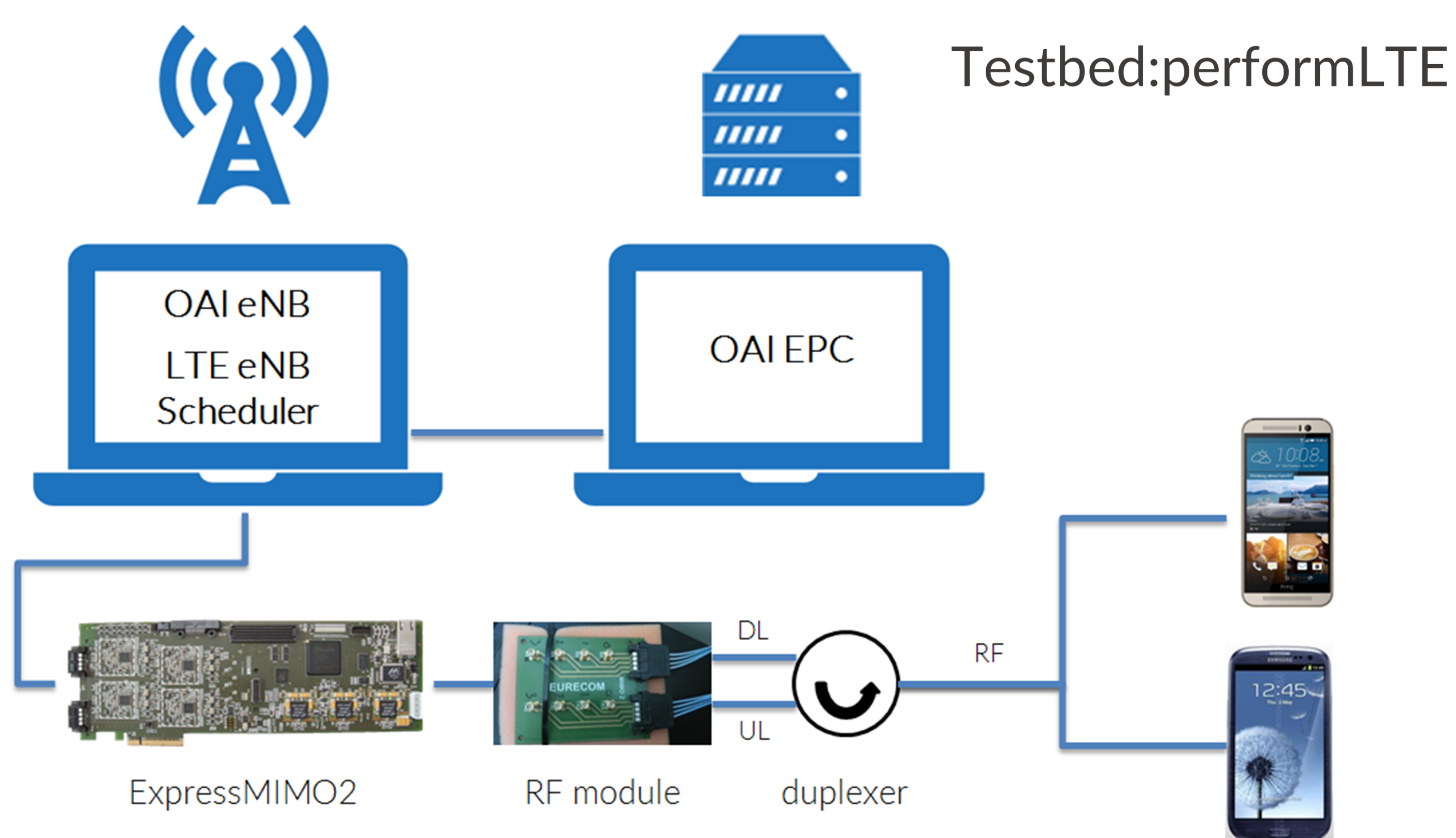


EXPERIMENT GOALS

- LTE eNB Scheduler experiments in the environment composed of LTE base station and multiple, simultaneously connected UE nodes
- User-oriented KPI measurement
 - for Carrier Aggregation transmission
 - in various environment conditions
- LTE eNB Scheduler testing using open-source software for LTE eNB/UE protocol stacks and various SDR front-end devices

EXPERIMENT SETUP



SW/HW components

- OAI eNB - the branch supporting FAPI interface and CA functionality (feature-31-ff-scheduler-api)
- OAI EPC - master branch at the newest release
- LTE eNB Scheduler - basic and advanced algorithms
- expressMIMO2 + RF module
- 4x COTS UE with test SIM cards
- 2x LTE duplexer, band 7
- USRP B210 for spectrum analysis
- Tools: TestelDroid and aLTeRnatiVe (new ISW's product supporting LTE open-source protocol stack)

LTE eNB Scheduler

- IS-Wireless' proprietary software library providing an advanced scheduling algorithm for LTE base station
- Implemented in ANSI C (C99) using the latest industry standards for improved safety and performance
- Interacts with LTE eNB protocol stack through FAPI interface extended to support Carrier Aggregation
- LTE eNB Scheduler is going to be a part of IS-Wireless' Software-Defined RAN for 4G and 5G

Algorithm/Component	Round Robin	maxCQI	Proportional Fair	M-LWDF	M-QBER	LTE eNB Scheduler
Channel conditions	No	Yes	Yes	Yes	Yes	Yes
Historical throughput	No	No	Yes	Yes	Yes	Yes
Packet delay	No	No	No	Yes	No	Yes
Queue length	No	No	No	No	Yes	Yes
GBR/non-GBR traffic	No	No	No	No	No	Yes
Carrier Aggregation*	No	No	No	No	No	Yes
Wrong CQI correction	No	No	No	No	No	Yes

Technical outcomes

- Successful deployment of LTE eNB Scheduler in cooperation with OAI and expressMIMO2
 - Carrier aggregation transmission with 2 CC
- The range of RF front-end equipment that is compatible with deployed LTE eNB successfully verified



- Additional implementation for LTE eNB Scheduler:
 - to increase the efficiency in cooperation with OAI
 - required for bug fixing
- New ideas for better OAI support within aLTeRnatiVe (some already implemented):
 - improvements of the eNB and EPC configuration procedures,
 - better support for software compilation,
 - support for the FAPI compilation, which is necessary for LTE eNB Scheduler application.

Conclusions

- LTE eNB works stable, however the KPI measurements could not be performed due to many encountered issues.
- LTE eNB is not yet resistant to the environment conditions - it might be a good idea to repeat the experiment in more controllable environment
- OAI software requires additional implementation
 - for EPC part - in order to fully support LTE attach procedure
 - for eNB part - in order to support single carrier transmission (feature-31-ff-scheduler-api does not support it)
- The high PC performance (including features for power management, CPU frequency scaling and hyperthreading) is required to support expressMIMO2