**HUAWEI 4G Router B311s-220**
**V100R001**

# Product Description

**Issue**   **01**

**Date**   **2017-12-12**

**HUAWEI TECHNOLOGIES CO., LTD.**

# About This Document

## Summary

This document provides information regarding the features, main functions and services, technical specifications, and technical references of the product.

This document includes:

| Chapter | Details |
|---|---|
| 1 Product Overview | Provides an overview of the product. |
| 2 Technical Specifications | Describes the specifications of the product hardware, software, and user interface. |
| 3 Services and Applications | Describes the main functions and applications of the product. |
| 4 System Structure and Scenario Constraints | Describes the product system structure. |
| 5 Technical References | Describes the standards and communication protocols of the product. |
| 6 Packing List | Describes the devices and accessories that comprise the product package |

☐ NOTE

The document is an invitation to offer but not an offer. It is intended to describe the general features and functions of a product. The features and functions of certain products may vary with the requirements of customers.

## History

| Issue | Date | Details |
|---|---|---|
| 01 | 2017-12-12 | Initial official release. |

# Acronyms and Abbreviations

| Acronym or Abbreviation | Full Spelling |
| --- | --- |
| 3GPP | 3rd Generation Partnership Project |
| ACS | Auto Configuration Server |
| AES | Advanced Encryption Standard |
| ALG | Application Layer Gateway |
| AMR-NB | Adaptive Multi-Rate compression - Narrowband |
| AMR-WB | Adaptive Multi-Rate compression - Wideband |
| AP | Access Point |
| APN | Access Point Name |
| ARP | Address Resolution Protocol |
| CLAT | Customer-side Translator |
| CPE | Customer Premises Equipment |
| CS | Circuit Switched |
| CSFB | Circuit Switched Fallback |
| DBDC | Dual Band Dual Concurrent |
| DC-HSPA+ | Dual-Carrier - High Speed Packet Access Evolution |
| DHCP | Dynamic Host Configuration Protocol |
| DL | Downlink |
| DMZ | Demilitarized Zone |
| DNS | Domain Name Server |
| DTMF | Dual-Tone Multi-Frequency |
| EDGE | Enhanced Data rates for Global Evolution |
| E-UTRA | Evolved Universal Terrestrial Radio Access Network |
| FDD | Frequency Division Duplex |
| HOTA | Huawei Firmware Over the Air |
| HSPA | High Speed Packet Access |
| HSPA+ | High Speed Packet Access Evolution |
| GPRS | General Packet Radio Service |
| GSM | Global System for Mobile Communications |
| IEEE | Institute of Electrical and Electronics Engineers |

| Acronym or Abbreviation | Full Spelling |
|---|---|
| IP | Internet Protocol |
| IPSec | Internet Protocol Security |
| IPv4 | Internet Protocol version 4 |
| IPv6 | Internet Protocol version 6 |
| ICMP | Internet Control Message Protocol |
| L2TP | Layer Two Tunneling Protocol |
| LAN | Local Area Network |
| LED | Light Emitting Diode |
| LTE | Long Term Evolution |
| MAC | Media Access Control |
| MDI | Medium Dependent Interface |
| MDIX | Medium Dependent Interface Crossover |
| MIMO | Multi-input Multi-output |
| MME | Mobility Management Entity |
| NAT | Network Address Translation |
| NAPT | Network Address and Port Translation |
| PC | Personal Computer |
| PCC | Primary Component Carrier |
| PGW | PDN Gateway |
| PIN | Personal Identification Number |
| PLAT | Provider-side Translator |
| PPTP | Point-to-Point Tunneling Protocol |
| QAM | Quadrature Amplitude Modulation |
| QR | Quick Response |
| RFC | Request For Comments |
| RTCP | Real-time Transport Control Protocol |
| RTP | Real-time Transport Protocol |
| SAMBA | System for Advanced Mobile Broadband Applications |
| SCC | Secondary Component Carrier |
| SCP | Service Control Point |
| SDRAM | Synchronous Dynamic Random Access Memory |

| Acronym or Abbreviation | Full Spelling |
|---|---|
| SDP | Session Description Protocol |
| SGW | Serving Gateway |
| SIP | Session Initiation Protocol |
| SMA | SubMiniature version A |
| SMS | Short Message |
| SOHO | Small Office Home Office |
| SSID | Service Set Identifier |
| TDD | Time Division Duplex |
| TKIP | Temporal Key Integrity Protocol |
| UE | User Equipment |
| UL | Uplink |
| UMTS | Universal Mobile Telecommunications System |
| UPnP | Universal Plug and Play |
| USB | Universal Serial Bus |
| USIM | UMTS Subscriber Identity Module |
| VPN | Virtual Private Network |
| WAN | Wide Area Network |
| WEP | Wireless Encryption Protocol |
| Wi-Fi | Wireless Fidelity |
| WMM | Wi-Fi Multimedia |
| WPA/WPA2-PSK | Wi-Fi Protected Access/Wi-Fi Protected Access II - Pre-Shared Key |
| WPA2-PSK | Wi-Fi Protected Access II - Pre-Shared Key |
| WPS | Wi-Fi Protected Setup |

# Contents

# 1 Product Overview

The HUAWEI 4G Router B311s-220 is a Long Term Evolution (LTE) wireless gateway for multiple users in household or small office environments. It enables users to access the Internet.

The B311s-220 supports 3GPP Release 9 with UE downlink/uplink category 4. The supported service functions are as follows:

- Data service up to DL 150Mbps (64QAM) and UL 50Mbps (16QAM)
- Working band: LTE: B1/3/7/8/20, UMTS: B1/B8, GSM: B2/B3/B5/B8
- Wi-Fi: 2.4 GHz 802.11b/g/n 2x2 MIMO up to 300Mbps. Maximum Users: 32
- 1 GE port for LAN/WAN
- Multi APN function (Optional) for Data, TR-069 services
- Routing mode: NAT enable (Default) / IP pass-through (Optional)
- VPN client service (L2TP, PPTP)
- Customer management via WebUI or HUAWEI SmartHome APP (iOS or Android)
- Operator maintenance via TR-069 (Optional) and TR-143 (Optional)
- Huawei Firmware Over the Air (HOTA)

**Figure 1-1** B311s-220 appearance

# 2 Technical Specifications

## 2.1 Hardware Specifications

Table 2-1 Technical specifications of the B311s-220 main unit

| Item | Description | |
|---|---|---|
| Technical standard | WAN | 3GPP Release 9 |
| | LAN | IEEE 802.3/802.3u |
| | WLAN | IEEE 802.11b/g/n |
| Working band/frequency | LTE | B1/B3/B7/B8/B20 |
| | UMTS | B1/B8 |
| | GSM | B2/B3/B5/B8 |
| | WLAN | 2.402 GHz～2.482 GHz |
| External port | • One power adapter port<br>• One LAN/WAN port (RJ45), IEEE 802.3/802.3u<br>• One external LTE antenna ports (SMA)<br>• One SIM card slot (Mini-SIM) | |
| Antennas | • Built-in LTE/UMTS/GSM primary antenna<br>• Built-in LTE/UMTS secondary antenna<br>• Built-in WLAN 2.4 GHz antenna | |

| Item | Description | | | | | | |
|------|-------------|--|--|--|--|--|--|
| LED Indicators | • One power indicator (White)<br>• One Internet status indicator<br>  Cyan: LTE network accessed<br>  Blue: UMTS network accessed<br>  Yellow: GSM network accessed<br>  Green: Ethernet network accessed<br>  Red: No SIM card is inserted or detected, or the SIM card has insufficient balance<br>• One Wi-Fi indicator (White)<br>  Flash slowly: A pairable HiLink device is detected.<br>  Flash quickly: HiLink pairing is in progress.<br>  Off: Wi-Fi is disabled.<br>  📖 NOTE<br>  • The indicator starts to flash slowly only when B311s-220 detects a new HiLink device.<br>  • HiLink devices include Honor routers, Honor set-up boxes, Honor handsets (EMUI 5.0 and later), and more.<br>• One LAN/WAN indicator (White)<br>• One group of signal strength indicators (White) | | | | | | |
| Buttons | • One Power ON/OFF switch<br>• One WPS button<br>  The Wi-Fi indicator flashes slowly when the router detects a HiLink device. Press the WPS button to connect the HiLink device to the router's Wi-Fi.<br>  When the Wi-Fi indicator is steady on, press the WPS button to enable WPS.<br>• One Reset button | | | | | | |
| Maximum transmit power | LTE | B1/B3/B7/B8/B20: 23dBm±2dB | | | | | |
| | UMTS | B1/B8: 24dBm+1/-3dB | | | | | |
| | GSM | • B2/B3: 30dBm±2dB<br>• B5/B8: 33dBm±2dB | | | | | |
| | WLAN | • 802.11b: 13 dBm<br>• 802.11g/n: 14.5 dBm | | | | | |
| Receiving sensitivity | LTE | Band | 1.4MHz (dBm) | 3MHz (dBm) | 5MHz (dBm) | 10MHz (dBm) | 15MHz (dBm) | 20MHz (dBm) |
| | | B1 | | | -100 | -97 | -95.2 | -94 |
| | | B3 | -101.7 | -98.7 | -97 | -94 | -92.2 | -91 |
| | | B7 | | | -98 | -95 | -93.2 | -92 |

| Item | Description | | | | | | |
|------|-------------|---|---|---|---|---|---|
| | | B8 | -102.2 | 99.2 | -97 | -94 | | |
| | | B20 | | | -97 | -94 | -91.2 | -90 |
| | UMTS | • B1: -106.7dBm<br>• B8: -103.7dBm | | | | | | |
| | GSM | B2/B3/B5/B8: -102dBm | | | | | | |
| | WLAN | • 802.11b: -85 dBm（11 Mbps）<br>• 802.11g: -71 dBm（54 Mbps）<br>• 802.11n: -69 dBm（65 Mbps） | | | | | | |
| Power consumption | < 12 W | | | | | | | |
| AC/DC power supply | • AC (input): 100V-240V 50Hz/60Hz<br>• DC (output): 12V/1A | | | | | | | |
| Dimensions (Maximum) | 181 mm (Width) x 126 mm (High) x 36 mm (Deep) | | | | | | | |
| Weight | About 218 g (excluding the power adapter) | | | | | | | |
| Temperature | • Working temperature: 0°C to 40°C<br>• Storage temperature: -20°C to +70°C | | | | | | | |
| Humidity | 5% − 95% (non-condensing) | | | | | | | |
| Certification/Compliance | CE certification<br>ROHS<br>REACH<br>WEEE<br>Wi-Fi certification<br>Erp<br>GCF | | | | | | | |

# 2.2 Antenna Specifications

## 2.2.1 Build-in LTE Antenna

Table 2-2 LTE antenna specifications

| Item | Description |
|------|-------------|
| Frequency | FDD LTE<br>• B1: UL 1920–1980 MHz    DL 2110–2170 MHz<br>• B3: UL 1710–1785 MHz    DL 1805–1880 MHz |

| Item | Description |
|---|---|
| | • B7: UL 2500–2570 MHz    DL 2620–2690 MHz<br>• B8: UL 880–915 MHz        DL 925–960 MHz<br>• B20: UL 832–862 MHz      DL 791–821 MHz<br>UMTS<br>• B1: UL 1920–1980 MHz  DL 2110–2170 MHz<br>• B8: UL 880–915 MHz        DL 925–960 MHz<br>GSM<br>• B2: UL 1850–1910 MHz   DL 1930–1990 MHz<br>• B3: UL 1710–1785 MHz   DL 1805–1880 MHz<br>• B5: UL 824–849 MHz        DL 869–894 MHz<br>• B8: UL 880–915 MHz        DL 925–960 MHz |
| Input impedance | 50 Ω |
| Standing wave ratio | < 3 |
| Main antenna efficiency | LTE<br>• B1: -1.5 dB<br>• B3: -2.5 dB<br>• B7: -2.5 dB<br>• B8: -2.5 dB<br>• B20: -2.5 dB<br>UMTS<br>• B1: -1.5 dB<br>• B8: -2.5dB<br>GSM<br>• B5/B8: -2.5 dB<br>• B2/B3: -2.5 dB |
| Diversity antenna efficiency | LTE:<br>• B1: -2.5 dB<br>• B3: -2.5 dB<br>• B7: -2.5 dB<br>• B8: -3 dB<br>• B20: -2 dB<br>UMTS:<br>• B1: -2.5 dB<br>• B8: -3 dB |
| Main antenna gain | LTE:<br>• B1/B3/B7B8/B20: 1~2 dBi<br>UMTS:<br>• B1/B8: 1~2 dBi |

| Item | Description |
|---|---|
| | GSM : <br> • B5/B8: 1~2 dBi <br> • B2/B3: 1~2 dBi |
| Diversity antenna gain | LTE: <br> B1/B3/B7/B8/B20: 1~2 dBi |
| TX/RX | 1T2R |
| Polarization | Linear polarization |

## 2.2.2 Build-in Wi-Fi Antenna

Table 2-3 WLAN 2.4 GHz antenna specifications

| Item | Description |
|---|---|
| Frequency | 2.402 GHz – 2.482 GHz (Channel 1 – Channel 13) |
| Input impedance | 50 Ω |
| Standing wave ratio | < 2 |
| Efficiency | -3 dB |
| Gain | 3.5 dBi |
| Polarization | Linear polarization |

# 2.3 Software Specifications

Table 2-4 Software specifications

| Item | Description | |
|---|---|---|
| LTE features | DL 2x2 MIMO | |
| | DL 64QAM, UL 16QAM | |
| Mobile network | APN management <br> APN auto adapter | |
| Gateway | Router | • Supports the default route: 0.0.0.0. <br> • Supports manual configuration of LAN IP addresses. <br> • Supports Address Resolution Protocol (ARP). |

| Item | Description | |
|---|---|---|
| | DHCP server | • The DHCP server can be enabled or disabled.<br>• The address pool of the DHCP server can be configured.<br>• The lease can be configured.<br>• The DNS relay under the DHCP server can be enabled. |
| | NAT | • Supports NAT and NAPT (compliant with RFC2663, RFC3022, and RFC3027).<br>• Supports cone NAT. |
| | ARP | |
| | ICMP | |
| | IPv4v6 dual stack<br>IPv6 only (Optional , CLAT for LAN side IPv4 device access Internet)<br>IPv4 only (Optional)<br>📖 **NOTE**<br>When the CLAT function is enabled, the IPv4 device Internet access service cannot reach the maximum throughput. Under IPv6 only, NAT-base service (such as port forwarding and port triggering) is not available. | |
| | VPN pass-through | |
| VPN client | • Support L2TP VPN client<br>• Support PPTP VPN client | |
| SMS | • Writing/sending/receiving<br>• Writing/sending/receiving extra-long messages | |
| Data service | • LTE FDD: DL 150Mbps, UL 50Mbps<br>• DC-HSPA+: DL 42 Mbps, UL 5.76 Mbps<br>• HSPA+: DL 21 Mbps (64QAM), UL 5.76 Mbps<br>• HSPA: DL 14.4 Mbps, UL 5.76 Mbps<br>• WCDMA PS: DL 384 Kbps, UL 384 Kbps<br>• EDGE: DL 236.8Kbps, UL 236.8 Kbps<br>• GPRS: DL 85.6 Kbps, UL 85.6 Kbps | |
| | WLAN 802.11b/g/n | |
| | Supports multi APNs (Optional, one for data, and one for TR-069). | |

| Item | Description | |
|---|---|---|
| Firewall setup | <ul><li>Firewall enable/disable</li><li>URL filtering</li><li>LAN IP filtering</li><li>Port forwarding (Virtual server)</li><li>Port triggering (Special Application)</li><li>DMZ service</li><li>UPnP service</li><li>ALG settings</li></ul> | |
| LAN | <ul><li>10/100/1000 Mbps auto-negotiation</li><li>MDI/MDIX auto-sensing</li><li>IEEE 802.3/802.3u-compatible</li></ul> | |
| WLAN | Broadcasts and hides service set identifiers (SSIDs) | |
| | Complies with IEEE 802.11b/g/n | |
| | WPS | |
| | WMM | |
| | Encryption | WEP, AES, and TKIP + AES |
| | Security mode | <ul><li>Open</li><li>WPA2-PSK</li><li>WPA/WPA2-PSK</li><li>WEP</li></ul> |
| | MAC address authentication | <ul><li>Supports the MAC address authentication whitelist.</li><li>Supports the MAC address authentication blacklist.</li><li>Supports a maximum of 10 MAC address entries.</li></ul> |
| | STA | <ul><li>Supports inquiry of STA status.</li><li>Supports a maximum of 32 connected stations.</li></ul> |
| Operator maintenance (Optional) | <ul><li>Supports TR-069 Amendment III</li><li>Supports TR-098 Amendment II</li><li>Supports TR-143 Amendment I</li><li>Supports TR-104 Amendment I (if VoIP is available)</li></ul> | |
| USIM | PIN management and USIM card authentication | |
| NTP | Supports daylight saving time (DST) (Optional). | |
| Maintenance | Supports export of current diagnosis results and operation logs. | |
| HUAWEI SmartHome APP | <ul><li>View data traffic usage and SMS.</li><li>Manage connected devices.</li><li>Change CPE's SSID and password.</li></ul> | |

| Item | Description | |
|---|---|---|
| System requirements | Operating system | Windows 7, Windows 8, Windows 8.1, Windows 10 (Not support Windows RT), MAC OS X 10.9, 10.10, 10.11 and 10.12 with latest updates. |
| | Web browser | • Microsoft Internet Explorer 8.0 with latest updates.<br>• FireFox 49.0 with latest updates.<br>• All major versions of Chrome in the last year (53.0 with latest updates).<br>• Safari 10.0 with latest updates (MACOS). |
| | Your computer's hardware system should meet or exceed the recommended system requirements for the installed OS version. | |

# 3 Services and Applications

## 3.1 Data Services

The B311s-220 can access the Internet through mobile networks and Ethernet networks. By connecting to the B311s-220 using Wi-Fi or a network cable, users can obtain access to high-speed Internet services and establish a local area network (LAN).

### 3.1.1 Accessing the Internet through a Mobile Network

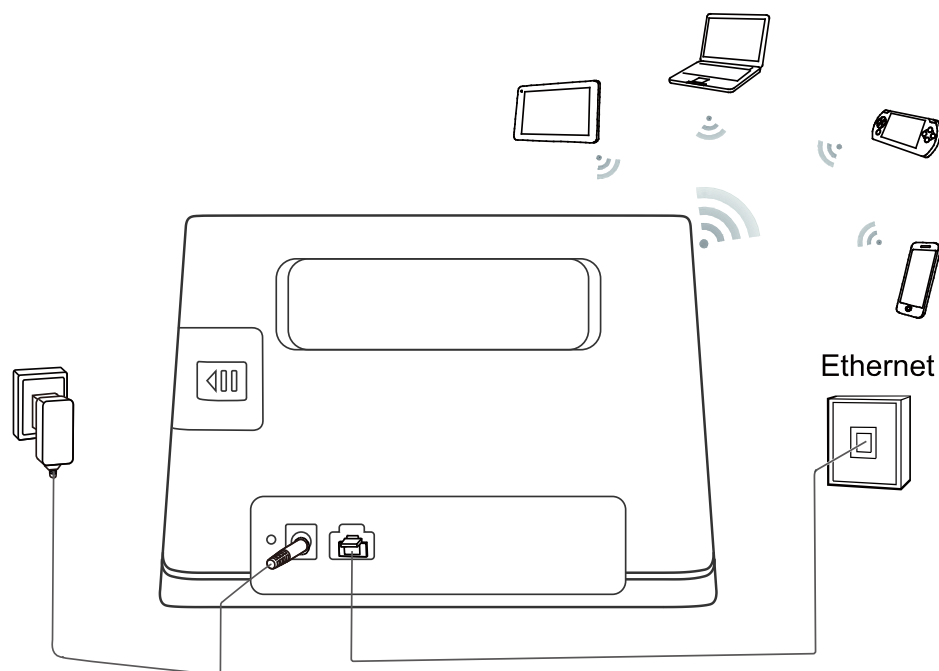The B311s-220 can access the Internet through mobile networks.

**Figure 3-1** Accessing the Internet through a mobile network
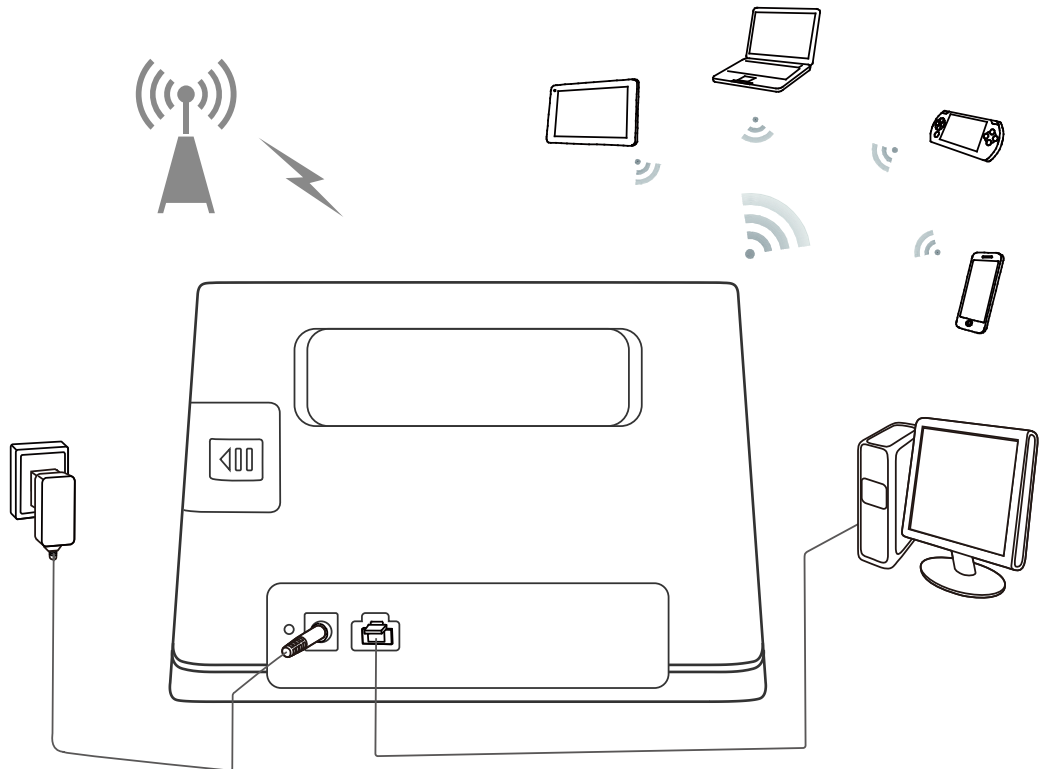
## 3.1.2 Accessing the Internet through an Ethernet Network

The B311s-220's LAN/WAN port can be connected to a wall-mounted Ethernet port using a network cable.

**Figure 3-2** Accessing the Internet through an Ethernet network



# 3.2 SMS

The B311s-220 supports message writing/sending/receiving and group sending (up to 50 -contacts at a time).

# 3.3 Security Service

The B311s-220 supports comprehensive and robust security services. It provides a firewall function and PIN protection mechanisms. These features allow users to connect their computers to the Internet and simultaneously protect their computers against security threats from the Internet.

## 3.3.1 Firewall Service

The B311s-220 supports the enabling or disabling of a firewall on the network connection, which protects the device and network from attacks by hackers on the Internet and controls access to the Internet.

## 3.3.2 MAC Filtering

The B311s-220 supports configuration of the Media Access Control (MAC) address to restrict network access.

### 3.3.3 Wi-Fi Authentication

The gateway supports the following user authentication protocols for WLAN:

- No encryption
- WEP, WPA2-PSK (AES), WPA/WPA2-PSK (TKIP/AES).

# 3.4 VPN Function

## 3.4.1 VPN Client

VPN tunneling involves establishing and maintaining a logical network connection (that may contain intermediate hops). On this connection, packets constructed in a specific VPN protocol format are first encapsulated within some other base or carrier protocol, then transmitted between the VPN client and server, and finally decapsulated on the receiving side.

The B311s-220 supports L2TP and PPTP tunneling protocols.
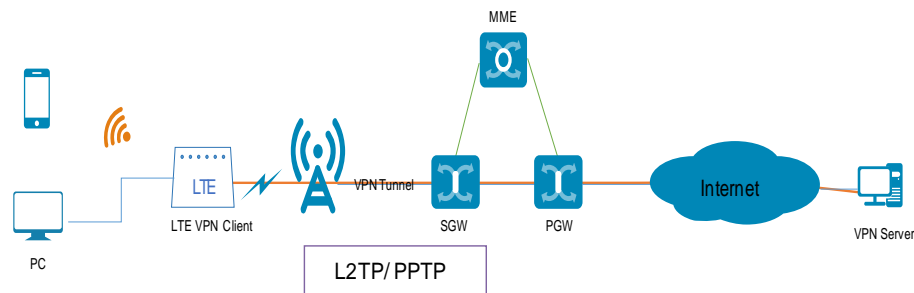
## 3.4.2 VPN Pass-Through

The B311s-220 supports L2TP/PPTP/IPsec VPN pass-through for the LAN side device. The LAN side device can create a VPN tunnel to the VPN server.
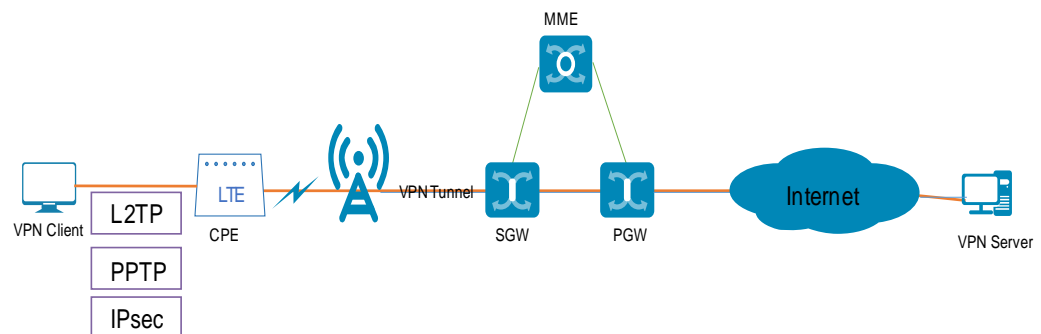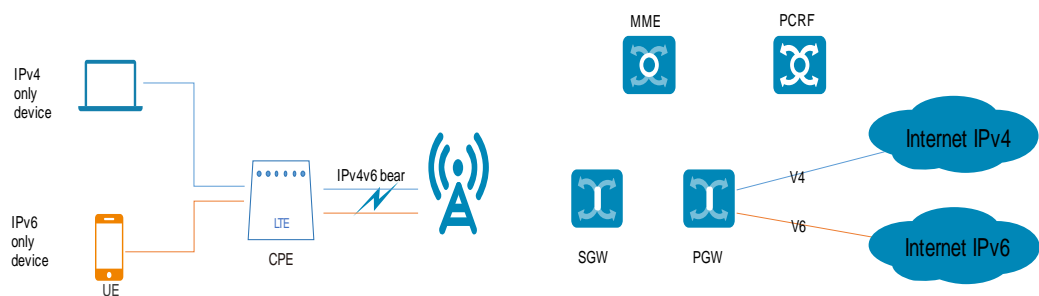
# 3.5 IP Pass-Through

The LTE CPE obtains the WAN IP address and passes it through to the PC (Case 1) or Router (Case 2), and then the PC (Case 1) or Router (Case 2) can directly use the WAP IP address.
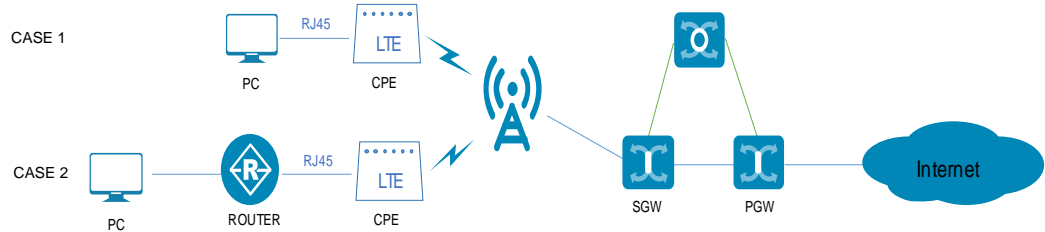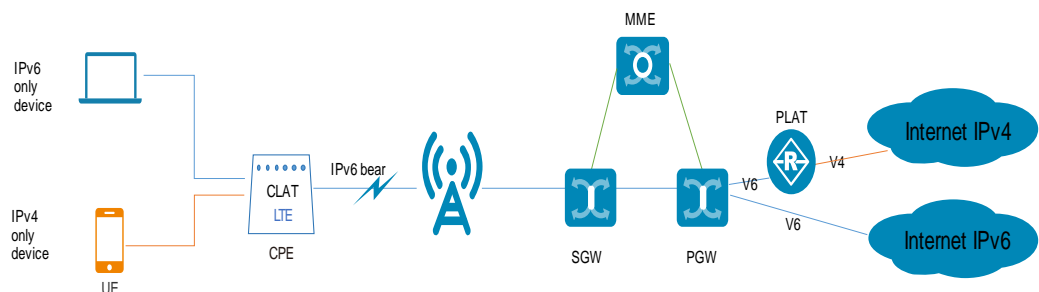
## 3.6 IPv6 Only and IPv4v6 Dual Stack

### 3.6.1 IPv4v6 Dual Stack

CPE provides dual stack function.



### 3.6.2 IPv6 Only (CLAT)

The LTE CPE supports IPv6 only with the transition solution CLAT for IPv4 device.



📖 NOTE

When the IPv6 only (CLAT) function is enabled, NAT-based functions (like DMZ/Port Forwarding/Port tigger) cannot be used.

When an IPv4 device accesses the Internet, the performance is degraded because packets need to be packetized and unpacked. However, IPv6 devices are not affected.

## 3.7 Multi-APN

The B311s-220 supports the establishment and maintenance of three APNs. These three APN connections isolate data, and remote management services on an operator's network.

The B311s-220 supports an independent APN for CPE internal/VoIP/TR-069.
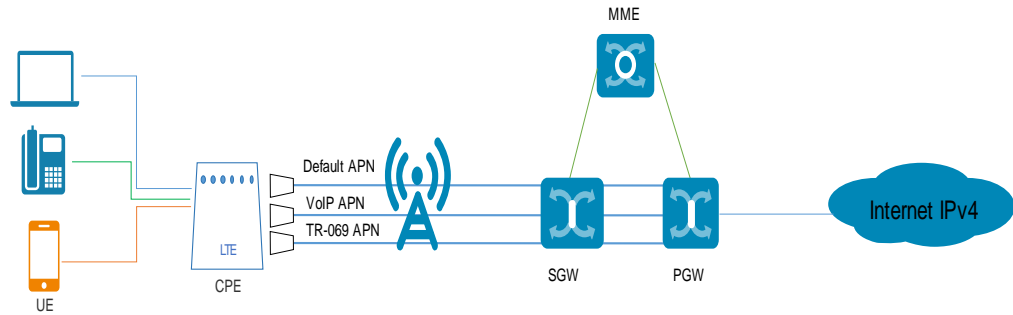
# 3.8 HiLink

- Supports up to two HiLink devices to connect to B311s-220 through the WPS/Hi button to create an expanded network.
- Supports quick connection between a HiLink device (such as Honor set-up boxes and Honor handsets running on EMUI 5.0 and later) and B311s-220 through the WPS/Hi button.
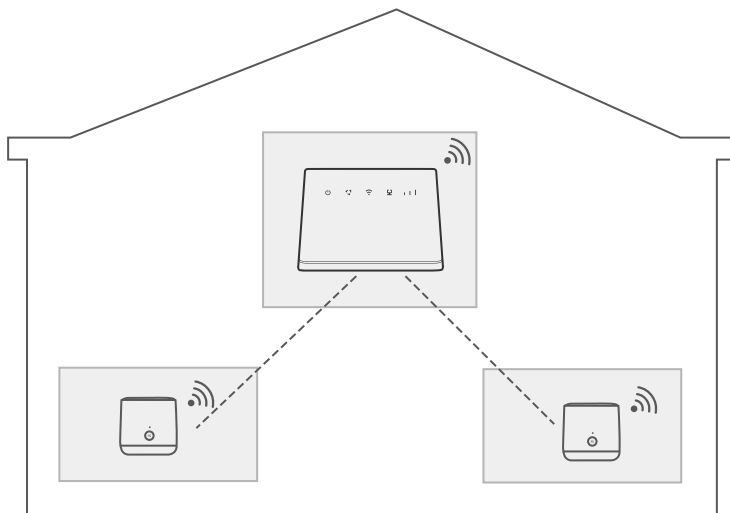


# 3.9 Customer management

## 3.9.1 WebUI

The B311s-220 supports local configuration through the Web UI. You can perform device management and network configuration to ensure normal and stable performance.

## 3.9.2 HUAWEI SmartHome APP

Scan the QR code (can be found in the Quick Start Guide and Web UI), or search for Huawei SmartHome in the Google Play Store or Apple App Store to download the HUAWEI SmartHome APP and configure the router from your phone.

# 3.10 Operator maintenance

The B311s-220 supports Operator maintenance through the TR-069. Operator remote manages the CPE software update/parameters configuration via TR-069.
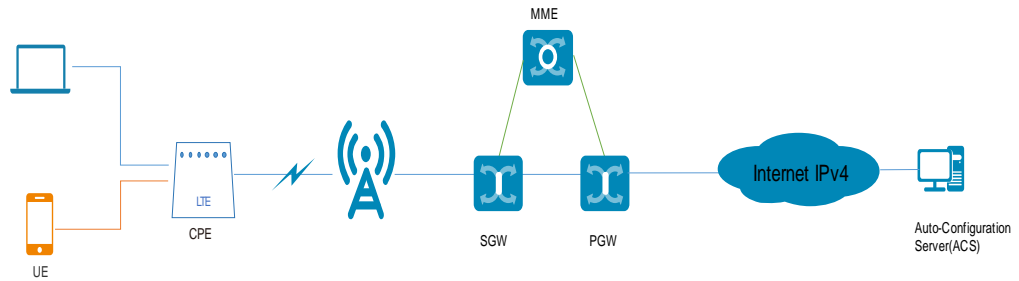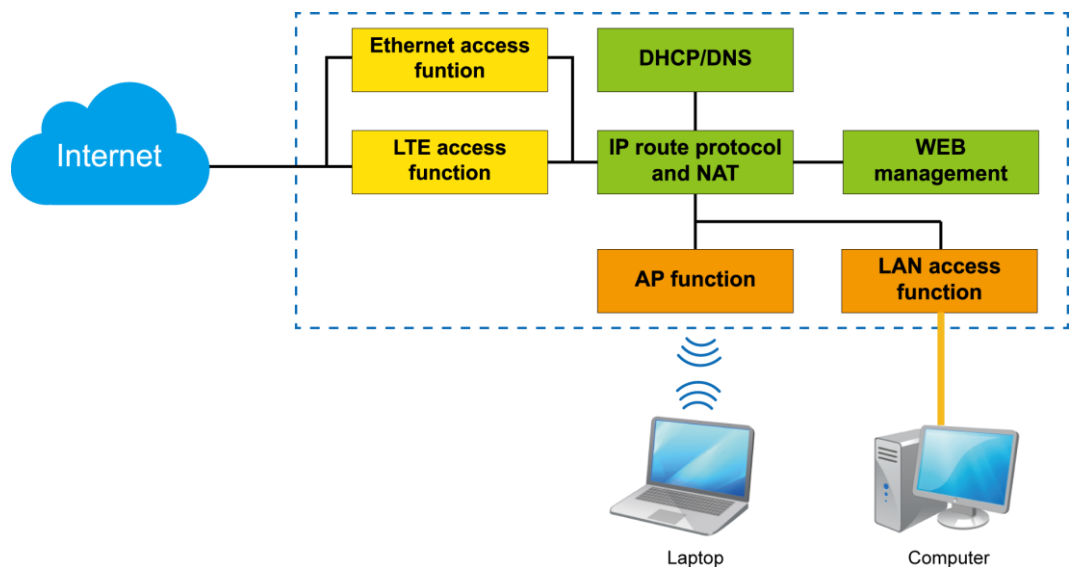


# 3.11 HOTA

The B311s-220 supports the HOTA feature, which allows users to remotely update the device firmware through the HOTA server.

# 4 System Structure and Scenario Constraints

## 4.1 System Architecture

Figure 4-1 shows the interfaces for the B311s-220.

**Figure 4-1** System structure



The following describes the modules shown in Figure 4-1.

- LTE access function: The B311s-220 adopts the LTE access technology at the WAN side.
- LAN access function: One 10/100/1000 Mbps high-speed Ethernet ports are provided at the LAN side. The B311s-220 provides the switching function for local networking and sharing of the broadband network when it is connected to terminal devices.
- AP function: An 802.11b/g/n-compliant WLAN AP interface is provided for wireless networking at home. The interface is compliant with the IEEE 802.11b/g/n standard and the WEP, WPA/WPA2-PSK, WPA2-PSK security authentication mechanisms.
- DHCP/DNS: The DHCP server dynamically allocates IP addresses to PCs.
- Web-based management: You can configure the B311s-220 and modify and view the configuration of the B311s-220.

- IP routing protocol and NAT: The B311s-220 has high-speed routing capability. With the built-in NAT, the B311s-220, together with LTE terminals, can provide flexible broadband access solutions and networking schemes.

# 4.2 Scenario Constraints

The B311s-220 is a household wireless broadband access product designed for use in scenarios with relatively few network access devices and relatively low network reliability requirements, such as homes or small office and home offices (SOHOs).

The B311s-220 is not an enterprise-grade product. It cannot be used by medium- or large-sized enterprises or in scenarios with high network reliability requirements, such as banks, securities agencies, traffic control, and communications device backhaul.

The B311s-220 has the following constraints:

- When the IP Pass-Through mode is enabled, the HOTA function cannot be used.

- When the L2TP/PPTP VPN client function is enabled, the throughput performance will slow down.

- A maximum of 32 devices can be connected to the WLAN in theory; the actual number of devices that can be connected and served depends on actual conditions.

# 5 Technical References

## 5.1 Standards and Communication Protocols

### 5.1.1 Standards and Communication Protocols of the Product

**Table 5-1** Standards and communication protocols of the product

| Item | Description |
|------|-------------|
| Physical layer | RFC894 |
| ARP | RFC826 |
| IP | RFC791, RFC1122, RFC1071, RFC1141, RFC1624, RFC792, RFC950, RFC1256 |
| ICMP | RFC792, RFC950, RFC1256 |
| TCP | RFC793 |
| UDP | RFC768 |
| DHCP | RFC1531, RFC1533 |
| NAT | RFC1631, RFC2663, RFC3022, RFC3027 |
| VoIP | RFC3261,RFC2327,RFC1889,RFC1890,RFC3550 |

### 5.1.2 Standards and Communication Protocols of the Wireless Uu Interface

This device supports 3GPP Release 9.

# 6 Packing List

**Table 6-1** Packing list

| Description | Quantity | Remarks |
| --- | --- | --- |
| Wireless Gateway | 1 | Standard |
| Power supply adapter | 1 | Standard |
| Quick Start | 1 | Standard |
| Ethernet cable | 1 | Standard |
| Warranty card | 1 | Optional |

The HUAWEI B311s-220 wireless gateway has an optional external antenna.