

Application Note:

Out-of-Band Management (OOBM) Using an LTE Cellular Gateway for Fail-over Failback

This app note applies to the following Lantronix Products:

*SLC 8000: Advanced Console
Manager SLB: Branch Office Manager*

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Overview

The SLC 8000 Advance Console Manager (SLC 8000) and the SLB Branch Office Manager (SLB) support Out-of-Band Management (OOBM) with several different options. This document specifically focuses on using the Sierra Wireless Airlink ES450 LTE cellular gateway (ES450 Gateway) as the Lantronix preferred option for LTE cellular support as a secondary channel of communication.

All the examples in this document reference the UI of the SLC 8000 but, please understand the same functionality and UI examples are also found in the SLB.

The SLC 8000 and the SLB have two network interfaces: Ethernet Port 1 (Eth1) and Ethernet Port 2 (Eth2). The concept is when the primary channel of communication to the SLC 8000/SLB over Eth1 is lost, a secondary channel of communication must be made available in order to enable Network Administrators to access their infrastructure equipment connected to the SLC 8000/SLB. It is the expectation of Network Administrators that the SLC 8000/SLB will 'fail-over' to a secondary channel of communication seamlessly and automatically. They also expect 'fail-back' to occur when the production network is back online.

The SLC 8000/SLB supports Fail-over/Fail-back between the two network interfaces (RJ45 Ethernet or SFP). This implementation allows the SLC 8000/SLB to fail-over from (Eth1) to (Eth2) when the SLC 8000 detects that Eth1 is no longer available. Since the ES450 Gateway is an Ethernet to cellular gateway, it is connected to Eth2 so when the fail-over occurs the SLC 8000/SLB will then be accessible over the cellular network. The Network Administrator is now able connect to the SLC 8000/SLB and all the attached equipment to begin the process of troubleshooting why the production network went down.

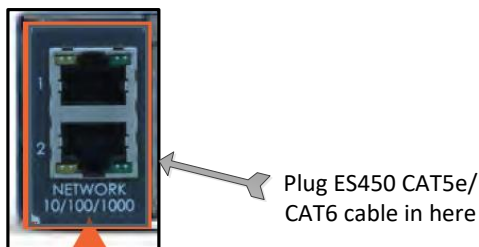
When the network on Eth1 is available again, the SLC 8000/SLB fails-back to Eth1. The primary channel of communication has been resorted.

This application note was written and tested using the SLC8000 with firmware v7.8.0.0.R13. For the best results, it is recommended that you upgrade/use this version.

Setup

Sierra Wireless Airlink ES450

The ES450 Gateway supports 3G/4G/LTE/CDMA/GSM and is an ideal fail-over device for the SLC 8000 and the SLB. It is completely integrated with the SLC 8000/SLB therefore setup is minimal. To setup the ES450 Gateway, connect the Ethernet interface of the Gateway to the Eth2 port on the SLC 8000/SLB with a CAT5e/CAT6 cable as shown. Then power up the ES450 Gateway by plugging in the power connector. The ES450 Gateway has a default static IP address assigned as **192.168.13.31**.



If you are using an SLC that supports SFP, you may need to use a hub/switch between the ES450 (10/100Mb) and the SFP interface (1Gb) to accommodate the different link speeds.

[SLC 8000](#)

Firmware Version 7.6.0.0 or higher is required to support the Fail-over/Fail-back cellular parameters that support the **ES450 Gateway** unit. It is recommended that you upgrade to the latest firmware version to get the best results. To verify the firmware version of the SLC, click on the Maintenance tab and then Firmware /Config. The firmware version is shown under the heading SLC Firmware. In this case the firmware is version 7.8.0.0.R13.

The screenshot shows the LANTRONIX SLC 8048 web interface. At the top, there's a status bar with 'Logout', 'Host: SLC.gpmLAB', and 'User: sysadmin'. Below this is a navigation bar with tabs: Network, Services, User Authentication, Devices, Maintenance, and Quick Setup. The 'Maintenance' tab is selected, and the 'Firmware/Config' sub-tab is active. The main heading is 'Firmware & Configurations'. Under the 'General' section, there are fields for Reboot and Shutdown. The 'Internal Temperature' section shows 'Current: 42 °C / 108 °F' and 'Low: 0 °C / 32 °F'. The 'Site Information' section has fields for Data Center Rack Row, Cluster, and Site Tag. The 'SLC Firmware' section, highlighted by a red arrow, shows 'Current Version: 7.8.0.0R13' and a 'Firmware Update Log' link. The 'Load Firmware Via Options' section includes fields for NFS Mounted Dir, USB Port (Port U1 or Port U2), FTP/SFTP/TFTP Server, Path, Login, Password, and Retype Password. The 'Boot Banks and Bootloader Settings' section shows 'Bank 1: 7.8.0.0R13 (current)' and 'Bank 2: 7.7.0.0R13', with a 'Next Boot Bank' set to 1. A 'Watchdog Timer' is set to 900 seconds. A 'Copy configuration from Bank 1 to Bank 2 during firmware update' checkbox is checked. The 'High Resolution Timers' checkbox is unchecked, with a note 'Requires reboot to take effect'.

Please note that the SLC has 2 boot banks so it can run 2 different versions of firmware. Make sure that the Boot Bank that contains the firmware image of v7.6 or higher is current and the running firmware.

Configuration

To configure the Fail-over/Fail-back parameters in the SLC 8000, click the **Network** tab and select **Network Settings**.

For Fail-over/Fail-back to work reliably, static IP addressing on both Eth1 and Eth2 is highly recommended. Keep in mind, in a true OOBM scenario, depending on a long-lease DHCP address is risky.

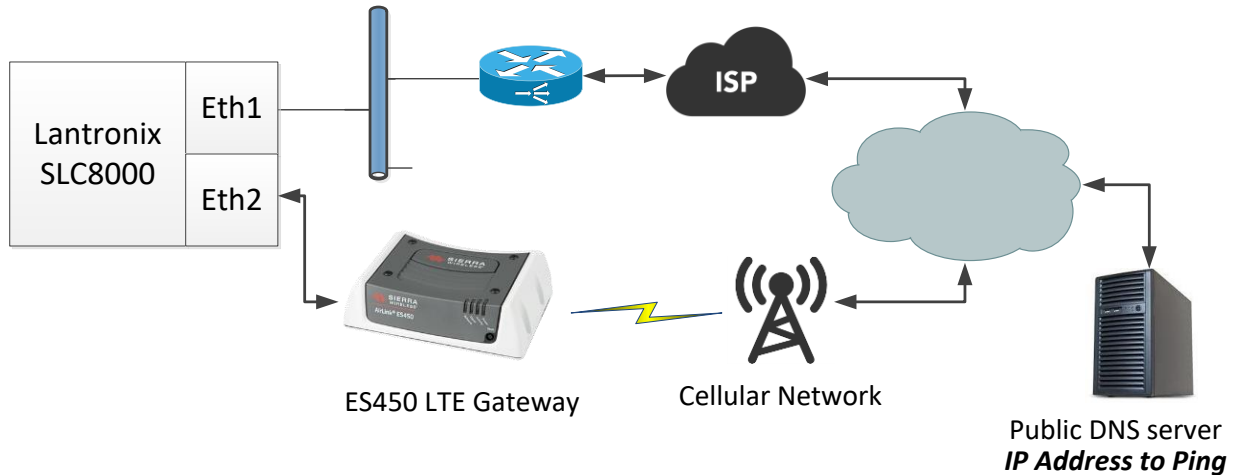
For the Eth1 settings, click the radio button for Specify, then enter the static IP address and subnet mask. For the Eth2 settings, click the radio button for Specify. Since the ES450 Gateway has an IP address of 192.168.13.31, for the Eth2 settings enter an IP of 192.168.13.xxx and mask of 255.255.255.0. In this example Eth2 is set to a static IP address of **192.168.13.33**.

Next, enter at least one IP address for the DNS server settings. A good IP address to use is 8.8.8.8 which is the Google DNS server. In this example, we are also using the local gateway DNS server.

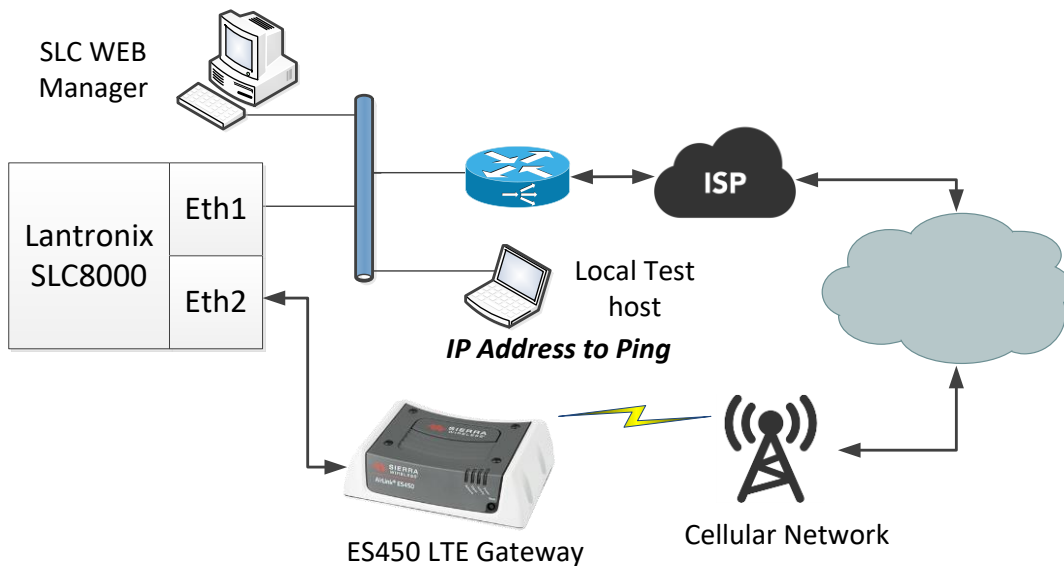
The screenshot shows the LANTRONIX SLC 8048 web interface. The top navigation bar includes tabs for Network, Services, User Authentication, Devices, Maintenance, and Quick Setup. The Network Settings page is active, showing Ethernet Interfaces for Eth1 and Eth2. Red arrows point to the 'Specify' radio buttons for both interfaces. The Eth1 settings show an IP Address of 192.168.1.50 and a Subnet Mask of 255.255.255.0. The Eth2 settings show an IP Address of 192.168.13.33 and a Subnet Mask of 255.255.255.0. The Hostname & Name Servers section shows a Hostname of SLC_gpmLAB and two DNS Servers: 192.168.1.1 and 8.8.8.8. The DHCP-Acquired DNS Servers section shows three None entries. The Prefer IPv4 DNS checkbox is checked.

To trigger the failover process, the SLC will ping an IP address on the other side of the ETH1 default gateway as a way to verify network connectivity. If the SLC receives the configured number of failed pings, then this will trigger or activate the fail-over process. You can configure a timer for the delay between pings. You can also configure the number of failed pings required before failover occurs.

There are 2 scenarios that you can use. One is the production configuration where the IP address to ping will want to be on the public internet (Public DNS Server, 1.1.1.1 is a good option) on the ETH1 interface. Here is a possible network topology:

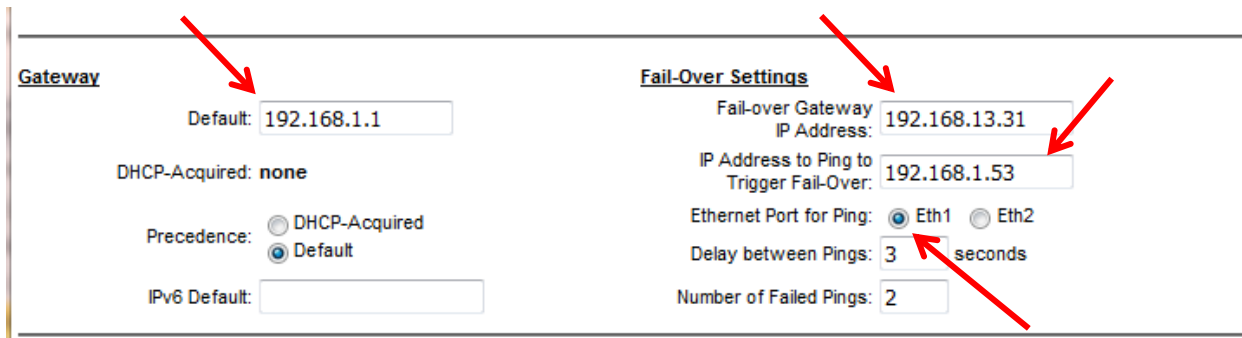


The second scenario is for testing the failover feature. The production configuration topology does not easily allow for failover to be tested. To simulate a failover with the production configuration, most of the options (pull network cable or power down the router) will cause the local subnet to lose connectivity on the ETH1 interface network. By using a local host as the **IP Address to Ping**, you can easily simulate a down network connection (by powering down the local host) as well as have continued network access to the SLC8000 WEB manager (to monitor fail over) on the ETH1 interface. Here is a possible network topology:



Follow the following steps to configure the failover feature

1. Enter the IP address of the default gateway of Eth1 in the **Default** field. This has to be the local subnet gateway.
2. Fill in the **Fail-over Gateway IP Address** field with IP address of the ES450 Gateway (192.168.13.31).
3. Enter the IP address in the **IP Address to Ping** field. Remember, this IP address is networked to the Eth1 interface so ensure that **Ethernet Port for Ping** radio button is set to **Eth1**.



Gateway

Default: 192.168.1.1

DHCP-Acquired: none

Precedence: ☐ DHCP-Acquired ☒ Default

IPv6 Default:

Fail-Over Settings

Fail-over Gateway IP Address: 192.168.13.31

IP Address to Ping to Trigger Fail-Over: 192.168.1.53

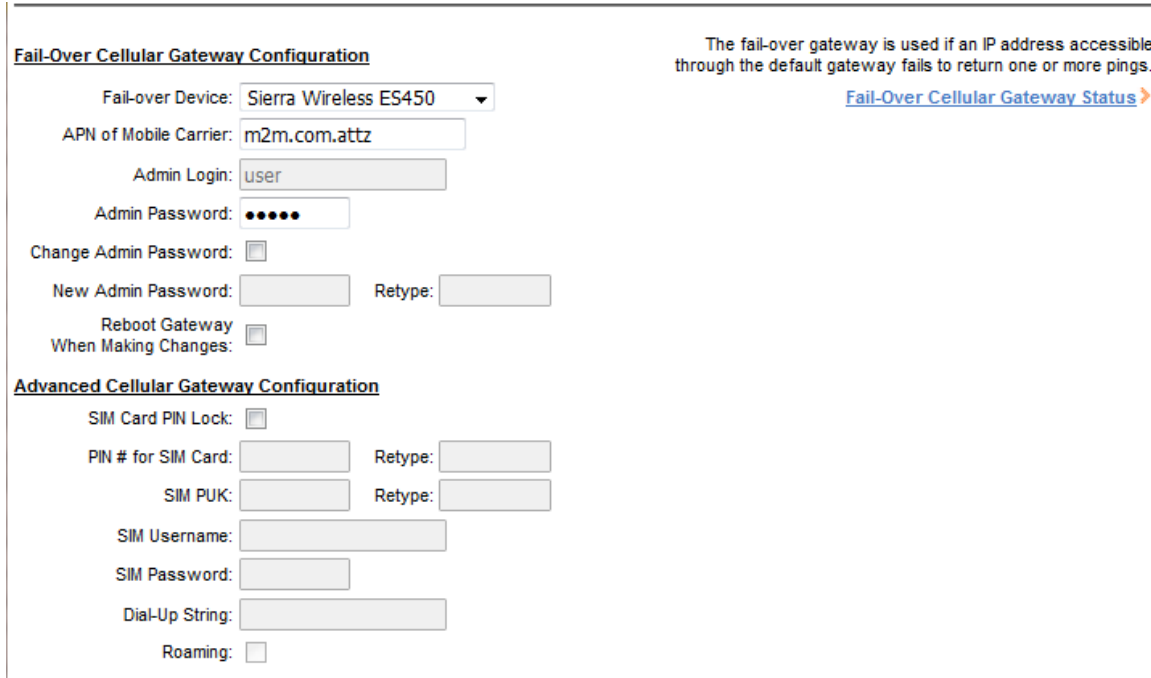
Ethernet Port for Ping: ☒ Eth1 ☐ Eth2

Delay between Pings: 3 seconds

Number of Failed Pings: 2

Next, in the **Fail-over Device** drop down box -> select **Sierra Wireless ES450**.

In the **APN of the Mobile Carrier** field, enter the APN address supplied by the mobile carrier. Please contact your Lantronix Sales Manager if you would like us to provide an Evaluation SIM from AT&T during your proof-of-concept testing.



Fail-Over Cellular Gateway Configuration

The fail-over gateway is used if an IP address accessible through the default gateway fails to return one or more pings. [Fail-Over Cellular Gateway Status >](#)

Fail-over Device: Sierra Wireless ES450

APN of Mobile Carrier: m2m.com.attz

Admin Login: user

Admin Password:

Change Admin Password: ☐

New Admin Password: Retype:

Reboot Gateway When Making Changes: ☐

Advanced Cellular Gateway Configuration

SIM Card PIN Lock: ☐

PIN # for SIM Card: Retype:

SIM PUK: Retype:

SIM Username:

SIM Password:

Dial-Up String:

Roaming: ☐

VPN Connection

When using the LTE cellular gateway solution as a secondary channel of communication a VPN tunnel is required. The SLC 8000/SLB is a VPN client and with the ES450 Gateway acting as a gateway from Ethernet to cellular, the SLC 8000 can VPN through the ES450 Gateway to an awaiting VPN server.

To configure the VPN setup in the SLC 8000/SLB, click the **Network** tab then click **VPN**. Click **Eth2** to ensure the VPN tunnel uses the ES450 Gateway. Since the SLC 8000/SLB is a VPN client, configure the remaining parameters in accordance with the VPN server.

VPN
Help ?

Enable VPN Tunnel: ☒

Name:

Ethernet Port: ☐ 1 ☒ 2 ☐ Default Route

Remote Host:

Remote Id:

Remote Hop/Router:

Remote Subnet(s):

Local Id:

Local Hop/Router:

Local Subnet(s):

IKE Negotiation: ☐ Main Mode ☒ Aggressive Mode

IKE v2:

IKE Encryption: Authentication: DH Group:

ESP Encryption: Authentication: DH Group:

Authentication: ☐ RSA Public Key ☒ Pre-Shared Key ☐ X.509 Certificate

RSA Public Key for Remote Host:

Pre-Shared Key: Retype Pre-Shared Key:

Certificate Authority for Remote Peer: [Upload File >](#)

Certificate File for Remote Peer: [Upload File >](#)

Certificate Authority for Local: [Upload File >](#)

Current Tunnel Status: **Down**

[View Detailed Status >](#)

[View VPN Logs >](#)

[View SLC RSA Public Key >](#)

[View X.509 Certificates >](#)

When complete, the **Current Tunnel Status** will change from **Down** to **Up**.

Fail Over Results

When the **IP Address to Ping** no longer responds, Fail-over is triggered. There is a notification on the **Network Settings** page.

Gateway
Default:
DHCP-Acquired: none
Precedence: ☐ DHCP-Acquired ☒ Default
IPv6 Default:

Fail-Over Settings > Currently using fail-over gateway <
Fail-over Gateway IP Address:
IP Address to Ping to Trigger Fail-Over:
Ethernet Port for Ping: ☒ Eth1 ☐ Eth2
Delay between Pings: seconds
Number of Failed Pings:

Fail-Over Cellular Gateway Configuration

The fail-over gateway is used if an IP address accessible through the default gateway fails to return one or more pings.
[Fail-Over Cellular Gateway Status >](#)

Fail-over Device:
APN of Mobile Carrier:
Admin Login:
Admin Password:
Change Admin Password: ☐

Since Eth2 is now available, the VPN tunnel opens.

VPN
[Help?](#)

Enable VPN Tunnel: ☒
Name:
Ethernet Port: ☐ 1 ☒ 2 ☐ Default Route
Remote Host:
Remote Id:
Remote Hop/Router:
Remote Subnet(s):
Local Id:

Current Tunnel Status: **Up, SLC IP is 11.0.0.10**

```

"FailoverTest": 11.0.0.10/32 ===
192.168.0.30<192.168.0.30>[@techsupport] ---
192.168.0.1 ... 70.168.148.9<70.168.148.9> === 0.0.0.0/0;
unrouted; eroute owner: #58
"FailoverTest": 11.0.0.10/32 === 192.168.0.30[@] ---
192.168.0.1 ... 70.168.148.9 === 172.18.0.0/16; unrouted;
eroute owner: #58
"FailoverTest": 11.0.0.10/32 === 192.168.0.30[@] ---
192.168.0.1 ... 70.168.148.9 === 11.0.0.0/16; erouted;
eroute owner: #58
"FailoverTest": 11.0.0.10/32 === 192.168.0.30[@] ---
192.168.0.1 ... 70.168.148.9 === 192.168.34.0/24; erouted;
eroute owner: #58
PSK + ENCRYPT + TUNNEL + PFS + UP + XAUTH +
AGGRESSIVE + IKEv2ALLOW + SAREFTRACK + IKOD +
rKOD; prio: 24,32; interface: eth1; kind=CK_PERMANENT

```

[View Detailed Status >](#)
[View VPN Logs >](#)

You will now be able to reach the SLC 8000/SLB and all of the devices attached through the VPN tunnel.

The SLC will continue to check network availability on ETH1 by continuing to ping the **IP Address to Ping**. When there is a response from the ping, this will trigger the SLC 8000/SLB to **fail-back** to Eth1. The **>>> Currently using fail-over gateway <<<** notification will disappear, and the VPN tunnel will come down. The production network connection has been restored.

Additional Information

It you would like to check the status of the ES450 Gateway at any time, click the **Fail-Over Cellular Gateway Status** hyperlink below the failed over settings.

Fail-Over Settings > Currently using fail-over gateway <

Fail-over Gateway IP Address:

IP Address to Ping to Trigger Fail-Over:

Ethernet Port for Ping: ☒ Eth1 ☐ Eth2

Delay between Pings: seconds

Number of Failed Pings:

The fail-over gateway is used if an IP address accessible through the default gateway fails to return one or more pings.

[Fail-Over Cellular Gateway Status](#) >



information:

This will show the following status

Network - Network Fail-over Device Status [Help ?](#)

Sierra Ethernet and Cellular Status:
 Gateway device uptime: 9 days, 22 hours, 50 minutes
 WAN uptime (minutes): 14330
 Software Version: 4.9.3.002 19200306000700000000000000000000 Boot v1.1.2 (c) 2009-2018 Sierra Wireless, Inc.
 Firmware Version: SWI9X15C_05.05.58.00 r27038 carmd-fwbuild1 2015/03/04 21:30:23 MC7354
 LAN MAC address: 00:14:3E:42:A0:7D
 Primary DNS: 8.8.8.8
 SECONDARY DNS: 8.8.4.4
 Phone Number: NA
 WAN IP address: 10.40.192.194
 WAN network state: Network Ready
 WAN network state detail: Gateway connected to WAN network and ready to send data
 Network operator: AT&T
 Receive Signal Strength Indicator (dB): -83
 LTE signal strength (dB): -110
 LTE signal quality (dB): -12
 Total cellular received bytes: 551902
 Total cellular transmitted bytes: 1040090
 Total cellular received packets: 1525
 Total cellular transmitted packets: 1540
 Total LAN transmitted packets: 2583
 Total LAN received packets: 3064

Cell connection info: CellInfo: TCH: 2200 RSSI: -83 LAC: 16676 CellID: 54129942
 Cell in-depth connection info: ES: 100Mb/s Full Duplex NS: LTE LTECh: 2200 LTERm: false LTECID: 54129942 LTELAC:

SIM ID: 89011703278215955207
 APN: m2m.com.attz
 Connection type: LTE
 Connection service type: 4G
 IMSI: 310170821595520
 Ping IP address: 0.0.0.0
 Ping interval (minutes): 15
 RX Diversity: Enabled
 Band frequency setting: 00
 Active Frequency Band: LTE BAND 4
 MSCI Server: Enabled

CLI Command Reference

For the sake of clearly understanding the process, screenshots from the SLC 8000 WEB Manager (GUI) were used in this App Note. If you intend to configure the above parameters using the SLC 8000/SLB CLI, see the Command Reference section in the User Guide.

https://www.lantronix.com/wp-content/uploads/pdf/SLC8000_UG.pdf

https://www.lantronix.com/wp-content/uploads/pdf/SLB_UG.pdf

If you require additional assistance finding necessary commands used for configuring the Fail-over/Failback process, please contact the Lantronix Technical Support team at:

<https://www.lantronix.com/technical-support/>

Troubleshooting

If you are experiencing trouble, it is a good idea to get the SLC log files. There is a log for the **Fail-Over Cellular Gateway Status** on the network page. This is a hyperlink so clicking on it will produce a log with Diagnostic data. Also, under the maintenance tab, click on the system log menu for more details.

Error	Resolution
No Network communication on Eth2	Click the Fail-Over Cellular Gateway Status hyperlink and review the log. Is there a WAN IP Address? Review "WAN Network state detail"
Failed to Configure Gateway	<ol style="list-style-type: none"> 1. Check for link light on the ES450 2. Make sure the ES450 is powered 3. Can the SLC ping the ES450 (use Maintenance -> Diagnostics -> Check ping box, type 192.168.13.31) 4. Make sure the LTE Gateway has the default password 5. Using the CLI type "connect direct telnet 192.168.13.31 port 2332" to test connection. Also, this will test to make sure the password is correct.
Cannot ping the LTE Gateway	Make sure there are no IP Filters enabled that could be blocking packets
No failover occurs	Can the SLC – ETH1 interface ping IP Address to Ping field ?
Diagnostics – check network settings	Using the CLI – type "show network all" to make sure ETH1 and ETH2 link states are UP.