FLUIDOS @MetaOS Workshop

Flexible, scalable, secure, and decentralized Operating System

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Many silos

IoT/Edge

Cloud
FLUIDOS is all about transparency

The FLUIDOS computing continuum defines *multiple, dynamic, secure virtual spaces*, spanning across multiple *technological domains* and *administrative boundaries*, with *deployment transparency, communication transparency*, and *resource transparency*. 

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**a)** Current silos-based computing continuum

**b)** FLUIDOS computing continuum
FLUIDOS technological pillars

- Node and Protocols
- Meta-orchestrator
- Security
- Energy
- Open-source

Use cases
(1) FLUIDOS node and Protocols

FLUIDOS Node

- Privacy and Security Manager
- Local Resource Manager
- Trust Security Agent

REAR Controller
- Gateway
- Discovery Manager
- Contract Manager
- Solv Controller
- Allocation Controller
- Peering Candidates
- Available Resources

Remote Telemetry Service

Local Telemetry Service

Ratings and Metrics

RESource Advertisement and Reservation protocol (REAR)

CONSUMER

REMOTE FLAVOR

LIST FLAVORS

CONSUMER

RESERVATION

RESERVE FLAVOR (FLAVOR ID)

OK/KO + TRANSACTION ID + TTP

CONSUMER

PURCHASE

PURCHASE FLAVOR (FLAVOR ID)

OK/KO

CONSUMER

K8s clusters
- VMs
- Software services
- Sensors
- Data

Provider

LIQO

Kubectl FLUIDOS Plugin

Meta Orchestrator
- MSPL Orchestrator
- Label Orchestrator
(2) Meta orchestrator

Service Handler API
- Native K8S
- Medium-level security policy language (MSPL)
- Model-based K8S
- More!

Node Meta-orchestrator
- MSPL-based Meta-orchestrator
- Model-based Meta-orchestrator

Available Resources
- REAR Manager

“local” K8S scheduler via standard deployment

“Local” FLUIDOS node

Intents
(3) Security

FLUIDOS Phases

- Discovery
  - Services against Infrastructure
  - Services against Services
  - Infrastructure against Services

- Resource Acquisition
  - Authentication and Authorisation
    - FLUIDOS nodes
    - IoT devices & FLUIDOS nodes
  - Intent-based Border Protection
  - Trustworthy image repositories
  - Node security policies enforcement
  - Threat Detection
  - Cloud-native Cyber Deception and Security Orchestration

- Usage
  - Attestation
  - Workload Confidentiality

S: Software tool
M: Method (Algorithm, Protocol, Policy, etc.)
(4) Energy

- **Energy efficiency**
  - Reduce operational carbon
    - Use cleaner electricity
      - Load shifting (Computing)
        - Spatial load shifting
        - Electricity mix
          - Temporal load shifting
            - Load predictions
              - Energy predictions
  - Reduce embodied carbon
    - Less infrastructure
      - Increase utilization rate
        - Data centres
        - Edge computing
          - IoT / deep edge

- Load shifting
  - Load predictions
  - Energy predictions

- Effective infrastructure
(5) Open-source

Kubernetes (K8s, K3s, etc), Liqo, KubeEdge

https://github.com/fluidos-project
Use cases

**Smart Viticulture**
Seamless deployment of services at device/edge/cloud level, with reduced devops overhead

**Intelligent Power Grid**
Increased resiliency and survivability properties of critical ICT services for smart grids

**Robotics Logistic**
Improved battery usage and decreased hardware cost through processing offloading