

CIO Router: CR48NA

User Manual

Rev: V1.3

5th Mar 2019

Revision History:

Date	Rev No.	Description	By
11-Feb-19	R1.0	Initial Release	Connected IO
25-Feb-19	R1.1	Add 5G statement in p.23	Connected IO
04-Mar-19	R1.2	Modify minimum distance of 31cm between the radiator and the human body. Add Antenna information into p.24	Connected IO
05-Mar-19	R1.3	Update Antenna information	Connected IO

Table of Contents

1. INTRODUCTION	5
2. Hardware Configuration	5
2.1. Product Interfaces	5
2.2. Radio Configurations	7
3. System Configuration	7
3.1. Initial IP Setup	7
3.2. Setup WAN protocol	9
3.3. Setup LAN IP	9
3.4. Setup Wi-Fi	10
3.4.1. Setup Wi-Fi network	10
3.4.2. Connecting to the Wi-Fi	11
4. Firewall	13
4.1. WAN Ping Respond	13
4.2. Port Forwards	13
4.3. IP Filtering	14
4.4. MAC Filtering	14
4.5. Dos Prevention	15
4.6. DMZ Host	15
5. System Maintenance	16
5.1. Backup the Configuration	16
5.2. Restore the Configuration	16
5.3. Reset to Factory Default under Web GUI	17
5.4. Firmware Upgrade	17
6. WWan	18
6.1. Auto Connect	18

6.2. APN Change	19
6.3. Unlock PIN protection	19
6.4. Authentication	19
6.5. Modem Firmware	20
6.6. SIM slot	20
7. LOGS	20
7.1. System LOG	20
8. Antenna	21
8.1. Detachable Antennas	21
8.2. Antenna - Installation Guidelines	21
8.2.1. Instructions d'installation Professionnelle	21
8. Environmental	22
8.1. Operating Environment	22
8.2. Physical Parameters	22
9. Approvals and Certifications	22
9.1. Manufacturing	22
9.2. North American Certifications	22
9.3. FCC General Warning	23

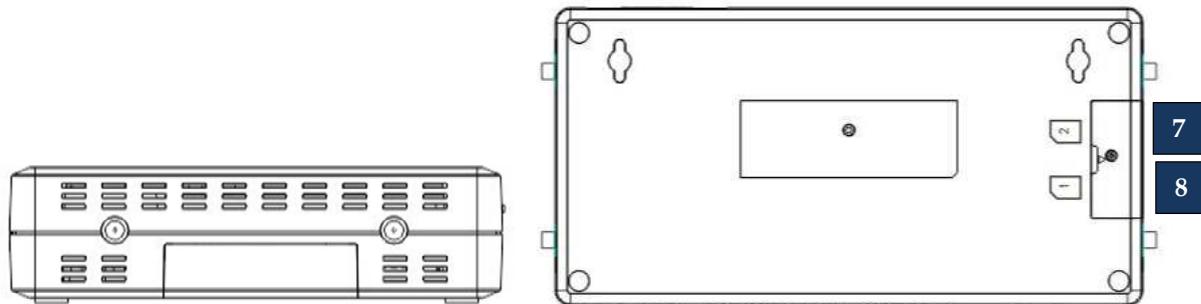
1. Introduction

Connected IO's CR48NA router ("The Router") is a 4G router offering CAT4 connectivity. The Router includes a 4G modem with an embedded host processor based on Qualcomm Dakota SoC which also supports 802.11 b/g/n/ac Wi-Fi functionality. The 4G connectivity is made by an operator certified LTE module.

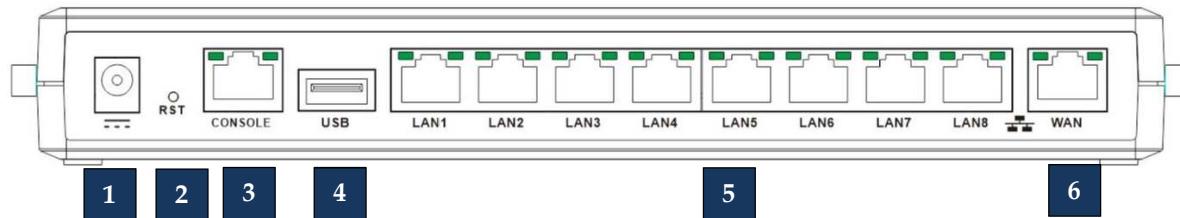
This document provides instructions, and basic operational guidelines, to aid a Systems Administrator with the deployment of this product.

2. Hardware Configuration

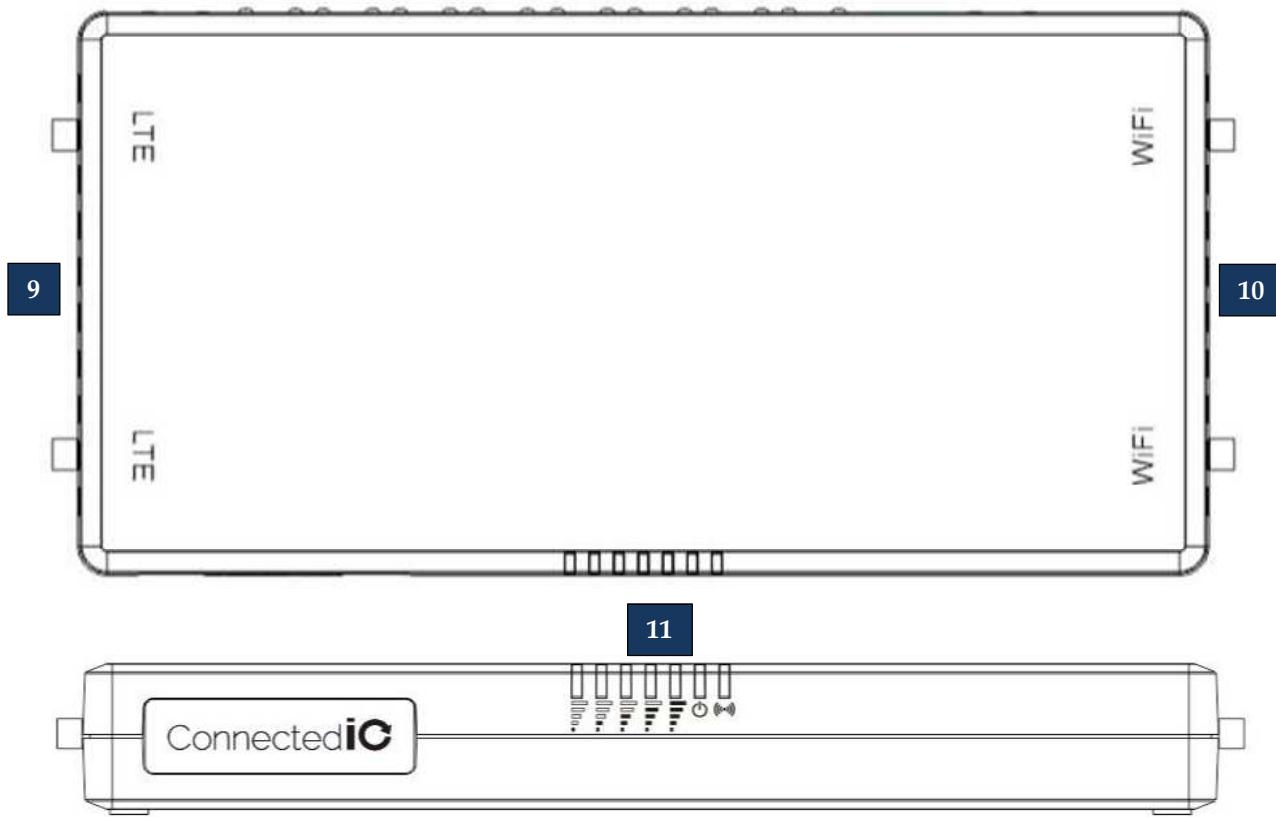
2.1. Product Interfaces



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 10-seconds then release installs factory preset
3	Console	Serial Communications port per EIA asynchronous data transfer
4	USB 2.0	USB 2.0 provides connectivity for optional storage or a USB Ethernet dongle. Port supplies up to 0.5A of 5V to connected devices.



Number	Item	Description
5	LAN Port	LAN Port for Wired Ethernet Clients LED: Solid Green for Link, Flashing Green for Traffic
6	WAN Port	WAN Port for establishing links to leased telecommunication circuits LED: Solid Green for Link, Flashing Green for Traffic
7	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
8	SD Card Slot	Full size SD card (Purchased Separately) for data storage. Slide the door open to access the SD card slot. Push SD card into the holder to engage, push a second time to eject the SD card.



Number	Item	Description
9	Wi-Fi Antenna	R-SMA connector for Wi-Fi Antennas

10	Cellular Antennas	SMA connector for both Primary and Auxiliary antenna Ports												
		Wi-Fi LED, Orange: Wi-Fi is connected/Off: No Wi-Fi												
		Power LED, Yellow: Power is connected/Off: unit is off												
11		<p>Cellular Connection Strength Indicators, Green: Cellular Connection</p> <p>The following table lists the signal strength range corresponding to the number of LEDs lit:</p> <table> <tr><td>5-LEDs On:</td><td>Excellent</td></tr> <tr><td>4-LEDs On:</td><td>Very Good</td></tr> <tr><td>3-LEDs On:</td><td>Good</td></tr> <tr><td>2-LEDs On:</td><td>Fair</td></tr> <tr><td>1-LED On:</td><td>Weak</td></tr> <tr><td>No-LEDs:</td><td>Not functional</td></tr> </table>	5-LEDs On:	Excellent	4-LEDs On:	Very Good	3-LEDs On:	Good	2-LEDs On:	Fair	1-LED On:	Weak	No-LEDs:	Not functional
5-LEDs On:	Excellent													
4-LEDs On:	Very Good													
3-LEDs On:	Good													
2-LEDs On:	Fair													
1-LED On:	Weak													
No-LEDs:	Not functional													

2.2. Radio Configurations

Model Name	LTE Band (MHz)	3G (MHz)	Wi-Fi
CR48NA	<ul style="list-style-type: none"> • B2: 1900 • B4: AWS 1700 • B5: 850 • B12: 700 • B13: 700 	<ul style="list-style-type: none"> • B2: 1900 • B5: 850 	<ul style="list-style-type: none"> • Yes, 802.11 a/b/g/n /ac compliant

3. System Configuration

3.1. Initial IP Setup

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

To configure The Router, follow the following sequence:

- Connect the Ethernet cable between the computer and The Router LAN port
- Setup the desktop as a static IP in **192.168.71.x** domain or DHCP client to get IP from The 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 username is “root” and default password is “password”, it is recommended that a new password be created under Web GUI Administrator->Administration page.

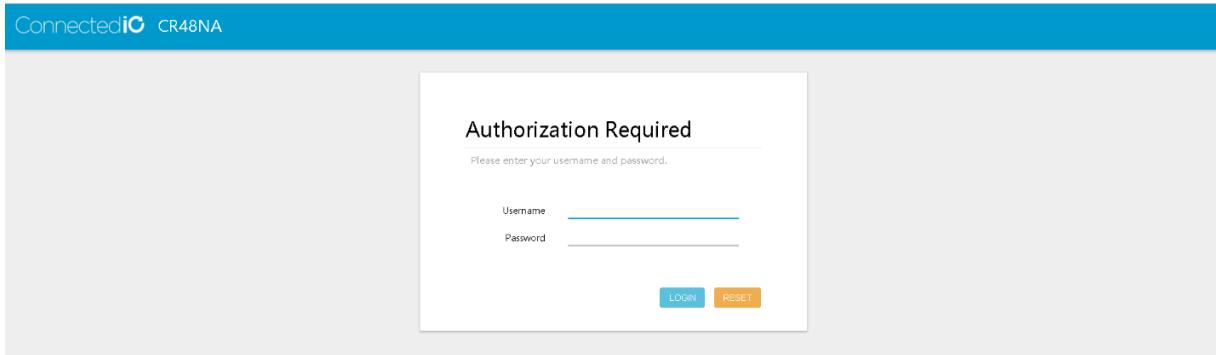


Figure 1: Login Page

The 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.

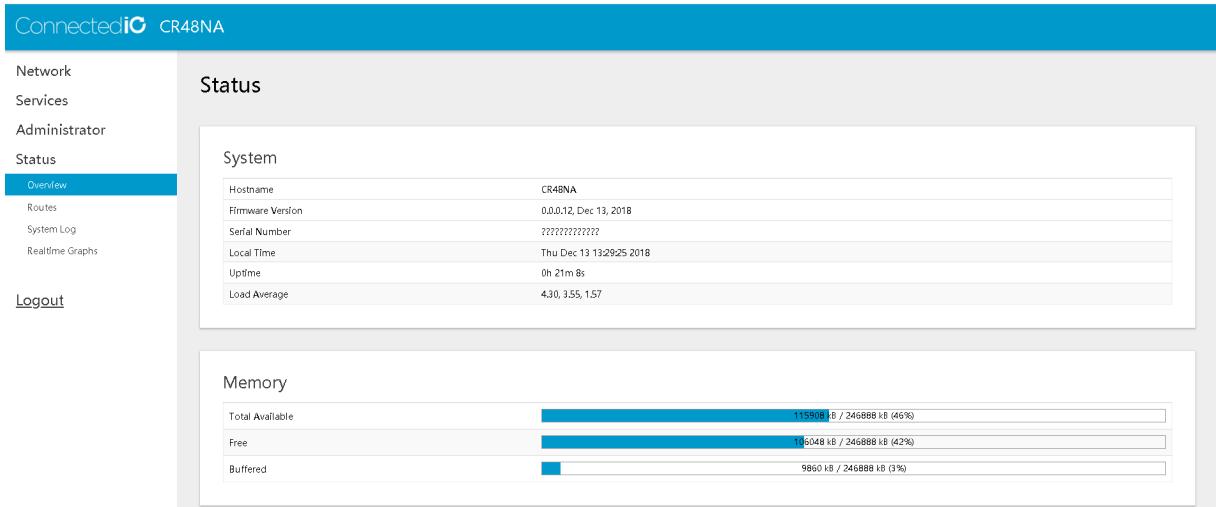


Figure 2: Overview Page

3.2. Setup WAN protocol

Select to Network -> WAN to configure WAN protocol as shown in Figure 3.

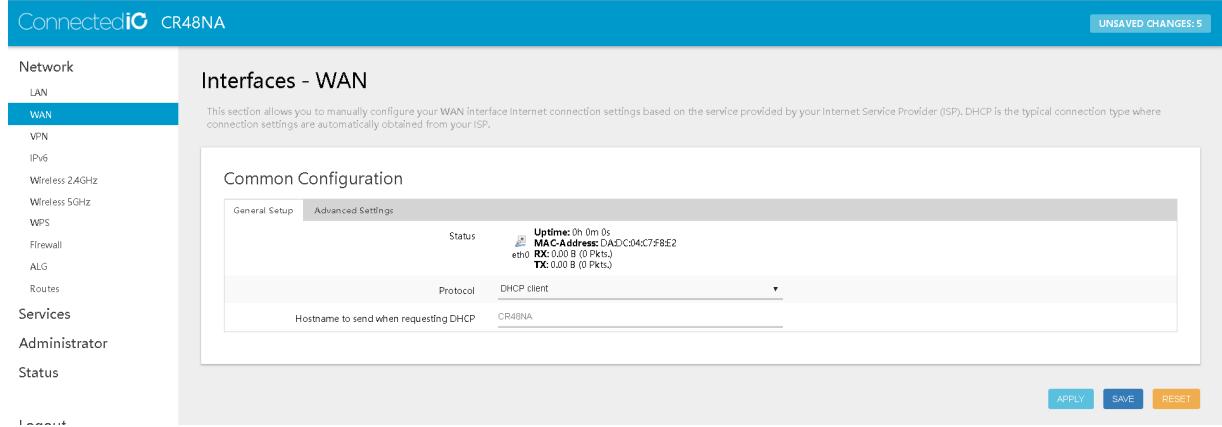


Figure 3: WAN protocol

Click SWITCH PROTOCOL button to after select in Protocol. Then, it needs to input WAN IP address when you select to Static address, or input server settings when you select to PPPoE PPTP and L2TP. For WWAN, please refer to [chapter 6](#).

3.3. Setup LAN IP

Select Network->LAN as shown in Figure 4. And Enter the new IP address in the “IPv4 address” field.

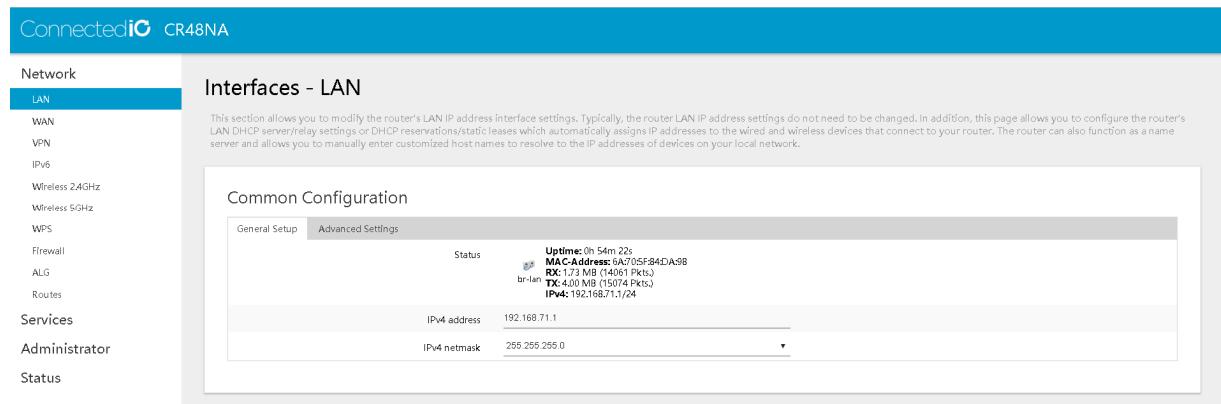


Figure 4: New IP Address for LAN

After the new IP setup, scroll down to the bottom of the page and press “APPLY” as shown in [錯誤! 找不到參照來源。](#).

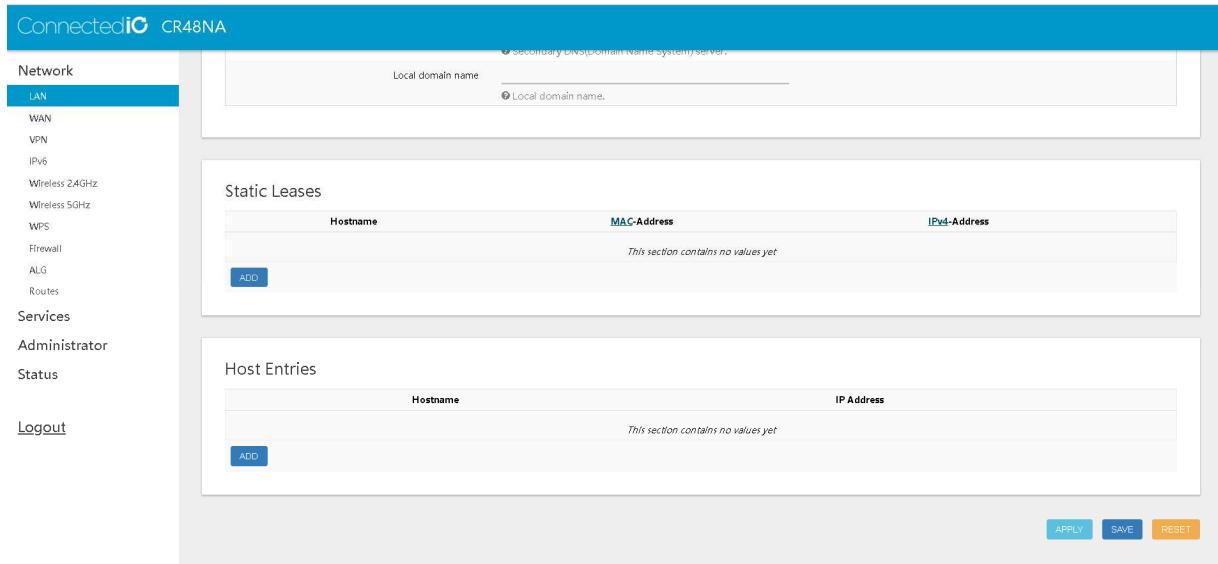


Figure 5: Save the New Setting

3.4. Setup Wi-Fi

3.4.1. Setup Wi-Fi network

Select to Network -> Wireless 2.4GHz and Network -> Wireless 5GHz to configure Wi-Fi network name, channel and encryption settings of your 2.4GHz and 5GHz respectively.

To configure Wi-Fi network name and channel, you can enter the name into SSID field and select channel in Operating frequency as shown in Figure 6.

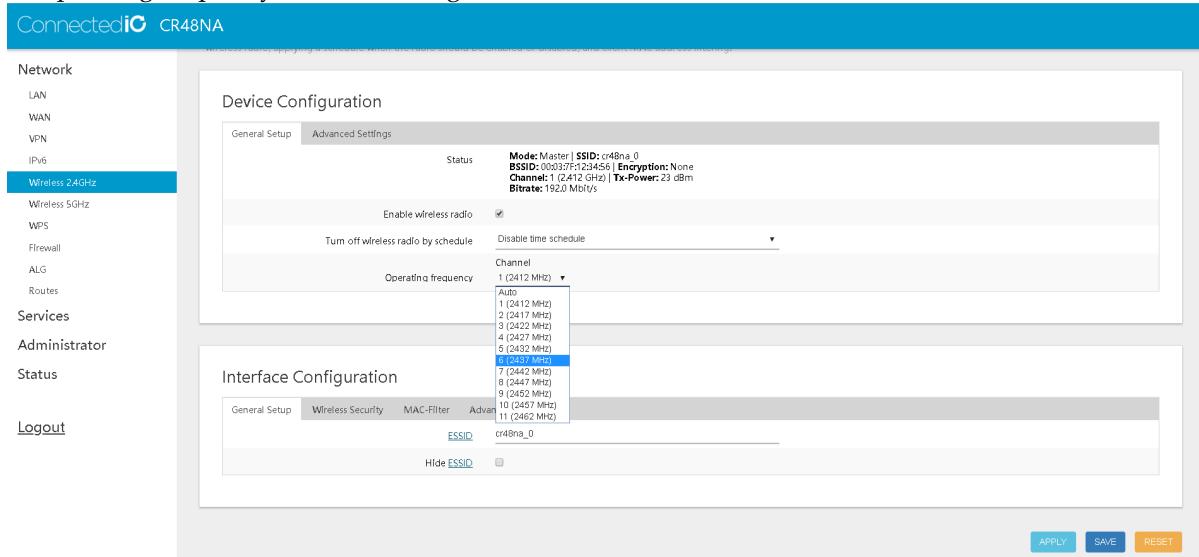


Figure 6: Wi-Fi name and channel

By default, there is no encryption on Wi-Fi interfaces. It is strongly suggested to enable encryption by switching to Wireless Security and enabling it by selecting in Encryption, Cipher and input Key as shown in Figure 7.

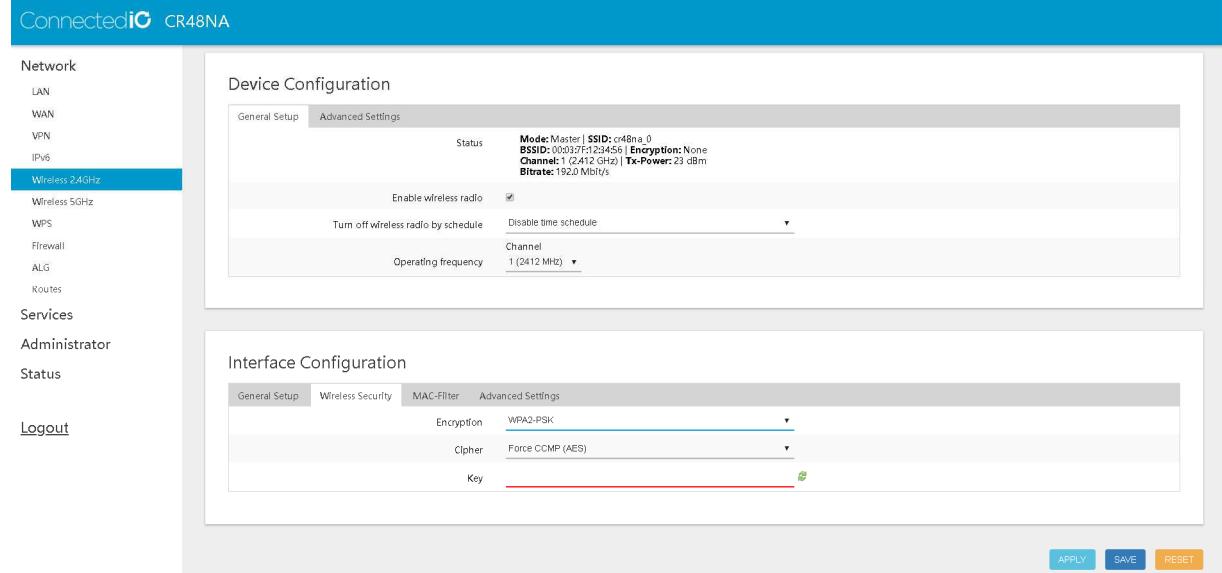


Figure 7: Wi-Fi security

After the Wi-Fi setup, scroll down to the bottom of the page and press “APPLY” as shown in Figure 6.

3.4.2. Connecting to the Wi-Fi

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 Wi-Fi “cr48na_0” or “cr48na_1” network without security key as shown in Figure 8.

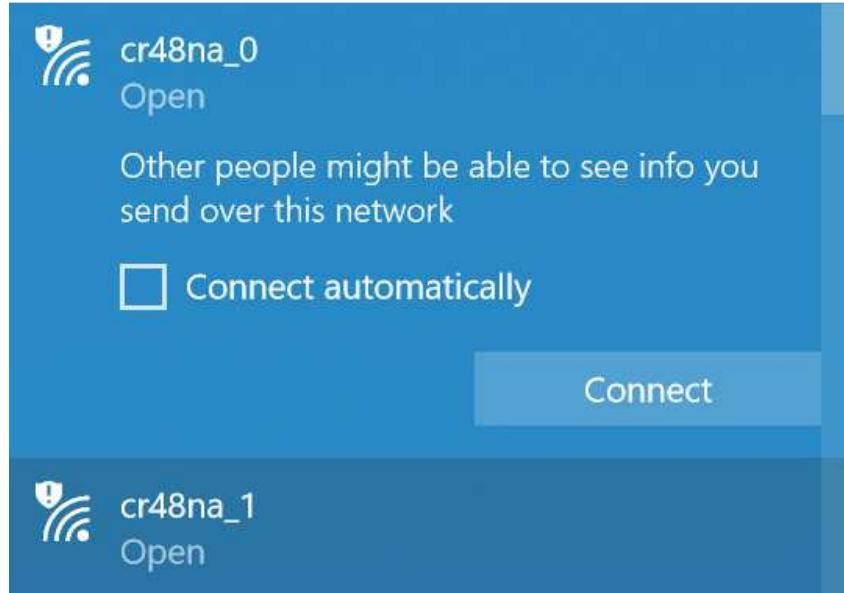


Figure 8: Network Internet Access

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 Wi-Fi Connection information as shown in Figure 9, Wireless Information.

The screenshot shows the 'Wireless' section of the ConnectediC GUI. It lists two wireless controllers: 'Generic 802.11bgn Wireless Controller' and 'Generic 802.11ac Wireless Controller'. Each controller is associated with a 'Wireless 2.4GHz Network' table. The first table (for the bgn controller) shows the following details:

SSID: cr48na_0
Mode: Master
Channel: 1 (2.412 GHz)
Bitrate: 15.3 Mbit/s
BSSID: 00:03:7F:12:34:56
Encryption: None

The second table (for the 11ac controller) shows the following details:

SSID: cr48na_1
Mode: Master
Channel: 40 (5.200 GHz)
Bitrate: 866.7 Mbit/s
BSSID: 12:34:56:78:90:12
Encryption: None

Figure 9: Wireless Information

4. Firewall

4.1. WAN Ping Respond

Select to Network -> Firewall -> General Settings to enable/disable WAN Ping Respond as shown in Figure 10. Disable WAN Ping Respond is able to prevent the WAN port interfaces from responding to ping/ICMP requests.

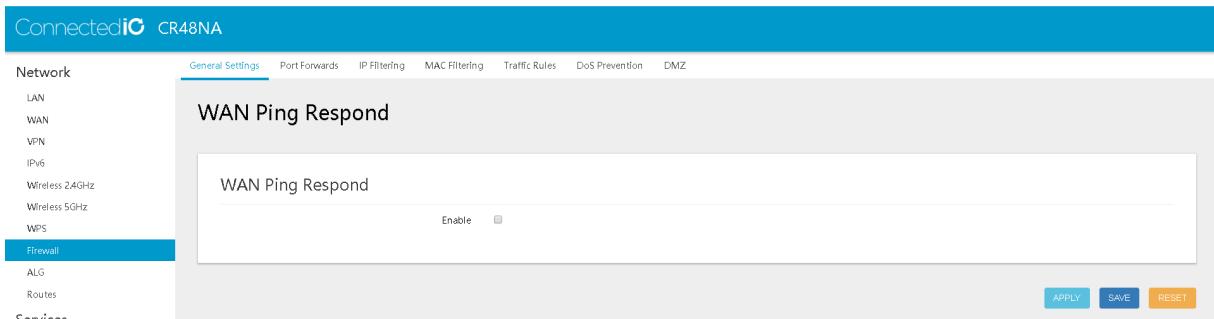


Figure 10: WAN ping response

4.2. Port Forwards

Select to Network -> Firewall -> Port Forwards as shown in Figure 11 to create inbound rules from the WAN interfaces/Internet to your internal computers or devices for specific services/protocols such as a WEB server, FTP server etc.

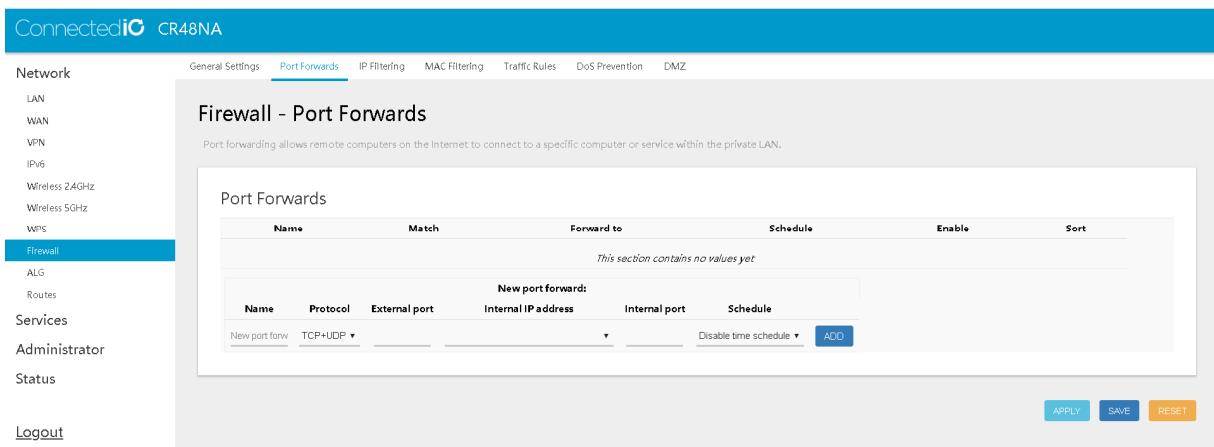


Figure 11: Port Forwards

4.3. IP Filtering

Select to Network -> Firewall -> IP Filtering as shown in Figure 12 to restrict access to the Internet to specific IP addresses on your LAN network.

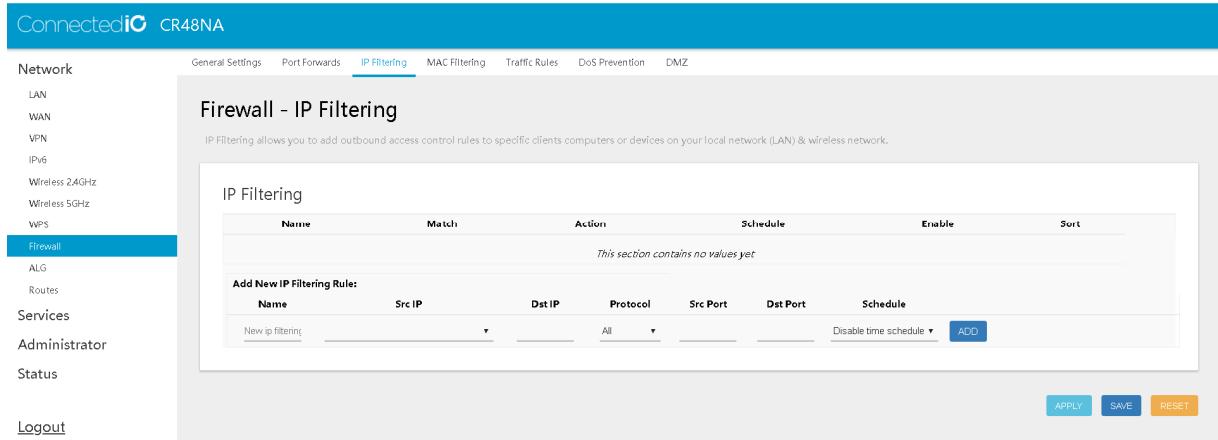


Figure 12: IP Filtering

4.4. MAC Filtering

Select to Network -> Firewall -> MAC Filtering as shown in Figure 13 to restrict access to the Internet to specific IP addresses on your LAN network.

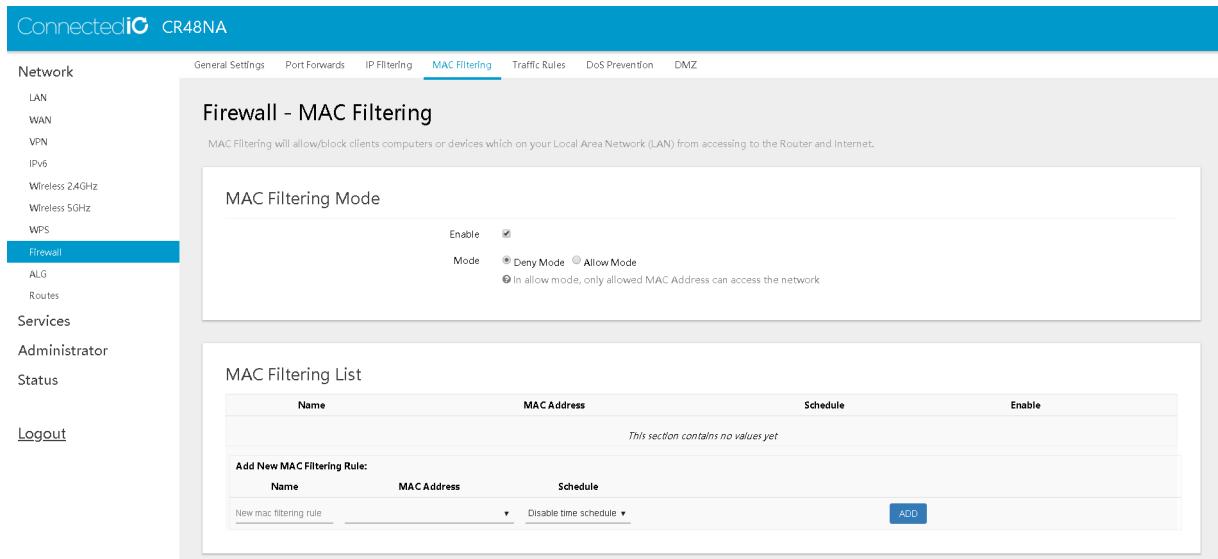


Figure 13: MAC Filtering

4.5.Dos Prevention

Select to Network -> Firewall -> Dos Prevention as shown in Figure 14 to against common denial of service (DoS) attacks. Dos attacks are achieved by flooding a specific network resource by excessively sending unnecessary requests which can cause the network device or resource to stop functioning.

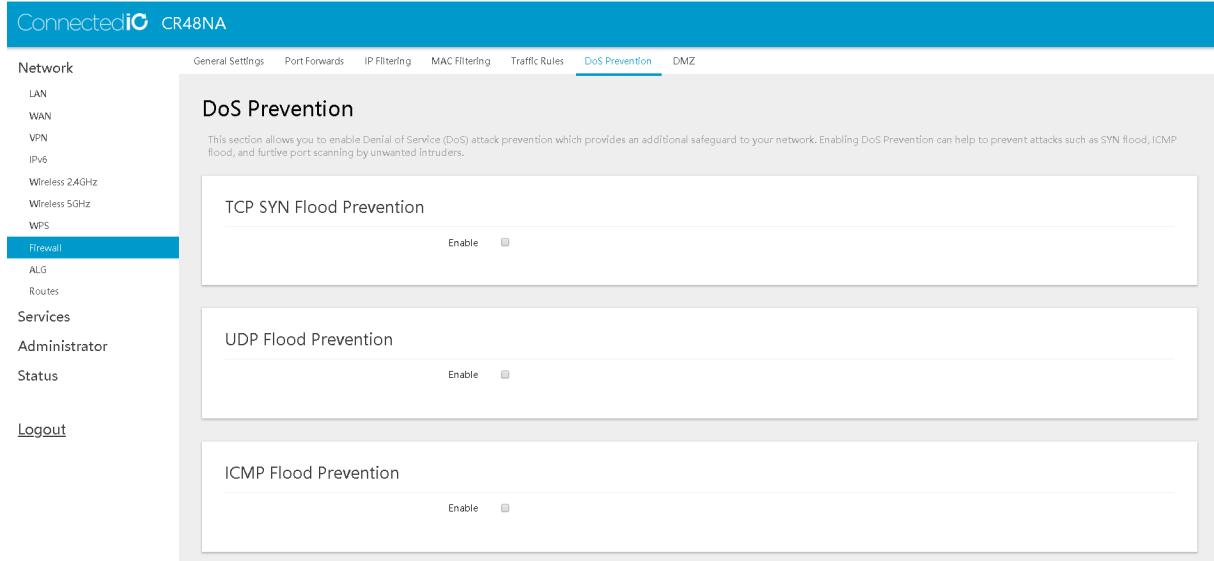


Figure 14: DoS Prevention

4.6.DMZ Host

Select to Network -> Firewall -> DMZ Host as shown in Figure 15 to expose a specific host or device on your LAN to the Internet to allow anyone to access it. This makes all the ports and services available on the WAN/Internet side of the router and forwards all ports to the DMZ host.

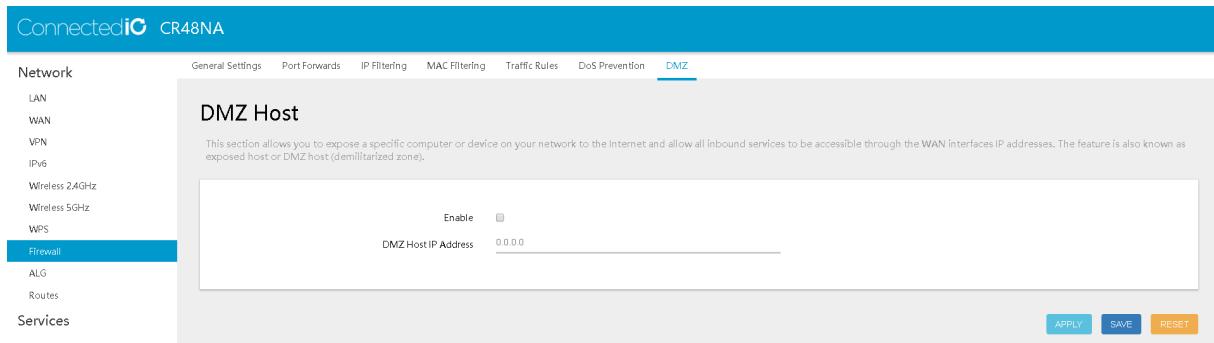


Figure 15: DMZ Host

5. System Maintenance

This chapter describes how to back-up the current The Router configuration to your computer, and how to restore that same configuration later if needed. This can be done by selecting Administrator > Backup / Flash Firmware as show in Figure 16

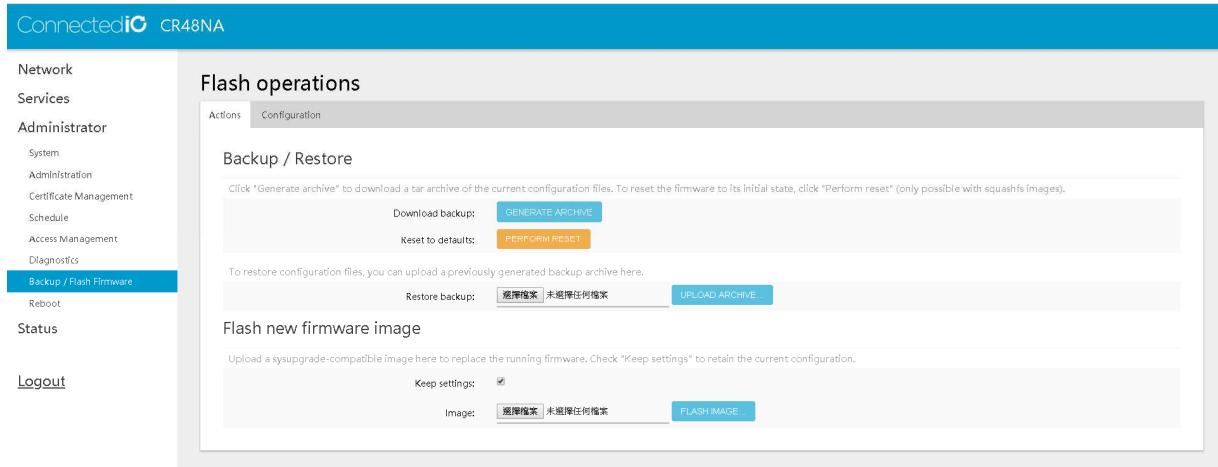


Figure 16: Backup/Restore the Configuration

5.1. Backup the Configuration

Select Backup / Flash firmware in the GUI page as shown in Figure 16, then click the icon “Generate archive” to save this configuration to a file in the folder you’ve specified.

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

5.2. Restore the Configuration

Click the icon “Choose File”, select the backup file, and then click “Upload archive” in flash operations page as shown in Figure 16. Device will write the stored configuration back to flash then reboot the system.

5.3. Reset to Factory Default under Web GUI

Click the icon “Perform reset” in the GUI page as shown in Figure 16, a warning window will pop-up saying, “Really reset all changes?” as shown in

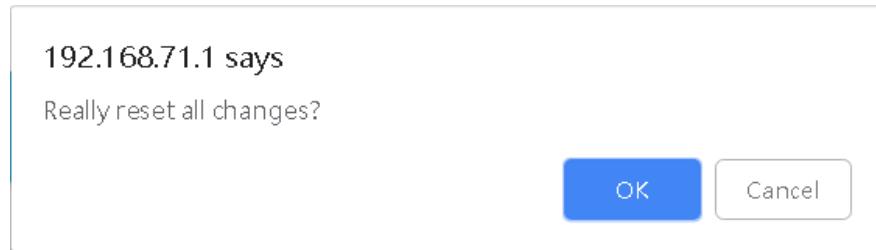


Figure 16. The device will reset to factory default and reboot if “Yes” is chosen.

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

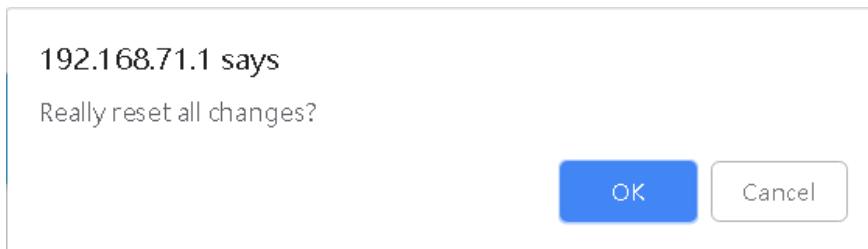


Figure 16: Reset to Default

5.4. Firmware Upgrade

Select Administrator from web GUI and find “Backup/Flash Firmware” section as shown Figure 16.

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 17.

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.

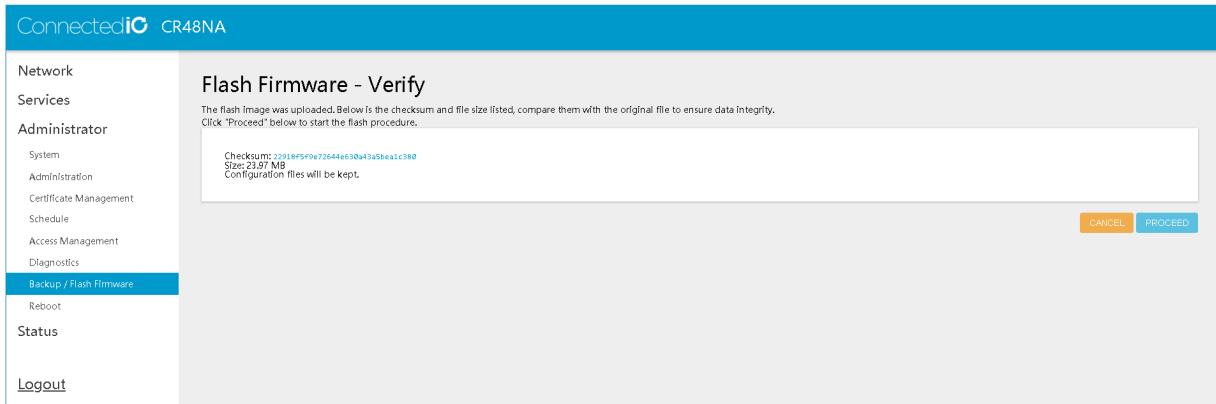


Figure 17: Firmware Upgrade

6. WWan

Select Network -> WAN as shown in Figure 18. Select Protocol to WWan. Then click the icon "SWITCH PROTOCOL"

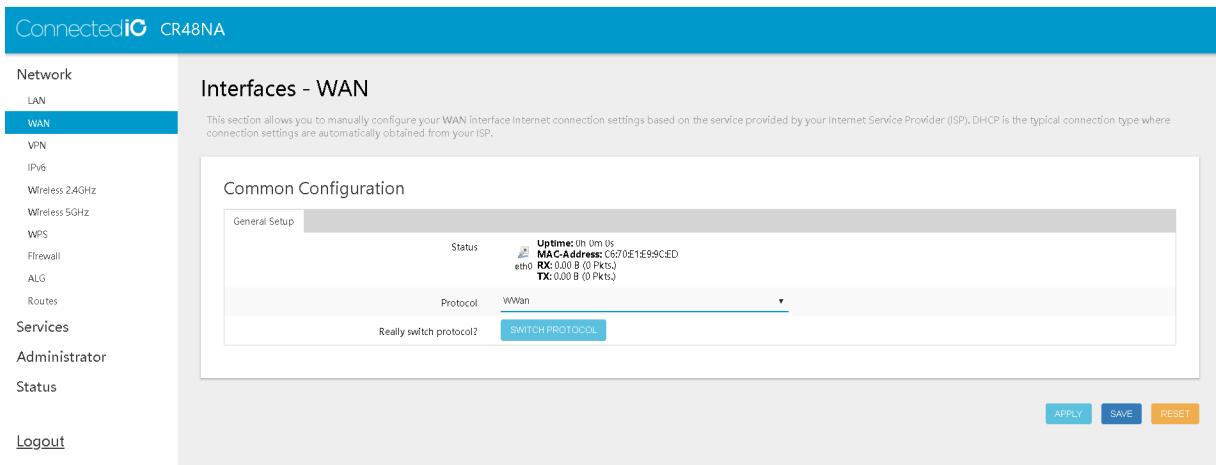


Figure 18: WAN Page

6.1. Auto Connect

Auto Connect option as shown in Figure 19, allow you to decide whether device automatic connect to carrier when disconnection, or only connect once you would like it to connect.

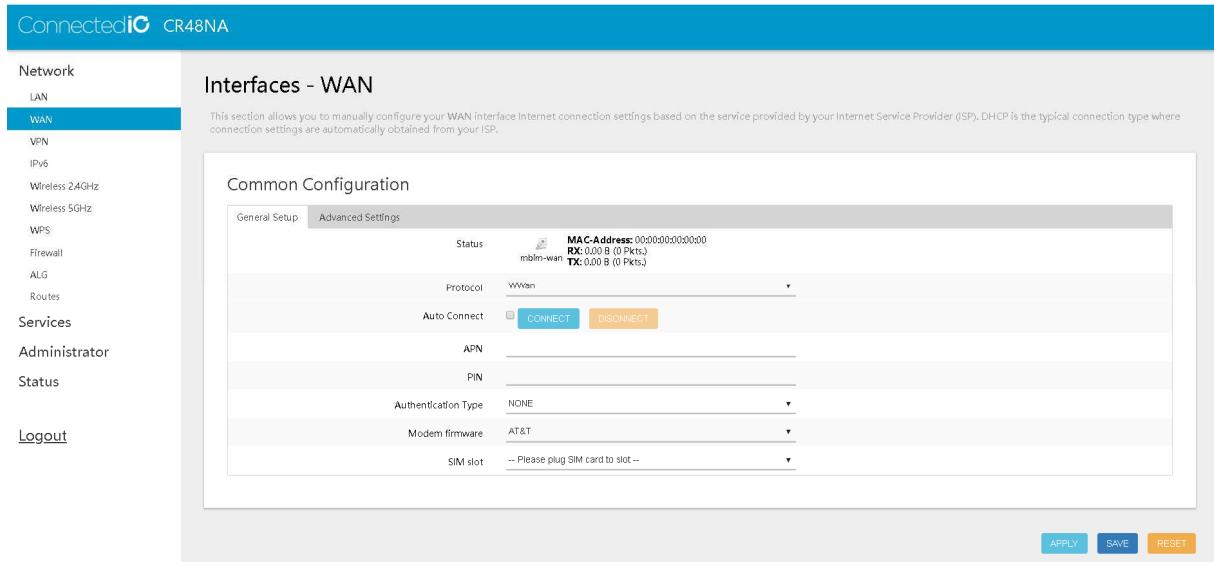


Figure 19: WWan page

6.2. APN Change

The APN Change field allows you to change the local telecommunication company. Enter the APN name and click “APPLY” button as shown in Figure 19.

6.3. Unlock PIN protection

If your SIM card is protected by PIN code, you must input your PIN in PIN field as shown in Figure 19 before your device is able to connect to carrier.

6.4. Authentication

Some carrier may request authentication before device able to connect to their network. In the case, once you select Authentication type to one except NONE, and you will need to input username and password as shown in Figure 20.

Authentication Type	CHAP
PAP/CHAP username	test1
PAP/CHAP password

Figure 20: Authentication Type

6.5. Modem Firmware

CR48NA supports Verizon, AT&T, T-Mobile and service providers in Canada (Refer to “9.2. North American Certifications”) in single sku. Select to proper modem firmware as shown in Figure 19 per your carrier.

6.6. SIM slot

CR48NA support two SIM slot. If only one SIM slot inserted SIM card, device will automatic detect and select to it. If both SIM slot inserted SIM card, you are able to decide which SIM is using by select in SIM slot field as shown in Figure 19.

7. LOGS

7.1. System LOG

Select Status -> System Log as show in Figure 21

```

Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.010894] htc_uefi_init 7563 host_enable 0 nps.nwifl_offload 0
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.021693] ol_txh_SetDefaultTgtConfig : AC Minfree buffer allocation through module param (umac.ko)
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.031088] OL_ACBMinfree : 0
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.034209] OL_ACBMinfree : 0
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.034223] OL_ACBMinfree : 0
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.040436] OL_ACVMinfree : 0
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.047060] CE_recv_buf_enqueue 877 Populate last entry 512 for CE 5
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.047060] CE_recv_buf_enqueue 886 CE 5 wi 511 dest_ptr 0x80338040 nbytes 0 recv_ctxt 0xc9042c00
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.061799] Startup Mode set
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.064308] pddev attach (null) : 1
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.064308] pddev attach (null) : 1
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.067837] <== [cfg max peer id 1056 ===>
Thu Dec 13 10:48:52 2018 kern.alert kernel: [ 284.073781] HTC Service:0x8000 ep1: TX flow control disabled
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.073781] htc_peer_map_timer_init Enter pdev ccff0000 hrtimer cc9f4000
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.085943]
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.085943] ht_alloc_peer_map_mem : Alloc Success : host q vaddr cc9dc000 paddr 8c0dc000
Thu Dec 13 10:48:52 2018 kern.warn kernel: [ 284.095553]
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.105930] ht_alloc_peer_map_mem : Flush Interval Configured to 256 pkts
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.105930] CE_pkt_d1_len_set CE 4 Pkt download length 64
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.110445] cl_txrx_pdev_attach : #80 tx desc's allocated ; range starts from cc7a0000
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.110445] cl_txrx_pdev_attach : #80 tx desc's allocated ; range starts from cc7a0000
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.124954] wml_service ready_event_rx : WM UNIFIED SERVICE READY event
Thu Dec 13 10:48:52 2018 kern.info kernel: [ 284.124954] wml_service ready_event_rx : WM UNIFIED SERVICE READY event

```

Figure 21: System Log

8. Antenna

8.1. Detachable Antennas

This LTE Router device, CR48NA integrates LTE (4G) and Wi-Fi radio function.

Detachable Antenna Guidelines

This equipment complies with the FCC and IC radiation exposure limits set forth for an uncontrolled environment. While EUT operates for Wi-Fi 2.4G/5G and UMTS concurrently, the antenna should be installed and operated with a minimum distance of 31cm between the radiator and the human body

8.2. Antenna – Installation Guidelines

When installing the antenna to The 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.
- At least 31cm of separation distance between the antennas, the collocated router transmitters, and the human body must be maintained always.

8.2.1. Instructions d'installation Professionnelle

1. Installation

Ce produit est destine a un usage specifique et doit etre installe par un personnel qualifie maîtrisant les radiofréquences et les règles s'y rapportant. L'installation et les réglages ne doivent pas être modifiés par l'utilisateur final.

2. Emplacement d'installation

En usage normal, afin de respecter les exigences réglementaires concernant l'exposition aux radiofréquences, ce produit doit être installé de façon à respecter une distance de **31 cm** entre l'antenne émettrice et les personnes.

3. Antenn externe.

Utiliser uniquement les antennes approuvées par le fabricant. L'utilisation d'autres antennes peut conduire à un niveau de rayonnement essentiel ou non essentiel dépassant les niveaux limites définis par FCC/ISED, ce qui est interdit.

4. Procédure 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 dépasse pas les limites en vigueur. La violation de cette règle peut conduire à des sévères pénalités fédérales.

8. Environmental

8.1. Operating Environment

- Operating Temperature: -20°C to +60°C
- Storage Temperature: -40°C to +85°C

8.2. Physical Parameters

- Size: 116mm x 231mm x 31mm
- Weight: 425gr (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

- 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.
- 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.
- 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:

Operations in the 5.15-5.25GHz band are restricted to indoor usage only.

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 23cm 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.

This radio transmitter FCCID: 2AMRICR48NA 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	Joymax	YWX-6252SAXX-711	Microstrip	LTE: 698-960MHz/ 1710-2170MHz/ 2500-2960MHz 3dBi Max
2	Joymax	TWX-6141RSXX-711	Microstrip	Wi-Fi: 2400~2500MHz: 3.0dBi 5000~5900MHz: 5.0dBi
3	Joymax	TWX-1513RSXX-711	Collinear	Wi-Fi: 2400~2500MHz: 5.0dBi 5000~5900MHz: 5.0dBi

Industry Canada (IC) Notices

Canada, Industry Canada (IC) Notices

This device complies with Canada license-exempt RSS standard(s).

The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems;

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. les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux; 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 31cm 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 31cm à partir du corps d'une personne).

This radio transmitter IC: 22975-CR48NA 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-CR48NA 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
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1	Joymax	YWX-6252SAXX-711	Microstrip	LTE: 698-960MHz/ 1710-2170MHz/ 2500-2960MHz 3dBi Max
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