



23. Software Ecosystems

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- 1) Software Platforms and Ecosystems
- 2) Software Ecosystems for Cyber-Physical Systems





23.1. Software Platforms and Software Ecosystems

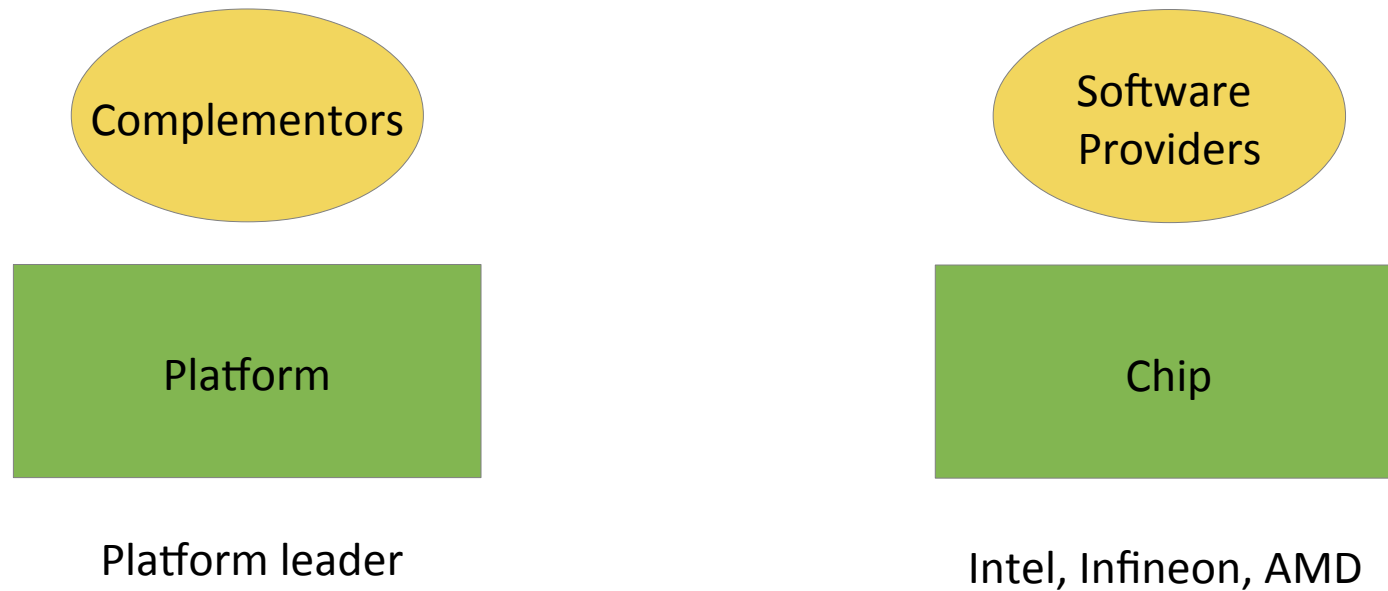
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Platforms and Ecosystems

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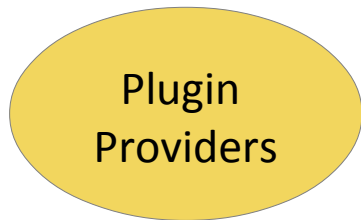
- ▶ „Platforms, not only products“ (Buch „Staying Power“ Michael Cusumano)
- ▶ Marktplätze brauchen Marktplattformen
 - Mit Vendor Lock-In



Plattform Leadership

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- ▶ Platform leadership und „platform wannable“
- ▶ Platform can be open or closed
- ▶ Platform can be for end users or for developers



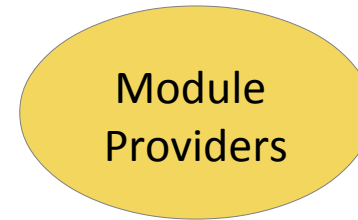
Eclipse

IBM, Itemis, many



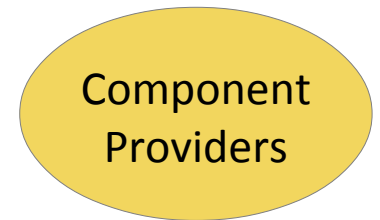
App Store

Apple, Intel, Google



AutoSAR

BMW, Bosch,...

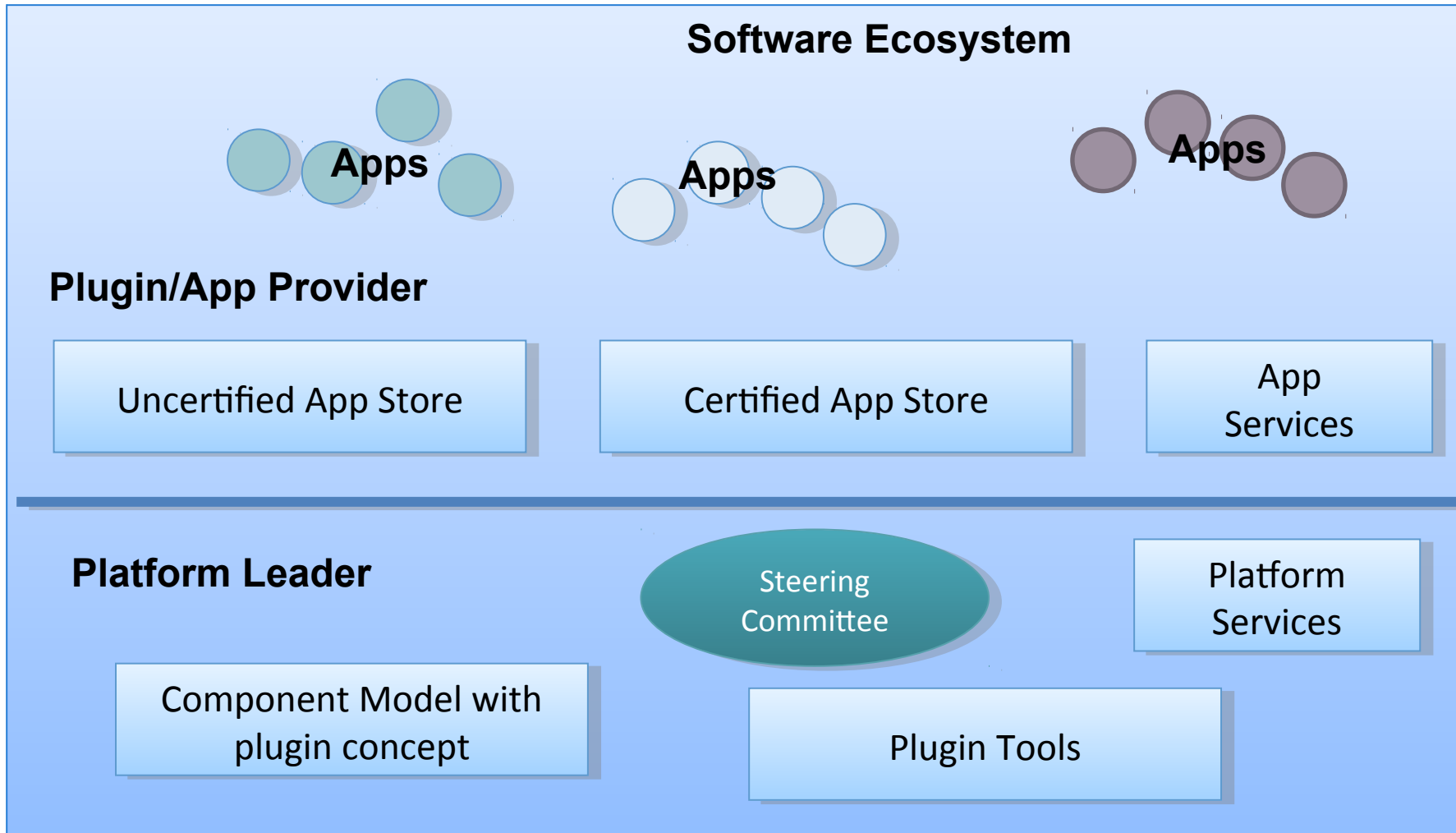


CESAR Reference
Technology Platform

CESAR consortium

Software Ecosystems a la iPad, AutoSAR, GENIVI

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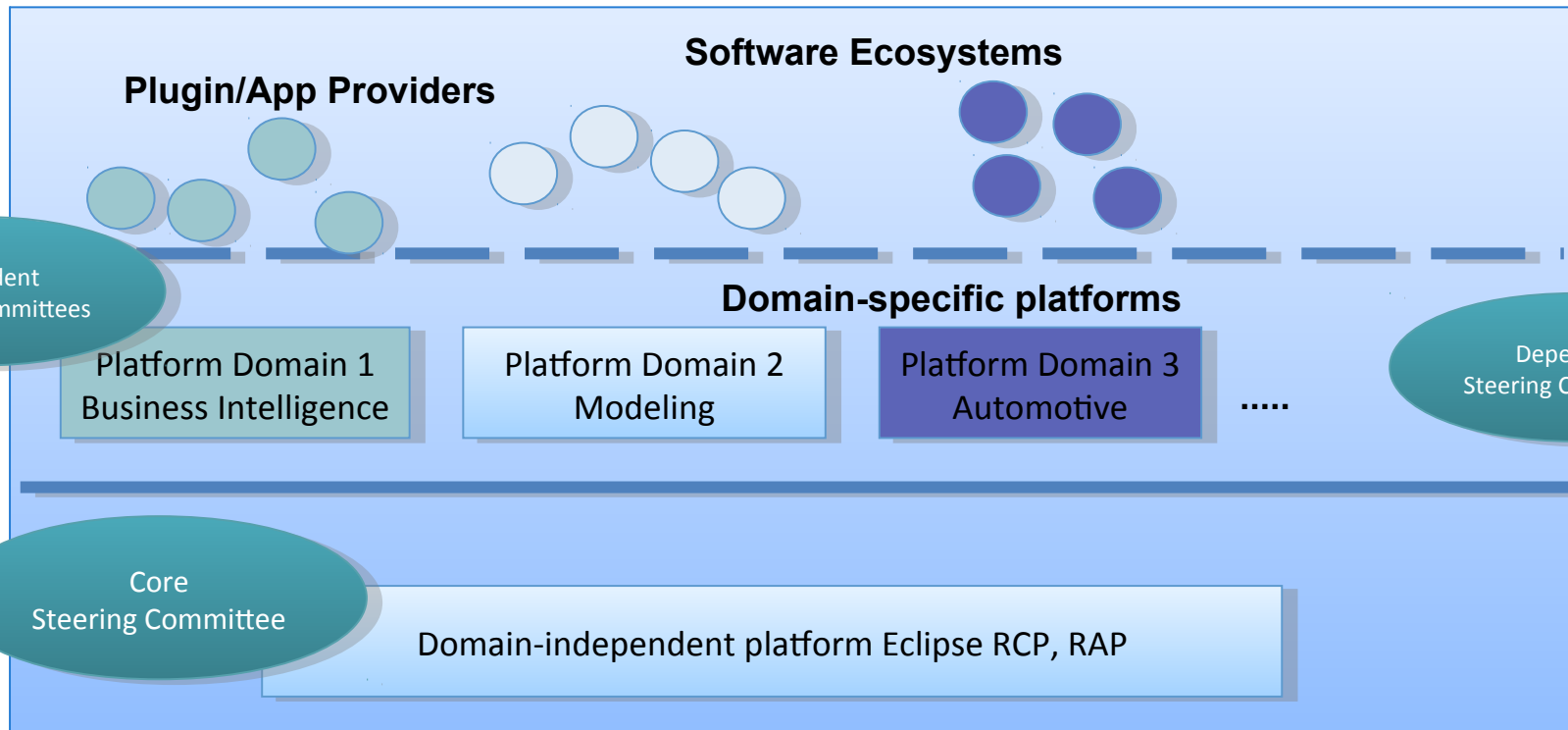
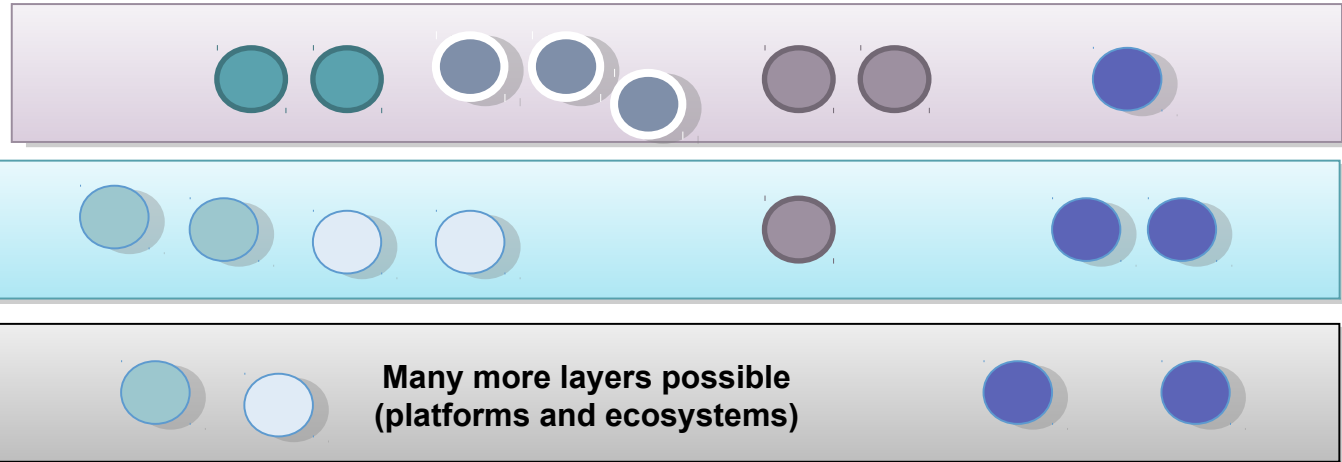


Layered Platforms and Layered Ecosystems (Eclipse.org)

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Patterns and Frameworks

Prof. Uwe Aßmann



Pay per Membership of the Foundation

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- Determined by bylaws of the foundation
- 1 vote costs
 - labor money: e.g. 1 py per vote
 - travel money, rent,..
- Votes can be splitted

Software Ecosystems

„An Eclipse-like software ecosystem relies on a modularity technology and business model“

Modularity Technology:

- Rich component model with plugin concept and non-functional verification
- Framework extension language

»Business model:

- Steering committees control the platforms and pay fees for their votes

Business Value for a Member of the Core Platform Steering Committee

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- ▶ Right to set
 - Standards for the future CPS ecosystems
 - Share a part of the markets
- ▶ Right to vote
 - Decision about dependent domain-specific platforms
 - Decision about dependent domain-specific projects
 - Decision about VIP-push projects for third parties
- ▶ Right to get transfer projects
 - Tailored, non-exclusive VIP-push projects
 - Tailored, exclusive Cell-pull projects
 - Student cell projects
 - Research rotation projects
 - Industry PhD projects
 -



Vendor-Lock-in-Mechanisms

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- ▶ Creation of service markets on the platforms („Marktrecht“)
- ▶ Certification right (admission of applications)
- ▶ Deployment right (Installation right)
- ▶ Sales right, Distribution right (see Apple AppStore)
- ▶ Licensing for interfaces, tools, infrastructure



23.2. Software Platforms and Software Ecosystems for CPS

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What are Cyber-Physical Systems (Resubic Systems)?

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Mixed-Reality Interaction

Cloud

Embedded

Ubiquitous



Cyber-physical

Mit Cloud vernetzte eingebettete Systeme



Resubic systems „Human CPS“



CPS-Plattform-Leadership

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- ▶ In a supply chain or value chain, each level can form an ecosystem on its own, with specific platform

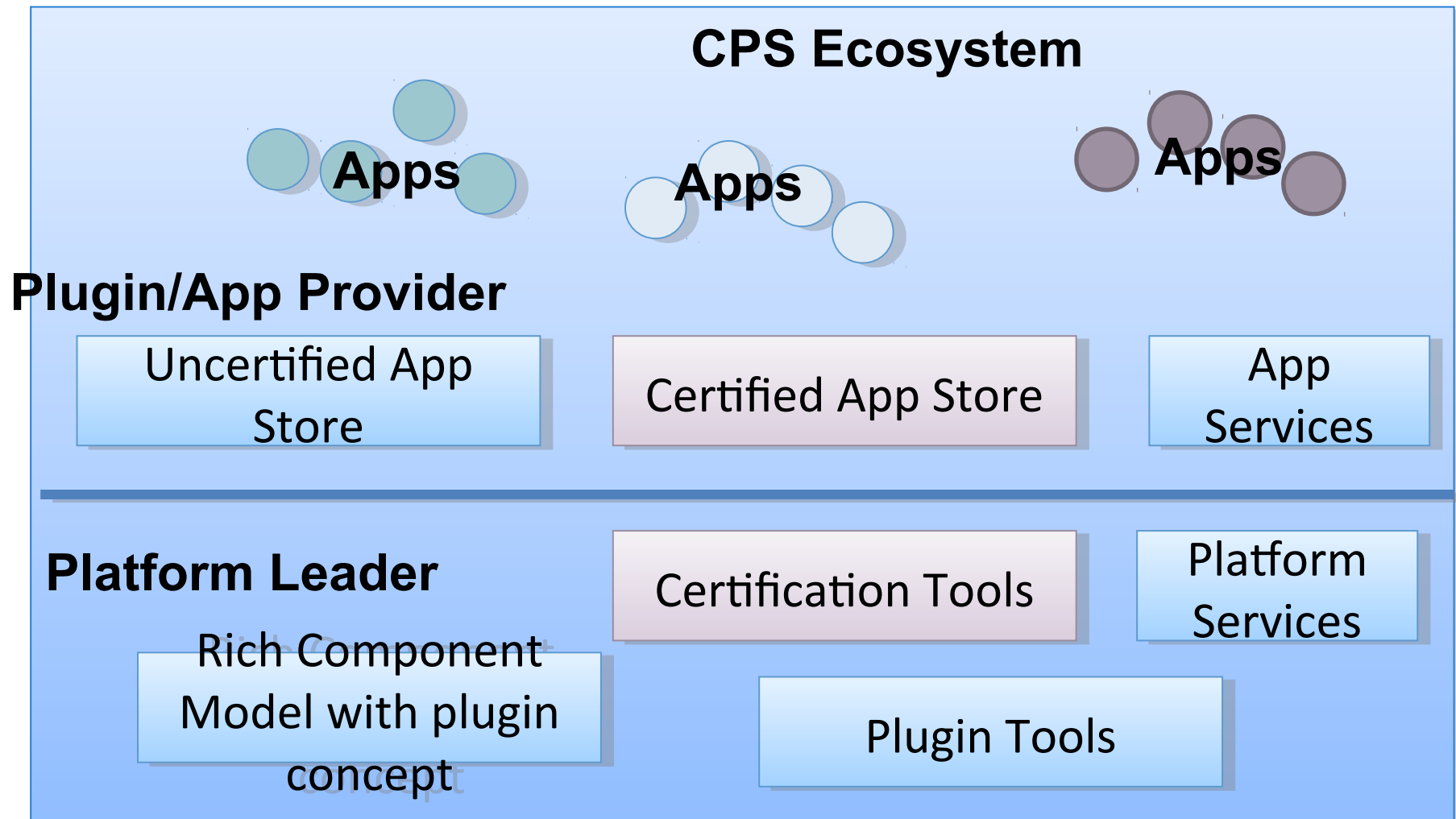


Who is going to own the CPS platforms?

Basic CPS Software Ecosystems

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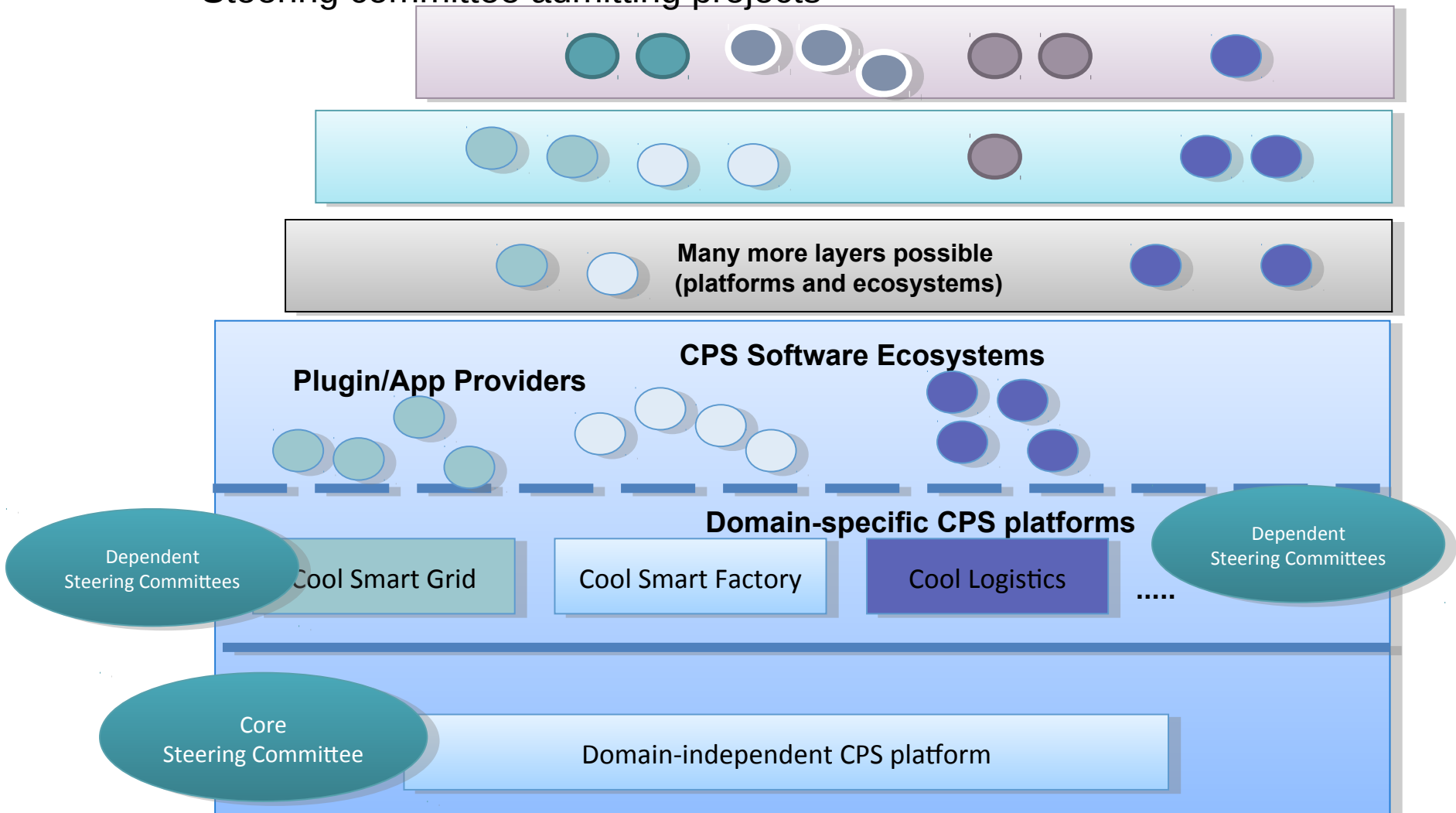
- ▶ Divided by platform leader and App provider
- ▶ Apps are safety-critical and must be certified



Layered CPS Software Ecosystems

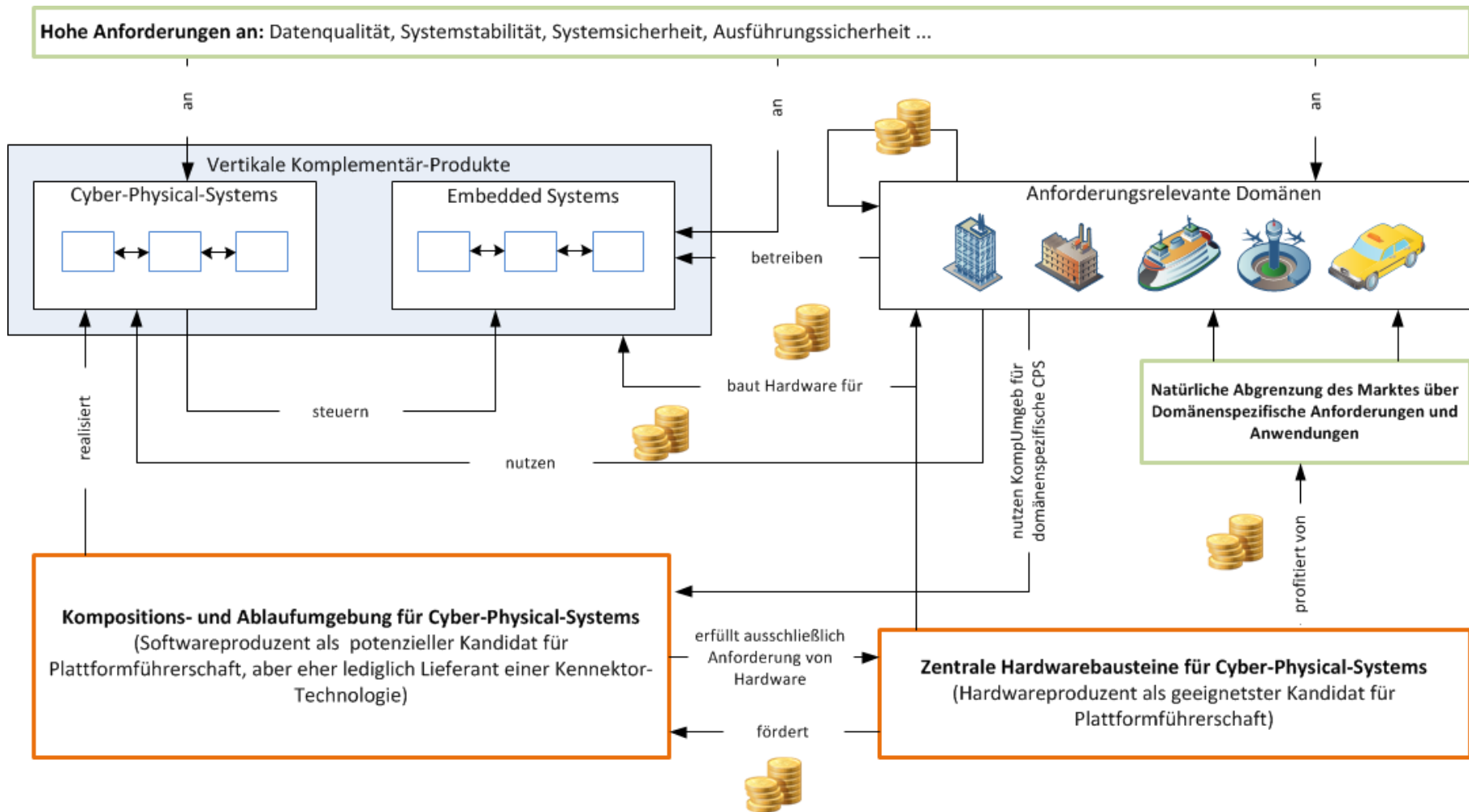
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- ▶ CPS ecosystems will be structured like the Eclipse ecosystem:
 - Layered platforms, hierarchic ecosystems
 - Steering committee admitting projects



Plattform Building

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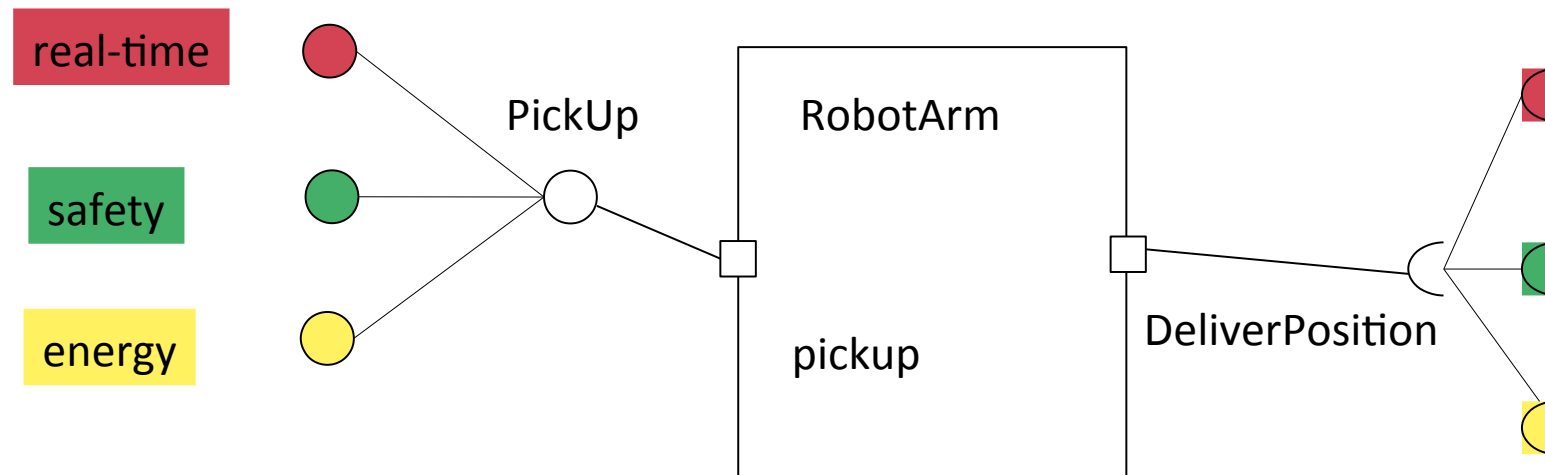


[Prof. S. Strahinger, TU Dresden]

Prerequisites for a CPS Platform

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- ▶ Component model for verification of safety-critical apps
- ▶ Software framework with Plugins/Extensions
- ▶ Extensions must be verified and certified
 - for function
 - for qualities
- ▶ more in CBSE



ResUbic Lab Dresden

Software Aspects

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- Exploring cyber-physical systems (res ubiquie)
- ESF Young Researcher Groups
 - ZESSY: safety-critical cyber-physical systems
 - EDYRA: seamless interaction, personal info services
 - FLEXCLOUD: cloud management
 - VICCI: CPS control and cloud robots
- 6 Mio € 2011-14, ESF, SMWK
- Focus „Smart Office“

