

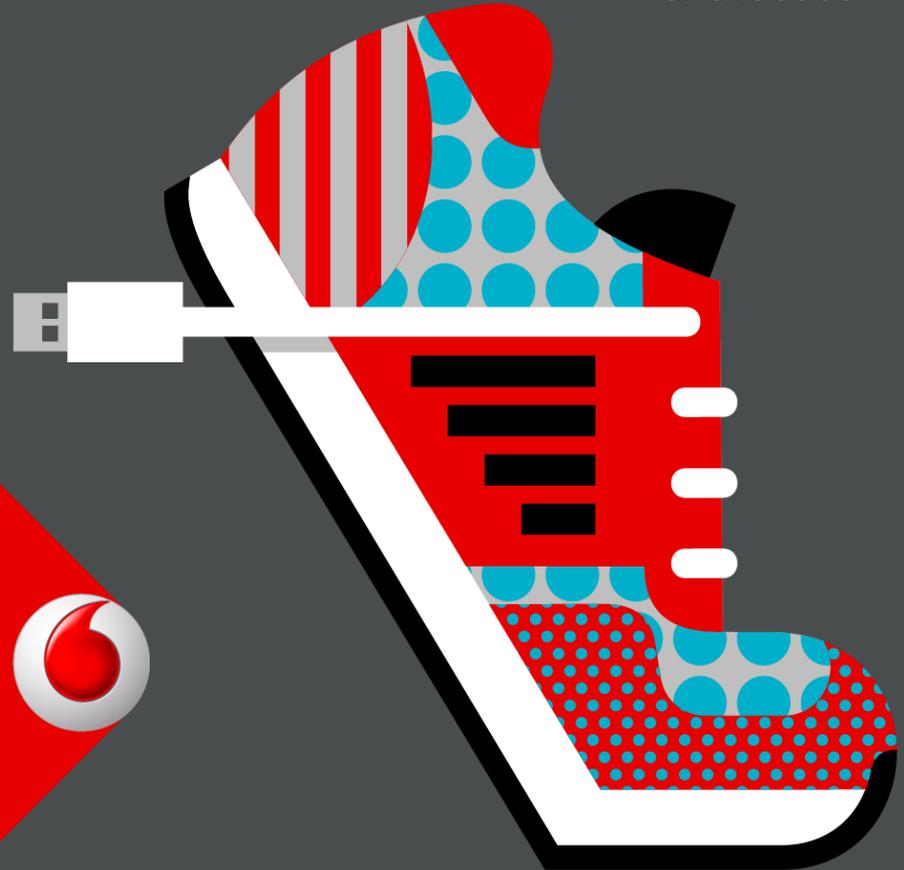
## Cellular Internet of Things:

Potential impact on CT work area from 'clean slate' part of GERAN's study on "Cellular System Support for Ultra Low Complexity and Low Throughput Internet of Things"

Vodafone Group

3GPP GERAN ad hoc#3 on CloT

29 June – 2 July 2015



# Introduction

- GERAN FS\_IoT\_LC Study and PCG #34 decisions:
  - new RAT may be specified in R'13
  - targets ultra-low data rates, 20 dB extended coverage, 10 year battery life, lower cost
  - opening of WI in RAN plenary in September
- Some CT impacts can be expected
- This presentation aims to give an overview of:
  - background
  - objectives
  - progress of SI
  - architecture aspects
  - likely impacts on CT specifications



# Background to start of GERAN Study Item

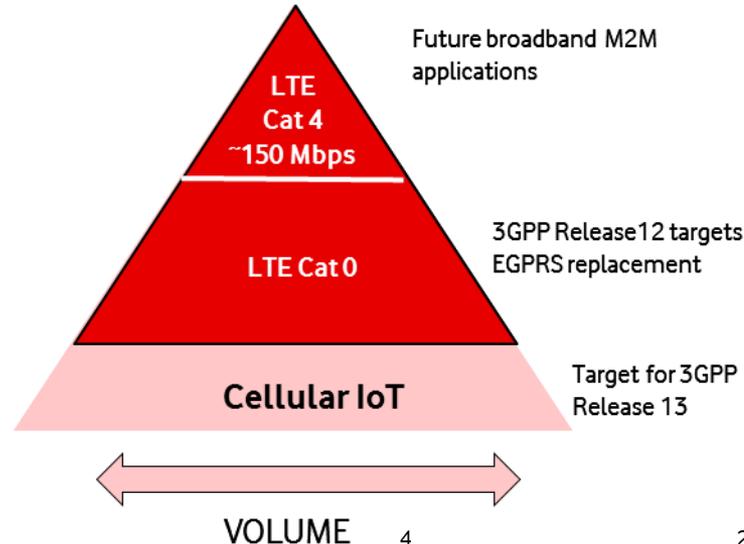


# Cellular Internet of Things

- White paper:

<http://www.cambridgewireless.co.uk/docs/Cellular%20IoT%20White%20Paper.pdf>

- “... in the IoT market, the challenge is to obtain the connectivity that is needed to unlock the potential for connecting billions of devices...”



# Cellular Internet of Things

- Current market scenario
  - Vast market for very low cost devices?
  - Non-3GPP competition appearing
    - designing new devices and installing own radio networks
    - appear to have convinced commercial backers on their business case.
  - Key question: what can 3GPP do to enable operators to compete?
- Current 3GPP M2M technology
  - Low data rate segment dominated by 2G
  - Vast majority of 2G M2M devices are not EDGE-capable

Page 29 of Ericsson June 2014 Mobility report: <http://www.ericsson.com/res/docs/2014/ericsson-mobility-report-june-2014.pdf>

→ Module cost needs to be cheaper than GSM



# Objectives



# Vodafone's targets

- **Data service:** Small, acknowledged datagrams
- **Cost:** Module cost much lower than GSM
- **Coverage:** “everywhere”, especially deep in buildings
- **Battery Life:** 10 years
- **Infrastructure:** Reuse existing ‘coverage layer’ cell sites
  - Especially, reuse of masthead equipment
- **Service:** Predictable quality from use of operator’s licensed spectrum
- **Security :** Suitable for professional M2M use



GP-140421.zip

And mostly importantly,

- **Deliver in time:** Rapid standardisation in Rel-13



# Standardisation Progress



# CloT Standardisation Progress

- 3GPP TSG GERAN
  - Target to “do better than GSM” implied GERAN work
- SI Timeline:
  - GP-140421, GERAN Study on “Cellular System Support for Ultra Low Complexity and Low Throughput Internet of Things” opened end May 2014. [ FS\_IoT\_LC]
  - TR 45.820v1.0.0 in March 2015 (60%);
  - TR 45.820v1.3.0 in May 2015 (75%);
  - Expected completion August 2015
- TR 45.820 covers both “evolved GSM” and “clean-slate, new concepts”

<http://www.3gpp.org/DynaReport/45820.htm>



# CloT Standardisation Progress (cont...)

- Potential Work Items
  - Likely that both Evolved GSM & clean-slate approaches will meet objectives of SI
- Clean-slate concepts not clearly covered by GERAN (or RAN) ToR
- PCG/OP meeting#34 (2015 April) consulted:
  - Outcome in PCG34\_39r2
  - Evolved GSM concepts Work Item in GERAN
  - 'Clean-Slate' Rel 13 Work Item for RAN plenary in September
- CT impacts of a new RAT getting standardised in R'13 should be considered



PCG34\_39r2.zip



# Architecture and Core Network Aspects



# 'Clean Slate' CloT architecture assumptions

- Speed to market → connect to an existing core network and reuse existing specs.
  - Gb or S1 or ~~Lu~~-based architecture?
  - includes NAS signalling
- Packet Switched only
  - plus SMS (but not "SMS over IMS")
- no requirement for inter-RAT mobility.
- intra-RAT mobility based on cell reselection.
- simple QoS model
- support network sharing
- no support for MBMS/ETWS/PWS/CBS in first release
  
- Section 8 of TR 45.820



# Size and Shape of Core Network

- Radio interface intended for sensors and actuators with small packets, e.g. 20 bytes
- Capacity model checks 40 devices/household and dense housing environments:
  - data rate for a whole (EU) country network < max data rate for an LTE base station site
- Signalling load can be high compared to data load
- Extreme coverage drops radio data rate to 160 bit/s
  - core network latencies not an issue
  - NAS timers in TS 24.008 / TS 24.301 need relaxing
  
- TR 45.820 v1.3.0, section 8.1.6 & 8.1.7



# CT specification impacts



# Core Network Specification Aspects

- NAS timers in UE and network need relaxing.
- “access restriction data” for new RAT
- “RAT type” e.g. in reports to GGSN/PDN-GW
- new RAT has a name? → editorial updates e.g. in TS 23.122
- What else?
  - identify other impacts between now and CT plenary in September 2015
  - agree WID in CT plenary (assuming RAN plenary agrees a ‘clean slate’ WID)



# Summary

- M2M market developing fast
- Non-3GPP competition is appearing
- Vodafone wants 3GPP to provide the capability for low-cost, extended-coverage, long battery life solutions
- Reuse of 3GPP architecture
- Rapid standardisation desired
- Rel-13 completion feasible.
  
- **If we keep moving fast, 3GPP connectivity could, globally, unlock the potential**
- **Some CT work needed**

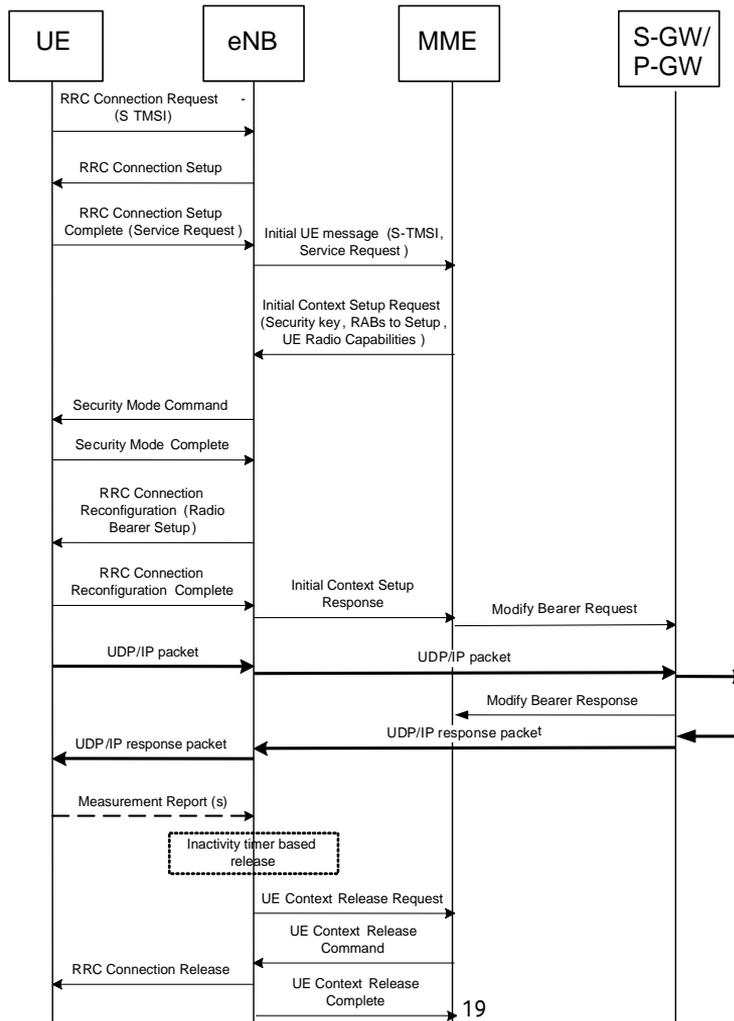


# Back Up



# Example S1 and Gb based architecture message flows

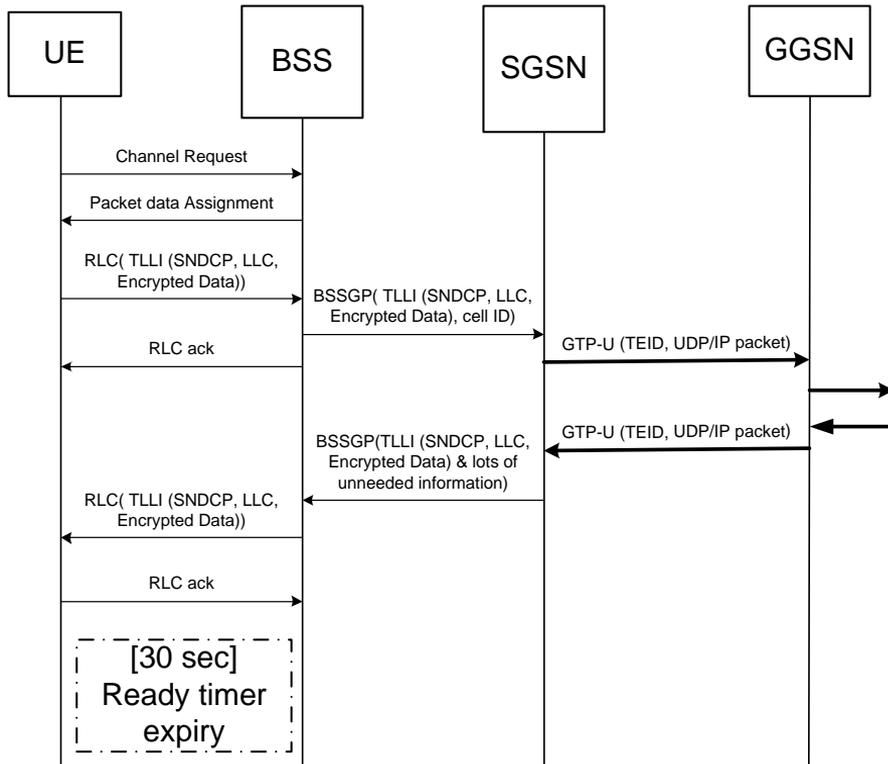




**Acknowledged  
Datagram transfer on S1  
based architecture for  
'clean slate' IoT.  
Without radio L2 acks.**



# Acknowledged Datagram transfer on Gb based architecture for Clean Slate CloT (with radio L2 acks)



Thank you

