M2M :
Machine to Machine Communication

(From ETSI/3GPP Aspect)

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Outlines

- Introduction
- M2M Application and Architecture
- M2M in 3GPP
- Summary

Introduction

- What is M2M?
  - Machine-to-Machine (M2M) involves communication without (or only limited) human intervention
  - The human is not the input, but only (optionally) the out put
  - Also named Machine Type Communication (MTC) in 3GPP

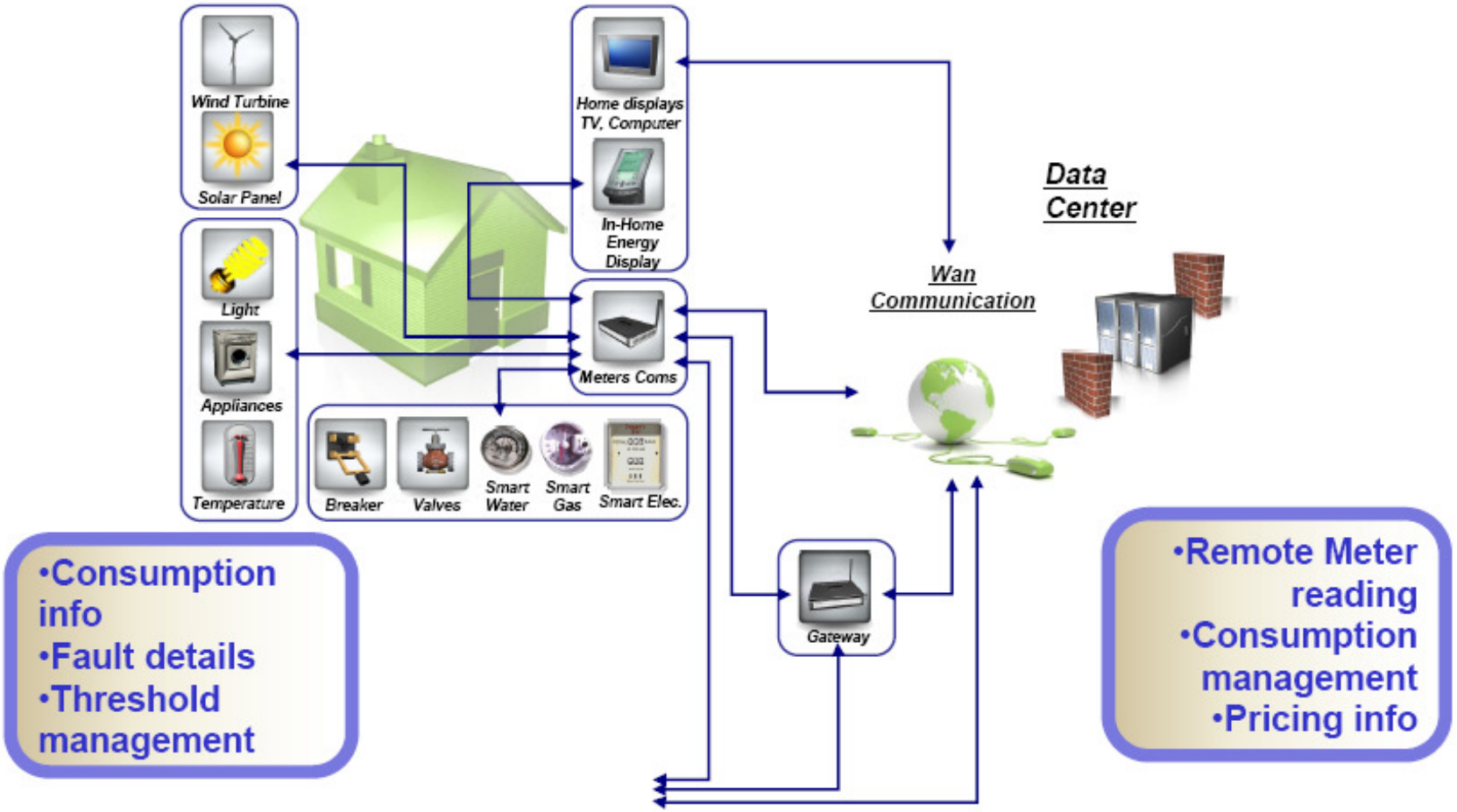
Source: ETSI

Introduction

- M2M applications
  - Security
    - Surveillance applications, alarms, people tracking
  - Transportation
    - Fleet management, emission control, toll payment
  - Health care
    - e-Health
  - Utilities
    - Measurement, provisioning and billing of utilities, such as Oil, and water
  - Manufacturing
    - Production chain monitoring and automation
  - Facility Management
    - Home / building / campus automation

Source: ETSI

M2M Application – Smart Metering

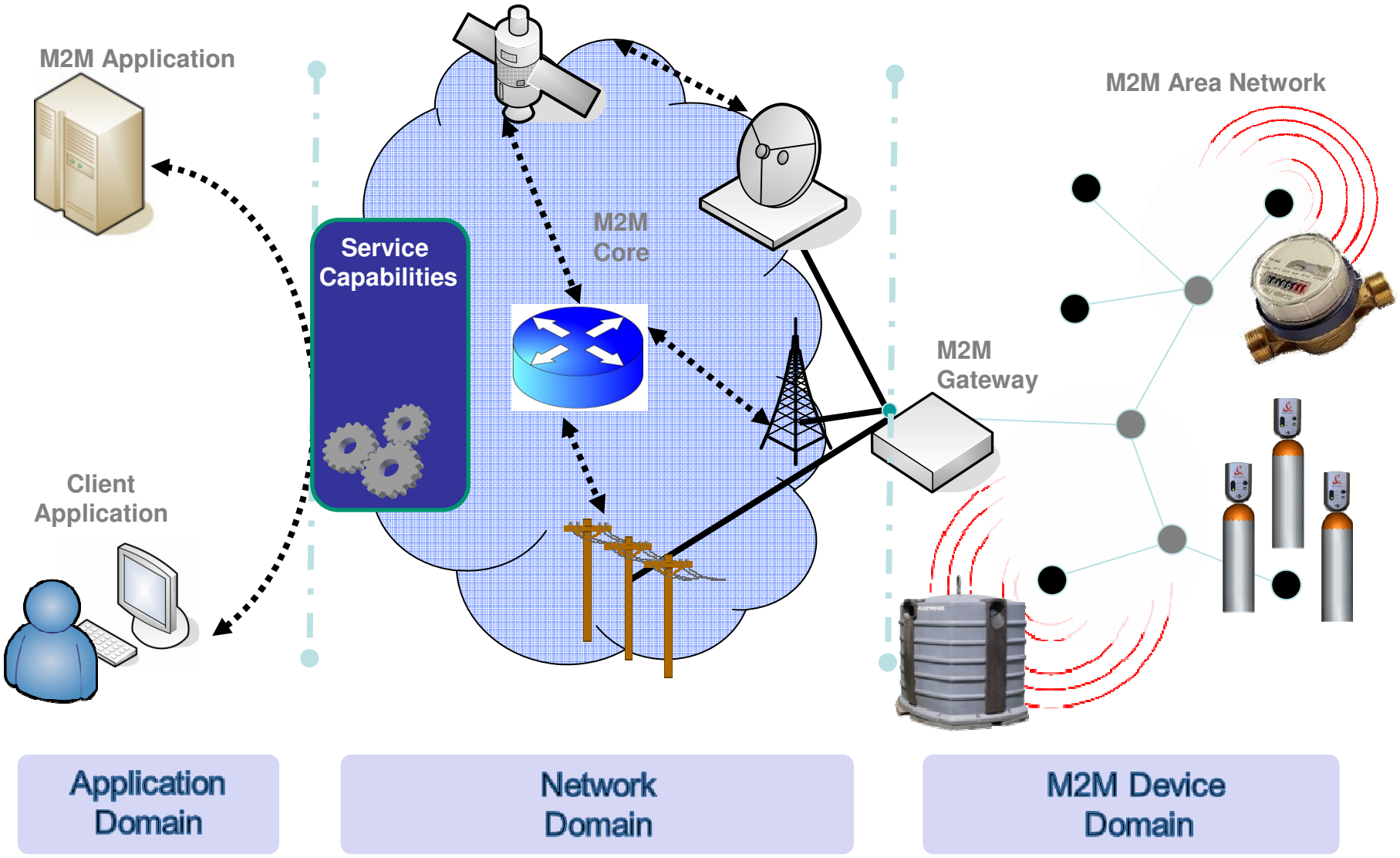


Source: ETSI

M2M Application – e-Health

Source: ETSI

Network Architecture



Source: ETSI

Key Elements

- M2M Device
  - A device capable of replying to request for data contained within those device or capable of transmitting data contained within those devices autonomously
- M2M Area Network (Device Domain)
  - Provide connectivity between M2M Devices and M2M Gateways
  - E.g. personal area network
- M2M Gateway
  - Use M2M capabilities to ensure M2M Devices inter-working and interconnection to the communication network
- M2M Communication Networks (Network Domain)
  - Communications between the M2M Gateway(s) and M2M application
  - E.g. xDSL, LTE, WiMAX, and WLAN
- M2M Applications
  - Contains the middleware layer where data goes through various application services and is used by the specific business-processing engines

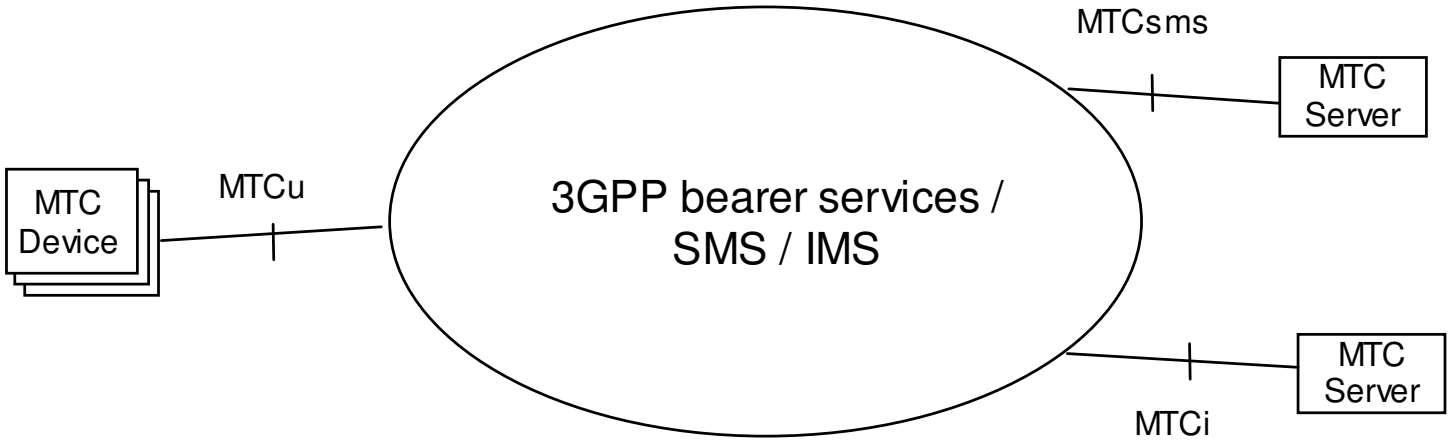
Source: ETSI

M2M in 3GPP – The Reason

- 3GPP has started the specification in 2010 for:
  - Interoperable Solution
    - Endure Interoperability
  - Product Innovation
    - Encourages innovation through R&D
  - New Markets
    - Expands markets
  - Standards Solution
    - Reduces cost
  - Regulatory Requirements
    - Satisfies essential regulatory requirement

Source: ETSI

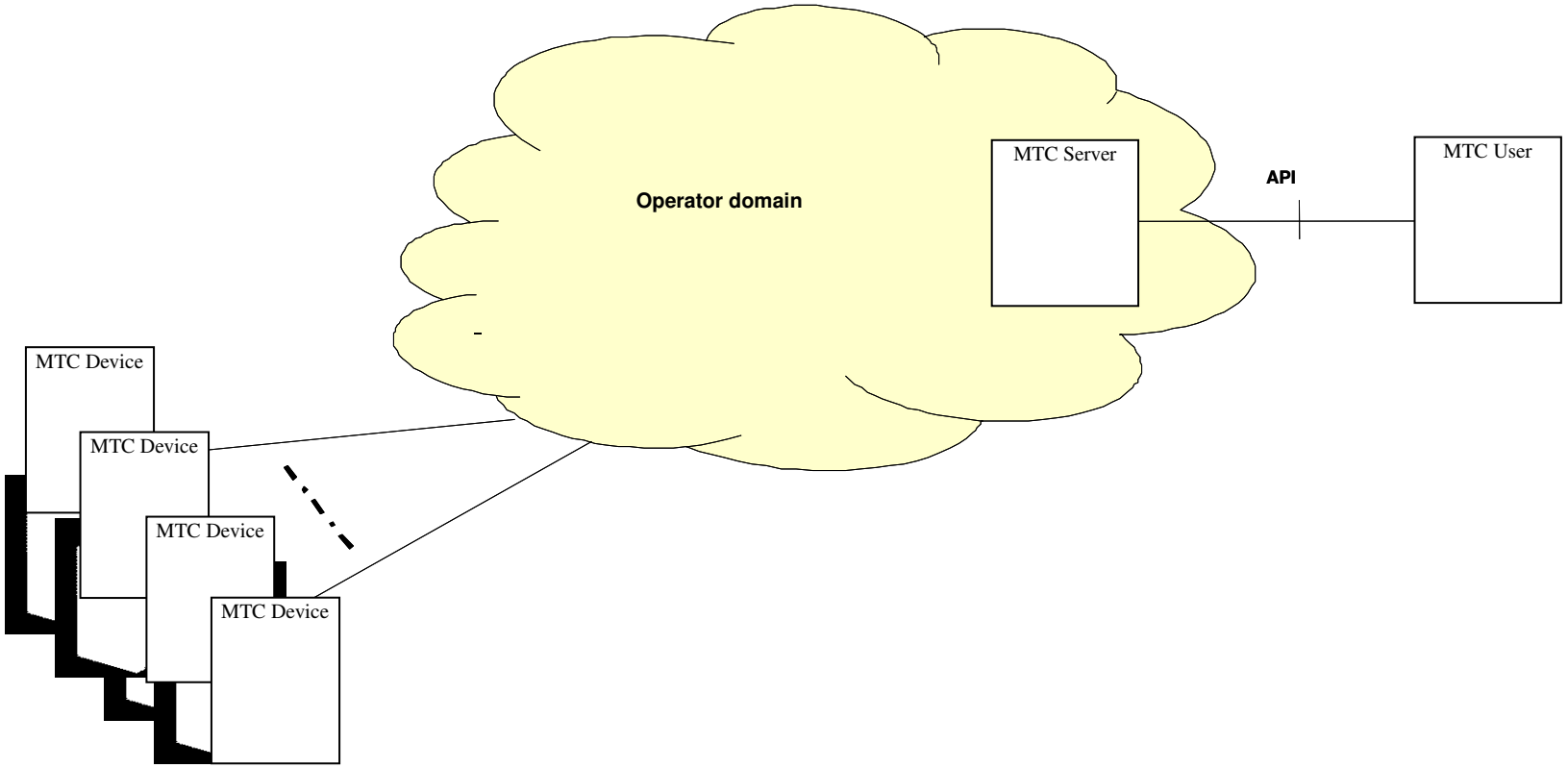
M2M in 3GPP – Architecture



- MTC : Machine Type Communication
- MTCu : provides MTC devices access to the 3GPP network for the transport of user traffic
- MTCi : the reference point for MTC server to connect the 3GPP network via 3GPP bearer service
- MTCsms : the reference point for MTC server to connect the 3GPP network via 3GPP SMS

Source: 3GPP TS 23.888

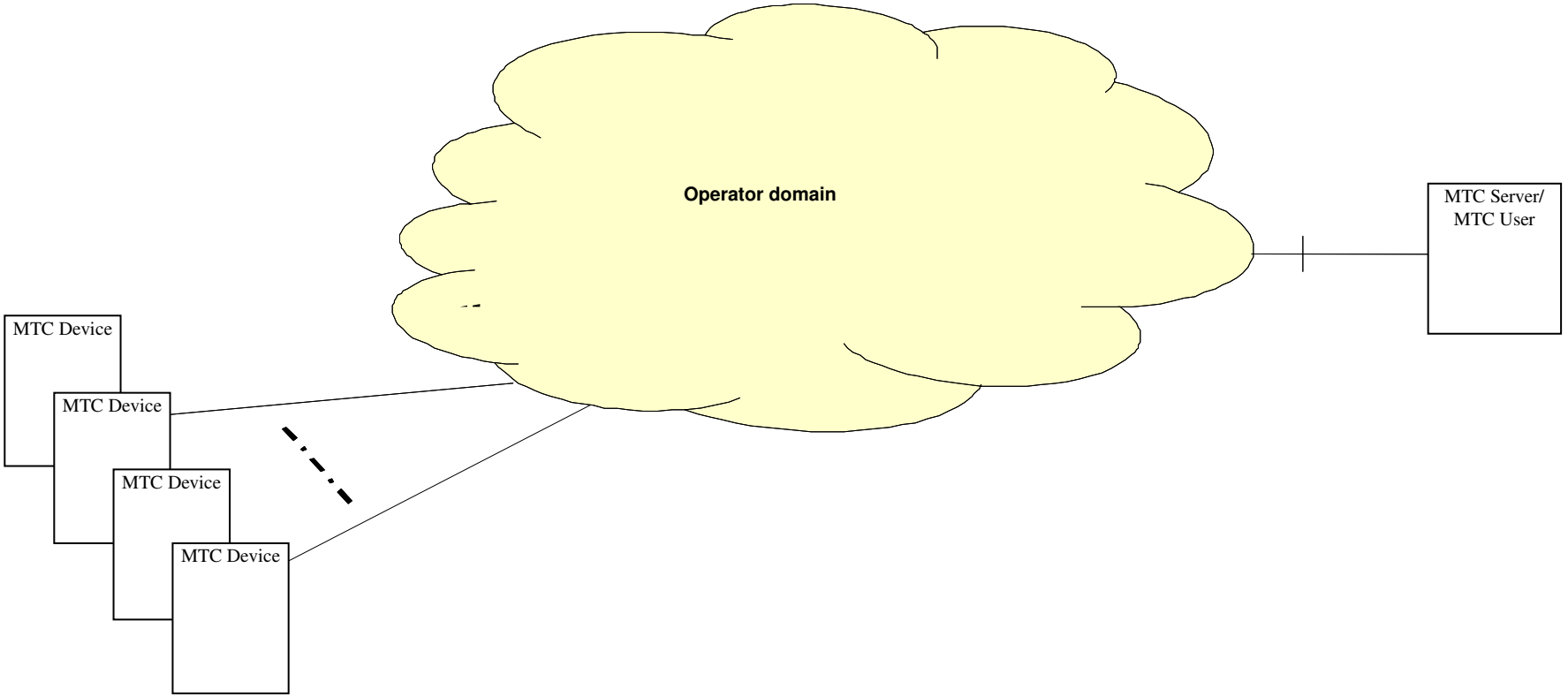
M2M in 3GPP – Scenario 1



Communication scenario with MTC Devices communicating with MTC Server.
MTC Server is *located in* the operator domain

Source: 3GPP TS 22.368

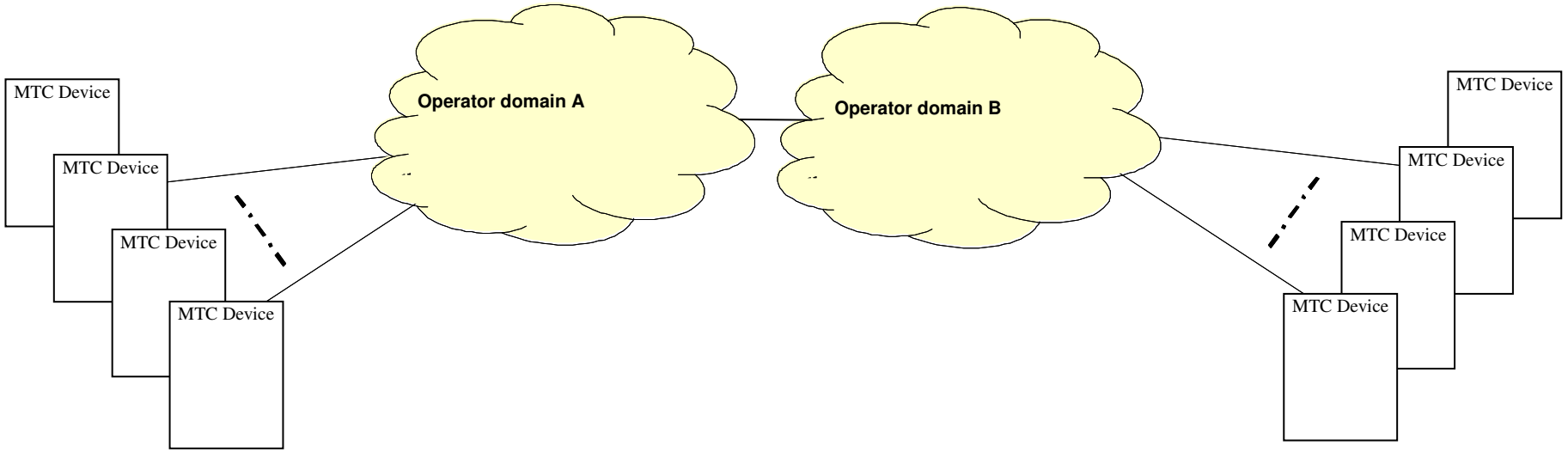
M2M in 3GPP – Scenario 2



Communication scenario with MTC Devices communicating with MTC Server.
MTC Server is *located outside* the operator domain.

Source: 3GPP TS 22.368

M2M in 3GPP – Scenario 3



MTC Devices communicating directly with each other
without intermediate MTC Server

Source: 3GPP TS 22.368

M2M in 3GPP - Features

- Low Mobility
  - MTC Devices that do not move, move infrequently, or move only within a certain region
- Time Controlled
  - Send or receive data only at certain pre-defined periods
- Time Tolerant
  - Data transfer can be delayed
- Packet Switched (PS) only
  - Network operator shall provide PS service with or without an MSISDN
- Online small Data Transmissions
  - MTC Devices frequently send or receive small amounts of data.

Source: 3GPP TS 22.368

M2M in 3GPP - Features

- MTC Monitoring
  - Not intend to prevent theft or vandalism but provide functionality to detect the events
- Offline Indication
  - For detecting the condition when it is no longer possible to establish signalling between the MTC Device and the network
- Jamming Indication
  - Require timely notification when an MTC Devices is being jammed due to an intentional broadband interferer
- Priority Alarm Message (PAM)
  - For the need of immediate attention, e.g. theft or vandalism

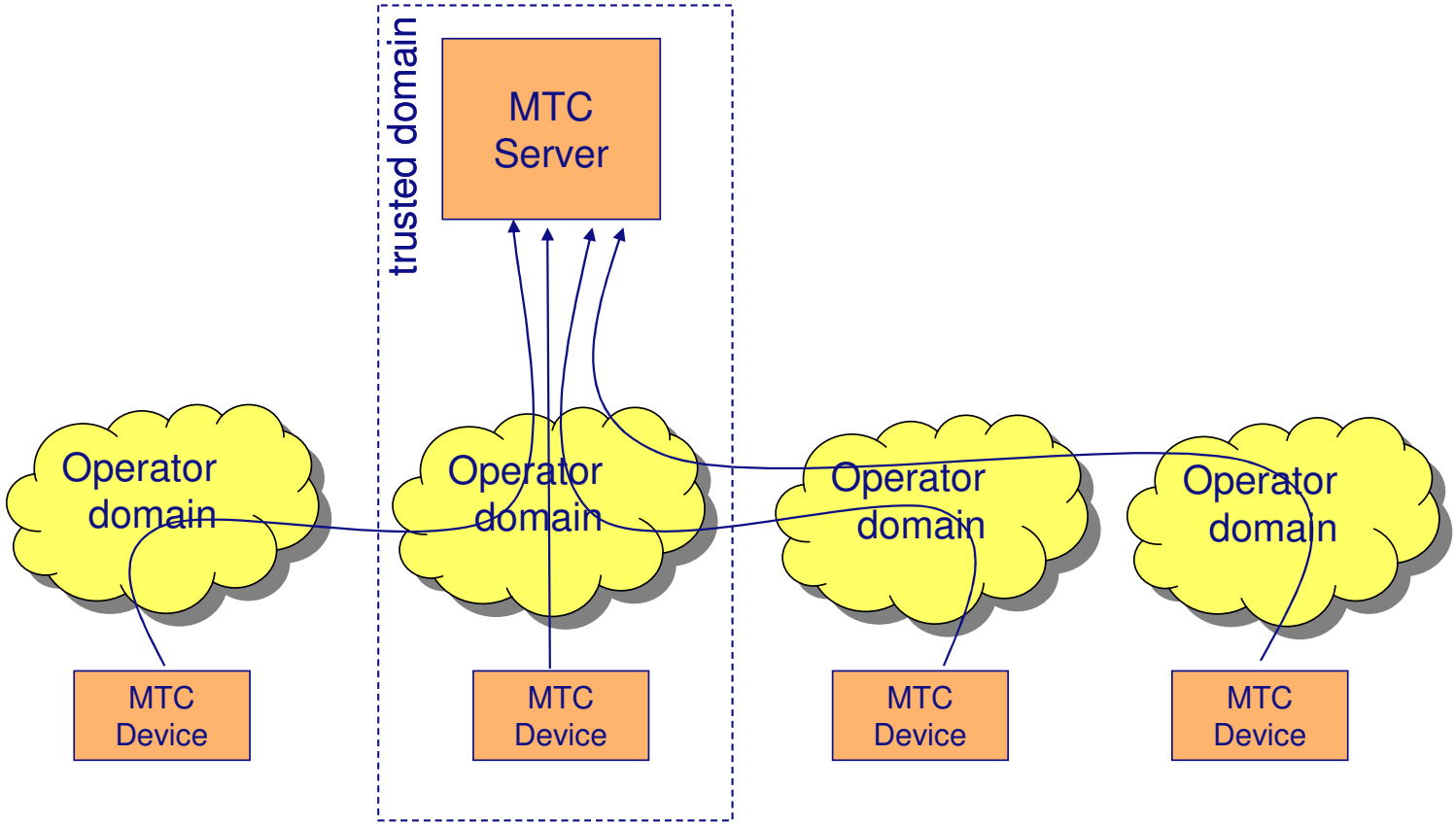
Source: 3GPP TS 22.368

M2M in 3GPP - Features

- Extra Low Power Consumption
  - Improving the ability of the system to efficiently service MTC applications
- Secure Connection
  - Convey communication when some of the devices are connected via a roaming operator
- Location Specific Trigger
  - Intending to trigger MTC device in a particular area, e.g. wake up the device
- Group based MTC Features
  - MTC device may be associated with one group

Source: 3GPP TS 22.368

End-to-End Security for Roaming MTC Devices



Source: 3GPP TS 22.368

Issues

- Access Agnostic
  - Data format of M2M applications
- Naming, Address and routing
  - Alternative addressing solution based on IP addresses should be studies
- Service levels and QoS
  - New QoS profiles needs to be defined
- Security, authentication, data integrity, privacy
  - Security association shall be maintained between “machines”
- Interconnect and interworking
  - Inter-communication via RATs

Example of MTC Applications

Service Area	MTC applications
Security	Surveillance systems Backup for landline Control of physical access (e.g. to buildings) Car/driver security
Tracking & Tracing	Fleet Management Order Management Pay as you drive Asset Tracking Navigation Traffic information Road tolling Road traffic optimisation/steering
Payment	Point of sales Vending machines Gaming machines
Health	Monitoring vital signs Supporting the aged or handicapped Web Access Telemedicine points Remote diagnostics
Remote Maintenance/Control	Sensors Lighting Pumps Valves Elevator control Vending machine control Vehicle diagnostics
Metering	Power Gas Water Heating Grid control Industrial metering
Consumer Devices	Digital photo frame Digital camera eBook

Summary

- M2M/MTC has been proposed to
  - Provide network operators with lower operational costs when offering machine-type communication services
  - Reduce the impact and effort of handling large machine-type communication groups
  - Optimize network operations to minimize impact on device battery power usage
  - Stimulate new machine-type communication applications by enabling operators to offer services tailored to machine-type communication requirements
- Some features and applications are also investigated and 3GPP has started the specification in early 2010

M2M
leads killer applications everywhere

Thank You