



Intro to Various (Wireless) Network Tools

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Networking Tools



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- Wireshark:
 - Free and open-source packet analyzer
- Tcpdump
 - CLI packet analyzer
- Unix (and not only)Tools
 - ICMP-based: ping, traceroute
 - Iperf: network performance measurements
 - Netstat, nslookup, ifconfig, nmap
- PRTG
 - SNMP-based Intermediate-device performance monitoring



Networking Tools

- Cisco Packet Tracker
 - Cross-platform visual simulator



- GNS3
 - Network software emulator



- ns-3
 - Network simulator
 - App store



- OMNet++
 - Discrete event simulator
 - Simulation models and tools



SDN Tools



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- Mininet
 - Emulator
 - <https://mininet.org/>
- ComNetsEmu
 - Based on Mininet
 - <https://www.granelli-lab.org/researches/relevant-projects/comnetsemu-sdn-nfv-emulator>
 - Possible to integrate with other 5G emulators for evaluate 5G deployment
 - Includes network slicing
 - Examples: <https://www.granelli-lab.org/researches/relevant-projects/comnetsemu-labs>
 - Video: <https://www.youtube.com/watch?v=RWXaa7sKOA0&t=1s>

NFV Tools



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- NFVO (+ VNFM)

- ETSI Open Source MANO (OSM):

<https://osm.etsi.org/>

- OSM Ecosystem:

https://osm.etsi.org/wikipub/index.php/OSM_Ecosystem



Open Source
MANO

- VIM

- OpenStack



- Kubernetes



Virtualization Tools

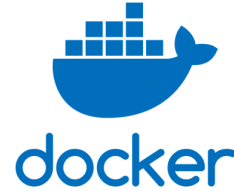


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- Creation of VMs



- Creation of containers



- Orchestration of VMs



- Orchestration of containers



MEC Tools



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- ETSI MEC Ecosystem:

https://mecwiki.etsi.org/index.php?title=MEC_Ecosystem

- AdvanteEdge



- OpenNESS
(not available anymore)



Security Network Labs



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https://seedsecuritylabs.org/Labs_20.04/Networking/



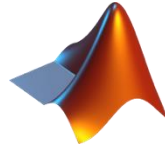
<https://www.handsonsecurity.net/resources.html>

5G Tools



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- Matlab
 - 5G Toolbox
- OMNet++
 - simu5G
- ns-3
 - 5G-LENA



5G Tools



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- OpenAirInterface



- Ueransim



- Open5GS

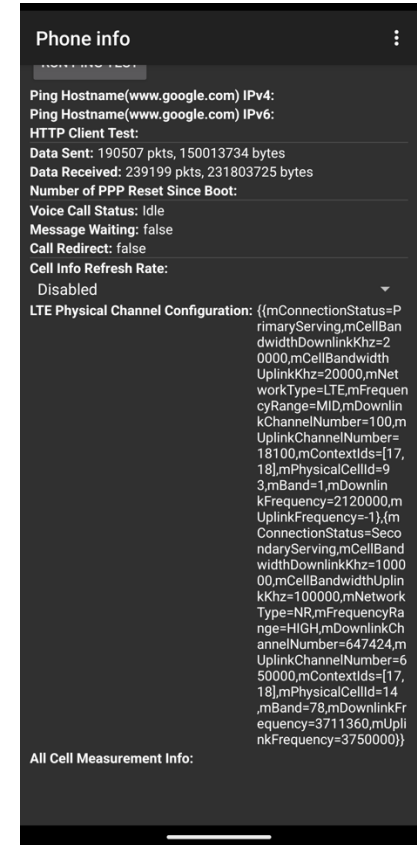
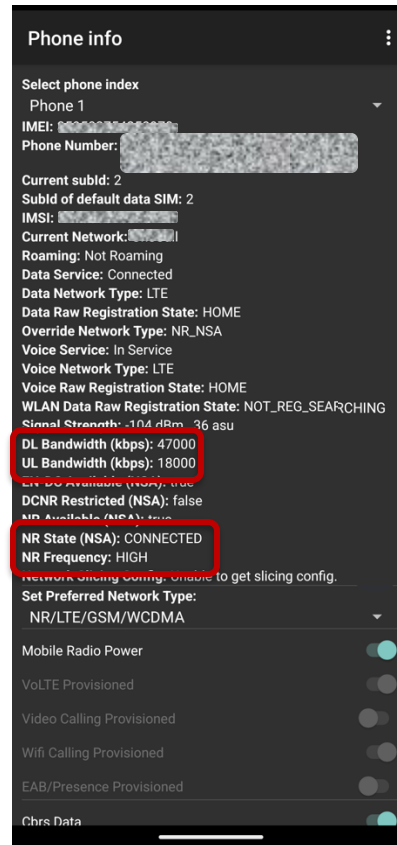
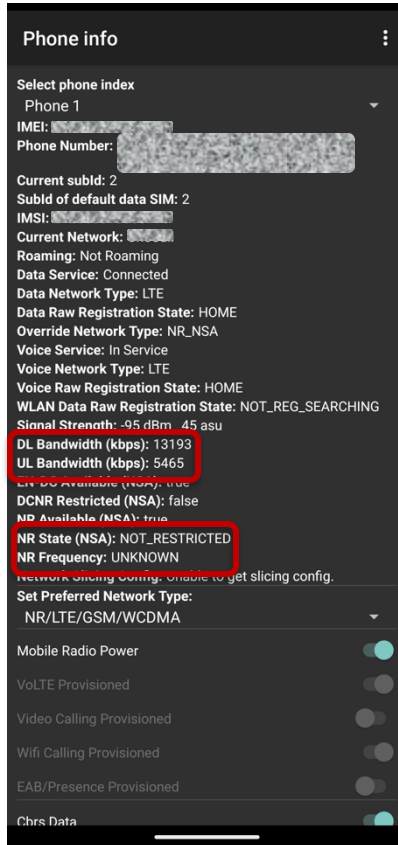


- Info about cell connectivity: G-NetTrack, CellMapper, ...
- Or see advanced cellular settings codes on your phone:
 - **Android** `***#4636***`
 - **iPhone** `*3001#12345#*` (*Not tested! Be careful!*)

Example



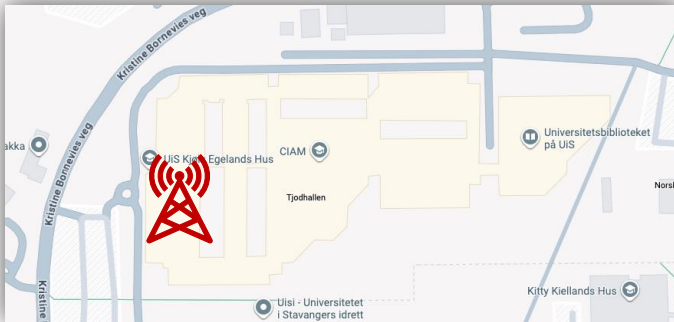
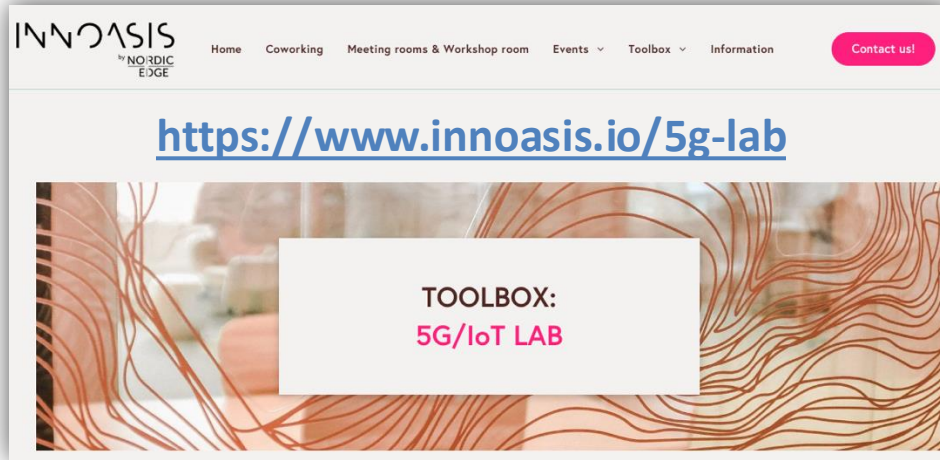
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Lyse's 5G Testbed



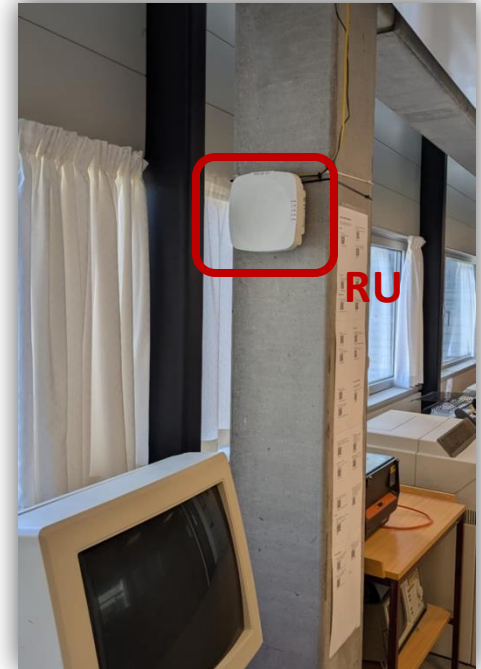
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Public 5G

Private 5G:

- 5G Core and one Radio Unit (RU) at Innoasis
- One RU at UiS
- One at new hospital

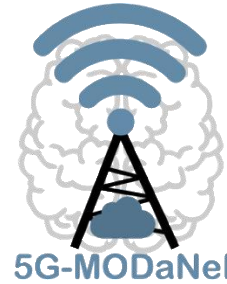


5G Project at UiS



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- 5G-MODaNel



The Research
Council of Norway

- Funded by the Norwegian Research Council
- 5G Multi-access Edge Computing
- Security and dependability
- AI-based orchestration of resources



5G-MODaNeI Testbeds: Private 5G



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5G-MODaNeI Testbeds: Edge Computing



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- 3 High-Performance NUCs
- 4 Servers
 - 2 +1 with GPUs on Openstack
 - 1 with GPUs
- Carrier-grade Switch