

- Mobility
 - Basic Internet (free access to basic information (text & pictures) on the Internet)
 - inverse MVNO: the customer owns the access network
 - WLAN system for video communication
 - ... (any other topic which you might find interesting)
- for further information, see [F1-Future_Networks](#)

Seraj

Technical

Kazi : buz mode
 "disruptive innovat
 → customer own

Yun Ai : Distribution of inc. waves in microcell

Qihao Li : WIMAX for video system

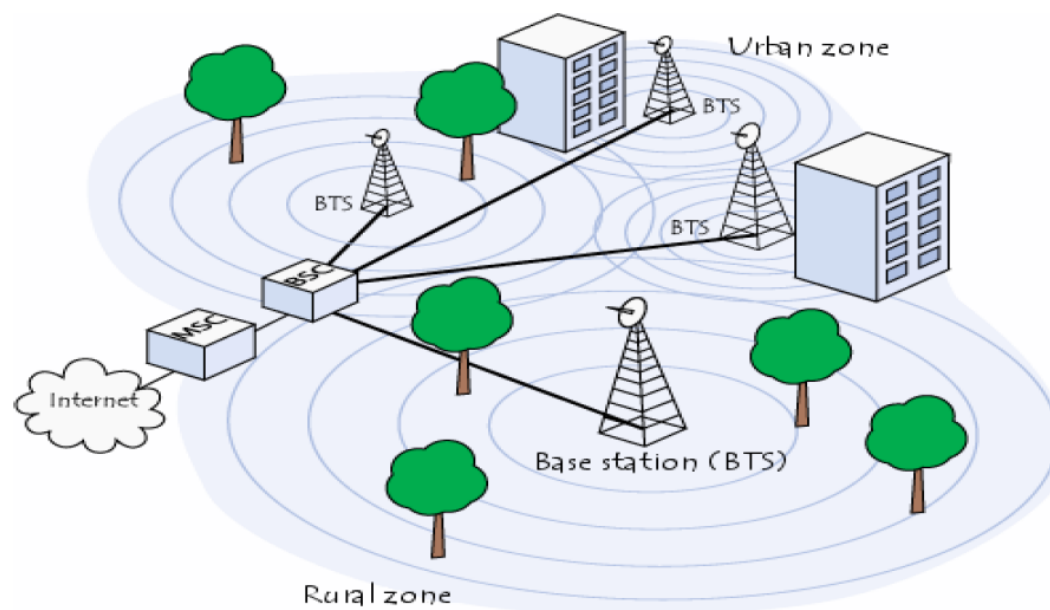
Raul : WiFi for video system

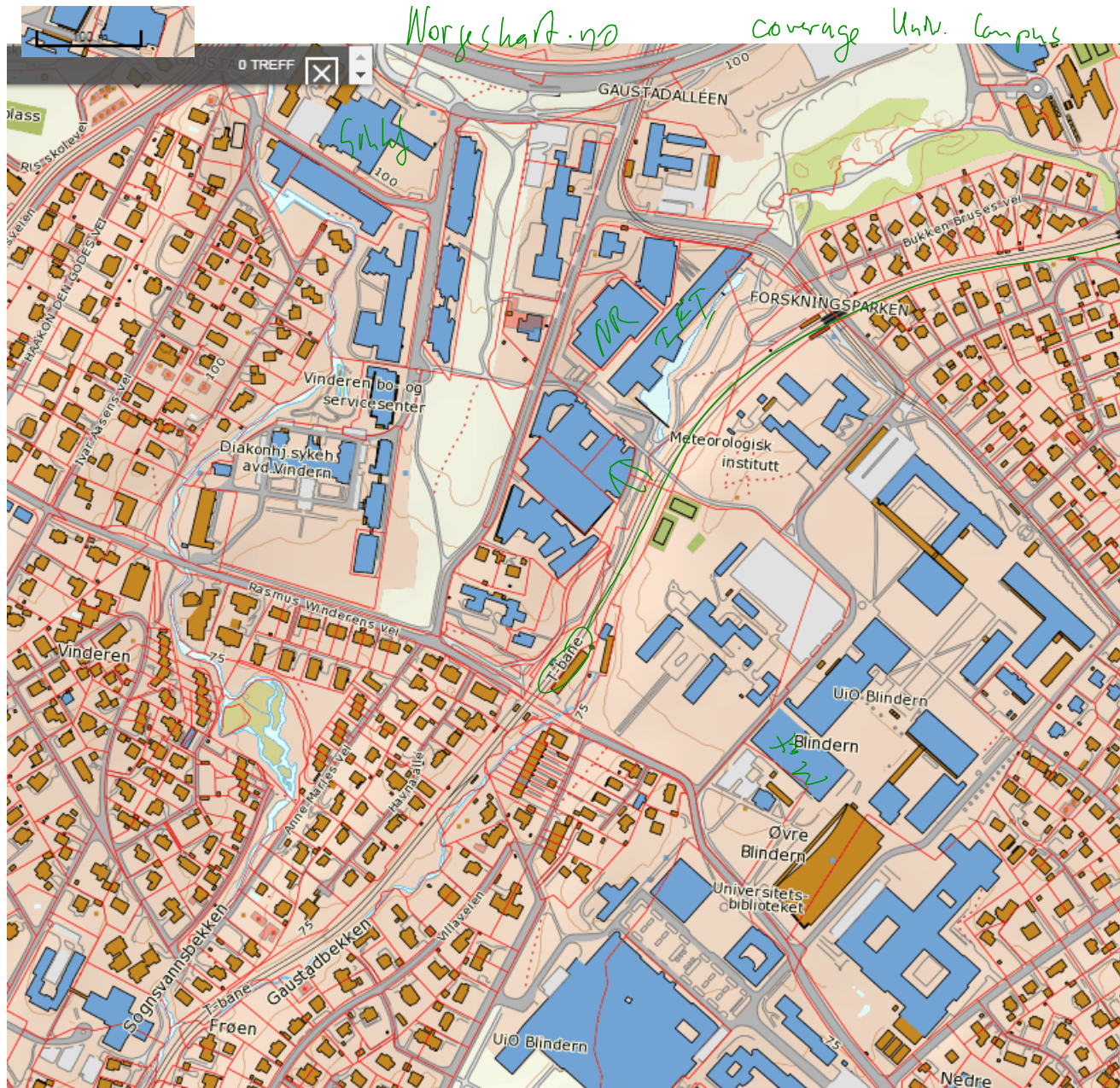
- Invers Mobile Network operator - Network aspects, by Seraj [File:Invers-Mobile-Network.pptx](#)
- Invers Mobile Network operator - Business aspects, by Kazi [File:Invers-Mobile-Business.pptx](#)
- Distribution of incident waves in Small Cells, by Yun Ai [File:Incident Wave Small Cell.pdf](#)
- Lecture notes: [Media:20141114Scenario_MobileOperator_overview.pdf](#)

Assignments Part II


MVNO Simulation

Building MVNO for a university campus such as Oslo university
(macro)





← → ↻



pt Post- og teletilsynet
Norwegian Post and Telecommunications Authority

NPT.NO OM TJENESTEN ORDBOK OM STRÅLING KONTAKTINFORMASJON **HJELP**

Finnsenderen

- Trådløse mikrofoner
- Strålingskalkulator

-- Velg fylke --
-- Velg kommune --


Adresse
Postnr
Søk
Nullstill alt

Vis sendere i kart

Tegnforklaring

- Radio- og TV
- Mobil

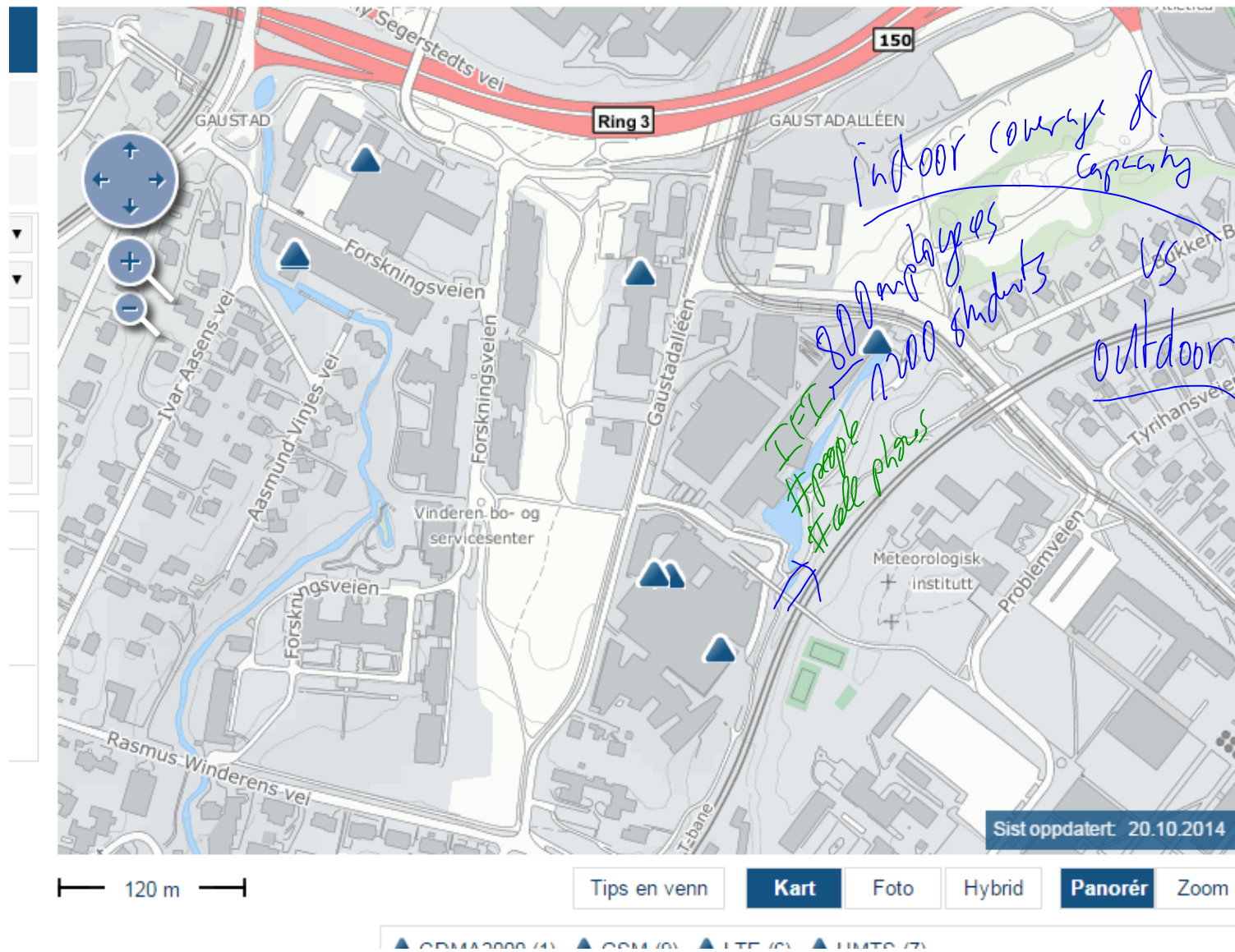
Vis alle
 Radio og TV
 Mobil



Sist oppdatert: 20.10.2014

468 km

Tips en venn **Kart** Foto Hybrid **Panorér** Zoom



SUI Path loss model

Statistical model

~ measurements

Stanford University Interim (SUI) can be used for frequencies above 1900 MHz. $PL = A + 10\gamma \log_{10}\left(\frac{d}{d_0}\right) + X_f + X_h + S$

PL = Path Loss in dB

A is free space path loss

d = distance between the transmitter and receiver

d_0 = 100m used as a reference

X_f = Correction factor for frequency

X_h = Correction factor for BS height

S = Shadowing

γ = Path loss component

reference area

20141114Scenario_MobileOperator_Seraj.pdf - Adobe Acrobat Pro

File Edit View Window Help

Open Create [Icons] Customize

5 / 9 102% [Icons] Tools Fill & Sign Comment

Antena Gain

Handset →

relevance for scenario? [RF]

➤ Transmitter and Receiver (Tx/Rx) Gain.

- Dipole 2 [dBi]
- Biquad 8 [dBi]
- Helix 15 [dBi]
- Parabolic 24 [dBi]

? → ? Relevance

5

View or add comments

LTE => f = 2.6 GHz

interaction:

Cable loss and Rain loss

for my scenario

$$\frac{\lambda}{10} < l < 2-3\lambda$$

$$10 \text{ cm} < l < 30 \text{ cm}$$

$$\lambda = \frac{c}{f}$$

~~Rain loss: absorption of a microwave radio frequency (RF) signal resulted from atmospheric rain.~~

rain -> > 10 GHz

relevance!

Cable loss: absorption of a microwave radio frequency (RF) signal resulted from sender and receiver cables.

Shadowing ← trees, landscape, buildings

$$\lambda = \frac{30 \text{ cm}}{f [\text{GHz}]} = 10 \text{ cm}$$

Outdoor to indoor loss
indoor loss (walls, floors)

Additional Points

Depending on previous description we will do the following:

- Divide the campus into cells (may be sectoring is required)
- Providing each cell with femto and micro cells depending on density of users.
 - (kilo meters)Microcell, picocell(30 80 meter), femto cell(used in highly dense urban areas "indoor").
 - Divding the frequency resources among the stations(micro and femto)
- Calculation of requied transmited power.
- How to know number of user could be supported by our network. Given (bandwidth of channel, data rate and SNR (assume, e.g. 10 db)

Outdoor

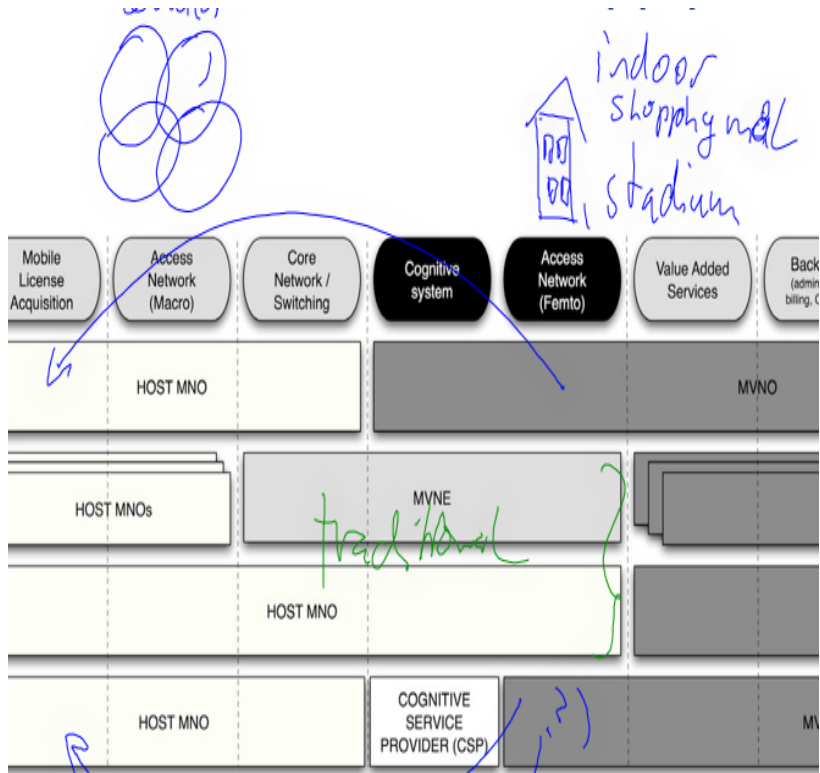
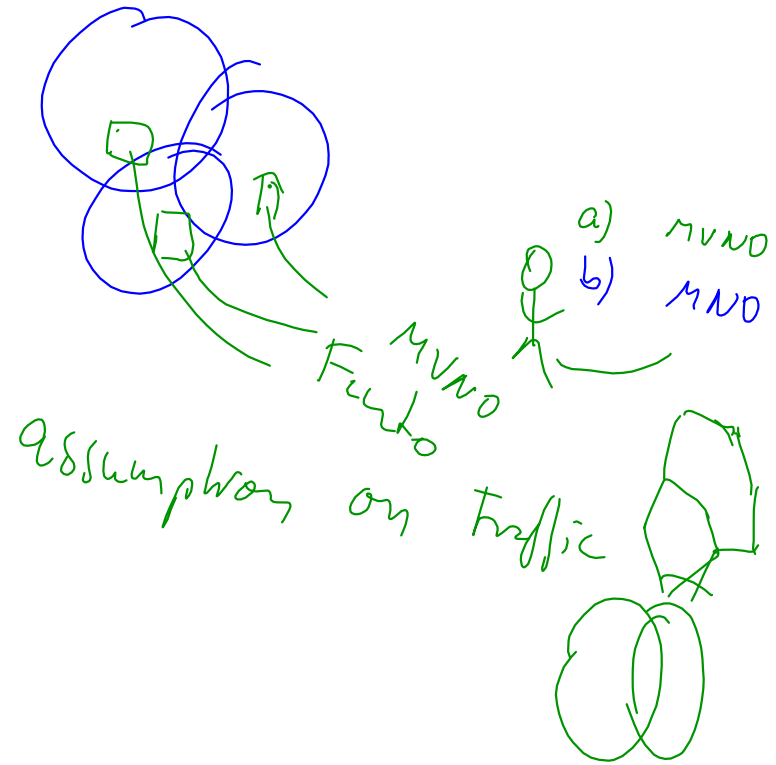
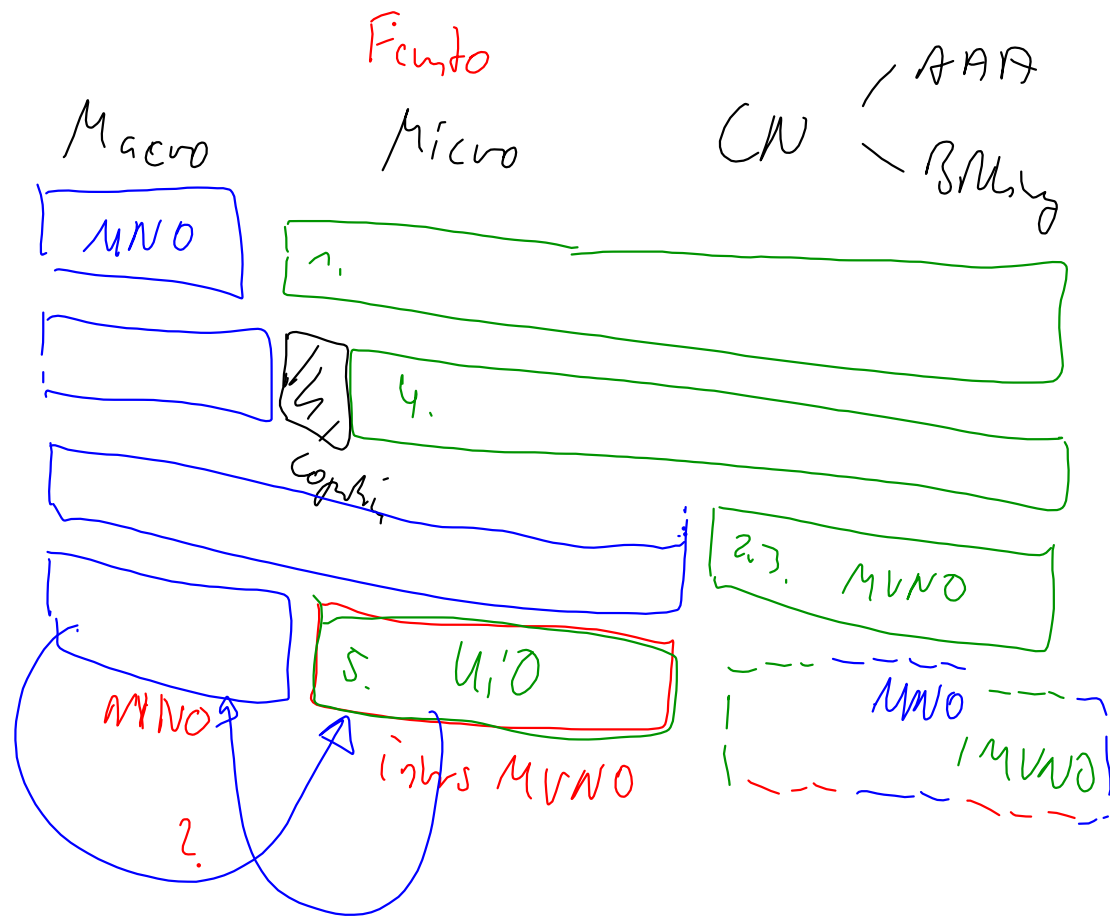


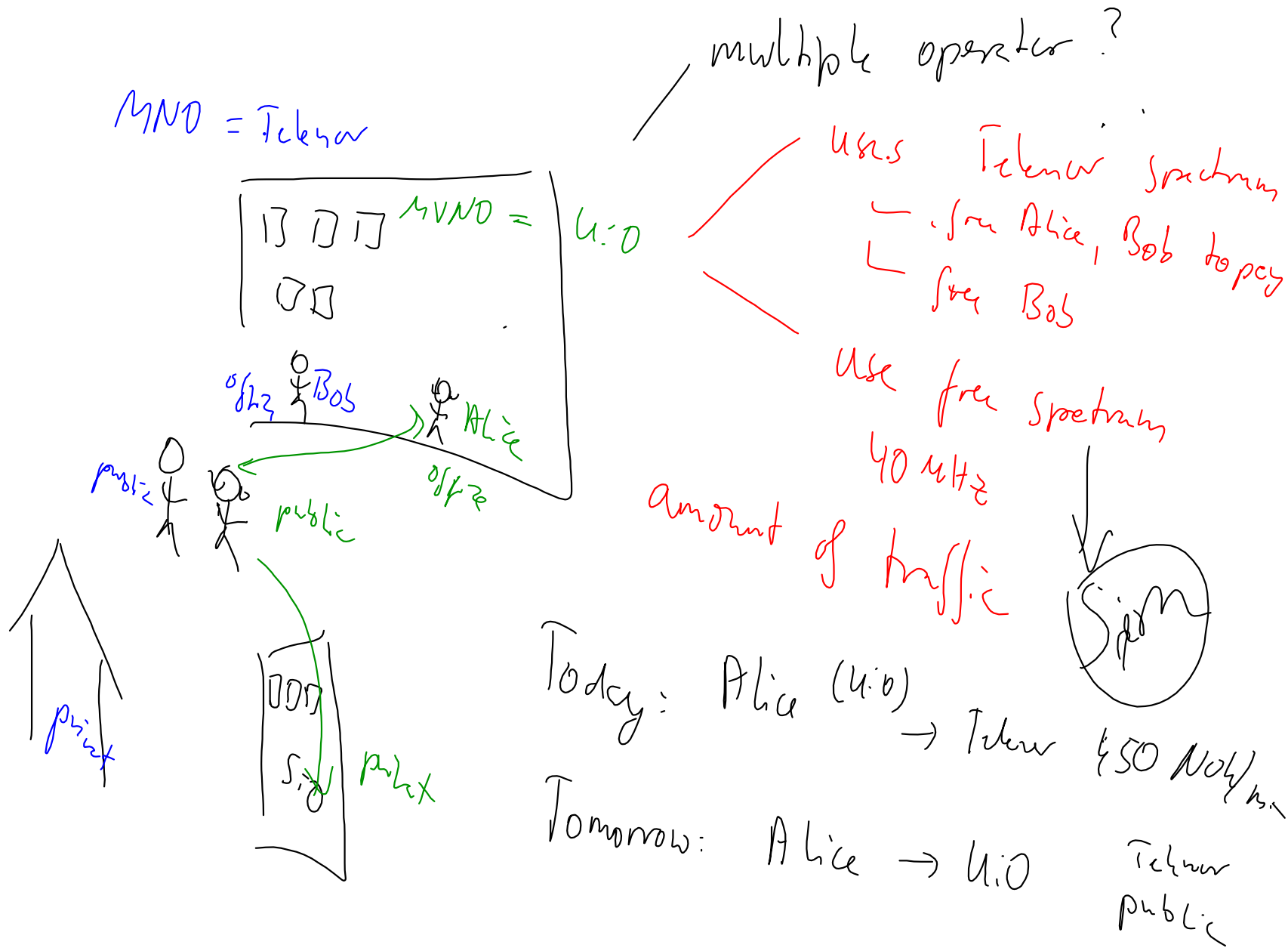
FIG. 1: A COMPARISON OF DEPLOYMENT SET-UPS, BASED ON THE ROLES AND ACTORS IN THE MOBILE SUPPLY CHAIN

freq 20/40 MHz
adaptive Freq





- ### Parameters
- traffic amount
 - handover
 - security
 - business options
 - MNO agreements
 - Spectrum costs
 - MNO
 - fem spectrum



Currently:

	Revenue
MNO	75% (?)
MVNO	4% ?

Red arrow from 75% to 4% with label "eats"

My outcome:

if MVNO owns Fento,
will his Revenue increase?

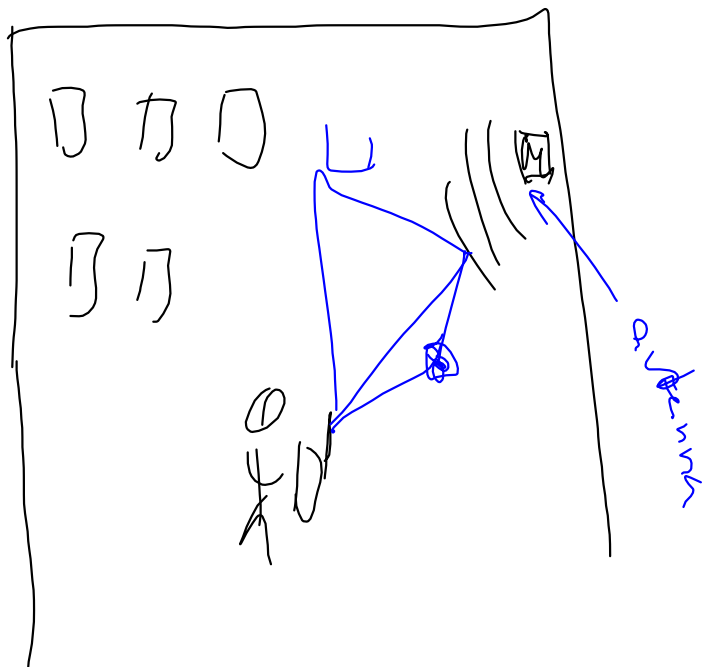


Starting point = current biz models

Bob — 0.8 GB data/monthly with phone...	office	home	friends Macro? Fido	Macro- bett public usage
Alice — 4 GB data/monthly				

Purpose ?

- Introduction ✓



What is the expected Outcome ?

- Comparison models through Simulations
- Literature review
- impact of scatter distribution
- antenna

Micro-cell geometry

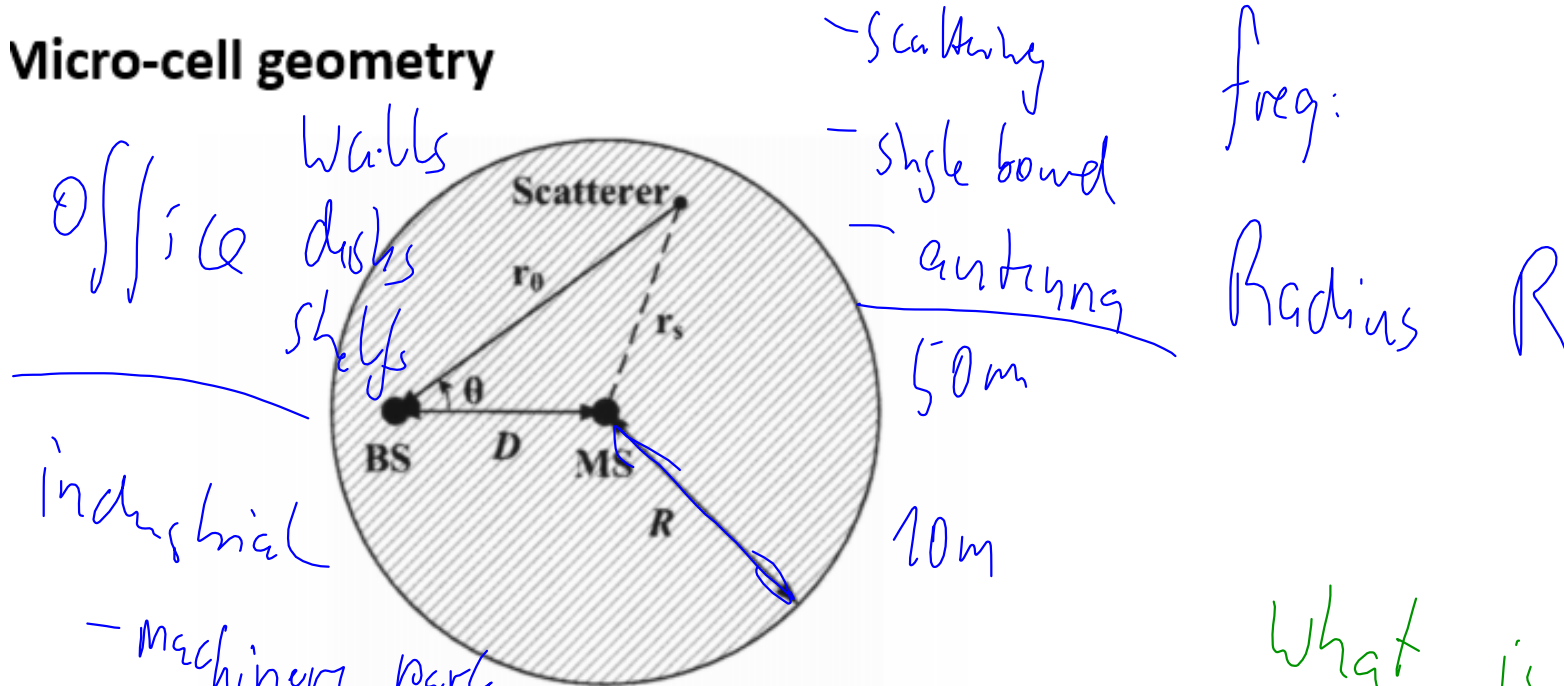


Figure 1b. The scatterers' spatial support region in the proposed indoor model, with the base-station (BS) transceiver lying among the scatterers.

What is important to classify my scenario

Mid-term evaluation

- learning outcome
- different
- like