CONTENTS

1 Out of the Box 2
2 How-To Guides 19
3 References 50
This Quick Start Guide covers the first time connection procedures for the Netgate® XG-7100 Desktop Firewall Appliance and will provide the information needed to keep the appliance up and running.
1.1 Getting Started

The basic firewall configuration begins with connecting the pfSense® appliance to the Internet. The pfSense 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 pfSense appliance. The other end of the same cable should be inserted into a port of the Cable or DSL modem. The modem provided by the ISP should have multiple LAN ports. Any port should work.

Next, connect one end of a second Ethernet cable to the LAN port (shown in the Input and Output Ports section) of the pfSense appliance. Connect the other end to the computer.
Warning: The default IP Address on the LAN subnet on the pfSense 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).

1.2 Initial Configuration

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

1. From the computer, log into the Web Interface

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

![Fig. 1: Enter the Default LAN IP Address](image)

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 Proceed to 192.168.1.1 (unsafe) to continue.

![Fig. 2: Click Advanced and then Proceed to 192.168.1.1 (unsafe)](image)

3. At the Sign In page, enter the default pfSense username and password and click Next.
• Default Username: admin
• Default Password: pfSense

1.2.1 The Setup Wizard

The following steps will step through the Setup Wizard for the initial configuration of the firewall.

Note: Ignore the warning to reset the ‘admin’ account password. One of the steps in the Setup Wizard is to change the default password.

1. Click Next to start the Setup Wizard.

Fig. 3: Click Next

2. Click Next after you have read the information on Netgate Global Support.

3. On the General Information page, use the following as a guide to configure the firewall.

   Hostname: Any desired name can be entered. For the purposes of this guide, the default hostname pfsense is used.

   Domain: The default localdomain 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).

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

   Time Server Hostname: Use the default pfSense time server address.

   Timezone: Select the time zone for the location of the firewall. For this guide, the Timezone will be set to America/Chicago for US Central time.

5. The WAN interface is the Public IP address the network will use to communicate with the Internet. Use the following information for the WAN configuration page.

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

   Default settings for the other items on this page should be acceptable for normal home users.
Fig. 4: Type in the DNS Server information and Click Next

Fig. 5: Change the Timezone and 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.

7. Change the Admin Password. Enter the same 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 dashboard, click Finish.

10. A final notification screen will appear stating that NO COMMERCIAL DISTRIBUTION… Click Accept to continue to the pfSense dashboard.

This completes the basic configuration for the pfSense firewall.

1.3 pfSense Overview

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

1.3.1 The Dashboard

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

Section 1 shows important system information such as the model, Serial Number, and Netgate Device ID for this pfSense firewall.

Section 2 identifies what version of pfSense software is installed, and if an update is available.
Fig. 7: Read and Click Accept

Fig. 8: The pfSense Dashboard
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.

![Re-run the Setup Wizard](image)

Fig. 9: Re-run the Setup Wizard

1.3.3 Backup and Restore

It is important to backup 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 pfSense 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.

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:
Fig. 10: Backup & Restore

Fig. 11: Click Download configuration as XML
Connecting to the Console Port  
Connect to the console. Cable is required.

Tip: To learn more about getting the most out of your pfSense appliance, sign up for a pfSense Training course or browse our extensive Resource Library.

1.4 Input and Output Ports

1.4.1 Ethernet Ports

<table>
<thead>
<tr>
<th>Interface Name</th>
<th>Port Name</th>
<th>Port Type</th>
<th>Port Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>WAN</td>
<td>ETH1</td>
<td>RJ-45</td>
<td>1 Gbps</td>
</tr>
<tr>
<td>LAN</td>
<td>ETH2-ETH8</td>
<td>RJ-45</td>
<td>1 Gbps</td>
</tr>
<tr>
<td>OPT1</td>
<td>IX0</td>
<td>SFP+</td>
<td>10 Gbps</td>
</tr>
<tr>
<td>OPT2</td>
<td>IX1</td>
<td>SFP+</td>
<td>10 Gbps</td>
</tr>
</tbody>
</table>

ETH1-8 are switched ports sharing 5 Gbps (2x 2.5 Gbps) to the Intel SoC. These ports can be isolated as an independent interface with the configuration of VLAN tagging as shown in Switch Ports Overview.

Warning: LAGG has limited support currently on the ethernet switchports (Load Balance mode only). For more information, review the Switch LAGG section of the XG-7100 Switch Overview page.

SFP+ Ethernet Ports (IX0-IX1)

IX0-IX1 are discrete ports, each with dedicated 10 Gbps back to the Intel SoC.

Below are some general guidelines for compatible SFP/SFP+ modules:

- Intel-branded SFP+ SR/LR Dual Speed (1G/10G) optical modules.
- Intel-branded SFP+ DA twin-ax cables that comply with SFF-8431 v4.1 and SFF-8472 v10.4 specifications. Note: Limited to 10G link speed (no 1G support).
- Third party SFP+ DA twin-ax cables that comply with SFF-8431 v4.1 and SFF-8472 v10.4 specifications. Note: Limited to 10G link speed (no 1G support).
- SFP+ AoCs (Active optical Cables). Note: Limited to 10G link speed (no 1G support).
- Third party SFP+ SR/LR dual speed 1G/10G) optical modules
- SFP+ active copper cables
• 1000BASE-SX / 1000BASE-LX optical modules

Specific known-working modules include:

<table>
<thead>
<tr>
<th>Model / Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finisar FTLF1318P3BTL</td>
<td>1000BASE-LX and 1G Fibre Channel (1GFC) 10km Industrial Temperature Gen 3 SFP Optical Transceiver</td>
</tr>
<tr>
<td>Finisar FTLX1471D3BCL</td>
<td>10Gb/s 10km Single Mode Datacom SFP+ Transceiver</td>
</tr>
<tr>
<td>Intel FTLX8571D3BCV-IT</td>
<td>1G/10G Dual Rate SFP Fiber Optical Transceiver Module</td>
</tr>
<tr>
<td>Finisar FTLX8574D3BCL</td>
<td>10GBASE-SR/SW 400m Multimode Datacom SFP+ Optical Transceiver</td>
</tr>
<tr>
<td>Finisar FTLF8519P3BNL</td>
<td>1000BASE-SX and 2G Fibre Channel (2GFC) 500m Extended Temperature SFP Optical Transceiver <strong>Note:</strong> Links at 1G, 2G is not supported</td>
</tr>
</tbody>
</table>

**Warning:** The ix(4) driver used for ports IX0-IX1 does not support ALTQ traffic shaping directly. Limiters or tagged VLAN interfaces may be used for ALTQ traffic shaping.

**Warning:** There is an Intel-supplied driver issue for the C3000, preventing 1Gbps and 10Gbps copper modules from being recognized on the SFP+ ports. Copper modules are not supported.

### 1.4.2 Other Ports, Buttons, and Indicators

- Semi-recessed Power (PWR) (performs a graceful shutdown of pfSense® software)
- Recessed Reset Button (performs a hard reset, immediately turning the system off)
- 1x USB 3.0
- Status LED
- Power (PWR) LED (green when powered on, red after a graceful shutdown)
- Console (Mini-USB)
- 2x USB 2.0
Note: When a graceful shutdown is performed, the XG-7100 Power (PWR) LED will turn red but will stay lit. The Ethernet activity LEDs will turn off. The power supply fan will continue to run. Turning off the rocker switch on the back of the power supply will eliminate all power to the system.

The power button should be depressed 3-5 seconds to initiate a graceful shutdown or to power on the device when the PWR LED is red.

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 web configurator to avoid data corruption.

### 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 Australia and New Zealand

This is a AMC Compliance level 2 product. This product is suitable for domestic environments.

### 1.5.6 CE Marking

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

### 1.5.7 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**

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
La direttiva europea 2002/96/EC richiede che le apparecchiature contrassegnate con questo simbolo sul prodotto e/o sull’imballo non siano smaltite insieme ai rifiuti urbani non differenziati. Il simbolo indica che questo prodotto non deve essere smaltito insieme ai normali rifiuti domestici. È responsabilità del proprietario smaltire sia questi prodotti sia le altre apparecchiature elettriche ed elettroniche mediante le specifiche strutture di raccolta indicate dal governo o dagli enti pubblici locali. Il corretto smaltimento ed il riciclaggio aiuteranno a prevenire conseguenze potenzialmente negative per l’ambiente e per la salute dell’essere umano. Per ricevere informazioni più dettagliate circa lo smaltimento delle vecchie apparecchiature in Vostro possesso, Vi invitiamo a contattare gli enti pubblici di competenza, il servizio di smaltimento rifiuti o il negozio nel quale avete acquistato il prodotto.

1.5.8 Declaration of Conformity

Česky[Czech]
NETGATE tímto prohlašuje, že tento NETGATE device, je ve shodě s základními požadavky a dalšími příslušnými ustanoveními směrnice 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.
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, tyypin 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”. (BMWi)

Ελληνικά [Greek]

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

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 citem ar to saist tajem noteikumiem.

Lietuviškai [Lithuanian]

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

Malti [Maltese]

Hawnhekk, Netgate, jiddikjara li dan NETGATE device, jikkonforma mal- ti ijet essenzjali 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 t mto vyhlasuje, e NETGATE device, sp a základné po iadavky a v etky príslo né 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 o wiadcza, e 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.
Prin prezenta, NETGATE declară că acest dispozitiv NETGATE este în conformitate cu cerințele esențiale și alte prevederi relevante ale Directivei 1999/5/CE.

1.5.9 Disputes

ANY DISPUTE OR CLAIM RELATING IN ANY WAY TO YOUR USE OF ANY PRODUCTS/SERVICES, OR TO ANY PRODUCTS OR SERVICES SOLD OR DISTRIBUTED BY RCL OR ESF WILL BE RESOLVED BY BINDING ARBITRATION IN AUSTIN, TEXAS, RATHER THAN IN COURT. The Federal Arbitration Act and federal arbitration law apply to this agreement.

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.

1.5.10 Applicable Law

By using any Products/Services, you agree that the Federal Arbitration Act, applicable federal law, and the laws of the state of Texas, without regard to principles of conflict of laws, will govern these terms and conditions of use and any dispute of any sort that might arise between you and RCL and/or ESF. Any claim or cause of action concerning these terms and conditions or use of the RCL and/or ESF website must be brought within one (1) year after the claim or cause of action arises. Exclusive jurisdiction and venue for any dispute or claim arising out of or relating to the parties’ relationship, these terms and conditions, or the RCL and/or ESF website, shall be with the arbitrator and/or courts located in Austin, Texas. The judgment of the arbitrator may be enforced by the courts located in Austin, Texas, or any other court having jurisdiction over you.

1.5.11 Site Policies, Modification, and Severability

Please review our other policies, such as our pricing policy, posted on our websites. These policies also govern your use of Products/Services. We reserve the right to make changes to our site, policies, service terms, and these terms
and conditions of use at any time.

1.5.12 Miscellaneous

If any provision of these terms and conditions of use, or our terms and conditions of sale, are held to be invalid, void or unenforceable, the invalid, void or unenforceable provision shall be modified to the minimum extent necessary in order to render it valid or enforceable and in keeping with the intent of these terms and conditions. If such modification is not possible, the invalid or unenforceable provision shall be severed, and the remaining terms and conditions shall be enforced as written. Headings are for reference purposes only and in no way define, limit, construe or describe the scope or extent of such section. Our failure to act with respect to a breach by you or others does not waive our right to act with respect to subsequent or similar breaches. These terms and conditions set forth the entire understanding and agreement between us with respect to the subject matter hereof, and supersede any prior oral or written agreement pertaining thereto, except as noted above with respect to any conflict between these terms and conditions and our reseller agreement, if the latter is applicable to you.

1.5.13 Limited Warranty

DISCLAIMER OF WARRANTIES AND LIMITATION OF LIABILITY

THE PRODUCTS/SERVICES AND ALL INFORMATION, CONTENT, MATERIALS, PRODUCTS (INCLUDING SOFTWARE) AND OTHER SERVICES INCLUDED ON OR OTHERWISE MADE AVAILABLE TO YOU THROUGH THE PRODUCTS/SERVICES ARE PROVIDED BY US ON AN “AS IS” AND “AS AVAILABLE” BASIS, UNLESS OTHERWISE SPECIFIED IN WRITING. WE MAKE NO REPRESENTATIONS OR WARRANTIES OF ANY KIND, EXPRESS OR IMPLIED, AS TO THE OPERATION OF THE PRODUCTS/SERVICES, OR THE INFORMATION, CONTENT, MATERIALS, PRODUCTS (INCLUDING SOFTWARE) OR OTHER SERVICES INCLUDED ON OR OTHERWISE MADE AVAILABLE TO YOU THROUGH THE PRODUCTS/SERVICES, UNLESS OTHERWISE SPECIFIED IN WRITING. YOU EXPRESSLY AGREE THAT YOUR USE OF THE PRODUCTS/SERVICES IS AT YOUR SOLE RISK.

TO THE FULL EXTENT PERMISSIBLE BY APPLICABLE LAW, RUBICON COMMUNICATIONS, LLC (RCL) AND ELECTRIC SHEEP FENCING (ESF) DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. RCL AND ESF DO NOT WARRANT THAT THE PRODUCTS/SERVICES, INFORMATION, CONTENT, MATERIALS, PRODUCTS (INCLUDING SOFTWARE) OR OTHER SERVICES INCLUDED ON OR OTHERWISE MADE AVAILABLE TO YOU THROUGH THE PRODUCTS/SERVICES, RCL’S OR ESF’S SERVERS OR ELECTRONIC COMMUNICATIONS SENT FROM RCL OR ESF ARE FREE OF VIRUSES OR OTHER HARMFUL COMPONENTS. RCL AND ESF WILL NOT BE LIABLE FOR ANY DAMAGES OF ANY KIND ARISING FROM THE USE OF ANY PRODUCTS/SERVICES, OR FROM ANY INFORMATION, CONTENT, MATERIALS, PRODUCTS (INCLUDING SOFTWARE) OR OTHER SERVICES INCLUDED ON OR OTHERWISE MADE AVAILABLE TO YOU THROUGH ANY PRODUCTS/SERVICES, INCLUDING, BUT NOT LIMITED TO DIRECT, INDIRECT, INCIDENTAL, PUNITIVE, AND CONSEQUENTIAL DAMAGES, UNLESS OTHERWISE SPECIFIED IN WRITING.

IN NO EVENT WILL RCL’S OR ESF’S LIABILITY TO YOU EXCEED THE PURCHASE PRICE PAID FOR THE PRODUCT OR SERVICE THAT IS THE BASIS OF THE CLAIM.

CERTAIN STATE LAWS DO NOT ALLOW LIMITATIONS ON IMPLIED WARRANTIES OR THE EXCLUSION OR LIMITATION OF CERTAIN DAMAGES. IF THESE LAWS APPLY TO YOU, SOME OR ALL OF THE ABOVE DISCLAIMERS, EXCLUSIONS, OR LIMITATIONS MAY NOT APPLY TO YOU, AND YOU MIGHT HAVE ADDITIONAL RIGHTS.
2.1 Configuring the Switch Ports

See also:

For an overview of how the switch ports are set up, see *Switch Ports Overview*.

2.1.1 Switch Section

From the pfSense webGUI, there is a menu option called *Switches* under the Interfaces drop-down. This section contains switch specific configuration options.

![Switches menu in pfSense webGUI]

Selecting *Switches* from the drop-down will bring up the Switch page with four sections:
2.1.2 Interfaces Section

There is also relevant configurations under Interfaces -> Assignments.

Interface Assignments

Under Interface Assignments, notice LAGG0 (UPLINK) is displayed as an available port but is not enabled in the list of interfaces. This is because the default configuration is only expecting VLAN tagged traffic so the VLAN child interface 4090 and 4091 are enabled instead.
<table>
<thead>
<tr>
<th>Port #</th>
<th>Port name</th>
<th>Port VID</th>
<th>Flags</th>
<th>State</th>
<th>Media</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ETH1</td>
<td>4090</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (1000Base-T &lt;full-duplex&gt;)</td>
<td>Active</td>
</tr>
<tr>
<td>2</td>
<td>ETH2</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>3</td>
<td>ETH3</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>4</td>
<td>ETH4</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>5</td>
<td>ETH5</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>6</td>
<td>ETH6</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>7</td>
<td>ETH7</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>8</td>
<td>ETH8</td>
<td>4091</td>
<td>FORWARDING</td>
<td>FORWARDING</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
</tr>
<tr>
<td>9</td>
<td>Uplink 2</td>
<td>1</td>
<td>HOST</td>
<td>FORWARDING</td>
<td>Ethernet 2500Base-KX &lt;full-duplex&gt;</td>
<td>Active</td>
</tr>
<tr>
<td>10</td>
<td>Uplink 1</td>
<td>1</td>
<td>HOST</td>
<td>FORWARDING</td>
<td>Ethernet 2500Base-KX &lt;full-duplex&gt;</td>
<td>Active</td>
</tr>
</tbody>
</table>

Fig. 3: 802.1q enabled (default)

<table>
<thead>
<tr>
<th>Port #</th>
<th>Port name</th>
<th>Flags</th>
<th>State</th>
<th>Media</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ETH1</td>
<td>DISABLED</td>
<td>Ethernet autoselect (1000Base-T &lt;full-duplex&gt;)</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ETH2</td>
<td>DISABLED</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>ETH3</td>
<td>DISABLED</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>ETH4</td>
<td>DISABLED</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>ETH5</td>
<td>DISABLED</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>ETH6</td>
<td>DISABLED</td>
<td>Ethernet autoselect (none)</td>
<td>No Carrier</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>ETH7</td>
<td>DISABLED</td>
<td>Ethernet autoselect (1000Base-T &lt;full-duplex&gt;)</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>ETH8</td>
<td>DISABLED</td>
<td>Ethernet autoselect (1000Base-T &lt;full-duplex&gt;)</td>
<td>Active</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Uplink 2</td>
<td>HOST</td>
<td>DISABLED</td>
<td>Ethernet 2500Base-KX &lt;full-duplex&gt;</td>
<td>Active</td>
</tr>
<tr>
<td>10</td>
<td>Uplink 1</td>
<td>HOST</td>
<td>DISABLED</td>
<td>Ethernet 2500Base-KX &lt;full-duplex&gt;</td>
<td>Active</td>
</tr>
</tbody>
</table>

Fig. 4: Port VLAN Mode
### Interfaces / Switch / VLANs

<table>
<thead>
<tr>
<th>System</th>
<th>Ports</th>
<th>VLANs</th>
<th>LAGGs</th>
</tr>
</thead>
</table>

#### XG-7100 Switch 802.1Q VLANs

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

<table>
<thead>
<tr>
<th>VLAN(s) table</th>
<th>VLAN group</th>
<th>VLAN tag</th>
<th>Members</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1</td>
<td></td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>4090</td>
<td>1,9,10t</td>
<td>WAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>4091</td>
<td>2,3,4,5,6,7,8,9,10t</td>
<td>LAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
</tbody>
</table>

![Save + Add Tag](save.png)

**Fig. 5:** 802.1q enabled (default)

---

#### XG-7100 Switch Port based VLANs

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

<table>
<thead>
<tr>
<th>VLAN(s) table</th>
<th>VLAN group</th>
<th>Port</th>
<th>Members</th>
<th>Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>1</td>
<td>2,3,4,5,6,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>2</td>
<td>1,3,4,5,6,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>3</td>
<td>1,2,4,5,6,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>4</td>
<td>1,2,3,5,6,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>5</td>
<td>1,2,3,4,6,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>6</td>
<td>1,2,3,4,5,7,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>7</td>
<td>1,2,3,4,5,6,8,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>8</td>
<td>1,2,3,4,5,6,7,9,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>9</td>
<td>1,2,3,4,5,6,7,8,10</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>10</td>
<td>1,2,3,4,5,6,7,8,9</td>
<td>Default System VLAN</td>
<td><img src="edit.png" alt="Edit" /></td>
</tr>
</tbody>
</table>

**Fig. 6:** Port VLAN Mode
VLANs

Under VLANs, the default WAN and LAN VLAN can be seen. Additional VLAN networks that will be used by the switch should be defined here with lagg0 as the parent interface.

Any additional VLAN interface added to the switch should also be added, enabled, and configured under Interface Assignments. Firewall rules will also be needed for new interfaces added.

LAGGs

Under LAGGs, the default lagg0 containing ix2 and ix3 can be seen. The lagg0 interface should not be modified.

2.1.3 Switch Configuration Examples

Dedicated LAN switch

In this scenario, SFP+ port ix0 will be configured as the WAN interface. ETH1-8 will be configured as a LAN switch.
For this specific example, I’ll perform the WAN interface reassignment over console. Re-assigning the WAN can be done from the webGUI as well.

This is what the default interface assignments look like on a XG-7100 without an addon NIC:

```
*** Welcome to pfSense 2.4.3-RELEASE (amd64) on pfSense ***
WAN (wan)      -> lagg0.4090  -> v4/DHCP4: 10.10.30.18/24
LAN (lan)       -> lagg0.4091  -> v4: 192.168.1.1/24
OPT1 (opt1)     -> ix0         ->
OPT2 (opt2)     -> ix1         ->

0) Logout (SSH only)                                      9) pfTop
1) Assign Interfaces                                     10) Filter Logs
2) Set interface(s) IP address                          11) Restart webConfigurator
3) Reset webConfigurator password                        12) PHP shell + pfSense tools
4) Reset to factory defaults                            13) Update from console
5) Reboot system                                        14) Enable Secure Shell (sshd)
6) Halt system                                           15) Restore recent configuration
7) Ping host                                             16) Restart PHP-FPM
8) Shell

Enter an option:  
```

In this example, \texttt{ix0} will be \texttt{WAN}, so select option \texttt{1} to re-assign \texttt{WAN} from \texttt{lagg0.4090} to \texttt{ix0}:

```
Enter an option: 1
```

```
Valid interfaces are:
ix0  00:a0:c9:00:00:00 (down) Intel(R) PRO/10GbE PCI-Express Network Driver,
ix1  34:12:78:56:01:01 (down) Intel(R) PRO/10GbE PCI-Express Network Driver,
ix2  00:a0:c9:00:00:02 (down) Intel(R) PRO/10GbE PCI-Express Network Driver,
ix3  00:a0:c9:00:00:02 (down) Intel(R) PRO/10GbE PCI-Express Network Driver,

Do VLANs need to be set up first?
If VLANs will not be used, or only for optional interfaces, it is typical to say no here and use the webConfigurator to configure VLANs later, if required.

Should VLANs be set up now [y/n]?  
```

No additional VLANs are needed for this, so enter \texttt{n} to continue.

Input \texttt{ix0} as the new \texttt{WAN} interface name:
Input the same default **LAN** interface of `lagg0.4091` for the **LAN** interface name and press `Enter` to complete the interface reassignment:

```
Enter the LAN interface name or 'a' for auto-detection
(ix0 ix1 ix2 ix3 lagg0.4090 lagg0.4091 or a): lagg0.4091
```

The interface assignments should show like this now:
At this point SFP+ port ix0 is now configured as the WAN interface. The LAN interface is still configured the same as the default. Next, the switch will need to be updated so that ETH1 (previously WAN) acts the same as ETH2-8. This will be done from the webGUI.

From the webGUI, pull up the Switch VLAN configuration under **Interfaces -> Switches -> VLANs:**

VLAN 4090 is no longer needed since **WAN** is dedicated to **ix0** now. You can either select **trash** on the row containing **4090** to delete this entry, or click **trash** to remove port 1 as a member:
For this example, I simply removed VLAN 4090 from the switch with Member 1. Now edit the VLAN 4091 entry to include Member 1 as shown below:

Next, update the PVID for ETH1 so that it uses VLAN 4091 rather than the old VLAN 4090. To do this, click on the Ports tab and click on the 4090 Port VID to modify it:
Then click on **Save**:

![Screen capture of the Interfaces / Switch / Ports page](image)

At this point, everything should be configured properly. ETH1-8 will act as a single LAN switch. One final step that should be performed is to remove the old VLAN 4090 from pfSense. So far VLAN 4090 was only removed from the switch. To remove the old VLAN, go to **Interfaces -> Assignments -> VLANs** and use ![click icon] on the 4090 row to remove this VLAN interface:

![Screen capture of the Interfaces / VLANs page](image)

### Two LAN switches

In this scenario, the LAN switch from the previous example will be split into two LAN switches.

A new LAN network should be created in pfSense first. Similar to the existing LAN interface, another VLAN interface should be used so the switch can segment traffic appropriately.

Create a new VLAN with `lagg0` as the parent under **Interfaces -> Assignments -> VLANs**:
Once the VLAN has been created, it should look something like this:

Add, enable, and configure the VLAN interface under Interfaces Assignments:
Also create any necessary firewall rules under **Firewall -> Rules**.

Now that pfSense knows of this new VLAN network, configure the switch so that ETH1-4 use the new network. To do this, go to **Interfaces -> Switches -> VLANs** and click the **Add Tag** button. Input the VLAN tag for the new network (same as the VLAN ID configured in the previous steps) and add ETH1-4 and PORT9-10 (uplinks) as members. Be sure 9 and 10 are marked as **tagged**.
Once this is done, delete the untagged members 1,2,3,4 from VLAN group 2 and click the Save button. The final result should look like this:

Lastly, update the Port VIDs to use the new 4081 VLAN rather than 4091 on ETH1-4 and click Save:
Now ETH1-4 act as a switch for the VLAN 4081 LAN and ETH5-8 act as a switch for the VLAN 4091 LAN.

**Trunking VLAN tagged traffic**

For expanding on the previous example, let’s assume there is a management VLAN of 4000 where devices are already tagged on this VLAN prior to hitting pfSense. Devices on this VLAN may come through on ETH8 but there may also be untagged client traffic.

First, create the management VLAN of 4000 in pfSense using the same steps in the previous example (up to the switch configuration part). Next, add the VLAN to the switch under Interfaces -> Switches -> VLANs. ETH8 and PORT9-10 should be added as members and all three will be marked as tagged:

Once it’s added, the final result should look like this:
Untagged traffic on ETH8 will be assigned a VLAN ID of 4091. ETH8 and the uplinks will also accept traffic that has already been tagged with a VLAN ID of 4000 as well.

2.2 Connecting to the Console Port

There are times when directly accessing the console is required. Perhaps webGUI or SSH access has been locked out, or the password has been lost or forgotten. This guide shows how to regain access directly through the console.

2.2.1 Install the Driver

A Silicon Labs CP210x USB-to-UART Bridge driver is used to provide access to the console, which is exposed via the USB Mini-b (5-pin) port on the appliance.

If needed, install an appropriate Silicon Labs CP210x USB to UART Bridge driver on the workstation used to connect with the system.

Windows
There are drivers available for Windows available for download.

Mac OSX
There are drivers available for Mac OSX available for download.

For Mac, choose the Macintosh OS X download.

Linux
There are drivers available for Linux available for download.

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

2.2.2 Connect a USB Cable

Next, locate an appropriate USB cable that has a USB Mini-b (5-pin) connector on one end and a regular USB Type A plug on the other end. These cables are commonly used with smaller USB peripherals such as GPS units, cameras, and so on.
Gently push the **USB Mini-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 Mini-b (5-pin)** connector on the system side completely. With most cables there will be a tangible “click”, “snap”, or similar indication when the cable is fully engaged.

### 2.2.3 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’s 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 **Silicon Labs CP210x USB to UART Bridge**. 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.

![Device Manager](image)

**Mac OSX**
The device associated with the system console is likely to show up as /dev/cu.SLAB_USBtoUART.

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`.

### 2.2.4 Launch a Terminal Program

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

**Windows**
For Windows it is recommended to run PuTTY or SecureCRT. An example of how to configure Putty is below.

**Warning:** Do not use Hyperterminal.

**Mac OSX**
For Mac OSX it is recommended to run `screen`, or `cu`. An example of how to configure screen is below.

**Linux**
For Linux it is recommended to run `screen`, PuTTY, `minicom`, or `dterm`. An example of how to configure Putty and screen is below.

**FreeBSD**
For FreeBSD it is recommended to run `screen` or `cu`. An example of how to configure screen is below.

**Client-Specific Examples**

**PuTTY**

Open PuTTY and select Session under Category on the left hand side. Next, set the Connection type to Serial. Then, set Serial line to the console port that was located above, in Locate the Console Port Device, and the Speed to 115200 bits per second.

Click the Open button and the console screen will be displayed.

**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.
Fig. 7: An example of using PuTTY in Windows.
sudo screen <console-port> 115200

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

2.2.5 Troubleshooting

No Serial Output

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

- Ensure the cable is correctly attached and fully inserted
- Ensure the terminal program is using the correct port
- 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**.
- Ensure the operating system is configured for the proper console (e.g. `ttyS1` in Linux). Consult the various operating install 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
Window > Translation 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, binary, or random characters check the following items:

- Ensure the terminal program is configured for the correct speed. (See No Serial Output)
- 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:

- Ensure the terminal program is configured for the correct speed for the installed operating system. (See No Serial Output)
- Ensure the installed operating system is configured to activate the serial console.
- Ensure the installed operating system is configured for the proper console (e.g. ttyS1 in Linux). Consult the various operating install guides on this site for further information.
- 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 Software

1. Please open a support ticket to request access to the factory firmware by selecting Firmware Access as the General Problem and then select Netgate XG-7100 Desktop for the platform. Make sure to include the serial number in the ticket to expedite access.

   Once the ticket is processed, the latest stable version of the firmware will be attached to the ticket, with a name such as:
   pfSense-netgate-memstick-XG-7100-2.4.5-RELEASE-amd64.img.gz

   **Note:** The pfSense® factory version is the version that is preinstalled on units purchased from Netgate. The factory image is optimally tuned for our hardware and contains some features that cannot be found elsewhere, such as the AWS VPN Wizard.

2. Write the image to a USB memstick. Locating the image and writing it to a USB memstick is covered in detail under Writing Flash Drives.

3. **Connect to the console port** of the pfSense device.

4. Insert the memstick into an open USB port and boot the system.

5. After a minute the pfSense loader menu will be displayed with a 3 second timer. Either allow the menu to timeout or press 1 (the default) to continue.

6. Console options are presented for serial console installation. The default option is vt100.

   Please choose the appropriate terminal type for your system.
   Common console types are:
   - ansi   Standard ANSI terminal
   - vt100  VT100 or compatible terminal
   - xterm  xterm terminal emulator (or compatible)
   - cons25w cons25w terminal
Note: Choosing the default *vt100* will work, but using *cons25w* on the XG-7100 will be easier to read.

7. The installer will automatically launch and several options will be presented. On Netgate firewalls, choosing **Enter** for the default options will complete the installation process.

   **Note:** Options such as the type of disk partition can be modified through this installation if required.

8. The installer will then prompt to choose the type of system being installed, which pre-configures device-specific defaults. Choose the option that exactly matches the unit being reinstalled. If the model is unknown, check the sticker on the bottom of the unit.

9. Once the installer is finished, choose **No** and press **Enter** to skip going to a shell.

10. The installer will then prompt to Reboot the system. Select **Reboot** and press **Enter**. The system will shutdown and reboot.

```
Dec 21 22:41:37 Waiting (max 60 seconds) for system process `vnlru` to stop... done
Waiting (max 60 seconds) for system process `syncer` to stop...
Waiting (max 60 seconds) for system process `bufdaemon` to stop... done
All buffers synced.
Uptime: 5m43s
umass0: detached
```

11. **Remove the USB drive** from the USB port. pfSense will restart automatically. If the USB drive remains attached, the system will boot into the installer again because by default the system firmware is configured so that a device plugged into the USB port will be booted with a higher priority.

   **Note:** For information on restoring from a previously saved configuration, go to **Backup and Restore**.

© Copyright 2020 Rubicon Communications LLC
2.4 M.2 SATA Installation

The XG-7100 Desktop has 32 GB of onboard eMMC storage. Optionally, a M.2 SATA drive can be installed as an upgrade or to bypass the onboard eMMC flash memory.

**Warning: Before proceeding:**

1. Backup your configuration file, if possible.
2. Unplug the system for at least 60 seconds to ensure all phantom power has dissipated.
3. Anti-static protection must be used throughout this procedure.
4. Any hardware damage incurred during this procedure is not covered by the hardware warranty.

**Note:** By default, the M.2 SATA drive will be the first drive recognized by pfSense® software. pfSense must be reinstalled on the M.2 SATA drive.

**Note:** The XG-7100 does not support NVMe drives.

The M.2 SATA slot is located underneath the XG-7100 system board, so the entire board must be removed. The standoff is for the 2280 (22mm x 80mm) M.2 SATA drive.

1. Turn the XG-7100 Desktop over and remove the four (4) case screws.
2. Unplug the Power Supply Connector from the system board, being careful not to flex the board.
3. Unplug the power supply connector and the fan connector from the system board, being careful not to flex the board.
   
   **Warning:** Be sure to pull from the connector, not the wires.

4. Remove the four (4) system board screws and gently slide system board away from the front faceplate until the board is free.
5. Turn the board over and locate the M.2 SATA slot.
6. Insert the gold leads of the M.2 SATA drive into the slot at the angle shown.
   
   **Note:** Be sure the drive label is facing up and can be seen. The drive slot is keyed and the drive can only go in one way. Do not force the drive into the slot.

7. Push the M.2 SATA drive down until it is parallel with the system board and use the screw to secure the M.2 SATA drive in place.
8. Turn the board over and place it into the chassis. Secure the system board with four (4) board screws.
9. Replace the power supply connector and fan connectors.
10. Slide the base back into the lid of the cace, and replace the case screws. **Use a hand screwdriver and be careful not to crossthread the screws.**
11. Reinstall the pfSense software on the new M.2 SATA drive.
Fig. 8: Case Screws
Fig. 9: Slide the Base of the System Away From the Lid
Fig. 10: Power Supply Connector and Fan Connector Location
Fig. 11: Board Screw Locations
Fig. 12: M.2 SATA Slot Location
Fig. 13: M.2 SATA Drive Properly Inserted into the Slot
Fig. 14: Secure the M.2 SATA Drive
Fig. 15: M.2 SATA Drive Installed
12. Restore your configuration backup if you have one.

2.5 BIOS Flash Procedure

2.5.1 Update via the GUI

**Warning:** This only works with Netgate systems running pfSense® version 2.3 or greater.

1. To install the package, navigate to **System > Package Manager > Available Packages**.
2. Click the **Install** button for the package named **Netgate_Coreboot_Upgrade**.
3. On the next page, click the **Confirm** button.
4. When the installation is complete a message will appear saying:
   
   pfSense-pkg-Netgate_Coreboot_Upgrade installation successfully completed

5. Now that the package is installed, navigate to **System > Netgate Coreboot Upgrade**.
6. This page will show you the latest version of Coreboot available and the current version that is running on the system. If you happen to be on an older version of Coreboot then an **Update** button will be available to click.

**Important:** Pay close attention to any disclaimers presented. Some devices require a physical reboot or some step unique to that device.
3.1 Switch Ports Overview

3.1.1 Interface Links

In addition to two SFP+ interfaces, there is also an ethernet switch on the XG-7100. There are eight ethernet ports on this switch that are physically accessible - these interfaces are referred to as ETH1-ETH8. In addition to those 8 ports, there are also three additional ports that operate behind the scenes - PORT 0, PORT 9 (ix2), and PORT 10 (ix3).

ETH1-ETH8 are gigabit switchports.

PORT 9-10 are 2.5 Gbps uplink switchports. These two ports connect the ethernet switch to a Denverton SoC. The SFP+ interfaces (ix0 and ix1) also connect to this SoC.

The diagram below demonstrates how these interfaces are connected:
From the operating systems perspective, there are four physical interfaces present:

- `ix0` - 10Gbps SFP+
- `ix1` - 10Gbps SFP+
- `ix2` - 2.5 Gbps (2500-Base-KX, switch link to SoC/CPU)
- `ix3` - 2.5 Gbps (2500-Base-KX, switch link to SoC/CPU)

### 3.1.2 Switch LAGG

`ix2` and `ix3` (switch uplink ports 9 and 10), are configured as a load-balanced LAGG. This provides an aggregate uplink capable of 5Gbps for ethernet switchports ETH1-8. This is further demonstrated in the diagram below:
When data is received on ETH1-8, the switch is capable of utilizing LAGG to determine whether that data should be sent out of PORT 9 or PORT 10. That data then passes over one of two 2.5Gbps switch links (PORT 9/10) to the SoC. Data coming from PORT 9 has a direct line to ix2 and data from PORT 10 has a direct line to ix3.

pfSense LAGG will then take in traffic from both ix2 and ix3 as though it came in on a single interface, lagg0. The same concept applies to traffic sourcing from the pfSense LAGG to the switch LAGG.

### 3.1.3 Switch VLANS

By default, ETH1 on the switch is configured as a WAN interface and ETH2-8 are configured as the LAN interface. These eight switchports are customizable and each can be configured to act as an independent interface. For example, all of these configurations are possible:

- ETH1-8 dedicated as a LAN switch
- ETH1-4 configured as a switch for LAN network A and ETH5-8 configured as a switch for LAN network B
- ETH1-8 configured as individual network interfaces
- ETH1 configured for WAN A, ETH2 configured for WAN B, ETH3 configured for LAN network A, ETH4-6 configured as a switch for LAN network B, and ETH8 configured as a H/A sync port.

These scenarios are possible by utilizing VLANs. Each of the switchports (ETH1-8 and PORT9-10) are VLAN aware interfaces. They are capable of functioning like 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, two VLANS are used to create the ETH1 WAN interface and ETH2-8 LAN interface:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAN</strong></td>
<td><strong>VLAN 4090</strong></td>
</tr>
<tr>
<td><strong>LAN</strong></td>
<td><strong>VLAN 4091</strong></td>
</tr>
</tbody>
</table>

ETH1-8 are configured to act as Access ports.
• When data comes into the ETH1 interface, a VLAN tag of 4090 is added to the ethernet frame.

• When data comes into interfaces ETH2-8, a VLAN tag of 4091 is added to the ethernet frame.

PORT9-10 are configured to act as Trunk ports.

• By default, only ethernet frames containing a VLAN tag of 4090 or 4091 are allowed over the trunk.

Each VLAN configured on the switch uses the LAGG interface as its parent interface. For example, the default interface assignment for WAN and LAN:

```
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>WAN</td>
<td>lagg0.4090</td>
</tr>
<tr>
<td>LAN</td>
<td>lagg0.4091</td>
</tr>
</tbody>
</table>
```

This means **vlan4090** and **vlan4091**, as well as any other VLANs created for the switch, all share the same 5Gbps LAGG uplink across two 2.5Gbps links. The visual below demonstrates how the VLAN tagging works along with the traffic flow:

**Note**: Traffic leaving and entering the ETH1-3 interfaces in the visual above are untagged. Devices sending/receiving traffic over these ports do not need to be VLAN aware. The VLAN tagging that occurs within the switch is completely transparent to clients. It’s used solely for segmenting switch traffic internally.

Aside from being able to specify whether a switchport 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 you have numerous VLANs on your network and want 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, you can specify which physical ports form a switch. For example, if I want to create two physical switches that act as individual dummy switches - allowing tagged or untagged traffic, I could configure Port VLAN Mode like so:

```
// UPLINKS
VLAN group 9, Port 9, Members 1,2,3,4,10
VLAN group 10, Port 10, Members 1,2,3,4,9

// SWITCH-A
VLAN group 1, Port 1, Members 2,3,4,9,10
VLAN group 2, Port 2, Members 1,3,4,9,10
VLAN group 3, Port 3, Members 1,2,4,9,10
VLAN group 4, Port 4, Members 1,2,3,9,10

// SWITCH-B
VLAN group 5, Port 5, Members 6,7,8
VLAN group 6, Port 6, Members 5,7,8
VLAN group 7, Port 7, Members 5,6,8
VLAN group 8, Port 8, Members 5,6,7
```

With this configuration in place, ETH1-8 now function like so:
// SWITCH-A
PORT 1 = ETH1
PORT 2 = ETH2
PORT 3 = ETH3
PORT 4 = ETH4
PORT 9 = UPLINK 1
PORT 10 = UPLINK 2

// SWITCH-B
PORT 5 = ETH5
PORT 6 = ETH6
PORT 7 = ETH7
PORT 8 = ETH8

SWITCH-A

ETH1-4 can talk to each other and to the LAGG uplink. PORT9-10 are members of this switch... this is required for this switch to have uplink to pfSense.

SWITCH-B

ETH5-8 can talk to each other but because PORT9-10 are not included as members, clients connecting to ETH5-8 can only talk to other clients on ETH5-8. They will not be able to reach the SoC where ix2 and ix3 are defined, so they never reach pfSense. This can be useful if you want a device other than pfSense to act as the primary uplink for those connected clients.

Since WAN and LAN are assigned to lag<sup>0</sup>.<sub>4090</sub> and lag<sup>0</sup>.<sub>4091</sub>, if Port VLAN Mode is enabled, be sure to update the LAN and WAN interface assignment to reference the appropriate VLAN. Also remember to create the new VLANs with lag<sup>0</sup> as the parent interface.

If Port VLAN Mode is being used to handle untagged traffic, the LAGG0 interface should be added, enabled, and configured under Interface Assignments.

See also:

For more information on how to configure the switch ports, see Configuring the Switch Ports.

### 3.2 Additional Resources

#### 3.2.1 Netgate Training

Netgate training offers training courses for increasing your knowledge of pfSense® products and services. Whether you need to maintain or improve the security skills of your staff or offer highly specialized support 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 your pfSense appliance and for other helpful resources, make sure to browse our Resource Library.

https://www.netgate.com/resources
3.2.3 Professional Services

Support 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®. 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

If you elected not to get a paid support plan, you can find help from the active and knowledgeable pfSense community on our forums.

https://forum.netgate.com/

3.3 Warranty and Support

- One year manufacturer’s warranty.
- Please contact Netgate for warranty information or view our Product Lifecycle page.
- All Specifications subject to change without notice

For support information, view our support plans.

See also:

For more information on how to use pfSense® software, see the pfSense Documentation and Resource Library.