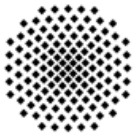
Customization and Provisioning of Complex Event Processing using TOSCA



IAAS & IPVS

University of Stuttgart
Germany

Ana C. Franco da Silva, Pascal Hirmer, Uwe Breitenbücher,
Oliver Kopp, Bernhard Mitschang
franco-da-silva@informatik.uni-stuttgart.de

SmartOrchestra

Supported by:

Federal Ministry
for Economic Affairs
and Energy

on the basis of a decision
by the German Bundestag

Motivation – Internet of Things

- Pervasive presence of smart devices, equipped with sensors, and exchanging information
- New IoT applications such as smart homes, smart factories, smart cities
- Important issues:
  - timely data processing
  - amount of exchanged data among devices

  ➔ established approach: Complex Event Processing (CEP)

Motivation – Complex Event Processing

- CEP systems
  - find event patterns based on data streams
  - filter and aggregate data
- Many heterogeneous CEP systems exist
- Set up of **customized** CEP systems requires
  - configuration of the system
  - binding of data sources and data sinks
  - deployment of CEP queries

  ➔ manual setup is cumbersome and time-consuming

Contribution & Outline

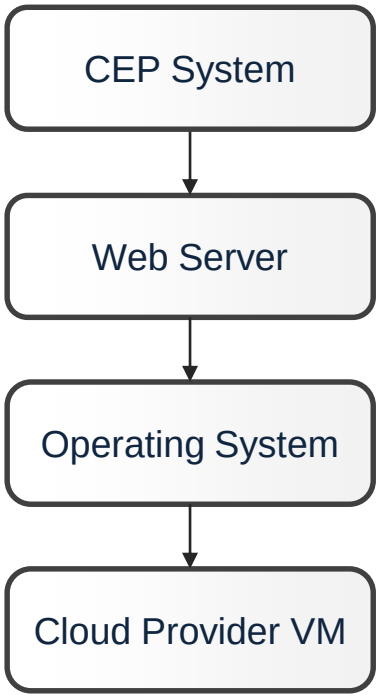
- Contribution:
  - Automated provisioning of **customized** CEP systems based on the TOSCA standard

- Outline:
  - TOSCA Overview
  - Customization and Provisioning of CEP using TOSCA
  - Case Study
  - Summary and Future Work

TOSCA Overview

TOSCA Overview

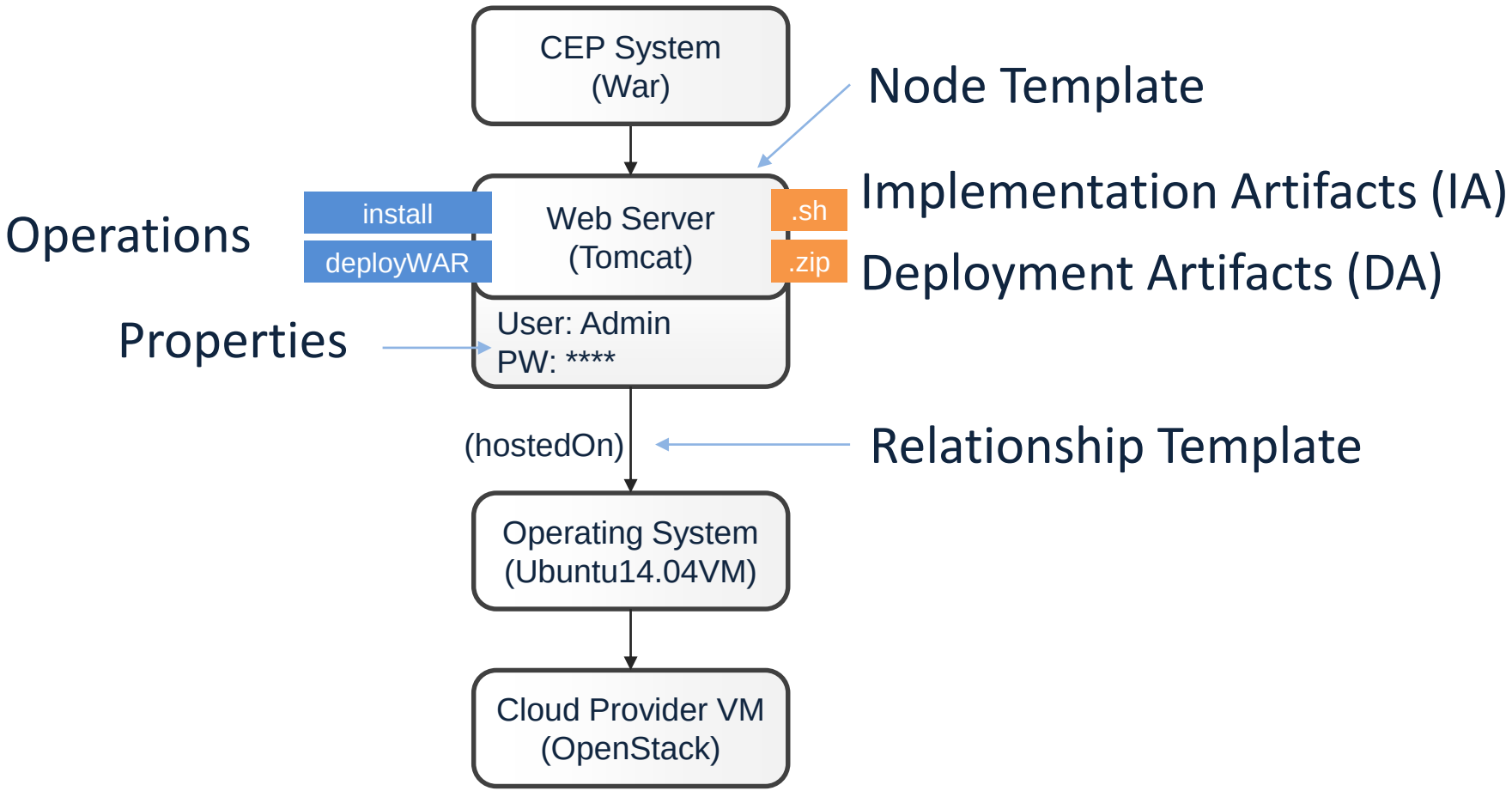
- **T**opology and **O**rchestration **S**pecification for **C**loud **A**pplications



Application **Topology**

Service **Orchestration** for Deployment and Management

Graphical Example of an Application Topology



Customization and Provisioning of CEP using TOSCA

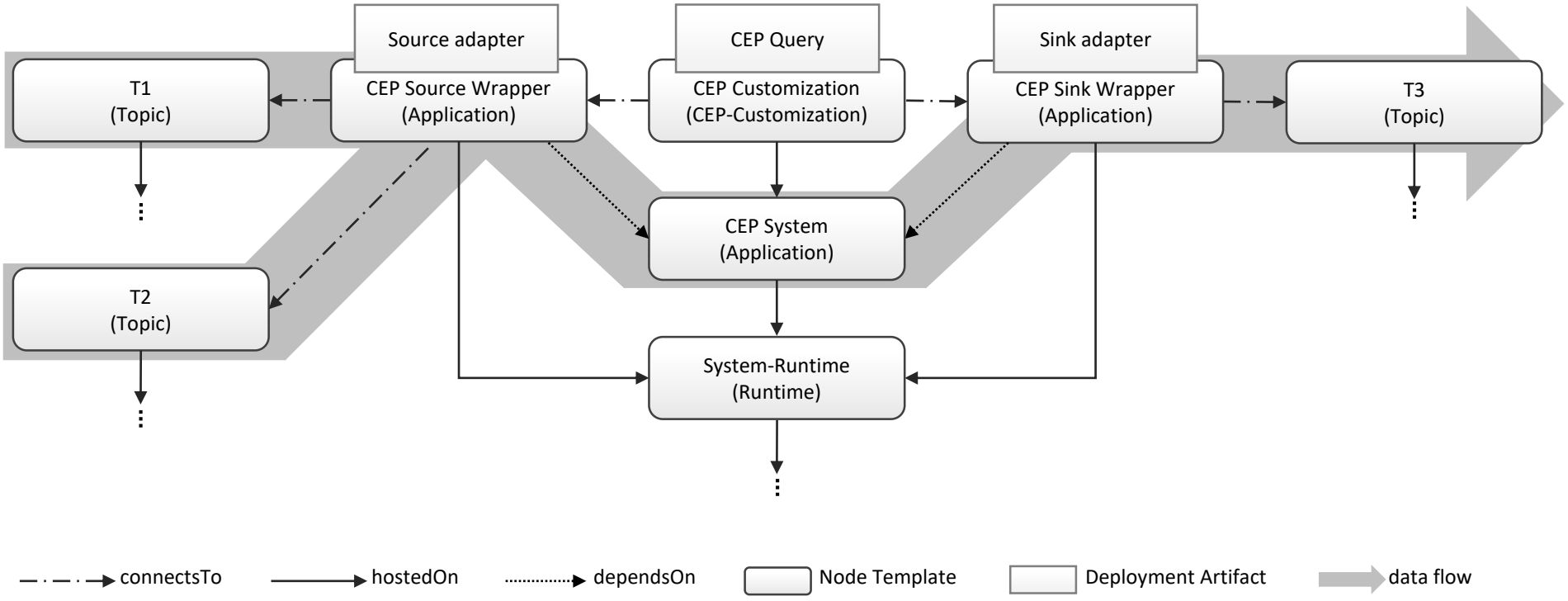
Main Contribution

Customization and Provisioning of CEP

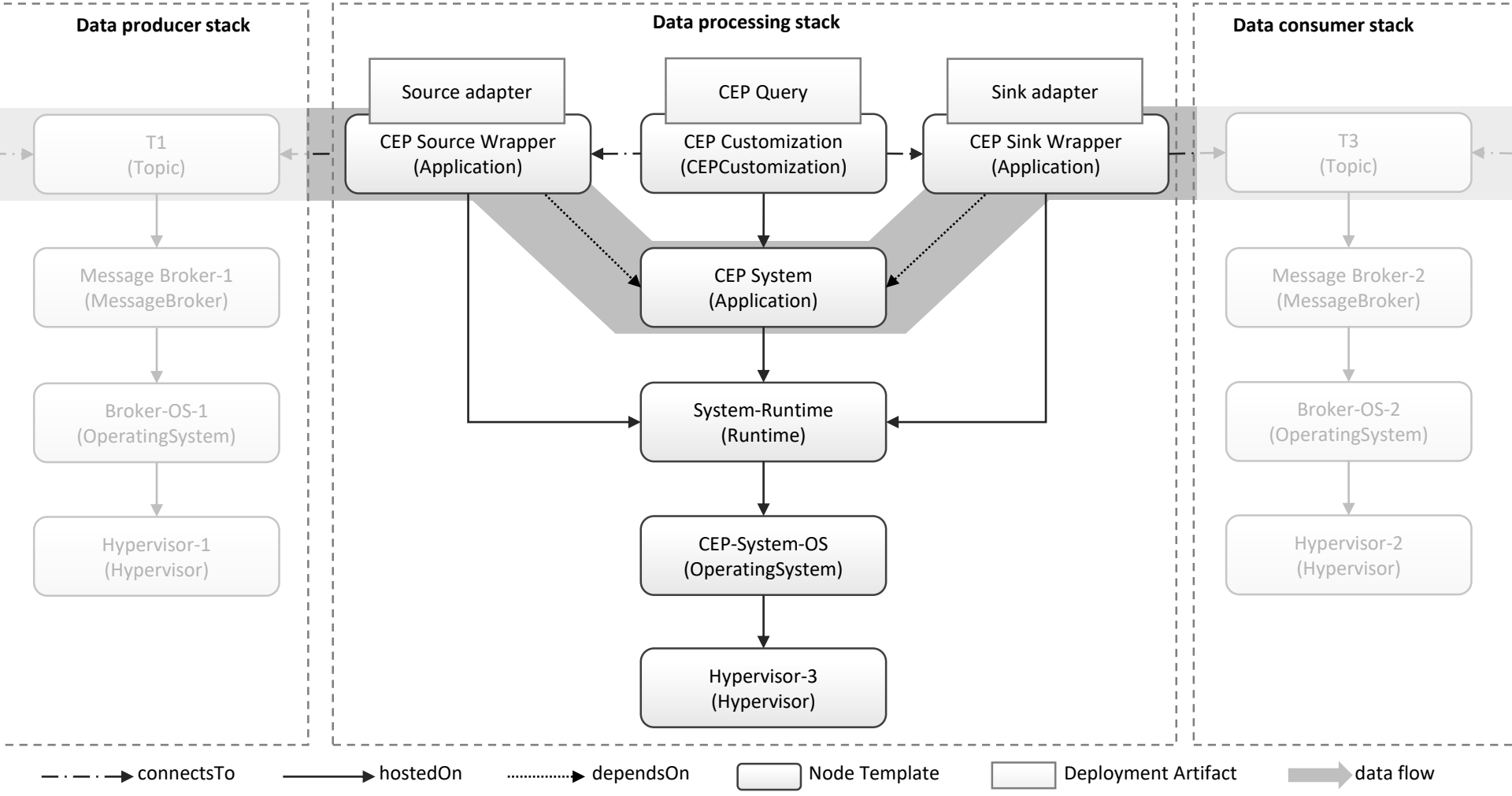
- Configuration of CEP system
- Binding of data sources and sinks
- Deployment of CEP queries

- Modeling of the TOSCA topology
- Deployment into a TOSCA runtime environment
- Instantiation of the CEP system setup

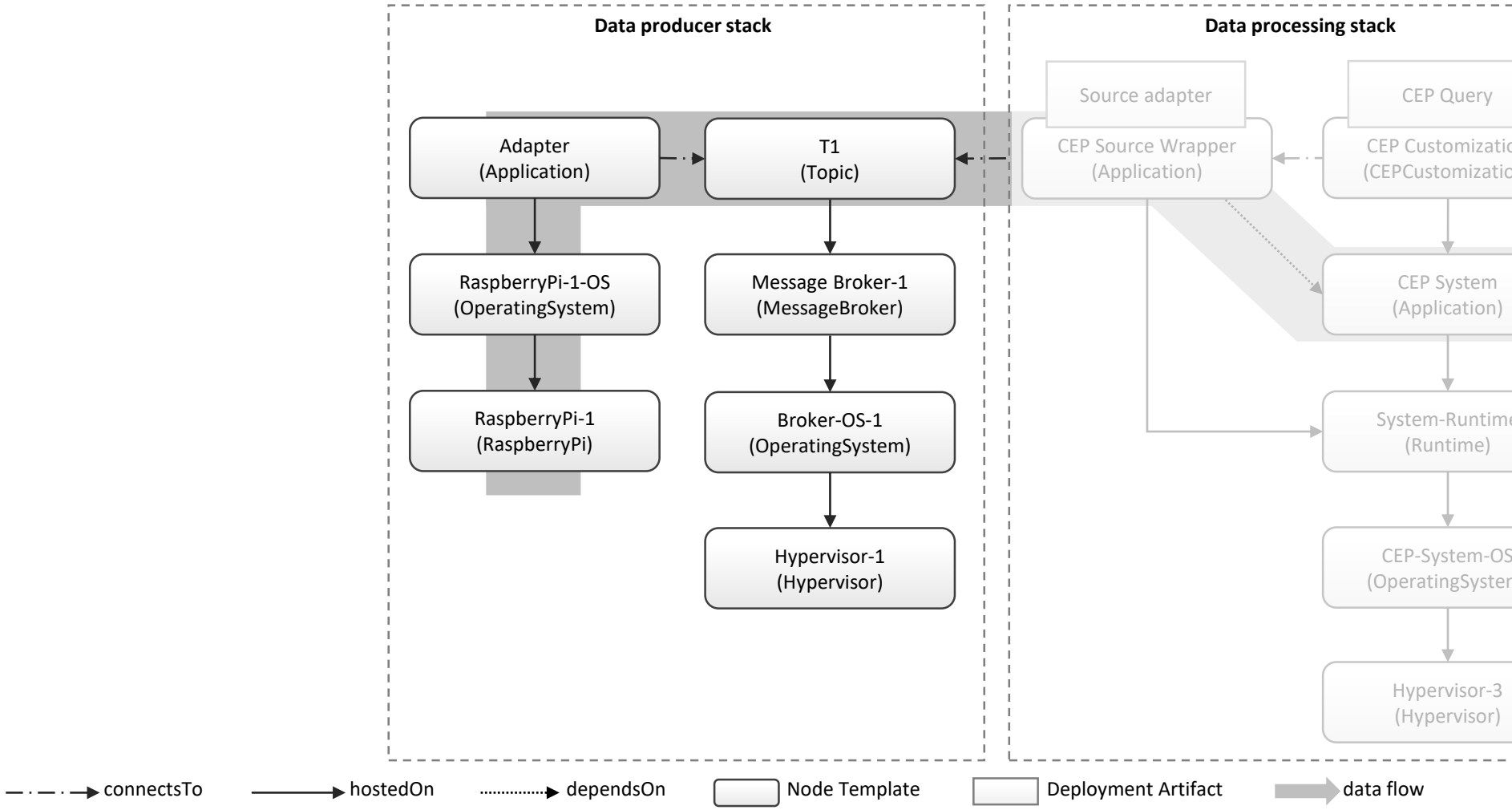
Topology for customized CEP systems



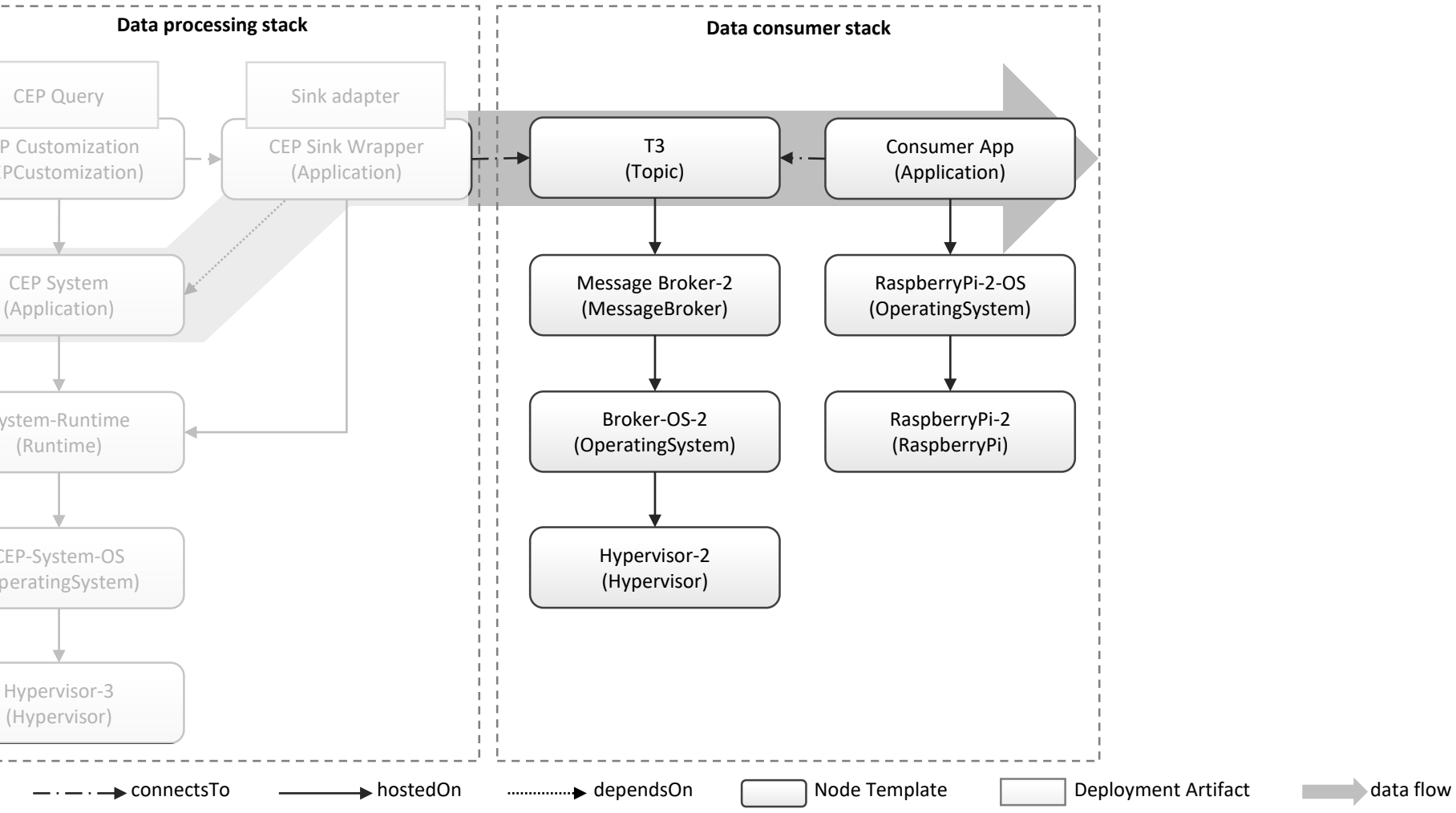
Data Processing Stack



Data Producer Stack



Data Consumer Stack

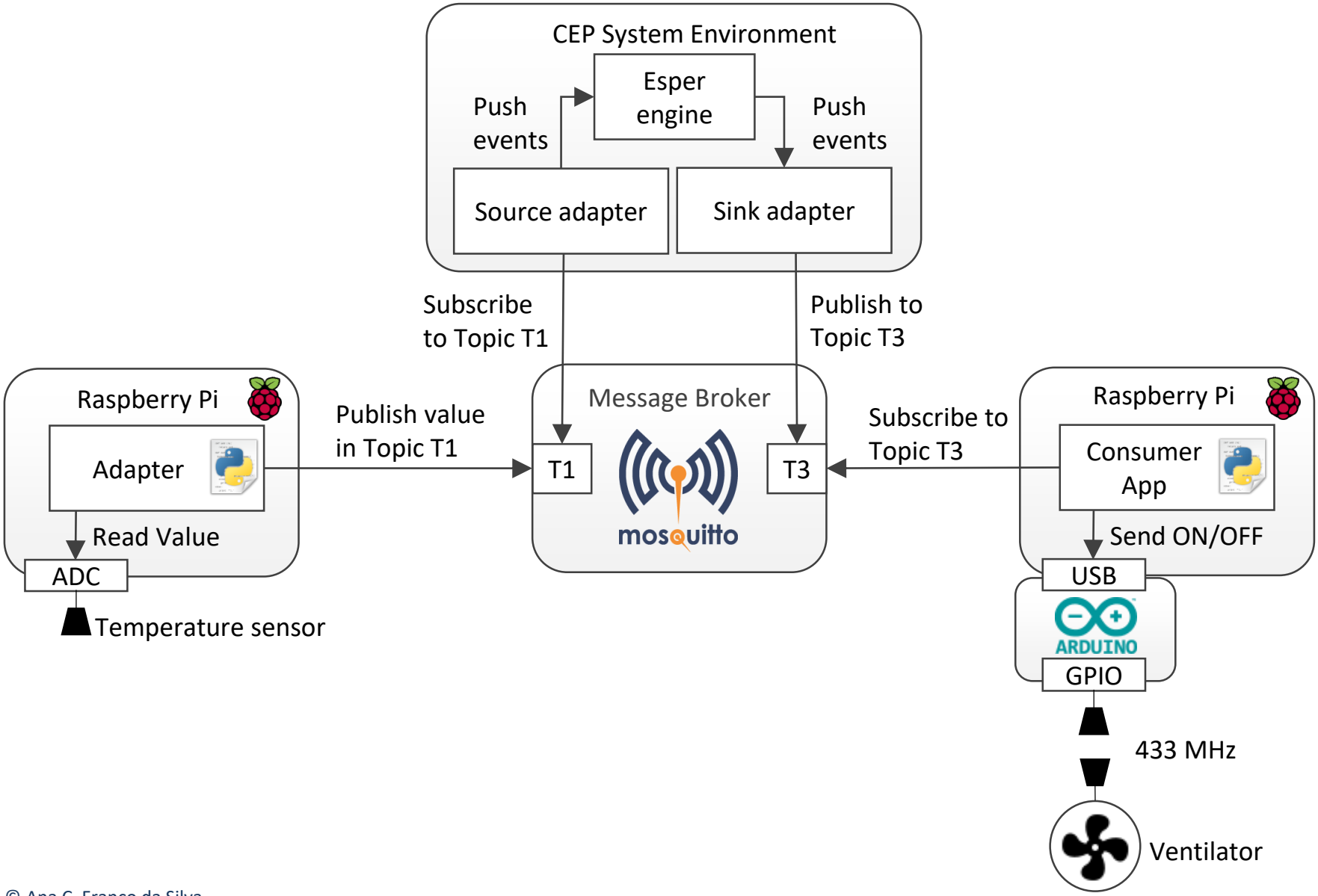


Case Study

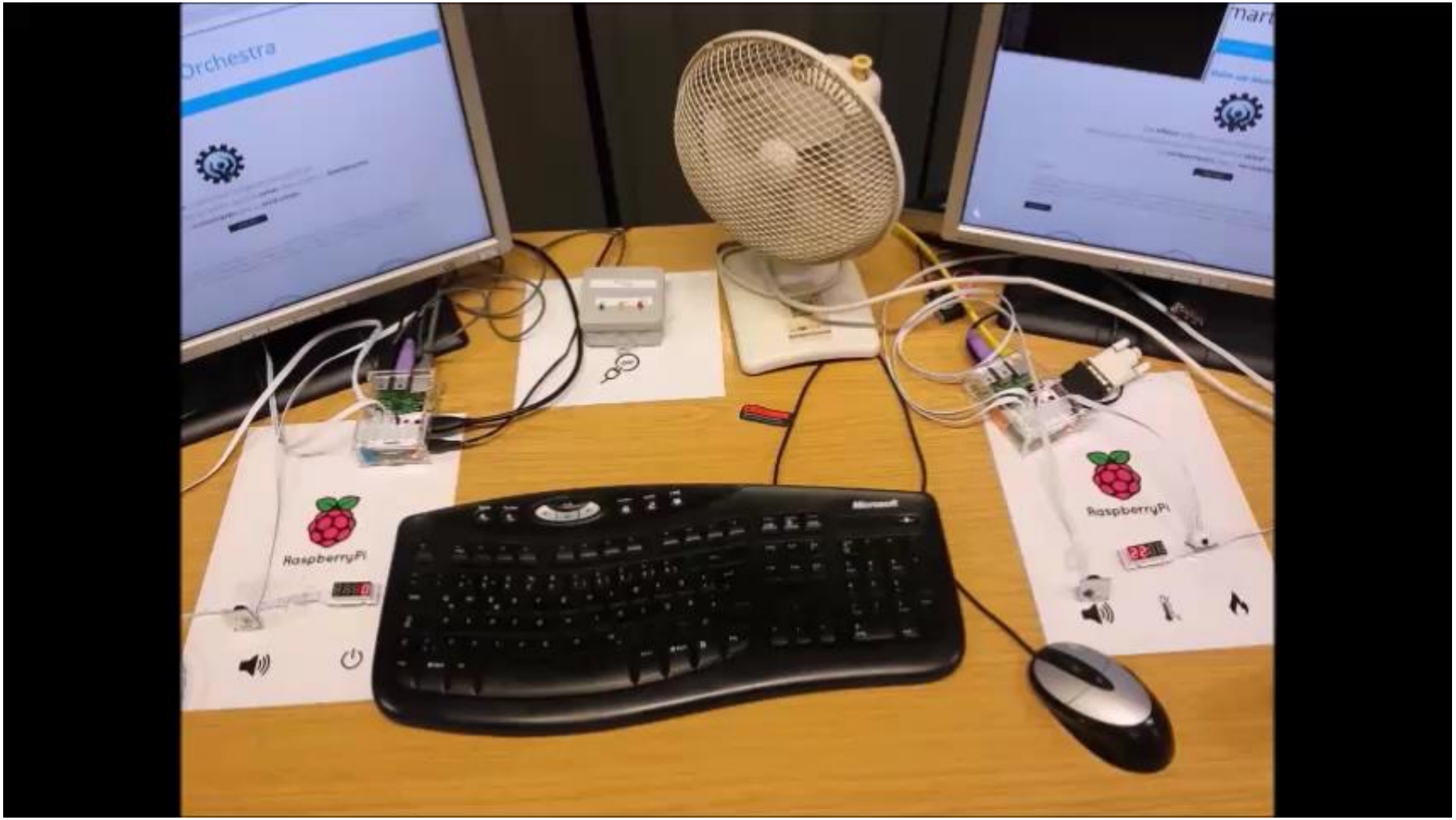
Temperature Monitoring

- Data producer:
  - Raspberry Pi measures the temperature
  - Temperature values are provided to the CEP system
- Data processing:
  - CEP system processes values and creates output events
    - Turn the ventilator ON or OFF
- Data consumer:
  - Raspberry Pi subscribes to topic ‘command’
    - Actuator triggered to turn the ventilator ON or OFF

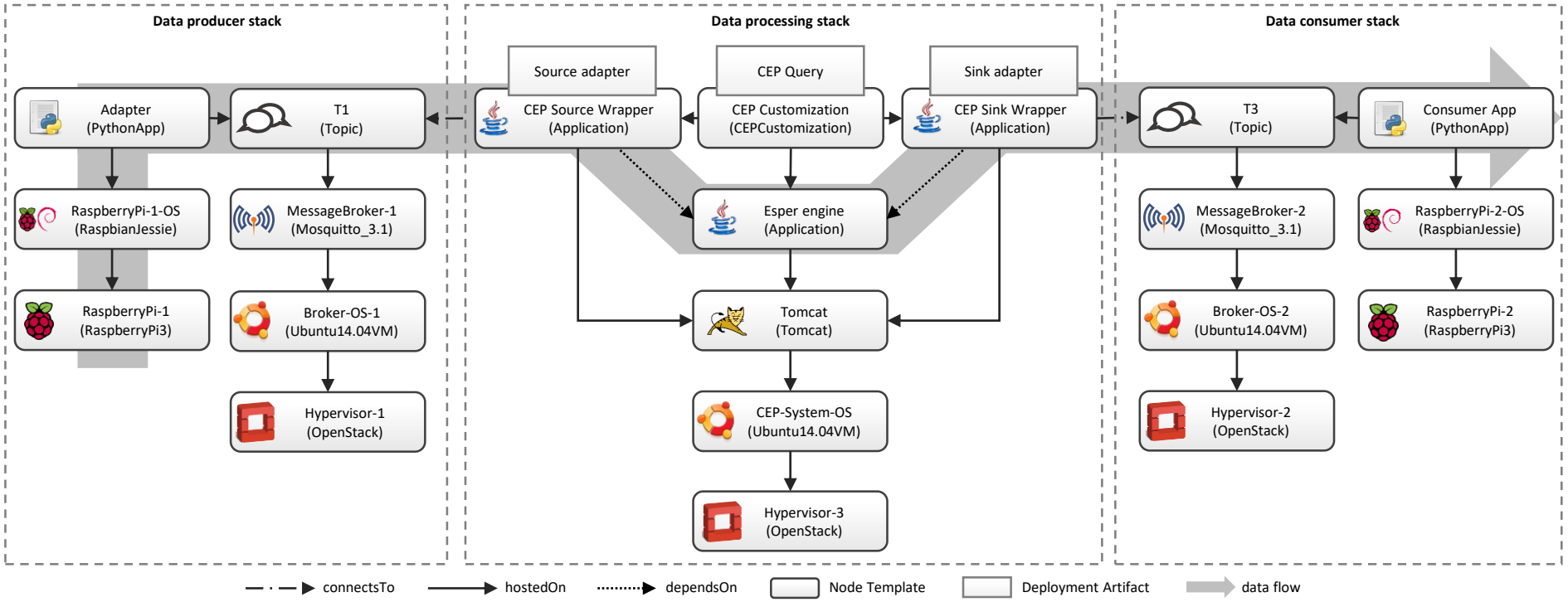
Experimental Setup



Experimental Setup



Topology Model

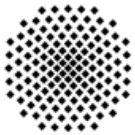


Summary and Future Work

- Our approach enables
  - Automated setup of customized CEP systems
  - Easy exchangeability of CEP systems

- Future work
  - Creation of more TOSCA Node Types to enable a wider range of CEP systems
  - Distribution of CEP using TOSCA

Customization and Provisioning of Complex Event Processing using TOSCA



IAAS & IPVS

University of Stuttgart
Germany

Ana C. Franco da Silva, Pascal Hirmer, Uwe Breitenbücher,
Oliver Kopp, Bernhard Mitschang
franco-da-silva@informatik.uni-stuttgart.de

SmartOrchestra

Supported by:

Federal Ministry
for Economic Affairs
and Energy

on the basis of a decision
by the German Bundestag