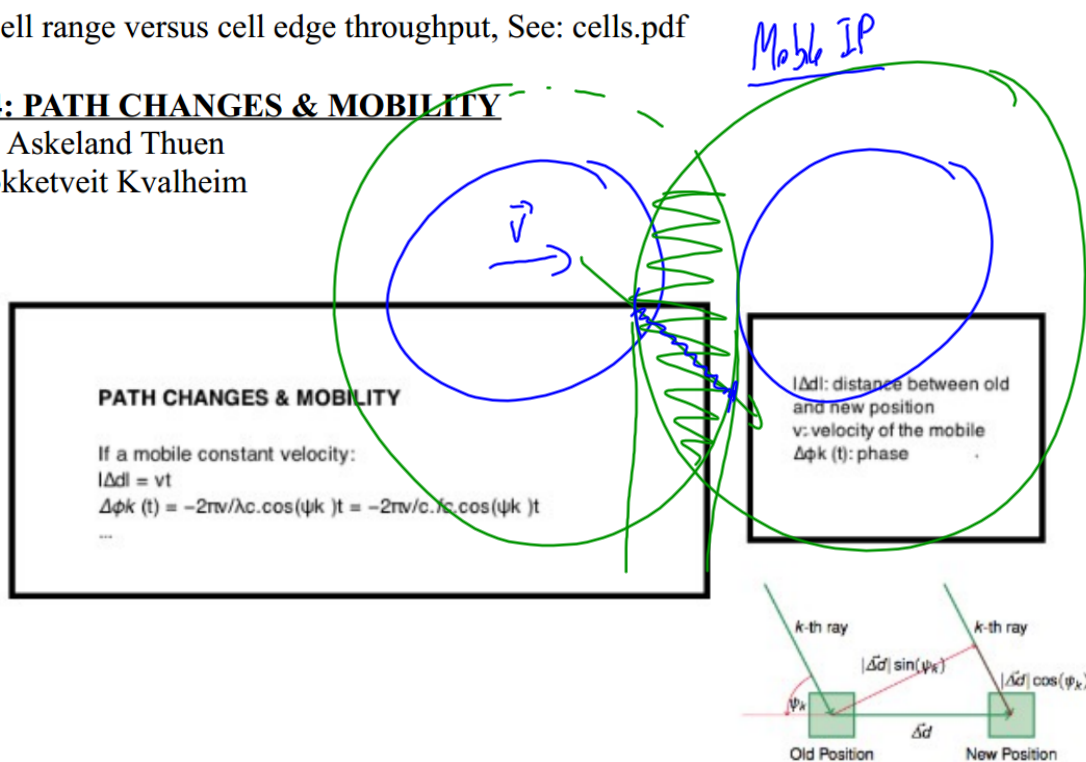


TCP/IP $\leftrightarrow$ UDP/IP
latency

- Cell range versus cell edge throughput, See: cells.pdf

TEAM 4: PATH CHANGES & MOBILITY

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- *Path-Changes Induced by Mobility*, See: Mobility.pdf (page 41-47)

TEAM 2: FADING

Ali Zaher

Johan Tresvig

FADING

Slow fading effects: $L_b(d) = (L(d), \sigma(x,y))$

Fast fading effects: $L_b(d) = (L(d), \sigma(x,y), R(x,y))$

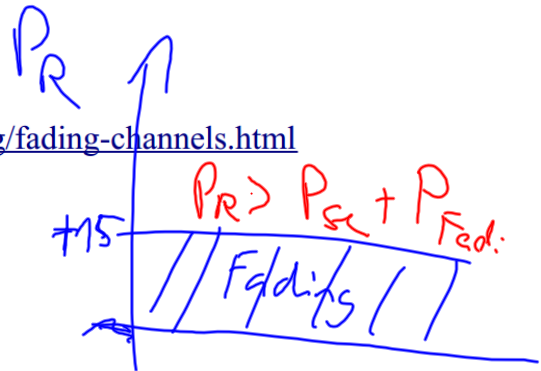
$L(d) = L_0 + 10n \log d$

...

$L(d)$: Loss distance d
 $\sigma(x,y)$: Gaussian random variable
 $R(x,y)$: Rayleigh random variable

Fading Margin

- See: <http://www.mathworks.se/help/comm/ug/fading-channels.html>



PATH LOSS & CELL SIZE *Cost 231 model*

Path loss (Free s): $L_p = (4\pi d, \lambda) = (4\pi d, f, c)$
 Okumura-hata model: $L_p = (f, h_m, h_b, d)$
 (Cell) Efficiency = (N_c, BW, A_c)

d: distance
 λ : wavelength
 Fc: Frequency
 C: light speed
 Nc: Number of channels per cell
 BW: Bandwidth
 Ac: Area of cell.
 hb: Height of base station Antenna
 hm: Height of mobile station Antenna
 f: Frequency of Transmission

- *Free Space*: $L_p = (4\pi d/\lambda)^2 = (4\pi df/c)^2$
- *Hata Model for Urban Areas*: $L_{pu} = 69.55 + 26.16 \log f - 13.82 \log h_b - C_h + (44.9 - 6.55 \log h_b) \log d$
- *Hata Model for Suburban Areas*: $L_{psu} = L_{pu} - 2 (\log (f/28))^2 - 5.4$
- *Hata Model for Open Areas*: $L_{po} = L_{pu} - 4.78 (\log f)^2 + 18.33 \log f - 40.94$
- See: <http://www.mathworks.com/matlabcentral/fileexchange/2096-rf-wave-toolbox/content/RFWave/hata.m>
- Cell range versus cell edge throughput, See: cells.pdf

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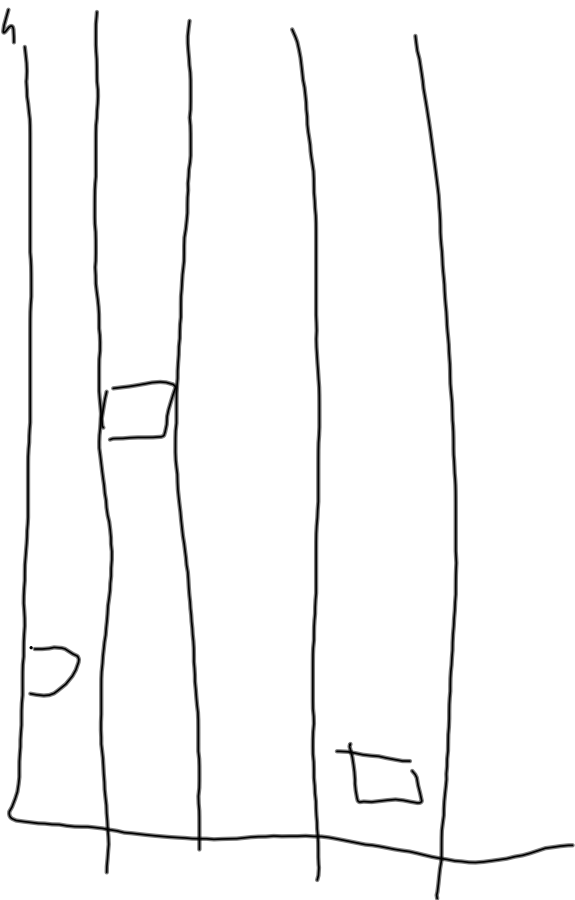
Frame
output
cor files



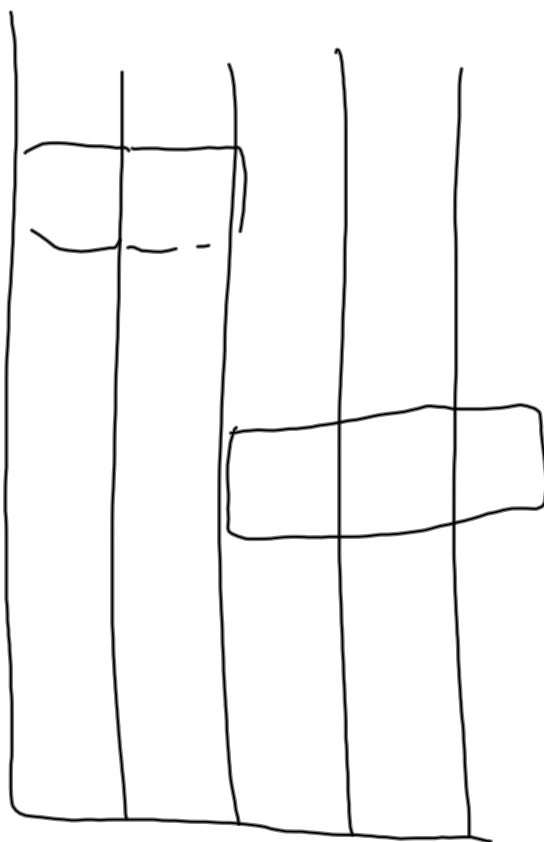
Susana

Doppler
Timing Advance

Ch



I



L - 1/2 d 1.2 6 Hz WiMAX
 S 2-4 Radar receivers
 3.1-3.4 GHz $\rightarrow$ 1 kW $\rightarrow$ 4-6 MW $\sim$ -95..-105 dBm
 C 1E6 mW

UMTS
 neighbour channel
 separation
 handset -15 dB



WIMAX

Standard BS, 60° , $P_t = 27 \text{ dBm}$

90°

$\rightarrow 48.5 \text{ km}$

3.3 GHz $P_t = 20 \text{ dBm}$ $G_t = 14 \text{ dB}$ $G_R = 17 \text{ dB}$

LOS $< 6.7 \text{ km}$

0LOS $< 3.5 \text{ km}$

$P_s \sim (P_E ?)$

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