

GÉANT Innovation Programme 2021 – showcase

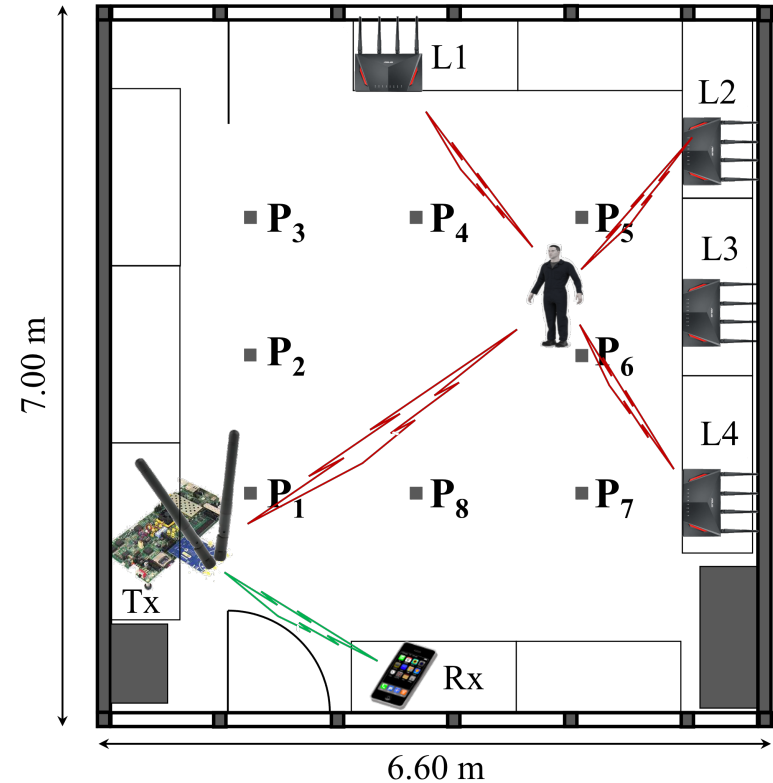
March 1, 2022 – BreakOut Session

Design and Implementation of an 802.11
Privacy Preserving Sub-Layer
DI-P²SL

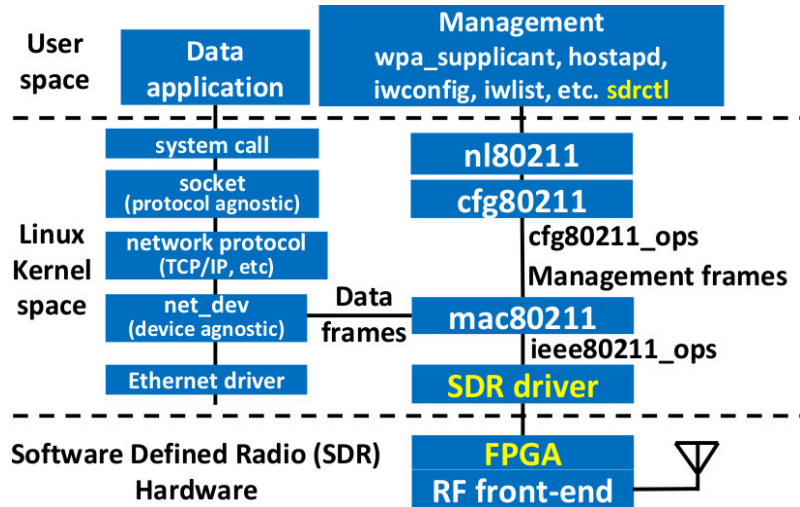
Renato Lo Cigno – Lorenzo Ghiro
Marco Cominelli – Francesco Gringoli

<https://ans.unibs.it/projects/di-p2sl/>

- Schematic representation
- A video for its virtual visit
 - Ugly & disordered ... as any respectable lab!
 - ...



- Open source FPGA+kernel project implementing 802.11b/g/n



white linux
yellow openwifi

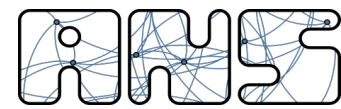
- Multiply the I/Q samples of the frame with a mask that changes randomly from frame to frame so that at the receiver it looks like a frame distorted by a realistic environment
- Equivalent Channel Response

$$A_R(f_i, k) = A_C(f_i, k) \times A_O(f_i, k)$$

- Multiplication Mask Computation

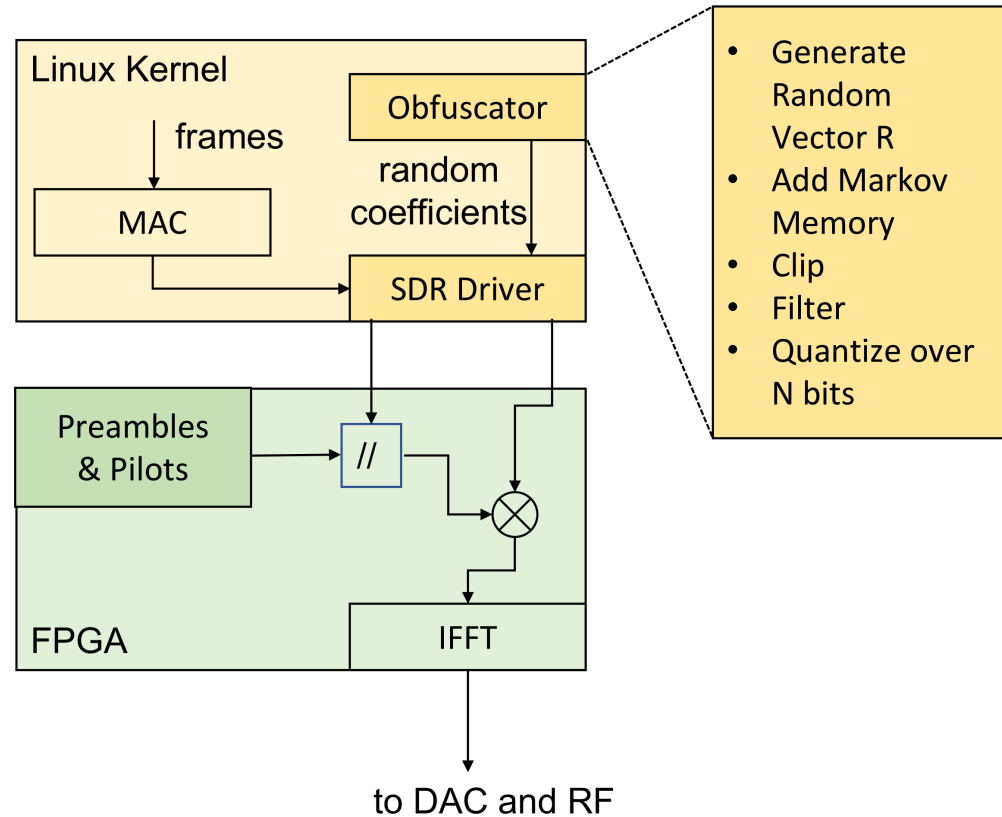
$$\mathcal{R}(k) = e^{-\alpha \Delta_t(k)} \mathcal{R}(k-1) + \mathbf{R}$$

$$A_O(k) = [1 + \mathcal{R}(k)] * \Theta_C$$



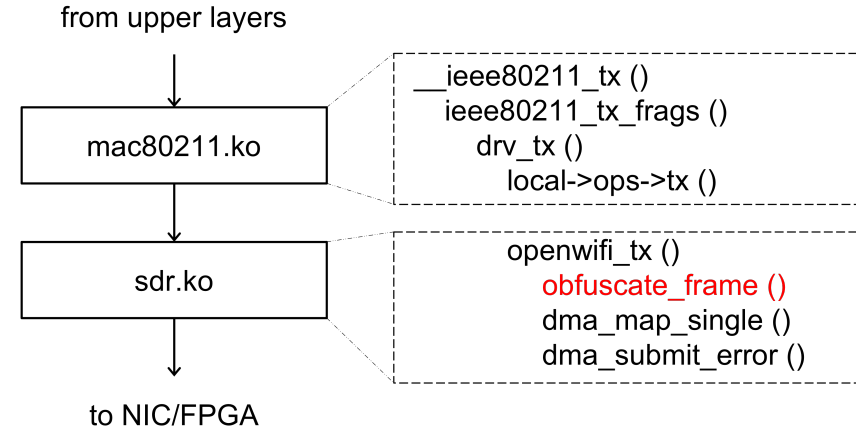
- As seen (statically) before the amplitude of the signal received changes in time following a realistic but random pattern, as if the room is ... filled with movein elephants 😊
- Let's see another video

- Modify openwifi¹ to include the predistortion
 - Both kernel driver and FPGA

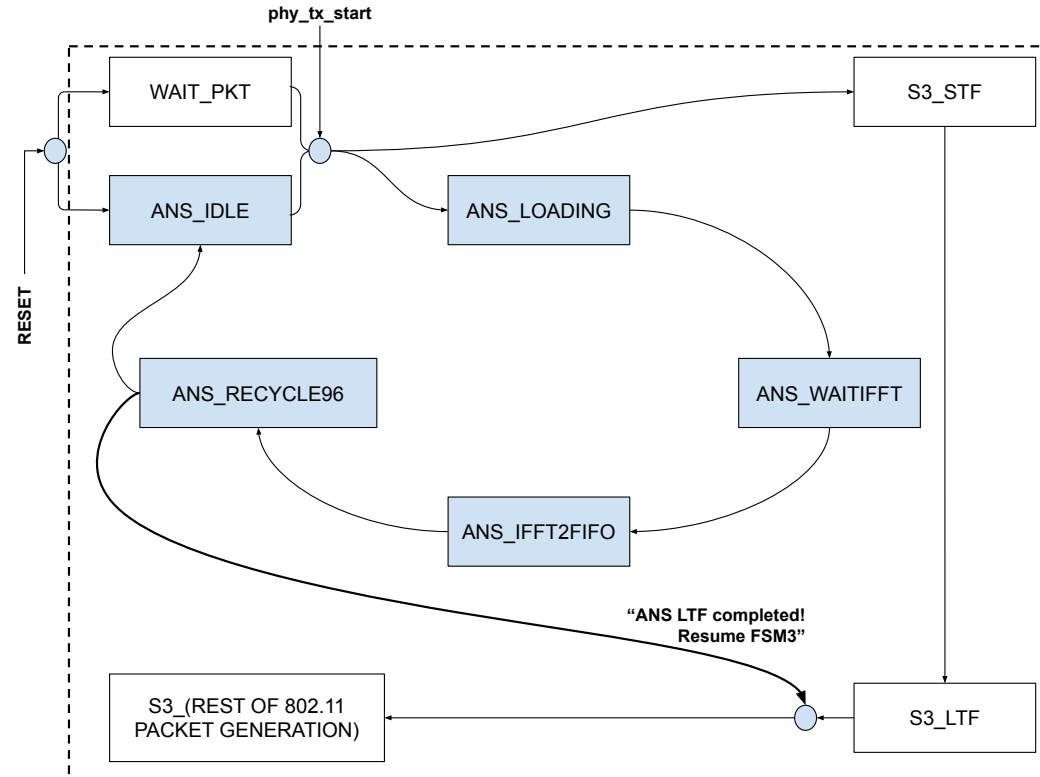


¹ <https://github.com/open-sdr/openwifi>

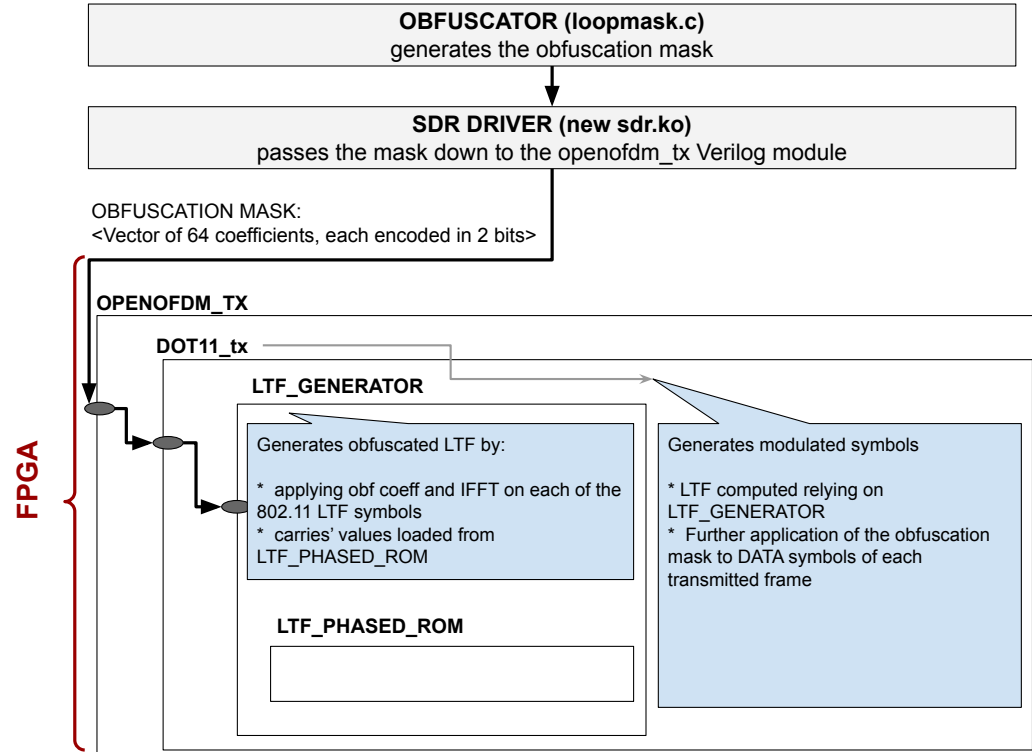
- Modifications here regard the computation of the random multiplication mask & its passage to the FPGA



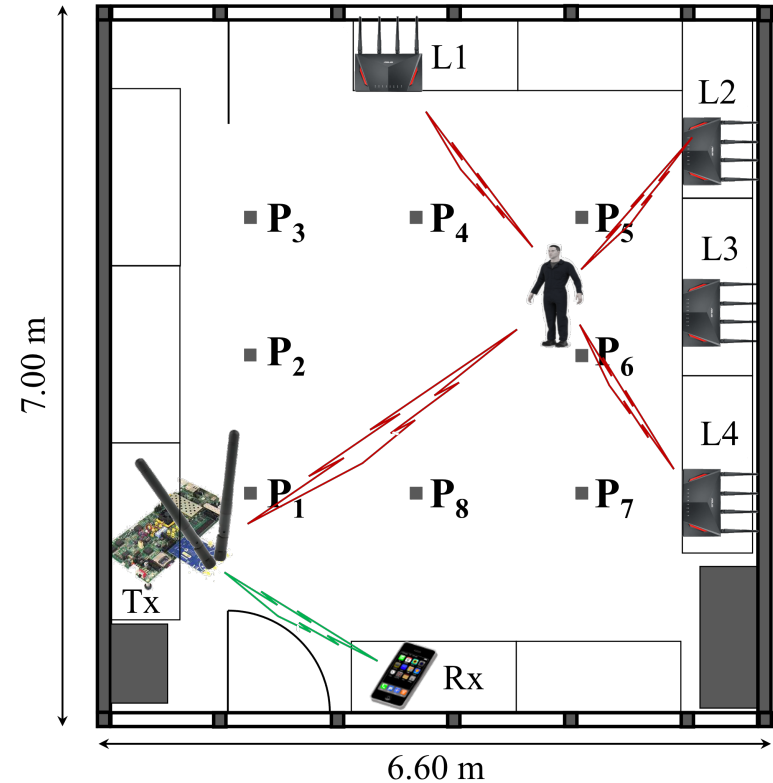
- Required changing the "logic" of the FPGA processing as now the preambles are not constant, but pre-distorted



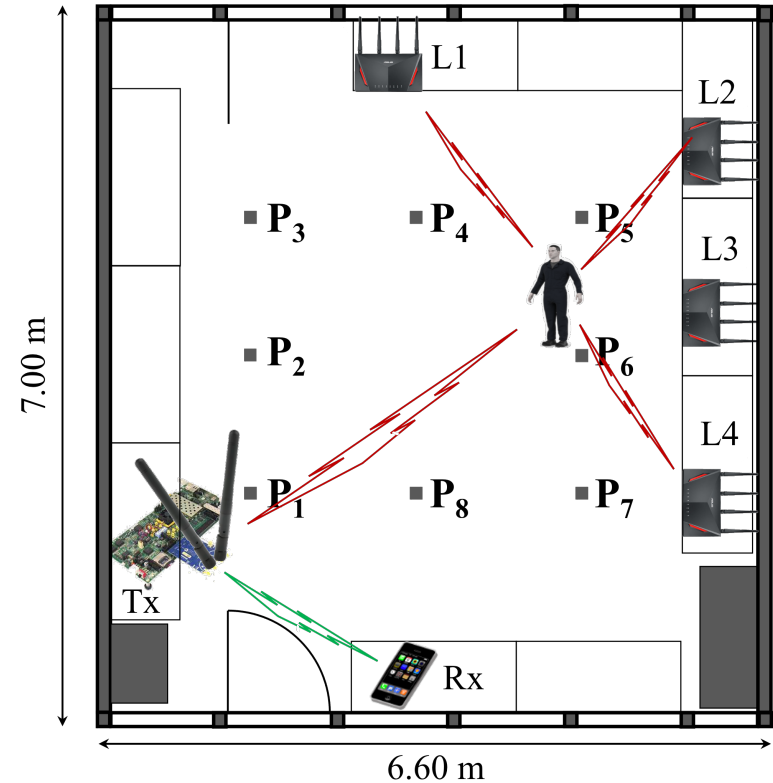
- Required changing the "logic" of the FPGA processing as now the preambles are not constant, but pre-distorted
- Means receiving the distortion mask and multiply all I/Q samples



- A person moving on 8 possible positions in the lab
- Let's see yet another video



- L1-L4 implement a CNN-based localizing device (not part of this project)
- Rx measures PDR



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Now Discussion!

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