

SHORETEL APPLICATION NOTE

for

CyberData SIP Paging Server & SIP Speakers

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For use with: CyberData SIP Paging Server & SIP Speakers

Product: ShoreTel Connect ONSITE

System: ST Connect 21.80.7823.0

Contents

Contents.....	2
Introduction	3
Network Topology	4
Special Notes	5
ShoreTel Configuration	6
CyberData SIP Speaker and Paging Server Configuration	13
Multicast Configuration	17
Conclusion	19
Additional Resources	20
ShoreTel. Brilliantly simple business communications.....	20

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Introduction

This document describes the configuration procedures for integrating the CyberData SIP Paging Server and SIP Speaker as SIP extensions on the ShoreTel Connect Onsite system.

CyberData

Founded in 1974 in Monterey, California, CyberData Corporation is a leading OEM design and manufacturing firm with more than 40 years of experience. We specialize in IP Endpoints for the VoIP marketplace, VoIP and POS (Point-of-Sale) connectivity solutions, and POS protocol conversion technologies.

Features

The CyberData SIP Paging Server enables users through a single SIP phone extension, to access multiple zones for paging in a VoIP network and to connect to legacy analog overhead paging systems. Newest features include voice prompting and password-controlled zones. A second SIP extension can be configured as a night ringer playing a user-uploadable audio file. The SIP Paging Server allows direct connection to legacy analog paging amplifiers that require a 'Page Port' type input that meets a balanced 600 Ohm 5VPP signal or a 10k Ohm Hi-Z 2VPP signal. You can also take advantage of connections for a dry contact relay (page start output) and sense input (Fault Sense Input) for additional functionality. The easy-to-use, web-based configuration provides a graphical user interface to set up to 100 paging zones for IP paging with unique Multicast address and port number combinations. The SIP Paging Server connects via a single CAT 5 or 6 network cable to a standard PoE 802.3af compliant switch.

The CyberData SIP Speaker is the latest in IP technology. This Power over Ethernet (PoE 802.3af/802.3at) VoIP mass notification device has network-controlled speaker volume, simultaneous SIP and priority-based Multicast streaming, and integrates with both the CyberData Wall Mount and the CyberData Wall Mount Clock Kit. The speaker is compatible with most SIP-based IP PBX. In a non-SIP environment, the speaker is capable of receiving audio through Multicast. Its small footprint and low height allows the speaker to be discreetly mounted almost anywhere.

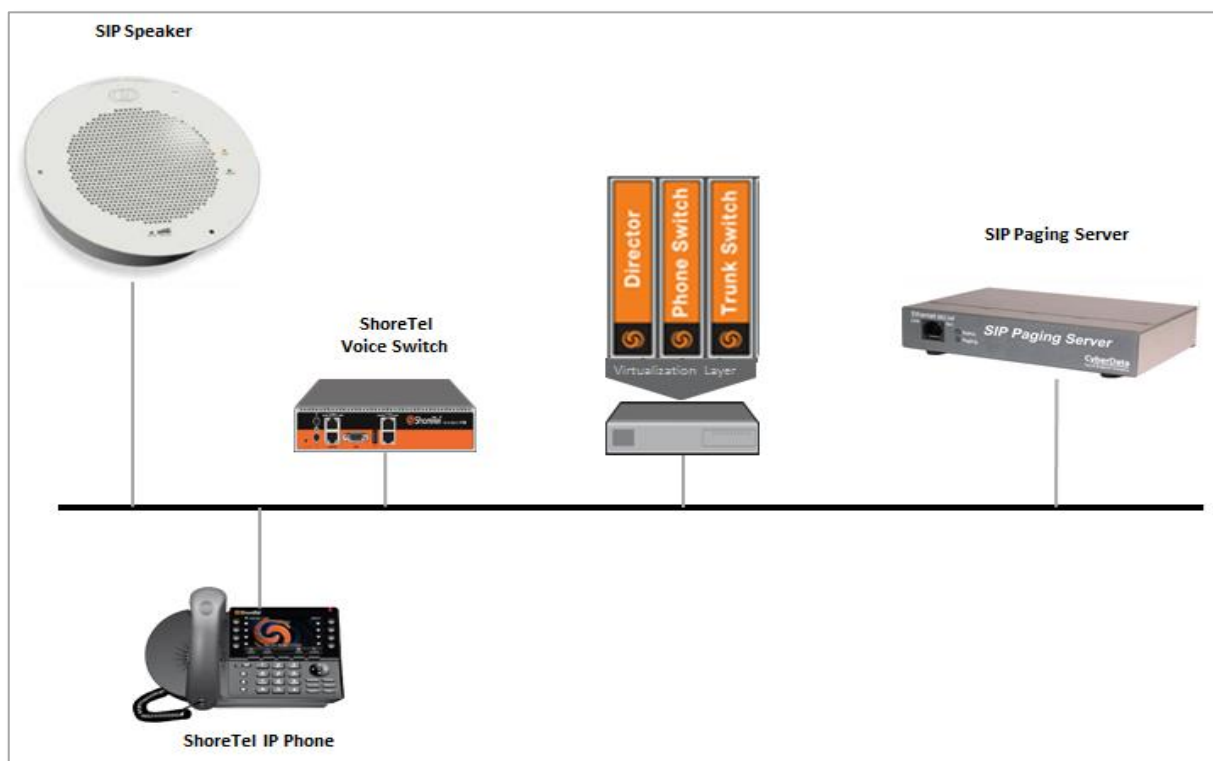
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Network Topology



Test Environment

- ShoreTel Connect ONSITE Server
- ShoreTel Virtual Phone Switch
- ShoreTel Voice Switch
- ShoreTel IP Phones
- CyberData SIP Paging Server (Version 12.0.0)
- CyberData SIP Speaker (Version 11.6.7)

NOTE: This Application Note assumes the setup, configuration and licensing of the Virtual/Physical Switches has already been completed. If you require additional information, please refer to the ShoreTel Connect Onsite Planning and Installation guide at the following location.

Special Notes

The following considerations must be taken when implementing CyberData devices as SIP Extensions on the ShoreTel Connect ONSITE system.

ShoreTel Extension License

Extension Licenses are required for each CyberData device.

ShoreTel SIP Phone License

Deployment of SIP Extensions require a SIP Phone License. One SIP Phone License is required for each CyberData SIP Extension.

NOTE: For additional information on SIP Endpoints with a ShoreTel Connect ONSITE system, please refer to Chapter 19 of the ShoreTel Connect Onsite System Administration Guide.

ShoreTel Configuration

This section describes the detailed steps required on the ShoreTel Connect ONSITE system to configure CyberData devices as SIP extensions.

Call Control Options

This section describes the SIP settings required on the ShoreTel system to work with CyberData SIP Speakers and SIP Paging Server. This is accomplished from ShoreTel Connect Director.

1. Navigate to Administration > Features > Call Control > Options
2. Verify the parameters located under the **SIP** section
3. **Realm:** The realm is used in authenticating all SIP devices. Changing this value will require a reboot of switches serving as SIP extensions. It is not necessary to modify this parameter
4. **Enable SIP Session Timer:** Ensure this parameter is checked
5. **Session interval:** Session interval value indicates the SIP session registration period. There is no need to modify the default value of 1800 seconds.
6. **Refresher:** The refresher setting decides if user agent client or user agent server refreshes the session. There is no need to modify the default value of "Caller (UAC)."
7. Click **SAVE**



The screenshot shows a configuration window titled "SIP:". It contains four fields: "Realm:" with a text input containing "ShoreTel"; "Enable session timer" with a checked checkbox; "Session interval:" with a text input containing "1800" followed by "seconds (90-3600)" and a small edit icon; and "Refresher:" with a dropdown menu showing "Caller (UAC)".

SIP Proxy Settings – Allocating Ports for SIP Extensions

This section describes the Switch configuration required on the ShoreTel system to work with the SIP Paging Server as a SIP Extension. Depending on the switch type, ShoreTel Voice Switches, and Virtual Phone Switches support variable numbers of SIP Proxies and IP Phones, and can be verified on the Switch Edit page of ShoreTel Connect Director.

ShoreTel ShoreGear Switches with processing resources that support Digital and Analog ports can be reallocated to support 100 SIP Proxies. The ShoreTel Administrator can define one of the “Port Type” settings from the available ports to “100 SIP Proxy”, as well as sufficient “IP Phone” ports to support the total number of CyberData devices. The following example shows Port allocation designated on a ShoreTel SG-90 for IP Phones and SIP Proxy resources

Port	Port Type	Trunk Group	Description	Jack Number
1	5 IP Phones	P01		
2	100 SIP Proxy	P02		

If the ShoreTel ShoreGear Switch that you have selected has “built-in” capacity (i.e., ShoreGear 50/90/220T1/E1, etc.) for IP phones and SIP trunks, you can also remove 5 ports from the total number available to provide the “100 SIP Proxy” configuration necessary. Every 5 ports you remove from the total available will result in “100 SIP Proxy” ports being made available. The following example shows 5 ports removed from total available resulting in 100 SIP Proxy ports being available.

Built-in capacity:		
IP phone +	SIP trunks =	Total
25	0	25 of 30 (100 SIP proxy ports)

Site Settings

The next settings to address are the administration of Sites. The ShoreTel Administrator can designate up to two Proxy switches per site for redundancy and reliability: one switch is assigned as the primary Proxy server, and the other switch acts as the backup Proxy server in case the primary fails. A Virtual IP Address is the IP Address of the switch that is configured as the SIP Proxy server for the Site. The Virtual IP Address must be static. If you choose not to define a “Virtual IP Address,” you can only define one proxy switch, and there will be no redundancy or failover capabilities. The switches available in the “Proxy Switch 1 / 2” will only be shown if proxy resources have been enabled on the switch. This is accomplished from ShoreTel Connect Director.

1. Navigate to Administration > System > Sites
2. Select the name of the Site in which SIP Proxies will be assigned
3. In the General Tab, set **Proxy switch 1**: Select the ShoreTel switch configured with SIP Proxies for the Site
4. Click **SAVE**

Virtual IP address:	<input type="text"/>
Proxy switch 1:	vPhone ▼
Proxy switch 2:	<None> ▼

NOTE: Once the ShoreTel switch has been selected to support SIP Proxies, please note the IP Address of the switch as it will be used later in the SIP Paging Server under the SIP configuration.

Configure a CyberData SIP Speaker as a SIP Extension

This section describes the steps required to configure a CyberData SIP Speaker as SIP Extension on the ShoreTel system. This is accomplished from ShoreTel Connect Director.

1. Navigate to Administration > Users > Users
2. Click **New**, to create a new user
3. Define the **First name:** and **Last name:** Enter the appropriate user information
4. Define an **Extension:** ShoreTel Connect Director will automatically assign the next available extension number, but it can also be modified to any available extension number
5. Define the **License type:** and **Access license:** In our example we chose “Extension-Only”, as it is not necessary to have a mailbox with the CyberData SIP Speaker, and “Phone Only” for Access license

NOTE: If the “License type” is configured as “Extension-Only”, then “Any IP Phone” cannot be selected, but instead must be set to “SoftSwitch”.

Users NEW | COPY | DELETE | EXPORT... | BULK DELETE | BULK EDIT

Extension 199: CyberData SIP Speaker SAVE RESET CANCEL

GENERAL TELEPHONY VOICE MAIL ROUTING MEMBERSHIP APPLICATIONS DNIS

First name: CyberData

Last name: SIPSpeaker

Extension: 199

Email address: csipspeaker@ruc1000 [Edit System Directory record](#)

Client username: CSIPSpeaker

☒ Include in System Dial by Name directory

☐ Make extension private

DID Settings: (not configured) [change settings...](#)

PSTN failover: None

Caller ID (overwrite DID): [\(e.g. +1 \(408\) 331-3300\)](#)

License type: Extension-Only

Access license: Phone Only

User group: Executives [Go to this user group](#)

Site: Headquarters [Go to this site](#)

Language: English(US)

Primary phone port: SoftSwitch: Headquarters [change settings...](#)

8. Define a **SIP phone password**: There is no default SIP phone password configured, it is masked with the appearance that there is a default password, and must be defined by the ShoreTel Director Administrator. Make certain to type the password in both fields.

NOTE: Please note the "SIP phone password" configured for the user as it will be used later for the CyberData SIP Speaker under the SIP configuration.

9. Click **SAVE**

Current port:	<input type="text" value="SIP-199-0131305452362407447"/>	<input type="button" value="GO PRIMARY PHONE"/>
Jack #:	<input type="text"/>	
Mailbox server:	<input type="button" value="v"/>	
Client password:	<input type="password" value="....."/> <input type="password" value="....."/>	(6 - 26 characters)
	<input checked="" type="checkbox"/> must change on next login	
SIP phone password:	<input type="password" value="....."/> <input type="password" value="....."/>	(6 - 26 characters)

Configure a CyberData SIP Paging Server as a SIP Extension

This section describes the steps required to configure a User for the CyberData SIP Paging Server as a SIP Extension on the ShoreTel system. This is accomplished from ShoreTel Connect Director.

1. Navigate to Administration > Users > Users
2. Click **New**, to create a new user
3. Define the **First name:** and **Last name:** Enter the appropriate user information
4. Define an **Extension:** ShoreTel Connect Director will automatically assign the next available extension number, but it can also be modified to any available extension number
5. Define the **License type:** and **Access license:** In our example we chose “Extension-Only”, as it is not necessary to have a mailbox with the CyberData SIP Paging Server, and “Phone Only” for Access license

NOTE: If the “License type” is configured as “Extension-Only”, then “Any IP Phone” cannot be selected, but instead must be set to “SoftSwitch”.

Users NEW | COPY | DELETE | EXPORT... | BULK DELETE | BULK EDIT

Extension 202: CyberData PagingServer SAVE RESET CANCEL

GENERAL | TELEPHONY | VOICE MAIL | ROUTING | MEMBERSHIP | APPLICATIONS | DNIS

First name:

Last name:

Extension:

Email address: [Edit System Directory record](#)

Client username:

☒ Include in System Dial by Name directory

☐ Make extension private

DID Settings: (not configured) [change settings...](#)

PSTN failover:

Caller ID (overwrite DID): (e.g. +1 (408) 331-3300)

License type:

Access license:

User group: [Go to this user group](#)

Site: [Go to this site](#)

Language:

Primary phone port: SoftSwitch: Headquarters [change settings...](#)

10. Define a **SIP phone password**: There is no default SIP phone password configured, it is masked with the appearance that there is a default password, and must be defined by the ShoreTel Director Administrator. Make certain to type the password in both fields.

NOTE: Please note the "SIP phone password" configured for the user as it will be used later for the CyberData SIP Paging Server under the SIP configuration.

11. Click **SAVE**

Current port:	<input type="text" value="SIP-202-0131306337122646004"/>	GO PRIMARY PHONE
Jack #:	<input type="text"/>	
Mailbox server:	<input type="button" value="v"/>	
Client password:	<input type="password" value="....."/> <input type="password" value="....."/>	(6 - 26 characters)
	<input checked="" type="checkbox"/> must change on next login	
SIP phone password:	<input type="password" value="....."/> <input type="password" value="....."/>	(6 - 26 characters)

CyberData SIP Speaker and Paging Server Configuration

The following steps detail the configuration process for the CyberData SIP Speaker and SIP Paging Server to register as SIP extensions onto a ShoreTel Connect Onsite system.

NOTE: The SIP Speaker was powered up using the Ethernet port on the SIP Speaker, via an Ethernet cable, connected to a PoE switch. DHCP is enabled by default on the CyberData SIP Speaker. A DHCP server was used for the network parameters, and then manually provisioned the minimum configuration parameters required for validation with the ShoreTel Connect Onsite system.

1. Login to the CyberData SIP Speaker Configuration GUI using a web browser on a PC that is on the same network as the SIP Speaker.
2. Enter the SIP Speaker IP Address into the browser's address bar.
3. When prompted to login, the default **User name** and **Password** is "admin".
4. The **Home** page will be displayed.

Home Device Network SIP Multicast Sensor Audiofiles Events Autopro Firmware

CyberData V3.1 Speaker

Current Status

Serial Number: 394100844
Mac Address: 00:20:f7:03:7f:20
Firmware Version: v11.6.7

IP Addressing: DHCP
IP Address: 10.140.5.121
Subnet Mask: 255.255.255.0
Default Gateway: 10.140.5.1
DNS Server 1: 10.40.12.3
DNS Server 2:

SIP Mode: Enabled
Multicast Mode: Enabled
Event Reporting: Disabled
Nightringer: Disabled

Primary SIP Server: Registered
Backup Server 1: Not registered
Backup Server 2: Not registered
Nightringer Server: Not registered
Monitor SIP Server: Not registered

Admin Settings

Username: admin
Password:
Confirm Password:

Save Reboot Toggle Help

Import Settings

Browse...
Import Config

Export Settings

Export Config

5. Click **SIP** on the menu bar to configure the SIP parameters.
6. Verify the parameters **Enable SIP operation** and **Register with a SIP Server** are both enabled (check marked).

7. Define the **Primary SIP Server**: Enter the IP Address of the ShoreTel switch configured with SIP Proxies for the Site.
8. Define the **Primary SIP User ID**: and **Primary SIP Auth ID**: Enter the extension number for both parameters associated with the user created in ShoreTel Connect Director for the SIP Speaker.
9. Define the **Primary SIP Auth Password**: Enter the SIP Password associated with the user created in ShoreTel Connect Director for the SIP Speaker.
10. **Re-registration Interval (in seconds)**: Set the value to 3600 seconds.
11. Click the **Save** button to save the parameters, then click the **Reboot** button.

The screenshot displays the configuration interface for the CyberData V3.1 Speaker. The interface is divided into several sections, each with its own settings:

- SIP Settings** (highlighted with a red box):
 - Enable SIP operation: ☒
 - Register with a SIP Server: ☒
 - Use Cisco SRST: ☐
 - Primary SIP Server: 10.140.5.101
 - Primary SIP User ID: 199
 - Primary SIP Auth ID: 199
 - Primary SIP Auth Password: *****
 - Backup SIP Server 1:
 - Backup SIP User ID 1:
 - Backup SIP Auth ID 1:
 - Backup SIP Auth Password 1:
 - Backup SIP Server 2:
 - Backup SIP User ID 2:
 - Backup SIP Auth ID 2:
 - Backup SIP Auth Password 2:
 - Remote SIP Port: 5060
 - Local SIP Port: 5060
 - Outbound Proxy:
 - Outbound Proxy Port: 0
 - Monitor User ID: 200
 - Monitor Authenticate ID: 200
 - Monitor Authenticate Password: *****
 - Disable rport Discovery: ☐
 - Buffer SIP Calls: ☐
 - Re-registration Interval (in seconds): 3600 (highlighted with a red box)
 - Unregister on Boot: ☐
 - Keep Alive Period: 10000
- Nightringer Settings**:
 - Enable Nightringer: ☐
 - SIP Server: 10.0.0.253
 - Remote SIP Port: 5060
 - Local SIP Port: 5061
 - Outbound Proxy:
 - Outbound Proxy Port: 0
 - User ID: 241
 - Authenticate ID: 241
 - Authenticate Password: *****
 - Re-registration Interval (in seconds): 360
- RTP Settings**:
 - RTP Port (even): 10500
 - Jitter Buffer: 50
- Call Disconnection**:
 - Terminate Call after delay: 0
- Codec Selection**:
 - Force Selected Codec: ☐
 - Codec: PCMU (G.711, u-law) (selected)
- Button Settings**:
 - Dial Out Extension: 204
 - Extension ID: id204

At the bottom of the interface, there are three buttons: **Save**, **Reboot**, and **Toggle Help**.

NOTE: The SIP Paging Server was powered up using the Ethernet port on the SIP Paging Server, via an Ethernet cable, connected to a PoE switch. DHCP is enabled by default on the CyberData SIP Paging Server. A DHCP server was used for the network parameters, and then manually provisioned the minimum configuration parameters required for validation with the ShoreTel Connect Onsite system.

12. Login to the SIP Paging Server Configuration GUI using a web browser on a PC that is on the same network as the SIP Paging Server.
13. Enter the SIP Paging Server IP Address into the browser's address bar.
14. When prompted to login, the default **User name** and **Password** is "admin".
15. The **Home** page will be displayed.

The screenshot displays the CyberData v3.1 Paging Server configuration interface. At the top, a navigation bar includes tabs for Home, Device, Network, SIP, PGROUPS, Schedules, Fault, Audiofiles, Events, Autoprov, and Firmware. The 'Home' tab is currently active. The main content area is titled 'CyberData v3.1 Paging Server' and is divided into several sections:

- Current Status:**
 - Serial Number: 146100864
 - Mac Address: 00:20:f7:03:86:7a
 - Firmware Version: v12.0.0
 - IP Addressing: DHCP
 - IP Address: 10.140.5.123
 - Subnet Mask: 255.255.255.0
 - Default Gateway: 10.140.5.1
 - DNS Server 1: 10.40.12.3
 - DNS Server 2:
 - SIP Mode: Enabled
 - Event Reporting: Disabled
 - Nightringer: Disabled
 - Primary SIP Server: **Registered**
 - Backup Server 1: Not registered
 - Backup Server 2: Not registered
 - Nightringer Server: Not registered
- Admin Settings:**
 - Username: admin
 - Password:
 - Confirm Password:
 - Buttons: Save, Reboot, Toggle Help
- Import Settings:**
 - File upload field with a 'Browse...' button
 - Import Config button
- Export Settings:**
 - Export Config button

16. Click **SIP** on the menu bar to configure the SIP parameters.
17. Verify the parameters **Enable SIP operation** and **Register with a SIP Server** are both enabled (check marked).
18. Define the **Primary SIP Server**: Enter the IP Address of the ShoreTel switch configured with SIP Proxies for the Site.
19. Define the **Primary SIP User ID**: and **Primary SIP Auth ID**: Enter the extension number for both parameters associated with the user created in ShoreTel Connect Director for the SIP Paging Server.
20. Define the **Primary SIP Auth Password**: Enter the SIP Password associated with the user created in ShoreTel Connect Director for the SIP Paging Server.
21. **Re-registration Interval (in seconds)**: Set the value to 3600 seconds.
22. Click the **Save** button to save the parameters, then click the **Reboot** button.

Home Device Network **SIP** PGROUPS Schedules Fault Audiofiles Events Autoprovisioning Firmware

CyberData v3.1 Paging Server

SIP Settings

Enable SIP operation: ☒
Register with a SIP Server: ☒
Use Cisco SRST: ☐
Primary SIP Server: 10.140.5.101
Primary SIP User ID: 202
Primary SIP Auth ID: 202
Primary SIP Auth Password: *****

Backup SIP Server 1:
Backup SIP User ID 1:
Backup SIP Auth ID 1:
Backup SIP Auth Password 1:

Backup SIP Server 2:
Backup SIP User ID 2:
Backup SIP Auth ID 2:
Backup SIP Auth Password 2:

Remote SIP Port: 5060
Local SIP Port: 5060
Outbound Proxy:
Outbound Proxy Port: 0

Disable rport Discovery: ☐
Buffer SIP Calls: ☐
Re-registration Interval (in seconds): 3600
Unregister on Boot: ☐
Keep Alive Period: 10000

RTP Settings

RTP Port (even): 10500
Jitter Buffer: 50

Nightringer Settings

Enable Nightringer: ☐
SIP Server: 10.0.0.253
Remote SIP Port: 5060
Local SIP Port: 5061
Outbound Proxy:
Outbound Proxy Port: 0
User ID: 241
Authenticate ID: 241
Authenticate Password: *****
Re-registration Interval (in seconds): 360
Relay rings to multicast: ☐
Multicast Address: 224.1.2.32
Multicast Port: 2020

Call Disconnection

Terminate Call after delay: 0

Codec Selection

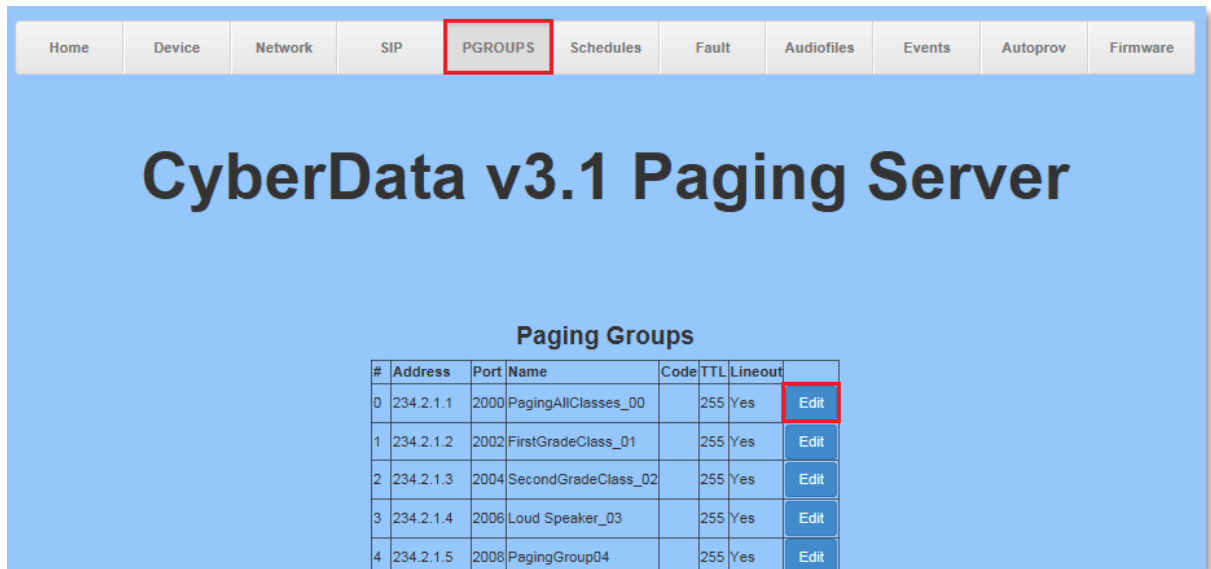
Force Selected Codec: ☐
Codec: PCMU (G.711, u-law)

Save Reboot Toggle Help

Multicast Configuration

The following steps detail the minimum configuration parameters required for the CyberData Paging Server and multicast SIP Speakers in paging zones.

1. Click **PGROUPS** on the menu bar of the SIP Paging Server Configuration GUI.
2. Click the **Edit** button to configure the Paging Group parameters.



3. Define a **Name** for the Paging Group, and click on the **Save Changes** button. Make note of the **Address** and **Port** number, as they will be used in the SIP Speaker configuration.

The screenshot shows the "Configure PGROUP" dialog box. It contains the following fields and controls:

- PGROUP: 0
- Address: 234.2.1.1 (highlighted with a red box)
- Port: 2000 (highlighted with a red box)
- Name: PagingAllClasses_00 (highlighted with a red box)
- Security Code: (empty field)
- TTL: 255
- Line-out: ☒
- Buttons: Save Changes (highlighted with a red box) and Cancel

4. Login to the CyberData SIP Speaker Configuration GUI.
5. Click **Multicast** on the menu bar
6. Enable (check mark) the parameter **Enable Multicast Operation**.
7. Define the **Address** and **Port** number (defined on the Paging Groups page in the SIP Paging Server configuration), and a **Name** for the multicast group.
8. Click the **Save** button to save the parameters, then click the **Reboot** button.

CyberData V3.1 Speaker

Multicast Settings

Enable Multicast Operation: ☒

Priority	Address	Port	Name	Buffer	Beep	Relay
9	239.168.3.10	11000	Emergency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	234.2.1.1	2000	Page All	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	234.2.1.2	2002	Grade 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	239.168.3.7	8000	MG6	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Initiating a Page from the CyberData SIP Paging Server

The following example displays the final configuration parameters on the CyberData SIP Paging Server and SIP Speaker for this validation.

CyberData v3.1 Paging Server

Paging Groups

#	Address	Port	Name	Code	TTL	Lineout	
0	234.2.1.1	2000	PagingAllClasses_00		255	Yes	Edit
1	234.2.1.2	2002	FirstGradeClass_01		255	Yes	Edit
2	234.2.1.3	2004	SecondGradeClass_02		255	Yes	Edit
3	234.2.1.4	2006	Loud Speaker_03		255	Yes	Edit

CyberData V3.1 Speaker

Multicast Settings

Enable Multicast Operation: ☒

Priority	Address	Port	Name	Buffer	Beep	Relay
9	239.168.3.10	11000	Emergency	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	234.2.1.1	2000	Page All	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	234.2.1.2	2002	Grade 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

When a ShoreTel IP Phone places a call to the CyberData Paging Server extension, Extension 202 was configured as the SIP extension in the ShoreTel Connect Director, the Paging Server will prompt the ShoreTel IP Phone user with the message “Enter the two-digit zone number”. In the example shown above, if the ShoreTel IP Phone user enters zone number “00” the Paging Server will send a multicast page to all the SIP Speakers defined in the Paging Groups. When the ShoreTel IP Phone user enters zone number “01”, then the Paging Server will only send the multicast page to one SIP Speaker, in our example we named the Paging Group “First Grade Class_01”.

Conclusion

CyberData was successfully validated and approved with ShoreTel Connect ONSITE.

Additional Resources

[ShoreTel Connect ONSITE System Administration Guide](#)

[ShoreTel Connect ONSITE Planning and Installation Guide](#)

[CyberData SIP Paging Server](#)

[CyberData SIP Speaker](#)

Version	Date	Contributor	Content
1.0	March 2017	J.Rodriguez	Original App Note

ShoreTel. Brilliantly simple business communications.

ShoreTel, Inc. (NASDAQ: SHOR) is a leading provider of brilliantly simple IP phone systems and unified communications solutions powering today's always-on workforce. Its flexible communications solutions for on-premises, cloud and hybrid environments eliminate complexity, reduce costs and improve productivity.

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