PERFORMANCE EVALUATION OF ACCURATE TRIGGER GENERATION FOR VERTICAL HANDOVER

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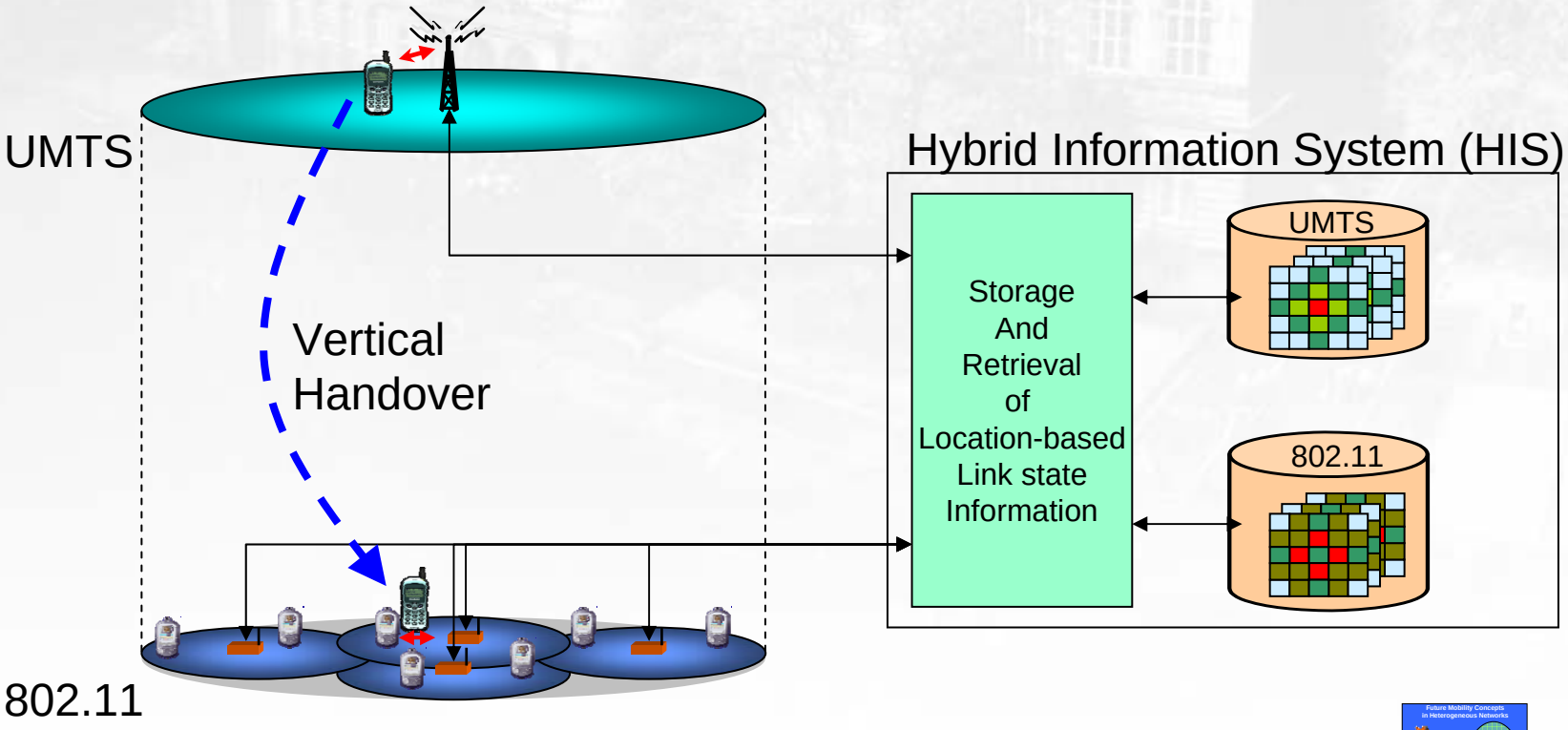
Overview

- Introduction and Motivation
- Hybrid Information System
- Coverage Detection
- Performance of Position Estimation
- Performance of Trigger Generation
- Conclusion and Outlook

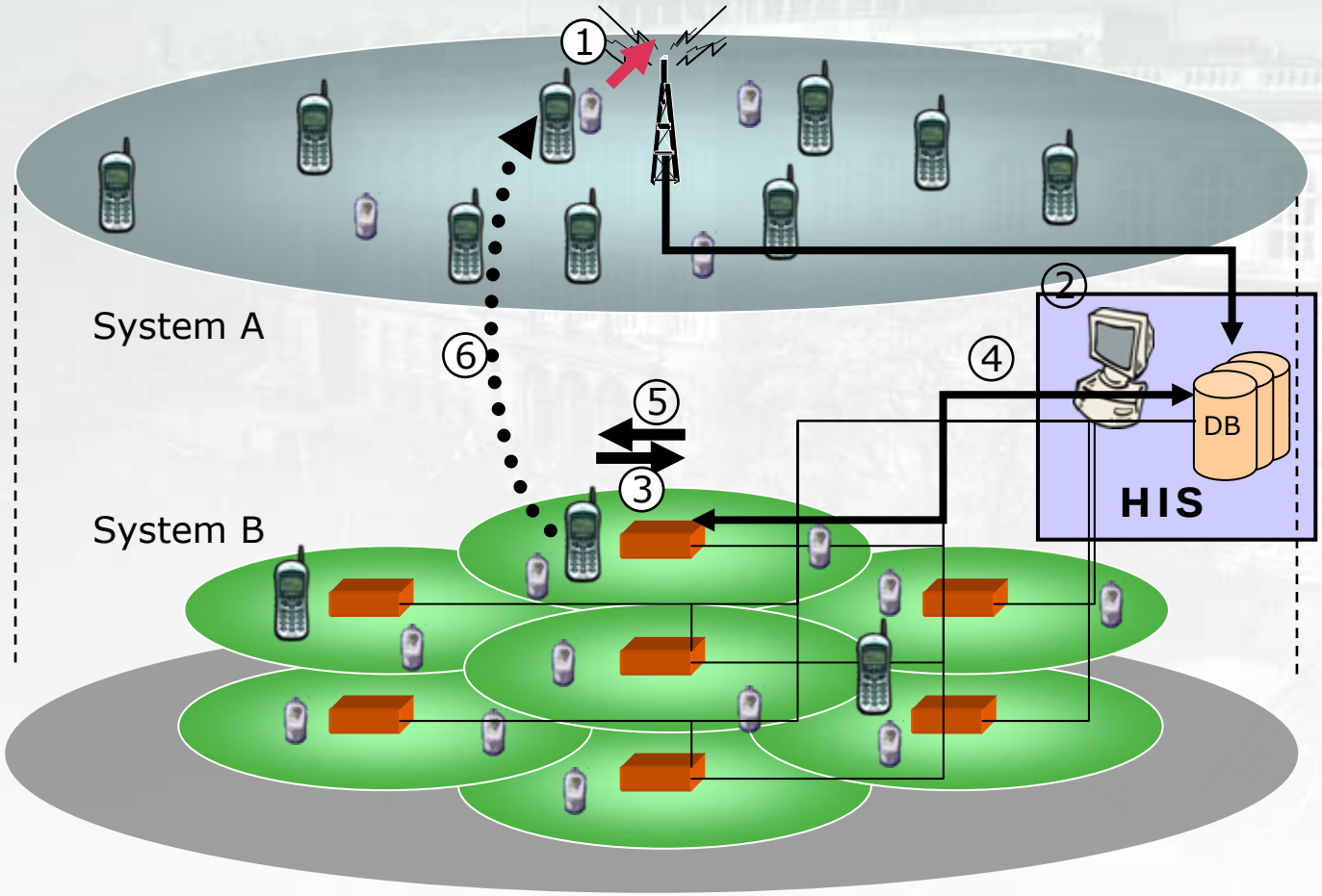
Motivation

- Detection of complementary system → scanning
- One transceiver → Mobile transmitting/receiving or scanning
  - WLAN and UMTS/TDD: scanning during idle periods
  - UMTS/FDD: Compressed Mode

➢ Scanning not best means!



Efficient Location-based VHO Support



① Measurement report with position info.

② Storage of measurement report in data base

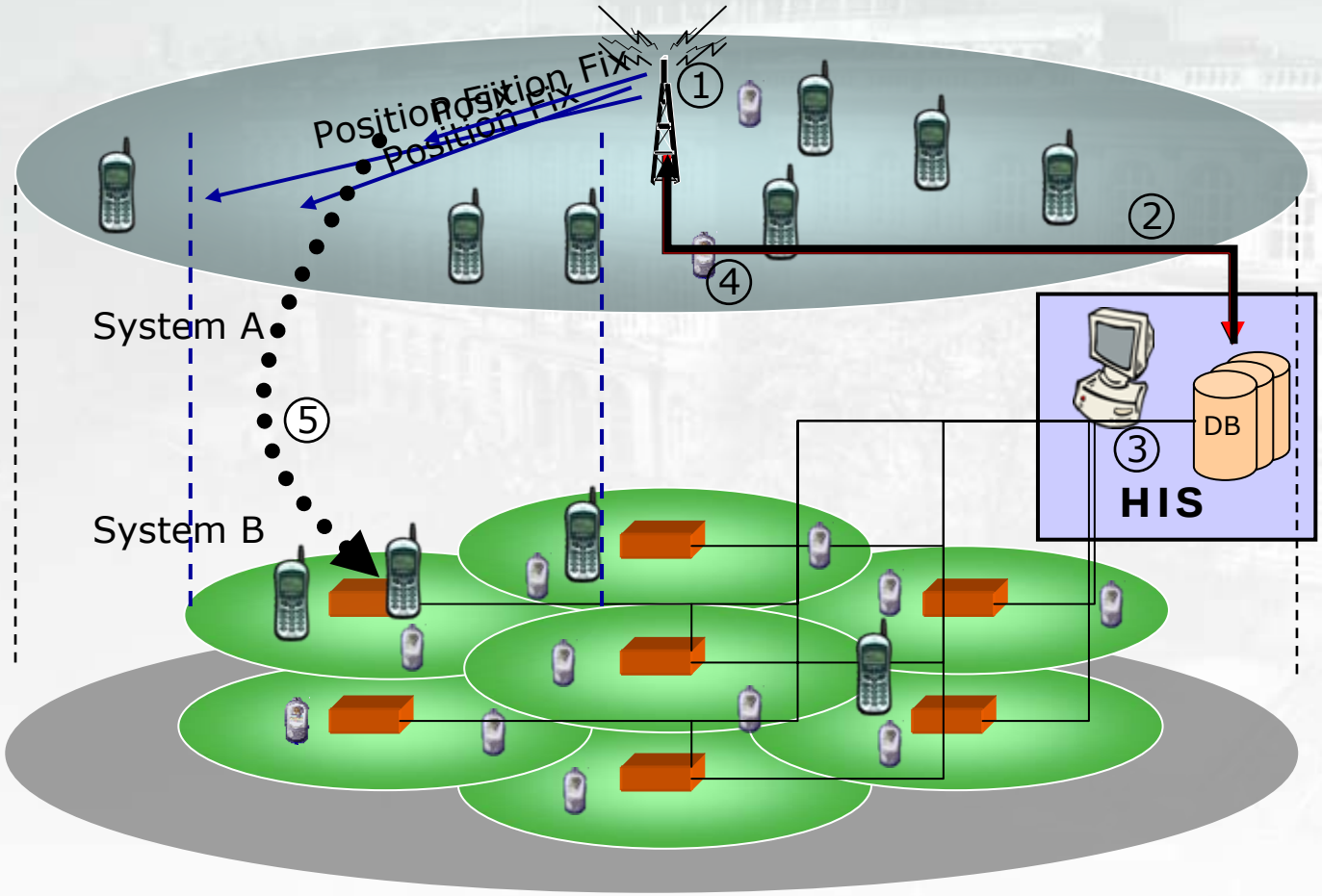
③ Handover request with position info.

④ Retrieve reports at resp. position

⑤ Decide on target system / cell for HO

⑥ Perform handover in new system

Efficient Location-based VHO Support



① Position Fixes

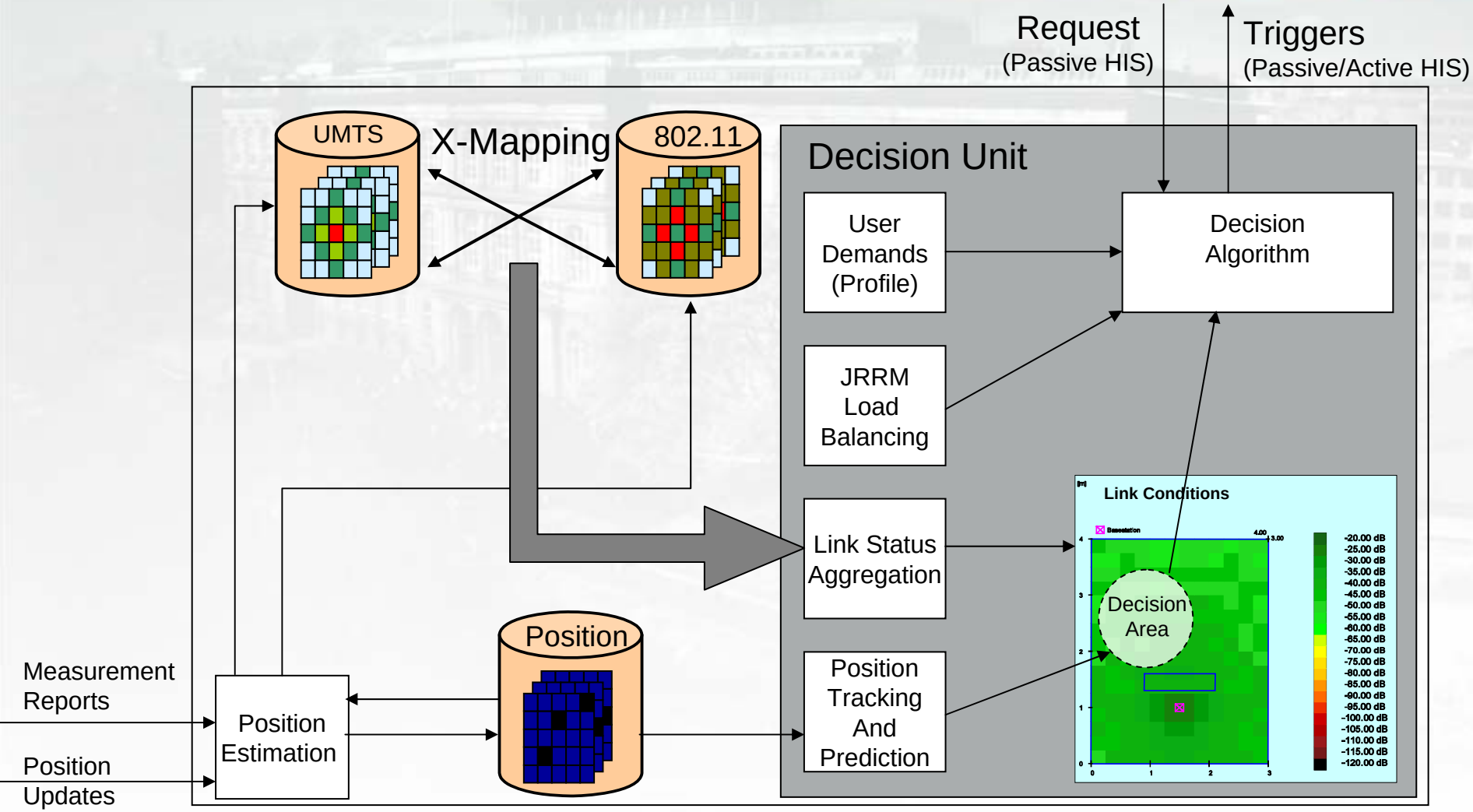
② Report Position to Hybrid Information System

③ Coverage Detection for complementary system

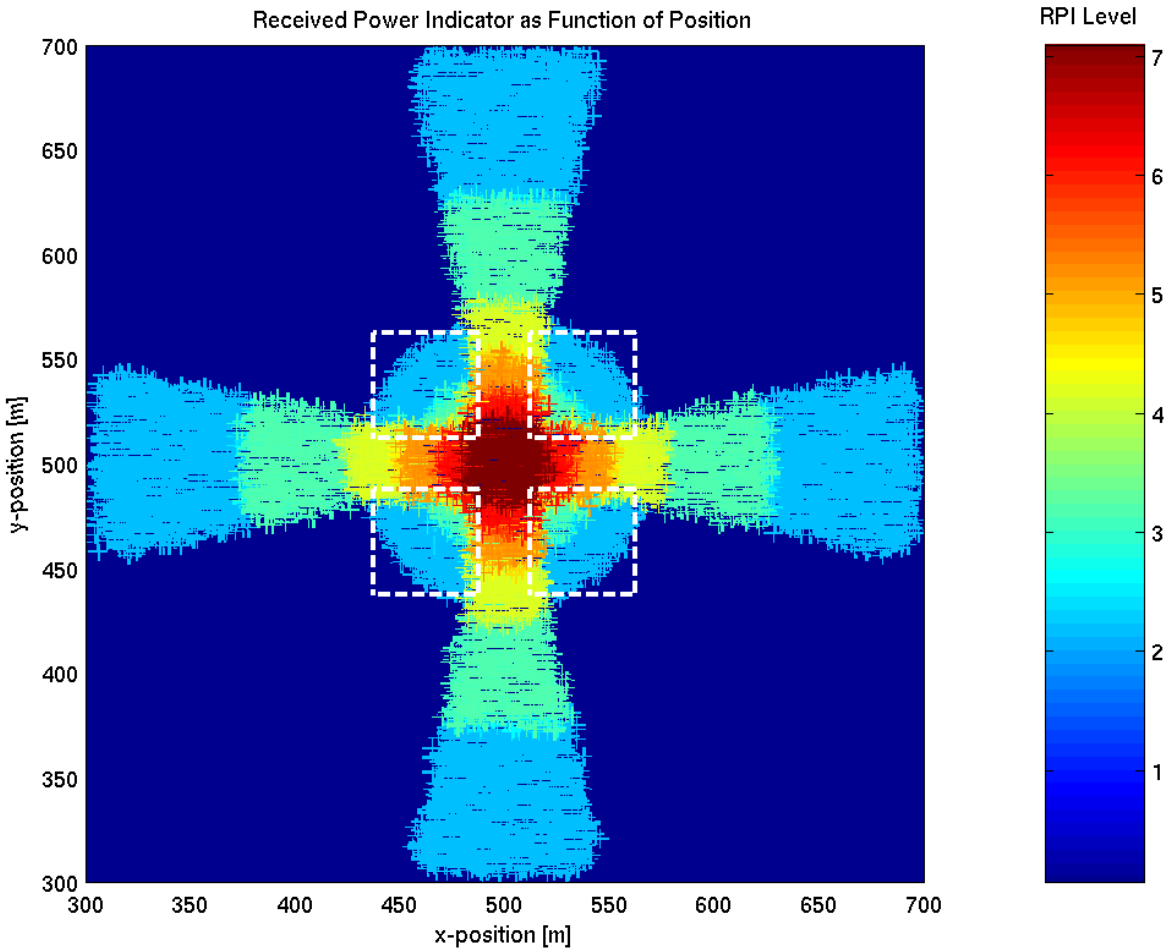
④ Fire VHO Trigger for MT

⑤ Perform VHO

Structure of the Hybrid Information System



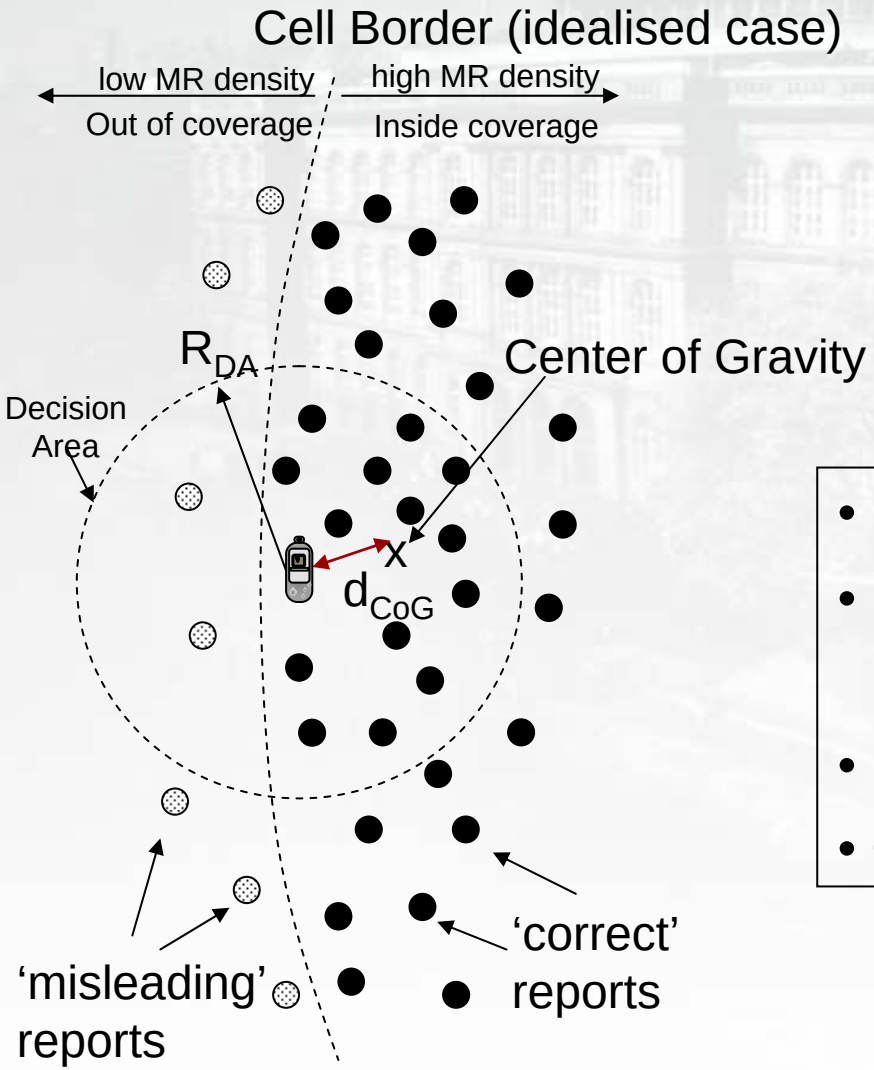
Database Contents



RPI Histograms according to 802.11h

RPI Level	Power observed at antenna (dBm)
7	]-57; ∞]
6	]-62; -57]
5	]-67; -62]
4	]-72; -67]
3	]-77; -72]
2	]-82; -77]
1	]-87; -82]
0	[-∞; -87]

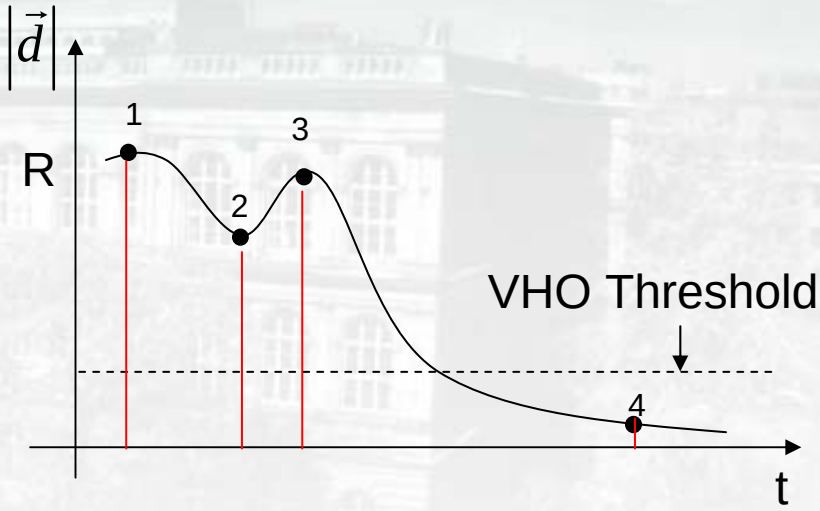
Centre of Gravity Algorithm(1/2)

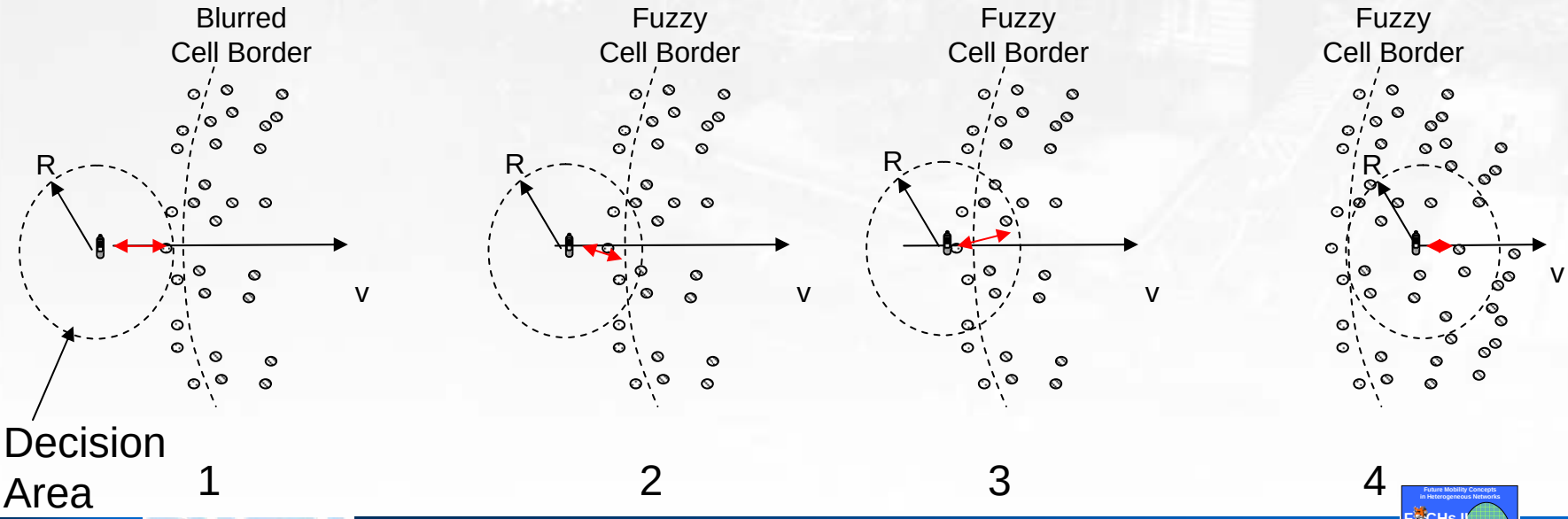


- MR in HIS database
- Exploitation of erroneous positioning
  - ➔density of MR changes
- Decision Area for evaluation
- Center of Gravity

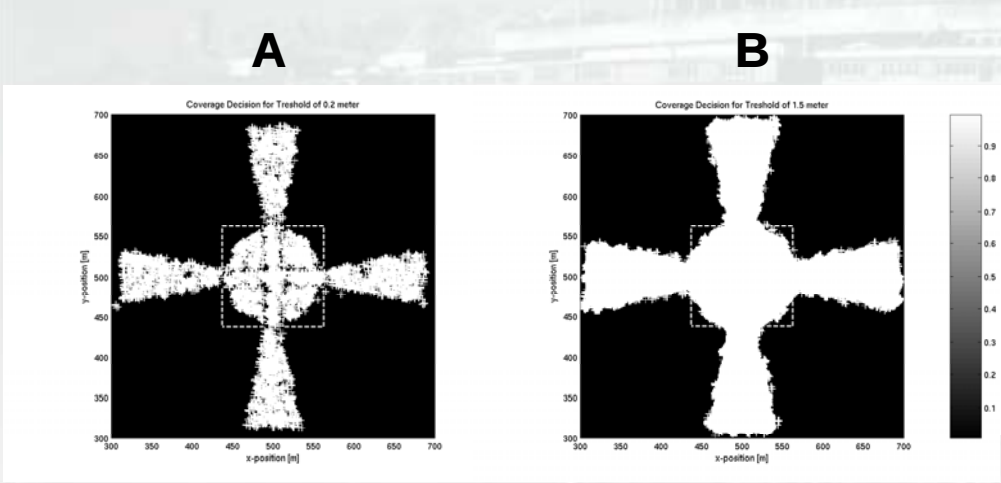
Centre of Gravity Algorithm(2/2)

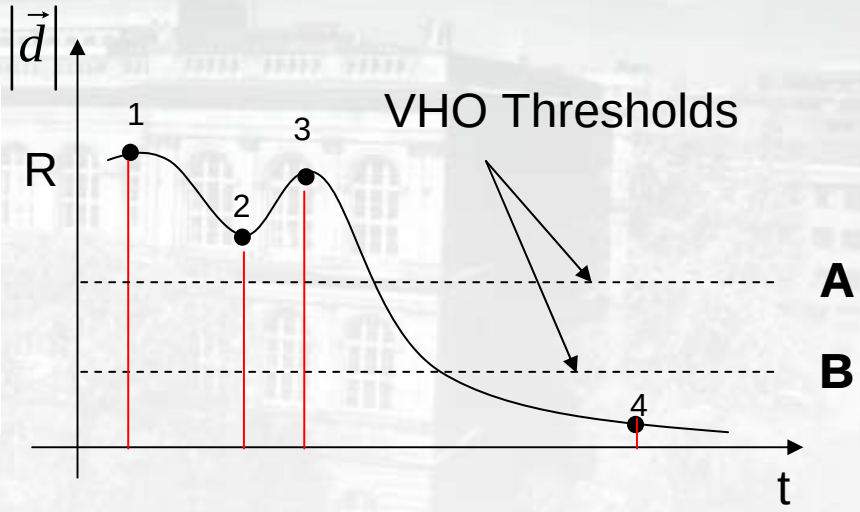
- Measurements selected from database by Decision Area
- Distance to center of gravity of all reports evaluated!

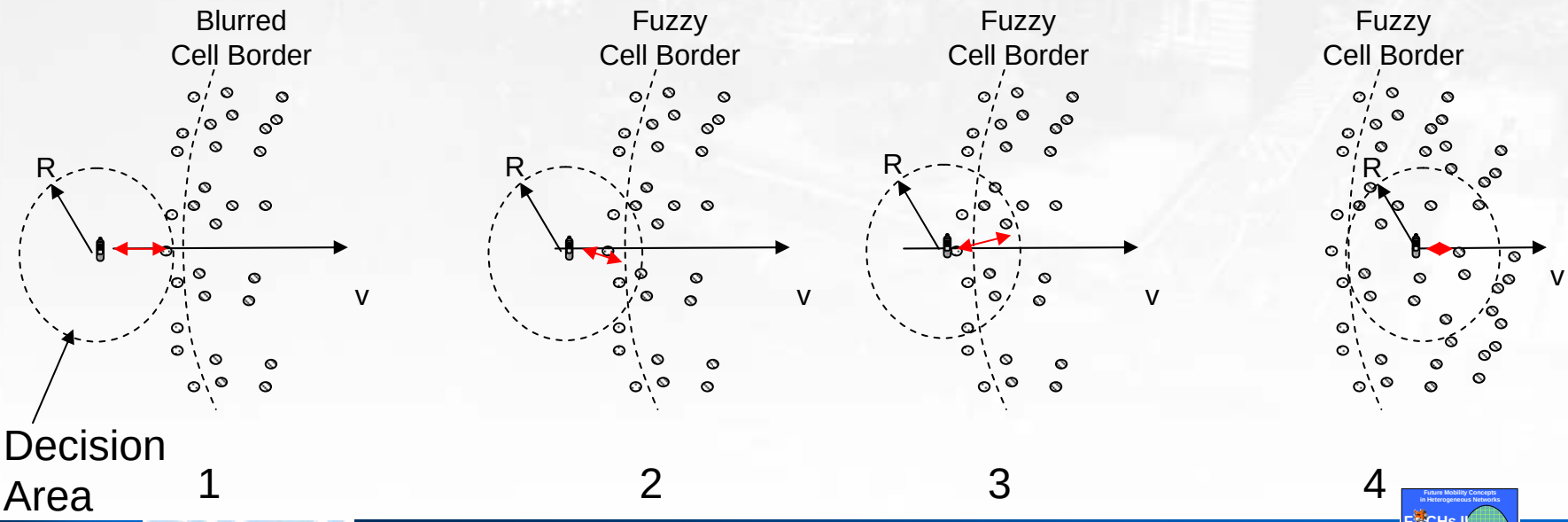




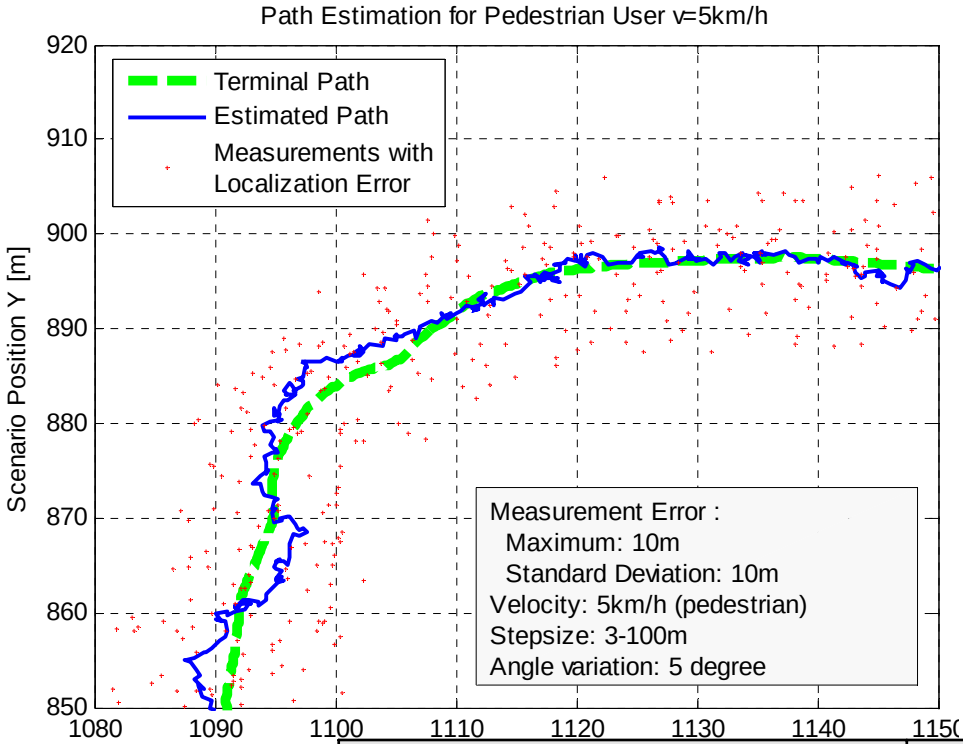
Centre of Gravity Algorithm(2/2)

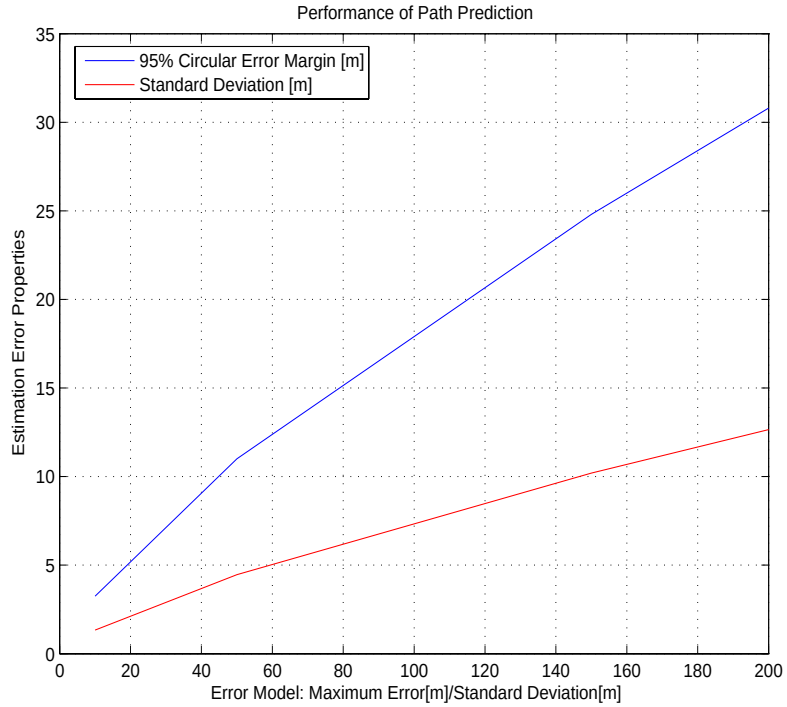






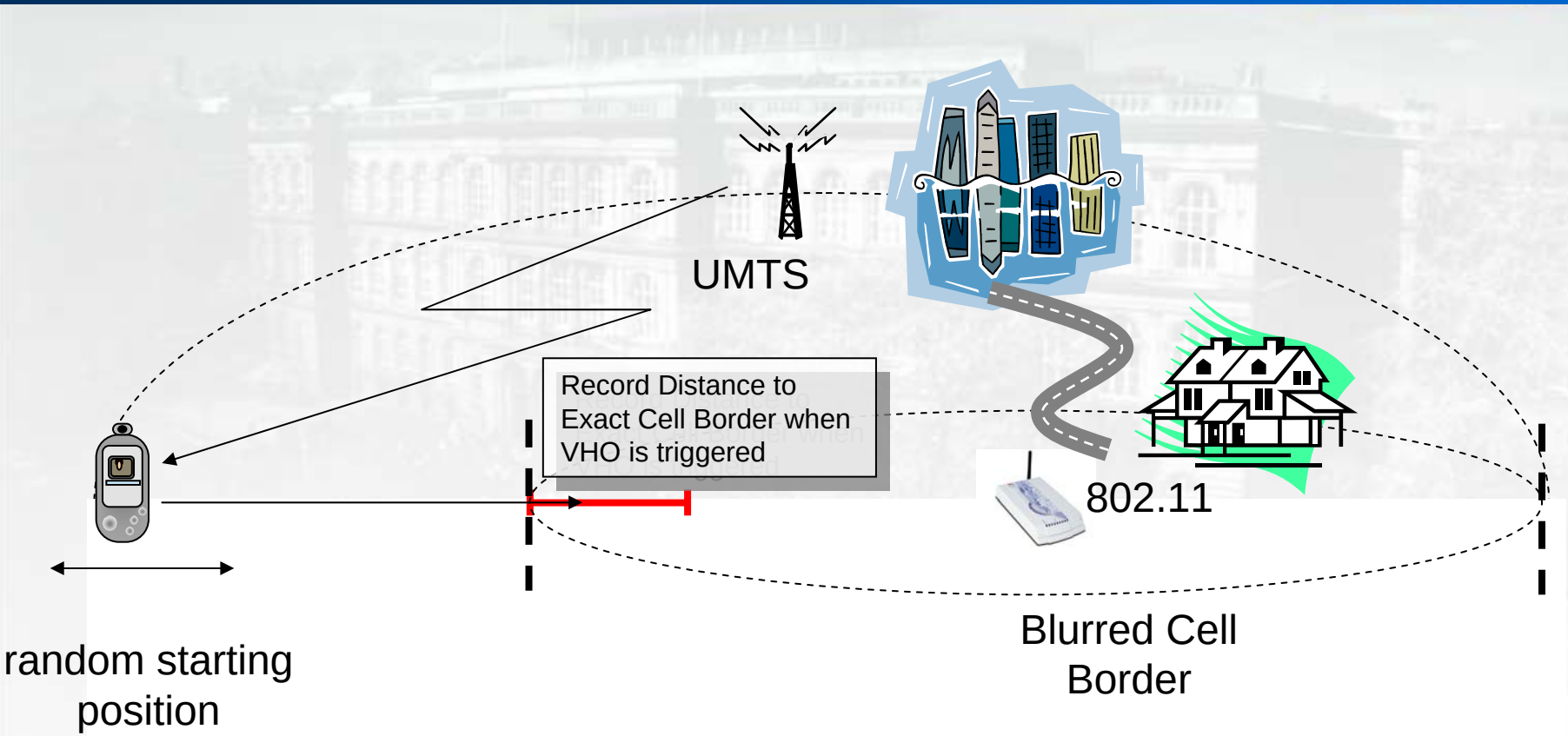
Path Prediction Results



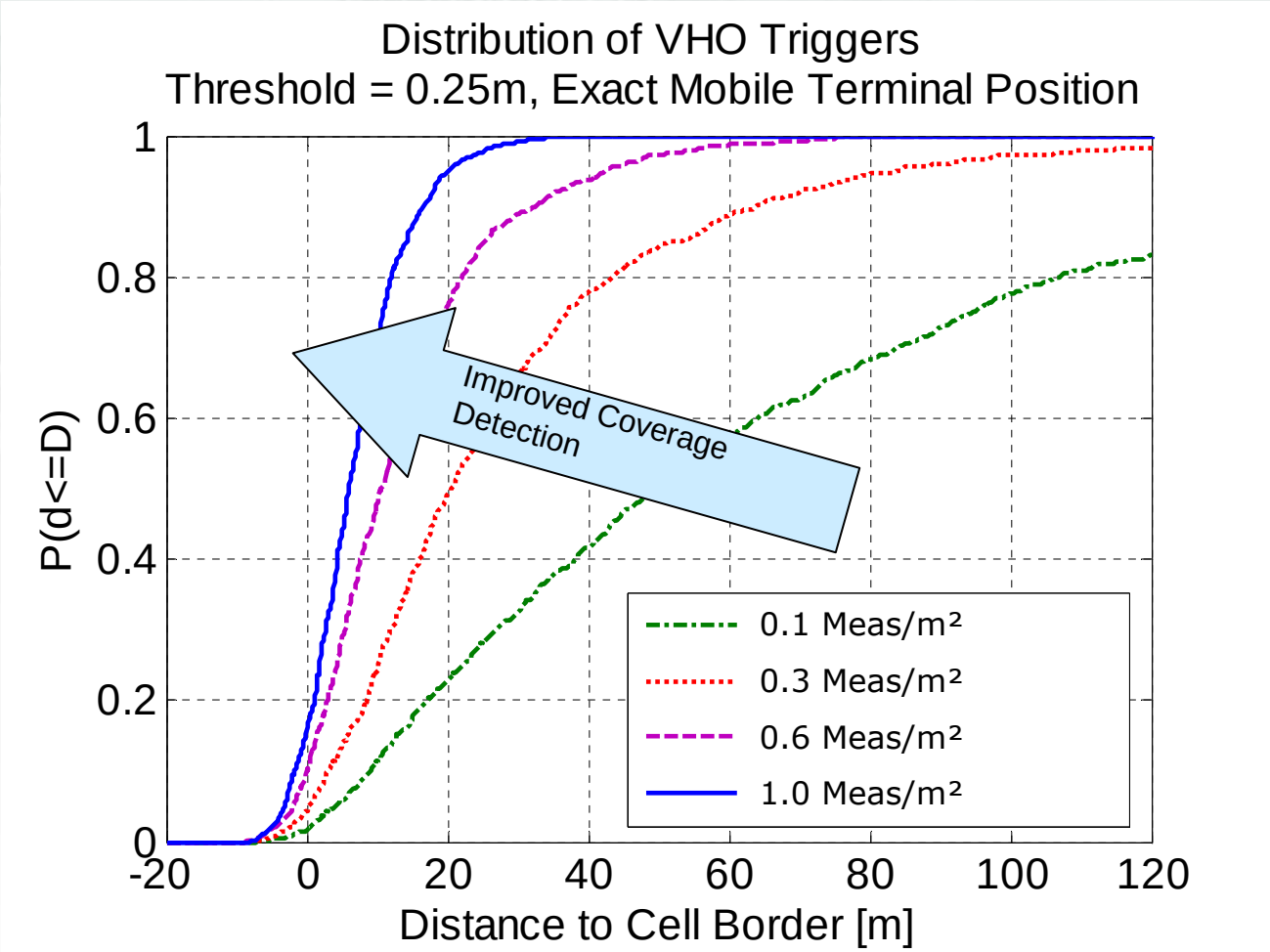


Localization Error Model		Estimation Error	
Maximum Error [m]	Standard Deviation [m] σ'	95% Circ. Error Margin [m]	Standard Deviation [m]
10m	10m	3.25m	1.33m
50m	50m	11m	4.46m
150m	150m	24.8m	10.20m
200m	200m	30.8m	12.65m

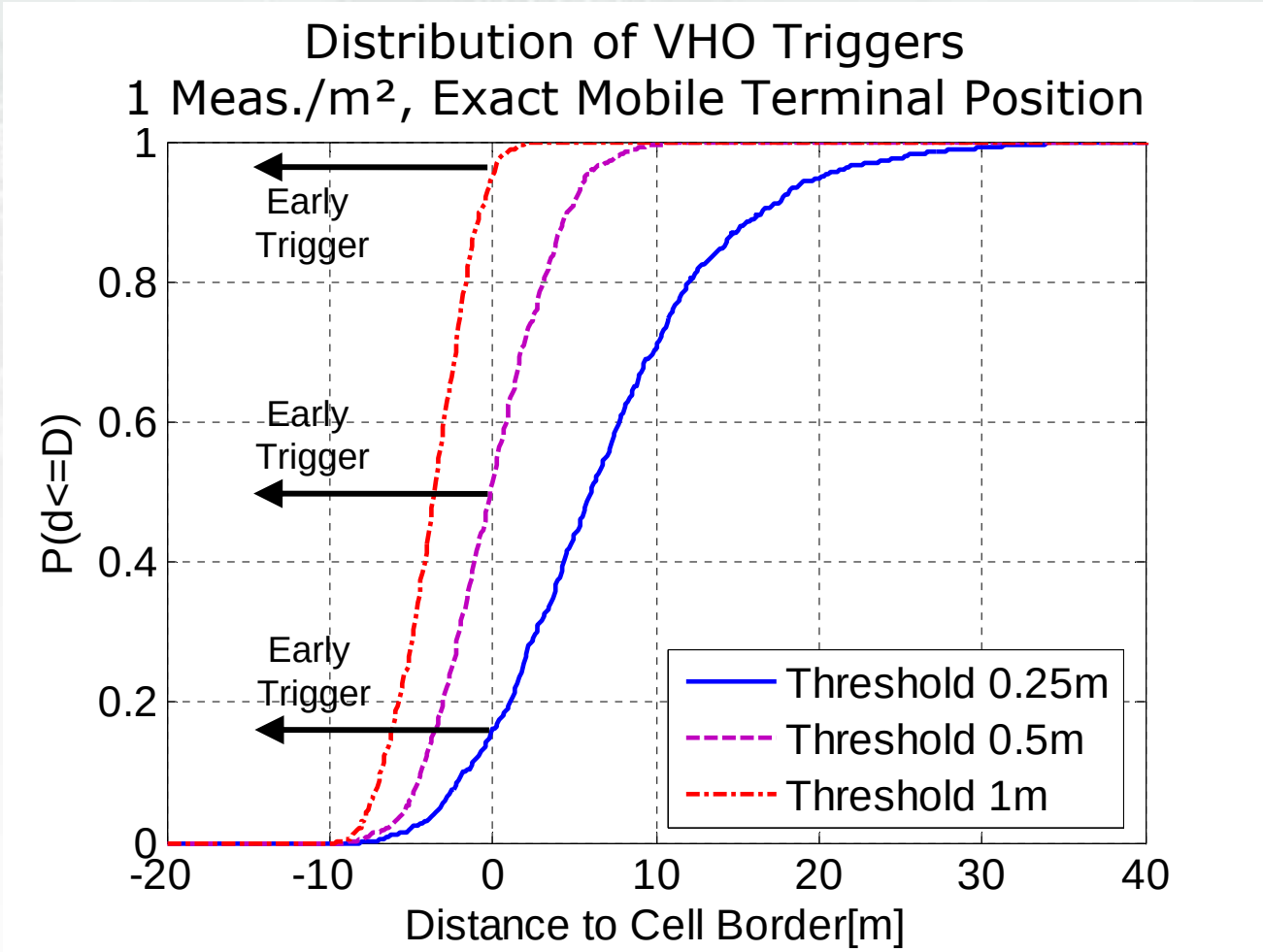
Trigger Generation Simulation Scenario



Impact of Measurement Density



Impact of Threshold Parameter

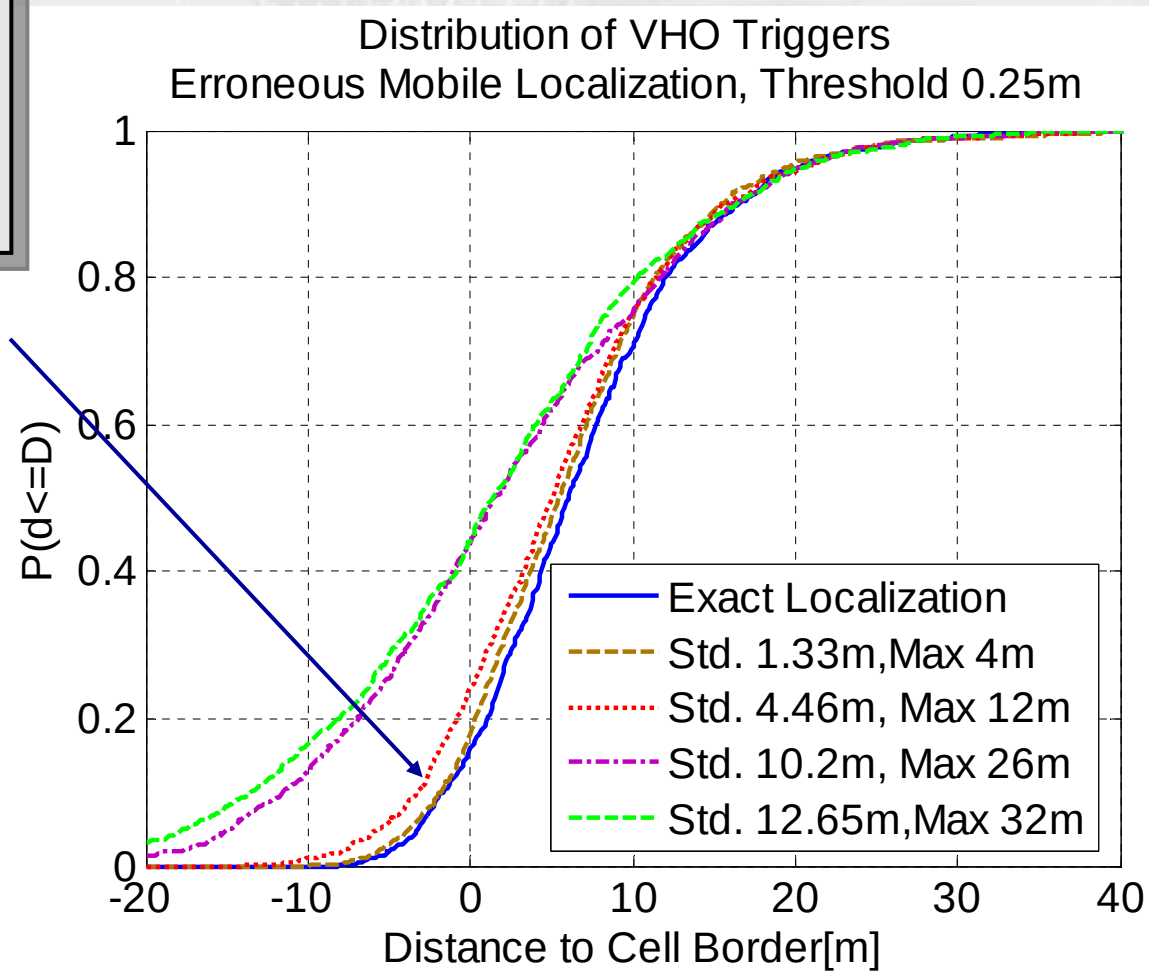


Impact of Positioning Error

Raw Positioning Error Before Path Prediction:

Std. 50m

Max Err. 50m



Conclusion and Outlook

Conclusion

- Position based VHO Trigger based on third-party measurements was developed
- CoG algorithm can be used for coverage detection and takes into account imprecise positioning
- Position estimation using Kalman-Filtering allows for trade-off between frequency of position fixes and positioning accuracy

Outlook

- Utilize directional information from CoG and movement prediction to minimize Ping-Pong Handovers
- Use movement prediction to trigger VHO at correct time-instances
- Adaptation of measurement frequency depending on vicinity to cell

Thank you for your attention !

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