

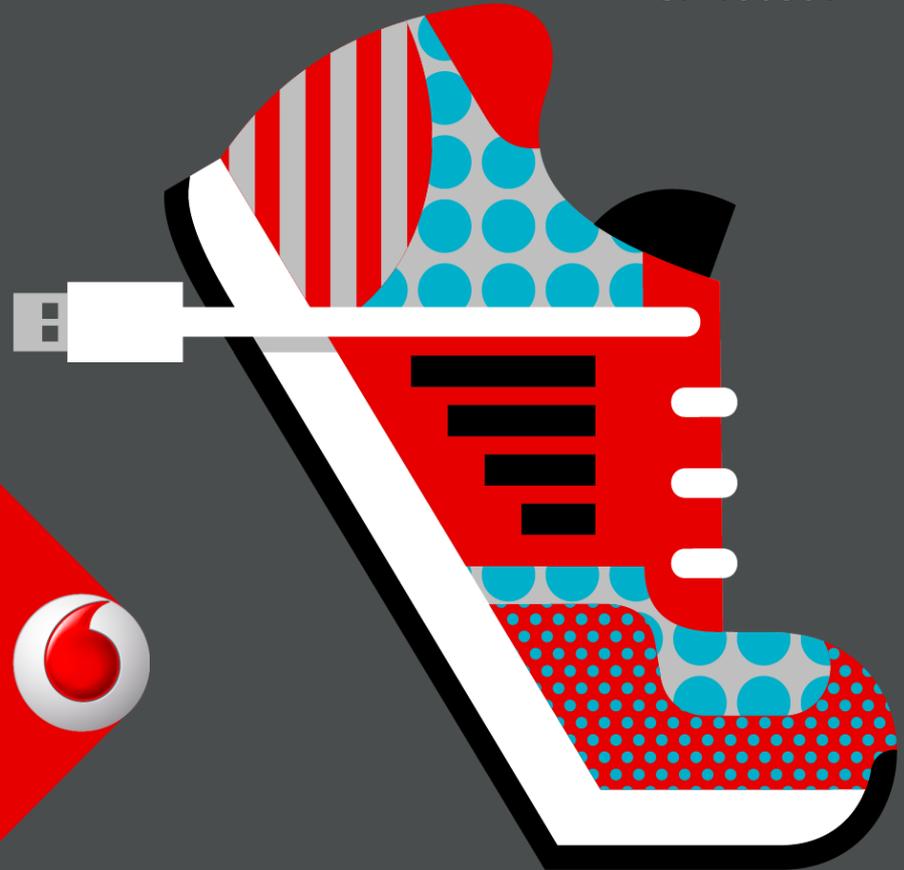
## Cellular Internet of Things:

Potential impact on SA work area from 'clean slate' part of GERAN's study on "Cellular System Support for Ultra Low Complexity and Low Throughput Internet of Things" when using an existing RAN-CN interface

Vodafone Group

3GPP SA plenary#68

17 – 19 June 2015



# Introduction

- FS\_IoT\_LC has been systematically reported to SA, and last SA held a joint session with GERAN. Background information on this SID in 'backup' slides.
- GERAN FS\_IoT\_LC Study and PCG #34:
  - new RAT may be specified in R'13
  - targets ultra-low data rates, 20 dB extended coverage, 10 year battery life, lower cost device
  - normative WI for RAN plenary in September
- Some SA impacts can be expected
- This presentation gives an overview of the:
  - standardisation progress;
  - architecture assumptions;
  - size and shape of core network;
  - likely impact on SA's specifications from reuse of current S1 or Gb for a new RAT





# 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”



GP-140421.zip

<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
- SA impacts of a new RAT getting standardised in R'13 should be considered



PCG34\_39r2.zip





# Architecture Aspects

# 'Clean Slate' CloT architecture assumptions

- Speed to market
  - SA2 "lite-core" SID in SP-150167 not scheduled to deliver normative CRs in R'13
    - connect to an existing core network and reuse existing specs.
  - Gb or S1 or H 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

More details in 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 for 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
  - e.g. 4 seconds to transfer an 80 byte message between Core Network and UE
  - core network latencies not an issue
  - geographically remote, virtualised core feasible

More details in TR 45.820 v1.3.0, section 8.1.6 & 8.1.7, and RP-150869





# 3 SA Specification Impacts

# Impacts from new RAT using unmodified RAN-CN interface

- Many specifications contain phrases similar to “with GERAN and UTRAN do X and with E-UTRAN do Y”
  - these need to be extended, or,
  - a generic statement is added somewhere to explain that “CloT-RAN” is treated in the same way as one of the legacy RATs.
- Some specifications need more dedicated work:
  - see subsequent slides
- Invite all interested companies to identify full impact of a new RAT
- Agree WID in next SA plenary (assuming next RAN plenary agrees a ‘clean slate’ WID)



# SA 1

- 22.101 “Service Principles”
  - 4.3.3: – “radio interface”,
  - 4.4: to indicate that CloT is not an IMT 2000 family member?,
  - 4.7: to permit CloT to be PS domain only
- 22.011 “Service Accessibility”
  - 3.2.2.2: handling of “GPRS not allowed”,
  - 4.3: select which Access Class Barring options to use for CloT
  - 7.1: closed list of 2G, 3G and 4G
- 22.105 “Service and Service capabilities”
  - introduction for very low data rate service?



## SA 2

- 23.060/23.401 Introduce general concept of CloT RAT
- 23.060/23.401 Specification for “no inter-RAT mobility”? E.g. any inter-RAT changes to/from the CloT RAT are handled by Attach/Detach.
- 23.002 Overall architecture specification
- 23.251 “network sharing”: all CloT UEs are “network sharing supporting UEs”;
- 23.203 “PCC”: the current RATs are named in many places, but no other impact?
- 23.272 “CSFB & SMS over SGs”: (if S1 based) RAT type to be sent to MSC



# SA 3

- SIDs started in SP-150171 and SP-150145



# SA5

- RAT type on PS data CDRs and SMS CDRs



# SA 4 and SA 6

- None?





# 4

## Summary

# 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 its potential**
- **Some SA work needed**





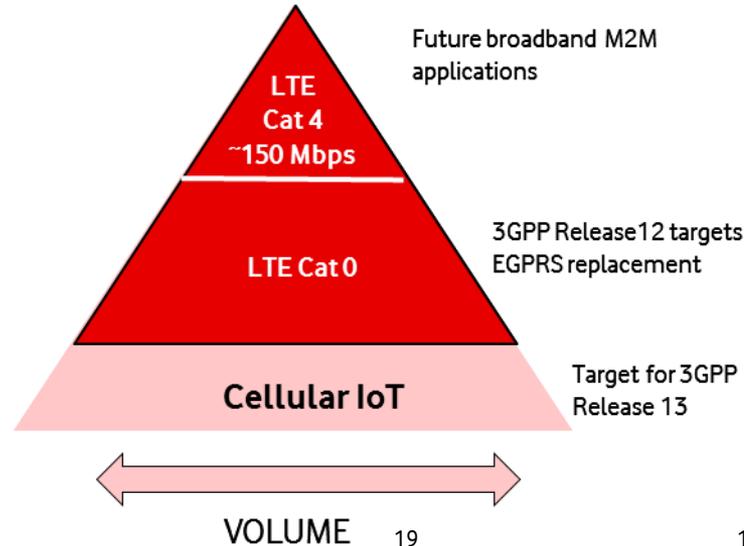
# **Back up: background to start of GERAN Study Item**

# 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



# 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

And mostly importantly,

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





**Thank You**