Allied Telesis

How To| Configure Load Balancer Redundancy on Allied Telesis Routers and Switches

Introduction

In many Server Hosting environments, two requirements are important: maximising throughput availability to each service, and minimising service downtime. This How To Note contributes towards both these aims.

The Note is split into two parts. The first part illustrates both redundancy of servers and redundancy of the load balancers themselves. The second part provides an optional extension that enables you to control server selection without losing redundancy. This is helpful when you prefer to have customers access a certain server, instead of balancing that traffic. However, if that server fails, the customers need to use the alternate server instead.

The examples

The network configuration for these examples is shown in the following figure.
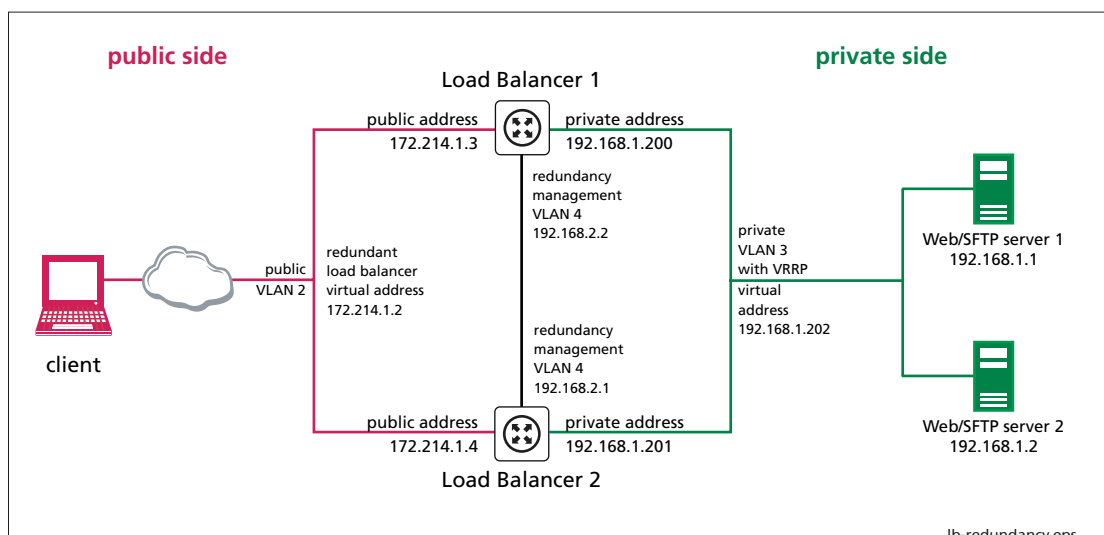
The Note's first example illustrates how to load balance web services, and includes:

- Load balancing of incoming web traffic to maximise throughput to web servers. It also provides redundancy if a web server goes down.

- Redundancy between two load balancing routers. In the unlikely event of a router going down, a backup router takes over as master and continues the load balancing work for incoming web connections. Load balancer redundancy and VRRP ensure that clients and servers access the same public and private addresses no matter which router is the master.

- A firewall to secure the LAN against attack. The firewall configuration changes automatically if the backup router takes over the load balancing role.

The Note's second example extends the first example by showing how to control server selection for SFTP (Secure File Transfer Protocol) traffic, while still providing server redundancy if the preferred server fails.

For simplicity, these examples provide load balancing between two servers. You can easily expand the examples by adding more servers.

What information will you find in this document?

As outlined above, the Note first describes **basic load balancer redundancy**. To configure this, do all the following steps:

- "Configure Load Balancer 1" on page 3
- "Configure Load Balancer 2" on page 7
- "Create the Scripts" on page 9

Then the Note describes the optional extensions that let you **control server selection**. To configure this, make all the following additions to the basic configuration:

- "Configure Load Balancing: Extra Commands" on page 10
- "Configure the Triggers: Extra Commands" on page 11
- "Modify the Scripts" on page 11
- "Create New Scripts" on page 12

Finally, the Note gives the complete extended configuration so you can verify your configuration. Also, you may find it easier to copy this configuration to your router instead of using the step-by-step configuration.

- "Commands: Load Balancer 1" on page 13
- "Commands: Load Balancer 2" on page 14
- "File: master.scp" on page 15
- "File: slave.scp" on page 15
- "File: sftp1down.scp" on page 15
- "File: sftp1up.scp" on page 15

Which products and software version does it apply to?

We created this configuration using AR440S routers and Software Version 275-05. However, the configuration applies to the following products:

- AR44xS and AR450S Series routers
- AR750S, AR7x5 routers
- Rapier i Series switches
- AT-8800 Series switches
- AT-9800 Series switches

It requires software version 275-05 or later (except version 276-01, which lacks the necessary trigger functionality).

Example of Basic Redundancy

Configure Load Balancer 1

1. Name the router

Name this router LB-1.

```
set system name=LB-1
```

2. Create the VLANs

Create the three VLANs that this example uses:

- VLAN 2 for the public Internet side

```
create vlan=vlan2 vid=2
```

- VLAN 3 for the private LAN side

```
create vlan=vlan3 vid=3
```

- VLAN 4 for managing the load balancer redundancy

```
create vlan=vlan4 vid=4
```

3. Add ports to the VLANs

Add ports to the three VLANs.

```
add vlan=2 port=1
add vlan=3 port=2-4
add vlan=4 port=5
```

4. Configure IP on the VLANs

Enable IP.

```
enable ip
```

Give the public VLAN a unique public address. Note that public clients will not browse to this address; they will browse to the virtual balancer's IP address instead (see step 8).

```
add ip int=vlan2 ip=172.214.1.3 mask=255.255.255.0
```

Give the private VLAN a private address. Note that the servers will not use this address as a gateway; they will use the VRRP virtual address instead (see step 7).

```
add ip int=vlan3 ip=192.168.1.200
```

Give the redundancy management VLAN a private address.

```
add ip int=vlan4 ip=192.168.2.2
```

5. Configure the firewall

Enable the firewall.

```
enable firewall
```

Create a firewall policy.

```
create firewall policy=lb
```

Set the firewall session timeouts for TCP, UDP and other packet types, in minutes.

```
set firewall policy=lb tcptimeout=5 udptimeout=5 othertimeout=5
```

Add the public and private interfaces to the firewall policy.

```
add firewall policy=lb int=vlan2 type=public
add firewall policy=lb int=vlan3 type=private
```

Add the redundancy management VLAN to the firewall policy as a private interface.

```
add firewall policy=lb int=vlan4 type=private
```

You do not need to add firewall access rules at this step. This example uses triggered scripts to dynamically add access rules, depending on which load balancer is the master (see step 9).

6. Disable the GUI and the HTTP server on port 80

You cannot use the router's GUI or its HTTP server on port 80 when load balancing web traffic. Therefore, you need to either disable the GUI and server, by using the following commands:

```
disable gui
disable http server
```

or change the port that the server uses. For example, to change the port to 8080, use the following command:

```
set http server port=8080
```

You can then use the GUI by pointing your browser to the router's private address and the new port (in this example, 192.168.1.200:8080).

Note that this configuration uses some advanced settings that are not available through the GUI, so you cannot use the GUI to create this configuration. You also cannot use the firewall pages in the GUI to modify this configuration's firewall settings, because the GUI does not recognise this firewall policy. However, you can use the GUI to monitor the router.

7. Configure VRRP

Configure VRRP for the private side interface. This step creates a virtual address for the private interface of both load balancing routers. Private servers use this address as their gateway to the Internet, instead of using the address of the private interface of either router. This means the servers' gateway is independent of which router is the master load balancer.

```
enable vrrp

create vrrp=2 over=vlan3 ipaddress=192.168.1.202
```

When you configure your servers, enter the VRRP address as their gateway address.

8. Configure load balancing

Enable load balancing.

```
enable lb
```

Add a resource pool for web traffic.

```
add lb respool=web selectmethod=roundrobin faillast=no
```

Add resources to the web resource pool. In this example, two resource servers share the web traffic.

```
add lb resource=web1 ip=192.168.1.1 port=80 respool=web

add lb resource=web2 ip=192.168.1.2 port=80 respool=web
```

Add and enable the Virtual Balancer for the web traffic that is to be balanced. This step also defines the load balancer's virtual public address. Public clients browse to this address, instead of browsing to either routers' public address. This means that the clients' destination address is independent of which router is the master load balancer.

```
add lb virtualbalancer=web publicip=172.214.1.2 publicport=80
  respool=web

enable lb virtualbalancer=web
```

Define the load balancing redundancy peer (Load Balancer 2 in the figure in "The examples" on page 1).

```
set lb redundancy peerip=192.168.2.1 listenport=5000
  redunip=172.214.1.2 publicint=vlan2 redunmask=255.255.255.0

enable lb redundancy
```

9. Configure triggers

If one of the load balancers goes down, the firewall configuration needs to change. This example uses triggers to make this change automatically, by running a script when the state changes. See "Create the Scripts" on page 9 for instructions for making the scripts.

Enable triggers.

```
enable trigger
```

Set the router to run the script `master.scp` if it becomes the master load balancer. This script adds firewall **allow** rules to support the resource pools.

```
create trigger=2 module=loadbalancer event=master
  script=master.scp
```

Set the router to run the script `slave.scp` if it becomes the slave load balancer. This script removes redundant firewall **allow** rules.

```
create trigger=3 module=loadbalancer event=slave script=slave.scp
```

10. Save the configuration

Save the configuration and set the router to use it when it restarts.

```
create config=lb_redun.cfg
```

```
set config=lb_redun.cfg
```

Configure Load Balancer 2

Load balancer 2 is identical to load balancer 1, except for its:

- name (which is just a convenience and does not affect how it functions)
- public interface's IP address
- private interface's IP address
- load balancer redundancy peer, which is load balancer 1

Because the two load balancers are so similar, the following instructions do not explain the steps—see the instructions for load balancer 1 for explanations.

1. Name the router

```
set system name=LB-2
```

2. Create the VLANs

```
create vlan=vlan2 vid=2
create vlan=vlan3 vid=3
create vlan=vlan4 vid=4
```

3. Add ports to the VLANs

```
add vlan=2 port=1
add vlan=3 port=2-4
add vlan=4 port=5
```

4. Configure IP on the VLANs

```
enable ip
add ip int=vlan2 ip=172.214.1.4 mask=255.255.255.0
add ip int=vlan3 ip=192.168.1.201
add ip int=vlan4 ip=192.168.2.1
```

5. Configure the firewall

```
enable firewall
create firewall policy=lb
set firewall policy=lb tcptimeout=5 udptimeout=5 othertimeout=5
add firewall policy=lb int=vlan2 type=public
add firewall policy=lb int=vlan3 type=private
add firewall policy=lb int=vlan4 type=private
```

6. Disable the GUI and the HTTP server on port 80

Either:

```
disable gui

disable http server
```

Or:

```
set http server port=8080
```

7. Configure VRRP

```
enable vrrp

create vrrp=2 over=vlan3 ipaddress=192.168.1.202
```

8. Configure load balancing

```
enable lb

add lb respool=web selectmethod=roundrobin faillast=no

add lb resource=web1 ip=192.168.1.1 port=80 respool=web

add lb resource=web2 ip=192.168.1.2 port=80 respool=web

add lb virtualbalancer=web publicip=172.214.1.2 publicport=80
  respool=web

enable lb virtualbalancer=web

set lb redundancy peerip=192.168.2.2 listenport=5000
  redunip=172.214.1.2 publicint=vlan2 redunmask=255.255.255.0

enable lb redundancy
```

9. Configure triggers

```
enable trigger

create trigger=2 module=loadbalancer event=master
  script=master.scp

create trigger=3 module=loadbalancer event=slave script=slave.scp
```

10. Save the configuration

```
create config=lb_redun.cfg

set config=lb_redun.cfg
```

Create the Scripts

This section describes the scripts that the trigger facility runs when the master or slave load balancer changes. Create the same scripts on both load balancer 1 and load balancer 2.

Create the scripts in a text editor on your PC. You can then open the router's editor by using the command **edit master.scp** (or **edit slave.scp**) and copy and paste the text of the script into the editor. Use Ctrl+K+X to save the script and exit.

Alternatively, you can copy your PC-created script to a TFTP server and use the router's **load** command to download the files from the server.

► Script for when a load balancer becomes the master: **master.scp**

```
# Add the load balancer virtual interface (vlan2-1) to the firewall policy
# as a public interface.
#
add firewall policy=lb int=vlan2-1 type=public

# Add an allow rule for web traffic access. Note that this rule does not map
# to a private address, as expected on a NAT firewall. It just opens the port.
# The load balancer handles security and NAT redirection to the server.
#
add firewall policy=lb rule=1 int=vlan2-1 action=allow protocol=tcp port=80

# Set the VRRP priority level to a value higher than the slave's priority.
#
set vrrp=2 priority=200
```

► Script for when a load balancer becomes the slave: **slave.scp**

```
# Remove the load balancer virtual interface (vlan2-1).
#
delete firewall policy=lb int=vlan2-1

# Remove the associated access rule.
#
delete firewall policy=lb rule=1

# Set the VRRP priority level to a value lower than the master's priority.
#
set vrrp=2 priority=100
```

Extension: Controlling Server Selection

Sometimes you may prefer your customers to access a certain server for certain traffic types. However, if that server fails, they still require redundancy to an alternate server.

This section shows how to configure this. The example gives you control over server selection for SFTP (Secure File Transfer Protocol) traffic, while providing server redundancy if the preferred server fails. In this example, SFTP favours the first resource only (192.168.1.1). It only uses the second resource if the first resource fails.

The load balancers use pings to monitor the health of each resource. When the primary resource fails, this triggers a script to enable the secondary resource.

To provide this solution, you need to add the following steps:

- **Configure Load Balancing: Extra Commands**
- **Configure the Triggers: Extra Commands**
- **Modify the Scripts**
- **Create New Scripts**

Configure Load Balancing: Extra Commands

This section describes the commands you need to add to step 8 on page 5 for load balancer 1 and page 8 for load balancer 2. These extra commands make load balancing act on SFTP traffic as well as web traffic.

Add a resource pool for SFTP.

```
add lb respool=sftp selectmethod=roundrobin faillast=no
```

Add both SFTP resources to the SFTP resource pool. Note that SFTP is FTP encapsulated by SSHv2 on port 22.

```
add lb resource=sftp1  ip=192.168.1.1 port=22 respool=sftp
add lb resource=sftp2  ip=192.168.1.2 port=22 respool=sftp
```

Disable SFTP2. This forces the load balancer to use SFTP1, which is the desired behaviour because SFTP1 is the preferred server. Later in this configuration, we will create a trigger so that the load balancer changes to SFTP2 if SFTP1 goes down.

```
disable lb resource=sftp2 immediately
```

Add and enable the Virtual Balancer for SFTP traffic.

```
add lb virtualbalancer=sftp publicip=172.214.1.2 publicport=22
  respool=sftp affinity=no

enable lb virtualbalancer=sftp
```

Note that **affinity** is turned off. If resource 1 fails, this stops new connections from automatically trying to use the failed resource.

Configure the Triggers: Extra Commands

When the preferred server goes down or comes back up again, the load balancer needs to change to the appropriate resource. This example uses triggers to make this change automatically, by running a script when the server's state changes.

This section describes the extra trigger commands you need to add on both load balancer 1 and load balancer 2. See "Create New Scripts" on page 12 for instructions for making the scripts.

As part of its *healthcheck* feature, the load balancer regularly sends pings to check the health of each server. If the server does not respond, the load balancer changes the resource state to Closing. If the server starts to respond to the pings again, the load balancer changes the resource state to Up. The following triggers activate a script when one of these state changes occurs.

Set the router to run the script `sftp1down.scp` if the first resource fails. This script enables the second resource.

```
create trigger=4 module=loadbalancer event=resstate
   resource=sftp1 lbstate=closing script=sftp1down.scp
```

Set the router to run the script `sftp1up.scp` if the first resource becomes available again. This script disables the second resource.

```
create trigger=5 module=loadbalancer event=resstate
   resource=sftp1 lbstate=up script=sftp1up.scp
```

Modify the Scripts

When the router is the master load balancer, it needs a rule to pass SFTP traffic through the firewall. Similarly, this rule needs to be deleted when the router becomes the slave.

Add the following lines to the scripts on both load balancer 1 and load balancer 2. See "Create the Scripts" on page 9 for the original scripts.

▶ master.scp

```
# Add an allow rule for SFTP traffic access over the SSHv2 port 22.
add firewall policy=lb rule=2 int=vlan2-1 action=allow protocol=tcp port=22
```

▶ slave.scp

```
# Remove the SFTP access rule.
delete firewall policy=lb rule=2
```

Create New Scripts

This section describes the scripts that the trigger facility runs when the preferred SFTP server goes down or comes back up again. The scripts enable and disable the second resource. Load the same scripts onto both load balancer 1 and load balancer 2.

The load balancers send pings every 60 seconds to check the health of each resource. Therefore, the load balancer can take up to 60 seconds to detect that the server has gone down or come up again.

▶ Script for when the preferred server goes down: **sftp1down.scp**

```
# Enable resource 2 because resource 1 is Closing.
enable lb resource=sftp2
```

▶ Script for when the preferred server comes back up: **sftp1up.scp**

```
# Disable resource 2 because resource 1 is Up.
disable lb resource=sftp2 immediately
```

Configuration Summary

This section shows the full extended configurations and scripts, without comments.

Commands: Load Balancer 1

```
set sys name=LB-1

create vlan=vlan2 vid=2
create vlan=vlan3 vid=3
create vlan=vlan4 vid=4

add vlan=2 port=1
add vlan=3 port=2-4
add vlan=4 port=5

enable ip

add ip int=vlan2 ip=172.214.1.3 mask=255.255.255.0
add ip int=vlan4 ip=192.168.2.2
add ip int=vlan3 ip=192.168.1.200

enable firewall
create firewall policy=lb

set firewall policy=lb tcpt=5
set firewall policy=lb udpt=5
set firewall policy=lb othert=5

add firewall policy=lb int=vlan3 type=private
add firewall policy=lb int=vlan2 type=public
add firewall policy=lb int=vlan4 type=private

dis gui
dis http serv

enable vrrp
create vrrp=2 over=vlan3 ipaddress=192.168.1.202

ena lb

add lb resp=web sel=roundrobin fail=no

add lb resp=sftp sel=roundrobin fail=no

add lb res=web1 ip=192.168.1.1 port=80 resp=web
add lb res=web2 ip=192.168.1.2 port=80 resp=web

add lb res=sftp1 ip=192.168.1.1 port=22 resp=sftp
add lb res=sftp2 ip=192.168.1.2 port=22 resp=sftp
dis lb res=sftp2 immediately

add lb virt=web publici=172.214.1.2 publicp=80 resp=web
add lb virt=sftp publici=172.214.1.2 publicp=22 resp=sftp aff=no

ena lb virt=web
ena lb virt=sftp

set lb redund peer=192.168.2.1 list=5000 reduni=172.214.1.2 publ=vlan2 redunm=255.255.255.0
ena lb redund

enable trigger
cre trigger=2 module=loadbalancer event=master script=master.scp
cre trigger=3 module=loadbalancer event=slave script=slave.scp
cre trigger=4 module=lb event=resstate resource=sftp1 lbstate=closing script=sftp1down.scp
cre trigger=5 module=lb event=resstate resource=sftp1 lbstate=up script=sftp1up.scp
```

Commands: Load Balancer 2

```
set sys name=LB-2

create vlan=vlan2 vid=2
create vlan=vlan3 vid=3
create vlan=vlan4 vid=4

add vlan=2 port=1
add vlan=3 port=2-4
add vlan=4 port=5

enable ip

add ip int=vlan2 ip=172.214.1.4 mask=255.255.255.0
add ip int=vlan4 ip=192.168.2.1
add ip int=vlan3 ip=192.168.1.201
enable firewall
create firewall policy=lb

set firewall policy=lb tcpt=5
set firewall policy=lb udpt=5
set firewall policy=lb othert=5

add firewall policy=lb int=vlan3 type=private
add firewall policy=lb int=vlan2 type=public
add firewall policy=lb int=vlan4 type=private

dis gui
dis http serv

enable vrrp
create vrrp=2 over=vlan3 ipaddress=192.168.1.202

ena lb
add lb resp=web sel=roundrobin fail=no
add lb resp=sftp sel=roundrobin fail=no

add lb res=web1 ip=192.168.1.1 port=80 resp=web
add lb res=web2 ip=192.168.1.2 port=80 resp=web

add lb res=sftp1 ip=192.168.1.1 port=22 resp=sftp
add lb res=sftp2 ip=192.168.1.2 port=22 resp=sftp
dis lb res=sftp2 immediately

add lb virt=web publici=172.214.1.2 publicp=80 resp=web
add lb virt=sftp publici=172.214.1.2 publicp=22 resp=sftp aff=no

ena lb virt=web
ena lb virt=sftp

set lb redund peer=192.168.2.2 list=5000 reduni=172.214.1.2 publ=vlan2 redunm=255.255.255.0
ena lb redund

enable trigger
cre trigger=2 module=loadbalancer event=master script=master.scp
cre trigger=3 module=loadbalancer event=slave script=slave.scp
cre trigger=4 module=lb event=resstate resource=sftp1 lbstate=closing script=sftp1down.scp
cre trigger=5 module=lb event=resstate resource=sftp1 lbstate=up script=sftp1up.scp
```

File: master.scp

```
add firewall poli=lb int=vlan2-1 type=public
add fire poli=lb ru=1 int=vlan2-1 action=allow prot=tcp po=80
add fire poli=lb ru=2 int=vlan2-1 action=allow prot=tcp po=22

set vrrp=2 prio=200
```

File: slave.scp

```
delete firewall poli=lb int=vlan2-1
delete firewall poli=lb ru=1
delete firewall poli=lb ru=2

set vrrp=2 prio=100
```

File: sftp1down.scp

```
ena lb res=sftp2
```

File: sftp1up.scp

```
dis lb res=sftp2 immediately
```

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