

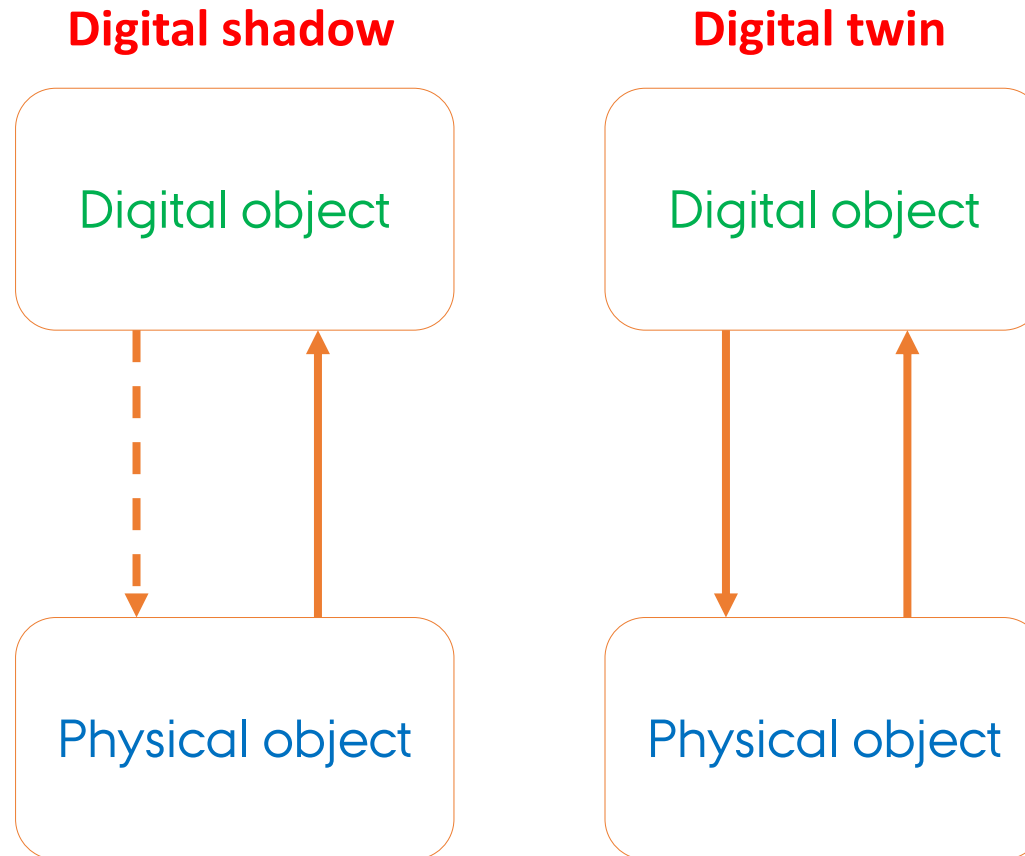
# DTaaS: Digital Twins as a Service

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# Different Levels of Ambition

Tekinerdogan, B.; Verdouw, C. Systems Architecture Design Pattern Catalog for Developing Digital Twins. *Sensors* **2020**, *20*, 5103.  
<https://doi.org/10.3390/s20185103>



**Legend:**

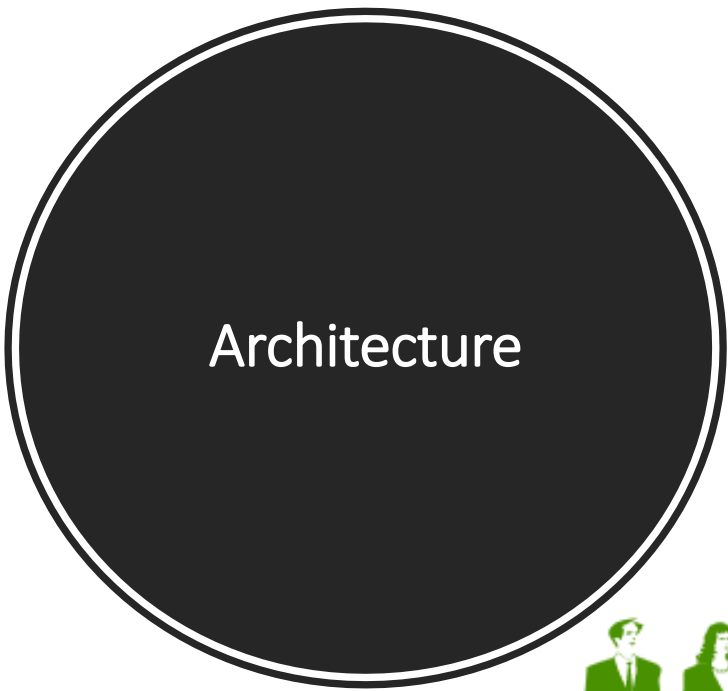


Manual dataflow  
Automatic dataflow

DTaaS is a

Platform to host:

- Digital twin development platform
- Reusable digital twin components
- Ready to use digital twins
- On-demand reconfiguration of digital twins
- Diverse execution environments



**Gateway**

**Service Mesh**



**Execution Manager**



**Digital Twins**



**Components**



**Data**



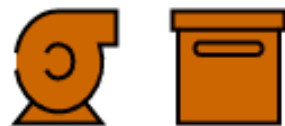
**Vis**



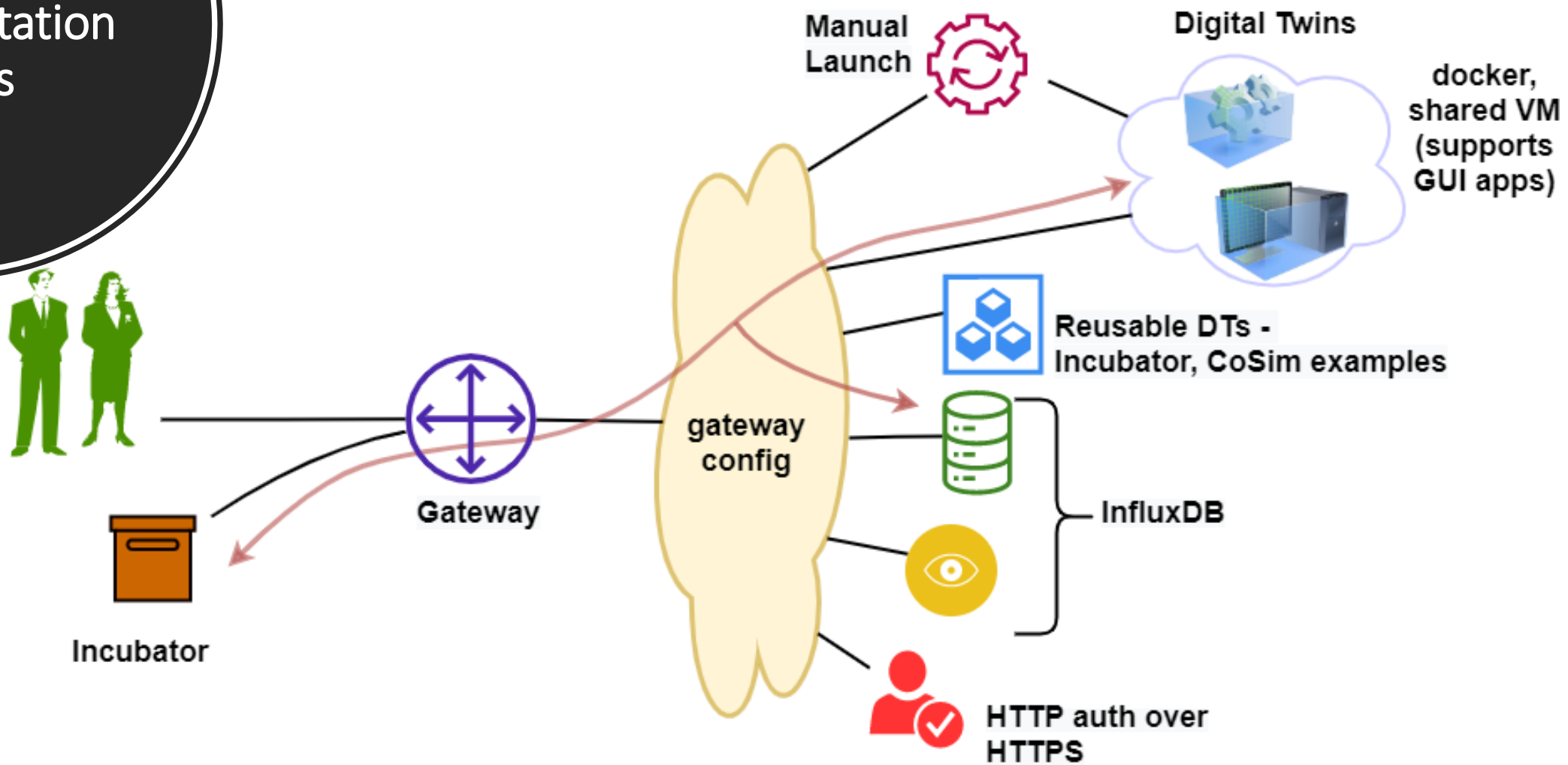
**Security**



**Physical Twins**

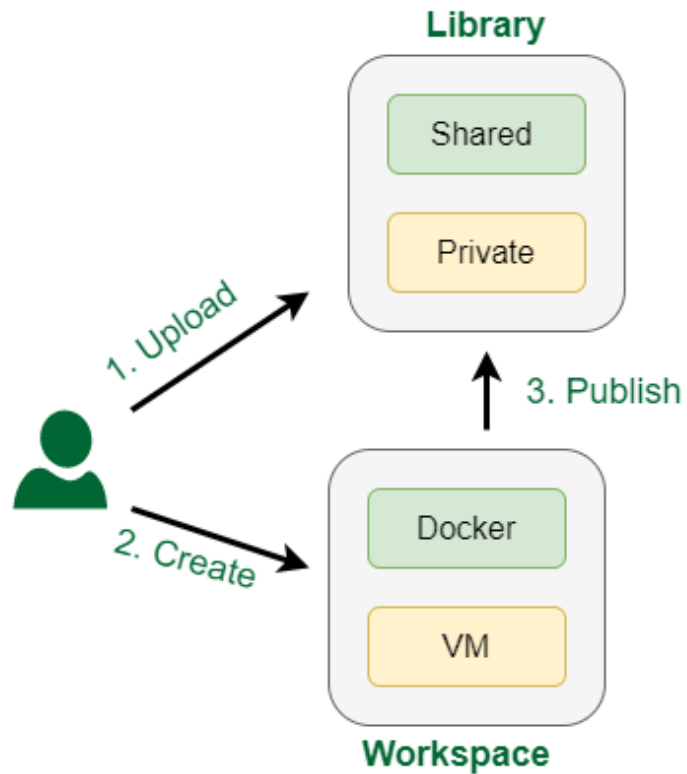


# Current Implementation Status

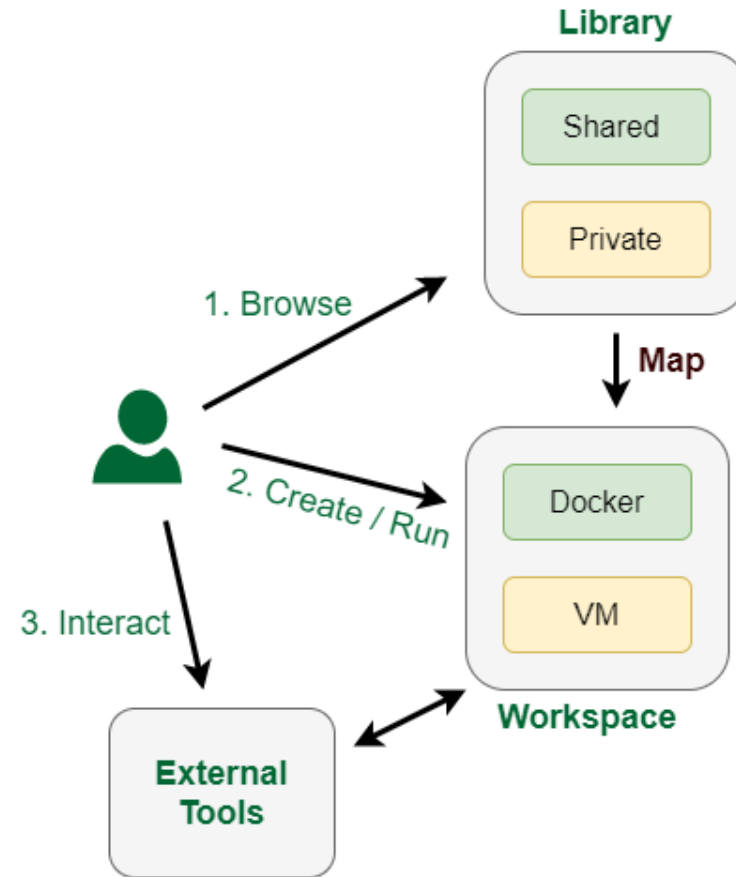


# Workflows

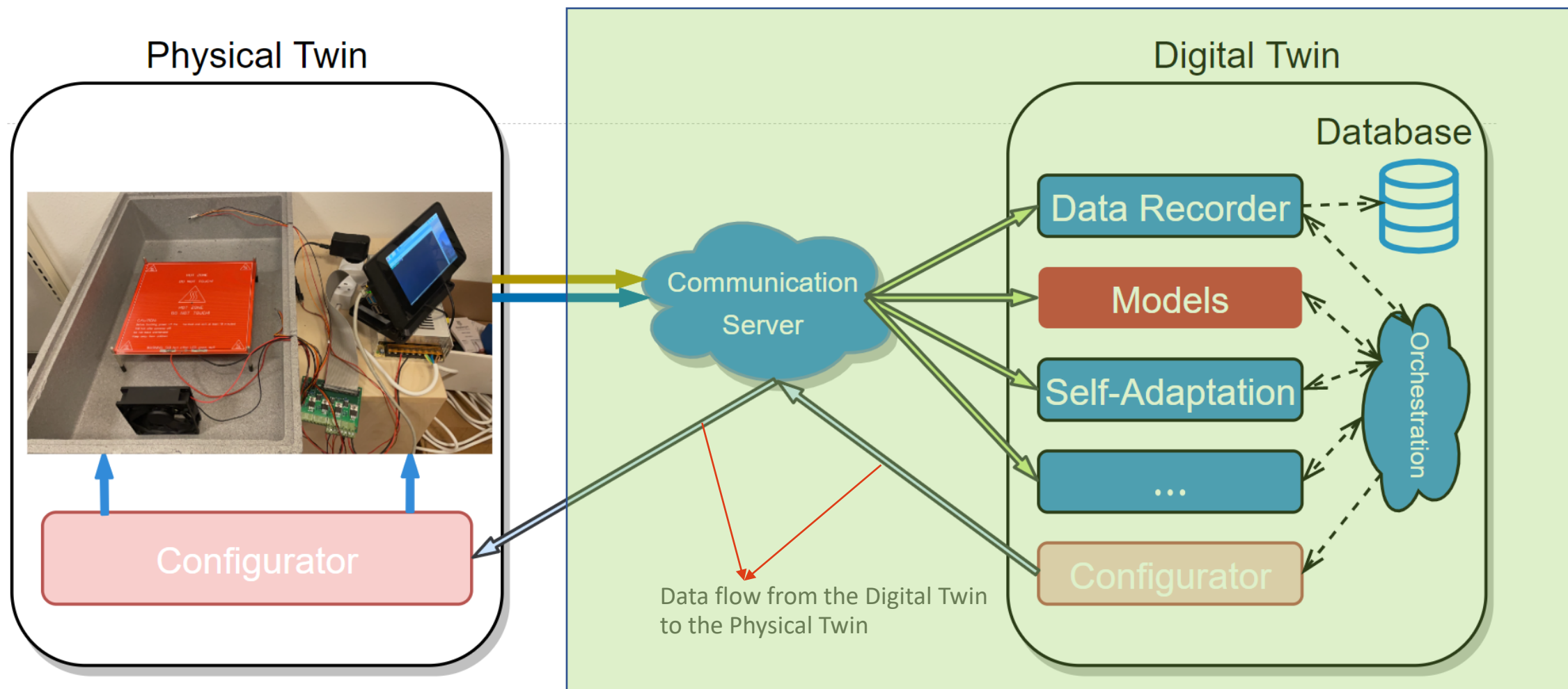
## Authoring (HUBCAP)



## Digital Twins (DIGITbrain)



# The Incubator



Inside Digital Twin as a Service (DTaaS)

# Case Studies

## Discussions

- Desktop Robotti
- Line following robot from Univ of Antwerp

## Onboarding

- Universal Robots with Eclipse Basyx
- Flex Manufacturing Cell with Kuka Robots

## Complete

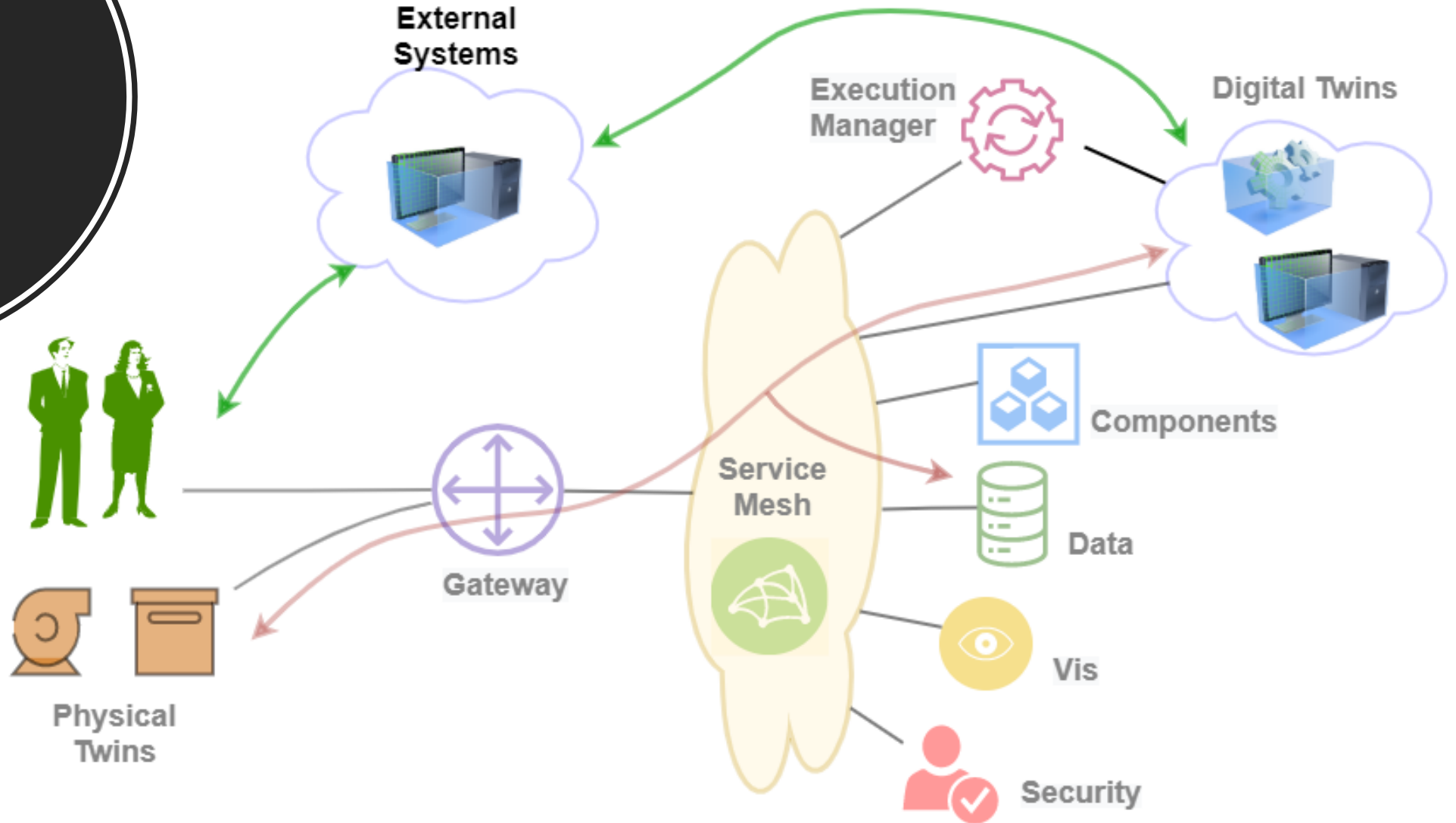
- Incubator
- Water tank in The INTO-CPS Application
- Maestro Co-simulation



# Lessons

- Execution environment:
  - Isolated host is preferred
  - Desktop access is needed for component development
- Direct access to digital twin
  - Reconfigure digital twin w.r.t all data, models, tools and link to external components
- Deployment lifecycle is unclear

# Likely Requirements in Architecture



# As a reusable piece of the INTO-CPS software eco-system

- Development stage
  - Support for Host-based development environment
  - Sharing of artifacts
- Co-simulation use cases
  - Use the INTO-CPS Toolchain
  - Support stand alone co-simulations
- Support Ongoing Development of Digital Twins
  - Versioning and file systems
  - Continuous integration for library components

# Demo Video and Questions