

# Cyber-physical sensing platform for digital twins of machines and structures (CP-SENS)

## Demo

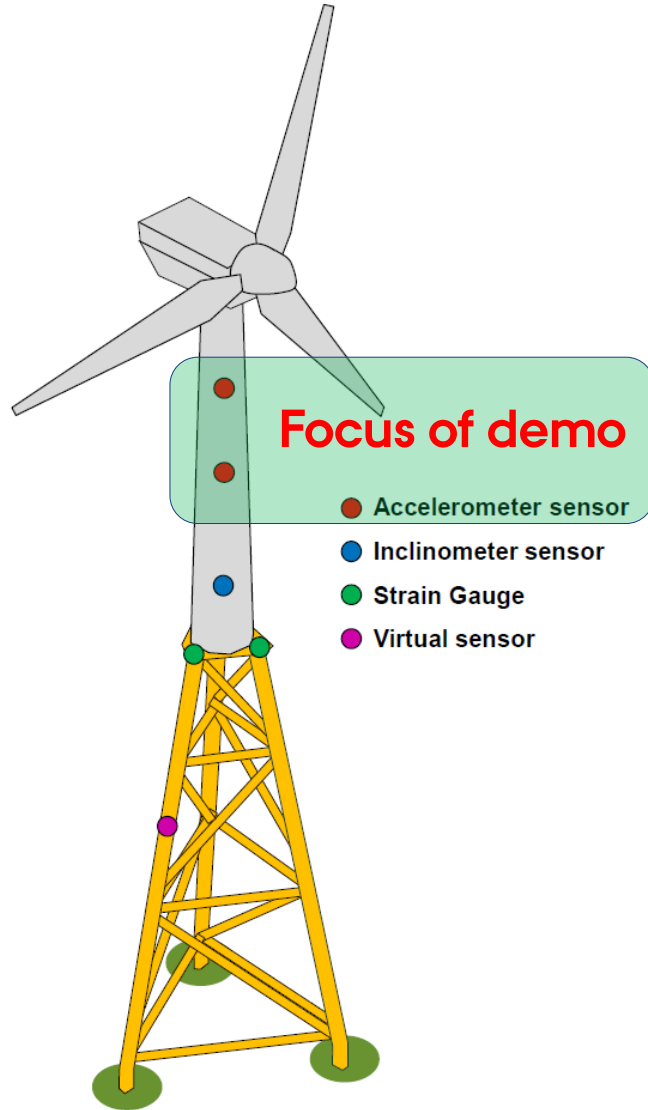
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# WIND TURBINE SENSOR SETUP

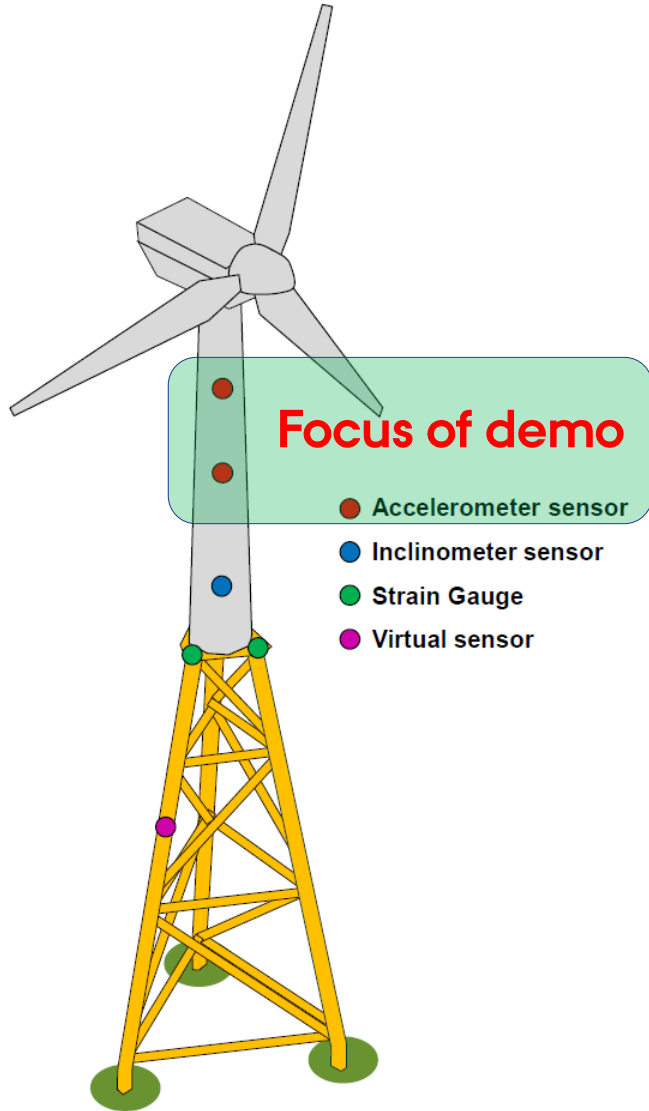


Turbines

cantilever beam in sand

Image courtesy of Anders Malund Dammark Jensen, 17-June-2024.

# WIND TURBINE SENSOR SETUP



Sensors  
(two per turbine)



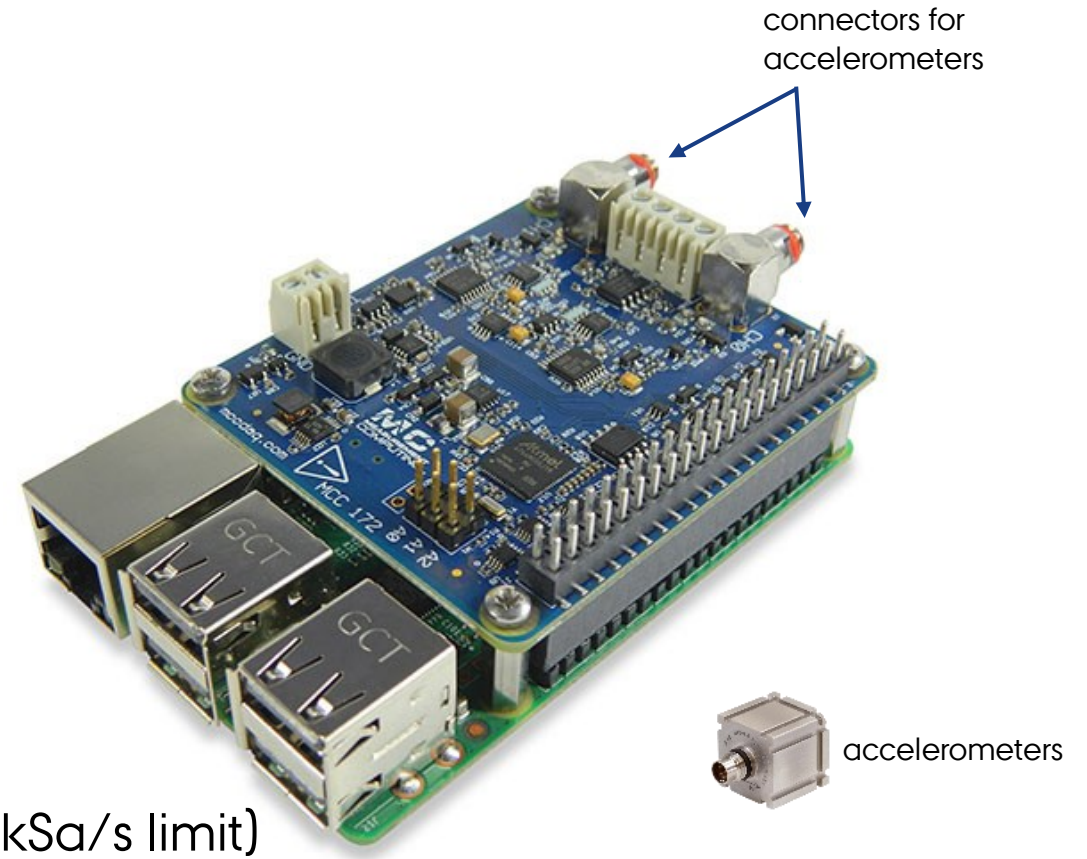
# DATA ACQUISITION SYSTEM (RASPBERRY PI WITH DAQ HAT)

- **Raspberry Pi v.4**

- Quad core ARM CPU, 1.8 GHz
- 8 GB RAM
- RJ45 + WiFi
- Power supply via USB-C / PoE\*
- 2xHDMI + 2xUSB + 2xUSB 3.0
- Linux OS (Raspberian)

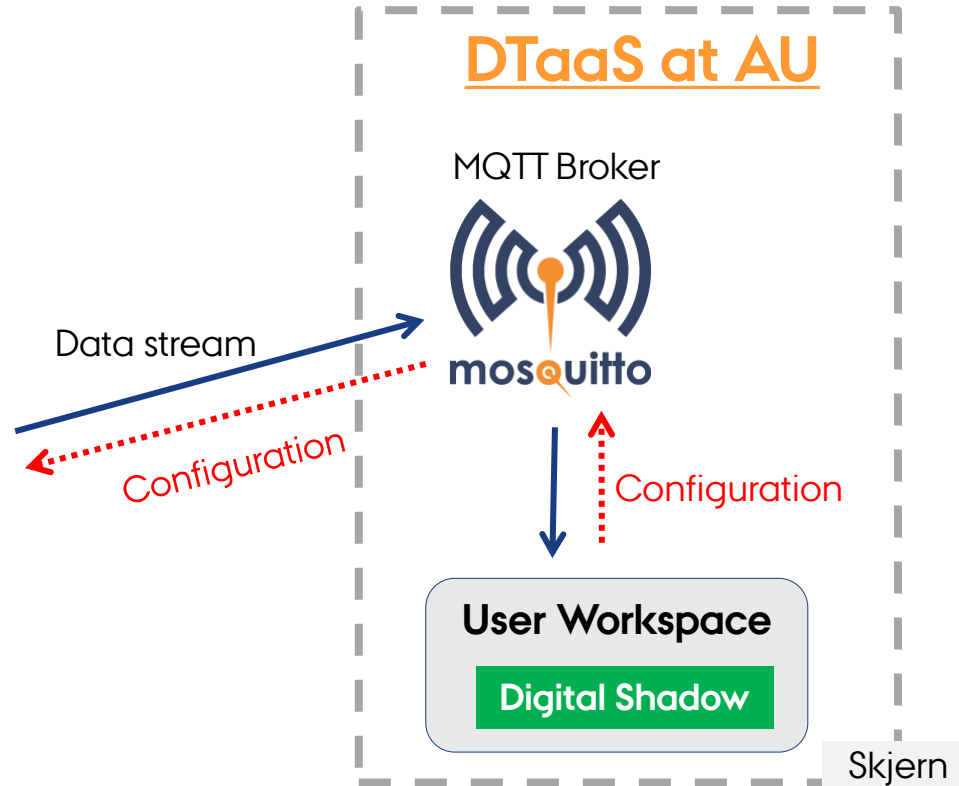
- **MCC 172: 2 ch. DAQ Raspberry Pi HAT**

- IEPE (CCLD) support
- 24 bit ADC
- 51.2 kSa/s per ch.
- Up to 8 HATs can be stacked (16 ch. but 307 kSa/s limit)



\*HAT= Hardware Attached on Top

# USE OF DTAAAS FOR ONE DIGITAL SHADOW



## Observations:

1. Use of platform services
2. Online re-configuration of data sources

Ref: Adopted from technical demo done in collaboration with Dmitri Tcherniak, 12-July-2024.

# USE OF DTAAAS FOR ONE DIGITAL SHADOW



Data stream



## DTaaS at AU

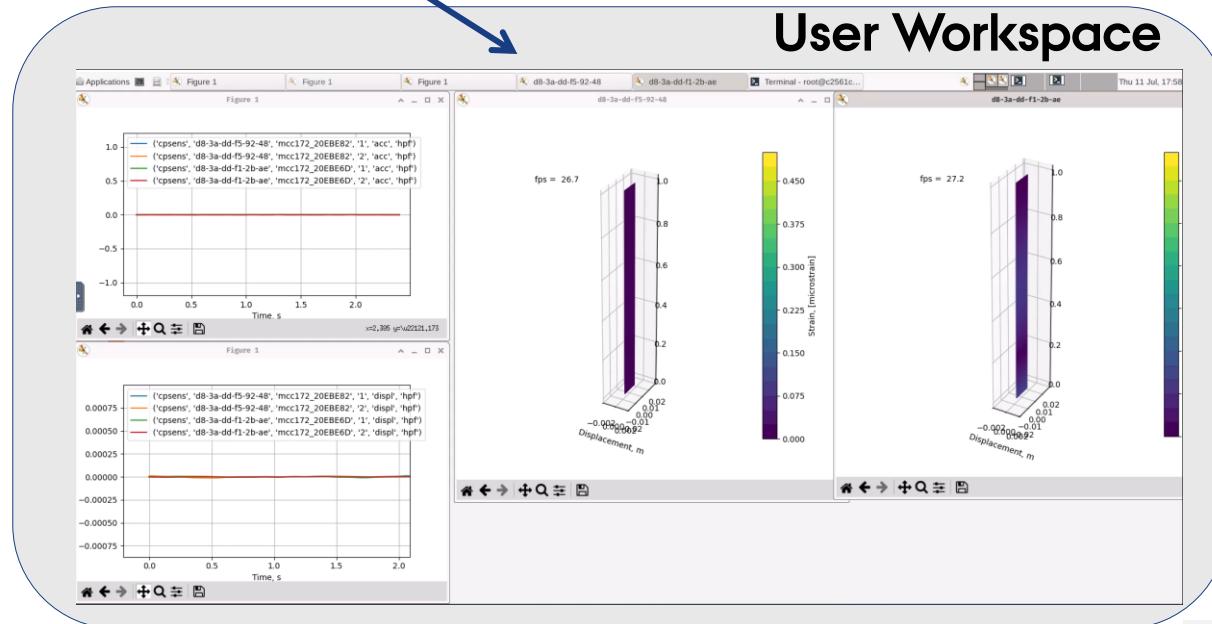
MQTT Broker



Data stream

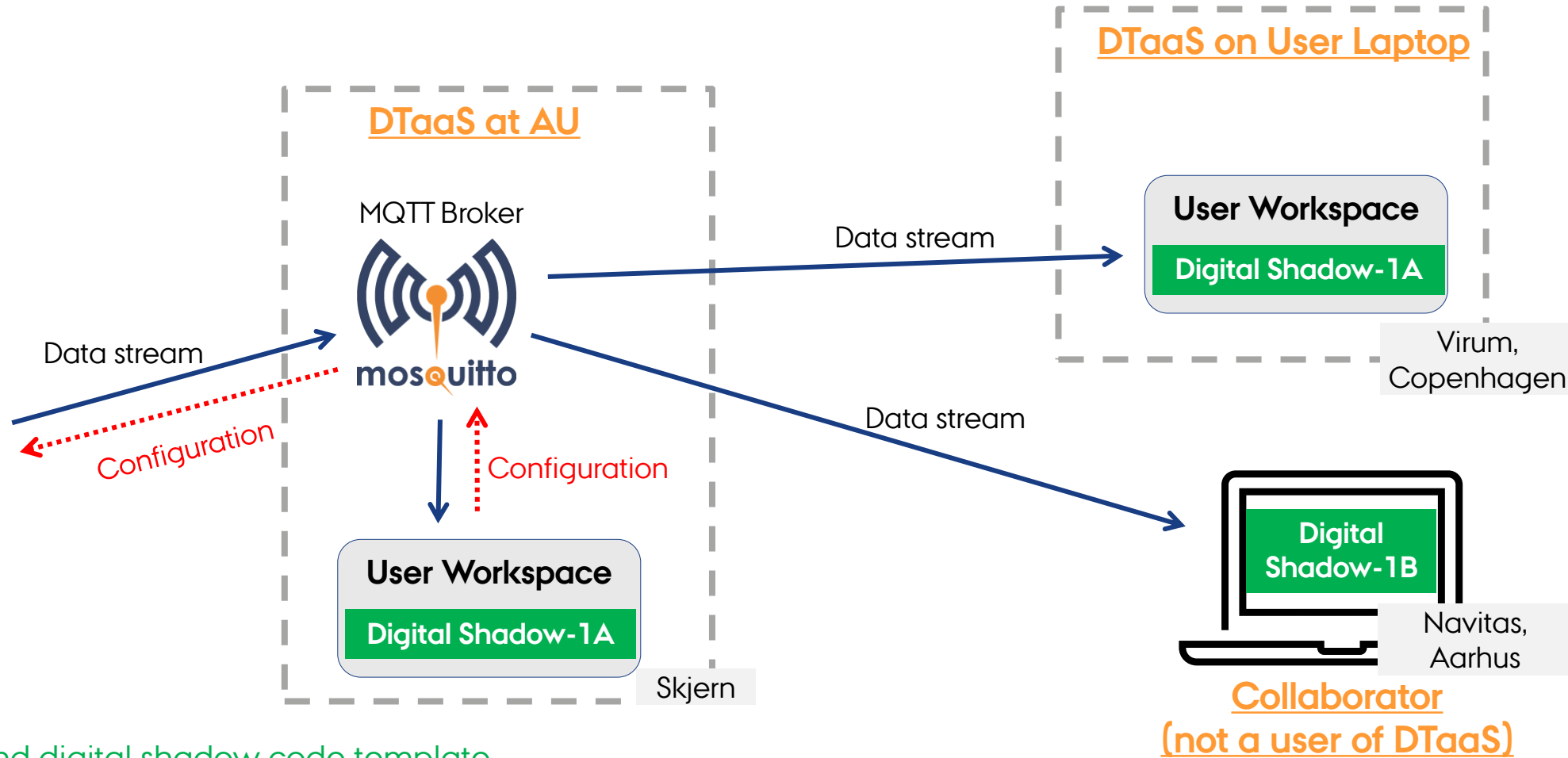


## User Workspace



Ref: Adopted from technical demo done in collaboration with Dmitri Tcherniak, 12-July-2024.

# USE OF DTAAAS FOR FEDERATED DIGITAL SHADOWS



## Observations:

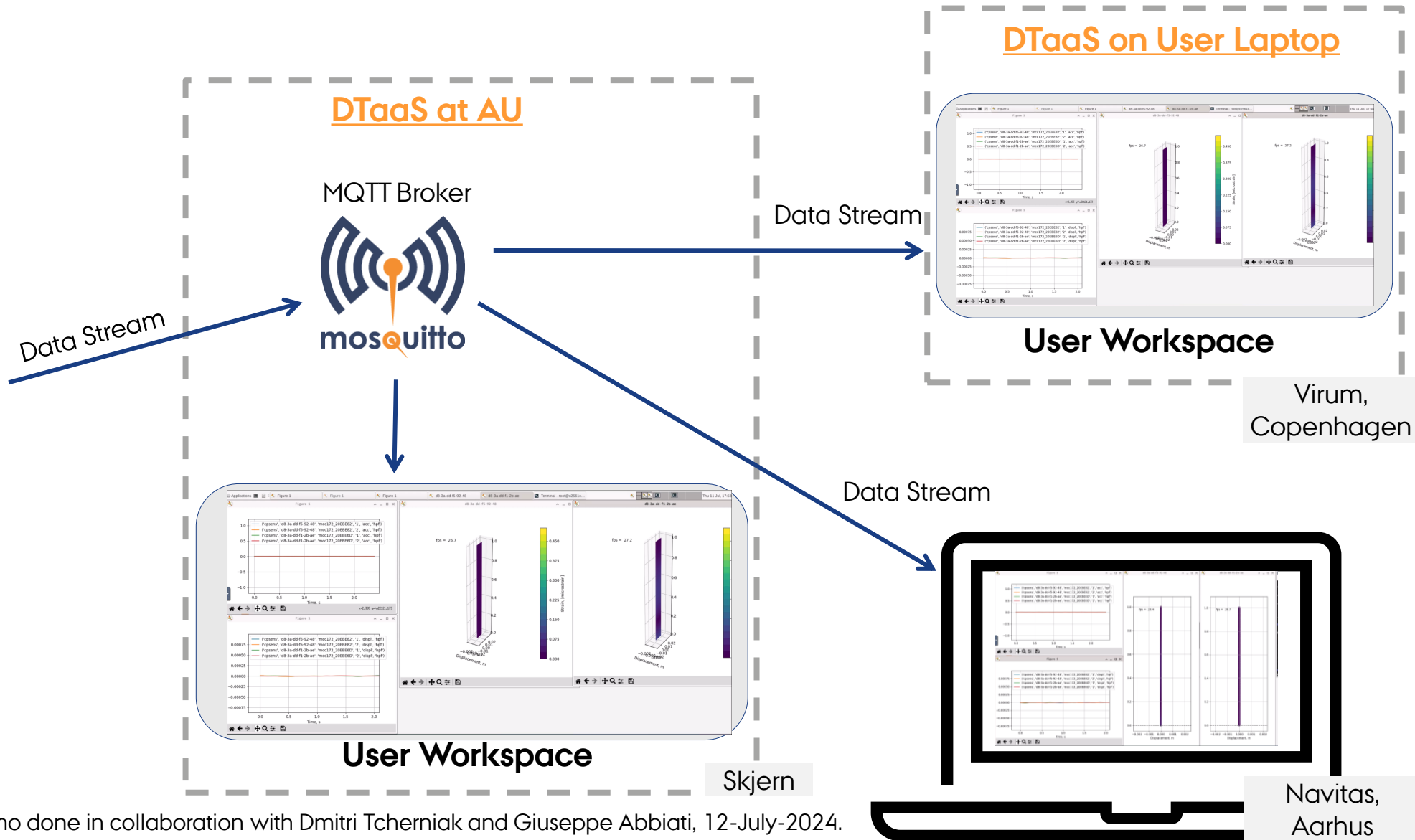
1. Reuse of data and digital shadow code template
2. Federation of DTaaS and services
3. Separation of data owner and user roles

Ref: Adopted from technical demo done in collaboration with Dmitri Tcherniak and Giuseppe Abbiati, 12-July-2024.

# USE OF DTAAAS FOR FEDERATED DIGITAL SHADOWS



Virum, Copenhagen



Ref: Adopted from technical demo done in collaboration with Dmitri Tcherniak and Giuseppe Abbiati, 12-July-2024.