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Secure Asset Tracking in Manufacturing through Employing IOTA Distributed Ledger Technology

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Agenda

- Industrial IoT revolution for predictive maintenance, asset analytics, etc.
- Challenges in convergence of IIoT, Cloud, LPWAN, DLT technologies
- IOTA DLT enabling trusted IoT – cloud automation
- STM32M7-based implementation and evaluation
- Conclusions

IoT Key Factor in Smart Industry

Configuration Layer

Optimization of Manufacturing Load

Spare Part Inventory Management

Maintenance Scheduling

Factories

Cognition Layer

Performance Evaluation

Risk Assessment

Cyber Layer

Knowledge Discovery

Time Machine Snapshot Collection

Degradation Progress Mode Feedback

Dynamic Fleet- sourced Prognostics

Conversion Layer

Individual Information

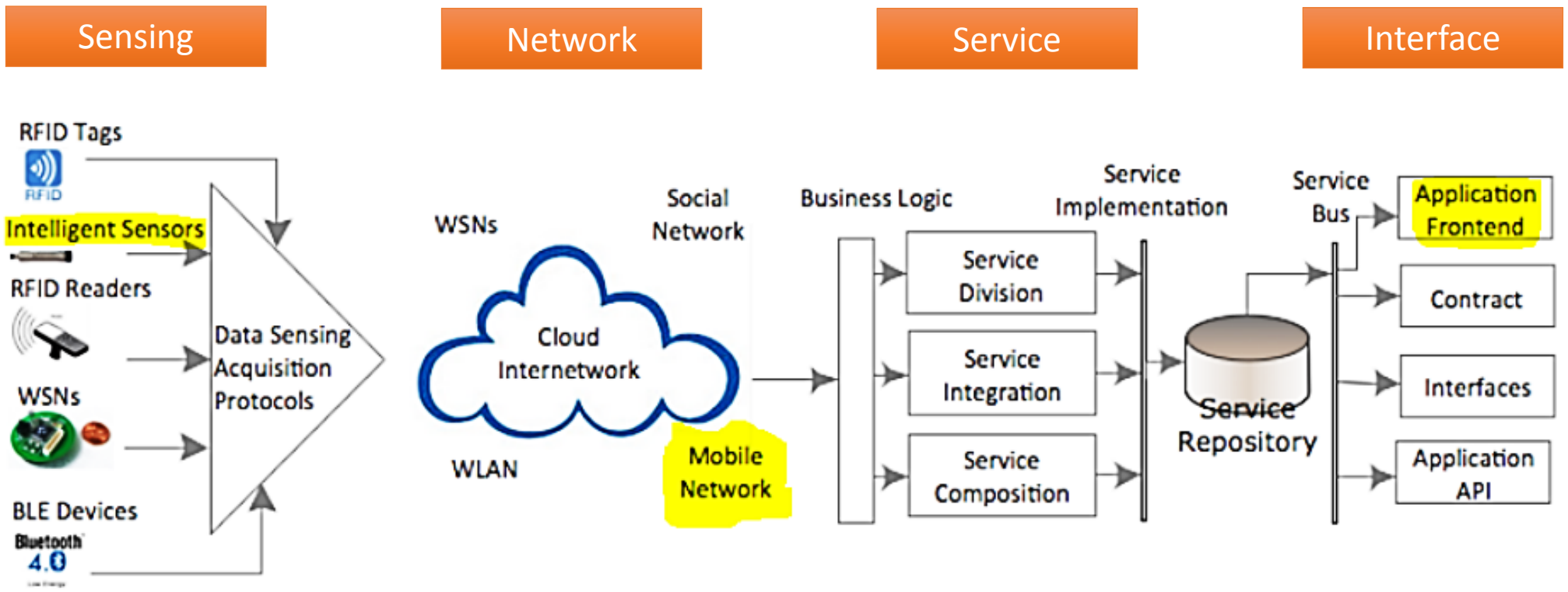
Smart Analytics

Perception - Connection Layer

Factory A Sensors Network

Factory B Data Acquisition

IoT End-to-End Organization



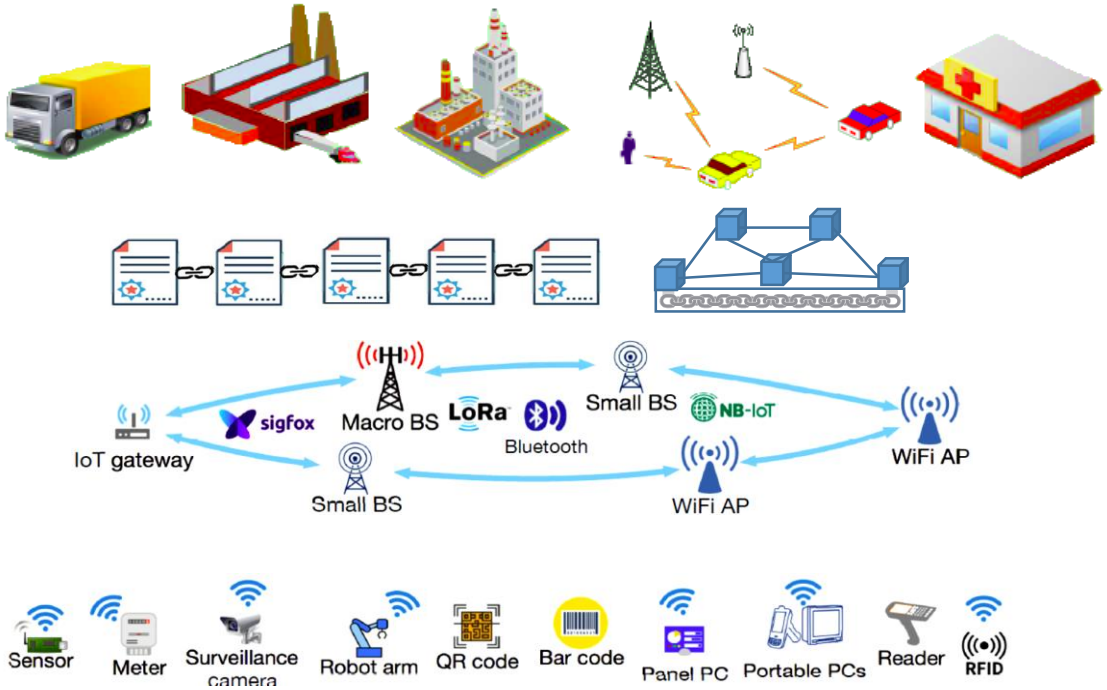
IIoT and Blockchain Convergence

Blockchain features

- Decentralization (identity management, access control)
- Tamper-proof data (immutable, traceable, signed-timestamps)
- Information security (confidentiality, integrity)
- Privacy (disassociate public keys/hashes from user IDs

Challenges:

- relative volatility of blockchain implementations involving protocol changes vs long-lived IIoT devices
- scale to the transaction rates that can be generated by large numbers of connected devices

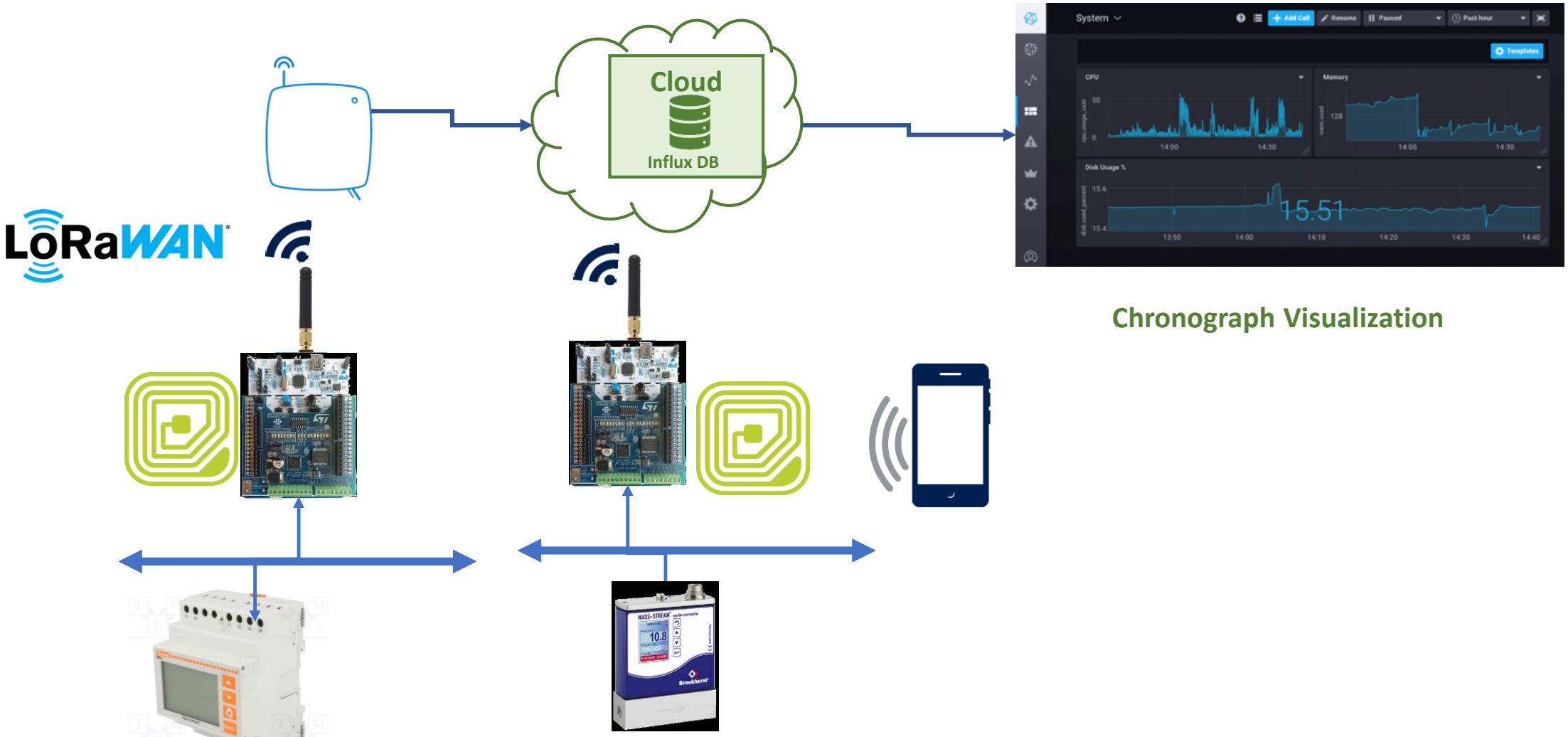


IoT↔Blockchain: trusted multi-party processes to bridge physical world things to industry process computing environments

Use Cases

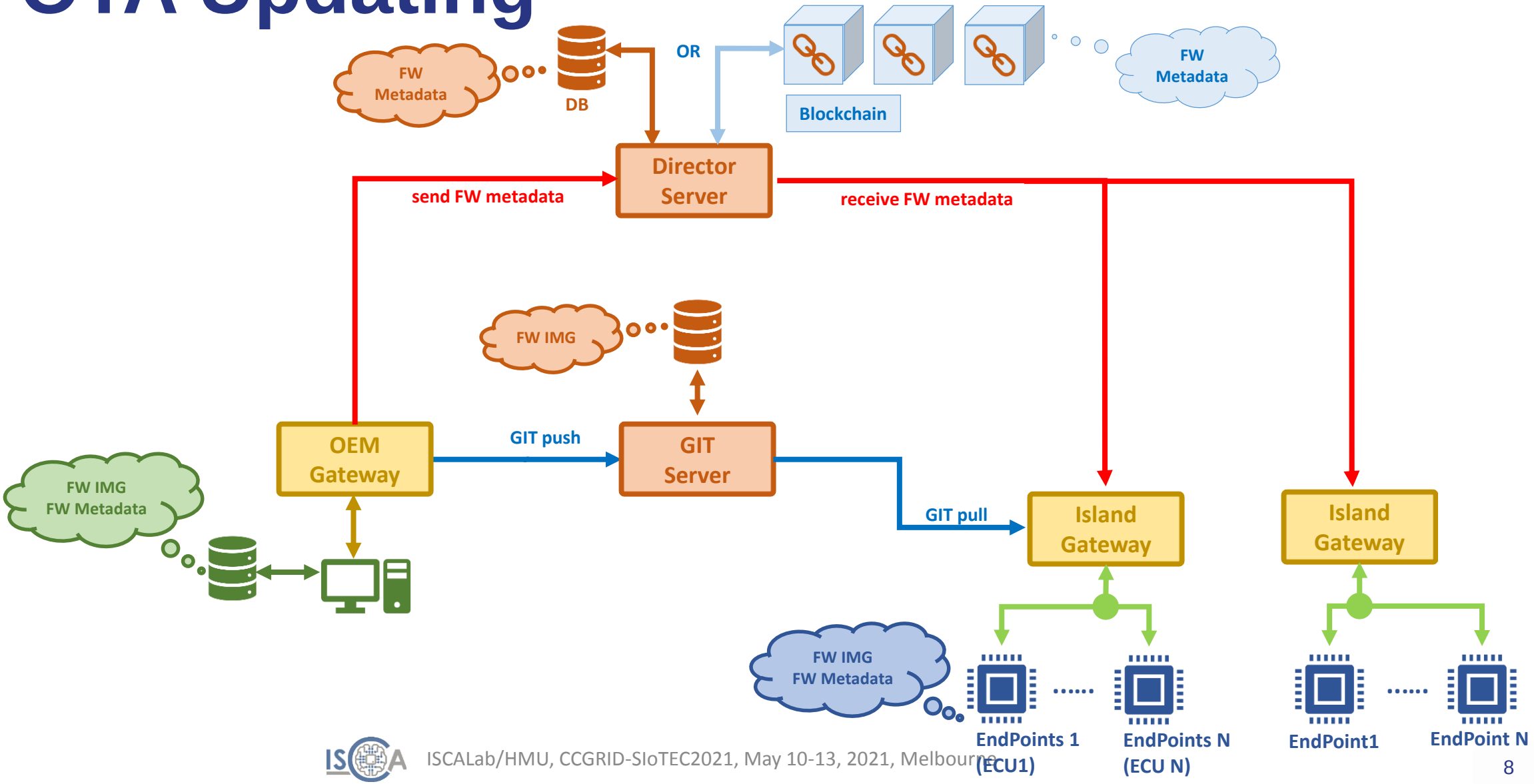
- Automation Monitoring and Maintenance in Manufacturing
  - Access and manage IoT devices/data in an industrial environment (IIoT)
    - Trusted monitoring of IoT device data (e.g., sensor values) at the ledger
  - Management of IIoT device lifecycle by using firmware updates
    - Record update information metadata at the ledger that can be used to manage the firmware update procedure of IoT devices

Industrial Monitoring

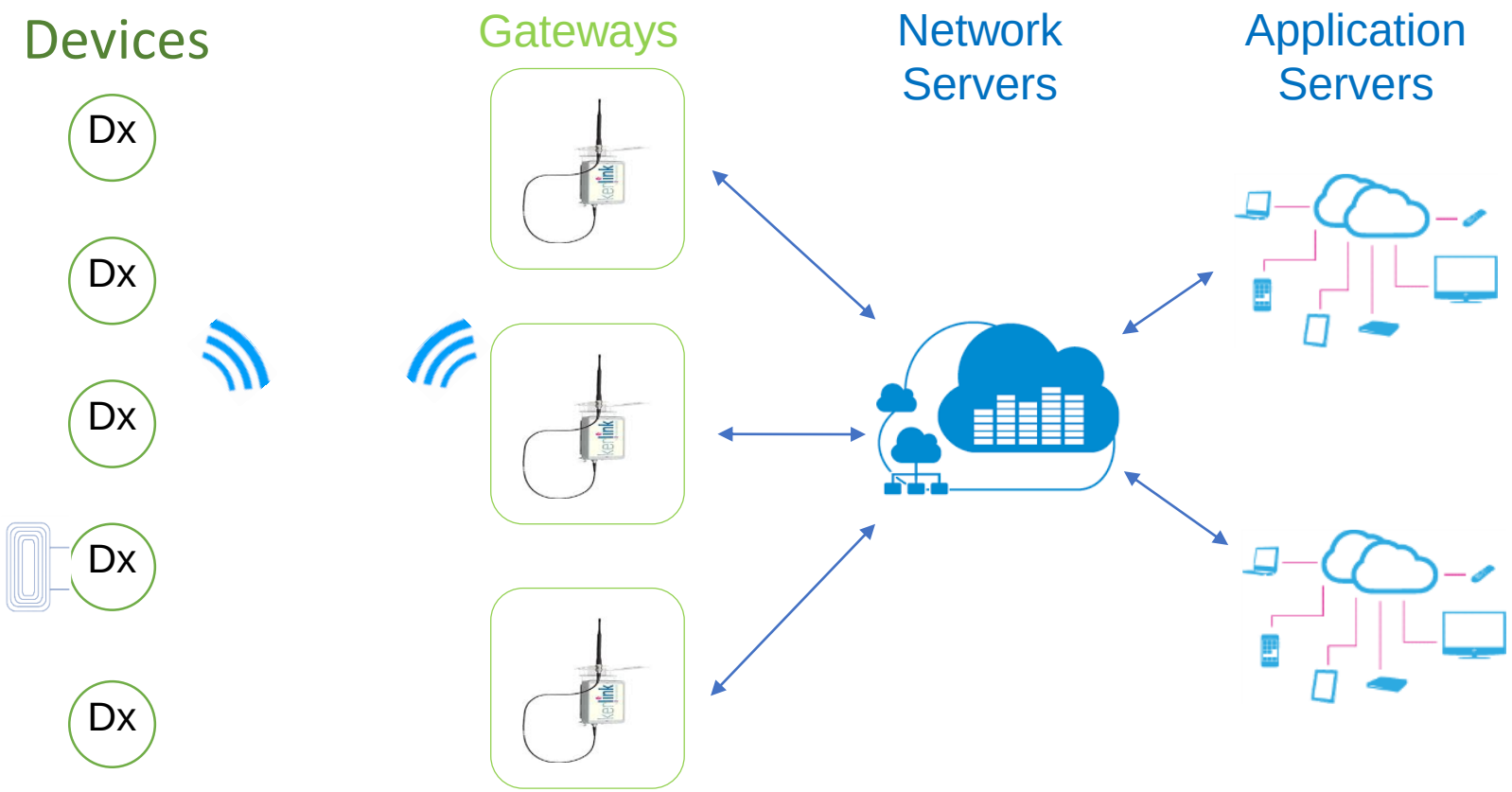


Chronograph Visualization

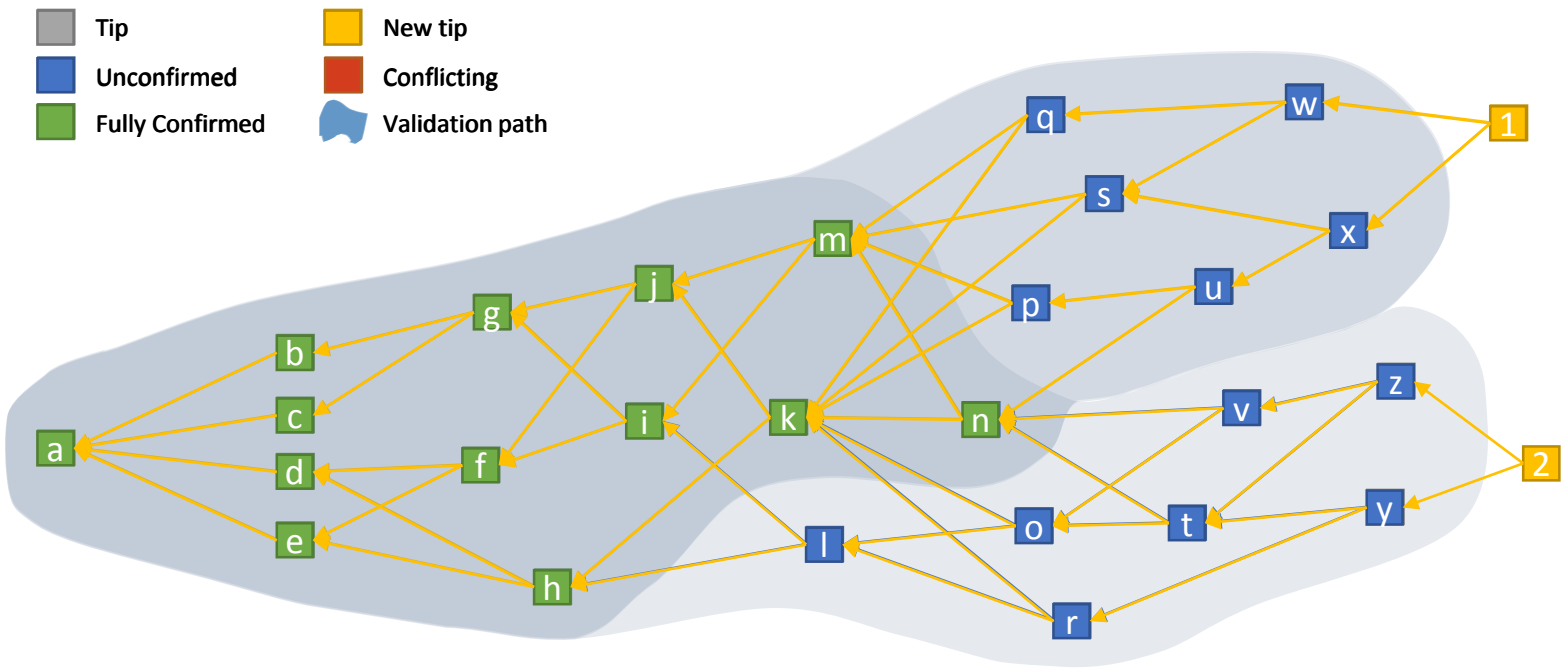
FOTA Updating



Trusting IoT LoRaWAN Devices

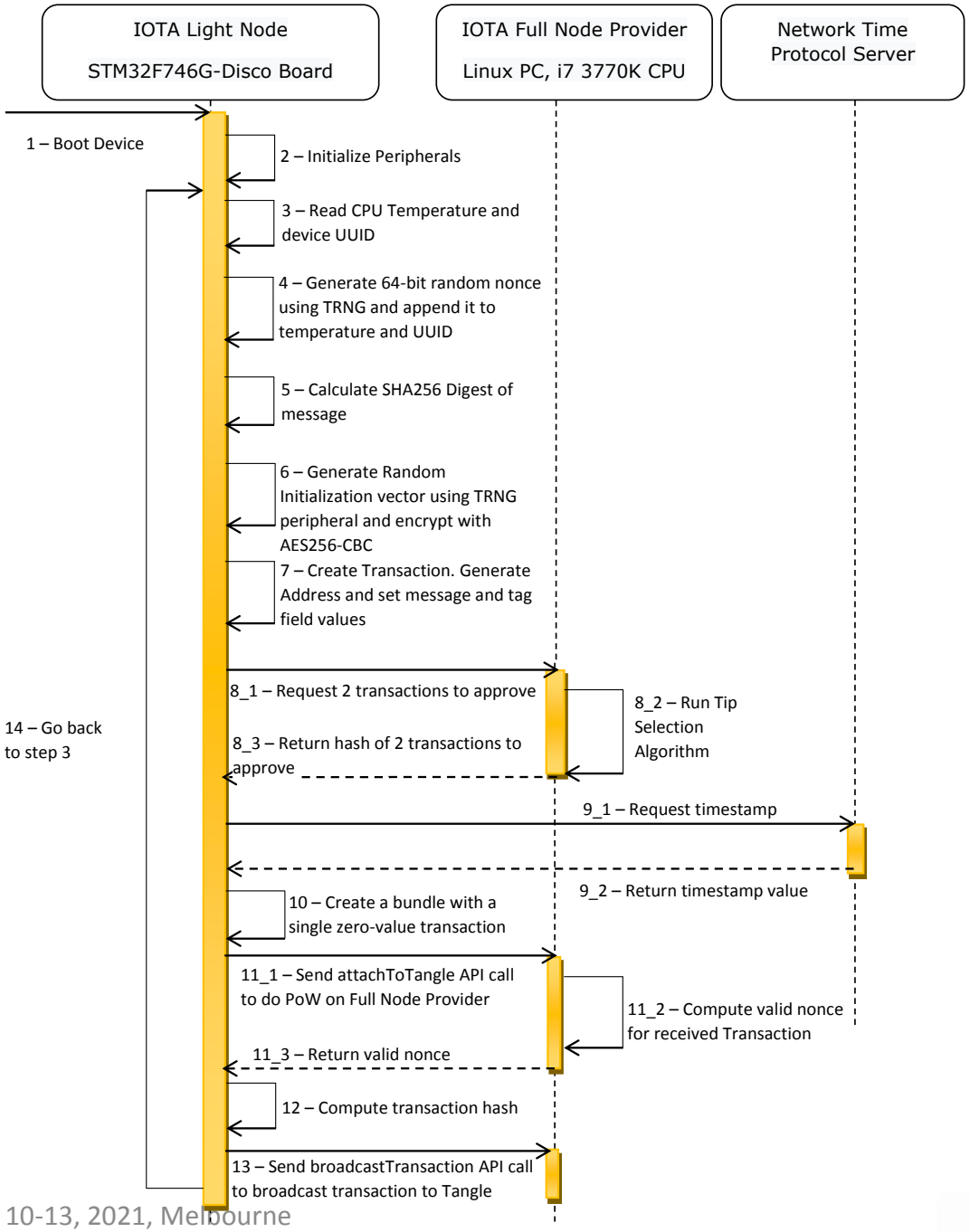


IOTA for Interoperable IIoT Deployments

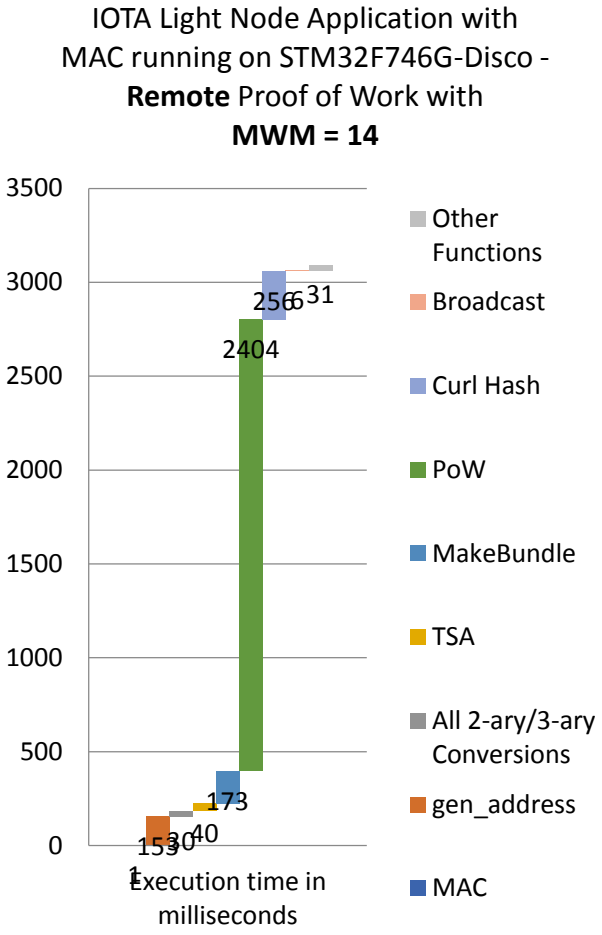


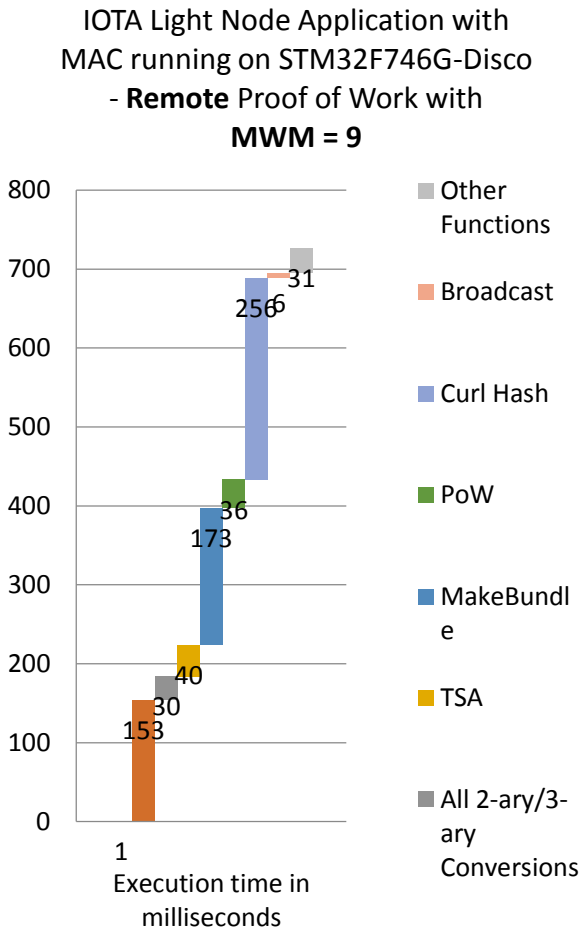
- All transactions bundled in a Directed Acyclic Graph (DAG)
- Each new transaction must approve two previous transactions
- PoW for preventing spam
- Flexibility in “confirming” transactions
- No transaction fees
- Support for offline transactions (partitioning)

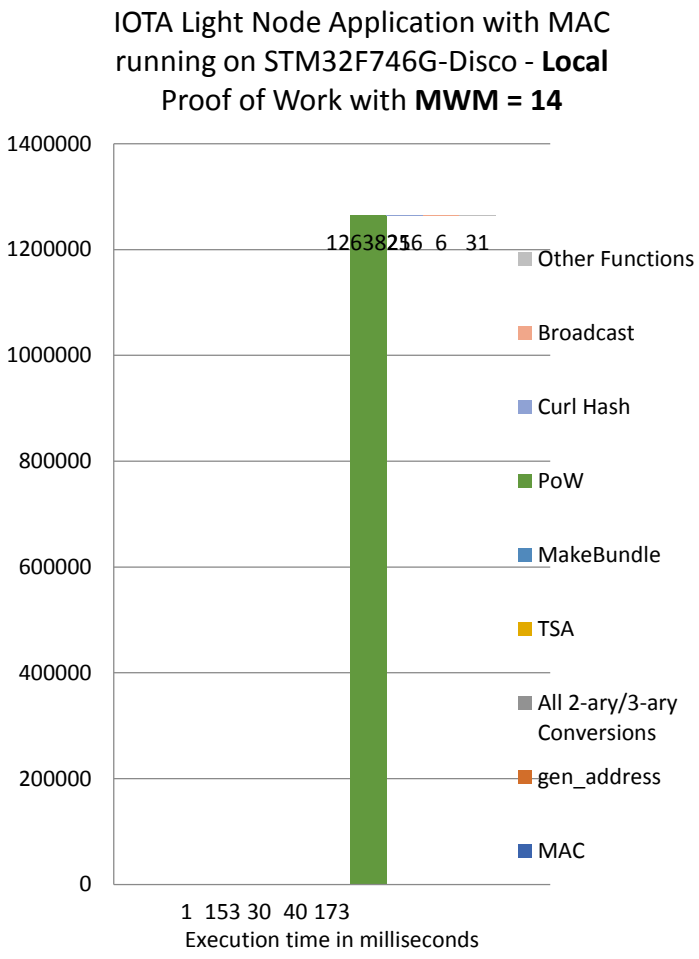
Light Node Transaction Flow

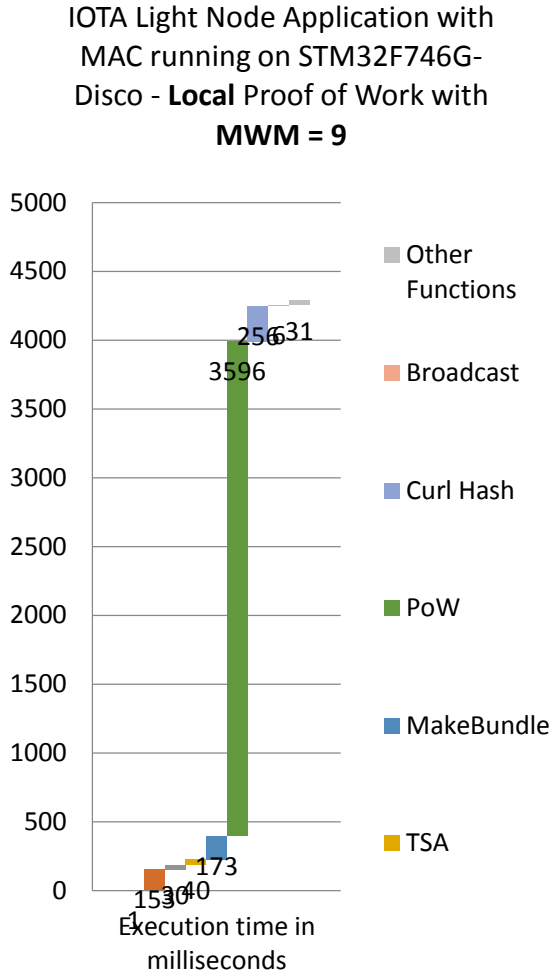


Latency Breakdown

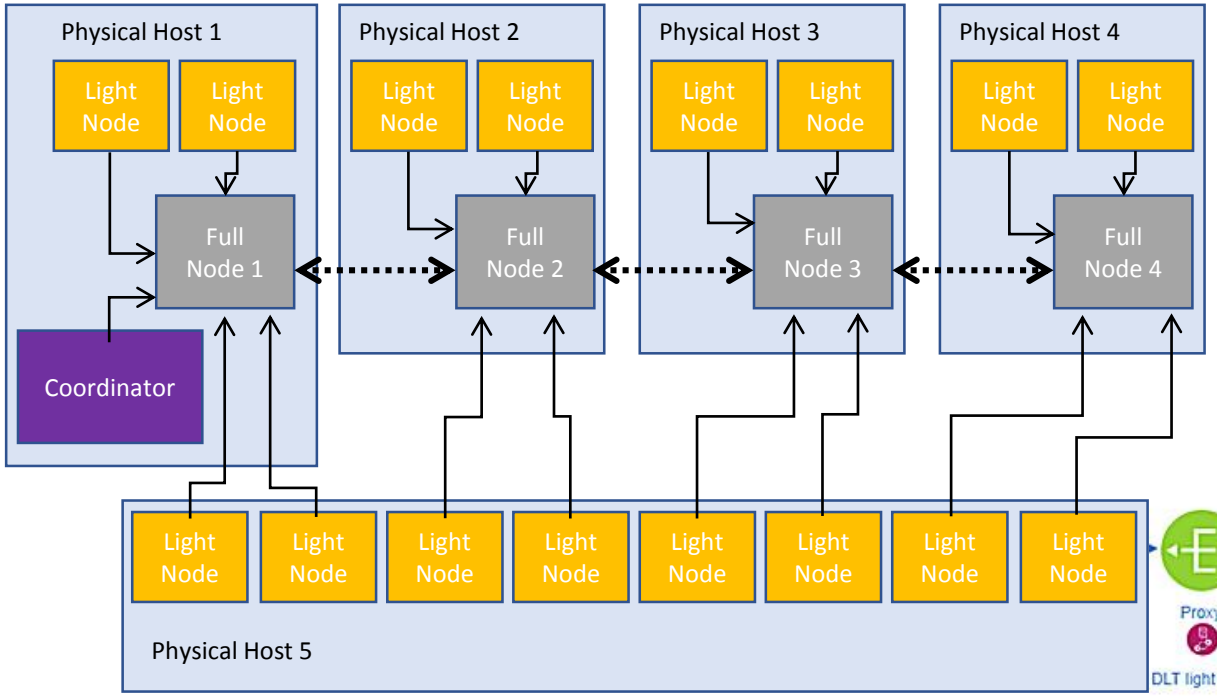


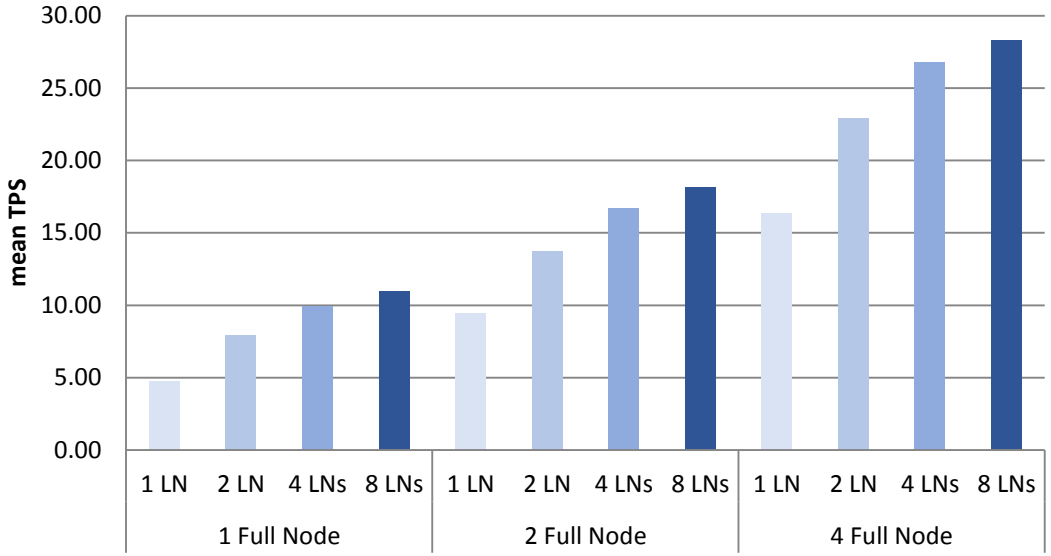


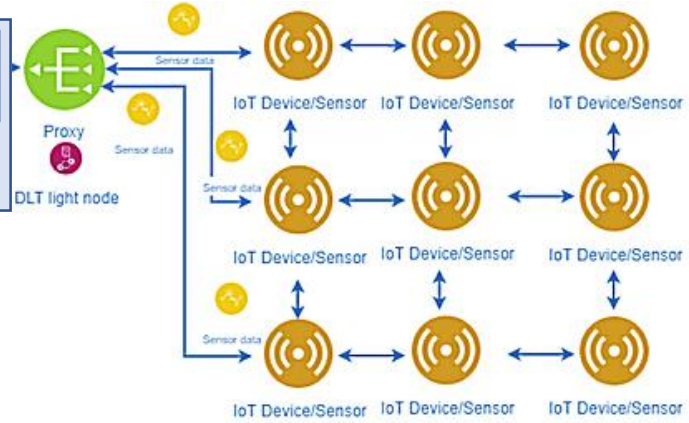




Scalability Evaluation on Docker-based IOTA Nodes







= Neighboring Full Nodes Link

= Light Node and Full Node Provider Link

Summary

- STM-based IoT devices authentication through decentralized integrity assurance framework enabled by IOTA
- Investigation on performance and scalability when partitioning Full Node Ledgers

Promising days, with potential for DLT technologies for next generation decentralized industrial networks and applications is clear

Thank you for your attention!

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