

USER MANUAL

(NZC-WS20 TVWS radio station)

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V CPE(STA) Settings

- Step1. WAN(Wide Area Network) Setting
- Step2. RF(Radio Frequency) Setting
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Service center



Do not connect power before connecting the antenna to the equipment

Before installing the Equipment, you should check and follow the instructions below.

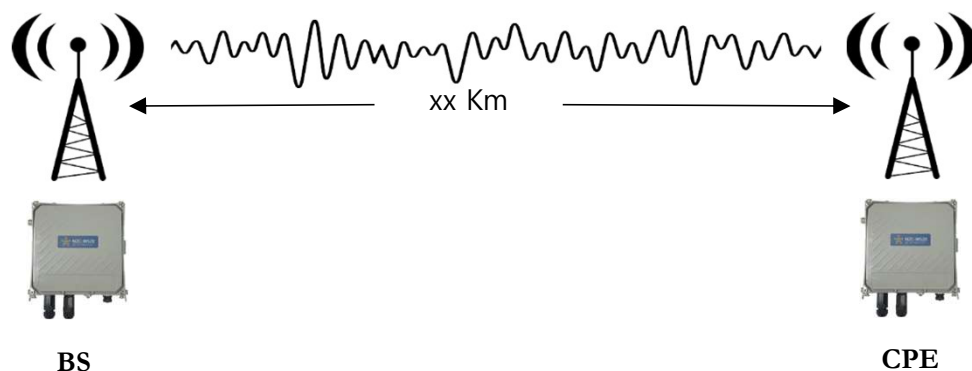
- (1) Height above average terrain (HAAT). Below 602 MHz, antenna shall not exceed 250 meters or 500 meters in less congested areas. All other bands not to exceeds 250 meters. The HAAT is calculated by the White Space database (§73.684(d)). For HAAT greater than 250 meters the following (2)-(7) procedures below are required:
- (2) The installing party must contact a White Space database, identify all TV broadcast station contours that would be potentially affected by operation at the planned HAAT and EIRP.
- (3) Notification -The installing party must notify each of these licensees and provide geographic coordinates, relevant technical parameters and contact information.
- (4) Start operations, No earlier than four calendar days after the notification in paragraph (g)(1)(ii)(B) above
- (5) Upon request, the installing party must provide affected licensee the time periods of operations.
- (6) Conduct a new notification if increasing its power level, moving more than 100 meters horizontally from its location, or making an increase in the HAAT or EIRP that results in an increase in the minimum required separation distances from co-channel or adjacent channel TV station contours.
- (7) All notifications required by this section must be in written form (including email).
To be kept by the White Space device operator for its records and supplied to the Commission upon request.

I Product descriptions

Summary

NZC-WS20 manages all the security features, traffic scheduling, and Quality of Service(QoS) functions of NZIA's TVWS Wireless TCP/IP CPE. NZC-WS20 provides fully configurable TVWS wireless CPE/BS features. NZC-WS20 provides Powerful processing capabilities to reliably transport any traffic between the CPE/BS and multiple remote devices.

Applications



TVWS communication equipment that provides long-distance/wide-range communication services using unlicensed section frequencies.

Features and benefit

- Fully supports 802.11af TVWS Standard.
- Reliably supports all types of network devices.
- Utilizes unlicensed RF Frequency.
- Provides high throughput for concurrent transport of M2M/IoT services telemetry and remote control of data, video, and voice services.
- Ultra long-distance communication.
- Extensive coverage of communication.
- Over-the-air monitoring, configuration, and software keyed features enable upgrades without physical access
- NMS support.

Specifications

Model Name	NZC-WS20
Model Type	TVWS CPE/BS
Tx Power	Max. 20dBm(100mW)
RF Band	473 ~ 698MHz
Antenna Info	N-Type External SISO Sectoral, omni directional, YaGi, LP
Capability	LOS/NLOS Software-defined CPE/BS
Wireless QoS	Auto link distance ranging, optimal channel selection, DFS
NMS	Support SNMP v2/3
Transmission	OFDM, high-rejection Tx/Rx filtering, AFD
Throughput	Max. 26.7Mbps(MCS9)
Channel Bandwidth	6MHz
Modulation	BPSK to 256QAM
Max. Range	20Km(With NZC-WS35)
Security	Management Encryption : TLS, AES-256, SHA-1 Authentication: AES-128/256
Network Feature	DHCP, NMS
Latency	<10ms(RSSI -60dBm under)
QoS	Supported
Location & Timing	Built-in GPS
Power	36W, High-protected Surge SMPS
Temperature	-30 to 60 °C
Connections	10/100 Ethernet(RJ-45), GPS, free-volt Power
Surge Protection	Built-in Surge
Dimensions	230 * 230 * 105(W*H*D)(mm)
Weight	3.0KG

II Device

Package contents

NZC-WS20 device, Antenna, Antenna cable, Power cable

Device layout



A. Antenna

B. WAN

C. LAN

D. LED

E. Power

F. Factory Reset

G. GPS

Useage



1. Connect the Antenna cable to N-female Port(A)
2. Connect the Power cable to Power port(E)
3. Connect the internet ethernet cable to WAN port(B)
4. Connect the device ethernet cable to LAN port(C)
5. Connect the GPS antenna to GPS port(G)

LED indicator

Status	CPE	BS
Power ON	Red ON	Red ON
Jump to kernel	Yellow ON	Yellow ON
Boot complete	Green ON	Green ON
Channel Scanning	Yellow Blink every 1 second	
Connected	Green ON	
Beacon out (Tx power > 0 dBm)		(Normal) Green Blink every 1 second. (Error) Yellow Blink every 1 second.
Update(USB/OTA)	Red Blink every 1 second	Red blink every 1 second

III Connect Web & Login

Step 1. Connect Web

1. Connect LAN port and PC with a LAN cable.
2. Use DHCP mode to set PC IP.
3. User can use the ipconfig command at the command prompt, when checking the ethernet gateway IP address.

```
C:\User: >ipconfig

Windows IP Configuration

Wireless LAN adapter 로컬 영역 연결* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
Wireless LAN adapter 로컬 영역 연결* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : 
Ethernet adapter 이더넷:

    Connection-specific DNS Suffix  . : lan
    Link-local IPv6 Address . . . . . : %16
    IPv4 Address. . . . . : 192.168.200.151
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : 192.168.200.254
```

4. Enter ethernet default gateway IP (ex: 10.1.1.254) in the address bar.



Step 2. Login

1. Enter the Username and Password below.

*Username: root

*Password: admin1234!@#\$

2. Click "Login" button.

NZC-WSIMX6ULL20 TVWS CPE

Authorization Required
Please enter your username and password.

1

Username

root

Password

2

Login

Reset

Powered by ROZY Master (3ffdacf976)

3. This screen shows up if logging in successfully.

NZC-WSIMX6ULL20 Status ▾ System ▾ Network ▾ Logout TVWS BS **AUTO REFRESH ON**

Status

System

Hostname	NZC-WSIMX6ULL20
Kernel Version	4.14.61
Local Time	Tue May 23 09:35:48 2023
Uptime	0h 11m 28s
Load Average	2.31, 2.84, 1.94

Memory

Total Available	419868 kB / 511996 kB (82%)
Free	419700 kB / 511996 kB (81%)
Buffered	168 kB / 511996 kB (0%)

Network

IPv4 Upstream

Protocol: DHCP client
Address: 192.168.0.212
Netmask: 255.255.255.0
Gateway: 192.168.0.254
DNS 1: 192.168.0.254
Expires: 23h 49m 16s
Connected: 0h 10m 44s

Device: Ethernet Adapter: "eth1"
MAC-Address: 38:F7:CD:10:00:AD

Active Connections

138 / 16384 (0%)

IV BS(AP) Settings

Step1. WAN(Wide Area Network) interface Setting

1. Click "Network->Interfaces" menu
2. Click "WAN" tab on the menu

NZC-WSIMX6ULL20 Status System Network Logout TVWS BS AUTO REFRESH ON

NCT11AF1 WAN LAN

Interfaces

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	Buttons
LAN (eth0)	Static address	0h 15m 15s	38:F7:CD:10:00:AC	2.81 MB (15936 Pkts.)	14.15 MB (10477 Pkts.)	192.168.220.254/24	Restart Stop Edit Delete
NCT11AF1 (nct11af1)	Static address	0h 14m 59s	38:F7:CD:10:00:AC	0 B (0 Pkts.)	0 B (0 Pkts.)	10.10.10.254/24	Restart Stop Edit Delete
WAN (eth1)	DHCP client	0h 15m 12s	38:F7:CD:10:00:AD	13.98 MB (14488 Pkts.)	2.18 MB (11623 Pkts.)	192.168.0.212/24	Restart Stop Edit Delete

3. Select "General Setup ->Protocol" menu.
4. Select DHCP client
5. Click "Save & Apply" button.

Interfaces - WAN

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. You can also use `VLAN` notation `INTERFACE.VLANNR` (e.g.: `eth0.1`).

Common Configuration

3 General Setup Advanced Settings Physical Settings Firewall Settings

Status Device: eth0.4
Uptime: 0h 2m 34s
MAC: 00:0C:43:76:20:38
RX: 107.86 KB (765 Pkts.)
TX: 9.93 KB (52 Pkts.)
IPv4: 192.168.0.236/24

Protocol Static address
DHCP client
Unmanaged
PPP
PPtP
PPPoE
PPPoATM
L2TP
DHCPv6 client
IPv6-in-IPv4 (RFC4213)
IPv6-over-IPv4 (6to4)
IPv6-over-IPv4 (6rd)
Dual-Stack Lite (RFC6333)
MAP / LW4over6
464XLAT (CLAT)

Hostname to send when requesting DHCP

Back to Overview

5 Save & Apply Save Reset

Powered by LuCI Master (git-20.12) SHOT r0-21d2380e6

Step2. LAN(Local Area Network) Setting

1. Find NCT11AF includes Mac address.
2. Click “Edit” button.

NZC-WSIMX6ULL20 Status System Network Logout TVWS BS AUTO REFRESH ON

NCT11AF1 WAN LAN

Interfaces

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	Buttons
LAN (eth0)	Static address	0h 15m 15s	38:F7:CD:10:00:00	2.81 MB (15936 Pkts.)	14.15 MB (10477 Pkts.)	192.168.220.254/24	Restart Stop Edit Delete
NCT11AF1 (nct11af1)	Static address	0h 14m 59s	38:F7:CD:10:00:AC	0 B (0 Pkts.)	0 B (0 Pkts.)	10.10.10.254/24	Restart Stop Edit Delete
WAN (eth1)	DHCP client	0h 15m 12s	38:F7:CD:10:00:AD	13.98 MB (14488 Pkts.)	2.18 MB (11623 Pkts.)	192.168.0.212/24	Restart Stop Edit Delete

3. If Protocol is not “Static address”, Change Protocol to “Static address”. If already set up to “static address”, jump to 5.

Interfaces - NCT11AF1

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. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

Common Configuration

General Setup

Status

Device: nct11af1
MAC: 38:F7:CD:10:00:3C
RX: 4.22 KB (18 Pkts.)
TX: 948 B (6 Pkts.)

Protocol: Static address

Really switch protocol?

Back to Overview

Save & Apply Save Reset

Powered by ROZY Master (bfd966)

4. Once Protocol is changed to “Static address”, Click “Switch Protocol” button.

Interfaces - NCT11AF1

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. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

Common Configuration

General Setup

Status Device: nct11af1
MAC: 38:F7:CD:10:00:3C
RX: 4.22 KB (18 Pkts.)
TX: 948 B (6 Pkts.)

Protocol Static address

Really switch protocol? **4** Switch protocol

Back to Overview Save & Apply Save Reset

5. Enter IPv4 address(10.1.1.254).

6. Enter IPv4 netmask(255.255.255.0).

Common Configuration

General Setup **Advanced Settings** Physical Settings Firewall Settings

Status Device: nct11af1
MAC: 38:F7:CD:10:00:3F
RX: 1.81 MB (6835 Pkts.)
TX: 17.29 KB (0 Pkts.)

Protocol Static address

5 IPv4 address 10.1.1.254

6 IPv4 netmask 255.255.255.0

IPv4 gateway

7. Uncheck the “Ignore Interface”.

8. Enter “100” into Start.

9. Enter “150” into Limit.

10. Enter “12h” into Lease time.

DHCP Server

General Setup **Advanced Settings** IPv6 Settings

7 Ignore interface ☐ Disable DHCP for this interface.

8 Start 100 Lowest leased address as offset from the network address.

9 Limit 150 Maximum number of leased addresses.

10 Lease time 12h Expiry time of leased addresses, minimum is 2 minutes (2m).

11. Please check the interface name on “Physical settings” tap. If setting NCT11AF1 interface, physical setting's interface is nct11af1.
12. Click “Save & Apply” button.

Interfaces - NCT11AF1

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. You can also use VLAN notation INTERFACE.VLANNR (e.g.: eth0.1).

Common Configuration

[General Setup](#) [Advanced Settings](#) [Physical Settings](#) [Firewall Settings](#)

Bridge interfaces ☐

 creates a bridge over specified interface(s)

11

Interface

nct11af1

DHCP Server

[General Setup](#) [Advanced Settings](#) [IPv6 Settings](#)

Ignore interface ☐

 Disable DHCP for this interface.

Start

100

 Lowest leased address as offset from the network address.

Limit

150

 Maximum number of leased addresses.

Lease time

12h

 Expiry time of leased addresses, minimum is 2 minutes (2m).

Back to Overview

12

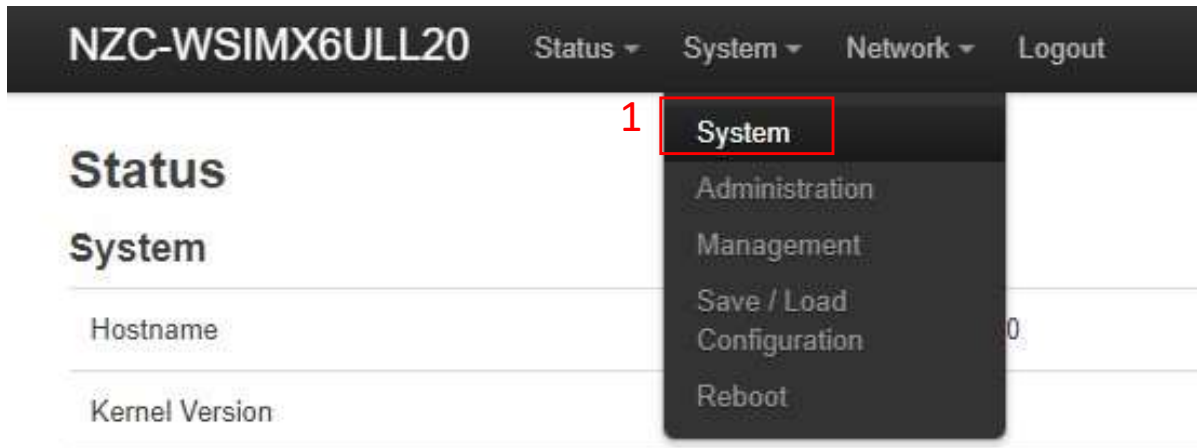
Save & Apply

Save

Reset

Step3. PAWS

1. Click “System -> System” menu.



2. Select Country Code.
3. Click “Save&Apply” button.

System

Here you can configure the basic aspects of your device like its hostname or the timezone.

System Properties

General Settings Logging Language and Style

Local Time: Thu Mar 23 01:22:56 2023 [Sync with browser](#)

Hostname:

Timezone:

SerialNumber

Country Code: (dropdown menu showing KR, ZA)

Time Synchronization

Enable NTP client: ☒

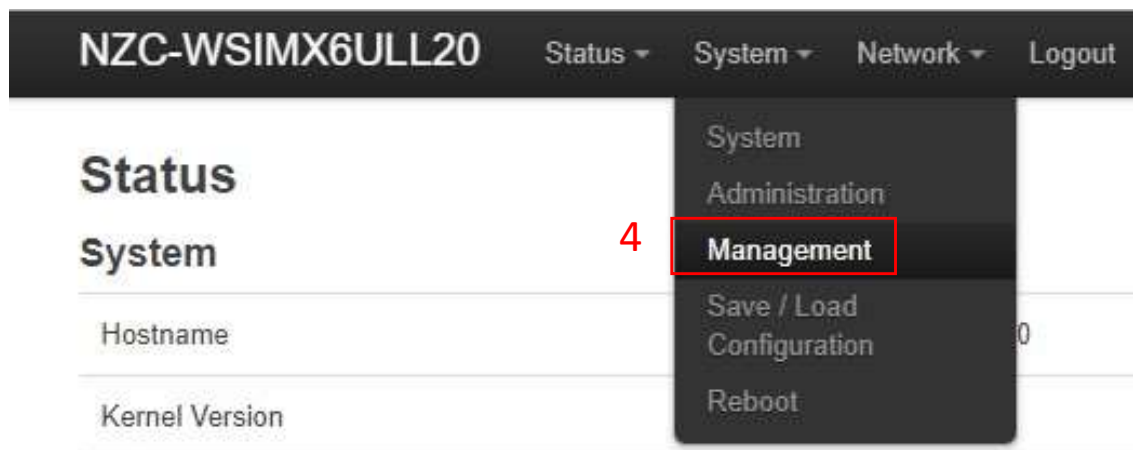
Provide NTP server: ☐

NTP server candidates:

0.openwrt.pool.ntp.org	x
1.openwrt.pool.ntp.org	x
2.openwrt.pool.ntp.org	x
3.openwrt.pool.ntp.org	x
	+

Save & Apply Save Reset

4. Click “System -> Management” menu.



5. Depending on the country code, PAWS-related information is automatically entered in PAWS Info.

- A. URL information is used, when connecting to Channel DB.
- B. Latitude and longitude information.
- C. Location setting method.(auto:automatic setting method/ manual: User input method)
- D. Antenna type information.(ASML:on the sea/AGL: ground)
- E. Antenna height information.

6. Click “Save & Apply” button.

PAWS Info

PAWS Information

A PAWS URL

DeviceType

Serial Number

Model ID

DBM

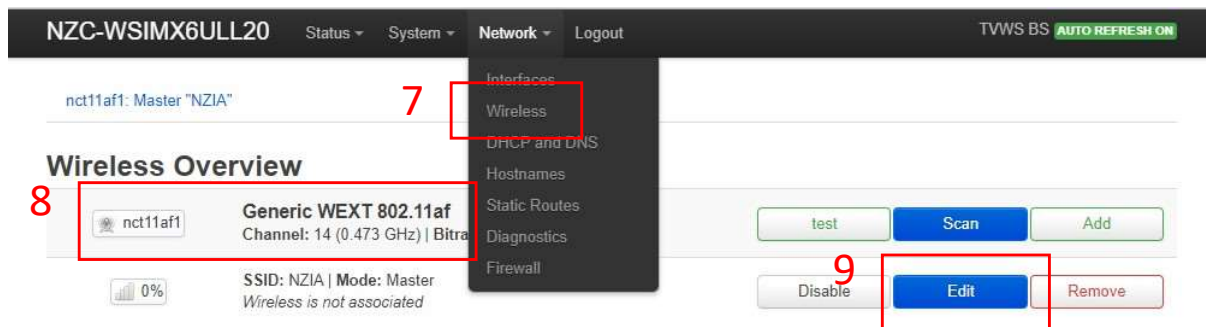
Cerification ID

B Location latitude longitude C gps mode

D Antenna Height Type Height(m) E

6

7. Click “Network -> Wireless” menu.
8. Select WEXT 802.11af interface or interface with Channel information.
9. Click “Edit” button.



10. Click “Change to use channel DB mode” button. If mode is not BS, click the “Change to BS” button.

Device Configuration

General Setup
Advanced Settings
NCT11AF Settings

Current Mode **BS**

Change to CPE

Status

SSID: ? | Mode: BS
10% Wireless is not associated

Mode	Channel	Width	CH Mode
Operating frequency	TVWS 32 (581 MHz) ▾	6M MHz ▾	Not use DB

Change to use channel DB mode

11. Select an available channel by click channel list.(Use DB mode offer available channel list.
User can select one available channel from available channel list.)

Device Configuration

General Setup

Advanced Settings

NCT11AF Settings

Current Mode

BS

Change to CPE

Status

SSID: ? | Mode: BS

10% Wireless is not associated

Operating frequency

Mode

Channel

Width

CH Mode

TVWS

32 (581 MHz)

6M MHz

Use DB

25 (539 MHz)

32 (581 MHz)

Get Channel

Channel DB mode

12. Click “Save&Apply” button.

12

Save & Apply

Save

Reset

13. Click “OK” button.

10.1.1.254 says

A reboot is required to apply the setting information.
Cancel to reboot later or click OK to reboot now.

13

OK

Cancel

* User can select channel from total channel list in “Not use DB” mode.

Device Configuration

General Setup

Advanced Settings

NCT11AF Settings

Current Mode BS

Change to CPE

Status

SSID: OpenWrt | Mode: BS

0% Wireless is not associated

Operating frequency

Mode TVWS

Channel 14 (473 MHz)

Width 6M MHz

CH Mode

Not use DB

DB mode

Interface Configuration

General Setup

Wireless Security

Advanced Settings

Mode

Base S

ESSID

OpenV

Network

nct11a

Hide ESSID☐

32 (581 MHz)

33 (587 MHz)

34 (593 MHz)

35 (599 MHz)

36 (605 MHz)

37 (611 MHz)

38 (617 MHz)

39 (623 MHz)

40 (629 MHz)

41 (635 MHz)

42 (641 MHz)

43 (647 MHz)

44 (653 MHz)

45 (659 MHz)

46 (665 MHz)

47 (671 MHz)

48 (677 MHz)

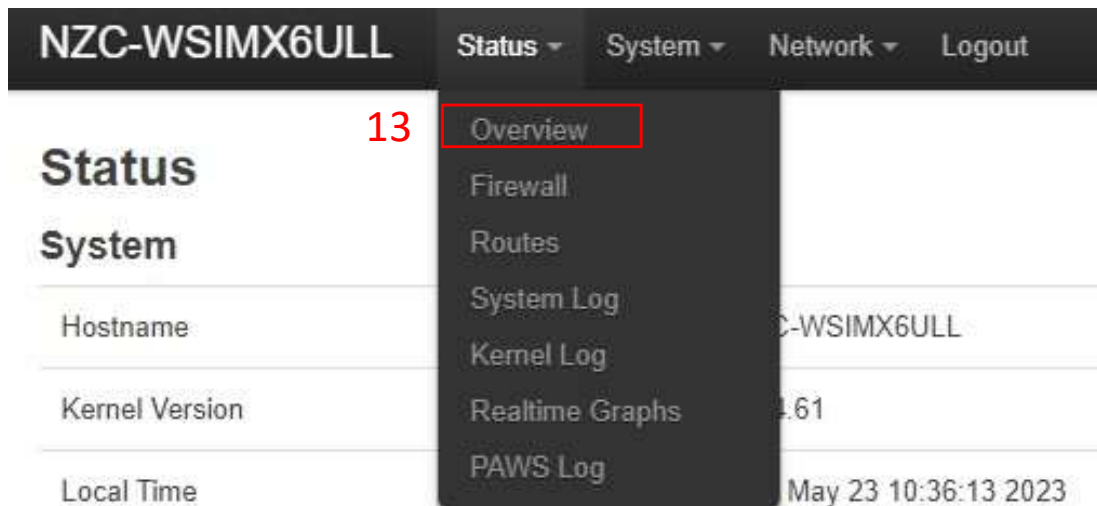
49 (683 MHz)

50 (689 MHz)

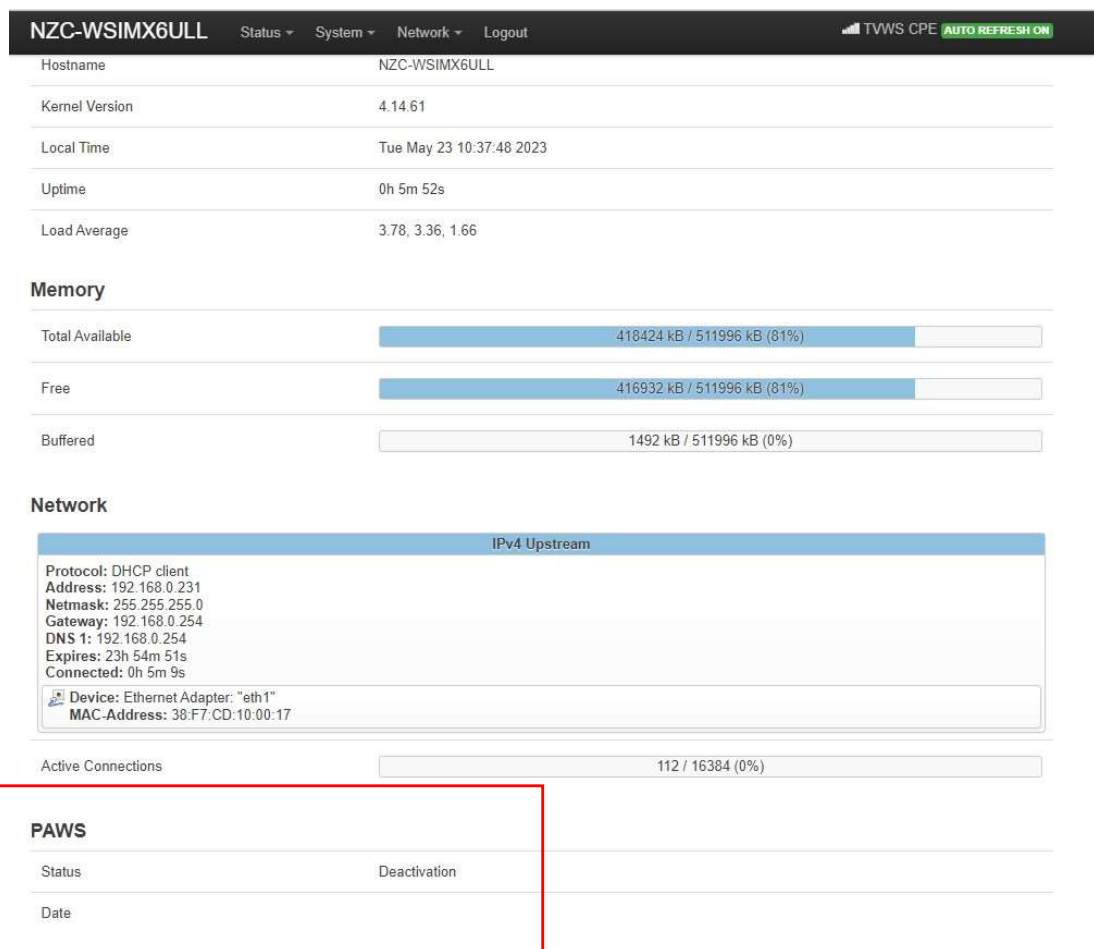
51 (695 MHz)

) you want to attach to this wireless interface or fill out the create field to define a new network.

13. Click "Status -> Overview" menu.



14. Selected channels can be adopted on PAWS area.(If PAWS setting adopted, status is Activation. If PAWS setting isn't adopted, status is Deactivation.)



* PAWS log confirmation

1. Select "Status -> PAWS Log" menu.
2. User can check PAWS log information when device and PAWS DB connected each other.

The screenshot shows the top navigation bar of the NZC-WSIMX6ULL20 dashboard. The 'Status' menu is open, displaying a list of options: Overview, Firewall, Routes, System Log, Kernel Log, Realtime Graphs, and PAWS Log. The 'PAWS Log' option is highlighted with a red box. To the left of the menu, the 'Memory' section is visible, showing 'Total Available', 'Free', and 'Buffered' memory usage. To the right, there are three horizontal bar charts representing memory usage for different components, with values like 412784 kB / 511996 kB (80%) and 412544 kB / 511996 kB (80%).

The screenshot shows the 'PAWS Log' interface. It displays two JSON objects: a 'send json' (request) and a 'read json' (response). The 'send json' is an 'INIT_REQ' from a device, and the 'read json' is an 'INIT_RESP' from the system. The interface is highlighted with a red box. The 'send json' object contains fields like 'version', 'type', 'deviceDesc', 'location', 'id', and 'method'. The 'read json' object contains fields like 'result', 'rulesetInfo', 'version', 'type', and 'id'.

```
send json :
{
  "params": {
    "version": "1.0",
    "type": "INIT_REQ",
    "deviceDesc": {
      "modelId": "NZC-WS20",
      "serialNumber": "WS20-224-0000004",
      "ksDeviceType": "Portable Master",
      "ksDeviceEmissionPower": 20,
      "ksCertId": "R-R-nZc-NZC-WS20"
    },
    "location": {
      "point": {
        "center": {
          "latitude": 37.585999999999999,
          "longitude": 126.8172
        }
      }
    }
  },
  "id": "000001",
  "method": "spectrum.paws.init"
}

read json :
{
  "result": {
    "rulesetInfo": {
      "ksDeviceType": "Portable Master",
      "maxPollingSecs": "86400",
      "resultId": "KsTvBandWhiteSpace-2015",
      "maxLocationChange": 100,
      "authority": "KR"
    },
    "version": "1.0",
    "type": "INIT_RESP"
  },
  "id": "000001"
}
```

Step4. RF(Radio Frequency) Setting

1. Select “Network -> Wireless” menu.
2. Select WEXT 802.11af interface or interface with Channel information.
3. Click “Edit” button.

The screenshot shows the web interface of the NZC-WSIMX6ULL20 device. The top navigation bar includes 'Status', 'System', 'Network', and 'Logout'. The 'Network' menu is expanded, showing options like 'Interfaces', 'Wireless', 'DHCP and DNS', 'Hostnames', 'Static Routes', 'Diagnostics', and 'Firewall'. The 'Wireless' option is selected, leading to the 'Wireless Overview' page. The page shows a list of wireless interfaces, with 'nct11af1' selected. The details for 'nct11af1' are displayed, including 'Generic WEXT 802.11af', 'Channel: 14 (0.473 GHz)', and 'Bitrate: 0%'. The 'SSID: NZIA | Mode: Master' is also shown. The 'Wireless is not associated' status is indicated. The 'Edit' button is highlighted. Below the overview, there is a table for 'Associated Stations' with columns for Network, MAC-Address, Host, Signal / Noise, and RX Rate / TX Rate. The table is currently empty, showing 'No information available'. The footer indicates the device is 'Powered by ROZY Master (3ffdacf976)'.

NZC-WSIMX6ULL20 Status System Network Logout TVWS BS **UNSAVED CHANGES: 2** **AUTO REFRESH ON**

nct11af1: Master "NZIA"

Wireless Overview

2 nct11af1 **Generic WEXT 802.11af**
Channel: 14 (0.473 GHz) | Bitrate: 0%

SSID: NZIA | Mode: Master
Wireless is not associated

test Scan Add

3 Disable **Edit** Remove

Associated Stations

Network	MAC-Address	Host	Signal / Noise	RX Rate / TX Rate
No information available				

Powered by ROZY Master (3ffdacf976)

4. Click “Change to BS” button, it goes to BS mode in few seconds.

Device Configuration

General Setup

Advanced Settings

NCT11AF Settings

Current Mode CPE

4

Change to BS

Status

SSID: OpenWrt | Mode: CPE
0% Wireless is not associated

Mode Width

Operating frequency

TVWS

6M MHz

5. Select the band width. 6(FCC) or 8(CE). And select channel.

6. Select “Not use DB” mode.(Non CH DB mode provide static channel, CH DB mode provide PAWS server information)

A) default mode is “Not use DB” mode.

B) For using PAWS, click “Change to use channel DB Mode”.

C) When select “use DB mode”, you can see the “Get Channel” button. If you click the “Get channel” button, you can get channels from the server.

Device Configuration

General Setup

Advanced Settings

NCT11AF Settings

Current Mode BS

Change to CPE

Status

SSID: ? | Mode: BS
10% Wireless is not associated

5

A

Mode

Channel

Width

CH Mode

Operating frequency

TVWS

14 (473 MHz)

6M MHz

Not use DB

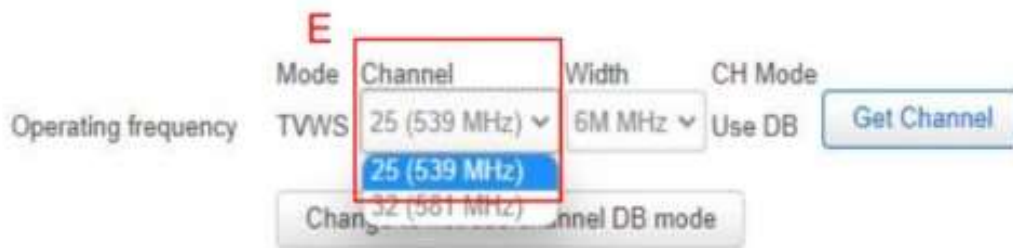
B

Change to use channel DB mode

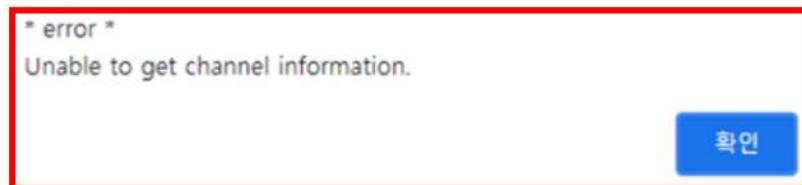


D) If you click “Change to not use channel DB” mode,
CH mode will change to “Not use DB” mode.

E) You can find available channel list at Use DB mode.



* If you cannot receive channel list from PAWS server, Error message pops up on the screen.



7. Enter "ESSID".
8. Select "WSM-20" module.

Interface Configuration

General Setup Wireless Security MAC-Filter Advanced Settings

Mode Base Station

7

ESSID OpenWrt

Network nct11af1

Choose the network(s) you want to attach to this wireless interface or fill out the *create* field to define a new network.

Hide ESSID ☐

WMM Mode ☒

8

Module WSM-20(100mW)

9. Click “Wireless Security” tab.
10. Select “Encryption”, “Cipher” option.
11. Enter password in “key”
12. Click “Save&Apply” button.

Interface Configuration

9 **Wireless Security** | General Setup | MAC-Filter | Advanced Settings

10 Encryption: WPA2-PSK

Cipher: Force CCMP (AES)

11 Key:

802.11r Fast Transition ☐
ⓘ Enables fast roaming among access points that belong to the same Mobility Domain

802.11w Management Frame Protection: Disabled (default)
ⓘ Requires the 'full' version of wpa2/hostapd and support from the wifi driver (as of Feb 2017: ath9k and ath10k, in LEDE also mwlwifi and mt76)

Enable key reinstallation (KRACK) countermeasures ☐
ⓘ Complicates key reinstallation attacks on the client side by disabling retransmission of EAPOL-Key frames that are used to install keys. This workaround might cause interoperability issues and reduced robustness of key negotiation especially in environments with heavy traffic load.

Back to Overview

12 **Save & Apply** | Save | Reset

13. Click “OK” button.

10.1.1.254 says

A reboot is required to apply the setting information.
Cancel to reboot later or click OK to reboot now.

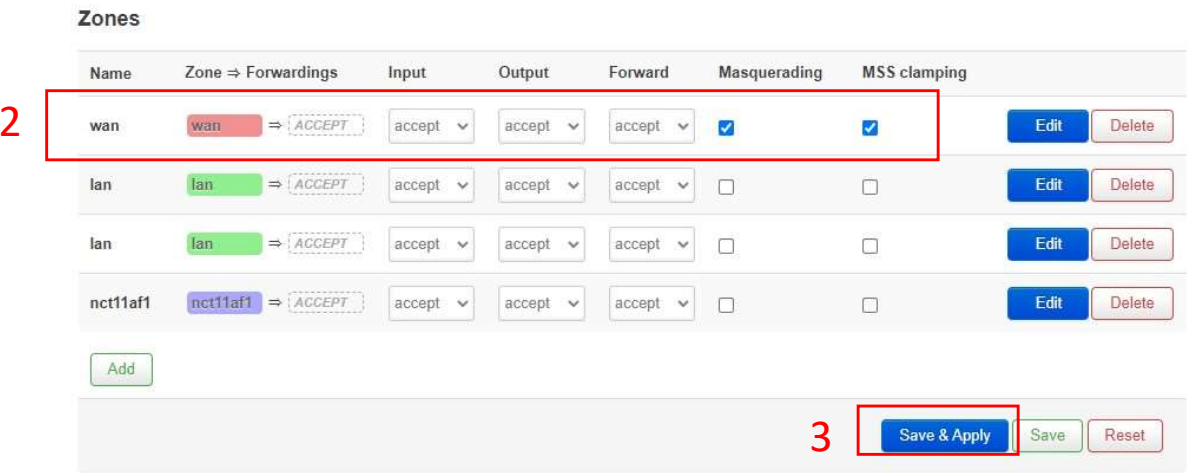
13 **OK** | Cancel

Step6. Masquerading

- 1. Click “Network -> Firewall” menu.

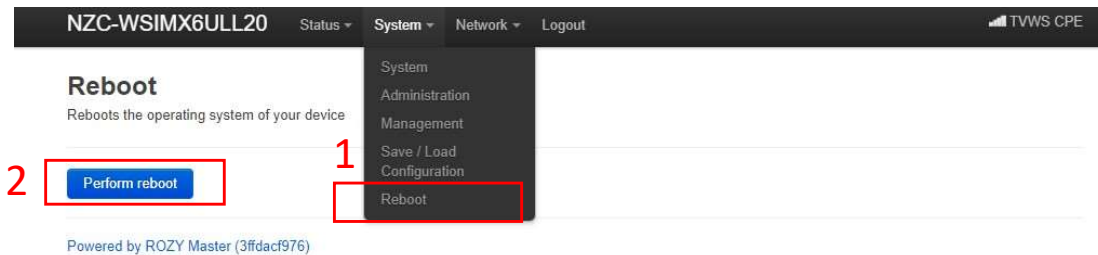


- 2. Check the box “Masquerading” and “MSS clamping” on WAN.
- 3. Click “Save & Apply” button.



Step7. Reboot System

1. Select "System -> Reboot" menu.
2. Click "Perform reboot" button.



3. Reboot will progress
4. After device reboots, user can see the login screen again.



5. After rebooting, check the TVWS MODE first.



V CPE(STA) Settings

Step1. WAN(Wide Area Network) Setting

1. Select “Network -> Interfaces” menu.
2. Find WAN includes Mac address.
3. Click “Edit” button.

The screenshot shows the network configuration interface for a device named NZC-WSIMX6ULL20. The top navigation bar includes 'Status', 'System', 'Network', and 'Logout'. The 'Network' menu is expanded, showing options like 'Interfaces', 'Wireless', 'DHCP and DNS', 'Hostnames', 'Static Routes', 'Diagnostics', and 'Firewall'. The 'Interfaces' section lists three interfaces: LAN (eth0), NCT11AF1 (nct11af1), and WAN (eth1). The WAN interface is highlighted with a red box, and its 'Edit' button is also highlighted with a red box. Below the interfaces, there is a section for 'Global network options' with a field for 'IPv6 ULA-Prefix' and a 'Save & Apply' button.

Network Configuration Interface:

- Top Bar:** NZC-WSIMX6ULL20 | Status | System | **Network** | Logout | TVWS BS | AUTO REFRESH ON
- Navigation:** NCT11AF1 | WAN | LAN
- Interfaces Menu:** Interfaces (selected), Wireless, DHCP and DNS, Hostnames, Static Routes, Diagnostics, Firewall
- Interface List:**
 - LAN (eth0):** Protocol: Static address, Uptime: 0h 2m 8s, MAC: 38:F7:CD:10:00:AD, RX: 242.97 KB (1284 Pkts.), TX: 472.77 KB (1265 Pkts.), IPv4: 192.168.220.254/24. Buttons: Restart, Stop, Edit, Delete.
 - NCT11AF1 (nct11af1):** Protocol: Static address, Uptime: 0h 1m 51s, MAC: 38:F7:CD:10:00:AC, RX: 0 B (0 Pkts.), TX: 0 B (0 Pkts.), IPv4: 10.1.1.254/24. Buttons: Restart, Stop, Edit, Delete.
 - WAN (eth1):** Protocol: DHCP client, Uptime: 0h 2m 4s, MAC: 38:F7:CD:10:00:AD, RX: 391.60 KB (1211 Pkts.), TX: 163.03 KB (764 Pkts.), IPv4: 192.168.0.212/24. Buttons: Restart, Stop, **Edit**, Delete.
- Global network options:** IPv6 ULA-Prefix: fdfa:e290:eb4c::/48. Buttons: Save & Apply, Save, Reset.

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4. Setup the protocol to “DHCP client”.
5. Click “Switch Protocol” button. If the Protocol is already set “DHCP client”, this button will be non-activate.
6. Click “Save & Apply”

The screenshot displays a network configuration interface. At the top, the 'General Setup' tab is active. Below it, a 'Status' box shows device information: Device: nct11af1, Uptime: 0h 16m 12s, MAC: 38:F7:CD:10:00:C3, RX: 0 B (0 Pkts.), TX: 0 B (0 Pkts.), and IPv4: 10.10.10.254/24. Below the status box, the 'Protocol' dropdown menu is set to 'DHCP client', highlighted with a red box and a red number '4'. To the right of the dropdown is a 'Switch protocol' button, also highlighted with a red box and a red number '5'. Below this, the 'Really switch protocol?' checkbox is checked. The 'DHCP Server' section is visible below, with 'General Setup' as the active tab. It contains settings for 'Ignore interface' (unchecked), 'Start' (100), 'Limit' (150), and 'Lease time' (12h). At the bottom, a 'Back to Overview' button is on the left, and a 'Save & Apply' button (highlighted with a red box and a red number '6') is on the right, along with 'Save' and 'Reset' buttons.

General Setup

Status

Device: nct11af1
Uptime: 0h 16m 12s
MAC: 38:F7:CD:10:00:C3
RX: 0 B (0 Pkts.)
TX: 0 B (0 Pkts.)
IPv4: 10.10.10.254/24

4 Protocol DHCP client

Really switch protocol? ☒ Switch protocol 5

DHCP Server

General Setup Advanced Settings IPv6 Settings

Ignore interface ☐ Disable DHCP for this interface.

Start 100
Lowest leased address as offset from the network address.

Limit 150
Maximum number of leased addresses.

Lease time 12h
Expiry time of leased addresses, minimum is 2 minutes (2m).

Back to Overview 6 Save & Apply Save Reset

Step2. RF(Radio Frequency) Setting

1. Select “Network->Wireless” menu
2. Select WEXT 802.11af interface or interface with Channel information.
3. Click “Edit” button.

The screenshot shows the top navigation bar of the NZC-WSIMX6ULL20 interface. The 'Network' menu is open, and the 'Wireless' option is highlighted. Below the menu, the 'Wireless Overview' section shows a table with one entry: 'nct11af1' with a signal strength of 0% and the text 'Generic WEXT 802.11af Channel: 14 (0.473 GHz) | Bitrate: 0'. The 'Edit' button is highlighted. The 'Associated Stations' table below is empty, showing 'No information available'.

4. If not “CPE mode”, click “Change to CPE”.
5. Select “WSM-20” on module tap.
6. Enter BS’s SSID in ESSID

The screenshot shows the 'Device Configuration' page with the 'NCT11AF Settings' tab selected. The 'Current Mode' is 'CPE', and the 'Change to BS' button is highlighted. Below this, the 'Status' section shows 'SSID: OpenWrt | Mode: CPE' and '0% Wireless is not associated'. The 'Operating frequency' is set to 'TVWS' and '6M MHz'. The 'Interface Configuration' page is also shown, with the 'Wireless Security' tab selected. The 'Mode' is set to 'Client', and the 'ESSID' field is highlighted. The 'BSSID' field is empty. The 'Network' dropdown is set to 'nct11af1'. The 'Module' dropdown is set to 'WSM-20(100mW)'.

7. Click “Wireless Security” tab.

8. Select Encryption, Cipher option like BS.(If BS Cipher is Force CCMP (AES), CPE Cipher is Force CCMP(AES)).

9. Enter BS’s password in Key.

Interface Configuration

7 **Wireless Security** Advanced Settings

8 Encryption WPA2-PSK
Cipher Force CCMP (AES)

9 Key *****

10. Select channel scan range on the “Advanced settings” tab.

(User can enter scan range. If BS channel is 20, scanning channel can set value as follow. Start is 15. End is 25.)

Device Configuration

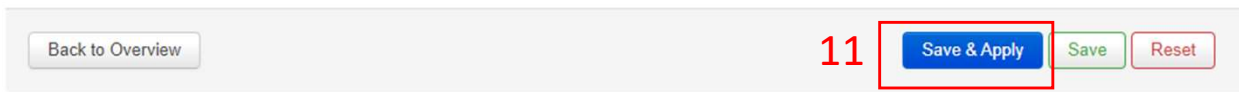
General Setup **Advanced Settings** NCT11AF Settings

MCS Auto

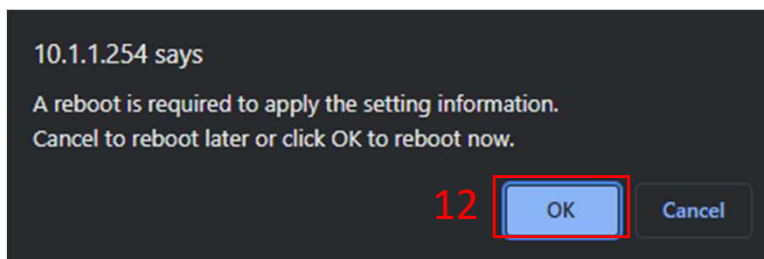
TX power adjustment 0

10 Range of scanning channel Start 14 ~ End 30

11. Click “Save&Apply” button.



12. Click “OK” button.



Step3. LAN interface Setting

1. Select “Network->Interfaces” Menu.
2. Select “LAN” interface.

The screenshot displays the network management interface for a device labeled 'NZC-WSIMX6ULL20'. The top navigation bar includes 'Status', 'System', 'Network', and 'Logout'. A red box labeled '1' highlights the 'Network' menu, which is open, showing a list of options: 'Interfaces', 'Wireless', 'DHCP and DNS', 'Hostnames', 'Static Routes', 'Diagnostics', and 'Firewall'. The 'Interfaces' option is selected. Below the navigation bar, there are tabs for 'NCT11AF1', 'WAN', and 'LAN'. The 'LAN' tab is active, showing a list of interfaces. The first interface is 'LAN' (eth0), which is highlighted with a green box. It has a 'Static address' protocol, an uptime of 0h 2m 8s, and an IPv4 address of 192.168.220.254/24. A red box labeled '2' highlights the 'Edit' button for this interface. The second interface is 'NCT11AF1' (nct11af1), which has a 'Static address' protocol, an uptime of 0h 1m 51s, and an IPv4 address of 10.1.1.254/24. The third interface is 'WAN' (eth1), which has a 'DHCP client' protocol, an uptime of 0h 2m 4s, and an IPv4 address of 192.168.0.212/24. Each interface has 'Restart', 'Stop', 'Edit', and 'Delete' buttons.

Interface	Protocol	Uptime	MAC	RX	TX	IPv4	Buttons
LAN (eth0)	Static address	0h 2m 8s	38:F7:CD:10:0:0	242.97 KB (1284 Pkts.)	472.77 KB (1265 Pkts.)	192.168.220.254/24	Restart, Stop, Edit, Delete
NCT11AF1 (nct11af1)	Static address	0h 1m 51s	38:F7:CD:10:00:AC	0 B (0 Pkts.)	0 B (0 Pkts.)	10.1.1.254/24	Restart, Stop, Edit, Delete
WAN (eth1)	DHCP client	0h 2m 4s	38:F7:CD:10:00:AD	391.60 KB (1211 Pkts.)	163.03 KB (764 Pkts.)	192.168.0.212/24	Restart, Stop, Edit, Delete

3. Setup IPv4 address(ex. 10.1.1.254)
4. Setup IPv4 netmask(ex.255.255.255.0)

General Setup | **Advanced Settings** | Physical Settings | Firewall Settings

Status: Device: eth0.1
Uptime: 1h 45m 4s
MAC: 00:0C:43:76:20:28
RX: 2.26 MB (14485 Pkts.)
TX: 3.18 MB (12646 Pkts.)
IPv4: 10.1.1.254/24

Protocol: Static address

IPv4 address: 10.1.1.254 **3**

IPv4 netmask: 255.255.255.0 **4**

IPv4 gateway:

5. Uncheck the “Ignore Interface”.
6. Setup “100” into Start.
7. Setup “150” into Limit.
8. Setup “12h” into Lease time.
9. Click “Save & Apply”.

DHCP Server

General Setup | **Advanced Settings** | IPv6 Settings

5 Ignore interface: ☐ Disable DHCP for this interface.

6 Start: 100 Lowest leased address as offset from the network address.

7 Limit: 150 Maximum number of leased addresses.

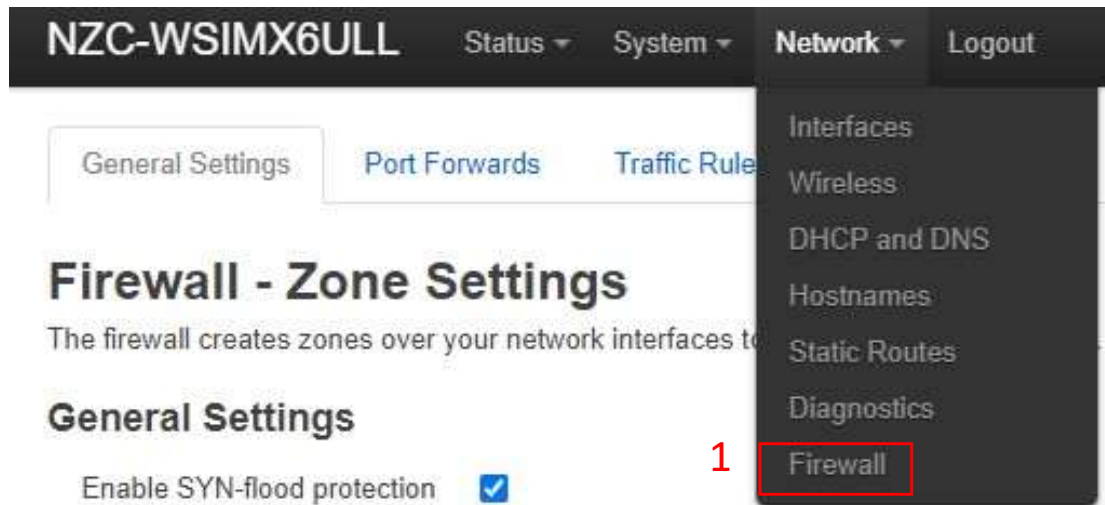
8 Lease time: 12h Expiry time of leased addresses, minimum is 2 minutes (2m).

9 **Save & Apply** | Save | Reset

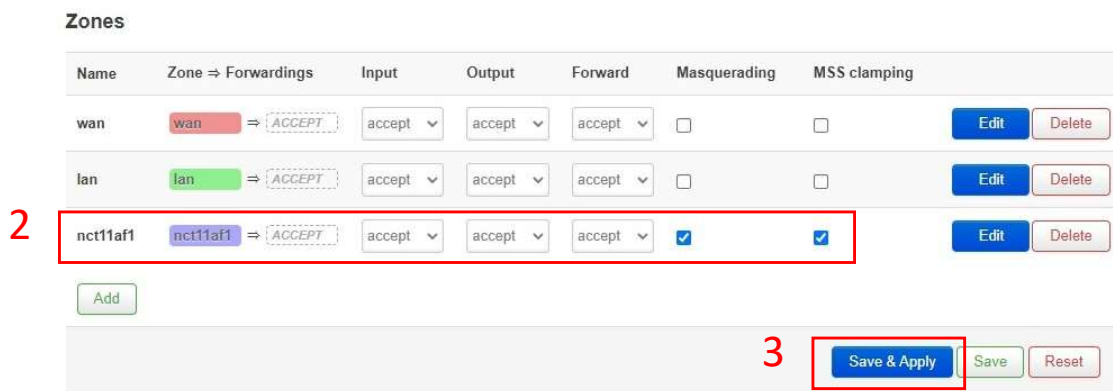
Back to Overview

Step4. Masquerading

1. Select “Network -> Firewall” menu.

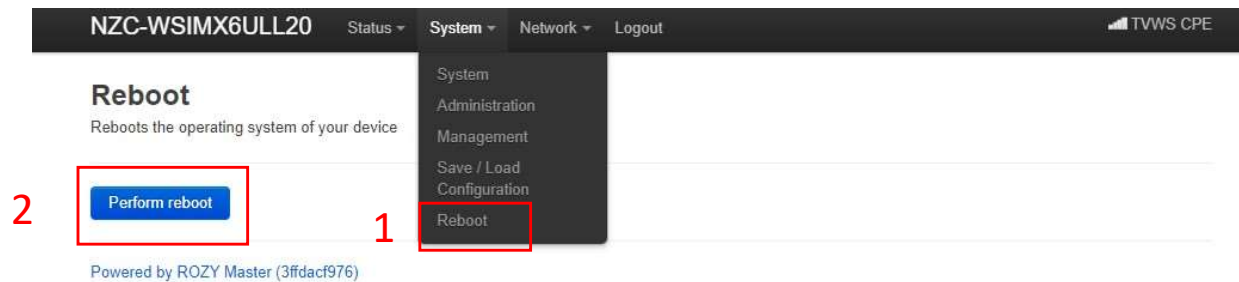


2. Check the “Masquerading” and “MSS clamping” to vailed nct11af interface.(ex. nct11af1).
3. Click “Save & Apply”.



Step5. Reboot System

1. Select "System -> Reboot" menu.
2. Click "Perform reboot" button.



3. Reboot will progress
4. After device reboots, user can see the login screen again.



5. After rebooting, check the TVWS MODE first.



Step6. How to check TVWS connection

1. Check the front page of CPE Web UI. The front page is Overview of Status.

NZC-WSIMX6ULL Status System Network Logout TVWS CPE **AUTO REFRESH ON**

Device: Ethernet Adapter: "eth1"
MAC-Address: 38:F7:CD:10:00:17

Active Connections: 203 / 16384 (1%)

PAWS

Status	Deactivation
Date	

Active DHCP Leases

Hostname	IPv4-Address	MAC-Address	Leasetime remaining
Laptop-YM	192.168.200.151	00:2B:67:0D:2D:ED	6h 55m 40s

Active DHCPv6 Leases

Host	IPv6-Address	DUID	Leasetime remaining
There are no active leases.			

1

Wireless

nct11af1

Type: WEXT 802.11
Channel: 14 (0.473 GHz)
Bitrate: 1 Mbit/s

SSID: ?
Mode: Unknown
Wireless is not associated

2. If the connection is success between CPE to BS, you can see the page below.

Wireless

nct11af1

Type: WEXT 802.11
Channel: 14 (0.473 GHz)
Bitrate: 29 Mbit/s

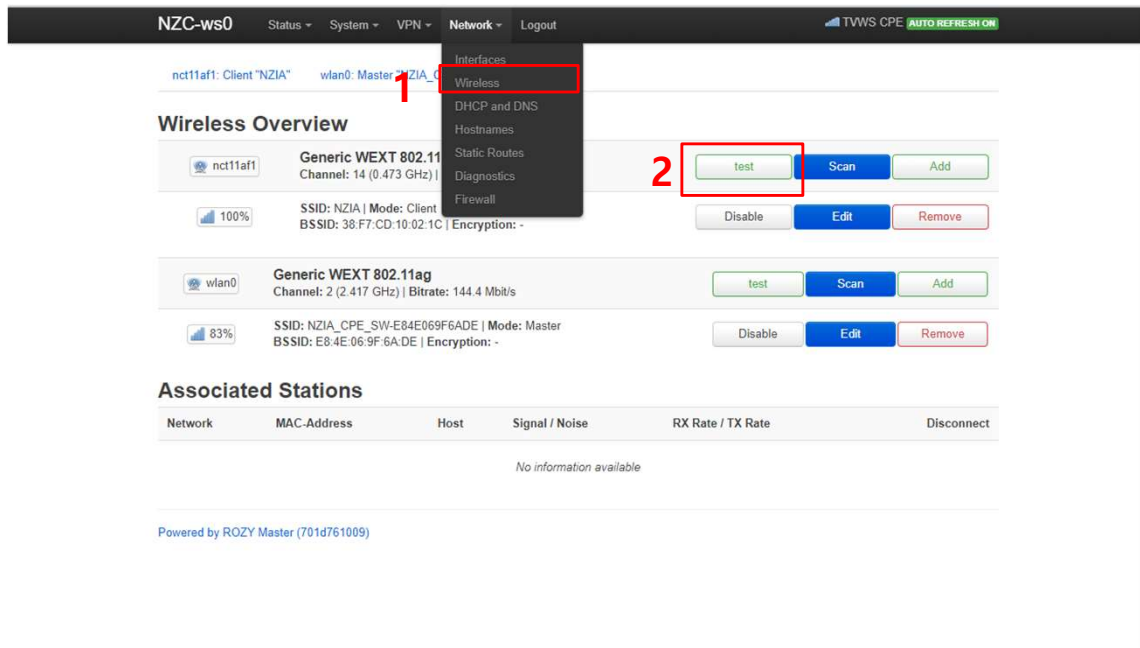
SSID: NZIA
Mode: Client
BSSID: 38:F7:CD:10:02:1C
Encryption: -
Associations: -

2

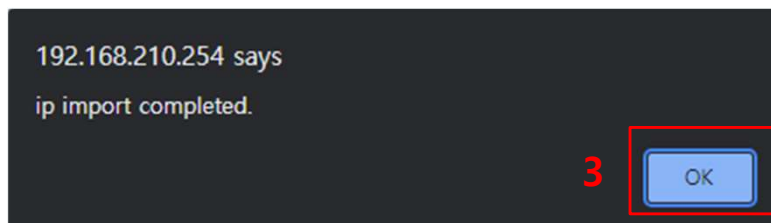
3. If the network is not connected. Please, follow the manual from the first step again.

Option1. Performance Test

1. Select “Network -> Wireless” menu.
2. Click “test” button.



3. Click “OK” button.



Option1. Performance Test

4. Select device IP at IP list.
5. Click "Test Start" button.

NZC-WS20

Status ▾System ▾VPN ▾Network ▾Logout

TVWS CPE

TVWS Performance Test

Network Test

4

Test IP : 10.10.10.254 ▾
All
10.10.10.254

Import IP

Bandwidth : 30 ▾ Mbps

Ping ☒
Throughput & RSSI ☒

5

Test Start

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6. The result will print on red box, when test finish.

NZC-WS20

Status ▾System ▾VPN ▾Network ▾Logout

TVWS CPE

TVWS Performance Test

Network Test

Test IP : 10.10.10.254 ▾ Import IP Bandwidth : 30 ▾ Mbps Ping ☒
Throughput & RSSI ☒ Test Start

6

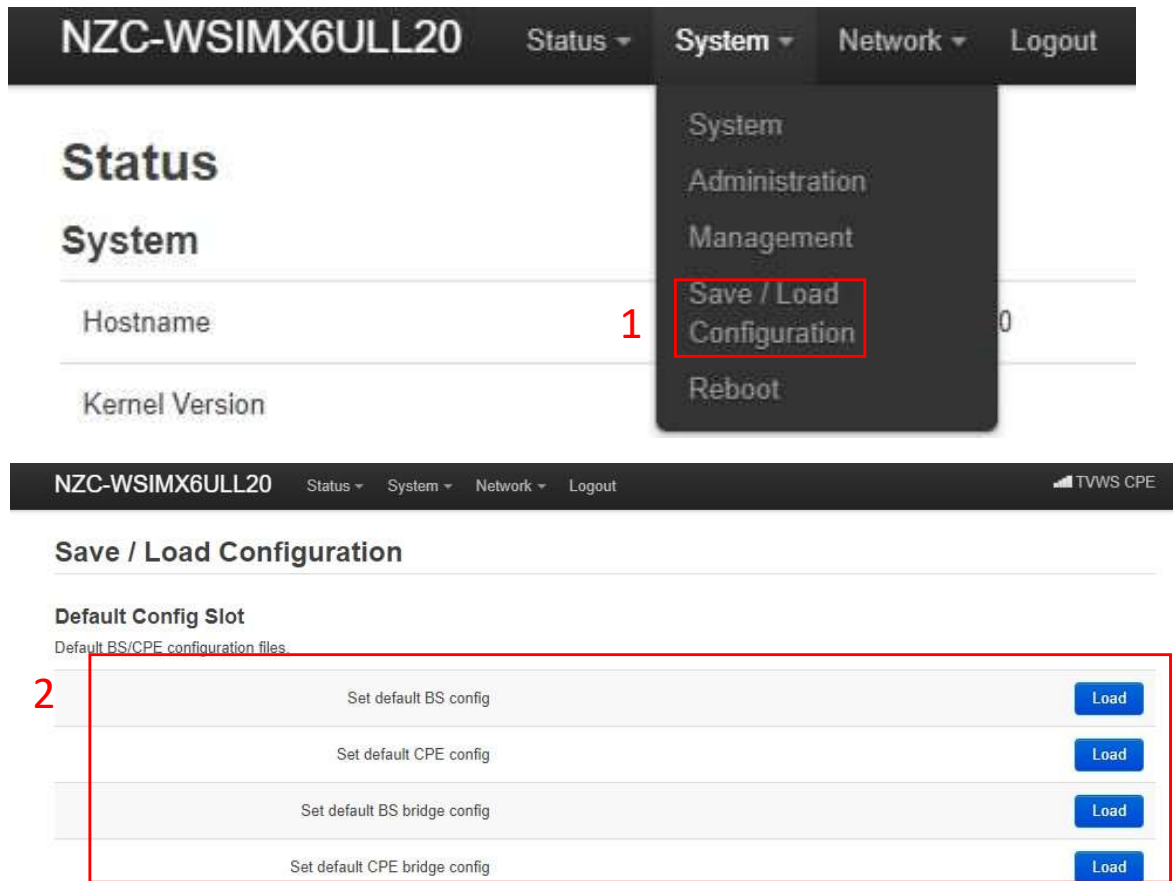
```
===== RESULT TEST =====  
  
Channel: 14  
IP : 10.10.10.254  
DownloadBandwidth : 21.16Mbps/sec  
Lost_bs : 0.0  
UploadBandwidth : 21.2Mbps/sec  
Lost_cpe : 0.0  
ping avg : 2.422  
ping loss : 0%  
ping max : 2.575  
ping min : 2.279  
RSSI : -31 dBm  
  
REPORT,21.16Mbps/sec,0.0,21.2Mbps/sec,0.0,2.422,0%,2.575,2.279,-31 dBm  
  
===== END =====
```

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VI SAVE/LOAD Configuration

Step1. Default BS/CPE Configuration Setting

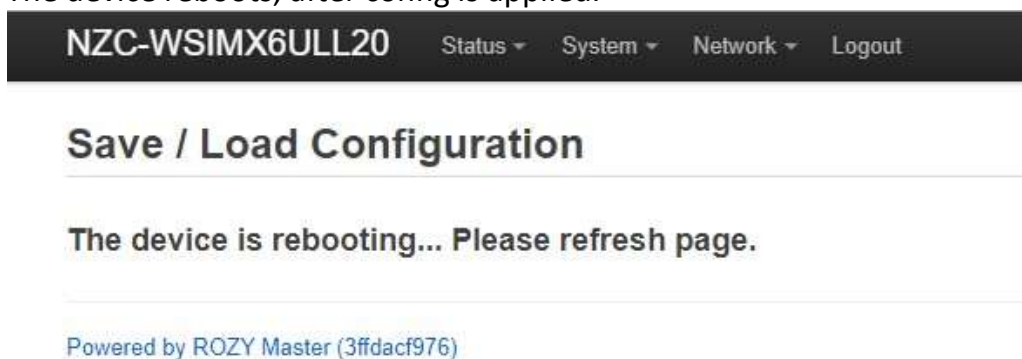
1. Select “System -> Save/Load configuration” menu.
2. Select default config slot and click load button



3. Click “OK” button.



4. The device reboots, after config is applied.



Step2. Save Configuration

1. Click empty slot “save” button

Config Back up Slot

Save configuration files.

1	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load

2. Click “OK” button.

192.168.200.254 says

Do you want to save the config?

OK Cancel

3. Config added to the Slot.

Config Back up Slot

Save configuration files.

3	CPE-2021-12-29-095456.tar.gz	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load
	[Empty Slot]	Save	Load

4. Click “save” button of the config slot, previously saved config is deleted and a new one is saved.

Config Back up Slot
Save configuration files.

	BS-2023-02-16-144453.tar.gz	Save	Load
	BS-2023-02-16-144410.tar.gz	Save	Load
	BS-2023-02-16-163954.tar.gz	Save	Load
	BS-2023-02-16-163958.tar.gz	Save	Load
4	BS-2023-02-16-143834.tar.gz	Save	Load

5. Click “OK” button.

192.168.200.254 says

Do you want to delete <5-BS-2023-02-16-143834.tar.gz> and save a new file?

5

OK Cancel

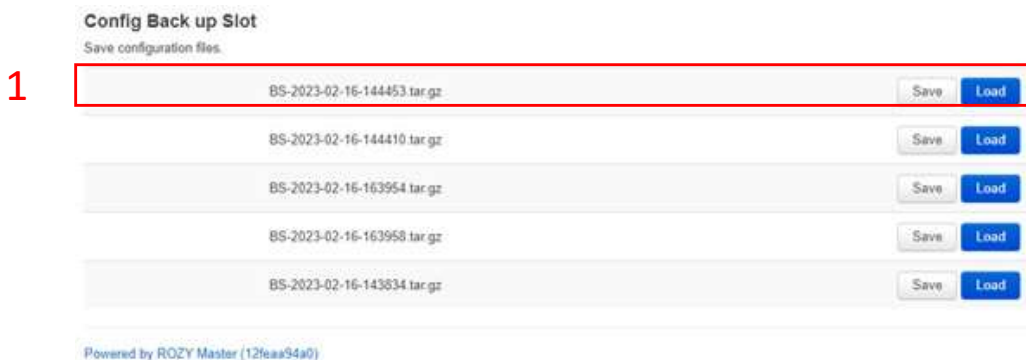
6. User can find new file at deleted config back up slot.

Config Back up Slot
Save configuration files.

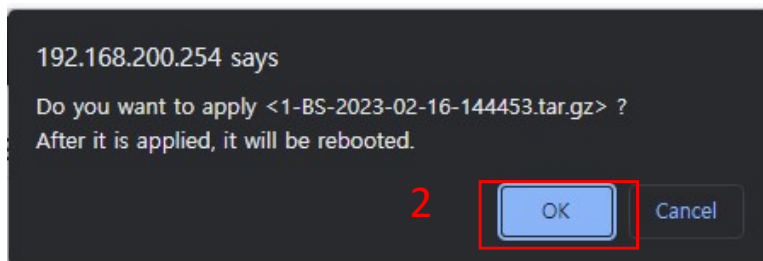
	BS-2021-12-29-094047.tar.gz	Save	Load
	BS-2021-12-29-094052.tar.gz	Save	Load
6	CPE-2021-12-28-174330.tar.gz	Save	Load
	CPE-2021-12-28-181045.tar.gz	Save	Load
	CPE-2021-12-29-094951.tar.gz	Save	Load

Step3. Load Configuration

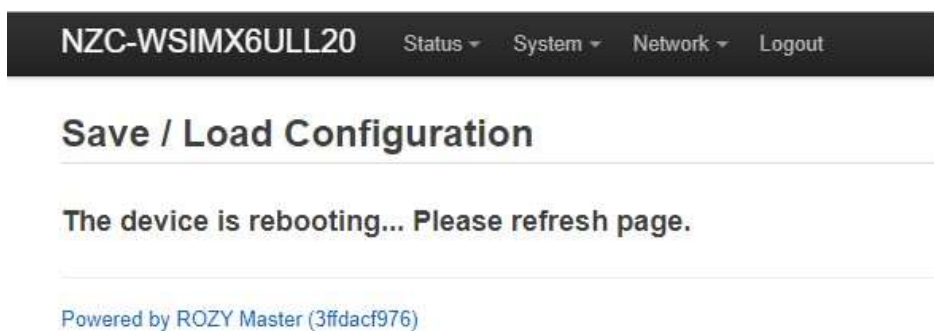
1. Click “load” button at config slot. (User can use saved config file through load button)



2. Click “OK” button.



3. The device reboots, after config is applied.



Service center



Call Center : (+82) 02 851 3873

e-mail : info@nzia.kr

FCC COMPLIANCE STATEMENT

CAUTION: Changes or modifications not expressly approved could void your authority to use this equipment

This device complies with Part 15 of the FCC Rules. Operation 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.

FCC §15.105 Information to the user.

NOTE: 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 to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and 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.

FCC §15.706 Information to the user.

This equipment has been tested and found to comply with the rules for white space devices, pursuant to part 15 of the FCC rules. These rules are designed to provide reasonable protection against harmful interference. 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. 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 to correct the interference by one or more of the following measures:

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

FCC RF Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

Caution: Exposure to Radio Frequency Radiation

To comply with FCC RF exposure compliance requirements, for fixed configurations, a separation distance of at least 30cm must be maintained between the antenna of this device and all persons. This device must not be co-located or operating in conjunction with any other antenna or transmitter.

