

# CoolSoftware

Energy Efficiency by Intelligent Software Systems

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Bundesministerium  
für Bildung  
und Forschung

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- Project Motivation & Overview
- Architectural Draft
- Research Challenges, Topics & Goals
- Current Tasks
- Conclusion

- Improving energy efficiency is a key challenge for industry and research
  - Energy consumption of IT infrastructures is determined by hardware load and therefore by execution of software
  - Current research projects focus mainly on hardware or single resources
  - Impact of software on energy efficiency has been proven
- Objective of CoolSoftware
  - Optimizing energy consumption of overall IT infrastructures by developing a reconfigurable energy-adaptive application architecture

- Part of CoolSilicon Area 2: CoolReader
- Project Details:
  - Duration: 10/2009 – 09/2012
  - 145 man-months
  - Project Partners:

## Research @ TU Dresden

Multimedia  
Technology Group  
J. Waltsgott



Software Technology  
Group  
S. Cech



## Case Studies @ Industry

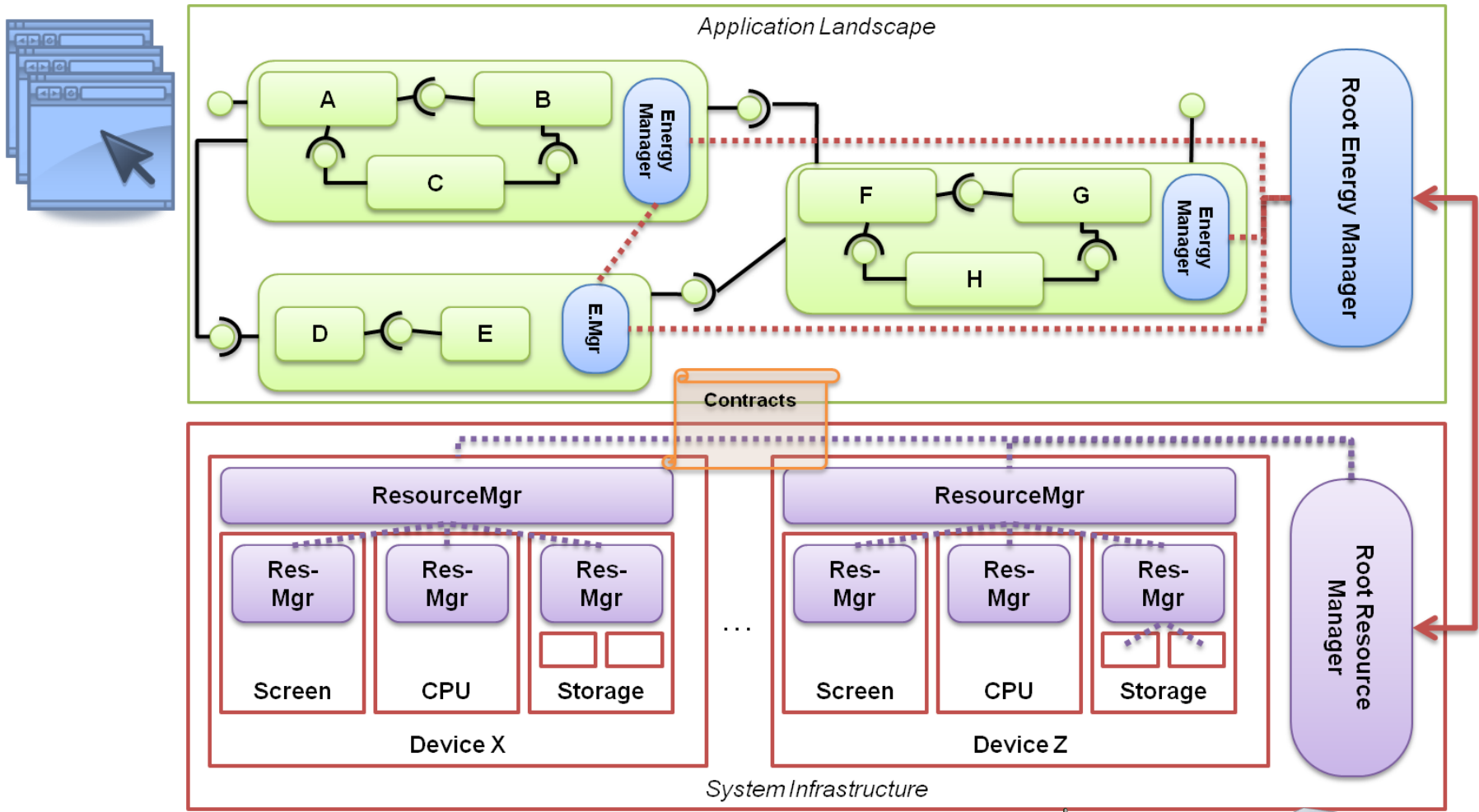
T Systems MMS, Dresden



Point Software and  
Systems, Siegen



# Architectural Draft



- Research challenges & topics:
  - Definition of relevant energy consumers
  - Manner of collection and propagation of energy parameters
  - Level of hardware abstraction/virtualization for Resource Manager
  - Simulation models and tools for HW-/SW-Systems
    - Profiles for energy-adaptive systems
    - Level of model abstraction
    - Evaluation of current simulation tools
- Research goals:
  - Design and specification of Resource Manager
  - Energy Manager – Resource Manager interface definition
  - Generalization of the derived architectural model
  - Energy-aware simulation model

- Component model for energy-adaptive applications
  - Energy consumption of hardware resources controlled by software components at runtime
  - Quality of Service contracts on software components
  - Modeling support for energy-adaptive applications
- Energy Manager
  - Processing of data from resource managers
  - Calculation/Simulation of energy consumption on component level
  - Derivation and quantification of configuration-variants
  - Reconfiguration strategies for software components
  - Optimizing overall energy consumption of IT infrastructures

- Modeling language and tool support for energy-adaptive applications
  - Specification of software components and quality contracts
  - Specification of relevant hardware resources and their energy consumption
  - Modeling process
- Energy Manager specification
  - Calculation of IT infrastructure's energy consumption
  - Decision algorithms for application reconfiguration
  - Reconfiguration strategies in order to save energy
- Evaluation of energy-adaptive applications based on project case studies

- Investigation of energy-relevant hardware resources
- Definition of case studies with industry partners
- Setup of a test infrastructure
- Evaluation of suitable component modeling languages
- Enhancement of an existing quality specification language for specifying energy-based contracts for software components

- Time frame:
  - Over 2 years to go to reach our high goals
- Feedback and co-operation from industrial companies (hardware area) is very welcome
- Exchange of ideas and co-operation with academic research projects are highly appreciated

Thank you  
for your kind Attention!

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