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Arrowhead Adapters for Integration Tools
WP 3

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Context & Motivation

Context

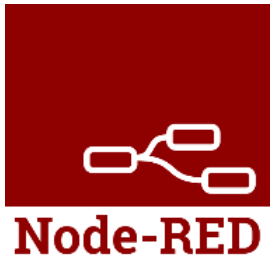
- Arrowhead research in three alternatives for Workflow or Process Management
  - **Process modelling standards (BPMN and BPEL) and tools and platforms for implementations (ESB) (MGEP)**
  - Colour Petri Nets (AITIA BME)
  - Workflow Manager (LTU)
- Other data and workflow Integration Tools exist (Node-RED, different ESB alternatives …)

Motivation

- Build Arrowhead “adapters” for those integration tools so developers that use them can easily become Arrowhead compliant.
- Those adapters are pieces of software that interact with the Arrowhead framework services providing interoperability
- Focus on **Node-RED** and **BPMN + WSO2** (ESB)

ARROWHEAD TOOLS

Node-RED



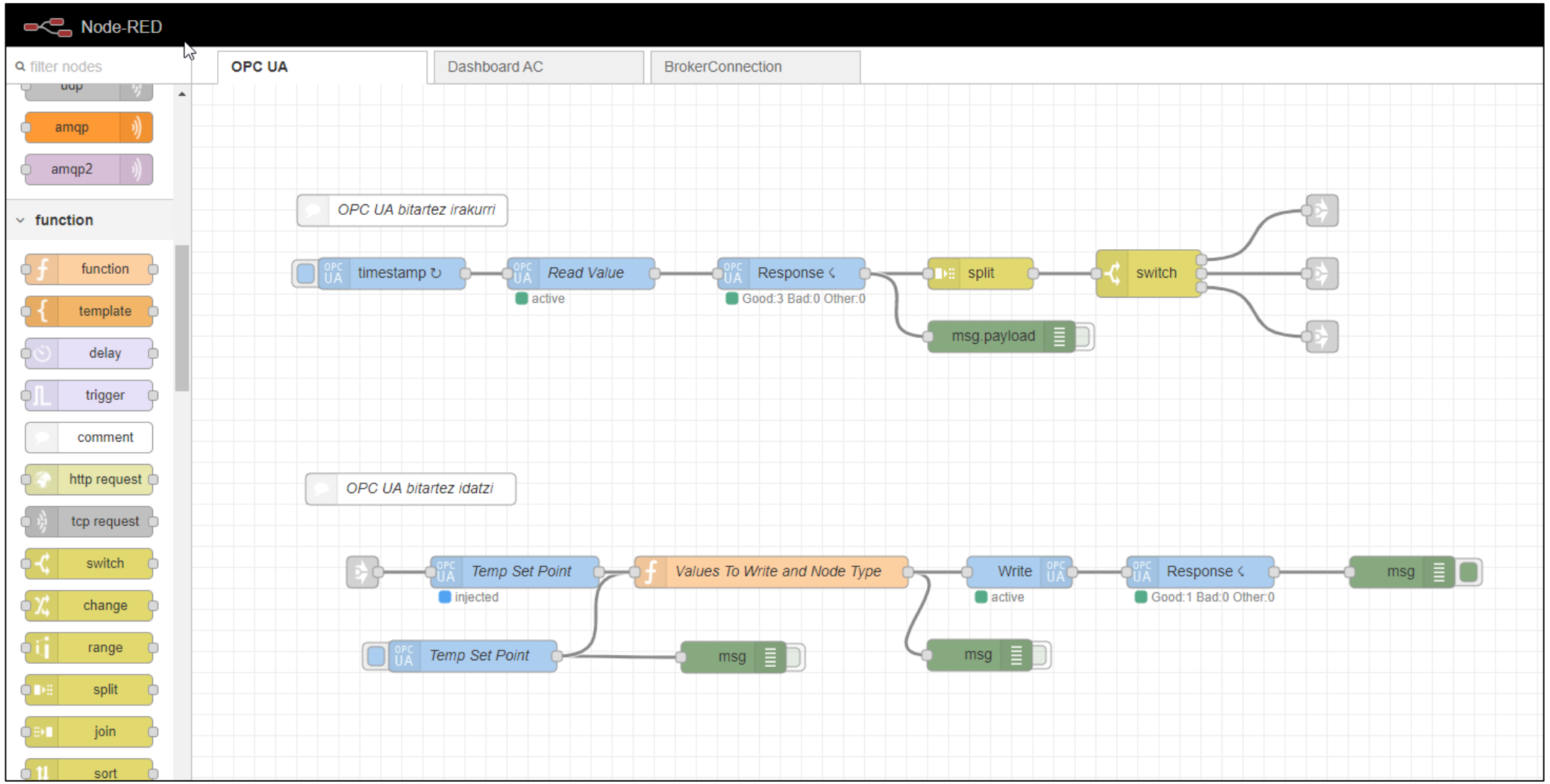
- Node-RED is a flow-based programming tool
- Created by IBM. Now is part of Open JS Foundation.
- Describe application's behavior as a network of black-boxes (nodes)
- Each node has a well-defined purpose
- Data → Node (does something) →Data'
- The network is responsible for the flow of data between the nodes.
- User friendly (visual representation)
- Node.js based runtime
- Web browser to access the flow editor
- Flows share as JSON files
- Community behind
- IoT oriented. Can run in a embedded device

ARROWHEAD TOOLS

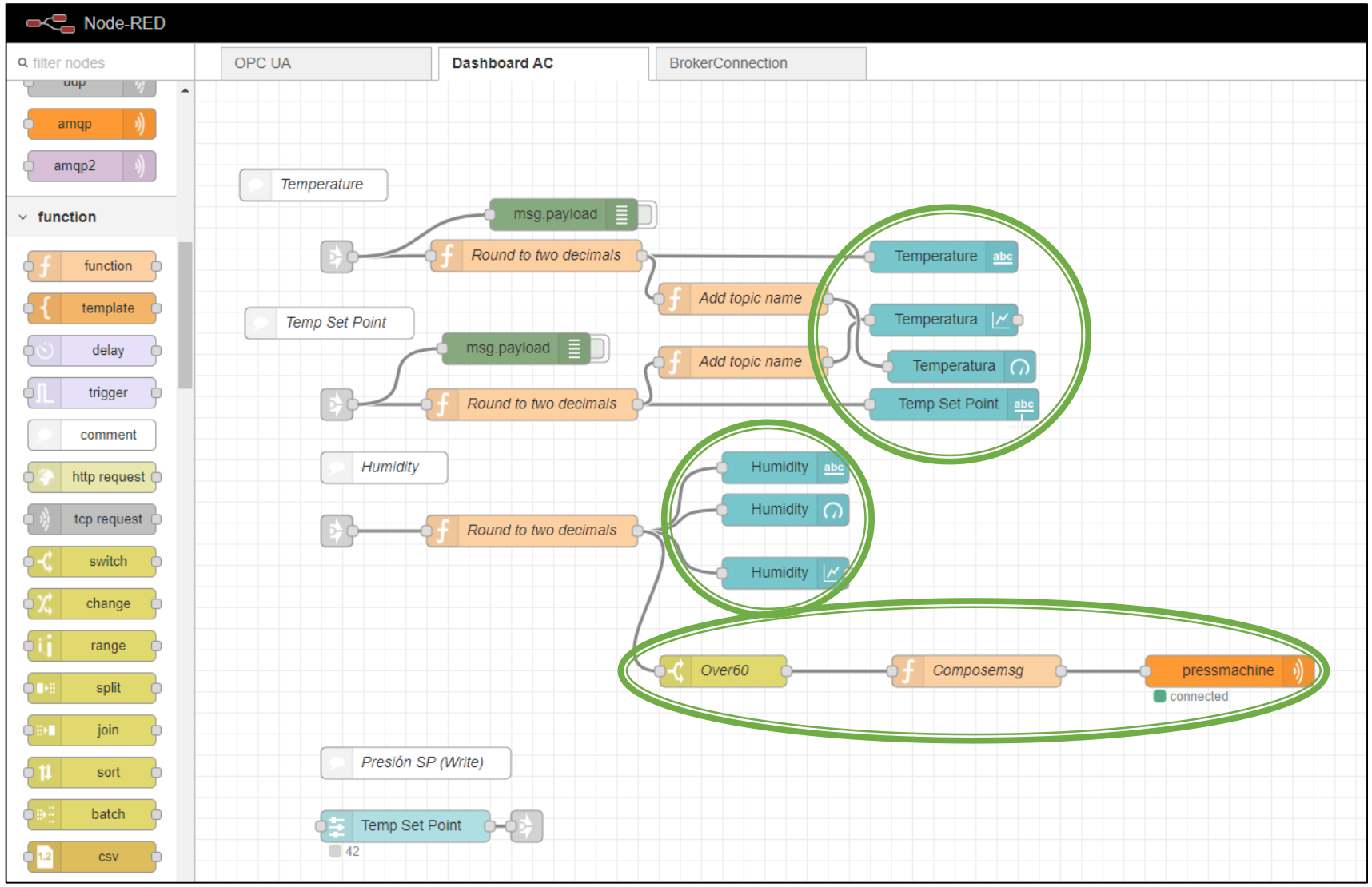
Node-RED Example

- Next 3 slides present data flows that enable interaction with an **OPC-UA** server, collect information, plot that information in dashboards and send messages to a AMQP broker (**RabbitMQ**)
- Node-RED also enables the consumption of web services and the creation of endpoints using a RESTful architecture

OT Integrator (Node-RED OPCUA Adaptor flow)

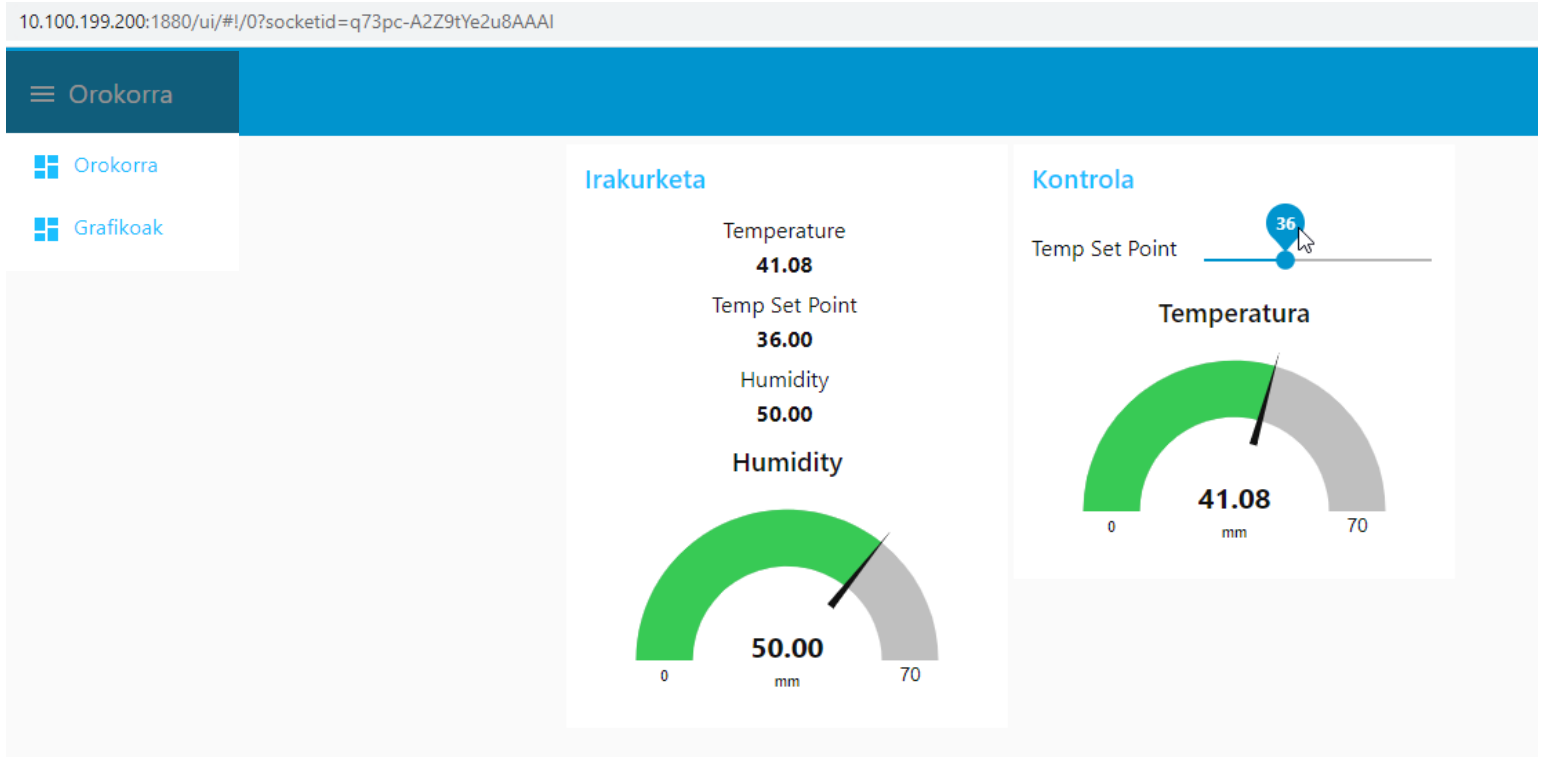


OT Integrator (Node-RED Dashboard flow)



- Creates Visualization adds
- Sends message to message broker when a conditions occurs:
  - Humidity >= 60

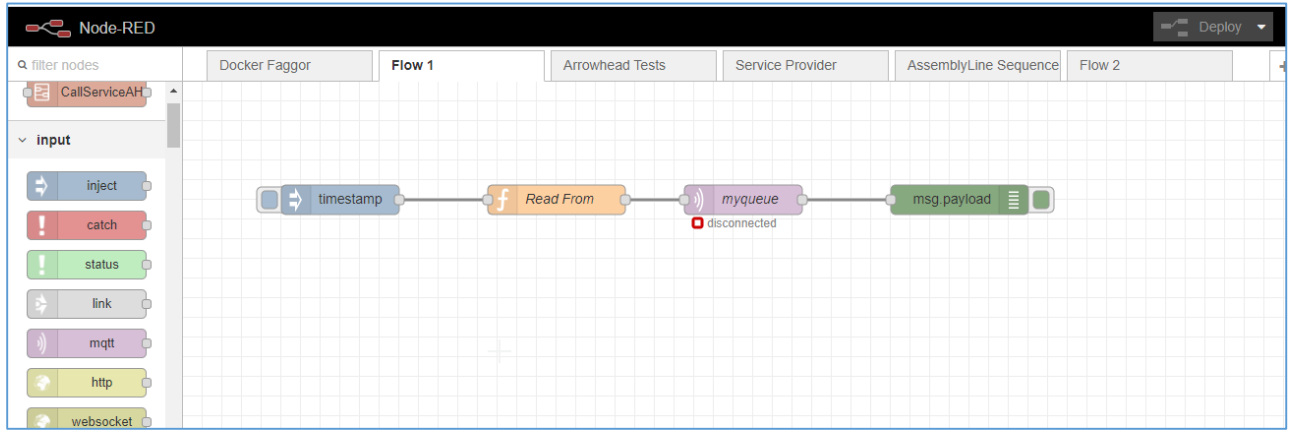
OT Integrator (Node-RED Dashboards)

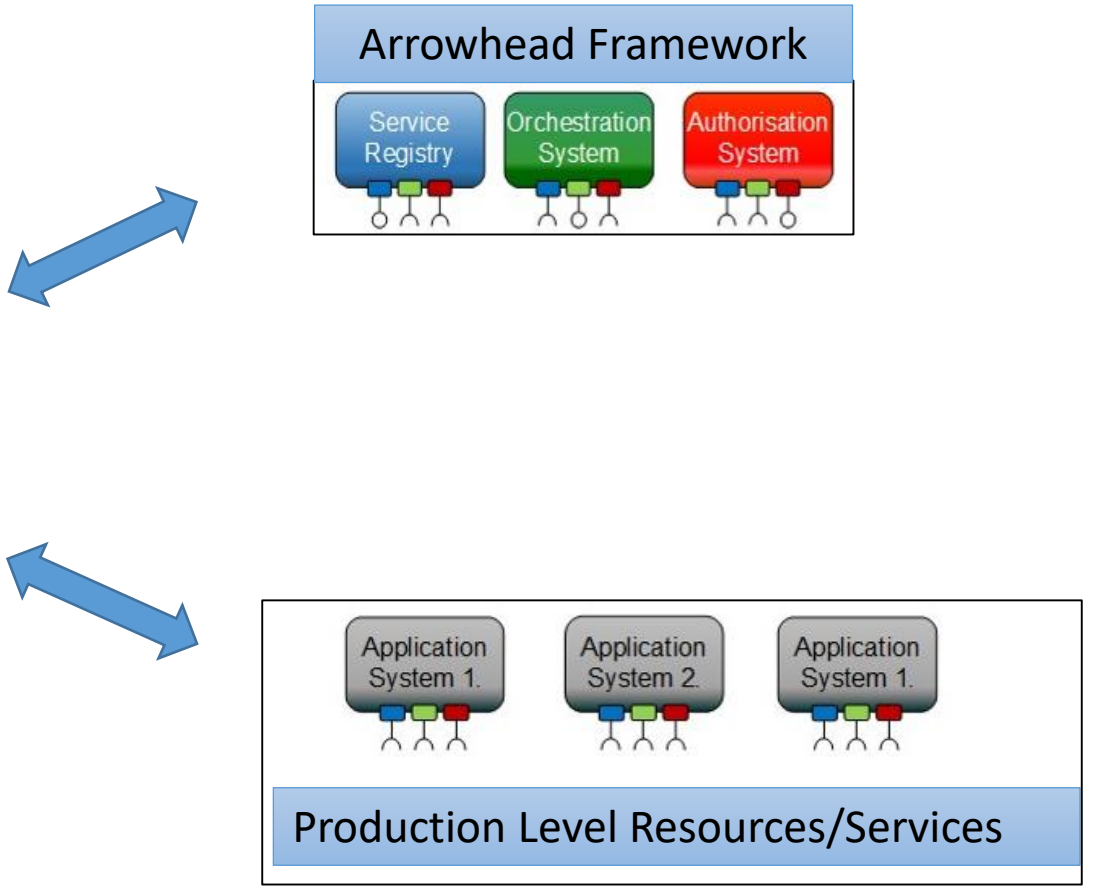


- OPCUA data is presented
- Interfaces are interactive
- Local visualization

Node-RED Arrowhead Architecture

Node-RED flows consume services using the Arrowhead framework





ARROWHEAD TOOLS

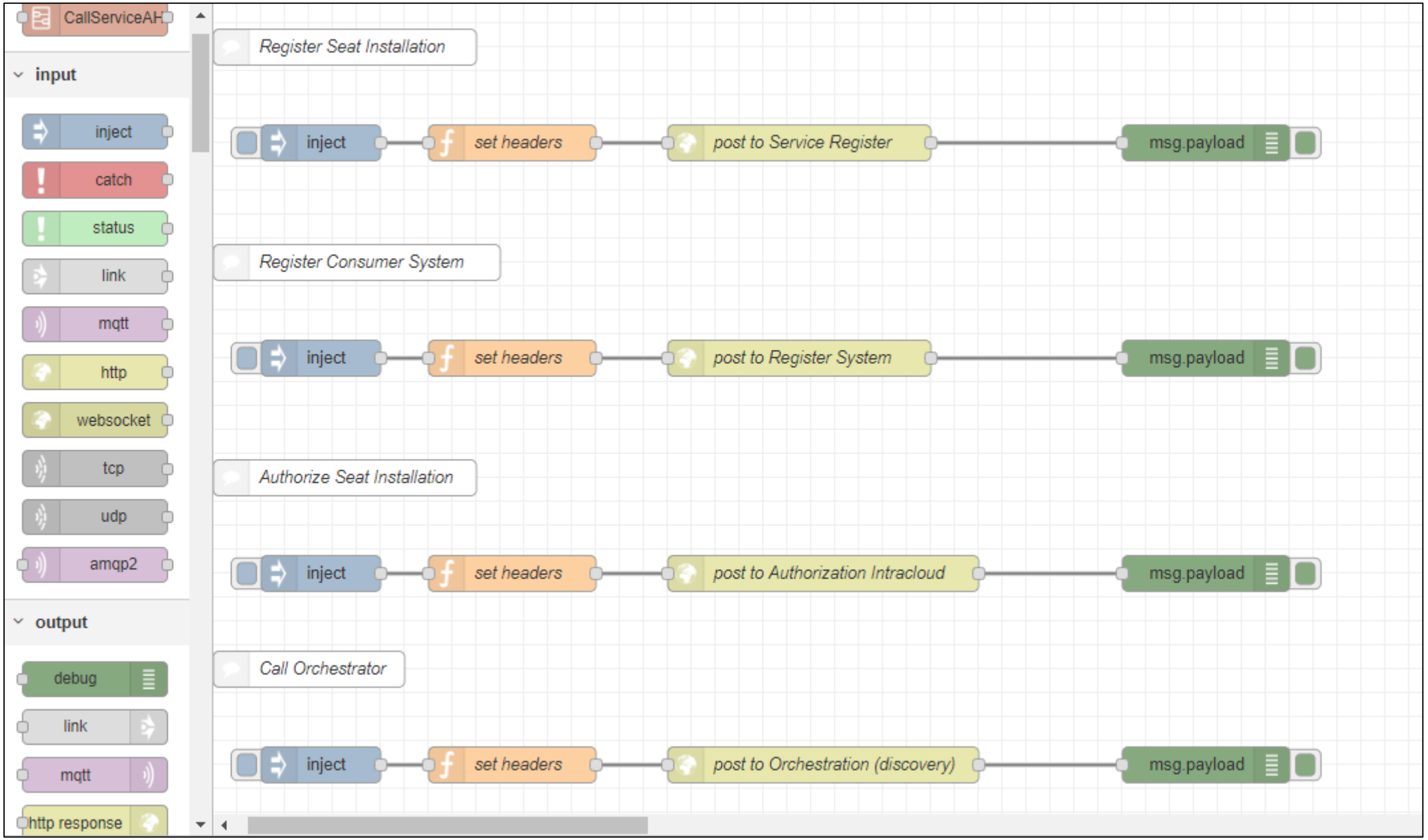
Node-RED Completed Steps

- ❑ Produce flows to call Arrowhead Core services (Registry, Orchestrator and Authorization) See next slide
- ❑ Consume service using Arrowhead Orchestrator (see slide 11)
- ❑ Build a flow involving several services using Arrowhead (see slide 12)
- ❑ Build a subflow combining a call to Arrowhead + a call to a Service (see slide 13).
- ❑ Simplify the sequence of service calls with the new subflow (see slide 14).

Note: Using Arrowhead version 4.1.3 Insecure mode

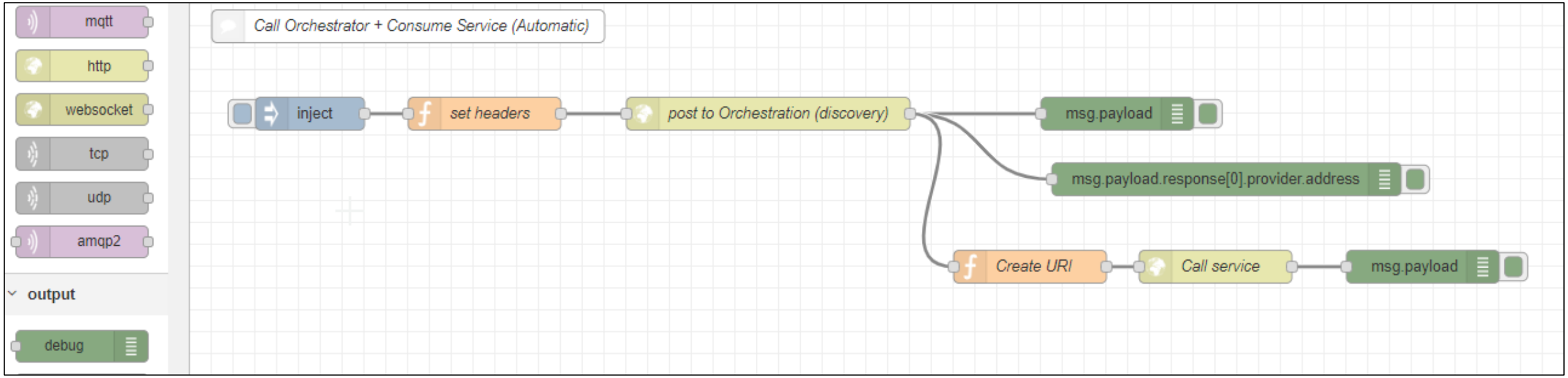
ARROWHEAD TOOLS

Node-RED call Arrowhead Core Services



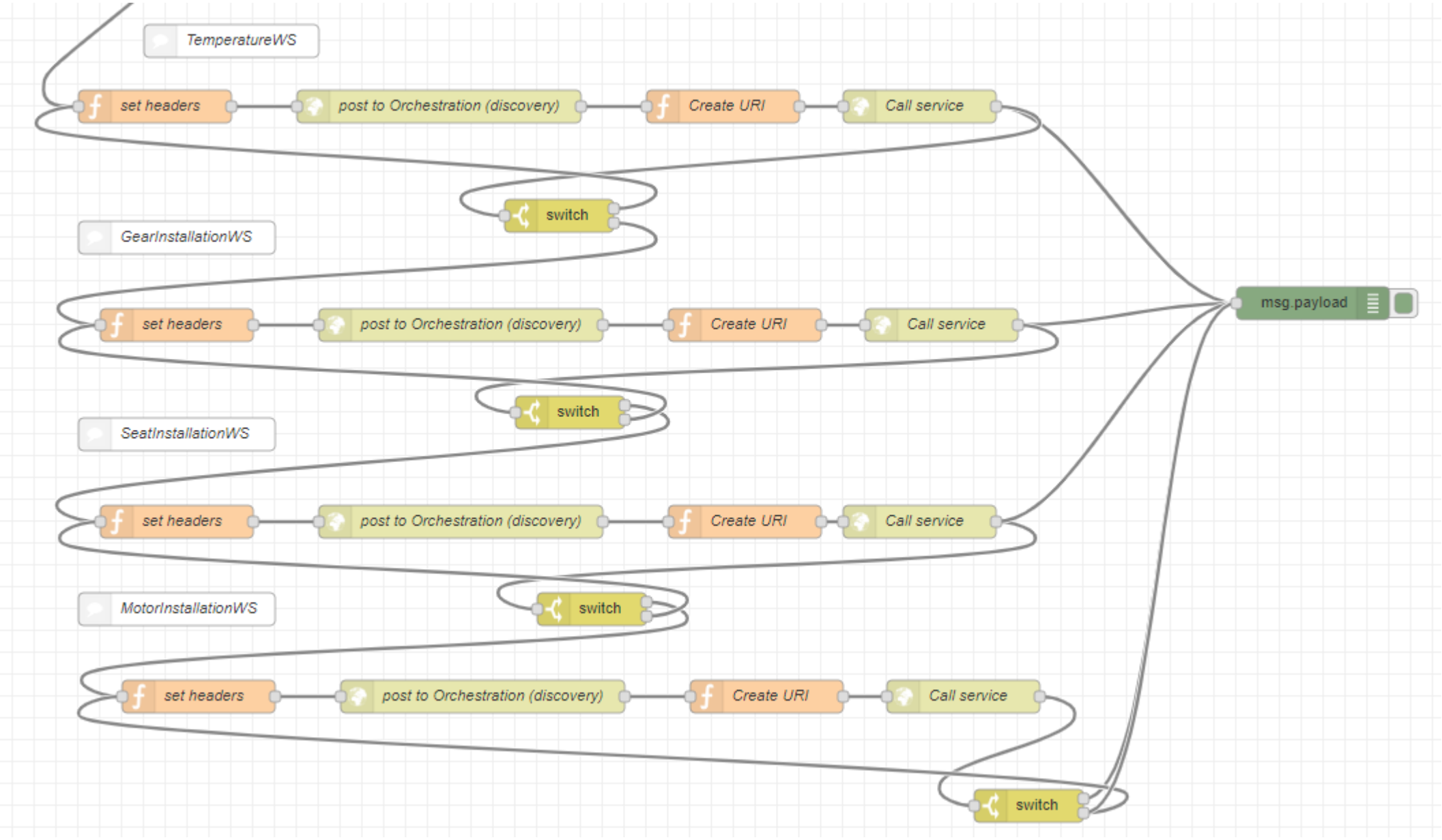
ARROWHEAD TOOLS

Node-RED consume Service using Arrowhead Orchestrator



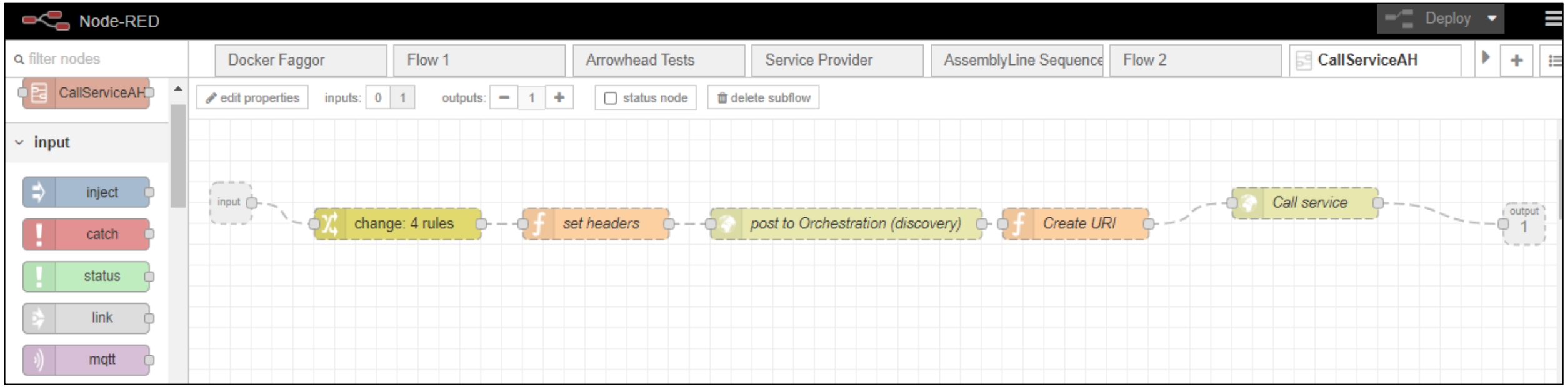
ARROWHEAD TOOLS

Node-RED flow with a several services through Arrowhead



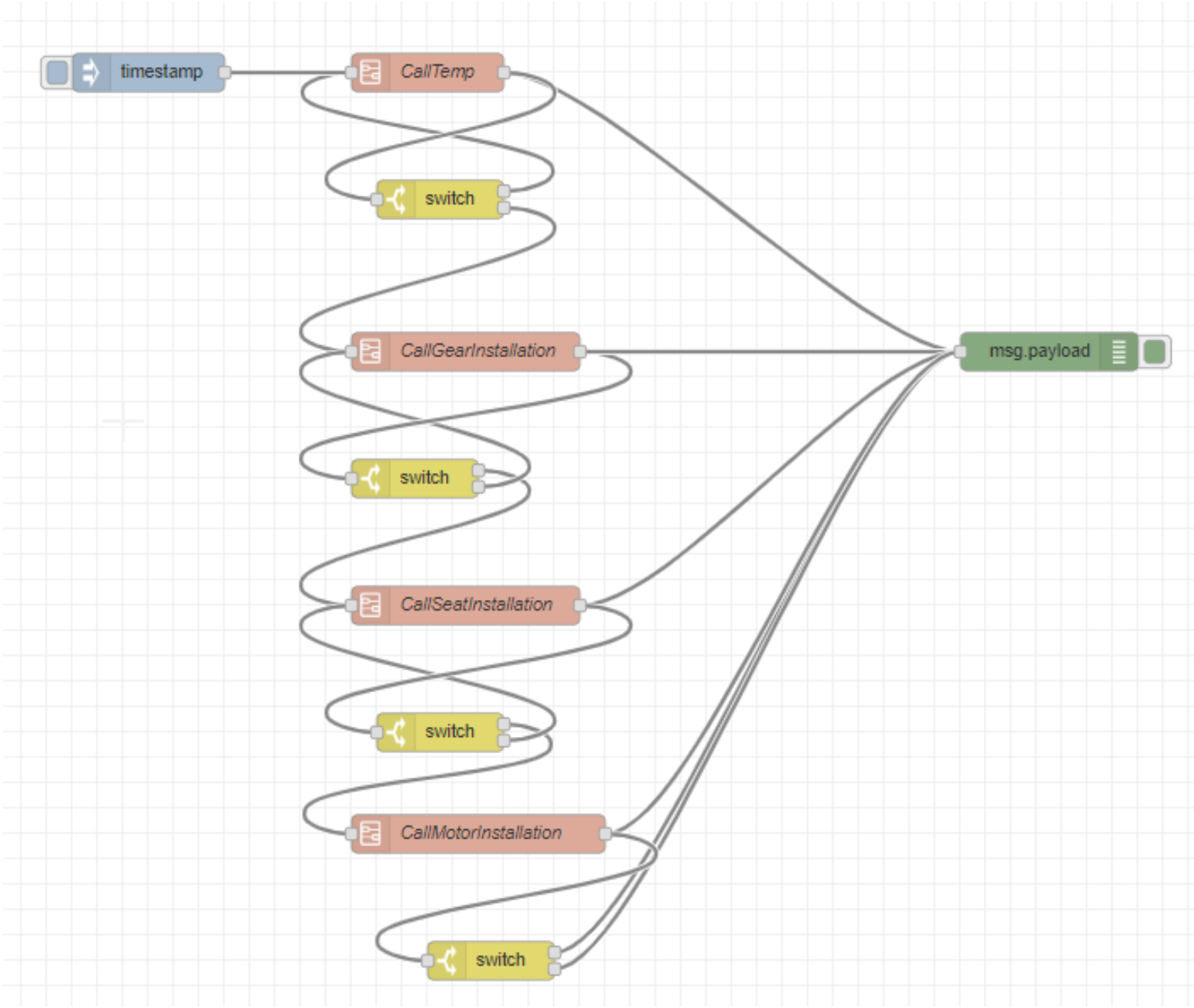
ARROWHEAD TOOLS

Node-RED build a subflow combining Arrowhead + Service Call



ARROWHEAD TOOLS

Node-RED Simplify the sequence of service calls with the new subflow



ARROWHEAD TOOLS

Node-RED Next Steps

- Identify which parameters can be set as configuration parameters and which parameters must be included in the messages travelling through the flow
- Build Arrowhead nodes instead of subflows to be used in the palette
- Create a package for the new Arrowhead nodes and upload it to the Node-RED community
- Repeat the process for the secure mode
- Include adapters for other Arrowhead services (Event Handler, Data Manager …)

Note: Using Arrowhead version 4.1.3 Insecure mode

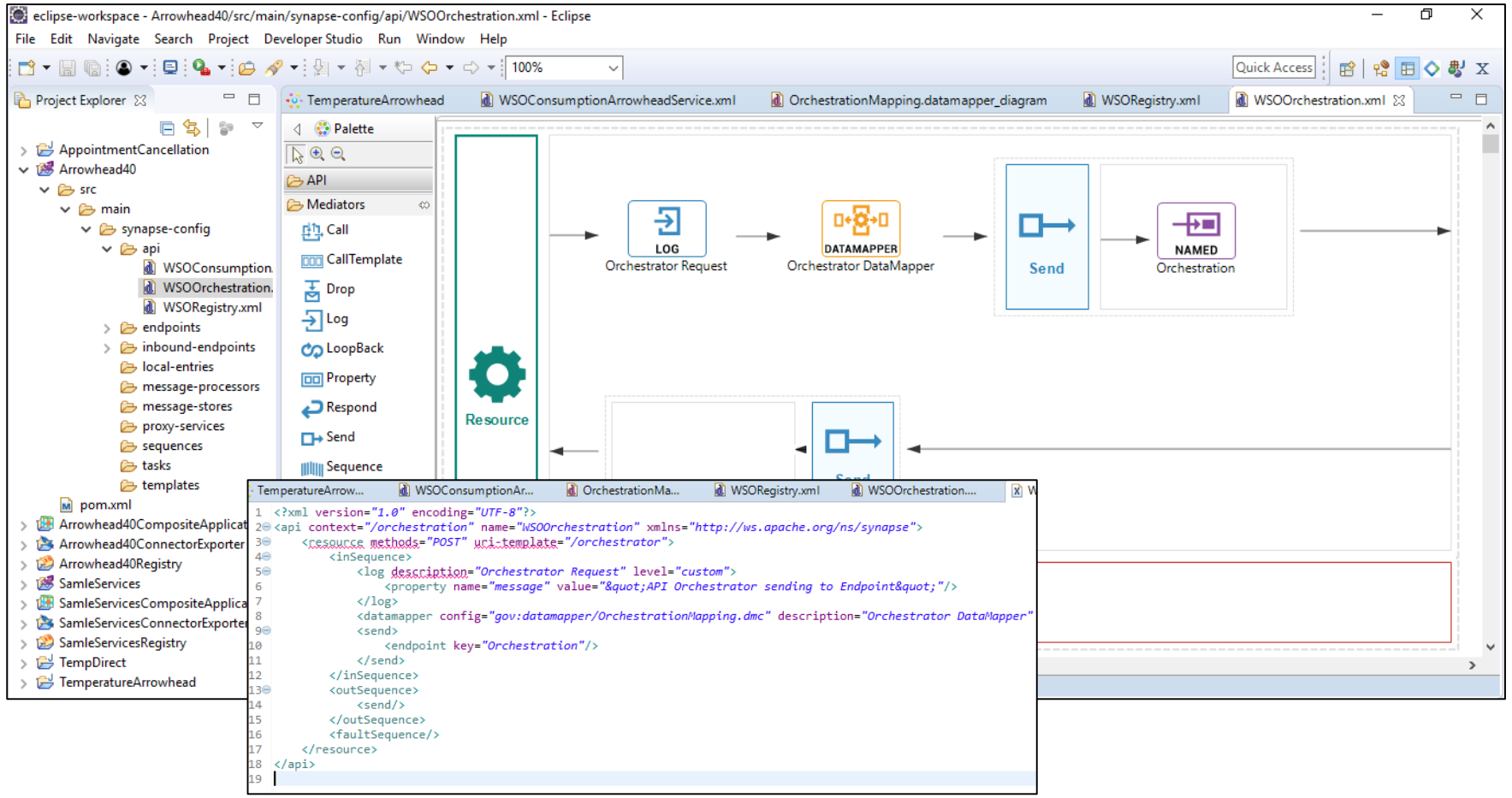
ARROWHEAD TOOLS

BPMN+WSO2

This is the continuation for the work started in Productive 4.0 but for the new version

Objectives: Build adapters in WSO2 for Arrowhead Core services (ver. 4.1.3) (as for Java, C++ or Python)

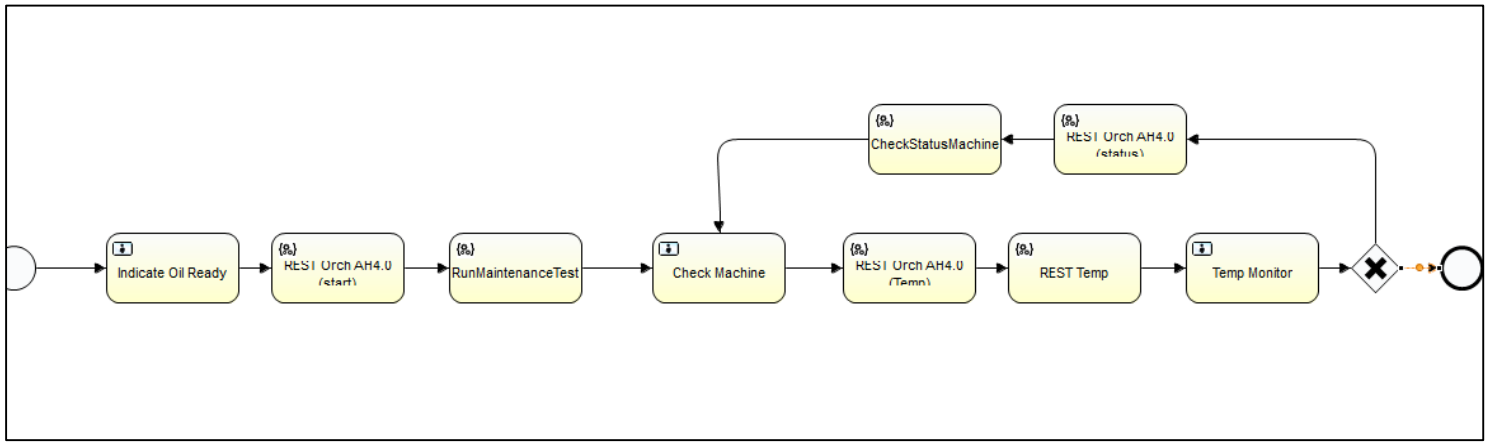
- APIs + Sequences
- Use those adapters in BPMN

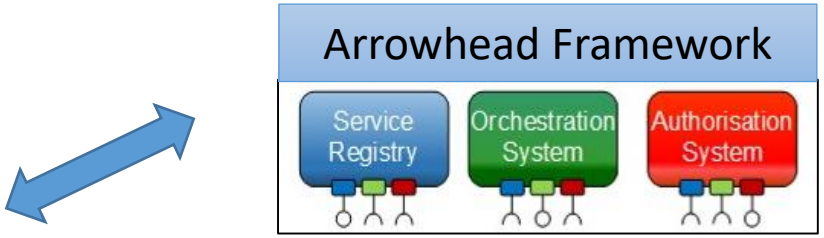


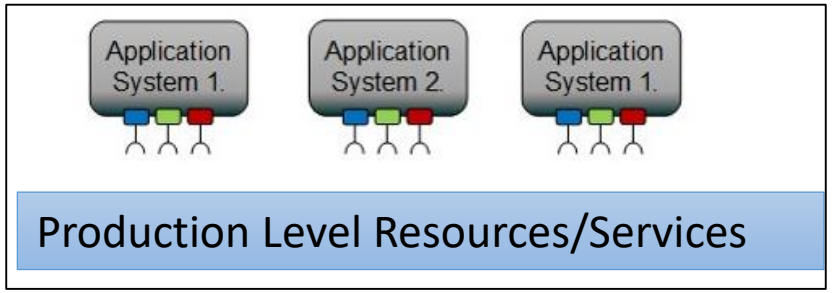
ARROWHEAD TOOLS

BPMN+WSO2 Architecture

Build BPMN processes that call services using the Arrowhead Framework and deploy the process in WSO2 servers







ARROWHEAD TOOLS

BPMN+WSO2 Completed Steps

- ❑ Produce sequences and APIs to call Arrowhead Core services (Registry, Orchestrator and Authorization)
- ❑ Consume service using Arrowhead Orchestrator
- ❑ Build a flow in BPMN involving several services using Arrowhead and deploy it in WSO2 Business Process Server

Note: Using Arrowhead version 4.1.3 Insecure mode

ARROWHEAD TOOLS

BPMN+WSO2 Next Steps

- ❑ Identify which parameters can be set as configuration parameters and which parameters must be passed.
- ❑ Build APIs for Arrowhead that simplify the usage of Arrowhead in BPMN
- ❑ Analyze the options for sharing those APIs towards the community
- ❑ Repeat the process for the secure mode
- ❑ Include adapters for other Arrowhead services (Event Handler, Data Manager …)

Note: Using Arrowhead version 4.1.3 Insecure mode

ARROWHEAD TOOLS