Industry Input

Role of 5G in Future Wireless Cities

NSF Future Wireless Cities Workshop

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Naseem Khan

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Future Wireless Cities

- Key Components:
  - Connect - via a cost-effective and scalable communication infrastructure
  - Collect real time data
  - Analyze for timely action plan and decision-making
- Application Areas (Examples)
  - Metering (e.g., gas, energy, and water),
  - Lights management,
  - Environmental monitoring (e.g., pollution, temperature, humidity, noise)
  - Vehicle traffic control
- Extremely high density of devices (sensors) with different characteristics and different communication needs

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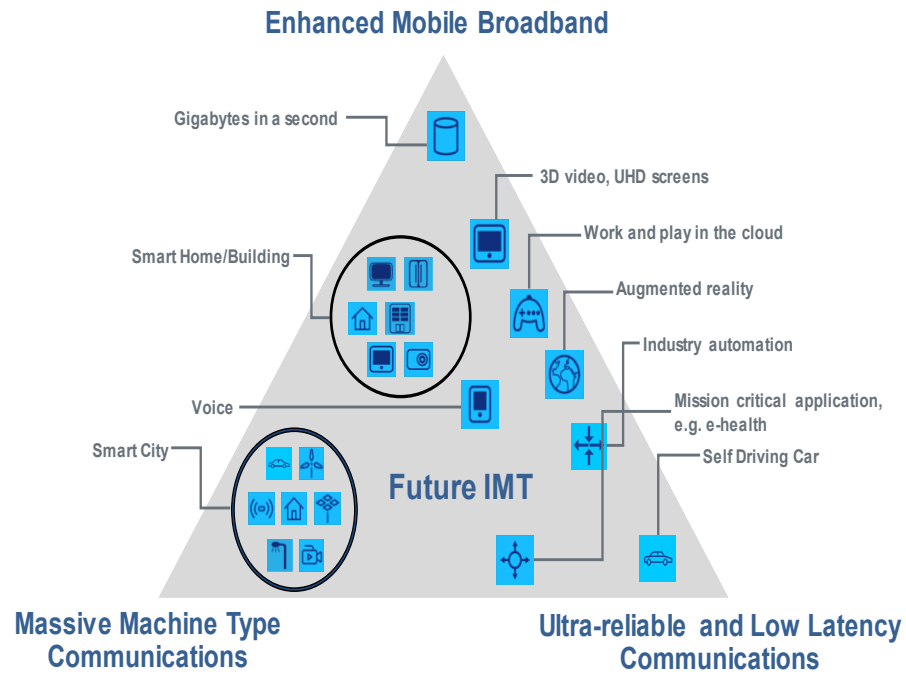
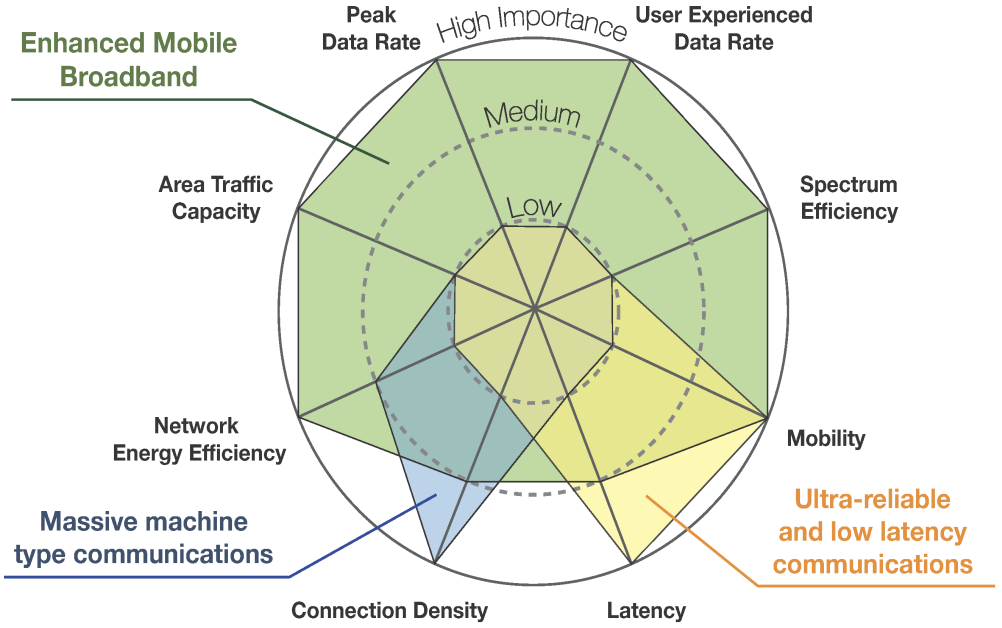
ITU-R vision for IMT-2020 and beyond





Three use case categories

Eight Key Capabilities

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5G supports a wide range of services

NGMN: 5G Use Case Families and Use Case Examples

Broadband access in dense areas	Broadband access everywhere	Higher user mobility	Massive Internet of Things
PERVASIVE VIDEO 	50+ MBPS EVERYWHERE 	HIGH SPEED TRAIN 	SENSOR NETWORKS 
Extreme real-time communications	**Lifeline communications**	**Ultra-reliable communications**	**Broadcast-like services**
TACTILE INTERNET 	NATURAL DISASTER 	E-HEALTH SERVICES 	BROADCAST SERVICES 

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See the NGMN 5G White Paper for a detailed list of all NGMN use cases

5G Use cases & Requirements

- **Broadband everywhere**
  - Peak data rate > 10 Gbps
- **High user mobility**
  - High speed train
- **Pervasive HD video communications (dense urban environments)**
  - Context awareness
- **Massive IoT**
  - Scalability, low cost
- **Real-time communication**
  - ETE response time
- **Mission critical**
  - High reliability

Almost all of the use cases will be applicable to future wireless cities

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5G - Key Architecture Principles

- **Evolution from 4G (LTE/LTE-A), not replacement**
- **SDN/NFV**
  - Programmable network/network slices
- **Scalability**
- **Separation of control and data plane in the core network**
- **More intelligence at the edge**
  - Centralization vs. de-centralization of functions based on latency requirements
- **Spectrum - licensed, shared, and unlicensed bands**
  - Low band < 6 GHz and high band ≥ 6 GHz
- **Front haul/backhaul complexity simplification**
- **Energy Efficient**
- **Convergence for various types of use cases**

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Future Wireless Cities - Studies & Trials Needed

- Network capabilities and interworking framework to serve all the future wireless cities use cases
- Role of 5G
- Varying characteristics of devices, communication, processing, and storage needs
- Different communication infrastructure architectures suited for future cities segmented on various criteria
- Performance, reliability, and security
- Role of NFV and SDN
- User experience, value, and cost
- An integrated View – scalability as the focus

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