5G for Future MTC Solutions

Rationale

The vertical industry is expected to be supported by 5G networks in highly efficient manner. These vertical industries have a diverse set of usage scenarios and it will be required to meet new challenging KPIs , e.g. very low latency, ultra high reliability, low energy consumption, support of massive connections, etc. The main driver for this action is to acquire realistic requirements from the vertical industries and provide integrated subsystem (e.g. latency, reliability, power...) solutions embedded in 5G cellular networks or network slices.

Objective

- To design a 5G Network capable of handling scalable guaranteed latency and scalable reliable end-to-end communications between machines and humans
- To design a 5G Network capable of handling scalable low-power and low bandwidth IoT services
- To provide network concepts for cellular, cellular-assisted and non-coverage (ad-hoc, satellite) IoT scenarios

Scope

- Vertical Requirements / use cases / Traffic calculations / spectrum demands
- Scalable reliable, low latency and low bandwidth, power L1 /2 design for data/control plane
- Defining new MTC UE capabilities / functions (e.g. distributed car terminals, low power IoT devices, etc.)
- SDN architecture /functions for MTC support like MEC (Mobile Edge Clouds), etc.
- Integration with legacy MTC radios, networks (e.g. WiGRID (WiMax for smart grids), 802.11p in cars, Tetra, satellite…)
- Interface design between vertical and 5G sub-system for e2e KPIs
- Validation / demo with integrated testbed solutions
- Industry forum / regulatory alignments (e.g. NGMN, ITU,…)
- Technical standardisation for aligned IEC/ETSI-ITS/ETSI-SES/C2C-CC/CENELEC/Health…3GPP (area is specific for each sector!)

Expected Impact

- Enabler for full autonomous driving, automatic control of the Smart Grid, automation, ehealth
- Support of low-power IoT devices like wearables, ehealth devices, etc. - low cost high volume 5G MTC devices
- Input for hybrid (cellular+D2D+satellite), cellular, D2D, ONF/IETF, 3GPP, ETSI, MEC, NFV standardisation
- Demonstration in large scale testbeds
- Enabler for new applications based on instantaneous sensoring and actuation (remote control like teleoperated driving, surgery, remote hands, etc.)
- Contribution to the forecasted EU booth in MWC 2019 showcasing the set of Phase 2 projects functionalities and capabilities

Background: New 5G study item in 3GPP on Vertical Sectors

Vertical group	QoE and Peak data rate	Latency	Reliability	Comm. efficiency	Traffic density	Conn. density	Position accuracy	Remarks
Group eMBB	Very High data rate (e.g. peak rate 10 Gbps, up to 10 Gbps when the user is moving slowly, DL 300Mbps with DL 50Mbps, 100Mbps)	Very low latency, low latency for high speed, reliable low-latency connectivity between aerial objects			High traffic density (e.g Tbps/ km2）	High density for UE (e.g. 200-2500 /km2, 2000/km2, 50 active UEs simultaneously)		Characterised by very high traffic, high bit rate. No Reliability needed, no accuracy need
Group CriC		Realtime low latency (e.g. as low as 1 ms end-to-end; the case “Smart grid system”: less than 8 ms, Round trip latency less than [150 ms], low latency (~1 ms), UE-UE latency: low latency [1-10 ms], 0.5ms one-way delay, Round trip latency less than [150 ms])	Ultra high Reliability, high availability (e.g. limit the duration of service interruption for mission critical traffic, Packet loss rate: as low as 1e-04; delivered in 8 ms, Realibity with Priority, Precedence, Preemption (PPP) mechanisms)		high density distribution (e.g. 10k sensor /10sqkm)		Precise position within [10 cm] in densely populated areas.	Characterised by low latency, ultra high reliability
Group mIOT				Coverage enhancement, Efficient resource and signalling to support low power, support devices (e.g., smart meter) with limited communication requirements and capabilities	High density massive connections (e.g.1 million connections per square kilometre), to accept information from large numbers of locally dense devices, possibly simultaneously	Low mobility (for majority of MTC cases except for inventory)	High positioning accuracy in both outdoor and indoor scenarios (e.g., 0.5m)	Difference with CC is: No low Latency

MTC proposal for Phase 2

- Joint involvement of selected vertical players
- Focus of mission-critical and mIoT end-to-end solutions
- Extensive trials needed for joint 5G and vertical subsystems to align interfaces and algorithms
- Joint standardization for 3GPP, ETSI, IEC, …