

# TAPPS

Trusted **Apps** for open CPSs

Nora Koch

fortiss GmbH

An-Institut Technische Universität München



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# Open CPSs

Cyber-Physical Systems that can be extended during operation adding **functionalities** on demand

- Functional extension by **Apps**, as it is already common for mobile and other consumer devices
- Apps (new services and customization features) provided by **3rd parties**



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## Extensibility

### Pro

enables products to keep pace with user expectations and latest technologies (eco-system)

### Cons

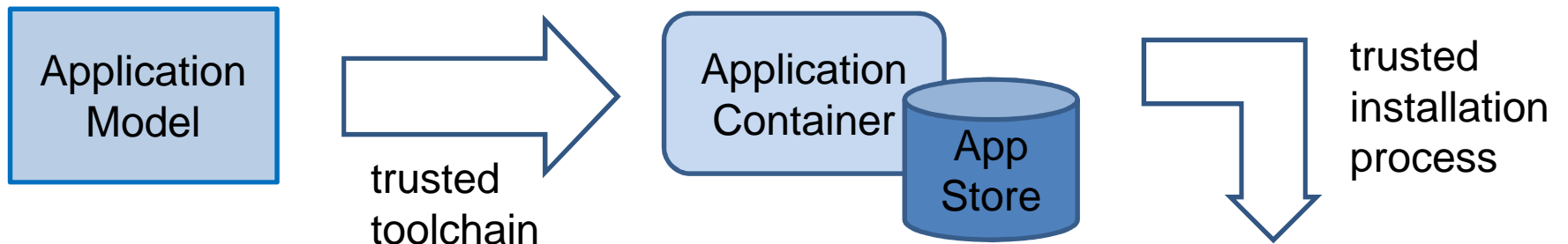
Apps imply safety, privacy & security risks

# TAPPS Approach: Multiple Layers of Security

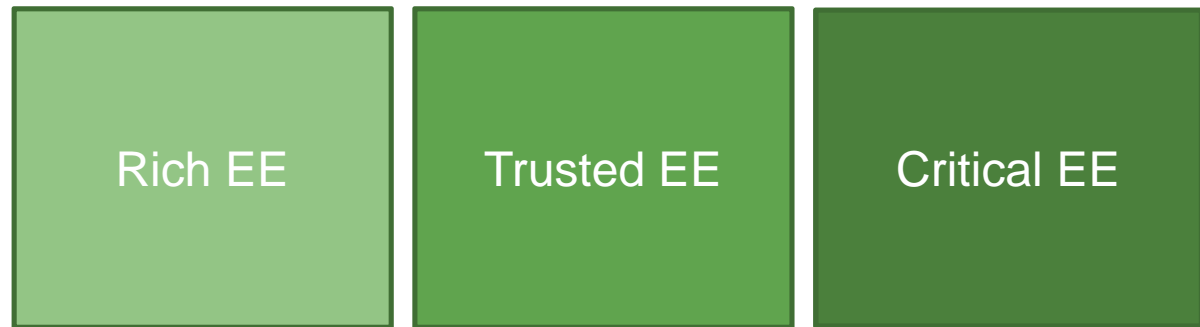
1. **Verified Apps** to ensure correct and secure behavior
  - model-checking, model-based development, toolchain
2. **Fine-grained access control** to resources of the CPS devices to ensure safety and privacy
  - communication with critical interfaces
3. **Tailored Execution Environments (EEs)**
  - spatial & temporal isolation of apps through virtualization
4. **Special hardware** equipped with security mechanisms
  - ARM multi-core processor (normal/secure world)
5. **Trusted network**
  - virtual end-to-end channels, transfer of mix-critically content

# Key Issues of TAPPS Architecture

## End-to-end solution



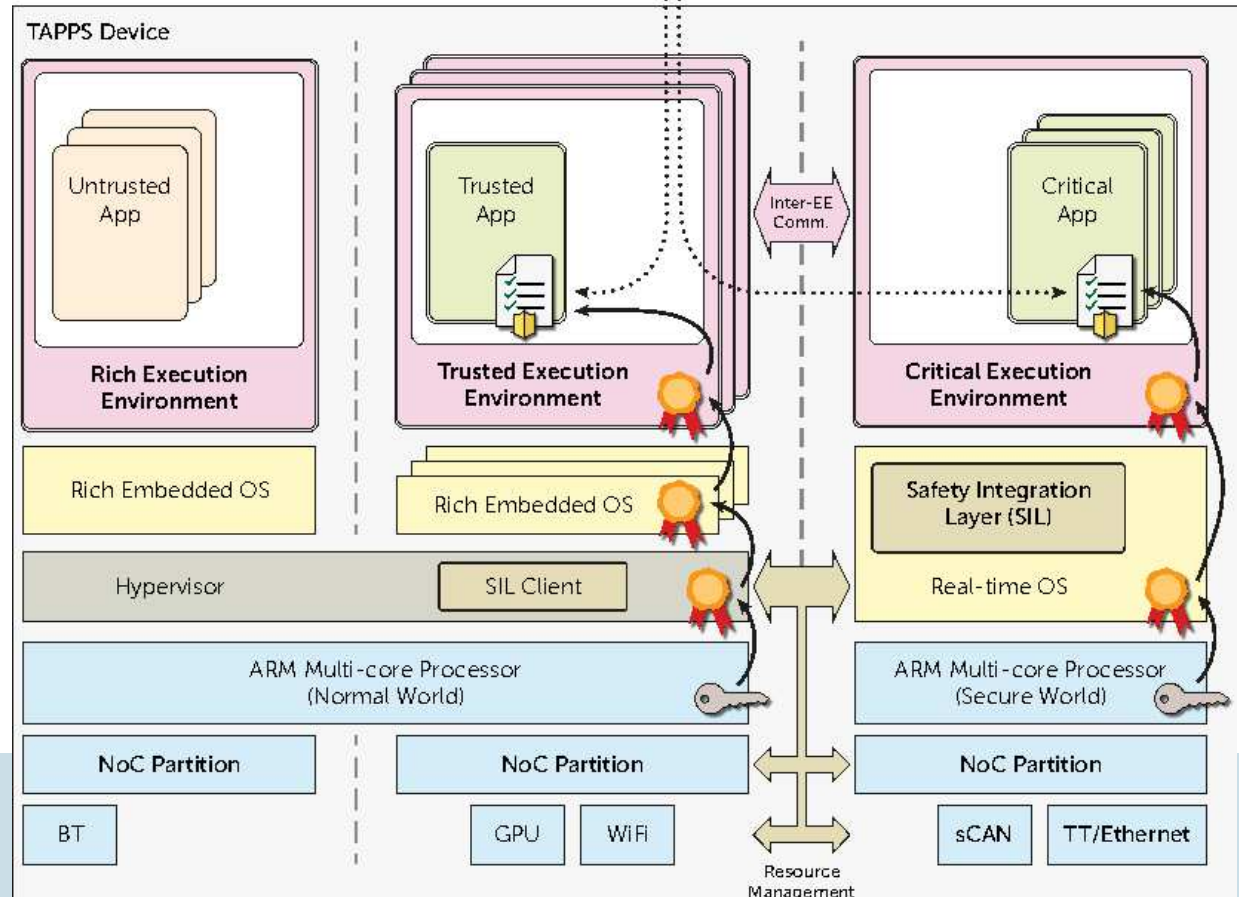
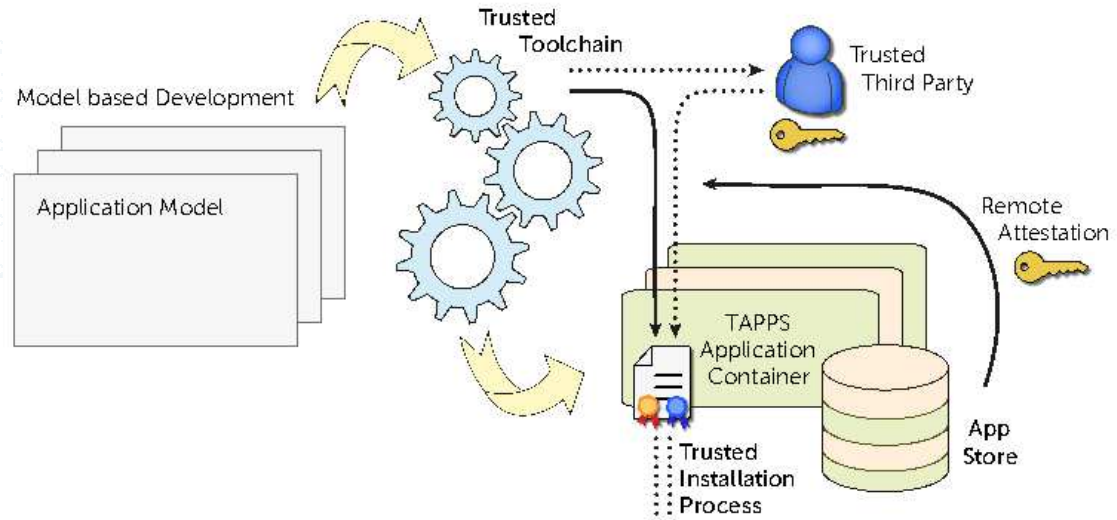
## Execution Environments



## Trusted HW & Networks



# TAPPS Architecture



# Validation Trusted Apps Platform



## Automotive domain

- check trip capability based on traffic conditions and battery status
- sport package changing driving behavior
- braking adjustment depending on environment conditions



Motorbike



Smart  
Trolley

## Healthcare domain

- automatic drawers for safe drug management
- patient identification
- access to electronic health records
- monitoring of vital signs



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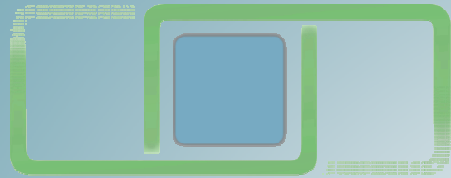
# Dissemination

- Internet of Things Conference, Berlin, March 2015
- Automotive Linux Summit, Tokyo, June 2015
- Innovative Software Development in Automotive, Munich, Oct. 2015
- World Autonomous Vehicle Summit, Stuttgart, Feb. 2016
- Future Therapy Workshop at Politecnico Milano, Feb. 2016
- Automotive Cyber Security Conference, Berlin, March 2016
- Emerging Ideas and Trends in Engineering of CPSs Workshop, Vienna, April 2016

## Upcoming Events

- Cyber Security and CPS, Vignola, May 2016
- Industrial Technologies, Amsterdam, June 2016
- Automotive Linux Summit, Tokyo, July 2016
- Automotive Ethernet Congress.de, Munich, Feb. 2017





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Thanks for your attention!

[nora.koch@fortiss.org](mailto:nora.koch@fortiss.org)

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**TTTech**



**actility**  
Making Things Smart



*Third party*