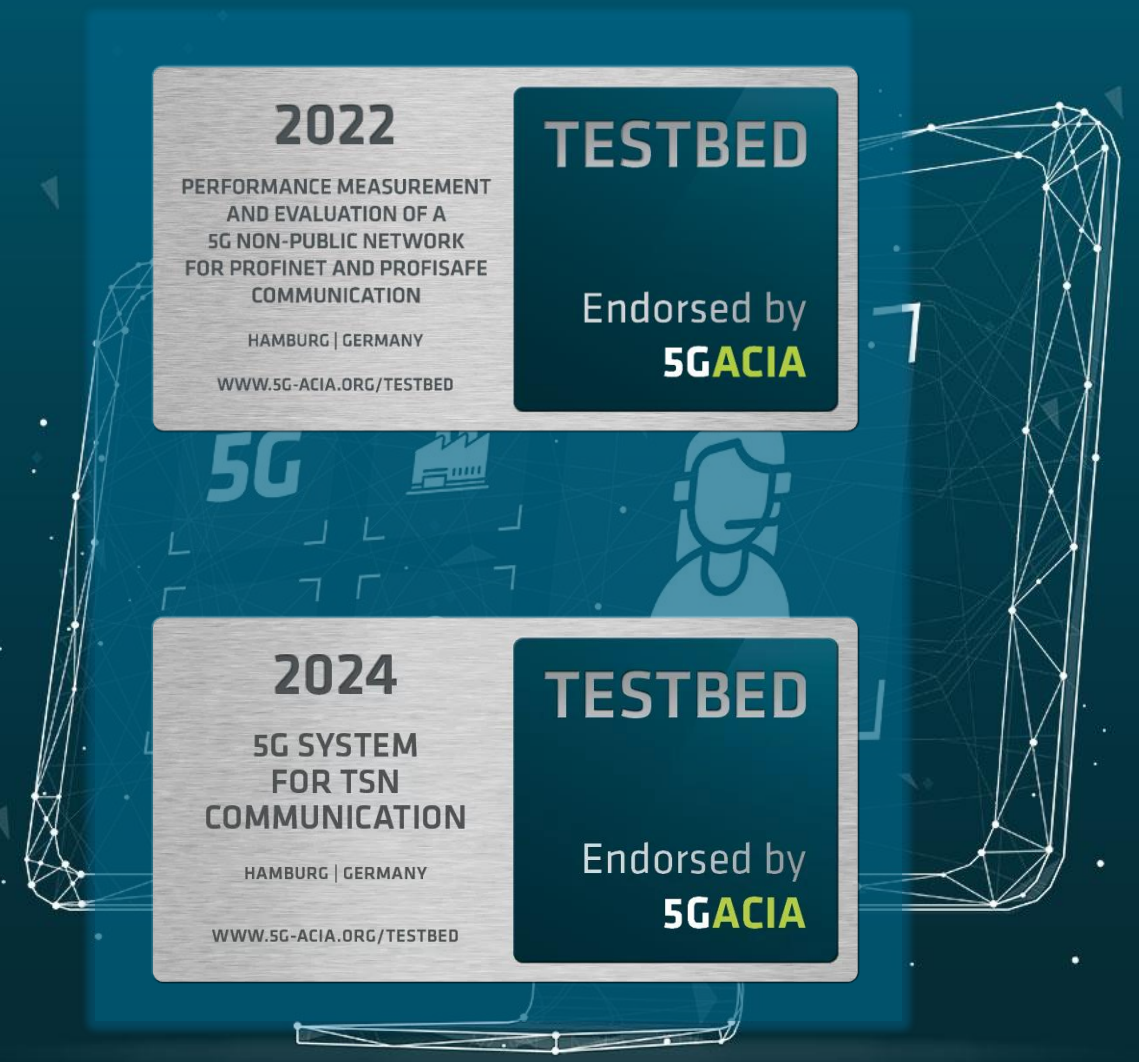
5G-ACIA Web Seminar

Testbed
Experiences and Perspectives



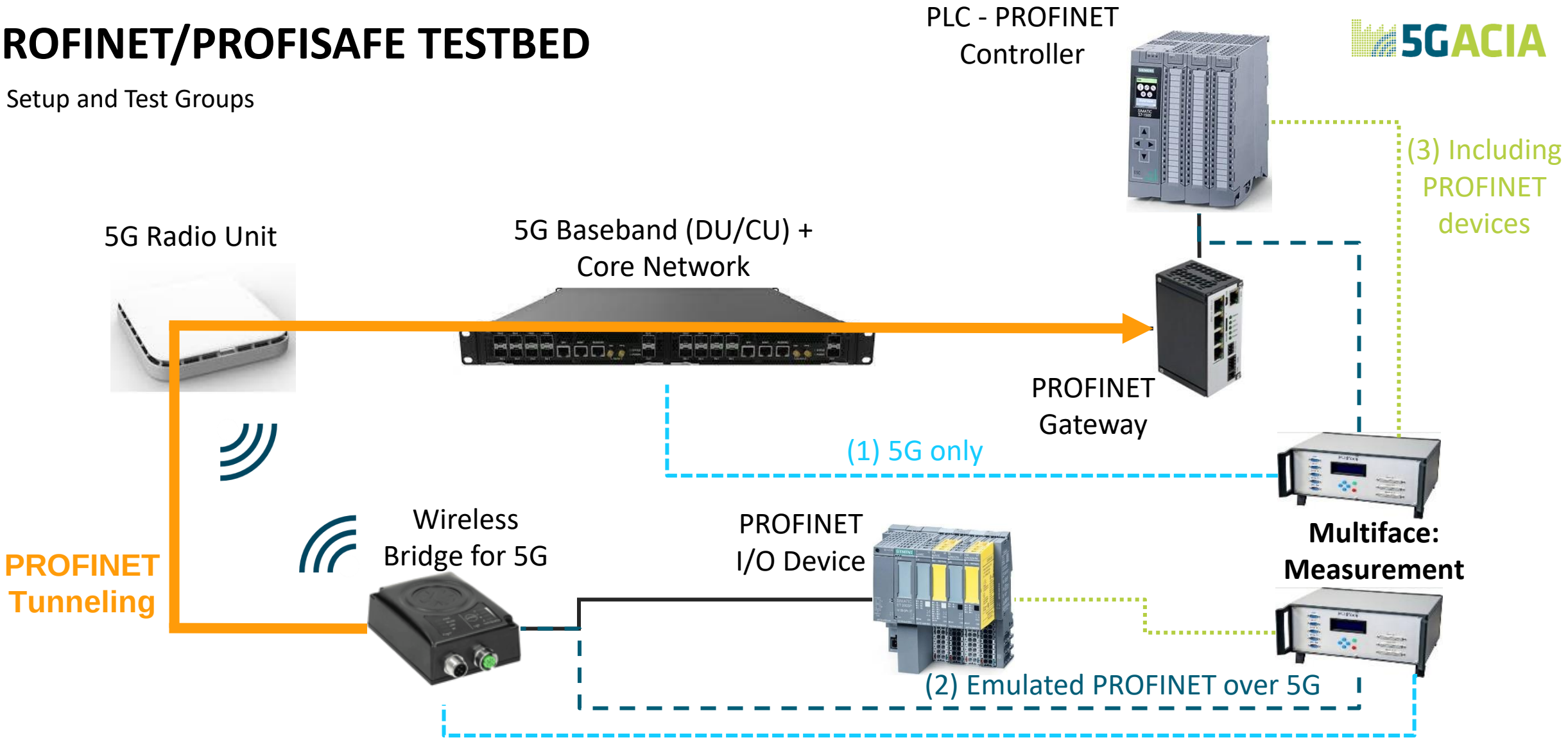
Presenter
Harsha Master | NXP

Outline

- Testbeds (1) PROFINET (2) TSN
- Results and Dissemination
- Learnings

PROFINET/PROFISAFE TESTBED

- Setup and Test Groups



Results Test group 1: Wired x Wireless (PROFINET over 5G)

- *P95 Wired = 45.1 ms*

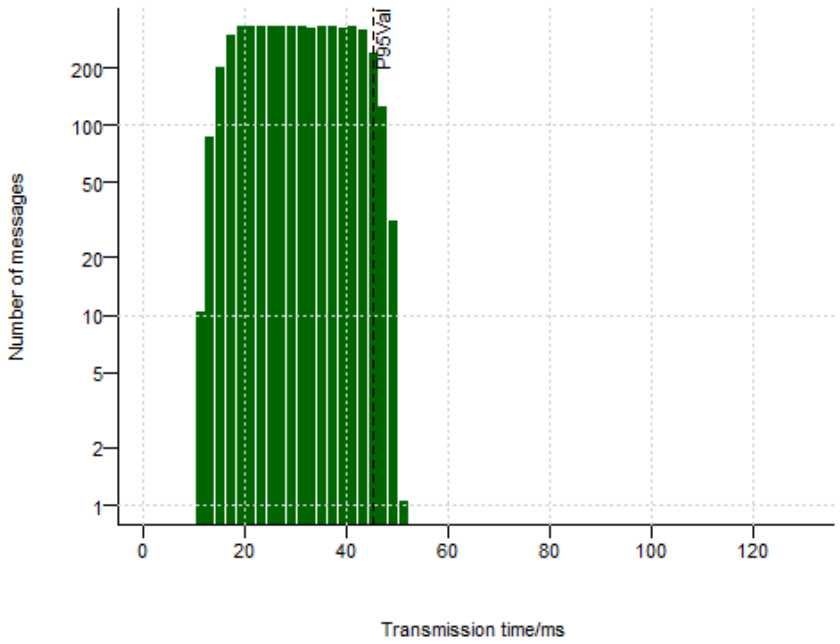


TABLE VI
TRANSMISSION TIME AND UPDATE TIME RESULTS OF TEST GROUP 2.

Test Case	Transmission Time [ms]			Update Time [ms]		
	Min	P95	Max	Min	Mean	Max
01 (Wired)	10.4	45.1	50.3	96	131	160
02 (Wireless)	18.6	52.6	127.8	32.5	131.3	339.9

- *P95 Wireless = 52.6 ms*

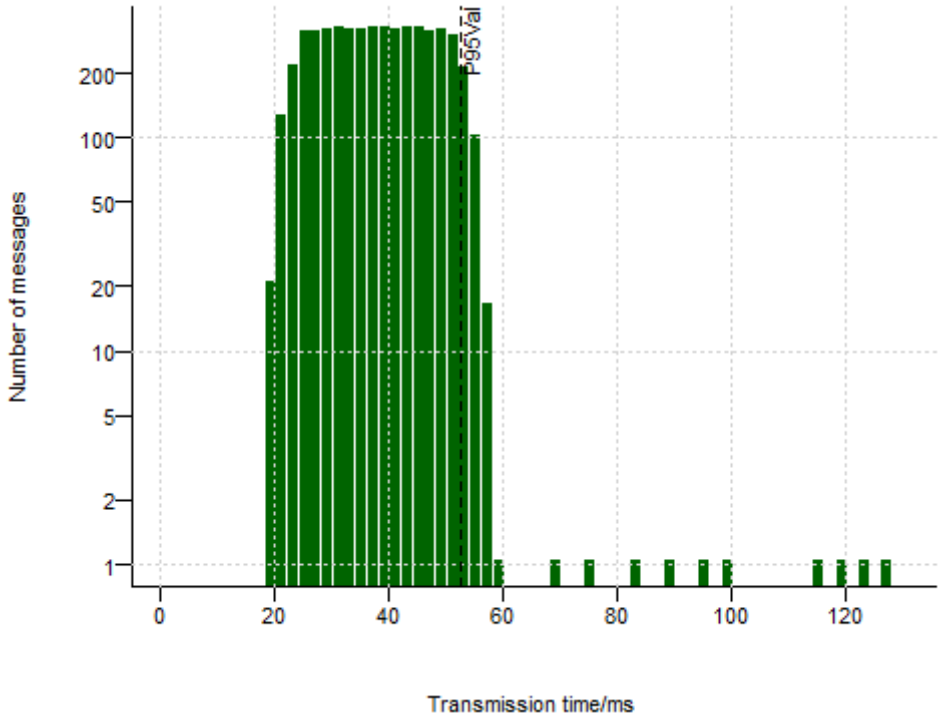


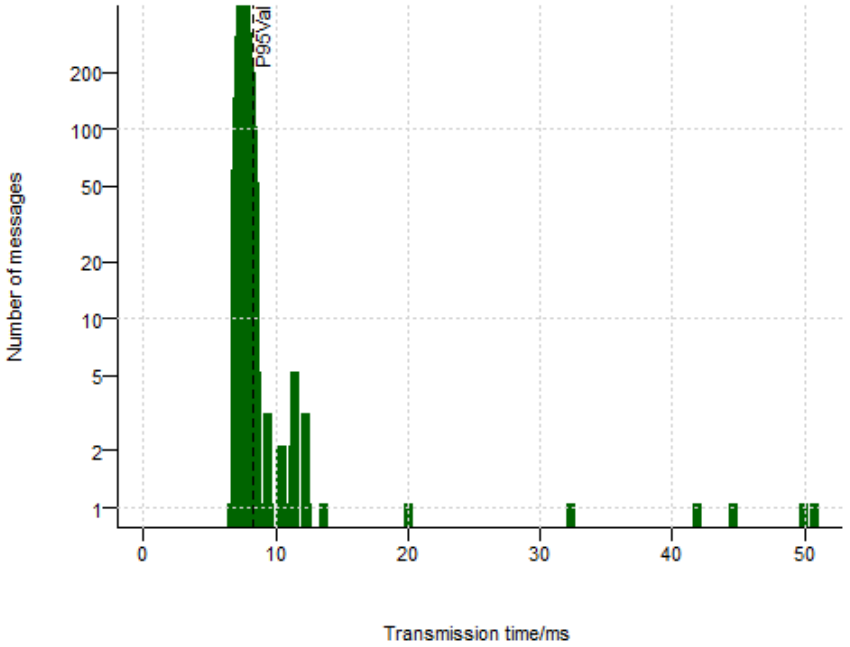
TABLE V
NUMBER OF RECEIVED MESSAGES, MESSAGE LOSS RATE, AND CONSECUTIVE INCORRECT MESSAGES FOR TEST GROUP 2.

Test Case	RX	MLR	CIM
01 (Wired)	5000	0	0
02 (Wireless)	4987	2.6e-03	1

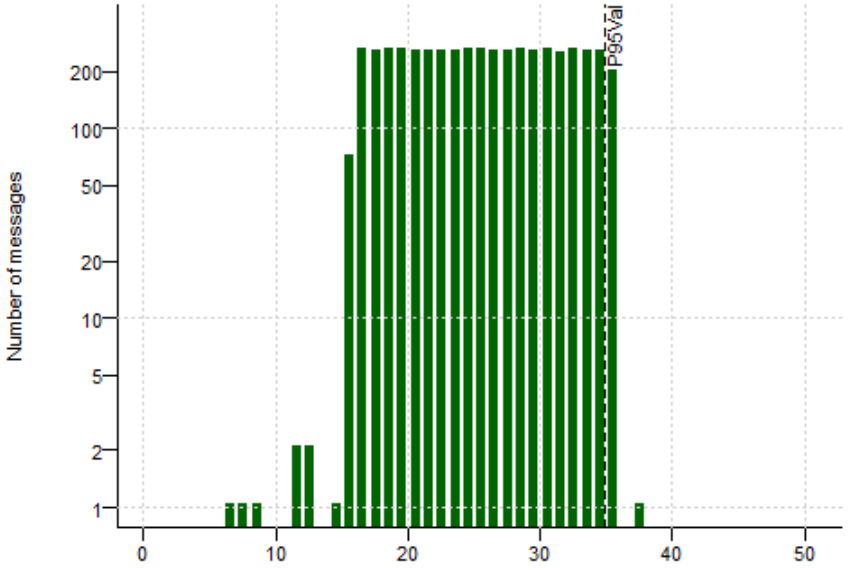
Results Test Group 2: Minimum Transfer Interval (Emulated PROFINET over 5G)

Histograms of transmission time

- *P95 Downlink = 8.2 ms*

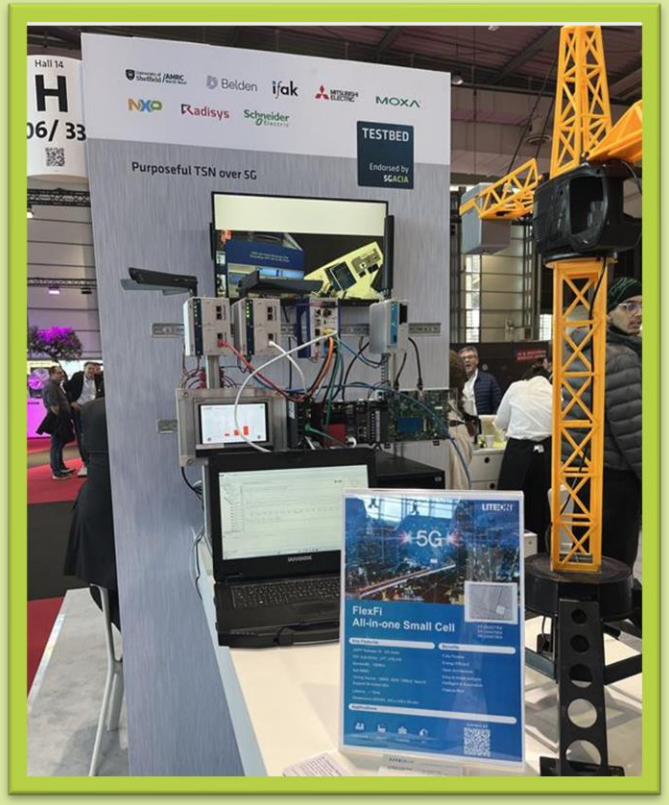


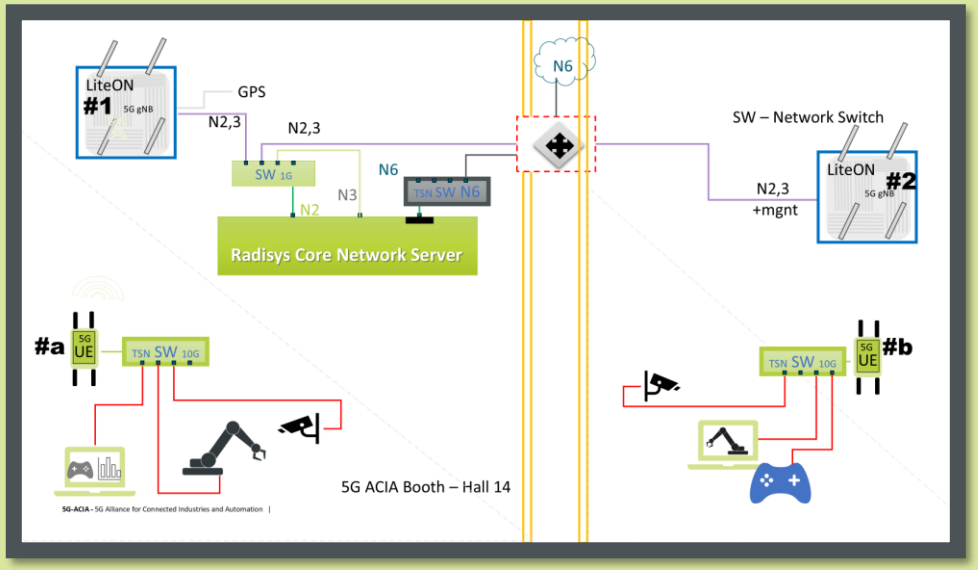
- *P95 Uplink = 34.9 ms*



Test Case	TI [ms]	LL	Transmission Time[ms] Min	P95	Max	Update Time [ms] Min	Mean
01	53	DL	6.6	8.2	50.8	10.6	53.2
		UL	6.3	34.9	36	39.3	53
02	23	DL	6.6	8.2	22.4	11.3	23.1
		UL	5.6	22.3	22.7	19.1	41.8
03	17	DL	6.6	8.1	12.5	11.8	17.1
		UL	5.6	16.7	17	19.8	47.1
04	11	DL	6.5	8.6	10.7	7.7	11.1
		UL	6	10.3	10.4	19.8	44
05	10	DL	6.4	9.3	9.7	7.2	10
		UL	5.6	6.5	6.7	19.3	20
06	7	DL	6.6	7	7	28	1203.4
		UL	6.1	6.3	6.4	139.8	144

PURPOSEFUL TSN OVER 5G





HANNOVER MESSE 2025

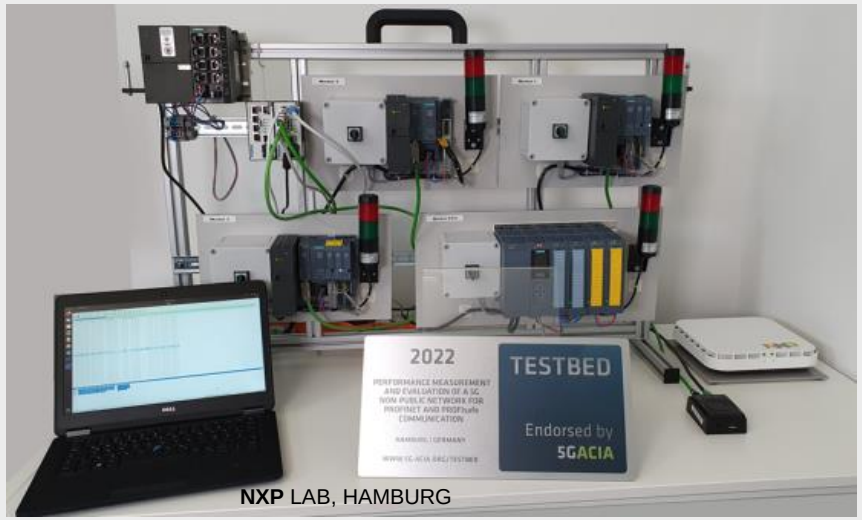
OPC FOUNDATION

Belden ifak MOXA NXP Radisys MITSUBISHI ELECTRIC Schneider Electric University of Sheffield AMRC Advanced Manufacturing Research Centre

Exhibitions and Dissemination

"**HANNOVER MESSE USA**", CHICAGO 2022

HANNOVER MESSE 2023



NXP LAB, HAMBURG

5G ACIA INDUSTRIAL DAY, TAIPEI 2023

Learnings & Prospectives

Collective Effort & Contribution of Partner

- **Expertise > Technical and Beyond**
  - Characterizing influence of 5G implementations (for example latency)
  - Setting 5G Industrial network parameters to manage the performance (example PROFINET and PROFIsafe)
  - Integrating multivendor TSN solutions over 5G ->*interoperability*
  - Identifying requirements of TSN to support Wireless
- **Resources > Systems & Devices, Engineers, Architects**
  - Test and improve of industrial UEs prototype
  - Brilliant minds from varied specialties
  - Opportunity to collaborate with organizations interested in TSN
- **Opportunities > Fairs, Demonstration, Presentation, Events**
- **Accommodation > include side demos, and related topics**
  - Industrial 5G Safety Demo
- **5G-ACIA Support**
  - Perfect environment to find the right partners
  - OT & ICT Ecosystem
  - Systematic approach to dissemination and publication of results to a focused audience

Thank You !

Content Credits & Support

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