



5G Small Cells as the enabling ComTech solution

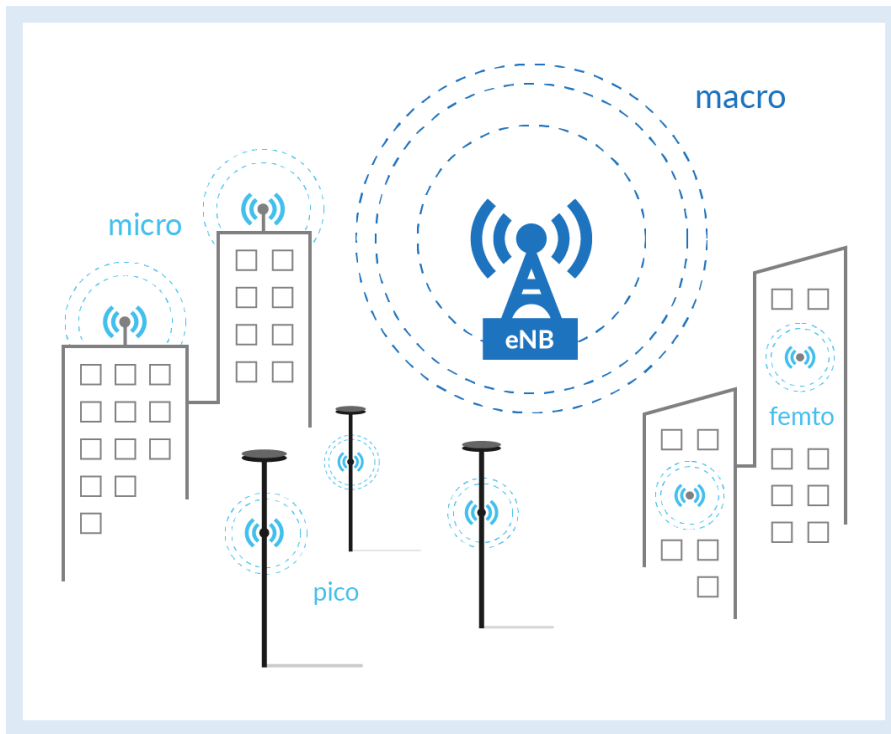
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IEEE International Conference on Communications 21-25 May 2017

// Paris // France



- Why small cells?
- What is new in 5G?
- RAN protocols - problems
- vRAN – the solution
- vRAN - features
- Activities in EU eWINE
- Impact on V2X and summary

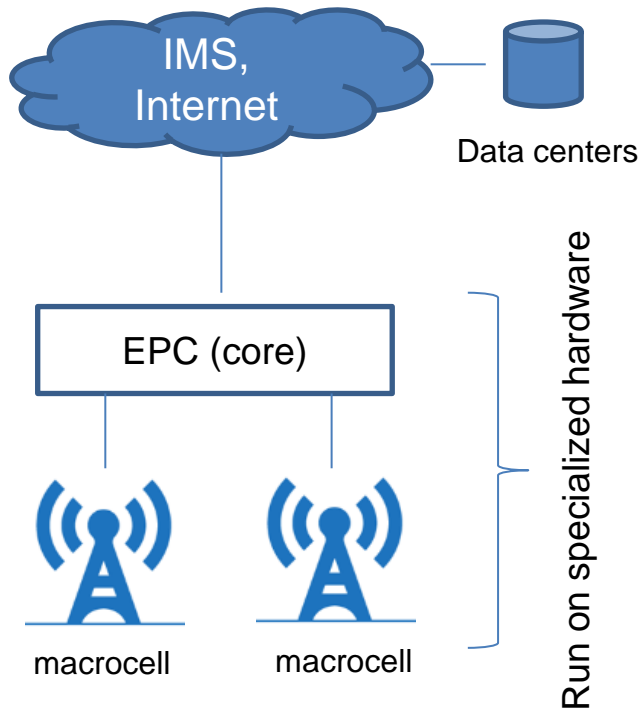


- THE ONLY solution to meet 1000x network densification
- Improve capacity, quality AND allow for low power operation
- Easy and cheap to manufacture (more a consumer electronics)
- Applicable to residential, enterprise, urban, and rural areas
- Market worth 6 billion USD in 2020

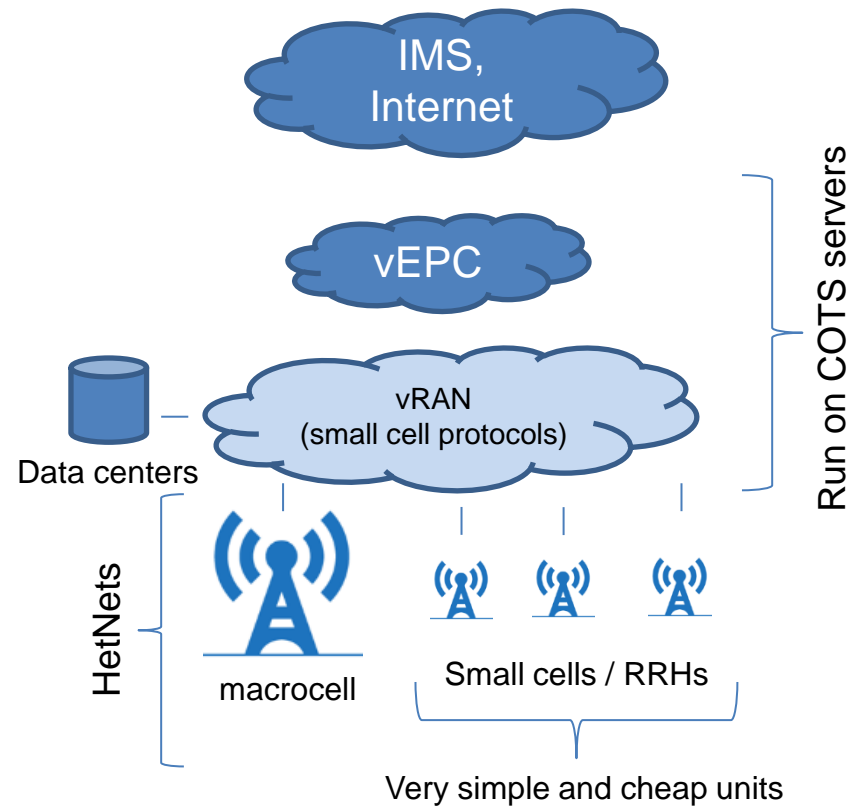
5G will require completely redefined RAN infrastructure

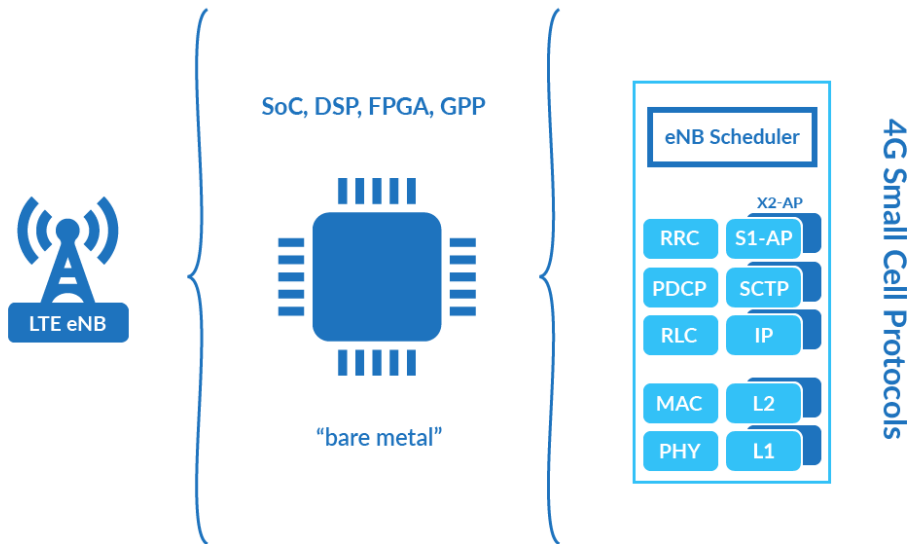
What is new in 5G?

Networks of the past



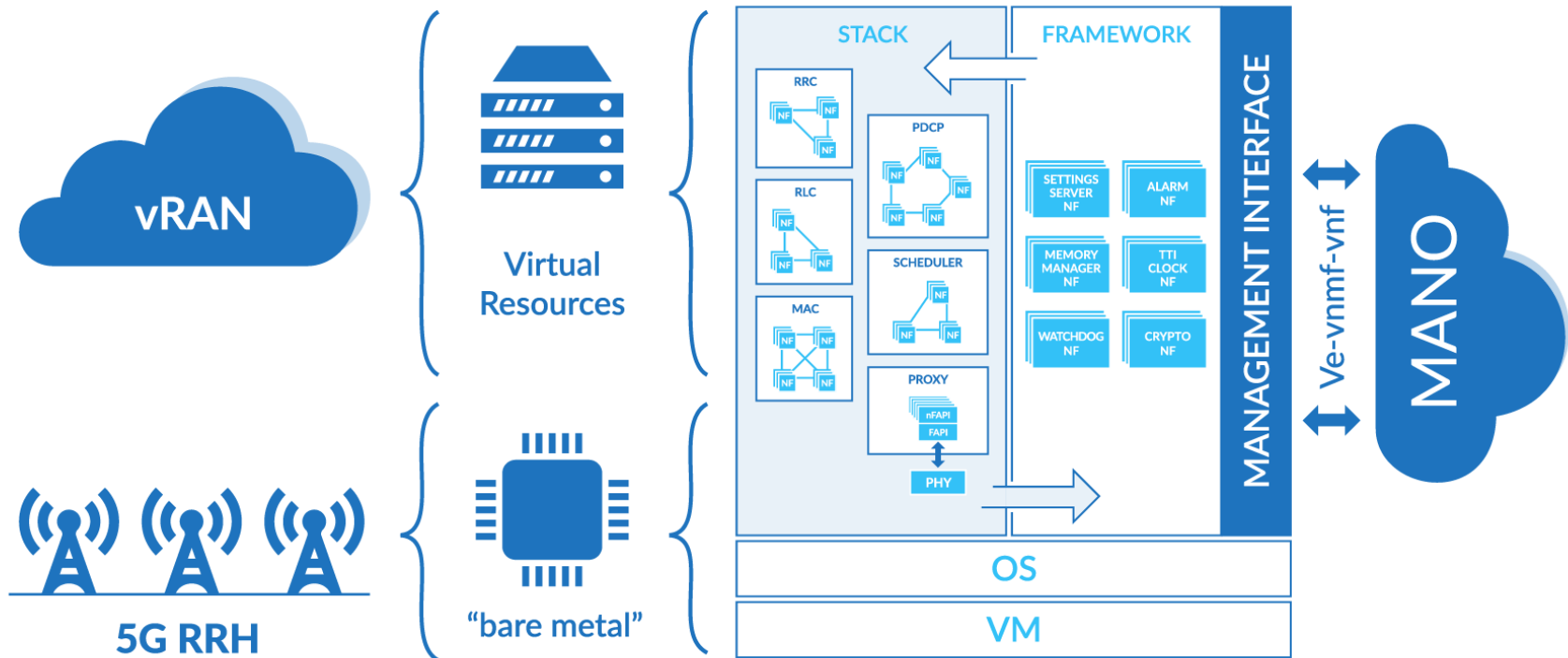
Networks of the future





- locked to particular hardware (chipset)
- underperforming and overpriced
- does not use radio resource efficiently
- does not operate on virtualized infrastructure
- Unable to address multiple verticals

Why not to address the new challenges and solve current problems at the same time?



5G Small Cell Protocols:

functional, modular and portable software, running on cheap and low complexity remote radio heads (RRH) and COTS virtual resources

- Virtualized base station functionalities
- Network slicing as building virtual networks over the same physical infrastructure
- Small remote radio heads instead of large base stations
- Base station software
 - moved from running on proprietary hardware to commercial servers
 - integrated with data centers close to end user
 - modular and universal with well-defined APIs
 - including proprietary intelligent radio resource management algorithms

- PHY
 - GFDM implementation on FPGA (TUD)
 - Beam-alignment algorithm for mmW links (TUD)
 - PHY porting and optimization on Manycore (Thales)
 - D2D PHY implementation (TCD)
 - LTE PHY benchmarking (ISW)
- Upper layers (L2-L3)
 - D2D protocols / scheduling (TCD)
 - LTE scheduler experiments (ISW)
 - Machine-learning algorithms for
 - MAC level performance prediction (imec)
 - Link quality prediction (JSI)
 - LTE-U duty cycle prediction (TUB)
 - UWB LOS/NLOS classification (JSI)

Partners



- Softwarized vRAN infrastructure allows for
 - Addressing multiple verticals including V2X
 - Create new business opportunities and introducing new players
 - Lower costs for operators
 - Shortening latency
 - Working with various underlying PHYs
 - Easy upgrades and customizations
- V2X perspective
 - Role of RRM
 - Latency reduction is key
 - Reliable operation is key



CONTACT DETAILS

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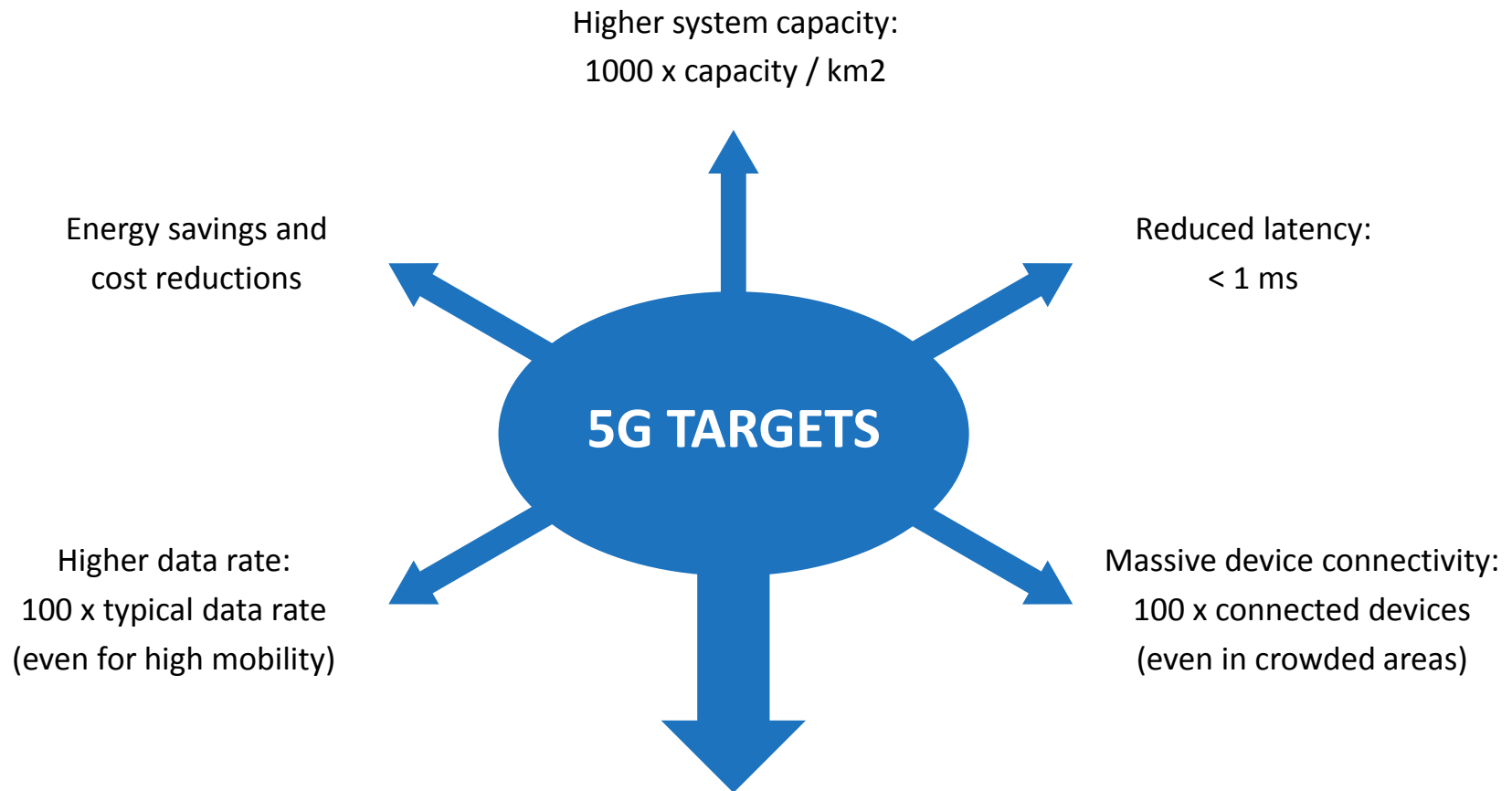
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IS-Wireless mission

to become the leader in the 5th generation (5G) of wireless systems
by delivering innovative algorithms and protocols

- IS-Wireless is a software developer and IP provider specializing in advanced solutions for wireless systems.
- IS-Wireless develops 4G and 5G algorithms, protocols and tools that are targeted primarily at early technology adopters including ODMs, OEMs, chip vendors and operators.

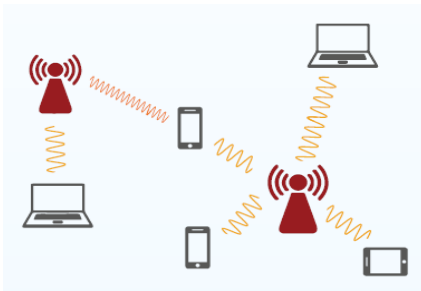
COMPANY FACTS

Founder and CEO	Slawomir Pietrzyk
Ownership	Privately held
Location	Piaseczno near Warsaw, Poland, EU
Industry	Wireless communications
Products	Software: protocols and simulators, IP: algorithms and know-how
Services	Technical courses, wireless systems design
Web	www.is-wireless.com

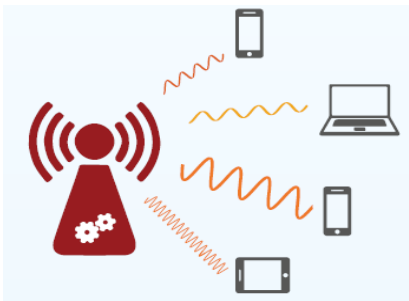
eWINE designs elastic network intelligence solutions for 3 innovative showcases



- On-demand, end-to-end location- & context-aware wireless connectivity services



- Elastic resource sharing in dense/small cells



- Open and reconfigurable physical layer