



OAI UE NR

Overview, Status and Way Forward

Bruno Jechoux , TCL 5G Labs,

**OAI 4th Workshop,
Nov 7-8 2017, Paris**

TCL Communication Technology Holdings Ltd.





Agenda

Roadmap

Development Status & Achievements

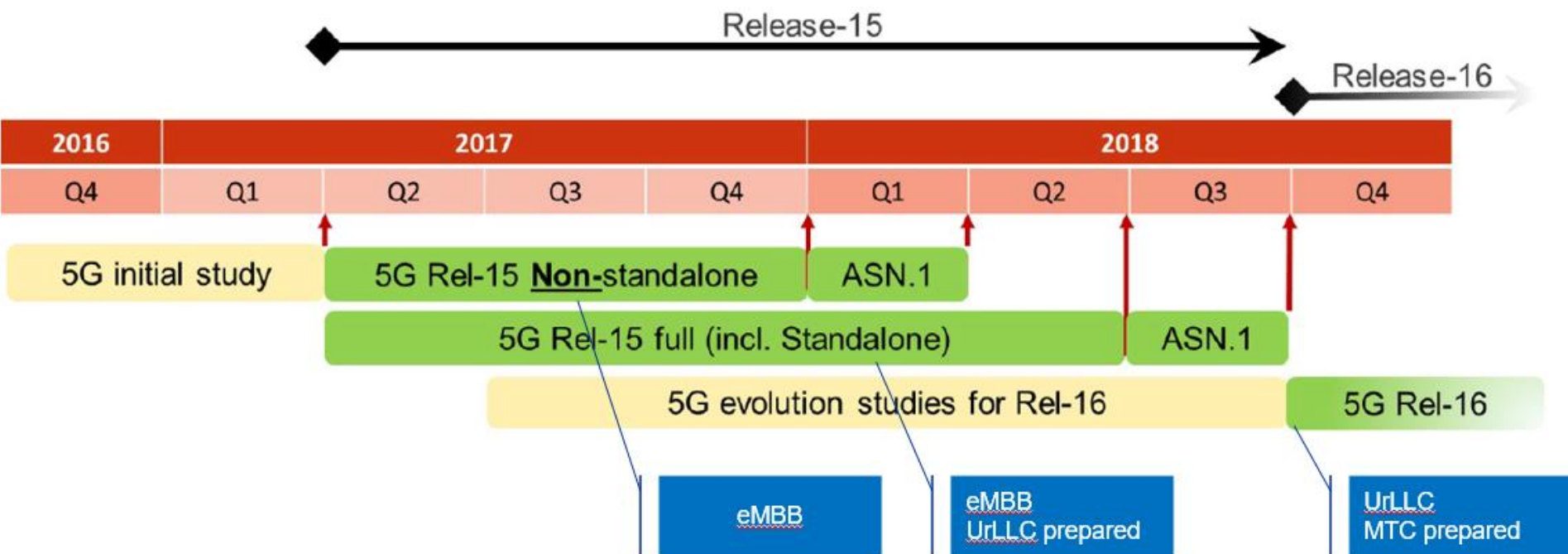
Features

How to contribute

Release 15 – the advent of 5G NR

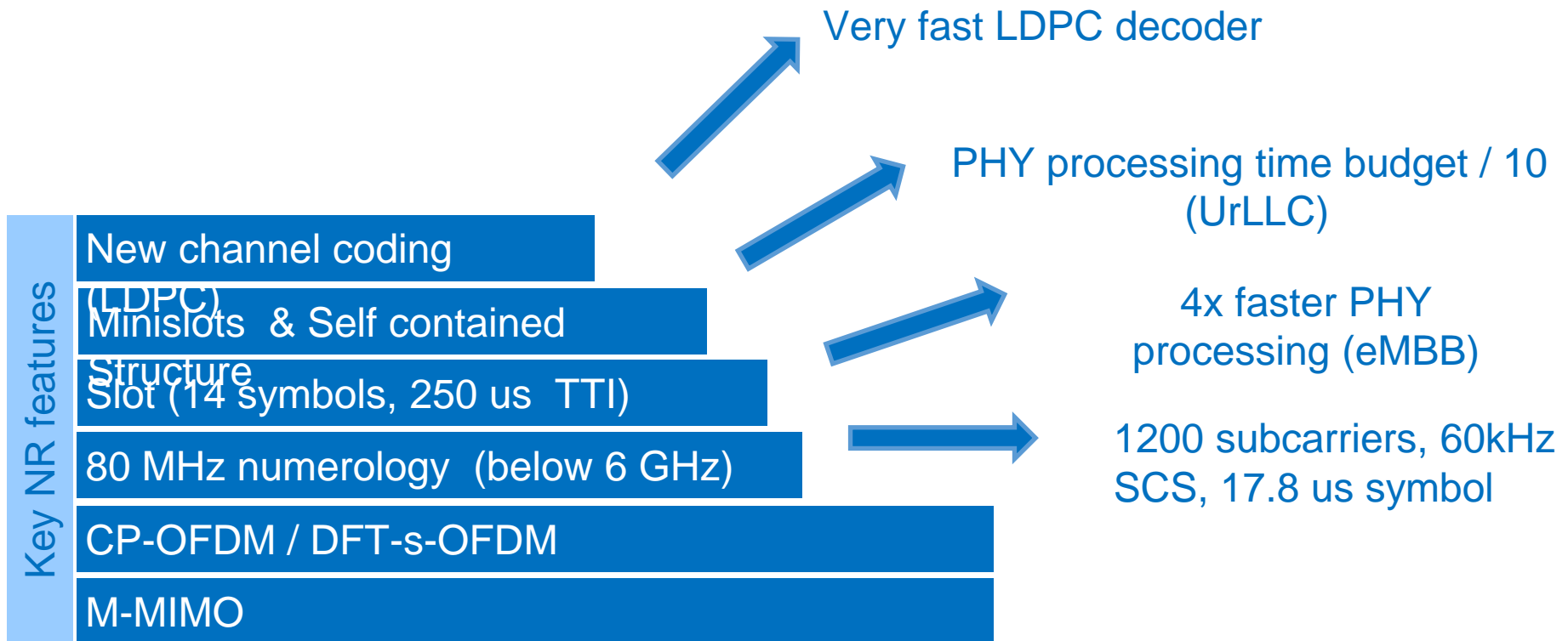
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Creative Life

TCL



5G NR UE challenges

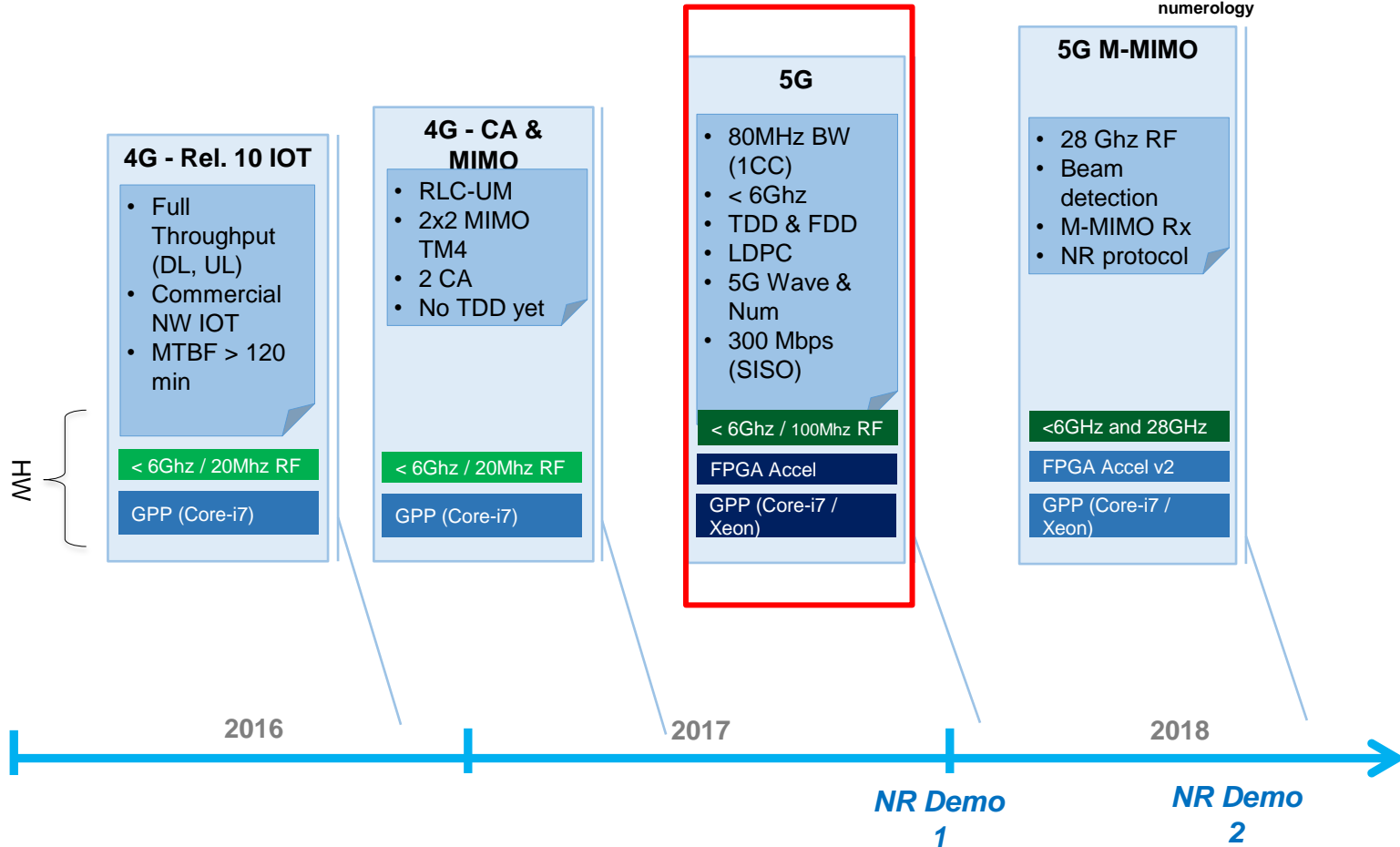
- Essentially at PHY level



OAI UE Roadmap



OAI 5G NR UE Test Bed - 80MHz BW / 5G numerology



Development Status (1/2)

SW Architecture Optimization results

- PHY blocks optimization (General)

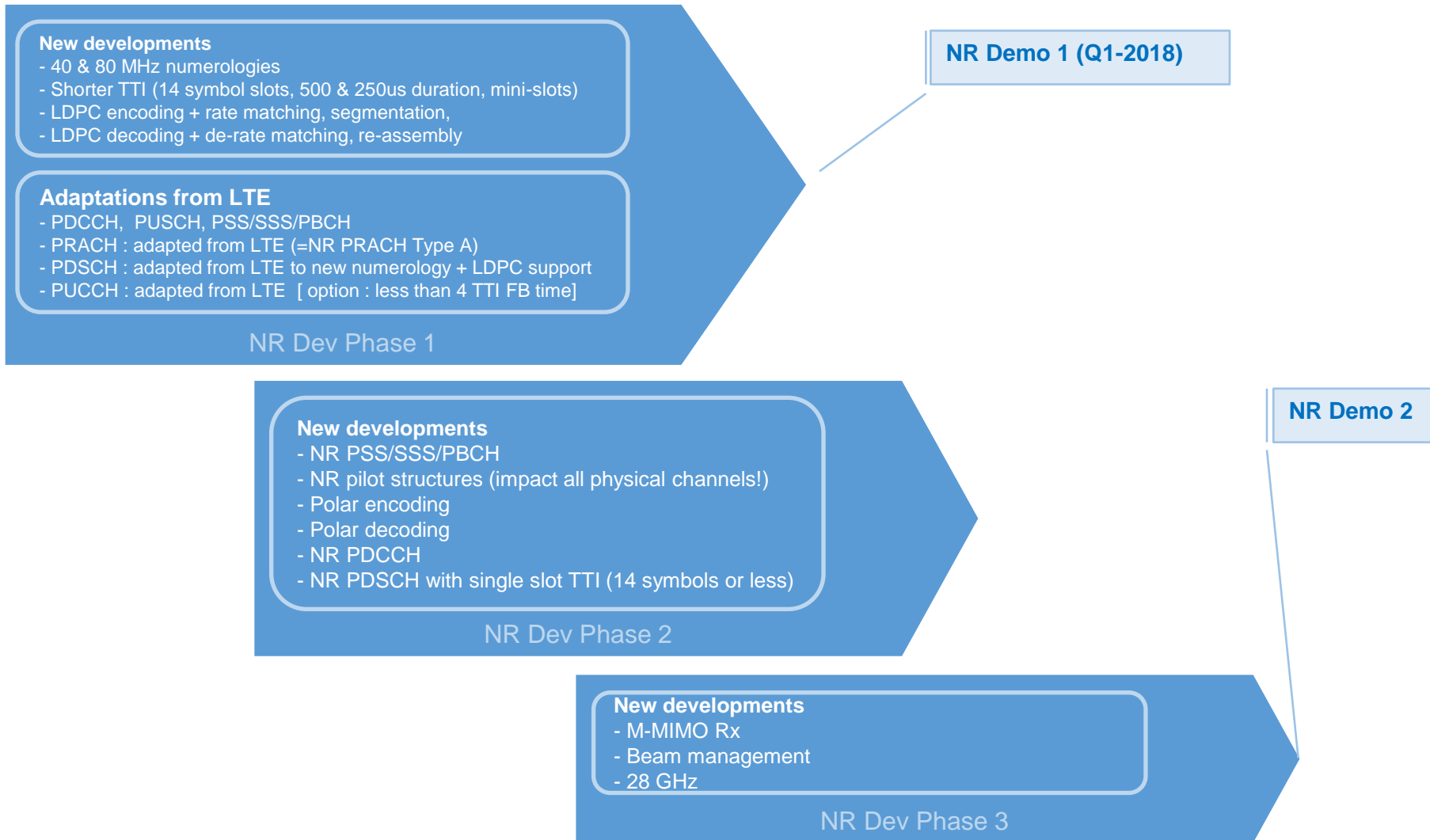
	20MHz without Optim @3,3GHz	Current 20MHz with Optim @4GHz	Optimization Gain	Targets for 5G NR compliance
Front End Processing	120 us	50 us	~59%	50 us
Pdcch Decoding	90 us	25 us	~72%	25 us
LLRs Computation	100 us	80 us	~20%	40 us ?
Sum	310 us	155 us	~50%	250 us (done)
Channel Decoder	1250 us	1000 us	~20%	250 us (req. FPGA)
Full Rx	1560 us	1155 us	~26%	500 us

- Enhanced Parallelization (leverage high end

Tasks	Dev Status	Details
Slots parallelization	100%	Process 'at the same time' on two different cores both slot0 and slot1
3 RX/TX parallel threads	100%	Process 3 consecutives subframes in parallel on different cores

Development Status (2/2)

OAI UE NR Development Phases

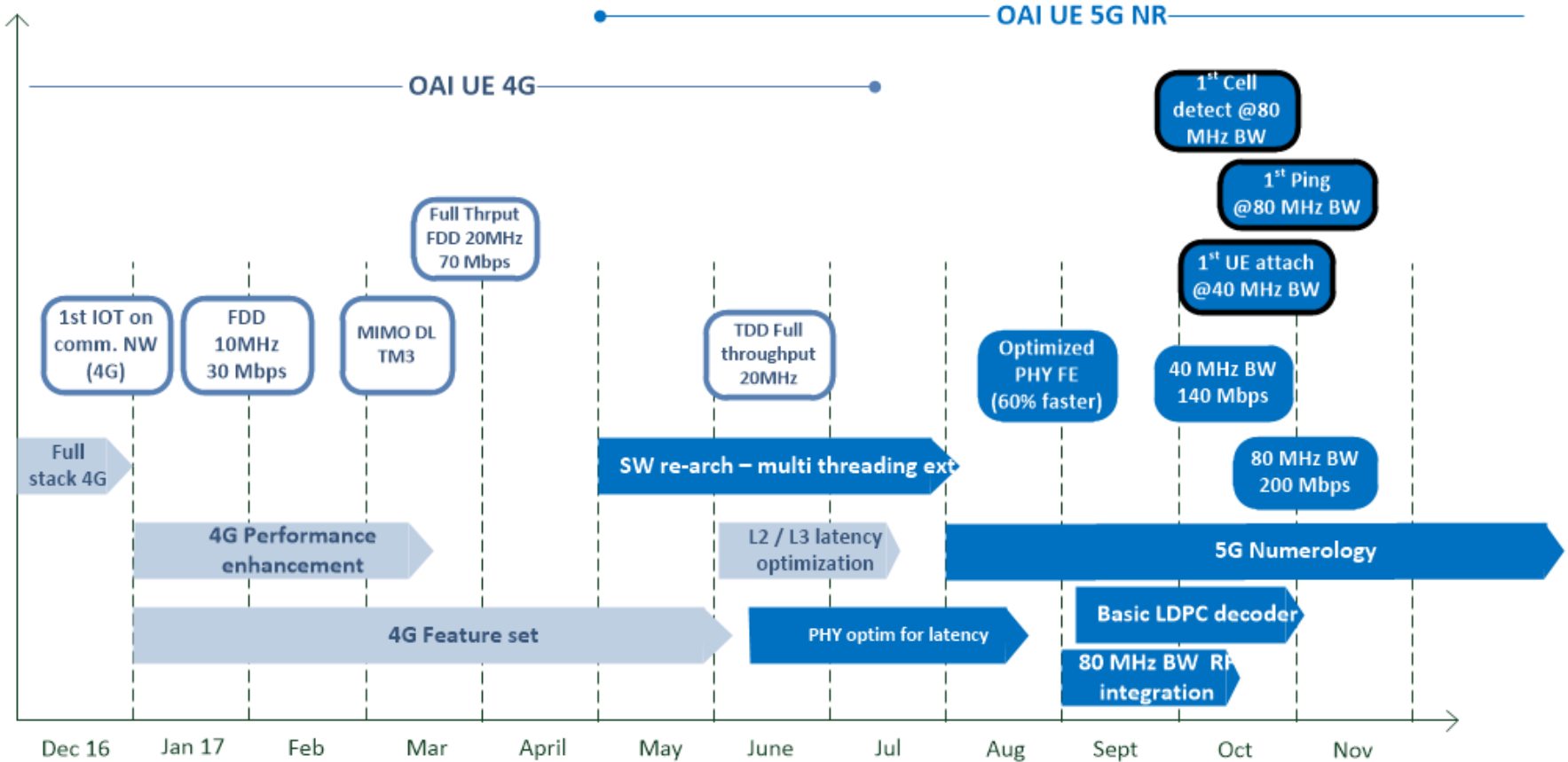


OAI UE NR Feature List

	5G-NR features	TCL plan for 2017 & 2018	Non covered
	Bandwidth	20-80 MHz	
	Carrier frequency	<= 6GHz	
	Throughput target	300 Mbps per 1 spatial stream	
	Latency target	< 2 ms RTD (L1/L2)	
PHY channels and modulation	Waveforms	CP-OFDM in DL, DFT-s-OFDM in UL	
	Duplex mode	FDD & TDD, incl. flexible TDD	
	MIMO Rx	2 antennas / 4 antennas	
	MIMO Tx	Tx diversity / beam forming	
	Flexible SCS	15 to 60 kHz	
	TTI	Slot based scheduling (14 OFDM symbols)	
	Slot / Mini-slots	Slot @ 80 MHz BW 2 symbols mini slot in 20 MHz BW, perhaps in 80 MHz BW with restrictions	
	Modulation	Up to 64 QAM	256QAM
	Error correction - LDPC	LDPC decoder (SW & FPGA)	LDPC encoder
Error correction - Polar Codes	None	Polar codes	
L1 Procedures	Synchronization channel & beam management	NR PSS/SSS wo beam sweeping	Beam management
	DL control channels	Adapt 4G prot. to 5G PHY feat.	NR Pilot structure
	UL control channels	Reuse of LTE RACH (adopted also in 5G NR as type A RACH)	NR PRACH (with beam sweeping)
L2/L3 Protocol	HARQ modification	Adapt 4G prot. to 5G PHY feat.	Asynchronous flexible HARQ
	MAC modification	Adapt 4G prot. to 5G PHY feat.	NR MAC
	RLC/PDCP modifications	Adapt 4G prot. to 5G PHY feat.	NR RLC / PDCP

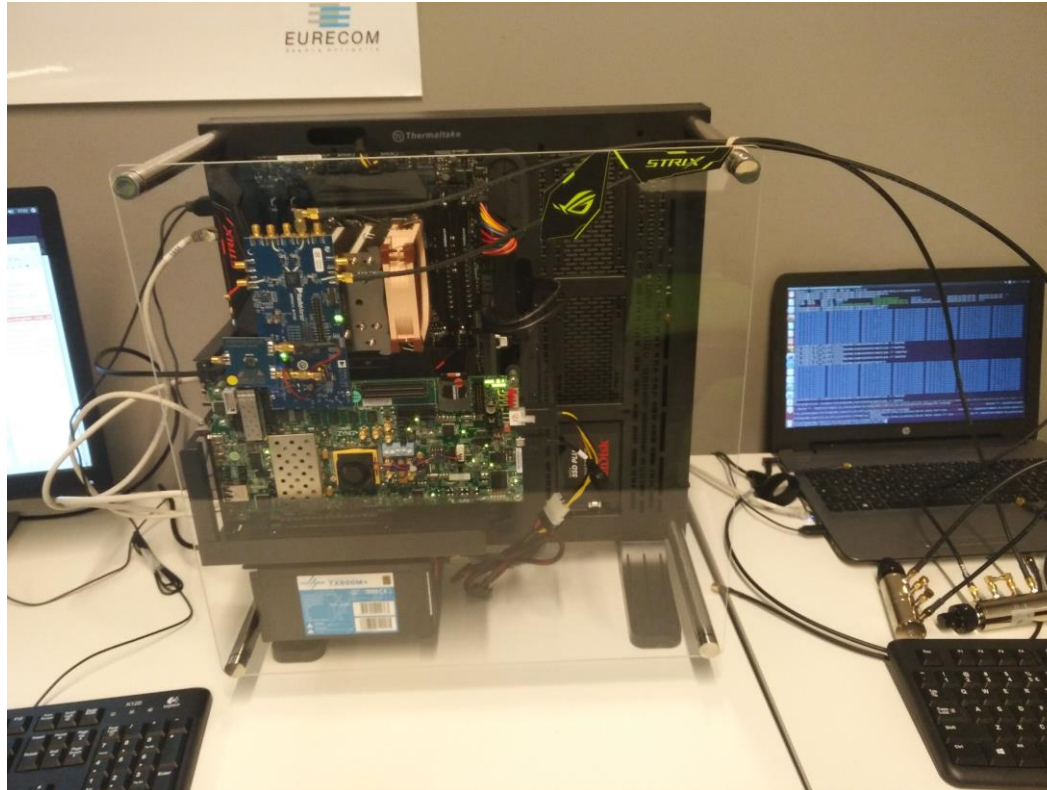
OAI UE KEY MILESTONES

Features and achievements



Nov 8 Demonstration

ZC706 +
AD9371
80MHz BW



Core I7-6900K
CPU (8 cores)

Current throughput : 200 Mbps in PHY test (full SW)

Room for Collaboration

- Still quite some opens
- TCL & Eurecom focus yet mainly on PHY
- Main rooms for 3rd party contribution
 - NR L1 Procedures
 - NR MAC
 - NR RLC / PDCP
 - Some PHY (256 QAM, polar)

How to contribute to OAI NR

- Pre-requisite

Request access to 5G_NR contributors space
(florian.kaltenberger@eurecom.fr)

<https://gitlab.eurecom.fr/oai-nr/openairinterface5g>

- 3 steps to contribute

Step 1 : Get last SW tag

Step 2 : Develop your feature

Step 3 : Unitary test it and submit for merging

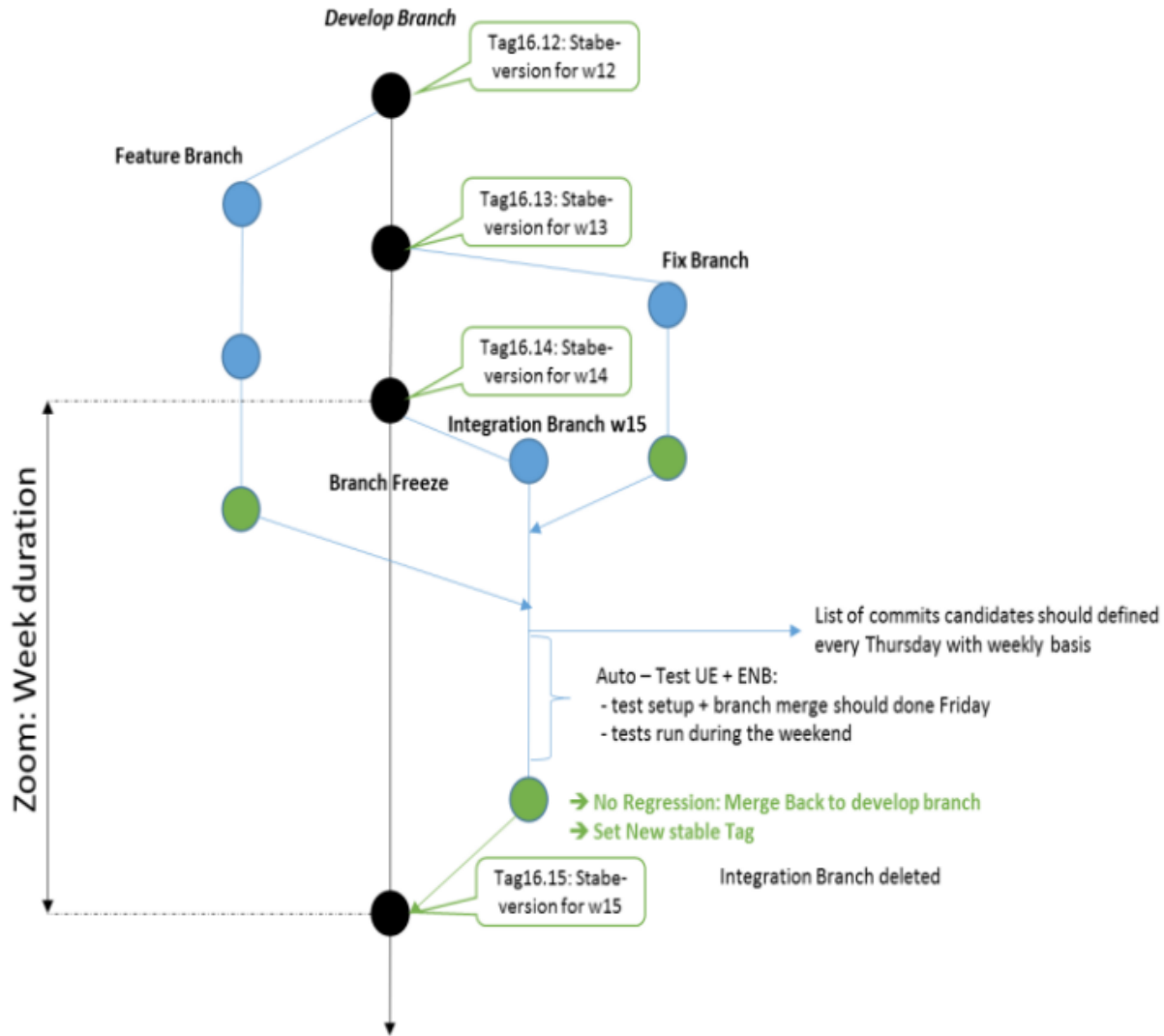
- OAI manage the rest for you

- Non regression tests, performance tests and merging (c.f. workflow)
- Bi-weekly NR developers meeting



OAI eNB / OAI UE WORKFLOW

- <https://gitlab.eurecom.fr/oai/openairinterface5g/wikis/GitLabWorkFlow>



Thank you.



谢谢

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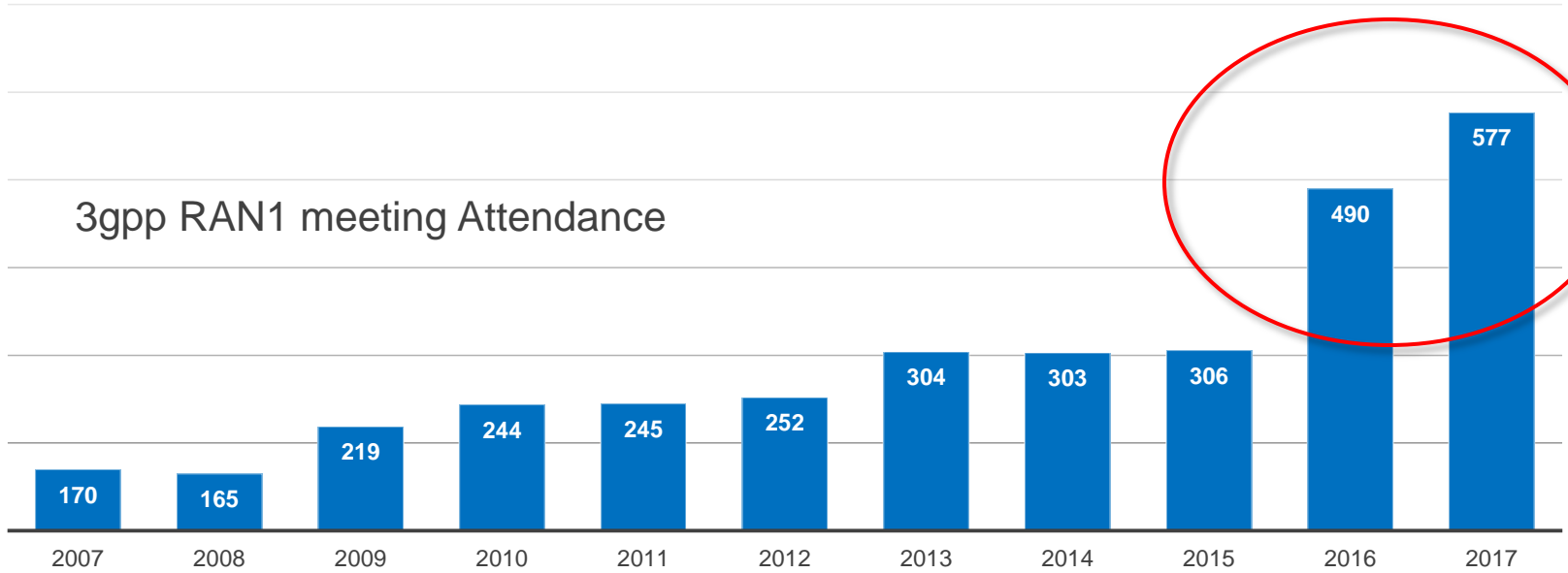


The 5G NR momentum

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3gpp RAN1 meeting Attendance



5G New Radio