NIO200WMR User Manual

V1.2

Content

Preface

This manual is for user to set up a network environment using the NIO200 series Product line. It contains step-by-step procedures and graphic examples to guide installer or individuals with slight network system knowledge to complete the installation.

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Acknowledgements

Safety Information

Before installing and using the device, note the following precautions:

- Read all instructions carefully.
- Do not place the unit on an unstable surface, cart, or stand.
- Follow all warnings and cautions in this manual.
- When replacing parts, ensure that your service technician uses parts specified by the manufacturer.
- Avoid using the system near water, in direct sunlight, or near a heating device.

Installation Recommendations

Ensure you have a stable, clean working environment. Dust and dirt can get into components and cause a malfunction.

Use containers to keep small components separated.

Adequate lighting and proper tools can prevent you from accidentally damaging the internal components. Most of the procedures that follow require only a few simple tools, including the following:

- A Philips screwdriver
- A flat-tipped screwdriver
- A grounding strap
- An anti-static pad

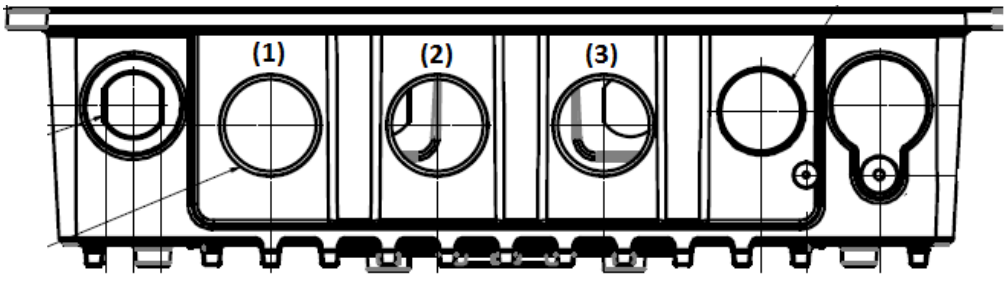
Using your fingers can disconnect most of the connections. It is recommended that you do not use needle-nose pliers to disconnect connections as these can damage the soft metal or plastic parts of the connectors.

Safety Precautions

1. Read these safety instructions carefully.
2. Keep this User Manual for later reference.
3. Disconnect this equipment from any AC outlet before cleaning. Use a damp cloth. Do not use liquid or spray detergents for cleaning.
4. For plug-in equipment, the power outlet socket must be located near the equipment and must be easily accessible.
5. Keep this equipment away from humidity.
6. Put this equipment on a stable surface during installation. Dropping it or letting it fall may cause damage.
7. The openings on the enclosure are for air convection to protect the equipment from overheating. DO NOT COVER THE OPENINGS.
8. Make sure the voltage of the power source is correct before connecting the equipment to the power outlet.
9. Place the power cord in a way so that people will not step on it. Do not place anything on top of the power cord. Use a power cord that has been approved for use with the product and that it matches the voltage and current marked on the product’s electrical range label. The voltage and current rating of the cord must be greater than the voltage and current rating marked on the product.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage by transient overvoltage.

12. Never pour any liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If one of the following situations arises, get the equipment checked by service personnel:
    a. The power cord or plug is damaged.
    b. Liquid has penetrated into the equipment.
    c. The equipment has been exposed to moisture.
    d. The equipment does not work well, or you cannot get it to work according to the user's manual.
    e. The equipment has been dropped and damaged.
    f. The equipment has obvious signs of breakage.
15. Do not place heavy objects on the equipment.
16. Be sure to ground the 0.75mm2 with an appropriate grounding wire (not included) by attaching it to the grounding screw on the unit and to a good ground connection. Earth, Green/Yellow wire, 18AWG, the minimum cross-sectional area of Earth conductor shall equal to Input wiring cable.
17. The front of the Equipment requires wiring terminals with the following specifications:
    - **Wire size: 30-12 AWG** (0.0509-3.3088 mm²)
    - **Wire Type: copper wire only**
    - **Terminal Blocks Torque: 5 lb In.** (0.565 N-m).
    - For supply connections, use wires suitable for at least 75 degree C ambient environment

    - **There must be a disconnect device in front of "NIO200 series" to keep the worker or field side maintainer be cautious and aware to close the general power supply before they start to do maintenance. The disconnect device hereby means a 20A circuit-breaker. Power installation must be performed with qualified electrician and followed with National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code, Part I, CSA C22.1.**
18.



(1) DC IN: 12-48Vdc, 2.1-0.6A
(2) LAN
(3) WAN(POE):57Vdc, 600mA

19. This equipment is intended to Ex nA IIC T4 Gc.

Note:

This equipment is intended to be mounted on a pole with the mounting bracket, wall mounting or DIN mounting; the mounting should always let water proof connectors down to bottom position.

Cet équipement est destiné à être monté a la place avec le support de montage, montage mural ou montage DIN; Le montage doit toujours laisser les connecteurs imperméable à la base.

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D or non-hazardous locations only.

Cet équipement est adapté à une utilisation en Classe I, Division 2, Groupes A, B, C et D ou des zones non dangereuses uniquement.

- WARNING – EXPLOSION HAZARD. DO NOT CONNECT OR DISCONNECT WHEN ENERGIZED."
- AVERTISSEMENT - RISQUE D'EXPLOSION. NE PAS CONNECTER NI DÉCONNECTER LORSQU'IL EST EN CHARGE.

- Product is UL Listed with UL Listed Fittings for use with liquid-tight flexible metal conduit. This wiring method is suitable for flexible connections in accordance with Article 501.10(B)(2) of the National Electrical Code (ANSI/NFPA 70). Suitability for installation in particular applications is at the discretion of the Authority Having Jurisdiction (AHJ) or similar.

- Le produit est homologué UL avec des accessoires homologués UL pour conduit métallique flexible étanche aux liquids.
  ette méthode de câblage convient aux flexibles connexions conformément
- à l'article 501.10 (B) (2) du National Code électrique (ANSI / NFPA 70). Pertinenced'installation dans certaines applications à

la discrétion de l'Autoritéayant Juridiction (AHJ) Ou similaire.

Technical Support and Assistance

1. For the most updated information of NEXCOM products, visit NEXCOM's website at www.nexcom.com.
2. For technical issues that require contacting our technical support team or sales representative, please have the

following information ready before calling:

- Product name and serial number
- Detailed information of the peripheral devices
- Detailed information of the installed software (operating system, version, application software, etc.)
- A complete description of the problem
- The exact wordings of the error messages

Warnings

Read and adhere to all warnings, cautions, and notices in this guide and the documentation supplied with the chassis, power supply, and accessory modules. If the instructions for the chassis and power supply are inconsistent with these instructions or the instructions for accessory modules, contact the supplier to find out how you can ensure that your computer meets safety and regulatory requirements.

1. Handling the unit: carry the unit with both hands and handle it with care.
2. Opening the enclosure: disconnect power before working on the unit to prevent electrical shocks.
3. Maintenance: to keep the unit clean, use only approved cleaning products or cleans with a dry cloth.

Safety Warning: This equipment is intended for installation in a Restricted Access Location only

Avertissement de sécurité: Cet équipement est destiné à être installé uniquement dans un lieu d'accès restreint

Cautions

Electrostatic discharge (ESD) can damage system components. Do the described procedures only at an ESD workstation.

If no such station is available, you can provide some ESD protection by wearing an antistatic wrist strap and attaching it to a metal part of the computer chassis.

Conventions Used in this Manual

Warning: Information about certain situations, which if not observed, can cause personal injury. This will prevent injury to yourself when performing a task.

Caution: Information to avoid damaging components or losing data.

Note: Provides additional information to complete a task easily.

Note: The surface temperature of enclosure may exceed 70℃ under working condition.
Remarque: La température de surface de l'enceinte peut dépasser 70 ℃ dans des conditions de travail.

1 General Information

1.1 Document Purpose

This quick installation guide is designed to let user quickly get necessary installation information about hardware as well as software so that the field installation can be well done through this first aid.

1.2 Definitions, Acronyms and Abbreviations

The following table lists definitions, acronyms, and abbreviations that are only suitable to this document.

Term	Description
API	Application Programming Interface
Backbone	Any data network (e.g. industrial Ethernet, IEEE 802.11, etc.) within a facility interfacing to the plants network.
Backbone Router	An entity in the ISA100.11a network with routing capability which serves as an interface between the radio network and the backbone network.
BBR	Backbone Router
Blacklisted channel	A channel on which transmission is prohibited.
Broadcast	Transmission intended for all the devices in an ISA100.11a network (used for advertisements with all devices including the BBR, or for receive links for field devices only).
CCA backoffs	The count of transmissions on an RF channel that were aborted due to CCA.
CGI	Common Gateway Interface
Channels	Divisions of radio frequencies supported in a wireless network.
Contract	An agreement between the system manager and a device in the network involving the allocation of network resources by the system manager to support a particular communication need of that device.
Device role	Device capabilities that will be accepted by the Security Manager.

Term	Description
DHCP	Dynamic Host Configuration Protocol – a method to automatically configure the IP settings of a host connected in a LAN.
EUI64, EUI-64	The 64-bit address of a device in the network; it is a unique identifier usually set at the manufacturing of the device.
Field	The geographic space that contains all the nodes of a wireless network.
Field device	A physical device designed to meet the rigors of plant operation that communicates via DPDU's conforming to the ISA100.11a protocol.
Gateway	An entity in the ISA100.11a network that serves as an interface between the ISA100.11a network and a client.
Graph (communication)	A collection of unidirectional interconnected devices, which defines a set of communication paths between a source device and a destination device.
Graph (Topology)	A graphical representation of the network topology.
GW	Gateway
Input/output	A device with minimum characteristics required to participate in an ISA100.11a network and which provides or uses data from other devices.
ISA100.11a	A communication protocol used in wireless networks, set up by the Wireless Compliance Institute.
JSON	JavaScript Object Notation
LAN	Local Area Network
Link	A momentary or persistent interconnecting path between two or more devices for the purpose of transmitting and receiving messaging.
MCS	Monitoring Control System
Network Address	The 128-bit address of a device in the network.
Packet Error Rate	The ratio, in percent, of the number of lost packets (DPDU's) to the total number of packets sent by the selected device to its parent.
Process value	The quantity being controlled or the measurement value.
Provision	To update settings on an entity in order to prepare it for working in the network.
Revision	The device software revision related to vendor/model.
Router	A device that has data routing capability.

Term	Description
Security Manager	An entity in the ISA100.11a network that assigns the security keys that are required for communication between devices.
SM	System Manager
Superframe	A collection of timeslots with a common repetition period and possibly other common attributes.
System Manager	An entity in the ISA100.11a network that supervises the various operational aspects of a network other than security.
TR	Transceiver – the BBR radio
User Application Process	From ISA100.11a standard: An active process within the highest portion of the application layer that is the user of OSI (Open Systems Interconnection) services.
UTC	Coordinated Universal Time – A universal timekeeping standard that is based on the Greenwich Mean Time (GMT). Local time is calculated in UTC and offset by the local time zone.
FD	Field Device

2 Product Overview

2.1 About the NIO200WMR

NIO200 CID2

NIO200 ATEX

NEXCOM's NIO200WMR is a unique anti-explosive (CID2 & ATEX certified) Wi-Fi routers which support Mesh, AP and Client modes. This is dedicated design for heavy industrial HazLoc environment. With the Wi-Fi Mesh technology, NIO200WMR provides most reliable wireless connectivity with intelligent multi-path mechanism. It establishes robust access and backbone infrastructure. To meet the requirement of critical environment, NIO200WMR equips with wide temperature (-40 ～75 °C), IP67 protection, highest standard level-4 EMC immunity, CID2 and ATEX anti-explosive capability.

For security consideration, NIO200WMR gives user versatile selection of different encryption (pre-shared key and Enterprise) black list and white list protection mechanism. Together with nCare, I4.0 network manager, NIO200WMR can be easily managed. Thus, effectively reduce the cost for network maintenance and management effort.

2.2 Package Contents

Each NIO200WMR package contains the following items:

- One NIO200WMR unit
- Two simple wall mounting kit
- Three liquid-tight cable gland or conduit based on the ATEX or CID2 model. (used only for DC power input and Ethernet port)
- Two-pin DC power connector for 12~48 VDC power input
- Grounding screws
- Four outdoor antennas for evaluation purpose (when deployed in field site, the antenna may be changed to meet the application requirement)

3 Getting Started

3.1 Installation background

The web-based administration is the preferred method to administer/configure the NIO200WMR. It requires a web browser and the IP of the NIO200WMR. The NIO200WMR is suggested to connect to the local LAN then powered on, and the IP/mask or the router must be accessible from the PC where the browser is running.

3.2 Hardware installation Guide

Hardware connection of NIO200 includes the power, Ethernet interfaces and RF connectors. The installation of NIO200 should be carefully done with standard waterproof connectors accessories in the package (CID2: conduit connector, ATEX: cable gland connector).

Note: the mounting of NIO200 should always let water proof connectors down to bottom position. The following picture illustrates the proper mounting direction of NIO200 in the field.

3.2.1 Water proof connector installation

A. Installation of conduit connector for CID2 model

To install conduit in NIO200 enclosure, please follow the steps below:

- Put conduit through cap nut and gland packing.

- Position the ferrule at the end of the conduit. (Just have the bottom of ferrule cover the conduit, over-tighten may enlarge conduit diameter and loosen

- Pass DC power cable or Ethernet cable through conduit

- Connect connector into

- Insert the conduit with

- Push gland packing and

NIO200 enclosure, tighten locknut with body.	ferrule into connector of NIO200 enclosure.	cap nut forwards to NIO200 conduit connector and tighten the cap nut

To install the conduit, user should implement with Flexible Metal Conduit, Liquid-tight which meets UL360 standard. Here is the requirement of the diameter and size information for the selection of Metal Conduit that mate with NIO200 conduit connectors.

Nominal size (inch)	Inner diameter min. (mm)	Inner diameter max. (mm)	Outside diameter min. (mm)	Outside diameter max. (mm)	Min bending radius (mm)	Packing length (m)
3/8"	12.29	12.80	17.50	18.00	50.50	30
1/2"	15.80	16.31	20.80	21.30	82.50	30
3/4"	20.83	21.34	26.20	26.70	108.00	30
1"	26.44	27.08	32.80	33.40	165.00	20
1-1/4"	35.05	35.81	41.40	42.20	203.00	20
1-1/2"	40.01	40.64	47.40	48.30	228.50	20

B. Installation of cable gland connector for ATEX model

To install cable gland with power / Ethernet cable on NIO200 enclosure, please follow the steps below:

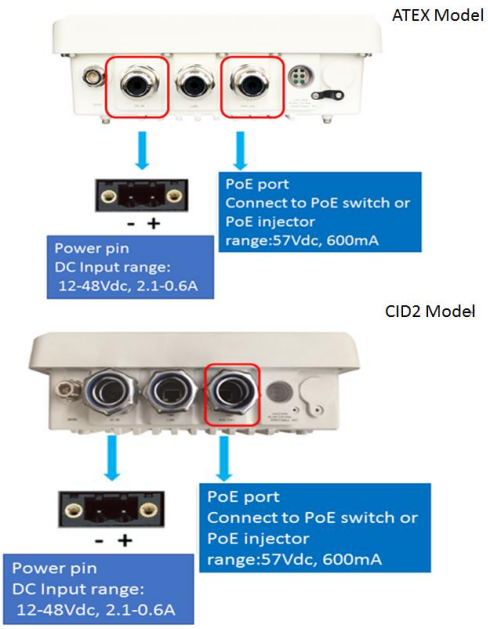
Power connector installation

1. De-assembly the cable gland connector.

1. Pass power and Ethernet cable through cable gland as the illustration at the left.

2. Connect cable gland to NIO200 unit:
   - Screw up the tips of power cable to green power connector.
   - Fit the power cable to the left screw hole and tightly fasten cable gland to enclosure of NIO200 unit.
   - Fit the Ethernet cable into the LAN or WAN hole on the enclosure. Tightly fasten cable gland to enclosure of NIO200 unit.

3.2.2 Power installation



- Prepare DC power source (12~48 VDC) or standard PoE facility such PoE swtich or PoE injector.
- If use external DC power source, please carefully check if the polarity of power cord fits the polarity drawing in this diagram.
- When use PoE power source, just plug the Ethernet cable into PoE port.
- If the power connects correctly, then the “Power LED” will light accordingly

3.2.3 Antenna installation

Wi-Fi antenna connector for Wi-Fi Mesh connection (WLAN 1 & WLAN 2)

IWSN antenna connector (for connecting to ISA100 or WirelessHART), not used in NIO200WMR.

3.2.4 Earth grounding

1. Be sure to ground the 0.75mm^2 ground screw with an appropriate grounding wire (Earth, Green/Yellow wire 18AWG, not included) by attaching it to a good earth ground connection.
2. There must be a disconnect device in front of “NIO200 series” to keep the worker or field side maintainer be cautious and aware to close the general power supply before they start to do maintenance.
3. The disconnect device hereby means a 20A circuit-breaker. Power installation must be performed with qualified electrician and followed with National Electrical Code, ANSI/NFPA 70 and Canadian Electrical Code, Part I, CSA C22.1.

3.2.5 Mounting of NIO200 Series

Mounting method in NIO200 is default with simple wall mounting kit. If the installation is with pole mounting method, then user should purchase pole mounting kit for the installation. Here is the guide for both simple wall mounting method and pole mounting method:

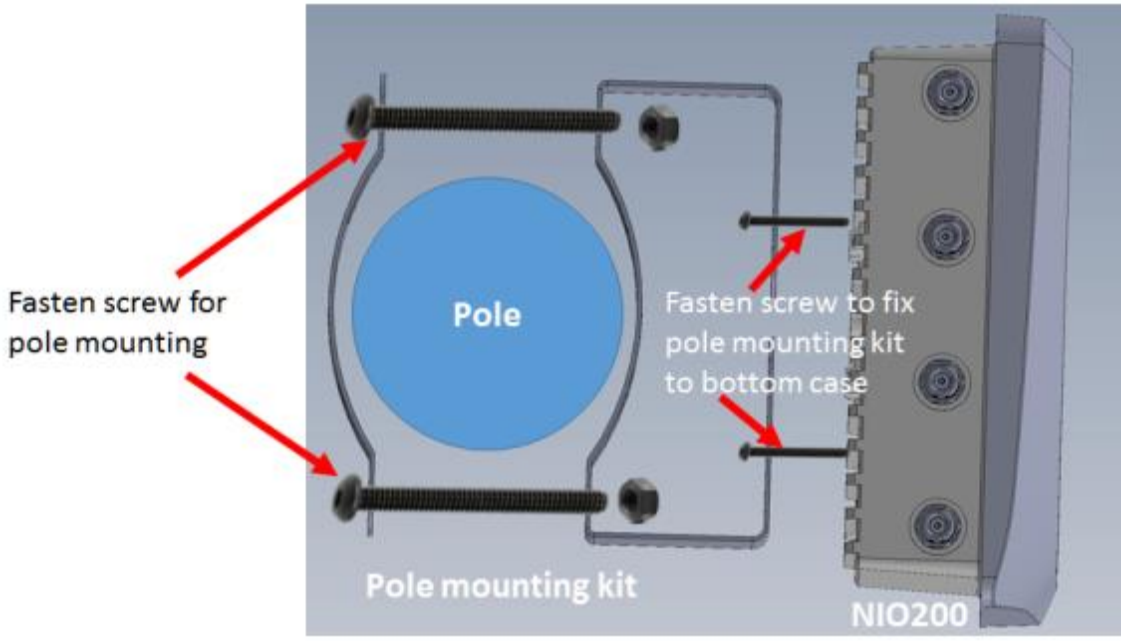
A.Simple wall mounting method:

1. Screw the simple wall mounting kit to the bottom of NIO200 enclosure.

2. Be sure to fasten the mounting kit with horizontal position as below:

3. Hang on NIO200 to the wall with water proof connector at the bottom direction.

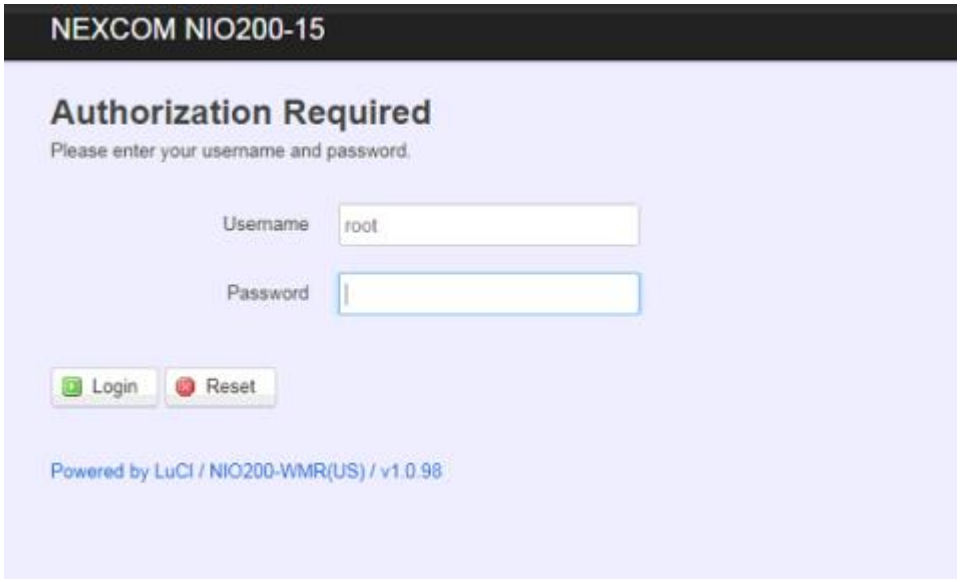
B.Pole mounting method:


Fasten screw for
pole mounting
Pole
Fasten screw to fix
pole mounting kit
to bottom case
Pole mounting kit
NIO200

4 System configuration

4.1 Login

To access the NIO200WMR device, you may open a browser to access the Web GUI via default IP address 192.168.1.1. The login Web page requires login information as below:



Default login information is:

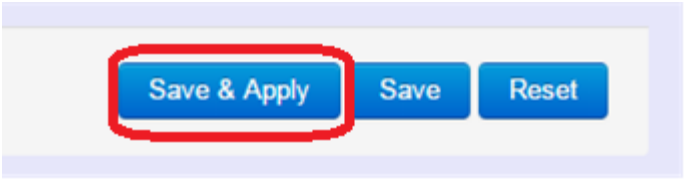
Login: root

Password: admin

After successful login, you will see the “Status” page of the device Web UI.

Saving Changes

Saving & apply the configuration in WebUI after you do the changes at the bottom of WebUI.

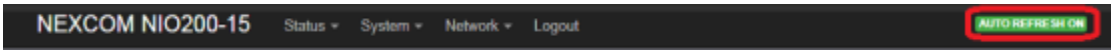


Unsaved Changes

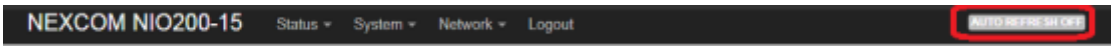
“UNSAVED CHANGES” provides the help to see the parameters which were not saved & applied,

Click “Save & Apply” button to save the parameters.

Auto Refresh



Toggle “AUTO REFRESH” button to turn on/off WebUI refresh function automatically



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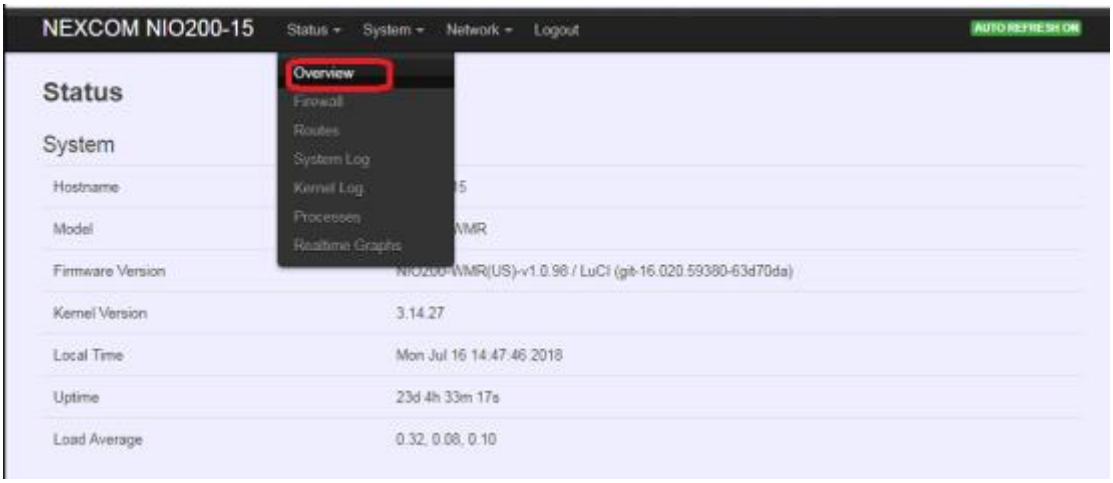
4.2 Status

To display more detailed status, you can click the “Status” under the page bar. This allows users to select the item of Overview, Firewall, Routes, System Log, Kernel Log, Process, and Real-time Graphs from the pull-down list like below screen:



4.2.1 Overview

To see NIO200 over all status, click “Overview” to displays the current system information and interface connection status.

4.2.1.1 System

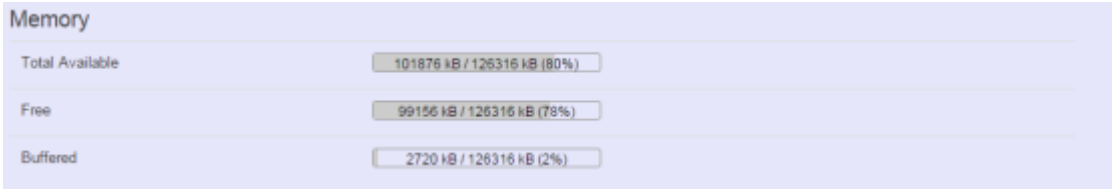
Hostname: Displays NIO200 host name
Model: Displays NIO200 HW basic information
Firmware Version: Displays NIO200 firmware version.
Kernel Version: Displays NIO200 Kernel version.
Local Time: Displays NIO200 current date and time.
Uptime: Displays how long NIO200 has been operating since last boot-up.

Load Average: CPU average loading in recent time frame.

For example,

CPU average loading:
94% in the past 1 minute.
43% in the past 5 minutes
24% in the past 15 minutes.

4.2.1.2 Memory

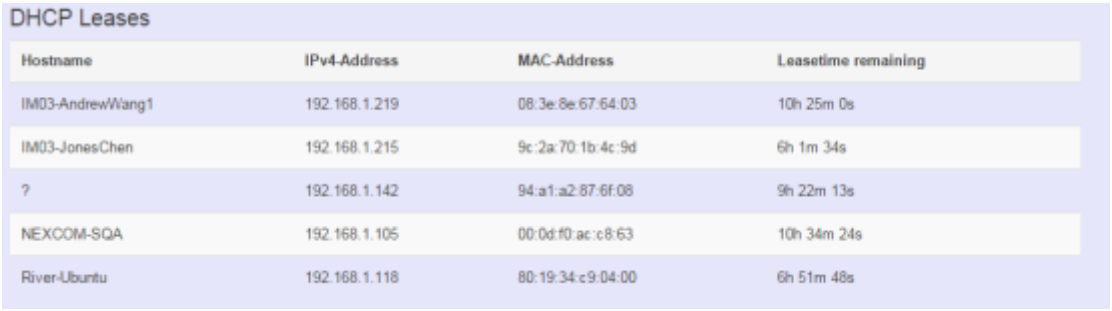


Total Available: Displays the available memory in percentage.
Free: Displays free memory of NIO200.
Buffered: Displays buffer memory used in the system.

4.2.1.3 Network

IPv4 WAN Status: Displays current connecting IPv4 information.
IPv6 WAN Status: Displays current connecting IPv6 information.
Active Connections: Displays current active connections.

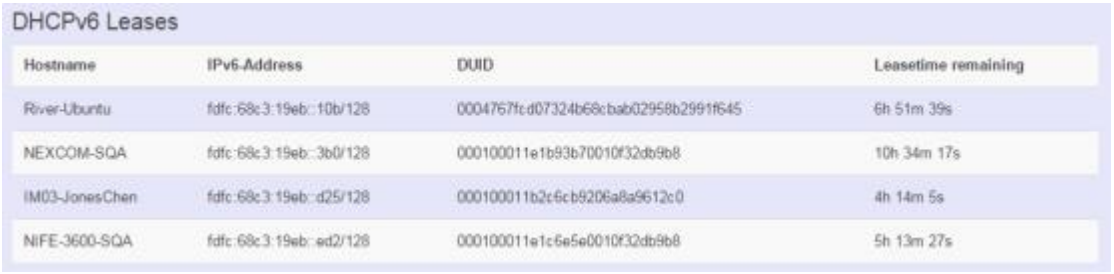
4.2.1.4 DHCP Leases


DHCP Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
IM03-AndrewWang1	192.168.1.219	08:3e:8e:67:64:03	10h 25m 0s
IM03-JonesChen	192.168.1.215	9c:2a:70:1b:4c:9d	6h 1m 34s
?	192.168.1.142	94:a1:a2:87:6f:08	9h 22m 13s
NEXCOM-SQA	192.168.1.105	00:0d:f0:ac:c8:63	10h 34m 24s
River-Ubuntu	192.168.1.118	80:19:34:c9:04:00	6h 51m 48s

This displays information about hosts (Personal Computers or electronic devices) that are connected to NIO200 including IPv4, MAC address and leasing time

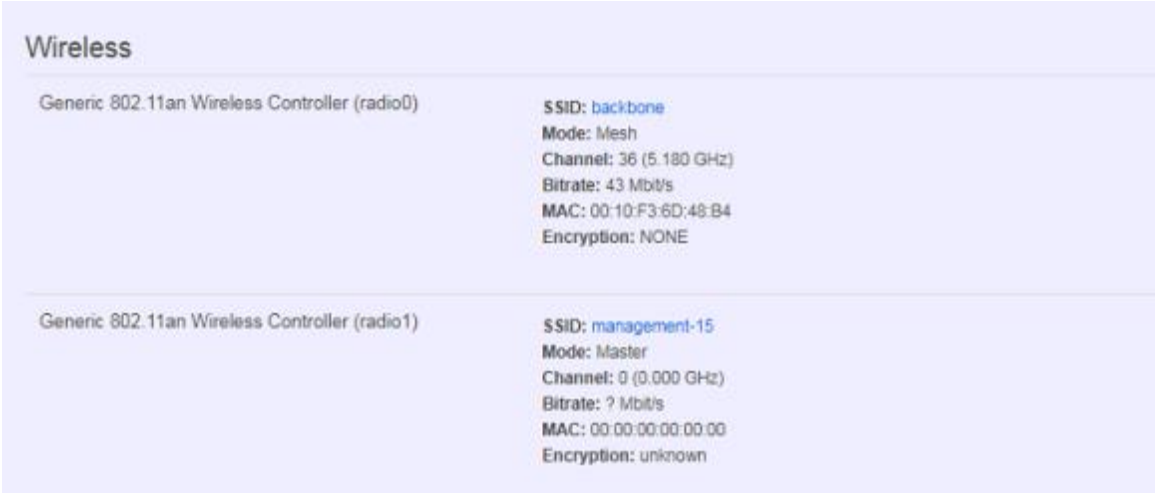
4.2.1.5 DHCPv6 Leases


DHCPv6 Leases

Hostname	IPv6-Address	DUID	Leasetime remaining
River-Ubuntu	fdfc:68c3:19eb::10b/128	0004767fcd07324b68cbab02958b2991f645	6h 51m 39s
NEXCOM-SQA	fdfc:68c3:19eb::3b0/128	000100011e1b93b70010f32db9b8	10h 34m 17s
IM03-JonesChen	fdfc:68c3:19eb::d25/128	000100011b2c6cb9206a8a9612c0	4h 14m 5s
NIFE-3600-SQA	fdfc:68c3:19eb::ed2/128	000100011e1c6e5e0010f32db9b8	5h 13m 27s

This displays information about hosts (Personal Computers or electronic devices) that are connected to NIO200 including IPv6, DUID and leasing time.

4.2.1.6 Wireless


Wireless

Generic 802.11an Wireless Controller (radio0)

SSID: backbone
Mode: Mesh
Channel: 36 (5.180 GHz)
Bitrate: 43 Mbit/s
MAC: 00:10:F3:6D:48:B4
Encryption: NONE

Generic 802.11an Wireless Controller (radio1)

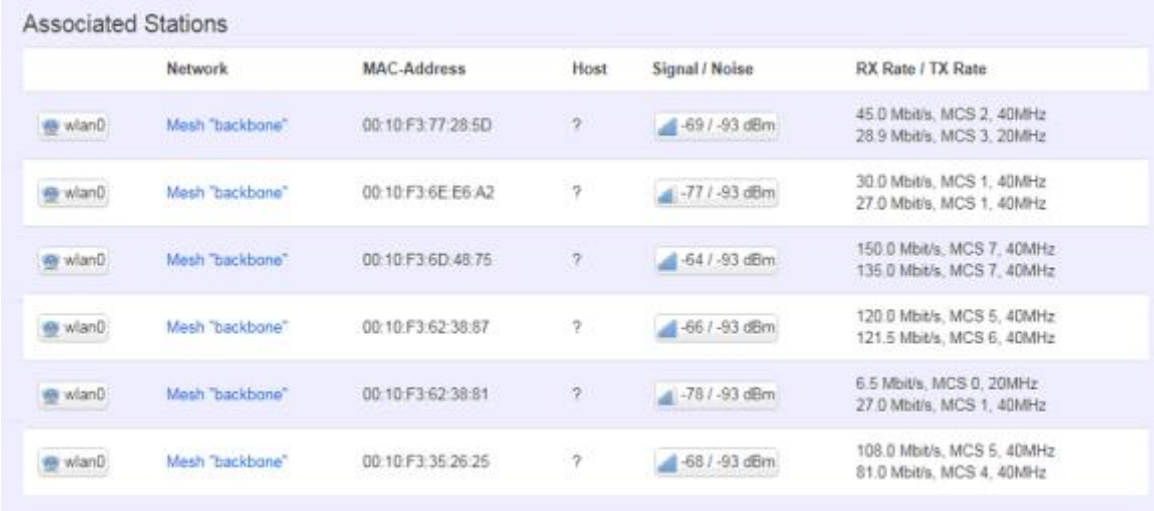
SSID: management-15
Mode: Master
Channel: 0 (0.000 GHz)
Bitrate: ? Mbit/s
MAC: 00:00:00:00:00:00
Encryption: unknown

This displays Wireless information about NIO200 for radio 0&1.

SSID: Displays the name of the wireless network.

Mode: Displays the mode in this radio
Channel: Displays current channel using.
Bitrate: Displays current wireless data rate.
BSSID: Displays MAC address of this radio
Encryption: Displays current encryption setting.

4.2.1.7 Associated Stations

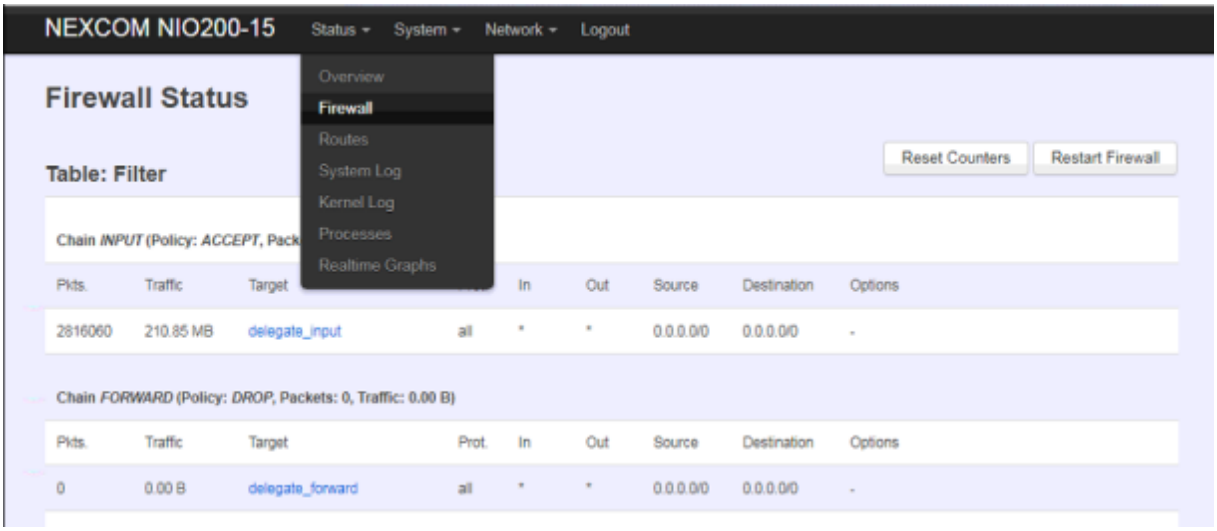


Displays current associated device information (Personal Computers or electronic devices) with NIO200WMR, including device's MAC address, signal level, noise, connecting data rate.

4.2.2 Firewall

Firewall setting is a particular function which allows user to connect or block two or more interfaces in device with sophisticated and specifically defined parameters in this Web page.

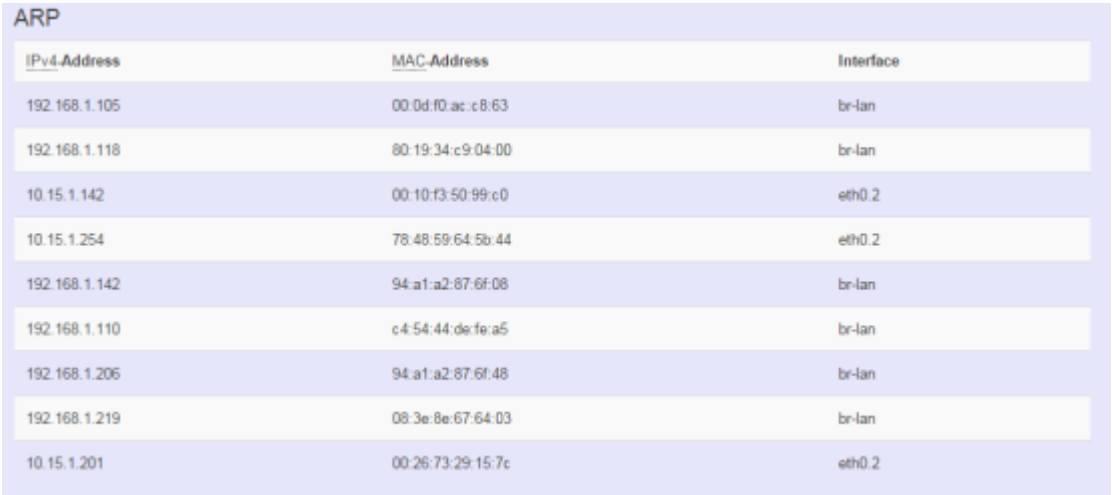
It's highly recommended to keep this Firewall setup page as it is.



4.2.3 Routes

This section display information about routing list for current connecting device.

4.2.3.1 ARP



Displays APR table information of NIO200 including IPv4 address, MAC address and connecting interface.

4.2.3.2 Active IPv4-Routes

Active IPv4-Routes

Network	Target	IPv4-Gateway	Metric	Table
wan	0.0.0.0/0	10.15.1.254	0	main
wan	10.15.1.0/24		0	main
lan	192.168.1.0/24		0	main

Displays active WAN and LAN port's IPv4 routing table.

4.2.3.3 Active IPv6-Routes

Active IPv6-Routes

Network	Target	Source	Metric	Table
lan	fdfc:68c3:19eb:0:e5df:2aba:f91:5221		0	main
lan	fdfc:68c3:19eb::/64		1024	main
wan	ff02::1		0	local
wan	ff02::2		0	local
wan	ff02::c		0	local
wan	ff02::1:2		0	local
wan	ff02::1:3		0	local
wan	ff02::1:ff50:9e09		0	local
lan	ff00::/8		256	local
(eth0)	ff00::/8		256	local
wan	ff00::/8		256	local
lan	ff00::/8		256	local
lan	ff00::/8		256	local

Displays active IPv6 routing table of WAN and LAN port.

4.2.3.4 IPv6 Neighbors

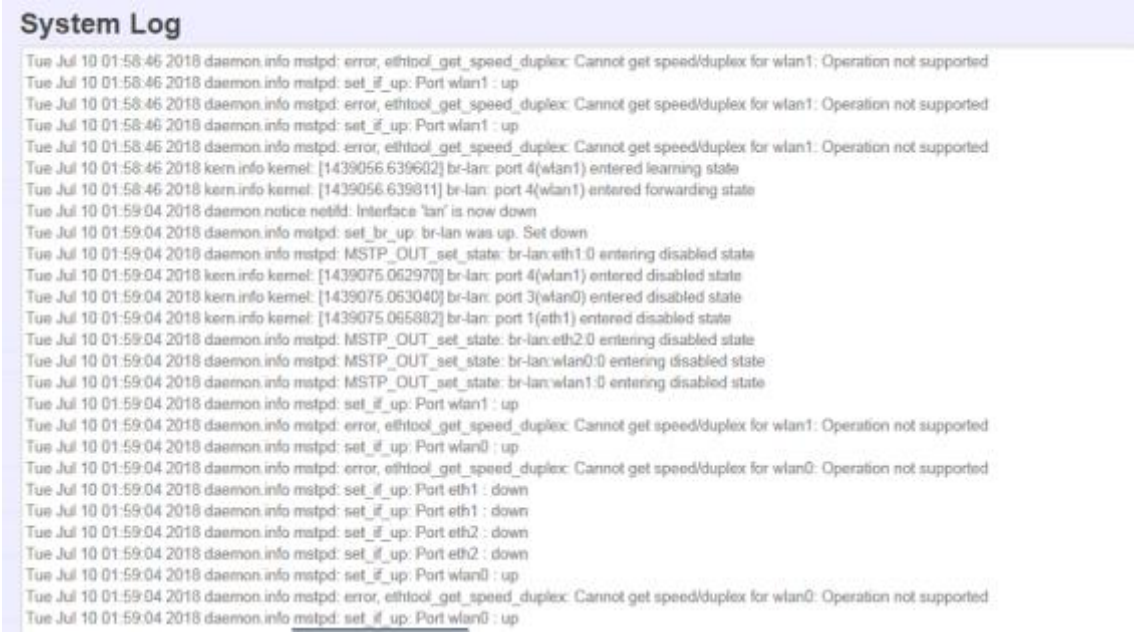
IPv6 Neighbours

IPv6-Address	MAC-Address	Interface
fdfc:68c3:19eb:0:1f4:f243:8a92:a881	80:19:34:c9:04:00	lan
fdfc:68c3:19eb:0:e5df:2aba:f91:5221	80:19:34:c9:04:00	lan
fdfc:68c3:19eb::3b0	00:0d:f0:ac:c8:63	lan
fdfc:68c3:19eb:0:21cf:78b5:a2c9:e438	00:0d:f0:ac:c8:63	lan
fdfc:68c3:19eb:0:b815:35d6:d6b7:df68	00:0d:f0:ac:c8:63	lan
fdfc:68c3:19eb:0:691a:9a70:b879:924d	80:19:34:c9:04:00	lan
fdfc:68c3:19eb:0:468:1e7:d4fe:8c9a	9c:2a:70:1b:4c:9d	lan
fdfc:68c3:19eb:0:f118:d10c:ab71:1676	80:19:34:c9:04:00	lan
fdfc:68c3:19eb:0:7c3e:bc4c:52a3:de5a	00:0d:f0:ac:c8:63	lan
fdfc:68c3:19eb:0:6046:1236:d6c8:82c1	00:0d:f0:ac:c8:63	lan
fdfc:68c3:19eb:0:c654:44ff:fede:fea5	c4:54:44:de:fe:a5	lan
fdfc:68c3:19eb:0:e151:5f16:e22f:fc7c	c4:54:44:de:fe:a5	lan
fdfc:68c3:19eb:0:61ad:92b6:99e2:bf9b	80:19:34:c9:04:00	lan

Display connected device with IPv6 information.

4.2.4 System Log

The “System Log” Web page contains the events log in NIO200 system for trouble shooting reference.

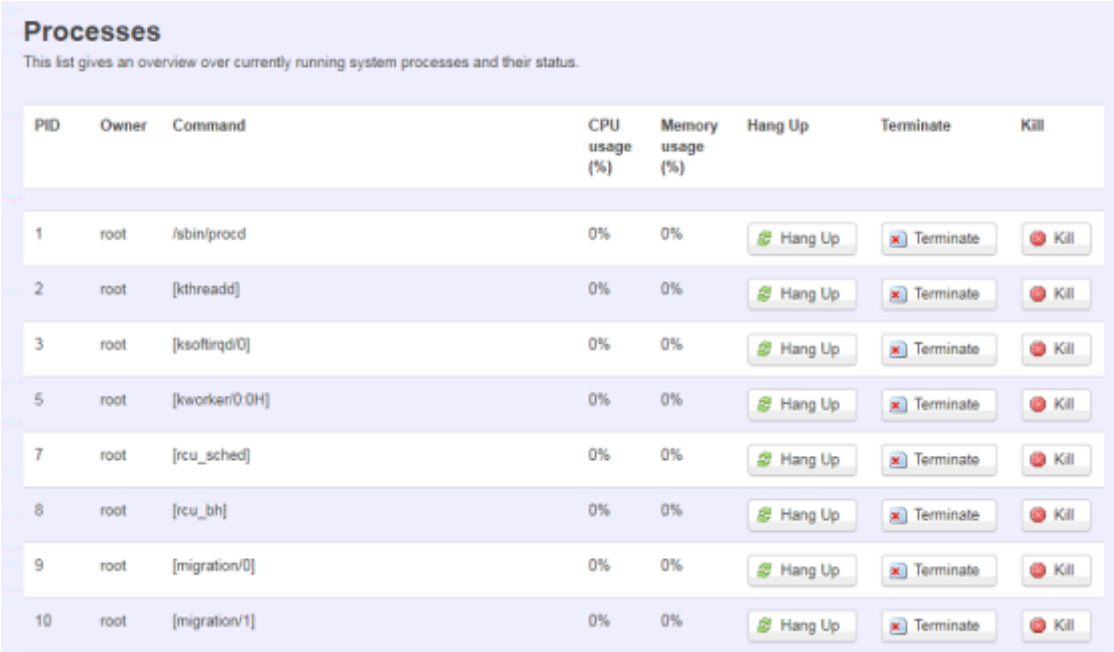


4.2.5 Kernel Log

The “Kernel Log” displays the record of kernel activities. The administrator can monitor the system status by checking this log.

4.2.6 Processes

This Webpage is designed for detailed trouble shooting/status monitoring by professional personnel in the field. Any improper terminating or killing individual process tasks may cause device malfunction. It's highly recommended to keep this Firewall setup page as it is.



4.2.7 Real-time Graphic

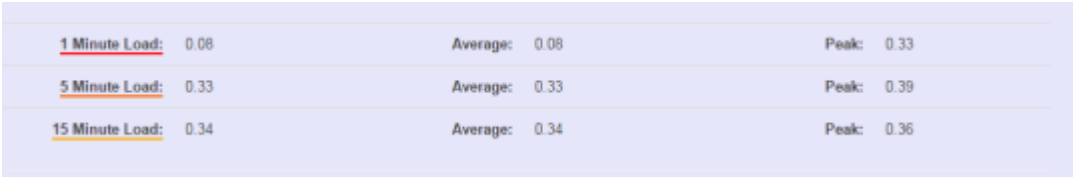
This section provides utilities to monitor NIO200 system information including real-time load, real-time Ethernet traffic, Real-time wireless signal and real-time associated device traffic.

To monitor status in this section, please make sure WebUI "auto refresh" function must be "**turn on**".

4.2.7.1 Load

Display real-time CPU average loading percentage.

i.e.



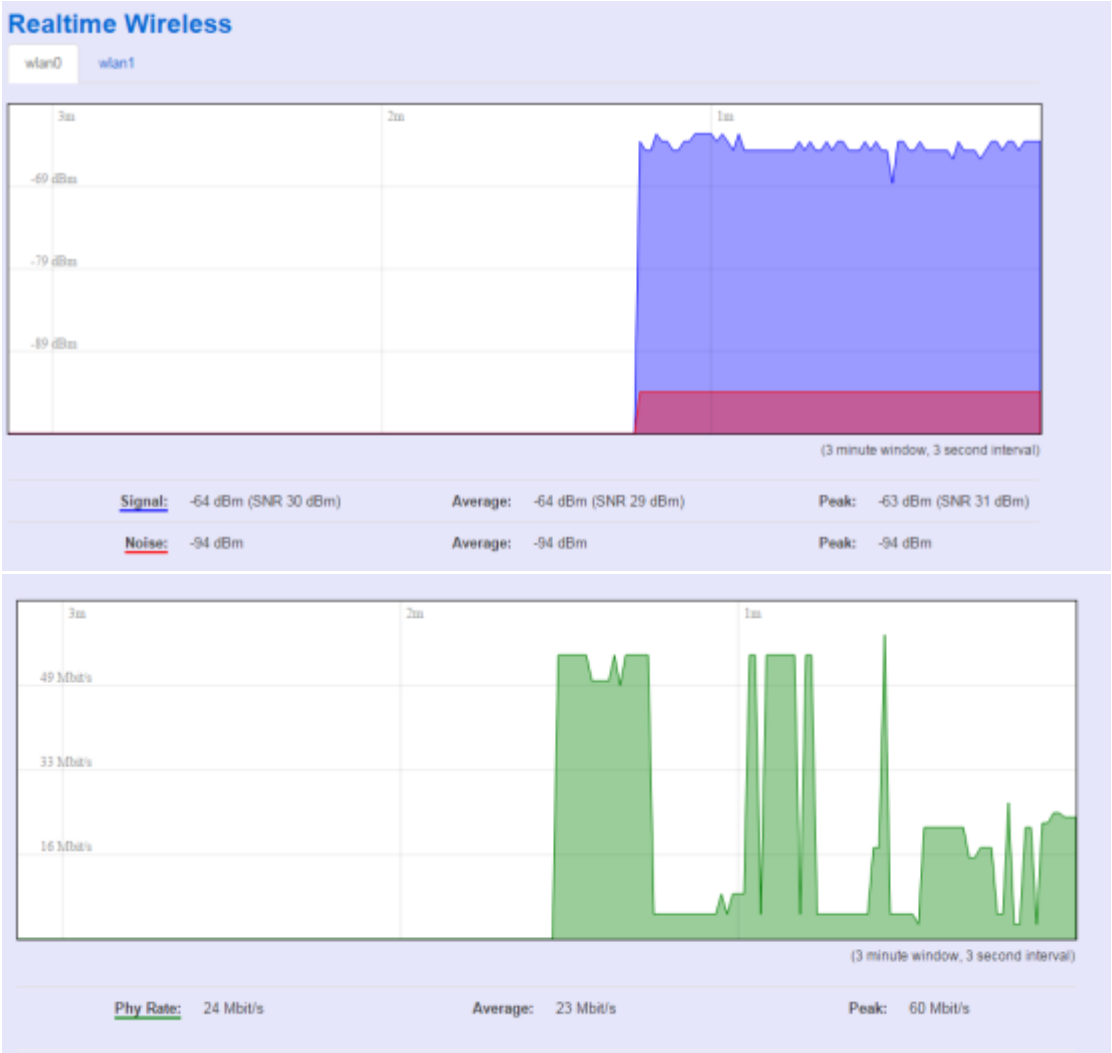
1 minute	Minimum	8%	Average	8%	Peak	33%
5 minutes		33%		33%		39%
15 minutes		34%		34%		36%

4.2.7.2 Traffic

Display NIO200 real-time traffic loading of Ethernet, WLAN and internal bridge interfaces.

Inbound: Incoming data throughput of the observed interface.
Outbound: Outgoing data throughput of the observed interface.

4.2.7.3 Wireless



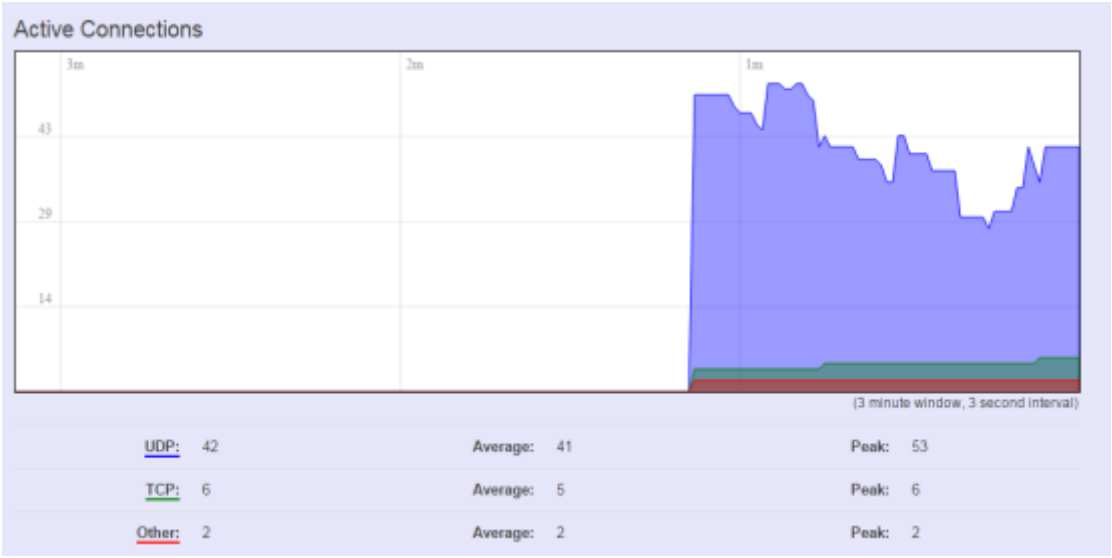
Display Wireless real-time signal quality including signal level, noise and data rate.

wlan0: Radio0 information.
wlan1: Radio1 information.

Note:
There will be no radio information when the WLAN interface is disabled.

4.2.7.4 Connections

This “Connections” displays NIO200 real-time active TCP/UDP/ICMP,… connection information for trouble shooting reference.



Network	Protocol	Source	Destination	Transfer
IPV4	ICMP	IM03-AndrewWang1.lan:0	IWF300.lan:0	602.29 KB (10279 Pkts.)
IPV4	UNKNOWN	0.0.0.0:0	all-systems.mcast.net:0	92.06 KB (2946 Pkts.)
IPV4	UDP	IM03-AndrewWang1.lan:17500	192.168.1.255:17500	57.95 KB (345 Pkts.)
IPV4	TCP	IM03-AndrewWang1.lan:57367	40.113.115.191:443	53.97 KB (573 Pkts.)
IPV4	TCP	IM03-AndrewWang1.lan:62255	IWF300.lan:80	19.43 KB (217 Pkts.)
IPV4	UDP	10.15.1.254:67	255.255.255.255:68	6.91 KB (21 Pkts.)
IPV4	TCP	IM03-AndrewWang1.lan:57369	tl-in-f125.1e100.net:5222	4.25 KB (55 Pkts.)
IPV4	TCP	IM03-AndrewWang1.lan:57366	91.190.218.53:12350	2.68 KB (48 Pkts.)
IPV4	UDP	IM03-AndrewWang1.lan:68	255.255.255.255:67	328.00 B (1 Pkts.)
IPV4	UDP	IWF300.lan:67	IM03-AndrewWang1.lan:68	328.00 B (1 Pkts.)
IPV4	UDP	IM03-AndrewWang1.lan:137	192.168.1.255:137	234.00 B (3 Pkts.)
IPV4	UDP	10.15.1.138:61033	10.1.1.2:53	118.00 B (1 Pkts.)
IPV4	UDP	10.15.1.138:43389	10.1.1.2:53	118.00 B (1 Pkts.)
IPV4	UDP	10.15.1.138:52009	10.1.1.2:53	118.00 B (1 Pkts.)

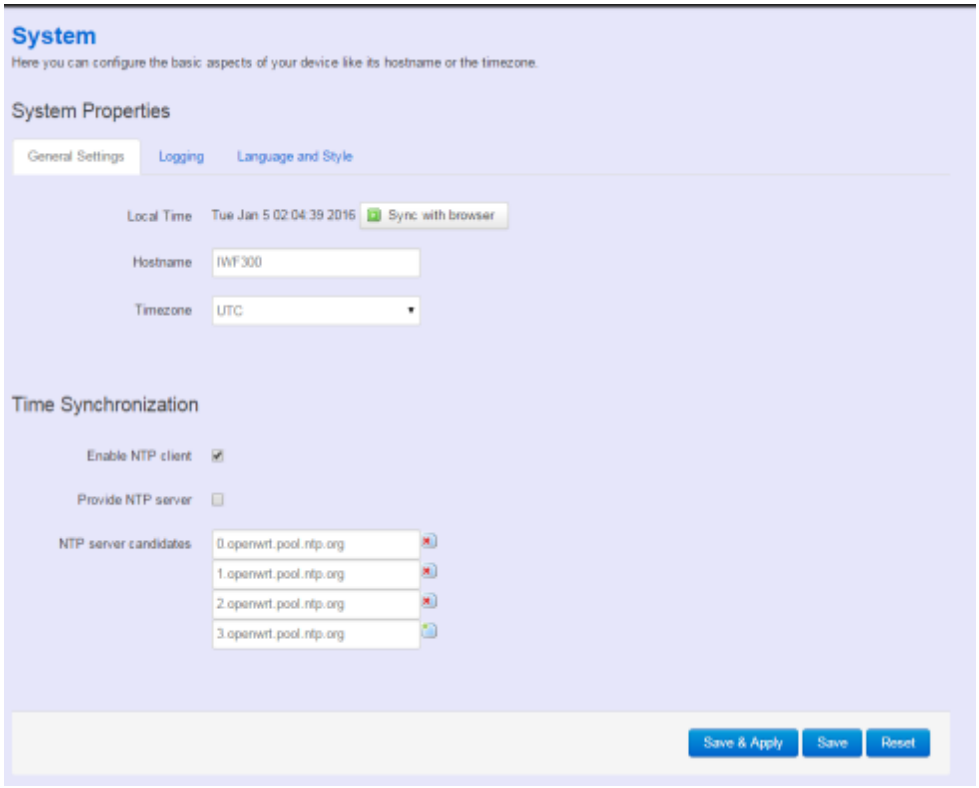
4.3 System

To setup detail configuration about NIO200 system, click the “System” under the page bar, then select the item of System, Administration, SNMP, Backup/Flash Firmware and Reboot from the pull-down list like below screen.

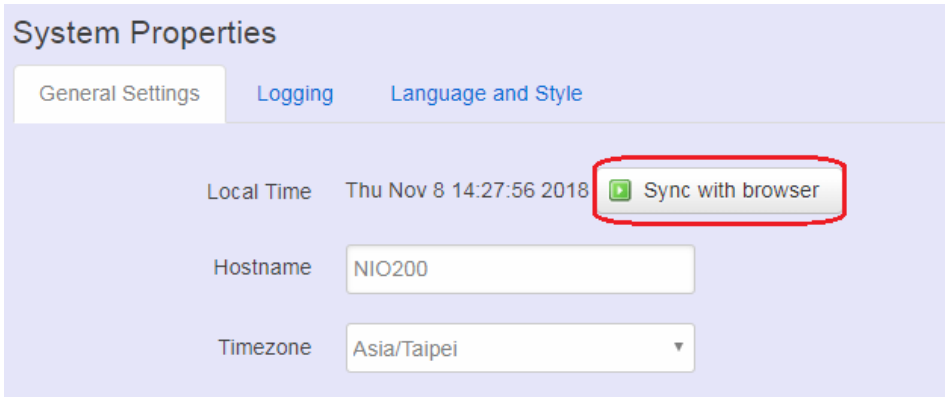
4.3.1 System

4.3.1.1 General Settings

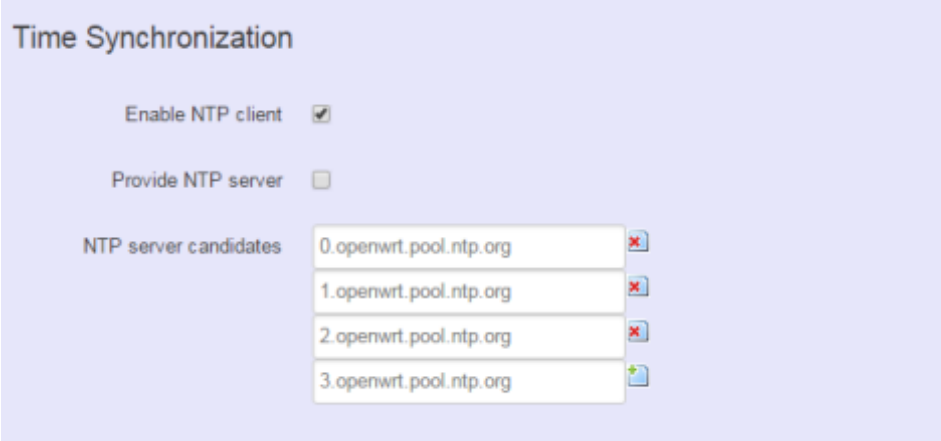
This section provide general settings of NIO200 including Time, Host name, Time zone and NTP.



Click “Sync with browser” let NIO200 sync time with your computer. And select country from the pull-down list in the Timezone.

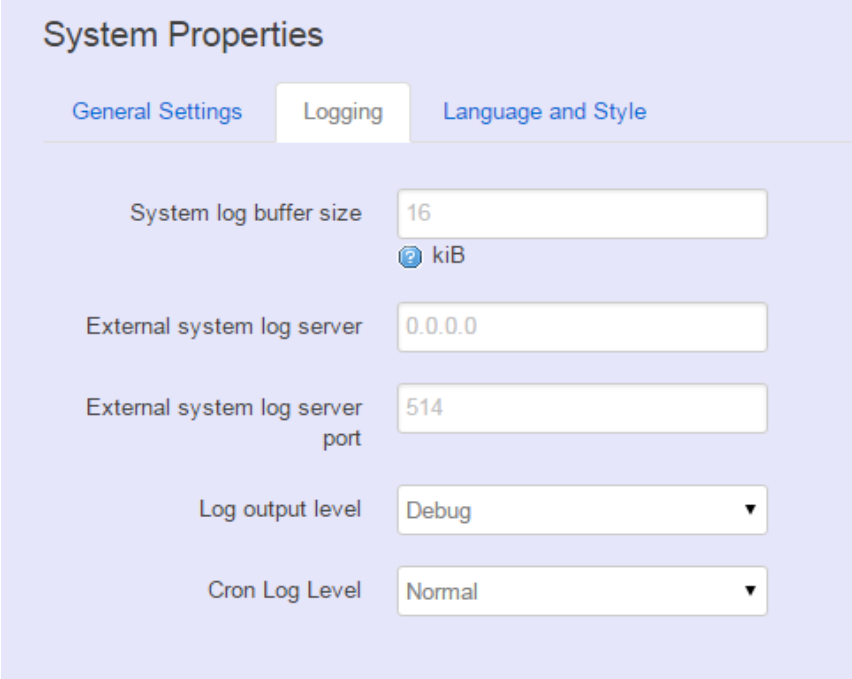


To make NIO200 system get time synchronization with NTP server, user may enable the NTP client and input the address of an NTP server to get the time updates.



4.3.1.2 Logging

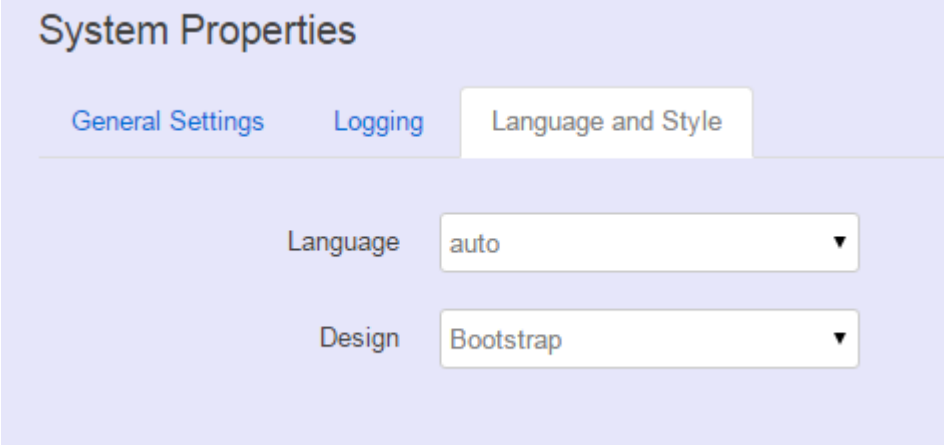
This section provides the setting of log configuration.



System log buffer size: The size of log information. Unit: Kbytes.
External system log server: The server address of external log server.
External system log server port: The port number of external log server.
Log output level: The output information of log, including Debug, Info, Notice, Warring, Error, Critical, Alert, and Emergency.
Cron Log Level: The minimal level for cron messages to be logged to syslog.

4.3.1.3 Language and Style

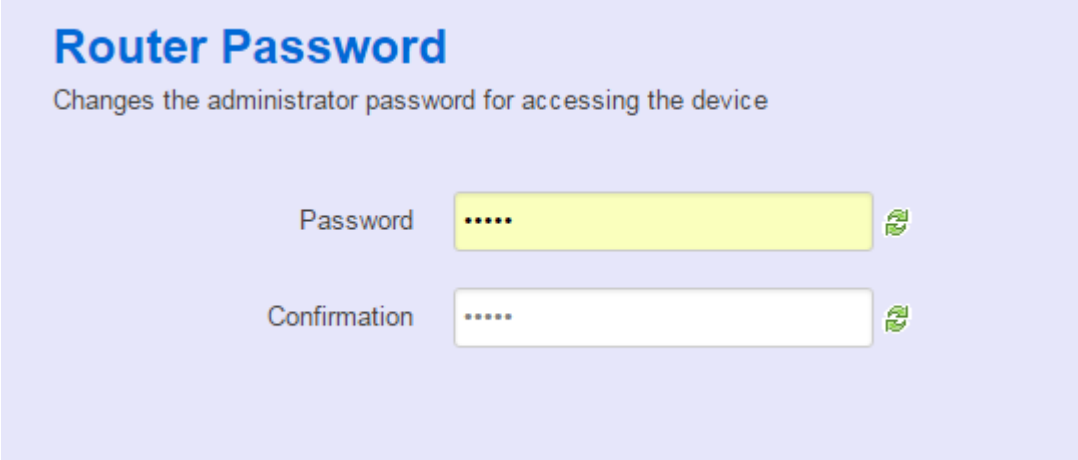
This section provides setting of language and WebUI style. NIO200 only provides English as default style.



4.3.2 Administration

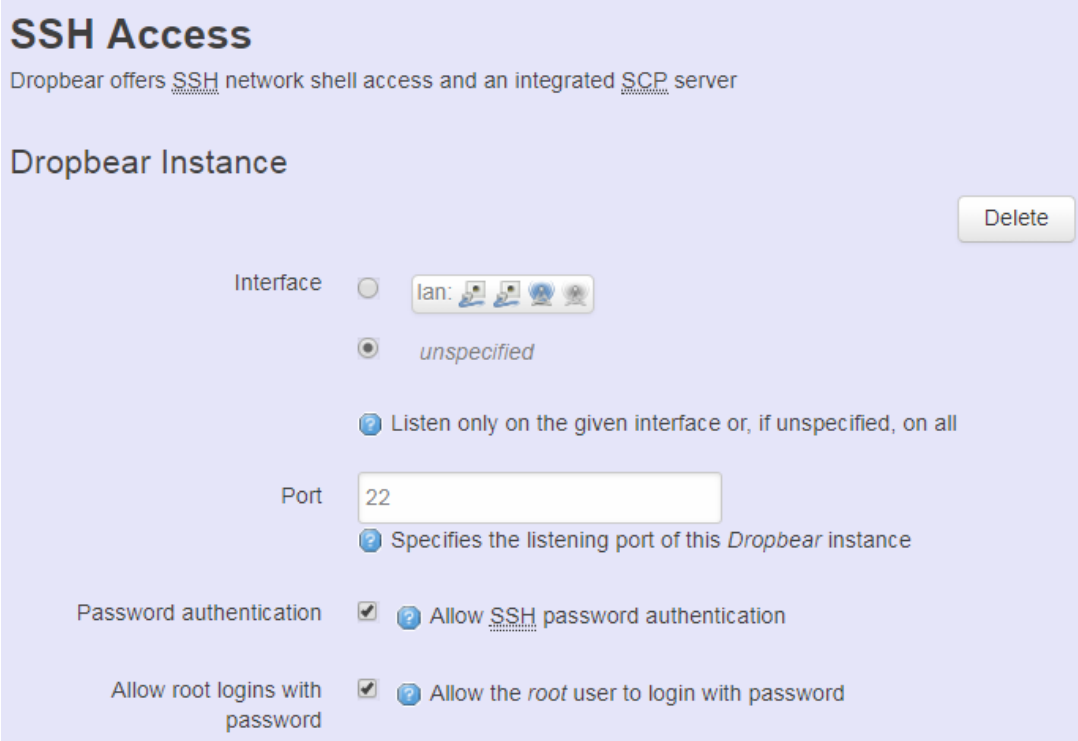
4.3.2.1 Router Password

To change default password, enter new password and confirm new one.



4.3.2.2 SSH Access

Secure Shell(SSH). Enable NIO200 to be accessed via SSH-based application. This increase the security in configuration of NIO200 remotely.



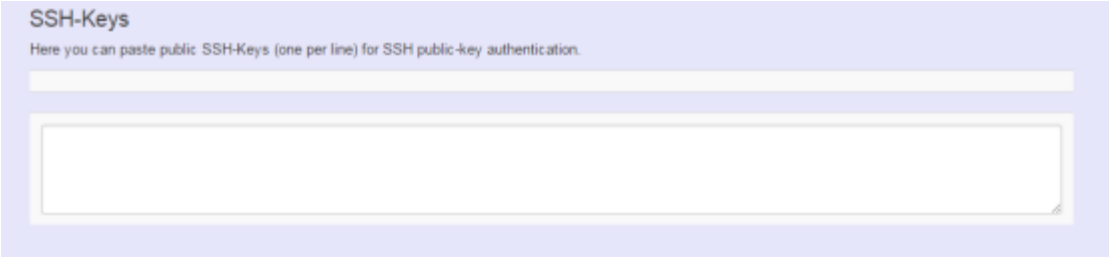
Interface: Select the interface.

Port: Enter the port number for the communication via SSH.

Password authentication: Enable/Disable SSH password authentication.

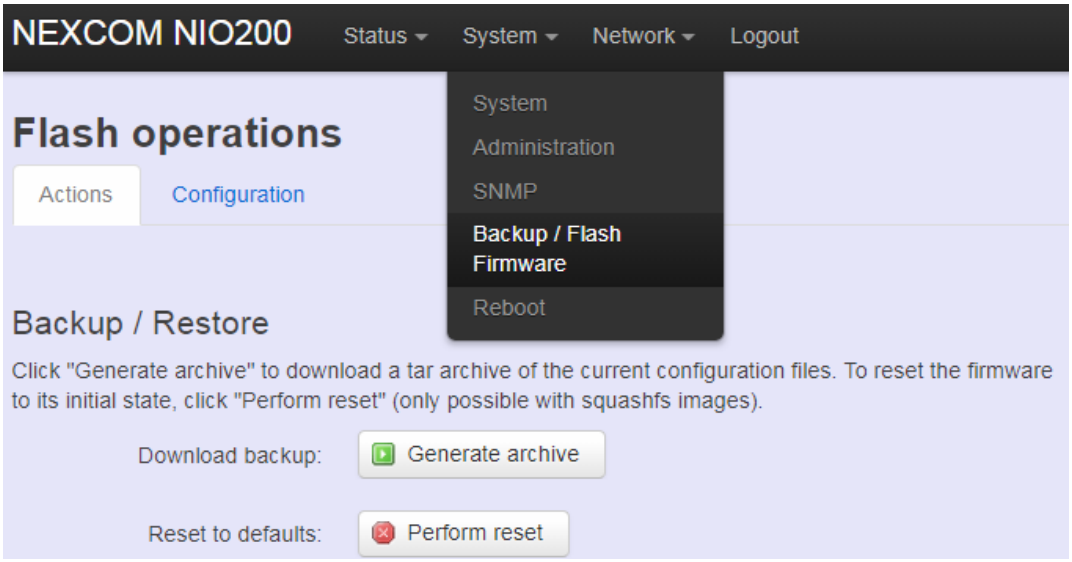
Allow root logins with password: Enable/Disable the *root* user to login with password.

User may paste the public SSH-Keys (one per line) for additional SSH public-key authentication.



4.3.3 Backup/Flash Firmware

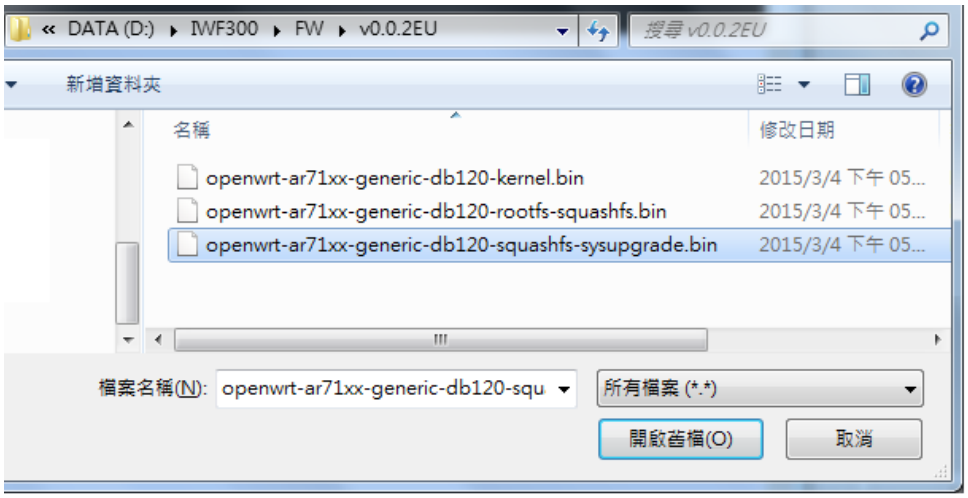
To upgrade new firmware on device, user may choose “Backup/Flash Firmware” from “Systme” in tool bar as below:



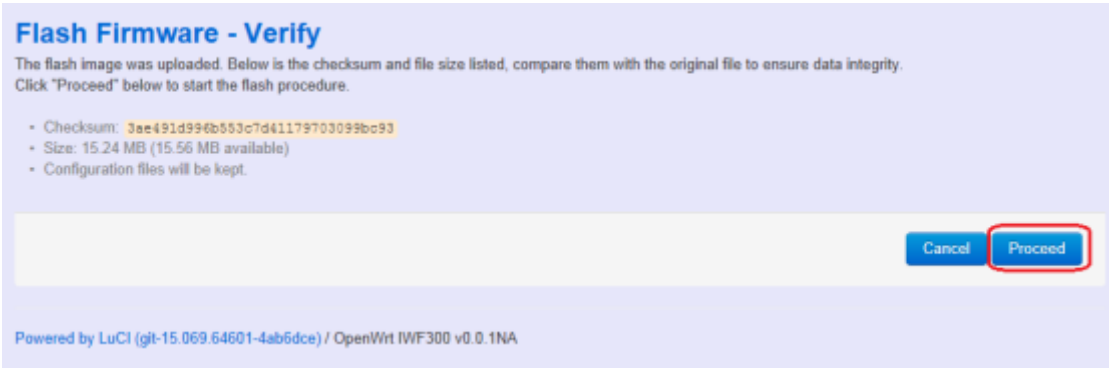
4.3.3.1 Upgrade Firmware

- To flash a new firmware image to NIO200, user may press the button of “Flash image” as below:

- Then select the correct firmware file from the file browser:

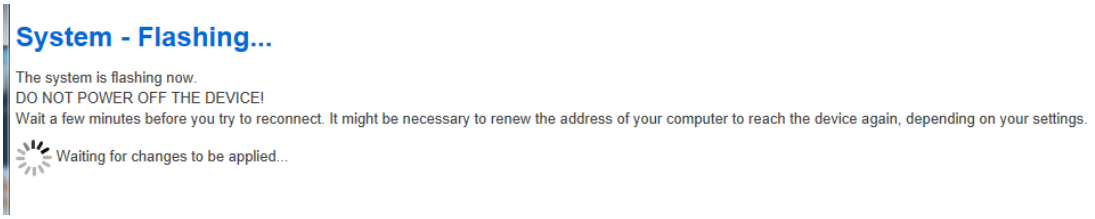


- Then, WebUI displays the file checksum.



- You can choose “Proceed” to start the upgrading.

Note: After you click “Proceed”, the DUT firmware will be upgraded with the file you selected, and the upgrade progress will display like below:



Note: The whole firmware image may take several minutes to complete the flash writing. PLEASE DO NOT REBOOT OR POWER OFF THE DEVICE before the whole progress.

If the firmware upgraded is successful, the WebUI should switch to the Login page. User can also confirm the firmware image is successfully upgraded via “Status” Web page.

4.3.3.2 Backup Configuration

To back up the configuration file, user may select the “Generate archive” button as below:

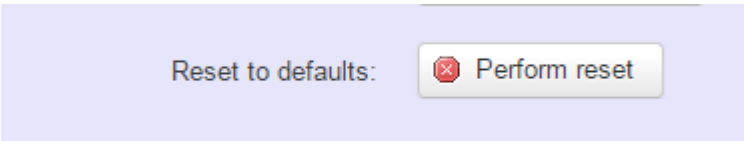
Then save it as a file in your PC.

To restore previous configuration, user need to browse the backup file and then press “Upload archive…” button as belwo:

Note: After restore the file, system will apply the changes and automatically reboot. Due to configuration backup may cause IP address change, you have to enter new IP address accordingly. Otherwise, the new web page may not be accessible.

4.3.3.3 Reset to default

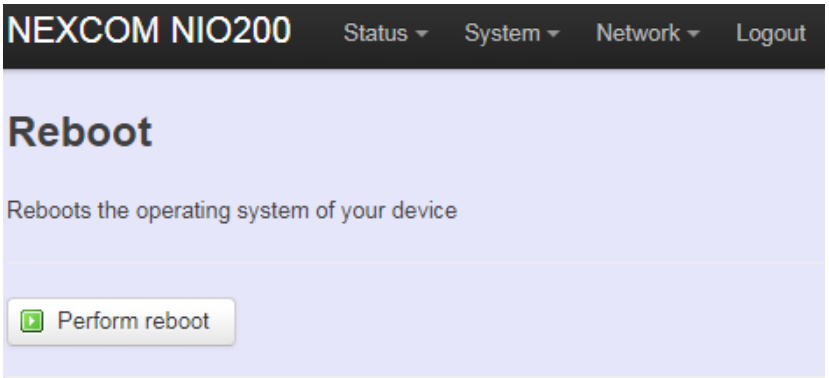
To reset NIO200 to factory default configuration, user will need to press “Perform reset” button as below.



Note: The whole process may take several minutes to complete.
PLEASE DO NOT REBOOT OR POWER OFF THE DEVICE before the whole process being successfully done.

4.3.4 Reboot

Click the “Perform reboot” button will help to warm start the system. After system finish reboot process, it will back to Login page.

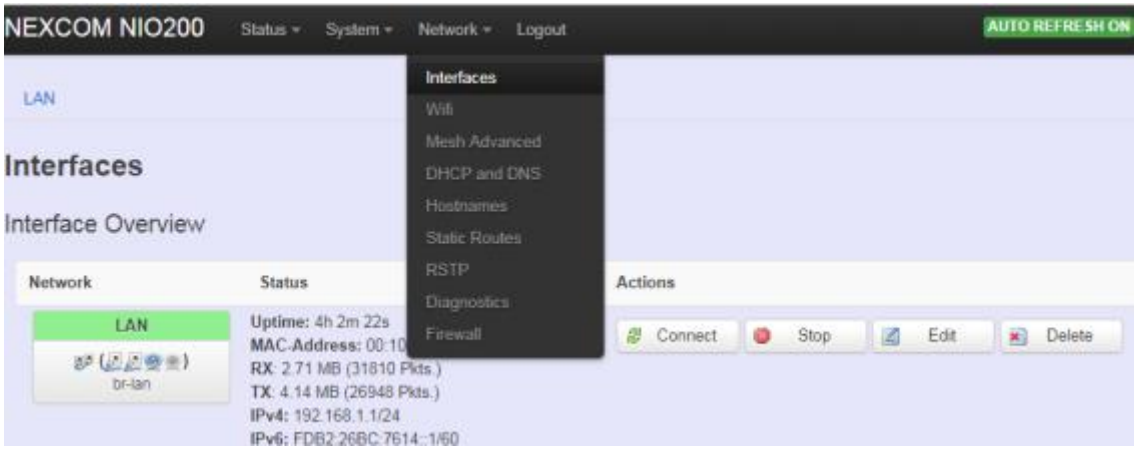


4.4 Network

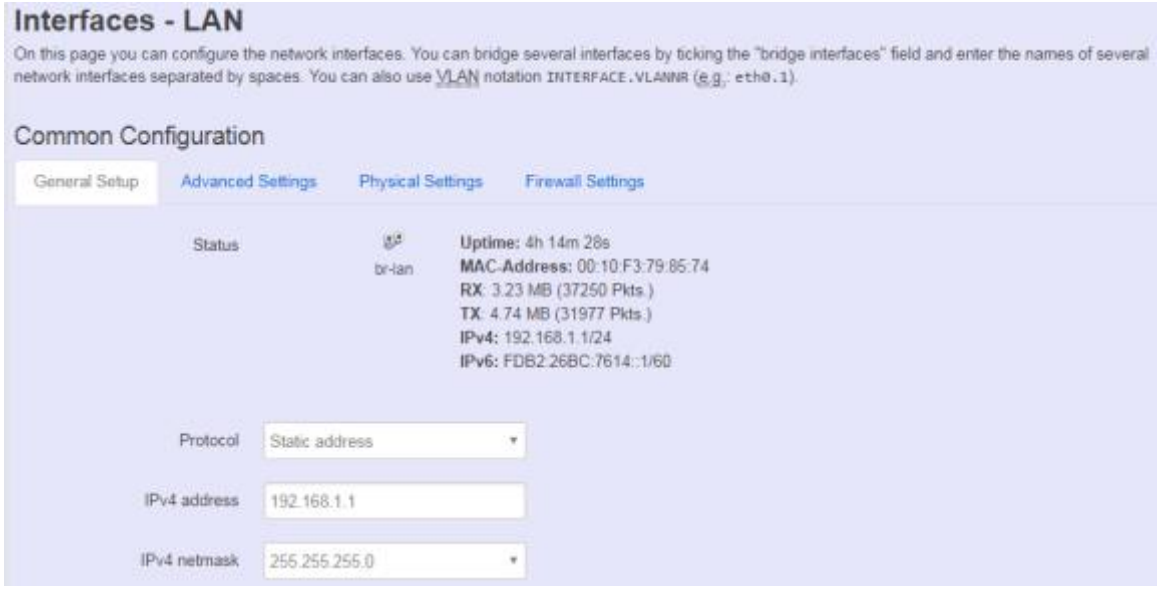
4.4.1 Interfaces

4.4.1.1 Configuration of IP address

To set up a new IP address, please click “Network” from page bar, then select the “Interface”, and then click “Edit”



Edit IP address:

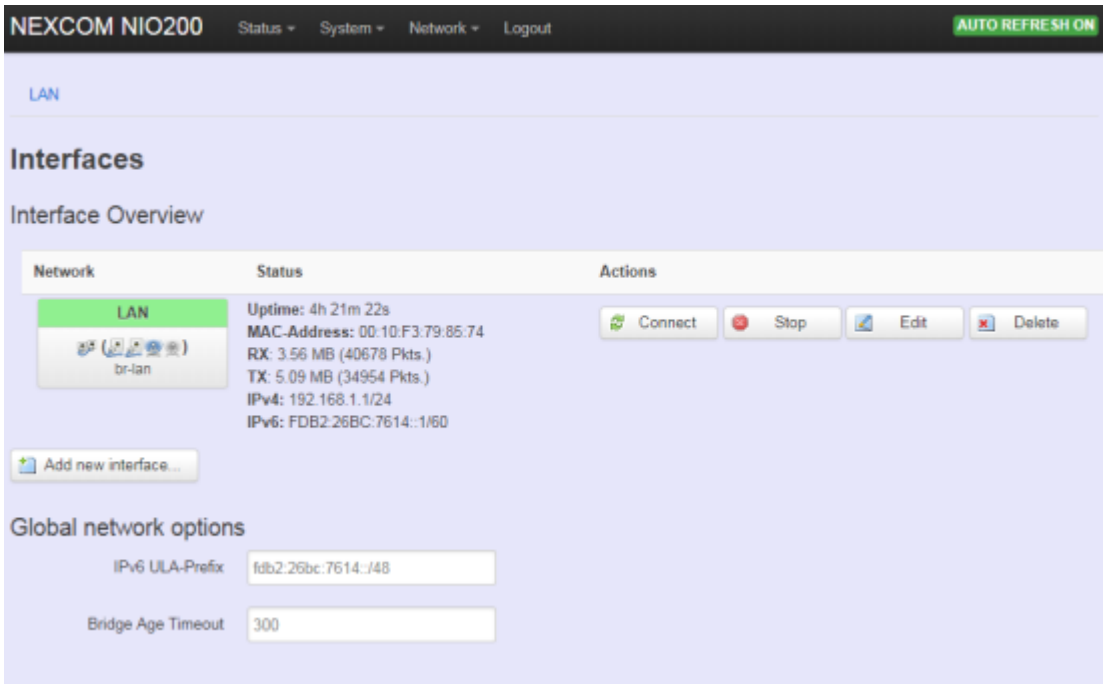


When modifying the IP address, user needs to input the IP address, netmask, gateway,.. for this device and then click “Save & Apply” to save this new IP address into flash and apply it immediately.

Note: after apply new IP, it would take several minutes to switch to the Status page via the new IP address. Please enter the new IP address on browser again if the browser does not

switch to new Web page after 5 minutes.

- **Interfaces overview**



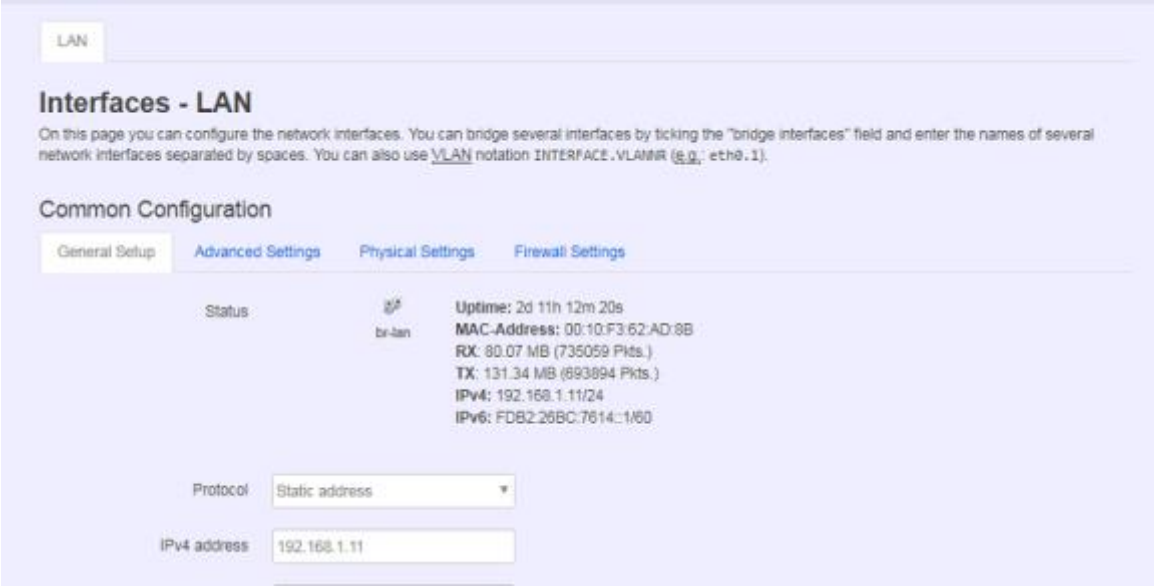
Connect: Press this button to re-connect LAN interface to Ethernet network.
Stop: Shutdown this interface.
Edit: Modify WAN port setting or LAN port group settings
Delete: Delete this Interfaces from group

Note:

- Do not perform “Stop” LAN interface when this is the only available interface, otherwise, the system will not be able to work.
- Under such condition, please press the button longer than 10 sec. to get system back to factory default setting. User can go on the configuration with defult IP address “192.168.1.1”.

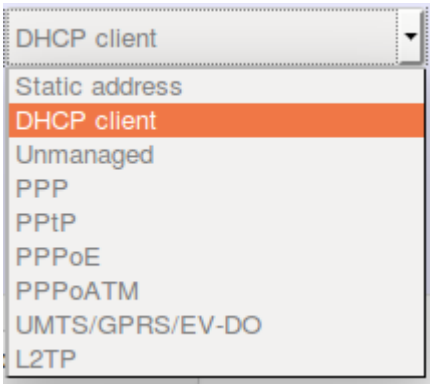
- **WAN(LAN) Interface overview**

On this page you can configure the network interfaces. You can bridge several interfaces by ticking the "bridge interfaces" field and enter the names of several network interfaces separated by spaces.



<General Setup>

You can change your Protocol to link worldwide Internet.



The default setting is DHCP client, send discover to find DHCP server.

Static address

Static IP (Manual):. Choose this option if you do not have a DHCP server in your network, or if you wish to assign a static IP address to NIO200WMR

DHCP client

When Dynamic IP (DHCP) is selected, the DHCP client to be functional once this selection is made

Unmanaged

This Interface have no configuration interface or options.

PPP

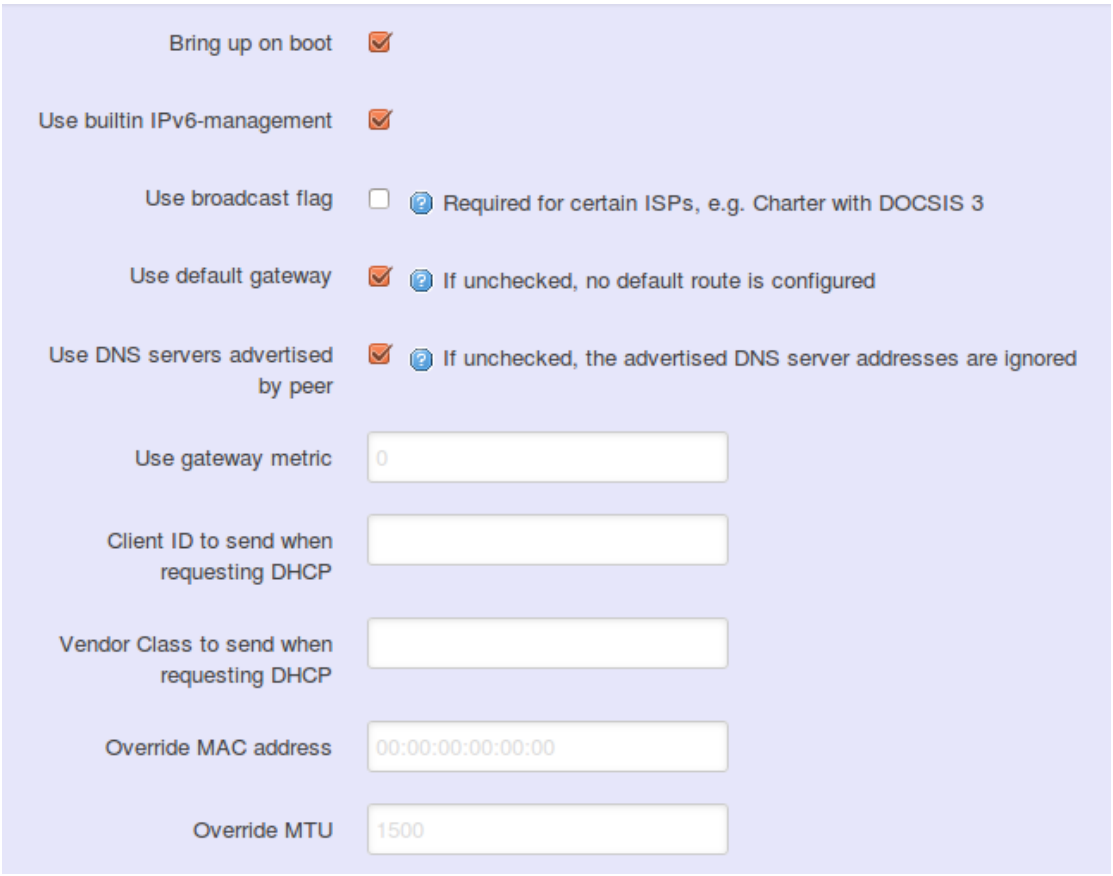
For old serial modem, provided point to point link for NIO200WMR

PPPoE

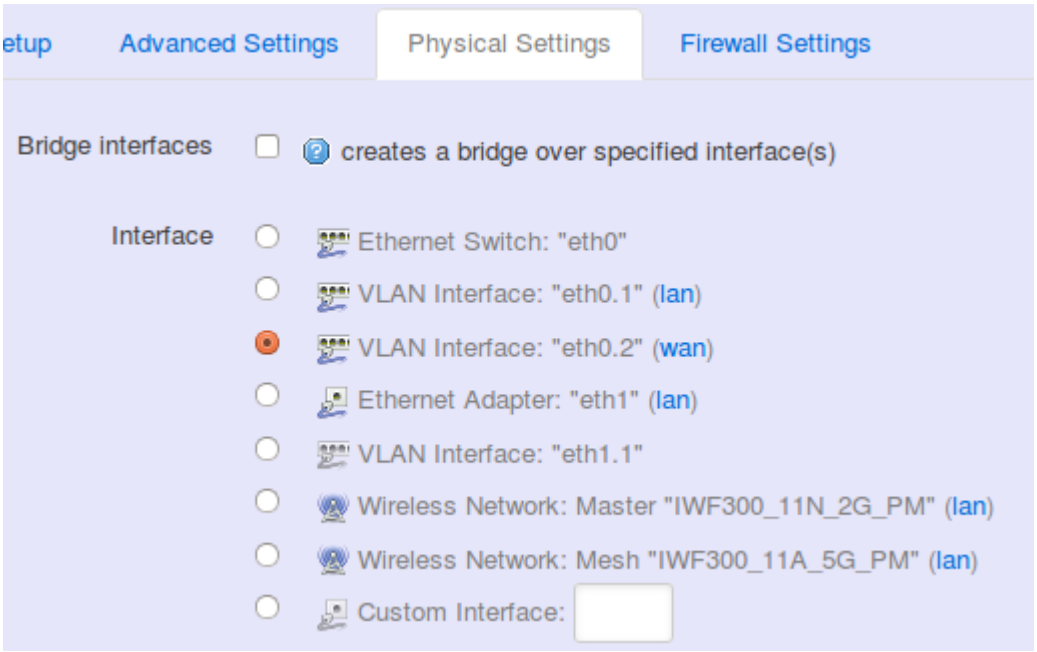
For cable modem or ADSL user, link NIO200WMR to your Internet provider.

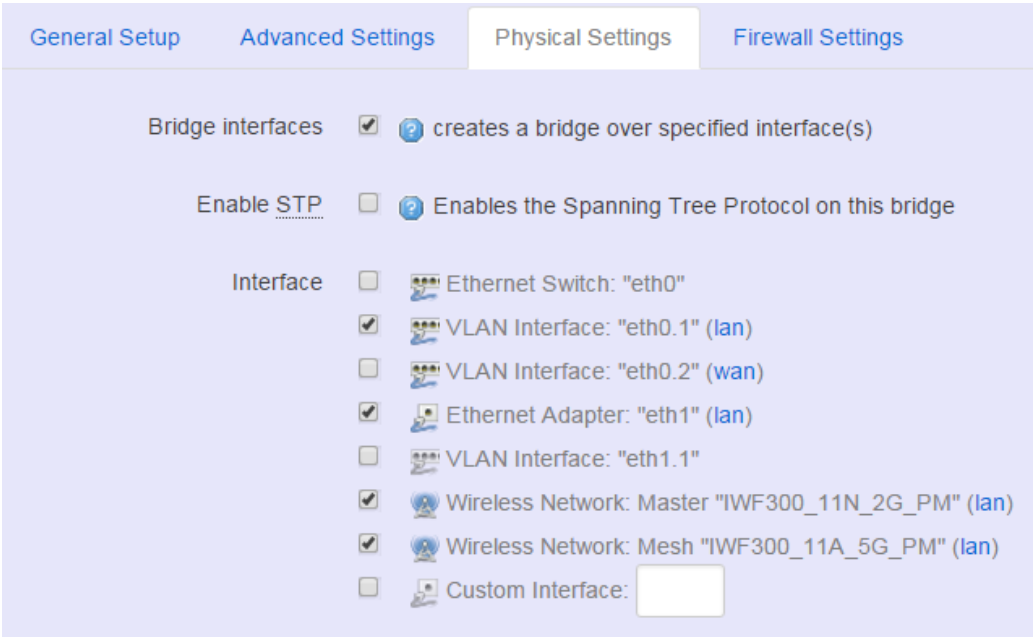
<Advanced Settings>

This is used for advanced settings and configure, strongly recommend user do not make change to this web page.



<Physical Settings>





Bridge interfaces

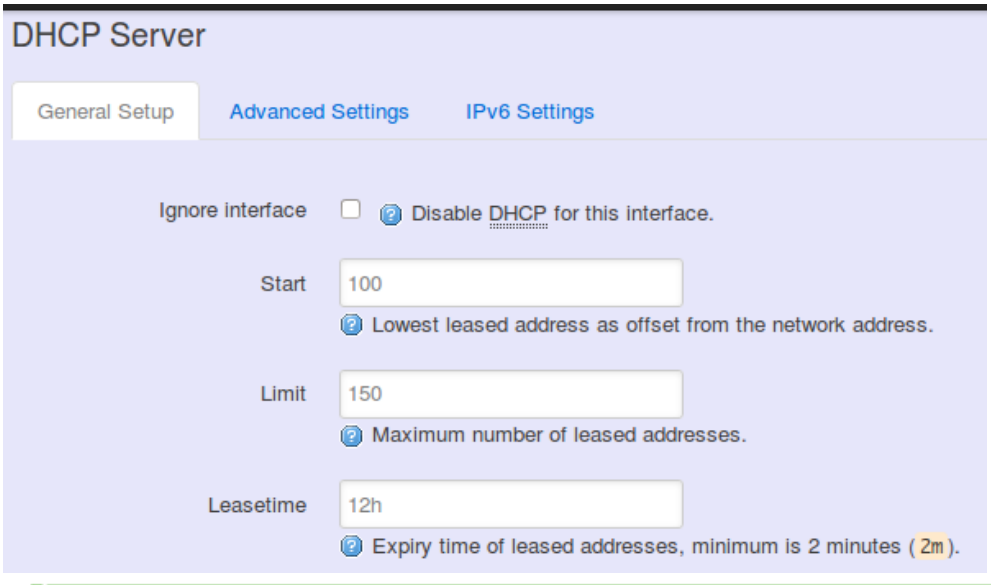
You can bridge an interfaces group for your WAN or LAN interface. Normally, only LAN interface need to enable bridge interfaces. After enable bridge interfaces, select interfaces to bridge.

Interface

Select interfaces for your bridge group. Select both the Ethernet adapter (most likely eth0.1' eth1) and the wireless network.

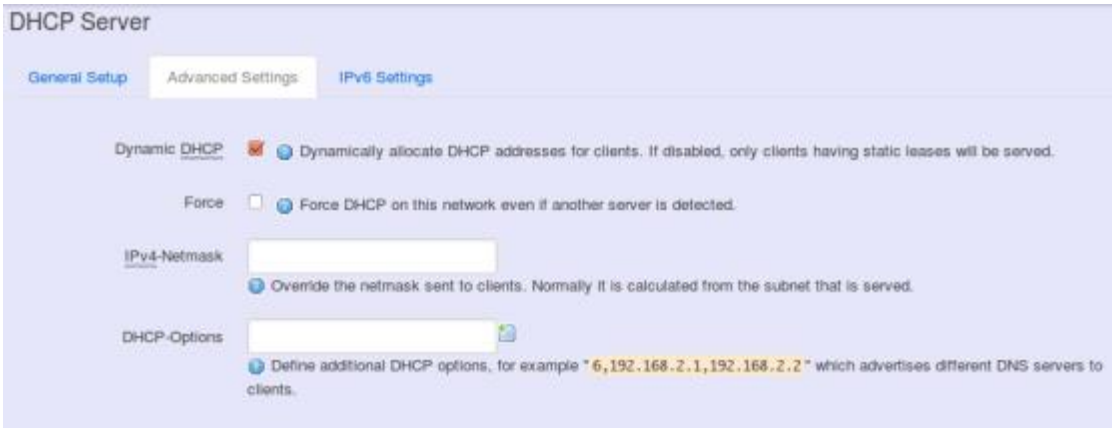
- **DHCP Server**

<General Setup>



Ignore Interface: Select this option to disable your DHCP server, you will need static IP or another DHCP server for your network interfaces. Default is “enable DHCP”

<Advanced Settings>

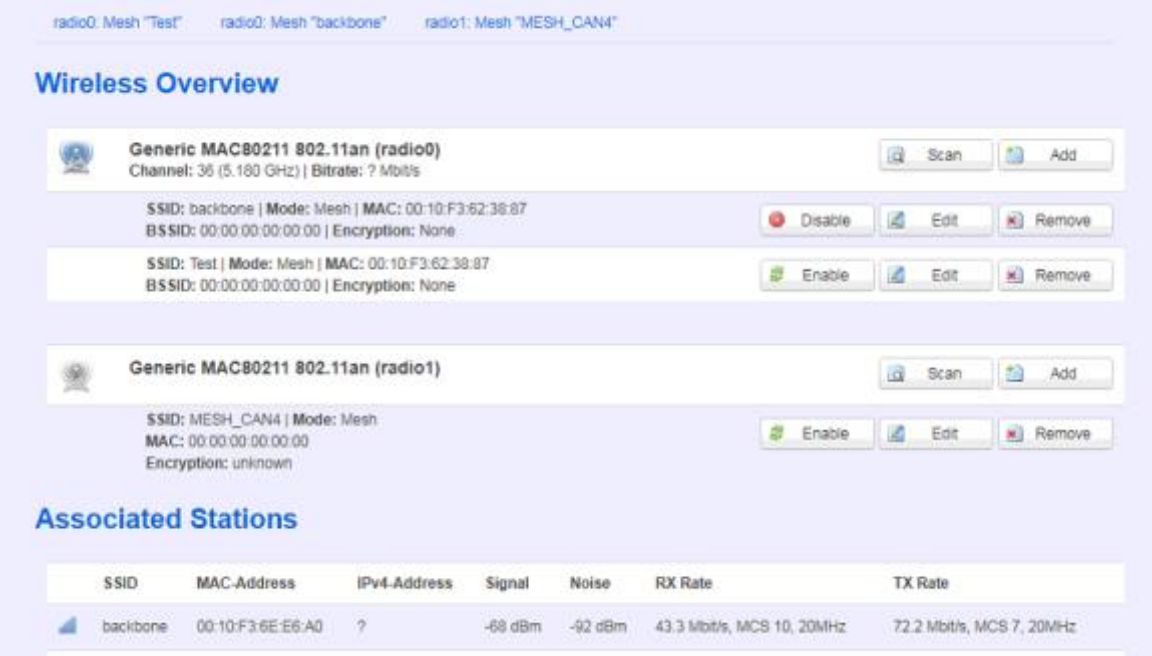


Dynamic DHCP: Dynamically allocate DHCP addresses for clients. If disabled, only clients having static leases will be served.

Force: Force DHCP on this network even if another server is detected.

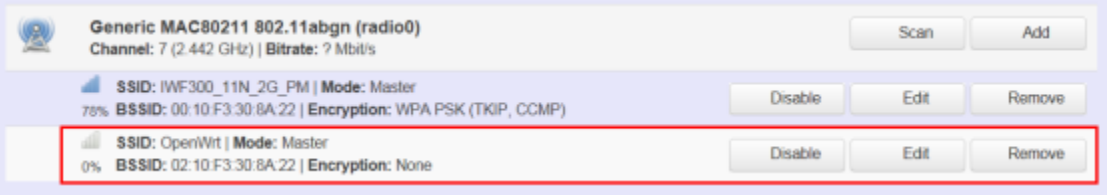
4.4.2 Wi-Fi

4.4.2.1 Wireless Overview



To set up the Wireless configuration, please select “Network” in the tab , then select “Wi-Fi”, which would show you the current radio interfaces status.
Wireless Overview includes channel’ SSID’ MAC address and security setting information.
Scan: Scan can explore how many AP signals can be detected. This is a good way to get the idea about how noisy the installation site is. User can choose a channel which is less interference with other APs.

Add: Add new virtual AP in the same radio interface. You will see new interface after click “add”

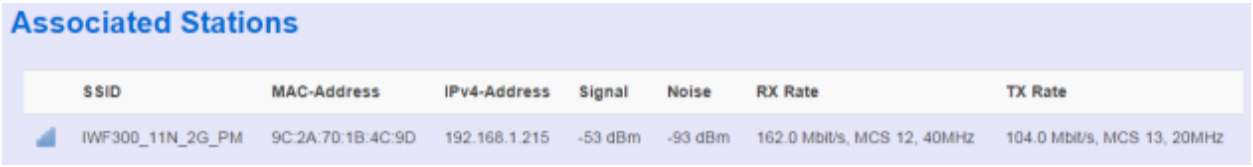


Disable: Disable the radio interface

Edit: Configure the radio interface
Remove: Remove radio interface. Please note that disable radio first when you don't want to use the radio interface.

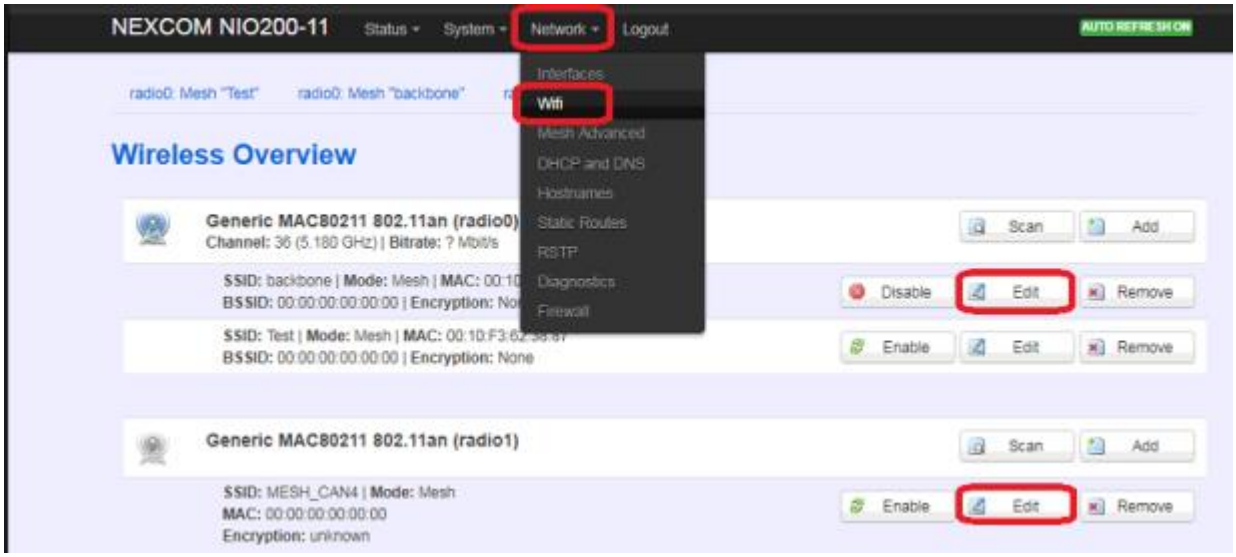
4.4.2.2 Associated Stations

Associated stations show wireless client connection information. It includes the SSID wireless client connect' wireless client MAC/ IP address' RSSI signal strength and Tx/Rx rate.

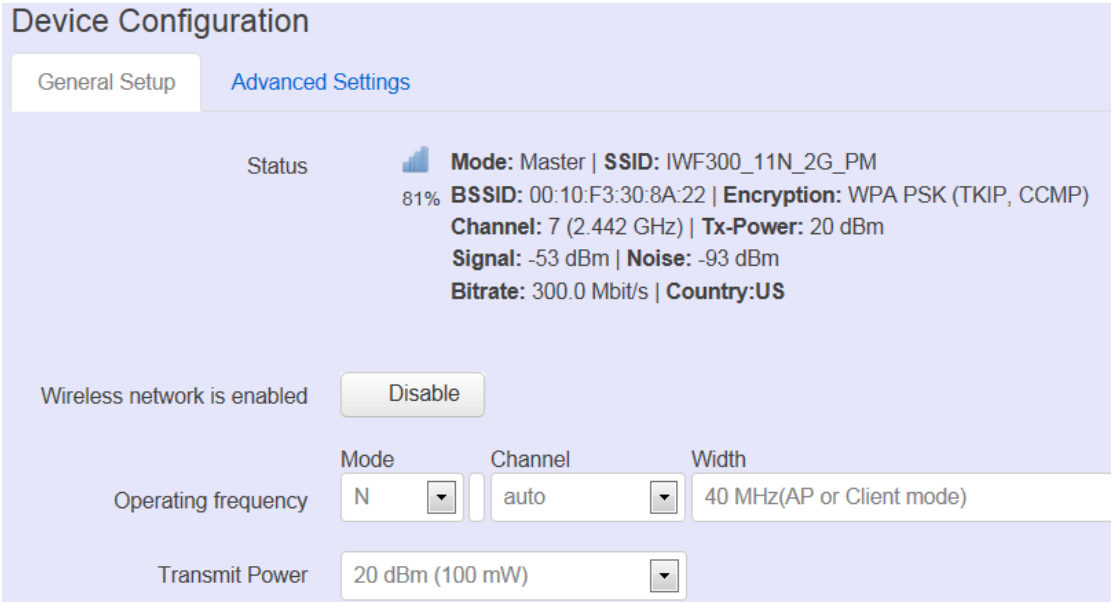


4.4.2.3 Wireless configuration

Please select "network" -> "Wi-Fi" and click Edit to configure Radio0 or Radio1.



The ***Device Configuration*** section covers physical settings of the radio hardware such as channel, transmit power…etc.

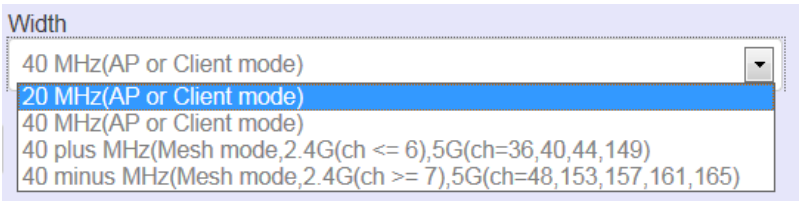


<General setup>

Wireless network is enabled: Enable or disable the radio interface

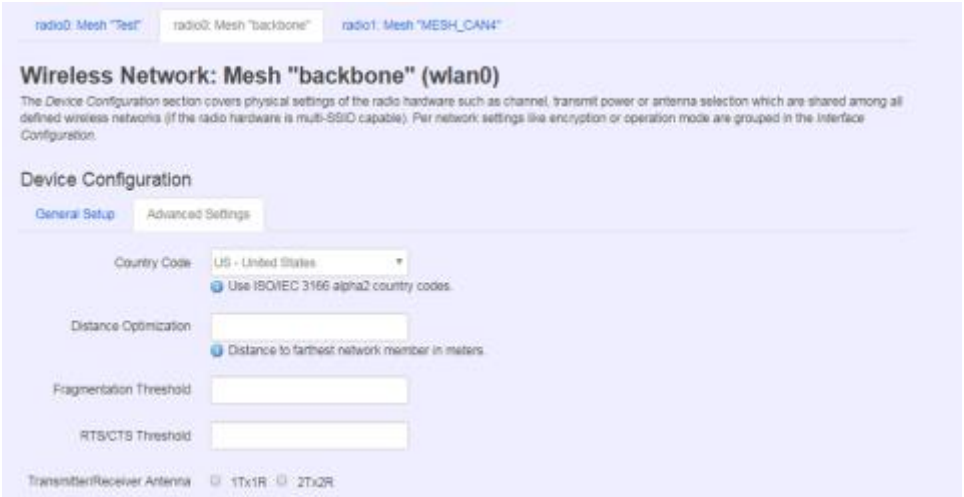
Operating frequency: Select radio frequency and channel bandwidth for signal transmission.

For channel bandwidth, please note you need to confirm AP/ client mode or mesh mode and which channel you will use



Transmit Power: Control the transmit power of a radio by selection of Transmission Power.

<Advanced settings>

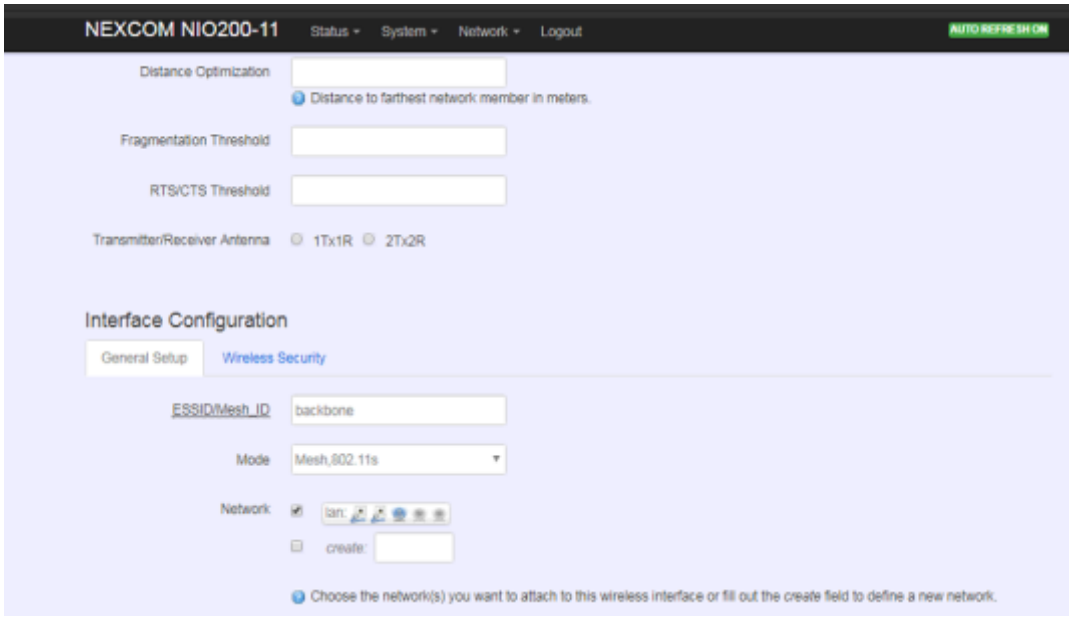


Distance Optimization: Specify the ACK timeout by entering the value manually. ACK timeout can be entered by defining the link distance. Too short value of the ACK timeout may cause transmission time out and no packet can be received. Too long value may cause low throughput rate.

Fragmentation Threshold: Default=off. Specify the Fragmentation threshold by entering the value manually [300-2346 bytes]. This is the maximum size for a packet before data is fragmented into multiple packets. Setting the Fragmentation threshold too low may result in poor network performance. Only minor modifications of this value are recommended

RTS/CTS Threshold: Default=off. RTS/CTS (Request to Send / Clear to Send) is the optional mechanism used by the 802.11 wireless networking protocol to reduce frame collisions introduced by the hidden node problem. RTS/CTS is an additional method to implement virtual carrier sensing in Carrier sense multiple access with collision avoidance (CSMA/CA). Specify the RTS threshold by entering the value manually [0-2346 bytes]. Typically, sending RTS/CTS frames does not occur unless the packet size exceeds this threshold.

This ***Interface Configuration*** section covers SSID' operation mode and encryption.



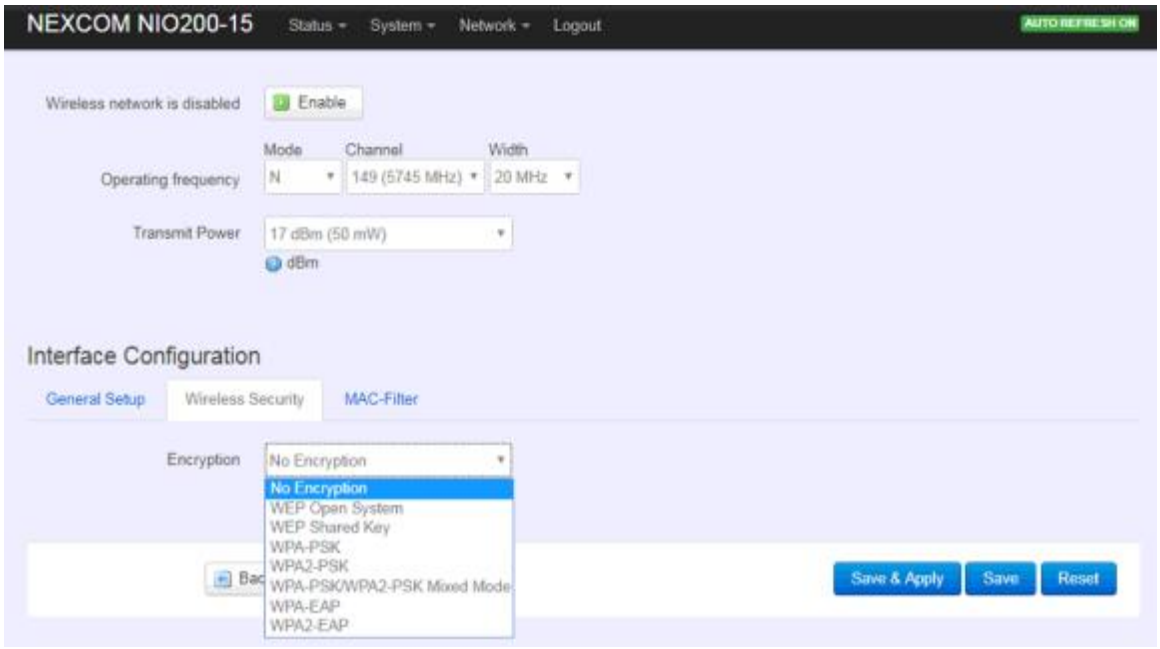
<General setup>

ESSID: Edit the SSID or Mesh ID.

Mode: Select operation mode

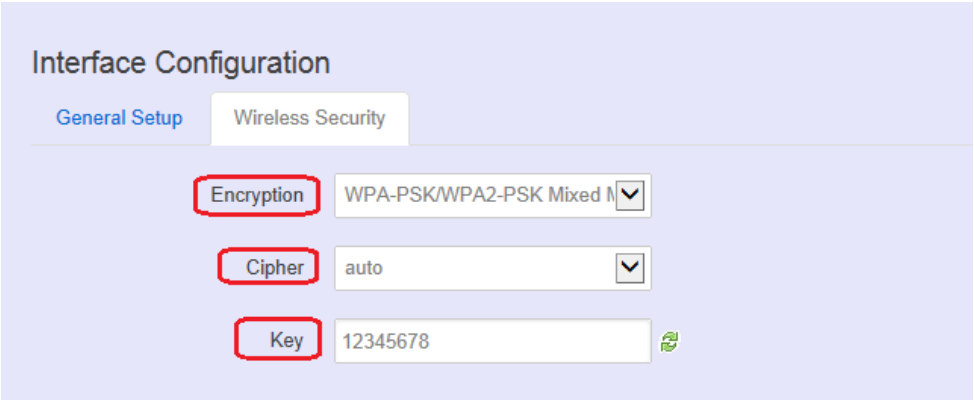
- AP
- Client Router
- 802.11s (Mesh mode)

<Wireless Security>



Encryption: To setup the Security on Radio, please select one of the Encryption:

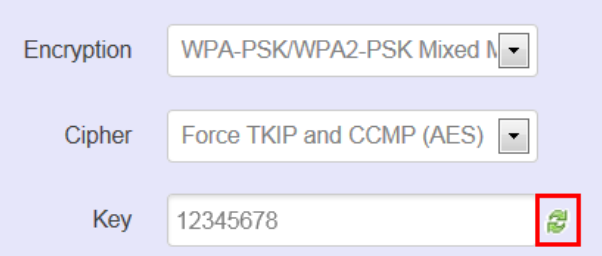
- No Encryption
- WEP Open System: WEP provides a basic level of security, preventing unauthorized access to the network. WEP uses static shared keys that are manually distributed to all clients that want to use the network
- WEP Shared Key: WEP provides a basic level of security, preventing unauthorized access to the network, and encrypting data transmitted between wireless clients and an access point. WEP uses static shared keys that are manually distributed to all clients that want to use the network
- WPA-PSK: Clients using WPA for authentication
- WPA2-PSK: Clients using WPA2 for authentication
- WPA-PSK/WPA2-PSK Mixed Mode: Clients using WPA or WPA2 for authentication



Cipher : To select cipher, recommend to select TKIP and CCMP(AES)

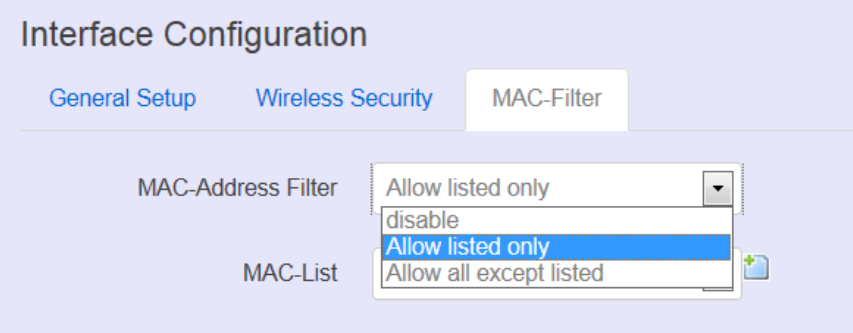
- Force CCMP(AES)
- Force TKIP

- Force TKIP and CCMP(AES)



The cycle icon will display the characters you just input.

<MAC filter>

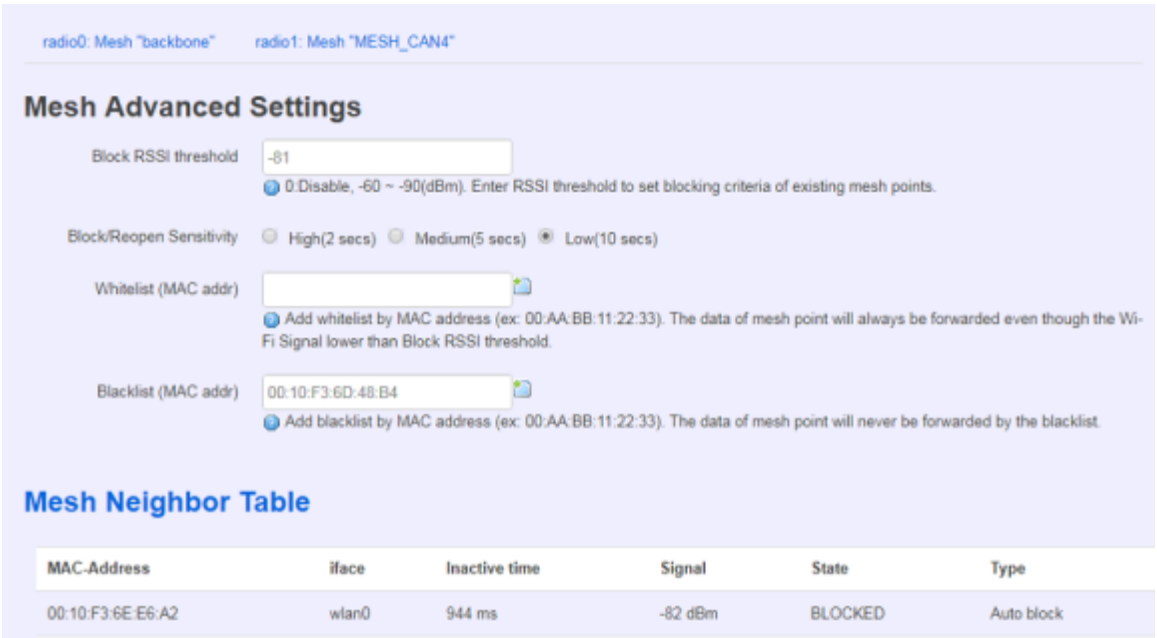


Select MAC Filtering. Specifies the MAC address to block or allow traffic from.

4.4.3 Mesh Advanced

Mesh Advanced setting contains the important information about real Mesh connection path and Neighbor node signal strength and blocking status. This is an advanced mechanism to keep Mesh network in stable and optimized condition.

4.4.3.1 Mesh Advanced



- Block RSSI threshold: This is used to set the threshold of blocking current associated Mesh points.
  - 0: Disable
  - Input value between -60 ~ -90(dBm)
- Block/Reopen Sensitivity: This is a criteria for choosing the sensitivity level in Mesh path availability.
  - High:
    - After continuous 2 seconds with signal level higher than Block threshold, the blocked Mesh link can be available again.
    - After continuous 2 seconds with signal level lower than Block threshold, the active Mesh link will be blocked.
  - Medium:
    - After continuous 5 seconds with signal level higher than Block threshold, the blocked Mesh link can be available again.
    - After continuous 5 seconds with signal level lower than Block threshold, the active Mesh link will be blocked.
  - Low:
    - After continuous 10 seconds with signal level higher than Block threshold, the blocked Mesh link can be available again.
- After continuous 10 seconds with signal level lower than Block threshold, the active Mesh link will be blocked.

- Whitelist (MAC addr):

The Mesh device in Whitelist will be regarded available connecting path for data forwarding no matter the RSSI value is high or low.

- Blacklist (MAC addr):

The Mesh device in Blacklist will NOT be used for data forwarding no matter the RSSI value is high or low.

- Mesh Neighbor Table

Mesh Neighbor Table

MAC-Address	iface	Inactive time	Signal	State	Type
00:10:F3:6E:E6:A2	wlan0	828 ms	-79 dBm	BLOCKED	Auto block
00:10:F3:6E:E6:B6	wlan0	268 ms	-81 dBm	BLOCKED	Auto block
00:10:F3:6E:E6:A0	wlan0	8 ms	-79 dBm	BLOCKED	Auto block
00:10:F3:62:38:87	wlan0	96 ms	-65 dBm	ESTAB	Normal
00:10:F3:77:28:5D	wlan0	116 ms	-79 dBm	BLOCKED	Auto block
00:10:F3:6E:E6:9C	wlan0	512 ms	-80 dBm	BLOCKED	Auto block
00:10:F3:62:38:81	wlan0	324 ms	-68 dBm	ESTAB	Normal
00:10:F3:6D:48:B4	wlan0	872 ms	-85 dBm	BLOCKED	Auto block

- Iface: display the Mesh interface used in the Wi-Fi radio
- Inactive time: the elapsed time since last forward data by the according Mesh path.
- Shorter inactive time implies more frequently used in data forwarding by Mesh network. Too long inactive time means the Mesh path is almost un-used.
- Signal: display the dynamic RSSI signal strength when refresh
- State: display the current status is ESTAB (established) or BLOCKED (blocked). When BLOCKED, implies the signal strength is too low to use in data forwarding.

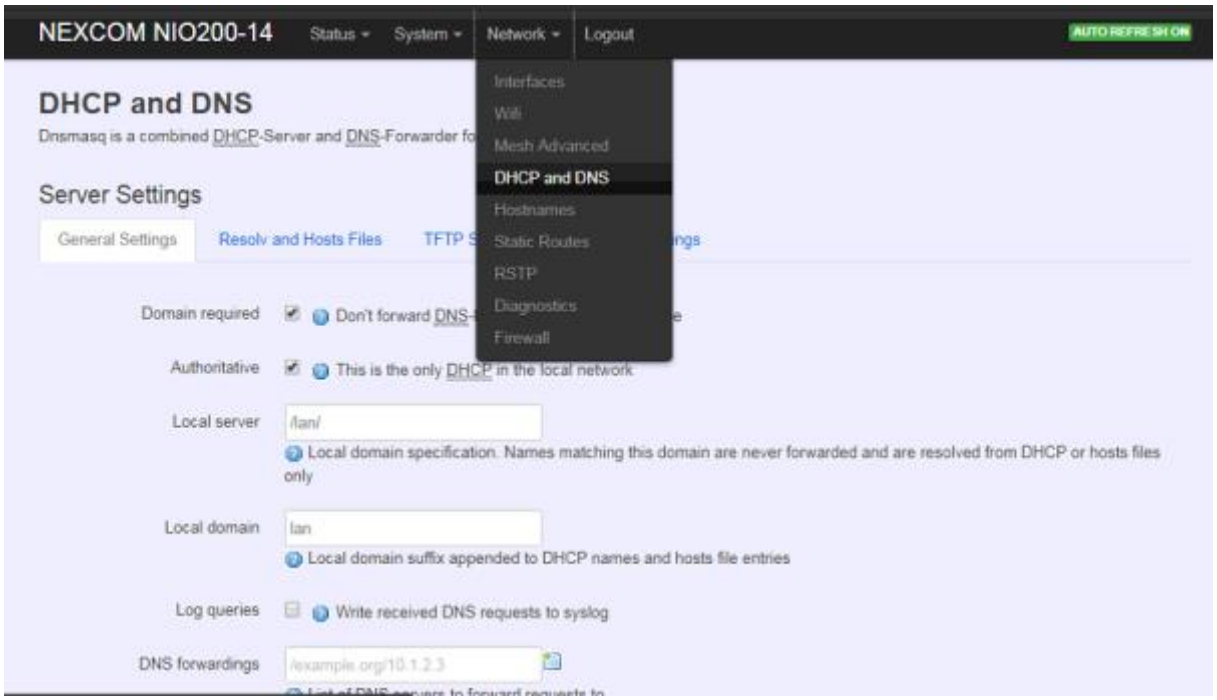
Mesh Path Table

Dest addr	Next hop	iface
00:10:F3:62:38:87	00:10:F3:62:38:87	wlan0
00:10:F3:62:38:81	00:10:F3:62:38:81	wlan0
00:10:F3:6E:E6:9C	00:10:F3:62:38:81	wlan0

- Dest addr/Next hop:
  When Dest (Destination) MAC address and Next hop MAC address is the same, the destination is available to connect directly from source Mesh node.
  When the two MAC address is different, the data forwarding to Destination MAC address should be routed via Next hop path.
- Iface: display the Mesh interface used in the Wi-Fi radio

4.4.4 DHCP and DNS

A combined DHCP-Server and DNS-Forwarder for NAT firewall is provided in NIO200WMR. Click the “Network” -> “DHCP and DNS” in the GUI menu. The “DHCP and DNS” page will appear. There are four categories of settings or lease status: “Active DHCP Leases”, “Active DHCPv6 Leases”, “Static Leases”, and “Server Settings”.



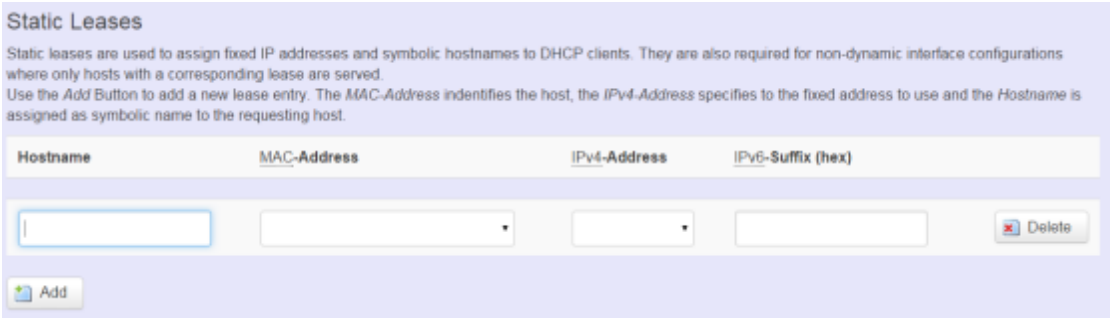
Scroll to the following screen in the “DHCP and DNS” window.

This screen displays the lease information to which DHCP server assigns automatically, including **Hostname**, **IP address**, **MAC address(or DUID)**, and Remaining Lease-time (DUID stands for the DHCP Unique Identifier). Please look at the frame in red above.

The next category that users can scroll to is “Static Leases” as follows.

Static leases are used to assign fixed IP addresses and symbolic hostnames to DHCP clients by calculating MAC-Address. They are also required for non-dynamic interface configurations where only hosts with a corresponding lease are served.

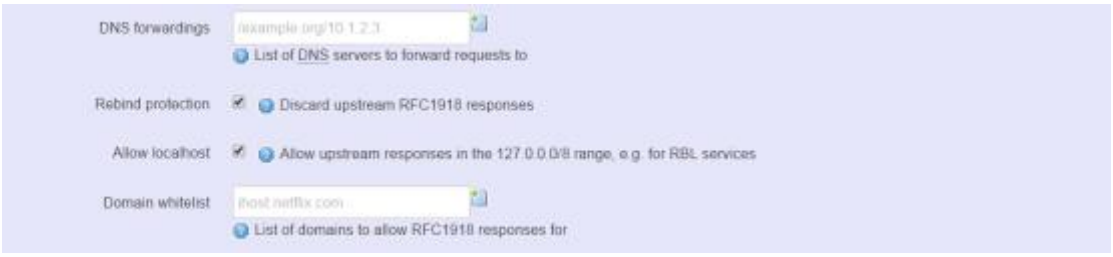
Add: Add a new lease entry.
After clicking “Add” button, a new entry with 4 blank input boxes will appear. Allow users to fill in the information such as The MAC**-Address** (identifies the host), the IPv4**-Address** (specifies the fixed address to use) and the **Hostname** (is assigned as symbolic name to the requesting host).



Delete: delete the followed entry.

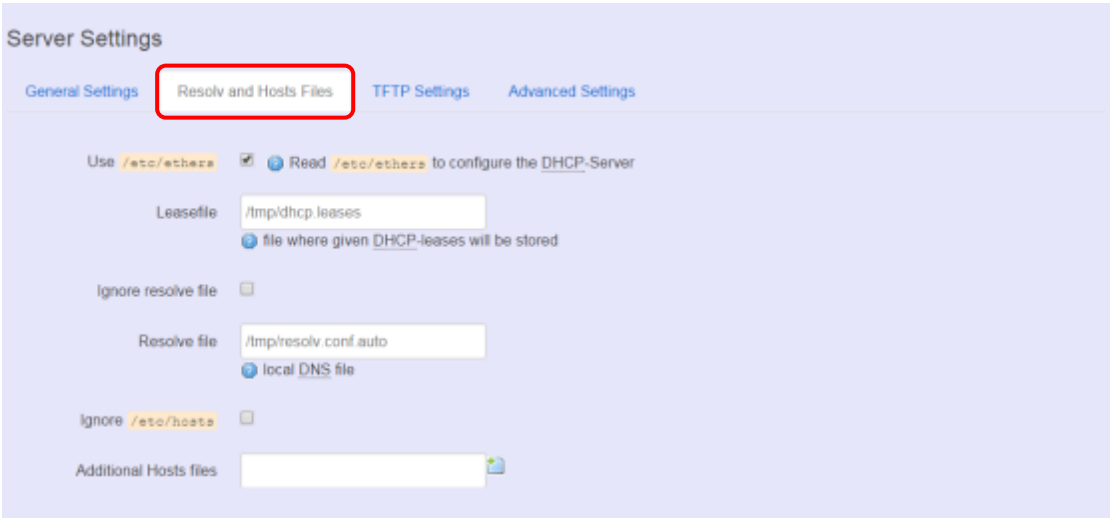
Scroll to the screen identified as “Server Settings” category.
There are 4 tabs to select more options for DHCP and DNS services in the NIO200WMR.

4.4.4.1 General Settings

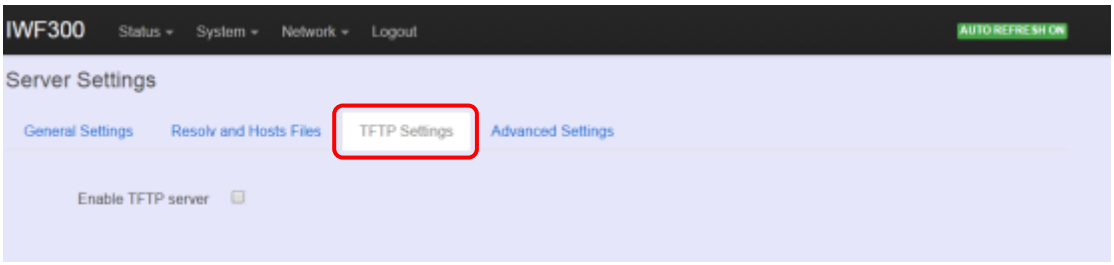


Domain required: default value is checked.
Authoritative: default value is checked.

4.4.4.2 Resolve and Hosts Files

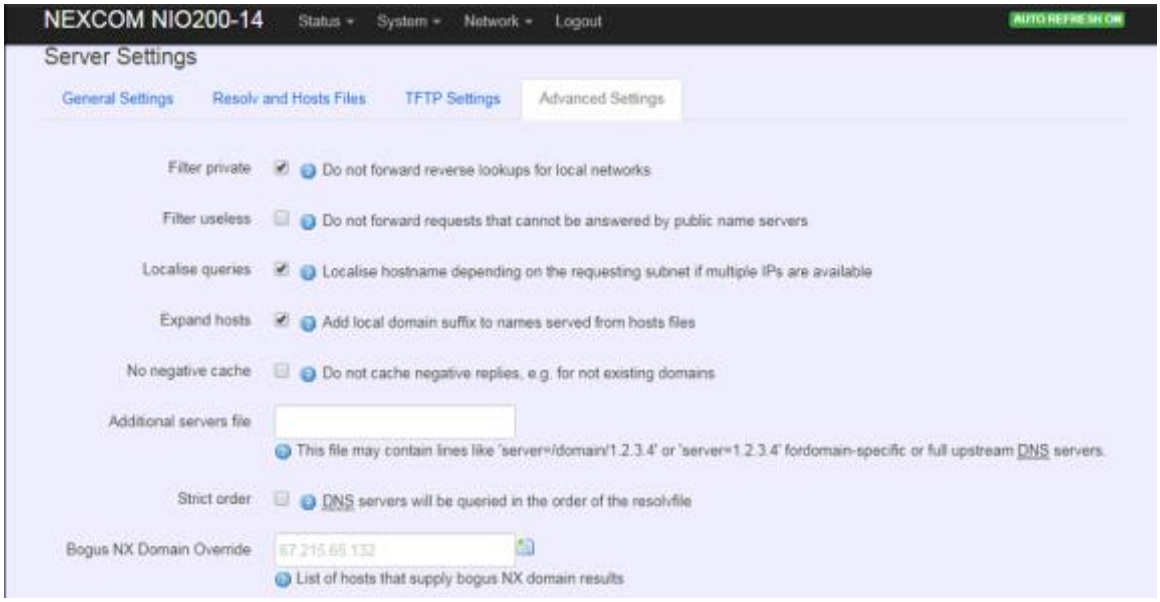


4.4.4.3 TFTP Settings



By default, TFTP server is not enabled.

4.4.4.4 Advanced Settings

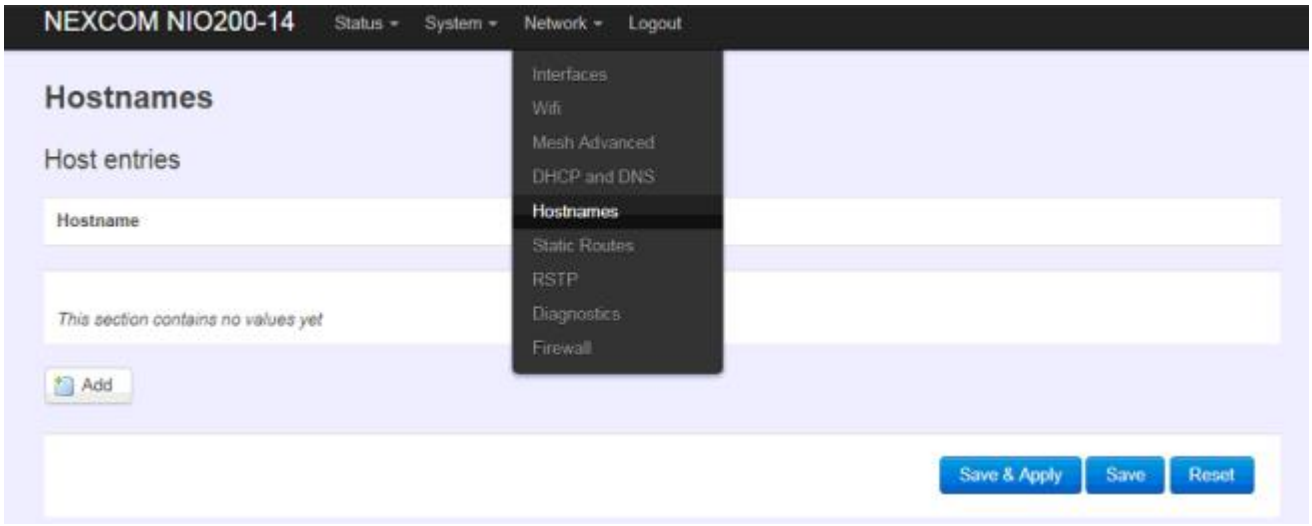


Max. DHCP Leases: default value is unlimited.

Max. concurrent queries: default value is 150

4.4.5 Hostnames

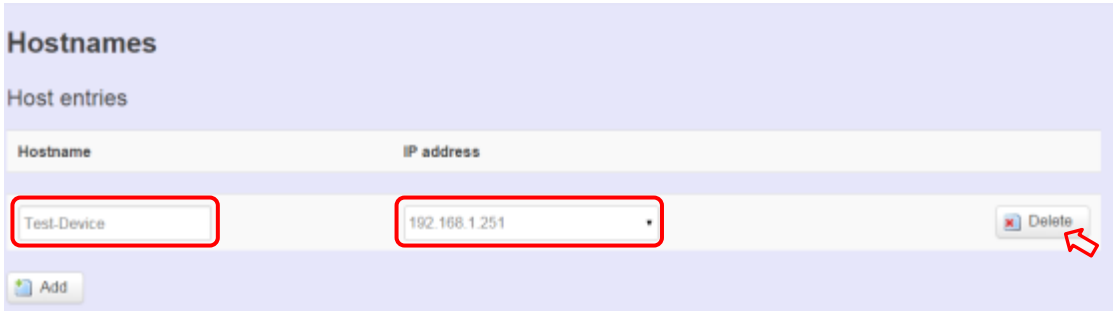
Clicking the “Network” -> “Hostnames” in the GUI menu will appear the “Hostnames” page.



For those device does not have hostname or does not resolve automatically, users manually assign hostname-IP pair to specific devices.

Add: create a host entry (hostname-IP pair) for a specific device.

(For example, **Hostname** => “Test-Device”; **IP address** => “192.168.1.251”)

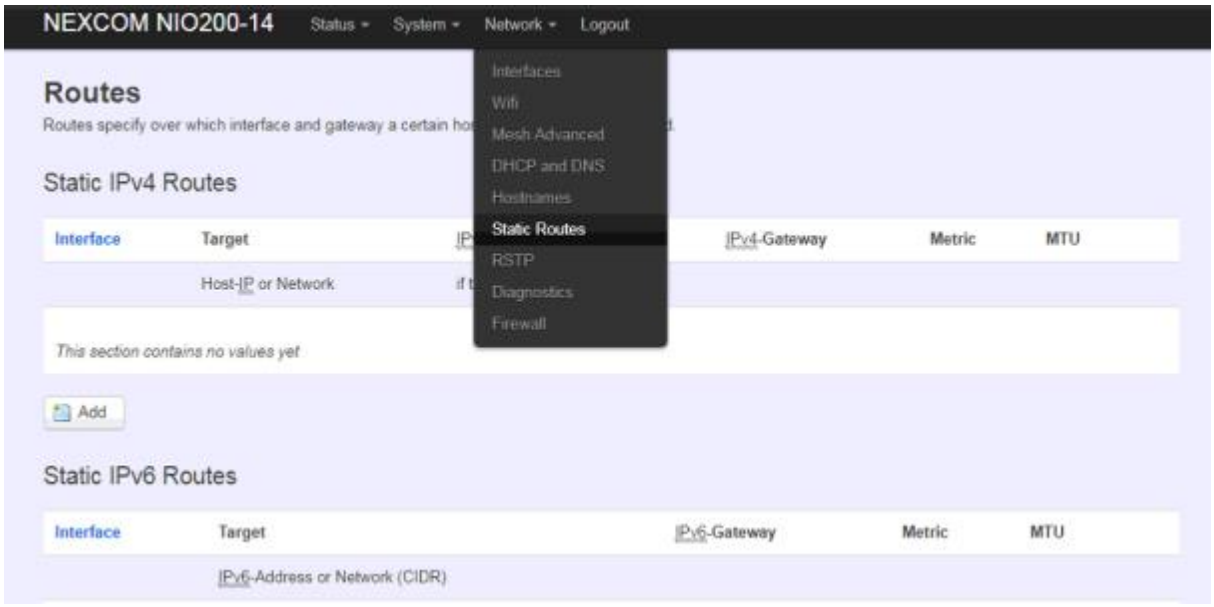


Delete: delete the followed host entry.

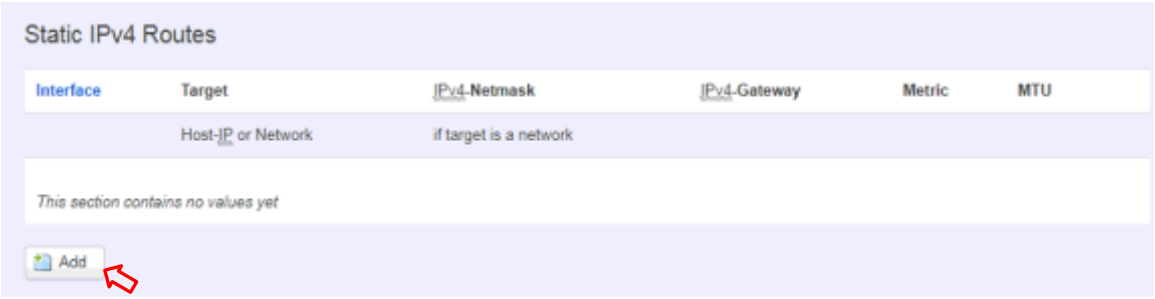
4.4.6 Static Routes

Clicking “Network” -> “Static Routes” in the GUI menu will appear the “Routes” page for two categories: “Static IPv4 Routes” and “Static IPv6 Routes”.

Static routes specify interface and gateway which certain host or network can be reached over. Such pair (interface and gateway) is called route.



For IPv4 network, scroll down to “Static IPv4 Routes” screen as follows.

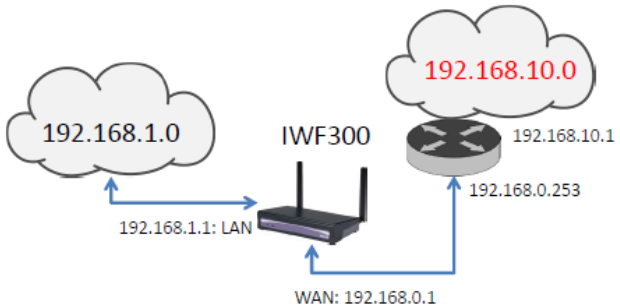


Add: add an entry for route to an IPv4 network or host.

For example: *Target network*=192.168.10.0; *Netmask*=255.255.255.0; *NIO200WMR WAN IP*=192.168.0.1;

The route to be assigned will be “wan” for interface and “192.168.0.253” for gateway.

Leave “Metric” and “MTU” field to have default values as 0 and 1500 respectively.

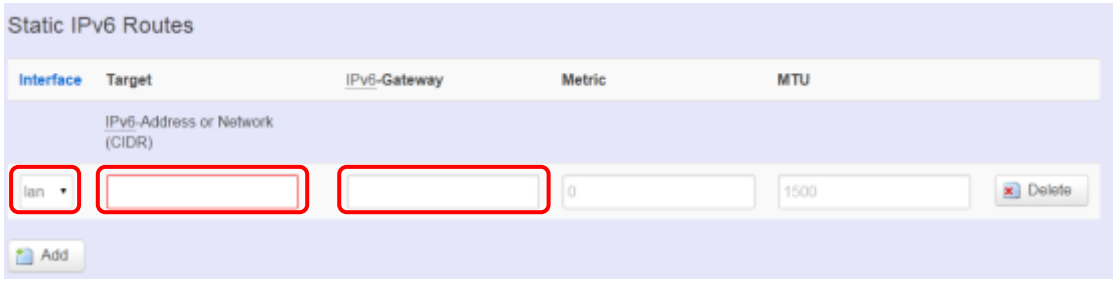


Delete: delete a followed route entry.

For IPv6 network, scroll down to “Static IPv6 Routes” screen as follows.

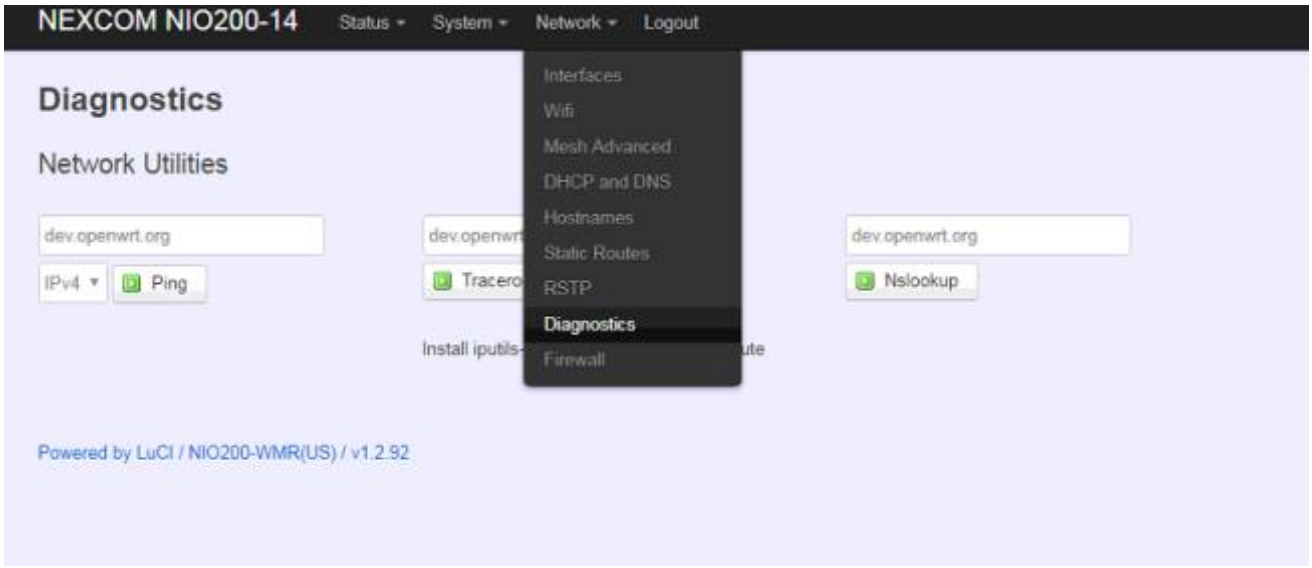
Add: add an entry for route to an IPv6 network or host.

Clicking “Add” button has an entry as follows.



4.4.7 Diagnostics

Click “Network” -> “Diagnostics” in the GUI menu, and navigate to “Diagnostics” web page.



In this page, there are 3 utilities for users to diagnose interface settings and network paths: Ping, Traceroute, and Nslookup.

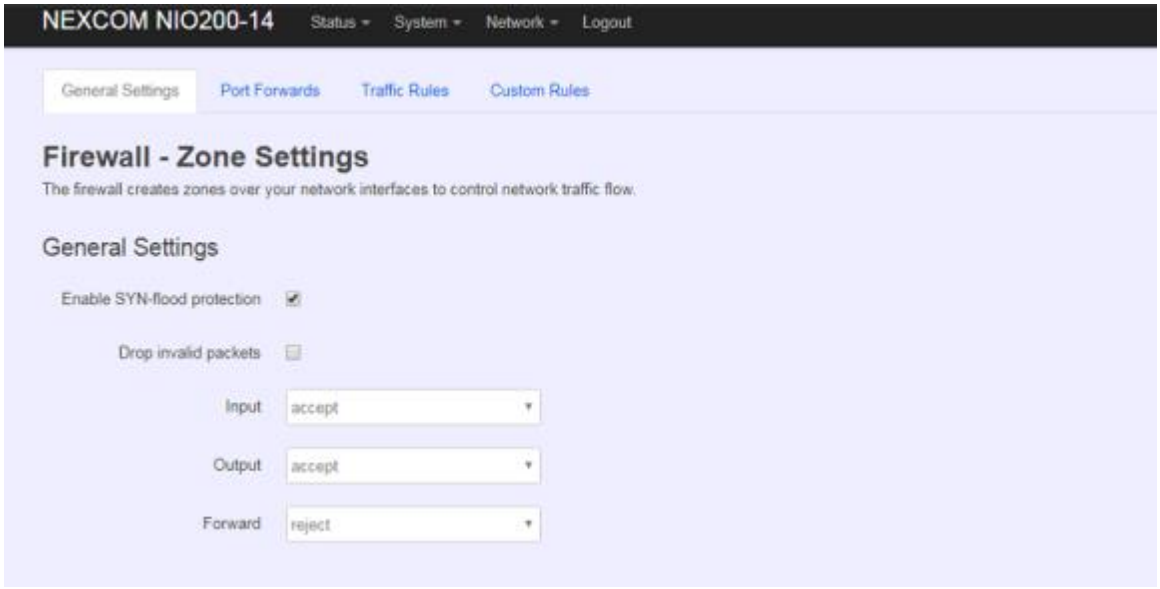
Ping: test the reachability of a host on an Internet Protocol (IP) network and measure the round-trip time for messages sent from the originating host to a destination host and back. The only required parameter is the name or IP address of the destination host.

Traceroute: track the route packets taken from an IP network on their way to a given destination host. The only required parameter is the name or IP address of the destination host.

Nslookup: query the Domain Name System (DNS) to obtain domain name or IP address mapping.

4.4.8 Firewall

Click “Network” -> “Firewall” in the GUI menu, and navigate to page configuring firewall attributes in the NIO200WMR.

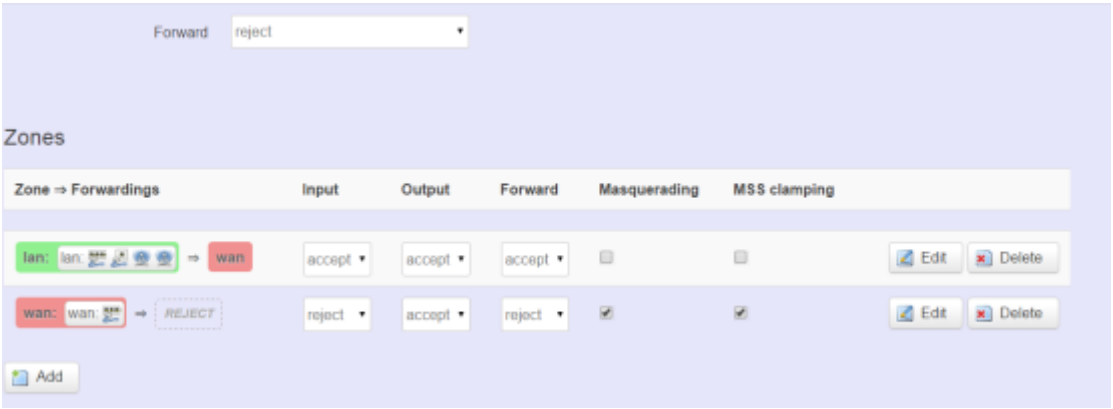


4.4.8.1 General Settings

Clicking “General Settings” tab on the top of screen will show the “Zone Settings” configuration including “General Settings” and “Zones” categories.

In the “General Settings” category, there are 5 basic options for traffic control over interfaces: ”Enable SYN-flood protection” (default: enabled), “Drop invalid packets” (default: disabled), “Input” (default: accept”), “Output” (default: accept), and “Forward” (default: reject)

In the “Zones” category, users create or edit zones over your network interfaces to control network traffic flow.



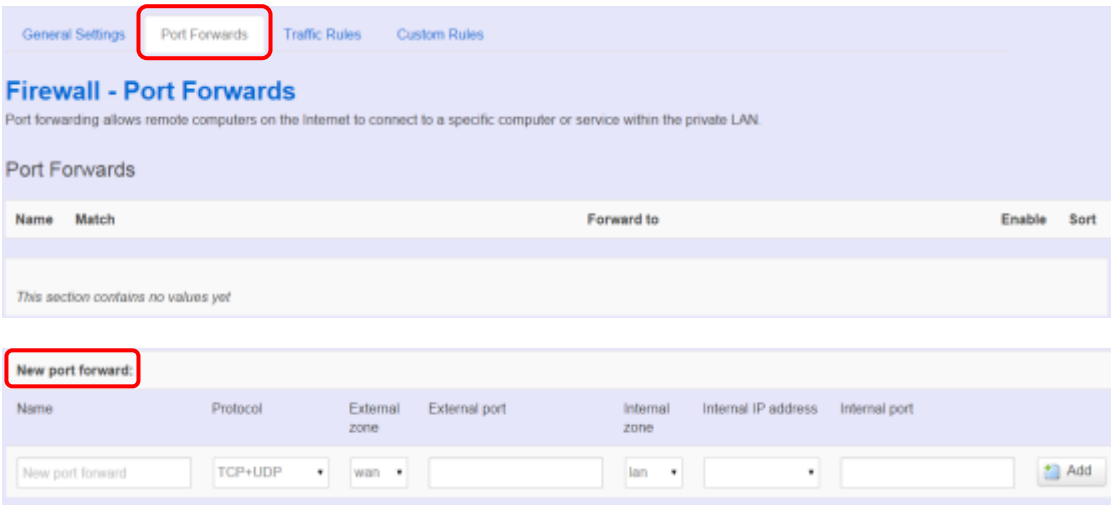
There 3 control buttons as follows for “Zones” settings:

Edit: edit the followed flow entry.

Delete: delete the followed flow entry.
Add: create a new entry for traffic flow among zones over interfaces.

4.4.8.2 Port Forwards

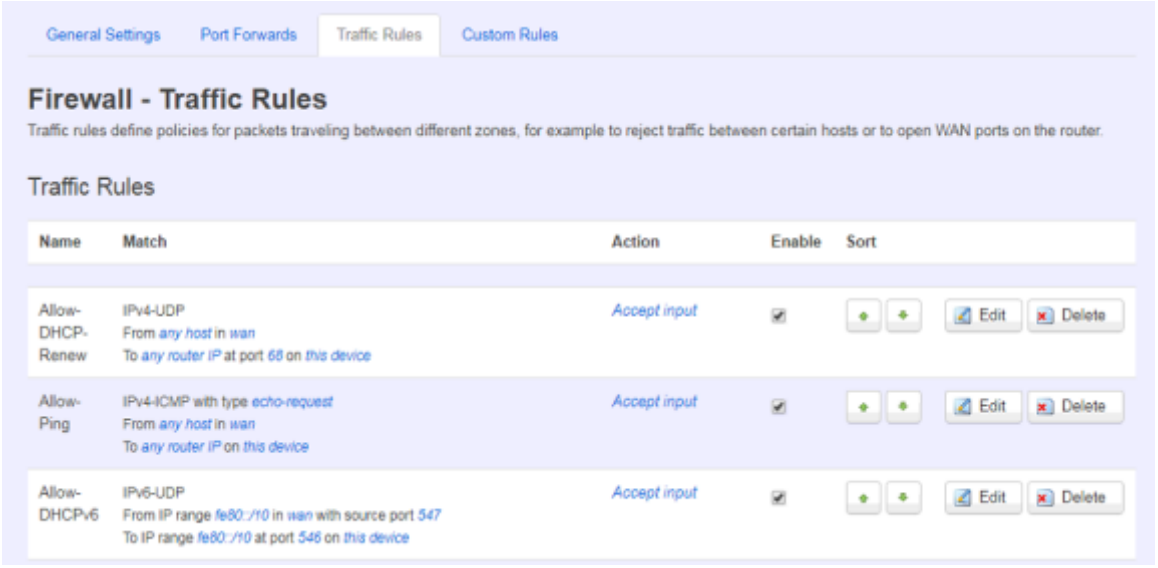
Clicking the “Port Forwards” tab on the top of screen will show the tables for port forwarding. Adding or editing specific forwarding table allows remote computers on the Internet to connect to a specific computer or service within the private LAN.



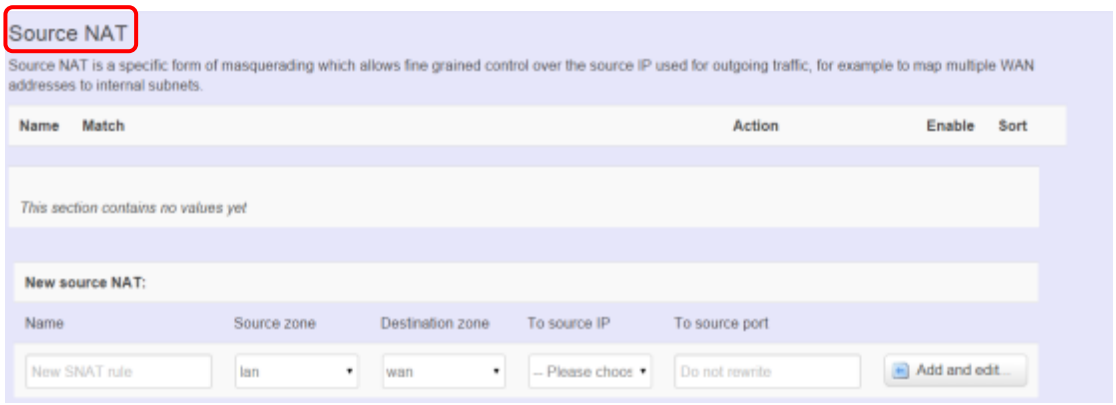
In the “New port forward” category, there is only one button for flow editing:
Add: create a new flow entry for port forwarding among zones.

4.4.8.3 Traffic Rules

Clicking the “Traffic Rules” tab on the top of screen will appear the policy tables of 2 categories: “Traffic Rules” and “Source NAT”.



In the “Traffic Rules” category, the flow entries of traffic rule define policies for packets traveling between different zones (for example, to reject traffic between certain hosts or to open WAN ports on the router).
In “Source NAT” category, specific flow entries of masquerading that allow fine grained control over the source IP used for outgoing traffic(For example, to map multiple WAN addresses to internal subnets) can be added or edited.



Add and edit: create a new entry with default values, and edit at once if required.

Please remember clicking “Save & Apply” button to activate the new settings.

4.4.8.4 Custom Rules

Custom rules allow you to execute arbitrary iptables commands which are not otherwise covered by the firewall framework. The commands are executed after each firewall re-start, right after the default rule-set has been loaded.