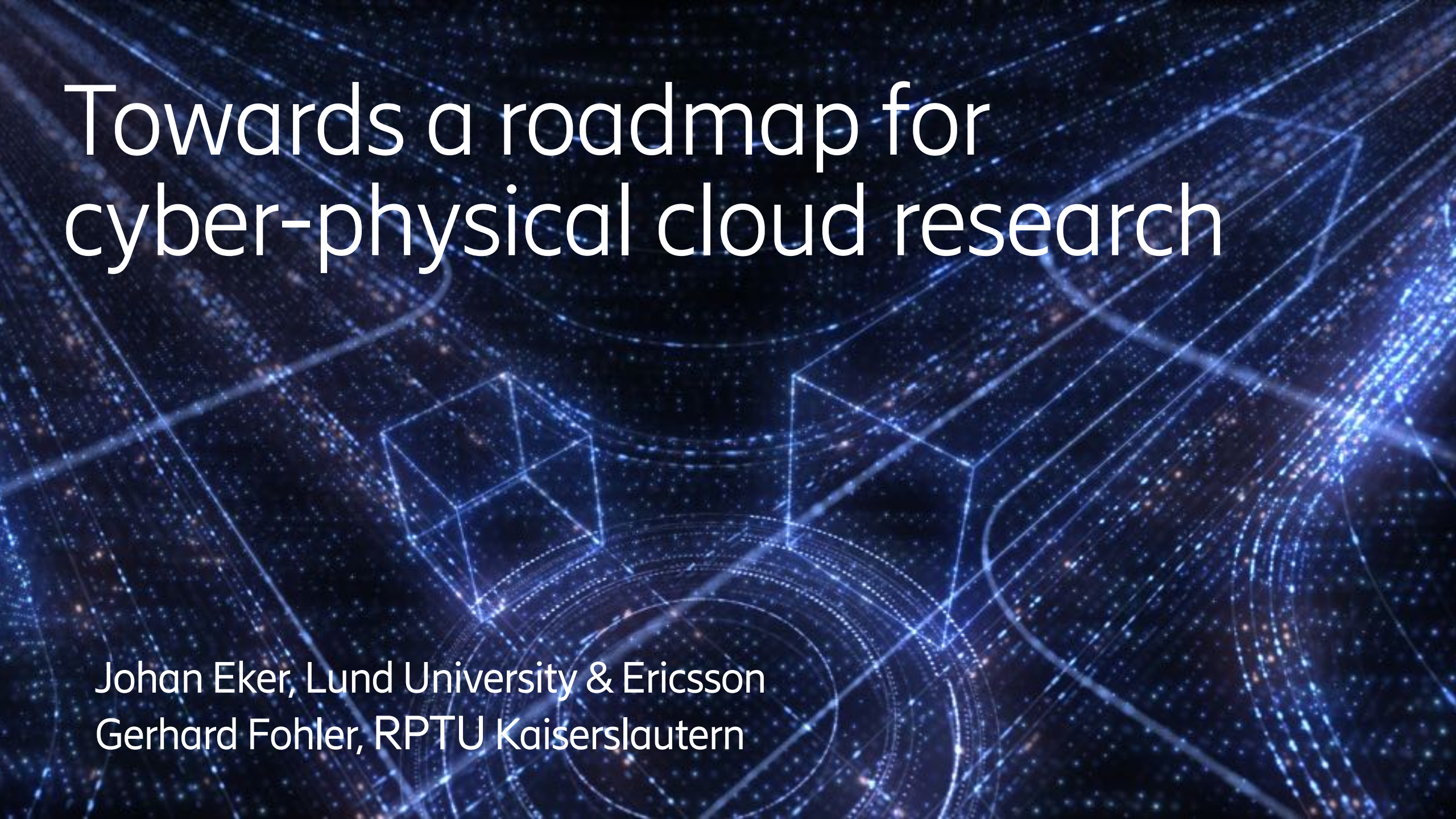
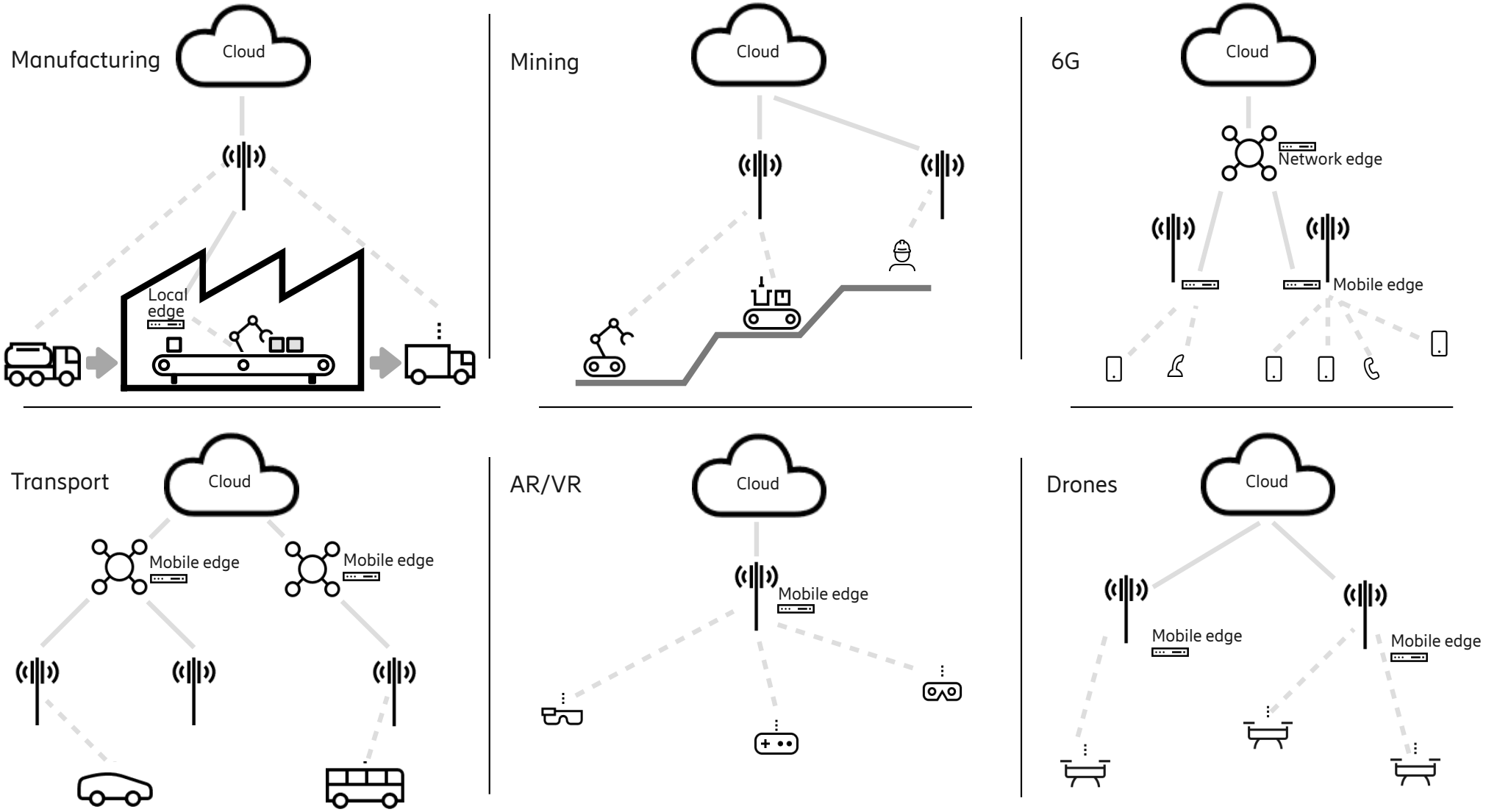


Towards a roadmap for cyber-physical cloud research

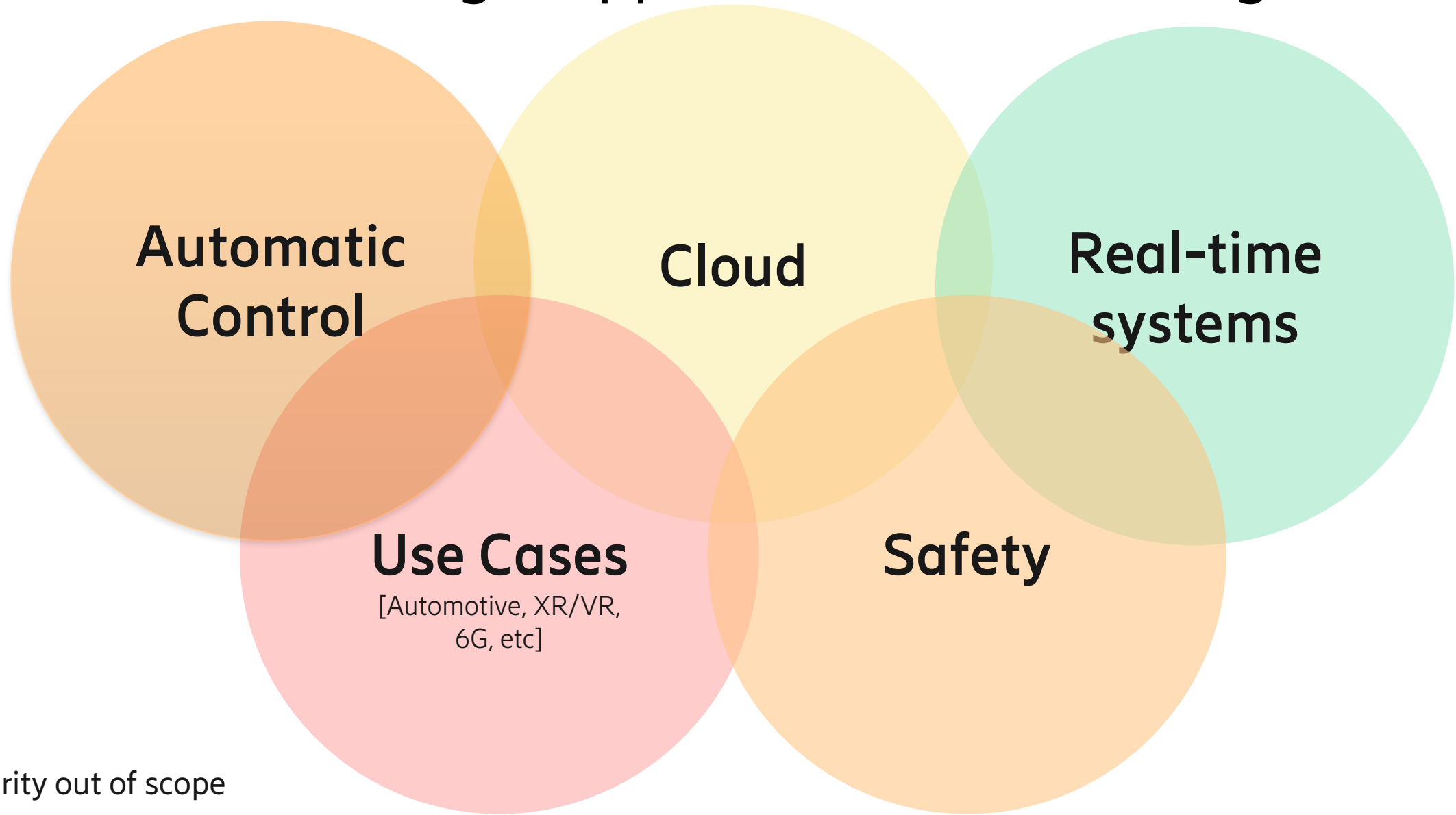
Johan Eker, Lund University & Ericsson
Gerhard Fohler, RPTU Kaiserslautern


Cloud meets cyber-physical systems

The cloud will be everywhere



Current research efforts lack a coherent understanding & approach to CPC challenges



NB: security out of scope

The people behind this

Johan Eker
Lund University
Ericsson

Arne Hamann
Bosch

Gerhard Fohler
RPTU

Erik Elmroth
Umeå University

Karl-Erik Årzén
Lund University

The Technical Committee

Why a road-map?

Create a research community! Break the silos!

- Ensure impact
- Drive funding
- Establish dissemination channels
- Shared terminology
- Steer research towards the right problems

(NB, it's not an industrial forum for standardization etc.)

The roadmap will serve as a foundation for

- writing papers,
- identifying EU and national funding opportunities, and
- recognizing potential academic and industrial collaborators.

The roadmap audience encompasses:

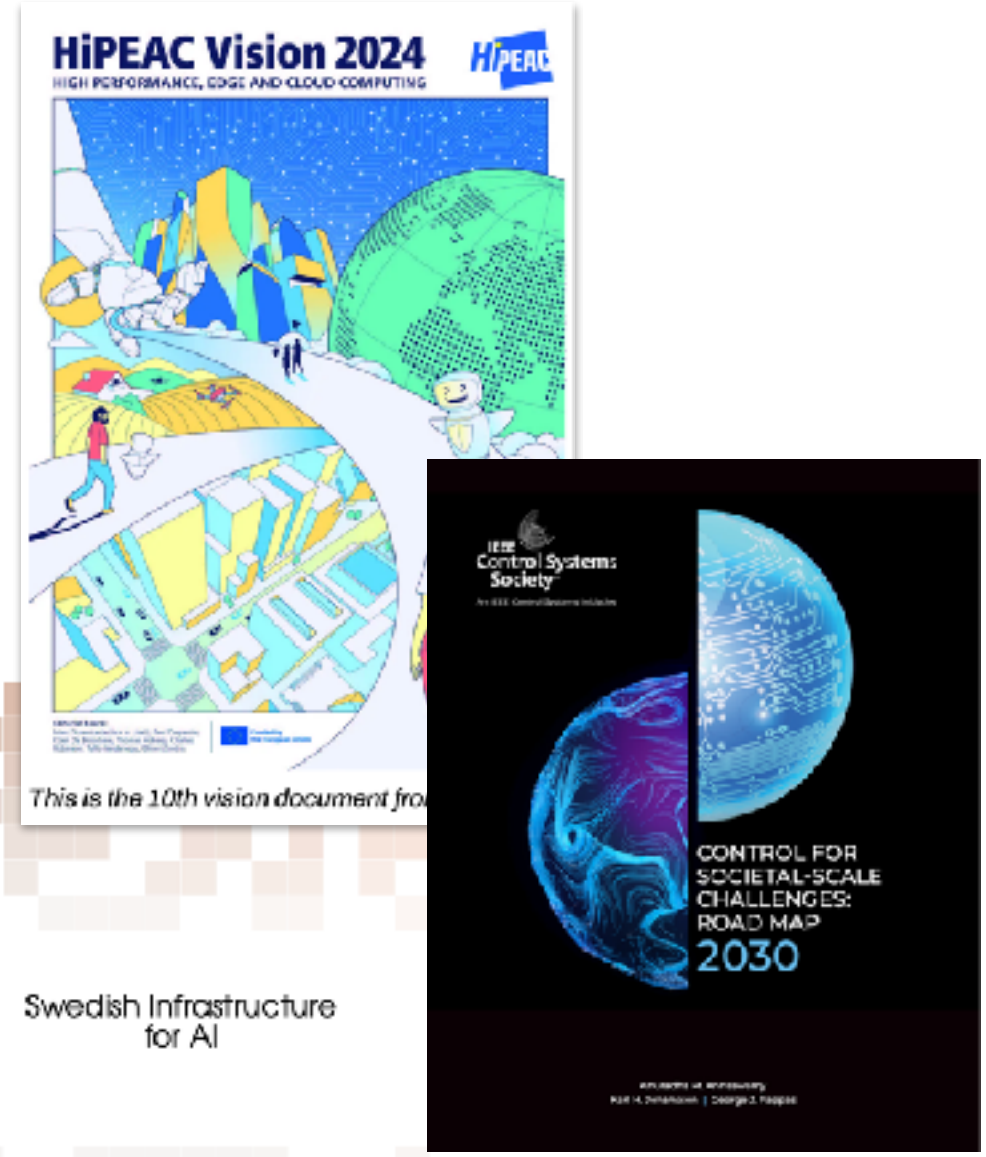
- CP-cloud researchers,
- broader CP systems, and
- cloud computing communities, and Industry 4.0 domain.

The roadmap shall provide

- terminologies,
- use cases, and
- state of-the art.

It should identify

- research gaps
- essential requirements, and
- significant challenges and research topics



Proposed outline

1. What is the things with cloud & CPS?
Outline advantages and challenges of connecting cyber physical systems to the cloud

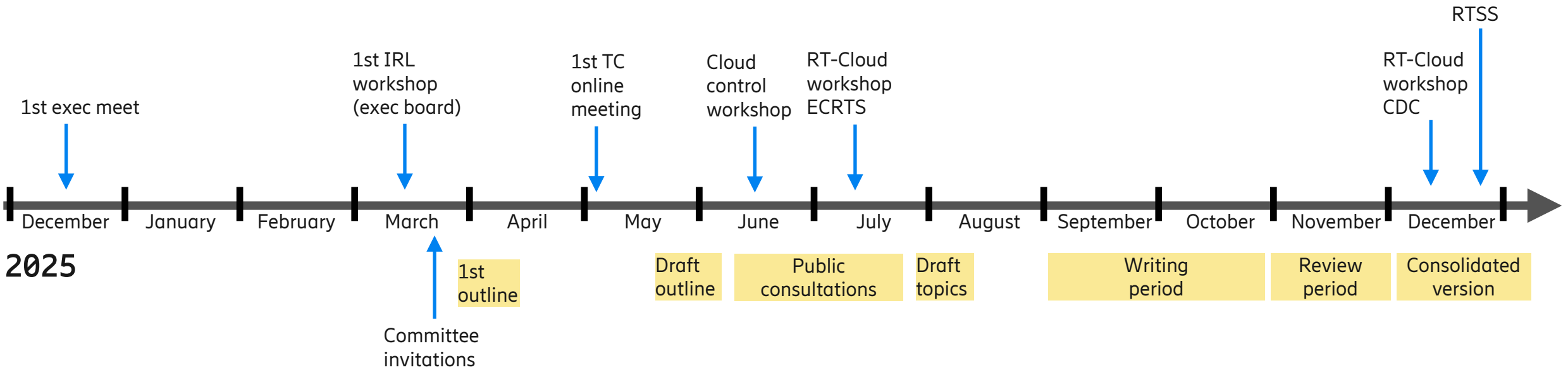
2. State-of-the-art/Existing landscape
Paint a picture of the current efforts/results around (critical) physical systems connected to the cloud.

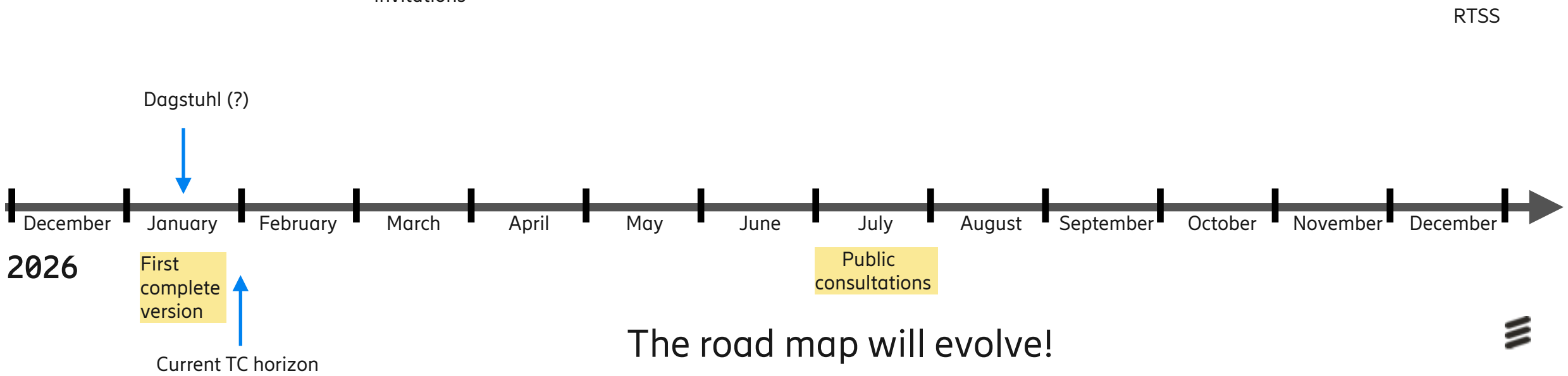
3. Use Cases (Verticals)
Provide use cases with sufficient details to inspire a research paper

4. Identified Research Topics (Horizontals)
Provide a set of research topics that are grounded in the real-world challenges and if solved would have impact.

NB. The proposed outline will be sent out after the meeting for review and feedback.

The plan





The road map will evolve!

CaPriC 2025

Capri PhD School on Cyber Physical Cloud

Anacapri, Capri Island, Italy

October 13-17, 2025

Lecturers and Experts

Prof. Gerhard Fohler
Technische Universität Kaiserslautern

Introduction to Real-Time Systems
Understanding time-critical computing in modern embedded applications

Prof. Sanjoy Baruah
Washington University in St. Louis, USA

Scheduling of Virtual Resources

Multicore and Hierarchical Scheduling

Prof. Marcello Cinque
Università degli Studi di Napoli Federico I, Italy

Real-time Virtualization and Hypervisors

Armando Migliaccio
Principal Software Engineer at DigitalOcean Inc., USA

Anatomy of a Cloud Platform
Core Building Blocks Behind Scalable, Elastic, and Distributed Computing

From Code to Cloud
A Hands-On Journey Through the Core Building Blocks of Cloud Platforms

Prof. Johan Eker
Ericsson, Sweden

Introduction to Cyber Physical Cloud

Fredrik Svensson
Software Architect at Ericsson, Sweden

Kubernetes and RT-K8S

Arne Hamann
Head of "Advanced Solutions for Intelligent Systems", Chief Expert "Distributed Intelligent Systems" at Bosch, Germany

Prof. Karl-Erik Årzen
Lund University, Sweden

Control over the cloud

A set of engineering challenges

- Application design
- Networking
- Resource management
- Compute scheduling
- Software development
- Multi tenancy

Want to contribute?

- What is the most important challenge?
- How to make a difference?
- What is missing?
- Is this just a stupid idea (DOA)?
- How to best incorporate input?
- Who should get a copy?