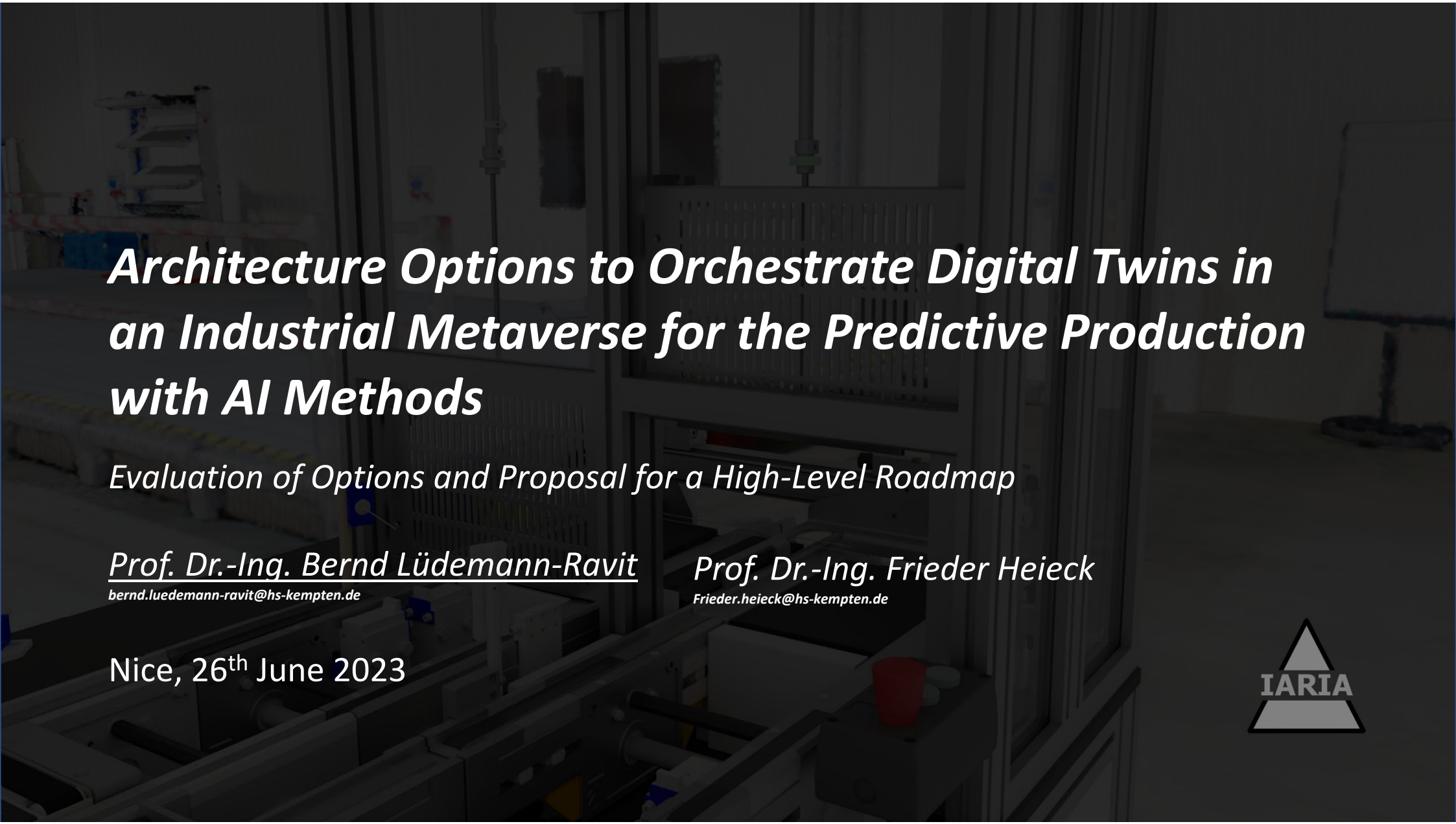

Architecture Options to Orchestrate Digital Twins in an Industrial Metaverse for the Predictive Production with AI Methods

Evaluation of Options and Proposal for a High-Level Roadmap

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Nice, 26th June 2023

IARIA

Presenter
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- Prof. Dr.-Ing Bernd Lüdemann-Ravit
  - 53 Jahre, Three Children
- Since 06/2021:
  - Professor „Toolchain for the Digital Production“
  - Faculty Computer Science, Applied Universiy Kempten, Germany
  - Director Institute for Production and Informatics / Technology Transfer Center, Sonthofen
- 2004-2021: Mercedes-Benz Cars, Sindelfingen
  - Leader Digital Factory IT
  - Leiter Digital Factory Powertrain IT
  - Project Leader Digital Produktion Planning
- 1997-2004: Institute für Robotics Research, Dortmund
- 1995-1996: Mercedes-Benz Cars, Sindelfingen
  - Production Control S-Class
- 1990-1995 Computer Science,
  - Karlsruhe Institute for Technology
- Hobbies: Mediation, Coach, Trainer

Architecture Options to Orchestrate Digital Twins in an IM

Agenda

I. Introduction
II. Use Cases for an Industrial Metaverse
III. Related Work
IV. Architecture Components
V. Architecture Options
VI. Architecture Roadmap

Architecture Options to Orchestrate Digital Twins in an IM

Introduction - Vision - Predictive Production

Today

Production Engineering → Production

Tomorrow

Predictive Production

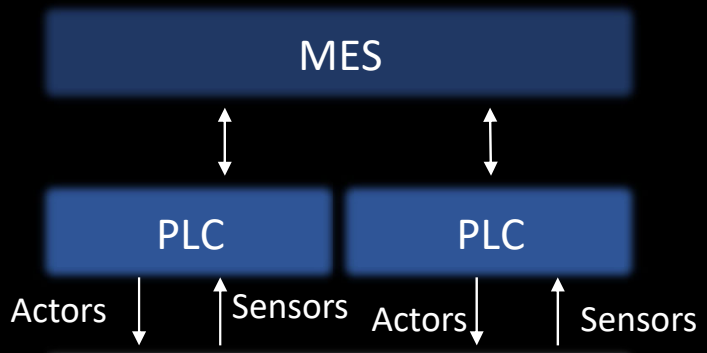
Production Engineering →  → Production

Industrial Metaverse

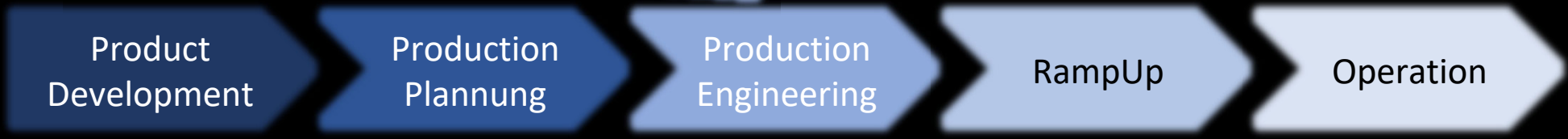
Architecture Options to Orchestrate Digital Twins in an IM

Use Cases for an Industrial Metaverse

Virtual Commissioning MES



Predictive Production



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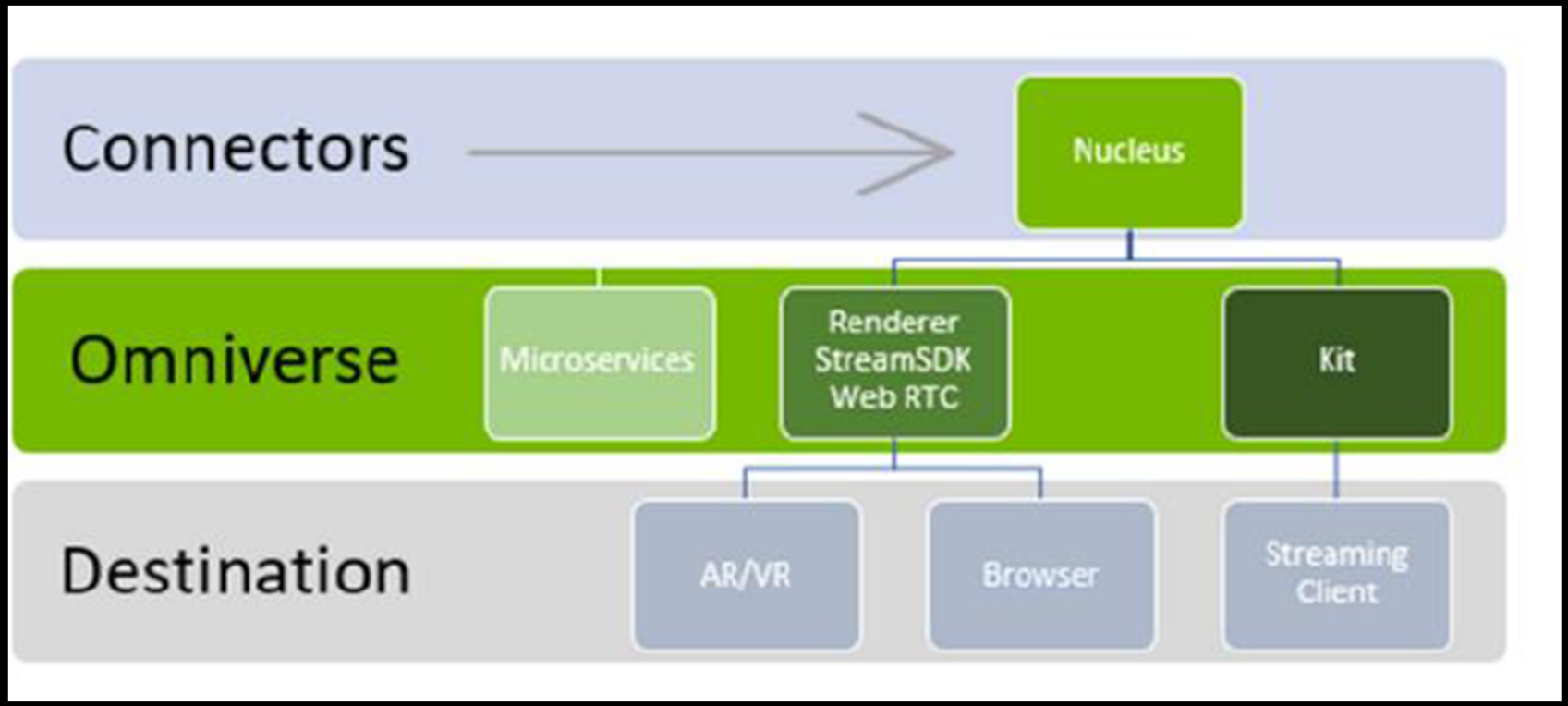
Architecture Options to Orchestrate Digital Twins in an IM

Related Work - Example NVIDIA Omniverse

Architecture Options to Orchestrate Digital Twins in an IM

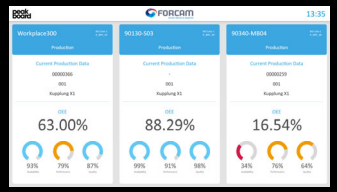
Example NVIDIA Omniverse

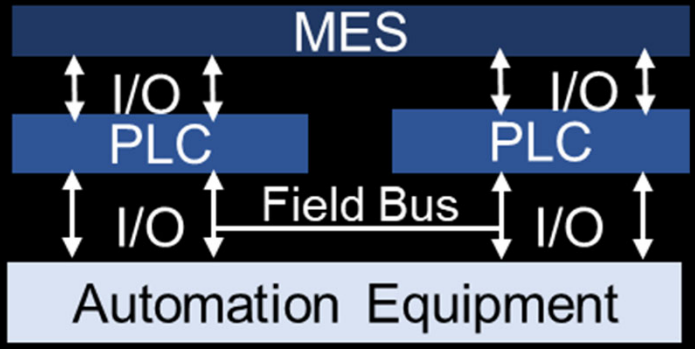


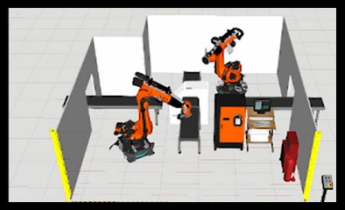
Architecture Options to Orchestrate Digital Twins in an IM

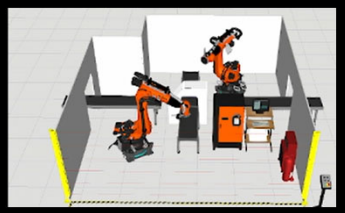
Architecture Components – Current IT Landscapes

Digital Factory / Virtual Commissioning	Shop Floor









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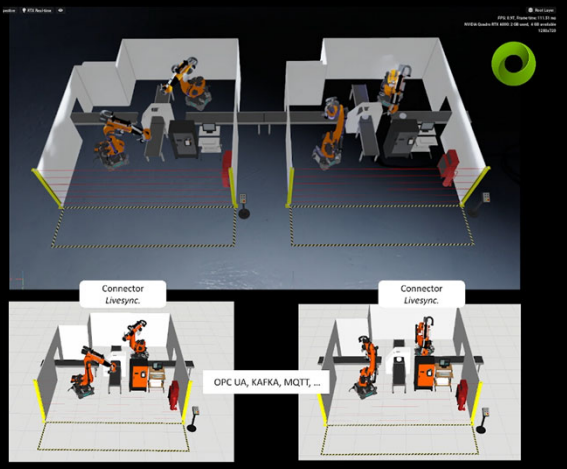
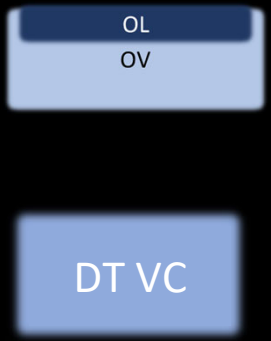
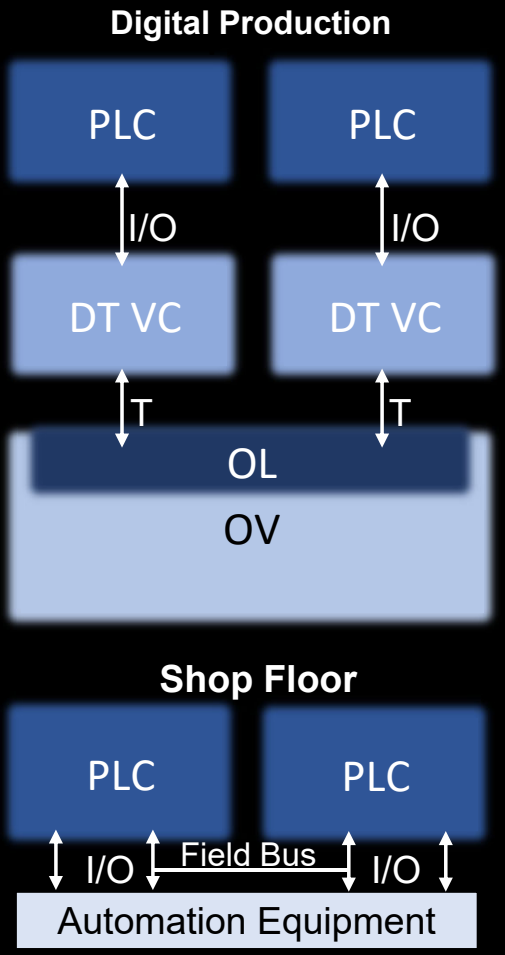
Architecture Options to Orchestrate Digital Twins in an IM

Option A

- Connection of DT VC systems to IM
- Streaming of Geometry into IM
- Bidirektional Connectiors
- Synch of Sequence and Material Flow
- Orchestration Layer : internal external

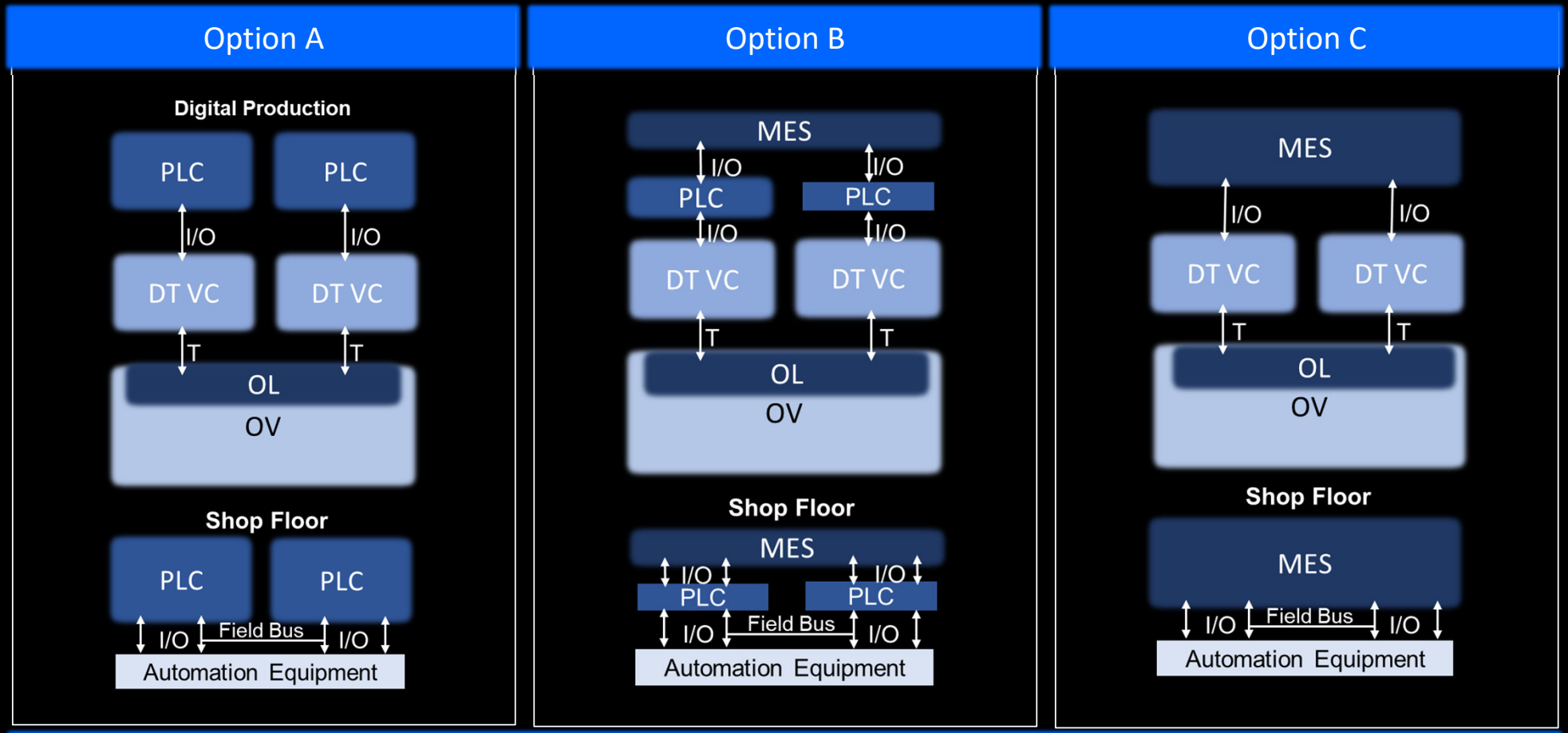






Architecture Options to Orchestrate Digital Twins in an IM

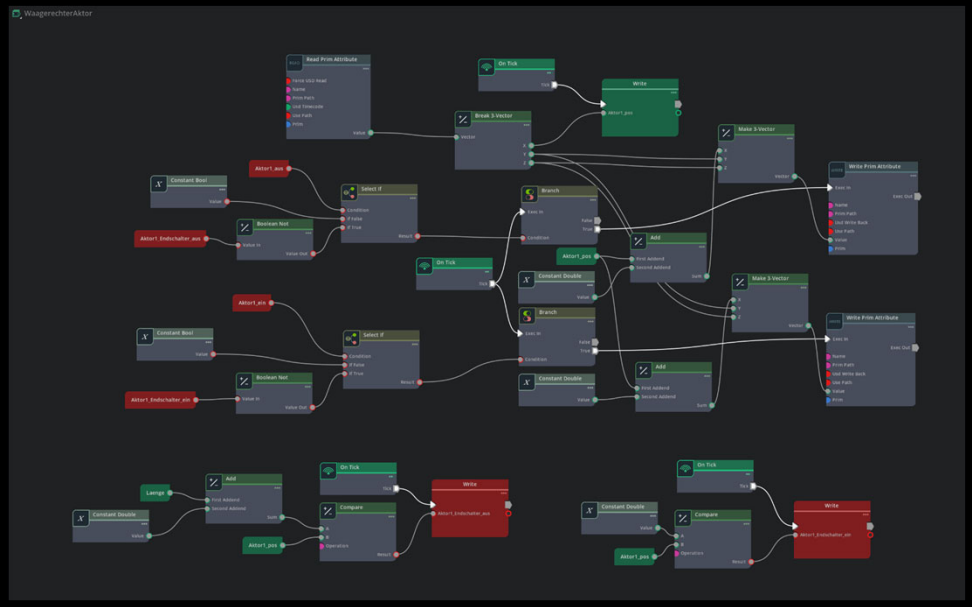
Option A-C



Architecture Options to Orchestrate Digital Twins in an IM

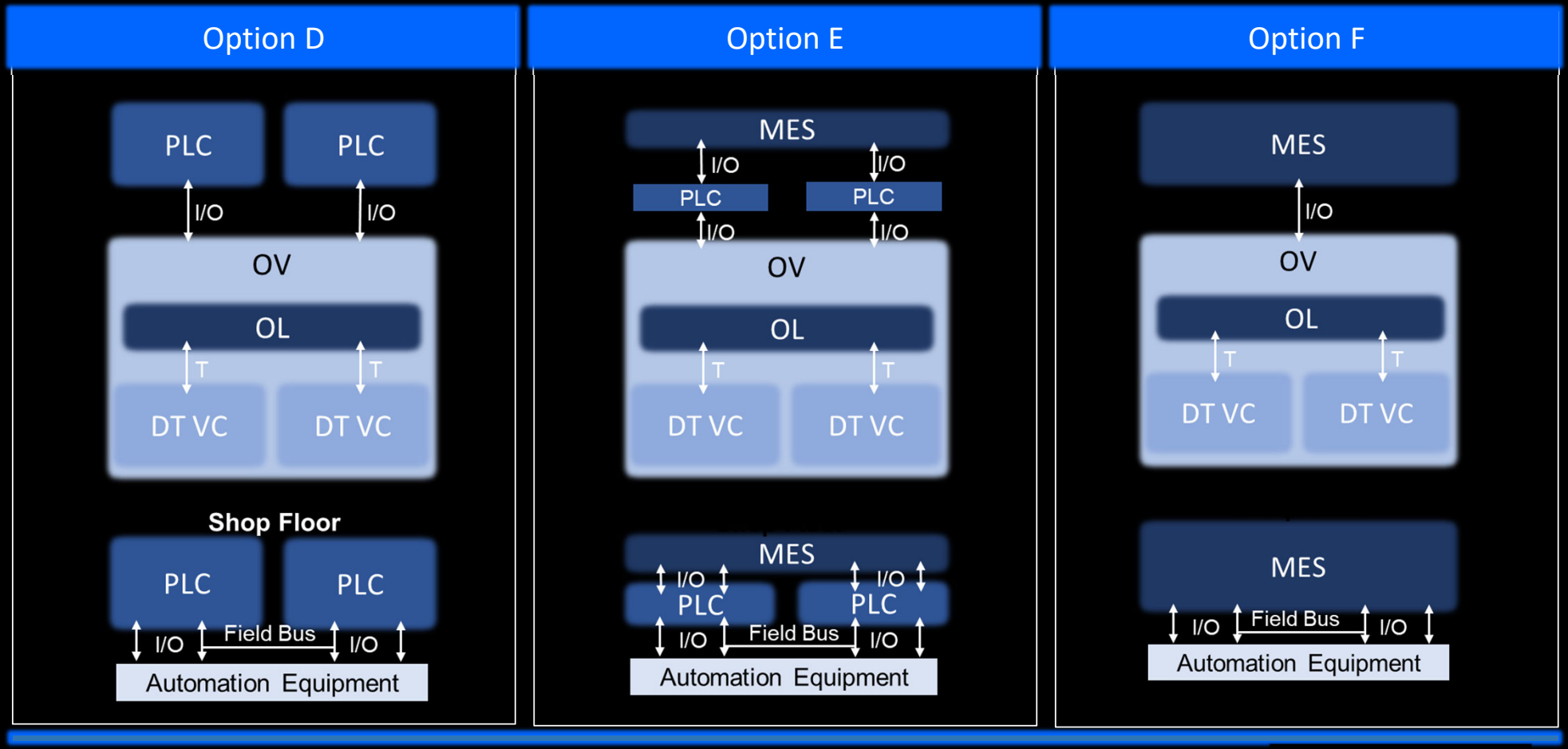
Option D

- Integration of DT VC functions into IM
- Orchestration Layer – internal/external



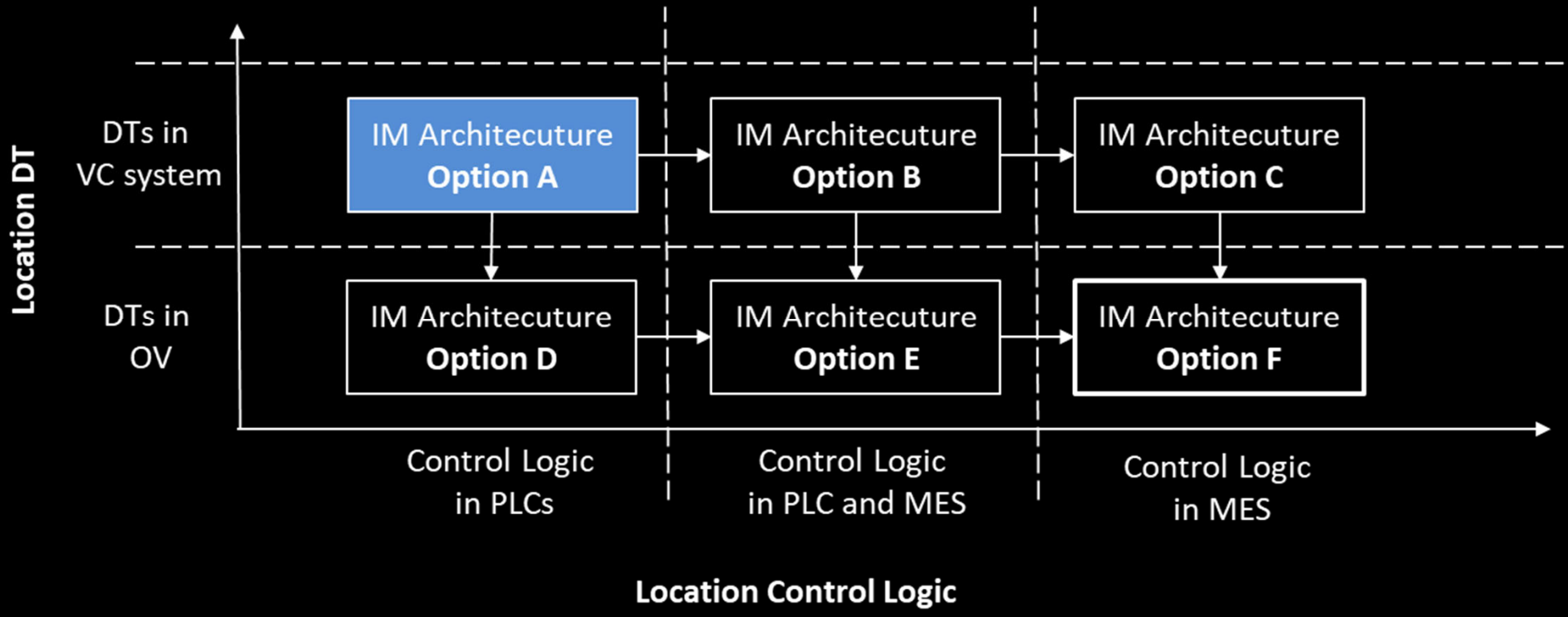
Architecture Options to Orchestrate Digital Twins in an IM

Option D-F



Architecture Options to Orchestrate Digital Twins in an IM

Road Map



Architecture Options to Orchestrate Digital Twins in an IM
Summary

- Base Digital Factory Model out of current IT Landscape
- Use Cases
  - Predictive Production with AI
  - Virtual Commissioning MES
- Related Work
  - Omniverse
- Architecture Components
  - PLC/MES, DT VC, IM, OV with OL
- Architecture Options: A-F
- Roadmap