
GSMA
5G IoT Strategy Group
Improving Energy Efficiency for Mobile IoT
Igor Tovberg, Sony
March 2, 2022

Introduction

Director of Product Marketing at Sony Semiconductor Israel.

- Sony Semiconductor Israel is a leading provider of Cellular IoT chipsets
- Ultra-low-power and ultra-small chipset solutions for 5G
- Millions of Sony chipsets connecting cellular IoT devices around the world.
- Sony's Altair chipsets can be found in wearables, vehicle telematics, smart utility meters, personal & logistics trackers, consumer electronics, and many other IoT devices.

Vice-Chair at the GSMA 5G IoT Strategy Group

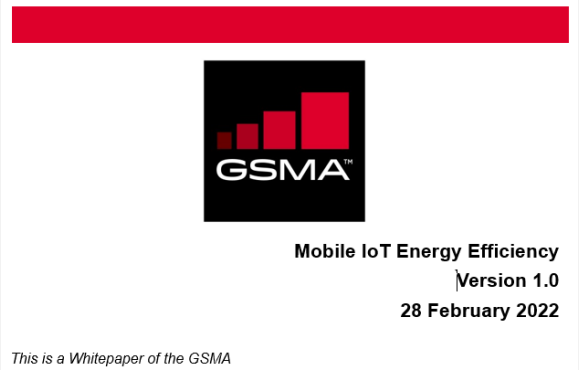
- Heading the energy efficiency subgroup
- Industry Experts:
  MNOs, Chipset vendors, Module Makers , Infrastructure vendors

Cellular IoT Use Cases

Mobile IoT - Energy Efficiency White Paper

Baseline guide document for application developers building low energy cellular IoT solutions

- Introduces energy efficiency capabilities of 5G Mobile IoT technologies
- Key energy efficiency features available for LTE-M and NB-IoT devices compared to 2G
- Power optimization technics in R13, R14 and later in R15
- Power class specifications and energy consumption impact
- Power efficient LTE-M/NB-IoT vs ~x6 higher current at 2G
- Application protocol selection
- Preferred operation modes - PSM/eDRX vs Device Shut down
- Reference Test Setup – Conducted/Radiated in a Lab and Live NW
- Measurement procedures and Reference test results



Typical Use Cases

Smart Meters

Gas, Electricity, Water meters

Power consumption and service longevity

PSM vs eDRX - Data logging and upload cycles

FOTA – Firmware Over The Air

Trackers

Telematics, Asset and Pet Trackers

Continues/Periodic tracking

Geofencing

eDRX and PSM combination

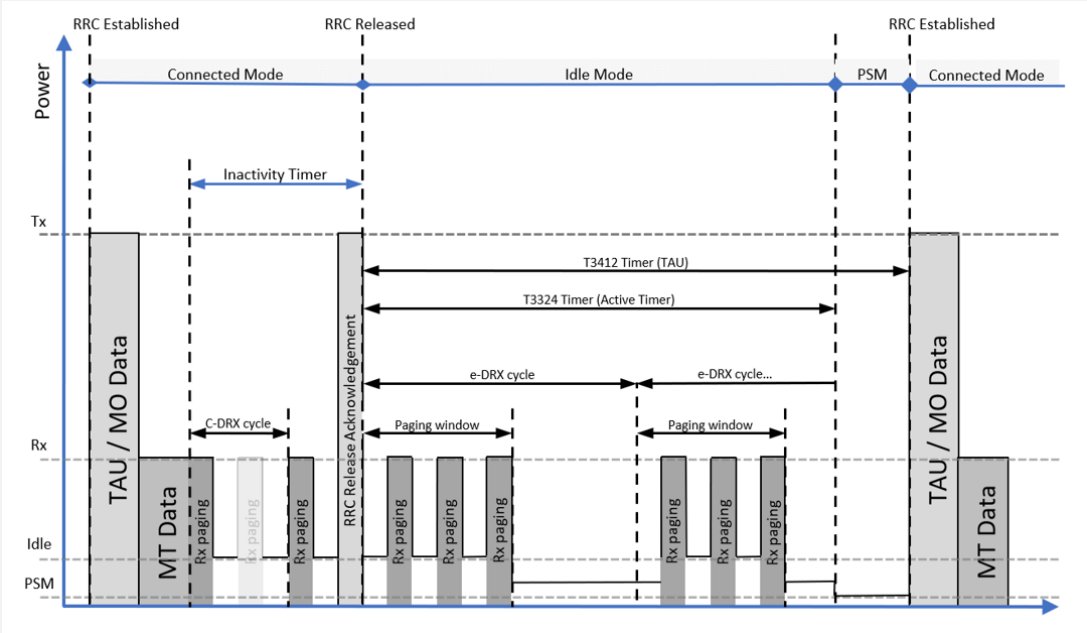
Power Profile Features

Device Power efficiency is directly affected by both Network & Device configurations

Device States:

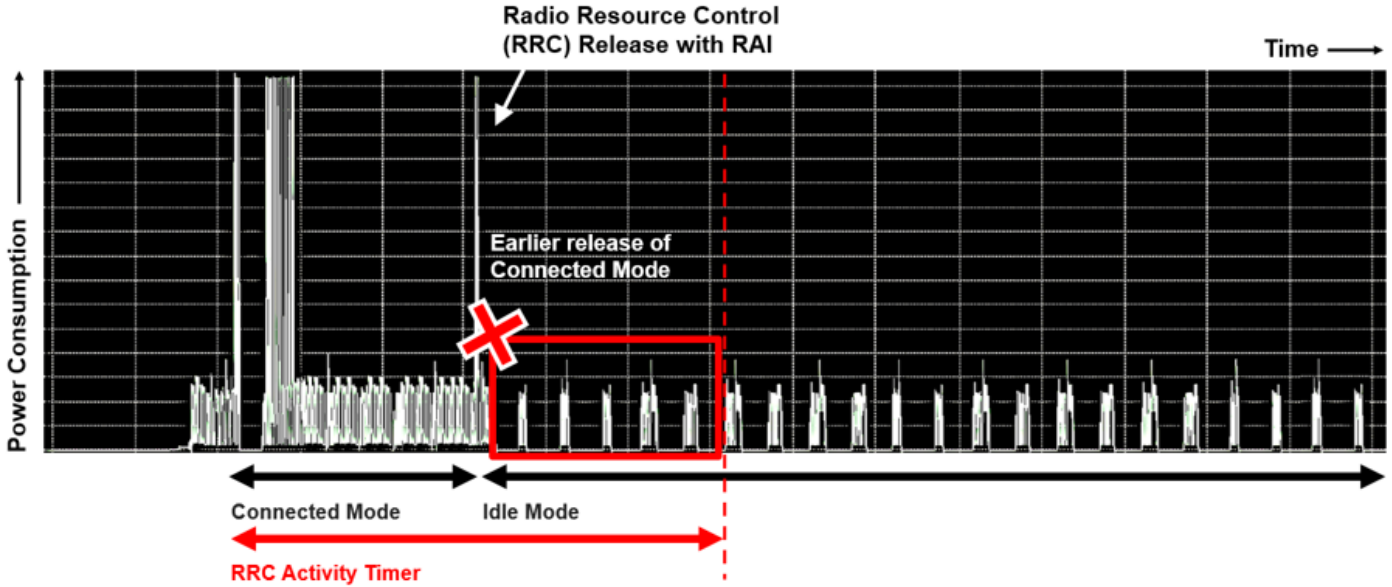
Off , Connected , Idle, Power save

- TAU - Tracking Area Update
- DRX -Discontinuous Reception
- C-DRX - Connected DRX
- Inactivity Timer
- RAI - Release Assistance Indication
- RRC - Radio Resource Control
- PTW - Paging Time Window
- PSM - Power Saving Mode
- eDRX - Extended Discontinuous Reception
- T3412 and T3324 timers



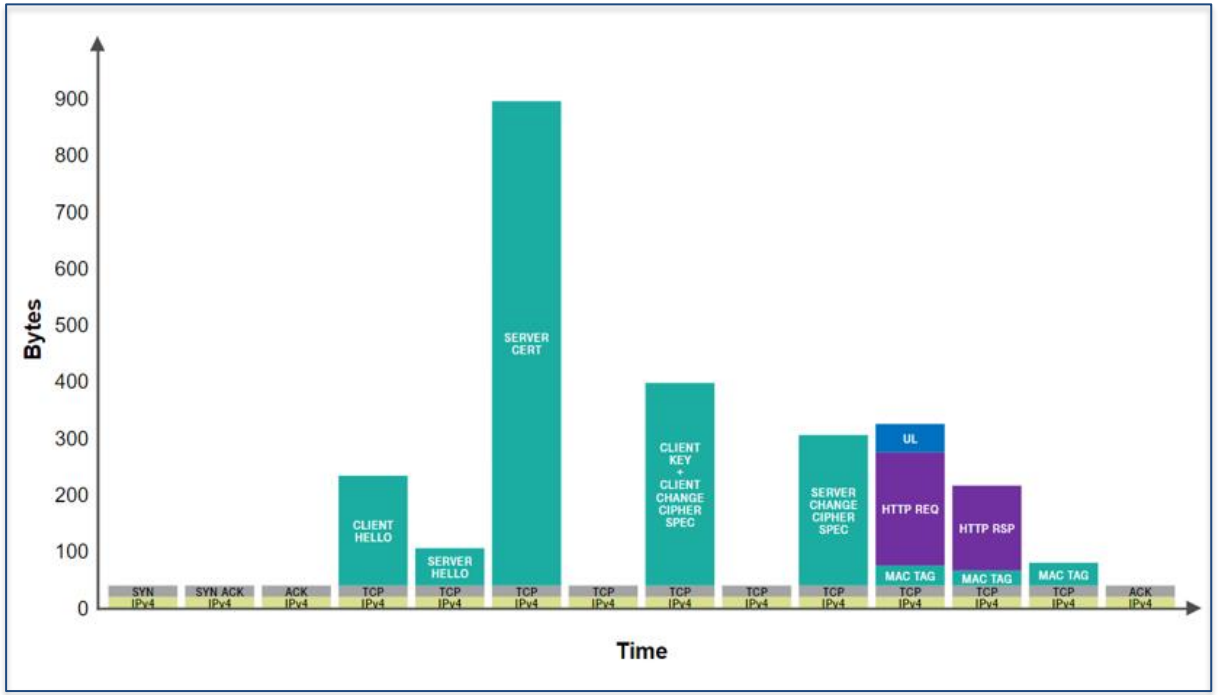
RAI Example

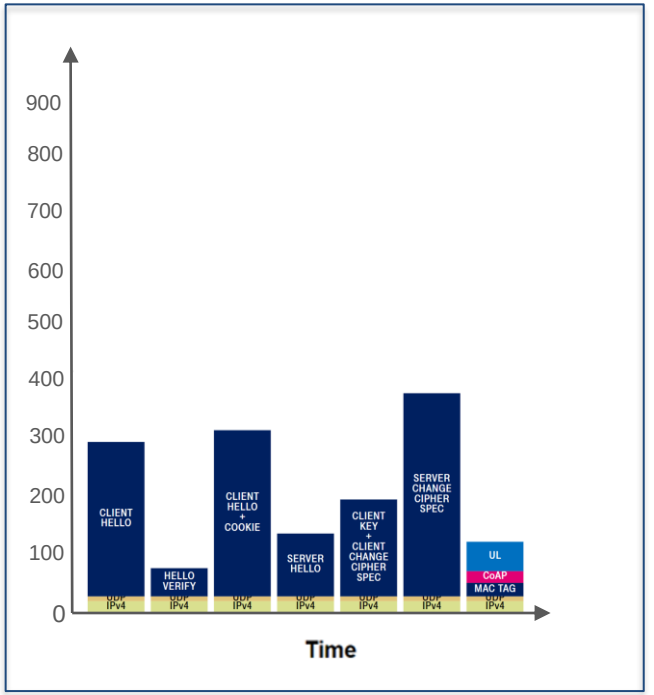
- Release Assistance Indication (RAI) helps further reduce device power
- RAI allowing the IoT device to prematurely tear down the Resource Control (RRC) bearer
- RAI informs the network that no subsequent UL/DL transmission is expected.
- Without RAI the IoT device is forced to remain in RRC_CONNECTED mode until the expiration of the eNodeB's RRC inactivity timer that could be as long as 20 to 30 seconds.



Selecting Power Efficient Application Protocol

HTTPs vs CoAP





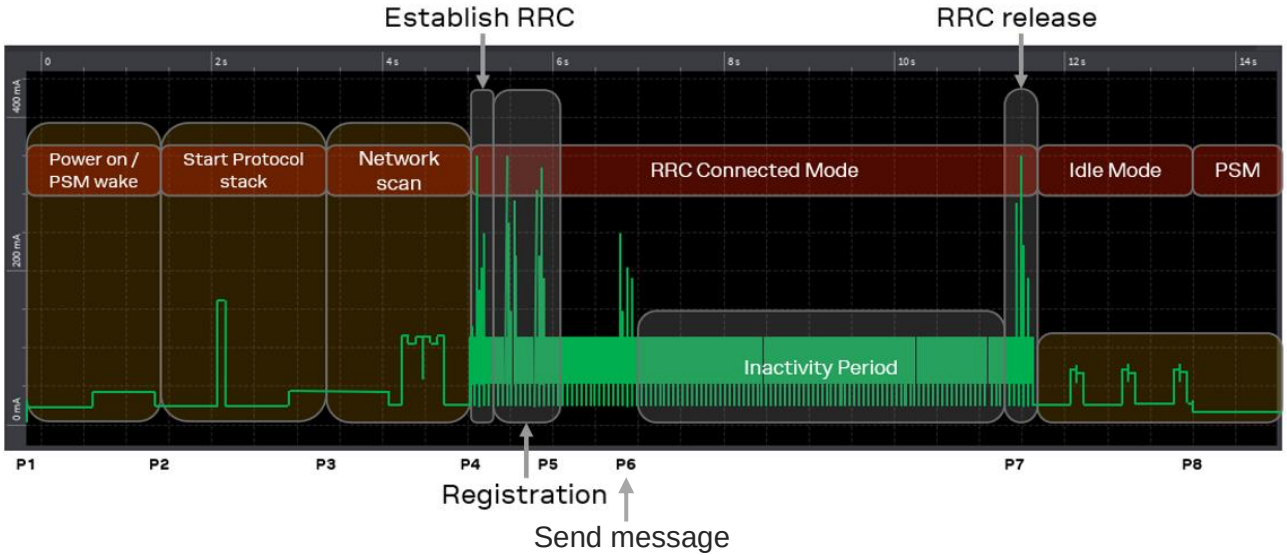
Measurement Scenarios

Lab tests proposal to predict devices performance in common use cases

Test Profiles:

1. PSM and TAU
2. Data transmission to/from PSM
3. Reception in eDRX
4. Connection to network and change to PSM
5. Always on transmission
6. eSIM Profile swap

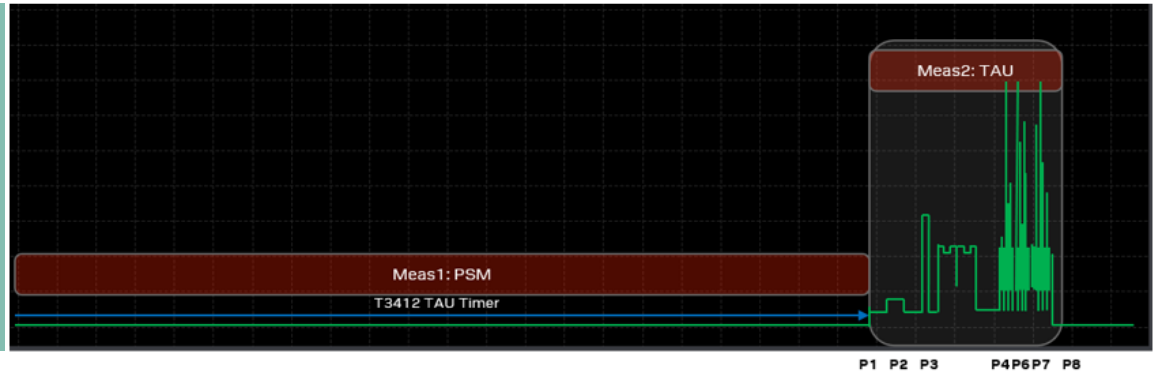
RT1: LTE-M	RT2: NB-IoT	RT3: GPRS



RT – Recommended Test

Four Step Procedure

Test Profile



- Profile
- Procedure
- Environment
- Test Result

Test Procedure

Action	Outcome	Measurement
Initial state: device connected to the network PSM status, with known TAU update time		
Device stays in PSM status		Meas1. Power (W)
TAU timer expires	Device executes TAU procedure	Meas2 Energy in TAU update (Wh)
Device goes back to PSM status		

Test Environment

PSM and TAU	Recommended Tests	
Parameters	**RT1: LTE-M1**	**RT2: NB-IoT**
Device	LTE-M device	NB-IoT Device
Band	3	20
Deployment model	-	in-band
Network	Cat-M1 R13	Cat-NB1 R13
T3412	60 minutes	60 minutes
T3324	0 seconds	0 seconds
RSRP (dBm)	-100	-100
Extended Coverage	Mode A Level 0	ECL0

Result

Results		
Meas1: Energy in PSM	6.5 – 15 µWh	6.5 – 15 µWh
Meas2: Energy in TAU	140 – 430 µWh	110 - 410 µWh

Summary

- Multiple factors affects battery life of a mobile IoT device:

  Network parameters , messaging period, application protocol, cloud latency and more
- Minimise the number of power On/Offs and Registrations → Use PSM
- Reduce Connected Mode consumption → Use Release Assistance Indication (RAI)
- Reduce Idle Mode consumption → Use eDRX
- Avoid chatty protocols.
- Proper RAT selection: LTE-M/NB-IoT enables significantly longer battery life vs 2G

Download your free copy of energy efficiency white paper here:
https://www.gsma.com/iot/resources/energy-efficiency-mobile-iot/