

ublox

UBX-R5

u-blox is redefining IoT security. UBX-R5: Our 5G-ready cellular chipset designed fully in-house.

June 11th, 2019

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<u>Why did we develop a secure cellular chipset for the IoT?</u>

<u>Market insights.</u>

UBX-R5 positioning.

UBX-R5 enables SARA-R5: Key strengths.

Expanding the revenue model.

Our vision.





We **deliver leading wireless technology** to reliably locate and connect people and devices.

We are convinced that the Internet of Things will change every aspect of our societies, our businesses, and our everyday lives.

That's why we develop reliable and innovative positioning and wireless communication solutions that **securely connect vehicles, industries, things, and millions of people around the world.**



Why did we develop a secure cellular chipset for the loT?

We master technology.



Independence from 3rd parties is key for future success.

- At the dawn of the 5G era, only a handful of companies are capable of designing 5G modems.
 - We sensed this when we started developing our platform.
 - Investment into a leading modem design team
- Sustainable differentiation is only possible if we own technology
 - Control of product life-cycle
 - No real innovation without access to the core
 - Optimized power consumption
 - Robust design for industrial and critical applications
 - Security concept encompassing all layers from HW to SW

We add security. IoT security has quickly become an industry priority.

More than **80% of senior executives** across industries, on average, say **IoT is critical** to some or all lines of their **business** in 2018. (Source: Statista)

IoT security market is forecast to **grow at CAGR of 36%** between 2016 and 2021. (Source: GSMA) By 2020, **20% of annual** security budgets will be devoted to **IoT solutions** (up from 1% in 2015). (Source: GSMA)







Long lasting experience.

We've been creating chips and modules for more than two decades.



Megatrends drive our growth.

Cellular technologies make them become reality.





246m

Mobility

More and more automation is

enabling the autonomous

driving car.

A quarter billion connected cars delivered between 2019 – 2023. Bl Intelligence 2018



Urbanization

Infrastructure is becoming smart for better usage and service of the increasing population living in cities.

1 billion smart meters installed between 2019 -2023. ABI research 2018



500m

Industry 4.0

Automation is linked with the cloud for closed control loops that enhance process efficiency.

More than 2 billion connected devices in 2023. BI Intelligence 2018

New health

The cloud is delivering services to mobile users and enhancing insights into a healthy life.

Over a half billion sports and wellness trackers will be sold in the next 5 years (2019-2023). TSR 2018

With UBX-R5 we complement our strategic core.

An ecosystem of chips, modules, and value added services.





- Important addition of product offer and solution capability
- Essential for our mainstream customer in the Industrial internet of Things space

What are the key takeaways?

IoT is different from traditional cellular connectivity.

We have to solve new challenges in the IoT:

Device longevity

10+ years

- Security concerns Critical applications, confidential data
- Complexity

of deployed devices

• **Power consumption** Devices need to run from batteries





Market insights.

Cellular IoT solutions are growing.



Low Power Wide Area (LPWA) is crucial for several industries.



Mobility applications will reach global market revenue of **\$840M** in 2022 for **LTE-M** and \$840m LTE Cat 1 products, where u-blox has a strong, established track record.



Industry 4.0 will see sustained growth, relying on LTE-M and LTE Cat 1 to reach \$850M market revenue by 2022 in industrial asset tracking and metering alone.



Urbanization requires a broad portfolio of LPWA products, reaching global market revenue of **\$640M** in 2022.

\$370m

New health will reach global market revenue of \$370M in 2022 with a focus on highly secure LTE-M, LTE Cat 1, and **NB-IoT** products.

Secured IoT devices protect business and data.



Security must be at the core of industrial IoT.



CAGR 2019-2024: 65%¹

Connected health

Ensure patient safety by guaranteeing that medical devices are authentic and use does not exceed the safety limits.

¹ Source: ABI Research Q1/2019

TAM 2023: USD 134m²



CAGR 2019-2024: 51%²

Asset tracking

Ensure your data can be authenticated to the correct device, make better operational decisions, and improve efficiency.

TAM 2023: USD 146m¹



CAGR 2019-2024: 122%¹

Industrial monitoring

Protect mission-critical industrial equipment and make sure only authorized personnel has access to keep workers, plants, and communities safe.

Low category LTE projects are on the rise.

New IoT applications coming in daily.

- Strong growth with new applications
- Growth inflection point passed
- Year-to-date order quantity already 20% higher than all of 2018.
- Strong market penetration achieved with SARA-R4 modules.
- Capture growth surge with UBX-R5 based modules.



Source: company data

Migration to LTE-M in full swing.



u-blox has built leading presence in LTE-M applications with R4 modules.



- SARA-R4 is the predecessor module based on third party chips
- Remains available for legacy and lower tier applications





- Strong market penetration achieved with R4 modules
- A majority of top tier customers have designed in R4 modules





ATM, POS, vending

- Automation, monitoring, sensor
- Gateway, router, hotspot
- Infrastructure, surveillance, security
- Medical, healthcare
- Metering
- Tracking, telematics
- Wearable, camera
- Broad application base
- Mobile and stationary use
- Migration from 2G and 3G expanding in all regions

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Competition is shaping the market.

There are several LTE-M chipsets in the market - most modules are Qualcomm based.

Relevant chip vendors

- Nordic EMEA
- Qualcomm Americas
- Sequans EMEA
- SONY EMEA
- u-blox EMEA

Relevant module vendors

•	Fibocom	Asia
•	Gemalto	EMEA
•	Neoway	Asia
•	Quectel	Asia
•	Sierra Wireless	Americas
•	SIMCom	Asia
•	Telit	EMEA
•	Wistron	Asia

• u-blox EMEA





UBX-R5 positioning.

Cellular technologies are moving towards 5G.



5G is the long term evolution (LTE) for cellular IoT connectivity.



Evolution in the LPWA space.

Cellular standards for the Industrial IoT.



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UBX-R5 LTE-M and NB-loT chipset.

A new chipset beyond the state-of-the-art.



Best-in-class hardwarebased security

Outstanding coverage and energy efficiency

5G ready to last an IoT lifetime

Integrated edge computing platform



Passed all inter-operability tests



Passed Swisscom Live network tests



Global certifications on-going

UBX-R5: A highly efficient platform investment.



- The UBX-R5 platform is based on the UBX-R3 LTE Cat 1 platform, the first u-blox cellular chipset platform fully developed in-house.
- Strong re-use of modem IP in UBX-R5 for much shorter development time.
- Radio integrated on chip.
- LTE stack software proven on UBX-R3.



- UBX-R3: The first u-blox cellular chipset developed inhouse (LTE Cat 1)
- For high data throughput (up to 10 Mb/s)
- Offers coverage in 324 live networks in 137 countries



What sets us apart with UBX-R5?

Solving the relevant problems of cellular connectivity.











Security

Built-in end-toend security

Longevity

Designed to last an IoT lifetime Services @ the core

Unique access to on-chip data sources Low power

Very long battery life time

u-blox has full technology ownership.

Unprecedented benefits for industrial IoT applications.

- u-blox core IP for
 - LTE modem (radio, baseband processor)
 - Security
 - Power management
 - GNSS positioning
- Key benefits
 - Comprehensive problem solving for IoT
 - End-to-end secure solution
 - Only one product for world-wide use
 - Commitment to longevity of product availability
 - Highly competent technical support





- UBX-R5, the second u-blox cellular chipset
- LTE-M and NB-IoT technology
- 5G ready
- Certifications and approvals for Verizon, AT&T, T-Mobile, Giteki, Softbank, and many more
- FCC, ISED, GCF, RED, [...] certified



Swisscom, as the leading 5G network operator in Europe, is going to refarm 2G by end of 2020. Therefore it is crucial for customers as well as for Swisscom to have products such as SARA-R5 which has been successfully passed first tests on Swisscom's LTE-M network, to migrate legacy m2m application to LTE IoT solutions.



Marco Canepa (Field CTO IoT)



UBXHBS enables SARA-R5: Key strengths

SARA-R5 series.

How u-blox chipsets are integrated.





Introducing the SARA-R5 module.

Our most advanced, secure, and highly integrated chipset to date.

Designed to last an IoT lifetime and 5G-ready with the u-blox UBX-R5 chipset:

- Built-in end-to-end security with hardware-based Root of Trust inside discrete Secure Element, EAL5+ High compliant
- Accurate and reliable positioning, always and everywhere, with u-blox M8 GNSS receiver
- Optimized ultra-low power consumption
- Critical firmware updates delivered and services enabled via uFOTA
- Simplified multi-regional deployments with each hardware variant





SARA-R5 Module

Including the UBX-R5 chipset



Security: IoT security from the ground up.



How we create trust to secure functions.



Provision trust: Insert Root of Trust at production

An immutable chip ID and hardware-based Root of Trust provide foundational security and a unique device identity. The only product in the market.

Leverage trust: Derive trusted keys

Secure libraries allow generation of hardware-backed crypto functions and keys that securely connect to the cloud.

Guarantee trust: Use keys to secure any function

Ensures authenticity, integrity, and confidentiality to maintain control of device and data.

Security solutions developed in partnership with Kudelski, a world leader in securing digital content.

Longevity. Designed to last an IoT lifetime.

- Roadmap stability is an essential aspect we can guarantee
- No third party dependencies for key components like LTE or Positioning chipset
- Long-term support of the entire platform, from the module down to the chipset level
- Full hardware and software ownership
- Products are 5G ready and will work in 5G LTE networks







Services @ the Core.

Adding value.

- UBX-R5 is designed with a **service-centric architecture**
- Unique access to on-chip data sources used to provide reliable and highly secure services
- Localization reliable position outdoors and indoors with CellLocate®
- Timing accurate timing information everywhere with CellTime®
- Management always up to date with uFOTA
- Scalable security tailored offering of features and services





Power: Ultra low power.

Smart Metering.

- LTE-M and NB-IoT standards decrease overall power consumption to meet industry requirements for long battery life time.
- SARA-R5 series assures maximum design flexibility, while preserving overall system power consumption.
- SARA-R510M is optimized to deliver the lowest achievable power consumption making it ideal for metering, smart city, connected health, security and surveillance, remote monitoring and other battery-powered applications.
- Unmatched stand-by current consumption <1 µA





Reliable Positioning.

Combining core technologies.

- SARA-R511M for applications where reliable positioning is paramount
 - Powered by an integrated UBX-M8 chip design
- Targets mobile applications in the automotive, fleet management, tracking, and telematics sectors
- Maximum functionality
 - Transferring data and getting position concurrently
- Benefit from superior positioning performance of UBX-M8
 - Best in class sensitivity, accuracy, fix-time

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Expanding the revenue model.

Pillars constitute UBX-R5 and deliver premium value.



Various components of platform investment deliver enhanced ROI.

Product Element	Customer Benefit	Revenue Model
Modem	Basic connectivity	Unit revenue (basic)

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Application processor	Lower HW cost	Unit revenue (add-on)
GNSS engine	Positioning and timing information	Unit revenue (add-on)
Edge computing	Less data volume	Unit revenue (add-on)

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Edge computing	Less data volume	Unit revenue (add-on)
Secure element	End-to-end security	Upfront (add-on) or recurring fee
Services @core	Enhanced product values	Upfront (add-on) or recurring fee

Migration to SARA-R5 for extracting more value.



Secure IoT and maintenance services.



Securing IoT connectivity a lifetime long





- Basic connectivity only
 - OEM must add key functionality, as far as supported by chipset

- Basic connectivity plus
 - Built-in security
 - Services @ the core
 - Edge computing
 - Ultra low power
 - Positioning and timing with cellular services
 - Built to last an IoT lifetime

Long harvesting time available.



Standards and networks have a long lifetime.



Market Valuation of wireless technology



Comparables from recent M&A activity.

Acquirer	Target	Transaction Value (in Million USD)	Enterprise Value (EV)/Sales 2019	EV/EBITDA 2019
ON Semiconductor	Quantenna	939	4.2	18.1
On Semi	Quantenna			
NXP	Marvell Wi-Fi/BT business	1760	5.9	>25*
infineon	CYPRESS EMBEDDED IN TOMORROW*	9132	4.6 6.0**	18.6
Infineon	Cypress company			
*estimated; ** estimat	ed without memory business (wireless only)			

Summarizing.

u-blox brings core wireless technology to the benefit of IoT.

- Developing cellular chipsets is hard, only a few players are capable doing it.
- We own the required technology to realize secure cellular connectivity.
- With chipset and modules we can tailor our offering to serve the entire IoT market.
- Wireless technology is highly valuated by capital markets.





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The best is yet to come!