

# Local & Wide Area Network Planning Guide



## About this Document

This document serves as the LAN Planning guide for WOCOM Cloud Hosted PBX, detailing the integration of the Cloud Hosted PBX with your network and outlining the essential requirements for optimizing the customer experience. Following the introductory section, each subsequent part of the document provides in-depth insights into the requirements and their underlying rationale. At the conclusion of each section, you will find specific technical recommendations presented in a concise bulleted list format.

Should you have any inquiries or require assistance, your dedicated WOCOM account team is readily available to provide support and guidance throughout the planning and implementation process. Your satisfaction and the seamless operation of the WOCOM Cloud Hosted PBX System on your network are our top priorities.

## Introduction: Key Elements of WOCOM Hosted PBX

WOCOM Cloud Hosted PBX is a cloud-based communication system. In practical terms, this system comprises the following components:

### Phones and SIP Devices:

Phones, situated within your premises on your users' desks, smartphones and desktop computers are integral components of the WOCOM Cloud Hosted PBX System.

Each phone establishes a connection to an Ethernet switch and can optionally draw power from it. Analog Terminal Adapters (ATAs) may also be employed to convert older analog devices, such as fax machines, for compatibility with the Hosted PBX system. Collectively, both phones and ATAs are referred to as SIP devices throughout this document.

### Ethernet Switch Connectivity:

An Ethernet switch serves as the nexus connecting SIP devices with each other and the broader network within your site. Some switches offer Power over Ethernet (PoE), delivering power to phones through the same cabling that facilitates the network connection. In instances where PoE switches are not utilized, phones derive power from standard electrical outlets.

### Network Configuration for Phones:

Phones can share switches with computers and other devices on your network, or they can be segregated into a distinct network. This separation can occur physically or through the implementation of virtual LAN (VLAN) technology within the switch, ensuring efficient network management.

### Ethernet Cabling:

Ethernet cabling is the conduit that links SIP devices to the overall network infrastructure, facilitating seamless communication and data exchange.

## Hosted PBX Call Control Platform:

The core of the Hosted PBX System, the call control platform, resides within the WOCOM cloud. It is responsible for call routing and establishing connections to the global telephone network on behalf of your SIP devices, ensuring seamless communication and integration with external networks.

## Foundations of Local Area Networks (LAN)

### Cabling and Power Infrastructure

In the context of LAN fundamentals, the structural elements of cabling and power constitute critical considerations for ensuring the efficiency of your network. If your office network has been established within the past five years, it's likely that you already possess the requisite LAN cabling and power infrastructure. Here are essential guidelines to verify and maintain optimal conditions.

### Cabling Standards:

LAN cabling must adhere to at least Category 5 standards or higher, ensuring high-speed data transmission and reliability. The connectors for the LAN cabling should be RJ-45, maintaining compatibility with modern networking equipment.

### Power Availability and Outlets:

A crucial requirement involves the availability of ample power outlets within your office environment. These power outlets should be strategically positioned to accommodate the power needs of SIP devices, switches, and the access router, ensuring seamless and uninterrupted network operations.

By adhering to these specifications, you can confirm that your LAN infrastructure is well-equipped to support the demands of modern networking technologies. This, in turn, fosters a robust and efficient network environment, essential for the smooth operation of SIP devices and other critical components within your network.

## Ethernet Switching Guidelines

In typical business networks, Ethernet switches play a pivotal role in interconnecting computers. For WOCOM Hosted PBX, similar connectivity principles apply to link SIP devices within your network. Here are key recommendations and considerations:

### Segmentation Best Practice

Ideally, deploy separate Ethernet switches for SIP devices, maintaining the existing PC network unchanged. This approach allows for scalability and simplifies network management.

### Combined Usage Considerations:

If necessary, SIP devices and computers can share the same Ethernet switches, but caution is advised.

Implement Virtual LANs (VLANs) to logically segregate traffic, ensuring that non-SIP devices' data doesn't interfere with SIP devices. Note that heavy loads on one VLAN may impact others.

## VLAN Implementation

When combining services on a single switch, employ VLANs to logically partition the switch. VLANs help prevent interference between traffic for SIP devices and other devices. This is especially useful for smaller or low-traffic sites.

## Key Requirements

Use 100Mbit or auto-sensing 100/1000Mbit Ethernet switches for SIP devices; avoid hubs and 10Mbit switches,

If running SIP devices on the same switch as other network equipment, ensure the switch supports VLANs via 802.1Q tagging.

Consult your LAN administrator or WOCOM account team for further guidance, especially if uncertainties arise. These guidelines aim to optimize the performance and management of your Ethernet switching infrastructure within the context of WOCOM Hosted PBX.

## Quality of Service Configuration

Quality of Service (QoS) pertains to the network's capacity to allocate distinct priorities to various applications across a network connection. In the context of Cloud Hosted PBX, it is imperative to consistently prioritize voice traffic over data to ensure that phone conversations take precedence on the network.

This prioritization is crucial as voice communication demands real-time responsiveness, unlike non-time-sensitive activities such as email and web browsing.

## Network Discovery and Configuration Services

### DHCP - Dynamic Host Configuration Protocol:

Every device within your site must possess a unique IP address to actively participate in the network, and SIP devices are no exception. In the context of WOCOM Cloud Hosted PBX, these devices obtain their IP addresses through the utilization of DHCP technology.

With DHCP, devices solicit an address, and a DHCP server on the LAN allocates one to them, along with other essential parameters facilitating their network integration.

### Key Requirements:

Your LAN must furnish DHCP service to SIP devices, offering essential parameters like IP address/mask, default gateway, and DNS server. Custom DHCP options, such as Option 66, are not mandatory and will be disregarded if configured.



## DNS - Domain Name System:

In a network where each device possesses a unique IP address, the DNS service plays a crucial role. It translates user-friendly names like "www.wocomja.com" into IP addresses. Furthermore, DNS can map a single name to a list of IP addresses, particularly valuable when device redundancy is employed to enhance performance and/or reliability.

## Customer-Provided Broadband (BYOB) for WOCOM Cloud Hosted PBX

The Bring Your Own Broadband (BYOB) feature within the WOCOM Cloud Hosted PBX service enables customers to link their site to the service utilizing their Internet connection.

## Firewalls

A firewall serves as a protective device for the LAN, shielding it from potentially harmful traffic. Essentially, firewalls have the capability to control the types of services that LAN users can access and restrict external users from gaining unauthorized entry. It's important to note that if not configured properly, firewalls can pose a challenge for SIP devices in utilizing the WOCOM Cloud Hosted PBX service.

Improper configuration may hinder communication with configuration servers, call control servers, network gateways, and other SIP devices. Therefore, meticulous configuration is essential to ensure seamless functionality and connectivity within the WOCOM Cloud Hosted PBX system.

## Network Address Translation (NAT)

Network Address Translation (NAT) is a standard router function that facilitates the translation of multiple private IP addresses within a LAN to a single public IP address on the WAN. This process effectively conceals the individual addresses of your LAN behind a unified public address, enabling multiple devices to access the WAN without each requiring a distinct address on the WAN. NAT is widely employed in contemporary business networks.

The NAT service must demonstrate SIP awareness, specifically the ability to establish a durable binding between an internal SIP device and an external IP address. Without this binding, scenarios may arise where calls can be made but not received, or where communication is one-sided. A recommended bind lifetime range is typically between 30 to 60 seconds for optimal performance.

For WOCM CHPBX service to function properly, firewalls must allow the services listed in Table 1.

**Table 1.**

Service Name	Protocol/port	Role
<b>HTTP</b>	TCP/80	Interaction between SIP devices and WOCOM Cloud Hosted PBX configuration servers.
<b>TLS/SSL</b>	TCP/443	TLS in SIP ensures secure communication by encrypting data, preserving confidentiality, and protecting against potential threats, providing a robust foundation for secure SIP-based interactions.
<b>SIP</b>	UDP/5060, TCP/5060 UDP/10000-20000, TCP/10000-20000	Communication between SIP devices in local and remote environments, encompassing WOCOM Hosted PBX call control platforms, network gateways, and other interconnected elements.
<b>RTP</b>	UDP/19560-24560	Communication between SIP devices in local and remote environments, encompassing WOCOM Hosted PBX call control platforms, network gateways, and other interconnected elements.
<b>NTP</b>	UDP/123	Utilized by SIP devices for synchronizing internal clocks with network time servers.
<b>DNS</b>	UDP/53, TCP/53	Employed by SIP devices for translating names to IP addresses as part of the service discovery process.

## Network Capacity - WAN Bandwidth

The capacity of your network, specifically the available WAN bandwidth, dictates the number of concurrent voice calls and data traffic your connection can accommodate. It's essential to note that a substantial bandwidth alone does not guarantee superior call quality; the implementation of Quality of Service (QoS) is imperative to ensure optimal call quality, even with a sizable internet connection.

## Calculation Formulas:

- Max Simultaneous Calls = Available Voice Bandwidth (Kbps) / 64Kbps

- Max Phones = Max Simultaneous Calls \* Users per Simultaneous Call

where:

- Available Voice Bandwidth (Kbps) is the maximum Internet bandwidth allowed for voice traffic, determined by the lower of the connection's download and upload speeds, minus an amount reserved for data traffic processing.

- 64Kbps is the bandwidth required for a standard phone call (including ATA connected devices).

- Max Simultaneous Calls is the number of simultaneous calls supported over the given internet bandwidth allocation.

- Users per Simultaneous Call is a statistical approximation of the total users sharing one call path with non-blocking results, typically recommended at 4 for average office usage, subject to variations based on office type and phone usage scenarios such as call centers or high-volume scenarios.

## Local Area Network (LAN) Bandwidth

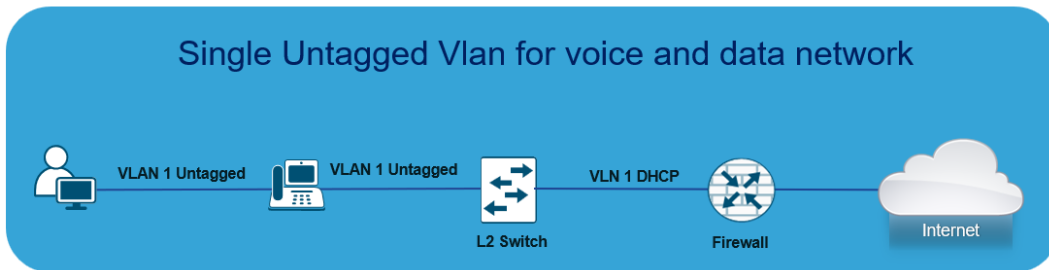
LAN bandwidth refers to the capacity of your internal network to handle data traffic, determined by the throughput specifications of the LAN infrastructure, including switches and cabling. The available bandwidth directly influences the number of simultaneous voice calls and data traffic that your LAN can accommodate.

In general, assuming adherence to the requirements outlined in this document, the LAN should possess sufficient bandwidth to support WOCOM Cloud Hosted PBX. However, if undersized, there may be a noticeable decline in perceived call quality during peak traffic periods. It is your responsibility to ensure that your LAN is adequately sized to accommodate the integration of WOCOM Cloud Hosted PBX.

## Network Topology Description: Single Untagged VLAN for Voice and Data Networks

The illustrated network diagram depicts a simplified flat network configuration where a solitary untagged VLAN is utilized for both voice and data networks, as illustrated in Figure 1.0. This particular setup is predominantly employed in smaller network environments, typically consisting of approximately 10 computers and IP phones.

**Figure 1.0**

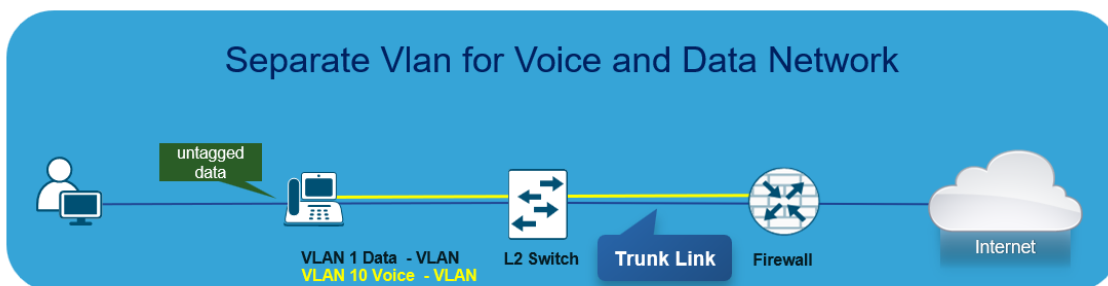


In this configuration, a unified VLAN streamlines network management for smaller-scale deployments, allowing seamless communication between computers and IP phones without the complexity of multiple VLANs. While this approach is well-suited for networks of limited size, it is essential to consider potential scalability challenges as the network expands. The utilization of a single untagged VLAN facilitates ease of implementation and maintenance, making it a practical choice for simpler network architectures.

## Network Configuration Overview: Logical Separation with VLANs

In Figure 2.0, the depicted diagram showcases a Local Area Network (LAN) architecture where distinct VLANs are employed for voice and data services. This strategic utilization of separate VLANs results in a logical separation of each service, facilitating streamlined management and enhanced security within the network.

**Figure 2.0**



By implementing separate VLANs for voice and data, a logical separation is established, allowing for the allocation of different IP address blocks for each service.





The delineation of separate VLANs for voice and data services not only facilitates effective network administration but also fortifies security protocols. The implementation of distinct IP schemes for voice and data imparts organizational lucidity, simplifying the tasks of management, troubleshooting, and the enforcement of security protocols.

This methodology engenders a meticulously structured and secure network milieu, affording the adaptability to custom-tailor IP address allocations autonomously for voice and data services. In essence, the utilization of VLANs in this configuration fine-tunes network functionality, concurrently upholding a methodically organized and secure operational framework.

## WOCOM Hosted PBX Compatibility with Diverse Phone Models

WOCOM Hosted PBX seamlessly integrates with an extensive selection of phones from top-tier manufacturers. While WOCOM typically provides the devices, there are instances where you have the option to furnish your own. In such cases, specific guidelines must be adhered to:

Only devices supported by WOCOM Hosted PBX are permissible, currently;

Polycom Phone Models	Grandstream GPX Models
Polycom VVX 101	GXP1600 Series
Polycom VVX 201	GXP1700 Series
Polycom VVX 300 Series (VVX 300, VVX 301, VVX 310, VVX 311)	GXP2100 Series
Polycom VVX 400 Series (VVX 400, VVX 401, VVX 410, VVX 411)	GXP2100EXT Expansion Module
Polycom VVX 500 Series (VVX 500, VVX 501)	GXV3200 Series (GXV3240, GXV3275)
Polycom VVX 600 Series (VVX 600, VVX 601)	GXV3300 Series (GXV3370, GXV3380)
Polycom VVX 1500	GRP2600 Series (GRP2612, GRP2613, GRP2614, GRP2615)
	GRP2700 Series (GRP2712, GRP2713, GRP2714, GRP2715)
Other Phone Models	
Yealink	Snom
Cisco	Cisco/Linksys SPA 50x, SPA 122 and SPA 30x
Fanvil	Yealink
Htek	Zoiper

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