

Lab Exercise Sheet 4

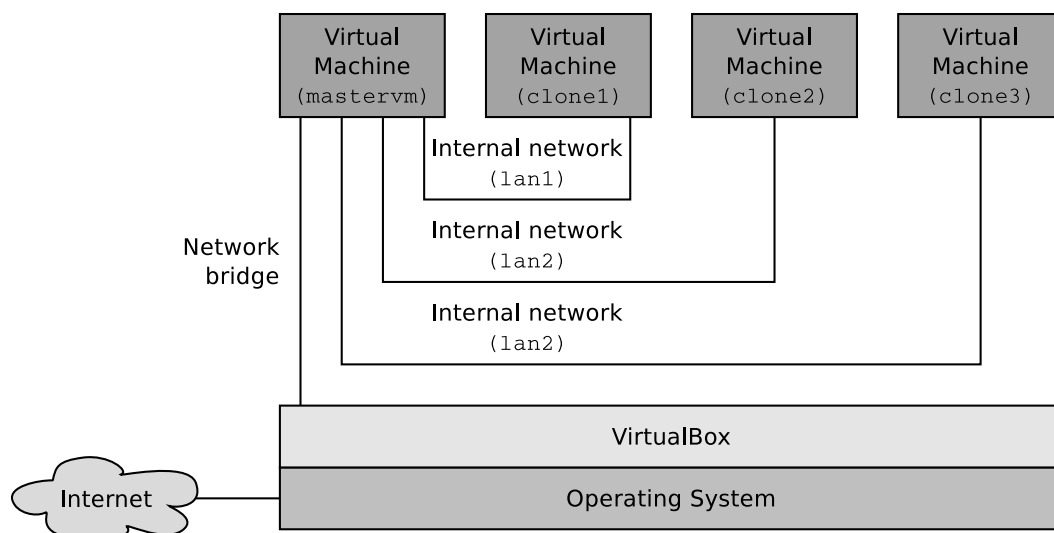
Document and analyze your experimental procedures by using your Wireshark and terminal recordings. Note all relevant intermediate steps. Mark and explain all relevant information, such as protocol header fields, MAC addresses, IP addresses, port numbers. If you have little experience with Linux, you may need to do some research. **Send your self prepared experiment documentation in the PDF file format to cocos@stud.fra-uas.de and christianbaun@fb2.fra-uas.de. Alternatively, fill out the document, print it out, and submit it during one of the exercise sessions.**

First name:

Last name:

Student number:

1. In the 2nd lab exercise you created four VMs (`mastervm` and `clonevm[1-3]`). You also configured the network infrastructure in a way that you have a logical Bridge or alternatively IP package forwarding (NAT-Masquerading).



Now, install a DHCP server (package `isc-dhcp-server`) and a DNS server (package `dnsmasq`) on the `mastervm`.

Configure the DHCP server in a way that `clonevm[1-3]` get their network configurations assigned automatically. You also need to modify the file `/etc/network/interfaces` on `clonevm[1-3]` in a way that these VMs use DHCP for their virtual network interfaces.

Configure the DNS server and the DHCP server on the `mastervm` in a way that `clonevm[1-3]` use the DNS server on the `mastervm` as name server.

Explain how you configured the DHCP and the DNS server on the `mastervm` and copy the relevant content of the configuration files into these fields:

Filename:

Depending on your configuration, you may need more space for your explanations. Here you have some some additional space for your solution.

Filename:

Depending on your configuration, you may need more space for your explanations. Here you have some some additional space for your solution.

Filename:

2. Install a web server software (e.g. nginx or the Apache HTTP server) on `clonevm[1-3]`. Install a HTTP load balancer software (e.g. nginx¹ or HAProxy²) on the `mastervm`. The Ubuntu Linux distribution provides packages for all these software solutions.

Configure the load balancer software on the `mastervm` in a way that incoming HTTP requests are forwarded (round-robin load balancing) to the web servers on `clonevm[1-3]`.

Explain how you configured the load balancer software on the `mastervm` and copy the relevant content of the configuration file(s) into these fields:

Filename:

¹http://nginx.org/en/docs/http/load_balancing.html

²<http://www.haproxy.org>

Depending on your configuration, you may need more space for your explanations. Here you have some some additional space for your solution.

Filename:

Explain how you configured the web server software on `clonevm[1-3]` and copy the relevant content of the configuration file(s) into these fields:

Filename:

Check the relevant MAC addresses and write them into this table:

Your local Router to the internet:
Physical network interface of your host:
 mastervm (bridged interface):
 mastervm (internal interface 1):
 mastervm (internal interface 2):
 mastervm (internal interface 3):
 clonevm1 (internal interface):
 clonevm2 (internal interface):
 clonevm3 (internal interface):

Check the relevant IP addresses and write them into this table:

Your local Router to the internet:
Physical network interface of your host:
 mastervm (bridged interface):
 mastervm (internal interface 1):
 mastervm (internal interface 2):
 mastervm (internal interface 3):
 clonevm1 (internal interface):
 clonevm2 (internal interface):
 clonevm3 (internal interface):

Send HTTP requests from your physical host (in other words: send from your host operating system) to the running load balancer. Now, the load balancer should distribute the HTTP requests to the available web servers. Make this visible by slightly modifying the default web pages of the installed web server software.

Monitor with Wireshark on the **mastervm** the forwarding of the HTTP requests and the replies from the web servers.

Which network protocols are involved in the transmission of the HTTP requests/replies? Assign them to the protocol stack.

Layer 7:
Layer 6:
Layer 5:
Layer 4:
Layer 3:
Layer 2:
Layer 1: