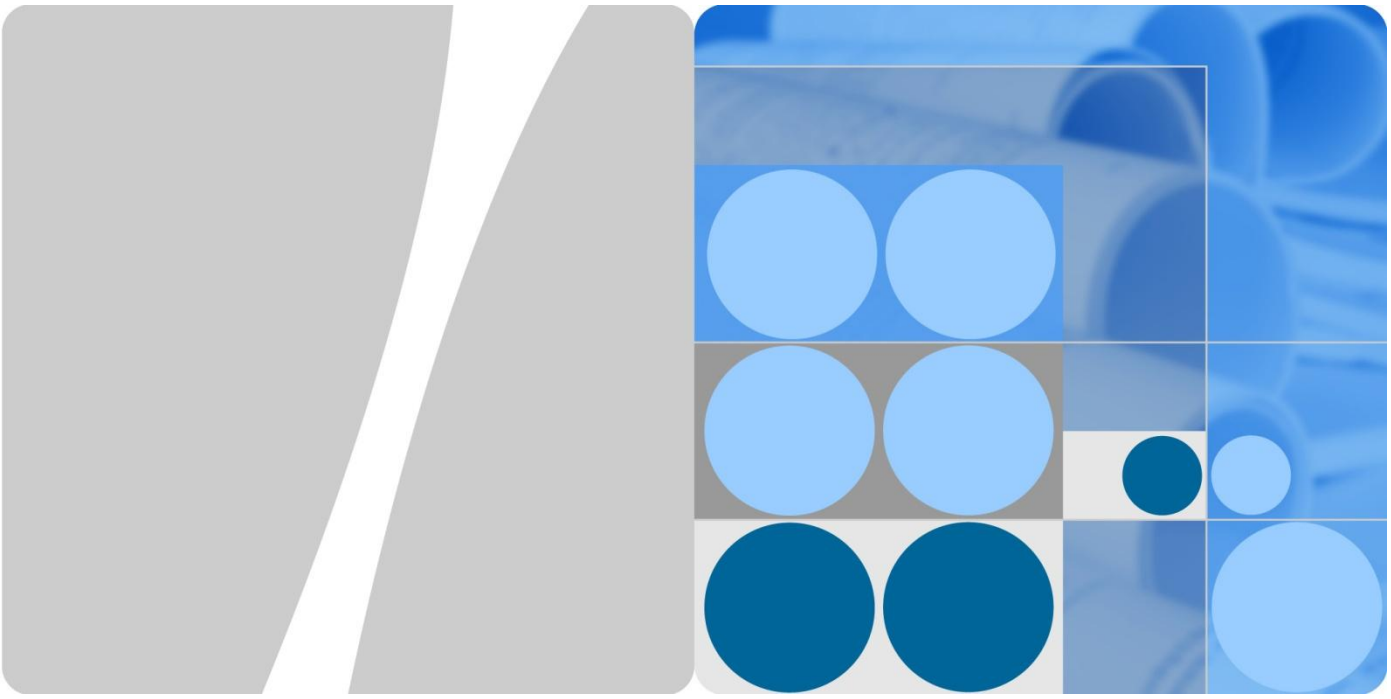

## HUAWEI eSpace IAD

# Feature Description

**Issue** 01

**Date** 2012-07-20

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# About This Document

## Change History

| Date | Version | Description | Author |
|---|---|---|---|
| 2012-05-28 | V1.0 | Completed the initial draft. | Si Yuanhai |
| | | | |
| | | | |

# Contents

# 1 Port Description

## 1.1 Uplink Ethernet Ports

eSpace integrated access device (IAD) registers with a Session Initiation Protocol (SIP) server or media gateway controller (MGC) through a 10/100 Mbit/s uplink Ethernet port (RJ45-type).

## 1.2 Downlink Ethernet Ports

The downlink network port of eSpace IAD102/104h can be connected to a PC. eSpace IAD208E(M) has eight data-and-voice integrated ports. Each port allows the access of RJ45 or RJ11 connector, and allows the distribution of RJ45 network connector and RJ11 phone connector through a distribution box. eSpace IAD132 downlink network port is used as eSpace IAD132 cascade. eSpace IAD1224 provides two downlink FE ports. One port (LAN port) is used for debugging (the port supports only 100 Mbit/s and is unavailable when the remote packet capturing function is enabled), and the other port is used for cascading.

## 1.3 FXS

eSpace IAD connects to plain old telephone service (POTS) phones or fax machines through Foreign Exchange Station (FXS) ports.

Based on these FXS ports, IAD 1224 can provide standard RJ-11 interface for analog phones, fax, etc.

## 1.4 FXO

eSpace IAD connects to a public switched telephone network (PSTN) through a Foreign Exchange Office (FXO) port.

# 1.5 Survival Ports

FXO ports that support the power-off survival function connect to FXO ports physically. When eSpace IAD encounters a power failure, POTS phones connected to these FXO ports can still make or answer PSTN calls.

# 1.6 Serial Port

eSpace IAD provides an RS232 serial port. Users configure and maintain the device through the serial port.

# 2 Signaling and Protocols

eSpace IAD complies with the following signaling and protocols:

- Tone detection and generation
  - Dual tone multiple frequency (DTMF) and call tones (such as dialing tone, busy tone, ring back tone, and off-hook tone)
  - International Telecommunication Union Telecommunication Standardization Sector (ITU-T) V.17, V.21, V.27ter, and V.29 fax standards
- Voice/multimedia digital signal coding and decoding
  - ITU-T G.711 μ-law (64 kbit/s)
  - ITU-T G.711 A-law (64 kbit/s)
  - Internet Low Bitrate Codec (iLBC) (supported only by eSpace IAD1224)
  - ITU-T G.729
- Call control
  - SIP (RFC3261–3265)
  - Media Gateway Control Protocol (MGCP) (RFC3435)
- Voice packet encapsulation and decapsulation

  Real-Time Transport Protocol (RTP)/Real Time Transport Control Protocol (RTCP) (RFC1889)
- Internet
  - Transmission Control Protocol (TCP)/Internet Protocol (IP)
  - User Datagram Protocol (UDP)/IP
  - Address Resolution Protocol (ARP)/(Reverse Address Resolution Protocol) RARP
  - Internet Control Message Protocol (ICMP)
  - Telnet/Secure Shell (SSH)
  - Domain Name Server (DNS) client
  - File Transfer Protocol (FTP)/Trivial File Transfer Protocol (TFTP)/File Transfer Protocol Secure (FTPS) client
- IP address allocation
  - IPv4 and IPv6 dual stack
  - Static
  - Dynamic Host Configuration Protocol (DHCP) client
  - Point-to-Point Protocol over Ethernet (PPPoE)

# 3 Voice Quality

## 3.1 Voice Codecs

eSpace IAD supports the following voice codecs:

- G.711 64 kbit/s (lossless compression)
- G.729 8 kbit/s (lossy compression)
- G.723.1 5.3/6.3 kbit/s (lossy compression)
- iLBC

  iLBC has better performance than G.729 and G.723.1, and provides a special mechanism for processing lost packets. The voice quality can be ensured even in a network environment with a higher packet loss rate. Only eSpace IAD1224 supports iLBC.

You can select the codec based on your requirements, for example, high encoding rate, good voice quality, or high bandwidth.

## 3.2 VAD

The voice activity detection (VAD) technology recognizes non-speech sections in a voice signal stream.

Based on statistics, during a voice call, silent periods account for 40% of the time. eSpace IAD automatically detects silent periods and stops transmitting data during silent periods, reducing the voice data volume.

## 3.3 CNG

Daily voice communication is conducted in an environment with more or less noise. When the VAD technology is applied, silent periods that are absolutely quiet will make calling and called parties feel uncomfortable. eSpace IAD uses the comfort noise generation (CNG) technology to generate appropriate background noise during silent periods to increase the comfort of users.

# 3.4 Echo Cancellation

Echo is classified into acoustic echo and hybrid echo.

Acoustic echo arises when sound from a loudspeaker is picked up by the microphone in the same room.

Hybrid echo is generated by the PSTN through the reflection of electrical energy by a device called a hybrid. Most telephone local loops are two-wire circuits while transmission facilities are four-wire circuits. Each hybrid produces echoes in both directions.

The echo cancellation technology uses a predictive filter to recognize echo in the transmitted or received signal based the reference signal, and removes the echo.

The echo cancellation technology used by eSpace IAD complies with the G.168 standard. The echo cancellation duration for eSpace IAD1224 is longer than 64 ms. The echo cancellation duration for other IADs is longer than 32 ms.

# 3.5 Dynamic Jitter Buffer (JB) adjustment and Disorder Prevention

Jitter occurs when the rate of data packets changes due to latency. Jitter causes disorder in a packet sequence. To reduce voice distortion caused by jitter and disorder, eSpace IAD uses a jitter buffer store packets for a specified period of time to ensure that the slowest packet can arrive in time. eSpace IAD adjusts the message length sent to the voice processing module to ensure that voice data is sent the voice processing module with uniform speed.

# 3.6 Automatic Gain Control

eSpace IAD automatically performs gain adjustment on voice volume to ensure the volume is appropriate. The gain adjustment includes input gain (IP > pulse code modulation (PCM)) and output gain (PCM > IP) adjustment.

# 3.7 Packet loss compensation

# 3.8 Detection and Generation of DTMF Code

eSpace IAD provides the DTMF detection function and generates DTMF codes that comply with international standards().

# 3.9 DTMF Transmission

eSpace IAD supports DTMF transmission by in-band/RFC2833/SIP-INFO.

# 3.10 QoS Guarantee

eSpace IAD supports IP Precedence/differentiated services code point (DSCP) labels(TOS). Media, signaling, and network management packets can be assigned with high-priority labels.

eSpace IAD supports 802.1P/Q . Signaling, media, and network management virtual local area networks (VLANs) can be created based on the IP address of the same physical port. VLAN tagging priorities can be configured.

eSpace IAD marks voice traffic by setting DSCP values in the IP layer or adding VLAN tags in the data link layer. Forwarding devices perform different operations on packets based on the tags to ensure that voice packets with higher priorities are forwarded first.

eSpace IAD supports the Voice Quality Monitor (VQM) function, which monitors the voice quality in real time and sends the quality information to a data center.

# 4 Services

This section describes voice services under U1900, next generation network (NGN), or IP multimedia subsystem (IMS).

## 4.1 Automatic configuration using DHCP

After being connected to the network, eSpace IAD obtains its own IP address through DHCP and obtains the IP address of the TFTP server. Then eSpace IAD obtains the corresponding configuration file from the TFTP server. Users can use the updated IAD configurations without configuring eSpace IAD.

**NOTE**

Configuration files must be put on the TFTP server in advance.

## 4.2 Registration

Users under eSpace IAD can be registered with a softswitch (such as SoftX3000 or U1900) using SIP or MGCP to implement voice services. eSpace IAD also can be registered with the IMS to implement voice services, which include basic call and fax services.

## 4.3 RTP/RTCP Packaging

eSpace IAD supports RTP and RTCP packets. The packaging duration can be 10 ms, 20 ms, or 30 ms.

## 4.4 Fax

eSpace IAD supports T.30 faxes in the circuit switched domain and T.38 faxes in the packet switched domain, and transparent transmission of G.711 faxes.

The end-to-end delay for fax signals cannot exceed two seconds.

eSpace IAD converts voice calls in G.723 and G.729 encoding modes into G.711 faxes for transparent transmission.

# 4.5 Dual-Homing

eSpace IAD supports dual-homing for Session Border Controllers (SBCs), SIP servers, and MGC servers.

# 4.6 Cascading Function

eSpace IAD can be connect to another eSpace IAD through the LAN port. The cascading function can be used to expand the capacity. eSpace IAD132E(T) and eSpace IAD1224 support three-level cascading.

# 4.7 Hotline Services

Hotline services allow a user to be connected automatically to a preset phone number (hotline number) after the user picks up the phone. eSpace IAD supports instant hotline and delayed hotline services.

Instant hotline: A user is immediately connected to a preset phone number (hotline number) after the user picks up the phone.

Delayed hotline: A user is connected to a preset phone number (hotline number) if the user does not perform any operations within the specified duration (such as five seconds) after the user picks up the phone.

eSpace IAD supports hotline services when deployed with NGN or U1900.

# 4.8 Local Switch

eSpace IAD allows POTS users to make calls to each other by dialing numbers allocated by eSpace IAD. When the local switch function is enabled, numbers allocated by the NGN, IMS, or softswitch cannot be used. This function can be enabled or disabled on the command line interface (CLI).

# 4.9 Local Switch When Network Connection Is Normal

eSpace IAD allows users to make calls to each other by dialing short numbers when the network connection is normal. The signaling is not transmitted through the service. Therefore, only the basic call function is available.

# 4.10 Remote Packet Capturing

eSpace IAD can function as a data source of RTP media streams, and send RTP media packets to a remote packet capturing server (eSpace IAD packet capturing tool). The packet capturing server processes RTP media packets and save them in a .cap file. You can use the Ethereal software to perform RTP packet analysis on the .cap file.

# 4.11 Polarity Reversal Charging

eSpace IAD sends polarity reversal signals to a charging system. The charging system starts charging when the polarity reversal signals are detected.

Polarity reversal refers to the phenomenon in which a voltage instantaneously changes from positive to negative or from negative to positive.

# 4.12 Video Call Fallback

Users under eSpace IAD can make voice calls with video terminal users. If the signaling contains video information, eSpace IAD can recognize the information.

# 4.13 MWI

When a user has a message, the server sends a notification to eSpace IAD. eSpace IAD turns on the message waiting indicator (MWI) of the corresponding phone. eSpace IAD supports the MWI function when deployed with the NGN.

# 4.14 Power-off Survival

When eSpace IAD encounters a power failure, the relay inside eSpace IAD is closed to allow FXS ports that support the power survival function to be connected to FXO ports physically. Phones connected to these FXS ports can still make or answer PSTN calls. One FXS port maps only one FXO port.

On eSpace IAD102H, the PHONE1 port supports the power-off survival function. eSpace IAD132E(T)-8O24S contains two boards. One board provides eight FXO ports and eight FXS ports. The other board provides 16 FXS ports. Only FXS ports on the first board support the power-off survival function. On eSpace IAD1224, only FXS ports on the board with 12 FXO ports and 12 FXS ports support the power-off survival function.

# 4.15 Network Interruption Survival

When eSpace IAD that uses a static IP address disconnects from the softswitch, eSpace IAD automatically enters the local switch mode. In local switch mode, users under eSpace IAD can make calls to other intra-office eSpace IAD users. If eSpace IAD has FXO ports, users can make outer-office calls through the eSpace IAD.

eSpace IAD1224 supports the local switch function in the DHCP or PPPoE mode.

In the local switch mode, eSpace IAD supports only basic voice calls.

# 4.16 Session Authentication

Session authentication refers to authentication that occurs during a session when a terminal changes from static to activated state or terminals are switched. eSpace IAD supports the session authentication function when deployed with the IMS.

# 4.17 Hookflash Function

If a user presses the hookflash and releases it within 200 ms during a call, eSpace IAD does not consider it as a hang up operation. Instead, the operation is considered as a call hold operation. The call is ended only when the user presses and holds the hookflash for more than 200 ms.

The typical application of the hookflash is call transfer. When a user wants to transfer a call to another extension number, the user can press the hookflash and dial the extension number. eSpace IAD holds the call and connects the call to the extension number.

# 4.18 Three-Party Services

The three-party services include the three-party conversation and three-party conference. If eSpace IAD reports an invite message to the softswitch (for example, when the IAD is connected to the IMS), you must configure eSpace IAD to implement three-party services; if the IAD reports an info message to the softswitch (for example, when the IAD is connected to U19100), you only need to configure the softswitch to implement three-party services.

Three-party services can be provided by eSpace IAD208/132/1224 or by the IMS. When **Three way mode** is set to **local**, you can use the three-party services on eSpace IAD no matter whether the services are enabled on the IMS.

# 4.19 Emergency Call

Users can configure emergency numbers on eSpace IAD. When eSpace IAD is registered with a server and a user dials an emergency number, eSpace IAD directly sends the call request to the server. A user can dial an emergency number even when eSpace IAD is not registered with a server. In this case, eSpace IAD can still send the call request. eSpace IAD supports the emergency call function when deployed with the NGN.

# 4.20 Digitmap Function

A digitmap specifies a dialing rule. When a user dials a number, if the dialed number length is the same as that defined in the digitmap, eSpace IAD stops collecting digits and initiates the

call, which reduces the connection duration. If the dialed number does not match the digitmap, the call cannot be connected.

The maximum length of a digitmap is 4096 bytes. When the SIP protocol is used, a maximum of 128 digitmaps can be configured.

# 4.21 Multi-Country Adaptation

You can change the voice configuration of the device by setting the area information. For example, if you set the country to United States, the system will play announcements in English. At this time, the American busy tone standard is used for FXO ports.

The following countries are supported: Brazil, Chile, China Mainland, Colombia, Egypt, Great Britain, Hong Kong, Russia Kingdom, Singapore, and United States.

The device provides default FXO port busy tone settings for China (China Mainland and Hong Kong), Russia, and Brazil. For the devices delivered to countries excluding China, Russia, and Brazil, the default China settings are configured before delivery. You can define the following parameters: busy tone frequency (single-frequency or dual-frequency), busy tone duration, minimum duration that a busy tone stays idle, and lower limit of the low frequency's level.

# 4.22 Phone Port Properties

eSpace IAD allows you to adjust the gain for phone ports, and supports pulse dialing, DTMF dialing, and polarity reversal pulses.

# 4.23 VLAN Function

eSpace IAD supports the VLAN configuration function, including assigning VLANs for ports and adding different VLAN tags to different types of packets to ensure the voice quality or data quality preferentially when the network condition is not good.

# 4.24 VQM Function

eSpace IAD208/132/1224 supports the VQM function, which monitors the voice quality in real time and sends the quality information to a data center.

# 4.25 Signaling and Media Encryption

eSpace IAD1224 supports Transport Layer Security (TLS) encryption V1.1 and media stream encryption.

# 4.26 Service List (with IMS)

| Service | Sub-service |
|---|---|
| Registration functions | SBC dual-homing |
| | SBC switching |
| | SBC switching back |
| | User-by-user registration/Refreshing registration/Deregistration |
| | Wildcard registration/Refreshing registration/Deregistration |
| Basic voice services | Voice intercommunication between IAD users and other IMS users |
| Supplementary services | Call-out restriction service |
| | DND service |
| | Alarm call |
| | CFU service |
| | CFB service |
| | CFNR service |
| | Call forwarding unregistered |
| | Call forwarding times (only twice) |
| | Blind call transfer |
| | Query transfer |
| | CLIP service |
| | CLIR service |
| | CLIR override |
| | Three-party conversion (terminal audio mixing) |
| | CRBT service |
| Unified Centrex | Short number dialing |
| | Same-group call pickup |
| | Designated call pickup service |
| | Displaying extension long numbers for outgoing calls |
| | Displaying the main number for outgoing calls |
| | Displaying the main number and short numbers of intra-group extensions for outgoing calls |
| | Call hold of inter-IMS users |

| Service | Sub-service |
|---|---|
| | Call wait of inter-IMS users |
| | Distinctive ringing |
| Fax services | G711 transparent transmission mode |
| | Fax in VBD transparently-transmitted mode |
| | T.38 fax |
| | Switch from G.729 to T.38 |
| | Switch from G.729 to G.711 fax transparent transmission |
| Charging service | T01-0901 polarity reversal charging |
| Security function | Session authentication |
| Performance statistics services | Statistics on successful incoming calls |
| | Statistics on successful outgoing calls |
| | CPU usage |

# 4.27 Service List (with NGN)

| Service | Sub-service | MGCP | SIP |
|---|---|---|---|
| Registration function | Registration/Refreshing registration/Deregistration | √ | √ |
| Basic voice services | Local call service | √ | √ |
| | Toll call service | √ | √ |
| | Long number intercommunication between IADs | √ | √ |
| | Intercommunication between IADs on the virtual network | √ | √ |
| Supplementary services | Abbreviated dialing service | √ | √ |
| | Hotline service | √ | √ |
| | Call-out restriction service | √ | √ |
| | DND service | √ | √ |
| | Hookflash service | √ | √ |
| | Alarm clock service | √ | √ |
| | CFU service | √ | √ |

| Service | Sub-service | MGCP | SIP |
|---|---|---|---|
| | CFB service | √ | √ |
| | CFNR service | √ | √ |
| | Absent user service | √ | √ |
| | Call waiting service | √ | √ |
| | Call back on busy service | √ | x |
| | Three-party conversation service | √ | √ |
| | Voice conference service | √ | √ |
| | Designated pickup service | √ | √ |
| | Call transfer service | √ | √ |
| | CLIP service | √ | √ |
| | CLIR service | √ | √ |
| | Secretary service | √ | x |
| | Secretary station service | √ | x |
| | RCB service | √ | x |
| | Call holding service | √ | √ |
| | Emergency call service | √ | √ |
| | MWI service | √ | √ |
| Fax services | G711 transparent transmission service | √ | √ |
| | T.38 fax service | √ | √ |
| | Local fax service | √ | √ |
| | Toll fax service | √ | √ |
| Charging services | Polarity reversal charging | √ | √ |
| | 12KC charging | √ | x |
| | 16KC charging | √ | x |

# 4.28 Service List (with U1900)

| Service | Sub-service |
|---|---|
| Registration function | User registration |
| Basic voice services | Basic voice service between IAD users and other SoftCo users |

| Service | Sub-service |
|---|---|
| Supplementary services | Local number querying service |
| | CLIP service |
| | CLIR service |
| | CFU service |
| | CFNR service |
| | CFB service |
| | CFO service |
| | Blind call transfer |
| | Semi-query transfer |
| | Query transfer |
| | Hold service |
| | Call Park service |
| | CW service |
| | Three-party service |
| | CONF service |
| | Abbreviated dialing service |
| | Co-group pickup service |
| | Designated pickup service |
| | Absent user service |
| | DND service |
| | Hotline service |
| | Alarm clock service |
| | Call-out restriction service |
| | RCB service |
| | Call back on busy service |
| | Secretary services |
| | Privilege user services |
| | Simultaneous ringing service |
| | Sequential ringing service |
| | Distinctive ring tone service |
| | ONLY service |

| Service | Sub-service |
| --- | --- |
| | NP service |
| Fax services | G.711 faxes transmitted transparently |
| | T.38 faxes transmitted transparently |