Emu Router

User Manual: ER2500T-XX-CAT1

Rev: V3.0

28th March 2018

Revision History:

Date	Rev No.	Description	By
03-28-2018	V1.0	Initial draft	CIO
03-29-2018	V2.0	Removed Section 7.4	CIO
03-29-2018	V3.0	Added "Professional Install" sections 7.4.1 & 7.4.2	CIO

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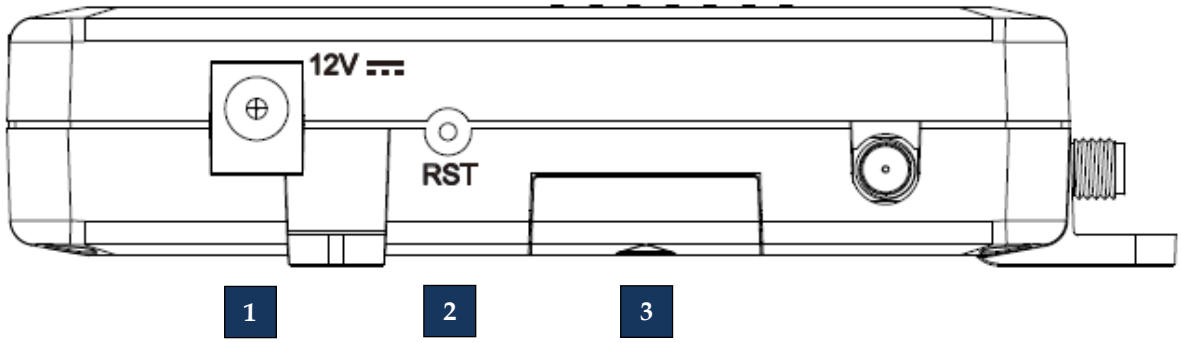
1. Introduction

Connected IO Inc's., Emu Router is a 4G router offering CAT1 connectivity for M2M applications. The Emu router includes a 4G modem with an embedded host processor based on the Mediatek MT7620A SoC which also supports 802.11 b/g/n WiFi functionality. The 4G connectivity is made by an operator certified LTE module.

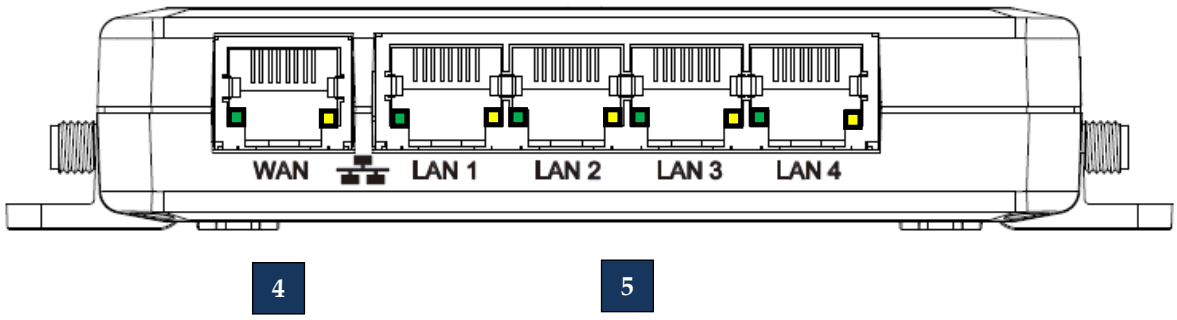
This document provides instructions, and basic operational guidelines, to aid a Systems Administrator with the deployment of this product.

2. Hardware Configuration

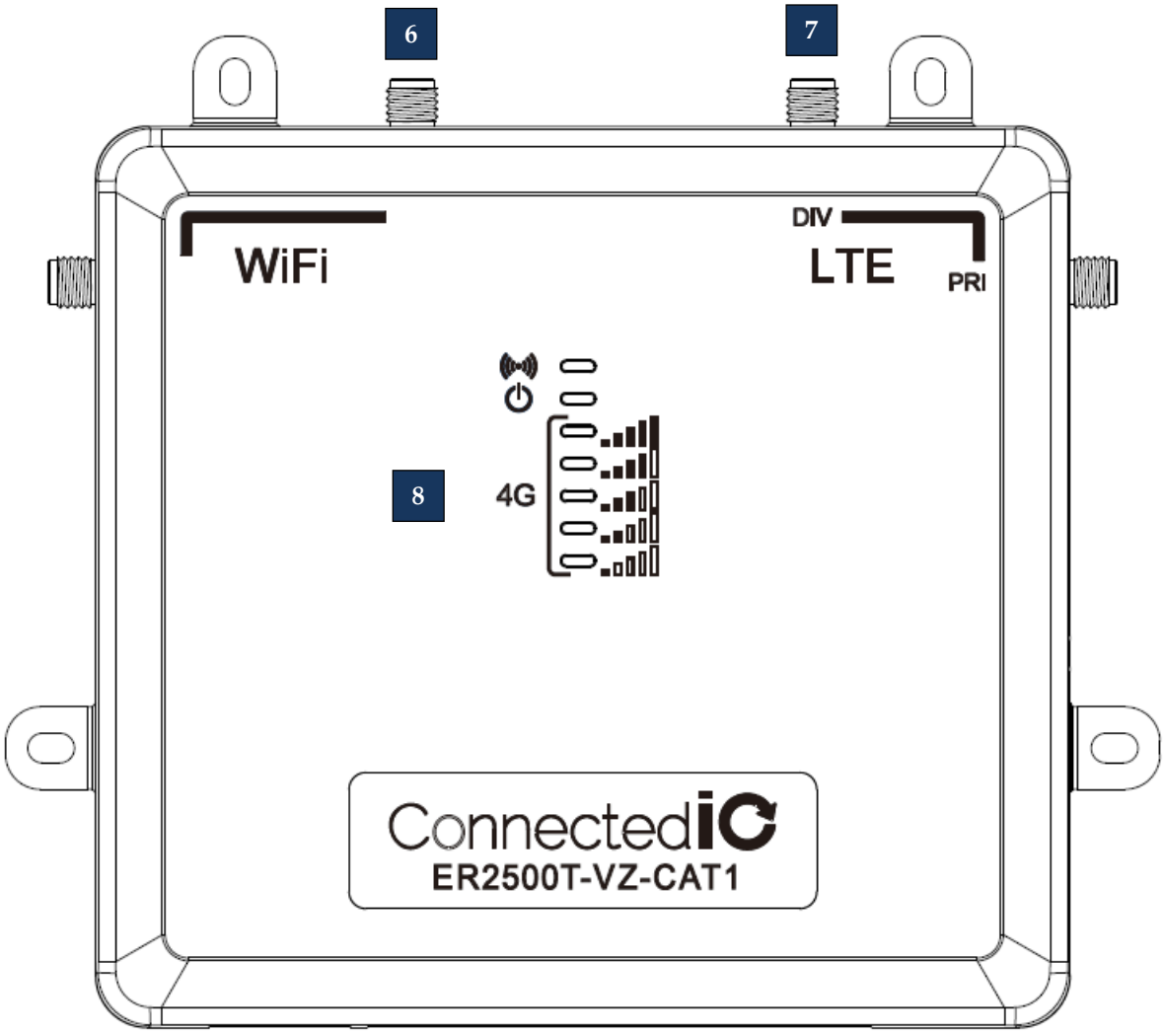
2.1. Product Interfaces



Number	Item	Description
1	DC Power Input	12VDC @ 2.0A Input. Center conductor is Positive
2	Reset Button	Push & Release to reset the device Push & Hold for 5-seconds then release installs factory preset
3	SIM Access	2FF Mini-SIM format Slide the door open to access the SIM holder. Push SIM into the holder to engage, push a second time to eject the SIM



Number	Item	Description
4	WAN Port	WAN Port for establishing links to leased telecommunication circuits LED: Solid Green for Link, Flashing Green for Traffic
5	LAN Port	LAN Port for Wired Ethernet Clients LED: Solid Green for Link, Flashing Green for Traffic



Number	Item	Description
6	WiFi Antenna	SMA connector for WiFi Antennas (NOT Reverse Polarized)
7	Cellular Antennas	SMA connector for both Primary and Diversity Antenna Ports
8		WiFi LED, Orange: Wifi is connected/Off: No WiFi

		Power LED, Yellow: Power is connected/Off: unit is off
		Cellcular Connection Strenght Indicators, Green: Cellcular Connection The following table lists the signal strength range corresponding to the number of LEDs lit: 5-LEDs On: > -61dBm 4-LEDs On: -63 dBm to -71 dBm 3-LEDs On: -73 dBm to -83 dBm 2-LEDs On: -85 dBm to -98 dBm 1-LED On: -97 dBm to -107 dBm No-LEDs: < -109 dBm

2.2. Radio Configurations

Model Name	LTE Band (MHz)	3G (MHz)	WiFi
ER2500T-NA-CAT1	• B2: 1900 PCS • B4: 1700/2100 AWS 1 • B5: 850 • B12: 700 ac • B13: 700 c	• B2: 1900 • B5: 850	• Yes, 802.11 b/g/n compliant
ER2500T-VZ-CAT1	• B2: 1900 PCS • B4: 1700/2100 AWS 1 • B13: 700 c	• No Fallback	• Yes, 802.11 b/g/n compliant

3. System Configuration

3.1. Initial IP Setup

The Emu Router Management GUI can be accessed through the Ethernet ports with the default IP address of **192.168.71.1**.

To configure the Emu Router, follow the following sequence:

- Connect the Ethernet cable between the computer and the Emu Router LAN port
- Setup the desktop as a static IP in **192.168.71.**x domain or DHCP client to get IP from EMU Router
- Open a browser and type http:// **192.199.71.1** to start the settings

On login page, you can just click the Login icon to enter the GUI as shown in Figure 1. Default password is “password”, it is recommended that a new password be created under Web GUI System->Administration page.

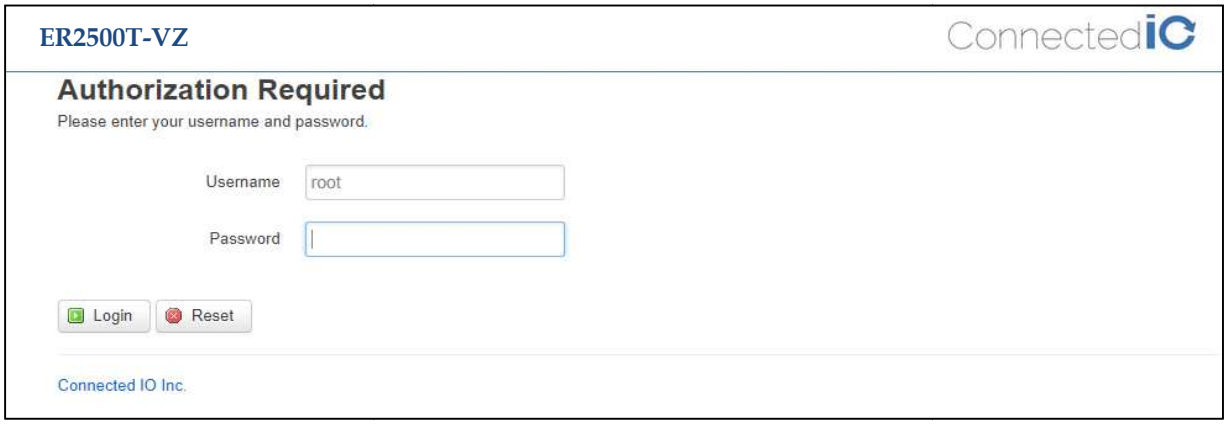


Figure 1: Login Page

The EMU Router overview is available after logging into the GUI, the overview page includes important messages such as system status and memory information as shown in Figure 2.

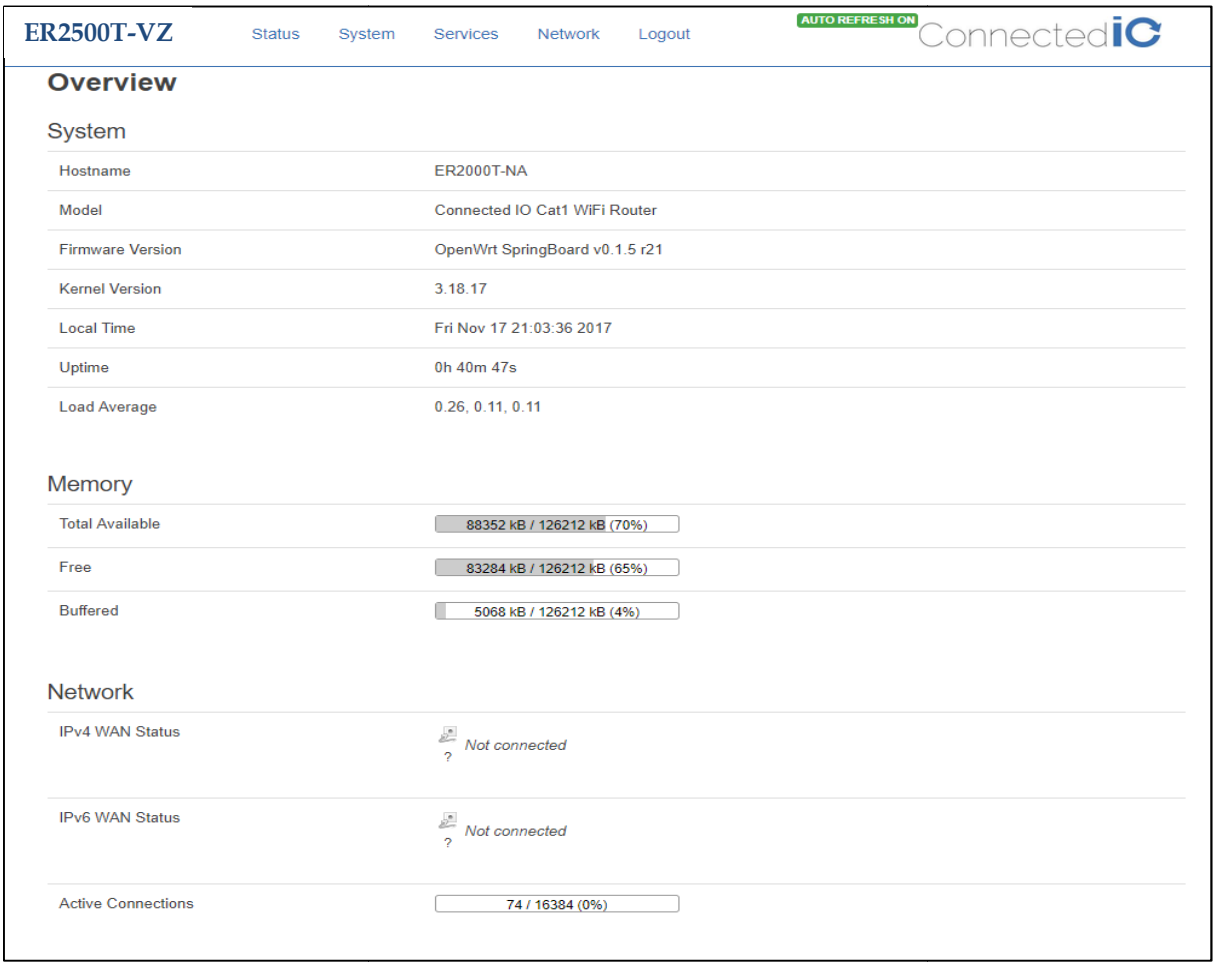


Figure 2: Overview Page

3.2. Setup New IP

Select Network->Interfaces as shown in

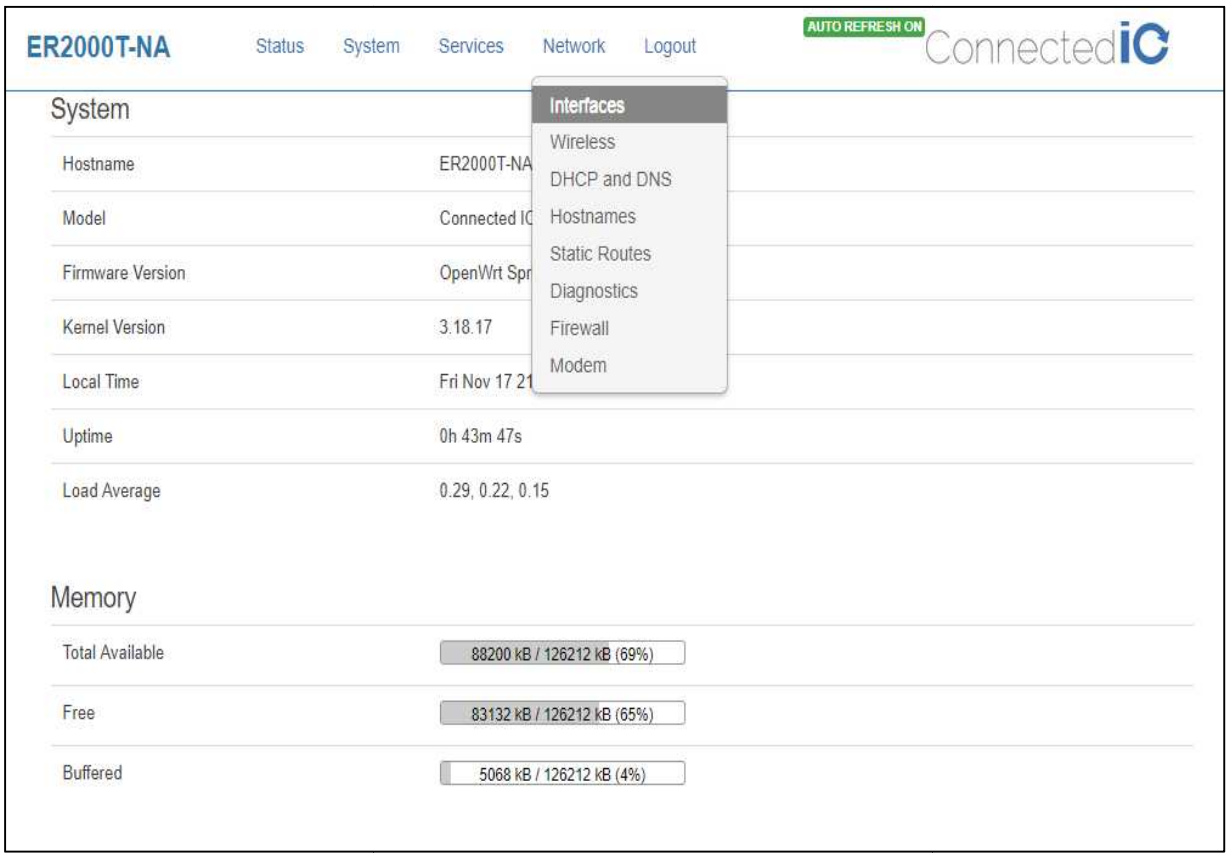


Figure 3.

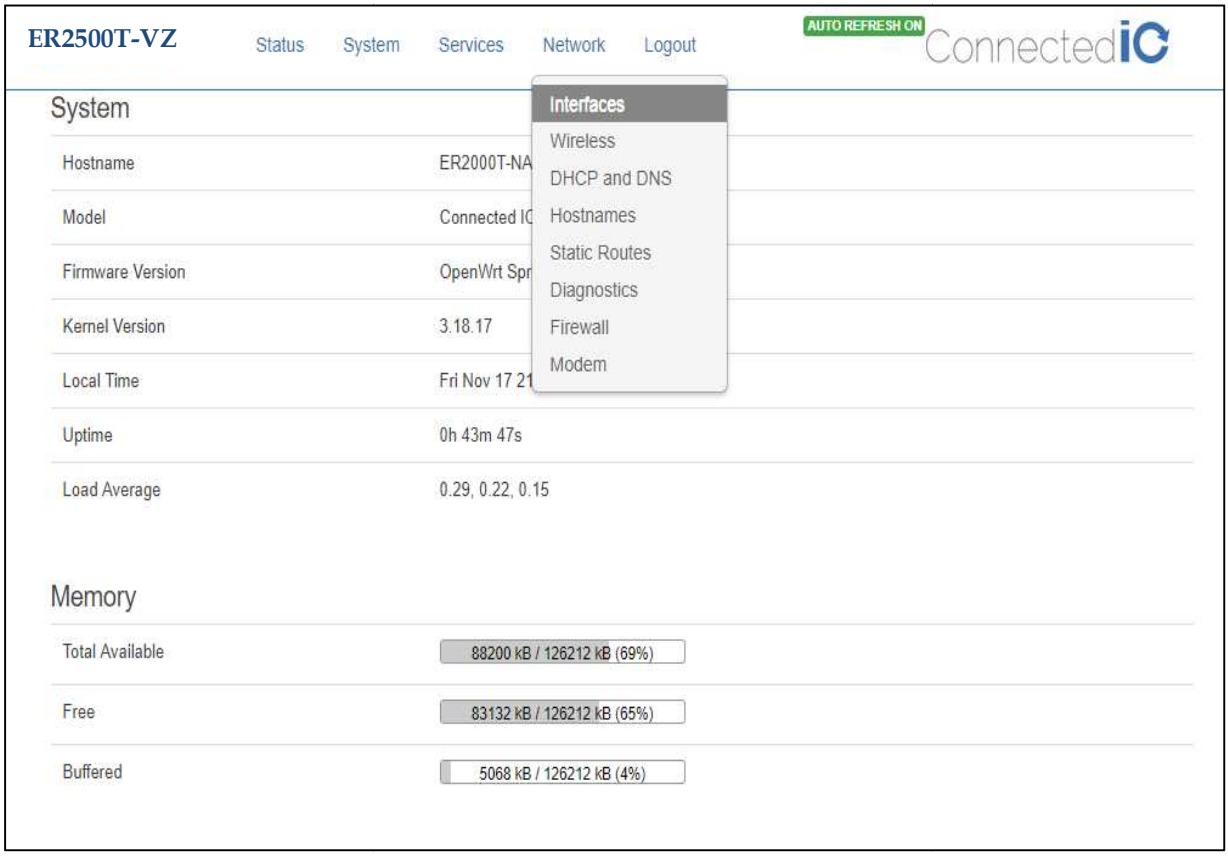


Figure 3: Network List

Select LAN and click "Edit" from Figure 4.

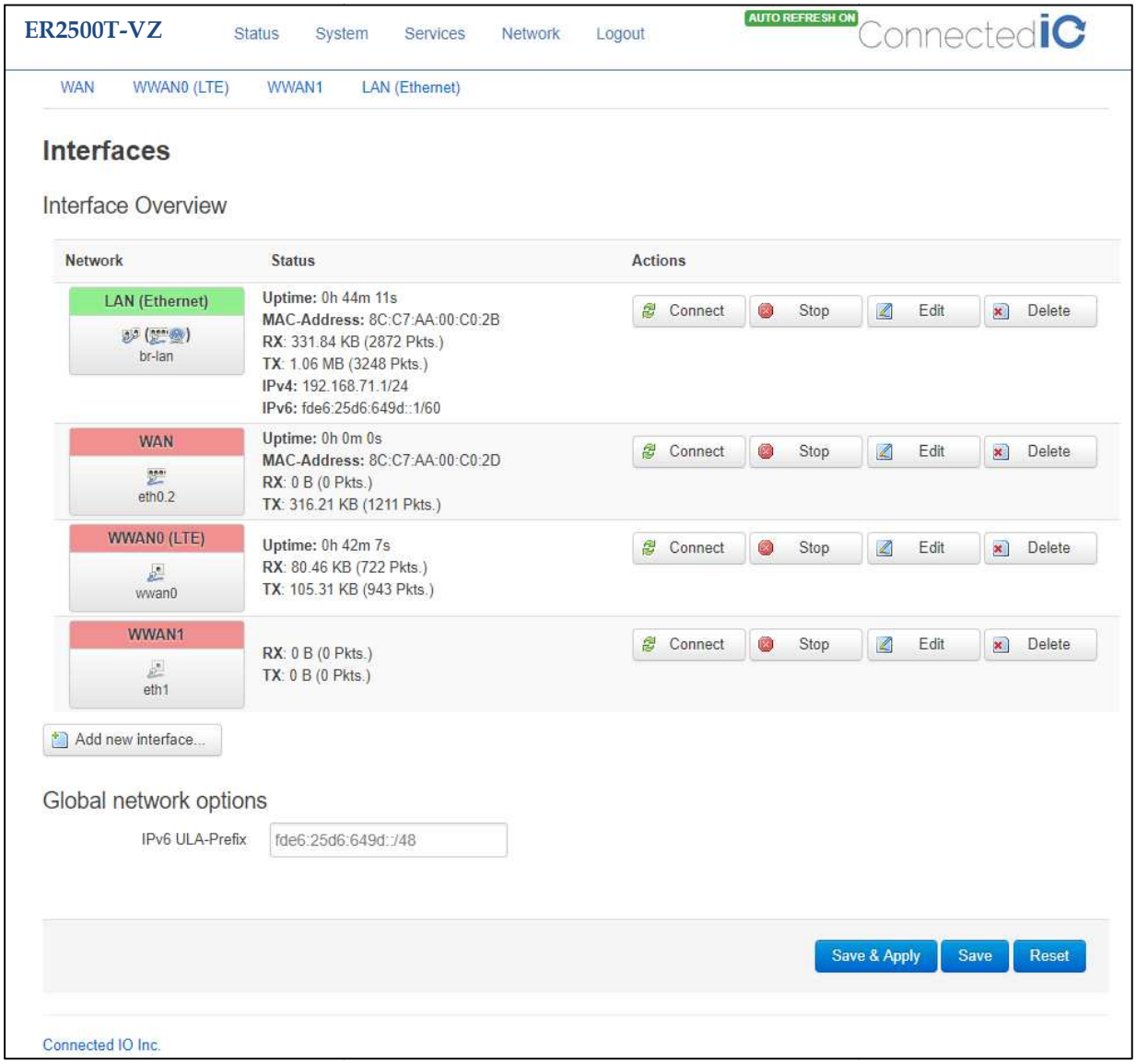


Figure 4: Interface Overview

Enter the new IP address in the "IPv4 address" filed, and then click the "Change" icon in the bottom-right corner in Figure 5.

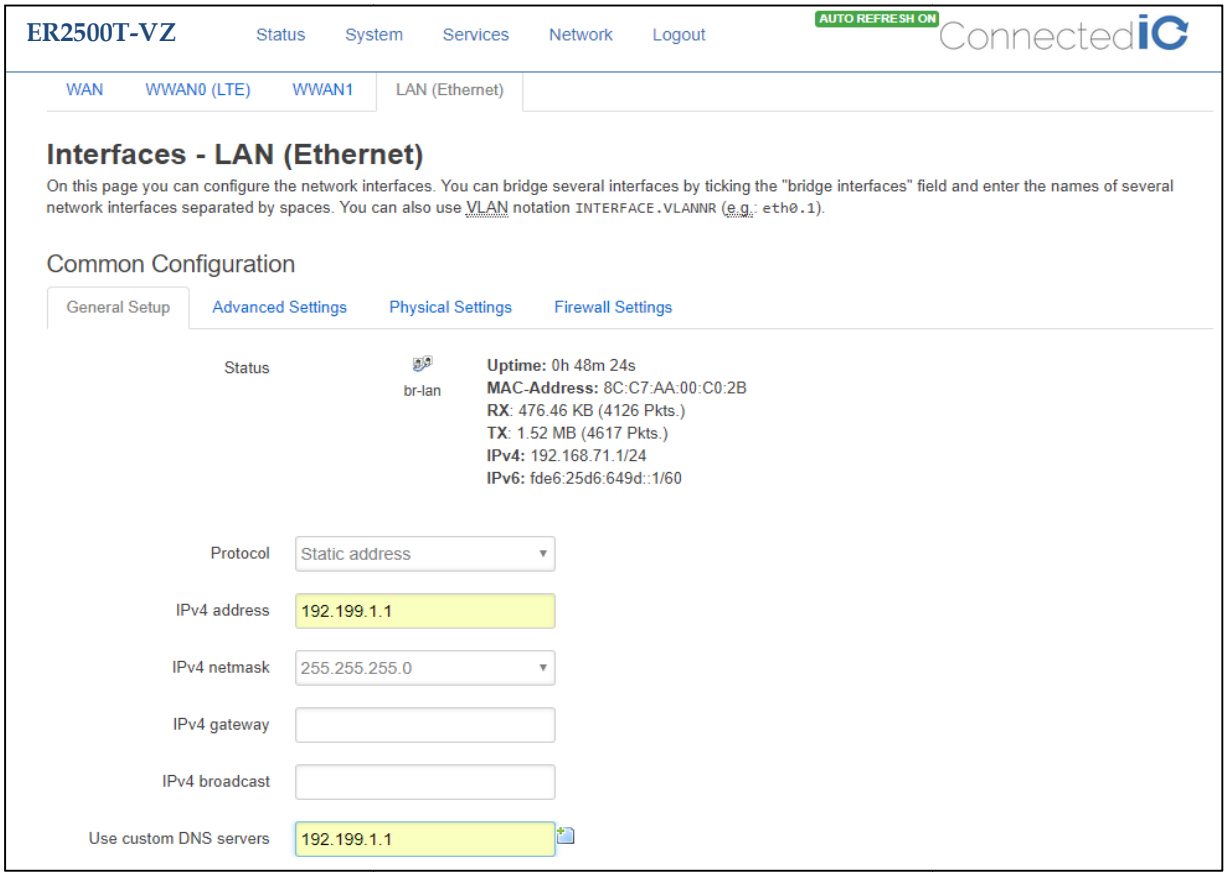


Figure 5: New IP Address for LAN

After the new IP setup, scroll down to the bottom of the page and press "Save & Apply" as shown in Figure 6.

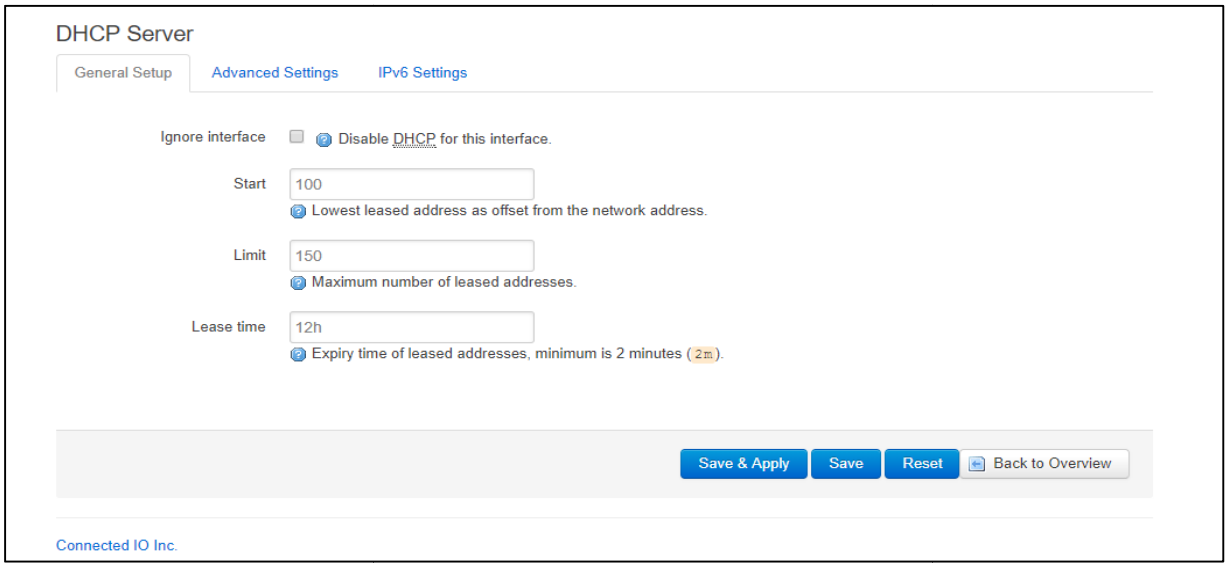


Figure 6: Save the New Setting

3.3. Connecting to the WiFi

For computers using the Windows operating system (For instance: Windows 10), Click the network internet access icon and if there are wireless networks in range, try to connect to a WiFi "ConnectedIO_M2M" network without security key as shown in Figure 6.

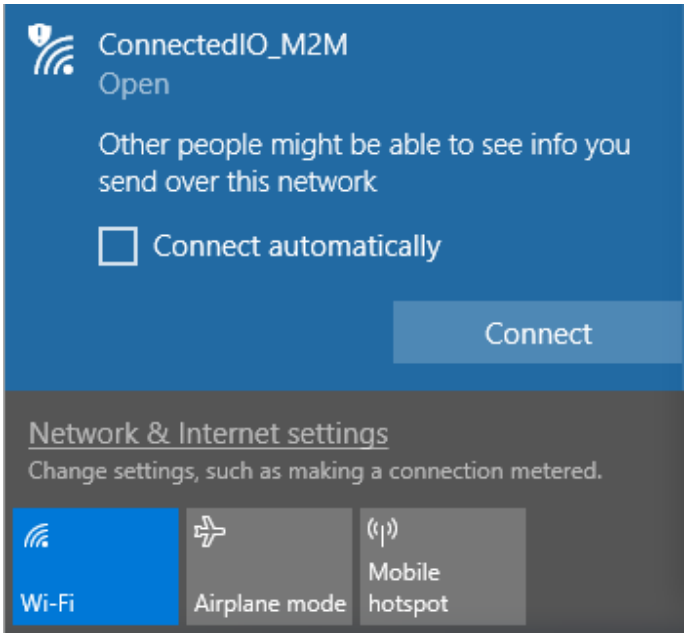


Figure 8 : Network Internet Access

Open a browser and typing http://192.168.71.1 to login into the GUI again. Once the GUI is up the user should see the EMU Router overview with WiFi Connection information as shown in Figure 9, Wireless Information.

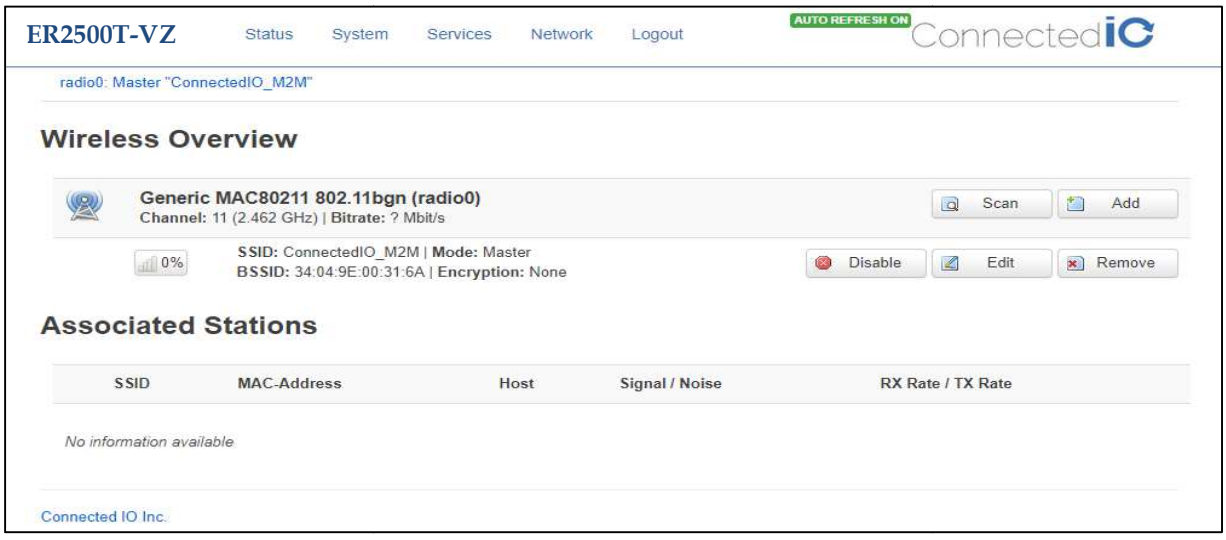


Figure 9: Wireless Information

4. System Maintenance

This chapter describes how to back-up the current EMU Router configuration to your computer, and how to restore that same configuration later if needed. This can be done by selecting System > Backup/Flash Firmware:

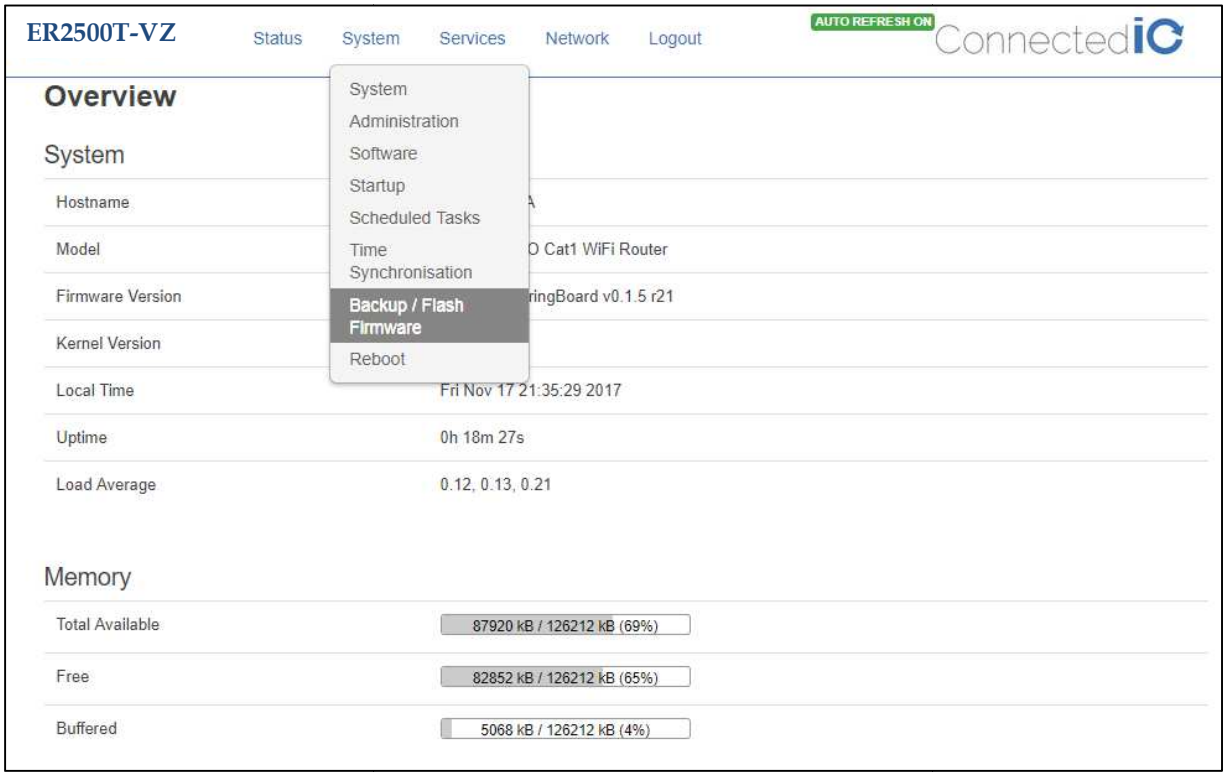


Figure 10: System List

4.1. Backup the Configuration

Select Firmware in the GUI page then click the icon "Generate archive" to save this configuration to a file in the folder you've specified.

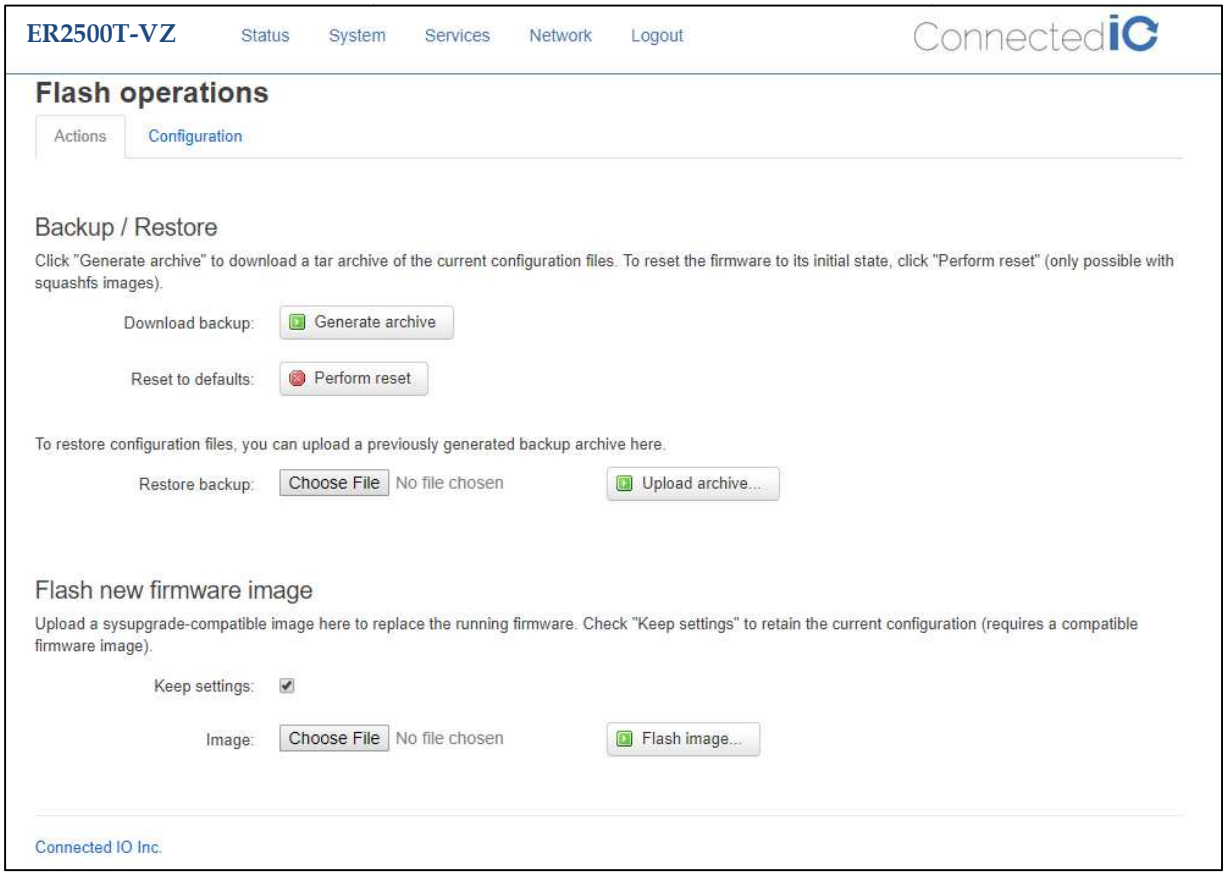


Figure 11: Backup the Configuration

The file is in tar.gz format, CIO suggests that you rename it to a meaningful filename for easy recovery.

4.2. Restore the Configuration

Click the icon "Choose File", select the backup file, and then click "Upload archive" in flash operations page as shown Figure 7. Device will write the stored configuration back to flash then reboot the system.

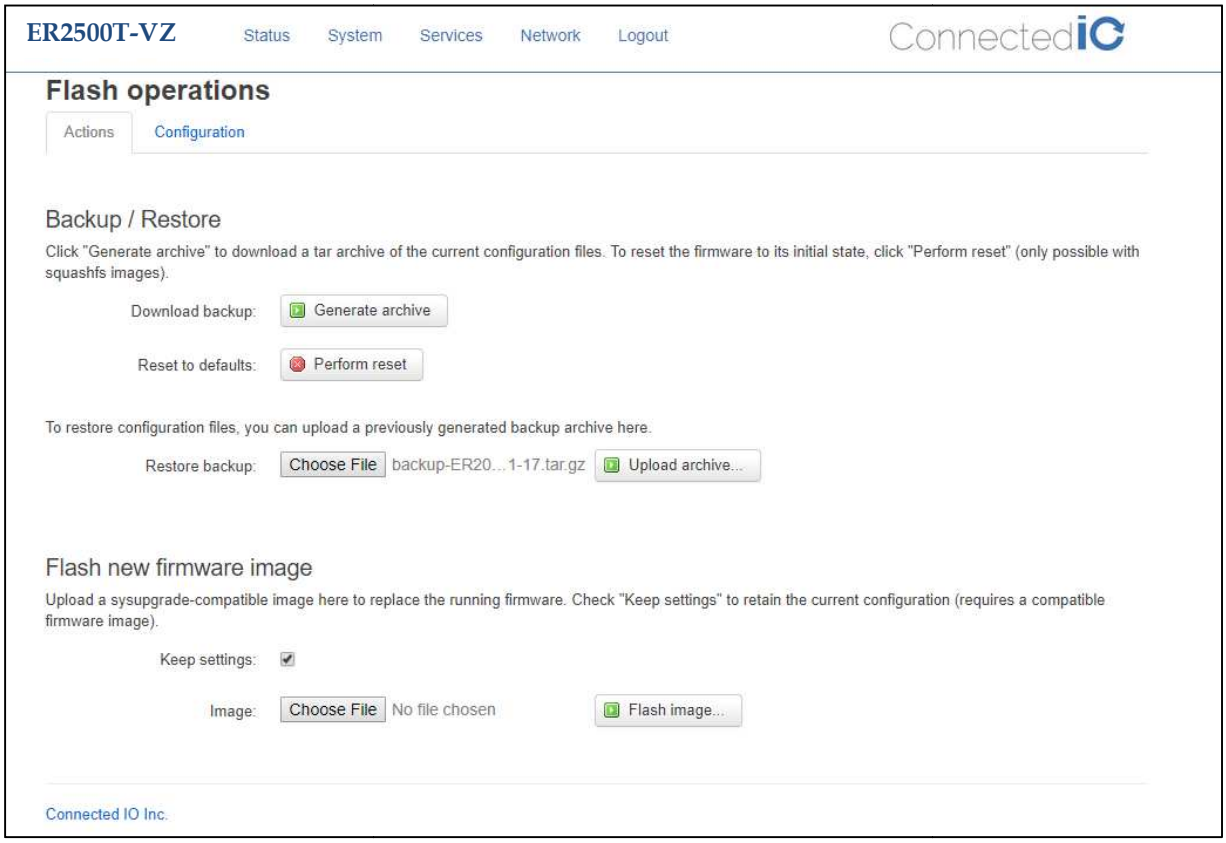


Figure 7: Restore the Configuration

4.3. Reset to Factory Default under Web GUI

Click the icon "Perform reset", a warning window will pop-up saying, "Really reset all changes?" The device will reset to factory default and reboot if "Yes" is chosen.

NOTE: It is important NOT to power off the device before the entire process is completed.

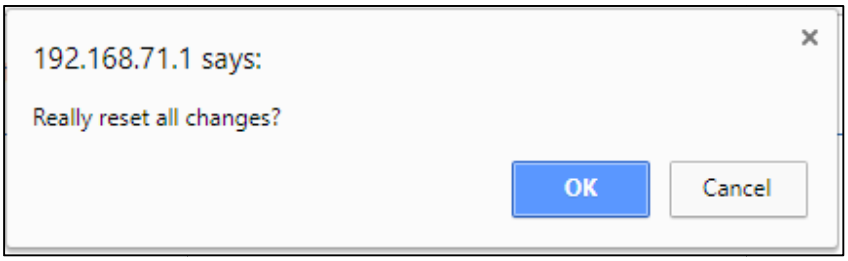


Figure 8: Reset to Default

4.4. Firmware Upgrade

Select System from web GUI, and find "Backup/Flash Firmware" section. Click the icon "Choose File" and select the new image that you want upgraded to the device, then click "Flash image". After system uploads the file, click "Proceed" on the confirmation page as shown in Figure 15.

The upgrade process may take longer than 10 minutes for flashing and rebooting. It is important NOT to power off the device during the process. Administrators can PING the device after the upgrade process is completed to ensure that the device is programmed and rebooted successfully.

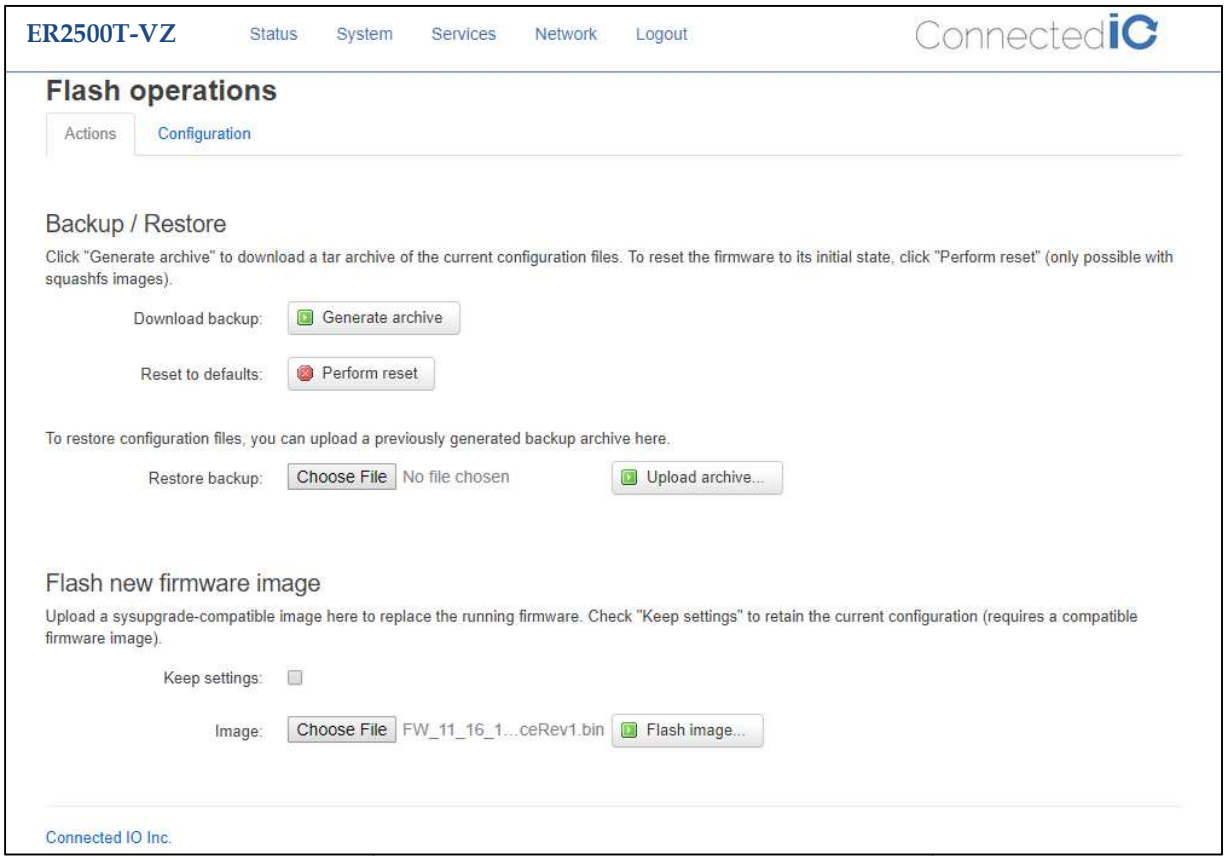


Figure 9: Firmware Upgrade

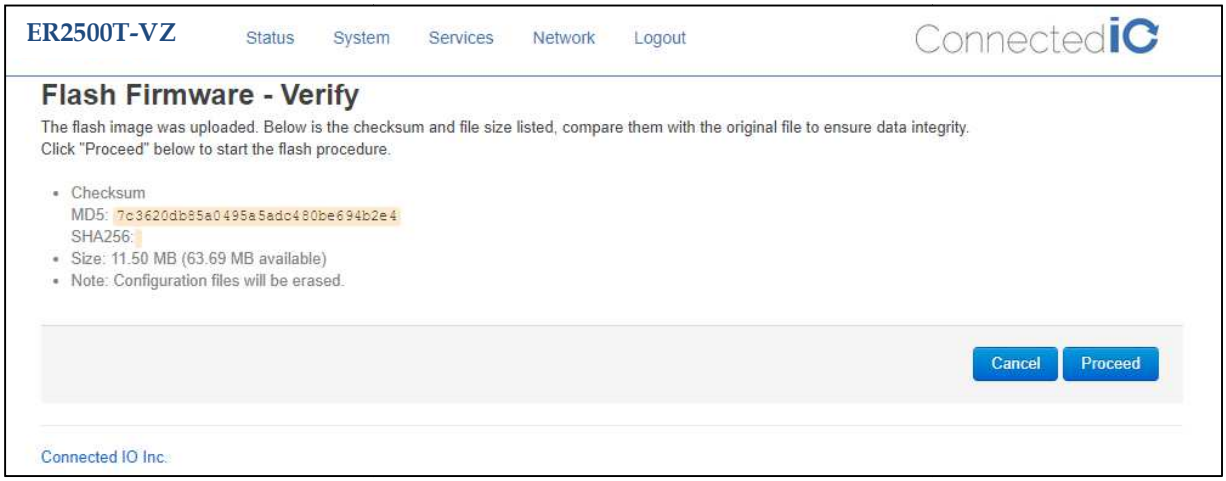


Figure 10: Firmware Upgrade

5. Modem

Select Network -> Modem as shown Figure 11.

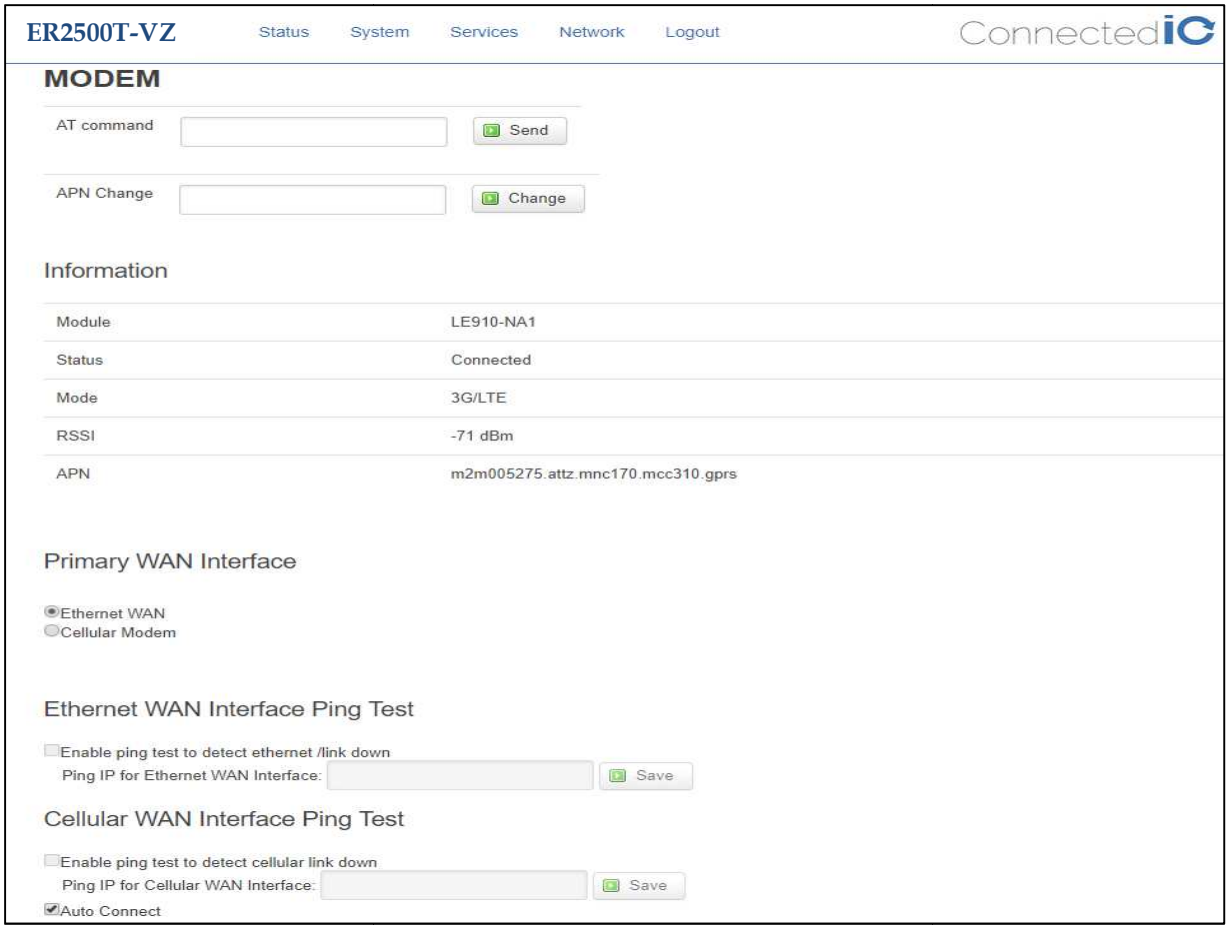


Figure 11: Modem Page

5.1. AT Command

You can use the AT command to check the LTE status. The AT command format is "AT+ Command" for example: AT+CSQ. Enter the AT command and click "Send".

AT command responses will be displayed in the message bar right below the command see Figure 12.

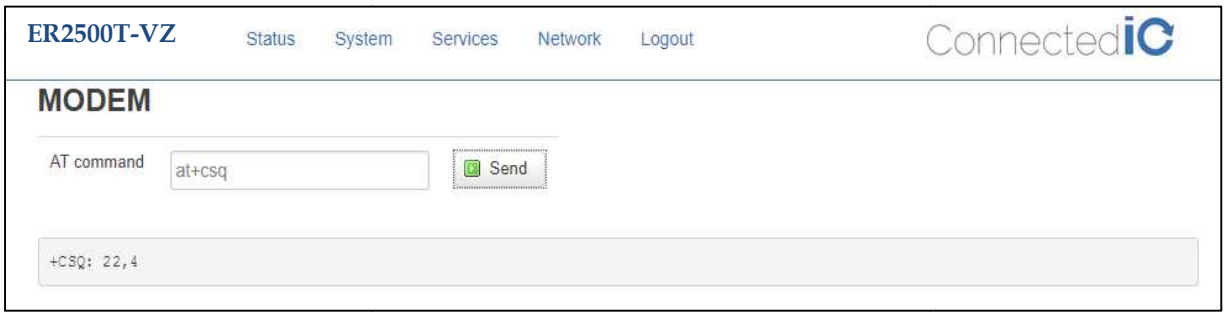


Figure 12: AT Command Example

5.2. APN Change

Typically, the APN is auto-configured or auto-detected. The APN Change command allows you to change the local telecommunication company. Enter the APN name and click "Change" button as shown in Figure 13.

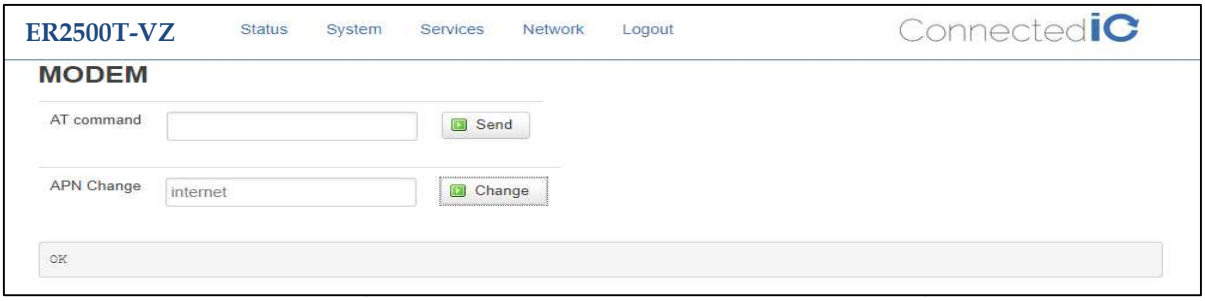


Figure 13: APN Change

If you would like to check whether the APN setting is successful, pleases enter AT command "AT+CGDCONT?" See Figure .

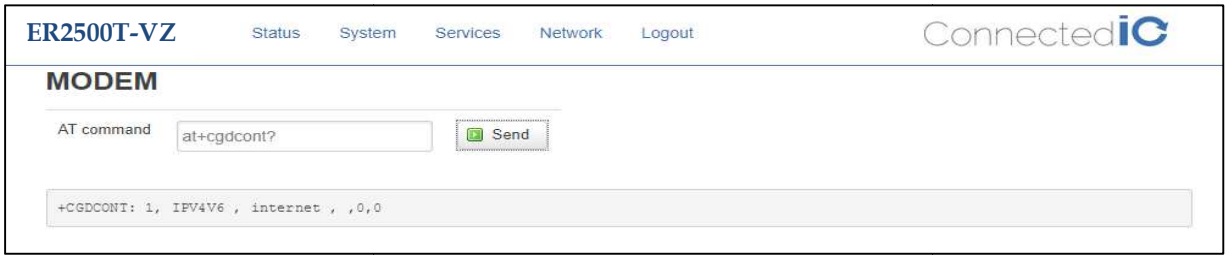


Figure 19: Check APN Function

6. LOGS

6.1. System LOG

Select Status -> System Log

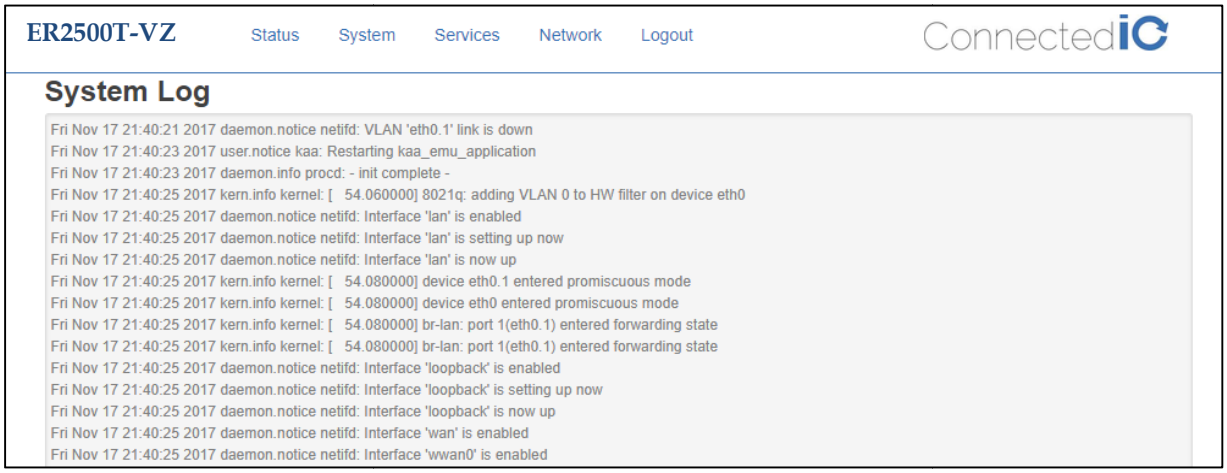


Figure 21: System Log

6.2. Kernel LOG

Select Status -> Kernel Log

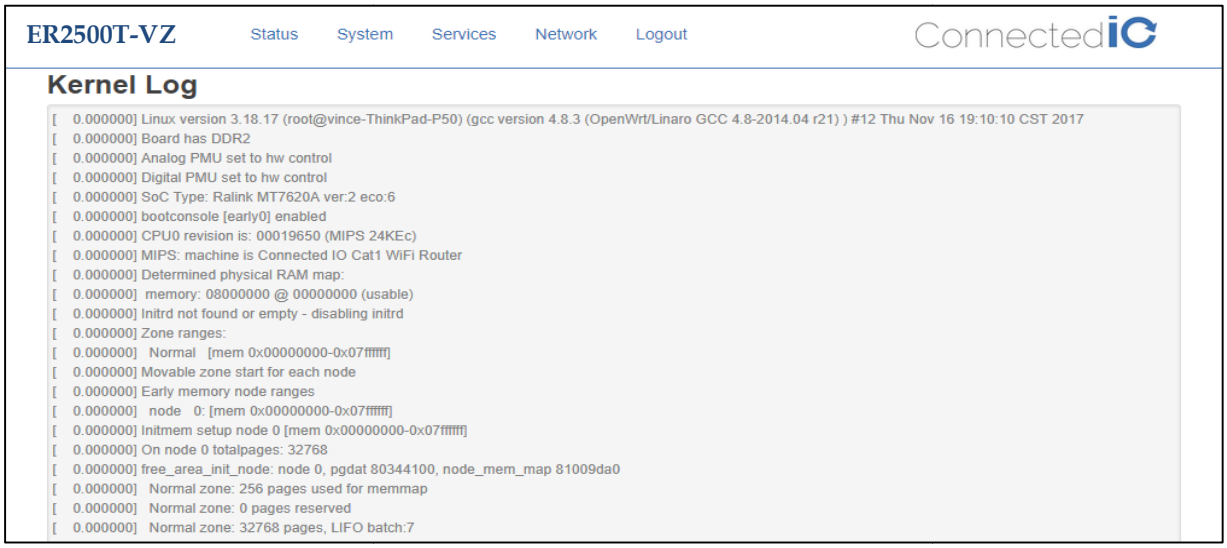


Figure 14: Kernel Log

7. Antenna

7.1. Detachable Antennas

This M2M Router device, ER2500T-NA-CAT1 and ER2500T-VZ-CAT1, integrates an LTE (4G) and WiFi radio function. Is uses an external antenna (dipole antenna) and a standard antenna connector (SMA type) which is not covered under FCC 15.203 requirements. Therefore, this equipment needs to be installed by a professional technician since the M2M application usually resides inside other equipment where the end-user cannot change the external antennas easily.

7.2. Detachable Antenna Guidelines

This equipment complies with the FCC and IC radiation exposure limits set forth for an uncontrolled environment. The antenna should be install and operated with a minimum distance of 20cm between the radiator and the human body.

7.3. Antenna – Installation Guidelines

When installing the antenna to the EMU Router product line there are many items to consider so good antenna performance can be maintained.

- Install the antenna in a place covered by the LTE signal.
- Antenna must not be installed inside a metal case.
- Antenna shall also be installed according to the Antenna manufacturer instructions.
- Antenna integration should optimize the Radiation Efficiency. Efficiency values >50% are recommended on all frequency bands for any antennas selected.
- Antenna integration should not dramatically perturb the radiation pattern. It is preferable to get, after antenna installation, an omnidirectional radiation pattern for the best overall coverage.
- Antenna Gain must not exceed values indicated in the regulatory requirements in order to meet related EIRP limitations.
    - Typical antenna Gain in most M2M applications should not exceed 2dBi.
- At least 20cm of separation distance between the antennas, the collocated router transmitters, and the human body must be maintained always.

7.4. Professional Antenna Installation

7.4.1. Professional Installation Instructions

1. Installation personal

   This product is designed for specific application and needs to be installed by a qualified personal who has RF and related rule knowledge. The general user shall not attempt to install or change the setting.

2. Installation location

   The product shall be installed at a location where the radiating antenna can be kept 20cm from nearby person in normal operation condition to meet regulatory RF exposure requirement.

3. External antenna

   Use only the antennas which have been approved by the applicant. The non-approved antenna(s) may produce unwanted spurious or excessive RF transmitting power which may lead to the violation of FCC/ISED limit and is prohibited.

4. Installation procedure

   Please refer to user's manual for the detail.

5. Warning

   Please carefully select the installation position and make sure that the final output power does not exceed the limit set force in relevant rules. The violation of the rule could lead to serious federal penalty.

7.4.2. Instructions d'installation Professionnelle

1. Installation

   Ce produit est destine a un usage specifique et doit etre installe par un personnel qualifie maitrisant les radiofrequences et les regles s'y rapportant. L'installation et les reglages ne doivent pas etre modifies par l'utilisateur final.

2. Emplacement d'installation

   En usage normal, afin de respecter les exigences reglementaires concernant l'exposition aux radiofrequences, ce produit doit etre installe de facon a respecter une distance de 20cm entre l'antenne emettrice et les personnes.

3. Antenn externe.

   Utiliser uniiquement les antennes approuvees par le fabricant. L'utilisation d'autres antennes peut conduire a un niveau de rayonnement essentiel ou non essentiel depassant les niveaux limites definis par FCC/ISED, ce qui est interdit.

4. Procedure d'installation

   Consulter le manuel d'utilisation.

4. Avertissement

   Choisir avec soin la position d'installation et s'assurer que la puissance de sortie ne depasse pas les limites en vigueur. La violation de cette regle peut conduire a de serieuses penalites federales.

8. Environmental

8.1. Operating Environment

- Operating Temperature: -20°C to +55°C
- Storage Temperature: -40°C to +85°C

8.2. Physical Parameters

- Size: 114.60mm x 105.95mm x 24.70mm
- Weight: 15gr (without antennas)

9. Approvals and Certifications

9.1. Manufacturing

- RoHS Compliance
- This device has been tested and found to be RoHS compliant with the council RoHS directive – 2011/65/EU.

9.2. North American Certifications

9.2.1. ER2500T-NA-CAT1 & ER2500T-VZ-CAT1

- FCC Compliance:
    - This device Complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions. (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.
    - This device has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules.

9.2.2. ER2500T-NA-CAT1

- Canada
    - **CAN ICES-3 (B) / NMB-3 (B)**
    - This device Complies with ICES-003:2016 Issue 6, Class B.
- PTCRB Certification
    - This device has been tested and conforms to the PTCRB testing standards which confirms that this cellular product operates within a defined global and industry specification and meets the minimum level of Network performance required by PTCRB operator Member networks.

9.2.3. ER2500T-VZ-CAT1

- Verizon Open Development Certification

9.3. FCC General Warning

This equipment has been tested and found to comply with the limits for a Class B Digital Device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

CAUTION:
Any changes or modification no expressly approved by the grantee of the device could void the user's authority to operate the equipment.

RF exposure warning

This equipment must be installed and operated in accordance with provided instructions and the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

Detachable Antenna:

This M2M Router device, ER2500T-NA-CAT1 and ER2500T-VZ-CAT1, integrates an LTE (4G) and WiFi radio function. Is uses an external antenna (dipole antenna) and a standard antenna connector (SMA type) which is not covered under FCC 15.203 requirements. Therefore, this equipment needs to be installed by a professional technician since the M2M application usually resides inside other equipment where the end-user cannot change the external antennas easily. There is no doubt that the antennas can be replaced by the end-user once installed in the final configuration.

This radio transmitter FCCID: 2AMRIER2500TC1 has been approved by FCC to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GTT Europe LTD	OA-LTE-01-01-GT	Omni-Dipole	LTE: 698-960MHz/1710-2170MHz/2500-2960MHz 0.7 dBi Max / 3.8 dBi Max / 3.2 dBi Max WiFi: 2400MHz-2500MHz 3.1 dBi Max

9.4. Industry Canada (IC) Notices

Canada, Industry Canada (IC) Notices

This device complies with Canada license-exempt RSS standard(s).
Operation is subject to the following two conditions:
(1) this device may not cause interference, and
(2) this device must accept any interference, including interference that may cause undesired operation of the device.

Canada, avis d'Industry Canada (IC)

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :
(1) l'appareil ne doit pas produire de brouillage, et
(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radio Frequency (RF) Exposure Information

The radiated output power of the Wireless Device is below the Industry Canada (IC) radio frequency exposure limits. The Wireless Device should be used in such a manner such that the potential for human contact during normal operation is minimized.

This device has also been evaluated and shown compliant with the IC RF Exposure limits under mobile exposure conditions. (antennas are greater than 20cm from a person's body).

Informations concernant l'exposition aux fréquences radio (RF)

La puissance de sortie émise par l'appareil de sans fil est inférieure à la limite d'exposition aux fréquences radio d'Industry Canada (IC). Utilisez l'appareil de sans fil de façon à minimiser les contacts humains lors du fonctionnement normal.

Ce périphérique a également été évalué et démontré conforme aux limites d'exposition aux RF d'IC dans des conditions d'exposition à des appareils mobiles (antennes sont supérieures à 20 cm à partir du corps d'une personne).

Detachable Antenna:

This M2M Router device, ER2500T-NA-CAT1, integrates an LTE (4G) and WiFi radio function. Is uses an external antenna (dipole antenna) and a standard antenna connector (SMA type) which is not covered under FCC 15.203 requirements. Therefore, this equipment needs to be installed by a professional technician since the M2M application usually resides inside other equipment where the end-user cannot change the external antennas easily.

There is no doubt that the antennas can be replaced by the end-user once installed in the final configuration.

This radio transmitter IC: 22975-ER2500TNAC1 has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet émetteur radio IC: 22975-ER2500TNAC1 a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et impédance d'antenne requise pour chaque type d'antenne indiqué. Types d'antennes n'est pas inclus dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour une utilisation avec cet appareil.

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	GTT Europe LTD	OA-LTE-01-01-GT	Omni-Dipole	LTE: 698-960MHz/1710-2170MHz/2500-2960MHz 0.7 dBi Max / 3.8 dBi Max / 3.2 dBi Max WiFi: 2400MHz-2500MHz 3.1 dBi Max

========== End of Document =========