Report:
Dagstuhl Seminar Model-Driven Quality Analysis

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DISTRIBUTED SYSTEMS RESEARCH GROUP
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CHARLES UNIVERSITY PRAGUE
Faculty of Mathematics and Physics
When, Who?

• 30\textsuperscript{th} November – 2\textsuperscript{nd} December
• Organizers:
  ▪ Steffen Becker (FZI)
  ▪ Raffaela Mirandola (Politecnico di Milano)
  ▪ Petr Tůma
• Keynote speakers:
  ▪ Radu Calinescu (Oxford University)
  ▪ Vincenzo Grassi (Università di Roma “Tor Vergata“)
• Ralf Reussner (Karlsruhe Institute of Technology)
• Many participants – doctoral students
  ▪ From institutions in UK, Italy, Germany, Switzerland, Sweden and Czech Republic (Vlasta Babka and me)
Where?

- Germany -> Saarland -> Wadern -> Schloss Dagstuhl
Where?

- Germany -> Saarland -> Wadern -> Schloss Dagstuhl
Why?

- Unfortunately, we did not know exactly in advance...
  - Even if we were asking one of the organizers

- Modeling and predictions of quality attributes
  - Performance
  - Dependability
  - Maintainability

- Discuss contemporary research and projects in the field
- Networking
What?

- The output should be a book
  - Review of related work in a compact form
  - To give an overview on modeling quality attributes
  - Point out how associated topics are related to modeling
    - (measurement)

- 200-300 pages
### How?

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### Monday
- Introduction
- Keynote
- Presentations 1
- Presentations 2
- Presentations 3
- Presentations 4
- Break-up group assignment

### Tuesday
- Keynote
- Break-up groups 1
- Feedback round 1
- Break-up groups 2

### Wednesday
- Feedback round 2
- Book structure
- Seminar feedback
Keynote Talk 1

- By Radu Calimnescu (Oxford University, UK)
- “Online Quantitative Verification for Quality Prediction and Adaptation”
- Background
  - MAPE loop
    - Monitor, Analyze, Plan, Execute
  - Integration of PRISM quantitative verification tool into MAPE loop
    - Reasoning about quantitative properties (uptime, queue length, …)
    - PRISM – probabilistic model checker
      - Uses Markov chains and processes
• General-purpose autonomic computing (GPAC)
• Three stage development process:

  - **Model**
  - **Developer:**
    - Generation of components
  - **Administrator:**
    - Deployment
  - **User:**
    - Set policies
    - Exploitation

• GPAC framework
  - Automation of the process
  - “Application independent autonomic manager”
Keynote Talk 2

• By Vincenzo Grassi (Università di Roma “Tor Vergata”, Italy)

• “The Many Lives of Models”
  ▪ “QoS engineering in complex software systems”

• More visions

• Models at design time vs. models at runtime
  ▪ Differences? The same models?
Keynote Talk 2

- Feedback and adaptation
- Many questions asked
  - And not so many answers
Break-out groups

• Smaller groups to discuss particular fields
  ▪ Up to 7-8 people
  ▪ Foundations
  ▪ Feedback
  ▪ Annotations
  ▪ Measurement
  ▪ Models at design time
  ▪ Runtime – parameter collection
  ▪ Runtime – adaptation
Break-out groups

- Smaller groups to discuss particular fields
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  - Feedback
  - Annotations
  - Measurement
  - Models at design time
  - Runtime – parameter collection
  - Runtime – adaptation
Break-out group: Measurements

• 5 questions
  ▪ Why care about measurement?
  ▪ When (in development cycle) to measure?
  ▪ What to measure?
  ▪ Where to measure?
  ▪ How to measure?

• Why to measure?
  ▪ Putting input data into models
  ▪ Black-box model construction
  ▪ Observation: “We measure what & where & when we can, the models are (in a sense) secondary”
Break-out group: Measurements

- When to measure?
  - At design time
    - Simple operations
    - Only some code available
  - At deployment time
    - Calibration
    - Validation
  - At runtime
    - Autonomic *
    - Model construction
Break-out group: Measurements

• What to measure?
  ▪ System properties
    • Time, timing
    • Resource consumption
    • Fault rate, error rate …
  ▪ Usage profile (data properties)
  ▪ User profile (request rates, …)

• Where to measure?
  ▪ “We measure where we can”
  ▪ Various layers (HW, OS, …)
  ▪ Various places (modules, functions, …)
Break-out group: Measurements

• How to measure?
  ▪ Workload generation
  ▪ Request generation
  ▪ Failure injection
  ▪ Statistics
  ▪ …

• Answering “Why & Where & What” should point to “How?”
  ▪ Only selected scenarios

• Focus on connection to models
• And finally we created a list of responsibilities
Break-out group: Runtime – parameter collection

• “I am not an expert in the runtime” group
  ▪ Surprisingly interesting and inspiring discussion

• What should this part be about?

• Core part of the chapter:
  ▪ Why do we collect different parameters
  ▪ Issues and questions when collecting
Break-out group: Runtime – parameter collection

• Why?
  ▪ Model design or refinement
    • Monitoring – transfer design model into runtime model
    • Recalibration of the model
    • Generation of complete model
  ▪ System analysis and optimization
    • Learn resource demands at runtime
    • Speculation based on history
      ▪ Proactive reconfiguration
      ▪ Branch prediction
  ▪ Model represents (in a way) ideal performance
    • Tuning the system
  ▪ Invalidation of model assumptions
Break-out group: Runtime – parameter collection

• Issues
  ▪ Differentiate Staging time and Runtime

  ▪ In Runtime:
    • Overhead → we have a different system
    • Workload is uncontrollable
    • Trust
    • ...

  ▪ In Staging time:
    • Automation of performance testing has many problems
Book Structure

- Part A
  - Preface
  - Introduction
    - I. Foundations
      - Terminology, models, lifecycle
    - II. Design Models
      - Update of Balsamo et al. survey (VB)
- Part B
  - Introduction
    - III. Runtime/Staging
      - Preface
      - "Runtime Parameter estimations/extraction" (PT, PL)
        - Or maybe into Part C
      - Runtime (prediction) and online evaluation
      - Runtime Adaptation
Book Structure

• Part C: Measurements
  ▪ IV. Techniques (PT, PL)
  ▪ V. Languages/Annotations (VB)

• Part D
  ▪ VI. Feedback
Remarks

• Are they really such experts in everything?

• Courage
  ▪ We invite 20 students in start of their PhD studies and we write a book...

• I find the seminar beneficial
Remarks

• Are they really such experts in everything?

• Courage
  - We invite 20 students in start of their PhD studies and we write a book...

• I find the seminar beneficial
  - A plenty of good food :-)


FOUND!