenance can be performed on the various data (including equipment data, gateway data, signaling data, routing data, charging data and subscriber data) which runs on the SoftSwitch system.

IV. Alarm Management

Alarm management receives and handles the variety of alarm information generated by the system. Depending on the category and severity level of the alarms, the

appropriate alarm terminal device such as the alarm box or the alarm station will be driven to produce different audible and visual signals. Moreover, the corresponding alarm message will be interpreted and then transmitted to the network management center through the network management interface. In addition, alarm management also has the functions to store the alarm information, query the alarm history and set the alarm processing mode.

V. Charging and Bill Management

Charging and bill management provides functions to manage and operate the bill information which is stored in the host bill pool and the iGWB hard disk. The functions include updating the host charging meters, getting bills from the host, querying the bills, backing up the bills, converting the bill format, sending the bills to the billing center.

VI. Trace Management

Trace management provides functions such as connection tracing, signaling tracing, interface tracing and message interpretation. By using these functions, a real-time and dynamic trace can be conducted on the connection process, state transition, resource occupancy, telephone number information transfer and control information streams relating to the terminal subscribers, trunk circuits, signaling links and interface protocols. The tracing information can be preserved for future reference. In this way, powerful fault analysis and location capabilities can be provided for subscribers.

VII. Signaling Analysis

Signaling analysis provides a built-in signaling analysis tool software which is developed independently by Huawei. The software works along with the trace management functions to analyze the signaling interaction processes in an online or offline way. Signaling analysis provides strong maintenance approaches to quickly locate the cause of a fault and also to optimize the configuration of signaling links.

VIII. Traffic Measurement

Traffic measurement (traffic statistics) performs measurements and statistics on the services and objects of a variety of call types. By analyzing the statistic data, the running conditions of the SoftSwitch, the gateways and the whole network can be known, which provides the basic data for the planning, design, operation, management and maintenance of the telecommunication network.

IX. Environment and Power Supply Monitoring

Environment and power supply monitoring performs monitoring and control, in a remote way, on the running environments, power supply devices and other intelligent devices in both central and remote equipment rooms.

4.1.2 MML Command Line

I. Features of MML

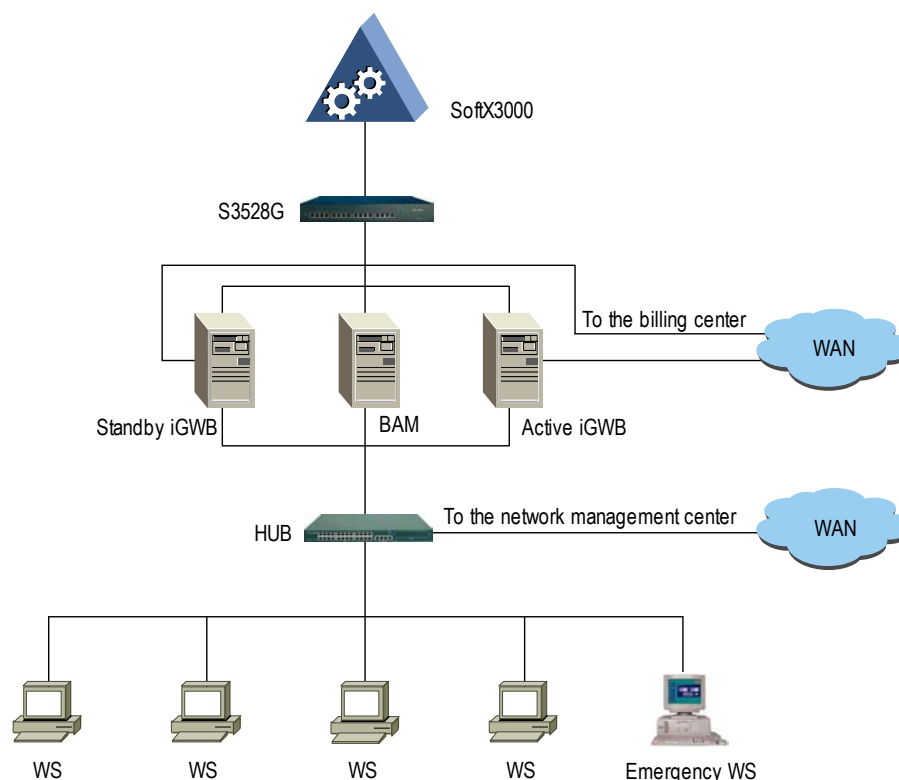
MML is a set of man-machine interactive interfaces which are compliant with the ITU-T Recommendations Z.301 to Z.341. MML provides subscribers with a command set to operate and query SoftX3000. By means of the command set, subscribers can perform monitoring and management on SoftX3000.

The features of SoftX3000 MML are as follows:

- The MML command set encapsulates the services of SoftX3000. One command corresponds to one function rather than a simple operation. For example, to add an ESL subscriber you should follow the steps: “modify the subscriber data index table → modify the subscriber data table → modify the subscriber equipment table → convert the format → set the host”. After the encapsulation of the MML commands, the steps become transparent. What is required is to execute one functional command to complete all the previous operations. It is unnecessary to learn what modifications are made to the database and how the modifications take effect.
- The MML system performs the strict consistency check on the data. When a function is executed, a detection is done on the inter-table relationship, which is an effective way to avoid producing junk data.
- The MML command set is equivalent to a group of APIs from the SoftX3000 point of view. Other application programs are all based on it. For a GUI terminal, the operations made through the terminal interfaces are translated to commands and then transferred to the MML system which is responsible for the execution of the commands and returns the results in the text way. Finally, the results will be converted to the suitable reflection on the graphical terminal. Accordingly, the stability of the system is guaranteed and the running of the whole system is influenced by a single application program issue.
- The input and output of the MML system are based on pure character streams. Programs like TELNET are supported to interact with SoftX3000. Therefore, the client can override a variety of platforms, for example, supporting a dumb terminal without processing capabilities. It is beneficial to a centralized network management and follows the development trends of telecommunication products.
- The MML system not only supports convenient search function and standard Windows search functions such as keyword search and fuzzy search, but also provides complete online help documents for subscribers to study and use MML commands.

4.1.3 OAM Hardware Platform – Terminal System

The terminal system is the key hardware platform to implement OAM functions. It consists of the BAM, the iGWB and several workstations (WSs). Its structure is shown in Figure 4-1.



S3528G: Ethernet switch of Huawei

Figure 4-1 Structure of the terminal system

The terminal system works in the client/server mode. The BAM and the iGWB function as the server; they are connected to the SoftX3000 host and the external computer network through the Ethernet. The workstations function as the client; they can be configured to the maintenance console, the data management console, the alarm console, the traffic measurement console and the bill console according to the specific requirements.

In the terminal system, the BAM is the hardware core to achieve the OAM functions. The BAM forwards the operation and maintenance commands from the workstations to the host and directs the response made by the host to the corresponding workstation. The BAM plays the bridge role in the communications between the workstations and the host.

For the purpose of guaranteeing the reliability of the terminal system, the following measures are taken in SoftX3000:

- Dual-plane mode is employed in the Ethernet connection between the BAM/iGWB and the host. The planes work in the active/standby way.
- Two iGWBs work in the active/standby way, which ensures the security of bills.
- An emergency workstation is designed as the online backup of the BAM. Whenever the BAM becomes faulty, the emergency workstation can substitute the BAM temporarily and meanwhile restore the BAM with the backup data stored on its own hard disk.

4.2 Network Management and Charging

SoftX3000 supports a variety of protocol interfaces such as SNMP, MML, FTP, and FTAM. SoftX3000 can fully satisfy the networking requirements for network management and charging. A typical networking model is illustrated in Figure 4-2.

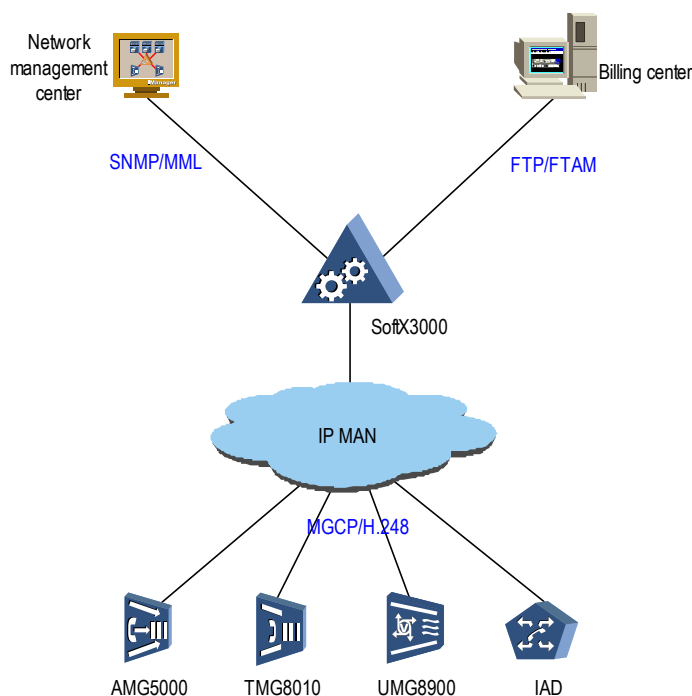


Figure 4-2 Networking model for network management and charging

4.2.1 Network Management

SoftX3000 provides SNMP/MML network management interfaces through the BAM, which enables SoftX3000 to be interconnected with the network management center. If Huawei iManager N2000 Integrated Network Management System is used at the network management center as the network management component of the whole network, the network management system has the following functions:

- Provides MML interfaces to directly connect the BAM because iManager N2000 integrates the OAM client software of SoftX3000. It is equivalent to a remote workstation of the terminal system.
- Provides a centralized management on the NGN network elements including AMG5000, TMG8010, UMG8900, SG7000 and IAD.
- Provides NGN service management including registration of IAD services and management of the subscribers.
- Provides NGN resource management including management of both equipment resources and service resources.

4.2.2 Charging

I. Charging Networking

SoftX3000 supports the interconnection to the billing center using the FTP/FTAM protocol, thereby realizing the effective and fast collection of bills.

II. Bill Management

- A stable storage mechanism of Call Detail Record (CDR) is provided to meet the billing requirements of the billing center.
- An automatic mechanism of fetching bills from the host bill pool is provided against overflow of the bill pool.
- A protective mechanism in the event of overflow of the host bill pool is provided in order to minimize the loss of the bills.
- A timing setting option of not automatically fetching bills is provided in order not to influence the call processing performance of the equipment at the busy hour.
- The dual-system hot backup mode is adopted in the iGWB and Hot RAID5 hard disk array is configured, which realize the dual backup and mass storage of the bill data.
- The charging meter values of subscribers and trunks can be saved in the database.
- The bills can be queried by using a number of parameters for the verification purposes.
- SoftX3000 can provide detailed bills, trunk bills, or subscriber bills by trunk group and office direction.
- SoftX3000 supports setting different charging rules of eight time segments per day.
- SoftX3000 supports instant display of charge.

Chapter 5 Services and Functions

5.1 Services

5.1.1 Classification of Service Provisioning Modes

SoftX3000 provides services for subscribers in the following ways:

- Services provided by SoftX3000 independently
- Services provided by SoftX3000 along with other servers

5.1.2 Services Provided by SoftX3000 Independently

The services include:

- Basic voice services
- Fax service
- Supplementary services
- IP Centrex services

5.1.3 Services Provided by SoftX3000 and Other Servers

I. With SCP Intelligent Platform

Together with an SCP, SoftX3000 provides value added services, such as Card Calling Service (CCS), Advanced Prepaid Service (APS), Family Free Phone (FFPH) service, and Virtual Private Network (VPN) service.

II. With SIP Application Server

By interconnecting with the SIP application server through SIP, SoftX3000 can provide a number of value added services, which integrate voice, multimedia, and Internet, such as Unified Communication (UC) service.

III. With Application Server of Third-Party or Virtual Carrier

By interconnecting with such application servers through a Parlay gateway, SoftX3000 can provide third-party or customized services, such as enterprise workflow, enterprise schedule, personal schedule and enterprise package.

IV. With SHLR

By connecting with an SHLR and the coordination with the SCP and the application server, SoftX3000 can provide the smart network services.

Note:

The following briefly describes various services supported by SoftX3000. For detailed information, refer to *U-SYS SoftX3000 SoftSwitch System Technical Manual – Features and Services*.

5.1.4 Voice Services

I. Basic Voice Services

SoftX3000 supports the basic voice services made among PSTN telephone terminals, MGCP packet terminals, H.248 packet terminals, SIP packet terminals, and H.323 packet terminals, including:

- Calls made between local network subscribers.
- National/international toll auto direct-dialing outgoing calls, national/international toll auto incoming calls, national/international toll calls of the local office.
- Special service calls, including inquiry, complaint, and fire emergency services.
- Calls made both directly to PBX extensions and to PBX console.
- Outgoing calls made from PBX extensions directly.
- Calls made from or to mobile subscribers and made to wireless paging subscribers.
- Calls made by maintenance personnel.

II. Fax Services

SoftX3000 supports Group-2, Group-3, and Group-4 fax services, with the following features:

- AMG/TMG can report the fax tone.
- AMG can connect fax machines and support fax service.
- Codec switching function is supported. Codec codes can be converted to the T.38 format for the transparent transfer over the packet switched domain, for the purpose of providing subscribers with end-to-end fax communication service of high quality.

III. Supplementary Services

SoftX3000 can provide more than 40 types of supplementary services. Some frequently used supplementary services are described in Table 5-1.

Table 5-1 Supplementary services supported by SoftX3000

No	Service type	Service description
1	Abbreviated dialing	It is a service that enables a subscriber to make a call by dialing one or two digits (also called abbreviated code) instead of the original called number. For example, in China, abbreviated codes are two-digit numbers, so the abbreviated codes range from 00 to 99, that is, a subscriber can set a maximum of 100 abbreviated codes for called numbers.
2	Hotline	With the hotline service registered, if a service subscriber does not dial any number within the specified time period (5 seconds for example) after picking up the phone, the phone set will connect the designated number (also called hotline number) automatically. With the immediate hotline service registered, as soon as the service subscriber picks up the phone, the phone set will automatically connect the called number that has been designated during service registration.
3	Outgoing call barring	This service enables a subscriber to restrict some outgoing authorities (for example, toll calls) of a particular phone set by following a certain dialing procedure.
4	Do-not-disturb service	This service enables a subscriber to reject all incoming calls during some period of time. After a subscriber registers this service, all incoming calls to the subscriber will be answered by the exchange. However, the outgoing calls of the subscriber will not be affected.
5	Malicious call identification	After applying for the malicious call identification service, a subscriber can find out the originating telephone number by following a certain operation procedure whenever a malicious call is received.
6	Wakeup service	With the wakeup service registered, when the time set by a subscriber arrives, the telephone will automatically ring to remind the subscriber to do what he/she has planned.
7	Interception service	When a call is made to an absent number or a changed number or a route is blocked temporarily during the call or the subscriber does not operate correctly to make a call, such calls will be automatically intercepted and directed to a pickup device, which avoids virtual connections of the switching equipment.

No	Service type	Service description
8	Call forwarding no reply (CFNR)	This service forwards the incoming calls to a service subscriber to another designated number automatically if the calls are not answered within a preset period of time.
9	Call forwarding unconditional (CFU)	This service forwards the incoming calls to a service subscriber to another designated number automatically regardless of the state of the service subscriber.
10	Call forwarding busy (CFB)	This service forwards the incoming calls to a service subscriber to another designated number automatically when the service subscriber is busy.
11	Registered call on busy	With this service registered, when a call is made but the callee is busy, the call will be registered. When the caller wants to call this callee next time, the call will be automatically put through after the caller picks up the handset.
12	Absent subscriber service	With this service registered, when a service subscriber is absent, the network will answer all incoming calls by means of playing an announcement.
13	Call back on busy	With this service registered, when a service subscriber calls another subscriber who is busy talking on the phone, the service subscriber can hang up and wait, and the call will be connected automatically once the callee becomes free.
14	Call transfer (CT)	This service enables a callee to transfer an established incoming call to a third party by pressing the hook for the purpose of establishing a new connection between the caller and the third party.
15	Call waiting (CW)	With this service registered, when Subscriber C attempts to establish a connection with a service subscriber who is in a conversation with Subscriber B, the service subscriber will hear a prompt tone indicating that there is a new incoming call waiting for the connection. At the same time, Subscriber C hears the call waiting tone.
16	Three-party service (3PTY)	This service enables a service subscriber who is talking on the phone either as a caller or a callee to make a call to a third party without interrupting the current conversation, so as to achieve the three-party communication or conversation with either party separately.
17	Conference call	This service enables multiples subscribers to communicate simultaneously. SoftX3000 supports three types of conference call services: normal conference call, auto list conference call, and convener-authorized conference call.
18	Designated pickup	This service allows a service subscriber to answer an incoming call to another subscriber by dialing the corresponding prefix and the called number.

No	Service type	Service description
19	Secretary service	This service enables a service subscriber to designate another telephone (secretary's telephone) to handle all his/her incoming calls, that is, all incoming calls will be transferred to the secretary's telephone first and only the secretary can call the service subscriber directly.
20	Secretary station service	This service is an enhanced type of secretary service. When a telephone set is enabled with this service, the incoming calls to the phone set will be queued. In other words, the new incoming calls will be held when the phone set is busy and will be connected once the phone set becomes idle. A secretary station can hold a maximum of five incoming calls.
21	Calling line identification presentation (CLIP)	This service enables SoftX3000 to send the caller's number to a callee and display it on the callee's phone set or terminal.
22	Calling line identification restriction (CLIR)	This service enables a caller to restrict the presentation of his/her number on the callee's phone set.
23	Calling line identification restriction override	This service enables a service subscriber's phone set to display calling numbers in all cases.
24	Temporary reservation for calling line identification restriction	For a Class-A subscriber, his/her number will be displayed on the phone set of a callee in normal cases, but by dialing a certain prefix before a called number, his/her number will not be presented to the callee in this call.
25	Temporary reservation for calling line identification presentation	For a Class-B subscriber, his/her number will not be displayed on the phone set of a callee in normal cases, but by dialing a certain prefix before a called number, his/her number will be presented to the callee in this call.
26	Permanent reservation of calling line identification restriction	For a Class-C subscriber, it is not allowed to present his/her number to the callee in all cases, even if he/she has dialed a certain prefix for number presentation before the called number.
27	Quota restricted calling	This service restricts a service subscriber's calling expenses. If the money in the subscriber's account is not enough for a call, SoftX3000 will prohibit the subscriber from making a new call or forcedly terminate the ongoing call. It should be noted that this service is only applicable to chargeable calls and it is ineffective to free calls such as police call, fire call, ambulance call, and intra-Centrex calls.

No	Service type	Service description
28	Quota restriction alarm	With this service registered, if the balance of a service subscriber is less than a certain threshold, SoftX3000 will send an alarm to the BAM. If the service subscriber belongs to a Centrex group, SoftX3000 will send an alarm to the corresponding console simultaneously. After that, if the subscriber continues the conversation, SoftX3000 will not send any alarm until a new quota value is set.
29	Time restricted calling	This service restricts the conversation duration of each call made by a service subscriber. Once the subscriber's conversation duration exceeds the restricted duration, SoftX3000 will release the call forcibly.
30	Time segment restriction	This service restricts the call authority of the Centrex subscriber in one or some time segments. That is, the subscriber is allowed to make calls of any level during these time segments. This service is operated by the operator at the console.
31	Co-group pickup	If a call is made to an extension in a subscriber group but is not answered, the other subscribers in the same group can answer the call by simply dialing the co-group pickup access code
32	Destination number restriction	With this service registered, a service subscriber cannot originate calls to the pre-designated restricted numbers.
33	Designated number connection	This service allows local subscribers to call designated numbers only, but restricts no incoming calls to local subscribers.
34	Operator call barring	With this service enabled, international calls from operators speaking English, French, German, Japanese, Spanish, Italian, and Russian to a service subscriber will be barred.
35	Calling indication	This service notifies a service subscriber who is talking on the phone of a new incoming call with a beep tone or an announcement prompting the new incoming toll call and the calling number, while the new caller hears the ringback tone or an announcement indicating that the service subscriber is busy.
36	Quota restored monthly	This service is used to restrict a service subscriber's calling expenses every month. At a fixed time of each month, SoftX3000 will restore the predefined quota for the subscriber. When the subscriber's calling charge exceeds the quota, outgoing/incoming calls will be prohibited until the recharge by the next month.
37	Caller call transfer	This service allows a service subscriber to transfer a call when acting as a caller.

No	Service type	Service description
38	Call forwarding offline	When a call is made to an offline phone set (which has not been registered in SoftX3000), the call will be automatically forwarded to a pre-designated number (such as voice mailbox or auto paging center) based on the forwarding list.
39	Call forwarding list	This service is used to activate or deactivate the related records in the call forwarding list of a service subscriber.
40	Advice of charge at end of call	With this service registered, at the end of a call originated by a service subscriber, the charge will be displayed on the phone set after one ringing tone.
41	Cancel all registered supplementary services	This service is used to cancel all registered supplementary services.

5.1.5 IP Centrex Services

Based on the IP network, IP Centrex services are a class of NGN value added services which inherits PSTN Centrex services and, based on them, integrates the flexibility of the IP network. Compared with the traditional Centrex services, IP Centrex services are not restricted to voice services. Instead, they integrate multimedia and data services and thus more conveniently provide an optimized and centralized communication solution for group subscribers, such as factories, enterprises, schools, hospitals, government agencies, corporations, hotels, and financial organizations.

SoftX3000 can provide a complete IP Centrex solution to support IP Centrex basic services, IP Centrex supplementary services, IP console, and IP supermarket services.

I. Major Technical Features

- IP Centrex services are all provided by the host software. There's no special requirement for subscriber terminals.
- PSTN telephone terminals are supported as IP Centrex subscribers. MGCP packet terminals, H.248 packet terminals, SIP packet terminals, and H.323 packet terminals are also supported as IP Centrex subscribers. Therefore, the networking mode is very flexible.
- IP Centrex subscribers can enjoy all PBX functions. In addition to all basic services provided for ordinary subscribers, IP Centrex subscribers can enjoy various supplementary services.
- IP Centrex subscribers can be distributed on different media gateways, which help achieve the local network cross-region distribution and the wide area cross-region distribution. The latter is also known as wide area Centrex.

- SoftX3000 supports a maximum of 8000 Centrex groups. The length of the group short numbers ranges from two to eight digits. The number of subscribers in each group only depends on the capacity of the controlling SoftSwitch equipment.

II. IP Centrex Basic Services

Table 5-2 IP Centrex basic services

No	Service type	Service description
1	Intra-group calling out	When a Centrex subscriber calls another subscriber in the same Centrex group, he/she can directly dial the extension number of the callee.
2	Out-group calling out	When a Centrex subscriber calls an out-Centrex subscriber, he/she must dial the outgoing prefix ("0" for example) before the number of the callee.
3	Intra-group calling in	When a Centrex subscriber calls another subscriber in the same Centrex group, he/she can directly dial the extension number of the callee, with no need to dial the PSTN number of the callee.
4	Out-group calling in	When an out-Centrex subscriber calls a Centrex subscriber, he/she can only dial the PSTN number of the callee, but not the extension number.
5	Originating call screening	A Centrex group can determine to restrict calls of some Centrex subscribers, including out-Centrex calls of some types or all types.
6	Emergency call	An intra-Centrex subscriber can directly dial the emergency numbers without dialing the outgoing prefix, for example, to make a fire emergency call.
7	Distinctive ringing	SoftX3000 supports distinctive ringing tones for intra-group and out-group incoming calls. For example, short ringing tone is played for intra-group incoming calls, normal/special ringing tone is played for out-group incoming calls.

III. IP Centrex Supplementary Services

IP Centrex subscribers can not only enjoy all basic services and supplementary services provided for ordinary subscribers, but also can enjoy a number of new services specialized for them, such as group-shared abbreviated dialing, forwarding of incoming call to Centrex, CFB/CFU/CFNR to Centrex attendant, operator interception, operator break in, and forced release by operator.

IV. IP Console

SoftX3000 supports IP console services.

U-Path is an IP console product of Huawei. As a key component of the IP Centrex solution, U-Path, under the control of SoftX3000, achieves voice, data and other service functions through the pure packet switched IP network. Besides, U-Path manages the subscribers in the IP Centrex group and the services they enjoy, which contributes to the integration and abundance of Huawei IP Centrex services.

IP console services have the following technical features:

- IP access feature, which allows the console to access SoftX3000 across the IP network so that the console operator can be located far away from SoftX3000.
- Call control functions such as call transfer, call assistance, incoming call queue, call hold and resume, and re-dialing.
- Call emergency override/transfer functions.
- Transferring calls to a standby number in the event of console failure.
- Calling by called party's name and calling name identification presentation functions.
- Multi-language auto wakeup.
- Do-not-disturb service.
- Night service function.
- Distinctive presentation for intra-group and out-group incoming calls.
- Call forwarding to console on busy, no reply or do-not-disturb.
- Forwarding charge not recorded in U-Path.
- Console queuing announcement.

V. IP Supermarket

IP supermarket refers to IP toll call services deployed by carriers. The IP supermarket function of SoftX3000 is implemented in IP Centrex mode and IP console (U-Path) charges all calls made at IP supermarkets. The technical features of the IP supermarket are as follows:

- Provides complete and powerful charging functions, such as immediate charging, quota restricted calling, daily or monthly settlement, and charging of callee.
- Supports several networking and access modes, such as 2B+D, access network (AN) serial port, IP AN, and NGN.
- Supports centralized management: One console can manage multiple phone sets.
- Provides easy the convenient operations: Using mouse, you can enable or disable service authorities, set immediate generation of bills after hook-off, and manage deposit and changes.
- Supports statistics and analysis.
- Supports hierarchical access and role-based access.

5.1.6 Multimedia Services

I. Point-to-Point Multimedia Communication

SoftX3000 supports multimedia communications between SIP-based and H.323-based multimedia terminals including soft terminals. SoftX3000 supports multiple audio/video coding formats such as G.711, G.723, H.261 and H.263. Depending on the bearer network, the occupied bandwidth can be negotiated between the calling and called parties and then be adjusted dynamically.

The point-to-point multimedia communication services supported by SoftX3000 include the following:

- Instant message: Allows real-time communication by means of text between one terminal subscriber and another who has already logged in.
- Video communication: With respective cameras installed, a terminal subscriber can directly originate a video call to the opposite party and the appropriate video quality can be determined depending on the network bandwidth.
- File transfer: Transfers files to another subscriber or department where the received files can be saved under a particular directory or a specified directory.
- Program sharing: A terminal subscriber shares a program; then the opposite party can use this shared program remotely.
- Electronic whiteboard: Both parties can write and draw on the same whiteboard, for example, for discussion purposes. It is applicable to many occasions such as remote teaching and technology information communication.
- Content release: The contents of advertisements and media streams can be released through a multimedia terminal, and a platform can be used to selectively locate the subscriber or to immediately release.

II. Multimedia Videoconferencing Service

SoftX3000 has gatekeeper functions and supports the multimedia videoconferencing service under the control of the MCU.

- Supports to hold the conference in reservation convening mode, and subscribers can make reservation through telephone, E-mail or Website.
- Supports a subscriber to convene and control a conference by means of iDo software which runs on the subscriber terminal and allows the subscriber to manage the conference.
- Supports data conferences with file transfer, electronic whiteboard, program sharing functions between terminals by introducing a data conference server.
- Supports SIP packet terminals and H.323 packet terminals to act as conferencing terminals.
- Supports both video conference and audio conference.

5.1.7 IN Services

I. Overview of IN Services

Fully compliant with the ITU-T Recommendations Q.122x and Q.123x series and the ITU-T Recommendation Q.1218, SoftX3000 supports SSF, so SoftX3000 can act as an SSP in the IN. With the cooperation of the SCP entity, SoftX3000 can provide subscribers with abundant IN services.

II. Card Calling Service

To meet the various demands on card services, the card calling service (CCS) has integrated the advantages and functions of various card services. CCS card can not only accomplish all the functions of such traditional card services as IPCARD, UCS, 200 and 201, but also can be used for calls supported by the install communication software, Internet access, payment of phone charge, water and electricity charge. In addition, it can be recharged directly from debit card or credit card.

III. Advanced Prepaid Service

The advanced prepaid service (APS) supports the setting of different preferential rates and payment modes (pre-payment, post-payment, or shift from pre-payment to post-payment) based on different types of card, as well as binding of card numbers and calling numbers. In addition, it supports two dialing modes: one-stage dialing and dual-stage dialing, and two voice prompts: advance prompt and last-minute prompt.

IV. Family Free Phone (FFPH)

The main feature of the family free phone (FFPH) service is that callees will be charged, and this service is intended for the calls between family members, for example, kids call parents. However, the targets of the service are not restricted to family members in actual applications. This service provides such features as payment by service subscribers, quota and charge control, black list, and family numbers.

V. Virtual Private Network

The virtual private network (VPN) service is to provide a logical private network for certain institutions and enterprises by using the PSTN resources so that these institutions and enterprises can provide services on this private network. This not only saves the investment in building private networks, but also ensures variety of services and flexibility of charging modes.

VI. Wide Area Centrex

The wide area Centrex (WAC) service enables Centrex groups distributed over different exchanges to operate on the same virtual private network. Calls between WAC subscribers under the same Centrex exchange are completed in the exchange itself. Calls between non-Centrex subscribers or subscribers of different Centrex exchanges are completed with the help of SSP and SCP.

VII. Intelligent Public Telephone

The intelligent public telephone (IPT) service is a public telephone operation mode using IN resources. As a supplement to CCS, the IPT service integrates the advantages of CCS in charging & routing and the convenience of intelligent card (IC). On the IC telephone dedicated for the IPT service, public calls can be made using the phone cards, so that such problems as low security, frequent illegal calls, charge complaint, and charge fraud can be avoided.

VIII. Telecom Communicate Partner

The Telecom Communicate Partner (TCP) service allocates a unique number to a service subscriber, and this number is associated with multiple numbers of the service subscriber. When other subscribers call this unique TCP number, the service subscriber can answer calls through home telephone, office telephone, cell phone, or PHS.

IX. Number Portability

After the application of the number portability (NP) service, when a subscriber calls the old number of a service subscriber, the system will notify the caller of the number change as well as the new number of the service subscriber. At this same time, the system will automatically connect the call to the new number (actual number) of the service subscriber.

5.1.8 UC Services

I. Overview of UC Services

Unified Communication (UC) services refer to the various value added services provided by SoftX3000 with the cooperation from an SIP application server and a third-party application server. The UC system of Huawei adopts the Info-Tech (IT) system developed by Microsoft or IBM as a third-party application server that cooperates well with the U-SYS solution to provide a variety of value added services for subscribers.

II. Click To Dial

The click to dial (CTD) service enables a subscriber to be in a VoIP communication through the packet based network with another pre-determined subscriber by clicking a link on a Web page. These two subscribers can be IP telephone terminals which are identified by IP telephone terminal number, personal computers which are used by the subscribers to view Web pages, or ordinary PSTN phone sets which are connected to the packet network through packet gateways and identified by E.164 telephone number.

III. Click To Fax

The click to fax (CTF) service enables a subscriber to transfer determined fax information to the called subscriber through the VoIP network by clicking a link on a Web page. SoftX3000 supports both the INAP extensions and the T.38, and can transfer fax information to a fax machine.

IV. Unified Message

The unified message (UM) service enables a subscriber to receive e-mail messages, voice mailbox messages, voice messages, video pictures, short messages and fax information, as well as viewing motion pictures.

V. Instant Message

The instant message (IM) service enables several subscribers to exchange content information in real time. Usually the content information is in the text format and does not need to store. The IM service is different from the e-mail messaging system. In the IM service the feature of real-time transfer of text messages is provided. The communication between IM subscribers are still based on text messages.

Combining instant messaging with mobile messaging, Internet messaging and fixed messaging, mobile subscribers, Internet subscribers and fixed terminal subscribers can have a chat in a multimedia manner.

VI. Phone To IM

This service enables IM subscribers to communicate in the voice manner. With the proper IM number, telephone subscribers including PSTN telephone terminals, SIP packet terminals and H.323 packet terminals can be in a voice communication with IM subscribers.

After a telephone subscriber dials the IM access code, a voice prompt is played to the telephone subscriber and the dialed IM number is collected. The IM service makes a judgment on the current state of the IM subscriber, for example, whether the IM

subscriber is on the Internet and whether the IM subscriber can receive voice communication. And then a voice channel is established between the telephone subscriber and the IM subscriber. Subsequently, the IM subscriber can communicate in a voice manner with the telephone subscriber, for example, by using an earpiece and a microphone connected to the computer; the IM subscriber can also communicate in the text way with other IM subscribers.

VII. Presence

This service enables a subscriber to modify or publicize the current communication status of the subscriber himself, and even the feeling and the mood of the subscriber himself. Besides, this service enables other subscribers to subscribe to the current status of the presence service subscriber. Whenever the communication status of the presence service subscriber changes, the presence service notifies the corresponding subscribers of the change.

For example, subscriber A subscribes to the telephone status of subscriber B by the presence service. Once subscriber B's telephone status moves from the conversation status to the available status (for example, the subscriber hooks on), the presence service notifies subscriber A of the change by means of e-mail, Short Message Service (SMS) or IM. And then subscriber A can select the most appropriate communication way to contact subscriber B.

The presence service can also be combined with other services and provide the subscriber's status information for those services. For example, the presence service is combined with the multimedia conferencing service. The multimedia conferencing service can display the attendance status of the conference members by using the status information provided by the presence service.

VIII. Personal Communication Assistant

The personal communication assistant (PCA) service provides a number of functions to realize the management of personal information. For example, a subscriber can put all personal information in the network including the address book, schedule, e-mail address, voice mailbox, fax mailbox, preferred news, and preferred stocks. The subscriber operates such information through Web pages or by means of voice interfaces to build a personal communication assistant.

5.2 Functions

SoftX3000 supports multiple unique functions or features, satisfying the requirements of various networking or applications.

5.2.1 Smart Network

I. Networking Solution

The smart network solution is a typical illustration of U-SYS NGN solution, which fully exemplifies the theory of NGN—separating service and bearer from call control. By connecting the SHLR, SCP, and application server with SoftX3000, the smart network ‘intelligentizes’ the PSTN and boosts its service provisioning capability. Figure 5-1 shows the details.

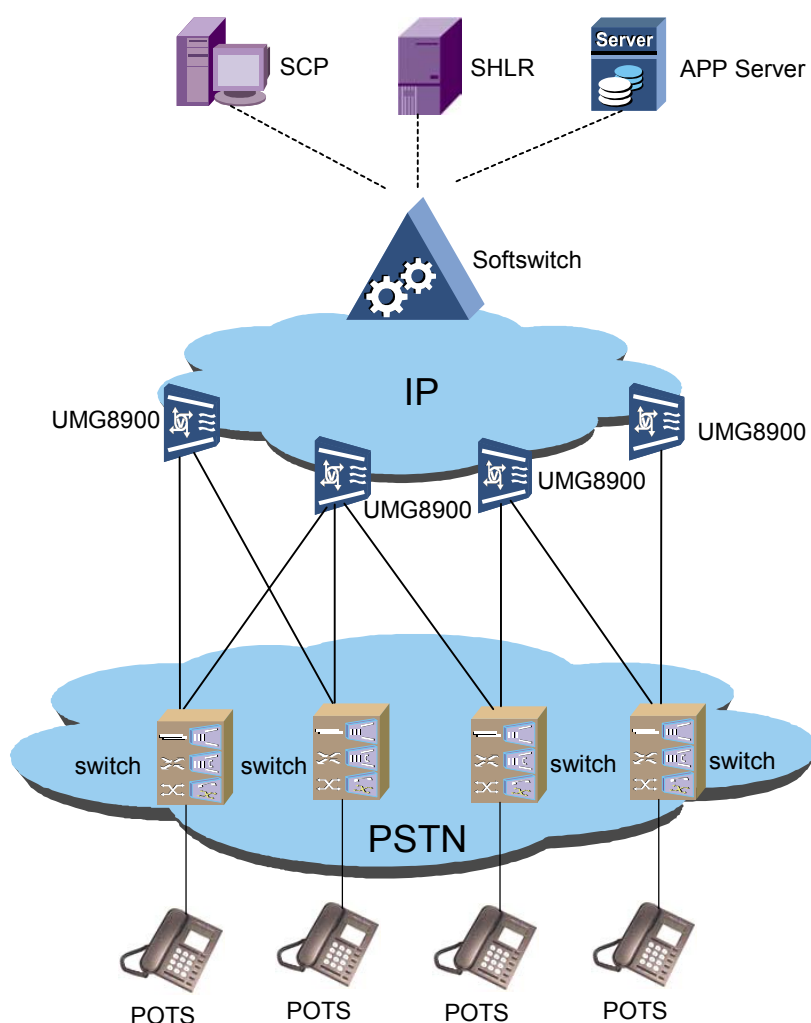


Figure 5-1 An illustration of smart network

- SHLR stores and manages all IN service related data of all subscribers in the network.
- SCP provides IN services for subscribers.
- APP Server provides NGN value-added services for all subscribers.

II. Features of Smart Network

The U-SYS smart network has the following features:

- Deploying services network wide without changing configuration of the local exchanges.
- Providing the hybrid service provisioning feature and the NP service, solving the number change issue during network optimization.
- Providing SSP capability through SoftX3000, solving the issue that local exchanges cannot be upgraded with the SSP feature.
- Streamlining maintenance procedure and reducing maintenance cost by maintaining the service, subscriber, and routing data in NGN.
- Providing CDRs for all local calls in SoftX3000 without upgrading the local exchanges, achieving online real-time billing in low cost.
- Optimizing network architecture by using NGN-centered, star-shaped network, significantly reducing local exchanges and networking cost.

III. Services Provided by Smart Network

The smart network adds new service provisioning capabilities to the PSTN local network. The increase of the service provision capability of the NGN will also boost that of the smart network.

- Traditional IN services: Pre-Paid Service (PPS), 800 service, televoting, and the like.
- Closed User Group (CUG) service: The CUG service is provided by SoftX3000 and SHLR. A CUG is composed of a mobile subscriber and multiple NGN subscribers. A mobile subscriber can be of different CUGs. There are two types of CUGs: ordinary CUG and super CUG. Ordinary CUG users can call within the CUG or super CUG users; super CUG users can call within the CUG and ordinary CUG users. A non-CUG user cannot call CUG users. During a call initiated by a CUG user, the charging number is the account number of the CUG, and the payment type is third party.
- NP service is provided by SoftX3000 and SHLR. An NP subscriber has two numbers: a physical number that identifies the location of the subscriber and a logical number that is publicly used. There are two types of NP service: the caller NP service that changes physical number to logical number and the called NP service that changes logical number to physical number. During call processing, SHLR changes the physical number to the logical number.
- ONLY service (including sequential ringing mode and simultaneous ringing mode): In the sequential ringing mode, an ONLY subscriber's various telephone numbers are bound together through a Virtual Private Number (VPN) that can be a real number or a virtual number of the ONLY subscriber. When another subscriber dials this VPN through IN, SCP sends several connection commands (the number of the commands depends on the telephone numbers of the ONLY subscriber

registered), and the SoftX3000 calls these numbers in turn. If only the call is answered, the other registered phone sets stop ringing and the related resources are released. Only the caller and the callee are charged. In the simultaneous ringing mode, SCP sends a connection command that contains several called numbers, and the SoftX3000 calls these numbers simultaneously. Once the call is answered, the other phone sets stop ringing.

- Color dialing tone service: When a service subscriber picks up, SoftX3000 triggers the IN service to SCP, and the latter instructs the MRS to play a predefined audio announcement (speech or music) through SoftX3000.
- RBT service. When a subscriber dials the number of an RBT subscriber, he/she will hear a predefined announcement. It can be a piece of music, advertisement, or user-defined message, rather than the old-fashioned, monotonous beeps.
- Advice of charge at end of call (AoCE) service: With this service registered, at the end of a call originated by an NGN service subscriber, the charge will be displayed on the phone set (supporting AoCE) after one ringing tone. For PPS subscribers, SCP will send charge and balance; for post-paid subscribers, SCP will only send the charge. The AoCE phone set can measure the charge by day and month.

5.2.2 Support for Multi-Country-Code, Multi-Area-Code, and Multi-Time-Zone Functions

As NGN adopts a high-speed packet switched network as its core bearer, it is made possible for a carrier to network across several regions and countries by using SoftSwitch equipment. This is a good way to reduce the investment of the network construction and improve the marketing competitive power of the carrier.

In a pure software manner, SoftX3000 simultaneously supports multi-country-code and multi-area-code functions to fully satisfy the across-region and across-country networking requirements of the carrier.

- Simultaneously supports 50 country codes, ensuring the correctness of calling number transmission and number analysis.
- Simultaneously supports 500 area codes, ensuring the correctness of calling number transmission and number analysis.
- The nature of service of the calls between multiple area codes is national toll calls, which can be flexibly charged.
- The E.164 numbers of the subscribers using different area codes can be the same, that is, E.164 numbers can be repeatedly used.
- Supports time zone dependent charging, that is, calls are charged according to the time zone where subscribers are located.
- Provides different announcement according to the gateway type.

5.2.3 Support for Multi-Signaling-Point-Code Function

SoftX3000 can function as a gateway office, supporting a maximum of 256 local signaling point codes. This breaks through the limit of 4096 ($2^{12} = 4096$) SS7 trunk circuits supported by a single office direction at most, and extends the number of SS7 trunk circuits supported by a single office direction to $256 \times 4096 = 1048567$. This fully satisfies the requirements of a gateway office for a large capacity of trunks.

5.2.4 Support for Dual-Homed Bastion Host Function

As NGN is an open and distributed network, media gateways can access the SoftSwitch at any location through the IP packet network. However, because of the complexity issues of the network, a variety of natural disasters, and the reliability issues of the SoftSwitch, media gateways will lose the control of the SoftSwitch in the event of an interruption of the network, an earthquake where the equipment room is resident, or a fault of the SoftSwitch equipment; media gateways cannot provide services for subscribers. This will directly influence the service quality of the carrier, and then the subscribers will complain about this.

To solve this problem, SoftX3000 provides a dual-homed bastion host control mechanism. That is, a media gateway device can simultaneously home at two independent SoftX3000s, one of which acts as an active Media Gateway Controller (MGC) and the other as a standby MGC. A real-time backup mechanism between the SoftX3000s guarantees the data consistency of the controlled media gateways. Whenever the active SoftX3000 becomes faulty, the standby one immediately receives the control of the media gateways against interruption of the services, so that the reliability of the system can be improved and the disaster-proof ability of the network can also be enhanced.

5.2.5 Support for Gateway Office Functions

SoftX3000 supports a number of gateway functions such as black and white lists, call authentication and call interception. Depending on the calling subscriber's number or incoming trunk's identifier, SoftX3000 can bar or allow incoming calls from certain calling subscribers or incoming trunks to certain destination numbers, including intra-network calls, national toll calls, international toll calls, and other voice services and multimedia services.

SoftX3000 acting as an inter-network gateway office has the following technical features:

- Comprehensive authentication and interception capabilities: SoftX3000 can conduct flexible authentication based on the calling number or calling number prefix, calling subscriber's category, outgoing/incoming trunk group identifier,

nature of call service, destination number (called number or called number prefix), calling time. SoftX3000 provides authentication capability associated with black and white lists. The capacity of the black and white lists is up to 2,000,000.

- Precise and flexible charging capabilities: SoftX3000 provides two charging modes, namely meter and detailed bill, and allows 100% calls to have a bill. The duration precision in the bill is 1 second. Bill statistics function is supported based on the tariff, date and time, destination number, trunk group and area code, for routine maintenance and settlement purposes.
- Strong and secure bill storage and transmission capabilities: SoftX3000 adopts a three-level bill storage mechanism (host, bill server, billing settlement center), so that bills can be stored and transmitted securely, rapidly and reliably.

5.2.6 Support for Tandem Office Functions

Acting as a tandem office, SoftX3000 has the following features:

- Supports traditional PSTN signaling such as SS7.
- Supports SIP/SIP-T protocol.
- Supports H.323 protocol.
- Supports plane static routing, hierarchical static routing, and dynamic routing.

5.2.7 Support for SSP Functions

SoftX3000 provides the following IN services by cooperating with SCP:

I. Free Phone (FPH)

This service enables calls to a callee to be paid by the callee. For example, if a commercial organization or a person applies for this service, the service subscriber will be charged for all the calls to him/her. As such outgoing calls are free for callers, they are usually called "Freephones".

II. Account Card Calling (ACC)

This service enables a subscriber to make calls on any dual-tone multi-frequency (DTMF) phone set, and have the charges for the calls automatically debited to a specified account card.

III. Universal Personal Telecommunication (UPT)

This service enables a subscriber to access any network and originate and receive any type of calls across multiple networks by using a unique personal telecommunication number (PTN), which is associated to mobility service.

IV. Mass Calling (MAS)

This service is similar to the hotline service. It mainly features the capability to prevent network congestion in case of instant heavy traffic. For example, this service is probably used when it is advertised that anyone making a call to a particular telephone number during a specific time segment has a chance to be rewarded.

V. Televoting (VOT)

This service is provided for consultation or opinion survey. The enterprises, government branches, or commercial organizations requiring opinion survey can apply for one or multiple televoting numbers for investigating mass opinions by means of the telephone network. Accordingly, people can dial the several specific televoting numbers to register their votes or dial one televoting number to express their opinions by following the recorded announcement to press phone set keys.

VI. Wide Area Centrex (WAC)

This service enables Centrex groups distributed over different exchanges to operate on the same virtual private network. Calls between WAC subscribers under the same Centrex exchange are completed in the exchange itself. Calls between non-Centrex subscribers or subscribers of different Centrex exchanges are completed with the help of SSP and SCP.

VII. IP800

This service enables all calls to a service subscriber, on the IP network, to be paid by the called party. The 800 service subscriber who applies for the service specifies the real destination number corresponding to the 800 number. The destination number may be a PSTN telephone number, an IP terminal number, an IP address, or subscriber ID. The 800 service subscribers can be various subscribers on the IP network. They can click the 800 number on a Web page or dial the 800 number to make a phone call.

5.2.8 Support for IPTN Functions

IP telecommunication network (IPTN) integrates the traditional telecom network technologies into the IP network, thus solving the IP network operation problem and improving the quality of service (QoS) of the networks. It has the following features:

- Uses the traffic classification and bandwidth control mechanism to identify and regulate services and traffic of subscribers.
- Uses the static routing mode.
- Uses the network resource manager to coordinate the service layer and the bearer layer, making a bearer network capable of sensing services and selecting a bearer network path for telecom services.

5.2.9 Support for Remote Access Functions

With the special number conversion function provided by the central database board (CDBI), SoftX3000 can address the remote or non-local mobile phones. The CDBI has powerful data storage capability and supports saving 1,000,000 special number conversion records, so that carriers' requirement on addressing remote/non-local mobile phones can be satisfied.

5.2.10 Support for Equal Access Functions

SoftX3000 supports the following equal access functions:

I. Classification of Authorities

SoftX3000 supports seven service attributes: intra-office calls, local calls, local toll calls, intra-module calls, out-module calls, intra-Centrex calls, and out-Centrex calls. These service attributes have one-to-one corresponding relationship with subscriber authorities.

II. Presetting of Carrier Identification Code

Each toll carrier is allocated with one carrier identification code (CIC). After a subscriber signs an agreement with a toll carrier, the subscriber can select the toll network of this carrier for making toll calls by dialing the corresponding CIC before called numbers. In addition, the subscriber can make toll calls either by presetting CIC or selecting toll carriers freely.

III. Authentication of Gateway Office

Serving as a gateway office, SoftX3000 can authenticate calls from the other carrier networks to judge whether a subscriber is authorized to use the local network services, such as national auto calls, international auto calls, and so on.

Chapter 6 Networking and Applications

6.1 System Networking

6.1.1 Packet Multimedia End Office

SoftX3000 can act as a packet multimedia end office to provide different multimedia applications: SoftX3000 supports SIP and H.323 protocol. It can function as H.323 gatekeeper (GK) or SIP Server to control and access multimedia terminal. SoftX3000 also supports MGCP and H.248 protocol. It can function as MGC to control and access packet voice media gateway. A typical networking model is illustrated in Figure 6-1.

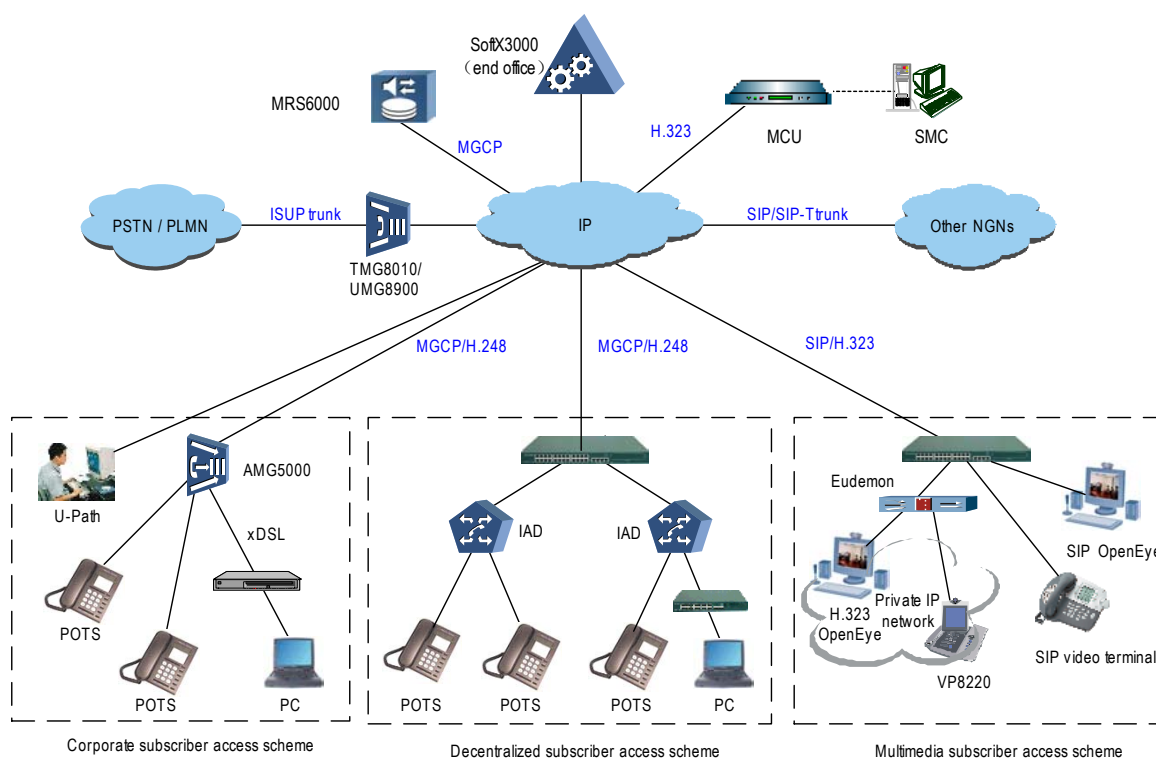


Figure 6-1 Typical networking model of packet multimedia end office

Specific functions include the following:

- H.323 and SIP multimedia video terminals interwork with SoftX3000 through SIP and H.323 protocol. Multimedia services such as voice communication between multimedia terminals, point-to-point (P2P) video, and data synchronization can be

implemented using the uniformly allocated unique telephone number in the whole network.

- With the support of the MCU and the SMC of the MediaCentre, multimedia terminal can convene a conference in SiteCall mode. The conference convening request is sent to the SMC that selects a valid resource allocation scheme according to conference site distribution and MCU usage. The SMC also automatically schedules conference according to the best utilization strategy of network resources. In this way, point-to-multipoint (P2MP) videoconferencing service can be implemented.
- H.323 and SIP multimedia subscribers can act as calling parties or called parties to implement voice services similar to those used by PSTN subscriber, MGCP packet voice subscriber, and H.248 packet voice subscriber.

6.1.2 Packet Tandem Office

SoftX3000 supports a number of routing functions such as the plane static routing, the layered static routing and the dynamic routing. SoftX3000 can act as a packet tandem office. A typical networking model is illustrated in Figure 6-2.

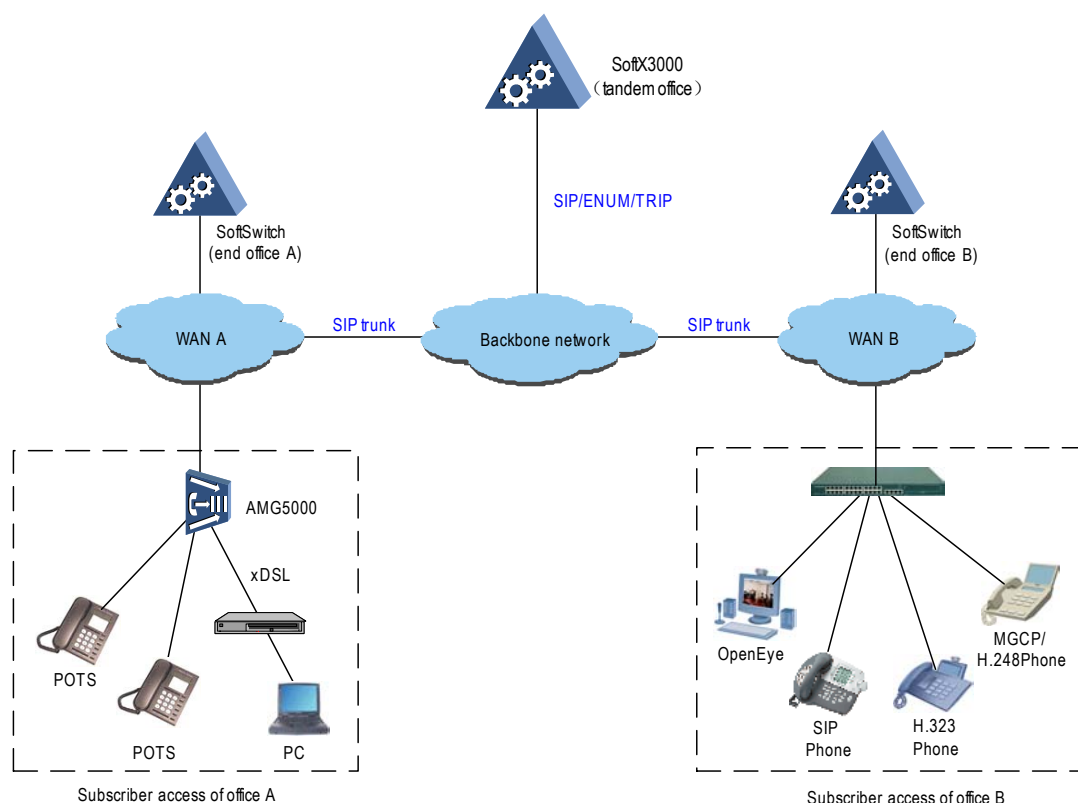


Figure 6-2 Typical networking model of packet tandem office

SoftX3000 provides the layered softswitch structure mode under the layered routing structure. In this mode, SoftX3000 adopts the plane static routing and transits the incoming calls from the end offices by means of SIP trunk.

6.1.3 Packet Gateway Office

SoftX3000 supports gateway functions such as black and white lists, call authentication and call interception. SoftX3000 can act as a packet gateway office. A typical networking model is illustrated in Figure 6-3.

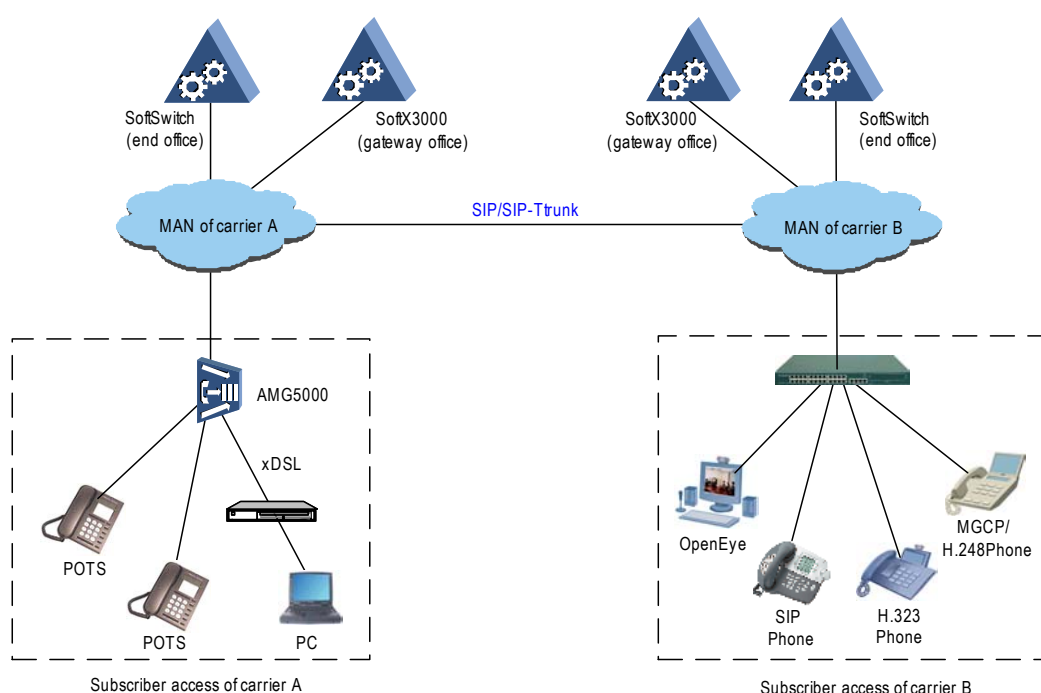


Figure 6-3 Typical networking model of packet gateway office

In the actual networking applications, the carrier can adopt any of the following modes to construct a gateway office:

- In the case of a large-scaled local network, an independent SoftX3000 is used to act as the gateway office.
- In the case of a small-scaled local network, a SoftX3000 is used to act as both the end office and the gateway office.

6.1.4 C5 Office (End Office)

SoftX3000 supports a number of signaling transport adaptation protocols including M2UA, V5UA and IUA, and supports a number of PSTN signaling including MTP, ISUP, R2, V5.2 and DSS1. When cooperating with Huawei UMG8900 or TMG8010,

SoftX3000 can act as a C5 office (end office) in the traditional PSTN. A typical networking model is illustrated in Figure 6-4.

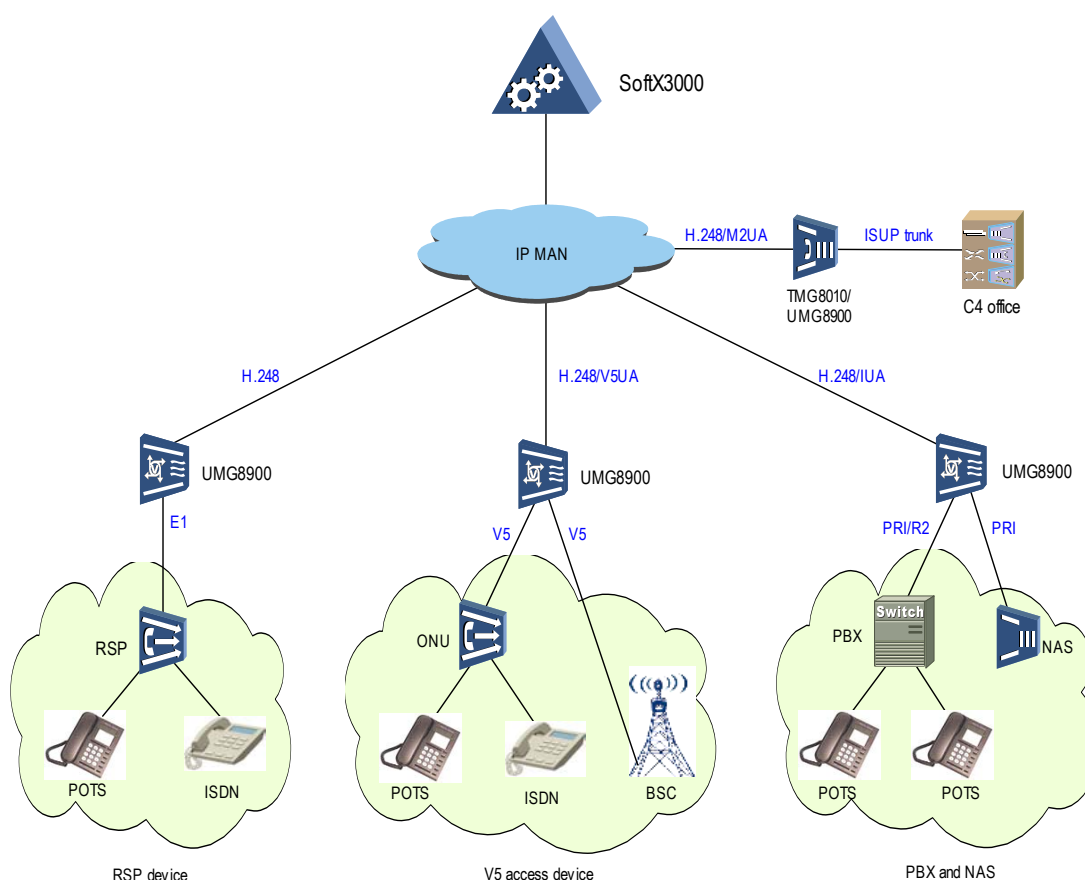


Figure 6-4 Typical networking model of C5 office (end office)

I. Interworking with Remote Subscriber Processor (RSP)

As part of the feature applications of UMG8900, the RSP device accesses UMG8900 through the internal protocol interface (called E1 interface physically). SoftX3000 controls the services in the H.248 protocol. A large-scale application of 200,000 subscribers can thus be achieved. This is a most applicable solution to re-build the existent PSTN exchange network.

II. Interworking with V5 Access Device

SoftX3000 can provide standard V5.1/V5.2 interfaces with the cooperation of Huawei UMG8900, achieving the interworking with access network devices and base station controllers (for example, Huawei ETS450).

III. Interworking with PBX and NAS

SoftX3000 can provide standard PRIs or R2 trunks with the cooperation of UMG8900, achieving the interworking with PBX and NAS.

6.1.5 C4 Office (Tandem Office)

SoftX3000 supports M2UA, M3UA, MTP and ISUP. When networking with Huawei UMG8900, TMG8010 and SG7000, SoftX3000 can act as the C4 office (tandem office) in the traditional PSTN network. A typical networking model is illustrated in Figure 6-5.

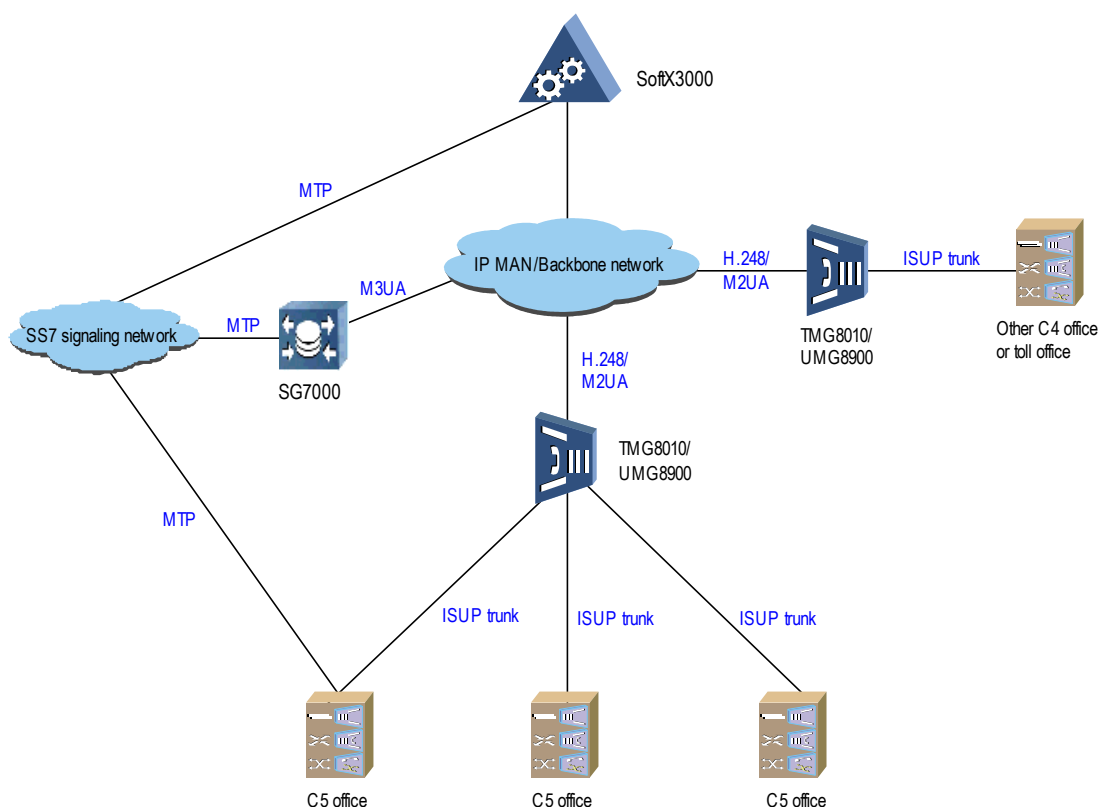


Figure 6-5 Typical networking model of C4 office (tandem office)

There are three networking cases for SoftX3000 to interwork with a C5 exchange.

- In case of M2UA, SoftX3000 can interwork with a C5 exchange through Huawei TMG8010/UMG8900, because TMG8010/UMG8900 has built-in signaling gateway functions. This networking model is a price-competitive solution.
- In case of M3UA, SoftX3000 interworks with a C5 exchange through TMG8010/UMG8900 and SG7000. TMG8010/UMG8900 implements the media stream conversion functions. SG7000 achieves the signaling conversion functions.

- In case of MTP, SoftX3000 interworks with a C5 exchange through TMG8010/UMG8900 and SS7 signaling network. TMG8010/UMG8900 implements the media stream conversion functions. SoftX3000 achieves the SP function by providing MTP links directly.

6.1.6 Interworking with H.323 Network

As H.323-based IP telephone network is widely used, attention should be focused on the interworking with the existent H.323 network when constructing a softswitching network. SoftX3000 interworks with the existent H.323 network in the H.323 protocol, equivalent to a gatekeeper. A typical networking model is illustrated in Figure 6-6.

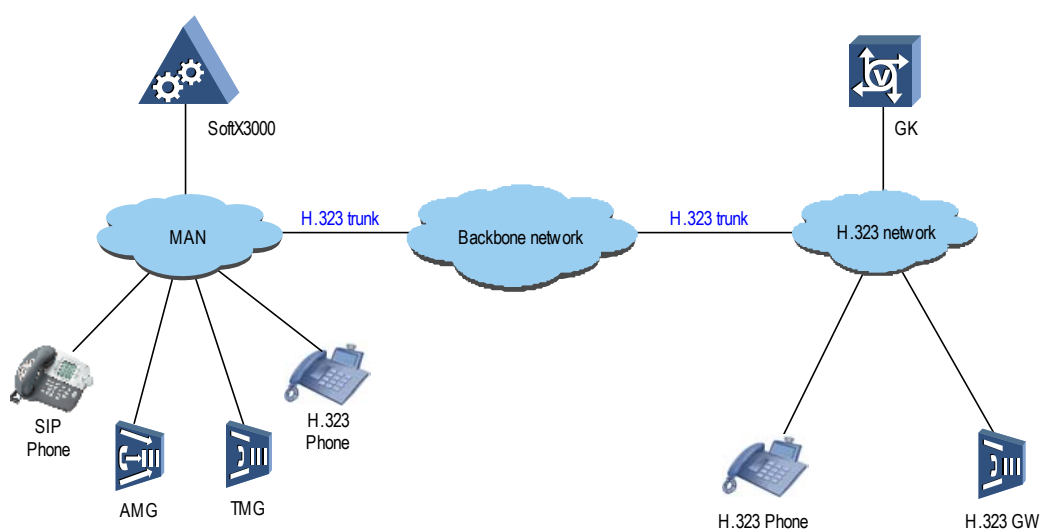


Figure 6-6 Interworking with H.323 network

When the SoftSwitch network and the H.323 network are owned by different carriers, the interworking point is resident between the local SoftX3000 and the top-level gatekeeper of the opposite party. When the SoftSwitch network and the H.323 network are owned by the same carrier, the interworking point is determined by the carrier depending on the actual conditions of the network construction.

6.1.7 Interworking with IN

SoftX3000 supports SCCP, TCAP, INAP, and provides SSF, CCF, SRF and CCAF. SoftX3000 can act as an SSP in the IN. A typical networking model for the interworking with IN is illustrated in Figure 6-7.

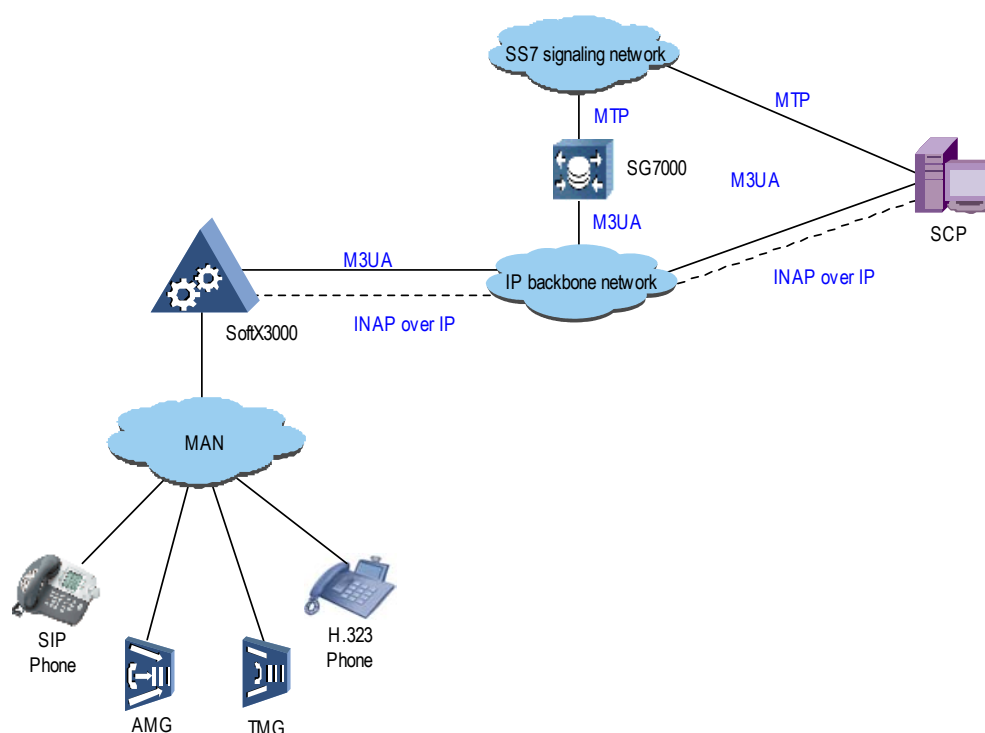


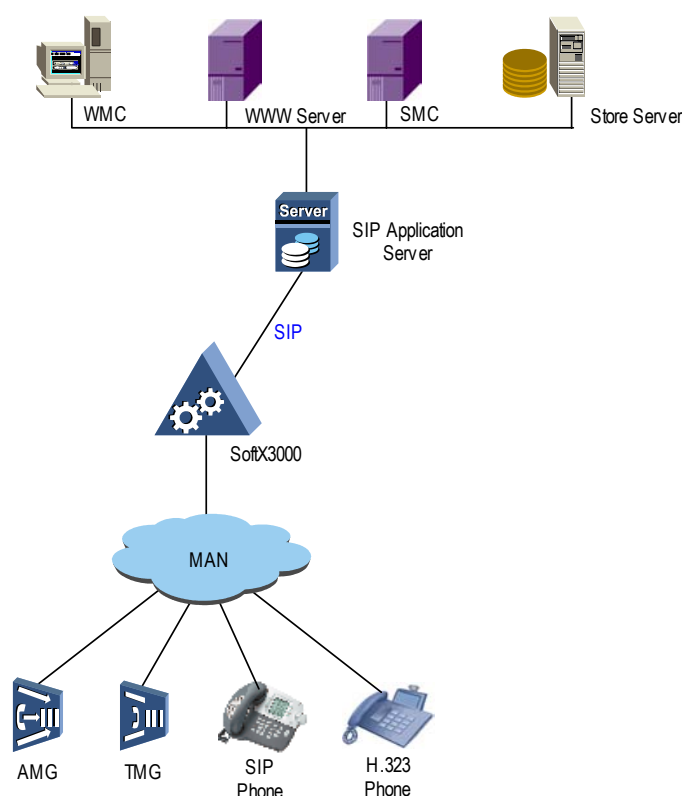
Figure 6-7 Interworking with IN

In the actual networking applications, the carrier can adopt any of the following modes for interworking with SCP:

- Both SoftX3000 and SCP provide M3UA links to the IP core network. The INAP protocol of both parties is borne over TCAP/SCCP/M3UA/SCTP/IP.
- SoftX3000 provides M3UA links to SG7000; SCP provides MTP links to the SS7 signaling network. SG7000 is responsible for the conversion of the protocols. At the SoftX3000 side, the INAP protocol is borne over TCAP/SCCP/M3UA/SCTP/IP; at the SCP side, the INAP protocol is borne over TCAP/SCCP/MTP.
- SoftX3000 connects with SCP in TCP/IP. INAP is borne over IP.

6.1.8 Interworking with SIP Network

SoftX3000 supports the SIP protocol and can interwork with SIP application server in the SIP network. A typical networking model for the interworking with the SIP network is illustrated in Figure 6-8.



WMC: Web Management Client SMS: Service Management Server

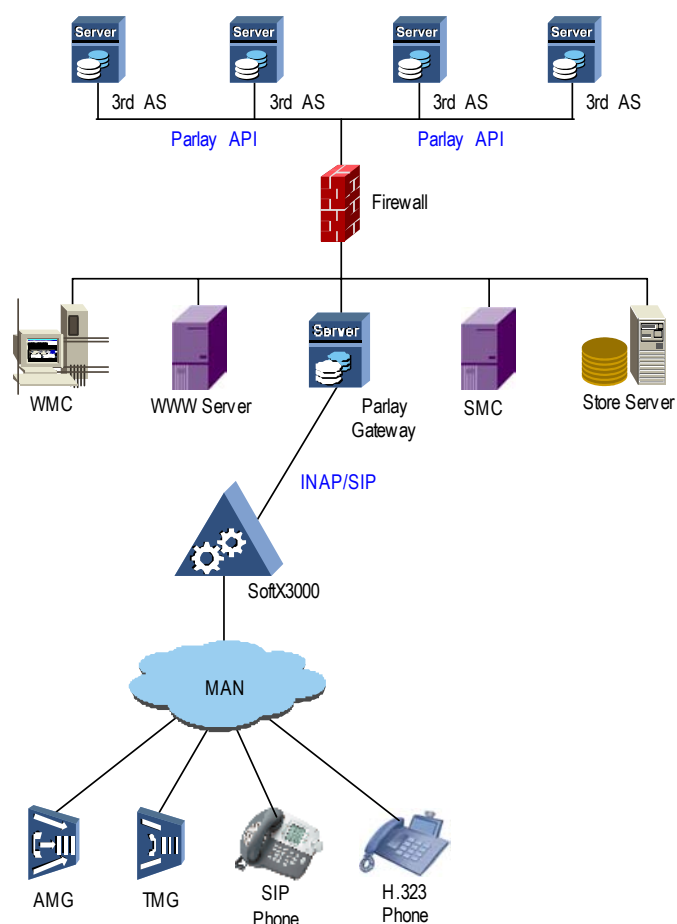
Figure 6-8 Interworking with SIP network

The SIP network application solution furthest reflects the bearer advantages of the packet-based services of NGN. In Figure 6-8, SoftX3000 provides call control functions, and the SIP network provides services. Their cooperation enables subscribers to enjoy SIP-based voice services and other services with voice and Internet integrated.

6.1.9 Interworking with Parlay Gateway

The Parlay system provides resource positioning, certification and authorization functions for the external applications accessing the IP-based Parlay services, thus the development, management and application of value added services can be realized even without the upgrade of the SoftSwitch equipment.

SoftX3000 supports the INAP and SIP protocols, and can interwork through the Parlay gateway with the application servers provided by a third party or a virtual carrier. A typical networking model is illustrated in Figure 6-9.



WMC: Web Management Client
3rd AS: 3rd Party Application Server

SMS: Service Management Server

Figure 6-9 Interworking with Parlay gateway

Figure 6-9 illustrates a solution for the applications of an open network where the carrier provides a platform for service running purposes and open APIs. The programs of a specialized software company or a carrier can be easily loaded to the network through the APIs, so that a diversity of customized services can be provided for the subscribers rapidly.

6.1.10 Interworking with 3G Multimedia Network

By collaborating with UMG8900, SoftX3000 can work as a VIG and interconnect the fixed line multimedia network and 3G multimedia network. Figure 6-10 shows the details.

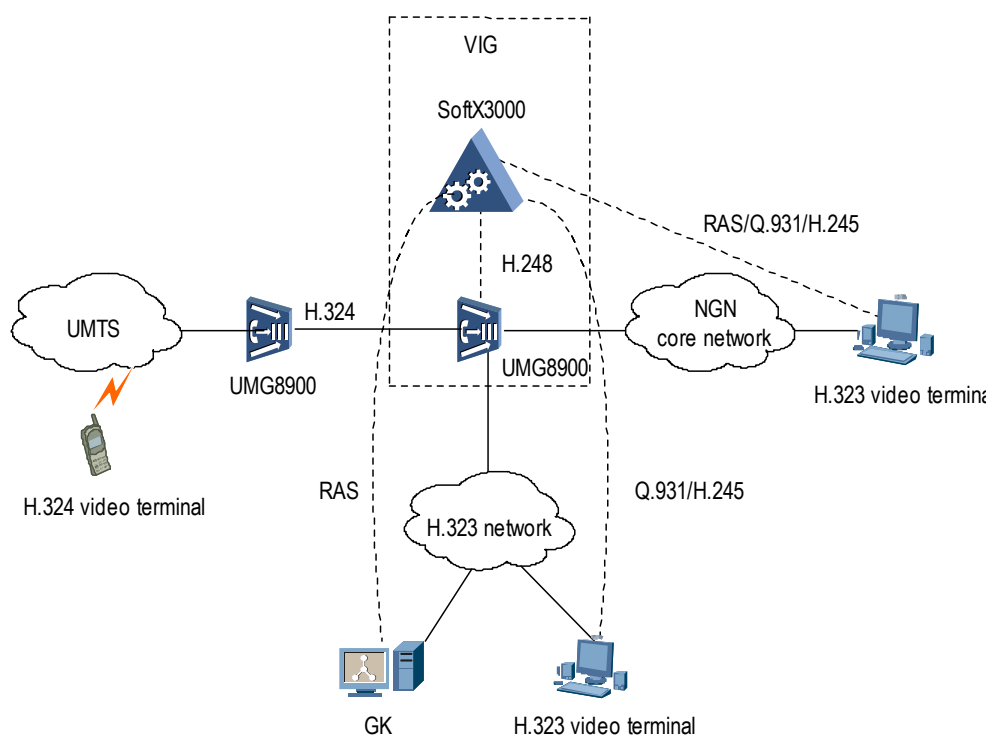


Figure 6-10 Interworking with 3G multimedia network

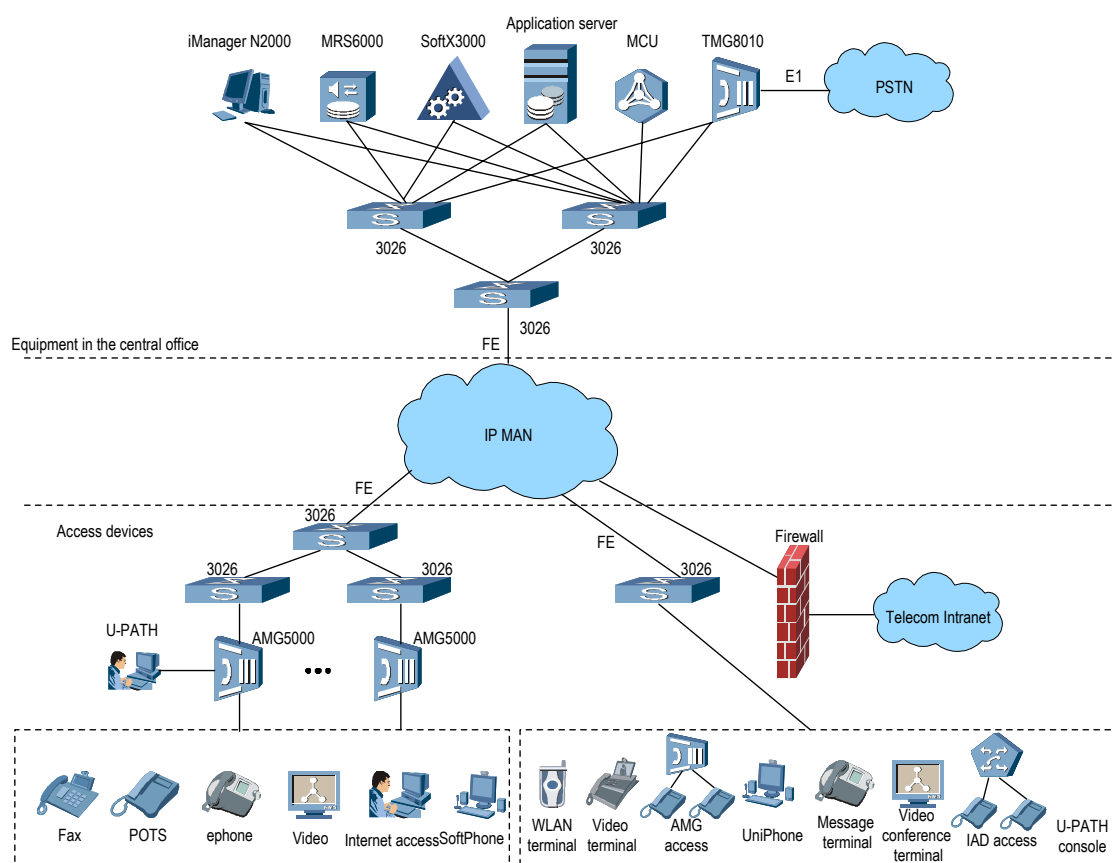
As shown in Figure 6-10, the VIG includes the control functions of UMG8900 and SoftX3000. The VIG interacts with 3G multimedia network in H.324, and with fixed line multimedia network in RAS, Q.931, or H.245.

6.2 Typical Applications

With a customized design and optimized cost performance ratio, SoftX3000 shows its advantages in NGN markets and VoIP markets.

6.2.1 Commercial NGN of Company D

It is expected by company D to adopt Huawei U-SYS product series to construct a commercial NGN, which uses IP MAN as the core and provides the advanced, open, operable, manageable, expansible, and secure integrated access networks without changing the existing PSTN and data network to support multimedia services integrating voice, video, and data. See Figure 6-11 for the networking model.



Note: 3026 is the Ethernet switch developed by Huawei

Figure 6-11 Networking model of company D's commercial NGN

The commercial NGN of company D is composed of the central office and a number of access networks. The central office equipment is SoftSwitch and various servers, including one SoftX3000, one MRS6000, one iManager N2000, one TMG8010, one MCU, and several application servers. The access equipment includes AMG and various terminals such as AMG5000, IAD, PSTN telephone, ePhone, SoftPhone, and WLAN terminal.

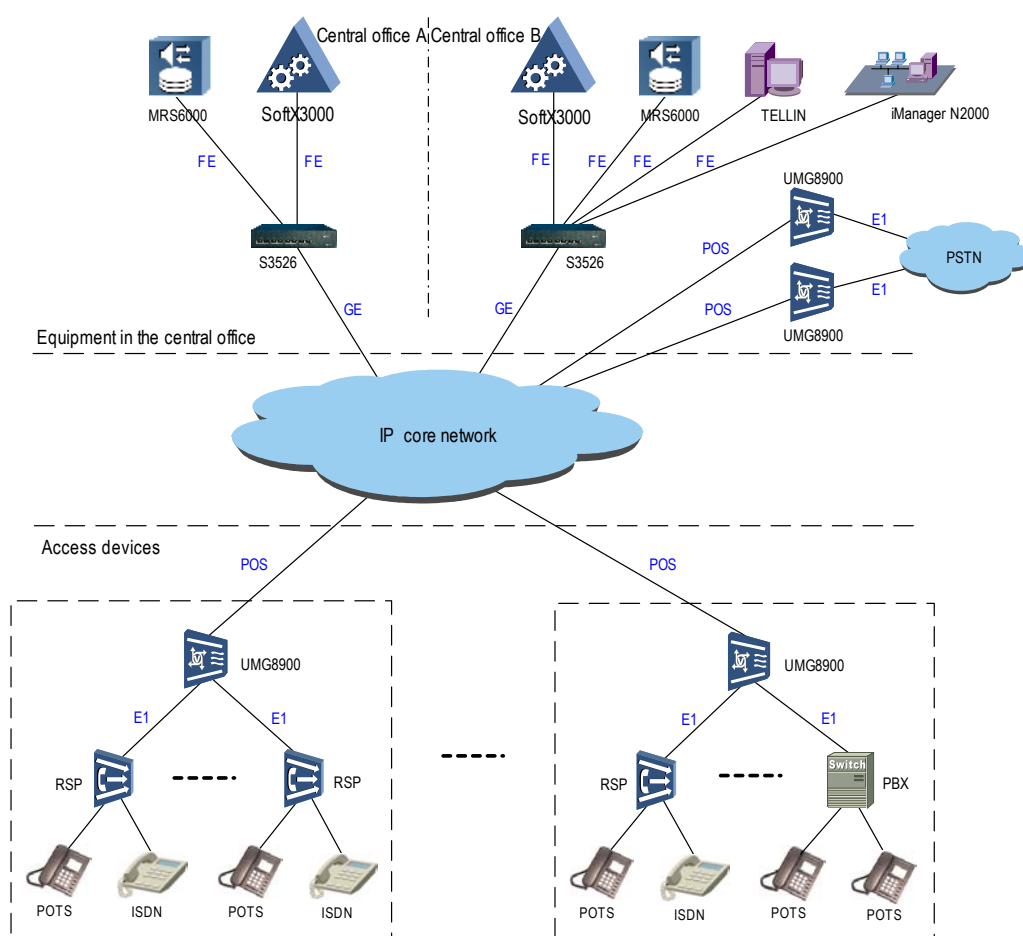
The networking features of the commercial NGN of company D are as follows:

- The voice, video, and data integrated multimedia services are supported.
- All the services are controlled and provided by the SoftSwitch center in the central office.
- The interworking between NGN and PSTN is realized with the help of the TMG8010 which has built-in signaling gateway functions. Therefore, it is unnecessary to use a physically separate signaling gateway and the network construction cost is reduced.
- The iManager N2000 is adopted in the network as the integrated network management system to provide hierarchical access and domain-based access.

6.2.2 Commercial VoIP Network of Country W

It is expected by country W to adopt Huawei U-SYS product series including SoftX3000, UMG8900 with RSPs and MRS6000 to re-build the existent exchange network to a commercial VoIP network, for the purposes of decreasing the number of exchange sites, simplifying the network layer and minimizing the operation and maintenance cost.

In the phase I of the commercial VoIP network of country W, two central office sites and 48 access network sites are established. The network capacity is planned to 100,000 subscribers. Mainly, POTS subscriber (analog subscribers) access and ISDN subscriber (2B + D) access are supported. The system networking model is illustrated in Figure 6-12.



Note: S3526 is the Ethernet switch developed by Huawei.

Figure 6-12 Networking model of country W's commercial VoIP network

The commercial VoIP network of country W is composed of two parts: central office equipment and access equipment. The central office equipment is SoftSwitch and various servers, including two sets of SoftX3000, two sets of MRS6000, one set of SCP, one set of iManager N2000 and two sets of UMG8900. The access equipment is media

gateways and remote subscriber processors, including thirteen sets of UMG8900 and forty-eight sets of RSP.

The networking features of the commercial VoIP network of country W are as follows:

- In the dual-homed bastion host, all UMG8900s (gateway device) are connected to both SoftX3000 (SoftSwitch) through different links. In the normal conditions, each SoftX3000 controls half of the gateway devices. Whenever one of the SoftX3000s becomes faulty, all the services on it are handed to the other SoftX3000, which greatly improves the reliability of the system networking.
- The interworking between the VoIP network and the PSTN is achieved by two UMG8900s which are installed at the central office. In this case, UMG8900s are equivalent to TMGs in terms of functions. Besides, UMG8900s have built-in signaling gateway functions (supporting the M2UA and ISUP protocols), so it is unnecessary to use a physically separate signaling gateway.
- UMG8900s at the access end are equivalent to AMGs in terms of functions. They not only support a number of PSTN signaling including V5, DSS1 and R2 to achieve the access of V5 access network devices and PBX devices, but also they support internal protocols to achieve the access of RSP devices.
- The system adopts Huawei TELLIN as the SCP intelligent platform which interworks with SoftX3000 (functioning as SSP also) in the INAP over IP manner, for the purpose of providing the prepaid card service for subscribers.
- The system adopts Huawei iManager N2000 as the iOSS device of the whole network for the purpose of device management and billing management on a network wide basis.

Chapter 7 Reliability and Security Design

7.1 System Reliability Design

7.1.1 Hardware Reliability

SoftX3000 is structured in a distributed manner physically, where a number of reliability measures are taken to guarantee the reliability of the hardware system. For example, the boards in use are designed in the active/standby mode, in the load-sharing mode and with redundant configuration. What are used in SoftX3000 are qualified electronic components which are carefully selected and have passed the aging test.

I. Distributed Processing

In SoftX3000 the distributed processing is achieved by means of modularized functions. The functions of the modules are relatively independent, and controlled by different processors. The fault of one processor does not influence the normal running and operation of the whole system.

II. Multi-Processor Redundant Technique

The key components used in SoftX3000 adopt the multi-processor redundant technique. For example, the SMUI, FCCU and CDBI boards all adopt the active/standby processor running mode. In the normal conditions, the active processor controls the running of the modules; the standby processor keeps synchronized with the active one in real time. Whenever the active processor becomes faulty, the standby one is brought into service immediately. The standby one replaces the active one to control the running and operation of the modules against service interruption of the system.

III. Board-Level Hot Backup

The board-level hot backup method is frequently used in communication products for the purpose of improving the reliability of the system. This method usually adopts the active/standby work mode and is mainly applicable to service processing, device management and resource management.

IV. Assistant Work Mode

Assistant work is also known as load-sharing. With the assistant work mode, two or more boards share the related functions during the normal working. Once one of the boards becomes faulty, the tasks imposed on the faulty board are taken to the hand of other boards on the premise that certain performance parameters such as call loss must be guaranteed.

7.1.2 Software Reliability

SoftX3000 software adopts a hierarchical modularized architecture with protective performance, error tolerance capability and fault monitoring function.

I. Protective Performance

From requirement analysis, system design to software test, all stages of the development of SoftX3000 strictly follow the Capability Maturity Model (CMM) procedures. Code walk-through, inspection, review, unit test, system test and other useful quality assurance measures taken in SoftX3000 development improve the reliability of the software greatly.

II. Error Tolerance Capability

By means of timing detection for key software resources, real-time task monitoring, storage protection and data check, SoftX3000 effectively prevents minor software faults from imposing a great effect on the whole system, which greatly improves the error tolerance capability of the system.

III. Fault Detection and Handling

SoftX3000 is able to automatically detect and diagnose both software and hardware faults. The faulty components can be automatically switched, restarted and reloaded to avoid service interruption.

7.1.3 System Overload Control

The load control mechanism of SoftX3000 is as follows:

- Provides 4-level overload restriction functions. When the CPU load reaches the threshold, the flow control mechanism is started and 25% subscribers are restricted at each level. When the CPU load grows heavier, the service level is degraded by one. Restoration is also conducted depending on the four levels.
- Dynamically adjusts the coding mode according to the resource occupancy and network congestion, and notifies the gateways of the adjustment.

- Preserves or immediately executes traffic control commands by analyzing the traffic measurement data and the equipment running state.
- Restricts the call volume to particular outgoing trunks, destination codes by percentage depending on the calling category, calling number, time segment, incoming trunk group identification of the incoming calls, and also provides the corresponding control cancellation commands (the restriction percentage can be adjusted consecutively).
- Restricts the maximum number of call attempts to particular outgoing trunks, destination codes in a pre-determined time interval depending on the calling category, calling number, time segment, incoming trunk group identification of the incoming calls (the restriction quantity can be adjusted consecutively).

7.1.4 Reliability Measures for Charging System

I. Hardware Reliability

iGWB Server developed by Huawei is employed as the charging gateway of SoftX3000. The dual-system is adopted in the iGWB and Hot RAID5 hard disk array is configured, which realizes the dual backup and mass storage of the bill data.

The network cards of the iGWB Server are in different network segments, and there is no message transfer among them. In this way, external subscribers are separated from internal private networks, thus ensuring the security of operations on the bill data.

II. Software Reliability

1) Program reliability

The iGWB Server is capable of transferring detailed alarm information to the alarm box through the BAM in real-time mode for centralized alarming purposes, thus facilitating the removal of the faults of the iGWB Server in time.

2) Reliability of bill data

- Against bill loss or bill repetition

After saving the original bill data, the iGWB Server sends a confirmation message to the host. At the same time, the current bill confirmation state is recorded in detail against bill loss or bill repetition. The iGWB Server is restored after each start to ensure the consistency between the original bill data and the final bill data.

- Data backup

The iGWB Server is responsible for backing up bill files and other important data in it regularly.

3) Bill error tolerance

- A protective mechanism of the bill pool is provided.

- The system is able to create the bill directory automatically for recovery after it is deleted intentionally.
 - Offline repair of error bills is available.
- 4) Transmission reliability

The iGWB Server transmits bills to the billing center by means of FTP or FTAM. Both retransmission and broken retransmission are supported.

III. Four-Level Buffer of Bill Information

From the completion of a call to the successful transfer of bill information to the billing center, there are four levels of bill buffer against bill data loss due to abnormal causes. The four levels are host bill pool buffer, original bill file buffer, final bill file buffer and automatic CD backup.

1) Host bill pool buffer

Every group of FCCU/FCSU boards provides a bill buffer for about 40,000,000 original bills.

2) Original bill file buffer

After transferred from the host bill pool to the iGWB Server, the original bills are stored first in the hard disk as the level-two buffer. At the full configuration, the iGWB Server can accommodate 3,000,000,000 bills.

3) Final bill file buffer

After having processed the original bills, the iGWB Server saves in the hard disk the final bill data to be sent to the billing center, thus implementing the level-three buffer.

4) Automatic disk backup

The iGWB Server regularly backs up the bill data in the hard disk to a magneto-optical disk to implement the level-four buffer.

IV. Security of Bill Console

1) Bill console lock

Subscriber name and password are protected by the bill console. If the subscriber makes no operation for a long time, the bill console will automatically log off against unauthorized access.

2) Operation restriction of bill client

Bill data and logs can be viewed at the bill client, but they cannot be deleted or modified for the purpose of ensuring the security of bill data.

3) IP address restriction of bill client

By configuring the Web Server, it is possible to restrict the IP address of the bill client (workstation) to prevent unauthorized nodes from accessing.

7.2 System Security Design

7.2.1 Networking Application Security

I. Closing Protocol Interfaces in No Use:

SoftX3000 provides protocol interfaces externally. On these interfaces, except necessary services such as MGCP, H.248, SIP, H.323, INAP, any other unnecessary network services such as HTTP are disabled, so as to prevent intrusion by unauthorized subscribers through invalid services.

II. Supporting Complete IPSec Protocol

SoftX3000 makes use of network routers to implement the firewall functions and supports a complete IPSec protocol.

III. Preventing DoS Attacks :preventing Dos attacks

SoftX3000 can effectively prevent the system from being attacked by unauthorized access by means of DoS.

7.2.2 Protocol and Conversation Security

SoftX3000 supports encryption processing on the security and packets of the MGCP, H.248, SIP and H.323 protocols for the purpose of guaranteeing the security of both protocols and call conversations.

7.2.3 Subscriber Security

I. Supporting Certification and Authentication on All Devices Attempting to Access SoftX3000

SoftX3000 supports certification processing on all media gateways, accessing gateways, packet terminals and soft terminals to avoid unauthorized registration.

II. Supporting Encryption and Ciphering of Certification Information

SoftX3000 supports encryption and ciphering processing on certification information and identification and tracing on malicious certification requests. SoftX3000 refuses any malicious certification requests.

7.2.4 Data Security

SoftX3000 provides strict data protection mechanisms:

- SoftX3000 supports a synchronous data backup mechanism between the active and standby boards in the real-time manner. Whenever an active board goes down, its standby board is automatically switched to be the active one. All programs and data on the board take effect immediately.
- SoftX3000 supports the backup of the data from the active processor's database to a flash memory, which enables a quick restart of the active processor after getting data from the flash memory.
- SoftX3000 supports an automatic backup mechanism of the bills.
- The BAM initiates CRC check of foreground data regularly. If the BAM finds that the data of the foreground is inconsistent with that of the background, it will initiate a setting procedure to the foreground. If the setting procedure fails after pre-determined attempts, an alarm will be generated to indicate to the operation personnel to restore the data.

7.2.5 Operation and Maintenance Security

The following measures are taken in SoftX3000 to ensure the operation and maintenance security of the system:

- SoftX3000 supports the dual-certification logon security management based on account and workstation's IP address, to avoid dormant troubles caused by account disclosure.
- SoftX3000 supports the multi-level subscriber authority management against authorized access.
- All operations performed by the maintenance personnel are recorded in a log to ensure the locatability and traceability of the history operations.
- Prompting alarms are available against system exceptions due to unintentional mistakes.
- An excellent check function is available for operator's configuration activities. Unauthorized configurations will be refused.
- The maintenance and operation system has a protection for subscriber names and passwords. If the subscriber makes no operation for a long time, the system will automatically log off against unauthorized access.

Chapter 8 Technical Specifications and Environmental Requirements

8.1 Technical Specifications

8.1.1 System Capacity:

Table 8-1 System capacity

Item	Specification
Maximum number of supported TDM trunks	360,000
Maximum number of supported gateways	2,000,000
Maximum capacity of supported black and white lists	2,000,000
Maximum number of supported subscribers	POTS subscribers: 2,000,000
	V5 subscribers: 2,000,000
	IP consoles: 100,000
Maximum number of supported multimedia terminals	SIP terminals: 2,000,000
	H.323 terminals: 1,000,000

8.1.2 System Processing Capability

Table 8-2 System processing capability

Item	Specification
BHCA of a single service processing module	400 k
BHCA of the system	16000 k
Call drop rate	≤ 0.01%
Call setup time	Calls between intra-domain subscribers: < 200 ms
	Calls between both intra-domain subscribers and out-domain subscribers: < 500 ms

8.1.3 Protocol Processing Capability

Table 8-3 Protocol processing capability

Item	Specification
Number of supported local signaling point codes	256
Maximum IP signaling bandwidth	4 x 100 Mbit/s
Packet dispatch ability of a single IFMI board	20,000 packets/second
SIP session holding capability of a single MSGI board	16,000
H.323 call holding capability of a single MSGI board	6,400
Number of SCTP associations of a single BSGI board	128
Capability of SCTP associations of a single BSGI board	1,500

8.1.4 Bill Processing Capability

Table 8-4 Bill processing capability

Item	Specification
Bill buffering capacity of the service processing module	180 MB
Length of original bill	468 bytes
Original bill storage capacity of FCCU/FCSU	390,000 bills
Bill transfer capability of the service processing module	120 bills/second
Bill storage capacity of the iGWB	216 GB
Bill transfer capability of the iGWB	4,000 bills/second

8.1.5 Reliability Specifications

Table 8-5 Reliability specifications

Item	Specification
Repair rate	0.3%
Usability	99.99983%

Item	Specification
Mean time between failures (MTBF)	53 years
Mean time to recovery (MTTR)	48 minutes
Pause time	0.89 minutes/year

8.1.6 Power Supply and Power Consumption

I. Power Supply

Rated voltage: –48 V DC

Voltage fluctuations: –57 V to –40 V

II. System Power Consumption

The power consumption specifications of the functional frames or components in a SoftX3000 cabinet are shown in Table 8-6.

Table 8-6 Power consumption specifications of SoftX3000

Functional unit	Power consumption (W)	Configuration
Power distribution frame	≤ 20	Single power distribution frame
Basic frame	≤ 480	(IFMI + BFII) x 2 + CDBI x 2 + (SMUI + SIUI) x 2 + HSCI x 2 + BSGI x 2 + MSGI x 2 + ALUI x 1 + UPWR x 4 + fan frame
Expansion frame	≤ 580	(SMUI + SIUI) x 2 + HSCI x 2 + ALUI x 1 + UPWR x 4 + fan frame
Media resource frame	≤ 680	(SMUI + SIUI) x 2 + HSCI x 2 + (MRCI + MRUI) x 12 + ALUI x 1 + UPWR x 4 + fan frame
MRS6000 frame	≤ 900	SCC x 1 + MPC x 12 + fan frame
BAM	≤ 250	Adopts HP/IBM DC Power server
iGWB	≤ 250	Adopts HP/IBM DC Power server
LCD monitor	≤ 50	/
LAN Switch	≤ 30	Adopts Huawei Quidway S3528G Ethernet switch

Functional unit	Power consumption (W)	Configuration
Hard disk array	≤ 200	When IBM server is used, it is required to configure 10 hot-swappable SCSI hard disks.

III. Example of Calculation of Power Consumptionpower supply and power consumption

Integrated configuration cabinet (at full configuration with 1 basic frame and 1 media resource frame)

Maximum power consumption = power distribution frame x 1 + basic frame x 1 + media resource frame x 1 + LCD x 1 + hard disk array x 1 + BAM x 1 + iGWB x 2 + LAN Switch x 2 = 20 x 1 + 480 x 1 + 680 x 1 + 50 x 1 + 200 x 1 + 250 x 1 + 250 x 2 + 30 x 2 = 2240W

Service processing cabinet (at full configuration with 3 expansion frames and 1 media resource frame)

Maximum power consumption = power distribution frame x 1 + expansion frame x 3 + media resource frame x 1 = 20 x 1 + 580 x 3 + 680 x 1 = 2440W

Media resource server cabinet (with 1 MRS6000)

Maximum power consumption = power distribution frame x 1 + MRS6000 x 1 = 20 x 1 + 900 x 1 = 920W

8.1.7 Physical Parameters

Table 8-7 Physical parameters of SoftX3000 cabinets

Item	Parameter or model
Cabinet model	N68-22 cabinet complying with IEC297 and meeting the earthquake-proof requirements of NEBS
Cabinet dimensions (height x width x depth)	2,200 mm x 600 mm x 800 mm
Weight of an integrated configuration cabinet (at full configuration)	400 kg
Weight of a service processing cabinet (at full configuration)	300 kg
Weight of a media resource server cabinet (with 1 MRS6000 configured)	250 kg

Item	Parameter or model
Designed bearing capacity of the floor in the equipment room	600 kg/m ²
Available height of cabinet	46 U (1 U = 44.45 mm)

8.1.8 Environmental Specifications

I. Environmental Adaptation

SoftX3000 can operate normally for a long term in the following environmental conditions:

Table 8-8 Environmental adaptation

Height above sea level	≤ 4,000 m
Atmospheric pressure	70 kPa to 106 kPa
Temperature	+5 °C to +45 °C
Relative humidity	5% to 85%
Earthquake-proof performance	Able to sustain Richter scale 9

II. Noise Specifications

- 1) Compliant with NEBS requirements: Sound-pressure-level noise is not greater than 65 dBA (internally limited to 60 dBA).
- 2) Compliant with ETS requirements: Sound-power-level noise does not exceed 7.2 bels.

8.1.9 Electromagnetic Compatibility Specifications

I. Electromagnetic Interference Specifications

- 1) Conducted emission (CE)

Table 8-9 CE specifications through the –48 V power supply port

Frequency range	Limits (dBμV)	
	Average limit	Quasi-peak limit
0.02 MHz to 0.15 MHz	/	79
0.15 MHz to 0.50 MHz	66	79
0.50 MHz to 30 MHz	60	73

Note:

The CE tests are designed to demonstrate the interference signals of the product conducted from the cable port.

2) Radiated emission (RE)

Table 8-10 RE specifications

Frequency band (MHz)	Quasi-peak limit (dBμV/m)
30 to 230	40
230 to 1000	47

Note:

- The RE tests are designed to demonstrate the interference signals of the product radiated from the shell port.
 - The measurement point is 10 meters away from the switching equipment.
-

II. Electromagnetic Susceptibility Specificationselectromagnetic compatibility specifications:electromagnetic susceptibility specifications

1) Conducted susceptibility (CS)

These specifications are applicable to –48 V DC supply cable side and partial signal side. These specifications will be considered when the connection line between the ports exceeds 3 meters.

Table 8-11 CS specifications

Measured port	Frequency range	Voltage criterion	Performance criterion
DC side	150 kHz to 230 MHz	10 V	A
Signal side		10 V	A

Note:

The CS tests are designed to demonstrate the bearing capability of the product regarding the external interference through cable port coupling.

2) Radiated susceptibility (RS)

Table 8-12 RS specifications

Frequency range	Voltage criterion	Performance criterion
80 MHz to 1 GHz	10 V/m	A

Note:

The RS tests are designed to demonstrate the bearing capability of the product regarding the external interference through shell port coupling.

3) Electrostatic discharge (ESD)

These specifications are applicable to people's hands or other electrostatic sources which may influence the components of the product, such as boards, frames and cabinet chassis.

Table 8-13 ESD specifications

Discharge mode	Voltage criterion	Performance criterion
Air discharge	8 kV	B
	15 kV	R
Contact discharge	6 kV	B
	8 kV	R

Note:

The ESD tests are designed to demonstrate the bearing capability of the equipment regarding electrostatic interference. There are two discharge modes: contact discharge and air discharge.

4) Electrical fast transient (EFT)

These specifications are applicable to DC side and partial signal side (when the connection line between the ports exceeds 3 meters).

Table 8-14 EFT specifications

Measured port	Voltage criterion	Performance criterion
AC side	2 kV	B

Measured port	Voltage criterion	Performance criterion
DC side	2 kV	B
Signal side	1 kV	B

Note:

The EFT tests are designed to demonstrate the influence, performed on equipment interference, of the high-frequency small-scaled energy impulse caused by an inductive load changeover.

5) Surge

These specifications are applicable to DC supply cable side and partial signal side, such as the port of an indoor signal line, E1.

Table 8-15 Surge specifications

Measured port		Voltage criterion	Performance criterion
DC side		1 kV (differential mode) 2 kV (common mode)	B
Signal side	Indoor (cabling inside the system)	1 kV	B

Note:

- Performance criterion A: SoftX3000 shall continue to operate as intended during and after the test without any software or equipment related data changed or any performance degraded. (Equipment related data refers to all the data stored in the memory and the data being processed.)
- Performance criterion B: SoftX3000 shall continue to operate as intended after the test. During the test, a certain degradation of performance is allowed as specified by the manufacturer, but the software data and memorized data is not changed and the established communication links are not interrupted. After the test, SoftX3000 automatically recovers to the normal performance without manual intervention.
- Performance criterion C: Temporary loss of function is allowed during the test, which can be restored after the test, typically after the shortest time required by system restart. But physical damage or degradation of system operational software does not occur.
- Performance criterion R: SoftX3000 is not damaged physically or becomes faulty (including software damage) after the test. A certain damage of protective components caused by external interference signals is allowed; but after the damaged protective components are replaced and the relative operation parameters are reset, the equipment can operate normally.

8.2 Environmental Requirements

8.2.1 Storage Environment

I. Climate Environment

Table 8-16 Climate environment requirements

Item	Range
Height above sea level	≤ 5,000 m
Atmospheric pressure	70 kPa to 106 kPa
Temperature	–40 °C to +70 °C
Temperature change rate	≤ 1 °C/min
Relative humidity	10% to 100%
Solar radiation	≤ 1,120 W/s ²
Heat radiation	≤ 600 W/s ²
Wind speed	≤ 30 m/s

II. Waterproof Requirements

Normally, the equipment on site is placed inside the equipment room.

- 1) If the equipment is to be stored inside the equipment room, place it as required.

Ensure that there is no water on the ground and no water flows into the package. Keep a proper distant from the equipment to the potential water-seeping or bursting devices such as automatic fire-extinguishing devices and heating pipes.

- 2) If the equipment is to be placed outside the equipment room, the following four conditions should be met at the same time.
 - The package is kept well.
 - Waterproof measures are used to prevent rain from entering the package.
 - There is no water on the ground where the package is placed. No water flows into the package.
 - The package is not exposed to the sunshine.

III. Biological Environment

- It is required to avoid propagation of epiphyte, mildew and other microorganism.
- It is required to prevent rodent animals, such as mouse.

IV. Air Cleanness

- No explosive, conductive, magneto-conductive or corrosive dust.
- The density of mechanically active materials should comply with the requirements shown in Table 8-17.

Table 8-17 Density requirements for mechanically active materials

Mechanically active material	Unit	Content
Suspending dust	mg/m ³	≤ 5.00
Precipitable dust	mg/m ² ·h	≤ 20.0
Sand	mg/m ³	≤ 300
Note: 1) Suspending dust: diameter ≤ 75 μm 2) Precipitable dust: 75 μm ≤ diameter ≤ 150 μm 3) Sand: 150 μm ≤ diameter ≤ 1,000 μm		

- The density of chemically active materials should comply with the requirements shown in Table 8-18.

Table 8-18 Density requirements for chemically active materials

Chemically active material	Unit	Content
SO ₂	mg/m ³	0.30 to 1.00
H ₂ S	mg/m ³	0.10 to 0.50
NO ₂	mg/m ³	0.50 to 1.00
NH ₃	mg/m ³	1.00 to 3.00
Cl ₂	mg/m ³	0.10 to 0.30
HCl	mg/m ³	0.10 to 0.50
HF	mg/m ³	0.01 to 0.03
O ₃	mg/m ³	0.05 to 0.10

V. Mechanical Stress

Table 8-19 Mechanical stress requirements

Item	Sub-item	Range	
Sinusoidal vibration	Offset	≤ 7.0 mm	/
	Accelerated speed	/	≤ 20.0 m/s ²
	Frequency range	2 Hz to 9 Hz	9 Hz to 200 Hz
Non-stable impulse	Impulse response spectrum II	≤ 250 m/s ²	
	Payload	≤ 5 kPa	
Note:			
1) Impulse response spectrum: It refers to the maximum accelerated speed response curve generated by the equipment under the specified impulse motivation. Impulse response spectrum II means that the duration of half-sine impulse response spectrum is 6 ms.			
2) Payload: It refers to the bearable pressure from the upper piled equipment with package in prescribed piling mode.			

8.2.2 Transportation Environment

I. Climate Environment

Table 8-20 Climate environment requirements

Item	Range
Height above sea level	$\leq 5,000$ m
Atmospheric pressure	70 kPa to 106 kPa
Temperature	-40°C to $+70^{\circ}\text{C}$
Temperature change rate	$\leq 3^{\circ}\text{C/min}$
Relative humidity	10% to 100%
Solar radiation	$\leq 1,120$ W/s ²
Heat radiation	≤ 600 W/s ²
Wind speed	≤ 30 m/s
Rain	≤ 6 mm/min

II. Waterproof Requirements

During the transportation, the following requirements should be met:

- The package is kept well.
- Waterproof measures are used in the transportation vehicles to prevent rain entering the package.
- There is no water inside the transportation vehicles.

III. Biological Environment

- It is required to avoid propagation of epiphyte, mildew and other microorganism.
- It is required to prevent rodent animals, such as mouse.

IV. Air Cleanness

- No explosive, conductive, magneto-conductive or corrosive dust.
- The density of mechanically active materials should comply with the requirements shown in Table 8-21.

Table 8-21 Density requirements for mechanically active materials

Mechanically active material	Unit	Content
Suspending dust	mg/m ³	No requirement
Precipitable dust	mg/m ² ·h	≤ 3.0

Mechanically active material	Unit	Content
Sand	mg/m ³	≤ 100
Note: 1) Suspending dust: diameter ≤ 75 μm 2) Precipitable dust: 75 μm ≤ diameter ≤ 150 μm 3) Sand: 150 μm ≤ diameter ≤ 1,000 μm		

- The density of chemically active materials should comply with the requirements shown in Table 8-22.

Table 8-22 Density requirements for chemically active materials

Chemically active material	Unit	Content
SO ₂	mg/m ³	≤ 1.00
H ₂ S	mg/m ³	≤ 0.50
NO ₂	mg/m ³	≤ 1.00
NH ₃	mg/m ³	≤ 3.00
Cl ₂	mg/m ³	≤ 0.30
HCl	mg/m ³	≤ 0.05
HF	mg/m ³	≤ 0.03
O ₃	mg/m ³	≤ 0.10

V. Mechanical Stress

Table 8-23 Mechanical stress requirements

Item	Sub-item	Range		
Sinusoidal vibration	Offset	≤ 7.5 mm	/	/
	Accelerated speed	/	≤ 20.0 m/s ²	≤ 40.0 m/s ²
	Frequency range	2 Hz to 9 Hz	9 Hz to 200 Hz	200 Hz to 500 Hz
Random vibration	Spectrum density of accelerated speed	10 m ² /s ³	3 m ² /s ³	1 m ² /s ³
	Frequency range	2 Hz to 9 Hz	9 Hz to 200 Hz	200 Hz to 500 Hz

Item	Sub-item	Range
Non-stable impulse	Impulse response spectrum II	$\leq 300 \text{ m/s}^2$
	Payload	$\leq 10 \text{ kPa}$
<p>Note:</p> <p>1) Impulse response spectrum: It refers to the maximum accelerated speed response curve generated by the equipment under the specified impulse motivation. Impulse response spectrum II means that the duration of half-sine impulse response spectrum is 6 ms.</p> <p>2) Payload: It refers to the bearable pressure from the upper piled equipment with package in prescribed piling mode.</p>		

8.2.3 Running Environment

I. Climate Environment

Table 8-24 Temperature and humidity requirements

Equipment	Temperature		Relative humidity	
	Working for a long term	Working for a short term	Working for a long term	Working for a short term
SoftX3000	+5 °C to +45 °C	-5 °C to +55 °C	5% to 85%	5% to 95%
<p>Note:</p> <p>1) The measurement points of temperature and humidity of SoftX3000 refer to the values measured 1.5 meters above the floor and 0.4 meter away from the front of SoftX3000 shelf when there are no protection panels in the front and back of SoftX3000 shelf.</p> <p>2) Short term means that the consecutive working duration is not more than 48 hours and that the accumulated working duration of a year is not more than 15 days.</p>				

Table 8-25 Other climate environment requirements

Item	Range
Height above sea level	$\leq 4,000 \text{ m}$
Atmospheric pressure	70 kPa to 106 kPa
Temperature change rate	$\leq 5 \text{ °C/h}$
Solar radiation	$\leq 700 \text{ W/s}^2$
Heat radiation	$\leq 600 \text{ W/s}^2$

Item	Range
Wind speed	≤ 1 m/s
IP level	IP50

II. Biological Environment

- It is required to avoid propagation of epiphyte, mildew and other microorganism.
- It is required to prevent rodent animals, such as mouse.

III. Air Cleanness

- No explosive, conductive, magneto-conductive or corrosive dust.
- The density of mechanically active materials should comply with the requirements shown in Table 8-26.

Table 8-26 Density requirements for mechanically active materials

Mechanically active material	Unit	Content
Dust particle	particle/m ³	$\leq 3 \times 10^5$
Suspending dust	mg/m ³	≤ 0.2
Precipitable dust	mg/m ² ·h	≤ 1.5
Sand	mg/m ³	≤ 30
Note: 1) Dust particle: diameter ≥ 5 μm 2) Suspending dust: diameter ≤ 75 μm 3) Precipitable dust: $75 \mu\text{m} \leq \text{diameter} \leq 150 \mu\text{m}$ 4) Sand: $150 \mu\text{m} \leq \text{diameter} \leq 1,000 \mu\text{m}$		

- The density of chemically active materials should comply with the requirements shown in Table 8-27.

Table 8-27 Density requirements for chemically active materials

Chemically active material	Unit	Content
SO ₂	mg/m ³	0.30 to 1.00
H ₂ S	mg/m ³	0.10 to 0.50
NO ₂	mg/m ³	0.50 to 1.00
NH ₃	mg/m ³	1.00 to 3.00
Cl ₂	mg/m ³	0.10 to 0.30
HCl	mg/m ³	0.10 to 0.50

Chemically active material	Unit	Content
HF	mg/m ³	0.01 to 0.03
O ₃	mg/m ³	0.05 to 0.10
CO	mg/m ³	≤ 5.0

IV. Mechanical Stress

Table 8-28 Mechanical stress requirements

Item	Sub-item	Range	
Sinusoidal vibration	Offset	≤ 5.0 mm	/
	Accelerated speed	/	≤ 2.0 m/s ²
	Frequency range	5 Hz to 62 Hz	62 Hz to 200 Hz
Non-stable impulse	Impulse response spectrum II	≤ 50 m/s ²	
	Payload	0	
Note:			
1) Impulse response spectrum: It refers to the maximum accelerated speed response curve generated by the equipment under the specified impulse motivation. Impulse response spectrum II means that the duration of half-sine impulse response spectrum is 6 ms.			
2) Payload: It refers to the bearable pressure from the upper piled equipment with package in prescribed piling mode.			

Chapter 9 Compliant Recommendations and Standards

SoftX3000 is compliant with the following recommendations and standards.

Table 9-1 SoftX3000 compliant recommendations and standards

Serial No.	Recommendation or standard	Issued by
G.703	physical/electrical features of hierarchical digital interfaces	ITU-T
G.704	synchronous frame structures used at primary and secondary hierarchical levels	ITU-T
G.812	timing requirements of slave clocks suitable for subscriber as node clocks in synchronization networks	ITU-T
G.964	V-Interfaces at the digital local exchange (LE) - V5.1-Interface (Based on 2048 kbit/S) for the support of access network (AN) - To be published	ITU-T
G.965	V-Interfaces at the digital local exchange (LE) - V5.2 interface (Based on 2048 kbit/s) for the support of access network (AN) - To be published	ITU-T
H.225.0	call signaling protocols and media stream packetization for packet based multimedia communications systems	ITU-T
H.245	control protocol for multimedia communication	ITU-T
H.248	Media Gateway Control Protocol	ITU-T
H.323	(including H.225.0, H.245, H.450) Packet-based multimedia communications systems	ITU-T
H.450	supplementary services for multimedia	ITU-T
I.430	Basic subscriber-network interface - Layer 1 specification	ITU-T
I.431	Primary rate subscriber-network interface - Layer 1 specification	ITU-T
IEC 60297	Mechanical structures for electronic equipment - Dimensions of mechanical structures of the 482,6 mm (19 in) series	IEC
Q.1218	Interface Recommendation for intelligent network CS-1	ITU-T
Q.122x	Intelligent Network	ITU-T
Q.123x	Intelligent Network	ITU-T
Q.4xx	Specifications of Signaling System R2 - Provision of a forward-transfer signaling facility	ITU-T

Serial No.	Recommendation or standard	Issued by
Q.701	functional description of the message transfer part (MTP) of Signaling System No.7	ITU-T
Q.702	Signaling Data Link	ITU-T
Q.703	Message Transfer Part Signaling Link	ITU-T
Q.704	Message Transfer Part - Signalling network functions and messages	ITU-T
Q.705	Signaling network structure	ITU-T
Q.706	Message Transfer Part - Signaling performance	ITU-T
Q.707	Message Transfer Part - Testing and maintenance	ITU-T
Q.711	Functional description of the Signalling Connection Control Part (SCCP)	ITU-T
Q.712	Definition and function of SCCP messages	ITU-T
Q.713	SCCP formats and codes	ITU-T
Q.714	Signaling Connection Control Part Procedures	ITU-T
Q.715	Signaling Connection Control Part Subscriber Guide	ITU-T
Q.716	Signaling Connection Control Part (SCCP) Performance	ITU-T
Q.730	ISDN subscriber part supplementary services	ITU-T
Q.761	Functional description of the ISDN subscriber part of Signalling System No.7	ITU-T
Q.762	General function of messages and Signals of ISUP	ITU-T
Q.763	Formats and codes of ISUP	ITU-T
Q.764	Signaling procedures of ISUP	ITU-T
Q.767	Application of the ISDN subscriber part of CCITT Signalling System No.7 for international ISDN interconnections	ITU-T
Q.771	Specifications of Signalling System No.7; Functional description of transaction capabilities (TC)	ITU-T
Q.772	Specifications of Signalling System No.7; Transaction capabilities information element definitions	ITU-T
Q.773	Specifications of Signalling System No.7; Transaction capabilities formats and encoding	ITU-T
Q.774	Specifications of Signalling System No.7; Transaction capabilities procedures	ITU-T
Q.775	Table of Contents and Summary of Recommendation	ITU-T
Q.921	ISDN subscriber-network interface - Data link layer specification	ITU-T

Serial No.	Recommendation or standard	Issued by
Q.931	ISDN subscriber-network interface layer 3 specification for basic call control	ITU-T
X.208	Specification of Abstract Syntax Notation One (ASN.1)	ITU-T
X.209	Specification of Basic Encoding Rules for Abstract Syntax Notation One (ASN.1)	ITU-T
draft-ietf-midcom-stun-02	Simple Traversal of UDP Through Network Address Translators (STUN)	IETF
draft-ietf-sigtran-v5ua-03	V5.2-Subscriber Adaptation Layer (V5UA)	IETF
RFC0768	Subscriber Datagram Protocol (UDP)	IETF
RFC0791	Internet Protocol (IP)	IETF
RFC0792	Internet Control Message Protocol (ICMP)	IETF
RFC0793	Transmission Control Protocol (TCP)	IETF
RFC0959	File Transfer Protocol (FTP)	IETF
RFC1035	Domain Names Implementation and Specification	IETF
RFC1157	Simple Network Management Protocol (SNMP)	IETF
RFC2327	SDP: Session Description Protocol	IETF
RFC2396	Uniform Resource Identifiers (URI): Generic Syntax	IETF
RFC2401	Security Architecture for IP (IPSec)	IETF
RFC2402	IP Authentication Header (IPSec)	IETF
RFC2406	IP Encapsulating Security Payload (IPSec)	IETF
RFC2411	IP Security Document Roadmap (IPSec)	IETF
RFC2543	SIP: Session Initiation Protocol	IETF
RFC2705	Media Gateway Control Protocol (MGCP) Version 1.2	IETF
RFC2719	Framework Architecture for Signaling Transport	IETF
RFC2871	A Framework for Telephony Routing over IP	IETF
RFC2897	Proposal for an MGCP Advanced Audio Package	IETF
RFC2916	E.164 number and DNS	IETF
RFC2960	Stream Control Transmission Protocol (SCTP)	IETF
RFC3015	Megaco Protocol Version 1.0 (H.248)	IETF
RFC3057	ISDN Q.921-Subscriber Adaptation Layer (IUA)	IETF
RFC3064	MGCP CAS Packages	IETF

Serial No.	Recommendation or standard	Issued by
RFC3261	Session Initiation Protocol (SIP)	IETF
RFC3309	Stream Control Transmission Protocol (SCTP) Checksum Change	IETF
RFC3331	SS7 MTP2 Subscriber Adaptation Layer (M2UA)	IETF
RFC3332	SS7 MTP3-Subscriber Adaptation Layer (M3UA)	IETF
RFC3372	Session Initiation Protocol for Telephones (SIP-T)	IETF

Chapter 10 Acronyms and Abbreviations

Abbreviation	Full name
3G	The Third Generation
3rd AS	3rd Party Application Server
A	
AAA	Authentication Authorization and Accounting
ACC	Account Card Calling
ACL	Access Control List
AM	Administration Module
AMG	Access Media Gateway
API	Application Programming Interface
ATM	Asynchronous Transfer Mode
B	
BAM	Back Administration Module
BHCA	Busy Hour Call Attempt
BICC	Bearer independent Call Control Protocol
BITS	Building Integrated Timing Supply
BSC	Base Station Controller
C	
CAS	Channel Associated Signaling
CCB	Call Control Block
CCC	Credit Card Calling
CDMA	Code Division Multiple Access
CDR	Call Detail Record
CE	Conformité Européene
C-INAP	China Intelligent Network Application Part
CMM	Capability Maturity Model
CN	Core Network
CODEC	Coder-decoder
CORBA	Common Object Request Broker Architecture
CS	Circuit Switched

Abbreviation	Full name
CTD	Click To Dial
CTF	Click to FAX
CUG	Closed User Group
D	
DC	Digital Center
DL	Digital Local
DNS	Domain Name Server
DOPRA	Distributed Object-oriented Programmable Realtime Architecture
DoS	Denial of Service
DSS1	Digital Subscriber Signaling No.1
DTMF	Dual-Tone Multifrequency
E	
EMC	Electromagnetic Compatibility
ETS	European Telecommunication Standards
F	
FAM	Front Administration Module
FE	Fast Ethernet
FPH	Free Phone
FTAM	File Transfer Access and Management Protocol
FTP	File Transfer Protocol
G	
GK	Gatekeeper
GUI	Graphical Subscriber Interface
GW	Gateway
H	
H.248	H.248/MECAMGO protocol
HTML	Hyper Text Markup Language
HTTP	Hyper Text Transport Protocol
I	
IAD	Integrated Access Device
ICP	Internet Content Provider
ICW	Internet Call Wait(ing)

Abbreviation	Full name
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IETF	Internet Engineering Task Force
iGWB	iGateWay Bill
IM	Instant Messaging
IMAP	Internet Message Access Protocol
IN	Intelligent Network
INAP	Intelligent Network Application Protocol
iOSS	integrated Operation Support System
IP	Internet Protocol
IPSec	Internet Protocol SECurity extensions
ISDN	Integrated Services Digital Network
ISUP	ISDN Subscriber Part
ITU-T	International Telecommunication Union - Telecommunication Standardization Sector
IUA	ISDN Q.921 - Subscriber Adaptation Layer
IVR	Interactive Voice Response
M	
M2PA	MTP2-Subscriber Peer-to-Peer Adaptation Layer
M2UA	Message Transfer Part 2 (MTP2) - Subscriber Adaptation Layer
M3UA	Message Transfer Part 3 (MTP3) - Subscriber Adaptation Layer
MAN	Metropolitan Area Network
MAS	Mass calling
MCU	Multipoint Control Unit
MG	Media Gateway
MGC	Media Gateway Controller
MGCP	Media Gateway Control Protocol
MML	Man Machine Language
MMU	Multimedia Management Unit
MRS	Media Resource Server
MTBF	Mean Time Between Failure
MTP	Message Transfer Part
MTTR	Mean Time To Repair

Abbreviation	Full name
N	
NAS	Network Access Server
NAT	Network Address Translation
NEBS	Network Equipment Building System
NGN	Next Generation Network
NMS	Network Management System
NP	Number Portability
O	
OAM	Operation Administration and Maintenance
ONLY	One Number Link You
OSS	Operation Support System
P	
PBX	Private Branch Exchange
PCA	Personal Communication Assistant
PDA	Personal Digital Assistant
PGW	Parlay Gateway
PLMN	Public Land Mobile Network
POTS	Plain Old Telephone Service
PPS	Pre-Paid Service
PRI	Primary Rate Interface
PS	Packed Switched
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PTN	Personal Telecommunication Number
Q	
QoS	Quality of Service
R	
RAID	Redundant Arrays of Inexpensive Disks
RBT	RingBack Tone service
RTP	Real-time Transport Protocol
S	
SAU	Signaling Access Unit
SCCP	Signaling Connection Control Part

Abbreviation	Full name
SCN	Switched Circuit Network
SCP	Service Control Point
SCSI	Small Computer Systems Interface
SCTP	Stream Control Transmission Protocol
SDH	Synchronous Digital Hierarchy
SDP	Service Data Point
SG	Signaling Gateway
SIGTRAN	Signaling Transport
SIP	Session Initiation Protocol
SMP	Service Management Point
SMS	Service Management System
SNMP	Simple Network Management Protocol
SP	Signaling Point
SPM	Service Processing Module
SS7	Signaling System No.7
SSP	Service Switching Point
STP	Signaling Transfer Point
STUN	Simple Traversal of UDP Through Network Address Translators
T	
TCAP	Transaction Capabilities Application Part
TCP	Transport Control Protocol
TDM	Time Division Multiplex(ing)
U	
UC	Unified Communication
UDP	Subscriber Datagram Protocol
UL	Underwriters Laboratories
UM	Unified Messaging
UMG	Universal Media Gateway
UNI	Subscriber Network Interface
U-NICA	Universal Network Intelligent Core Architecture
UPS	Uninterrupted Power Supply
UPT	Universal Personal Telecommunication
U-SYS	You Design Your System

Abbreviation	Full name
UTP	Unshielded Twisted Pair
V	
V5UA	V5.2 - Subscriber Adaptation Layer
VIG	Video Interworking Gateway
VoIP	Voice Over IP
VOT	Televoting
VPN	Virtual Private Network
W	
WAC	Wide Area Centrex
WWW	World Wide Web
X	
xDSL	x Digital Subscriber Line
XML	Extensible Markup Language

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