INTELLIGENT 5G CELLULAR ENVIRONMENT

Mareesh Kumar Issar
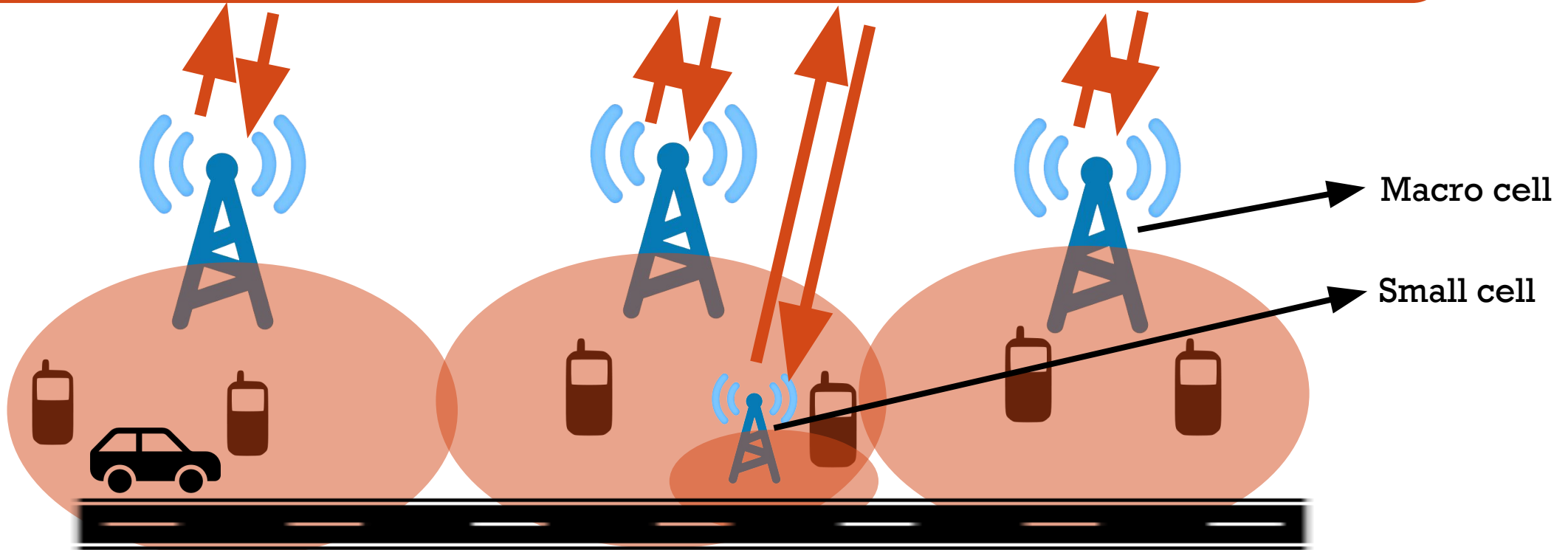
PROJECT PARTICIPANT

- Mareesh Kumar Issar
  - Graduate student, ECE department
 - Rutgers University

PROJECT OVERVIEW

RADIO ACCESS NETWORK INTELLIGENT CONTROLLER (RIC)
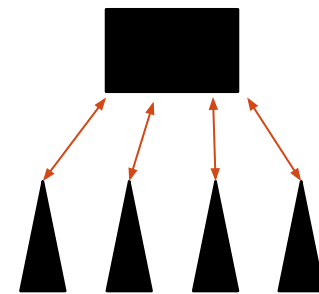

Macro cell

Small cell

BACKGROUND

- **What current technologies do?**

- Each cellular base station works as an independent entity during the handover process.

- Handover is governed by the signal strength.

- **What am I trying to achieve?**

- Better Quality-of-Experience (QoE) for users by optimizing the network throughput.
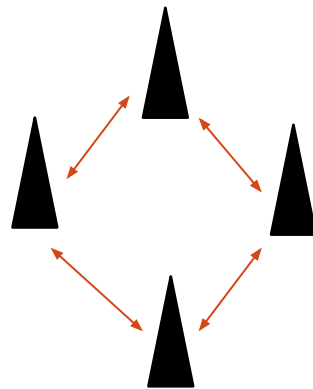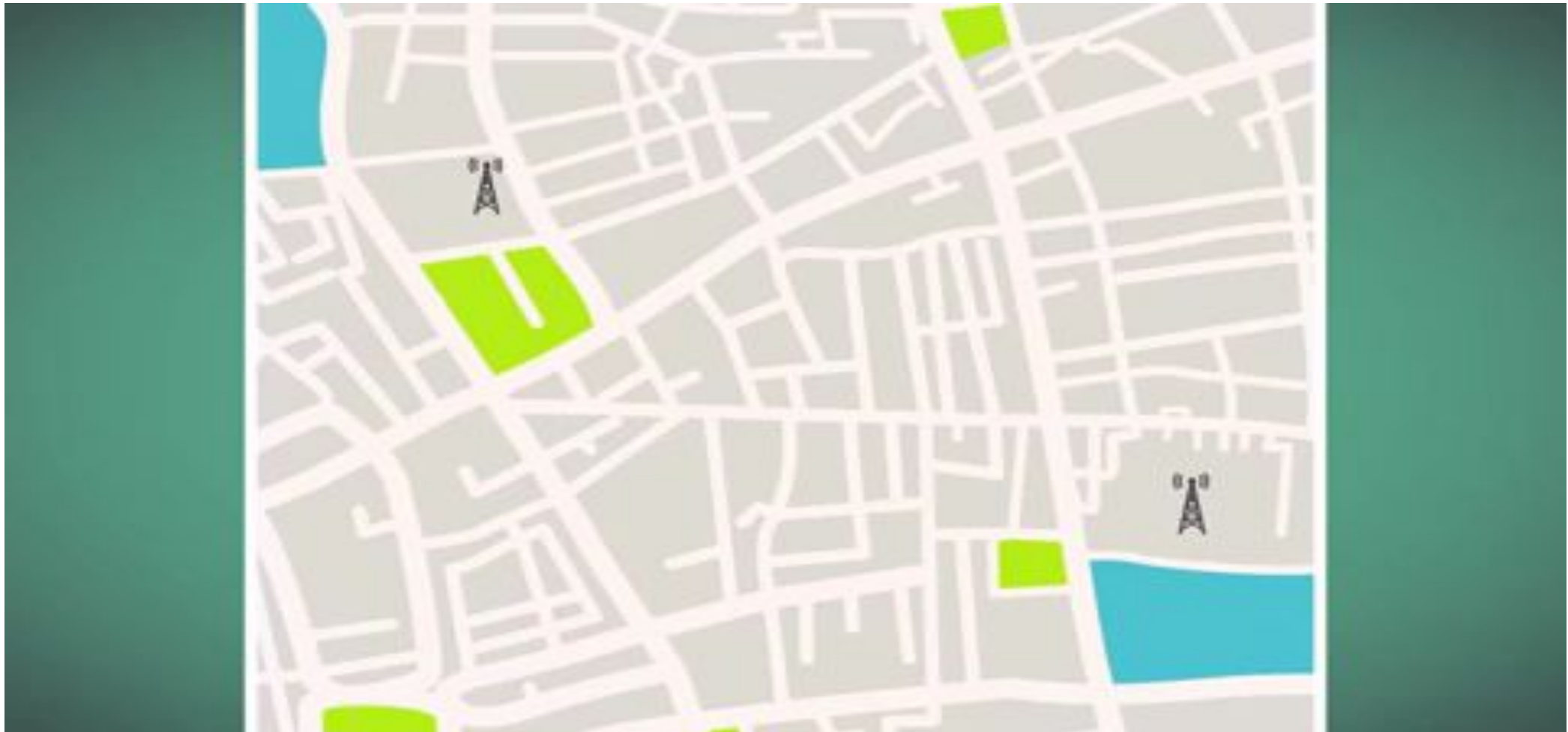
Distributed

Centralized

CELLULAR ARCHITECTURE

# HANDOVER

WHY SIMULATION?

- Evaluation of cellular systems typically involves the following three different methodologies:-
  - Analytical modeling
  - Real-world measurements
  - Simulation

- Network simulators are fundamental tools to assess the effectiveness of novel designs, architectures, and algorithms for networking problems, offering the possibility to monitor the performance of the overall system in a controlled environment, with different scenarios and parameter settings, and without the need for a real deployment.

- NS-3 is a discrete-event network simulator for Internet systems, targeted primarily for research and educational use.

BUILDING BLOCKS USING NS-3
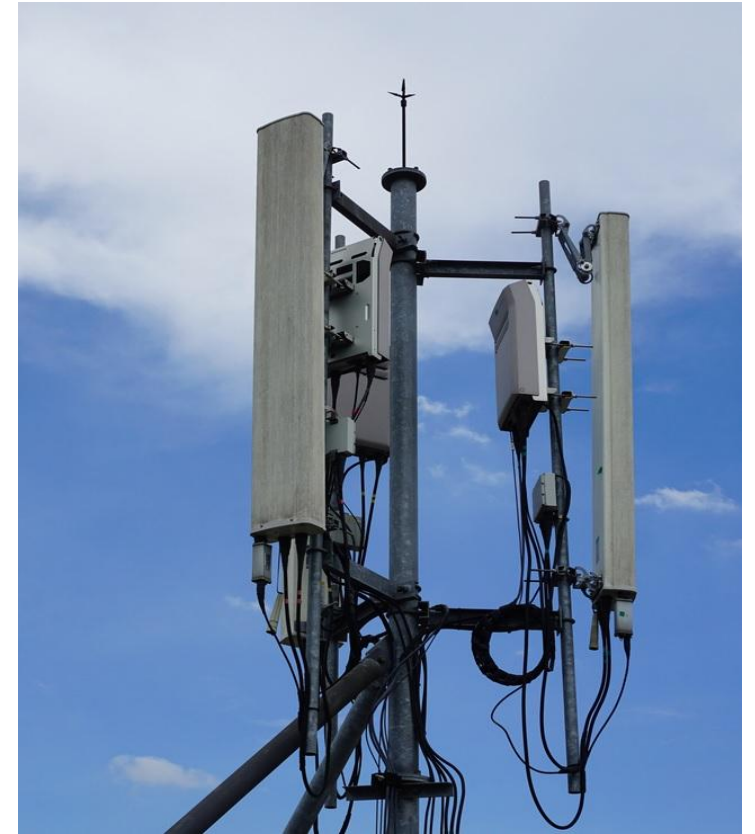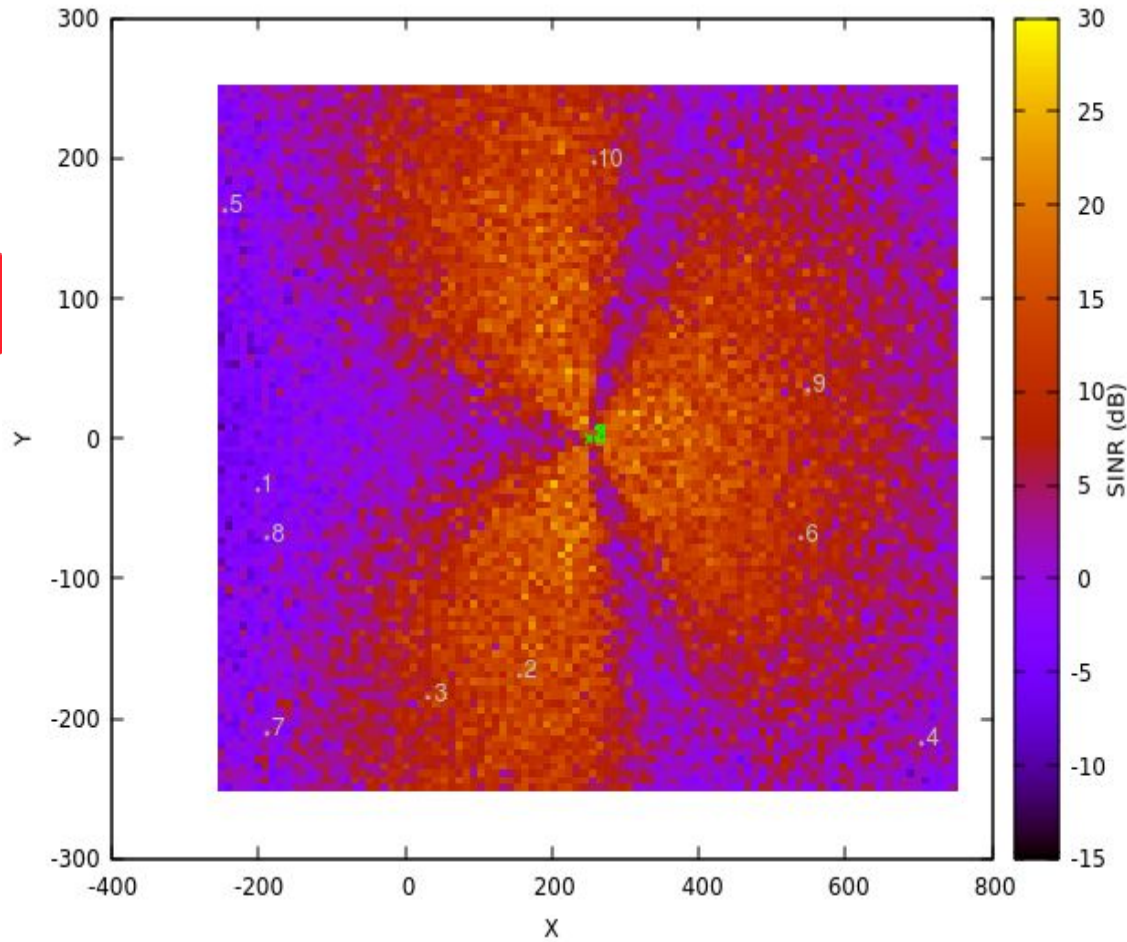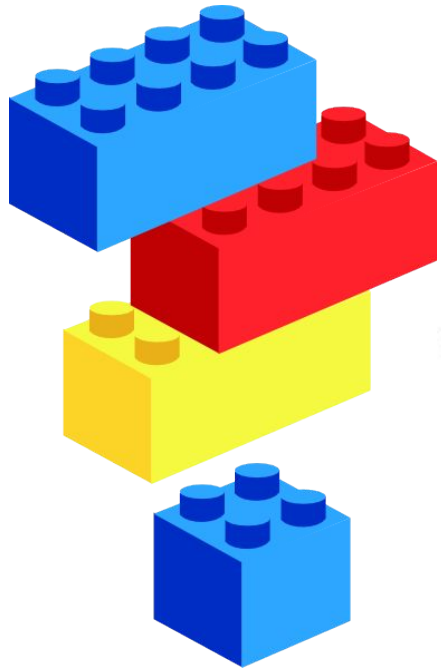
RADIO ENVIRONMENT MAP
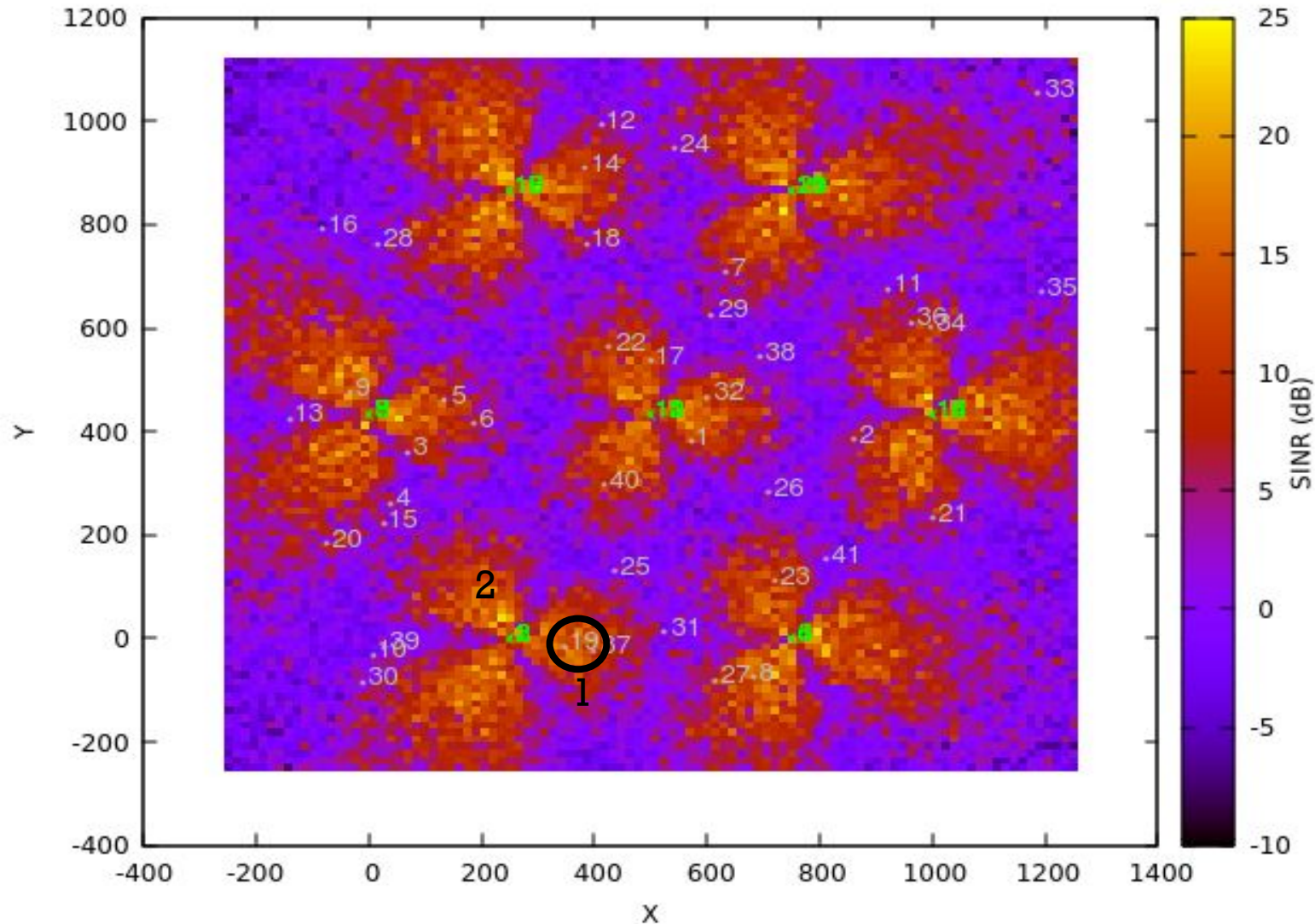
Time	CellID	IMSI	RSRP	SINR
7.395	1	19	-163.121	1.467015
7.396	1	19	-160.791	2.132547
7.397	1	19	-170.757	-8.5337
7.398	1	19	-167.64	-10.3427
7.399	1	19	-167.704	-7.02386
7.401	2	19	-168.756	-4.42811
7.402	2	19	-162.607	0.424731
7.403	2	19	-160.164	4.756901
7.404	2	19	-162.546	4.809995
7.405	2	19	-163.571	0.510174

RADIO ENVIRONMENT MAP

* as per 3GPP R4-092042
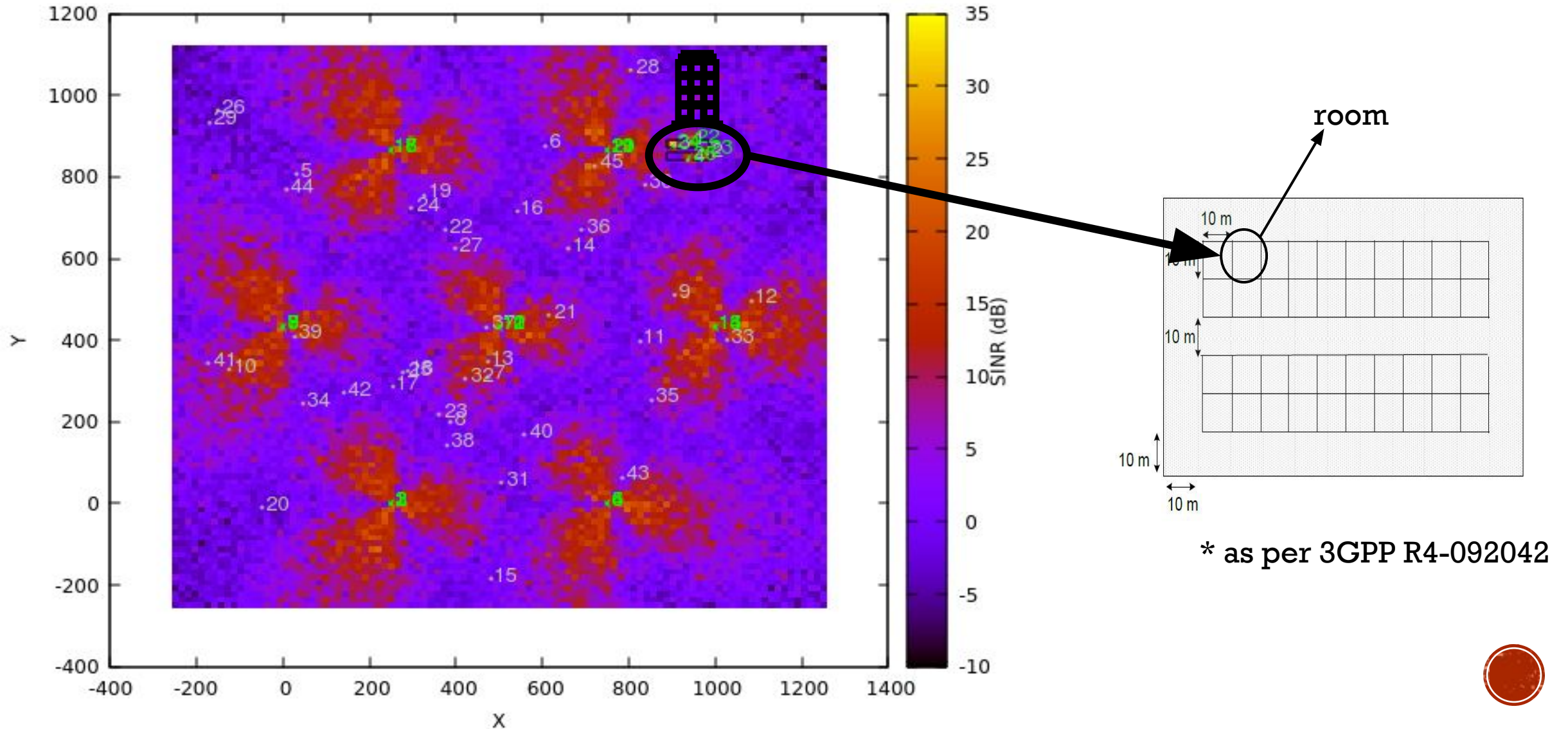
RADIO ENVIRONMENT MAP
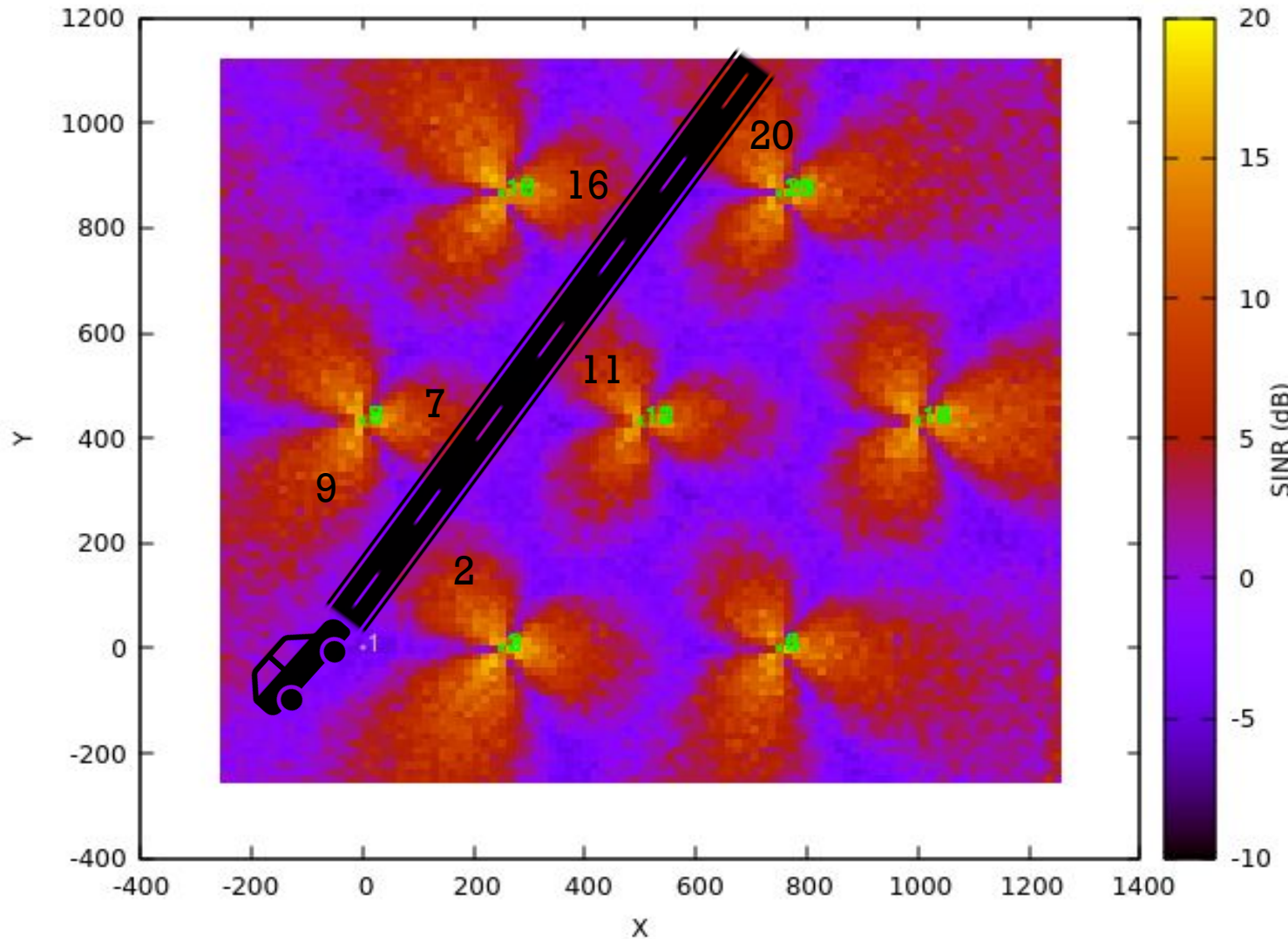
Time	CellID	IMSI
1.359	9	1
1.361	2	1
21.479	2	1
21.481	7	1
34.559	7	1
34.561	11	1
56.279	11	1
56.281	16	1
63.119	16	1
63.121	20	1

REFERENCES

- Zugno, Tommaso, et al. "Simulation of Next-generation Cellular Networks with ns-3: Open Challenges and New Directions." *Proceedings of the 2019 Workshop on Next-Generation Wireless with ns-3*. ACM, 2019.

- Dalla Cia, Massimo, et al. "Mobility-aware handover strategies in smart cities." *2017 International Symposium on Wireless Communication Systems (ISWCS)*. IEEE, 2017.

- Karandikar, Abhay, Nadeem Akhtar, and Mahima Mehta. *Mobility Management in LTE Heterogeneous Networks*. Springer Singapore, 2017.

- Asghar, Ahmad, Hasan Farooq, and Ali Imran. "Self-Healing in Emerging Cellular Networks: Review, Challenges, and Research Directions." *IEEE Communications Surveys & Tutorials* 20.3 (2018): 1682-1709.

THANK YOU ☺

QUESTIONS?