M2M applications and 3GPP cellular networks

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A cellular operator:
Can any of the 3GPP technologies (GSM, UMTS, LTE) be used to meet the M2M requirements?

- Low device price
- Long battery life

NOTE: 3GPP uses Machine Type Communication (MTC) term beside M2M
Challenges for 3GPP cellular networks

**Traditional applications**
- Voice, multimedia, large data
- Highly mobile devices
- No strict requirements for chipset price and battery life

**M2M application characteristics**
- Business: low ARPU
- Device requirements: **low price, long battery life**
- Data characteristics: small data, periodic, (in)frequent
End-to-end architecture

Why 3GPP cellular network as transport for M2M applications?

Deployment aspect:
- Global, wireless reachability
- Operators deploy M2M platforms
- SoC allows embedded modem (<5$) into sensors/meters

3GPP offers to 3rd parties:
- C-plane access (network APIs)
- IP bearer service
- SMS service

3GPP to meet M2M device requirements
3GPP enables access to/from M2M providers

3GPP main scope
3GPP System Architecture evolution (1/3)

### Release 10 (NIMTC)
- Started with a dozen of features....
- Congestion/overload control in the network
  - low access priority devices
  - ... later dual priority devices
  - Extended Access Class Barring (EAB)

### Release 11 (SIMTC)
- Device Triggering TS23.682 (reachability from the M2M App server)
  - New network function MTC-IWF (Tsp interface to 3rd party)
- SMS in MME (LTE only deployment)
- MSISDN-less support

### Release 12
- UE Power Consumption Optimizations (UEPCOP)
  - Power saving mode (PSM): UE not reachable during PSM state.
- Small Data and Device Triggering (SDDTE)
  - Core Network assisted eNB parameters for small data transfer

=> Release 13 ongoing (following slides)
3GPP System Architecture evolution (2/3)

Release 11
(Design Triggering)
3GPP System Architecture evolution (3/3)

Release 11
(Device Triggering)

Release 13
(service exposure architecture)

Service Capability Exposure Function

OMA/
GSMA/
other SDOs

3GPP

OMA/
GSMA/
other SDOs

3GPP

OMA/
GSMA/
other SDOs

3GPP

OMA/
GSMA/
other SDOs

3GPP
3GPP System Architecture: Release 13

### Architecture Enhancements for Service Capability Exposure (AESE)
- **Architecture agreed**
- Exposing network services to 3rd party

### Monitoring Enhancements (MONTE)
- Configuring monitoring events in the network
- Exposing network information to 3rd party for troubleshooting

### Group based Enhancements (GROUPE)
- Group based messaging
  - Broadcast/multicast to a group (opt. in a geo area)
  - Group addressing and identifiers
- Group based policing: QoS policies, congestion control

=> More M2M-related features are studied (HLCom, DECOR, eDRX)
3GPP Radio Access (RAN/GERAN)

**RAN1/2 (UTRAN, LTE)**
- **Release 11**
  - Implementing SA specs on congestion/overload control
  - Study on **Low Cost UE** (low data rate, 1 RX antenna, in-building coverage, half-duplex)
- **Release 12**
  - Specified a new **Cat0 UE** (result from Rel-11 “Low Cost UE”)
- **Release 13**
  - RAN enhancements for small data transmission in LTE

**GERAN (GPRS)**
- **Rel-12**: Study of Power Saving for MTC Devices (**uPoD**)
- **Rel-13**: Support for **Ultra Low Complexity and Low Throughput IoT** (**Cellular IoT**)
  - **Data rate** >= 160 bps
  - **Battery lifetime** > 10 years
  - Massive **number of devices** (40 per household)
  - Optionally **non backward compatibility**
Towards 5G

- **In the past (2G, 3G, 4G)**
  The service requirements (SA1) did not consider M2M use cases
  => hence, later enhancements were needed

- **In the future (5G, 2018~2020)**
  SA1 to specify use cases based on M2M applications (e.g. ultra-fast network access, e.g. ~1ms latency for automated driving, industrial sensors, robots. Described in docs S1-144361, S1-144384).
Summary

3GPP standardizes **M2M-specific features** (since ~2010)
- Network internal optimizations for M2M characteristics
- Cheep and power efficient M2M devices (by RAN/GERAN WGs)
- Unified access to/from M2M service providers (by SA WGs)
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