

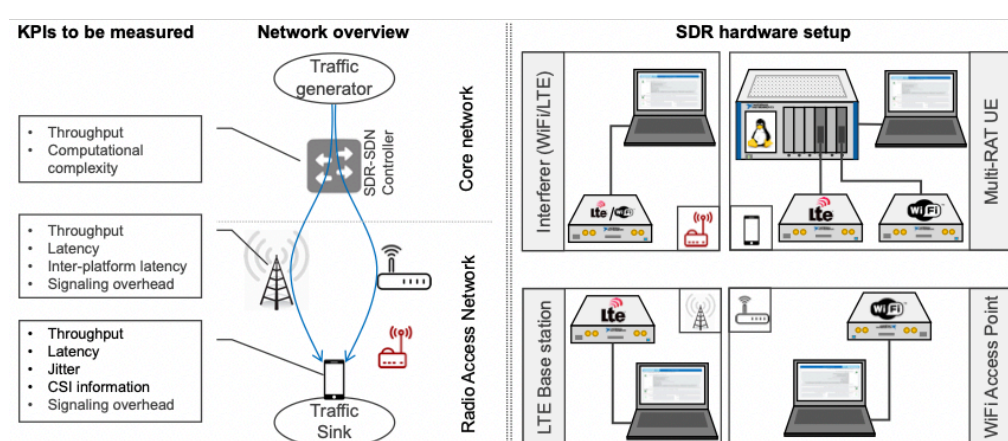
An Experimental Study of Multi-RAT Systems ¹



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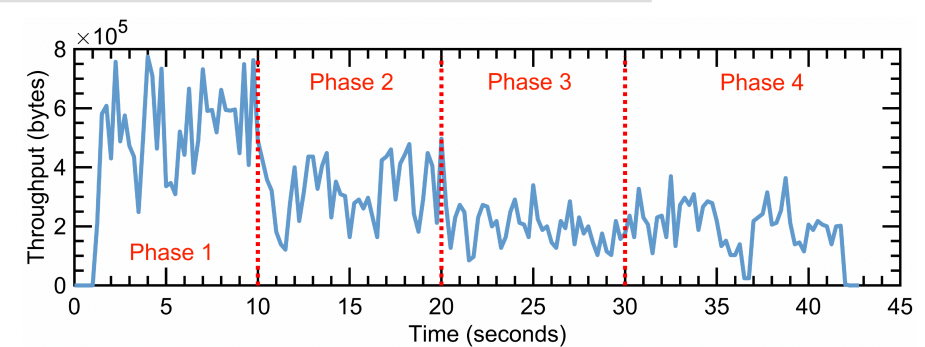
Objectives & System Overview

- **Obj1:** Definition of evaluation scenarios
- **Obj2:** Implementation of required features/logic
- **Obj3:** Exp. analysis of multi-RAT communication

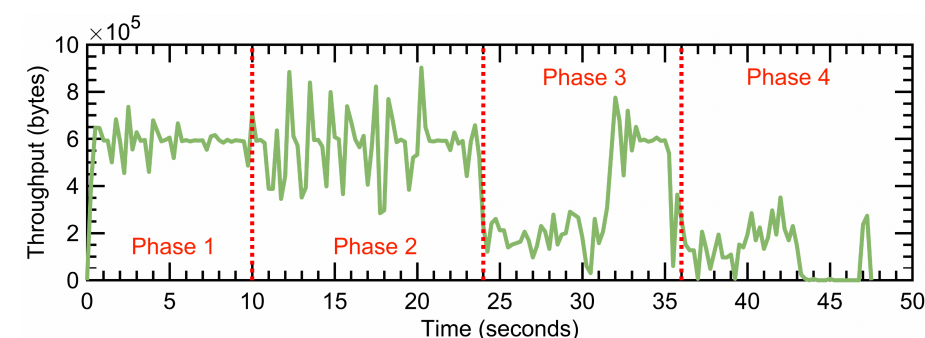


Overview of the setup from network and hardware perspective

Experimental Analysis



TCP Throughput (byte/s) of LTE PHY under different channel conditions.



TCP Throughput (byte/s) of fully switched LWA mode (WiFi PHY) under different channel conditions.

Multi-RAT Scheduling Algorithm

Testbed Implementation

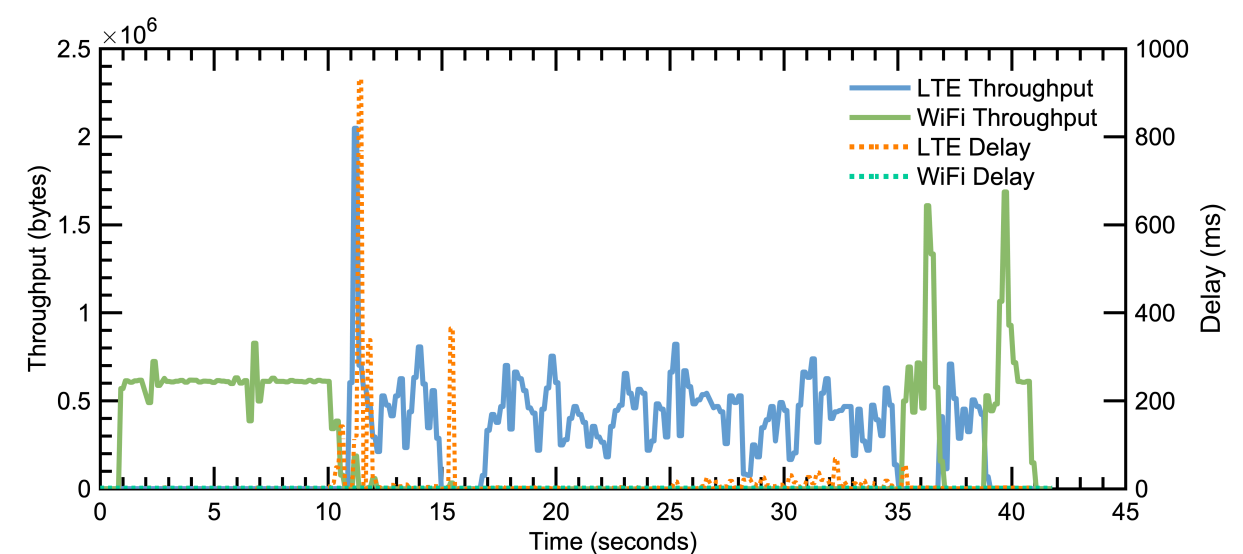
- Based on multi-RAT demo application ²
- Implemented additional packet merging at UE (PDCP reordering missing)
- Implemented feedback mechanism for LTE & WiFi latency, throughput measured at UE at (via CQI feedback)
- Implemented simplistic threshold-based multi-RAT scheduler

Scheduler Pseudocode

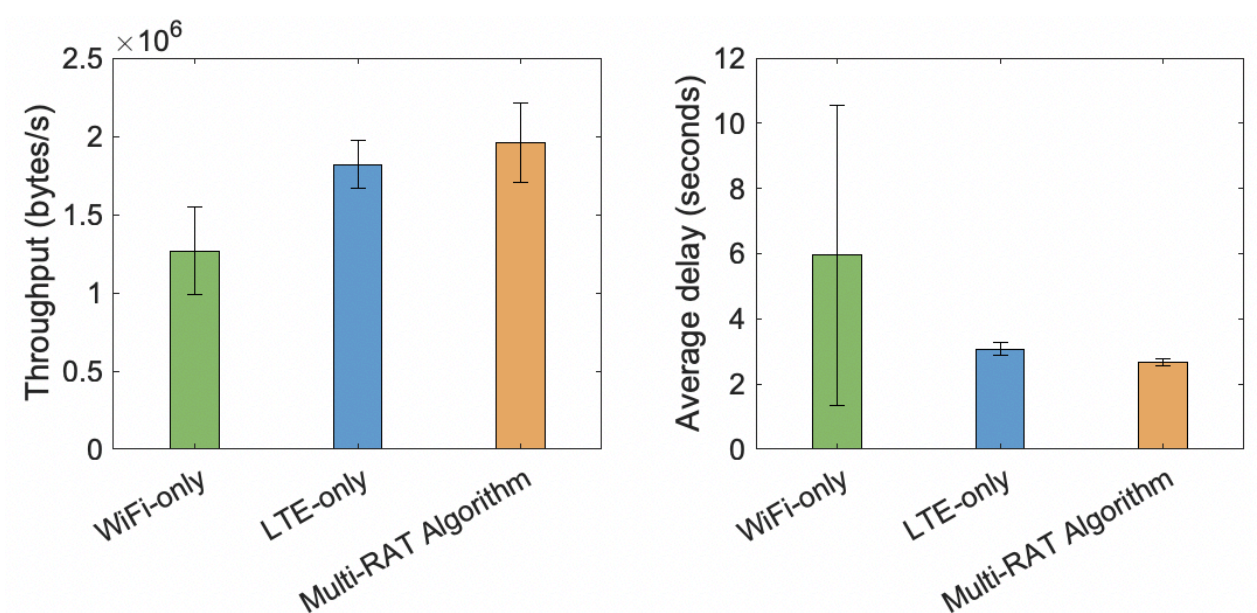
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1 use wifi initially;
2 if (wifi & (wifi_jitter > threshold || wifi_latency >
  threshold || wifi_throughput < threshold)) then
3   switch to lte and wait 2 seconds;
4 if (lte & (lte_jitter > threshold || lte_latency >
  threshold || lte_throughput < threshold)) then
5   switch to lte and wait 2 seconds;
6 goto 2;

```



Multi-RAT scheduler performance under varying channel conditions for WiFi and LTE



Observed throughput, latency and jitter for our simplistic multi-RAT scheduling algorithm

¹This work was conducted within ORCA-RAT project funded through the open call for experiment under EU H2020 ORCA (agreement No 732174)

²<https://github.com/ni/NI-ns3-ApplicationExample>