

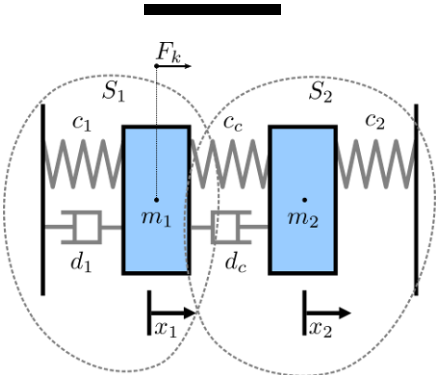
Digital Twin Examples on Digital Twin as a Service Software Platform



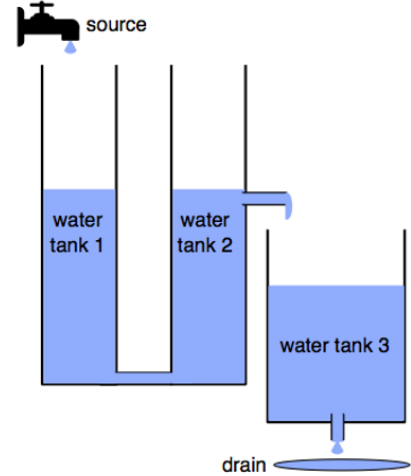
Prasad Talasila

prasad.talasila@ece.au.dk

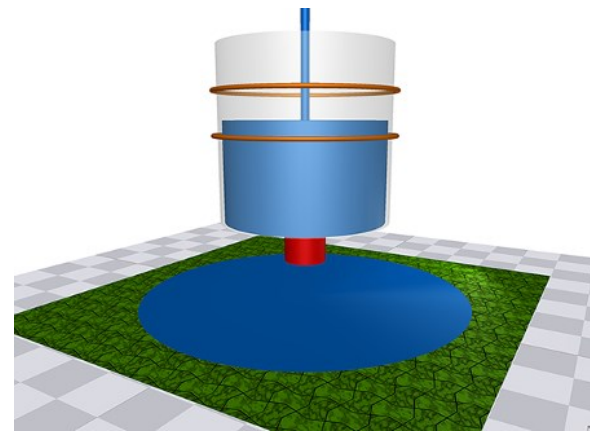
CO-SIMULATION EXAMPLES



Mass Spring Damper



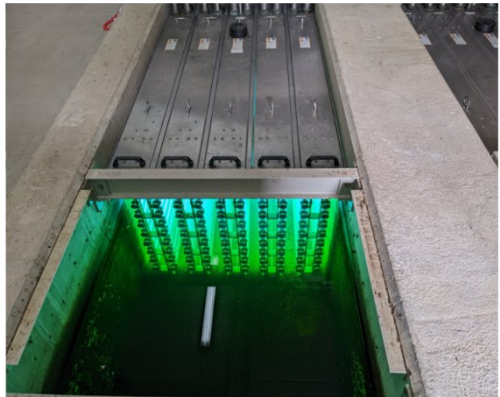
Three Water Tank



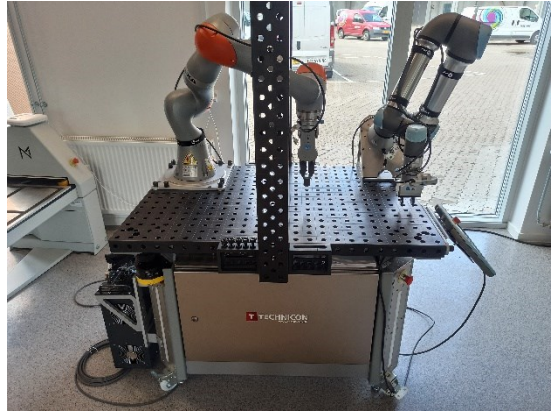
Fault Injection



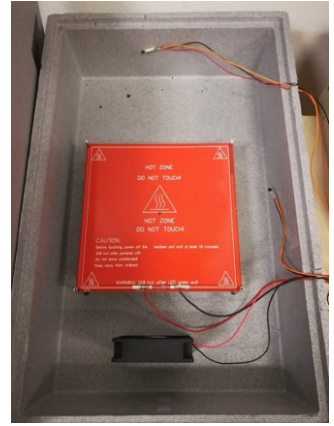
Desktop Robotti



Waste Water Treatment Plant

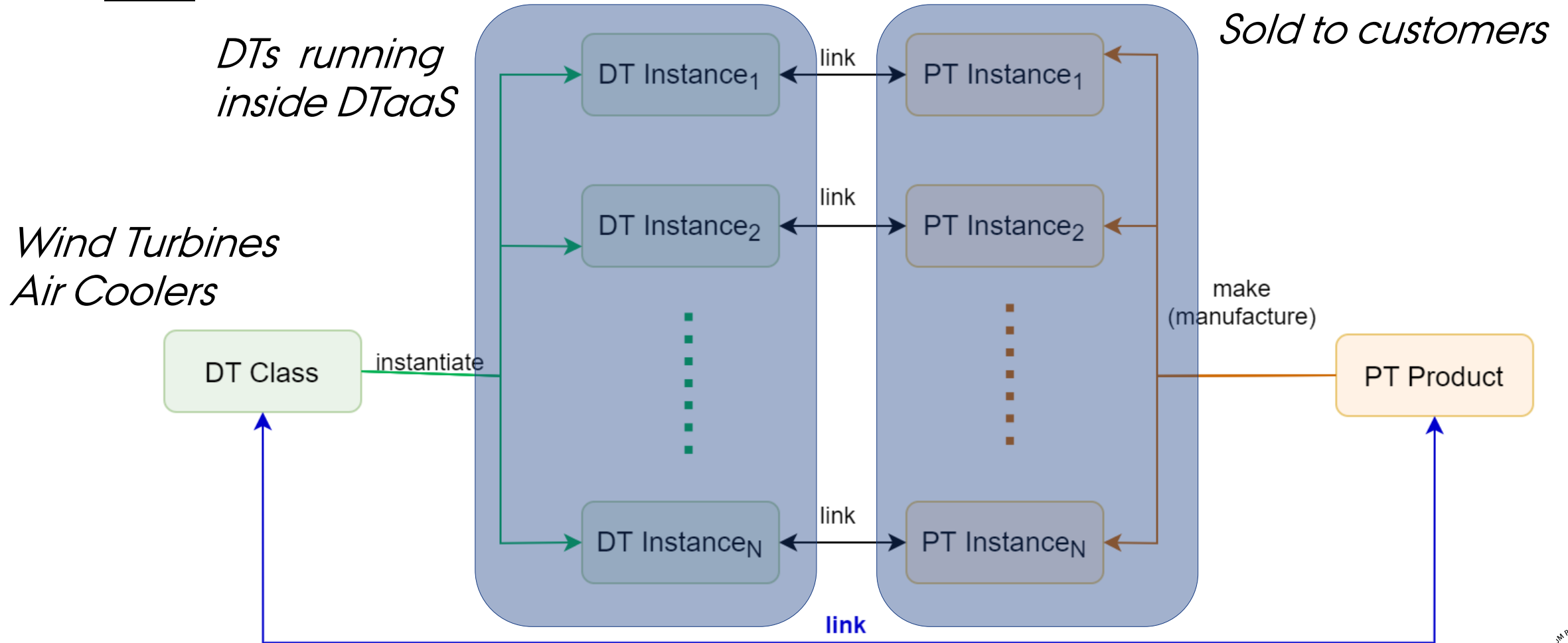


Flex Cell Workstation



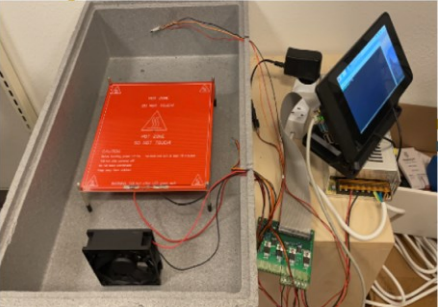
Incubator

Linking Digital Twins with Physical Products

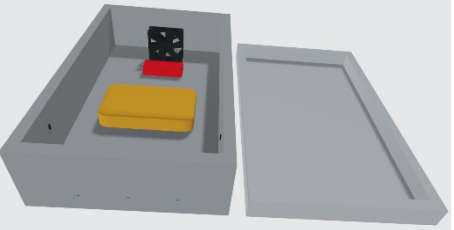


INCUBATOR DIGITAL TWIN WITH DTAAAS

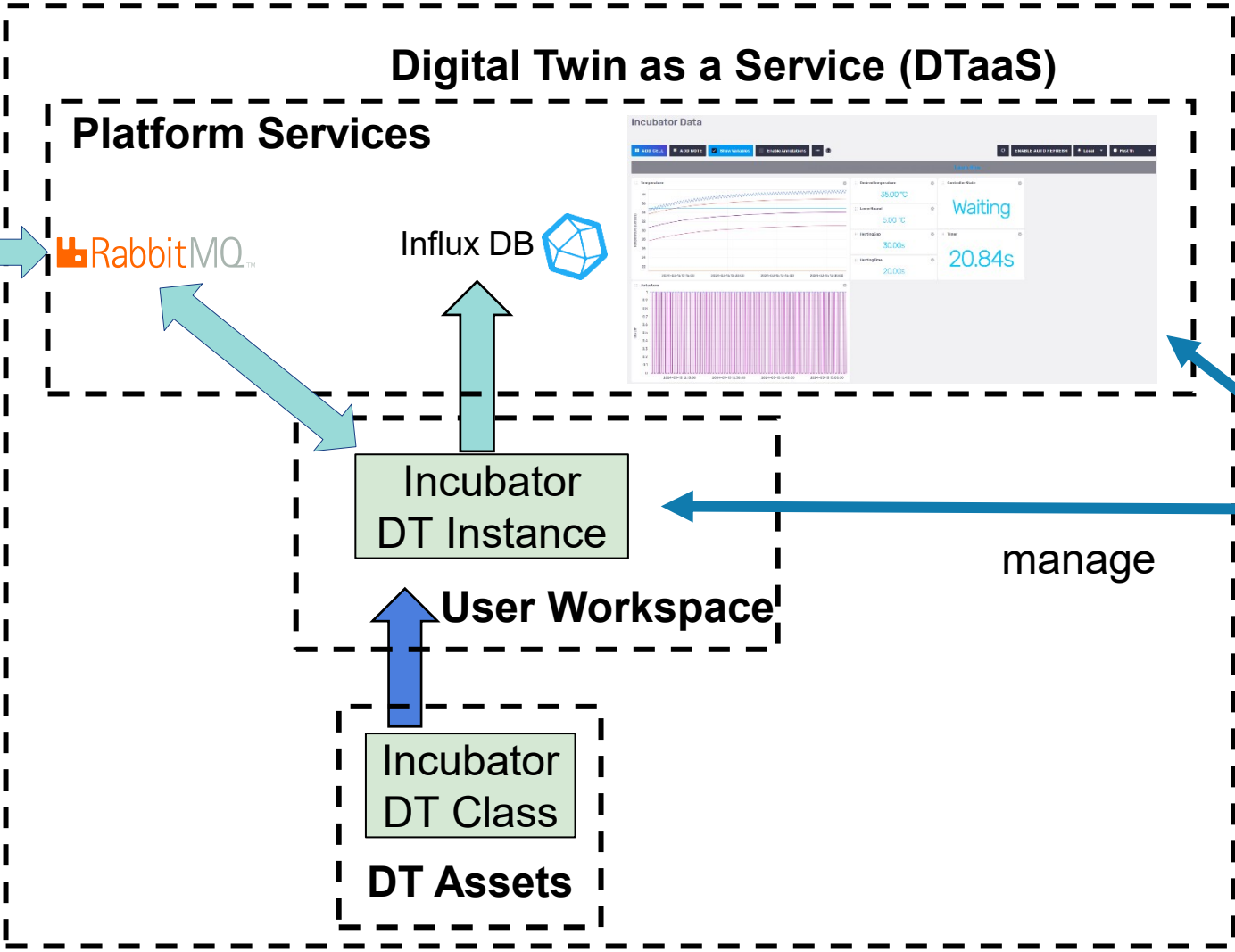
Incubator PT Instance



make ↑



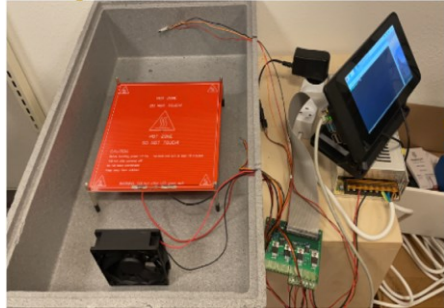
Incubator PT Product



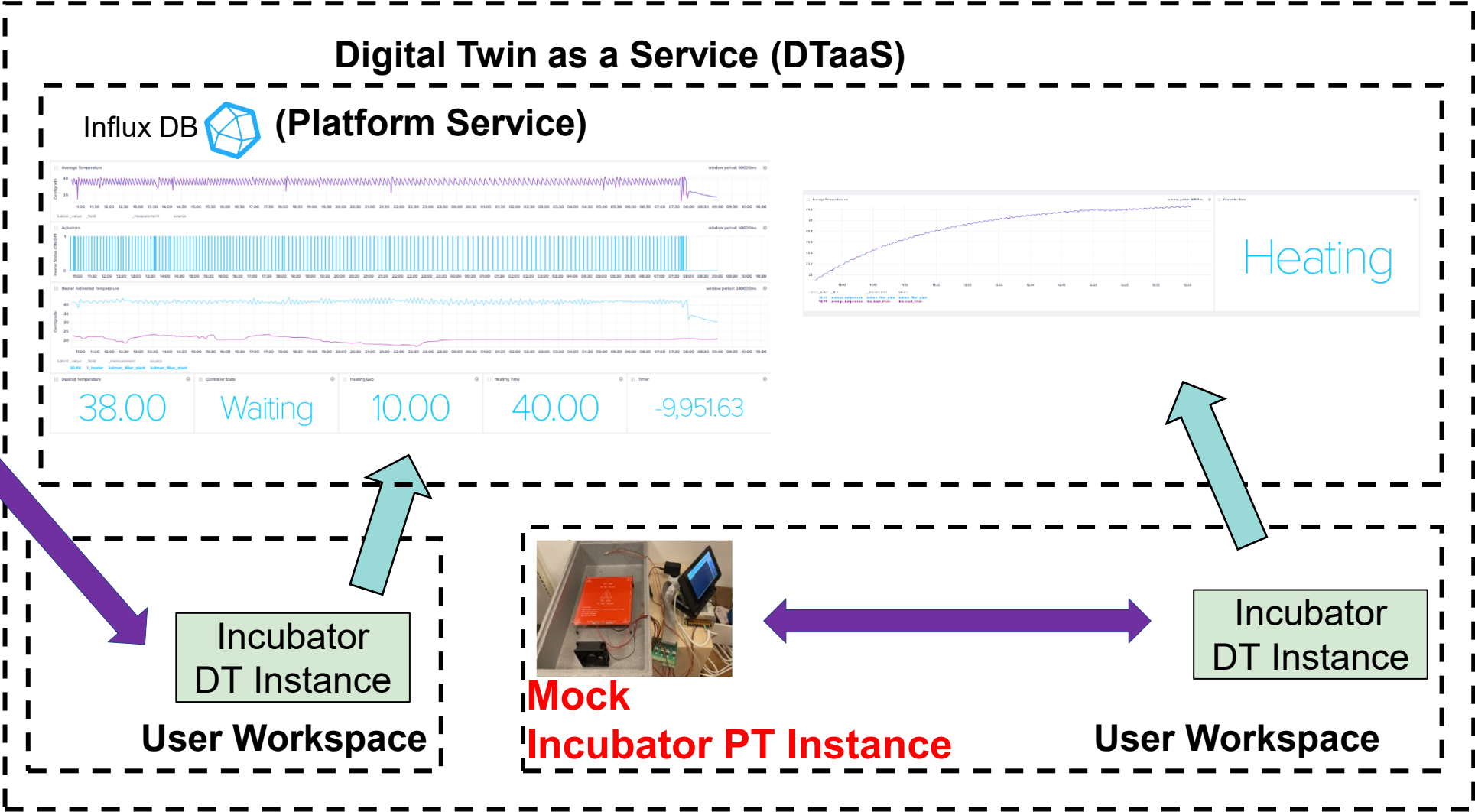
Ref: [Incubator repository](#)



INCUBATOR DIGITAL TWIN WITH DTAAAS



Incubator PT Instance

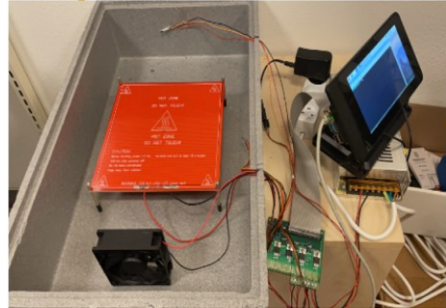


Communication over RabbitMQ

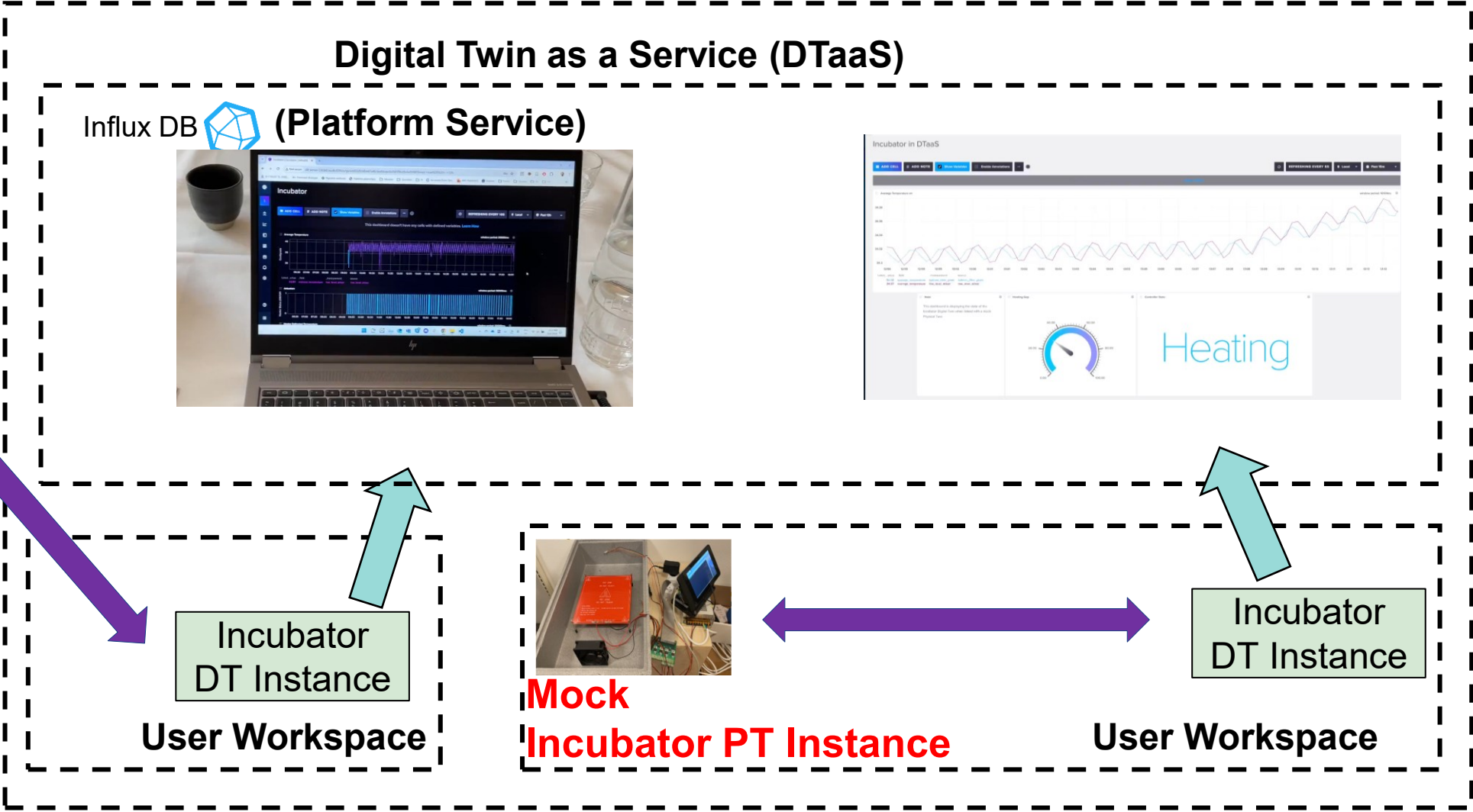
Ref: [Incubator repository](#)



INCUBATOR DIGITAL TWIN WITH DTAAAS



Incubator PT Instance

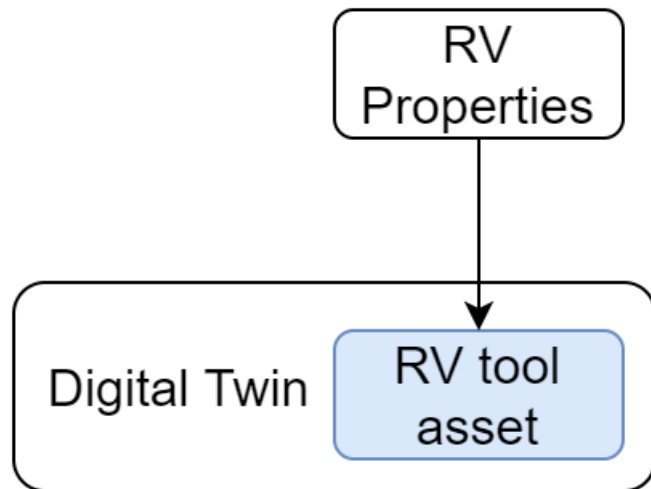


Ref: [Incubator repository](#)

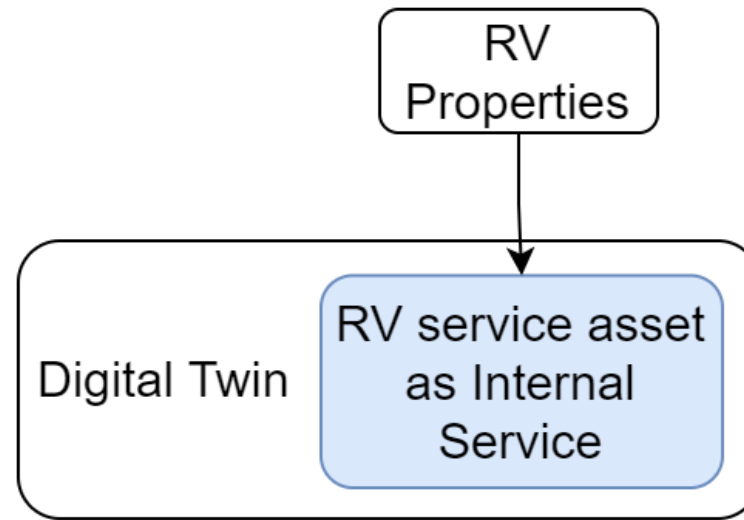


Integration of Runtime Verification Methodologies

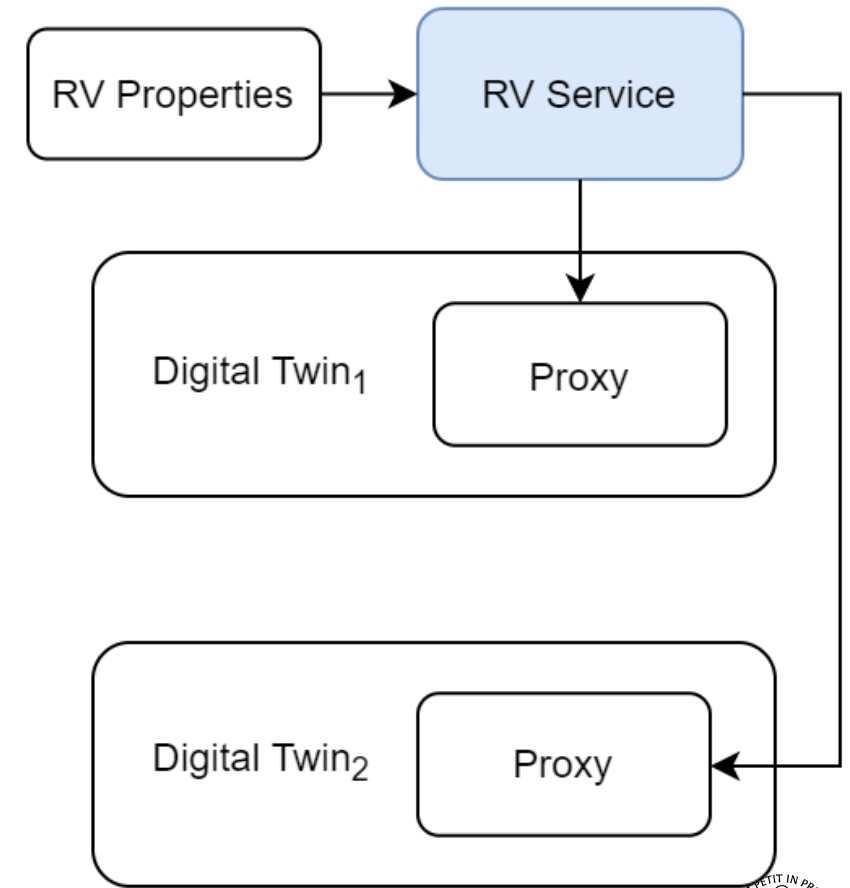
Internal Asset



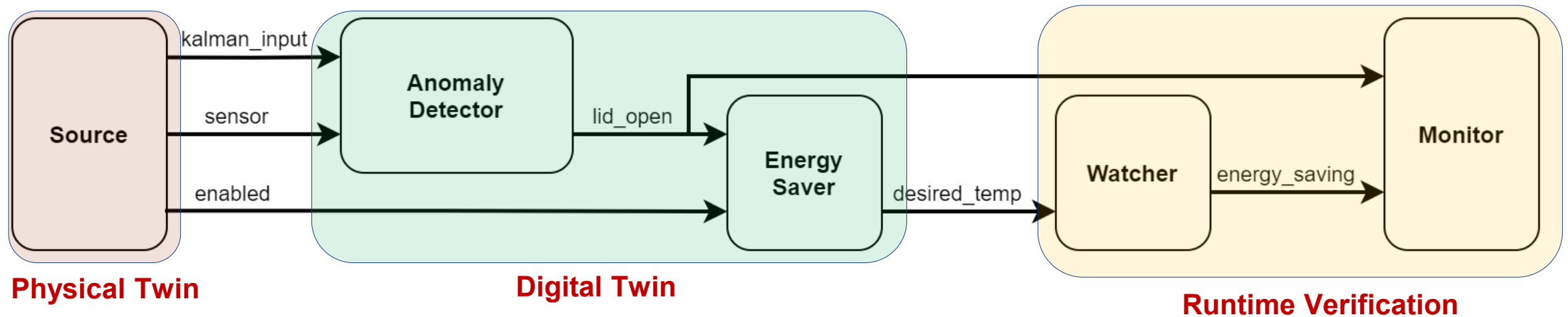
Internal Service



External Service



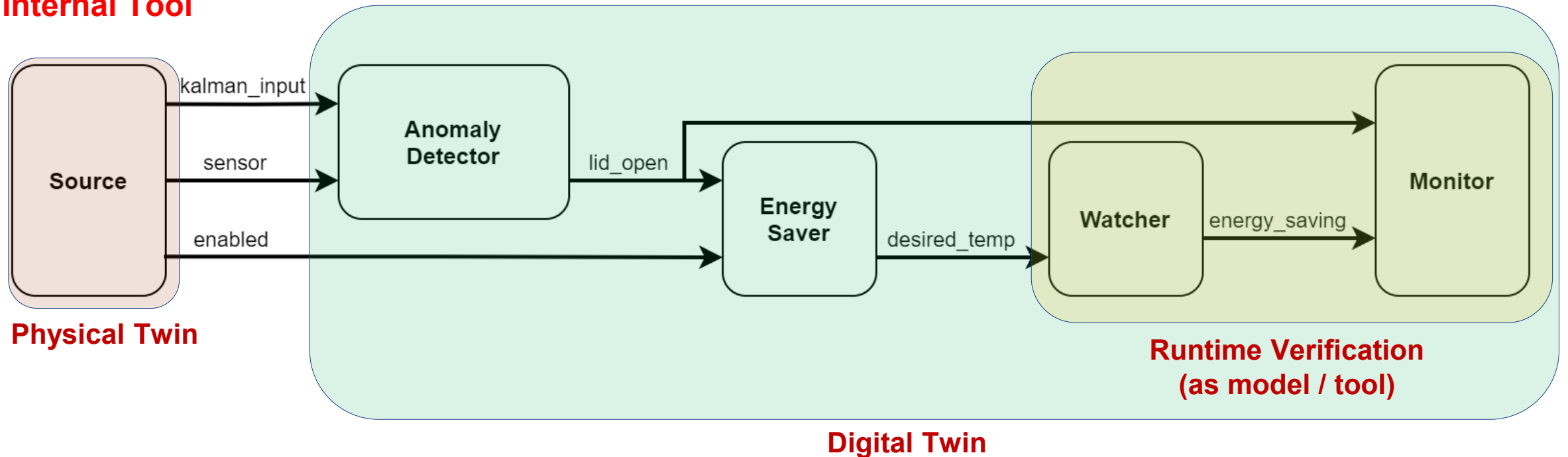
Example: RV in Incubator(2)



Ref: Morten Haar Kristensen et al., "Runtime Verification of Autonomous Systems utilizing Digital Twins as a Service" Tutorial at 2024 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS). IEEE, 2024.

Example: RV in Incubator(2)

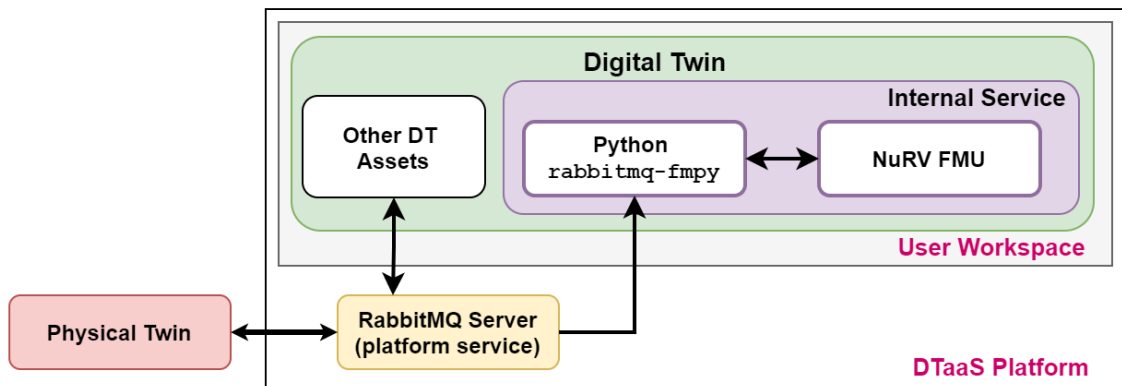
Internal Tool



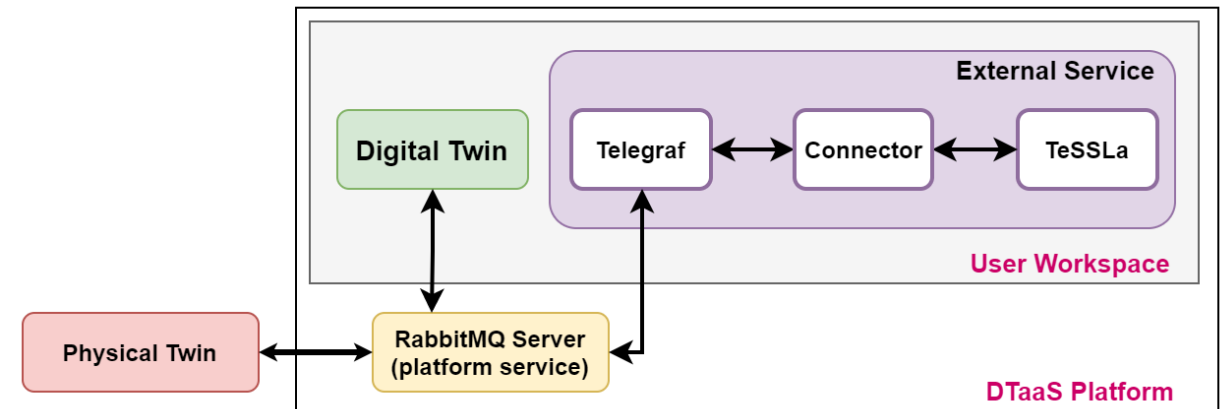
Ref: Morten Haar Kristensen et al., "Runtime Verification of Autonomous Systems utilizing Digital Twins as a Service" Tutorial at 2024 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS). IEEE, 2024.

Example: RV in Incubator(2)

Internal Service



External Service

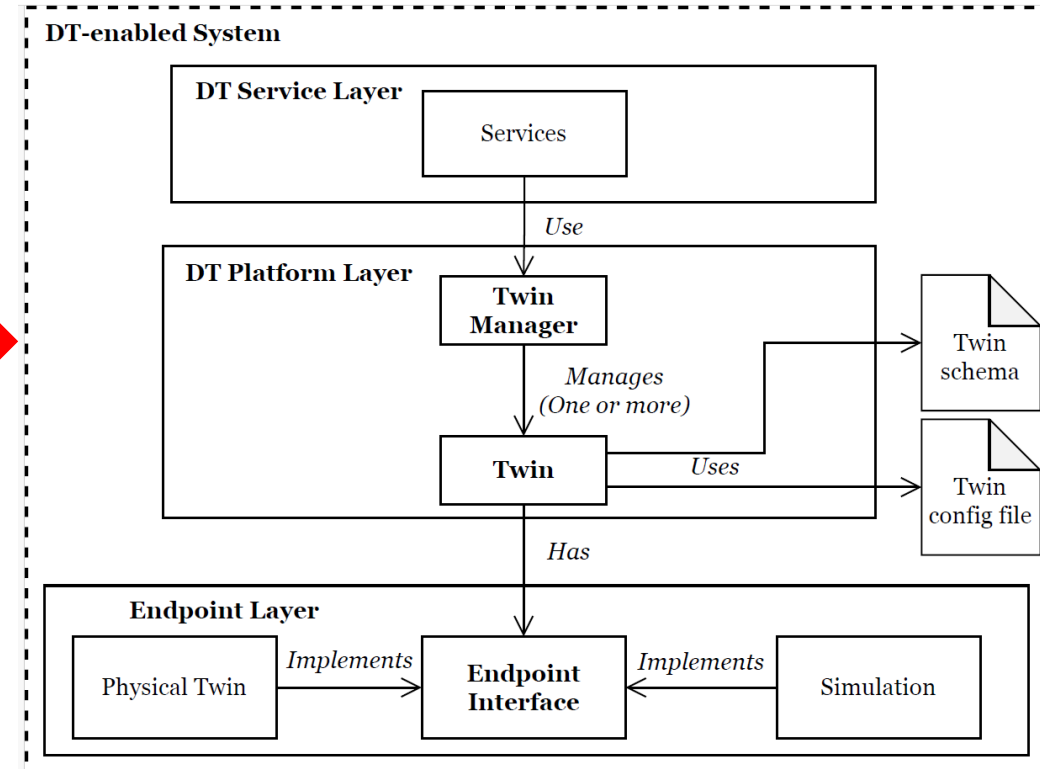


Ref: Morten Haar Kristensen et al., "Runtime Verification of Autonomous Systems utilizing Digital Twins as a Service" Tutorial at 2024 IEEE International Conference on Autonomic Computing and Self-Organizing Systems (ACSOS). IEEE, 2024.

FLEX CELL EXAMPLE



Digital Twin

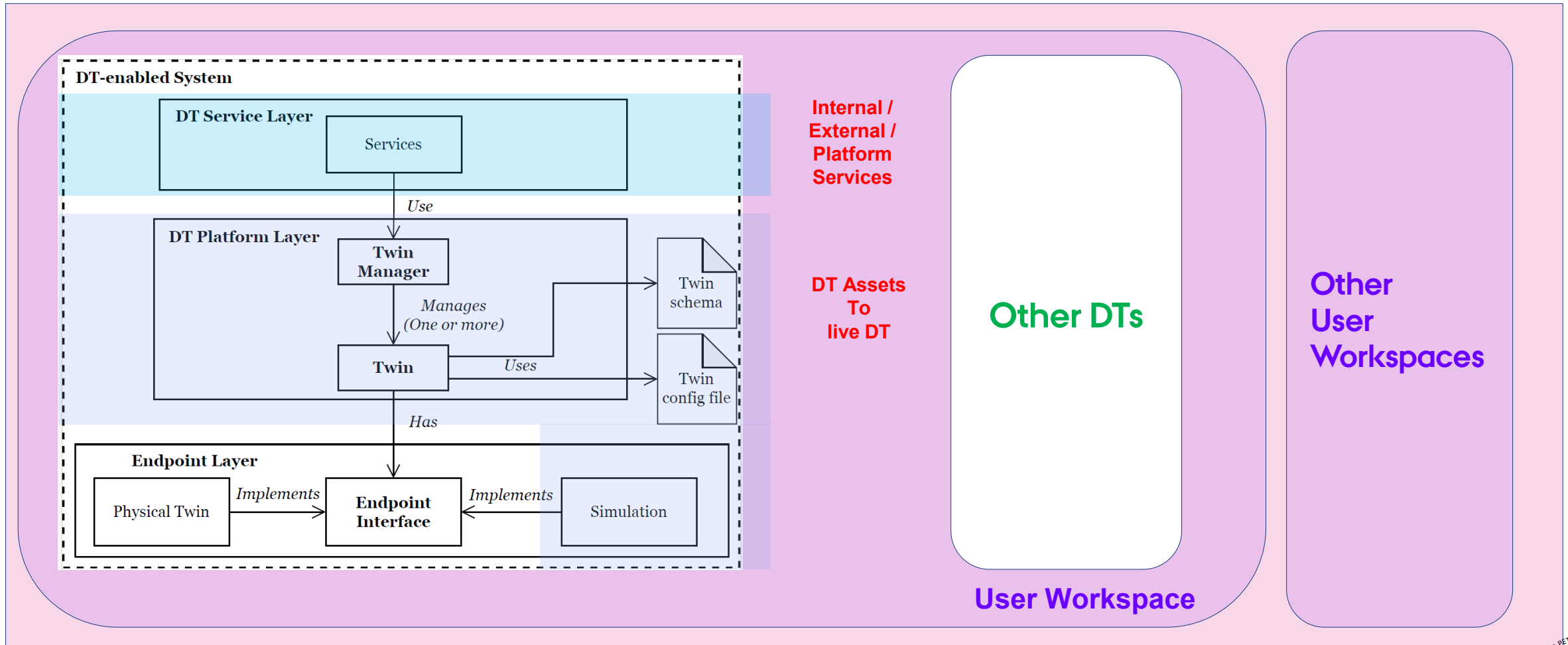


- ❖ Uses Multiple models – data-driven model and behavioral models
- ❖ Uses RabbitMQ and MQTT broker platform services
- ❖ Data replay to emulate PT

Ref: Lehner, D., Gil, S., Mikkelsen, P. H., Larsen, P. G. & Wimmer, M. An architectural extension for digital twin platforms to leverage behavioral models, 1-8 (2023).

FLEX CELL EXAMPLE IN DIGITAL TWIN AS A SERVICE

Digital Twin as a Service



Ref: Lehner, D., Gil, S., Mikkelsen, P. H., Larsen, P. G. & Wimmer, M. An architectural extension for digital twin platforms to leverage behavioral models,