



**Die Brücke
zur Realität**

Simulation in der Logistik

am Beispiel großer Distributionszentren

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**Workshop „Perspektiven der Modellbildung und
Simulation, München, 18./19.2016**

Agenda

- SimPlan Group – A Brief Company Background
- Intralogistics
- Simulation of (Intralogistic-)Logistic Systems
 - Examples & Objectives
 - Broader View – System Lifecycle
- Summary

SimPlan Group

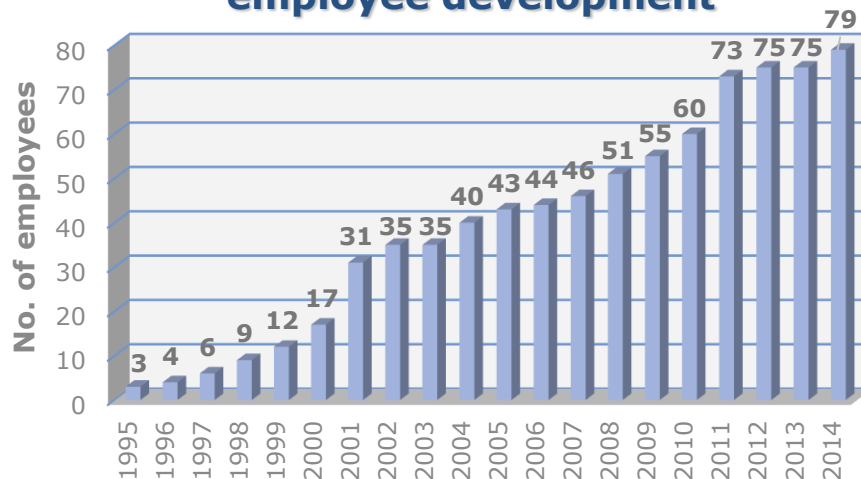
Consulting, Engineering,
Simulation, Software



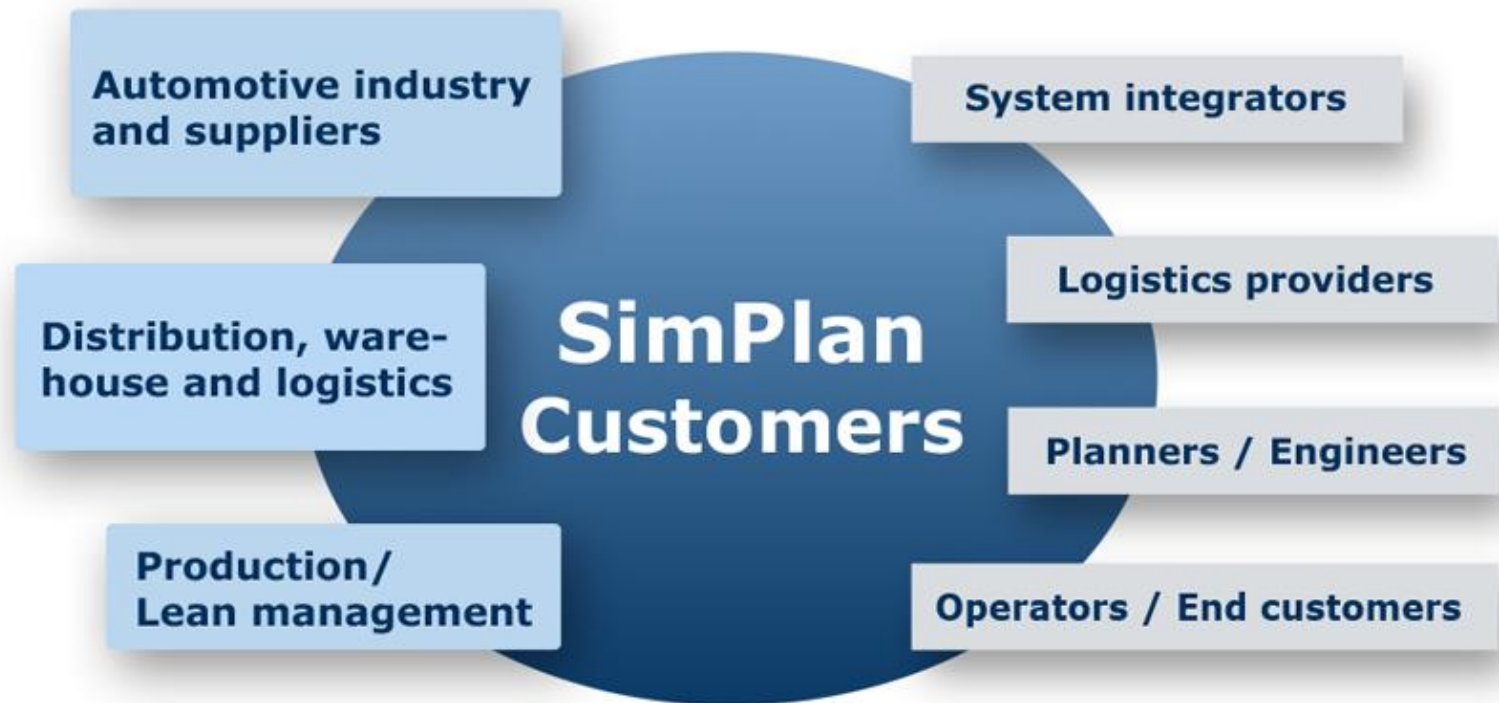
Europe:
Germany
Austria

Asia:
Shanghai, China

employee development



- 1992 Formation
- 2000 Transition to AG (plc)
- 2001 SimPlan Integrations GmbH, Witten
- 2002 Branches:
Brunswick, Regensburg
- 2004 induSim GmbH, Langenau
- 2006 Branch Munich
- 2007 Branch Holzgerlingen
- 2009 SimPlan Austria;
Business extension:
Planning & Consulting
- 2010 SimPlan China
- 2012 SimPlan Systems
- 2015 Branch Dresden
- Today > 90 Employees
11 Locations
11,7 Mio. EUR turnover (2014)



Intralogistics





Ingram Micro Straubing

80.000 m² Lager

4.200 m² Büro

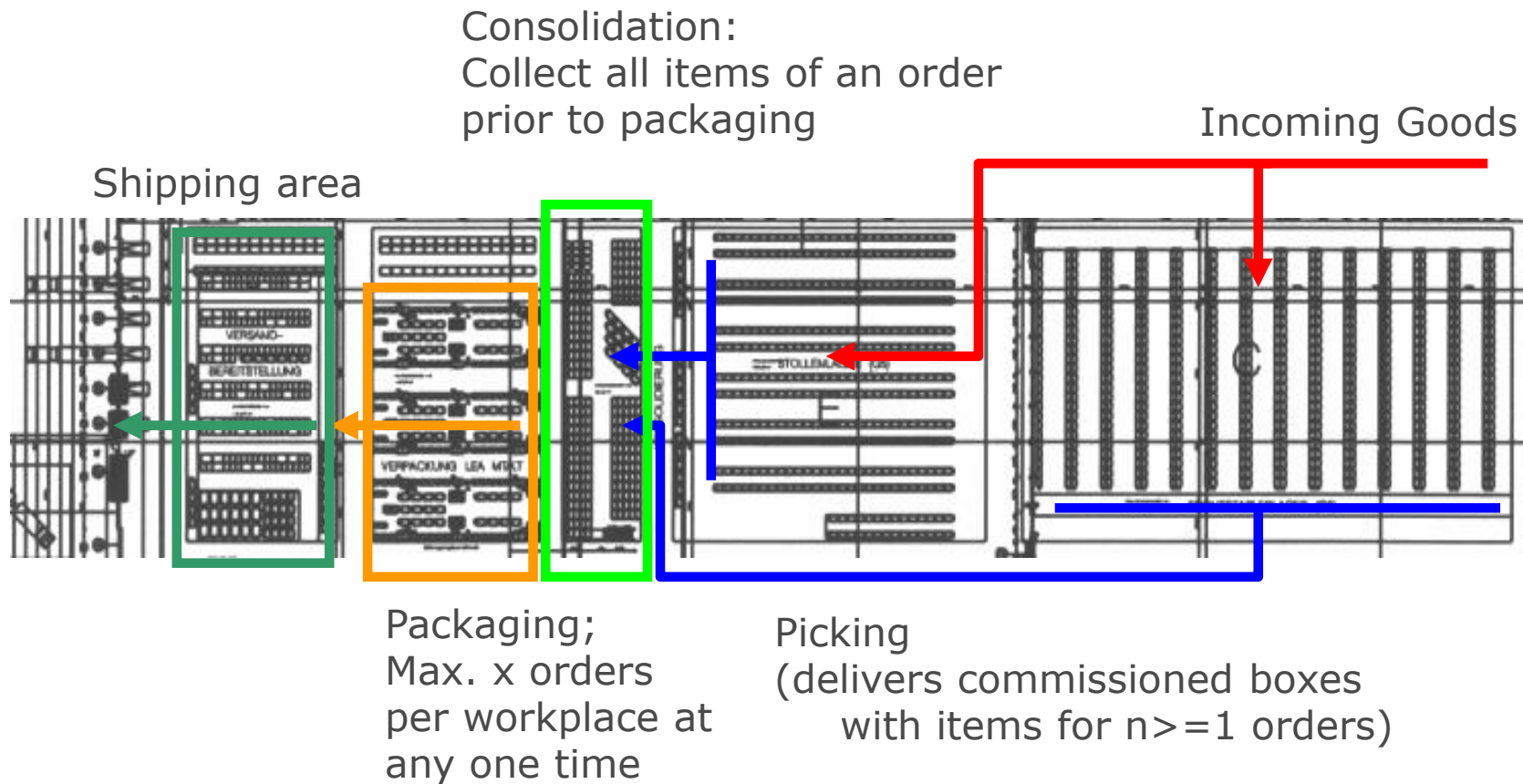
Ladetore: 86

Regalstellplätze: ca. 60.000

Fördertechnik: ca. 6,5 km



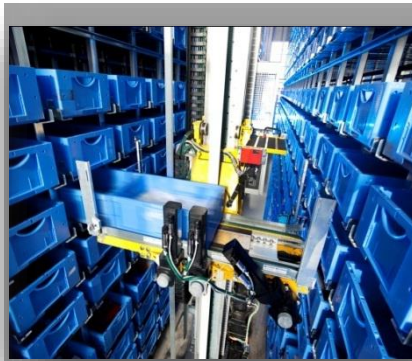
Material Flow in Warehouses: a First Example



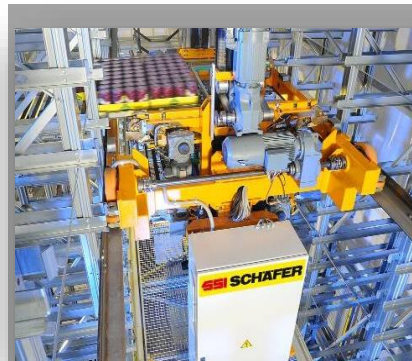
Hardware Examples (from a specific System Integrator)



SCC –
Schaefer Compact Crane



SMC –
Schaefer Miniload Crane



STS –
Schaefer Tray System



Robotics



Schaefer Case Picking



SQS –
Schaefer Quad System

- In Germany given by VDMA (German Engineering Foundation)

„Organisation, control, operation and improvement of goods, material handling, logistics and related information in industry and distribution
- Focused on logistic processes within the boundaries of one organisation (site!?)
- Here: focus on large (automated) warehouses

Simulation of (Intra-) Logistic Systems

Examples & Objectives

- Monte Carlo Simulation
Evaluation of a large number of stochastic experiments (typically, time is not considered explicitly)

- System Dynamics
Simulation based cause and effect with cycles and feedback loops

- Discrete Event Systems
Simulation steps forward over timed events (e.g. start or end of processes)

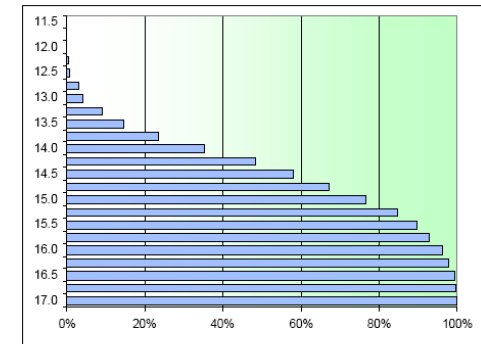
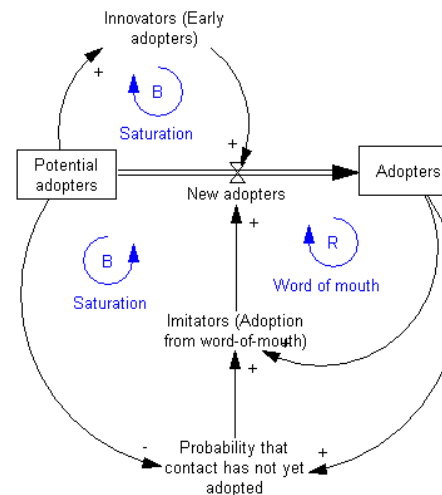
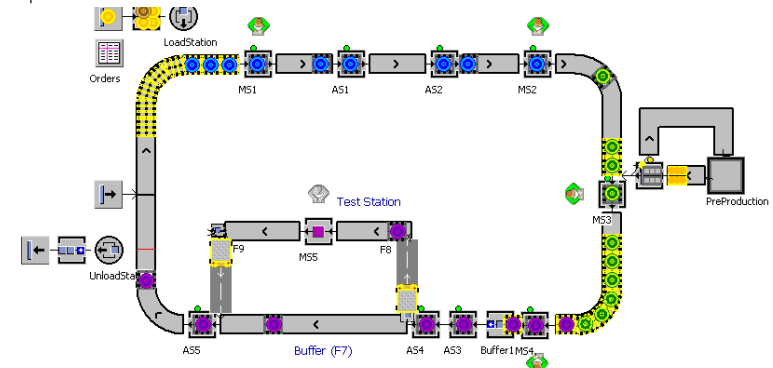
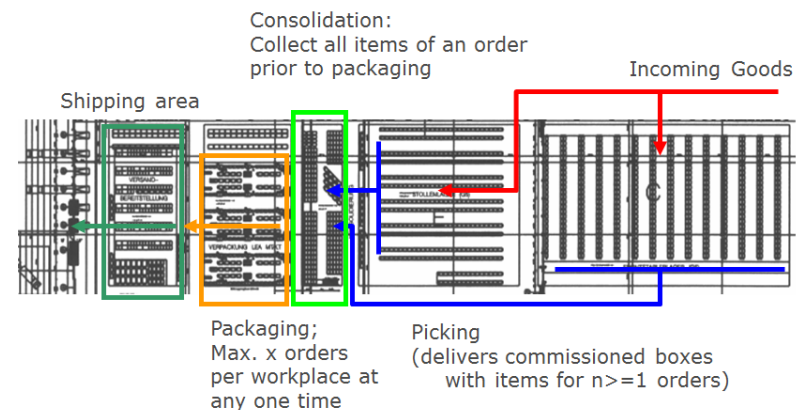


Figure 1: Probability of Completion Within Specified Time (Months)

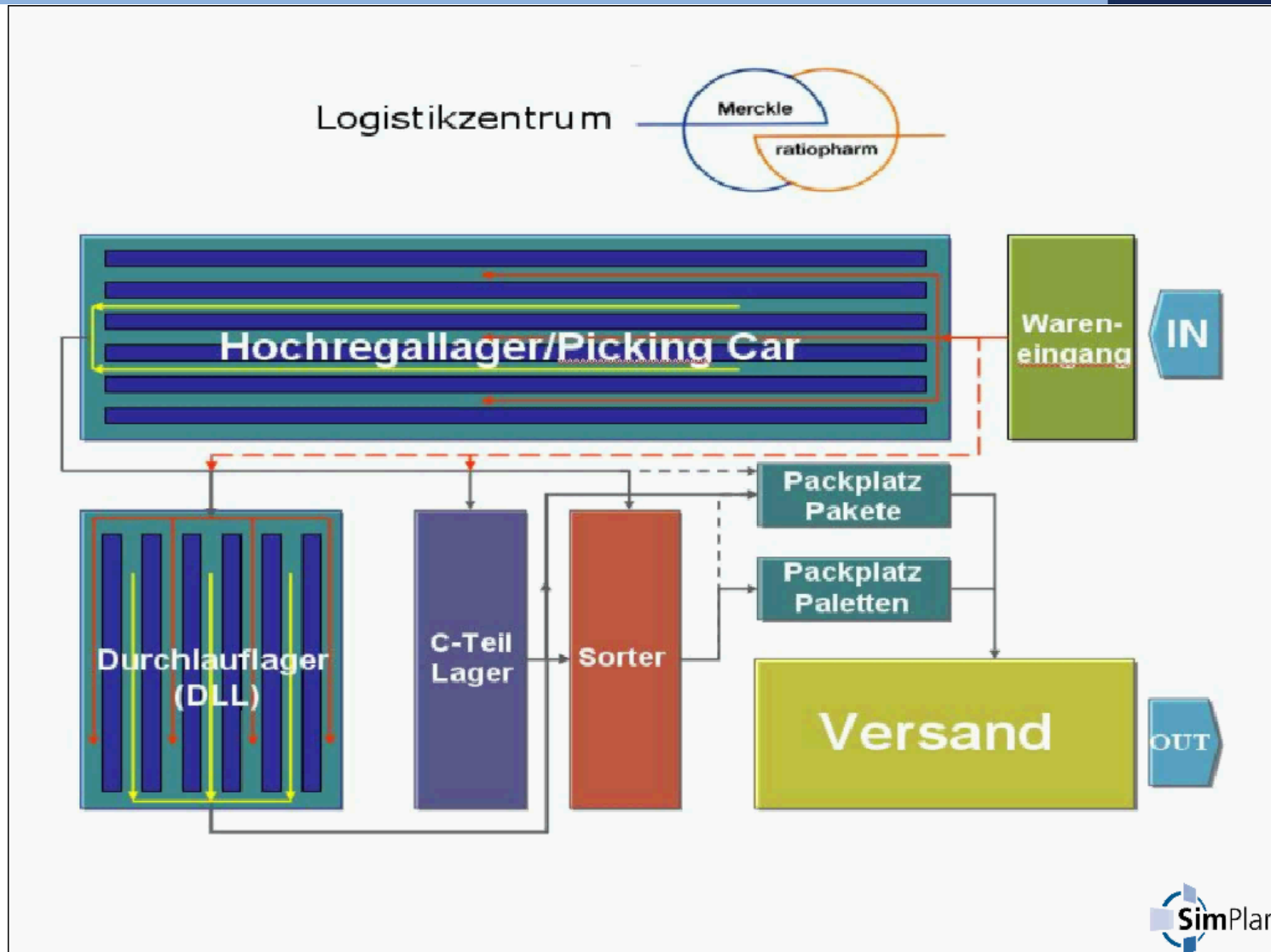


- Static / **dynamic**
is time considered explicitly (dynamic) or not (static)?
wird die Zeit berücksichtigt (dynamisch) oder nicht (statisch)?
- Deterministic / **stochastic**
is randomness of events considered explicitly (stochastic) or not (deterministic)?
- **Discrete** / continuous
is the state of objects described via a set of distinct states (discrete) or via equations defining the state (continuous)?

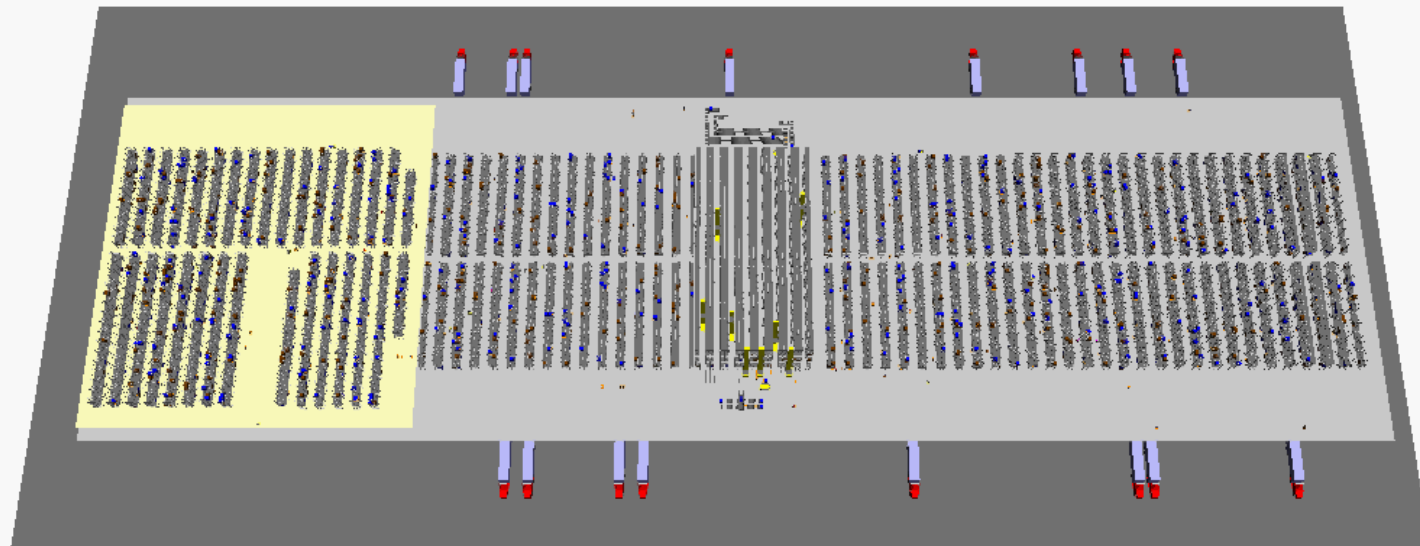
- How many resources (forklifts etc.) do I need?
- How much storage capacity for the different areas is necessary?
- Are all orders finished on time for shipment?
- What is an economic way to run my logistic operations?



Example 1 – Automated DC



Example 2 – Manual DC



Example 3 – Recent Developments in Animation etc.



Simulation of (Intra-) Logistic Systems

Broader View – System Lifecycle

Marketing Sales



- Visualisation Concepts
- Animating Processes
- Demonstrating Complexities

Planning



- Verifying Concepts
- Evaluating Alternatives
- Identifying bottlenecks
- Optimising Solutions

Ramp-up

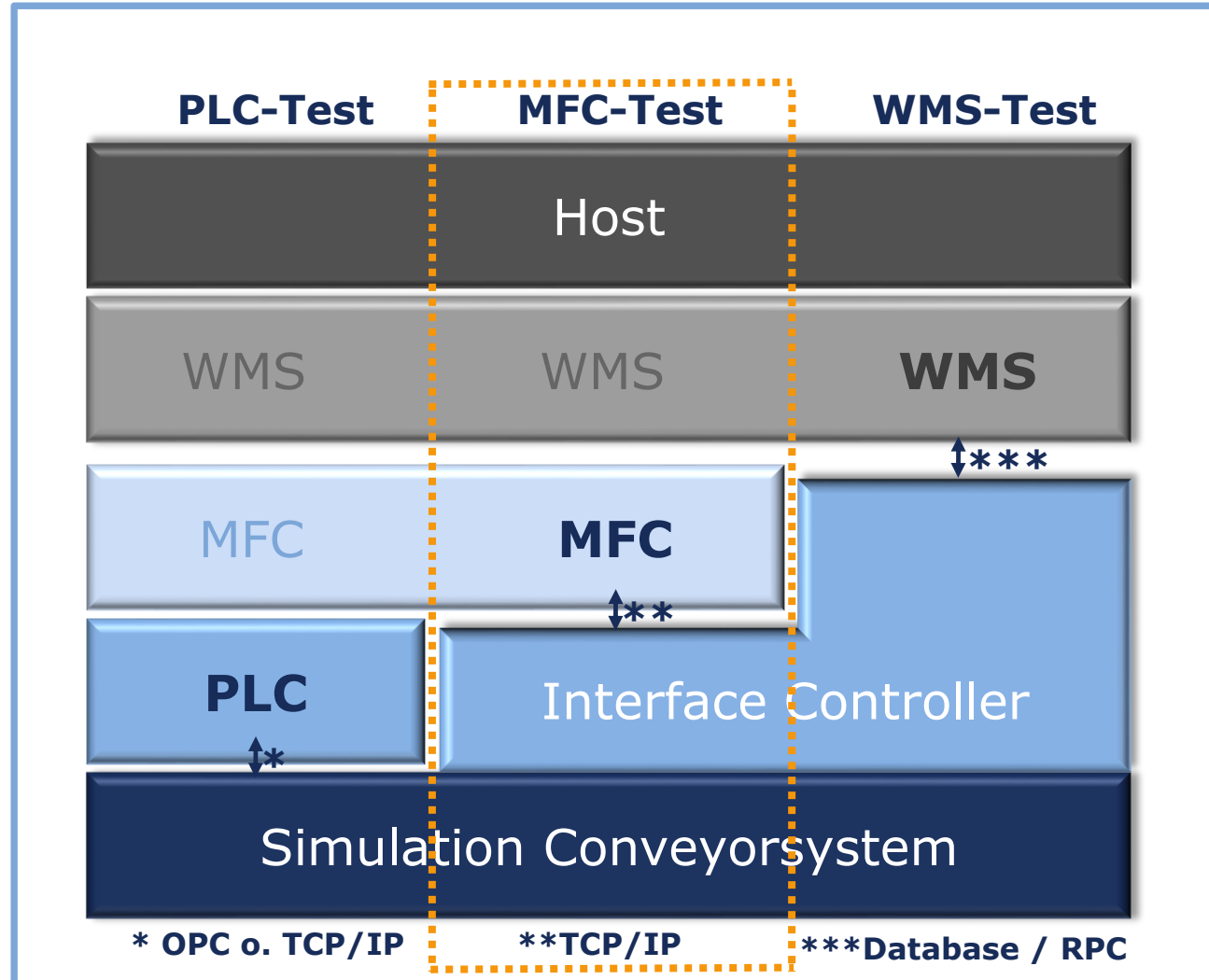
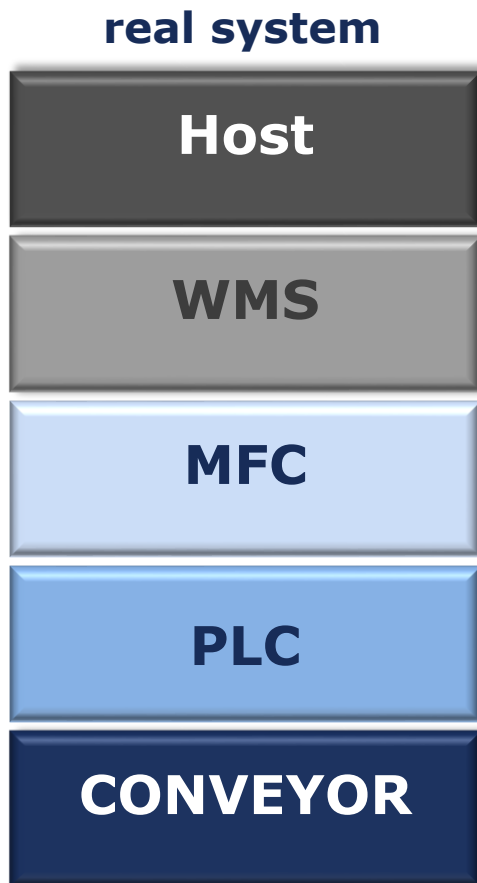


- Part of the call for proposals
- Software test/ Emulation (MFC/WMS)
- Support during ramp-up

Operations



- Simulation-based personnel scheduling / working time models
- Optimising production sequence / lot sizes



Demo3D

er Far SiemensKepware - Emulate3D

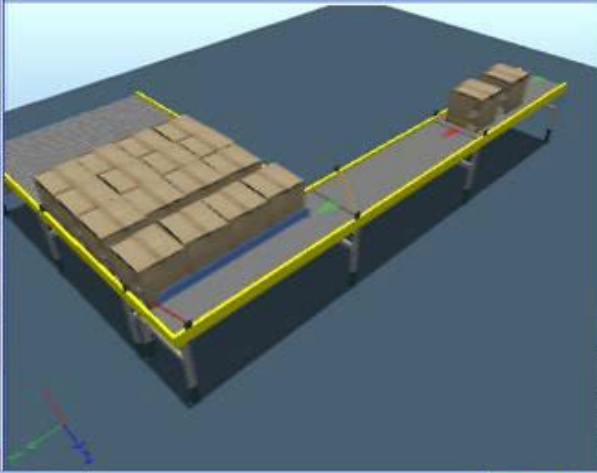
Arrange Animate Catalogs Tags Tools Help

Tag Browser

Servers: Kepware.XEP Disconnect Record Import Export

Drag a column header here to group by that column.

Act.	Item	Value	Visual	Property
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.SB4	<input checked="" type="checkbox"/>	SB1	IsMotorOn
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.PE3	<input checked="" type="checkbox"/>	SB3.PE3	IsBlocked
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.PUSH1	<input checked="" type="checkbox"/>	SB3.Pusher1	IsActivated
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.PE2	<input checked="" type="checkbox"/>	SB2.PE2	IsBlocked
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.SB2	<input checked="" type="checkbox"/>	SB2	IsMotorOn
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.PE1	<input checked="" type="checkbox"/>	SB1.PE1	IsBlocked
<input checked="" type="checkbox"/>	Siemens TCP/IP S7-300.SB1	<input checked="" type="checkbox"/>	SB1	IsMotorOn



Speed: x1.01 Size: 518x405 Time: 1645.81

[@OB1 -- "Cycle Execution" -- PalletizationDemoSBMATIC.300]

Simple Palletizing Demo

Network 1: Slug Conveyor (SB2)

Run the slug conveyor (SB2) if load arriving or a slug is complete and ready to run to palletizer

```

R1.1 "PE2"
R2.1 "SB2"
R1.0 "PE1"
    
```

Network 2: Infeed Conveyor (SB1)

Stop the infeed conveyor if we detect a complete slug (PE2)

```

R1.1 "PE2"
R2.0 "SB1"
    
```

Network 3: Palletizer

Run the outfeed conveyor and the pusher if we detect a new slug arrived (PE3)

```

R1.2 "PE3"
R1.1 "PE2"
R2.2 "SB4"
R2.3 "PUSH1"
    
```

1: Error 2: Info 3: Cross-references 4: Address info 5: Modify

RUN Abs < 5.2 Nw 1 Rd

Summary

- Discrete-Event Simulation is one State-of-the-Art approach for the analysis of transportation or (and) logistics supply chains
- Almost all major investments in new distribution centers / warehouses are supported by simulation
- Benefit of simulation for projects still largely depends on the simulationists experience

SERVICE

SOLUTIONS

SOFTWARE

SUPPORT

**Thank you for your
attention!**



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CEO

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