PORTrockIT Bonding

Setup Guide

Eli-v6.4.84

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1 Introduction

This document is intended to guide a user through the setup of a network bond on a Bridgeworks PORTrockIT product. It covers an outline of the different modes that can be used for a network bond, as well as an example of how to set up a single network bond on the Bridgeworks PORTrockIT. Creating more network bonds on the PORTrockIT will follow the same procedure.

Further information about the different settings available for bonds is available in the PORTrockIT product manual.

This guide does not provide details on how to set up a network bond on other equipment that could be connected to the Bridgeworks PORTrockIT, such as network switches. For further guidance on setting up network bonds for other equipment, please reference the manufacturer's documentation.

1.1 Bonding Overview

Network bonding is when multiple physical interfaces are grouped together to act as a single interface. This can create two benefits: fault tolerance, where one or more links can go down but the link remains active, and load balancing, where network traffic can be balanced between multiple physical links.

Network bonding may also be known as *NIC Teaming*, *Link Bundling*, and *Port Trunking*.

1.2 Example Topology

Below is an example of a network topology that could be implemented to make use of network bonds with a PORTrockIT Node:
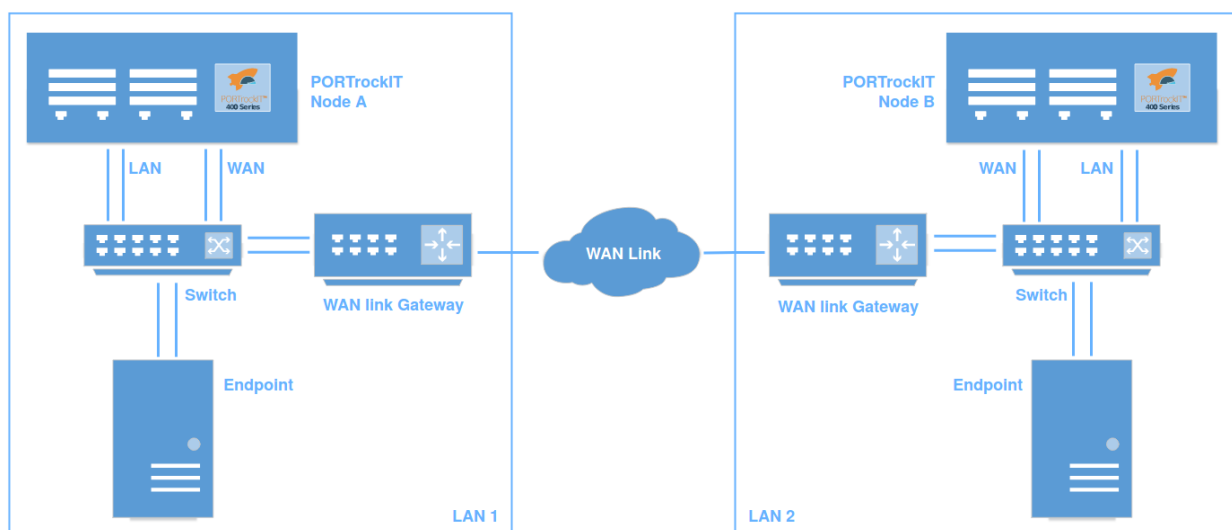
In this example, bonding is used for every link on the LAN. Using the *Active Backup* or *Broadcast* aggregation modes will provide fault tolerance, allowing single links to go down without a loss of connectivity. Using *LACP (IEEE 802.3ad)* or *Balance Round Robin* modes will provide fault tolerance as well as increase the bandwidth available for network transfers. See Section 2.1: Aggregation Modes for more detail about aggregation modes.

2 Definitions

LACP A vendor-independent network bonding protocol for Ethernet, defined in IEEE 802.1AX, previously IEEE 802.3ad.

Fault Tolerance The ability for a network bond to remain active despite one or more of the physical links going down.

Load Balancing The ability for a network bond to balance traffic between multiple physical links, increasing the total speed of the link and reducing the load placed on the component links.

LAG Short for *Link Aggregation Group*, a LAG is a logical grouping of physical network ports used for a single bond/aggregation. The name of a LAG may differ on other equipment. *Trunk Groups* is a common alternative name for LAGs. Cisco® switches may refer to LAGs as *EtherChannel* groups.

Network Switch In the context of this guide, a network switch will refer to the device that the bonded links are directly connected to. This could be a dedicated network switch or another system which supports the selected aggregation mode.

2.1   Aggregation Modes

Balance Round Robin When a network bond is in this mode every interface in the bond will be used for sending traffic. Each packet will be sent out of the next interface in turn (Round Robin). This mode provides load balancing because traffic is distributed between every interface in the bond. This mode also provides fault tolerance because traffic will not be sent down a link once it has been detected as down. Some disruption can be seen when the bond has not yet stopped using a dead link. The bandwidth of the bond will be the combined bandwidth of all active interfaces in the bond.

Active Backup When a network bond is in this mode only one interface in the bond will be active at a time. Once the active link goes down the bond will start sending traffic out of a new active interface. This mode does not provide load balancing because traffic is only using a single link at a time. This mode does provide fault tolerance because when an interface goes down the traffic will start to be sent out of another interface in the bond. Each interface in the bond can be connected to different network switches to create further fault tolerance. Some disruption can be seen when the bond is changing its active interface. The bandwidth of the bond will be the bandwidth of the currently active link.

Broadcast When a network bond is in this mode every interface will be used for sending traffic. Each packet will be sent out of every interface in the bond at the same time. This means the device connected to the PORTrockIT network bond will receive every packet multiple times. This mode does not provide load balancing because every link is used for the same traffic. This mode does provide fault tolerance because when a link goes down the traffic will continue to be sent through all other links. Each interface in the bond can be connected to different network switches to create further fault tolerance. Disruption is not caused when a link goes down because the bond doesn't need to change its active interfaces. The bandwidth of the bond will be limited to the bandwidth of the slowest active link.

LACP (IEEE 802.3ad) This mode is an implementation of the IEEE 802.1AX (previously IEEE 802.3ad) standard. Interfaces within the bond will be split up in to LAGs based on their link speed and duplex settings. The bond will only ever use one of these LAGs at any time for

sending traffic. Packets will be sent out of an interface selected using the result of an XOR operation on the destination MAC address of the packet. When a LAG no longer has active links a re-selection process happens and the LAG with the next highest bandwidth is selected. The PORTrockIT provides advanced settings for specifying when and how a bond undertakes the re-selection process when in this mode. This mode provides load balancing when there are multiple interface in a LAG because all interfaces in the LAG will be used to send traffic. This mode provides fault tolerance because when a link inside a LAG goes down the other links are used. When a LAG goes down the next available LAG will be used.

For information about the network switch requirements for each aggregation mode, please reference Chapter 3: Requirements.

3 Requirements

The device that the PORTrockIT is connected to will need to be set up to be compatible with the mode selected on the PORTrockIT.

Balance Round Robin This mode requires that the network ports on the connected switch are grouped in to a LAG. The network switch must support traffic striping for this mode to benefit from an incoming bandwidth greater than that of a single link.

Active Backup This mode should work when connected to any network switch. This mode can work while connected to different switches, providing extra fault tolerance.

Broadcast This mode requires that the network ports on the connected switch are grouped in to a LAG. This mode can work while connected to different switches, providing extra fault tolerance.

LACP (IEEE 802.3ad) This mode requires a network switch that is compatible with LACP (IEEE 802.3ad/802.1AX). Cisco® switches are compatible using Cisco® EtherChannel in LACP mode.

This guide will not give instructions for creating network bonds for other products. For information about setting up network bonds for other products, please reference the manufacturer's documentation.

This guide will assume that the bonded interfaces are directly connected to a hardware network switch. It is not recommended to use network bonding when connected to a virtual network switch. For detail about network bonding and virtual network switches please reference the manufacturer's documentation.

Every port that makes up a bond must have the same mapped protocols for the bond to inherit the protocol. If one interface in the bond does not have the correct mapped protocol then the bond will not be able to use it.

For more general Node setup information, see the appropriate guides/manuals for your platform and specific PORTrockIT product.
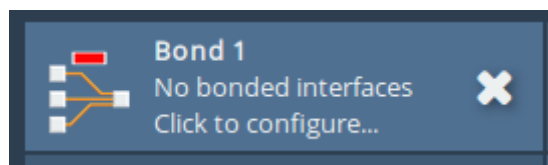
4 Procedure

4.1 Adding a new bond

To add a new network bond first navigate to the *Network Connections* page. At the bottom of the page, press the *Add Bond* button.
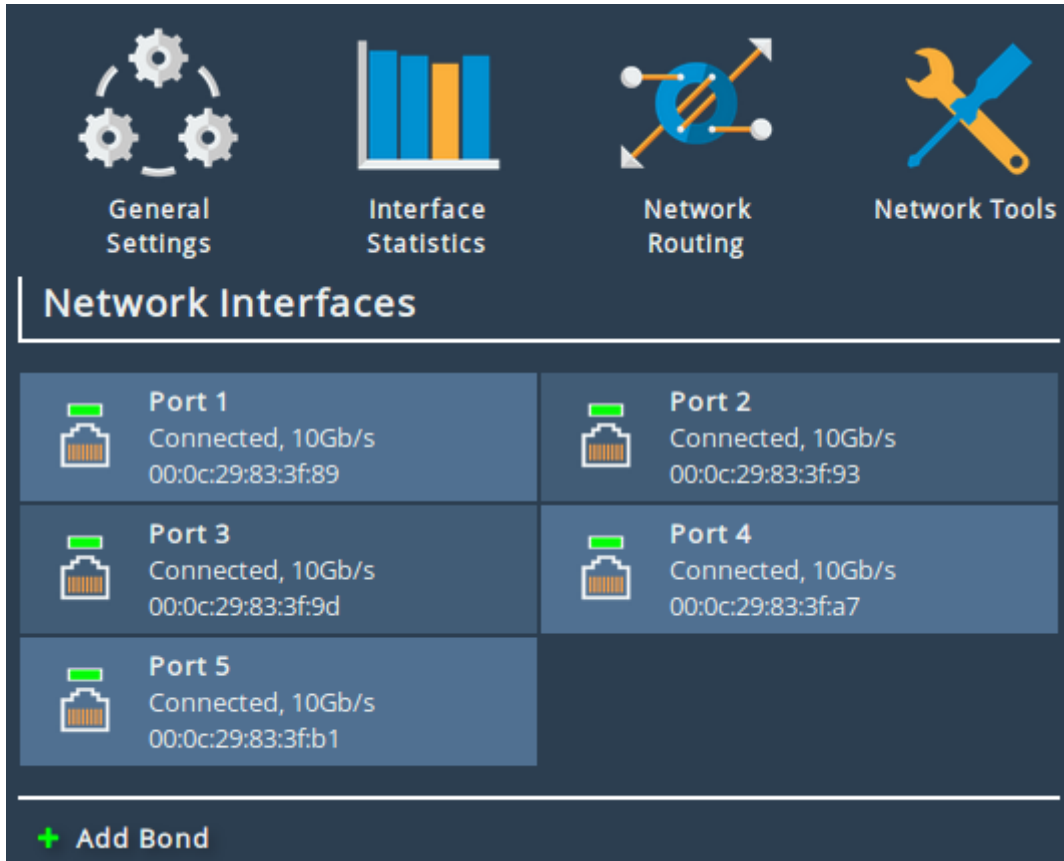
A new interface will appear in the *Network Interfaces* list named *Bond 1*.

Since this is a new bond it does not yet have have any interfaces so it is in a down state.

4.2 Adding interfaces to a bond

To add a new interface to the bond first navigate to the bonds configuration page by clicking on the bond in the *Network Interfaces* list on the *Network Connections* page. You will be navigated to this page:

Link Status

Link State:	Down	Link Speed:	0Mb/s
RX Bytes:	0	TX Bytes:	0
RX Errors:	0	TX Errors:	0

Settings

IPv4 Address:

MTU: 1500

Mapped Protocols

None

Linked Interfaces

No interfaces currently added

+ Add Interface

Port Settings

MTU Size: 1500

Enable Routing: ☐

○ **Use DHCP to assign an IP address automatically**
◉ **Use the following IP address:**

IP Address:

Netmask:

Gateway:

Bonding Options

Aggregation Mode: Balance Round Robin ▼

Down Delay: 0

Packets Per Interface: 1

Primary Interface Re-Selection: As soon as possible ▼

IGMP Membership Reports: 1

Up Delay: 0

Interface VLANs

No VLANs configured

Clicking on the *Add Interface* button under the *Linked Interfaces* section will open a dialogue for adding a new interface to the bond. Select the interface you would like to add to the bond in the dropdown and click *OK*.
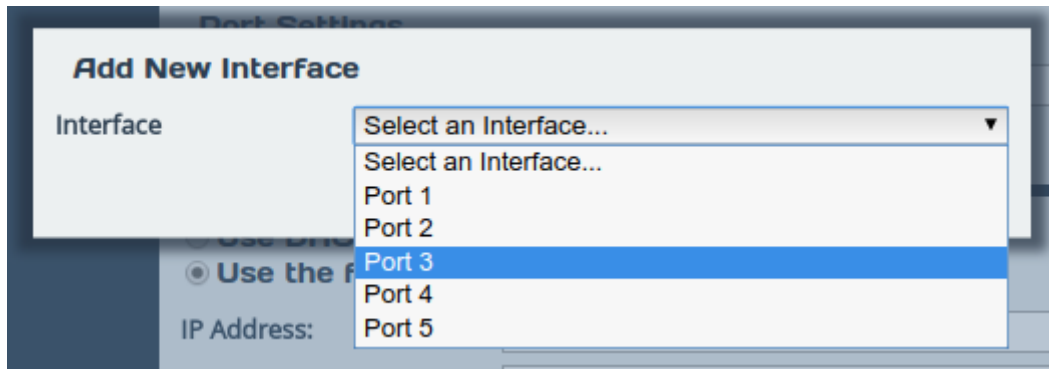
This process should be repeated for add each interface you would like to add to your bond. In this example we will add both of our WAN ports (*Port 2* and *Port 3*).

When an interface is added to a bond its existing configuration will be cleared. If the interface has any VLANs these will also be lost.

Each network interface that was added to the bond will now display under the *Linked Interfaces* list. These interfaces will be *Queued to be added* to the bond, but will not yet actually be added to the bond. To finish adding the interfaces press the *Save* button at the bottom of the page.
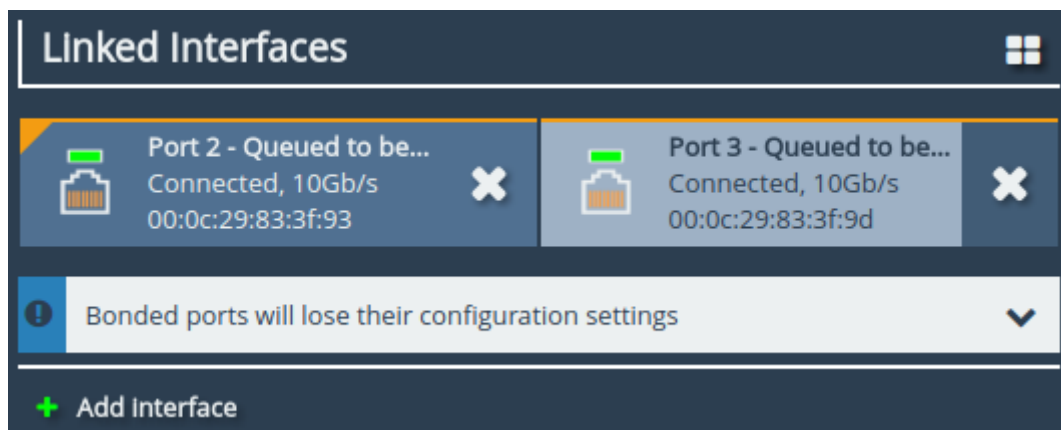
If the *Cancel* button is pressed, or you navigate away from the bonds configuration page without pressing the *Save* button, then the interfaces will not be added to the bond.

After pressing the *Save* button you will be navigated back to the *Network Connections* page. Under the *Network Interfaces* list the bond will now be displayed as connected and will display the bonds link speed and MAC address.
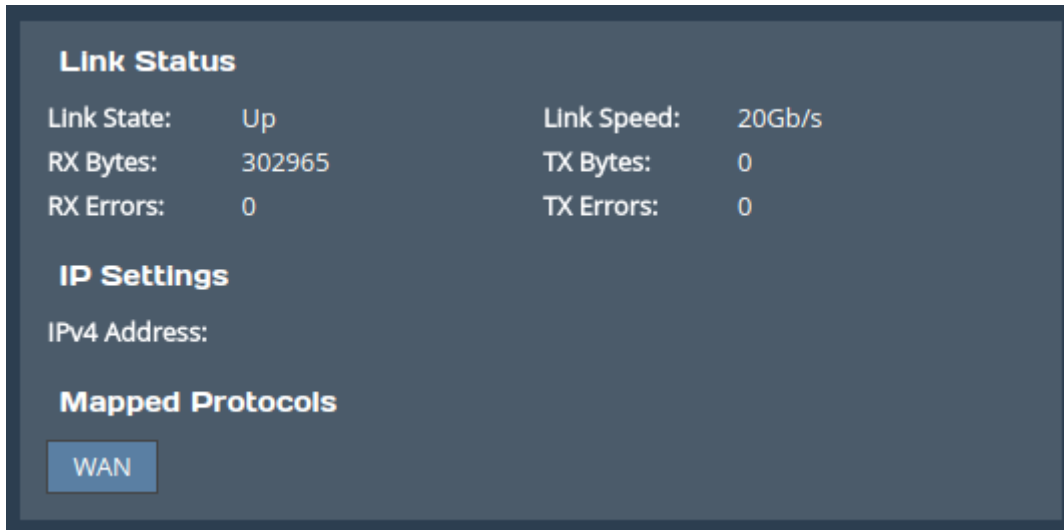
The interfaces that were added to the bond will no longer be visible from the *Network Interfaces* list.
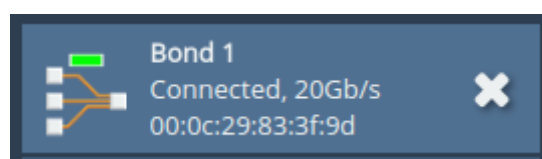
4.3   Mapped Protocols

The mapped protocols on a bond are inherited from the common protocols mapped to the interfaces that are added to the bond. In this example we have added two interfaces with a WAN mapping to our bond, so the bond inherits this WAN mapping. If another interface was added that didn't have a WAN mapping then the bond would lose its WAN mapping.

The mapped protocols can be viewed for any interface or bond by navigating to the interfaces configuration page. Below you can see that our bond has inherited the WAN mapping from its bonded interfaces.
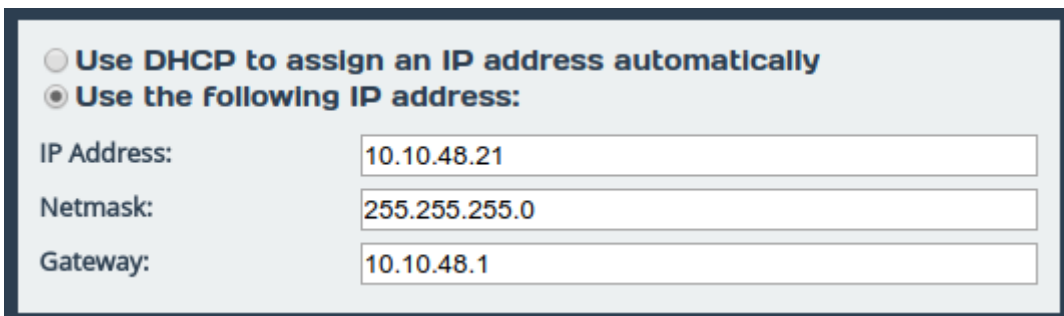
4.4   Setting the IP Address of the bond

A bond essentially behaves just like a normal interface on a PORTrockIT. This means IP configuration follows the same process as it would with any other interface. To set the IP address of a bond click on the bond in the *Network Interfaces* list on the *Network Connections* page.

From the bonds configuration page simply enter the desired IP address, netmask and gateway and press the *Save* button at the bottom of the page. For these settings to take effect the PORTrockIT will need to be rebooted.
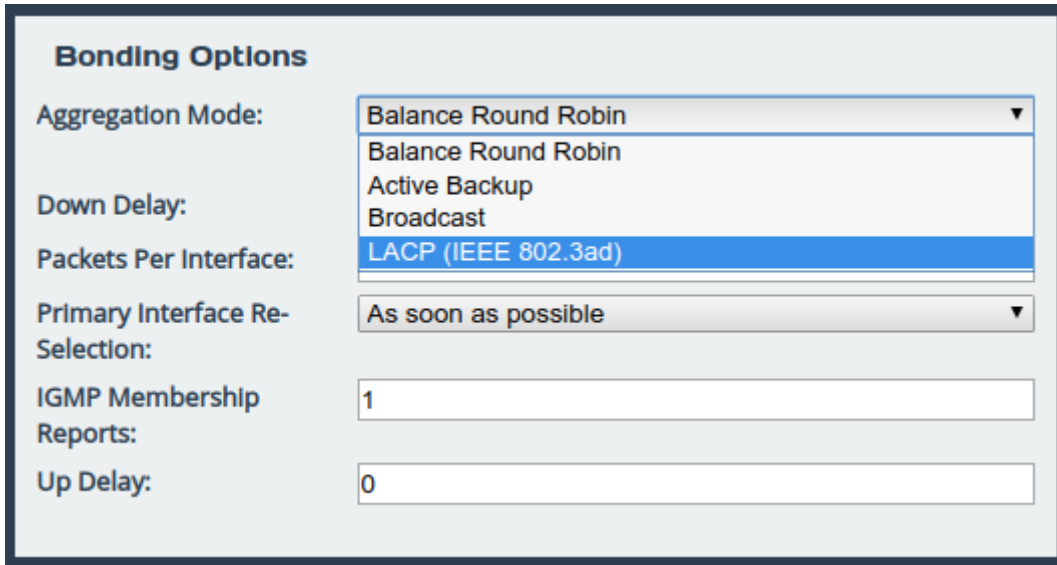
4.5   Setting the aggregation mode of the bond

To change the mode of the bond, navigate to the bonds configuration page by clicking on the bond in the *Network Interfaces* list on the *Network Connections* page.

From the bonds configuration page, the mode can be changed using the *Aggregation Mode* dropdown under the *Bonding Options* section.

For this example we will use *LACP (IEEE 802.3ad)* mode since we are connected to a network switch that supports this mode.

For more information about the different aggregation modes see Section 2.1: Aggregation Modes. For more information about the network switch requirements for each mode see Chapter 3: Requirements.

Each aggregation mode supports a different set of advanced configuration options. For further information please reference the PORTrockIT manual.

4.6   Using the bond

Once the bond is set up with interfaces, an IP address, and the correct mode selected, the bond will function like a normal network interface.

For any further setup please follow the appropriate guide or PORTrockIT manual.

4.7   Removing an interface from a bond

If you would like to remove an interface from a network bond, simply navigate to the bonds configuration page by clicking on the bond in the *Network Interfaces* list on the *Network Connections* page.

From the bonds configuration page, press the white *X* next to the interface you would like to remove from the bond. After pressing the *X* a *Delete* button should appear. Pressing the *Delete* button will queue the interface to be removed from the bond.

The interface will not be removed from the bond until the *Save* button is pressed. If the *Cancel* button is pressed or the page is navigated away from then the interface will remain bonded.
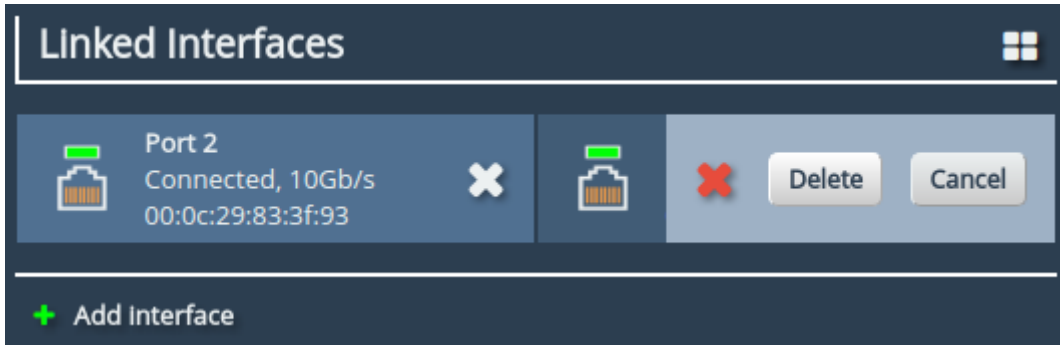

When the interface is removed from the bond it will return to the *Network Connections* page and can be configured as a normal interface.

4.8   Removing a bond

To remove a bond first navigate to the *Network Connections* page. From here press the white *X* next to the bond you would like to delete and press *Delete*.

When a bond is deleted all of its configuration will be cleared. This includes all bond options and VLANs given to the bond.
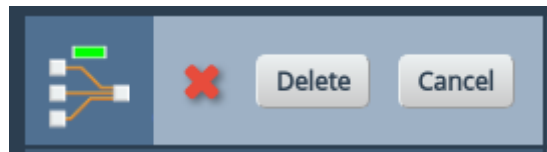
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6 Useful Links

The following section contains links to other guides and FAQs. Support is available through our website: `https://support.4bridgeworks.com/`

The following resources are available online:

- User Manuals

- Installation Guides

- General FAQ

- AWS FAQ

If your question is not answered in our documentation, please submit a ticket through our website.