Paris Session 2022

5G and the Power System Applications Requirements

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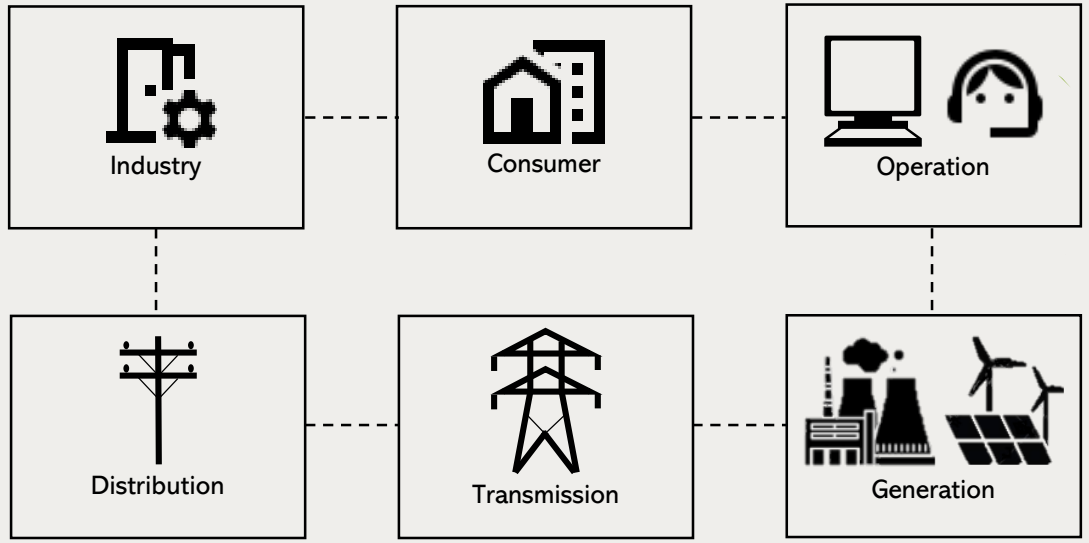
The digitalization of the electrical system and its challenges

Smart grid is the transformation of the electrical system using new technologies and innovative tools from the power generation sector to the final consumer.



Smart City | ***Internet of Things*** | ***IEC-61850***

Challenges:

1 Intelligent Devices

Massive integration of devices without compromising technical network requirements.

2 Latency

Strict requirements about time delay for critical mission applications.

3 High investments

Adaptation of wired network infrastructure for applications, such as teleprotection.

Efficiency, security and innovation in communication infrastructures!

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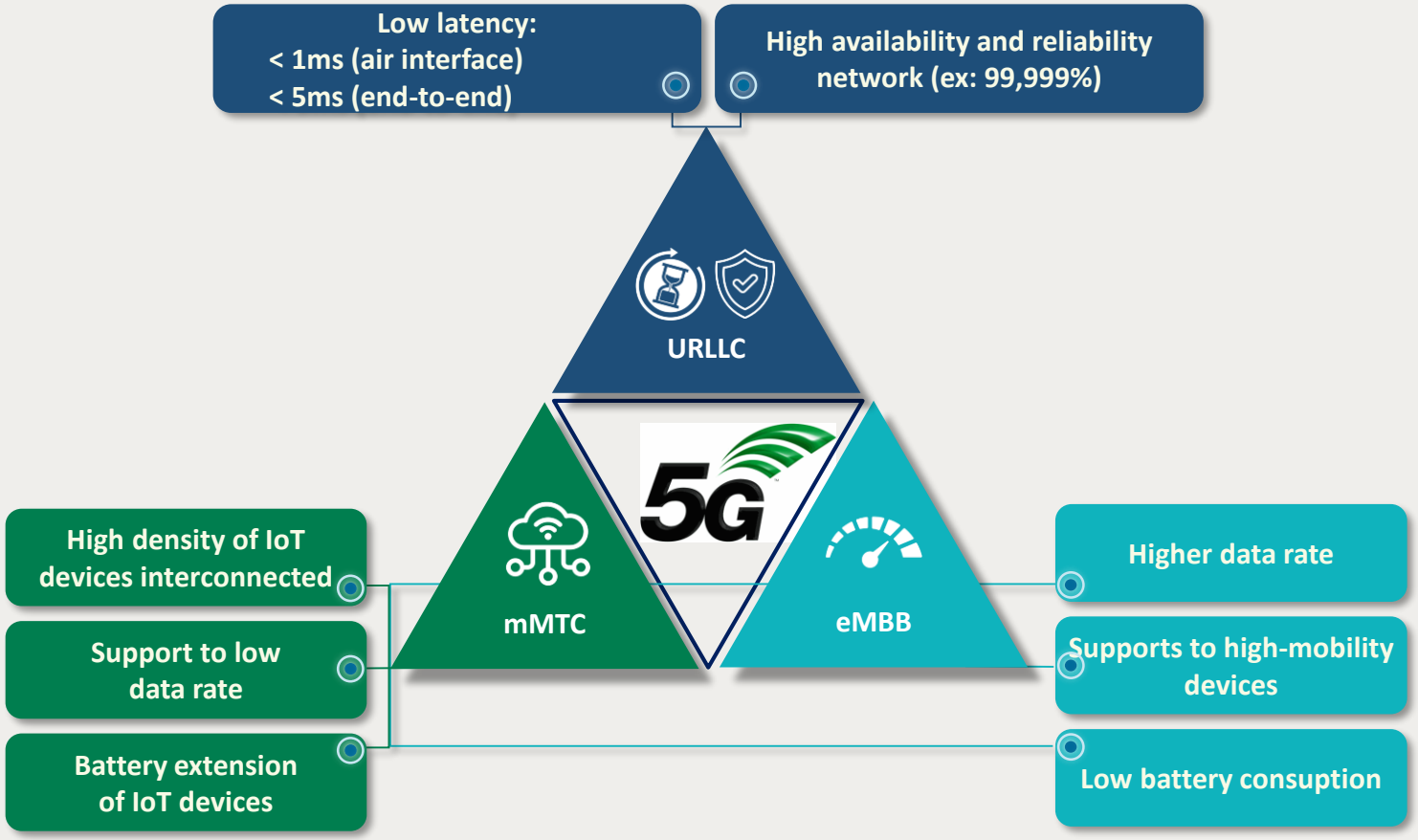
The 5G technology

Characteristics



Concepts and Enablers:

- Network Slicing
- Edge Computing
- Private Network

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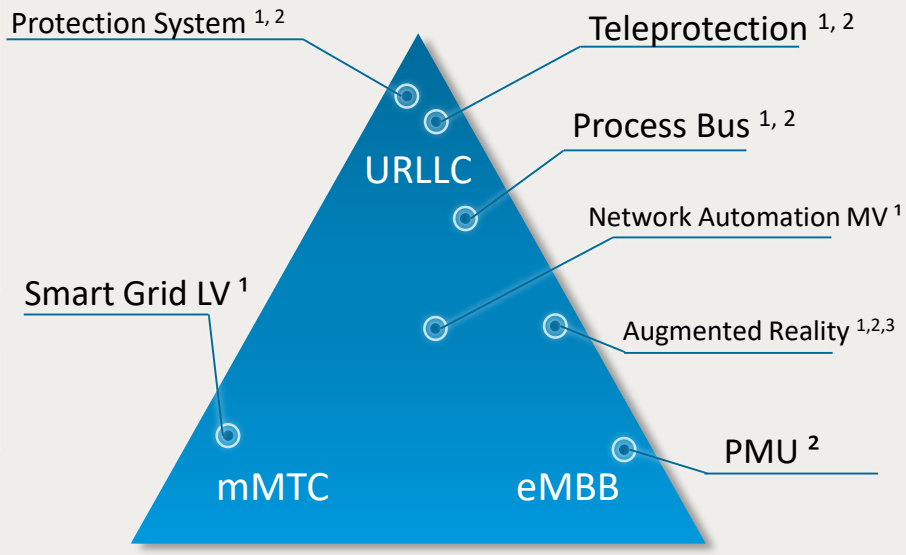
Power systems applications requirements

[1] Distribution
[2] Transmission
[3] Another applications



	Data rate	Latency E2E	Reliability	Availability	Density of connection
Teleprotection	< 64 kbps	< 10 ms	99,999 %	99,999 %	Low
Process Bus: Analog signals	> 15 Mbps	3 - 10 ms	99,999 %	99,999 %	Low
Protection System	< 10 kbps	3 - 10 ms	99,999 %	99,999 %	Low
Phasor Measurement Units (PMU – Cass M)	> 62 kbps	500 ms	99,000 %	99,98 %	High
Smart Grid in Distribution Field (Low Voltage)	1 kbps	< 1 s	-	99,897 %	High
Medium Voltage Network Automation	> 1 Mbps	< 50 ms	99,999 %	99,990 %	Medium
Augmented Reality (for intelligent inspections)	> 1 Gbps	<10 ms* <1 ms **	99,999 %	99,999 %	Low

* General Applications
** Critical Applications

5g in the power systems nowadays

Cases around the world

1. Process Bus communication using 5G Wireless System;
2. Topology Identification Method of Urban Power Grid based of 5G Communication;
3. Distributed Fault Recovery Scheme of Active Distribution Network;
4. Application of 5G communication Technology on intelligent inspection in 750 kV substation;

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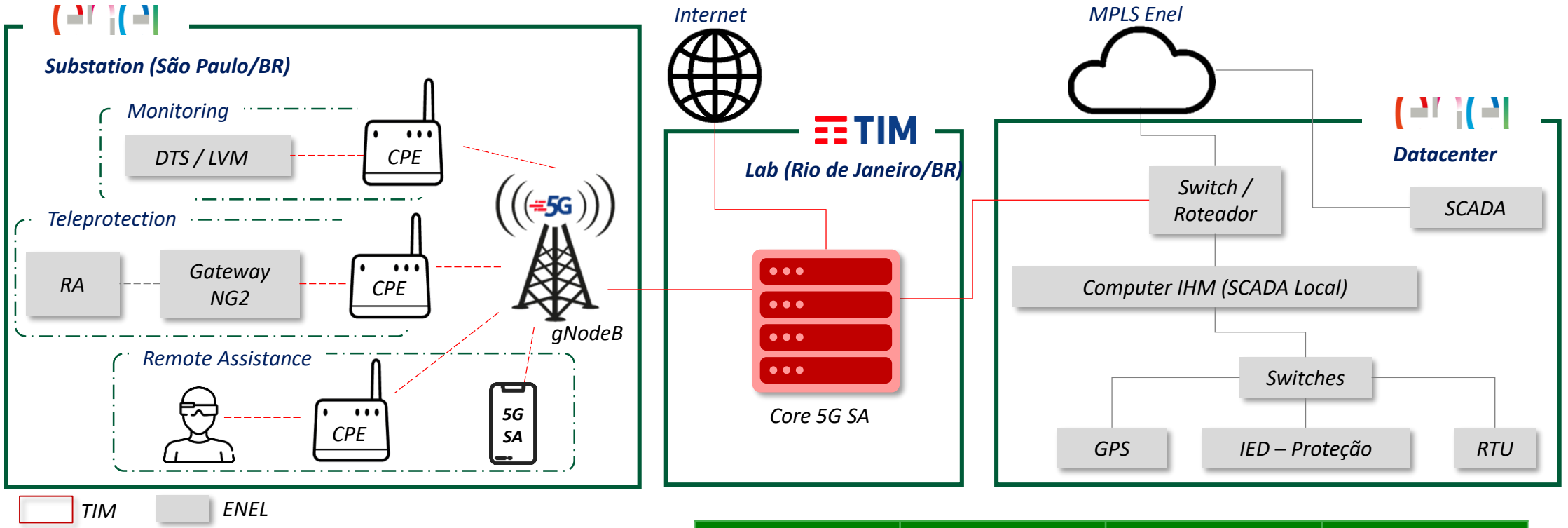
Proof of Concept

Remote assistance with HoloLens virtual reality glasses using a “Digital Twin” architecture

Proof of Concept



Setup	Max. DL Rate	Max. UL Rate	Latency RTT
CPE – 5G	613 Mbps	40 Mbps	40 ms
5G – 5G	1231 Mbps	82 Mbps	43 ms
4G – 4G	50 Mbps	10 Mbps	40 ms

Conclusion

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Thank you!

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