

$$mms = // \text{Lux} \cdot \text{unih.no} / 308$$

Assignments Part II

Part II assignments

- Cell capacity, System capacity
- Traffic Modelling
- 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

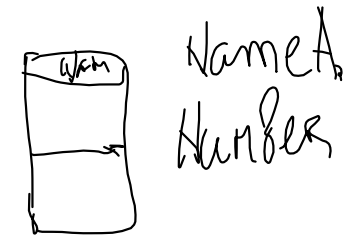
Kazi : buz model
"disruptive innovation"
→ customer "owns"

Yun Ai : Distribution of inc. waves in microcell
Qihao Li : WIMAX for video system
Raul : WiFi for video system

Wifi / WiMAX video distribution system

20,000.

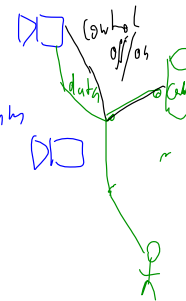
10.000





Questions to Raul

- real or simulation
 - ↳ mobile phones with U.F.I + camera
 - laptop with Web Cam
- cyclists (video from behind?)
- distances → $\hookrightarrow$ specific dimension [m], [km]
- equipment: what
- spectators at home, Spectators along the track?
- central server
 - ↳ all data?
 - ↳ only signalling
 - separate data stream
- network & antenna topology
- type of antennas, range



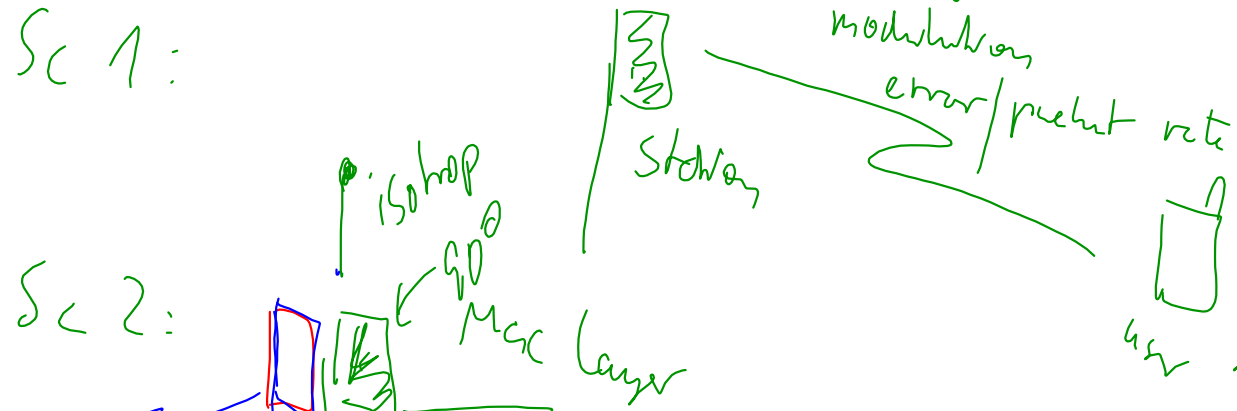
Real outcome?

- simulation of capacity
- " of bandwidth
- References / literature $\Rightarrow$ state-of-the-art

Video over (WiMAX) $\rightarrow$ Wi-Fi;
physical

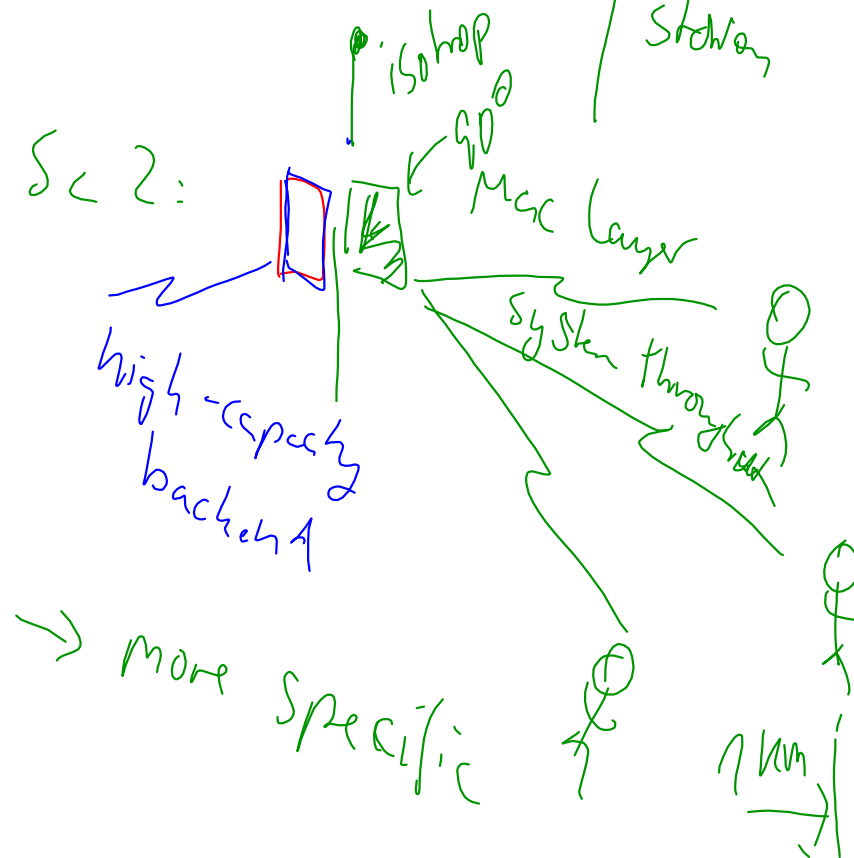
Buz: heavy stuff

Sc 1:



802.16 e
 $\Downarrow$
LTE

Sc 2:



of people 5-10 ... 1000

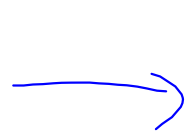
range

802.11 ac $\leftarrow$ or 802.11n

$\rightarrow$ more specific

Output

Literature

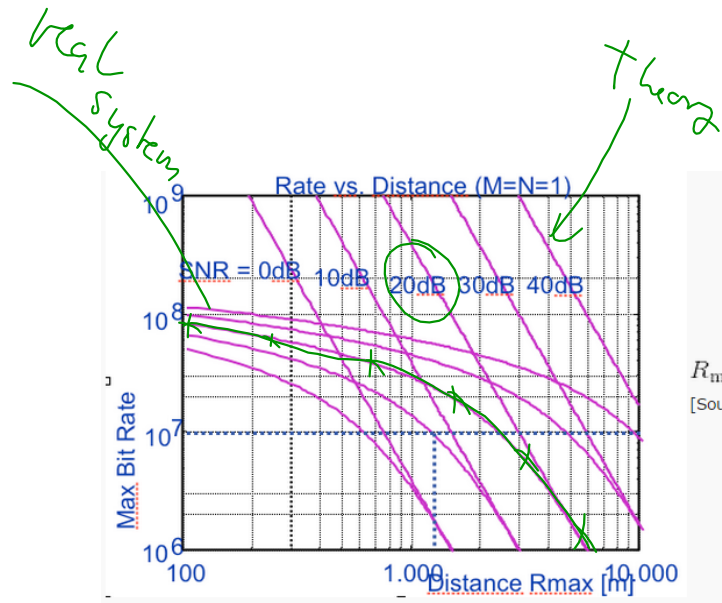


②

Curves

⑦ (models)

③

interpolation / linearisation
is only valid for

$$R_{\max} = \log_2(1 + \text{SNR})$$

[Source: Valenzuela, BLAST project]

$\gamma_{un} A_i$: incoming waves in micro cells

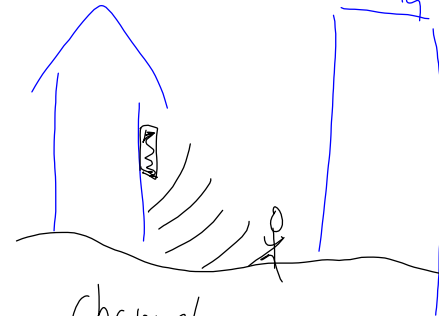
Macro ~ Range isotropic vs directional antenna
~ 1.5... 10km

Micro ~ 300-500m
(1km)

Pico }
Femto } Small cell
Nano }

indoor
~ 50m

"Outdoor
street lamp"
stadium



Channel
- reflection
- scattered
- diffraction
- frequency

- mobility
* - type of traffic
- bandwidth

$f \sim 2.6 \text{ GHz}$

Outcome:

- angle of arrival from mobile terminals

* narrow-/wide band

LTE = 2.6 GHz

LTE₁₈₀₀

LTE₉₀₀

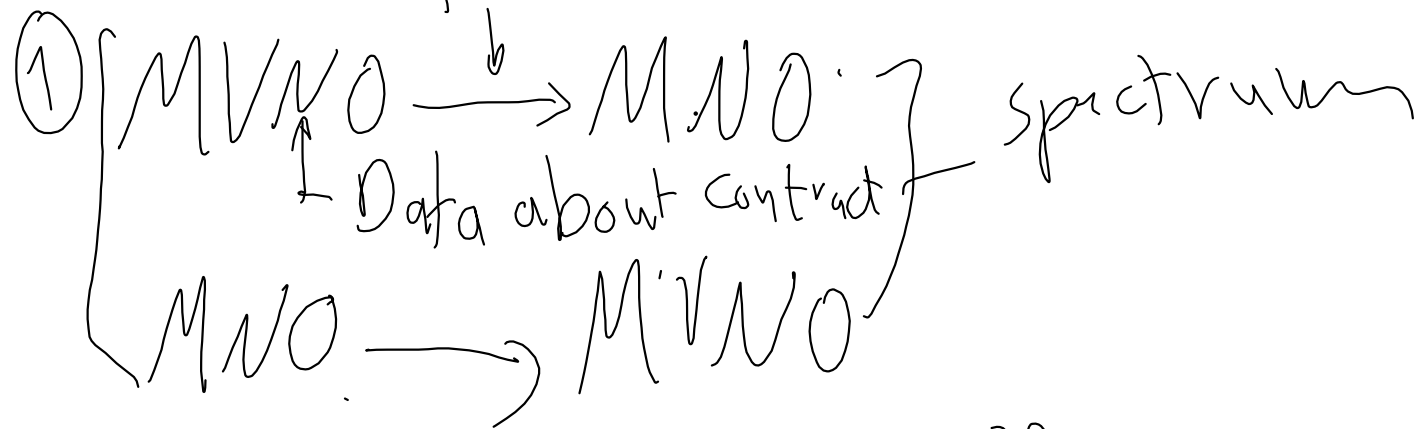
LTE₄₅₀

$f = 450 \text{ MHz}$

LTE at 450 MHz

$$G \sim \left(\frac{D}{\lambda} \right)^2 \sim \frac{1}{25} G_{2.6 \text{ GHz}}$$

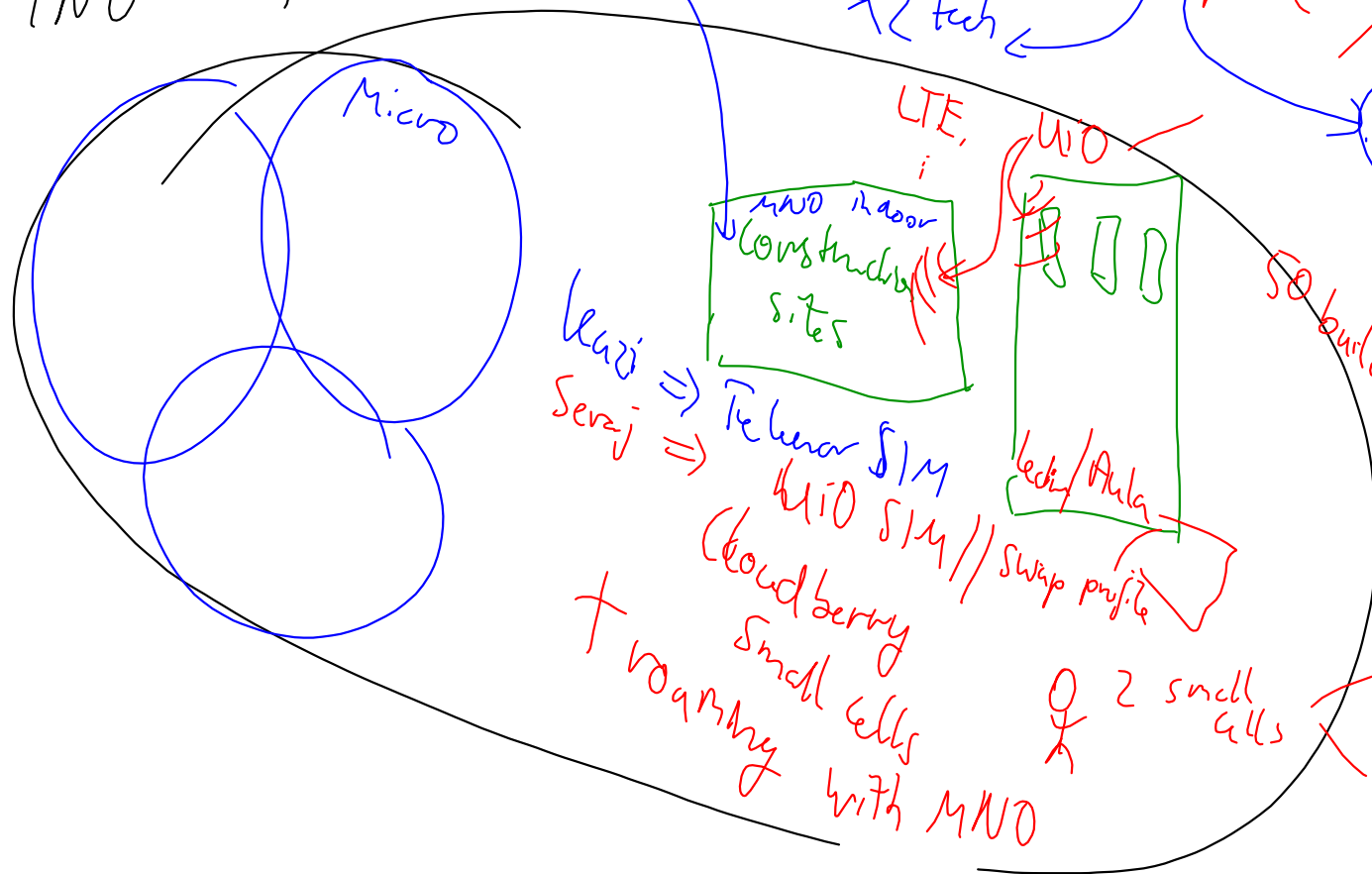
Kazi, Seraj — invers MVNO
 Rent from



② $\rightarrow$ ① U-map Customer Data
 $\rightarrow$ ③ MVNO $\rightarrow$ 2MNO $\rightarrow$

Future network

- Capacity
Spectrum is owned by MNO
MNO Macro



Options:

U.O has agreement with foreign operator

Cloud berry

$f = 2.6 \text{ GHz}$
2.1

new / disruptive
tech

SE, WL

spectrum is free available

BU = for Comm.
50 buildings 40 MHz
100 MHz

technical questions

Quiz questions

traffic handover

Signalling

Coverage interference

$BW_1 = 40$ interference
or 700 MHz

how much traffic

base stations $\leftarrow$ $\rightarrow$ SIO

indoor, outdoor camp,

Case: - foreign operator

Suraj - T-Mobile ← Roaming

4.0

Tenor

Traffic split: U.O campus $\leftrightarrow$ Telecom
 - home for cell $\rightarrow \approx 80\%$ 20%

- home fcn to cell $\rightarrow \sum 80\%$

Customer?

H_2O , SiO_2

Cloud berry

type of service

Voice → termination fee

← who owns equipment
- SIM (customer)

Cooperating access points

power, interference

SiO, Telenor?

↳ "SSID" : Network
: 4.0

Security

[From coverage to quality: building the future network Δ](#), Femtocells - Building the Quality Network for Mobile Operations - Oslo, 28 Oct 2010

Ayaz Khan Afridi, "[Macro and Femto Network Aspects in Realistic LTE Usage Scenarios Δ](#)", Master Thesis, Network Services and System in Department of Electrical Engineering, Royal Institute of Technology (KTH), Stockholm, Sweden, May 2011.

Standalone Femtocell Operator Business Case | Use Cases ...

www.thinksmallcell.com › Business Case › Use Cases ▼

Nov 14, 2013 - This led me to reconsider if there is a **business case** for an operator to launch with a **femtocell** only approach. Femtocells do require the ...

The screenshot shows a Google search interface with the query 'femtocell business case' entered in the search bar. Below the search bar, there are tabs for 'Web', 'Images', 'News', 'Videos', 'More', and 'Search tools'. The 'Web' tab is selected. The search results indicate 'About 32,600 results (0.37 seconds)'. The first result is titled 'Business Case for Femtocells - Unwired Insight' with a link to www.unwiredinsight.com/femtocell-business-case. The second result is a PDF titled 'FEMTO FORUM FEMTOCELL BUSINESS CASE WHITE...' with a link to www.3gamericas.org/.../Femto%20Forum%20Business%20Case%20Whi.... The third result is a PDF titled 'Navigating Operator Business Model Concerns for Femto...' with a link to www.motorolasolutions.com/.../Business/.../Femtocells/_.../Navigating_Ope.... The fourth result is a PDF titled 'Femtocells: The Market and Technology' with a link to www.theiet.org/policy/panels/comms/femtocell/simon-saunders.cfm?....

Summary

- be specific (numbers!) of your use case
- literature (CWI, Google scholar, ...) state of the art
- Assumptions (reduce complexity)
 - ↳ why?
- expected outcome

Future steps

Today: "rough" scenario (area)

7 Nov detailed scenario
+ literature SOTA → idea about outcome
State of the art

14 Nov start simulations "framework"

⋮

27 Nov - 5 Dec (?) Simulation results
+ Presentation

Feedback

IBM's Watson Supercomputer Destroys Humans in Jeopardy ...



www.youtube.com/watch?v=WFR3IOm_xhE ▼

Jan 14, 2011 - Uploaded by Engadget

IBM's **Watson** supercomputer destroys all humans in **Jeopardy**. »

Subscribe To Engadget Today: <http://bit.ly/engadget> ...

About 296,000 results (0.53 seconds)



Jeopardy! IBM Challenge - Day 1 - YouTube

www.youtube.com/watch?v=uMpPT_2gADM ▼

Feedback