

UiO : Department of Technology Systems
University of Oslo

TEK5110

L4 Information Distribution - Internet Lite



Josef Noll
Secretary General and Co-Founder at BasicInternet.org, Professor at UiO, Head of Research at Movation
Oslo Area, Norway | Telecommunications

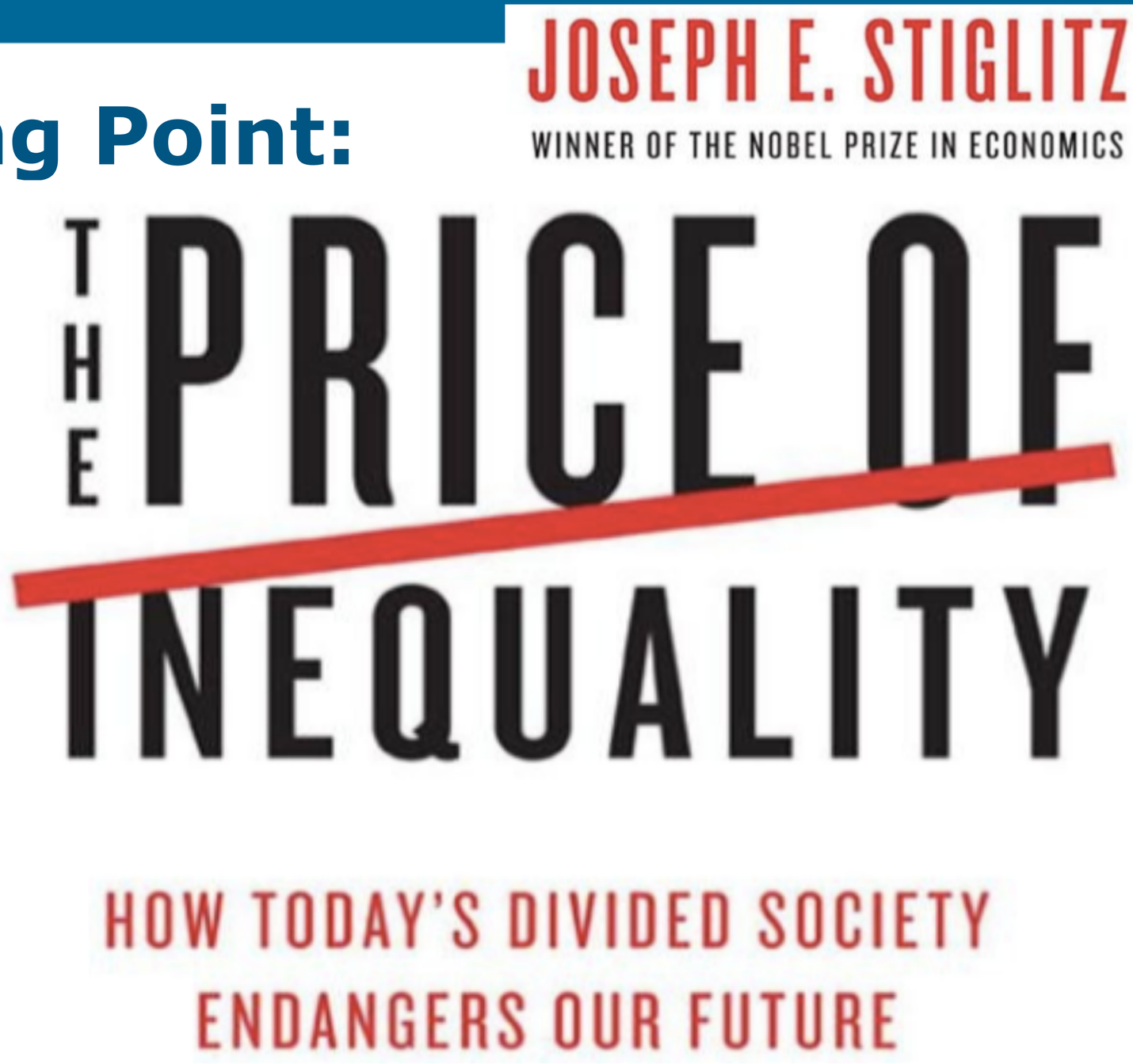
Current	Basic Internet Foundation, University Graduate Studies (UNIK), University of Oslo (UiO), Movation AS
Previous	MobileMonday, Telenor R&I, Telenor R&D
Education	Ruhr University Bochum



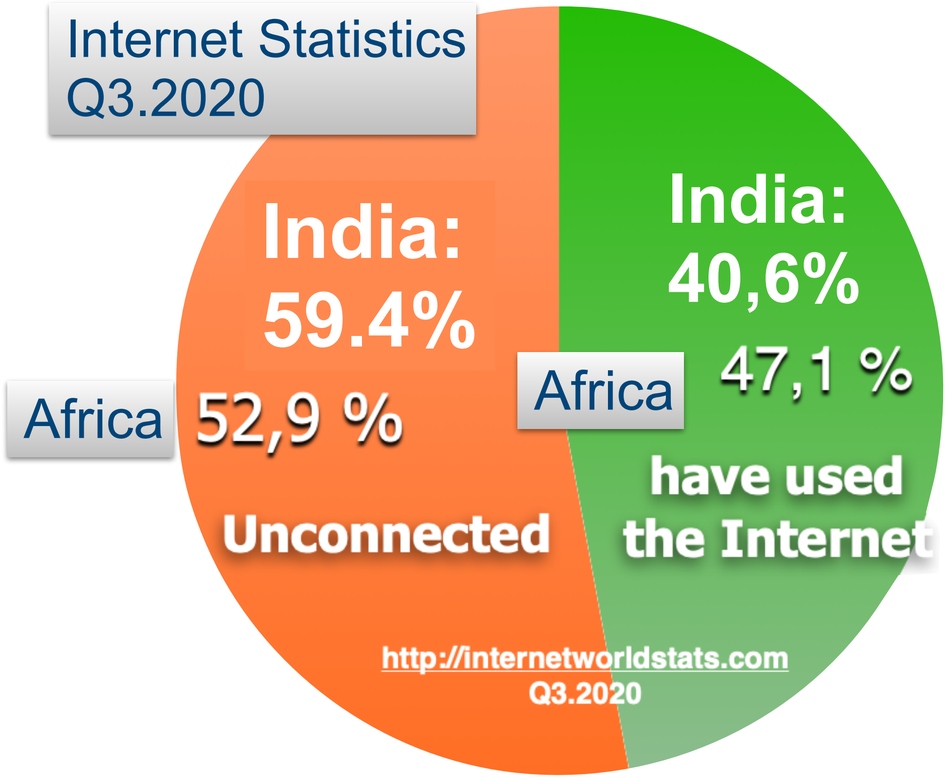
Maghsoud Morshedi
PhD Fellow at Eye Networks AS
Oslo, Oslo, Norway
Information Technology and Services

Current	Eye Networks AS
Previous	Høgskolen i Oslo og Akershus, State Organization for Registry of Deed & Property, Karaj Islamic Azad University
Education	University of Oslo (UiO)

Starting Point:



"Connect the >50% unconnected"



Reality on the ground

"There is no broadband in rural areas"
(in South of Sahara Africa - SSA)

Broadband = Mobile Broadband

TZ: 640 USD for 4 Mbit/s
GH: 600 USD for 5 Mbit/s
KE: 600 USD for 10 Mbit/s
"every single month"

The Buz model of operators / device manufacturer / mobile industry …

ASIA INTERNET USE, POPULATION STATISTICS DATA AND FACEBOOK DATA - JUNE 30, 2020

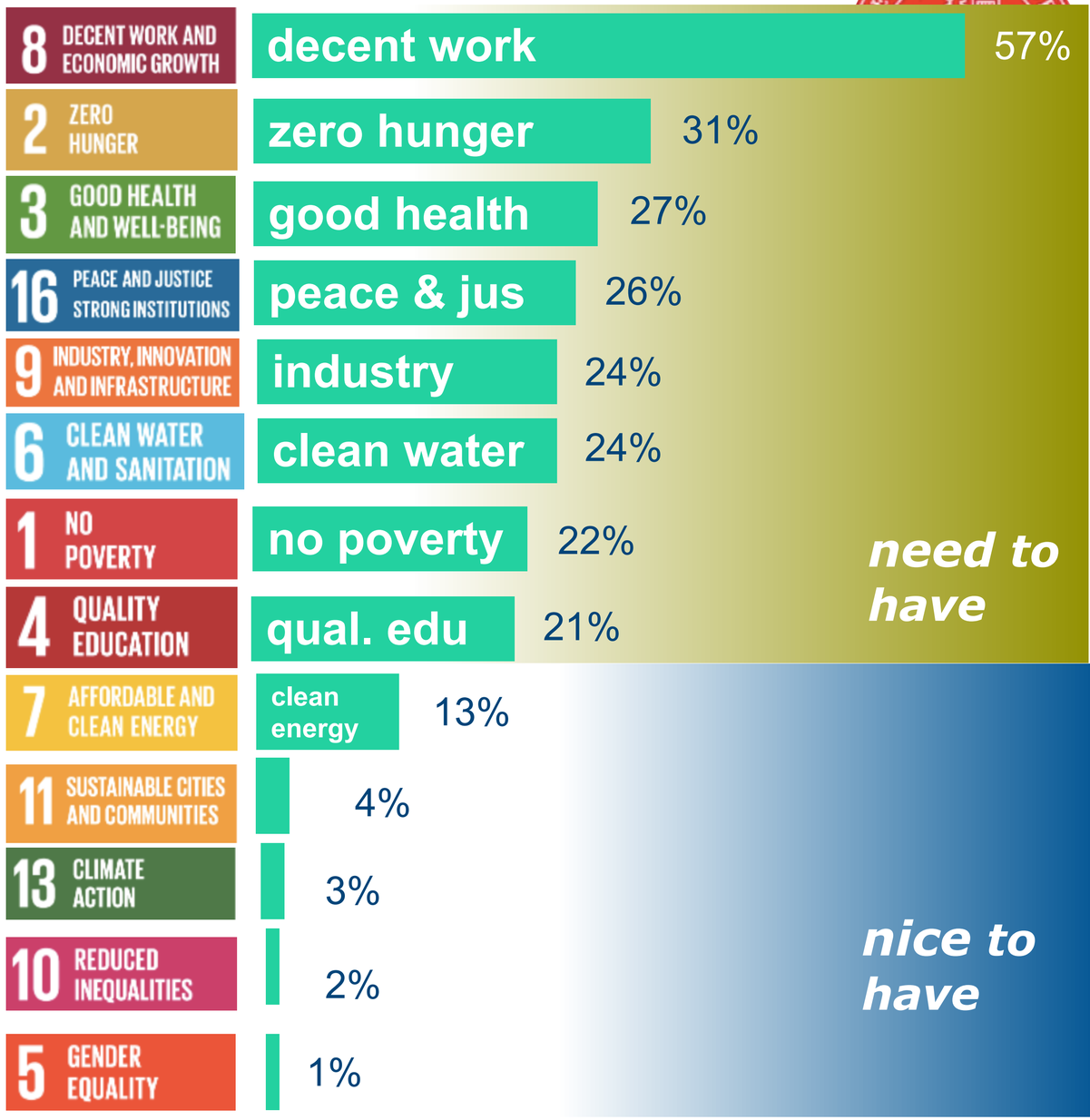
ASIA	Population (2020 Est.)	Internet Users, (Year 2000)	Internet Users 31-MAY-2020	Penetration % Population	Users % Asia	Facebook 31-MAR-2020
India	1,380,004,385	5,000,000	560,000,000	40.6 %	24.3 %	251,000,000

United Nations
Sustainable Development Goals



Public Opinion on SDGs (afrobarometer.org)

- Priorities by people in Africa
  - decent work
  - zero hunger
  - good health
  - …



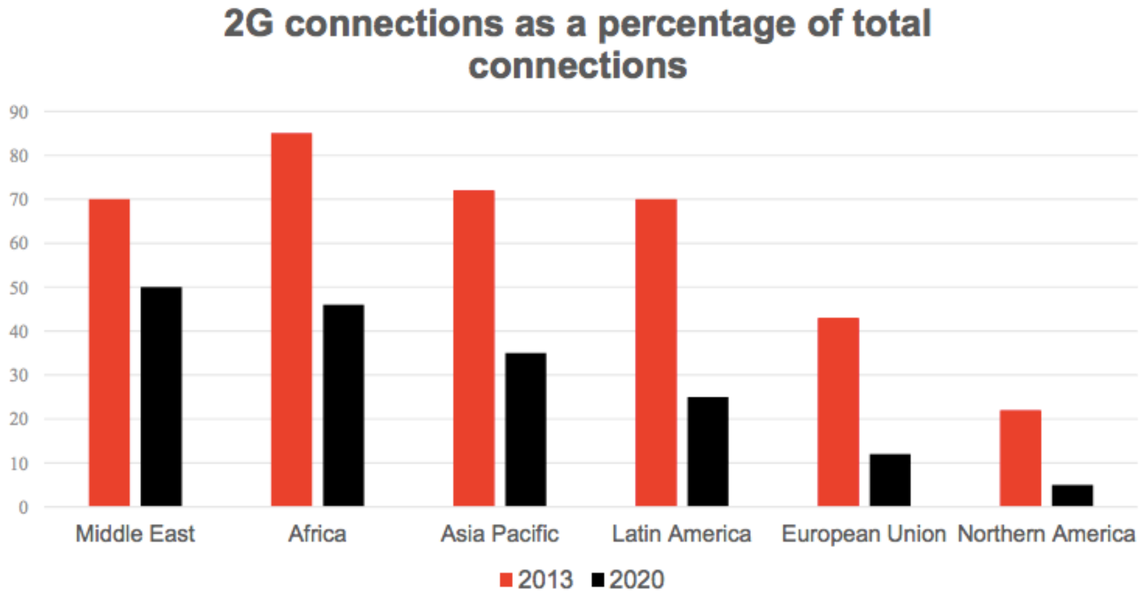
https://blogs.worldbank.org/africacan/how-do-africans-priorities-align-with-the-sdgs-and-government-performance-new-results-from

The challenge of area coverage

- Land area Norway, 385.178 km^2 - 7500 basestasjons
  - http://www.mynewsdesk.com/no/telenor/pressreleases/sjekk-naar-du-faar-4g-der-du-bor-1399662

- Tanzania 947,303 km^2 = 3 x Norway,
- Mali 1.240.000 km^2 = 4 x Norway
- DR Congo 2.345.000 km^2 = 8 x Norway

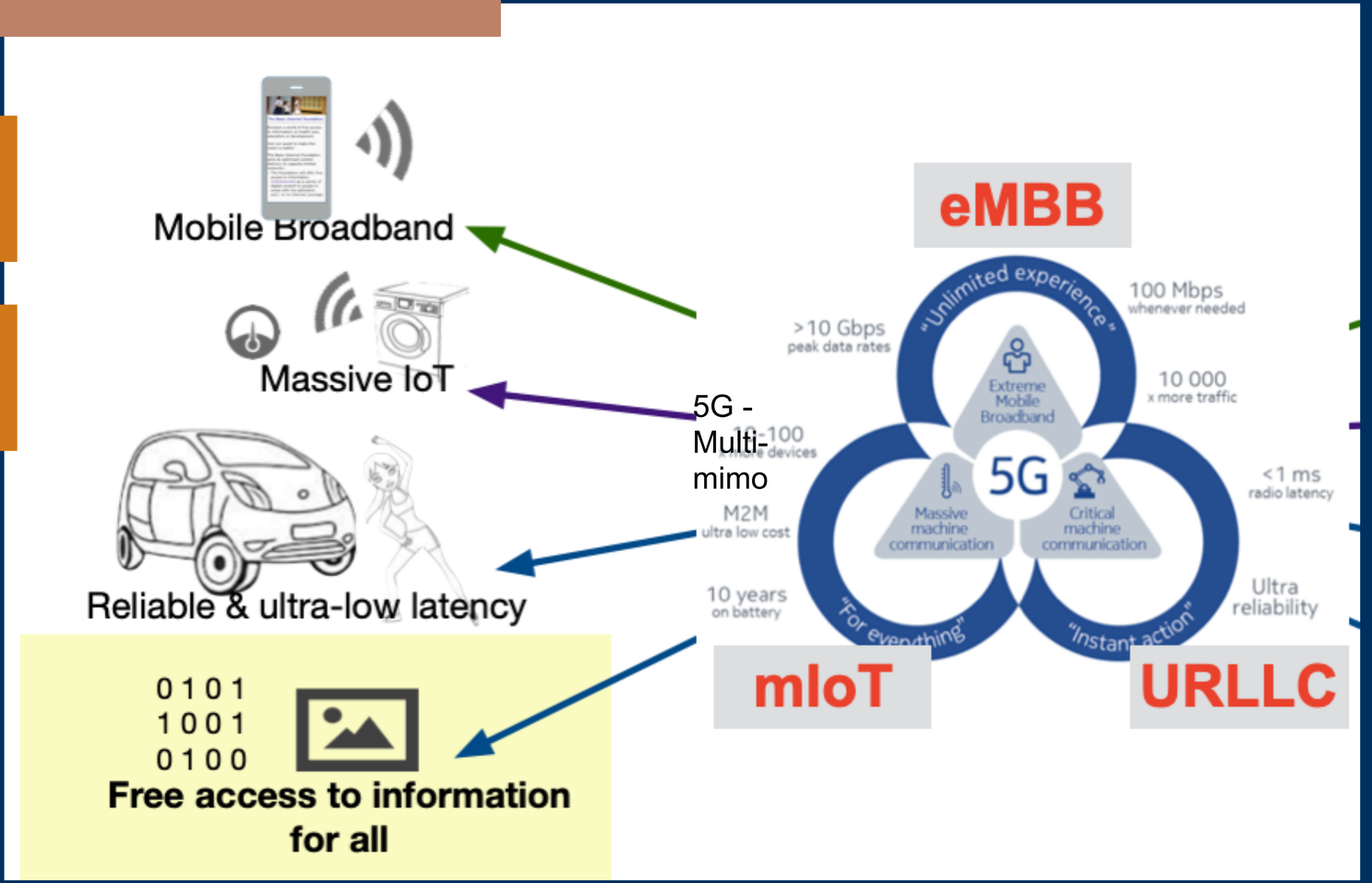
- Economy in building Wireless Broadband
  - #5Gforall - *Discuss*

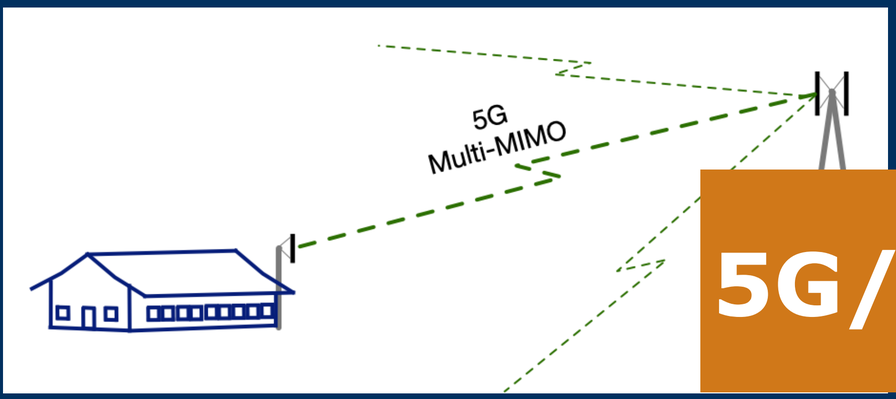


Paradigm Change (5G/6G)

Road model: pedestrians & cyclists

Internet: text & pictures





5G/6G for school/village connectivity

Providing Internet for All

- **Free access** to **Information** (Internet Lite)
  - 1) Access - one **Information Spot** per village
  - 2) Skills - Health, Education, Agriculture
  - 3) Regulations - Freemium model
  - 4) Inclusion -
    Free access for all #LeaveNoOneBehind

- Internet Lite & **Freemium** model for access
  - **free access to National Knowledge Portal** for all
  - **premium** access to **broadband**
  - sustainable solution



Operator model - tower

- Example: Digital Tanzania
  - ➡ Unconnected: 13 Million people in 4.000 villages



1 USD/month for Telecom



GSM + Wifi
- ➡ 200W
- ➡ MicroBTS

Cost: 70 kUS$/village

the village that got Internet:
http://www.bistandsaktuelt.no/nyheter/2018/landsbyen--som-fikk-facebook/

What if?

1

- We adopt the model of the road?
  - free for pedestrians and cyclists // text & pictures
  - premium for cars // broadband

2

- We establish Digital Information Spots (“InfoSpots”)
  - in every village
  - solar power, Wifi hot-spot, phone charger, light

3

- InfoSpot design and realisation
  - Health, Education, Agriculture, Digital,…

Internet Lite
free access to information



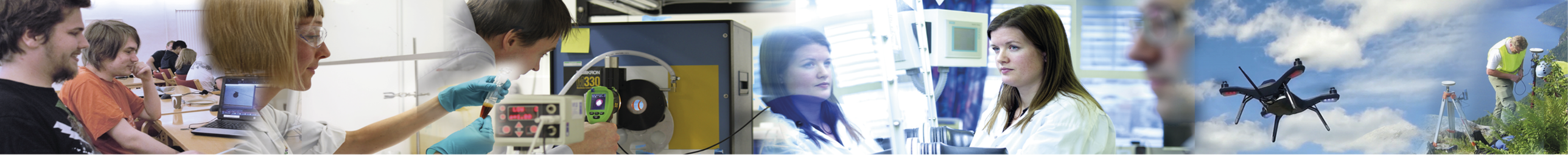
for every single human being

Discuss

1 - Freemium model
- Internet Lite

2 - 5G MIMO for village/school connectivity

3 - Decentralised Internet (InfoSpot)

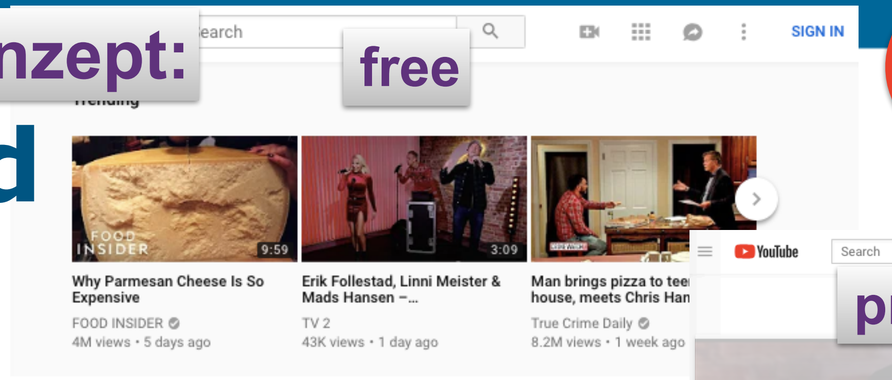


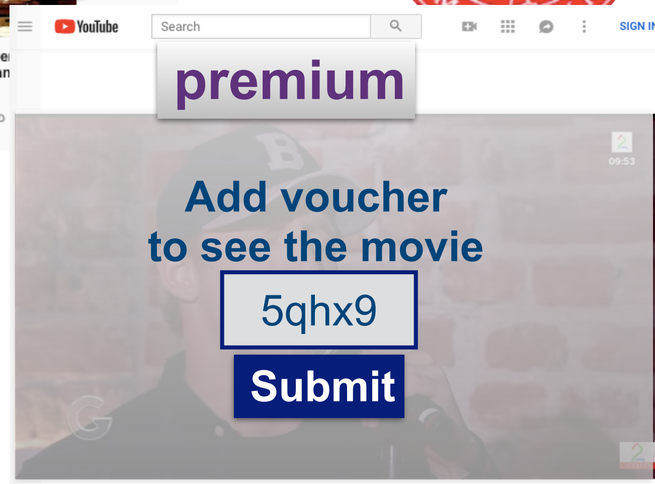
UiO : Department of Technology Systems
University of Oslo

1

Internet Lite
the freemium model for access

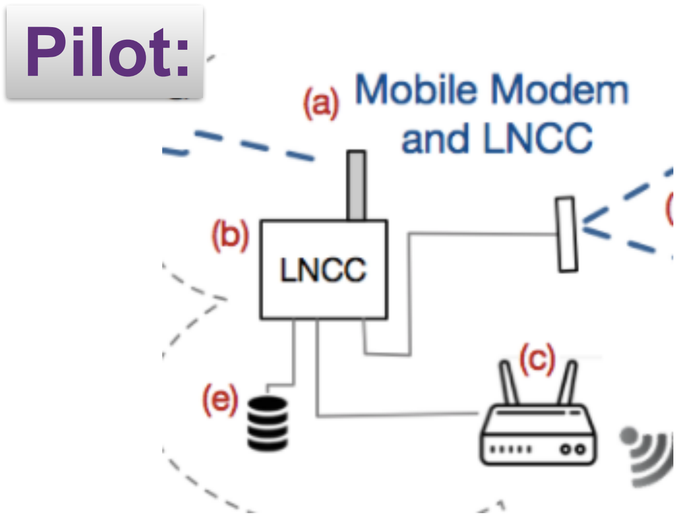
Internet Lite Standard

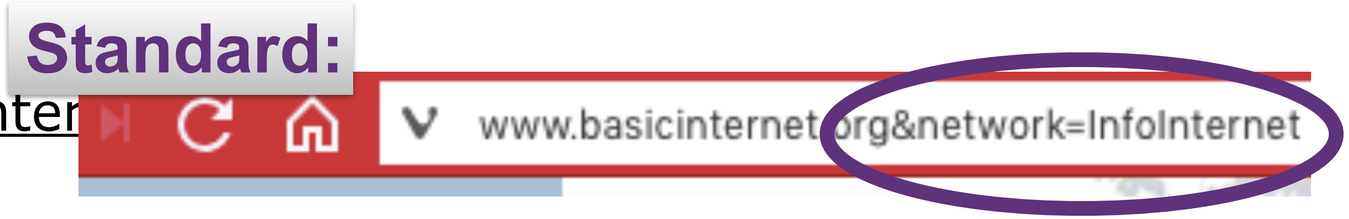




- Network responsiveness

- InfoInternet Standard development
  - **Konzept**: www-filtering
    - free: text & picture, premium: video
  - **Pilot**: www metadata & inspection
    - address, port & deep packet analysis
  - **Standard**: proxy & html5 standard,
    - http://BasicInternet.org&standard=InfoInter





No magic, exist today….
Lightweight Protocols, e.g. AMP

https://basicinternet.org/internet-lite-to-the-migoli-high-school/

https://basicinternet.org/internet-lite-to-the-migoli-high-school/amp/amp/

Full Web experience

Basic Internet Foundation

PROJECTS ABOUT PARTNERS MEDIA

INTERNET LITE TO THE MIGOLI HIGH SCHOOL

By josef | 4 May 2019 | Uncategorized

The Migoli High School has 1271 pupils (Apr2019) and 35 full-time teachers. The high school is located about 3 km outside of Migoli in the Iringa district in Tanzania.



Internet Lite - AMP experience

Basic Internet Foundation

Internet Lite to the Migoli High School

josef ... ths ago

The Migoli High School has 1271 pupils (Apr2019) and 35 full-time teachers. The high school is located about 3 km outside of Migoli in the Iringa district in Tanzania.



Challenges:
Internet Lite - freemium model for access

1

- Standard: Internet Lite
  - AMP, other standards

- Realisation
  - local filtering on router (white/black-list)
    - Web page analyser (video yes/no)
  - DNS filter
  - Opera Mini concept



Technical details

https://nextcloud.basicinternet.org/index.php/apps/files?dir=/Mikrotik_config&openfile=17435

AMP DNS filtering for Internet Lite

- if an amp page exists, by testing: https://cdn.ampproject.org/c/s/BasicInternet.org/mission/ then a modified AMP URL will appear https://basicinternet-org.cdn.ampproject.org/c/s/BasicInternet.org/mission/
- if amp doesn't exist, e.t. http://cdn.ampproject.org/c/s/NYTimes.com then the return will be the ordinary NYtimes page

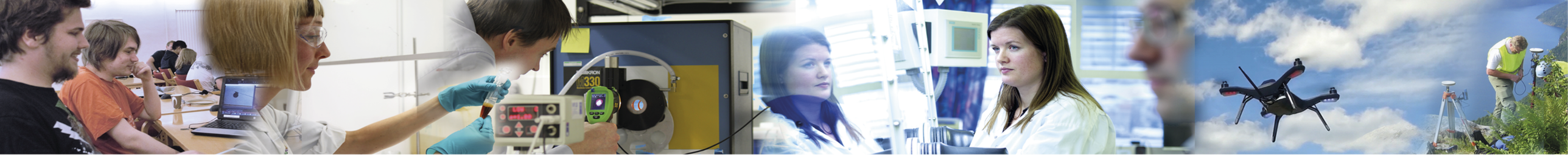
  https://www.nytimes.com
- should the basis for a logic, either in the RPI, in the LNCC or in a DNS

Automatic configuration of the LNCC

- Public key from LNCC (to register on the Maincorerouter)
- Building the DNS for AMP filtering (allowing all AMP pages)
- Security analysis of Internet Lite

SMS-info communication with LTE antenna

- information for the end user to understand how much traffic is used (still available), typ done by SMS from the SIM "how much data"
- OTP, remaining capacity (GB left), MPesa based "another 10 GB" SMS 90838066 10 GB
- Can Mikrotik send an SMS? check...
- http post from LNCC to central administration



UiO : Department of Technology Systems
University of Oslo

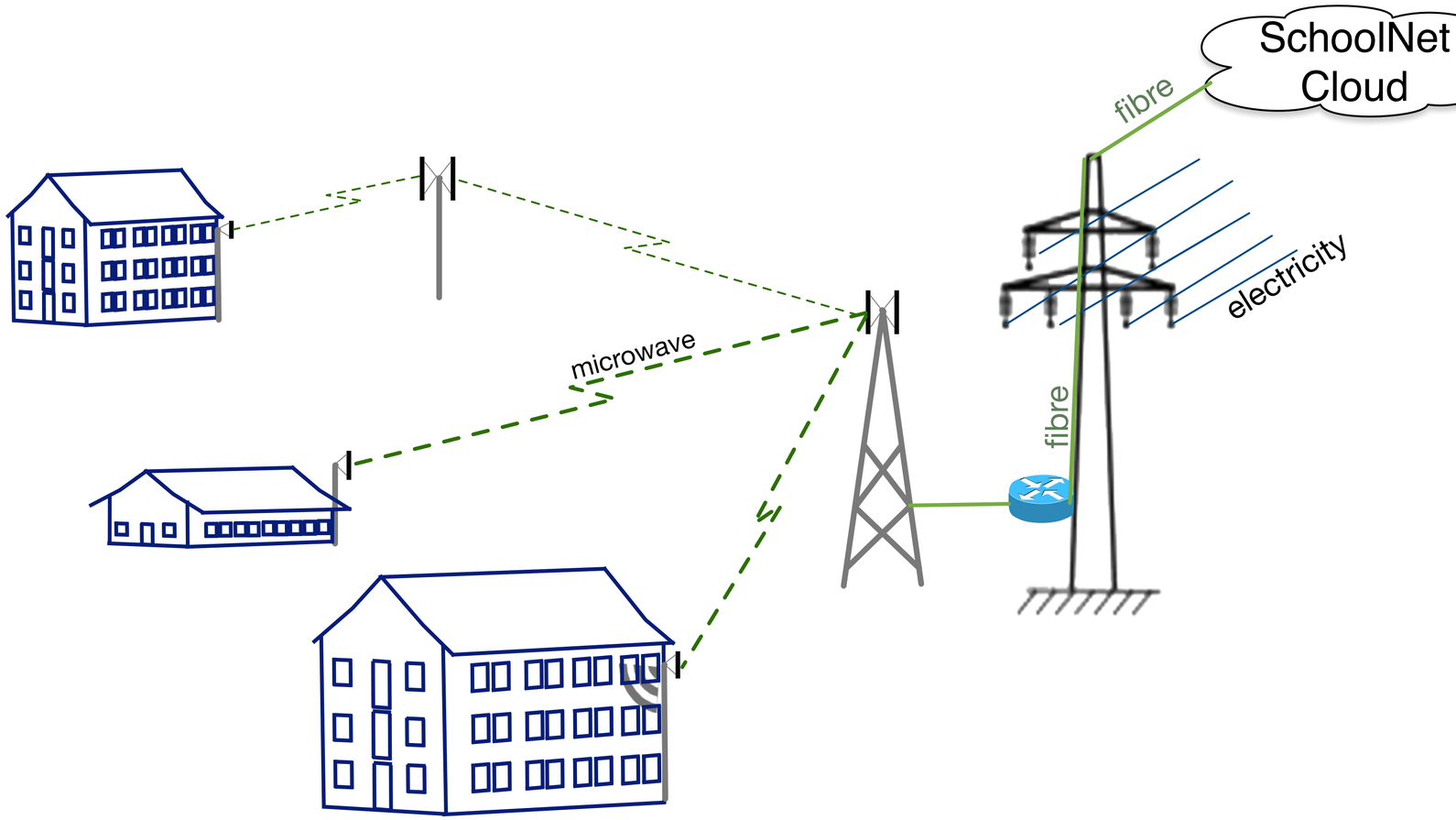
2

School/Village connectivity
- infrastructure package
- access: 4G/5G MIMO

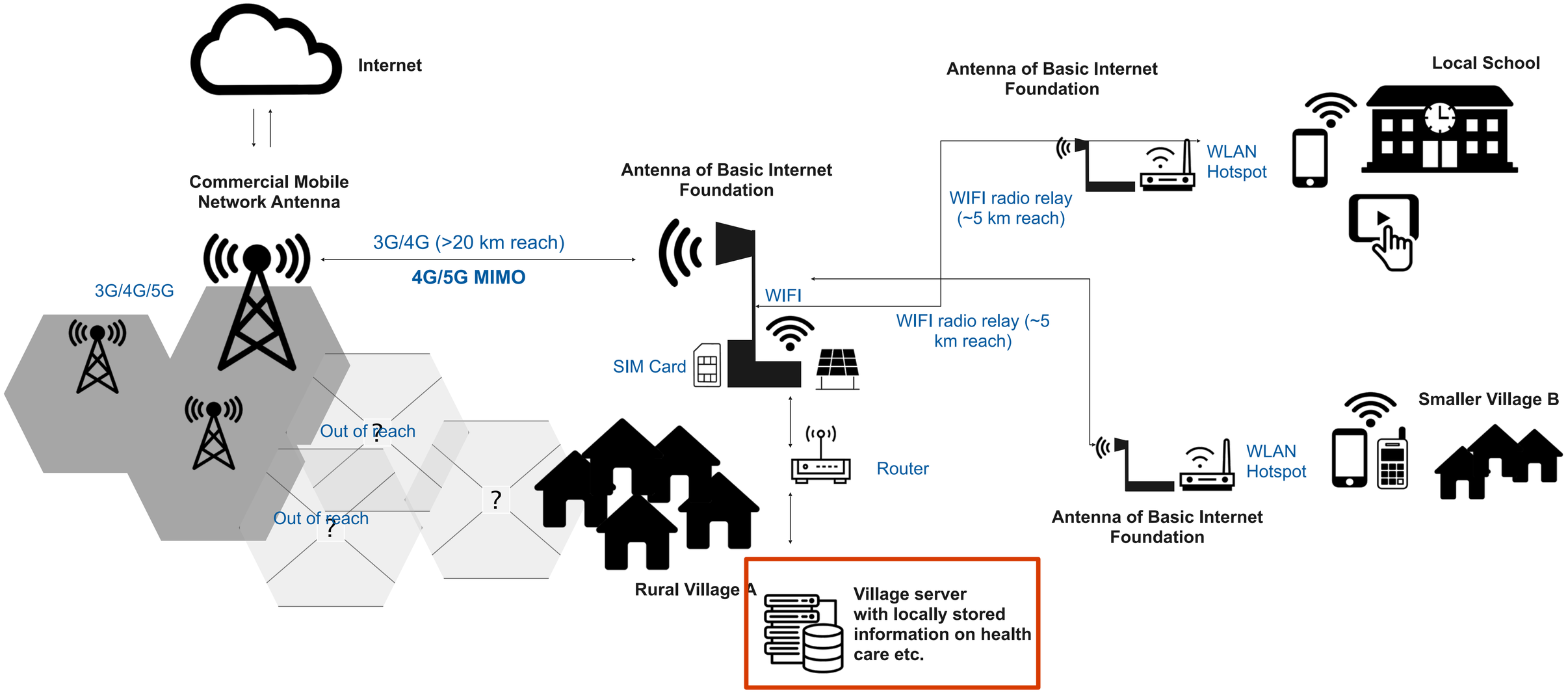
Governmental / Community model

2

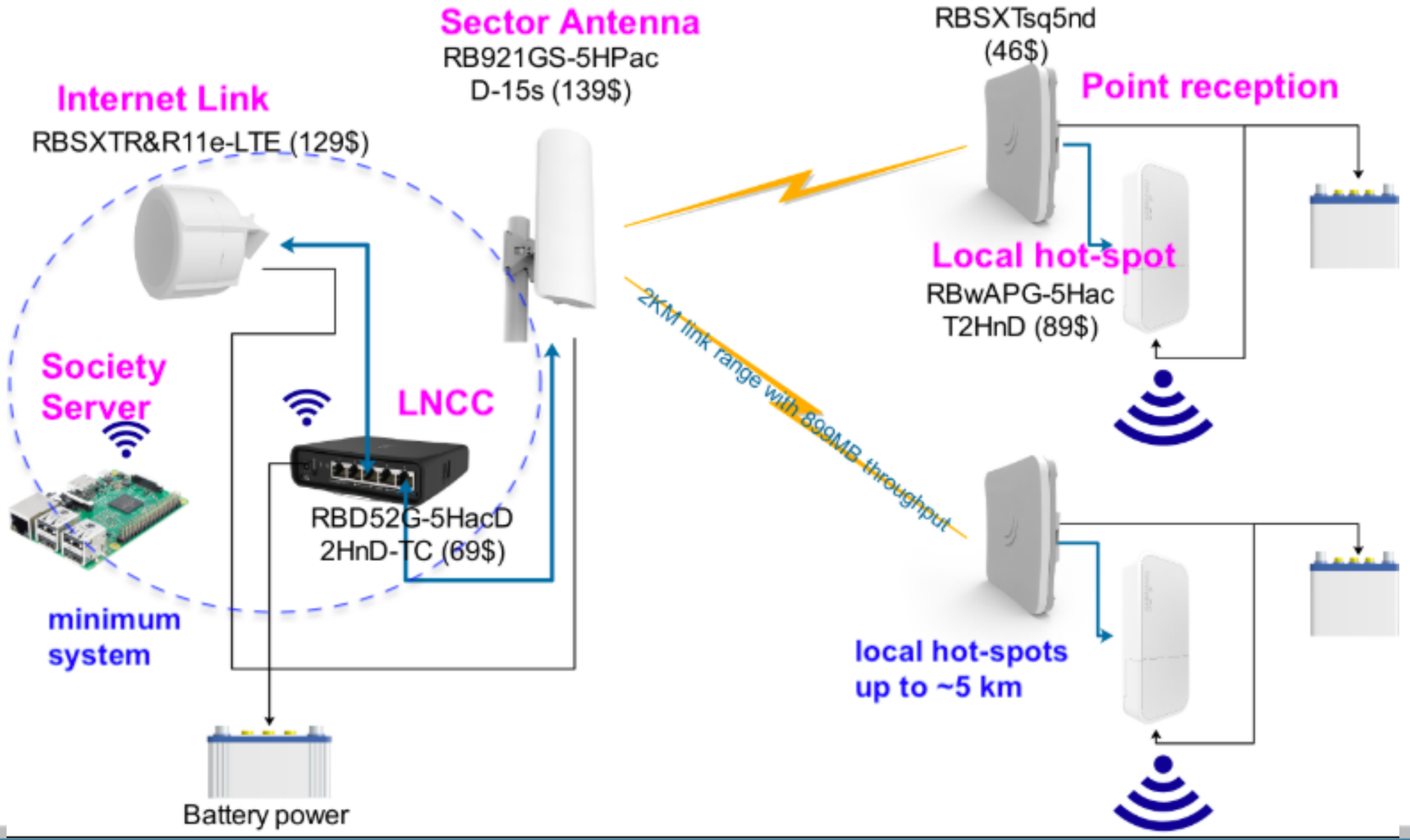
- SchoolNet distribution (Ethiopia)
  - educational network by Ministry of Education (MoE)
  - national fibre on high-voltage lines
  - fibre to microwave
- Microwave distribution
  - 0-5 km: point to multipoint
  - 5-15 km: point to point (mast)
  - >15 km: microwave relay mast
- Local school
  - receive microwave antenna
  - local Wifi distribution: local network controller & school server



Set-up and Design – Connecting Rural Villages



Wireless infrastructure
http://Solutions.BasicInternet.no



“Connect the Unconnected”
Selela Market Place







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

Digital Health Spot for 300 €

Creating digital access for the unconnected







- Digital society
- Agricultural and rural development
- Education
- Health
- Food, water and shelter

Digital inclusion

The catalyst for sustainable development

300 € digital health hotspot
60.000 € connecting a village in TZ
250.000.000 € connecting all villages in TZ
89.000.000.000 € EU border control per year

80 € Solar panel	30 € Regulator
50 € Hotspot	20 € USB-charger
50 € Tablet	15 € LED light
20 € Battery	20 € Materials

digi.basicinternet.no

Founded by: UiO : University of Oslo, KJELLER INNOVASJON

Challenges:
School/Village connectivity

2

- 4G/5G MIMO
  - cell size
- Communication to LTE antenna
  - RPI or LNCC contact to LTE (GB used)
- LNCC scripts for reporting
  - communication with antenna on status
  - white list update
  - usage monitoring
- Monitoring of all Schools
  - Cabana server (monitoring.basicinternet.org)

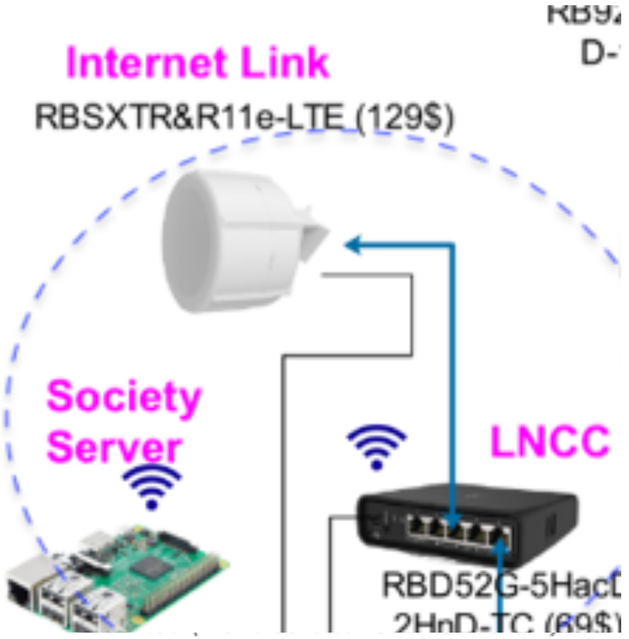
SMS-info communication with LTE antenna

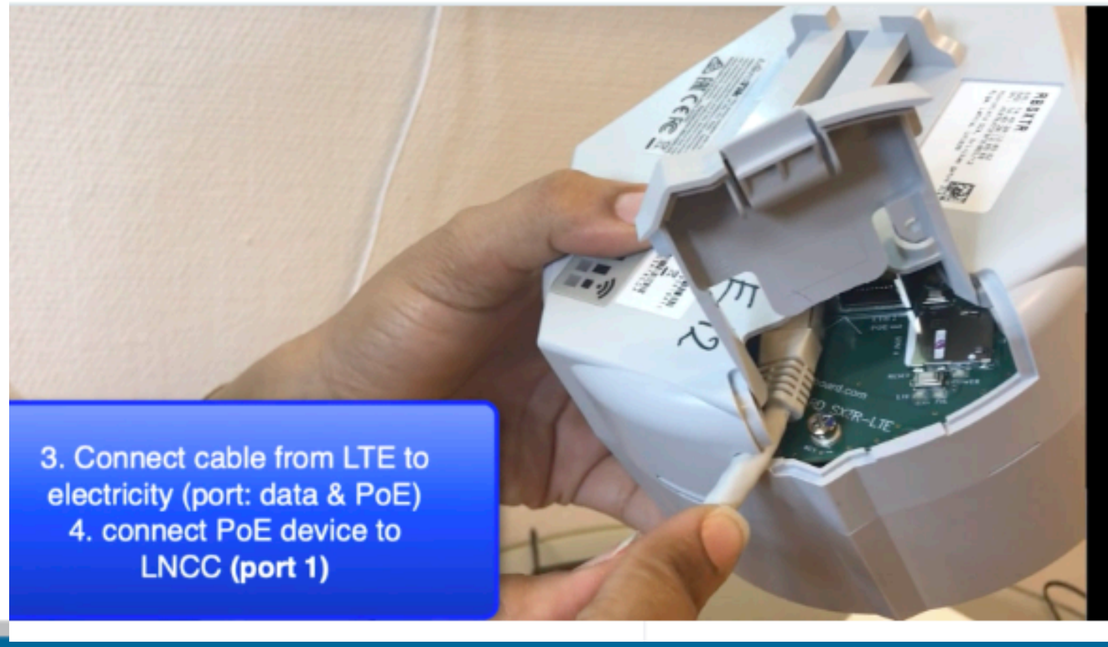
- information for the end user to understand how much traffic is used (still available), typically done by SMS from the SIM "how much data"
- OTP, remaining capacity (GB left), MPesa based "another 10 GB" SMS 90838066 10 GB
- Can Mikrotik send an SMS? check...
- http post from LNCC to central administration

- Script for Whitelist update duplicates all the time (sometimes even an infinite loop) - CRLF challenge @Maghsoud? - see errors in some config files (needs further elaboration)

LTE antenna reporting

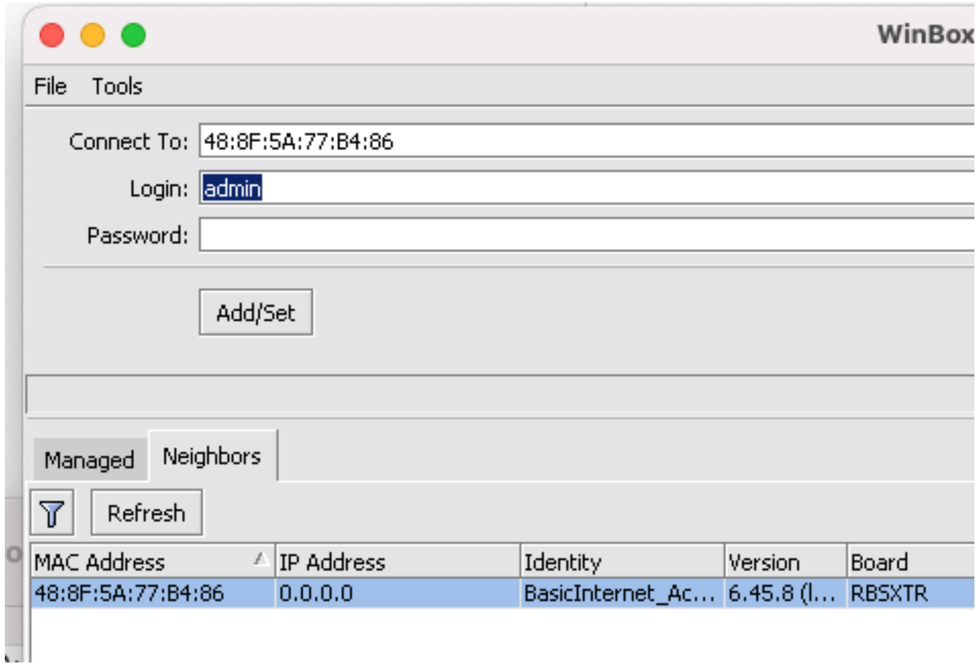
- Provides the 3G/4G Internet link
  - allows communication with SIM card

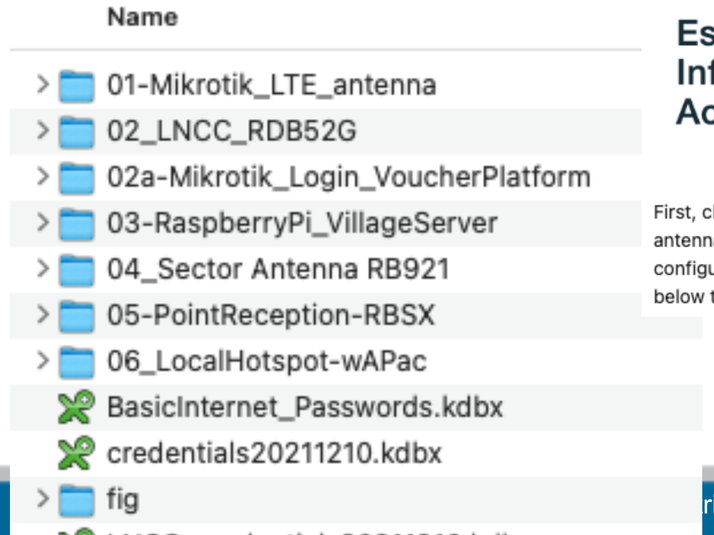




Using Winbox to connect to LTE antenna

- nextcloud.basic internet.org
  - register (ask Josef/Maghsoud for member of config group)
  - each device has an own directory
- see Config.md for configuration

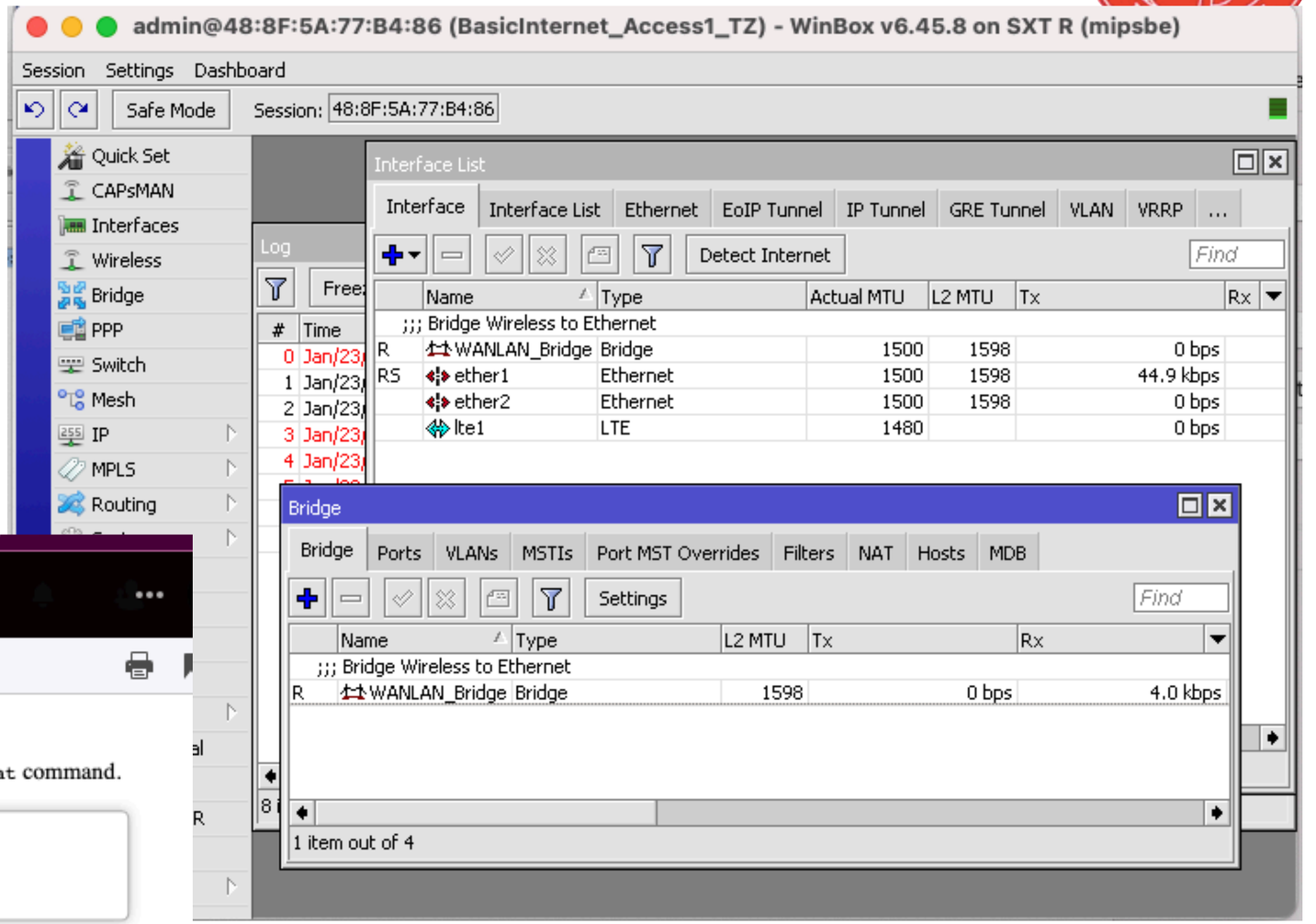


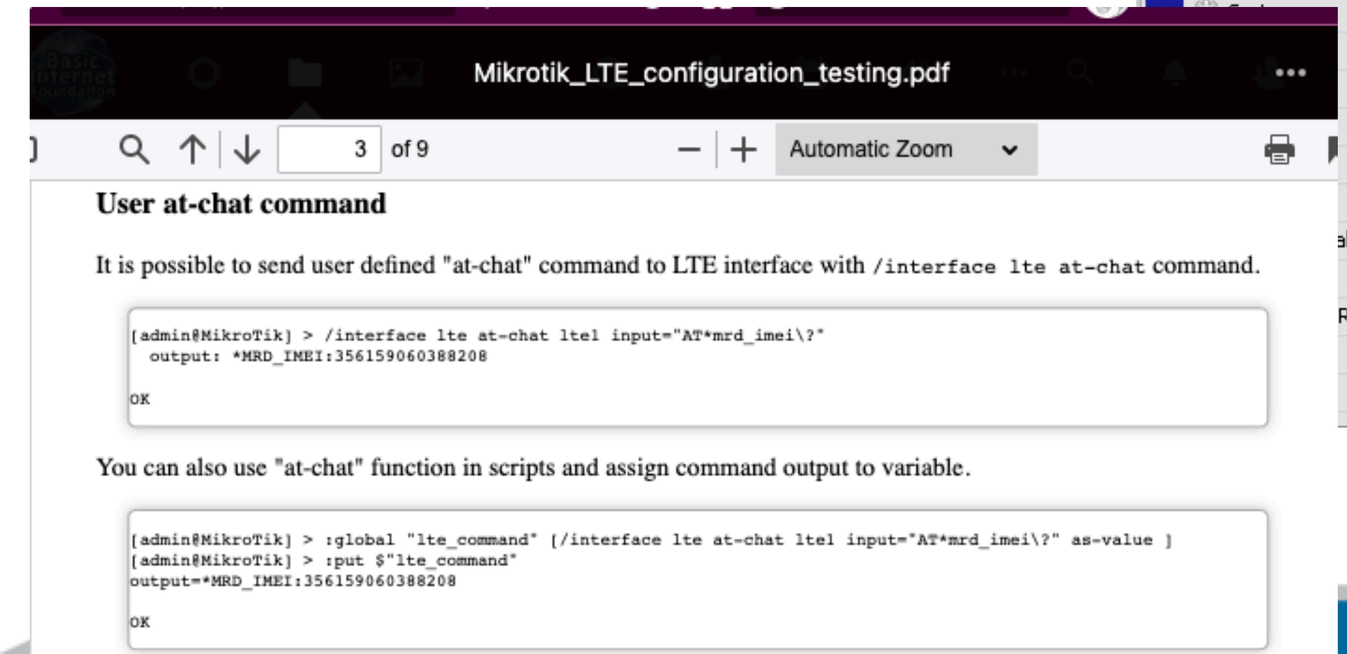




LTE antenna tasks

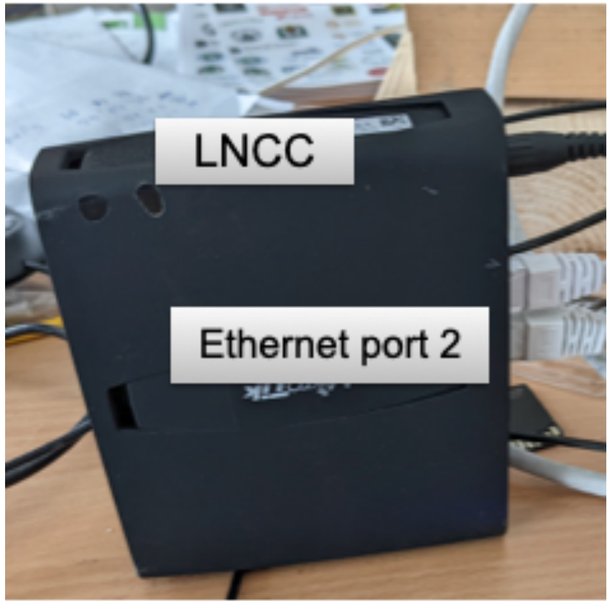
- Communicate with SIM card
  - Status (GB used)
  - evtl reporting





Local Network Control Center (LNCC) solutions.BasicInternet.no

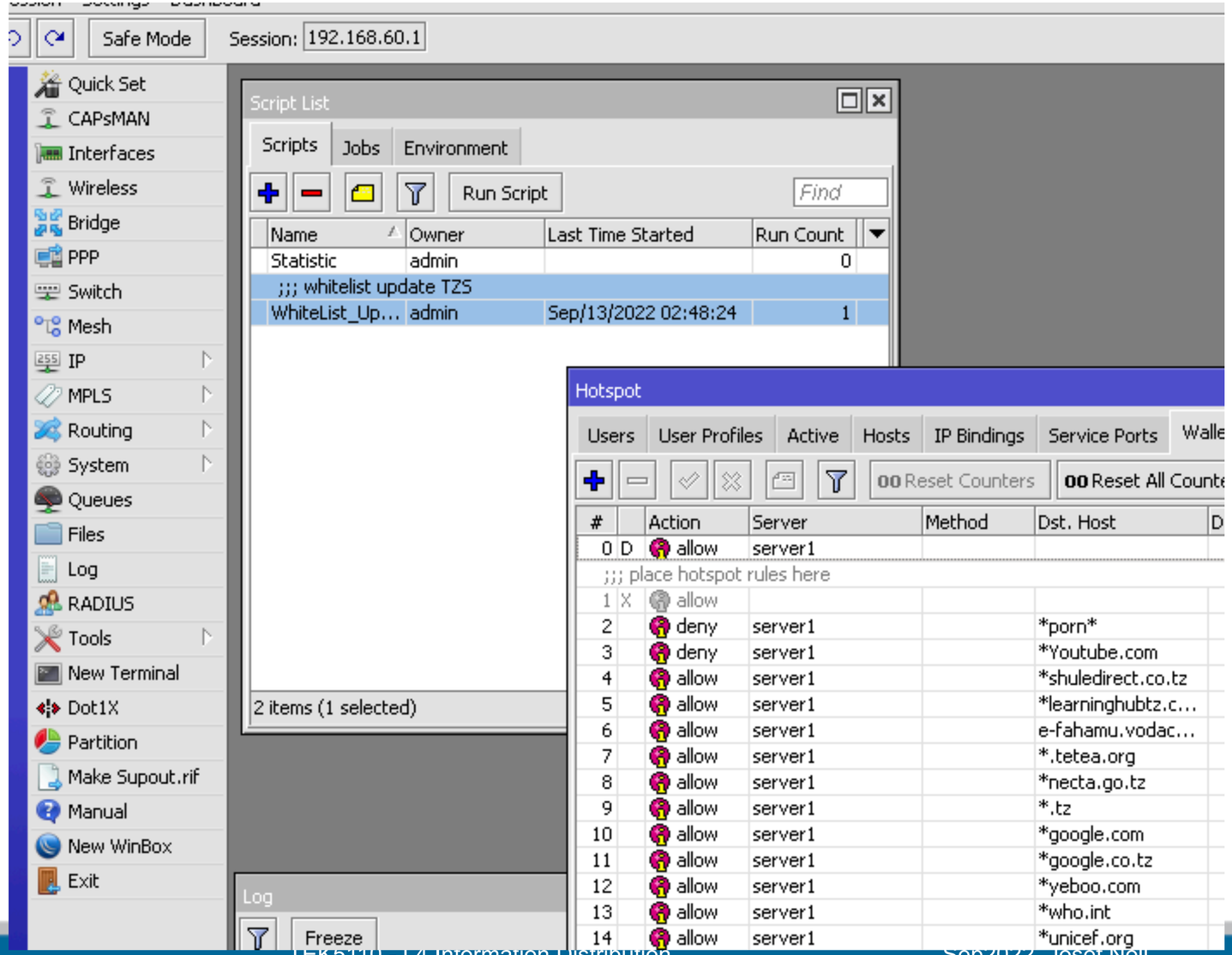
- Using Winbox to connect
  - 192.168.60.1 or MAC address

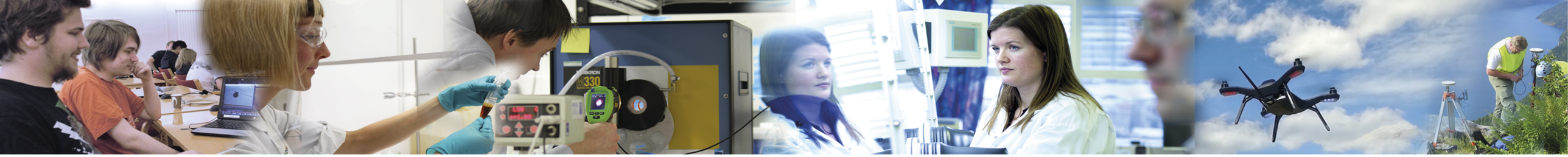




Local Network Control Center (LNCC) solutions.BasicInternet.no

- Internet Lite filtering
- ➡ Web page analysis,
- "most visited sites" (video?)





UiO : Department of Technology Systems
University of Oslo

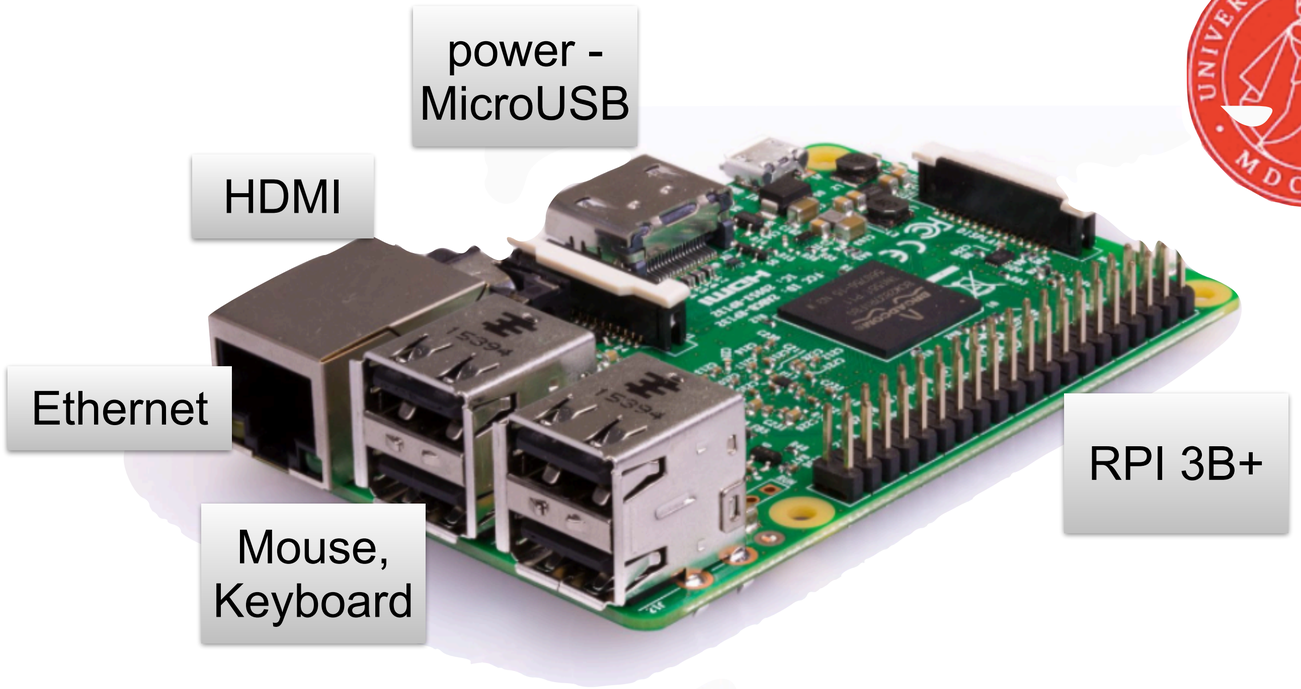
3

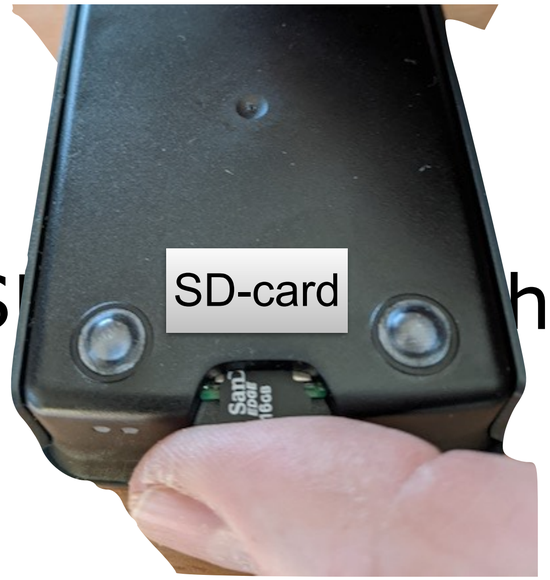
Decentralised Internet with InfoSpot for Education, Health, Agriculture, Digital

Raspberry Pi (RPI)

- A mini computer
- comes i different versions
  - RPI 3B+
  - RPI 4
  - RPI 4 integrated

- ensure that the SD-card is inserted before booting



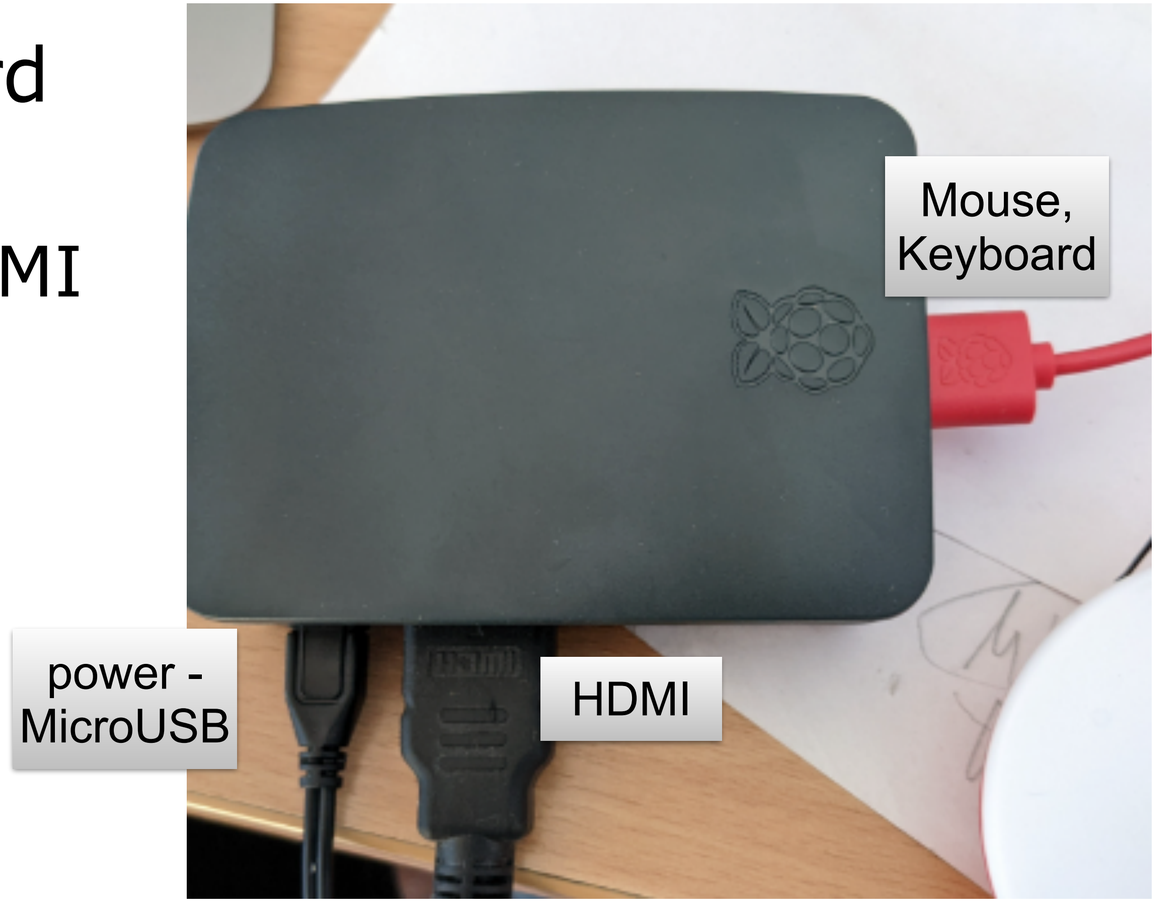




Prepare for the session
Alternative A connect to an external screen

- connect the RPI with a keyboard and a mouse
  - connect to an external screen (HDMI cable)
  - power up the RPI

- you should see yeboo.com

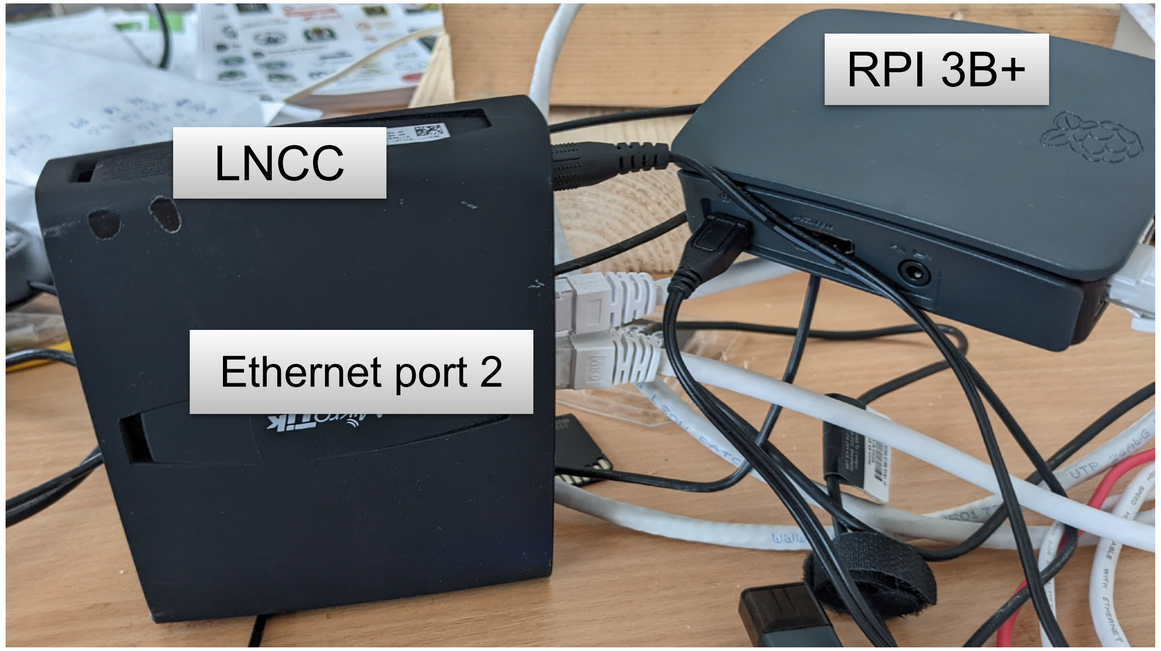


Prepare for the session
Alternative B: connect an LNCC

- Connect the RPI to a LNCC (port 2) using an Internet cable

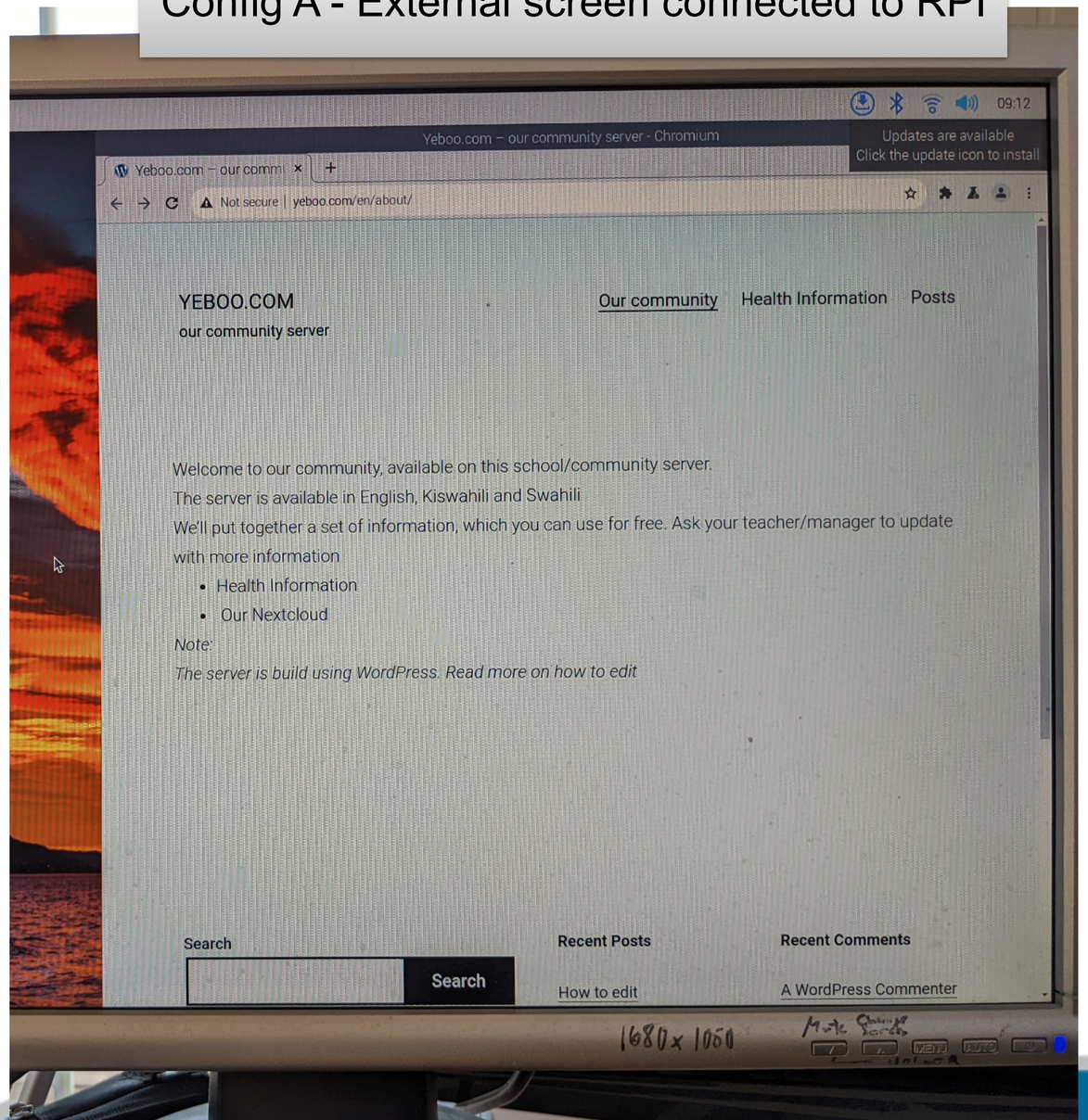
- connect your laptop/mobile phone to Wifi “BasicInternet”

- Note: LNCC is the local network control center, which is configured as BasicInternet, see: solutions.basicinternet.no

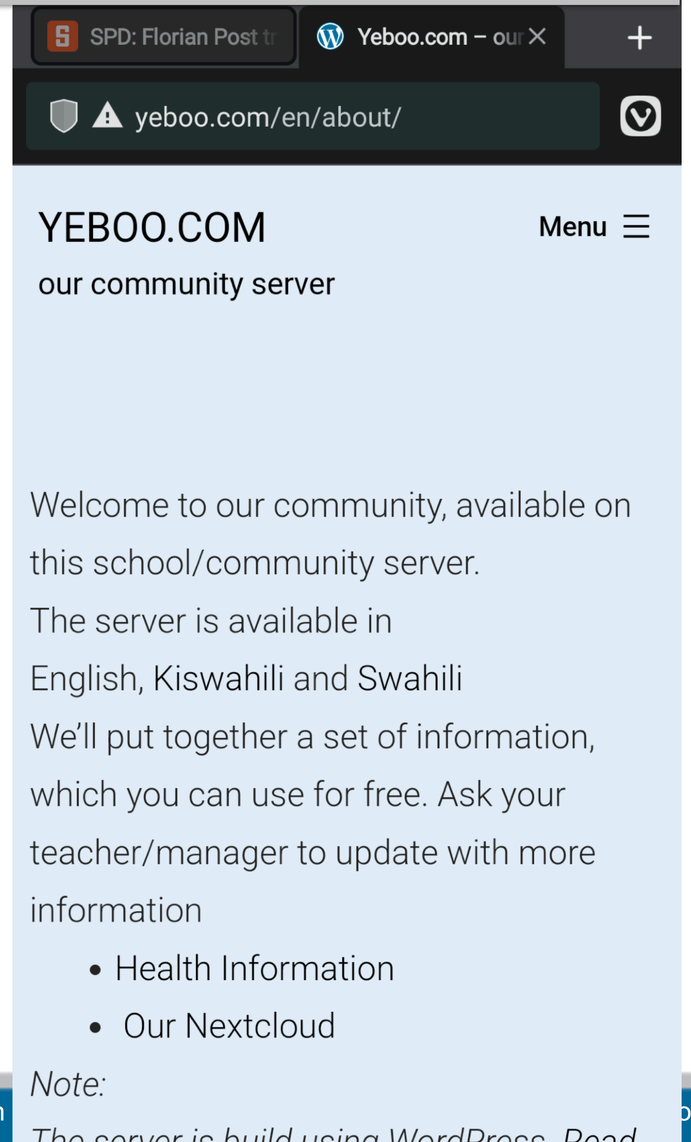


Welcome page yeboo.com

Config A - External screen connected to RPI



Config B - Mobile Phone connected to SSID BasicInternet on LNCC

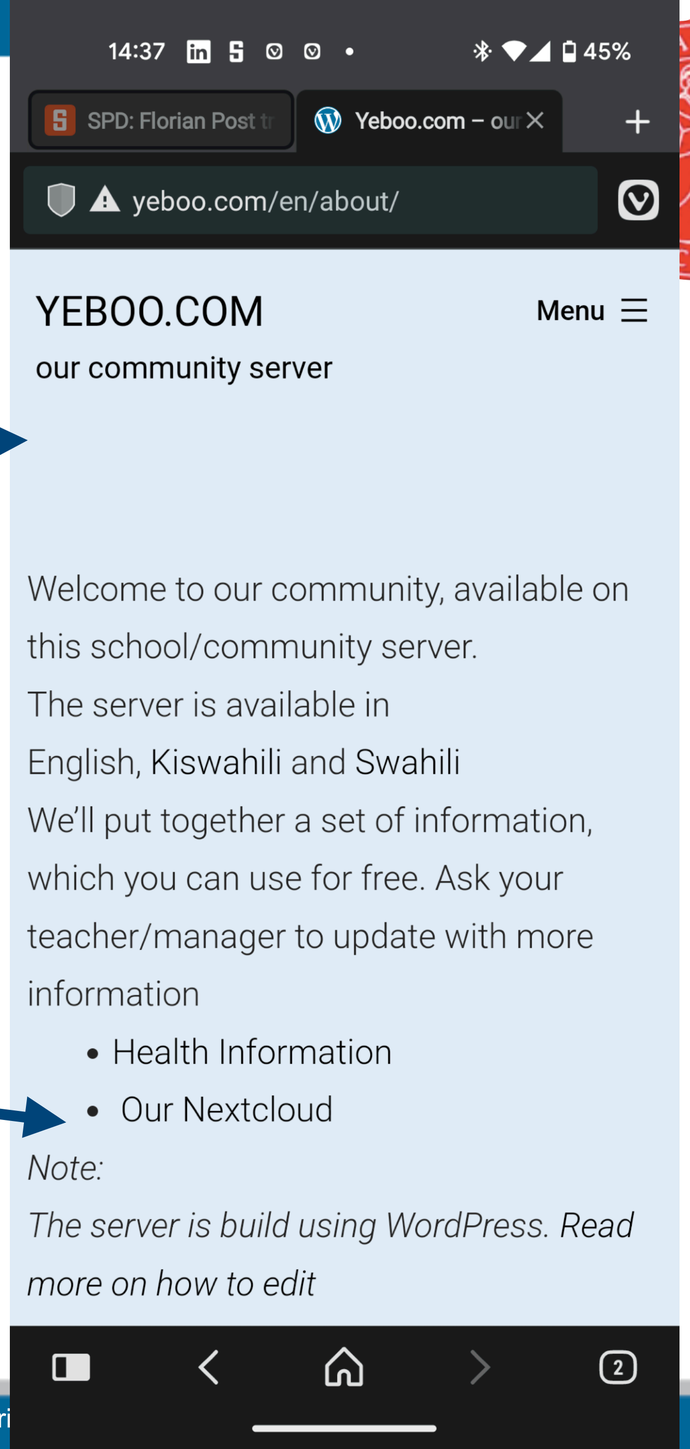


Goal
Use the RPI

- Create a **web page**
  - edit wordpress
  - add new sections (see health information)

- Share content with people
  - Add to Nextcloud
  - Add new videos/information

this is a web page on te RPI

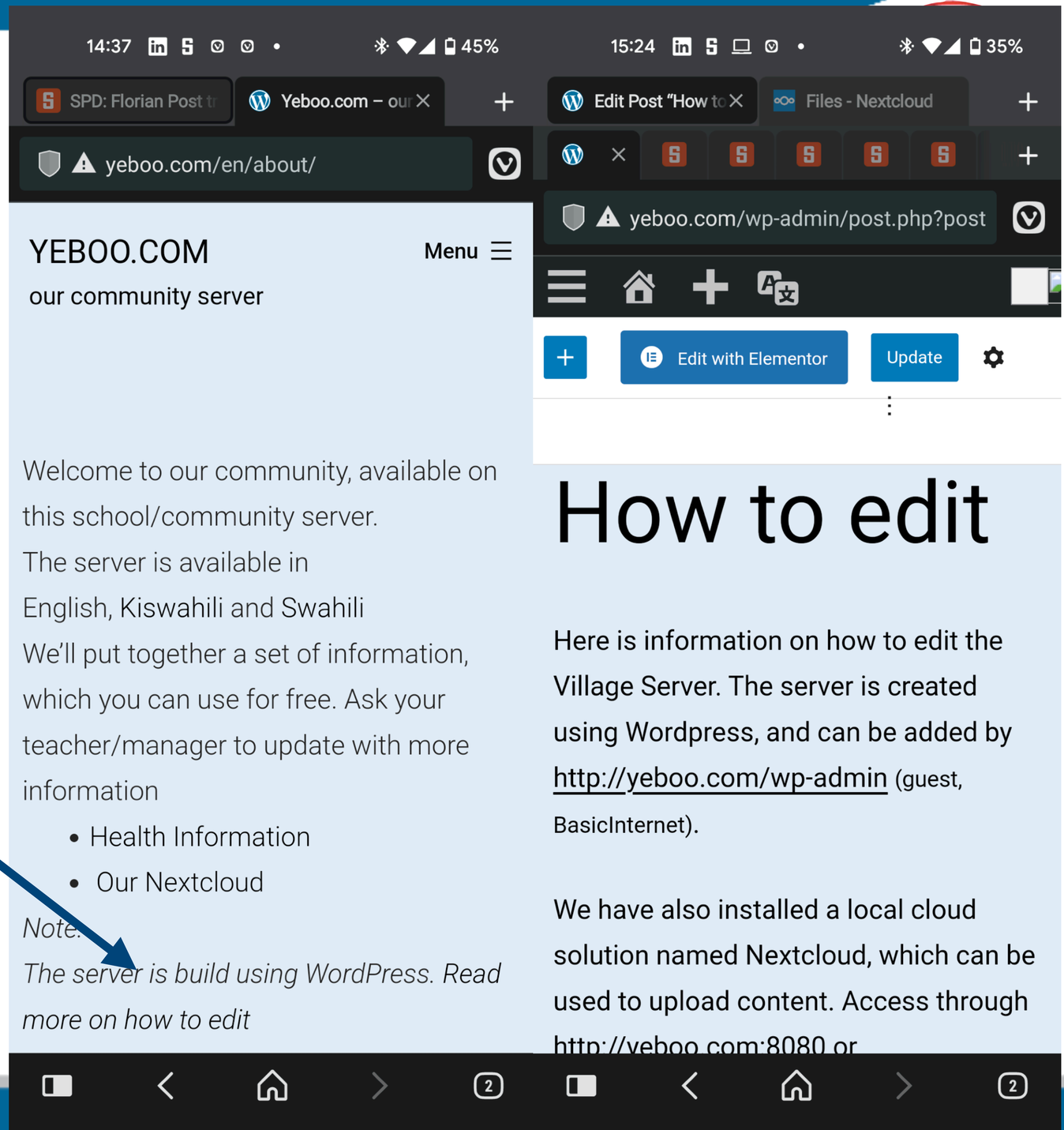


Web page creation
- use wordpress
- on RPI: http://Yeboo.com

Edit a web page

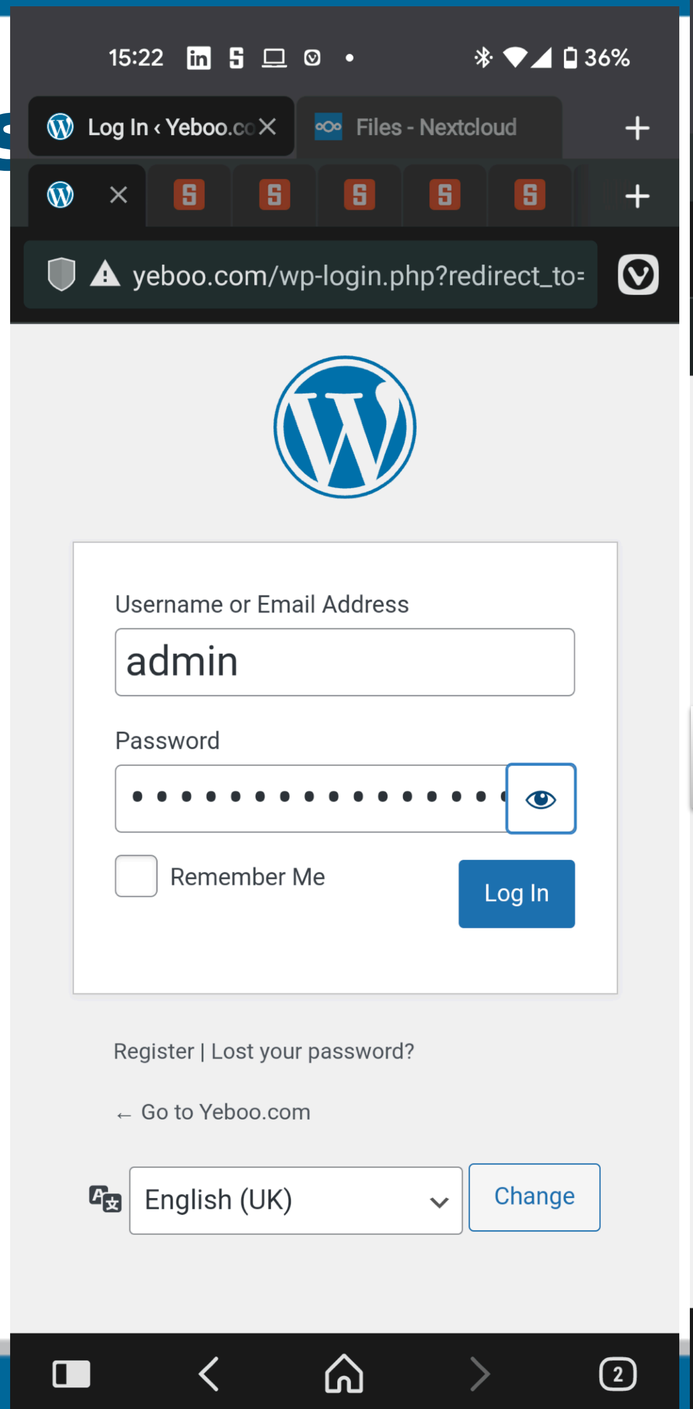
- yeboo.com is the local web page on your Raspberry Pi

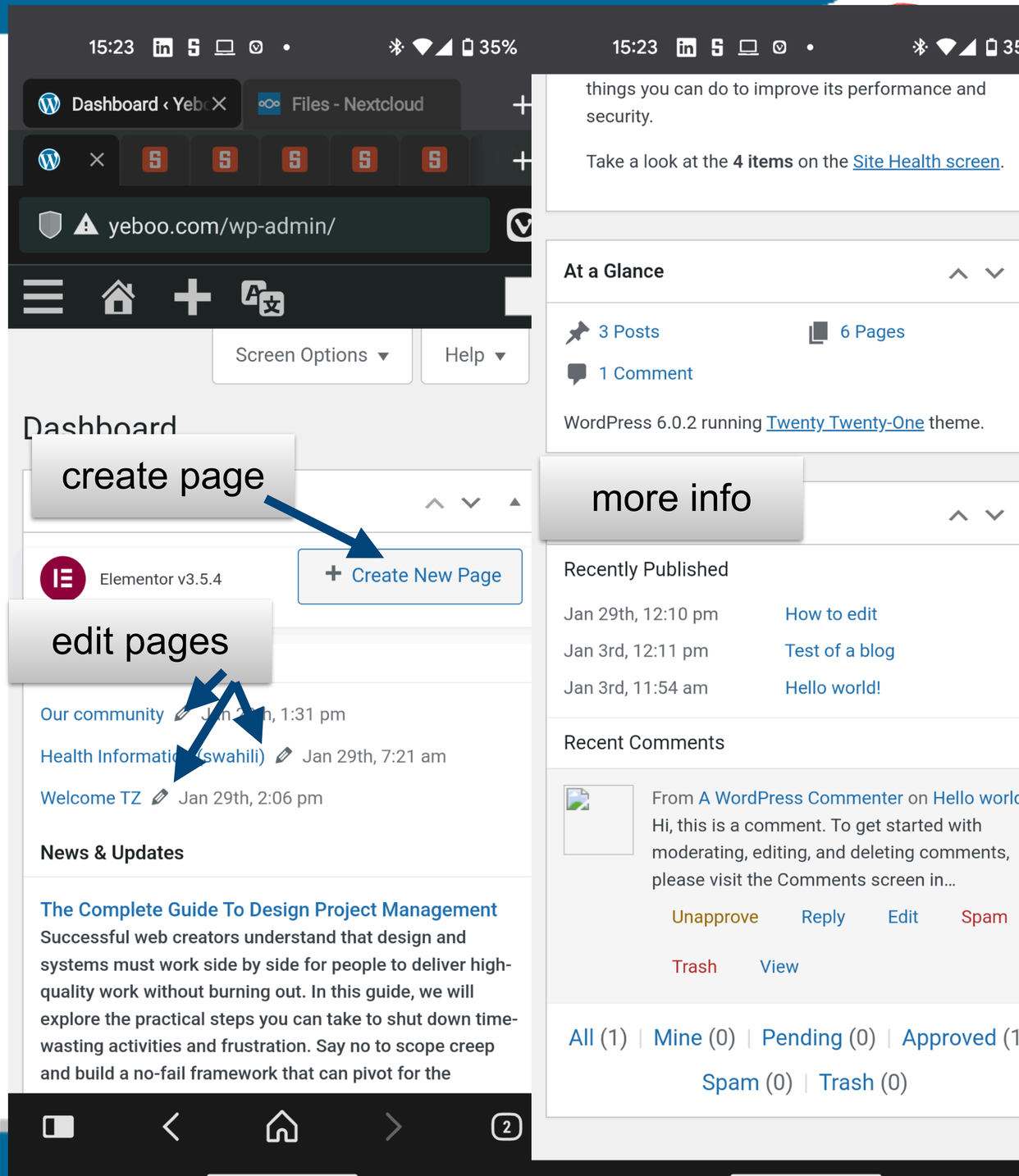
- See the link “Read more on how to edit”
  - http://yeboo.com/wp-admin
- Users
  - guest, BasicInternet or
  - admin, **********



Wordpress

- Information on Wordpress installation
  - update wordpress
  - create users
  - add pages

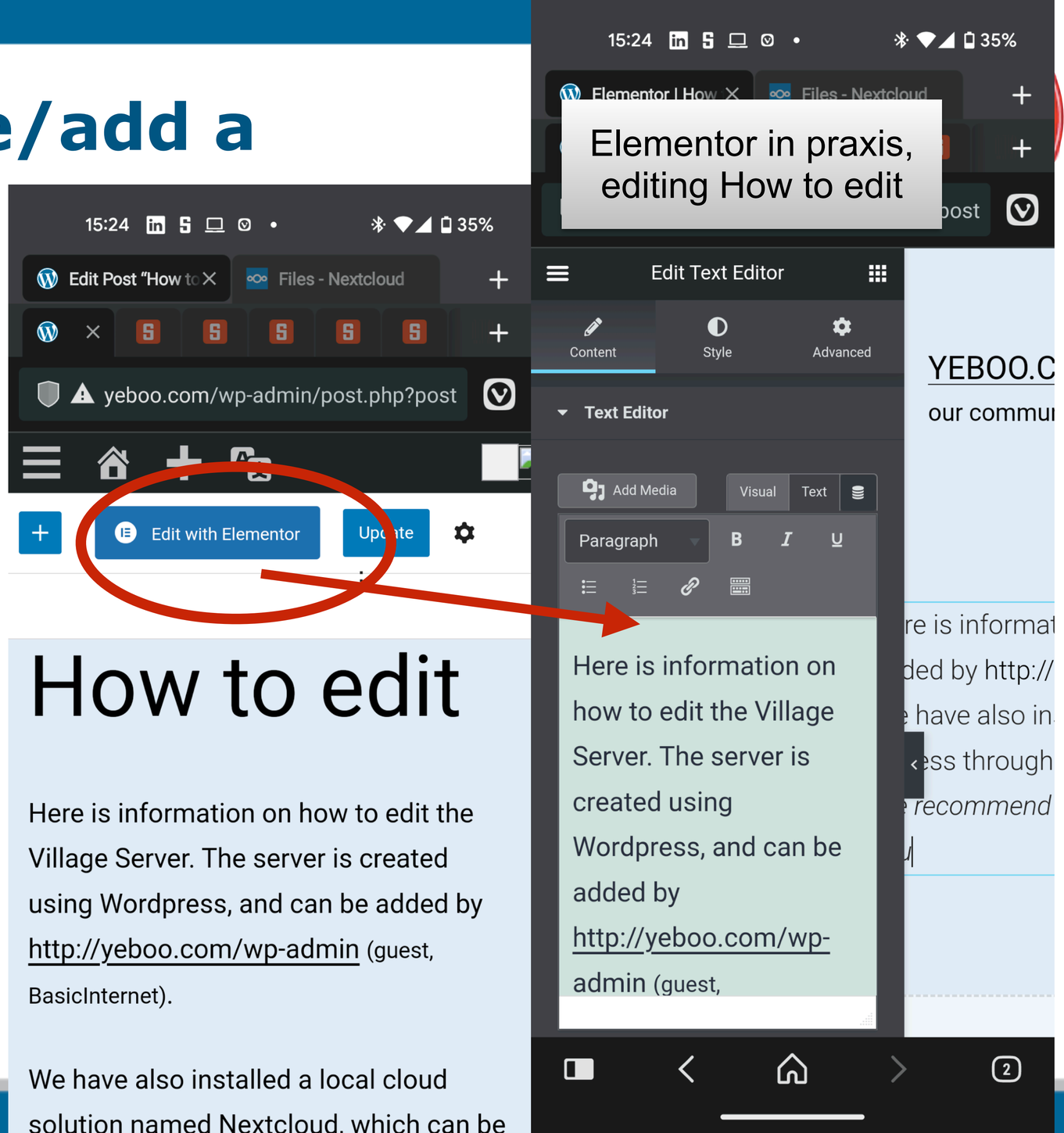




Using Elementor to create/add a new page

- Wordpress has two page editors
  - Block editor (default)
  - Elementor (easier to use)

- Suggest to use a PC/Mac to edit, too small on a Phone



Sharing information
- use Nextcloud
- on RPI: http://Yeboo.com:8080

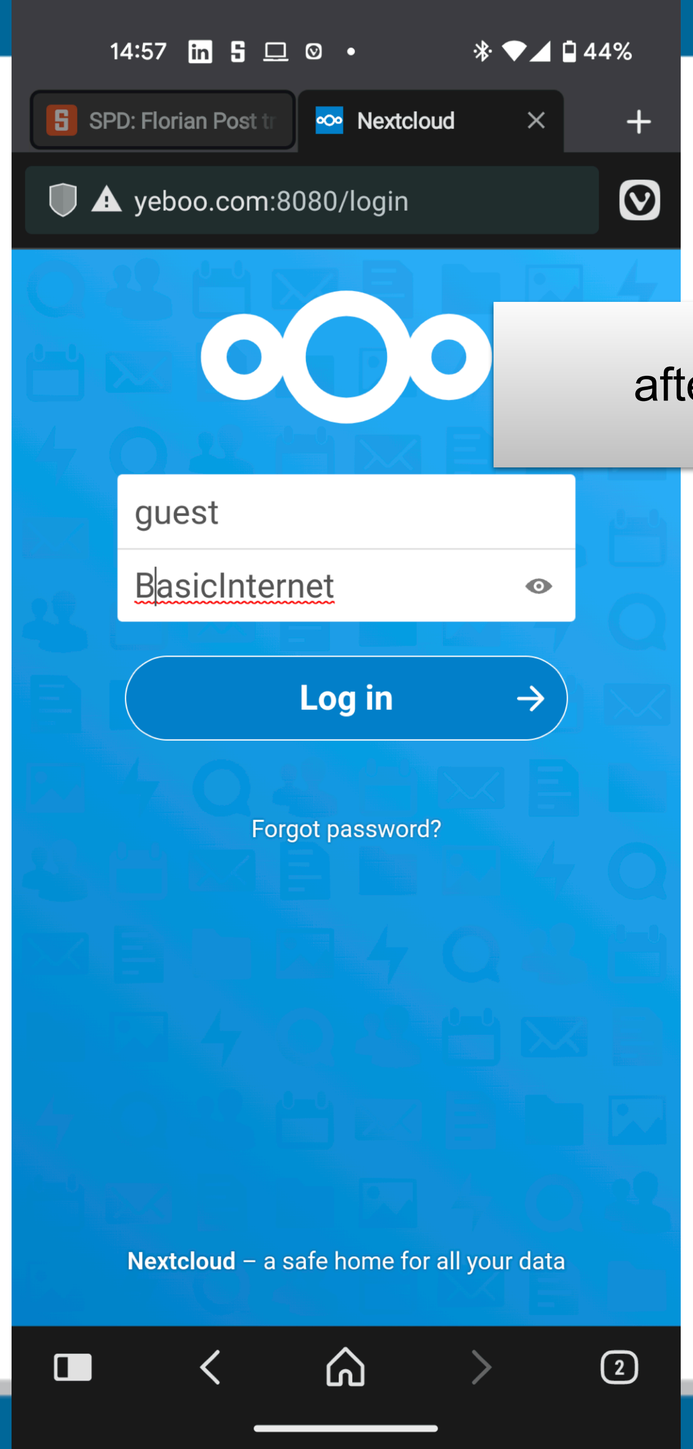
Nextcloud

http://Yeboo.com:8080

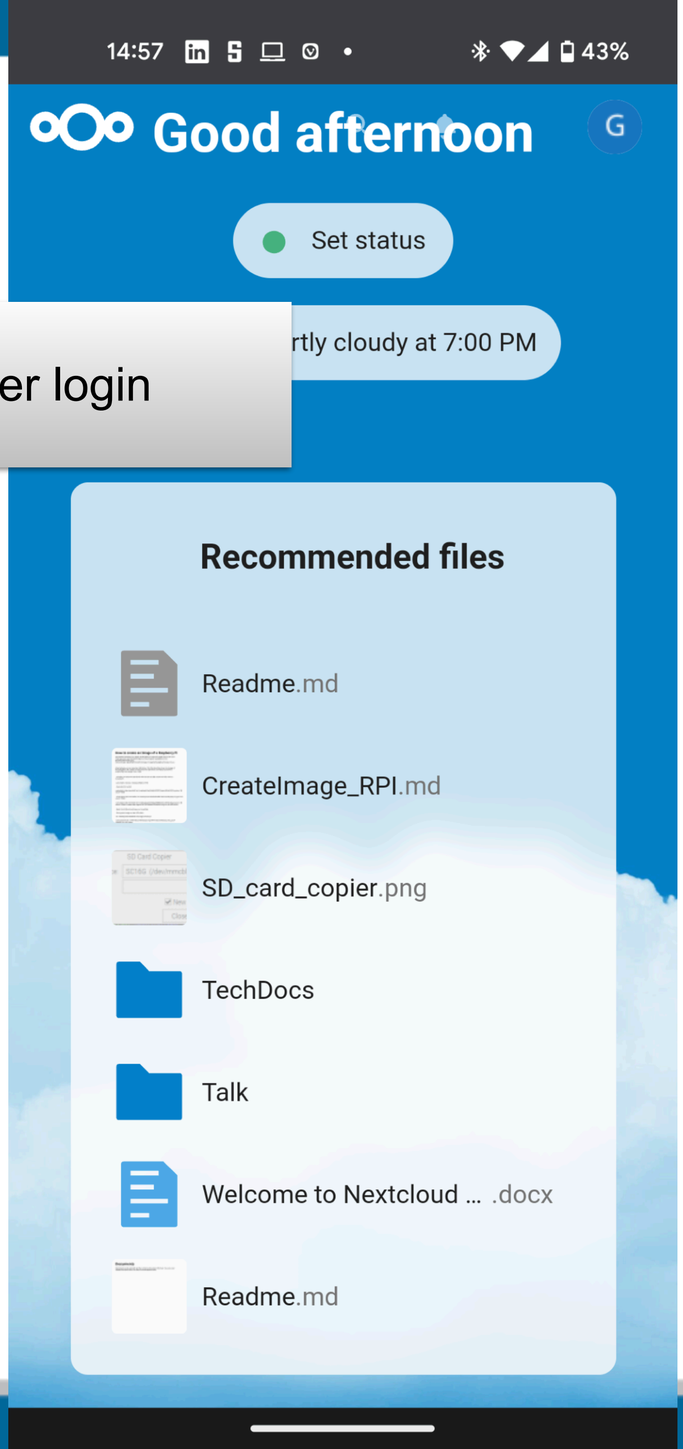
- Sharing files/information with others
  - have your own information space
  - Dashboard shows new information

- create users (admin)
- common folders (admin)

- login
  - guest, BasicInternet
  - admin, **********

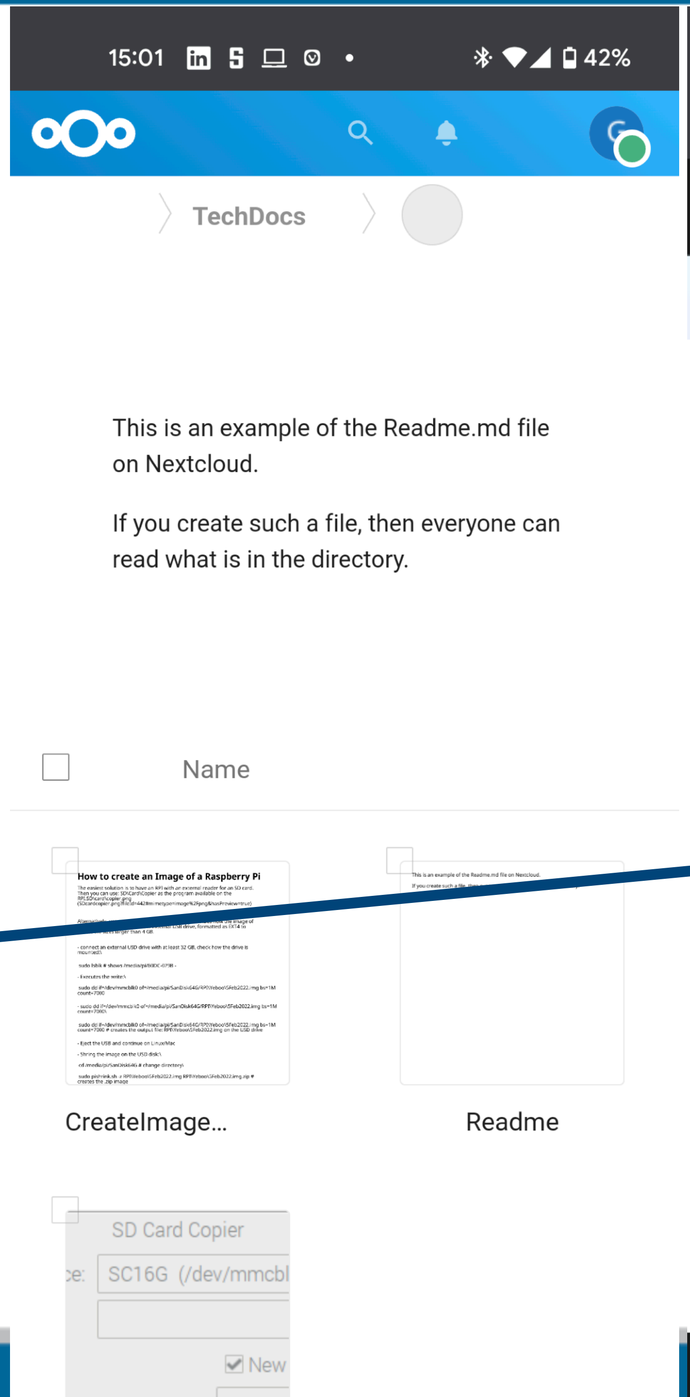


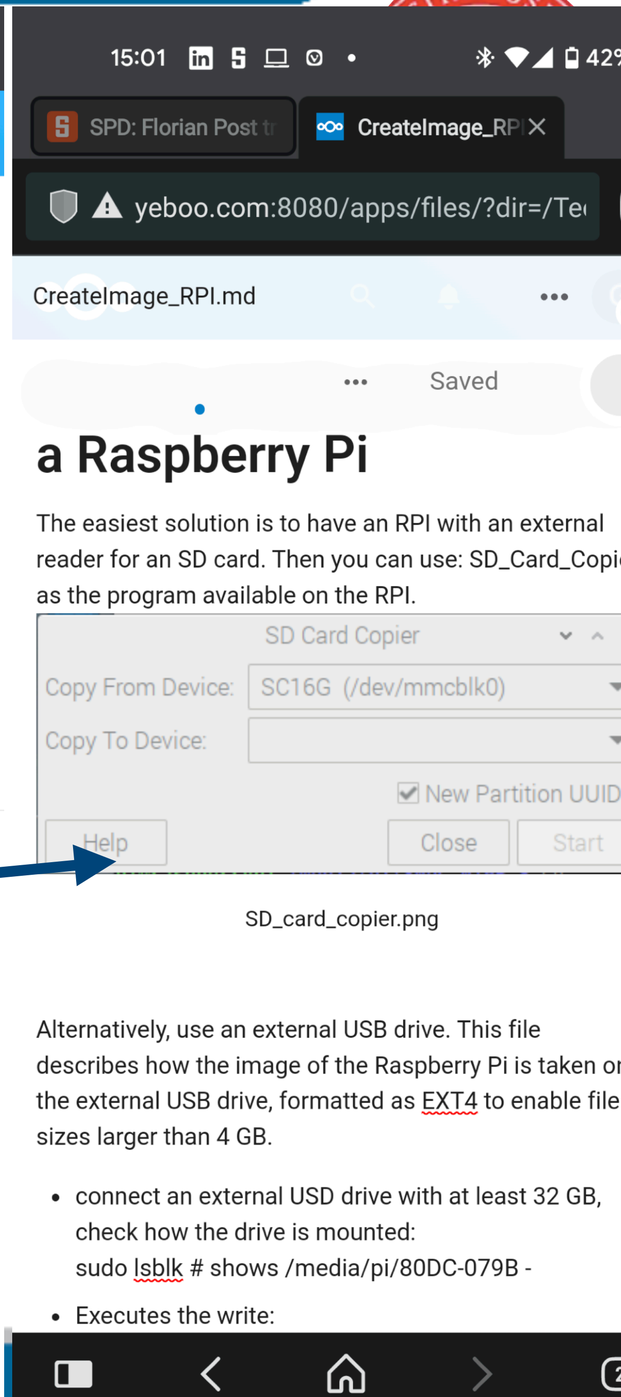
after login



File examples

- TechDocs is a directory shared with everyone
- Readme.md files are the ones that are automatically shown (if exist) in each directory
  - .md is the markup language, allowing **bold**, *italics*, lists, tasks and include pictures
  - see CreateImage_RPI.md as example

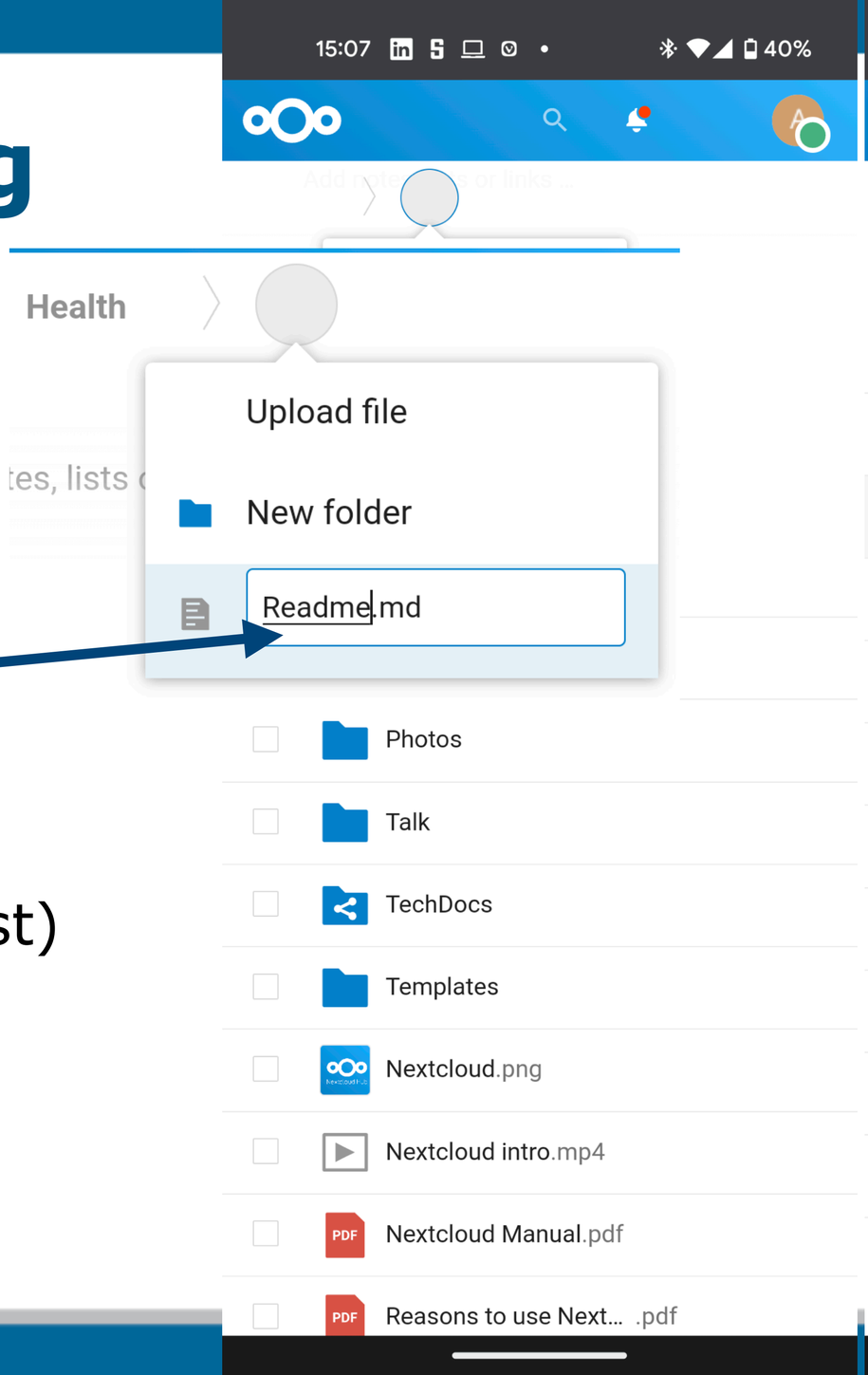


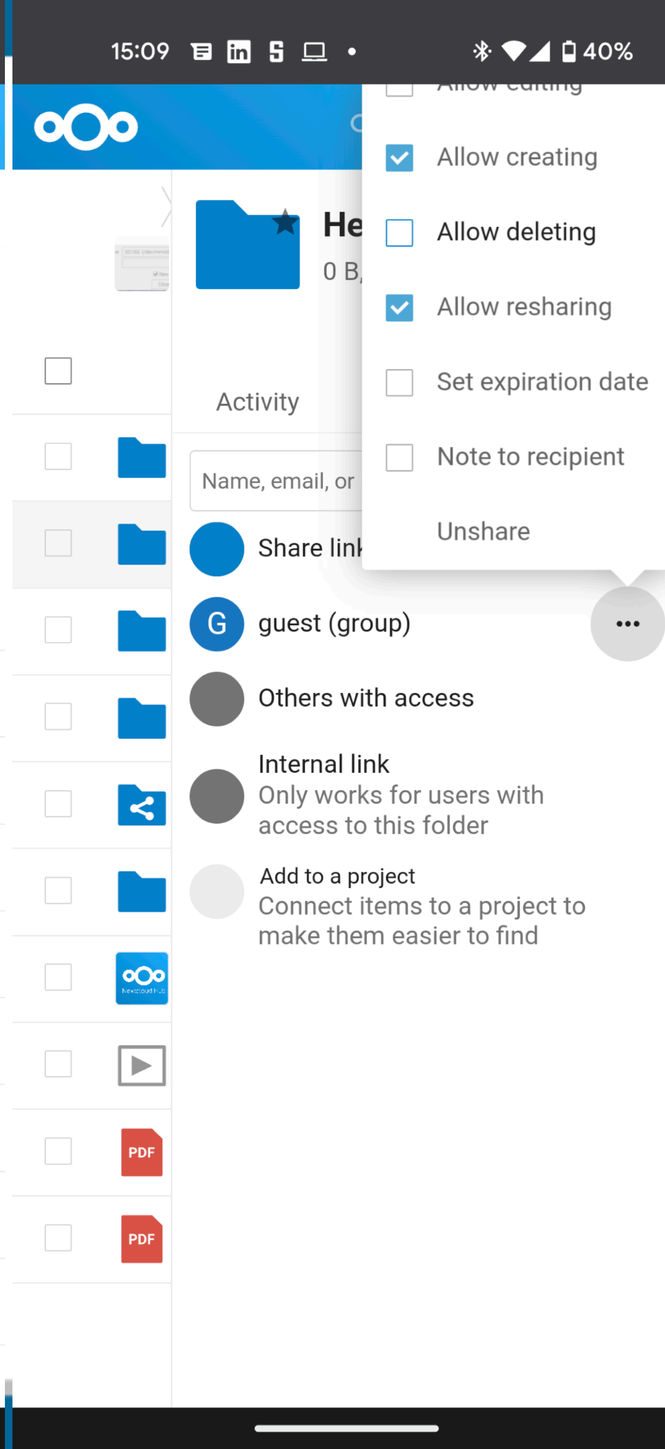


Basic file handling

- Upload files
- Create folders
- Create new text (.md) document

- Share files & folders
  - with existing users (here: guest)
  - through a public link (can be added to wordpress)

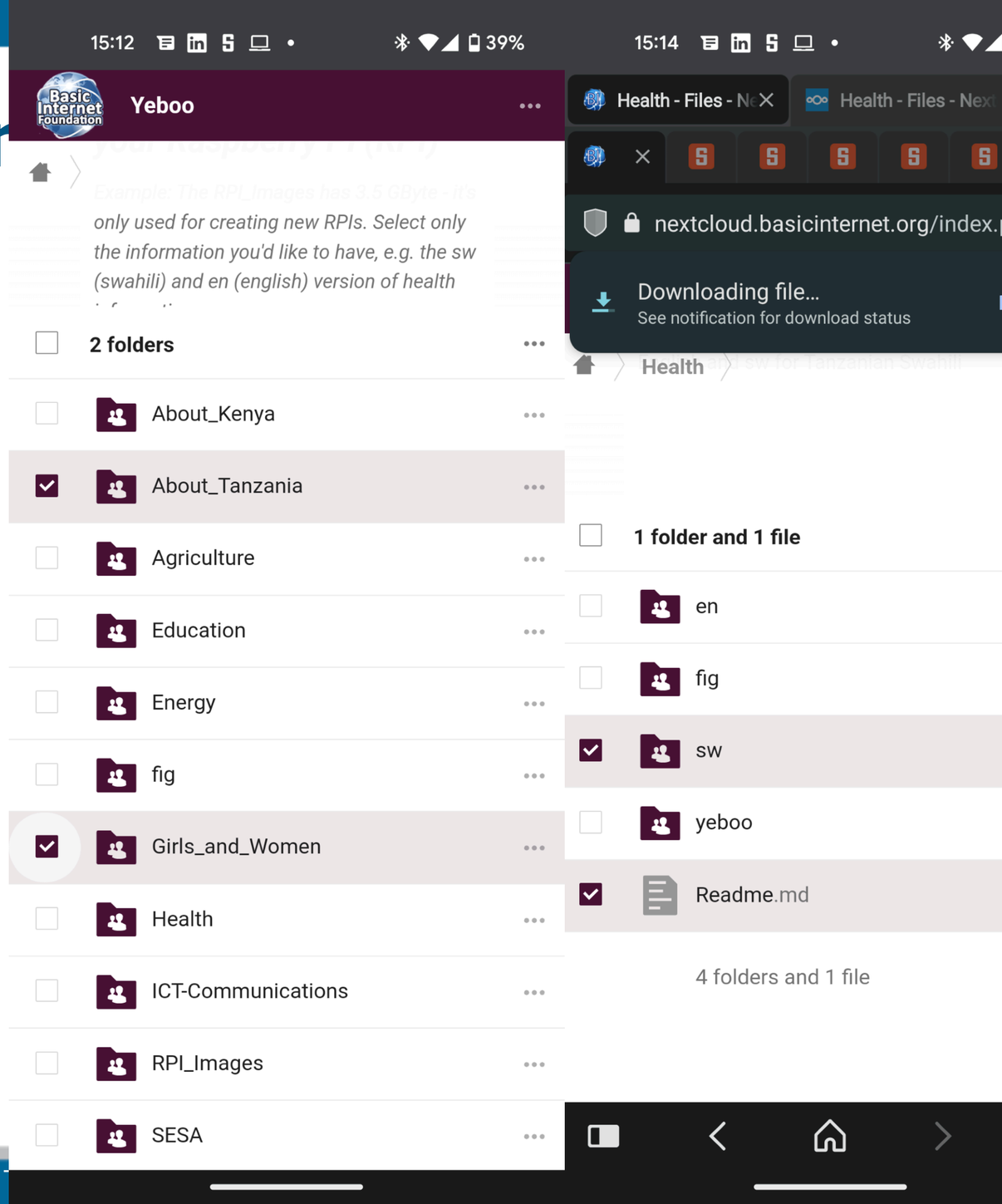




Download files from the Ir

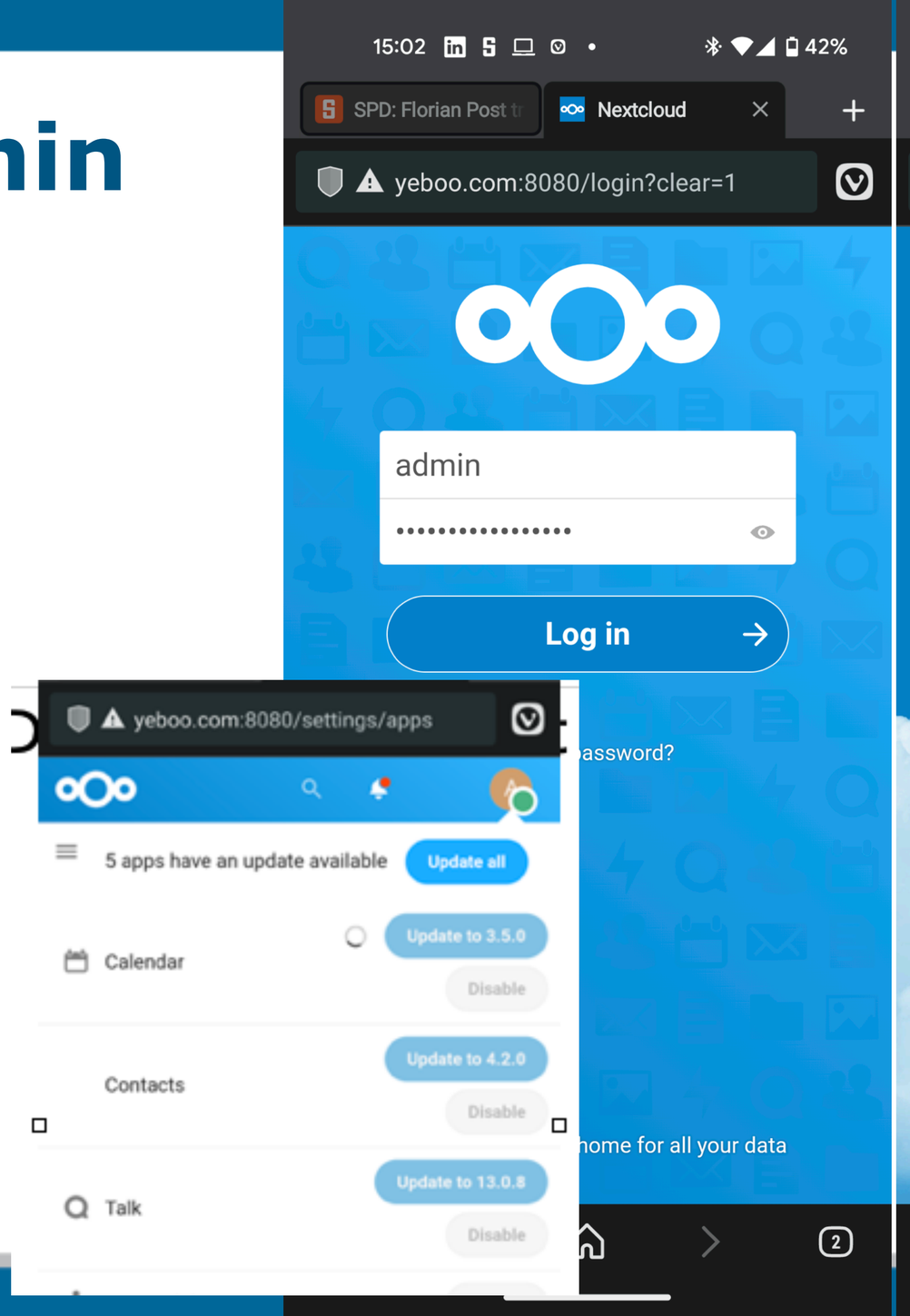
- Example: yeboo.BasicInternet.org

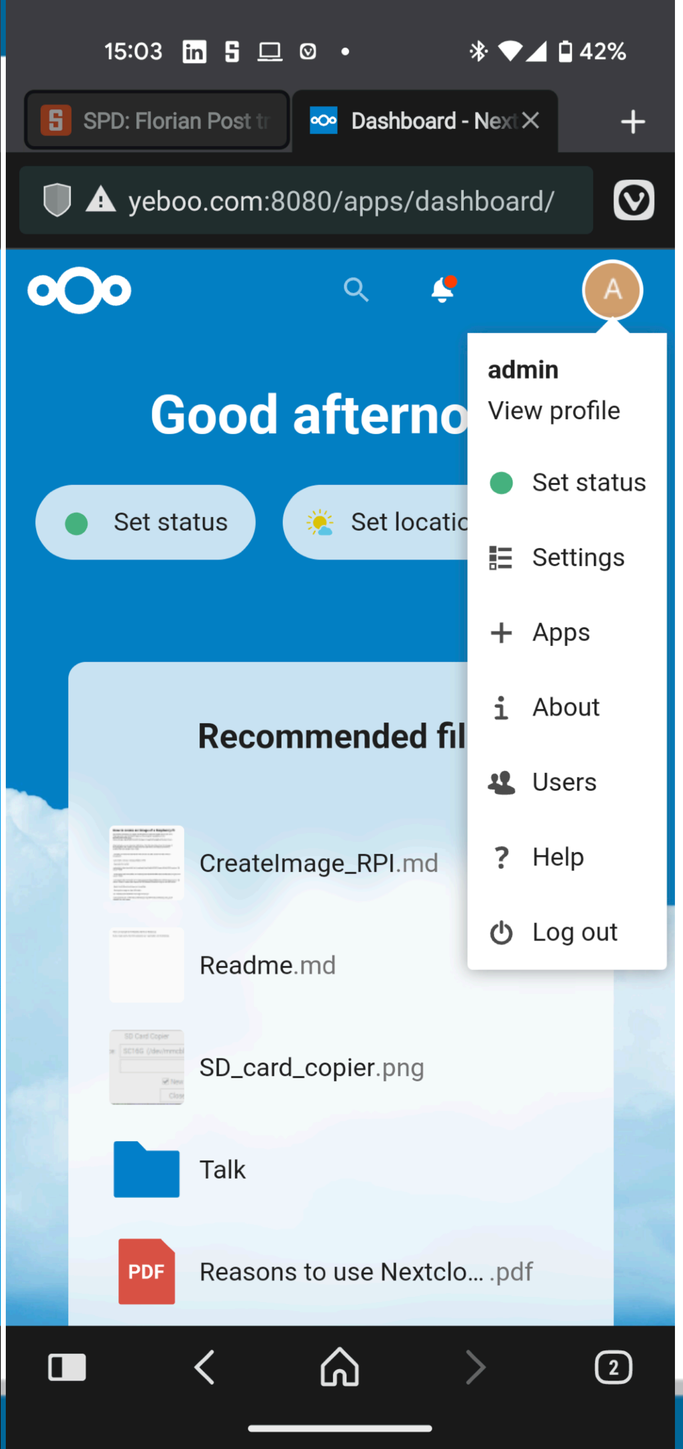
- Other download
  - YouTube downloaders



Nextcloud - admin

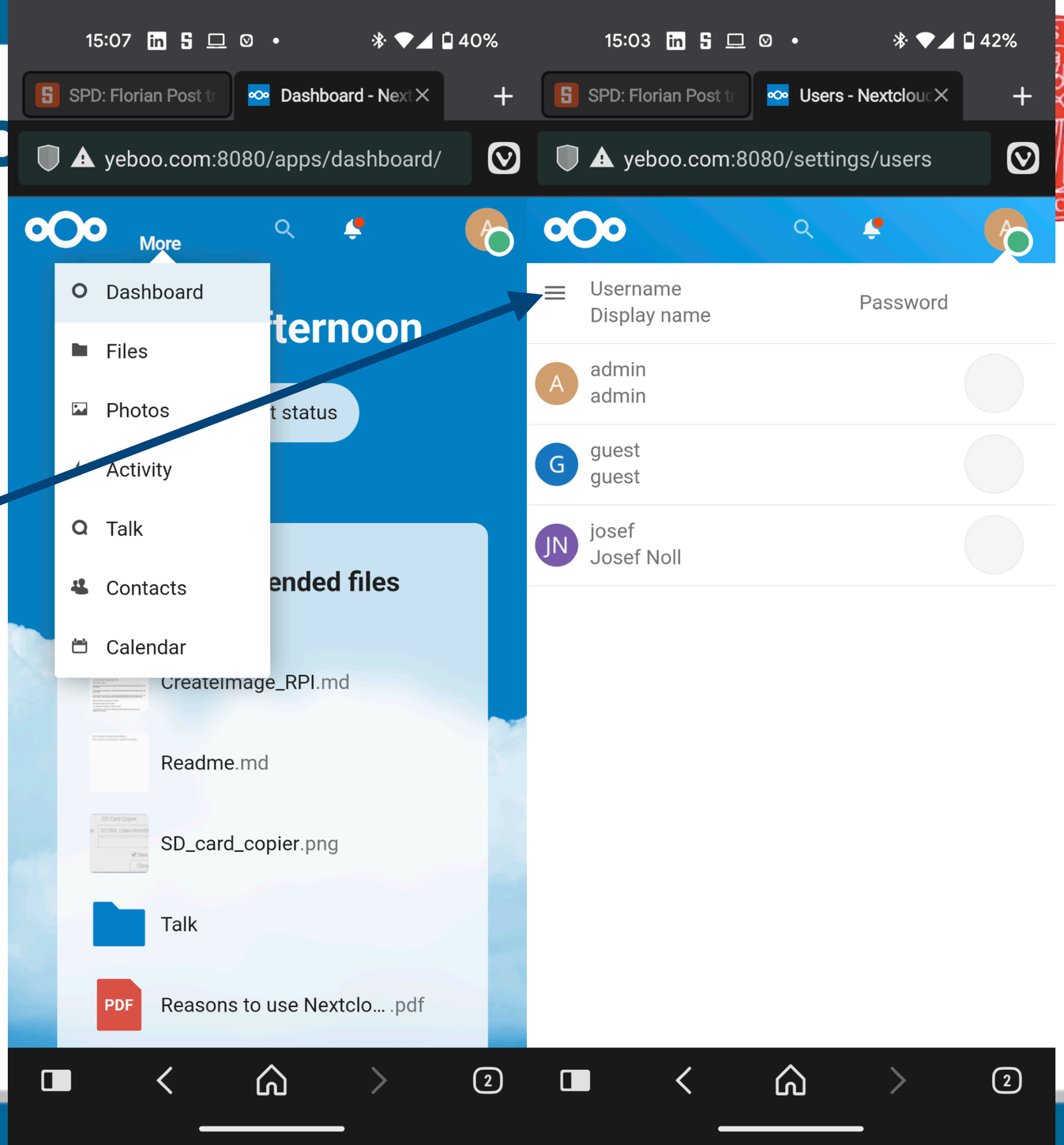
- Admin login allows administration
  - update of nextcloud
  - create users
  - create common folders
  -





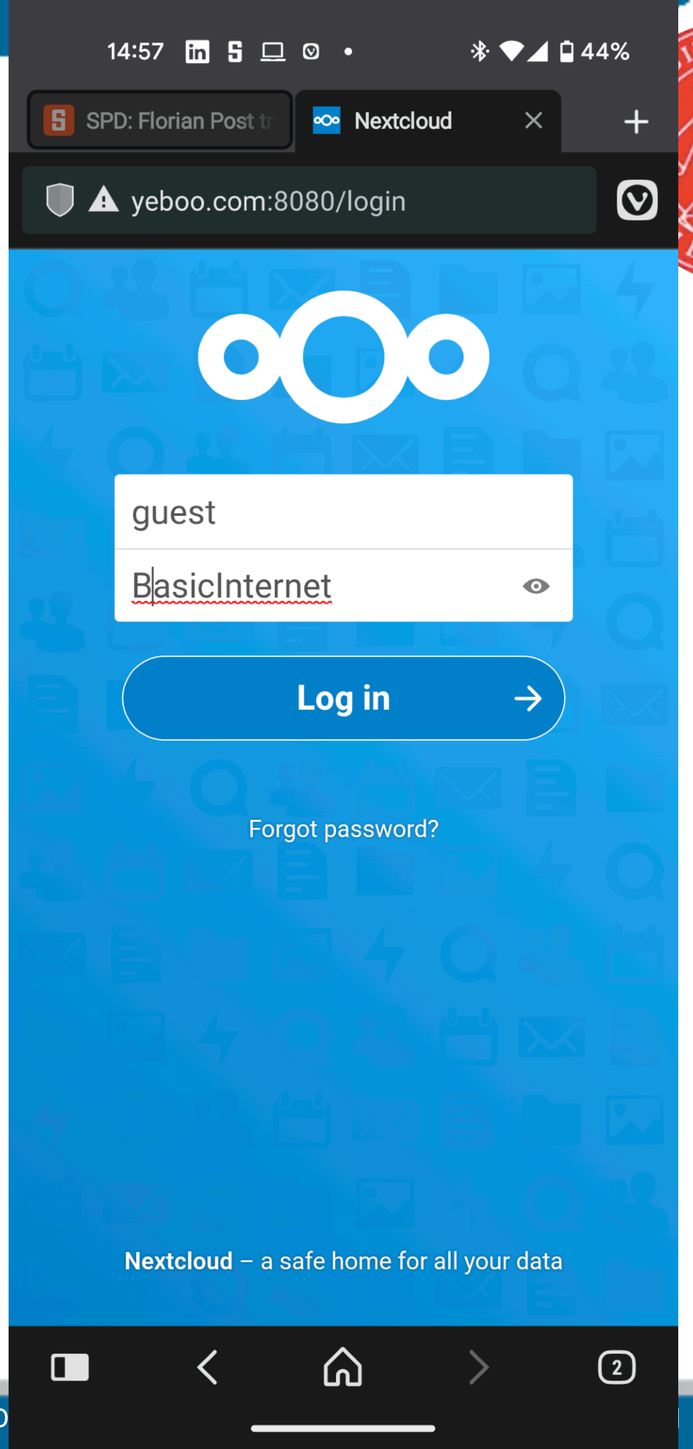
Admin: User creatio

- See existing users
- Create new users
  - click on the the 3 bars



Tasks

- Create a directory
- Create a Readme.md and write some text
- Download a video from yeboo.BasicInternet.org and place it on Nextcloud
- Share you file with others
  - create a public link



Lessons learned
Use the Raspberry Pi as School server

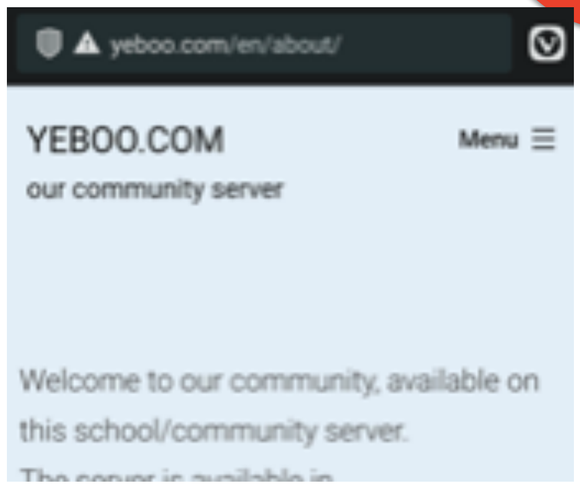
- What is a Raspberry PI
  - nothing else than a small computer
  - all information is stored on the SD-card
- Edit a web page
  - http://yeboo.com/wp-admin
- Add a video or other educational material
  - Use Nextcloud
  - create users
  - Share content



Challenges
InfoSpot content

3

- Internet of Things (IoT) for rural usage
  - services: microgrid, humidity,
- Usage monitoring
  - Wireless Network analysis
  - InfoSpot usage (GByte used)
- Remote update
  - Sync between remote server
    - nextcloud.basicinternet.org and local yeboo.com
  - Scripts on LNCC



Ideas

- [ ] Establish markdown (md) as in this file in Wordpress (install new plugin)
- [ ] Test the sharing to a local RPI (public link?)
- [ ] Add culture/music

School Connectivity (ET)

- Koye Secondary and Preparatory School
  - connected as part of African Innovation Week 2019
  - using mobile network
- Local knowledge portal
  - yeboo.com health information



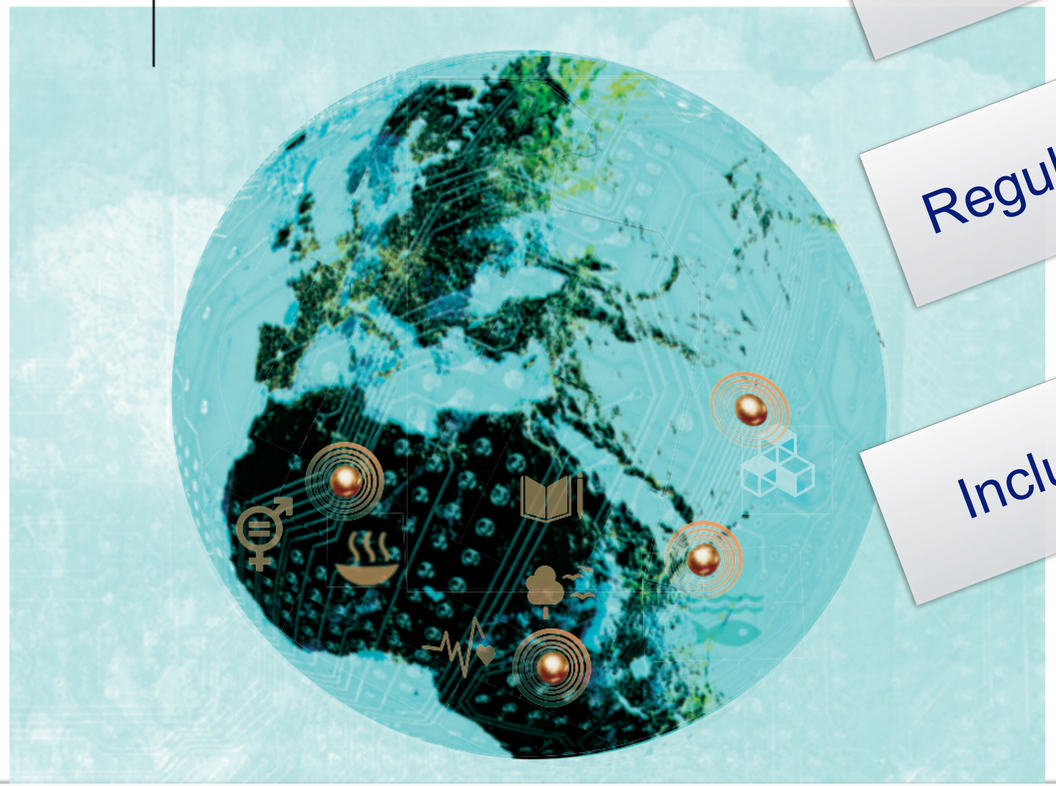


Addressing the Priorities of Norway

- Report to Stortinget 11 (2019-2020), Priorities
  - Access, skills, regulations, inclusion

- "Boys have the toys"
  - digital divide in both devices
  - and mobile broadband access

- Integrated model for digital inclusion
  - School connectivity (SDG indicator 4.A.1)
  - SchoolNet as Knowledge Portal
  - Knowledge transfer
  - Community involvement



https://www.regjeringen.no/no/dokumenter/meldst11_summary/id2699502/?ch=1

Conclusions: What if…

- Freemium Model,
  - Internet Lite, AMP, other lightweight
  - Realisation: whitelist, DNS,
  - Opera Mini
- School/Village Communication
  - 4G/5G MIMO, cell size
  - Communication to LTE antenna
- InfoSpot design
  - Internet of Things (IoT) for rural usage
  - Usage monitoring
  - Remote update, Scripts on LNCC

1. We adopt the model of the road?
   - free for pedestrians and cyclists // text & pictures
   - premium for cars // broadband
2. We establish Digital Information Spots ("InfoSpots")
   - in every village
   - solar power, Wifi hot-spot, phone charger, light
3. InfoSpot design and realisation
   - Health, Education, Agriculture, Digital,…



Access to Information - a basic Human right