

AREDN on Proxmox

December, 18th 2023

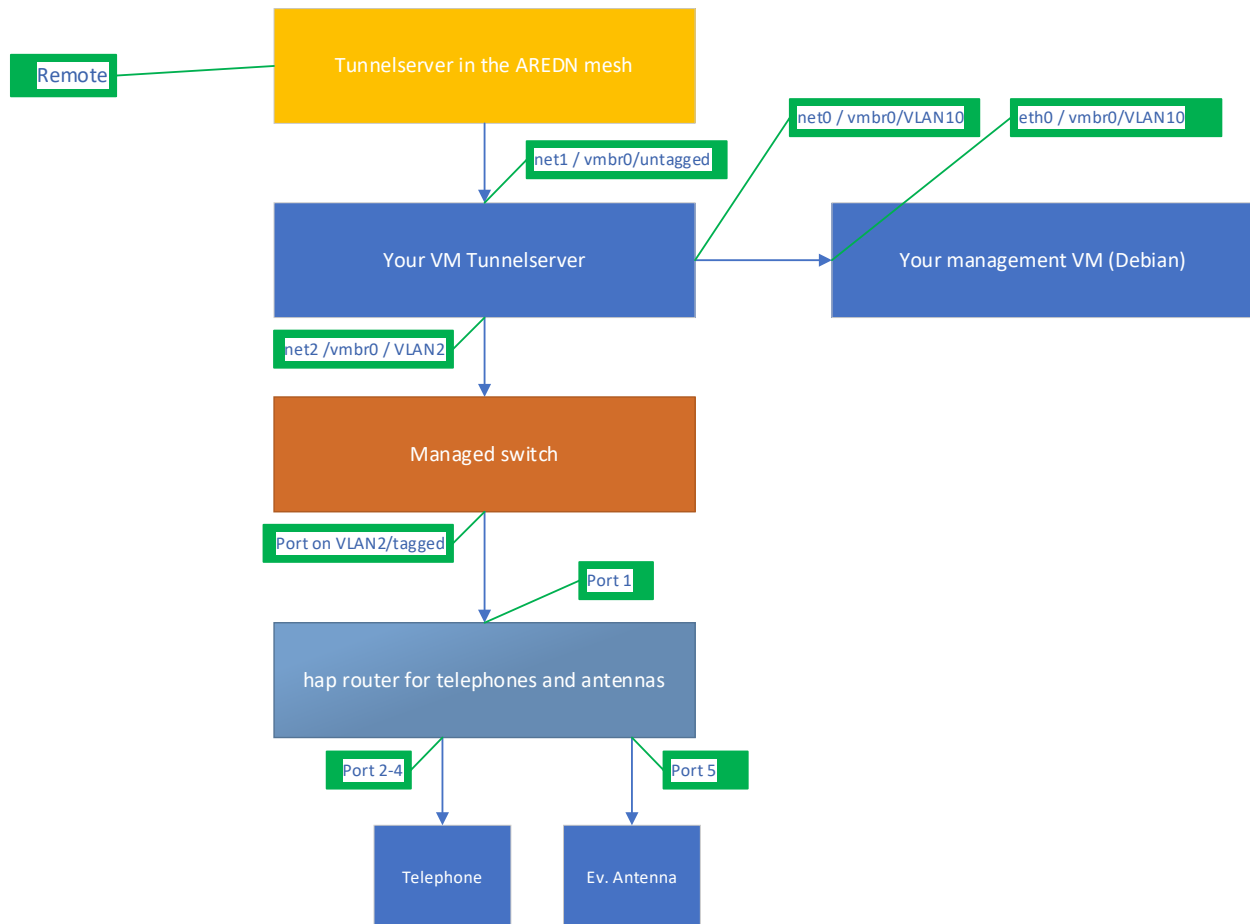
German Video of Webinar on this channel: <https://www.youtube.com/@uskapr113>

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System Overview

This is the setup we want to achieve:



Needed Steps

- 1- Install Proxmox on an X.86 machine (PC)
- 2- Adjust network of the node
- 3- Create an AREDN VM
- 4- Create a Debian VM (or any other distribution that can run a terminal and a browser)
- 5- Connect to AREDN from Debian to setup the network configuration as well as the AREDN node

Proxmox installation

You find many tutorials to install Proxmox on an X86 machine.

Find the IP address of your Proxmox server (using Advanced IP Scanner)

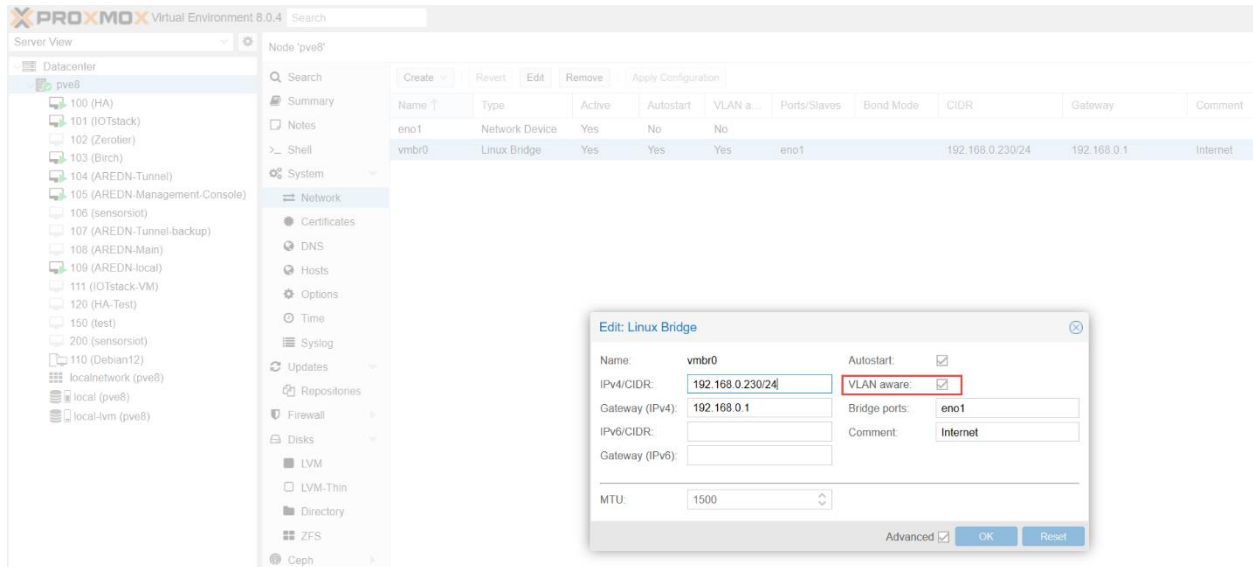
Open a web browser and navigate to the Proxmox web UI (e.g. <https://192.168.0.230:8006/>)

VLAN enabling of the Proxmox network

Navigate to pve8→Network

vmbr0 is the same as port 1 on the hap router and is connected to the internet (for tunnels) It is default on Proxmox.

Make vmbr0 VLAN aware:



The screenshot shows the Proxmox VE 8.0.4 interface. On the left, the 'Datacenter' view shows a list of VMs and containers under the node 'pve8'. The 'Network' tab is selected in the left sidebar. The main panel displays a table of network devices:

Name	Type	Active	Autostart	VLAN aware	Ports/Slaves	Bond Mode	CIDR	Gateway	Comment
eno1	Network Device	Yes	No	No					
vmbr0	Linux Bridge	Yes	Yes	Yes	eno1		192.168.0.230/24	192.168.0.1	Internet

Below the table, the 'Edit: Linux Bridge' dialog for 'vmbr0' is open. The 'VLAN aware' checkbox is checked and highlighted with a red box. Other fields include:

- Name: vmbr0
- Autostart: ☒
- IPV4/CIDR: 192.168.0.230/24
- Gateway (IPV4): 192.168.0.1
- Bridge ports: eno1
- Comment: Internet
- MTU: 1500

VLAN definition for this document

VLAN1: Used as “untagged” VLAN by AREDN

VLAN2: Used for Device-to-Device (DtD) communication by AREDN

VLAN10: Used as LAN network for the Tunnel Server (by the author, can be changed)

VLAN20: Used as LAN network for the Telephone Server (by the author, can be changed)

Create an AREDN VM (Tunnel or Telephone Server)

Based on: <https://i12bretro.github.io/tutorials/0405.html>

and

<https://youtu.be/8nsdrWeeg8o>

Creating the VM

Click the Create VM button at the top right:



And fill in a name and an ID for your VM (start at boot not ticked):

A screenshot of the 'Create: Virtual Machine' dialog box in Proxmox VE, showing the 'General' tab. The 'Node' is set to 'pve8', 'VM ID' is '108', and 'Name' is 'AREDN-Main'. The 'Start at boot' checkbox is unchecked. The 'Resource Pool' is empty. The 'Start/Shutdown order' is 'any', 'Startup delay' is 'default', and 'Shutdown timeout' is 'default'. At the bottom, there is a 'Help' button, an 'Advanced' checkbox (checked), and 'Back' and 'Next' buttons.

Start at boot can be ticked when everything works

A screenshot of the 'Create: Virtual Machine' dialog box in Proxmox VE, showing the 'OS' tab. The 'Use CD/DVD disc image file (iso)' option is selected. The 'Storage' is 'local', 'ISO image' is empty, and 'Guest OS' is 'Linux'. The 'Type' is 'Linux' and 'Version' is '6.x - 2.6 Kernel'. The 'Do not use any media' radio button is selected and highlighted with a red box. The 'Use physical CD/DVD Drive' option is also visible.

Create: Virtual Machine

General OS **System** Disks CPU Memory Network Confirm

Graphic card: Default SCSI Controller: VirtIO SCSI single

Machine: Default (i440fx) Qemu Agent: ☐

Firmware

BIOS: Default (SeaBIOS) Add TPM: ☐

Create: Virtual Machine

General OS System **Disks** CPU Memory Network Confirm

scsi0

Disk Bandwidth

Bus/Device: SCSI 0 Cache: Default (No cache)

SCSI Controller: VirtIO SCSI single Discard: ☐

Storage: local-lvm IO thread: ☒

Disk size (GiB): 0.01

Format: Raw disk image (raw)

SSD emulation: ☐ Backup: ☒

Read-only: ☐ Skip replication: ☐

Async IO: Default (io_uring)

Create: Virtual Machine

General OS System Disks **CPU** Memory Network Confirm

Sockets: 1 Type: x86-64-v2-AES

Cores: 2 Total cores: 2

VCPUs: 2 CPU units: 100

CPU limit: unlimited Enable NUMA: ☐

CPU Affinity: All Cores

Extra CPU Flags:

Default	- <input type="radio"/> <input checked="" type="radio"/> +	md-clear	Required to let the guest OS know if MDS is mitigated correctly
Default	- <input type="radio"/> <input checked="" type="radio"/> +	pcid	Meltdown fix cost reduction on Westmere, Sandy-, and IvyBridge Intel CPUs
Default	- <input type="radio"/> <input checked="" type="radio"/> +	spec-ctrl	Allows improved Spectre mitigation with Intel CPUs
Default	- <input type="radio"/> <input checked="" type="radio"/> +	ssbd	Protection for "Speculative Store Bypass" for Intel models
Default	- <input type="radio"/> <input checked="" type="radio"/> +	ibpb	Allows improved Spectre mitigation with AMD CPUs
Default	- <input type="radio"/> <input checked="" type="radio"/> +	virt-ssbd	Basis for "Speculative Store Bypass" protection for AMD models

Help Advanced ☒ Back Next

Create: Virtual Machine

General OS System Disks CPU **Memory** Network Confirm

Memory (MiB): 512

Minimum memory (MiB): 512

Shares: Default (1000)

Ballooning Device: ☒

Create: Virtual Machine

General OS System Disks CPU Memory **Network** Confirm

☐ No network device

Bridge: vmbr0 Model: VirtIO (paravirtualized)

VLAN Tag: 20 MAC address: auto

Firewall: ☐

Disconnect: ☐ Rate limit (MB/s): unlimited

MTU: 1500 (1 = bridge MTU) Multiqueue:

Add VLAN 20 (to prevent DHCP server interacting with your home network (and untick firewall):

Create: Virtual Machine

General OS System Disks CPU Memory Network **Confirm**

Key ↑	Value
cores	2
cpu	x86-64-v2-AES
ide2	none,media=cdrom
memory	512
name	AREDN-Main
net0	virtio,bridge=vmbr0,tag=20
nodename	pve8
numa	0
ostype	l26
scsi0	local-lvm:0.01,iothread=on
scsihw	virtio-scsi-single
sockets	1
vmid	108

☐ Start after created

Advanced ☒ Back Finish

Confirm the summary and wait till the VM is created

Configuring the AREDN VM

Change VLAN tag and remove firewall of Network device (net0) to create LAN port

Bridge: vmbro Model: VirtIO (paravirtualized)
VLAN Tag: 10 MAC address: F2:E2:A4:3F:22:4A
Firewall: ☐
Disconnect: ☐ Rate limit (MB/s): unlimited
MTU: 1500 (1 = bridge MTU) Multiqueue:
Help Advanced ☒ OK Reset

VLAN 10 is used to insulate the DHCP server of the AREDN node. If you forget it, you can shut down your whole home network when you start the server!

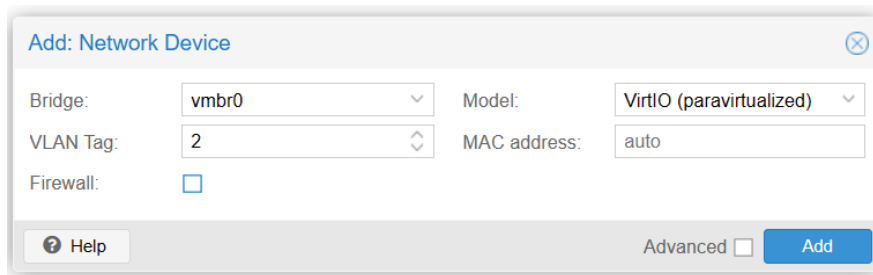
Click the Add button > Network Device

Virtual Machine 108 (AREDN-Main) on node 'pve8' No Tags
Add Detach Edit Disk Action Revert
Summary Console Hardware Cloud-Init Options Task History Monitor Backup Replication Snapshots Firewall Permissions
Hard Disk 512.00 MiB
CD/DVD Drive 2 (1 sockets, 2 cores) [x86-64-v2-AES]
Network Device Default (SeaBIOS)
EFI Disk Default
TPM State Default (i440fx)
USB Device VirtIO SCSI single
PCI Device (2) none,media=cdrom
Serial Port local-lvm:vm-108-disk-0,iotthread=1,size=10486K
CloudInit Drive net0) virtio=F2:E2:A4:3F:22:4A,bridge=vmbro,tag=20
Audio Device
VirtIO RNG

to create the WAN port

Bridge: vmbro Model: VirtIO (paravirtualized)
VLAN Tag: no VLAN MAC address: auto
Firewall: ☐
Disconnect: ☐ Rate limit (MB/s): unlimited
MTU: 1500 (1 = bridge MTU) Multiqueue:
Help Advanced ☒ Add

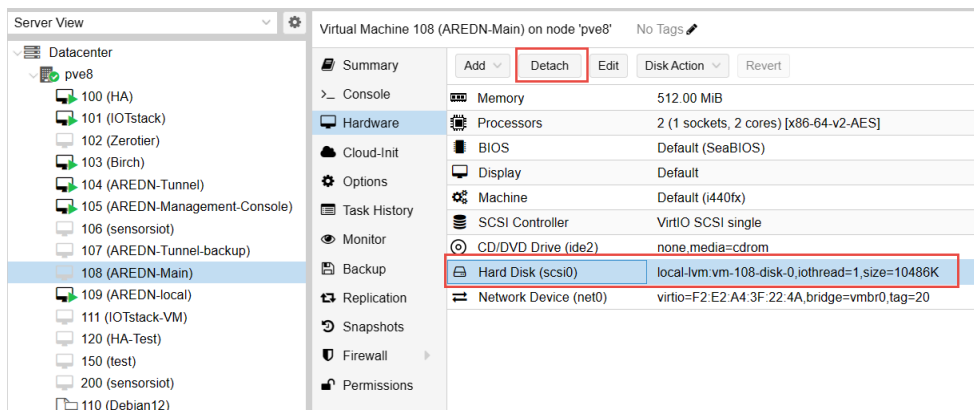
Add the DtD interface in VLAN2



The result should look like that:

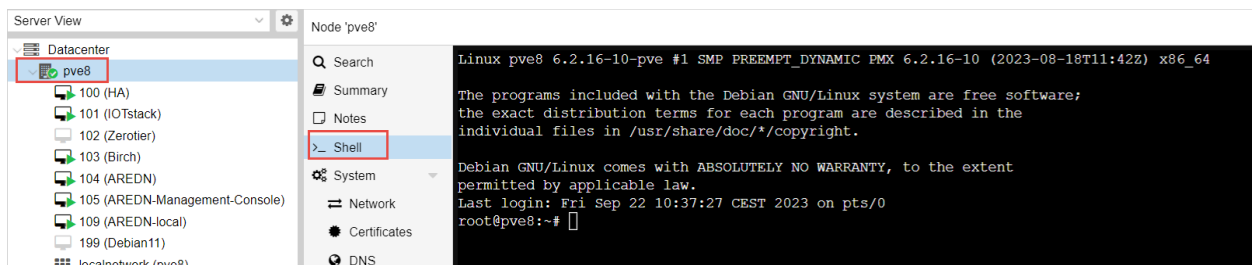
Network Device (net0)	virtio=F2:E2:A4:3F:22:4A,bridge=vmbr0,tag=10
Network Device (net1)	virtio=CE:89:6D:54:3A:AC,bridge=vmbr0,link_down=1
Network Device (net2)	virtio=DE:D8:C2:12:53:D6,bridge=vmbr0,tag=3

And finally, detach and remove harddisk (scsi0)



Setting Up the AREDN Disk

Go to the shell of the server and download the image



```
wget -O aredn.img.gz
http://downloads.arednmesh.org/releases/3.23.8.0/targets/x86/64/aredn-3.23.8.0-
x86-64-generic-ext4-combined.img.gz
```

Adjust the release if you want. Or upgrade your VM later using the AREDN VM

extract the AREDN img

```
gunzip ./aredn.img.gz
```

rename the extracted img

```
mv ./aredn*.img ./aredn.raw
```

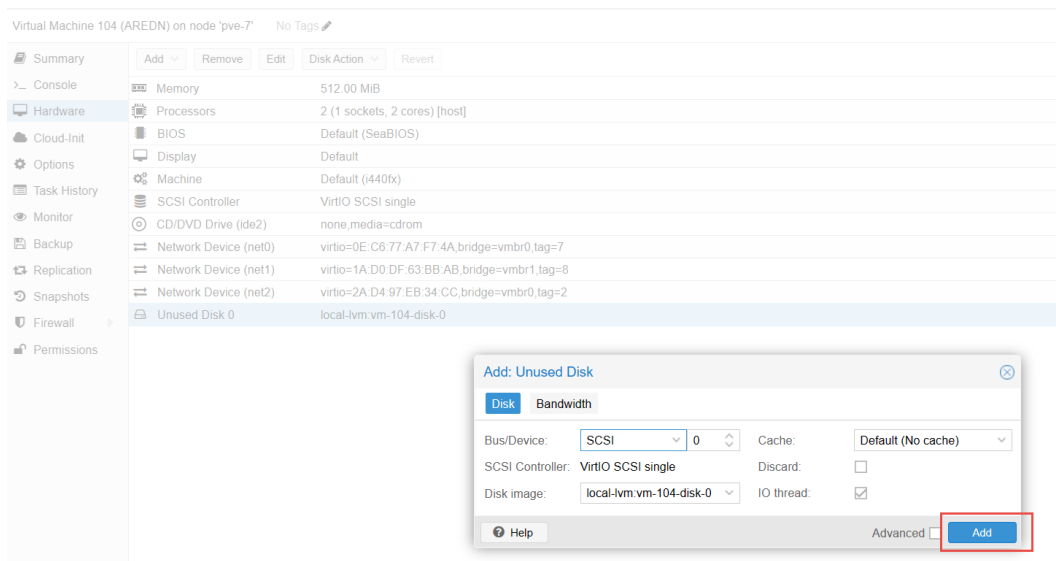
increase the raw disk to 512 MB

```
qemu-img resize -f raw ./aredn.raw 512M
```

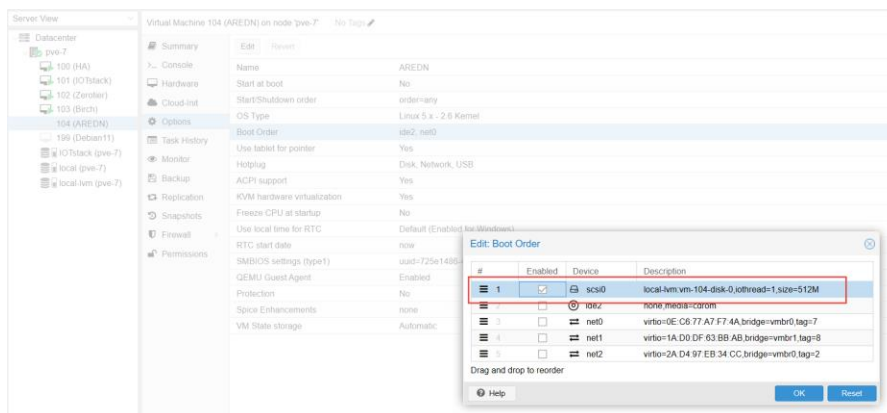
import the disk to the openwrt VM (replace 104 with your VM number)

```
qm importdisk 104 /root/aredn.raw local-lvm
```

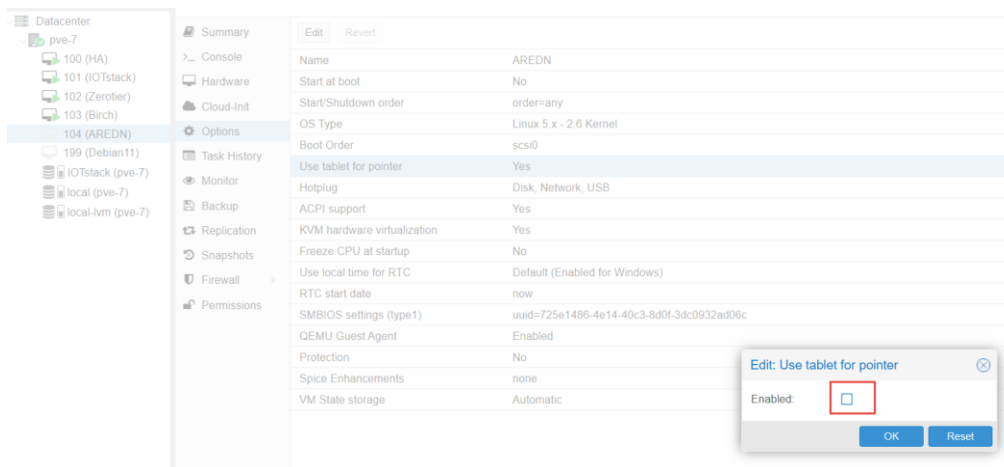
The disk is now visible as “Unused Disk 0”. Add the disk (double click on it) to your VM:



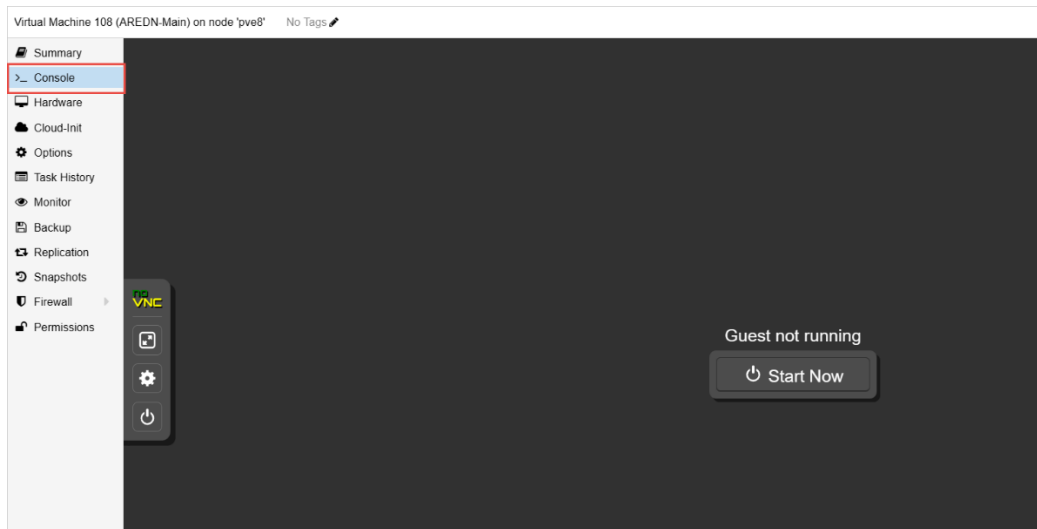
Change boot order:



Double click Use tablet pointer > Uncheck the Enabled box > Click OK



Go to Console and press “Start Now”



Watch the boot process, wait for the text to stop scrolling and press “Enter”



Run the following command to change/set the root password

```
passwd
```

Type a new root password twice. **Attention: It is a US keyboard (Y/Z)**

For the moment we are done with the AREDN node. Because we had to separate the LAN from our home network, we only can manage the node in the Proxmox terminal (it does not offer a browser). To solve the problem, we add a VM with plain vanilla Debian and connect it to VLAN20, too. Like that we have a private connection to manage our AREDN node.

Of course, you can use any other VM that offers a browser and is connected to vmbr0/VLAN10.

Type

```
ip addr
```

To check the address of your VM. It should be 192.168.1.1

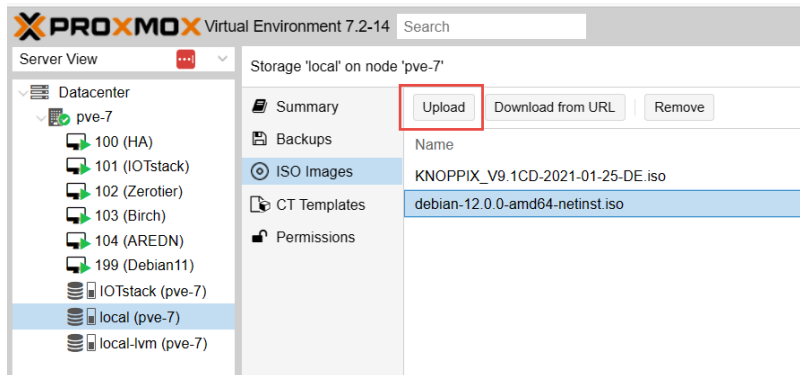
```
root@NOCALL:~# ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel master br-lan state UP qlen 1000
    link/ether f2:e2:a4:3f:22:4a brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether ce:89:6d:54:3a:ac brd ff:ff:ff:ff:ff:ff
4: eth2: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN qlen 1000
    link/ether de:d8:c2:12:53:d6 brd ff:ff:ff:ff:ff:ff
5: tunl0@NONE: <NOARP> mtu 1480 qdisc noop state DOWN qlen 1000
    link/ipip 0.0.0.0 brd 0.0.0.0
6: br-lan: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP qlen 1000
    link/ether f2:e2:a4:3f:22:4a brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.1/24 brd 192.168.1.255 scope global br-lan
        valid_lft forever preferred_lft forever
7: eth0.2@eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP qlen 1000
    link/ether f2:e2:a4:3f:22:4a brd ff:ff:ff:ff:ff:ff
    inet 192.168.2.1/24 brd 192.168.2.255 scope global eth0.2
        valid_lft forever preferred_lft forever
8: eth0.1@eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UP qlen 1000
    link/ether f2:e2:a4:3f:22:4a brd ff:ff:ff:ff:ff:ff
```

Create a Debian VM as a Management Console

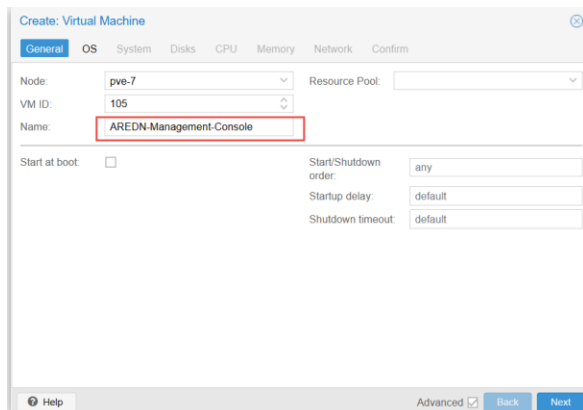
<https://youtu.be/OUC7DMBfR3Y?si=y4r3edcwzzpd2JHJ>

Download the Debian 11 iso Download

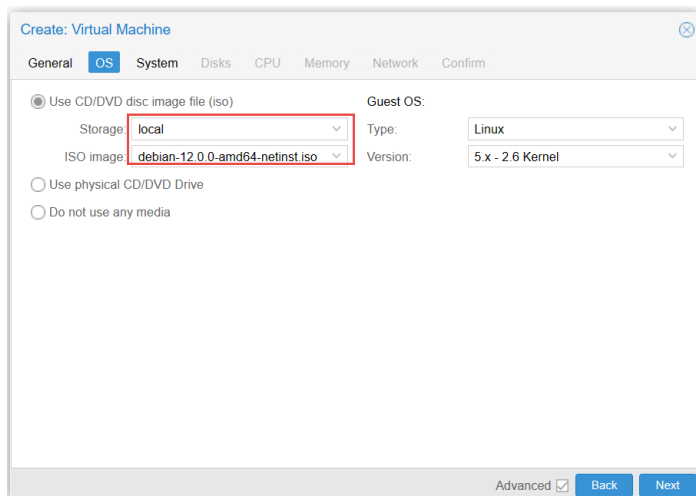
<https://cdimage.debian.org/debian-cd/current/amd64/iso-cd/> (debian-12.1.0-amd64-netinst.iso)



Create VM



On the OS tab,



Leave the defaults on the System tab

The screenshot shows the 'Create: Virtual Machine' dialog with the 'System' tab selected. The 'General' tab is also visible. The 'System' tab contains the following settings:

- Graphic card: Default
- Machine: Default (i440fx)
- Firmware: BIOS: Default (SeaBIOS)
- SCSI Controller: VirtIO SCSI single
- Qemu Agent: ☐
- Add TPM: ☐

At the bottom, there is a 'Help' button, an 'Advanced' checkbox (checked), and 'Back' and 'Next' buttons.

On the Hard Disk tab, set the Disk size to 16 GiB or more

The screenshot shows the 'Create: Virtual Machine' dialog with the 'Disks' tab selected. The 'Disk' sub-tab is active. The 'scsi0' disk is listed on the left. The settings for the disk are:

- Bus/Device: SCSI 0
- Cache: Default (No cache)
- SCSI Controller: VirtIO SCSI single
- Storage: local-lvm
- Disk size (GiB): 16
- Format: Raw disk image (raw)
- SSD emulation: ☐
- Read-only: ☐
- Backup: ☒
- Skip replication: ☐
- Async IO: Default (io_uring)

At the bottom, there is a 'Help' button, an 'Advanced' checkbox (checked), and 'Back' and 'Next' buttons.

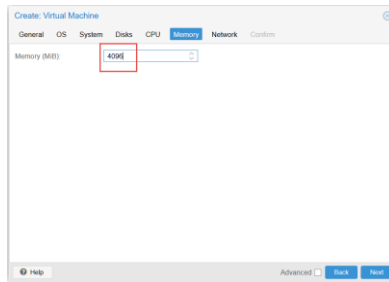
On the CPU tab

The screenshot shows the 'Create: Virtual Machine' dialog with the 'CPU' tab selected. The settings are:

- Sockets: 1
- Cores: 2
- Type: host
- Total cores: 2

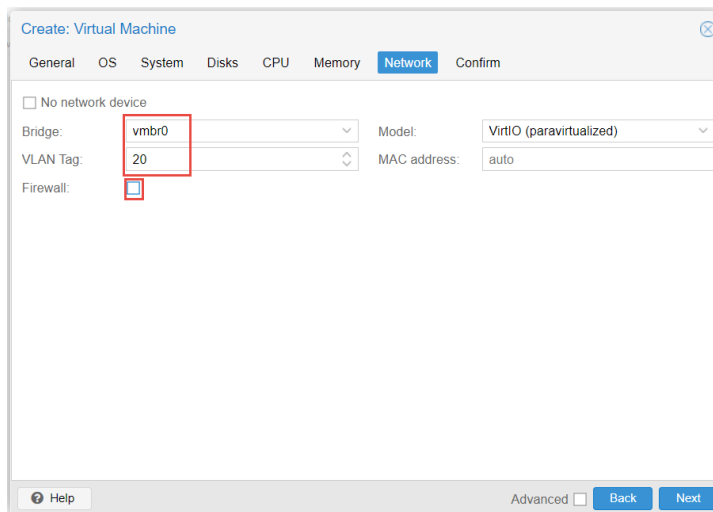
At the bottom, there is a 'Help' button, an 'Advanced' checkbox (unchecked), and 'Back' and 'Next' buttons.

On the Memory tab



Network tab: Add the VLAN number of the LAN port of the AREDN server you want to connect to and untick the firewall.

Edit: Do not add the VLAN right now. Add it when you are finished with the installation and want to connect to an AREDN node. Otherwise you will not be able to continue.

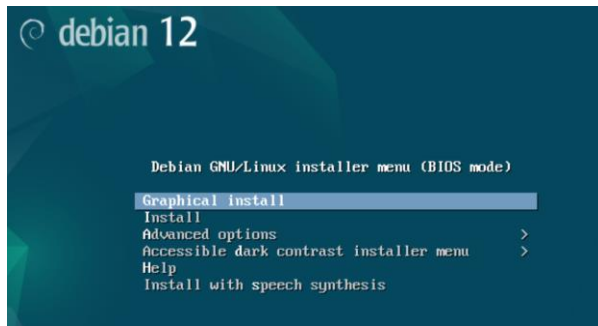


Verify the summary and click Finish

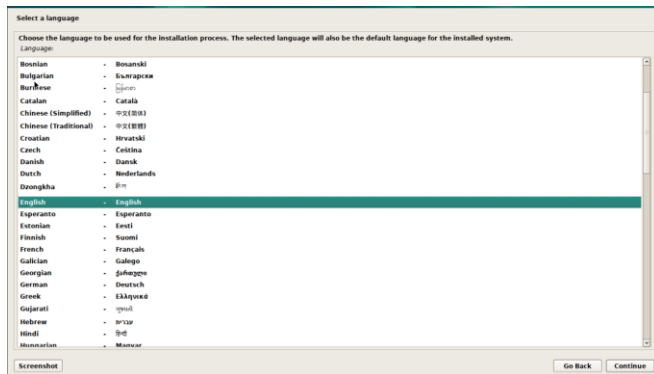
Start the VM



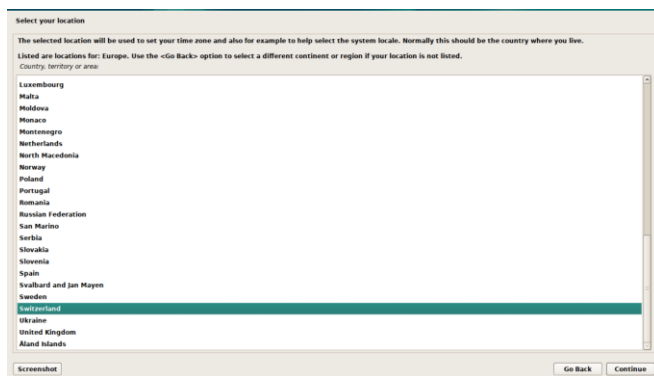
Graphical Install



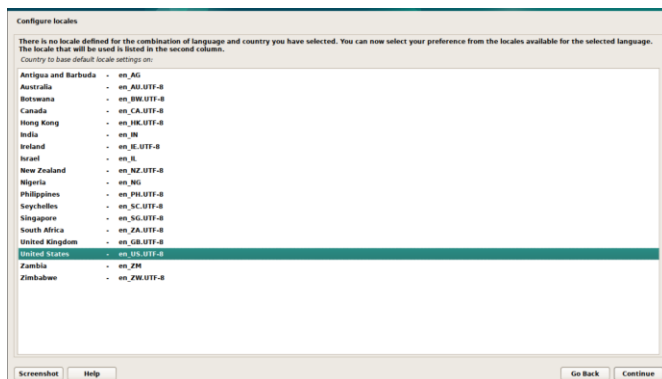
Select a language



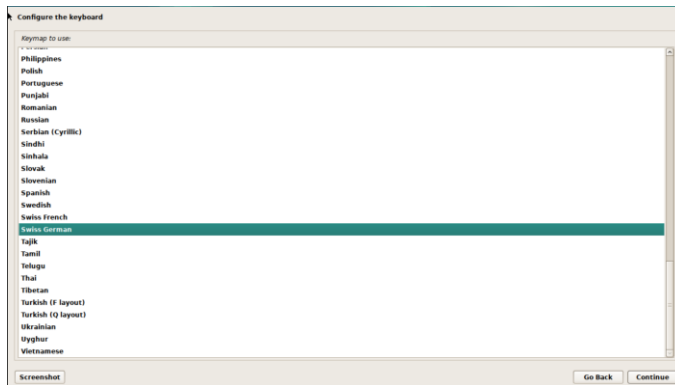
Select a Location (other →Europe→Switzerland)



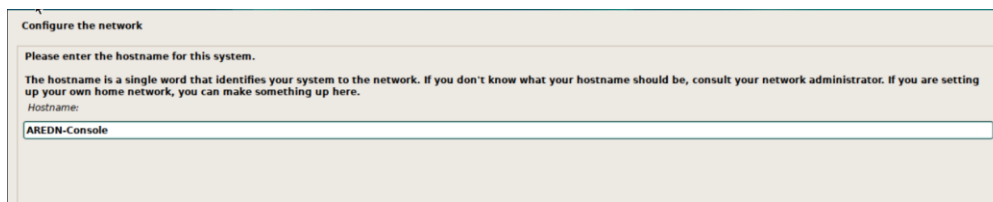
Select locales (can be adapted later)



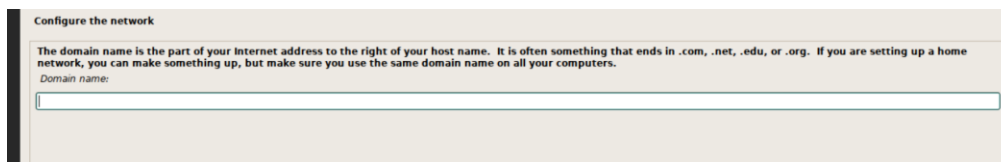
Select a keyboard layout (can be changed later)



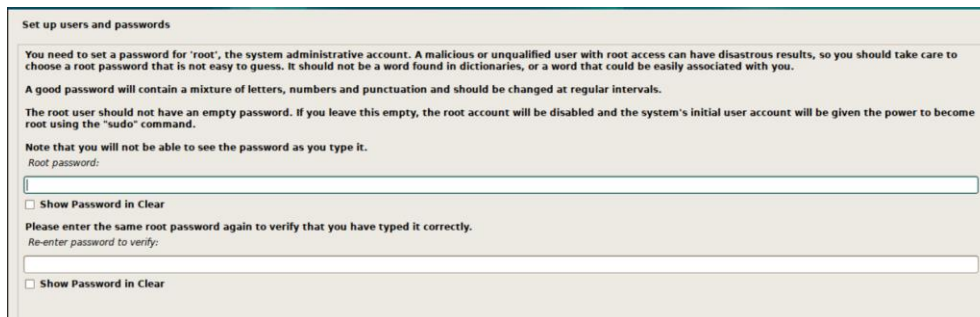
Enter a hostname for the VM



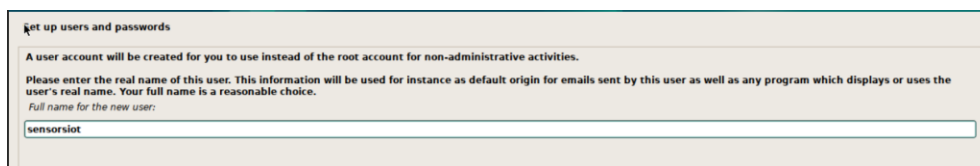
Leave domain name empty



Leave root password empty



Enter the full name for the new user



Enter the username for the new user

Set up users and passwords

Select a username for the new account. Your first name is a reasonable choice. The username should start with a lower-case letter, which can be followed by any combination of numbers and more lower-case letters.

Username for your account:

ubuntu@ubuntu

Enter and confirm a password for the new user

Set up users and passwords

A good password will contain a mixture of letters, numbers and punctuation and should be changed at regular intervals.

Choose a password for the new user:

••••••••

☐ Show Password in Clear

Please enter the same user password again to verify you have typed it correctly.

Re-enter password to verify:

••••••••

☐ Show Password in Clear

Select Disk

Partition disks

The installer can guide you through partitioning a disk (using different standard schemes) or, if you prefer, you can do it manually. With guided partitioning you will still have a chance later to review and customise the results.

If you choose guided partitioning for an entire disk, you will next be asked which disk should be used.

Partitioning method:

Guided - use entire disk

Guided - use entire disk and set up LVM

Guided - use entire disk and set up encrypted LVM

Manual

Partition disks

Note that all data on the disk you select will be erased, but not before you have confirmed that you really want to make the changes.

Select disk to partition:

SCSI3 (0,0,0) (sda) - 17.2 GB QEMU QEMU HARDDISK

Partition disks

Selected for partitioning:

SCSI3 (0,0,0) (sda) - QEMU QEMU HARDDISK: 17.2 GB

The disk can be partitioned using one of several different schemes. If you are unsure, choose the first one.

Partitioning scheme:

All files in one partition (recommended for new users)

Separate /home partition

Separate /home, /var, and /tmp partitions

Check and click Continue

Partition disks

This is an overview of your currently configured partitions and mount points. Select a partition to modify its settings (file system, mount point, etc.), a free space initialize its partition table.

Guided partitioning

Configure software RAID

Configure the Logical Volume Manager

Configure encrypted volumes

Configure iSCSI volumes

SCSI3 (0,0,0) (sda) - 17.2 GB QEMU QEMU HARDDISK

> #1 primary 16.2 GB f ext4 /

> #5 logical 1.0 GB f swap swap

Undo changes to partitions

Finish partitioning and write changes to disk

Select Yes to confirm writing the changes

Partition disks

If you continue, the changes listed below will be written to the disks. Otherwise, you will be able to make further changes manually.

The partition tables of the following devices are changed:
SCSI0 (0,0,0) (sda)

The following partitions are going to be formatted:
partition #1 of SCSI0 (0,0,0) (sda) as ext4
partition #5 of SCSI0 (0,0,0) (sda) as swap
Write the changes to disks?

☐ No
☒ Yes

Wait for Debian to copy and install files

Configure the package manager

Scanning your installation media finds the label:
Debian GNU/Linux 12.0.0_Bookworm - Official amd64 NETINST with firmware 20230610-10:21

You now have the option of scanning additional media for use by the package manager (apt). Normally these should be from the same set as the one you booted from. If you do not have any additional media, this step can just be skipped.

If you wish to scan more media, please insert another one now.
Scan extra installation media?

☒ No
☐ Yes

Configure the package manager

The goal is to find a mirror of the Debian archive that is close to you on the network -- be aware that nearby countries, or even your own, may not be the best choice.

Debian archive mirror country:

- New Zealand
- North Macedonia
- Norway
- Poland
- Portugal
- Romania
- Russian Federation
- Réunion
- Singapore
- Slovakia
- Slovenia
- South Africa
- South Korea
- Spain
- Sweden
- Switzerland
- Taiwan
- Thailand
- Türkiye
- Ukraine
- United Kingdom
- United States
- Uruguay
- Vietnam

Screenshot

Go Back Continue

Configure the package manager

Please select a Debian archive mirror. You should use a mirror in your country or region if you do not know which mirror has the best Internet connection to you.

Usually, deb.debian.org is a good choice.

Debian archive mirror:

- deb.debian.org
- ftp.ch.debian.org
- debian.ethz.ch
- mirror.sinavps.ch
- mirror.iway.ch
- mirror.init7.net
- mirror1.infomaniak.com
- mirror2.infomaniak.com
- debian-archive.trafficmanager.net

Configure the package manager

If you need to use a HTTP proxy to access the outside world, enter the proxy information here. Otherwise, leave this blank.

The proxy information should be given in the standard form of "http://[[user][:pass]@]host[:port]".
HTTP proxy information (blank for none):

Wait

Participating in package survey

Configuring popularity-contest

The system may anonymously supply the distribution developers with statistics about the most used packages on this system. This information influences decisions such as which packages should go on the first distribution CD.

If you choose to participate, the automatic submission script will run once every week, sending statistics to the distribution developers. The collected statistics can be viewed on <https://popcon.debian.org/>.

This choice can be later modified by running "dpkg-reconfigure popularity-contest".

Participate in the package usage survey?

☒ No

☐ Yes

Select the software to install

Software selection

At the moment, only the core of the system is installed. To tune the system to your needs, you can choose to install one or more of the following predefined collections of software.

Choose software to install:

- ☒ Debian desktop environment
- ☒ ... GNOME
- ☐ ... Xfce
- ☐ ... GNOME Flashback
- ☐ ... KDE Plasma
- ☐ ... Cinnamon
- ☐ ... MATE
- ☐ ... LXDE
- ☐ ... LXQt
- ☐ web server
- ☒ SSH server
- ☒ standard system utilities

Select (tick) "SSH server"

Wait

Select Yes to install GRUB

Install the GRUB boot loader

It seems that this new installation is the only operating system on this computer. If so, it should be safe to install the GRUB boot loader to your primary drive (UEFI partition/boot record).

Warning: If your computer has another operating system that the installer failed to detect, this will make that operating system temporarily unbootable, though GRUB can be manually configured later to boot it.

Install the GRUB boot loader to your primary drive?

☐ No

☒ Yes

Select drive for the boot loader

Install the GRUB boot loader

You need to make the newly installed system bootable, by installing the GRUB boot loader on a bootable device. The usual way to do this is to install GRUB to your primary drive (UEFI partition/boot record). You may instead install GRUB to a different drive (or partition), or to removable media.

Device for boot loader installation:

Enter device manually

/dev/sda (scsi-0QEMU_QEMU_HARDDISK_drive-scsi0)

Reboot

Remove CD drive (it will only be removed after reboot)

Virtual Machine 105 (AREDN-Management-Console) on node 'pve-7' No Tags

Summary Add Remove Edit Disk Action Revert

Console

Hardware

Cloud-Init

Options

Task History

Monitor

Backup

Replication

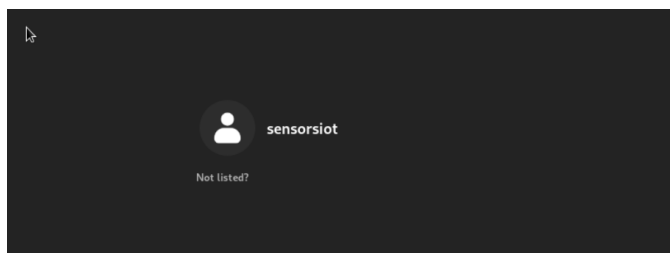
Snapshots

Firewall

Permissions

Memory	4.00 GiB
Processors	2 (1 sockets, 2 cores) [host]
BIOS	Default (SeaBIOS)
Display	Default
Machine	Default (i440fx)
SCSI Controller	VirtIO SCSI single
CD/DVD Drive (ide2)	local:iso/debian-12.0.0-amd64-netinst.iso,media=cdrom,size=738M
Hard Disk (scsi0)	local-lvm:vm-105-disk-0,iothread=1,size=16G
Network Device (net0)	virtio=2E:72:31:08:AA:FA,bridge=vmbr1

Go to the Console and login



Start Firefox. On <http://localnode.local.mesh> you should see your AREDN server on the same VLAN because your Management Console is connected via the vmbr0/10 interface.

Create a Management Console in an LXC Container (work in progress, not finished)

Create a Container using a Debian image

Create a new user

```
apt install sudo curl -y
```

```
adduser aredn
```

```
usermod -aG sudo aredn  
exit
```

Logout and login with new user

Check if it worked:

```
sudo apt update
```

```
sudo apt install xrdp -y
```

```
sudo echo xfce4-session > ~/.xsession  
  
sudo nano /etc/xrdp/startwm.sh
```

add

```
startxfce4
```

at the end of the file

Configure the AREDN Tunnel Server

Because our Management Console VM is connected to our AREDN VM via vmbro0/VLAN10 it should get an IP.

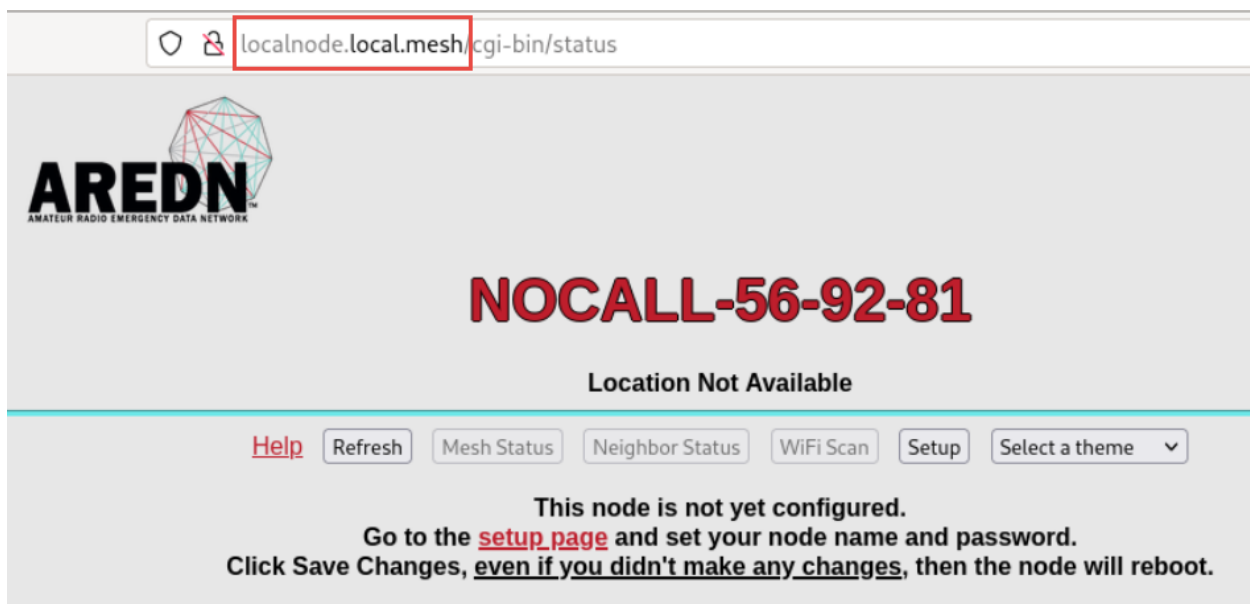
```
sensorsiot@AREDN-Console:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
        valid_lft forever preferred_lft forever
2: ens18: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 2e:72:31:08:aa:fa brd ff:ff:ff:ff:ff:ff
    altname enp0s18
    inet 192.168.1.20/24 brd 192.168.1.255 scope global dynamic ens18
        valid_lft 41302sec preferred_lft 41302sec
    inet6 fe80::2c72:31ff:fe08:aafa/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```

To check the connection, you can ping the AREDN VM:

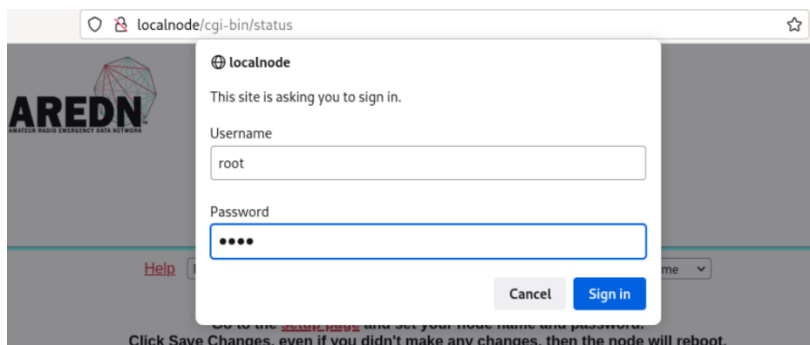
```
ping localnode.local.mesh
```

Initial setup of the AREDN router

Open the browser and call localnode.local.mesh



Press setup (password: hsmm)



Give it a name and a password, hit “Save changes” and “reboot”

Node Status **Basic Setup** Port Forwarding, DHCP, and Services Tunnel Server Tunnel Client Administration Advanced Network Advanced Configuration

Help Save Changes Reset Values Default Values Reboot

Node Name: HB9BLA-VM-TUNNELSERVER-2 Password: Verify Password:

Node Description (optional):

Mesh		LAN		WAN	
IP Address	10.56.92.81	LAN Mode	5 host Direct	Protocol	DHCP
Netmask	255.0.0.0	IP Address	10.194.226.137	DNS 1	8.8.8.8
		Netmask	255.255.255.248	DNS 2	8.8.4.4
		DHCP Server	<input checked="" type="checkbox"/>		
		DHCP Start	138		
		DHCP End	142		

After reboot, your AREDN VM should have an 10.x.x.x address

If the Management Console does not connect to the AREDN VM, it still has its old address.

So type these two commands to get a new address from the AREDN VM:

```
sudo dhclient -r
sudo dhclient
```

From now on, you can manage your AREDN node from the Management Console

HB9BLA-VM-TUNNELSERVER-2

Location Not Available

Help Refresh Mesh Status Neighbor Status Setup Select a theme

primary address: 10.56.92.81 / 32 LAN address: 10.194.226.137 / 29 WAN address: none default gateway: none

firmware version: 3.23.8.0 model: QEMU PC system time: Tue Nov 21 2023 09:36:08 UTC uptime: 0:04 load average: 0.00, 0.01, 0.00 available space: flash = 86632 KB memory = 458616 KB host entries: 1 nodes / 2 total devices

Part of the AREDN™ Project. For more details please [view here](#)

Connection to the configured Tunnel Server (incl. ssh)

Connect again to your AREDN server (unfortunately, Proxmox does not allow copy-paste):

Network mapping inside the AREDN VM

In the end we would like the following mapping:

Network Device (net0)	virtio=F2:E2:A4:3F:22:4A,bridge=vibr0,tag=10	eth0	LAN port (ports 2-4 on hap)
Network Device (net1)	virtio=CE:89:6D:54:3A:AC,bridge=vibr0	eth1	LAN port (port 1 on hap)
Network Device (net2)	virtio=DE:D8:C2:12:53:D6,bridge=vibr0,tag=3	eth2	LAN port (port 5 on hap)

The mapping of the nets has to be done now in the terminal of the Management Console.

Type:

```
vi /etc/config/network
```

and hit the “insert” key.

Leave the Wi-Fi configuration as it is:

```
### Loopback configuration
config interface loopback
    option device "lo"
    option proto static
    option ipaddr 127.0.0.1
    option netmask 255.0.0.0

#### WIFI configuration
config device
    option name 'br-nomesh'
    option type 'bridge'
    option bridge_empty '1'

config interface wifi
    option device 'br-nomesh'
    option proto 'static'
    option ipaddr '10.124.142.47'
    option netmask '255.255.255.255'

config interface wifi_mon
    option proto none
```

Add two ports to the bridge configuration:

```
### Bridge configuration
config device
    option name 'br0'
    option type 'bridge'
    list ports 'eth0'
    list ports 'eth1'
    list ports 'eth2'
```

Adjust the LAN configuration:

```

#### LAN configuration

config bridge-vlan
    option device 'br0'
    option vlan '3'
    list ports 'eth0:u'

config device
    option name 'br-lan'
    option type 'bridge'
    option macaddr '02:40:B0:C3:7B:A5'
    list ports 'br0.3'

config interface lan
    option device 'br-lan'
    option proto 'static'
    option ipaddr '10.61.86.209'
    option netmask '255.255.255.240'
    option dns '8.8.8.8 8.8.4.4'

```

The LAN is connected to eth0 that is net0 in Proxmox on VLAN 20. Only our Management Console is connected to this network. So the DHCP server inside the AREDN server is insulated and does not harm your home network.

The WAN port has to be connected to the internet. Vmbr0 is connected to the RJ45 connector of your server. It uses the general purpose VLAN 1 and will get a DHCP address from your home network.

```

#### WAN configuration

config bridge-vlan
    option device 'br0'
    option vlan '1'
    list ports 'eth1:u'

config device
    option name 'br-wan'
    option type 'bridge'
    list ports 'br0.1'

config interface wan
    option device 'br-wan'
    option proto 'dhcp'

```

The Dtd (device-to-device) port is connected to the RJ45 of your Proxmox server via vmbr0, but this time using VLAN 2. To avoid problems with the DHCP server of other AREDN devices like the hap routers, we have to add a managed switch where we only transfer VLAN 2 to the ports where we connect port 5 of the hap routers or any “antennas”.

```

#### Dtd configuration

config bridge-vlan
    option device 'br0'
    option vlan '2'
    list ports 'eth2:u'

config device
    option name 'br-dtdlink'
    option type 'bridge'
    list ports 'br0.2'

config interface dtdlink
    option device 'br-dtdlink'
    option proto 'static'
    option ipaddr '10.60.118.44'
    option netmask '255.0.0.0'

```

All networks have to be marked “untagged” (e.g. “eth2:u”). They are tagged by Proxmox. And Proxmox does not like tagged stuff from the container.

The rest of the configuration file is only comments and is not changed for the moment.

Press the “escape” button and “:wq” to save your changes.

Reboot.

Now you can connect to localnode.local.mesh via browser and start to customize your server.

Give it the name: Callsign-VM-TUNNELSERVER (if not done before).

Connect it as a client to your Tunnel Server in the AREDN network. Make sure the administrator of your tunnel adjusts the name and the address of your new server. Maybe you want to run in parallel for a few days. After connecting to your Tunnel Server, you should see the other nodes in the net.

Now, you can add the tunnels you serve. Do not forget to forward port 5525 to the address of your Tunnel Server.

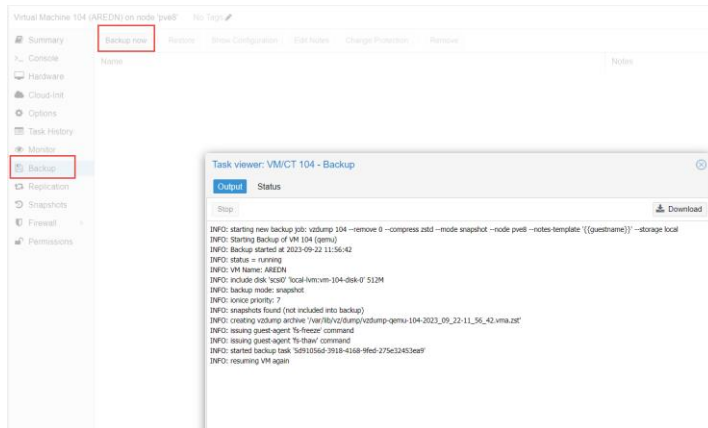
Enabled?	Server	Pwd	Network	Active	Action
<input checked="" type="checkbox"/>	i.v6.rocks	:	172.31		Del

Now your Server should be connected to the SwissDigitalNet. Congratulations!

Node Name	LAN Hostname	Service Name
HB9BLA-VM-TUNNELSERVER		
Current Neighbors	LAN Hostname	Service Name
HB9BLA-VM-1 (old)	441531	
HB9DIO-hap-1 (bur)		
HB9EDL-VM-GW (bur)		CHAT4ALL Illespa
HB9ETS-BASE-WSTEIN (bur)	422530	
	freepbx citadel	HP VOIP CITADEL Server
HB9GNO-HAP-TUNNELSERVER (bur)	720830	
HB9GVM-HAP-1 (bur)	870830	
HB9HCH-198-151-232 (bur)		
HB9HCO-HAP-1 (bur)		
HB9VCJ-HAP-1 (bur)	443430	
Remote Nodes	LAN Hostname	Service Name
		ETX

Backup of the VM

Backup machine to the local directory



You find this directory

```
cd /var/lib/vz/dump/
```

on the Proxmox **server**. It can be saved to the local disk using WinSCP

Install QEMU Agent

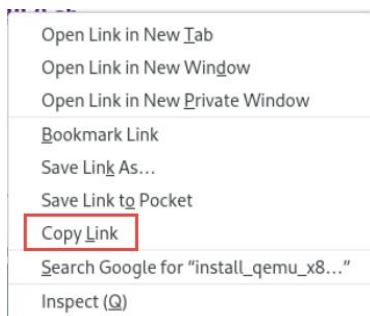
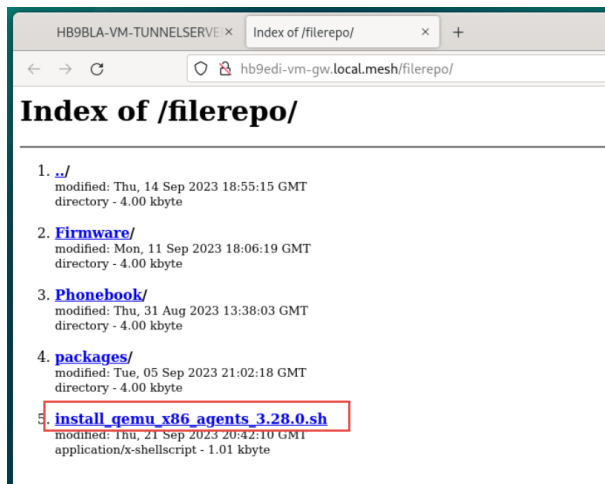
This step is needed to control (e.g. shut down) the AREDN VM from Proxmox

You have to be connected to the SwissDigitalNet for this task

In your Management Console, you go to mesh status and select HB9EDI's filerepo:



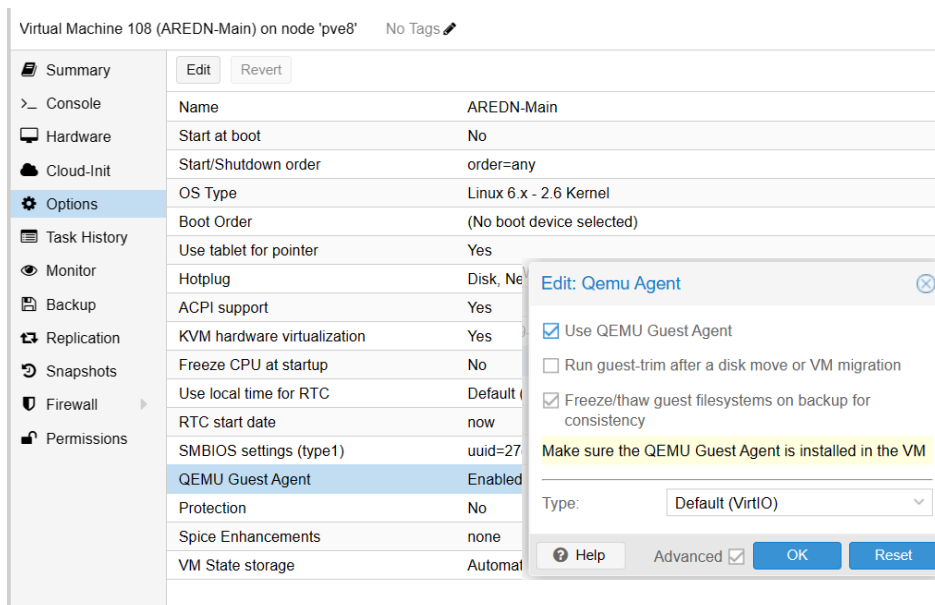
And copy this link (right mouse click):



Now you paste the link into your terminal and add the yellow command

```
curl http://hb9edi-vm-gw.local.mesh/filerepo/install_qemu_x86_agents_3.28.0.sh | ash
```

Finally, you enable Guest Agent and reboot the machine



Now your Tunnel Server can be controlled by Proxmox.

Without connection to the SwissDigitalNet

Download and install these packets from

```
https://downloads.openwrt.org/releases/23.05.0/packages/x86_64/
```

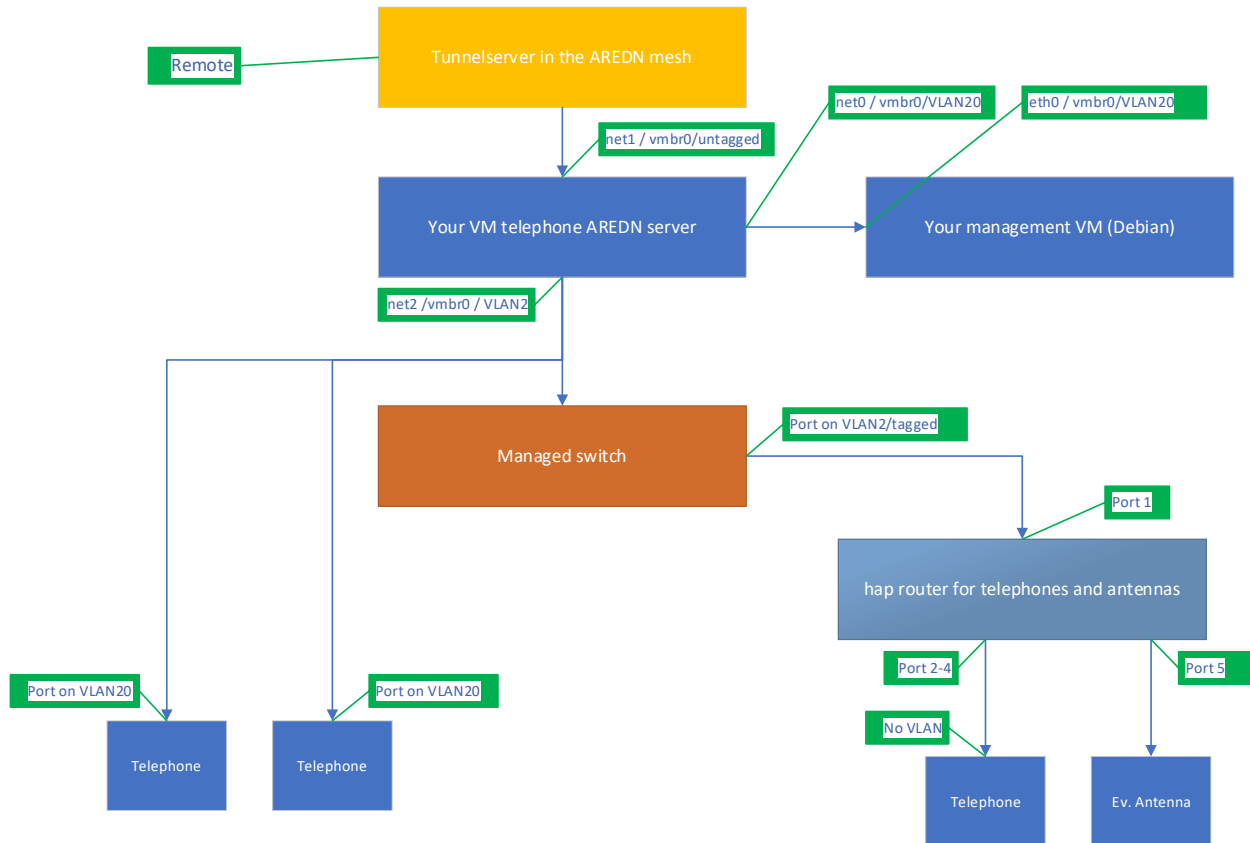
```
/22.03.5/packages/x86_64/packages/libattr_2.5.1-1_x86_64.ipk  
/22.03.5/packages/x86_64/packages/libffi_3.4.2-2_x86_64.ipk  
/22.03.5/packages/x86_64/base/libpcre_8.45-3_x86_64.ipk  
/22.03.5/packages/x86_64/packages/glib2_2.70.5-4_x86_64.ipk  
/22.03.5/packages/x86_64/packages/virtio-console-helper_6.2.0-2_x86_64.ipk  
22.03.5/packages/x86_64/packages/libevdev_1.13.0-1_x86_64.ipk  
/22.03.5/packages/x86_64/packages/libudev-zero_1.0.1-1_x86_64.ipk  
/22.03.5/packages/x86_64/packages/libstdcpp6_11.2.0-4_x86_64.ipk  
/22.03.5/packages/x86_64/packages/qemu-ga_6.2.0-2_x86_64.ipk
```

If you do not find libstdcpp6_11.2.0-4_x86_64.ipk, download and install it from

```
https://github.com/dhamstack/AREDNstack/blob/main/Firmware%20Repo/Proxmox/libstdcp  
p6_11.2.0-4_x86_64.ipk
```

AREDN Virtual Machine as a Telephone Server

Overview



Setup

We create a new VM in addition to the Tunnel Server. If you do not operate a Tunnel Server, you just create a VM for your Telephone Server.

Do not copy the VM of the Tunnel Server.

The basis setup has to be done the same way as for the Tunnel Server. The main difference is that we chose VLAN10 as the management connection:

⇌ Network Device (net0)	virtio=AA:88:4A:2F:F5:D1,bridge=vmbro,tag=20
⇌ Network Device (net1)	virtio=0A:DC:B3:77:C5:08,bridge=vmbro
⇌ Network Device (net2)	virtio=3A:55:E2:13:D0:C1,bridge=vmbro,tag=2

And we have to change the network of the Management Console, too:

Memory	2.00 GiB
Processors	2 (1 sockets, 2 cores) [host]
BIOS	Default (SeaBIOS)
Display	Default
Machine	Default (i440fx)
SCSI Controller	VirtIO SCSI single
Hard Disk (scsi0)	local-lvm:vm-105-disk-0,iosthread=1,size=16G
Network Device (net0)	virtio=2E:72:31:08:AA:FA,bridge=vmbrio,tag=20

Do not assign the same VLAN to two AREDN management connections (you will get two concurrent DHCP servers)!

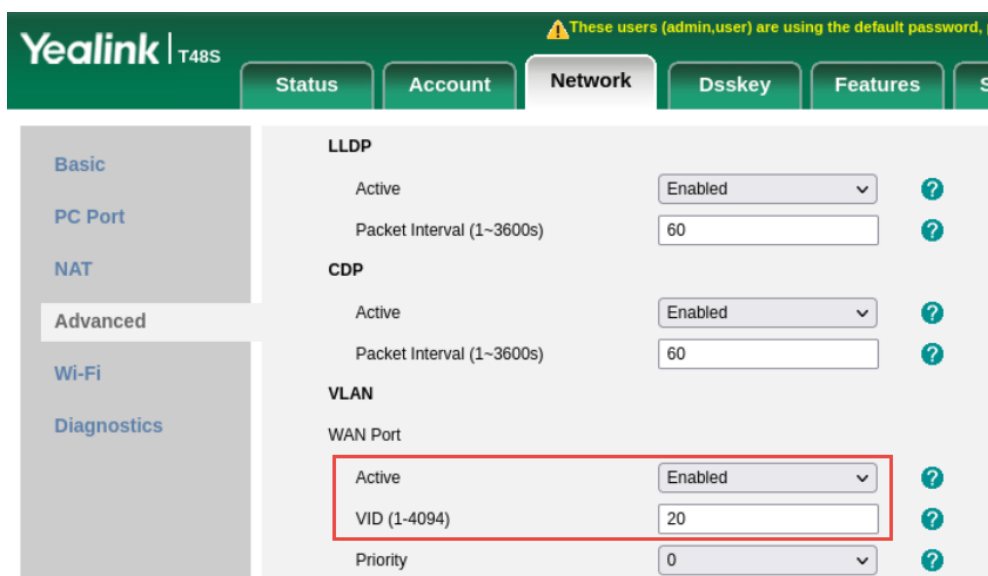
Now we should be able to manage the Telephone Server from the Management Console.

Maybe you have to reassign a new IP to the Management Console:

```
sudo dhclient -r
sudo dhclient
```

We can connect our phones to our home network instead of the hap router and they should get a normal address in the 192.168.xxx.xxx range.

Because our LAN of the VM is on VLAN 20, we must change the VLAN of the phone, too. We login and go to Network → Advanced and enable VLAN 20.



Now your phone should get a 10.xx.xx.xx address (instead of a 192.168.xxx.xxx) and you can install the phonebook and the SIP server as in every hap router and make the first test call.

The Tunnel Server VM and the telephone VM should be connected by a DtD link. You see this in the neighbour status:

HB9BLA-VM-1 neighbor status					
Location: 47.47469 7.76729					
Help Refresh Quit					
Neighbor	Link DID	SNR	Distance	Quality	Status ⓘ
hb9bla-vm-tunnelsrver		-	0.0 miles	100%	active

Be aware that you can only manage your VMs (other than the Tunnel Server) and phones from the Management Console. They are not connected to your home network.

You can shut the Management Console VM down if you do not need it if you do not have too much resources on your server.

Final tip:

You can connect your Management Console to whatever AREDN VM you want (select VLAN 10 for the Tunnel and VLAN20 for the Telephone Server). From there, you can reach all your devices without changing the VLAN of the Management Console.

Update VM to new AREDN Version

Unfortunately, you cannot upgrade the VMs from the GUI. You need quite a few steps (described below).

Check if your Management console is connected to the node you want to update:

Virtual Machine 105 (AREDN-Management-Console) on node 'pve8' No Tags

Summary Add Remove Edit Disk Action Revert

Console Memory 2.00 GiB

Hardware Processors 2 (1 sockets, 2 cores) [host]

Cloud-Init BIOS Default (SeaBIOS)

Options Display Default

Task History Machine Default (i440fx)

Monitor SCSI Controller VirtIO SCSI single

Backup Hard Disk (scsi0) local-lvm:vm-105-disk-0,iothread=1,size=16G

Replication Network Device (net0) virtio=2E:72:31:08:AA:FA,bridge=vmbro,tag=20

Snapshots

Firewall

Permissions

Virtual Machine 109 (AREDN-local) on node 'pve8' No Tags

Summary Add Remove Edit Disk Action Revert

Console Memory 512.00 MiB

Hardware Processors 2 (1 sockets, 2 cores) [x86-64-v2-AES]

Cloud-Init BIOS Default (SeaBIOS)

Options Display Default

Task History Machine Default (i440fx)

Monitor SCSI Controller VirtIO SCSI single

Backup Hard Disk (scsi0) local-lvm:vm-109-disk-0,iothread=1,size=512M

Replication Network Device (net0) virtio=AA:88:4A:2F:F5:D1,bridge=vmbro,tag=20

Snapshots Network Device (net1) virtio=0A:DC:B3:77:C5:08,bridge=vmbro

Network Device (net2) virtio=3A:55:E2:13:D0:C1,bridge=vmbro,tag=2

Shutdown the VM you want to upgrade as well as the management console

Documentation Create VM

Start Shutdown

Detach and remove the disk with the old version:

Add ▾	Detach	Edit	Disk Action ▾	Revert
Memory	512.00 MiB			
Processors	2 (1 sockets, 2 cores) [x86-64-v2-AES]			
BIOS	Default (SeaBIOS)			
Display	Default			
Machine	Default (i440fx)			
SCSI Controller	VirtIO SCSI single			
Hard Disk (scsi0)	local-lvm:vm-109-disk-0,discard=on,iothread=1,size=512M			
Network Device (net0)	virtio=AA:88:4A:2F:F5:D1,bridge=vibr0,tag=20			
Network Device (net1)	virtio=0A:DC:B3:77:C5:08,bridge=vibr0			
Network Device (net2)	virtio=3A:55:E2:13:D0:C1,bridge=vibr0,tag=2			
Unused Disk 0	local-lvm:vm-109-disk-1			

Add ▾	Remove	Edit	Disk Action ▾	Revert
Memory	512.00 MiB			
Processors	2 (1 sockets, 2 cores) [x86-64-v2-AES]			
BIOS	Default (SeaBIOS)			
Display	Default			
Machine	Default (i440fx)			
SCSI Controller	VirtIO SCSI single			
Network Device (net0)	virtio=AA:88:4A:2F:F5:D1,bridge=vibr0,tag=20			
Network Device (net1)	virtio=0A:DC:B3:77:C5:08,bridge=vibr0			
Network Device (net2)	virtio=3A:55:E2:13:D0:C1,bridge=vibr0,tag=2			
Unused Disk 1	local-lvm:vm-109-disk-0			

Start to build the new server starting with [Setting Up the AREDN Disk](#)

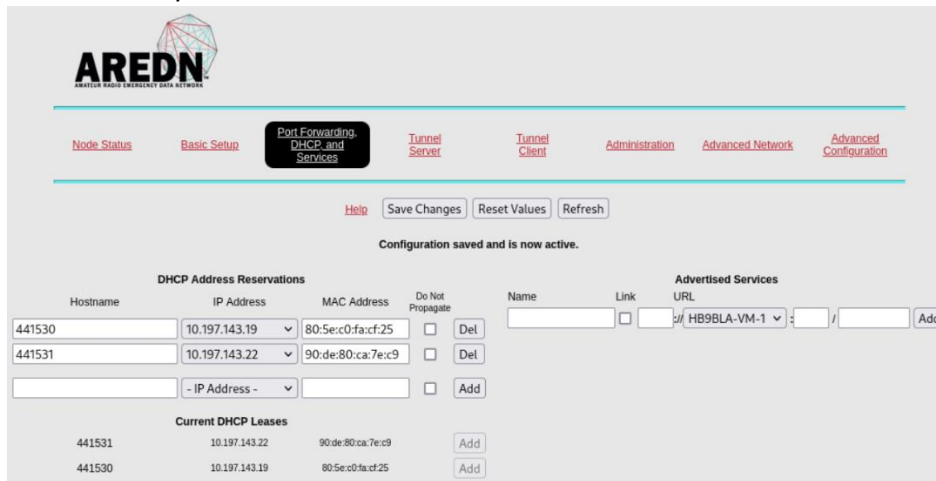
Continue till you changed the password (**Attention: It is a US keyboard (Y/Z)**) and checked the ip address.

Start the Management Console. It should get the IP address from the newly created AREDN VM. Login to the console, start the terminal and check the connection

```
ping localnode.local.mesh
```

Continue with [Configure the AREDN Tunnel Server](#)

You have to do all configurations from scratch. If you have telephones attached, you have to reboot them that they become visible in the VM:



The screenshot shows the AREDN web interface. At the top, there is a navigation bar with the AREDN logo and several menu items: Node Status, Basic Setup, Port Forwarding, DHCP, and Services (which is highlighted), Tunnel Server, Tunnel Client, Administration, Advanced Network, and Advanced Configuration. Below the navigation bar, there are buttons for Help, Save Changes, Reset Values, and Refresh. A message states "Configuration saved and is now active." The main content area is divided into two sections: "DHCP Address Reservations" and "Current DHCP Leases".

DHCP Address Reservations			
Hostname	IP Address	MAC Address	Do Not Propagate
441530	10.197.143.19	80:5e:c0:fa:cf:25	<input type="checkbox"/>
441531	10.197.143.22	90:de:80:ca:7e:c9	<input type="checkbox"/>
	- IP Address -		<input type="checkbox"/>

Current DHCP Leases			
IP Address	MAC Address	Hostname	Link
10.197.143.22	90:de:80:ca:7e:c9	441531	<input type="checkbox"/>
10.197.143.19	80:5e:c0:fa:cf:25	441530	<input type="checkbox"/>

And you have to re-install the direct calling software if you used it before

(<https://github.com/dhamstack/AREDNstack/blob/main/Documentation/AREDN%20Setup-English.pdf>)

Do not forget to reload the phonebooks: <http://localnode.local.mesh/cgi-bin/phonebook.sh>