1 Access Controllers

About This Chapter

1.1 AC6003 Product Description

1.1.1 Product Characteristics (AC6003)

NOTICE

The AC6003 is a class A product. The AC6003 that is operating may cause radio interference. Customers need to take prevention measures.

Huawei AC6003-8 (AC6003 for short) is an access controller (AC) applicable to MANs and enterprise networks for wireless access. The AC6003 has a large capacity and high performance. It is highly reliable, easy to install and maintain, and features such advantages as flexible networking and energy conservation.

The AC6003 has the following features:

- Has various user policy management and authority control capabilities.

- Can be managed using the eSight, web system, or command line interface (CLI).

Abundant Port Types

The AC6003 provides various ports to meet the requirements of all scenarios. **Table 1-1** lists the ports on the AC6003.

Table 1-1 AC6003 port description

Port Type	Quantity	Description
Service port	8 GE ports	Among the 8 electrical ports, the last two are used with two optical ports as combo interfaces.
Maintenance port	One RJ45 maintenance serial port	It is an RS-232 port.
	One USB port	The USB port is used to connect USB disks for deployment, configuration file transfer, and file upgrade.

Large Capacity, High Performance, Integrated Design

The AC6003 provides a large capacity and high performance, and adopts an integrated design to allow for flexible deployment.

- Large forwarding capacity: The AC6003 has 8 GE ports. It provides 20 Gbit/s switching capacity and 2 Gbit/s forwarding performance.

Carrier-Class Reliability

The AC provides the following reliability designs, ensuring long-term operation.

- The AC supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- The AC supports 1+1 hot backup.

Easy-to-Install and Easy-to-Maintain

The AC is easy to install and maintain, simplifying network deployment.

- The AC dimensions (H x W x D) are 43.6 mm x 320 mm x 233.6 mm (1.72 in. x 12.60 in. x 9.20 in.), and the AC can be installed on a desk or in a standard IEC cabinet (19 inches).
- The built-in web system of the AC allows local GUI-based management.
- The AC can be managed by the eSight that provides various northbound interfaces.

- The AC supports the intra-board temperature probe, which monitors the operating environment of the AC in real time.

Energy Conservation

The AC adopts the following measures to save energy:

- Low noise fans that can adjust the speed automatically are used, thus reducing noises in the system and power consumption of fans.
- The AC switches to the power saving mode when no connected device is detected on a service interface, that is, the interface is idle.
- It uses highly-integrated and energy-saving chips produced through advanced processing techniques. With the help of the intelligent device management system, the chips not only improve system performance but also greatly reduce power consumption of the entire system.

1.1.2 Application Scenarios (AC6003)

1.1.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

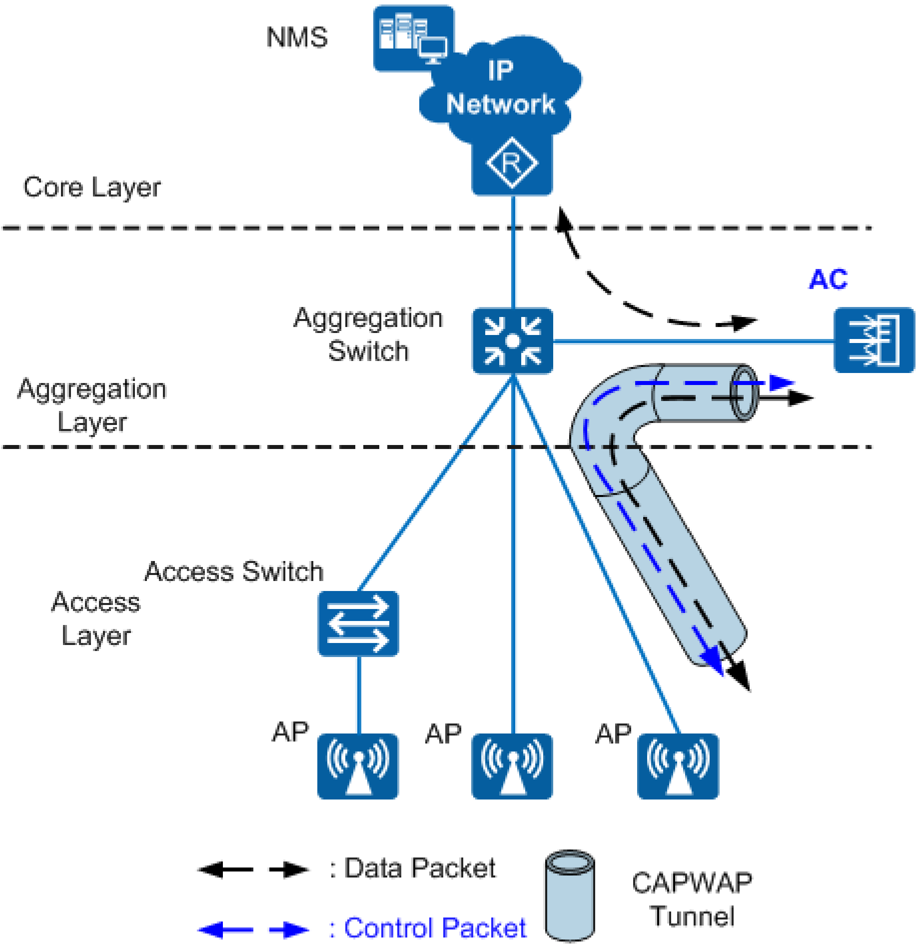
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-1**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-1 Bypass networking in tunnel forwarding mode

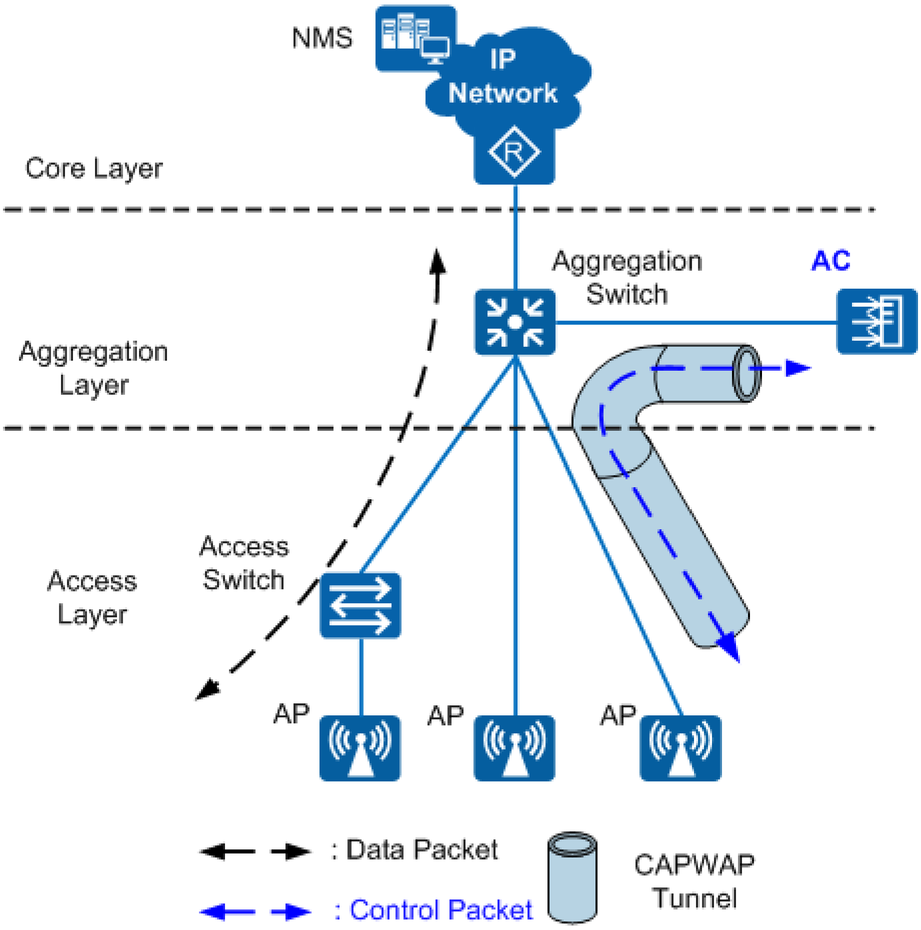


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-2 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.1.2.2 Inline Networking

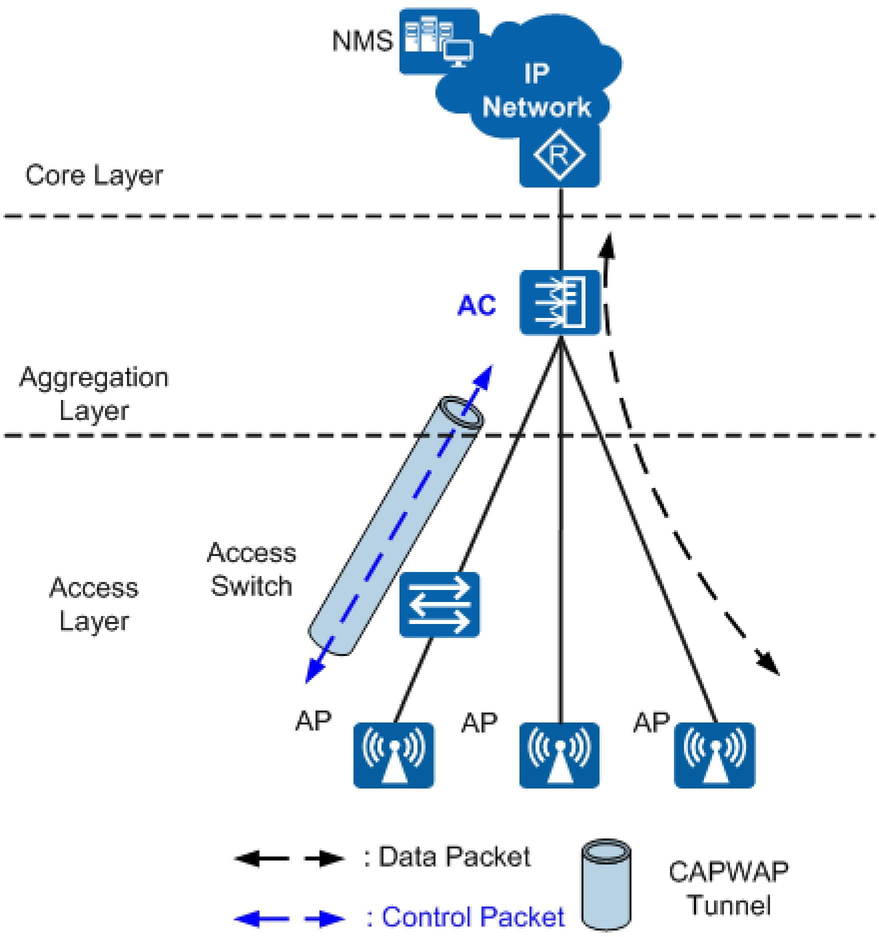
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-3 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-3**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

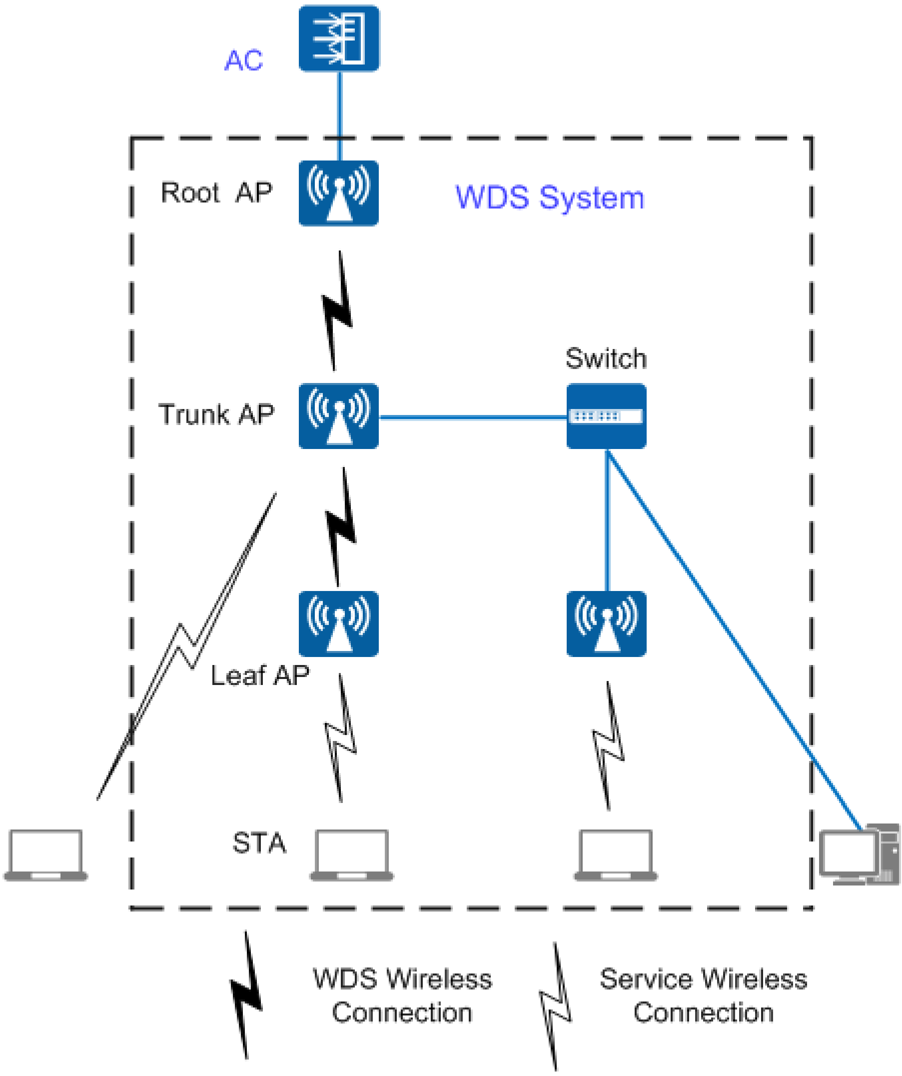
1.1.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-4 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

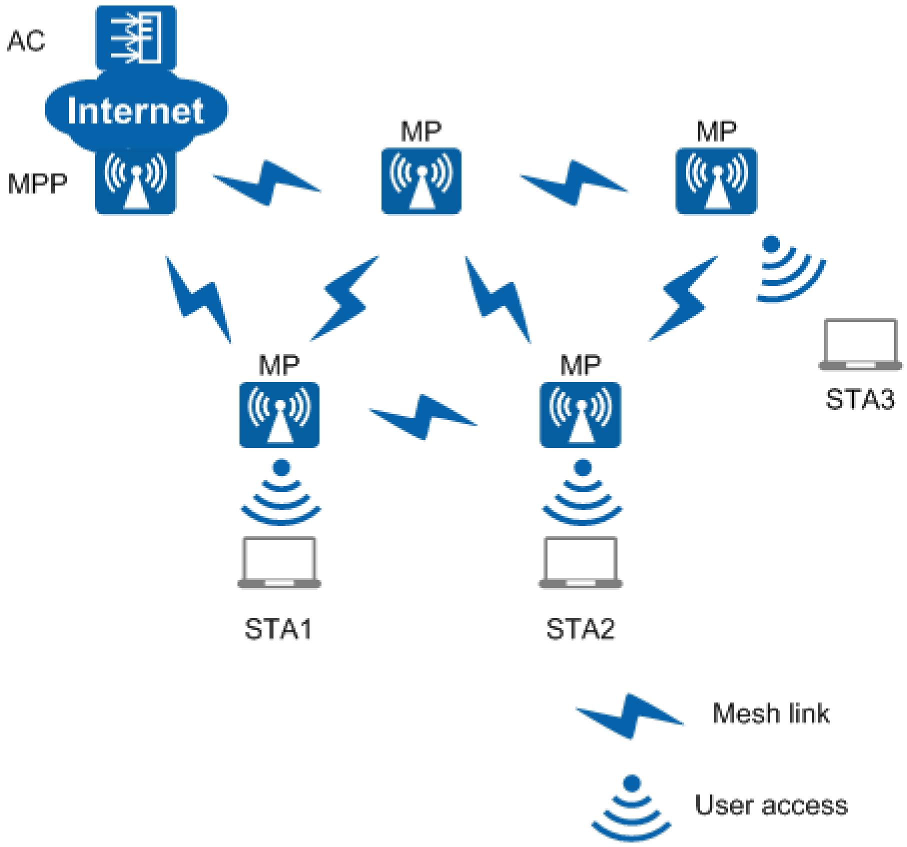
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-5 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

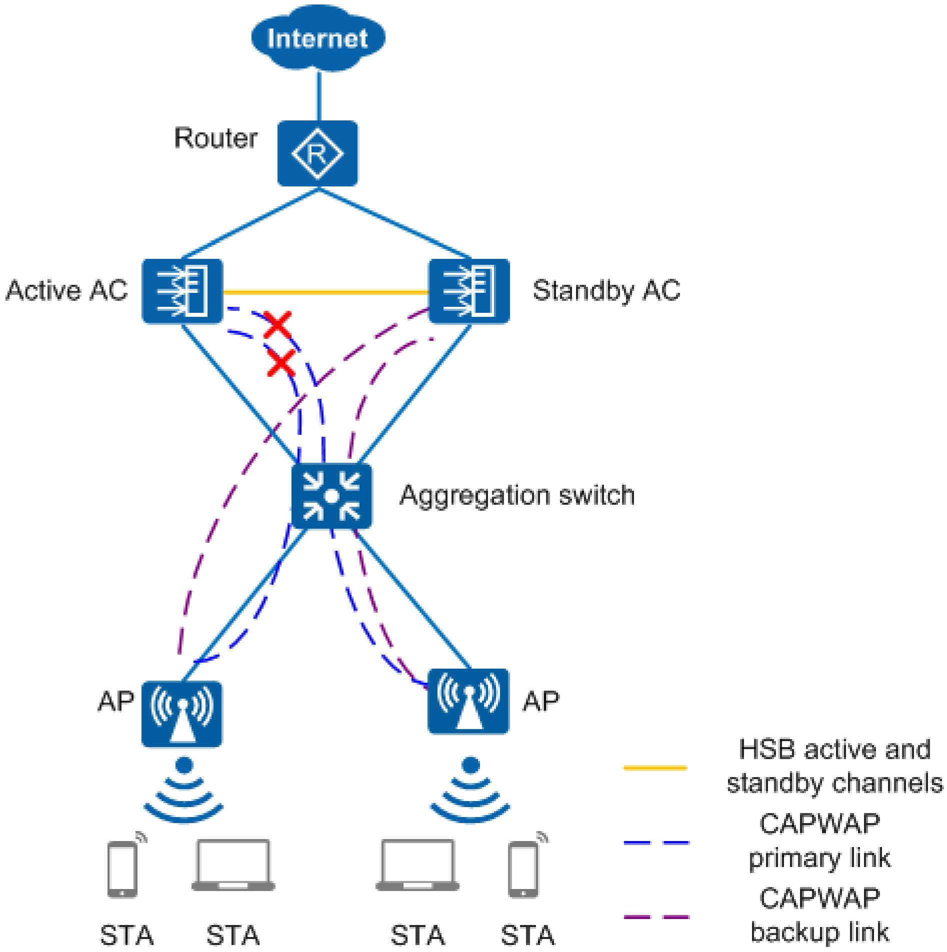
1.1.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

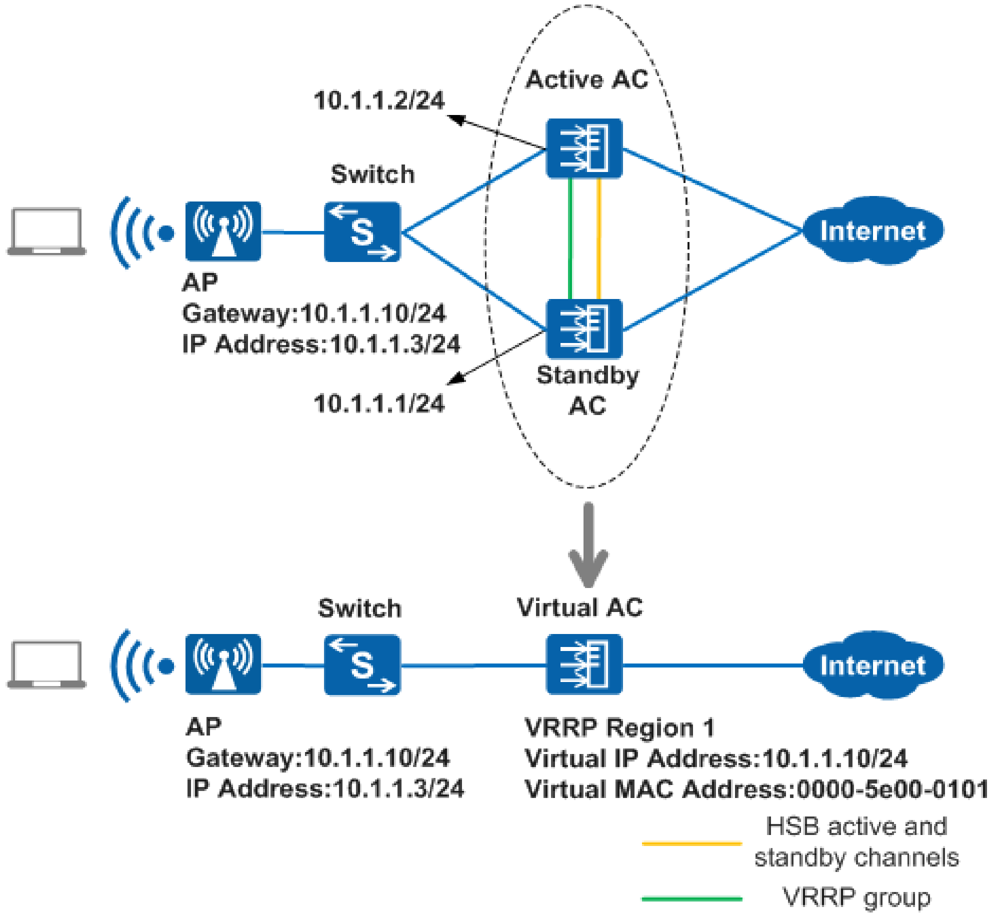
- HSB + dual-link backup: As shown in **Figure 1-6**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-6 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-7**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-7 HSB + VRRP networking



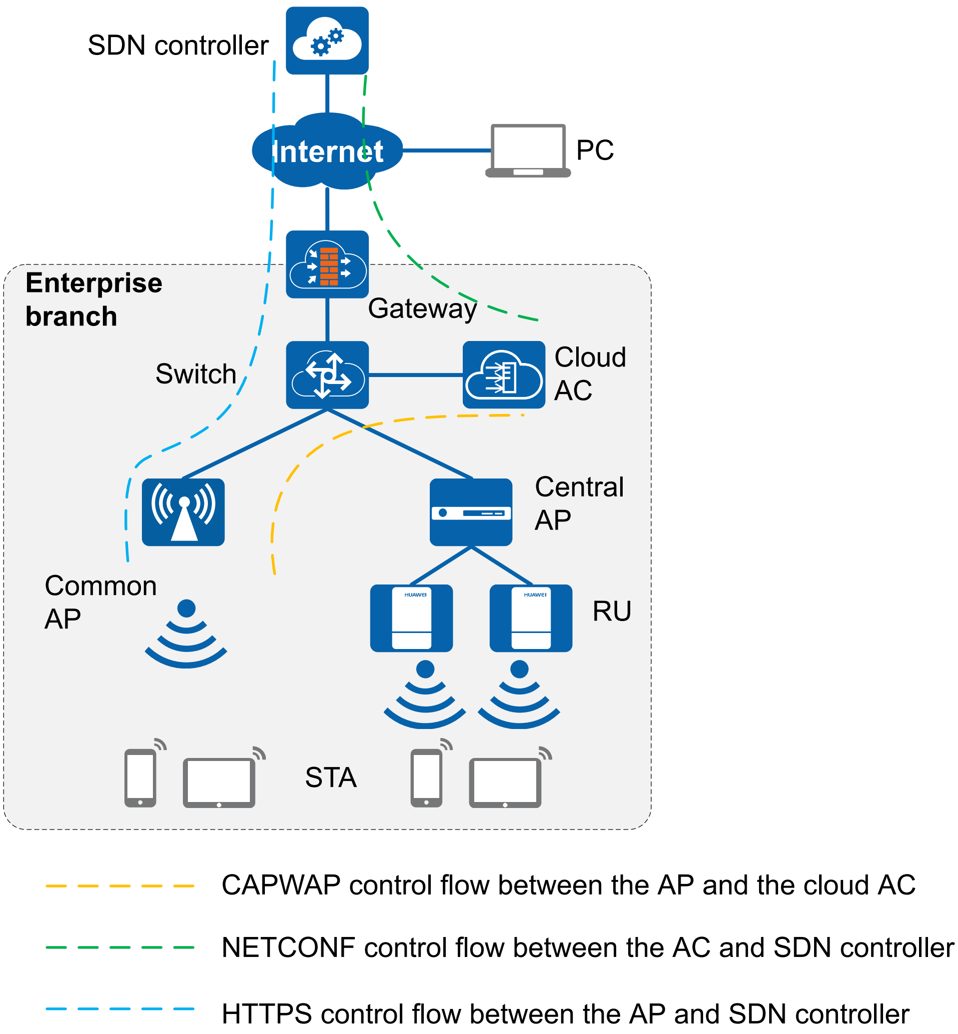
1.1.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-8**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-8 Typical cloud AC networking diagram



1.1.3 Product Structure (AC6003)

Appearance and Structure

Currently, the AC6003 series only has one model AC6003-8 (AC6003 for short).

Figure 1-9 and **Figure 1-10** show the appearance of the AC6003.

Figure 1-9 Appearance of the AC6003 (front view)

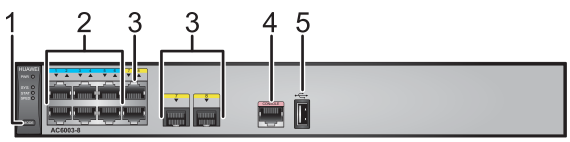
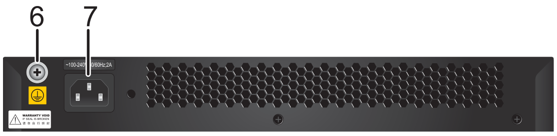


Figure 1-10 Appearance of the AC6003 (rear view)



No.	Description
1	MODE button: switches the working mode of service port indicators.
2	Six 10/100/1000BASE-T Ethernet electrical ports. Support 10M/100M/1000M auto-sensing.
3	Two pairs of combo ports. When being used as an electrical port, it supports 10M/100M/1000M auto-sensing.
4	Console port.
5	USB port.
6	Ground point.
7	AC power jack.

Indicator Description

Figure 1-11 shows the indicators on the AC6003 front panel.

Figure 1-11 Indicators on the AC6003 front panel

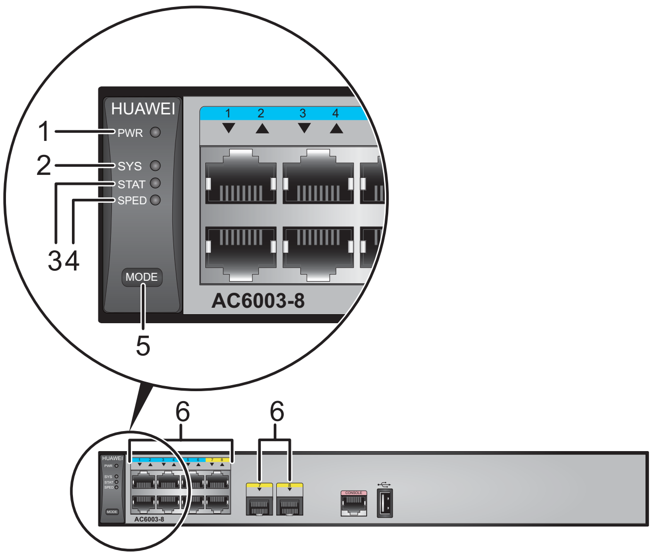


Table 1-2 describes indicators on the AC6003 front panel.

NOTE

Indicator colors may vary slightly at different temperature.

Table 1-2 Description of indicators on the AC6003 front panel

No.	Indicator/ Button	Status	Description
1	PWR: power indicator	Off	The device is powered off.
		Steady green	The power supply is working properly.
2	SYS: system status indicator	Off	The system is not running.
		Green	• Fast blinking: The system is starting. • Slow blinking: The system is running properly.
		Steady red	The system cannot start normally, or an overheat alarm or fan alarm is generated.
3	STAT: state mode indicator	Off	The state mode is not selected.
		Steady green	The service port indicator works in the default mode (STAT). In this mode, the indicator indicates the port status.
4	SPED: speed mode indicator	Off	The speed mode is not selected.
		Steady green	The service port indicator indicates the port speed. After 45 seconds, the service port indicator automatically restores to the default mode (STAT).
5	MODE: mode switch button	–	• When you press the button once, the SPED indicator turns green and the service port indicators indicate the speed of the ports. • When you press the button for a second time, the STAT indicator turns green. If you do not press the button within 45 seconds, the indicators restore to the default mode. That is, the STAT indicator turns green, and the SPED indicator is off.

No.	Indicator/ Button	Status	Description
6	Service port indicator • GE electrical ports: The first indicator indicates the status of the lower left port. The indicators correspond to the ports from bottom to top and from left to right. • GE optical ports: Each optical port has a corresponding indicator above it.	Meanings of service port indicators vary in different modes. For details, see **Table 1-3**.	

Table 1-3 Description of service port indicators in different modes

Mode	Status	Description
STAT	Off	No link has been established to the port or the port has been shut down.
	Green	• Steady on: A link has been established to the port. • Blinking: The port is sending or receiving data.
SPED	Off	No link has been established to the port or the port has been shut down.
	Green	• Steady on: The port is working at 10 or 100 Mbit/s. • Blinking: The port is working at 1000 Mbit/s.

Physical Specifications

Table 1-4 Physical specifications

Item		Description
Dimensions and weight	Dimensions (H x W x D)	43.6 mm x 320 mm x 233.6 mm
	Maximum weight (standard configuration)	2.9 kg
Power specifications	Maximum power consumption	25.6 W
	AC input voltage	• Rated voltage range: 100 V AC to 240 V AC, 50/60 Hz • Maximum voltage range: 90 V AC to 264 V AC, 47 Hz to 63 Hz
Environment specifications	Operating temperature and altitude	• -60 m to +1800 m: -5°C to +50°C • 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.

Item		Description
	Relative humidity	5% RH to 95% RH, noncondensing
	Operating altitude	-60 m to +5000 m

1.1.4 Performance Specifications (AC6003)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.2 AC6005 Product Description

1.2.1 Product Characteristics (AC6005)

NOTICE

The AC6005 is a class A product. The AC6005 that is operating may cause radio interference. Customers need to take prevention measures.

Huawei AC6005 series (AC6005 for short) is an access controller (AC) applicable to MANs and enterprise networks for wireless access. The AC6005 has a large capacity and high performance. It is highly reliable, easy to install and maintain, and features such advantages as flexible networking and energy conservation.

Huawei AC6005 series has two models: AC6005-8 and AC6005-8-PWR.

The AC6005 has the following features:

- The AC6005-8-PWR provides PoE power (15.4 W) for 8 interfaces or PoE+ power (30 W) for 4 interfaces so that APs can directly connect to these interfaces.
- Has various user policy management and authority control capabilities.
- Can be managed using the eSight, web system, or command line interface.

Abundant Port Types

The AC6005 provides various ports to meet the requirements of all scenarios. **Table 1-5** lists the ports on the AC6005.

Table 1-5 AC6005 port description

Port Type	Quantity	Description
Service port	Eight GE ports	Among the eight electrical ports, the last two are used with two optical ports as combo interfaces.
Maintenance port	One RJ45 maintenance serial port	It is an RS-232 port.
	One USB port	The USB port is used to connect USB disks for deployment, configuration file transfer, and file upgrade.

Large Capacity, High Performance, Integrated Design

The AC provides a large capacity and high performance, and adopts an integrated design to allow for flexible deployment.

- Large forwarding capacity: The AC has eight GE ports. It provides 20 Gbit/s switching capacity and 4 Gbit/s forwarding performance.
- PoE: The AC supports the PoE function and can provide the maximum power on eight ports. This PoE capability can provide power to APs and other powered devices (PDs) connected to the AC.

Carrier-Class Reliability

The AC provides the following reliability designs, ensuring long-term operation.

- The AC supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- The AC supports 1+1 hot backup.

Easy-to-Install and Easy-to-Maintain

The AC is easy to install and maintain, simplifying network deployment.

- The AC dimensions (H x W x D) are 43.6 mm x 320 mm x 233.6 mm (1.72 in. x 12.60 in. x 9.20 in.), and the AC can be installed on a desk or in a standard IEC cabinet (19 inches).
- The built-in web system of the AC allows local GUI-based management.
- The AC can be managed by the eSight that provides various northbound interfaces.
- The AC supports the intra-board temperature probe, which monitors the operating environment of the AC in real time.

Energy Conservation

The AC adopts the following measures to save energy:

- Low noise fans that can adjust the speed automatically are used, thus reducing noises in the system and power consumption of fans.
- The AC switches to the power saving mode when no connected device is detected on a service interface, that is, the interface is idle.
- It uses highly-integrated and energy-saving chips produced through advanced processing techniques. With the help of the intelligent device management system, the chips not only improve system performance but also greatly reduce power consumption of the entire system.

1.2.2 Application Scenarios (AC6005)

1.2.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

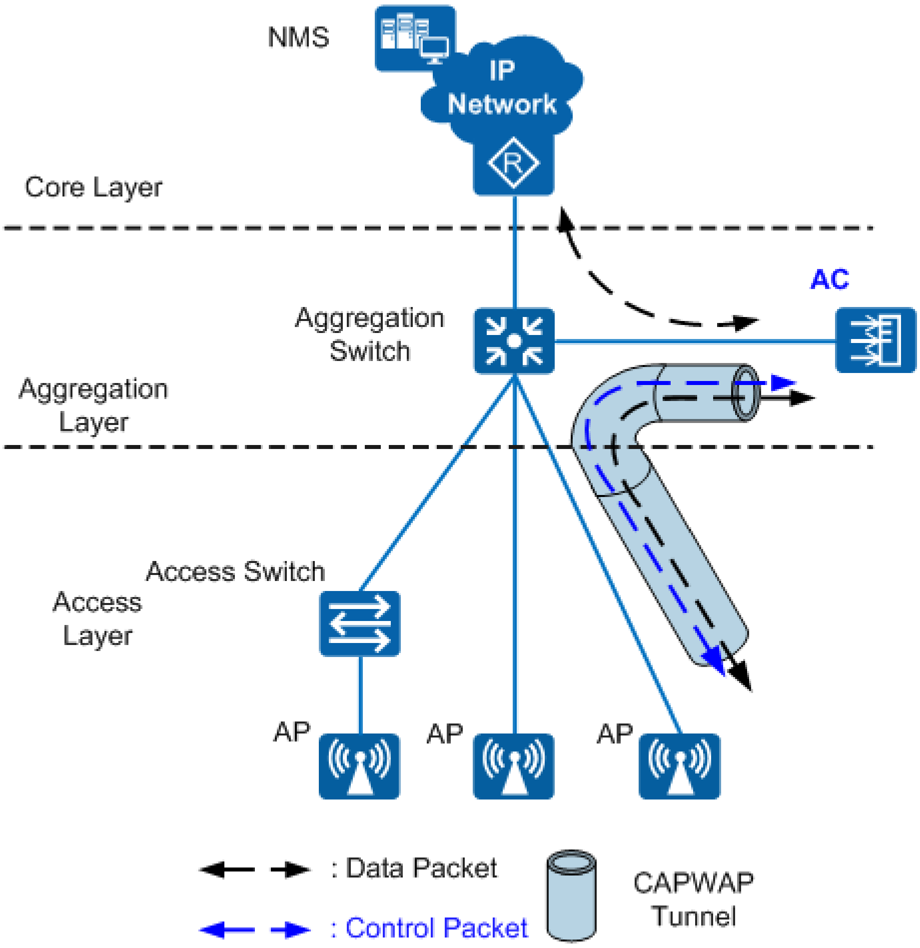
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-12**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-12 Bypass networking in tunnel forwarding mode

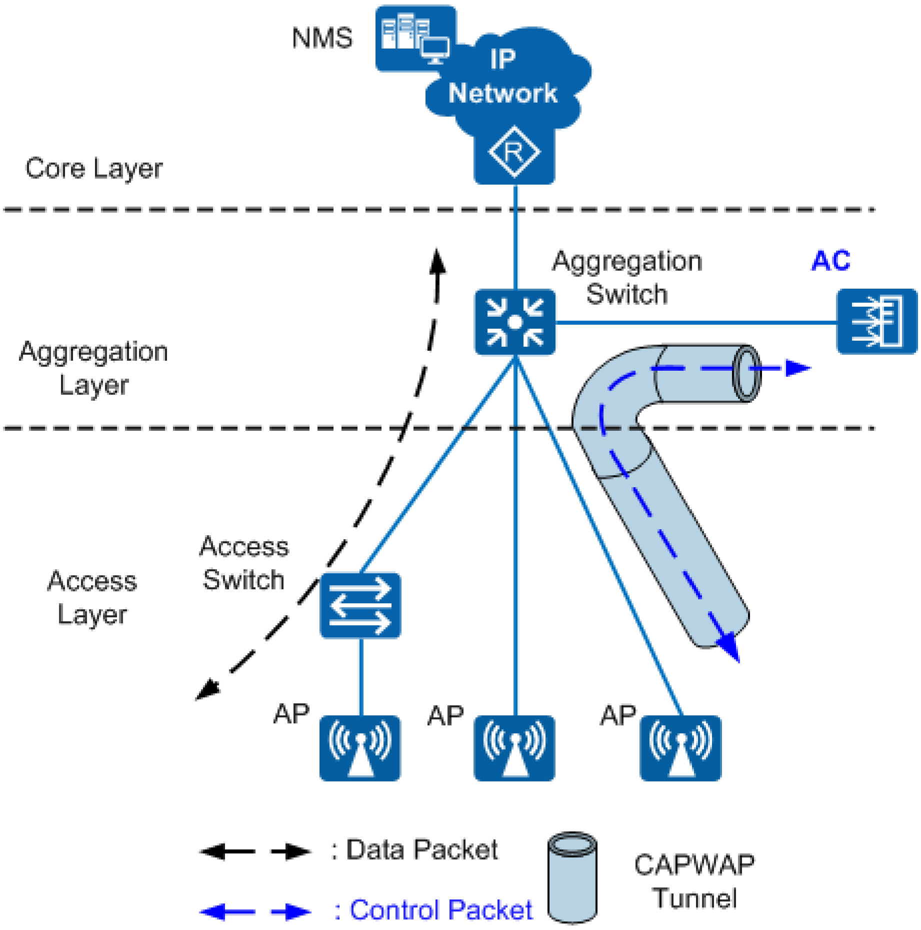


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-13 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.2.2.2 Inline Networking

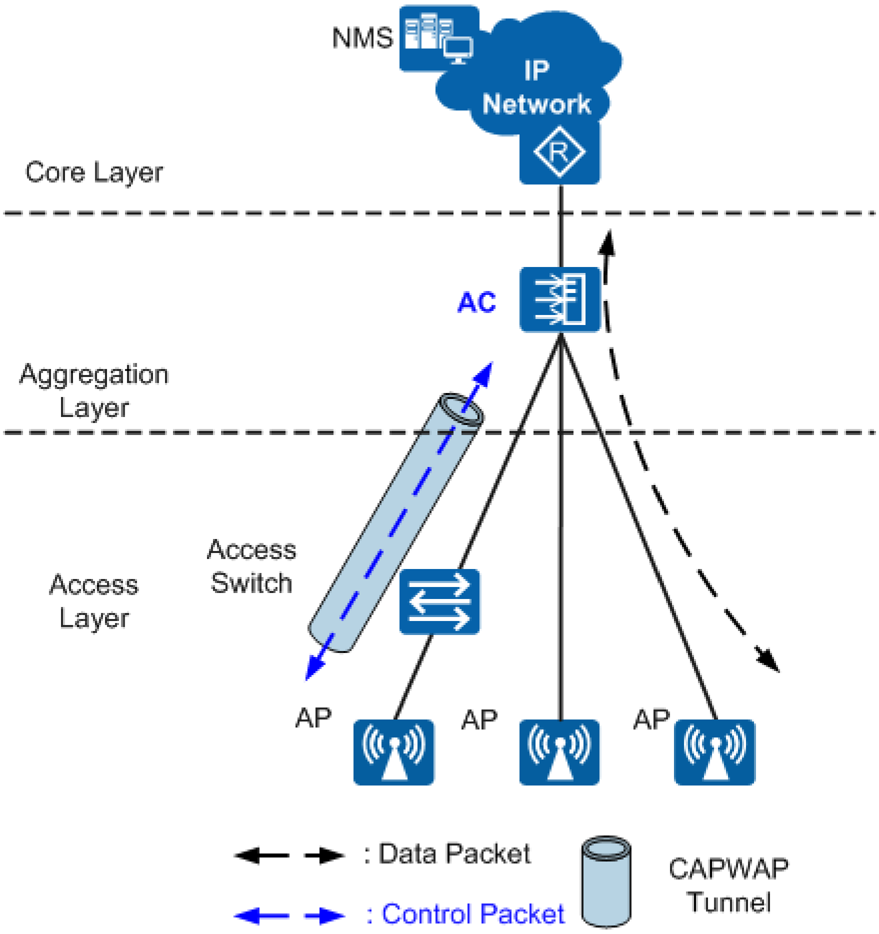
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-14 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-14**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

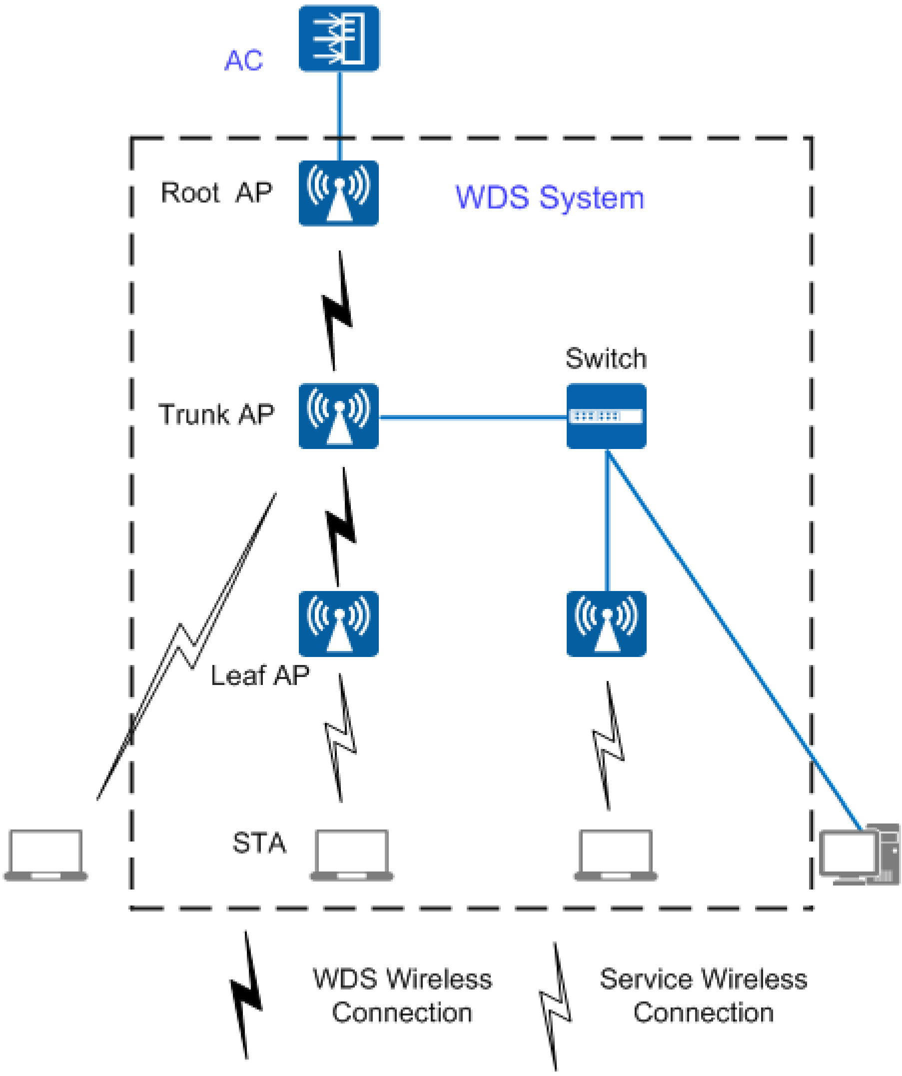
1.2.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-15 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

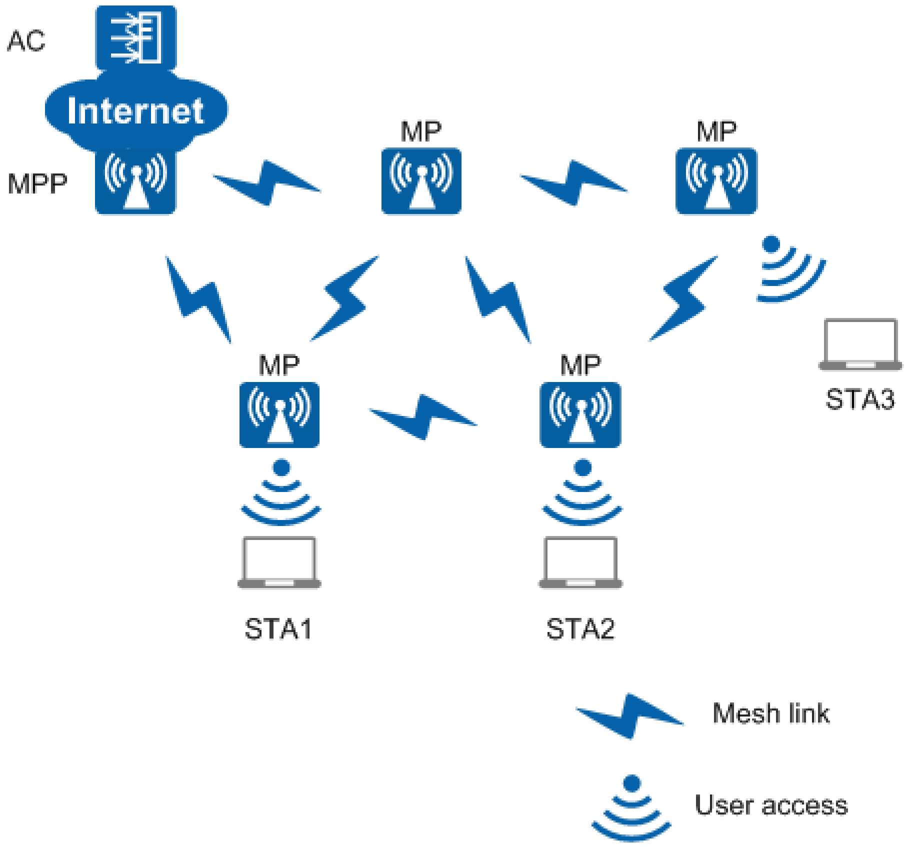
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-16 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

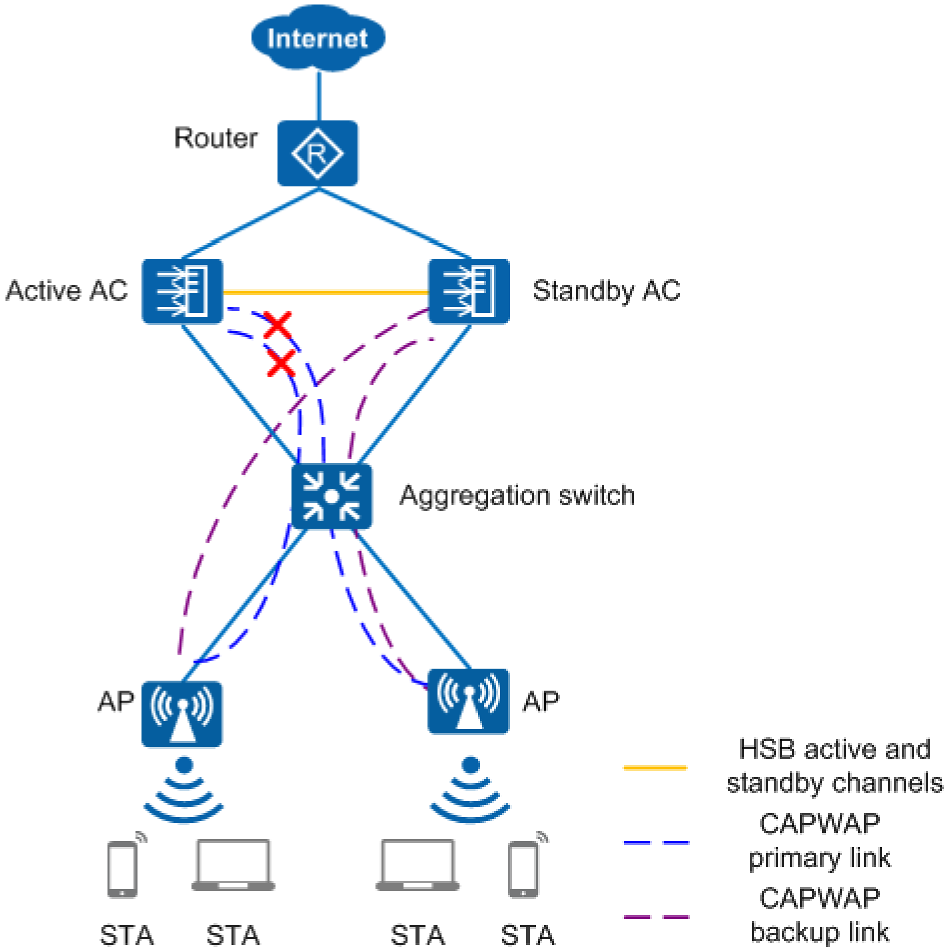
1.2.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

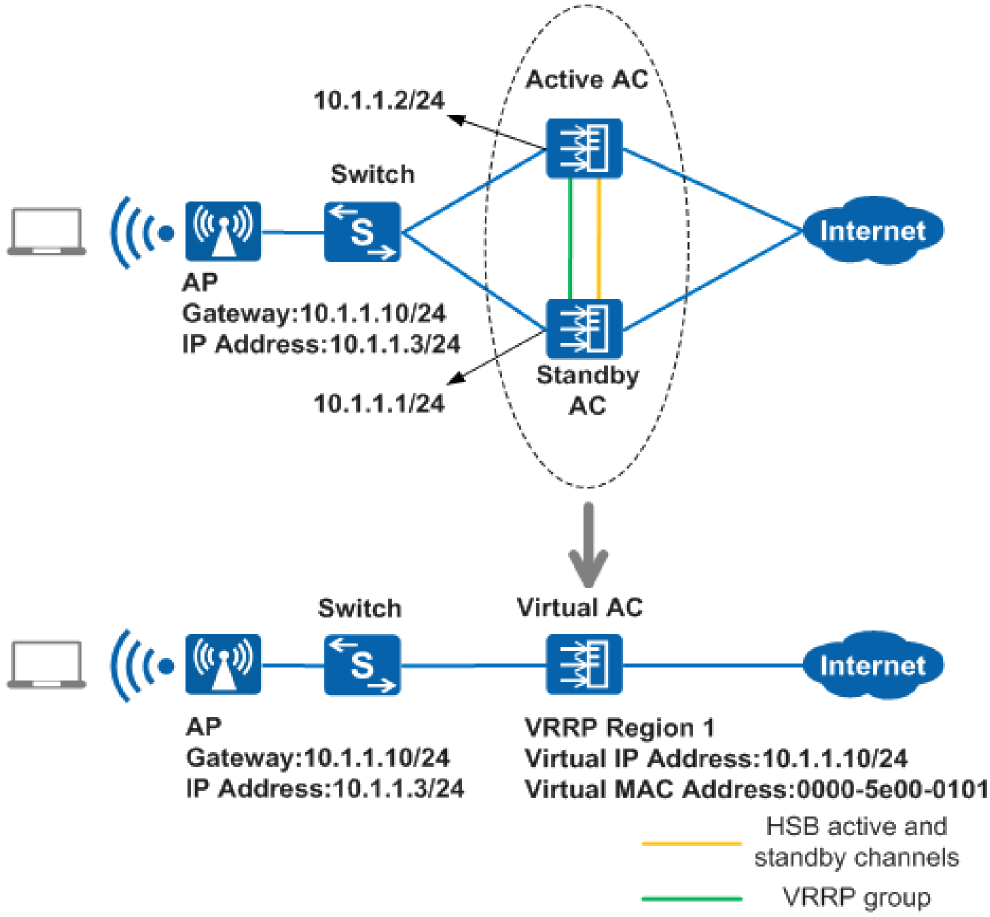
- HSB + dual-link backup: As shown in **Figure 1-17**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-17 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-18**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-18 HSB + VRRP networking



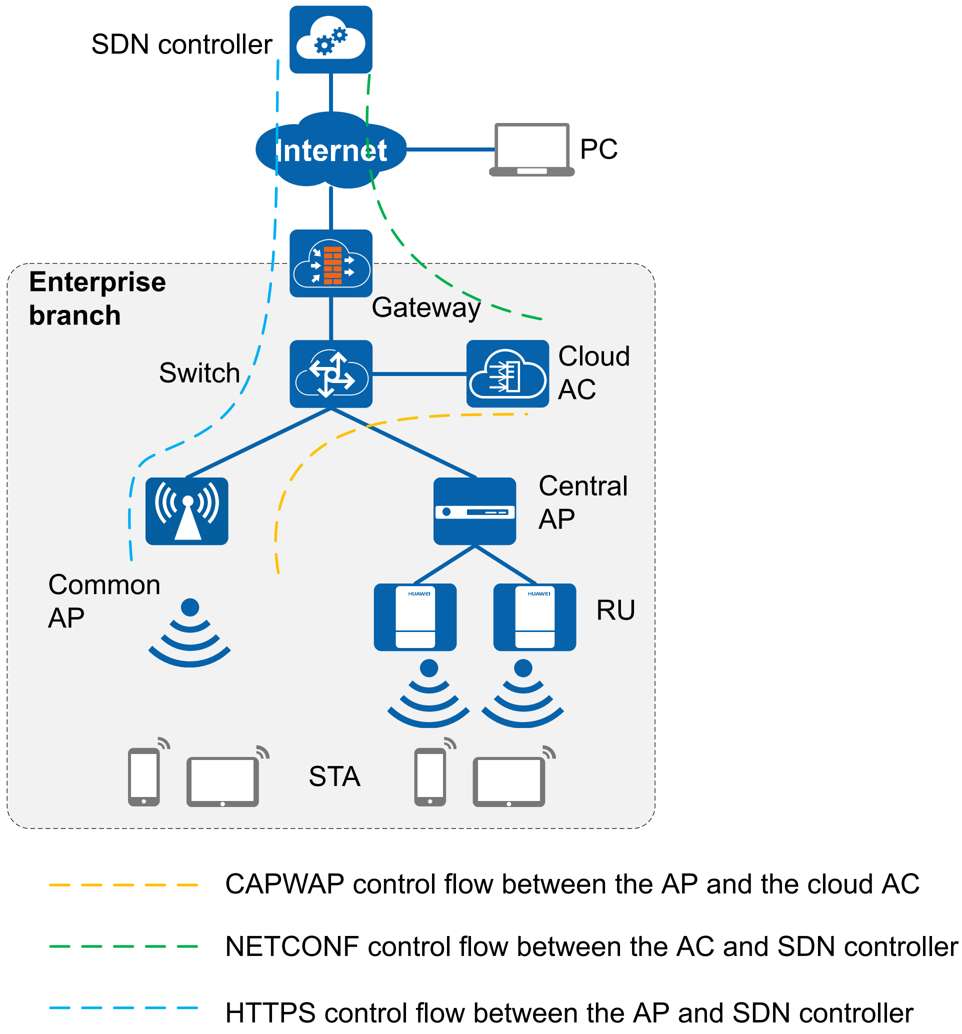
1.2.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-19**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-19 Typical cloud AC networking diagram



1.2.3 Product Structure (AC6005)

Appearance and Structure

The AC6005 series has two models: AC6005-8 and AC6005-8-PWR.

Table 1-6 and **Table 1-7** show the appearance of the AC6005.

Table 1-6 Appearance of the AC6005 (front view)

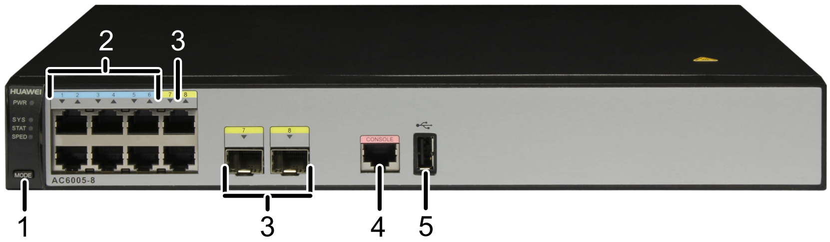
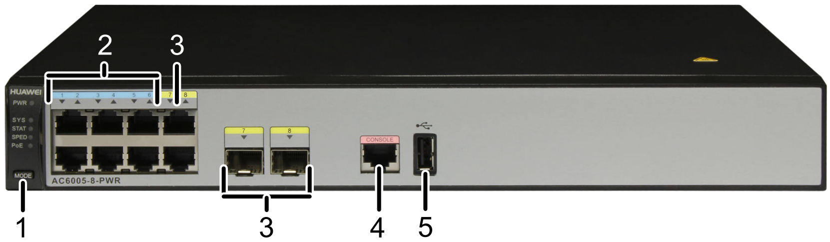
Model	Appearance
AC6005-8	
AC6005-8-PWR	

Table 1-7 Appearance of the AC6005 (rear view)

Model	Appearance
AC6005-8	
AC6005-8-PWR	

No.	Description
1	MODE button: switches the working mode of service port indicators.
2	Six 10/100/1000BASE-T Ethernet electrical ports. ● Support 10M/100M/1000M auto-sensing. ● The AC6005-8-PWR supports PoE power supply on six ports.

No.	Description
3	Two pairs of combo ports. When used as electrical ports: ● They support 10M/100M/1000M auto-sensing. ● The AC6005-8-PWR supports PoE power supply on two ports.
4	Console port.
5	USB port.
6	Ground point.
7	AC power jack.

Indicator Description

The AC6005-8-PWR has the same indicators on the front panel as the AC6005-8 except that the AC6005-8-PWR has a PoE indicator. The following uses the appearance of the AC6005-8-PWR as an example. **Figure 1-20** shows the indicators on the AC6005-8-PWR front panel.

Figure 1-20 Indicators on the AC6005-8-PWR front panel

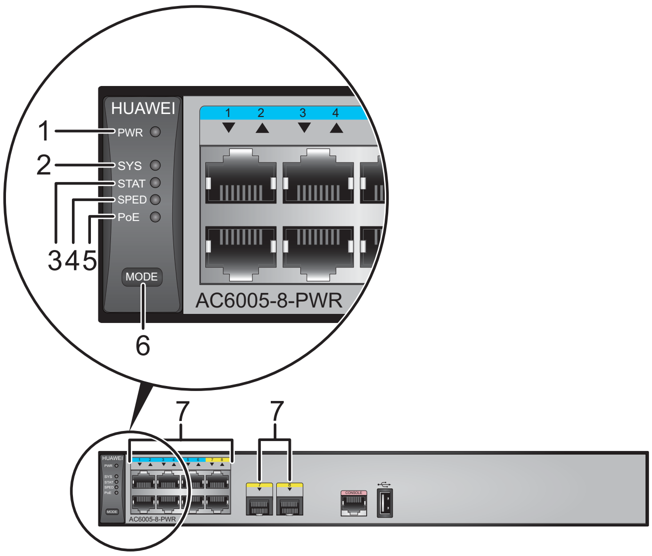


Table 1-8 describes indicators on the AC6005 front panel.

NOTE

Indicator colors may vary slightly at different temperature.

Table 1-8 Description of indicators on the AC6005 front panel

No.	Indicator/ Button	Status	Description
1	PWR: power indicator	Off	The AC6005-8-PWR is powered off.
		Steady green	The power supply is working properly.
		Yellow **NOTE** Only the PWR indicator on the AC6005-8-PWR displays yellow.	The PoE power supply is faulty.
2	SYS: system status indicator	Off	The system is not running.
		Green	• Fast blinking: The system is starting. • Slow blinking: The system is running properly.
		Steady red	The system cannot start normally, or an overheat alarm or fan alarm is generated.
3	STAT: state mode indicator	Off	The state mode is not selected.
		Steady green	The service port indicator works in the default mode (STAT). In this mode, the indicator indicates the port status.
4	SPED: speed mode indicator	Off	The speed mode is not selected.
		Steady green	The service port indicator indicates the port speed. After 45 seconds, the service port indicator automatically restores to the default mode (STAT).
5	PoE: PoE mode indicator **NOTE** Only the AC6005-8-PWR has this indicator.	Off	The PoE mode is not selected.
		Steady green	The service port indicator indicates the PoE status of each port. After 45 seconds, the service port indicator automatically restores to the default mode (STAT).

No.	Indicator/ Button	Status	Description
6	MODE: mode switch button	–	AC6005-8-PWR: ● When you press the button once, the SPED indicator turns green and the service port indicators indicate the speed of the ports. ● When you press the button for a second time, the PoE indicator turns green and the service port indicators indicate the PoE status of the ports. ● When you press the button for a third time, the STAT indicator turns green. AC6005-8: ● When you press the button once, the SPED indicator turns green and the service port indicators indicate the speed of the ports. ● When you press the button for a second time, the STAT indicator turns green. If you do not press the button within 45 seconds, the indicators restore to the default mode. That is, the STAT indicator turns green, and the SPED and PoE indicators are off.

No.	Indicator/ Button	Status	Description
7	Service port indicator • GE electrical ports: The first indicator indicates the status of the bottom left port. The indicators correspond to the ports from bottom to top and from left to right. • GE optical ports: Each optical port has a corresponding indicator above it.	Meanings of service port indicators vary in different modes. For details, see **Table 1-9**.	

Table 1-9 Description of service port indicators in different modes

Mode	Status	Description
STAT	Off	No link has been established to the port or the port has been shut down.
	Green	• Steady on: A link has been established to the port. • Blinking: The port is sending or receiving data.
SPED	Off	No link has been established to the port or the port has been shut down.
	Green	• Steady on: The port is working at 10 or 100 Mbit/s. • Blinking: The port is working at 1000 Mbit/s.
PoE **NOTE** Only the AC6005-8-PWR has this mode.	Off	The port is not providing PoE power.
	Steady green	Steady on: The port is providing PoE power.
	Yellow	• Steady on: The PoE function is disabled on the port. • Blinking: The port stops providing PoE power because a fault occurs, for example, an incompatible powered device (PD) is connected to the port.

Mode	Status	Description
	Blinking green and yellow	The port cannot provide PoE power due to any of the following reasons: ● The power of the PD exceeds the power supply capability of the port or exceeds the threshold. ● The total power consumption of PDs has reached the maximum power of the device. ● The PoE power function is not enabled on the interface in manual power-management mode.

Physical Specifications

Table 1-10 Physical specifications

Item		Description
Dimensions and weight	Dimensions (H x W x D)	43.6 mm x 320 mm x 233.6 mm
	Maximum weight (standard configuration)	● AC6005-8-PWR: 2.30 kg ● AC6005-8: 2.05 kg
Power specifications	Maximum power consumption	● AC6005-8-PWR: 163.6 W (device power consumption: 39.6 W, PoE: 124 W) ● AC6005-8: 25.6 W
	AC input voltage	● Rated voltage range: 100 V AC to 240 V AC, 50/60 Hz ● Maximum voltage range: 90 V AC to 264 V AC, 47 Hz to 63 Hz
Environment specifications	Operating temperature and altitude	● -60 m to +1800 m: -5°C to +50°C ● 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.

Item		Description
	Relative humidity	5% RH to 95% RH, noncondensing
	Operating altitude	-60 m to +5000 m

1.2.4 Performance Specifications (AC6005)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.3 AC6605 Product Description

1.3.1 Product Characteristics (AC6605)

Huawei AC6605-26-PWR (AC6605 for short) is an access controller (AC) applicable to MANs and enterprise networks for wireless access. The AC6605 has a large capacity and high performance. It is highly reliable, easy to install and maintain, and features such advantages as flexible networking and energy conservation.

NOTICE

The AC6605 is a class A product. The AC6605 that is operating may cause radio interference. Customers need to take prevention measures.

The AC6605 has the following features:

- Has the access and aggregation functions.
- Provides PoE power (15.4 W) or PoE+ power (30 W) on 24 interfaces, and can directly connect to APs.
- Has various user policy management and authority control capabilities.
- Supports redundancy backup and hot swapping of AC or DC power supplies, ensuring long-term operation.
- Can be maintained using the eSight, web system, or command line interface.

Abundant Port Types

The AC6605 provides various ports to meet the requirements of all scenarios. **Table 1-11** lists the ports on the AC6605.

Table 1-11 AC6605 port description

Port Type	Quantity	Description
Uplink port	Two 10GE optical ports	The 10GE ports use Small Form-Factor Pluggable (SFP+) optical transceivers.
Service port	24 GE ports	Among the 24 electrical ports, the last four are used with four optical ports as combo interfaces.
Maintenance port	One RJ45 maintenance serial port	It is an RS-232 port.
	One RJ45 maintenance Ethernet port	It is a 100BASE-TX port.

Large Capacity, High Performance, Integrated Design

The AC provides a large capacity and high performance, and adopts an integrated design to allow for flexible deployment.

- Integrated design: An AC can function as an access or aggregation device to provide wired access services and function as a management device to control STA access.
- Large switching capacity: The AC has twenty-four GE interfaces and two 10GE interfaces. It provides 128 Gbit/s switching capacity and 10 Gbit/s forwarding performance.
- PoE: The AC supports the PoE function and can provide the maximum power on 24 ports. This PoE capability can provide power to APs and other powered devices (PDs) connected to the AC.

Carrier-Class Reliability

The AC provides the following reliability designs, ensuring long-term operation.

- The AC supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- The AC supports redundant AC/DC power supplies.
- The AC supports hot swappable power supplies.
- The AC supports 1+1 hot backup.

Easy-to-Install and Easy-to-Maintain

The AC is easy to install and maintain, simplifying network deployment.

- The AC6605 dimensions (H x W x D) are 43.6 mm x 442 mm x 420 mm (1.72 in. x 17.40 in. x 16.54 in.), and the AC6605 can be installed in a standard IEC cabinet (19 inches).

- Power supplies of the AC are hot swappable, facilitating maintenance.
- The built-in web system of the AC allows local GUI-based management.
- The AC can be managed by the eSight that provides various northbound interfaces.
- The AC supports the intra-board temperature probe, which monitors the operating environment of the AC in real time.

Energy Conservation

The AC adopts the following measures to save energy:

- Low noise fans that can adjust the speed automatically are used, thus reducing noises in the system and power consumption of fans.
- The AC switches to the power saving mode when no connected device is detected on a service interface, that is, the interface is idle.
- It uses highly-integrated and energy-saving chips produced through advanced processing techniques. With the help of the intelligent device management system, the chips not only improve system performance but also greatly reduce power consumption of the entire system.

1.3.2 Application Scenarios (AC6605)

1.3.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

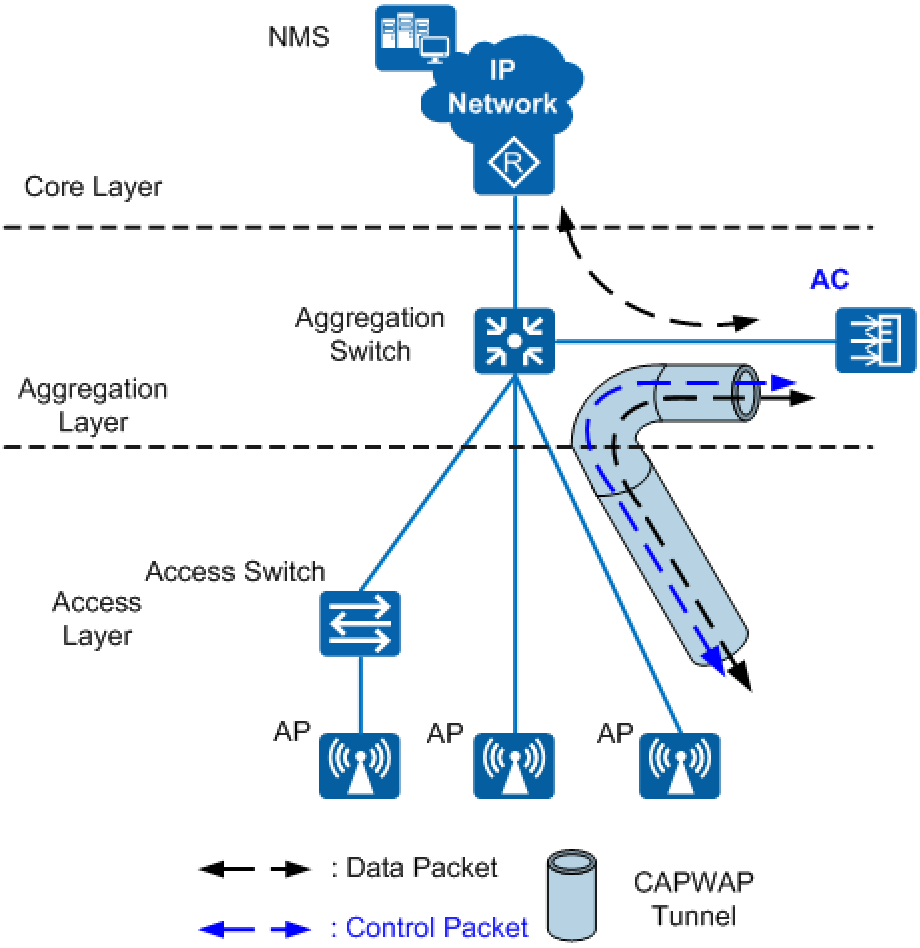
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-21**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-21 Bypass networking in tunnel forwarding mode

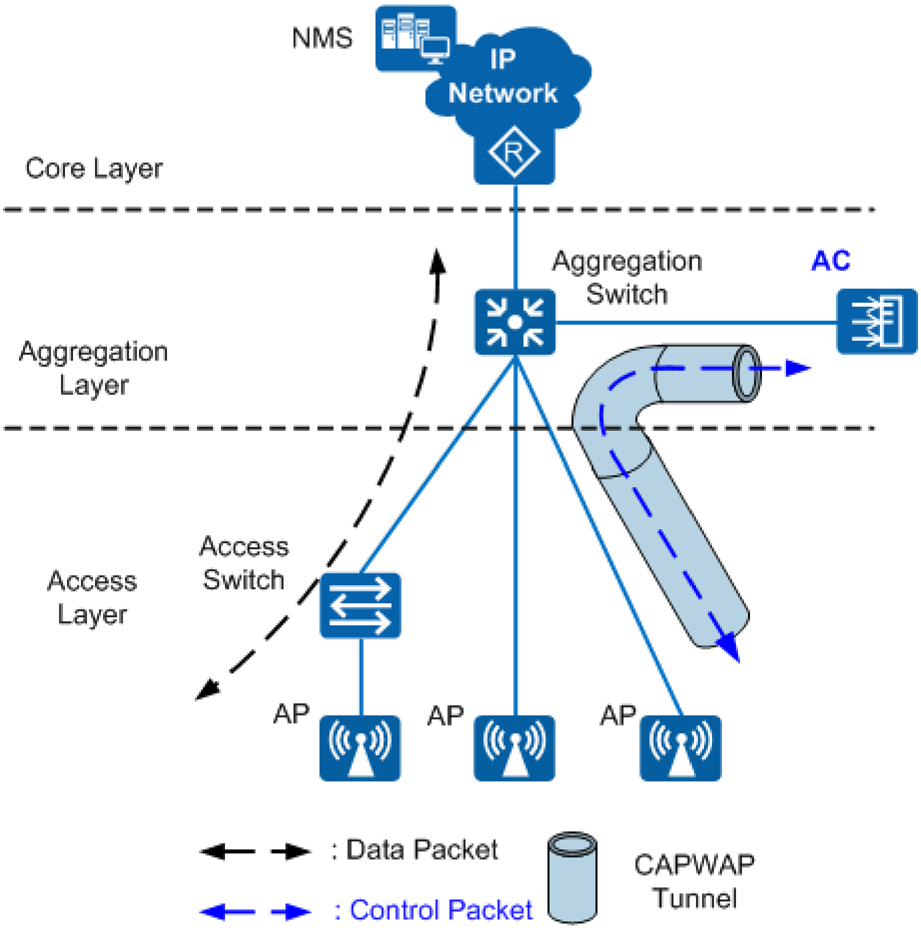


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-22 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.3.2.2 Inline Networking

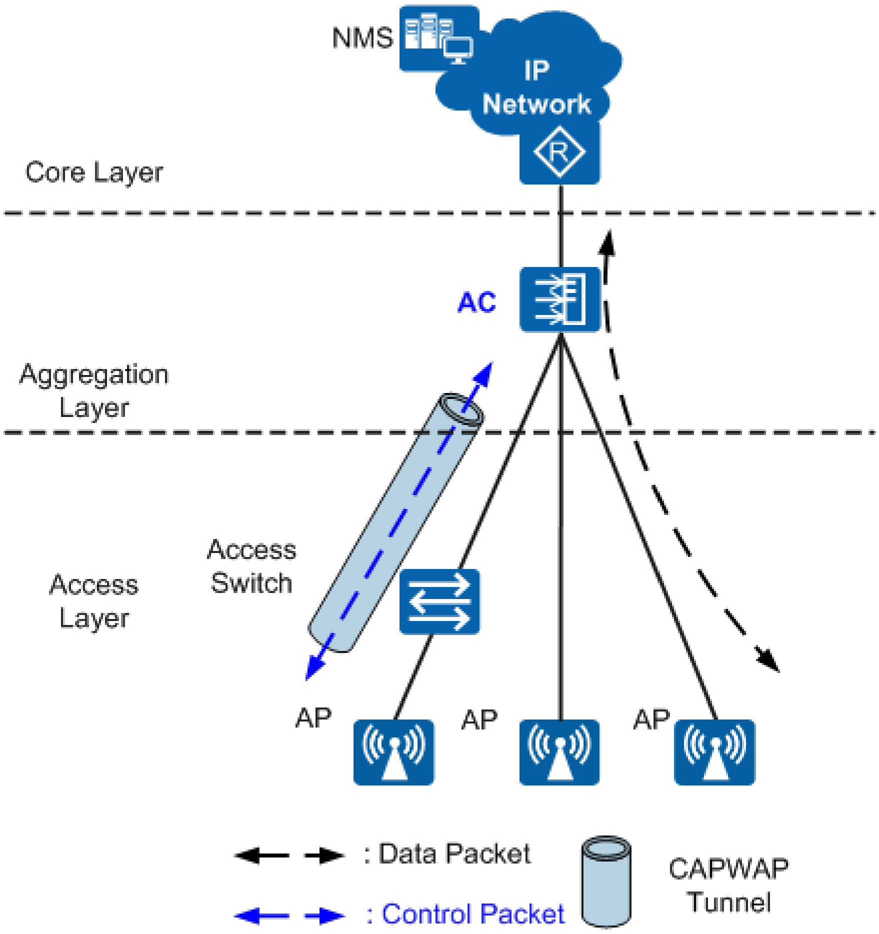
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-23 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-23**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

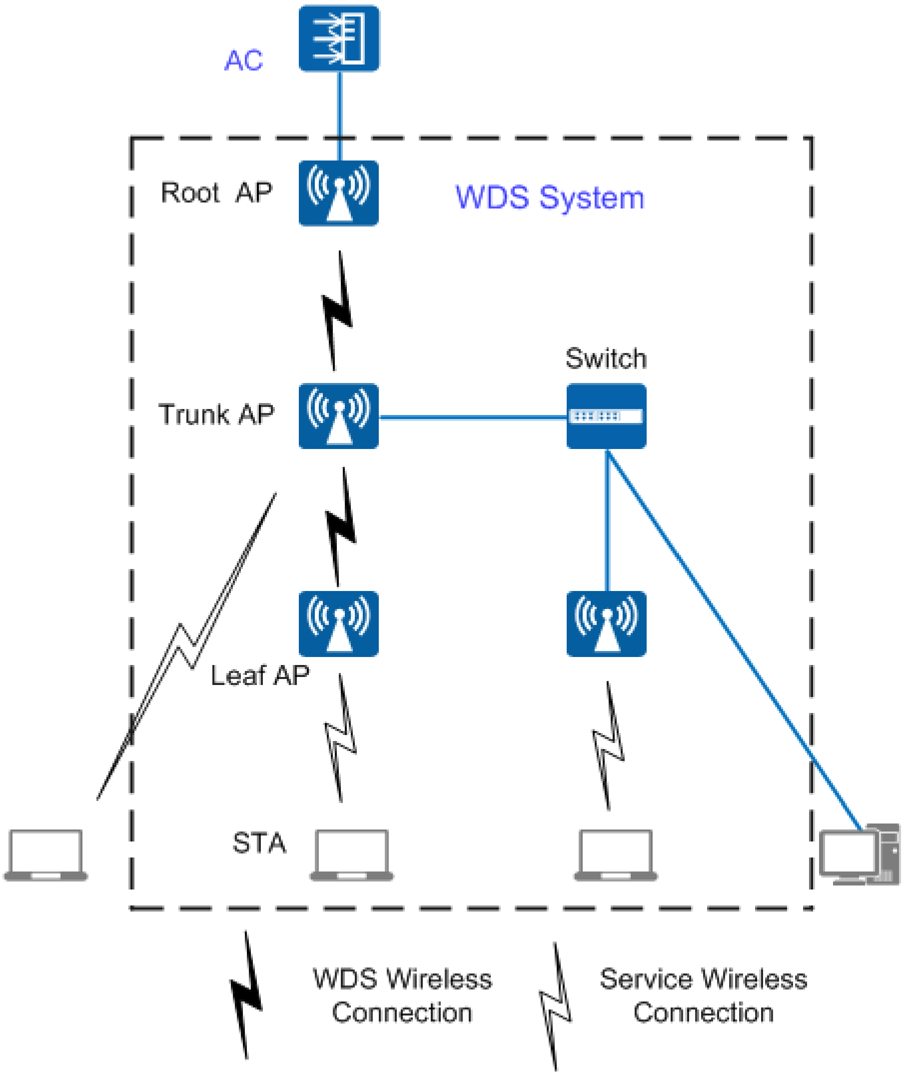
1.3.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-24 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

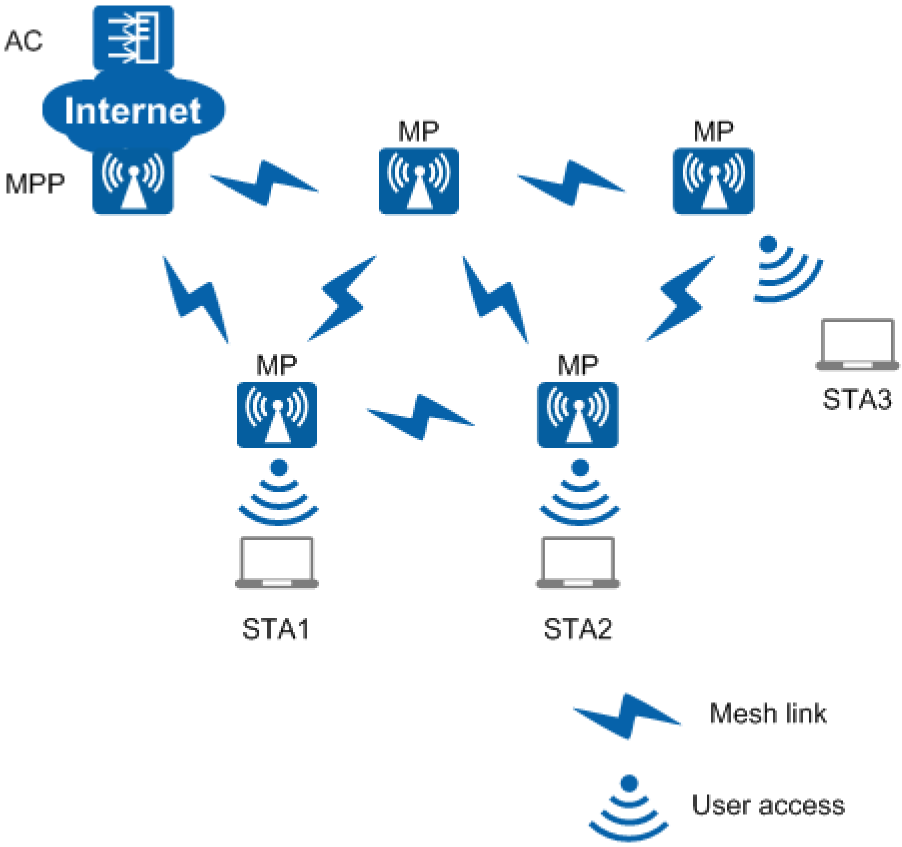
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-25 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.

- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

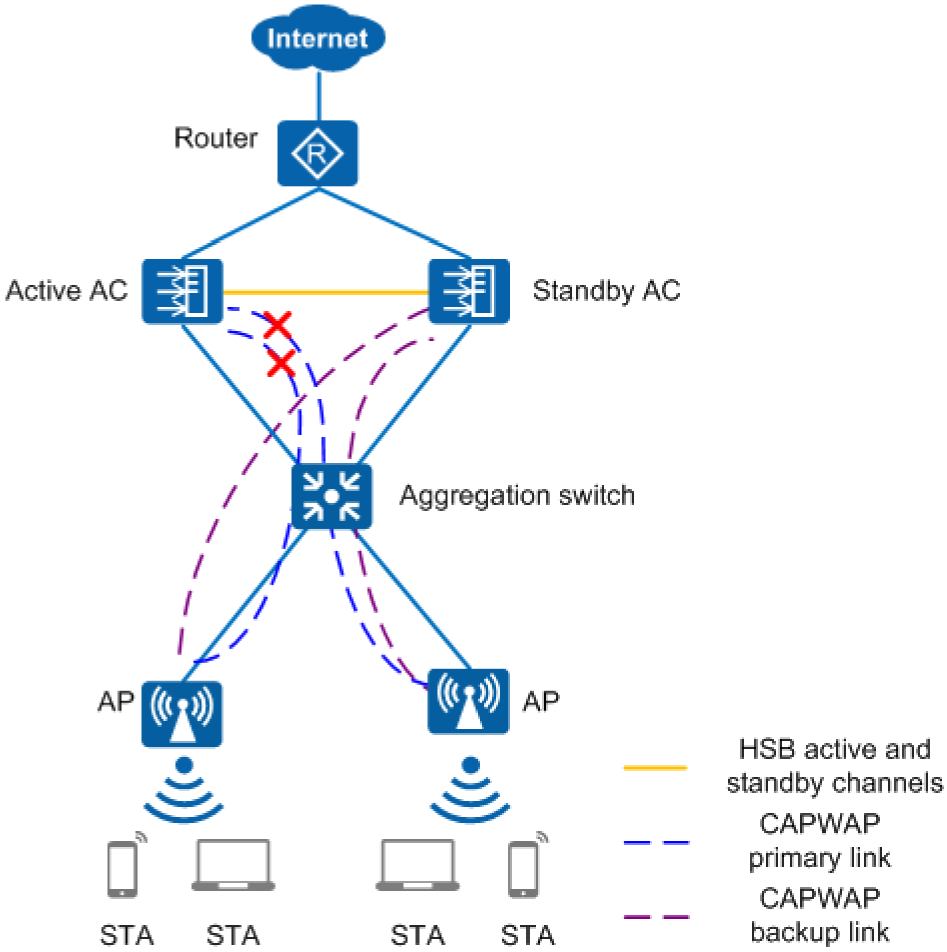
1.3.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

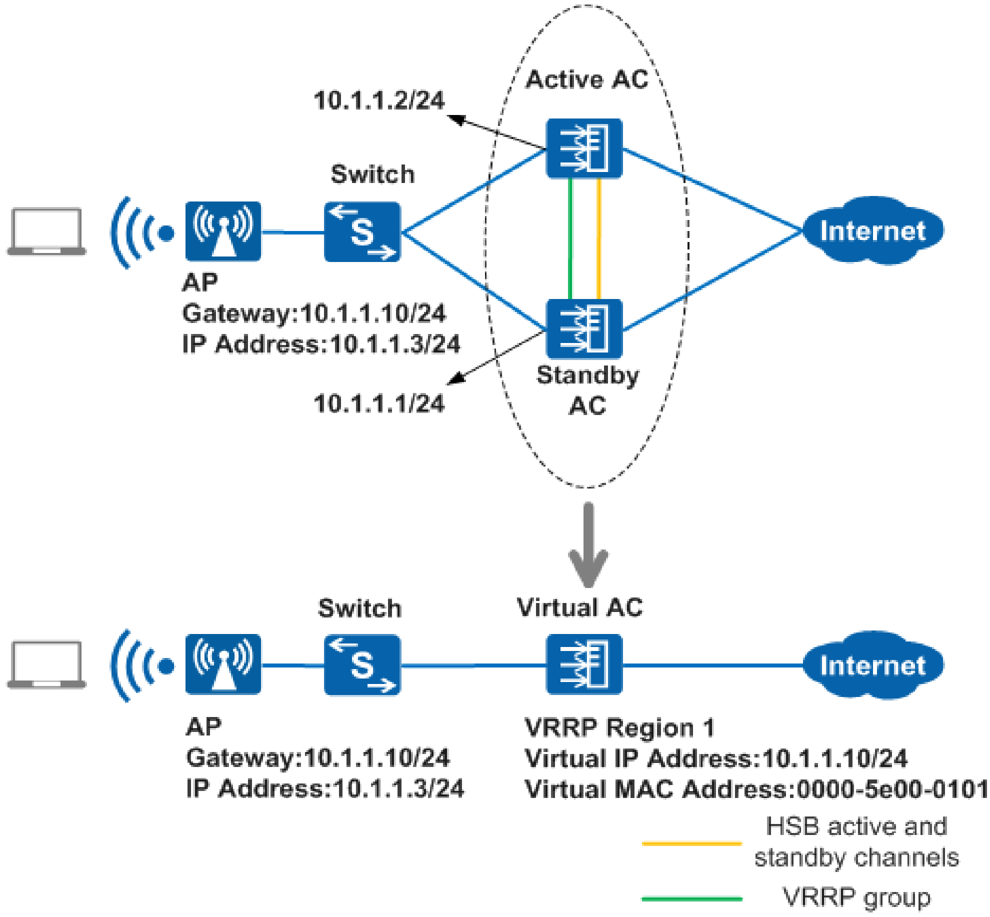
- HSB + dual-link backup: As shown in **Figure 1-26**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-26 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-27**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-27 HSB + VRRP networking



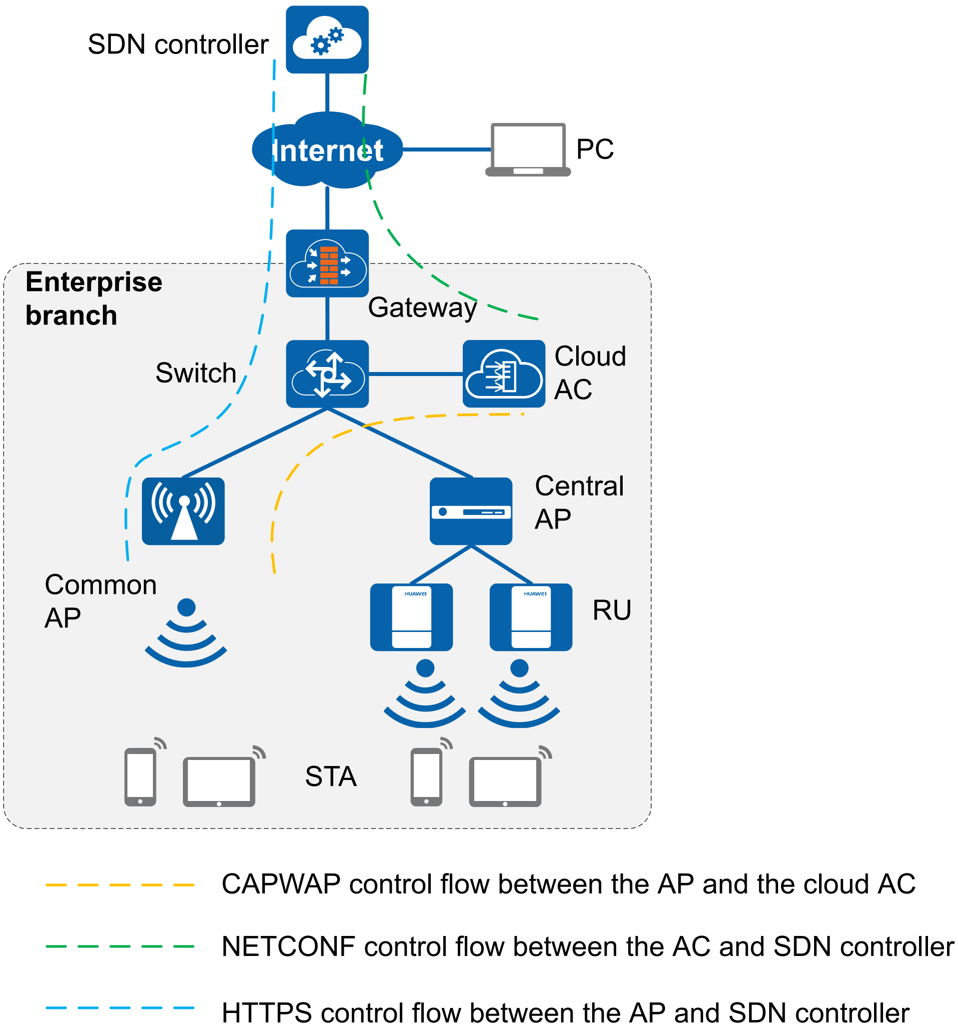
1.3.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-28**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-28 Typical cloud AC networking diagram



1.3.3 Product Structure (AC6605)

Appearance and Structure

Currently, the AC6605 series has only one model AC6605-26-PWR (AC6605 for short).

Figure 1-29 and **Figure 1-30** show the appearance of the AC6605.

Figure 1-29 Appearance of the AC6605 (front view)

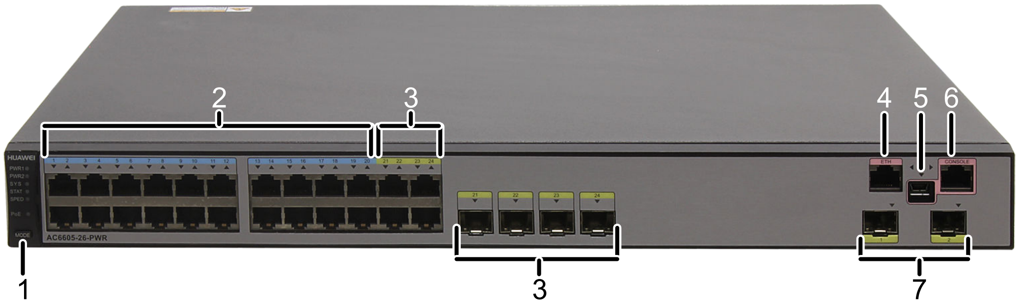
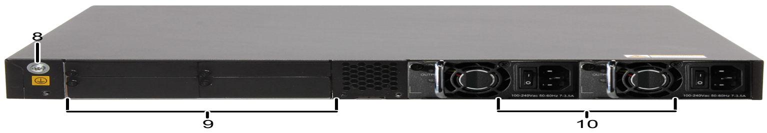


Figure 1-30 Appearance of the AC6605 (rear view)



No.	Description
1	MODE button: switches the working mode of service port indicators.
2	Twenty 10/100/1000BASE-T Ethernet electrical ports. ● Support 10M/100M/1000M auto-sensing. ● Support PoE power supply on 20 ports.
3	Four pairs of combo ports. When used as electrical ports: ● Support 10M/100M/1000M auto-sensing. ● Support PoE power supply on four ports.
4	ETH management port.
5	Mini USB port: Reserved.
6	Console port.
7	Two 10GE SFP+ uplink optical ports.
8	Ground point.
9	Filler panel.
10	Two slots for the power modules. The AC6605 supports three types of power modules: ● 150 W DC power module ● 150 W AC power module ● 500 W AC PoE power module

Indicator Description

Figure 1-31 shows the indicators on the AC6605 front panel.

Figure 1-31 Indicators on the AC6605 front panel

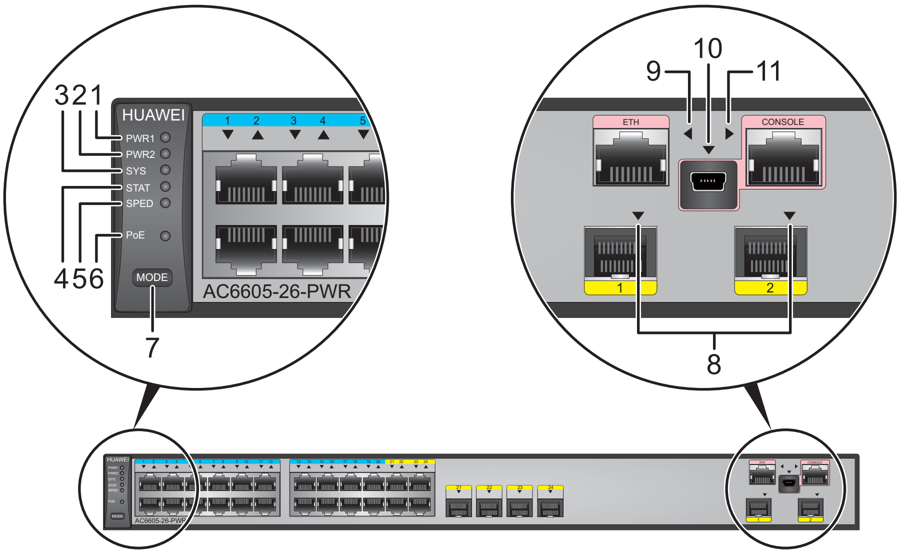


Table 1-12 describes indicators on the AC6605 front panel.

Table 1-12 Description of indicators on the AC6605 front panel

Number	Indicator	Color	Description
1	PWR1: power supply indicator	-	Off: The PWR1 slot has no power module installed, or the power module is faulty when a single power module is used.
		Green	Steady on: The power module is working properly.
		Yellow	Steady on: Any of the following conditions may exist: ● Dual power modules are installed, but not switched on. ● Dual power modules are installed, but receive no input power. ● The power modules are faulty.
2	PWR2: power supply indicator	-	Off: The PWR2 slot has no power module installed, or the power module is faulty when a single power module is used.

Number	Indicator	Color	Description
		Green	Steady on: The power module is working properly.
		Yellow	Steady on: Any of the following conditions may exist: ● Dual power modules are installed, but not switched on. ● Dual power modules are installed, but receive no input power. ● The power modules are faulty.
3	SYS: system status indicator	-	Off: The system is not running.
		Green	● Fast blinking: The system is starting. ● Slow blinking: The system is running properly.
		Yellow	● Steady on: The temperature or functions of the device become abnormal. ● Blinking: The device has entered the dormancy mode.
		Red	Steady on: After registering, the system does not operate properly, or a fan or temperature alarm has been generated.
4	STAT: status indicator	Green	● Off: The status mode is not selected. ● Steady on: The service port indicators are in the status mode (default).
5	SPED: speed indicator	Green	● Off: The speed mode is not selected. ● Steady on: The service port indicators show the port speed. After 45 seconds, the service port indicators automatically restore to the status mode.

Number	Indicator	Color	Description
6	PoE: PoE indicator	Green	• Off: The PoE mode is not selected. • Steady on: The service port indicators show the PoE status. After 45 seconds, the service port indicators automatically restore to the status mode.
7	MODE: mode switch button	-	• When you press this button once, the service port indicators change to speed mode and show the speed of service ports. • When you press this button a third time, the service port indicators change to PoE mode and show the PoE status of ports. • When you press this button a fourth time, the STAT indicator turns green and the service port indicators restore to the default mode. If you do not press the MODE button within 45 seconds, the service port indicators restore to the default mode. In this case, the STAT indicator is steady green, the SPED and PoE indicators are off.
8	Service port indicator • GE electrical ports: The ports are numbered from bottom to top and left to right, starting with 1. • GE/10GE optical ports: Each port has an indicator above it.	Meanings of service port indicators vary in different modes. For details, see **Table 1-13**.	

Number	Indicator	Color	Description
9	ETH indicator	Green	• Off: No link is established on the port. • Steady on: The port is connected. • Blinking: The port is sending or receiving data.
10	Mini USB indicator	Green	Mini USB port: Reserved.
11	Console indicator	Green	• Off: The console port is not active. • Steady on (default): The console port is active.

Table 1-13 Description of service port indicators in different modes

Display Mode	Color	Description
Status	Green	• Off: The port is not connected or has been shut down. • Steady on: A link has been established to the port. • Blinking: The port is sending or receiving data.
Speed	Green	• Off: The port is not connected or has been shut down. • Steady on: 10M/100M/1000M port: The port is operating at 10/100 Mbit/s. 1000M/10GE port: The port is operating at 1000 Mbit/s. • Blinking: 10M/100M/1000M port: The port is operating at 1000 Mbit/s. 1000M/10GE port: The port is operating at 10 Gbit/s.
PoE	-	Off: The port does not provide PoE power.
	Green	Steady on: The port is providing PoE power.

Display Mode	Color	Description
	Yellow	• Steady on: The PoE function is disabled on the port. • Blinking: A PoE fault has occurred. For example, an incompatible PD is connected to the port.
	Green and yellow	Blinking green and yellow alternately: • The power of the PD exceeds the maximum power or power threshold of the port. • The total power consumption of PDs has reached the maximum power of the device. • The manual power management mode is used and the port is not enabled to provide power to the PD.

Physical Specifications

Table 1-14 Physical specifications

Item		Description
Dimensions and weight	Dimensions (H x W x D)	43.6 mm x 442 mm x 420 mm
	Weight	• Net weight: 5.48 kg • Fully configured with 150 W power modules: 7.16 kg • Fully configured with 500 W power modules: 7.48 kg
Power specifications	Maximum power consumption	85 W
	DC input voltage	• Rated voltage range: -48 V DC to -60 V DC • Maximum voltage range: -36 V DC to -72 V DC
	AC input voltage	• Rated voltage range: 100 V AC to 240 V AC, 50/60 Hz • Maximum voltage range: 90 V AC to 264 V AC, 47 Hz to 63 Hz

Item		Description
Environment specifications	Operating temperature and altitude	• -60 m to +1800 m: -5°C to +50°C • 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Operating altitude of the power modules	• 150 W DC power module: 0 m to 3000 m • 150 W AC power module: 0 m to 5000 m • 500 W AC power module: 0 m to 5000 m
	Relative humidity	5% RH to 95% RH, noncondensing

1.3.4 Performance Specifications (AC6605)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.4 AC6507S, AC6508, and AirEngine 9700S-S Product Description

1.4.1 Product Characteristics (AC6507S, AC6508, and AirEngine 9700S-S)

The AC6507S, AC6508, and AirEngine 9700S-S are small-capacity box wireless access controllers (ACs) for small and medium enterprises. They integrate the GE Ethernet switch function, achieving integrated access for wired and wireless users. The WLAN AC features high scalability and offers users considerable flexibility in configuring the number of managed APs. When used with Huawei's full series 802.11ax, 802.11ac and 802.11n APs, the AC6507S, AC6508, and AirEngine 9700S-S can be used to construct small and medium campus networks, enterprise office networks, wireless Metropolitan Area Networks (MANs), and hotspot coverage networks.

Large-capacity and high-performance design

- The AC6507S can manage up to 128 APs, provides 2 x 10GE optical interfaces and 10 x GE electrical interfaces, and supports up to 4 Gbit/s forwarding performance.
- The AC6508 can manage up to 256 APs, provides 2 x 10GE optical interfaces and 10 x GE electrical interfaces, and supports up to 6 Gbit/s forwarding performance.

- The AirEngine 9700S-S can manage up to 64 APs, provides 2 x 10GE optical interfaces and 10 x GE electrical interfaces, and supports up to 4 Gbit/s forwarding performance.

SmartRadio for air interface optimization

- Load balancing during smart roaming: The load balancing algorithm works during smart roaming, enabling load balancing detection between APs on the network after STA roaming to adjust the STA load on each AP, improving network stability.
- Intelligent DFA technology: The dynamic frequency assignment (DFA) algorithm is used to automatically detect adjacent-channel and co-channel interference, and identify any redundant 2.4 GHz radios. Through automatic inter-AP negotiation, a redundant radio is automatically switched to another mode (dual-5G AP models support 2.4G-to-5G switchover) or is disabled to reduce 2.4 GHz co-channel interference and increase the system capacity.
- Intelligent conflict optimization technology: Dynamic enhanced distributed channel access (EDCA) and airtime scheduling algorithms are used to schedule the channel occupation time and service priority of each user. This ensures that each user is assigned a relatively equal amount of time for using channel resources and user services are scheduled in an orderly manner, improving service processing efficiency and user experience.

Various roles

- The WLAN AC has a built-in Portal/AAA server and can provide Portal/802.1X authentication for users, protecting customer investment.

Flexible networking

- The WLAN AC can be deployed in inline, bypass, bridge, and mesh network modes, and supports both centralized and local forwarding.
- The WLAN AC and APs can be connected across a Layer 2 or Layer 3 network. In addition, NAT can be deployed when APs are deployed on the private network and the WLAN AC is deployed on the public network.
- The WLAN AC is compatible with Huawei full-series 802.11n, 802.11ac, and 802.11ax APs and supports the hybrid networking of 802.11n, 802.11ac, and 802.11ax APs for simple scalability.

Built-in application identification server

- Supports Layer 4 to Layer 7 application identification and can identify over 6000 applications, including common office applications and P2P download applications, such as Lync, FaceTime, YouTube, and Facebook.
- Supports application-based policy control technologies, including traffic blocking, traffic limit, and priority adjustment policies.
- Supports automatic application expansion in the application signature database.

Comprehensive reliability design

- Supports AC 1+1 HSB, and N+1 backup, ensuring uninterrupted services.

- Supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- Supports WAN authentication escape between APs and WLAN ACs. In local forwarding mode, this feature keeps existing STAs online and allows for the access of new STAs when APs are disconnected from WLAN ACs, ensuring service continuity.

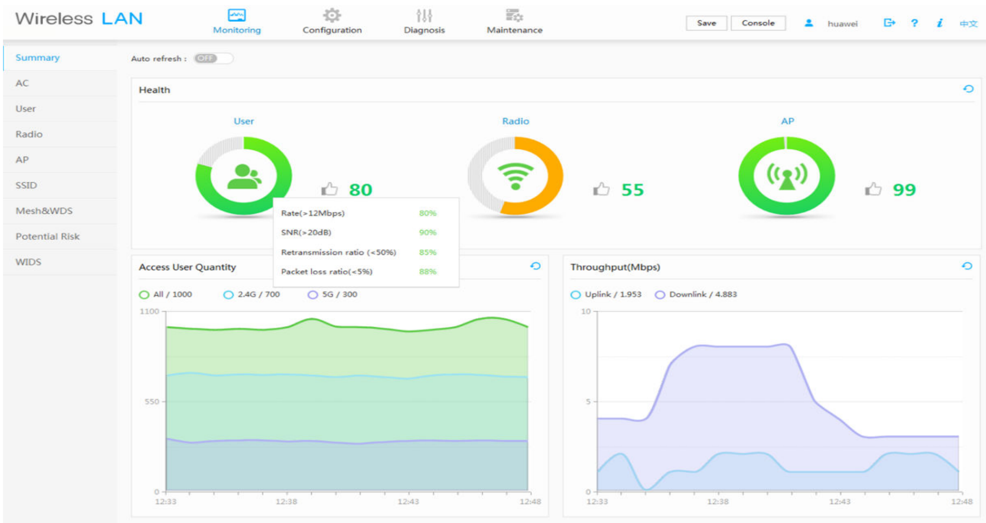
Built-in visualized network management platform

- The AC6507S, AC6508, and AirEngine 9700S-S have a built-in web system that is easy to configure and provides comprehensive monitoring and intelligent diagnosis.

Health-centric one-page monitoring, visualized KPIs

- One page integrates the summary and real-time statistics. KPIs are displayed in graphs, including user, radio, and AP performance, enabling users to extract useful information from the massive amount of data, while also being instantly aware of the device and network status.

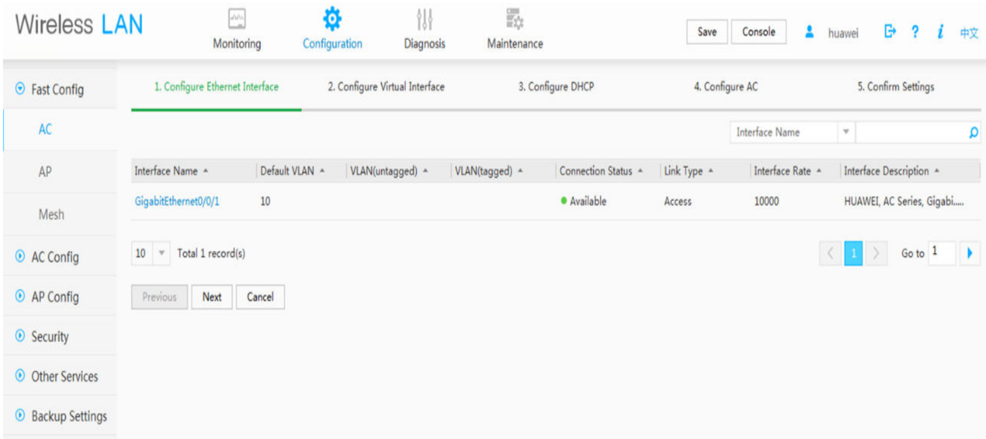
Figure 1-32 Monitoring interface



Profile-based configuration by AP group simplifies configuration and improves efficiency

- The web system supports AP group-centric configuration and automatically selects the common parameters for users, simplifying configuration.

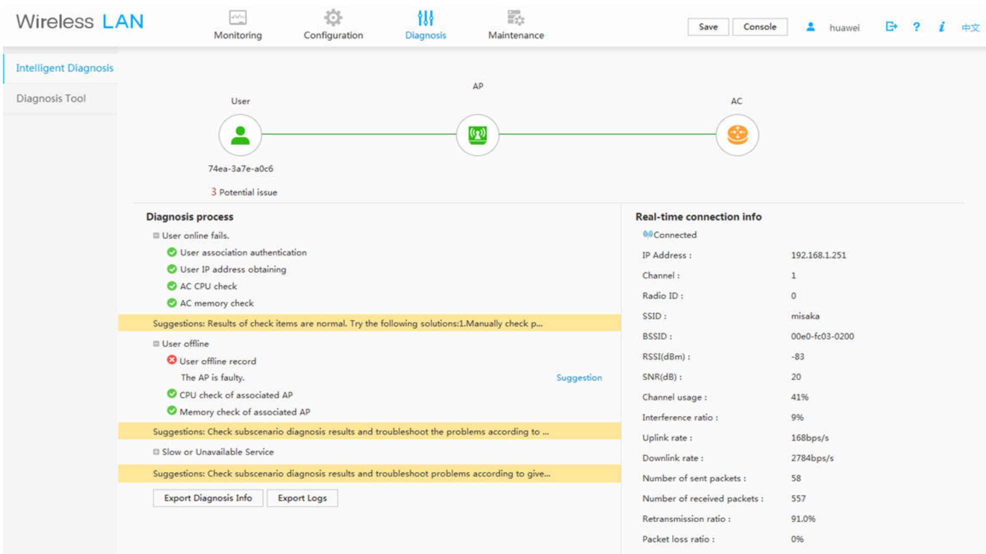
Figure 1-33 Configuration interface



One-click diagnosis solves 80% of common network problems.

- The web system supports real-time and periodic one-click intelligent diagnosis from the dimensions of users, APs, and WLAN ACs, and provides feasible suggestions for troubleshooting.

Figure 1-34 Intelligent diagnosis



1.4.2 Application Scenarios (AC6507S, AC6508, and AirEngine 9700S-S)

1.4.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

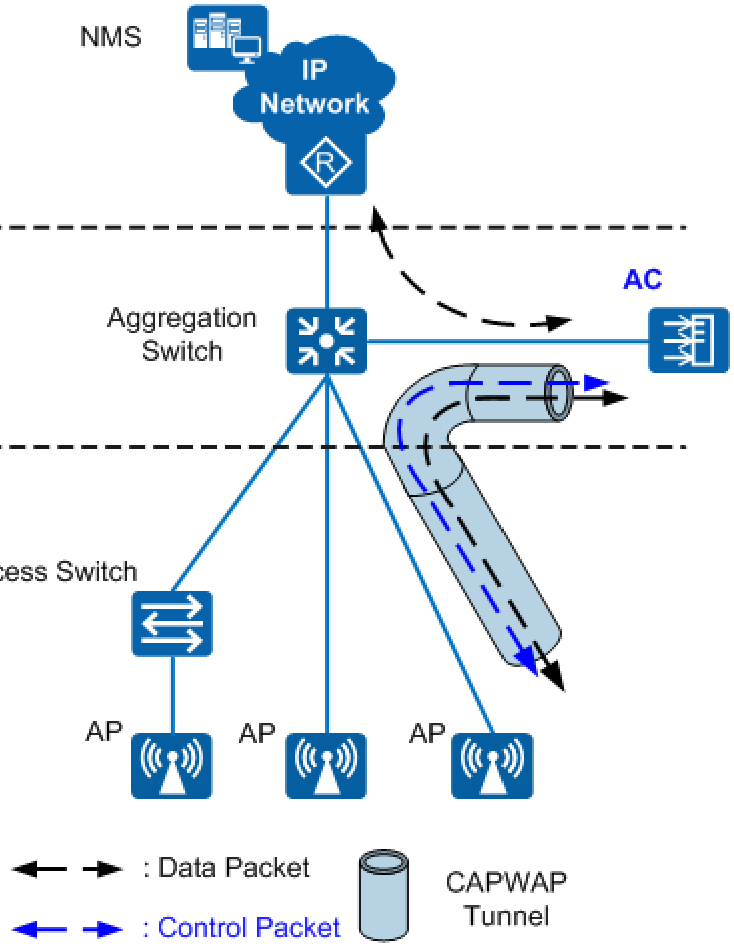
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-35**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-35 Bypass networking in tunnel forwarding mode

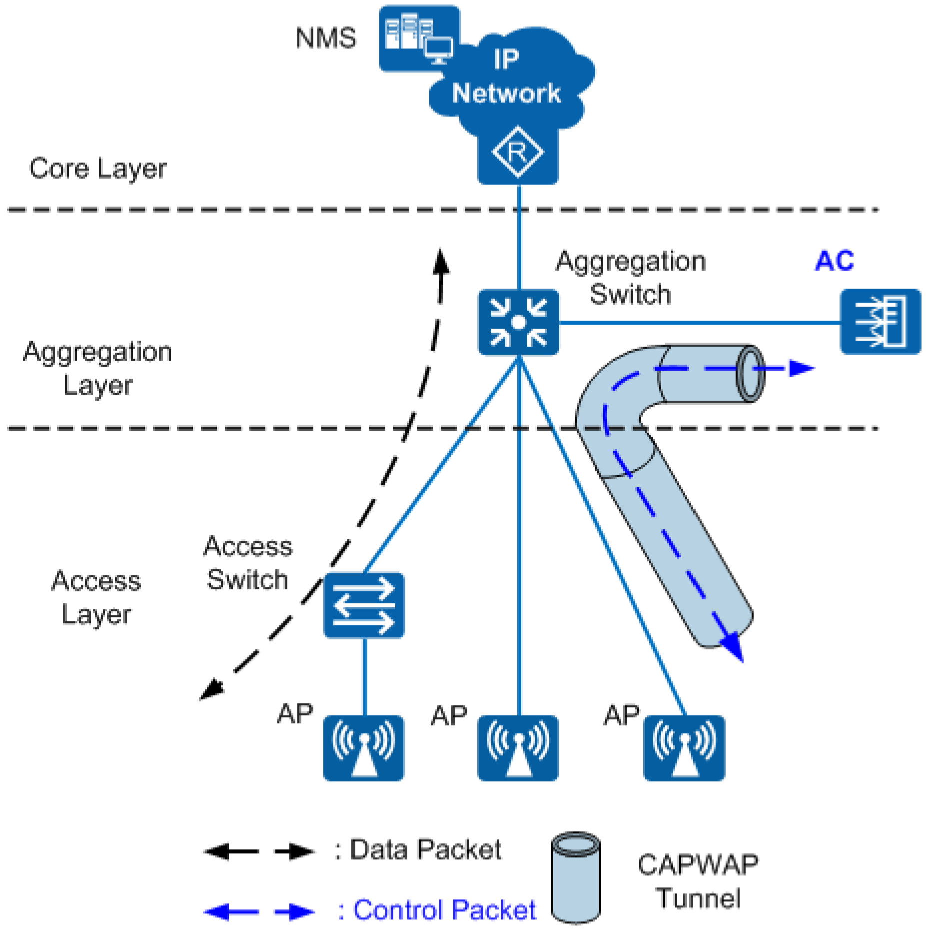


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-36 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.4.2.2 Inline Networking

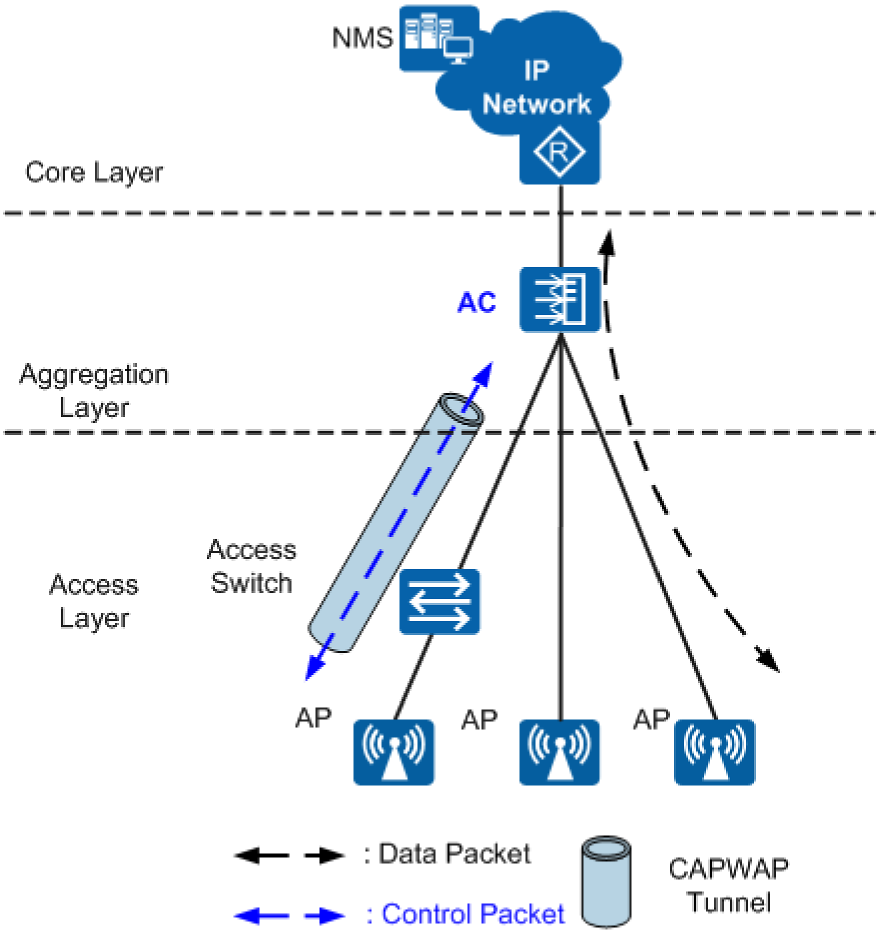
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-37 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-37**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

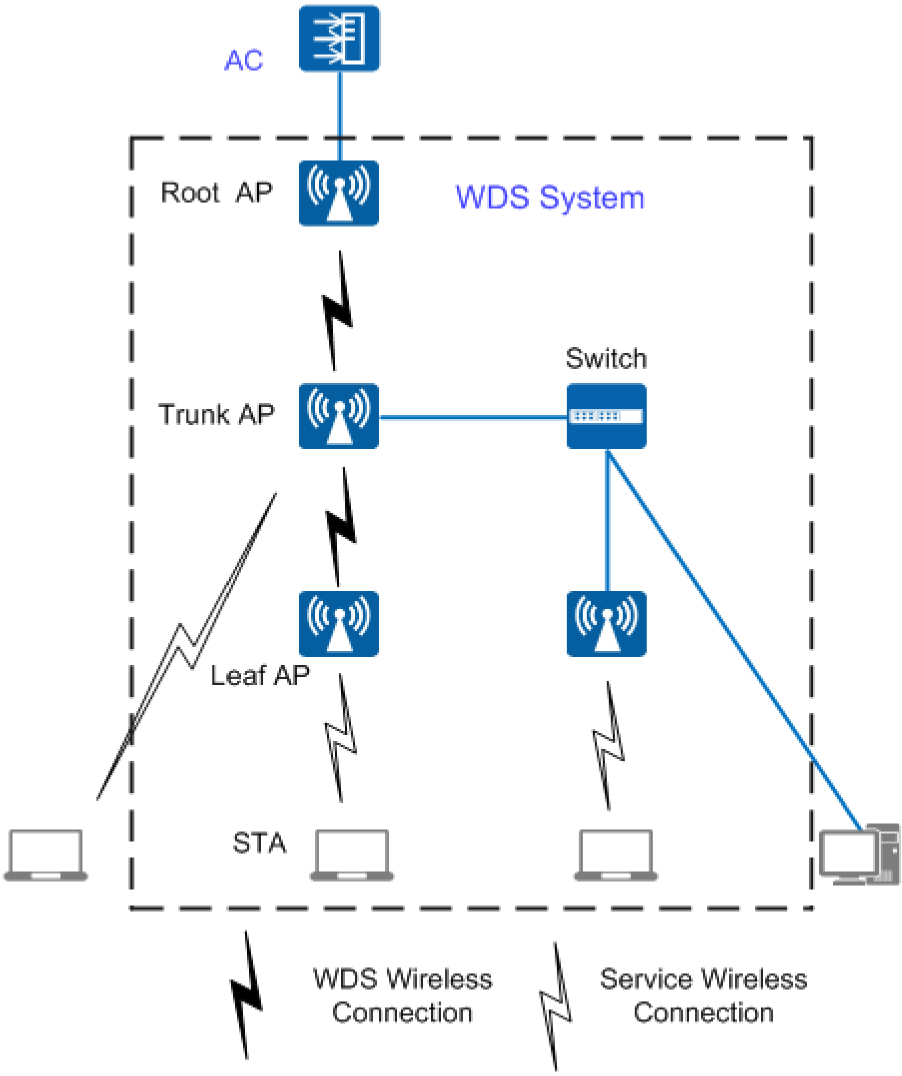
1.4.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-38 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

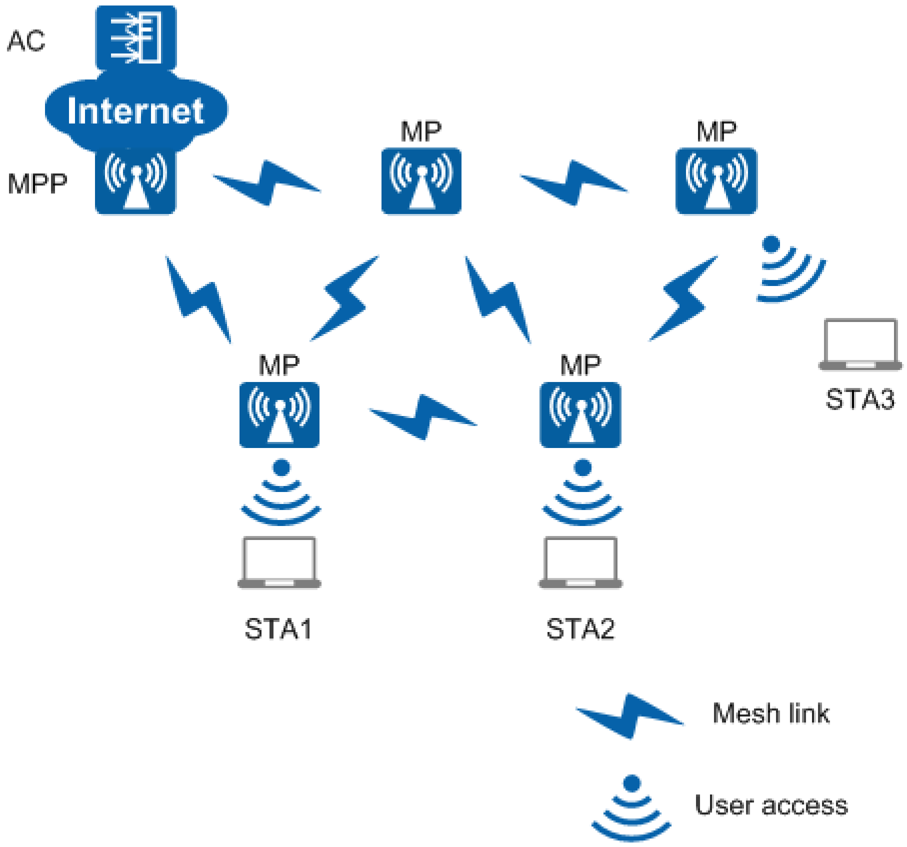
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-39 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

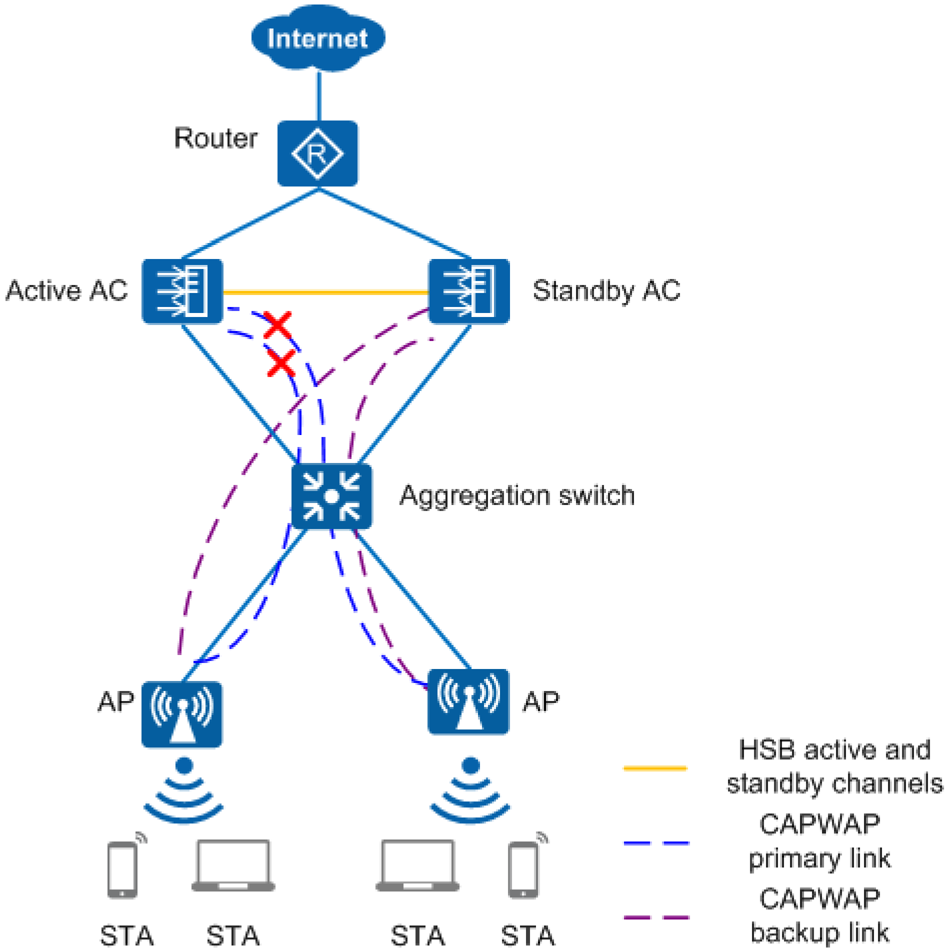
1.4.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

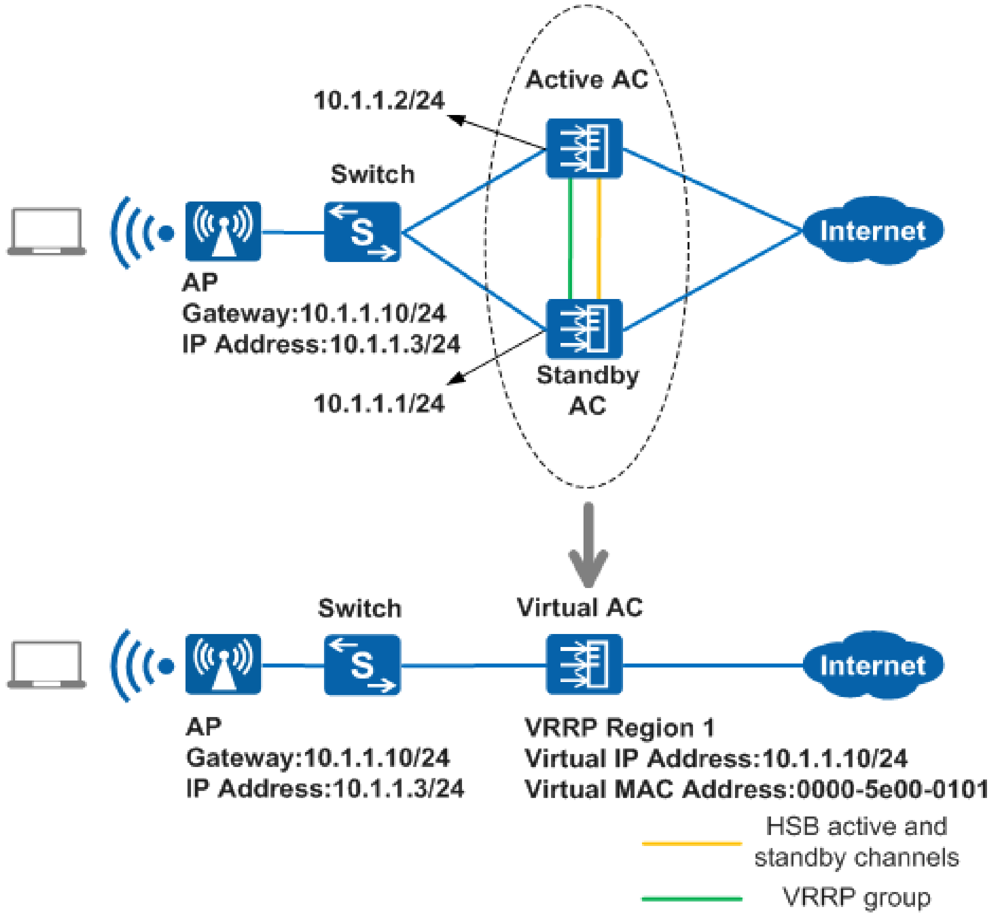
- HSB + dual-link backup: As shown in **Figure 1-40**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-40 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-41**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-41 HSB + VRRP networking



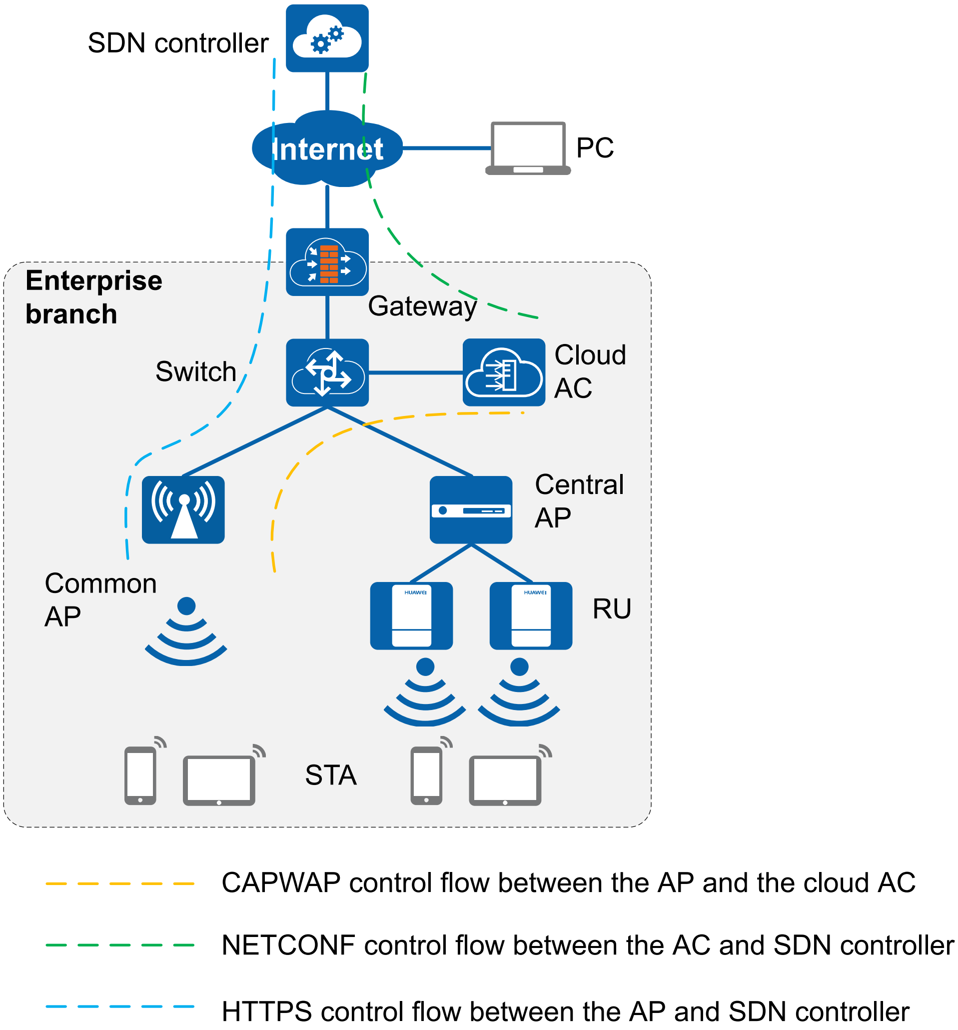
1.4.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-42**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-42 Typical cloud AC networking diagram



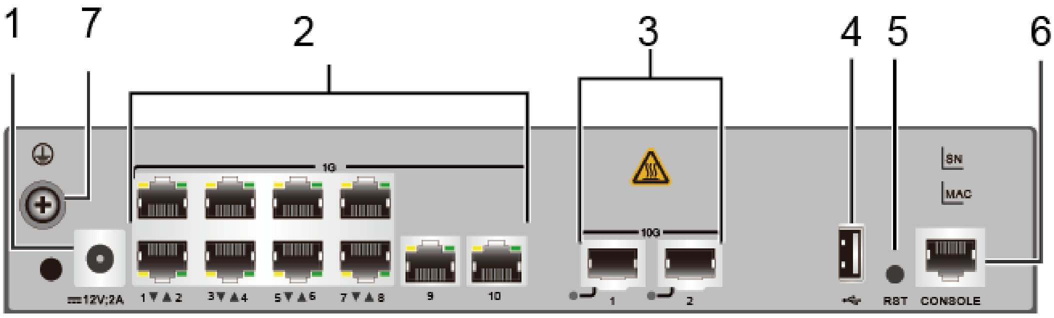
1.4.3 Hardware Information (AC6507S, AC6508, and AirEngine 9700S-S)

Appearance and Structure

Figure 1-43 and **Figure 1-44** show the appearance of the AC6508/AC6507S/AirEngine 9700S-S.

Figure 1-43 Appearance of the AC (front view)

Figure 1-44 Appearance of the AC (rear view)



No.	Description
1	DC input port.
2	Ten 10/100/1000BASE-T Ethernet electrical ports.
3	Two 10GE SFP+ Ethernet optical ports.
4	USB 2.0 port.
5	Reset button. ● Press the reset button for no more than 3 seconds to reset the AC manually. Resetting the AC will cause service interruption. Exercise caution when using this button. ● Press and hold down the reset button for more than 5 seconds to restore the AC configuration.
6	Console port.
7	Ground point.

Indicator Description

Figure 1-45 shows the indicators on the AC6508/AC6507S/AirEngine 9700S-S front panel.

Figure 1-45 Indicators on the AC6508/AC6507S/AirEngine 9700S-S front panel

The following table describes the indicators on the AC6508/AC6507S/AirEngine 9700S-S front panel.

No.	Indicator	Color	Description
1	PWR: power supply indicator	-	Off: The system is powered off or faulty.
		Green	Steady on: The power module is working properly.
2	SYS: system status indicator	-	Off: The system is not running.
		Green	• Steady on: The system is powering on or restarting. • Fast blinking(4 Hz): The system is starting. • Slow blinking(0.5 Hz): The system is running properly.
		Red	The system is faulty.
3	USB indicator	-	No USB flash drive is connected to the AC.
		Green	Steady on: The USB flash drive is inserted and working properly.
4	CLOUD indicator	Green	• Off: The device is not connected or lost the connection to the Agile Controller-Campus. • Steady on: The connection to the Agile Controller-Campus is normal. • Fast blinking(4 Hz): The device is connecting to the Agile Controller-Campus.

Display Mode	Color	Description
GE electrical service port indicator	Green	• Off: The port is not connected or has been shut down. • Steady on: The port is connected.
	Yellow	Blinking: The port is sending or receiving data.
10GE optical service port indicator	Green	• Off: The port is not connected or has been shut down. • Steady on: The port is connected. • Blinking: The port is sending or receiving data.

Physical Specifications

The following table describes the physical specifications of the AC6508, AC6507S and AirEngine 9700S-S.

Item		Description
Physical specifications	Dimensions (H x W x D)	• Basic: 43.6 mm x 250 mm x 210 mm • Maximum: 43.6 mm x 250 mm x 215 mm
	Weight	1.57kg
Power specifications	Maximum power consumption	22.3W
	Power input	DC: 12 V ± 5%
Environment parameters	Operating temperature	• -60 m to +1800 m: 0°C to +45°C • 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Storage temperature and altitude	-60 m to +5000 m: -40°C to +70°C
	Relative humidity	5% RH to 95% RH, noncondensing

1.4.4 Performance Specifications (AC6507S, AC6508, and AirEngine 9700S-S)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.5 AC6805 Product Description

1.5.1 Product Characteristics (AC6805)

NOTICE

The AC6805 is a class A product. The AC6805 that is operating may cause radio interference. Customers need to take prevention measures.

The AC6805 is a high-end wireless access controller (AC) for large enterprise campuses, enterprise branches, and school campuses. The AC6805 can manage up to 6K access points (APs) and provide 40 Gbit/s forwarding performance. It features high scalability and offers users considerable flexibility in configuring the number of managed APs. When used with Huawei's full series 802.11ax, 802.11ac, and 802.11n APs, the AC6805 delivers an adaptable solution for large campus networks, enterprise office networks, wireless Metropolitan Area Networks (MANs), and hotspot coverage.

The AC6805 has the following features:

- Large capacity and high performance: Provides 12 x GE ports, 12 x 10 GE ports, and 2 x 40 GE ports with 40 Gbit/s forwarding capability for up to 6K managed APs.
- Flexibility: Flexible data forwarding modes, including direct forwarding and tunnel forwarding and fine-grained user rights management with user- and role-based access controls.
- Flexible O&M methods: Various network O&M methods, including eSight, web platform, and Command Line Interface (CLI).

1.5.2 Application Scenarios (AC6805)

1.5.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

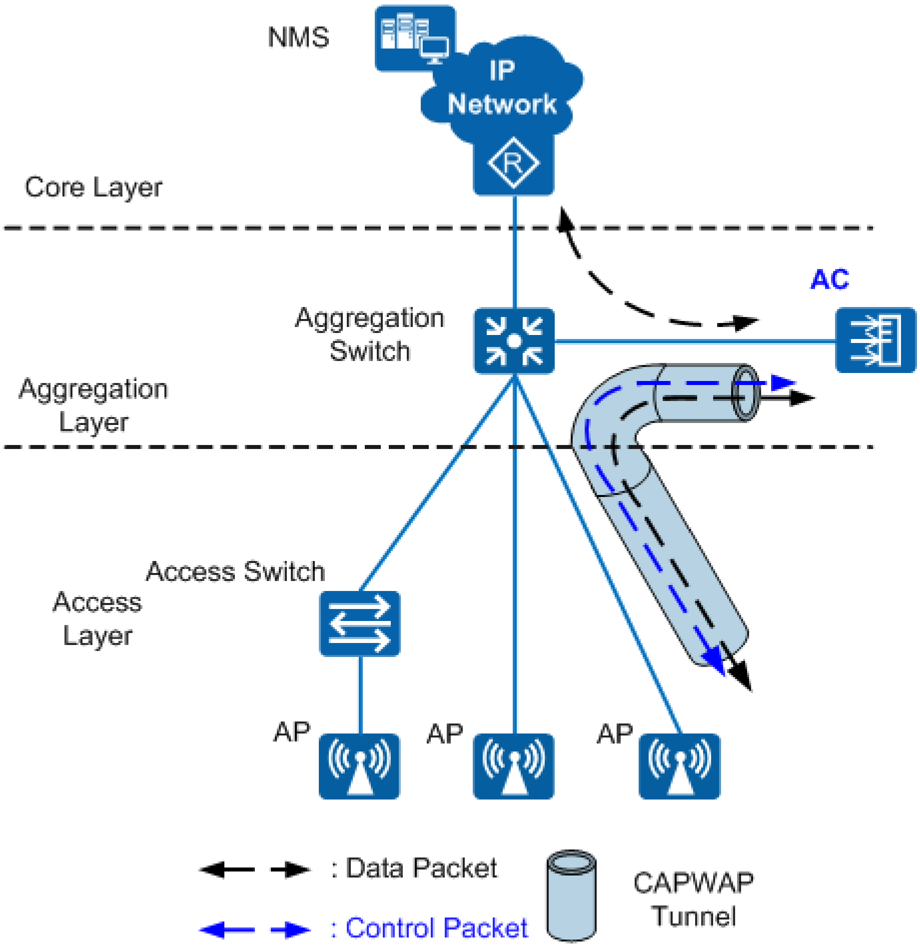
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-46**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-46 Bypass networking in tunnel forwarding mode

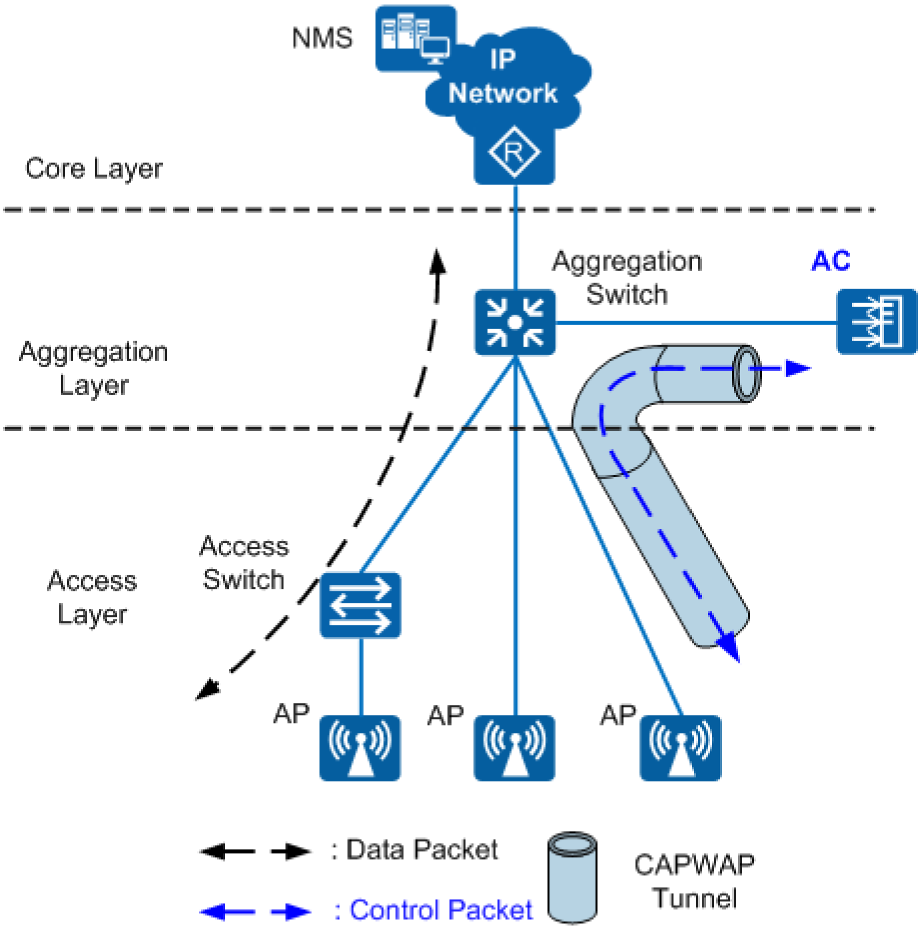


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-47 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.5.2.2 Inline Networking

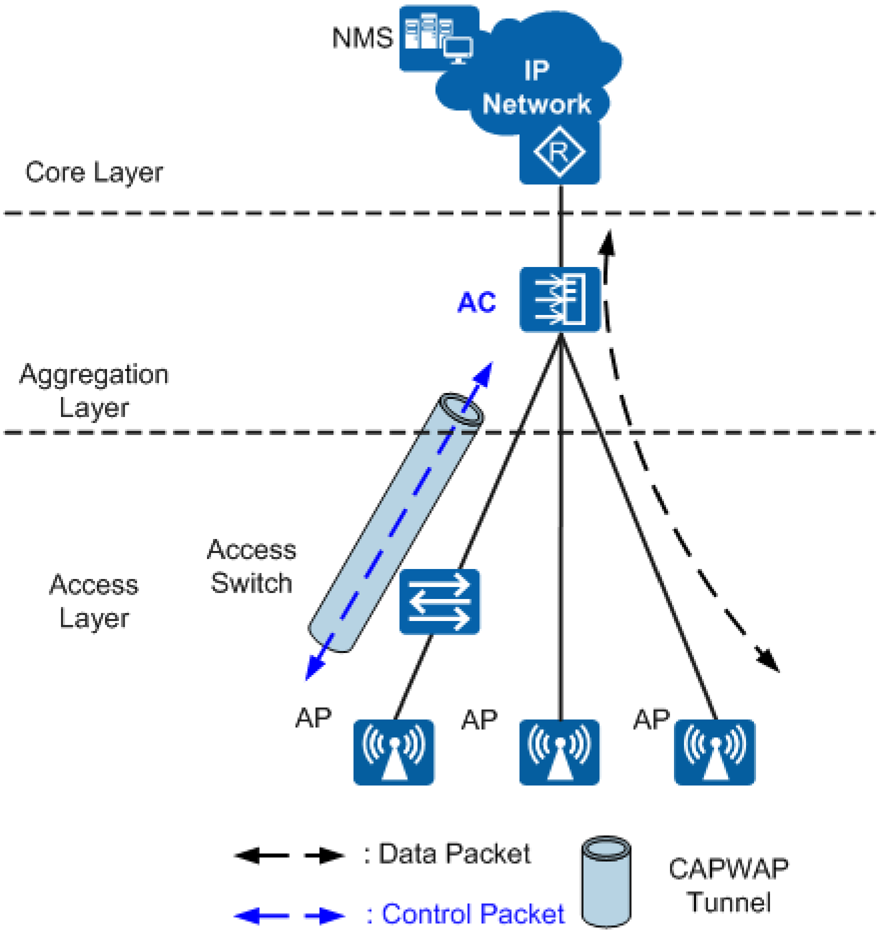
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-48 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-48**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

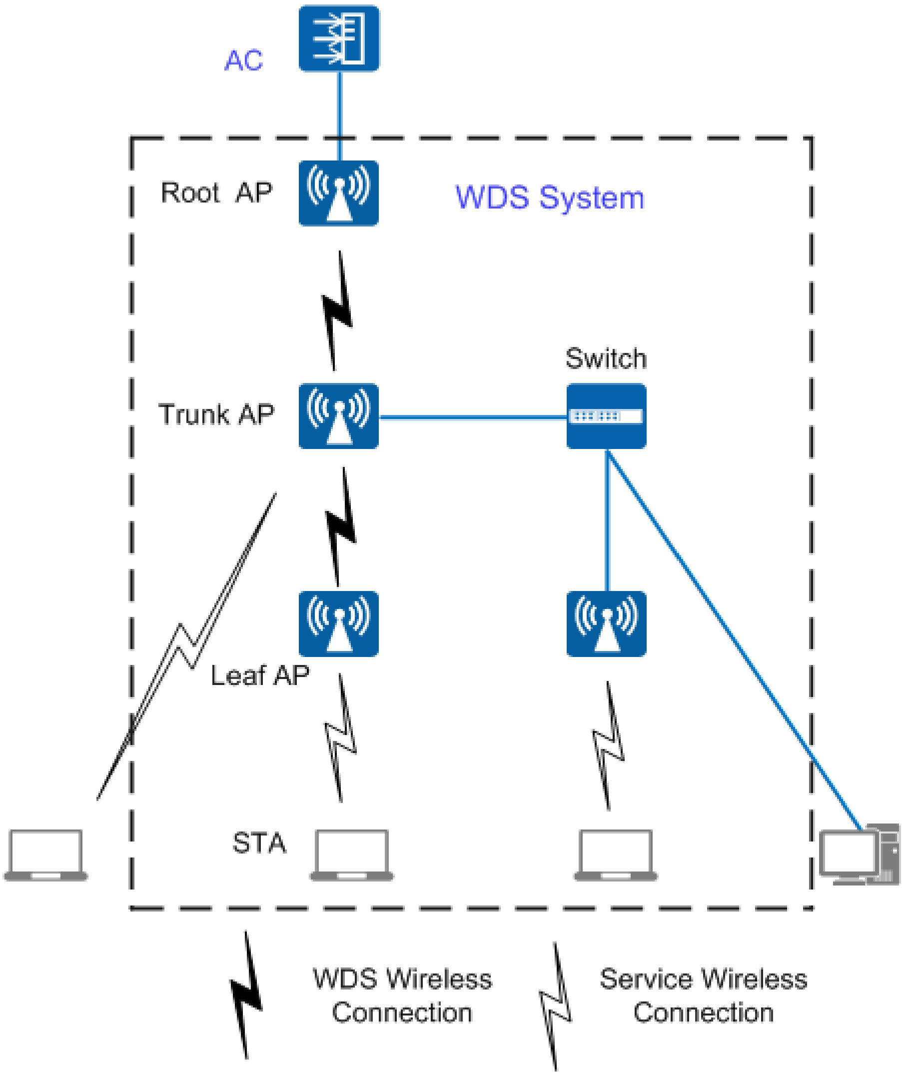
1.5.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-49 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

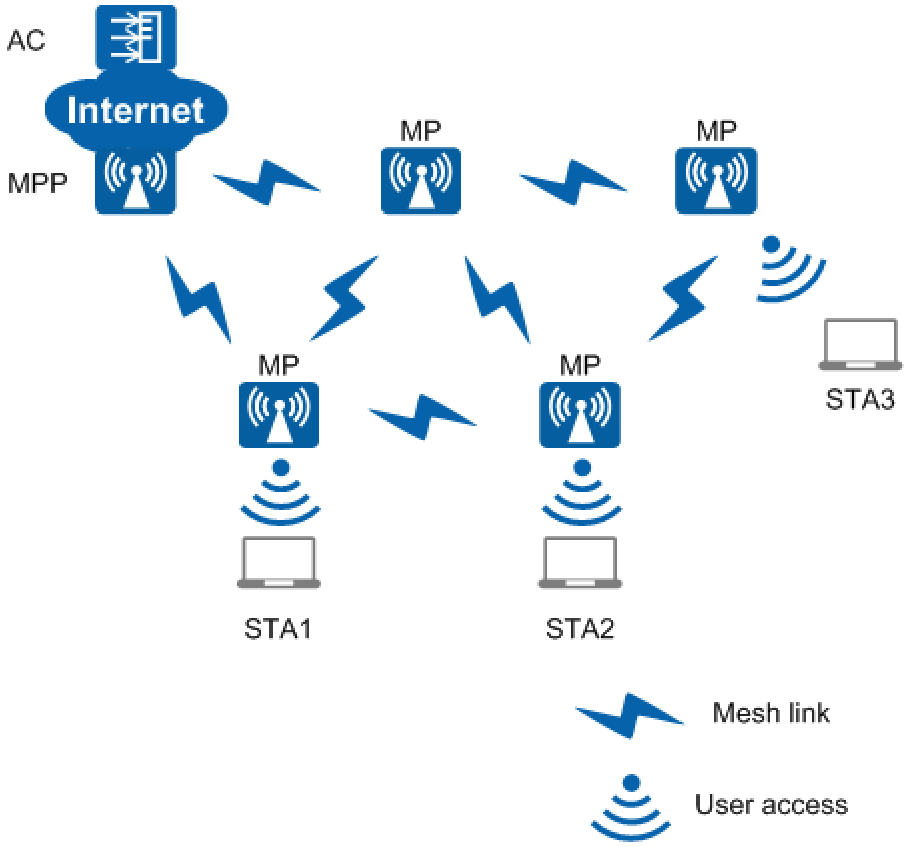
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-50 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

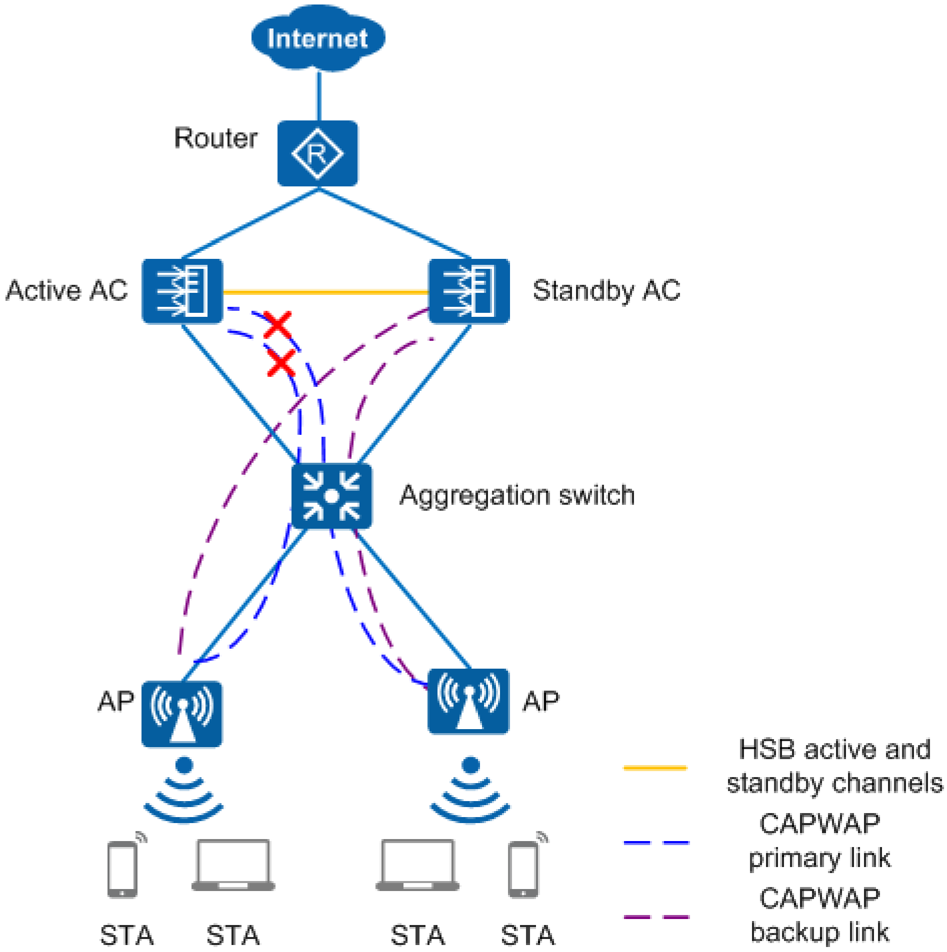
1.5.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

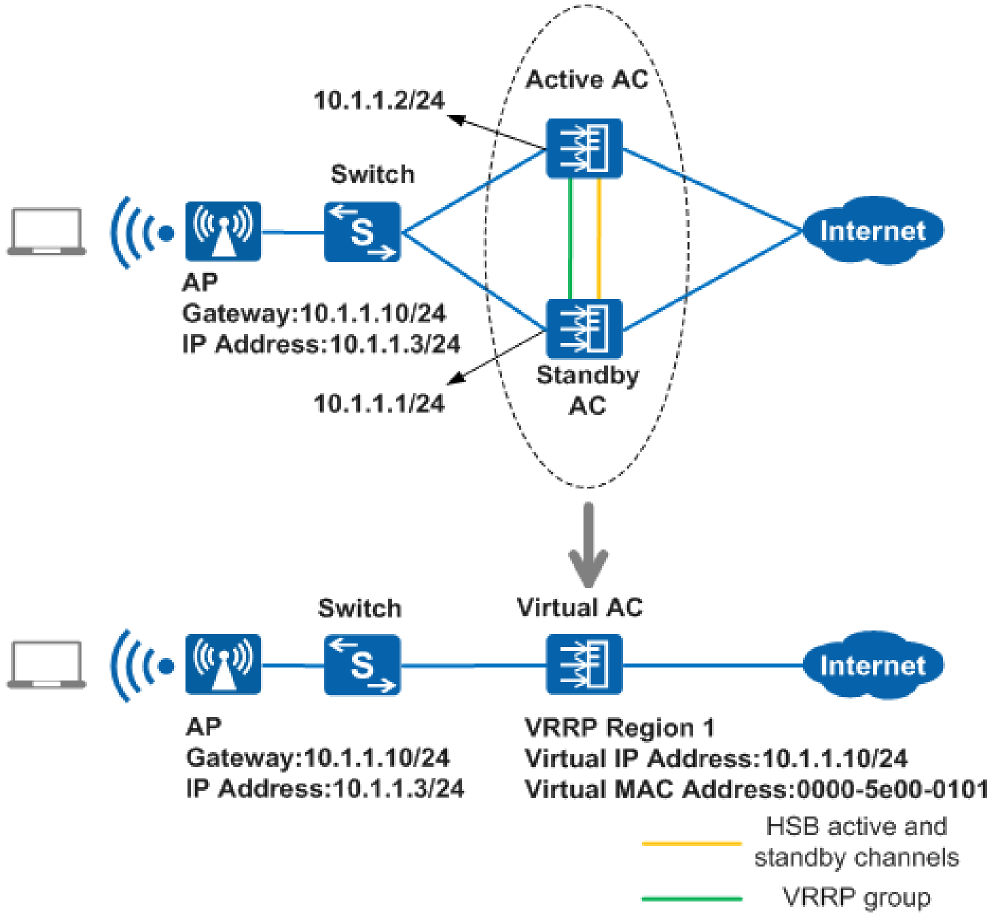
- HSB + dual-link backup: As shown in **Figure 1-51**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-51 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-52**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-52 HSB + VRRP networking



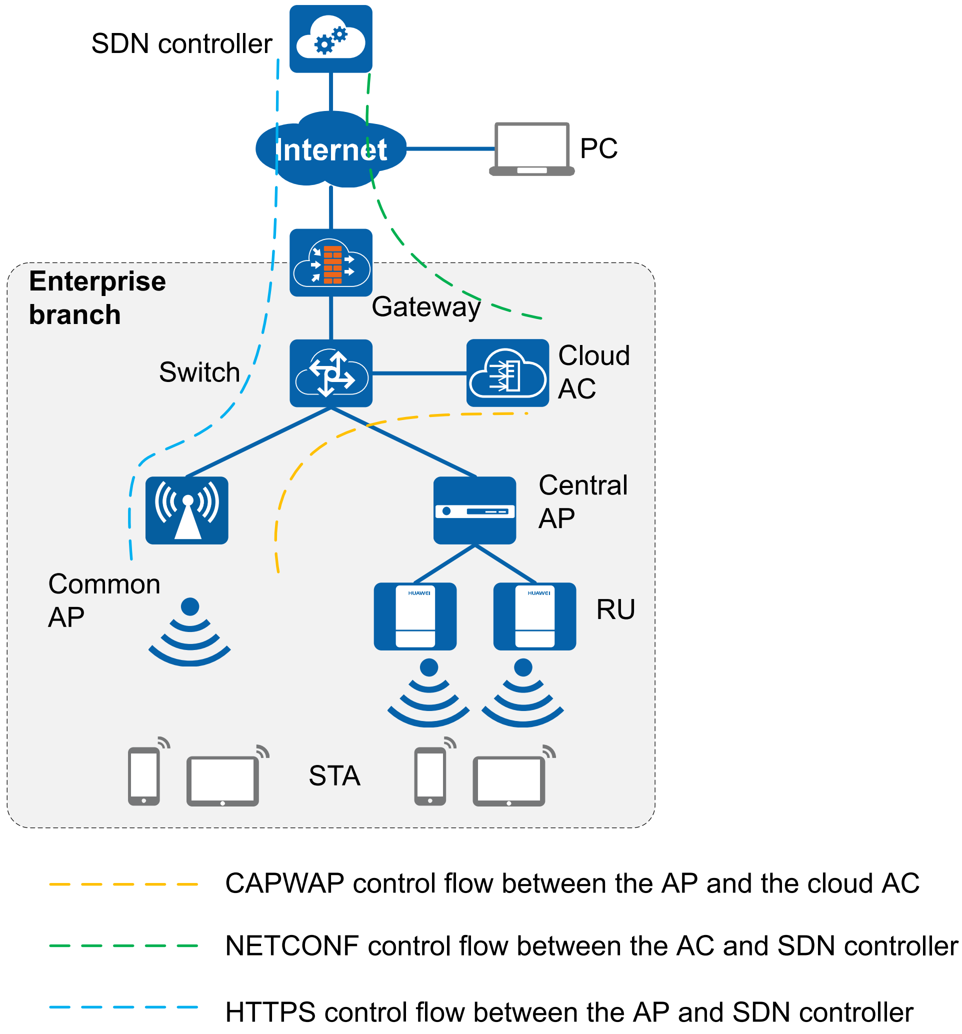
1.5.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-53**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-53 Typical cloud AC networking diagram



1.5.3 Product Structure (AC6805)

Appearance and Structure

Currently, the AC6805 series has only one model AC6805.

Figure 1-54 and **Figure 1-55** show the appearance of the AC6805.

Figure 1-54 Appearance of the AC6805 (front view)

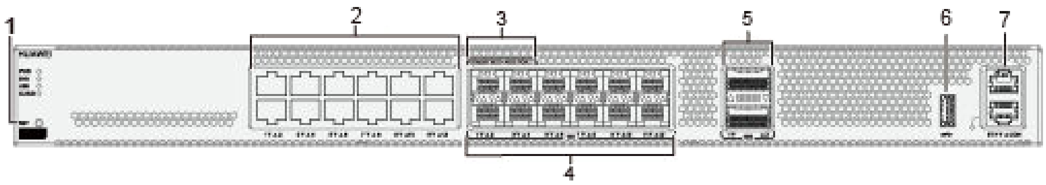
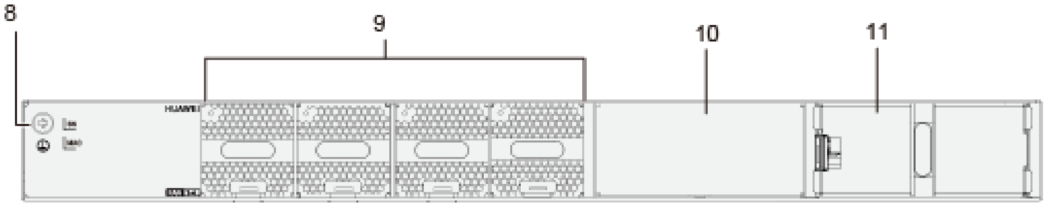


Figure 1-55 Appearance of the AC6805 (rear view)



No.	Description
1	Reset button. ● Press the reset button (for no more than 3 seconds) to reset the AC manually. Resetting the AC will cause service interruption. Exercise caution when using this button. ● Press and hold down the reset button (for more than 5 seconds) to restore the AC configuration.
2	Twelve 10/100/1000BASE-T Ethernet electrical ports.
3	Combo port: can be used as one 40GE QSFP+ optical port or four 10GE SFP+ optical ports. By default, the QSFP+ optical works, and SFP+ ports 1 through 4 are unavailable. When any SFP+ port is configured to work, the QSFP+ port becomes unavailable.
4	Twelve 10GE SFP+ optical ports.
5	Two 40GE QSFP+ optical ports.
6	Standard USB 3.0 port.
7	ETH management port and console port.
8	Ground point.
9	Pluggable fan module.
10	Power module slot.
11	Filler panel for the backup power module.

Indicator Description

Figure 1-56 shows the indicators on the AC6805 front panel, and **Figure 1-57** shows the fan indicator.

Figure 1-56 Indicators on the AC6805 front panel

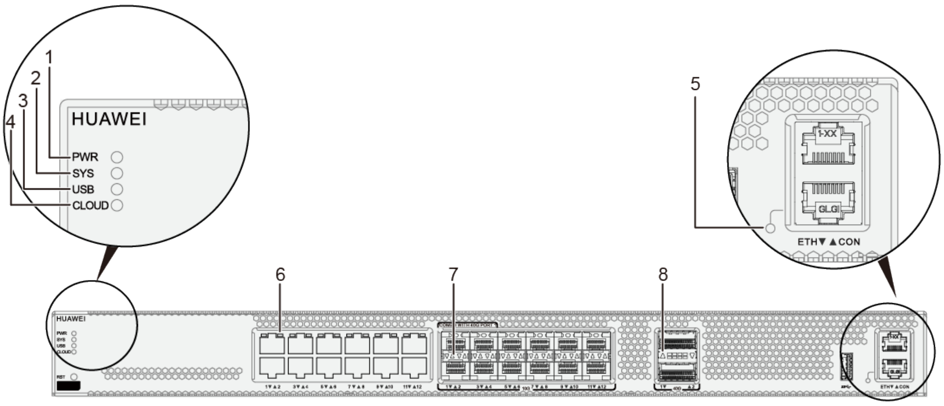


Figure 1-57 Fan indicator on the AC6805

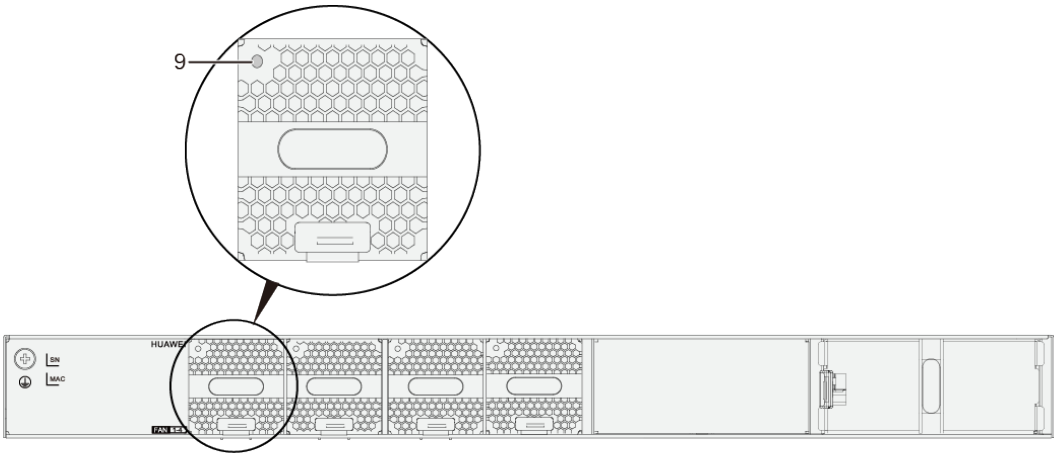


Table 1-15 describes the meanings of indicators on AC6805 front panel.

Table 1-15 Description of indicators on the AC6805 front panel

No.	Indicator	Color	Description
1	PWR: power supply indicator	-	Off: The system is powered off or faulty.
		Green	Steady on: The power module is working properly.
2	SYS: system status indicator	-	Off: The system is not running.

<table>
<tr><th>No.</th><th>Indicator</th><th>Color</th><th>Description</th></tr>
<tr><td rowspan="2"></td><td rowspan="2"></td><td>Green</td><td>● Fast blinking (4 Hz): The system is starting.
● Slow blinking (0.5 Hz): The system is running properly.
● Steady on: The system is being powered on or restarted.</td></tr>
<tr><td>Red</td><td>Steady on:
● The system is faulty.
● The power module does not work properly.
NOTE
When the AC supports two power modules:
1. If only one power module is available and is running properly, the SYS indicator blinks green.
2. If two power modules are present in the power supply slots and one or two of them are faulty, the SYS indicator blinks red.
● The fan module does not work properly.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">USB indicator</td><td>-</td><td>Off: No USB flash drive is connected to the AC.</td></tr>
<tr><td>Green</td><td>Steady on: A USB flash drive is connected and works properly.</td></tr>
<tr><td>4</td><td>CLOUD indicator</td><td>Green</td><td>● Off: The AC is not connected or lost the connection to SDN controller.
● Steady on: The connection to SDN controller is normal.
● Fast blinking (4 Hz): The AC is connecting to SDN controller.</td></tr>
<tr><td>5</td><td>ETH indicator</td><td>Green</td><td>● Off: No link is established on the ETH port.
● Steady on: The ETH port is connected.
● Blinking: The ETH port is sending or receiving data.</td></tr>
</table>

No.	Indicator	Color	Description
6	GE electrical service port indicator (Indicators correspond to ports 1 through 12 from left to right.)	Green	● Off: No link is established on the port. ● Steady on: The port is connected. ● Blinking: The port is sending or receiving data.
7	GE/10GE optical service port indicator ● A down arrow indicates a lower port, while an up arrow indicates an upper port. ● Four indicators (arrows) are located between two ports vertically, with two yellow indicators on the left, and two green indicators on the right.	Green	● Off: No link is established on the port. ● Steady on: The port is connected.
		Yellow	Blinking: The port is sending or receiving data.
8	40GE optical service port indicator	Green	● Off: No link is established on the port. ● Steady on: The port is connected. ● Blinking: The port is sending or receiving data.
9	Fan indicator	-	Off: No fan module is installed.
		Green	Blinking: The fan module is working properly.
		Red	Blinking: The fan is not running at a proper speed or stops rotating.

Physical Specifications

Table 1-16 Physical specifications

Item		Description
Dimensions and weight	Dimensions (H x W x D)	• Basic: 43.6 mm x 442 mm x 420 mm • Maximum: 43.6 mm x 442 mm x 444 mm
	Weight	5.83 kg
Power specifications	Maximum power consumption	231.7 W
	Rated input voltage	• AC power input: 100 V AC to 240 V AC, 50/60 Hz • DC power input: -48 V DC to -60 V DC
Environment specifications	Operating temperature and altitude	• - 60 m to +1800 m: 0°C to +45°C • 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Storage temperature and altitude	-60 m to +5000 m: -40°C to +70°C
	Operating altitude of the power modules	0 m to 5000 m
	Relative humidity	5% RH to 95% RH, noncondensing

1.5.4 Performance Specifications (AC6805)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.6 AC6800V Product Description

1.6.1 Product Characteristics (AC6800V)

NOTICE

The AC6800V is a class A product. The AC6800V that is operating may cause radio interference. Customers need to take prevention measures.

Huawei AC6800V is an X86-based access controller (AC). The AC6800V has a large capacity and high performance. It is highly reliable, easy to install and maintain, and features such advantages as flexible networking and energy conservation.

NOTE

In real-world applications, the AC6800V must be deployed in redundancy mode to ensure WLAN service reliability.

The AC6800V has the following features:

- Has various user policy management and authority control capabilities.
- Can be managed using the eSight, web system, or command line interface.

Abundant Port Types

The AC6800V hardware adopts the FusionServer 2288H V5 server and provides abundant types of ports, meeting requirements of various usage scenarios. **Table 1-17** lists the ports that the AC6800V provides.

Table 1-17 AC6800V port description

Port Type	Quantity	Description
Service port	Six GE electrical ports	RJ-45
	Six 10GE optical ports	SFP+
Maintenance port	One RJ45 maintenance serial port	It is an RS-232 port.
	One RJ-45 iBMC management port	It is used to log in to the iBMC web management page but cannot be used to log in to the web page of the AC. You can log in to the web page of the AC only through the service port.
	Two USB 2.0 ports Three USB 3.0 ports	The USB port is used to connect USB disks for deployment, configuration file transfer, and file upgrade.

Large Capacity, High Performance, Integrated Design

The AC provides a large capacity and high performance, and adopts an integrated design to allow for flexible deployment.

- Large forwarding capacity: The AC has six 10GE ports. It provides 60 Gbit/s forwarding capacity.

Carrier-Class Reliability

The AC provides the following reliability designs, ensuring long-term operation.

- The AC supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- The AC supports 1+1 hot backup.

Easy-to-Install and Easy-to-Maintain

The AC is easy to install and maintain, simplifying network deployment.

- The AC dimensions (H x W x D) are 86.1 mm x 477 mm x 708 mm (3.39 in. x 18.78 in. x 27.87 in.), and the AC can be installed in a standard IEC cabinet (19 inches).
- The built-in web system of AC allows local GUI-based management.
- The AC can be managed by the eSight that provides various northbound interfaces.
- The AC supports the intra-board temperature probe, which monitors the operating environment of the AC in real time.

1.6.2 Application Scenarios (AC6800V)

1.6.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

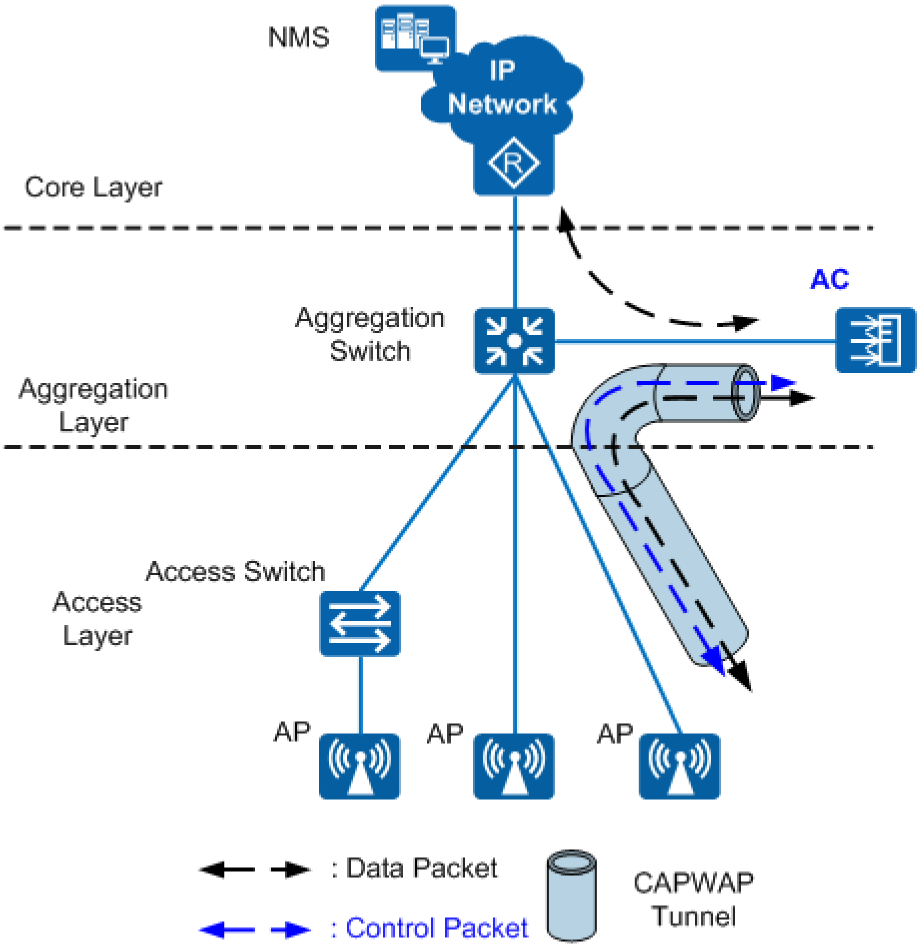
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-58**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-58 Bypass networking in tunnel forwarding mode

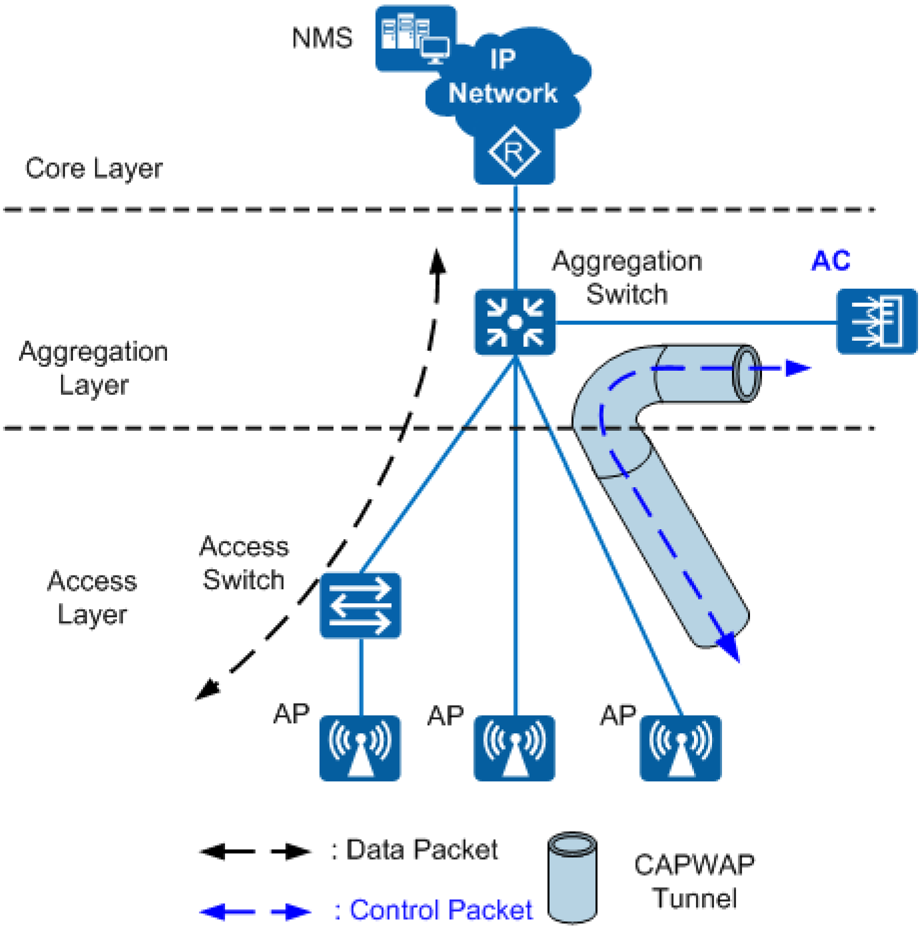


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-59 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.6.2.2 Inline Networking

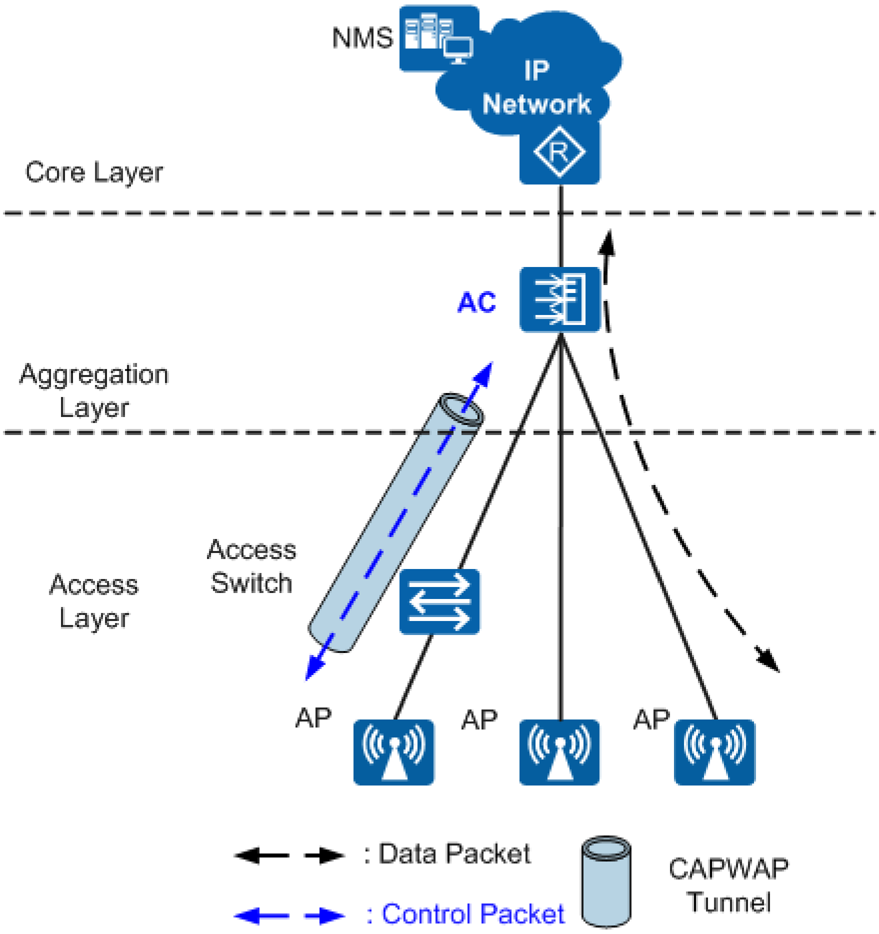
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-60 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-60**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

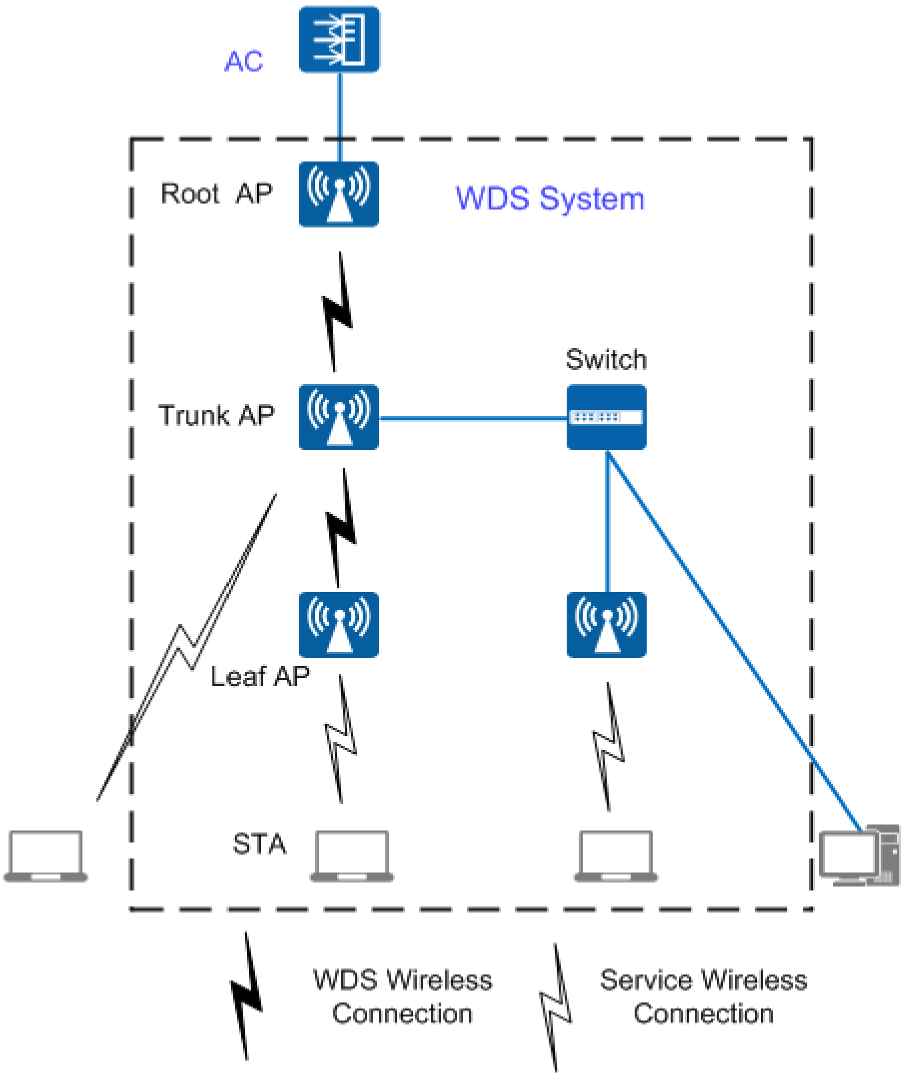
1.6.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-61 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

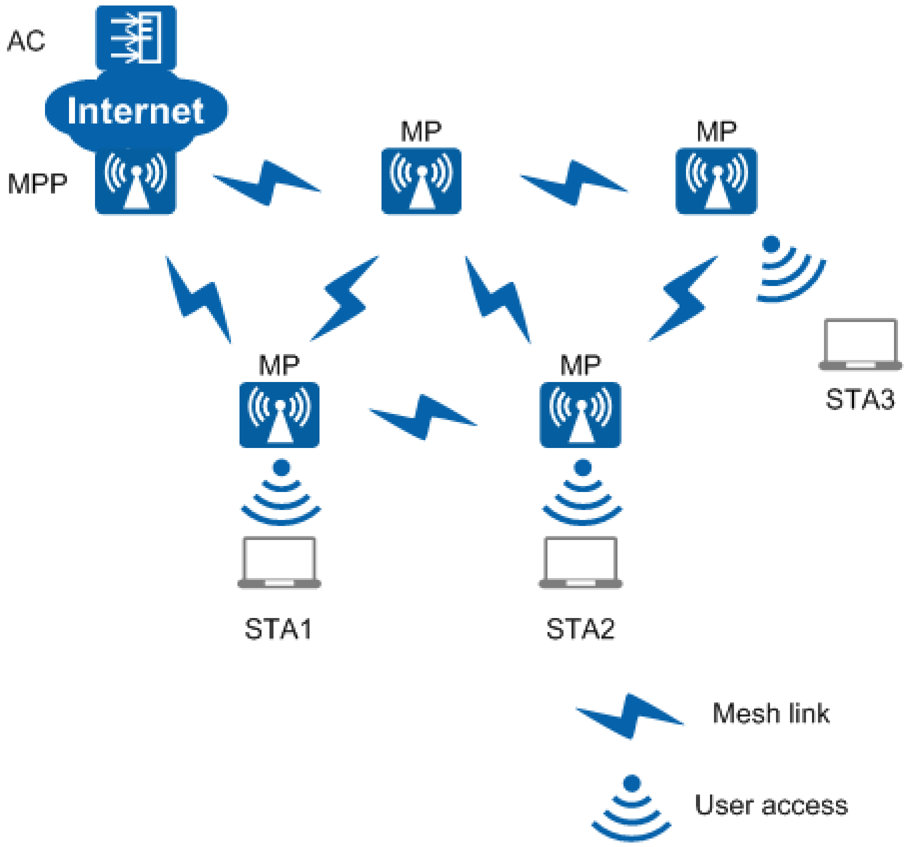
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-62 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

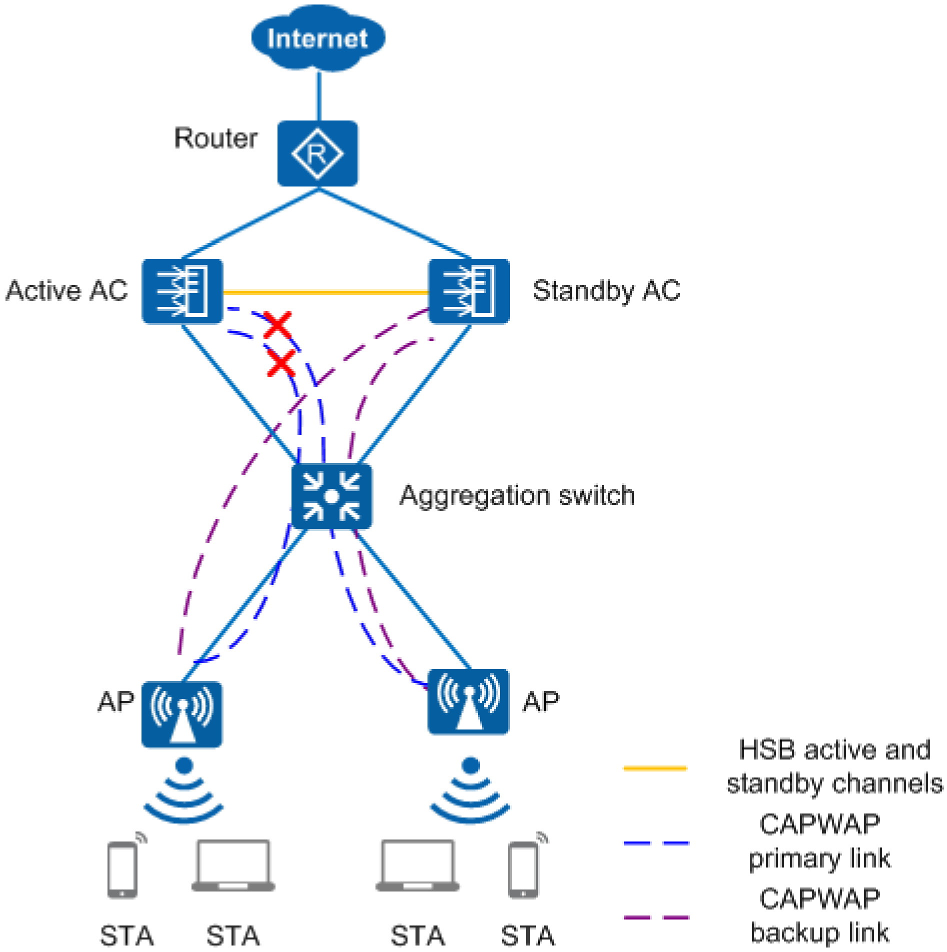
1.6.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

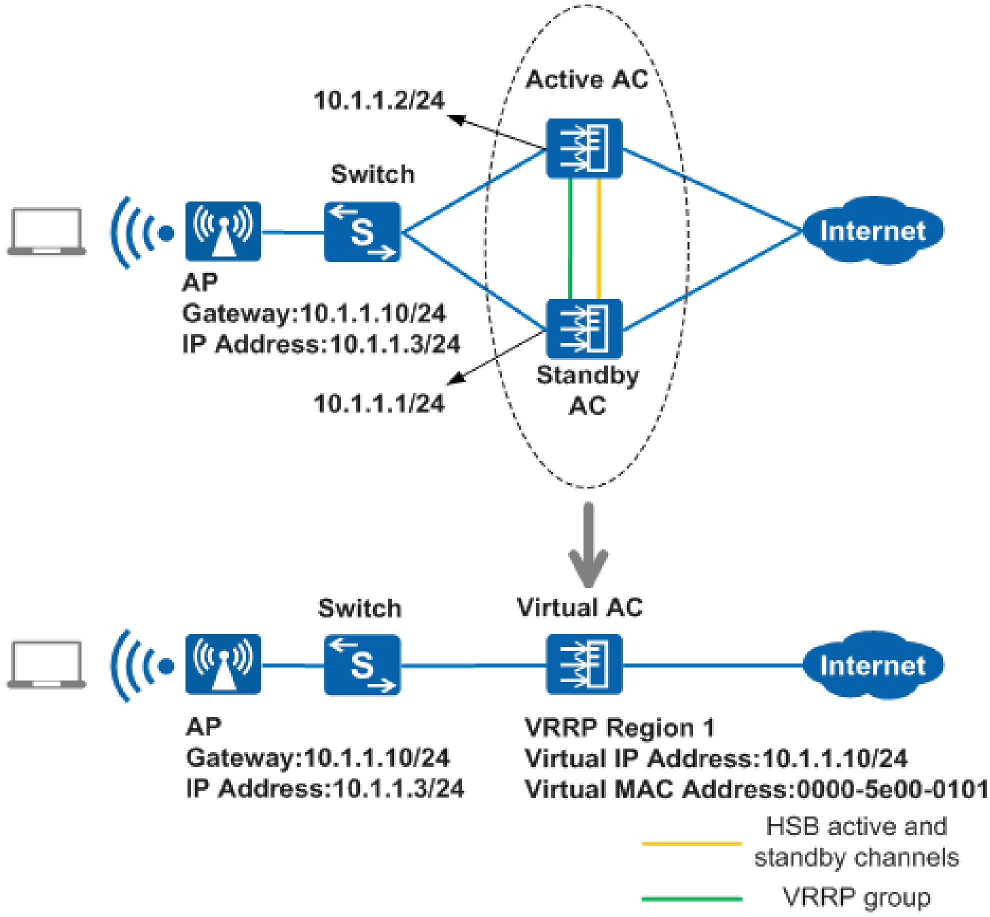
- HSB + dual-link backup: As shown in **Figure 1-63**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-63 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-64**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-64 HSB + VRRP networking



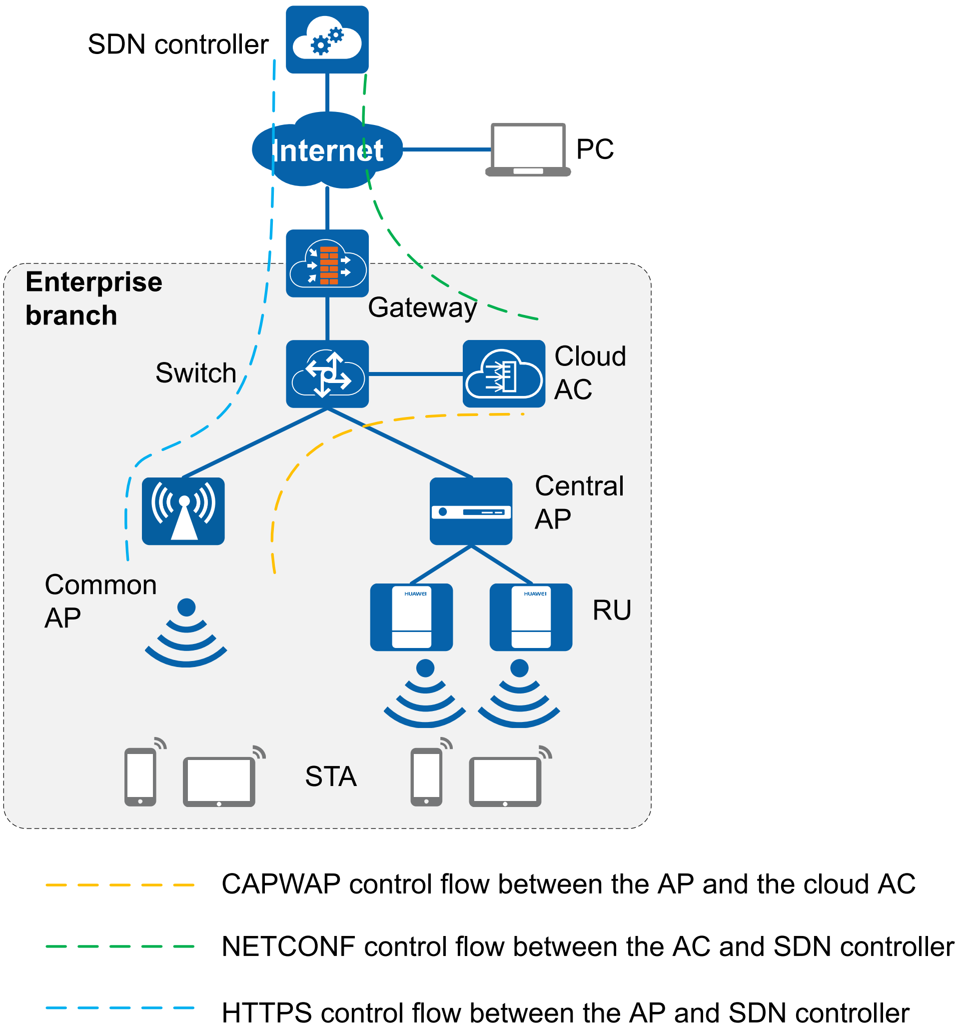
1.6.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-65**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-65 Typical cloud AC networking diagram



1.6.3 Product Structure (AC6800V)

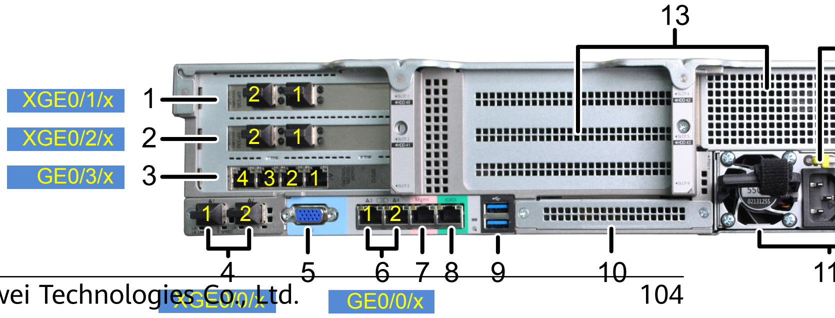
Appearance and Structure

Figure 1-66 and **Figure 1-67** show the appearance of the AC6800V.

Figure 1-66 Appearance of the AC6800V (front view)

1	USB 2.0 ports	2	Built-in DVD-RW drive (optional)
3	USB 3.0 ports	4	VGA port
5	Label (including SN)	6	Hard disk

Figure 1-67 Appearance of the AC6800V (rear view)



1	10GE optical ports	2	10GE optical ports
3	GE electrical ports	4	10GE optical ports
5	VGA port	6	GE electrical ports
7	Management network port	8	Serial port
9	USB 3.0 ports	10	Flexible NIC (optional)
11	Power supply unit (PSU)	12	PSU sockets
13	I/O module	-	-

NOTE

You can change NICs (GE/10GE/40GE) as required to meet different port requirements. The preceding figure is for reference only.

The AC6800V supports only Huawei optical transceivers of the following part numbers: 02318169, 02318170, 02310RMB, and 02310MHS.

Table 1-18 Ports on the rear panel

Port	Type	Quantity	Description
10GE optical port	10GE SFP+	6	The mainboard provides two 10GE optical ports and the network adapter provides four 10GE optical ports.
VGA port	DB15	1	The VGA port is connected to a terminal, such as a monitor or KVM. **NOTE** If cables are connected to the front and rear VGA ports at the same time, the display effect may be affected.

Port	Type	Quantity	Description
GE electrical port	1000BASE-T	6	Server service network port. The mainboard provides two GE electrical ports and the network adapter provides four GE electrical ports.
Serial port	RJ45	1	The serial port is used as the system serial port by default. You can set it as the iBMC serial port by using the iBMC command. This port is used for debugging.
Management network port	1000BASE-T	1	The 1000 Mbit/s Ethernet port is used for server management.
USB port	USB 3.0	2	The USB ports allow USB devices to be connected to the server. **NOTE** Before connecting an external USB device, check that the USB device functions properly. A server may operate abnormally if an abnormal USB device is connected.

Port	Type	Quantity	Description
PSU socket	-	1 or 2	Determine the number of PSUs based on actual requirements, but ensure that the rated power of the PSUs is greater than that of the server. When one PSU is used, **Predicted PSU Status** cannot be set to **Active/Standby** on the iBMC WebUI.

Table 1-19 LOM port description

LOM Port	Chip Model	Rate Negotiation Mode	Supported Rate	Not Supported Rate
10GE optical port	X722	Auto-negotiation 10000 Mbit/s (full duplex)	10000M	10/100/1000 M
GE electrical port		Auto-negotiation 1000 Mbit/s (full duplex)	1000M	10/100M

Physical Specifications

Table 1-20 Physical specifications

Item		Description
Dimensions and weight	Dimensions (H x W x D)	86.1 mm x 477 mm x 708 mm (3.39 in. x 18.78 in. x 27.87 in.)
	Maximum weight (standard configuration)	21 kg

Item		Description
Power specifications	Maximum power consumption	21 kg350 W
	AC input voltage	● Rated voltage range: 100 V AC to 240 V AC, 50/60 Hz ● Maximum voltage range: 90 V AC to 264 V AC, 47 Hz to 63 Hz
Environment specifications	Operating temperature and altitude	-60 m to +1800 m: 0°C to 45°C 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Relative humidity	8% RH to 95% RH, noncondensing
	Operating altitude	-60 m to +5000 m

1.6.4 Performance Specifications (AC6800V)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.7 AirEngine 9700-M Product Description

1.7.1 Product Characteristics (AirEngine 9700-M)

The AirEngine 9700-M is a high-specification wireless access controller (AC) for medium and large enterprise campuses, enterprise branches, and school campuses. The AirEngine 9700-M can manage up to 2048 access points (APs) and provide up to 20 Gbit/s forwarding performance. It features high scalability and offers users considerable flexibility in configuring the number of managed APs. When used with Huawei's full series 802.11ax, 802.11ac, and 802.11n APs, the AirEngine 9700-M delivers an adaptable solution for medium and large campus networks, enterprise office networks, wireless metropolitan area networks (MANs), and hotspot coverage networks.

Figure 1-68 AirEngine 9700-M

Large-capacity and high-performance design

- The AirEngine 9700-M is capable of supporting medium and large campuses with up to 2048 APs.
- Provides 2 x 40GE optical interfaces, 12 x 10GE optical interfaces and 16 x GE electrical interfaces, supporting up to 20 Gbit/s forwarding performance. (The 40GE port cannot be used when one of the four 10GE combo ports is in use.)

SmartRadio for air interface optimization

- Load balancing during smart roaming: The load balancing algorithm works during smart roaming, enabling load balancing detection between APs on the network after STA roaming to adjust the STA load on each AP, improving network stability.
- Intelligent DFA technology: The dynamic frequency assignment (DFA) algorithm is used to automatically detect adjacent-channel and co-channel interference, and identify any redundant 2.4 GHz radios. Through automatic inter-AP negotiation, a redundant radio is automatically switched to another mode (dual-5G AP models support 2.4G-to-5G switchover) or is disabled to reduce 2.4 GHz co-channel interference and increase the system capacity.
- Intelligent conflict optimization technology: Dynamic enhanced distributed channel access (EDCA) and airtime scheduling algorithms are used to schedule the channel occupation time and service priority of each user. This ensures that each user is assigned a relatively equal amount of time for using channel resources and user services are scheduled in an orderly manner, improving service processing efficiency and user experience.

Various roles

The AirEngine 9700-M has a built-in Portal/AAA server and can provide Portal/802.1X authentication for users, protecting customer investment.

Flexible networking

- The WLAN AC can be deployed in bypass or inline mode, allows for the bridging or mesh networking, and supports the centralized and local data forwarding modes.
- The WLAN AC and APs can be connected across a Layer 2 or Layer 3 network. In addition, NAT can be deployed when APs are deployed on the private network and the WLAN AC is deployed on the public network.
- The WLAN AC is compatible with Huawei full-series 802.11n, 802.11ac and 802.11ax APs and supports the hybrid networking of 802.11n, 802.11ac, and 802.11ax APs for simple scalability.

Built-in application identification server

- Supports Layer 4 to Layer 7 application identification and can identify over 6000 applications, including common office applications and P2P download applications, such as Lync, FaceTime, YouTube, and Facebook.
- Supports application-based policy control technologies, including traffic blocking, traffic limit, and priority adjustment policies.
- Supports automatic application expansion in the application signature database.

Comprehensive reliability design

- Supports AC power supply.
- Supports WLAN AC 1+1 HSB, and N+1 backup, ensuring uninterrupted services.
- Supports port backup based on the Link Aggregation Control Protocol (LACP) or Multiple Spanning Tree Protocol (MSTP).
- Supports WAN authentication escape between APs and WLAN ACs. In local forwarding mode, this feature keeps existing STAs online and allows for the access of new STAs when APs are disconnected from WLAN ACs, ensuring service continuity.

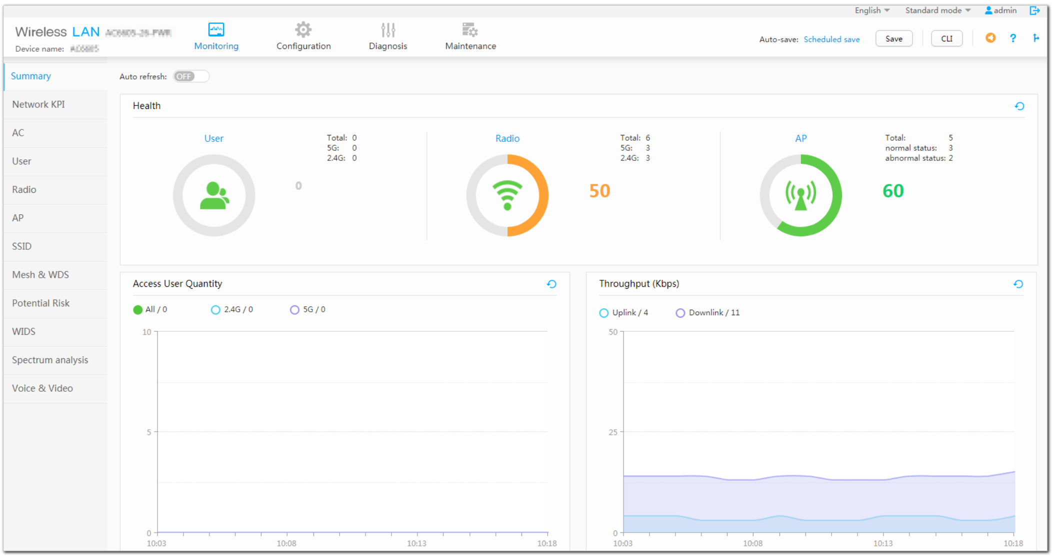
Built-in visualized network management platform

The AirEngine 9700-M has a built-in web system that is easy to configure and provides comprehensive monitoring and intelligent diagnosis.

Health-centric one-page monitoring, visualized KPIs

One page integrates the summary and real-time statistics. KPIs are displayed in graphs, including user, radio, and AP performance, enabling users to extract useful information from the massive amount of data, while also being instantly aware of the device and network status.

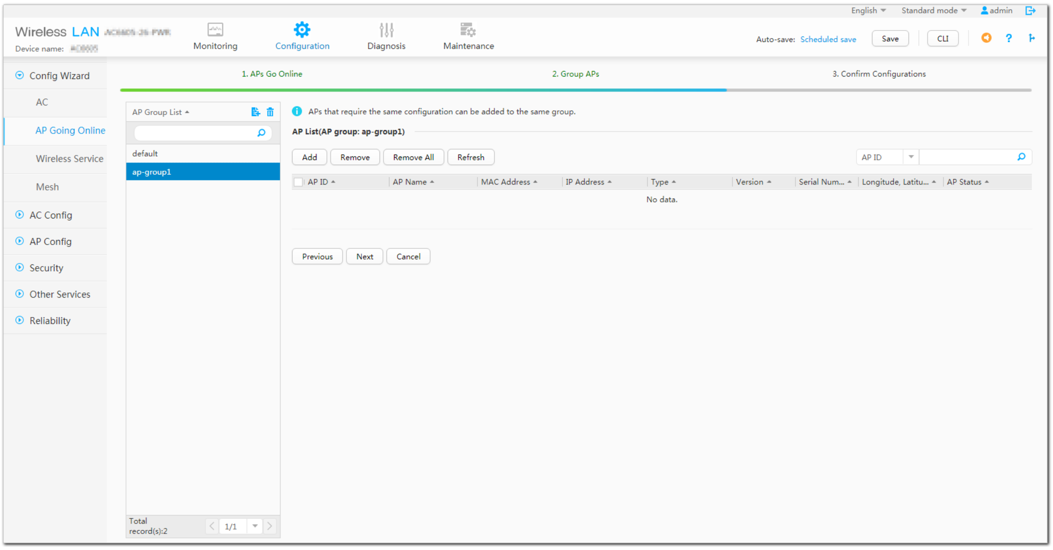
Figure 1-69 Monitoring interface



Profile-based configuration by AP group simplifies configuration and improves efficiency

- The web system supports AP group-centric configuration and automatically selects the common parameters for users, simplifying configuration.
- If two AP groups have small configuration differences, users can copy the configurations of one AP group to the other. This improves configuration efficiency because users only need to modify the original configurations instead of creating entirely new ones each time.

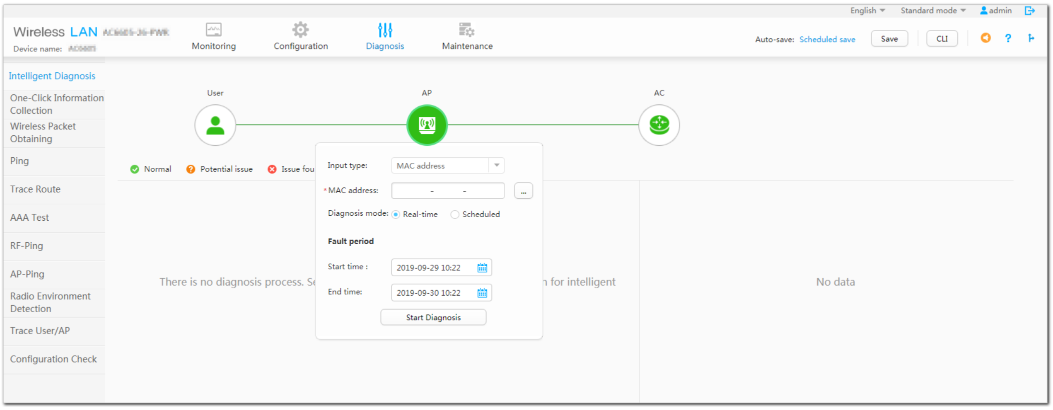
Figure 1-70 Configuration interface



One-click diagnosis solves 80% of common network problems.

The web system supports real-time and periodic one-click intelligent diagnosis from the dimensions of users, APs, and WLAN ACs, and provides feasible suggestions for troubleshooting.

Figure 1-71 Intelligent diagnosis



1.7.2 Application Scenarios (AirEngine 9700-M)

1.7.2.1 Bypass Networking

In bypass networking mode, the AC is connected to a network device (usually an aggregation switch) to manage APs.

The AC manages APs. Management flows are transmitted in CAPWAP tunnels, and data flows are forwarded to the upper layer network by the aggregation switch and do not pass through the AC.

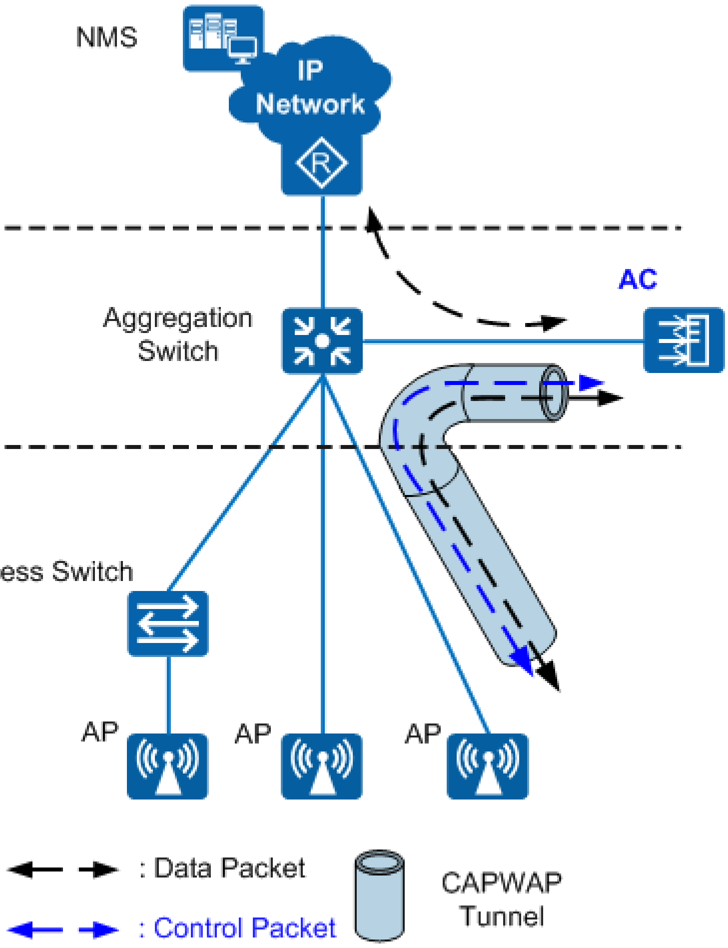
Tunnel Forwarding

In tunnel forwarding mode, wireless data is transmitted between APs and ACs over CAPWAP tunnels.

In **Figure 1-72**, both management flows and data flows of APs are transmitted to the AC over CAPWAP tunnels, and then the AC transparently transmits these flows to the upstream device.

Tunnel forwarding is usually used to control wireless user traffic in a centralized manner. This forwarding mode facilitates device deployment and controls all wireless service data flows by aggregating traffic of all wireless users connected to APs to an AC through CAPWAP data tunnels.

Figure 1-72 Bypass networking in tunnel forwarding mode

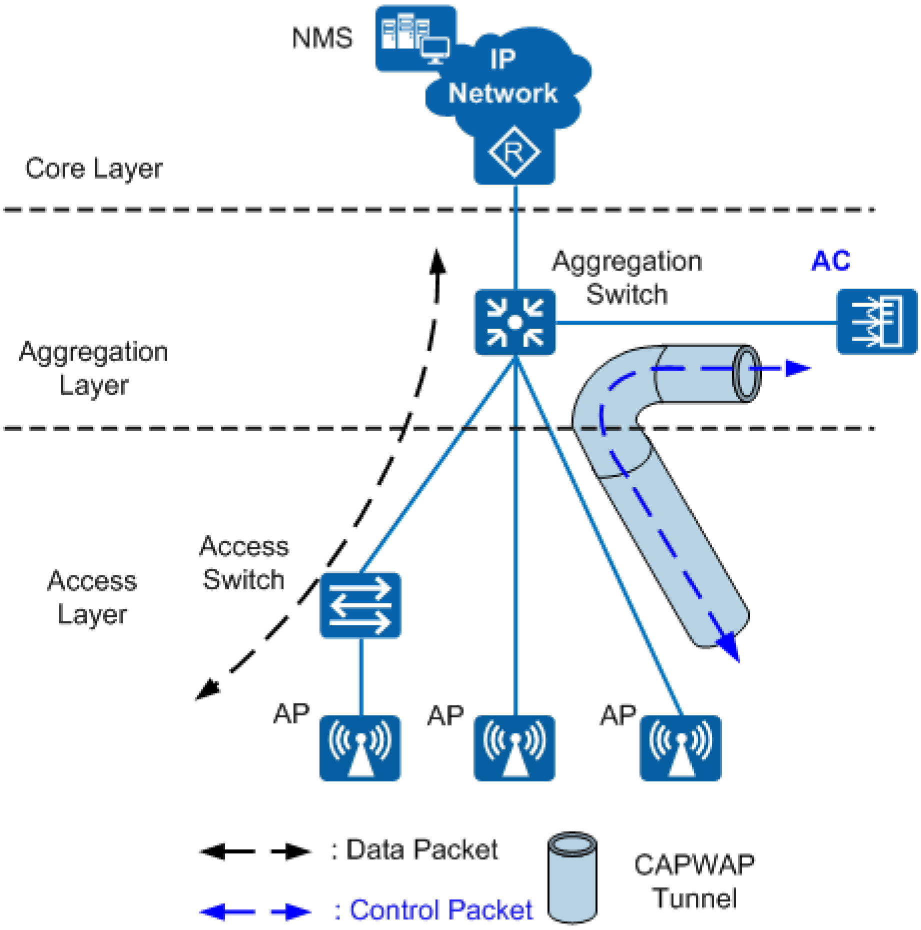


Direct Forwarding

In direct forwarding mode, wireless data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

The bypass networking mode is often used on enterprise networks. Wireless data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended for integrated network deployment.

Figure 1-73 Bypass networking in direct forwarding mode



- The AC only manages APs. All AP management flows (including authentication traffic) must arrive at the AC.

  Interfaces connected to the AC are reserved on the aggregation switch. The aggregation switch functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode or broadcast mode.
- Data flows from APs are forwarded by the Layer 2 switch and aggregation switch, and do not pass through the AC.

  Different service VLANs are assigned to STAs with different service set identifiers (SSIDs). The access switch and aggregation switch identify packets from these VLANs and forward these packets to the upstream device. The aggregation switch allocates IP addresses to STAs.

Application

In bypass networking mode, the AC manages all the APs connected to the aggregation switch. This network topology applies to scenarios where APs are scattered across hot spots.

The bypass networking mode requires only a small modification to the existing network, facilitating device deployment. You can select the direct or tunnel forwarding mode according to networking requirements.

1.7.2.2 Inline Networking

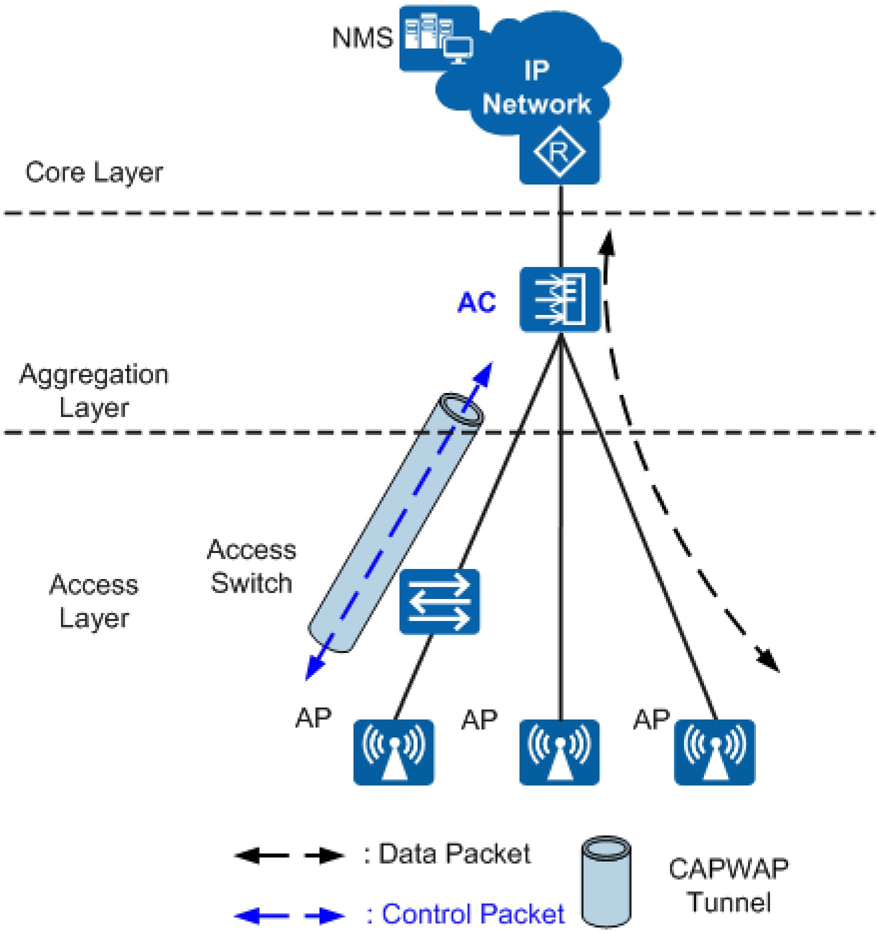
In inline networking mode, APs or access switches are directly connected to the AC. The AC also functions as an aggregation switch to forward and process APs' data and management services.

In inline networking mode, the AC sets up CAPWAP tunnels with APs to configure and manage these APs over CAPWAP tunnels. Service data of wireless users can be forwarded between APs and the AC over CAPWAP data tunnels or be directly forwarded by APs.

In inline networking mode, direct forwarding is often used so that service data can be forwarded on APs.

The AC functions as the DHCP server to allocate IP addresses to APs. APs obtain the IP address of the AC using the DNS mode, DHCP mode, or broadcast mode, and set up data tunnels with the AC.

Figure 1-74 Data flows not transmitted in CAPWAP tunnels



In direct forwarding mode, only control flows are transmitted in CAPWAP tunnels, and data flows sent from APs are transparently transmitted to the upstream device by the AC, as shown in **Figure 1-74**.

When data flows are not transmitted in CAPWAP tunnels, configure management VLANs and data VLANs as follows:

- On the AC and its upstream devices, configure an AC management VLAN to transmit control flows between the AC and the NMS.
- On the switches between APs and the AC, configure AP management VLANs to transmit control flows between APs and the AC.
- On all switches between APs and the AC, configure data VLANs to differentiate WLAN data flows.

Application

The AC provides powerful access, aggregation, and switching capabilities. Therefore, APs can directly connect to the AC. Direct forwarding is often used in inline networking mode. This networking mode simplifies the network architecture and applies to small- and medium-scale centralized WLANs.

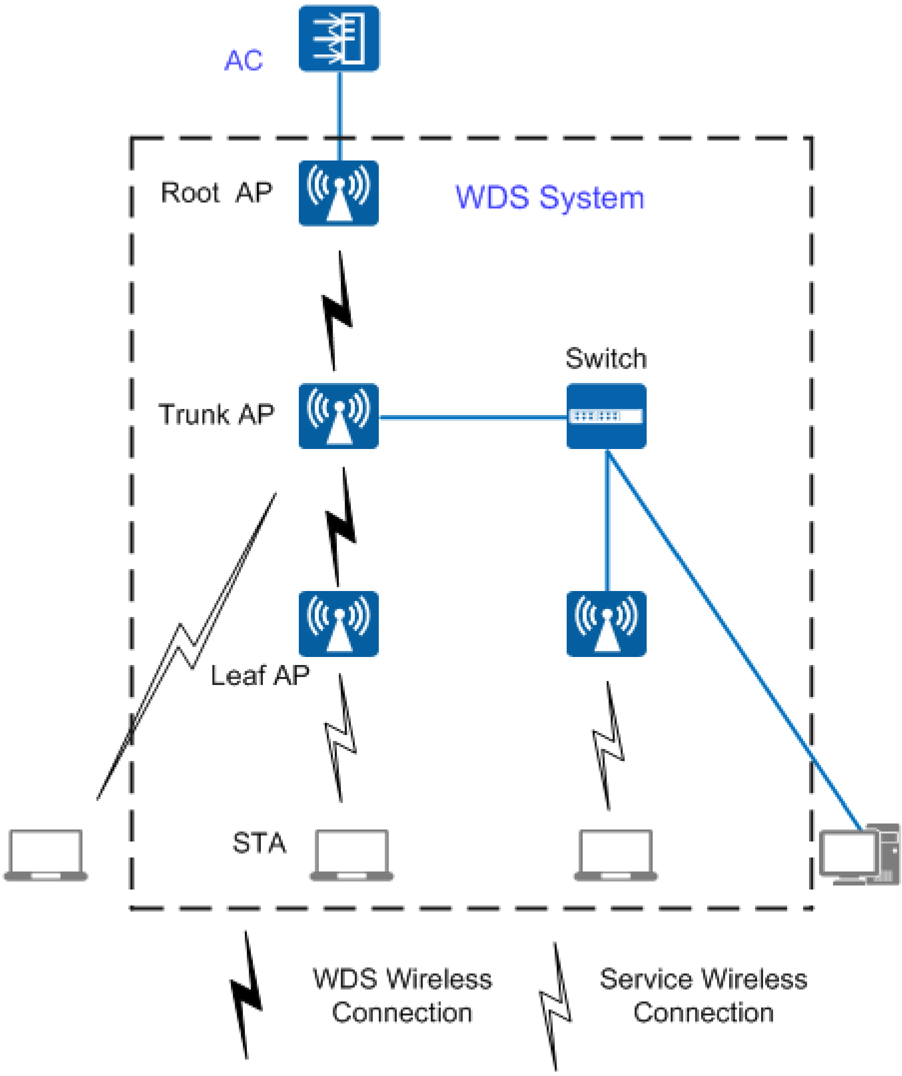
1.7.2.3 Wireless Backhaul Networking

802.11 wireless technology has been widely used in home networks and enterprise networks. Users can easily access the Internet over WLANs. In this network application, APs must be connected to the existing wired network to provide network access services for wireless users. To expand the wireless coverage area, APs need to be connected using cables, switches, and power supplies. This increases network costs and prolongs network construction period. Wired deployment requirements may not be met in special circumstances. The Wireless Distribution System (WDS) or mesh technology allows APs to be connected wirelessly, facilitating WLAN construction in a complex environment.

WDS

The WDS is a distribution system comprised of APs. The WDS connects to an AC on the network side, which is then connected to a network device such as a gateway or an aggregation switch. The WDS connects to a station (STA) or a wired network device (such as a PC) on the user side.

Figure 1-75 WDS



On a WDS network, an AC manages the following devices:

- Root AP: connects to an AC on the wired side, and functions as a WDS master to connect to trunk APs or leaf APs.
- Trunk AP: functions as a WDS slave to connect to a root AP, connects to wired devices on the wired side, or functions as a WDS master to connect to leaf APs.
- Leaf AP: functions as a WDS slave to connect to a root AP or trunk AP or connects to STAs on the wireless side.

NOTE

Both the root AP and trunk AP can function as leaf APs.

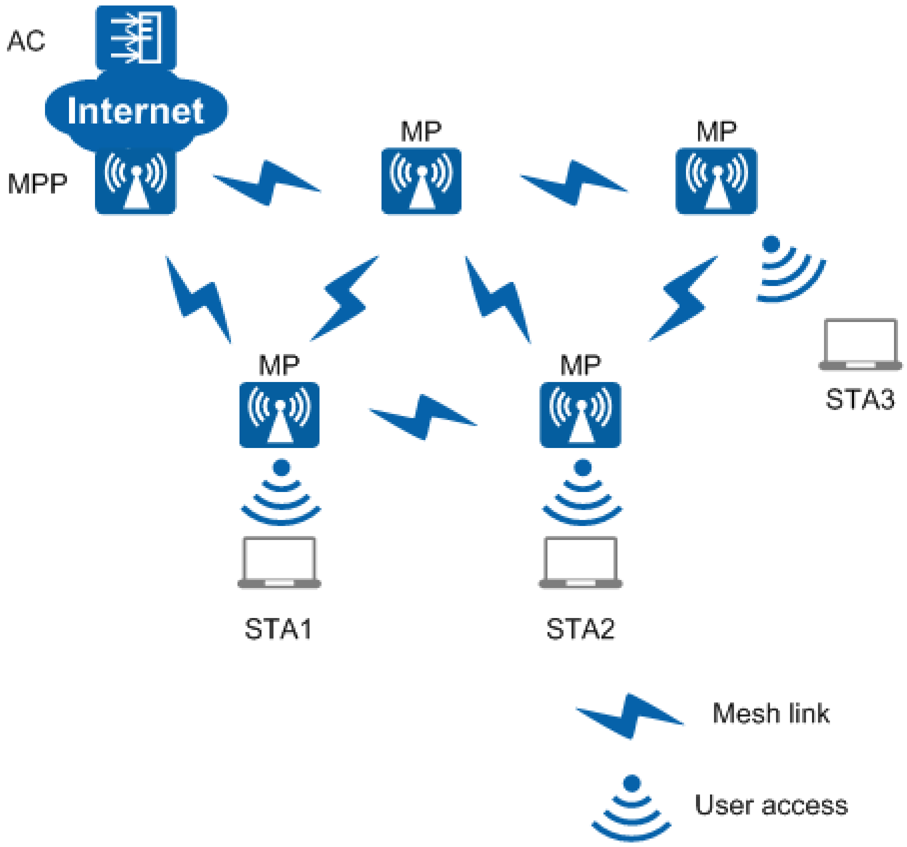
The WDS networking can expand WLANs and applies to indoor wireless deployment scenarios.

WMN

Compared with a traditional WLAN, a Wireless Mesh Network (WMN) has the following advantages:

- Fast deployment: Mesh nodes can be easily installed to construct a WMN in a short time, much shorter than the construction period of a traditional WLAN.
- Dynamic coverage area expansion: As more mesh nodes are deployed on a WMN, the WMN coverage area can be rapidly expanded.
- Robustness: A WMN is a peer-to-peer network that will not be affected by the failure of a single node. If a node fails, packets are forwarded to the destination node along other paths.
- Flexible networking: An AP can directly join or leave a WMN, without the need of connections to infrastructure. This allows for flexible networking.
- Various application scenarios: Besides traditional WLAN scenarios such as enterprise networks, office networks, and campus networks, a WMN also applies to scenarios such as large-scale warehouses, docks, MANs, metro lines, and emergency communications.
- Cost-effectiveness: Only MPPs need to connect to a wired network, which minimizes the dependency of a WMN on wired devices and saves costs in wired device purchasing and cable deployment.

Figure 1-76 WMN



Nodes on a WMN can be classified into the following types based on their functions:

- Mesh point (MP)

  A mesh-capable node that uses IEEE 802.11 MAC and physical layer protocols for wireless communication. This node supports automatic topology discovery, automatic route discovery, and data packet forwarding.
- Mesh portal point (MPP)

  An MP that connects to a WMN or another type of network. This node has the portal function and enables mesh nodes to communicate with external networks.

On a WMN, MPs are fully meshed to establish an auto-configured, and self-healing backbone WMN, and MPPs with the gateway function provide connections to the Internet. An MP provides access services and connects a STA to a WMN. A WMN uses special mesh routing protocols, which ensures high transmission quality. The WMN is applicable to scenarios that require high-bandwidth and highly stable Internet connections.

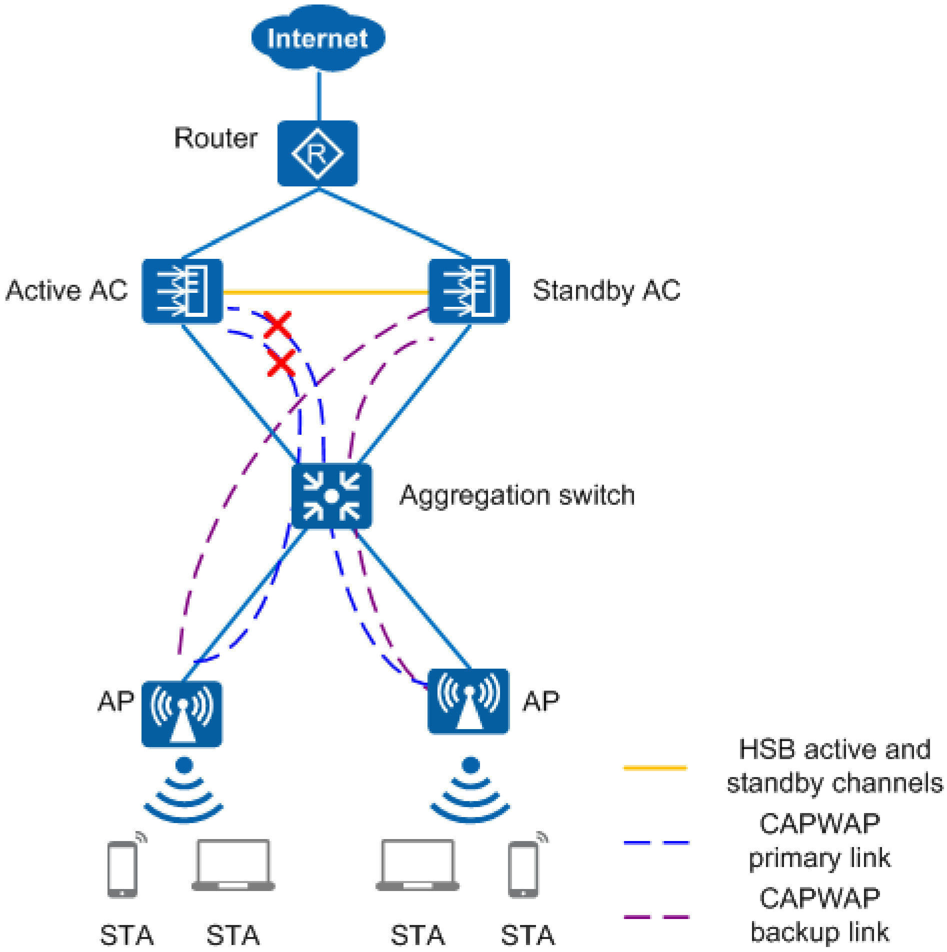
1.7.2.4 Dual-AC Networking

To ensure uninterrupted service forwarding, enterprises that require high reliability use active and standby ACs for networking.

Dual-AC backup can be implemented in two modes:

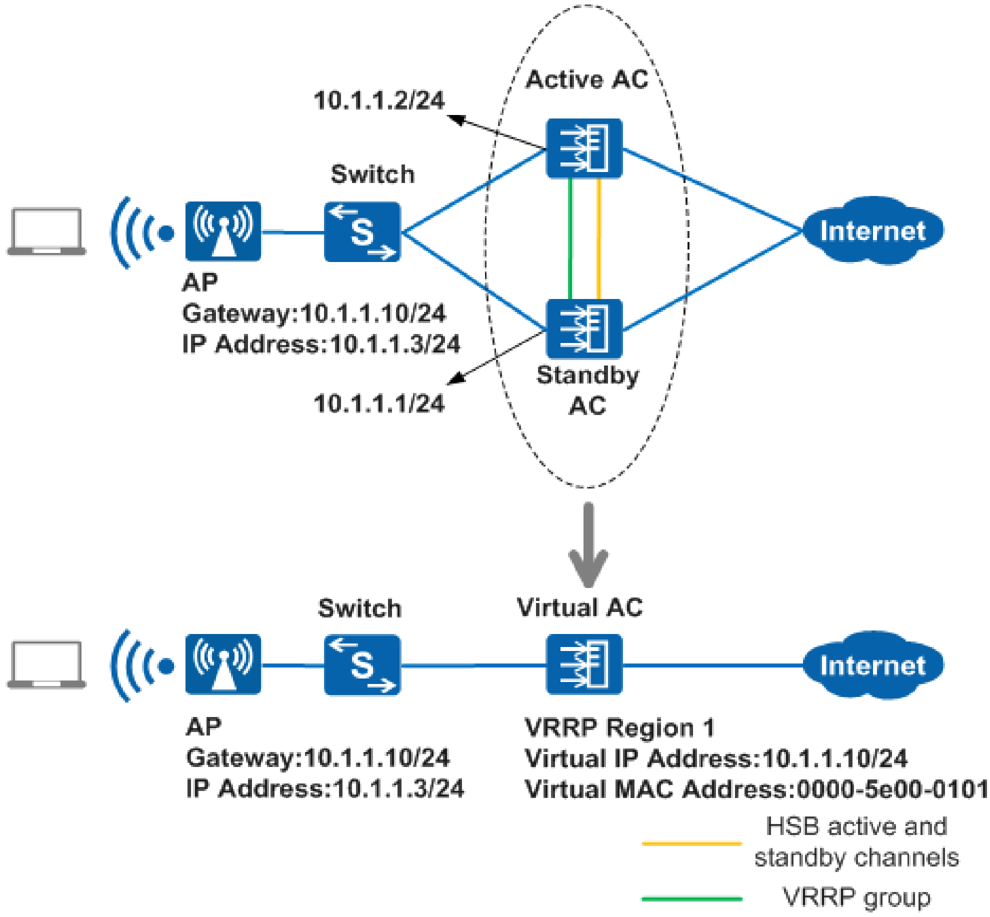
- HSB + dual-link backup: As shown in **Figure 1-77**, an AP establishes CAPWAP tunnels with both the active and standby ACs. The two ACs synchronize service information (such as NAC and WLAN service information) through the hot standby (HSB) function. When an AP is disconnected from the active AC, the AP notifies the standby AC of a switchover. This mode frees active and standby ACs from location restrictions and allows both ACs to be flexibly deployed. In this mode, the two ACs can implement load balancing to make efficient use of resources. However, service switching takes a relatively long time.

Figure 1-77 HSB + dual-link backup networking



- HSB + VRRP: As shown in **Figure 1-78**, an AP obtains only the virtual IP address of both the active and standby ACs. The active AC backs up information including AP entries, CAPWAP link information, and user information on the standby AC. In this mode, the AP only detects the presence of one AC. The active/standby switchover is determined by the Virtual Router Redundancy Protocol (VRRP). Currently, this mode cannot be used in a VRRP multi-instance scenario. This mode restricts deployment locations of both ACs. Compared to HSB + dual-link backup, services can be switched faster in this mode.

Figure 1-78 HSB + VRRP networking



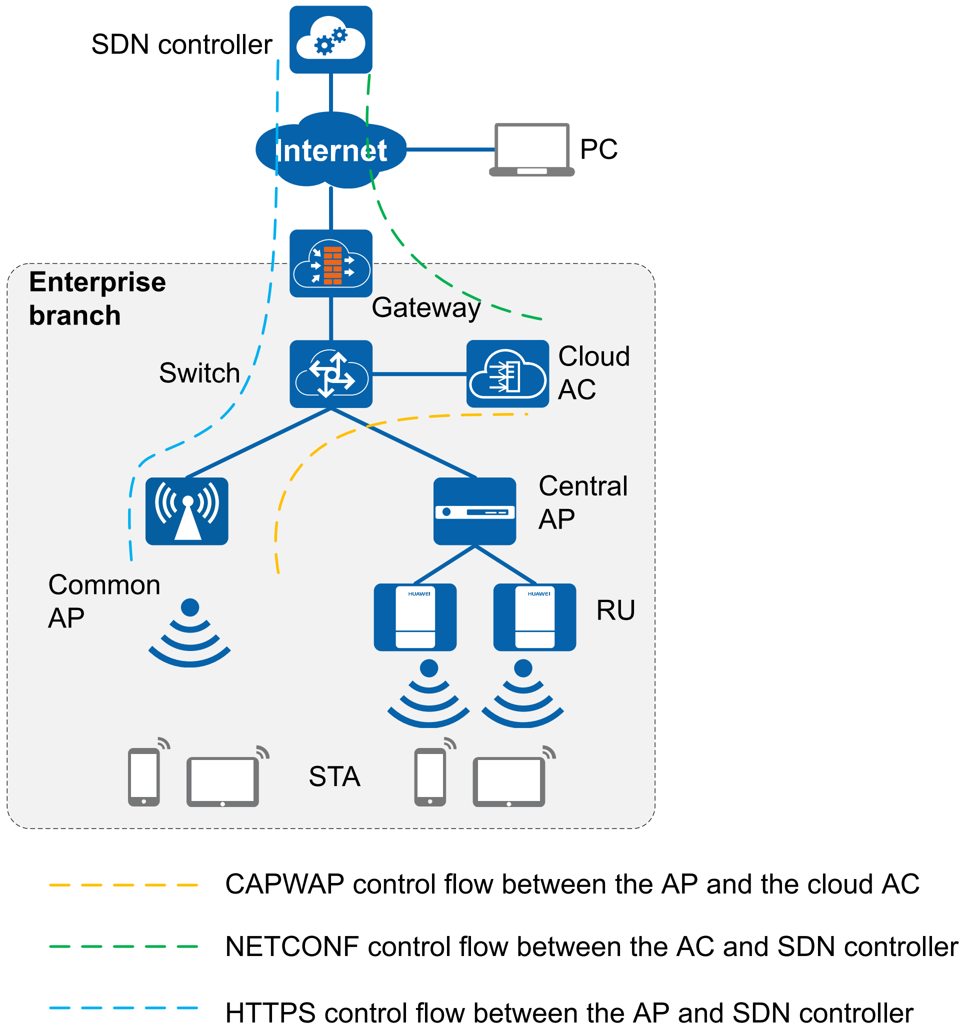
1.7.2.5 Cloud AC Networking

The cloud AC solution is suitable for medium- and large-sized sites with a large number of APs.

As shown in **Figure 1-79**, the AP in Fit mode registers with the AC through CAPWAP. The AC works in cloud mode and uses NETCONF to register with the SDN controller (CloudCampus@AC-Campus for ACs running V200R019C00 and earlier versions; iMaster NCE-Campus for ACs running V200R019C10 and later versions). The administrator can remotely manage the ACs and APs on the enterprise network to implement automatic WLAN deployment, service provisioning, and monitoring and O&M.

- Log in to the AC's web platform through the SDN controller to remotely configure services.
- Manage the status of ACs and APs on the SDN controller to learn about performance and service statistics in real time.

Figure 1-79 Typical cloud AC networking diagram



1.7.3 Hardware Information (AirEngine 9700-M)

Appearance and Structure

Figure 1-80 and **Figure 1-81** show the appearance of the AirEngine 9700-M.

Figure 1-80 Appearance of the AirEngine 9700-M (front view)

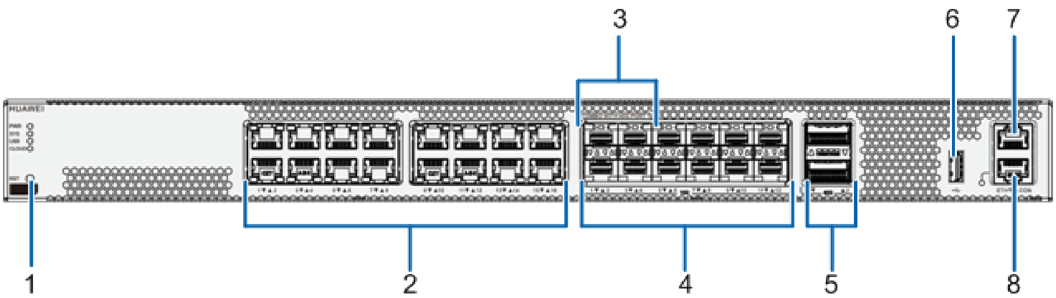
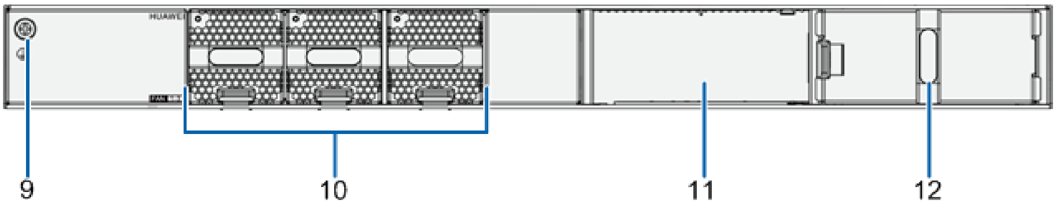


Figure 1-81 Appearance of the AirEngine 9700-M (rear view)



No.	Description
1	Reset button. ● Press the reset button (for no more than 3 seconds) to reset the AC manually. Resetting the AC will cause service interruption. Exercise caution when using this button. ● Press and hold down the reset button (for more than 5 seconds) to restore the AC configuration.
2	Sixteen 10/100/1000BASE-T Ethernet electrical ports.
3	Combo port: can be used as one 40GE QSFP+ optical port or four 10GE SFP+ optical ports. By default, the one 40GE QSFP+ optical works, and SFP+ ports 1 through 4 are unavailable. After these SFP+ ports are configured to work, the QSFP+ port becomes unavailable.
4	Twelve 10GE SFP+ uplink optical ports.
5	Two 40GE QSFP+ Ethernet optical ports. If an MPO connector is used, select the Type B fiber.
6	Standard USB 2.0 port.
7	Console port.
8	ETH management port.
9	Ground point.
10	Pluggable fan module. Houses a FAN-023A-B fan module. (Part Number: 02312DKW)
11	Power module slot.
12	Filler panel for the backup power module.

Indicator Description

Figure 1-82 shows the indicators on the AirEngine 9700-M front panel, and Figure 1-83shows the fan indicator.

Figure 1-82 Indicators on the AirEngine 9700-M front panel

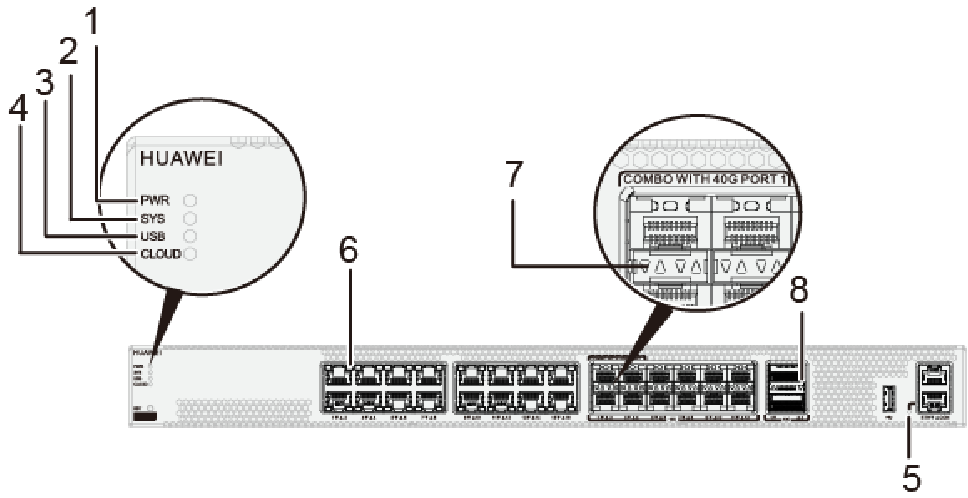


Figure 1-83 Fan indicator on the AirEngine 9700-M

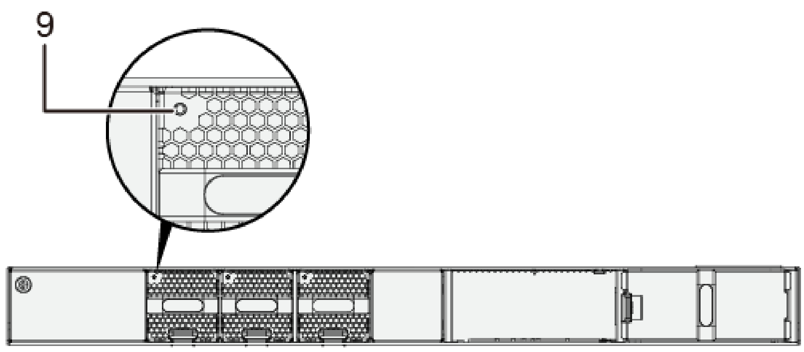


Table 1-21 describes the indicators on AirEngine 9700-M front panel.

Table 1-21 Description of indicators on AirEngine 9700-M front panel

Number	Indicator	Color	Description
1	PWR: power supply indicator	-	Off: The system is powered off or faulty.
		Green	Steady on: The power module is working properly.

<table>
<tr><th>Number</th><th>Indicator</th><th>Color</th><th>Description</th></tr>
<tr><td rowspan="3">2</td><td rowspan="3">SYS: system status indicator</td><td>-</td><td>Off: The system is not running.</td></tr>
<tr><td>Green</td><td>● Fast blinking (4 Hz): The system is starting.
● Slow blinking (0.5 Hz): The system is running properly.
● Steady on: The system is powering on or restarting.</td></tr>
<tr><td>Red</td><td>Steady on:
● The system is faulty.
● The power module does not work properly.
NOTE
When the device supports two power modules:
1. If only one power module is available and is running properly, the SYS indicator blinks green.
2. If two power modules are present in the power supply slots and one or two of them are faulty, the SYS indicator blinks red.
● The fan module does not work properly.
NOTE
When the red indicator is on, the reasons are one or more of the preceding ones. Locate faults in sequence.</td></tr>
<tr><td rowspan="2">3</td><td rowspan="2">USB indicator</td><td>-</td><td>Off: No USB flash drive is connected to the AC.</td></tr>
<tr><td>Green</td><td>Steady on: A USB flash drive is connected and works properly.</td></tr>
<tr><td>4</td><td>CLOUD indicator</td><td>Green</td><td>● Off: The device is not connected or lost the connection to the Agile Controller-Campus.
● Steady on: The connection to the Agile Controller-Campus is normal.
● Fast blinking (4 Hz): The device is connecting to the Agile Controller-Campus.</td></tr>
</table>

Number	Indicator	Color	Description
5	ETH indicator	Green	• Off: No link is established on the ETH port. • On: The ETH port is connected. • Blinking: The ETH port is sending or receiving data.
6	GE electrical service port indicator Indicators correspond to ports 1 through 12 from left to right.	Green	• Off: No link is established on the port. • Steady on: The port is connected. • Blinking: The port is sending or receiving data.
7	GE/10GE optical service port indicator • A down arrow indicates a lower port, while an up arrow indicates an upper port. • Four indicators (arrows) are located between two ports vertically, with two yellow indicators on the left, and two green indicators on the right.	Green	• Off: No link is established on the port. • Steady on: The port is connected.
		Yellow	Blinking: The port is sending or receiving data.

Number	Indicator	Color	Description
8	40GE optical service port indicator	Green	• Off: No link is established on the port. • Steady on: The port is connected. • Blinking: The port is sending or receiving data.
9	Fan indicator	-	Off: The fan module is not installed.
		Green	Blinking: The fan module is working properly.
		Red	Blinking: The fan is not running at a proper speed or stops rotating.

Physical Specifications

Table 1-22 Physical specifications

Item		Description
Physical specifications	Dimensions (H x W x D)	• Basic: 43.6 mm x 442 mm x 420 mm • Maximum: 43.6 mm x 442 mm x 444 mm
	Weight	5.65 kg
Power specifications	Maximum power consumption	122.3 W
	Rated input voltage	• AC power input: 100 V AC to 240 V AC, 50/60 Hz • DC power input: 240 V DC
Environment specifications	Operating temperature and altitude	• - 60 m to +1800 m: 0°C to +45°C • 1800 m to 5000 m: Temperature decreases by 1°C every time the altitude increases 300 m.
	Storage temperature and altitude	-60 m to +5000 m: -40°C to +70°C
	Operating altitude of the power modules	0 m to 5000 m
	Relative humidity	5% RH to 95% RH, noncondensing

1.7.4 Performance Specifications (AirEngine 9700-M)

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.

1.8 ACU2 Product Description

1.8.1 ACU2 Overview

Wireless local area network (WLAN) uses radio technology to implement fast Ethernet access. Data traffic sent from wireless stations (STAs) to the Internet is transmitted over two types of media: wireless links between the STAs and access points (APs) and wired links between APs and access controllers (ACs). WLAN technology allows STAs, such as computers, to access a network through a wireless medium but not a physical cable. This facilitates network construction and allows users to move around without interrupting communication.

1.8.1.1 Introduction to the ACU2

The ACU2 can be installed on an S7700&S9300&S9700&S12700 switch and functions as a WLAN AC. The ACU2 is used to deploy WLANs on industry networks.

The ACU2's WLAN feature makes network construction and access more flexible.

Product Orientation

Wireless local area network (WLAN) technology defined in IEEE 802.11 is widely used on MANs and enterprise networks. WLAN can be used as the last-mile access solution. Compared with other wireless access technologies, WLAN provides higher bandwidth with lower costs, fully meeting user requirements for the high-speed wireless broadband service.

As increasing laptops, tablet PCs, and Wi-Fi mobile phones are used to connect to the Internet, WLAN access has become an important access mode for enterprises, and therefore wireless access control and switching are indispensable on enterprise networks.

The ACU2 is a service unit used on a chassis switch and provides access control capabilities on an enterprise wireless network. An aggregation switch with an ACU2 provides both wireless and wired service capabilities, reducing space occupied and cables in equipment rooms and lowering network construction cost.

ACU2s can be installed on chassis switches such as S7700&S9300&S9700&S12700 to establish WLAN networks.

A commonly used deployment mode is to install ACU2s on an aggregation switch. Another method is to install ACU2s on a switch connected to the aggregation switch in bypass mode. The AP management capability of the switch can be expanded smoothly by adding ACU2s on the switch.

Product Characteristics

- High access capacity and processing capability
  - An ACU2 can manage a maximum of 2048 APs (packet forwarding over 2048 tunnels) and supports a maximum of 32K STAs.
  - The ACU2 provides nearly 40 Gbit/s line-speed forwarding capacity.
- Independent service unit, facilitating centralized deployment and capacity expansion
  - The ACU2 provides access control capabilities on an enterprise wireless network. An aggregation switch with ACU2s provides both wireless and wired service capabilities, reducing space occupied and cables in equipment rooms and lowering network construction cost.
  - You can install multiple ACU2s on a switch to manage *N*x2048 APs. (*N* is the number of ACU2s.)
- Flexible user policy management and authority control capabilities
  - The ACU2 implements per-user access control based on parameters delivered by the RADIUS server, such as ACLs, VLAN IDs, and bandwidth limit.
  - You can define user groups for users of different rules and apply access control policies to the user groups. Access of users in a user group is controlled based on the ACL, user isolation policy, and bandwidth limit applied to the user group. You can configure inter-group user isolation or intra-group user isolation as required to implement access control.
- Visualized WLAN network management and maintenance

  The ACU2 and APs establish a fit AP+AC networking for centralized AP management, facilitating network management and maintenance. Huawei AC and AP products support standard Link Layer Discovery Protocol (LLDP), which helps display topology of wired and wireless networks for visualized management and maintenance.

1.8.1.2 ACU2 Functions and Applications

An ACU2 is a WLAN service card installed on a chassis switch such as an S7700&S9300&S9700&S12700 switch.

WLAN ACU2 provides the following functions:

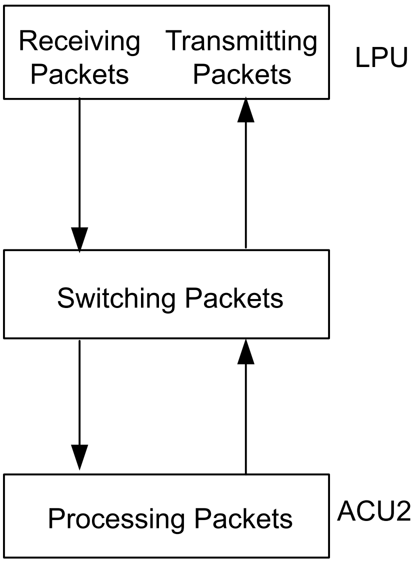
- Centralized configuration and management of APs
- WLAN user access control (authentication and authorization)
- WLAN service configuration and delivery
- Integrated DHCP server to assign addresses to STAs
- Traffic management, congestion control, forwarding and scheduling of data packets

Data Processing on the ACU2

The ACU2 can be installed in any LPU slot of a chassis switch such as the S7700&S9300&S9700&S12700. The ACU2 processes data packets sent from the MPU of the S7700&S9300&S9700&S12700 to manage APs in a centralized manner and control access from STAs. In centralized deployment mode, the ACU2 is responsible for routing and forwarding of wireless user traffic.

Figure 1-84 shows how the ACU2 processes data.

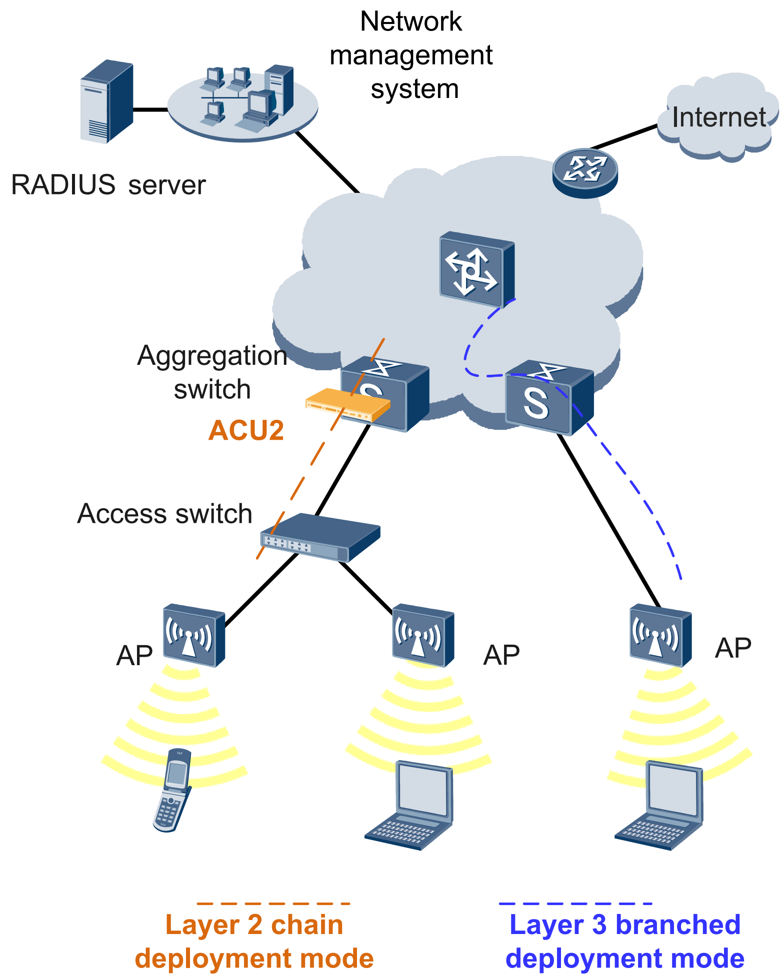
Figure 1-84 Data processing on the ACU2



Typical Networking of the ACU2

Figure 1-85 shows deployment of the ACU2 in a WLAN (AC + fit AP) networking.

Figure 1-85 WLAN networking



Different from an individual case-shaped AC, the ACU2 is installed on a switch. The ACU2 supports two deployment modes:

- Layer 2 chain deployment mode: as shown in the left part of **Figure 1-85**

  The ACU2 is installed on an aggregation switch to manage APs connected to the aggregation switch directly or through an access switch.

  In this deployment mode, the network between aggregation switches (ACs) and APs is a Layer 2 network.

- Layer 3 branched deployment mode, as shown in the right part of **Figure 1-85**

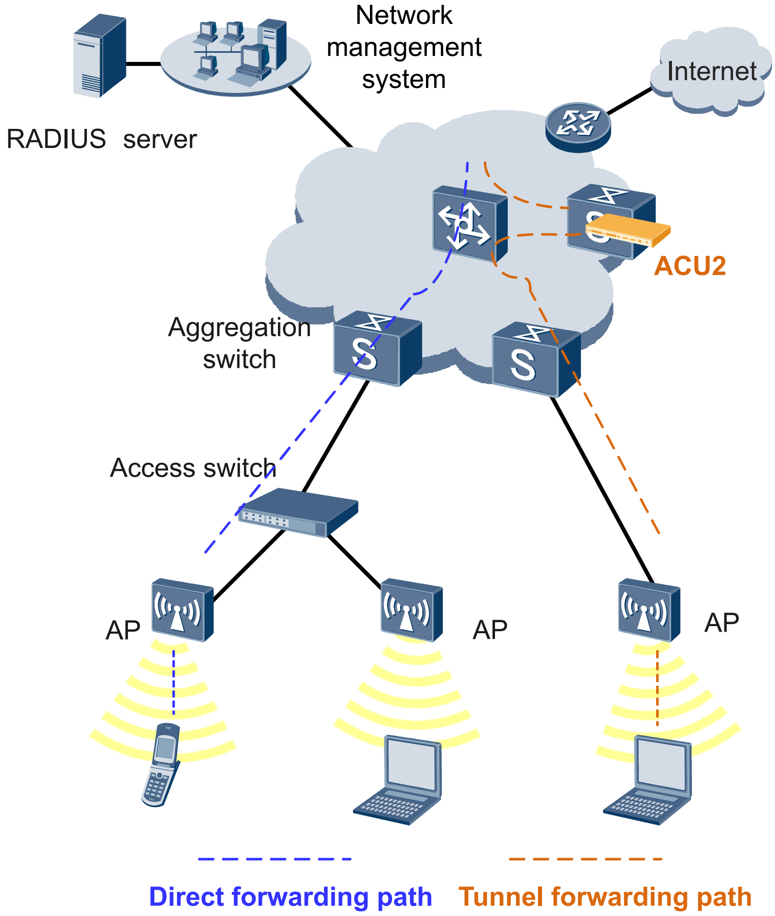
  The ACU2 is installed on an aggregation switch other than the aggregation switch connected to APs. APs communicate with the ACU2 through the local aggregation switch. In this deployment mode, the network between ACs and APs is a Layer 3 network.

NOTE

- Layer 2 chain deployment is recommended for small- and medium-scale WLAN networking because this mode brings fewer changes to existing network.
- Layer 3 branched deployment is recommended for large-scale WLAN networking. As shown in **Figure 1-86**, a chassis switch is used as an AC. In this deployment mode, the WLAN network capacity can be smoothly expanded by installing more ACU2s on the aggregation switch.

ACU2 Forwarding Mode

Figure 1-86 ACU2 forwarding mode



- Direct Forwarding

  In direct forwarding mode, wireless user service data is translated from 802.3 packets into 802.11 packets, which are then forwarded by an uplink aggregation switch.

  The branched networking mode is often used on enterprise networks. Wireless user service data does not need to be processed by an AC, eliminating the bandwidth bottleneck and facilitating the usage of existing security policies. Therefore, this networking mode is recommended.

- Tunnel Forwarding

In tunnel forwarding mode, wireless user service data is transmitted between APs and ACs over CAPWAP tunnels.

Both control flows and service data flows are transmitted in CAPWAP tunnels. APs send data packets to the switch where the ACU2 is installed, and the ACU2 decapsulates the packets and forwards the packets.

Traffic from wireless users under all APs is aggregated to the AC through CAPWAP tunnels to implement centralized traffic control.

1.8.2 Hardware Structure of the ACU2

This section describes hardware information about the ACU2.

1.8.2.1 Appearance and Structure

This section describes appearance and structure of ACU2.

Figure 1-87 shows ACU2 appearance.

Figure 1-87 ACU2 appearance

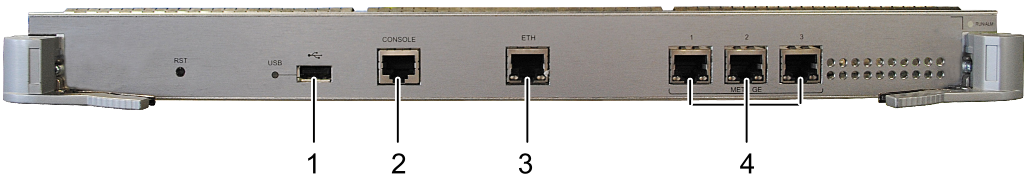


Table 1-23 Description of ACU2 buttons and interfaces

No.	Interface	Quantity	Description
1	RST	-	The Reset button is used for resetting cards manually. Resetting a card interrupts services. Confirm the action before you press this button.
2	USB interface	1	Connects to a USB flash drive to transfer configuration files.
3	Console interface	1	Provides a serial interface. To configure the ACU2 locally, you can log in to the local ACU2 by connecting a cable between the serial interface on the host and the console interface on the ACU2.
4	Ethernet interface	1	Provides a GE interface. To configure the ACU2, you can log in to the ACU2 through Telnet.
5	GE interface	3	Reserved interface

1.8.2.2 Interface Attributes

This section describes connector types, attributes, operation modes, and compliance standards of the serial interfaces and ETH interfaces on the ACU2 panel.

Table 1-24 and **Table 1-25** describe attributes of the interfaces on the ACU2.

Table 1-24 Serial interface attributes

Attribute	Description
Connector type	RJ45
Interface attribute	RS232
Standards compliance	EIA/TIA-232

Table 1-25 Ethernet interface attributes

Attribute	Description
Connector type	RJ45
Interface attribute	10BASE-T/100BASE-TX/1000BASE-T
Operation mode	Full duplex
Standards compliance	IEEE 802.3

1.8.2.3 Indicator Description

This section describes indicators on the panel of ACU2, including its colors, blinking states, and state meanings.

Figure 1-88 shows indicators on the ACU2 panel.

Figure 1-88 Indicators on the ACU2 panel

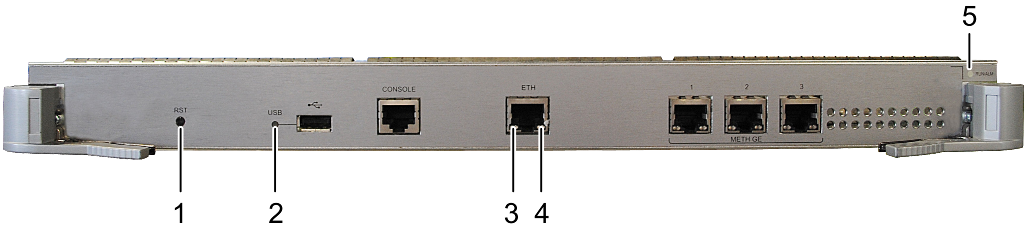


Table 1-26 describes indicators on the ACU2.

Table 1-26 Indicators on the ACU2

No.	Indicator/ Button	Color	Description
1	USB	Off	In the current version, the USB indicator remains off.
2	ACT	yellow	When the indicator blinks, data is being transmitted or received. When the indicator is off, no data is being transmitted or received.
3	LINK	Green	When the indicator is on, the link is connected. When the indicator is off, the link is blocked.
4	RUN/ALM	Green	When the indicator is on, the board is powered on but the software is not running. When the indicator blinks once every 2s (0.5 Hz), the system is running properly. When the indicator blinks once every 0.25s (4 Hz), the system is starting.
		Red	When the indicator is on, the board is faulty.
		yellow	When the indicator is on, the board is installed in the slot and is powered on.

1.8.2.4 Technical Specifications

This section describes technical specifications of the ACU2, including board dimensions, maximum power consumption, and board weight.

Table 1-27 describes technical specifications of the ACU2.

Table 1-27 Technical specifications of the ACU2

Parameter	Description
Board dimensions	35.56 mm x 380.00 mm x 378.45 mm (height x width x depth)
Maximum power consumption	168 w
Board weight	3.2 kg

1.8.3 Performance Specifications of the ACU2

For AC performance specifications, log in to **Huawei official website** and download the brochure of the corresponding AC model, or query the specifications using **Info-Finder**.