DISCLAIMER
The attached document is provided as a basic guideline for setup and configuration of Cisco Unified Communications 500 Series IP PBX systems with MegaPath’s SIP Trunking service, based on MegaPath’s testing and validation process. It does not include advanced configurations to enable features such as voicemail, Find-Me-Follow-Me, etc. MegaPath is not responsible for customer IP PBX configurations. For more information on advanced features, please refer to your IP PBX documentation.

OVERVIEW
Cisco Unified Communications 500 series IP PBX (www.cisco.com) is an “all-in-one” converged IP PBX solution featuring built-in PBX functionality, voicemail, SIP gateway, IP router, Gigabit uplinks, Power of Ethernet (PoE) ports, Firewall, VPN, and DSU/CSU. The steps outlined in this guide reflect the process used by MegaPath to successfully configure MegaPath’s SIP trunks on the described software/hardware versions only.

SUPPORTED HARDWARE MODELS
The following hardware models are interoperable and described with this setup guide:
- Cisco UC 520
- Cisco UC 540
- Cisco UC 560

SUPPORTED SOFTWARE DEPLOYMENTS
The following software deployments are interoperable and described with this setup guide:
- Cisco Configuration Assistant: v3.0
- Cisco Software Pack: v8.1.0
- Cisco IOS: (UC500-ADVIPSERVICESK9-M), v15.1(2)T2
- System Bootstrap ROM: v12.4 (11r)XW3

REQUIRED INFORMATION
The following software deployments are supported with this setup guide:

Maximum Channels ____________________________
Host ________________________________________
Username ___________________ Password __________________
## Appendix: Cisco Unified Communications 500 Series Setup

The Cisco Unified Communications 500 Series is comprised of three primary models with numerous options and configurations available to each. Below is a high-level comparison of the Unified Communications 520, 540 and 560.

<table>
<thead>
<tr>
<th>Model</th>
<th>Cisco UC 520</th>
<th>Cisco UC 540</th>
<th>Cisco UC 560</th>
</tr>
</thead>
</table>
| Feature Highlights | • 8 to 64 IP phone station support  
• Four to 8 analog trunks or two to 4 BRI digital trunks  
• Optional single T1/E1 voice interface (PRI and CAS)  
• Integrated voicemail  
• 16 hours voicemail storage  
• Automated attendant  
• Integrated business productivity applications  
• Integrated security  
• Music on hold  
• Optional on board wireless access  
• Simple system configuration and management | • Eight to 32 phone station support  
• Four to 8 analog trunks or two to 4 BRI digital trunks  
• Optional single T1/E1 voice interface (PRI and CAS)  
• Integrated voicemail  
• 32 hours voicemail storage  
• Automated attendant  
• Integrated business productivity applications  
• Integrated security  
• Music on hold  
• On board wireless included  
• Simple system configuration and management | • 16 to 104 phone station support  
• Four to 12 analog trunks or two to 6 BRI digital trunks  
• Optional one or two T1/E1 voice interface (PRI and CAS)  
• Integrated voicemail  
• 32 or 64 hours voicemail storage  
• Automated attendant  
• Integrated business productivity applications  
• Integrated security  
• Music on hold  
• Wireless support with the Cisco AP 500 Series Wireless Access Point  
• Simple system configuration and management |

### A.1. Cisco Configuration Assistant Setup

To use the Cisco Configuration Assistant to create and save the initial software configuration, please follow the steps below:

1) If necessary, install Configuration Assistant on a PC to be used to manage the configuration of the UC 500. See the Getting Started with Cisco Configuration Assistant document at [www.cisco.com/go/configassist](http://www.cisco.com/go/configassist) or on the CD-ROM that shipped with your product for more information.
2) Launch Configuration Assistant. See the Getting Started with Cisco Configuration Assistant document at www.cisco.com/go/configassist or on the CD-ROM that shipped with your product for more information.

   a) Factory default username and password are cisco/cisco

3) Using an RJ-45-to-RJ-45 Ethernet cable, connect the Ethernet port of the PC on which the Cisco Configuration Assistant is installed to a PoE port on the front panel of the UC 500.

4) Use the Configuration Assistant to perform the following tasks. For more information, see online help.

   a) Connect to a New Community.

   b) Accept the default values to create the initial configuration.

   **Note** – If you are installing a single-site key system configuration, change the "Voice System Type" setting from PBX to Key System Configuration.

   c) Save the configuration

5) Confirm that the UC 500 appears in the Topology View.

**A.2. Telephony Setup Wizard**

When running Cisco Configuration Assistant for the first time, the Telephony Setup Wizard will start automatically and guide you through configuring basic settings on the Cisco UC500

![Welcome and Overview](https://example.com/welcome.png)
A.2.1 Welcome - Discovered Phones

If compatible phones are connected to the UC500 it will automatically discover and display them here.

**Discovered/added phones**

If no phones are connected or will be connected later, they may be added here for later use.

**Adding phones**
A.2.2 Welcome - Software Settings

This screen displays licensing and software version information. Additional user licenses can be added and the system software version can be upgraded here.

Software Upgrade and License Management

A.2.3 Networking – System Access

Configure the UC500 system hostname and administrator access credentials on this screen.

Configuring System Access settings
Note – Login credentials configured here apply to both Cisco Configuration Assistant and CLI access.

A.2.4 Networking – Choose Locale

Select “Custom” and choose the “North American-10-Digit” dial plan template.

A.2.5 Networking – WAN

Configure WAN Internet settings here, making sure to specify CIDR notation in the “IP Address” field which will automatically populate the “Subnet Mask” field.
Configuring WAN settings

Note – Using a static IP address is highly recommended. No testing or verification of behavior using a DHCP assigned IP address was completed.

A.2.6 Networking – Local LAN

If needed, configure Local LAN settings here including voice and data VLANs. This step is optional and these settings will function with the default configuration.
A.2.7 Users/Extensions and Auto Attendant

Options in this section are customer specific and configuration will not be covered. Navigate through this section to configure the following:

- Extension digit length
- Access Code for outside dialing
- Voicemail extension
- Create and configure an Auto Attendant, customize prompts and actions
- Configure FXS (analog) ports
- Create Users
  - Assign User extensions
  - Assign User phones
- Create and configure Hunt Groups

![Users Setup Summary](image)
Auto Attendant Setup Summary

A.2.8 Trunks – FXO Ports
Configure FXO (analog) Trunk settings here. SIP Trunk settings are not included in the wizard and will be covered later in this document.

**Note** – At least one FXO port must remain active during setup or the error displayed below will be received. This port can be disabled once the configuration wizard is complete.

Error displayed when all FXO ports have been disabled

A.2.9 Done – Applying and Saving the Configuration
Now that the Telephony Setup Wizard is complete, click “Apply Configuration” to apply the settings to the running configuration.
Wizard Summary – Apply Configuration

Writing the configuration can take some time, please allow it to complete and do not close Cisco Configuration Assistant while in process.

Writing settings to the running configuration

Telephony Setup Wizard is now complete. Click “Save Config and Exit Wizard” to save the running configuration to the startup configuration, and exit the wizard.
A.3. Additional Voice Configuration

To finish configuration for SIP Trunking on the UC 500 Series IP-PBX, additional settings must be entered outside of the Telephony Setup Wizard and SIP Trunk sections. **Please complete these steps prior to configuring the SIP Trunk.**

A.3.1 DNS Server and Domain Hostname

1. Navigate to Configure → Routing → IP Addresses

2. Select the “Device Configuration” tab
   a. Domain Name: speakeasy.net
   b. Enable Domain Lookup: Checked
   c. Current Servers: These should have been configured during Telephony Setup Wizard and the primary and secondary DNS server addresses should appear here. If not, enter DNS server IP information under New Server → Enter a valid IP Address then click “Add”.

3. Click “OK” to save the settings
A.3.2 QoS/Traffic Shaping

The Cisco Unified Communications 500 Series IP-PBX supports DSCP and will mark packets for prioritization if Traffic Shaping is configured and active. Once enabled, signaling (SIP) is marked with DSCP CS4 and media (RTP) is marked with DSCP CS5.

DSCP QoS is honored through MegaPath’s network. If Internet connectivity is provided by an off-net third party then Quality of Service cannot be guaranteed. Other providers may or may not honor DSCP packet marking and standard best practice is to strip the ToS byte at the provider’s network edge.

Note – Traffic Shaping MUST be configured and active in order to activate DSCP marking and utilize QoS prioritization across MegaPath’s network.

To configure the Cisco UC 500 Series for DSCP marking, please follow the steps outlined below:

1. Navigate to Configure → Routing → Internet Connection
2. Under “WAN Interfaces”, FastEthernet0/0 should be listed, select this interface and click “Modify”
3. The “Modify Internet Connections” window should display, click the “Traffic Shaping” tab
   a. Traffic Shaping: Checked
   b. Upstream Bandwidth [kbps]: Approximately 92% of actual upstream bandwidth as defined by speed tests. For example, a
T1 circuit at 1536k would be set at 1428k to account for IP overhead.

c. Media Reservation: Testing was completed with the default setting of 50% WAN bandwidth reservation however this may be adjusted as needed to meet customer requirements.

4. Click “OK” in the “Modify Internet Connection” window, then once more in the “Internet Connection” window to save the new settings.
A.4. SIP Trunk Configuration

The Cisco Unified Communications 500 Series IP-PBX can be configured for different types LAN/WAN topologies and different methods of communicating with the SIP server. Testing was focused on the following:

1. Direct Internet connection on public IP (UC500 → Router → Internet)
   a. Using SRV record resolution for SIP Server address
   b. Using A record resolution for SIP Server address

2. SIP Proxy connection using NAT (UC500 → Edgemarc 4552 as SIP Proxy → Router → Internet)

Configuration and behavior varies between the different methods/topologies and is outlined when necessary in this guide.

A.4.1 Configure SIP Trunk

1. Navigate to Configure → Telephony → Ports and Trunks → SIP Trunk

2. Select the “Generic SIP Trunk Provider” template from the “Service Provider” dropdown menu which configures the following default settings:
   a. Voice Codec: G.711-ulaw only. Secondary codecs are not included in this template and must be configured using the CLI.
   b. Fax Codec: G.711
   c. DTMF (dual-tone multi-frequency) payload: 101
   d. SIP Registration: Registers main number only. Additional DID registration is not included in this template and must be configured using the CLI.
   e. SIP Registration Expiry Timer: Set at 3600 seconds. The Edgemarc 4552 SIP Proxy and MegaPath SBCs reply with a reset expiry timer of 60 seconds in the 200 OK response to a successful registration so the UC500 will re-register every 60 seconds regardless of the configured timer value.

3. Configure as outlined below based on the solution in use at the customer site.
A.4.1.1.1 Direct Internet Connection – SRV Resolution

Using SRV records as the SIP server/registrar allows for redundancy in the case that the primary server is not reachable. This is the recommended configuration, however if A record resolution is preferred or required please refer to the next section titled “Direct Internet Connection – A Record Resolution” for configuration instructions.
The UC 500 Series is configured by default to attempt and resolve the SIP server address as both A and SRV records, input the SRV address as follows:

1. Proxy Server (primary): <st>1-siptrunk-srv.voice.speakeasy.net (replace <st> with the state abbreviation of the customer site, for example Washington state would be wa1-siptrunk-srv.voice.speakeasy.net)
2. (secondary): Leave blank
3. Registrar Server: <st>1-siptrunk-srv.voice.speakeasy.net
5. Maximum Number of Calls: The number of SIP Trunks assigned to the customer
6. Digest Authentication
   a. Username: provisioned trunk group username
   b. Password: provisioned trunk group password
7. Domain Name Service
   a. SIP Domain Name: speakeasy.net (input this if blank)
   b. DNS Service Address: Primary DNS server address (input this if blank)
8. User Credentials: Leave blank, this is only used if each DID requires a unique username and password to authenticate.

**Due to the way that SRV resolves, the Cisco UC500 needs to be explicitly configured to allow the SBC IP addresses. The following step should only apply when using SRV. If skipped, registrations will fail as the UC500 will not recognize the server as authorized and therefore will not respond.**

9. Within the SIP Trunk window, click the “Advanced Options” tab. Click “Add” and input each of the following addresses:
   a. 64.81.79.177
   b. 216.254.95.160
   c. 64.81.79.160
   d. 216.254.95.177

**Note** – These IP addresses may change at any time without prior notice!
10. Click “OK” to apply settings

11. A "User Confirmation" window will display, enter the following information:
   a. SIP Trunk → Add Generic SIP Trunk Provider as a SIP Trunk options to Outgoing Numbers in the Dial Plan?: Checked
   b. Caller ID → Company Main Number: Enter primary DID, this will be used as the primary register number as well as for outbound CLID
   c. Click “OK”

Outbound SIP Trunk and CLID/Main Number Configuration
12. Due to the use of SRV DNS, the UC 500 produces an error that the SIP server is not reachable although registration has likely succeeded. This error may appear one or more times, ignore it and click "OK" to continue.

![Invalid SIP Server Reachability Error]

*Invalid SIP Server Reachability Error*

13. SIP Trunk configuration using SRV is now complete. Please continue to configuring Dial Plans.