METIS Concepts for 5G

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METIS – Scenarios

Amazingly fast
(Very high data rate)

Great service in a crowd
(Very dense crowds of users)

Best experience follows you
(Mobility)

Super real-time and reliable connections
(Very low latency)

Ubiquitous things communicating
(Very low energy and cost. Massive number of devices)
Develop a concept for future mobile and wireless communications system that supports the connected information society

1000x higher mobile data volumes
10x – 100x higher number of connected devices
10x – 100x typical end-user data rates
5x lower latency
10x longer battery life for low-power devices

Affordable and sustainable
Direct Device-to-Device Communication

› Flexible TDD air interface
› D2D device discovery
› Communication mode selection
  - Distributed CSI-based mode selection
  - Location based mode selection,
  - Joint mode selection and scheduling for direct D2D.
› Interference management
› Mobility management
› D2D relay and relayed D2D
› Spectrum detection/management/sharing

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Massive Machine Communication

› Time synchronous access.
› One common air interface supported by devices independent of the radio access type
› Both connectionless and always-connected approaches should be supported.
› Both contention-based transmission and access reservation should be supported.
› For low cost devices half-duplex operation should be the working assumption
› Licensed IMT spectrum access is preferred for MMC
› More device centric processing for mobility

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Moving Networks

› MN-M: Mobility-robust high-data rate communication
  - Access link enhancement
  - Framework for URC
  - Handover optimization mechanisms
  - Interference identification and prediction
  - Spectrum management

› MN-N: Flexible and demand-driven deployment of nomadic network nodes.
  - Node activation/deactivation, dynamic interference management, node clustering
  - Backhaul link and relaying enhancements
  - UE mobility management

› MN-V: V2X communications
  - Network-controlled and ad-hoc D2D for highly mobile devices
  - New waveforms and channel estimation for latency reduction and improved robustness
  - Framework for URC.
  - Optimized handover mechanisms

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Ultra-Dense Networks

UDN Core concept
› New OFDM-based spectrum-flexible TDD air interface optimized for UDN
   - Flexible spectrum from few GHz to mmW
   - Flexible UL/DL based on TDD
   - Reduction TTI and RTT latency
› Small cell integration and interaction
   - Fast node activation/deactivation
   - Clustering algorithms
› Wireless self-backhauling & network coding schemes.

UDN Extended concept
› UDN/macro integration
   - potential split of control and user planes
› Efficient wireless backhaul for UDN
› Context information, service reliability, improved management

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Ultra-Reliable Communication

› Reliable Service Composition
› Signaling structure
› Multi-RAT
› URC over a long term (URC-L)
   - Massive MIMO,
   - CoMP,
   - Radio node densification.
› URC in a short term (URC-S)
   - Techniques considering deadlines, e.g. deadline-driven HARQ
   - Prioritization of latency-critical messages down to the physical layer.
› URC for emergency (URC-E),
   - D2D concept
   - Multi-hop and relaying techniques, cooperative D2D communications.
   - Nomadic network nodes

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95%
97%
99.999%
Overall METIS concept

› Integrated multi/RAT system that integrating:
  - MMC, MN and URC,
  - scalable data rates, and
  - scalable latencies,
› using a system architecture that supports
  - D2D communication,
  - UDN deployments and
  - evolved versions of existing systems
› to provide improved QoE and reliability to humans and devices/machines.

› Use of higher frequency bands
› Massive MIMO
› Full duplex, likely low-power radio nodes
METIS Architecture

› Dynamic RAN will efficiently handle
  - multiple layers and
  - a variety of air interfaces
  - nomadic nodes.

› Control and cope with dynamics in
  - traffic,
  - user behavior, and
  - active nodes involved.

› Handle variety of QoS characteristics:
  - ultra-low latency traffic,
  - ultra-reliable communications,
  - broadcast traffic etc.

› Utilizing
  - SDN
  - NFV and
  - SON
METIS simulation activities

› Simulation and evaluation of technology components supporting sub-concepts
› Simulation and evaluation of overall concept
› Simulation software and data available on METIS web site: https://www.metis2020.com/documents/simulations/
Future research directions

› 5G Wireless system design
› 5G Air interface
› 5G for MTC
› 5G mm-Wave interface
› 5G HW/SW platforms
› Architecture
› Backhaul/fronthaul
http://www.metis2020.com