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1 Audience

This document is intended for the SIP trunk customer’s technical staff and Value Added Retailer (VAR) having installation and operational responsibilities.

2 Introduction

This Configuration Guide describes configuration steps for Cox SIP trunking to a NetVanta 7100 “Office In A Box” IP-PBX. Cox SIP trunking is a scalable and efficient IP trunking telecommunication solution for your business that provides all the traditional services such as Direct Inward Dialing, Hunting, Calling Name, Calling Number, Local/Long Distance and Business Continuity options, including:

- Burstable Trunk Capacity – Dynamically increases call capacity during peak busy periods so your customers never receive a busy signal.
- Call Forward Always – On the trunk group pilot number for all calls in case of an outage (i.e., flood, fire, loss of power, etc.).
- Call Forward Not Reachable – On the trunk group pilot number that operates on a per-call contingency basis to forward the call to any PSTN number (i.e., call center or alternate office location) during temporary call completion impairments.
- Route Exhaustion – Automatic reroute of trunk group calls to any PSTN phone number (i.e., a call center) if calls can’t be completed to the PBX.
- Support for geo-redundant PBX deployments and automatic reroute of SIP trunks to the backup customer data center.

All calls are routed over Cox’s national fiber network with guaranteed Quality of Service (QoS); calls never traverse the Internet.

Figure 1 – Cox Fiber Network
2.1 tekVizion Labs

tekVizion Labs™ is an independent testing and Verification facility offered by tekVizion PVS, Inc. ("tekVizion"). tekVizion Labs offers several types of testing services including:

- Remote Testing – provides secure, remote access to certain products in tekVizion Labs for pre-Verification and ad hoc testing
- Verification Testing – Verification of interoperability performed on-site at tekVizion Labs between two products or in a multi-vendor configuration ("solution Verification")
- Product Assessment – independent assessment and verification of product functionality, interface usability, assessment of differentiating features as well as suggestions for added functionality, stress and performance testing, etc.

tekVizion is a systems integrator specifically dedicated to the telecommunications industry. Our core services include consulting/solution design, interoperability/Verification testing, integration, custom software development and solution support services. Our services help service providers achieve a smooth transition to packet-voice networks, speeding delivery of integrated services. While we have expertise covering a wide range of technologies, we have extensive experience surrounding our FastForward>> practice areas which include: SIP Trunking, Packet Voice, Service Delivery, and Integrated Services.

The tekVizion team brings together experience from the leading service providers and vendors in telecom. Our unique expertise includes legacy switching services and platforms, and unparalleled product knowledge, interoperability and integration experience on a vast array of VoIP and other next-generation products. We rely on this combined experience to do what we do best: help our clients advance the rollout of services that excite customers and result in new revenues for the bottom line. tekVizion leverages this real-world, multi-vendor integration and test experience and proven processes to offer services to vendors, network operators, enhanced service providers, large enterprises and other professional services firms. tekVizion's headquarters, along with a state-of-the-art test lab and Executive Briefing Center, is located in the Telecom Corridor® in Richardson, Texas.

(For more information on tekVizion and its practice areas, please visit tekVizion Labs’s web site at www.tekVizionlabs.com.)
3 SIP Trunking Network Components

The network for the SIP trunk reference configuration is illustrated below and is representative of a NetVanta 7100 configuration. A key element of the NetVanta 7100 configuration are the use of Virtual LANs (VLANs) to route the data (Internet) traffic separately from the SIP Trunking voice services.

![Diagram of SIP Trunk Lab Reference Network](image)

**Figure 2 – SIP Trunk Lab Reference Network**

**Note:** While the NetVanta 7100 does offer a DHCP server for dynamic IP address assignment for the SIP phones; the Cox Enterprise Session Border Controller (E-SBC) requires a static LAN IP address that must be manually assigned by the LAN network administrator. The DHCP’s IP address pool is constrained so that the E-SBC can be assigned a static LAN IP address outside of the dynamic pool.

The lab network consists of the following components:

- Adtran NetVanta PBX for voice features, DHCP Server, SIP proxy and SIP trunk termination.
- Various SIP phones on the local LAN.
- The Cox E-SBC is the Edgewater Networks (www.edgewaternetworks.com) EdgeMarc appliance. The EdgeMarc is the service demarcation point between customer’s LAN network and Cox’s WAN network and provides firewall/NAT traversal, B2B/UA and SIP Application-level gateway. The EdgeMarc has diverse routes to a primary and secondary Acme SBC.
- Acme Packet Net-Net 9200 Session Border Controllers (SBC).
3.1 Hardware Components

- Adtran NetVanta 7100
- Polycom IP330 Phone
- Analog fax machine
- EdgeMarc 4550 E-SBC

3.2 Software Requirements

- Adtran NetVanta 7100 Release A4.03.00.SC.E
- EdgeMarc 4550 9.12.5 Release
4 Features

4.1 SIP Registration Method
Cox Network requires SIP REGISTER support to allow the IP-PBX to originate calls from the IP-PBX and to send calls to the PBX from the PSTN. NetVanta 7100 supports SIP Register with authentication. Cox implementation team provides the Pilot number and the authentication key, which should be provisioned in the NetVanta 7100. How to configure these in the NetVanta 7100 are shown in Section 6.3.4.

4.2 Features Supported
- Basic calls using G.711ulaw
- Calling Party Number Presentation
- Anonymous call
- Call Transfer Consultative
- Call Forwarding
- Call Hold and Resume
- Call Pickup
- Call Waiting
- DND
- Call Park
- Hunt groups (Simultaneous and Sequential Ring)
- Three-Way Calling
- PBX Auto Attendant to Off-net Numbers
- G.711 Fax
- E911 Call
- RFC2833 transcoding
- PBX-Defined Caller ID (spoofing)

4.3 Features Not Supported
- PBX Authorization Codes
- PBX Account Codes
5 Caveats and Limitations

- Adtran VetVanta 7100 hairpins both call legs during call transfer and call forward, meaning the SIP sessions are not released after transfer or forward. The sessions are released when the calls are released.
- To make a call to the LD operator (9 +0) call please reference Section 6.4.2
- Provisioning the Pilot number to be used as an extension causes Blind Transfer and Call Forward type calls to have no talk path. All other DID’s work without problem when assigned to an extension.
6 Configuration

6.1 Configuration Checklist
In this section we present an overview of the steps that are required to configure NetVanta 7100 for SIP Trunking as well as all features that were tested.

Table 1 – PBX Configuration Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>Set System IP Address</td>
<td>Section 6.3.1</td>
</tr>
<tr>
<td>Step 2</td>
<td>VLAN Configuration</td>
<td>Section 6.3.2</td>
</tr>
<tr>
<td>Step 3</td>
<td>DHCP Server</td>
<td>Section 6.3.3</td>
</tr>
<tr>
<td>Step 4</td>
<td>Set System Parameters</td>
<td>Section 6.3.4</td>
</tr>
<tr>
<td>Step 5</td>
<td>Create Trunk</td>
<td>Section 6.3.5</td>
</tr>
<tr>
<td>Step 6</td>
<td>Trunk Groups</td>
<td>Section 6.3.6</td>
</tr>
</tbody>
</table>
6.2 IP Address Worksheet

The specific values listed in the table below and in subsequent sections are used in the lab configuration described in this document, and are for **illustrative purposes only**. The customer must obtain and use the values for your deployment.

Table 2 – IP Addresses

<table>
<thead>
<tr>
<th>Component</th>
<th>Cox Lab Value</th>
<th>Customer Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EdgeMarc E-SBC</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• LAN IP Address</td>
<td>10.10.20.2</td>
<td></td>
</tr>
<tr>
<td>• LAN Subnet Mask</td>
<td>255.255.255.0</td>
<td></td>
</tr>
<tr>
<td><strong>NetVanta 7100 IP PBX</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Voip Signaling IP Address</td>
<td>10.10.20.1</td>
<td></td>
</tr>
<tr>
<td>The Voip Connection will typically be on the same subnet as the LAN IP Address of the E-SBC. If this is not the case, then Layer 3 routing must be in place.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• VLan 1</td>
<td>10.10.10.1</td>
<td></td>
</tr>
<tr>
<td>This is Default VLan. This is the Data VLan. Please Reference Figure 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• VLan 2</td>
<td>10.10.20.1</td>
<td></td>
</tr>
<tr>
<td>This is VoIP VLan. This is the Phone/Signalling network. Please Reference Figure 10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Eth 0/0 Interface</td>
<td>174.46.0.114</td>
<td></td>
</tr>
<tr>
<td>This is the IP Address that is configured for the Internet connection. This will be different than the IP Address used for this example. Please Reference Figure 8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Default Gateway</td>
<td>174.46.0.113</td>
<td></td>
</tr>
<tr>
<td>The Default Gateway must be Eth 0/0's default gateway. Please consult your Network Administrator for the correct address. Please Reference Figure 8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
6.3 NetVanta 7100 Detailed Configuration Steps

Equipment used for configuration setup:
- Adtran NetVanta 7100.
- Adtran NetVanta 7100 software version release A4.03.00.SC.E

6.3.1 Set System IP Address
This is accomplished via an Ethernet cable connected from a laptop or PC to the 1st port on the front panel of the NetVanta 7100 (eth0/1). NetVanta’s default IP address is 10.10.10.1. Once the steps in 6.3.1 are completed the PC settings will be placed back to their original values. (may want to record the original values before change the IP address of the PC) The default IP address for the NetVanta 7100 is 10.10.10.1.

1. Set the IP Address on the PC to Obtain An IP address Automatically.
2. Click on OK.

![Figure 3 – Set IP Address in PC](image-url)
3. Apply power to the NetVanta 7100. Wait approx. 3min. to allow the NetVanta 7100 to be come up and fully operational

4. Connect ETH 0/0 to the network that the Internet Connection is located. Please reference Figure 2 and Table 2

5. Connect Fax machine to FSX 0/1

6. Connect Lan Cable between PC and NetVanta 7100

7. Start Internet Explorer(IE) on the PC connect to the NetVanta 7100

8. In the address bar type https://10.10.10.1/admin

9. There will be a dialog window appear requesting username and password.

10. Enter **username**: admin

11. Enter **password**: password

12. Click **OK**

13. Navigate to **System > Physical Interfaces**
14. Double Click on eth0/0
15. Set Description: For this example ‘PBX Network Interface’ is used
16. Set Enable: Check box
17. Set Speed/Duplex: For this example 100Mbps/full is used. Consult your network Administrator person for proper settings.
18. Set Interface Mode: IP routing
19. Set Address Type: Static
20. Set IP Address: For this example 174.46.0.114 is used. This is the IP address that the IP PBX uses for the Internet Connection. Please refer to Figure 2 and Table 2 for the IP address scheme used for this example.
21. Set Subnet Mask: For this example 255.255.255.240 is used.
22. Set Dynamic DNS: disabled. Cox Network does not provide DNS services.
23. Set Media-Gateway IP Address Type: None
24. Click Apply
Figure 7 – Eth 0/0
25. Navigate to **Data > Router/Bridge > Route table**
26. This default route is required for the Internet connection.
27. Set **Destination Address**: 0.0.0.0
28. Set **Destination Mask**: 0.0.0.0
29. Set **Gateway: Address**: For this example 174.46.0.113 is used. Please reference Figure 2 and Table 2 for the IP address scheme used for this example. Please consult your network Administrator for the IP address to use.
30. Click on **Add**
31. Click on **Save**

Figure 8 – Add Static Route

32. Navigate to **Utilities > Reboot Unit**
33. Click on **Save and Reboot**
34. Disconnect the Ethernet Cable between your PC and the NetVanta 7100
35. Return the PC to its original configuration with the information stored from step 1 of Section 6.3.1
36. Connect the PC to its original network cable
37. Once the NetVanta 7100 is rebooted the administrator should be able to connect to 174.46.0.114 via the WEB GUI.
38. Open IE
39. In the address bar type https://174.46.0.114/admin

### 6.3.2 VLAN Configuration

There are two VLANS by default that are provisioned in the NetVanta 7100. The names are Default (for data traffic) and VoIP.

1. Navigate to Data > VLANs

---

![Figure 9 – Save and Reboot](image)

![Figure 10 – Default VLANs](image)
Figure 11 – Default VLAN
Figure 12 – VoIP VLAN

### VLAN Configuration for "VoIP"

Use this dialog to modify the VLAN configuration. If a VLAN name is not entered, one will be generated.

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled</td>
<td>✓</td>
</tr>
<tr>
<td>VLAN Name</td>
<td>VoIP</td>
</tr>
<tr>
<td>VLAN ID</td>
<td>2</td>
</tr>
<tr>
<td>VLAN Type</td>
<td>Static</td>
</tr>
<tr>
<td>VLAN Interfaces</td>
<td>✓</td>
</tr>
</tbody>
</table>

### Wireless Control Protocol

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enabled AWCP</td>
<td>✓</td>
</tr>
</tbody>
</table>

### VLAN Interface Configuration

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>Enabled</td>
<td>✓</td>
</tr>
<tr>
<td>MAC Address</td>
<td>00 : A0 : C8 : 68 : 9C : 68</td>
</tr>
<tr>
<td>Traffic-Shaping</td>
<td></td>
</tr>
<tr>
<td>Traffic-Shaping Rate</td>
<td></td>
</tr>
<tr>
<td>QoS-policy</td>
<td>None</td>
</tr>
</tbody>
</table>

### IP Settings

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Address Type</td>
<td>Static</td>
</tr>
<tr>
<td>IP Address</td>
<td>10 . 10 . 20 . 1</td>
</tr>
<tr>
<td>Subnet Mask</td>
<td>255 . 255 . 255 . 0</td>
</tr>
<tr>
<td>Dynamic DNS</td>
<td>&lt;disabled&gt;</td>
</tr>
</tbody>
</table>

### Secondary IP Settings

To add a range of secondary IP addresses (up to 255 addresses), enter a valid start IP address, IP mask, and the number of addresses to add.

<table>
<thead>
<tr>
<th>Range</th>
<th>Start IP Address</th>
<th>Mask</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD A NEW SECONDARY IP ADDRESS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Media-Gateway

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>IP Address Type</td>
<td>Primary</td>
</tr>
</tbody>
</table>

RTP traffic will flow over the selected IP address.
6.3.3 DHCP Server

By default there are two DHCP Servers configured on the NetVanta 7100 one for each VLAN; Default and VoIP. Phones use the VoIP DHCP Server and PCs use the Default DHCP Server. Eth0/0 DOES NOT use either of the DHCP Servers, rather it uses a statically assigned IP Address to be assigned from the “Excluded Ranges” per the following steps. Please refer to Figure 2 and Table 2 for the IP address Scheme used for this example.

1. Navigate to System > DHCP Server
2. Click on Excluded Ranges

Figure 13 – DHCP Server Settings
3. Set **Start IP Address**: This is the first IP address in the range not to be used. For this example 10.10.20.1 is used.

4. Set **End IP Address**: This is the last IP address in the range not to be used/allocated by the DHCP server. For this example the range is 5 IP addresses 10.10.20.1 – 10.10.20.5. The range is created so that the IP addresses can be excluded from the DHCP Pool!

![DHCP Excluded Ranges](Image)

Figure 14 – DHCP Excluded Ranges
6.3.4 Set System Parameters

The System Parameters Shown in Figure 15 below is the defaults used in this example.

1. Navigate to Voice > System setup

![System Parameters](image-url)

**Figure 15 – System Parameters**
6.3.5 Configure Eth 0/1
For this example Eth 0/1 is used to connect to the LAN interface of the E-SBC and to carry the VLAN 2 voice traffic in the steps below. Two applications are associated with this interface: Voice and Voice Signaling.

1. Navigate to System > Physical Interfaces.
2. Click on Eth 0/1

1. Click on Configuration tab
2. Confirm Enabled: is checked
3. Set Power Over Ethernet: un checked. This is not required when this port is used for connection to the LAN interface of the E-SBC.
4. Set Native VLAN: vlan2(Voip)
5. Confirm Edge-Port Mode: is checked
6. Click Apply
7. Click on **Allowed VLAN List** tab

The only Allowed VLAN List should be 2 as the Figure below shows. You may have to perform step 8 then step 9 to accomplish this task.

8. Click on **Delete all** and Click **Apply**

9. Click on **Add Range**: 2 – 2
   See screen below.

10. Click on **Add**

11. Click on **Apply**
6.3.6 Create Trunk

1. Navigate to Voice > Trunks > Trunk Accounts
2. Set Trunk Name: Cox SIP Trunk
3. Type: SIP
4. Click Add

Figure 19 – Allowed VLAN List

Figure 20 – Create Trunk Account
5. Navigate to **Voice > Trunks > Trunk Accounts > Modify Trunk Account**

6. Click on **Trunk Name**: Cox SIPTrunk as used in this example

7. Confirm **Operational Status**: Available

8. Confirm **Administrative Status**: Enabled

9. Set Max Number Calls: [example “10”] This number will be received from a Cox Representative and is based on the service purchased from Cox.

10. Set **SIP Server Address**: This is the static LAN IP address of the Cox E-SBC. Please use the actual E-SBC LAN IP for your network. The IP Address used in this configuration is 10.10.20.2.

   The E-SBC LAN IP address may/will be different from this example. Please see **Figure 2** and **Table 2** for the IP address scheme.

11. Set **SIP Server Port**: 5060
12. Set **SIP Proxy Address**: This is also the static LAN IP address of the Cox E-SBC. Please use the actual E-SBC LAN IP for your network. The IP Address used in this configuration is 10.70.96.2. The E-SBC LAN IP address may/will be different from this example. Please see **Figure 2** and **Table 2** for the IP address scheme.

13. Set **Outbound Proxy Port**: 5060

![Figure 22 – Modify SIP Trunk cont](image-url)
14. Set **User Name:** 6782383600

15. Set **Password:** ***********

The **actual** SIP Registration Password and Username will be provided by your Cox Account Representative and must be kept confidential! The Trunk Group Pilot Number (User) is used here for illustration purposes only!

16. Click **Add Register Entry**

---

**Figure 23 – Modify SIP Trunk cont**
17. Set **Start Value**: 6782383600
18. Set **End Value**: 6782383600
   
   Note: Only the Trunk Group Pilot Number needs to SIP Register with Cox SIP Trunking.

19. Set **Authentication**: Set
20. Set **User**: 6782383600
21. Set **Password**: 6782383600
   
   The actual SIP Registration Password and Username will be provided by your Cox Account Representative and must be kept confidential! The Trunk Group Pilot Number (User) is used here for illustration purposes only!

22. Click **Add Register Entry**

![Figure 24 – Add Register Entry](image)

23. In **Figure 23** click Apply
6.3.7 Trunk Groups
Each Trunk Group created comes packaged with default Outbound Call Templates. As noted in the Figure below, Class of Service should be used to restrict call types for individual user types (normal vs. executives, etc.)

1. Navigate to Voice > Trunks > Trunk Groups
2. Set Group Name: COXSIPTRUNK is used for this example
3. Click Add

![Figure 25 – Add TrunkGroup](image-url)
4. Set **Resource Selection**: Linear Hunt
5. Click on **Add Members** and add the trunk member that was created in [Section 6.3.4](#).
6. Check the calls that are allowed to go out on this trunk group as seen in the Figure 21 below.
7. Notice **Detailed View – Permit/Restriction Call Templates**. This will be covered in [Section 6.4.2](#).
8. Click **Apply**

**Figure 26 – Default Outbound Call Templates for Trunk Group**