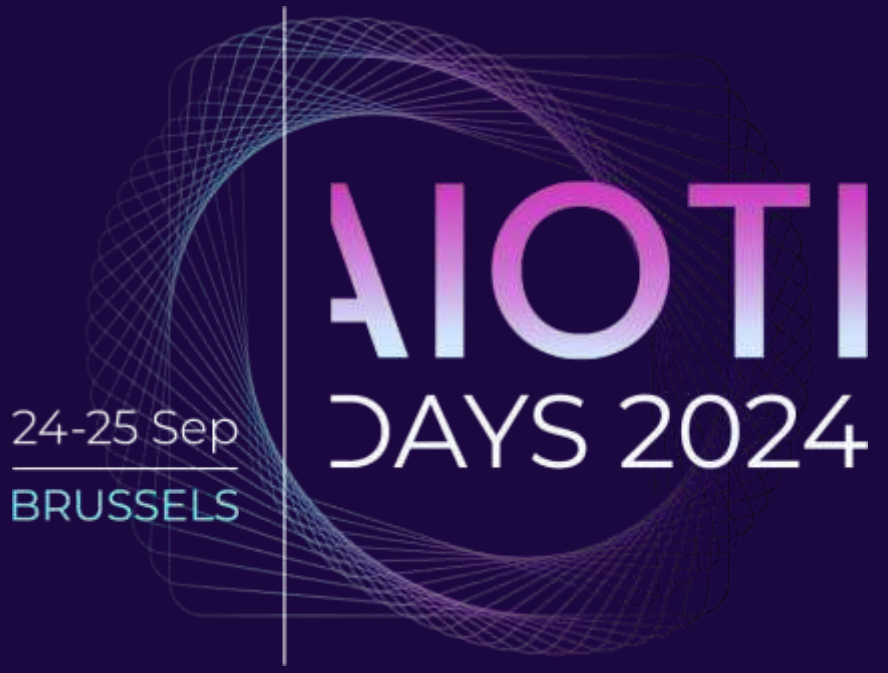
Alliance for IoT
and Edge Computing
Innovation



AIOTI AWARD 2024

Indoor environment monitoring subsystem based on Recursive InterNetwork Architecture (RINA)

David Sarabia-Jácome, Marisa Catalán, Eduard Grasa.

i2CAT

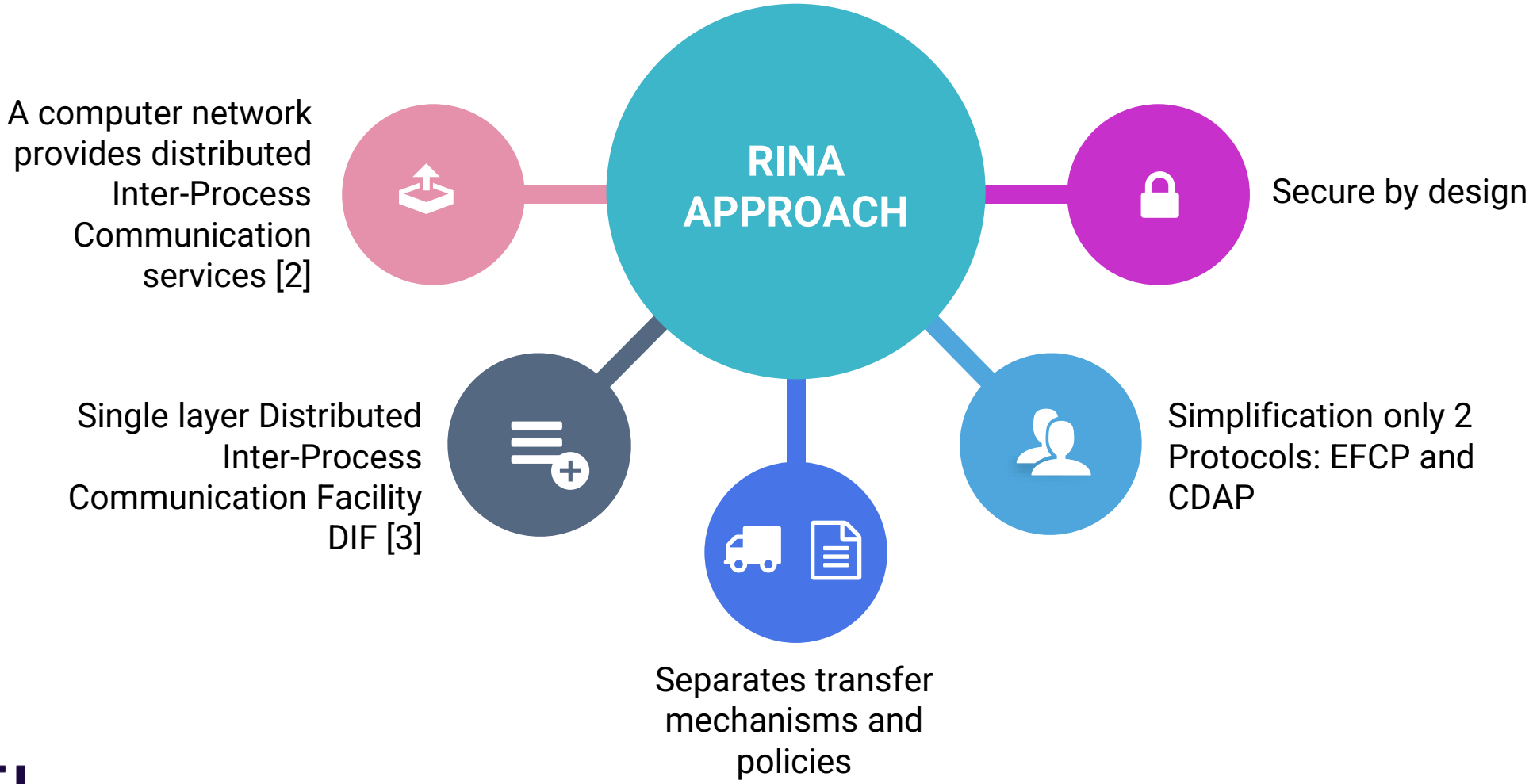
Background and Aims

- Smart Buildings

integrate technology to optimize energy use, enhance occupant comfort, and improve operational efficiency, and are facing several challenges as they evolve.

Background and Aims

- Introduction to the Recursive InterNetwork Architecture (RINA)



Background and Aims

RINA-based environmental subsystem **multi-platform**, **energy- and resource-efficient RINA sensors**, **secure and protocol-efficient communication**, and **flexible and programmable layers** to accommodate future smart building requirements.

Challenges

C1. Interoperability with existing systems (TCP/IP)

C2. Device Compatibility – RINA-based sensors

C3. Scalability in Dense environments

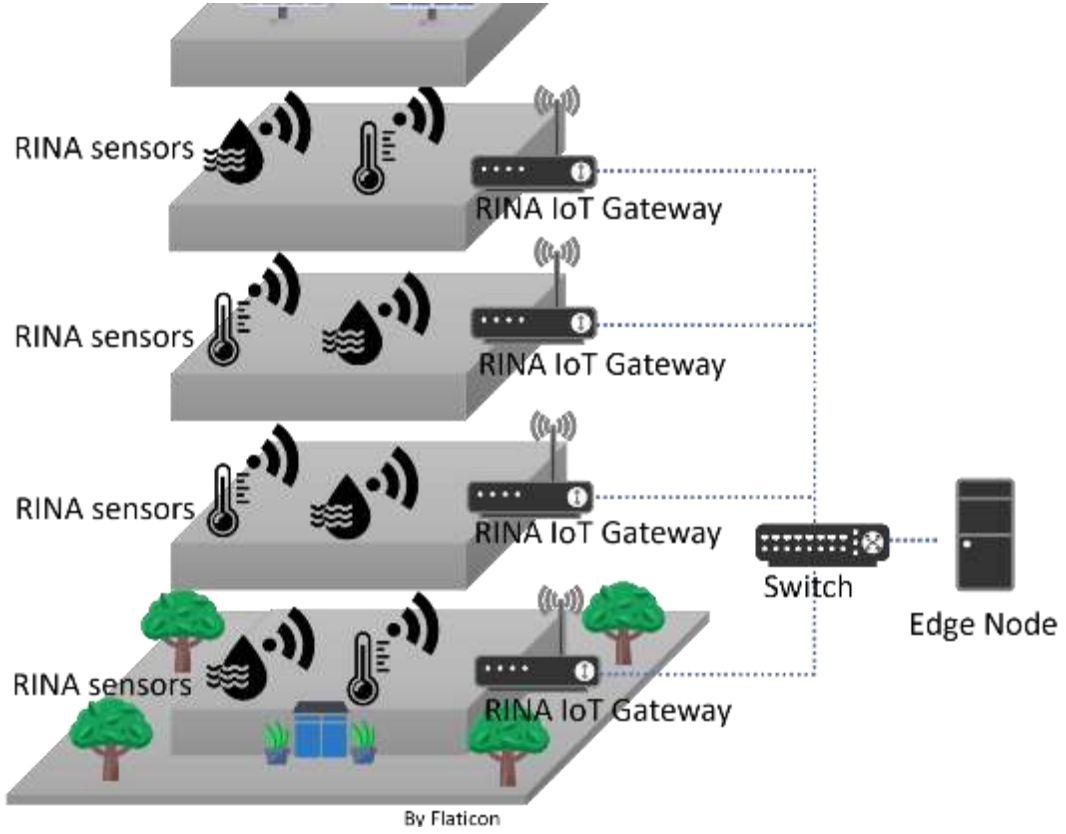
C4. Security and Privacy

C5. Energy Efficiency devices

C6. Efficient communications

Solutions

- Design of the RINA-based environmental subsystem architecture
  - Defined the components, interfaces, modules, RINA protocol, and policies.
- RINA principles of recursion, single programmable and isolated layer (DIF) to achieve scalability, flexibility and security.



Solutions

C1. Interoperability with existing systems (TCP/IP)

S1. Implementation of a RINA-based application to translate CDAP protocol used by the sensors into MQTT protocol employed by the EdgeX broker.

C2. Device Compatibility – RINA-based sensors

S2. Designing of RINA sensors for embedded devices and a RINA-based IoT Gateway. Implementation of temperature, humidity and air quality sensors using ESP-IDF and Arduino (multiplatform), and a Raspberry Pi.

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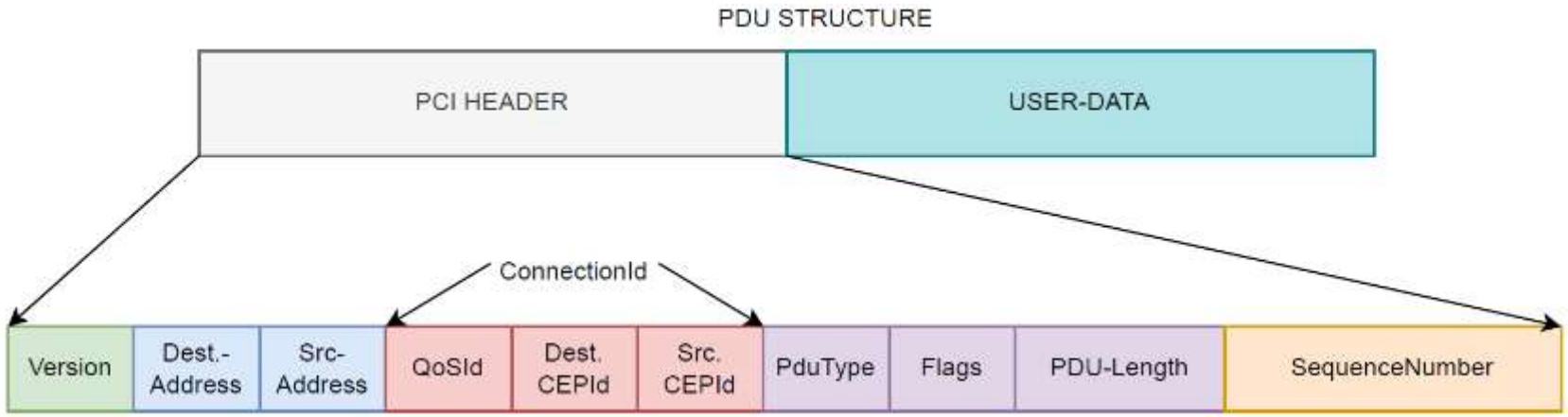
Solutions

C3. Scalability in Dense environments

S3.1 Flexible protocol design to accommodate grown

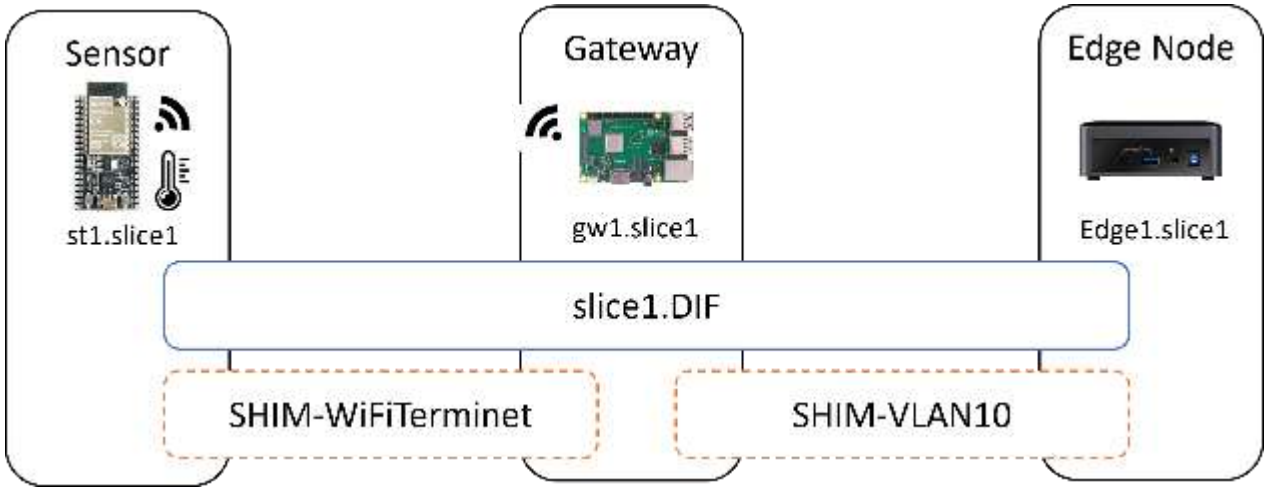


S3.2 Programmable layer (DIF layer) to reuse as many times as posible to cover the dense environment.

Solutions

C4. Security and Privacy

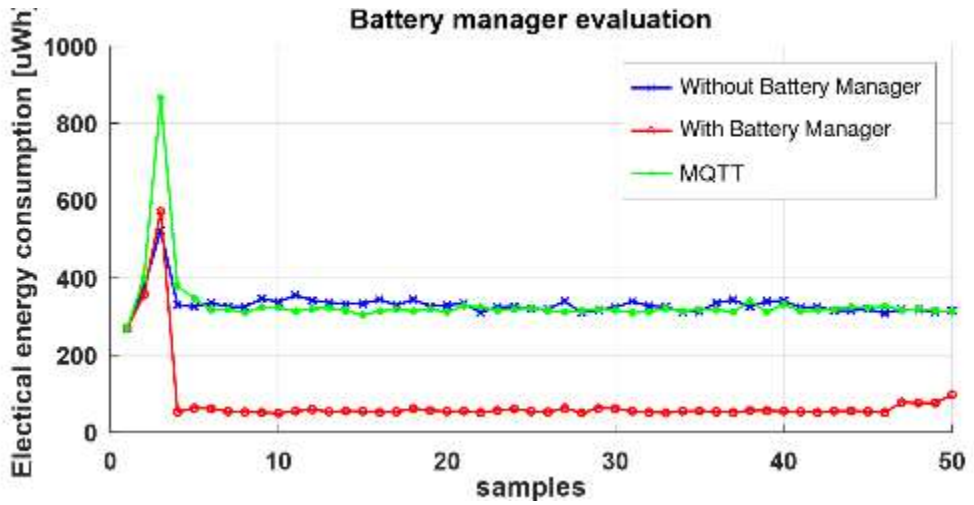
S4. RINA-based secure policies and its principle of secure by design architecture in where a self-contained security layer operates independently, eliminating the need for additional, specialized protocols or equipment.



Solutions

C5. Energy Efficiency Devices

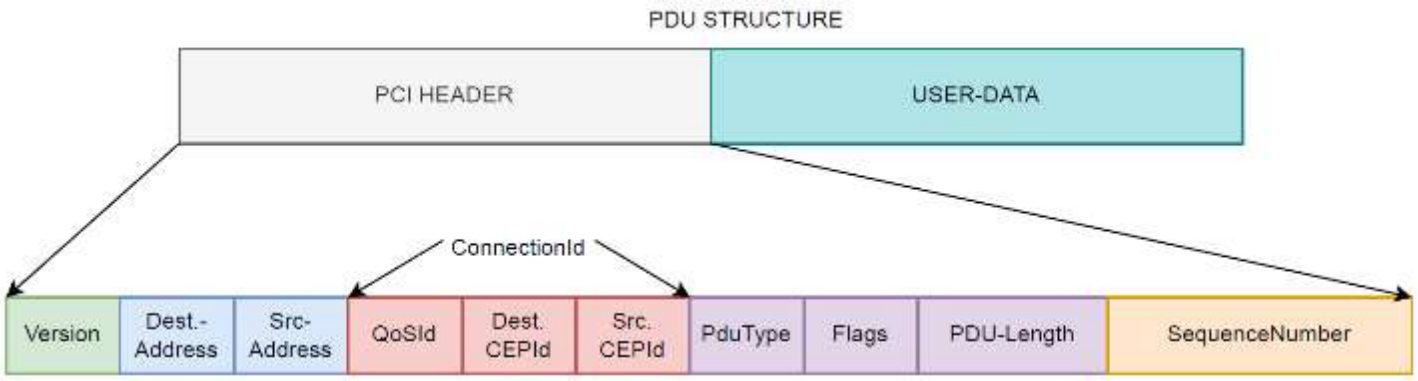
S5. Designing of energy strategy to send data only when it is required keeping the DIF isolation principle.

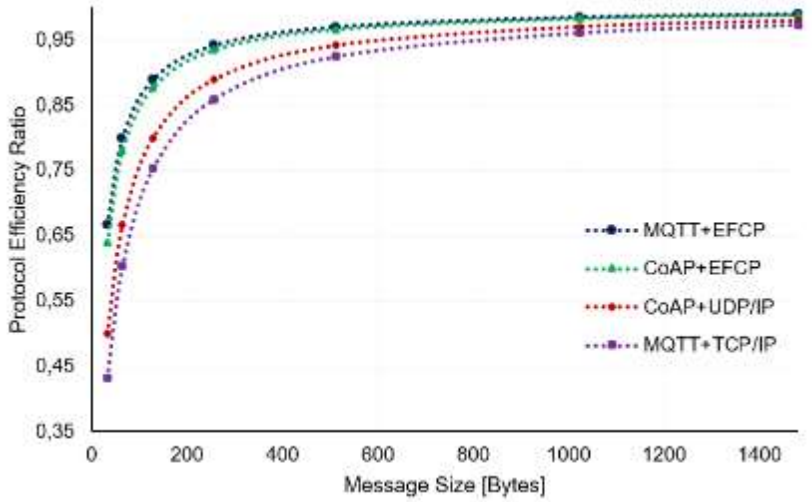


Solutions

C6. Efficient communications

S6.1. Designing RINA-based protocol header based on smart buildings requirements.

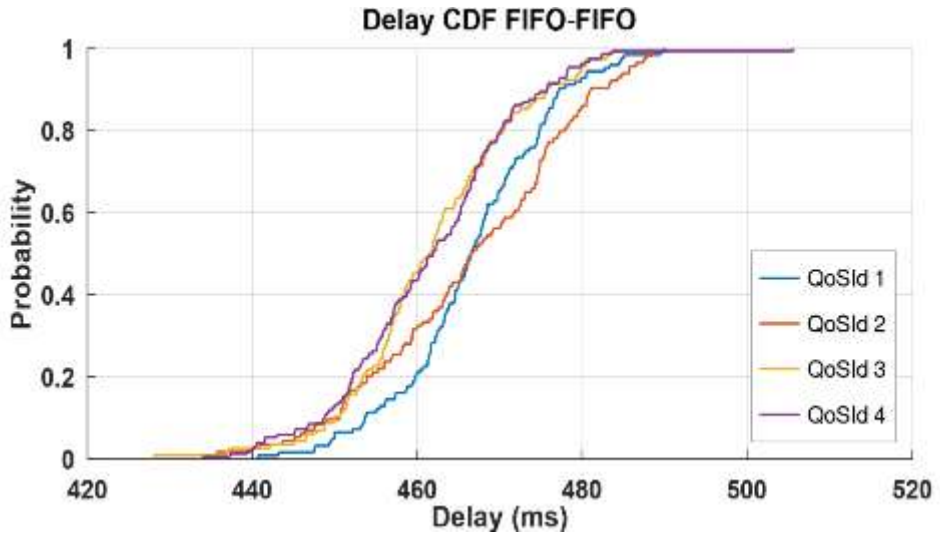


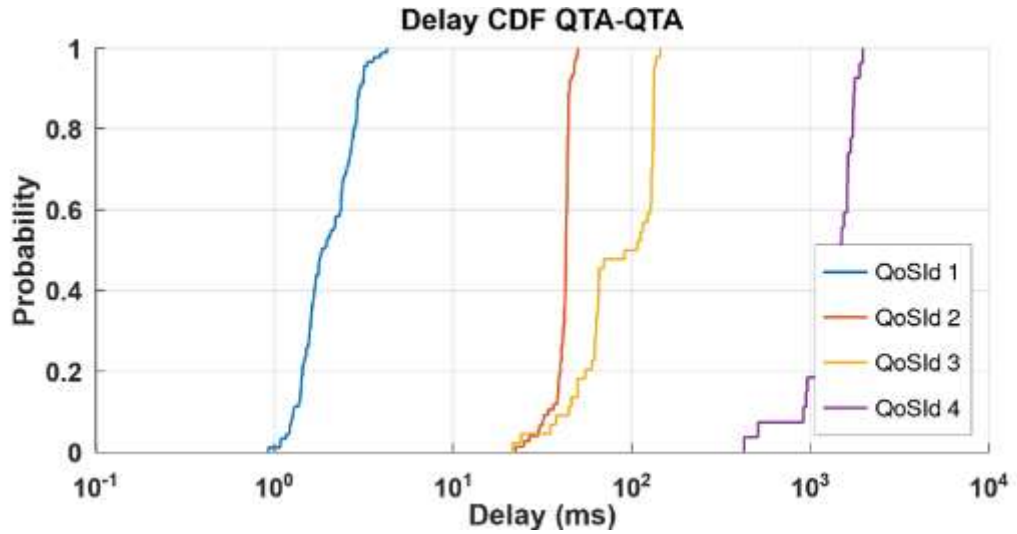


Solutions

C6. Efficient communications

S6.2. RINA-based resource optimization by designing RINA QoS Cube for support flow prioritization.





Conclusions

- Innovative environment monitoring sybsystem based on RINA integrated into an operative smart building system.
- Enabling adoption of RINA in IoT environments.

Low Latency communications

Reliable Communications

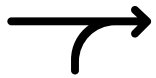
Energy Efficient sensors

Scalable Network

Secure communications

High Goodput

Interoperable with TCP/IP



For more information about RINA sensor