About Spectrum Enterprise:

Spectrum Enterprise is a division of Charter Communications following a merger with Time Warner Cable and acquisition of Bright House Networks. Spectrum Enterprise is a national provider of scalable, fiber technology solutions. The Spectrum Enterprise portfolio includes networking and managed services solutions, including Internet access, Ethernet and Managed Network Services, Voice, TV and Cloud solutions. Our industry-leading team of experts works closely with clients to achieve greater business success.

About this document:

Spectrum Enterprise assures IP PBX compatibility by conducting interoperability testing to ensure any potential compatibility issues have been resolved prior to installation. Please review the IP PBX configuration instructions in this guide prior to your installation date.

Be advised that this document may contain references to Time Warner Cable Business Class. All references to Time Warner Cable Business Class, TWCBC or TWC should be read as Spectrum Enterprise.

Thank you,

Spectrum Enterprise
# Contents

Document Purpose and Target Audience ..................................................................................................... 3
SIP Trunk Components ................................................................................................................................. 4
Special Notes ................................................................................................................................................ 5
Getting Started .............................................................................................................................................. 6
  Required SIP trunk provisioning and configuration information ............................................................... 7
  Wave Server requirements ........................................................................................................................ 7
  Router requirements .................................................................................................................................. 9
Configuring SIP trunks for Time Warner Cable ........................................................................................... 10
  Enabling SIP trunking on the Wave Server ............................................................................................. 10
Creating a new signaling control point (SCP) .............................................................................................. 11
  Creating a new SCP and setting up inbound routing .................................................................. 11
  Setting up inbound routing for the new SCP ....................................................................................... 12
  Adding a rule to the inbound routing table for the new SCP ............................................................... 13
  Setting up Caller ID for the new SCP .......................................................................................... 14
  Configuring SIP settings for the new SCP .................................................................................. 15
Configuring bandwidth management zones ............................................................................................ 19
  Configuring the Home zone ........................................................................................................ 19
  Configuring the Remote Default zone ......................................................................................... 20
Configuring outbound routing for SIP calls ............................................................................................ 21
  Allocating VoIP resources ........................................................................................................... 25
  Making a test call ........................................................................................................................... 25
  Setting up emergency 911 service .............................................................................................. 25
Configuring a backup proxy server ............................................................................................................. 26
Troubleshooting .......................................................................................................................................... 27
  TWC Turn-up Testing Procedure ................................................................................................. 28
**Document Purpose and Target Audience**

This document should be used as a reference guide for TWC SIP Trunks customers or TWC System Integrators responsible for configuring and deploying the Vertical Wave IP 500 or 2500 PBX.

| It is not a replacement of the Vertical Wave IP PBX user or configuration guide. It is intended to provide guidance to the customer preparing the turn up of Time Warner Cable (TWC) SIP Trunks service and provides detailed instructions and best practices for successful implementations of TWC SIP Trunks |

There are many options for establishing and maintaining service using the Wave IP PBX series. This guide focuses on the minimum configurations essential for success interoperability with Time Warner Cable Business Class SIP Trunks.

This configuration guide is based on:

**Customer Premise Equipment:**

<table>
<thead>
<tr>
<th>Model</th>
<th>Vertical Wave IP 500 &amp; 2500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software</td>
<td>4.5</td>
</tr>
</tbody>
</table>

**TWC Network Equipment:**

| ESG | InnoMedia ESBC 9378-4B |

*The information in this configuration guide has been reviewed and approved by Vertical Communications, Inc.*
SIP Trunk Components

A SIP trunk uses Session Initiation Protocol (SIP), which is the common signaling standard for communications using Voice over Internet Protocol (VoIP). SIP is an open-standard that allows a Time Warner Cable’s voice equipment to interoperate seamlessly with customer premise equipment (CPE). The voice channel established between the two is what is referred to as a “SIP Trunk” - a virtual phone line that uses a Broadband connection for access.

SIP trunking is a service that replaces the traditional circuit-based trunk between a business and a telecom service provider. More specific, it replaces PRI or simple T-1 trunks that are traditionally used. SIP trunking connects to an IP PBX (or a Hybrid IP PBX equipped with an IP-capable trunk card). The IP PBX uses SIP to exchange signaling information with the service provider, and deliver and receive voice in IP packets.

The IP-PBX is connected to the TWC Enterprise SIP Gateway, or ESG, which provides network access for voice traffic. The customer is responsible for the LAN infrastructure and configuration, including the physical connection to the LAN port 2 on the ESG.

The ESG is the demarcation point to the TWC network. The ESG is connected to a dedicated router for SIP Trunks over a fiber connection or a cable modem for a DOCSIS connection.

SIP Trunk components located on the customer premise including connections to the TWC network is illustrated below.
All SIP Trunk calls are routed over Time Warner Cable’s IP network, and are not routed over the public internet. This guide describes how to configure SIP trunks on the Wave Server when you are using SIP trunking from Time Warner Cable.

Throughout this guide, “your ITSP” refers specifically and only to Time Warner Cable.

SIP trunk configuration consists of the following tasks:

- Enable SIP trunking on the Wave Server.
- Create a new signaling control point (SCP) for Time Warner Cable SIP trunking
- Configure bandwidth management zones.
- Configure outbound routing for SIP calls.
- Allocate VoIP resources.

Optional configuration tasks include:

- Set up emergency 911 service.
- Configure a backup proxy server to maintain SIP trunk service if the primary SIP proxy server fails, your ITSP has provided you with backup proxy server configuration information.

**Special Notes**

Wave Software Version 4.5

- Does not support RTCP.
- Fax (G711 and T.38): This configuration does NOT support fax, for workarounds use Analog/T1/ISDN trunks or see Wave Manuals for more information.
- Does not support authenticating for the BYE request (vertical reference JIRA TM-286)

Time Warner Cable:

- Does not support G729 codec.
Getting Started

You will need to have the TWC “SIP Trunk Questionnaire” and “Business Class (BC) SIP Trunks: Customer Cut Sheet” in order to configure your IP PBX for TWC Business Class SIP Trunk service.

Confirm that your IP PBX model number and software versions recorded on the Customer Cut Sheet match those associated with your current equipment. If they do not, be sure to alert your TWC sales engineer or TWC project manager as this can impact how TWC designs your service configuration.

**Example from Customer Cut Sheet:**

<table>
<thead>
<tr>
<th>SERVICE INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PRODUCT</strong></td>
</tr>
<tr>
<td><strong>IP-PBX MAKE</strong></td>
</tr>
<tr>
<td><strong>IP-PBX MODEL</strong></td>
</tr>
<tr>
<td><strong>IP-PBX SOFTWARE VERSION</strong></td>
</tr>
</tbody>
</table>

While configuring your IP PBX for BC SIP Trunk service you will need to know your Lead Telephone Number and the IP address of your IP PBX.

The **Lead Number** is confirmed on the **Customer Cut Sheet** as seen below:

<table>
<thead>
<tr>
<th>Trunk Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TWC TRUNK Group ID</strong></td>
</tr>
</tbody>
</table>

The **IP Address** of the IP PBX was recorded on the **SIP Trunk Questionnaire**, Section 5. Signaling and Media as shown below:

This document is intended as an aid to help you configure your equipment for successful implementation of Business Class SIP Trunk Service.
Required SIP trunk provisioning and configuration information

Before you begin, make sure that you have obtained the following information from your ITSP:

- **Required SIP trunk with disable authenticating for the BYE request**

- **Proxy server information:**
  
  Registrar Server ______________________________________________________
  
  Proxy Server _______________________________________________________
  
  Outbound proxy1 _____________________________________________________
  
  Outbound proxy2 _____________________________________________________

- **Pilot Identity Bulk Registration Credentials:**
  
  Username ___________________________________________________________
  
  Password ___________________________________________________________

- **SIP Domain Name:**
  
  ________________________________________________________________

- **SIP codec to use:**
  
  ________________________________________________________________

- **DID phone numbers:**
  
  ________________________________________________________________
  
  ________________________________________________________________

- **Technical support contact information**
  
  ________________________________________________________________

Wave Server requirements

- **Wave ISM version:** Verify that the Wave Server is running one of following versions:
  
  - Wave 4.5 base version
  
  - Wave 4.0 base version
  
  - Wave 3.0 + Feature Pack 1 or higher

- **Wave licensing:** Add the following Wave licenses, in addition to any other Wave licenses required to support your configuration:
- **Wave IP User license.** Depending on the IP phones that you use, you will need one or more of the following types of licenses:
  - **Wave IP User – Edge IP and ViewPoint Phone license:** For Edge 5000-series IP phones or the ViewPoint Softphone.
  - **Wave IP User – Certified Third Party IP Phone license:** For supported Aastra or Edge 1500-series IP phones
  - **Wave IP User – Generic Third Party IP Phone:** For third-party IP phones.
- **Wave SIP Trunk license**
- **Wave IP Gateway license**
- **Registry:** Add setting (DWORD)
  
  | DiversionSource Registry setting to 1 | ReinviteAfterUpdate Registry setting to 1 | PropagateProgressCutThrough Registry setting to 1 |
  
@HKEY_LOCAL_MACHINE\SOFTWARE\Vertical Networks\InstantOffice\IpTelephony\Sip\SCP\scpname
Router requirements

You can use any NAT router with a DMZ option as a default gateway for Wave and all IP phones. Wave registers with your ITSP and handles all inbound and outbound calls over the SIP trunks.

The following information assumes that you are using a Linksys RV042 router. If you are using a different router, equivalent configuration settings should be available.

- **Network settings:**
  - LAN IP: IP address ON of router (LAN)
  - WAN IP: IP address ON of router WAN I/f
  - DMZ IP: 0.0.0.0
  - Mode: Gateway
  - DNS: Provided by your ISP or ITSP
  - DDNS: OFF
  - DMZ Host: Wave IP address

- **Firewall settings:**
  - SPI (Stateful Packet Inspection): ON
  - DoS (Denial of Service): ON
  - Block WAN Request: ON

- **VPN settings:**
  - Tunnel(s) Used: 0
  - Tunnel(s) Available: 50

No VPN Group is defined.
Configuring SIP trunks for Time Warner Cable
The steps and screenshots in this guide reflect the configuration process on a Wave 4.0 Server. Since the Wave user interface has been modified over time, if you are configuring SIP trunking on an earlier version of Wave, if necessary see Chapter 6 in the Wave Global Administrator Guide for that version for specific details.

Enabling SIP trunking on the Wave Server

1. Start the Wave Global Administrator Management Console. Click IP Telephony, located in the PBX Administration section.
2. Expand Signaling Protocols in the left pane and then click SIP. Select the SIP Enabled checkbox. SIP Local IP Address is selected automatically.
Creating a new signaling control point (SCP)

This section describes how to create a new SCP and then:

- Set up inbound routing.
- Add a rule to the inbound routing table.
- Set up Caller ID.
- Configure SIP settings.

- Creating a new SCP and setting up inbound routing

1. Expand **Call Routing** in the left pane and choose **Signaling Control Points**.

2. Click **New**.
3. In the Signaling Control Point dialog, enter a **Name** for the new SCP, for example “TWC”. (When you configure outbound call routing, this name will appear in the Routing Table as “IP”, a vertical bar (|), and the name you enter here, for example “IP|TWC”.)

You can enter alphanumeric characters as well as the following special characters:

`~ ! # $ % & * ( ) - = + | { } ; : " , . / < > ?`

![Signaling Control Point dialog](image)

- **Setting up inbound routing for the new SCP**

1. On the Inbound Routing tab, for **Intercept Destination**, select the extension from the drop-down list to which any incoming call from this SCP that is not matched in the Inbound Routing Table will be directed.

2. For **Access Profile for Tandem Calls**, select the access profile to apply to calls received from this SCP that will be connecting to another trunk. (Access profiles identify the different calling privileges that can be associated with SCPs, and can also be associated with extensions, trunk groups, and digital connections. For more information, see “Configuring specific access profiles” in Chapter 9 in the **Wave Global Administrator Guide**.)

   If you are not sure which access profile to choose, you can select the “Unrestricted” profile.

   **Warning!** If you have not modified the default “Unrestricted” access profile, selecting “Unrestricted” here could leave your system vulnerable to hackers who are able to identify your Tandem Access Profile number.
### Adding a rule to the inbound routing table for the new SCP

1. Still on the Inbound Routing tab, click **Edit Inbound Routing Table**.
2. In the Inbound Routing Table dialog, verify that **Route By Source or Dialed Number** is selected. (This setting lets you decide how calls from this SCP get routed based on the DID digits the caller dialed.)

3. Click **Add** to add a new rule to the table for the DID numbers provided to you by your ITSP.
4. For each DID number, double-click in the following columns in the new rule:
   - For **Dialed Number**, enter one of the DID numbers provided by your ITSP. You can enter the entire 10-digit number, or use “x” characters as wildcards.
   - For **Destination**, enter the extension or external phone number to which calls with this DID number will be routed. This number is interpreted as if dialed from an internal station, so for an external number, be sure to enter the external access digit as defined in the First Digit Table.
5. Click **OK** to save your changes to the Inbound Routing table.

- **Setting up Caller ID for the new SCP**

1. Still in the Signaling Control Point dialog, select the Outbound Routing tab.
2. Choose one of the Caller ID formats to send on outbound calls to this SCP. (Note that your ITSP may not support all of the listed formats.)
Configuring SIP settings for the new SCP

1. Still in the Signaling Control Point dialog, select the SIP Settings tab.

2. Enter the following information:
   - For **User Name**, enter the main telephone number (also known as “Pilot Identity”) provided by your ITSP, for example “4693418148”.
   - For **Proxy Server**, enter the DNS name or IP address of the proxy server provided by your ITSP.
   - For **Port**, leave the default port number, “5060”.

3. In the Inbound/Outbound Settings section:
   - Select the **SCP is located outside of Wave's network** checkbox.
   - Select **Register with a Proxy/Registrar**.

4. In the Authentication Settings section:
   - Select the **Authentication Required** checkbox.
   - Enter the **Authentication Name** and **Password** provided by your ITSP.

5. In the Registration Settings section:
   - Select the **Registration Required** checkbox.
   - Enter the **Registrar Server** DNS name or IP address provided by your ITSP. (Typically, this is the same as the **Proxy Server** address that you entered above.)
   - For **Registrar Port** number, enter “5060”.

![Signaling Control Point](image)
6. Click **Advanced Settings**.
7. If your ITSP has provided you with backup proxy server configuration information, do the following:
   - Select the **Enable Outbound Proxy** checkbox, and then enter the **Outbound Proxy Server** and **Outbound Proxy Server Port**.
   - Select the **Monitor SIP Trunks** checkbox, and then specify a **Keep Alive Timer** and **Recovery Timer** value in seconds.
   For more about using a backup proxy server, including an additional required configuration step, see “Configuring a backup proxy server” on page 26.
8. In the SIP Trunk Transfer Options section, select both of the following:
   - **Attempt Hairpin Elimination on Supervised Transfer**
   - **Attempt Hairpin Elimination on Blind Transfer**
9. Leave all other advanced settings at their default values, unless instructed otherwise by your Wave provider. Click OK to save your changes, and exit the Signaling Control Point dialog.

10. Back on the main IP Telephony screen, select the new SCP and change the **Route Step Timeout** (at the top of the screen) to 20 seconds. This setting adjusts the amount of time that the system waits on this SCP before trying the next step in the outbound routing table, to allow for network or other delays.

11. Click **Apply** to save your changes. Do not exit IP Telephony yet.
Configuring bandwidth management zones

- Configuring the Home zone

1. Expand **Bandwidth Management** in the left pane and click **Zones**.
2. In the **Zone Name** list, select “Home” and then click **Edit**.
3. In the Bandwidth Management dialog, select the IP Address Ranges tab.
4. Review the **IP Address Range** for the Home zone and make corrections if necessary. Leave all other values on this tab unchanged---these are expert settings that should not be modified unless you are instructed to do so by your Wave technical support representative.

5. On the Inter-Zone Codecs tab, do the following:
   - Make sure that the VoIP codec to use with your ITSP is in the Step 1 position. To change a codec’s position in the list, select it and then click **Up** or **Down**.
   - Optionally, for each codec select the **Silence Suppression** checkbox.
6. On the Intra-Zone Codecs tab, make the same changes that you did in the previous step.
7. Click **OK** to save your changes, but don’t exit IP Telephony yet.

**Configuring the Remote Default zone**

All IP addresses outside of the Home zone are automatically in the Remote Default zone.

1. In the **Zone Name** list, select “Remote Default” and then click **Edit**.
2. On the Inter-Zone Codecs tab, do the following:
   - Make sure that the VoIP codec to use with your ITSP is in the Step 1 position. To change a codec’s position in the list, select it and then click **Up** or **Down**.
   - Optionally, for each codec select the **Silence Suppression** checkbox.
3. On the Intra-Zone Codecs tab, make the same changes that you did in the previous step.
4. Click **OK** to exit the Bandwidth Management dialog.
5. Click **Apply** to apply all your changes, and then click **Done** to exit IP Telephony.
Configuring outbound routing for SIP calls

1. In the Global Administrator Management Console, click **Outbound Routing** in the Trunk Administration section.
2. In the Outbound Routing dialog, select the “Unrestricted” access profile and then click **Edit**.
3. The Access Profile dialog opens. On the Area Code Table tab, click **Add**.

A new entry is added at the bottom of the Area Code list:
4. Double-click in the following columns:
   - For **Area Code**, enter “Default”.
   - Leave **Office Code Range** set to “Default”.
   - For **Routing Table**, select “(New Routing Table)” from the drop-down list.

5. The Routing Table dialog opens. Enter a name for the new Routing Table entry, for example “TWC”.

6. Click **Add** to add a new route.
7. Click in the **Destination** column and select “IP|TWC” from the drop-down list.

8. Leave all of the other default settings unchanged, and click **OK** to save the new route.
9. Click **Apply** to save your changes, and then click **Done** to exit Outbound Routing.
Allocating VoIP resources

1. In the Global Administrator Management Console, click **Resource Management**, located in the PBX Administration section.
2. Expand **IP Telephony Resources / Voice Over IP Group** in the left pane.
3. Select the **Standard Bit Rate G.711** resource, and then allocate the number of VoIP resources to use by selecting a value from the drop-down list. (You only need to allocate VoIP resources to one codec.) **Time Warner Cable does not support G729 codec.**

   ![Resource Management](image.png)

   **Available Resources**
   - Ports: 20
   - Power (MWPS): 2.0

4. Click **Apply** to apply your changes, and then click **Done** to exit Resource Management.

This completes the SIP trunk configuration process. Contact your Wave provider if you have any further questions.

Making a test call

To verify that your SIP trunks are configured correctly:

- **Make an outbound call to an external number from a Wave phone**, answer the call and verify that there is a two-way voice path.
- **Make an inbound call to a DID number from outside the Wave network**, for example from a cell phone. Answer the call and verify that there is a two-way voice path.

Setting up emergency 911 service

Consult with your ITSP’s technical support representative for detailed guidance on how to configure emergency 911 service. See “Setting up emergency dialing” in Chapter 9 in the **Wave Global Administrator Guide** for more information.

Important!
• Ensure that all employees, visitors, and any other people who may attempt to make an emergency call using a SIP trunk are aware of an alternate method to use to access emergency services in the event that VoIP service fails.
• If your specific configuration includes centralized trunking or multiple Wave Servers at different locations, it is imperative that emergency 911 calls are routed to the local public safety answering point (PSAP) that serves a specific caller’s location.

**Configuring a backup proxy server**

This section applies to you if your ITSP has provided you with backup proxy server configuration information.

When you configure and enable a backup proxy server, if the primary SIP proxy server fails, Wave will automatically switch to the backup proxy server to maintain SIP trunk service. When the primary SIP proxy server becomes available again, Wave will switch back automatically.

Backup proxy server configuration consists of the following tasks:

1. Configure and enable required settings when you create the SCP for your ITSP, as described in step 7 on page 17.

2. Edit the registry and add the following STRING registry value for the SCP you created for your ITSP:

   SOFTWARE\Vertical Networks\InstantOffice\IpTelephony\Sip\Scp\[SCP_NAME]\OutboundProxy2

   For example:

   SOFTWARE\Vertical Networks\InstantOffice\IpTelephony\Sip\Scp\[SCP_NAME]\OutboundProxy2

   Set **OutboundProxy2** to the fully-qualified domain name of the backup proxy server as provided by your ITSP.
Troubleshooting
Please see Vertical University course:

401- 4 Understanding SIP

This advanced course will be available after you pass Wave advanced instructor lead training.

This course has 3 modules;

- Introduction to SIP
- SIP Operation
- Troubleshooting SIP

For assistance please contact Vertical Technical Support at 1-877-Vertical. Prior to contacting Tech Support, please have available Wave Trace files, a Wireshark packet capture of the failure and a network diagram.
Appendix

TWC Turn-up Testing Procedure

To ensure proper service between the IP PBX and the TWC network, test calls from the IP PBX will be made. Typically the following call types will be used (call testing varies depending on service configuration)

1. Outbound/Inbound call to a local number
2. Outbound/Inbound call to a long distance number
3. Calls to 411 and 611
4. Outbound calls to a blocked number to verify call blocking settings
5. Other calls based on customer request, e.g. FAX testing using T.38 or calls to an auto-attendant to verify DTMF

Questions

If you have questions, please contact your Time Warner Cable Business Class Account Executive.