

srsLTE Project Update

How 2019 went and what's up in 2020

Andre Puschmann

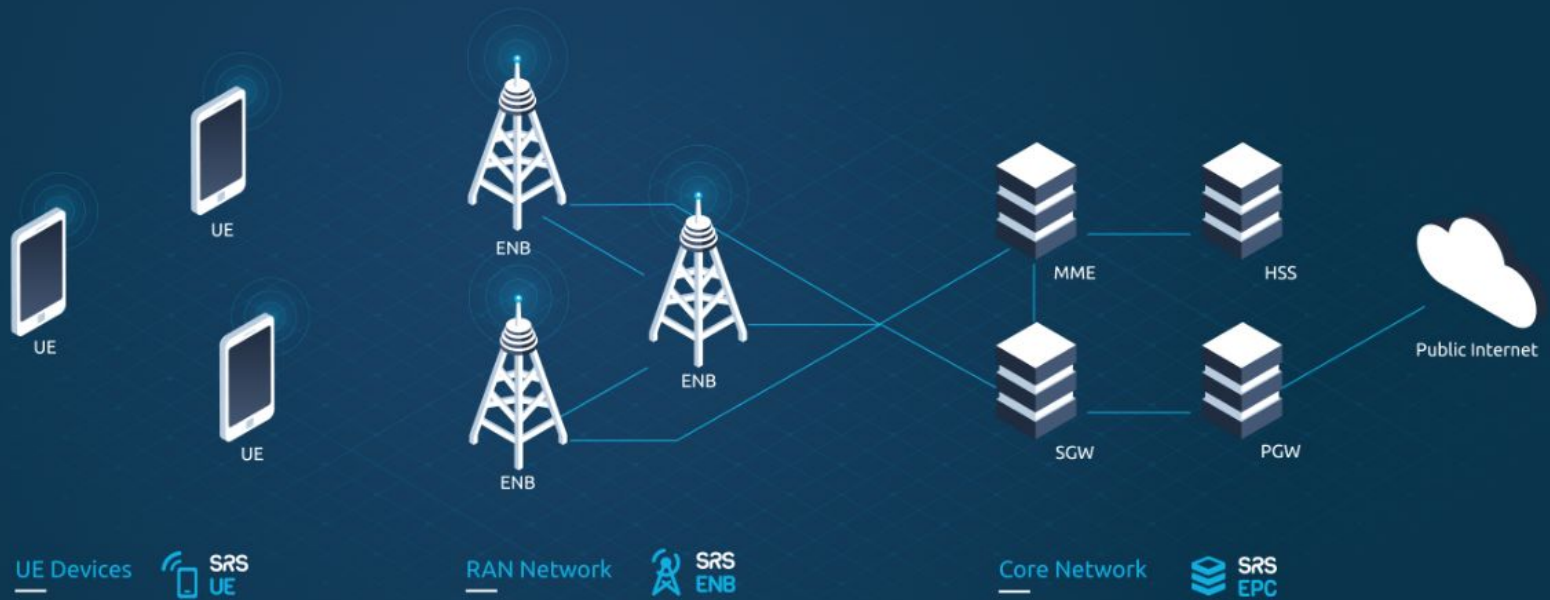


Free Software Radio devroom @ FOSDEM 2020
2020_02_02_0202 ←

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GSMA Mobile Security Hall of Fame

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CVD-2018	00011	Gildas Avoine	INSA Rennes / IRISA http://avoine.net
CVD-2018	0012	David Basin Jannik Dreier Lucca Hirschi Sasa Radomirovic Ralf Sasse Vincent Stettler	ETH Zurich, Université de Lorraine CNRS, Inria, University of Dundee https://arxiv.org/abs/1806.10360
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CVD-2018	0013	Christina Pöpper	NYU Abu Dhabi, United Arab Emirates Paper , Talk
CVD-2018	0014	Elisa Bertino	Purdue University https://www.cs.purdue.edu/homes/bertino/
CVD-2018	0014	Omar Chowdhury	University of Iowa http://homepage.dvms.uiowa.edu/~comarhaider/
CVD-2018	0014	Mitziu Echeverria	University of Iowa
CVD-2018	0014	Syed Rafiul Hussain	Purdue University https://relentless-warrior.github.io/
CVD-2018	0014	Ninghui Li	Purdue University https://www.cs.purdue.edu/homes/ninghui/
CVD-2019	0018	Altaf Shaik	Technical University of Berlin https://www.isti.tu-berlin.de/security_in_telecommunications
CVD-2019	0018	Ravishankar Borgaonkar	SINTEF Digital https://www.sintef.no/en/all-employees/employee/?empid=7616
CVD-2019	0024	David Rupprecht Christina Pöpper Thorsten Holz	Ruhr University Bochum, Germany and New York University Abu Dhabi
CVD-2019	0026	Cathal Mc Daid	AdaptiveMobile Security https://www.adaptivemobile.com
CVD-2019	0029	Syed Rafiul Hussain Mitziu Echeverria Imtiaz Karim Omar Chowdhury Elisa Bertino	Purdue University University of Iowa Purdue University University of Iowa Purdue University
CVD-2019	0030	David Rupprecht Katharina Kohls Thorsten Holz	Ruhr University Bochum
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8/11 recent CVD
> 165 research papers

Agenda

- Highlights of 2019 srsLTE Releases
- Sneak Preview for 2020
- Target Platforms
- Test and Quality Assurance

srsLTE Release Highlights in 2019

- 19.03
 - PHY library refactor, TDD and CA for srsUE
 - 3GPP channel simulator
 - Paging and user-plane encryption
- 19.06
 - UE and eNB architecture refactor
 - QoS in srsUE
- 19.09
 - Initial support for NR in MAC/RLC/PDCP, and NB-IoT
 - CSFB and ZUC support in srsENB/EPC
 - srsUE conformance testing
- 19.12
 - 5G NR RRC and NGAP packing/unpacking
 - Initial Sidelink support

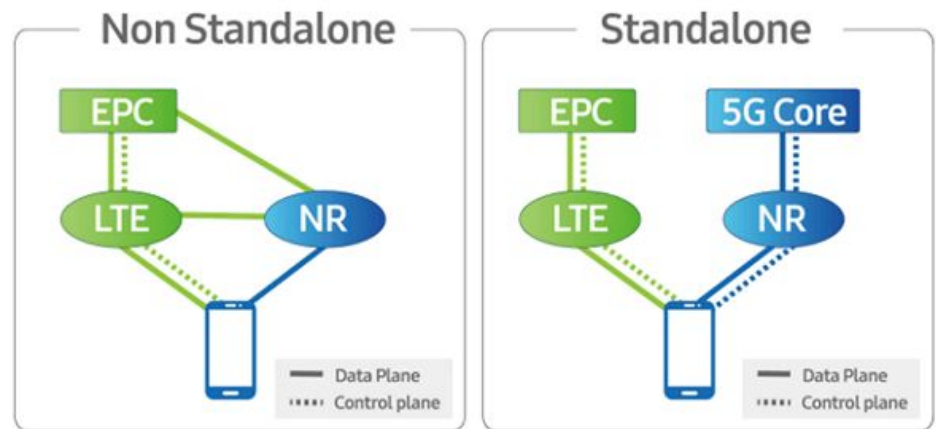
New Release Cycle in 2020

- Quarterly release schedule for +2 years
 - Especially the x.6 and x.12 releases were hard
- Six-month cycle from now on
 - Adopting Ubuntu cycle, i.e. 20.04 and 20.10
 - Spring and Autumn better match of development activity

Upcoming srsLTE Features in 2020

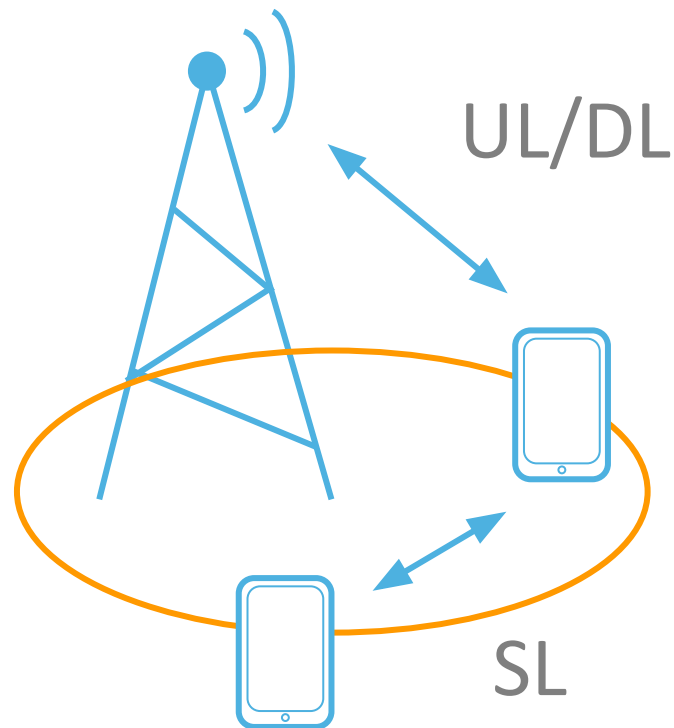
5G-NR Non-Standalone (NSA)

- First for srsUE, then srsENB (core currently not planned)
- Completed:
 - User-plane protocol layers
 - 4G control plane
- Under development:
 - 5G control plane
 - x86 PHY
 - RFSoc PHY



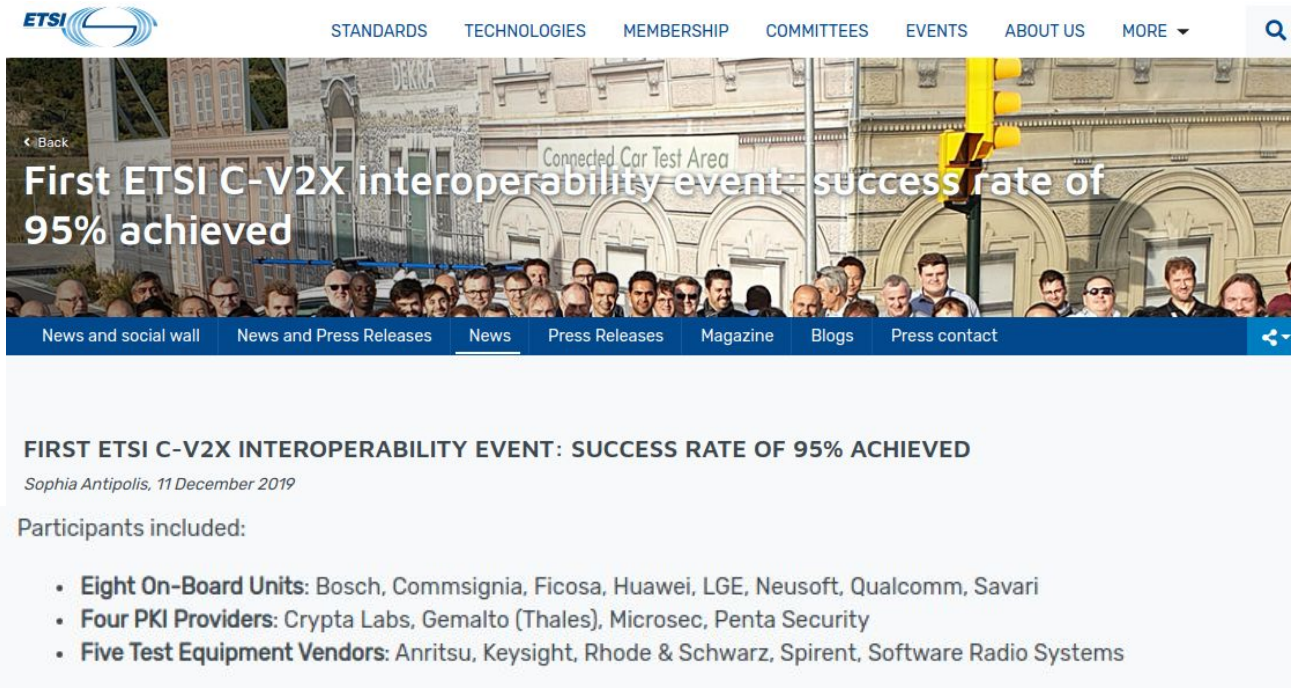
C-V2X

- Full PHY layer for Sidelink (SL) Mode 1 - 4
- Tested interoperability with 3rd-party devices



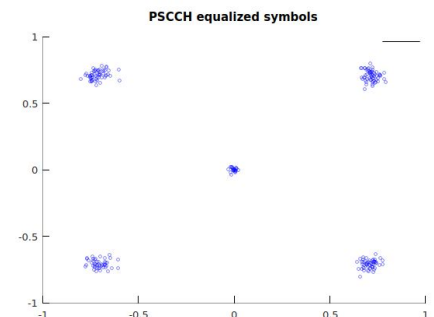
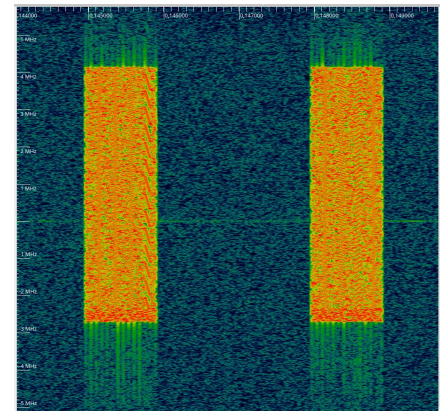
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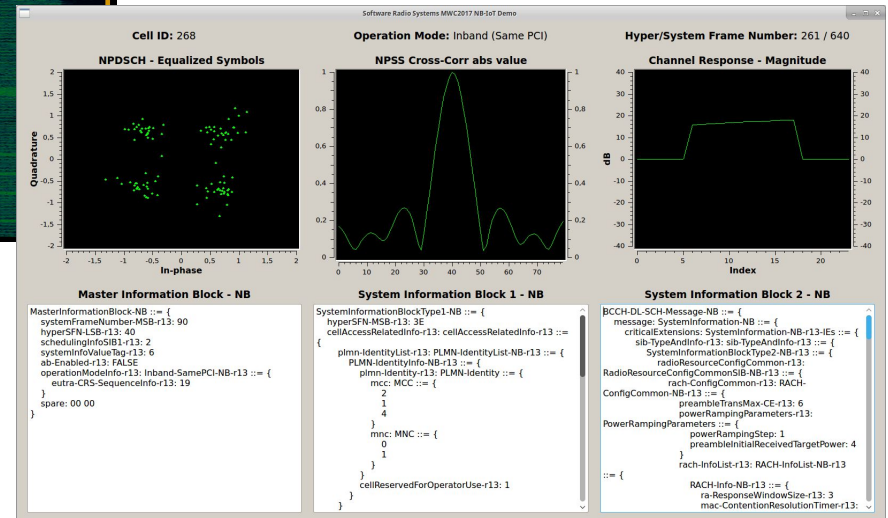
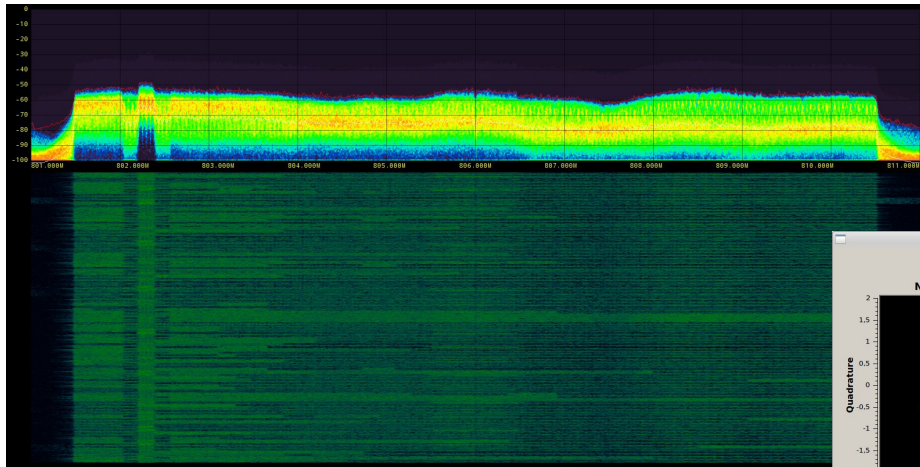
The screenshot shows the ETSI website with a navigation bar including links for STANDARDS, TECHNOLOGIES, MEMBERSHIP, COMMITTEES, EVENTS, ABOUT US, and MORE. The main banner features a group photo of participants at the 'Connected Car Test Area' with the headline 'First ETSI C-V2X interoperability event: success rate of 95% achieved'. Below the banner is a news section titled 'FIRST ETSI C-V2X INTEROPERABILITY EVENT: SUCCESS RATE OF 95% ACHIEVED' dated 11 December 2019. The participants listed are:

- **Eight On-Board Units:** Bosch, Commsignia, Ficosa, Huawei, LGE, Neusoft, Qualcomm, Savari
- **Four PKI Providers:** Crypta Labs, Gemalto (Thales), Microsec, Penta Security
- **Five Test Equipment Vendors:** Anritsu, Keysight, Rhode & Schwarz, Spirent, Software Radio Systems



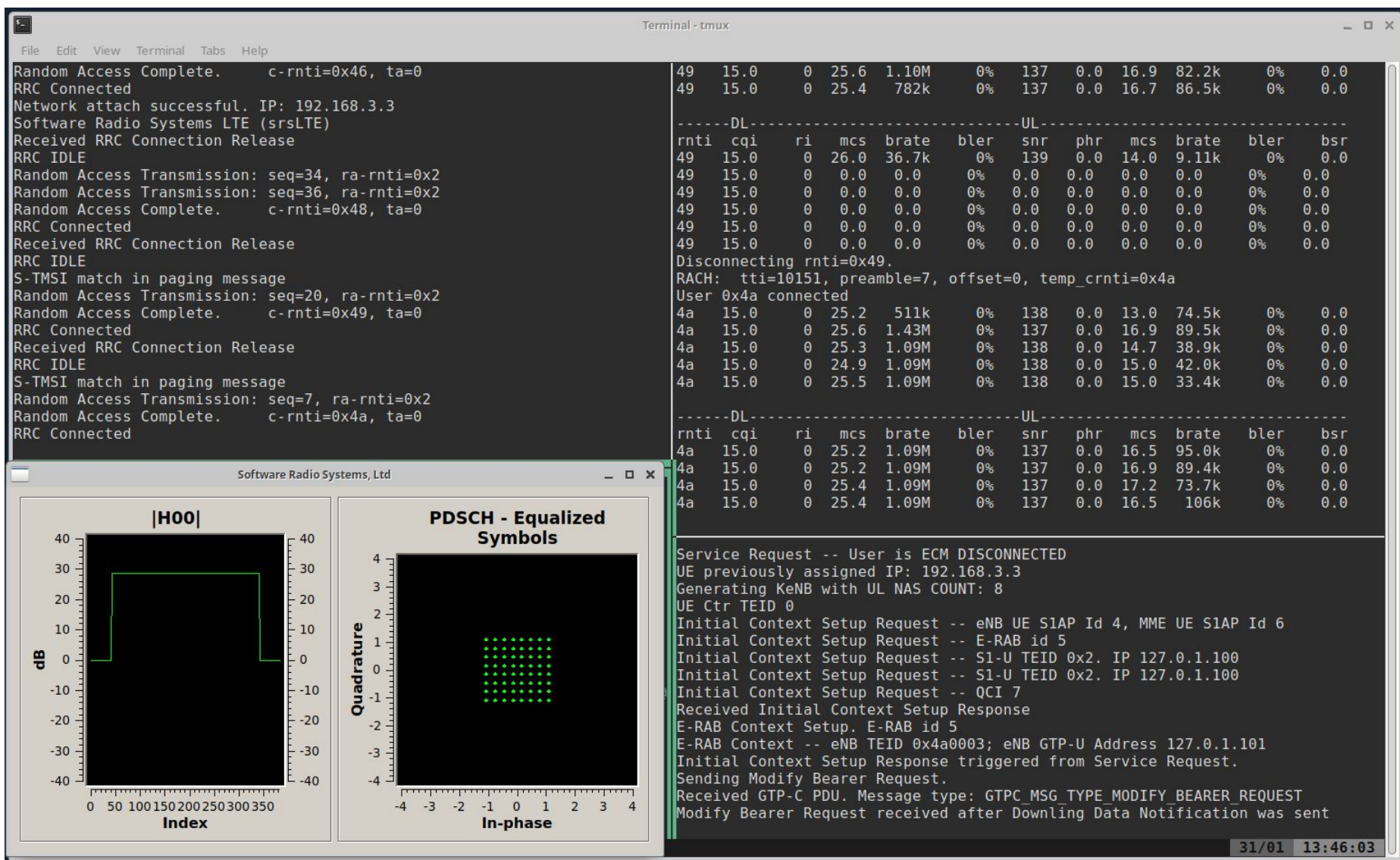
NB-IoT

- Full PHY layer for UE and eNB in mainline
- No upper layer support (for now)



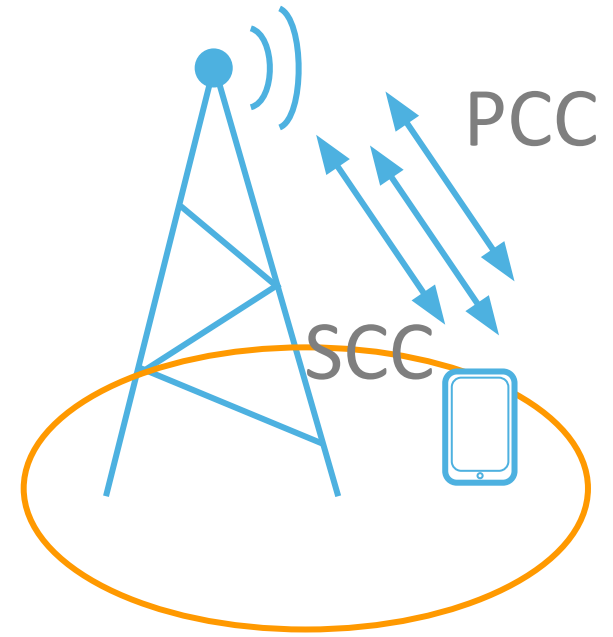
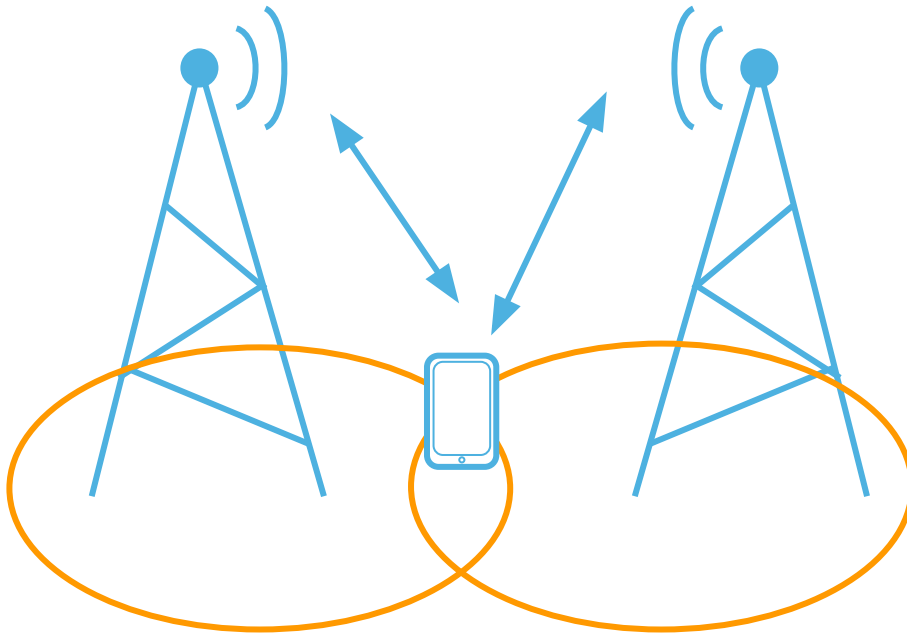
ZeroMQ Radio Module

- Full stack testing **without** RF hardware
- Use tools like Valgrind, ASAN, gdb, etc., run faster, slower, pause
- Model complex environments (N eNBs, M UEs, channel matrix)
- IQ samples over ZMQ IPC/IP sockets
- Timestamp sync and resampling
- No system timers in UE and eNB (timing from samples)
- Part of CMake testing without container or other dependencies



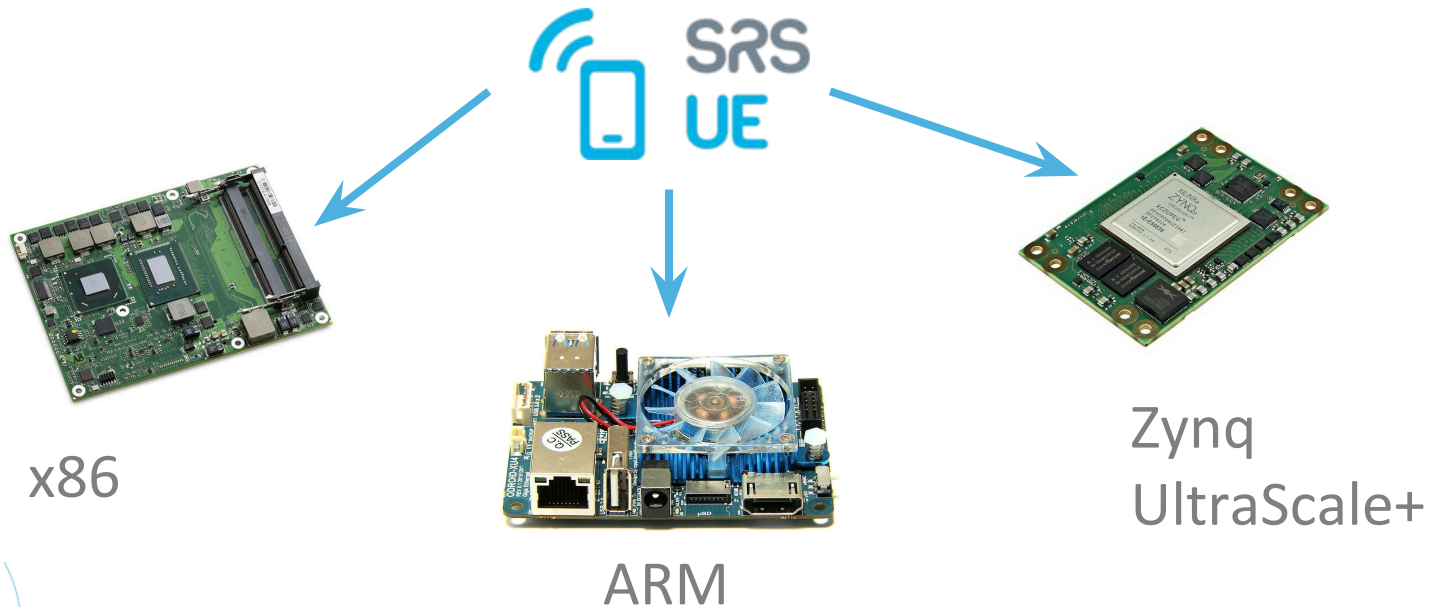
srsENB Outlook

- Support for handover
- Support for Carrier Aggregation
- Performance and stability (towards carrier-grade)



Target Platforms

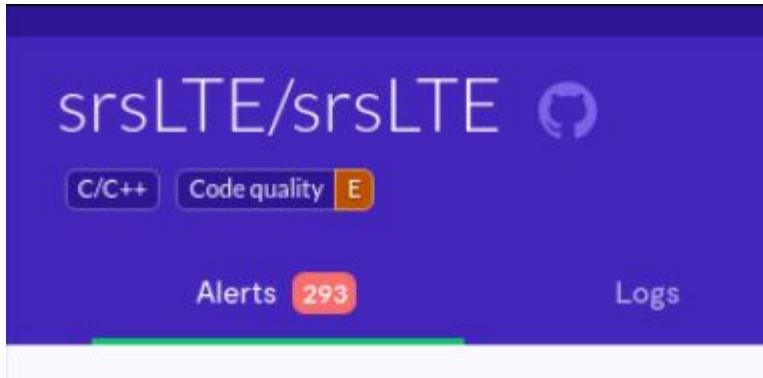
- Wide range of RF hardware
 - Ettus USRP B2x0/X3x0 families, Epiq Sidekiq, BladeRF, LimeSDR, etc.
 - ZeroMQ based fake RF for I/Q over IPC/network
- Wide range of DSP platforms



Quality Assurance

Continuous Integration

- ~600 unit tests
- Address sanitizer/Valgrind on x86/(ARM)
- Static code analysis with Coverity and LGTM



srsLTE

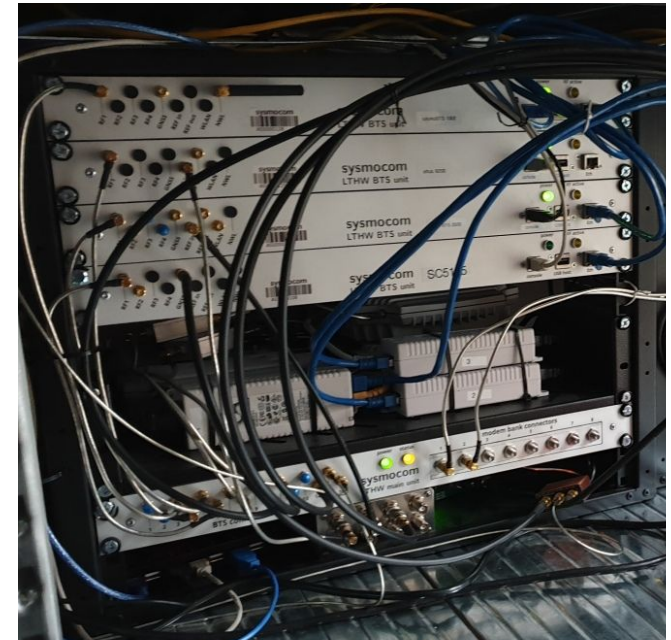
build **passing** code quality: c/c++ **A** coverity **passed**

srsLTE is a free and open-source LTE software suite de project pages (www.srslte.com) for documentation, guid

www.softwareradiosystems.com

RF Continuous Integration (RFCI)

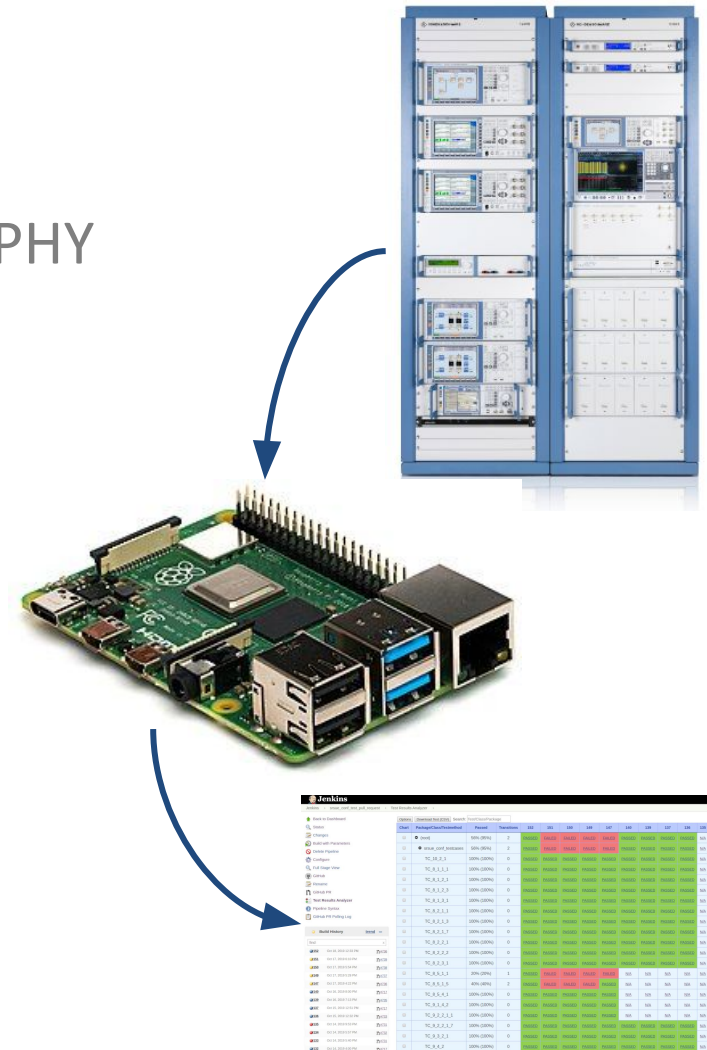
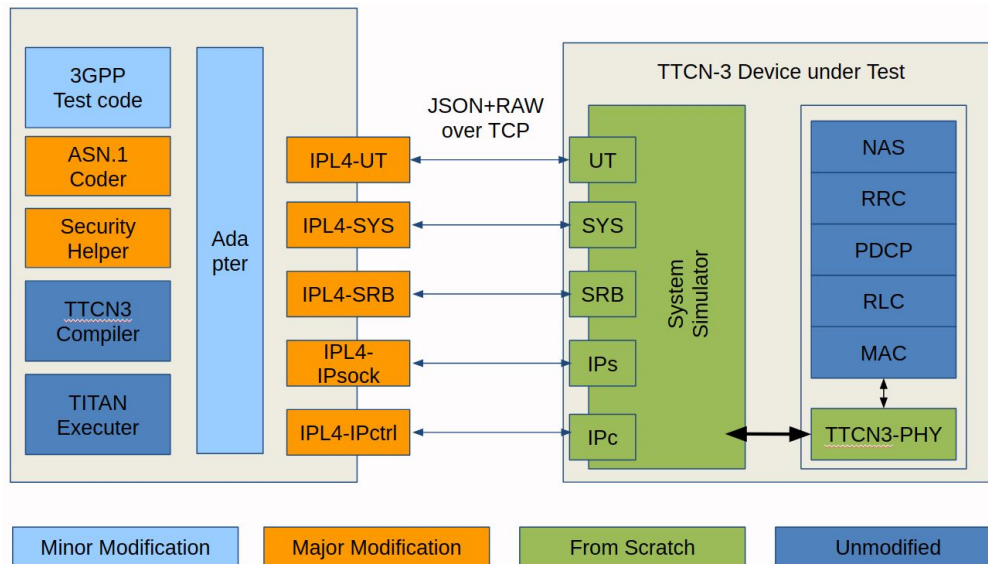
- In-house testbed based on Jenkins/Docker/Python/etc.
- Execution for each PR, and periodic testing for long jobs
- Cooperation with sysmocom
 - Port to OsmoGSMTester
 - Extend RF infrastructure



sysmocom installation to be deployed in SRS

UE Conformance Testing

- 3GPP EUTRA UE conformance tests
- Eclipse TITAN TTCN3 compiler
- Custom System Simulator with fake PHY
- Full CI/CD integration



Thanks!

SRS

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