TECHNICAL NOTE

STORMSHIELD NETWORK SECURITY

LEVEL 2 ENCAPSULATION

Product concerned: SNS 2.3 and higher, SNS 3.x

Date: April 21, 2021

Reference: sns-en-level_2_encapsulation_technical_note

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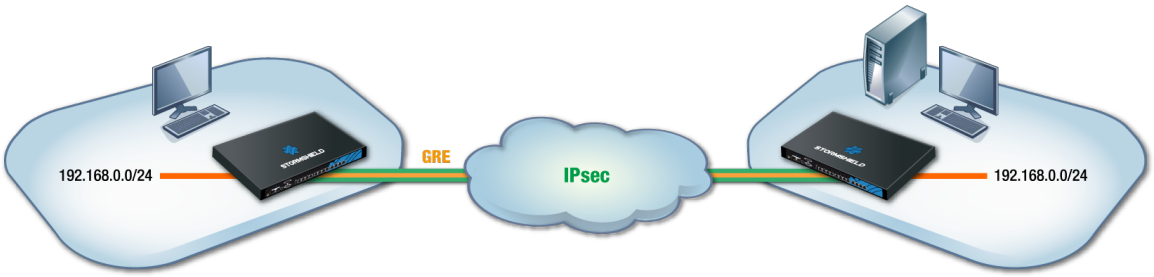
Introduction

From firmware version 2.x onwards, Stormshield Network firewalls can encapsulate Level 2 traffic in GRE (Generic Routing Encapsulation) tunnels based on GRETAP interfaces. Since GRE tunnels are not encrypted natively, exchanges can be secured by making GRE traffic go through IPSec.

The use of GRE tunnels based on GRETAP interfaces makes it possible, for instance, to link sites with the same address range through a bridge. DHCP services can therefore be shared between both sites. This kind of tunnel also allows transporting VLANs identified and explicitly declared on the firewalls between two sites

Architectures shown

Case 1: bringing together two sites sharing the same address range

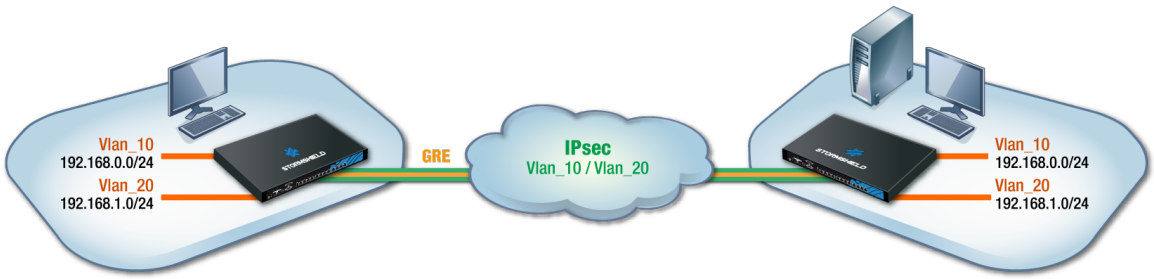


This section of the technical note sets out the scenario of a company seeking to link two sites sharing an identical address range through a bridge. Services, for example DHCP, and shared network resources will therefore be considered local services, regardless of the site. To secure exchanges, GRE traffic will be encrypted in an IPsec tunnel.

NOTE

IP addresses assigned to devices on both sites must of course be unique.

Case 2: transporting VLAN in a GRE tunnel



This section of the technical note sets out the scenario of a company seeking to share two VLANs between two sites through a GRE tunnel secured by encryption (IPSec). It covers the specific configurations in the creation of GRETAP interfaces, IPSec tunnels, VLAN settings and their attachment to GRETAP interfaces.

IMPORTANT

A bridge is needed for each VLAN transported. It is therefore essential that you ensure the firewall supports the number of bridges planned.

The `system property` command (**Système** > **Console CLI** menu) allows you to get this information:

CONSOLE CLI

```
SYSTEM      : System commands
USER        : User related functions
VERSION     : Display server version
system property
[Result]
Type=Firewall
Model=V50-A
MachineType=amd64
Version=
ASQVersion=7.3.0
SerialNumber=V50XXA3E0000017
MTUmax=9198
LACP=0
Bridge=8
```

Case 1: bringing together two sites sharing the same address range

Configuring the firewall on Site A

Creating the GRETAP interface

In the **Network** > **Interfaces** module, click on **Add** and select **Add a interface**. Enter the following mandatory fields:

Global configuration

Name: assign a name to the GRETAP interface (gretap in the example).

Interface Configuration

Bridge: select an existing bridge on the firewall. This may be a bridge created by the default configuration or a bridge created specifically for this purpose.

NOTE

Bridges cannot be created in the GRETAP interface creation wizard.

NOTE

It is possible to not assign any bridge to the interface by selecting the option **Create an inactive GRETAP interface**. The interface can then be enabled later by moving it to a bridge.

GRETAP tunnel configuration

Tunnel source: select the physical interface through which GRE traffic will travel on the firewall. In the example given, this is the **Firewall_out** interface.

Tunnel destination: select an object bearing the public IP address of the remote firewall (**Remote_Firewall** in the example).

Click on **Finish** then **Apply** to confirm the creation of the GRETAP interface.

Creating IPsec tunnels

In the *Encryption policy - Tunnels* tab of the **VPN** > **IPsec VPN** module, click on **Add** and select **Site-to-site tunnel**. Fill in the various fields suggested by the tunnel creation wizard and confirm:

Local network: select the physical interface bearing the GRE tunnel (**Firewall_out** in the example).

Remote network: select an object bearing the public IP address of the remote firewall.

Peer selection: create (or select it if it exists) a peer whose remote gateway will be an object bearing the public IP address of the remote firewall.

NOTE

For further detail on how to create a peer using authentication by pre-shared key or certificates, please refer to the documents *IPsec VPN - Authentication by pre-shared key* and *IPsec VPN - Authentication by certificate*.

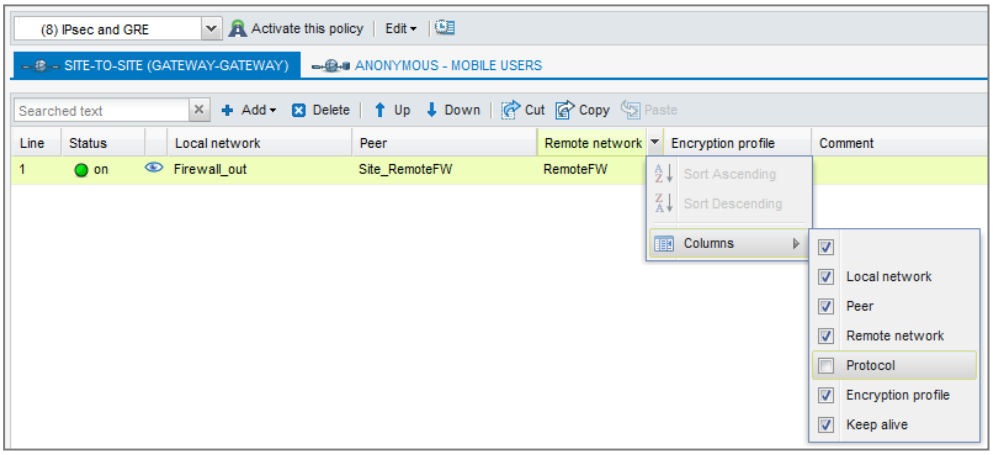
NOTE

The version of the IKE protocol for this peer has to be the same as:

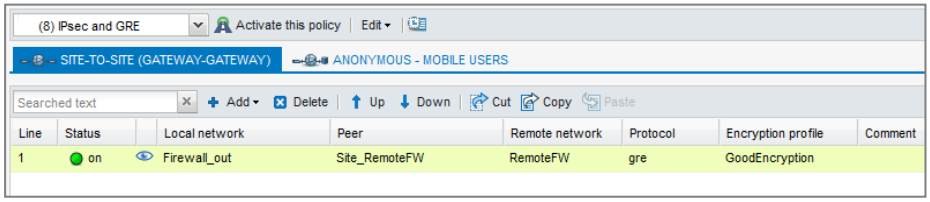
the one used on the remote firewall,

the one for the peers used in the other rules of the IPsec policy in question.

In order to prevent the setup of IPsec tunnels for protocols other than GRE and thereby preventing the encryption of traffic such as ICMP (ping), the GRE protocol can be specified in the **Protocol** column. If this column does not display, roll your mouse over the title of any column and expand the pop-up menu by clicking on the arrow. Select **Columns** then check **Protocol**:



The IPsec VPN policy will therefore resemble:



NOTE

Since the firewall initiated the sending of GRE network packets, filter rules therefore do not need to be created for this protocol.

Configuring the firewall on Site B

Creating the GRETAP interface

Following the method used on site A's firewall, create the GRETAP interface:

Global configuration

Name: assign a name to the GRETAP interface

Interface configuration

Bridge: select an existing bridge on the firewall. This may be a bridge created by the default configuration or a bridge created specifically for this purpose.

GRETAP tunnel configuration

Tunnel source: select the physical interface through which GRE traffic will travel on the firewall. In the example given, this is the **Firewall_out** interface.

Tunnel destination: select an object bearing the public IP address of the remote firewall (**Remote_Firewall** in the example).

Click on **Finish** then **Apply** to confirm the creation of the interface.

Creating IPsec tunnels

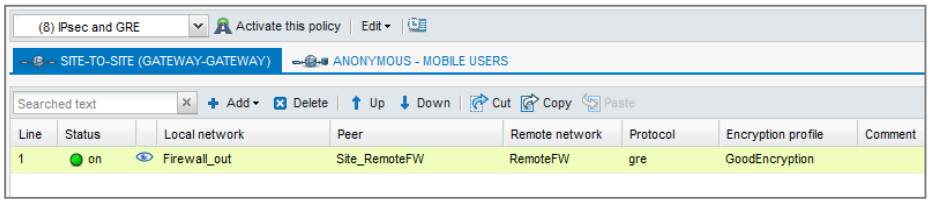
Following the method used for creating the IPsec tunnel on site A's firewall, define a tunnel with the following values:

- **Local network**: select the physical interface bearing the GRE tunnel (**Firewall_out** in the example).
- **Remote network**: select an object bearing the public IP address of the remote firewall (**Remote_Firewall** in the example).
- **Peer selection**: create (or select it if it exists) a peer whose remote gateway will be an object bearing the public IP address of the remote firewall.

> **NOTE**
>
> The version of the IKE protocol for this peer has to be the same as:
>
> - the one used on the remote firewall,
> - the one for the peers used in the other rules of the IPsec policy in question.

Select **GRE** in the **Protocol** column of the IPsec rule in order to restrict the use of the tunnel to GRE traffic.

The IPsec VPN policy will therefore resemble:



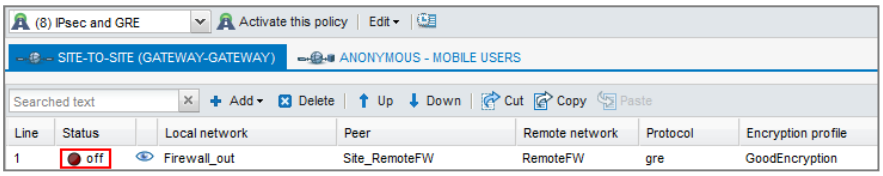
NOTE

Since the firewall initiated the sending of GRE network packets, filter rules therefore do not need to be created for this protocol.

Verifying tunnels

GRE tunnels

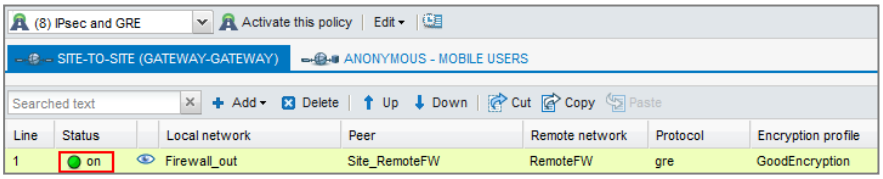
To check the operational status of the unencrypted GRE tunnel between both firewalls, disable the IPsec rule on each site by setting its status to **off** and enable the IPsec policy:



From a workstation located on the local network of Site A, ping a machine located on the local network of Site B. This machine should respond to requests.

Encrypted GRE tunnel in an IPsec tunnel

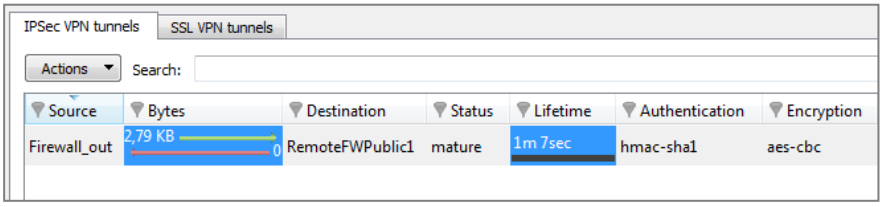
On each firewall, enable the IPsec rule by setting its status to **on** and enable the IPsec policy:



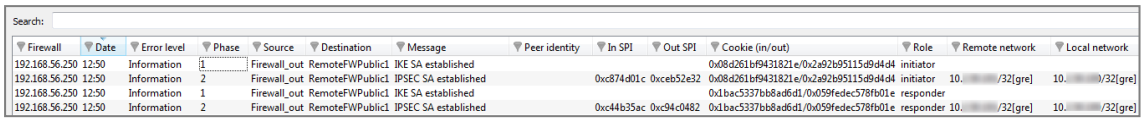
From a workstation located on the local network of Site A, send a ping from a machine located on the local network of Site B. This machine should respond to requests.

Verifying in SN Real-Time Monitor

The status of the IPsec tunnel can be viewed in the *IPsec VPN tunnels* tab in the **VPN** tunnels module in SN Real-Time Monitor:



Logs regarding the setup of IPsec tunnels can be looked up in the **Logs** > **VPN** module:



Search:

Firewall	Date	Error level	Phase	Source	Destination	Message	Peer identity	In SPI	Out SPI	Cookie (in/out)	Role	Remote network	Local network
192.168.56.250	12:50	Information	1	Firewall_out	RemoteFWPublic1	IKE SA established				0x08d261bf9431821e/0x2a92b95115d9d4d4	initiator		
192.168.56.250	12:50	Information	2	Firewall_out	RemoteFWPublic1	IPSEC SA established		0xc874d01c	0xceb52e32	0x08d261bf9431821e/0x2a92b95115d9d4d4	initiator	10. /32[gre]	10. /32[gre]
192.168.56.250	12:50	Information	1	Firewall_out	RemoteFWPublic1	IKE SA established				0x1bac5337bb8ad6d1/0x059fedec578fb01e	responder		
192.168.56.250	12:50	Information	2	Firewall_out	RemoteFWPublic1	IPSEC SA established		0xc44b35ac	0xc94c0482	0x1bac5337bb8ad6d1/0x059fedec578fb01e	responder	10. /32[gre]	10. /32[gre]

Verifying in the firewall web interface

In the firewall's web administration interface, you can display logs and reports to verify that your configuration operates correctly.

Case 2: transporting VLAN in a GRE tunnel

Configuring the firewall on Site A

Creating the GRETAP interface

Creation

In the **Network** > **Interfaces** module, click on **Add** and select **Add a interface**. Enter the following mandatory fields:

Global configuration

Name: assign a name to the GRETAP interface (GretapVLAN in the example).

Interface Configuration

Bridge: select the option **Create an inactive GRETAP interface**. The interface will be enabled thereafter and assigned with a dedicated IP address.

NOTE

Not attaching the GRETAP interface to a bridge makes it possible to authorize only network packets through the GRE tunnel from VLANs attached to this interface (VLAN10 and 20 in the example).

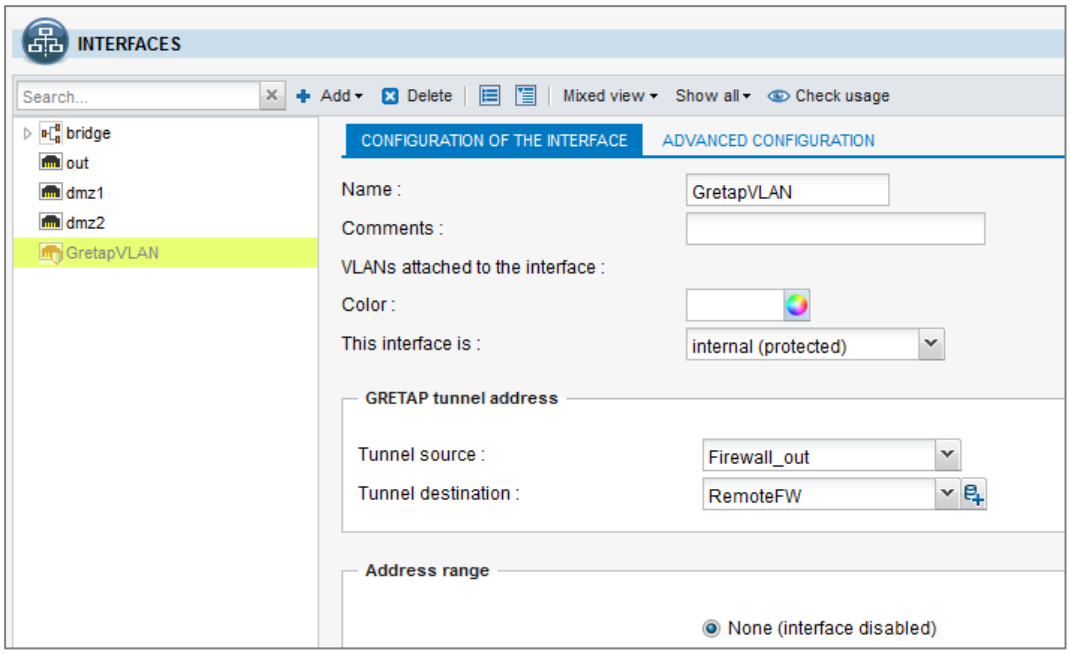
GRETAP tunnel configuration

Tunnel source: select the physical interface through which GRE traffic will travel on the firewall. In the example given, this is the **Firewall_out** interface.

Tunnel destination: select an object bearing the public IP address of the remote firewall (**Remote_Firewall** in the example).

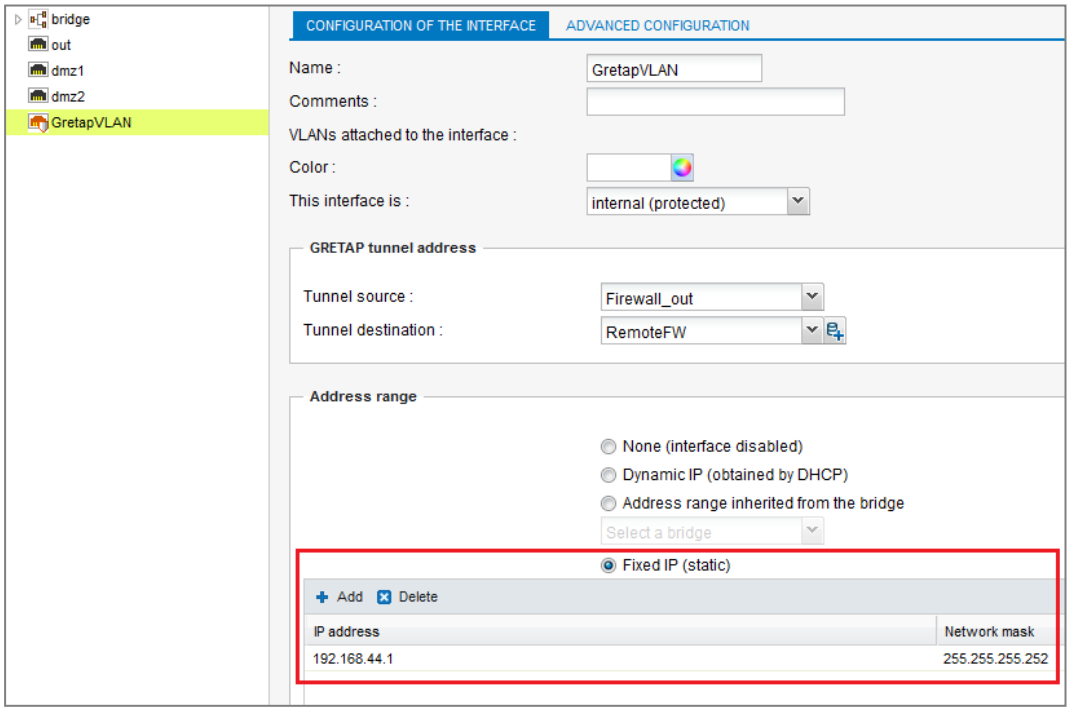
Click on **Finish** then **Apply** to confirm the creation of the GRETAP interface.

The GretapVLAN interface created will then appear grayed out (inactive) in the list of interfaces:



Activation

In the tab *Configuration of the interface*, assign an IP address to the GRETAP interface by selecting **Fixed IP (static)** then entering the IP address and network mask. Confirm the configuration by clicking on **Apply**. The GRETAP interface will then be enabled. In this example, the IP address and network selected have the values 192.168.44.1 and 255.255.255.252 respectively:



Creating IPsec tunnels

To create the IPsec tunnel on Site A's firewall, please refer to the section Creating the IPsec tunnel in Case 1.

NOTE

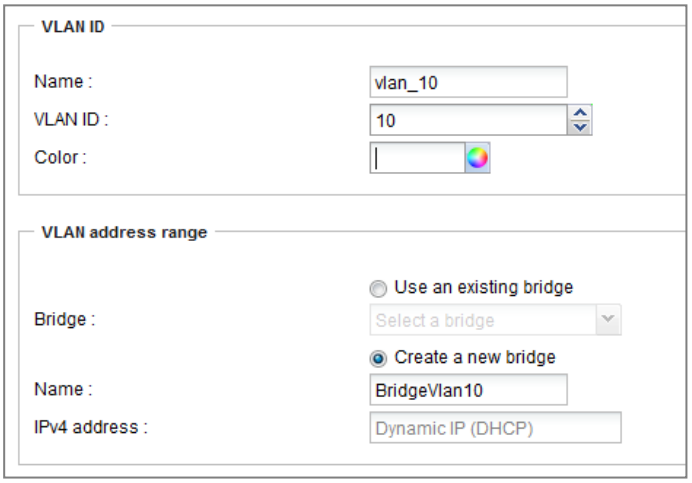
Since the firewall initiated the sending of GRE network packets, filter rules therefore do not need to be created for this protocol.

Creating VLANs

Creating VLAN 10

In the **Network** > **Interfaces** menu, click on **Add** then **Add a VLAN**. In the first window of the wizard, select the option **VLAN attached to 2 interfaces (crossing VLAN)**.

Next, fill in the fields in the various windows of the wizard as follows:

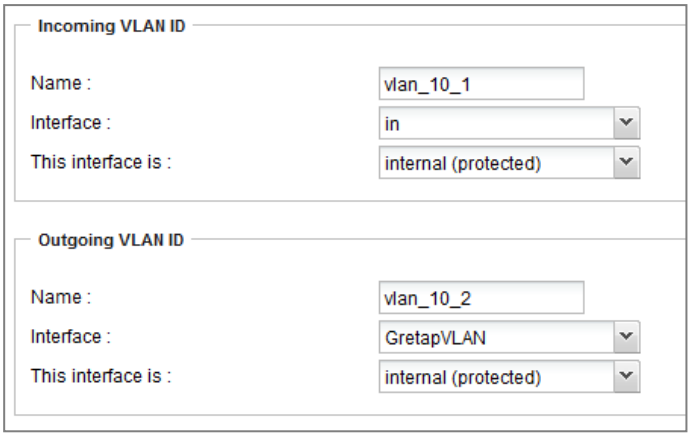


VLAN ID

- **Name**: choose a name for this VLAN (**vlan_10** in the example).
- **VLAN ID**: select the 802.1q identifier associated with the VLAN (10 in the example).

VLAN address range

- Select **Create a new bridge** and assign a name to this bridge (**BridgeVlan10** in the example).
- **IPv4 address**: leave the default dynamic IP assignment (DHCP) then confirm and click on **Next**.



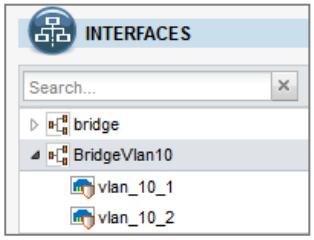
Incoming VLAN ID

- **Name**: select a name for the VLAN attached to the interface for incoming traffic. By default, this should be the name of the VLAN selected in the first window with the addition of the suffix "_1" (**vlan_10_1** in the example).
- **Interface**: select the interface through which packets belonging to the VLAN will enter the firewall. In the example, since the hosts are on the internal network, this will be the **in** interface.
- **This interface is**: specify that the VLAN has to be considered as an internal (protected) interface.

Outgoing VLAN ID

- **Name**: select a name for the VLAN attached to the interface for outgoing traffic. By default, this should be the name of the VLAN selected in the first window with the addition of the suffix "_2" (**vlan_10_2** in the example).
- **Interface**: select the GRETAP interface through which packets belonging to the VLAN will leave the firewall. In the example, this would be the **GretapVLAN** interface.
- **This interface is**: specify that the VLAN has to be considered as an internal (protected) interface.

After having confirmed the configuration, the VLANs and their associated bridges can be seen in the list of interfaces:



Creating VLAN 20

To create the second VLAN that needs to be transported through the GRE tunnel, follow the method described in the paragraph Creating VLAN 10 using the following values:

VLAN ID

- **Name**: **vlan_20** in the example.

- **VLAN ID**: 20 in the example.

VLAN address range

- Select **Create a new bridge**. **Name**: BridgeVlan20 in the example.
- **IPv4 address**: Dynamic IP (DHCP).

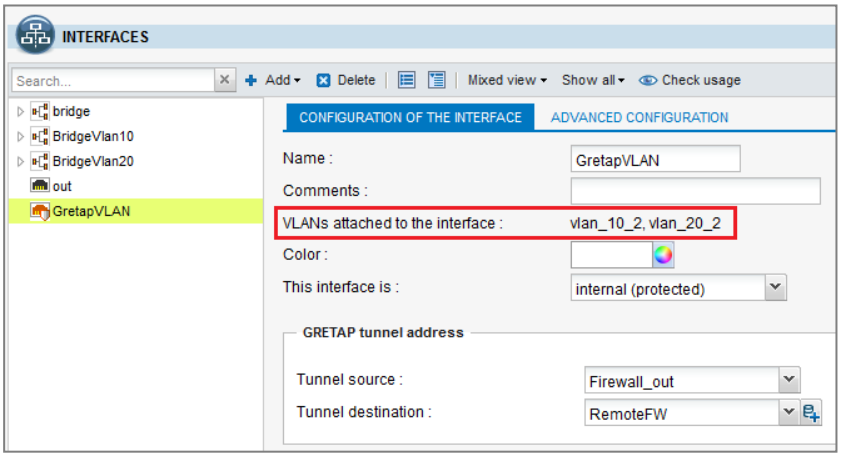
Incoming VLAN ID

- **Name**: vlan_20_1 in the example.
- **Interface**: in in the example.
- **This interface is**: specify that the VLAN has to be considered as an internal (protected) interface.

Outgoing VLAN ID

- **Name**: vlan_20_2 in the example.
- **Interface**: GretapVLAN in the example.
- **This interface is**: specify that the VLAN has to be considered as an internal (protected) interface.

By clicking on the GRETAP interface, you will be able to check that both VLANs vlan_10_2 and vlan_20_2 have been attached to it:



Configuring the firewall on Site B

Creating the GRETAP interface

To create the GRETAP interface on the firewall of site B, please follow the method explained in the paragraph Creating the GRETAP interface on site A. For the example shown, the values used will be the following:

- **IP address:** 192.168.44.2.
- **Mask:** 255.255.255.252.

Creating IPsec tunnels

To create the IPsec tunnel on Site B's firewall, please refer to the section Creating the IPsec tunnel in Case 1.

NOTE

Since the firewall initiated the sending of GRE network packets, filter rules therefore do not need to be created for this protocol.

Creating VLAN

To create VLAN 10 and 20 and assign them to the GRETAP interface on the second firewall, follow the method described in the paragraph Creating VLAN for the firewall on Site A.

Verification

From a machine on Site A belonging to VLAN 10 or VLAN 20, ping a machine on Site B belonging to the same VLAN: the machine on Site B should respond to requests.

It is also possible to check whether VLAN are indeed being transported through the tunnel by creating a network capture on the incoming interface of the tunnel on Site B's firewall. In this case, captured network packets will show the GRE protocol encapsulating the transported VLAN (VLAN 20 in the example).

```
15:41:06.019669 00:90:fb:2c:5d:b2 > 00:0d:b4:0c:c6:b6, ethertype IPv4 (0x0800), length 108: 172.16.3.1 > 172.16.2.1: GREv0,
proto TEB (0x6558), length 74: 18:03:73:8b:51:d8 > 01:00:5e:00:00:fc, ethertype 802.1Q (0x8100), length 70: vlan 20, p 0,
ethertype IPv4, 192.168.1.10.50677 > 224.0.0.252.5355: UDP, length 24
```

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