Arrowhead Framework development coordination telco 170523

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Agenda

1) Productive4.0 and FAR-EDGE projects usage of Arrowhead Framework
Short introduction

2) Arrowhead Framework 3.0 + 3.2 -> 4.0
Information on ongoing specification work

3) Automation support services, update

4) Arrowhead Framework in dept course, start August 15

5) Next meeting

6) AoB

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Productive4.0

Will use Arrowhead Framework as a base line architecture for Industri4.0 Production/Manufacturing automation

WP1 - Architecture and Concepts

Lead BnearIT and LTU

Fredrik Blomstedt, Jerker Delsing

Requirements WS

- Lead by Prof. Oyster Haugen, Norway
- June 21: 8.30-10.30
- webex link

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Productive4.0

Requirements WS

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https://meetings.webex.com/collabs/#/meetings/detail?uuid=MEU3Q7LQAIJPQ6HGWTWFK78UHX-6CWH&rnd=617655.77494

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FAR-EDGE

Will use Arrowhead Framework for manufacturing automation integration

- Virtual twin - simulation
- Multi stakeholder trust - ledger/block chain
- Analytics/big data
- Machine/instrument integration

Current phase is

- Manufacturing automation architecture definition
- M7

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Arrowhead Framework v4.0

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Arrowhead Framework
Mandatory core systems

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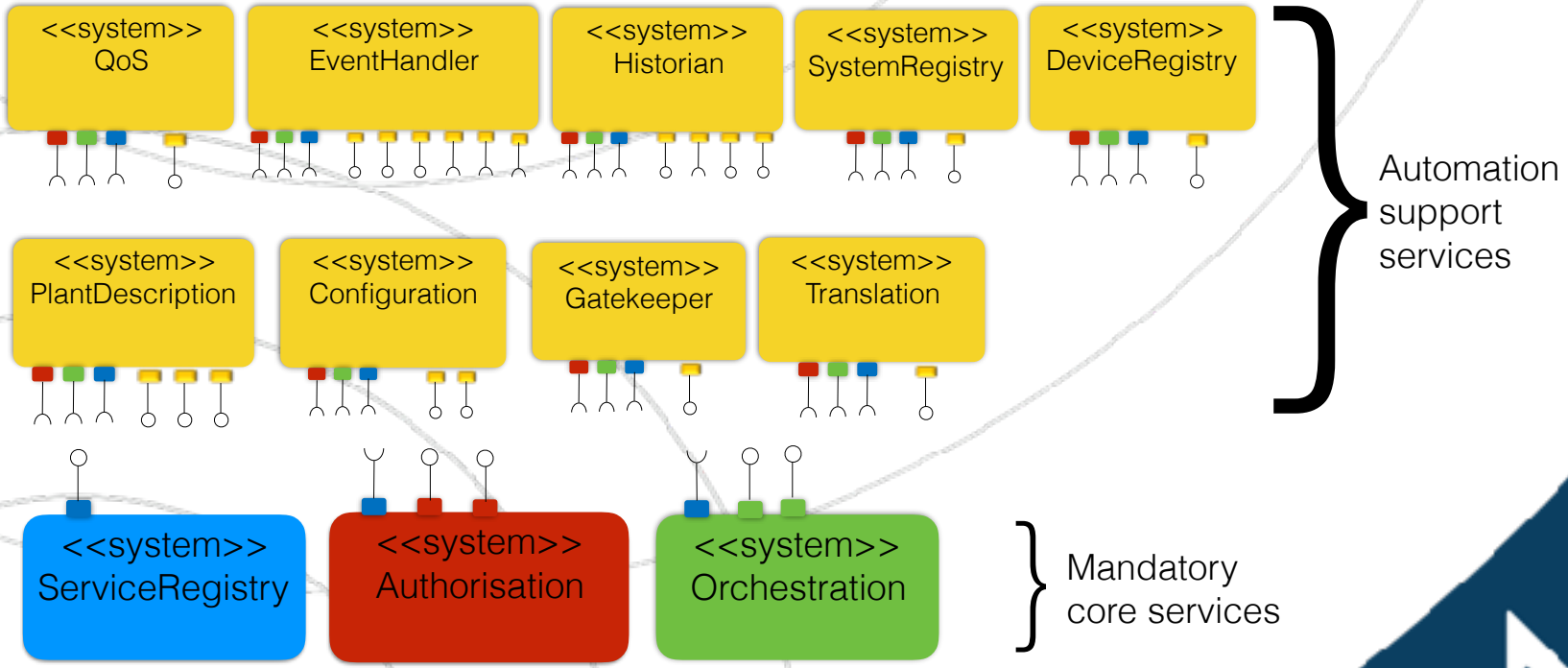
Arrowhead Framework core systems



Mandatory core services

ServiceRegistry

- DNS-SD based
- Interaction with SystemRegistry, DeviceRegistry, Authorisation
- Extend search capability to all data in the DNS-SD
- ServiceRegistry will have multiple protocol interfaces allowing it to be well known enabling a service producer X tuning protocol Y to register it’s services with the ServiceRegistry.

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Mandatory core services

Authorisation

- X.509 certificates and tokens
- Resource constrained devices
- Authentication mechanisms for devices, systems and services
- Identity management tools

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Mandatory core services

Orchestration

- Based on engineering data - push
  - Integration to PlantDescription, Configuration
- Based on System knowledge - pull

- OrchestrationCapability (Fredrik B)
  - New service

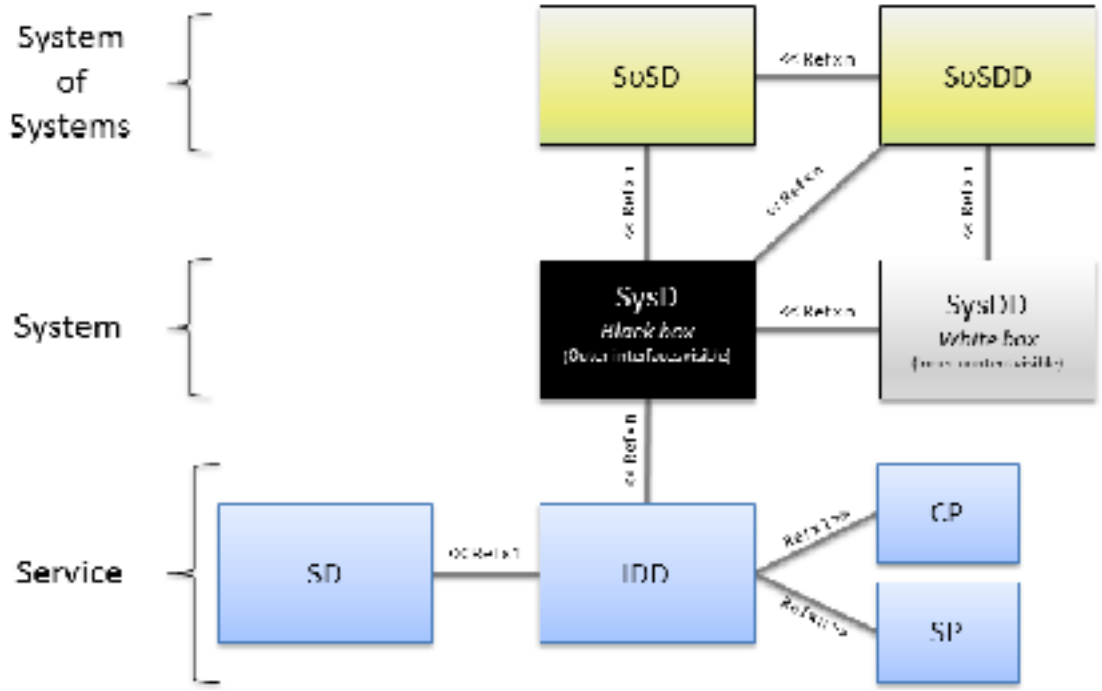
Next step

Produce v4.0 documentation

- SysD/SysDD
- IDD CP/SP
- SD

Next webex

May 29, 15-17



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Arrowhead Framework
Support core systems

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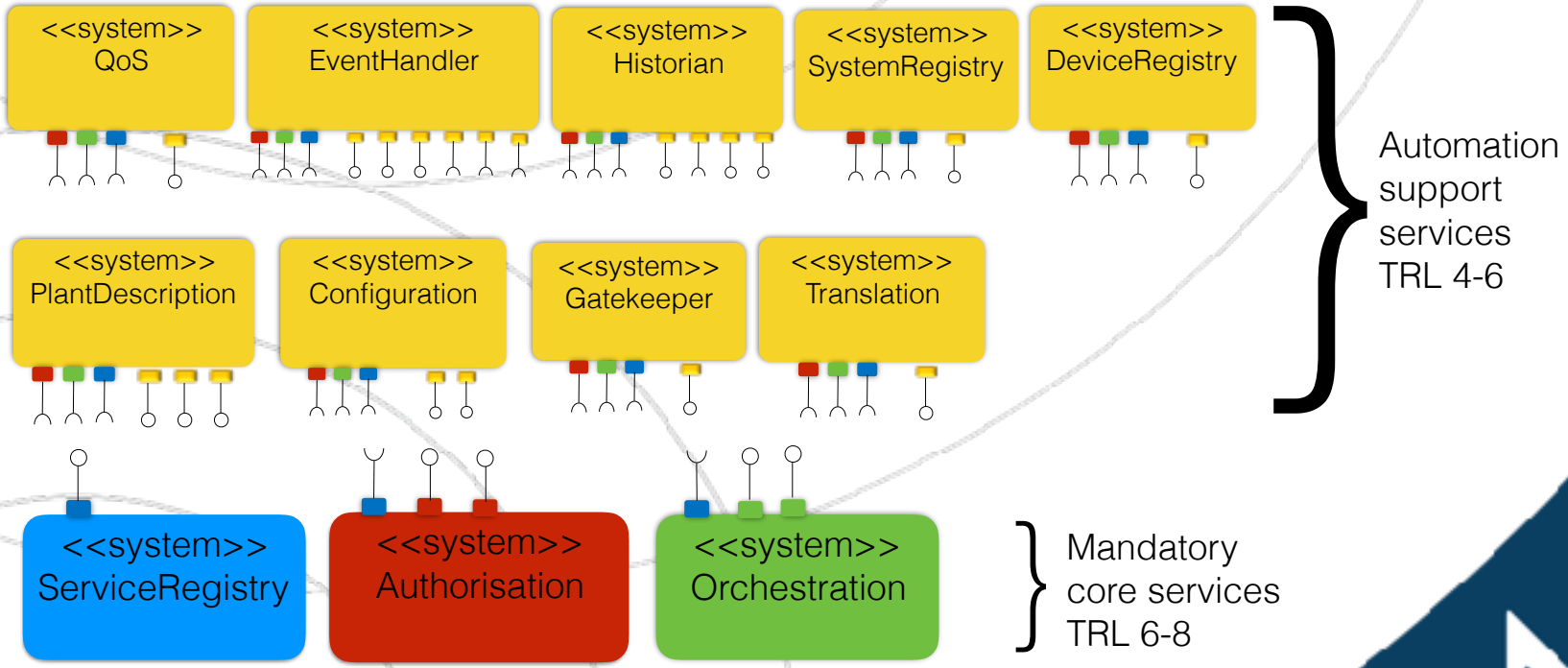
Automation support core systems - currently



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Automation Support core systems - maintainers

- Historian, Jens
- QoS, Michelle
- EventHandler, Michelle
- Gatekeeper, Csaba
- Translation, Hasan
- PlantDescription, Oscar
- Configuration, Oscar

- SystemRegistry, TBD
- DeviceRegistry, TBD

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Arrowhead Framework summer school

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Start: Aug 16, 13.00

Obejctive: Provide the foundations for IoT automation and introduction to the Arrowhead Framework properties and core systems. Leading to capabilities of designing and implementing Arrowhead Framework compliant service.

6 x 2-3 hour lectures: Aug 15 - Aug 24

location Luleå, LTU premises

will be transmitted using webex

Cover chapter 1-6 of the book:
IoT Automation - Arrowhead Framework

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Examination

Arrowhead Framework compliant system

- Design - documentation
- Implementation - working code
- Test - passing Arrowhead Framework compliance test

Sign up with: jerker.delsing@ltu.se

Further issues for investigations

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Dynamic generation of service producers

Can a new service be dynamically created by a system based on API’s or updated configuration?

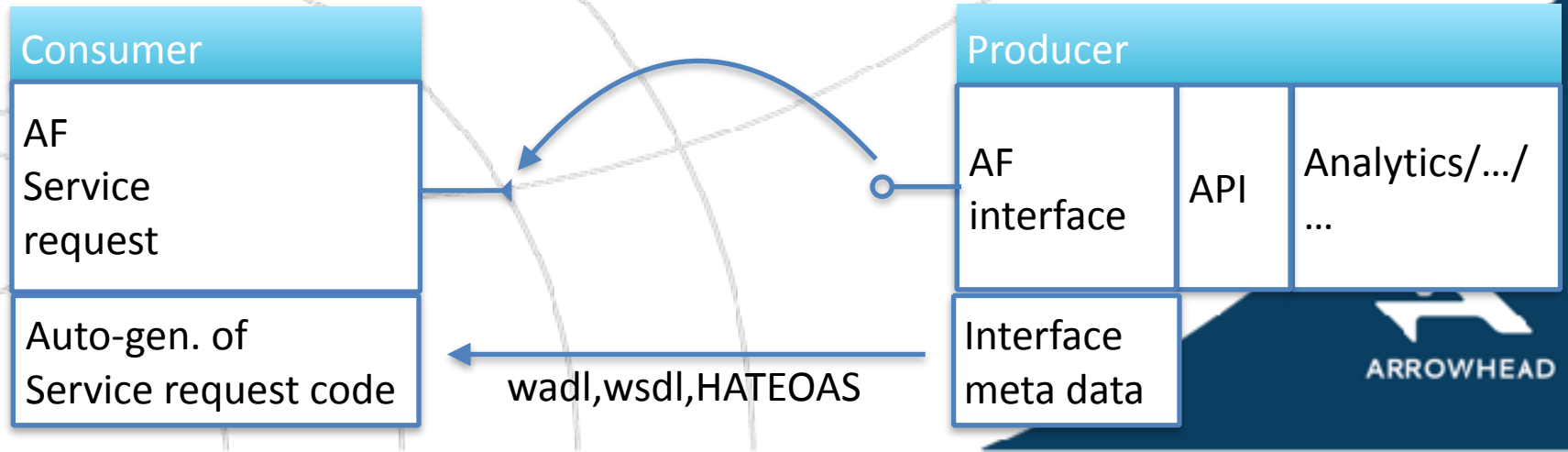
Integration to API based “tools” e.g. analytics, ledgers, …

Available API

API to Arrowhead Framework Service tool

Mechanism for autogeneration of service producer/consumer code based on SysD, IDD, SD, CP, SP documentation

- wadl
- wsdl



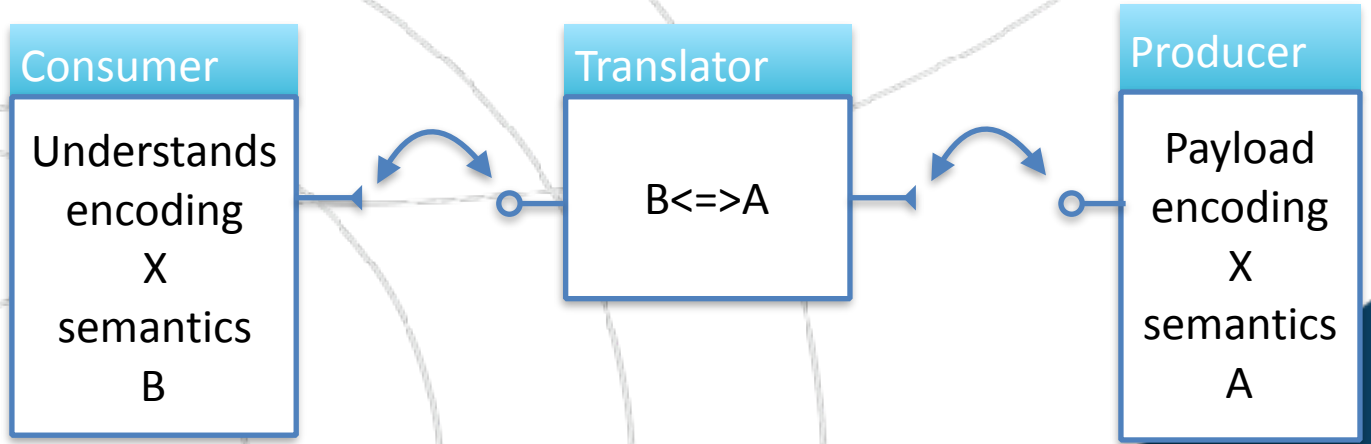
Semantics interoperability

- Can semantics interoperability be created/supported by machine learning translations?
  - Extending Arrowhead Framework Translation system
    - Current translation capability
      - SOA Protocol level
        - REST, MQTT, CoAP
        - OPC-UA initial work

Mechanism for Semantics translation

Service semantics retrieved from metadata

- Semantics translation using machine learning
- Training on static data sets
- Training update on dynamic data



Smart service contracts

Can Smart service contracts and associated trust be built based on block chain/ledger technology?

Can Smart service contracts be updated based on detected system anomalies/degradation?

Smart Contracts - Trust among stakeholders

Technical contract, protocols, semantics, etc…

Business contract, terms and conditions, penalties, …..

SoS contract, what if condition based behaviour, plan B, C, D, …

Context detection and context based behaviour

Contract agreement between stakeholders

Stakeholder identity

Smart Contracts - trust

Usage of Blockchain/ledger technology

- trust levels
- trust establishment with different HW capacities

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System of Systems engineering

Can legacy system engineering and system management tools data be utilised for Arrowhead Framework PlantDescription and Configuration systems?

How to add security engineering and management to automation functionality engineering and management?

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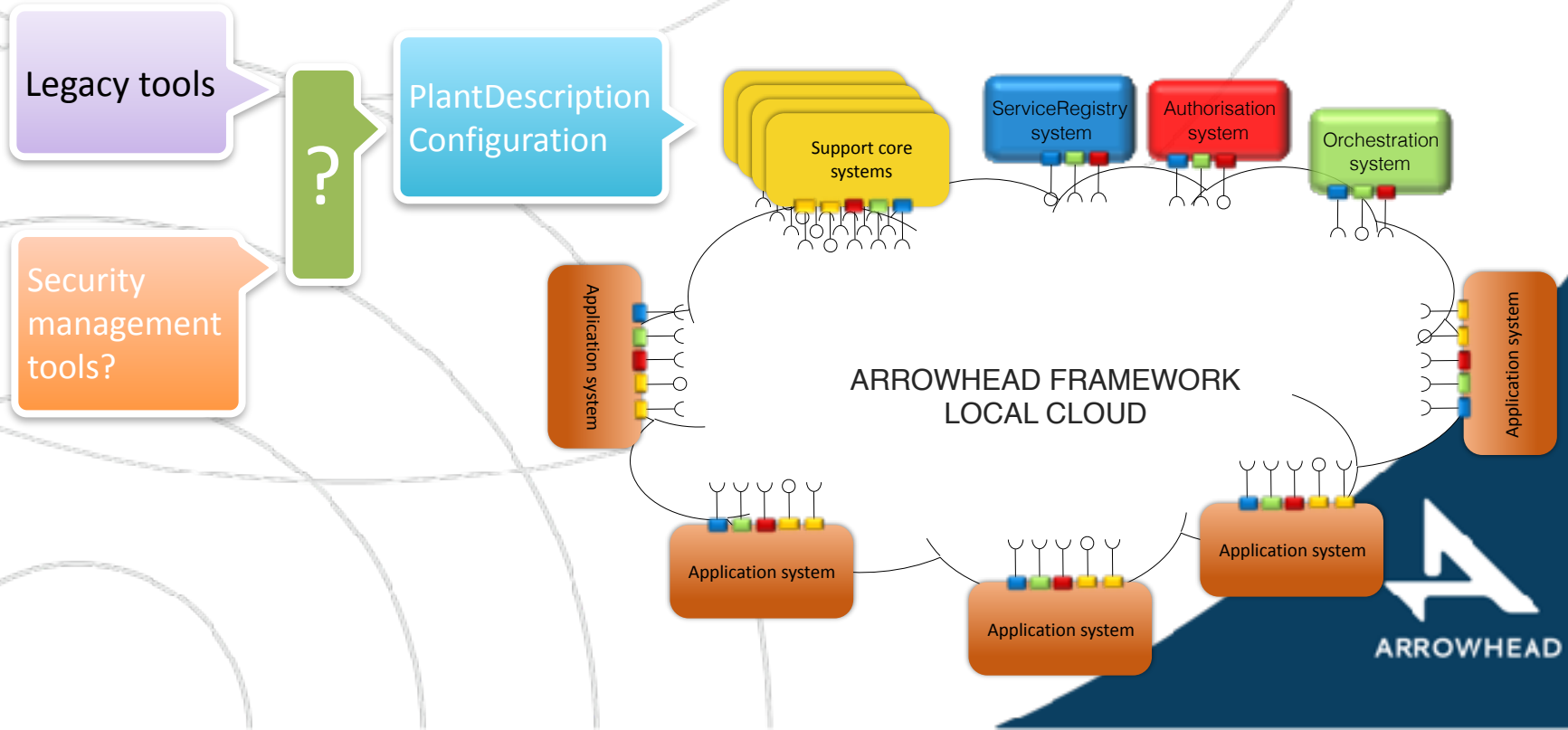
Integration to legacy engineering process



PlantDescription

Implementation based on Oscar Carlssons work

Smart contracts integration, what if scenarios

Integration of legacy tool data

Integration to v4.0

Tool chain integration using OSLC

Configuration system

Implementation of first prototype

Smart contracts and configuration data

Security aspects of configuration updates

Security aspects of code updates

Integration with dynamic service changes based on configuration changes

Integration to v4.0

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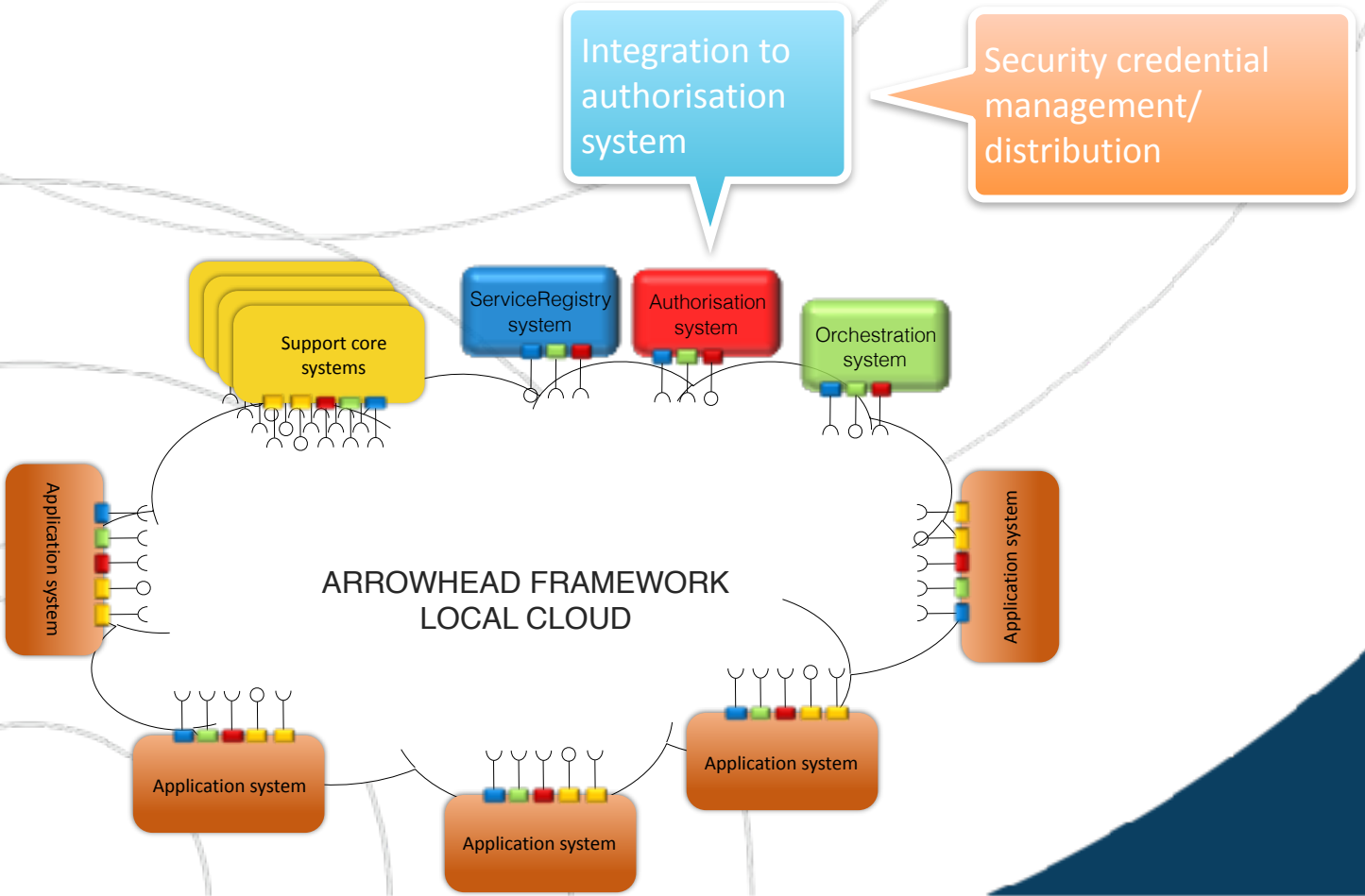
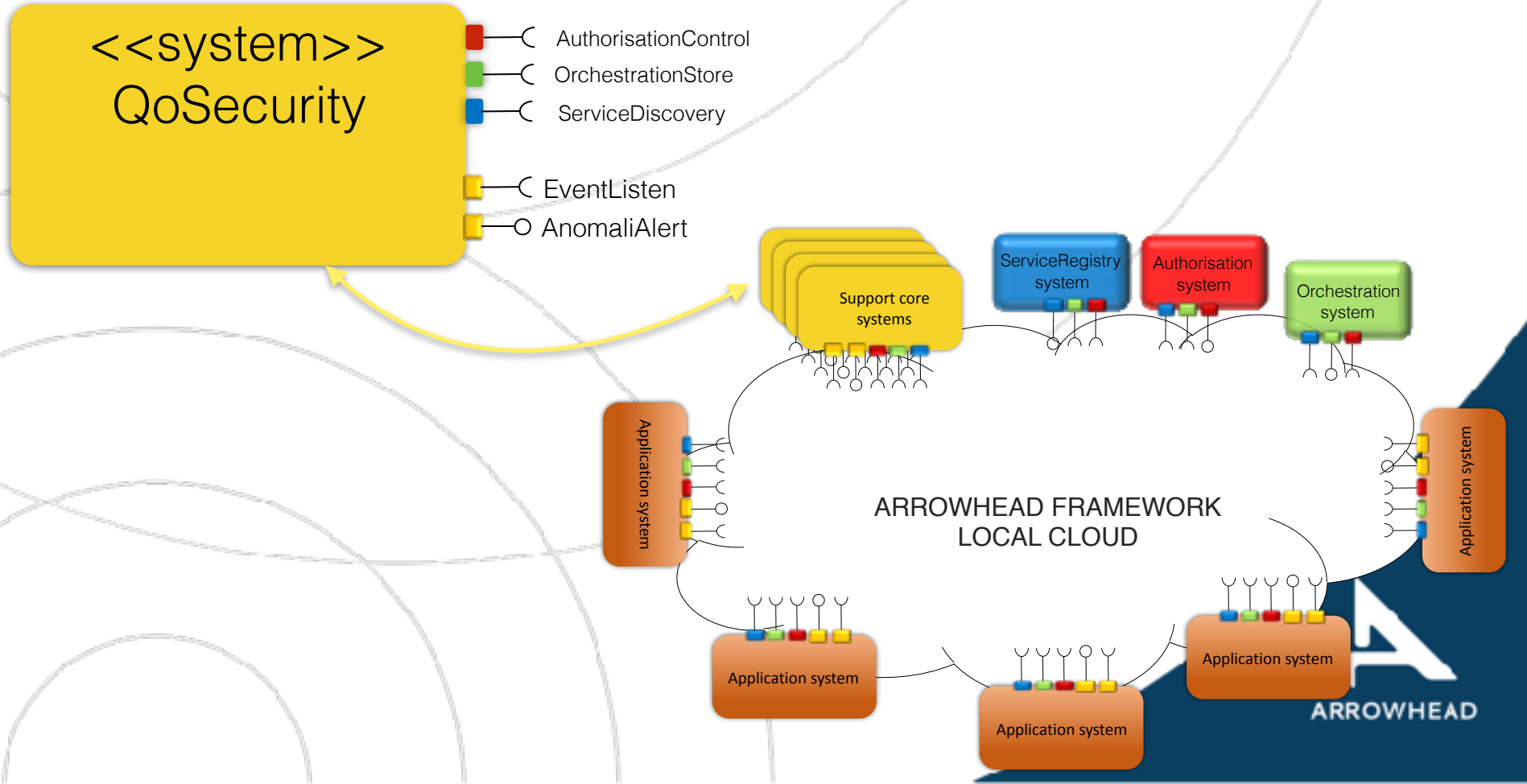
System anomali detection

Can system anomalis and degradation be detected in a local cloud?

Integration of credential management



System anomaly detection



Anomali detection

- Quality of Security
  - Detection of operations and functional anomalies
    - Based Security and Orchestration engineering data
    - Determine security and safety? implications

- Quality of Operations
  - Detection of functional degradation and anomalies e.g.
    - Based PlantDescription and Configuration engineering data e.g.
      - Sensor error
      - Operations errors
      - Predictive maintenance - RUL