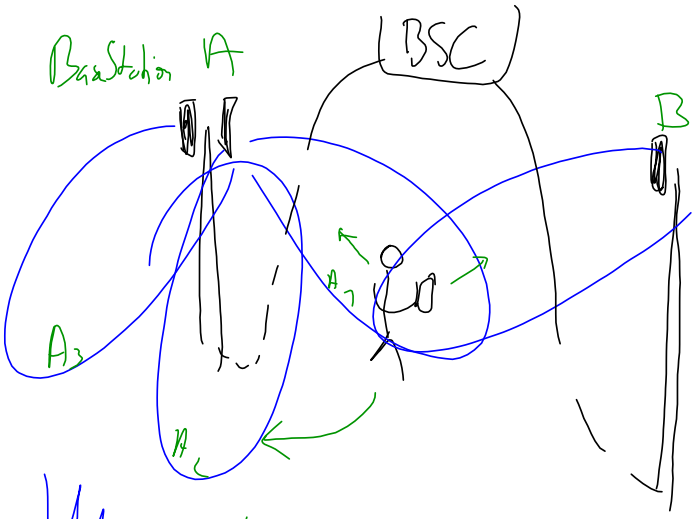


GSM: time slots

- Mobile reports
- Network analyses
  - cell capacity
  - cell load
- network decides

UMTS/LTE

- softer handover from $A_1 \rightarrow A_2$ same BS
- soft handover from A to A/B to B
- handover from A to B

Micro Mobility

Macro Mobility

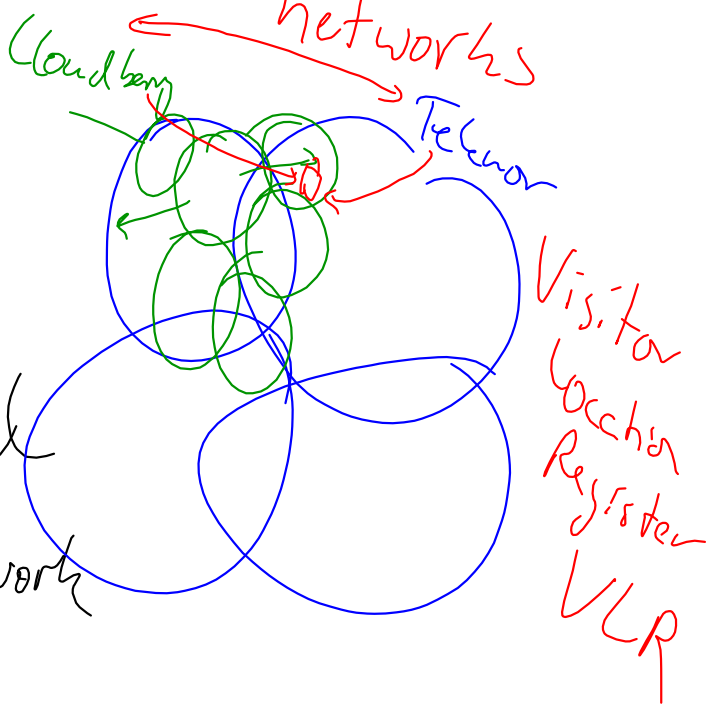
Home location Register
HLR
(- Out of coverage)

- Roaming - international
- National Roaming

Telenor
↕
Cloudberry Mobile

Network Norway
Tele2 → Tele2

Switch between networks

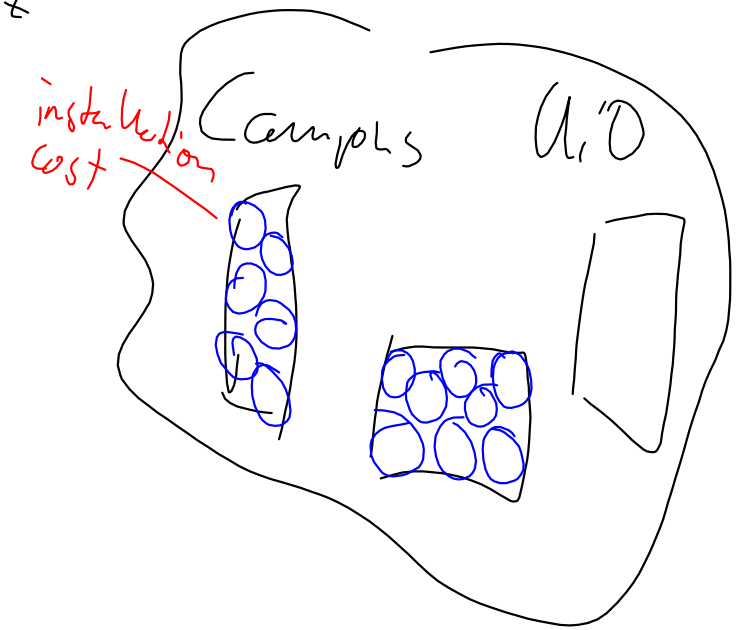


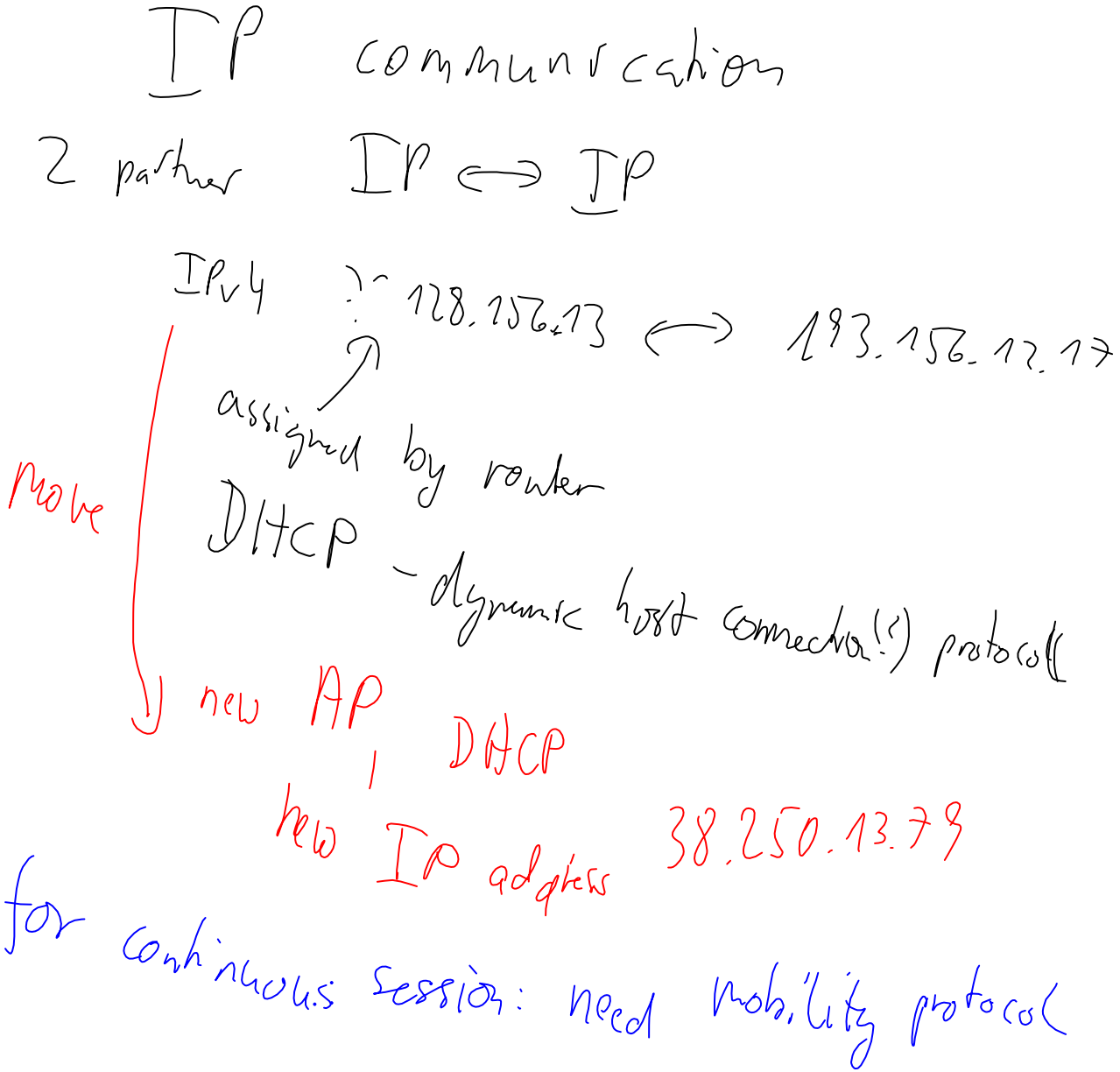
- Femto cell / Small cell
  roaming to Macro Network

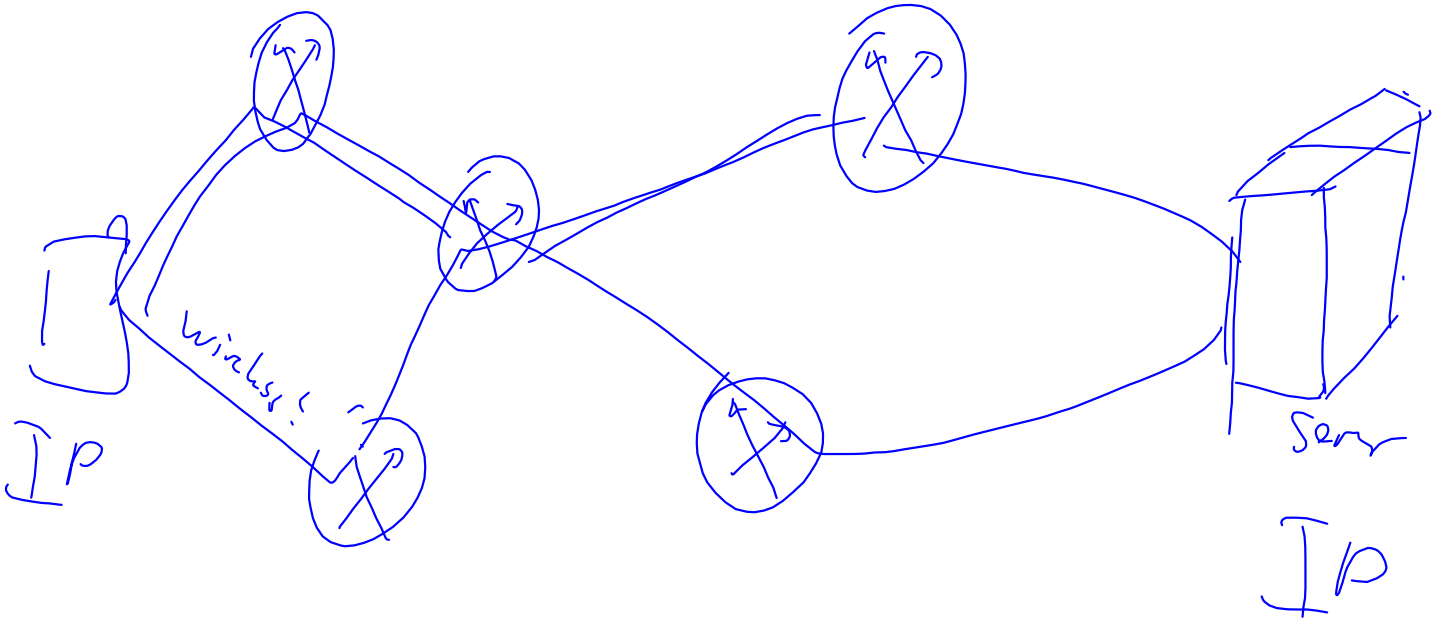
Case:

- free. spectrum — 2.1 GHz
                  — 2.6 GHz
  - max output power small cells

20, 40, (100) MHz




IP communication
2 partner
IP ⟷ IP
IPv4 : 128.156.13 ⟷ 193.156.12.17
assigned by router
DHCP - dynamic host connection protocol
move
new AP
DHCP
new IP address 38.250.13.79
for continuous session: need mobility protocol


Ip
Ip

E2-IP Mobility

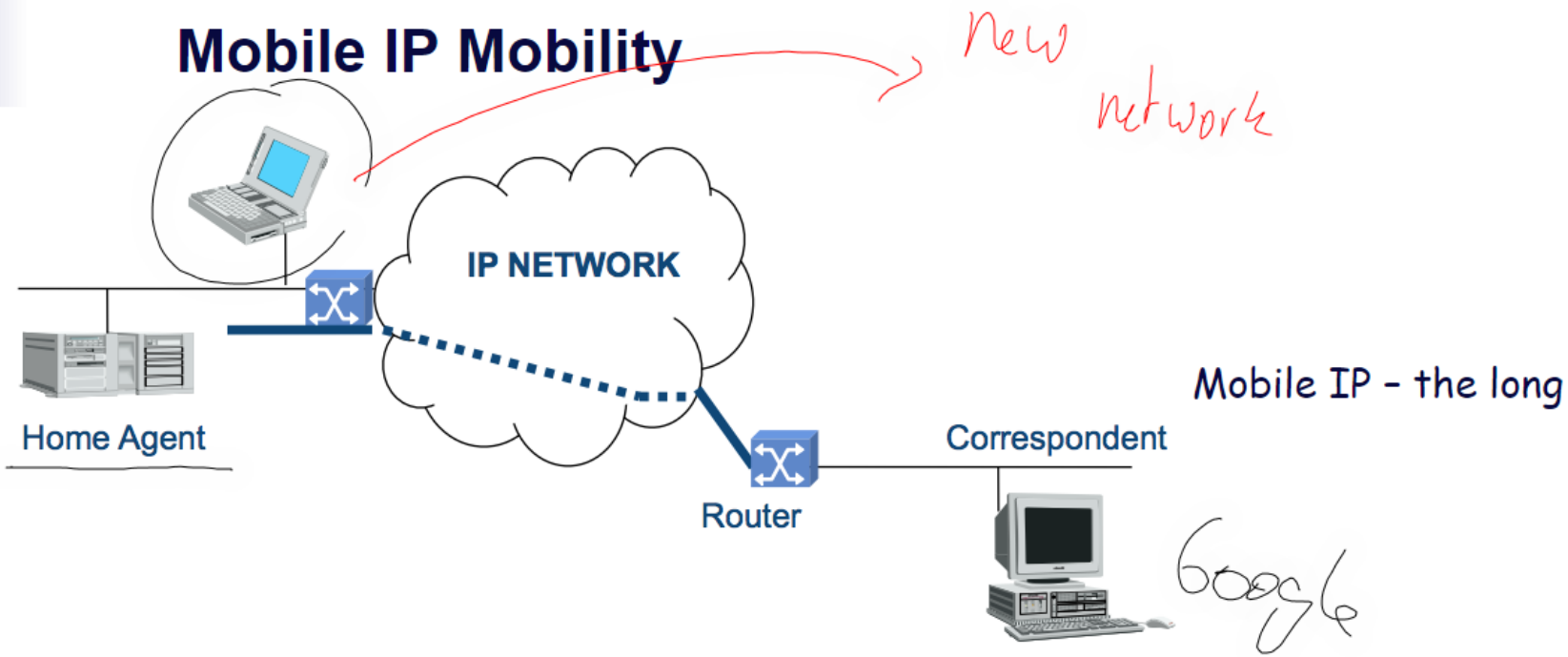
Main components

- Home Agent (HA)
- Foreign Agent (FA)

Mobile

Home location Register HLR

Visitor location Register VLR



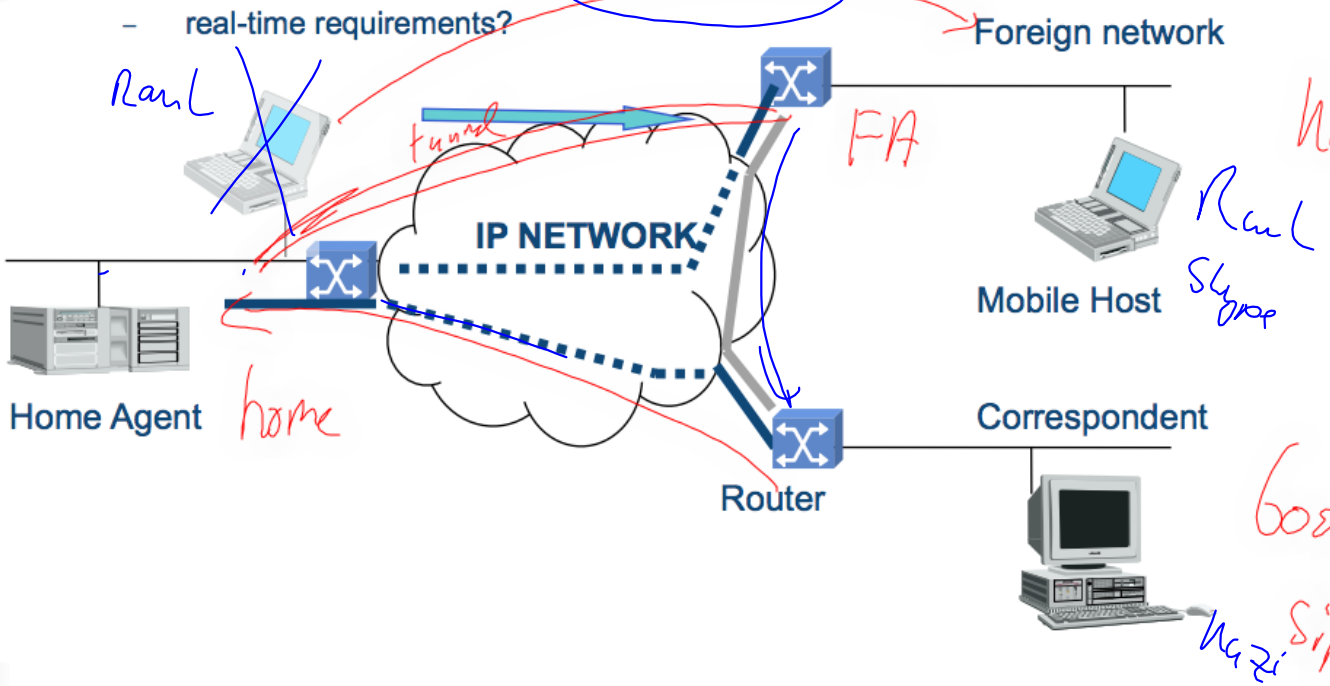
term vision (also for mobile networks)

- HA, FA
- IPv6
- real-time requirements?

Mobile-IP developments

- IDMP - intra-domain mobility protocoll

Mobile IPv4 Triangular Routing



- Correspondent does not know IP address of "moved" device, thus sends a request to the HA
- HA forwards to the moved device via Foreign Agent (FA)
- Moved device answers directly to the Correspondent

Mobile IPv4 To Mobile IPv6

- replace triangular routing, keep address
- route optimisation
- defined for low-speed mobility

Intra-domain mobility

- Host based routing
- Data integrity protection,

Security

- Sender authentication,
- Data integrity protection,
- Replay protection

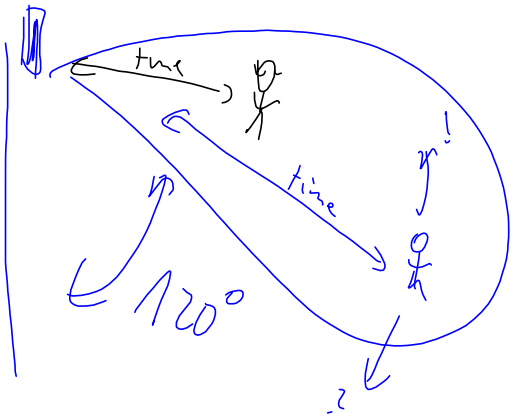
32 bit address
change network ID | keep device ID
device ID

See References

driven by mobile/tablet/PC

IP mobility

- Speed / Fast Mobile IP
  Hierarchical Mobile IP
- make before break
  - mobile senses the environment
  - pre-connects to the new network
  - break (handoff) → connect

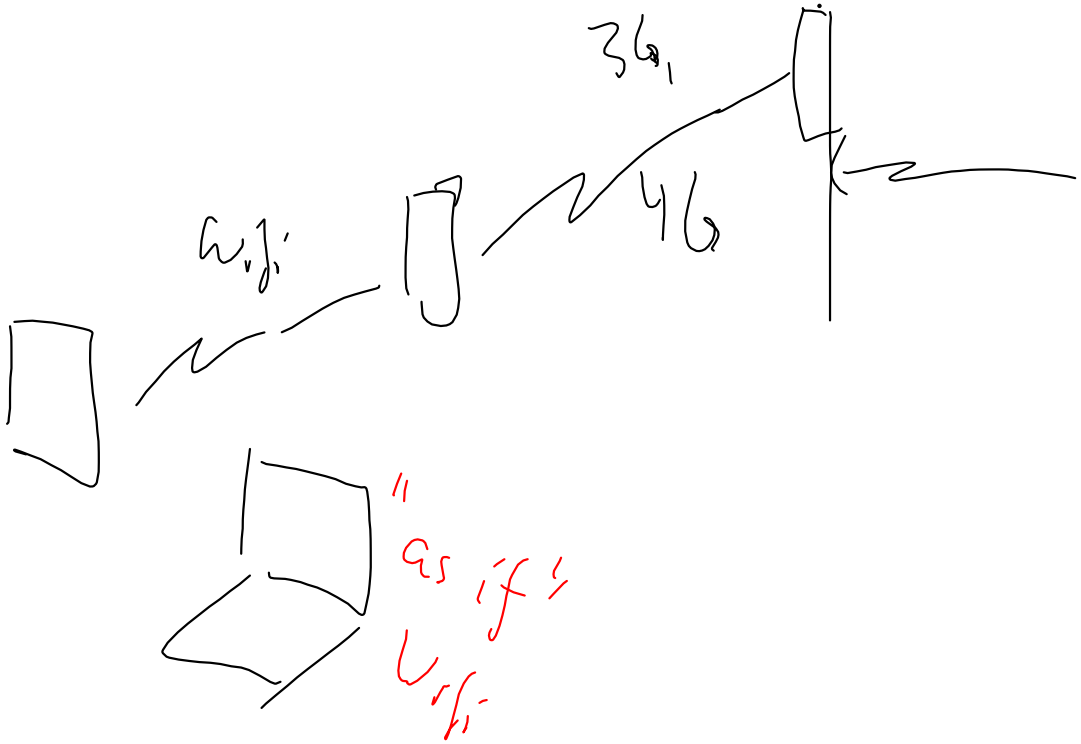


intelligent mobile
- 95-97% predictable
- location database + cell information

→ predictive handover

Applications: Facetime
<50ms handover time

Challenge:

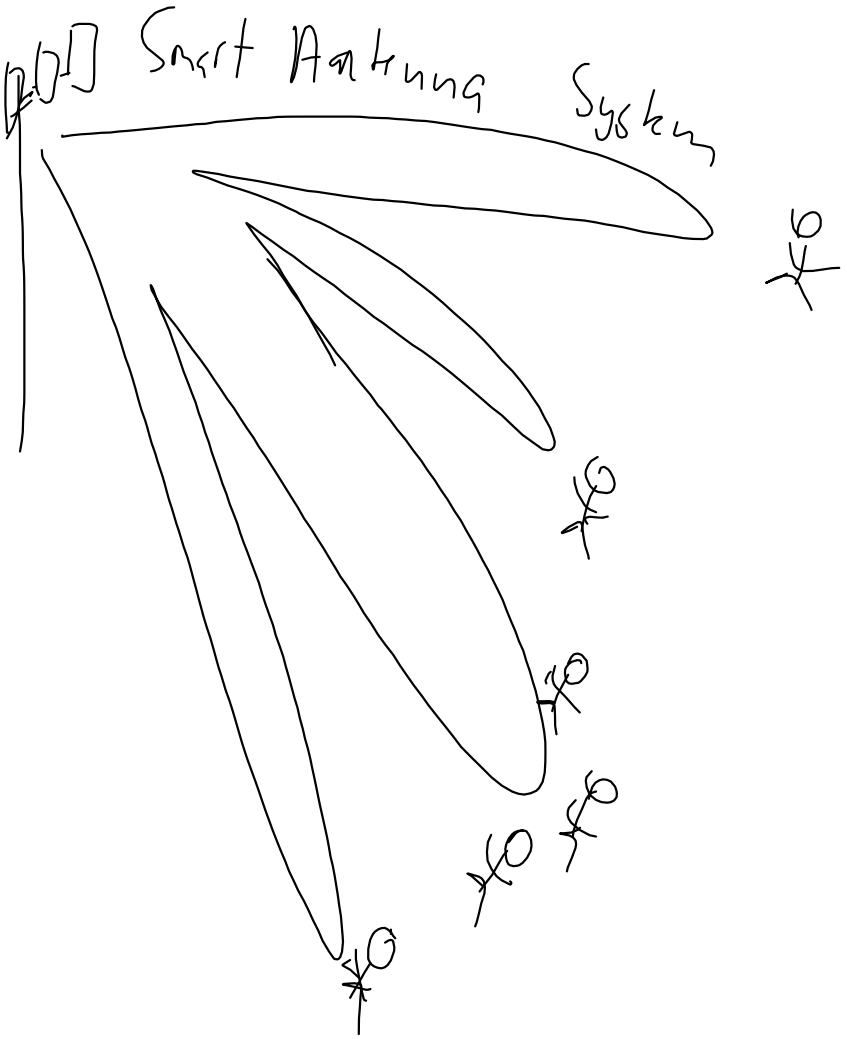


Towards higher speed

"5G"

- MIMO

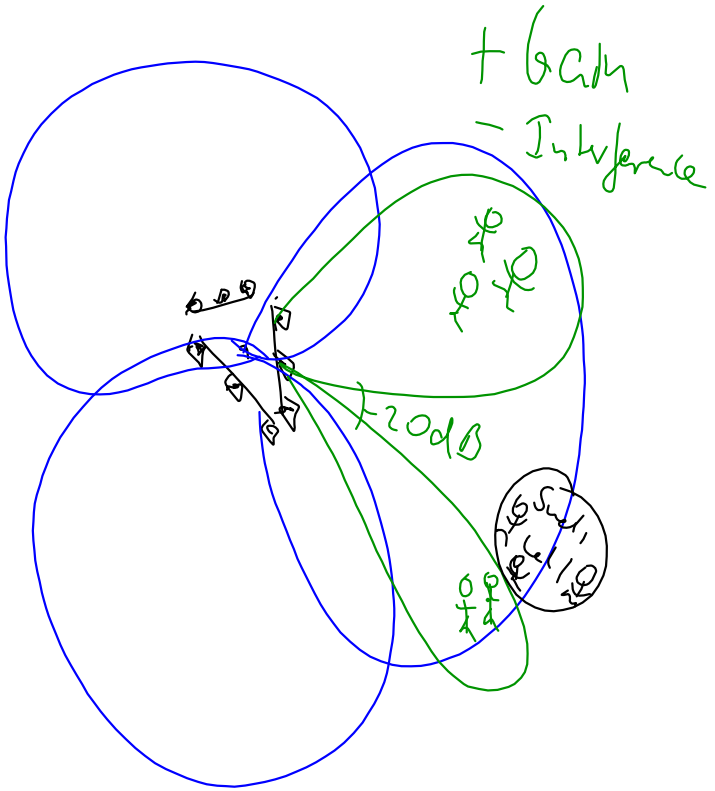
Smart Antenna System

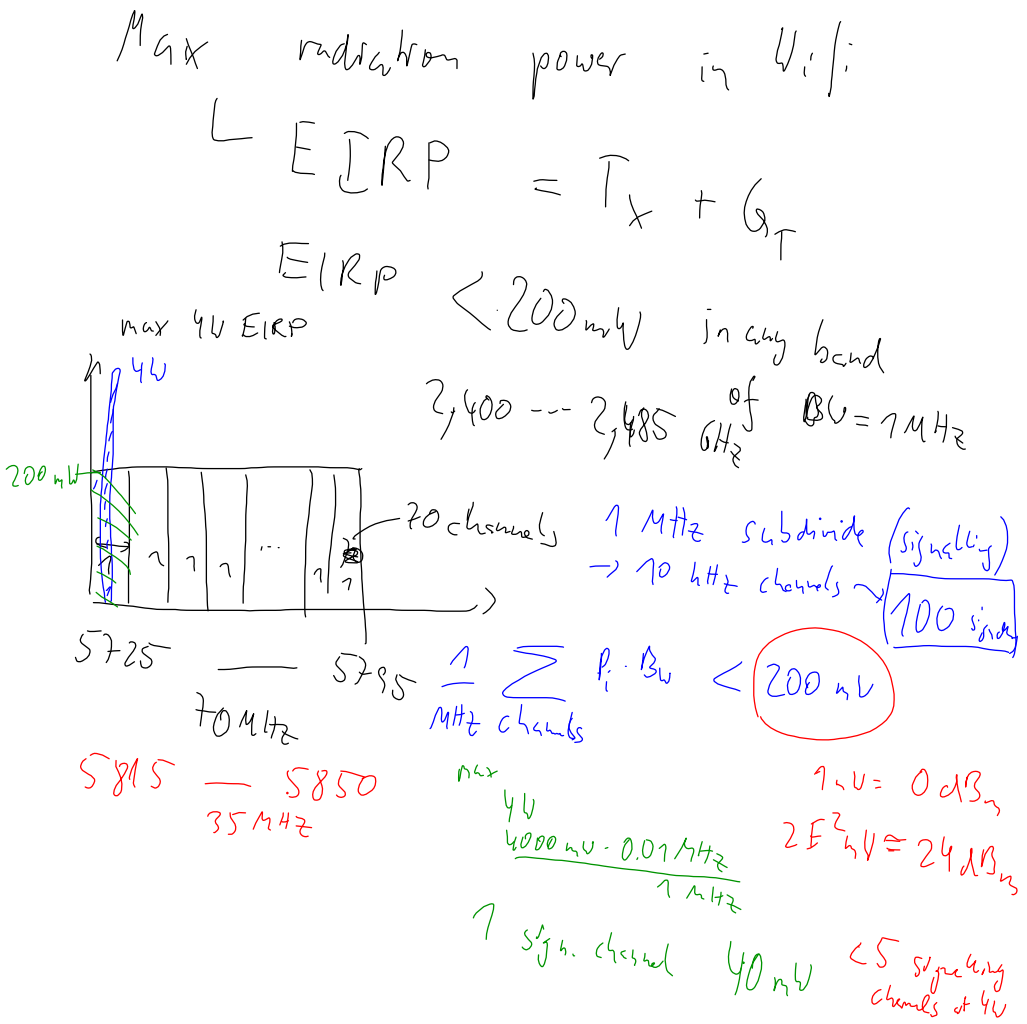


from top

+ Gain

- Interference





Point to point: max 200 W EIRP, max 1 W Tx power (not point to multipoint)

5 Dec – Kazi
– Raul

12 Dec – Yun Ai
– Qiaholi