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Overview & Collaboration Possibilities with Open Horizon

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About RAINBOW

- Fog computing research project
- Part of European Union's Horizon 2020 research and innovation program
- 16 contributing organizations (universities & companies)
- Duration: Jan 2020 – Dec 2022

The RAINBOW Vision

- IoT service operators should focus on their services' business logic
- RAINBOW abstracts and seamlessly handles:
  - The deployment and placement of geo-distributed Fog/IoT services
  - The orchestration (including runtime adaptation) of Fog/IoT services
  - The network fabric administration
  - Establishing "trust" among collaborating entities, while also verifying security primitives across the device-fog-cloud stack
  - Pushing "intelligence" to the network "edge" with -in place- data management and fog analytics services

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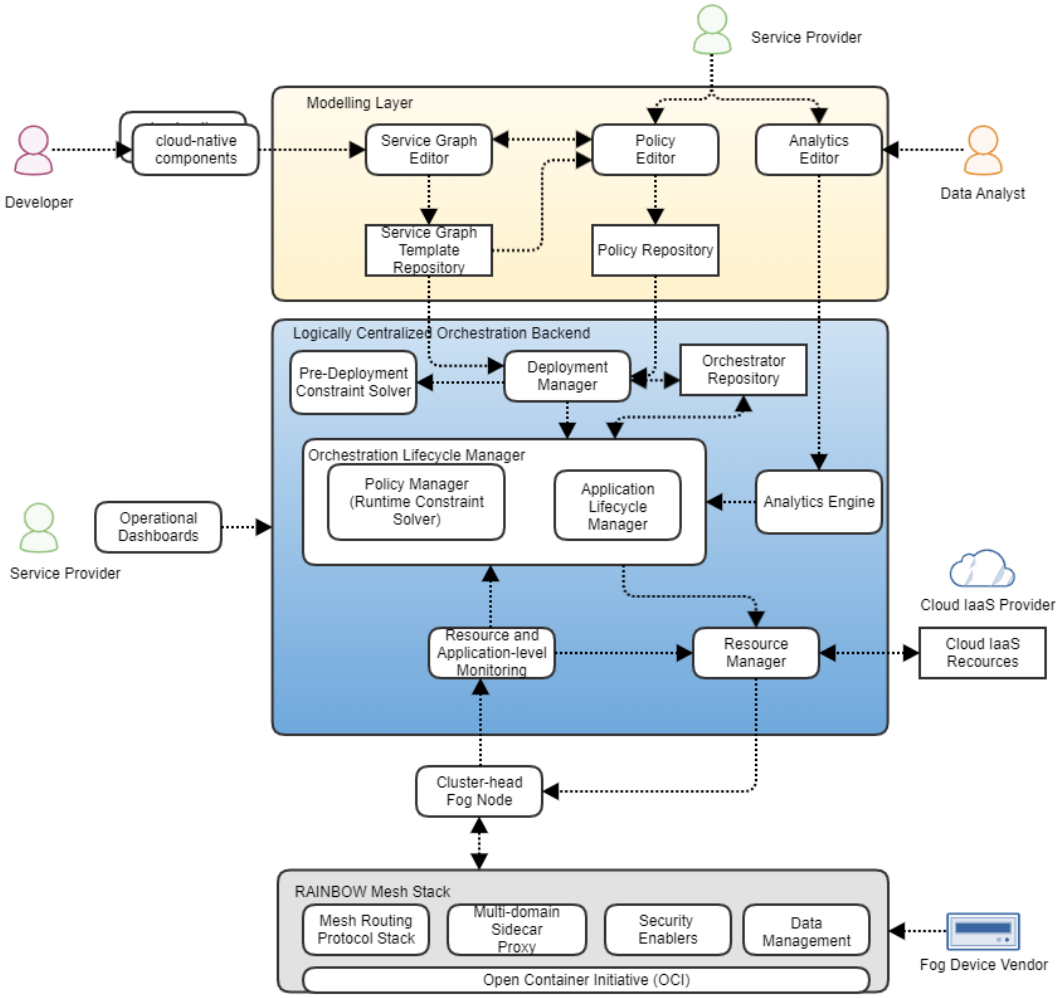
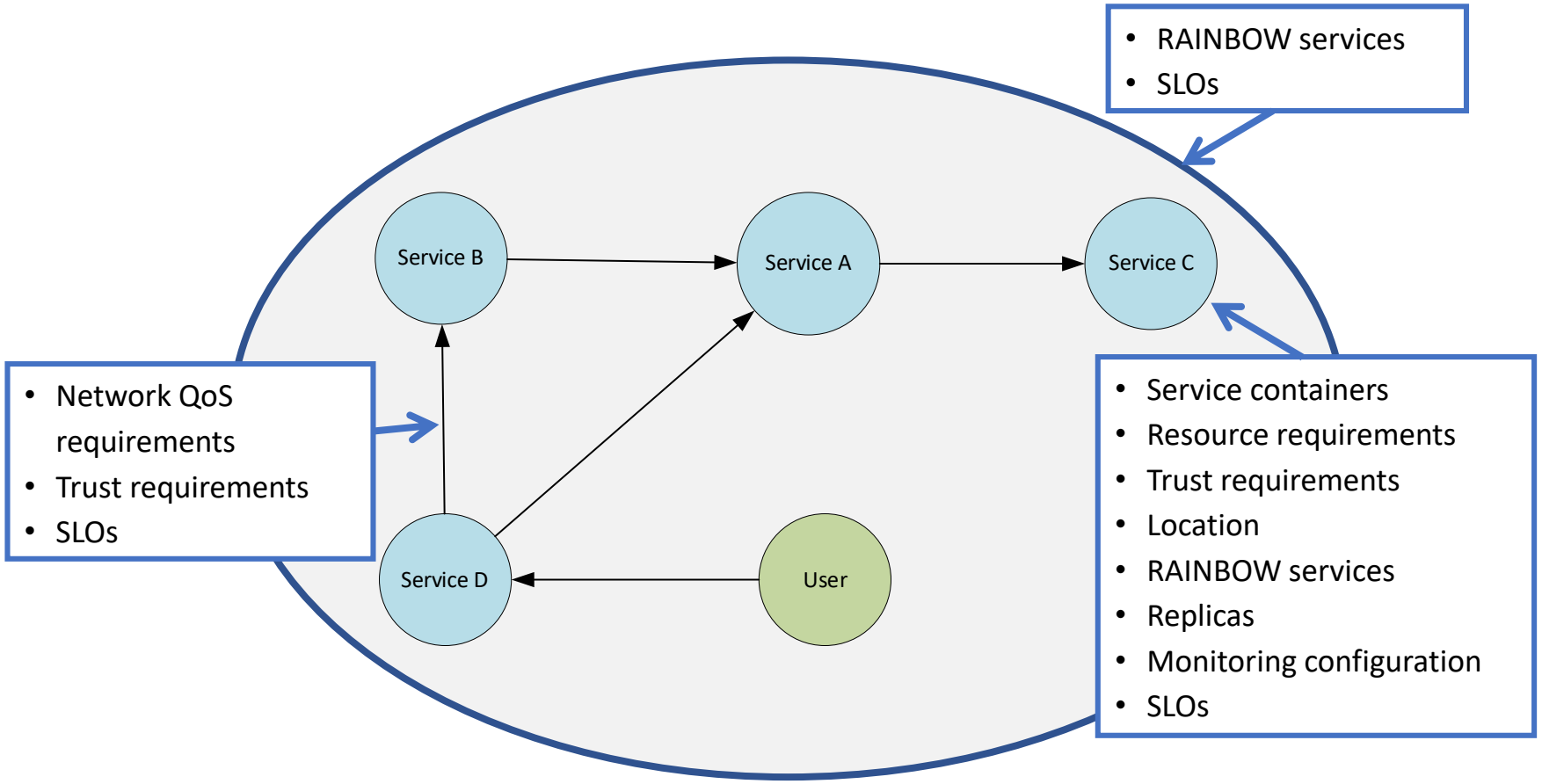
RAINBOW Platform Architecture



Service Graph

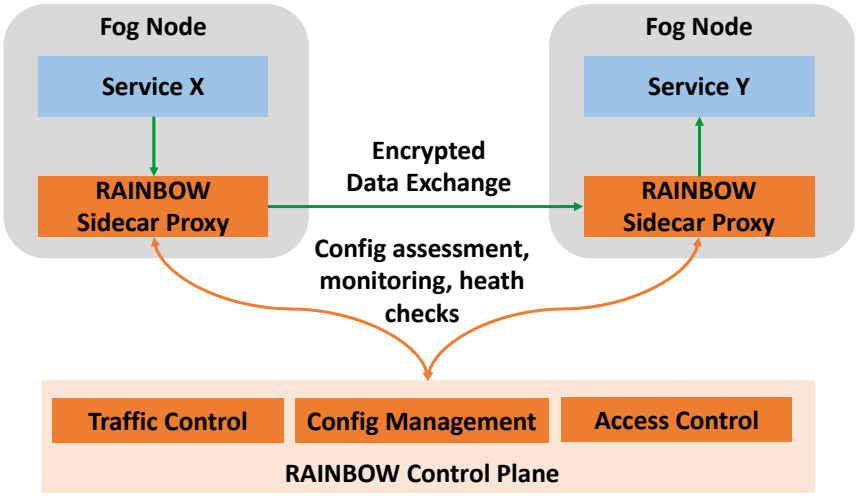


RAINBOW Orchestration

- Service Graph is used to create all deployment entities
- Near-optimal fog service placement to ensure desired “hard” and “soft” constraints are met
- Establishment of Secure Overlay Mesh Network via the RAINBOW Mesh Stack
- Lifecycle management
- Runtime adaptation to ensure desired SLOs are met
- Implementation as extensions to Kubernetes

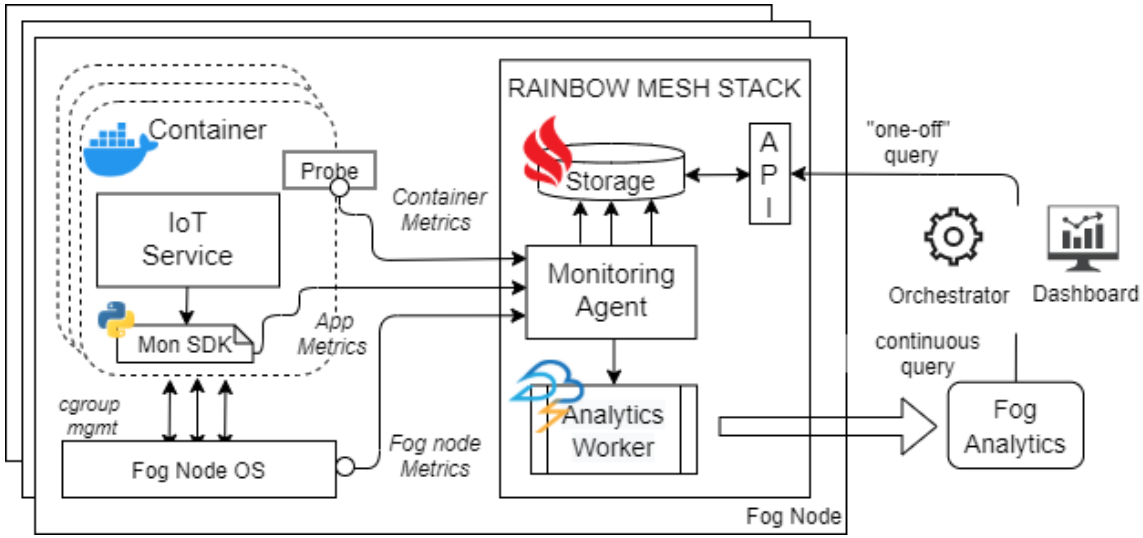
The RAINBOW Mesh Stack

- **Reactive routing:** dynamic and encrypted intra-overlay routing to guarantee secure connectivity between (non-adjacent) collaborative fog nodes without fixed routing tables.
- **Side-car proxies:** Provide fog node monitoring and management by ensuring all control msgs from orchestrator are met



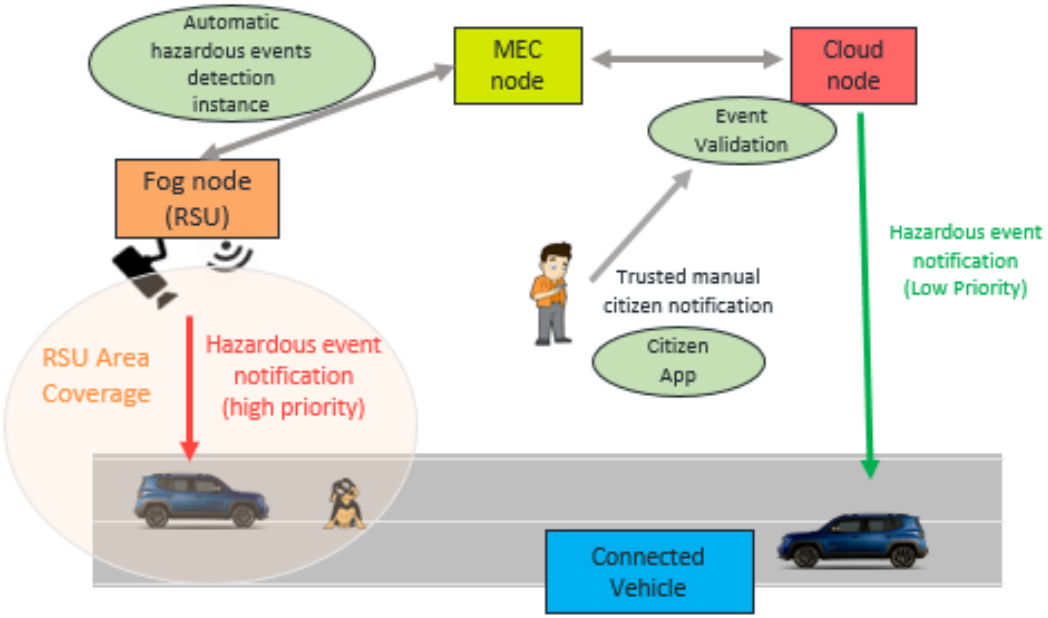
Adaptive Monitoring

- Dynamically adjust sensing intensity and/or data dissemination rate
- Distributed data storage fabric
- Monitoring API routes queries to appropriate nodes



Urban Mobility Use Case

- Real-time geo-referenced notification system about hazards on the road
- Info come from trusted devices
- If network gets congested, stop video stream from RSU and/or move service to MEC node



Collaboration Possibility 1: Secure Control Plane

- Sidecar Proxy adapter for Open Horizon
- Allows Sidecar Proxy to be deployed on Open Horizon Nodes
  - Offers orchestrator interface to apps on node
  - Configurable monitoring
  - Carries our orchestration actions on node

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Collaboration Possibility 2: Geo-distributed data processing

- Integrate RAINBOW's monitoring data storage fabric into Open Horizon
- API for running distributed analytics queries on fog nodes

Collaboration Possibility 3: Rapid Testing/Prototyping via Emulation

- Create reusable fog test scenarios using Fogify emulator
- Allows simulation of fog environment using Docker containers
- Configurable network QoS properties
- Testing scenarios that simulate network changes and node failures

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Thank you!

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