



Internship carried out by
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M1 Info @ UBx
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Outline

- I. Context
- II. Architecture
- III. Webterm
- IV. Current Status



Context – QemuNet

A solution based on virtualization to learn network (routing, firewall, ...)

⇒ a light shell script based on *Qemu Virtual Machine* and *VDE Virtual Switch*

(1) describe your own network topology

```
# Topology: LAN
#
#   ope*th   grave
#   \       /
#   [s1]
#   /       \
#   syl     immortal
```



```
SWITCH s1
HOST debian immortal s1
HOST debian ope*th s1
HOST debian syl s1
HOST debian grave s1
```

(2) start your virtual network (as root), break it, and start again...

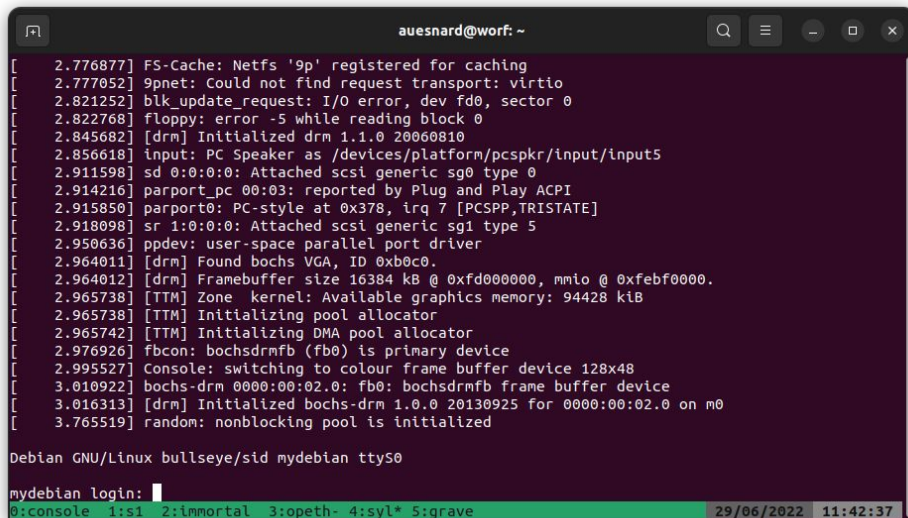


⇒ <https://github.com/orel33/qemunet>

Context – How to use QemuNet at Home?

Former solution based on SSH + TMux used by students during COVID period!!!

```
$ ssh cremi # connect cremi gateway
$ ssh <host> # need to wake up <host> remotely if needed
$ /net/ens/qemunet/qemunet.sh -b -d tmux -t /net/ens/qemunet/demo/lan.topo
$ tmux a
```



```

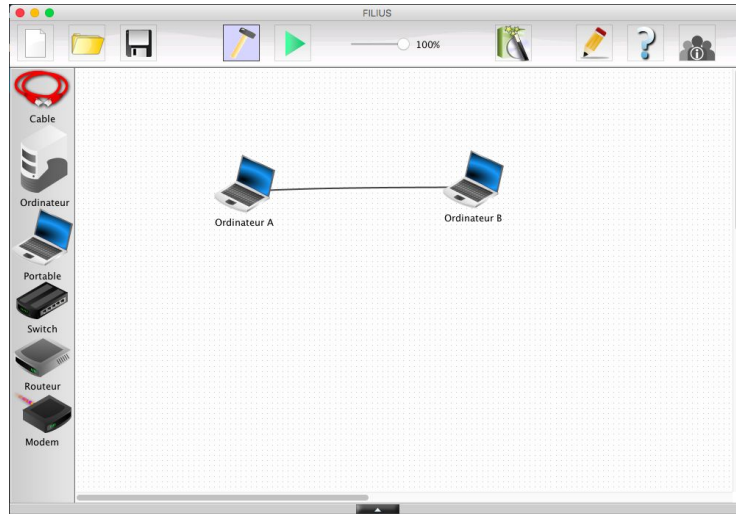
[ 2.776877] FS-Cache: Netfs '9p' registered for caching
[ 2.777052] 9pnet: Could not find request transport: virtio
[ 2.821252] blk_update_request: I/O error, dev fd0, sector 0
[ 2.822768] floppy: error -5 while reading block 0
[ 2.845682] [drm] Initialized drm 1.1.0 20060810
[ 2.856618] input: PC Speaker as /devices/platform/pcspkr/input/inputs
[ 2.911598] sd 0:0:0:0: Attached scsi generic sg0 type 0
[ 2.914216] parport_pc 00:03: reported by Plug and Play ACPI
[ 2.915850] parport0: PC-style at 0x378, irq 7 [PCSP,TRISTATE]
[ 2.918098] sr 1:0:0:0: Attached scsi generic sg1 type 5
[ 2.950636] ppdev: user-space parallel port driver
[ 2.964011] [drm] Found bochs VGA, ID 0xb0c0.
[ 2.964012] [drm] Framebuffer size 16384 kB @ 0xfd000000, mmio @ 0xfeb0000.
[ 2.965738] [TTM] Zone kernel: Available graphics memory: 94428 kiB
[ 2.965738] [TTM] Initializing pool allocator
[ 2.965742] [TTM] Initializing DMA pool allocator
[ 2.976926] fbcon: bochsdrmfb (fb0) is primary device
[ 2.995527] Console: switching to colour frame buffer device 128x48
[ 3.010922] bochs-drm 0000:00:02.0: fb0: bochsdrmfb frame buffer device
[ 3.016313] [drm] Initialized bochs-drm 1.0.0 20130925 for 0000:00:02.0 on m0
[ 3.765519] random: nonblocking pool is initialized

Debian GNU/Linux bullseye/sid mydebian ttyS0
mydebian login:
0:console 1:s1 2:immortal 3:opeth- 4:syl* 5:grave 29/06/2022 11:42:37
```

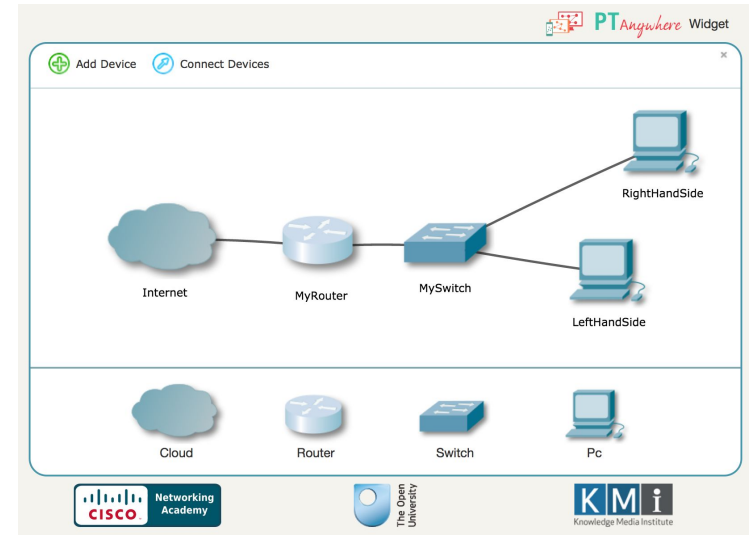
Context – QemuWeb

My Internship – develop a web version of QemuNet → allow students to use QemuNet from a simple browser...

Related Softwares



Filius Network Simulator (standalone software)



PT Anywhere (web app based on Cisco solution)

Architecture – Client-Server

client-side (frontend)

- Design a virtual network topology
- Host & Switch settings
- Display and interact with virtual machine via web terminals



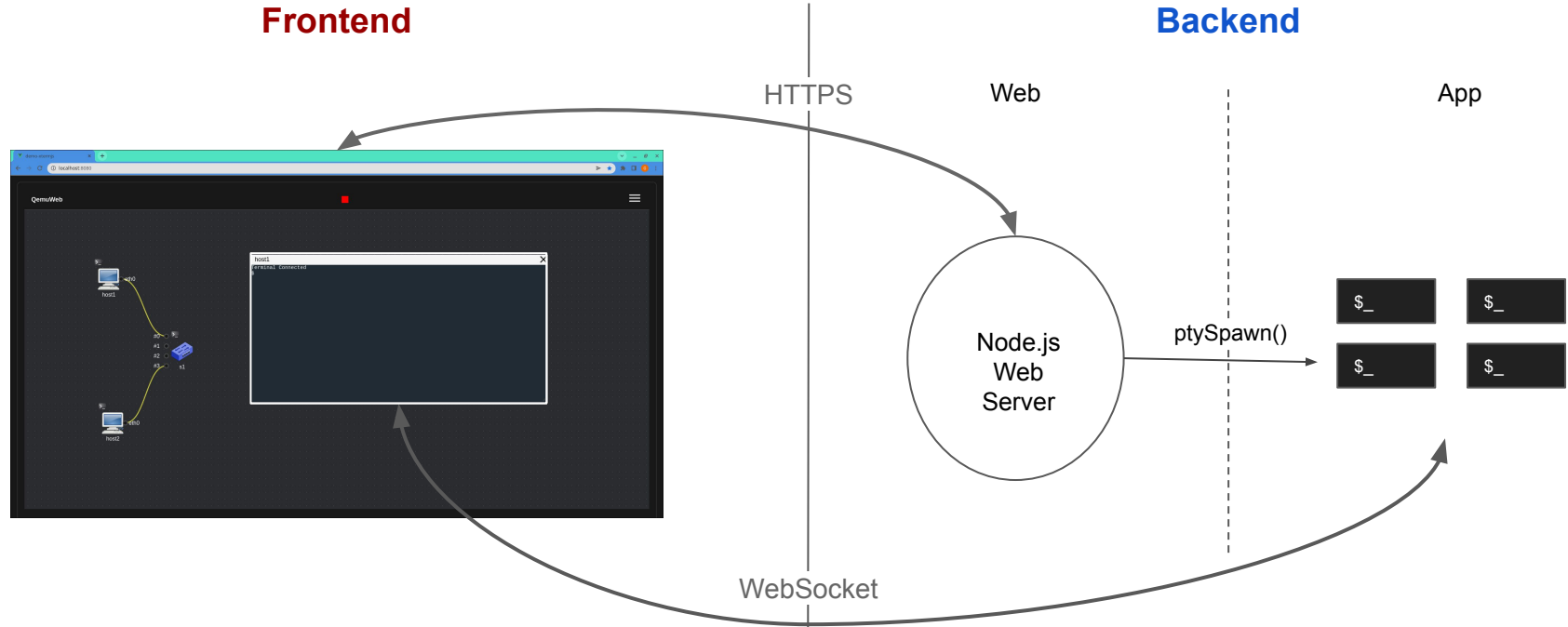
server-side (backend)

- Handle multiple users (a single session by user)
- Run a virtual network session (based on Qemunet)
- Ensure the persistence of a session (e.g. network failure)
- Preserve the integrity of the host machine (security issue)



Requirements: Performance (WebSocket), HTTPS, Authentication (OpenID), Security Issues, Deployment at CREMI, ..

Architecture – Overview

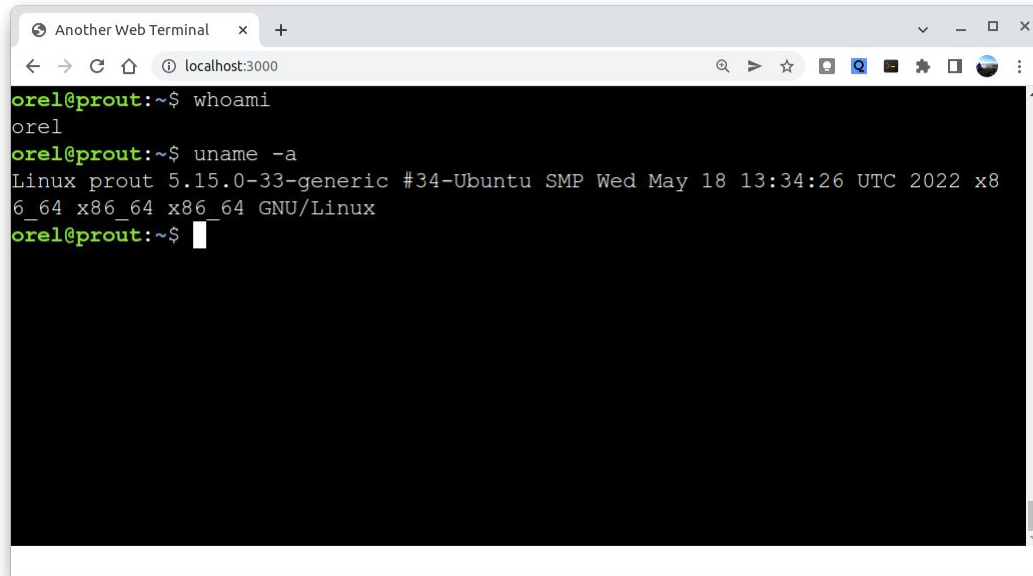


Express



WebTerm – Proof-of-Concept for QemuWeb

Preliminary Project – just runs an interactive shell (on a remote server) and plays with it in your browser



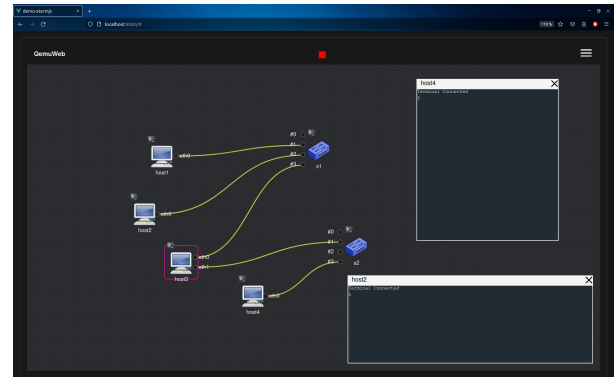
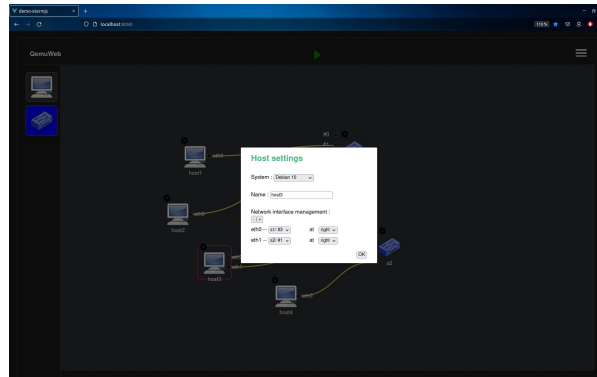
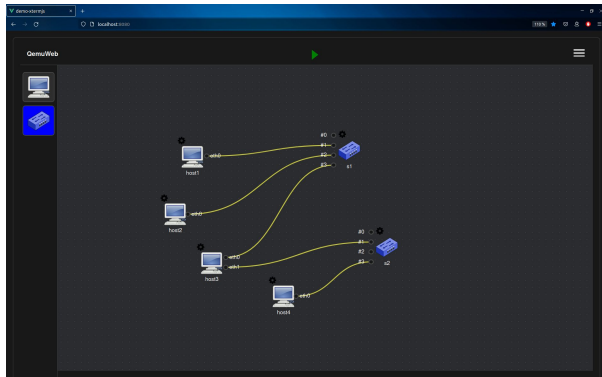
```
Another Web Terminal x +
localhost:3000
orel@prout:~$ whoami
orel
orel@prout:~$ uname -a
Linux prout 5.15.0-33-generic #34-Ubuntu SMP Wed May 18 13:34:26 UTC 2022 x8
6_64 x86_64 x86_64 GNU/Linux
orel@prout:~$
```

- Display and interact with multiple remote terminals (based on *xterm.js*) ✓
- Performance achieved using WebSocket technology (*socket.io*) ✓
- Ensure persistence of multiple sessions (*tmux*) ◆
- Security Issues: session containment in a harmless jail (*firejail*) ✗

Idea – deploy it on the web to help students to learn basic Linux commands at home (in a sandbox)

QemuWeb – Current Status

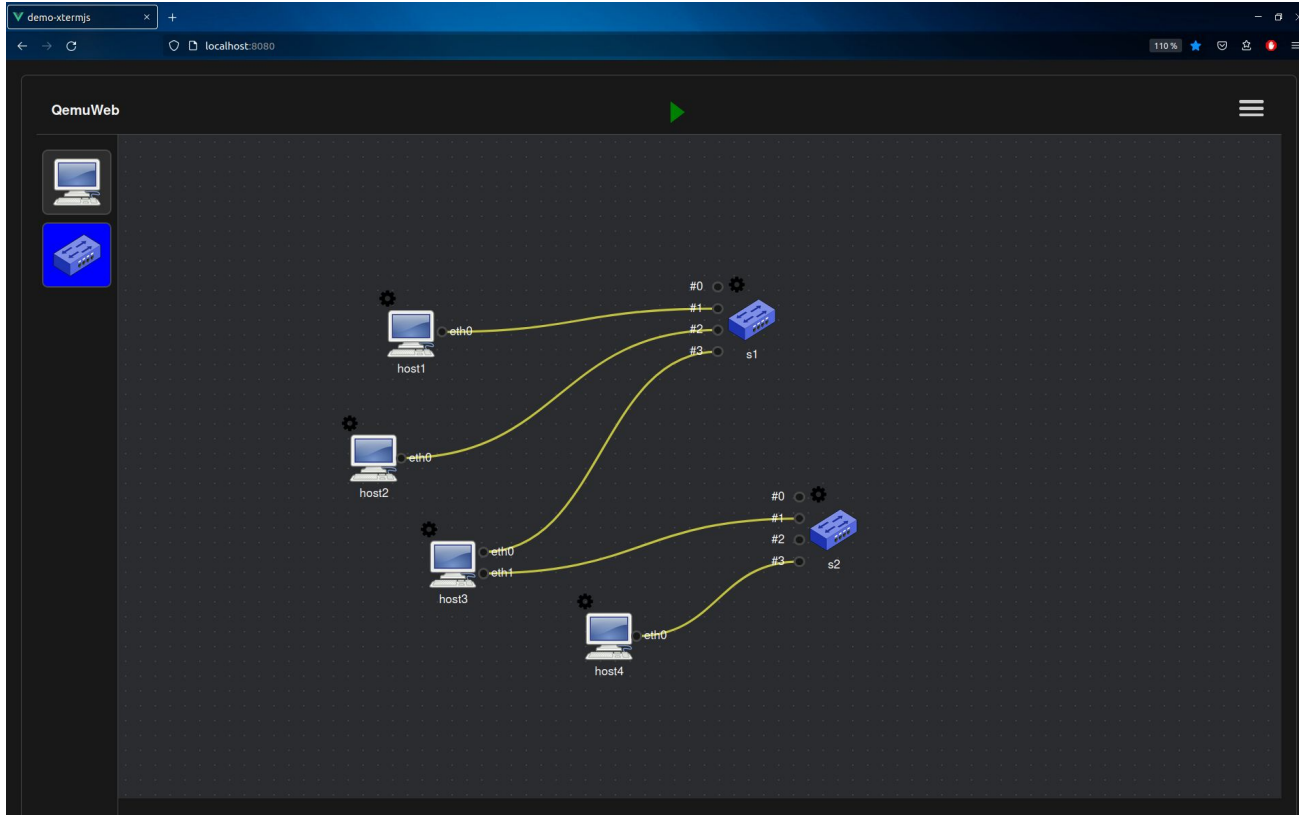
- Design Mode
 - edit a virtual network topology → interconnect hosts and switches
 - host & switch settings (system, name, interfaces, ...)
- Execution Mode (true host & network emulation)
 - components terminal can be displayed
 - Terminals are movable and resizable



QemuWeb – To Do

- Connect frontend *xterm.js* terminals with backend pty instances
- Import/Export a topology file
- Some issues to fix
 - Inputs/outputs do not center when changed sides
 - Curved connections do not connect correctly when the input is to the right of the switch
 - Hosts can have the same name (identification issue)

QemuWeb – Short Demo



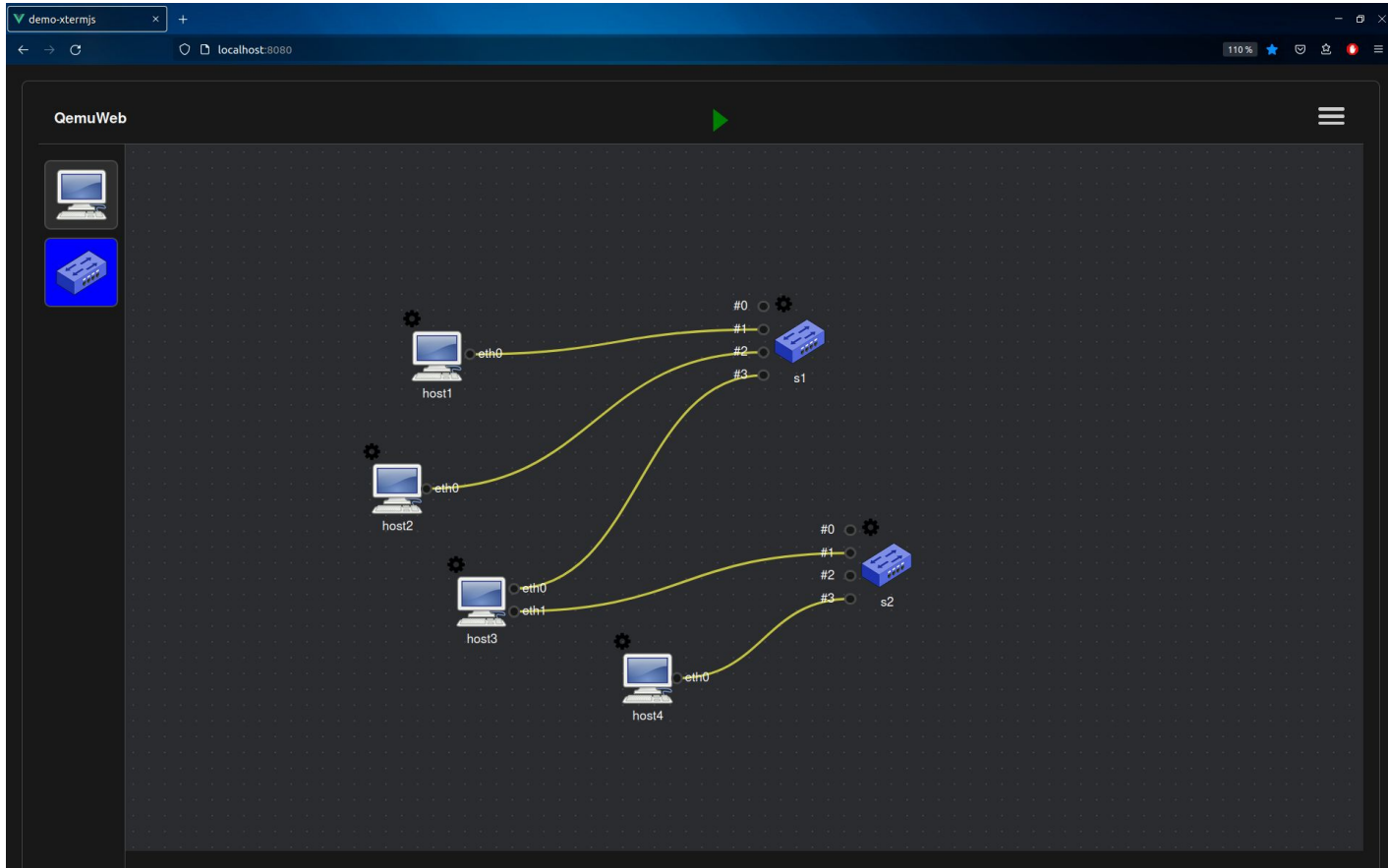
Thank you for listening!



QemuWeb

Appendix

Design Mode – create & modify virtual network topology

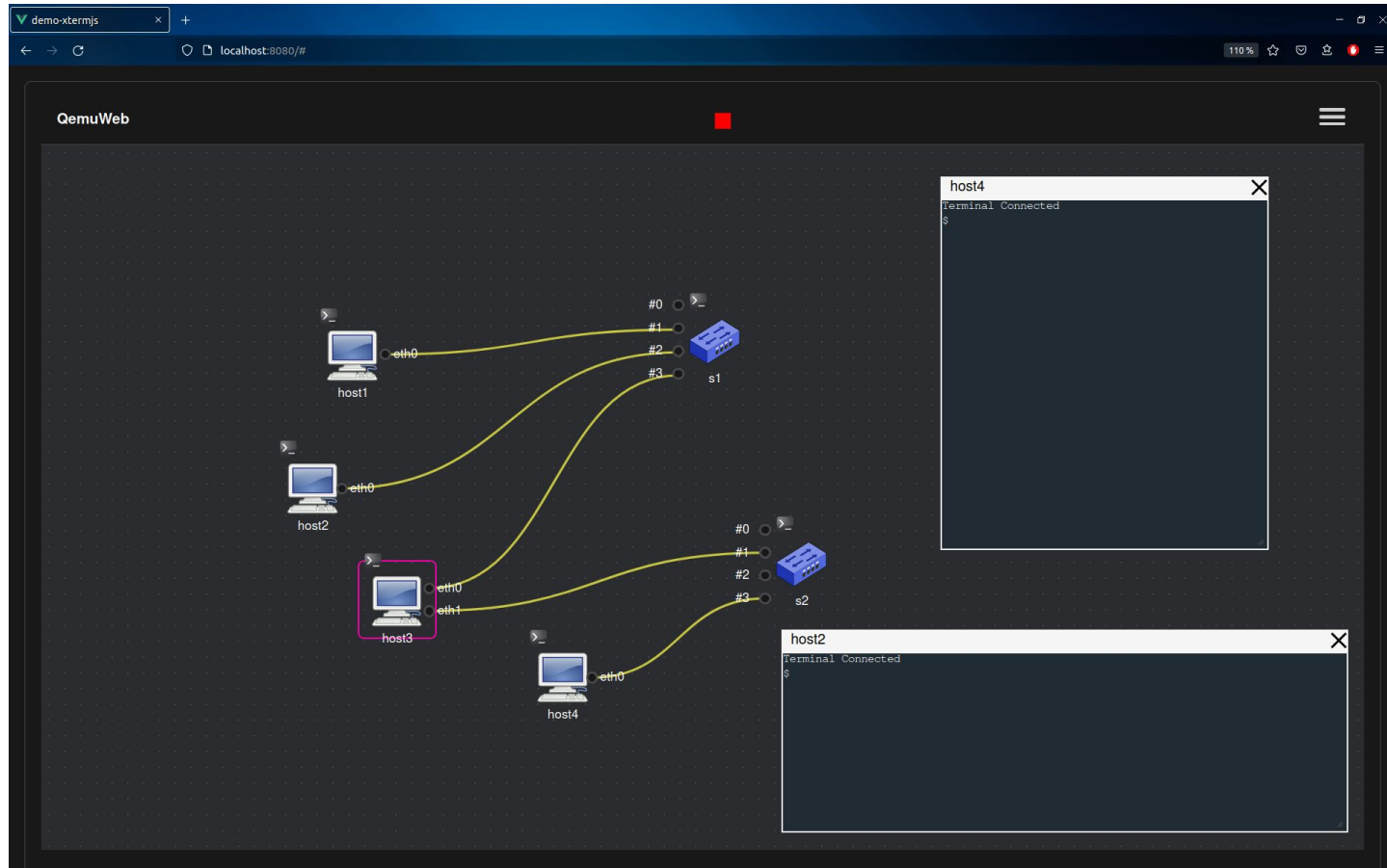


Design Mode – Host Settings

The screenshot shows a web browser window titled "demo-xtermjs" with the address bar displaying "localhost:8080". The main content area is a dark-themed interface for "QemuWeb". On the left, there are icons for a computer and a server rack. The central area displays a network diagram with four host icons labeled "host1", "host2", "host3", and "host4". Host3 is highlighted with a red dashed box. A "Host settings" dialog box is open over host3, containing the following fields:

- System: Debian 10 (dropdown menu)
- Name: host3 (text input)
- Network interface management: (collapse/expand icon)
- eth0: s1/ #3 (dropdown) at right (dropdown)
- eth1: s2/ #1 (dropdown) at right (dropdown)
- OK button

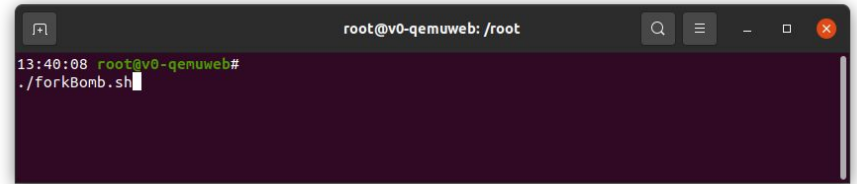
Execution Mode (Network Emulation)



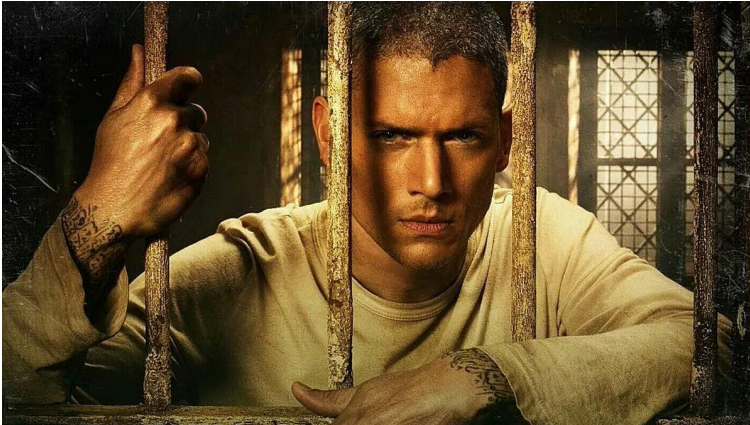
Security Issues

What if a remote client...

- ❑ can run network commands on server machine?
- ❑ can see and modify others files?
- ❑ had root access to the server machine?



```
root@v0-qemuweb: /root
13:40:08 root@v0-qemuweb#
./forkBomb.sh
```



- We have to confine users in separated *jails* and give them only a restricted environment