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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)requent



End-to-end architecture

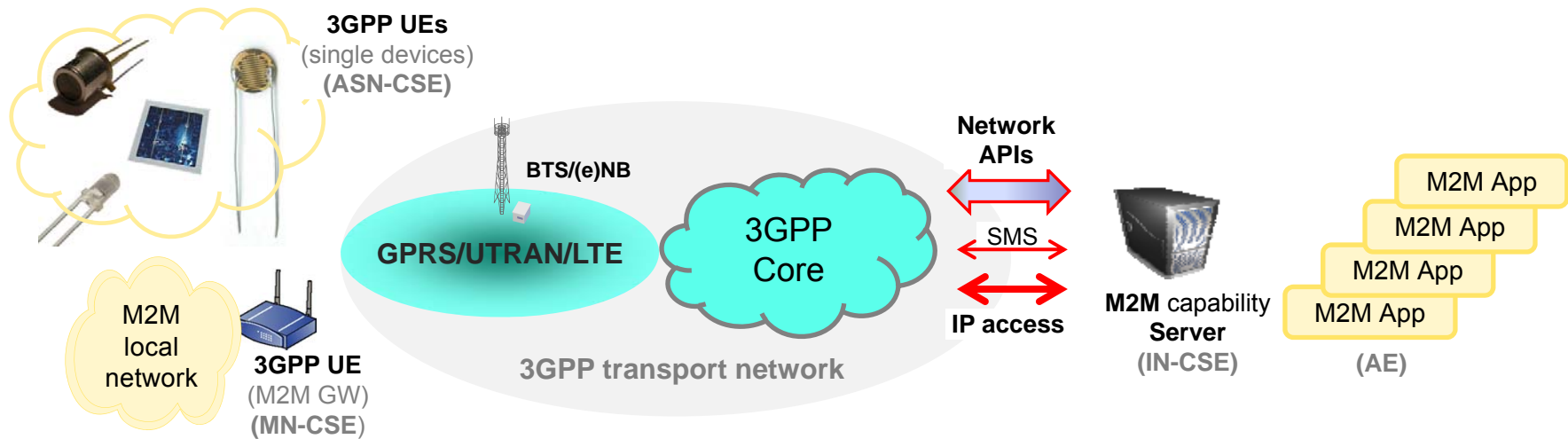
Why 3GPP cellular network as transport for M2M applications?

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**)

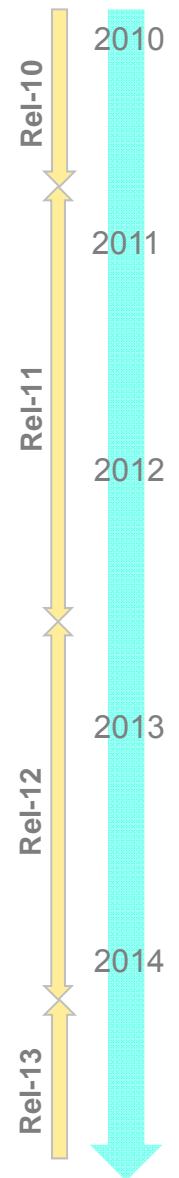
Release 11 (SIMTC)

- **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

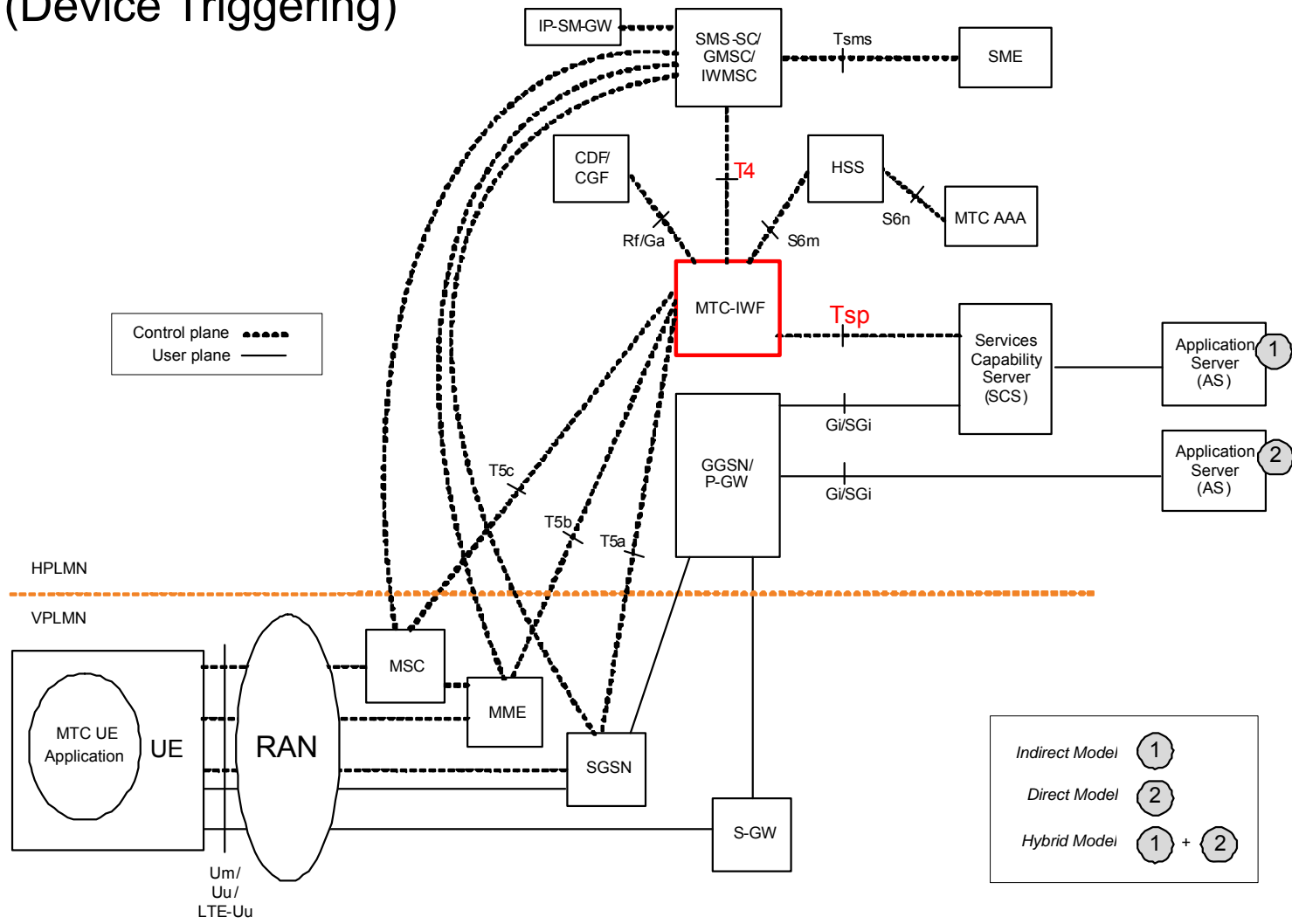
- UE Power Consumption Optimizations (**UEPCOP**)
 - **Power saving mode (PSM)**: UE not reachable during PSM state.
- Small Data and Device Triggering (**SDDTE**)
 - **Core Network assisted eNB parameters** for small data transfer

=> Release 13 ongoing (following slides)



3GPP System Architecture evolution (2/3)

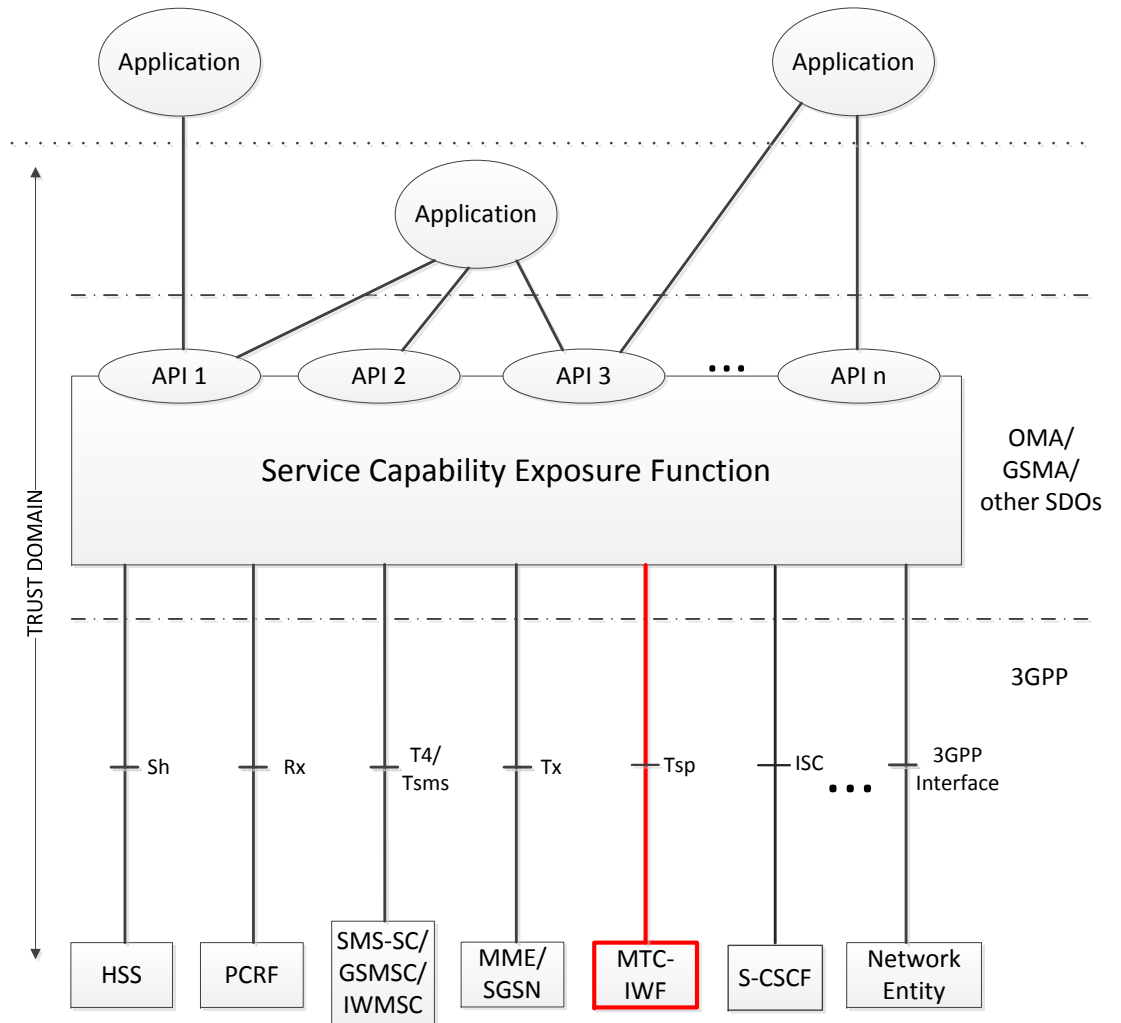
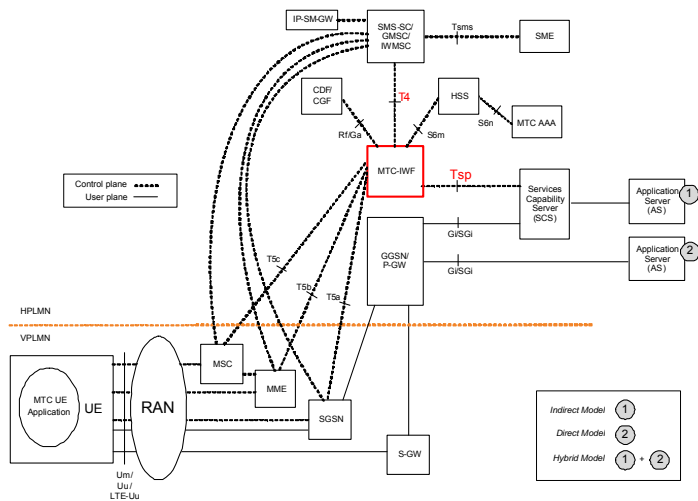
Release 11 (Device Triggering)



3GPP System Architecture evolution (3/3)

Release 11
(Device Triggering)

Release 13
(service exposure architecture)



3GPP System Architecture: Release 13

Architecture Enhancements for Service Capability Exposure ([AESE](#))

- **Architecture agreed**
- Exposing network services to 3rd party

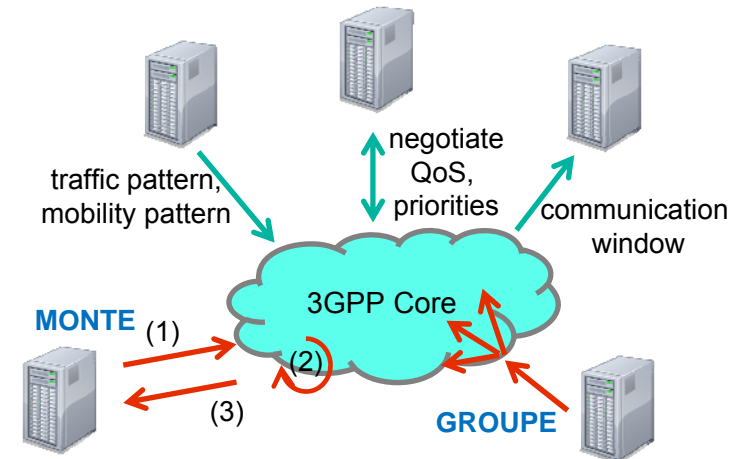
Monitoring Enhancements ([MONTE](#))

- 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

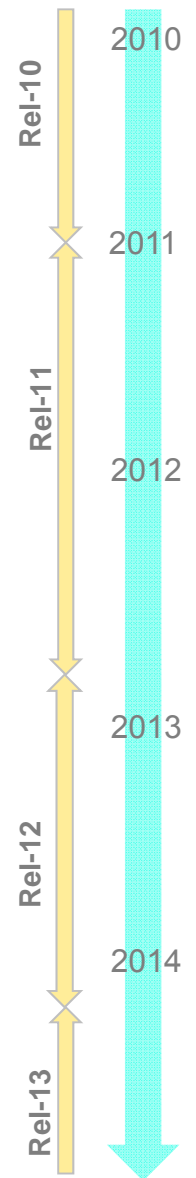
=> More M2M-related features are studied ([HLCom](#), [DECOR](#), [eDRX](#))



3GPP Radio Access (RAN/GERAN)

- RAN1/2 (UTRAN, **LTE**)** LTE is considered for M2M business
- 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**)** 2G is the legacy M2M business of 3GPP operators
- 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

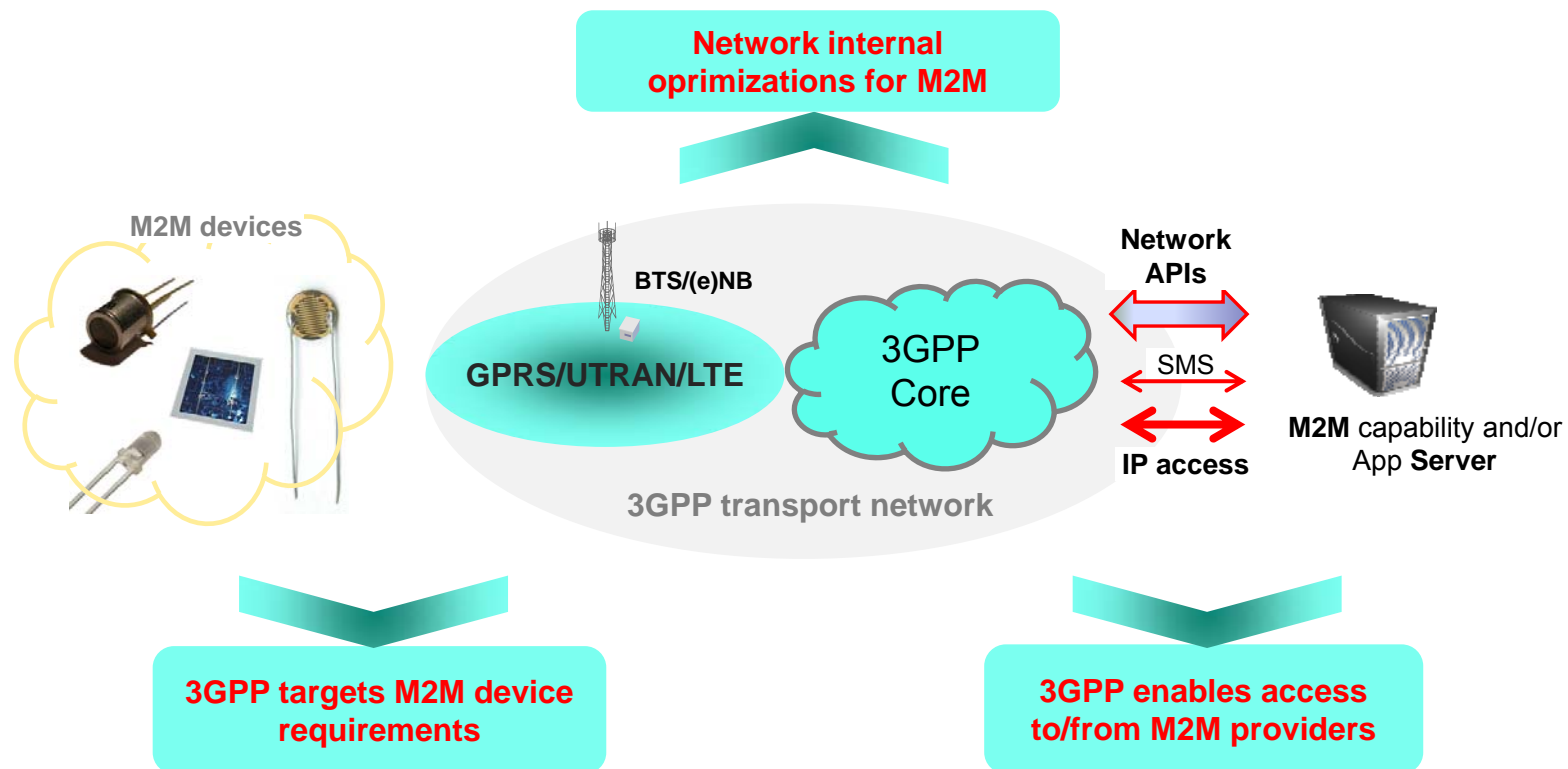
■ In the future (5G, 2018~2020)

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
- Cheap and power efficient M2M devices (by RAN/GERAN WGs)
- Unified access to/from M2M service providers (by SA WGs)





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