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Improving the Accuracy of Cellular Emulation

Motivation

Network emulation is important for testing new protocols in terms of signaling, algorithms and mechanisms. Recently, a new tool called CellReplay [1] based on mahimahi was proposed for accurate replaying of cellular network paths.

While CellReplay has improved accuracy, it does not take a cell's load (i.e., the amount of cross-traffic) into account.

The goal of this work is to improve CellReplay by investigating how cell load can be incorporated into the measurements necessary for CellReplay and into the emulation. Cell load shall be measured using existing cell sniffing tools [2] and Software Defined Radios.

Your Task

- Use UE Cell Tracker (based on ng-scope) to measure cell load.

- Introduce cell load as a parameter into CellReplay.

- Evaluate the accuracy of the improvements.

Requirements

- General knowledge of computer networking

- Basic understanding of cellular networks

- Interest or experience in systems programming

References

[1] William Sentosa, and others. 2025. CellReplay: towards accurate record-and-replay for cellular networks. In Proceedings of the 22nd USENIX Symposium on Networked Systems Design and Implementation (NSDI '25). USENIX Association, USA, Article 63, 1169–1186.

[2] Bastian Schmidt. UE Cell Tracker. https://github.com/bastian-src/UECellTracker

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