KEYSIGHT

Boost IoT with 5G NR RedCap

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The Origins of Redcap aka “Red”uced “Cap”acity

First RedCap Release in R17

main areas of interest for RedCap and the major initiatives undertaken in Release 17:

Use case	Cost-reduction strategies	Low power consumption enhancements
• industrial sensors • wearables • surveillance	• reduced Tx / Rx and MIMO • reduced bandwidth • half-duplex and reduced antenna gain	• relaxed DL and RRM monitoring • extended disconnect receiver times • small data transmission

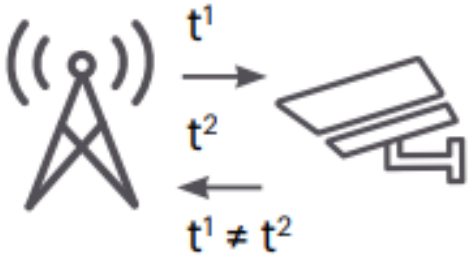
5G NR RedCap goals and related implementation strategies

RedCap's first use cases, data rate, and latency requirements

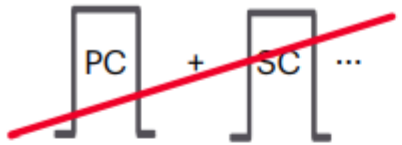
Use case	Data rate (max)	End-to-end latency	Service availability
Wireless industry sensor 	2 Mbps	< 100 ms	99.99%
Wearables 	25 Mbps		
Surveillance 	150 Mbps (DL), 50 Mbps (UL)	< 500 ms	99 – 99.9%

Source: 3GPP TR 38.875

Benefits and trade-offs of RedCap cost-reduction strategies

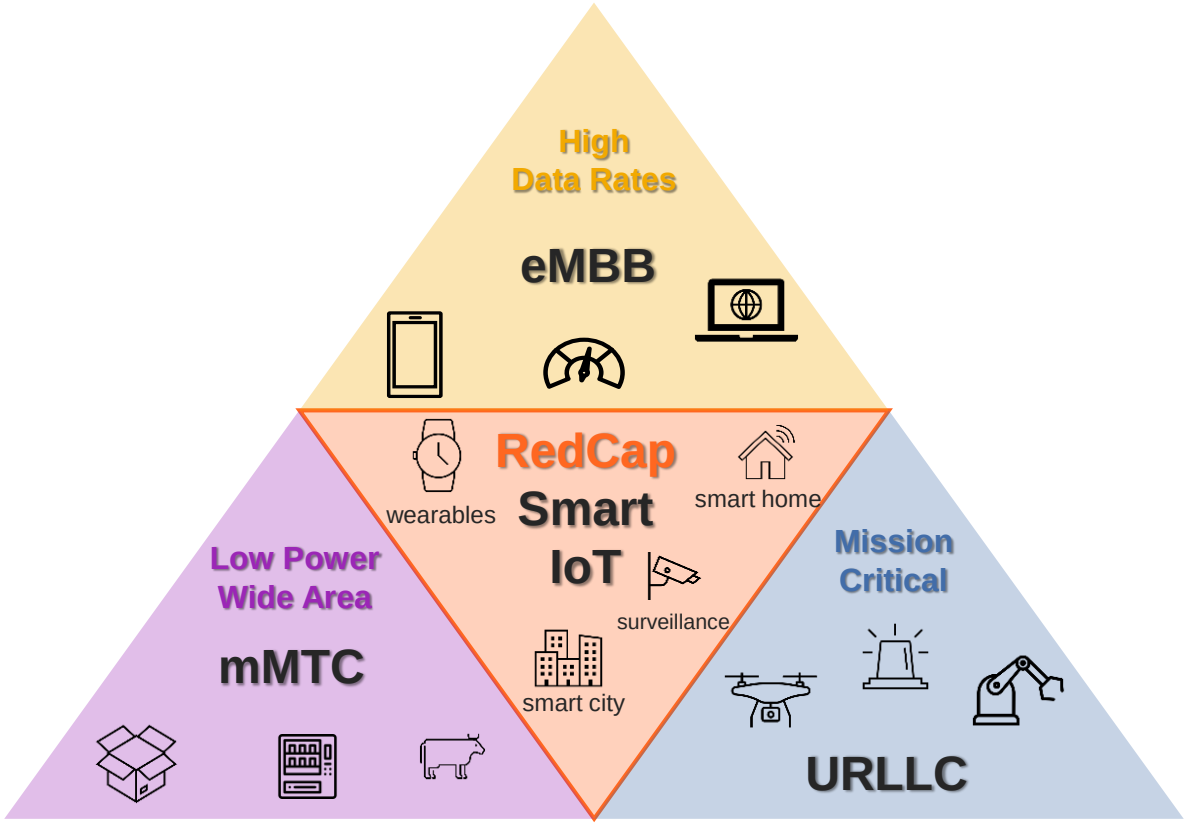
	What	Benefits	Trade-off
	Reduced number of Tx and Rx with support for maximum DL 2x2 and UL SISO only	Strong cost reduction	Coverage and maximum data rates
	Reduced bandwidth of 20 MHz (FR1) [1]	Strong cost reduction	Coverage and maximum data rates
	Half-duplex FDD instead of full-duplex FDD	Moderate cost reduction	Increased scheduling complexity as RedCap half-duplex device will not monitor DL messages while communicating in UL

Benefits and trade-offs of RedCap simplifications

	What	Benefit	Trade-offs
	Single carrier, with no support for carrier aggregation scenarios	Simplified baseband development	Reduced maximum throughput
	Single connectivity, NR standalone only	Reduced RF module size and cost	Requires 5G standalone coverage and cannot connect to 5G networks using LTE as an anchor; also, no support for fallback to other RATs, which reduces coverage
	Power Class 3	Optimized power consumption reduces built-in battery size	Coverage

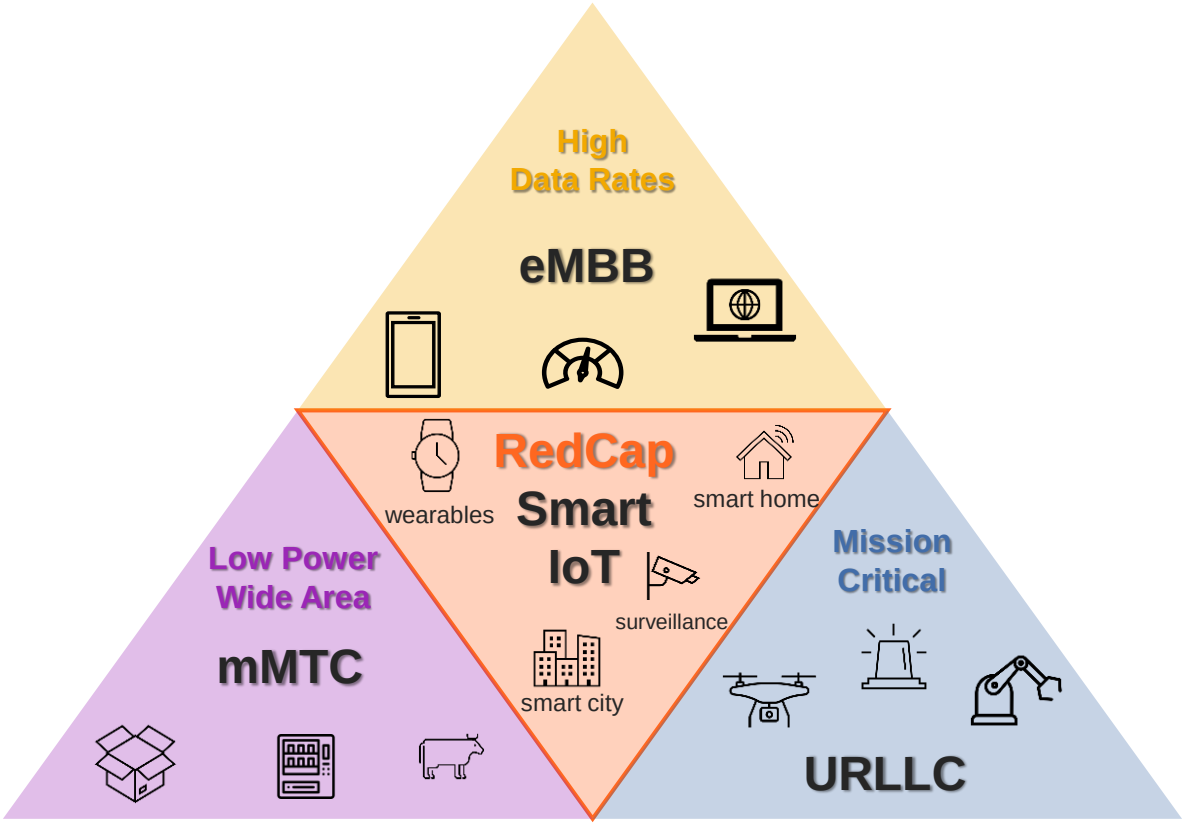
Rel-17 5G NR Reduced Capabilities (RedCap)

5G Use Case Triangle: Why do we need yet another type?



Rel-17 5G NR Reduced Capabilities (RedCap)

5G Use Case Triangle: Why do we need yet another type?



RedCap Example Use Cases

	Surveillance	Industrial sensors	Wearables
Data Rate	< 25 Mbps	2 Mbps	< 30Mbps
Battery life	-	Years	Days
Latency	500 ms	100 ms	-

RedCap Maximum Capabilities as per 3GPP 38.306

	FR1 NR	FR1 RedCap	FR2 NR	FR2 RedCap
Bandwidth	100 MHz	20 MHz	400 MHz	100 MHz
DL Antenna	Up to 4Rx	1Rx or 2Rx	2Rx	2Rx
DL MIMO	Up to 4 layers	1 or 2 layers	Up to 2 layers	1 or 2 layers
Cost reduction	0%	~65%	0%	~50%

No support for CA, MR-DC, DAPS, CPAC and IAB.

Source:
Toward Smaller and Lower-Cost 5G Devices with Longer Battery Life: An Overview of 3GPP release 17 RedCap

Cellular IoT Technologies Comparison

Why do we need yet another type?

	NB-IoT	Cat-M1	LTE Cat-1bis	NR RedCap
Use Case	LPWA	LPWA	Smart IoT	Smart IoT
Core Network	EPC / NGC	EPC	EPC	NGC
Bandwidth	180 kHz	1.4 MHz	20 MHz	20 MHz
Antennas	1Tx, 1Rx	1Tx, 1Rx	1Tx, 1RX	1/2Tx, 1/2Rx
Modulation	QPSK	64QAM	64QAM	256QAM
Battery Life	Years	Years	Days	Days
Throughput (DL/UL)	26/62 Kbps	1/1 Mbps	10/5 Mbps	220/100 Mbps
Duplexing	FDD	FDD, TDD	FDD, TDD	FDD, TDD
Max Coupling Loss	164 dB	164 dB	140 dB	140 dB

- Capabilities of these technologies are reduced (2x2 MIMO, low data rates, low bandwidths, …)
- C-IoT Products are reduced Capabilities and so test platforms are expected reduced as well

Press Release: Keysight – MediaTek First R17 RedCap call

Accelerating 5G RedCap Deployments

- Successfully established a 5G Rel-17 RedCap data call between UXM 5G and MediaTek Dimensity 5G chipsets
- Accelerate the deployment of new Rel-17 5G features including reduced power use, and enhanced MIMO capability
- RedCap devices are less complex, lower cost, and consume less power, allowing them to address new use cases such as industrial sensors and wearables

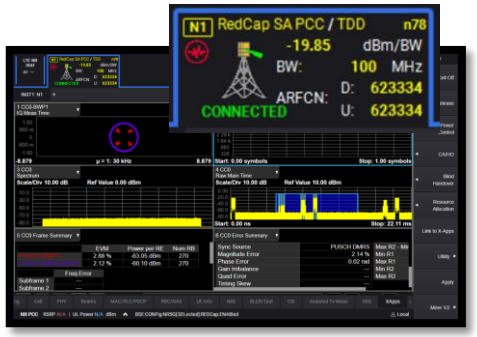
Keysight and MediaTek Achieve 5G Connection Based on 3GPP Release 17 and RedCap Technology

- **Collaboration accelerates the deployment of the latest 5G technology**
- **RedCap will enable more 5G use cases and extend the 5G device ecosystem**

SANTA ROSA, Calif. November 30, 2022

Keysight, MediaTek Achieve 5G Connections with Rel-17 and RedCap

RedCap
(NR-light)



Introducing the E7515R UXM 5G Wireless Test Platform

Optimized platform for 5G NR RedCap and C-IoT testing

- ✓ The only platform for RedCap & C-IoT
- ✓ Optimized reduced hardware platform
- ✓ Based on Industry's reference E7515B
- ✓ Leverage same software & solutions
- ✓ First to Market in new Rel-17 features
- ✓ Shipping from February 2023

E7515R UXM 5G Wireless Test Platform

Key features and capabilities

- Protocol, RF and Functional (IP data, Battery, Voice) testing
- Single cell, 2x2 MIMO, multi-technology focused on C-IoT
- FR1 frequency range up to 6GHz and FR2-ready
- 2 Tx (DL) + 2 Rx (UL) RF ports @ 100MHz
- Flexible RF connector usage (combined or separate Tx/Rx)
- Meet 3GPP technical specifications
- Data rates up to 220 Mbps in FR1 (1 Gbps for FR2)
- BBIQ interface to enable early FPGA development
- Embedded PC (external monitor or remote desktop)

All the capabilities you need for RedCap & C-IoT Testing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