



Security Gateway Manual

SG-1100

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This Quick Start Guide covers the first time connection procedures for the Netgate® 1100 Firewall Appliance and will provide the information needed to keep the appliance up and running.

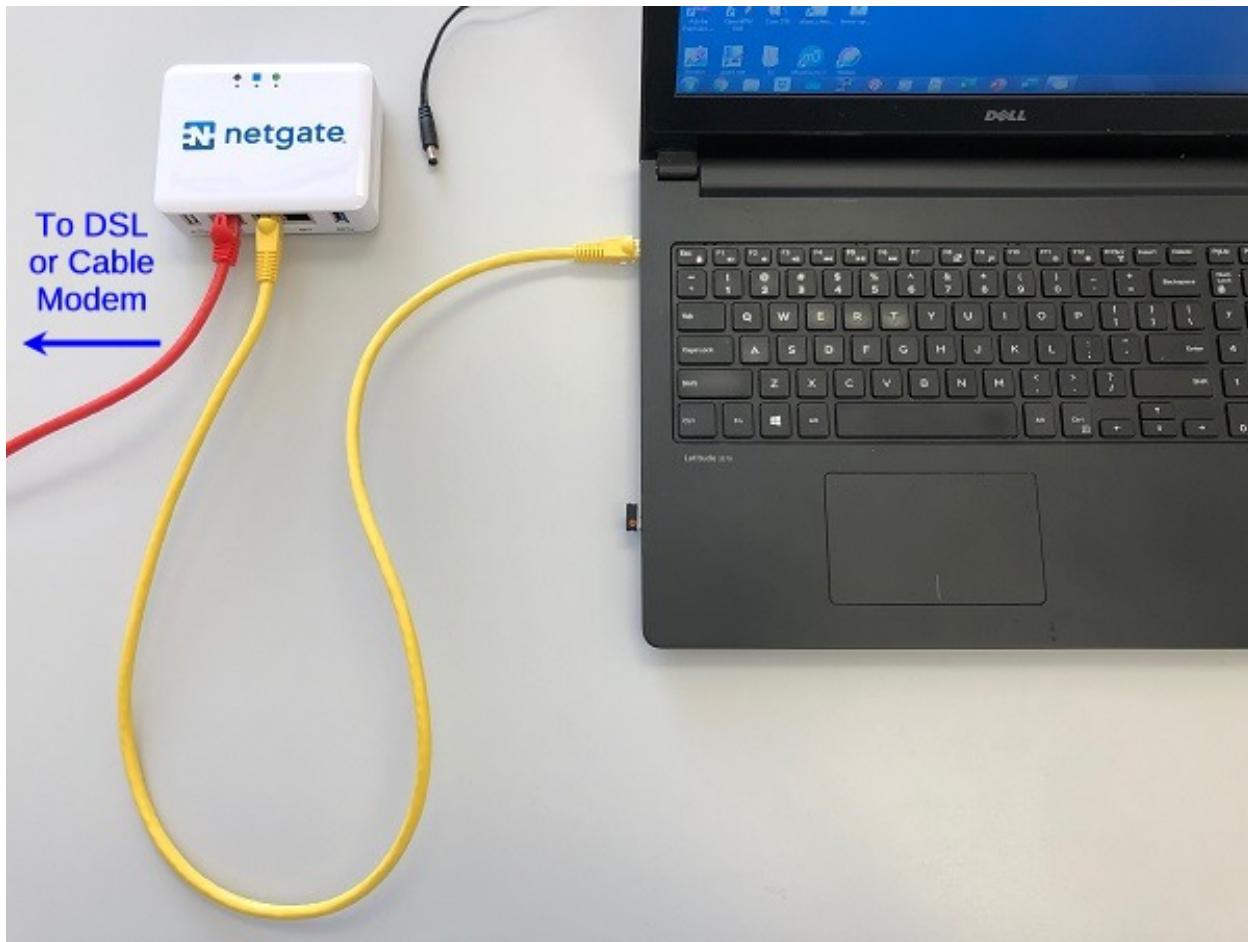
OUT OF THE BOX

1.1 Getting Started

The basic firewall configuration begins with connecting the Netgate® appliance to the Internet. The Netgate appliance should be unplugged at this time.

Connect one end of an Ethernet cable to the WAN port (shown in the *Input and Output Ports* section) of the Netgate appliance. The other end of the same cable should be inserted into a LAN port on the ISP Customer Premise Equipment (CPE) device, such as a cable or fiber router. If the CPE device provided by the ISP has multiple LAN ports, any LAN port should work in most circumstances.

Next, connect one end of a second Ethernet cable to the LAN port (shown in the *Input and Output Ports* section) of the Netgate appliance. Connect the other end to the computer.



1.1.1 What next?

To connect to the GUI and configure the firewall in a browser, continue on to [Initial Configuration](#).

To connect to the console and make adjustments before connecting to the GUI, see [Connecting to the USB Console](#).

Warning: The default IP Address on the LAN subnet on the Netgate firewall is 192.168.1.1/24. The same subnet **cannot** be used on both WAN and LAN, so if the default IP address on the ISP-supplied modem is also 192.168.1.1/24, **disconnect the WAN interface** until the LAN interface on the firewall has been renumbered to a different subnet (like 192.168.2.1/24) to avoid an IP Address conflict.

To change an interface IP address, choose option 2 from the [Console Menu](#) and walk through the steps to change it, or from the GUI, go through the Setup Wizard (opens at first boot, also found at [System > Setup Wizard](#)) and change the IP address on Step 5. Complete the Wizard and save the changes.

1.2 Initial Configuration

Plug the power cable into the power port (shown in the *Input and Output Ports* section) to turn on the Netgate® Firewall. Allow 4 or 5 minutes to boot up completely.

Warning: If the ISP Customer Premise Equipment (CPE) on WAN (e.g. Fiber or Cable Router) has a default IP Address of 192.168.1.1, disconnect the Ethernet cable from the WAN port on the Netgate 1100 Security Gateway before proceeding.

Change the default LAN IP Address of the device during a later step in the configuration to avoid having conflicting subnets on the WAN and LAN.

1.2.1 Connecting to the Web Interface (GUI)

1. From the computer, log into the web interface

Open a web browser (Google Chrome in this example) and enter 192.168.1.1 in the address bar. Press Enter.

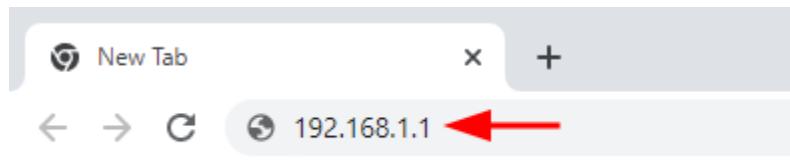


Fig. 1: Enter the default LAN IP address in the browser

2. A warning message may appear. If this message or similar message is encountered, it is safe to proceed. Click the **Advanced** Button and then click **Proceed to 192.168.1.1 (unsafe)** to continue.
3. At the **Sign In** page, enter the default pfSense® Plus username and password and click **Next**.
 - Default Username: **admin**
 - Default Password: **pfsense**

1.2.2 The Setup Wizard

This section steps through each page of the Setup Wizard to perform the initial configuration of the firewall. The wizard collects information one page at a time, but it does not make any changes to the firewall until the wizard is completed.

Tip: The wizard can be safely stopped at any time for those who wish to perform the configuration manually or restore an existing backup ([Backup and Restore](#)).

To stop the wizard, navigate away from the wizard pages by clicking the logo in the upper left of the page or by choosing an entry from one of the menus.

Note: Ignore the warning at the top of each wizard page about resetting the **admin** account password. One of the steps in the Setup Wizard is to change the default password, but the new password is not applied until the end of the wizard.



Your connection is not private

Attackers might be trying to steal your information from **192.168.1.1** (for example, passwords, messages, or credit cards). [Learn more](#)

NET::ERR_CERT_AUTHORITY_INVALID



To get Chrome's highest level of security, [turn on enhanced protection](#)

[Hide advanced](#)

1

[Back to safety](#)

This server could not prove that it is **192.168.1.1**; its security certificate is not trusted by your computer's operating system. This may be caused by a misconfiguration or an attacker intercepting your connection.

[Proceed to 192.168.1.1 \(unsafe\)](#)

2

Fig. 2: Example certificate warning message

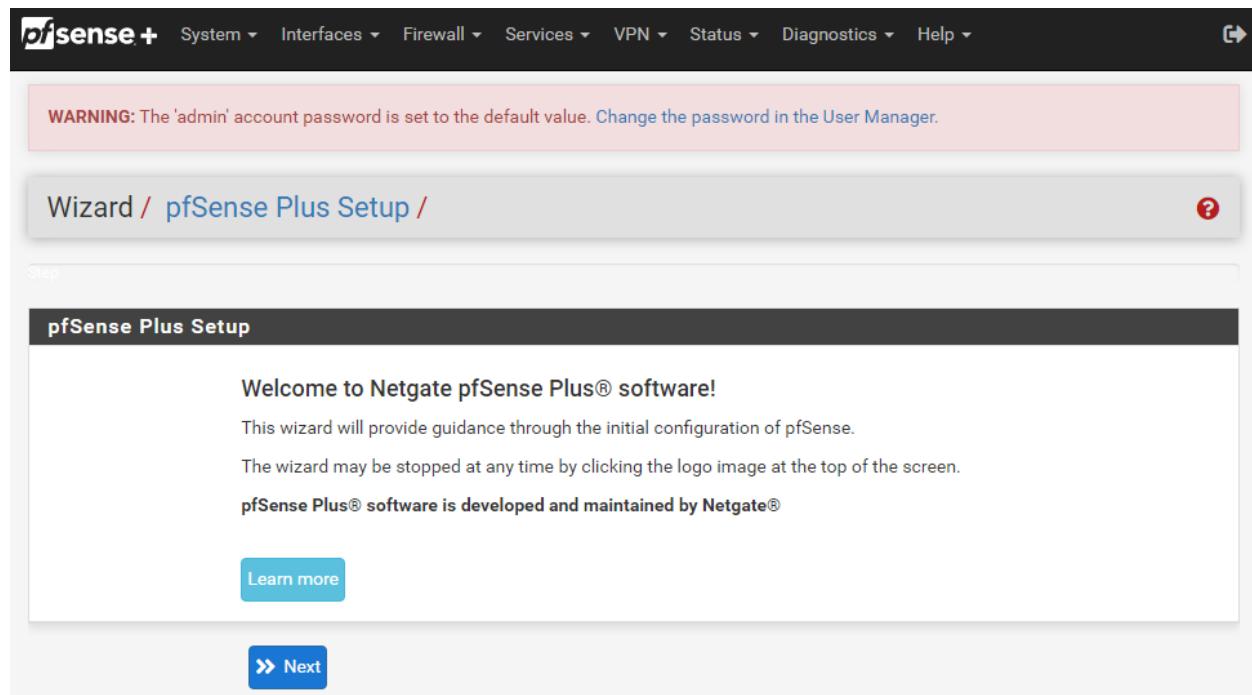


Fig. 3: Setup Wizard starting page

1. Click **Next** to start the **Setup Wizard**.
2. Click **Next** after reading the information on **Netgate Global Support**.
3. Use the following items as a guide to configure the options on the **General Information** page:

Hostname

Any desired hostname name can be entered to identify the firewall. For the purposes of this guide, the default hostname `pfsense` is used.

Domain

The domain name under which the firewall operates. The default `home.arpa` is used for the purposes of this tutorial.

DNS Servers

For purposes of this setup guide, use the Google public DNS servers (8.8.8.8 and 8.8.4.4).

Note: The firewall defaults to acting as a resolver and clients will not utilize these forwarding DNS servers. However, these servers give the firewall itself a way to ensure it has working DNS if resolving the default way does not work properly.

Type in the DNS Server information and Click **Next**.

4. Use the following information for the **Time Server Information** page:

Time Server Hostname

Use the default time server address. The default hostname is suitable for both IPv4 and IPv6 NTP clients.

Timezone

Select a geographically named time zone for the location of the firewall.

Wizard / pfSense Plus Setup / General Information ?

Step 2 of 9

General Information

On this screen the general pfSense Plus parameters will be set.

Hostname	<input type="text" value="pfSense"/>
EXAMPLE: myserver	
Domain	<input type="text" value="home.arpa"/>
EXAMPLE: mydomain.com	
The default behavior of the DNS Resolver will ignore manually configured DNS servers for client queries and query root DNS servers directly. To use the manually configured DNS servers below for client queries, visit Services > DNS Resolver and enable DNS Query Forwarding after completing the wizard.	
Primary DNS Server	<input type="text" value="8.8.8.8"/>
Secondary DNS Server	<input type="text" value="8.8.4.4"/>
Override DNS	<input checked="" type="checkbox"/>
Allow DNS servers to be overridden by DHCP/PPP on WAN	

>> Next

Fig. 4: **General Information** page in the Setup Wizard

For this guide, the Timezone will be set to **America/Chicago** for US Central time.

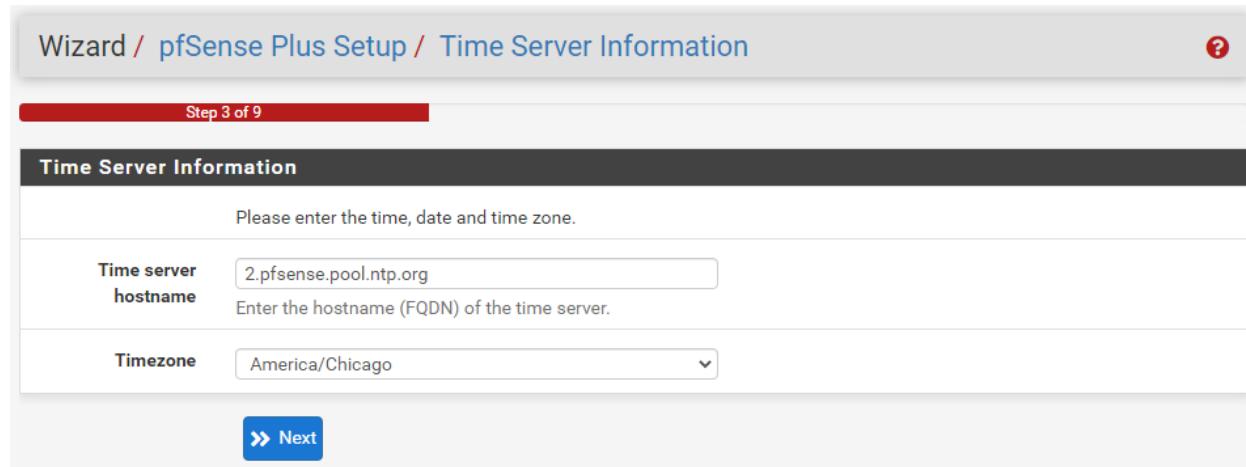


Fig. 5: **Time Server Information** page in the Setup Wizard

Change the Timezone and click **Next**.

5. Use the following information for the **Configure WAN Interface** page:

The WAN interface is the external (public) IP address the firewall will use to communicate with the Internet.

DHCP is the default and is the most common type of WAN interface for home fiber and cable modems.

Default settings for the other items on this page should be acceptable for normal home users.

Default settings should be acceptable. Click **Next**.

6. Configuring LAN IP Address & Subnet Mask. The default LAN IP address of 192.168.1.1 and subnet mask of 24 is usually sufficient.

Tip: If the CPE on WAN (e.g. Fiber or Cable Modem) has a default IP Address of 192.168.1.1, the Ethernet cable should be disconnected from the WAN port on the Netgate 1100 Security Gateway before starting.

Change the default LAN IP Address of the device during this step in the configuration to avoid having conflicting subnets on the WAN and LAN.

7. Change the **Admin Password**. Enter the same new password in both fields.
8. Click **Reload** to save the configuration.
9. After a few seconds, a message will indicate the Setup Wizard has completed. To proceed to the pfSense® Plus dashboard, click **Finish**.

Note: This step of the wizard also contains several useful links to Netgate resources and methods of obtaining assistance with the product. Be sure to read through the items on this page before finishing the wizard.

The screenshot shows the 'Configure WAN Interface' page of the pfSense Plus Setup Wizard, Step 4 of 9. The page has a header 'Wizard / pfSense Plus Setup / Configure WAN Interface' with a help icon. A progress bar at the top indicates 'Step 4 of 9'. The main section is titled 'Configure WAN Interface' and contains the following fields:

- SelectedType:** A dropdown menu set to 'DHCP'.
- General configuration** section:
 - MAC Address:** An input field with a placeholder for a MAC address (xx:xx:xx:xx:xx:xx) and a note explaining it can be spoofed.
 - MTU:** An input field with a note explaining the default values for PPPoE and other connection types.
 - MSS:** An input field with a note explaining the default values for PPPoE and other connection types.

Fig. 6: **Configure WAN Interface** page in the Setup Wizard

1.2.3 Finishing Up

After completing or exiting the wizard, during the first time loading the **Dashboard** the firewall will display a notification modal dialog with the **Copyright and Trademark Notices**.

Read and click **Accept** to continue to the dashboard.

If the Ethernet cable was unplugged at the beginning of this configuration, reconnect it to the WAN port now.

This completes the basic configuration for the Netgate appliance.

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Accept

Fig. 7: Copyright and Trademark Notices

1.3 pfSense® Plus Software Overview

This page provides an overview of the pfSense® Plus dashboard and navigation. It also provides information on how to perform frequent tasks such as backing up the pfSense® Plus software and connecting to the Netgate firewall console.

1.3.1 The Dashboard

pfSense® Plus software is highly configurable, all of which can be done through the dashboard. This orientation will help to navigate and further configure the firewall.

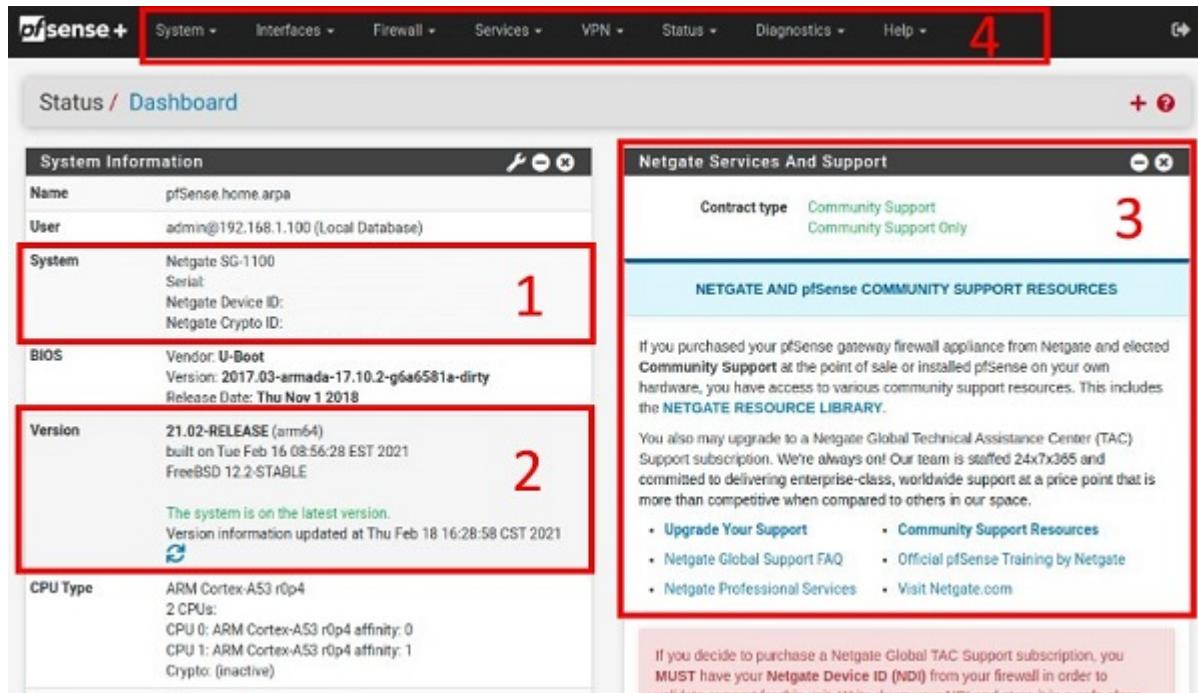


Fig. 8: The pfSense® Plus Dashboard

Section 1

Important system information such as the model, Serial Number, and Netgate Device ID for this Netgate firewall.

Section 2

Identifies what version of pfSense® Plus software is installed, and if an update is available.

Section 3

Describes Netgate Service and Support.

Section 4

Shows the various menu headings. Each menu heading has drop-down options for a wide range of configuration choices.

1.3.2 Re-running the Setup Wizard

To re-run the Setup Wizard, navigate to **System > Setup Wizard**.

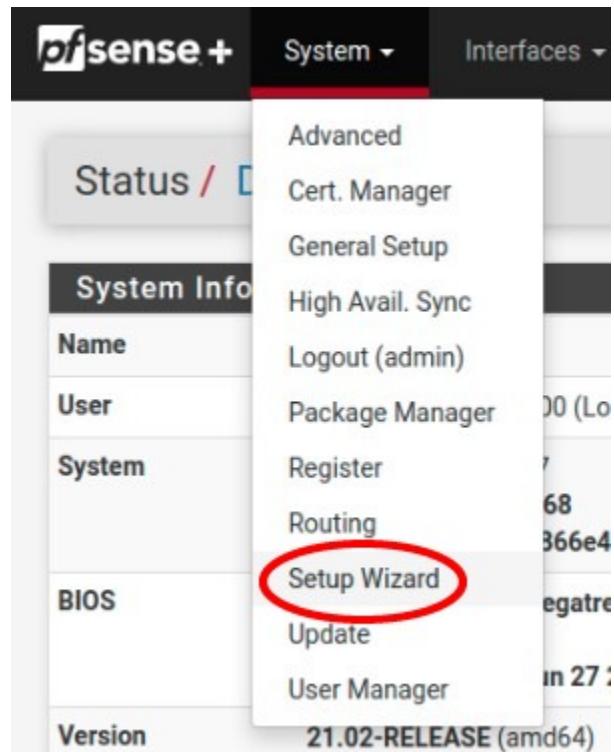


Fig. 9: Re-run the Setup Wizard

1.3.3 Backup and Restore

It is important to back up the firewall configuration prior to updating or making any configuration changes. From the menu at the top of the page, browse to **Diagnostics > Backup/Restore**.

Click `Download configuration as XML` and save a copy of the firewall configuration to the computer connected to the Netgate firewall.

This backup (or any backup) can be restored from the same screen by choosing the backed up file under **Restore Configuration**.

Note: Auto Config Backup is a built-in service located at **Services > Auto Config Backup**. This service will save up to 100 encrypted backup files automatically, any time a change to the configuration has been made. Visit the [Auto Config Backup](#) page for more information.

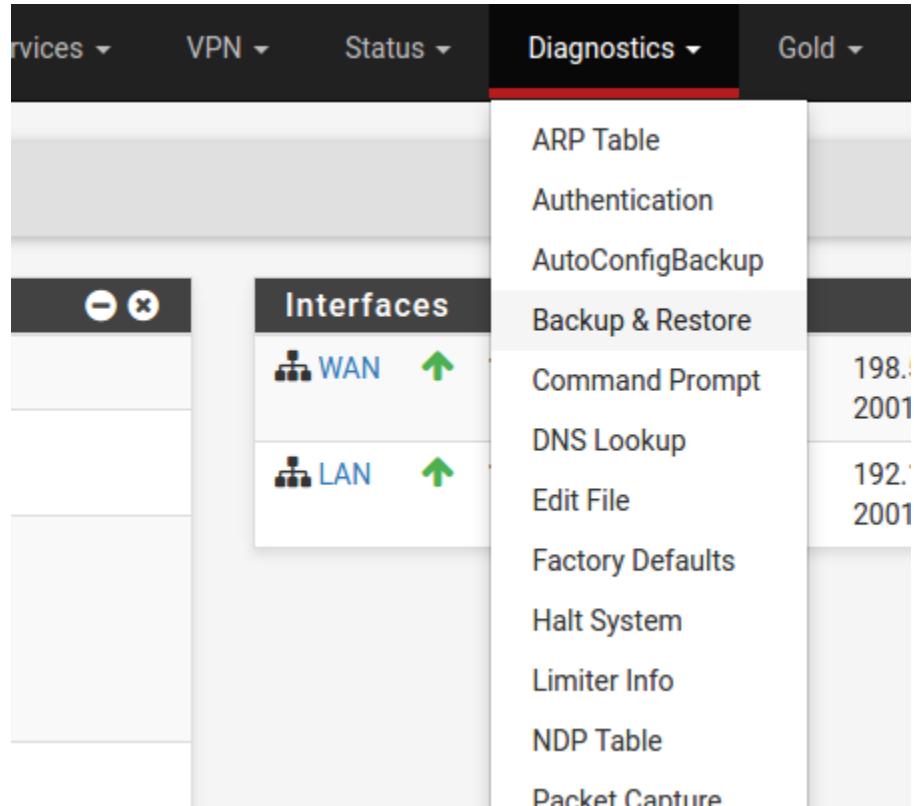


Fig. 10: Backup & Restore

This screenshot shows the 'Backup Configuration' page. At the top, there are two tabs: 'Backup & Restore' (which is active and highlighted in red) and 'Config History'. The main area is titled 'Backup Configuration'. It contains several configuration options with checkboxes:

- Backup area:** A dropdown menu set to 'All'.
- Skip packages:** An unchecked checkbox with the label 'Do not backup package information.'
- Skip RRD data:** A checked checkbox with the label 'Do not backup RRD data (NOTE: RRD Data can consume 4+ megabytes of config.xml space!)'
- Encryption:** An unchecked checkbox with the label 'Encrypt this configuration file.'

At the bottom of the page is a blue button with a download icon and the text 'Download configuration as XML'.

Fig. 11: Click Download configuration as XML

1.3.4 Connecting to the Console

There are times when accessing the console is required. Perhaps GUI console access has been locked out, or the password has been lost or forgotten.

See also:

Connecting to the USB Console. Cable is required.

Tip: To learn more about getting the most out of a Netgate appliance, sign up for a pfSense Plus Software Training course or browse the extensive [Resource Library](#).

1.3.5 Updates

When a new version of pfSense Plus software is available, the device will indicate the availability of the new version on the System Information dashboard widget. Users can perform a manual check as well by visiting **System > Update**.

Users can initiate an upgrade from the **System > Update** page as needed.

For more information, see the [Upgrade Guide](#).

Warning: Depending on the configuration, running services, and installed packages, the **Netgate 1100** may not have sufficient available RAM to run upgrades. Temporarily disabling packages and services which consume large amounts of RAM can help work around this limitation.

Some older installations of pfSense Plus software on **Netgate 1100** devices contain an EFI partition which does not have sufficient space to accommodate the new EFI loader for version 23.01 and later. This primarily affects UFS-based systems **initially** installed with version 21.02-p1 or before.

For details on these issues and more, see [Troubleshooting Upgrades on Netgate 1100 and Netgate 2100 Devices](#).

1.4 Input and Output Ports

1.4.1 Front Side



Fig. 12: Front view of the Netgate 1100 Firewall Appliance
The items in this image are described by entries in [Ethernet Ports](#) and [Other Front Ports](#).

Ethernet Ports

Interface Name	Port Name	Port Type	Port Speed
WAN	mvneta0.4090	RJ-45	1 Gbps
LAN	mvneta0.4091	RJ-45	1 Gbps
OPT	mvneta0.4092	RJ-45	1 Gbps

The Ethernet ports are switched ports. By default, these ports are configured as discrete interfaces on separate VLANs.

Note: For more details on how the switch operates, see *Switch Overview*.

For instructions on how to configure the switch see *Configuring the Switch Ports*.

Other Front Ports

- 1x USB 2.0 Port (left side)
- 1x USB 3.0 Ports (right side)

USB Ports

USB ports on the device can be used for a variety of purposes.

The primary use for the USB ports is to install or reinstall the operating system on the device. Beyond that, there are numerous USB devices which can expand the base functionality of the hardware, including some implemented by add-on packages. For example, UPS/Battery Backups, Cellular modems, GPS units, and storage devices. Though the operating system also includes drivers for wired and wireless USB network devices, these are not ideal and should be avoided.

1.4.2 Rear Side



Fig. 13: Rear side view of the Netgate 1100 Firewall Appliance

From left to right:

1. Power Connector
 - 12VDC 2A Center Pin Positive
 - Power Consumption 3.48W (Idle)

2. *Micro-USB Serial Console*
3. Recessed Reset Button (performs a hard reset, immediately turning the system off)

Warning: A hard reset of the system *could* cause data corruption and should be avoided. Halt or reboot the system through the console menu or the GUI to avoid data corruption.

1.4.3 Top Side

LED Patterns

Table 1: Indicators

Status LED	State	Description
Black Diamond	Blink Fast	pfSense® Plus boot in progress
	Solid	pfSense® Plus boot complete
	Blink Slow	pfSense® Plus software upgrade is available
Blue Square	Active	mPCIe Expansion Slot Activity (not supported)
Green Circle	Solid	Power

Note: Though the system board has a Mini-PCI Express (mPCIe) expansion slot, it is not currently supported.

1.5 Safety and Legal

1.5.1 Safety Notices

1. Read, follow, and keep these instructions.
2. Heed all warnings.
3. Only use attachments/accessories specified by the manufacturer.

Warning: Do not use this product in location that can be submerged by water.

Warning: Do not use this product during an electrical storm to avoid electrical shock.

1.5.2 Electrical Safety Information

1. Compliance is required with respect to voltage, frequency, and current requirements indicated on the manufacturer's label. Connection to a different power source than those specified may result in improper operation, damage to the equipment or pose a fire hazard if the limitations are not followed.
2. There are no operator serviceable parts inside this equipment. Service should be provided only by a qualified service technician.
3. This equipment is provided with a detachable power cord which has an integral safety ground wire intended for connection to a grounded safety outlet.
 - a) Do not substitute the power cord with one that is not the provided approved type. If a 3 prong plug is provided, never use an adapter plug to connect to a 2-wire outlet as this will defeat the continuity of the grounding wire.
 - b) The equipment requires the use of the ground wire as a part of the safety certification, modification or misuse can provide a shock hazard that can result in serious injury or death.
 - c) Contact a qualified electrician or the manufacturer if there are questions about the installation prior to connecting the equipment.
 - d) Protective grounding/earthing is provided by Listed AC adapter. Building installation shall provide appropriate short-circuit backup protection.
 - e) Protective bonding must be installed in accordance with local national wiring rules and regulations.

1.5.3 FCC Compliance

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

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 when the equipment is operated in a residential environment.

1.5.4 Industry Canada

This Class B digital apparatus complies with Canadian ICES-3(B). Cet appareil numérique de la classe B est conforme à la norme NMB-3(B) Canada.

1.5.5 CE Marking

CE marking on this product represents the product is in compliance with all directives that are applicable to it.

1.5.6 RoHS/WEEE Compliance Statement

English

European Directive 2002/96/EC requires that the equipment bearing this symbol on the product and/or its packaging must not be disposed of with unsorted municipal waste. The symbol indicates that this product should be disposed of separately from regular household waste streams. It is your responsibility to dispose of this and other electric and electronic equipment via designated collection facilities appointed by the government or local authorities. Correct disposal and recycling will help prevent potential negative consequences to the environment and human health. For more detailed information about the disposal of your old equipment, please contact your local authorities, waste disposal service, or the shop where you purchased the product.

Deutsch

Die Europäische Richtlinie 2002/96/EC verlangt, dass technische Ausrüstung, die direkt am Gerät und/oder an der Verpackung mit diesem Symbol versehen ist, nicht zusammen mit unsortiertem Gemeindeabfall entsorgt werden darf. Das Symbol weist darauf hin, dass das Produkt von regulärem Haushaltmüll getrennt entsorgt werden sollte. Es liegt in Ihrer Verantwortung, dieses Gerät und andere elektrische und elektronische Geräte über die dafür zuständigen und von der Regierung oder örtlichen Behörden dazu bestimmten Sammelstellen zu entsorgen. Ordnungsgemäßes Entsorgen und Recyceln trägt dazu bei, potentielle negative Folgen für Umwelt und die menschliche Gesundheit zu vermeiden. Wenn Sie weitere Informationen zur Entsorgung Ihrer Altgeräte benötigen, wenden Sie sich bitte an die örtlichen Behörden oder städtischen Entsorgungsdienste oder an den Händler, bei dem Sie das Produkt erworben haben.

Español

La Directiva 2002/96/CE de la UE exige que los equipos que lleven este símbolo en el propio aparato y/o en su embalaje no deben eliminarse junto con otros residuos urbanos no seleccionados. El símbolo indica que el producto en cuestión debe separarse de los residuos domésticos convencionales con vistas a su eliminación. Es responsabilidad suya desechar este y cualesquiera otros aparatos eléctricos y electrónicos a través de los puntos de recogida que ponen a su disposición el gobierno y las autoridades locales. Al desechar y reciclar correctamente estos aparatos estará contribuyendo a evitar posibles consecuencias negativas para el medio ambiente y la salud de las personas. Si desea obtener información más detallada sobre la eliminación segura de su aparato usado, consulte a las autoridades locales, al servicio de recogida y eliminación de residuos de su zona o pregunte en la tienda donde adquirió el producto.

Français

La directive européenne 2002/96/CE exige que l'équipement sur lequel est apposé ce symbole sur le produit et/ou son emballage ne soit pas jeté avec les autres ordures ménagères. Ce symbole indique que le produit doit être éliminé dans un circuit distinct de celui pour les déchets des ménages. Il est de votre responsabilité de jeter ce matériel ainsi que tout autre matériel électrique ou électronique par les moyens de collecte indiqués par le gouvernement et les pouvoirs publics des collectivités territoriales. L'élimination et le recyclage en bonne et due forme ont pour but de lutter contre l'impact néfaste potentiel de ce type de produits sur l'environnement et la santé publique. Pour plus d'informations sur le mode d'élimination de votre ancien équipement, veuillez prendre contact avec les pouvoirs publics locaux, le service de traitement des déchets, ou l'endroit où vous avez acheté le produit.

Italiano

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1.5.7 Declaration of Conformity**Česky[Czech]**

NETGATE tímto prohlaší uje, e tento NETGATE device, je ve shod se základními po adavky a dalími po íslu n mi ustanoveními smrnice 1999/5/ES.

Dansk [Danish]

Undertegnede NETGATE erklærer herved, at følgende udstyr NETGATE device, overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.

Nederlands [Dutch]

Hierbij verklaart NETGATE dat het toestel NETGATE device, in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG. Bij deze verklaart NETGATE dat deze NETGATE device, voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.

English

Hereby, NETGATE , declares that this NETGATE device, is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Eesti [Estonian]

Käesolevaga kinnitab NETGATE seadme NETGATE device, vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.

Suomi [Finnish]

NETGATE vakuuttaa täten että NETGATE device, tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen. Français [French] Par la présente NETGATE déclare que l'appareil Netgate, device est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.

Deutsch [German]

Hiermit erklärt Netgate, dass sich diese NETGATE device, in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMW)

Ελληνικά [Greek]

ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ NETGATE ΔΗΛΩΝΕΙ ΟΤΙ NETGATE device, ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΟΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1995/5/EK.

Magyar [Hungarian]

Alulírott, NETGATE nyilatkozom, hogy a NETGATE device, megfelel a vonatkozó alapvető követelményeknek és az 1999/5/EC irányelv egyéb előírásainak.

Íslenska [Icelandic]

Hér me l sir NETGATE yfir ví a NETGATE device, er í samræmi vi grunnkröfur og a rar kröfur, sem ger ar eru í tilskipun 1999/5/EC.

Italiano [Italian]

Con la presente NETGATE dichiara che questo NETGATE device, è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.

Latviski [Latvian]

Ar o NETGATE deklar , ka NETGATE device, atbilst Direkt vas 1999/5/EK b tiskaj m pras b m un citiem ar to saist tajiem noteikumiem.

Lietuviškai [Lithuanian]

NETGATE deklaruoja, kad šis NETGATE įrenginys atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.

Malti [Maltese]

Hawnhekk, Netgate, jiddikjara li dan NETGATE device, jikkonforma mal- ti ijiet essenziali u ma provvedimenti o rajn relevanti li hemm fid-Dirrettiva 1999/5/EC.

Norsk [Norwegian]

NETGATE erklærer herved at utstyret NETGATE device, er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 1999/5/EF.

Slovensky [Slovak]

NETGATE tento vyhlasuje, že NETGATE device, spadá základné poiaďavky a v etky príslušné ustanovenia Smernice 1999/5/ES.

Svenska [Swedish]

Härmed intygar NETGATE att denna NETGATE device, står i överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

Español [Spanish]

Por medio de la presente NETGATE declara que el NETGATE device, cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.

Polski [Polish]

Niniejszym, firma NETGATE oznacza, że produkt serii NETGATE device, spełnia zasadnicze wymagania i inne istotne postanowienia Dyrektywy 1999/5/EC.

Português [Portuguese]

NETGATE declara que este NETGATE device, está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.

Română [Romanian]

Prin prezenta, NETGATE declară că acest dispozitiv NETGATE este în conformitate cu cerințele esențiale și alte prevederi relevante ale Directivei 1999/5/CE.

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THERE IS NO JUDGE OR JURY IN ARBITRATION, AND COURT REVIEW OF AN ARBITRATION AWARD IS LIMITED. HOWEVER, AN ARBITRATOR CAN AWARD ON AN INDIVIDUAL BASIS THE SAME DAMAGES AND RELIEF AS A COURT (INCLUDING INJUNCTIVE AND DECLARATORY RELIEF OR STATUTORY DAMAGES), AND MUST FOLLOW THE TERMS OF THESE TERMS AND CONDITIONS OF USE AS A COURT WOULD.

To begin an arbitration proceeding, you must send a letter requesting arbitration and describing your claim to the following:

Rubicon Communications LLC
Attn.: Legal Dept.
4616 West Howard Lane, Suite 900
Austin, Texas 78728
legal@netgate.com

The arbitration will be conducted by the American Arbitration Association (AAA) under its rules. The AAA's rules are available at www.adr.org. Payment of all filing, administration and arbitrator fees will be governed by the AAA's rules.

We each agree that any dispute resolution proceedings will be conducted only on an individual basis and not in a class, consolidated or representative action. We also both agree that you or we may bring suit in court to enjoin infringement or other misuse of intellectual property rights.

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HOW-TO GUIDES

2.1 Installing the Wall Mount Kit

This page shows how to install the optional [Netgate 1100 Wall Mount Kit](#).

Tip: Save the Netgate 1100 MAC Address, Serial Number, and NDI, located on the bottom of the system, before attaching the Netgate 1100 to the wall.

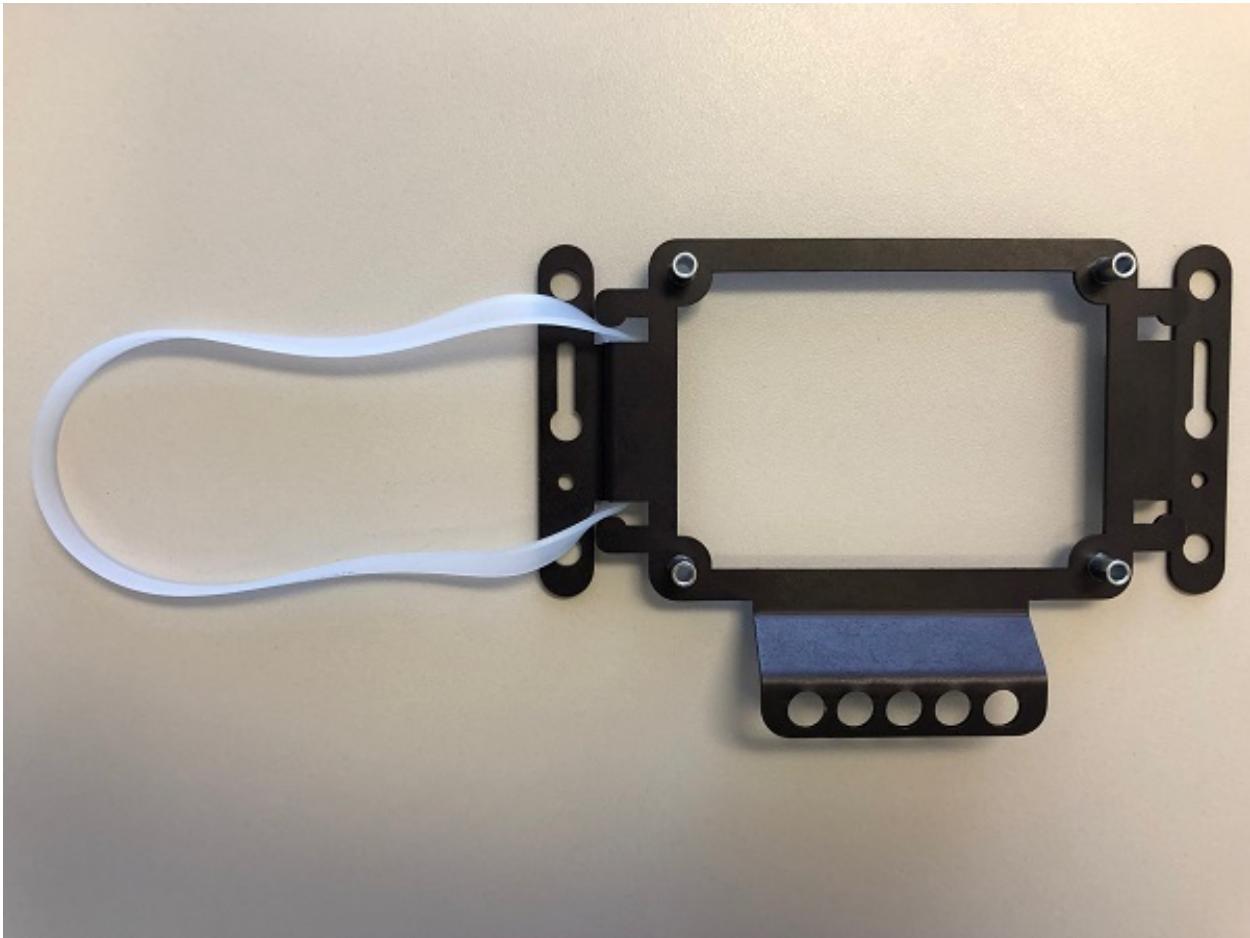


Fig. 1: Loop one side of the Silicone Band under the wall mount of the Netgate 1100

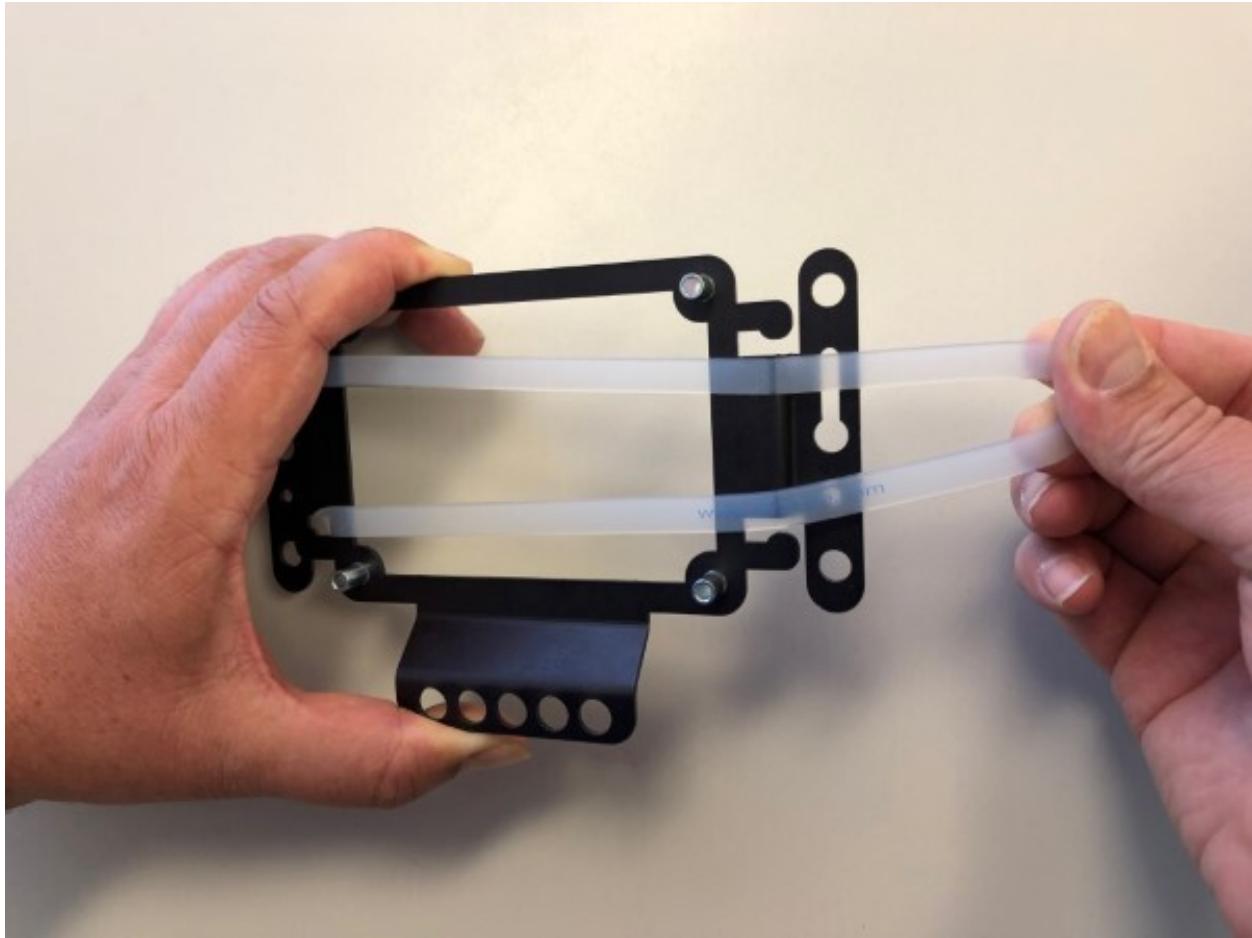
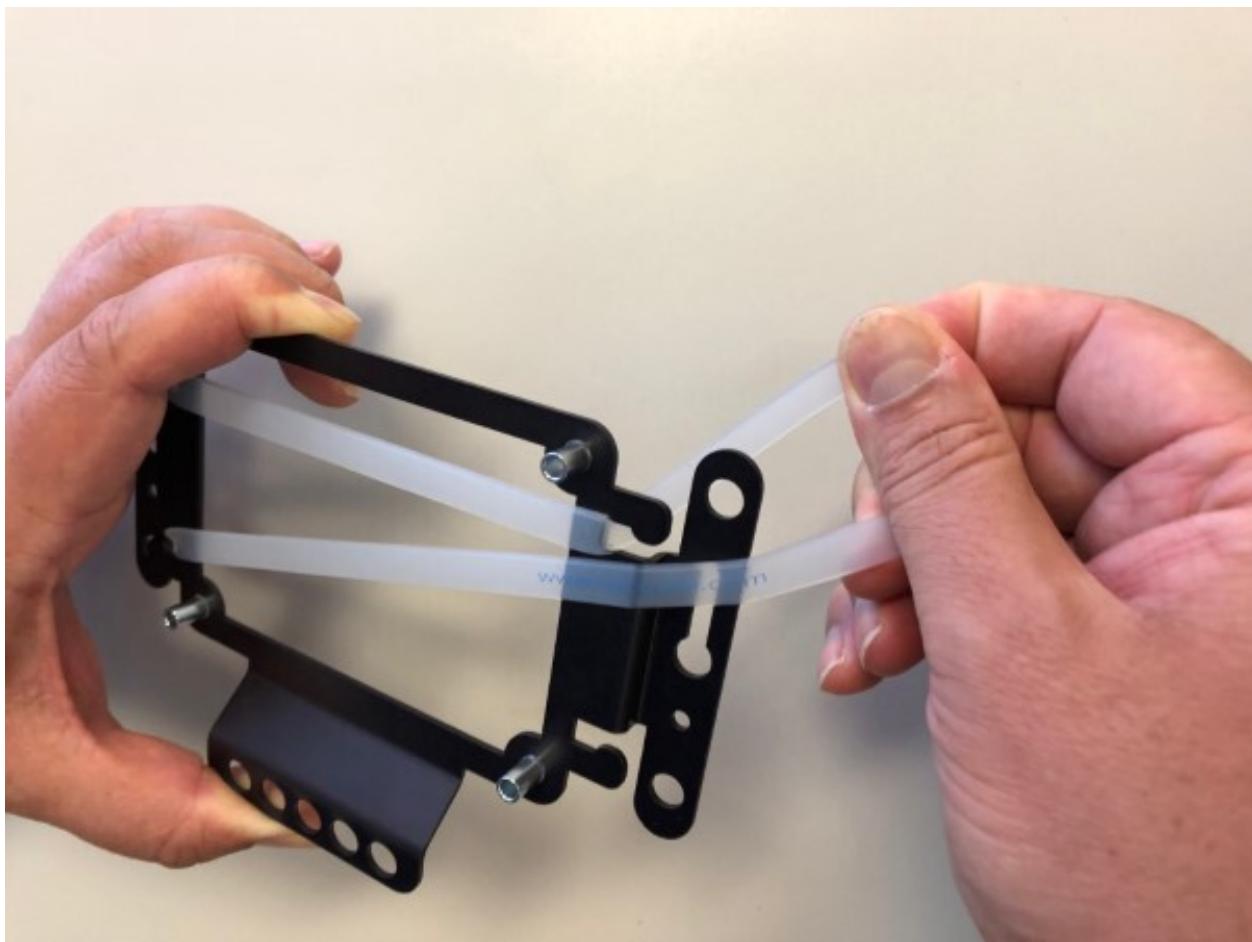


Fig. 2: Stretch the Silicone Band to the opposite side of the wall mount



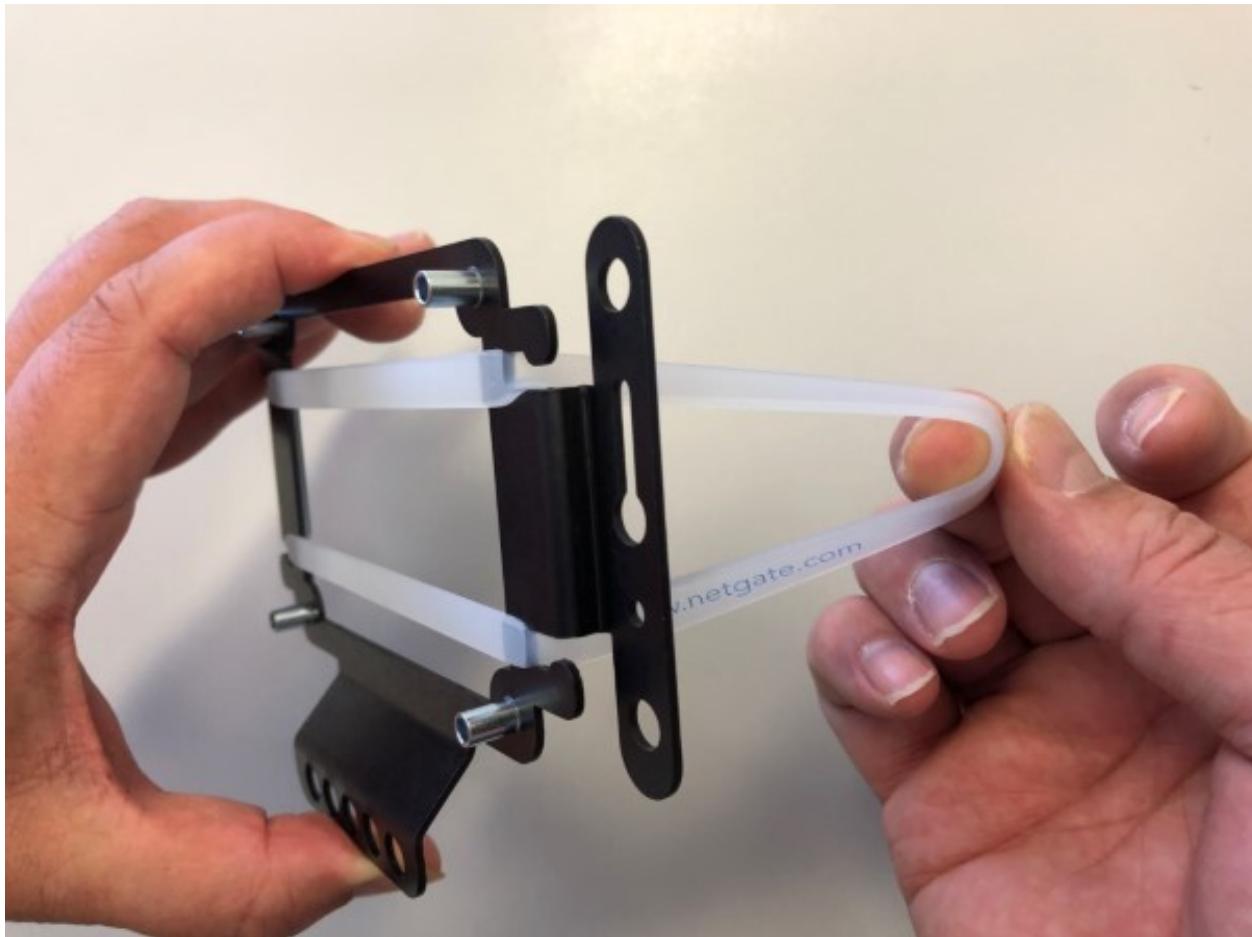


Fig. 3: Loop the silicone band under the opposite side of the wall mount

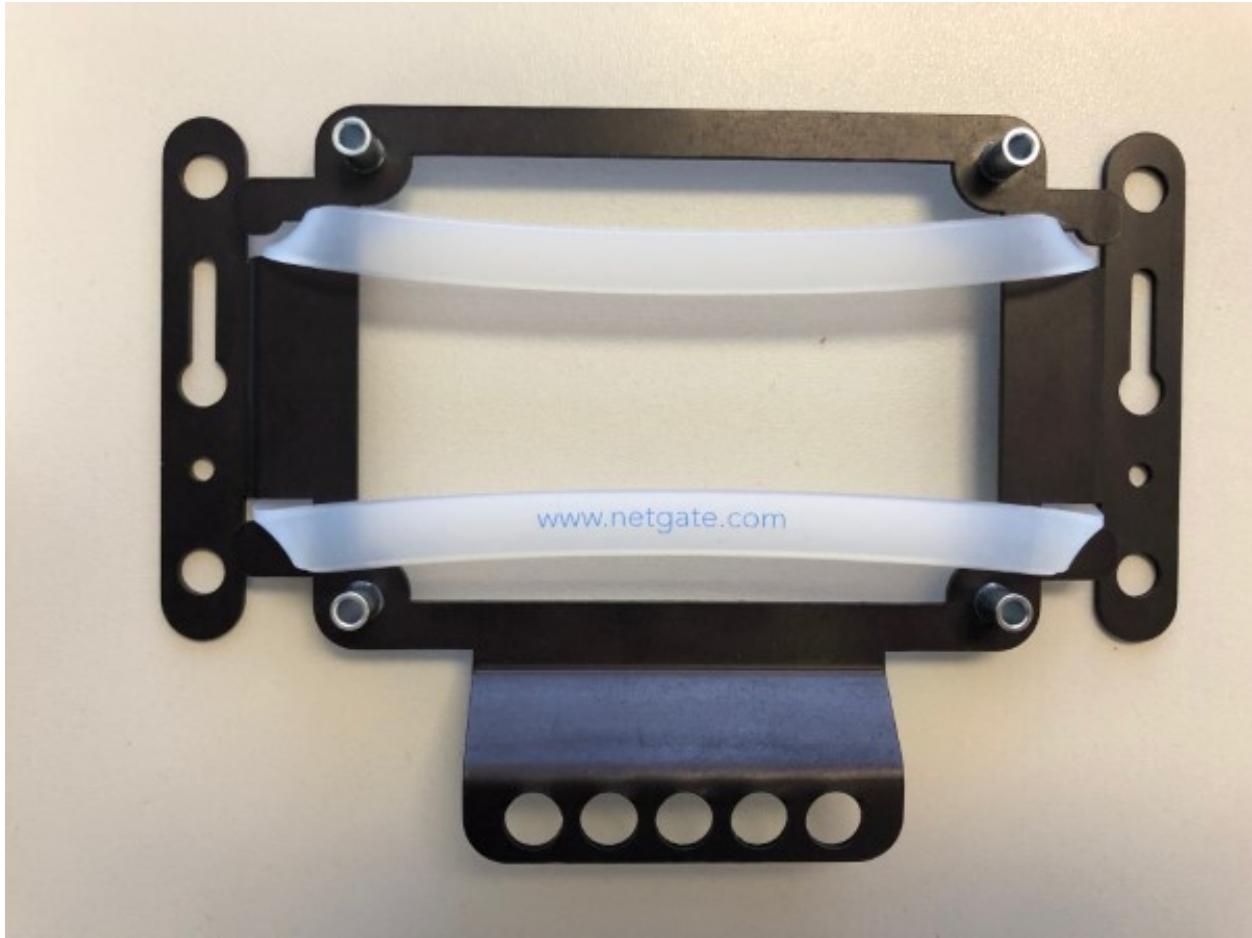


Fig. 4: The silicone band should look like this

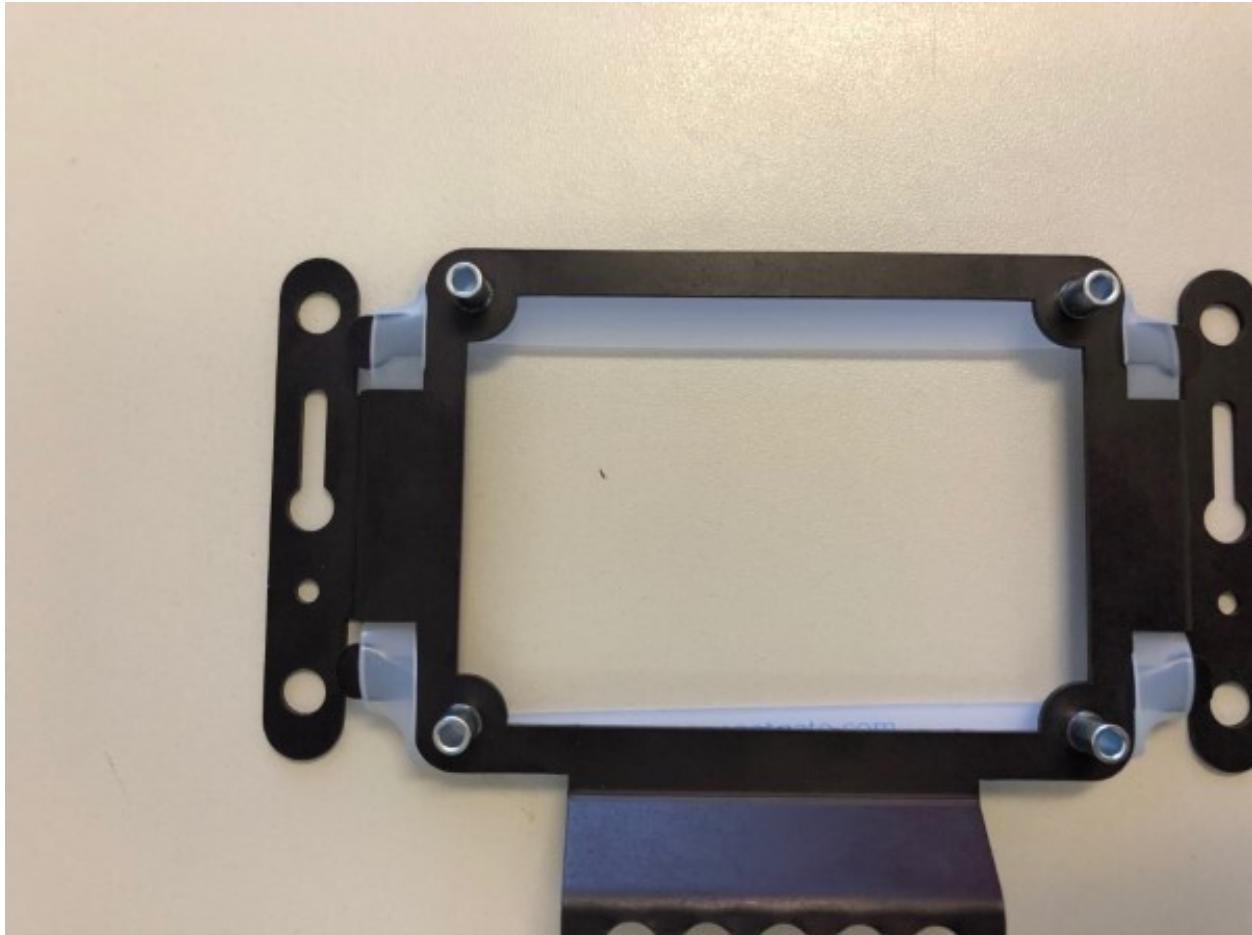


Fig. 5: Tuck both sides of the silicone band under the wall mount

Note: Remove the rubber standoff feet from the Netgate 1100 prior to attaching to the wall mount. Do **not** remove the screws that are under the rubber standoff feet.



Fig. 6: Place the Netgate 1100 over the silver aluminum standoffs on the wall mount and pull one side of the silicone band over the Netgate 1100, then the other

Tip: Remember to save the Netgate 1100 MAC Address, Serial Number, and NDI, located on the bottom of the system, before attaching the Netgate 1100 to the wall.

Hang the wall mount with the cables hanging down. Secure the cables to the holes on the wall mount with cable ties to relieve the weight from the ports.



Fig. 7: When mounted properly, the Netgate 1100 should look like this



Fig. 8: Note the silicone band under the Netgate 1100 when installed correctly



Fig. 9: The Netgate 1100 wall mount kit correctly installed

2.2 Connecting to the USB Console

This guide shows how to access the serial console which can be used for troubleshooting and diagnostics tasks as well as some basic configuration.

There are times when directly accessing the console is required. Perhaps GUI or SSH access has been locked out, or the password has been lost or forgotten.

2.2.1 USB Serial Console Device

This device uses a **Prolific PL2303 USB-to-UART Bridge** which provides access to the console. This device is exposed via the **USB Micro-B (5-pin)** port on the appliance.

Install the Driver

If needed, install an appropriate **Prolific PL2303 USB to UART Bridge** driver on the workstation used to connect with the device.

Windows

There are drivers available for Windows [available for download](#).

macOS

There are drivers available for macOS [available for download](#).

Linux

There are drivers available for Linux [available for download](#).

Recent versions of many Linux distributions include this driver and will not require manual installation.

FreeBSD

Recent versions of FreeBSD include this driver and will not require manual installation.

Connect a USB Cable

Next, connect to the console port using the cable that has a **USB Micro-B (5-pin)** connector on one end and a **USB Type A** plug on the other end.

Gently push the **USB Micro-B (5-pin)** plug end into the console port on the appliance and connect the **USB Type A** plug into an available USB port on the workstation.

Tip: Be certain to gently push in the **USB Micro-B (5-pin)** connector on the device side completely. With most cables there will be a tangible “click”, “snap”, or similar indication when the cable is fully engaged.

Apply Power to the Device

On some hardware, the USB serial console port may not be detected by the client operating system until the device is plugged into a power source.

If the client OS does not detect the USB serial console port, connect the power cord to the device to allow it to start booting.

If the USB serial console port appears without power applied to the device, then the best practice is to wait until the terminal is open and connected to the serial console before powering on the device. That way the client can view the entire boot output.

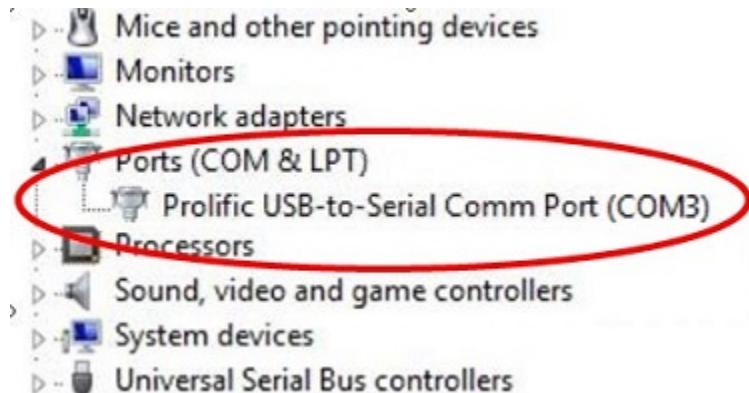
Locate the Console Port Device

The appropriate console port device that the workstation assigned as the serial port must be located before attempting to connect to the console.

Note: Even if the serial port was assigned in the BIOS, the workstation OS may remap it to a different COM Port.

Windows

To locate the device name on Windows, open **Device Manager** and expand the section for **Ports (COM & LPT)**. Look for an entry with a title such as **Prolific USB-to-Serial Comm Port**. If there is a label in the name that contains COMX where X is a decimal digit (e.g. COM3), that value is what would be used as the port in the terminal program.



macOS

The device associated with the system console is likely to show up as, or start with, `/dev/cu.usbserial-<id>`.

Run `ls -l /dev/cu.*` from a Terminal prompt to see a list of available USB serial devices and locate the appropriate one for the hardware. If there are multiple devices, the correct device is likely the one with the most recent timestamp or highest ID.

Linux

The device associated with the system console is likely to show up as `/dev/ttyUSB0`. Look for messages about the device attaching in the system log files or by running `dmesg`.

Note: If the device does not appear in `/dev/`, see the note above in the driver section about manually loading the Linux driver and then try again.

FreeBSD

The device associated with the system console is likely to show up as `/dev/cuaU0`. Look for messages about the device attaching in the system log files or by running `dmesg`.

Note: If the serial device is not present, ensure the device has power and then check again.

2.2.2 Launch a Terminal Program

Use a terminal program to connect to the system console port. Some choices of terminal programs:

Windows

For Windows the best practice is to run [PuTTY on Windows](#) or [SecureCRT](#). An example of how to configure PuTTY is below.

Warning: Do not use **HyperTerminal**.

macOS

For macOS the best practice is to run `GNU screen`, or `cu`. An example of how to configure `GNU screen` is below.

Linux

For Linux the best practices are to run `GNU screen`, [PuTTY on Linux](#), `minicom`, or `dterm`. Examples of how to configure PuTTY and `GNU screen` are below.

FreeBSD

For FreeBSD the best practice is to run `GNU screen` or `cu`. An example of how to configure `GNU screen` is below.

Client-Specific Examples

PuTTY on Windows

- Open PuTTY and select **Session** under **Category** on the left-hand side.
- Set the **Connection type** to **Serial**
- Set **Serial line** to the *console port determined previously*
- Set the **Speed** to 115200 bits per second.
- Click the **Open** button

PuTTY will then display the console.

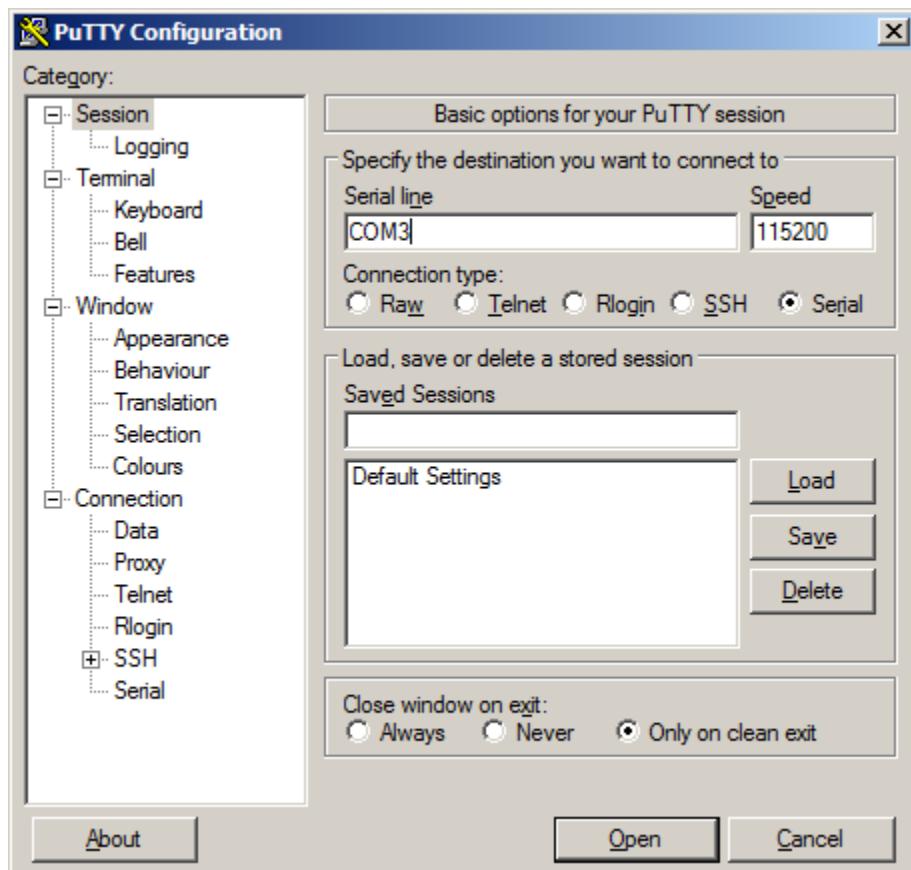


Fig. 10: An example of using PuTTY on Windows

PuTTY on Linux

- Open PuTTY from a terminal by typing `sudo putty`

Note: The `sudo` command will prompt for the local workstation password of the current account.

- Set the **Connection type** to **Serial**
- Set **Serial line** to `/dev/ttyUSB0`
- Set the **Speed** to **115200** bits per second
- Click the **Open** button

PuTTY will then display the console.



Fig. 11: An example of using PuTTY on Linux

GNU screen

In many cases `screen` may be invoked simply by using the proper command line, where `<console-port>` is the console port that was located above.

```
$ sudo screen <console-port> 115200
```

Note: The `sudo` command will prompt for the local workstation password of the current account.

If portions of the text are unreadable but appear to be properly formatted, the most likely culprit is a character encoding mismatch in the terminal. Adding the `-U` parameter to the `screen` command line arguments forces it to use UTF-8 for character encoding:

```
$ sudo screen -U <console-port> 115200
```

Terminal Settings

The settings to use within the terminal program are:

Speed

115200 baud, the speed of the BIOS

Data bits

8

Parity

None

Stop bits

1

Flow Control

Off or XON/OFF.

Warning: Hardware flow control (RTS/CTS) **must** be disabled.

Terminal Optimization

Beyond the required settings there are additional options in terminal programs which will help input behavior and output rendering to ensure the best experience. These settings vary location and client, and may not be available in all clients or terminals.

These are:

Terminal Type

xterm

This setting may be under Terminal, Terminal Emulation, or similar areas.

Color Support

ANSI colors / 256 Color / ANSI with 256 Colors

This setting may be under Terminal Emulation, Window Colors, Text, Advanced Terminfo, or similar areas.

Character Set / Character Encoding

UTF-8

This setting may be under Terminal Appearance, Window Translation, Advanced International, or similar areas. In GNU screen this is activated by passing the `-U` parameter.

Line Drawing

Look for and enable setting such as “Draw lines graphically”, “Use Unicode graphics characters”, and/or “Use Unicode line drawing code points”.

These settings may be under Terminal Appearance, Window Translation, or similar areas.

Function Keys / Keypad

Xterm R6

In Putty this is under **Terminal > Keyboard** and is labeled **The Function Keys and Keypad**.

Font

For the best experience, use a modern monospaced Unicode font such as DejaVu Sans Mono, Liberation Mono, Monaco, Consolas, Fira Code, or similar.

This setting may be under Terminal Appearance, Window Appearance, Text, or similar areas.

2.2.3 What's Next?

After connecting a terminal client, it may not immediately see any output. This could be because the device has already finished booting, or it may be that the device is waiting for some other input.

If the device does not yet have power applied, plug it in and monitor the terminal output.

If the device is already powered on, try pressing **Space**. If there is still no output, press **Enter**. If the device was booted, it may re-display the console menu or login prompt, or produce other output indicating its status.

From the console, a variety of things are possible, such as changing interface addresses. There is a full explanation of [every console menu option](#) in the pfSense software documentation.

2.2.4 Troubleshooting

Serial Device Missing

With a USB serial console there are a few reasons why the serial port may not be present in the client operating system, including:

No Power

Some models require power before the client can connect to the USB serial console.

USB Cable Not Plugged In

For USB consoles, the USB cable may not be fully engaged on both ends. Gently, but firmly, ensure the cable has a good connection on both sides.

Bad USB Cable

Some USB cables are not suitable for use as data cables. For example, some cables are only capable of delivering power for charging devices and not acting as data cables. Others may be of low quality or have poor or worn connectors.

The ideal cable to use is the one that came with the device. Failing that, ensure the cable is of the correct type and specifications, and try multiple cables.

Wrong Device

In some cases there may be multiple serial devices available. Ensure the one used by the serial client is the correct one. Some devices expose multiple ports, so using the incorrect port may lead to no output or unexpected output.

Hardware Failure

There could be a hardware failure preventing the serial console from working. Contact Netgate TAC for assistance.

No Serial Output

If there is no output at all, check the following items:

USB Cable Not Plugged In

For USB consoles, the USB cable may not be fully engaged on both ends. Gently, but firmly, ensure the cable has a good connection on both sides.

Wrong Device

In some cases there may be multiple serial devices available. Ensure the one used by the serial client is the correct one. Some devices expose multiple ports, so using the incorrect port may lead to no output or unexpected output.

Wrong Terminal Settings

Ensure the terminal program is configured for the correct speed. The default BIOS speed is 115200, and many other modern operating systems use that speed as well.

Some older operating systems or custom configurations may use slower speeds such as 9600 or 38400.

Device OS Serial Console Settings

Ensure the operating system is configured for the proper console (e.g. `ttyS1` in Linux). Consult the various operating installation guides on this site for further information.

PuTTY has issues with line drawing

PuTTY generally handles most cases OK but can have issues with line drawing characters on certain platforms.

These settings seem to work best (tested on Windows):

Window

Columns x Rows

80x24

Window > Appearance

Font

Courier New 10pt or *Consolas 10pt*

Window > Translation

Remote Character Set

Use font encoding or *UTF-8*

Handling of line drawing characters

Use font in both ANSI and OEM modes or *Use Unicode line drawing code points*

Window > Colours

Indicate bolded text by changing

The colour

Garbled Serial Output

If the serial output appears to be garbled, missing characters, binary, or random characters check the following items:

Flow Control

In some cases flow control can interfere with serial communication, causing dropped characters or other issues. Disabling flow control in the client can potentially correct this problem.

On PuTTY and other GUI clients there is typically a per-session option to disable flow control. In PuTTY, the **Flow Control** option is in the settings tree under **Connection**, then **Serial**.

To disable flow control in GNU Screen, add the `-ixon` and/or `-ixoff` parameters after the serial speed as in the following example:

```
$ sudo screen <console port> 115200,-ixon
```

Terminal Speed

Ensure the terminal program is configured for the correct speed. (See [No Serial Output](#))

Character Encoding

Ensure the terminal program is configured for the proper character encoding, such as **UTF-8** or **Latin-1**, depending on the operating system. (See [GNU Screen](#))

Serial Output Stops After the BIOS

If serial output is shown for the BIOS but stops afterward, check the following items:

Terminal Speed

Ensure the terminal program is configured for the correct speed for the installed operating system. (See [No Serial Output](#))

Device OS Serial Console Settings

Ensure the installed operating system is configured to activate the serial console and that it is configured for the proper console (e.g. `ttyS1` in Linux). Consult the various operating installation guides on this site for further information.

Bootable Media

If booting from a USB flash drive, ensure that the drive was written correctly and contains a bootable operating system image.

2.3 Reinstalling pfSense Plus Software

This guide uses the [Netgate Installer](#) to install pfSense® Plus software on a **Netgate-1100** device.

Note: pfSense® Plus is preinstalled on Netgate appliances. It is optimally tuned for Netgate hardware and contains features that cannot be found elsewhere, such as ZFS Boot Environments, OpenVPN DCO, Built-in IPFIX Export, and the [AWS VPC Wizard](#).

2.3.1 Download Installation Media

The [Netgate Installer](#) can be downloaded from the [Netgate Store](#) using a [Netgate Store Account](#).

See also:

For a more detailed walkthrough of the download process, see [Download Installation Media](#) in the pfSense Software Documentation.

The image to download for this device is:

`netgate-installer-aarch64.img.gz`

2.3.2 Prepare Installation Media

Next, write the installation image to a USB memstick.

See also:

Locating the image and writing it to a USB memstick is covered in detail under [Writing Flash Drives](#).

2.3.3 Connect to the Console

The installation process is interactive and utilizes the console. Follow the directions under [Connect to the console](#) to configure and use the console.

2.3.4 Boot the Installation Media

1. Insert the memstick into the USB port and boot the system.

Tip: The best practice is to connect to the **console**, **turn off** the device gracefully by using the **Halt system** option from the console and removing power once the shutdown procedure completes, then **insert** the USB memstick and **boot** the device.

Starting the recovery process requires **interrupting the boot process** very soon after the boot process begins, so having an active console connection before booting is important.

2. When prompted, press any key to stop the autoboot process.
3. Type `run usbboot` at the `Marvell>>` prompt and press **Enter**.

Note: If the device does not boot after issuing this command, enter `usb reset` and then try `run usbboot` again. Some USB drives require an extra reset to fully initialize.

If the device still does not boot the installer, or the installer fails, use `run usbrecovery` instead which will wipe the drive before starting the installer.

```
WTMI: system early-init
SVC REV: 5, CPU VDD voltage: 1.260V
NOTICE: Booting Trusted Firmware
NOTICE: BL1: v1.5(release):1f8ca7e-dirty (Marvell-devel-18.12.2)
NOTICE: BL1: Built : 18:22:47, Oct  7 2021
NOTICE: BL1: Booting BL2
NOTICE: BL2: v1.5(release):1f8ca7e-dirty (Marvell-devel-18.12.2)
NOTICE: BL2: Built : 18:22:52, Oct  7 2021
NOTICE: BL1: Booting BL31
NOTICE: BL31: v1.5(release):1f8ca7e-dirty (Marvell-devel-18.12.2)
NOTICE: BL31: Built : 18

U-Boot 2018.03-devel-18.12.3-gc9aa92c-dirty (Oct 07 2021 - 18:20:55 -0300)

Model: Netgate 1100
      CPU      1200 [MHz]
      L2       800 [MHz]
      TClock   200 [MHz]
      DDR      750 [MHz]
DRAM:  1 GiB
Comphy chip #0:
Comphy-0: USB3          5 Gbps
Comphy-1: PEX0          2.5 Gbps
Comphy-2: SATA0          6 Gbps
SATA link 0 timeout.
AHCI 0001.0300 32 slots 1 ports 6 Gbps 0x1 impl SATA mode
flags: ncq led only pmp fbss pio slum part sxs
PCIE-0: Link down
MMC:  sdhci@d0000: 0, sdhci@d8000: 1
Loading Environment from SPI Flash... SF: Detected mx25u3235f with page size 256
  Bytes, erase size 64 KiB, total 4 MiB
OK
Model: Netgate 1100
Net:  eth0: neta@30000 [PRIME]
Hit any key to stop autoboot: 2
```

2.3.5 Determine Target Drive

During the installation process the installer will prompt to select a target drive. The installer will then write pfSense® Plus to the chosen drive. In most cases a device will have only one potential target drive.

- On devices with only MMC storage, the only choice is `mmc0`.
- USB storage devices appear as `daX` where `X` is a device number, such as `da1`. The device number may shift depending on the order in which the OS probes USB devices or the order in which they are inserted while the OS is running.

Note: The installation media is also a USB drive, but the installer does not offer its own disk as a target drive.

2.3.6 Install pfSense Plus Software

The installer will automatically launch and present several options. On Netgate appliances, choosing **Enter** for the default options will complete the installation process in most cases.

Tip: There are options on the Welcome screen of the installer which can recover configuration data from a previous installation or from a USB drive.

See also:

For a complete walkthrough of the installation process, see [Installation Walkthrough](#).

When the installation is complete, remove the USB drive from the USB port.

Important: If the USB drive remains attached, the device may boot into the installer again.

See also:

For information on restoring from a previously saved configuration, go to [Backup and Restore](#).

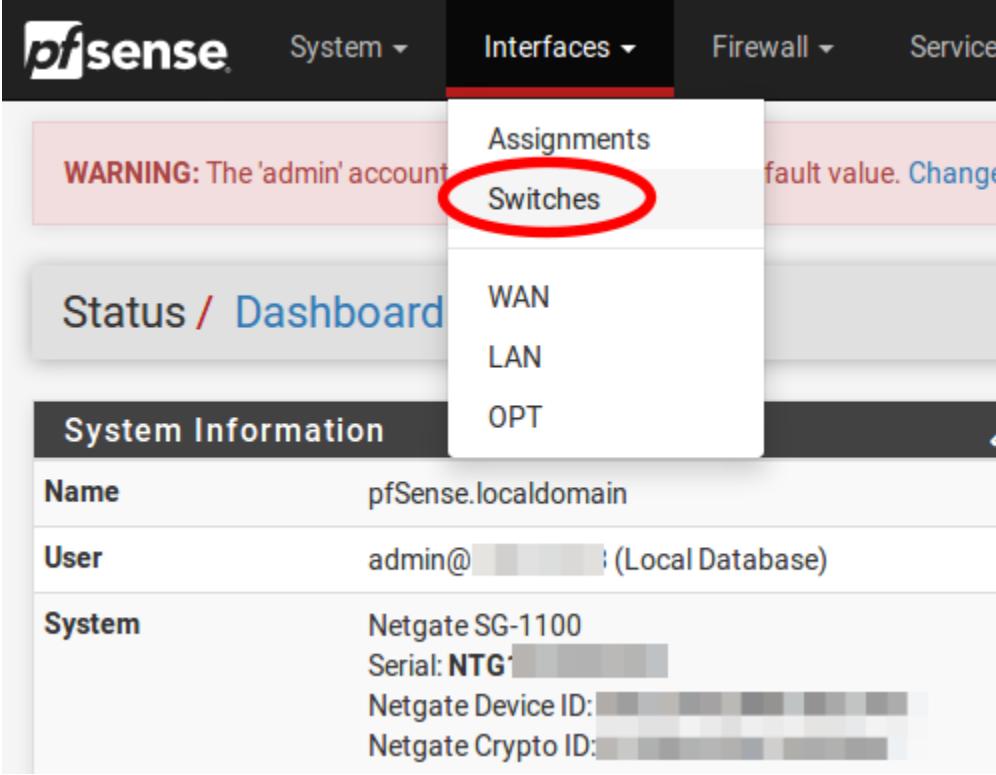
2.4 Configuring the Switch Ports

The default configuration of the Netgate 1100 has each port configured as a discrete interface (WAN, LAN, OPT), but under the hood the interfaces operate as a switch and the default configuration isolates them by using a separate VLAN for each port.

This optional guide changes the configuration such that the LAN and OPT Ethernet ports are on the same VLAN, effectively creating a small two-port LAN switch.

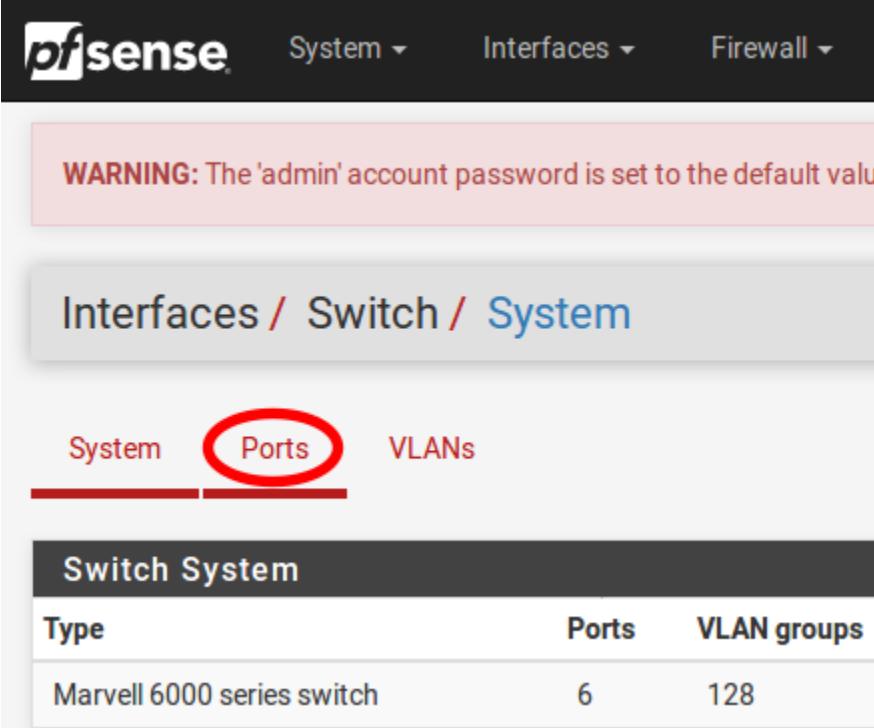
Note: When connecting to the GUI, do NOT connect to any port being configured during this procedure or the device will lose connectivity to the GUI.

1. Open the pfSense® Plus software GUI and log in.
2. From the menu, navigate to **Interfaces > Switches**.
3. Go to the **Ports** tab.



The screenshot shows the pfSense web interface. The top navigation bar includes 'pfSense', 'System', 'Interfaces' (which is highlighted in red), 'Firewall', and 'Services'. A red circle highlights the 'Switches' link in the 'Interfaces' dropdown menu. A warning message in a red box says: 'WARNING: The 'admin' account password is set to the default value. Change it as soon as possible.' Below the menu is a 'Status / Dashboard' box and a 'System Information' box. The 'System Information' box contains the following data:

Name	pfSense.locaLdomain
User	admin@ (Local Database)
System	Netgate SG-1100 Serial: NTG1 Netgate Device ID: [REDACTED] Netgate Crypto ID: [REDACTED]



The screenshot shows the pfSense web interface. The top navigation bar includes 'pfSense', 'System', 'Interfaces' (highlighted in red), 'Firewall', and 'Services'. A red circle highlights the 'Ports' link in the 'Switches' dropdown menu. A warning message in a red box says: 'WARNING: The 'admin' account password is set to the default value. Change it as soon as possible.' Below the menu is a 'Interfaces / Switch / System' box. The 'Switch System' section is highlighted with a red circle around the 'Ports' tab. The 'Switch System' table is as follows:

Type	Ports	VLAN groups
Marvell 6000 series switch	6	128

4. Click on the **Port VID** for **OPT**. Change the default value from **4092** to **4091**. In the lower right-hand corner click **Save**.

Port #	Port name	Port VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4092			FORWARDING	Default (no preference, typically autoselect)	No Carrier
2	LAN	40			FORWARDING	Default (no preference, typically autoselect)	No Carrier
3	WAN	4090	-		FORWARDING	Ethernet autoselect (1000baseT <full-duplex>)	Active

At this point the **Ports** tab under **Interfaces > Switches** should look like the following:

5. Click on the **VLANs** tab.

6. Click on the button for **VLAN group 3**.

Warning: **VLAN group 0** must remain in place and **VLAN groups 1-3** must include **0t** as a member, to function properly.

7. Click **Delete** for **Member 1**, then click **Save**.

8. Click on the button on **VLAN group 2**.

9. Click on the **Add member** button. Enter Member 1, uncheck **tagged** and then click **Save**.

10. Confirm the configuration matches the screenshots below:

11. Navigate to **Interfaces > LAN**, unset the **Switch Port** option, then click **Save** and **Apply Changes**.

Note: Setting the drop-down menu to “Select the switch port...” ensures the port status is not tied to a physical port. Otherwise, if LAN is unplugged, then devices plugged into the OPT port could not access services bound

Interfaces / Switch / Ports

System Ports VLANs

Port settings updated.

SG-1100 Switch Ports							
Port #	Port name	Port VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4091	-		FORWARDING	Default (no preference, typically autoselect) ▾	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect) ▾	No Carrier
3	WAN	4090	-		FORWARDING	Default (no preference, typically autoselect) ▾	No Carrier

 Save

Interfaces / Switch / Ports ?

System Ports **VLANs**

SG-1100 Switch Ports

Port #	Port name	Port VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4091	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier
3	WAN	4090	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier

Save

Interfaces / Switch / VLANs ?

System Ports **VLANs**

SG-1100 Switch 802.1Q VLANs

Enable Enable 802.1q VLAN mode
If enabled, packets with unknown VLAN tags will be dropped.

VLAN(s) table	VLAN group	VLAN tag	Members	Description	Action
	0	1	0	Default System VLAN	Edit
	1	4090	0t,3	WAN	Edit Delete
	2	4091	0t,2	LAN	Edit Delete
	3	4092	0t,1	OPT	Edit Delete

Save + Add Tag Edit

Interfaces / Switch / VLANs / Edit

Vlan properties

VLAN tag	4092	?
Enter a VLAN ID number (that is not already in use.)		
Description	OPT	?
A description may be entered here for administrative reference (not parsed).		
Member(s)	0	<input checked="" type="checkbox"/> tagged ✓ Delete
	1	<input type="checkbox"/> tagged 1 Delete
2 Save + Add member		

Interfaces / Switch / VLANs

System	Ports	VLANs																																
<h3>SG-1100 Switch 802.1Q VLANs</h3> <table border="1"> <tr> <td>Enable</td> <td><input checked="" type="checkbox"/> Enable 802.1q VLAN mode If enabled, packets with unknown VLAN tags will be dropped.</td> </tr> <tr> <td>VLAN(s) table</td> <td> <table border="1"> <thead> <tr> <th>VLAN group</th> <th>VLAN tag</th> <th>Members</th> <th>Description</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Default System VLAN</td> <td>Edit</td> </tr> <tr> <td>1</td> <td>4090</td> <td>0t,3</td> <td>WAN</td> <td>Edit Delete</td> </tr> <tr> <td>2</td> <td>4091</td> <td>0t,2</td> <td>LAN</td> <td>Edit Delete</td> </tr> <tr> <td>3</td> <td>4092</td> <td>0t</td> <td>OPT</td> <td>Edit Delete</td> </tr> </tbody> </table> </td> </tr> <tr> <td colspan="3"> Save + Add Tag </td> </tr> </table>			Enable	<input checked="" type="checkbox"/> Enable 802.1q VLAN mode If enabled, packets with unknown VLAN tags will be dropped.	VLAN(s) table	<table border="1"> <thead> <tr> <th>VLAN group</th> <th>VLAN tag</th> <th>Members</th> <th>Description</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Default System VLAN</td> <td>Edit</td> </tr> <tr> <td>1</td> <td>4090</td> <td>0t,3</td> <td>WAN</td> <td>Edit Delete</td> </tr> <tr> <td>2</td> <td>4091</td> <td>0t,2</td> <td>LAN</td> <td>Edit Delete</td> </tr> <tr> <td>3</td> <td>4092</td> <td>0t</td> <td>OPT</td> <td>Edit Delete</td> </tr> </tbody> </table>	VLAN group	VLAN tag	Members	Description	Action	0	1	0	Default System VLAN	Edit	1	4090	0t,3	WAN	Edit Delete	2	4091	0t,2	LAN	Edit Delete	3	4092	0t	OPT	Edit Delete	Save + Add Tag		
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3	4092	0t	OPT	Edit Delete																														
Save + Add Tag																																		

Interfaces / Switch / VLANs / Edit ?

Vlan properties

VLAN tag	4091	↑ ↓
Enter a VLAN ID number (that is not already in use.)		
Description	LAN	⊕
A description may be entered here for administrative reference (not parsed).		
Member(s)	<input type="text" value="0"/> ✓ tagged Delete <input type="text" value="2"/> ■ tagged Delete 2 <input type="text" value="1"/> ■ tagged Delete 3	
4 Save + Add member 1		

Interfaces / Switch / VLANs ?

System Ports VLANs

SG-1100 Switch 802.1Q VLANs

Enable	<input checked="" type="checkbox"/> Enable 802.1q VLAN mode If enabled, packets with unknown VLAN tags will be dropped.																									
VLAN(s) table	<table border="1"> <thead> <tr> <th>VLAN group</th> <th>VLAN tag</th> <th>Members</th> <th>Description</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Default System VLAN</td> <td>Edit</td> </tr> <tr> <td>1</td> <td>4090</td> <td>0t,3</td> <td>WAN</td> <td>Edit Delete</td> </tr> <tr> <td>2</td> <td>4091</td> <td>0t,1,2</td> <td>LAN</td> <td>Edit Delete</td> </tr> <tr> <td>3</td> <td>4092</td> <td>0t</td> <td>OPT</td> <td>Edit Delete</td> </tr> </tbody> </table>	VLAN group	VLAN tag	Members	Description	Action	0	1	0	Default System VLAN	Edit	1	4090	0t,3	WAN	Edit Delete	2	4091	0t,1,2	LAN	Edit Delete	3	4092	0t	OPT	Edit Delete
VLAN group	VLAN tag	Members	Description	Action																						
0	1	0	Default System VLAN	Edit																						
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3	4092	0t	OPT	Edit Delete																						
Save + Add Tag																										

Interfaces / Switch / Ports ?

System Ports VLANs

SG-1100 Switch Ports

Port #	Port name	VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4091	-		FORWARDING	Default (no preference, typically autoselect) ▼	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect) ▼	No Carrier
3	WAN	4090	-		FORWARDING	Ethernet autoselect (1000baseT <full-duplex>)	Active
						Default (no preference, typically autoselect) ▼	

Save

to the LAN interface, such as DHCP or DNS.

Switch port

Select the Switch port to monitor for media state changes ▼

Use the selected Switch port as source for the port state changes.

Note: Unlike software bridging, traffic between ports 1 and 2 will never leave the switch chip so it will perform at switching speed. The firewall cannot filter traffic between the two ports as pfSense® Plus software will never see it, as with any other (external) switch.

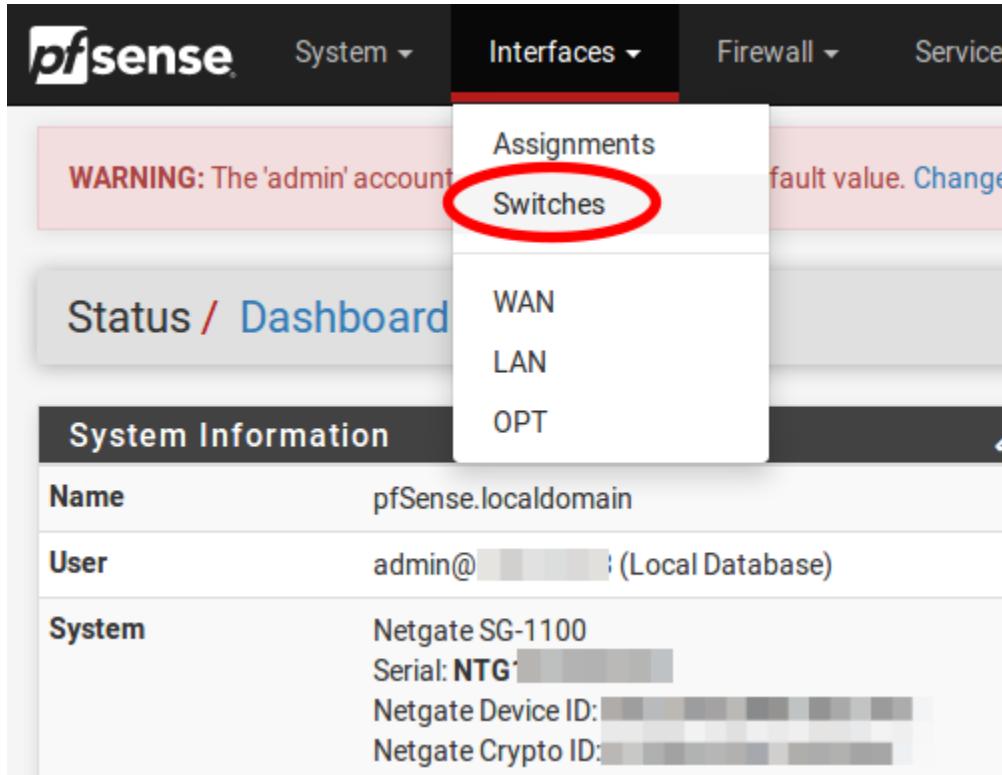
With both the LAN and OPT switch ports using the same VLAN on the switch (4091), the firewall will receive traffic from either port on its `mvneta0.4091` interface, which is assigned as LAN by default. The assigned OPT interface in the *firewall* settings is redundant at this point and can be removed, along with the definition for VLAN 4092 on `mvneta0`.

2.5 Configuring a Router on a Stick

This optional guide shows the steps required to configure all three VLANs on one port, such as the OPT port in this example. This allows the OPT port to act as a trunk port and connect to a VLAN aware switch so it can pass tagged VLAN traffic corresponding to the configured VLANs.

Note: Performing this configuration from the LAN port helps prevent being locked out. Also, the WAN and LAN ports will still work with untagged devices connected to them. The LAN port could be used as a management port. In normal operation, the switch would only need to be connected to OPT, with WAN and LAN disconnected.

1. Connect to the LAN port on the SG-1100.
2. From the pfSense® Plus GUI menu, navigate to **Interfaces > Switches**.



The screenshot shows the pfSense Plus GUI interface. The top navigation bar has tabs for System, Interfaces (which is highlighted with a red underline), Firewall, and Services. A red box highlights the 'Switches' tab under the Interfaces menu. A warning message in a red box says: "WARNING: The 'admin' account". Below the navigation bar, there are three tabs: Status / Dashboard, Assignments, and Switches. The 'Switches' tab is selected. On the left, there are three buttons: WAN, LAN, and OPT. On the right, there is a table with system information:

Name	pfSense.localdomain
User	admin@ (Local Database)
System	Netgate SG-1100 Serial: NTG1 Netgate Device ID: Netgate Crypto ID:

3. Go to the **VLANs** tab.
4. Click on the  button for **VLAN group 3**.

Warning: **VLAN group 0** must remain in place and **VLAN groups 1-3** must include **0t** as a member, in order to function properly.

5. Check **tagged** for **Member 1**, then click **Save**.
6. Click on the  button for **VLAN group 2**.

Interfaces / Switch / Ports ?

System Ports **VLANs**

SG-1100 Switch Ports

Port #	Port name	Port VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4091	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier
3	WAN	4090	-		FORWARDING	Default (no preference, typically autoselect) 	No Carrier

 Save

Interfaces / Switch / VLANs ?

System Ports **VLANs**

SG-1100 Switch 802.1Q VLANs

Enable	<input checked="" type="checkbox"/> Enable 802.1q VLAN mode If enabled, packets with unknown VLAN tags will be dropped.																									
VLAN(s) table <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>VLAN group</th> <th>VLAN tag</th> <th>Members</th> <th>Description</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>1</td> <td>0</td> <td>Default System VLAN</td> <td> </td> </tr> <tr> <td>1</td> <td>4090</td> <td>0t,3</td> <td>WAN</td> <td> </td> </tr> <tr> <td>2</td> <td>4091</td> <td>0t,2</td> <td>LAN</td> <td> </td> </tr> <tr> <td>3</td> <td>4092</td> <td>0t,1</td> <td>OPT</td> <td> </td> </tr> </tbody> </table>		VLAN group	VLAN tag	Members	Description	Action	0	1	0	Default System VLAN	 	1	4090	0t,3	WAN	 	2	4091	0t,2	LAN	 	3	4092	0t,1	OPT	
VLAN group	VLAN tag	Members	Description	Action																						
0	1	0	Default System VLAN	 																						
1	4090	0t,3	WAN	 																						
2	4091	0t,2	LAN	 																						
3	4092	0t,1	OPT	 																						

 Save + Add Tag Edit

Interfaces / Switch / VLANs / Edit

Vlan properties

VLAN tag	4092	?
Enter a VLAN ID number (that is not already in use.)		
Description	OPT	?
A description may be entered here for administrative reference (not parsed).		
Member(s)	0	<input checked="" type="checkbox"/> tagged Delete
	1	1 <input type="checkbox"/> tagged Delete
2 Save + Add member		

Interfaces / Switch / VLANs

System Ports VLANs

SG-1100 Switch 802.1Q VLANs

Enable	<input checked="" type="checkbox"/> Enable 802.1q VLAN mode If enabled, packets with unknown VLAN tags will be dropped.																									
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VLAN group	VLAN tag	Members	Description	Action																						
0	1	0	Default System VLAN	Edit																						
1	4090	0t,3	WAN	Edit Delete																						
2	4091	0t,2	LAN	Edit																						
3	4092	0t	OPT	Edit																						
Save + Add Tag																										

7. Click on the **Add member** button, Enter Member 1, check **tagged** and then click **Save**.

Vlan properties

VLAN tag 4091
Enter a VLAN ID number (that is not already in use.)

Description LAN
A description may be entered here for administrative reference (not parsed).

Member(s)

0	<input checked="" type="checkbox"/> tagged	
2	<input type="checkbox"/> tagged	
② 1	③ <input checked="" type="checkbox"/> tagged	

④ Save **+ Add member** ①

8. Click on the button for **VLAN group 1**.

9. Click on the **Add member** button, Enter Member 1, check **tagged** and then click **Save**.

10. Click on the **Ports** tab.

11. Click on the **Port VID** for **OPT**. Change the default value 4092 to 1. In the lower right-hand corner click **Save**.

When completed the Ports and VLANs configuration should reflect the screenshots below:

Now connect a managed switch (VLANs 4090-4092 must be trunked on the switchport of the managed switch) to OPT with VLANs 4090 (WAN), 4091 (LAN), and 4092 (OPT) tagged to it.

To access the GUI from the LAN, connect a laptop to LAN, and it should receive a DHCP lease (unless DHCP Server on LAN has been disabled). The GUI will also be accessible (unless the default Anti-Lockout Rule has been disabled) and internet (unless the Default rule to allow LAN traffic to any destination has been disabled).

Interfaces / Switch / VLANs

System Ports VLANs

SG-1100 Switch 802.1Q VLANs

VLAN(s) table	VLAN group	VLAN tag	Members	Description	Action
0	1	0		Default System VLAN	
1	4090	0t,3		WAN	
2	4091	0t,1t,2		LAN	
3	4092	0t,1t		OPT	

Save Add Tag

Interfaces / Switch / VLANs / Edit

Vlan properties

VLAN tag	4090	
Enter a VLAN ID number (that is not already in use.)		
Description	WAN	
A description may be entered here for administrative reference (not parsed).		
Member(s)	0	<input checked="" type="checkbox"/> tagged
	3	<input type="checkbox"/> tagged
2	1	<input checked="" type="checkbox"/> tagged
4	Save Add member	1

Interfaces / Switch / VLANs

System **Ports** VLANs

SG-1100 Switch 802.1Q VLANs

Enable Enable 802.1q VLAN mode
If enabled, packets with unknown VLAN tags will be dropped.

VLAN(s) table	VLAN group	VLAN tag	Members	Description	Action
	0	1	0	Default System VLAN	
	1	4090	0t,1t,3	WAN	
	2	4091	0t,1t,2	LAN	
	3	4092	0t,1t	OPT	

Save Add Tag

Interfaces / Switch / Ports

System Ports VLANs

SG-1100 Switch Ports

Port #	Port name	Port VID	LAGG	Flags	State	Media	Status
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	4092	-		FORWARDING	Default (no preference, typically autoselect)	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect)	No Carrier
3	WAN	4090	-		FORWARDING	Ethernet autoselect (1000baseT <full-duplex>)	Active

Save

Interfaces / Switch / VLANs

System Ports VLANs

SG-1100 Switch 802.1Q VLANs

Enable Enable 802.1q VLAN mode
If enabled, packets with unknown VLAN tags will be dropped.

VLAN(s) table	VLAN group	VLAN tag	Members	Description	Action
	0	1	0	Default System VLAN	 
	1	4090	0t,1t,3	WAN	 
	2	4091	0t,1t,2	LAN	 
	3	4092	0t,1t	OPT	 

 Save  Add Tag

Interfaces / Switch / Ports ?

System Ports VLANs

Port settings updated. X

SG-1100 Switch Ports							Status
Port #	Port name	Port VID	LAGG	Flags	State	Media	
0	LAN Uplink	1	-	HOST	FORWARDING	Ethernet 1000baseT <full-duplex>	Active
1	OPT	1	-		FORWARDING	Default (no preference, typically autoselect) ▼	No Carrier
2	LAN	4091	-		FORWARDING	Default (no preference, typically autoselect) ▼	No Carrier
3	WAN	4090	-		FORWARDING	Default (no preference, typically autoselect) ▼	No Carrier

Save

2.6 Configuring an OPT interface as an additional WAN

Note: The default configuration of the Netgate 1100 has the OPT port already assigned.

This guide configures an OPT port as an additional WAN type interface. These interfaces connect to upstream networks providing connectivity to the Internet or other remote destinations.

See also:

[Multi-WAN documentation](#)

Configuring an additional WAN

- [Requirements](#)
- [Assign the Interface](#)
- [Interface Configuration](#)
- [Outbound NAT](#)
 - [Automatic or Hybrid Outbound NAT](#)
 - [Manual Outbound NAT](#)
- [Firewall Rules](#)
- [Gateway Groups](#)
- [DNS](#)
- [Setup Policy Routing](#)
- [Dynamic DNS](#)
- [VPN Considerations](#)
- [Testing](#)

2.6.1 Requirements

- This guide assumes the underlying interface is already present (e.g. physical port, VLAN, etc.).
- The WAN configuration type and settings must be known before starting. For example, this might be an IP address, subnet mask, and gateway value for static addresses or credentials for PPPoE.

2.6.2 Assign the Interface

- Navigate to **Interfaces > Assignments**

Look at list of current assignments. If the interface in question is already assigned, there is nothing to do. Skip ahead to the interface configuration.

- Pick an available interface in **Available network ports**

If there are no available interfaces, then one may need to be created first (e.g. VLANs).

- Click  **Add**

The firewall will assign the next available OPT interface number corresponding to the internal interface designation. For example, if there are no current OPT interfaces, the new interface will be **OPT1**. The next will be **OPT2**, and so on.

Note: As this guide does not know what that number will be on a given configuration, it will refer to the interface generically as **OPTx** and the customized name **WAN2**.

The newly assigned interface will have its own entry under the **Interfaces** menu and elsewhere in the GUI.

2.6.3 Interface Configuration

The new interface must be enabled and configured.

- Navigate to **Interfaces > OPTx**
- Check **Enable interface**
- Set custom name in the **Description**, e.g. **WAN2**
- Set IP address and CIDR for static, or DHCP/PPPoE/etc.

See also:

[IPv4 Configuration Types](#)

- Create a Gateway if this is a static IP address WAN:

- Click  **Add a New Gateway**
- Configure the gateway as follows:

Default

Check if this new WAN should be the default gateway.

Gateway Name

Name it the same as the interface (e.g. **WAN2**), or a variation thereof.

Gateway IPv4

The IPv4 address of the gateway inside the same subnet.

Description

Optional text describing the purpose of the gateway.

- Click  **Add**
- Ensure the new gateway is selected as the **IPv4 Upstream Gateway**

- Check **Block private networks**

This will block private network traffic on the interface, though if the firewall rules for this WAN are not permissive, this may be unnecessary.

- Check **Block bogon networks**

This will traffic from bogus or unassigned networks on the interface, though if the firewall rules for this WAN are not permissive, this may be unnecessary.

- Click **Save**
- Click **Apply Changes**

The presence of a selected gateway in the interface configuration causes the firewall to treat the interface as a *WAN type* interface. This is manual for static configurations, as above, but is automatic for dynamic WANs (e.g. DHCP, PPPoE).

The firewall applies outbound NAT to traffic exiting WAN type interfaces but does not use WAN type interface networks as a source for outbound NAT on other interfaces. Firewall rules on WAN type interfaces get **reply-to** added to ensure traffic entering a WAN exits the same WAN, and traffic exiting the interface is nudged toward its gateway. The DNS Resolver will not accept queries from clients on WAN type interfaces without manual ACL entries.

See also:

[Interface Configuration](#)

2.6.4 Outbound NAT

For clients on local interfaces to reach the Internet from private addresses to destinations through this WAN, the firewall must apply Outbound NAT on traffic leaving this new WAN.

- Navigate to **Firewall > NAT, Outbound** tab
- Check the current outbound NAT mode and follow the section below which matches the mode.

Automatic or Hybrid Outbound NAT

If the mode is set to **Automatic** or **Hybrid**, then this may not need further configuration.

Ensure there are rules for the new WAN listed as an **Interface** in the **Automatic Rules** at the bottom of the page. If so, skip ahead to the next section to configure Firewall Rules.

Manual Outbound NAT

If the mode is set to **Manual**, create a new rule or set of rules to cover the new WAN.

If there are existing rules in the **Mappings** table, they can be copied and adjusted to use the new WAN. Otherwise, create them manually:

- Click  to add a new rule at the top of the list.
- Configure the rule as follows:

Interface

Choose the new WAN interface (e.g. **WAN2**)

Address Family

IPv4

Protocol

Any

Source

Either choose *LAN Subnets*, which will automatically reference any networks on the LAN interface, or choose *Network or Alias* and manually fill in the LAN subnet, e.g. **192.168.1.0/24**.

If there are multiple local networks, create rules for each or use other methods such as aliases or CIDR summarization to cover them all.

Destination*Any***Translation Address***WAN2 Address (or the custom name of the new WAN interface)***Description***Text describing the rule, e.g. LAN outbound on WAN2*

- Click **Save**
- Click **Apply Changes**

Repeat as needed for additional local networks.

2.6.5 Firewall Rules

By default, there are no rules on the new interface, so the firewall will block all traffic. This is ideal for a WAN, so is safe to leave as-is. Adding services on the new WAN, such as VPNs, may require rules, but those should be handled on a case-by-case basis.

Warning: **Do not** add any blanket “allow all” style rules on any WAN.

2.6.6 Gateway Groups

Gateway Groups do not control traffic directly, but can be used in other places, such as firewall rules and service bindings, to influence how those areas use gateways.

For most scenarios it helps to create three gateway groups to start with: **PreferWAN**, **PreferWAN2**, and **LoadBalance**:

- Navigate to **System > Routing, Gateway Groups** tab



- Click **Add** to create a new gateway group
- Configure the group as follows:

Group Name*PreferWAN***Gateway Priority***Gateway for WAN on Tier 1, Gateway for WAN2 on Tier 2***Description***Prefer WAN, fail to WAN2*

- Click **Save**



- Click **Add** to create another gateway group
- Configure the group as follows:

Group Name*PreferWAN2***Gateway Priority***Gateway for WAN on Tier 2, Gateway for WAN2 on Tier 1*

Description

Prefer WAN2, fail to WAN

- Click **Save**



- Click **Add** to create another gateway group
- Configure the group as follows:

Group Name

LoadBalance

Gateway Priority

Gateways for WAN and WAN2 both on **Tier 1**

Description

Load Balance Connections on WAN and WAN2

Note: Rules using this group enable connection-based load balancing, not per-packet load balancing.

Rules using this group will also have failover style behavior as WANs which are down are removed from load balancing.

- Click **Save**
- Click **Apply Changes**

Now set the default gateway to a failover group:

- Navigate to **System > Routing, Gateways** tab
- Set **Default gateway IPv4** to *PreferWAN*
- Click **Save**
- Click **Apply Changes**

Note: This is important for failover from the firewall itself so it always has outbound access. While this also enables basic failover for client traffic, it's better to use policy routing rules to control client traffic behavior.

2.6.7 DNS

DNS is critical for Internet access, and it is important to ensure the firewall can always resolve hostnames using DNS even when running on a secondary WAN.

The needs here depend upon the configuration of the DNS Resolver or Forwarder.

If the DNS Resolver is in its default resolver mode, then default gateway switching will be sufficient to handle failover in most cases, though it may not be as reliable as using forwarding mode.

If the DNS Resolver is in forwarding mode or the firewall is using the DNS Forwarder instead, then maintaining functional DNS requires manually configuring gateways for forwarding DNS servers.

- Navigate to **System > General Setup**
- Add at least one DNS server for each WAN in the **DNS Server Settings** section, ideally two or more. Click



Add DNS Server to create additional rows.

Each entry should be configured as follows:

Address

The IP address of a DNS server.

Each server address **must be unique**, the same server **cannot** be listed more than once.

DNS Hostname

Leave this field blank unless the server will be contacted using DNS over TLS through the DNS Resolver. In this case, enter the FQDN of the DNS server, so its name can be validated against its TLS certificate.

Gateway

Select a gateway for each DNS server, corresponding to the WAN through which the firewall can reach the DNS server.

For public DNS servers such as CloudFlare or Google, either WAN is OK, but if either WAN uses DNS servers from a specific ISP, ensure those exit the appropriate WAN.

Note: If the gateway drop-down does not appear next to each DNS server, then the firewall does not have more than one gateway configured for any address family. Double-check the gateway settings for all WAN interfaces.

- **Uncheck DNS Server Override**

This will tell the firewall to use the DNS servers entered on this page and to ignore servers provided by dynamic WANs such as DHCP or PPPoE. Occasionally these providers may push conflicting DNS server information, so the best practice is to assign the DNS servers manually.

- **Click Save**

Note: If the DNS Resolver has specific outgoing interfaces selected in its configuration, select the new WAN there well as well.

2.6.8 Setup Policy Routing

Policy routing involves setting a gateway on firewall rules which direct matching traffic out specific WANs or failover groups.

In simple cases (one LAN, no VPNs) the only requirement to configure policy routing is to add a gateway to existing rules.

- Navigate to **Firewall > Rules, LAN tab**
- Edit the default pass rule for the LAN
- **Click Display Advanced**
- Set the **Gateway** to one of the gateway groups based on the desired LAN client behavior.
For example, pick *PreferWAN*, so clients use WAN and then if WAN fails, they use WAN2.
- **Click Save**
- **Click Apply Changes**

If there are other local networks or VPNs which clients on LAN must reach, add rules **above** the default pass rules to pass local traffic without a gateway set:

- Navigate to **Firewall > Rules, LAN tab**

- Click  to add a new rule at the **top** of the list
- Configure the rule as follows:

Action
Pass

Interface
LAN

Protocol
Any

Source
LAN subnets

Destination
The other local subnet, VPN network, or an alias of such networks.

Description
Pass to local and VPN networks

Do not set a gateway on this rule.

- Click **Save**
- Click **Apply Changes**

2.6.9 Dynamic DNS

Dynamic DNS provides several benefits for multiple WANs, particularly with VPNs. If the firewall does not already have one or more Dynamic DNS hostnames configured, consider signing up with a provider and creating one or more.

It is a good practice to have a separate DNS entry for each WAN and a shared entry for failover, or one per failover group. If that is not viable, at least have one for the most common needs.

The particulars of configuring Dynamic DNS entries vary by provider and are beyond the scope of this document.

2.6.10 VPN Considerations

IPsec can use a gateway group as an interface, but needs a dynamic DNS hostname as companion. The remote peer would need to use the Dynamic DNS hostname as the peer address of this firewall instead of an IP address. Because this relies on DNS, failover can be slow.

WireGuard does not bind to an interface, but can work with Multi-WAN. It will respond from WAN2 if client contacts WAN2, but when initiating it will always use the current default gateway. Static routes can nudge traffic for a specific peer out a specific WAN.

OpenVPN can use a gateway group as an interface for clients or servers. Client behavior is OK and should match default failover behavior configured on the group. For servers, it is better to bind the server to localhost and use port forwards from each WAN to localhost. Remote clients can then have multiple remote entries and contact each WAN as needed at any time.

2.6.11 Testing

Methods for testing depend on the type of WANs and gateway groups in use.

- For most WANs, a better test is to unplug the **upstream** connection from the ISP Customer Premise Equipment (CPE). This more accurately simulates a typical type of upstream connectivity failure. Do not power off the CPE or unplug the connection between the firewall and the CPE. While this may work, it's a much less common scenario and can behave differently.
- For testing load balancing, use cURL or multiple browsers/sessions when checking the IP address multiple times. Refreshing the same browser window will reuse a connection to the server and is not helpful for testing connection-based load balancing.

2.7 Configuring an OPT interface as an additional LAN

Note: The default configuration of the Netgate 1100 has the OPT port already assigned.

This guide configures an OPT port as an additional LAN type interface. These local interfaces can perform a variety of tasks, such as being a guest network, DMZ, IOT isolation, wireless segment, lab network, and more.

Configuring an additional LAN

- *Requirements*
- *Assign the Interface*
- *Interface Configuration*
- *DHCP Server*
- *Outbound NAT*
 - *Automatic or Hybrid Outbound NAT*
 - *Manual Outbound NAT*
- *Firewall Rules*
 - *Open*
 - *Isolated*
- *Other Services*

2.7.1 Requirements

- This guide assumes the underlying interface is already present (e.g. physical port, VLAN, etc.).
- Choose a new local subnet to use for the additional LAN type interface. This example uses 192.168.2.0/24.

2.7.2 Assign the Interface

The first step is to assign an OPT interface.

- Navigate to **Interfaces > Assignments**

Look at list of current assignments. If the interface in question is already assigned, there is nothing to do. Skip ahead to the interface configuration.

- Pick an available interface in **Available network ports**

If there are no available interfaces, then one may need to be created first (e.g. VLANs).

- Click  **Add**

The firewall will assign the next available OPT interface number corresponding to the internal interface designation. For example, if there are no current OPT interfaces, the new interface will be **OPT1**. The next will be **OPT2**, and so on.

Note: As this guide does not know what that number will be on a given configuration, it will refer to the interface generically as **OPTx**.

The newly assigned interface will have its own entry under the **Interfaces** menu and elsewhere in the GUI.

2.7.3 Interface Configuration

The new interface must be enabled and configured.

- Navigate to **Interfaces > OPTx**
- Check **Enable interface**
- Set custom name in the **Description**, e.g. GUESTS, DMZ, etc.
- Set the **IPv4 Address** and CIDR mask for the new LAN

For this example, 192.168.2.1/24.

- **Do not** add or choose an **IPv4 Upstream gateway**
- Uncheck **Block private networks**

This interface is a private network, this option would prevent it from functioning.

- Uncheck **Block bogon networks**

The rules on this interface should only allow traffic from the subnet on the interface, making this option unnecessary.

- Click **Save**
- Click **Apply Changes**

The lack of a selected gateway in the interface configuration causes the firewall to treat the interface as a *LAN type* interface.

The firewall uses LAN type interfaces as sources of outbound NAT traffic but does not apply outbound NAT on traffic exiting a LAN. The firewall does not add any extra properties on firewall rules to influence traffic behavior. The DNS Resolver will accept queries from clients on LAN type interfaces.

See also:[Interface Configuration](#)

2.7.4 DHCP Server

Next, configure DHCP service for this local interface. This is a convenient and easy way assign addresses for clients on the interface, but is optional if clients will be statically addressed instead.

This configuration varies slightly depending on the DHCP server and version.

See also:[DHCPv4 Configuration](#)

- Navigate to **Services > DHCP Server, OPTx** tab (or the custom name)
- Check **Enable**
- Configure the **Address Pool Range**, e.g. from 192.168.2.100 to 192.168.2.199

This sets the lower (**From**) and upper (**To**) bound of automatic addresses assigned to clients.

- The rest of the settings can be left at defaults
- Click **Save**

2.7.5 Outbound NAT

For clients on this interface to reach the Internet from private addresses, the firewall must apply Outbound NAT for the new subnet.

- Navigate to **Firewall > NAT, Outbound** tab
- Check the current outbound NAT mode and follow the section below which matches the mode.

Automatic or Hybrid Outbound NAT

If the mode is set to **Automatic** or **Hybrid**, then this likely does not need further configuration.

Ensure the new LAN subnet is listed as a **Source** in the **Automatic Rules** at the bottom of the page. If so, skip ahead to the next section to configure Firewall Rules.

Manual Outbound NAT

If the mode is set to **Manual**, create a new rule or set of rules to cover the new subnet.



- Click **Add** to add a new rule at the top of the list
- Configure the rule as follows:

Interface

Choose the WAN interface. If there is more than one WAN interface, add separate rules for each WAN interface.

Address Family

IPv4

Protocol*Any***Source**

Either choose *OPTx Subnets*, which will automatically reference the new interface, or choose *Network or Alias* and manually fill in the new subnet, e.g. 192.168.2.0/24.

Destination*Any***Translation Address**

WAN Address (or the customized name matching the WAN/egress interface)

Description

Text describing the rule, e.g. Guest LAN outbound on WAN

- Click **Save**
- Click **Apply Changes**

Alternately, clone existing NAT rules and adjust as needed to match the new LAN.

2.7.6 Firewall Rules

By default, there are no firewall rules on the new interface, so the firewall will block all traffic. This is not ideal for a LAN as generally speaking, the clients on this LAN will need to contact hosts through the firewall.

Rules for this interface can be found under **Firewall > Rules**, on the **OPTx** tab (or the custom name, e.g. **GUESTS**).

There are two common scenarios administrators typically choose for local interfaces: Open and Isolated

Open

On an open LAN, hosts in that LAN are free to contact any other host through the firewall. This might be a host on the Internet, across a VPN, or on another local LAN.

In this case a simple “allow all” style rule for the interface will suffice.

- Navigate to **Firewall > Rules**, on the **OPTx** tab (or the custom name)
- Click  to add a new rule at the top of the list
- Configure the rule as follows:

Action*Pass***Interface**

OPTx (or the custom name) should already be set by default

Protocol*Any***Source**

OPTx subnets (or the custom name)

Destination*Any***Description**

Text describing the rule, e.g. Default allow all from OPTx

- Click **Save**
- Click **Apply Changes**

Isolated

In an isolated local network, hosts on the network cannot contact hosts on other networks unless explicitly allowed in the rules. Hosts can still contact the Internet as needed in this example, but that can also be restricted with additional rules.

This scenario is common for locked down networks such as for IOT devices, a DMZ with public services, untrusted Guest/BYOD networks, and other similar scenarios.

Warning: A full set of reject rules as described in this example is the best practice. Do not rely on shortcuts such as using policy routing to isolate clients.

Create a Private Networks Alias

Create an alias using all RFC 1918 networks (listed in the example below) or at least an alias containing the local/private networks on this firewall, such as VPNs. Using all RFC 1918 networks is a safer practice.

- Navigate to **Firewall > Aliases**



- Click **Add**

- Configure the alias as follows:

Name

PrivateNets

Description

Private Networks

Type

Network(s)

- Add entries for:

- 192.168.0.0/16
- 172.16.0.0/12
- 10.0.0.0/8

- Click **Save**

Add Firewall Rules

With the alias in place, the next task is to create firewall rules for the interface.

- Navigate to **Firewall > Rules**, on the **OPTx** tab (or the custom name)

Allow DNS

Add rule to allow DNS requests from local clients to the firewall itself or other DNS servers.

- Click  to add a new rule at the bottom of the list.
- Configure the rule as follows:

Action	<i>Pass</i>
Interface	<i>OPTx</i> (or the custom name)
Protocol	<i>TCP/UDP</i>
Source	<i>OPTx subnets</i> (or the custom name)
Destination	<i>This Firewall (self)</i>
Destination Port Range	Select the <i>DNS (53)</i> entry or choose <i>Other</i> and manually enter <i>53</i> To allow DNS over TLS, create a separate rule using the <i>DNS over TLS</i> entry or manually enter port <i>853</i> .
Description	Text describing the rule, e.g. <i>Allow clients to resolve DNS through the firewall</i>
- Click **Save**

Allow ICMP to the Firewall

Add a rule to allow ICMP traffic from local devices to the firewall.

- Click  to add a new rule at the bottom of the list.
- Configure the rule as follows:

Action	<i>Pass</i>
Interface	<i>OPTx</i> (or the custom name)
Protocol	<i>ICMP</i>

ICMP Subtype*Any*

Tip: While ICMP is useful, some network administrators prefer to limit the allowed ICMP types to *Echo Request* only. This allows devices to use ICMP ping for diagnostic purposes, but no other types of ICMP traffic.

Source*OPTx subnets* (or the custom name)**Destination***This Firewall (self)***Description**

Allow client ICMP to the firewall

- Click **Save**

Reject Other Firewall-bound Traffic

Add rule to reject any other traffic to the firewall to ensure users on this interface cannot connect to management services such as the GUI, SSH, and so on.



- Click **Add** to add a new rule at the bottom of the list.
- Configure the rule as follows:

Action*Reject***Interface***OPTx* (or the custom name)**Protocol***Any***Source***Any***Destination***This Firewall (self)***Description**

Reject all other traffic to the firewall

- Click **Save**

Reject Private Traffic

Add rule to reject traffic from this network to all other private networks.



- Click **Add** to add a new rule at the bottom of the list.
- Configure the rule as follows:

Action*Reject***Interface***OPTx* (or the custom name)**Protocol***Any***Source***Any***Destination***Address or Alias, PrivateNets* (the alias created earlier)**Description***Reject all other traffic to private networks*

- Click **Save**

Allow Other Traffic

Add rule to allow traffic from this interface network to any other destination, which enables clients on this interface to reach the Internet and/or other remote public networks.



- Click **Add** to add a new rule at the bottom of the list.
- Configure the rule as follows:

Action*Pass***Interface***OPTx* (or the custom name)**Protocol***Any***Source***OPTx subnets* (or the custom name)**Destination***Any***Description***Default allow all from OPTx*

- Click **Save**

Apply Changes

With the rules all in place, click **Apply Changes** to finish and activate the new rules.

The rules should look similar to the following figure:

Rules (Drag to Change Order)											Actions
	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	
Exceptions to Local Blocks											
<input type="checkbox"/>	✓	0/0 B	IPv4 TCP/ UDP	OPTX subnets	*	This Firewall (self)	53 (DNS)	*	none	Allow clients to resolve DNS through the firewall	
<input type="checkbox"/>	✓	0/0 B	IPv4 ICMP any.	OPTX subnets	*	This Firewall (self)	*	*	none	Allow client ICMP to the firewall	
Block to protected local networks											
<input type="checkbox"/>		0/0 B	IPv4 *	*	*	This Firewall (self)	*	*	none	Reject all other traffic to the firewall	
<input type="checkbox"/>		0/0 B	IPv4 *	*	*	PrivateNets	*	*	none	Reject all other traffic to private networks	
General pass rules											
<input type="checkbox"/>	✓	0/0 B	IPv4 *	OPTX subnets	*	*	*	*	none	Default allow all from OPTX	
Add Add Delete Toggle Copy Save Separator											

Fig. 12: Example firewall rules for isolated LAN type segment

Tip: Rule separators are useful for documenting a ruleset in place.

Similar to the isolated network scenario, it is also possible to be much more strict with rules to only allow specific outbound ports. When creating this type of configuration,

2.7.7 Other Services

In most cases the above configuration is sufficient and clients on the new LAN can now obtain an address and reach the Internet. However, there may be other custom settings which need accounted for when adding a new local interface:

- If the DNS resolver has specific interface bindings, add the new interface to the list.
- If using ALTQ traffic shaping, re-run the shaper wizard to include this new LAN type interface.
- Consider using captive portal to control access the interface

2.8 Factory Reset Procedure

The Netgate 1100 firewall appliance does not have a hardware button to reset the configuration to factory defaults. On this device it is still possible to perform a [Factory Reset](#) from [GUI](#) or [Console](#).

Warning: On this hardware the button labeled “Reset” **does not** reset the pfSense software configuration. The “Reset” button immediately performs a hardware reset, which is similar to a cold boot or power cycle.

See also:

- Factory Reset from GUI or Console

The linked document has complete details, but the procedure can be summarized as follows:

Reset from the console:

- *Connecting to the USB Console* or SSH
- Choose menu option 4 to reset to factory defaults
- Confirm the action and allow the appliance to reboot

Reset from the GUI:

- Navigate to **Diagnostics > Factory Defaults** to perform the reset.

REFERENCES

3.1 Switch Overview

This document is an overview of how the switch operates and its capabilities.

See also:

For instructions on how to configure the switch ports, see:

- Configure LAN and OPT to act as switched ports on the same VLAN: [Configuring the Switch Ports](#)
- Configure a trunk port to pass tagged VLAN traffic to another switch: [Configuring a Router on a Stick](#).

Warning: The switch ports do not implement the Spanning Tree Protocol (STP). Two or more ports connected to another Layer 2 switch, or connected to 2 or more different interconnected switches, could create a flooding loop between the switches. This can cause the router to stop functioning until the loop is resolved.

Warning: The switch is limited to a total maximum of 128 separate VLANs.

3.1.1 Interface Links

All three ports on the Netgate 1100 (WAN, LAN, OPT) are connected internally to a switch.

In addition to the three physical ports there is also an internal port connected to the switch: Port 0 on the switch for an uplink and the `mvneta0` interface which is the corresponding operating system interface for the switch uplink.

The internal uplink port operates at 1 Gbps and connects the switch to the SoC. From the perspective of the operating system, the only port is the `mvneta0` interface which also runs at the same 1 Gbps speed.

3.1.2 802.1q VLAN Mode

By default, the three physical ports are configured on separate VLANs which feed into the WAN, LAN, and OPT interfaces. These switch ports are customizable. For example, all of these configurations are possible:

- WAN, LAN, and OPT as individual network interfaces.
- WAN configured as a WAN, LAN and OPT configured as a switch for LAN A.
- WAN, LAN, and OPT on the same VLAN as a single LAN A.

These scenarios are possible by utilizing VLANs. Each of the switch ports (LAN, WAN, OPT, and Port 0) are VLAN aware interfaces. They are capable of functioning as a standard access or trunk port:

Access Port:

Adds a VLAN tag to inbound untagged traffic

Trunk Port:

Allows tagged traffic containing specified VLAN IDs

In the default configuration, three VLANs are used to create the WAN, LAN, and OPT interfaces:

WAN	VLAN 4090
LAN	VLAN 4091
OPT	VLAN 4092

The ports are configured to act as **Access** ports.

- When data comes into the WAN interface, a VLAN tag of 4090 is added to the Ethernet frame.
- When data comes into the LAN interface, a VLAN tag of 4091 is added to the Ethernet frame.
- When data comes into the OPT interface, a VLAN tag of 4092 is added to the Ethernet frame.

Port 0 is configured to act as a **Trunk** port.

- By default, only Ethernet frames containing a VLAN tag of 4090, 4091, or 4092 are allowed over the trunk.

Each VLAN configured on the switch uses the `mvneta0` interface as its parent interface. For example, the default interface assignments are:

WAN	mvneta0.4090
LAN	mvneta0.4091
OPT	mvneta0.4092

This means `mvneta0.4090`, `mvneta0.4091`, and `mvneta0.4092`, as well as any other VLANs created for the switch, all share the same 1 Gbps uplink.

3.1.3 Port Mode

Aside from being able to specify whether a switch port should act as an access or trunk port, it's also possible to disable 802.1q VLAN mode. When this is done, a third mode called **Port VLAN Mode** is enabled. In this mode, any and all VLAN tags are allowed on all ports. No VLAN tags are added or removed. Think of it as a dummy switch that retains VLAN tags on frames, if present. This mode is useful when there are numerous VLANs on a network and the goal is to physically segment the switch, while allowing the same VLANs on all segments of the switch.

In **Port VLAN Mode**, rather than specifying which interfaces are associated to a VLAN, the configuration can specify which physical ports form a switch. For example, to create two physical switches that act as individual dummy switches -- allowing tagged or untagged traffic

Though the switch is capable of using this mode, the nature of the way the ports are used makes it less useful than 802.1q mode

3.2 Additional Resources

3.2.1 Netgate Training

Netgate training offers training courses for increasing your knowledge of pfSense® Plus products and services. Whether you need to maintain or improve the security skills of your staff or offer highly specialized assistance and improve your customer satisfaction; Netgate training has got you covered.

<https://www.netgate.com/training>

3.2.2 Resource Library

To learn more about how to use Netgate appliances and for other helpful resources, make sure to browse the Netgate Resource Library.

<https://www.netgate.com/resources>

3.2.3 Professional Services

Netgate TAC does not cover more complex tasks such as CARP configuration for redundancy on multiple firewalls or circuits, network design, and conversion from other firewalls to pfSense® Plus software. These items are offered as professional services and can be purchased and scheduled accordingly.

<https://www.netgate.com/our-services/professional-services.html>

3.2.4 Community Options

Customers who elected not to get a Netgate TAC plan, can seek assistance from the active and knowledgeable pfSense software community on the Netgate forum.

<https://forum.netgate.com/>

3.3 Warranty and Support

- One year manufacturer's warranty (optional second year warranty available at time of purchase only).
- Please contact Netgate for warranty information or view the [Product Lifecycle](#) page.
- All Specifications subject to change without notice

For support information, view [support plans](#) offered by Netgate.

See also:

For more information on how to use pfSense® Plus software, see the [pfSense Documentation](#) and [Resource Library](#).