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Introduction

The high availability of voice services is a fundamental requirement for enterprises deploying their own IP telephony equipment or subscribing to hosted VoIP services. In both cases providing reliable communications to remote branch offices is costly usually involving the installation of local call processing servers or additional wide area network (WAN) links to these locations.

Edgewater's VoIP survivability enhances the reliability of VoIP services to branch offices in a cost effective manner by providing local call switching in the event of WAN link failures or a loss of connectivity to network based call processing servers. VoIP survivability is an orderable software option for Edgewater's EdgeMarc Series appliances. EdgeMarc appliances are flexible networking devices that can also be configured to provide IP routing, optional T1 WAN link termination, resolve NAT/firewall traversal problems, ensure high quality voice using QoS, monitor voice call quality and provide comprehensive security for the LAN using a VoIP and data firewall.

Key benefits and features of VoIP survivability

Edgewater's VoIP survivability offers the following important benefits:

- Continuity of voice services to branch offices during WAN link failures or failures in network based call processing servers
- Significant savings over alternative solutions requiring redundant call processing servers or multiple WAN links
- Simplified design that is easier to manage than alternative solutions requiring maintenance of multiple dial plans in distributed call processing servers and complex routing

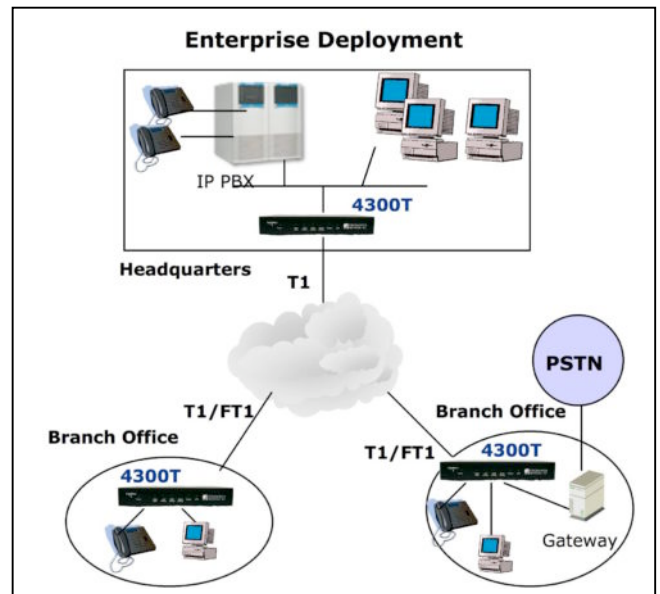
Survivability features:

- Application layer based monitoring of call processing servers to determine connectivity
- Automatic detection of loss of connectivity to call processing servers caused by WAN link failures, network congestion or call processing server software failure
- Automatic return of call control to network based call processing servers once connectivity has been restored
- Configurable timers to determine call processing server connectivity
- Call processing server connectivity status indicators
- Support for multiple call processing servers using DNS

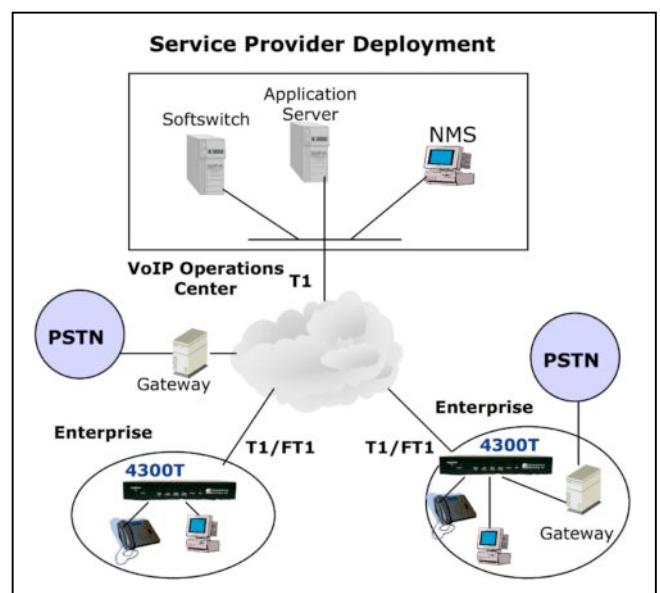
- Reporting of the currently active call processing server in environments using multiple call processing servers
- Local call switching between VoIP endpoints and premises based PSTN gateways during WAN link failures or other failures that prevent connectivity to network based call processing servers
- Calling features such as transfer, hold and conference are provided by EdgeMarc Series appliances
- Simplified setup that creates a local dial plan in the EdgeMarc appliance by monitoring traffic to network based call processing servers

Example network topologies

Enterprises deploying their own IP telephony infrastructure install EdgeMarc appliances at remote branch offices between the WAN and LAN. A call processing server or IP PBX is typically deployed at the main site or headquarters location to provide call switching for all VoIP endpoints. EdgeMarc appliances can terminate the T1 connection at the branch office or can be installed behind other WAN routers or SDSL modems that terminate the WAN link. The EdgeMarc 4200 and 4300T offer 4 integrated LAN switch ports and if greater density is required a 3rd party LAN switch can be connected to one of the LAN ports. IP phones and a PSTN gateway can then be connected on the LAN side of the EdgeMarc appliances.



Service providers offering IP PBX services use EdgeMarc Series appliances as the demarcation point at the customer premises for the hosted VoIP service. EdgeMarc appliances are installed at SOHO, branch office and headquarters locations and are used to connect VoIP subscribers to the softswitch located in the service provider's network. IP phones and a local PSTN gateway can be installed on the LAN side of the EdgeMarc appliances. Call processing for the hosted service is provided by network based softswitches.



How survivability works

The EdgeMarc appliance automatically creates a local dialing plan by monitoring the registration requests sent by LAN based SIP user agents as they register with the network based call processing server. In creating this dial plan the EdgeMarc appliance now has knowledge of all local SIP user agents installed on its LAN interface. This dial plan will be used during fallback mode of operation when the EdgeMarc appliance provides local call switching between user agents and/or a LAN side PSTN gateway.

EdgeMarc appliances continuously monitor the status of connectivity to network based call processing servers using application layer heartbeat messages. Configuration settings in EdgeMarc appliances control how often messages are sent to the call processing server and how quickly the server will be declared unreachable in the event of a failure. The use of application layer messages provides the added benefit of detecting the failure condition where an EdgeMarc appliance has IP connectivity to the call processing server but the call processing server software itself is not functioning properly.

Once a call processing server has been declared unreachable EdgeMarc appliances enter fallback mode and perform call processing for local SIP user agents. A SIP PSTN gateway can also be installed at the branch office on the LAN side of the EdgeMarc appliance and used for inbound and outbound calling during fallback mode. To maximize utilization of this gateway it can also be used when call switching is being performed by the network based call processing server.

Once connectivity to the network based call processing server is restored the EdgeMarc appliance will automatically turn control of all subsequent call requests over to the softswitch. Calls in progress that were established while the EdgeMarc appliance was in fallback mode will not be disrupted when connectivity is restored to the network based call processing server.

Redundant or multiple call processing servers can be used in conjunction with EdgeMarc Series appliances to further enhance the availability of voice services. EdgeMarc appliances will use DNS SRV records from a DNS server to obtain a prioritized list of available network based call processing servers. The EdgeMarc appliance using periodic messages monitors each server and the highest priority server that is currently reachable will be used for call processing. This feature can also be used to load balance or distribute calls among multiple servers however state replication is required by the call processing servers to provide full redundancy.

Platform support

EdgeMarc Converged Network Appliances

- 4200 Series
- 4300T Series
- 5300 Series
- 6400 Series

IP Phones

- Polycom IP500 & IP600
- Cisco

PSTN Gateways

- Audiocodes MP-104/108

Configuring VoIP survivability in EdgeMarc appliances

Configuring VoIP survivability in EdgeMarc appliances consists of the following tasks:

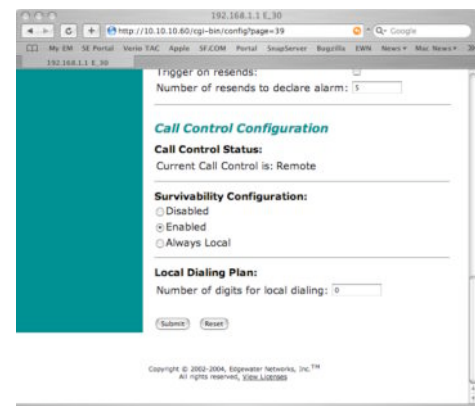
1. Enable VoIP survivability.
2. Configure call processing server reachability settings (optional).
3. Specify the number of digits to use for local dialing (optional).
4. Configure the IP address of the local LAN side PSTN gateway (optional).
5. Configure call processing server redundancy (optional).

Please note that this configuration requires that you have completed the basic installation of the EdgeMarc appliance including interface, IP, traffic management and VoIP configurations. Information regarding these tasks can be found in the "info" section of the EdgeMarc appliance, the User Manual or in Edgewater's online knowledgebase located in the support section of www.edgewaternetworks.com

Step 1 – Enable VoIP Survivability

- A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
- B. Select **System**.
- C. Select **Survivability**.
- D. Select the **Enabled** radio button under the **Survivability Configuration** section of the web page.
- E. Press **Submit**.

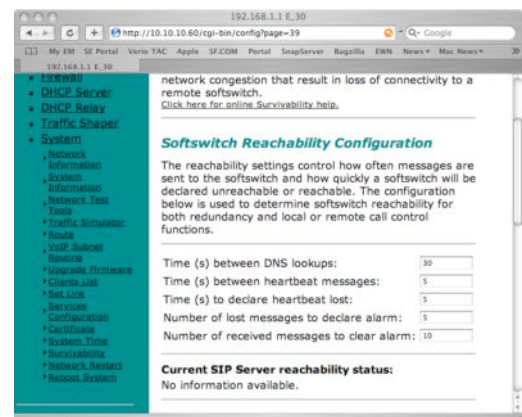
The EdgeMarc appliance is now configured to check the connectivity of the call processing server and will automatically perform local call switching if the server becomes unavailable.



Step 2 – Configure call processing server reachability settings (optional)

The reachability settings control how often messages are sent to network based call processing servers and how quickly a server will be declared unreachable or reachable. These settings can be changed to match the particular needs of your environment by using the following steps:

- A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
- B. Select **System**.
- C. Select **Survivability**.
- D. Enter the desired values for **Time between heartbeat messages**, **Time to declare heartbeat lost**, **Number of lost messages to declare alarm** and **Number of received messages to clear alarm** in the **Softswitch Reachability** section of the web page.
- E. Press **Submit**.



The reachability settings are used to determine when the EdgeMarc appliance provides local call switching by entering fallback mode and when it returns call control to network based call processing servers. The definitions of the reachability settings are as follows:

Time between heartbeat messages - The number of seconds between each heartbeat message sent to the call processing servers to determine connectivity.

Time to declare heartbeat lost - The number of seconds that the EdgeMarc appliance will wait before declaring a response to a heartbeat message lost.

Number of lost messages to declare alarm - the number of consecutively lost responses to heartbeat messages required for the EdgeMarc appliance to declare a loss of connectivity to the network based call processing server.

Number of received messages to clear alarm - the number of consecutively received responses to heartbeat messages required for the EdgeMarc Appliance to declare successful connectivity to the network based call processing server.

The formula used to determine the **maximum** time for the EdgeMarc appliance to declare a loss of connectivity to a call processing server is: $\text{maximum time} = (X * Y) + Z$, where,

X = Time between heartbeat messages

Y = Number of lost messages to declare alarm

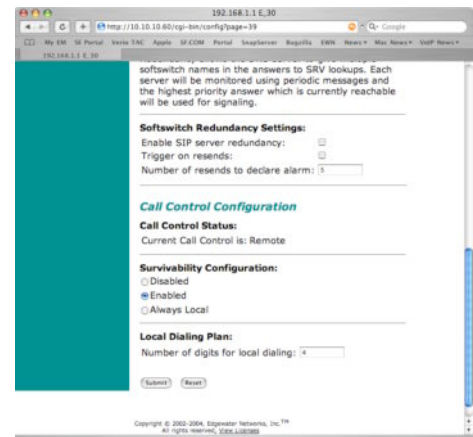
Z = Time to declare a heartbeat lost

The default value for X, Y and Z in the EdgeMarc appliance is 5. Therefore, the default maximum time to declare a call processing server unreachable is 30 seconds or $((5*5) + 5)$.

Step 3 - Specify the number of digits to use for local dialing

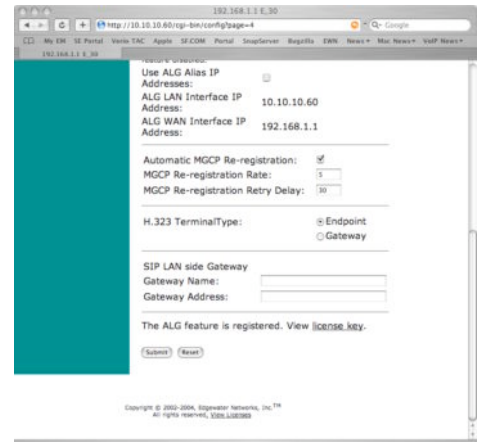
This field is the number of digits that the EdgeMarc appliance will use for dialing when providing local call switching. By default the EdgeMarc appliance will use 4, 7 and 10 digit dialing. Please follow the steps below if you would like to use a different number of digits:

- A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
- B. Select **System**.
- C. Select **Survivability**.
- D. Enter the **number of digits for local dialing** in the **Local Dial Plan** section of the web page.
- E. Press **Submit**.



Step 4 - Configure the IP address of the local LAN side PSTN gateway (optional)

This step should be used if you have installed a PSTN gateway at the branch office location. In this case the IP address of the LAN side PSTN gateway must be configured in the EdgeMarc appliance to support inbound and outbound PSTN calling while in fallback mode of operation. This gateway resource may also be used by network based call processing servers when the WAN link is operational. In fallback mode when the call processing server cannot be reached the EdgeMarc appliance will route outbound calls to the LAN side PSTN gateway if a number is dialed that is not stored in its local dial plan (e.g. a local SIP user agent).



- A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
- B. Select **System**.
- C. Select **Survivability**.
- D. Press **Submit**.

Step 5 - Configure call processing server redundancy

If you will be using multiple network based call processing servers then you will need to enable server redundancy and specify the time between DNS lookups in the EdgeMarc appliance. Enabling redundancy allows a DNS server to provide a list of multiple call processing servers to the EdgeMarc appliance in the answers to SRV lookups. Each server in the list will be monitored using periodic messages by the EdgeMarc appliance and the highest priority server that is currently reachable will be used for signaling. The EdgeMarc appliance uses the reachability settings described in step 2 to determine the status of remote servers and remove inoperable servers from the list.

Triggers can also be used by the EdgeMarc appliance to determine when to forward call requests to a secondary server in the list. A trigger is set when a configured number of resends are received by the EdgeMarc appliance from a SIP user agent attempting to place a call. When initiating a call a SIP user agent will send an INVITE message to the EdgeMarc appliance that will then be forwarded to the primary server. In the event that the primary server fails **before** a reachability alarm has been declared using the heartbeat messages the user agent will resend INVITE messages until the trigger condition is met. At this point the EdgeMarc appliance will forward the call request on to the secondary server in the list. Please use the following steps to enable redundancy and set triggers:

- A. Log into the EdgeMarc appliance using a Netscape or Internet Explorer web browser.
- B. Select **System**.
- C. Select **Survivability**.
- D. Enter the **Time between DNS** lookups (in seconds) in the **Softswitch Reachability** section of the web page.
- E. Select **Enable SIP server redundancy** in the **Softswitch Redundancy Settings** section of the web page.
- F. Select **Trigger on resends** in the **Softswitch Redundancy Settings** section of the web page.
- G. Enter the **Number of resends to declare alarm**.
- H. Press **Submit**.

