B5G/6G Wireless Connectivity: Technologies, Challenges and Applications

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Institute work

- ICE composed of two comprehensive chairs:
  - Chair for Software for Systems on Silicon (SSS)
  - Chair for Distributed Signal Processing (DSP)
- ~25 researchers
- ~10 non-academic staff

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Future is about experience-rich services
Connected intelligence through learning

The technological leap in an infrastructure that becomes self-aware and able to search for its own evolution path

Ubiquitous connectivity

01
Flexible and hyper-dense connectivity of everything

Communication sensing

02
Perceive and understand surroundings through ambient intelligence

Computing communications

03
Ultra-low cost and high energy efficiency of soft-radio with edge
Requirements of radio applications

- Online radio operation in real-time with continuous transmission
- Real-time learning at the speed of the target radio application
- Sub-ms cross-device decision making
Transition from dedicated to flexible connectivity

Delay sensitive services

Flexible radio infrastructure with autonomous response to dynamic demands

Reliability $[1-10^{-x}]$ vs. Latency [ms]

Dedicated

5G

B5G

URLLC

LLC

Dedicated

5G
Research topics @ ICE

- Soft-radio infrastructure
- Extreme flexibility
- Communications computing
- Data-driven learning
- Embedded learning
- Learning-based distributed RRM
- Immersive sensing and communication
Home example

- Critical computing
- Home network with xR
  - Distributed processing
  - Network access control
  - Home network APIs (PHY/MAC)

Edge cloud

- High-end computing
  - Autonomous network operations
    - Interference management
    - Cyber-physical control
    - Automated deployments
    - Dynamic computing
    - Flexible coverage

Customer space

- Flexible network
  - ca. 1ms network delay for real time xR experience

Flexible computing design

- <30ms computing delay for real time xR
- ca. 1ms network delay for real time xR experience
True Radio Experience
@ ICE, RWTH Aachen