

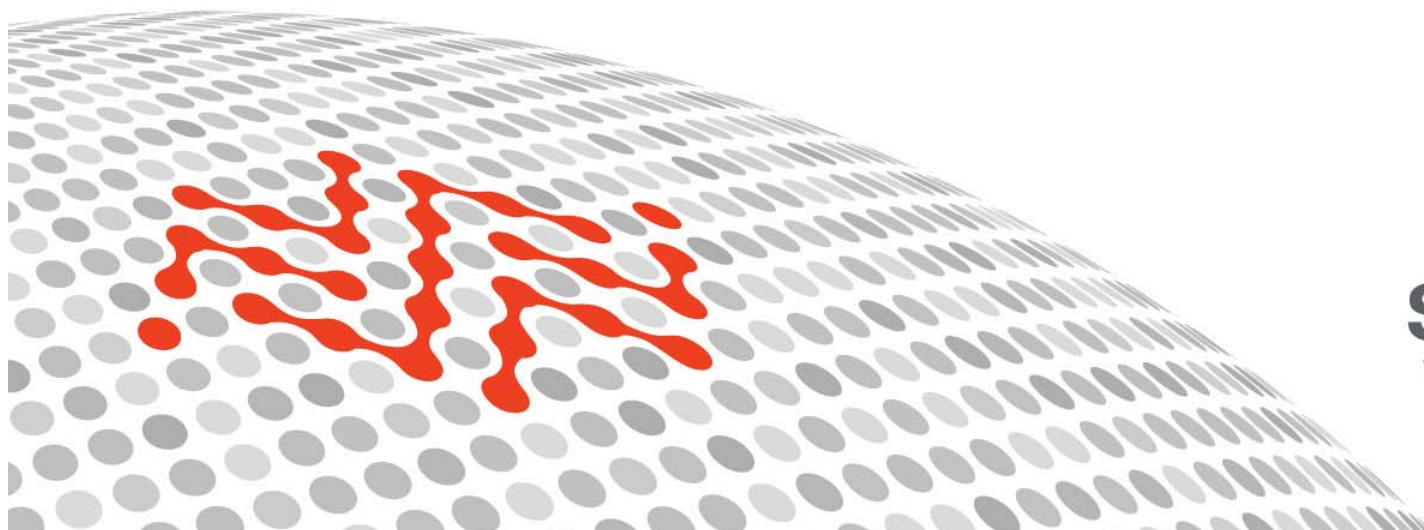


ETSI M2M Workshop

3GPP IoT Standardization Status

3GPP GERAN WG3 Chairman

Rémi Lascoux- Sierra Wireless



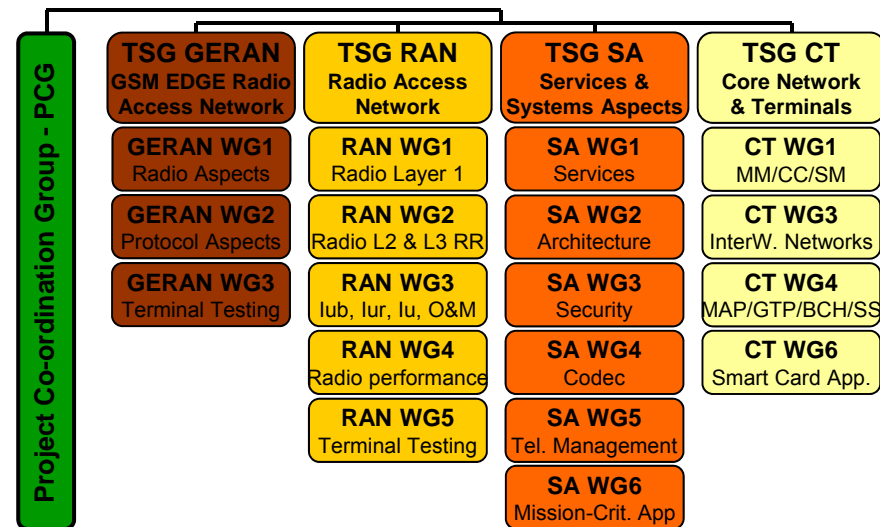
General Information – What is 3GPP ?



- **3rd Generation Partnership Project (3GPP)**: Group of telecommunication associations (ETSI, ATIS, TTA...) with a wide scope of development and maintenance of 2G/2.5G (GSM/GPRS/EDGE), 3G (UMTS/HSPA), 4G (LTE), IMS, VoLTE...

- **Notion of Release:**

- Rel-97 (Q1 1998): GPRS
- Rel-99 (Q1 2000): UMTS
- Rel-5 (Q1 2002): HSDPA
- Rel-8 (Q4 2008): LTE
- Rel-12 (Q1 2015): LTE Cat 0
- Rel-13 (Q1/2 2016): IoT



- **Standardization process for a specific Release:**

- Stage1 : Service Requirements
- Stage2 : Architecture to support the service requirements
- Stage3 : Implementation with detailed protocols specification
- Test Conformance (out of Release Timeframe)

3GPP Rel-13: IoT Aspects



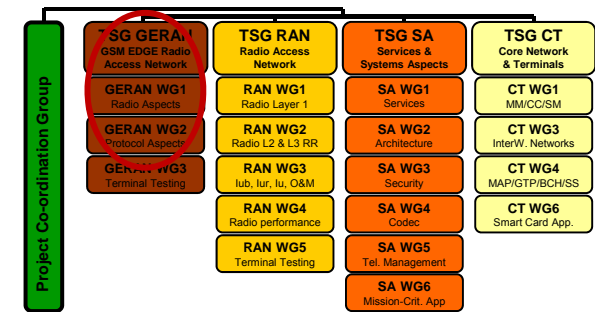
- 3GPP GERAN Study Item on Cellular IoT
- Radio Access Standardization
- Others

A GLOBAL INITIATIVE

3GPP GERAN Study Item on Cellular IoT



May 2014: GERAN #62 : Study item to deal with the increasing needs of M2M standardization in 3GPP : [GP-140421](#) ”Cellular System Support for Ultra Low Complexity and Low Throughput Internet of Things”



Study **both** potential **GERAN evolutions** and **Clean Slate** Solutions.

- Improved indoor coverage (+20 dB compared to legacy GPRS, i.e. 164 dB MCL)
- Support for massive number devices (with a small data to be transferred)
- Ultra low cost of M2M devices (even disposable, as CS not necessary & very low throughput)
- Low power consumption (battery life up to 10 year with 5Wh batteries, even with Extended Coverage)
- Reachability (i.e. 2 ways communication, UL & DL traffic)
- No (or very light) Network impacts (minimize the impact on GPRS/EDGE BTS, identify Core network interface and security improvement needed for the 2017 & onwards timeframe)

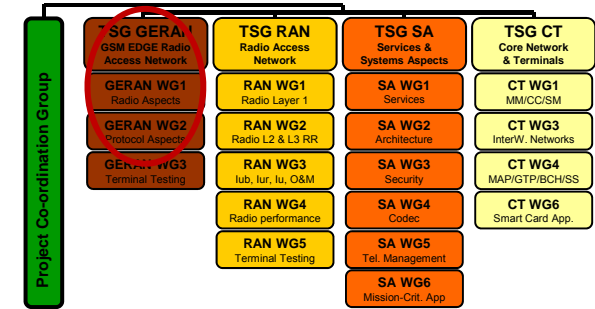
Traffic Model similar to **LTE-M/eMTC** study (TR 36.888) with the exception of 40 devices /person/home instead of 3.

3GPP Standardization: GERAN / RAN



August 2015: GERAN Study Item completed. Three solutions kept as Rel-13 Candidate solutions (7 solutions in TR 45.820)

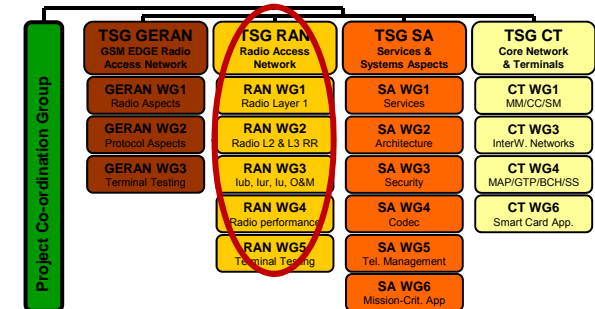
- **EC-GSM Work Item approved**
(as a GERAN Evolution)
- **Other Solutions sent to RAN (NB-CIoT / NB-LTE)**



Sept 2015: Following PCG decision to move the “non-GERAN evolution” IoT Solutions to RAN, RAN inherited of NB-CIoT and NB-LTE.

In Addition to the on-going **LTE-M / eMTC** workload, a merge of the “Narrow Band” solutions was agreed to be studied as a way forward: **NB-IoT**

- **LTE-M / eMTC** (already part of Rel-13 scope)
- **NB-IoT** (as a Candidate solution for Dec 15 decision)



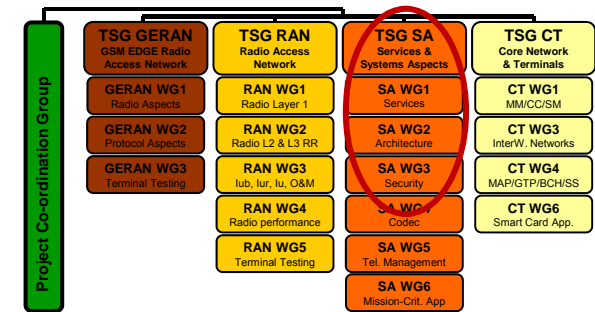
3GPP Standardization : Other TSGs



IoT is more than just a Radio Access:

TSG SA/CT and TSG SA/CT WGx involved from early stage on :

- Security Aspects with the introduction of new security Algorithm or Integrity Protection (TBD)
- Core Network Optimizations especially on the LTE side
- Two small data solutions will be added in Rel-13 (TR 23.720)
 - Control plane solution for optimizing SMS (Solution 2 in TR)
 - User plane solution to minimize radio resource control plane overhead (solution 18 in TR)



→ Evolutions / Additions could come on a later stage (not preventing Radio Access to be standardized)

3GPP Rel-13 IoT Radio Access Solutions



– 3GPP GERAN : EC-EGPRS (EC-GSM)

– 3GPP RAN : LTE-M / eMTC

– 3GPP RAN : NB-IoT



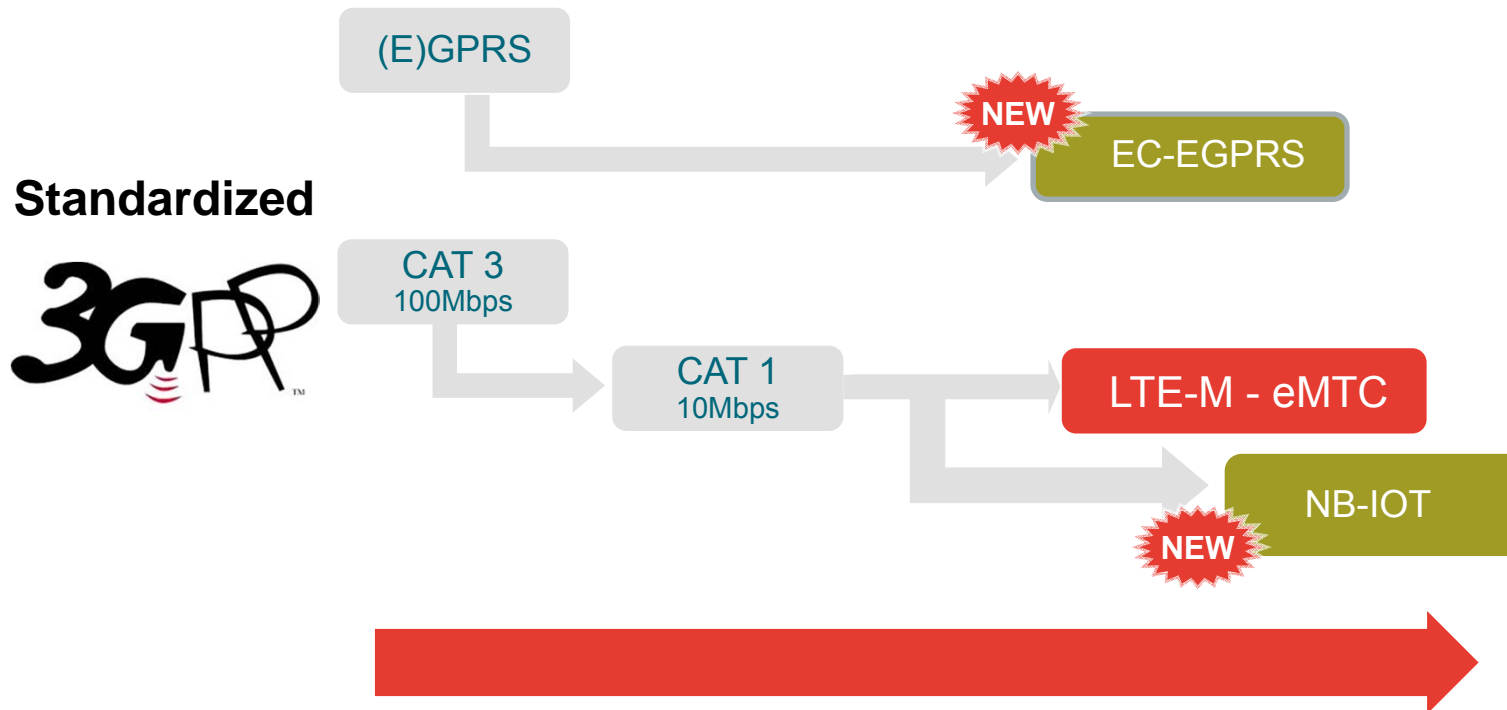
TM

A GLOBAL INITIATIVE

3GPP REL-13 IoT Radio Access (Nov15)



- **EC-GPRS** (**EC-GSM** renamed) : Good progress, Stage3 completion expected Q1-16, eDRX completed
- **LTE-M**: Good progress, eDRX, PHY scheduled for Q4-15 (this week) and MAC layers on schedule Q1-16; Performance Limits on schedule Q1/Q2-16
- **NB-IoT**: Way forward approved on PHY; MAC most likely reuse a lot of LTE-M work. Unclear schedule as 3GPP RAN plenary on-going (Q1 for PHY, Q2 for MAC/ASN.1?). Still planned in Rel-13 with no deadline (Q3 ?)



3GPP GERAN : EC-EGPRS / eDRX



- **EC-EGPRS** (Extended Coverage - EGPRS):

- ➔ **Stage2 Completed (Q4-15), next step Stage3 targeted Q1-16**

- Capability on top of (E)GPRS device or Standalone device
 - Simplified RLC/MAC EGPRS, with Extended Coverage access based on Physical Layer Repetitions
 - Under normal coverage, PHY similar to EGPRS.
 - Multiplexing with Legacy GPRS/EGPRS on Data Traffic Channel
 - Should be deployable on existing EGPRS NW with minimum impact.

- **eDRX** (extended Discontinuous Reception) :

- ➔ **Completed (Q4-15), next Step Conformance Testing**

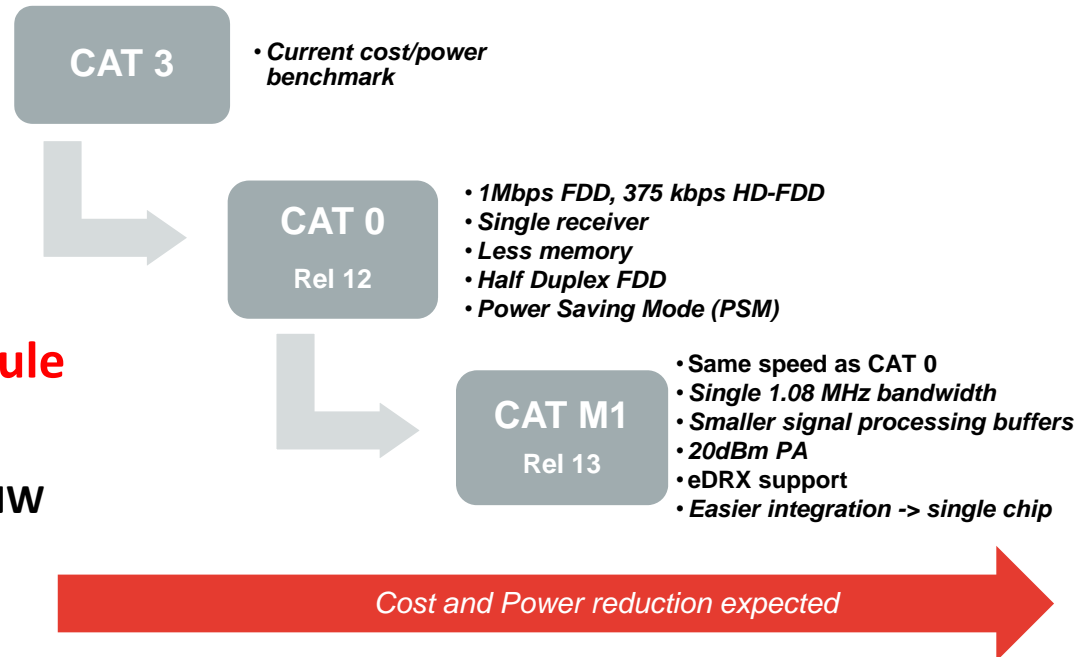
- New Power Saving mechanism/state needed for extended battery life, sleep cycles up to 52 minutes
 - Not strictly part of EC-EGPRS scope, could be applied, such as Rel-12 PSM (Power Save Mode), on existing GPRS/EDGE Devices

3GPP RAN : eMTC & eDRX / LTE-M

eMTC (enhanced Machine Type Communication) :

Schedule:

- Started **Q3-14**
- PHY (RAN1): **Completion this week**
- MAC (RAN2): **90% Q1-16**
- ASN.1 review: **Q2-16**
- Performance Limits (RAN4): **Q2-16**
- ➔ **Rel-13 Completion on Schedule**
- Extended Coverage
- Software upgradable for existing LTE NW



eDRX (extended Discontinuous Reception):

- Sleep cycles up to 44 minutes
- Protocol aspects (RAN2): **Completion this week**
- Performance Limits (RAN4): **Q1-16**
- ➔ **Rel-13 Completion on Schedule**

3GPP RAN : NB-IoT (Narrow Band-IoT)



Schedule

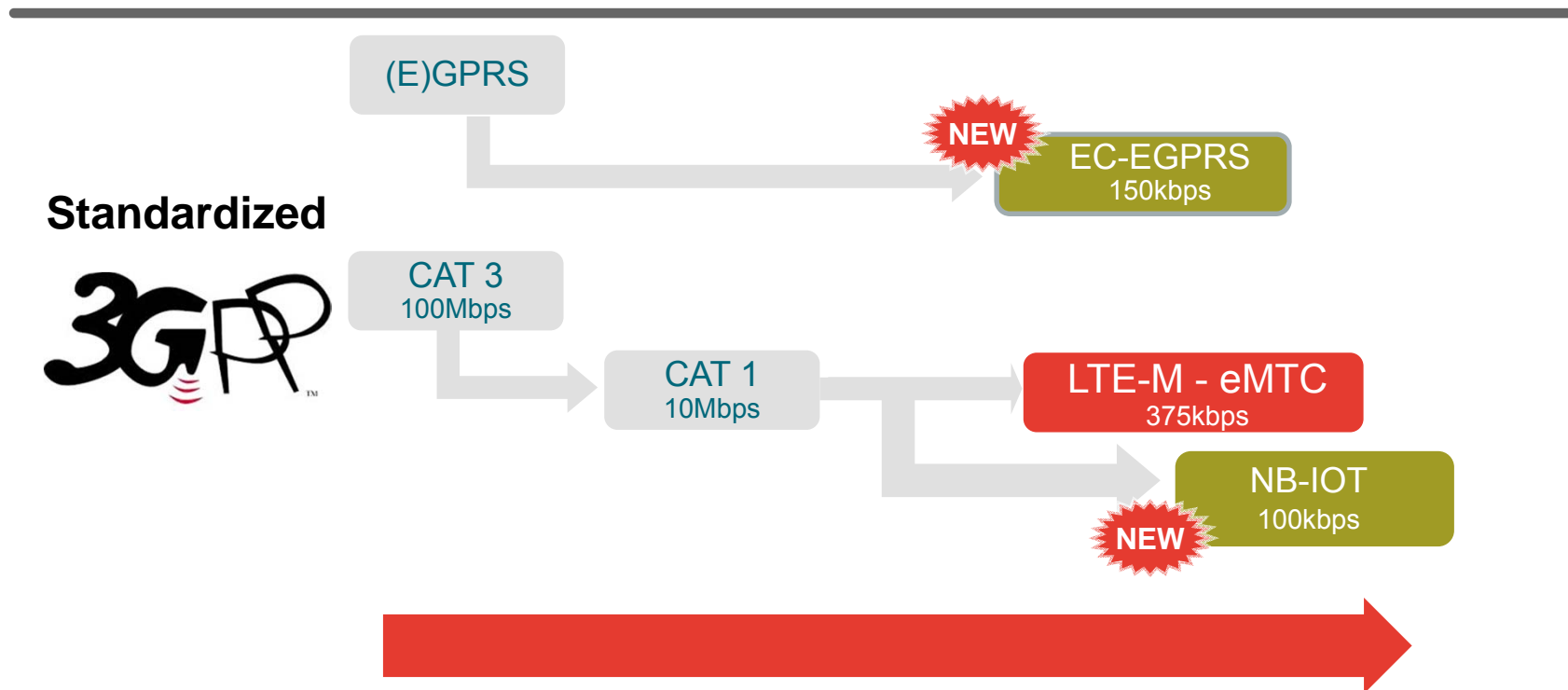
- Started **Q3-15 (WID for approval this week)**
 - PHY (RAN1): **30% Q1-16**
 - MAC (RAN2): **30% Q1-16**
 - ASN.1 Review: **earliest Q2-16**
 - Performance Part (RAN4): **Q3-15 (Latest view)**
- **Challenging Schedule but Rel-13 completion expected, not sooner than Q2 / Q3-16 (to be dealt with this week in RAN Plenary)**

NB-LTE vs NB-CIOT -> A single way forward was reached (R1-157783).

- NB-IoT UL (200kHz channel)
 - Single-tone transmissions are supported
 - 2 numerologies should be configurable for Single-tone transmission: [3.75]kHz and 15kHz
 - A cyclic prefix is inserted
 - Frequency domain Sinc pulse shaping in the physical layer description
 - Multi-tone transmissions are supported
 - Multi-tone transmissions are based on SC-FDMA
 - 15 kHz UL subcarrier spacing
 - Additional mechanisms for PAPR reduction FFS
 - The UE shall indicate the support of Single-tone and/or Multi-tone
 - Details to be discussed by WGs
- NB-IoT DL (200kHz channel)
 - Downlink transmission with 15kHz subcarrier spacing for all the scenarios: standalone, guardband, in-band
- **Extended coverage**
- **Reuse of eDRX as per LTE-M**
- **Should be deployable on LTE NW with minimum impacts**

3GPP REL-13 IoT status (November 15)

- All 3 Solutions in Rel-13.
 - LTE-M / eMTC: Most likely Q1-16 (March 16)
 - EC-EGPRS: Most likely Q1-16 (Feb 16)
 - NB-IoT: Most likely Q2/Q3-16



Standardized





Thanks.

