

Breakout Group

- Participants:

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- Objectives: Address the following 3 points:

1. Compelling scenarios and/or applications for sustainability
2. Emerging Research Challenges for scenarios
3. Enabling technologies needed
 - From our community
 - From other disciplines (e.g., control theory, machine learning, biology, psychology, etc.)

Initial Discussions

- Development over time to renew resources used and get rid of waste
 - Lifecycle analysis to understand impact and consumptions
- Discussion on boundary of “sustainable software” and “software for sustainability” – sometimes the boundary is not clear
- Social issues (e.g., parental control, software to affect bullying)
- Design for perfection (taking sustainability into account) vs design for adaptation (monitor and improve)
 - Sensors that know users context and software that can help to make decisions on behalf of users
 - A company may pick a choice that maximizes utility for majority, but adapts to those not (or negatively) impacted

Initial Discussions

- Sustainability =
 - Resource usage
 - Economic impact
 - Social impact
- Many scenarios to choose from
- Need examples from small to large developments
- Challenge: To realize when some action can affect sustainability that user may not realize
 - Building software in a way that influences user awareness of sustainability concerns

Examples Initially Discussed

- Green Conference Organization
- Development of Bridge and its impact on transit behavior
- Sustainable Campus / City
- Smart Home / Grid / *

Five Dimensions of Sustainability

Software contexts – for control and optimization problems

- Software Engineering
 - Re-examine all of our past assumptions in terms of sustainability
- Software Cost energy/algorithms
- Software managing machines (CPS)
- Software simulators
- Modeling society (impact of machines/software has on society)
 - Human Awareness
- A matter of what is being monitored and optimized
- Meta-scenarios

Enabling Technologies

- Self-adaptive and context awareness taken to new levels
 - Micro-DSLs
 - Applied to vacuum cleaners and cyberbullying
- Technologies to optimize over 5 dimensions mentioned previously
 - Composition of model types
 - Stochastic, continuous and discrete models
- Metrics
 - Measure happiness of user populations (social scientists)
 - Big Data – understand combinations of multiple models in presence of uncertainty; see correlations not always causation

Enabling Technologies

- Modularization techniques to separate the core components from the sustainability concerns
- Software/System design workbenches to help with sustainability issues that are challenging to fully automate
 - Notation for design, languages for sustainability