Energy Efficient UE in a 5G Multi-connectivity UDN City Scenario

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I. INTRODUCTION

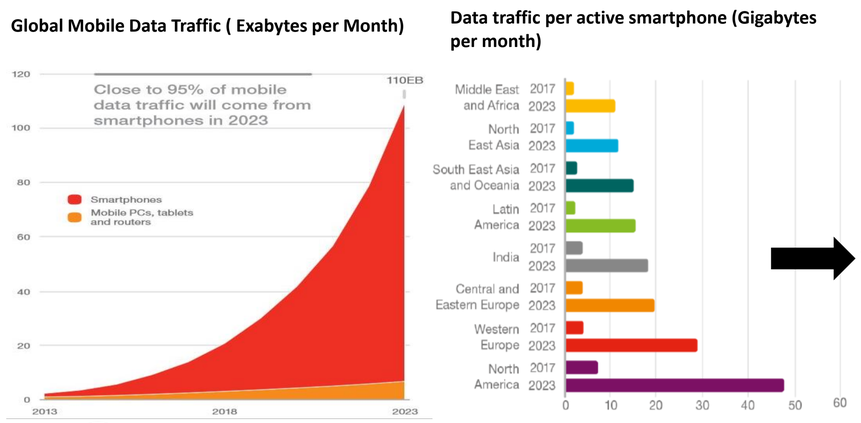
With the advent of exponential traffic growth in mobile networks, 5G is being developed to address such increase in data demand. Moreover, novel applications like autonomous vehicles and smart industry are requiring stringent QoS requirements in terms of reliability and delay. METIS, EU's 5G Flagship Project, has identified horizontal topics that address one or more of these new use cases. Ultra-Dense Networks (**UDN**) is one of those paradigms, and it's based under the premise of improving the user's throughput and reliability via infrastructure densification and multi-connectivity.

II. PROBLEM DEFINITION

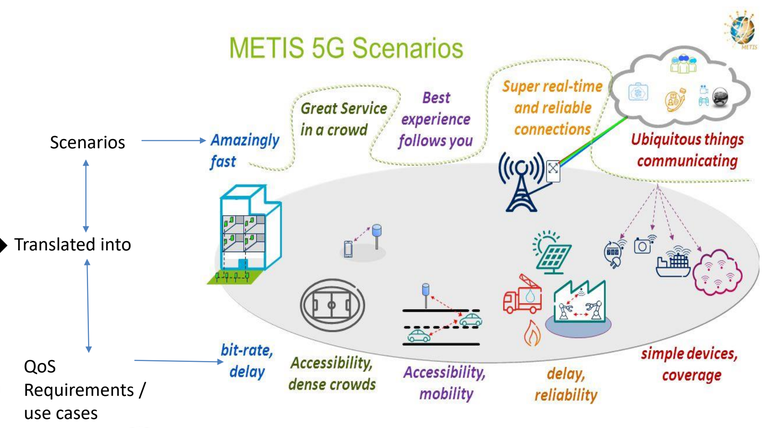
Multi-connectivity (**MC**) will allow the user equipment (**UE**) to connect to multiple access nodes simultaneously, thus aggregating bandwidth for high uplink (**UL**) and downlink (**DL**) data rates and conjointly improve reliability. MC will require UDN deployments that might pose an increase in UE power consumption, due to increased signaling and the management of multiple radio links. In addition, UDNs will most likely be deployed in urban city environments. Therefore, it is necessary to design energy efficient MC schemes for the UE in a UDN city scenario without compromising user's QoS requirements.

III. BACKGROUND AND RELATED WORK

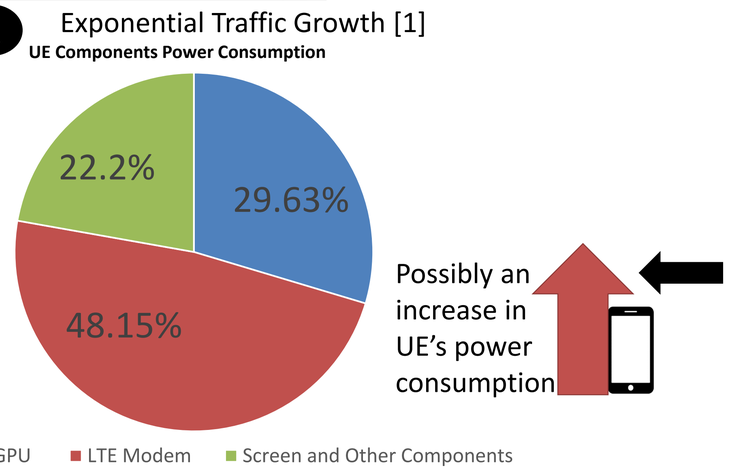
Baseline Characteristics



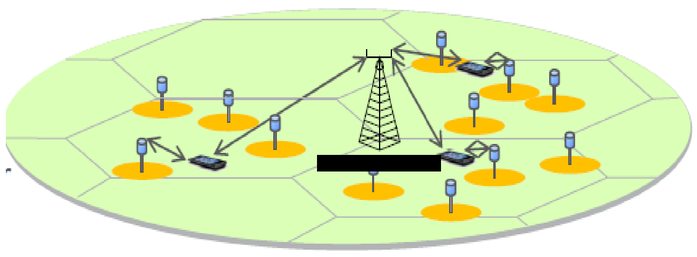
1 Exponential Traffic Growth [1]



2 Definition of 5G METIS Scenarios [3]



4 Power measurements from a fully-loaded LTE UE adapted from [2].



3 UDN deployment in a Heterogeneous Network. 5G anchors LTE.

IV. RESEARCH QUESTIONS

I. How does multi-connectivity in a dense urban city scenario impact UE performance ?

- I.I How does multi-connectivity enhances UE's uplink throughput in a city scenario?
- I.II What is the effect on UE's power consumption using multi-connectivity ?
- I.III To what extent does multi-connectivity conserves reliability in a dense urban city scenario?

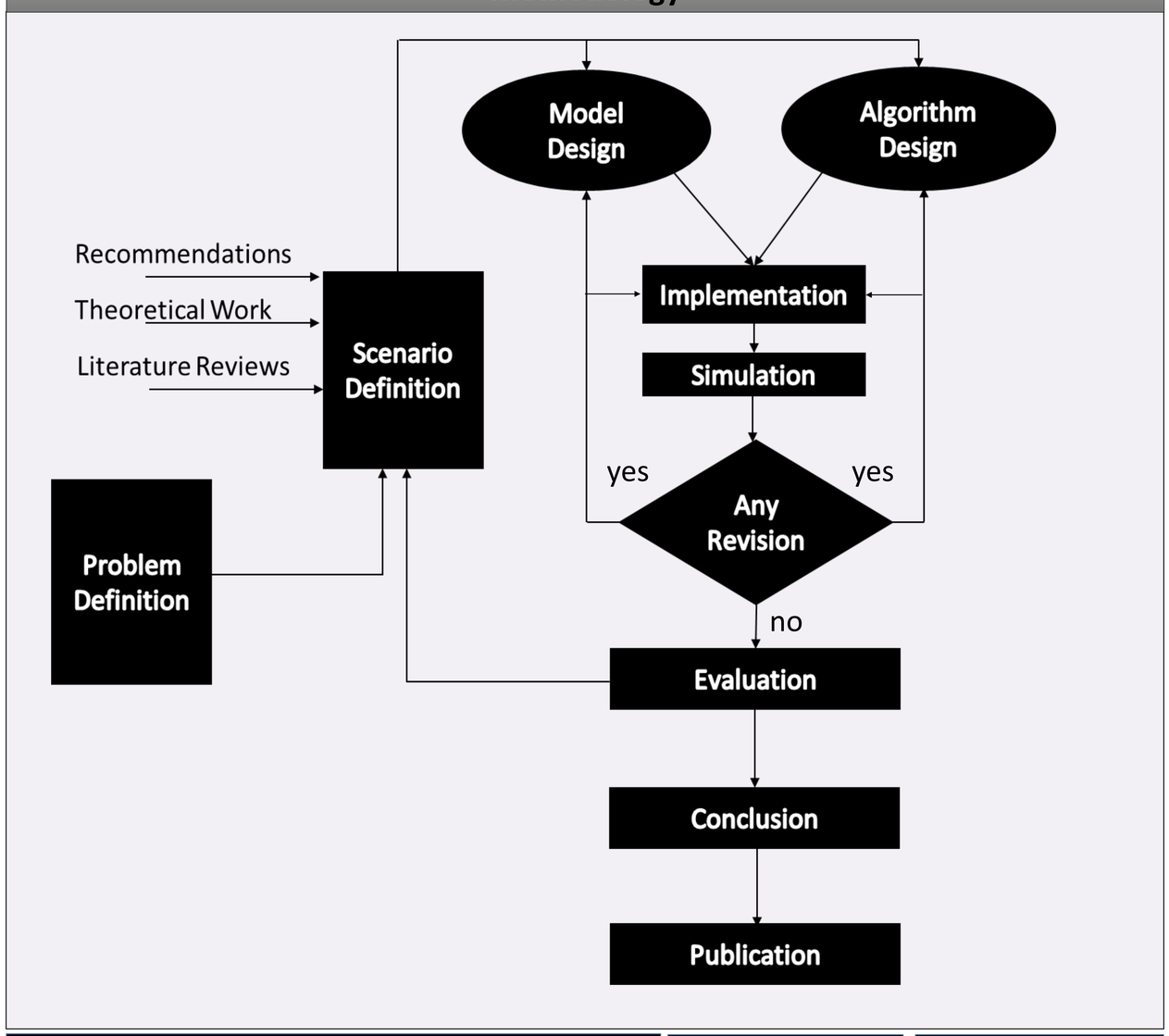
II. When using multi-connectivity in a dense urban city scenario, which smart traffic steering algorithms yield superior UE performance in terms of energy efficiency, reliability and uplink throughput ?

V. RESEARCH OUTCOMES

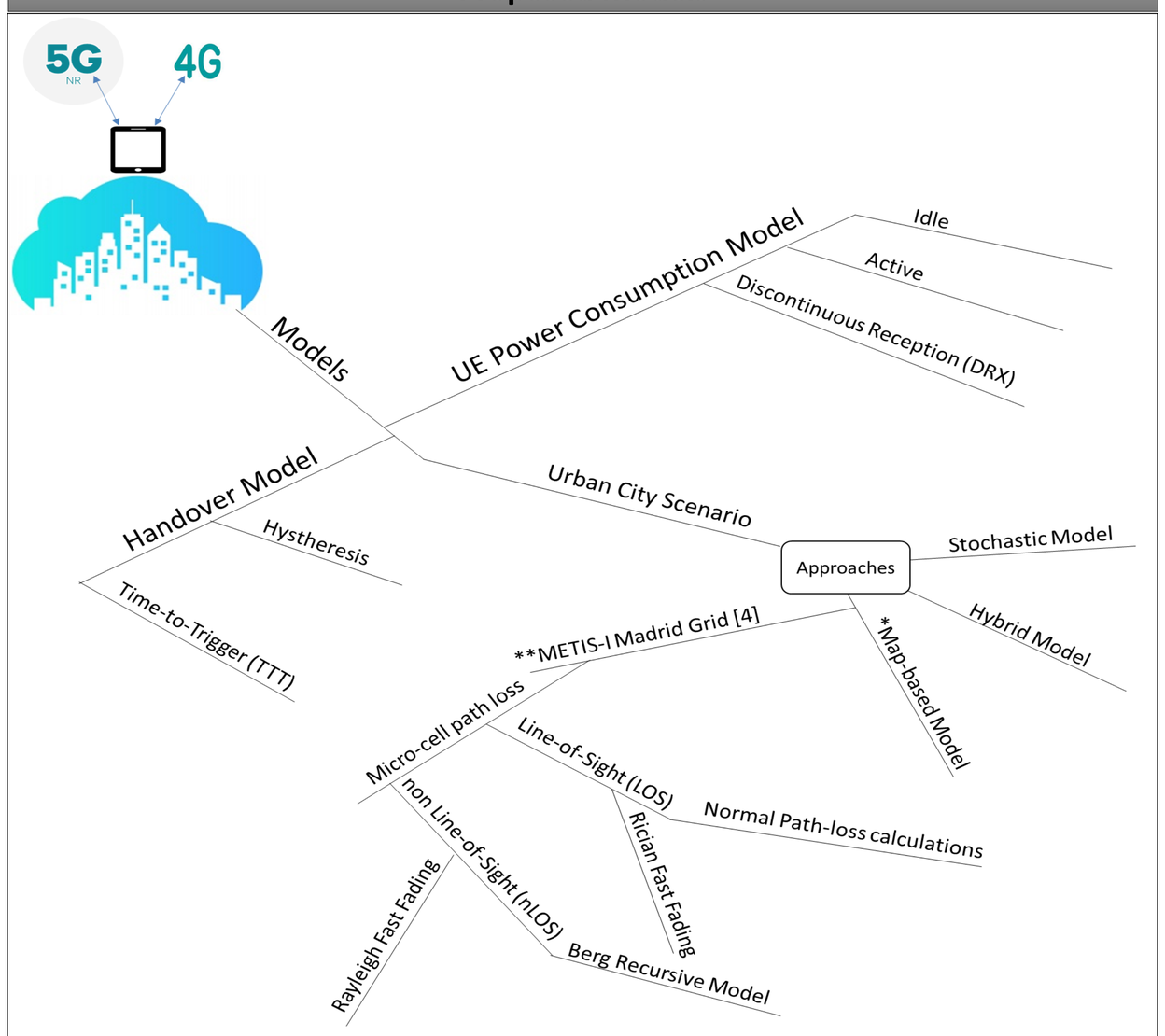
- Analysis of UE performance in a UDN city scenario.
- Smart traffic steering algorithms that increase UL throughput, reliability, and decrease UE power consumption, mainly based on secondary cell(s) association.

VI. SYSTEM DESIGN

Methodology



Proposed Models



VII. REFERENCES

[1] Ericsson, "Mobility Report," White Pap.
[2] M. Lauridsen, P. Mogensen, and L. Noël, "Empirical LTE smartphone power model with DRX operation for system level simulations,".
[3] A. Osseiran *et al.*, "Scenarios for 5G Mobile and Wireless Communications,"
[4] L. Raschkowski et al., "METIS D1.4: Summary METIS channel models,".

FINDINGS

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