5G Panel Discussion

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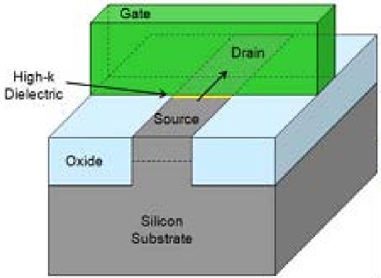
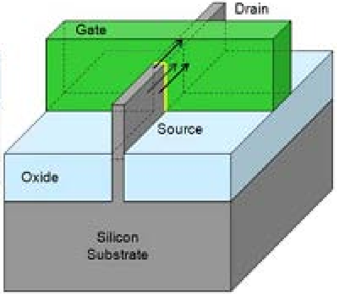
Semiconductor Architectural Innovation

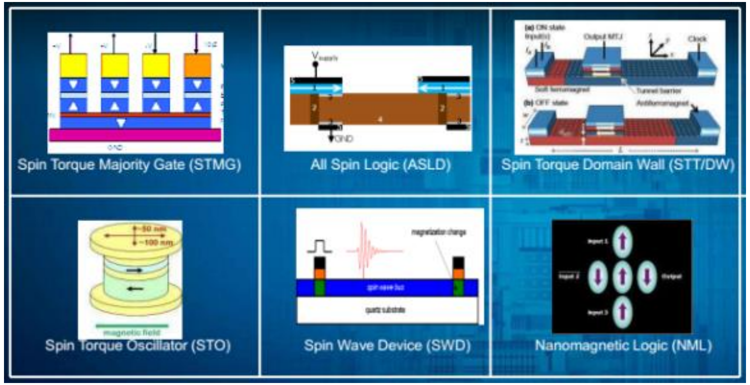
New Topologies



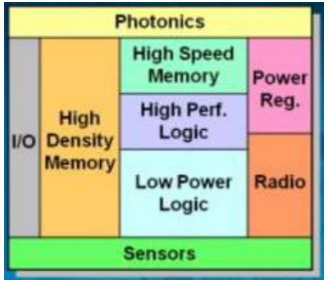
Planar

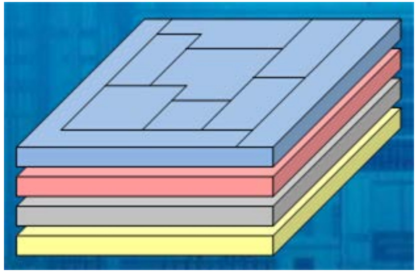


FinFET



Beyond CMOS Devices[2,3]

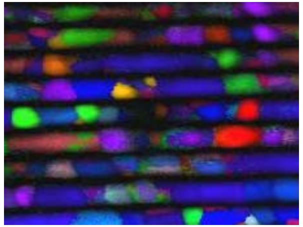




Logic
Memory
Power Reg.
Radio
Sensors
Photonics

2D Integration **3D Integration**

Heterogeneous System Integration[1]

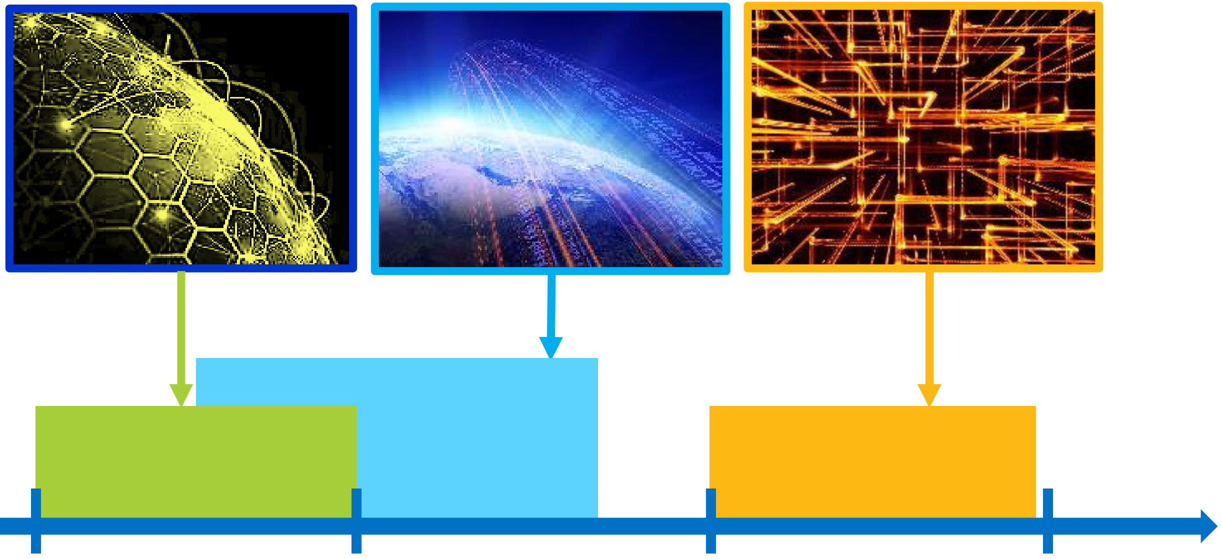


Cu Wires at 17nm.
Colour indicates crystal orientation.

Advanced Interconnect

1. IEDM 2011, *The Evolution of Scaling from the Homogeneous Era to the Heterogeneous Era*, M. Bohr
2. IEDM 2012, *Uniform Methodology for Benchmarking Beyond-CMOS Logic Devices*, D. Nikonov, I. Young
3. IEDM 2012, *The Ultimate CMOS Device and Beyond*, K. Kuhn et al.

Three Technology Tracks of 5G



IOT
NEW

LTE & WiFi
EVOLUTION

cmW / mmW
NEW

Spectrum

100 MHz

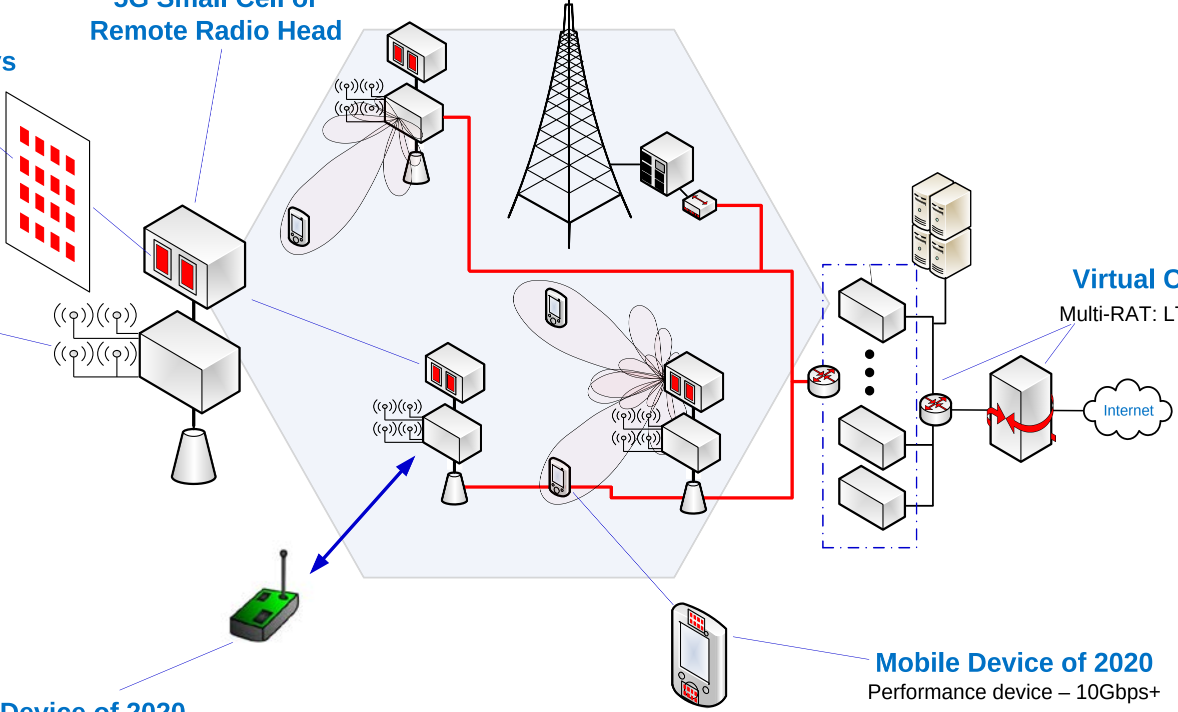
1 GHz

10 GHz

100 GHz

5G Network of 2020

Multi-RAT Virtualized Heterogeneous Network



Macro-Cell

5G Small Cell or Remote Radio Head

cm- and mm-Wave Arrays

500MHz+ Bandwidth

Multiband μ-Wave Array

LTE Rel-15, WiFi 802.11ax

Virtual Core Network (VNC)

Multi-RAT: LTE (FDD/TDD), HSPA+, 5G

Mobile Device of 2020

Performance device – 10Gbps+

IOT Device of 2020

5G Device Implementation

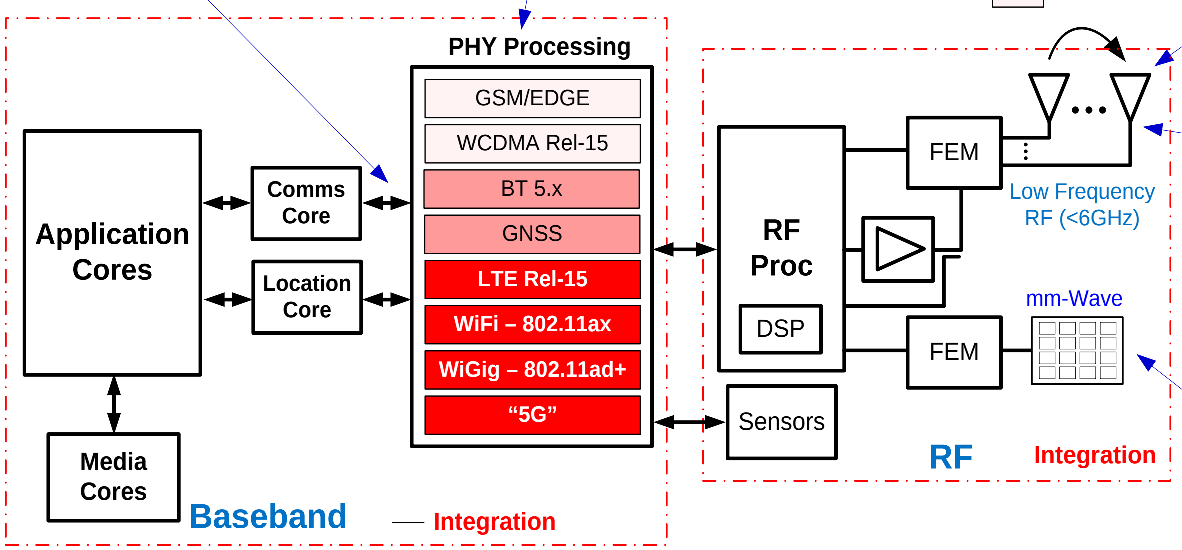
Ultra High Speed Inter-Processor Comm's

Multiple RATs (Radio Access Technologies)

4G-5G Transition Impact

🟥	**High**
▨	**Medium**
☐	**Low**

Multi-Band Support



Multi- μ-Wave Antenna Operation

cm- and mm-wave Antennas