

HUAWEI ENTERPRISE ICT SOLUTIONS **A BETTER WAY**

# Huawei WLAN Tech-level Main Slide

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HUAWEI TECHNOLOGIES CO., LTD.



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**1****Ubiquitous WiFi on the Access Network****2****WLAN Network Design****3****Service Design****4****Products****5****Success Stories**

# What is a Wireless Campus Network?



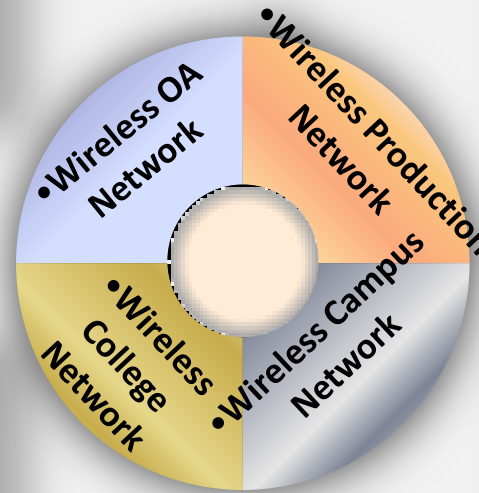
Government, finance, traffic control and energy ...



Utilities, oil and manufacturing...



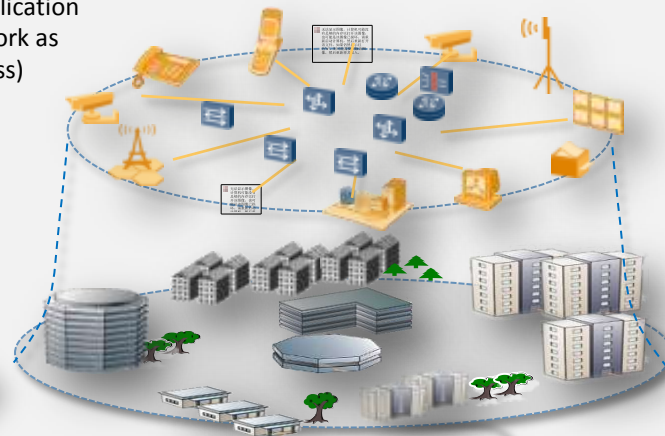
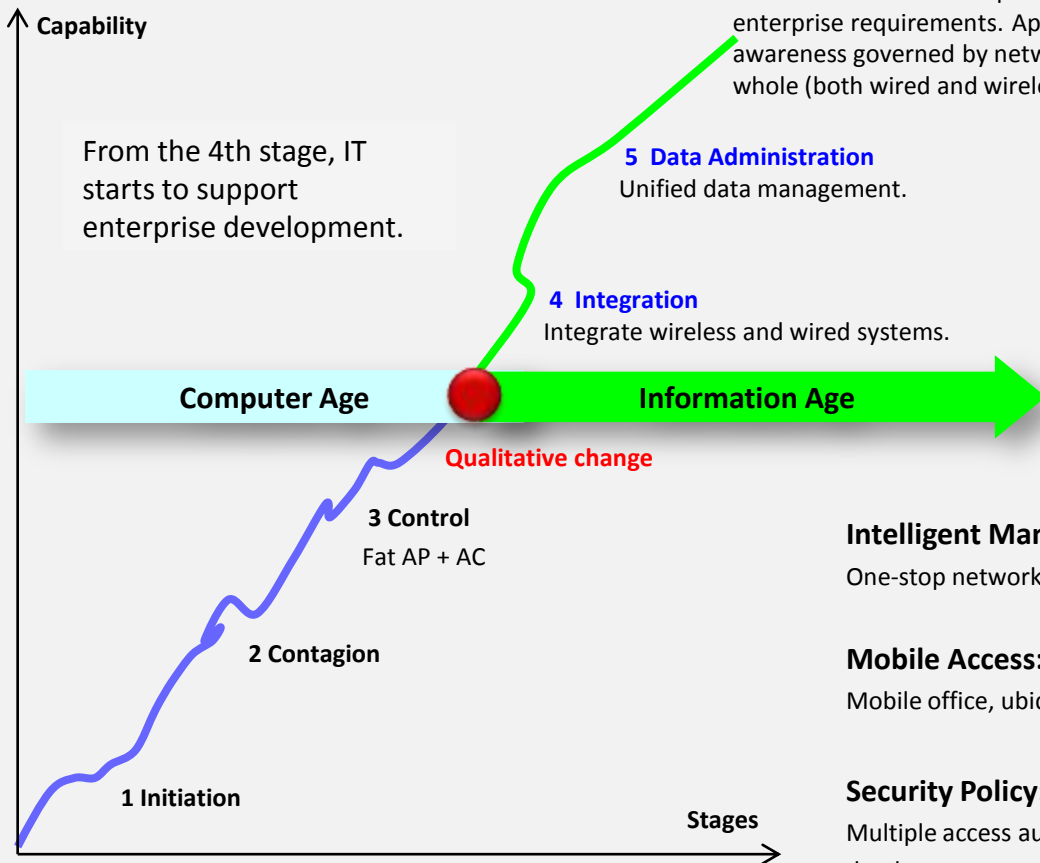
Wireless college campus network



Hi-tech park, software park ...

Campus Type	Small	Medium	Large
Number of Terminals	< 200	200-1000	> 1000

# Information Age Needs the Wireless Campus Network



## Stages of Growth Model

This model describes enterprise development in 6 phases.

### Intelligent Management:

One-stop network management, wired+wireless integrated



### Mobile Access:

Mobile office, ubiquitous mobile access, mobile privacy



### Security Policy:

Multiple access authentication, rights and zone management, database management, behavior monitoring



### Intelligent Campus:

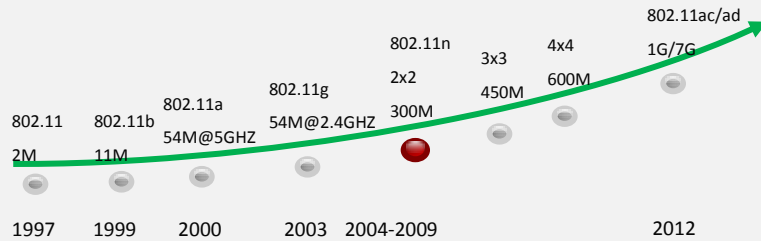
Intelligent power management, fast deployment, intelligent operation and maintenance, precise access point control



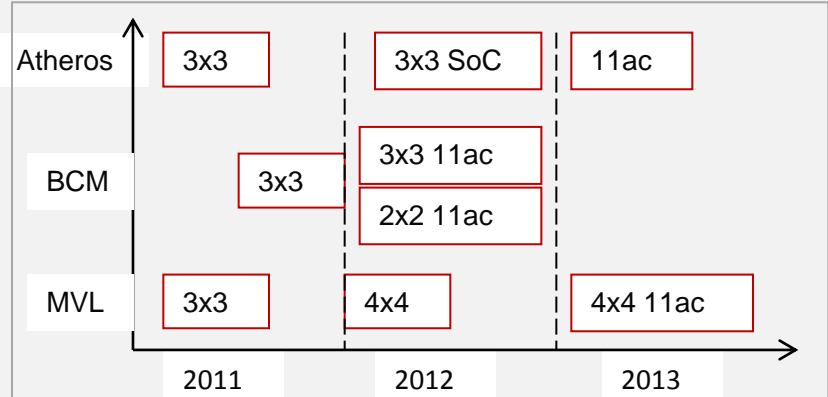
# WLAN Development: Frequent Technology Updates, a Supplement or Replacement to

## Fast efficiency improvement

IEEE promotes WLAN development. MIMO encounters a performance bottleneck in 3x3 and 4x4 phases. High-performance 802.11ac is being developed and will be released at the end of 2012.



## New ICs complying with latest standards are launched every year



Major IC vendors focus on 802.11ac, and ICs complying with 802.11ac will be launched at the end of 2012.

## Mobile office becomes popular in enterprises, 1.019 billion people in 2013

	2008	2013
USA	72.2%	75.5%
Japan	62.9%	74.5%
Asia	30.2%	37.4%
Western Europe	48.7%	50.3%
Others	13.5%	15.4%

Source: IDC

## Wireless networks use low TCO and high service experience to replace wired networks

Item	11n-compliant AP	Access Switch
TCO	Low cost on cables, saving 75% cost	High
	OAM cost: cables are not required, saving 50% cost	High (24 cables)
	Easy to scale, move, and add ports	Difficult to add ports
Service experience	Access any where	No mobility
	Scalable to meet bandwidth and user requirements	Difficult to scale
	WPA2-Enterprise meets security requirement.	Similar to AP
	Service integration: location service and resource management	None

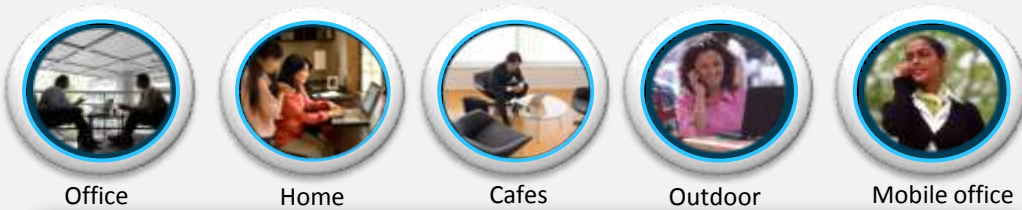
APs have various models using the latest technologies to apply to different use scenarios. The newly launched ICs improve APs competitiveness.

# Challenges to Wireless Campus Networks

Today, many new wireless applications are emerging. Enterprises require various wireless data services, including ERP, financial management, and OA. These requirements promote wireless campus network development as well as posing challenges to wireless campus networks.



## Nearby wireless campus networks



1

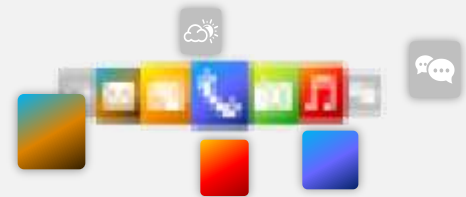
WiFi signal strength in high-density area

## Various applications



2

Packet loss due to insufficient bandwidth



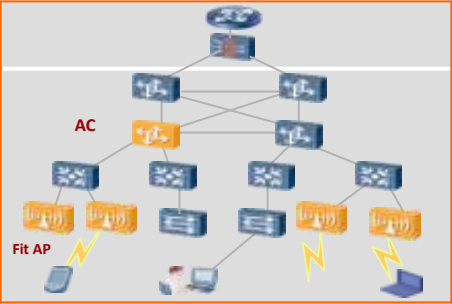
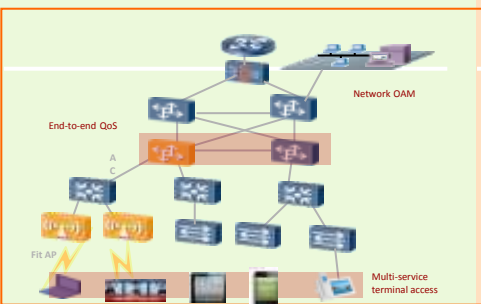
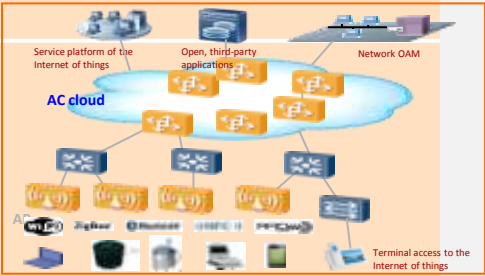
3

Heavy load of device maintenance and management



# Huawei Wireless Campus Network Solution

## -From wireless + wired integration to full-wireless

	Wired + wireless data bearer	Service-oriented media bearer	Cloud AC + aware of wireless
Characteristics	<ul style="list-style-type: none"> <li>Wired + wireless integration</li> <li>Switching + AC integrating</li> </ul>	<ul style="list-style-type: none"> <li>Service-oriented, QoS, all scenarios</li> <li>Integrated media</li> </ul>	<ul style="list-style-type: none"> <li>Cloud AC structure and platform</li> <li>The Internet of things, high bandwidth, real-time application</li> </ul>
Key features	<ul style="list-style-type: none"> <li>Switch integrating AC</li> <li>Fat AP, fit AP</li> <li><b>802.11a/b/g/n</b></li> <li><b>Security: WEP, WPA2, WAPI</b></li> <li>Multiple product series</li> <li>(integration of Wired/Wireless switch )</li> </ul>	<ul style="list-style-type: none"> <li>Service QoS, WMM</li> <li>Security: spectrum, L2-L7 association</li> <li>Locating RFID, RRM, network plan and optimization</li> <li>VoWLAN, video, Telepresence</li> <li>Mesh</li> </ul>	<ul style="list-style-type: none"> <li>Virtual AC and cloud structure</li> <li>Content aware and open service</li> <li>AP multi-link (LTE, TD, WiMAX)</li> <li>Industry AP, IP67, applicable to bad environment</li> <li>802.11ac</li> </ul>
Services	<ul style="list-style-type: none"> <li>Data transmission channel</li> </ul>	<ul style="list-style-type: none"> <li>ICT: voice, data, multimedia</li> <li>Industry: warehouse, hospital, jail</li> </ul>	<ul style="list-style-type: none"> <li>The Internet of things, intelligent service channel, fusion of multiple control platform</li> </ul>
Market	<ul style="list-style-type: none"> <li>Widely used in commercial markets</li> </ul>	<ul style="list-style-type: none"> <li>Used in some commercial markets</li> </ul>	<ul style="list-style-type: none"> <li>Propagandize</li> </ul>
Typical network			
	Now	2011-2013	2013-

# Contents

## 2

## WLAN Network Design

1

**Basic Network Architecture and Design**

2

Network Plan and Forwarding Model

3

Reliability Design

4

Wireless Quality Scheduling

5

Security Design

6

Network Management Design

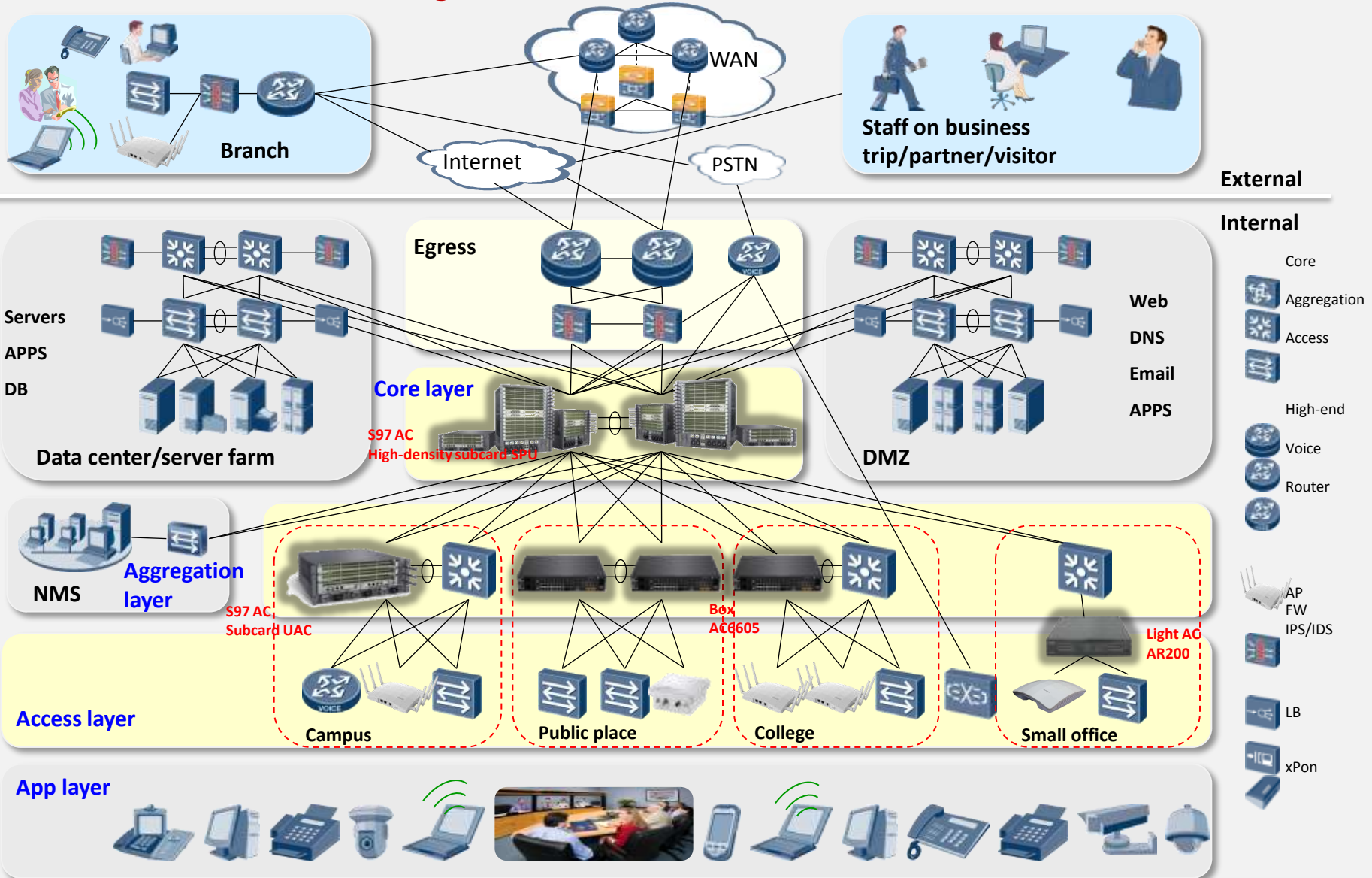
# WLAN Architecture

## Smart Wireless Campus Architecture

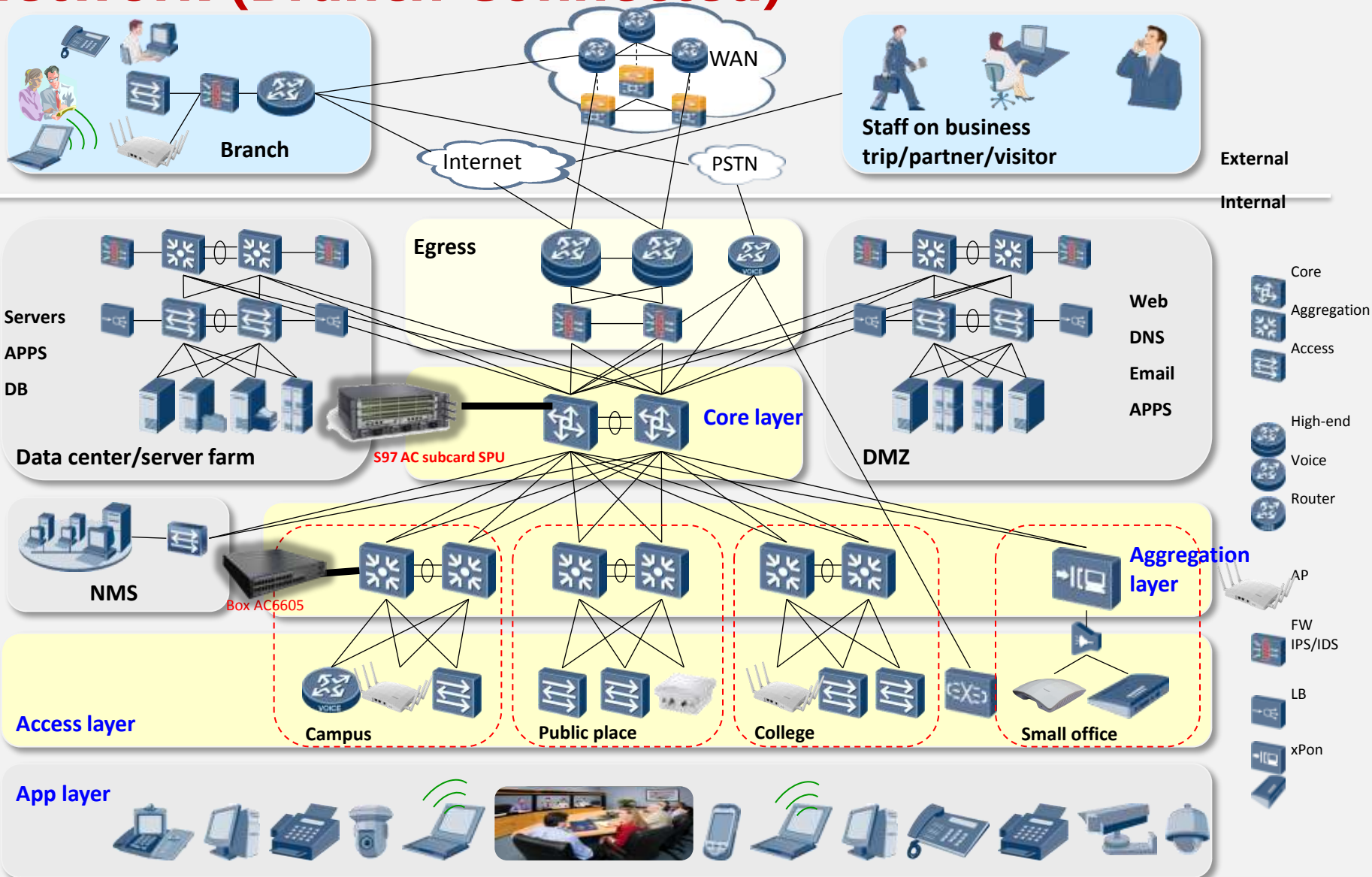
Multi-Layer Design	Centralized Management Design	Multi-Service Design
Core layer Aggregation layer Access layer	AC + AP ubiquitous structure Improve reliability Reduce deployment and maintenance costs Improve bandwidth efficiency Provide clear logical topologies	Secure access Wireless access authentication Multiple types of user isolation Customized forwarding mode

- **Smart wireless terminal integration**
- **Smart wireless access synchronization**
- **Smart wireless management unification**

# Basic Network Architecture- Greenfield Network (Directly Connected)

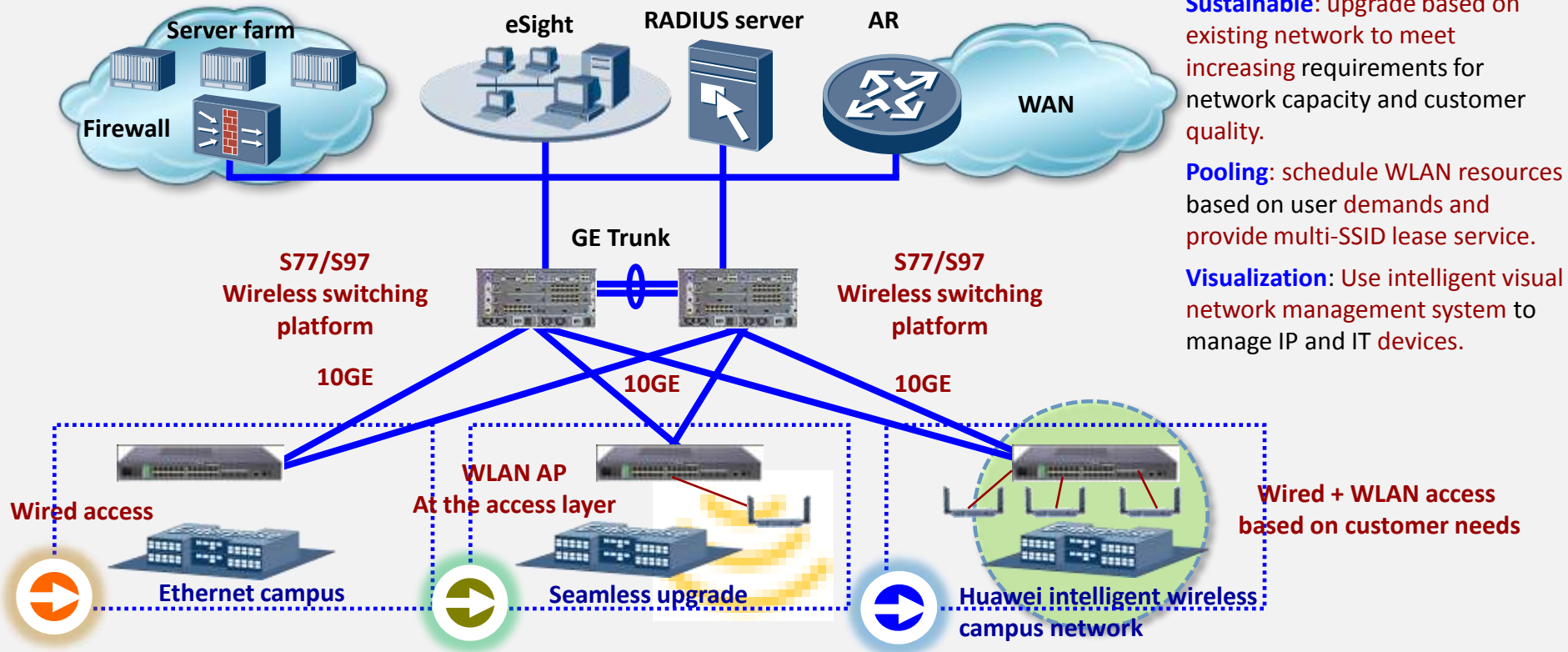


# Basic Network Architecture-Upgraded Network (Branch Connected)



- Core
- Aggregation
- Access
- High-end
- Voice
- Router
- AP
- FW
- IPS/IDS
- LB
- xPon

# Ubiquitous WiFi Ensures Sustainable WLAN Development on Ethernet



**Evolution:** migrate to cloud AC and virtual AP.

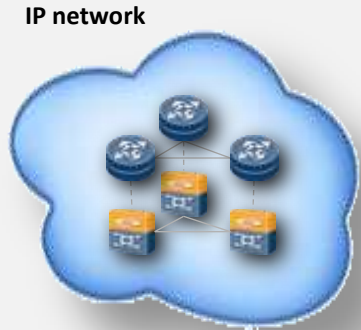
**Sustainable:** upgrade based on existing network to meet increasing requirements for network capacity and customer quality.

**Pooling:** schedule WLAN resources based on user demands and provide multi-SSID lease service.

**Visualization:** Use intelligent visual network management system to manage IP and IT devices.

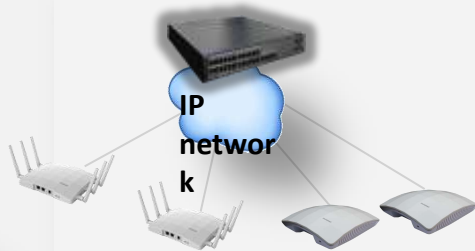
Huawei wireless network seamless upgrade solution helps you fix the problems of wireless office, Ethernet upgrade, virtual wireless, data security, multi-tenant, uniform authentication and accounting, and multi-service. **It sets up an intelligent sustainable wireless network for you.**

# WLAN Deployment



Intelligent coverage  
Intelligent detection  
Intelligent and convenient O&M

## Indoor Deployment



### Centralized management:

WLAN APs are managed by an AC in a centralized manner and services on APs are forwarded by an AC or using IP routes.

Industry: **Indoor office network** (office wireless networks are managed by an AC in a centralized manner)

## Indoor DAS Deployment



**Ubiquitous coverage:** The coverage is the same as that on the 2G/3G network. **Signals are mixed.** WLAN and 3G data services are authenticated uniformly.

Industry: hotels and buildings

## Distributed Outdoor Deployment



### O&M synergy:

Outdoor area-based management, **services aggregated on the AC**, ensuring services on outdoor APs and adjusting signal coverage

Industry: wireless cities, outdoor stadiums, and intelligent campus networks



Enterprise



Education



Government



Electric power



Energy



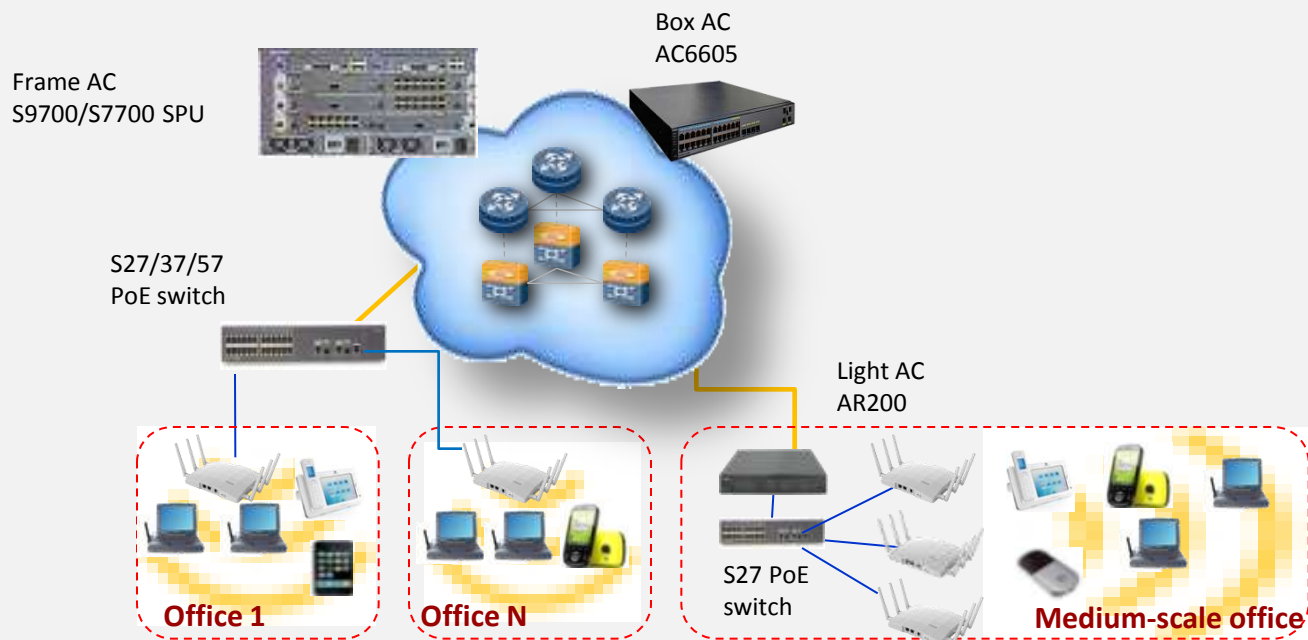
Finance



Transportation

.....

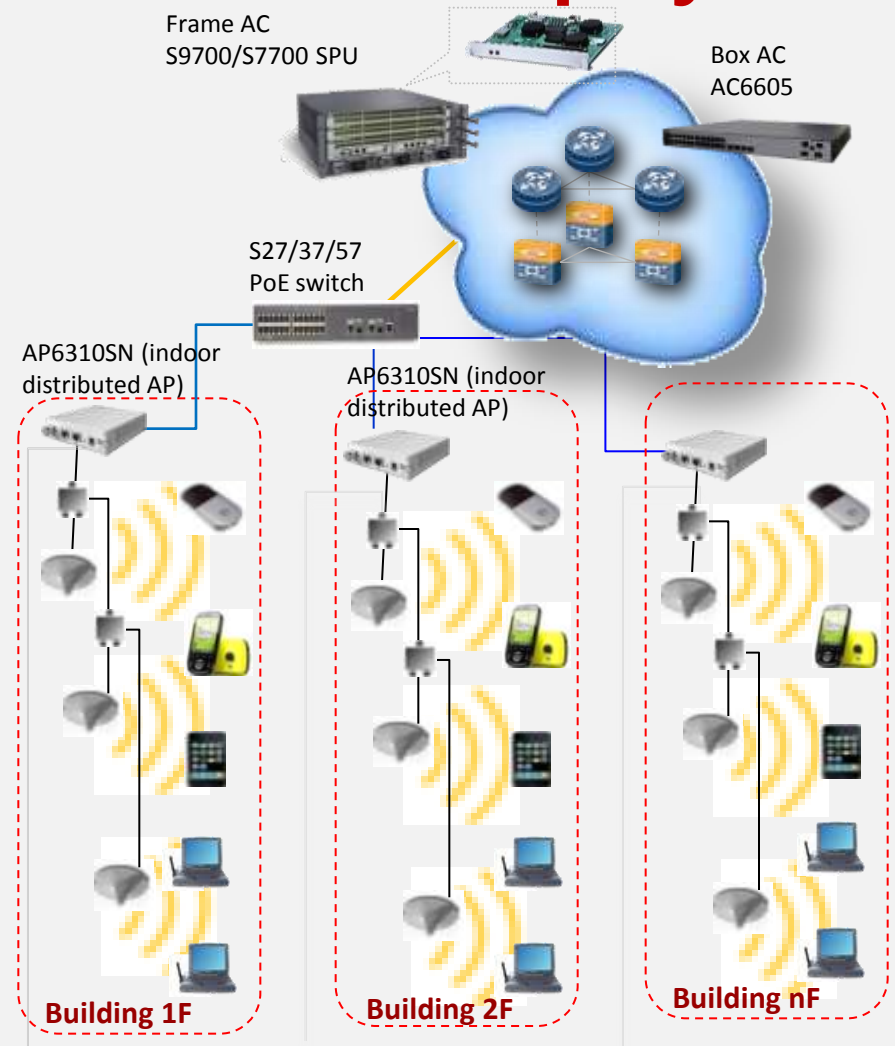
# Deployment on the Access Side – Indoor Distributed Deployment



Indoor distributed deployment is often used. The distributed AP connects to an upstream network node such as the access switch or light routing AC on the access side, and connects to downstream WLAN terminals through WLAN signaling.

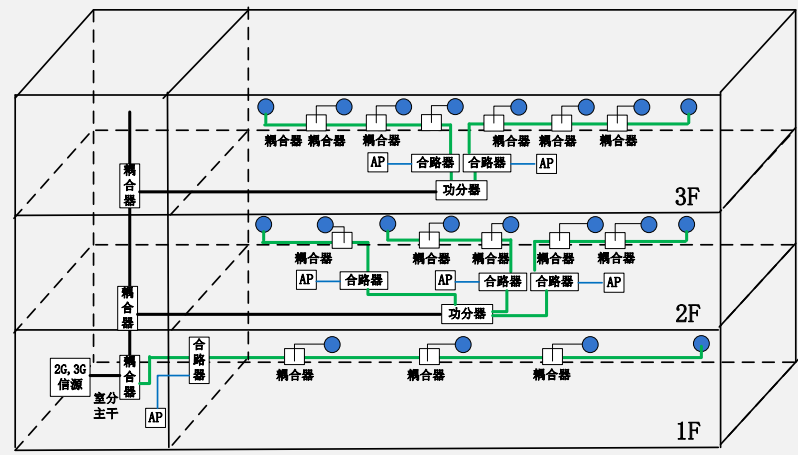
Indoor distributed deployment applies to small- or medium-scale scenarios such as open areas and meeting rooms.

# Deployment on the Access Side – Indoor DAS Deployment

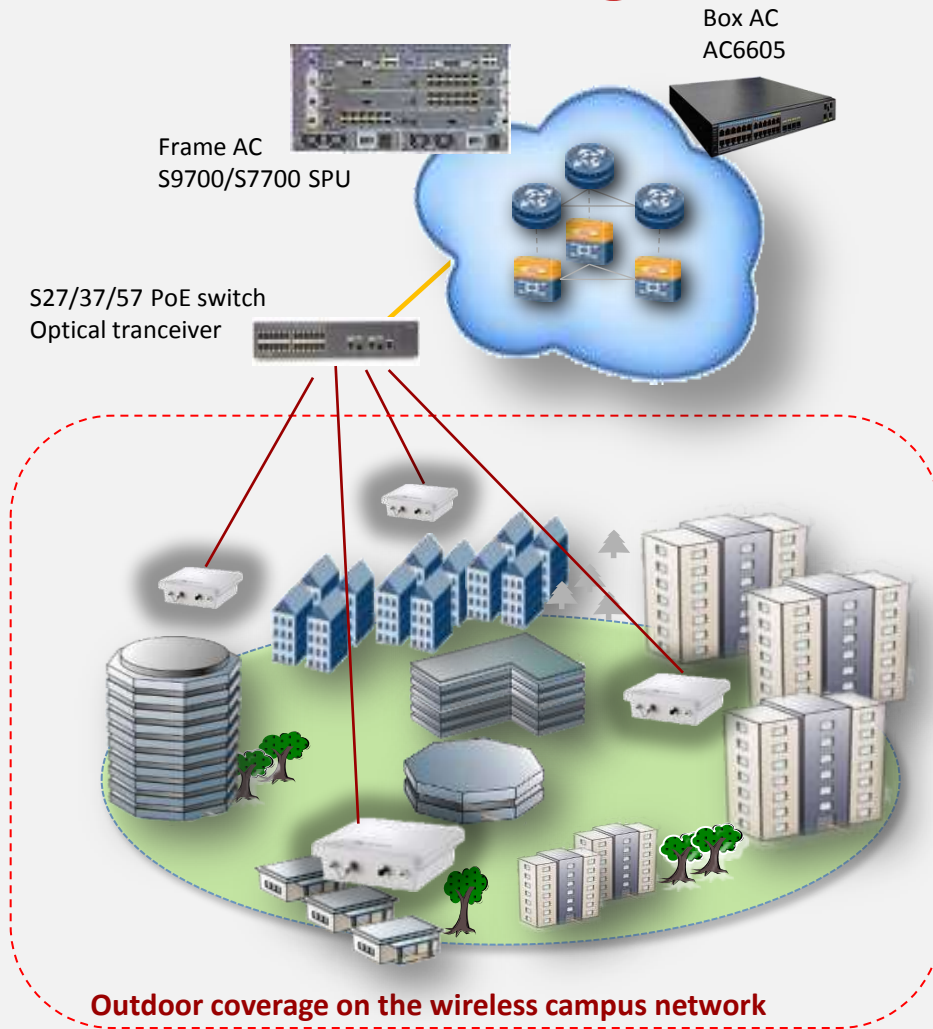


2G/3G indoor distribution system

Indoor DAS deployment has been applied to 2G/3G indoor distribution environments. The indoor DAS AP uses the line where 2G/3G signals are transmitted, saving deployment costs.



# Deployment on the Access Side – Outdoor Coverage

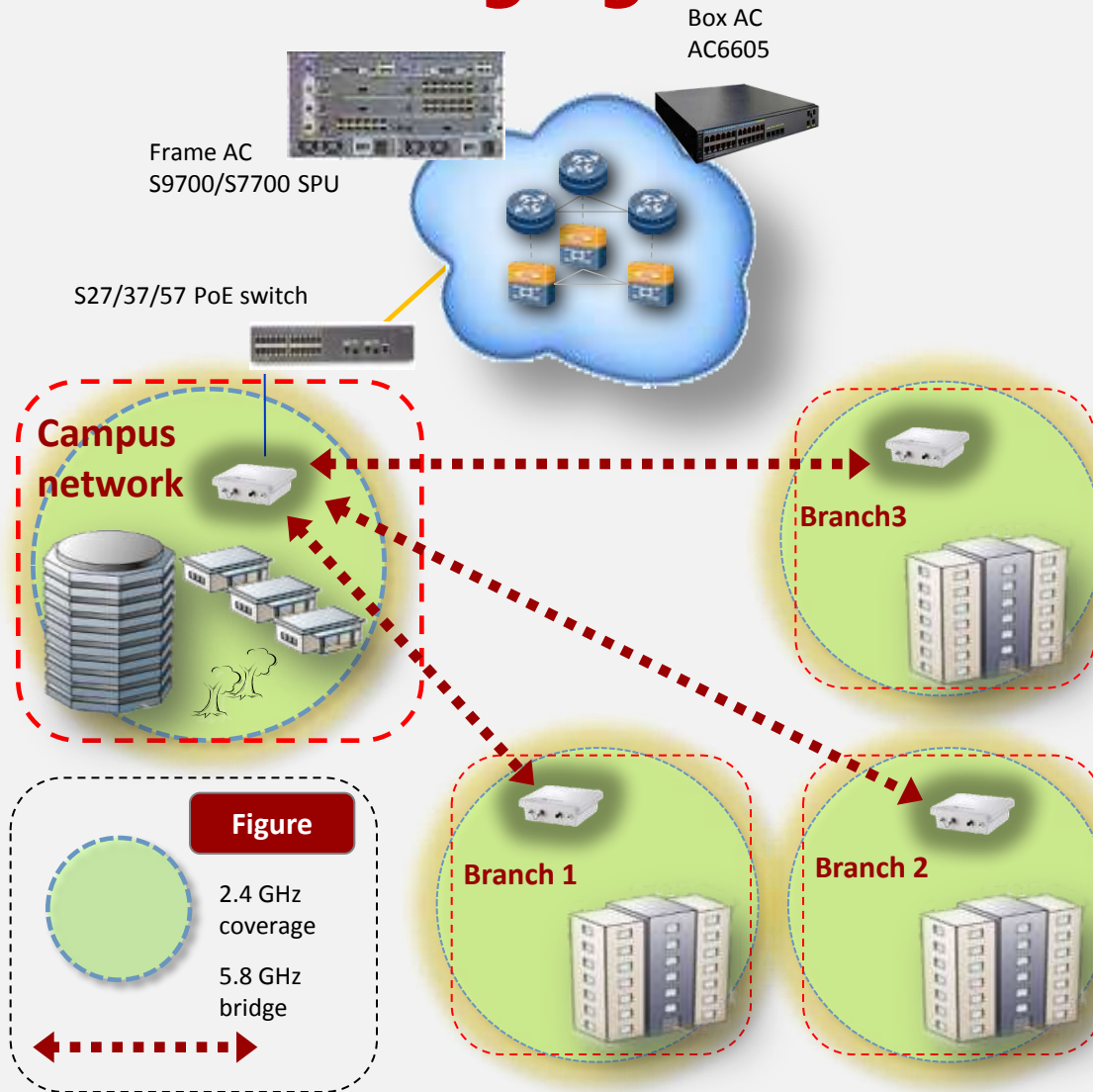


Huawei outdoor AP provides full power and high receiver sensitivity. It uses a metal shell and high protection levels. It can work in very low temperatures and is applicable in challenging environments.

The AP can be used in open areas with distributed users and wide coverage, for example, squares, streets, and countries.

It applies to open wireless networks with simple, building structure, small signal coverage, high density of users, and high capacity demands, for example, outdoor WLANs of hotels, airports, schools, and medium- and small-scale enterprises.

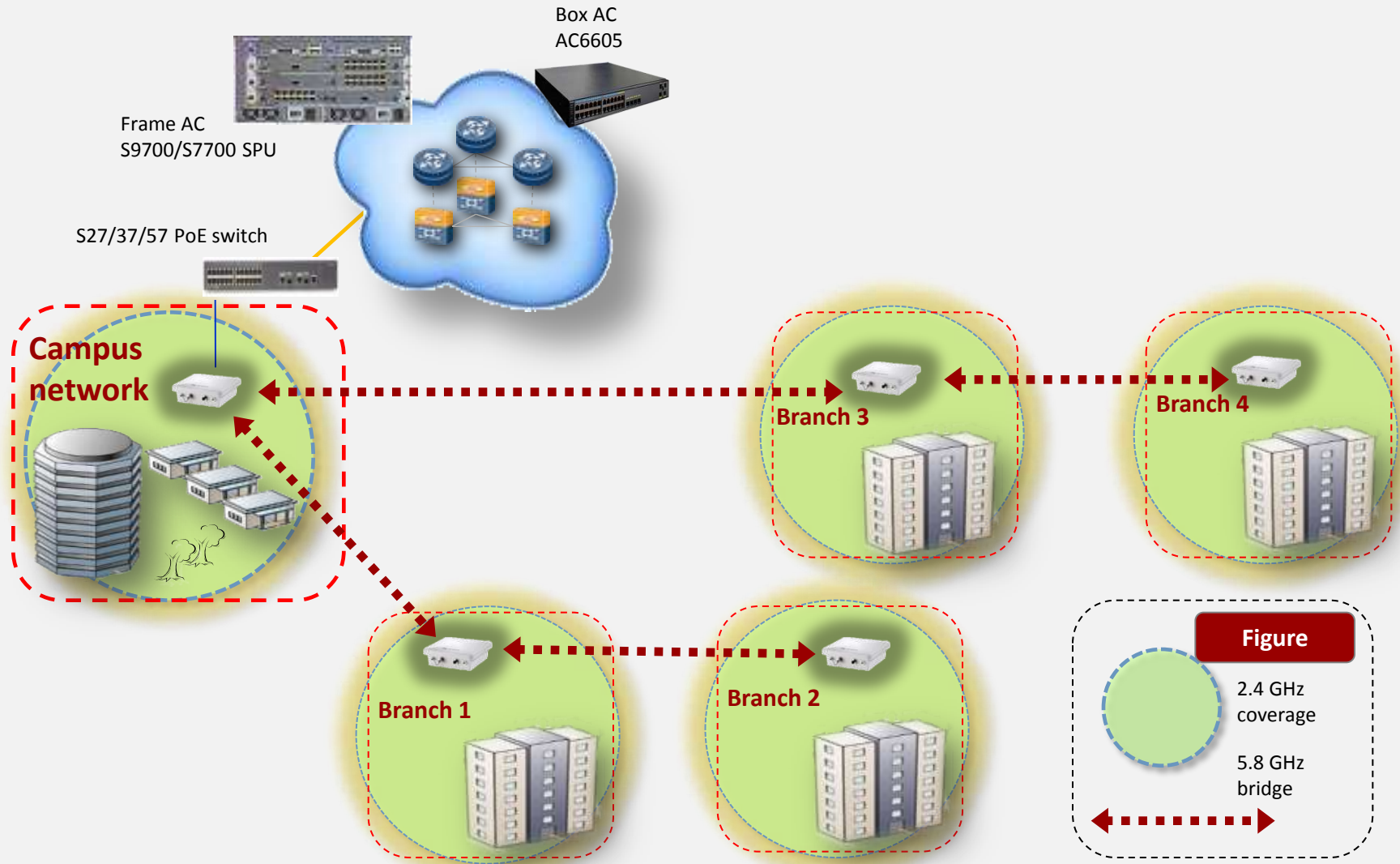
# Deployment on the Access Side – Wireless Bridging



Huawei outdoor dual-frequency AP supports the wireless distribution system (WDS) function, meeting requirements for user access and wireless network bridge.

The AP supports P2P and P2MP and implements wireless bridge between the central campus network and multiple branches. It applies to scenarios where there is no wired network and cable routing is inconvenient. It helps reduce network construction costs and accelerate network construction.

# Deployment on the Access Side – Wireless MESH



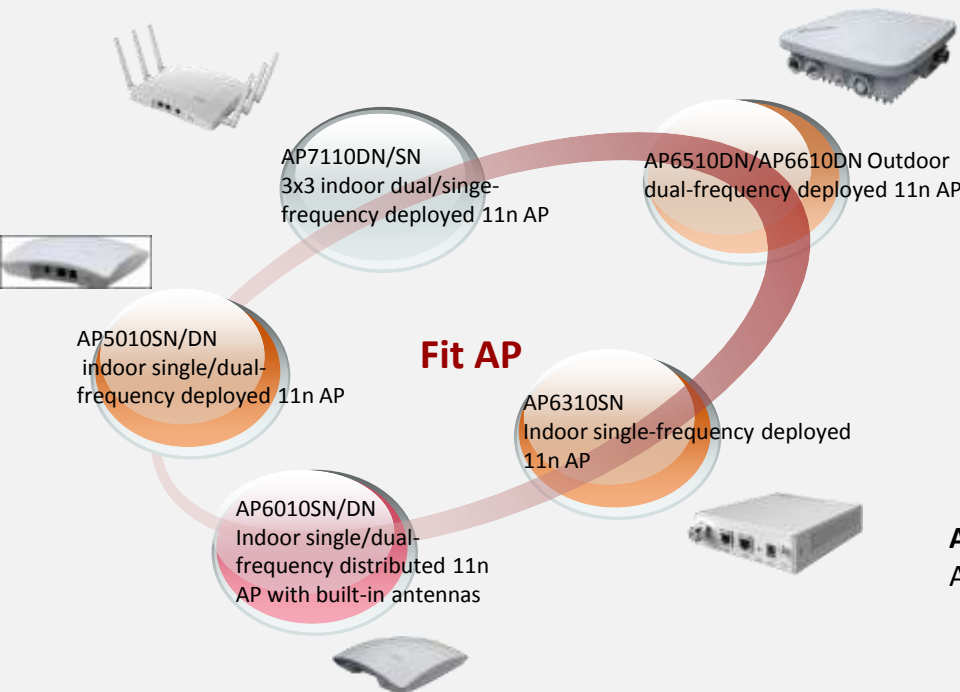
# AC+Fit AP Network Architecture



AC

**AC deployment:** The AC can be deployed at the core layer, aggregation layer, and access layer based on its capacity and performance. Redundancy can be configured at the core and aggregation layers.

	Technology Implementation	Advantage
AC	802.1x, TKIP, QoS, 802.11h Right control Policy control Mobile IP, VPN Layer 3 roaming Dynamic load balance Tunnel authentication, local forwarding	AP management Detection of invalid wireless devices Position detection Service switchover Security policy per user RF management
Fit AP	Antenna 802.11a/b/g/n Encryption	Zero touch Easy to deploy Centralized management



**AP deployment:** The AP is deployed at the access layer. Select APs based on requirements for the wireless network.

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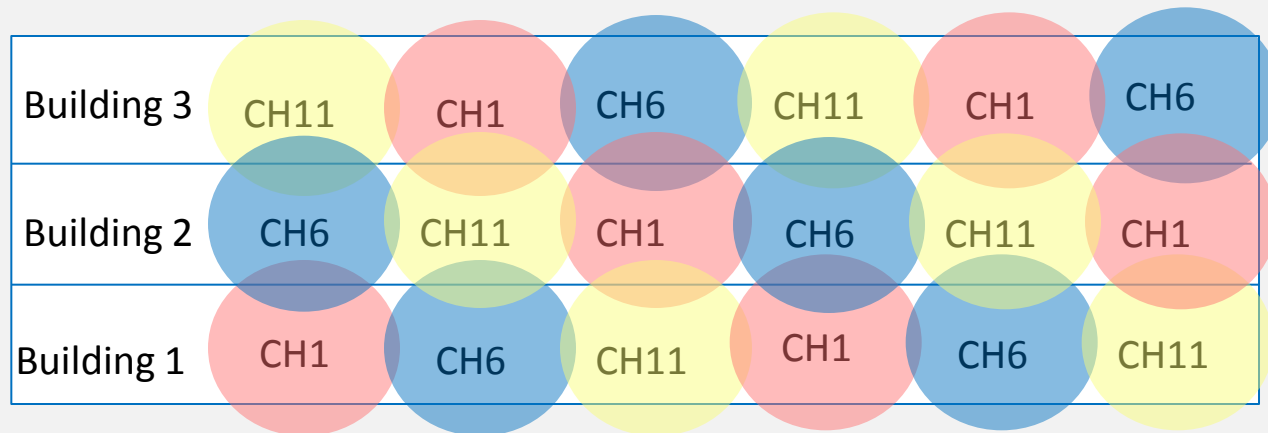
## 2

### Basic WLAN Solution

- 1 WLAN Architecture and Design
- 2 Network Plan and Forwarding Model**
- 3 Reliability Design
- 4 Wireless Service Quality Scheduling
- 5 Security Design
- 6 Network Management Design

# WLAN Channel Design

- Similar to an IP address plan, a proper WLAN channel plan is important to the WLAN design. On a large-scale WLAN, WLAN channels must be allocated uniformly.
- The WLAN channel plan affects WLAN bandwidth, performance, expansion, and anti-interference capabilities, and even affects user experience.
- WLAN channel plan: cellular coverage and channel overlapping



When distributed APs are deployed in a corridor, pay attention to the following points:

1. On each AP, channels 1, 6, and 11 are used in overlapping mode.
2. The power of each AP is adjusted so that signals of the same channel do not interfere with each other.

# WLAN SSID Plan

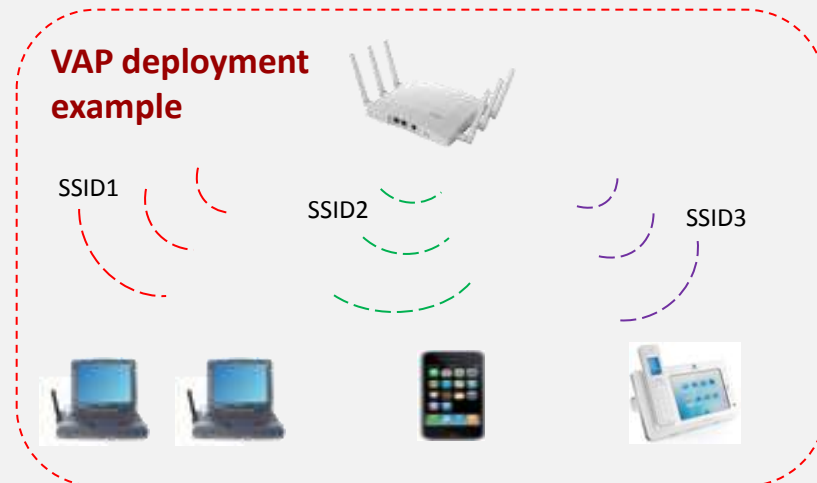
## SSIDs mapping VLANs on the Ethernet

Service VLANs identify services and users. On WLANs, SSIDs also identify services and users. Therefore, you must determine the mapping method between VLANs and SSIDs. The number of service VLANs and number of SSIDs should be in the ratio of 1:1, 1:N, N:1, N:N based on service requirements.

## An AP can be configured with multiple SSIDs to construct VAPs.

An AP can be configured with multiple SSIDs. Huawei single-frequency APs support 16 SSIDs and dual-frequency APs support 32 SSIDs. You can divide an AP into multiple VAPs and each SSID corresponds to one VAP. The AC delivers policies based on VAPs and the VAP manages terminals and services based on policies.

**It is recommended that SSIDs be divided based on service types when you deploy the wireless campus network.**

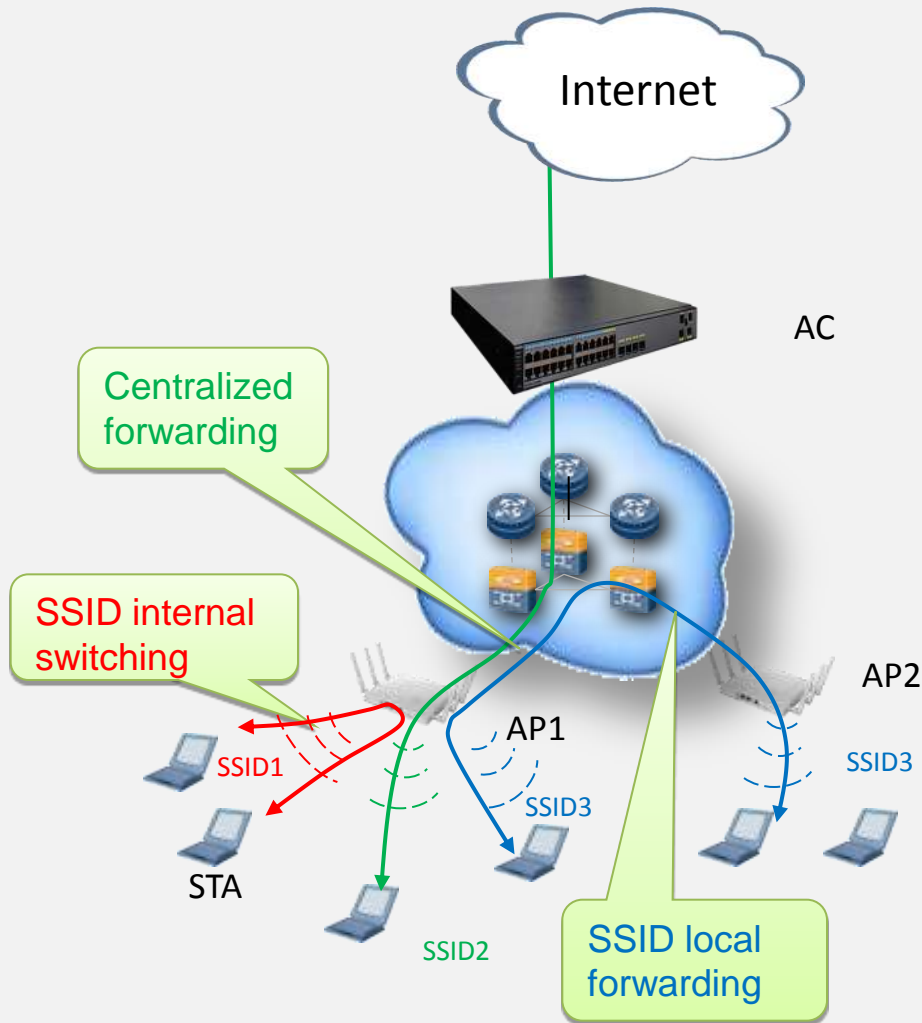


On the campus network, there are three types of wireless services, so three SSIDs are configured on the AP. The three SSIDs correspond to data service, visitor access, and VoIP service respectively.

# AC Address Pool Plan

- **Loopback interface address:** Each AC is configured with a loopback interface, and the loopback interface address is used as the management address. The loopback address has a 32-bit mask.
- **Interconnected address:** An interconnection address refers to the address of an interface connected to another device's interface. An interconnection address uses a 30-bit mask. Core devices use lower IP addresses than other devices. Connection IP addresses are usually aggregated before being advertised. Therefore, allocate contiguous and aggregatable IP addresses as connection IP addresses should be considered.
- **WLAN service address:** The service address is the address of a WLAN terminal connected to the AP. WLAN terminals include mobile phones, computers, tablet PCs, and VoIP phones. If the service address pool is planned on an AC, IP addresses and gateway addresses used by terminals with the same SSID must be on the same network segment. Terminals with different SSIDs use addresses on different network segments to ensure mapping between SSIDs and service VLANs.
- **AP address allocation:** It is recommended that a DHCP server be used to allocate IP addresses to APs because static IP address configuration requires huge workload and may cause address conflicts. Dynamic IP addresses can be assigned to APs using DHCP in any of the following modes:
  - Based on DHCP Option 60: DHCP Discover packets sent from APs carry the DHCP Option 60 field to identify AP identities. For example, the option content "Huawei AP" indicates that a Huawei AP but not a WLAN user applies for an IP address. The DHCP server assigns an IP address to the AP from the IP address pool based on the DHCP Option 60 field.
  - Based on VLAN: VLAN trunking is configured on switch ports connected to APs. Then the DHCP server assigns IP addresses to APs based on the default VLAN IDs of the ports connected to the APs.
- **AP management address:** The management address of a registered AP must be planned on an AC. It is recommended that the AP management address and WLAN service address be planned on different network segments. In addition, to build large-scale wireless campus networks, reserve management address network segments for new devices in future network expansion.
- An AC at the aggregation or core layer may connect to multiple network segments. When allocating IP addresses, ensure that these network segments can be aggregated to reduce number of routes on core devices.

# WLAN Data Forwarding Modes



The following three forwarding modes are implemented through software configuration.

## Centralized Forwarding

In centralized forwarding mode, AP data is encapsulated over the CAPWAP tunnel and sent to an AC. Then the AC forwards the AP data.

## Local Forwarding

In local forwarding mode, AP data is directly forwarded to the destination through routes.

## Internal switching

You can configure switching rules, for example, isolation or interworking, between STAs with the same SSID.

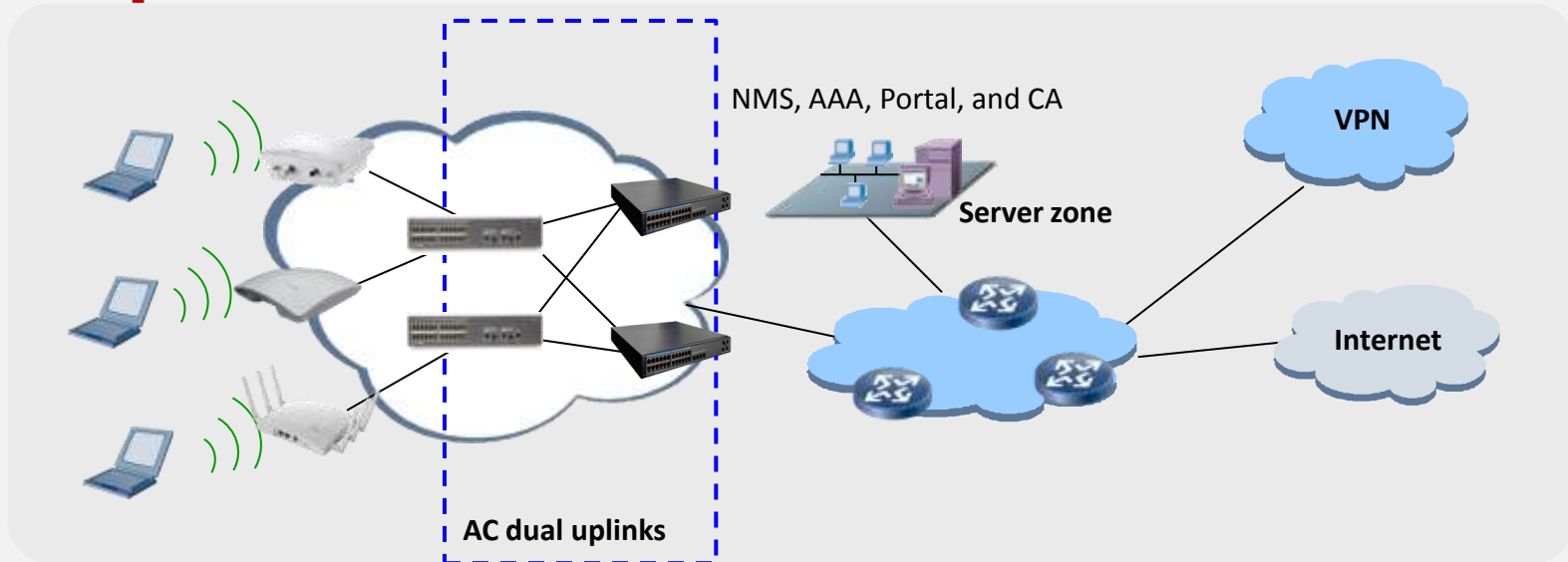
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- 1 WLAN Architecture and Design
- 2 SSID Plan and Forwarding Rule
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# AC 1+1 Hot Standby Without Service Interruption



## Key features:

- AC 1+1 hot standby and inter-AC heartbeat design
- CAPWAP control channel backup
- Dual-homed networking

## Customer benefits:

- This function provides enhanced reliability and solves single-point failures.
- When services are switched between ACs, user services are not interrupted in local forwarding mode. This function provides best user experience.
- Two ACs back up each other to ensure AC reliability.

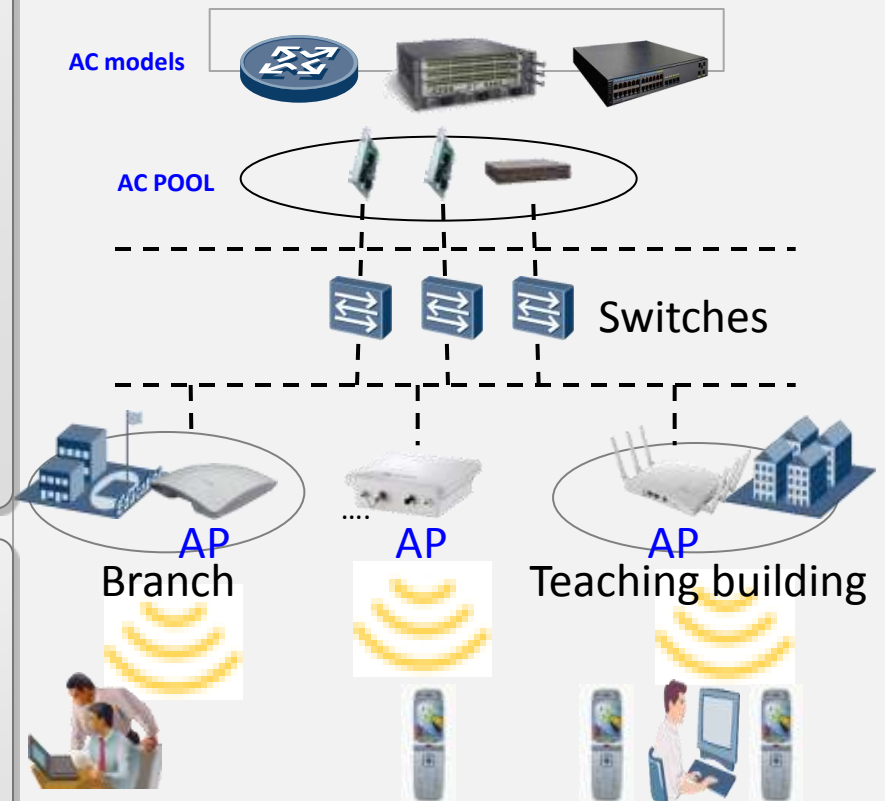
# AC Pool Improving WLAN Efficiency and Reliability

## Key features:

- **Disaster recovery:** When an AC is faulty, another AC in the pool takes over the faulty AC.
- **Load balancing:** AP traffic is load balanced to ACs in the pool through the load balancing algorithm. You can configure policies such as times and zones used for load balancing.
- **Nonstop service design:** When an AC board or independent AC is added for network expansion, the system transmits services based on policies. When an AC is faulty, another AC in the pool takes over the faulty device.

## Customer benefits:

- **Improved network performance (↑20%):** shaves the peak load, reduces the single-point configuration margin, and saves 20% of the capacity
- **Enhanced network reliability:** When an AC is Down, another AC in the AC pool takes over the faulty AC.
- **Efficient network maintenance:** Uniform plan and integrated maintenance reduce the OPEX.



AC board isolation and AC pool real-time detection minimize the effect of AC device upgrade and expansion. The two functions together with lossless upgrade implement nonstop service transmission during upgrade.

# Huawei Outdoor AP with Industry-level Reliability: 6510SN/DN/6610DN



● 60°C



● -40°C



● High protection level **IP67**



## Key Features

- Uses industry-standard components, which improves industry-level reliability. Adapts to a wide temperature range from -40°C to +60°C.
- Starts rapidly at low temperatures, without heating boards.
- Provides high protection level: IP67.

## Customer Benefits

- Reliability: Huawei AP uses industry-standard components to improve device reliability.
- Low power consumption: Heating boards are not required.
- OPEX reduction: In areas such as energy and mining areas, outdoor APs are sparsely distributed. When APs become faulty, it is difficult to maintain them. Huawei AP makes on-site maintenance easier.

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### Basic WLAN Solution

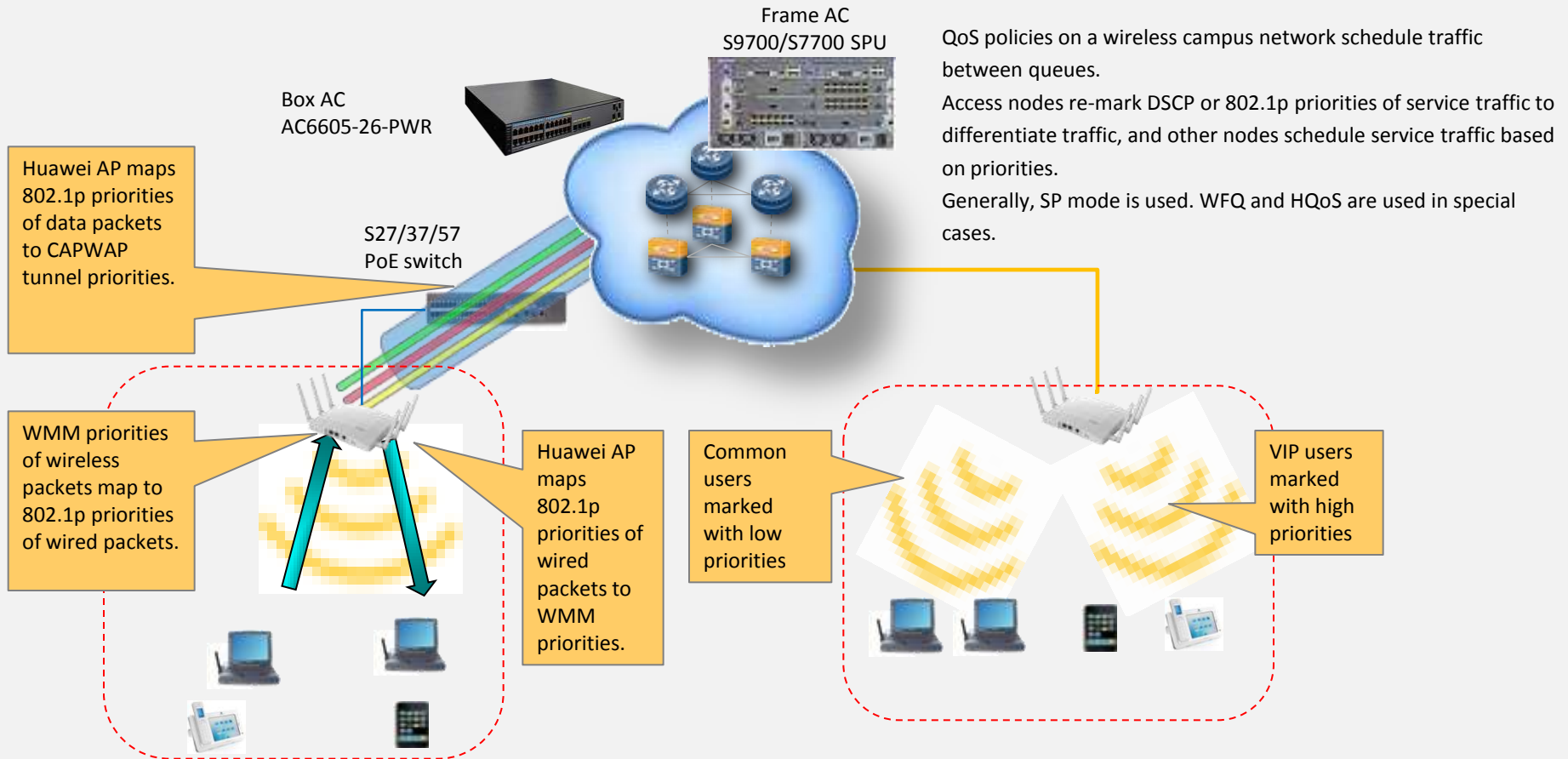
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# End-to-End QoS Deployment Ensuring Core Services and VIP Users' Services

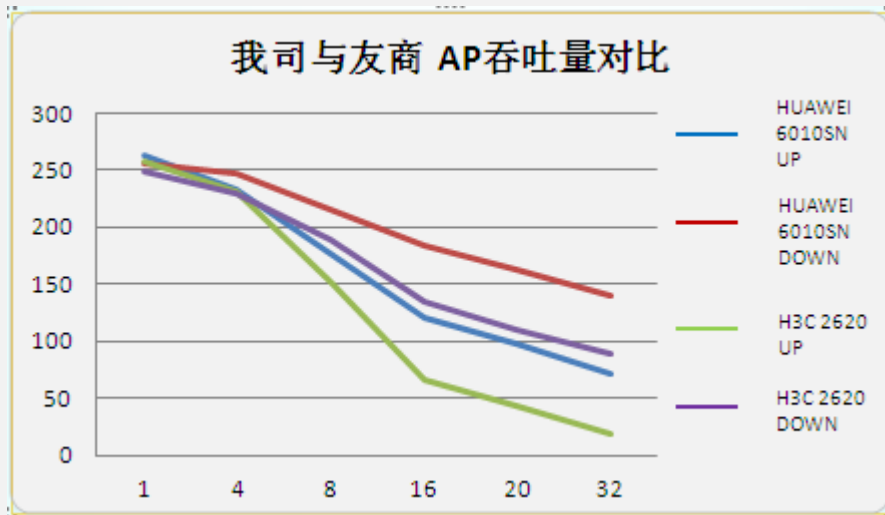
Wireless campus networks must implement non-blocking forwarding.

Wireless campus networks use QoS policies to prevent applications such as BitComet.

QoS must be configured on all devices on a wireless campus network, and each device has its own responsibilities. All the nodes on the wireless campus network must implement QoS policies.



# WLAN Intelligent Multiuser Scheduling



## Customer problems:

In high-density areas such as meeting rooms, large-scale stadiums, and entertainment places, an AP often connects to more than 20 users.

WiFi using the collision scheduling mechanism: **When more users connect to an AP, AP performance reduces sharply. This may result in poor user experience, or even some users to fail to connect to the AP.**

## Solution:

To improve user experience, increase APs. This increases investment costs.

## Huawei solution:

- Intelligent multi-user scheduling:** Detects the user quantity and flexibly adjusts Enhanced Distributed Channel Access (EDCA) parameters, which reduces the possibility of collision, improves the throughput, and enhances user experience. In scenarios where there is high-density user coverage, the number of APs can be reduced by 30%.

When there are 20 users, Huawei AP's uplink rate is twice the uplink rate of a common AP and the downlink rate is 32% higher than the downlink rate of a common AP.

- HQoS scheduling:** Ensures that all users can access.

## Comparison with competitor's devices

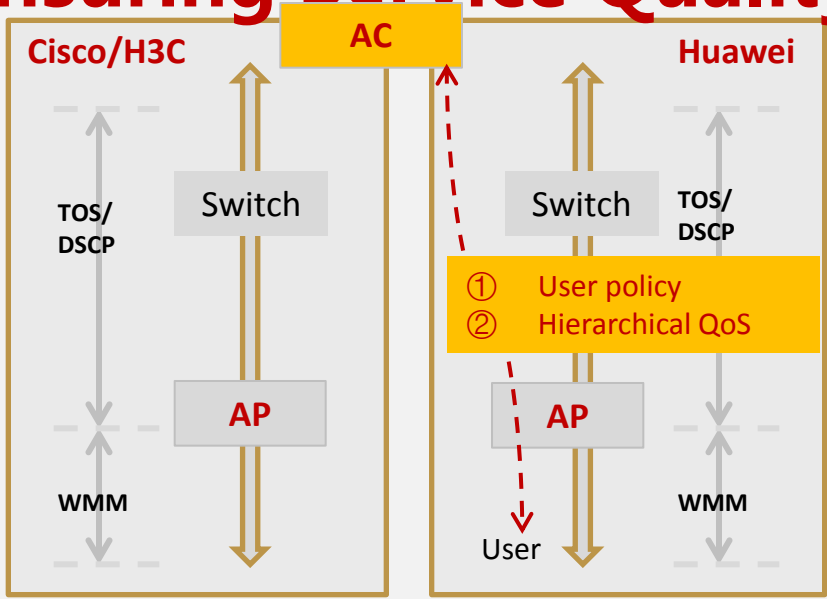
Cisco: The maximum throughput of the Huawei device is 15% higher than that of the equivalent Cisco device.

H3C: The average bandwidth of the Huawei device is 30% higher than that of the equivalent H3C device.

## Competitive test

**In China Telecom's 2012 central purchasing test, Huawei's device performance is the leading performer.**

# Huawei Fine-grained User Management Ensuring Service Quality



## ❑ Huawei solution

- Huawei's solution uses BRAS bandwidth management mechanism. **Huawei's solution provides user-based or user group-based policy control to ensure bandwidth per user, and uses HQoS to implement fine-grained service control and good user experience.** You only need to bind QoS profiles, which makes it easy for you to deploy services.
- Huawei AC supports RADIUS user group-based policies, local user group-based policies, LDAP domain-based control policies, various user profiles, and flexible ACL rules.
- Huawei AP uses intelligent multi-user scheduling technology to adjust EDCA parameters based on the user quantity. Huawei AP's performance is 15% higher than Cisco device's performance.

## ❑ Competitors

Cisco:

- (1) Cisco devices do not support local user group-based policies or LDAP domain-based control policies.
- (2) Cisco devices do not support uplink bandwidth control. It uses only simple bandwidth control for downlink traffic, but does not use traffic shaping.
- (3) Cisco devices do not support HQoS scheduling.

H3C:

H3C devices support only RADIUS user group-based policies and TOS/DSCP scheduling, but do not support HQoS scheduling.

## ❑ Customer problems:

On enterprise office networks, the WLAN transmits real-time services such as voice and video conferencing services in addition to data services. The real-time services are delay-sensitive services and require high reliability. On enterprise campus networks and in public areas, high-priority services must be processed preferentially.

Currently, mainstream devices use air-based WMM scheduling and ToS/DSCP priority scheduling. **When more users connect to networks or high-priority services burst, resources are insufficient.** Packets may be lost and delayed.

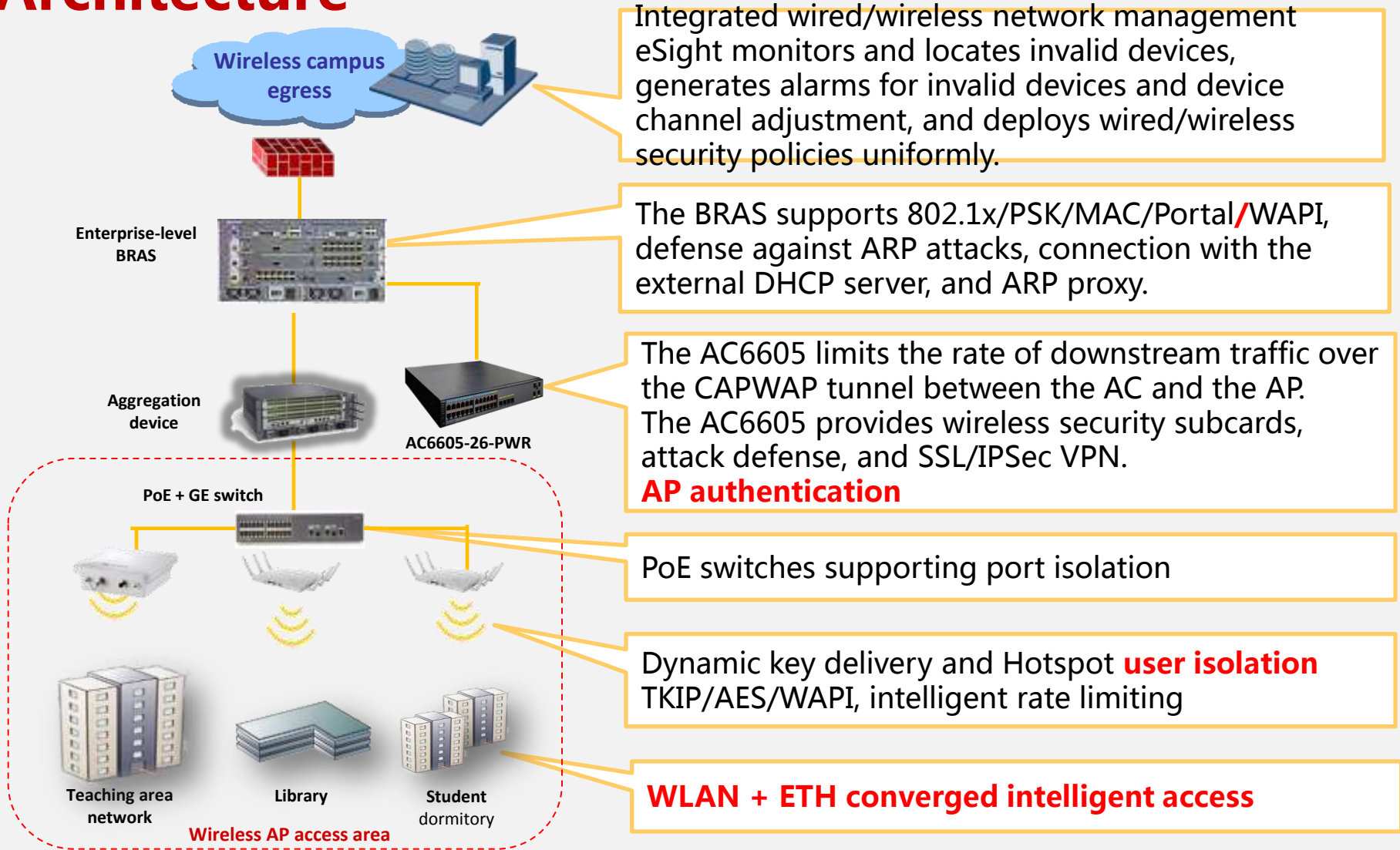
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- 6 Network Management Design

# Wireless Campus Network Security Architecture



Integrated wired/wireless network management eSight monitors and locates invalid devices, generates alarms for invalid devices and device channel adjustment, and deploys wired/wireless security policies uniformly.

The BRAS supports 802.1x/PSK/MAC/Portal/WAPI, defense against ARP attacks, connection with the external DHCP server, and ARP proxy.

The AC6605 limits the rate of downstream traffic over the CAPWAP tunnel between the AC and the AP. The AC6605 provides wireless security subcards, attack defense, and SSL/IPSec VPN.  
**AP authentication**

PoE switches supporting port isolation

Dynamic key delivery and Hotspot **user isolation** TKIP/AES/WAPI, intelligent rate limiting

**WLAN + ETH converged intelligent access**

# Authentication Technologies

Huawei wireless converged intelligent network supports multiple authentication technologies, including MAC address authentication, Portal authentication, 802.1x authentication, and PPPoE authentication. The following shows the comparisons between these authentication technologies.

Item	MAC	Portal/Web	802.1x	PPPoE
Standardization	Standard	Proprietary web software vendor	Standard	Standard
Encapsulation cost	Low	Low	Low	High
Control mode	Separated data authentication	Separated data authentication	Separated data authentication	Unified data authentication
IP address	Allocation after authentication	Allocation before authentication	Allocation after authentication	Allocation after authentication
Multicast support	Good	Good	Good	Low
Client software	Not required	Not required (browser)	Not required (operating system attached with the client)	Not required (operating system attached with the client)
Device requirements	None	Proprietary protocol	Switch	BRAS
Security	Low	Medium	High	Medium
Address spoofing	None	Low	Low	Strong
Usage scenario	Client or dumb terminal with special requirements	Internal and external users	Confidential data access such as the core office	Not recommended on campus networks

# Subcontents

## 2

### Basic WLAN Solution

- 1 WLAN Architecture and Design
- 2 SSID Plan and Forwarding Rule
- 3 Reliability Design
- 4 Wireless Service Quality Scheduling
- 5 Security Design
- 6 Network Management Design

# Uniform Enterprise Resource Management NMS

## IP Device

- Router
- Switch
- Security device
- WLAN device
- Non-Huawei devices



## Network Service

- IPSec VPN
- WLAN
- Other



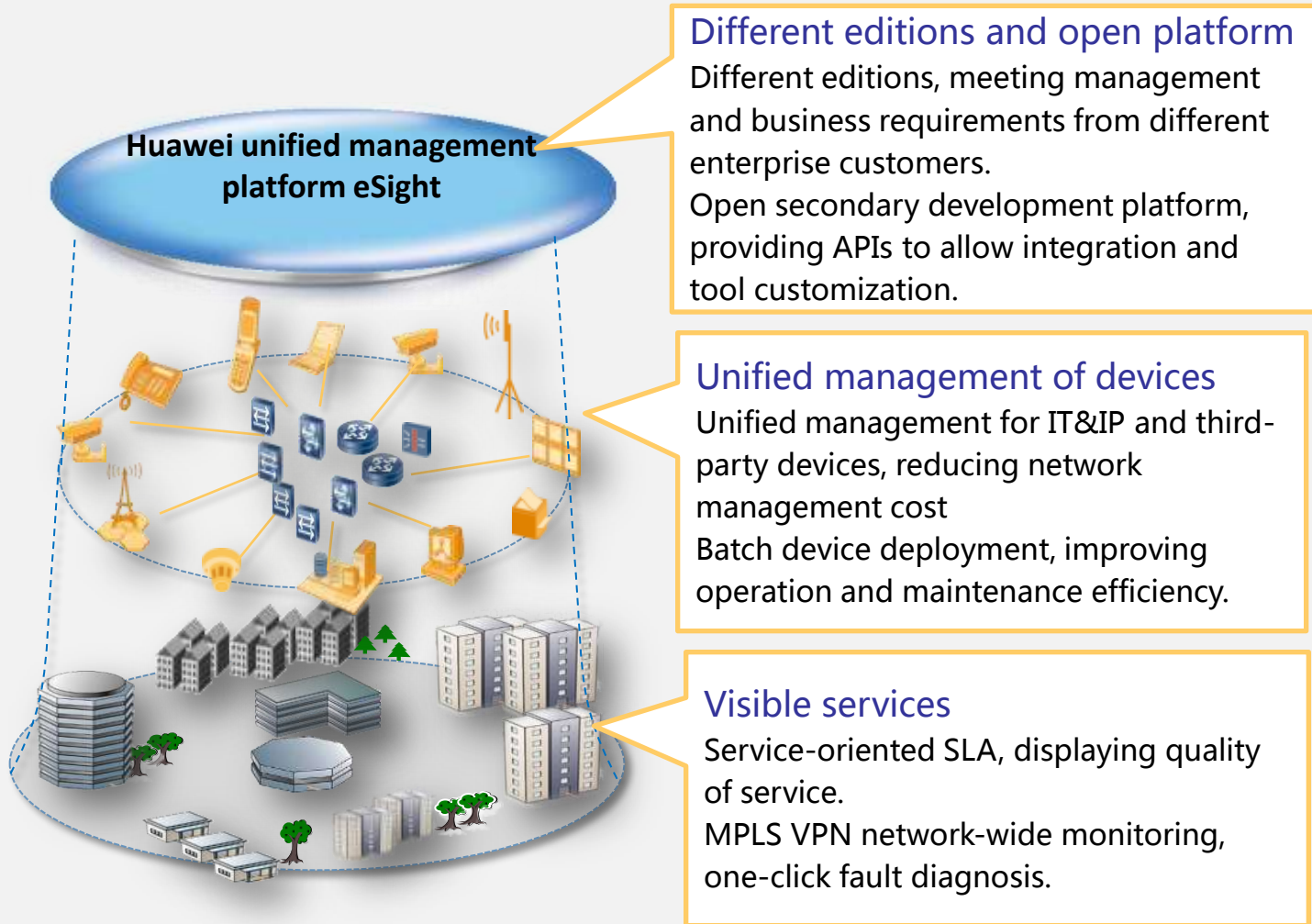
## IT Device

- Server
- Workstation
- Printer
- Fax machine
- Other



eSight manages IP&IT devices and services.

# Huawei Unified Management Solution on the Wireless Campus Network



eSight Web 2.0 uses the B/S structure and allows users to access the eSight server using browsers such as Internet Explorer and Firefox.

# WLAN Visual Management and Configuration Wizard (1)



↓ Planning list



↓ Fill in AP information



⇒ Import the planning list

The AC and LSW are discovered and added to eSight.

The smart configuration tool establishes service channels and management channels between the AC and the LSW.

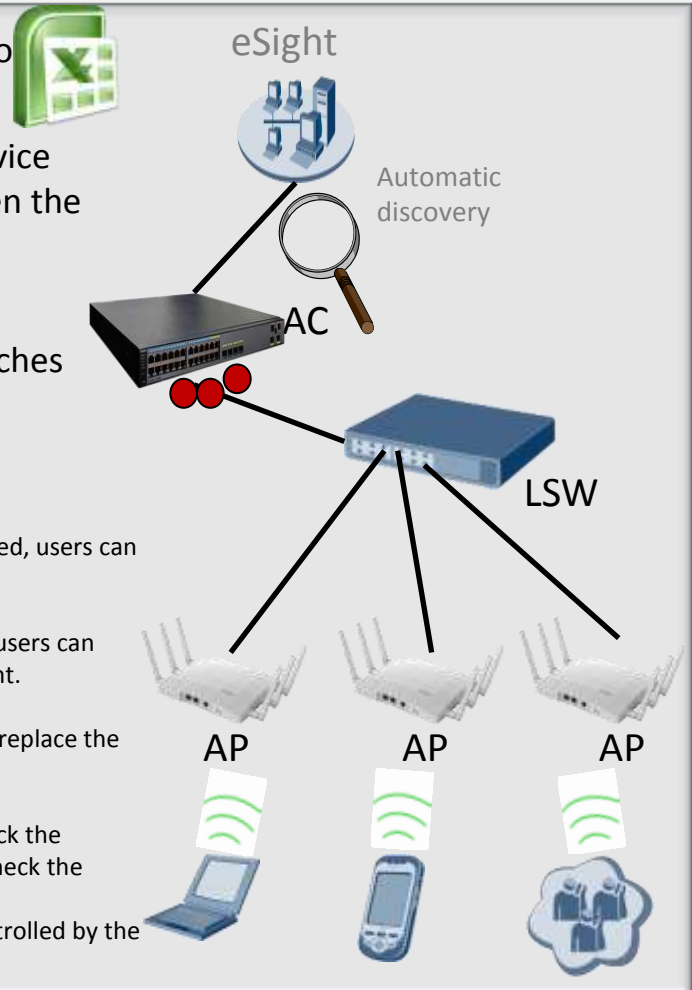
Configure basic AC information.

Import an AP plan sheet to create APs in batches

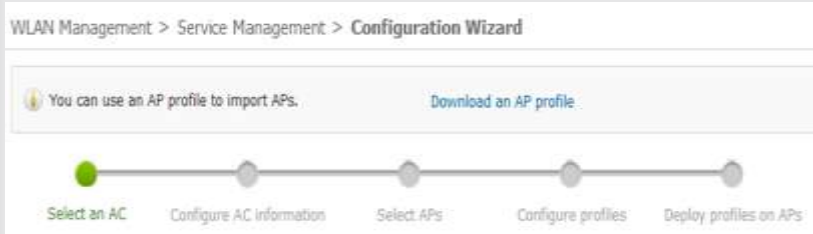
APs download configurations from the AC.

- **Restarting AP**  
During WLAN network debugging or when APs are upgraded, users can remotely restart APs in batches in eSight.
- **Restoring APs to factory settings**  
During WLAN network debugging or when APs are faulty, users can remotely restore APs to factory settings in batches in eSight.
- **Replacing an AP**  
When a hardware fault occurs on an AP, users can quickly replace the AP.
- **Diagnosing links**  
Ping the IP address of an upstream device on an AP to check the upstream link status. Ping the AP IP address on an AC to check the status of the link between the AP and AC.

**Remarks:** Only Huawei devices are supported. Fit APs are controlled by the AC.

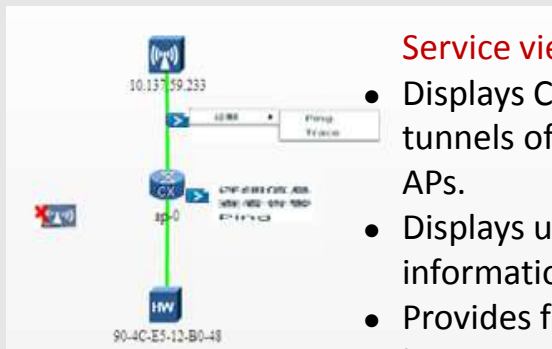


# WLAN Visual Management and Configuration Wizard (2)

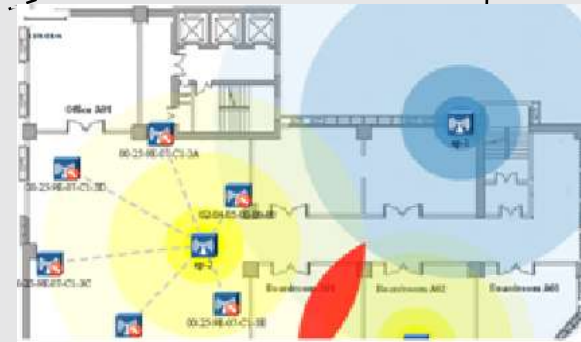


**Configuration wizard service**

**Time spent deploying 100 APs is reduced from 100 to 10 minutes.**



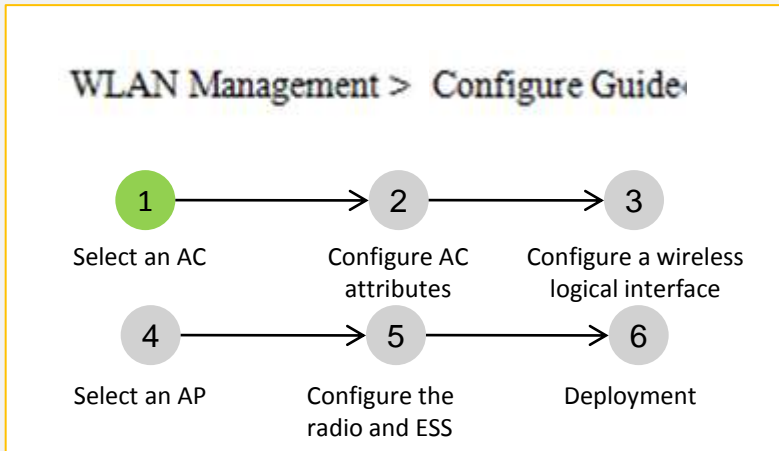
- Service view**
- Displays CAPWAP tunnels of ACs and APs.
  - Displays user information on APs.
  - Provides fast fault location.



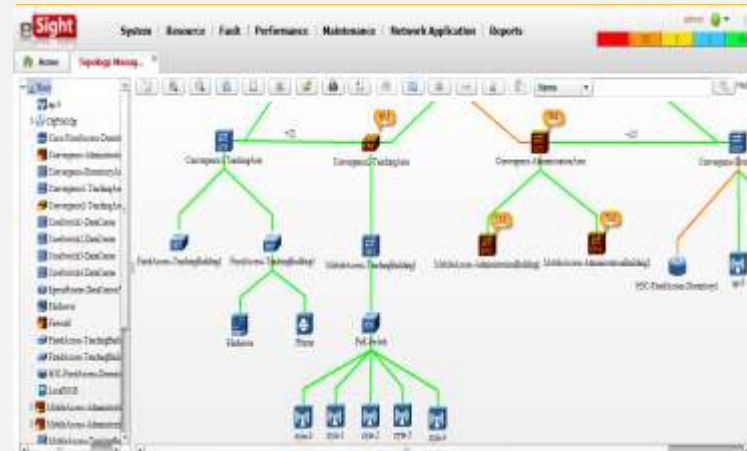
- Location view**
- Identifies channels in color.
  - Uses shading to indicate signal strength
  - Identifies unauthorized APs.
  - Displays collision domains.

**Identifies unauthorized APs quickly and speeds up fault location**

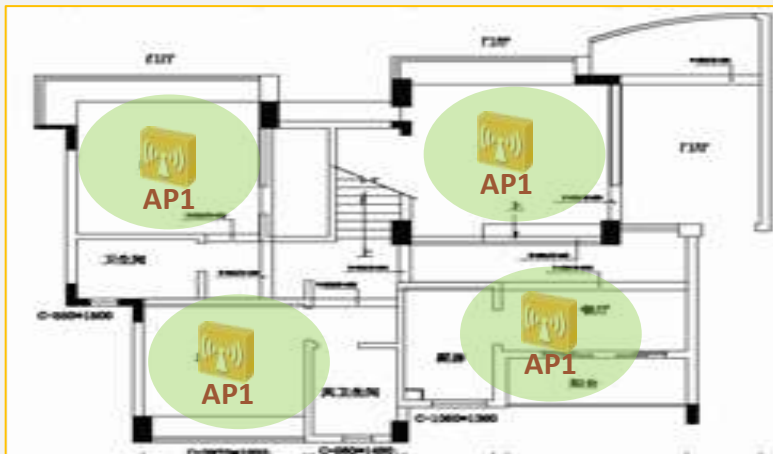
# WLAN Visual Management and Configuration Wizard (3)



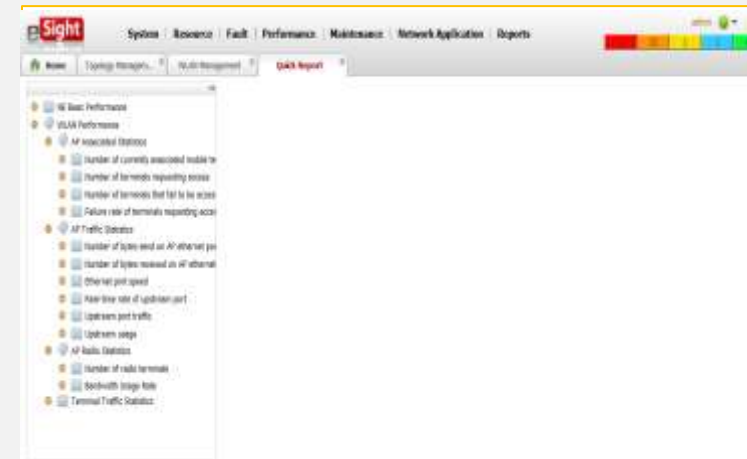
- Configuration wizard improving AC deployment efficiency



- Integrated topology and management of wired and wireless devices



- Location topology and visual management



- Multiple types of wireless service reports

# WLAN Reports

## eSight reports

User-defined report type



- ★ User-defined report type
- ★ Various report display modes

User-defined report data



- ★ User-defined report data fields
- ★ Report design preview

User-defined report generation

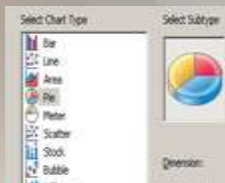
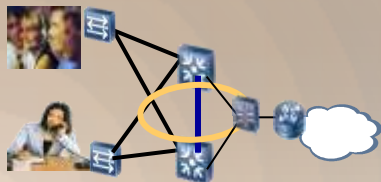


- ★ Scheduled reports
- ★ Real-time statistical report

User-defined report distribution



- ★ Automatic report distribution
- ★ Multiple distribution modes such as E-mail and FTP



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**1** Ubiquitous WiFi on the Access Network

**2** WLAN Network Design

**3** Service Design

**4** Products

**5** Success Stories

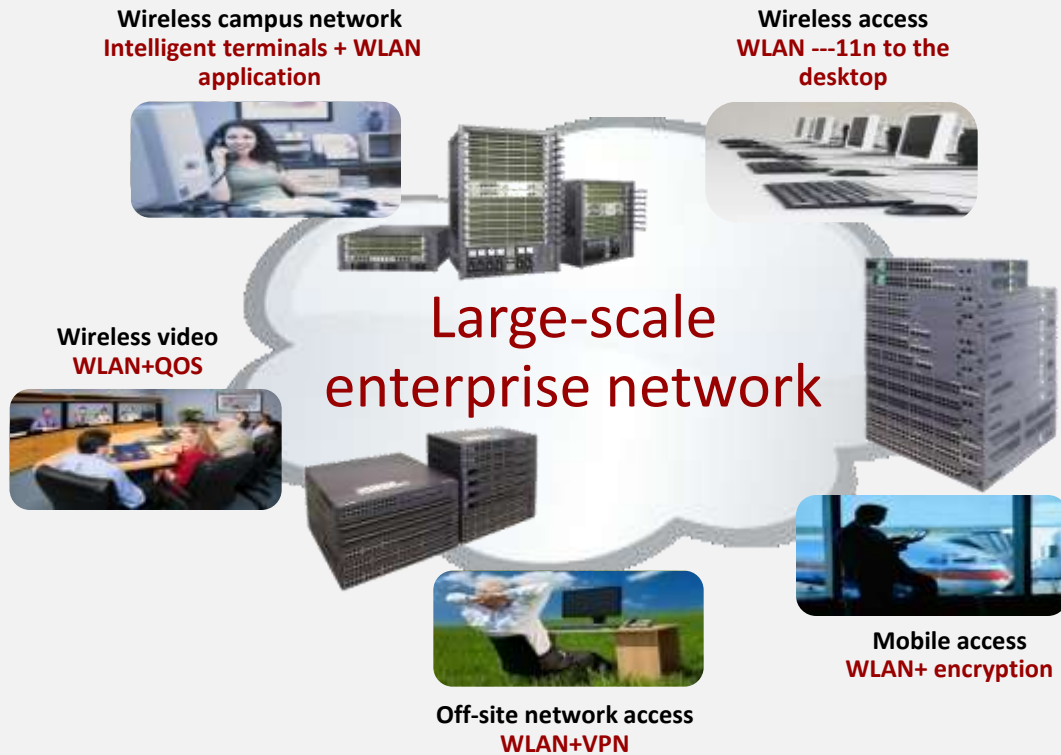
# Subcontents

**3**

## Wireless Campus Network Service Solution

**1****Virtual WLAN****2****Voice Solution****3****Video Surveillance Solution****4****Office Solution****5****WLAN Positioning Solution**

# Integrated and Intelligent WLAN

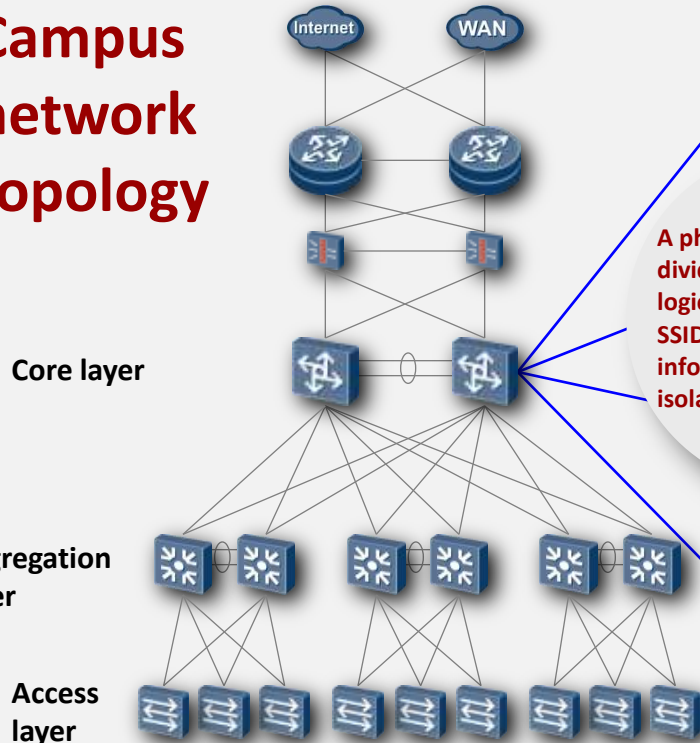


## WLAN Network

- 1 **Wireless access:** high rate, high efficiency, and easy deployment
- 2 **Mobile access:** high reliability and security
- 3 **Off-site access:** access to the office system anytime and anywhere using the wireless city and VPN
- 4 **Wireless video:** high bandwidth, QoS, integrated access
- 5 **Wireless campus network:** intelligent terminals and rich applications

# Virtual AP (VAP, Multi-SSID)

## Campus network topology



A physical WLAN is divided into multiple logical networks based on SSIDs to implement information share and isolation.



Office 1- ssid1



Office 2 - ssid2



Office 3 - ssid3



Concentrated office - multi-SSID

**Access control**  
Ensures security of access users.

**Service isolation**  
Isolates services of users with different privileges and allows certain users to communicate with each other.

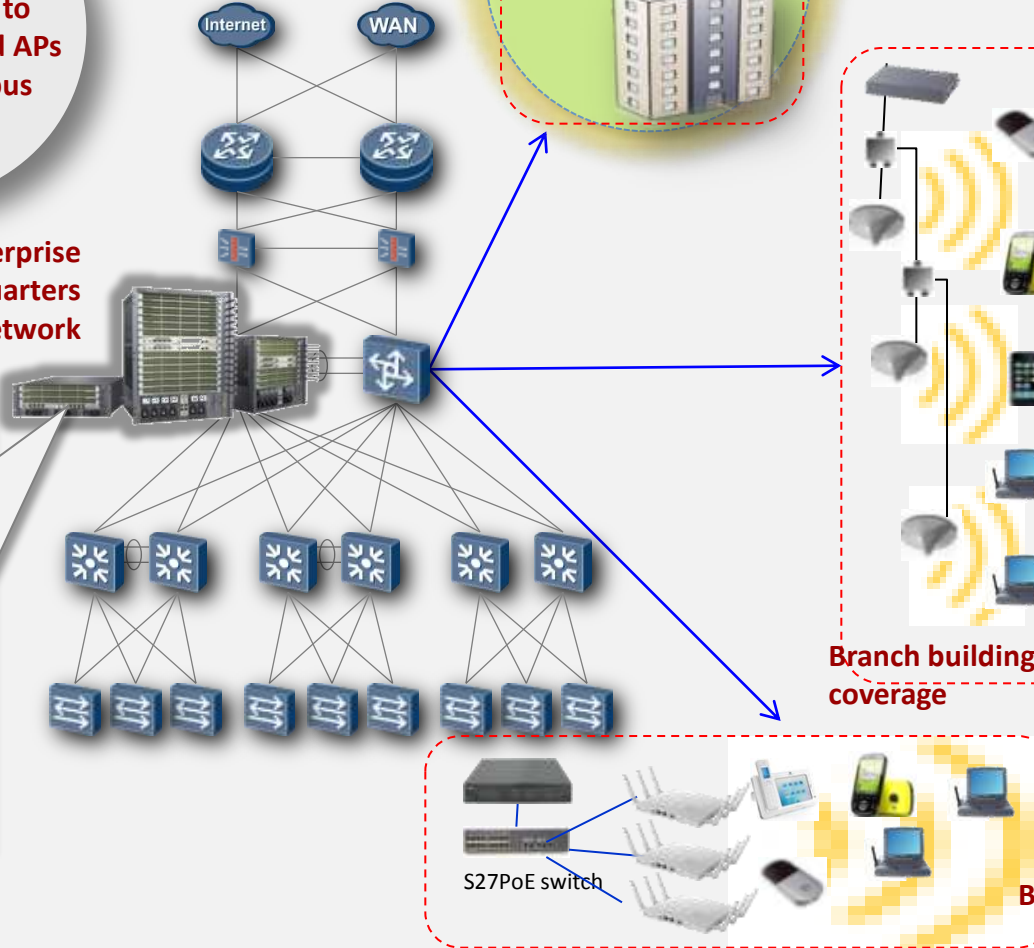
**Resource isolation**  
controls users' access permission to network resources

# Virtual AC (Cluster AC management > Cloud AC)

A set of ACs are deployed at the core or aggregation layer to manage users and APs on different campus networks.

Enterprise headquarters network

AC cluster >> Cloud AC



Outdoor coverage in the branch

### Access control

Ensures security of access users.

### Service isolation

Isolates services of users with different privileges and allows certain users to communicate with each other.

### Resource isolation

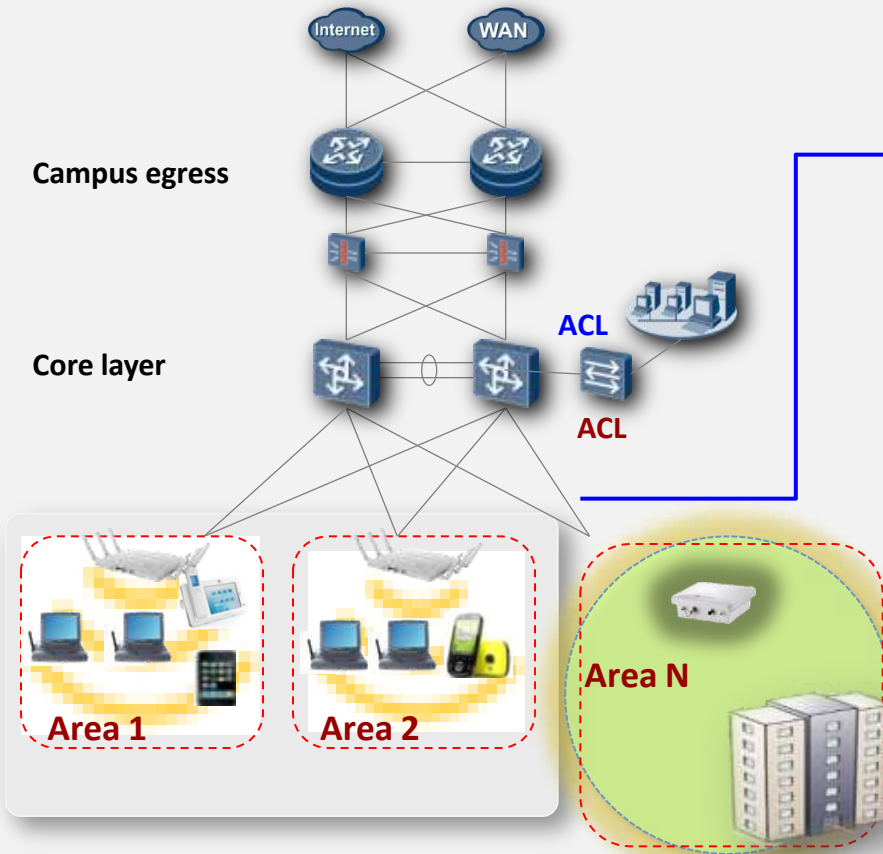
controls users' access permission to network resources

Branch building coverage

S27PoE switch

Branch office

# SSID and ACL Isolation on the Wireless Campus Network



## ACL and VLAN isolation

ACLs are deployed at the network edge and data area edge to limit access between campus networks.

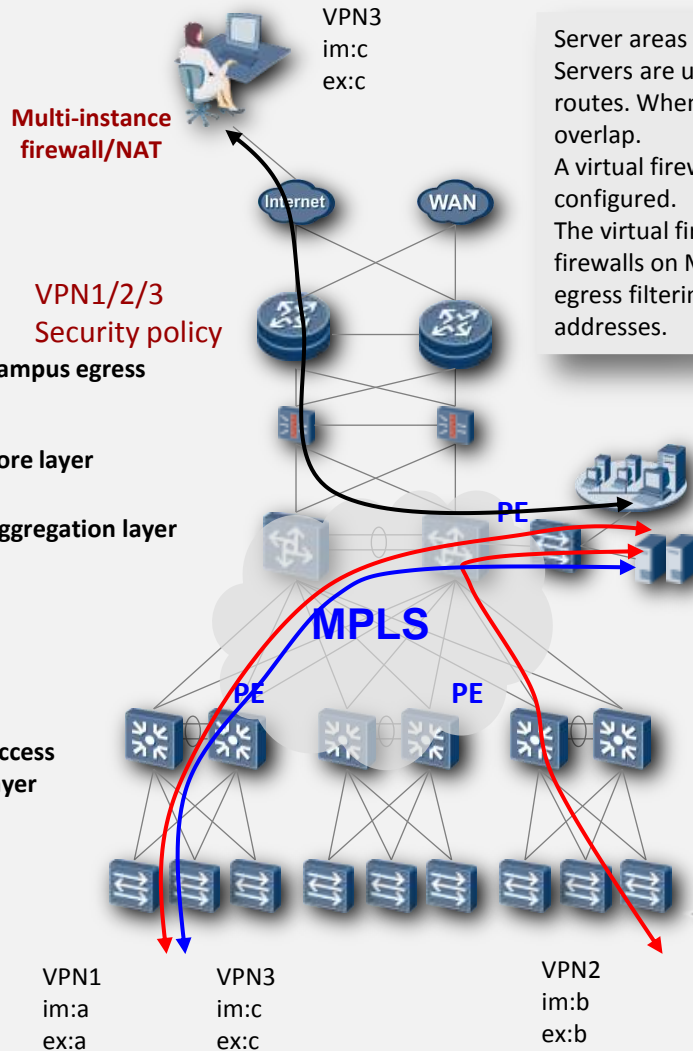
Change the ACL configuration when the services or networks are adjusted.

ACLs and VLAN isolation apply to small-scale wireless campus networks.

## SSID isolation

SSID isolation is widely used to isolate internal services on the wireless campus network.

# Integration of the WLAN Campus Network and MPLS Network: SSIDs Divided into Different VLANs and VLANs into Different VPNs

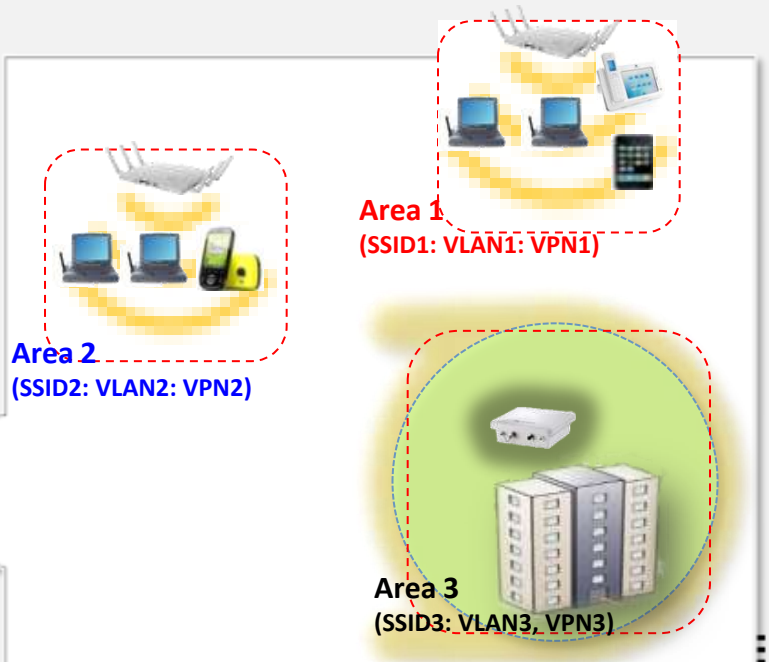


Server areas are connected to the corresponding VPNs through VLANs. Servers are used in three modes: public, exclusively used, and external. They control access by advertising MPLS VPN routes. When users in multiple areas need to access the public server, the user IP addresses in different VPNs cannot overlap.

A virtual firewall is deployed as an egress. Different security policies are deployed for the service areas and NAT is configured.

The virtual firewall is implemented through the MCE and VRFs that need to access the Internet are bound to virtual firewalls on MPLS PEs. A default route is advertised to all VRFs so that traffic destined for the Internet uses the same egress filtering. After all service traffic passes the firewall, the addresses of traffic are translated into public network addresses.

- VPN 1 Internal data area, public server**  
im: a,b  
ex: a,b
- VPN 2 Internal data area, exclusive server**  
im: a  
ex: a
- VPN 3 Campus coverage zone Internet**  
im: c  
ex: c



# Subcontents

## 3

### Wireless Campus Network Service Solution

1

Virtual WLAN

2

Voice Solution

3

Video Surveillance Solution

4

Office Solution

5

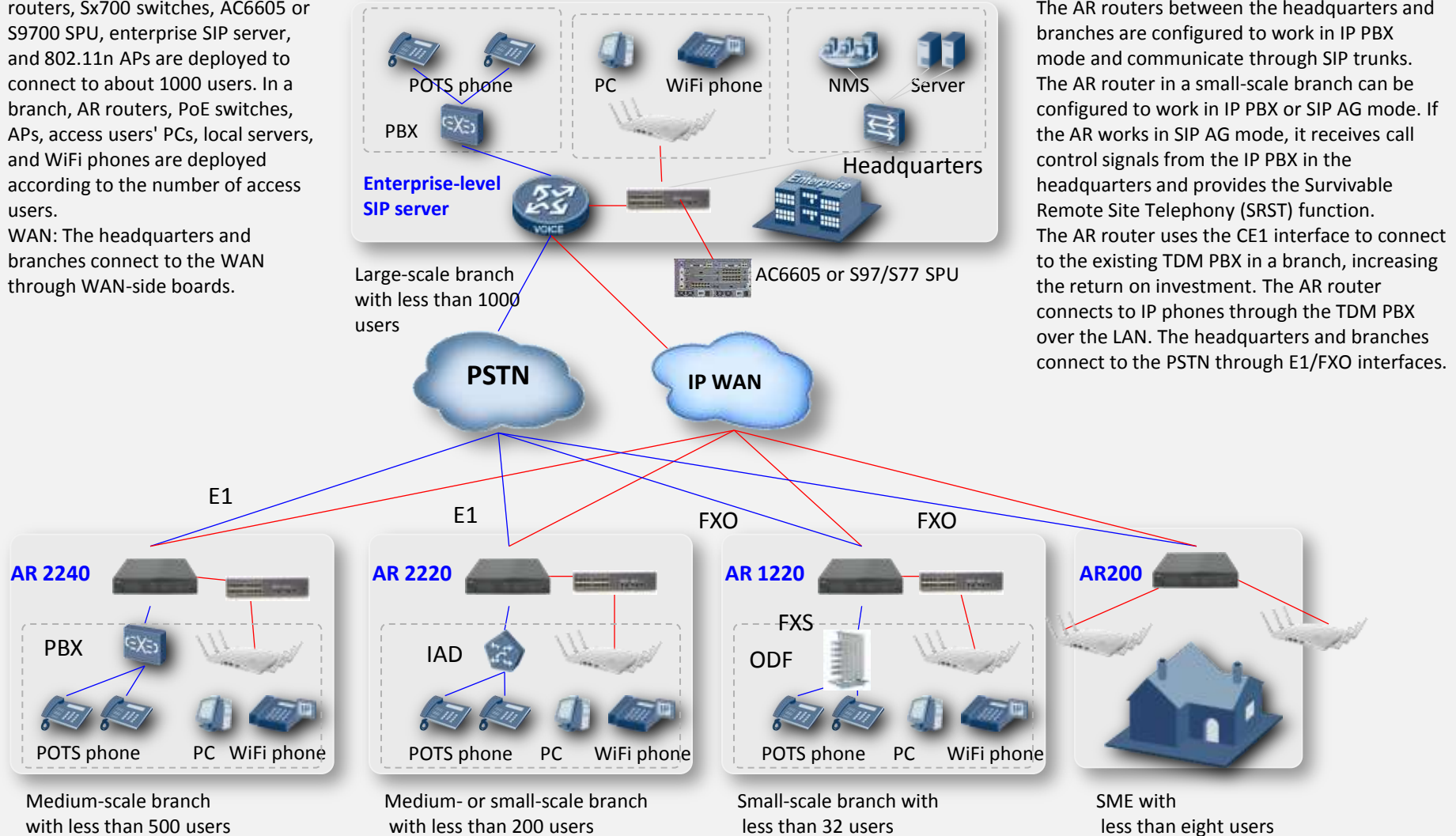
WLAN Positioning Solution

# Huawei-VoWiFi (Wireless Voice Solution)

## Headquarters and branch networks:

**LAN:** In the headquarters, AR routers, Sx700 switches, AC6605 or S9700 SPU, enterprise SIP server, and 802.11n APs are deployed to connect to about 1000 users. In a branch, AR routers, PoE switches, APs, access users' PCs, local servers, and WiFi phones are deployed according to the number of access users.

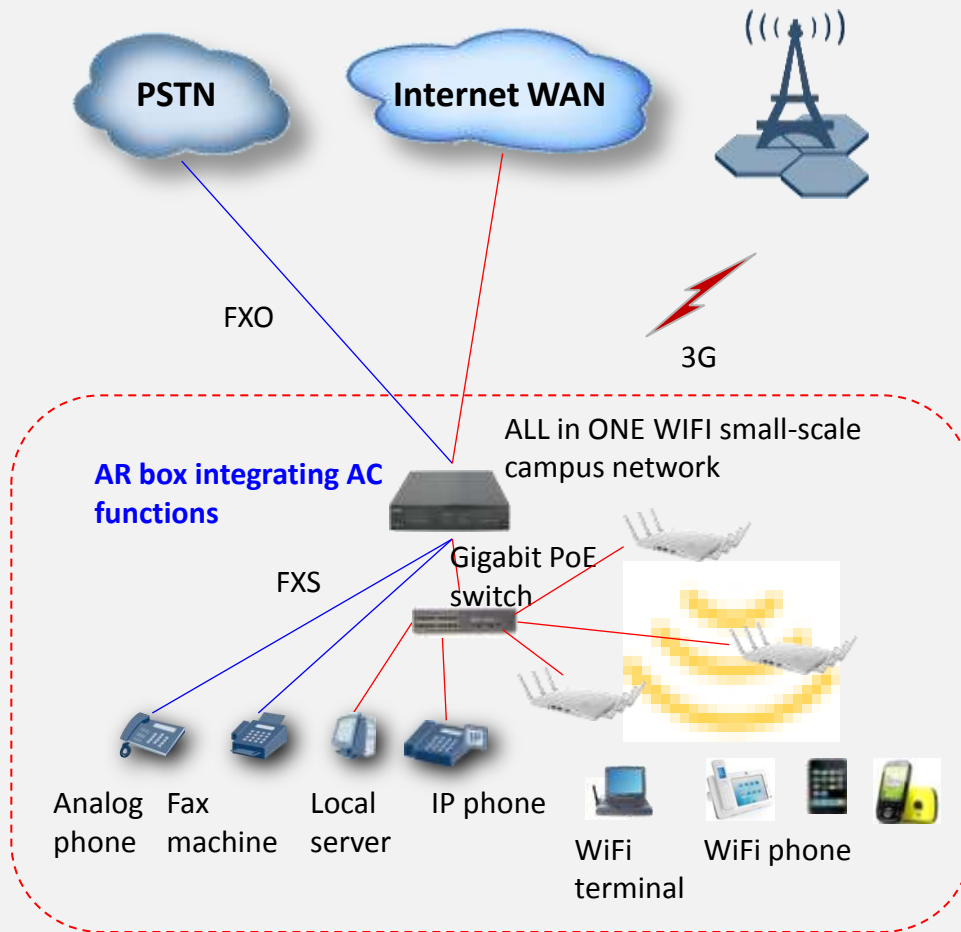
**WAN:** The headquarters and branches connect to the WAN through WAN-side boards.



## VoIP communication between the headquarters and branches:

The AR routers between the headquarters and branches are configured to work in IP PBX mode and communicate through SIP trunks. The AR router in a small-scale branch can be configured to work in IP PBX or SIP AG mode. If the AR works in SIP AG mode, it receives call control signals from the IP PBX in the headquarters and provides the Survivable Remote Site Telephony (SRST) function. The AR router uses the CE1 interface to connect to the existing TDM PBX in a branch, increasing the return on investment. The AR router connects to IP phones through the TDM PBX over the LAN. The headquarters and branches connect to the PSTN through E1/FXO interfaces.

# ALL in ONE VoWiFi Solution on the Small-Scale Campus Network



The AR integrates 3G, voice, and routing functions and connects to users in the small-scale branch.

The AR200/AR1220 connects to POTS or IP phones to provide basic voice functions.

WiFi terminals can be configured with the software phone to provide mobile voice services.

# Subcontents

## 3

### Wireless Campus Network Service Solution

1

Virtual WLAN

2

Voice Solution

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Video Surveillance Solution

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Office Solution

5

WLAN Positioning Solution

# Video Surveillance Solution on the Campus Network

## Storage system

Video image storage - IP SAN



## Front-end system

Video signal collection-analog camera, IP camera, and video coder



## Management platform

Surveillance system management involves the hardware server and management software.



## Monitoring center

Video image display - big screen and console



## IP network

Video image transmission – switch, WLAN, and PON device

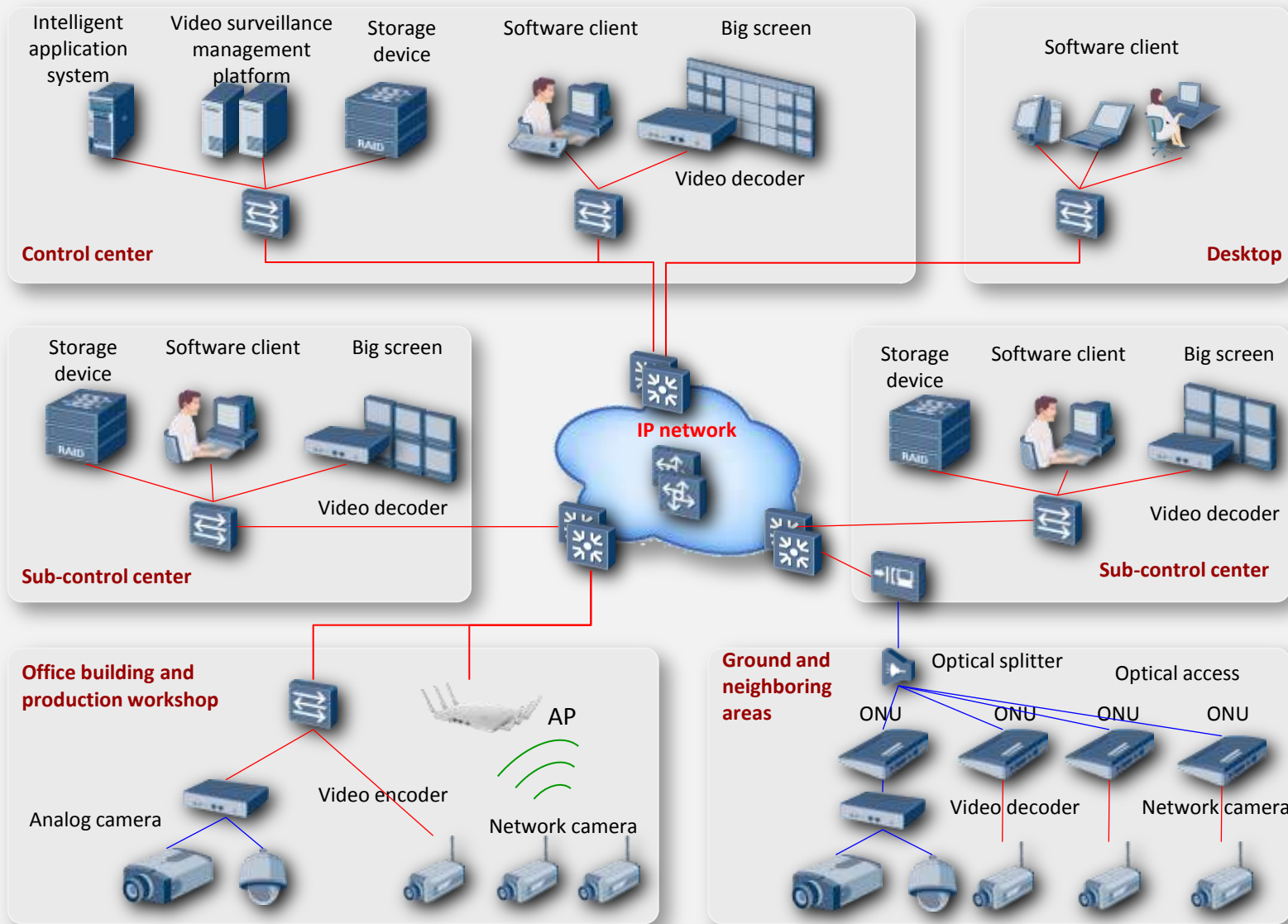


The video surveillance system provides the following functions:

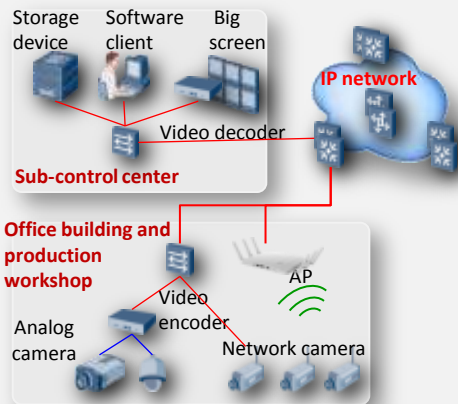
1. Safety: The video surveillance system provides safety for the campus network.
2. Auxiliary management: The video surveillance system strengthens management, for example, visual management for the product line and remote proctoring.

This solution uses the front-end system, storage system, IP network, surveillance center, and management platform. We focus on the IP network solution design.

# Video Surveillance Solution Network Topology



# Video Surveillance Solution on the Campus Network



## Video surveillance

- Single image
- Multi-image
- PTZ control
- Video polling
- TV wall

## Alarm linkage

- Alarm input
- Output control
- Motion detection
- Information storage
- Call forwarding

## Storage and playback

- Image storage
- Local snapshot
- Image retrieval
- Intelligent marking

## Management functions

- User management
- Right management
- Device management
- Log management

## Personalized function

- Image snapshot
- Image identification
- Electronic map
- Action identification

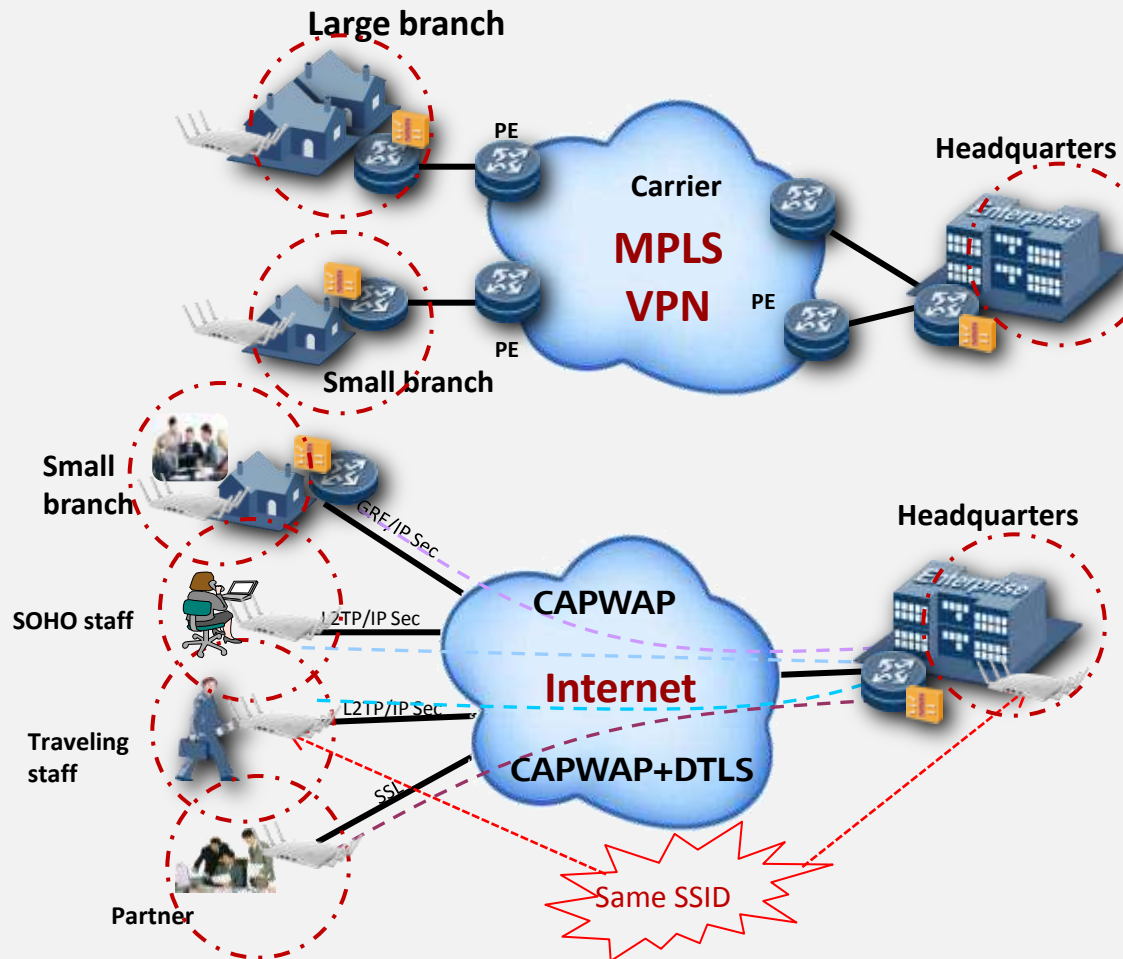
# Subcontents

## 3

### Wireless Campus Network Service Solution

- 1 Virtual WLAN
- 2 Voice Solution
- 3 Video Surveillance Solution
- 4 **Office Solution**
- 5 WLAN Positioning Solution

# Wireless Office Solution: Remote office + Portable Office



## Campus network interconnection

- ◆ Enterprise without WANs use the carrier's MPLS VPNs to connect their branches.
- ◆ Enterprises leasing lines from the carrier use MPLS VPNs to isolate services and implement internal communication.
- ◆ Vertical industries deploy MPLS VPNs on their own WANs to connect their branches. Their egress routers function as PEs.

## Remote Internet access

- ◆ An enterprise's branches use the GRE over IPsec function to provide the same services as the headquarters network while ensuring service security.
- ◆ Employees working at home or on a business trip use the L2TP tunnel or IPsec VPN function to gain the same access rights as the employees within the campus.
- ◆ Partners and guests can access some data on the enterprise network using SSL VPN.

**Huawei WLAN solution provides secure, reliable remote access for users any where at any time**

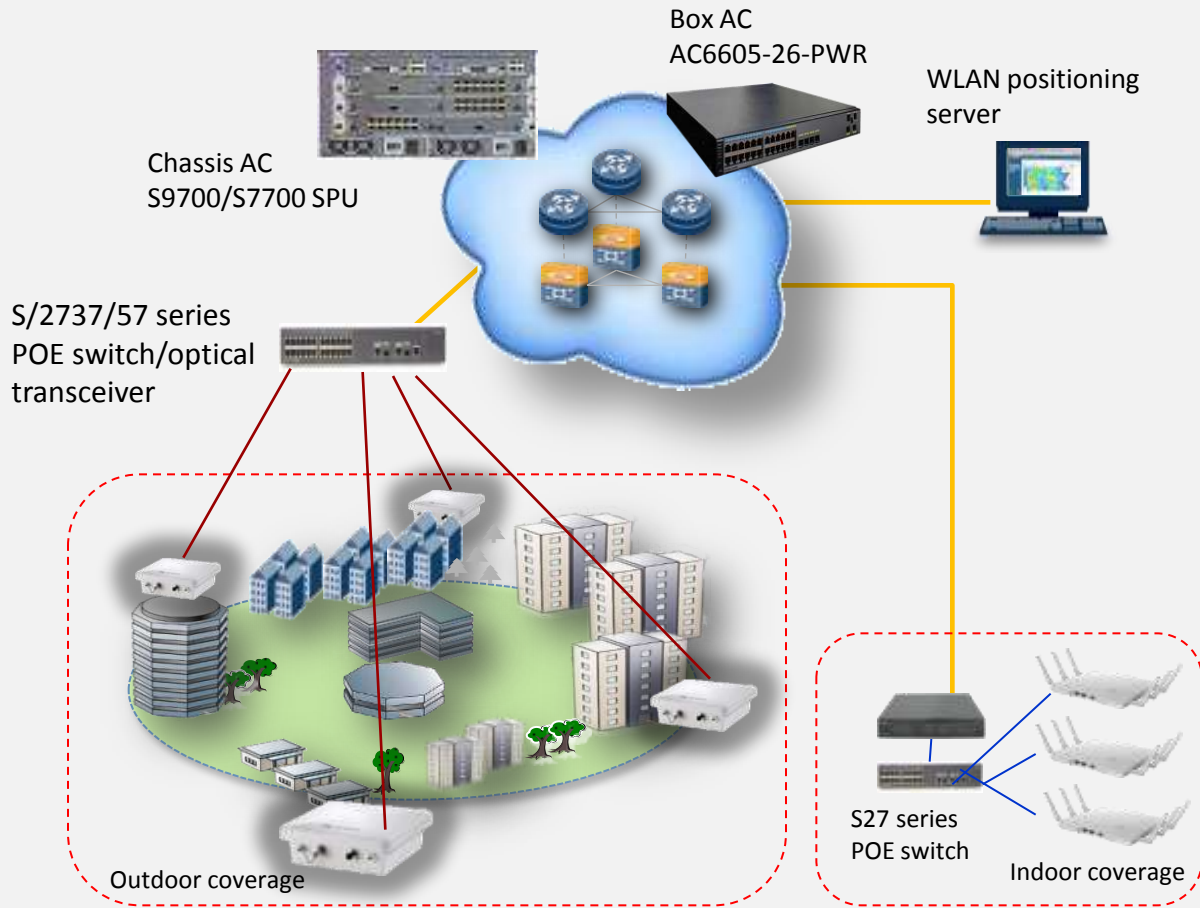
# Subcontents

## 3

### Wireless Campus Network Service Solution

- 1 Virtual WLAN
- 2 Voice Solution
- 3 Video Surveillance Solution
- 4 Office Solution
- 5 **WLAN Positioning Solution**

# Wi-Fi Positioning Solution



The WLAN-based positioning system can be deployed on existing networks, which reduces customers' initial investment and maintenance cost. The Internet of Things and cloud computing will promote development of WLAN-based positioning technology.

All Huawei WLAN products support the Wi-Fi positioning system (WPS).

# Contents

**1** Ubiquitous WiFi on the Access Network

**2** WLAN Network Design

**3** Service Design

**4** **Products**

**5** Success Stories

# AP6010SN-GN

- **IEEE:** 802.11b/g/n, support 2.4Gz frequency band
- **Dimensions :** 180\*180\*50mm
- **Weight:** 0.4kg
- **Power Consumption :** 6.5W(Max)
- **PoE:** 802.3af
- **Transmit power :** 100mW(Max)
- **Antenna :**



**Built-in 2.4 GHz omni antenna, gain 4 dBi, horizontal beam width 360°**

- 2x2 multiple-input multiple-output (MIMO) with two spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11g beamforming (explicit)
- 20- and 40-MHz channels
- PHY data rates up to 300 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP6010DN-AGN

- **IEEE:** 802.11a/b/g/n, support 2.4GHz和5GHz frequency band
- **Dimensions :** 180\*180\*50mm
- **Weight :** 0.4kg
- **Power Consumption :** 10.2W
- **PoE :** 802.3af
- **Transmit power :** 100mW
- **Antenna :**



**Built-in 2.4 GHz omni antenna, gain 4 dBi, horizontal beam width 360°**

**Built-in 5 GHz omni antenna, gain 5 dBi, horizontal beam width 360°**

- 2x2 multiple-input multiple-output (MIMO) with two spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11a/g beamforming (explicit)
- 20- and 40-MHz channels
- PHY data rates up to 600 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP6310SN-GN

- **IEEE:** 802.11b/g/n, support 2.4Gz frequency band
- **Dimensions :** 150\*130\*35 mm
- **Weight :** 0.6kg
- **Power Consumption :** 8.3W
- **PoE :** 802.3af
- **Transmit power :** 500mW



- 20- and 40-MHz channels
- PHY data rates up to 150 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP6510DN-AGN

- **IEEE:** 802.11a/b/g/n, support 2.4Gz和5GHz frequency band
- **Dimensions :** 255\*255\*83mm
- **Weight :** 2.2kg
- **Power Consumption :** 25.5W
- **PoE :** 802.3at
- **Transmit power :** 2.4GHz-500mW  
5GHz-125mW



**temperature range:-40~60° C**

**Ingress Protection:IP67**

- 2x2 multiple-input multiple-output (MIMO) with two spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11g beamforming
- 20- and 40-MHz channels
- PHY data rates up to 600 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP6610DN-AGN

- IEEE: 802.11a/b/g/n, support 2.4Gz和5GHz frequency band
- Dimensions : 255\*255\*83mm
- Weight : 2.65kg
- Power Consumption : 30W
- PoE : 802.3at
- Transmit power : 2.4GHz-500mW  
5GHz-250mW



temperature range:-40~60° C

Ingress Protection:IP67

- **Other interface: fibers and obtains power from the connected AC.**
  - 2x2 multiple-input multiple-output (MIMO) with two spatial streams
  - Maximal ratio combining (MRC)
  - 802.11n and 802.11a/g beamforming
  - 20- and 40-MHz channels
  - PHY data rates up to 600 Mbps
  - Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
  - 802.11 dynamic frequency selection (DFS)

# AP5010SN-GN

- **IEEE:** 802.11b/g/n, support 2.4Gz frequency band
- **Dimensions :** 180\*180\*50mm
- **Weight:** 0.4kg
- **Power Consumption :** 6.0W(Max)
- **PoE:** 802.3af
- **Transmit power :** 50mW(Max)
- **Antenna :**



**Built-in 2.4 GHz omni antenna, gain 4 dBi, horizontal beam width 360°**

- 2x2 multiple-input multiple-output (MIMO) with two spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11g beamforming (explicit)
- 20- and 40-MHz channels
- PHY data rates up to 300 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP5010DN-AGN

- **IEEE:** 802.11a/b/g/n, support 2.4Gz和5GHz frequency band
- **Dimensions :** 180\*180\*50mm
- **Weight :** 0.4kg
- **Power Consumption :** 9.5W
- **PoE :** 802.3af(Max)
- **Transmit power :** 50mW (Max)
- **Antenna :**



**Built-in 2.4 GHz omni antenna, gain 4 dBi, horizontal beam width 360°**

**Built-in 5 GHz omni antenna, gain 5 dBi, horizontal beam width 360°**

- 2x2 multiple-input multiple-output (MIMO) with two spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11a/g beamforming (explicit)
- 20- and 40-MHz channels
- PHY data rates up to 600 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP7110SN-GN

- **IEEE:** 802.11a/b/g/n, support 2.4Gz frequency band
- **Dimensions :** 200mm × 200mm × 45mm
- **Weight :** 1.0kg
- **Power Consumption :** 8.7W
- **PoE :** 802.3af
- **Transmit power :** 100mW
- **Antenna :**



External 2.4 GHz omni antenna, gain 2.5 dBi, horizontal beam width 360°

- 3x3 multiple-input multiple-output (MIMO) with three spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11a/g beamforming
- 20- and 40-MHz channels
- PHY data rates up to 450 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AP7110DN-AGN

- **IEEE:** 802.11a/b/g/n, support 2.4GHz和5GHz frequency band
- **Dimensions :** 200mm × 200mm × 45mm
- **Weight :** 1.0kg
- **Power Consumption :** 15.7W
- **PoE :** 802.3af/at
- **Transmit power :** 100mW
- **Antenna :**



**External 2.4 GHz omni antenna, gain 2.5 dBi, horizontal beam width 360°**

**External 5 GHz omni antenna, gain 4 dBi, horizontal beam width 360°**

- 3x3 multiple-input multiple-output (MIMO) with three spatial streams
- Maximal ratio combining (MRC)
- 802.11n and 802.11a/g beamforming
- 20- and 40-MHz channels
- PHY data rates up to 900 Mbps
- Packet aggregation: A-MPDU (Tx/Rx), A-MSDU (Rx only)
- 802.11 dynamic frequency selection (DFS)

# AC6605——Box AC with the Industry-leading Capacity



- High performance
- High reliability
- Powerful networking and service capabilities
- Investment protection

## AC6605's Benefits to WLANs

### • High performance



- Line-speed forwarding based on hardware through CAPWAP tunnels
- Fast roaming and inter-VLAN Layer 3 roaming
- Managing a maximum of 512 APs

### • High reliability



- 1+1 and N+1 AC backup
- LACP and MSTP protection within 50 ms
- Redundancy backup of power supplies
- Hot swappable fans and power supplies and over temperature protection

### • Powerful networking and service capabilities



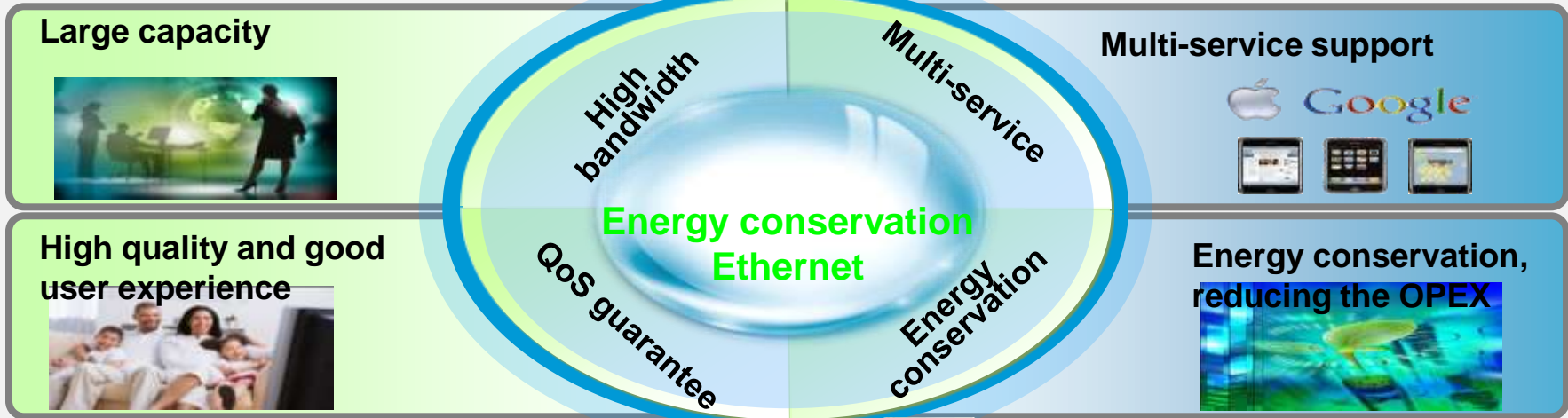
- Various interfaces: 2\*10GE optical interface, 20\*GE electrical interface, and 4\*GE Combo interface
- Powerful service functions: fine-grained QoS, various Layer 2/Layer 3 functions, and standard MIB interfaces

### • Investment protection



- Low power consumption: < 85 W (0.085 W for each AP)
- Compliance with 802.11b/g and 802.11n
- Huawei standard software platform, which seamlessly integrates with broadband MAN devices

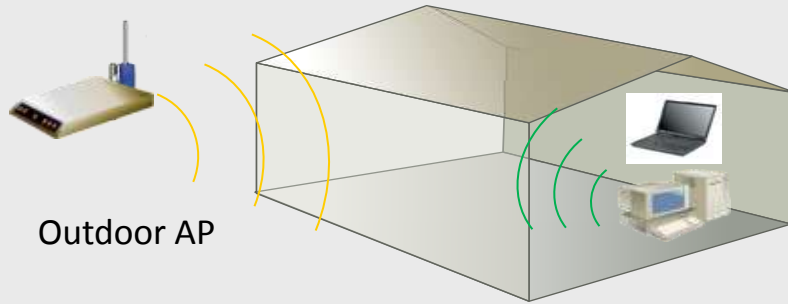
# S9700/S7700 SPU, High-Performance Integrated AC



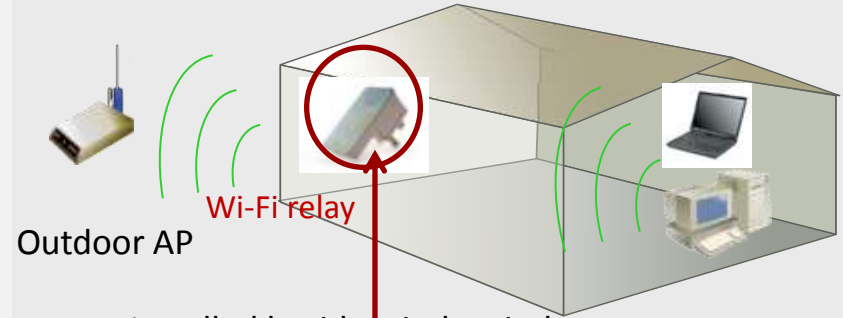
S9700/S7700 SPU

AP management and user access	Security and right control	Wireless network
<ul style="list-style-type: none"> <li>■ Large capacity: Each SPU connects to 1024 APs and up to 11 K APs.</li> <li>■ Batch AP configuration using profiles</li> <li>■ Various authentication mode: MAC address authentication, Portal authentication, 802.1x authentication, and non-authentication</li> <li>■ Global calibration, partial calibration, coverage hole compensation</li> </ul>	<ul style="list-style-type: none"> <li>■ Flexible user right control such as user groups, isolation, and ACLs</li> <li>■ WEP, WPA/WPA2(PSK/1X), WAPI</li> <li>■ Key management/AP blacklist</li> <li>■ Robust against STA IP address spoofing, ARP attacks, and attacks from bogus DHCP servers</li> </ul>	<ul style="list-style-type: none"> <li>■ CAPWAP tunnel, line-speed forwarding</li> <li>■ WMM, priority mapping, CAR, flow level definition, and load balancing and AC backup</li> <li>■ Flexible networking (local forwarding/centralized forwarding/centralized authentication, local forwarding, and Layer 2/Layer 3 networking), WDS deployment</li> </ul>

# Wide Signal Coverage by Outdoor APs



Outdoor AP



Outdoor AP

Installed beside window indoors

## ❑ Application scenarios:

In dormitory buildings of enterprises or schools, it is difficult and expensive to deploy Wi-Fi networks using indoor APs. Outdoor APs are used to provide wireless access in these buildings. When Wi-Fi networks are deployed in freight yards, docks, or production plants, a wide signal coverage is required.

## ❑ Difficulties:

Attenuation of 2.4 GHz radio signals is high. The transmit power and antenna gain of STAs are much lower than those of APs, so uplinks become a bottleneck in wireless transmission. The line of sight transmission range is within 200 m. Walls cause a great attenuation of radio signals. The radio transmission distance cannot exceed 50 m if blocked by a wall. For these reasons, outdoor APs cannot provide expected signal coverage in these scenarios. Users can gain wireless access only when they are sitting near windows.

## ❑ Huawei solutions:

Solution 1: Install Wi-Fi relays indoors, which can increase the transmit power of STAs by 100% and increase their antenna gain by more than 100%. This solution can improve signal coverage by at least 2 times.

Solution 2: Use Huawei circuit enhancement technology to increase the receive sensitivity of APs by 100% and increase their transmit gain by 100%. This solution can improve signal coverage by 30%. Solution 1 and solution 2 can be used together to enable outdoor APs to provide signal coverage for indoor users, improving user experience.

## ❑ Other vendors' solutions

ZTE provides a Wi-Fi relay solution similar to solution 1 but has no circuit enhancement technology. H3C and Cisco have no such solutions.

## ❑ Case:

China Mobile Shandong branch has decided to use Huawei's outdoor AP solution.

# Centralized Bridge Management, Zero-Configuration Deployment

- **Huawei eSight manages wireless bridges and other wired/wireless devices in a centralized manner.**

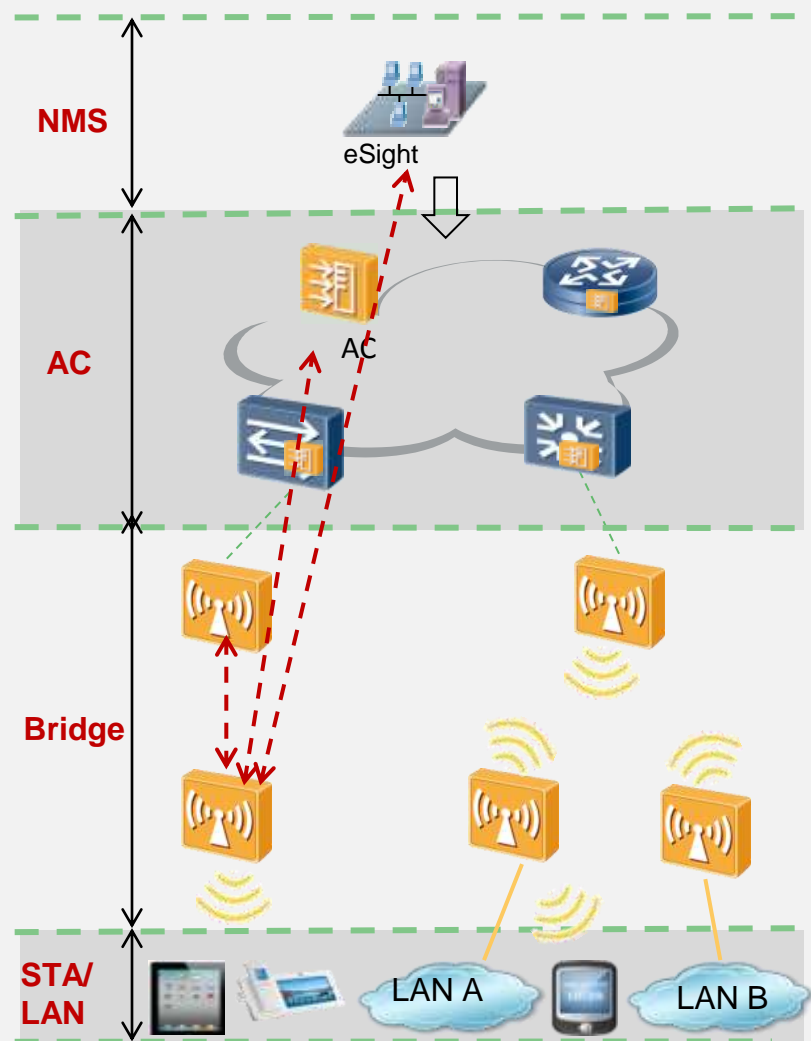
Centralized management facilitates network management and maintenance, allows for real-time status monitoring, alarm reporting, and traffic statistics collection, and reduces maintenance costs.

- **Huawei bridges automatically set up links with upstream APs, discover ACs, and obtain configuration from the associated AC, saving workload on manual configuration.**

Most wireless bridges in the industry are fat APs that require manual configuration. Huawei bridges' AC discovery and auto configuration functions make the bridges plug-and-play.

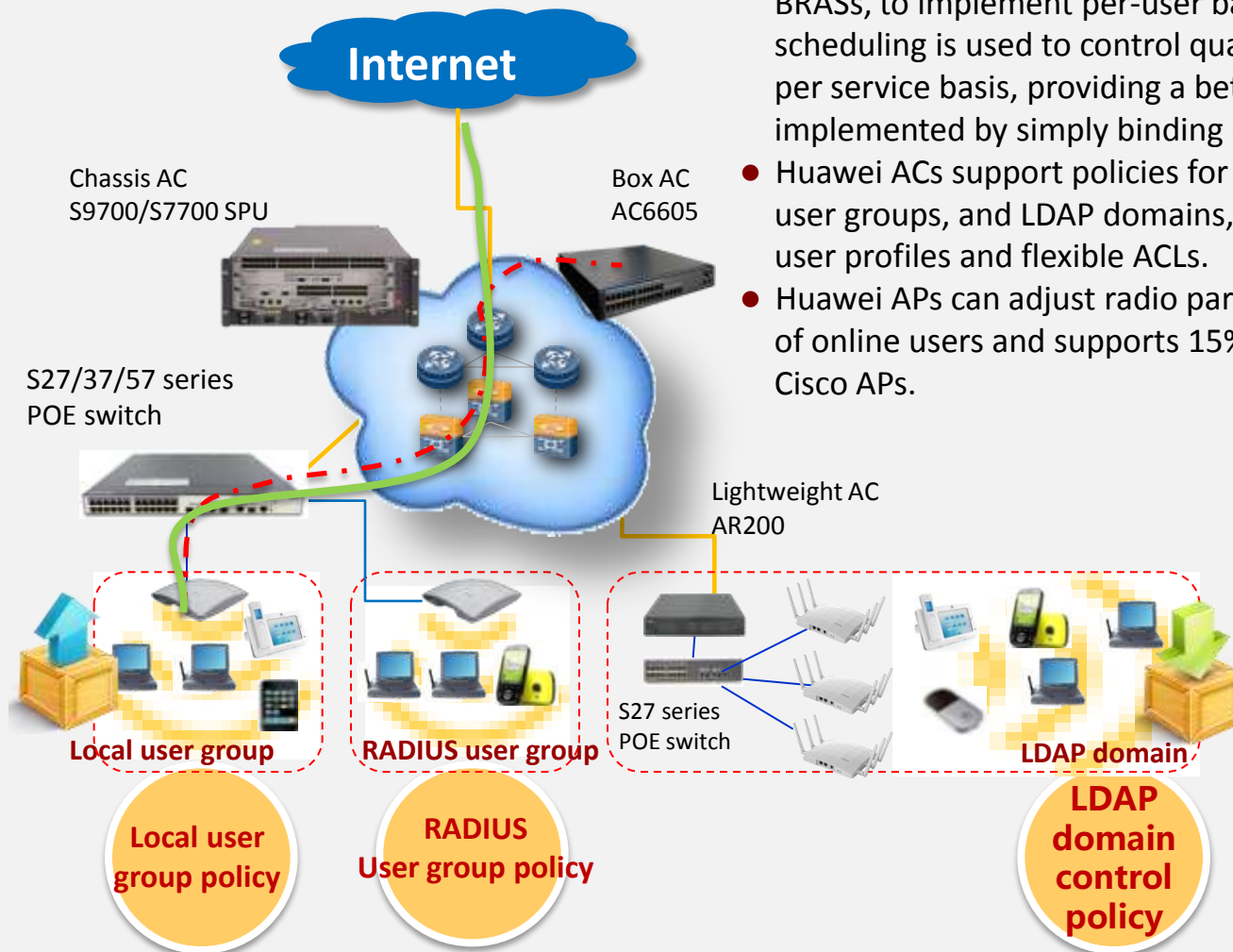
- **Huawei bridges support various networking modes to transmit VLAN services.**

Huawei bridges support various networking modes, including point-to-multipoint bridging, single-band/dual-band multi-hop relay, dual-band WDS bridging+WLAN access, and single-band WDS bridging+WLAN access.

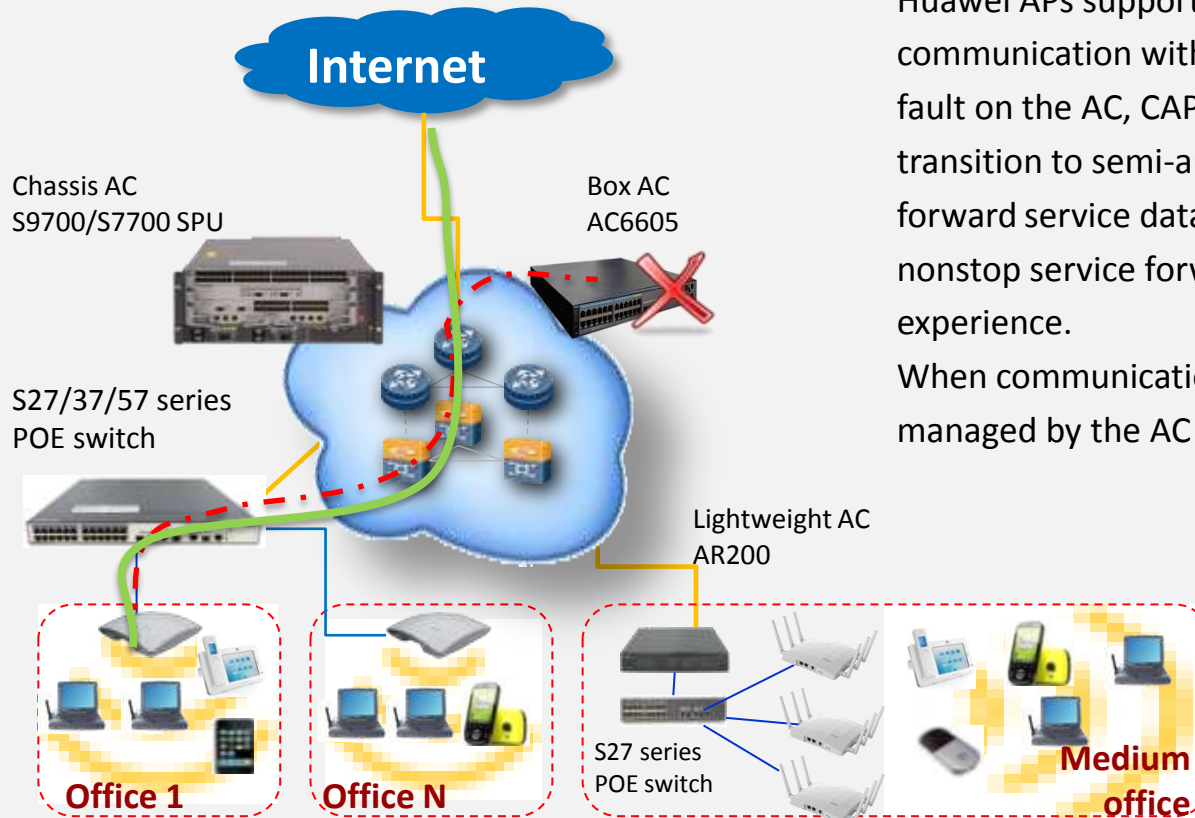


# Smart User and Bandwidth Management

- Huawei WLAN solution uses a user/user group policy control mechanism, similar to the user management mechanism on BRASs, to implement per-user bandwidth control. HQoS scheduling is used to control quality of service on a per user per service basis, providing a better user experience. HQoS is implemented by simply binding QoS profiles to user groups.
- Huawei ACs support policies for RADIUS user groups, local user groups, and LDAP domains, and also provides various user profiles and flexible ACLs.
- Huawei APs can adjust radio parameters based on the number of online users and supports 15% more concurrent users than Cisco APs.



# Service Endurance on APs



Huawei APs support service endurance. When communication with an AC is interrupted due to a fault on the AC, CAPWAP tunnel, or control link, APs transition to semi-autonomous state and continue to forward service data from STAs. This function ensures nonstop service forwarding and improves user experience.

When communication with the AC recovers, the AP is managed by the AC again.

# Smart IT Technologies

APs support **smart forwarding** based on MAC addresses to reduce broadcast storms.



ACs **identify rogue STAs** based on neighboring relationships between APs.

Smart  
isolation

Smart  
identification

Smart  
security

Smart  
authentication

ACs support IP Source Guard, DHCP snooping, and DAI in local forwarding mode, **enhancing security without comprising system performance.**

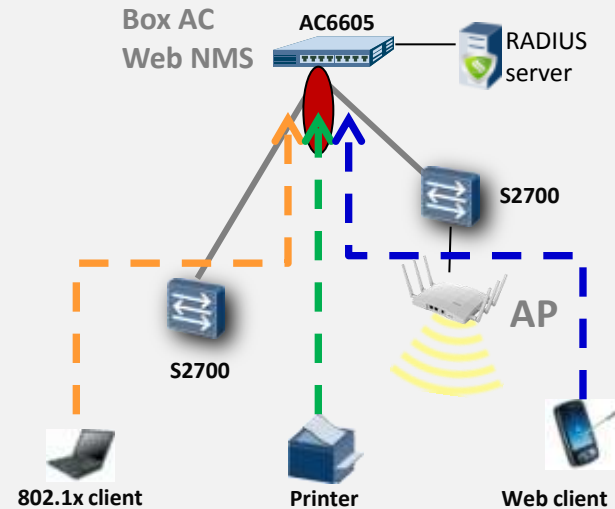


STAs are authenticated by an authentication server, and **APs are authenticated by ACs using 802.1x** to ensure correct associations.



# Integrated Wired and Wireless Access (ONET)

- Huawei AC6605 integrates switch and AC functions and uses the same authentication mode for wired and wireless terminals. It supports local 802.1x authentication and local portal authentication.



- Lower network construction cost
- More flexible access

- Huawei AC6605 performs authentication uniformly for wired and wireless user terminals as well as printers using the configured authentication mode.
- AC6605 delivers NAC policies to APs to control user authority.
- AC6605 supports local 802.1x authentication and local portal authentication.
- AC6605 can be managed by the local web NMS.

# Contents

**1** Ubiquitous WiFi on the Access Network

**2** WLAN Network Design

**3** Service Design

**4** Products

**5** Success Stories

# WLAN Project for Anhui Agricultural University

## Background and Objective

- The existing network structure remains unchanged, fully utilizing existing network resources.
- Different authentication modes are required for intranet access and extranet access. Users are charged only when they access the Internet.
- External users or visitors do not need to be authenticated and access only limited campus network resources.
- IPv6 services are promoted in the university. Wireless access of IPv6 users requires no authentication.

## Customer Benefits

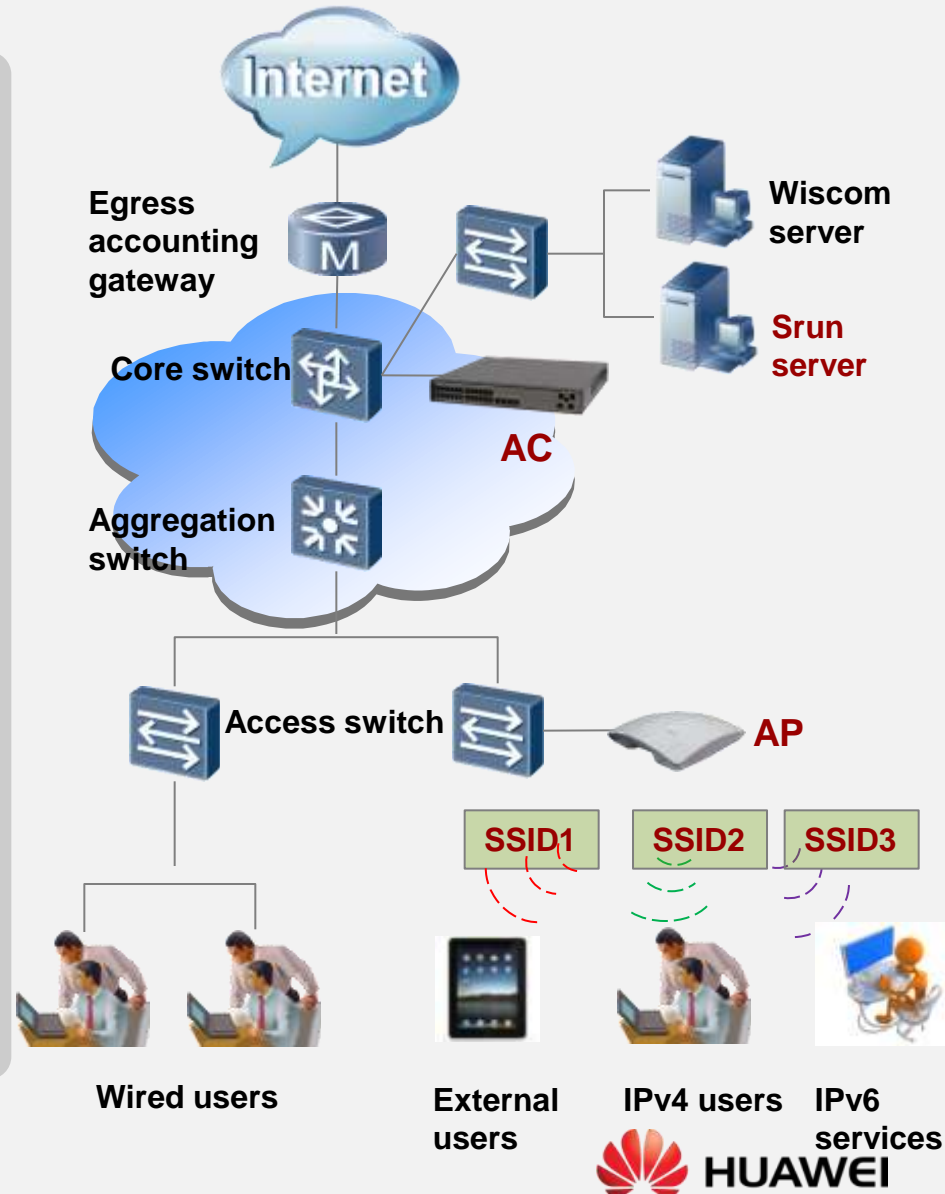
- User access control ensures security of key data.
- Users enjoy highly efficient and ubiquitous access to the network. Integration of wired and wireless access improves working efficiency.
- The network is easy to deploy and maintain, and users are managed in a centralized manner.



# Campus Network of Anhui Agricultural University

## Huawei Solution

- Connects the AC6605 to core switches in bypass mode without changing the network topology.
- Uses corresponding servers to implement integrated authentication and accounting for wired and wireless users.
- Provides three SSIDs to associate with external users, internal users, and internal IPv6 users respectively.



# De La Salle University, Philippines

## Background and Objective

- Huawei provides high-quality campus wireless networks to De La Salle University in Philippines.
- The campus wireless network covers teaching buildings and other public places on the campus, such as canteens, sports center, libraries, and classrooms in the e-classroom building. Teachers and students can access digital services provided by the library using the wireless network. Staff in the office area can access the campus network in any place at any time using the wireless network.

## Customer Benefits

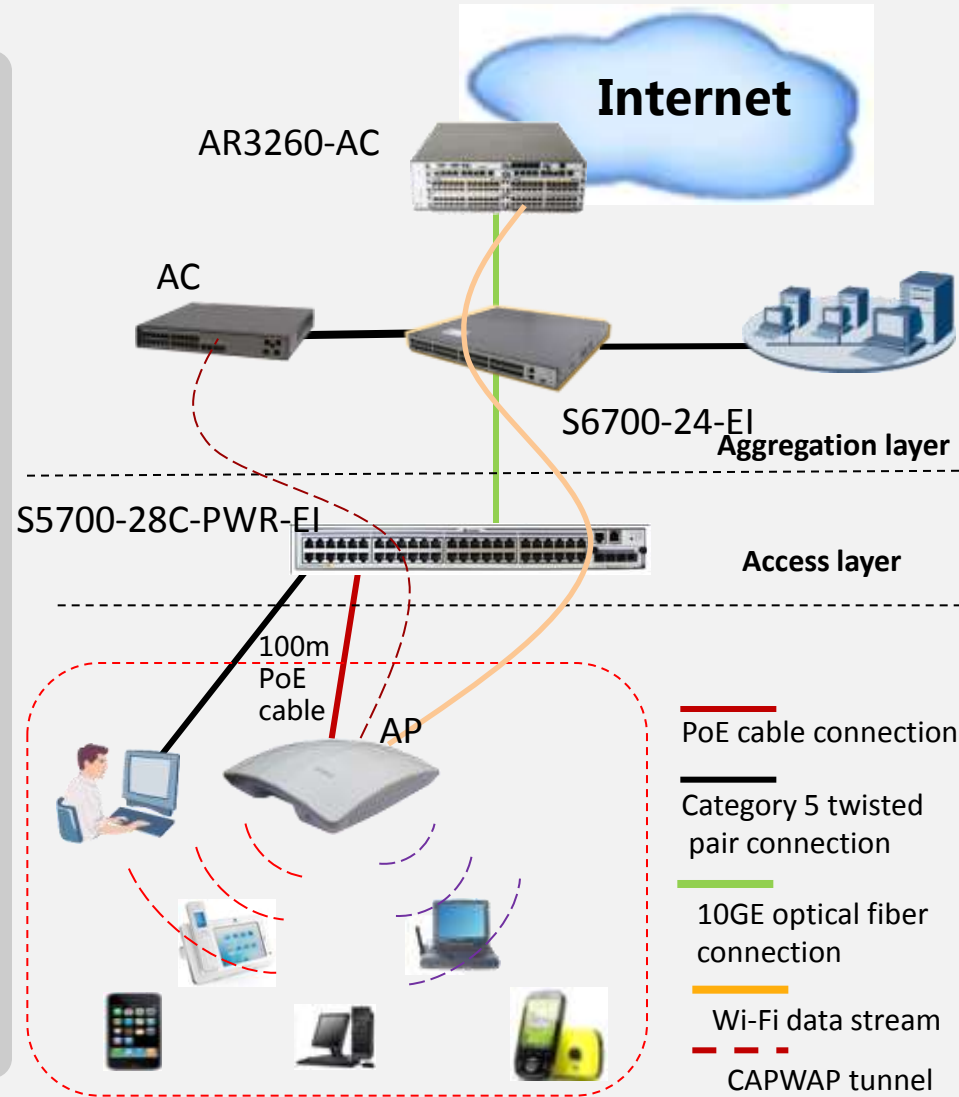
- Centralized management of Fit APs, flexible networking, and easy maintenance
- Dual-band services and optimal performance
- Access authentication to protect confidential data
- Reliable and easy to install



# Campus Network of De La Salle University

## Huawei Solution

- Automatic AC discovery in Fit AP mode and zero-touch configuration
- Local forwarding mode
- Layer 3 roaming
- Providing the dual-band services with the same SSID for fast roaming
- WPA2-PSK encryption



# WLAN Project for Kunming Changshui Airport of China Eastern Airlines

## Background and Objective and Objective

- With the implementation of Yunnan "Bridgehead" strategy, Kunming new airport of China Eastern Airlines has entered into a new phase of great development.
- Kunming airport requires wireless coverage of offices to implement flexible mobile office in constructing the campus network.
- The network of the new airport has many Internet egresses and group interconnection egresses. Huawei solution must ensure the network security and load balancing of bandwidth.
- The government requires that Kunming Changshui airport network migration must be complete within 8 hours to ensure the successful system switchover.

## Customer Benefits

After the network migration, network services of Kunming airport of China Eastern Airlines are stable and run properly, which gains good reputation for Kunming airport.

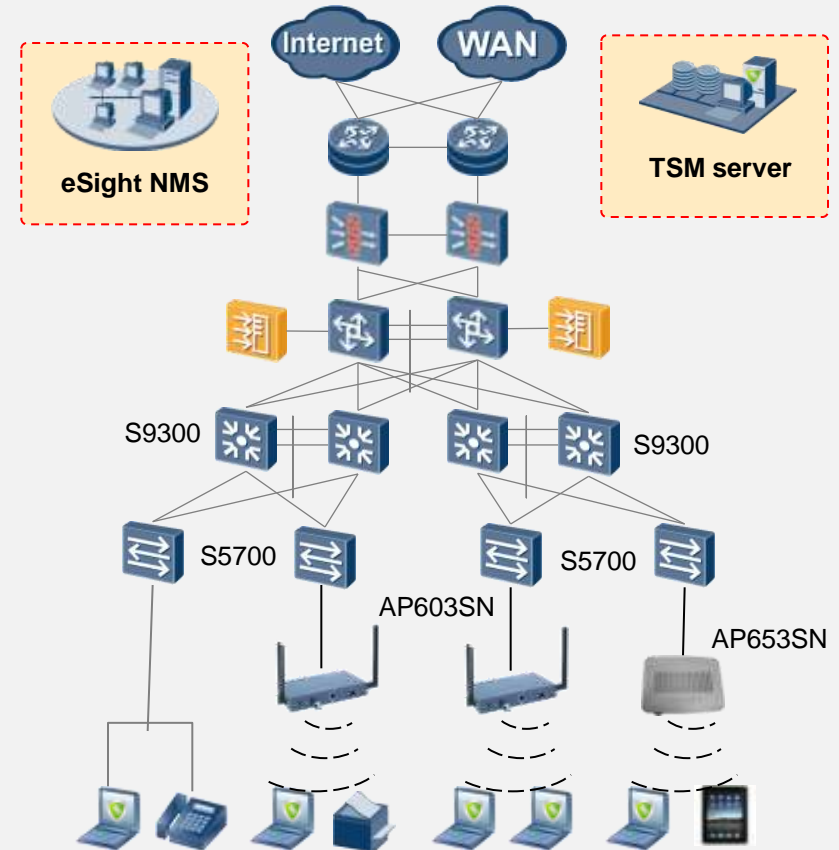
- Huawei solution provides an efficient and ubiquitous access and an integrated wired and wireless access, which improves efficiency.
- The redundancy design improves the network reliability and ensures that services are not interrupted.



# Network for Kunming New Airport of China Eastern Airlines

## Huawei Solution

- Huawei used the CSS technology at the aggregation and core layers to facilitate network management.
- Firewall boards were deployed on the core switches, and the firewall, IPS, and SSL VPN were deployed at the egress for convenient access.
- About 300 APs were deployed to provide wireless coverage of offices. Huawei NAC solution is used to authenticate and manage Wi-Fi users to improve network security.



# Mexico National Water Commission Conagua

## Background and Objective

- Mexico National Water Commission (Conagua) is the only organization that manages the federal's water resources. It is an administrative and supervisory organization.
- Conagua manages distribution and scheduling of water resources in centralized manner.
- Conagua has dozens of departments and more than 10,000 employees at 368 workplaces all over Mexico.

## Customer Benefits

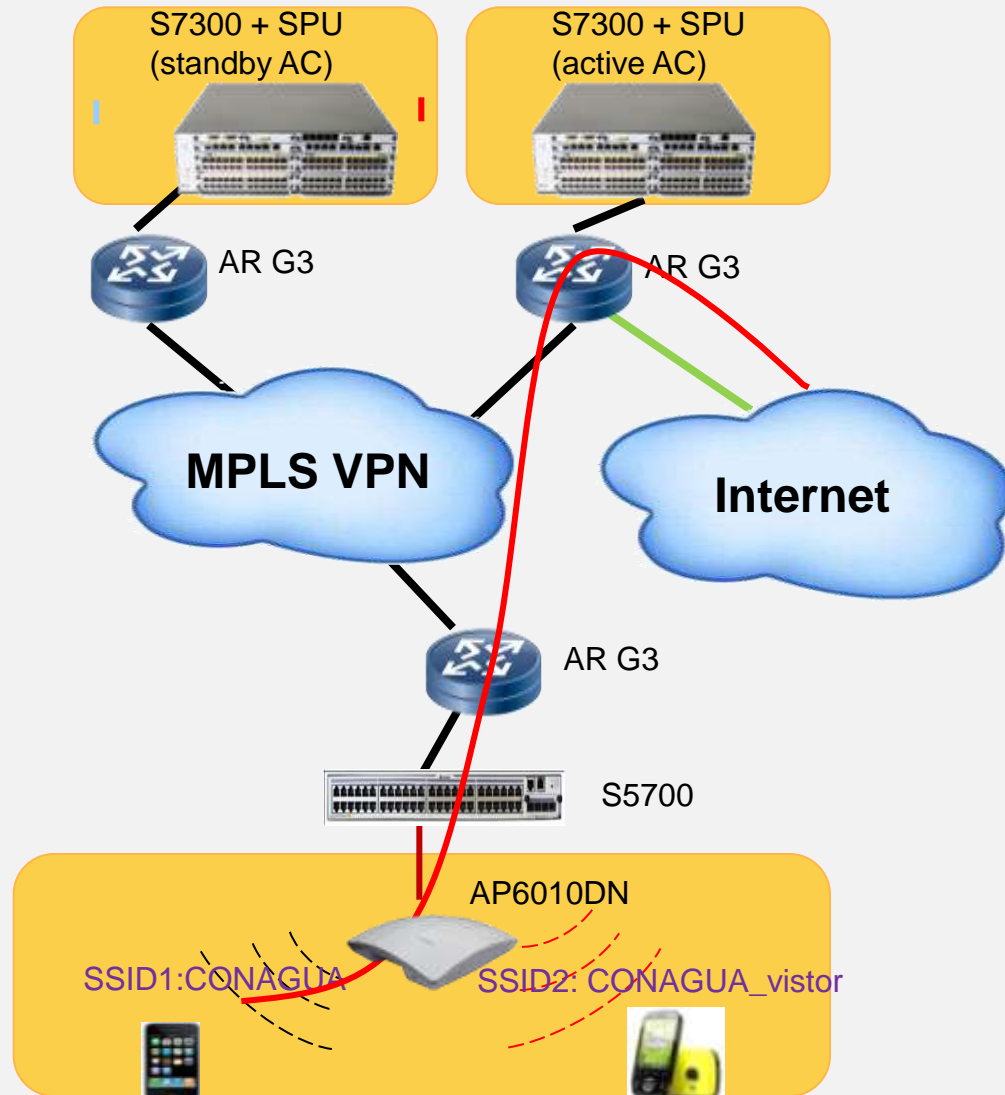
- Easy deployment and maintenance, and centralized management
- Improved working efficiency due to integrated wired and wireless access
- Protection of sensitive private data through the access control mechanism



# Conagu Project Network Overview

## Huawei Solution

- Uses the centralized AC + Fit AP architecture. The APs can automatically discover an AC and download configurations from the AC.
- Configures multiple SSIDs to isolate visitors from employees.
- Provides the wireless distribution system (WDS) for outdoor access.
- Uses Portal authentication.



# Power Construction Corporation of China

## Background and Objective

Power Construction Corporation of China is one of the Fortune Global 50. It has more than 90 branches globally and requires to deploy WLAN in manager rooms, meeting rooms, and offices. The requirements are as follows:

- The 14 seniors only need to enter their passwords at the first time to log in to the senior VLAN with high access rights.
- Other staff log in to the other VLAN by entering their user names and passwords. They enter different VLANs based on their roles with different rights.
- Visitors can only access the external network.

## Customer Benefits

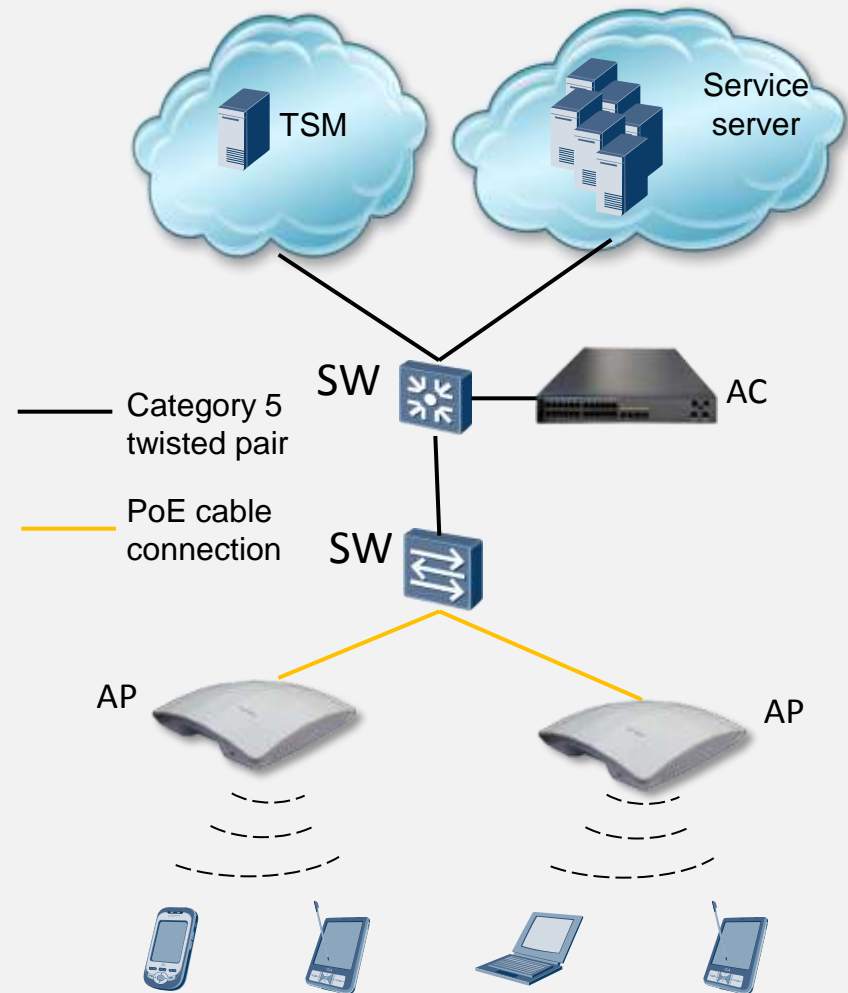
- The seniors only need to enter their passwords at the first time to pass the authentication.
- The staff and visitors use the same SSID to reduce the number of SSIDs. Dynamic VLAN IDs are used to ensure that different user groups have different access rights.
- Layer 3 roaming is available in offices and meeting rooms for the staff without service interruption.



# Campus Network of Power Construction Corporation of China

## Huawei Solution

- The seniors use PSK authentication to access the senior SSID using ACLs. The seniors only need to enter their passwords at the first time.
- The staff use 802.1x authentication to access the staff SSID. Different service VLANs are delivered to different users.
- Visitors use 802.1x authentication to access the staff SSID. They are assigned with guest VLAN and can only access the external network.





## HUAWEI ENTERPRISE ICT SOLUTIONS **A BETTER WAY**

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