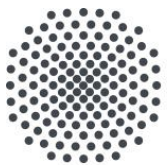


Hands-On Session



University of Stuttgart

Martin Beisel, Benjamin Weder

[beisel, weder]@iaas.uni-stuttgart.de

Institute of Architecture of Application Systems



PlanQK

SequenC

EniQmΛ

Tutorial Structure

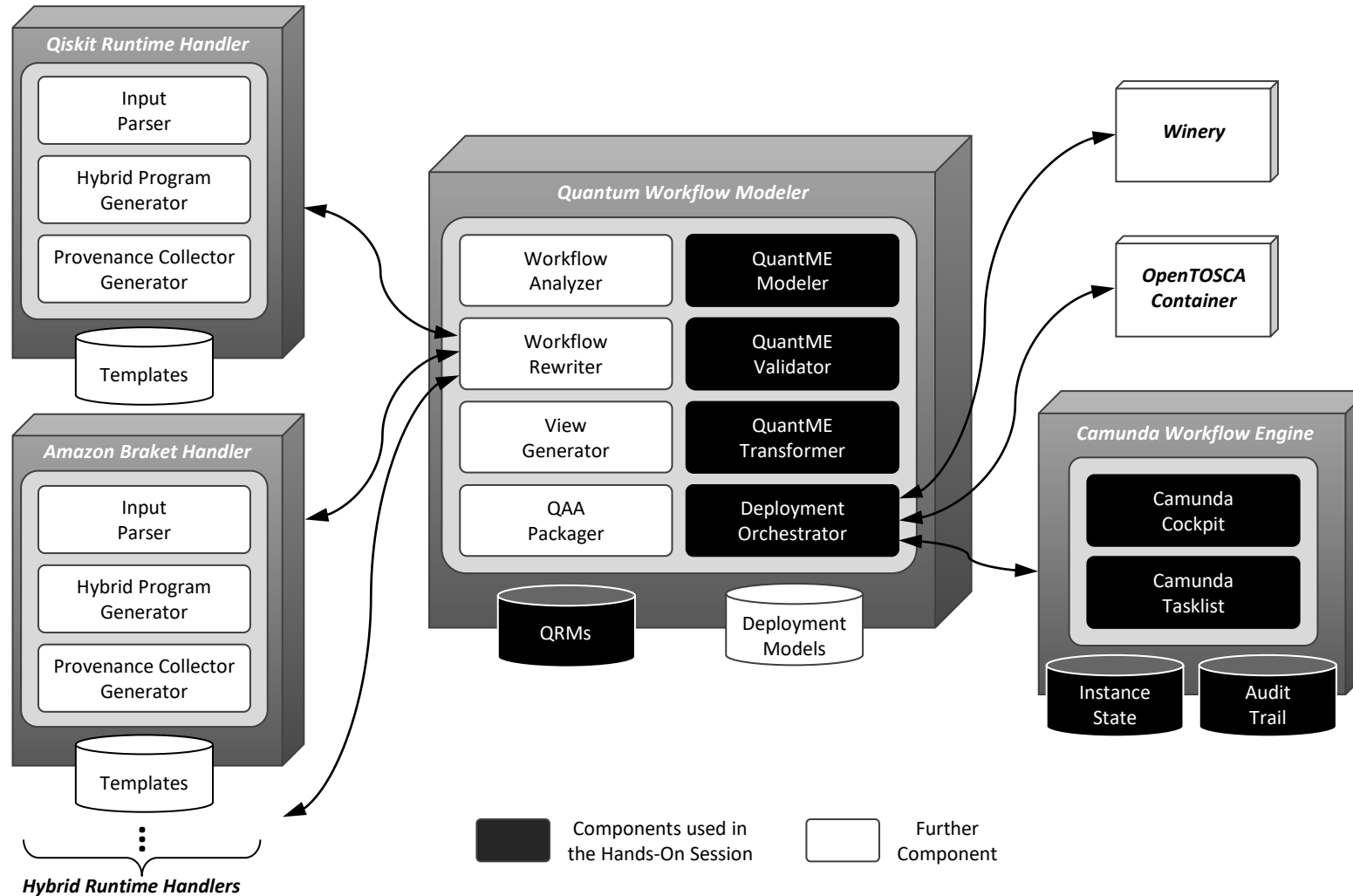
- Session 1 (09:00 - 10:30): An Introduction to Quantum Computing
- Session 2 (11:00 - 12:30): Quantum Software Engineering
- **Session 3 (14:00 - 15:30): Quantum Workflows**
 - Quantum Workflows
 - Service-oriented Quantum Applications
 - Introduction to Hands-On Session
 - Hands-On Session Part 1
- Session 4 (16:00 - 17:30): Operation of Hybrid Quantum Applications

Tutorial Structure

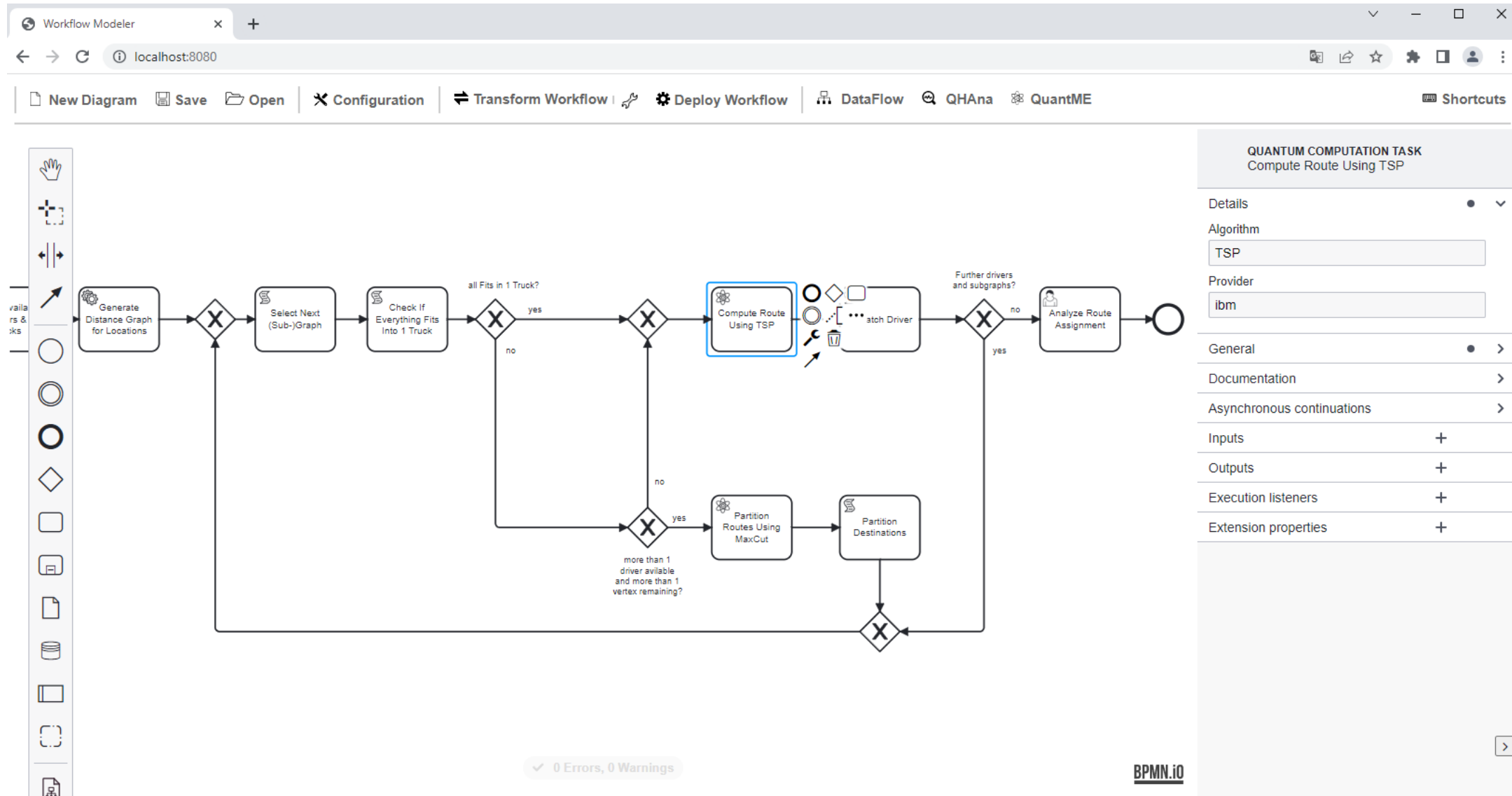
- Session 1 (09:00 - 10:30): An Introduction to Quantum Computing
- Session 2 (11:00 - 12:30): Quantum Software Engineering
- **Session 3 (14:00 - 15:30): Quantum Workflows**
 - Quantum Workflows
 - Service-oriented Quantum Applications
 - **Introduction to Hands-On Session**
 - Hands-On Session Part 1
- Session 4 (16:00 - 17:30): Operation of Hybrid Quantum Applications

QuAntiL Ecosystem

Architecture of the Quantum Workflow Modeler



Workflow Modeler Overview



Workflow Modeler Overview

Workflow Modeler

localhost:8080

New Diagram Save Open Configuration Transform Workflow Deploy Workflow DataFlow QHAna QuantME Shortcuts

Toolbar

Modeling Palette

Replace Menu

Properties Panel

0 Errors, 0 Warnings

BPMN.io

QUANTUM COMPUTATION TASK
Compute Route Using TSP

Details

Algorithm
TSP

Provider
ibm

General

Documentation

Asynchronous continuations

Inputs +

Outputs +

Execution listeners +

Extension properties +

Use Case:
Delivery & Routing

Use Case Motivation

- Finding the optimal route for package delivery is difficult
 - Many constraints to consider:
 - Driver availability
 - Different destinations
 - Truck capacities
 - Package priorities
 - ...
- ➔ Efficiency improvement using quantum computing
- Using QAOA to solve Maximum Cut (MaxCut) and Traveling Salesman Problem (TSP)

Overview

Stuttgart, 2, 10.0
Stuttgart, 3, 08.0
Stuttgart, 1, 09.0
München, 4, 10.0
München, 1, 10.0
München, 1, 10.0
Nürnberg, 2, 09.0
Nürnberg, 1, 10.0
Nürnberg, 3, 09.0
Berlin, 4, 10.05.2
Berlin, 2, 10.05.2
Berlin, 1, 09.05.2
Hamburg, 3, 10.0
Hamburg, 2, 08.0
Hamburg, 2, 09.0
Frankfurt, 1, 10.0
Frankfurt, 2, 08.0



stuttgart.de

... and now its your turn ...



<https://ust-quantil.github.io/icwe-tutorial/handson.html>