

Virtualize IoT Multi-RAT Stacks at Edge



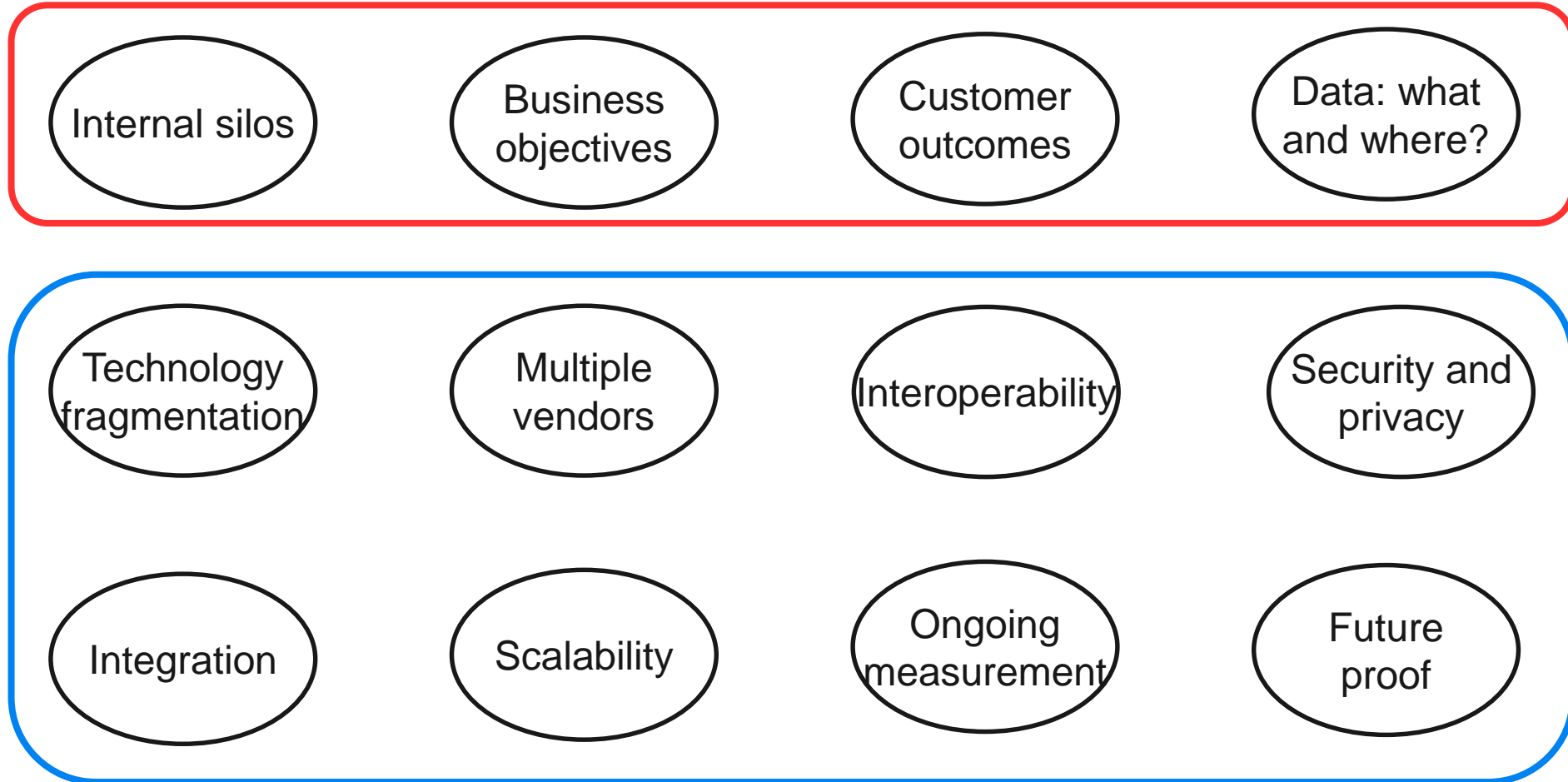
A work in collaboration with RISE SICS

Presentation for EUCNC18 Workshop 3:
Multi-provider, multi-vendor, multi-player orchestration:
from distributed cloud to edge and fog environments in 5G

IoT challenges

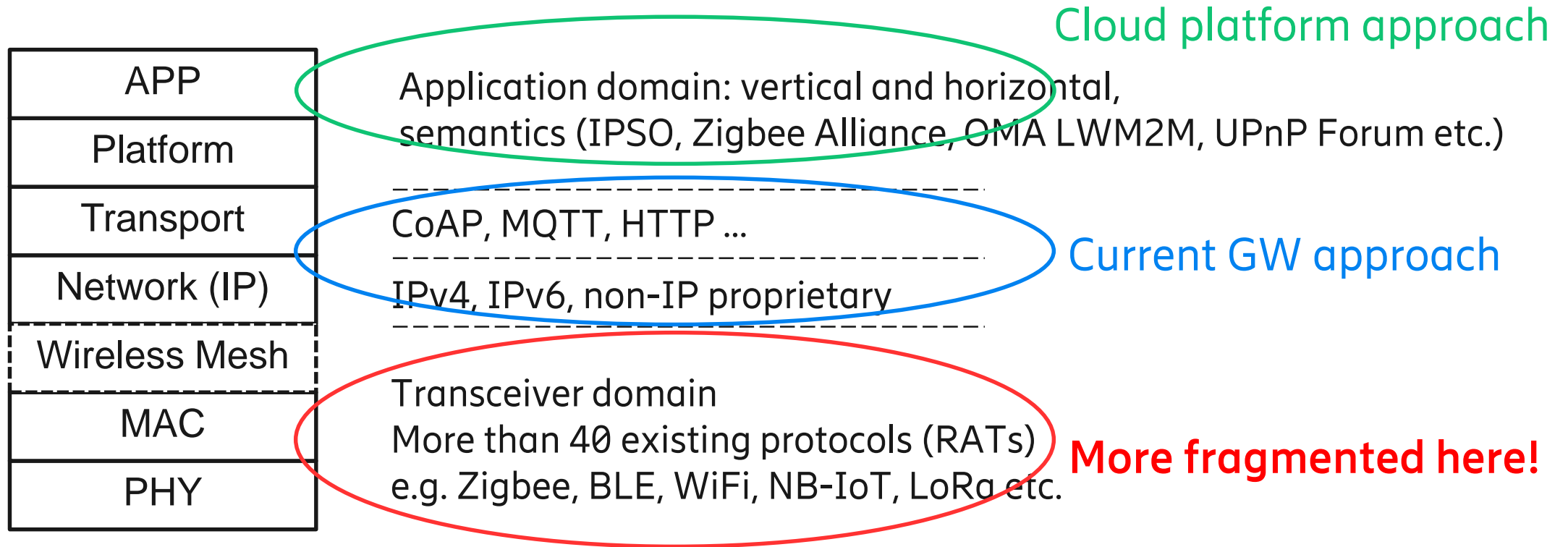


Business and operation challenges



Most of them are about technologies!

Fragmentation over protocol stacks



- To support multi-RATs, parallel IoT networks need to be deployed
 - Drives up costs
 - Not scalable



Virtualize IoT multi-RAT at Edge Cloud

- Cloud-RAN approach for IoT

- Reference approaches: single RAT
 - WiFi AP-AC approach: real time function in AP and non-real time function in AC.
 - Cellular C-RAN/V-RAN approach: centralize processing for performance, cloudify high layers for scalability and cost reduction
- Extend such approaches for Multi-RAT IoT: IoT Cloud RAN at Edge
 - Radio infrastructure: IoT radio heads handling multiple IoT radios, e.g. BLE, Zigbee, NB-IoT, LoRa etc.
 - Edge Cloud: virtualized full-stack IoT multi-RAT functions, i.e. PHY, MAC, NET ..., in an Edge Cloud environment

IoT challenges addressed



Internal silos

Business objectives

Customer outcomes

Data: what and where?

Technology fragmentation

Multiple vendors

Interoperability

Security and privacy

Integration

Scalability

Ongoing measurement

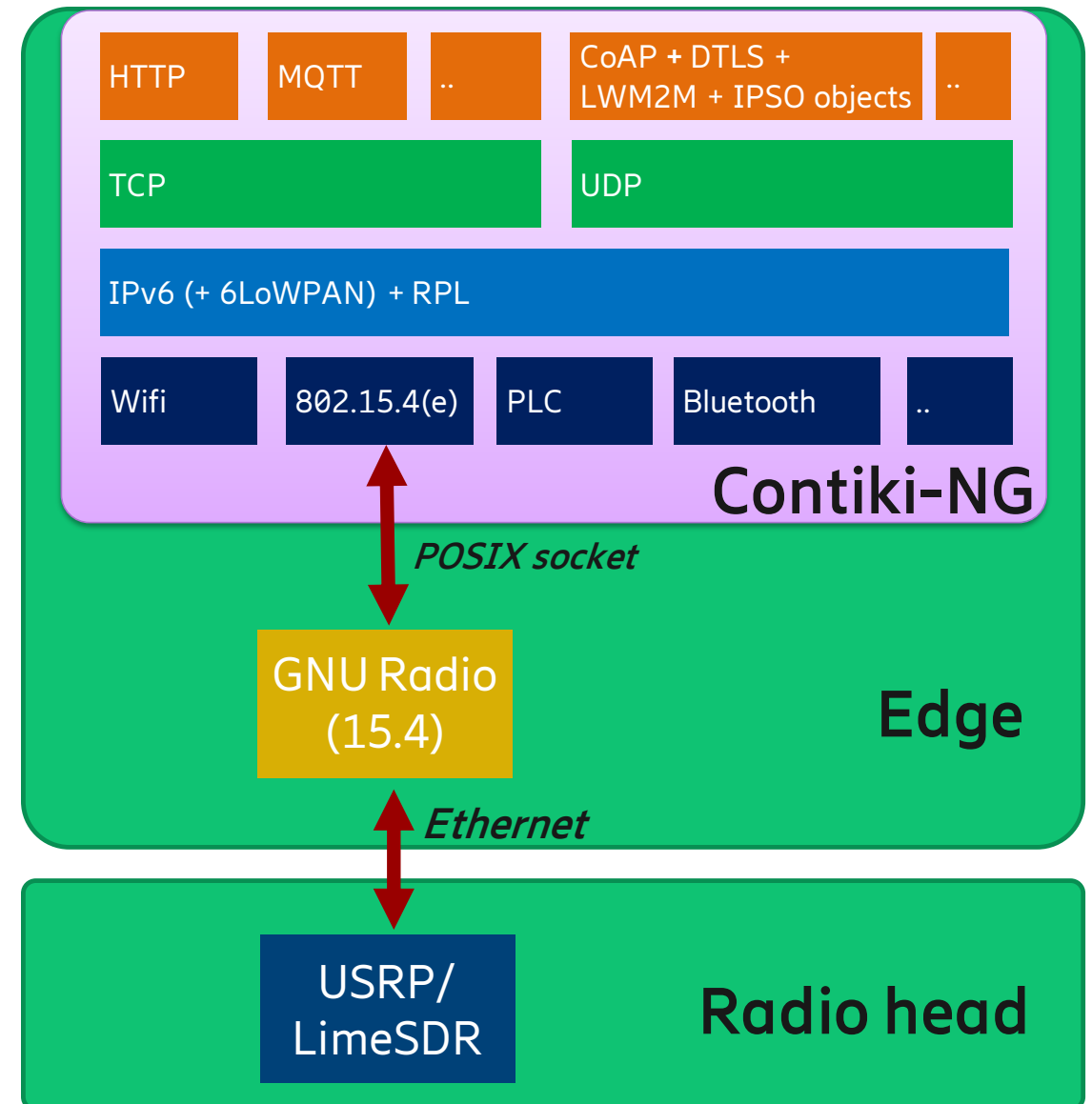
Future proof

Softwarization of lower layers helps address these challenges

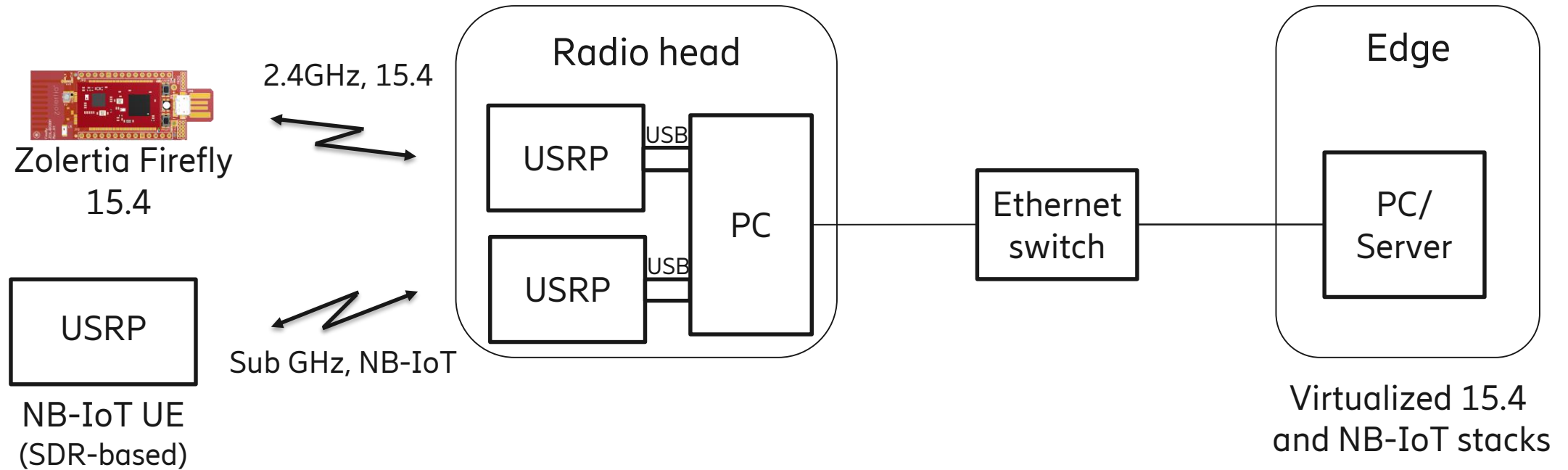
PoC design example: IEEE 802.15.4



- Full stack implementation
 - PHY: GNU Radio
 - MAC and higher: Contiki-NG
 - Early integration: UDP socket
- Virtualization: Docker
- Radio head: SDR-based
- FH interface: IQ samples over Ethernet (currently ZeroMQ)
- Challenges:
 - Decrease latency
 - Decrease jitter



Testbed design: 15.4 + NB-IoT



- EUCNC demo: first functional-level software implementation and system integration, 15.4 full stack and NB-IoT DL (key PHY functions) dockerized at edge
- Next step: more measurements and results analysis, and then further improve the implementations, e.g. in radio performance, reliability, latency etc.



See you in Booth 02!