

# EASCI: Emergent and Adaptive Semantic Composition in IoT Ecosystems

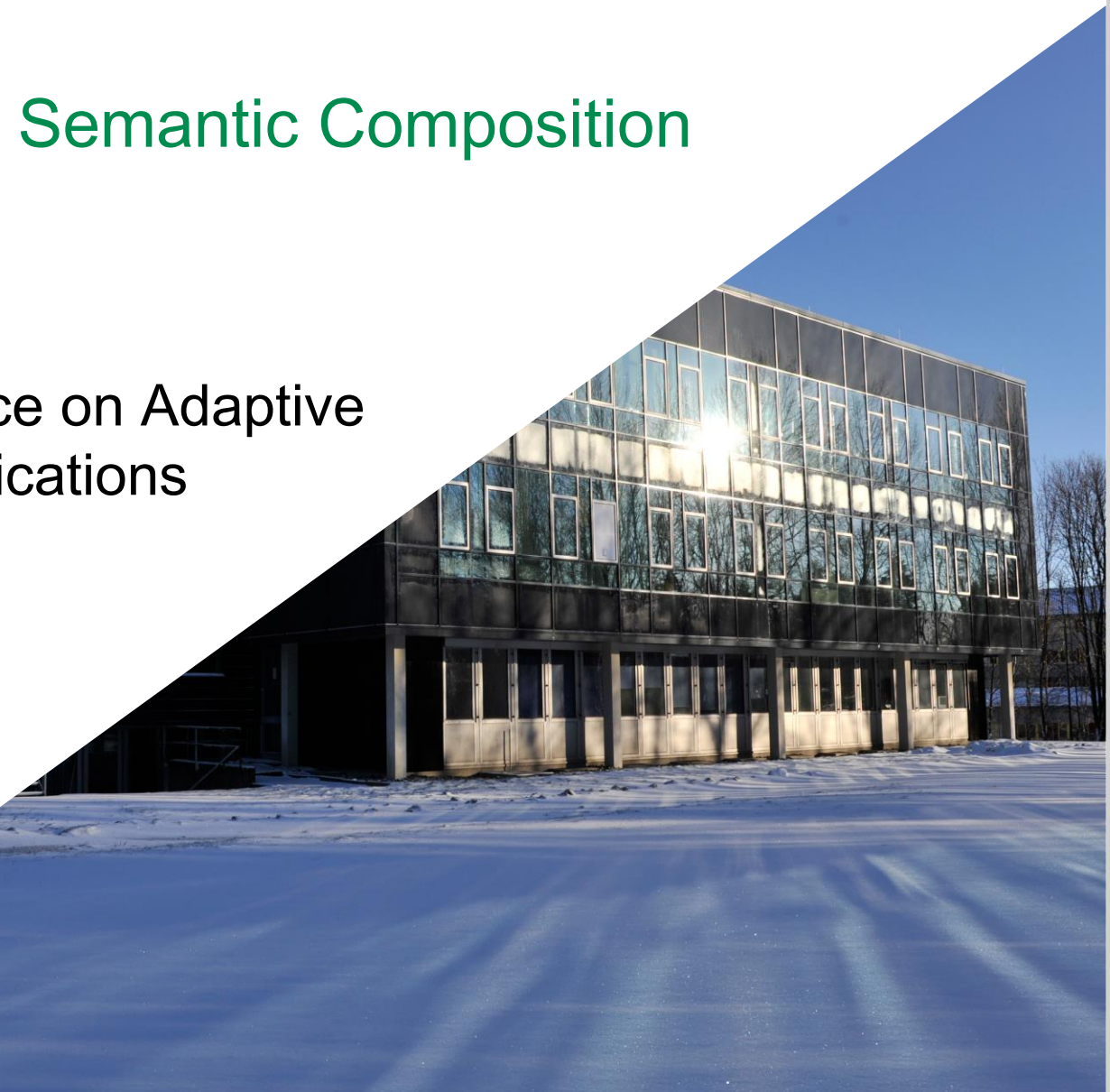
along with ADAPTIVE 2023

The Fifteenth International Conference on Adaptive  
and Self-Adaptive Systems and Applications

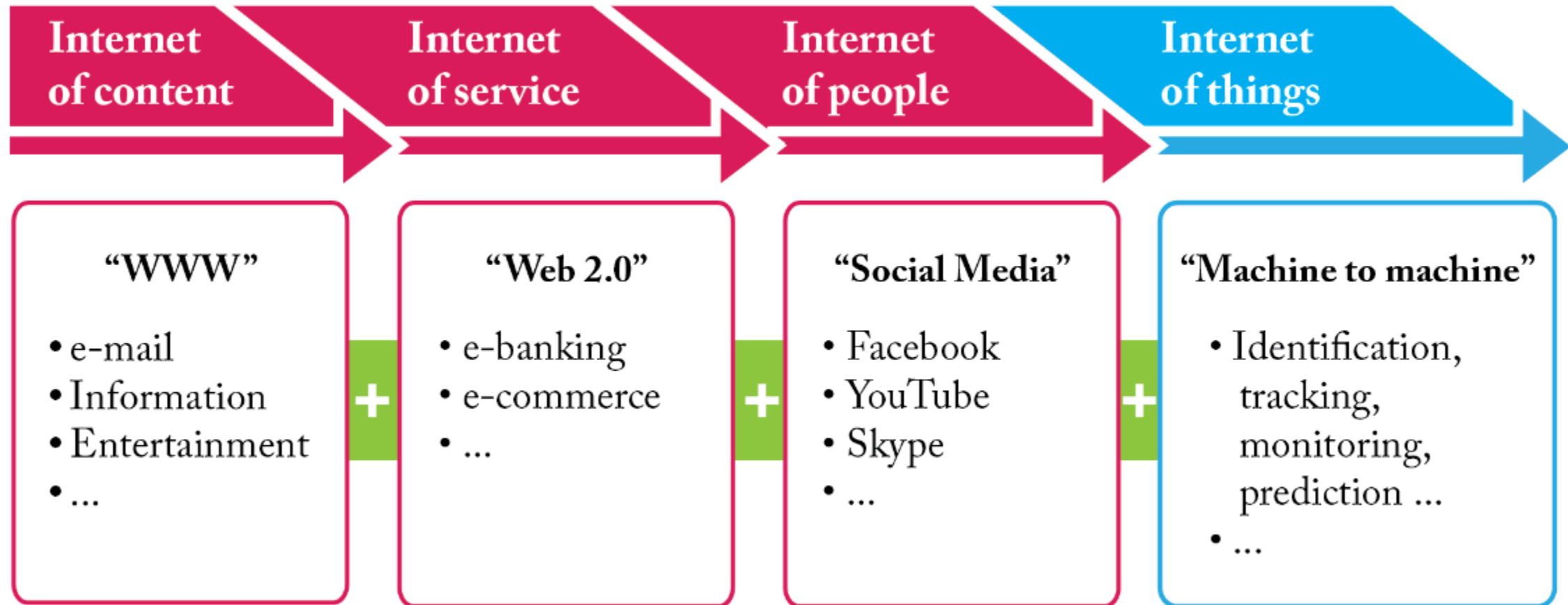
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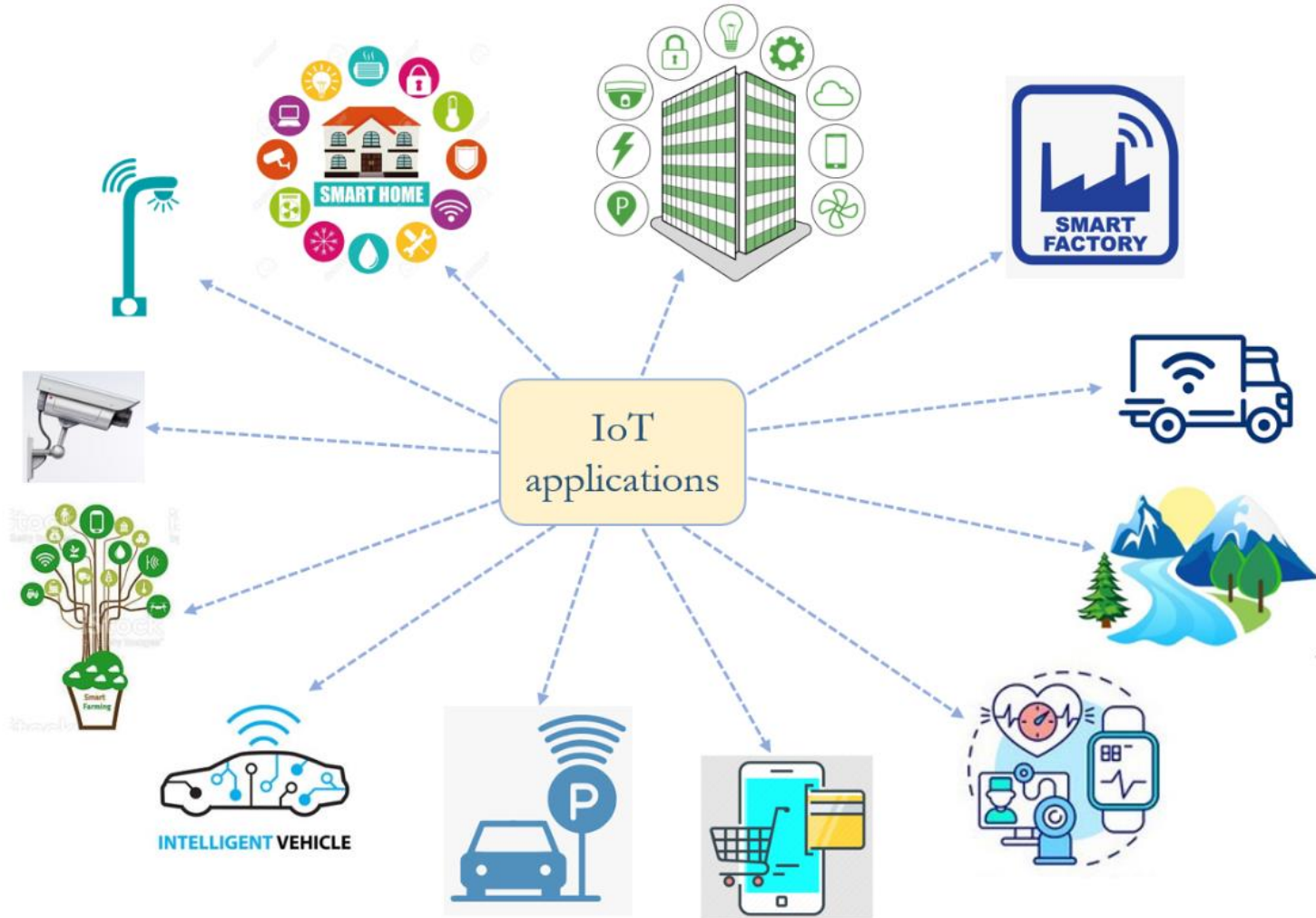


# From Internet of Content to Internet of Things



Ref.: Paolone, G., Iachetti, D., Paesani, R., Pilotti, F., Marinelli, M., & Di Felice, P. (2022). A Holistic Overview of the Internet of Things Ecosystem. *IoT*, 3(4), 398-434.

# Examples of IoT Application Domains



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## IoT Ecosystems

- Complex system networks of autonomous and interacting individual systems  
→ ability to adapt
- Through the (emergent) combination of several services of this IoT ecosystem, higher-value goals can be achieved by the overall system
- Challenges:
  - How to design and realize such an ecosystem?
  - How to influence and control such dynamical and autonomous changing system landscapes?



## Topics of the EASCI Track

- Semantic integration of services in IoT ecosystems
- Emergent web service composition
- Automated service composition
- Resilience in IoT ecosystems
- Emergence in IoT ecosystems
- Concepts for interaction in an IoT ecosystem
- Runtime behavior and runtime optimization of IoT ecosystems
- Operator models and business models for IoT ecosystems
- Security of IoT ecosystems
- Service interoperability in emergent systems
- Self-organization in decentralized IoT ecosystems
- ...

## Papers in the EASCI Track

- Tailored Digital Twins for LCA & LCM - Stakeholder centered Digital Twin Framework Design for Product Lifecycle Managements and Assessment  
*Dominique Briechle, Marit Mathiszig, Nelly Nicaise Nyeck Mbialeu, Ali Piriyaie, Argianto Rahartomo*
- Emergent Software Service Platform and its Application in a Smart Mobility Setting  
*Christoph Knieke, Eric Douglas Nyakam Chiadjeu, Andreas Rausch, Christian Schindler, Christian Bartelt, Nils Wilken, Nikolaus Ziebura*
- Towards Transforming OpenAPI Specified Web Services into Planning Domain Definition Language Actions for Automatic Web Service Composition  
*Christian Schindler, Christoph Knieke, Andreas Rausch, Eric Douglas Nyakam Chiadjeu*

## Paper: Tailored Digital Twins for LCA & LCM - Stakeholder centered Digital Twin Framework Design for Product Lifecycle Managements and Assessment

### ■ Speaker: Dominique Briechle

- Doctoral researcher at TU Clausthal (Germany), Institute for Software and Systems Engineering, Group of Prof. Dr. Andreas Rausch
- Research focus:
  - Circular economy
  - Product Lifecycle
  - Digital twin

### ■ Content of the Paper:

- Requirement-based framework for designing a sustainable digital twin to meet circular economy objectives
- Framework focus: To answer the information requirement that the stakeholders desire
- Improving the current lifecycle assessment while ensuring the optimization of digital twin design flexibility

## Paper: Emergent Software Service Platform and its Application in a Smart Mobility Setting

### ■ Speaker: Nils Wilken

- Doctoral researcher at University of Mannheim (Germany), Institute of Enterprise Systems
- Research focus:
  - Plan recognition
  - Goal recognition
  - Artificial intelligence

### ■ Content of the Paper:

- Concept and architecture of an Emergent Software Service Platform
- Platform able to design software services from the set of available software services completely automatically at runtime to provide higher-value services
- Prototype implementation of the platform demonstrated by a smart parking lot scenario



## Paper: Towards Transforming OpenAPI Specified Web Services into Planning Domain Definition Language Actions for Automatic Web Service Composition

### ■ Speaker: Christian Schindler

- Doctoral researcher at TU Clausthal (Germany), Institute for Software and Systems Engineering, Group of Prof. Dr. Andreas Rausch
- Research focus:
  - Software engineering
  - Software architecture
  - Inductive rule learning

### ■ Content of the Paper:

- Approach to transform web services specified in OpenAPI into PDDL actions
- Advantage of this approach: Web service compositions can be performed with common PDDL solvers
- A set of transformation rules are defined and the pseudo code is described