



FIDAL

FIELD TRIALS BEYOND 5G

FIDAL Open Calls

2024-07-17

Maestro: The FIDAL Service Orchestrator

Georgios P. Katsikas



Funded by
the European Union

- Service definition
 - Service Developer viewpoint
 - Orchestrator's viewpoint
- Service onboarding
- Service ordering
- Service (De-)Activation
- Service LCM
- FIDAL
 - Maestro in FIDAL
 - Contact points
- Maestro APIs
- Maestro Docs





Service

Service (graph) definition



MS#1



MS#2

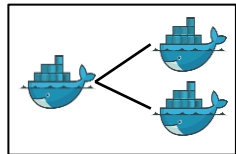


MS#3

(Micro)Service

An individual deployment unit,
not necessarily self-contained

Service (graph) definition



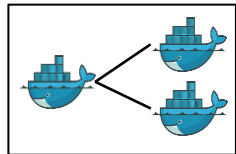
(Micro)Service

An individual deployment unit,
not necessarily self-contained

Service graph

One or more (micro)services
forming a composite service

Service (graph) definition



Service graph

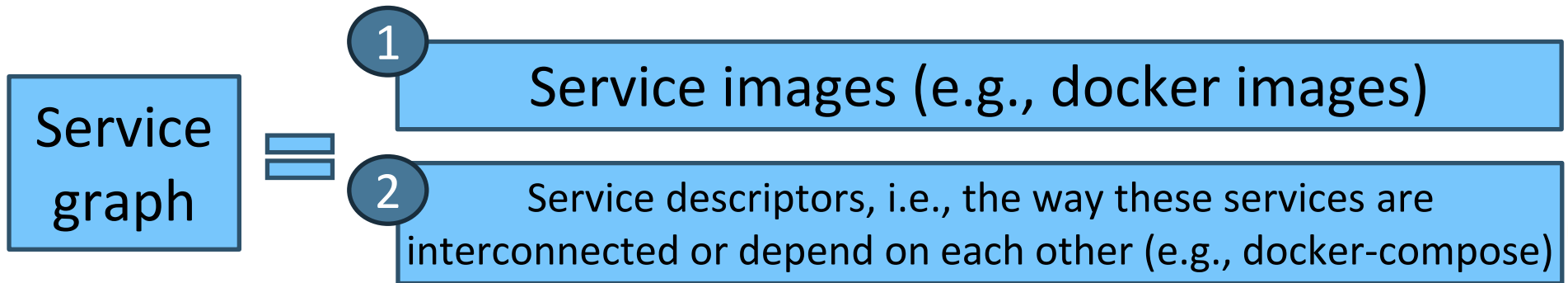


- 1 Service images (e.g., docker images)
- 2 Service descriptors, i.e., the way these services are interconnected or depend on each other (e.g., docker-compose)

(Micro)Service
An individual deployment unit,
not necessarily self-contained

Service graph
One or more (micro)services
forming a composite service

How to produce a service graph?



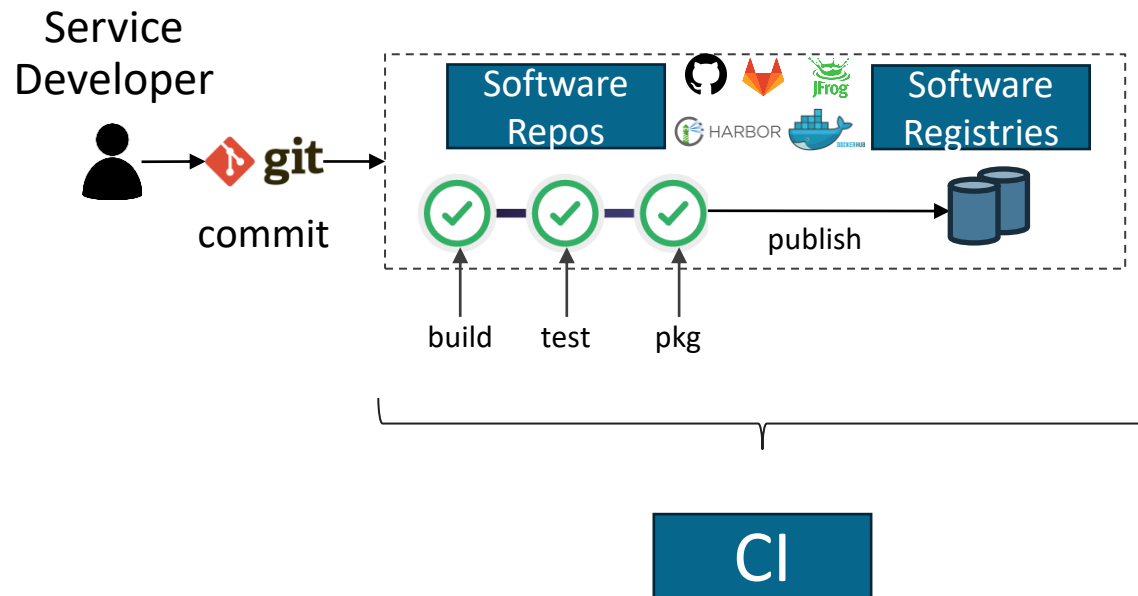
Let's see what it takes to create service images + descriptors

Service – Where to begin

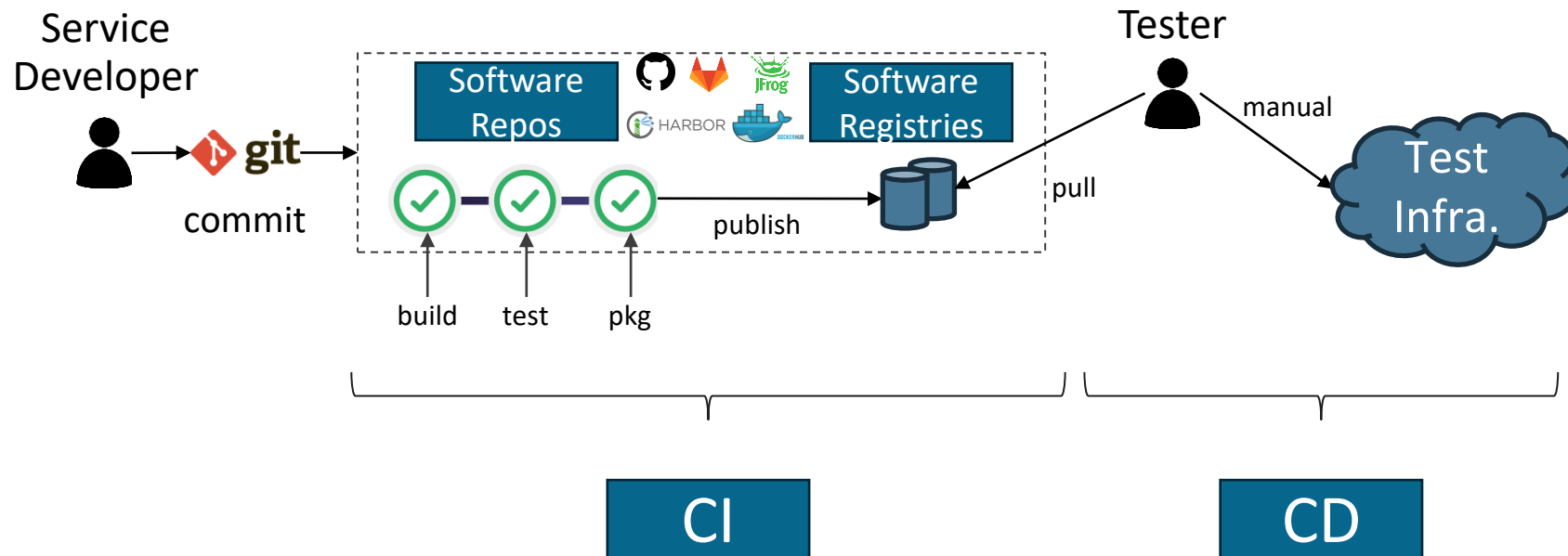


**Reference
point**

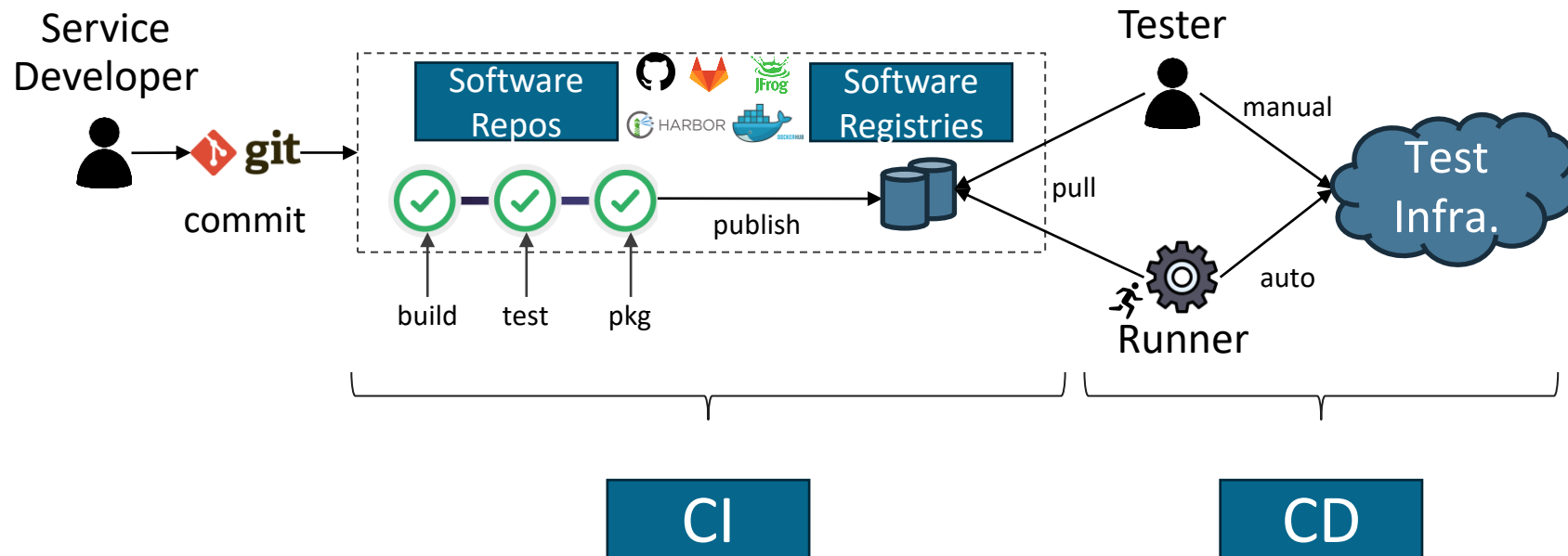
Service – Developer-side



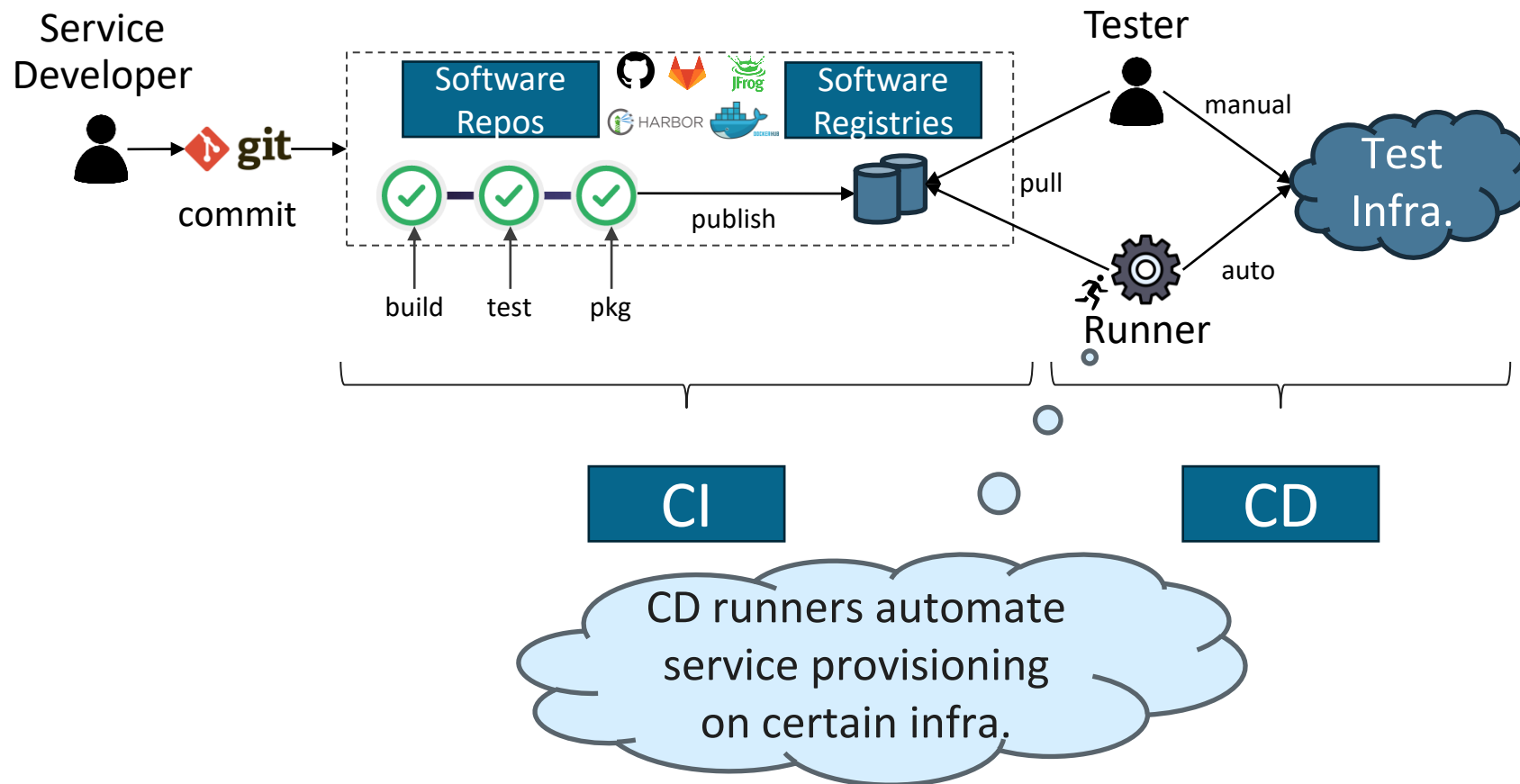
Service – Developer-side



Service – Developer-side

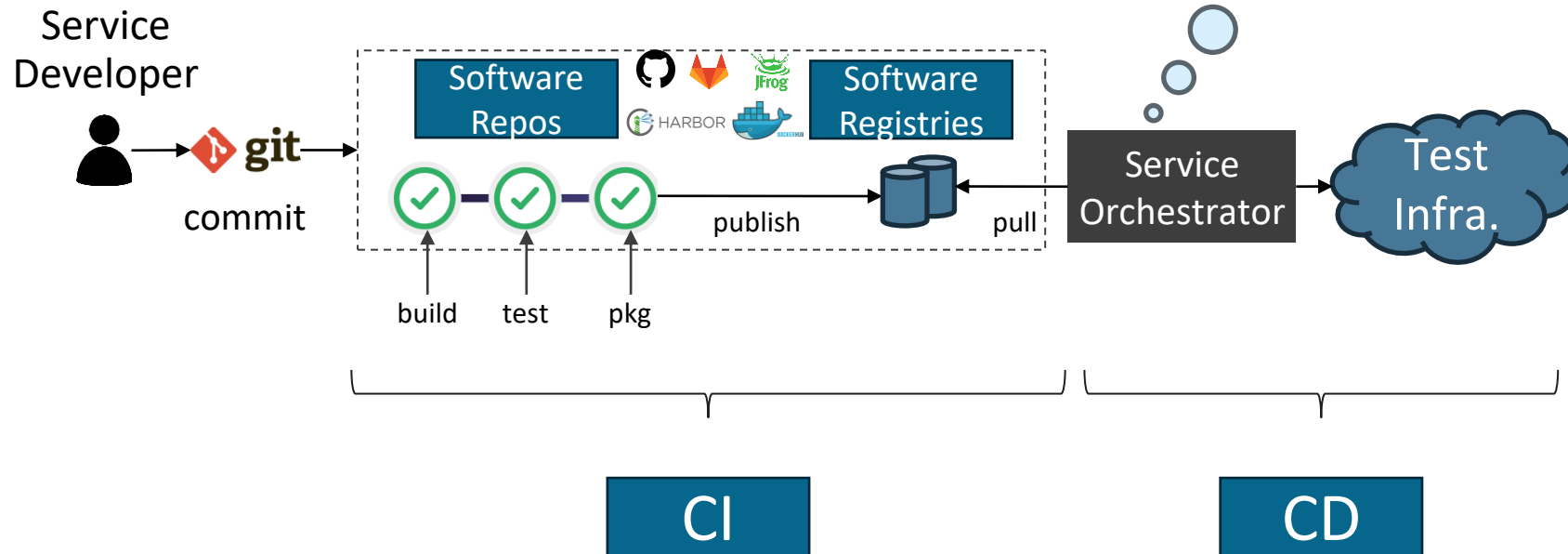


Service – Developer-side

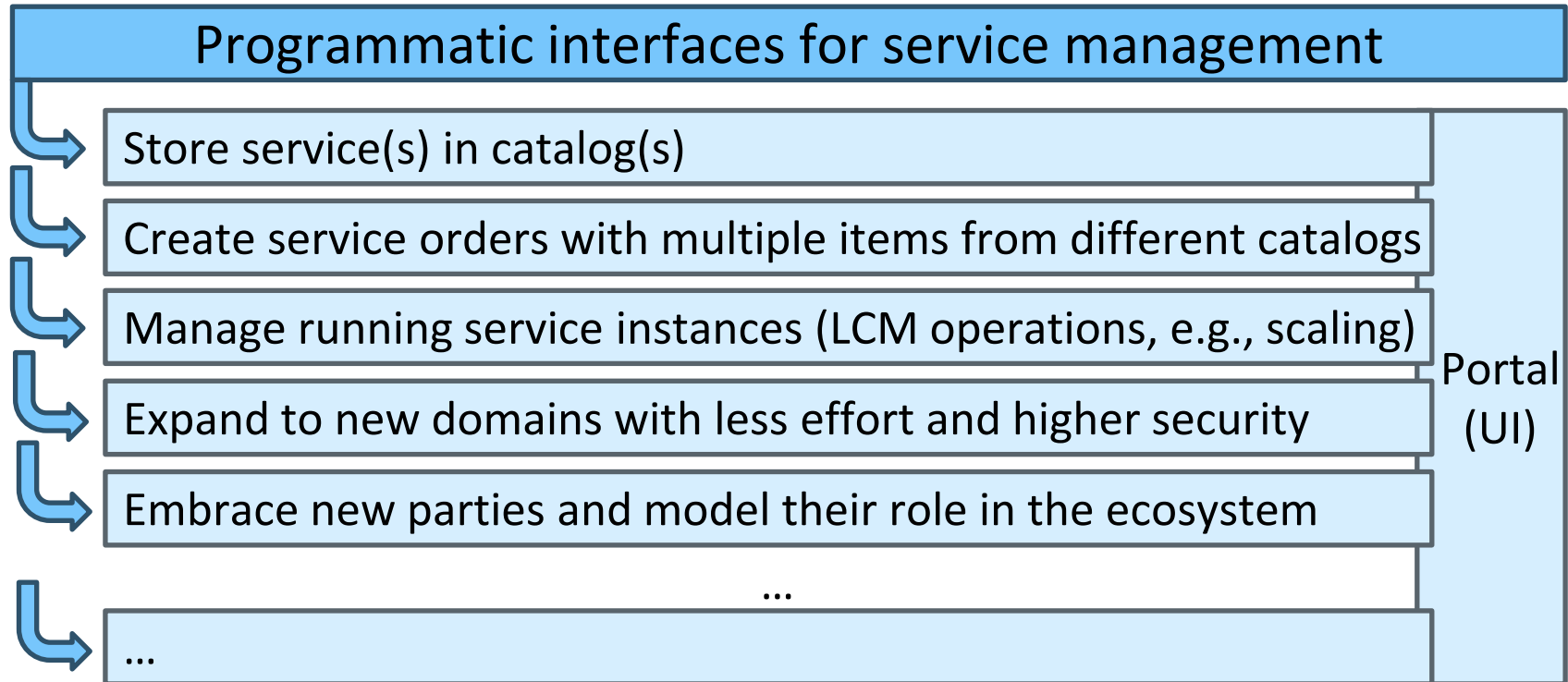


Service – Orchestrator-side

An orchestrator could automate service management beyond provisioning



Automation offered by orchestrators



Service Onboarding

Describe a service to a language
understood by an orchestrator

Describe a service to a language understood by an orchestrator

WHAT

Find what to tell the orchestrator (important service characteristics)

Community + Industry Needs

Global community projects drive innovation (e.g., K8s)

Describe a service to a language understood by an orchestrator

WHAT

Find what to tell the orchestrator (important service characteristics)

Community + Industry Needs

Global community projects drive innovation (e.g., K8s)

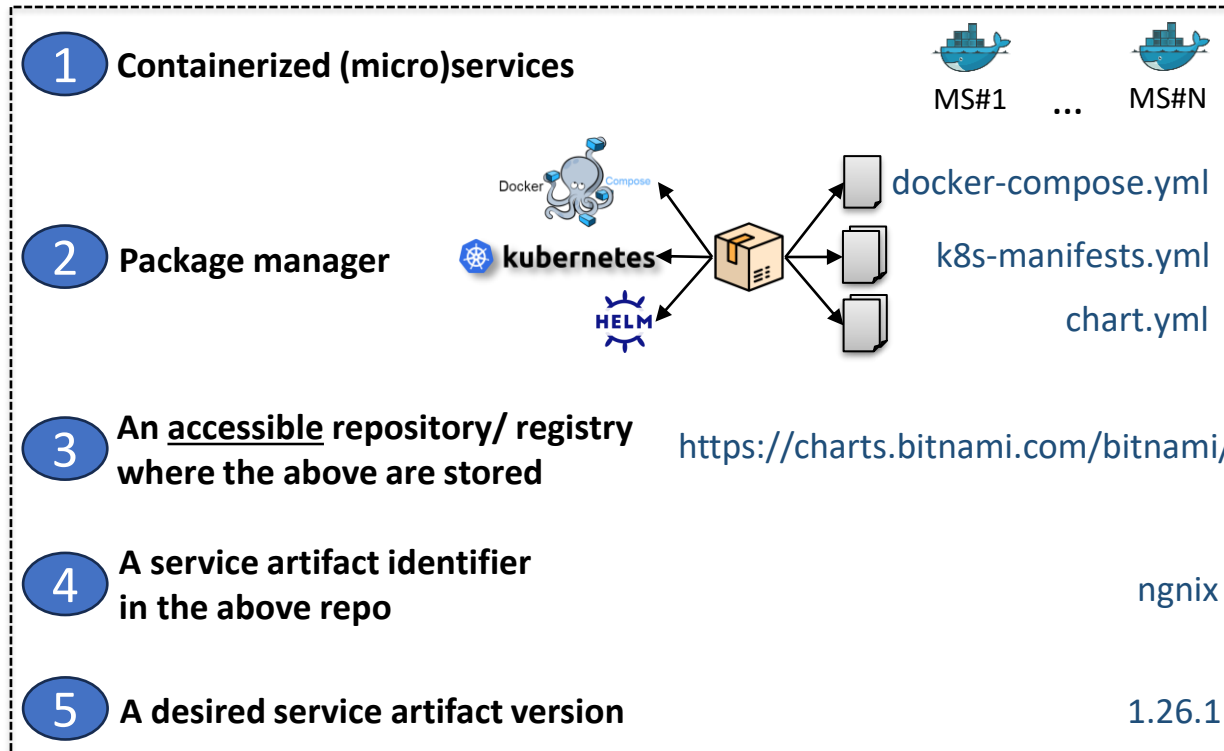
HOW

Find how to provide this info (speak its language)

Standards

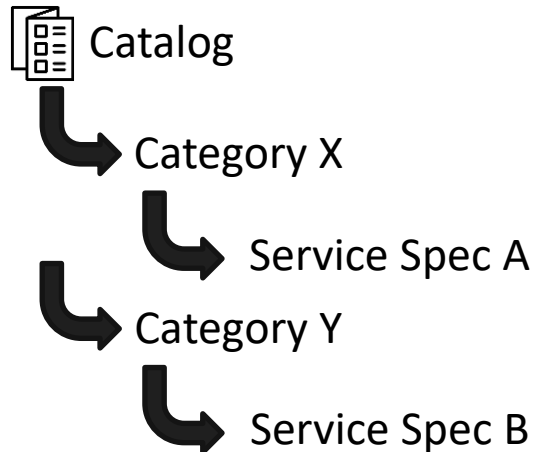
A standardized language reaches broader audience

Service Onboarding



WHAT

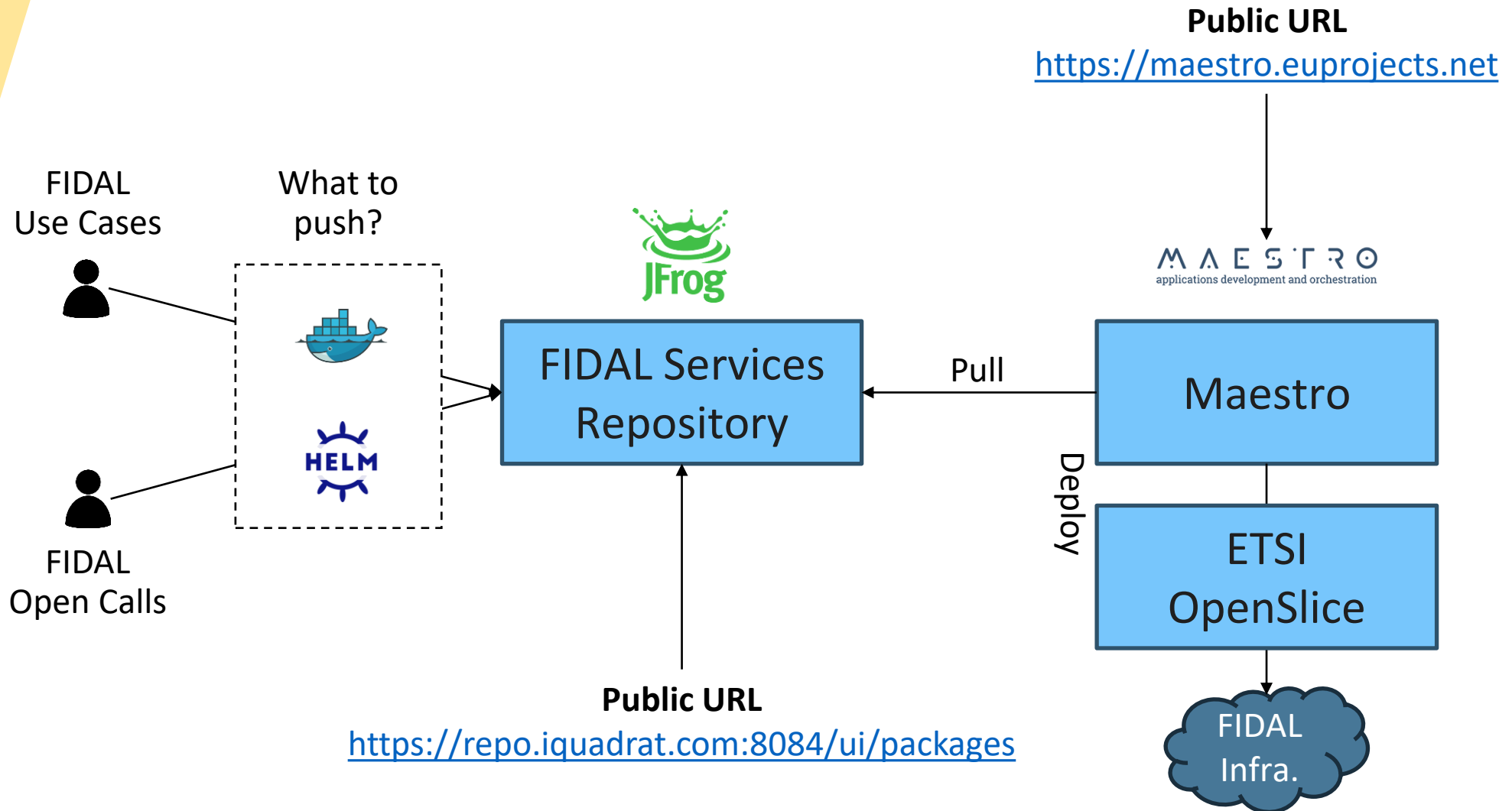
Maestro leverages the TMF 633 Service Catalog Management API



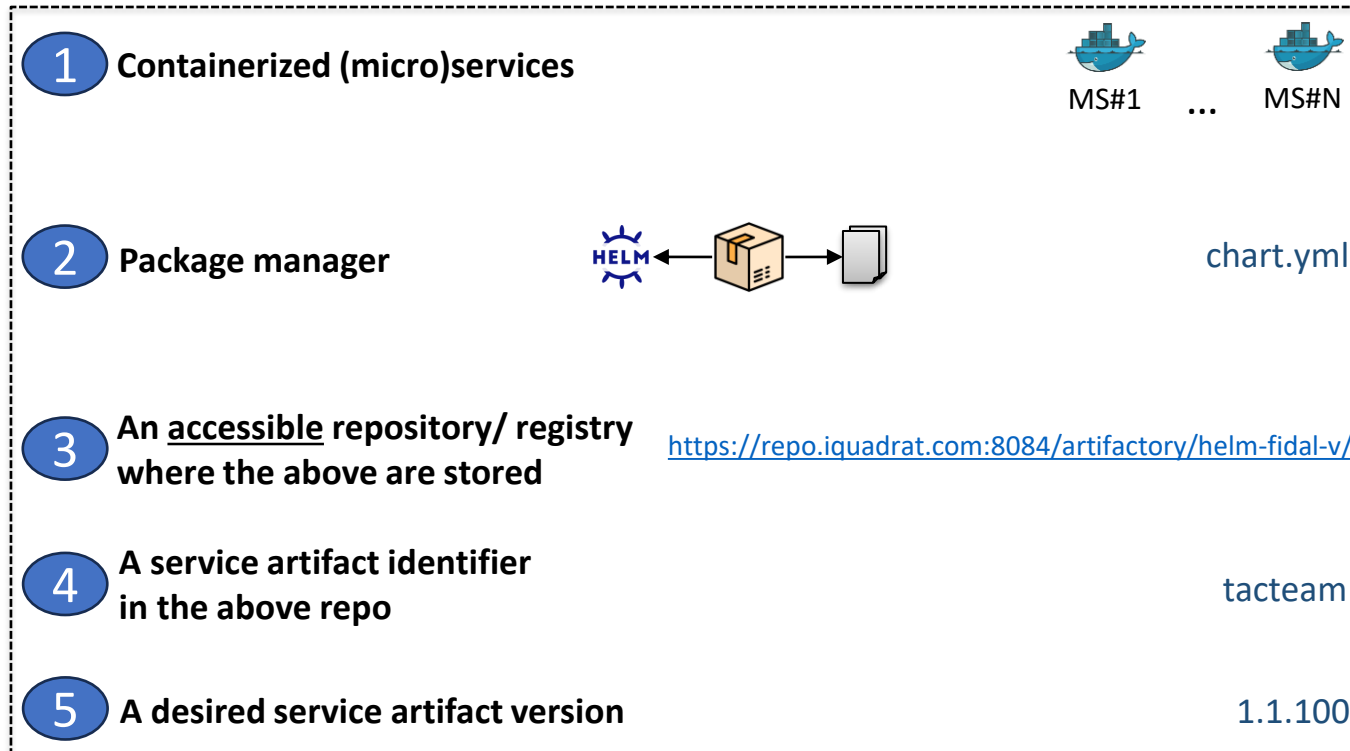
Neat organization of service in catalogs and categories

HOW

Service Onboarding - FIDAL



Service Onboarding – FIDAL Example



Service Ordering

Ask the orchestrator to deploy a service

Service Ordering



TMF 633 Service Catalog Management API



TMF 641 Service Ordering Management API



Catalog



Category X



Service Spec A



Category Y



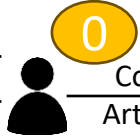
Service Spec B

....

```
orderList: [  
  Service Spec A  
  Service Spec B  
  ...  
  Service Spec N  
]
```

HOW

End-user and/or
Service Provider



Commit
Artifact(s)



Service Repository

```

"orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager",
        "valueType": "ENUM",
        "value": {
          "value": "helm",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL",
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/"
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version",
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1",
          "alias": null
        }
      }
    ]
  }
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

3

4



5

Service Order Blueprint based on TMF 641 Service Order Management API

End-user and/or Service Provider

0

Commit Artifact(s)



Service Designer



Design & store TMF service blueprint

1



```

orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager",
        "valueType": "ENUM",
        "value": {
          "value": "helm",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL",
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version",
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1",
          "alias": null
        }
      }
    ]
  }
}
]

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

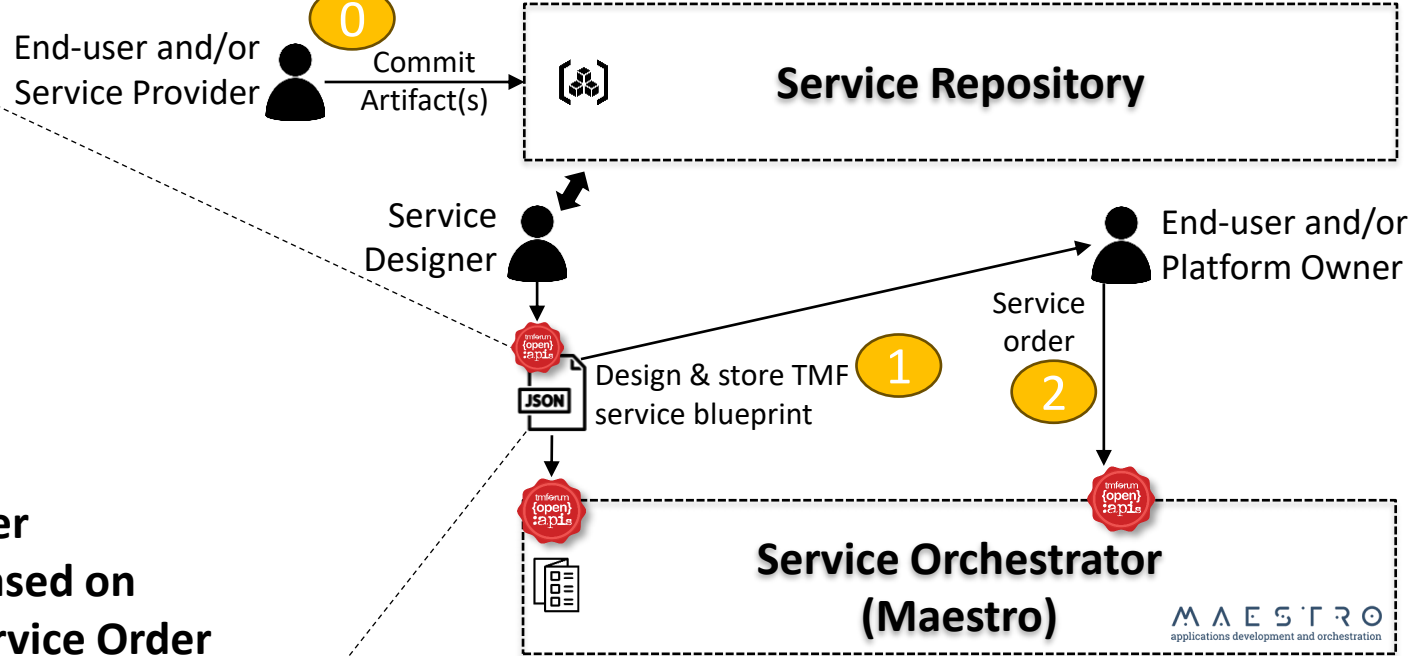
3

4

5



Service Order Blueprint based on TMF 641 Service Order Management API



```

"service": {
  "serviceCharacteristic": [
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service name",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service package manager",
      "valueType": "ENUM",
      "value": {
        "value": "helm",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Base service registry/repository URL",
      "valueType": "TEXT",
      "value": {
        "value": "https://charts.bitnami.com/bitnami/"
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact identifier in service registry/repository",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact version",
      "valueType": "TEXT",
      "value": {
        "value": "1.26.1",
        "alias": null
      }
    }
  ]
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

3

4

5



Service Order Blueprint based on TMF 641 Service Order Management API

End-user and/or Service Provider

0

Commit Artifact(s)



Service Repository

Service Designer



Design & store TMF service blueprint

1

End-user and/or Platform Owner



Service order

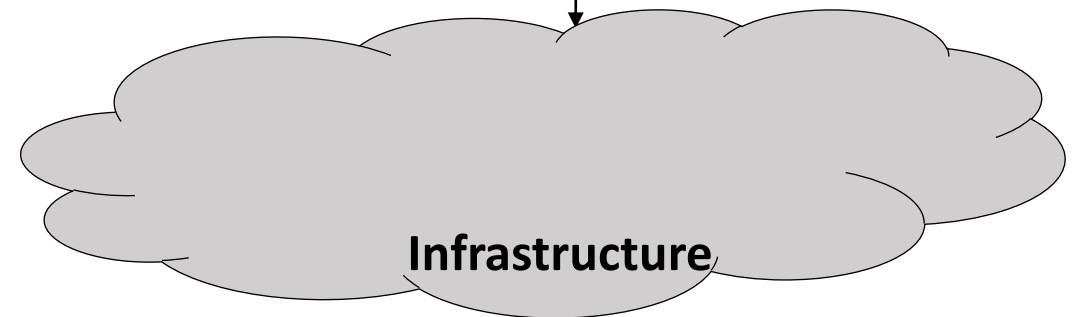
2



Service Orchestrator (Maestro)



Maestro cannot directly manage resources. It consumes resource-as-a-Service from an OSS



Infrastructure

```

orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager",
        "valueType": "ENUM",
        "value": {
          "value": "helm",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL",
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/"
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version",
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1",
          "alias": null
        }
      }
    ]
  }
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

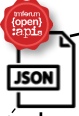
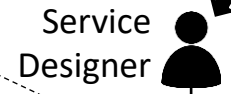
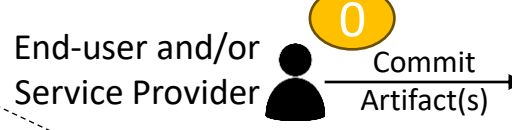
3

4

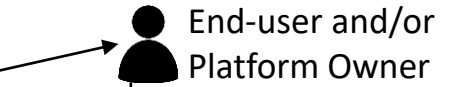
5



Service Order Blueprint based on TMF 641 Service Order Management API



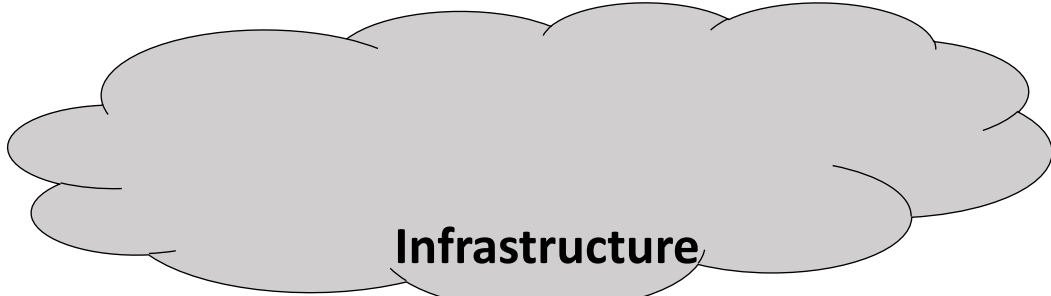
1



Service order 2



3 Order compute resources (K8s-aaS)



```

orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name"
        "valueType": "TEXT",
        "value": {
          "value": "nginx"
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager"
        "valueType": "ENUM",
        "value": {
          "value": "helm"
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL"
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/"
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository"
        "valueType": "TEXT",
        "value": {
          "value": "nginx"
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version"
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1"
          "alias": null
        }
      }
    ]
  }
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

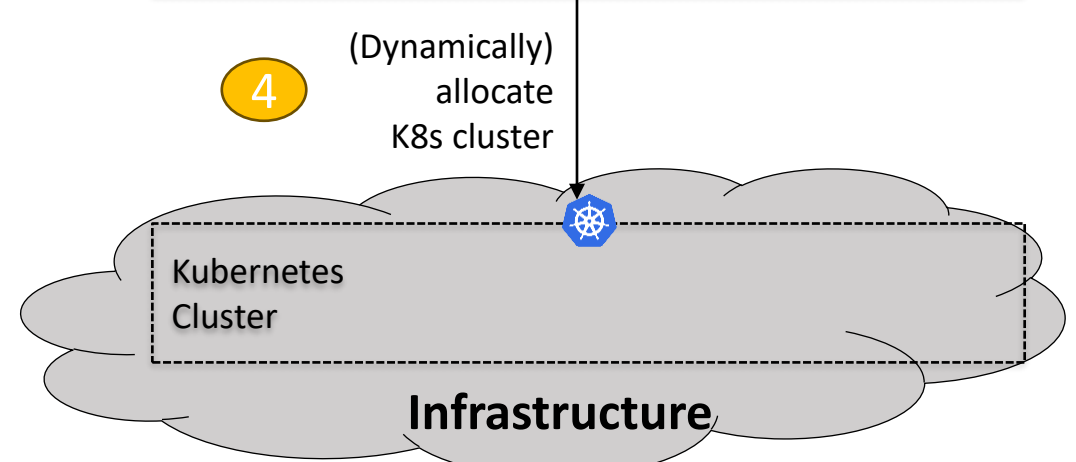
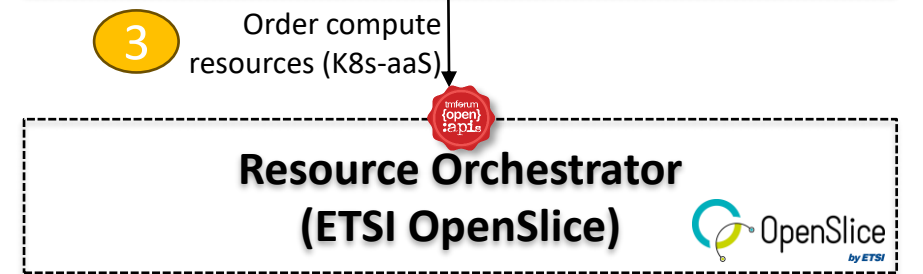
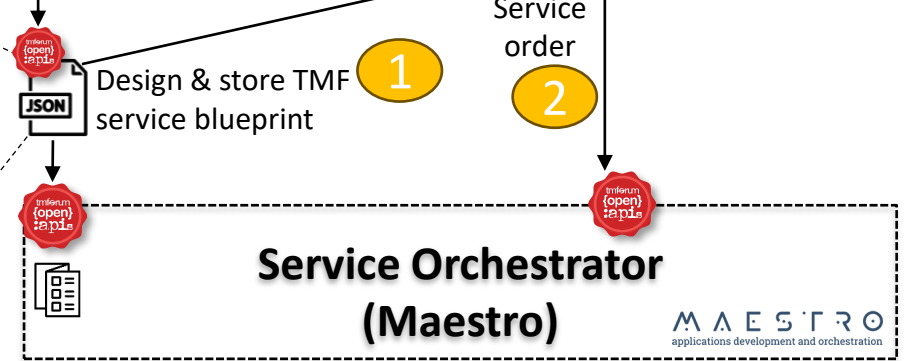
3

4

5



Service Order Blueprint based on TMF 641 Service Order Management API



```

"orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager",
        "valueType": "ENUM",
        "value": {
          "value": "helm",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL",
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/"
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version",
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1",
          "alias": null
        }
      }
    ]
  }
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

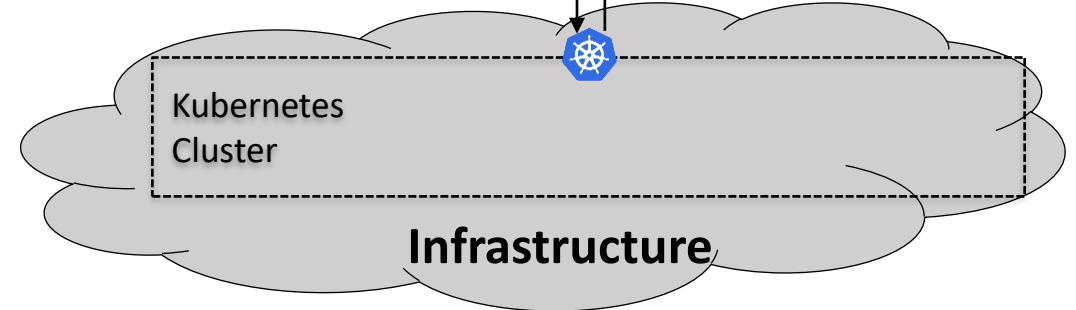
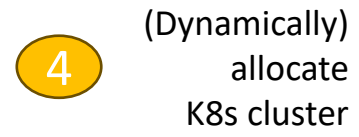
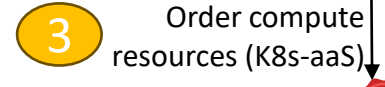
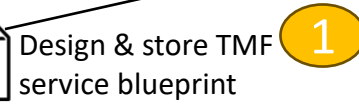
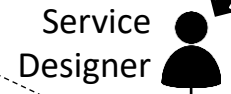
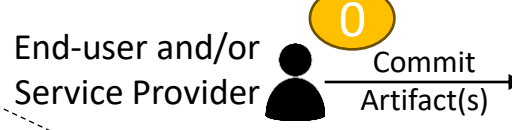
3

4

5



Service Order Blueprint based on TMF 641 Service Order Management API



```

"orderItem": {
  "service": {
    "serviceCharacteristic": [
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service name",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service package manager",
        "valueType": "ENUM",
        "value": {
          "value": "helm",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Base service registry/repository URL",
        "valueType": "TEXT",
        "value": {
          "value": "https://charts.bitnami.com/bitnami/"
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact identifier in service registry/repository",
        "valueType": "TEXT",
        "value": {
          "value": "nginx",
          "alias": null
        }
      },
      {
        "@baseType": "BaseRootEntity",
        "@schemaLocation": null,
        "@type": null,
        "href": null,
        "name": "Service artifact version",
        "valueType": "TEXT",
        "value": {
          "value": "1.26.1",
          "alias": null
        }
      }
    ]
  }
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

||

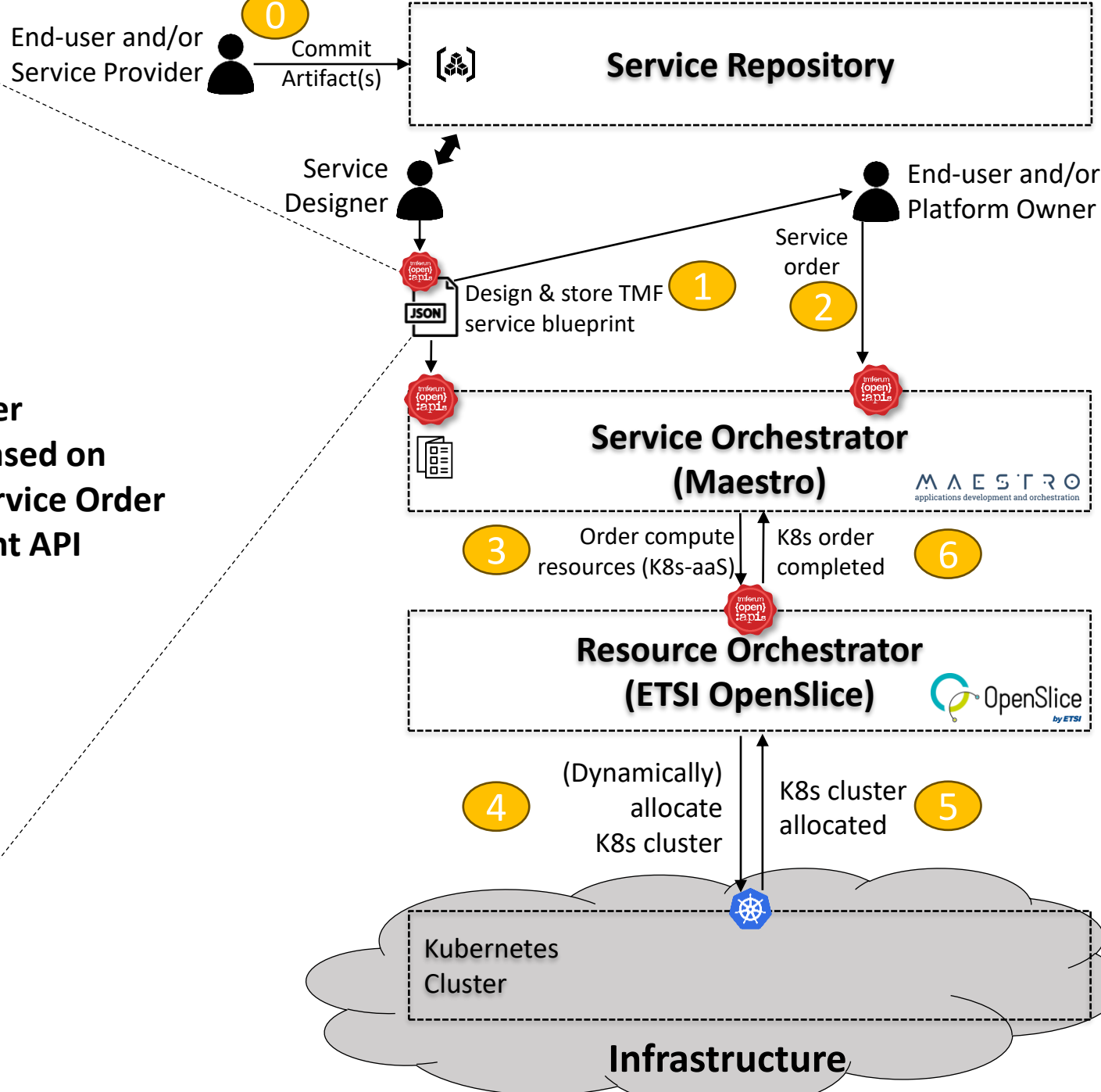
3

4

5



Service Order Blueprint based on TMF 641 Service Order Management API



```

"service": {
  "serviceCharacteristic": [
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service name",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service package manager",
      "valueType": "ENUM",
      "value": {
        "value": "helm",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Base service registry/repository URL",
      "valueType": "TEXT",
      "value": {
        "value": "https://charts.bitnami.com/bitnami/"
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact identifier in service registry/repository",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact version",
      "valueType": "TEXT",
      "value": {
        "value": "1.26.1",
        "alias": null
      }
    }
  ]
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

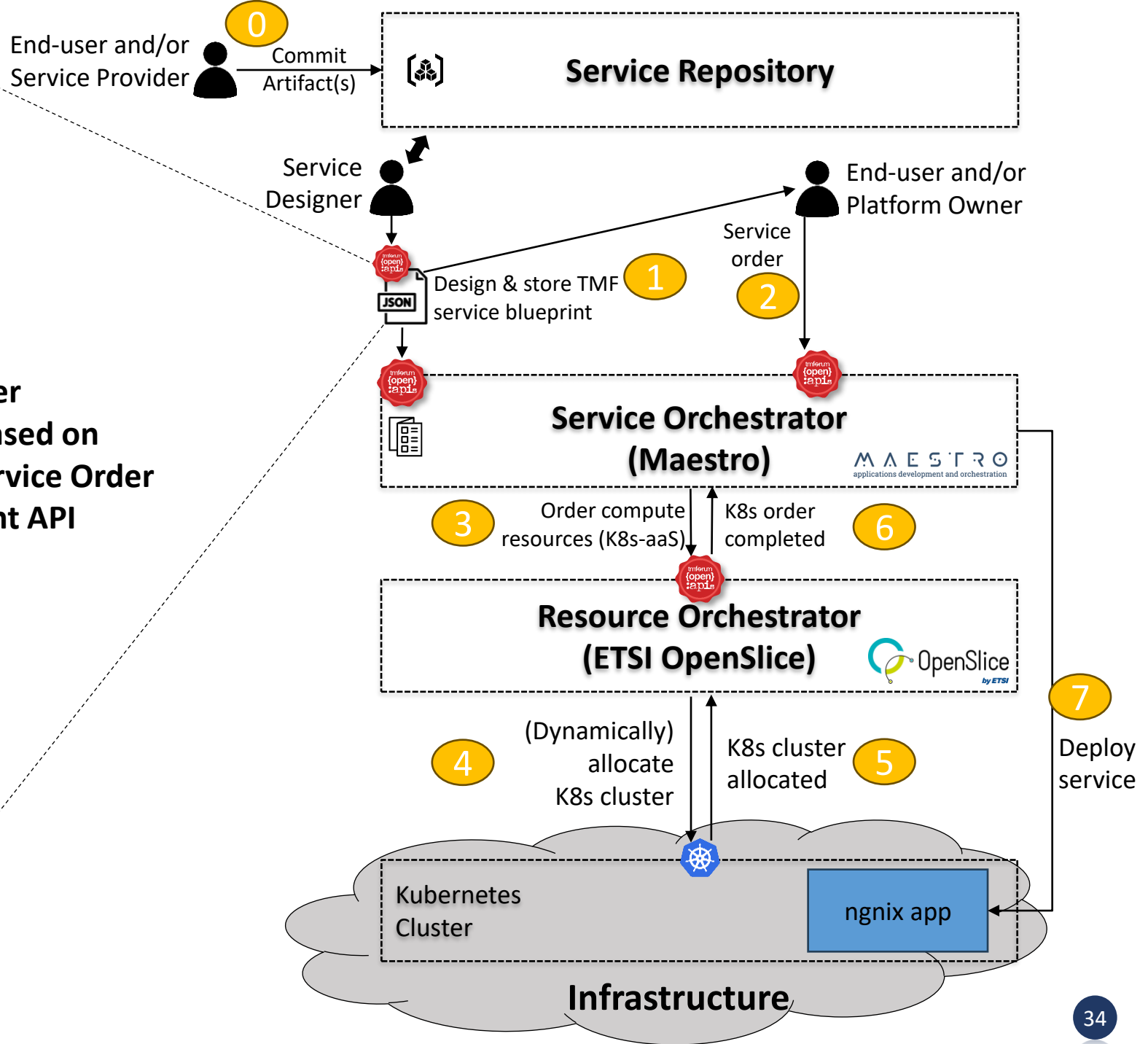
||

3

4

5

Service Order Blueprint based on TMF 641 Service Order Management API



```

"service": {
  "serviceCharacteristic": [
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service name",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service package manager",
      "valueType": "ENUM",
      "value": {
        "value": "helm",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Base service registry/repository URL",
      "valueType": "TEXT",
      "value": {
        "value": "https://charts.bitnami.com/bitnami/"
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact identifier in service registry/repository",
      "valueType": "TEXT",
      "value": {
        "value": "nginx",
        "alias": null
      }
    },
    {
      "@baseType": "BaseRootEntity",
      "@schemaLocation": null,
      "@type": null,
      "href": null,
      "name": "Service artifact version",
      "valueType": "TEXT",
      "value": {
        "value": "1.26.1",
        "alias": null
      }
    }
  ]
}

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

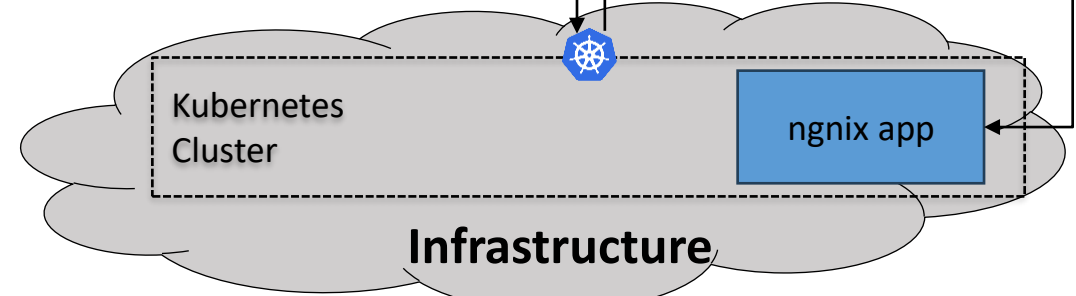
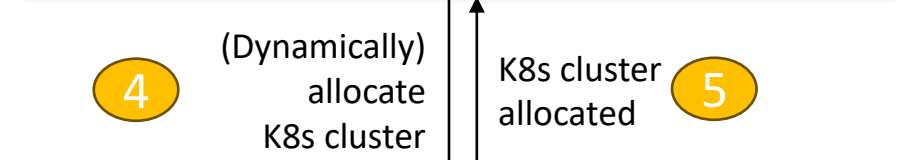
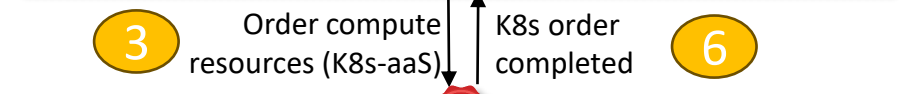
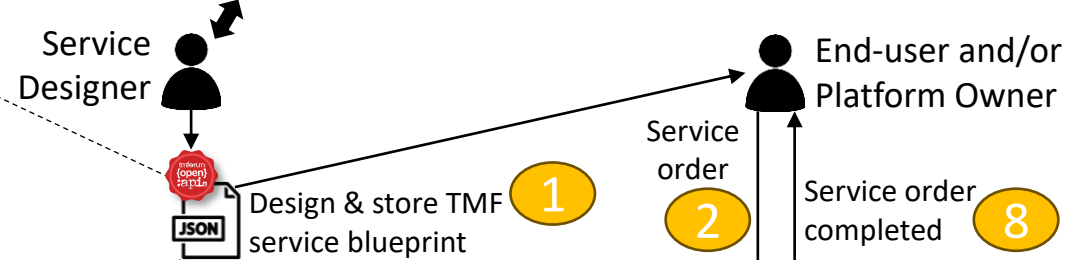
||

3

4

5

Service Order Blueprint based on TMF 641 Service Order Management API



7 Deploy service

```

"orderItem": [
  {
    "service": {
      "serviceCharacteristic": [
        {
          "@baseType": "BaseRootEntity",
          "@schemaLocation": null,
          "@type": null,
          "href": null,
          "name": "Service name"
          "valueType": "TEXT",
          "value": {
            "value": "nginx"
            "alias": null
          }
        },
        {
          "@baseType": "BaseRootEntity",
          "@schemaLocation": null,
          "@type": null,
          "href": null,
          "name": "Service package manager"
          "valueType": "ENUM",
          "value": {
            "value": "helm"
            "alias": null
          }
        },
        {
          "@baseType": "BaseRootEntity",
          "@schemaLocation": null,
          "@type": null,
          "href": null,
          "name": "Base service registry/repository URL"
          "valueType": "TEXT",
          "value": {
            "value": "https://charts.bitnami.com/bitnami/"
            "alias": null
          }
        },
        {
          "@baseType": "BaseRootEntity",
          "@schemaLocation": null,
          "@type": null,
          "href": null,
          "name": "Service artifact identifier in service registry/repository"
          "valueType": "TEXT",
          "value": {
            "value": "nginx"
            "alias": null
          }
        },
        {
          "@baseType": "BaseRootEntity",
          "@schemaLocation": null,
          "@type": null,
          "href": null,
          "name": "Service artifact version"
          "valueType": "TEXT",
          "value": {
            "value": "1.26.1"
            "alias": null
          }
        }
      ]
    }
  }
]

```

Service characteristics in the service order

Service spec. template filled in with values

1

2

3

4

5

End user service



K8s-aaS
Service Order Item

5G-aaS
Service Order Item

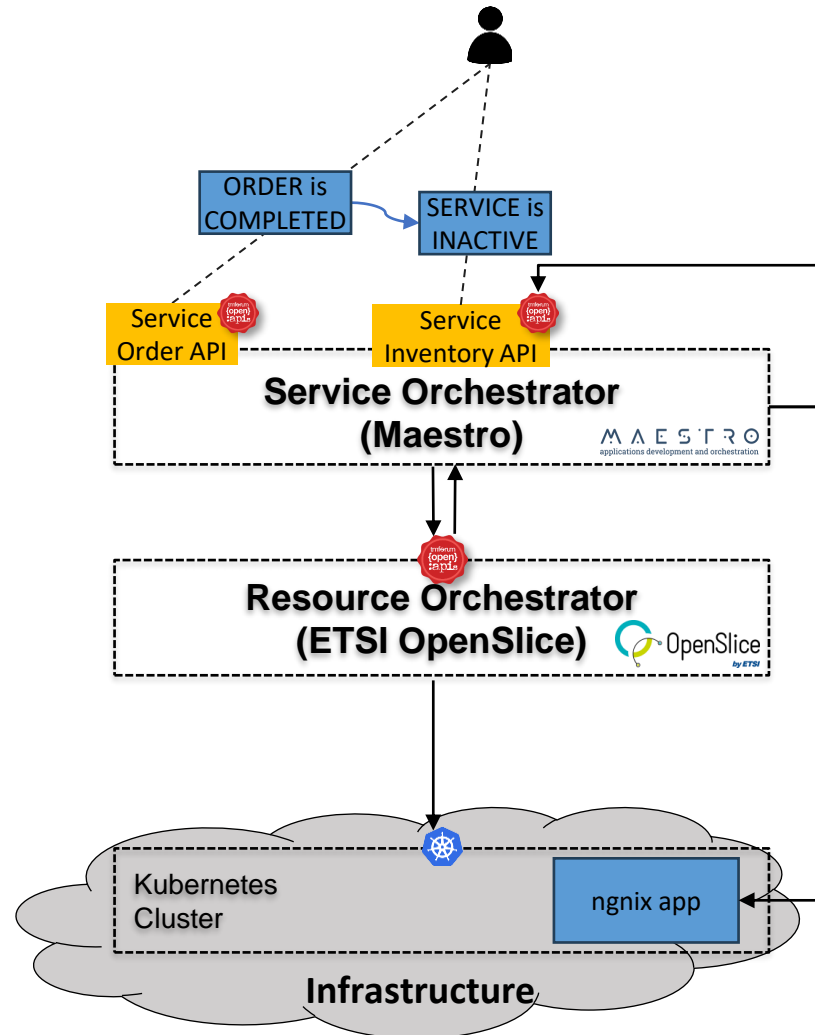
Choose number of worker nodes and flavor (CPU, RAM, etc.) per worker node

Choose area of service (which gNBs), service profile (e.g., low latency)

Platform services

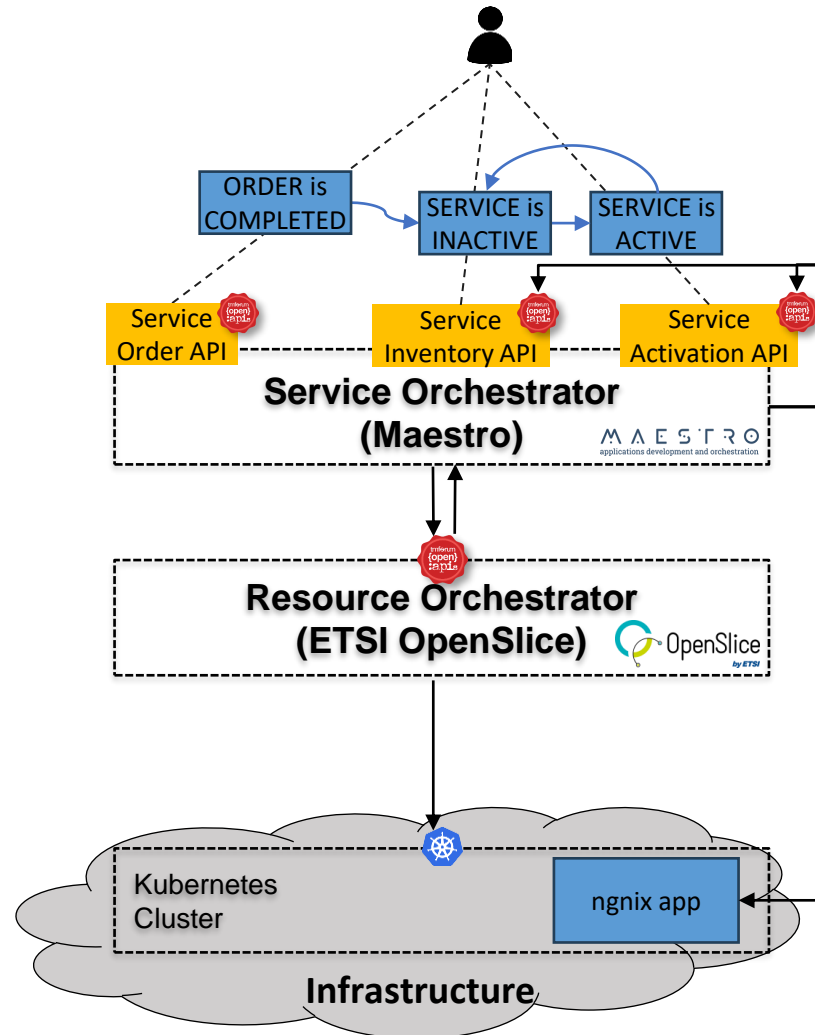
Composite FIDAL Net App.

Service Order results in INACTIVE instance (by default)



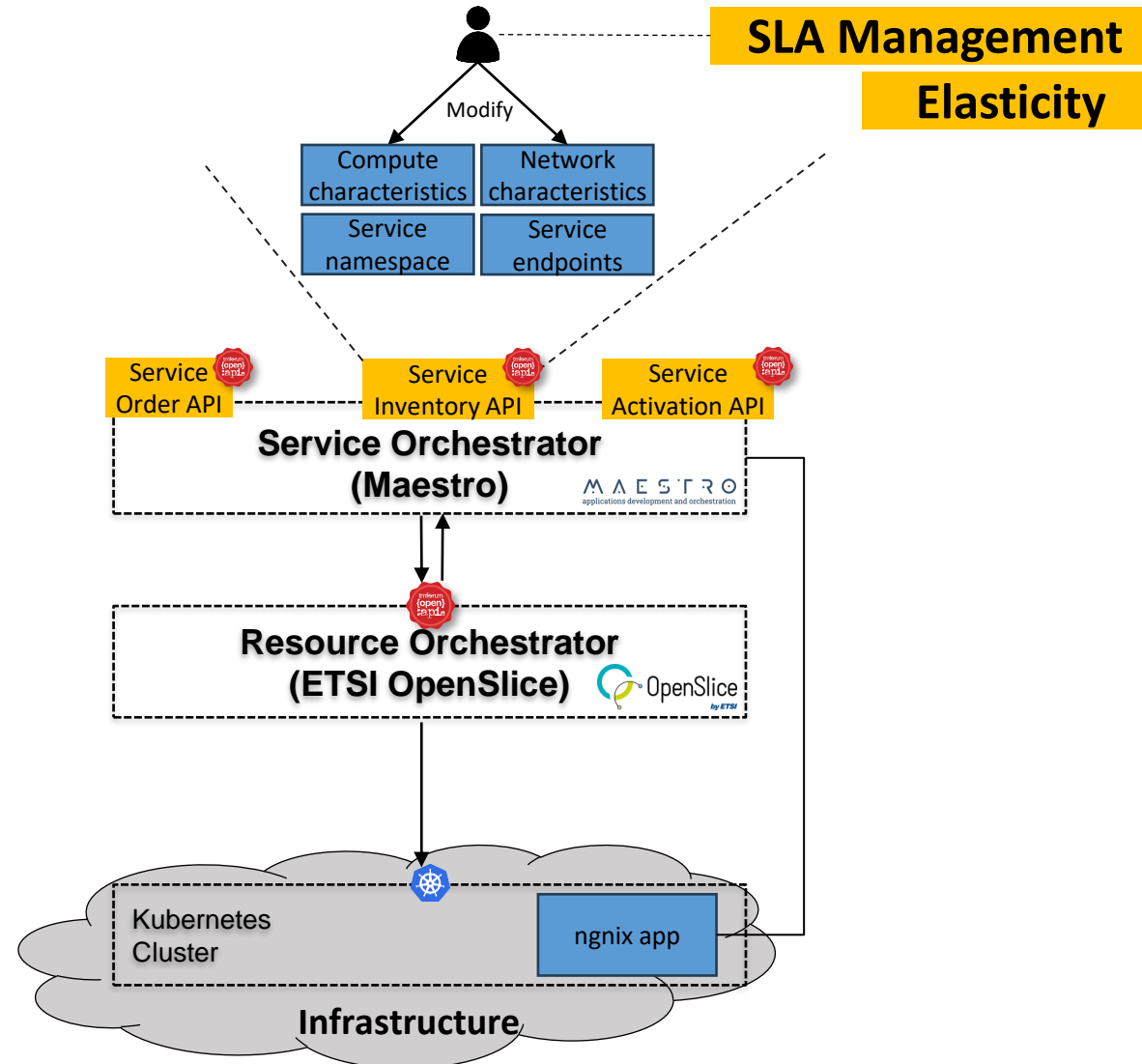
Service (De-)Activation

Explicit Service Activation/De-Activation



Service Lifecycle Management (LCM)

Service Lifecycle Management





FIDAL

What Maestro expects from FIDAL service providers (UCs+ OpenCalls)

- A “maestro” account to access the [FIDAL Services Repository](#) (jFrog)
- This is where all FIDAL services should be published
- Maestro should be able to “see” every service in there
- What to publish there:
 - All docker images of your service
 - A helm chart that packages your service

FIDAL Maestro

- Responsible partner is UBI
- Contact point is Georgios Katsikas (gkatsikas@ubitech.eu)

FIDAL OpenSlice

- Responsible partner is UoP
- Contact point is Panagiotis Papaioannou (papajohn@upatras.gr)

FIDAL Services Repository

- Responsible partner is IQU
- Contact point is Kostas Ramadas (kramantas@iquadrat.com)

FIDAL Monitoring

- Responsible partner is AppArt
- Contact point is Michail Sfakianos (m.sfakianos@app-art.gr)

FIDAL AlaaS

- Responsible partner is UBITECH
- Contact point is Sofia Karagiorgou (skaragiorgou@ubitech.eu)

Maestro APIs

Production Maestro

- Public [Maestro swagger URL](#)
- You may also see the [open TMF APIs](#) to understand how our APIs look like

Service Management APIs

- [Service Catalog Management API](#)
- [Service Ordering API](#)
- [Service Inventory Management API](#)
- [Service Activation and Configuration API](#)

Resource Management APIs

- [Resource Catalog Management API](#)
- [Resource Ordering API](#)
- [Resource Inventory Management API](#)

Party Management APIs

- [Party Management API](#)
- [Party Role Management API](#)

Location Management API

- [Geographic Site Management API](#)

QoS and SLA Management APIs (Not fully-supported yet)

- [Service Quality Management API](#)
- [SLA Management API](#)

Maestro Docs

Maestro public docs

Thank you!



Georgios P. Katsikas

Technical Project Manager



UBITECH

gkatsikas@ubitech.eu



Funded by
the European Union