



1st International Workshop on Conceptual Modeling for Digital Twins (CoMoDiTy 2020)

Mission

The workshop on Conceptual Modeling for Digital Twins (CoMoDiTy) aims at **bringing together researchers and practitioners** working on modeling concepts, methods, and tools for **bringing the vision of digital twins to life**.

- Conceptual modeling techniques for digital shadows and digital twins
- Theories for conceptual modeling of digital twins in the context of the observed cyber-physical systems
- Modeling methods and tools for developing digital shadows and digital twins
- Evolution and Life-Cycle Management with/for digital twins
- Case Studies of modeling digital twins
- Integrating 3D modeling and conceptual modeling
- Challenges in modeling digital twins
- Interaction of digital twin models and design time and at runtime
- ...

Program

1st Session: Opening & Keynote

16:00 - 16:15: Opening

16:15 - 17:00: Keynote by Thomas Bednar: Towards a multistakeholder IT environment for developing, constructing and operating buildings and cities based on digital twins and shadows.
Lessons learned from the project SIMULTAN and the follow-up "Virtuelle Flughafenstadt"

17: 00 Social Break

2nd Session: Input Talks and Discussion

17:15 - 17:25: Manuela Dalibor (RWTH Aachen University): Conceptual Models of Digital Twins and Digital Shadows

17:25 - 17:35: Georg Grossmann (University of South Australia): tba

17:35 - 17:45: Alexandra Mazak-Huemer (Montanuniversität Leoben): How can digital twin strategies make conventional tunnelling smart?

17:45 - 18:10: Discussion

People behind the workshop

Organizers



Markus Stumptner
(U. of South Australia)



Manuel Wimmer
(JKU Linz)

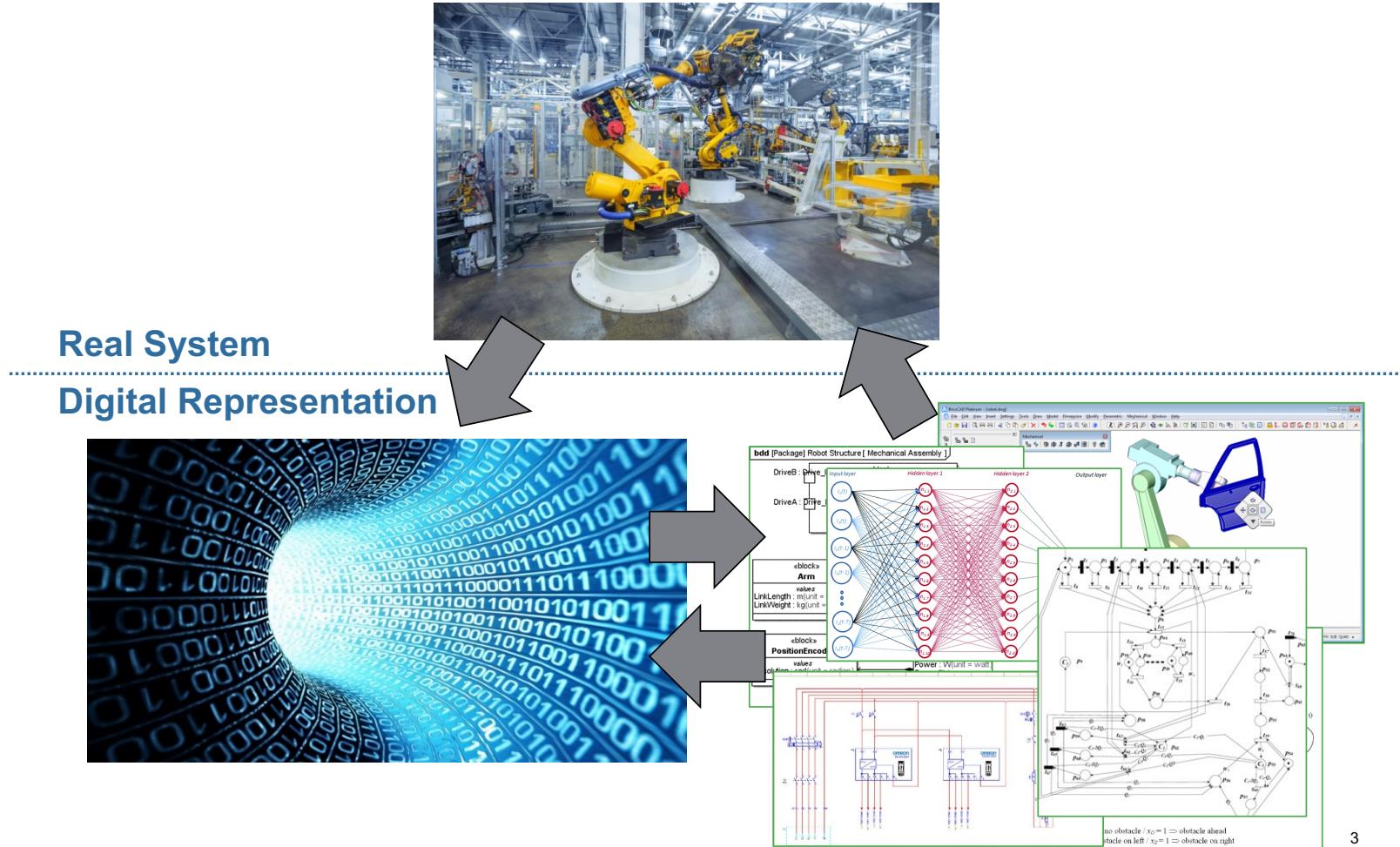


Andreas Wortmann
(RWTH Aachen)

Program committee

- Loli Burgueño (Open University of Catalonia & CEA LIST)
- Jordi Cabot (ICREA - UOC)
- Benoit Combemale (University of Toulouse & Inria)
- Manuela Dalibor (RWTH Aachen University)
- Romina Eramo (University of L'Aquila)
- Alexandra Mazak-Huemer (JKU Linz)
- Bran Selic (Malina Software Corp.)
- Michael Weyrich (University of Stuttgart)
- Mark van den Brand (Eindhoven University of Technology)

Cyber-physical systems are everywhere

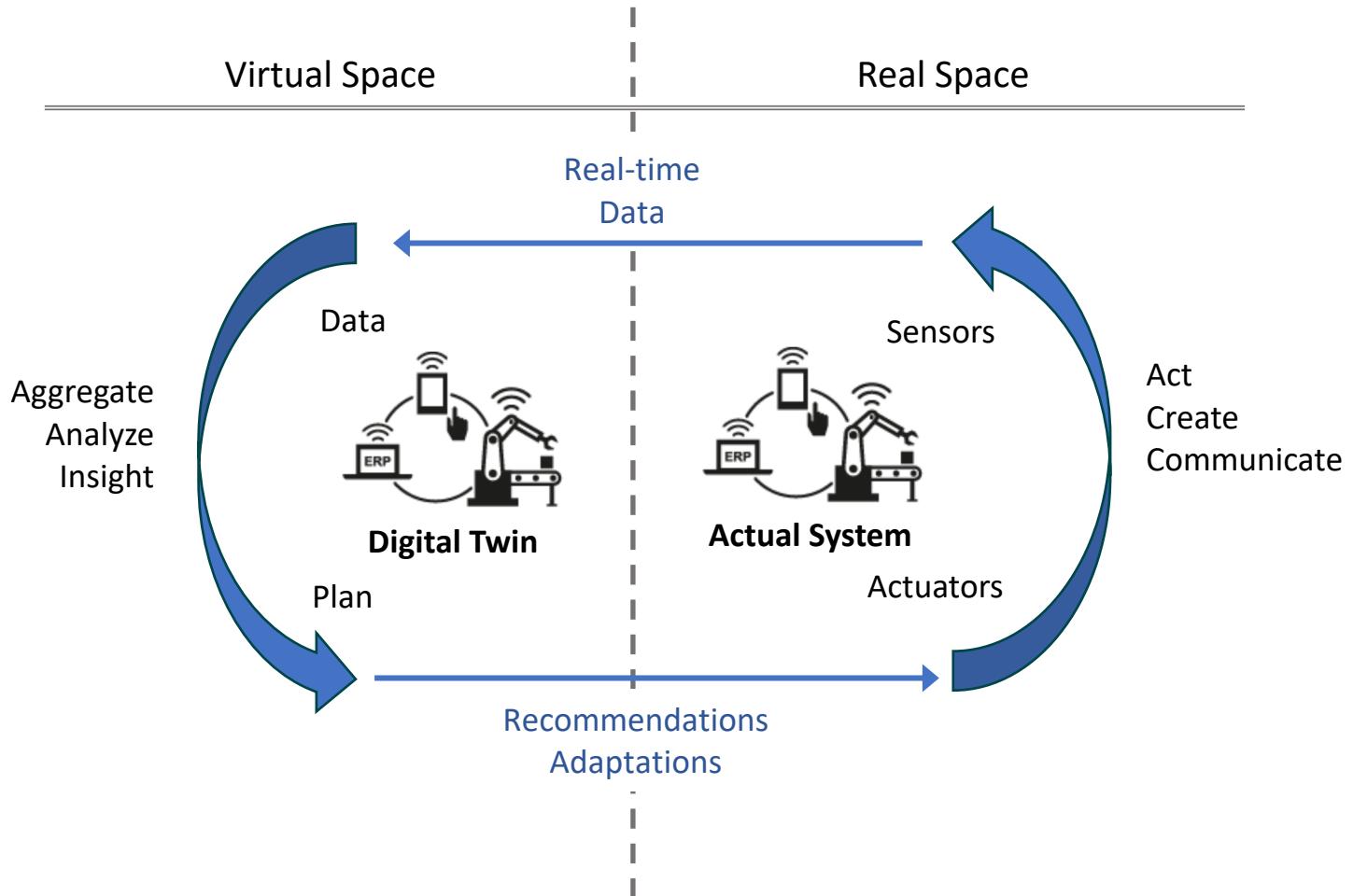


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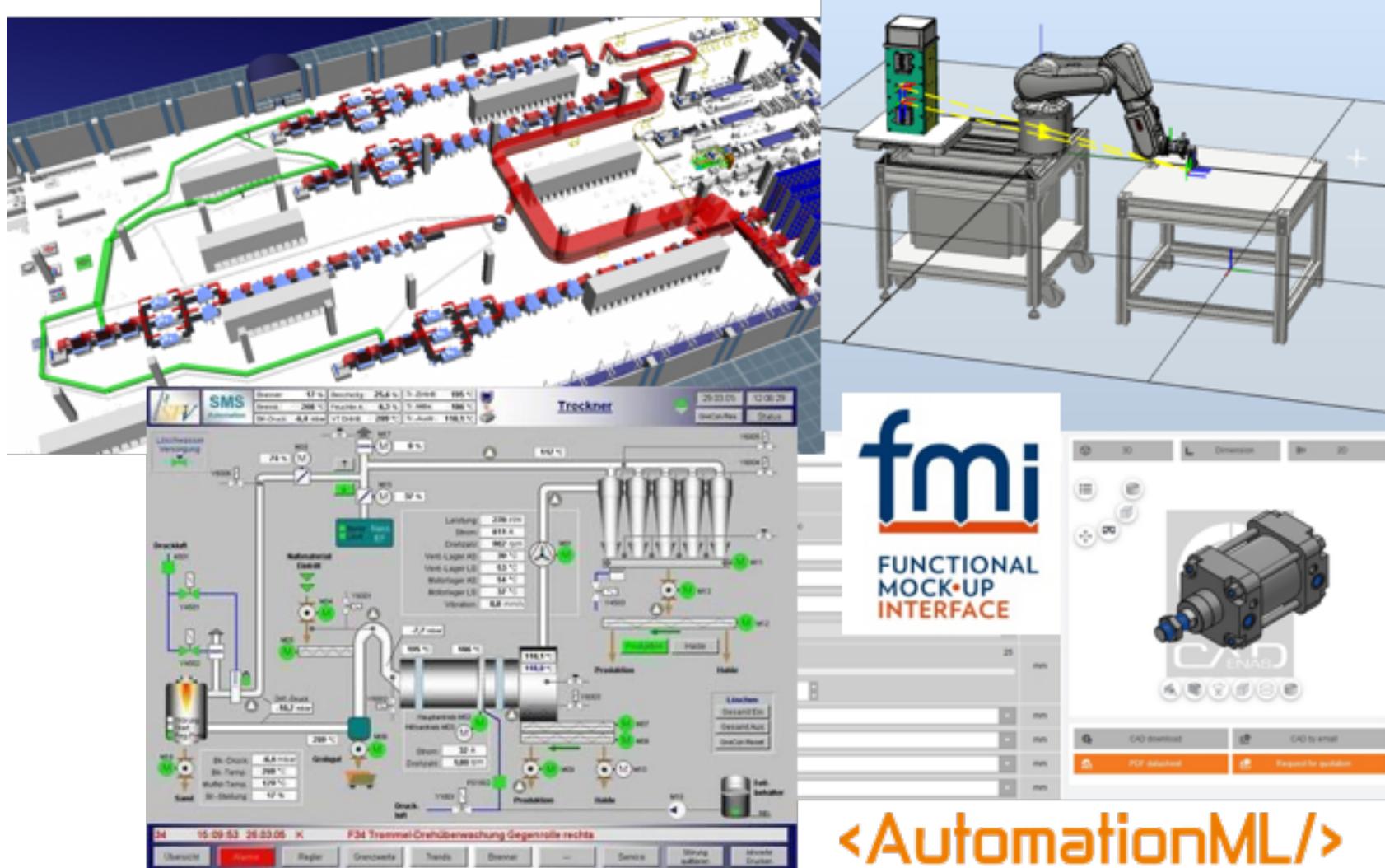
Digital twin definitions

- Digital twins shall enable a better
 - **understanding** of systems
 - **use** of resources (materials, reject, downtime)
- Plethora of definitions that are
 - **Ambiguous**: “digital equivalent to a physical product”, “digital avatar”, “digital duplicate”, ...
 - **Narrow**: “a virtual representation of a product on the shop-floor”, “digital model of the real network environment”, “virtual representation based on AR-technology”, ...
 - **Impossible**: “integrated virtual model of a real-world system containing all of its physical information”, “complete digital representation”, ...

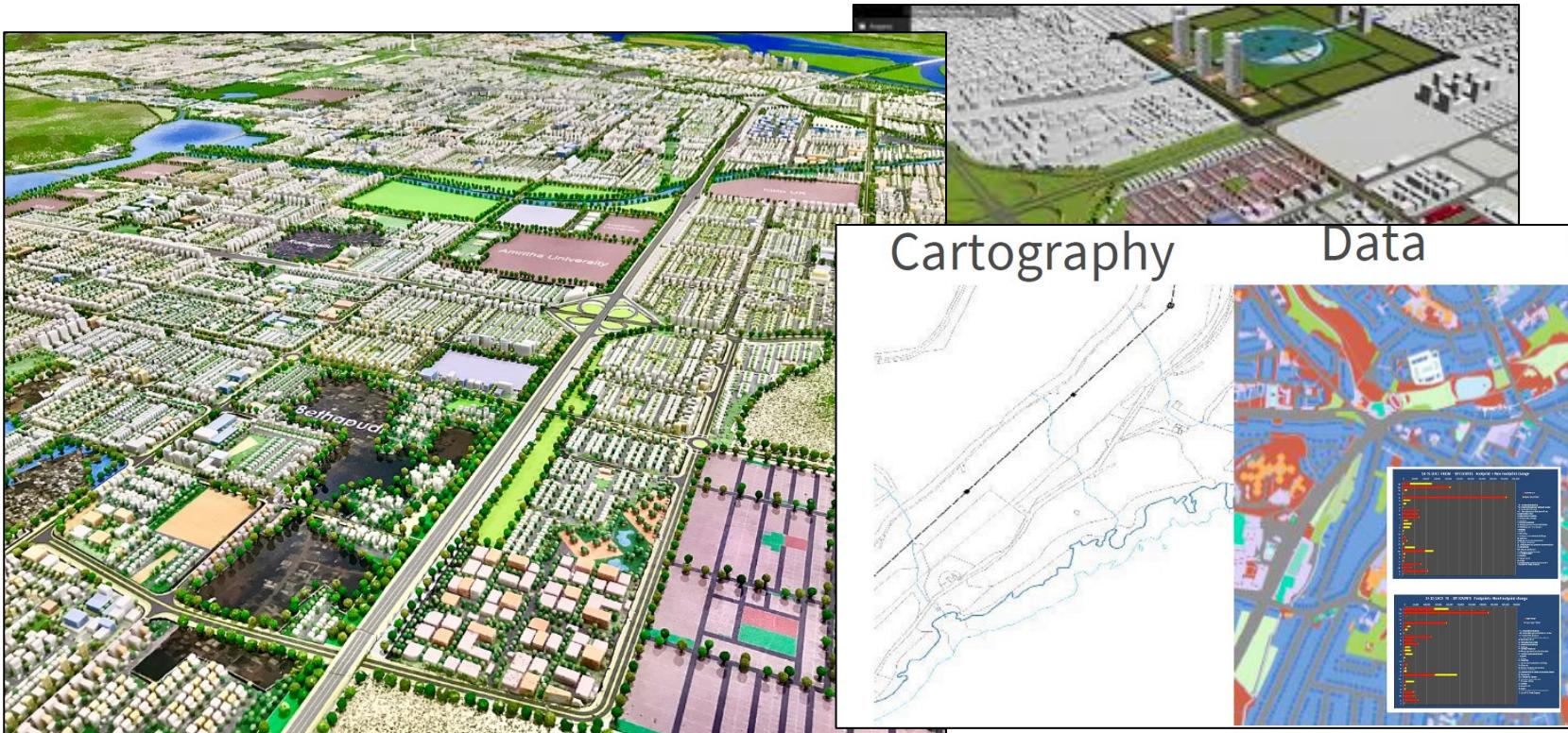
Digital twin at a glance



Emerging digital twin domains: smart manufacturing



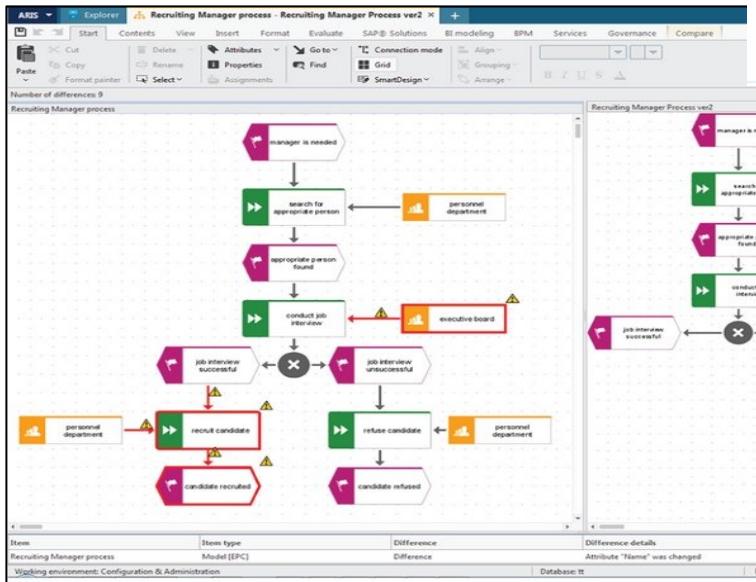
Emerging digital twin domains: smart cities



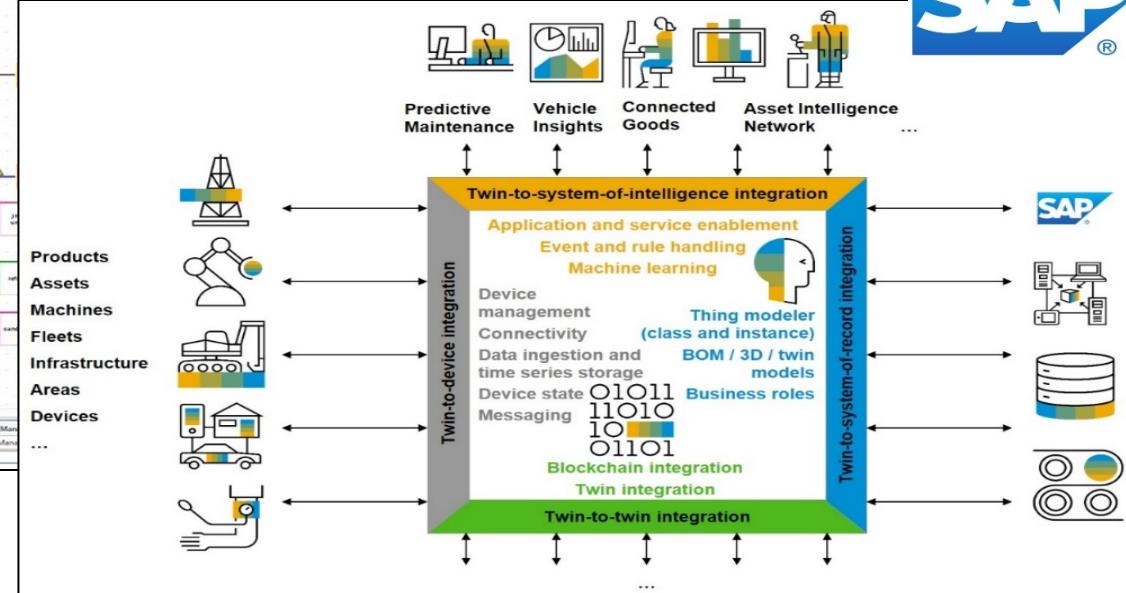
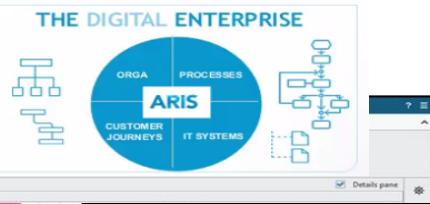
*Amaravati, the new capital of the Indian state of Andhra Pradesh,
is thought to be the **first entire city born with a digital twin**.*

Emerging digital twin domains: smart enterprise

S software AG

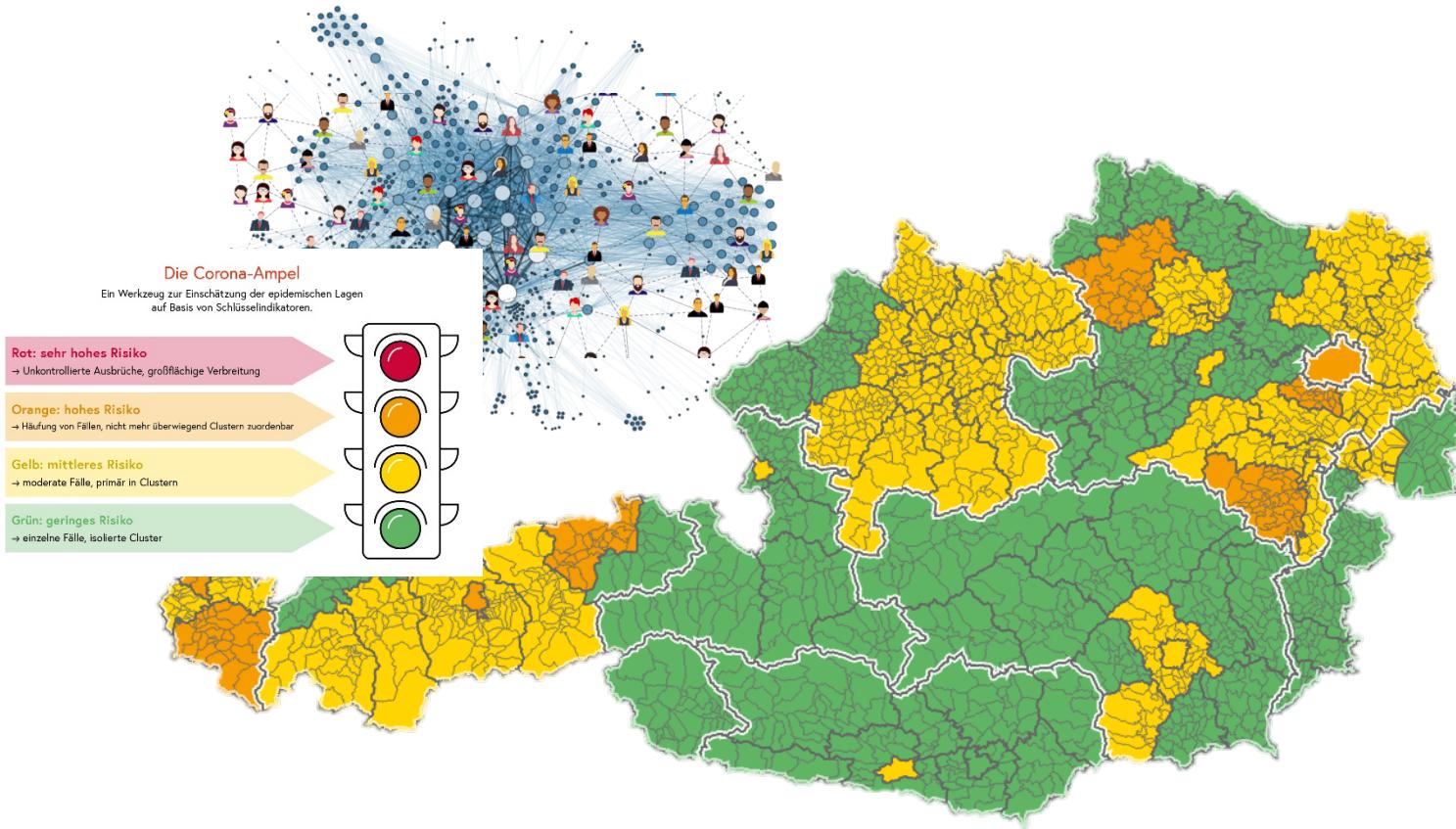


<https://industrie.de/top-list/software-ag-stellt-enterprise-digital-twin-framework-vor/>



https://blogs.sap.com/wp-content/uploads/2017/09/Digital_Twin_Implementation.jpg

Emerging digital twin domains: smart society



ESA digital twin earth challenge

Create an **interactive model of the Earth**, from the **integration of individual models** that **accurately reflect** diverse physical aspects of our planet

Finalists

- **DeepSentinel**: combines Sentinel-1 and Sentinel-2 satellite imagery to a general-purpose computer vision model of Earth.
- **forecast**: forest Intelligence combining data from the Copernicus satellite Sentinel-2, airborne LiDAR, aerial orthoimages, and ground plot sampling
- **Urban Green from Earth Observation** combines Copernicus data with urban planning, resource management, and green infrastructure to create efficient green infrastructure and continuously monitor vegetation health conditions



Keynote by Thomas Bednar

Towards a multistakeholder IT environment for developing, constructing and operating buildings and cities based on digital twins and shadows. Lessons learned from the project SIMULTAN and the follow-up "Virtuelle Flughafenstadt"

Social Break

The screenshot shows a Slack workspace interface. The left sidebar has a dark purple header with the workspace name "ER2020" and a dropdown menu. Below it are sections for "Alle DMs" and "Channels". The "Channels" section lists several channels, with "#cmls" highlighted by a blue bar. At the bottom of the sidebar is a red button labeled "↓ Ungelesene Erwähnungen". The main area shows the "#cmls" channel. The header of the channel shows it was created yesterday by @liddle. There are buttons to "Leute hinzufügen" and "Eine App verbinden". A timestamp "Gestern" is visible. The channel history shows three messages: one from liddle at 14:25, another from liddle at 14:25 stating they set the description to "CMS Workshop", and a message from Dominik Bork at 19:39 stating he was added to the channel. Below the history is a message input field with placeholder "Nachrichten senden an #cmls" and various rich text and emoji icons.

https://join.slack.com/t/er2020-workspace/shared_invite/zt-irbd4abp-7hDxCkxYMLba5f8mIFV16A

Welcome back

2nd Session: Input Talks and Discussion

17:15 - 17:25: Manuela Dalibor (RWTH Aachen University):
Conceptual Models of Digital Twins and Digital Shadows

17:25 - 17:35: Georg Grossmann (University of South Australia):
Challenges in Standards-Based Interoperability for Digital Twins

17:35 - 17:45: Alexandra Mazak-Huemer (Montanuniversität Leoben):
How can digital twin strategies make conventional tunnelling smart?

17:45 - 18:10: Discussion

Discussion

- **Inaccurate digital twin replicas**
 - Insufficient data quality, simulation precision, ...
- **Affordability**
 - What about small businesses, short-term perspective?
- **Interoperability issues**
 - Vendor lock-in, composing digital twins, ...
- **Intellectual property rights**
 - Tool provider, company, algorithm, ... ?
- **Data ownership, confidentiality, and security**
 - Cloud computing, public/private interfaces, ... ?
- **Employees**
 - Digital shadows of **socio**-cyber-physical systems
- **Longevity of technology**
 - How to support long-living systems (> 50 years)
- ...

Closing

Thank you for making the 1st International Workshop on Conceptual Modeling for Digital Twins (CoMoDiTy 2020) interesting!