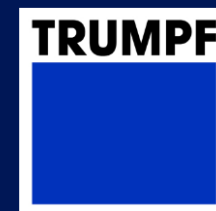




ERF 2026 – Workshop #57: Industry Challenges for Robotics

AI-based Robotics for Modern Sheet Metal Processing

Ralph Lange, Head of Robotics at TRUMPF Machine Tools



TRUMPF Machine Tools

Portfolio Overview



Machines for laser cutting



Punching and punch laser processing



Machines for bending



Machines for laser welding



Machines for tube processing

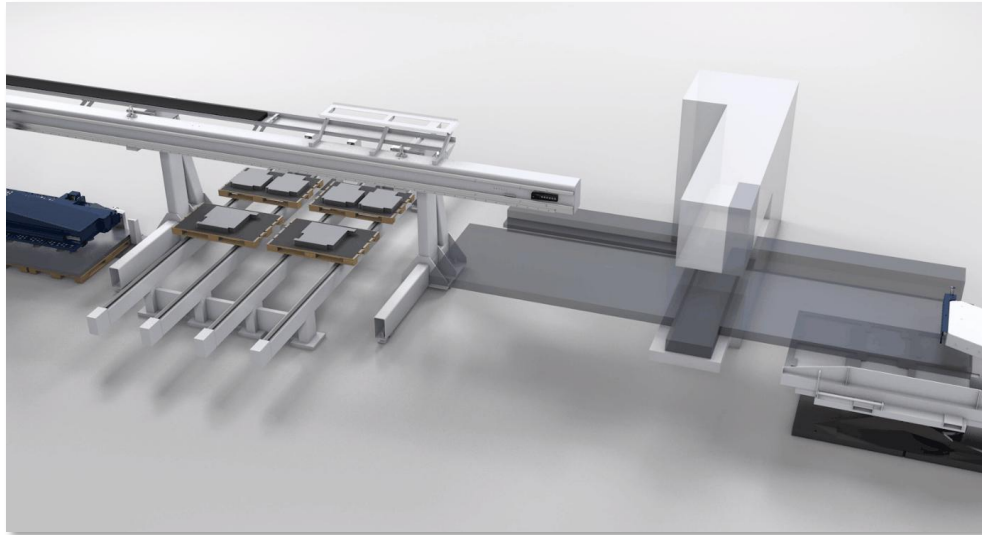


Solutions for a networked production



Examples for Automation at TRUMPF Machine Tools

Punch laser combination



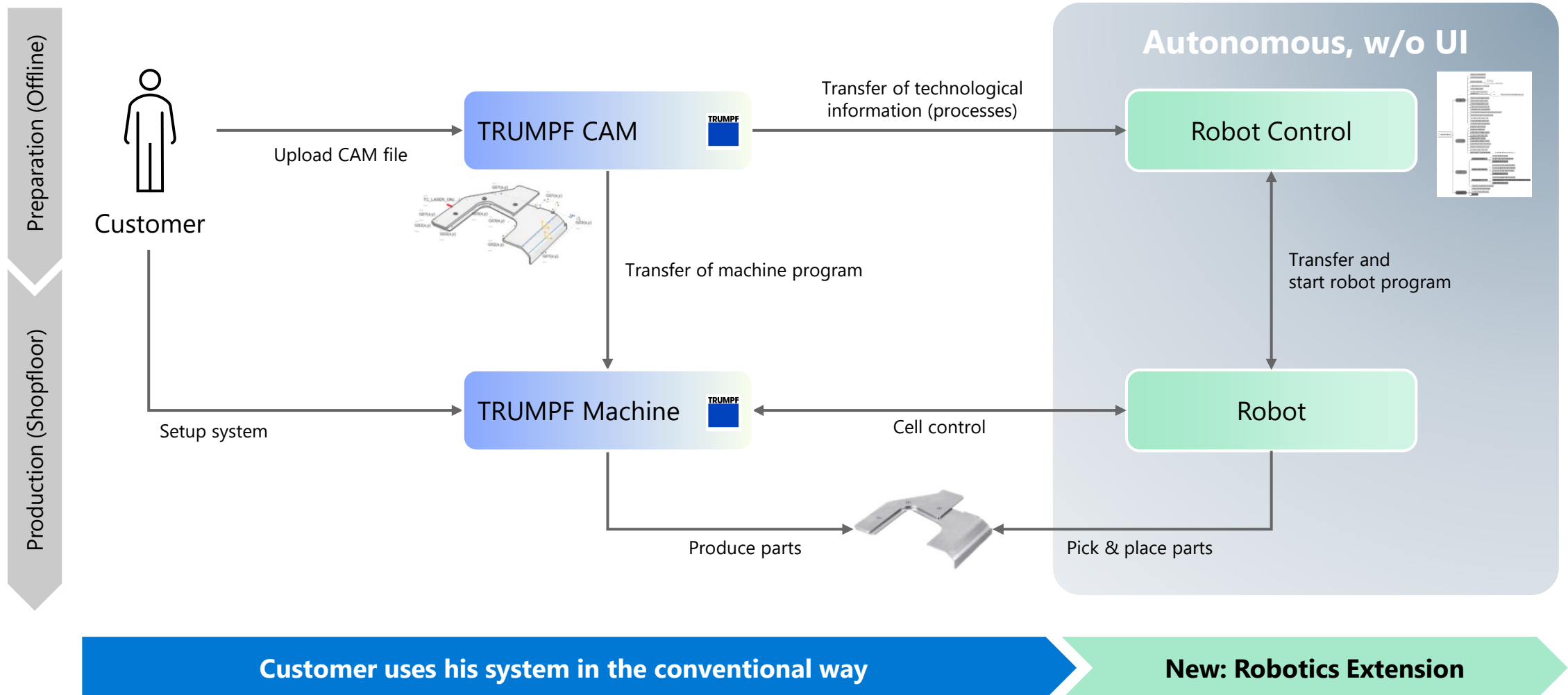
- One automation system for two applications
- Sheet metal feeding + automated sorting
- Available for punch machines as punch laser machines

Bending



- Multi-axes system: one or two robots + bending machine
- Automatic setup, picking up, bending, palletizing
- Double sheet detection (oily environment)

Base Architecture for Autonomous Robotics Applications





SortMaster Station and SortMaster Vision

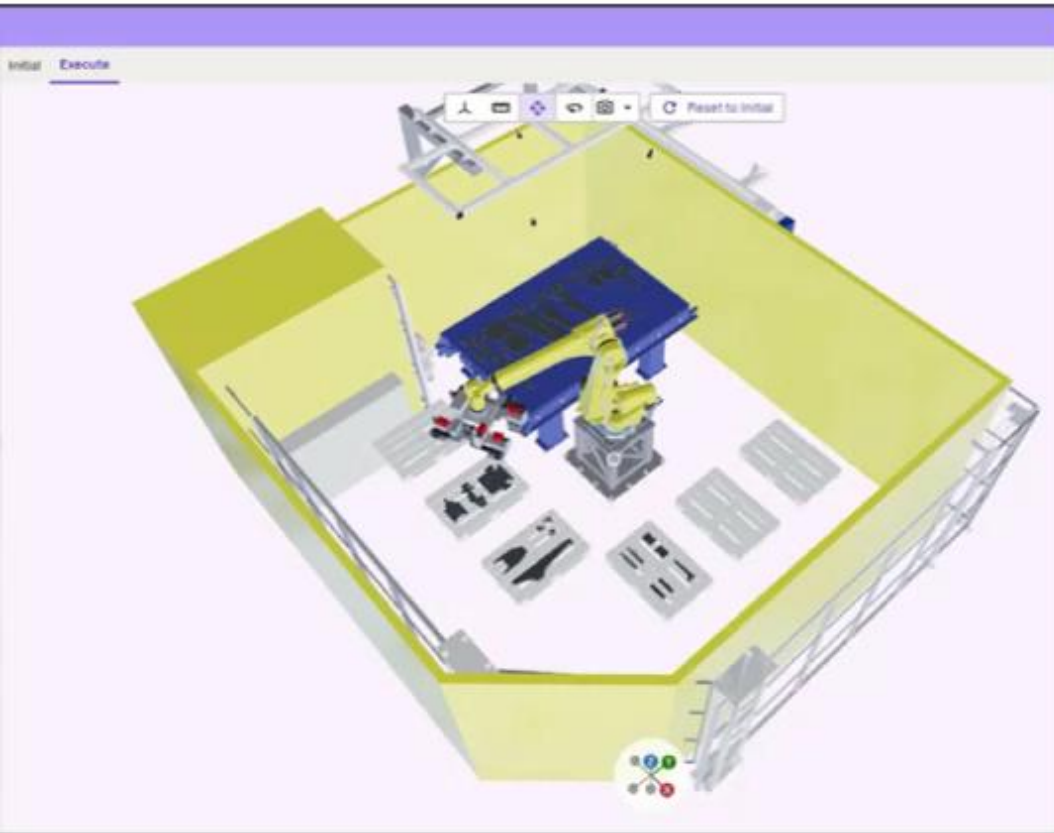
Reliable separation,
autonomous sorting!



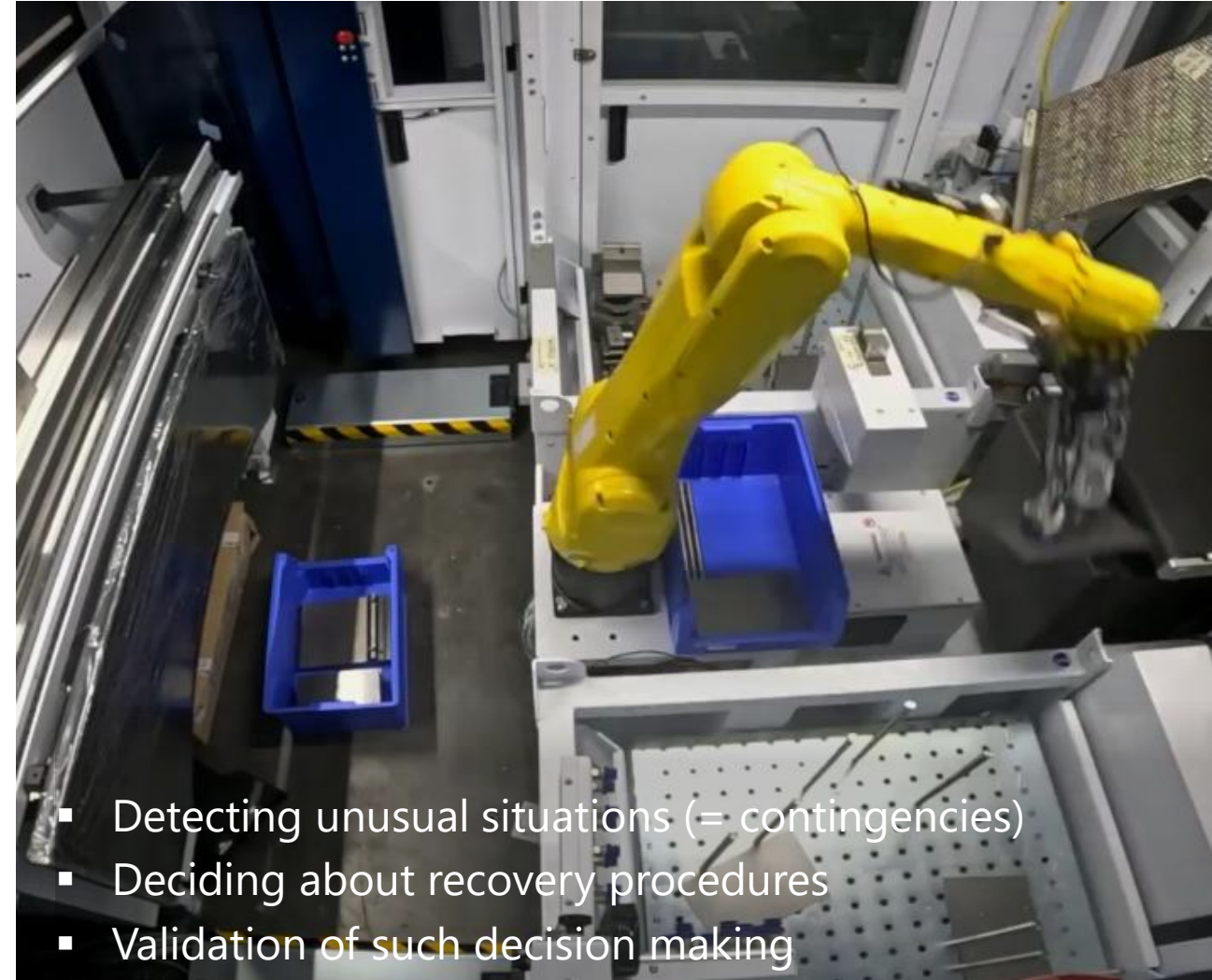
https://www.trumpf.com/en_INT/products/machines-systems/automation/separating-and-sorting/sorting/

SortMaster Vision

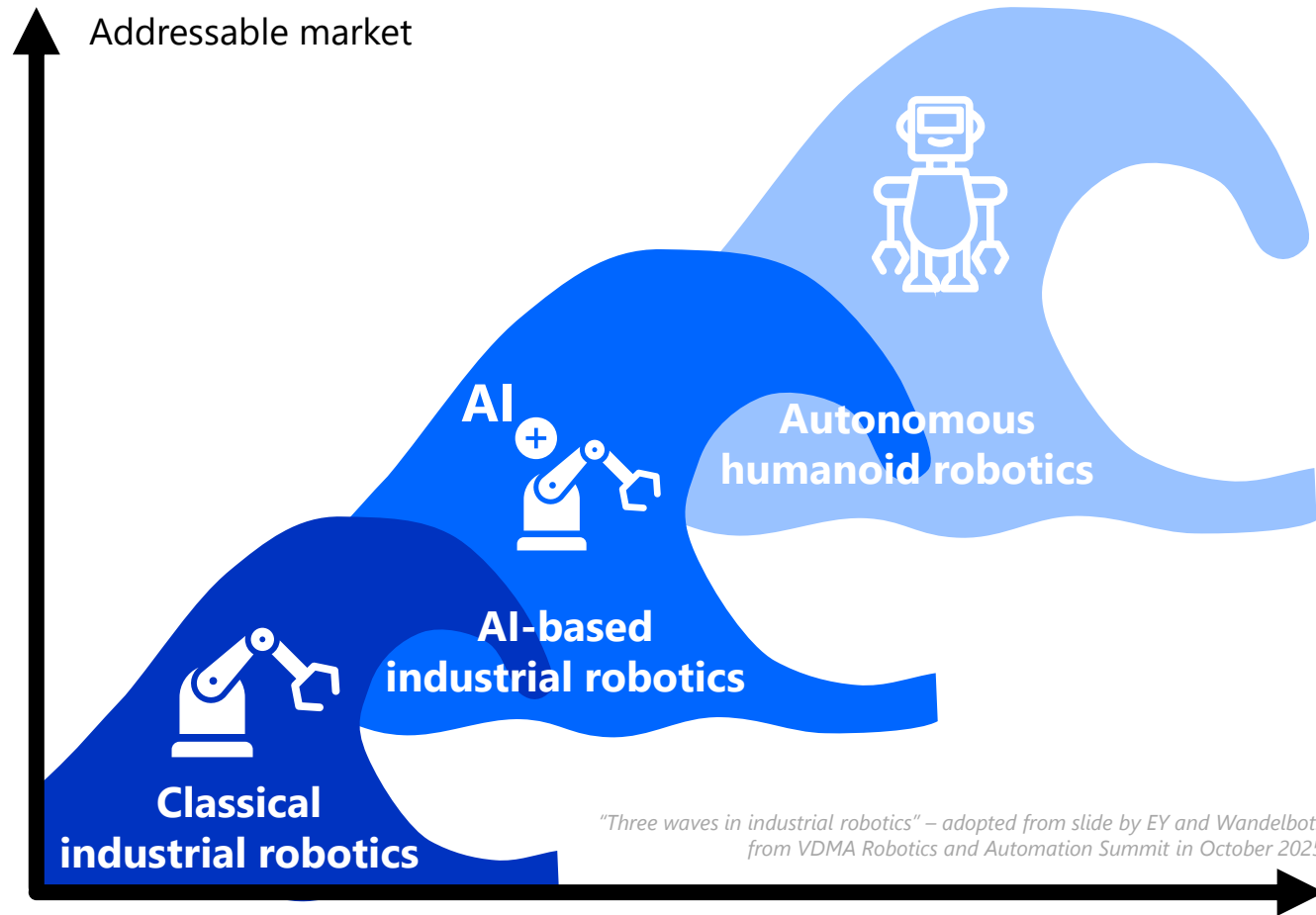
Consistent use of digital twin with Intrinsic Flowstate



Challenge 1: Perception and Contingency Handling

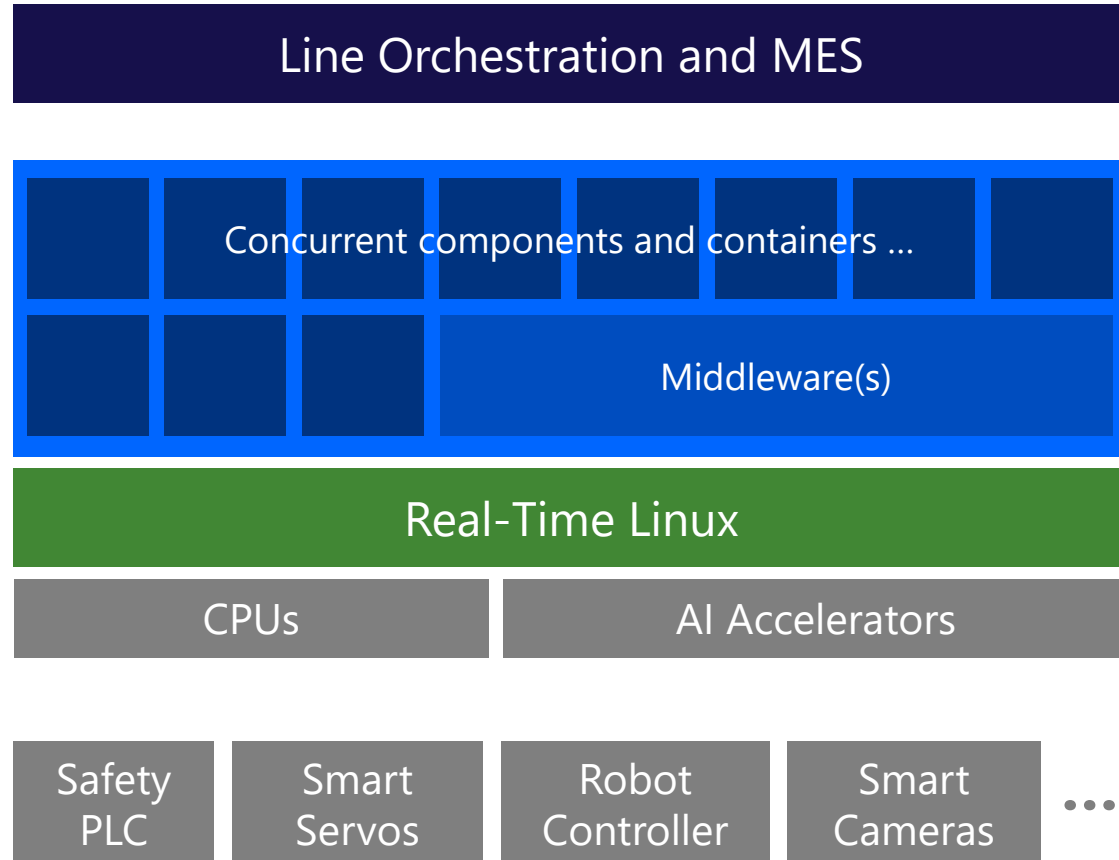


Challenge 2: Open, extensible, easy-to-use SW platforms



- Importance of SW platforms grows dramatically with second wave
- Numerous startups, established robotics OEMs, and even hyperscalers seek their role in this situation by proprietary platforms
- The multitude of platforms slows down innovation and the necessary evolution of the robotics SW ecosystem!
- Needs of integrators and solutions builders in terms of openness, extensibility and ease-of-use are only partially fulfilled
- Role of the Robot Operating System (ROS)? Data and interoperability standard only?

Challenge 3: Deterministic execution



- Highly concurrent software architectures by service-oriented approach
- Very diverse timing characteristics and requirements: few 100µs to seconds, single-threaded to GPU-workloads, ...
- Deterministic replay is hardly supported
- Difficult to validate and debug
- Lack of suitable scheduling and simulation mechanisms

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