Enabling Secure, NB-IoT End Nodes with MCUXpresso Enablement and PSA-Certified MCUs to Address the Growing Industrial IoT market

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SECURE CONNECTIONS
FOR A SMARTER WORLD

Cellular Connectivity

SEQUANS
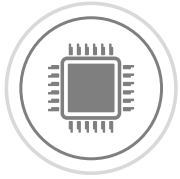
NB-IoT + LTE-M

NXP

LPC5500 MCU

LPC5500 MCU Series
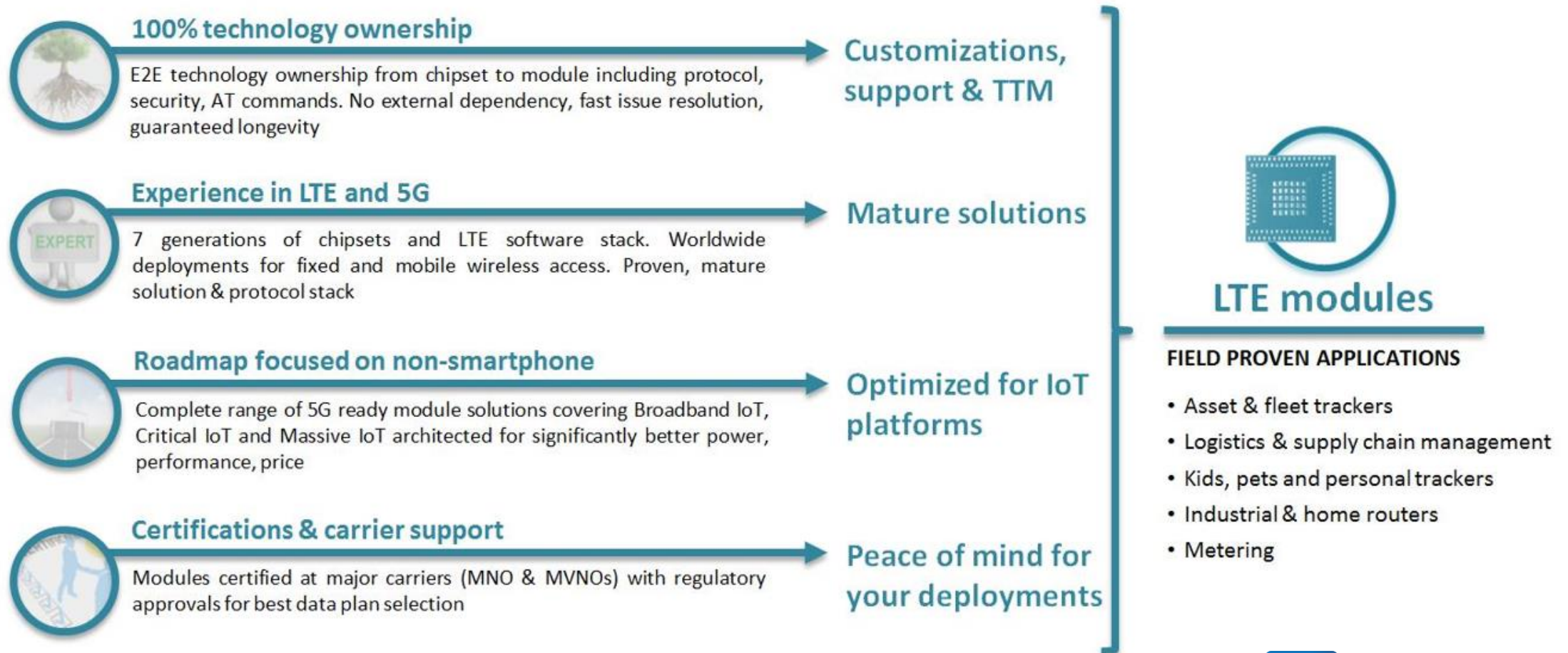
Single and dual-core Arm® Cortex®-M33 based MCU

- Ultra-efficient 40-nm flash technology:
  - Over 1150 CoreMarks and as low as 32uA/MHz2
  - DSP accelerator
  - Cryptography accelerators
  - Enhanced safety and security
  - Scalable memory and package size
  - System Integration for Industrial and IoT Markets
    - High-Precision ADCs
    - CAN-FD for industrial control
    - HS USB with On-Chip PHY
    - HS SPI, SDIO, FlexComms (UART, I2C, I2S,SPI)
- MCUXpresso developer ecosystem
- Longevity extended to 15 years

NXP

LPC5500 MCU SERIES OVERVIEW

	LPC551x/S1x	LPC552x/S2x	LPC55S6x
Cortex-M33 #0	Up to 150MHz	Up to 150MHz	Up to 150MHz
Cortex-M33 #1	-	-	Yes (Up to 150MHz)
Accelerators/ Co-proccessors	Crypto Accelerator	Crypto Accelerator	PowerQuad DSP, Crypto Accelerator
Flash	Up to 256 KB	Up to 512 KB	Up to 640 KB
SRAM	Up to 96KB	Up to 256 KB	Up to 320 KB
Security	TrustZone Secure boot Tamper protection Debug authentication PRINCE TRNG, SHA-2, AES-256, PFR Code watchdog	Secure boot Tamper protection Debug authentication PRINCE TRNG, SHA-2, AES-256, PFR	TrustZone Secure boot Tamper protection Debug authentication PRINCE TRNG, SHA-2, AES-256, PFR
CoreMarks	600	600	1150+ (Dual-core)
Serial Interfaces	Up to 9 FlexComm supporting USART, SPI, I2C and I2S. 1x HS LSPI	Up to 9 FlexComm supporting USART, SPI, I2C and I2S. 1x HS LSPI	Up to 9 FlexComm supporting USART, SPI, I2C and I2S. 1x HS LSPI
USB	USB FS w/PHY, USB HS w/PHY	USB FS w/PHY, USB HS w/PHY	USB FS w/PHY, USB HS w/PHY
SDIO	-	SDIO/SD/MMC	SDIO/SD/MMC
CAN	CAN FD/CAN 2.0	-	-
ADC	16b 2 Msps	16b 1 Msps	16b 1 Msps
GPIO	Up to 64	Up to 64	Up to 64
Active Power Consumption	32uA/MHz	32uA/MHz	32uA/MHz
Packages	HTQFP64, HLQFP100, VFBGA98	HTQFP64, HLQFP100, VFBGA98	HTQFP64, HLQFP100, VFBGA98

100% technology ownership

E2E technology ownership from chipset to module including protocol, security, AT commands. No external dependency, fast issue resolution, guaranteed longevity

→ **Customizations, support & TTM**

Experience in LTE and 5G

7 generations of chipsets and LTE software stack. Worldwide deployments for fixed and mobile wireless access. Proven, mature solution & protocol stack

→ **Mature solutions**

Roadmap focused on non-smartphone

Complete range of 5G ready module solutions covering Broadband IoT, Critical IoT and Massive IoT architected for significantly better power, performance, price

→ **Optimized for IoT platforms**

Certifications & carrier support

Modules certified at major carriers (MNO & MVNOs) with regulatory approvals for best data plan selection

→ **Peace of mind for your deployments**

LTE modules

FIELD PROVEN APPLICATIONS

- Asset & fleet trackers
- Logistics & supply chain management
- Kids, pets and personal trackers
- Industrial & home routers
- Metering

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Overview of popular wireless connectivity

	WiFi	Bluetooth	LoRaWAN®	LTE-M	NB-IoT
Standard	IEEE 802.11	Bluetooth SIG	LoRa Alliance®	3GPP	3GPP
Range	Medium Range	Short Range	Medium Range	Long Range	Long Range
Data rate	Very high	High	Medium	High	Low
Security	Medium	High	Medium	Very High	Very High
Deployment	Requires Access points	Requires Access points	Requires dedicated Lora network equipment	Standard Carrier Infra structure	Standard Carrier Infra structure
Pairing complexity	Medium	Medium	Medium	Seamless	Seamless
Availability	Local	Local	Local	Global	Global
Power consumption	high	ultra low	very low	very low	very low

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INTERNET OF THINGS: LTE-M AND NB-IOT DEPLOYMENT MAP

EXTERNAL   6
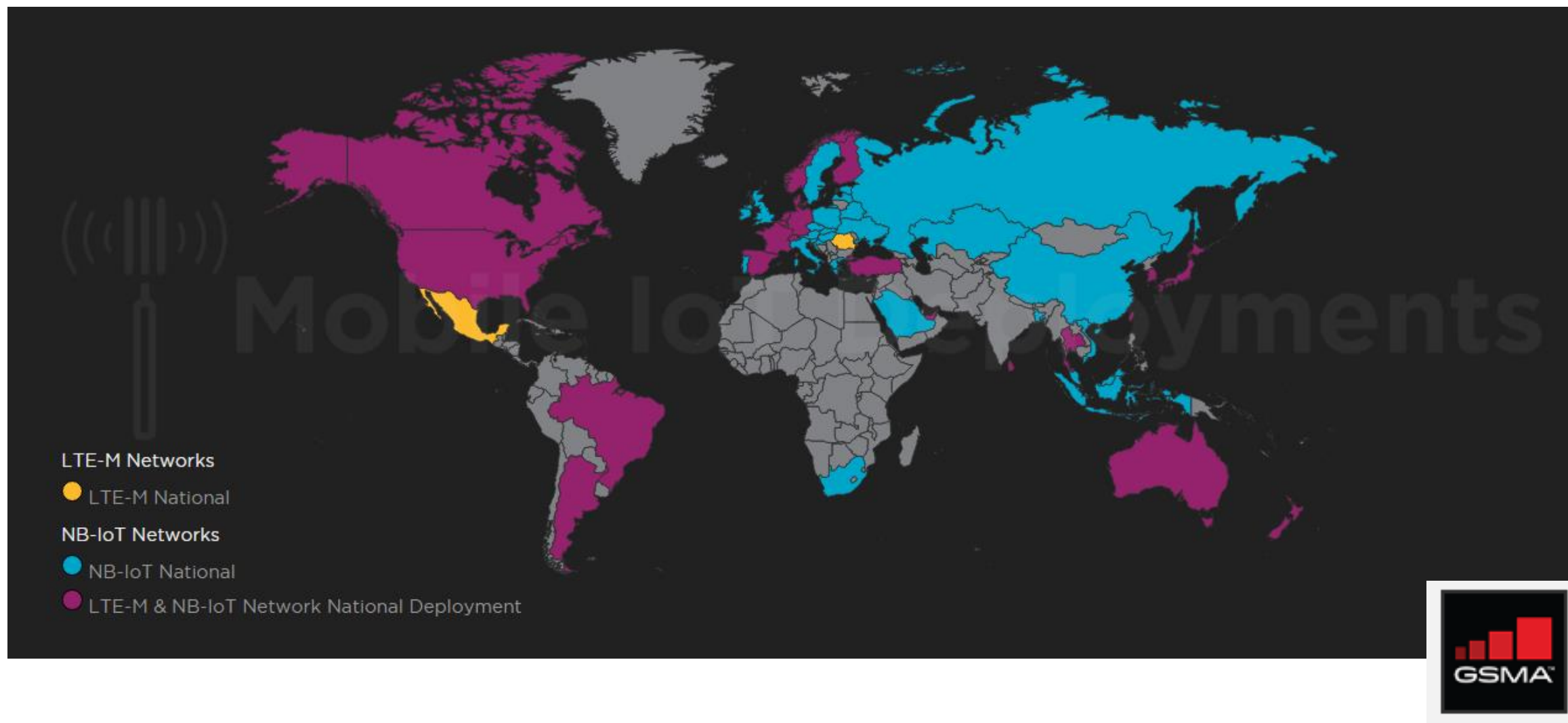
# MONARCH BASED GM01Q/NB01Q
CAT-M1 / CAT NB1

First truly optimized worldwide LTE-M/NB-IoT module

Monarch GM01Q (Cat M1) and Monarch NB01Q (Cat NB1)
Main features
- 3GPP Release 13
- World-wide band support in a Single SKU™ design
- Lowest power consumption with 1µA PSM
- eco-Paging™ for optimized eDRX
- Power class options 20 and 23dBm
- VoLTE support
- On-modem location based services
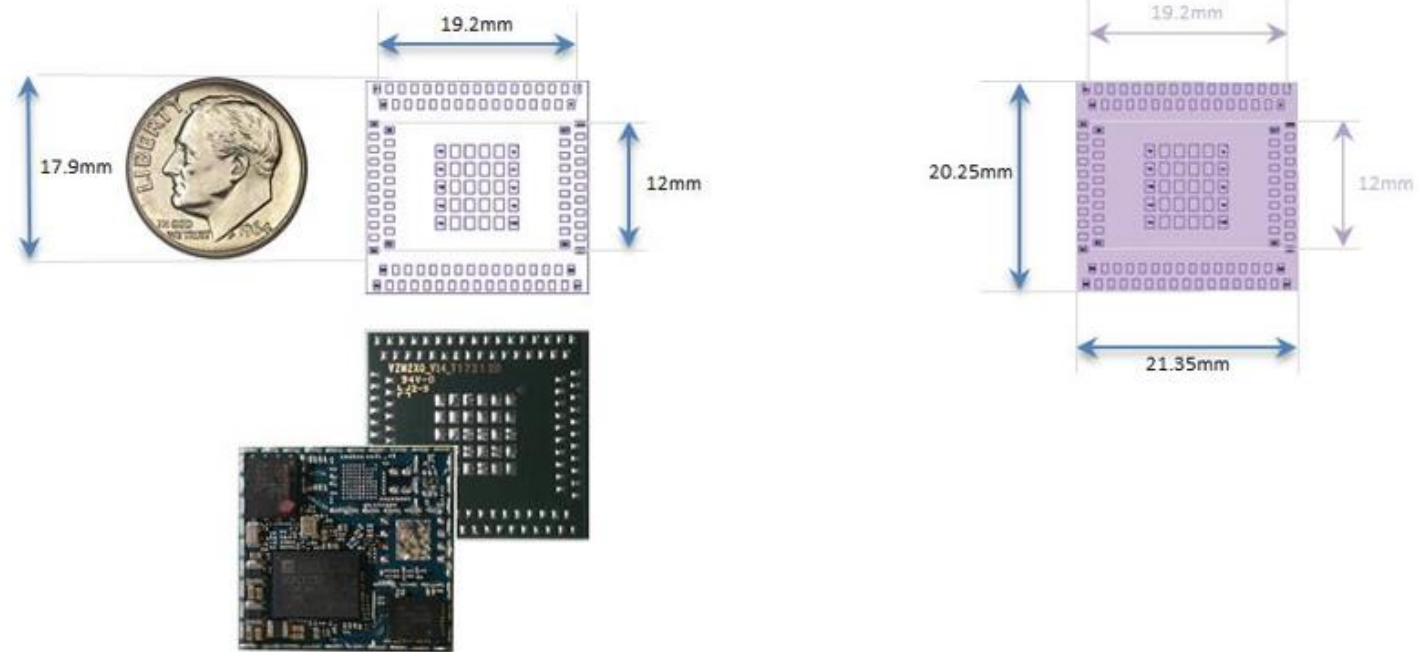
Interfaces
- JTAG
- I2C (rsvd)
- USIM
- SPI (rsvd)
- GPIO
- UART x 3

Software
- Field proven LTE software stack
- Sequans owned LPP, SUPL, and certified LWM2M stack
- Cloud Connector™ for direct HTTPS, MQTTS and for various cloud platforms (Verizon Thingspace, Orange Live Objects, AWS...)

RF Frequency
- Worldwide Single SKU™ design
- 699 – 2200MHz (incl. bands 1,2,3,4,5,8,12,13,14,17,18,19,20,25, 26,28,66,85)

Certifications
- GCF, PTCRB

Packaging
- LGA package
- 20.25 x 21.35mm
- 108 pads
- RoHS compliant, halogen-free

Operating Supply
- Voltage 3.1 – 4.5V
- Current 1µA in PSM

Humidity
- 5% to 85%

Operating Temperature
- RF compliant -30°C to +60°C
- Operational -40°C to +85°C

Born from a tight partnership between Sequans and NXP

Connected LPCXpresso55S69 development platform
- The Monarch GM01Q-NXP companion board from Sequans provides cellular connectivity solution to LPCXpresso55S69 MCU board
- Monarch GM01Q-NXP companion board fits into LPCXpresso55S69 through the Arduino bus, and exposes the existing mikro-BUS connector.
- Monarch GM01Q-NXP board is pre-integrated into LPCXpresso55S69 software suite, which provides a turnkey solution for connecting NXP products to any cloud server like AWS, GCP, Azure, etc. Cellular driver and Examples for NXP based CPU are available
- The kit can be shipped with a worldwide Truphone MVNO SIM card –refer to Truphone coverage-
- Two Monarch GM01Q-NXP SKUs exist for Cat-M1 and NB-IoT

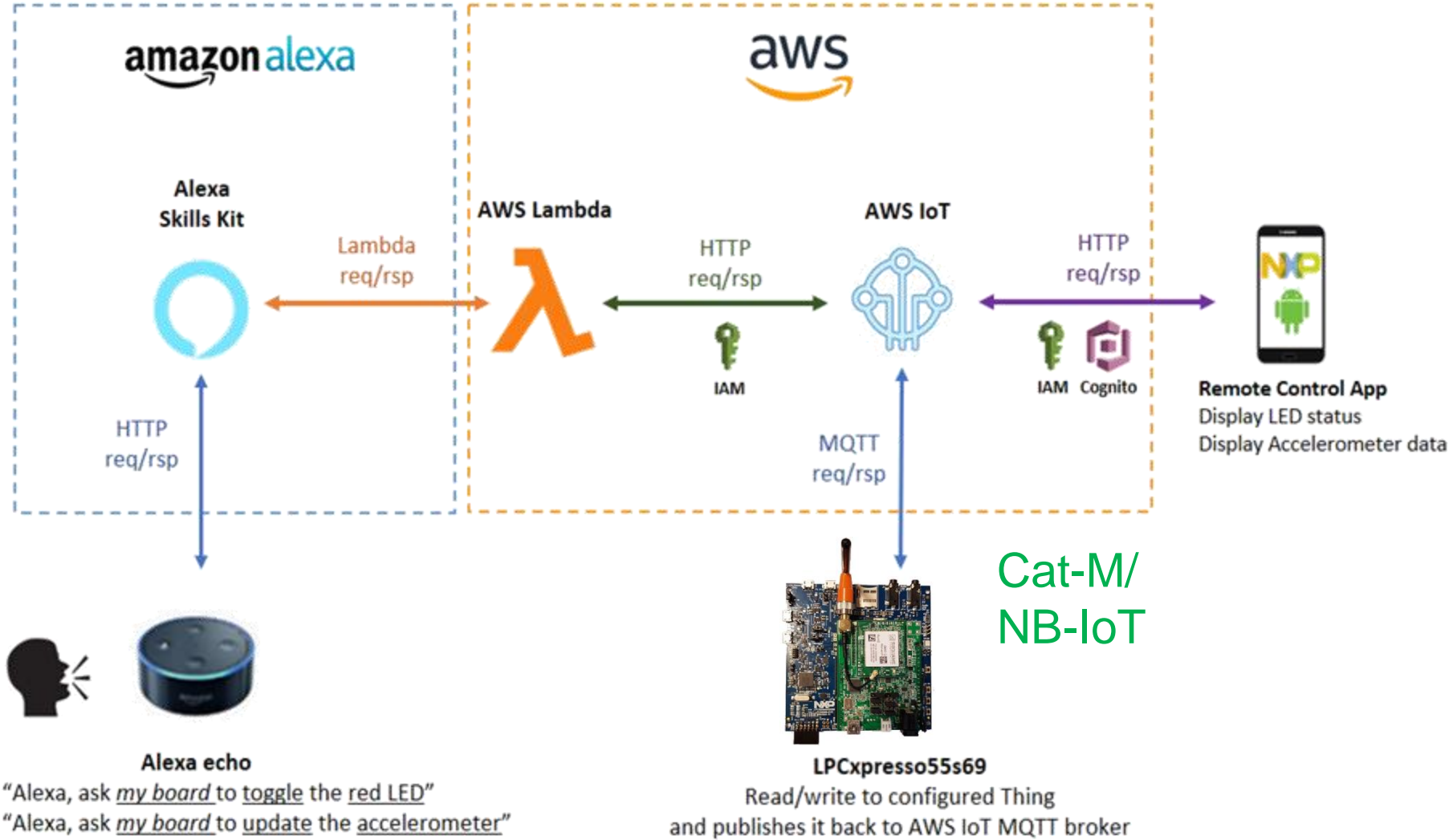**LPCXpresso55S69**

Monarch GM01Q-NXP

Key Features
- Sequans GM01Q LTE Module
- Worldwide LTE-M or to NB-IoT support
- Designed for **LPCXpresso55S69**
- Debug connector for modem upgrade and console
- High-performance antenna for frequency ranges: 700MHz—2100MHz
- Free drivers and code examples available

Deliverables
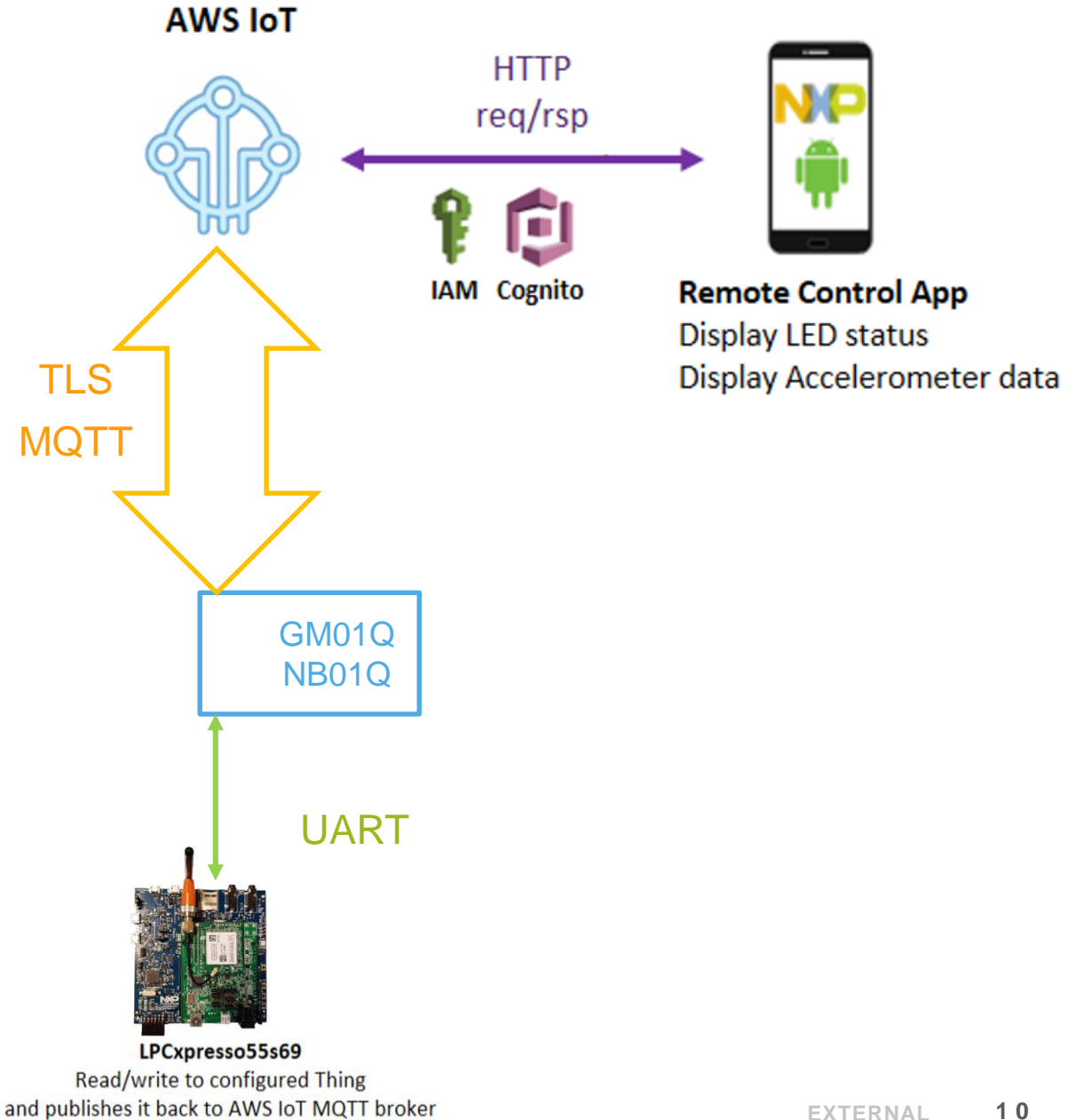- Board documentation
- Software updates

DEMO OVERVIEW

Cat-M/ NB-IoT

Alexa Skills Kit

Lambda req/rsp

AWS Lambda

HTTP req/rsp

IAM

AWS IoT

HTTP req/rsp

IAM   Cognito

Remote Control App
Display LED status
Display Accelerometer data

HTTP req/rsp

MQTT req/rsp

Alexa echo
"Alexa, ask _my board_ to _toggle_ the _red LED_"
"Alexa, ask _my board_ to _update_ the _accelerometer_"

LPCxpresso55s69
Read/write to configured Thing
and publishes it back to AWS IoT MQTT broker

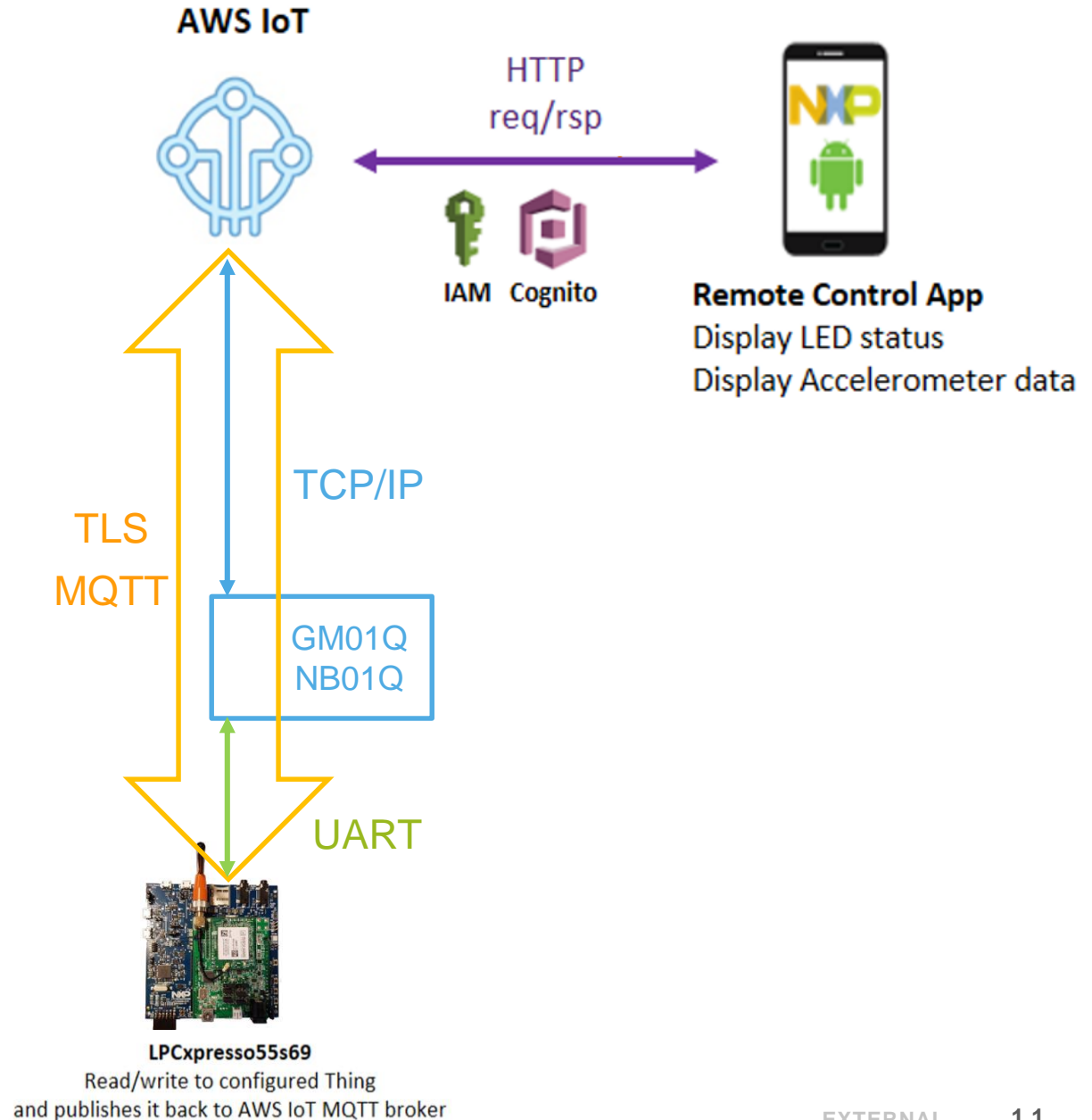# DEMO OVERVIEW – CASE 1

- AWS cloud
- Cellular connection
  - NB IoT / LTE-M
  - Private key in module
- End device
  - LPC5500 (GPIO,I2C, UART,..)

AWS IoT

HTTP req/rsp

IAM Cognito

Remote Control App
Display LED status
Display Accelerometer data

TLS
MQTT

GM01Q
NB01Q

UART

LPCxpresso55s69
Read/write to configured Thing
and publishes it back to AWS IoT MQTT broker

DEMO OVERVIEW – CASE 2

- AWS cloud
- Cellular connection
  - NB IoT / LTE-M
- End device
  - LPC5500 (GPIO,I2C, UART,..)
  - Private key in LPC5500

- End to end security
  - MbedTLS
  - PUF
  - Encrypted data from chip to cloud

AWS IoT

HTTP
req/rsp

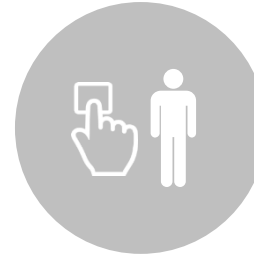IAM   Cognito

Remote Control App
Display LED status
Display Accelerometer data

TCP/IP

TLS
MQTT

GM01Q
NB01Q

UART

LPCxpresso55s69
Read/write to configured Thing
and publishes it back to AWS IoT MQTT broker

ADDITIONAL RESOURCES

Visit Sequans Online
https://www.sequans.com/

Visit Sequans Modules
https://www.sequans.com/products-solutions/modules/

Visit Sequans Development Platforms
https://www.sequans.com/products-solutions/development-platforms/
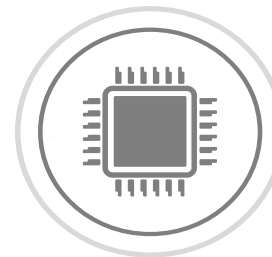
NXP Community Technical Support
https://community.nxp.com/welcome

Visit NXP MCUs Online
www.NXP.com/MCU

Visit LPC5500 MCU Series
www.NXP.com/LPC5500

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