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NimbeLink®
Smart. Simple. Cellular.

E2CLink™

# Ethernet to Cellular Router User Manual

**NimbeLink Corp**

**Updated: May 2016**

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GPL Compliance

Federal Regulatory Licensing


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# 1. Introduction

## 1.1 Overview

This document is the user manual for NimbeLink's Ethernet to Cellular Router. Throughout this document the Ethernet to Cellular Router will often be referred to as the 'E2CLink™' or the 'router,' although it may be referred to by its full name.

NimbeLink E2CLink is available with bundled data plans from leading cellular carriers.

Make sure to check the **E2CLink's product page** for the most up to date information.

This document documents the operation of the E2CLink using firmware e2c1p-20160321. If your E2CLink is running an earlier firmware version certain features described in this document may not be available. If you would like to update the firmware on your device to the e2c1p-20160321 firmware, please contact NimbeLink's technical support team.

## 1.2 Product Description

The E2CLink provides a low cost, industrial-grade alternative to cable, DSL, or Wi-Fi internet connections. The E2CLink™ delivers instant cellular connectivity over the Verizon network for any Ethernet enabled device. It is significantly smaller and more affordable than other external cellular routers and can cost significantly less to operate than cable or DSL connections.

NimbeLink's E2CLink router has been tested by Verizon and granted Private Network Certification, which allows it to be used with the Verizon Private Network service. Verizon offers their Private Network service to allow customers to assign private IP addresses from their own private networks, to the E2C Link cellular router. This ensures that the device remains separate and inaccessible from the public internet. Generally, the device is then set up to send data through a hardware Virtual Private Network (VPN) connection between Verizon's core network and the customer's endpoint (application server, edge router, or other private endpoint). For more information about Verizon's Private Network service, please contact a Verizon Wireless business representative, or reach out to NimbeLink to be connected to a representative.


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## 1.3 Orderable Part Numbers

The table below contains a list of orderable part numbers. The retail versions include the Antenna, power supply, and mounting hardware for the E2CLink whereas the non-retail versions are for the OEM device only and do not include any accessories.

| Orderable Parts | | | |
|---|---|---|---|
| **Part Number** | **Description** | **Carrier** | **Network Type** |
| **NL-R-E2GCR** | Ethernet to Cellular Modem 2G 1xRTT Verizon - Retail Version | Verizon | 2G 1xRTT CDMA |
| **NL-R-E3GDR** | E2CLink – Ethernet to Cellular Modem 3G EVDO with 2G 1XRTT fallback Verizon - Retail Version | Verizon | 3G CDMA, 2G 1xRTT CDMA |
| **NL-R-E4GLSR** | E2CLink – Ethernet to Cellular Modem 4G LTE Verizon - Retail Version | Verizon | 4G LTE CAT 3 |
| **NL-R-E2GC** | Ethernet to Cellular Modem 2G 1xRTT - Device Only | Verizon | 2G CDMA |
| **NL-R-E3GD** | Ethernet to Cellular Modem 3G EVDO with 2G 1xRTT fallback - Device Only | Verizon | 3G CDMA |
| **NL-R-E4GLS** | Ethernet to Cellular Modem 4G LTE - Device Only | Verizon | 4G LTE CAT 3 |
| **NL-R-EC1G-V** | Ethernet to Cellular Modem. LTE CAT1 Ether - Device only | Verizon | 4G LTE CAT 1 |
| **NL-R-EC1G-VR** | Ethernet to Cellular Modem. LTE CAT1 Ether - Retail Version | Verizon | 4G LTE CAT 1 |


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# 1.4 Accessories

## 1.4.1 Antennas

The E2CLink requires a cellular antenna that supports the underlying cellular technology (2G, 3G, or 4G) that the E2CLink is using. These frequencies will vary between cellular technologies and cellular carriers. The standard antenna shipped with the E2CLink retail kit is a Taoglas TG.30.8113 and supports 2G, 3G and 4G applications. The E2CLink requires a dipole antenna for maximum performance.

Recommended antennas are listed in the table below.

| Orderable Parts | | |
|---|---|---|
| **Manufacturer** | **Part Number** | **Network Type** |
| Taoglas | TG.30.8113 | 2G/3G CDMA, 2G GSM, 3G HSPA, 4G LTE |
| CDW | MAG-212-12-SMA-M | 2G/3G CDMA, 2G GSM, 3G HSPA, 4G LTE |
| Taoglas | TG.35.8113 | 2G/3G CDMA, 2G GSM, 3G HSPA, 4G LTE |
| Taoglas | GA.110.101111 | 2G/3G CDMA, 2G GSM, 3G HSPA, 4G LTE |

## 1.4.2 Power Supplies

The E2CLink requires a 5V DC power supply that can supply at least 1.2A. E2CLink retail kits ship with CUI Inc's SWI6-5-N-P5. The ethernet port on the E2C Link does not support Power Over Ethernet (POE). If POE is required an external power adapter must be used.


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# 2. E2CLink Setup

## 2.1 Device Overview

The E2CLink™ Ethernet-to-Cellular Router provides a low-cost, industrial-grade alternative to cable, DSL or Wi-Fi internet connections. The E2CLink™ delivers instant cellular connectivity over the Verizon network for any Ethernet enabled device.

**Figure 1: Connector Side View of the E2CLink**

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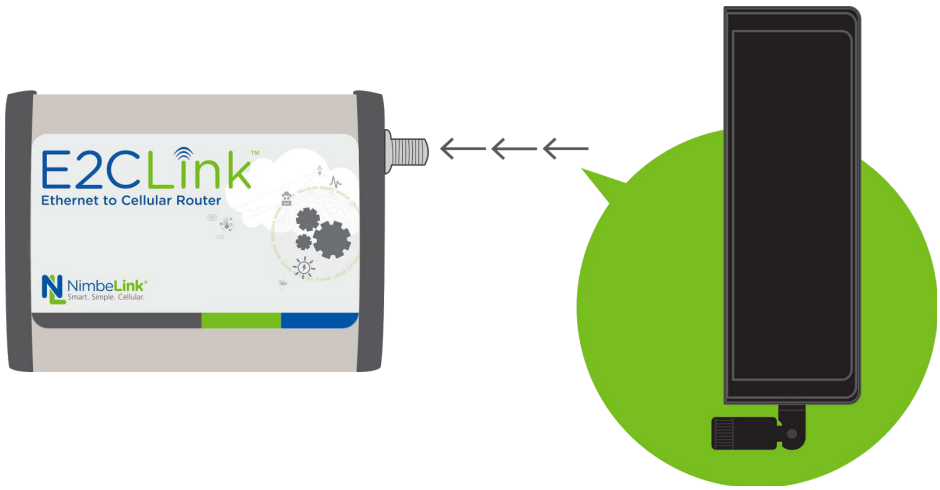
**Figure 2: Antenna Side View of the E2CLink**

## 2.2 Attach Antenna

The E2CLink requires an external antenna and provides a standard SMA connector for easy connection. On 2G and 3G devices there is only one antenna port. On 4G devices there are two antenna ports and both antenna ports need an antenna connected to them. If the E2CLink is installed inside of a metal cabinet, a remote antenna should be used.

The retail package includes a wide-band blade style antenna that can attach directly to the SMA connector.





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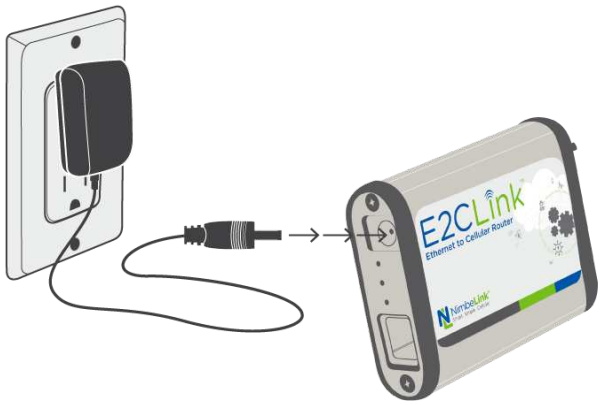
## 2.3 Apply Power

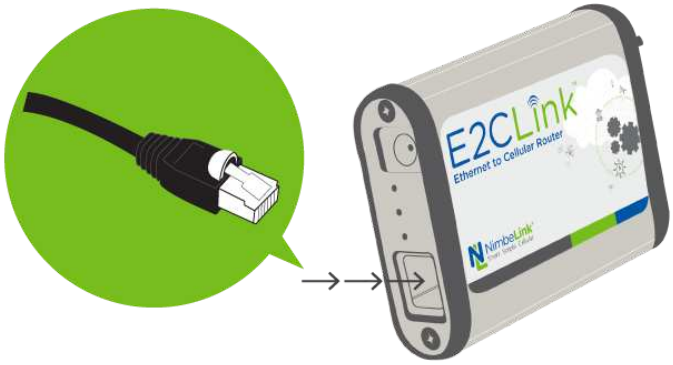
The E2CLink requires a 5V DC power source. The input is a 5.5mm outside diameter, 2.1mm inside diameter barrel jack. The center pin is +5V.

The retail package includes an AC to DC power converter with 6ft cord. Replacement part number: CUI INC. SWI6-5-N-P5




## 2.4 Plug in Ethernet Cable

The E2CLink connects to equipment with standard CAT 5/CAT 5E Ethernet cables through a RJ45 jack. The Ethernet port on the E2C Link does not support port over Ethernet (POE). If POE is needed an external converter must be used.





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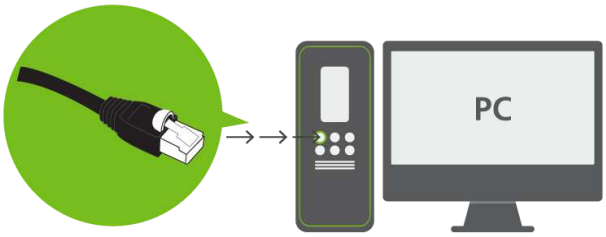
## 2.5 Plug in Equipment

The final step is to plug the other end of the Ethernet cable into a PC or router WAN port.




# 3. Get Connected

The E2CLink typically does not have an active cellular data plan when it arrives. Once a data plan is active, Verizon devices will automatically provision themselves during first use. While non-Verizon devices may need to have their APNs and or provisioning commands configured. The provisioning process typically takes a few minutes to complete.

Customers using devices on networks other than Verizon will need to contact their cellular data provider to set up a cellular data plan for their device. For Verizon enabled devices there are multiple data plan options available from NimbeLink that will get you connected in minutes or you may contact your Verizon account representative to set up your cellular data plan.

Cellular devices on the Verizon network can be classified as several different device types. On the Verizon Network the E2CLink is classified as a Machine to Machine (M2M) device and needs to be activated on an M2M account. SIM cards that are on consumer plans may not work with the E2CLink because of this classification difference. If your Verizon representative is having difficulties activating a cellular data plan for your E2CLink please have them contact NimbeLink's support team at https://support.nimbelink.com/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## 3.1 Connect with NimbeLink

If you don't have a Verizon M2M Business account, NimbeLink can provide Verizon data plans directly without contract commitments.

The available data plans can be viewed here:
http://nimbelink.com/skywire-cellular-data-plans/

To activate service please fill out our online form at http://go.nimbelink.com

To activate a line of service you will need to provide the following information for activation and billing purposes:

- Name
- Address
- Email
- Phone
- Desired Data Plan
- E2CLink MEID or IMEI & SIM ID number which can be found on the back of the device of the device (examples shown below)

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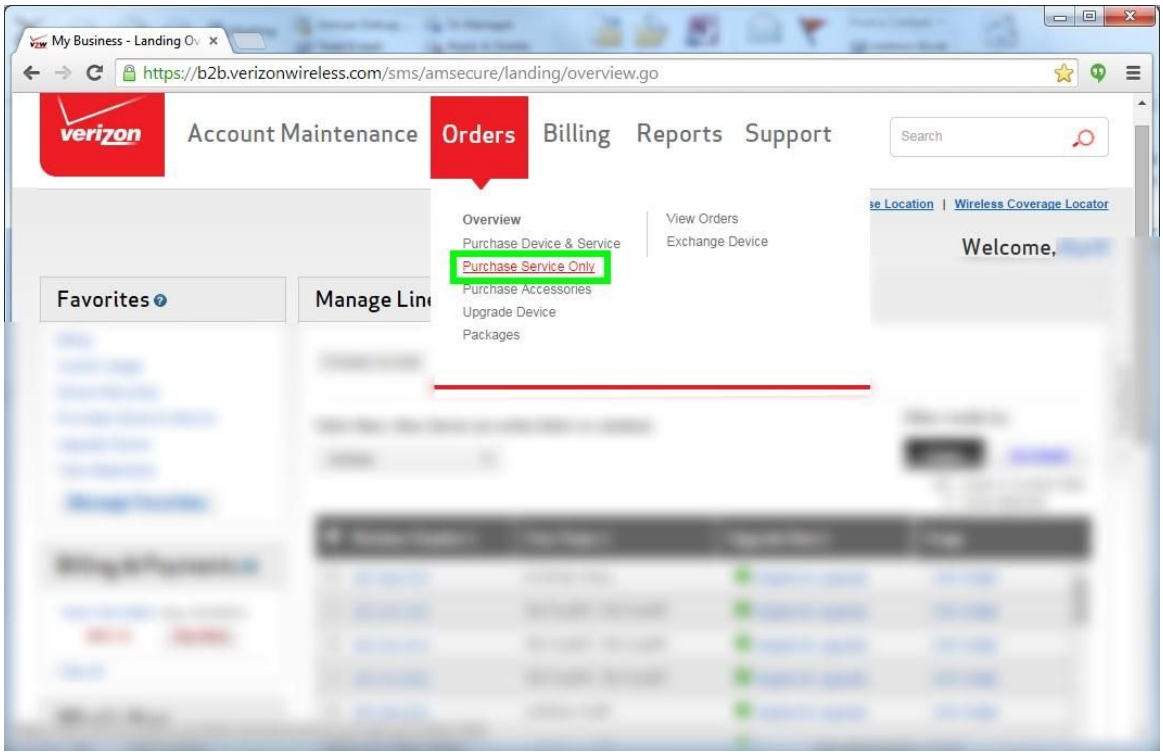
## 3.2 Activate on your Verizon Account

There are two ways to activate an E2C Link on your existing Verizon account:

1) Log into your Verizon My Business Portal account and select Orders -> Purchase Service Only. Follow the onscreen instructions.




2) Call your Verizon account representative and tell them you'd like to activate service on your E2CLink. You will need to supply the MEID or IMEI & SIM details which can be found on the bottom of your device. If your Verizon account representative would like the recommended feature codes for activating an E2CLink please have them contact NimbeLink at: https://support.nimbelink.com/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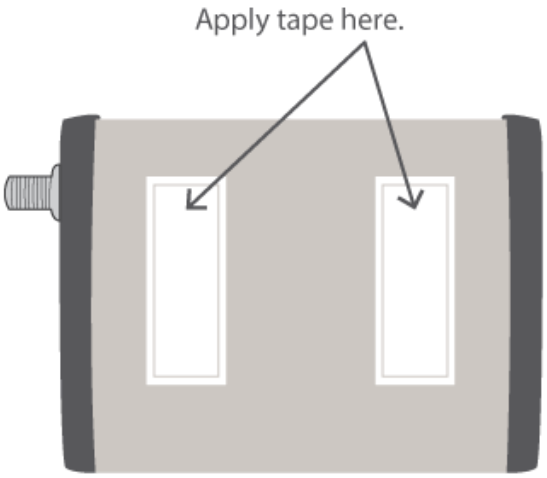
# 4. Mounting

The E2CLink is a rugged product that can be attached to equipment in numerous ways. The retail packaging includes two methods to adhere the E2CLink in the end application.

## 4.1 Adhesive Tape

The retail packaged product includes two pieces of weather-resistant, double sided polyurethane foam adhesive which can be applied to the enclosure to adhere the product to a surface. The adhesive attaches well to rigid surfaces.

1) Wipe dust from the surface of the E2CLink and apply double sided tape as shown. Be sure to copy the MEID or IMEI and ICCID (SIM number) from the bottom label if it will not be visible after installation.
2) Wipe dust from surface of the equipment and press the E2CLink firmly for 30 seconds.

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## 4.2 Reusable Strap

The retail package includes one reusable strap that can attach to many surfaces and provide an installation option that allows you to later remove the product if necessary.

1) Screw strap to desired surface using screw or bolt appropriate for the surface type.

2) Wrap strap around E2CLink and tighten strap to secure the product.

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# 5. Default Operation

When power is applied, the E2CLink will obtain an IP address from the cellular network if the device has a valid cellular data plan. The IP address may be either static or dynamic, and is assigned by your cellular service provider.

By default, the E2CLink acts as a DHCP server and will assign an IP address to any equipment that connects via the Ethernet port. The E2CLink will provide the IP address, subnet mask and default gateway information to the equipment.

If the connected equipment requests or sends data from/to an external IP address, the E2CLink will use the cellular connection to process the request and route the data back to the originating equipment.

The device has 3 states:

Powered-Off: The E2CLink does not have power. This is indicated by the power LED being off off and is caused by the device being unplugged or not having any power applied to its input. The ethernet and cellular network are powered down and cannot be detected by the cellular network or any downstream equipment.

Initialization: When power is applied to E2CLink, the power LED will turn on and stay on and the cellular and ethernet Status LEDs will be off. The E2CLink will go through its initialization phase where it will attempt to automatically connect its WAN interface to the cellular network and enable the LAN connection via it's Ethernet port.

The initialization phase may take several minutes to complete.

Powered-On: Once the E2CLink completes its initialization phase it will enter its powered-on mode. This is indicated by the Power LED being on and the Cellular and Ethernet Status LEDs may be on or blinking to indicate connection status and activity.

Once the E2CLink has reached the Power-On state, the connected equipment can get a DHCP address and begin sending/receiving data over the internet. The E2CLink is now connected to the cellular network and is ready to send and receive data.

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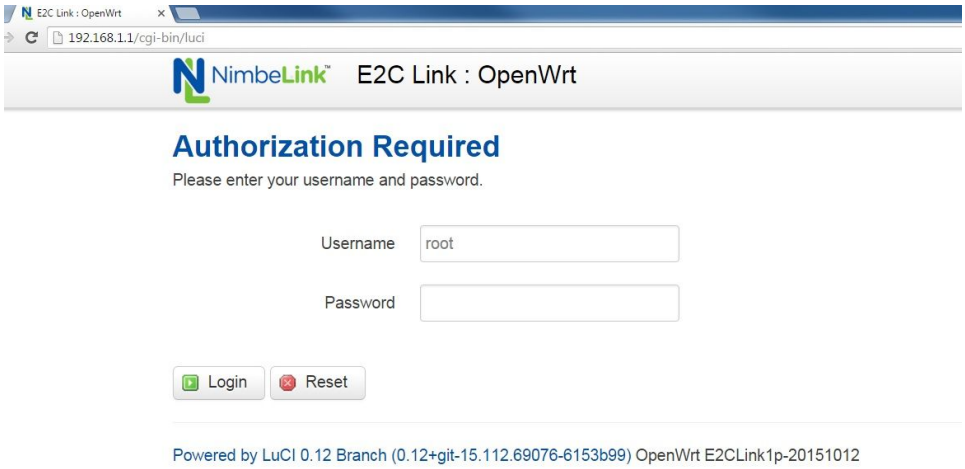
# 6. Accessing the Management Console

For advanced networking scenarios, the E2CLink configuration can be modified via a web-based management console. The E2CLink is based on the OpenWRT operating system so there is extensive flexibility in how the device can be configured. Typical network use cases may require opening Ports, setting up specific routing rules, or adjusting default Firewall settings.

## 6.1 How to Connect to the Management Console

1) Connect the E2CLink to a PC with an Ethernet cable.
2) Configure the PC Ethernet port to get an IP address via DHCP.
3) Apply power to the E2CLink and wait one minute. After one minute the E2CLink should be close to completing or will have completed its initialization process and will have assigned an IP address to the PC.
4) Using a web browser on the PC, navigate to the web URL: 192.168.1.1

   The E2CLink will serve up a web page. The default username is root and password can be left blank until a new username and password are set.





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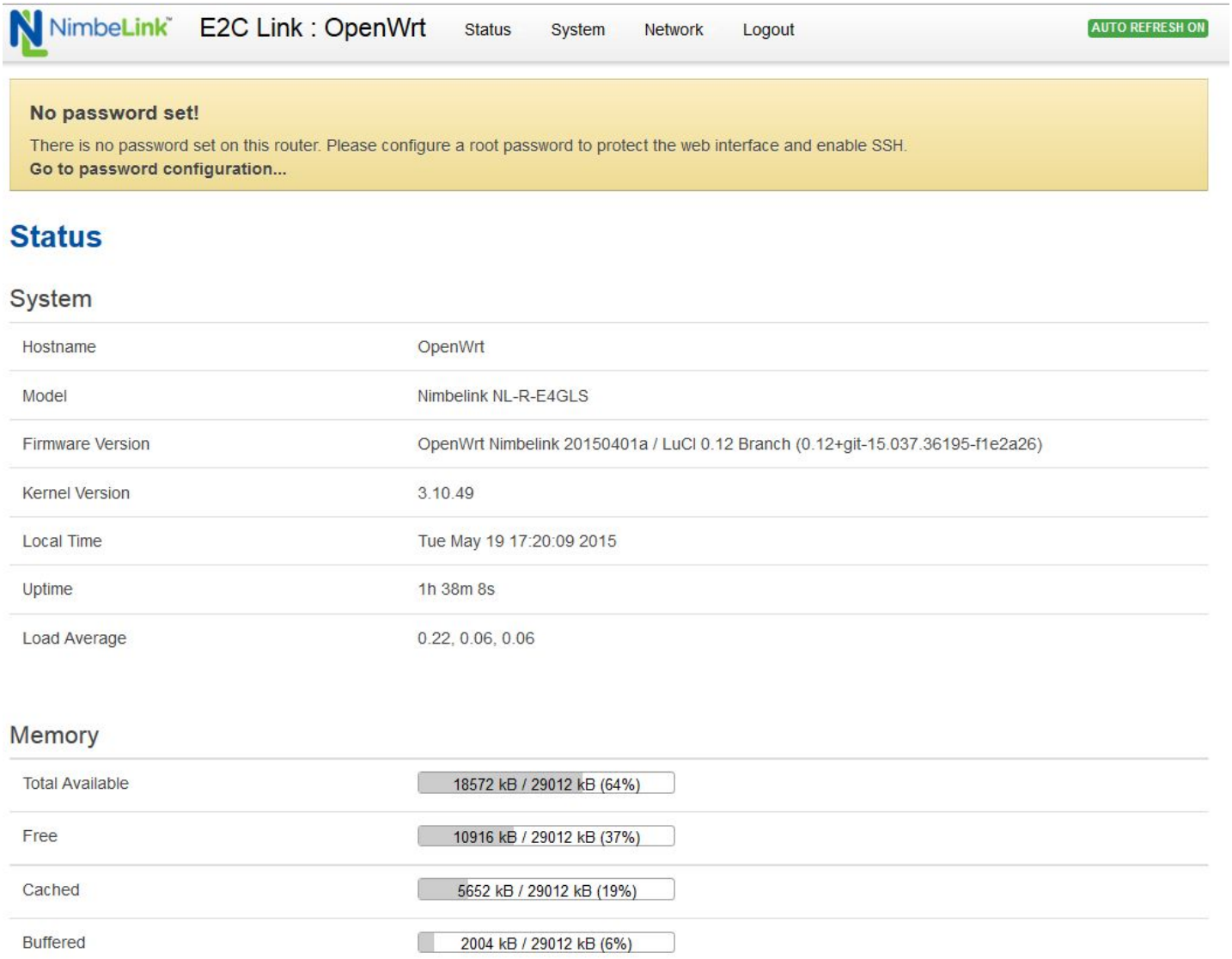
5) Once the user has logged into the E2CLink they will be greeted by the Status page where they can view system information of the E2CLink. If the password is not set a yellow warning box will be visible on the top of the page as shown below.

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# 7. Password Configuration

The E2CLink is shipped with “root” as the default user name and no password. The password needs to be configured upon setup to secure the device against unwanted users. The password can be changed under *System>Administration* as indicated by the blue circles in the image below.

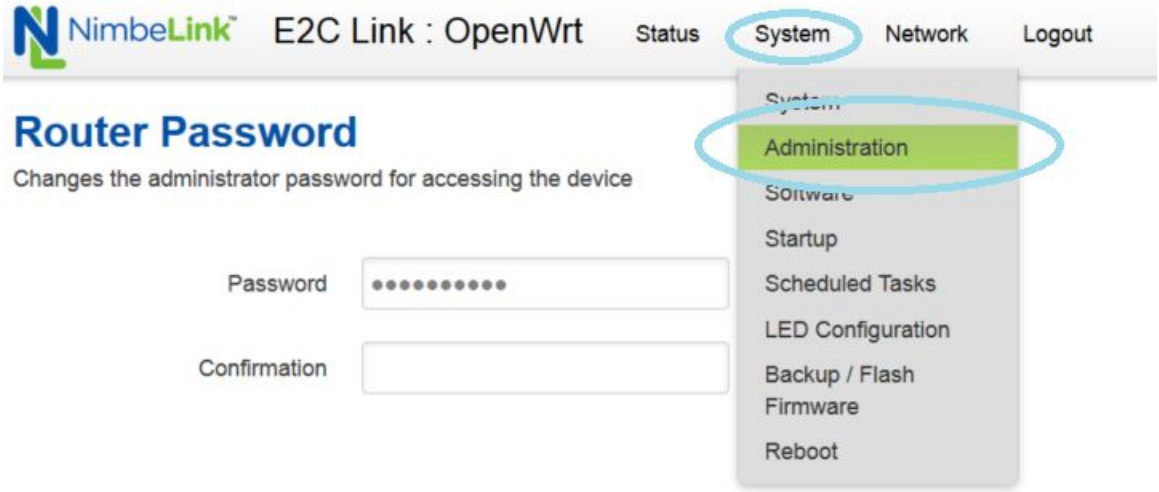


Figure 5

# 8. Lost Password Reset

If the E2CLink administrative password is lost or the unit has been configured for a static IP address that is now unknown, the unit can be recovered by reflashing the firmware using the boot loader failsafe method. Note that this recovery method does revert the unit to factory settings and the previous unique configuration will be lost. You will need a computer on which you can manually set a static IP address. **DO NOT** remove power from the device during the reset process as removing power could damage your device.

## 8.1 Steps to Reset a Lost Password

1) Obtain the latest version of the E2CLink Firmware by contacting your NimbeLink representative at https://support.nimbelink.com/. You will need this firmware image on the computer before you disconnect it from its normal network and connect it only to the E2CLink being recovered.
2) Remove power from the E2CLink.
3) Connect the computer and the E2CLink together. Make sure they are the only two things connected to this network segment.


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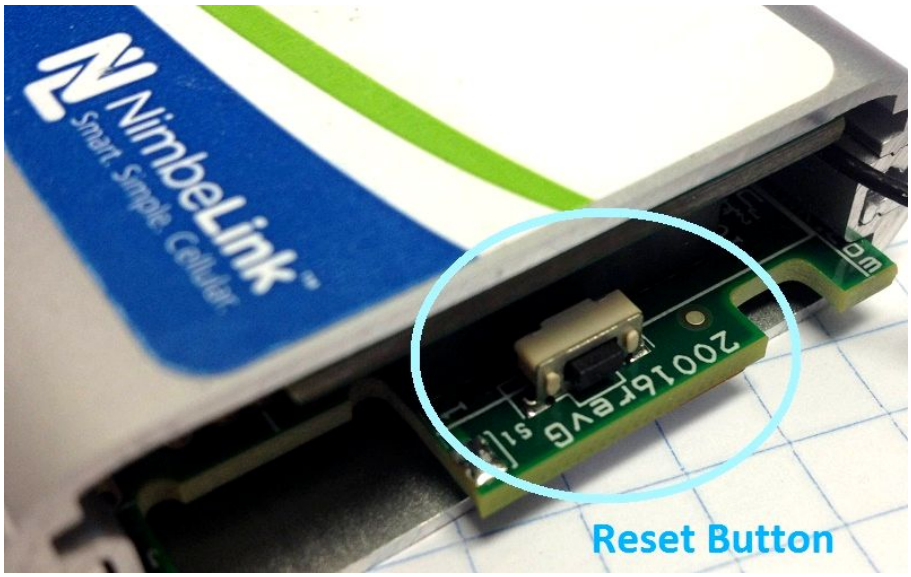
4) Use a T-9 Torx screwdriver to remove the endplate with the antenna connector(s) attached. Remove both screws and the end plate will come away, revealing a small push button on the PCB in the center of the opening. This small push button is the reset button. Be careful not to pull the end plate and coax cable too far out from the enclosure. The coax cable is fragile.
5) Configure the computer for a static IP address of 192.168.1.2
6) Press and hold the reset button on the E2CLink.




7) Apply power to the E2CLink and carefully watch the LEDs on the other end. As soon as you see four blinks from the two LEDs closest to the Ethernet jack, release the reset button. You should get a burst of fast blinks from the two LEDs. If you do not get the faster blinks, power off the E2CLink and try again.
8) Use a browser on the computer to navigate to the management console at 192.168.1.1. You should see the following screen displaying “Firmware Update” in a large font.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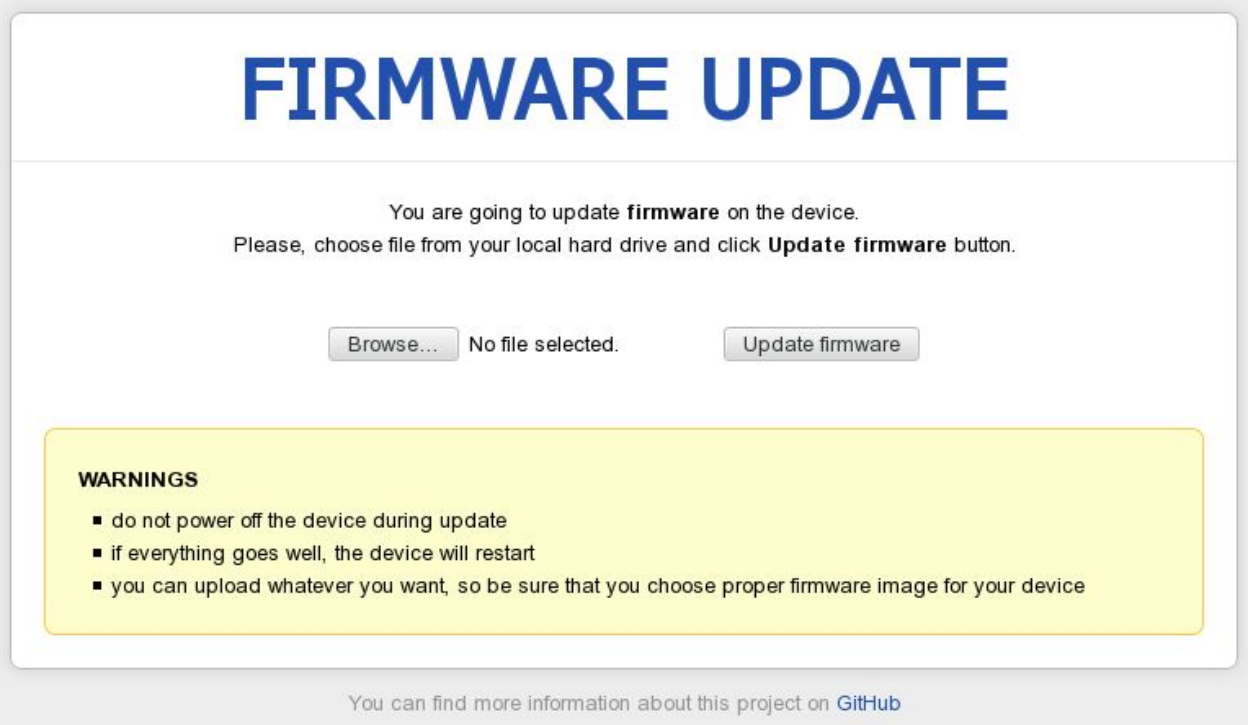


9) Click the browse button to select the firmware image provided by NimbeLink.
10) Click the *Update Firmware* button to initiate the firmware installation. This will load an update page indicating the firmware update is in progress. **DO NOT** remove power from the device during this process as this will brick the device.
11) When this process completes, the E2CLink will be reflashed with fresh firmware and all settings will be reverted to factory default. There will be no administrative password set and you will need to reconfigure any custom settings you had in the router, including the cellular APN if that was previously customized.


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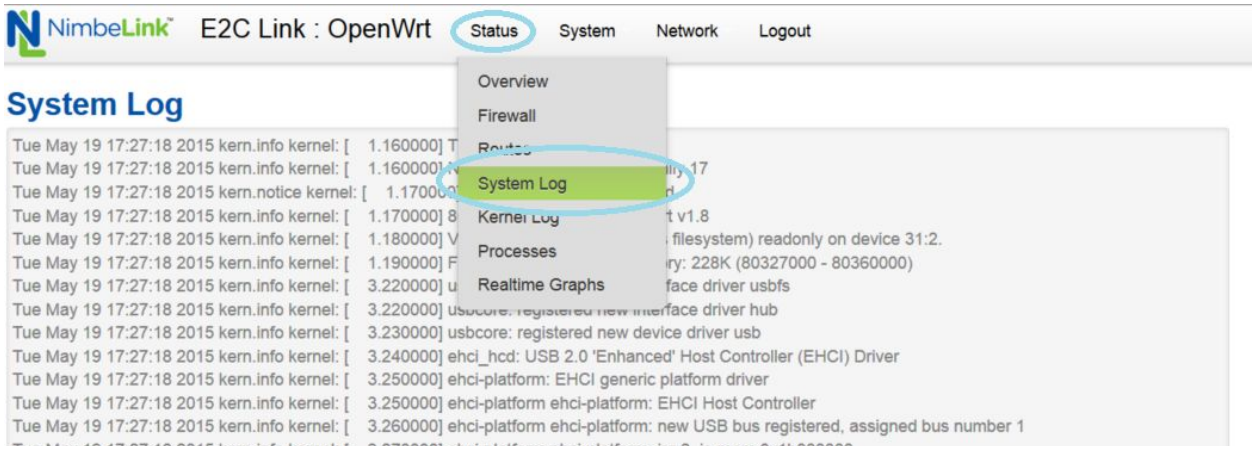
# 9. Checking the MEID/IMEI/SIM ID

The device's MEID/IMEI is a unique identifier for the cellular modem inside of the device. The IMEI can be found in two places. The first is on the back side of the case on the devices label.

The second option is to check the system log where the device's MEID/IMEI, SIM ID, and phone number can be found. To access the system log go to *Status>System log*.




To find the IMEI/MEID, SIM ID, or phone number search the page (ctrl+f in most browsers) for MEID, IMEI, SIM, or phone numbers. The phone number may not be available depending on the firmware version on your E2CLink.

# 10. Updating the Firmware

The latest version of the E2CLink Firmware is available by contacting your NimbeLink representative at For additional troubleshooting resources, or to ask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any technical questions, please visit: https://support.nimbelink.com/. It is recommended to update to the latest firmware version during the device's initial configuration.

To flash the E2CLink's firmware go to *system>Backup/Flash Firmware.* Under the “Flash new firmware image” section click the “choose file” button (3) then navigate to the firmware file provided by NimbeLink and select it.

Make sure the “Keep Settings” option is not selected. Then click the “Flash Image” (4) button to start the firmware update. This will load a new page asking for a confirmation and displaying the MD5 sum of the firmware image. Confirm that the MD5 sum is correct against the MD5 sum provided by NimbeLink for the Firmware image and click continue.

The E2CLink will now flash the new image; DO NOT disconnect power to the device during this process. When the new firmware has been flashed the router will reload the login screen. The user information will revert to its default settings.

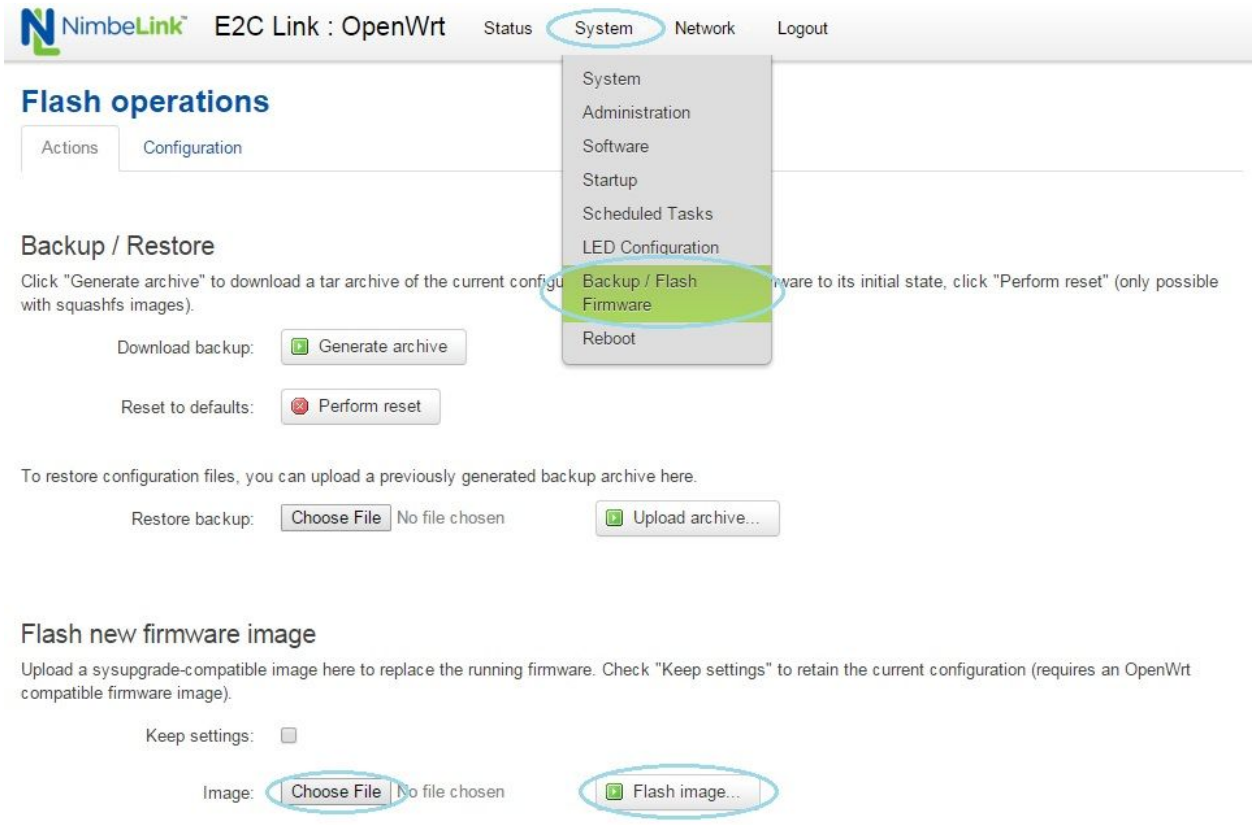


**Figure 6**

# 11. Accessing the System Log

The system log is a log files that records systems events. This log file is used to diagnose any issues that may arise when using the E2CLink and a copy may be needed by service technician to diagnose any issues. To view the system log go


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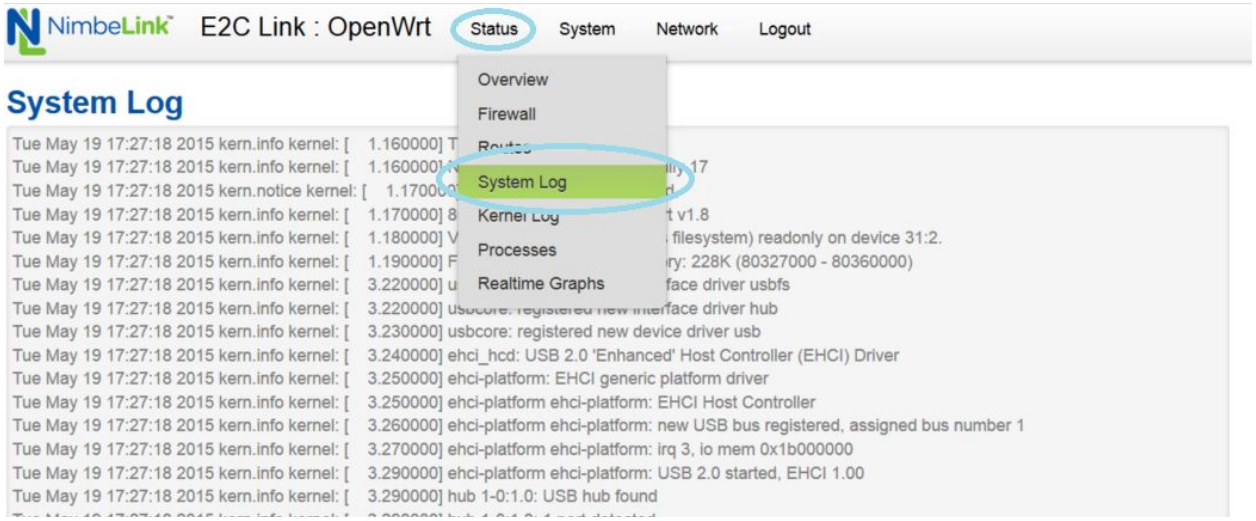
to S*tatus>System Log*. Data in the System Log is constantly being overwritten; startup data may not be available after the system has been running for some time.




# 12. Startup Script

Upon boot-up, the E2CLink runs a Local Startup script in addition to any user scripts that may have been configured. The Local Startup script allows to user to

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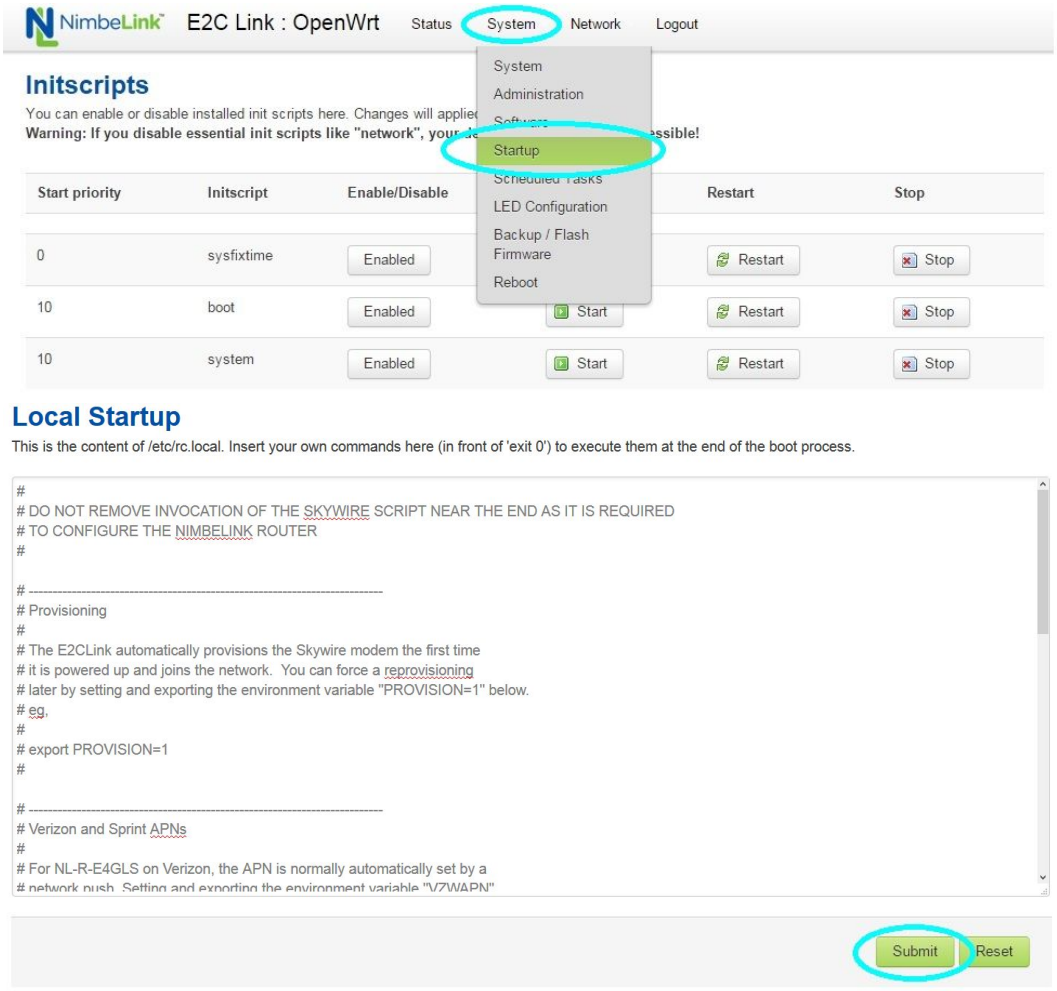
manually provision the modem and manually configure the devices APN (Access Point Name) for applicable devices.

The Local Startup script is divided into five sections: Provisioning, Verizon and Sprint APN configuration, AT&T & T-Mobile APN configuration, Skywire™ initialization, and a custom script section.

To access the Local Startup script navigate to *System>Startup* as indicated by the image below. This will load the page where the Local Startup script resides. When the Local Startup scripts configuration is complete click the submit button (2) and then restart the E2CLink by going to S*ystem>Reboot.*




# 12.1 Provisioning

Upon the first initialization of the E2CLink, or when the plan associated with the E2CLink is deactivated and then a new one is activated, the modem will need to be provisioned. This is the initialization process where the cellular modem in the E2CLink becomes a registered device on the cellular carrier's network and receives its phone number and APN (Access Point Name). 4G and GSM devices require an APN for (APN is needed for 4G LTE devices and GSM devices).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