

UNIVERSITY OF OSLO

Oslo VGS, Jevnaker, 21Mar2023

Connecting Schools and Communities in Africa

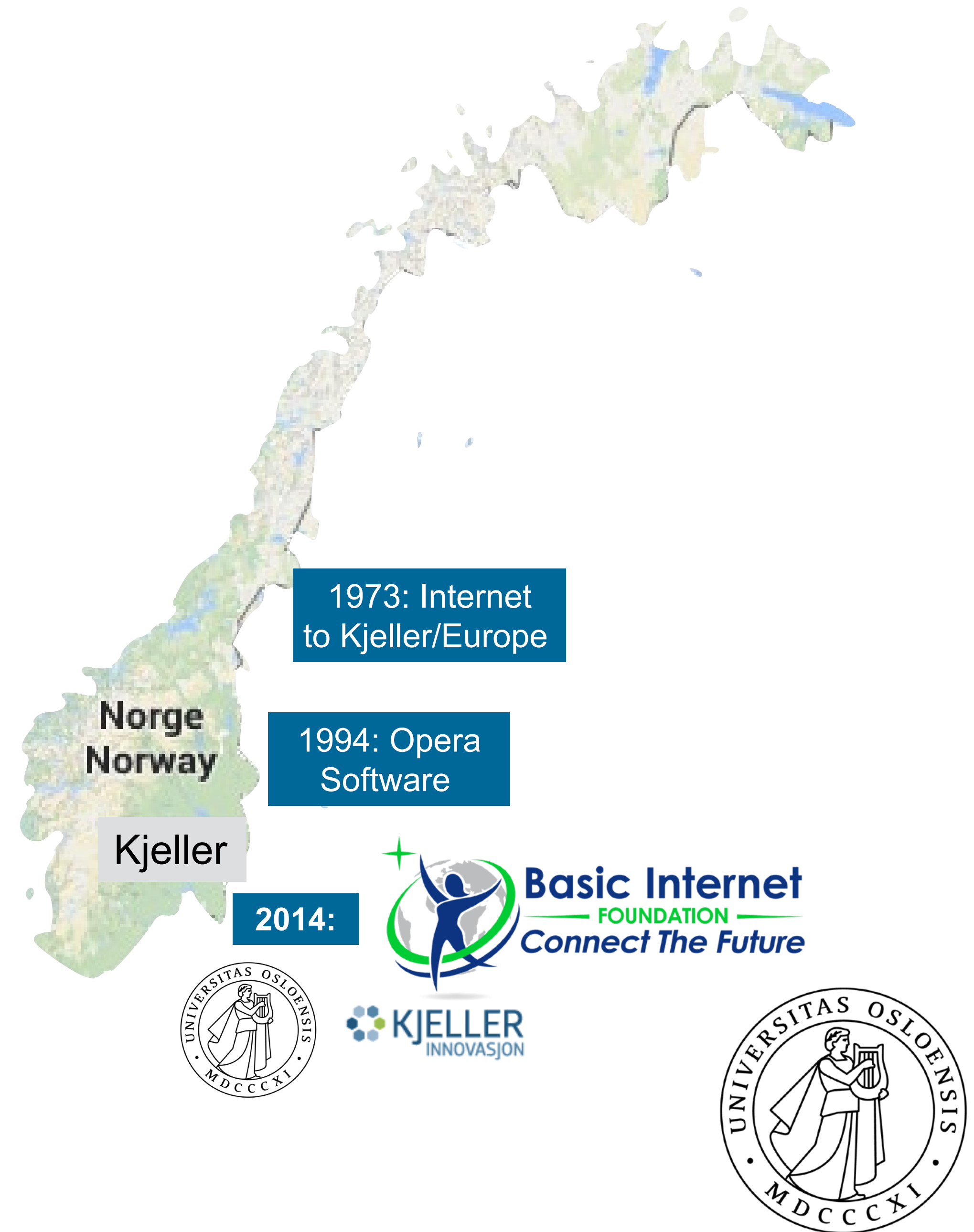
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Lead Digital Global Health, Centre for Global Health

Secretary General, Basic Internet Foundation

UNIVERSITY
OF OSLO



Africa

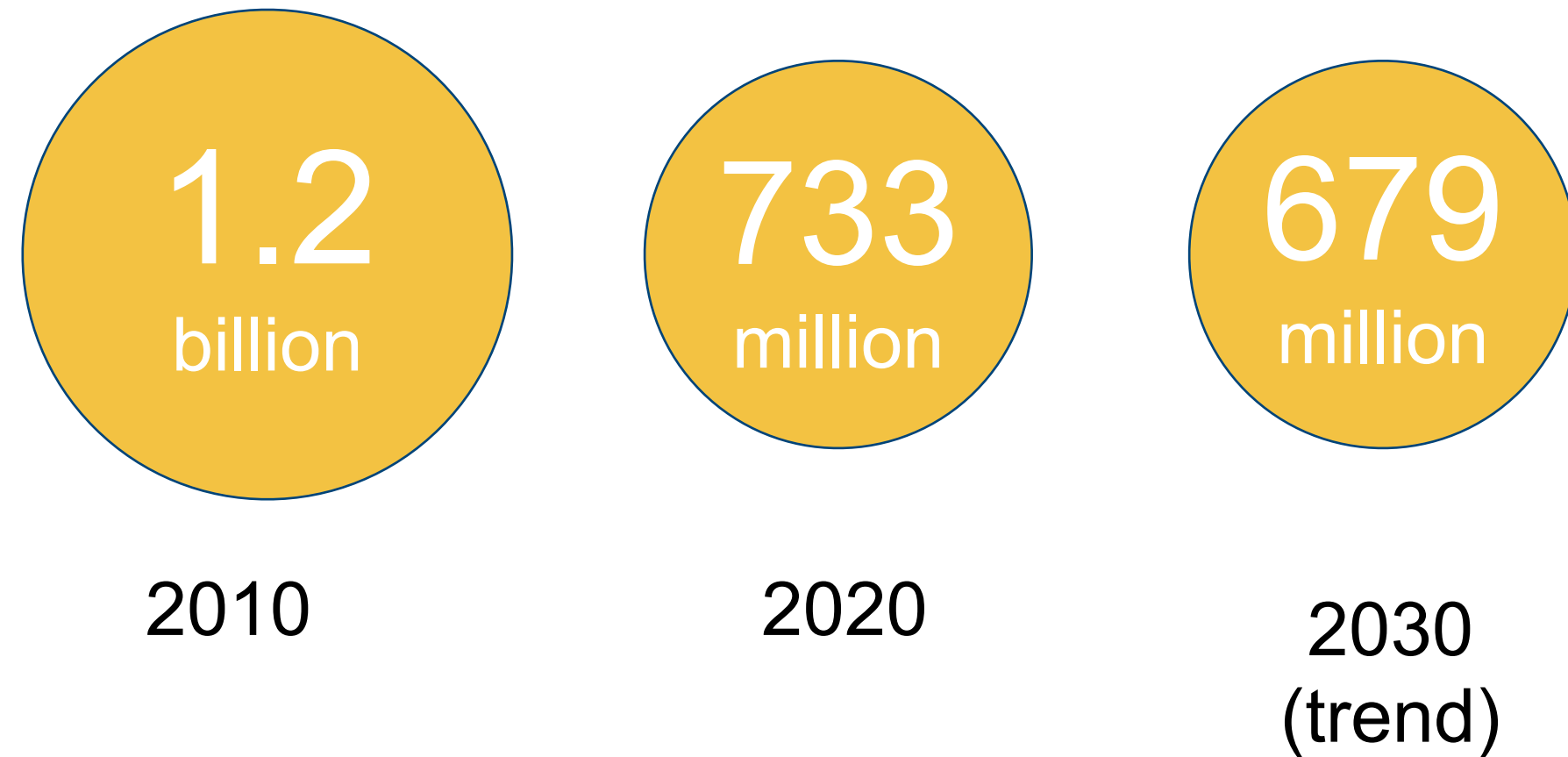


Energy- and Digital-Equity?



SDG 7.1 calls for universal access to energy by 2030

People without electricity

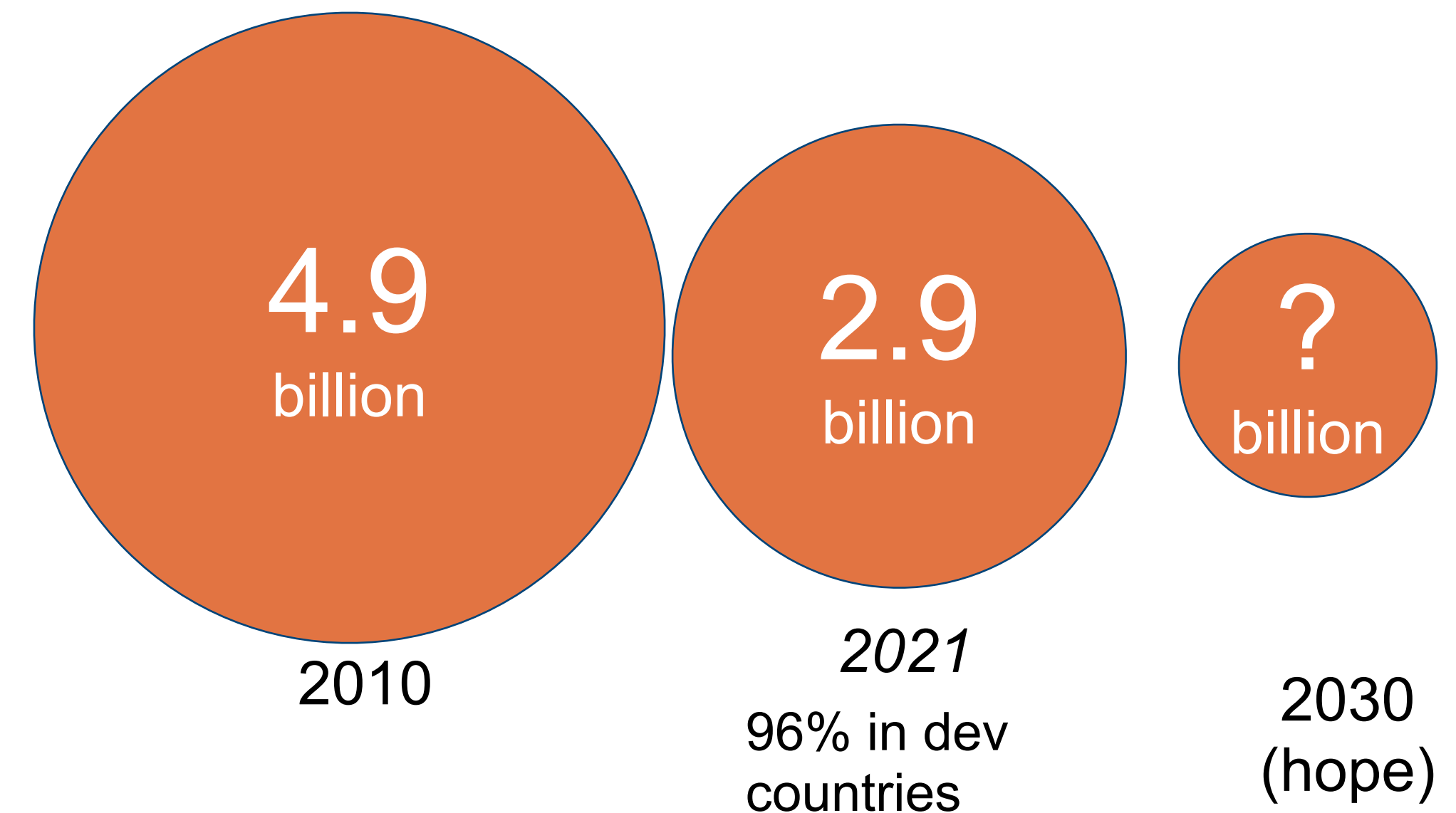


[WorldBank 2021]
<https://www.worldbank.org/en/news/press-release/2021/06/07/report-universal-access-to-sustainable-energy-will-remain-elusive-without-addressing-inequalities>



SDG 9c calls for universal, affordable internet access by 2020

People not using Internet



[ITU 2010, 2021]
<https://www.itu.int/hub/2021/11/facts-and-figures-2021-2-9-billion-people-still-offline/>



Catalysts for the SDGs?

Role of Internet?

Business model?

Bærekraftsmålene i Afrika (afrobarometer.org)



<https://blogs.worldbank.org/africacan/how-do-africans-priorities-align-with-the-sdgs-and-government-performance-new-results-from>

Catalysts for the SDGs?



SDG 1.4 Equal access to basic services

SDG 4.A Education facilities for effective learning for all

SDG 5.B Use of enabling technologies

SDG 9.C universal and affordable access

SDG 16.10 ensure public access to information

SDG 17 Partnerships for the Goals

Role of the Internet?

Empower
my dreams

World Summit of the Information Society - WSIS 2023



Doreen Bogdan
Secretary General ITU

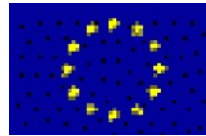


Business model?



How to “Connect the Future” and “Empower my Dreams”

→ Western World

- fixed & mobile & work - about 100-200 USD/family
-  17.000 base stations,  EU: 421.000 towers [Statista]

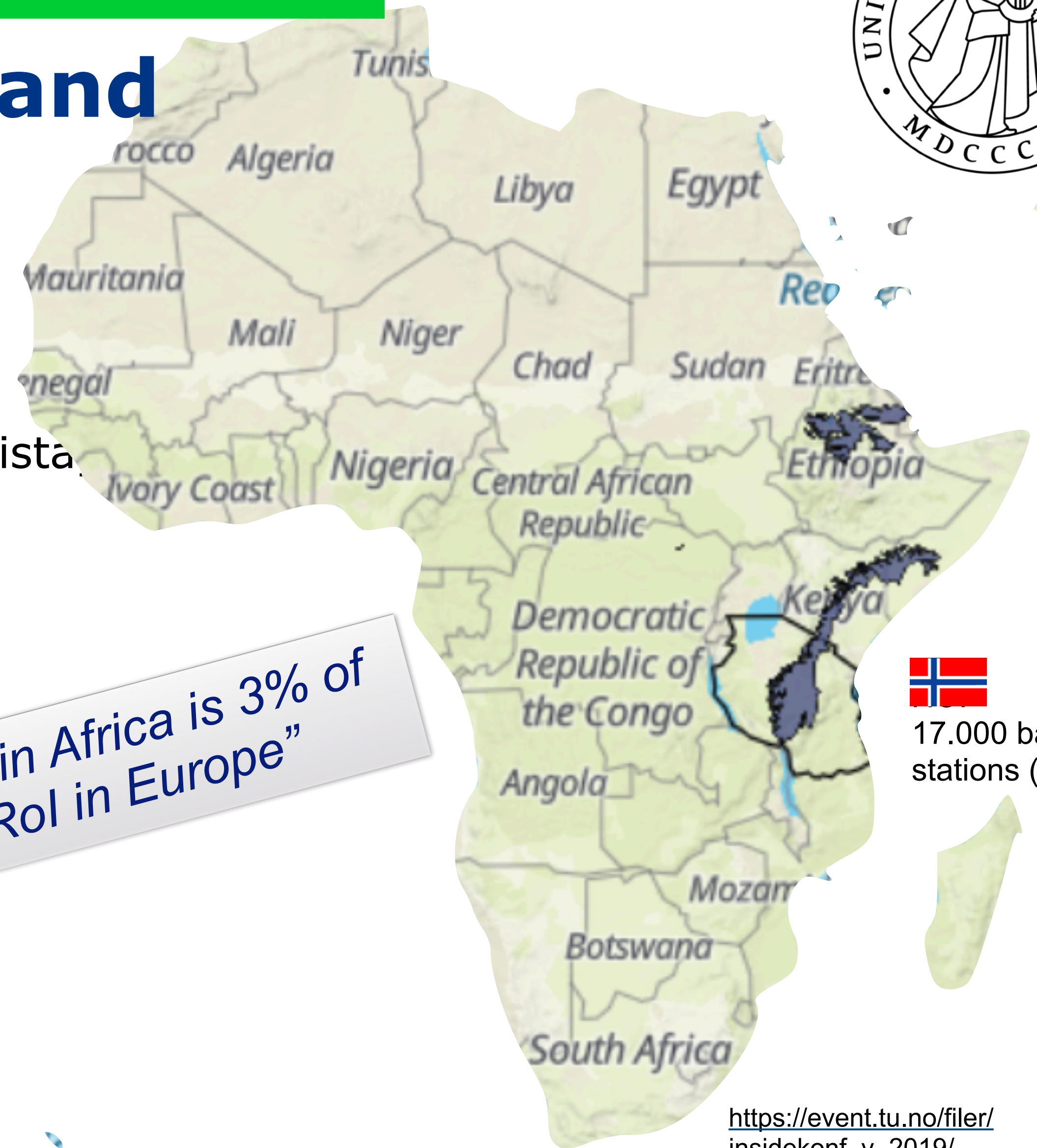
→ Example: Tanzania

- large distances (3 x size of Norway)
 - expensive access
 - negligible fixed broadband
- ability to pay: 10-20 USD/family

→ Europe vs Africa

- 6.8% vs 20% of land area
- 746 million vs 1.3 billion (2018)
- 112 vs 43 people/km² [Worldbank, Statista]

“RoI in Africa is 3% of
RoI in Europe”



https://event.tu.no/filer/insidekonf_v_2019/Eivind_Mikkelsen_Trenger_Norge_100.000_basestasjoner.pdf

What if ...

We revisit access

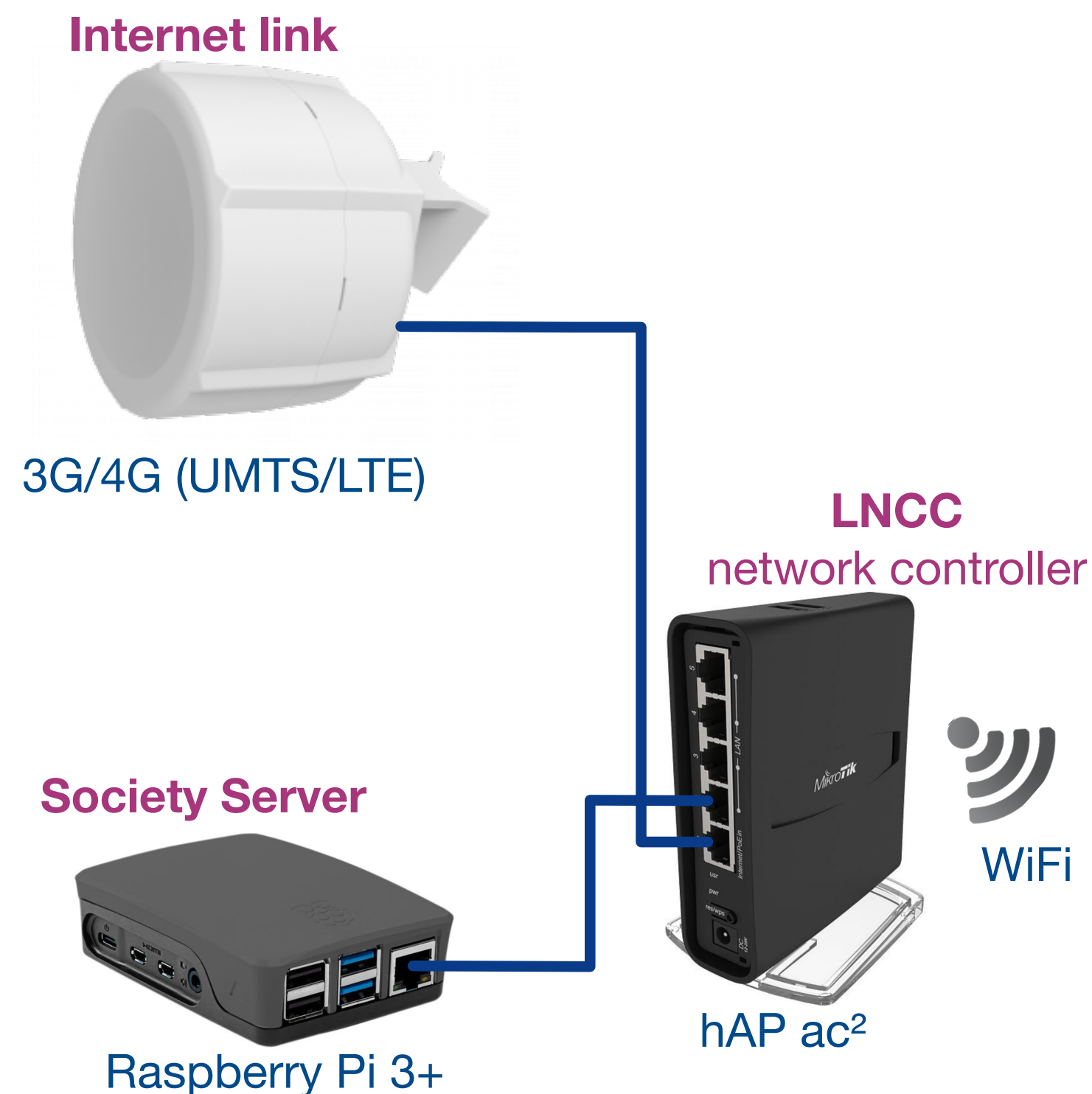
We decentralise the Internet

We use Universities to connect



Solving the Access

- wireless information spot (InfoSpot)
- Reaching out >20 km to mobile network
- Affordable solution: OPEX <20 USD/month

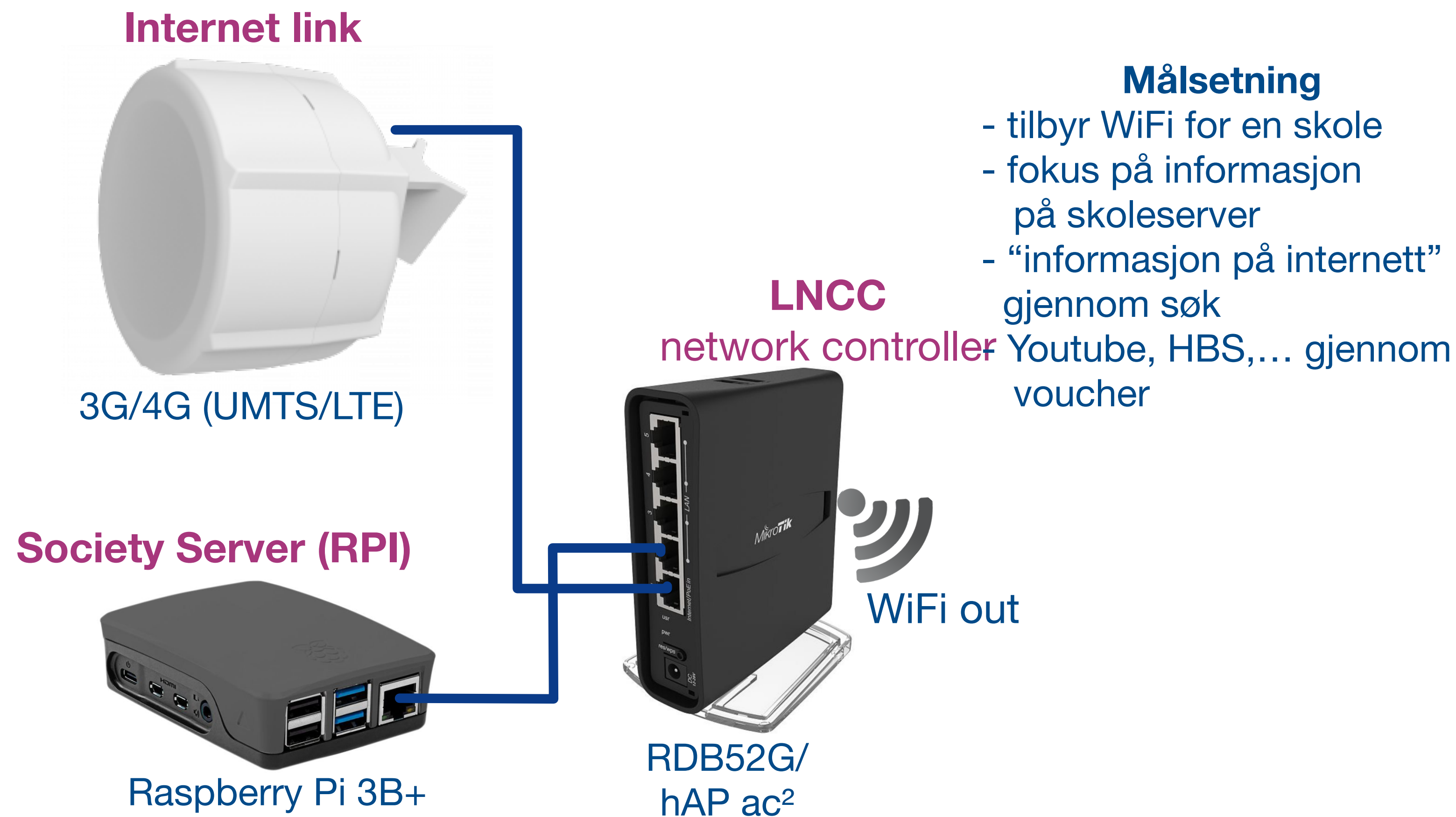


Let's configure

- Antennas
- Local Network Control Centre (Router)
- Raspberry Pi

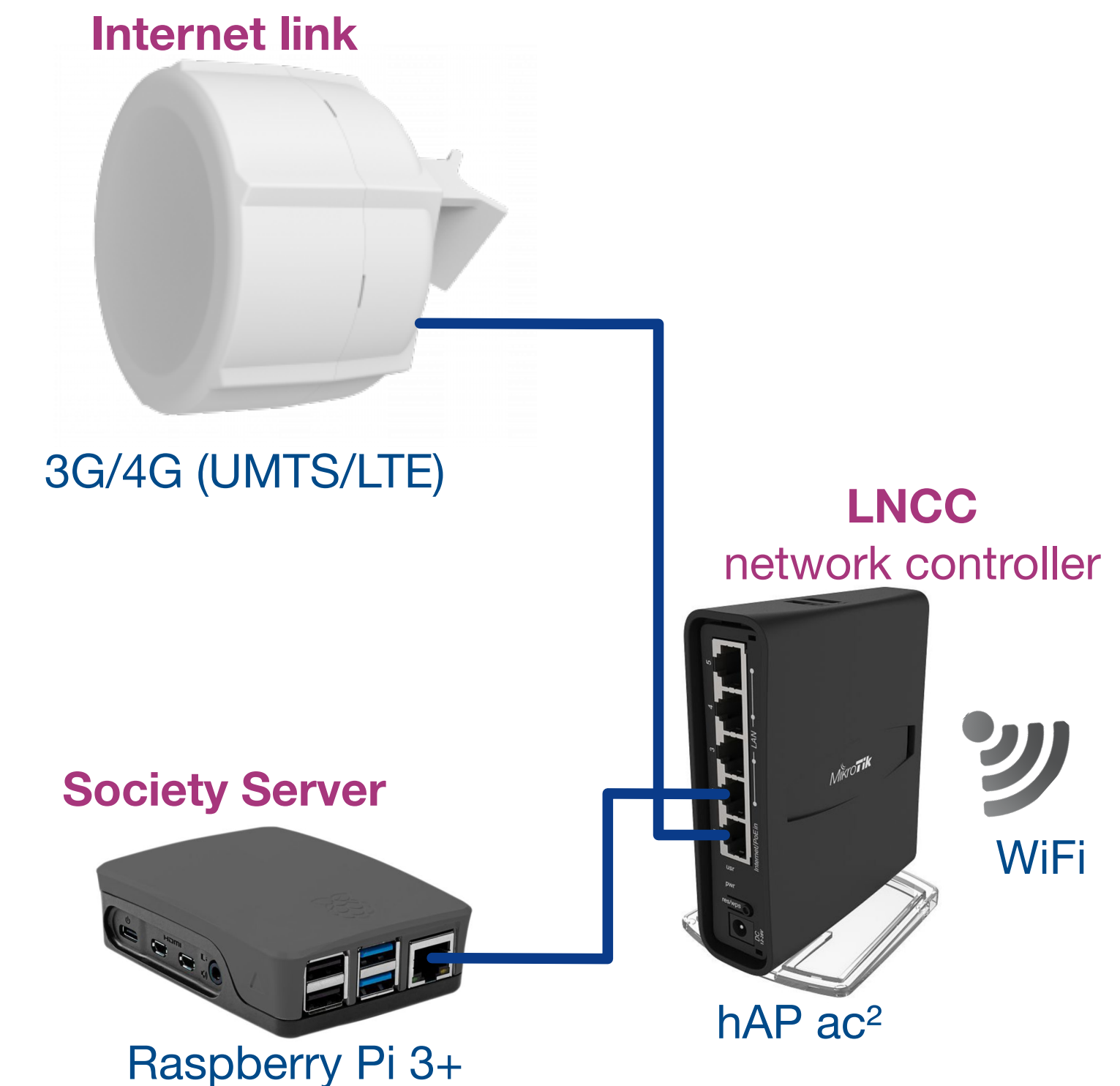


Systemoversikt trådløs informasjonsspot i en skole



Configuration today

- ➔ Antenna, catching the mobile signal from the mobile radio tower and converts to mobile Internet
- ➔ Local Network Control Centre (LNCC):
 - Router with whitelist handling and
 - Signalling connecting to Basic Internet backend system for vouchers
 - Scripts for update of whitelist
- ➔ Raspberry Pi (RPI) - School-/Community Server
 - local information free available for everyone
 - Course to create a web page (Wordpress)
 - Upload & sharing data locally (Nextcloud)



Backend System (for information)

- ➔ Information for configuration <http://Nextcloud.BasicInternet.org>
 - specific for each region, e.g. Kenya with AHERI = KEA, Gamb with IAC = GMI, Tanzania SchoolConnectivity TZS
 - own configuration files for Antenna, LNCC, and course for RP]
- ➔ Open information packages on health, ICT,... <http://Yeboo.BasicInternet.org>
- ➔ Voucher system to have e.g. 1h, 4h, 24h access
 - Creating vouchers: <http://voucher.Basicinternet.org>
 - Wiki with explanations on how to create vouchers: <http://voucher.BasicInternet.org>

Mikrotik device configuration

- See [01-MikrotikLTEantenna](#) for antenna configuration
- See [02_*LNCC_*RDB52G](#) for LNCC configuration (still to be completed)

Wiki documentation

- <http://Solutions.BasicInternet.no> - entry to describe the system
- <http://Config.BasicInternet.no> - entry point for configuration
- Course content for configuration
https://docs.google.com/document/d/1tcd4Nco8XTAmZKB1HPubMhbjUvj_LXaisZZGJe7k/
- BasicInternet = Technology
- [Open issues- ToDo](#) - lessons learned from operations

before you install the configuration, always reset/remove the default configuration on the antenna or the LNCC

Yeboo.com - your local information server

Our concept is to provide every community/school with a community/school server. On this server (see picture), we have a local web page, as well as a local Nextcloud installation. Thus, you can

- Train to edit the local web page - and thus learn the skills for becoming a web page creator
- Share files and other information with your colleagues, citizens and students through Nextcloud
- Subscribe to [Nextcloud.BasicInternet.org](#) and download packages on health, education, agriculture, entrepreneurship and more



☐

Name

Size

Modified

☐

Health

2.1 GB

13 days ago

☐

ICT-Communication

☐

Readme.md

Basic Internet

Home

Zone

Voucher limits

User

Language

administrator

Your voucher batches

Name	Quantity	Upload / Download	Daily	Duration	Created
AHERI_Omuga	10	--	--	8 Days(s)	Barrack.O
AHERI_AKALA	10	--	--	8 Days(s)	Barrack.O

Antenna configuration

→ Connect cables

Internet antenna



power

PoE

PC med
Winbox.exe



→ Open <http://Nextcloud.BasicInternet.org>

- login: VGS
- passwd: ***

→ Goto files

- 01-Mikrotik_LTE_antenna
- follow 00ReadmeConfig_latest.md

☐  01-Mikrotik_LTE_antenna

☐  03-RaspberryPi_VillageServer

☐  2022_GMI_LNCC_config

Nextcloud = 01-Mikrotik_LTE...

How to configure the LTE antenna

Download Winbox.exe from Mikrotik and connect your antenna. Make sure to

- connect the power over ethernet (PoE) adapter such that "data+power" goes to the antenna.
- cable connects to port 1 (PoE in), see <https://vimeo.com/354375901>

SIM card is inserted (make sure to remove the PIN)



The device will reboot. After, reboot, connect again using Winbox, and open Files

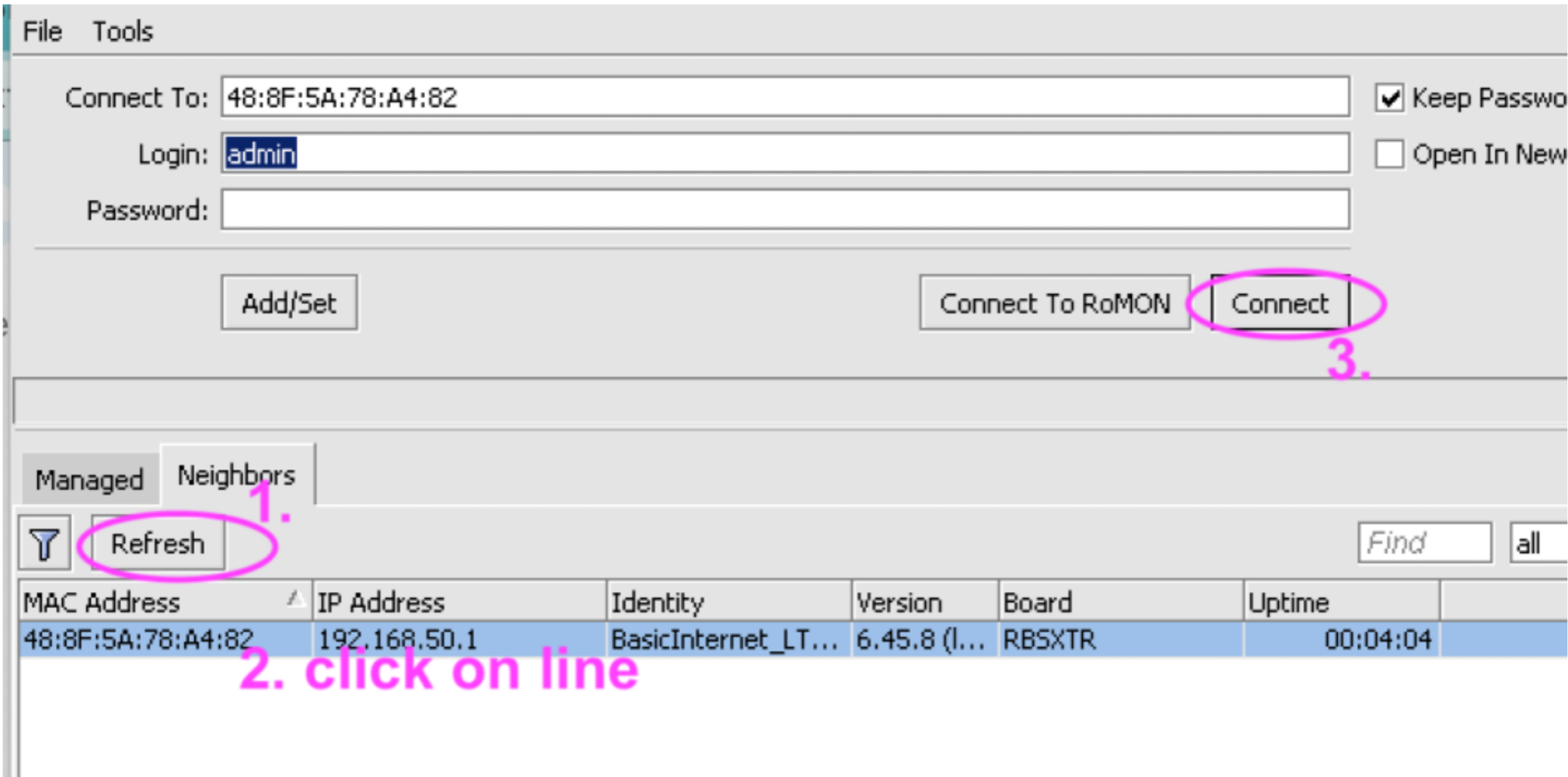
- drag the file LTE-93-config.rsc into the main directory
- open `New Terminal` and run command `import file=LTE-93-config.rsc`

The configuration will be loaded, and the the antenna reboots

- reconnect through Winbox, open `New Terminal` and add the password `/user set 0 password=B@sicInternet_2019`

On success, you'll see a screen like Figure 5

```
[admin@MikroTik] /ip firewall filter> add action=drop chain=forward comment=\
... "defconf: drop all from WAN not DSTNATED" connection-nat-state=!dstnat \
... connection-state=new in-interface-list=WAN
```



Control the LTE antenna configuration

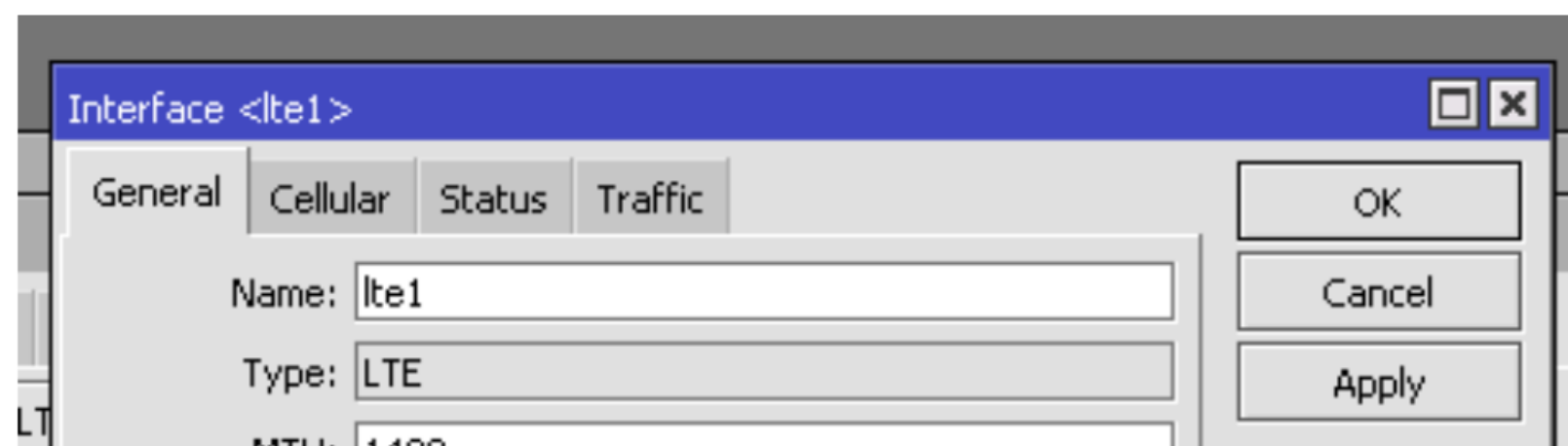
Nextcloud = 01-Mikrotik-antenna = 01Control.md

Control the configuration of the LTE antenna

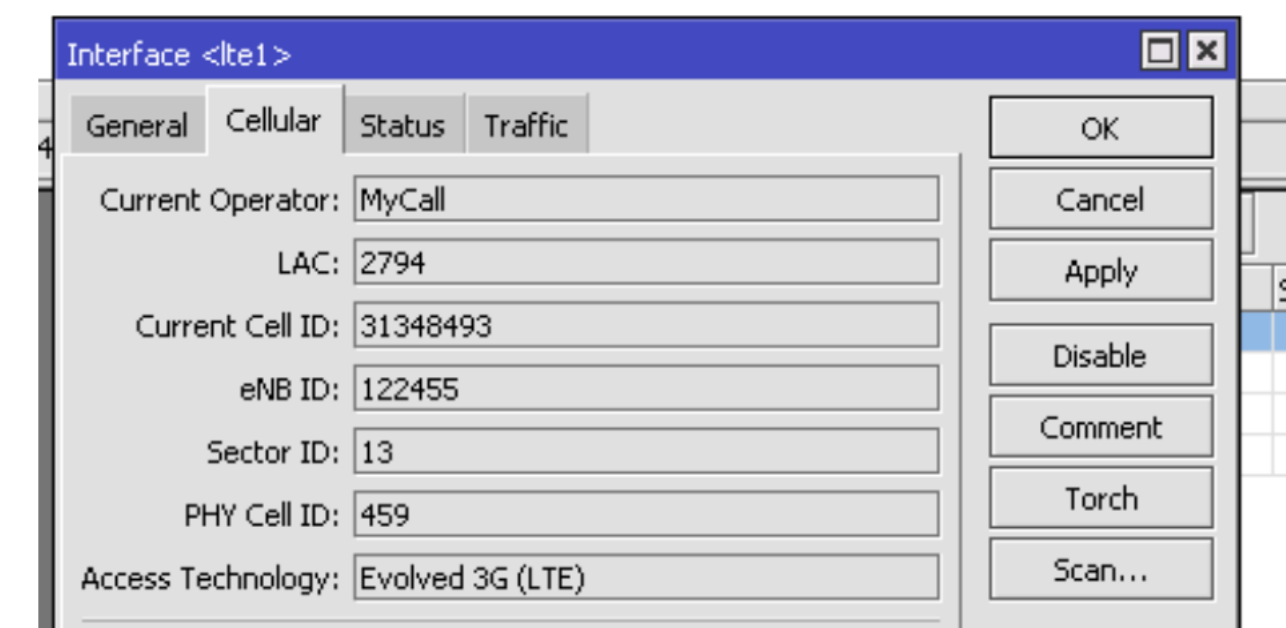
After connectivity and configuration, see [00Readme.md](#), check that your antenna works as expected

Control the APN settings

- ☐ Check that the **two diodes** are on, showing power & association to the network
- ☐ In Winbox, check that the LTE APN has the default settings Internet
/interface lte apn add name=default apn=internet
- ☐ in Winbox, check that GSM is Guest ed
/interface lte set network-mode=3g,lte lte1



- ☐ Paste the following into a Winbox = new terminal, or go through the winbox interface
- ☐ Check if the SIM card is connected to the network, see: "enabled" and "running" in the bottom of the window



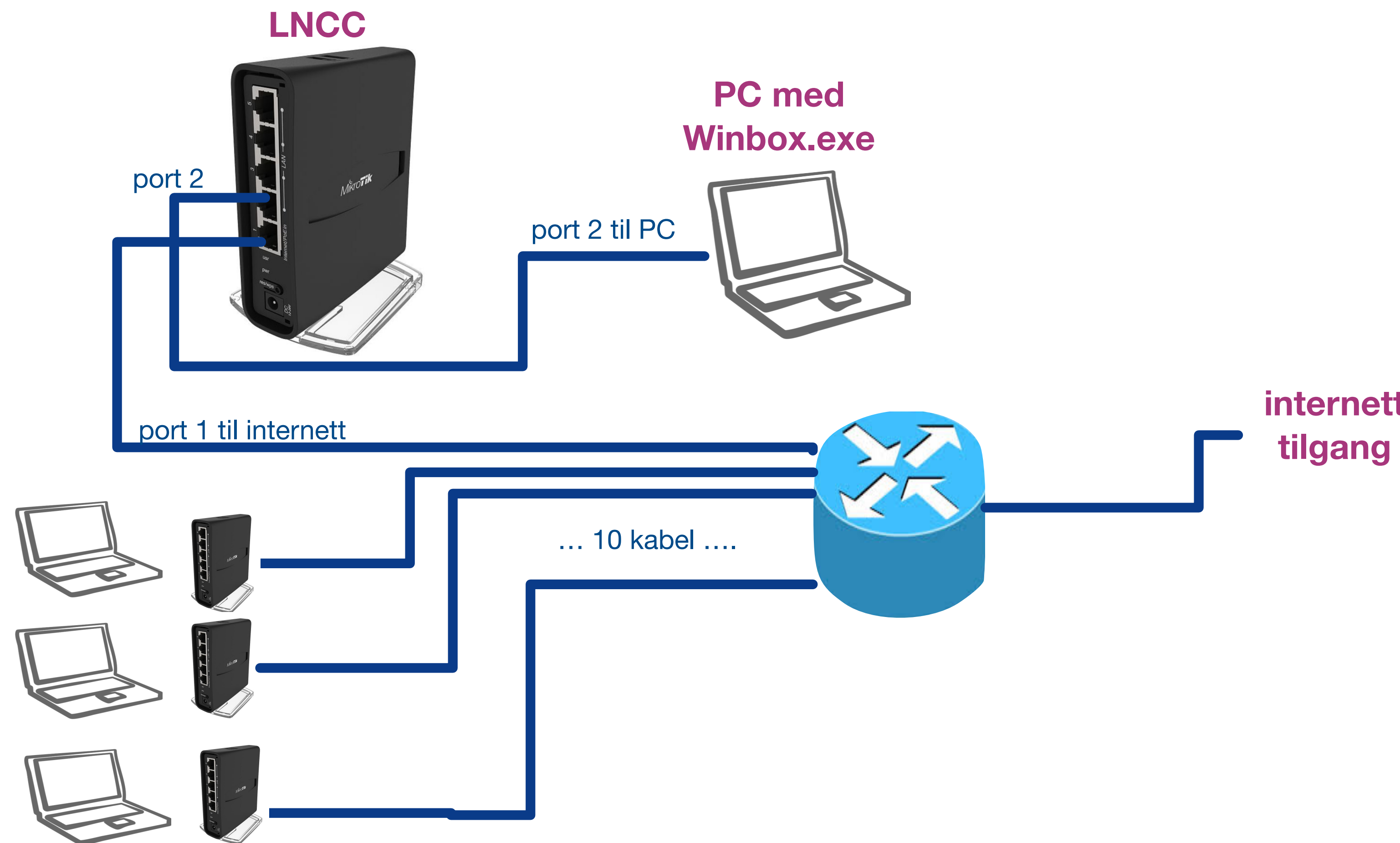
Configuration of LNCC

→ Cabling

- Port 2 to PC
- Port 1 to Internet (via router)

→ Follow-steps in

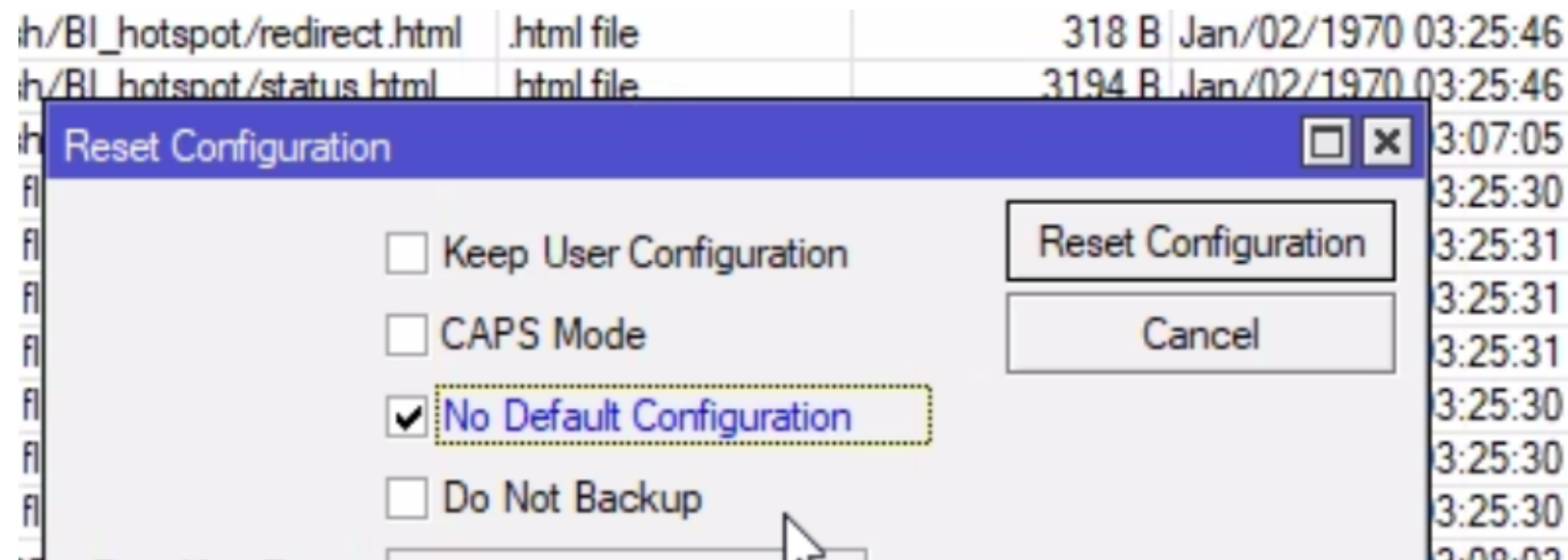
- Nextcloud =
2022_GMI_LNCC_config =
00_LNCC_GMI_config_lates
t.md



LNCC config

Connect the LNCC to the PC

- ☐ Download Winbox.exe for configuration of the Mikrotik from a PC
- ☐ Connect a cable from port 2 of the LNCC to your PC. Ensure that the PC connects through the Ethernet - see [antenna configuration as an example](#)
- ☐ **Reset the configuration** (System = Reset configuration - **ensure that there is no default configuration**) - system will reboot after "Reset Configuration"



2022_GMI_LNCC_config > 01_InstallFiles



Name ▲



flash



GMI-02-sstpkenya71.src



LastWhitelist.txt

Replace with
GMI-02-sstpkenyaXX.src (your LNCC)

Test configuration of LNCC

➔ Nextcloud = 2022_GMI_LNCC_config = 02-Control_LNCC.md

02-Control_LNCC.md



Control the installation of the LNCC

On Winbox, open the log file and search for sstp-tanzania - if it says *connecting, authenticated and connect*, then your LNCC is connected to the Maincorerouter.

1. Check if the LNCC connects to the Maincorerouter

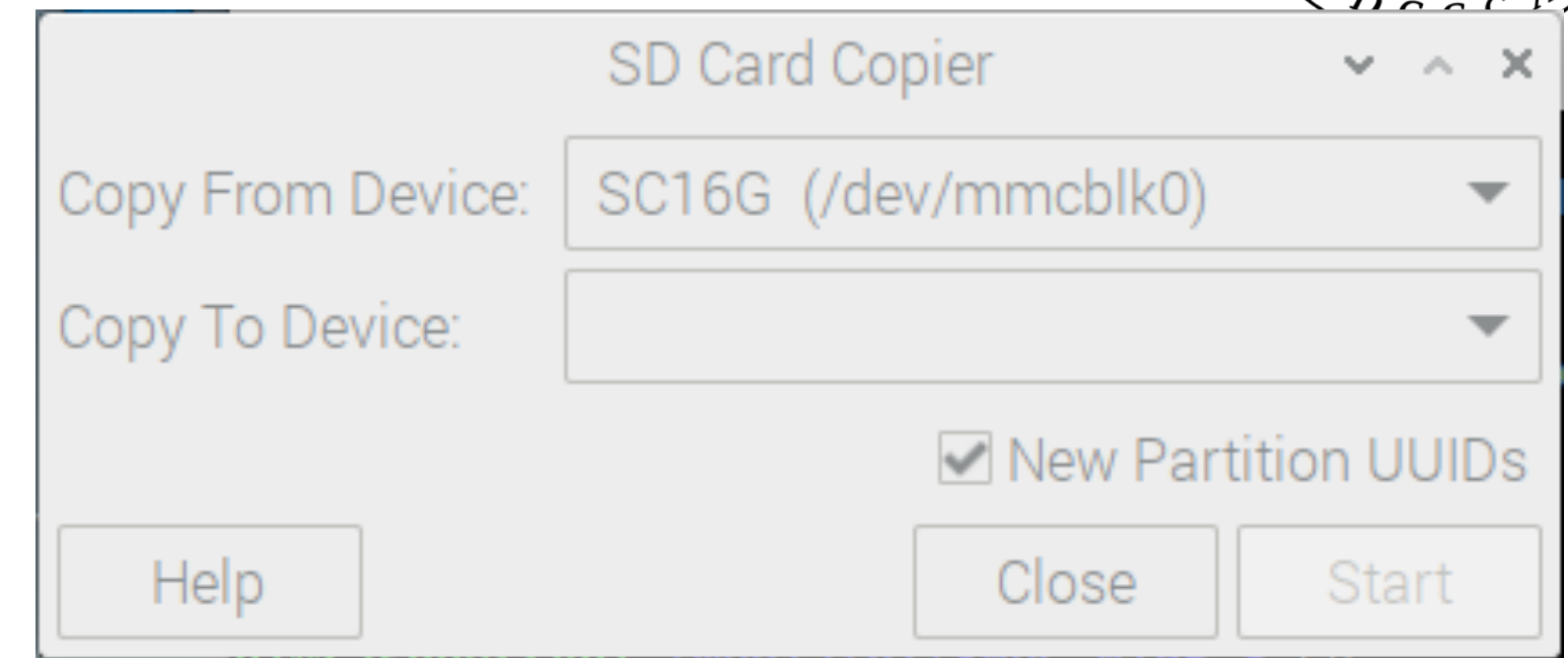
Open the log file in Winbox, and see if the LNCC is connecting to the Maincorerouter, ensure that port 1 of the LNCC is either connected to a network (cable) or to an LTE antenna

Guest				
31	Jan/25/2022 19:24:24	memory	dhcp, info	dhcp-client on ether1 got IP address 192.168.188.56
32	Jan/25/2022 19:24:24	memory	dhcp, info	dhcp-client on ether1 got IP address 192.168.188.56
33	Jan/25/2022 19:24:26	memory	sstp, ppp, info	sstp-tanzania: initializing...
34	Jan/25/2022 19:24:26	memory	sstp, ppp, info	sstp-tanzania: connecting...
35	Jan/25/2022 19:24:27	memory	sstp, ppp, info	sstp-tanzania: authenticated
36	Jan/25/2022 19:24:27	memory	sstp, ppp, info	sstp-tanzania: connected
37	Jan/26/2022 15:26:09	memory	dhcp, info	HSDHCP deassigned 10.5.50.254 from F6:33:1D:CC:DC:75
38	Jan/26/2022 20:57:28	memory	wireless, info	A4:83:E7:74:4C:0A@wlan1: connected, signal strength -40

Check_Server_re...

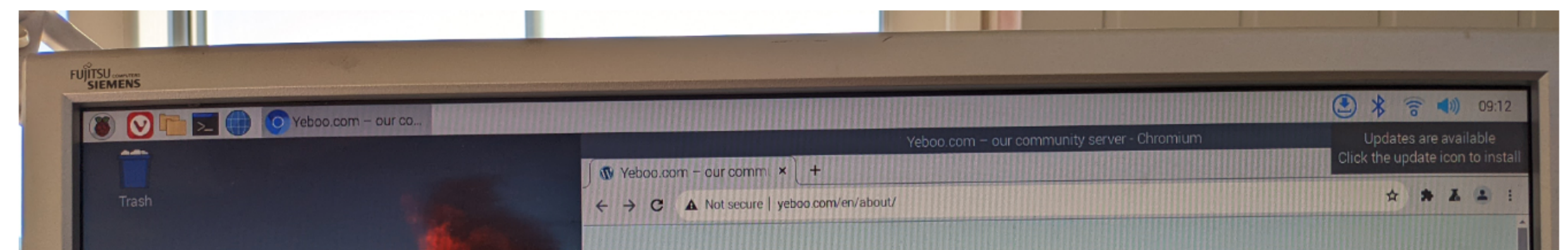
Raspberry Pi (RPI) config

- Unpack and set together
- Copy SD card (SD Card Copier)
- Information on
 - Nextcloud = Yeboo = ICT-Communications = Readme.md
 - See other information



About your village server

We use a Raspberry Pi (RPI) as a local village/school server. The Raspberry Pi has a local Wordpress and a Nextcloud installation, thus does not need a network connection for access to the information. When everything works as expected, the RPI will boot up into a screen with a local home page called "yeboo.com". Here you see the links on how to edit the wordpress (yeboo.com/wp-admin) and the local nextcloud installation.

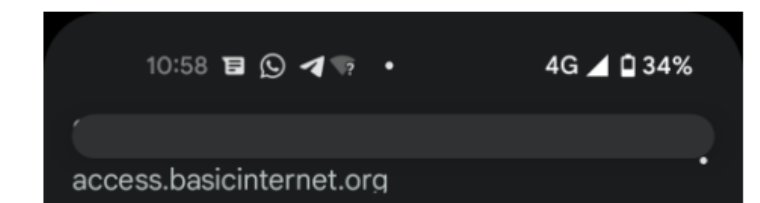
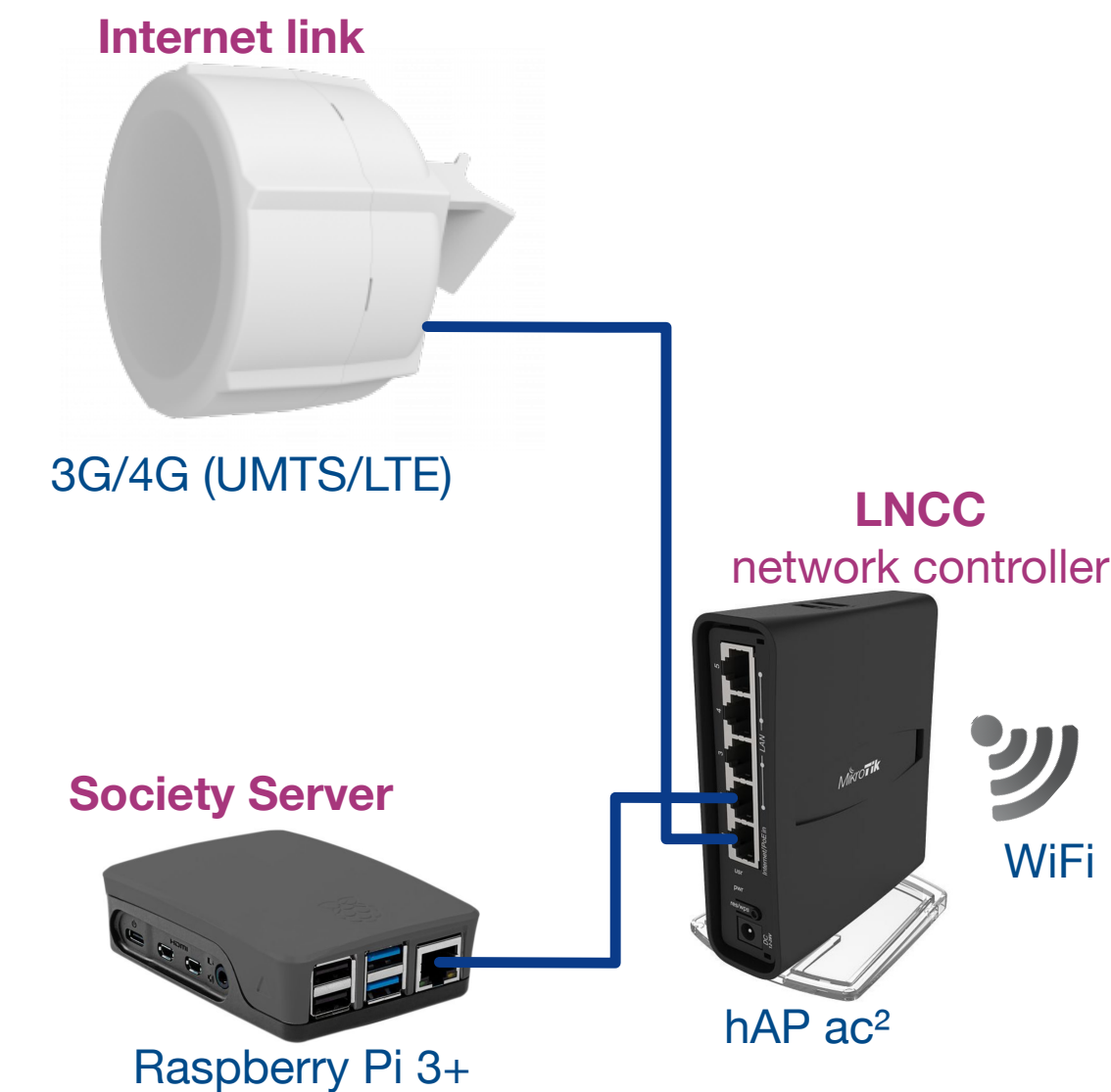


Final check

- Connect all cables
 - Insert SIM in antenna (or Internet cable into port 2)
- Connect with your phone to SSID BasicInternet
 - Click “Free Access”
 - Connected to Raspberry Pi
- Add voucher
 - Connect to NRK.no ... (open Internet)

Connect Antenna to LNCC

- ☐ Connect the cable from the antenna to port 1 of the LNCC,
- ☐ then connect a phone/tablet to Wifi BasicInternet



FREE ACCESS!

Voucher access for Internet

Login Form

Username

Password

Login

Test vouchers, on success you come to the status page, showing how much you have used
<http://access.basicinternet.org>



Welcome to Basic Internet!

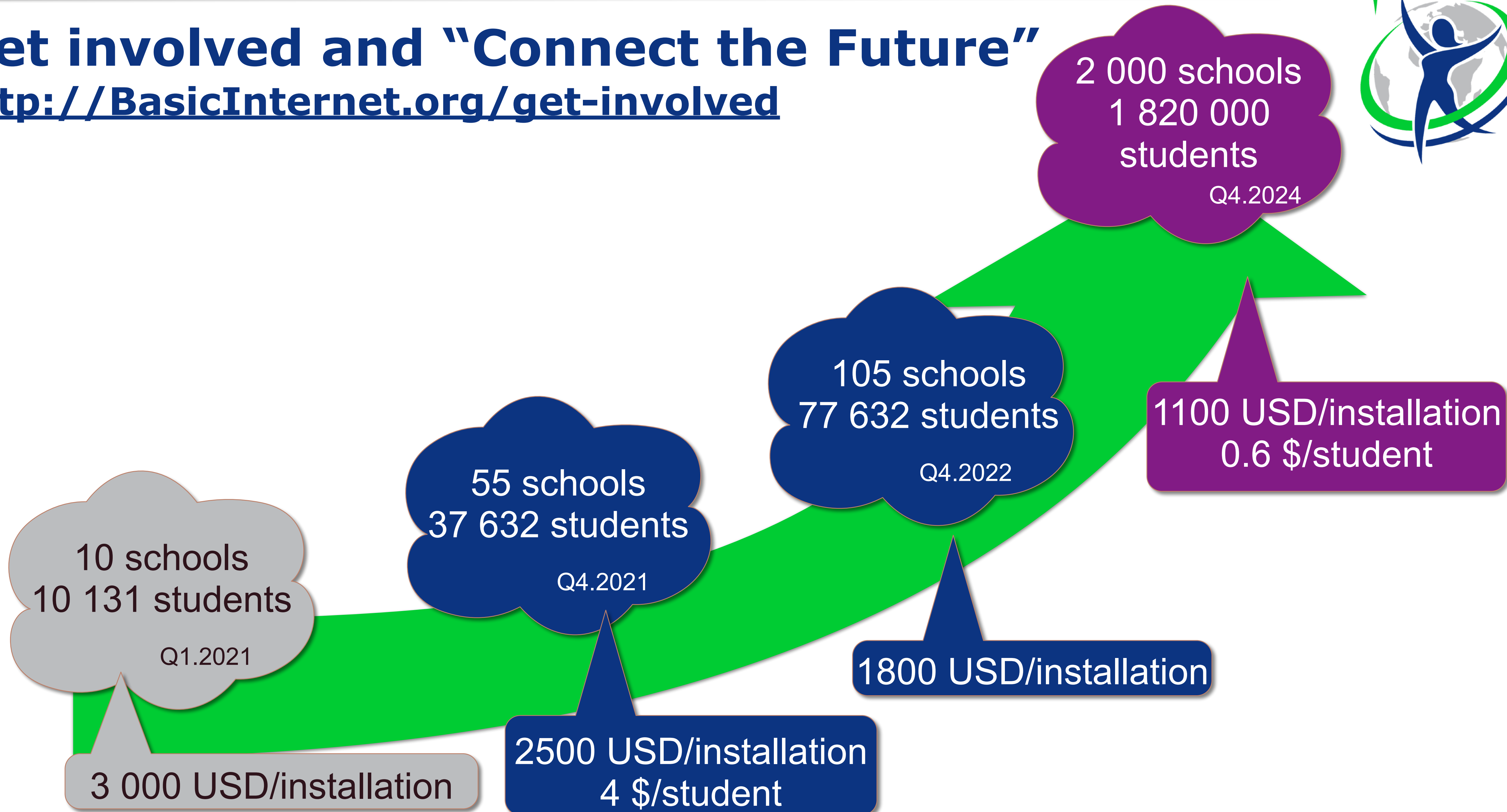
IP address:	10.5.50.254
bytes up/down:	1338 B / 0 B
connected / left:	0s / 1h
status refresh:	1m

log off



Get involved and “Connect the Future”

<http://BasicInternet.org/get-involved>



Esilalei (2019)
120 W solar panel,
light & connectivity



Mto wa Mbu

Lake Manjara

Esilalei

4.6 km

Mbash - primary health station

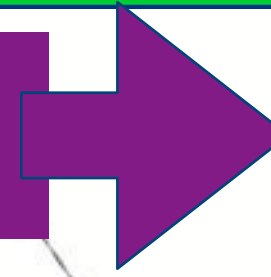
The mobile phone has replaced the machete (even in places without Mobile Broadband)



“Connect The Future” Selela Market Place



antenna



- Antenna in 6 m height
- Reaches Tigo tower > 20 km away

“Connect the Future” Izazi



Installation time: 1,5 h
catching the signal from the Vodacom
tower in Migoli (~10km away)

Village office

Migoli, Nyerere High School - 2019



1271 pupils, 34 full-time teachers
9 m pole (above trees) base to connect
- Migoli health station
- Migoli village office



Phase III TZ (2023) - 300 schools

antenna

