THE INTERNET OF THINGS

ETSI work on Standards for the IoT

Presented by Luis Jorge Romero for IoT Platforms and Standardization WS, 8 February 2017
2 LAYERS FOR THE IOT IN ETSI

Radio Access

• Basically relying on 3GPP’s work
• Though also worked in LTN (Low Throughput Networks, an ETSI ISG, now into TC ERM TG28 LTN TR and TSs)
• Also in ULE (Ultra-Low Energy, an evolution of DECT for the IoT)

Services layer

• Under the umbrella of oneM2M
• But also contributing from ETSI through SmartM2M – e.g. SAREF is a direct ETSI contribution...
• ... and others may be coming
3GPP (3G Partnership Project)

Organizational Partners

- Standards organizations:
  - ARIB (Japan),
  - ATIS (USA),
  - CCSA (China),
  - ETSI (Europe),
  - TTA (Korea),
  - TTC (Japan),
  - TSDSI (India)

Market Representative Partners

- 14 Market partners representing the broader industry:
  - 4G Americas,
  - COAI (India),
  - GSA,
  - GSMA,
  - IMS Forum,
  - InfoCommunication Union (Russia),
  - IPV6 Forum,
  - MDG (formerly CDG),
  - NGMN Alliance,
  - Small Cell Forum,
  - TCCA,
  - TD Industry Alliance,
  - TD-Forum,
  - UMTS Forum

Source: 3GPP
3GPP Standards for the Internet-of-Things

In **Release-13** 3GPP has made a major effort to address the IoT market.

The portfolio of technologies that 3GPP operators can now use to address their different market requirements includes:

1. **eMTC** - Further LTE enhancements for Machine Type Communications, building on the work started in Release-12 (UE Cat 0, new power saving mode: PSM)
2. **NB-IOT** - New radio added to the LTE platform optimized for the low end of the market
3. **EC-GSM-IoT** - EGPRS enhancements which in combination with PSM makes GSM/EDGE markets prepared for IoT

Freeze of the protocol specifications achieved in Q2-16

Source: 3GPP
# Summary for eMTC, NB-IOT and EC-GSM-IoT

<table>
<thead>
<tr>
<th></th>
<th>eMTC (LTE Cat M1)</th>
<th>NB-IOT</th>
<th>EC-GSM-IoT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deployment</td>
<td>In-band LTE</td>
<td>In-band &amp; Guard-band LTE, standalone</td>
<td>In-band GSM</td>
</tr>
<tr>
<td>Coverage*</td>
<td>155.7 dB</td>
<td>164 dB for standalone, FFS others</td>
<td>164 dB, with 33dBm power class</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>154 dB, with 23dBm power class</td>
</tr>
<tr>
<td>Downlink</td>
<td>OFDMA, 15 KHz tone spacing, Turbo Code, 16 QAM, 1 Rx</td>
<td>OFDMA, 15 KHz tone spacing, 1 Rx</td>
<td>TDMA/FDMA, GMSK and 8PSK (optional), 1 Rx</td>
</tr>
<tr>
<td>Uplink</td>
<td>SC-FDMA, 15 KHz tone spacing, Turbo code, 16 QAM</td>
<td>Single tone, 15 KHz and 3.75 KHz spacing</td>
<td>TDMA/FDMA, GMSK and 8PSK (optional)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SC-FDMA, 15 KHz tone spacing, Turbo code</td>
<td></td>
</tr>
<tr>
<td>Bandwidth</td>
<td>1.08 MHz</td>
<td>180 KHz</td>
<td>200KHz per channel. Typical system bandwidth</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>of 2.4MHz [smaller bandwidth down to 600 KHz</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>being studied within Rel-13]</td>
</tr>
<tr>
<td>Peak rate (DL/UL)</td>
<td>1 Mbps for DL and UL</td>
<td>DL: ~50 kbps</td>
<td>For DL and UL (using 4 timeslots): ~70 kbps</td>
</tr>
<tr>
<td></td>
<td></td>
<td>UL: ~50 for multi-tone, ~20 kbps for single tone</td>
<td>(GMSK), ~240kbps (8PSK)</td>
</tr>
<tr>
<td>Duplexing</td>
<td>FD &amp; HD (type B), FDD &amp; TDD</td>
<td>HD (type B), FDD</td>
<td>HD, FDD</td>
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<tr>
<td>Power saving</td>
<td>PSM, ext. I-DRX, C-DRX</td>
<td>PSM, ext. I-DRX, C-DRX</td>
<td>PSM, ext. I-DRX</td>
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<tr>
<td>Power class</td>
<td>23 dBm, 20 dBm</td>
<td>23 dBm, others TBD</td>
<td>33 dBm, 23 dBm</td>
</tr>
</tbody>
</table>

*In terms of MCL target. Targets for different technologies are based on somewhat different link budget assumptions (see TR 36.888/45.820 for more information).
TC SmartM2M

ETSI SmartM2M (supporting AIOTI):

- Developed two releases of M2M specifications.
- Used as one of the initial baseline proposal for the oneM2M initiative

ETSI SmartM2M is currently working on:

- Supporting the European industry and institutions on the identification and adoption of standards, in particular regarding the oneM2M framework
- Bridging the European needs in the area of M2M/IoT towards oneM2M
- Smart Appliance REFerence ontology SAREF / oneM2M IoT Semantic Interoperability
ETSI is active and/or cooperating with:

- **CEN-CENELEC-ETSI Coordination Groups**: on **Smart Cities** SSCC-CG (also with ISO, IEC, UN, ITU-T..), **Smart Meters** SM-CG and **Smart Grid** SEG-CG

- **AIOTI** www.aioti.org: WG3 (IoT Standardisation/ETSI) and AIOTI WG08 (Smart Cities/Nokia) with many SDOs (ITU-T, W3C, IEEE, CEN, ISO, CENELEC, IEC, JTC1, ETSI, oneM2M, 3GPP..), OSS, Industry/Verticals and IoT Alliances, IERC, IoT-EPI, IoT LSPs...

- **FIWARE / OASC..** Now members of the new ISG CIM

**ETSI is a partner in the H2020 Smart City project ESPRESSO (OGC, CITYKEYS/Eurocities, Sharing Cities, EIP-SCC, Urban Platforms), IoT-EPI/UNIFY-IoT and IoT LSP CSA CREATE-IoT**
... more IoT related Technologies in ETSI

**Impacted groups:** (from ETSI portal) [http://portal.etsi.org](http://portal.etsi.org)

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<th>BOARD</th>
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<th>BRAN</th>
<th>BROADCAST</th>
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<td>SAGE</td>
<td>SCP</td>
<td>SES</td>
<td>SmartBAN</td>
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<td>mWT</td>
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<td>OEU</td>
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<td>OSM</td>
<td>NSO</td>
<td>STF</td>
<td>WORKSHOP</td>
<td></td>
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</tbody>
</table>

**SmartM2M**, ATTM, CABLE, NTECH, PLT, NFV, MEC, NGP, oneM2M, 3GPP, AERO, BRAN, DECT/ULE, EMTEL, ERM (TG28/LTN), mWT, ITS, MSG, RRS, RT, SES, TCCE-SA6... . and the new ISG CIM!

**Security** (ESI, Li, SAGE, Cyber, ISI, QKD, QSC), **Energy Efficiency** (ATTM/EE/OEU), **Machine to Machine/IoT** (oneM2M, smartM2M), **QoS/QoE** (STQ), **Interconnect & test** (INT, MTS) **Smart Card** (SCP) **data management / semantics** (Cloud/SmartM2M), **Health** (eHealth, SmartBAN), **Other** (USER, HF, SAFETY)...
oneM2M Partnership Project

Over 200 member organizations in oneM2M

www.oneM2M.org

All documents are publicly available
IoT cross-domain interoperability

- Highly fragmented market with small vendor-specific applications.
- Reinventing the wheel: Same services developed again and again.
- Each silo contains its own technologies without interop.

- End-to-end platform: common service capabilities layer.
- Interoperability at the level of communications and data.
- Seamless interaction between heterogeneous applications and devices.

Source: oneM2M © ETSI 2017. All rights reserved
Vision

Specialist application provider, under contract to cities. Connecting using Mca interface. Standardized interface, economy of scale.

Cities with their own oneM2M platforms. Connecting to Mcc’ interfaces on Utilities platforms. Only see data, not connectivity.

Utilities operating across multiple cities. Each with own applications, own data, own oneM2M platform.

Source: oneM2M
Reality: SK Telecom, Korea

• SK Telecom leading Smart City project in Busan
• oneM2M-based open source IoT platform
• Services:
  – smart streetlights, lost-child prevention system, emergency evacuation system, smart parking, building energy management and small business marketing system
• http://www.koreatimes.co.kr/www/news/tech/2015/12/133_192923.html
• https://www.us-ignite.org/globalcityteams/actioncluster/5wSYxJhQoKef4WEvHmPLaZ/
oneM2M based smart city deployment example - Busan

Source: SKT
Smart city Busan use case examples

Safety service for Children and the old

- A Smart location management and a service of smart education supporting which are based on the free communications for the disadvantaged people such as the demented elderly, disabled people, children, and infants.

Smart marine safety based on drone

- In order to prevent coast and marine accidents, a drone with device of video transmission and automated pilot devices based on LTE controls the site in real-time.

Source: SKT
Thank You