

Technical Note

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1 Introduction

Direct Server Return (DSR) is a method whereby traffic hits the LoadMaster on the way in and bypasses the LoadMaster on the way out.

The primary advantage of DSR is that the LoadMaster only handles a portion of the work associated with load balancing, specifically the inbound traffic. The servers respond directly to the clients, bypassing the LoadMaster on the way out.

If the particular traffic profile for a site is for every packet in, eight packets are sent out, this would result in the LoadMaster handling around 87% less traffic than it would without DSR.

For DSR to work, the Virtual IP (VIP) address on a Real Server must be configured so that the server does not respond to ARP requests on the VIP address.

For Linux with a recent 2.4 kernel, this can be done by creating the VIP as an IP alias on the loopback interface. On Windows this involves creating a loopback adapter with specific configuration parameters. Refer to the **Configuring a VIP on the loopback interface on Linux** and **DSR Configuration on Windows** sections for detailed steps on how to do this in both operating systems.

When you create the Virtual Service, enable **Force L4** in **Standard Options** and select **Direct return** as the **Forwarding method** when adding the Real Server. This means that the LoadMaster just routes the packets from a client to a Real Server without modifying the IP addresses. The Real Server accepts requests for the VIP destination address because it has configured the VIP as an IP alias. The Real Server will then reply to the IP address of the requesting client with the source IP address of the reply set to the VIP.

Step	Source IP	Destination IP	MAC Address
1	216.139.43.10	195.30.70.200	Dest.: 00:00:00:00:00:aa
2	216.139.43.10	195.30.70.200	Dest.: 00:00:00:00:00:bb
3	195.30.70.200	216.139.43.10	Source: 00:00:00:00:00:bb

The table below shows an example of DSR steps.

1 Introduction



1.1 Related Firmware Version

Published with LMOS version 7.2.48.4 LTS. This document has not required substantial changes since 7.2.48.4 LTS. However, the content is in sync with the latest LoadMaster LTS firmware.



2 Configuring a VIP on the loopback interface on Linux

On a linux machine, the "ifconfig –a" command will look something like this:

root@RS1 \$ ifconfig -a

eth0 Link encap:Ethernet HWaddr 00:00:00:00:00:bb inet addr: 195.30.70.11 Bcast: 195.30.70.255 Mask:255.255.255.0

UP BROADCAST RUNNING MULTICAST MTU:1500 Metric:1 RX packets:96561817 errors:526 dropped:0 overruns:5 frame:0 TX

packets:97174301 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:100 Interrupt:10 Base address:0x4000

lo Link encap:Local Loopback inet addr:127.0.0.1 Mask:255.0.0.0 UP LOOPBACK RUNNING MTU:3924 Metric:1 RX packets:3985923

errors:0 dropped:0 overruns:0 frame:0 TX packets:3985923 errors:0 dropped:0 overruns:0 carrier:0 collisions:0 txqueuelen:0

To create an additional loopback interface with an IP alias, use the "ifconfig" command like this:

root@RS1 \$ ifconfig lo:1 <VirtualServiceIPAddress> broadcast 195.30.70.200 netmask 255.255.255.255

root@RS1 \$ ifconfig lo:1

lo:1 Link encap:Local Loopback inet addr:195.30.70.200 Mask:255.255.255.255 UP LOOPBACK RUNNING MTU:3924 Metric:1

If the machine reboots, this configuration will no longer be available. To set this permanently, some Linux configuration files need to be edited. Steps on how to do this vary from distribution to distribution.

The next step is to disable invalid ARP replies. Add the following to the /etc/sysctl.conf file:

net.ipv4.conf.all.arp_ignore=1

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net.ipv4.conf.eth0.arp_ignore=1
net.ipv4.conf.eth1.arp_ignore=1
net.ipv4.conf.all.arp_announce=2
net.ipv4.conf.eth0.arp_announce=2
net.ipv4.conf.eth1.arp_announce=2



For Windows, it is typically best to use the loopback address. However, to use the loopback address, the loopback adapter needs to be added first. To add the loopback adapter for the relevant version of Windows and to configure the VIP of the loopback interface, follow the instructions in the Add a loopback interface on Windows Server 2012, 2016 and 2019 section.

1.

3.1 Add a loopback interface on Windows Server 2012, 2016 and 2019

To add a loopback adapter on Windows Server 2012, 2016 and 2019, follow the steps below:

1. Click Start and select Server Manager.



2. Click Tools and selectComputer Management.



3. Click Device Manager.





4. Click the computer name, click **Action** from the top menu bar and select **Add Legacy Hardware**.

🚪 Computer Management				
File	Action	View	Help	
<= =	Scan for hardware changes			
Add legacy hardware				
A1				

5. Click Next.

Add Hardware				
The wizard can help you install other hardware				
	The wizard can search for other hardware and automatically install it for you. Or, if you know exactly which hardware model you want to install, you can select it from a list.			
	What do you want the wizard to do?			
	O Search for and install the hardware automatically (Recommended)			
	Install the hardware that I manually select from a list (Advanced)			
	Deda Neda Const			
	< Back Next > Cancel			

- 6. Select Install the hardware that I manually select from a list (Advanced).
- 7. Click Next.

3 DSR Configuration on Windows



d Hardware From the list below, select the type of hardware you are installing				
If you do not see the hardware categor	y you want, click Sl	how All Dev	vices.	
Common hardware types:				
Media Center Extenders				^
Memory technology devices				
Miracast display devices				
Handems				
Multi-port serial adapters				
Retwork adapters				
CPOS Legacy Device				
PCMCIA adapters				
Portable Devices				~
		< Back	Next >	Cancel

- 8. Select Network adapters.
- 9. Click Next.
- 10. Select Microsoft on the left.

3 DSR Configuration on Windows



Add Hardware		
Select the device driver you want	to install for this hardware.	
	model of your hardware device and then click Ne you want to install, click Have Disk.	xt. If you have a
	,	
Manufacturer	Model	^
Intel	🖳 Microsoft Hyper-V Network Adapter	
Intel Corporation	GMicrosoft Hyper-V VPN Network Adapter	
Mellanox Technologies Ltd.	GMicrosoft Hyper-V WiFi Network Adapter	
Microsoft	Carl Microsoft KM-TEST Loopback Adapter	
		•
This driver is digitally signed.		Have Disk
Tell me why driver signing is imp	ortant	
	< Back Next >	Cancel

- 11. Select Microsoft KM-TEST Loopback Adapter on the right.
- 12. Click Next.
- 13. Click Next again.
- 14. Click Finish.
- 15. Click Start and select Control Panel.



16. Click Network and Internet.

3 DSR Configuration on Windows





17. Click Network and Sharing Center.



18. Click Change adapter settings.

Control Panel Home	
Change adapter settings Change advanced sharing settings	

It is a good idea to rename the adapters so that they are distinguishable, for example; rename the new adapter to **loopback** and the real network adapter to **network**.

- 19. Configure the loopback adapter with the Virtual Service IP.
 - a) Right-click the loopback interface and select **Properties**.



Loopback Properties	\times
Networking Sharing	
Connect using:	
Microsoft KM-TEST Loopback Adapter	
Configure]
This connection uses the following items:	
 Client for Microsoft Networks File and Printer Sharing for Microsoft Networks QoS Packet Scheduler Internet Protocol Version 4 (TCP/IPv4) Microsoft Network Adapter Multiplexor Protocol Microsoft LLDP Protocol Driver Internet Protocol Version 6 (TCP/IPv6) 	
had a line of the second	
Install Uninstall Properties	
Description Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.	
OK Cancel	

b) Select Internet Protocol Version 4 (TCP/IP) and click Properties.



Internet Protocol Version 4 (TCP/IPv4)	Properties	×
General		
You can get IP settings assigned auton this capability. Otherwise, you need to for the appropriate IP settings.		
Obtain an IP address automatical	ly	
• Use the following IP address:		- 1
IP address:	192.168.1.50	
Subnet mask:	255.255.255.0	
Default gateway:		
Obtain DNS server address autom	natically	
Use the following DNS server add	resses:	
Preferred DNS server:		
Alternate DNS server:		
Validate settings upon exit	Advanced	
	OK Cancel	

c) The TCP/IP properties window will appear. This is where the Virtual Service **IP address** can be configured. Enter the Virtual Service **IP address** and click **Advanced...**.





Advanced TCP/IP Settings	
IP Settings DNS WINS	
IP addresses	
IP address	Subnet mask
192.168.1.50	255.255.255.0
Add	. Edit Remove
Default gateways:	
Gateway	Metric
Add	Edit Remove
Automatic metric	
Interface metric: 254	
	OK Cancel

d) In Advanced TCP/IP Settings, remove the check from the **Automatic metric** checkbox.

e) Enter **254** in the **Interface metric** text box.

Setting the Interface metric is an important step. This will disable this server so that it will not respond to ARP requests for the MAC address for the Virtual Service IP.

- f) Click **OK** to activate the change.
- g) Click **OK** and **Close**.



Ensure the "network" adapter is the actual network adapter that will send and receive traffic.

20. On the Windows command line, run the following commands:

netsh interface ipv4 set interface "network" weakhostreceive=enabled

netsh interface ipv4 set interface "loopback" weakhostreceive=enabled

netsh interface ipv4 set interface "loopback" weakhostsend=enabled

3.1.1 Loopback Adapter Configuration for IPv6

On the Windows command line, run the following commands:

- netsh interface ipv6 set interface LAN weakhostreceive=enabled
- netsh interface *ipv6 *set interface Kemp-SMTP-LOOPBACK weakhostreceive=enabled
- netsh interface *ipv6 *set interface Kemp-SMTP-LOOPBACK weakhostsend=enabled

In the loopback adapter properties:

- IPv6 address: <IPAddressOf TheVIP>
- Subnet prefix length: 128

In Advanced Properties, set the Interface metric to 254.

If you want IPv6 DSR, you must have the IPv6 address as the primary address on the interface. Additional addresses may be IPv6 or IPv4, as required.

References





Unless otherwise specified, the following documents can be found at <u>http://kemptechnologies.com/documentation</u>.

Web User Interface (WUI), Configuration Guide



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