Application Note

AT&T IP Flex Reach - Configuration Guide

21 May 2009

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Tested versions: Ingate Firewall and SIParator version 4.7.1
Startup Tool version 2.5.1
Nortel CS1000

1 AT&T IP Flex Reach and Ingate

This document provides a configuration guide to assist AT&T administrators and various IP-PBX vendors in connecting an Ingate Systems SIParator® to the AT&T IP Flexible Reach SIP Trunking service.

1.1 Ingate SIParator with AT&T IP Flexible Reach

AT&T IP Flexible Reach is a SIP "Trunking" service that delivers integrated access for Key System (analog phones), TDM PBX and IP PBX environments. This managed voice over IP communication solution supports inbound and outbound calling on your data network giving you local, U.S. long distance and international reach for your U.S. sites. With AT&T you gain the efficiency and economic benefits of network convergence for your organization.

Ingate offers SIParators and Firewalls, an Enterprise level SIP Session Border Controller (E-SBC) and SIP Security device. A powerful tool that offers enterprises a controlled and secured migration to VoIP (Voice over IP) and other live communications, based on Session Initiation Protocol (SIP). With the SIParator and Firewall, even the largest of businesses, with branch offices around the world and remote workers, can easily harness the productivity and cost-saving benefits of VoIP and other IP-based communications while maintaining current investments in security technology.

Various IP-PBXs provide call control, various business orientated features and supports desktop devices and applications for enterprises. The IP-PBX is an integral element of a business portfolio of products that: facilitate business wide communication and collaboration, enhance workforce mobility and extend enterprise connectivity, improve client service and contact management, provide tools to manage communication overload.

In this application, above and beyond the E-SBC capabilities that the Ingate products provide, the SIParator and Firewall are providing a number of additional features to enable SIP Trunking connectivity to various IP-PBX solutions using the AT&T IP Flex Reach SIP Trunking service. The Ingate products offer the use of the SIP Trunking Module, where there are features such as Routing Rules, basic Security Policies, Client/Server Registrar, B2BUA capabilities, SIP Protocol 'Normalization' and more. These features allow the Ingate to connect with AT&T IP Flex Reach in a secure and reliable manner.

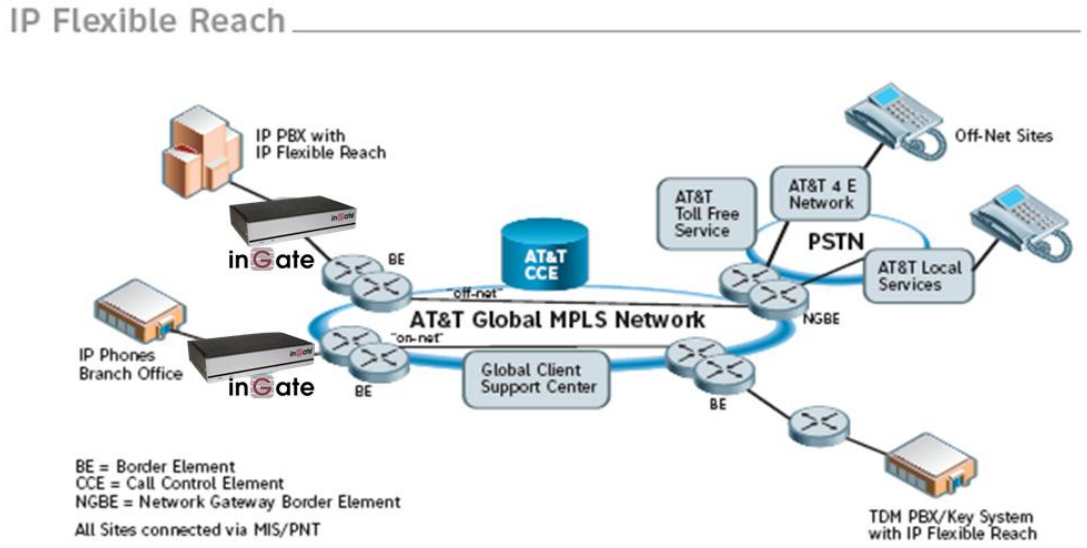
1.2 SIP Trunking

In this application, the IP-PBX is the call control server processing the phone features and PBX functionality required for an enterprise. It resides on the private LAN segment of enterprise, away from the Internet and serviced by the Ingate as a Session Border Controller.

The Ingate SIParator or Firewall sits on the Enterprise network edge, providing a security solution for data and SIP communications with E-SBC functionality. It is responsible for all SIP communications security by providing Policy and Routing Rules to allow specific SIP traffic intended for the Enterprise.

The AT&T IP Flexible Reach is located across the AT&T Global MPLS Network.

Application Diagram

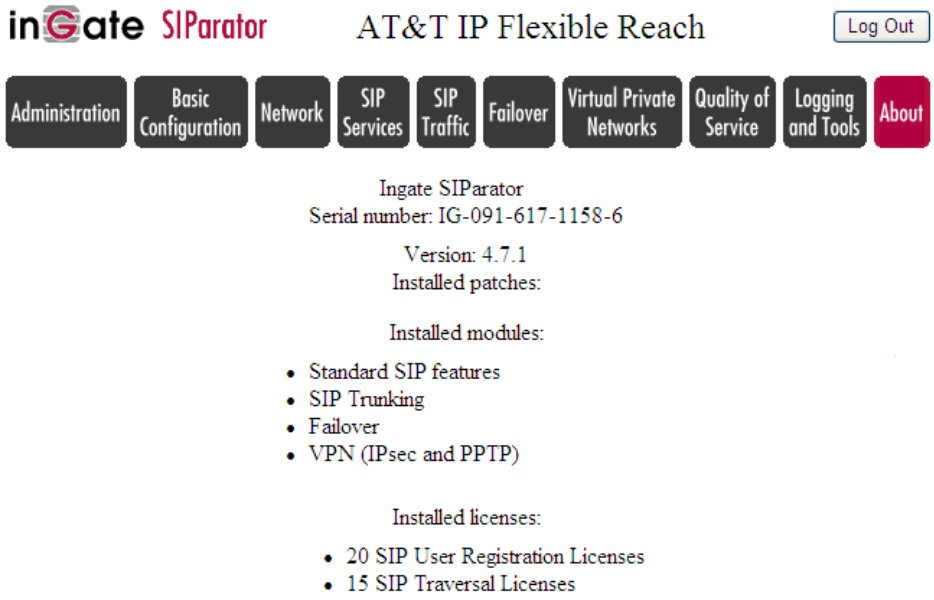


Look for the AT&T Icon at&t to focus your attention to specific AT&T IP Flexible Reach setup instructions. These instructions are specific to the Ingate & AT&T IP Flexible Reach deployment with SIP Trunking.

2 Ingate SIParator Version

The Ingate SIParator® has software version 4.7.1. You can check the version of the SIParator® by viewing the About page.

The SIP Trunking Module is required for AT&T IP Flexible Reach connectivity, and the Remote SIP Connectivity Module is optional for Far End NAT Traversal functionality.



Licensing and Modules

SIP Trunking Module	Provides Advanced Routing and SIP Normalization features specific to the SIP trunking application
Remote SIP Connectivity Module	Provide Far End NAT Traversal solutions and STUN Server
SIP Traversal Licenses	Provides number of concurrent calls limit, each HW variant has different limits.

3 Ingate Startup Tool

The Ingate Startup Tool is an installation tool for Ingate Firewall® and Ingate SIParator® products using the Ingate SIP Trunking module or the Remote SIP Connectivity module, which facilitates the setup of complete SIP Trunking solutions.

The Startup Tool is designed to simplify the initial "out of the box" commissioning and programming of the Network Topology, SIP Trunk deployments and Remote User deployments. The tool will automatically configure a user's Ingate Firewall or SIParator to work with the IP-PBX of their choice and AT&T IP Flexible Reach SIP Trunking service, and sets up all the routing needed to enable remote users to access and use the enterprise IP-PBX. Thanks to detailed interoperability testing, Ingate has been able to create this tool with pre-configured set ups for several of the leading IP-PBX vendors and AT&T.

Download Free of Charge: The Startup Tool is free of charge for all Ingate Firewalls and SIParators. Get the latest version of the Startup Tool at
http://www.ingate.com/Startup_Tool.php

For more detailed programming instructions consult the Startup Tool – Getting Started Guide, available here:
http://www.ingate.com/appnotes/Ingate_Startup_Tool_Getting_Started_Guide.pdf

Make sure that you always have the latest version of the configuration tool as Ingate continuously adds new vendors once interoperability testing is complete. If you don't find your IP-PBX vendor, please contact Ingate for further information.

The Startup Tool will install and run on any Windows 2000, Windows XP, Windows Vista, and Wine on Linux operating systems.

Keep in mind, this Ingate Startup Tool is a commissioning tool, not an alternate administration tool. This tool is meant to get an "out of the box" Ingate started with a pre-configured setup, enough to make your first call from IP-PBX to AT&T. Additional programming and administration of this Ingate unit should be done through the Web Administration.

4 Connecting the Ingate Firewall/SIParator

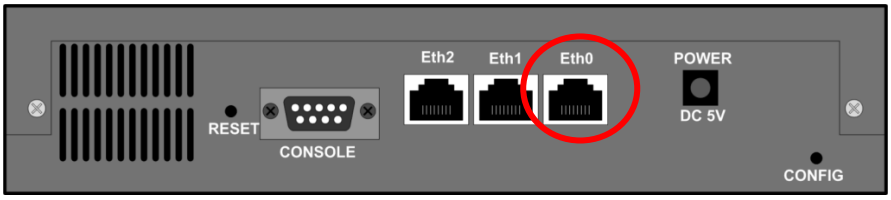
From the factory the Ingate Firewall and SIParator does not come preconfigured with an IP address or Password to administer the unit. Web administration is not possible unless an IP Address and Password are assigned to the unit via the Startup Tool or Console port.

The following will describe a process to connect the Ingate unit to the network then have the Ingate Startup Tool assign an IP Address and Password to the Unit.

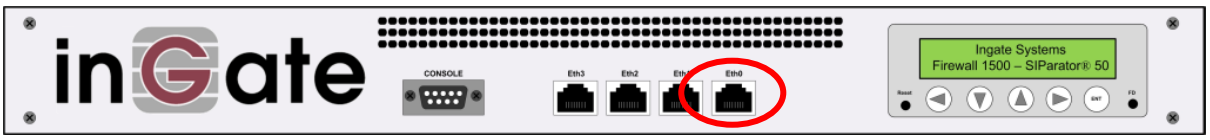
Configuration Steps:

1) Connect Power to the Unit.
2) Connect an Ethernet cable to "Eth0". This Ethernet cable should connect to a LAN network. Below are some illustrations of where "Eth0" are located on each of the Ingate Model types.

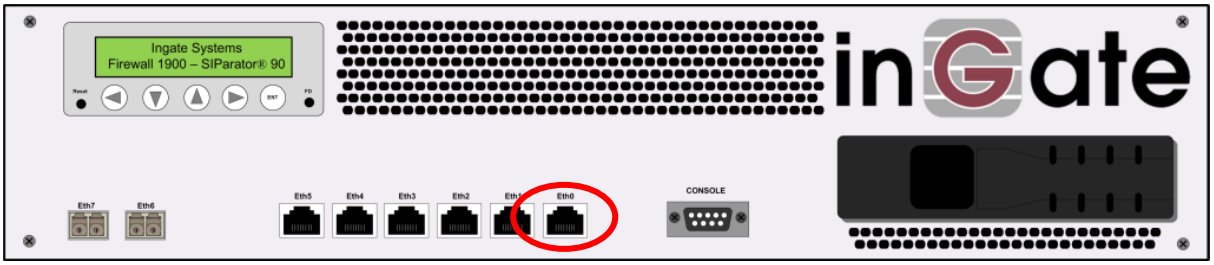
Ingate 1190 Firewall and SIParator 19 (Back)



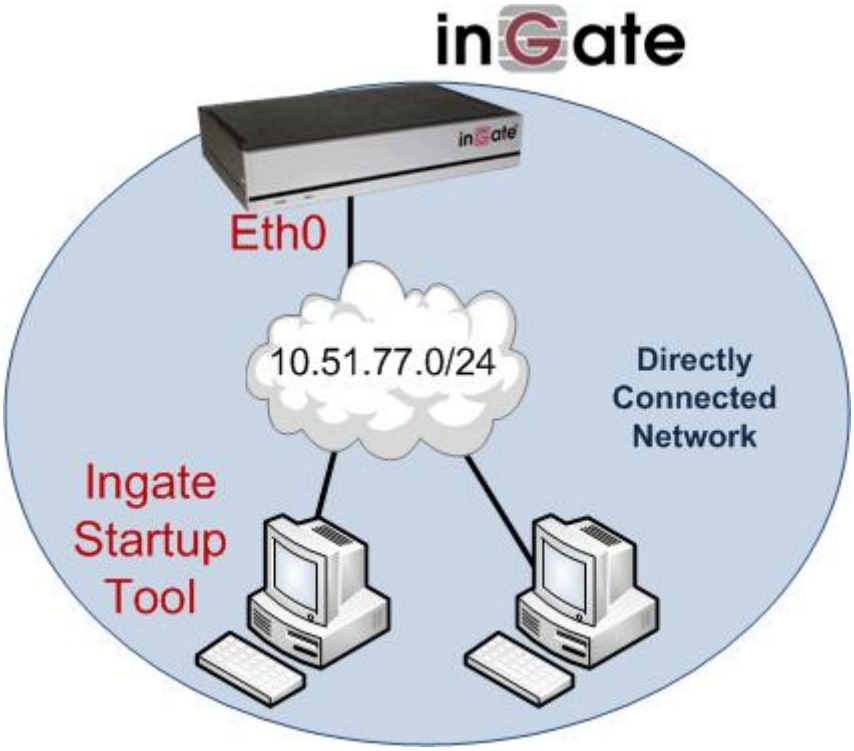
Ingate 1500/1550/1650 Firewall and SIParator 50/55/65



Ingate 1900 Firewall and SIParator 90



3) The PC/Server with the Startup Tool should be located on the same LAN segment/subnet. It is required that the Ingate unit and the Startup Tool are on the same LAN Subnet to which you are going to assign an IP Address to the Ingate Unit.
Note: When configuring the unit for the first time, avoid having the Startup Tool on a PC/Server on a different Subnet, or across a Router, or NAT device, Tagged VLAN, or VPN Tunnel. Keep the network Simple.



4) Proceed to Section 5: Using the Startup Tool for instructions on using the Startup Tool.

5 Using the Startup Tool

There are three main reasons for using the Ingate Startup Tool. First, the "Out of the Box" configuring the Ingate Unit for the first time. Second, is to change or update an existing configuration. Third, is to register the unit, install a License Key, and upgrade the unit to the latest software.

5.1 Configure the Unit for the First Time

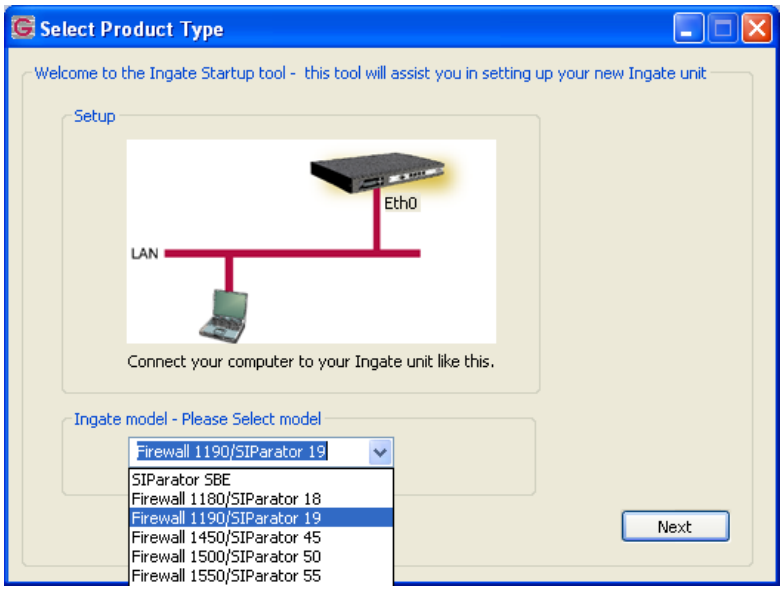
From the factory the Ingate Firewall and SIParator does not come preconfigured with an IP address or Password to administer the unit. Web administration is not possible unless an IP Address and Password are assigned to the unit via the Startup Tool or Console port.

In the Startup Tool, when selecting "Configure the unit for the first time", the Startup Tool will find the Ingate Unit on the network and assign an IP Address and Password to the Ingate unit. This procedure only needs to be done ONCE. When completed, the Ingate unit will have an IP Address and Password assigned.

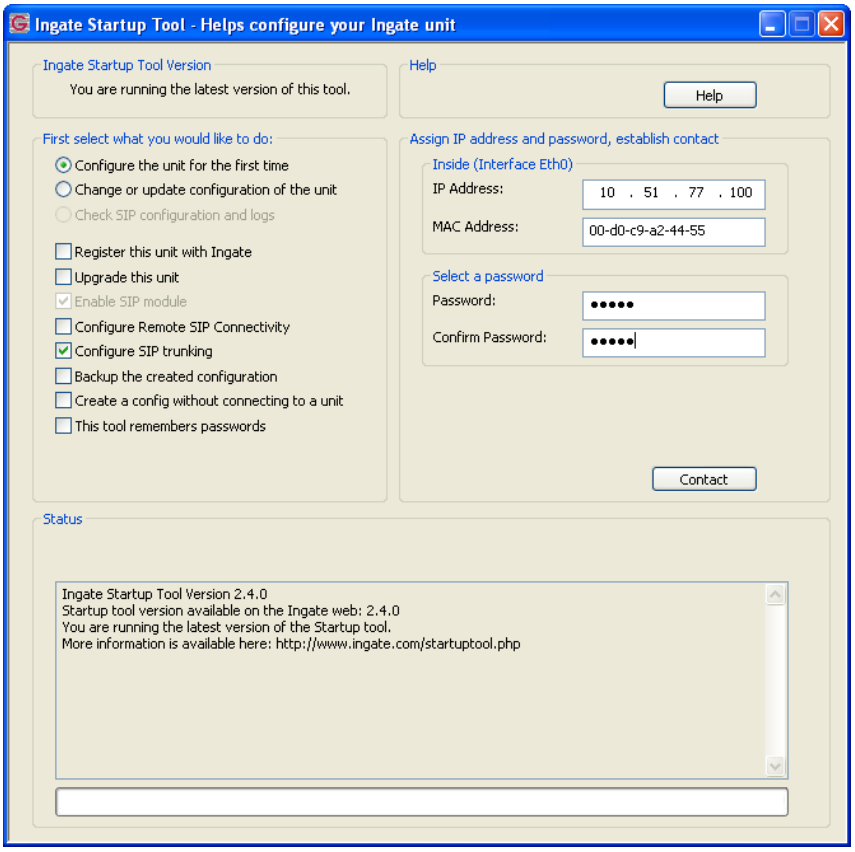
Note: If the Ingate Unit already has an IP Addressed and Password assigned to it (by the Startup Tool or Console) proceed directly to Section 4.2: "Change or Update Configuration".

Configuration Steps:

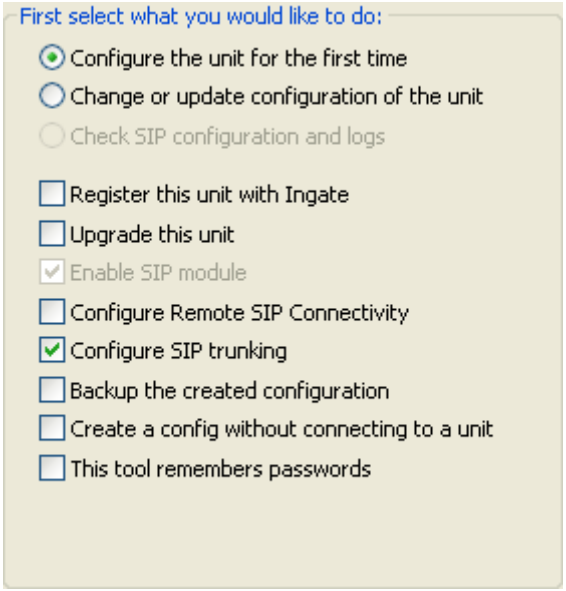
1) Launch the Startup Tool
2) Select the Model type of the Ingate Unit, and then click Next.



3) In the "Select first what you would like to do", select "Configure the unit for the first time".

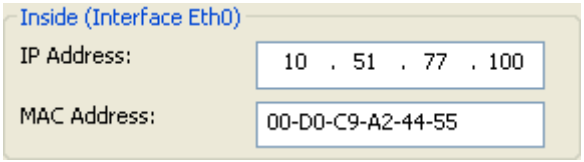


4) Other Options in the "Select first what you would like to do",



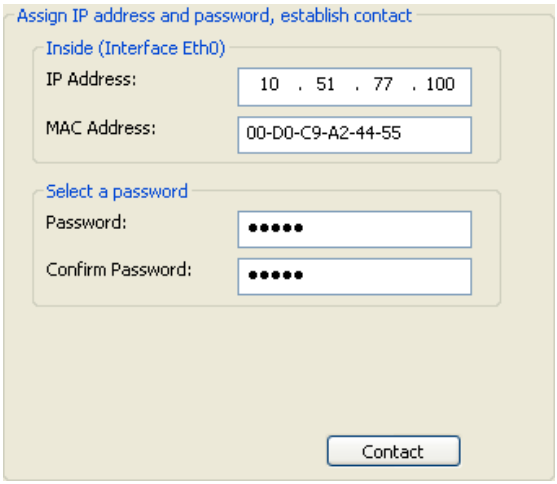
a. Select "Configure SIP Trunking" if you want the tool to configure SIP Trunking between a IP-PBX and ITSP.
b. *Optional:* All other selections, if selected, consult the Startup Tool – Getting Started Guide available at www.ingate.com.

5) In the "Inside (Interface Eth0)",
   a. Enter the IP Address to be assigned to the Ingate Unit.
   b. Enter the MAC Address of the Ingate Unit, this MAC Address will be used to find the unit on the network. The MAC Address can be found on a sticker attached to the unit.



6) In the "Select a Password", enter the Password to be assigned to the Ingate unit.

7) Once all required values are entered, the "Contact" button will become active. Press the "Contact" button to have the Startup Tool find the Ingate unit on the network, assign the IP Address and Password.



8) Proceed to Section 5.3: Network Topology.

5.2 Change or Update Configuration

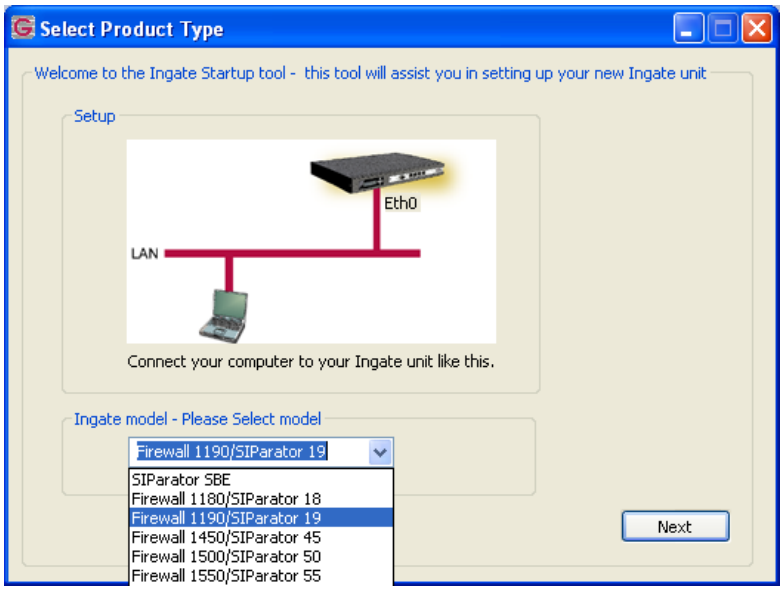
When selecting the "Change or update configuration of the unit" setting in the Startup Tool the Ingate Unit must have already been assigned an IP Address and Password, either by the Startup Tool – "Configure the unit for the first time" or via the Console port.

In the Startup Tool, when selecting "Change or update configuration of the unit", the Startup Tool will connect directly with the Ingate Unit on the network with the provided IP Address and Password. When completed, the Startup Tool will completely overwrite the existing configuration in the Ingate unit with the new settings.

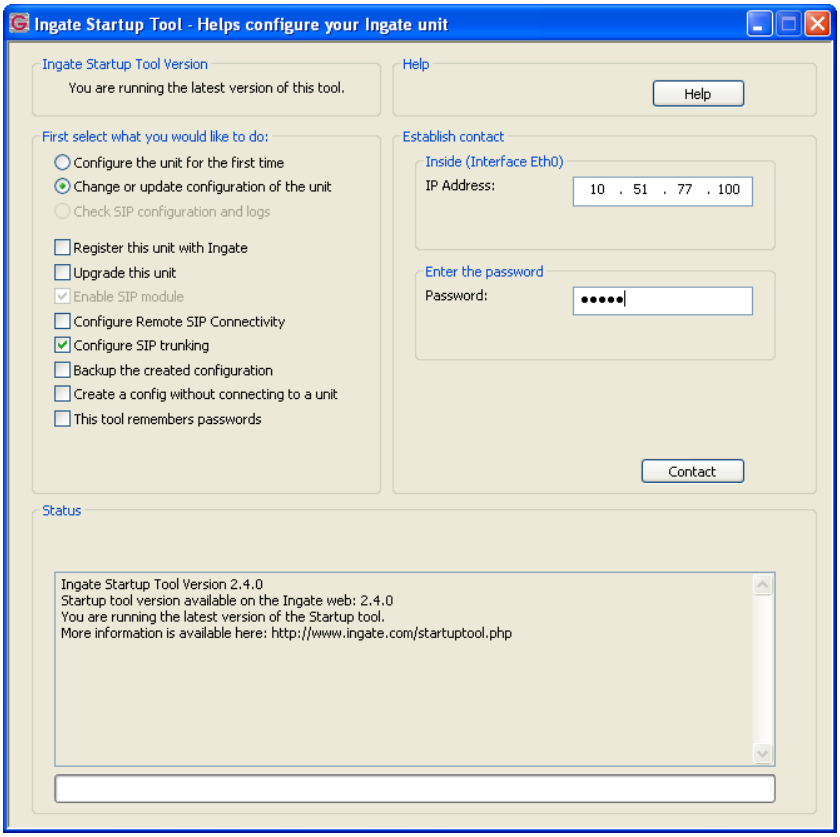
Note: If the Ingate Unit does not have an IP Addressed and Password assigned to it, proceed directly to Section 5.1: "Configure the Unit for the First Time".

Configuration Steps:

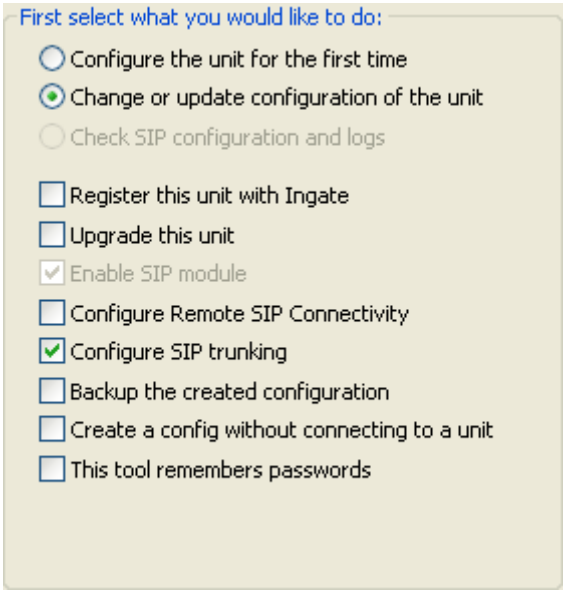
1) Launch the Startup Tool
2) Select the Model type of the Ingate Unit, and then click Next.



3) In the "Select first what you would like to do", select "Change or update configuration of the unit".

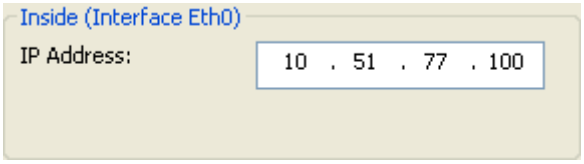


4) Other Options in the "Select first what you would like to do",



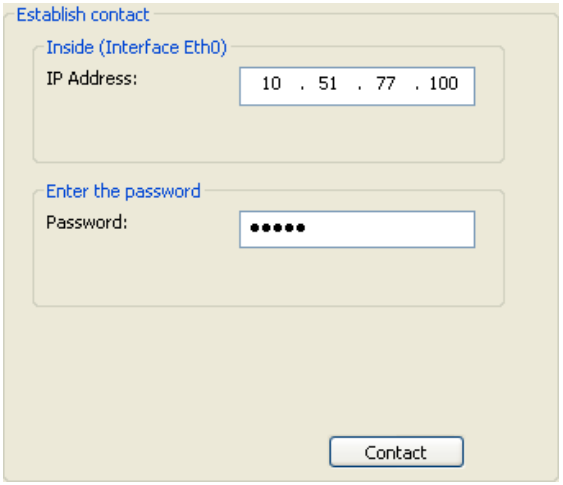
a. Select "Configure SIP Trunking" if you want the tool to configure SIP Trunking between a IP-PBX and ITSP.
b. *Optional:* All other selections, if selected, consult the Startup Tool – Getting Started Guide available at www.ingate.com.

5) In the "Inside (Interface Eth0)",
   a. Enter the IP Address of the Ingate Unit.



6) In the "Enter a Password", enter the Password of the Ingate unit.

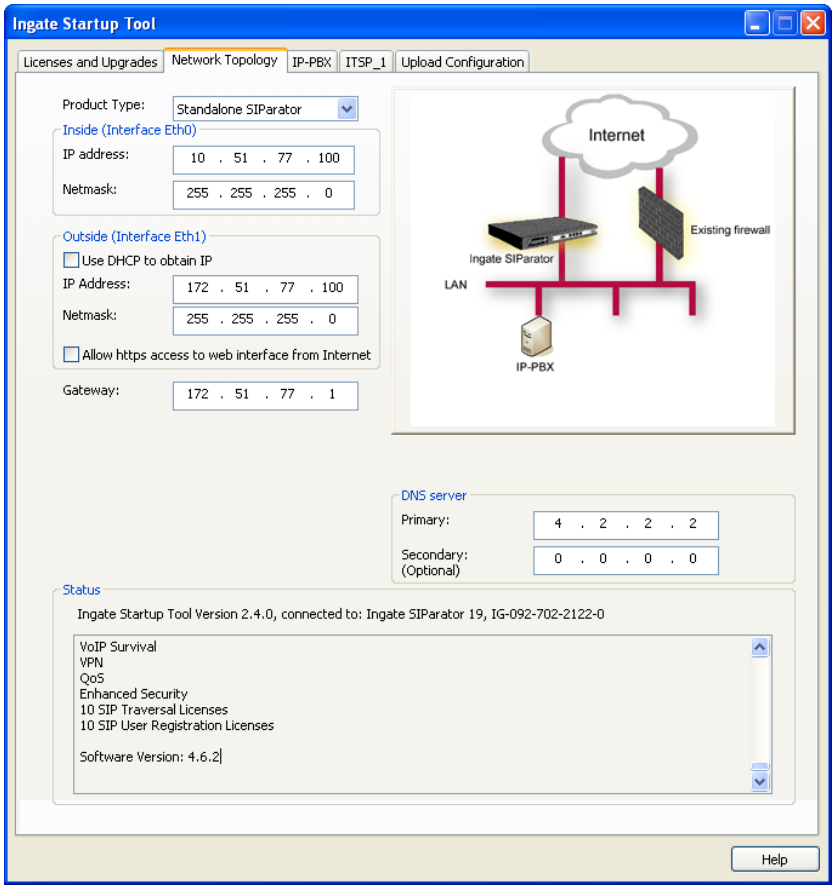
7) Once all required values are entered, the "Contact" button will become active. Press the "Contact" button to have the Startup Tool contact the Ingate unit on the network.



8) Proceed to Section 5.3: Network Topology.

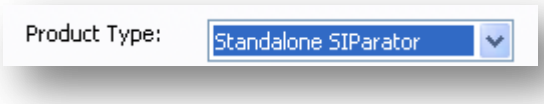
5.3 Network Topology

The Network Topology is where the IP Addresses, Netmask, Default Gateways, Public IP Address of NAT'ed Firewall, and DNS Servers are assigned to the Ingate unit. The configuration of the Network Topology is dependent on the deployment (Product) type. When selected, each type has a unique set of programming and deployment requirements, be sure to pick the Product Type that matches the network setup requirements.



Configuration Steps:

1) In the Product Type drop down list, select the deployment type of the Ingate Firewall or SIParator.

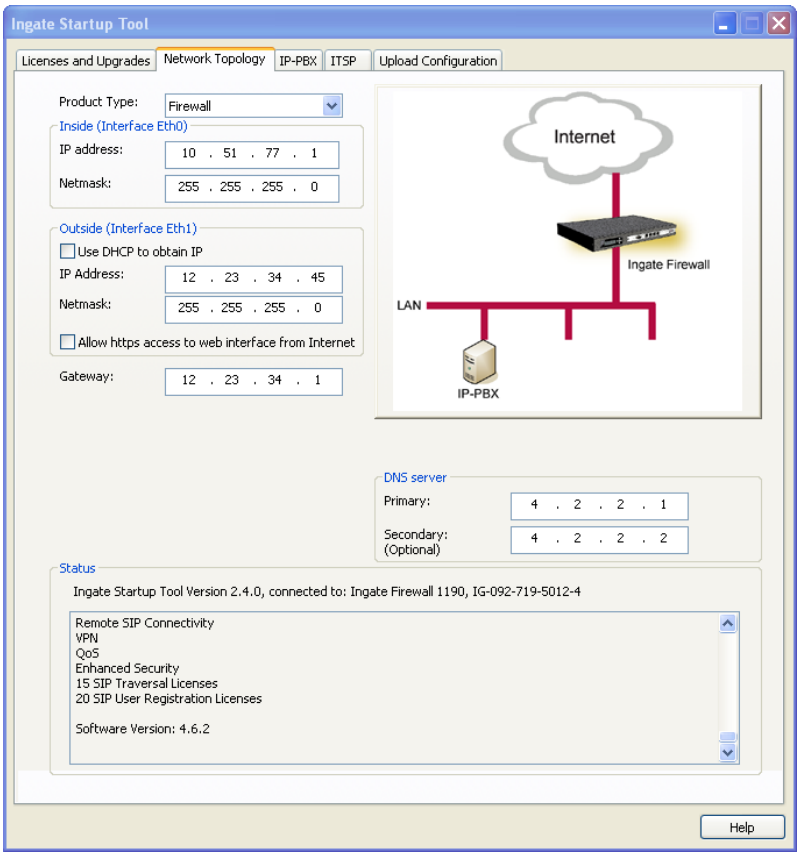


Hint: Match the picture to the network deployment.

2) When selecting the Product Type, the rest of the page will change based on the type selected. Go to the Sections below to configure the options based on your choice.

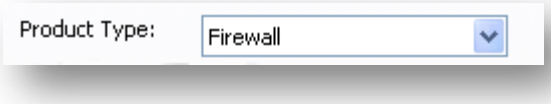
5.3.1 Product Type: Firewall

When deploying an Ingate Firewall, there is only one way the Firewall can be installed. The Firewall must be the Default Gateway for the LAN; it is the primary edge device for all data and voice traffic out of the LAN to the Internet.

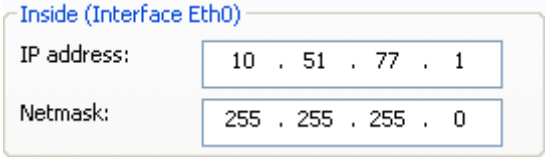


Configuration Steps:

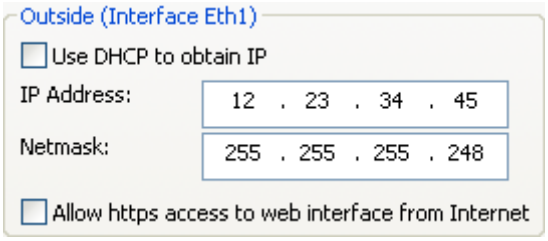
1) In Product Type, select "Firewall".



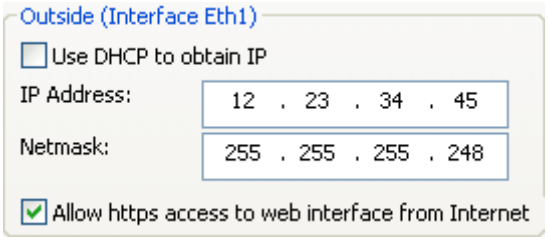
2) Define the Inside (Interface Eth0) IP Address and Netmask. This is the IP Address that will be used on the LAN side on the Ingate unit.



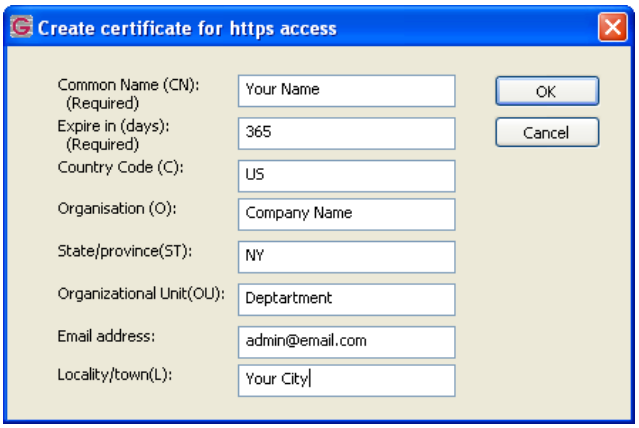
3) Define the Outside (Interface Eth1) IP Address and Netmask. This is the IP Address that will be used on the Internet (WAN) side on the Ingate unit.
   a. A Static IP Address and Netmask can be entered
   b. Or select "Use DHCP to obtain IP", if you want the Ingate Unit to acquire an IP address dynamically using DCHP.



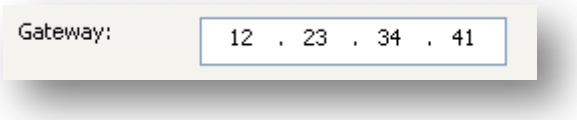
4) **Optional:** To configure Secure Web (https) from the Internet to the Ingate Unit for remote administration,
   a. Select "Allow https access to web interface from Internet"



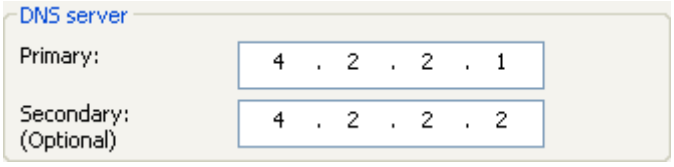
   b. Create a Private Certificate for https access, enter the corresponding information required to generate a certificate.



5) Enter the Default Gateway for the Ingate Firewall. The Default Gateway for the Ingate Firewall will always be an IP Address of the Gateway within the network of the outside interface (Eth1).

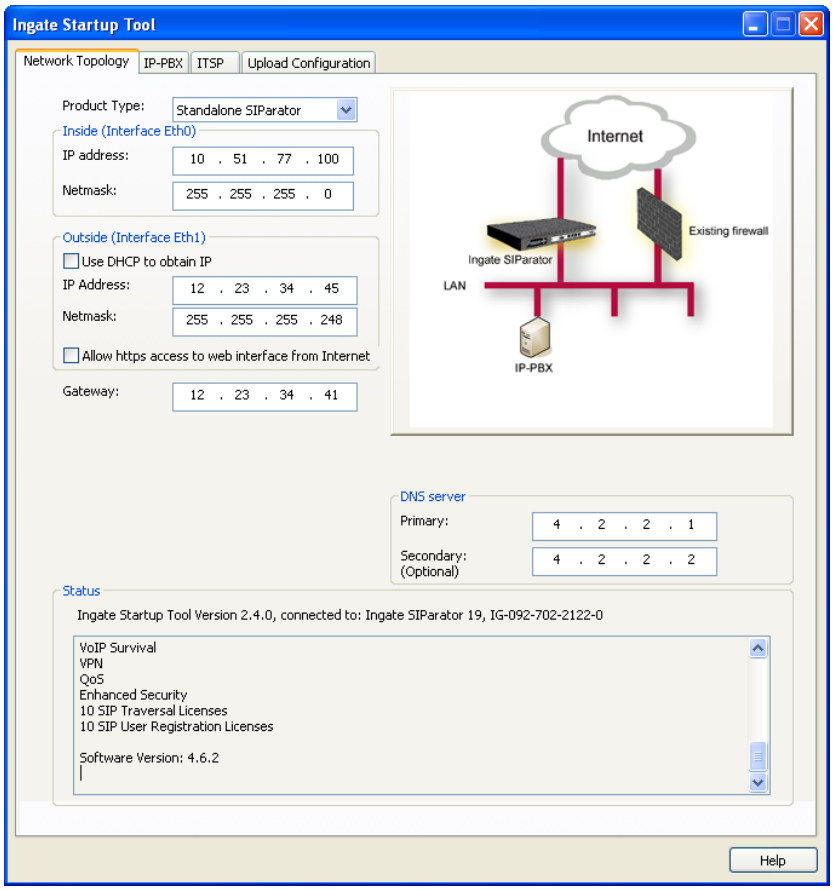


6) Enter the DNS Servers for the Ingate Firewall. These DNS Servers will be used to resolve FQDNs of SIP Requests and other features within the Ingate. They can be internal LAN addresses or outside WAN addresses.



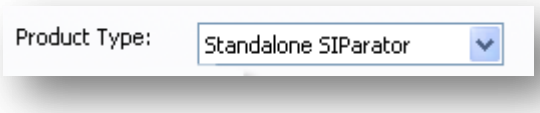
5.3.2 Product Type: Standalone

When deploying an Ingate SIParator in a Standalone configuration, the SIParator resides on a LAN network and on the WAN/Internet network. The Default Gateway for SIParator resides on the WAN/Internet network. The existing Firewall is in parallel and independent of the SIParator. Firewall is the primary edge device for all data traffic out of the LAN to the Internet. The SIParator is the primary edge device for all voice traffic out of the LAN to the Internet.

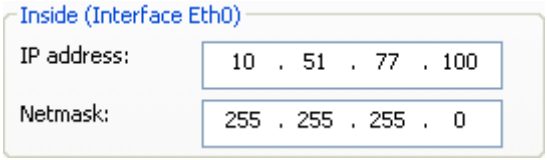


Configuration Steps:

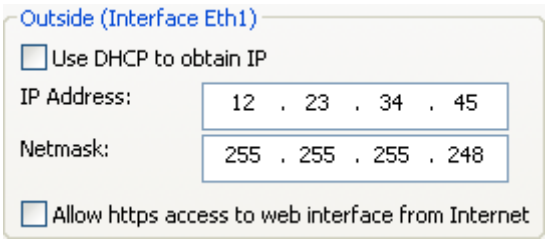
1) In Product Type, select "Standalone SIParator".



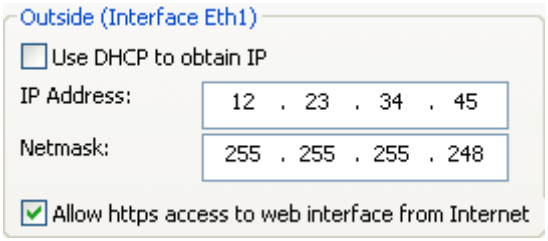
2) Define the IP Address and Netmask of the inside LAN (Interface Eth0). This is the IP Address that will be used on the Ingate unit to connect to the LAN network.



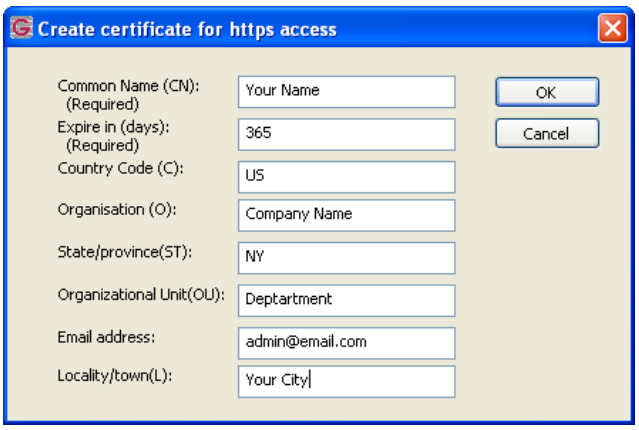
3) Define the Outside (Interface Eth1) IP Address and Netmask. This is the IP Address that will be used on the Internet (WAN) side on the Ingate unit.
   a. A Static IP Address and Netmask can be entered
   b. Or select "Use DHCP to obtain IP", if you want the Ingate Unit to acquire an IP address dynamically using DCHP.



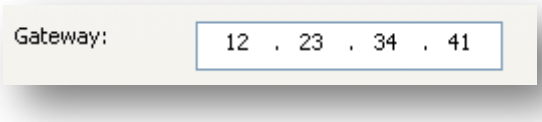
4) **Optional:** To configure Secure Web (https) from the Internet to the Ingate Unit for remote administration,
   c. Select "Allow https access to web interface from Internet"



   d. Create a Private Certificate for https access, enter the corresponding information required to generate a certificate.



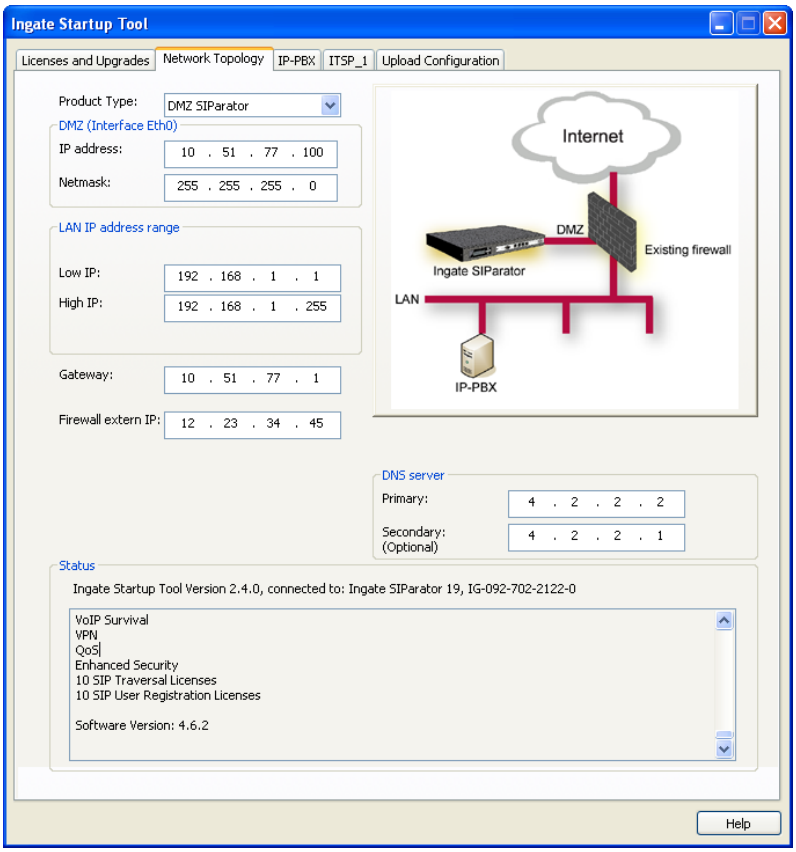
5) Enter the Default Gateway for the Ingate SIParator. The Default Gateway for the SIParator will be the existing Firewalls IP Address on the DMZ network.



6) Enter the DNS Servers for the Ingate Firewall. These DNS Servers will be used to resolve FQDNs of SIP Requests and other features within the Ingate. They can be internal LAN addresses or outside WAN addresses.

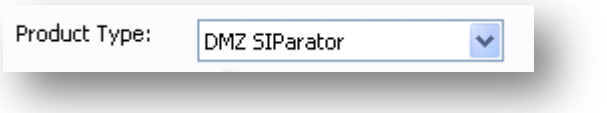
5.3.3 Product Type: DMZ SIParator

When deploying an Ingate SIParator in a DMZ configuration, the Ingate resides on a DMZ network connected to an existing Firewall. The Ingate needs to know what the Public IP Address of the Firewall. This existing Firewall must be the Default Gateway for the DMZ network; the existing Firewall is the primary edge device for all data and voice traffic out of the LAN and DMZ to the Internet. SIP Signaling and Media must be forwarded to the Ingate SIParator, both from the Internet to the SIParator and from the DMZ to the LAN.

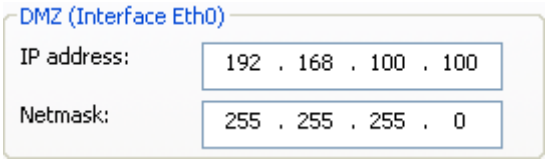


Configuration Steps:

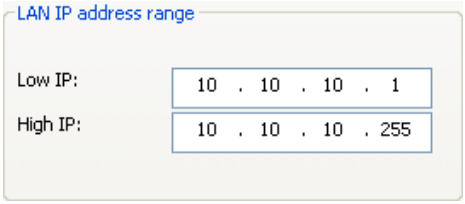
- In Product Type, select "DMZ SIParator".



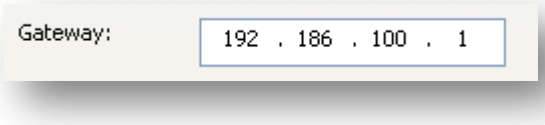
- Define the IP Address and Netmask of the DMZ (Interface Eth0). This is the IP Address that will be used on the Ingate unit to connect to the DMZ network side on the existing Firewall.



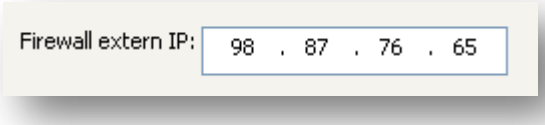
- Define the LAN IP Address Range, the lower and upper limit of the network addresses located on the LAN. This is the scope of IP Addresses contained on the LAN side of the existing Firewall.



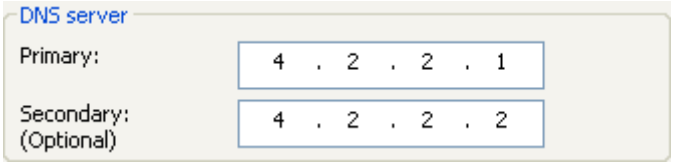
- Enter the Default Gateway for the Ingate SIParator. The Default Gateway for the SIParator will be the existing Firewalls IP Address on the DMZ network.



- Enter the existing Firewall's external WAN/Internet IP Address. This is used to ensure correct SIP Signaling and Media traversal functionality. This is required when the existing Firewall is providing NAT.



- Enter the DNS Servers for the Ingate Firewall. These DNS Servers will be used to resolve FQDNs of SIP Requests and other features within the Ingate. They can be internal LAN addresses or outside WAN addresses.

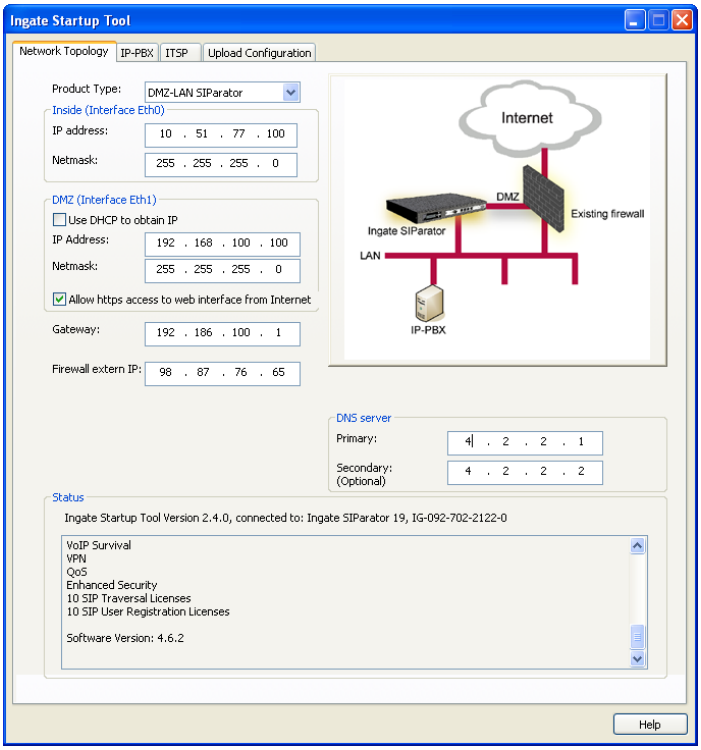


- On the Existing Firewall, the SIP Signaling Port and RTP Media Ports need to be forwarded to the Ingate SIParator. The Ingate SIParator is an ICSA Certified network edge security device, so there are no security concerns forwarding network traffic to the SIParator.

  On the existing Firewall:
  a. Port Forward the WAN/Internet interface SIP Signaling port of 5060 with a UDP/TCP Forward to the Ingate SIParator
  b. Port Forward the a range of RTP Media ports of 58024 to 60999 with a UDP Forward to the Ingate SIParator
  c. If necessary; provide a Rule that allows the SIP Signaling on port 5060 using UDP/TCP transport on the DMZ network to the LAN network
  d. If necessary; provide a Rule that allows a range of RTP Media ports of 58024 to 60999 using UDP transport on the DMZ network to the LAN network.

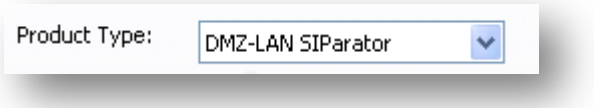
5.3.4 Product Type: DMZ-LAN SIParator

When deploying an Ingate SIParator in a DMZ-LAN configuration, the Ingate resides on a DMZ network connected to an existing Firewall and also on the LAN network. The Ingate needs to know what the Public IP Address of the Firewall. This existing Firewall must be the Default Gateway for the DMZ network; the existing Firewall is the primary edge device for all data and voice traffic out of the LAN and DMZ to the Internet. SIP Signaling and Media must be forwarded to the Ingate SIParator, from the Internet to the SIParator. The voice traffic from the LAN is directed to the SIParator then to the existing Firewall.

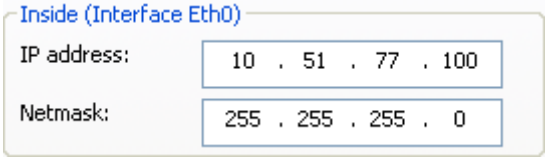


Configuration Steps:

1) In Product Type, select "DMZ-LAN SIParator".

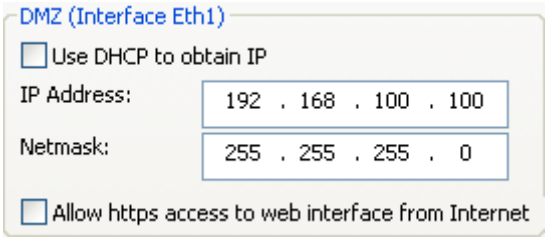


2) Define the IP Address and Netmask of the inside LAN (Interface Eth0). This is the IP Address that will be used on the Ingate unit to connect to the LAN network.

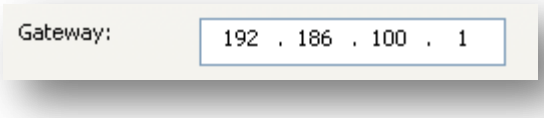


3) Define the IP Address and Netmask of the DMZ (Interface Eth1). This is the IP Address that will be used on the Ingate unit to connect to the DMZ network side on the existing Firewall.

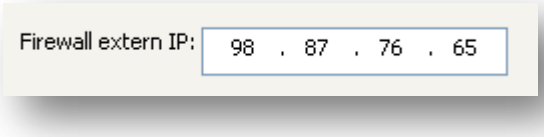
a. A Static IP Address and Netmask can be entered
b. Or select "Use DHCP to obtain IP", if you want the Ingate Unit to acquire an IP address dynamically using DCHP.



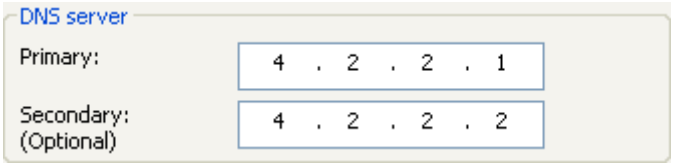
4) Enter the Default Gateway for the Ingate SIParator. The Default Gateway for the SIParator will be the existing Firewalls IP Address on the DMZ network.



5) Enter the existing Firewall's external WAN/Internet IP Address. This is used to ensure correct SIP Signaling and Media traversal functionality. This is required when the existing Firewall is providing NAT.



6) Enter the DNS Servers for the Ingate Firewall. These DNS Servers will be used to resolve FQDNs of SIP Requests and other features within the Ingate. They can be internal LAN addresses or outside WAN addresses.



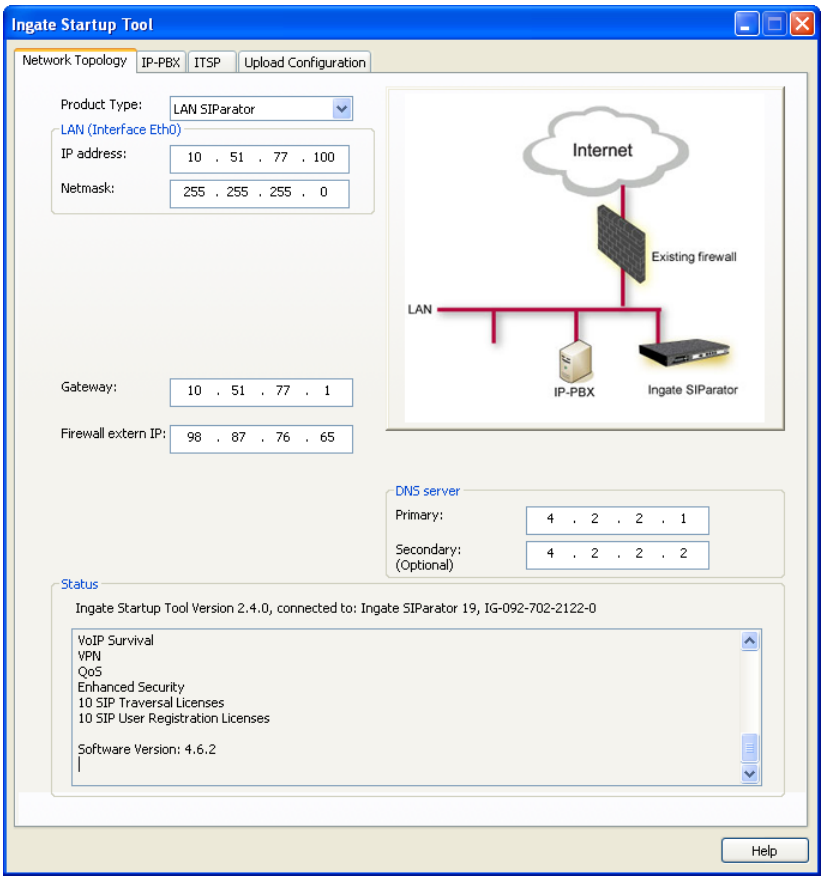
7) On the Existing Firewall, the SIP Signaling Port and RTP Media Ports need to be forwarded to the Ingate SIParator. The Ingate SIParator is an ICSA Certified network edge security device, so there are no security concerns forwarding network traffic to the SIParator.

On the existing Firewall:

a. Port Forward the WAN/Internet interface SIP Signaling port of 5060 with a UDP/TCP Forward to the Ingate SIParator
b. Port Forward the a range of RTP Media ports of 58024 to 60999 with a UDP Forward to the Ingate SIParator

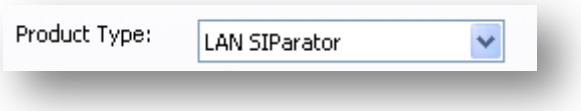
5.3.5 Product Type: LAN SIParator

When deploying an Ingate SIParator in a LAN configuration, the Ingate resides on a LAN network with all of the other network devices. The existing Firewall must be the Default Gateway for the LAN network; the existing Firewall is the primary edge device for all data and voice traffic out of the LAN to the WAN/Internet. SIP Signaling and Media must be forwarded to the Ingate SIParator, from the Internet to the SIParator. The voice traffic from the LAN is directed to the SIParator then to the existing Firewall.

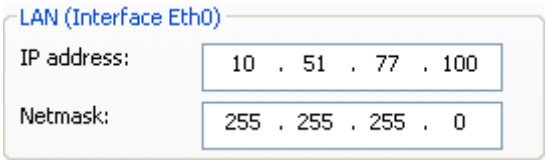


Configuration Steps:

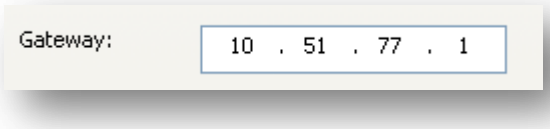
1) In Product Type, select "LAN SIParator".



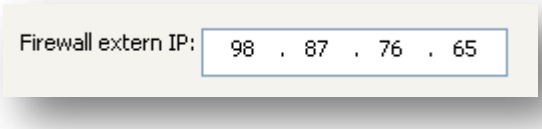
2) Define the IP Address and Netmask of the inside LAN (Interface Eth0). This is the IP Address that will be used on the Ingate unit to connect to the LAN network.



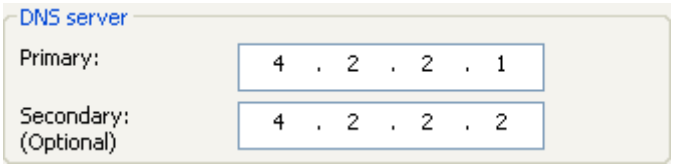
3) Enter the Default Gateway for the Ingate SIParator. The Default Gateway for the SIParator will be the existing Firewalls IP Address on the DMZ network.



4) Enter the existing Firewall's external WAN/Internet IP Address. This is used to ensure correct SIP Signaling and Media traversal functionality. This is required when the existing Firewall is providing NAT.



5) Enter the DNS Servers for the Ingate Firewall. These DNS Servers will be used to resolve FQDNs of SIP Requests and other features within the Ingate. They can be internal LAN addresses or outside WAN addresses.



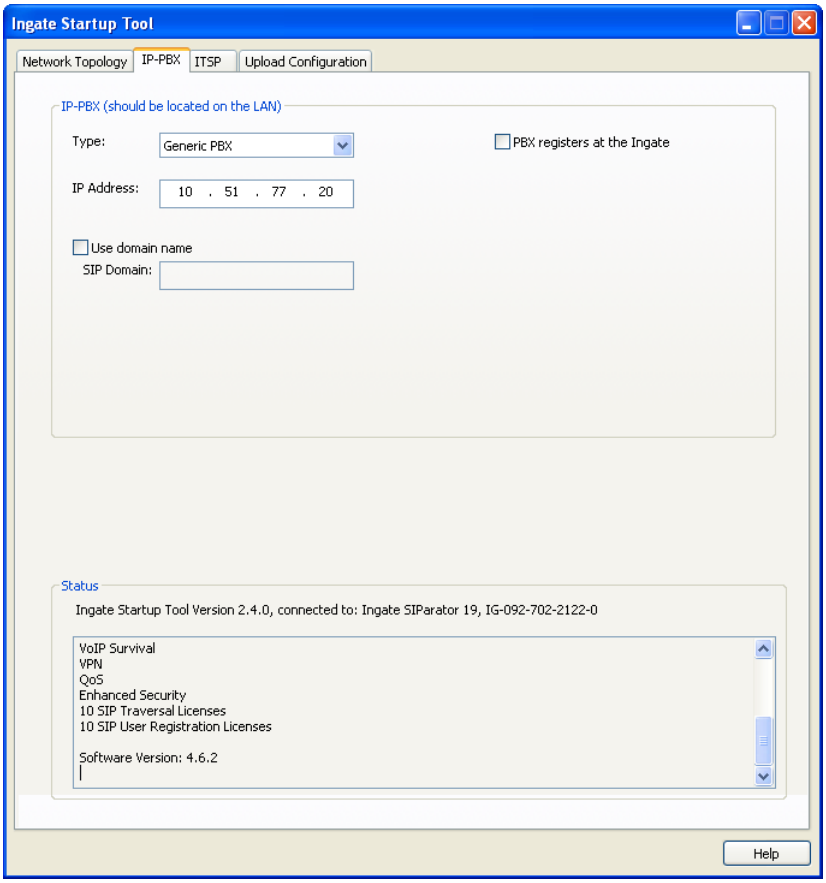
6) On the Existing Firewall, the SIP Signaling Port and RTP Media Ports need to be forwarded to the Ingate SIParator. The Ingate SIParator is an ICSA Certified network edge security device, so there are no security concerns forwarding network traffic to the SIParator.

On the existing Firewall:

a. Port Forward the WAN/Internet interface SIP Signaling port of 5060 with a UDP/TCP Forward to the Ingate SIParator
b. Port Forward the a range of RTP Media ports of 58024 to 60999 with a UDP Forward to the Ingate SIParator

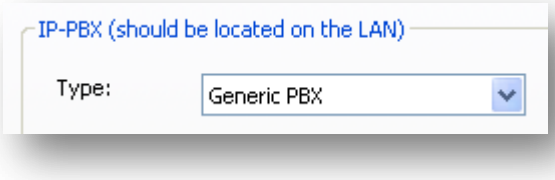
5.4 IP-PBX

The IP-PBX section is where the IP Addresses and Domain location are provided to the Ingate unit. The configuration of the IP-PBX will allow for the Ingate unit to know the location of the IP-PBX as to direct SIP traffic for the use with SIP Trunking and Remote Phones. The IP Address of the IP-PBX must be on the same network subnet at the IP Address of the inside interface of the Ingate unit. Ingate has confirmed interoperability several of the leading IP-PBX vendors.

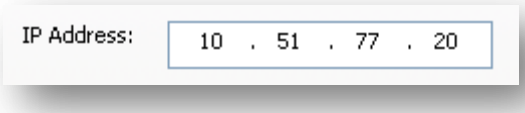


Configuration Steps:

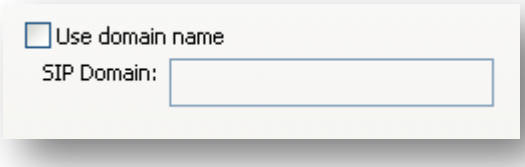
1) In the IP-PBX Type drop down list, select the appropriate IP-PBX vendor. Ingate has confirmed interoperability several of the leading IP-PBX vendors, the unique requirements of the vendor testing are contained in the Startup Tool. If the vendor choice is not seen, select "Generic PBX".



2) Enter the IP Address of the IP-PBX. The IP Address should be on the same LAN subnet as the Ingate unit.



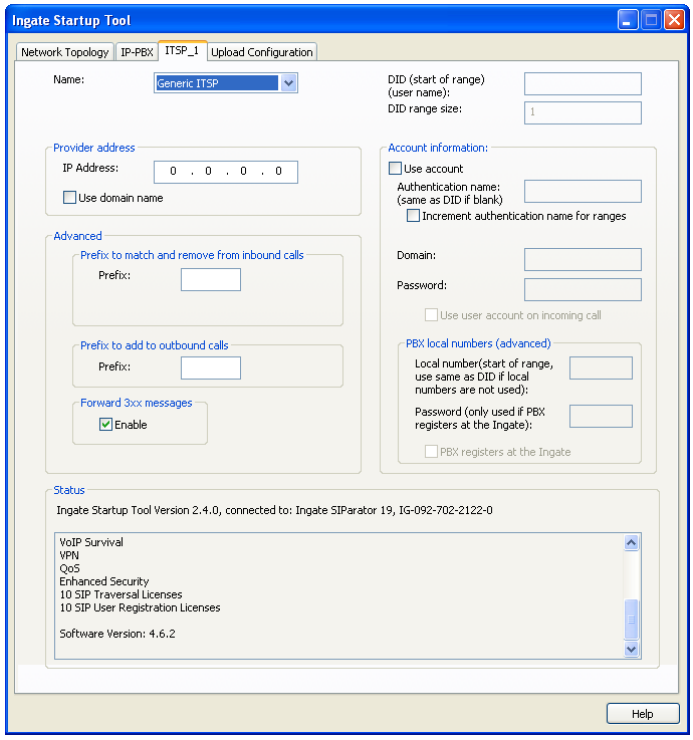
3) *Optional:* For some IP-PBX solutions they require a SIP Domain. This domain name is used to route SIP Requests to the IP-PBX associated with that domain. Select "Use domain name" and enter the FQDN



4) *Optional:* Only for when Generic PBX is selected, will this option become available. When is option is enabled, the Ingate Registrar is enabled, later on the ITSP configuration, Identities or Users are assigned on the Registrar and associated to the incoming call characteristics. So the PBX registers to the Ingate and the Ingate sends the incoming call to these registered users/identities.

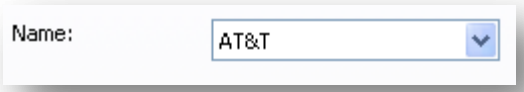
5.5 ITSP

The ITSP section is where all of the attributes of the AT&T IP Flexible Reach SIP Trunking service are programmed. Details like the IP Addresses or Domain, DIDs, Authentication Account information, Prefixes, and PBX local number. The configuration of AT&T IP Flexible Reach will allow for the Ingate unit to know the location of the AT&T IP Flexible Reach as to direct SIP traffic for the use with SIP Trunking. Ingate has confirmed interoperability with AT&T IP Flexible Reach.



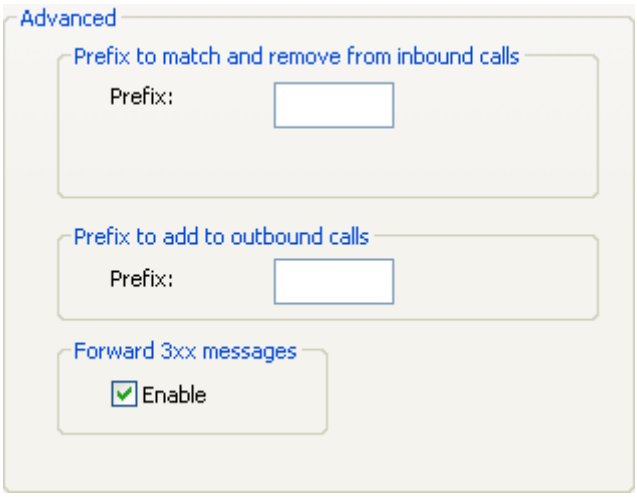
Configuration Steps:

1) In the ITSP drop down list, select AT&T. Ingate has confirmed interoperability with AT&T IP Flexible Reach. The unique requirements of the testing are contained in the Startup Tool.



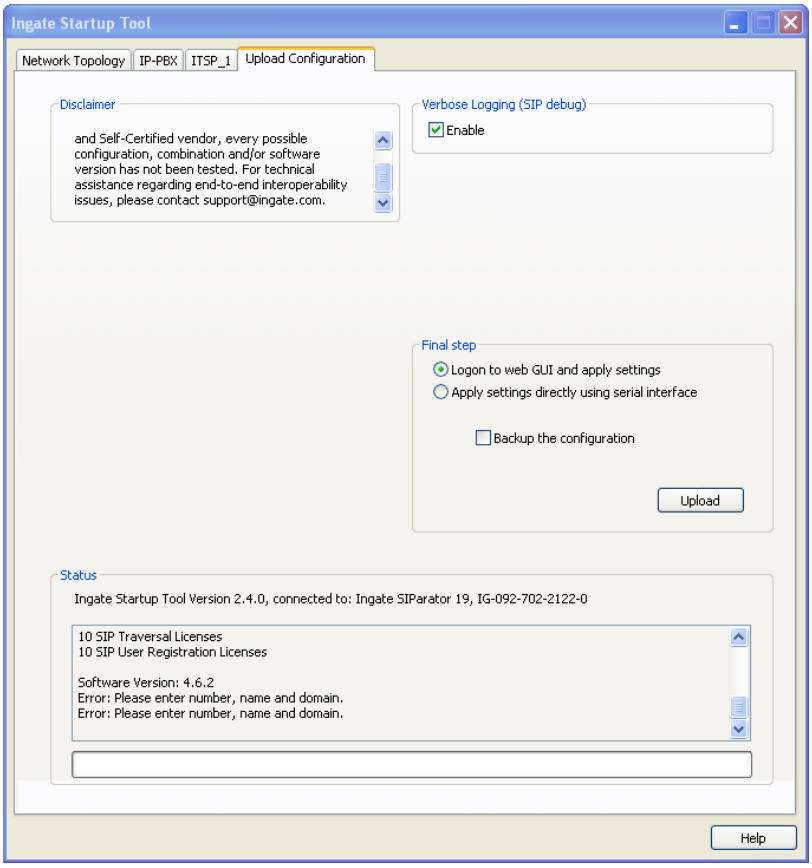
2) AT&T IP Flexible Reach uses a Trusted IP deployment, all that is required is to enter the IP Address or Domain of the AT&T IP Flexible Reach IP Border Element's IP. Enter the IP Address here.

3) The Ingate has the ability to add/remove digits and characters from the Request URI Header. A typical scenario is the addition/removal of ENUM character "+". Many IP-PBX and ITSPs either need to add or remove this character prior to sending or receiving SIP requests. Here you can enter values to Match and remove from the Request URI.



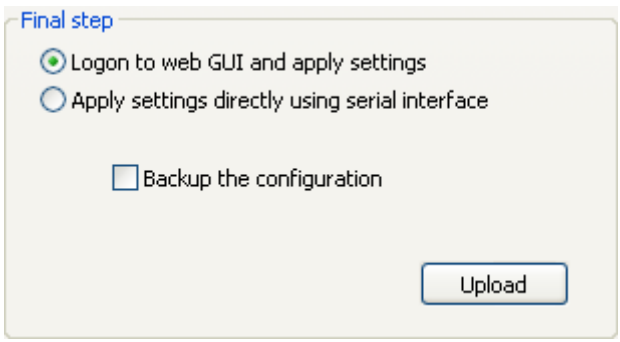
5.6 Upload Configuration

At this point the Startup Tool has all the information required to push a database into the Ingate unit. The Startup Tool can also create a backup file for later use.

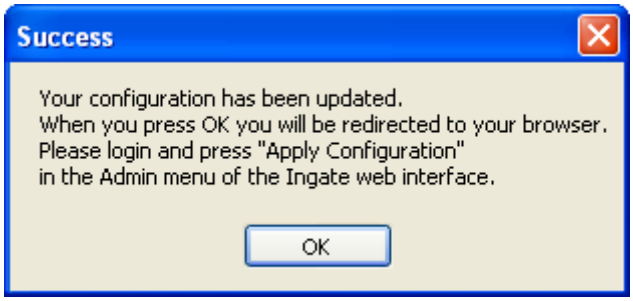


Configuration Steps:

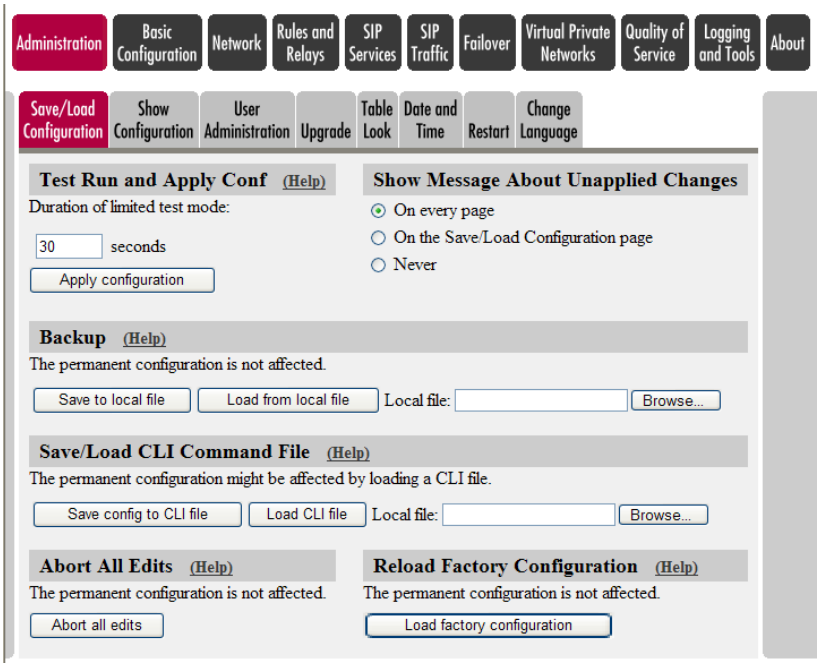
1) Press the "Upload" button. If you would like the Startup Tool to create a Backup file also select "Backup the configuration". Upon pressing the "Upload" button the Startup Tool will push a database into the Ingate unit.



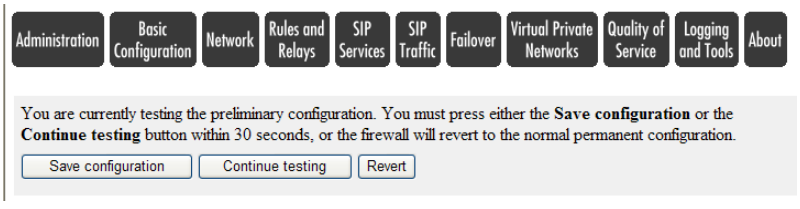
2) When the Startup has finished uploading the database a window will appear and once pressing OK the Startup Tool will launch a default browser and direct you to the Ingate Web GUI.



3) Although the Startup Tool has pushed a database into the Ingate unit, the changes have not been applied to the unit. Press "Apply Configuration" to apply the changes to the Ingate unit.



4) A new page will appear after the previous step requesting to save the configuration. Press "Save Configuration" to complete the saving process.



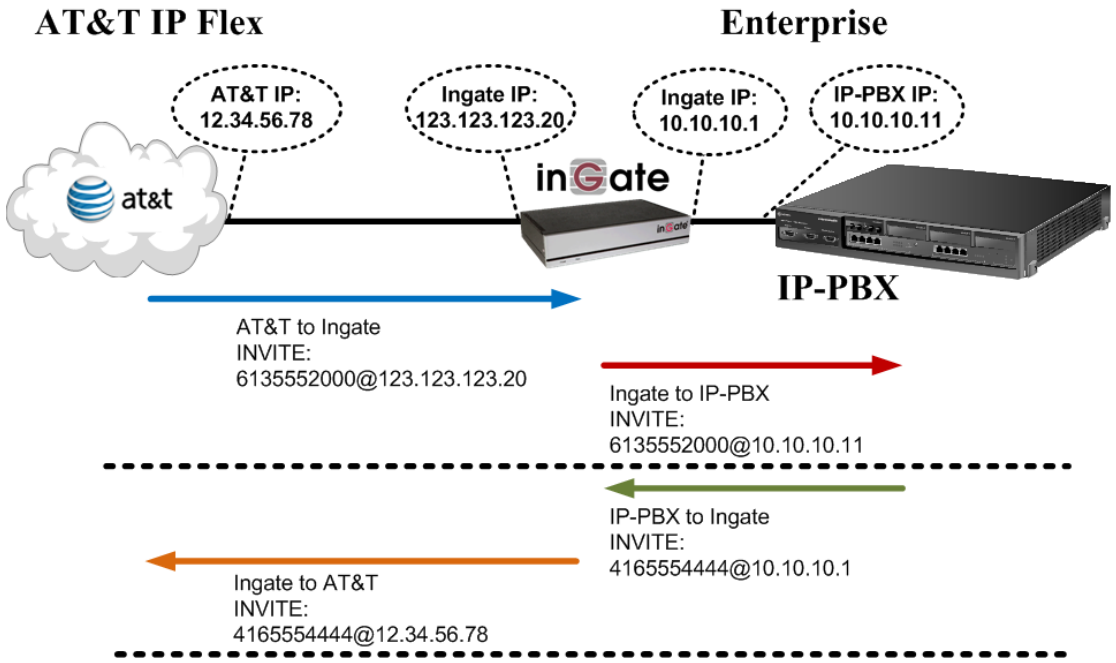
6 Troubleshooting

This section should provide some tips for troubleshooting problems, including troubleshooting commands and contact numbers within Vendor X's Company for trouble escalation.

6.1 AT&T IP Flex to Ingate to IP-PBX Call Flow

For an Incoming call the call starts at the AT&T IP Flex IP Border Element's IP, they will deliver a DID, contained in the Request URI header of a SIP INVITE. Typically AT&T IP Flex IP Border Element will send an INVITE to the SIP URI address of "DID@IP_Address_of_Ingate". The Ingate then processes this through the Dial Plan and forwards the INVITE to the SIP URI address "DID@IP_Address_IP-PBX".

For an outgoing call the call starts at the IP-PBX, they will deliver a DID, contained in the Request URI header of a SIP INVITE. Typically IP-PBX will send an INVITE to the SIP URI address of "DID@IP_Address_of_Ingate". The Ingate then processes this through the Dial Plan and forwards the INVITE to the SIP URI address "DID@IP_Address_AT&T".



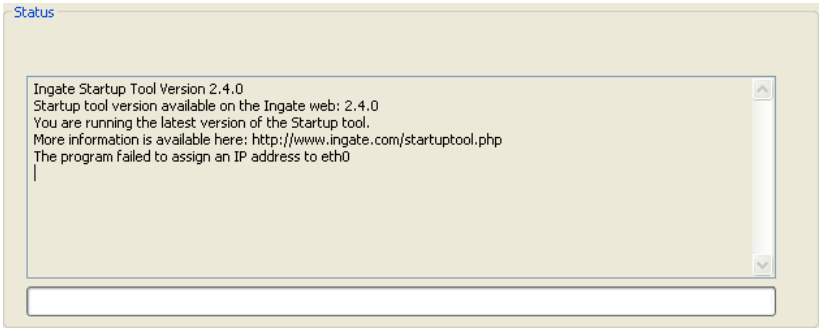
6.2 Startup Tool

6.2.1 Status Bar

Located on every page of the Startup Tool is the Status Bar. This is a display and recording of all of the activity of the Startup Tool, displaying Ingate unit information, software versions, Startup Tool events, errors and connection information. Please refer to the Status Bar to acquire the current status and activity of the Startup Tool.

6.2.2 Configure Unit for the First Time

Right "Out of the Box", sometimes connecting and assigning an IP Address and Password to the Ingate Unit can be a challenge. Typically, the Startup Tool cannot program the Ingate Unit. The Status Bar will display **"The program failed to assign an IP address to eth0"**.



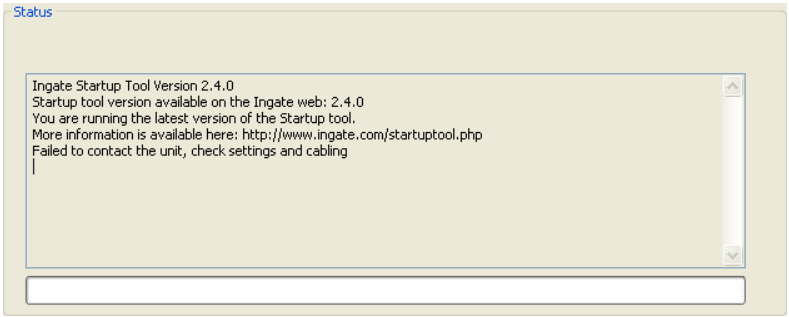
Possible Problems and Resolutions

Possible Problems	Possible Resolution
Ingate Unit is not Turned On.	Turn On or Connect Power (Trust me, I've been there)
Ethernet cable is not connected to Eth0.	Eth0 must always be used with the Startup Tool.
Incorrect MAC Address	Check the MAC address on the Unit itself. MAC Address of Eth0.
An IP Address and/or Password have already been assigned to the Ingate Unit	It is possible that an IP Address or Password have been already been assigned to the unit via the Startup Tool or Console

Possible Problems	Possible Resolution
Ingate Unit on a different Subnet or Network	The Startup Tool uses an application called "Magic PING" to assign the IP Address to the Unit. It is heavily reliant on ARP, if the PC with the Startup Tool is located across Routers, Gateways and VPN Tunnels, it is possible that MAC addresses cannot be found. It is the intension of the Startup Tool when configuring the unit for the first time to keep the network simple. See Section 3.
Despite your best efforts…	1) Use the Console Port, please refer to the Reference Guide, section "Installation with a serial cable", and step through the "Basic Configuration". Then you can use the Startup Tool, this time select "Change or Update the Configuration" 2) Factory Default the Database, then try again.

6.2.3 Change or Update Configuration

If the Ingate already has an IP Address and Password assigned to it, then you should be able use a Web Browser to reach the Ingate Web GUI. If you are able to use your Web Browser to access the Ingate Unit, then the Startup should be able to contact the Ingate unit as well. The Startup Tool will respond with **"Failed to contact the unit, check settings and cabling"** when it is unable to access the Ingate unit.

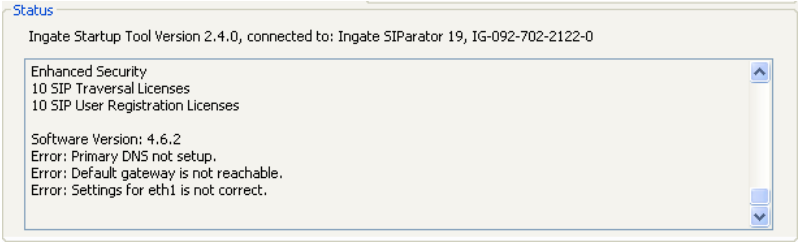


Possible Problems and Resolutions

Possible Problems	Possible Resolution
Ingate Unit is not Turned On.	Turn On or Connect Power
Incorrect IP Address	Check the IP Address using a Web Browser.
Incorrect Password	Check the Password.
Despite your best efforts…	1) Since this process uses the Web (http) to access the Ingate Unit, it should seem that any web browser should also have access to the Ingate Unit. If the Web Browser works, then the Startup Tool should work. 2) If the Browser also does not have access, it might be possible the PC's IP Address does not have connection privileges in "Access Control" within the Ingate. Try from a PC that have access to the Ingate Unit, or add the PC's IP Address into "Access Control".

6.2.4 Network Topology

There are several possible error possibilities here, mainly with the definition of the network. Things like IP Addresses, Gateways, NetMasks and so on.

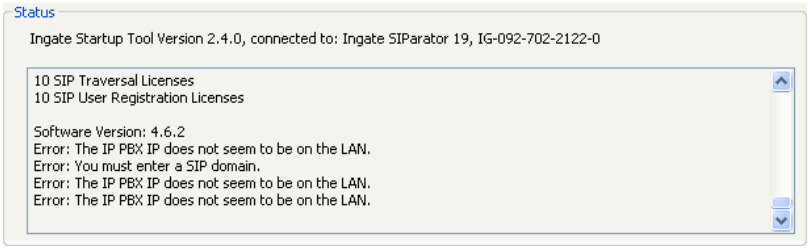


Possible Problems and Resolutions

Possible Problems	Possible Resolution
Error: Default gateway is not reachable.	The Default Gateway is always the way to the Internet, in the Standalone or Firewall it will be the Public Default Gateway, on the others it will be a Gateway address on the local network.
Error: Settings for eth0/1 is not correct.	IP Address of Netmask is in an Invalid format.
Error: Please provide a correct netmask for eth0/1	Netmask is in an Invalid format.
Error: Primary DNS not setup.	Enter a DNS Server IP address

6.2.5 IP-PBX

The errors here are fairly simple to resolve. The IP address of the IP-PBX must be on the same LAN segment/subnet as the Eth0 IP Address/Mask.

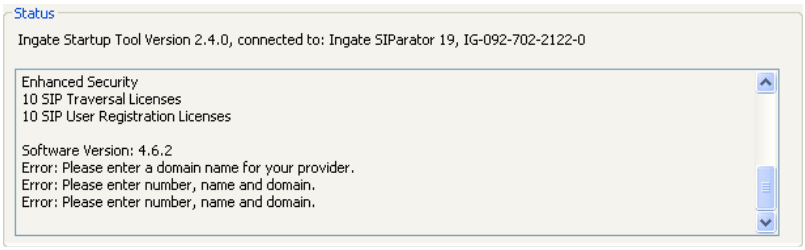


Possible Problems and Resolutions

Possible Problems	Possible Resolution
Error: The IP PBX IP does not seem to be on the LAN.	The IP Address of the IP-PBX must be on the same subnet as the inside interface of the Ingate Eth0.
Error: You must enter a SIP domain.	Enter a Domain, or de-select "Use Domain"
Error: As you intend to use RSC you must enter a SIP domain. Alternatively you may configure a static IP address on eth1 under Network Topology	Enter a Domain or IP Address used for Remote SIP Connectivity. Note: must be a Domain when used with SIP Trunking module.

6.2.6 ITSP

The errors here are fairly simple to resolve. The IP address, Domain, and DID of the ITSP must be entered.

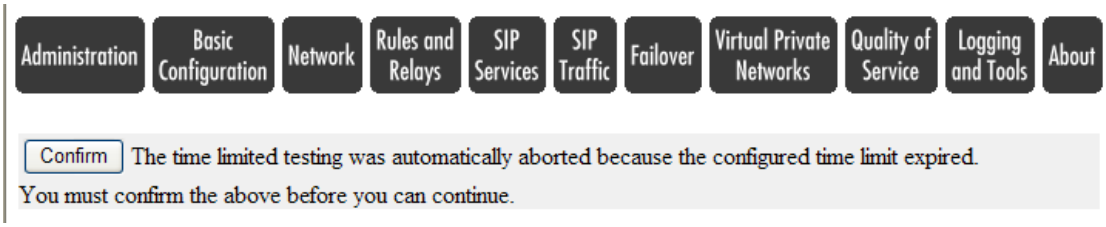


Possible Problems and Resolutions

Possible Problems	Possible Resolution
Error: Please enter a domain name for your provider	Enter a Domain, or de-select "Use Domain"
Error: Please enter number, name and domain.	Enter a DID and Domain, or de-select "Use Account"

6.2.7 Apply Configuration

At this point the Startup Tool has pushed a database to the Ingate Unit, you have Pressed "Apply Configuration" in Step 3) of Section 4.7 Upload Configuration, but the "Save Configuration" is never presented. Instead after a period of time the following webpage is presented. This page is an indication that there was a change in the database significant enough that the PC could no longer web to the Ingate unit.

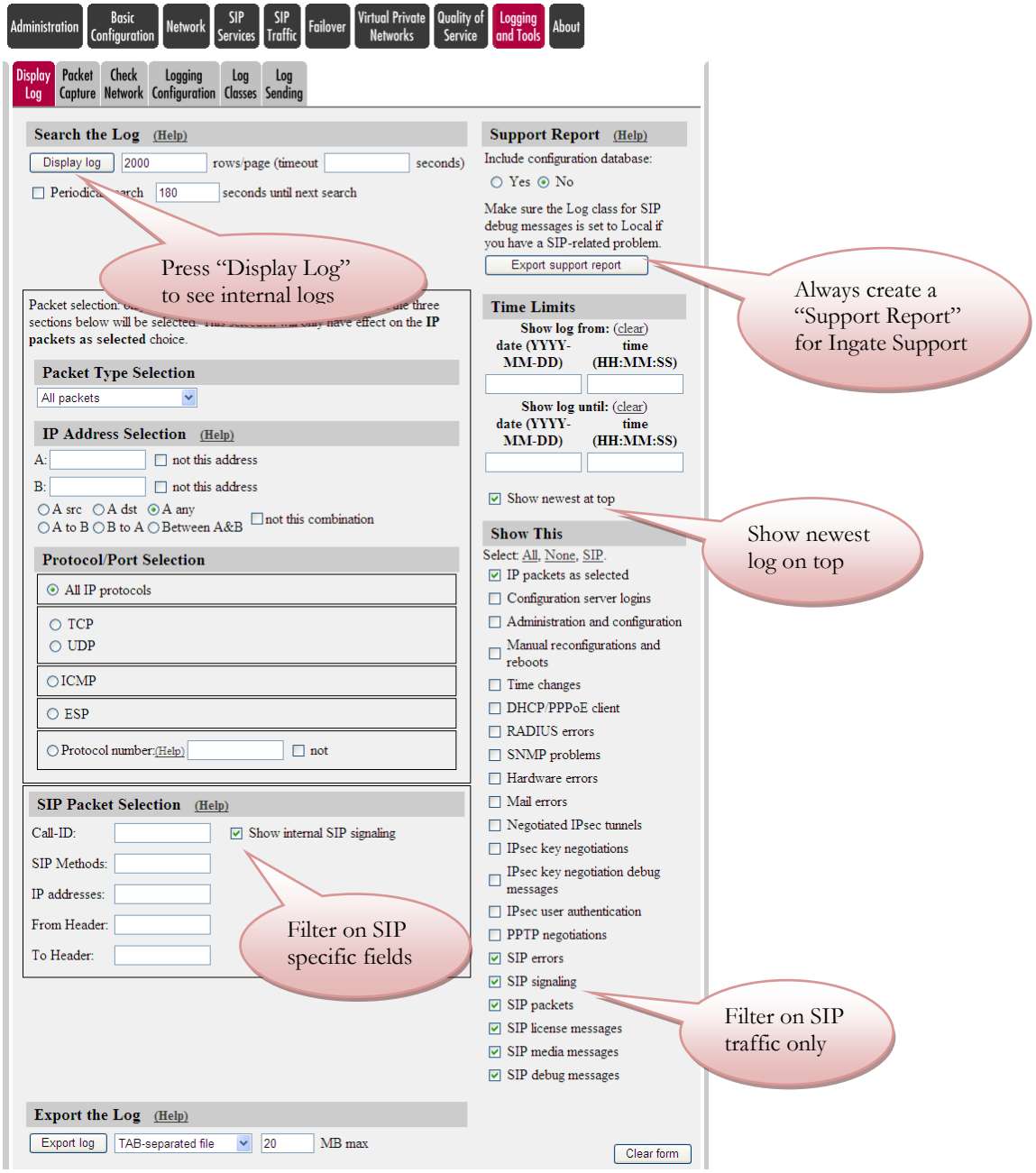


Possible Problems and Resolutions

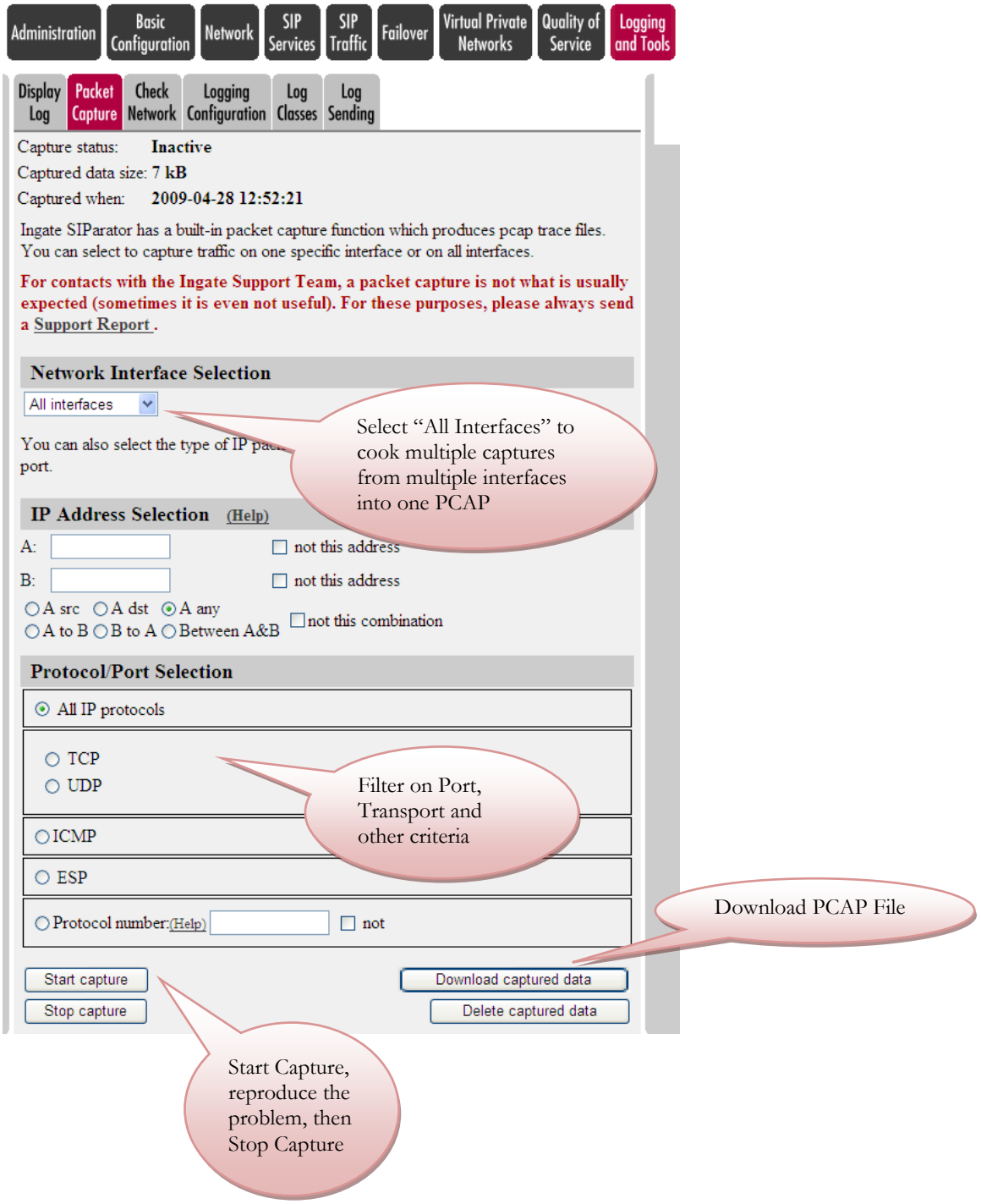
Possible Problems	Possible Resolution
Eth0 Interface IP Address has changed	Increase the duration of the test mode, press "Apply Configuration" and start a new browser to the new IP address, then press "Save Configuration"
Access Control does not allow administration from the IP address of the PC.	Verify the IP address of the PC with the Startup Tool. Go to "Basic Configuration", then "Access Control". Under "Configuration Computers", ensure the IP Address or Network address of the PC is allowed to HTTP to the Ingate unit.

6.3 Ingate Troubleshooting Tools

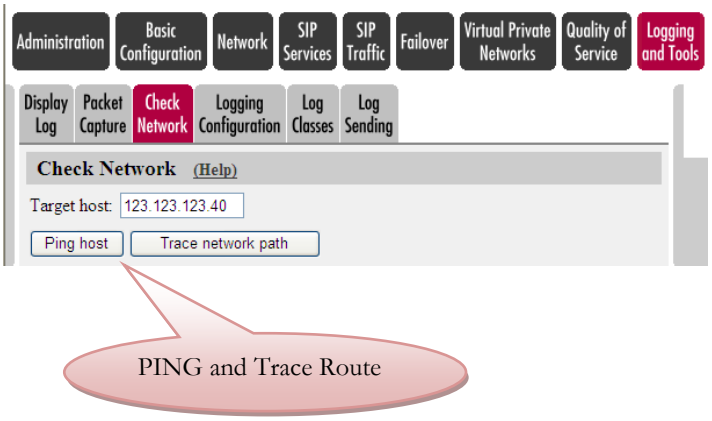
6.3.1 Display Logs



6.3.2 Packet Capture



6.3.3 Check Network

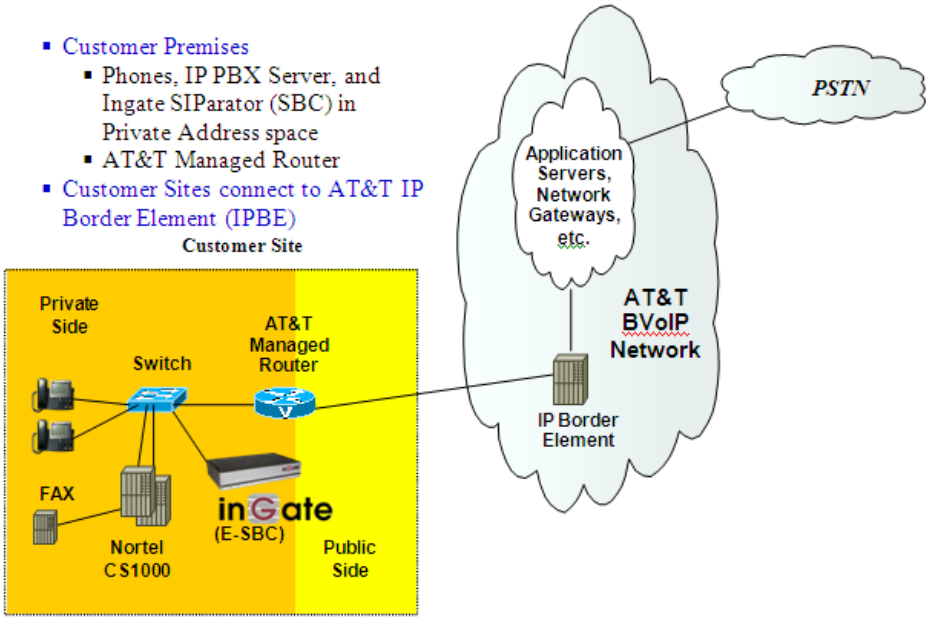


7 Appendix – Nortel CS1000 Configuration

7.1 Nortel CS1000 and Ingate SIParator (SBC) with AT&T IP Flexible Reach

The Nortel CS1000 IP PBX was also tested with an on-site Ingate SIParator used as a session border controller (SBC). In this architecture, the CS1000 directs SIP signaling to the Ingate SIParator (SBC), which communicates with the AT&T IP Border Elements. The media should also traverse through the Ingate SIParator (SBC).

The Ingate SIParator is currently supported by AT&T and Nortel on IP Flexible Reach and can be deployed at a customer site.



Nortel CS1000 Configuration

Please refer to AT&T VOIP Nortel CS 1000 (Release 5.00W / 5.50J) SIP Configuration Guide (NN10000-104 Issue 2.4) Section 4 for configuration of the CS1000 for IP Flexible Reach, with one change: In Section 4.3.3, enter the on-site Ingate SIParator's (SBC) IP address (instead of the IP Border Element's IP) for the Primary Proxy or Redirect (TLAN) IP address, ensure the Port used is 5060, and the Transport Protocol used is UDP.

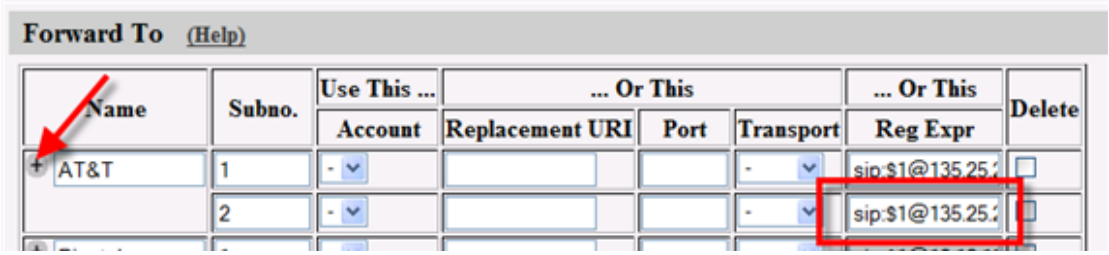
7.1.1 Ingate SIParator Configuration

Section 4.0 of this document describes the setup requirements for the Ingate SIParator and Firewall products. The Ingate Startup Tool can be used to accurately provide the necessary programming within the Ingate products to deliver the AT&T IP Flex SIP Trunk to the Nortel CS1000.

7.2 Configuring the SIParator to Failover to a Secondary IPBE

AT&T will provide the customer with multiple IPBE addresses for failover conditions. The SIParator can be configured to send calls to a secondary IPBE, if the primary IPBE is unavailable.

Go to SIP Traffic Dial Plan, under the "Forward To" section, add a sub-group for the "AT&T" group; under "Reg Expr", enter the expression sip:$1@x.x.x.x as the one above it, replacing x.x.x.x with the IP address of the secondary IPBE.

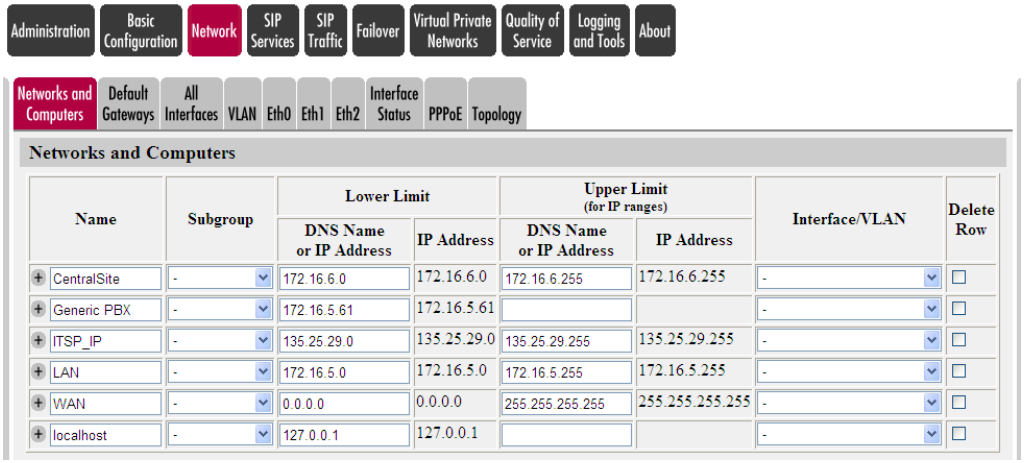


In this example, the "Reg Expr" for the primary IPBE is sip:$1@135.25.29.74, and for the secondary IPBE, sip:$1@135.25.29.135. This will allow the SIParator to send calls to the primary IPBE at 135.25.29.74, and if there is no response from the primary, the SIParator will send the call to the secondary IPBE at 135.25.29.135.

7.3 Example Ingate Configuration with Nortel

7.3.1 Networks - Networks & Computers

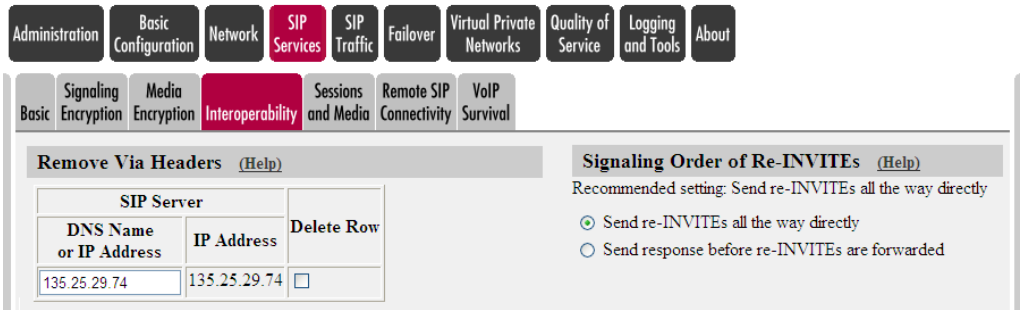
Here is an example of a SIParator in a LAN SIParator configuration when used with the Nortel CS1000. Networks and Computers section is like a Route List, used to identify various Networks and associate them to specific interfaces. In the case of a LAN SIParator, there is only one interface so referencing it is not necessary. Stand-alone and DMZ-LAN will have references to the WAN Interface, DMZ Interface and the LAN Interface for each of the networks connected.



7.3.2 SIP Services - Interoperability

The Interoperability page is where common deviations from the SIP Standard are programmed.

1. Remove the Nortel CS1000 IP Address from the VIA Headers.
2. Ensure the recommended settings of Signaling Order of Re-INVITE.

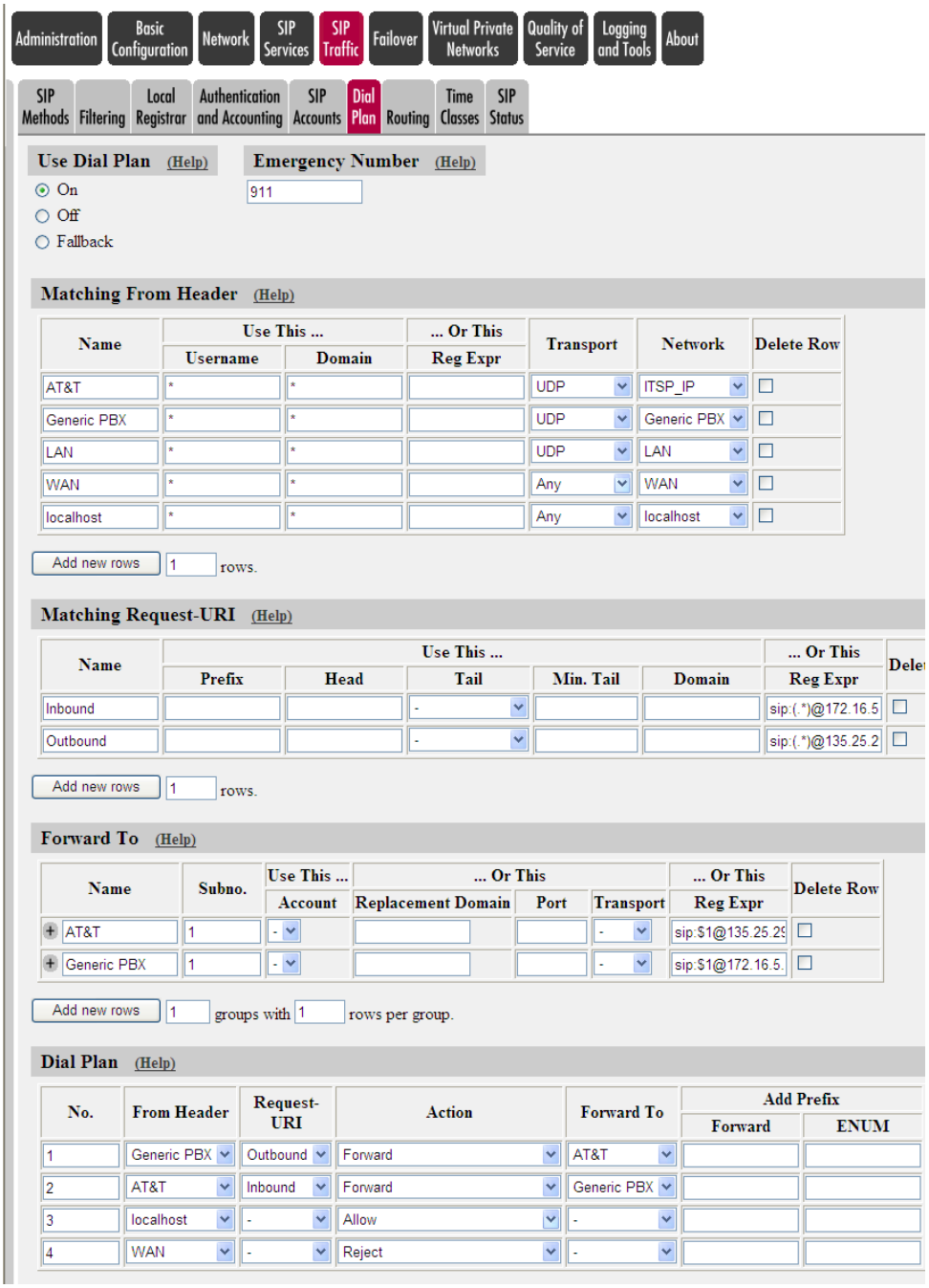


7.3.3 SIP Traffic – Dial Plan

The Dial Plan is how the Ingate defines the traffic routing policies. Incoming and Outgoing, by defining three attributes;

1. Matching FROM Header to perform Source based matching
2. Matching Request URI to perform SIP routing matching
    a. Inbound expression has the Ingate's IP
    b. Outbound has AT&T IPBE's IP
3. Forward To defines the target destination
    a. The AT&T expression has IPBE's IP
    b. The Nortel PBX's expression has CS1000's IP

Finally the three attributes are put together in the Dial Plan to form a routing policy.



7.4 Centralized Voicemail in an IP Flexible Reach Environment

It is common for Nortel customers with large IP PBX solutions to use the centralized voicemail architecture. In this architecture, the larger IP PBX servers at the main locations host the voicemail capabilities, and the "remote" or "non-voicemail" sites communicate to main location IP PBX servers to access voicemail.

NOTE	Currently, this configuration applies to Nortel CS1000 environments. Additionally, IP Flexible Reach is deployed at each CS1000 location.

NOTE	The Nortel CS1000 Centralized Voicemail application has one caveat when the Ingate SIParator is deployed in a LAN SIParator Mode

For centralized voicemail, an Ingate SIParator session border controller (SBC) is required at the remote site B. See below figure:

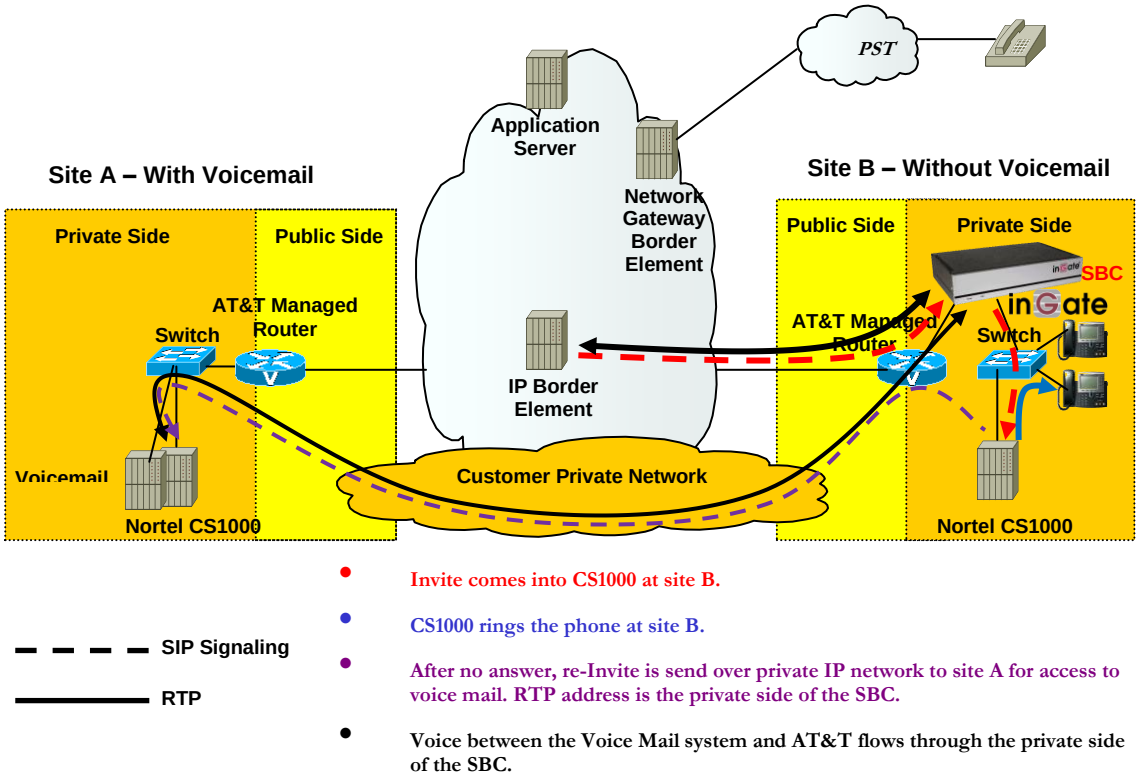


Figure: Centralized Voicemail, Standard Call Flow with Ingate SIParator

Inbound calls are sent to the Ingate SIParator (SBC) before reaching the CS1000. When an incoming call to the non-voicemail site B is forwarded to voicemail at site A, the bi-directional RTP media traverses the Ingate SIParator (SBC). This is a standard and supported IP Flexible Reach call flow.

7.4.1 Detailed Sample Network Diagram

Refer to the following network diagram as an example (please keep in mind that not all physical/logical connections are defined in this diagram):

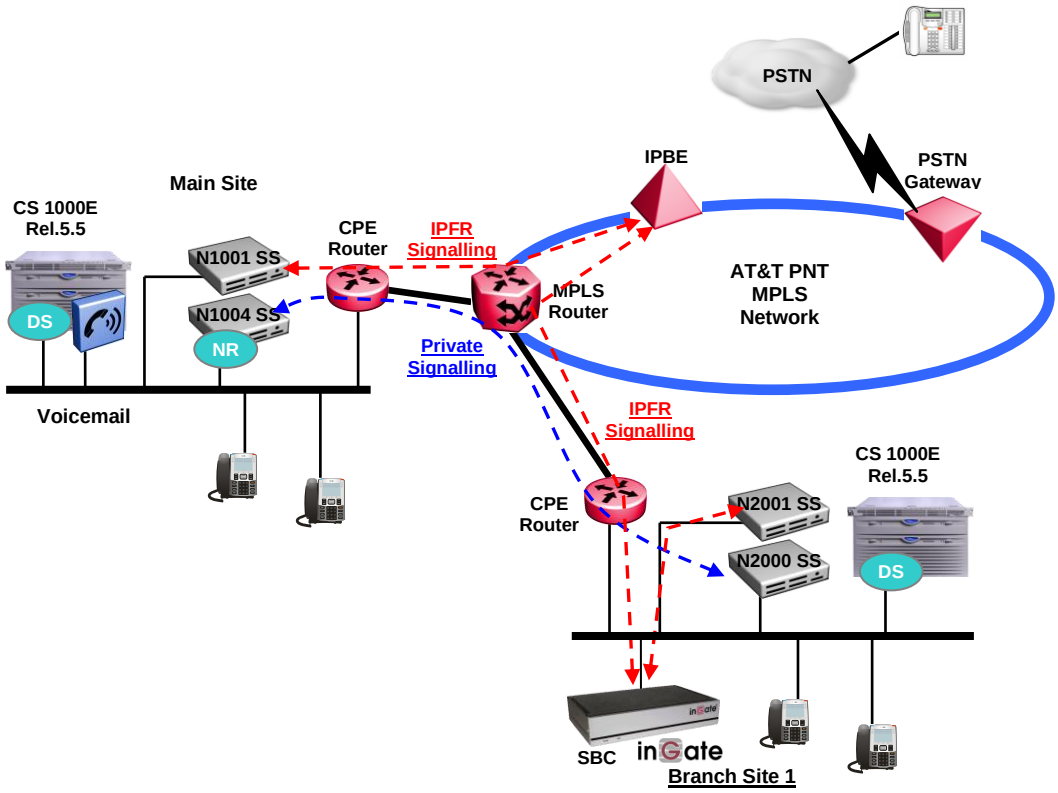


Figure: Sample Centralized Voicemail Network Diagram

The following are required for centralized voicemail in an IP Flexible Reach environment:

- Each location will have IP Flexible Reach
- Each location has at least TWO Signaling Servers: one for interfacing with IP Flexible Reach, another for private MCDN networking. The Network Routing Server (NRS) is required for private MCDN networking call control – Nortel recommends deploying the NRS at the main/central location(s).
- Ingate SIParator (SBC) at each branch (non-voicemail) site, an Ingate SIParator at the main site is optional but not required

7.4.2 Nortel CS1000 Configuration

Please refer to AT&T VOIP Nortel CS 1000 (Release 5.00W / 5.50J) SIP Configuration Guide (NN10000-104 Issue 2.4) Section 4 for configuration of the CS1000 for IP Flexible Reach and the Centralized Voicemail application.

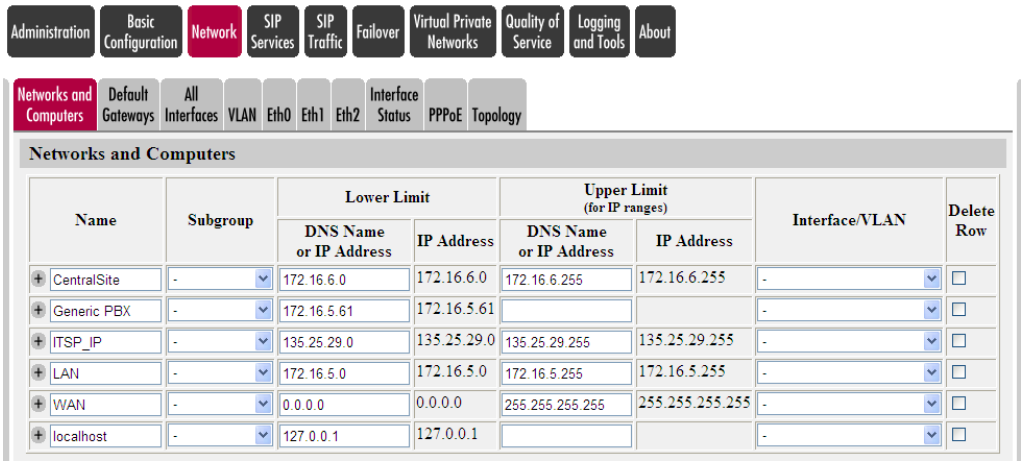
7.4.3 Ingate SIParator Configuration

Section 5.0 of this document describes the setup requirements for the Ingate SIParator and Firewall products with the Nortel CS1000 for AT&T IP Flexible Reach application.

The Nortel CS1000 Centralized Voicemail application has one caveat when the Ingate SIParator is deployed in a LAN SIParator Mode. There is one additional programming setup required for correct operation, Network – Topology section. The purpose of this Topology section is where you list all networks, as defined on the "Networks and Computers" dialogue that are known by your firewall and not reached via the default gateway of the firewall. All networks that can reach each other without going through the firewall should be grouped together.

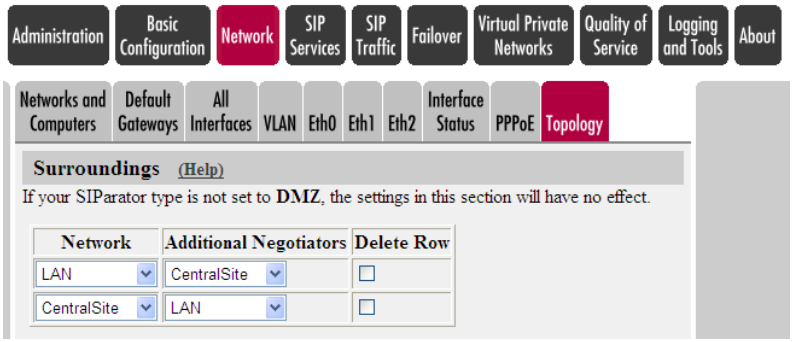
7.4.3.1 Networks and Computers

Here is an example of a SIParator in a LAN SIParator configuration when used with the Nortel CS1000. Networks and Computers section is like a Route List, used to identify various Networks and associate them to specific interfaces. In the case of a LAN SIParator, there is only one interface so referencing it is not necessary. There is an addition of the "Central Site" Network addresses to be later used to define the "Topology".



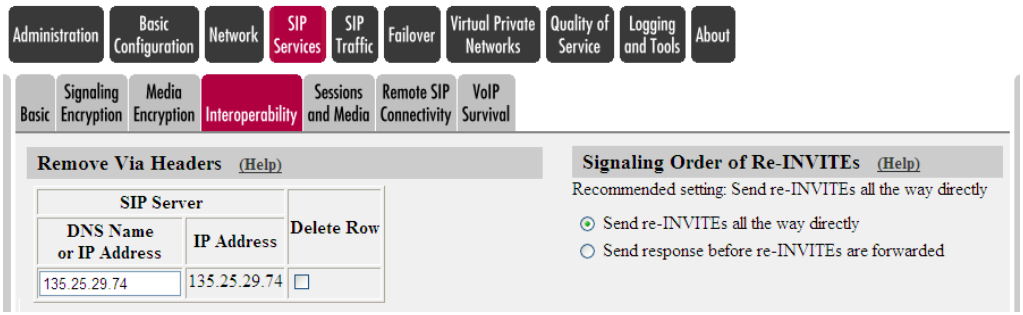
7.4.3.2 Topology

The result of putting two IP addresses in the same Surrounding is that the SIParator will not NAT any traffic between them. If two devices are in different Surroundings, the SIParator will rewrite the SIP signaling to make all SIP media be sent to itself instead of directly between the end devices. By default, the SIParator will not allow media between endpoints if the unit negotiating the media stream is not in the same Surrounding as the endpoint that will receive media. This can happen when you have an IP-PBX on one network and the clients on a different network. To enable the endpoints to receive media, you can allow additional negotiators for a Surrounding. In the case of the IP-PBX and the clients above, you would allow the IP-PBX network as an Additional Negotiator for the client Surrounding.



7.4.3.3 Interoperability

Remove the Nortel CS1000 IP Address from the VIA Headers. And ensure the recommended settings of Signaling Order of Re-INVITE.



8 Appendix – Special Notes

Emergency 911/E911 Services Limitations
While AT&T IP Flexible Reach services support E911/911 calling capabilities in certain circumstances, there are significant limitations on how these capabilities are delivered. Please review the AT&T IP Flexible Reach Service Guide in detail to understand these limitations and restrictions.

NAT'ing From Header
The Ingate does not NAT the From Header, although there is no technical impact, it was an observation. This is scheduled to be resolved in next release of the Ingate software.