srsLTE Project Update
How the year went and what’s up next

Andre Puschmann <andre@softwareradiosystems.com>
Full E2E Open-Source 4G/5G!

Our complete LTE software suite

www.srslte.com
<table>
<thead>
<tr>
<th>CVD#</th>
<th>Name</th>
<th>Organisation &amp; Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD-2020 0040</td>
<td>Nitya Lakshmanan Nishant Budhdev Mun Choon Chan Jun Hen</td>
<td>National University of Singapore</td>
</tr>
<tr>
<td></td>
<td>Min Suk Kang</td>
<td>KAIST</td>
</tr>
<tr>
<td>CVD-2020 0035</td>
<td>Guancheng Li Zhengyi Shang</td>
<td>Tencent Security Xuanwu Lab</td>
</tr>
<tr>
<td>CVD-2019 0030</td>
<td>David Rupprecht Katharina Kohls Thorsten Holz</td>
<td>Ruhr University Bochum</td>
</tr>
<tr>
<td></td>
<td>Christina Pöpper</td>
<td>NYU Abu Dhabi</td>
</tr>
<tr>
<td>CVD-2019 0029</td>
<td>Syed Rafiul Hussain Mitzu Echeverria Imtiaz Karim Omar Choudhury Elisa Bertino</td>
<td>Purdue University University of Iowa Purdue University University of Iowa Purdue University</td>
</tr>
<tr>
<td>CVD-2019 0024</td>
<td>David Rupprecht Christina Pöpper Thorsten Holz</td>
<td>Ruhr University Bochum, Germany and New York University Abu Dhabi</td>
</tr>
<tr>
<td>CVD-2019 0018</td>
<td>Altaf Shaik</td>
<td>Technical University of Berlin <a href="https://www.ist.it-berlin.de/security_in_telecommunications">https://www.ist.it-berlin.de/security_in_telecommunications</a></td>
</tr>
<tr>
<td></td>
<td>Ravishankar Borgaonkar</td>
<td>SINTEF Digital <a href="https://www.sintef.no/en/all-employees/employee/?empId=7616">https://www.sintef.no/en/all-employees/employee/?empId=7616</a></td>
</tr>
</tbody>
</table>

CVD: coordinated vulnerability disclosure
<table>
<thead>
<tr>
<th>CVD#</th>
<th>Name</th>
<th>Organisation &amp; Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVD-2020 0040</td>
<td>Nitya Lakshmanan, Nishant Budoov, Mun Choon Chan, Jun Hen</td>
<td>National University of Singapore</td>
</tr>
<tr>
<td></td>
<td>Min Suk Kang</td>
<td>KAIST</td>
</tr>
<tr>
<td>CVD-2020 0035</td>
<td>Guancheng Li, Zhengyi Sheng</td>
<td>Tencent Security Xuanwu Lab</td>
</tr>
<tr>
<td>CVD-2019 0030</td>
<td>David Rupprecht, Katharina Kohls, Thorsten Holz</td>
<td>Ruhr University Bochum</td>
</tr>
<tr>
<td></td>
<td>Christina Pöpper</td>
<td>NYU Abu Dhabi</td>
</tr>
<tr>
<td>CVD-2019 0029</td>
<td>Syed Raffi Hussain, Mitziu Echeverria, Ident Karim, Omar Chowdhury, Elisa Bertino</td>
<td>Purdue University, University of Iowa, Purdue University, University of Iowa, Purdue University</td>
</tr>
<tr>
<td>CVD-2019 0024</td>
<td>David Rupprecht, Christina Pöpper, Thorsten Holz</td>
<td>Ruhr University Bochum, Germany and New York University Abu Dhabi</td>
</tr>
</tbody>
</table>

January 2021:
5/7 CVD in 2019/20
> 200 research papers

Captured: 2021/01/16

CVD: coordinated vulnerability disclosure

www.softwareradiosystems.com
Agenda

• Highlights of 2020
• Sneak Preview for 2021
• Test and Quality Assurance
srsLTE Release Highlights in 2020

• 20.04(.2)
  – Carrier Aggregation in srsENB
  – Complete Sidelink PHY layer (all transmission modes)
  – Complete NB-IoT PHY downlink signals
  – New S1AP packing/unpacking library

• 20.10(.1)
  – Mobility (Intra-eNB and S1) in srsENB
  – New logging framework
  – Non-blocking/decoupled PHY layer
  – QAM256 support
  – Initial NR PHY layer and stack components
srsLTE Release Highlights in 2020

- Docs, docs, docs
- Updated troubleshooting sections for all apps
- New application notes
  - COTS handset testing
  - Handover with GNU Radio
- ...

Visit: docs.srslte.com
4G Carrier Aggregation Demo
COVID-19 Impact

• Deep remote-working philosophy
• 2 successful releases
• Random developer with kids
  – Productivity reduced
  – Weekends disappeared

The good times  Lockdown start  Schools open again
Upcoming srsLTE Features in 2021

5G NSA UE

4G ENB

carrier grade

5G NSA gNB
Towards a Carrier Grade RAN

• Maturity, robustness and stability
• High-performance, multi-UE
  – New proportional-fair scheduler with frequency selective scheduling
• Quality-of-Service
• Uplink Power-Control
• Network management and operation
  – Advanced KPIs: per-cell and per-user statistics
  – Error-handling, notifications, alarms, etc.
1st FOSS 5G NSA UE

- Initial 5G NSA support
- Compatible and tested with Amarisoft
- Selected set of supported config parameters, e.g.
  - Same bandwidth for LTE anchor and NR carrier
- 5G-NR PHY layer for x86
  - Focus on downlink channel processing (with required UL bits)
  - AVX2-optimized NR coding (but unoptimized threading)
- L2/L3 features
  - Full attach to 5G eNB/gNB/core
  - Data traffic over Secondary Cell group (SCG) bearer for NR

Initially available in srsLTE 21.04!
5G NSA {e/g}NB

- Initial 5G NSA support for the eNB
- Compatible and tested with srsUE and open5gs
- Selected set of supported configuration parameters
  - replication of the UE features
- Core-side features:
  - Attach to NSA-enhanced core
- RAN-side features:
  - Single, multi-RAT binary with LTE and NR cells (short-cut interfaces)
  - Basic UE capability and measurement handling
  - Data traffic over Secondary Cell group (SCG) bearer for NR

Initially available in srsLTE 21.10!
Quality Assurance
Continuous Integration

- The journey continues
- ~900 unit tests
- Builds for x86-64, ARM\{32,64\}, PPC64
RF Continuous Integration (RFCI)

- In-house testbed orchestrated with OsmoGSMTester [1]
- Controlled end-to-end system tests with complex scenarios
  - Mobility, Carrier Aggregation, etc.
- External RF hardware control
- RF and no-RF (ZMQ+GR) based
  - COTS SDR (USRPs, Lime, Blade)
  - Android COTS handsets
  - Customer HW

RF Continuous Integration (RFCI)

• In-house testbed orchestrated with OsmoGSMTester [1]
• Controlled end-to-end system tests with complex scenarios
  – Mobility, Carrier Aggregation
• External RF hardware control
• RF and no-RF (ZMQ+GR) based
  – COTS SDR (USRPs, Lime, Etc)
  – Android COTS handsets
  – Customer HW

Thanks!

We’re (still) hiring!
See you at FOSDEM 2022

Sorry, this room is FULL
All seats are taken.
Please DO NOT ENTER as room capacity may not be exceeded for security reasons.
Follow the stream at https://live.fosdem.org