



FROM LABORATORY TO THE FIELD:
AN OPEN SOURCE SDR PROJECT COUPLED WITH NATIVE
LINUX DRIVER FRAMEWORK

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OPENWIFI

FIRST OPEN SOURCE FULL STACK REAL-TIME WI-FI



- Motivation
- Project positioning and technical information
- License consideration and collaboration
- Development schedule

FIRST OPEN SOURCE FULL STACK REAL-TIME WI-FI ON FPGA WITH EMBEDDED ARM AND LINUX

MOTIVATION

You have a good idea to improve Wi-Fi:

- New antenna system that need to work tightly with baseband control
- New RF front-end that need to work together with baseband
- New baseband waveform/algorithm for new scenario/applicaiton
- New high and low MAC to improve QoS

And want to demonstrate your idea in the real world.

Option1:
Dig into commercial chip black-box. Some reverse engineering. Good luck!

Option2:
Buy expensive proprietary SDR HW/SW design with limitations. Like NI, WARP

Option3:
Learn special language and use special HW (not cheap) with special OS (Windows) – Microsoft SORA/Ziria

Option4:
Use some blocks from Gnuradio or papers. Never get end-to-end. Most of them work in sniffing mode.

Option5:
DIY...

Still no ideal SDR option for Wi-Fi research...

MAC philosophy is so different: 10us SIFS (Wi-Fi) vs 4ms HARQ (LTE)
Not like pure SW implementation of LTE (srsLTE, OA), Wi-Fi implementation needs HW acceleration, which is more challenging!

FIRST OPEN SOURCE FULL STACK REAL-TIME WI-FI

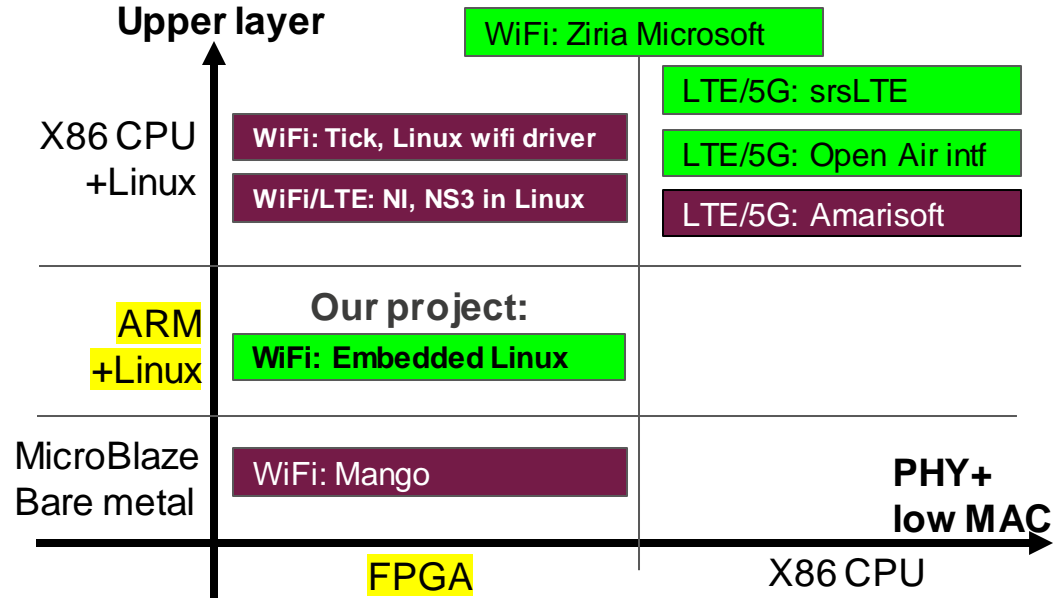
ON FPGA WITH EMBEDDED ARM AND LINUX

The project positioning/benefits:

- **FPGA** (PL of Xilinx Zynq SoC)
 - High performance, low latency
 - ASIC friendly (in case people want ASIC)
 - Fast/in-field iteration, bug-fix, update
- **ARM** (PS of Xilinx Zynq SoC)
 - Low power, low cost
 - Embedded/portable friendly
 - Very big processor eco system
- **Linux**
 - Very big community
 - Very rich software and kernel components
 - Embedded friendly
 - Low cost
 - High security – open source code (hackers are staring on it)

Full stack SDR project survey:

- Free Open source
- Non Free/Open



IMPLEMENTATION ARCHITECTURE AND FEATURES

Basic features (802.11a/g; 802.11n 20MHz MCS 0~7)

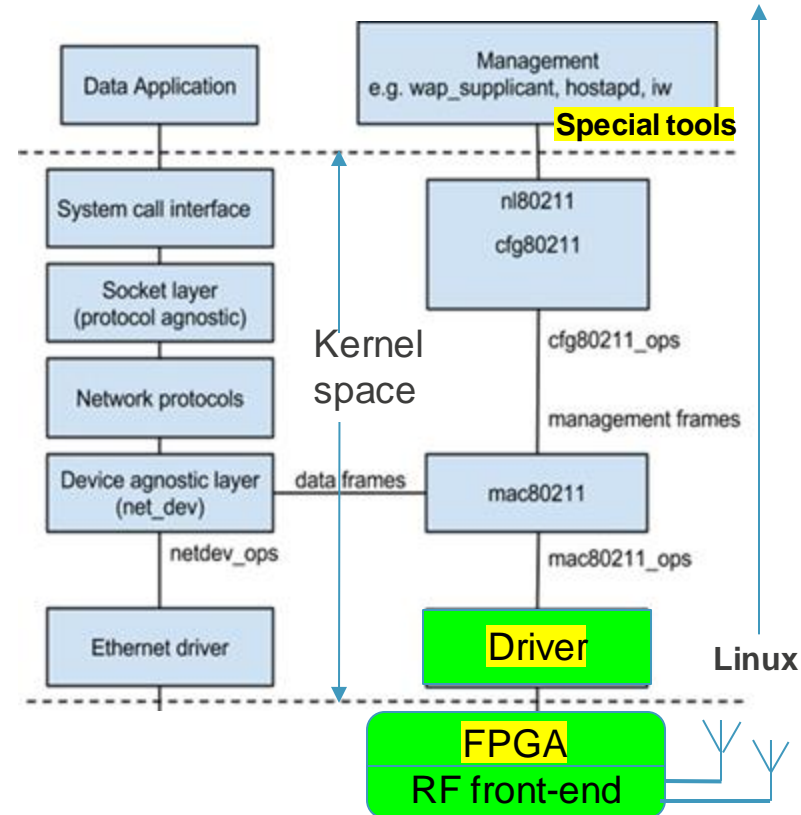
- Ad-hoc mode
- AP mode
- Station mode

Special features (Survey/feedback in community/conference)

- IQ sample and spectrum sensing capability without interrupt communication
- TAISC (Flexible MAC engine) to ease MAC development

Possible future features

- Access deep PHY information: channel response, etc.
- Multi antenna support: direction finding; beamforming; MIMO
- Multiple virtual interfaces/slices from one PHY
- 802.11p DSRC for V2V, most popular V2V standard
- 802.11ah
- 802.11ax
- Community input



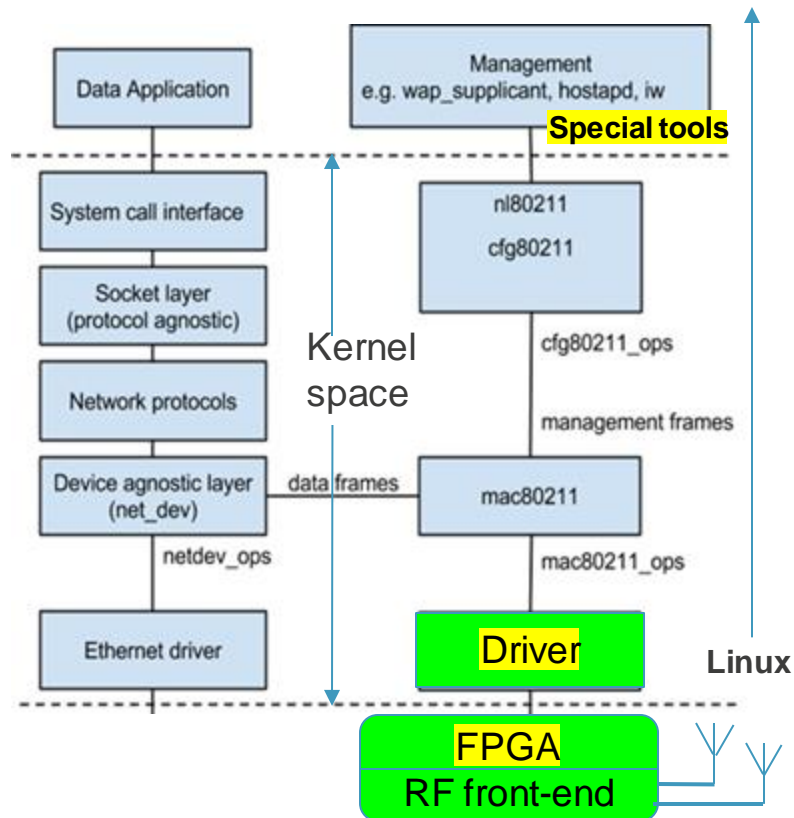
WHAT WILL BE AVAILABLE OUT OF BOX

Ours: images and source code

- Precompiled images for specific hardware platform
 - Linux image
 - FPGA image
- Source code of software/FPGA components
 - **Special tools** in user space to access special feature in driver and FPGA
 - Linux **driver**
 - **FPGA** design

Yours: Hardware platform

- Zedboard+ad9364 (720 euro)
- ADRV9364-Z7020 SOM + ADRV1CRR-BOB carrier (750 euro)
- ADRV9361-Z7035 SOM + ADRV1CRR-BOB carrier (1300 euro)
- Zc706/zcu102+ad9361 (3250 euro)
- Xxx according to community input

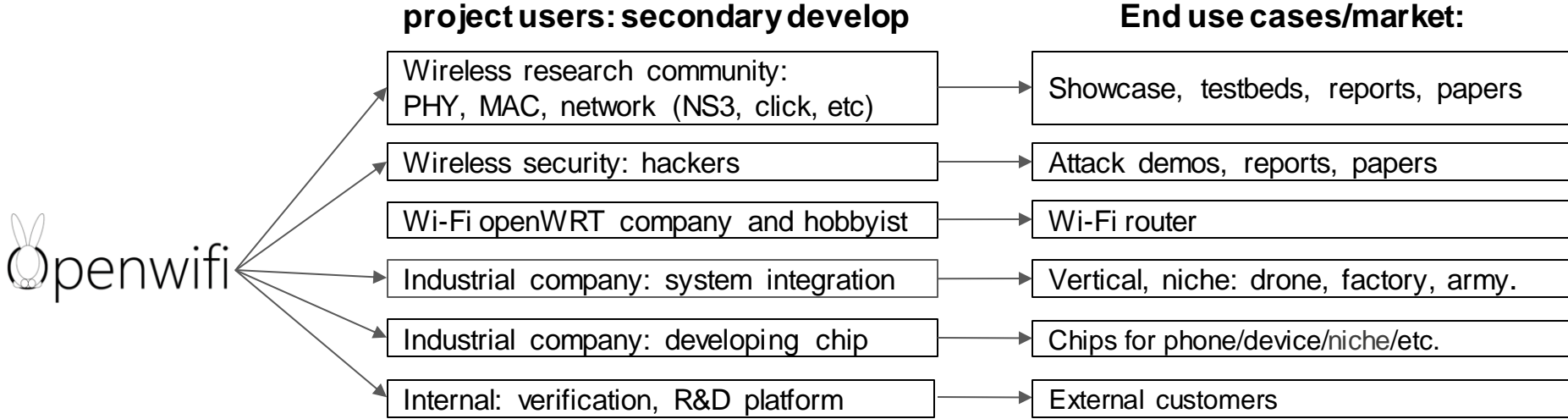


OPEN SOURCE PLATFORM LEVERAGE FOR COLLABORATIONS

CHOICE OF OPEN SOURCE LICENSE IS IMPORTANT

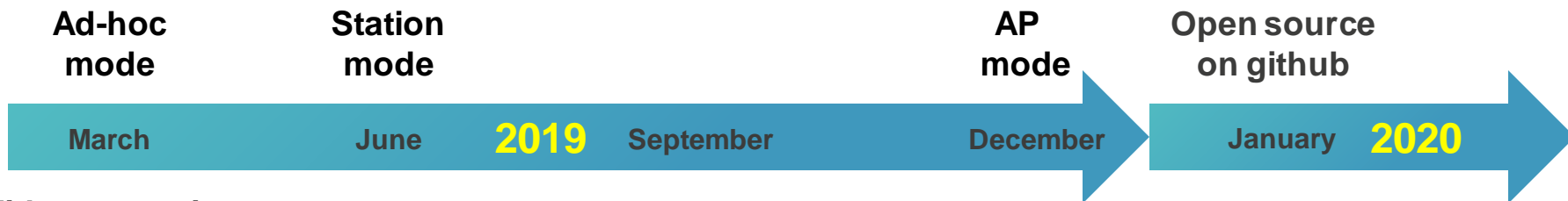
- Low-entry level for various users because of **Open Source**:
 - Academic research partners and corresponding projects
 - Industrial partners doing R&D
- Non-commercial usage (License type to be decided).
 - For research usage without request/registration or complicated administrative procedure.
- Commercial usage, Support and Customization
 - License for non-open commercial purpose
 - Dedicated support service
 - R&D service: adapting the implementation to customer request

POTENTIAL AUDIENCES/CUSTOMERS IN OUR MIND



DEVELOPMENT SCHEDULE

FIRST STABLE VERSION BY END OF THIS YEAR



**Video streaming
via 1 time slice.
in ORCA project
review meeting**



THANKS!
Q&A