Welcome to the World of Standards

ETSI World Class Standards

MACHINE TO MACHINE STANDARDIZATION IN ETSI

CEPT Workshop on Machine-to-Machine communications

Presented by Michael Sharpe Mainz, 21 to 22 March 2016

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Some history…

- ETSI Board investigations during 2008
- Formation of ETSI TC M2M January 2009
- OneM2M partnership project founded September 2012
- European work continues in ETSI TC SmartM2M

Plus…

- ETSI TC ITS (Intelligent Transport Systems)
- ISG LTN (Low Throughput Networks)
  - (work now transferred to ETSI TC ERM TG28)
- ETST TC SmartBAN
- ETSI TC ERM (in particular TG28) short-range devices addressing a number of M2M applications
- …..

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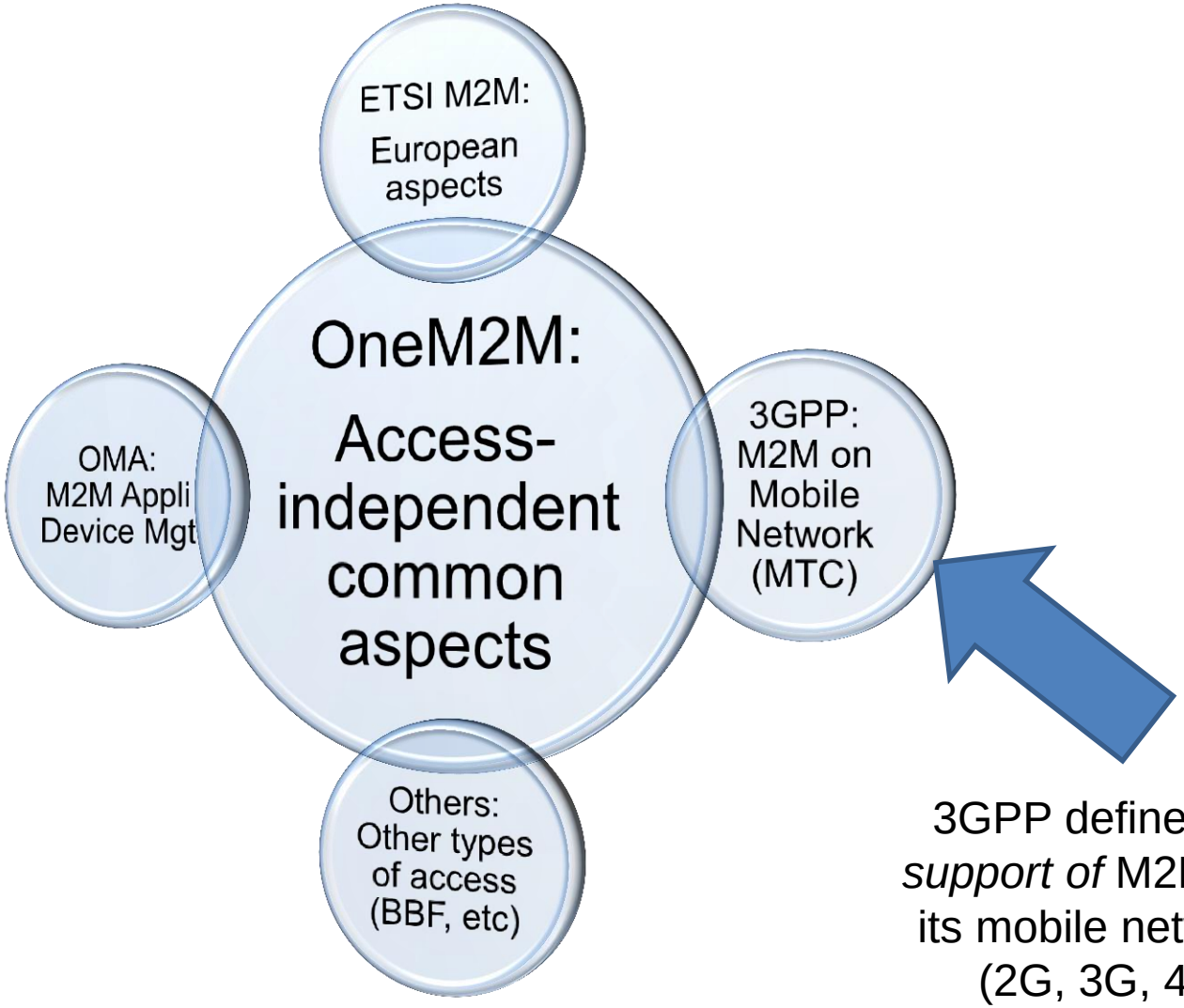
…and don't forget…



3GPP defines the *support of* M2M over its mobile networks (2G, 3G, 4G)

An early vision…

Telemetry
- Utility meters
- Parking meters
- Industrial meters
- Elevators
- Vending Machines

Fleet Management
- Cargo tracking
- Stock management
- Temperature control
- Route planning
- Order tracking
- Vehicle diagnostics

Service & Maintenance
- Industrial machines
- Vending machines
- …

Telematics / Vehicle
- Navigation
- Traffic / weather info
- Road safety
- Vehicle diagnostics
- Location services

M2M

Security & Surveillance
- Public surveillance
- Asset monitoring
- Congestion and movement monitoring
- Urban management

Home Applications
- Heating control
- Electrical appliances
- Alarms and security
- Surveillance cameras
- Garage & garden

e-Health Applications
- Patient monitoring
- Remote diagnostics
- Activity monitoring
- Lifestyle suggestions
- Personal security

Sales & Payment
- POS terminals
- Vending machines
- Gaming & entertainment

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Operational requirements

- Interoperability
- Security
- Privacy
- (In some cases) predictable & robust end-to-end performance

- (Very) large numbers of terminals
- Low power consumption
- Low cost
- (Sometimes) low latency
- (Often) low data capacity per device
- (Often) high density of terminals
- Long terminal life

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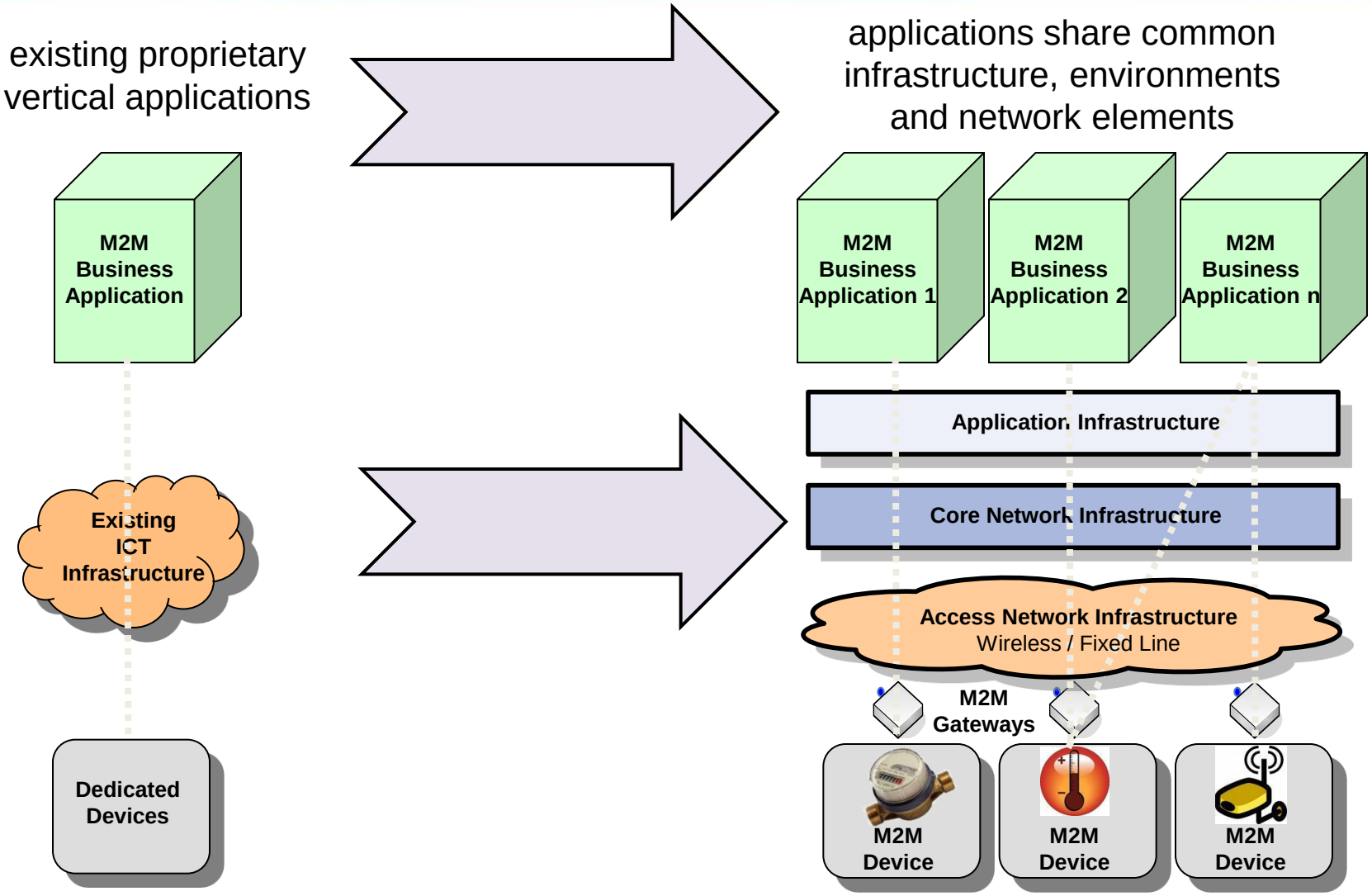
Early vision: “Inverting the pipes”



Why 3GPP needs to define anything at all?

- Indeed, M2M can be supported as Over-The-Top, classical communications

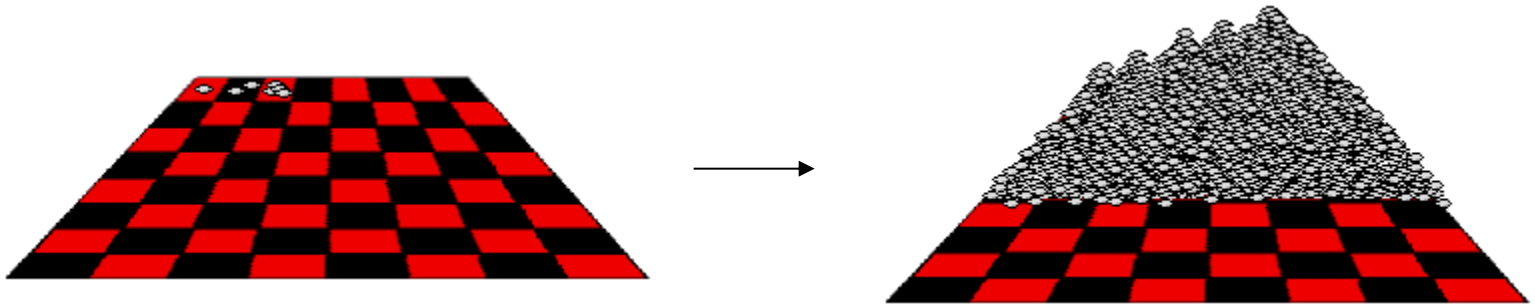
  -=> This is what is done in early implementations, already on the market for some years

- However, an ***optimised*** support of M2M flows requires a number of network improvements, knowing that M2M Devices are characterised by:
  - Little traffic
  - Data communications only
  - Low mobility
  - Very large number of terminals
  - Etc.

- 3GPP “MTC” stand for this set of -rather independent- improvements

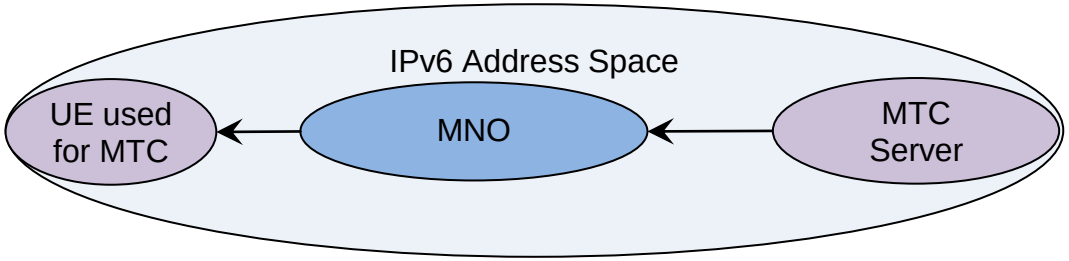
Challenge 1: Addressing

- Up to now, humans were the main users of telecommunication networks.
- This was already causing a huge expansion of the number of users.
- Now with e.g. Machine-to-Machine and eCall, the “end user” are machines. This will raise the number of new “users” to a new scale, with specific characteristics (not much traffic generated, no/reduced mobility, etc).

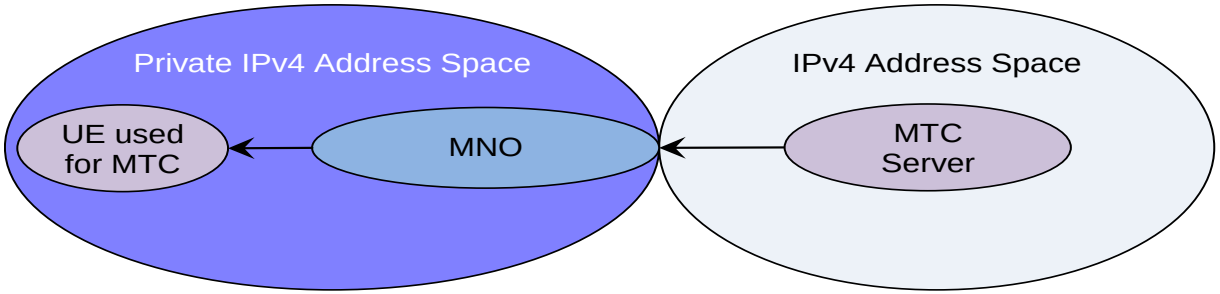


Challenge 1: Addressing (cont'd)

- Issue: Billions of machines to address
- Solution (Rel-11):
  - If/whenever possible, use IPv6:



  - if not: transition solutions using IP v4
    - The MNO has to insure the interworking so that the MTC Server and the UE can communicate in the same IPv4 addressing space



Challenge 2: Overload/Congestion Control

- Issue: control that all the MTC Devices do not send their data all together and congest the network
- Handled in Rel-10
- Solution in 2G:
  - The Core Network (CN) can notify the GERAN of a CN overload situation
  - An implicit reject mechanism can be used by the network to reject all devices configured for low priority access
  - MTC-specific broadcast mechanism for access baring
- Solution in 3G/4G:
  - “delay-tolerant” indication sent by MTC Device to RAN at set-up
  - the RAN can reject/release “delay tolerant” connections with an “extended wait timer” (up to 30 min)
  - The CN can indicate “overload” to RAN to limit the delay-tolerant traffic

Challenge 3: small amounts of data and power consumption

- Issue: a majority of MTC Devices will send or receive only small amounts of data.
  - The power consumption of these MTC Devices shall be as low as possible
  - The use of Network (including Access) Resources shall remain as efficient as possible
- Solutions:
  - Reduction in control signalling and the number of concurrent/active network connections by sending user data on signalling connection rather than set up a data connection or instead of SMS;
  - Online Device triggering: Wake-up the device to tell him to start sending its data. Trigger sent by SMS in Rel-11, and over signalling channel in Rel-12. In Rel-12, the trigger control is enhanced by introducing triggers overload handling and by enabling the cancellation of previously submitted triggers
  - UE Power Consumptions Optimizations: introduction of long paging cycles in Rel-12

Some of the other Challenges

- Low mobility
  - Solution (Rel-10): Removal of Subscribed Periodic LAU/RAU timer in HSS subscription
- Device Grouping:
  - Allow common actions for a group of MTC devices (group policing and addressing)
- Subscription Control and Charging
- Low-Cost MTC Device
- Other M2M specific problems
  - TR 23.888 (FS on Stage 2 of System improvements for MTC) identifies 15 specific problems and evaluate 62 possible solutions

Rel-10: “Network Improvements for Machine-Type Communications”

- First MTC-related feature in Rel-10:
  - Setting the principles
  - Focus on overload and congestion control
- Many 3GPP Groups involved:
  - Core aspects defined by SA1, SA2, SA5, CT1, CT4, CT6, GERAN2
  - RAN2 and 3: RAN mechanisms to avoid CN overload due to Machine-Type Communications
  - GERAN3 and RAN5: MS/UE Conformance Test
- Rel-10 MTC completed mid-2011,

Rel-11: "System Improvements to Machine-Type Communications"

- Introduced in Rel-11:
  - MTC architecture: new Tsp interface. However, in Rel-11 the Tsp interface does not yet do anything more than what the large scale SMS interface does.
  - Online device trigger: a SMS is sent to the device to wake it up, e.g. to set up a connection. In Release 11 implemented with SMS.
- Rel-11 MTC completed end-2012

Rel-12: “Machine-Type and other mobile data applications Communications enhancements”

- Further improvements in Rel-12:
  - Group based features: messaging, policing (maximum aggregate bit rate per group), charging
  - Interworking with M2M Service Enablement (SA1)
  - Small Data and Device Triggering Enhancements:
    - send user data on signalling connection rather than set up a data connection or instead of SMS;
    - Overload handling for triggering;
    - Cancelling previously submitted triggers
  - UE Power Consumptions Optimizations: introduction of long paging cycles
  - Security and Privacy aspects (SA3), postponed from Rel-10 and Rel-11
- Rel-12 frozen September 2014

Rel-13: New features to support MTC

- Service Requirements Maintenance for Machine-Type Communications (MTC)
- Cellular (Narrowband) Internet of Things
- Extended Coverage GSM (EC-GSM) for support of Cellular Internet of Things
- Extended DRX cycle for Power Consumption
- Optimizations to Support High Latency Communications
- Further LTE Physical Layer Enhancements for MTC
- EGPRS Access Security Enhancements in relation to Cellular IoT
- Rel-13 frozen December 2015

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Looking to the future

- "Hyperconnectivity" and the need for high performance, high availability, low latency applications (e.g. mission critical applications) are being studied in the context of 5G
- Rel-14: studies on 5G (target date: March 2017)
  - Massive Internet of Things
  - Critical Communications
  - Enhanced Mobile Broadband
  - Network Operation
- Rel-15: "pre-5G"
  - Target date: June 2018
- Rel-16: "full 5G"
  - Target date: December 2019

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Issues to be addressed for M2M

- Balance between networked and non-networked M2M solutions
- Because of the variety of applications and technical solutions, spectrum requirements are difficult to assess
- International / cross-border Naming & Addressing
- Interoperability: see ETSI M2M Workshop 9 to 11 December 2015

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Exciting times ahead

Contact Details:

Michael Sharpe

ETSI Director of Spectrum and Equipment Regulation

Thank you for listening!

info@etsi.org

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