

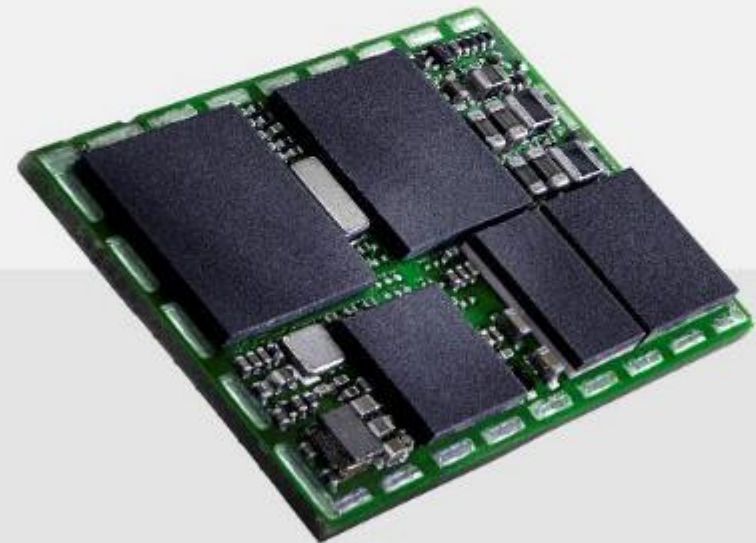
5G - Enabling Technologies

NGMN & ITU Conference on Licensing Practices in 5G Industry Segments

Jan 29th, 2019

Sylvia Lu

- 5G Tech Lead, u-blox AG
- Member of UK5G Advisory Board
- Board Director at CW (Cambridge Wireless)

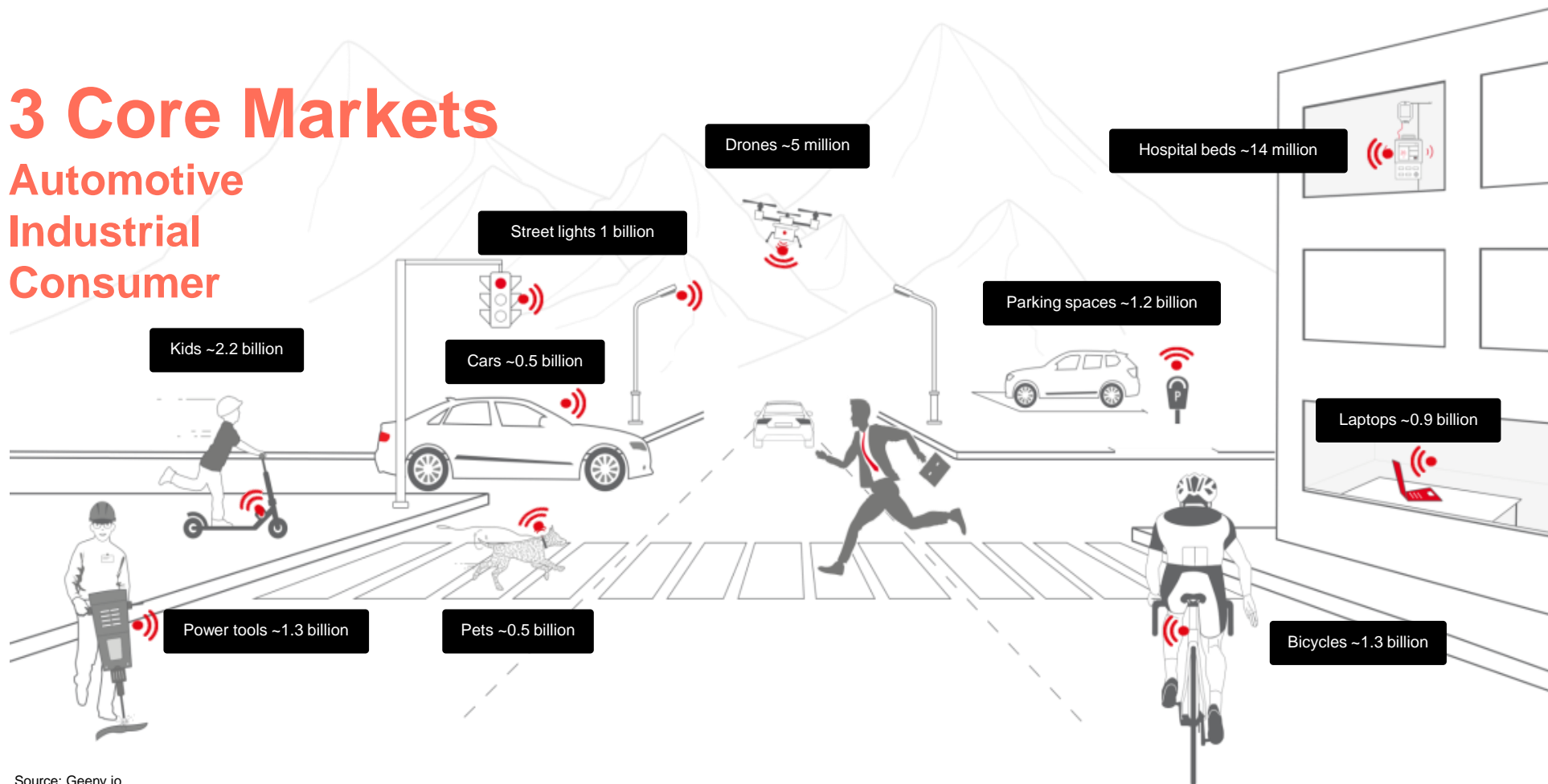


5G Era: Billions of things waiting to be connected



3 Core Markets

Automotive
Industrial
Consumer



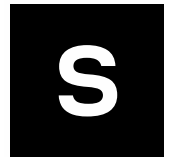
Source: Geeny.io



Positioning



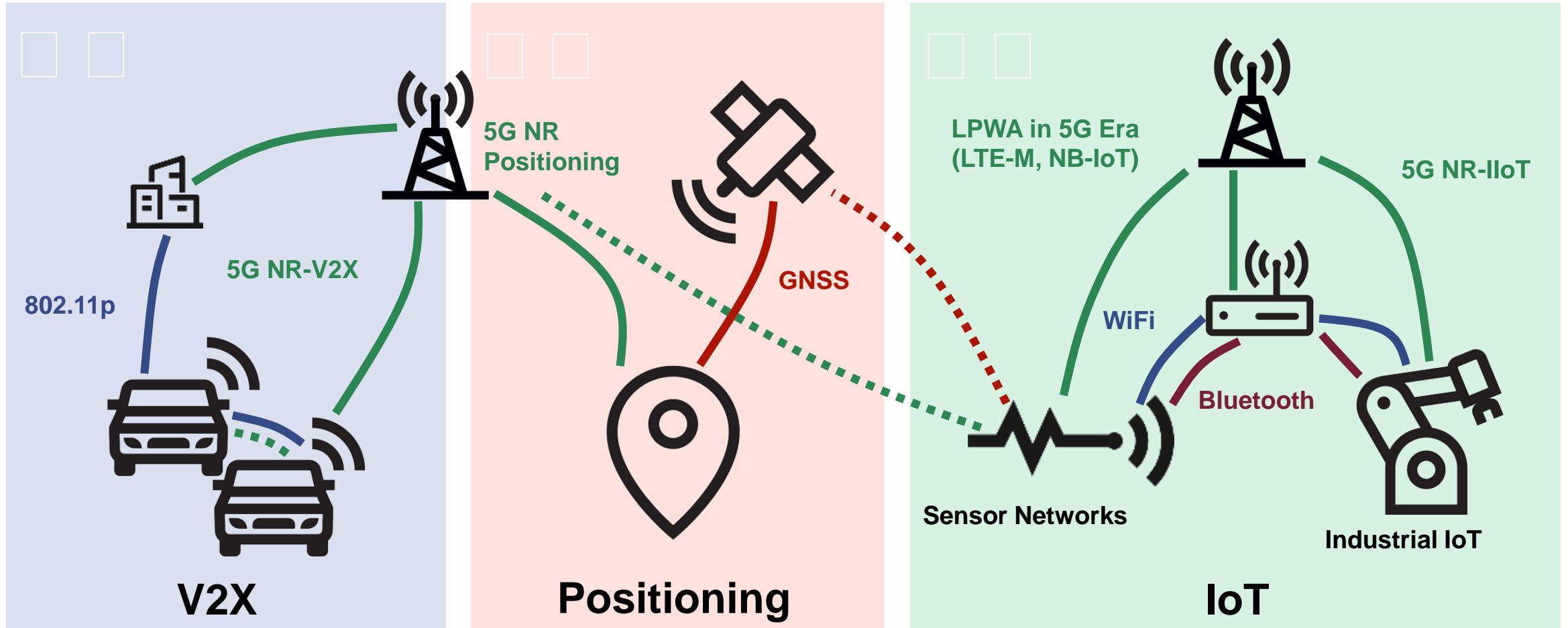
Cellular



Short Range

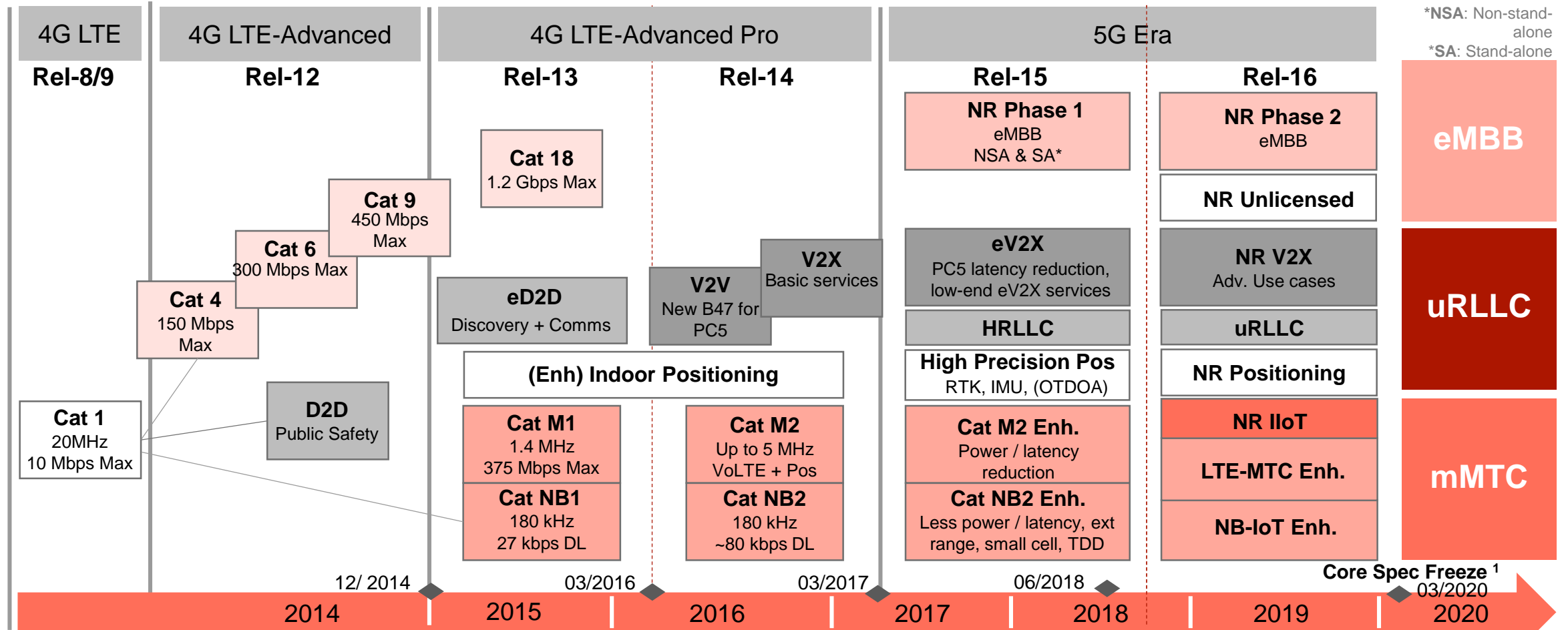
What does 5G mean to u-blox?

Complementary to existing technologies



3GPP technology roadmap

Evolution to 5G NR and LTE evolution in the 5G era



*NSA: Non-stand-alone
*SA: Stand-alone

¹ASN.1 freeze 3 month after that, Chipset availability expected ~1.5yrs after ASN.1 freeze

Challenges and Opportunities in the 5G Era



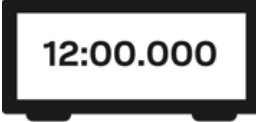





Towards higher precision & automation



- High accuracy & precision
- Easy to integrate
- In all environment
- Global deployment
- Mass market
- Low power consumption
- Low latency
- High availability
- High speed
- Scalability
- Security
- Data

Timing in Industrial Revolution

The relevance of timing in industrial revolutions

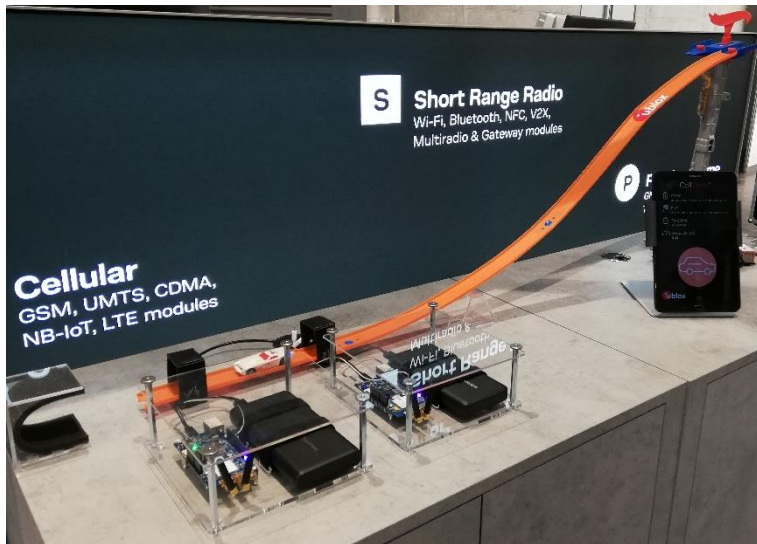
Hours	Hours-Minutes	Sec-mSec	μSec and better
			
			
1 st Revolution	2 nd Revolution	3 rd Revolution	4 th Revolution
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber physical systems

CellTime™ for remote applications

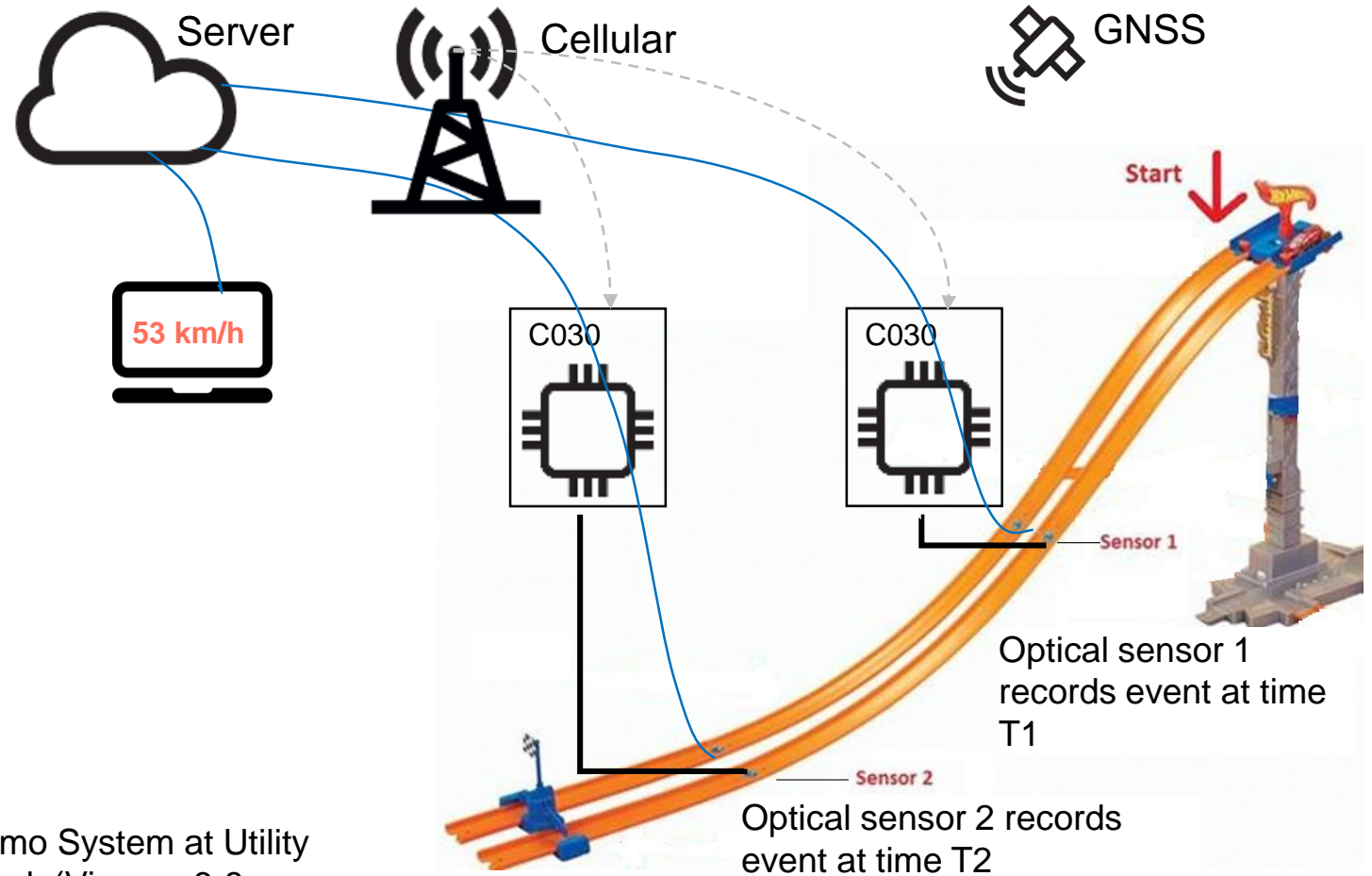
Hybrid relative timing, for IoT applications



- IoT timing applications
 - $<1\mu\text{s}$ relative timing between modems using cellular signals supported by service
 - calibration by modem GPS if accurate UTC desired
- Application i/f for device or service



Demo System at Utility Week (Vienna, 6-8 November 2018)



**UK
5G**

UK: 5G Trials and Testbed Programme

- Showcases the geographic and vertical possibilities of 5G

5GRIT

Lead: Cybermoor
Field: Consumer, Tourism, Agriculture



Liverpool 5G

Lead: Sensor City
Field: Health, Social Care



5G Rural First

Lead: Cisco
Field: Agriculture, Utilities



5G Smart Tourism

Lead: West of England CA
Field: Tourism



AutoAir

Lead: Airspan
Field: Connected Autonomous Vehicles



Worcestershire 5G Consortium

Lead: Worcestershire LEP
Field: Manufacturing



Thank you!

Sylvia Lu    

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- Advisory Board Member UK5G
- Board Director CW (Cambridge Wireless)

5G Industrial Automation Use Cases



Performance requirements

Use Case	Availability	Latency	Typical payload size	# of devices	Typical service area	
Motion control	Printing machine	>99.9999%	< 2 ms	20 bytes	> 100	100 x 100 x 30 m
	Machine tool	>99.9999%	< 0.5 ms	50 bytes	~20	15 x 15 x 3 m
	Packaging machine	>99.9999%	< 1 ms	40 bytes	~50	10 x 5 x 3 m
Mobile robots	Cooperative motion control	>99.9999%	1 ms	40-250 bytes	100	< 1 km ²
	Video-operated remote control	>99.9999%	10-100 ms	15-150 kbytes	100	< 1 km ²
Mobile control panels with safety functions	Assembly robots or milling machines	>99.9999%	4-8 ms	40-250 bytes	4	10 x 10 m
	Mobile cranes	>99.9999%	12 ms	40-250 bytes	2	40 x 60 m
Process automation	>99.99%	> 50 ms	Varies	10,000 devices per km ²		