A brief introduction to our 5GLab

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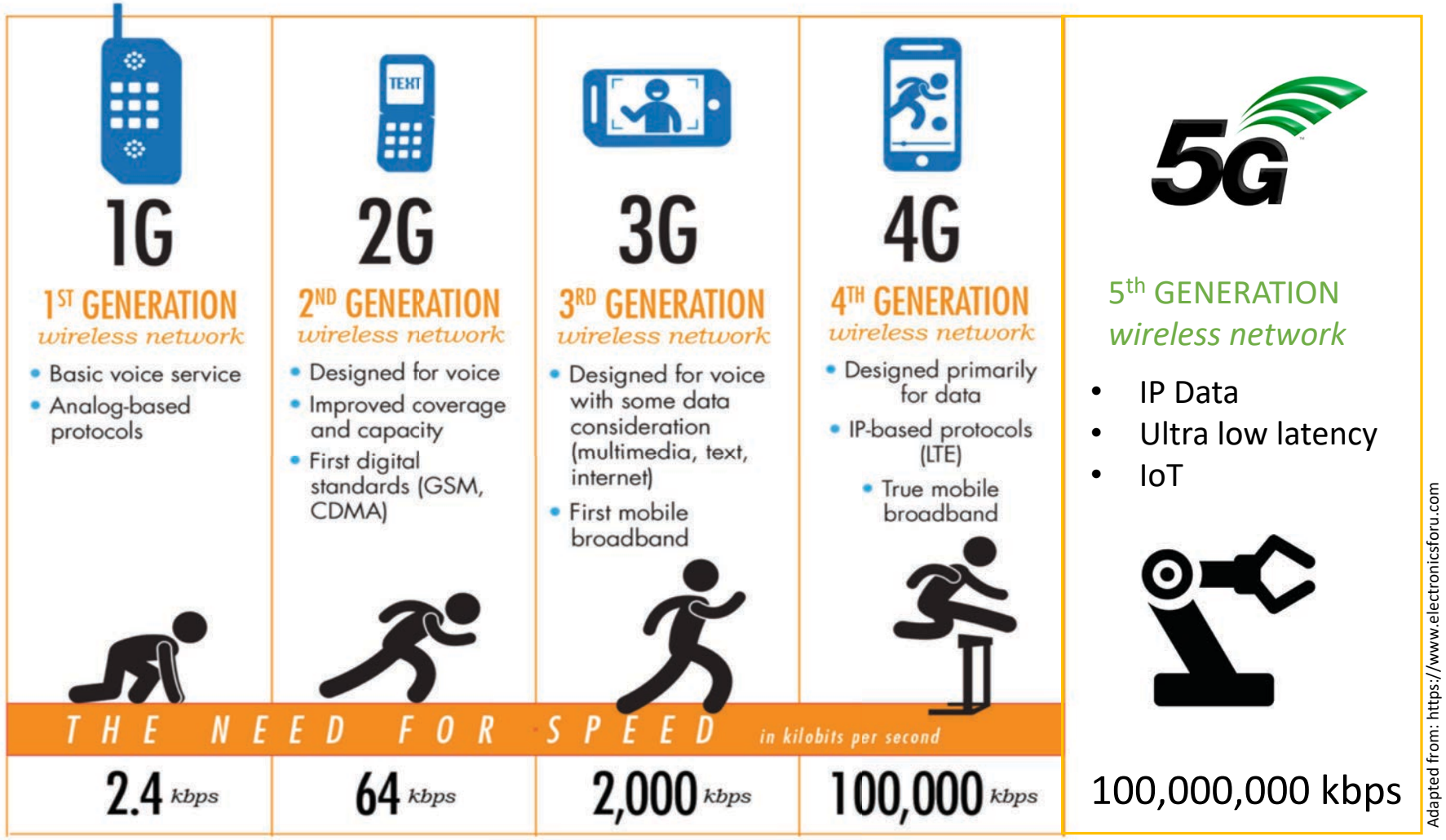
Evolution of cellular network technology



5G: Current state

- Globally: Since 2019, deployment in the UHF and SHF bands (phase 1)
  - Phase 2 (mmWave) will begin approximately 2025
- Germany: Operators paid 6.55 Mrd. € for 420 MHz of spectrum
  - Committed to providing 5G coverage to 98% of households by 2022
  - As of Sep. 2019, commerically available in Germany in 5 cities (Deutsche Telekom), 20 cities (Vodafone)
- Darmstadt: 5G pilot since 2018, public since Summer 2019, 18 antennas at 5 sites at 3.5 and 3.7 GHz

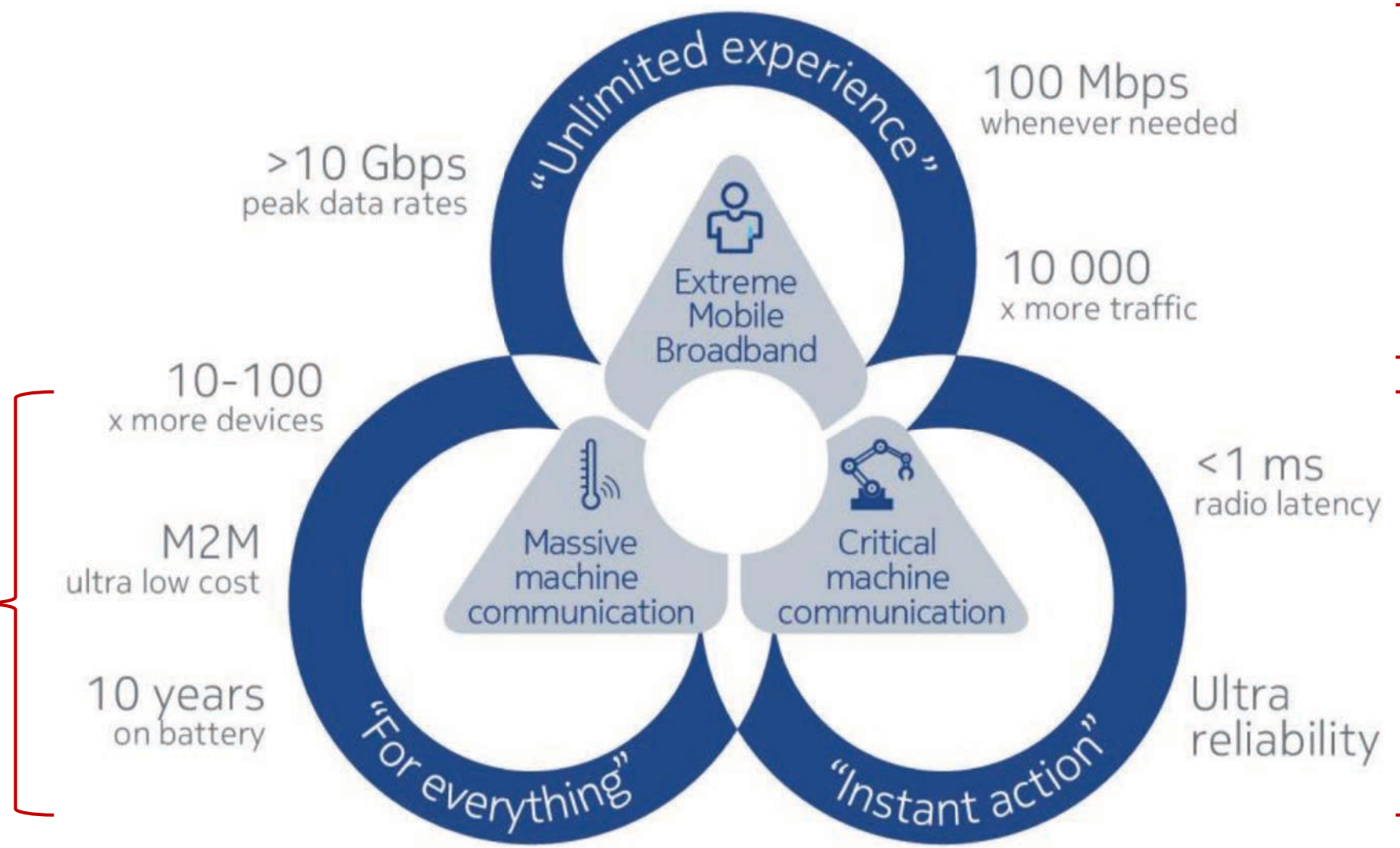
Source: https://commons.wikimedia.org

Source: https://www.speedtest.net

Image above: 5G antennas at the site of Deutsche Telekom in Darmstadt, Germany

Left image: Speedtest of a 5G downlink

5G features and communication profiles



Consumers (throughput)

Tracking (IoT, M2M)

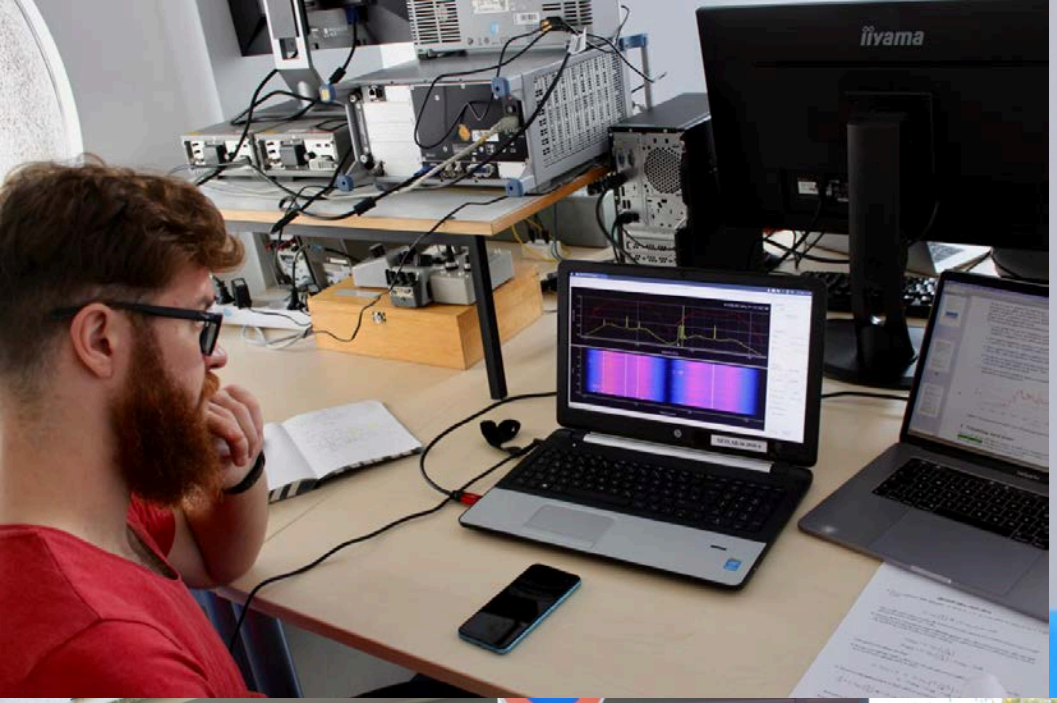
Control (URLLC)

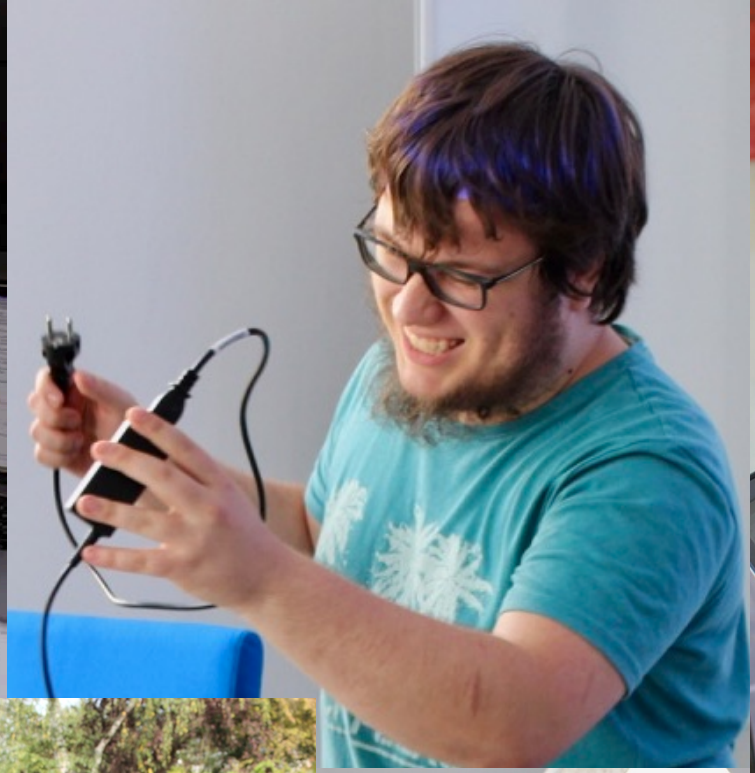
Source: Nokia, 3GPP

5GLab: Overview

- Founded in July 2019: Funding secured from German state of Hesse
- Teaching started in Oct. 2019 with preliminary equipment
- Lab will be fully equipped in March 2020

- Main objectives:
  - Train our students on modern technology and teach fundamentals in a practical manner
  - Offer summer schools and seminars (also to international partners)
  - Offer a vendor-independent lab to industry partners, e.g., for testing and R&D actions





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5GLab: Main equipment

- Low-performance Software-defined Radios (SDRs): Capable of running a 4G RAN
- High-performance Software-defined Radios (SDRs): Capable of running a 5G NR interface and beyond (200 Gbit/s Antenna IF)
- Signalling testers to emulate a core network: 4G and 5G
- Various spectrum analyzers
- Various test antennas (omni, directional)
- 5G phones from several vendors
- RF shielding boxes
- High performance, programmable core switches (20 Gbit/s)

5GLab: What can we do for you?

- We train students and interested partners on 5G technology
- We analyze complete transceiver chains and run our own 4G/5G network
- We are testing and studying 5G technology independent of vendors and operators

And by the way:
Our professors have 15+ years of R&D experience in the telecommunication industry and contributed to algorithms, standards, and patents behind 5G.

Interested? Contact us!

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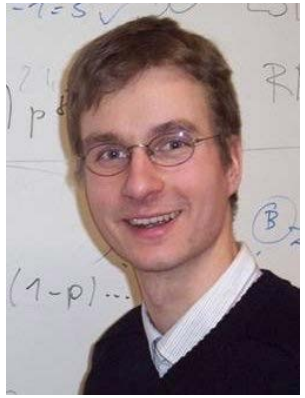

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