



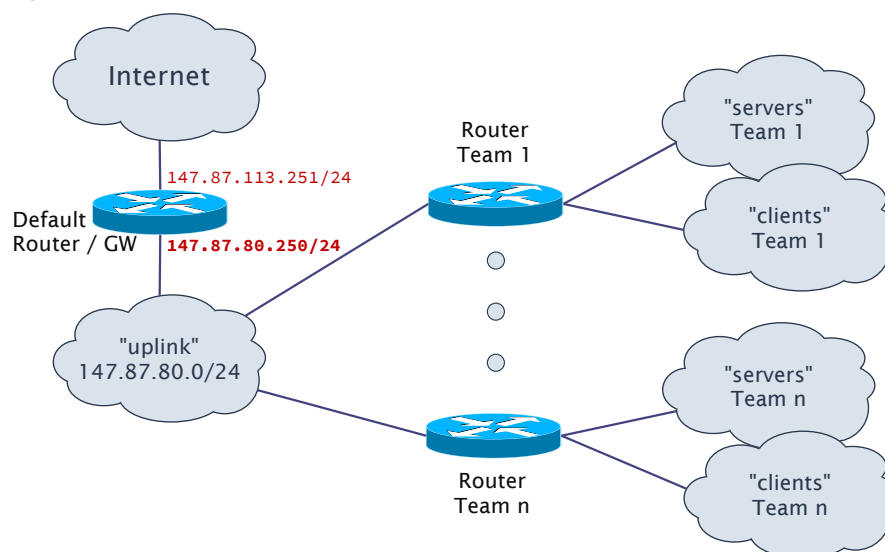
Berner Fachhochschule
Haute école spécialisée bernoise
Bern University of Applied Sciences

Laboratory Exercise

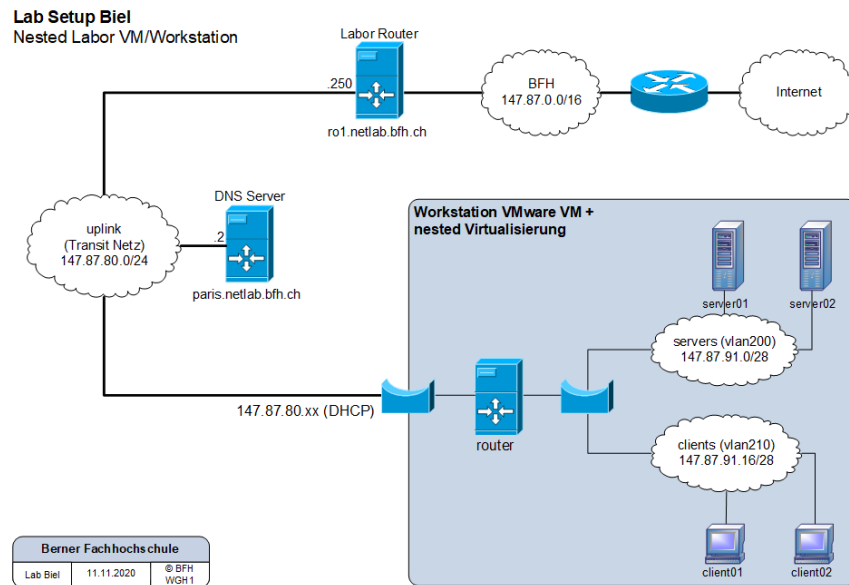
Module BT11331

Network Configuration

Overview:



Network Configuration - Lab Setup



Lab Setup

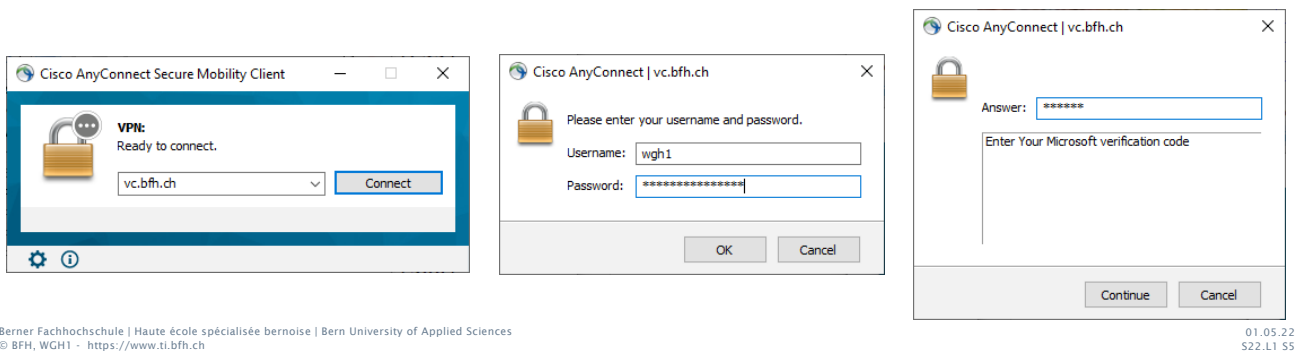
Workstation → VMware Host VM

- ▶ **Origin of the Laboratory Setup:**
the original physical lab setup for use on the lab workstations was transferred to the VMware environment of the "Network & Security Lab" for remote use
- ▶ **Resources for the Lab Groups:**
each group is assigned one VM of this setup (host VM)
each of these host VMs in turn provides the VMs needed in the lab (nested virtualization)
- ▶ **Please Note:**
the performance of these nested VMs is limited
→ have some patience, especially when starting the nested VMs or software (e.g., web browser) for the first time
- ▶ **Collaboration:**
group members can collaborate via screen sharing, e.g., in the group's Teams channel
You can also connect to VMware ESXi at the same time and work together in the console of a VM (which is more performant)

Lab Setup

Access to the Lab Environment / Host VM (VMware ESXi)

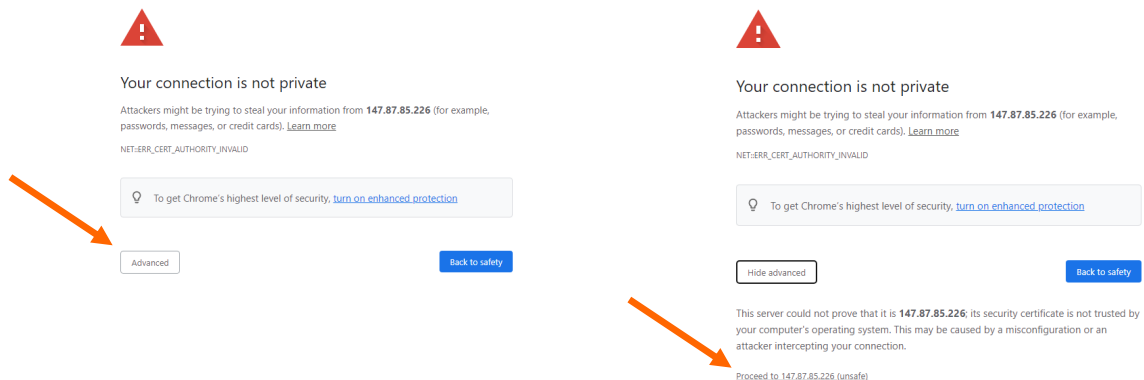
- ▶ direct access to the VMware ESXi hypervisors is **only possible from the BFH network (147.87.0.0/16)**
- ▶ for remote access to the host VM, a **VPN connection (with 2FA)** to the BFH network must first be started
- ▶ for help consult the IT Services guide on the intranet website (requires BFH login and eventually also 2FA)
https://intranet.bfh.ch/BFH/de/Dienste/IT_Services/Netzwerk/VPN/Seiten/default.aspx



Lab Setup

Access to the VMWare ESXi Environment

- ▶ if you are in the BFH network or the VPN connection is working, you can access the host VM via web browser
 - ▶ use the link of your group from the guidelines document "S22.L2 - Lab Networks and Names"
 - ▶ **IMPORTANT:** You must accept the self-signed certificate of the VMware ESXi host (Chrome example)



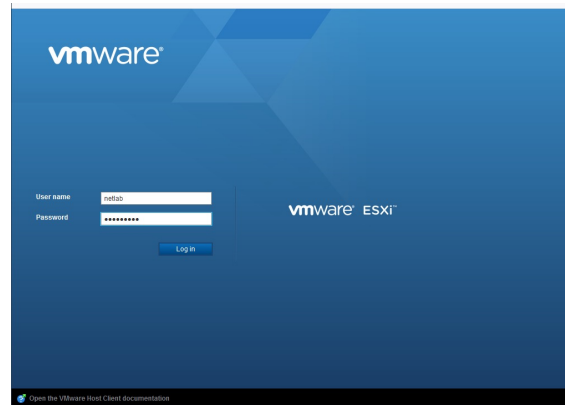
Lab Setup

Access to the virtual Lab Environment

- ▶ to access the lab environment of the group, make a connection to the hypervisor of your group according to "S22.L2 - Lab Networks and Names"
- ▶ Log in with the following login:

User:
Passwort:

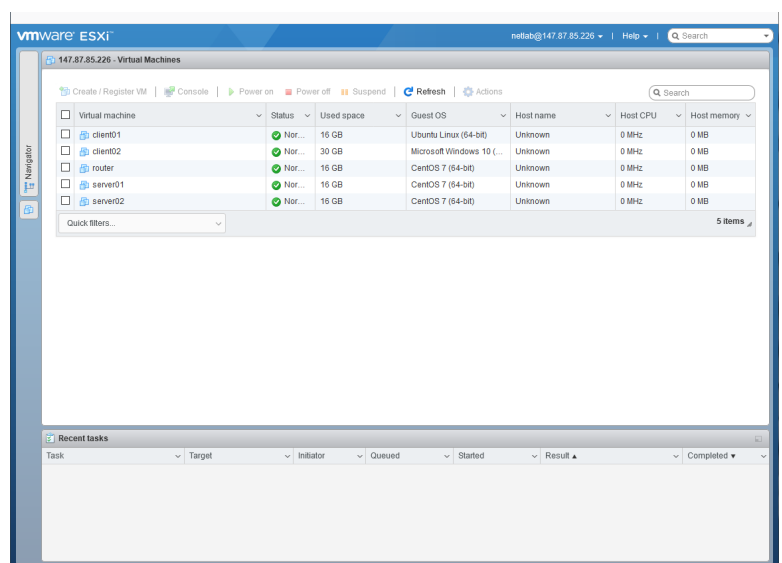
Please keep confidential!!



Lab Setup

Access to the nested VMs

- ▶ You should now be able to see and manage your VMs



Pre-installed Virtual Machines (VMs)

- ▶ the following pre-installed but not fully configured VM's (Guests) are available in the virtualized environment:
 - ▶ **router**
pre-installed Linux system (Debian) for use as router between the networks "clients", "servers" and "uplink" and as DHCP server for the network "clients"
 - ▶ **server01-02**
pre-installed Linux systems (Debian) for use as servers for DNS, e-mail and web, etc. in the network "servers"
 - ▶ **client01** (Ubuntu Linux) and **client02** (Windows)
clients for the network "clients"
the clients are configured as DHCP clients by default:
→ for a use without a running DHCP server they must be configured manually!

All VMs should be connected to the correct networks!

Logins and Passwords

Login / Passwords VMs:

admin, root

user

Please keep confidential!

Please log in with the account "user" and work with it if possible!

If you need "root" permission on Linux systems, you can start commands using "sudo", or get a "root" shell using:

- ▶ `$ sudo -i` -> Authenticate with the password of "user"
- ▶ `$ su -` -> Authenticate with the password of "root"

Virtual Machine Manager

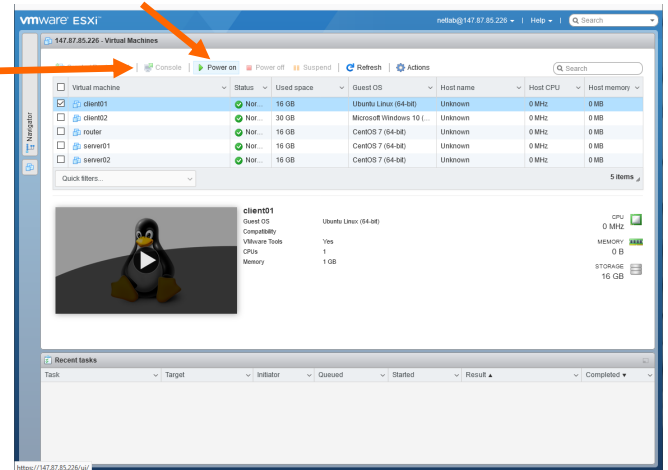
Starting VMs, accessing the console of VMs

Starting VMs:

- ▶ select the virtual machine in the list and click "Power on" in the menu bar

Access to the console of VMs:

- ▶ "Console" becomes active on the menu bar
- ▶ this can be used to open a console on the VM

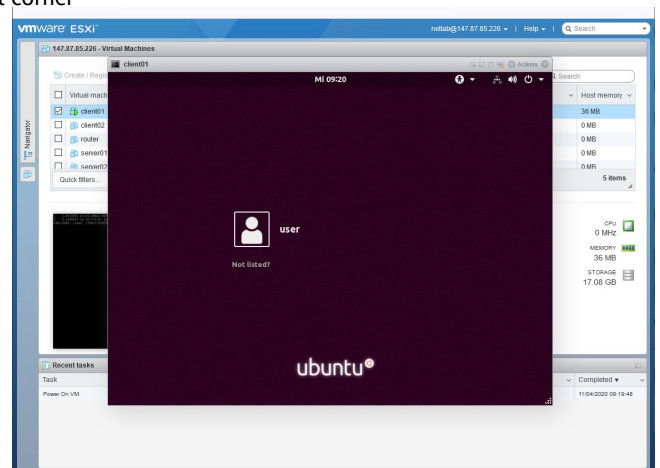


Virtual Machine Manager

Starting VMs, accessing the console of VMs

Customize the size of the console window:

- ▶ the size of the console window can be changed in the bottom right corner



Virtual Machine Manager

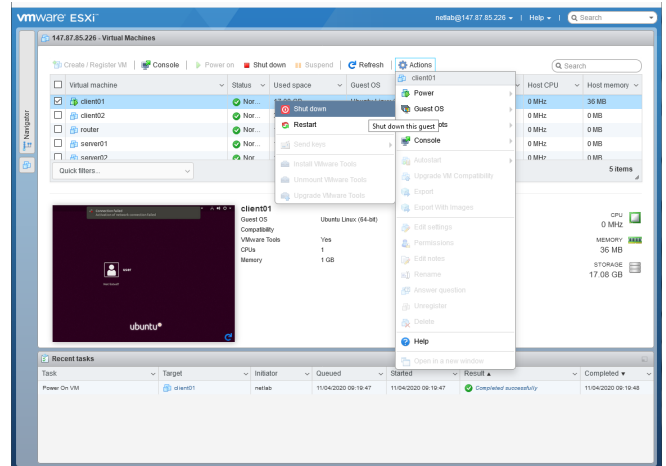
Shutdown / Pause VMs

Shutdown VMs:

- ▶ VMs can be shut down using the standard shutdown procedure of the operating system
- ▶ With switched on [ACPI](#) support
 - ▶ Actions -> Guest OS -> Shutdown

Please note:

- ▶ the button "Power off" should not be used → use "Shutdown"
- ▶ VMs should be shut down when not in use!
- ▶ closing the VM window does not terminate the VM!
- ▶ the state of the VMs can be checked in the virtual machines overview



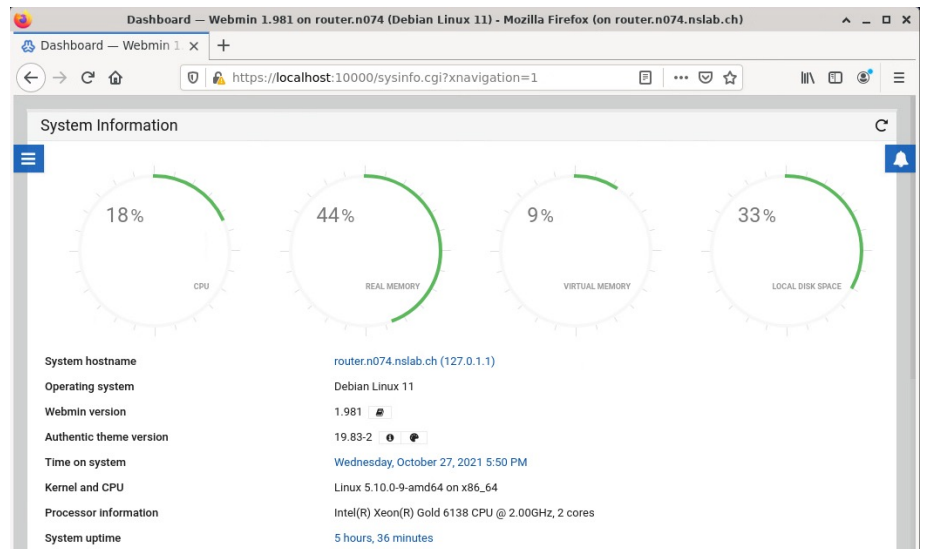
Software

- ▶ server operating systems:
 - ▶ Linux (Debian)
- ▶ desktop (client) operating systems:
 - ▶ Linux (Ubuntu)
 - ▶ Windows
- ▶ router software:
 - ▶ embedded router of Linux
- ▶ DNS software:
 - ▶ bind on Linux
- ▶ DHCP server software:
 - ▶ ISC DHCP under Linux
- ▶ webserver software:
 - ▶ Apache webserver under Linux
- ▶ information about any further software required and its installation in a VM is provided in the lab exercise descriptions

Webmin - Linux Administration

Webmin

- ▶ [Webmin](#) allows web-based system administration of Linux systems
- ▶ Webmin allows the configuration of a Linux system even for users who do not know the Linux command line well



Auxiliary Programs and Utilities

- ▶ network packet sniffers:
 - ▶ [tcpdump](#) or [wireshark/tshark](#) under Linux
 - ▶ [wireshark/tshark](#) under Windows
- ▶ connectivity
 - ▶ (open)ssh, [putty](#), VNC, [thinlinc](#), Remote Desktop Connection RDP, etc.
- ▶ utilities:
 - ▶ Linux
 - arp, arping, arpwatch, bmon, dnstop, dig, host, ifconfig, ip, iptraf, mtr, netload, netstat, nc, nmap, nslookup, ping[6], route, trafshow, tracepath, traceroute, etc.
 - ▶ Windows
 - ipconfig, net, netsh, netstat, nslookup, ping, tracert, etc.

Documentation Laboratory Exercise

- ▶ **The lab exercise incl. lab journal results in a percentage of the course evaluation! (see course introduction/syllabus)**
- ▶ Document the work done during the lab exercise in [journal form](#)
- ▶ The lab journal must include for each exercise:
 1. Brief description of how a task was solved, including any problems encountered and how they were solved
 2. Relevant excerpts from configuration files
(if necessary, enclose working configuration files separately)
 3. Tests performed to verify the solution including their results, excerpts from recordings of the network packet sniffers with commentary (attach capture files if necessary)
- ▶ The following must also be recorded in the lab journal :
 1. Who did what, when, in the lab
e.g., who has made configurations, who has checked them, who has documented them
 2. All presence/absence of group members
- ▶ **Important:** Reproducibility of the work, configurations and tests carried out in the group
(for the students, the lecturer as well as for third parties)
- ▶ **Form of the lab journal:**
PDF, source files (e.g., DOCX, ODT, etc.) can also be submitted
After agreement with the lecturer also other formats
- ▶ **Delivery:** All lab exercises series are to be turned in at the end of the last week of the module/semester
The submission takes place via the Moodle page of the module "Submission of Lab Journals" (note the deadline!)

Names and Numbers

Network

Net-Number: "N" according to allocation (i.e., "n011")

External network ("uplink"):
External default router address: 147.87.80.0/24
147.87.80.250

Router address ("uplink"): according to the Excel sheet*

Internal networks: according to the Excel sheet*

Internal router addresses:
(Default GW for networks
"servers" & "clients") according to the Excel sheet*
netaddress+1

* "S22.L2 - Lab Networks and Names"

Names and Numbers

DNS & DHCP

DHCP scopes:	according to the Excel sheet*
DNS forward zone:	"N".ns1ab.ch see also according to Excel sheet*
DNS reverse zones:	according to Excel sheet* (pay attention to the exercise description!)
Primary DNS server (as soon as available): IPv4 (net "servers"):	ns."N".ns1ab.ch netaddress+2
Secondary DNS server:	use: paris.bfh.ch / 147.87.80.2

* "S22.L2 - Lab Networks and Names"