



# Grandstream Networks, Inc.

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Load Balancing and Failover on GWN7000

Configuration Guide



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## INTRODUCTION

The GWN7000 is an enterprise Gigabit router, that offers enhanced network reliability, high performance for routing / switching along with access security and protection. The various features of the GWN7000 include comprehensive Wi-Fi management, enhanced network reliability and security, VPN solutions, Multi-WAN for traffic load balancing and failover, as well as other advanced features.

Among the above cited features, the Load Balancing and Failover features aim to maximize network reliability across multi-WAN ports, by helping to share the broadband connections to all the LAN users, and ensure service continuity when the primary connection is lost.

This guide describes the utility and steps for configuring the Load Balancing and Failover on GWN7000, as a main feature when having multiple and redundant Internet connections, which ensures a higher reliability to the network connection.



## OVERVIEW

The Load Balancing feature improves the distribution and balancing of broadband connection between multiple network links, to maximize throughput and minimize latency. The redundancy can be also ensured, when having Multi-WAN configured with Failover feature.

Load Balancing is using simultaneously both broadband connections through the two WAN ports, offering the ability to use the total bandwidth of the two connections. The Failover is mainly used when aiming to be connected using only the primary connection, and use the secondary broadband connection only when the primary is failed, this may be helpful for path-sensitive connections, such as VoIP or VPN traffic.

This guide will need the user to have a similar topology to the one illustrated below, the router is supposed to have two different Broadband connections or to be connected to two different ISPs. The GWN7000 will be handling both WAN connections using the Multi-WAN feature as displayed on the following diagram:

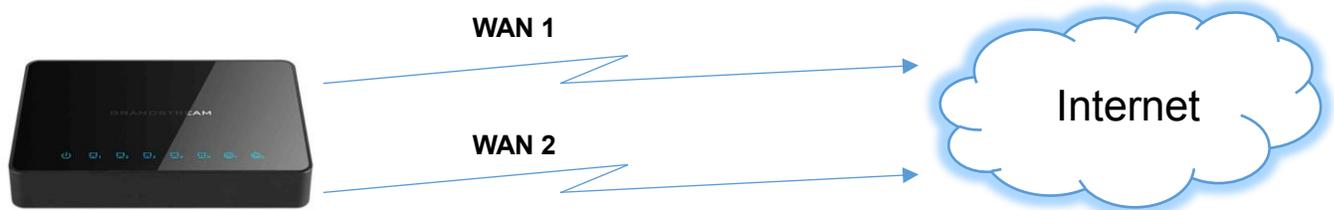


Figure 1 : Multi-WAN on GWN7000

The prerequisites are as follow:

- GWN7000 with firmware version 1.0.2.71 or higher.
- Two different Broadband connections or two ISP lines.



## LOAD BALANCING

### WAN Ports Configuration

When configuring Load Balancing on the GWN7000 router, both WAN Ports will be used and will share the bandwidth of both Internet connections, instead of using only the primary WAN port until this one is failed, which is the case for Failover feature.

Various scenarios can be deployed for Load Balancing and the bandwidth sharing, this can be done either per-destination or per-packet. When the Load Balancing is based on the destination IP, all the packets for destination 1 will go over the first WAN port, all the packets for destination 2 will go over the second port, and so on.

On GWN7000, the Load Balancing is based on sharing all the packets on both WAN ports, meaning that the router sends one packet for destination 1 over the first path, the second packet for (the same) destination 1 over the second path, and so on, which will guarantee equal load across the two links, and equal utilization of both bandwidths. The following diagram illustrates the deployed scenario:

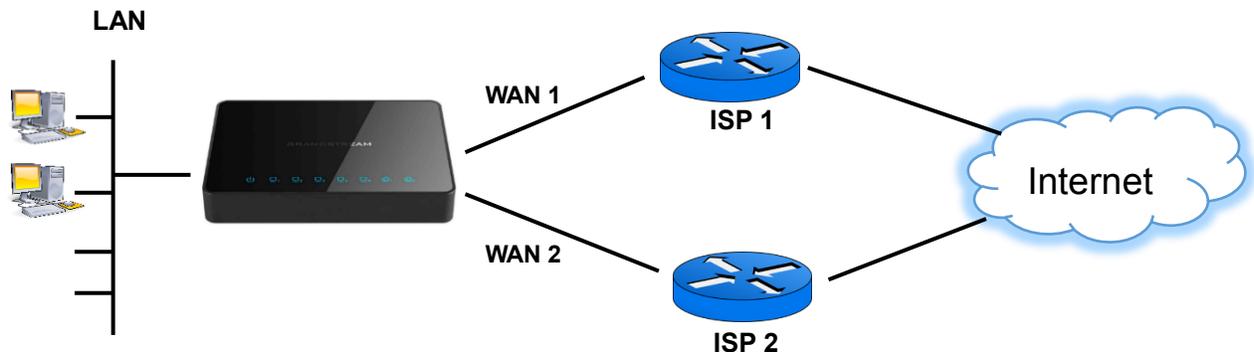
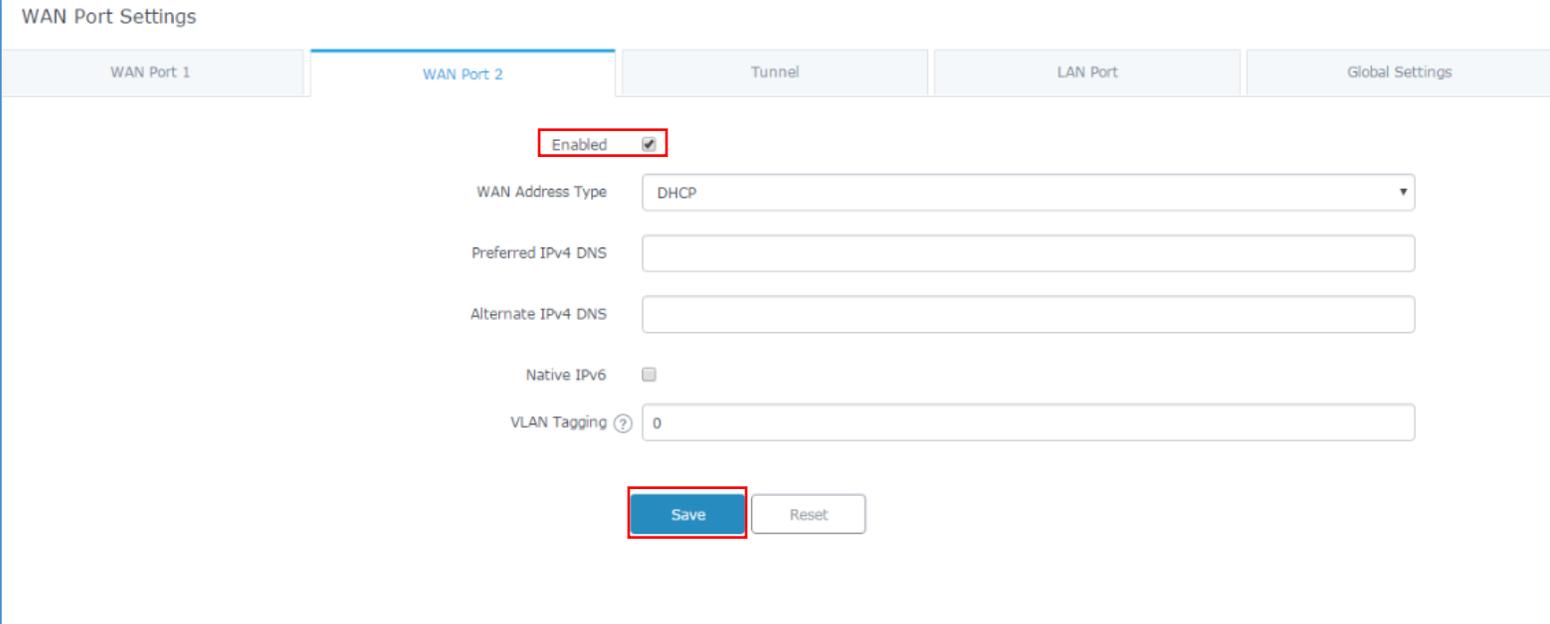


Figure 2 : Load Balancing Schema

By default, only the port WAN 1 is enabled on the router, to ensure that WAN 2 port is enabled, please do the following:

1. Access the GWN7000's Web GUI from a computer connected to a LAN port, and navigate to **Router-> Port** page settings.
2. Make sure to enable WAN Port 2.





WAN Port Settings

WAN Port 1 | **WAN Port 2** | Tunnel | LAN Port | Global Settings

**Enabled**

WAN Address Type: DHCP

Preferred IPv4 DNS:

Alternate IPv4 DNS:

Native IPv6:

VLAN Tagging <sup>?</sup>: 0

**Save** | Reset

**Figure 3 : Enable WAN Port 2**

In our scenario, we are using **DHCP** for WAN Address Type as illustrated on the above screenshot. The WAN Port in this case will acquire an IPv4 address automatically from the DHCP server through the broadband connection. You can set this option to **Static** if your ISP has provided a Fixed or Static IP address, or set it to **PPPoE** if your ISP uses this method.

So far, both WAN Ports are enabled, but only WAN Port 1 is being used until now, user needs to enable Multi-WAN feature in order to use both ports.

After making sure that WAN port 2 is enabled, you can proceed for Multi-WAN configuration as described on the following steps:

- 1- On the same web page (WAN Port Settings) navigate to **Global Settings**.
- 2- Set **Multi-WAN** to **Load Balance + Failover**.
- 3- Press **Save** button to save the new setting.
- 4- Make sure to press **Apply** button on the pop-up window, to apply the new configuration.



WAN Port Settings

WAN Port 1	WAN Port 2	Tunnel	LAN Port	Global Settings
------------	------------	--------	----------	-----------------

Multi-WAN ? **Load Balance + Failover**

Banned Client MAC ?  +  
Add new item +

MAC Override Address ?

**Save** Reset

**Figure 4 : Multi-WAN with Load Balancing**

Once selecting **Load Balance + Failover** and saving the changes, a new Multi-WAN rubric will be added under WAN Port 1 and WAN Port 2.

The new added options are used when both WAN ports are enabled and using Failover feature, this will be detailed later in the upcoming pages related to **Failover Settings**.

Both WAN Port 1 and WAN Port 2 should be enabled and should display Multi-WAN details as follow:

WAN Port 1	WAN Port 2	Tunnel	LAN Port	Global Settings
------------	------------	--------	----------	-----------------

**Enabled**

WAN Address Type

Preferred IPv4 DNS

Alternate IPv4 DNS

Native IPv6

**Multi-WAN**

Tracking IP ?  +  
Add new item +

Tracking Timeout (sec) ?

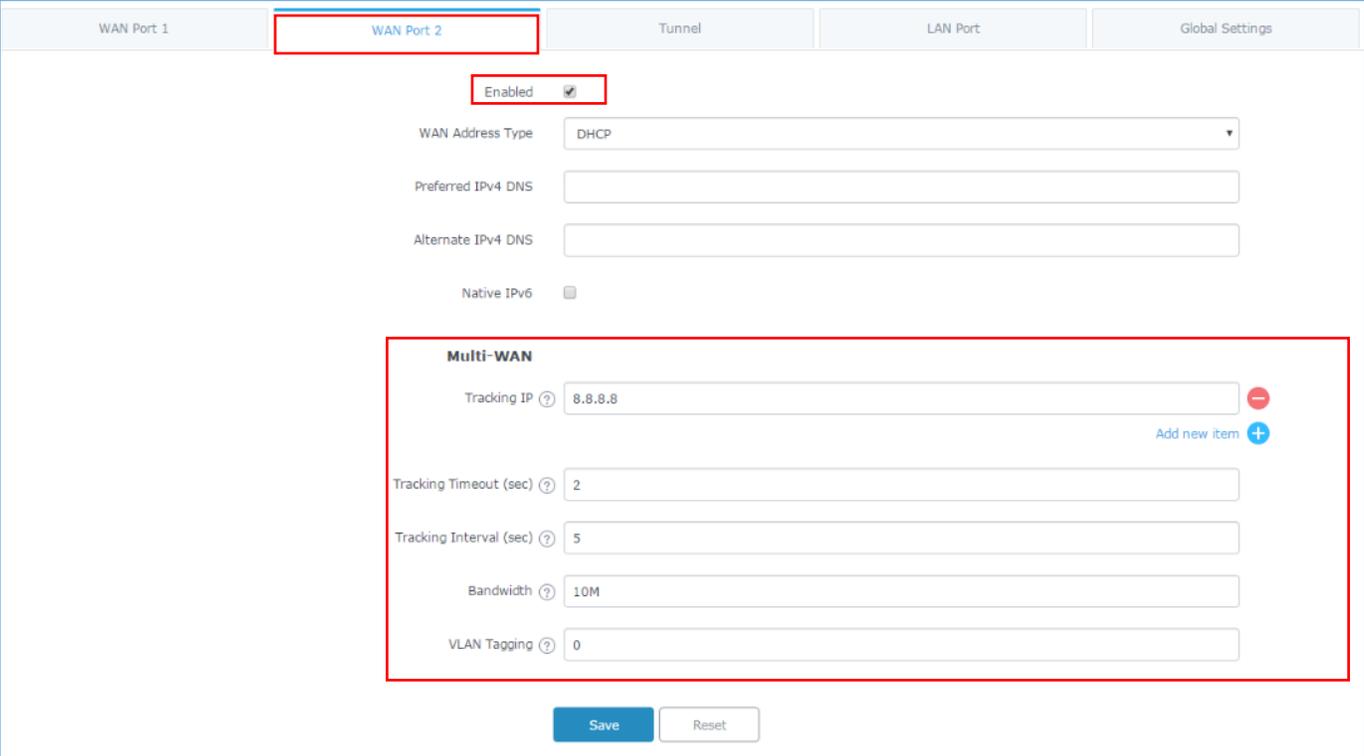
Tracking Interval (sec) ?

Bandwidth ?

VLAN Tagging ?

**Save** Reset

**Figure 5 : WAN Port 1**



**Figure 6 : WAN Port 2**

## WAN Membership Configuration

Once configuring the WAN Ports to be working in Multi-WAN mode, we need to configure the WAN membership to Multi-WAN to allow the LAN ports to communicate through both WAN ports, the Load Balancing and the Failover need this option to be enabled and to have the default network group (group0) set to Multi-WAN. Below are the needed steps to edit the WAN Membership:

- 1- Go to **Network Group->Network Group**.
- 2- Edit the default group (group0) by pressing .
- 3- Set the option **WAN Membership** to **Multi-WAN**.
- 4- Press **Save**, and then **Apply** the new configuration.



Edit ✕

Basic
Wi-Fi
Device Membership

Network Group Name ?

WAN Membership ?

Multi-WAN ▼  
Multi-WAN  
 WAN Port 1  
 WAN Port 2

Enable IPv4 ?

IPv4 Static Address

IPv4 Subnet Mask

DHCP Enabled for IPv4

DHCP Start Address

DHCP End Address

DHCP Lease Time ?

DHCP Options ?  -  
Add new item +

DHCPv4 Relay Enabled

Enable IPv6 ?

Enable Landing Page

Save
Cancel

**Figure 7 : Multi-WAN Membership**

## Status and Overview

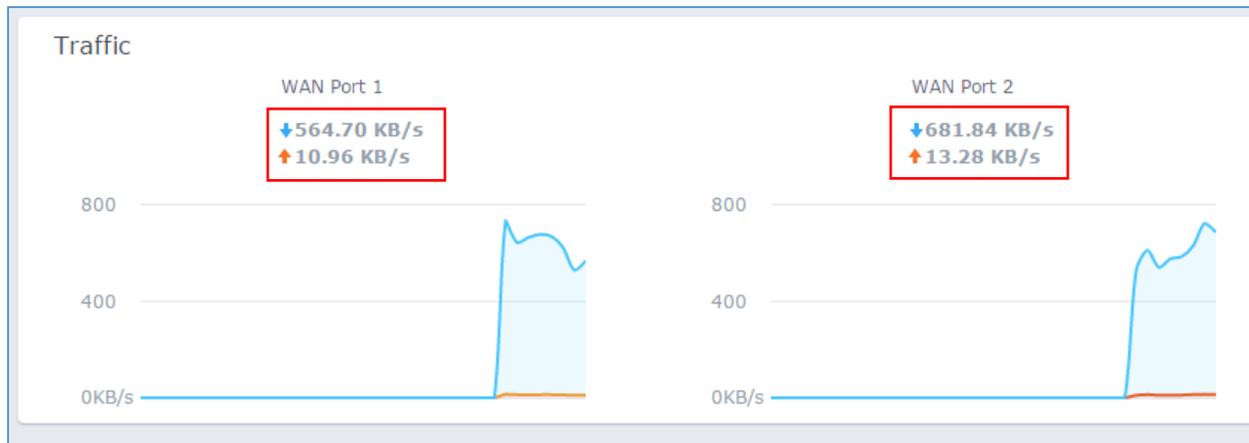
Once the Multi-WAN and WAN Membership are configured correctly, the ports status will be displayed under **Web GUI->Router->Status**. The used data rate on both WAN ports should be approximately the same.

WAN Status					
WAN	Enable WAN	IP Address	Uptime	Throughput	Aggregate
WAN Port 1	✓	192.168.6.231	2m 40s	Tx:11.87KB/s	Tx:1.70MB
		fe80::20b:82ff:fe9c:f1e8		Rx:554.83KB/s	
WAN Port 2	✓	192.168.2.101	2m 38s	Tx:20.72KB/s	Tx:1.60MB
		fe80::20b:82ff:fe9c:f1e8		Rx:904.83KB/s	

**Figure 8 : Load Balancing and WAN Ports Status**



The **Overview** page can also illustrate the bandwidth usage, the download and upload throughputs on both WAN port 1 and WAN port 2 are equivalent:



**Figure 9 : Load Balancing and Bandwidth**

As you can see on the above screenshots, the throughput is approximately the same, and the bandwidth is shared between the two WAN ports, meaning equal utilization per packets of both links.

The following section will be illustrating the Failover feature as a second option for Multi-WAN usage. Instead of using both broadband connections as Load Balancing, the Failover is using one port as a primary WAN port, meaning that only the bandwidth offered by the connection over this port is used, and traffic will be redirected to secondary port when the primary is failed.

User can also specify Failover conditions to indicate when the failed gateway is to be detected.



# FAILOVER

## WAN Ports Configuration

When enabling the Failover mode on the GWN7000 router, the secondary WAN port will only be used when the connection through the primary WAN port has failed. The expected scenario in this case is as follow:

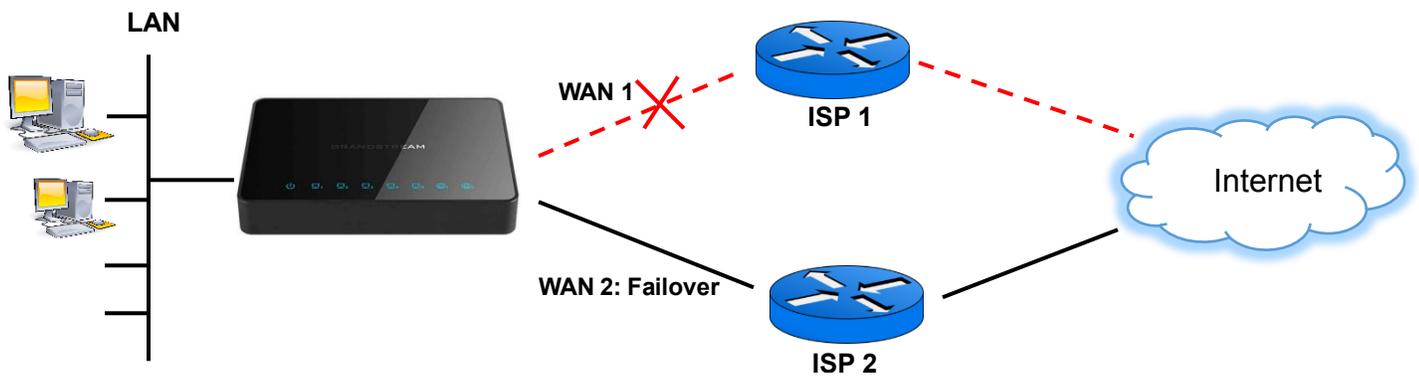


Figure 10 : Failover Schema

The advantage of failover in this case is to ensure that all traffic is going through a single path, which is helpful for path-sensitive connections such as VPN traffic. But the disadvantage is the bandwidth of the backup connection being unused, which is not the case for Load Balancing using the bandwidth of both Internet connections.

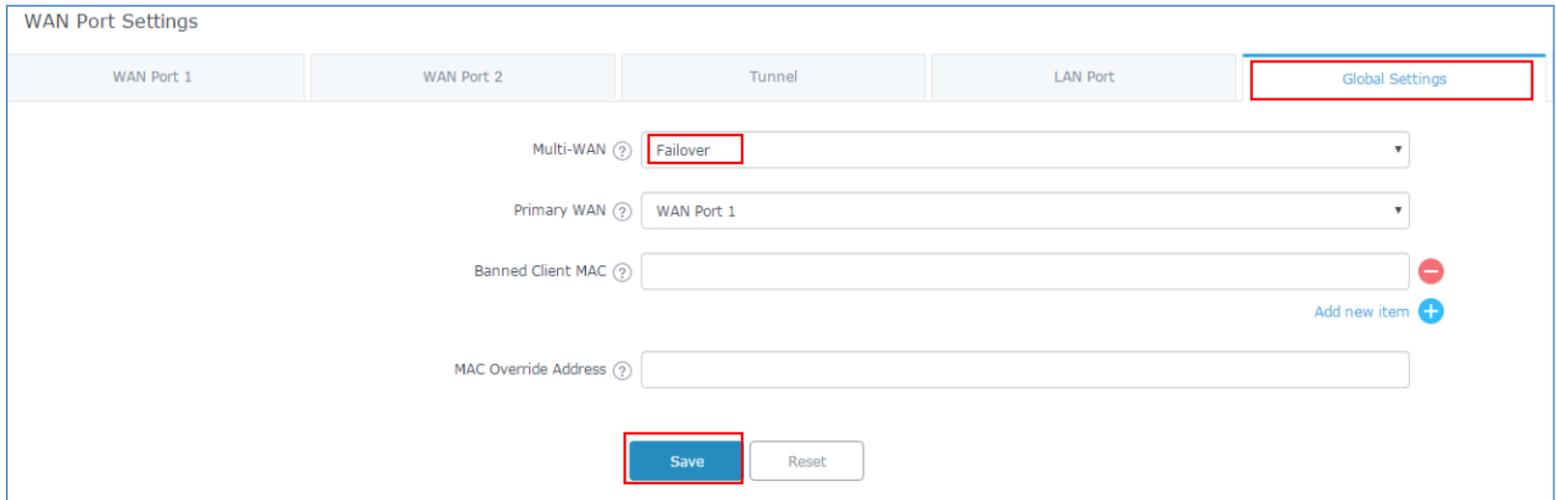
The main internet failure on GWN7000 is detected by using some tracking details, the failure detection method used in this case is pinging a host elsewhere on the Internet (8.8.8.8 by default), pinging the ISP's default gateway, a host on the ISP's network or any other IP Address redirected through the WAN Port.

As mentioned previously, by default only the WAN port 1 is enabled on the router, make sure the WAN Port 2 is enabled as well.

Then you can proceed for Multi-WAN configuration in Failover mode, below are the steps to follow:

- 1- Access the GWN7000 **Web GUI** -> **Router**-> **Port**.
- 2- Navigate to **Global Settings**.
- 3- Set **Multi-WAN** to **Failover**, and select a WAN port to be as the primary port, in our case the WAN Port 1 is used as primary.
- 4- Press **Save** then **Apply** buttons to save and apply the new configurations.





WAN Port Settings

WAN Port 1 | WAN Port 2 | Tunnel | LAN Port | **Global Settings**

Multi-WAN ? **Failover**

Primary WAN ? WAN Port 1

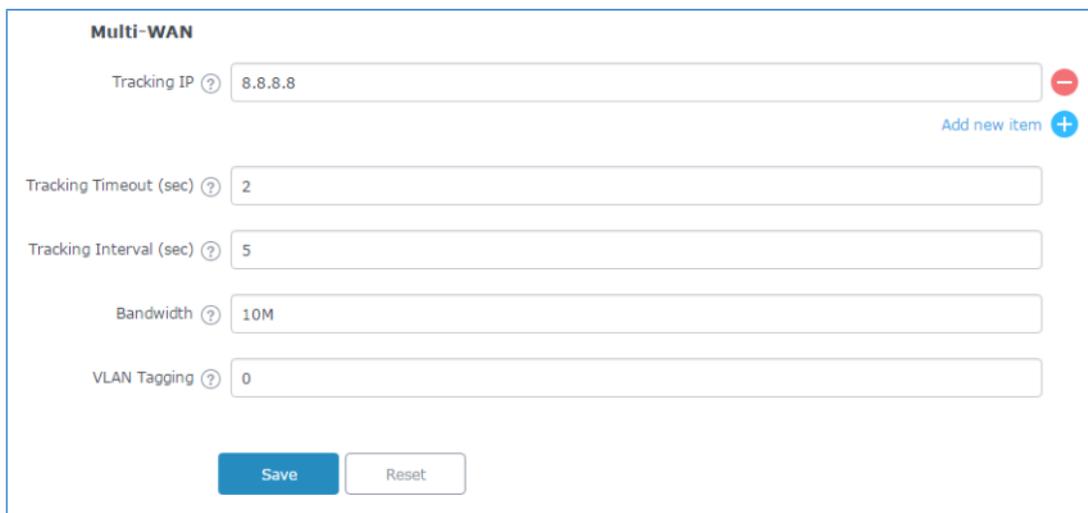
Banned Client MAC ?  +

MAC Override Address ?

**Save** Reset

**Figure 11 : Multi-WAN with Failover**

Similarly to Load Balancing, once selecting **Failover** and saving the changes, a new Multi-WAN rubric will be added under WAN Port 1 and WAN Port 2, this rubric is mainly used for **Failover** only:



**Multi-WAN**

Tracking IP ? 8.8.8.8 +

Tracking Timeout (sec) ? 2

Tracking Interval (sec) ? 5

Bandwidth ? 10M

VLAN Tagging ? 0

**Save** Reset

**Figure 12 : Failover Settings**

The above added options are used when both WAN ports are enabled and using Failover feature, those options are explained below:

- **Tracking IP:** Router determines if a WAN is disconnected or not according to this IP Address, ICMP packets are being used to track the IP(s) address(es). When the tracking fails, the GWN7000 will use the secondary WAN port as failover. Default IP used is 8.8.8.8.

**Note:** When setting multiple IP Addresses as Tracking IPs, the ICMP tracking messages will be sent to all the configured IP addresses consecutively, and the tracking will be considered as failed when there is no answer from all those IPs.



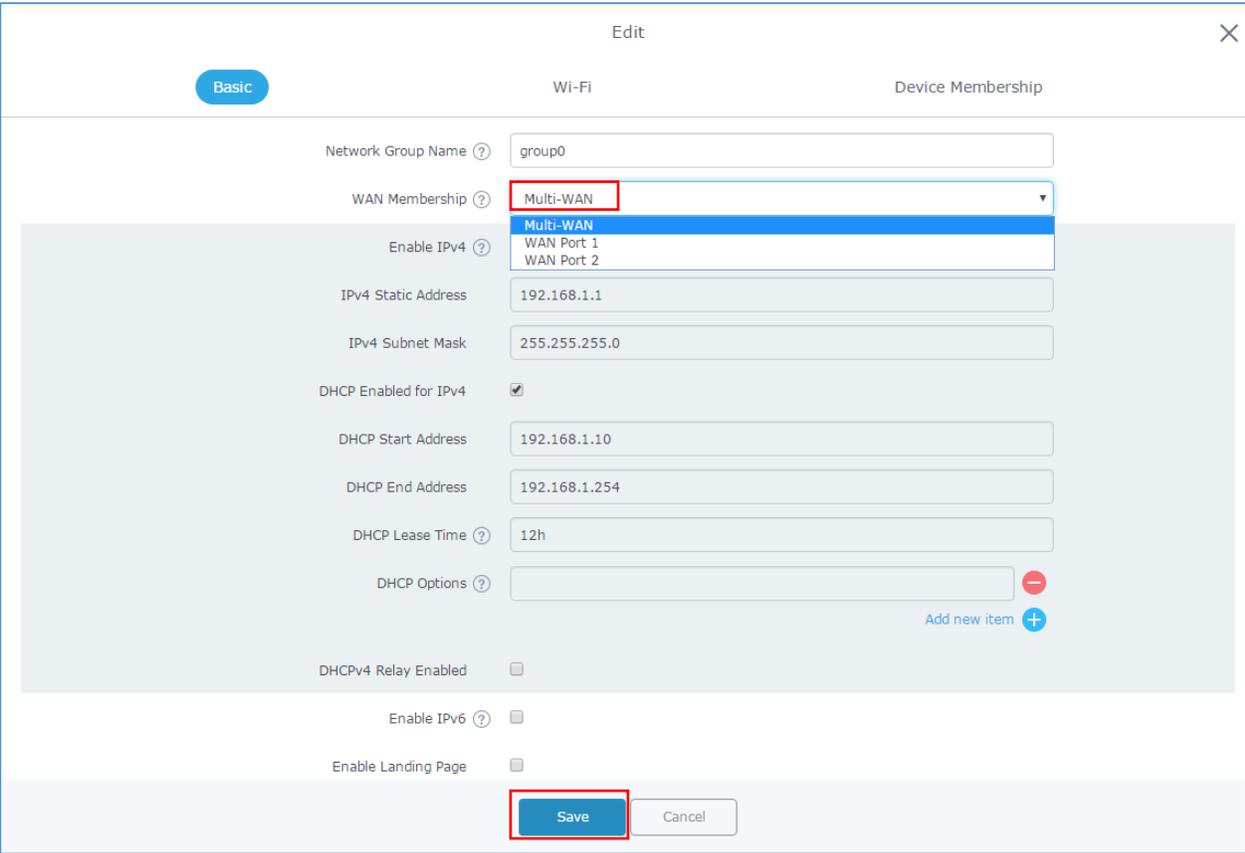
- **Tracking Timeout (sec):** Timeout to consider the tracking as failed if no answer. Default value is 2 seconds.
- **Tracking Interval (sec):** Time between ICMP tracking messages. Default value is 5 seconds.
- **Bandwidth:** Specifies the bandwidth for the port, e.g: “100k”, “1M” or “100M”.

In our scenario, you can see that we are configuring the router to track / ping the IP Address 8.8.8.8 every 5 seconds, and a timeout occurs if the reply isn't received within 2 seconds. After 3 timeouts, the WAN is marked as down. A failover event to the backup WAN will occur.

## WAN Membership Configuration

The Network Group option needs to be enabled and to have the default network group (group0) set to Multi-WAN.

- 1- Go to **Network Group->Network Group**.
- 2- Edit the default group (group0) by pressing .
- 3- Set the option **WAN Membership** to **Multi-WAN**.
- 4- Press **Save**, and then **Apply** to save and apply the new configuration.



The screenshot shows the 'Edit' configuration page for a Network Group named 'group0'. The 'Basic' tab is active. The 'WAN Membership' dropdown menu is open, showing 'Multi-WAN' as the selected option. Other fields include IPv4 Static Address (192.168.1.1), IPv4 Subnet Mask (255.255.255.0), DHCP Start Address (192.168.1.10), and DHCP End Address (192.168.1.254). The 'Save' button at the bottom is highlighted with a red box.

Figure 13 : Multi-WAN Membership



## Status and Overview

Once the Multi-WAN and WAN Membership are correctly configured, the ports should show a valid status, and only the WAN port 1 should be used for downstream / upstream before Failover is occurred, this can be displayed under **Web GUI->Router->Status**:

WAN	Enable WAN	IP Address	Uptime	Throughput	Aggregate
WAN Port 1	✓	192.168.6.231 fe80::20b:82ff:fe9cf1e8	1m 27s	TX:37.12KB/s RX:1.43MB/s	TX:688.62KB RX:24.45MB
WAN Port 2	✓	192.168.2.101 fe80::20b:82ff:fe9cf1e8	1m 22s	TX:18B/s RX:18B/s	TX:13.06KB RX:2.65KB

Figure 14 : WAN Ports Status before Failover

The **Overview** page also illustrates the unique usage of WAN port 1:

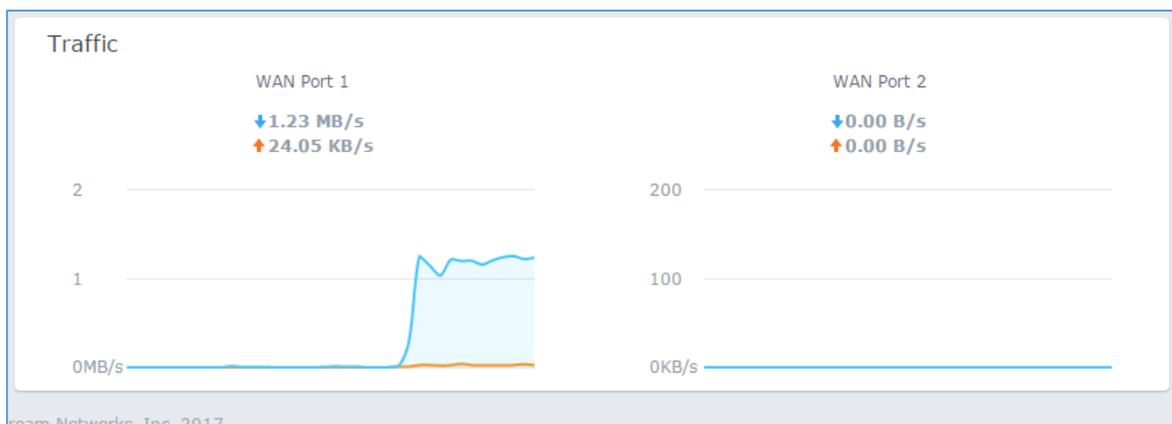


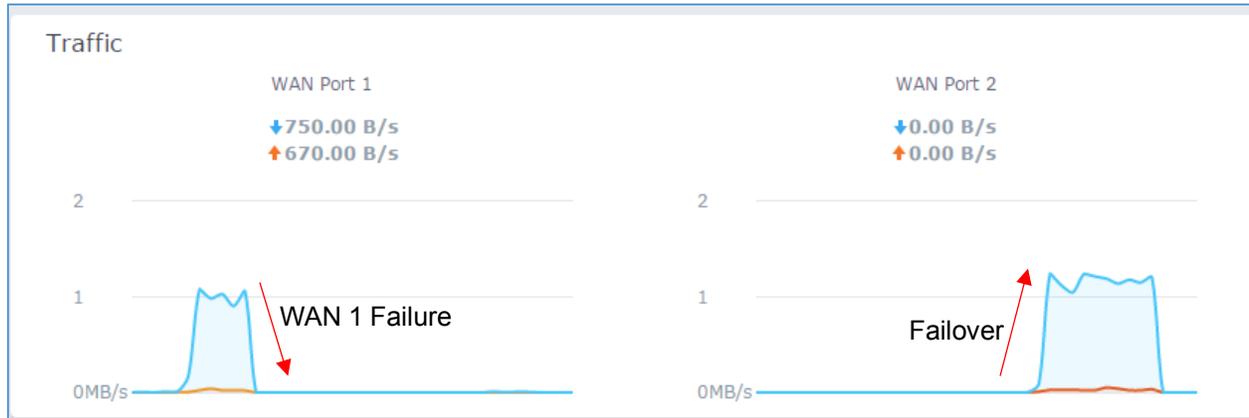
Figure 15 : WAN Ports Overview before Failover

Once tracking the failure of WAN port 1 based on the provided tracking details, only the WAN Port 2 should be active, this can be displayed on **Status** page when refreshed:

WAN	Enable WAN	IP Address	Uptime	Throughput	Aggregate
WAN Port 1	✓			TX:0b/s RX:0b/s	TX:1.26MB RX:48.40MB
WAN Port 2	✓	192.168.2.101 fe80::20b:82ff:fe9cf1e8	2m 31s	TX:34.12KB/s RX:1.34MB/s	TX:469.35KB RX:17.20MB

Figure 16 : WAN Ports Status after Failover

The WAN port 1 failure can be displayed also on the **Overview** page:

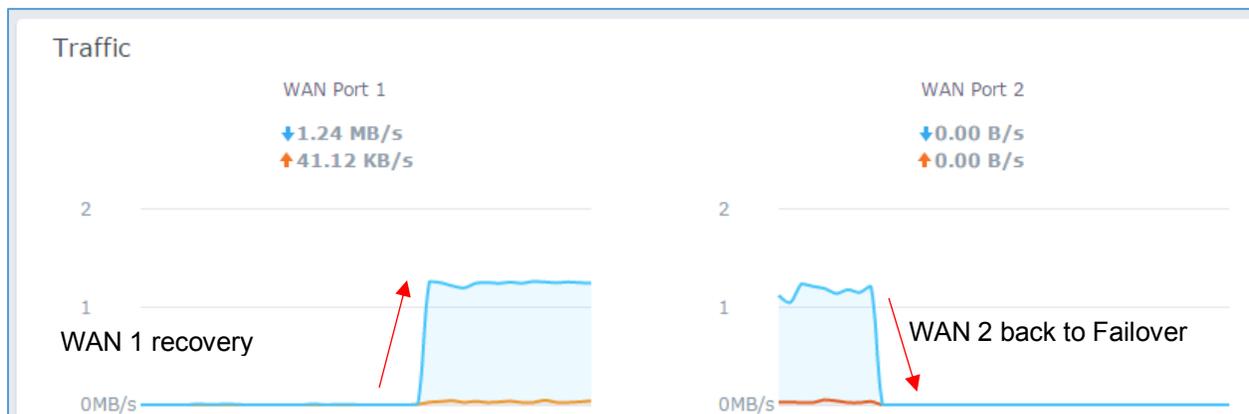


**Figure 17 : WAN Port 1 / WAN Port 2 Failover**

**Notes:**

- The router will keep using WAN Port 2 until the connection through WAN Port 1 is retrieved.
- After 3 successful ping tests, the WAN Port is marked as up again. The primary WAN Port will again be utilized once it's detected as up.
- If the WAN Port 1 is detected as up and WAN Port 2 is being used for a current task (e.g. Download), only this task will be continued on WAN Port 2, and the primary WAN will be used for all upcoming tasks.

The following overview screenshot shows the phase where the WAN Port 1 is marked as up again, the router switches from WAN Port 2 to WAN Port 1:



**Figure 18 : WAN Port 1 recovery**

