

		<b>T P P A P P N O T E</b>
		<b>TPP: 10273</b> <b>Date: June, 2010</b>
<b>Product: ShoreTel   ADTRAN®</b>		<b>System version: ShoreTel 10.x</b>

## Abstract

The ShoreTel system has some known limitations with SIP trunking, please refer to ShoreTel's Administration Guide, chapter 18, for the SIP trunking limitations. Some customers may have the need to implement a SIP trunk from an Internet Telephony Service Provider (ITSP) to take advantage of reduced telephony costs, but they require some of the features that aren't supported on a ShoreTel system, via SIP trunks. In order for the customer to take advantage of the ITSP's offerings and not be affected by ShoreTel SIP trunk limitations they will need to implement an Integrated Access Device (IAD) to convert the SIP signaling to a T1 PRI. In this manner ShoreTel will not have any feature limitations and the customer can still take full advantage of the ITSP's offerings.

This solution includes Bandwidth.com SIP trunk, ADTRAN's market-leading Total Access® series of routing, switching and IP gateway products, along with the ShoreTel ShoreGear® IP PBX and ShorePhone™. When combined with the ShoreTel IP Telephony platform, this solution introduces a new level of value into network operations with savings that extend well beyond the initial purchase price. ADTRAN platforms are specifically designed for business VoIP networks with enhanced performance and functionality. The ADTRAN platforms provide all of the robust routing, switching, Quality of Service (QoS) and security features needed to deploy a world-class business VoIP solution. Application Diagrams of the product scenarios tested with the ShoreTel ShoreGear switch appear in Figure A below.



Figure A: ShoreTel's ShoreGear, Adtran's Total Access 916e connected with Bandwidth.com

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## Overview

This document provides details for connecting the ShoreTel system through the ADTRAN Total Access® series of routing, switching and IP gateway products to Bandwidth.com, for SIP Trunking, to enable audio communications. The connection to the ShoreTel system will be a T1 PRI from the ADTRAN Total Access product. The document focuses on the configuration procedures needed to set up these systems to interoperate.

## Features and Benefits

The Bandwidth.com, ADTRAN and ShoreTel solution provides the following features and benefits:

- Inbound Calling (requires Bandwidth.com extension), 800 Inbound (requires purchase or port), Long Distance Termination (includes intra-, inter-state and international), Expanded Local Calling, Outbound



calling to 888, 877, 800 numbers, e911, 411 and Operator Services, Inbound Caller ID and Location, White Page Listing, Toll-Free, Domestic and International Long Distance, G.711 and G.729a Codecs.

- Benefits - Smart Reasons to Switch to SIP Trunks Save Money - Enjoy the cost savings of converging your local, long distance and broadband Internet services onto a single circuit with dynamic bandwidth allocation. Save Time - Dedicated and knowledgeable Bandwidth.com technicians, installation teams and customer support specialists assure rapid deployment. Simplify - Experience the efficiency of managing a single network connection, receiving one bill and engaging one point of contact for all your local, long distance, and broadband Internet needs. Protect your Investment - Preserve your existing capabilities via seamless integration with the ShoreTel IP PBX system. Grow Your Business - When you grow, adding more SIP Trunks is easy, and happens in days, not weeks. SIP Trunks can be installed and turned up remotely so you do not have to slow down.
- Affordable converged IP voice and data solution for small and medium enterprises or branch office VoIP networks
- Lower Total Cost of Ownership and rapid return on investment
- IP PBX, Multiservice Access Router with integrated Layer 3 switch, Wi-Fi and 802.3af PoE wire-speed performance for IP Telephony, corporate connectivity and Internet access convergence
- Enhanced routing performance, integrated firewall, VPN and robust QoS functionality
- Ease of use features for monitoring and scoring voice quality, trending and tracking
- Web-based configuration Graphical User Interface (GUI), monitoring and remote management
- Industry-leading warranty and customer support and services
- The widest variety of standards-based , ShoreTel interoperable business networking infrastructure available
- Provide ShoreTel PBX with a PRI interface, thus eliminating the feature limitations that ShoreTel has with SIP trunking

## **Bandwidth.com Overview and Contacts**

Bandwidth.com is a complete nationwide communications provider offering businesses advanced Internet, IPBased Voice and network service solutions. As a single source provider for business telecom needs, Bandwidth provides its customers with unparalleled selection, savings and service. The company's unique methodology, experienced team and dedicated customer service ensures accountability and service superior to that of traditional Internet and VoIP providers.

Sales Inquiries  
800-808-5150  
[sales@bandwidth.com](mailto:sales@bandwidth.com)

Channel Inquiries  
888-BWC-VARS  
[channelsales@bandwidth.com](mailto:channelsales@bandwidth.com)

## **ADTRAN Overview and Contacts**

ADTRAN offers a robust suite of IP business solutions for converged IP networking. This suite includes a variety of business trunking, hosted VoIP and premises-based VoIP solutions including IP business gateways, multiservice access routers, managed Layer 2/3, PoE and Gigabit Ethernet switches, 802.11 a/b/g Wireless Access Points and modular access routers. These products are ideal for bundled services or business networks. They address the need for branch office connectivity, Internet access, VoIP migration, bandwidth expansion, network security and voice



quality monitoring.

For general sales questions regarding ADTRAN products and solutions, contact your reseller or contact ADTRAN directly at:

ADTRAN Applications Engineering  
1-800-615-1176  
support@adtran.com  
www.adtran.com

To become an ADTRAN reseller, visit [www.adtran.com/partner](http://www.adtran.com/partner) to find out how to join ADTRAN's award-winning partner program, or dial 1-800-9ADTRAN and asked to speak to a Customer Service Representative about the ADTRAN Advantage partner program.

## **ADTRAN Product Information Part Numbers and Pricing**

For configuring joint solutions, select from the following ShoreTel-interoperable ADTRAN platforms.

Total Access 900e – SKU (908e) 4242908L1, List \$2320; SKU (916e) 4242916L1, List \$2745

## **ADTRAN Product Information Product Description**

1. ADTRAN Total Access 900e Series – IP Business Gateway with SIP and MGCP, and analog gateway functionality, router, FXS/FXO interfaces

ADTRAN's NetVanta Total Access 900e Series of IP Business Gateways integrates the functionality of a SIP and MGCP gateway and robust IP router into a compact platform. By providing access to a dynamic IP WAN while employing some analog interfaces to connect legacy devices when combined with the ShoreTel IP PBX, businesses have a complete solution for robust, affordable converged services, including premises-based VoIP without a forklift upgrade to the existing voice infrastructure.

## **Architecture Overview**

Platforms used during application testing:

- Total Access 916e
- ShoreGear 220T1
- ShoreTel IP Phones





## Version Support

The ADTRAN Products detailed in this application note are certified with the following versions of the ShoreTel system, listed below.

ADTRAN		Product Name
Total Access		Firmware Version A2.06.00.E
ShoreTel Release	8.1	✓
	9.x	✓
	10.x	✓

## Certification Testing Results Summary

### Platforms Used During Testing:

- Total Access 916e
- ShoreGear 220T1
- ShoreTel IP Phones

### Features Used During Testing:

- T1 Interface
- SIP

The ShoreTel system has some known limitations with SIP trunking, please refer to ShoreTel's Administration Guide, chapter 18, for the SIP trunking limitations.

## 1.0 Initialization and Basic Calls

ID	Name	Description	Results
1.1	Setup and initialization	Verify successful setup and initialization of the Total Access System	Pass
1.2	Outbound Call (Domestic)	Verify calls placed outbound through Total Access reach the external destination.	Pass
1.3	Inbound Call (Domestic)	Verify calls received by Total Access are routed to the proper trunk group.	Pass
1.4	Device restart – Power Loss	Verify that the Total Access system recovers after power loss.	Pass
1.5	Device restart – Network Loss	Verify that the Total Access system recovers after loss of network link.	Pass
1.6	All Trunks Busy – Inbound Callers	Verify inbound callers hear busy tone when all channels / trunks are in use.	Conditional Pass Note 1
1.7	All Trunks Busy – Outbound Callers	Verify outbound callers hear reorder tone when all channels / trunks are in use.	Pass
1.8	Incomplete Inbound Calls	Verify proper call progress tones are provided and proper call teardown for incomplete inbound calls.	Pass

**Note 1:** The Total Access system sends a 503 (Service Unavailable) message to Bandwidth.com, resulting in system message: “the number you have dialed is not in service”.

## 2.0 Media and DTMF Support

ID	Name	Description	Results
2.1	Media Support – ShoreTel Phone to Total Access	Verify call connection and audio path from a ShoreTel phone to an external destination through the Total Access system using all supported tones with both sides set to a common codec.	Pass
2.2	Media Support – SIP Reference to Total Access	Verify call connection and audio path from a SIP reference phone to an external destination through the Total Access system using all supported tones with both sides set to a common codec.	Pass
2.3	Codec Negotiation	Verify codec negotiation between Total Access and Bandwidth.com with each side configured for a different codec.	Pass
2.4	DTMF Transmission	Verify DTMF transmission per RFC2833 for calls placed through the Total Access System.	Pass
2.5	Auto Attendant Menu	Verify that inbound calls are properly terminated on the ShoreTel Auto Attendant menu and that you can transfer to the desired extension.	Pass
2.6	Auto Attendant “Dial by Name”	Verify that inbound calls are properly terminated on the ShoreTel Auto Attendant menu and that you can transfer to the desired extension using the “Dial by Name” feature.	Pass
2.7	Auto Attendant menu checking Voice Mail mailbox	Verify that inbound calls are properly terminated on the ShoreTel Auto Attendant menu and that you can transfer to the Voice Mail Login Extension.	Pass



### 3.0 Performance and Quality of Service

ID	Name	Description	Results
3.1	Voice Quality Service Levels	Verify the Total Access System can provide a voice quality SLA across the WAN from the customer premises.	Pass
3.2	Capacity Test	Verify the service provider interface can sustain services through period of heavy outbound and inbound load.	Pass
3.3	Post Dial Delay	Verify that post dial delay is within acceptable limits.	Pass

## 4.0 Enhanced Services and Features

ID	Name	Description	Results
4.1	Caller ID Name and Number – Inbound	Verify that Caller ID name and number is received properly.	Pass
4.2	Caller ID Name and Number – Outbound	Verify that Caller ID name and number is sent properly.	Pass
4.3	Hold	Verify successful hold and resume of a connected call.	Pass
4.4	Call Forward	Verify outbound calls that are being forwarded are redirected and connected to the appropriate destination.	Pass
4.5	Call Transfer – Blind	Verify a call connected to the ShoreTel phone can be transferred to an alternate destination.	Pass
4.6	Call Transfer – Consultative	Verify a call connected to the ShoreTel phone can be transferred consultatively to an alternate destination.	Pass
4.7	Conference – ad hoc	Verify successful ad hoc conference of three parties.	Pass
4.8	Inbound DID / DNIS	Verify the Total Access System provides inbound “dialed number information” and is correctly routed to the configured destination.	Pass
4.9	Outbound 911	Verify that outbound calls to 911 are routed to the correct PSAP for the calling location and that caller ID information is delivered.	Pass
4.10	Operator Assisted	Verify that 0+ calls are routed to an operator for calling assistance.	Pass
4.11	Inbound / Outbound call with Blocked Caller ID	Verify that calls with Blocked Caller ID route properly and the answering phone does not display any Caller ID information.	Pass
4.12	Inbound call to a Hunt Group	Verify that calls route to the proper Hunt Group and are answered by an available hunt group member with audio in both directions.	Pass
4.13	Inbound call to a Workgroup	Verify that calls route to the proper Workgroup and are answered successfully by an available workgroup agent with audio in both directions.	Pass
4.14	Inbound call to DNIS / DID and leave a voice mail message	Verify that inbound calls to a user, via DID / DNIS, routes to the proper user mailbox and a message can be left with proper audio.	Pass
4.15	Call Forward – “FindMe”	Verify that inbound calls are forwarded to a user’s “FindMe” destination.	Pass
4.16	Call Forward – Always	Verify that inbound calls are immediately forwarded to a user’s external destination.	Pass
4.17	Inbound / Outbound Fax calls	Verify that inbound / outbound fax calls complete successfully.	Pass
4.18	ShoreTel Converged Conferencing Server	Verify that inbound calls are properly forwarded to the ShoreTel Converged Conferencing Server and it properly accepts the access code with audio to all involved parties.	Pass
4.19	Inbound call to Bridged Call Appearance (BCA) extension	Verify that inbound calls are properly presented to all of the phones that have BCA configured and that the call can be answered, placed on-hold and then transferred.	Pass

ID	Name	Description	Results
4.20	Inbound call to a Group Pickup extension	Verify that inbound calls to extensions that are part of a Group Pickup extension can be answered, placed on-hold and then transferred.	Pass

## Configuration Overview

The steps included in the ADTRAN and ShoreTel Configuration sections below provide instructions on configuring a converged ADTRAN Total Access router with a ShoreTel IP Telephony system. All ADTRAN products use a familiar command-line interface for configuration via console connection, Telnet, or a Web-based GUI is available for many features and configurations.

## ShoreTel Configuration

In this implementation ShoreTel interoperates with the ADTRAN Total Access platform via T1 PRI trunks. The connection between the two units will be via a T1 Crossover cable (if you are not familiar with what a T1 Crossover cable is, perform an Internet search for T1 crossover cable).

The configuration details below are concise, for complete configuration details please refer to the ShoreTel Administration Guide.

Log into ShoreWare Director and create a new PRI Trunk Group:

**Trunk Groups**  
Edit PRI Trunk Group

[New](#) [Copy](#) [Save](#) [Delete](#) [Reset](#) [Help](#)

[Edit this record](#) [Refresh this page](#)

Name:

Site: Sunnyvale TPP Lab

Language:

**Inbound:**

Number of Digits from CO:

DNIS [Edit DNIS Map](#)

DID [Edit DID Range](#)

Extension

Translation Table:

Prepend Dial In Prefix:

Use Site Extension Prefix

Tandem Trunking

User Group:

Prepend Dial In Prefix:

Destination:  [Search](#)

Go to the “Inbound” parameters section and configure the “Number of Digits from CO” to 10. Configure all of the other trunk group parameters as necessary. Please refer to the ShoreTel Administration Guide for details on the configuration parameters. Once you’ve modified the trunk group parameters as needed “Save” your changes.

**Note:** If this a new trunk group you will be prompted to allow access to all user groups, it’s always good practice to allow all user groups access to the newly created trunk group, but you can “Cancel” the request and provide individual user groups access to this new trunk group.

Using ShoreWare Director configure the ShoreGear T1 as follows:

**Switches**  
Edit ShoreGear T1 Switch

New Copy Save Delete Reset

Edit this record Refresh this page

Name: SGT1  
Description:  
Site: Sunnyvale TPP Lab  
IP Address: 10.3.0.55 Find Switches  
Ethernet Address: 00-10-49-03-C1-5C  
Server to Manage Switch: Headquarters

**Layer 3:**  
Protocol Type: ISDN User  
Central Office Type: NI-2  
Call by Call Service: <None>

Enable Outbound Calling Name

**Layer 1:**  
Clock Source: Slave  
Framing Format: ESF  
Line Code: B8ZS  
Line Build Out: 0.5 dB (0 - 110 feet)

Go to the “Layer 3:” parameter section, configure the “Protocol Type” for “ISDN User” and the “Central Office Type” for “NI-2”. In the “Layer 1:” parameter section configure the “Clock Source” for “Slave”, the “Framing Format” for “ESF” and the “Line Code” for “B8ZS”.

Scroll towards the bottom of the page to the channel parameters:

Channel	Port Type	Trunk Group	Description	Jack Number	Tx Gain (dB)	Rx Gain (dB)		
1	<a href="#">Edit</a>	Trunk	PRI	Port		0	0	<input type="button" value="Fill Down"/>
2	<a href="#">Edit</a>	Trunk	PRI	Port (2)		0	0	
3	<a href="#">Edit</a>	Trunk	PRI	Port (3)		0	0	
4	<a href="#">Edit</a>	Trunk	PRI	Port (4)		0	0	
5	<a href="#">Edit</a>	Trunk	PRI	Port (5)		0	0	
6	<a href="#">Edit</a>	Trunk	PRI	Port (6)		0	0	
7	<a href="#">Edit</a>	Trunk	PRI	Port (7)		0	0	
8	<a href="#">Edit</a>	Trunk	PRI	Port (8)		0	0	
9	<a href="#">Edit</a>	Trunk	PRI	Port (9)		0	0	
10	<a href="#">Edit</a>	Trunk	PRI	Port (10)		0	0	

Begin on Channel 1 (do not click on the Edit option), configure the “Port Type” to “Trunk”, then set the “Trunk Group” to match the trunk group name you created and define a “Description” (the “Description” is a label and can be anything, but you should define something that is useful and will allow you to determine which channel is being utilized), then click on the “Fill Down” radio button. This action will automatically populate all of the remaining channels. Finally, be sure to “Save” all of the changes. This completes all the configuration modifications necessary on the ShoreTel system.

### ADTRAN Configuration

To get started with the ADTRAN device configuration, refer to the Quick Start Guide and ADTRAN Operating System (AOS) and documentation CD included in the product box with each device. Quick Start Guides may also be downloaded from the ADTRAN support Web site at [www.adtran.com/support](http://www.adtran.com/support) by searching on the product device name. Once the ADTRAN device is unpacked and powered on, ADTRAN Total Access platforms can be configured via a command-line interface accessible from a com port connect (9600 8 N 1) or via Telnet. Configuration may also be accomplished using the Web interface GUI that provides step-by-step configuration guidelines.

Initial configuration will be via the CRAFT port, where you’ll define an IP address on ETH 0/1, the remaining configuration will be via the Web interface GUI. Connect to the CRAFT port with the following com port settings, using your preferred terminal emulation application (i.e. Tera Term Pro, Putty, HyperTerm, etc.).

#### Com Port

Pre-configured for 9600 8 N 1 using a straight through dB 9, RS 232 cable. Username and Passwords are all set to adtran.

Once you have successfully logged in, perform the following actions:

#### CONFIGURE THE UNIT’S IP ADDRESS

1. At the # prompt, enter config terminal.
2. At the (config)# prompt, enter interface eth 0/1 to access the configuration parameters for the



ETH 0/1 Ethernet port located on the rear of the unit.

3. Enter ip address 10.3.0.151 255.255.255.0 to assign an IP address to the Ethernet port using 24-bit subnet mask. This IP address and subnet mask are only examples, configure an IP address and subnet mask that are appropriate to your network environment. In addition this IP address should be accessible from your internal network so you can complete the configuration from the Web User Interface.

4. Enter no shutdown to activate the interface to pass data.

5. Enter exit to exit the interface commands and return to the Global configuration mode.

Depending on your configuration, you may need to set a default gateway as well as using the (config)#ip default gateway command. If IP routing is enabled on the unit, do NOT set a default gateway.

Then enable Web interface access using the following configuration:

### Web Access

```
Switch>
Switch>
Switch>en
Password:
Switch#conf t
Switch(config)#ip http server
```

Telnet configuration is not necessary but is recommended, use the following commands to enable Telnet access:

### Telnet Configuration

```
Switch>
Switch>
Switch>en
Password: adtran
Switch#conf t
Switch(config)#line telnet 0 4
Switch(config-telnet0-4)#login
Switch(config-telnet0-4)#password adtran
Switch(config-telnet0-4)#
```

Note: Telnet and Web access require a static IP address or DHCP configured IP address. If accessing from a different subnet, routing configuration will be required.

### Web User Interface

Using your preferred Web browser navigate to the Adtran Total Access product Web interface GUI, using the IP address configured earlier via the CRAFT port, using the following syntax:

HTTP://10.3.0.151

You will be prompted with a login window:





The User name is adtran and the password is also adtran.

Once you have successfully logged in you will get the System Summary page:

**ADTRAN** Total Access 916e (2nd Gen) Save Logout

**System**

- System Summary
- Physical Interfaces
- Passwords
- IP Services
- DHCP Server
- Hostname / DNS
- LLDP
- SNMP

**Voice**

**Data**

**Monitoring**

**Utilities**

**System Information**

**Firmware Version** A2.06.00.E

**Part Number** 4242916L1

**Serial Number** CFG0585340

**System Uptime** 2 weeks, 1 days, 2 hours, 50 minutes, 6 seconds

**System Time** 07:36:25 PM PST

**System Date** May 04, 2010

**Current System Clock Source** Internal (Primary clock source locked)

**Memory** Total Heap: 103,795,696 Bytes  
Free Heap: 80,473,072 Bytes

**CPU Utilization** System Load: 3.32%  
1 Min Avg Load: 5.48% 5 Min Avg Load: 5.5%  
Min Load: 0% Max Load: 60.3%  
Context Switch Load: 0.12%

**File System** Total: 31,769,055 Bytes  
Used: 26,746,065 Bytes  
Free: 5,022,990 Bytes

**SNTP Time Server** (Not Configured)

**WARNING!! A problem has been detected with your system. Please go to the troubleshooting page for more detail.**

Clear CPU Max Load

Refresh in 3 seconds...

We will only cover the parameters necessary to get the systems to interoperate for other parameters please refer to Adtran's documentation.

## T1 Interface Configuration

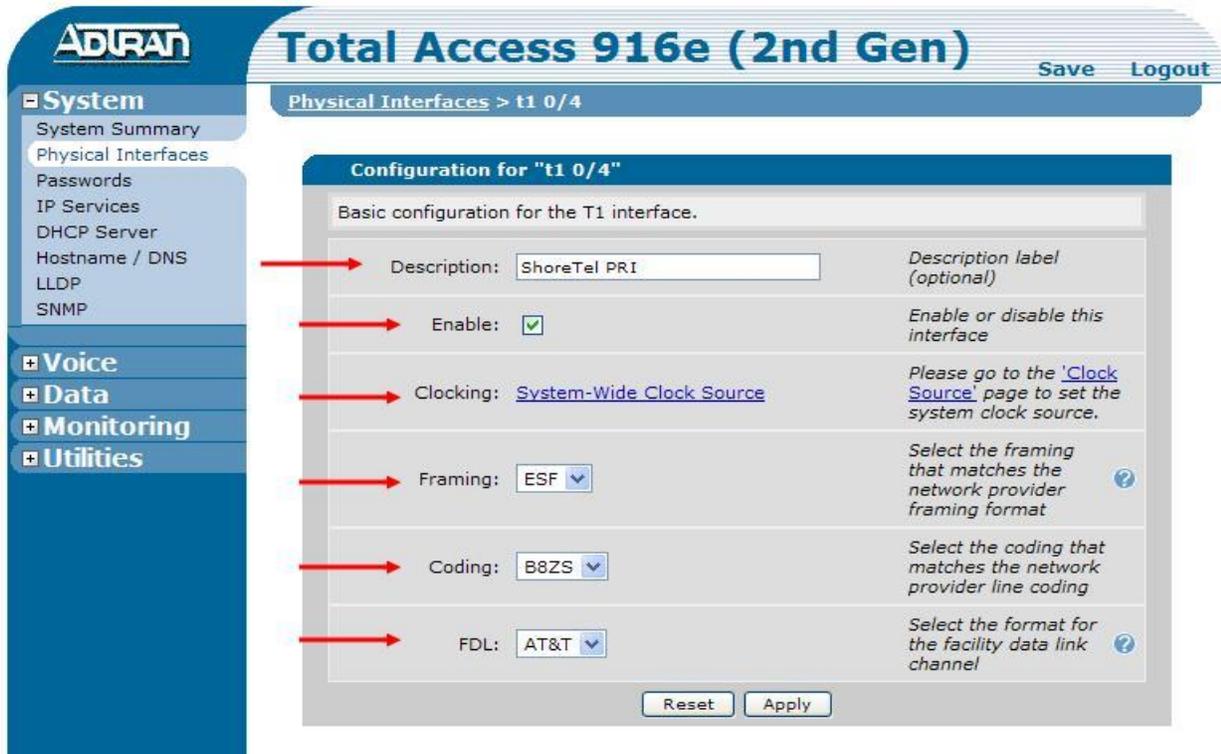
From the System Summary page scroll down to the WAN Summary page:

**WAN Summary**

Status for the WAN interfaces.

Name	t1 0/1	t1 0/2	t1 0/3	t1 0/4
Type	WAN-T1	WAN-T1	WAN-T1	WAN-T1
Link	Disabled	Disabled	Disabled	Up
Encapsulation	none	none	none	none

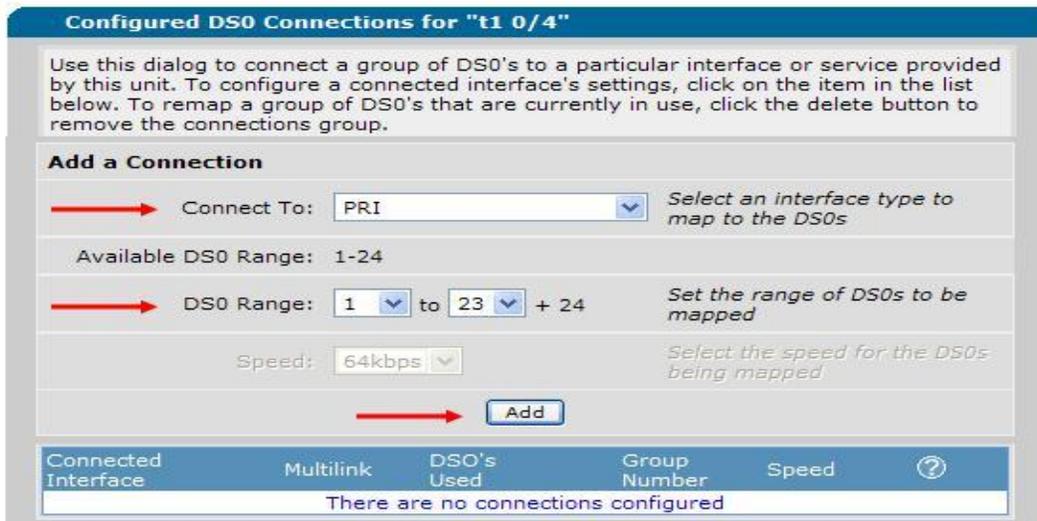
Then select the WAN interface (Name) you want to enable and configure, for connection to the ShoreGear T1. We selected WAN interface 4 (t1 0/4):



This action brings up the Physical Interfaces page, in the “Configuration for “t1 0/4”” perform the following:

1. Define a “Description” for the interface (we chose ShoreTel PRI).
2. Click to the right of the “Enable” parameter to enable the interface, the box should now be checked.
3. Clocking will be discussed below.
4. Configure the “Framing” parameter to “ESF”.
5. Configure the “Coding” parameter to “B8ZS”.
6. Configure the “FDL” parameter to “AT&T”.
7. Click on the “Apply” radio button. You will get the message “**Settings applied successfully**”.

Scroll down to the “Configured DS0 Connections for “t1 0/4””:



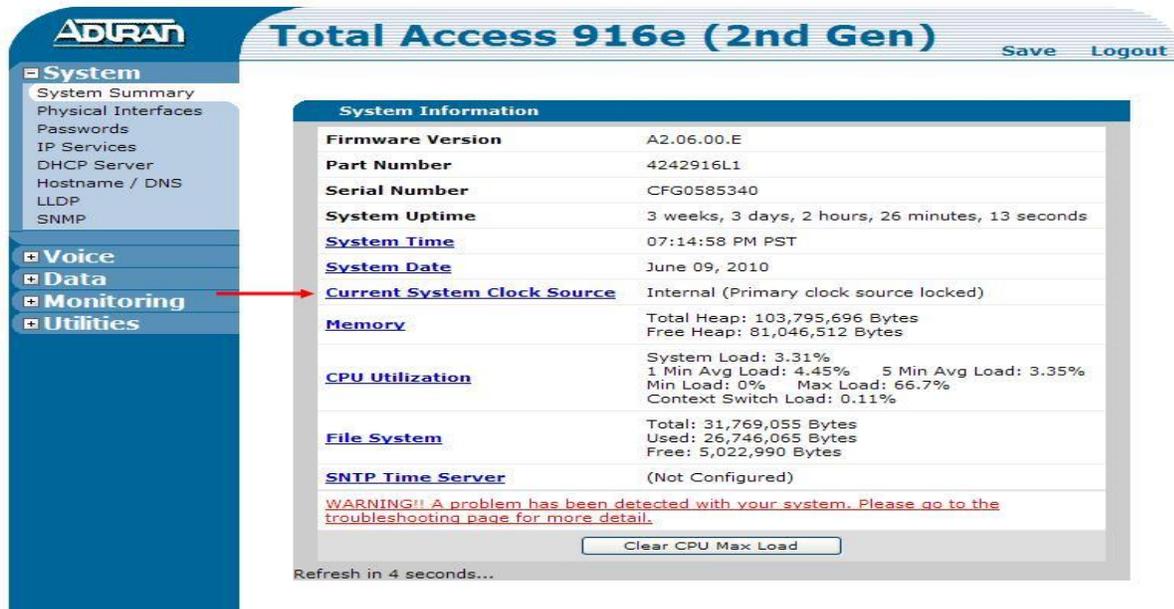
You will need to add the DS0s for the PRI by performing the following:

1. For the “Connect To:” parameter select “PRI”.
2. For the “DS0 Range:” parameter select “1” to “23”.
3. Click on the “Add” radio button

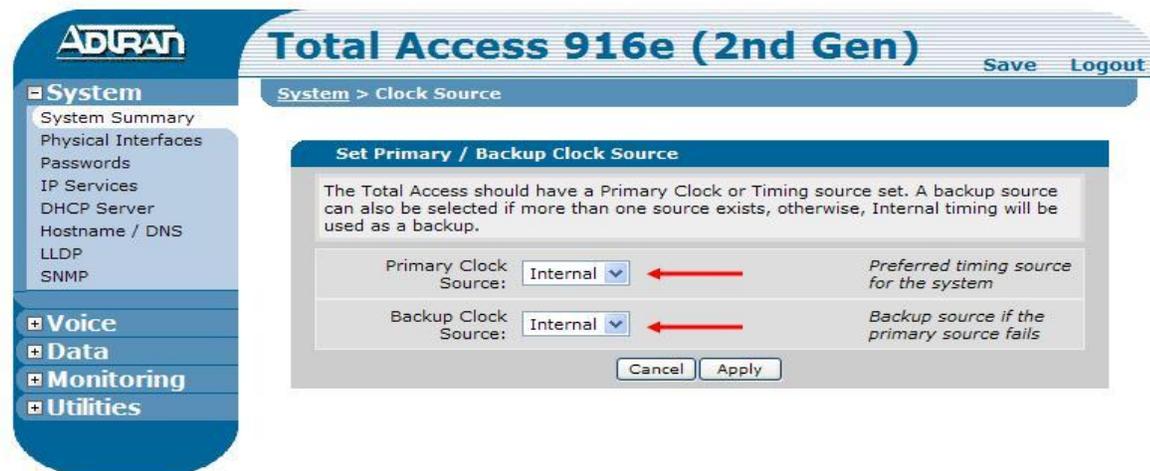
This action brings up the “PRI Configuration” page:

1. The “Description:” defaults to “pri 1”, leave it at default as you will need this entry later on when defining the trunk account for ISDN.
2. Enable the PRI interface by clicking the box to the right of “Enabled:”.
3. Set the “Switch Type:” to “National ISDN 2”.
4. Set the “Protocol Emulation:” to “Network”.
5. Set the “B-Channel Restart:” option to “Enabled” by clicking the box.
6. Set the “Name Delivery:” parameter to “display”.
7. Set the “Digits Transferred:” parameter to “All”.
8. Click on the “Apply” radio button. You will get the message “**PRI Interface updated successfully**”.

We will now update the system clock, under the “System” area click on the “System Summary”:



Click on the “Current System Clock Source” link, this action will bring up the “System > Clock Source” page:



Set the “Primary Clock Source:” and “Backup Clock Source:” to “Internal” for both options, then click on the “Apply” radio button. You will get the message “Settings applied successfully”.

### Eth 0/2 Interface Configuration

We will now configure the external / WAN Ethernet interface, this will be the interface that Bandwidth.com will send calls to. You will need to navigate to the “Configuration for “Ethernet 0/2”” page, you can do so either from the “System Summary” page, where you will need to scroll to the bottom of the page (Ethernet Summary) and click on the interface name “eth 0/2”. Or from the “Physical Interfaces” page, click on the interface name of “eth 0/2”, both of these pages are available under the “System” pull down menu on the left hand side of the Adtran Web UI.

The “Configuration for “Ethernet 0/2”” page will look as follows:

**ADTRAN** Total Access 916e (2nd Gen) Save Logout

Physical Interfaces > Ethernet 0/2

**Configuration for "Ethernet 0/2"**

Basic configuration for the Ethernet interface.

Description: WAN SIP Interface *Description label (optional)*

Enable:  *Enable or disable this interface.*

Speed/Duplex: Auto *Selection of Auto will auto-negotiate the best speed and duplex.*

Factory MAC Address: 00 : A0 : C8 : 2D : 5E : F8 *The factory Media Access Control address*

MAC Address Masquerade:  *Check to allow MAC Address Masquerade.*

MAC Address: 00 : A0 : C8 : 2D : 5E : F8 *Set the masquerade Media Access Control address.*

Traffic-Shaping:  *Enable traffic-shaping.*

Qos-policy: None *Outbound QoS-Policy map*

Interface Mode: IP routing *Select an interface mode.*

**Wireless Control Protocol**

Enable AWCP:  *Enable/Disable Wireless Control Protocol.*

**IP Settings**

Address Type: Static *Set to 'None' if connecting to a Bridge with IP routing disabled.*

IP Address: 12 . 167 . 101 . 254 *IP address for this numbered interface*

Subnet Mask: 255 . 255 . 255 . 0 *Subnet Mask for this numbered interface*

Dynamic DNS: <disabled> *Used to register this interface's IP address with a DNS Name.*

**Secondary IP Settings**

IP Address	Mask
<a href="#">Add a new Secondary IP Address</a>	

**Media-Gateway**

IP Address Type: Primary *RTP traffic will flow over the selected IP address.*

**Monitoring**

RTP Monitoring:  *Enables RTP monitoring on this interface.*

Reset Apply

1. Define a "Description:" for the label, we chose WAN SIP Interface.
2. Enable the interface by clicking to the right of "Enable:", making sure that the box is checked.
3. Set the "Interface Mode:" to "IP routing".
4. In the "IP Settings" area, be sure to configure the interface as appropriate, setting the "Address Type:", "IP Address:", "Subnet Mask:", and "Dynamic DNS:".
5. Click on the "Apply" radio button.

## System Summary

Connect all of the appropriate cables (a T1 crossover cable between the ShoreGear T1 and the Total Access T1 interface and the appropriate Ethernet cables), then click on the "System Summary" link:

**ADTRAN Total Access 916e (2nd Gen)** Save Logout

**System Information**

<b>Firmware Version</b>	A2.06.00.E
<b>Part Number</b>	4242916L1
<b>Serial Number</b>	CFG0585340
<b>System Uptime</b>	3 weeks, 3 days, 4 hours, 17 minutes, 19 seconds
<b>System Time</b>	06:41:53 PM PST
<b>System Date</b>	June 21, 2010
<b>Current System Clock Source</b>	Internal (Primary clock source locked)
<b>Memory</b>	Total Heap: 103,795,696 Bytes Free Heap: 80,911,344 Bytes
<b>CPU Utilization</b>	System Load: 6.6% 1 Min Avg Load: 6.6% 5 Min Avg Load: 5.51% Min Load: 0% Max Load: 60.19% Context Switch Load: 0.12%
<b>File System</b>	Total: 31,769,055 Bytes Used: 26,746,065 Bytes Free: 5,022,990 Bytes
<b>SNTP Time Server</b>	10.0.0.43
<b>SNTP Last Sync</b>	Not yet synched

Refresh in 1 seconds... Clear CPU Max Load

**WAN Summary**

Status for the WAN interfaces.

Name	t1 0/1	t1 0/2	t1 0/3	t1 0/4
Type	WAN-T1	WAN-T1	WAN-T1	WAN-T1
Link	Disabled	Disabled	Disabled	Up
Encapsulation	none	none	none	none

**Ethernet Summary**

Status for the Ethernet interfaces.

Name	eth 0/1	eth 0/2
Type	Ethernet	Ethernet
Link	100Mbps/full	100Mbps/full
Encapsulation	none	none
IP Address	10.3.0.151	209.172.118.115
IP Mask	255.255.255.0	255.255.255.224

1. Verify that you don't have any warnings in the "System Information" section.
2. Verify that the "WAN Summary" section shows the T1 interface "Link" as "Up" and green.
3. Verify that the "Ethernet Summary" section shows the "Link" for both Ethernet interfaces with the correct Ethernet link speed.

If you have any warnings, be sure to review your configuration and cabling.

### Trunk Account Configuration

Click on the "Voice" link, this will expand the available options:

**ADTRAN Total Access 916e (2nd Gen)** Save Logout

**Voice**

**Add / Modify / Delete Trunk Accounts**

Use this page to add and configure trunk accounts.

**Add a New Trunk Account**

Trunk Name:  ?

Type: SIP ?

Add

In the “Trunks” section click on “Trunk Accounts”, this action brings up the “Add / Modify / Delete Trunk Accounts” page. You will need to add two separate trunk accounts (one for SIP and one for ISDN). We’ll add the SIP trunk account first:

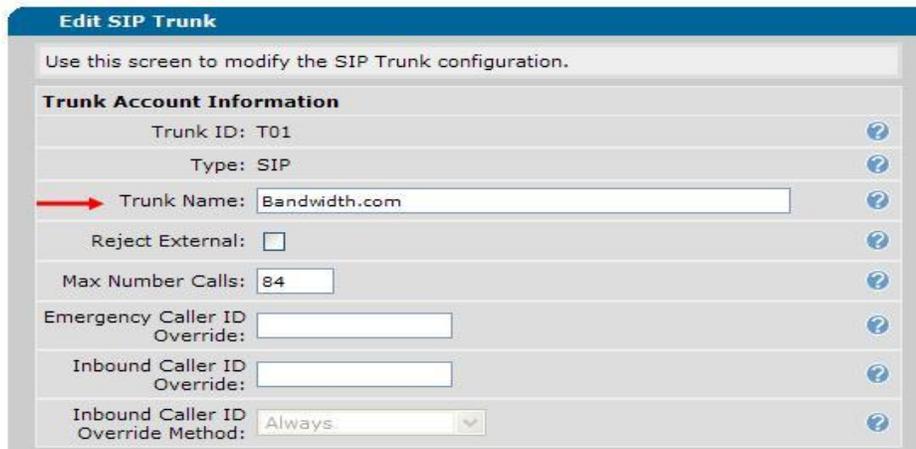
1. Define a “Trunk Name:” that is appropriate, we chose Bandwidth.com
2. Set the “Type:” to “SIP”
3. Click on the “Add” radio button.

This action brings up the “Trunk Accounts > Txx” page which includes a “Trunk Status” section and “Edit SIP Trunk” section. We’ll begin with the “Trunk Status” section:



1. The “Operational Status:” may be “Unavailable” after you apply ALL of the settings it will become “Available”.
2. Verify that the “Administrative Status:” is “Enabled”.
3. Click on the “Apply” radio button. You will get the message “Administrative status set successfully”.

Scroll down to the “Edit SIP Trunk Section”:



The “Trunk ID:” will be auto assigned, but in general will be “T01”, the “Type:” should be “SIP”, if it’s not “SIP” then you added the “Trunk Group” incorrectly, be sure to add the “Type” as “SIP” above. Define a “Trunk Name:”, this can be anything you choose, we set the name as “Bandwidth.com”, there isn’t a need to modify any of the other parameters in this section.

Scroll down to the “SIP Settings” tab:

The screenshot shows the 'SIP Settings' configuration page. The 'SIP Settings' tab is selected. The configuration includes:

- SIP Server Address:** IP Address: 216 . 82 . 225 . 202 (with a red arrow pointing to the IP address).
- SIP Server Port:** 5060 (with a red arrow pointing to the port number).
- SIP Proxy Address:** Not Set.
- SIP Proxy Port:** (empty field).
- SIP Conferencing URI:** (empty field).
- Force Host Resolve:**  Override  Enable.
- FROM Header User Formatting:**  Override Domestic (dropdown).
- FROM Header Host Type:**  Override Local (dropdown).
- TO Header Host Type:**  Override SIP Server (dropdown).
- P-Asserted Identity Host Type:**  Override Local (dropdown).
- Request URI Header Host Type:**  Override SIP Server (dropdown).
- Alert Info URL:**  Override  Default  Custom: (empty field).
- Supports 100rel:**  Override  Enable.
- Require 100rel:**  Override  Enable.
- Dial String Source:** Request URI (dropdown, with a red arrow pointing to it).
- Trust Domain:**  Enable.
- Require P-Assert Identity:**  Require.
- Verify Remote Supports Replaces:**  Enable.
- SIP Keepalive Type / Timeout:** None (dropdown) 30 (input) seconds <30-3600>.
- Default Ring Cadence:** Internal (dropdown).
- Diversion Support:**  Enable.

**SIP Registrar Settings** (with a question mark icon)

1. Set "SIP Server Address:" parameter to "IP" and define the IP address given to you by Bandwidth.com.
2. Set "SIP Server Port:" parameter to "5060".
3. Set the "Dial String Source:" parameter to "Request URI".

No other parameters require adjustment, leave them at default settings. Scroll to the bottom of the "SIP Registrar Settings":

**SIP Registrar Settings**

SIP Registrar Address:  Not Set  
 IP Address: [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]  
 Host Name: [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

SIP Registrar Port: [ ] [ ] [ ] [ ]

Requires Expires:  Enable

Registration Expire Time:  Server Default  
 Request an Expire Time: 3600 seconds

Max Concurrent Registrations: 32 <0-32>

Registrar Threshold:  Absolute: <30 secs - 7 days>  
 0 days 0 hours 5 min 0 sec.  
 Percentage: [ ] % <0 - 90%>

Default Authentication:  Not Set  
 Set  
 User: [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Domain Address:  Server Default  
 Use this domain: [ ] [ ] [ ] [ ] [ ] [ ] [ ] [ ]

Codec Group: 729\_711 (G.729, G.711 uLaw) ←

**Registration Settings**

Register value	End (if range)	Authname
There are no Register entries for this Trunk.		

Add Register Entry

Cancel Apply

4. Set the “Codec Group.” parameter to “729\_711 (G.729, G.711 uLaw)”. No other parameter modifications are necessary in this area.

Scroll up and select the “DNIS Substitution” tab:

SIP Settings ANI Substitution **DNIS Substitution** DNIS:ANI Replacement

**Add New DNIS Substitution**

Match Number: XNXX-NXX-XXXX

Substitution Number: 011XNXX-NXX-XXXX

Substitution Name: BandwidthE.164

Add Substitution

5. Set the “Match Number:” to XNXX-NXX-XXXX
6. Set the “Substitution Number:” to 011XNXX-NXX-XXXX
7. Define a “Substitution Name:” we chose BandwidthE.164
8. Click on the “Add Substitution” radio button.

The entry will be added to the “Current Substitution Entries” section, as seen below:

- Click on the “Apply” radio button. This action will change the page to the main “Trunk Accounts” and you will get the message “**SIP Trunk updated successfully**”.

We will now add the “ISDN” trunk account:

- Define a “Trunk Name:” that is appropriate, we chose ShoreTel.
- Set the “Type:” to “ISDN”
- Click on the “Add” radio button.

This action brings up the “Trunk Accounts > Txx” page which includes a “Trunk Status” section and “Edit Trunk” section. We’ll begin with the “Trunk Status” section:

- The “Operational Status:” may be “**Unavailable**” after you apply ALL of the settings it will become “**Available**”.
- Verify that the “Administrative Status:” is “Enabled”.
- Click on the “Apply” radio button. You will get the message “**Administrative status set successfully**”.

Scroll down to the “Edit Trunk Section”:

The “Trunk ID:” will be automatically assigned, if it’s a new installation it will most likely be “T02”, in our case it was actually “T03”. Verify that the “Type:” and “Supervision:” are set to “ISDN”, if they are not, then you added the incorrect “Type” for the “Trunk Account” above. The “Trunk Name:” will be what you defined when adding the trunk account, you may modify it here (if necessary).

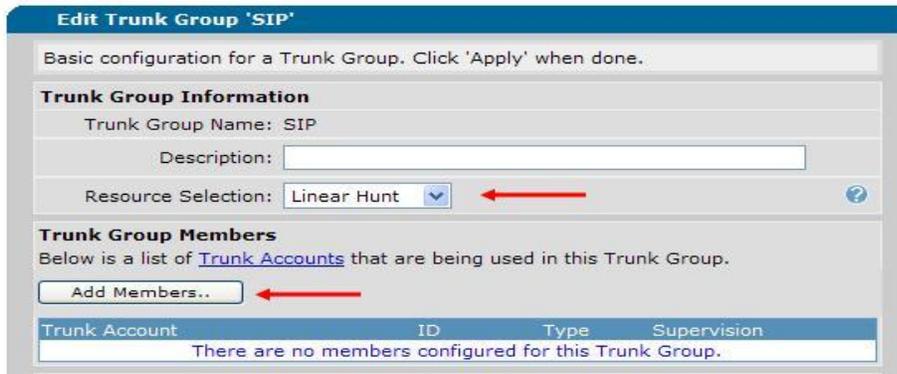
1. Set the “Resource Selection:” to “Linear Hunt Ascending”.
2. Set the “ISDN Interface:” to the entry you created above (PRI Configuration), should be named “pri 1”.

No additional modifications are necessary; the default settings should not be adjusted scroll to the bottom of the page and click on the “Apply” radio button. This action will change the page to the main “Trunk Accounts” and you will get the message “**Trunk updated successfully**”.

### Trunk Group Configuration

On the left of the Web UI, below the “Trunks” section, click on the “Trunk Groups” link:

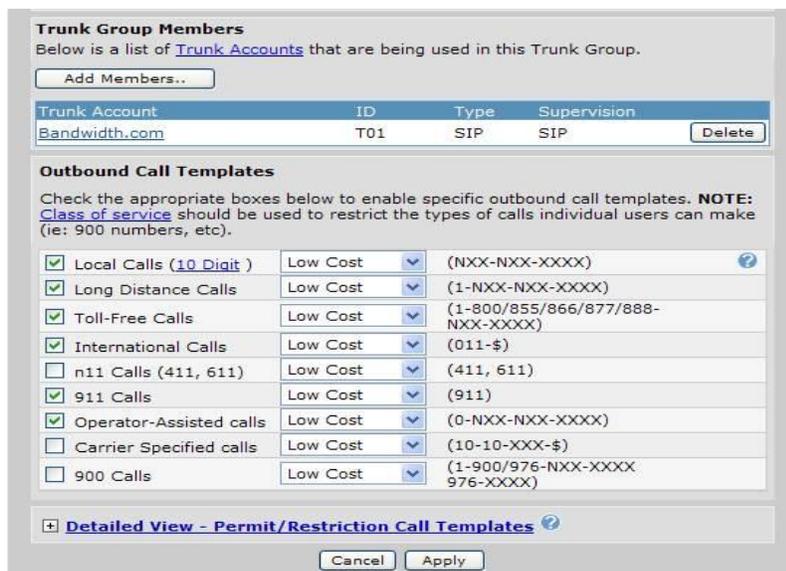
You will need to define two trunk groups, one for SIP and one for PRI, we will add SIP first. In the “Group Name:” section type SIP and click on the “Add” radio button. This action brings up the “Edit Trunk Group ‘SIP’” page.



Verify that the “Resource Selection:” parameter is set to “Linear Hunt” (this is the default setting), then click on the “Add Members...” radio button, this action brings up the “Add Members to Trunk Group” pop-up window:



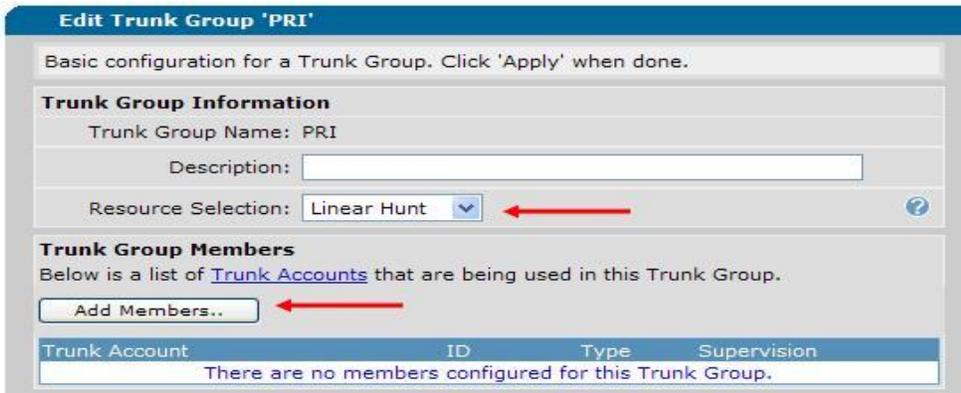
Click to the left of the “Bandwidth.com” trunk account (which was created earlier) to select the SIP trunk account. Then click on the “Add Selected Trunks” radio button. This action takes you back to the “Edit Trunk Group ‘SIP’” page, but now you’ll have the “Bandwidth.com” account listed in the “Trunk Group Members” section and you will get the message “**Account(s) added successfully**”.



Set the “Outbound Call Templates” parameters as needed and click on the “Apply” radio button. This action takes you back to the main “Trunk Group” page (Add / Modify / Delete Trunk Groups) and you will get the message “Settings applied successfully”.



We will now add the PRI trunk group. In the “Group Name:” section type PRI and click on the “Add” radio button. This action brings up the “Edit Trunk Group ‘PRI’” page.



Verify that the “Resource Selection:” parameter is set to “Linear Hunt” (this is the default setting), then click on the “Add Members...” radio button, this action brings up the “Add Members to Trunk Group” pop-up window:



Click to the left of the “ShoreTel” trunk account (which was created earlier) to select the ISDN trunk account. Then click on the “Add Selected Trunks” radio button. This action takes you back to the “Edit Trunk Group ‘PRI’” page, but now you’ll have the “ShoreTel” account listed in the “Trunk Group Members” section and you will get the message “Account(s) added successfully”.

**Trunk Group Members**  
Below is a list of [Trunk Accounts](#) that are being used in this Trunk Group.

Trunk Account	ID	Type	Supervision
<a href="#">ShoreTel</a>	T03	ISDN	ISDN

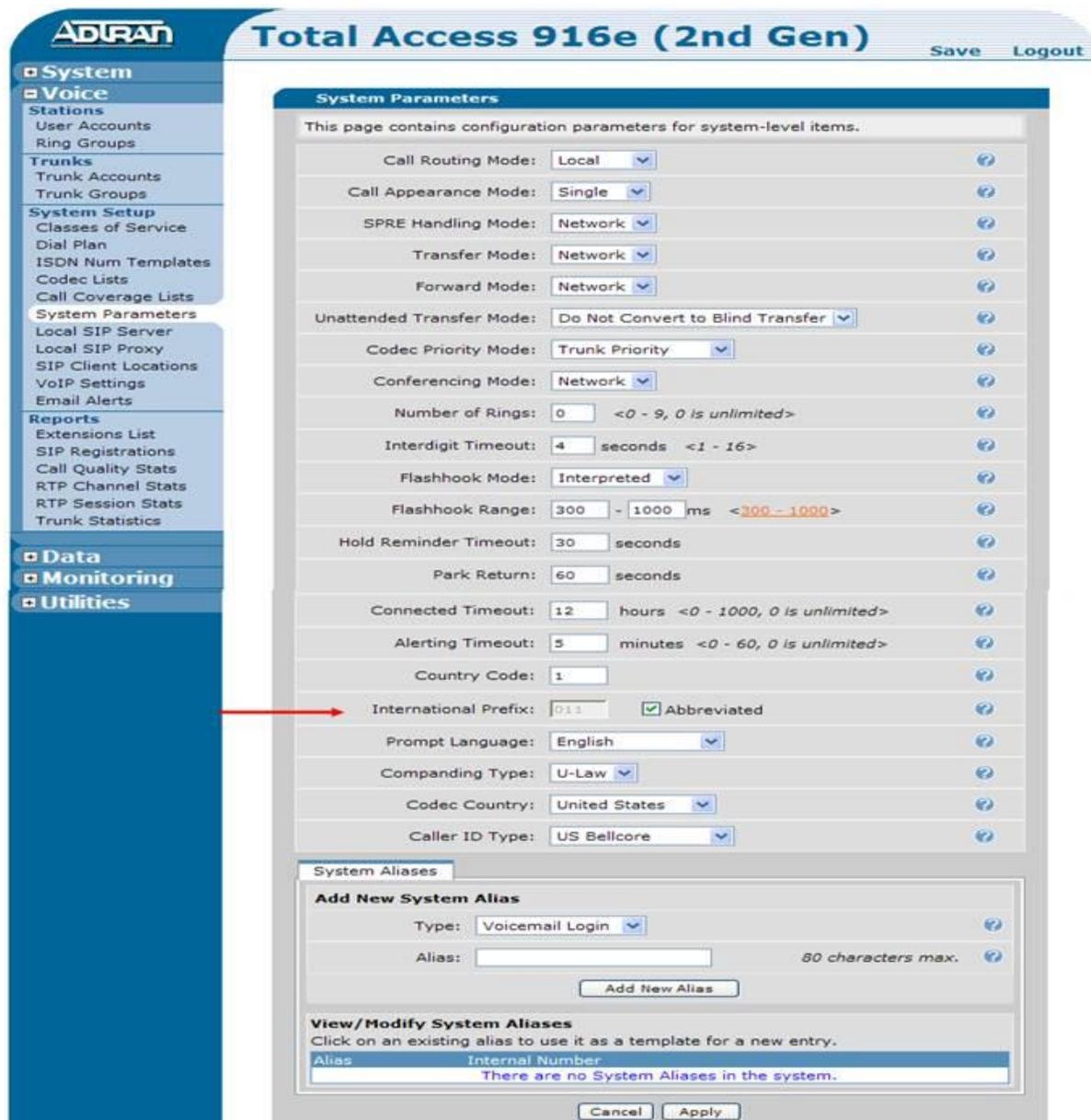
**Outbound Call Templates**  
Check the appropriate boxes below to enable specific outbound call templates. **NOTE:** [Class of service](#) should be used to restrict the types of calls individual users can make (ie: 900 numbers, etc).

<input checked="" type="checkbox"/> Local Calls (10 Digit )	Low Cost	(NXX-NXX-XXXX)
<input checked="" type="checkbox"/> Long Distance Calls	Low Cost	(1-NXX-NXX-XXXX)
<input checked="" type="checkbox"/> Toll-Free Calls	Low Cost	(1-800/855/866/877/888-NXX-XXXX)
<input checked="" type="checkbox"/> International Calls	Low Cost	(011-#)
<input type="checkbox"/> n11 Calls (411, 611)	Low Cost	(411, 611)
<input checked="" type="checkbox"/> 911 Calls	Low Cost	(911)
<input checked="" type="checkbox"/> Operator-Assisted calls	Low Cost	(0-NXX-NXX-XXXX)
<input type="checkbox"/> Carrier Specified calls	Low Cost	(10-10-XXX-#)
<input type="checkbox"/> 900 Calls	Low Cost	(1-900/976-NXX-XXXX 976-XXXX)

Set the “Outbound Call Templates” parameters as needed and click on the “Apply” radio button. This action takes you back to the main “Trunk Group” page (Add / Modify / Delete Trunk Groups) and you will get the message “**Settings applied successfully**”.

## System Parameters Configuration

In the “System Setup” section click on the “System Parameters” link:



Go to the “International Prefix:” parameter and verify that it has 011 then click on the on check box to the left of “Abbreviated”. This causes the Adtran Total Access system to dial numbers in E.164 (canonical) format, which is what Bandwidth.com requires. Scroll to the bottom of the page and click on the “Apply” radio button. You will get the message “**System parameters applied successfully**”.

This completes the configuration necessary to interoperate between Bandwidth.com, Adtran Total Access and ShoreTel.

## Dial Plan and ISDN Num Templates

It may be necessary to modify the “Dial Plan” and “ISDN Num Templates” specifically to your implementation. For a detail explanation of how to configure these parameters please see the configuration guides online at [www.adtran.com](http://www.adtran.com) or in the included “ADTRAN OS System Documentaton” CD. Following are screen shots of the lab configuration for “Dial Plan” and “ISDN Num Templates” for reference only:





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- Voice**
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    - User Accounts
    - Ring Groups
  - Trunks
    - Trunk Accounts
    - Trunk Groups
  - System Setup
    - Classes of Service
    - Dial Plan
      - ISDN Num Templates
      - Codec Lists
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      - System Parameters
      - Local SIP Server
      - Local SIP Proxy
      - SIP Client Locations
      - VoIP Settings
      - Email Alerts
  - Reports
    - Extensions List
    - SIP Registrations
    - Call Quality Stats
    - RTP Channel Stats
    - RTP Session Stats
    - Trunk Statistics
- Data
- Monitoring
- Utilities

### Dial Plan Parameters

Dial plan parameters not only tell the system how to route calls, but also work with Classes of Service to determine whether a user has permission to dial a given number.

Local Dialing Type:  *Based on how users normally dial local numbers*

### Dial Plan Templates (Advanced)

Dial plan templates allow the system to recognize dialed numbers as a particular type of call. The type of call is matched against the user's class of service to determine whether that user has the permission to make the call.

#### Add New Dial Plan Template

Template:  Valid characters: 0-9, () - M N X [] \$

Number Type:  Used when defining what call types are permitted in the user class of service.

#### View/Delete Dial Plan Templates

The following list details the currently configured dial plan templates. To delete a template, click on the Delete button next to that template. You can use an existing template as the basis for a new template by clicking on a template row. The form above will be initialized to that template's values.

Dial Plan Template	Number Type	
911	Always Permitted	<input type="button" value="Delete"/>
1XX	Extensions	<input type="button" value="Delete"/>
2XX	Extensions	<input type="button" value="Delete"/>
NXX-NXX-XXXX	Local	<input type="button" value="Delete"/>



## Total Access 916e (2nd Gen)

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    - SIP Registrations
    - Call Quality Stats
    - RTP Channel Stats
    - RTP Session Stats
    - Trunk Statistics
- Data
- Monitoring

### ISDN Number Templates

ISDN Number Templates look similar to standard dial plan templates but are used exclusively by ISDN-based trunks to recognize dialed numbers as a particular type of call. Additionally, if a prefix is specified, then the number template matches against that prefix as well but strips those digits before sending the number.

#### Add New ISDN Number Template

Prefix:

Template:  Valid characters: 0-9, () - M N X [] \$

Number Type/Plan:

#### View/Delete ISDN Number Templates

The following list details the currently configured ISDN Number templates. To delete a template, click on the Delete button next to that template. You can use an existing template as the basis for a new template by clicking on a template row. The form above will be initialized to that template's values.

Prefix	Dial Plan Template	Number Type/Plan	
	911	Subscriber type/E.164 plan	<input type="button" value="Delete"/>
	NXX-NXX-XXXX	National type/E.164 plan	<input type="button" value="Delete"/>
0	NXX-NXX-XXXX	Unknown type/Unknown plan	<input type="button" value="Delete"/>
1	NXX-NXX-XXXX	National type/E.164 plan	<input type="button" value="Delete"/>



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For a detailed explanation of how to configure the units along with frequently asked questions, please see configuration guides online at [www.adtran.com](http://www.adtran.com) or in the included “ADTRAN OS System Documentation” CD.

## **ADTRAN Troubleshooting and Technical Support**

ADTRAN Technical Support is available toll-free for the life of the product during business hours. To speak with an ADTRAN Technical Support Specialist or Network Engineer, contact ADTRAN support at the following number or via the support Web site listed below:

### **Post-Sales Technical Support**

888-423-8726

[support@adtran.com](mailto:support@adtran.com)

[www.adtran.com/support](http://www.adtran.com/support)

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### **Pre-Sales Technical Support**

800-615-1176

[application.engineer@adtran.com](mailto:application.engineer@adtran.com)

[www.adtran.com/support](http://www.adtran.com/support)

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