



Summary of Deliverable D1.2: Initial channel models based on measurements

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Contributors



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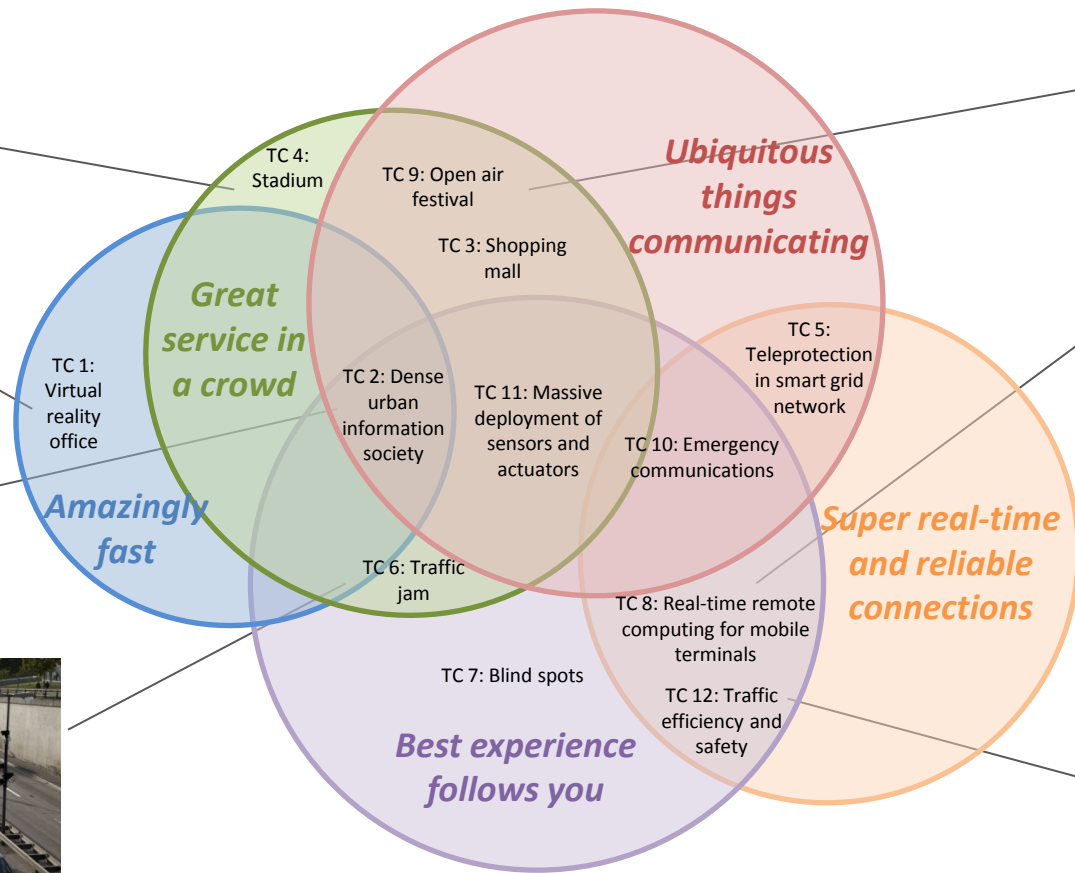
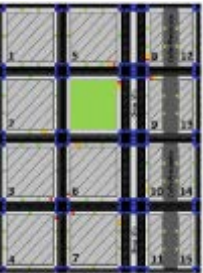
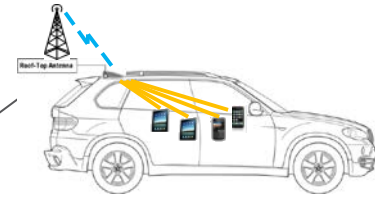
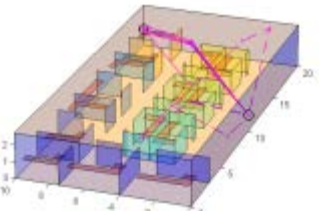
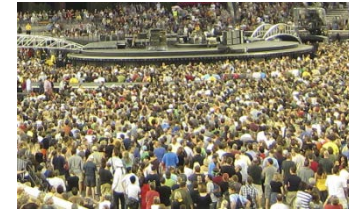
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Summary of D1.2

- › Identified 5G propagation scenarios
 - Based on the analysis of scenarios and test-cases reported in D1.1
- › Identified 5G channel model requirements
- › Literature search results
 - No existing model addresses all the 5G channel model requirements
- › New measurements results
- › New channel modeling approaches
 - Not final model, current status is summarized
- › Initial METIS channel model

Scenarios and test cases in D1.1



Analyzed 5 scenarios and 12 test cases from end-user perspective and identified relevant 5G propagation scenarios (next slide)



Identified 5G Propagation Scenarios and mapping to test cases

	Propagation Scenario	Test Case											
		1	2	3	4	5	6	7	8	9	10	11	12
BS-UE	Urban Micro O2O		X		X	x	x	x	x	X		X	x
	Urban Micro O2I	x	x									x	
	Urban Macro O2O		x		X	x	x	x	x	X	x	x	x
	Urban Macro O2I	x	x	x							x		
	Rural O2O					x	x	x	x	X	x		
	Rural O2I												
	Indoor Office	X	X										x
	Indoor Shopping mall			X									X
	Open Air Festival									x			
	Stadium				x								
D2D	Urban O2O (also V2V)		x			x	x	x	x		x	x	x
	Urban O2I	x	x								x		
	Rural O2O									x	x	x	
	Rural O2I												
	Indoor Office	X	X										
	Indoor Shopping mall			X								x	
	Highway V2V						x						x
	Open Air Festival									x			
	Stadium				x								

Identified 5G Channel Model Requirements

- › Spatial consistency
 - For highly dense scenarios and coexistence of different link types in same area, e.g., cellular links with different cell sizes and D2D links

- › High spatial resolution
 - For very large antenna arrays and beamforming

- › Dual link mobility
 - For D2D/V2F communications and moving base stations

- › High frequency (mmW)
 - For sufficient spectrum and high bandwidth

- › High bandwidth
 - For high bitrates

Literature review

› WINNER/IMT-Advanced

- Widely used models
- Frequency range 450 MHz – 6 GHz
- Medium spatial and frequency resolution
- Poor support for mobility, no dual end mobility
- Only plane waves

› COST 2100

- Supports mobility (not dual link end mobility)
- Frequency range < 5 GHz
- Not fully parameterized
- Not widely used

› IEEE 802.11 for 60 GHz

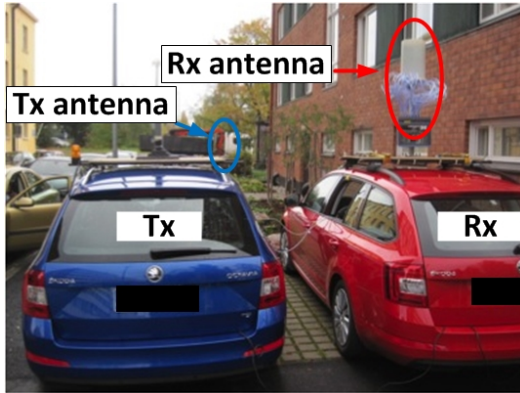
- Only a few specific scenarios

› Ray tracing

- Site specific and highly computational complex

➔ None of the existing models address all the 5G channel model requirements

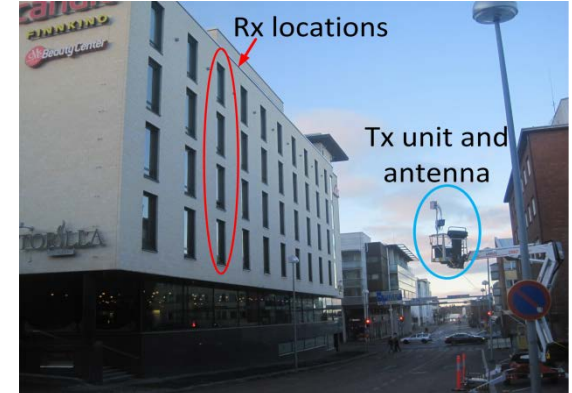
Measurement Campaigns (examples)



Car-to-car 2.3/ 5.25 GHz (UOulu)



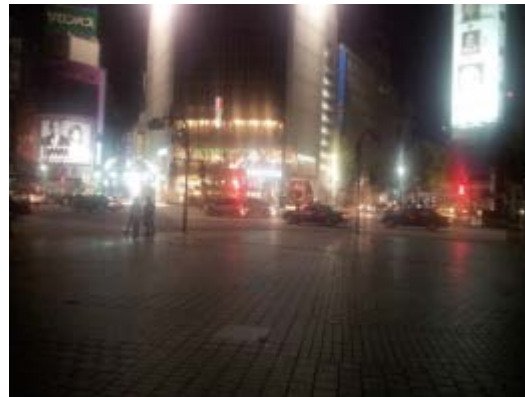
Shopping Mall 60 GHz (Aalto)



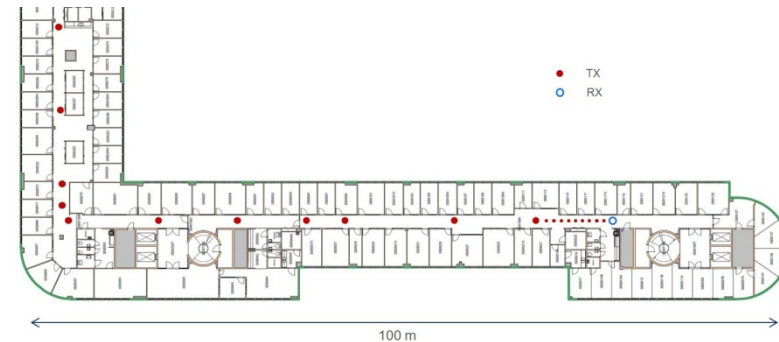
Urban Micro Outdoor-to-Indoor (UOulu)



D2D Crowd Area, daytime (DOCOMO)



D2D Crowd Area, midnight (DOCOMO)

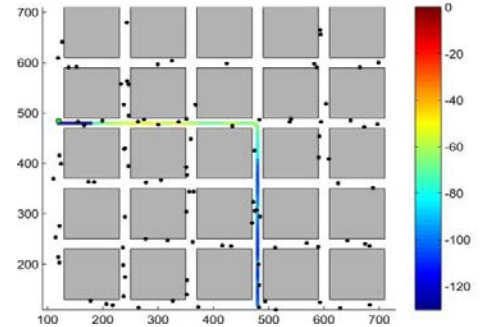


Indoor office, 60 GHz (Ericsson)

Channel Modeling Approaches (1)

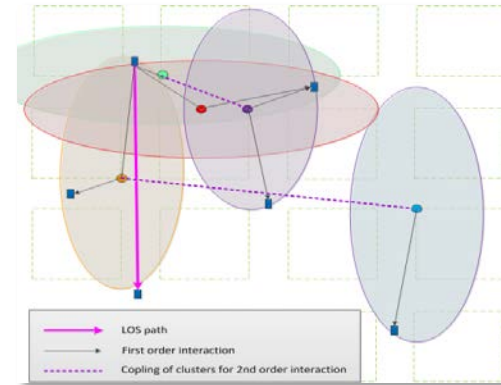
› Map based modelling

- Realistic spatial channel properties
- Propagation by physical processes
- Spatial consistent link correlations provided



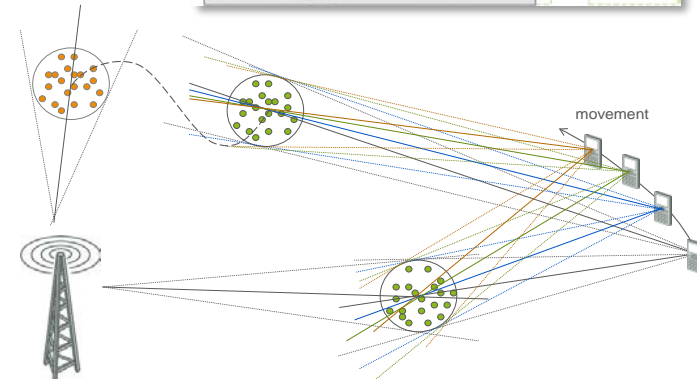
Visibility region based modelling (VRBM)

- Based on coupled clusters
- Spatial consistent link correlations provided
- Challenge: Extensive measurements needed for parameterization

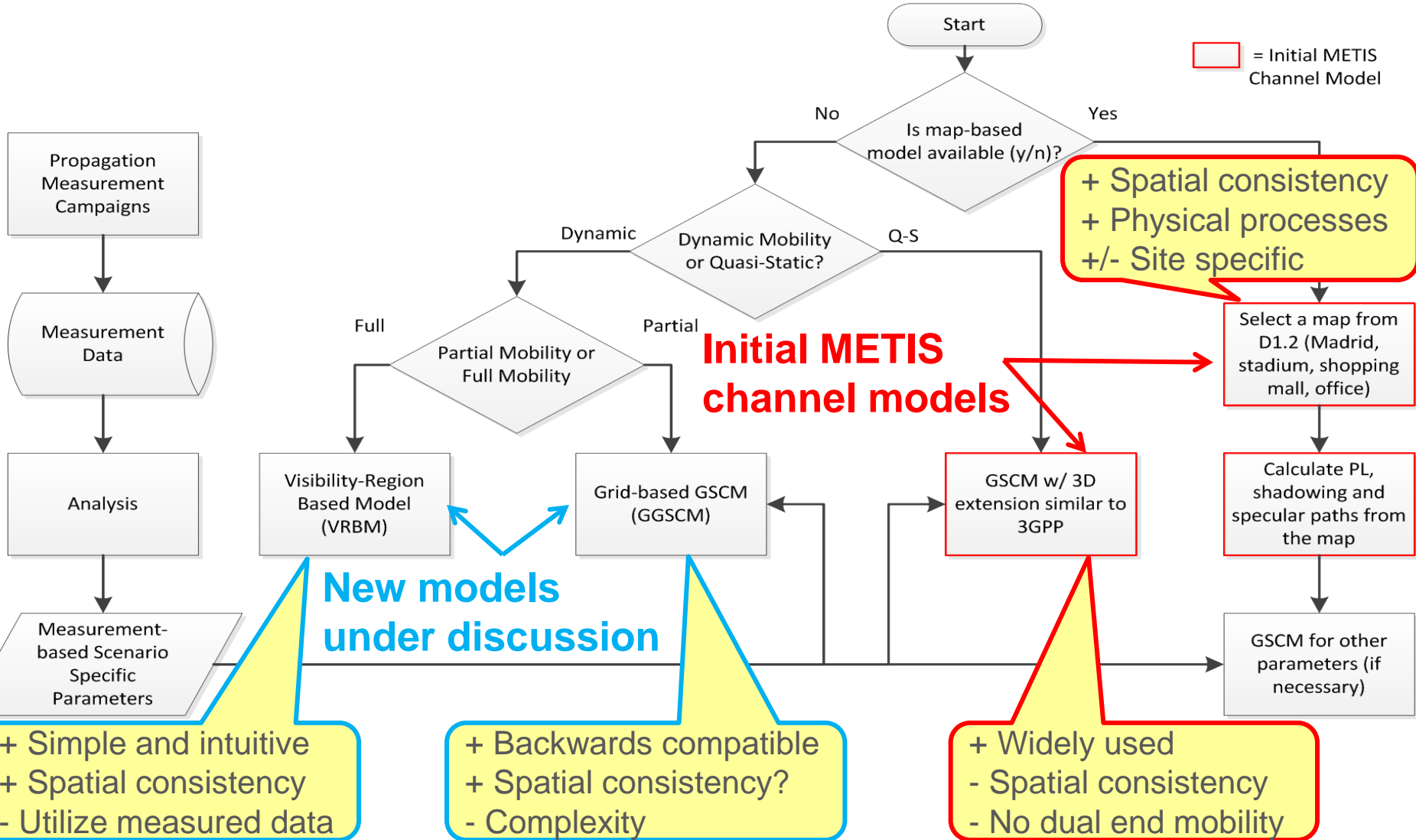


› Grid based GSCM (GGSCM)

- Spatial consistency not validated



Channel Modeling Approaches (2)



Step-by-step guideline is provided for initial METIS channel models



5G Propagation Scenarios and Mapping to Initial METIS model

Propagation Scenario		Initial METIS Model			
#	Name	Map-based Model (recommended in 5G simulations)		Geometry-based Stochastic Model	
		Model description	Supported link types	Model description	Supported link types
1	Urban Micro O2O, O2I	✓	any	✓	BS-MS, D2D/V2V
2	Urban Macro O2O, O2I	✓	any	✓	BS-MS, BH
3	Rural Macro O2O, O2I	✓		✓	BS-MS, D2D/V2V, BH
4	Indoor Office	✓	any	✓	BS-MS
5	Indoor Shopping mall	✓	any	✓	BS-MS
6	Highway			✓	BS-MS, V2V
7	Open Air Festival O2O	✓		✓	BS-MS, BH, D2D, BH
8	Stadium O2O	✓	any		

Next steps

- › Further development of modelling approaches towards deliverable D1.4 (February 2015)
 - Validation
 - Simplification
 - Implementation
 - Comparison and selection of final model
 - Complementary measurements
 - › To be utilized for parameterization of final channel model