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## **M2M communications in Wide Area Mobile networks**

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ETSI Workshop on Machine to Machine Standardization  
4 - 5 June 2008 - ETSI, Sophia Antipolis, France

**BUSINESS MADE SIMPLE**



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# Introduction

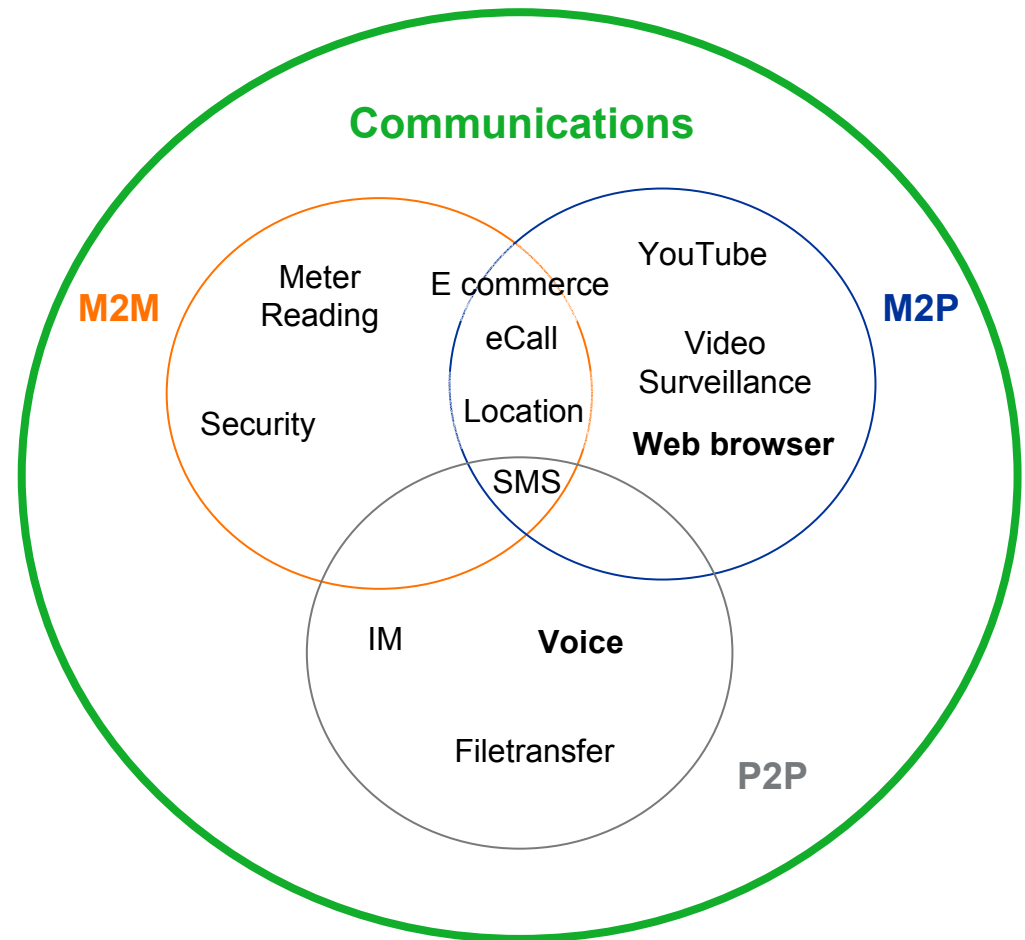
- WANs for communications between machines

- Topics:

- Traffic
- Ecosystem
- Business Models
- Standardisation

- Application Scenarios

- P2P
- M2P (P2M)
- M2M
- Overlapping segments



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# Traffic overview

- The communication traffic of machines, or embedded devices (ED), has different characteristics and requirements to that of humans
  - Generally small data payloads ( ~100 bytes)
  - Many more transactions since there are (or will be) more machines than humans – an order of magnitude more?
  - Different QoS requirements
    - Short delays but delivery guarantees
  - Handover
    - Applications may be supported over multiple different access networks and technology
  - Mobile ED
    - May have power limits (batteries) and radio constraints

# Traffic example

- A WAN to support ED must include a very efficient means to handle
  - small packets
  - at frequent intervals

Application type	Aggregate average traffic at core network	Rate messages /sec/cell	Device rate bytes/sec
Outpatient monitoring	2.5 Mbytes/s (Binary)	7	0.08 bytes/s (bin)
	27 Mbytes/s (XML)		0.87 bytes/s (XML)
Remote meter reading and control	70 Kbytes/s (binary)	50	0.23 bytes/s (bin)
	630 Kbytes (XML)		2.1 bytes/s (XML)
Location service	47 Mbytes/s (Binary)	160	0.2 bytes/s (bin)
	370 Mbytes/s (XML)		1.6 bytes/s (XML)

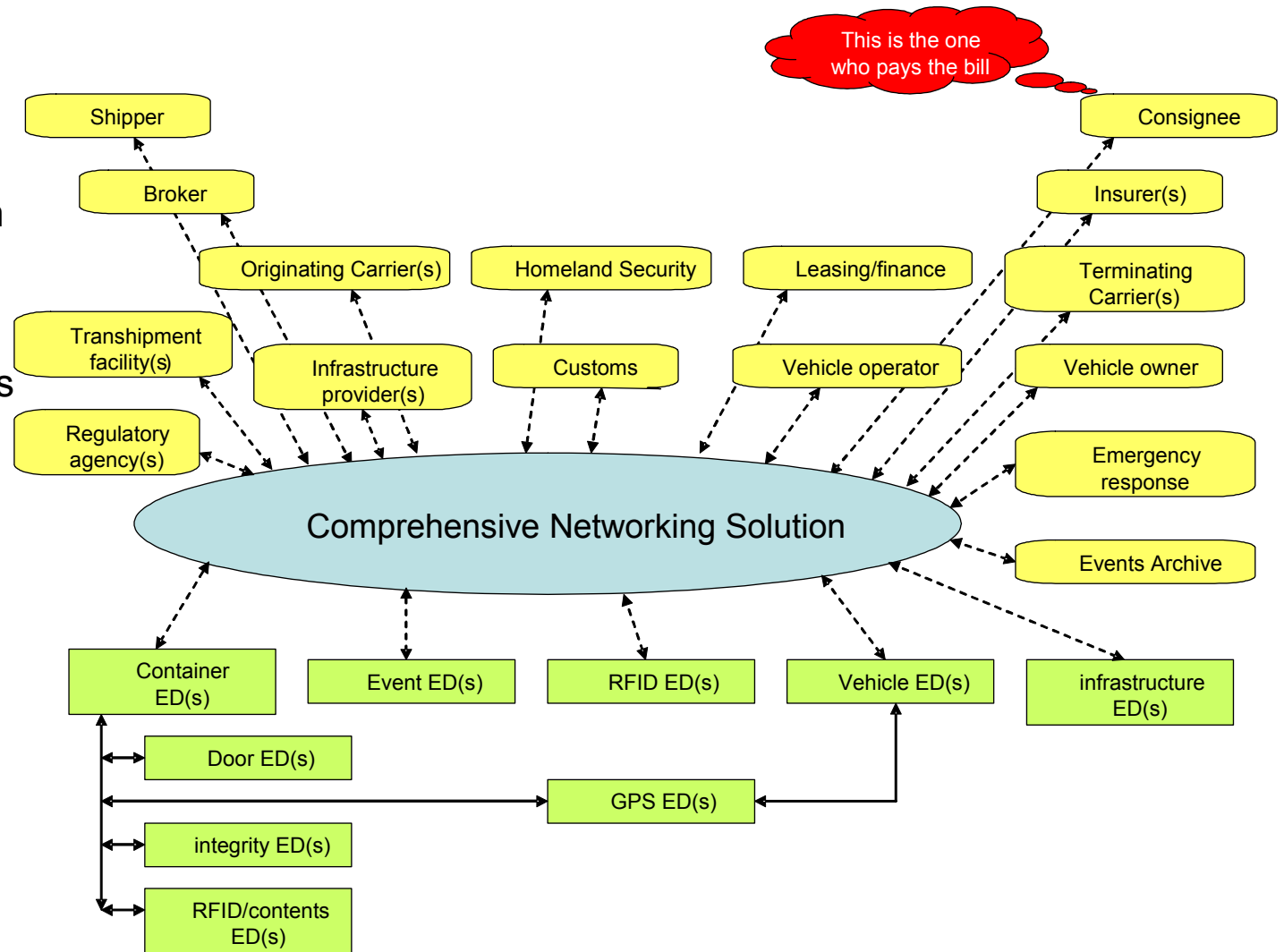
Generic estimates of ED traffic for example applications

Avg msg/sec	Blocking Probability		
	0.01	0.001	0.0001
7	14	17	19
50	64	71	77
160	180	194	205

Peak traffic

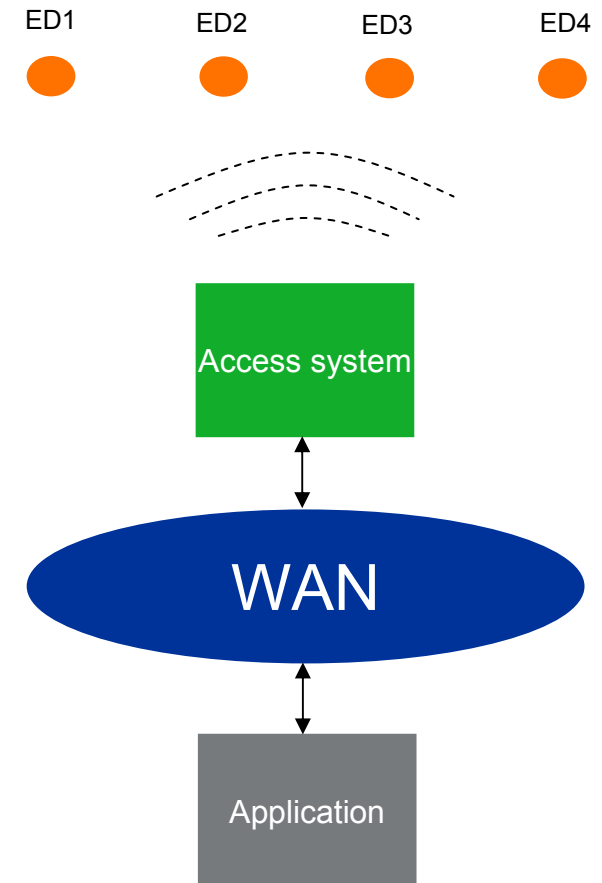
# Players

- Example communication among mobile and fixed ED for wide area transportation scenario.
- Many participants
- Synergistic benefits of optimal interconnection among ED and applications users



# Ecosystem – Wireless example

- ED may connect to WAN using
  - Mobile
    - 2G
    - 3G
    - 4G
    - WLAN
    - RFID – ZigBee (etc.)
  - Wireline (fixed)
    - DSL
    - Cable
- WAN to Application is likely wireline
  - For M2M at least



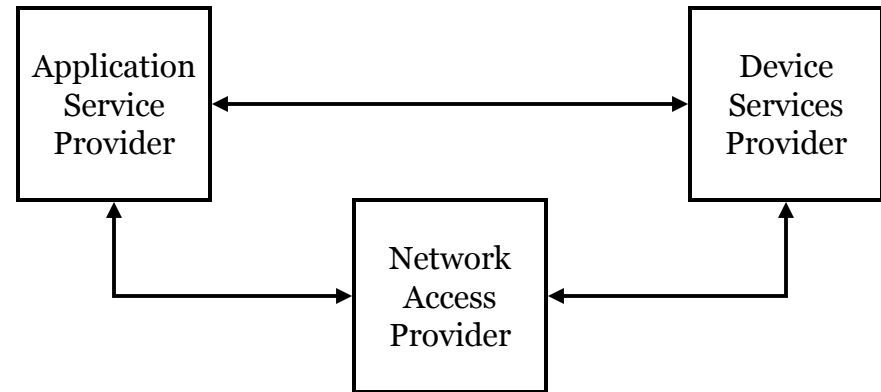
# Business Models – Some thoughts

- Enable application developers and ED manufacturers to access generic ED using generic networks
  - Majority of developers expected to be 3rd party
  - Market expansion for M2M rather than M2P
    - Many transactions with small payloads
    - Video for example is predominantly M2P or P2P
  - Mobile ED may use radio communications,
  - Fixed ED may use wired or wireless connection (when is justified by the business model)
  - The application is located in the
    - Network; or
    - Enterprise premises; or
    - Mobile user device
- “New” revenues
  - Internet rather than voice model
  - Increased network traffic
  - Offer ubiquitous services and hardware to application developers and ED manufacturers
- One subscriber – One bill not necessarily appropriate
  - Many ED may be owned by single entity
  - Applications may interact with ED belonging to multiple entities
  - ED may communication via multiple different facilities

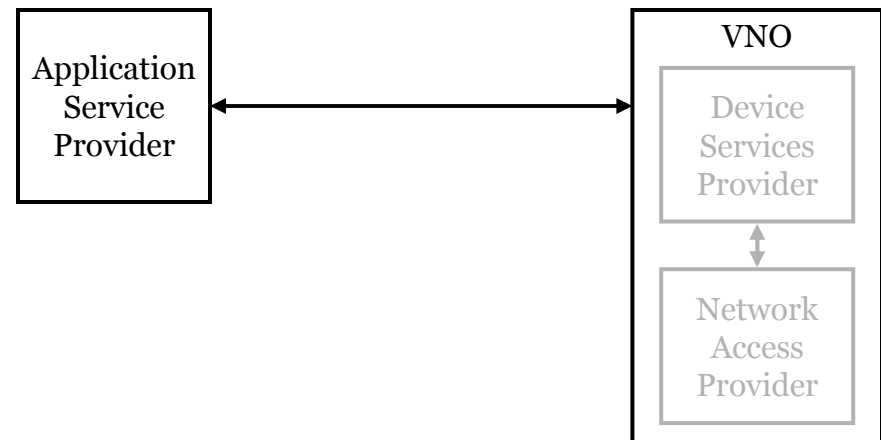


# Business Models – Examples 1

- Pure Play
  - Each business entity is realised through a separate autonomous entity
  - Each business entity is focused on the specialised set of skills within their specific domain
  - Multiple service level agreements are required to realise an end-to-end service

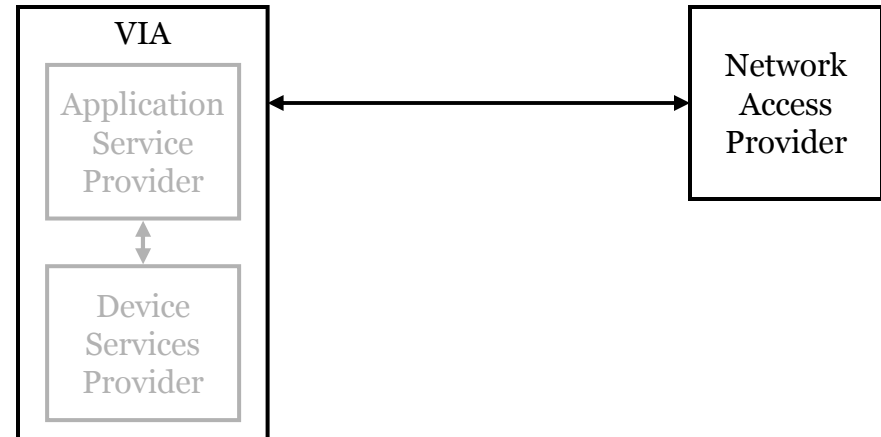


- Virtual [Device] Network Operator (VNO)
  - One business entity provides both the devices and the access network infrastructure, possibly through wholesale reseller agreements with existing NAPs
  - An ASP often has a single service agreement with one VNO, effectively outsourcing all of the networking and device management activities
  - The VNO would normally have multiple ASP customers, providing a virtual network for each of those ASPs



# Business Models – Examples 2

- Vertically Integrated ASP (VIA)
  - One business entity provides both the application service and the devices required to deliver that service
  - The VIA contracts with a NAP to provide connectivity to devices operating within the realm of the NAP
  - The VIA may have service agreements with multiple (regional) NAPs or may contract with a single NAP that offers coverage in all of the regions of interest to the ASP

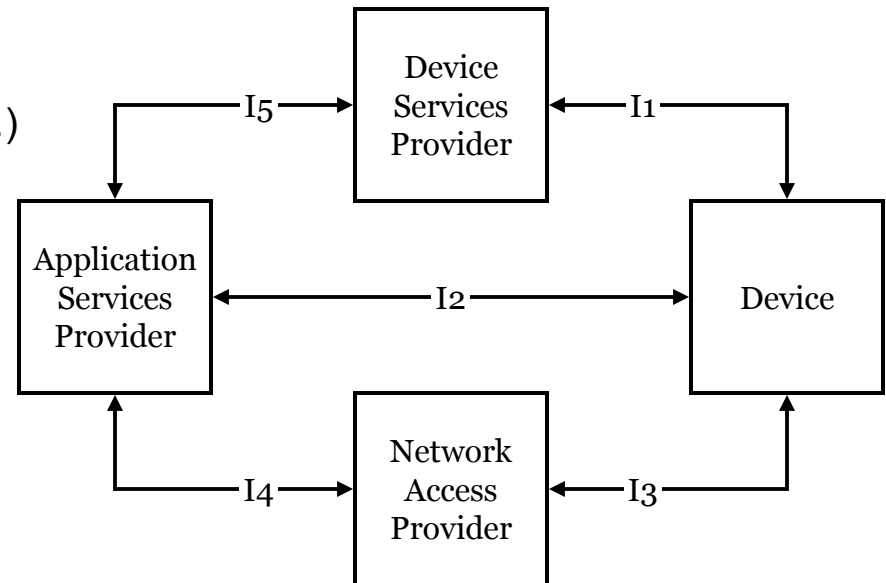


- Dedicated Network
  - One business entity incorporates the application, the devices and the access network infrastructure
  - This model is usually used to provide a closed private network or to provide a higher level service to pure-play ASP clients



# Potential Focus of Standardisation

- Minimal set of interface standards required for interoperability in various business models:
- Interface I1
  - Provisioning
  - Operational status
  - Maintenance
- Interface I2
  - Device to Application (reports, events, ...)
  - Application to Device (queries, commands, ...)
- Interface I3
  - Access control
  - Transport
- Interface I4
  - Access control
  - Device to application message dissemination
  - Application to device message dissemination
  - Accounting
- Interface I5
  - Authorisation
  - Accounting



# Potential Areas To Be Addressed

- Networking:
  - Architecture
  - UICC/SIM
  - Connectivity
  - Naming & Addressing
  - Security
  - Trust
  - Privacy
  - Middleware
  - Services / Service Platforms
  - Traffic Model
- Plus:
  - Accounting
  - Radio access convergence layers
  - Content-based networking
  - Secure over-the-air provisioning



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