



vDiff User Guide



Versioning

- Document version: v6.0.0-pre06.
- For software version v6.0.x.

Basic Applications

- Switching.
- Routing.
- L4 filtering (firewall).
- L4 routing.

Advanced Applications

- L4 switching (i.e., load balancing and fault tolerance) for AP servers.
- L4 switching for WAN routers, i.e., outbound WAN load balancing.

vDiff Models

Model	VDA100	VDA200	VDA300	VDA400
Max connections	1M	2M	4M	8M
Max targets	5	20	100	1000
RAM requirement	2G	4G	8G	16G
Compatible hypervisors	VMware ESXi, MS Hyper-V, Xen.			

User Interfaces

■ Web UI

- <https://192.168.1.99/>
- <http://192.168.1.99/>

■ CLI

- telnet 192.168.1.99
- ssh 192.168.1.99
- virtual machine console

Defaults

- Management IP : 192.168.1.99/24,
- One bridge, bridge_1. The first Ethernet port, e1, is on bridge_1.
- Console is always on, https and ssh are on, http and telnet are off
- One account with username/password = admin/admin.

Emergency Account

- Select “Emergency account” on the boot menu on the console.

```
pyGRUB version 0.6
lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x Regular boot x
x Emergency account x
x Factory default x
x x
x x
x x
x x
x x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj
    Use the ^ and v keys to select which entry is highlighted.
    Press enter to boot the selected OS, 'e' to edit the
    commands before booting, 'a' to modify the kernel arguments
    before booting, or 'c' for a command line.
```


Emergency Account

- Login with username = emergency and password = emergency during the initial 30 seconds the system is booted.
- Useful commands:
 - get all (show the current configuration)
 - save config from default to system (restore the default configuration)
 - get ip
 - get route
 - get dns
 - get account

Restore Factory Defaults

- Select “Factory default” on the boot menu.

```
pyGRUB version 0.6
lqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqk
x Regular boot x
x Emergency account x
x Factory default x
x x
x x
x x
x x
x x
mqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqj
Use the ^ and v keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the
commands before booting, 'a' to modify the kernel arguments
before booting, or 'c' for a command line.
```

Web UI Layout

Menu



View

- System info
- Group status
- Logs
- Ethernet info

Configuration

- Ethernet
- IP
- Filters
- Load balancing
- Misc.

Tools

- Diagnostic
- System
- Language
- Logout (admin)

System time

Fri Mar 31 10:28:16 CST 2017

[Edit](#)

Timezone

CST-8

[Edit](#)

NTP server

Index NTP server

1	pool.ntp.org	Edit	Delete	Insert	Insert
---	--------------	----------------------	------------------------	------------------------	------------------------

Admin interface

HTTP (Web)	on
HTTPS (Web)	on
Telnet (Console)	off
SSH (Console)	on

[Edit](#)

Account

Index	User name	Password	Type	Flush
1	admin	***	Admin	Edit Delete Insert

Page



Command Line Interface (CLI)

```
Welcome to ServerDiff
ref login: admin
Password:

Welcome to ServerDiff
(TAB for help)

admin# get ip
set ip flush
set ip append ipmask 192.168.1.99/24 bridge bridge_1
admin# get route
set route flush
set route append dst default via 192.168.1.1
admin# get account
set account flush
set account append username admin crypt_password $1$/syGMAyD$bg/jamK1mb88fjuIcdt
ki. type Admin
admin# get admin
set admin http off https on telnet off ssh on
admin# █
```

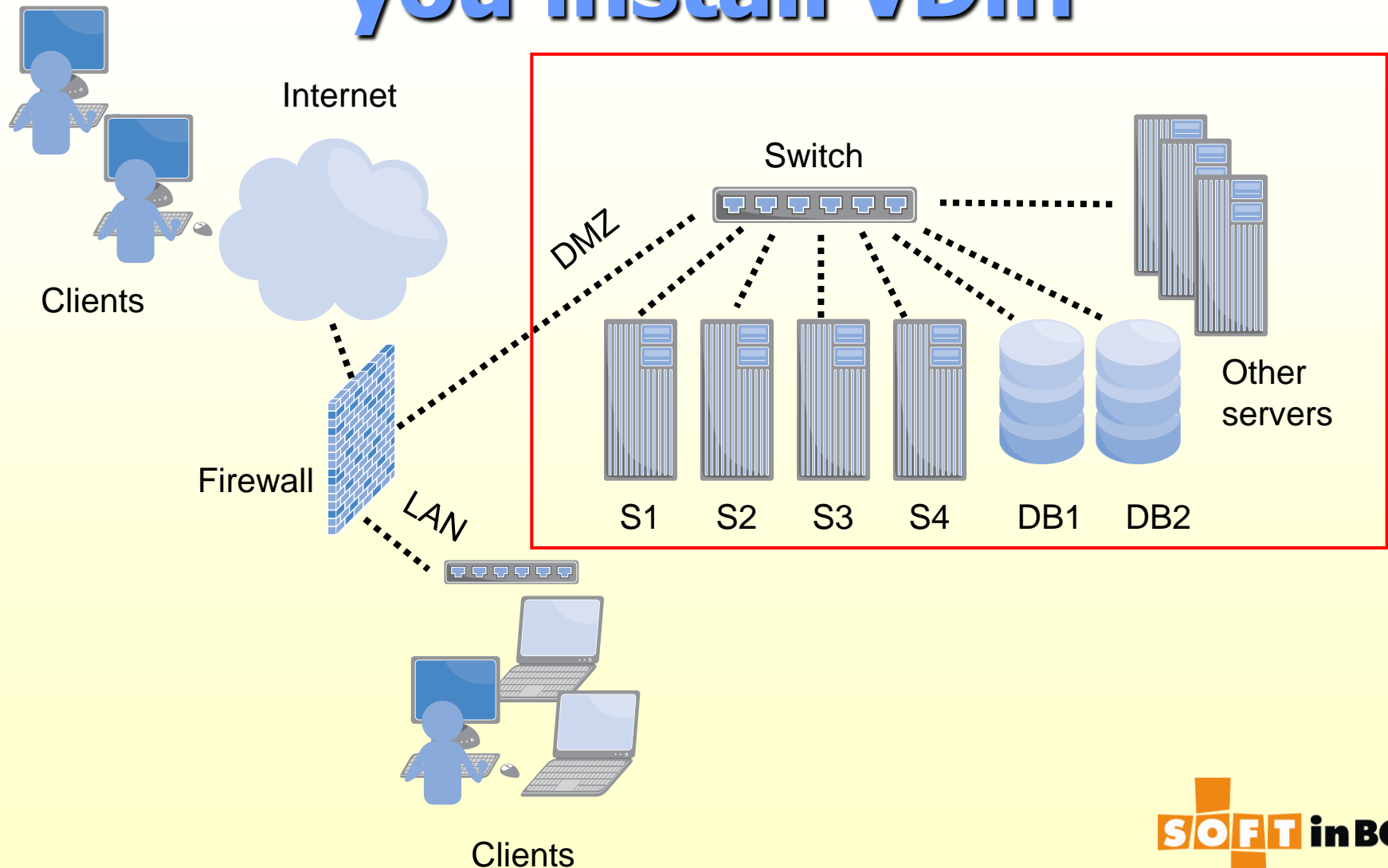
CLI Editing Keys

Key name	Function
Control-A	Jump to the front of the command.
Control-B or LEFT	Move the cursor backward one character.
Control-C	Cancel the command.
Control-D or DELETE	Delete the character on the cursor.
Control-E	Jump to the end of the command.
Control-F or RIGHT	Move forward one character.
Control-H or Backspace	Delete the character on the left of the cursor.
Control-P or UP	Browse the previous command in the history buffer.
Control-N or DOWN	Browse the next command in the history buffer.
Control-R	Clear the screen.
TAB	Help.
Enter	Execute the command.

CLI Usage

- get ip
- set ip append ipmask 192.168.1.99/24
bridge bridge_1
- If you see error messages, the command failed. Correct the command and try again.
- Otherwise (no error message), the command is applied successfully, and new configuration is saved.

Network topology before you install vDiff



Basic Networking models for AP load balancing

- Transparent bridge mode
- VIP bridge mode
- Single-arm mode
- VIP router mode
- FW mode

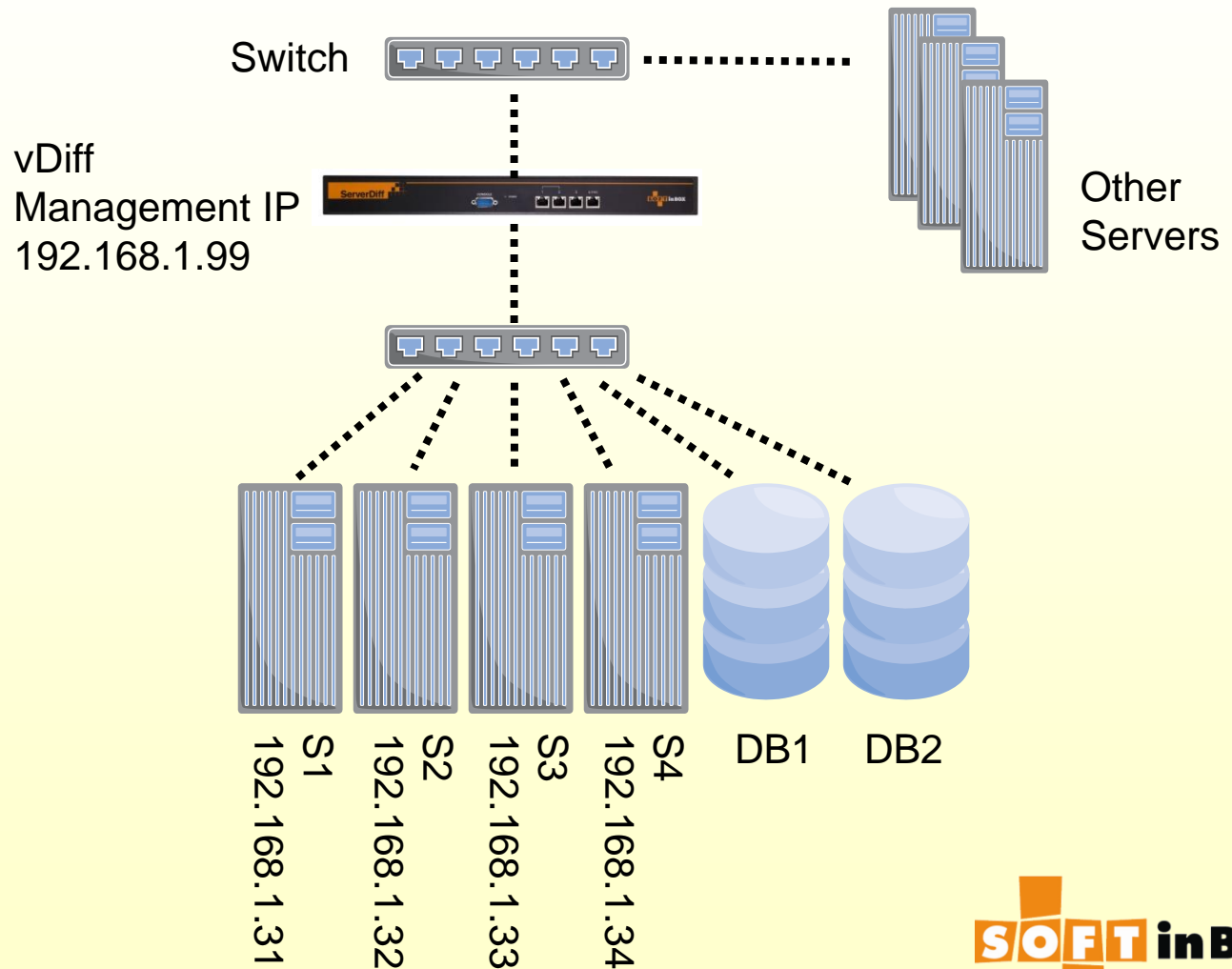
Mode 1: Transparent Bridge Mode

Transparent Bridge (TB) Mode

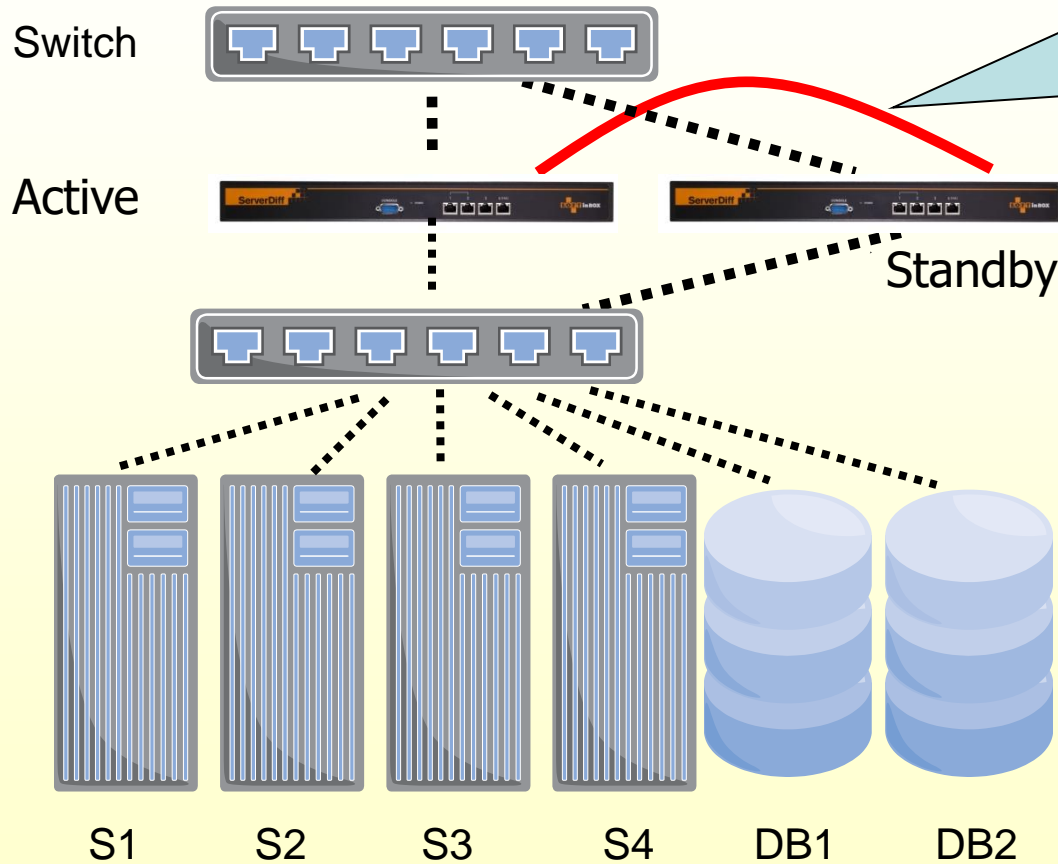
- ✓ Configure vDiff as a bridge (i.e., L2 switch) and place it in front of the AP servers.

- ✓ Clients connects as before to the AP servers (with IP or domain name to the AP servers), with the added benefits of load balancing and fault tolerance.

- ✓ Servers see the real source IP of the clients.



High Availability in TB mode



Configuration in TB mode (1/4)

Ethernet port setting

Ethernet	Speed	Watch	Mode	
e1	all-auto	off	on	Edit
e2	all-auto	off	on	Edit

Ethernet bonding

Ethernet	Mode	
e1	active-backup	Edit
e2	active-backup	Edit

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	
1	e1	none	bridge_1	100	32	Edit
2	e2	none	bridge_1	100	32	Edit

Bridge list

Index	Name	
1	bridge_1	Edit Delete Insert Insert

(2/4)

IPv4 address

Index	IP/mask	Bridge	
1	192.168.1.99/24	bridge_1	Edit Delete Insert Insert

IPv4 route

Index	Destination subnet	Gateway	
1	default	192.168.1.1	Edit Delete Insert Insert

IPv4 ARP watch

Index	IP	Bridge	
1	192.168.1.31	bridge_1	Flush Edit Delete Insert
2	192.168.1.32	bridge_1	Edit Delete Up Insert
3	192.168.1.33	bridge_1	Edit Delete Up Insert
4	192.168.1.34	bridge_1	Edit Delete Up Insert Insert

Notice this.

(3/4)

Group list

Index	Name	
1	G_web_sample	VIP 192.168.1.31, Edit Delete Insert tcp 80,443, 4 targets. Detail Insert

Group G_web_sample parameter

Virtual IP: 192.168.1.31
Virtual IP6:
TCP ports: 80,443
UDP ports:
=====
Load balancing algorithm: RANDOM
Session help: S
 Session timeout: 600
 Connection limit per session:1000000
=====
SNAT IP:
SNAT IP6:
DNAT: on
All targets down action: CONTINUE
[Edit](#)

Group G_web_sample health check

Health check method: HTTP
Health check port: 80
HTTP URL to check: /
HTTP text to match: 200 OK
Health check interval (in sec): 10
Health check target:
Health check counts: 1:1:0:1:1:0
One target down action: CONTINUE
[Edit](#)

Group G_web_sample target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	AP_31	192.168.1.31		1		Edit Delete
2	AP_32	192.168.1.32		1		Edit Delete Up
3	AP_33	192.168.1.33		1		Edit Delete Up
4	AP_34	192.168.1.34		1		Edit Delete Up

(4/4)

Table

Index	Name		Flush
1	Root	(root table)	Edit Delete Insert
2	admin_accept		Edit Delete Up Insert
3	group_tweak		Edit Delete Up Insert Insert

Filter Root (root table)

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush
1					CALL#admin_accept	Edit Delete Insert
2					CALL#group_tweak	Edit Delete Up Insert Insert

Filter admin_accept

Index	Bridge	Source IP	Destination IP	Misc.	Action	
1		10.10.10.123			ACCEPT	Edit Delete Insert Insert

Filter group_tweak

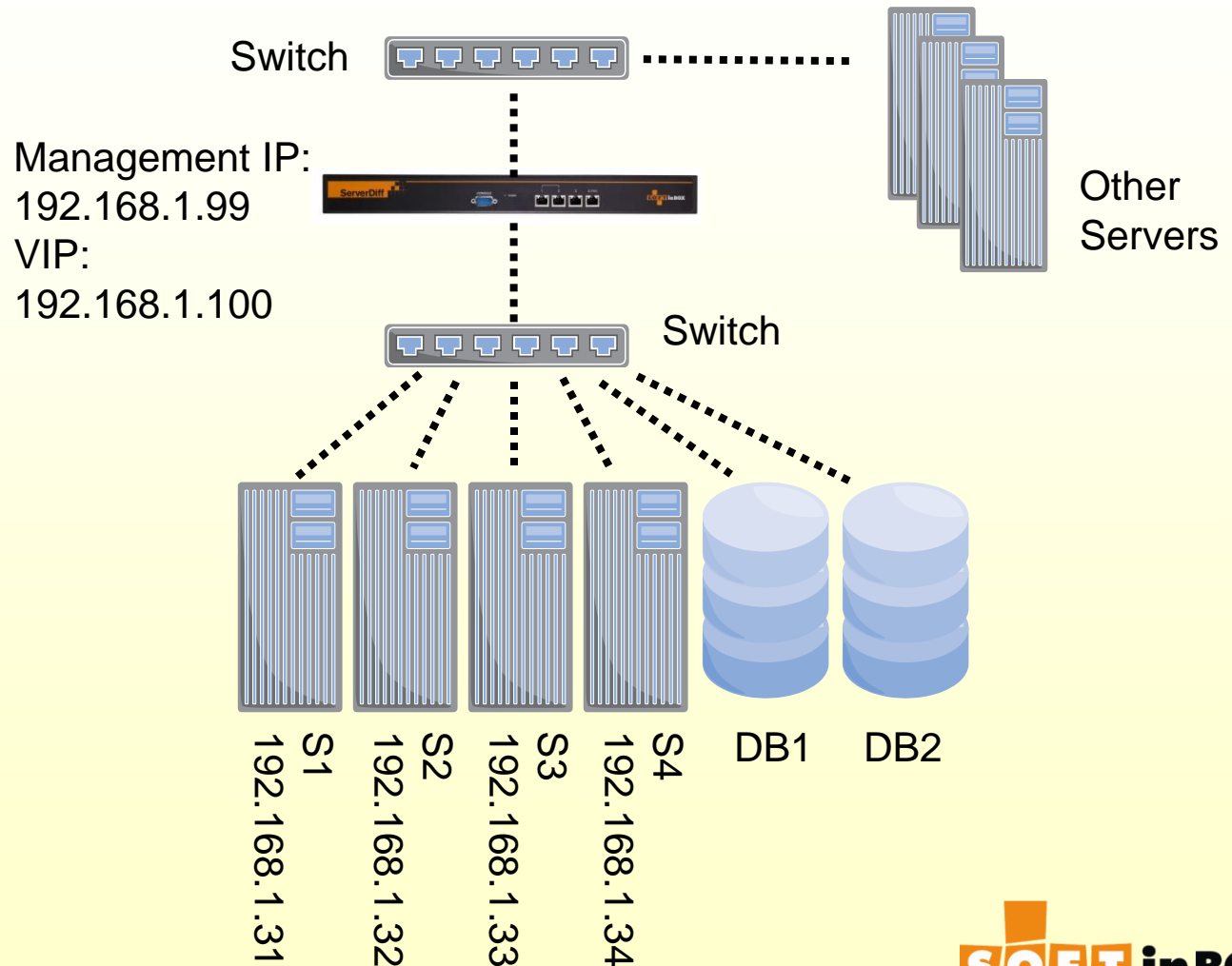
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1			192.168.1.32-192.168.1.34	TCP dstport=80	L4SW#G_web_sample	Edit
2			192.168.1.32-192.168.1.34	TCP dstport=443	L4SW#G_web_sample	Edit

Do not load balance connections from the administrator (you, 10.10.10.123). So when you connect to say 192.168.1.32 you are not load balanced. This helps debugging.

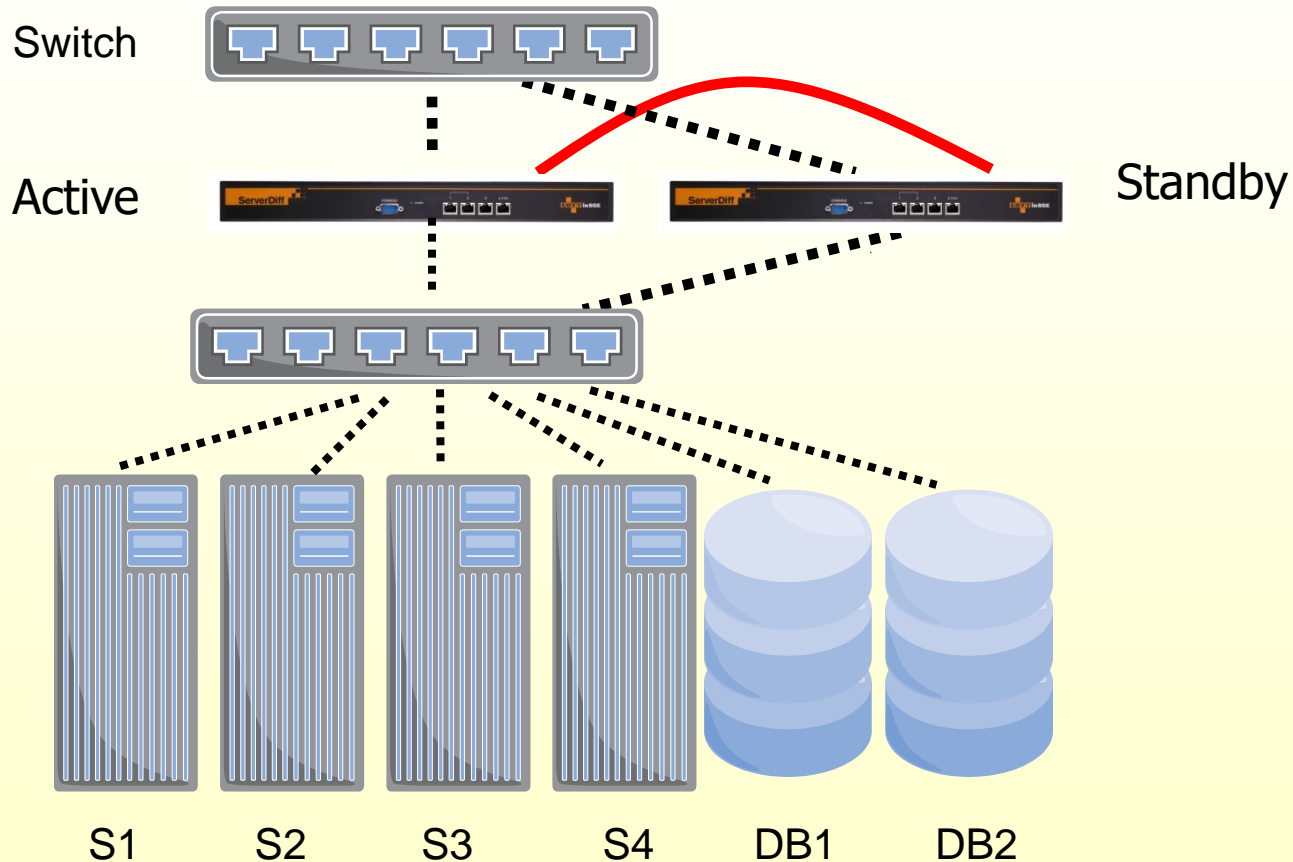
Mode 2: VIP Bridge Mode

VIP Bridge Mode

- ✓ vDiff is configured as a bridge (L2 switch) and with an additional IP called the VIP (192.168.1.100 here).
- ✓ Connect to the VIP and you get the load balancing.
- ✓ The AP servers see the original client IP(s).



HA in VIP bridge mode



VIP bridge mode config (1/3)

Ethernet port setting

Ethernet	Speed	Watch	Mode	
e1	all-auto	off	on	Edit
e2	all-auto	off	on	Edit

Ethernet bonding

Ethernet	Mode	
e1	active-backup	Edit
e2	active-backup	Edit

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	
1	e1	none	bridge_1	100	32	Edit
2	e2	none	bridge_1	100	32	Edit

Bridge list

Index	Name	
1	bridge_1	Edit Delete Insert
		Insert

Config (2/3)

Add the VIP
192.168.1.100.

IPv4 address

Index	IP/mask	Bridge	Flush
1	192.168.1.99/24	bridge_1	Edit Delete Insert
2	192.168.1.100/24	bridge_1	Edit Delete Up Insert Insert

IPv4 route

Index	Destination subnet	Gateway	
1	default	192.168.1.1	Edit Delete Insert Insert

Config (3/3)

Group list

Index	Name	
1	G_web_sample	VIP 192.168.1.100, Edit Delete Insert tcp 80,443, 4 targets. Detail Insert

Group G_web_sample parameter

Virtual IP: 192.168.1.100
Virtual IP6:
TCP ports: 80,443
UDP ports:
=====
Load balancing algorithm: RANDOM
Session help: S
 Session timeout: 600
 Connection limit per session: 1000000
=====
SNAT IP:
SNAT IP6:
DNAT: on
All targets down action: CONTINUE
[Edit](#)

Group G_web_sample health check

Health check method: HTTP
Health check port: 80
HTTP URL to check: /
HTTP text to match: 200 OK
Health check interval (in sec): 10
Health check target:
Health check counts: 1:1:0:1:1:0
One target down action: CONTINUE

[Edit](#)

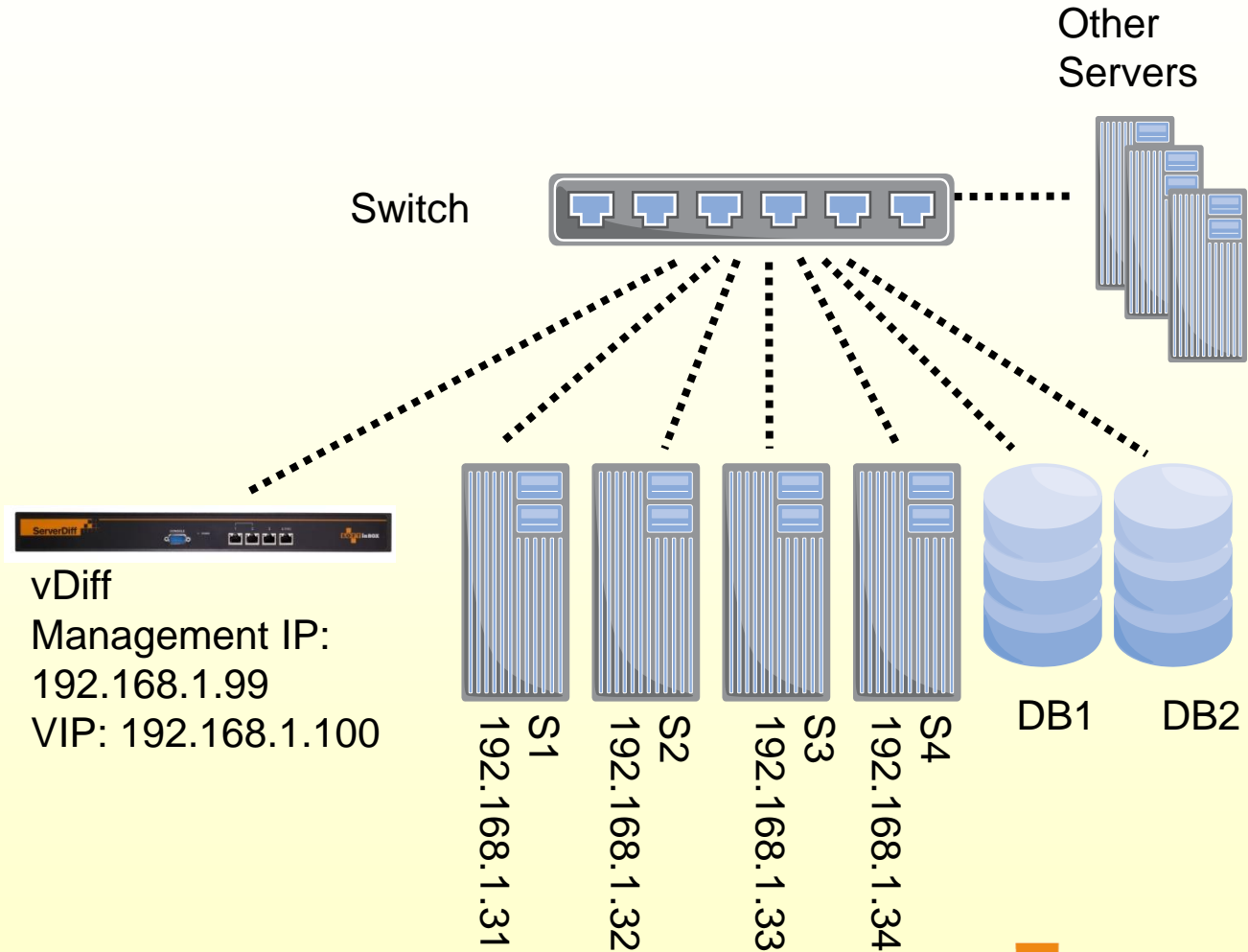
Group G_web_sample target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	AP_31	192.168.1.31		1		Edit Delete
2	AP_32	192.168.1.32		1		Edit Delete Up
3	AP_33	192.168.1.33		1		Edit Delete Up
4	AP_34	192.168.1.34		1		Edit Delete Up

Mode 3: VIP One-Arm Mode

Mode 3: VIP One-Arm Mode

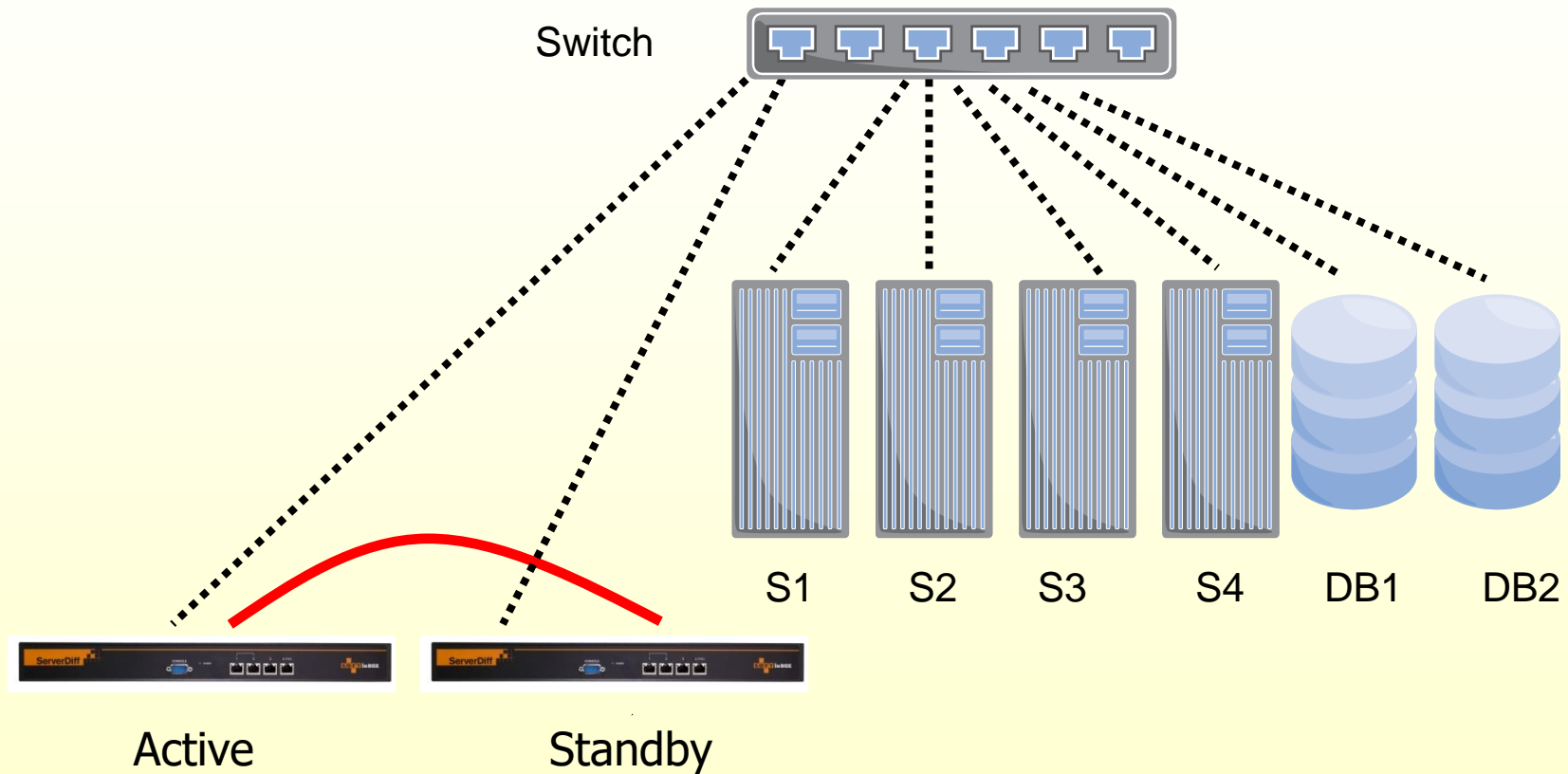
- ✓ A Client connects to the VIP (192.168.1.100).
- ✓ vDiff connects to the selected server, with VIP as the source IP.
- ✓ The server processes the request and reply to VIP (which is vDiff).
- ✓ vDiff reply to the client.



Characteristics

- vDiff is acting just like a host, with one cable to the switch.
- The AP server does not see the IP(s) of the clients. All the connections comes from the VIP.

HA in one-arm mode



Config (1/3)

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	
1	e1	none	bridge_1	100	32	Edit Delete Insert Insert

Bridge list

Index	Name	
1	bridge_1	Edit Delete Insert Insert

Config (2/3)

Add the VIP
192.168.1.100.

IPv4 address

Index	IP/mask	Bridge	Flush
1	192.168.1.99/24	bridge_1	Edit Delete Insert
2	192.168.1.100/24	bridge_1	Edit Delete Up Insert Insert

IPv4 route

Index	Destination subnet	Gateway	
1	default	192.168.1.1	Edit Delete Insert Insert

Config (3/3)

Group list

Index	Name	
1	G_web_sample	VIP 192.168.1.100, Edit Delete Insert tcp 80,443, 4 targets. Detail Insert

Group G_web_sample parameter

Virtual IP: 192.168.1.100
Virtual IP6:
TCP ports: 80,443
UDP ports:
=====
Load balancing algorithm: RANDOM
Session help: S
 Session timeout: 600
 Connection limit per session:1000000
=====
SNAT IP: 192.168.1.100
SNAT IP6:
DNAT: on
All targets down action: CONTINUE
[Edit](#)

Group G_web_sample health check

Health check method: HTTP
Health check port: 80
HTTP URL to check: /
HTTP text to match: 200 OK
Health check interval (in sec): 10
Health check target:
Health check counts: 1:1:0:1:1:0
One target down action: CONTINUE
[Edit](#)

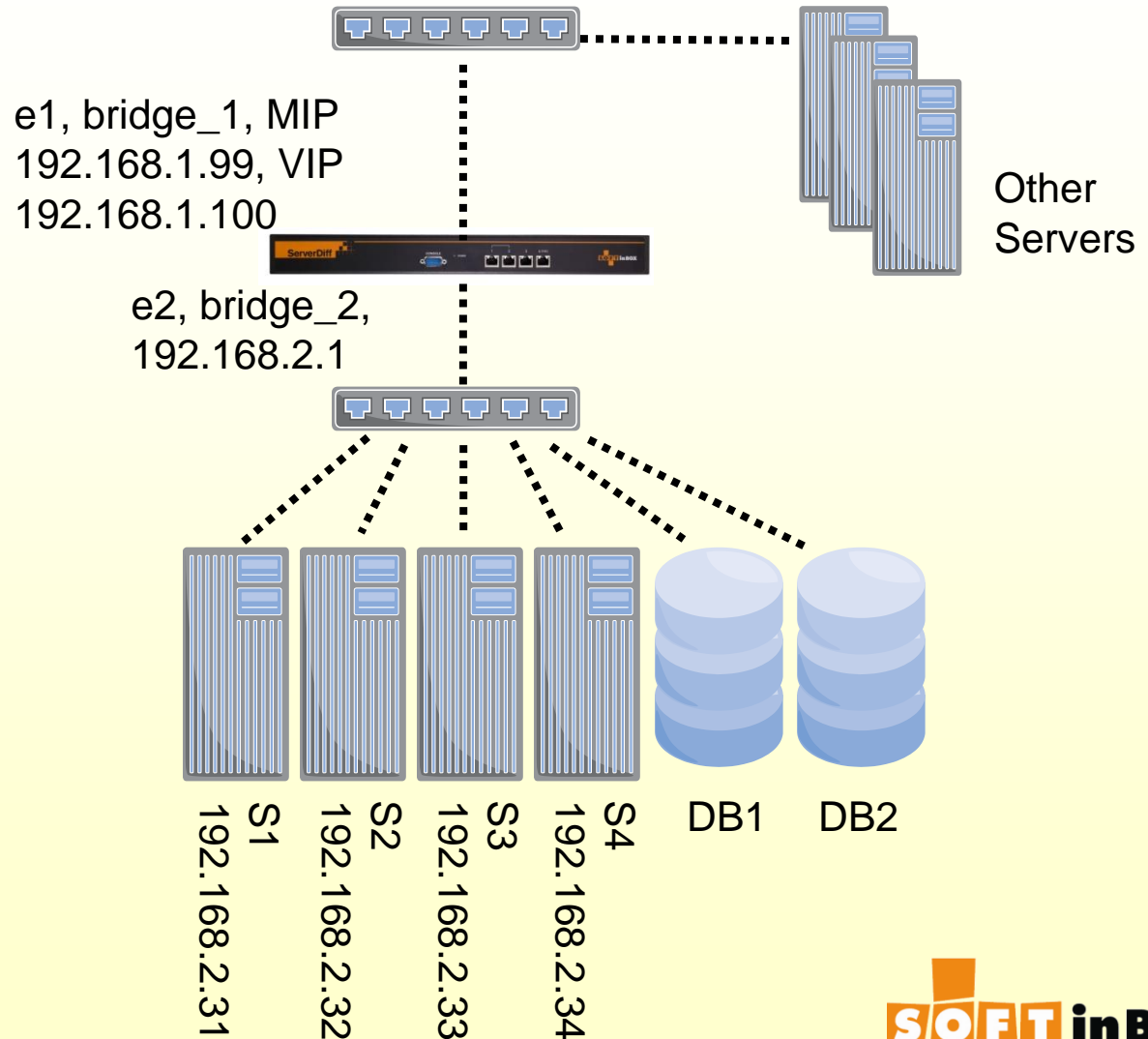
Group G_web_sample target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	AP_31	192.168.1.31		1		Edit Delete
2	AP_32	192.168.1.32		1		Edit Delete Up
3	AP_33	192.168.1.33		1		Edit Delete Up
4	AP_34	192.168.1.34		1		Edit Delete Up

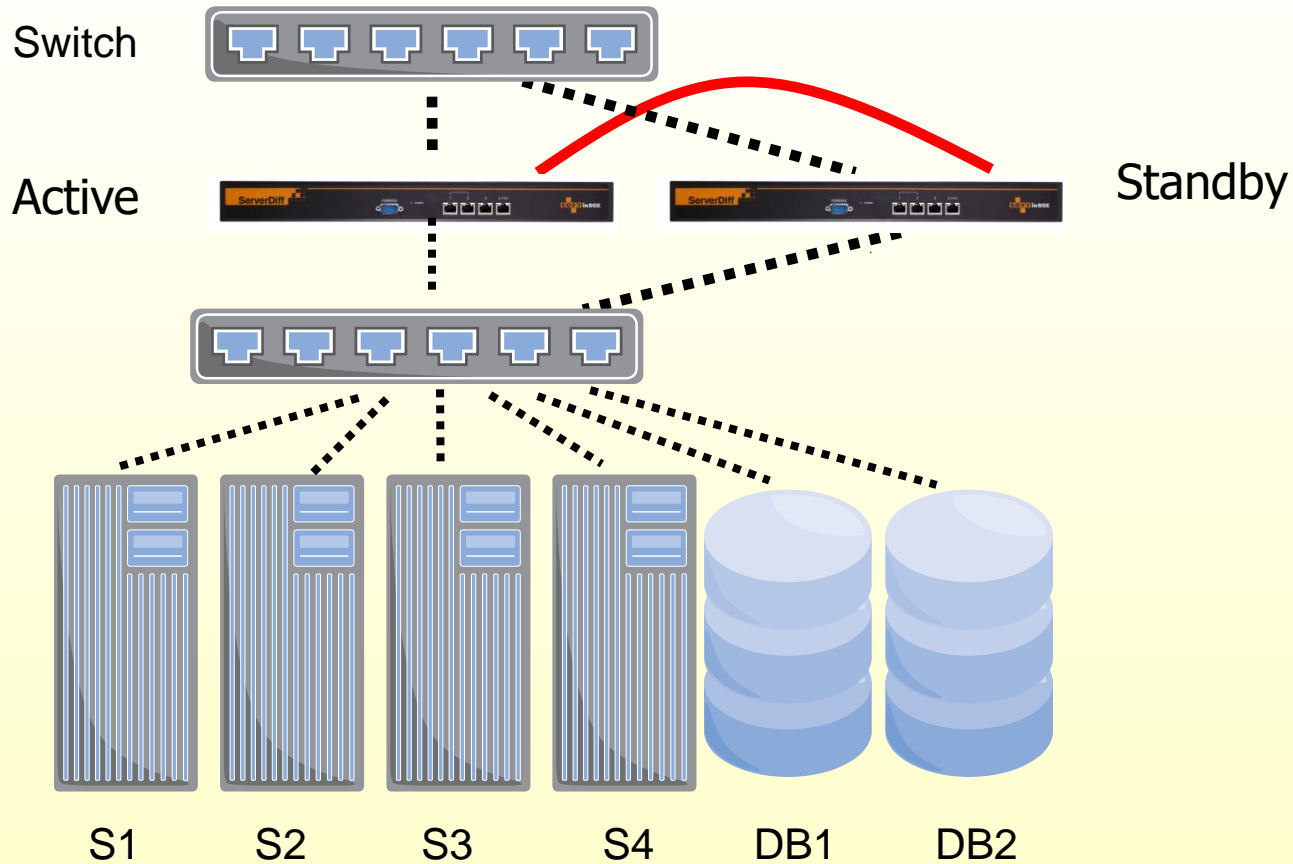
Notice!

Mode 4: VIP Router Mode

- ✓ vDiff is configured as a router and with an additional IP called the VIP (192.168.1.100 here).
- ✓ 192.168.2.1 is the gateway for the hosts in 192.168.2.0/24
- ✓ The clients Connect to the VIP and get load balanced.
- ✓ The AP servers see the original client IP(s).



HA in VIP router mode



Config (1/3)

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	Flush
1	e1	none	bridge_1	100	32	Edit Delete Insert
2	e2	none	bridge_2	100	32	Edit Delete Up Insert Insert

Bridge list

Index	Name	Flush
1	bridge_1	Edit Delete Insert
2	bridge_2	Edit Delete Up Insert Insert

Config (2/3)

IPv4 address

Index	IP/mask	Bridge	Flush
1	192.168.1.99/24	bridge_1	Edit Delete Insert
2	192.168.1.100/24	bridge_1	Edit Delete Up Insert
3	192.168.2.1/24	bridge_2	Edit Delete Up Insert Insert

IPv4 route

Index	Destination subnet	Gateway	
1	default	192.168.1.1	Edit Delete Insert Insert

Config (3/3)

Group list

Index	Name			
1	G_web_sample	VIP 192.168.1.100, tcp 80,443, 4 targets.	Edit Delete Insert	Insert
		Detail		

Group G_web_sample health check

Health check method: HTTP
Health check port: 80
HTTP URL to check: /
HTTP text to match: 200 OK
Health check interval (in sec): 10
Health check target:
Health check counts: 1:1:0:1:1:0
One target down action: CONTINUE

[Edit](#)

Group G_web_sample parameter

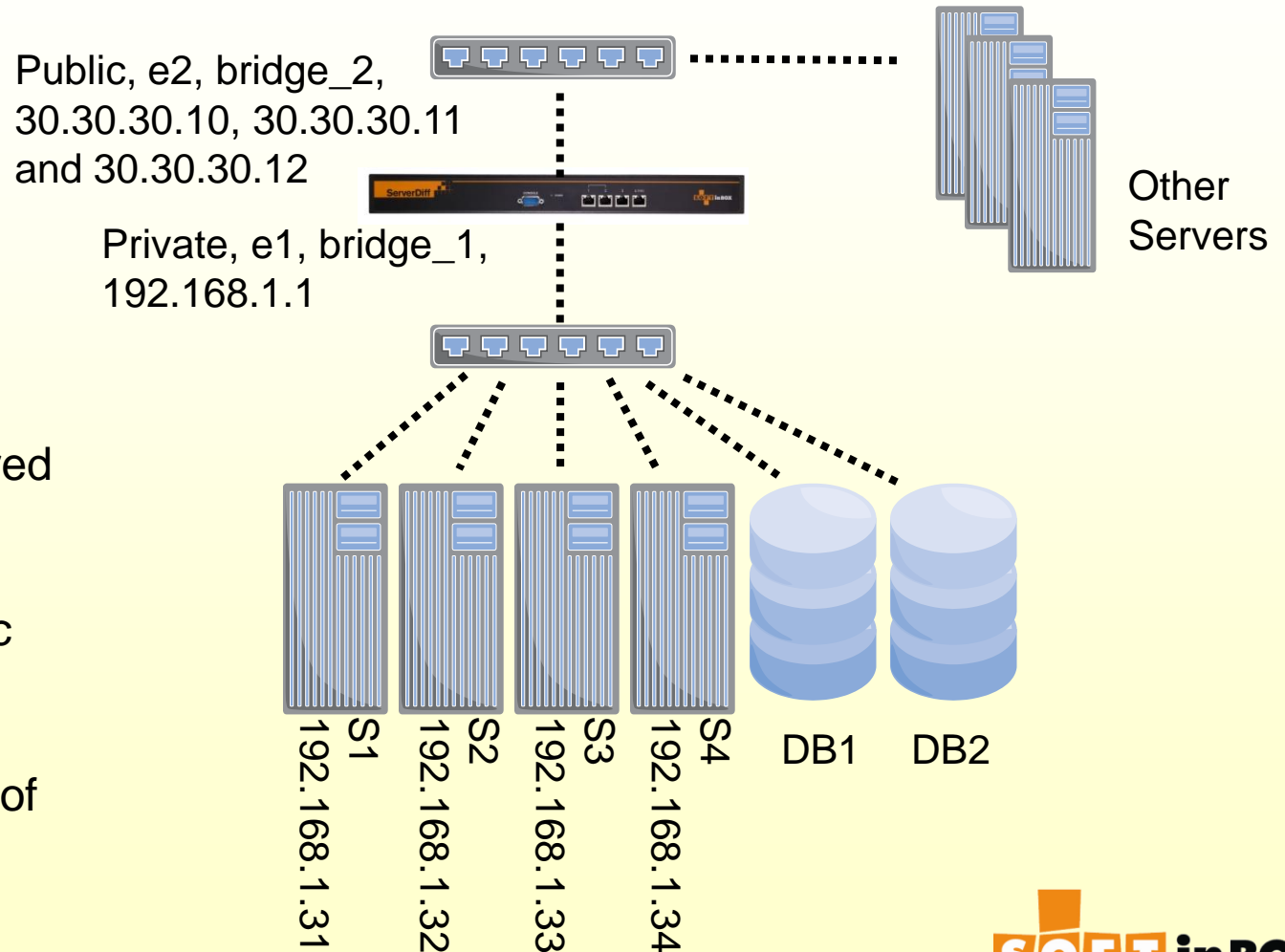
Virtual IP: 192.168.1.100
Virtual IP6:
TCP ports: 80,443
UDP ports:
=====
Load balancing algorithm: RANDOM
Session help: S
 Session timeout: 600
 Connection limit per session: 1000000
=====
SNAT IP:
SNAT IP6:
DNAT: on
All targets down action: CONTINUE

[Edit](#)

Group G_web_sample target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	AP_31	192.168.2.31		1		Edit Delete
2	AP_32	192.168.2.32		1		Edit Delete Up
3	AP_33	192.168.2.33		1		Edit Delete Up
4	AP_34	192.168.2.34		1		Edit Delete Up

5: VIP FW mode



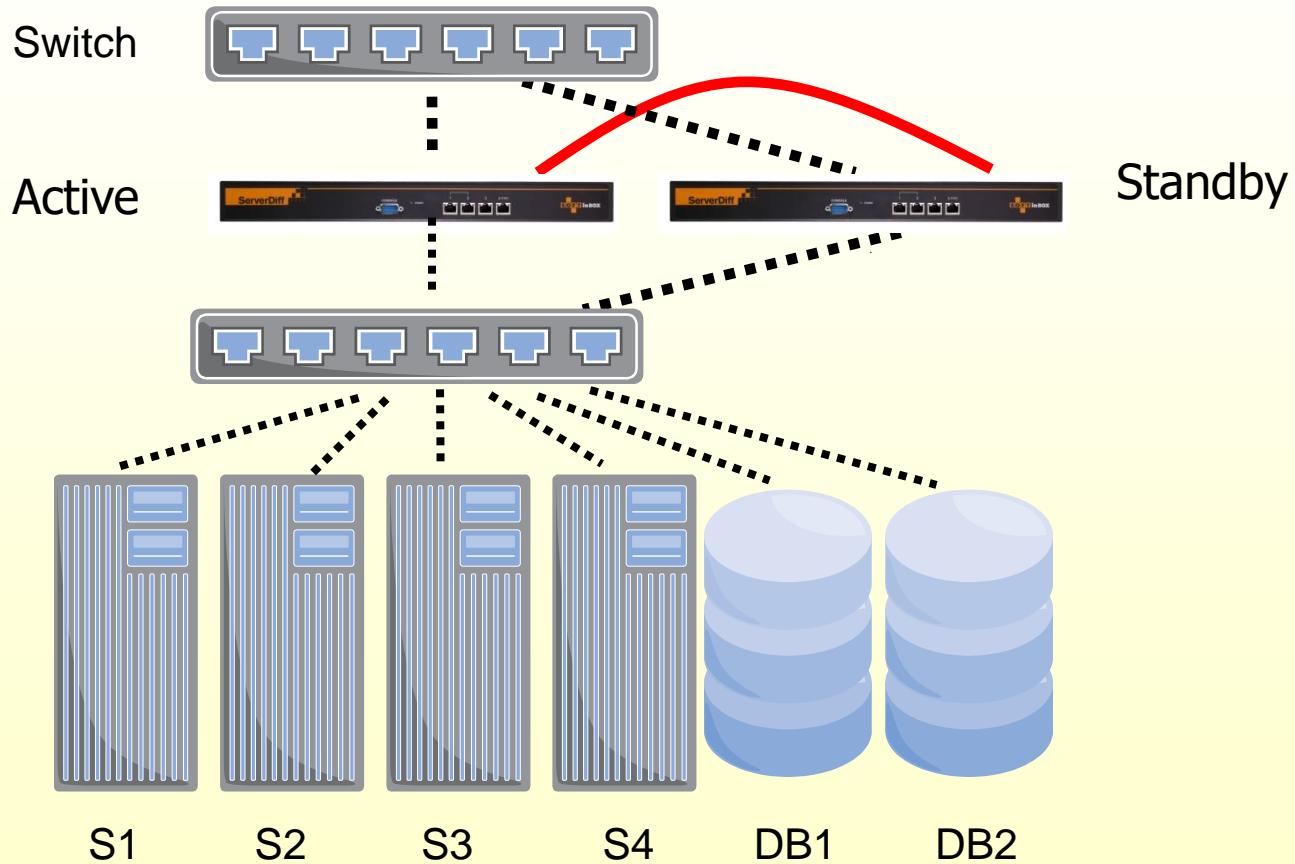
✓vDiff is configured as a router that separates the private and public networks.

✓AP servers see the original IP(s) of clients.

Tasks

- vDiff is a simple firewall that separates the public and the private subnets.
- 30.30.30.10 is the source IP for outbound connections.
- Connections to 30.30.30.11 (which is called the VIP) is load balanced to the AP servers.
- Connections to 30.30.30.12 is redirected to some internal server.
- See the configuration in the following for details.

HA in FW mode



Config (1/5)

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	Flush
1	e1	none	bridge_lan	100	32	Edit Delete Insert
2	e2	none	bridge_wan	100	32	Edit Delete Up Insert Insert

Bridge list

Index	Name	Flush
1	bridge_lan	Edit Delete Insert
2	bridge_wan	Edit Delete Up Insert Insert

Config (2/5)

IPv4 address

Index	IP/mask	Bridge	Flush
1	192.168.1.1/24	bridge_lan	Edit Delete Insert
2	30.30.30.10/24	bridge_wan	Edit Delete Up Insert
3	30.30.30.11/24	bridge_wan	Edit Delete Up Insert
4	30.30.30.12/24	bridge_wan	Edit Delete Up Insert Insert

Ignore it.

IPv4 route

Index	Destination subnet	Gateway	Flush
1	30.30.30.0	30.30.30.1	Edit Delete Insert
2	default	30.30.30.1	Edit Delete Up Insert Insert

Config (3/5)

Group list

Index	Name			
1	G_web_sample	VIP 30.30.30.11, tcp 80,443, 4 targets. Detail	Edit Delete Insert	Insert

Group G_web_sample parameter

Virtual IP: 30.30.30.11
Virtual IP6:
TCP ports: 80,443
UDP ports:
=====
Load balancing algorithm: RANDOM
Session help: S
 Session timeout: 600
 Connection limit per session:1000000
=====
SNAT IP:
SNAT IP6:
DNAT: on
All targets down action: CONTINUE

[Edit](#)

Group G_web_sample health check

Health check method: HTTP
Health check port: 80
HTTP URL to check: /
HTTP text to match: 200 OK
Health check interval (in sec): 10
Health check target:
Health check counts: 1:1:0:1:1:0
One target down action: CONTINUE

[Edit](#)

Group G_web_sample target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	AP_31	192.168.1.31		1		Edit Delete
2	AP_32	192.168.1.32		1		Edit Delete Up
3	AP_33	192.168.1.33		1		Edit Delete Up
4	AP_34	192.168.1.34		1		Edit Delete Up

Config (4/5)

Table				
Index	Name		Flush	
1	Root	(root table)	Edit Delete	Insert
2	local_accept		Edit Delete Up	Insert
3	out_snat		Edit Delete Up	Insert
4	in_dnat		Edit Delete Up	Insert
				Insert

Config (5/5)

Filter local_accept

Index	Bridge	Source IP	Destination IP	Misc.	Action
1	bridge_lan	192.168.1.0/24	192.168.1.0/24		ACCEPT Edit Delete Insert Insert

Filter out_snat

Index	Bridge	Source IP	Destination IP	Misc.	Action
1	bridge_lan	192.168.1.0/24			SNAT#30.30.30.10 Edit Delete Insert Insert

Filter in_dnat

Index	Bridge	Source IP	Destination IP	Misc.	Action
1	bridge_wan		30.30.30.12	TCP dstport=1022	DNAT#192.168.1.33#22 Edit Delete Insert Insert

Filter Root (root table)

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush
1					CALL#local_accept	Edit Delete Insert
2					CALL#out_snat	Edit Delete Up Insert
3					CALL#in_dnat	Edit Delete Up Insert Insert

High Availability

HA operations (1/2)

- With HA in operation, one of the vDiff is the “master” and the other is the “slave.” The master is responsible for the processing of all traffic, and the slave works in standby mode and monitors the status of the master via the HA links.
- When the master fails, the slave will take over and become the new master.

(2/2)

- When you log into the UI (web or CLI), you are connecting to the master. When the configuration changes, it is transferred to the slave automatically.
- The master and the slave shares all configurations and IP(s). There is no IP configured specifically for the slave.
- You can check the status of the slave in the UI. With console, use “show hainfo”. With Web UI, check “View>System” and watch the “HA peer information” block.

HA config

- You can configure vDiff with zero, one or two Ethernet ports as the HA ports.
- Use it in CLI (console, SSH, telnet)
- `tool halink 0`
- `tool halink 1 e1 all-auto`
- `tool halink 2 e1 all-auto e2 all-auto`
- Then reboot.
- The involving two vDiff(s) should be configured separately with exactly the same halink config.
- You can give the two vDiff(s) different hostnames to distinguish them easily. Use "`tool hostname <name>`" in the console.

HA requirements

- Two vDiff(s) should have same hardware (CPU, RAM, Ethernet ports, etc), same software version, and same halink config.
- Save the configuration file in case something went wrong.
- Link the HA port(s) of the two vDiff(s) BEFORE you power on the second vDiff.

Verification of HA

- Ping continuously an IP on vDiff. Usually you pick the IP used to connect to the web UI.
- Power off the master.
- The ping will continue after a few drops.
- Log in the web UI and see that the old slave is now the new master. You may distinguish them by the serial numbers or the hostnames.

Load Balancing Algorithms

LBA: Randomized

- Choose a target randomly.
- Example: 3 targets A, B, and C, with weights 1, 3, and 2, respectively. Then the probability to target A, B, or C is $1/6$, $3/6$, and $2/6$, respectively.

LBA: Round Robin

- Choose a target in round robin.
- Example: 3 targets A, B, and C, with weights 1, 1, and 2. Then connections to this group will be delivered to A, B, C, C, A, B, C, C, and so on.

LBA: Connection Rate

- Choose a target that has minimum connection rate.
- Connection rates are measured in connections per second, in the last few seconds.

LBA: Bandwidth

- Choose a target with minimum bandwidth consumptions.
- Bandwidth consumption is measured in bytes per second, in both directions, in the last few seconds.

LBA: Active Connections

- Choose a target with the least number of active connections.
- An active connection is an connection that is in vDiff's connection table.

LBA: Session Rate

- Choose a target with minimum session rate.
- Session rate is measured in sessions per second, in the last few seconds.

LBA: Active Sessions

- Choose a target with the least active sessions.
- A active session is a session that is in vDiff's session table.

LBA: Response Time

- Choose a target with probability reciprocal to the response time in its last health check.

LBA: Hash

- Choose a target with a static hash function.
- The hash function takes as arguments the source and destination addresses of the connection and the weight of a target. Connections whose source and destination addresses are the same will be dispatched to the same target.

Session Helper

SH: None

- This means that every connection get the opportunity to be load balanced.

SH: By source and destination IP

- The session table in vDiff keeps track of which target to use for a (src, dst) pair. When a new connection arrived, the session table is looked up. If an entry is found, use the stored target. Otherwise, do load balance and choose a target and new an entry in the session table about it.

SH: By source IP

- Ignore the destination IP in the session table described in the previous page. Use the source IP only.

Health Check Method

HCM: Ping

- Use ping (IPv4 echo request) to check if a target is alive or dead (faulty).

HCM: TCP connection establishment

- Try to establish a TCP connection (the SYN, SYN-ACK, ACK handshake) to a target at the specified port.

HCM: SMTP server 220 response

- Try TCP connection to a target at the specified port (usually 25) and wait for the SMTP 220 response (the hello response).
- Useful for SMTP (sendmail) servers.

HCM: HTTP page test (1/2)

- Do health check by connecting to the specified TCP port (usually 80) and try to grab a HTTP page.
- Example: If you provide a page /aux/health.php on the web server, set the "HTTP URL to check" as "/aux/health.php", "HTTP text to match" as "200 OK" (this is usually the first line of text you see in the HTTP response) or a string that can be found on the page.

(2/2)

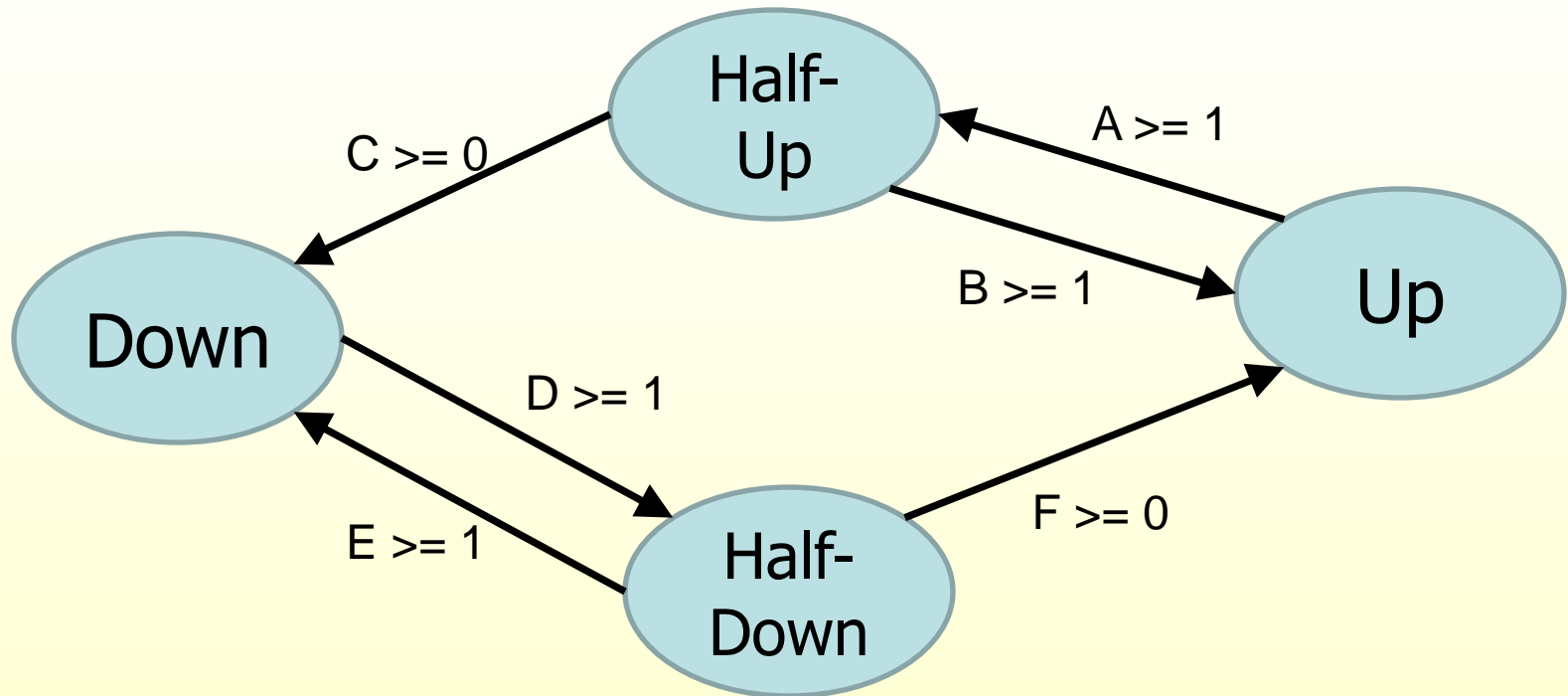
- HTTP host to check: The domain name of the web server, for example `www.abc.com`. Usually you can leave it blank.
- HTTP additional header 1/2/3: supply additional HTTP header lines here. Usually they can be left blank.

Target State Transition

Target states

- A target can be in one of the four states.
- Up: The target accepts new connections.
- Half-Up or Half-Down: The target accepts new connections that match some entry in the session table.
- Down: The target is unable to accept new connections.

State transition diagram



Moving in the state transition diagram

- A: Number of consecutive health check failures to move from Up to Half_Up.
- B: Number of consecutive health check successes to move from Half_Up to Up.
- C: Number of consecutive failures to move from Half_Up to Down.
- D: Number of consecutive successes to move from Down to Half_Down.
- E: Number of consecutive failures to move from Half_Down to Down.
- F: Number of consecutive successes to move from Half_Down to Up

Aggressive default configuration

- The default configuration for the state transition counters, which is 1:1:0:1:1:0, is pretty aggressive. It catches the up/down events fast.
- However, if you find unusually many up/down logs in the “target health check log,” consider change the counters to something milder, for example, 2:2:1:2:2:1.

Action when one target is down

- When a target is down, what to do to the packets of the existing connections to the target. The options are:
- Continue: flow of the packets continues.
- Drop: drop the packets.
- Reject: drop the packets and send REJECT packets back to the senders.

Action when all targets are down (1/2)

- When all the targets in a group is unable to accept new connections, what to do to new connections. (This may due to that a target is down, the connection/session limit of the a target is reached, or the connection per session count is reached.)
- This config is in "group parameter."
- The options are:

(2/2)

- Continue: forwarding the connection without load balancing. This is usually useful only to the transparent bridge mode. With other networking models, the connection may hit vDiff and show the management UI or be simply rejected.
- Drop: the connection is dropped.
- Reject: the connection is dropped and a reject packet is returned to the sender.

Some measures to protect the targets

- Connection limit (target configuration): The number of active connections a target can have.
- Session limit (target configuration): The number of active sessions a target can have.
- Connections per session limit (group parameter): The limit of the number of active connections of a session.

Configuration examples for some popular services

Example for the web service

- TCP ports: "80,443"
- Session help: S or SD
- Health check method: HTTP

Example for the SMTP service

- TCP ports: "25"
- Session help: None
- Health check method: SMTP

Example for the MS terminal service

- TCP ports: "3389"
- Session help: S or SD
- Health check method: SYNACK at port 3389

Gracefully off-line a target for maintenance (1/5)

- Four AP servers run smoothly.

Group G_web_sample status

Index	Name	IP	Status	Weight	Active connections	Active sessions	Mode
1	AP_31	192.168.1.31	Up	1	3,009	4,428	On Edit
2	AP_32	192.168.1.32	Up	1	3,000	4,424	On Edit
3	AP_33	192.168.1.33	Up	1	2,995	4,433	On Edit
4	AP_34	192.168.1.34	Up	1	2,996	4,426	On Edit

(2/5)

- AP_32 is scheduled to upgrade the RAM, for example. So we change its mode to "half."
- New connections to old sessions on AP_32 still go to AP_32, but new sessions are not to be created on AP_32. The active connections/sessions counters decrease.

(3/5)

- Like this.

Group G_web_sample status

Index	Name	IP	Status	Weight	Active connections	Active sessions	Mode
1	AP_31	192.168.1.31	Up	1	3,339	4,765	On Edit
2	AP_32	192.168.1.32	Up	0	2,015	3,443	Half Edit
3	AP_33	192.168.1.33	Up	1	3,325	4,733	On Edit
4	AP_34	192.168.1.34	Up	1	3,321	4,760	On Edit

(4/5)

- Eventually the counters are zeros (or close to zeros). It is time to off-line AP_32 and do your maintenance.

Group G_web_sample status

Index	Name	IP	Status	Weight	Active connections	Active sessions	Mode
1	AP_31	192.168.1.31	Up	1	4,073	6,005	On Edit
2	AP_32	192.168.1.32	Up	0	0	0	Half Edit
3	AP_33	192.168.1.33	Up	1	3,972	5,859	On Edit
4	AP_34	192.168.1.34	Up	1	3,955	5,840	On Edit

(5/5)

- After the maintenance. Change its mode back to "on."
- The counters of AP_32 increase and back to normal gradually.

Group G_web_sample status

Index	Name	IP	Status	Weight	Active connections	Active sessions	Mode
1	AP_31	192.168.1.31	Up	1	3,805	5,761	On Edit
2	AP_32	192.168.1.32	Up	1	750	750	On Edit
3	AP_33	192.168.1.33	Up	1	3,729	5,614	On Edit
4	AP_34	192.168.1.34	Up	1	3,716	5,606	On Edit

ARP request/reply test (1/3)

- This is useful to detect duplicate IP(s) on the network. For example to test if there are duplicate IP(s) of the VIP 192.168.1.100 on the network, do the following in web UI > Tools > Diagnostic.

ARP requests/replies (IPv4)

Bridge:

Target address or domain name:

[Run](#)

(2/3)

- Normally, there should not be other hosts on the network that have the IP, so the result look like this:

[Back](#)

```
ARPING to 192.168.1.100 from 192.168.1.99 via bridge_1  
Sent 3 probe(s) (3 broadcast(s))  
Received 0 reply (0 request(s), 0 broadcast(s))
```

(3/3)

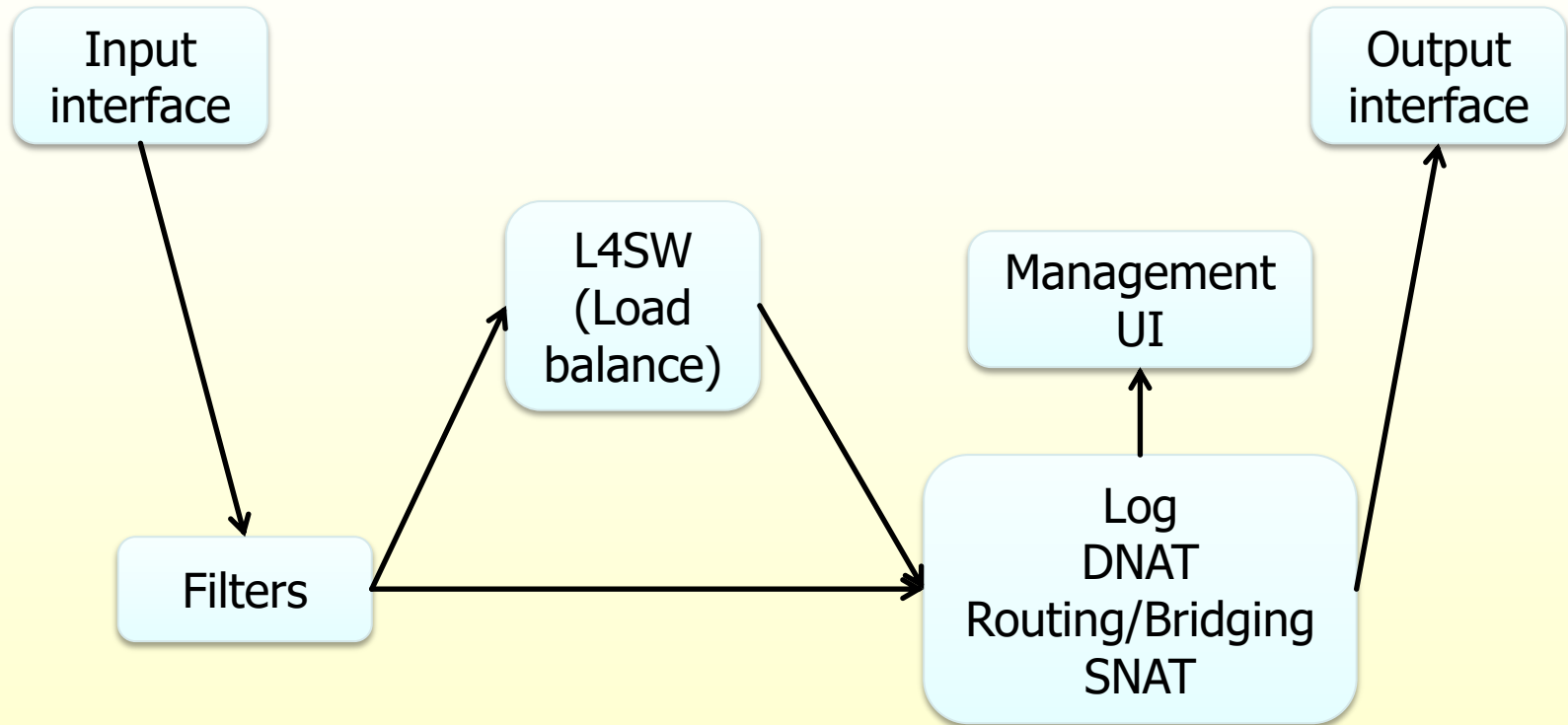
- Otherwise, you will see something like this, indicating some duplicate IP.

[Back](#)

```
ARPING to 192.168.1.100 from 192.168.1.99 via bridge_1
Unicast reply from 192.168.1.100 [0:c:29:fb:85:b9] 0.181ms
Unicast reply from 192.168.1.100 [0:c:29:fb:85:b9] 0.169ms
Unicast reply from 192.168.1.100 [0:c:29:fb:85:b9] 0.198ms
Sent 3 probe(s) (3 broadcast(s))
Received 3 reply (0 request(s), 0 broadcast(s))
```


Filters and the processing of connections

Processing of connections



Basics (1/2)

- Every new connection travelling through vDiff is processed by the filters.
- Start from the first rule of the table marked as “root table” and “flow” through the rules one by one.
- The connection is matched against the rule. If it matches, the action is taken.
- Depending on the action it takes, the connection may (1) leave the filters all together, (2) be dropped, or (3) “flow” the following rules.

(2/2)

- At the end of a non-root table. The flow resumes at the calling rule.
- At the end of the root table, the connection will be given to the L4 switching module, which matches the connection against the groups.

The matches

- Input interface.
- Source IP.
- Destination IP.
- Protocol: None, TCP, UDP, or ICMP.
- TCP/UDP source and destination port.
- Forwarded from <ip>. Match if the source MAC address of the connection is equal to the MAC of <ip>. Useful to see if the connection is from some gateway (router) specified by <ip>.

The actions (1/6)

- CONTINUE. A dummy action that does nothing. Flow the next rule.
- LOG <text>. Emit a entry to the “connection log” along with the <text>. Flow the next rule.
- ACCEPT. Leave the filters all together. The connection will be processed by the L2/L3 modules of vDiff. It goes to the management UI if appropriate. But it will NOT be processed by the L4 switching module.

(2/6)

- DROP. Drop the connection. It is fed to “the blackhole.”
- REJECT. The same to “DROP” and a reject packet is returned to the sender.
- CALL <table>. Jump to <table> (and flow the first rule).
- RETURN. The flow of the connection resumes at the calling rule.

(3/6)

- L4SW log on. Turn on the “L4SW log flag.” The flow continues.
- L4SW log off. Turn off the “L4SW log flag”. The flow continues.
- Admin allow. Turn on the “admin allow flag.” The flow continues.
- Admin deny. Turn off the “admin allow flag.” The flow continues.

(4/6)

- SNAT <ip>. Replace the “SNAT mark” with <ip>. The flow continues.
- DNAT <ip>. Replace the “DNAT mark” with <ip>. The flow continues.
- DNAT <ip> <port>. Replace the “DNAT mark” with <ip> and <port>. The flow continues.

(5/6)

- L4SW <group>. Feed the connection to the load balance <group>. If it is not processed by <group>, the flow continues, otherwise, leave the filters all together.
- Session help with source IP override <ip>. Replace the "session help source ip mark" with <ip>. The flow continues.

(6/6)

- Session help with source IP mask <mask>. Replace the “session help source ip mask” with <mask>. The flow continues.
- REPLY_GW <ip>. Replace the “reply gateway mark” with <ip>. The flow continues.

Admin UI access

(1/2)

- There are several administrative user interfaces: http, https, telnet, and ssh. They can be activated/deactivated individually by:

Admin interface	
HTTP (Web)	off
HTTPS (Web)	on
Telnet (Console)	off
SSH (Console)	on
Edit	

(2/2)

- By default, admin UI is allowed from all IP(s). You can allow connections only from hosts in 10.0.0.0/8, as follows.

Table			
Index	Name		Flush
1	Root	(root table)	Edit Delete Insert
2	Admin_control		Edit Delete Up Insert Insert

Filter Admin_control						
Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush
1					ADMIN_DENY	Edit Delete Insert
2		10.0.0.0/8			ADMIN_ALLOW	Edit Delete Up Insert Insert

Filter Root (root table)						
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1					CALL#Admin_control	Edit Delete Insert Insert

L4SW (load balancing) logs

(1/2)

- By default, the L4SW log is off. You can enable it as follows.

Table						
Index	Name		Flush			
1	Root	(root table)	Edit	Delete	Insert	
2	L4SW_log		Edit	Delete	Up	Insert
					Insert	

Filter Root (root table)						
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1					CALL#L4SW_log	Edit Delete Insert
						Insert

Filter L4SW_log						
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1					L4SW_LOG_ON	Edit Delete Insert
						Insert

(2/2)

- And you can fine tune it, for example log only connections from 192.168.2.0/24, like this:

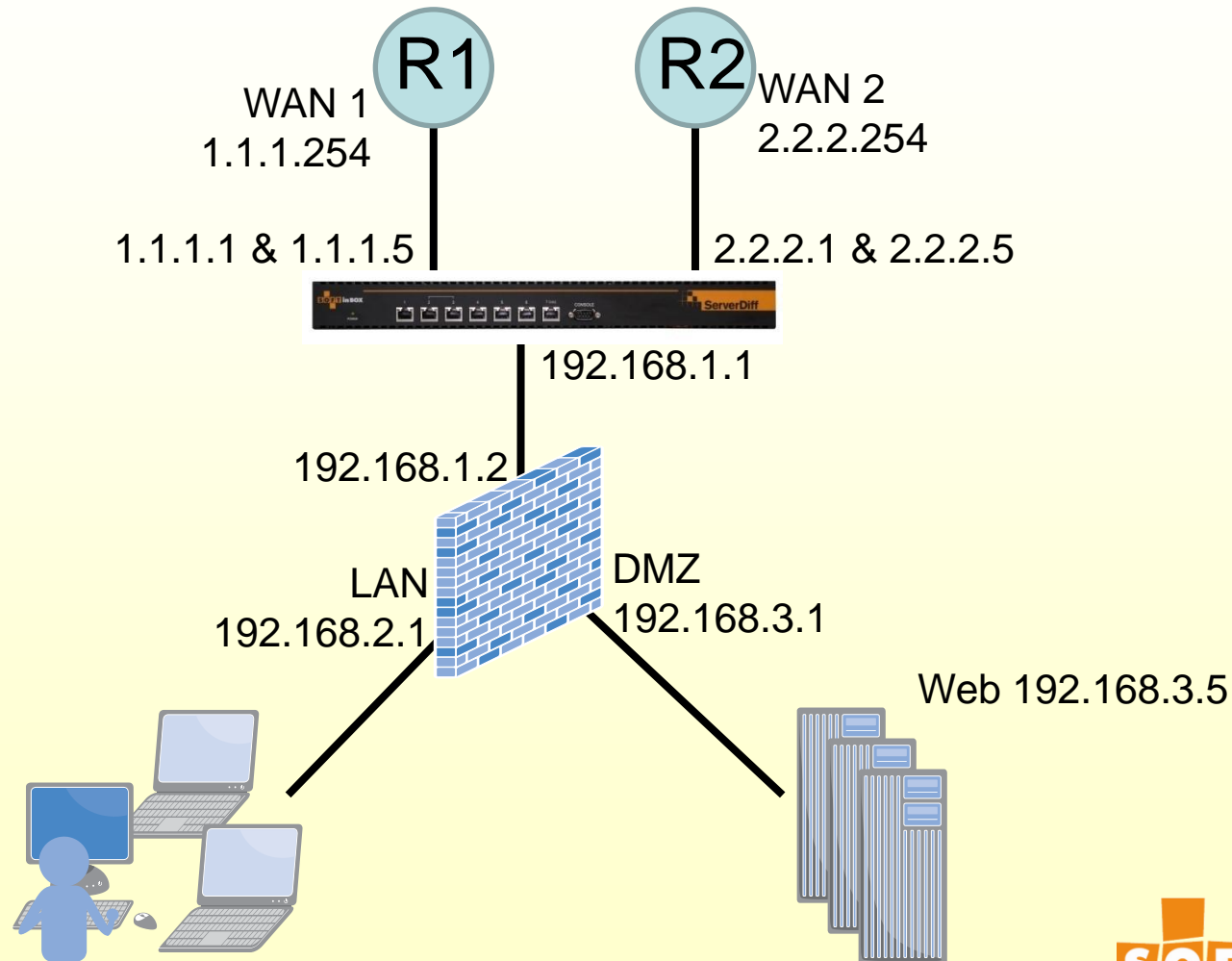
Table						
Index	Name		Flush			
1	Root	(root table)	Edit	Delete	Insert	
2	L4SW_log		Edit	Delete	Up	Insert
					Insert	

Filter Root (root table)						
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1					CALL#L4SW_log	Edit Delete Insert
						Insert

Filter L4SW_log						
Index	Bridge	Source IP	Destination IP	Misc.	Action	
1		192.168.2.0/24			L4SW_LOG_ON	Edit Delete Insert
						Insert

WAN load balance

Network topology



Tasks (1/2)

- Outbound load balancing. For connections from 192.168.x.x to Internet, load balance on WAN 1 and WAN 2, by doing so, SNAT to 1.1.1.1 for WAN 1 and 2.2.2.1 for WAN 2, respectively.

Tasks (2/2)

- Map public IP(s) to internal services. In this example, map 1.1.1.5 and 2.2.2.5 to the internal web server at 192.168.3.5.

Config (1/5)

VLAN and bridge binding

Index	Ethernet	VLAN tag	bridge	path cost	port priority	Flush	
1	e1	none	b_lan	100	32	Edit	Delete Insert
2	e2	none	b_wan_1	100	32	Edit	Delete Up Insert
3	e3	none	b_wan_2	100	32	Edit	Delete Up Insert
							Insert

Bridge list

Index	Name	Flush	
1	b_lan	Edit	Delete Insert
2	b_wan_1	Edit	Delete Up Insert
3	b_wan_2	Edit	Delete Up Insert
			Insert

(2/5)

IPv4 address

Index	IP/mask	Bridge	Flush
1	192.168.1.1/24	b_lan	Edit Delete Insert
2	1.1.1.1/24	b_wan_1	Edit Delete Up Insert
3	2.2.2.1/24	b_wan_2	Edit Delete Up Insert Insert

IPv4 route

Index	Destination subnet	Gateway	
1	default	192.168.1.2	Edit Delete Insert Insert

(3/5)

Group WAN_LB parameter

Virtual IP:

Virtual IP6:

TCP ports:

UDP ports:

=====

Load balancing algorithm: CONN_RATE

Session help: SD

Session timeout: 600

Connection limit per session: 1000000

=====

SNAT IP:

SNAT IP6:

DNAT: off

All targets down action: CONTINUE

Group WAN_LB health check

Health check method: PING

Ping TTL: 4

Health check interval (in sec): 10

Health check target: 8.8.8.8

Health check counts: 1:1:0:1:1:0

One target down action: CONTINUE

[Edit](#)

Group WAN_LB target list

Index	Name	IP	IP6	Weight	Misc.	Flush
1	WAN_1	1.1.1.254		1	SNAT IP: 1.1.1.1	Edit Delete Insert
2	WAN_2	2.2.2.254		1	SNAT IP: 2.2.2.1	Edit Delete Up Insert

(4/5)

Table

Index	Name		Flush
1	Root	(root table)	Edit Delete Insert
2	admin_control		Edit Delete Up Insert
3	reply		Edit Delete Up Insert
4	inbound		Edit Delete Up Insert
5	outbound		Edit Delete Up Insert
			Insert

Filter admin_control

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush
1					ADMIN_DENY	Edit Delete Insert
2			192.168.1.1		ADMIN_ALLOW	Edit Delete Up Insert
3			192.168.1.1		ACCEPT	Edit Delete Up Insert
						Insert

Filter reply

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush
1	b_wan_1			forwarded_from=1.1.1.254	REPLY_GW#1.1.1.254	Edit Delete Insert
2	b_wan_2			forwarded_from=2.2.2.254	REPLY_GW#2.2.2.254	Edit Delete Up Insert
						Insert

(5/5)

Filter inbound

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush	
1	b_wan_1		1.1.1.5	TCP dstport=80	DNAT#192.168.3.5	Edit Delete	Insert
2	b_wan_2		2.2.2.5	TCP dstport=80	DNAT#192.168.3.5	Edit Delete Up	Insert
							Insert

Filter outbound

Index	Bridge	Source IP	Destination IP	Misc.	Action	
1	b_lan				L4SW#WAN_LB	Edit Delete Insert
						Insert

Filter Root (root table)

Index	Bridge	Source IP	Destination IP	Misc.	Action	Flush	
1					CALL#admin_control	Edit Delete	Insert
2					CALL#reply	Edit Delete Up	Insert
3					CALL#inbound	Edit Delete Up	Insert
4					CALL#outbound	Edit Delete Up	Insert
							Insert

vDiff installation

install.zip

- You are supplied with an install file `install.zip`, with the following contents:

`install`

`install/00readme.txt`

`install/install_hyperv`

`install/install_hyperv/disk.vhd`

`install/install_vmware`

`install/install_vmware/disk.vmdk`

`install/install_vmware/vdiff.ovf`

`install/install_xen`

`install/install_xen/config_sample.1`

`install/install_xen/config_sample.2`

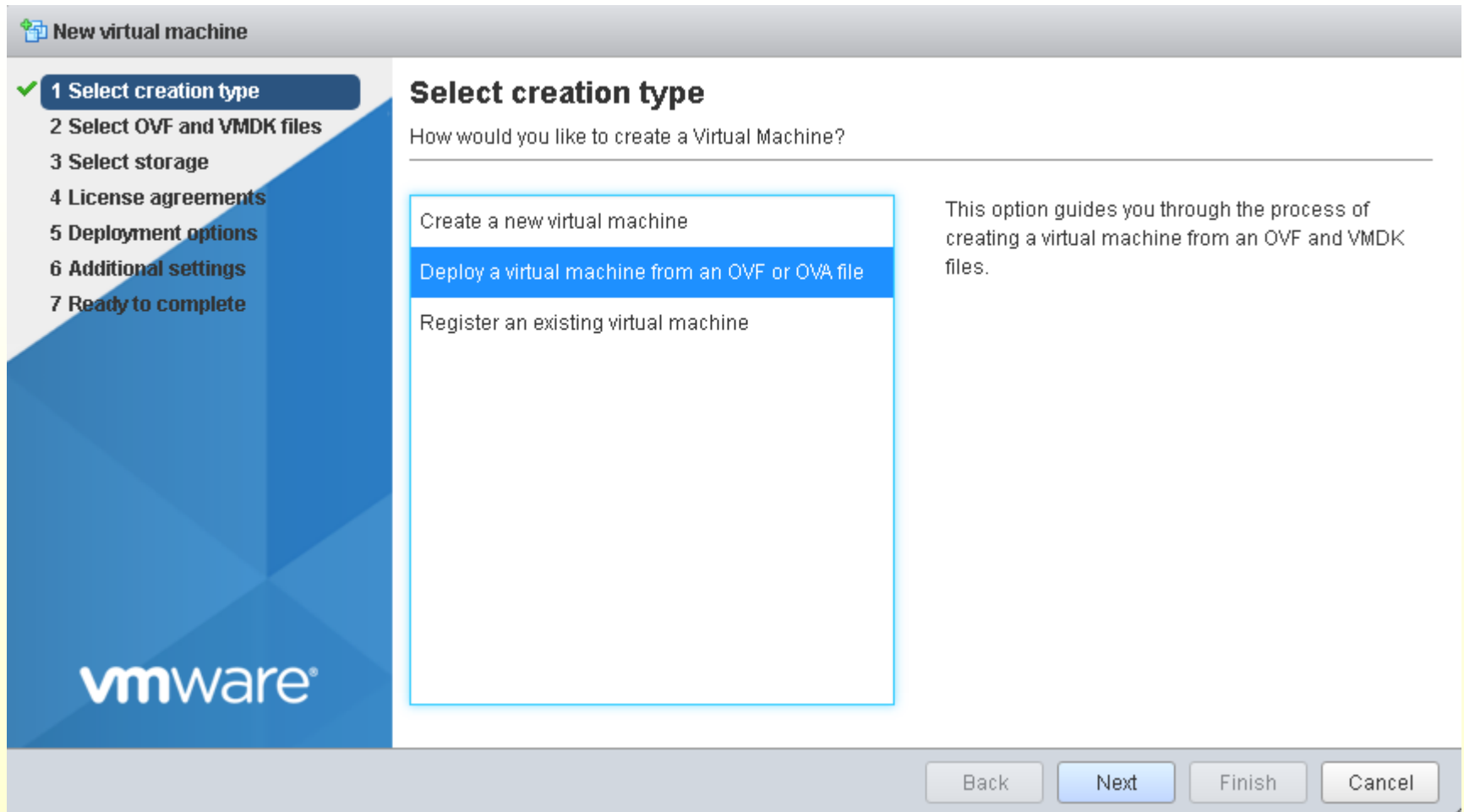
`install/install_xen/disk.bin`

VMWare installation

Sample environment

- This document is prepared with VMware ESXi-6.5.0 Host Client web UI.
- Extract install.zip and look into the install_vmware directory.

Create a VMWare ESXi VM from OVF and VMDK files



Select “Deploy a virtual machine from an OVF or OVA file.”

New virtual machine - vdiff

- 1 Select creation type
- 2 Select OVF and VMDK files**
- 3 Select storage
- 4 License agreements
- 5 Deployment options
- 6 Additional settings
- 7 Ready to complete



Select OVF and VMDK files

Select the OVF and VMDK files or OVA for the VM you would like to deploy

Enter a name for the virtual machine.

vdiff

Virtual machine names can contain up to 80 characters and they must be unique within each ESXi instance.

- ×  vdiff.ovf
- ×  disk.vmdk

vmware

Back Next Finish Cancel

Give a name to the new VM and upload the ovf and vmdk files.

New virtual machine - vdiff

✓ 1 Select creation type

✓ 2 Select OVF and VMDK files

✓ 3 Select storage

4 License agreements

5 Deployment options

6 Additional settings

7 Ready to complete

vmware®

Select storage

Select the datastore in which to store the configuration and disk files.

The following datastores are accessible from the destination resource that you selected. Select the destination datastore for the virtual machine configuration files and all of the virtual disks.

Name	Cap...	Free	Type	Thin...	Acc...
datastore1	458.2...	453.7...	VMFS5	Supp...	Single

1 items

Back

Next

Finish

Cancel

Select a storage you prefer.

New virtual machine - vdiff - vdiff

- ✓ 1 Select creation type
- ✓ 2 Select OVF and VMDK files
- ✓ 3 Select storage
- ✓ 4 **Deployment options**
- 5 Ready to complete

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Deployment options

Select deployment options

Network mappings	e1	VM Network ▼
Disk provisioning	<input checked="" type="radio"/> Thin <input type="radio"/> Thick	

Back Next Finish Cancel

Attach e1 to the default port group
“VM Network” or whatever port
group you like.


New virtual machine - vdiff

- ✓ 1 Select creation type
- ✓ 2 Select OVF and VMDK files
- ✓ 3 Select storage
- ✓ 4 Deployment options
- ✓ 5 Ready to complete

Ready to complete

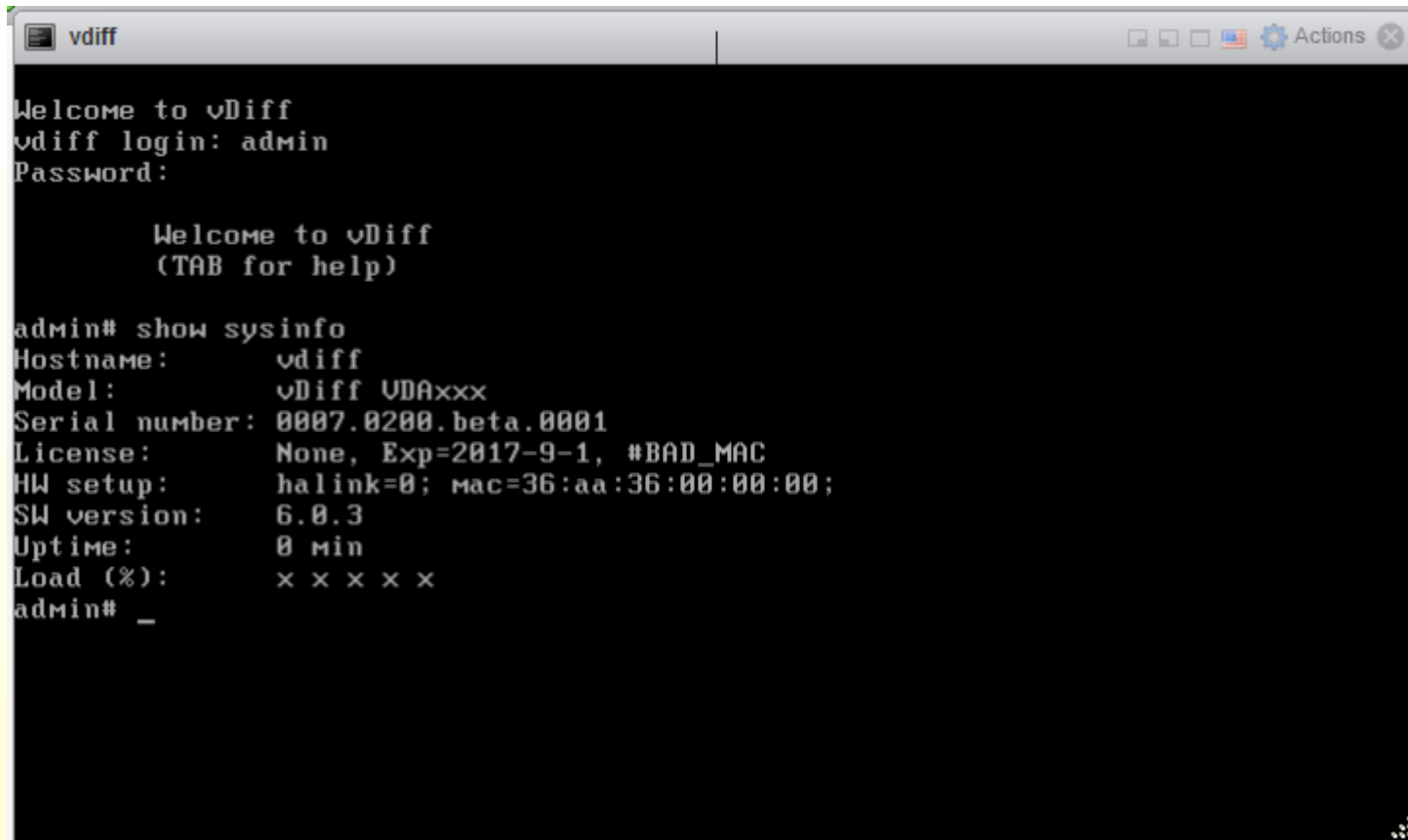
Review your settings selection before finishing the wizard

Product	vdiff
VM Name	vdiff
Disks	disk.vmdk
Datastore	datastore1
Provisioning type	Thin
Network mappings	e1: VM Network
Guest OS Name	Unknown

 Do not refresh your browser while this VM is being deployed.

Back Next Finish Cancel

Click “Finish” and wait for the vmdk file to upload.

A screenshot of a terminal window titled 'vdiff'. The window has a standard macOS-style title bar with window control buttons and an 'Actions' menu. The terminal text shows a login sequence: 'Welcome to vDiff', 'vdiff login: admin', and 'Password:'. After a blank line, it shows 'Welcome to vDiff (TAB for help)'. The user enters 'admin# show sysinfo', and the terminal displays system information: 'Hostname: vdiff', 'Model: vDiff UDAxxx', 'Serial number: 0007.0200.beta.0001', 'License: None, Exp=2017-9-1, #BAD_MAC', 'HW setup: halink=0; mac=36:aa:36:00:00:00;', 'SW version: 6.0.3', 'Uptime: 0 min', and 'Load (%): x x x x x'. The prompt 'admin# _' is shown at the bottom.

```
vdiff
Welcome to vDiff
vdiff login: admin
Password:

Welcome to vDiff
(TAB for help)

admin# show sysinfo
Hostname:      vdiff
Model:        vDiff UDAxxx
Serial number: 0007.0200.beta.0001
License:      None, Exp=2017-9-1, #BAD_MAC
HW setup:     halink=0; mac=36:aa:36:00:00:00;
SW version:   6.0.3
Uptime:       0 min
Load (%):     x x x x x
admin# _
```

You can log into the console with
username/password = admin/admin.
Enter the command “show sysinfo”.

Assign MAC address

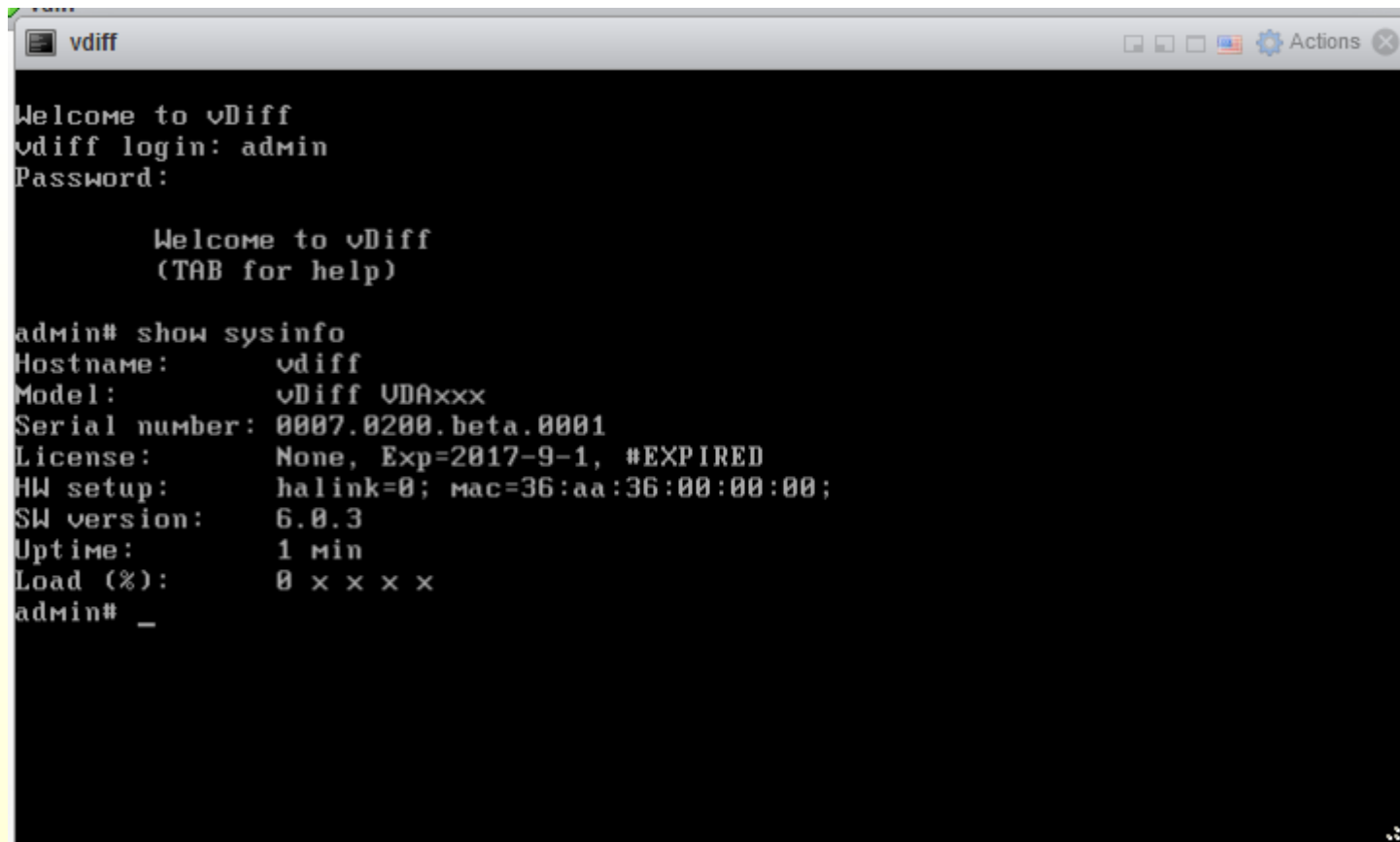
- Note the MAC address shown in the “HW setup” line. In this sample, its 36:aa:36:00:00:00.
- “Power off” the VM and “Edit” its settings.
- Expand “Network Adapter 1”, select the “MAC address” line and change it from “Automatic” to “Manual” and enter “36:aa:36:00:00:00” in the next field.
- (Cont at the following page.)

Edit settings - vdiff (ESX/ESXi 4.x virtual machine)

	1		
Memory	2000	MB	
Hard disk 1	100	MB	
SCSI Controller 0	VMware Paravirtual		
USB controller 1	USB 2.0		
Network Adapter 1	pg_192		
Status	<input checked="" type="checkbox"/> Connect at power on		
Adapter Type	VMXNET 3		
MAC Address	Manual	36:aa:36:00:00:00	
Video Card	Auto-detect settings		

Save Cancel

Click "Save" when you are done.

A screenshot of a terminal window titled 'vdiff'. The window has a standard Linux-style title bar with window control buttons and an 'Actions' menu. The terminal text shows a login sequence: 'Welcome to vDiff', 'vdiff login: admin', and 'Password:'. After a blank line, it shows 'Welcome to vDiff (TAB for help)'. The user then enters 'admin# show sysinfo', which displays system details: 'Hostname: vdiff', 'Model: vDiff VDAxxx', 'Serial number: 0007.0200.beta.0001', 'License: None, Exp=2017-9-1, #EXPIRED', 'HW setup: halink=0; mac=36:aa:36:00:00:00;', 'SW version: 6.0.3', 'Uptime: 1 min', and 'Load (%): 0 x x x x'. The prompt returns to 'admin# _'.

Power on the VM and login the console and “show sysinfo”. Check that the “#BAD_MAC” is gone in the License line.

At this stage, you should be able to connect to the web management UI at <https://192.168.1.99>. Username/password is the same admin/admin.

Request for up-to-date license

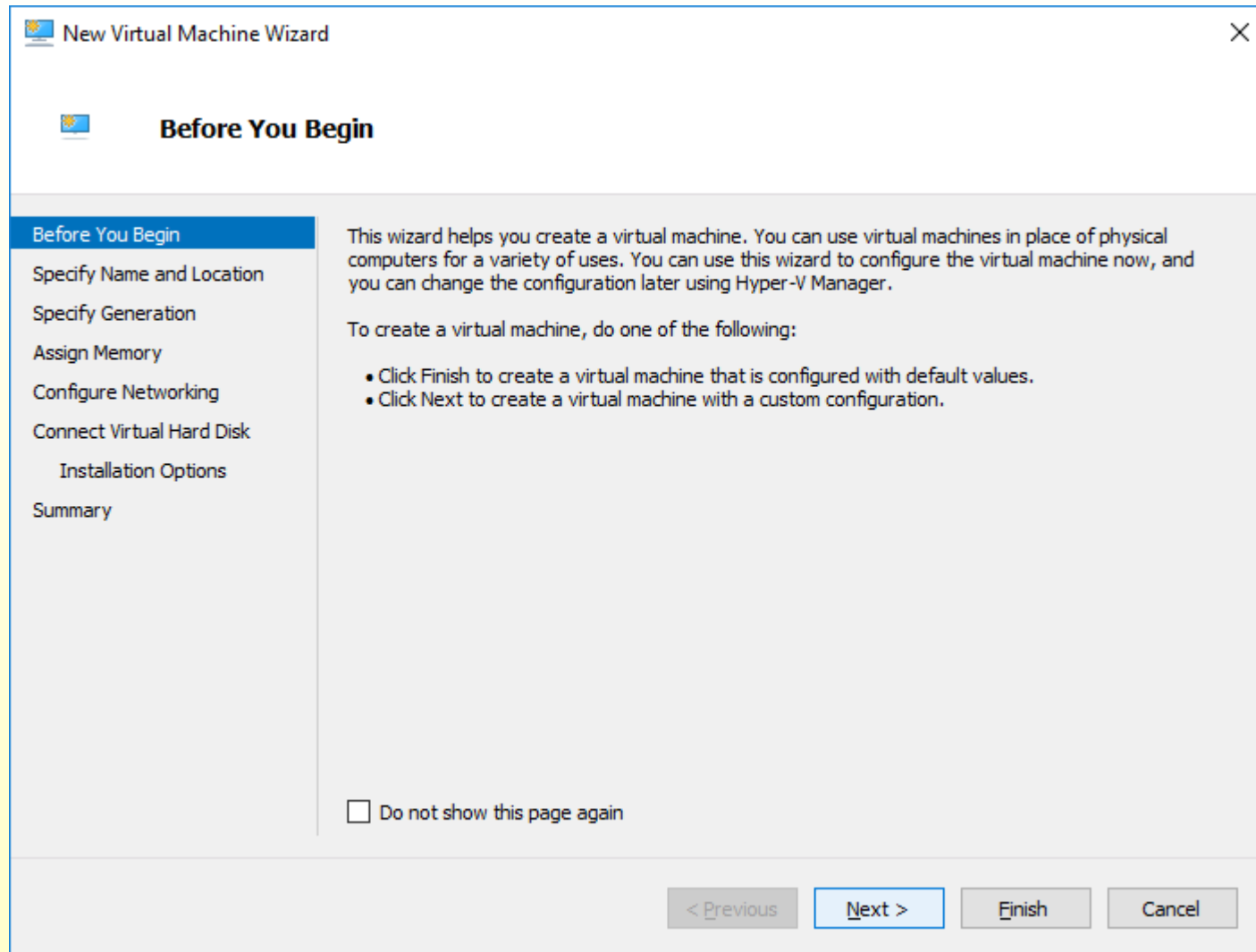
- See the chapter “Request for up-to-date license” to complete the installation process.

Creating a Hyper-V VM

Extract disk.vhd

- Extract install.zip and locate disk.vhd (install/install_hyperv/disk.vhd)
- Save disk.vhd somewhere in the Hyper-V host.

■ “New” a “Virtual Machine” in “Hyper-V Manager.”

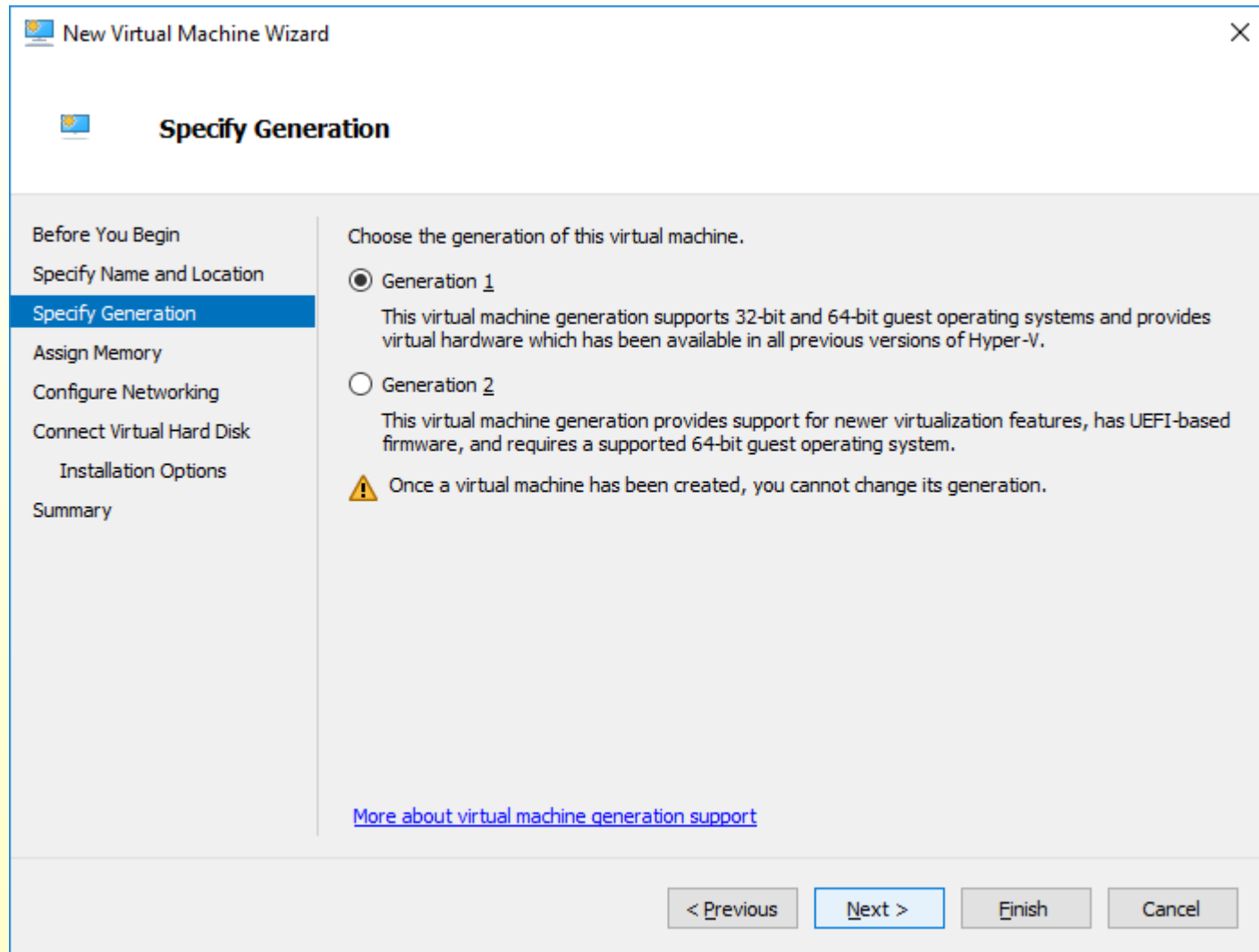


■ Give it a name.

The screenshot shows the 'New Virtual Machine Wizard' window, specifically the 'Specify Name and Location' step. The window has a title bar with a close button. On the left is a navigation pane with the following steps: 'Before You Begin', 'Specify Name and Location' (which is selected and highlighted in blue), 'Specify Generation', 'Assign Memory', 'Configure Networking', 'Connect Virtual Hard Disk', 'Installation Options', and 'Summary'. The main area of the wizard contains the following text and controls:

- Header: 'Specify Name and Location' with a small icon.
- Instruction: 'Choose a name and location for this virtual machine.'
- Text: 'The name is displayed in Hyper-V Manager. We recommend that you use a name that helps you easily identify this virtual machine, such as the name of the guest operating system or workload.'
- Form: A text box labeled 'Name:' containing the text 'vdiff'.
- Text: 'You can create a folder or use an existing folder to store the virtual machine. If you don't select a folder, the virtual machine is stored in the default folder configured for this server.'
- Form: A checkbox labeled 'Store the virtual machine in a different location' which is currently unchecked.
- Form: A text box labeled 'Location:' containing the path 'C:\ProgramData\Microsoft\Windows\Hyper-V\'.
- Form: A 'Browse...' button next to the location text box.
- Warning: A yellow warning icon followed by the text: 'If you plan to take checkpoints of this virtual machine, select a location that has enough free space. Checkpoints include virtual machine data and may require a large amount of space.'
- Navigation: At the bottom right, there are four buttons: '< Previous', 'Next >' (highlighted in blue), 'Finish', and 'Cancel'.

■ Specify “Generation 1.”



The screenshot shows the 'New Virtual Machine Wizard' window with the 'Specify Generation' step selected in the left-hand navigation pane. The main area displays two radio button options: 'Generation 1' (selected) and 'Generation 2'. Below these options is a warning icon and text stating that the generation cannot be changed after creation. A link for 'More about virtual machine generation support' is at the bottom. The bottom of the window features four buttons: '< Previous', 'Next >', 'Finish', and 'Cancel'.

New Virtual Machine Wizard

Specify Generation

Before You Begin
Specify Name and Location
Specify Generation
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

Choose the generation of this virtual machine.

☒ Generation 1
This virtual machine generation supports 32-bit and 64-bit guest operating systems and provides virtual hardware which has been available in all previous versions of Hyper-V.

☐ Generation 2
This virtual machine generation provides support for newer virtualization features, has UEFI-based firmware, and requires a supported 64-bit guest operating system.

⚠ Once a virtual machine has been created, you cannot change its generation.

[More about virtual machine generation support](#)

< Previous Next > Finish Cancel

- Give it 2000MB of memory for VDA100.
(Check the spec page for other models.)

The screenshot shows the 'New Virtual Machine Wizard' window, specifically the 'Assign Memory' step. The window has a title bar with the text 'New Virtual Machine Wizard' and a close button. Below the title bar is a sub-header 'Assign Memory'. On the left side, there is a list of steps: 'Before You Begin', 'Specify Name and Location', 'Specify Generation', 'Assign Memory' (which is highlighted with a blue background), 'Configure Networking', 'Connect Virtual Hard Disk', 'Installation Options', and 'Summary'. The main area of the wizard contains the following text: 'Specify the amount of memory to allocate to this virtual machine. You can specify an amount from 32 MB through 12582912 MB. To improve performance, specify more than the minimum amount recommended for the operating system.' Below this text is a label 'Startup memory:' followed by a text box containing '2000' and the unit 'MB'. There is a checkbox labeled 'Use Dynamic Memory for this virtual machine.' which is currently unchecked. Below the checkbox is an information icon (a blue circle with a white 'i') followed by the text: 'When you decide how much memory to assign to a virtual machine, consider how you intend to use the virtual machine and the operating system that it will run.' At the bottom of the wizard, there are four buttons: '< Previous', 'Next >' (which is highlighted with a blue border), 'Finish', and 'Cancel'.

New Virtual Machine Wizard

Assign Memory

Before You Begin
Specify Name and Location
Specify Generation
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

Specify the amount of memory to allocate to this virtual machine. You can specify an amount from 32 MB through 12582912 MB. To improve performance, specify more than the minimum amount recommended for the operating system.

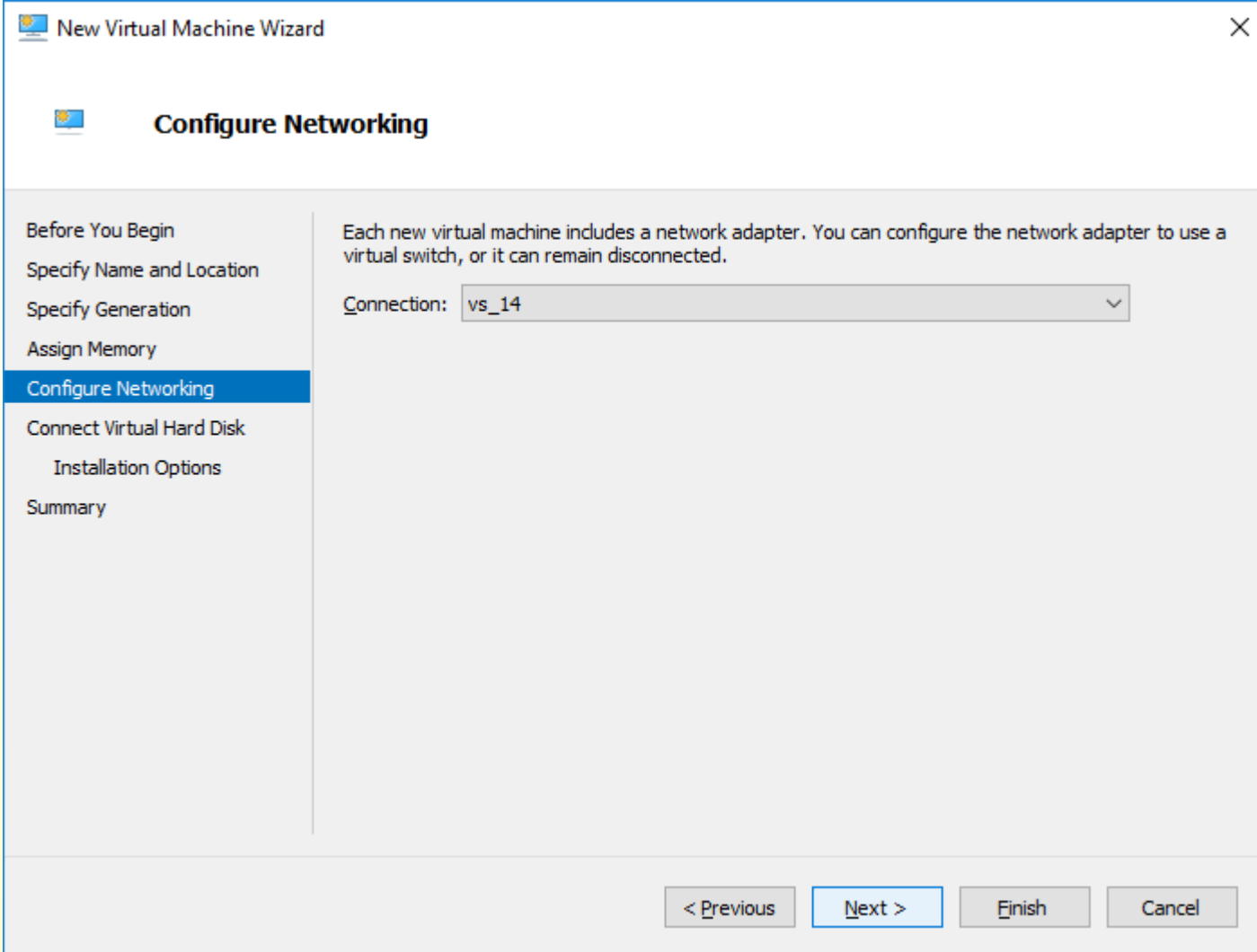
Startup memory: MB

☐ Use Dynamic Memory for this virtual machine.

i When you decide how much memory to assign to a virtual machine, consider how you intend to use the virtual machine and the operating system that it will run.

< Previous **Next >** Finish Cancel

■ Connect to some virtual switch.



The screenshot shows the 'New Virtual Machine Wizard' window, specifically the 'Configure Networking' step. The window has a title bar with a close button. On the left, a sidebar lists the steps: 'Before You Begin', 'Specify Name and Location', 'Specify Generation', 'Assign Memory', 'Configure Networking' (highlighted), 'Connect Virtual Hard Disk', 'Installation Options', and 'Summary'. The main area contains the text: 'Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual switch, or it can remain disconnected.' Below this, there is a 'Connection:' label followed by a dropdown menu showing 'vs_14'. At the bottom, there are four buttons: '< Previous', 'Next >' (highlighted), 'Finish', and 'Cancel'.

New Virtual Machine Wizard

Configure Networking

Before You Begin
Specify Name and Location
Specify Generation
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Installation Options
Summary

Each new virtual machine includes a network adapter. You can configure the network adapter to use a virtual switch, or it can remain disconnected.

Connection: vs_14

< Previous Next > Finish Cancel

- “Use an existing virtual hard disk” and specify the extracted disk.vhd.

The screenshot shows the 'New Virtual Machine Wizard' window, specifically the 'Connect Virtual Hard Disk' step. The window has a title bar with the text 'New Virtual Machine Wizard' and a close button. On the left, there is a navigation pane with the following steps: 'Before You Begin', 'Specify Name and Location', 'Specify Generation', 'Assign Memory', 'Configure Networking', 'Connect Virtual Hard Disk' (which is highlighted in blue), and 'Summary'. The main area of the window contains the following text: 'A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties.' There are three radio button options: 1. 'Create a virtual hard disk' (unselected): 'Use this option to create a VHDX dynamically expanding virtual hard disk.' Below this are fields for 'Name' (vdiff.vhdx), 'Location' (C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\), and 'Size' (127 GB (Maximum: 64 TB)). There is a 'Browse...' button next to the location field. 2. 'Use an existing virtual hard disk' (selected): 'Use this option to attach an existing virtual hard disk, either VHD or VHDX format.' Below this is a 'Location' field containing 'C:\disk.vhd' and a 'Browse...' button. 3. 'Attach a virtual hard disk later' (unselected): 'Use this option to skip this step now and attach an existing virtual hard disk later.' At the bottom of the window, there are four buttons: '< Previous', 'Next >', 'Finish', and 'Cancel'. The 'Next >' button is highlighted in blue.

New Virtual Machine Wizard

Connect Virtual Hard Disk

Before You Begin
Specify Name and Location
Specify Generation
Assign Memory
Configure Networking
Connect Virtual Hard Disk
Summary

A virtual machine requires storage so that you can install an operating system. You can specify the storage now or configure it later by modifying the virtual machine's properties.

☐ Create a virtual hard disk
Use this option to create a VHDX dynamically expanding virtual hard disk.

Name: vdiff.vhdx
Location: C:\Users\Public\Documents\Hyper-V\Virtual Hard Disks\ Browse...
Size: 127 GB (Maximum: 64 TB)

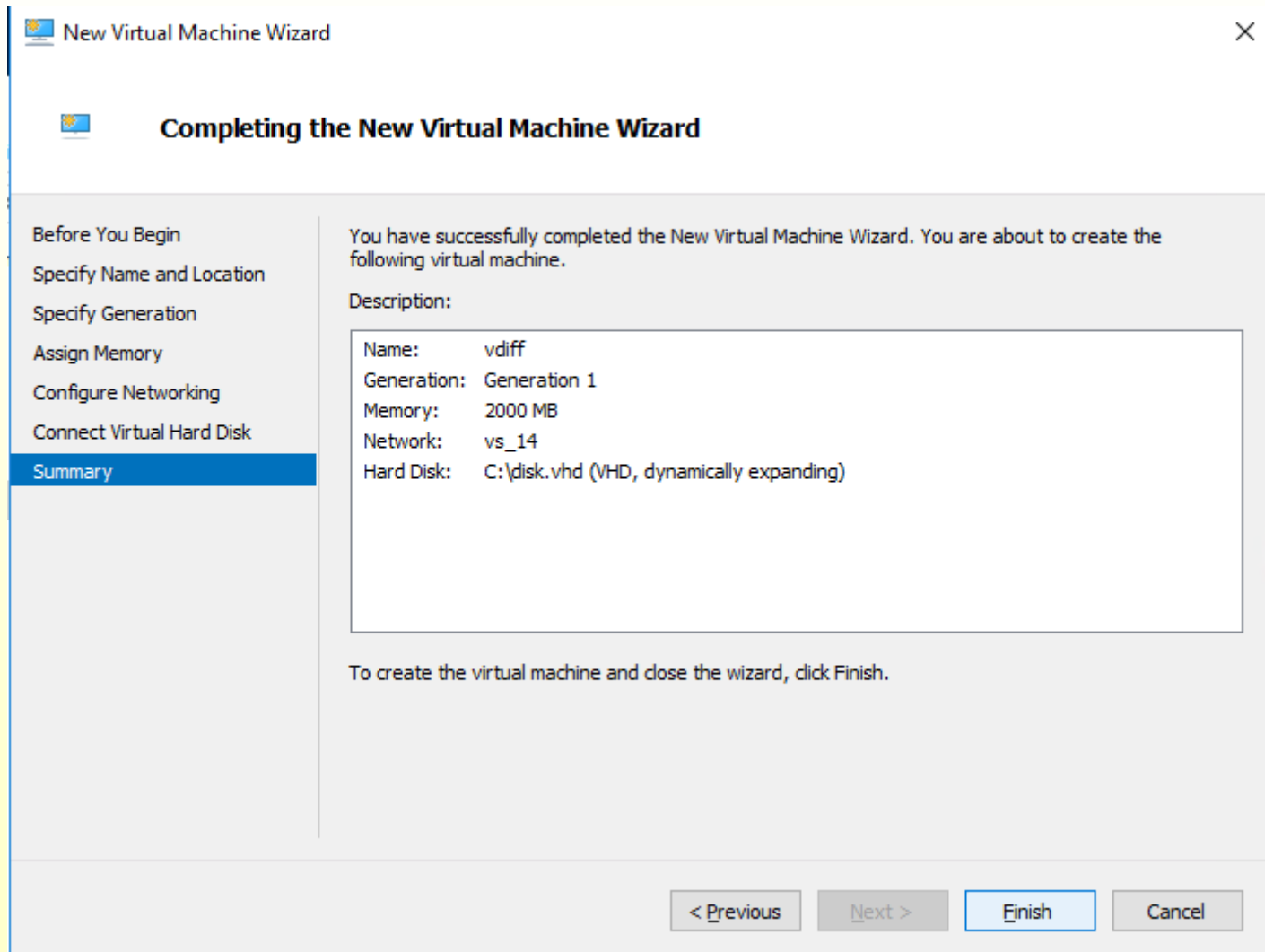
☒ Use an existing virtual hard disk
Use this option to attach an existing virtual hard disk, either VHD or VHDX format.

Location: C:\disk.vhd Browse...

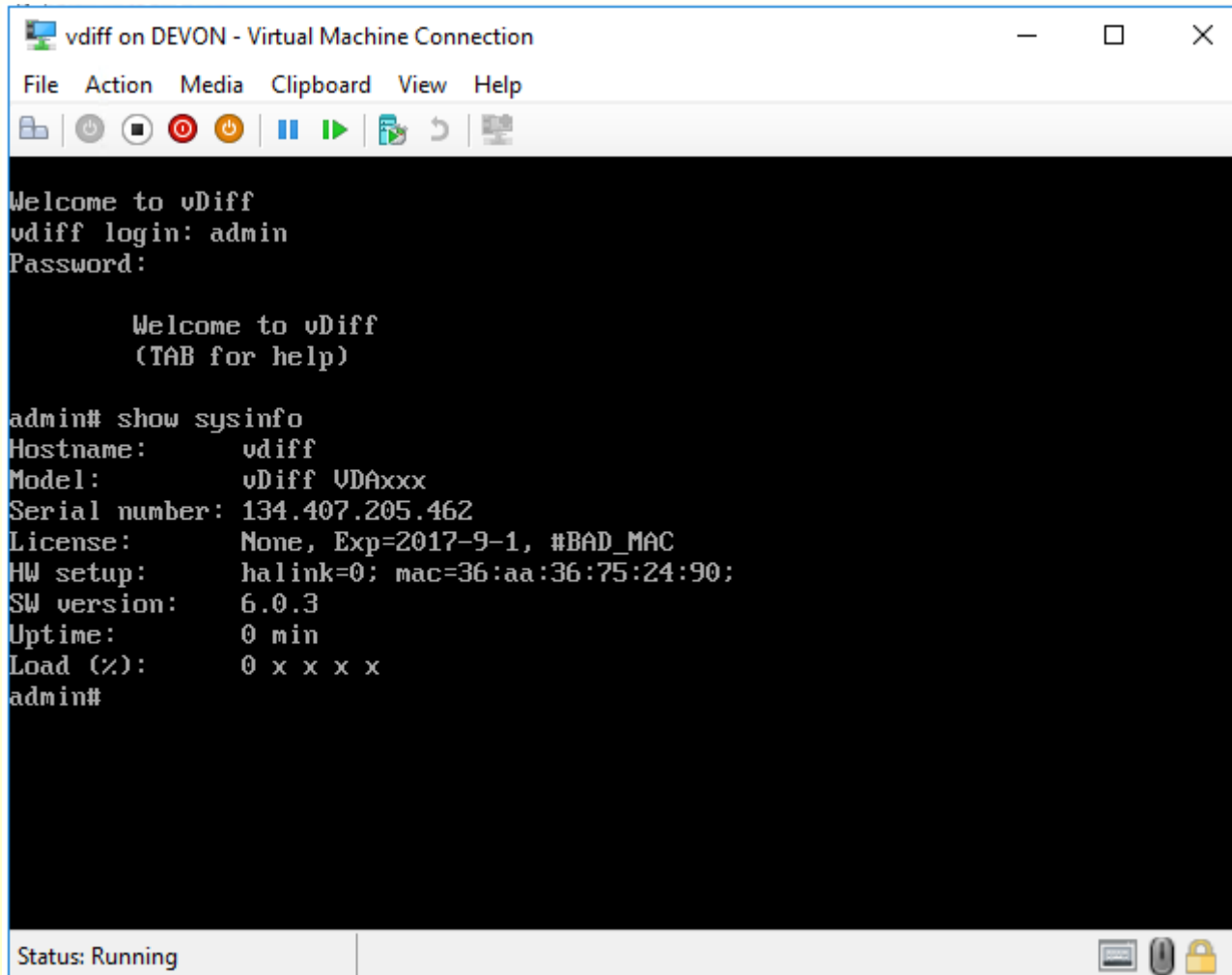
☐ Attach a virtual hard disk later
Use this option to skip this step now and attach an existing virtual hard disk later.

< Previous Next > Finish Cancel

- “Finish” the creation of the new virtual machine.



- Start (power on) the new VM and login with username/password = admin/admin.
- Enter the command "show sysinfo".



```
vdiff on DEVON - Virtual Machine Connection
File Action Media Clipboard View Help

Welcome to vDiff
vdiff login: admin
Password:

Welcome to vDiff
(TAB for help)

admin# show sysinfo
Hostname:      vdiff
Model:         vDiff VDAxxx
Serial number: 134.407.205.462
License:       None, Exp=2017-9-1, #BAD_MAC
HW setup:      halink=0; mac=36:aa:36:75:24:90;
SW version:    6.0.3
Uptime:        0 min
Load (%):      0 x x x x
admin#
```

Status: Running

Assign MAC address

- First we must resolve the “#BAD_MAC” in the “License” line.
- Record the MAC address given in the “HW setup” line. In this example, it is 36:aa:36:75:24:90.
- “Turn off” the VM and edit its “Settings”.
- Expand “Network Adapter” and click “Advanced features”.

Cont.

- Click “Static” and enter the MAC supplied in the previous step.
- Check “Enable MAC address spoofing”.
- Click “OK”.
- See the figure in the following page.

vdiff

Hardware

- Add Hardware
- BIOS
 - Boot from CD
- Security
 - Key Storage Drive disabled
- Memory
 - 2000 MB
- Processor
 - 1 Virtual processor
- IDE Controller 0
 - Hard Drive
 - disk.vhd
- IDE Controller 1
 - DVD Drive
 - None
- SCSI Controller
- Network Adapter
 - vs_14
 - Hardware Acceleration

Advanced Features

- COM 1
 - None
- COM 2
 - None
- Diskette Drive
 - None

Management

- Name
 - vdiff
- Integration Services
 - Some services offered
- Checkpoints
 - Production

Advanced Features

MAC address

- ☐ Dynamic
- ☒ Static

36 - AA - 36 - 75 - 24 - 90

MAC address spoofing allows virtual machines to change the source MAC address in outgoing packets to one that is not assigned to them.

☒ Enable MAC address spoofing

DHCP guard

DHCP guard drops DHCP server messages from unauthorized virtual machines pretending to be DHCP servers.

☐ Enable DHCP guard

Router guard

Router guard drops router advertisement and redirection messages from unauthorized virtual machines pretending to be routers.

☐ Enable router advertisement guard

Protected network

Move this virtual machine to another cluster node if a network disconnection is detected.

☒ Protected network

Port mirroring

Port mirroring allows the network traffic of a virtual machine to be monitored by copying incoming and outgoing packets and forwarding the copies to another virtual machine configured for monitoring.

Mirroring mode:

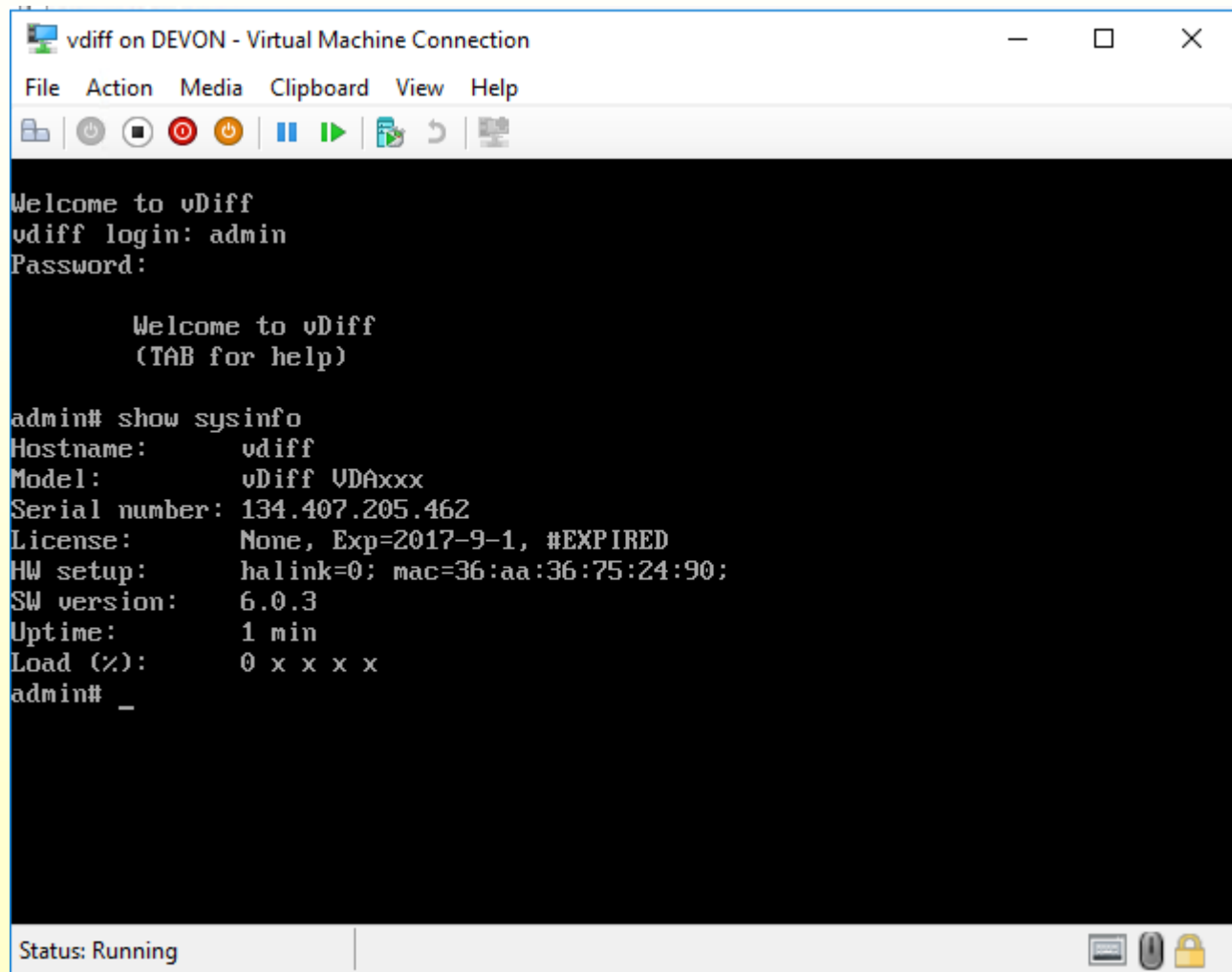
None

OK

Cancel

Apply

- Start the VM again and login the console.
- “show sysinfo” and verify that “#BAD_MAC” is gone.



The screenshot shows a virtual machine window titled "vdiff on DEVON - Virtual Machine Connection". The window has a menu bar with "File", "Action", "Media", "Clipboard", "View", and "Help". Below the menu bar is a toolbar with icons for power, reset, pause, play, and other controls. The main area is a black terminal window with white text. The text shows a login sequence: "Welcome to vDiff", "vdiff login: admin", and "Password:". After the password is entered, it shows "Welcome to vDiff (TAB for help)". Then, the user enters "admin# show sysinfo" and the output is displayed: "Hostname: vdiff", "Model: vDiff VDAxxx", "Serial number: 134.407.205.462", "License: None, Exp=2017-9-1, #EXPIRED", "HW setup: halink=0; mac=36:aa:36:75:24:90;", "SW version: 6.0.3", "Uptime: 1 min", "Load (%): 0 x x x x", and "admin# _". At the bottom of the window, there is a status bar that says "Status: Running" and some icons on the right.

```
vdiff on DEVON - Virtual Machine Connection
File Action Media Clipboard View Help

Welcome to vDiff
vdiff login: admin
Password:

Welcome to vDiff
(TAB for help)

admin# show sysinfo
Hostname: vdiff
Model: vDiff VDAxxx
Serial number: 134.407.205.462
License: None, Exp=2017-9-1, #EXPIRED
HW setup: halink=0; mac=36:aa:36:75:24:90;
SW version: 6.0.3
Uptime: 1 min
Load (%): 0 x x x x
admin# _
```

Status: Running

Request for new license

- However, this time, it show “#EXPIRED” which means that the license is expired.
- Please see the chapter “Request for new license” to resolve it.

Creating a Xen DomU

Install files

- Related files in install.zip are:
 - install/install_xen/disk.bin
 - install/install_xen/config_sample.1
 - install/install_xen/config_sample.2

- Use config_sample.1 as the starting point. Edit it with the following notes:
- Memory size: it is 2000 in the sample. Change it to your model.
- vif bridge name: bridge0 in the sample.
- Disk file location: /home/xen/vdiff/disk.bin in the sample.
- Boot vdiff with something like “xl create -c config_sample”.
- Check config_sample.2 for additional Ethernet ports.

Request for new license

- Log in the web management UI.
- Go to the “Tools > System” page.
- Click “Request for up-to-date license”.
- You will see “200 Operation completed successfully. Please check email.”
- Check you email. and download “upgrade_license.bin”
- Upload the file in “Upload kernel/license” block in “Tools > System” page
- Reboot

- Log in the system and check “System information” block in “View > System info” page.
- Check that “#EXPIRED” is gone in the “License” line.
- Also check that your model name is correct in the “Model” line.