TIGER
ExperimenTal evaluation of a new IoT board embedding 5G tEchnology in Fed4FiRe+ (F4Fp-SME-COD210907-01)

FED4FIRE | European Commission | insigh.io — embedding intelligence

GOALS

The TIGER experiment aimed at the validation and assessment of INSIGHIO's new 5G-IoT MVP prototype, into a real-world 5G environment, using the TRIANGLE testbed. Main goals were:

- Verification of 5G radio connectivity
- Benchmarking of core KPIs (data speed, latency, reliability, energy consumption)
- TRL advancement to 6 (operational environment demo)

CHALLENGES

- 5G network roll-out and commercial services still at initial stage delaying technology and testing uptake
- Testing in Public 5G Network has limitations:
  - Zero input for network configuration and parametrization
  - Unpredictable background traffic load conditions
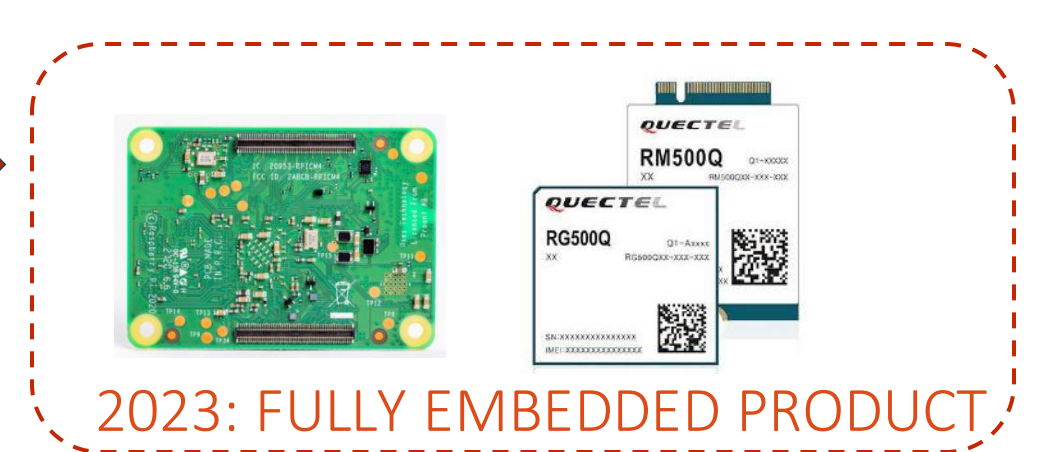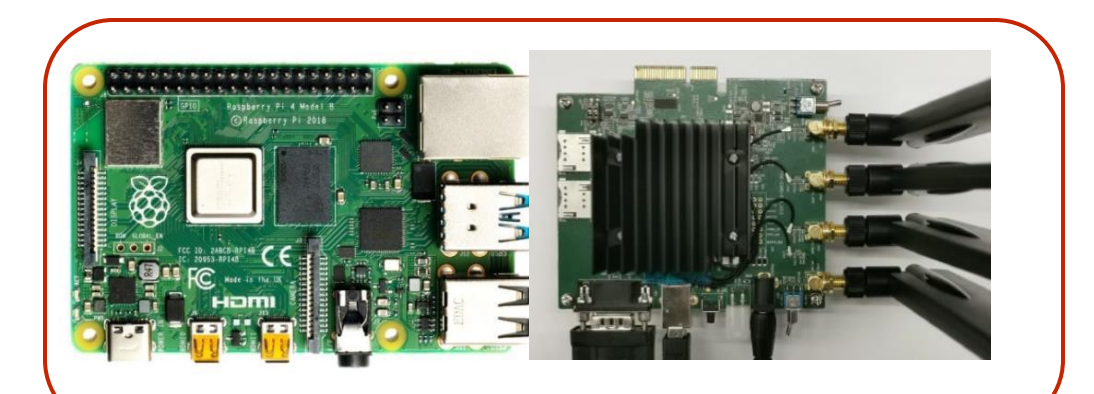 - Heavy data usage (10 GBs per experiment batch)

DEMO SETUP
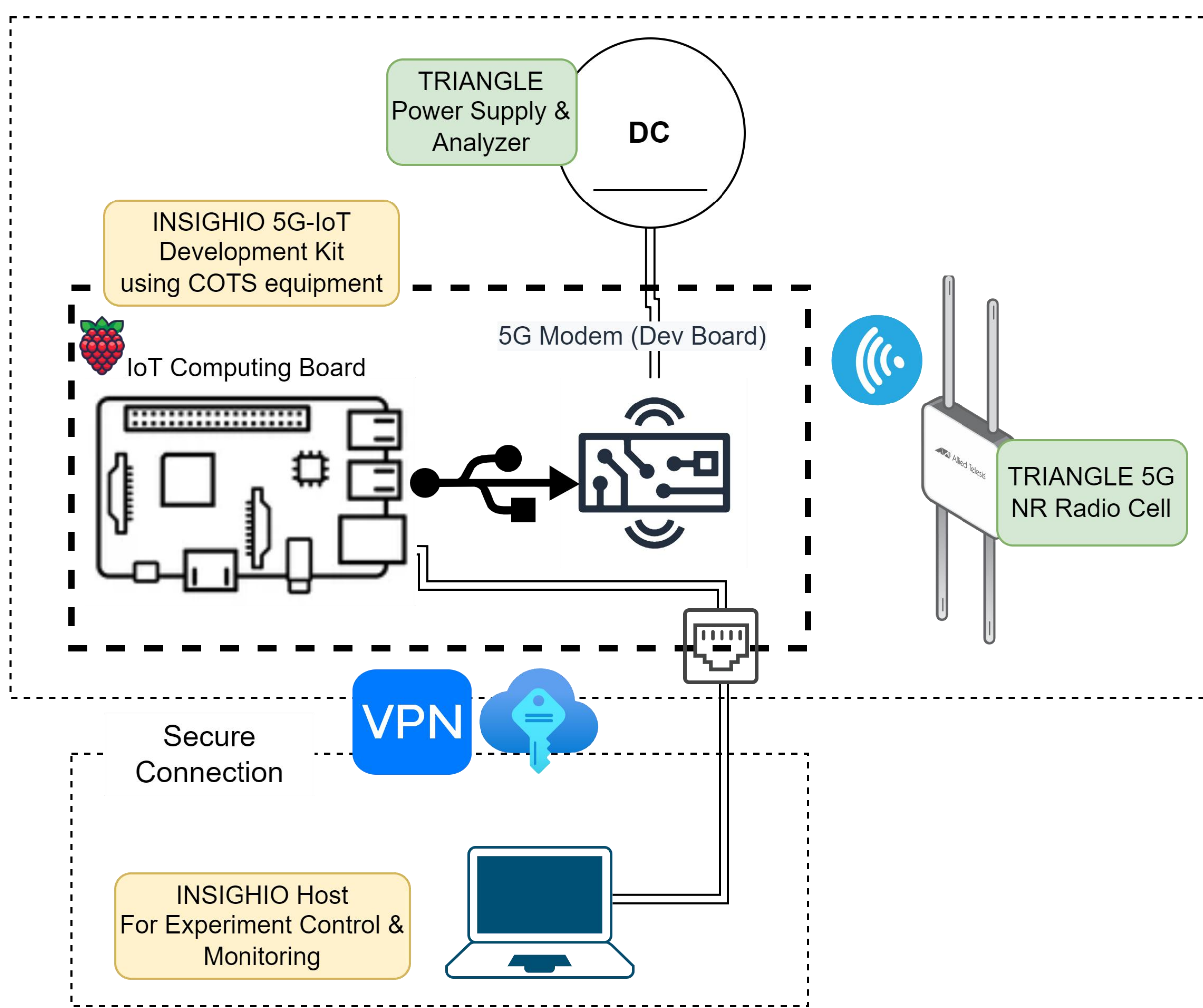
USED RESOURCES & TOOLS

- Private 5G Cell based on Nokia's commercial radio equipment accessed through test SIM cards
- DC Power Supply & Analyzer
- Secure Local Network Resources (VPN)
- Power Analyzer Automated Script (SW)

5G-IOT MVP

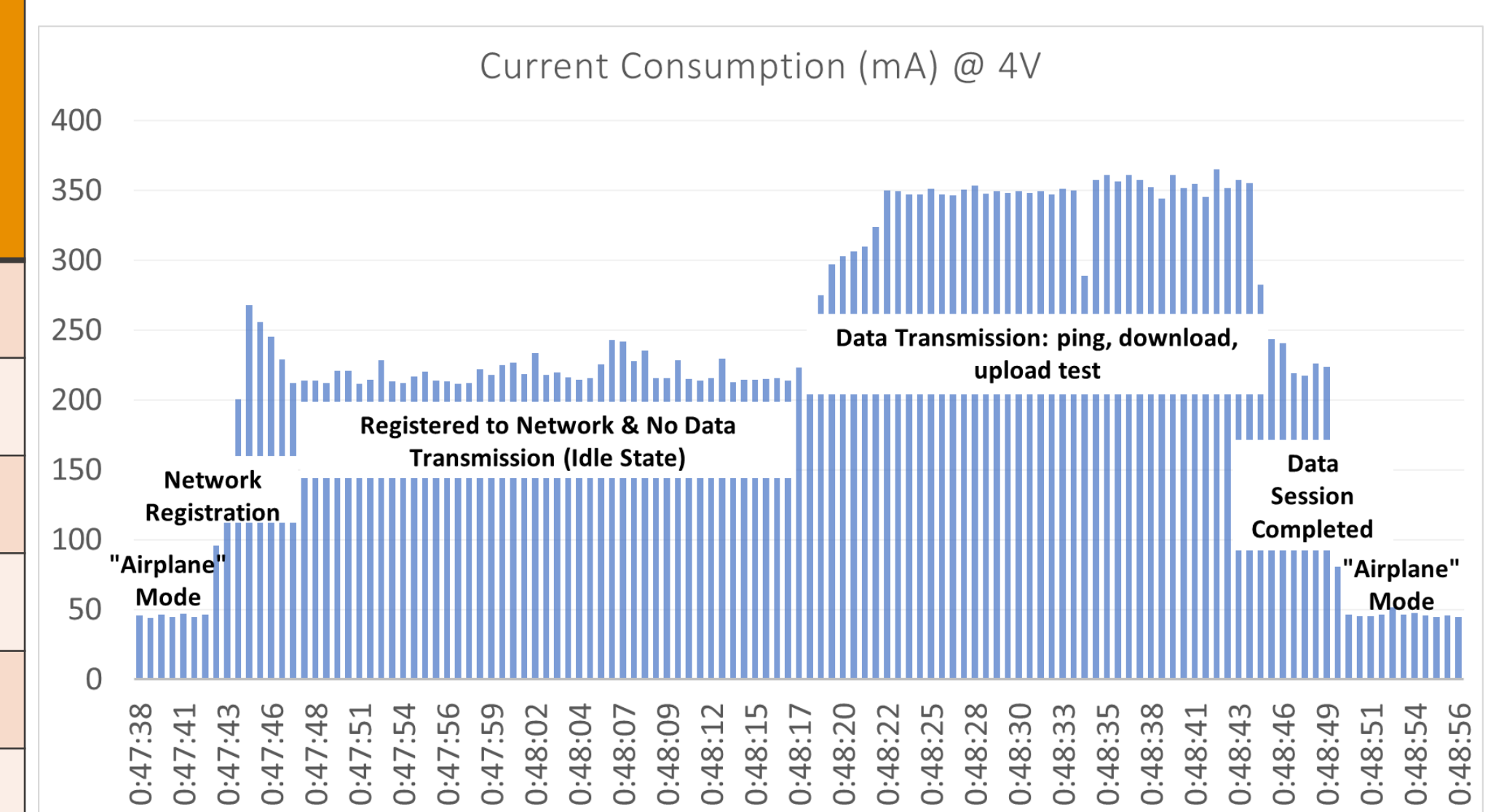2023: FULLY EMBEDDED PRODUCT
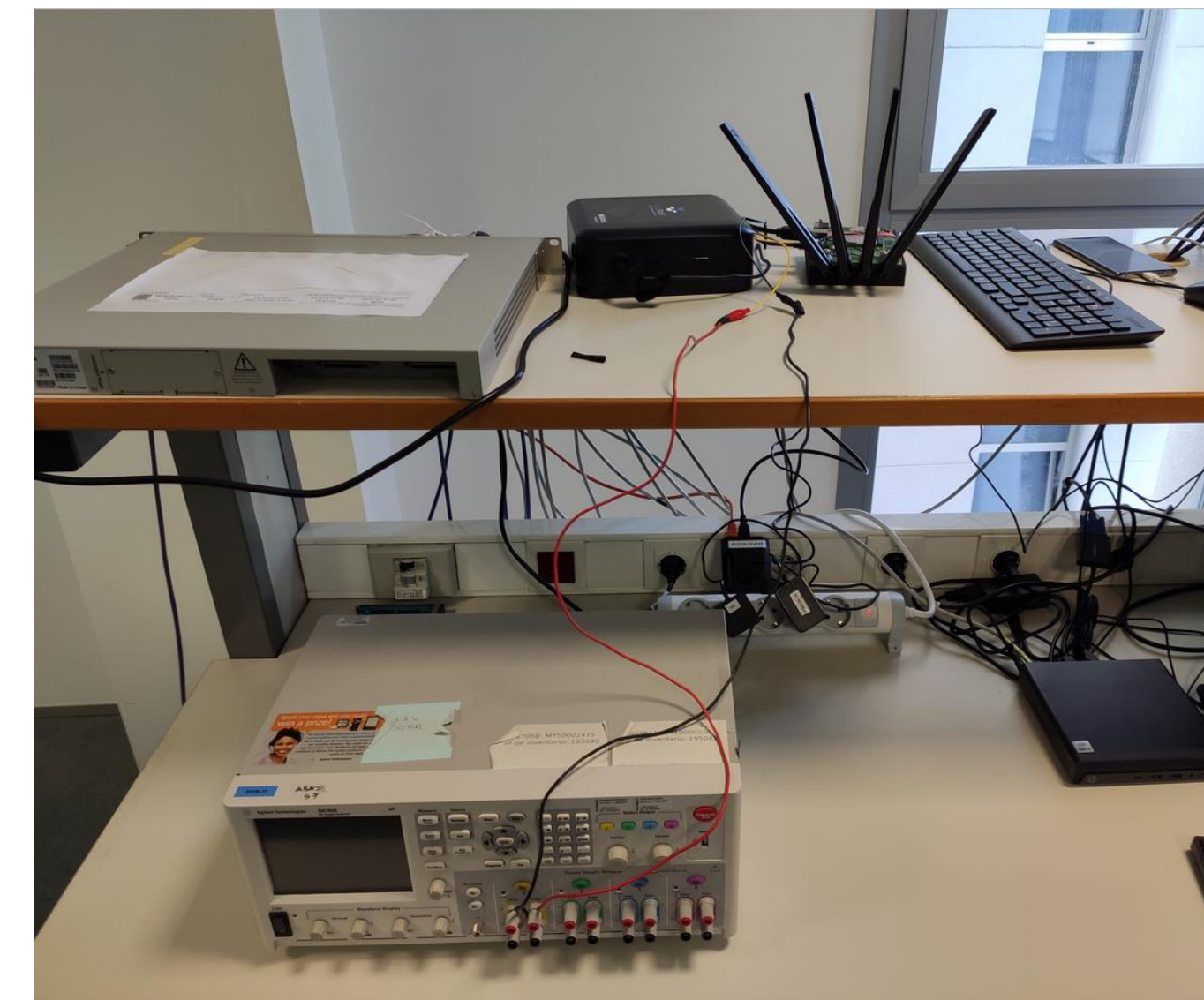
MAIN RESULTS

5G RADIO CONNECTIVITY VALIDATION

AT Command (Scope)	Output
AT+CEREG? (Network Registration Status)	2,1,"1","12C",13
AT+COPS? (Selected Operator)	0,0,"TestNetwork Telikom PNG",13
AT+QENDC (Dual Connectivity Status)	1,1,0,1
AT+QNWINFO (Network Information)	"FDD LTE","00101","LTE BAND 7",2850 "FDD NR5G","00101","NR5G BAND 78",651648
AT+QENG="servingcell" (Primary Serving Cell Information)	"LTE","FDD",1,01,12C,318,2850,7,5,5,1,-60,-10,-29,25,15,-330,-"NR5G-NSA",1,01,3,-57,34,-11,651648,78,6,1
AT+QNWCFG="NR5G_dlMCS" (NR5G Downlink MCS and Modulation type)	"nr5g_dlMCS",1,27,3
AT+QNWCFG="NR5G_ulMCS" (NR5G Uplink MCS and Modulation type)	"nr5g_ulMCS",1,0,1
AT+QNWCFG="NR5G_PUSCH_data (Get Uplink signaling channel data)	"nr5g_pusch_data",1,1,0,1,80,14,51

5G NETWORK KPIS ASSESSMENT

Date\KPI	LATENCY (ms)	JITTER (ms)	PACKET LOSS RATE (%)	DL THROUGHPUT (Mbps)	UL THROUGHPUT (Mbps)	Total Bytes (GB)
29/03/2022 15:00	48.75	1.28	0.02	252.56	65.11	9.18
29/03/2022 18:00	47.79	8.80	0.05	219.11	58.93	8.36
29/03/2022 21:00	48.83	1.42	0.00	253.25	65.09	9.17
30/03/2022 00:00	48.45	1.59	0.00	252.74	65.24	8.94
30/03/2022 03:00	48.71	1.22	0.00	252.84	64.90	9.14
Average: MALAGA Server	48.51	2.86	0.01	246.10	63.86	8.96

ENERGY CONSUMPTION PROFILING

Current Consumption (mA) @ 4V — "Airplane" Mode, Network Registration, Registered to Network & No Data Transmission (Idle State), Data Transmission: ping, download, upload test, Data Session Completed, "Airplane" Mode

CONCLUSIONS & ROADMAP

- Successfully validated our newly developed MVP prototype in operational environment
- Used the technical results to obtain insights in potential 5G-IoT application support
- Move to productization stage in next 9-18 months
- Anticipate to increase our IoT hardware market share by uniquely combining 5G communications and IoT computing technologies
- Expand to new verticals

ADDED VALUE OF FED4FIRE+

- State-of-the-Art hardware equipment hardly found in the market or non-available commercially, supporting diverse technologies
- Easy, full and secure remote access to the experimentation nodes
- Technical support during the whole experimentation cycle
- Test scripts for automating/accelerating experimentation process

Thanks to the experiment we conducted within Fed4FIRE+ we were able to significantly advance the technology readiness level of our newly developed minimum viable product prototype related to 5G-IoT technologies.

We seized this opportunity to validate and demonstrate the prototype in a real-world private network offered by one of Fed4Fire+ state-of-the-art experimentation facilities.