Quality Prediction (QP) Working Group

"Prediction is very difficult, especially if it's about the future."

Nils Bohr

Andreas Metzger & QP WG Members
London, November 2010
Quality Prediction WG: Why?

• Initiated by observation that many people work on QP
  – S-Cube members: TUW, UPM, UniDue, ...
  – Associate members: IT Innovation, ...
  – External collaborators: SLA@SOI, ...

• Agreement on general problem, but different solutions:
  – Analytical
  – Estimates
  – Machine Learning
  – Design-time vs. run-time

• Understand in where and when the approaches work best
  – compare and contras
  – validate / experiment

• Foster joint research and publications
  – Also with JRA-1.2 (M&A) activities
Quality Prediction WG: How?

- Step 1: Classify the approaches
Quality Prediction WG: How?

- Step 2: Identify Synergies / Joint Research Challenges

<table>
<thead>
<tr>
<th>Approach</th>
<th>Service Consumer</th>
<th>Service Provider</th>
<th>Passive</th>
<th>Active</th>
<th>Q.-Attri.</th>
<th>SBA Layer</th>
<th>Artifact checked</th>
<th>Checked against</th>
<th>Level of Automation</th>
<th>Application Domain</th>
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Quality Prediction WG: How?

- **Further Steps**
  - Publications
    - Joint Journal Articles
  - **Experimentation**
    - 200 kEUR per Experiment on the BONfire facilities
  - **Workshop organisation**
    - Expand MONA+ 2011 to more strongly consider QP
  - **Interrelating with M&A activities (JRA-1.2)**
    - Prediction “method suite” as a building block
  - **More?**
    - ...

Quality Prediction WG: How?

- Step 1: Classify the approaches
### Step 2: Identify Synergies / Joint Research Challenges

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<tbody>
<tr>
<td>Runtime Verif. (UniDue)</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>Performance</td>
<td>SCC</td>
<td>Workflo w</td>
<td>Req, SLO</td>
<td>Full</td>
<td>eGov</td>
</tr>
<tr>
<td>Online Testing (UniDue)</td>
<td>X</td>
<td>-</td>
<td>-</td>
<td>X</td>
<td>Performance</td>
<td>SCC</td>
<td>Service</td>
<td>SLO</td>
<td>Full (modulo Testing techn.)</td>
<td>eGov</td>
</tr>
<tr>
<td>JIT Testing (SEERC / UniDue)</td>
<td>X</td>
<td>(X)</td>
<td>-</td>
<td>X</td>
<td>Protocol (fct.)</td>
<td>SCC</td>
<td>Service</td>
<td>Protocol Spec.</td>
<td>Full</td>
<td>eShop</td>
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<tr>
<td>Static Analysis for S.O.C.</td>
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<tr>
<td>(UPM)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevent SLA Viol. (USTUTT/TUW)</td>
<td>-</td>
<td>X</td>
<td>X</td>
<td>-</td>
<td>KPIs (e.g., delivery time)</td>
<td>BPM, SCC</td>
<td>Post mortem data; live data</td>
<td>KPIs / SLAs</td>
<td>full</td>
<td>?</td>
</tr>
</tbody>
</table>

- **Service Consumer** indicates whether the approach requires the involvement of the service consumer.
- **Service Provider** indicates whether the approach requires the involvement of the service provider.
- **Passive** indicates whether the approach is passive.
- **Active** indicates whether the approach is active.
- **Q.-Attri.** indicates whether the approach focuses on quality attributes.
- **SBA Layer** indicates the specific layer of the Service Business Architecture that the approach targets.
- **Artifact checked** indicates what artifacts are checked by the approach.
- **Checked against** indicates what is checked against the artifacts.
- **Level of Autom.** indicates the level of automation achieved by the approach.
- **Application Domain** indicates the domain in which the approach is applicable.
### Step 2: Identify Synergies / Joint Research Challenges

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<th>Applicatio n Domain</th>
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<tbody>
<tr>
<td>QoS sim. for soft RT sys. (IRMOS) (IT Innov.)</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Performance</td>
<td>SCC/SI</td>
<td>Statechart model</td>
<td>SLO?</td>
<td>Full</td>
<td>Media / Content</td>
</tr>
<tr>
<td>EVEREST+ (SLA@SOI) (CITY)</td>
<td>X</td>
<td>(X)</td>
<td>X</td>
<td>-</td>
<td>SLA (all SLOs)</td>
<td>BPM/SC C/SI</td>
<td>Moni. data</td>
<td>SLO</td>
<td>Full</td>
<td>?</td>
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<tr>
<td>Historical Data (SZTAKI)</td>
<td>?</td>
<td>?</td>
<td>X</td>
<td></td>
<td>?</td>
<td>SI</td>
<td>Grid/Cloud resource, jobs</td>
<td>Original schedule</td>
<td>Full</td>
<td>Grid/Cloud computing</td>
</tr>
<tr>
<td>Soft Constraints in QP (UCBL)</td>
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<td>-</td>
<td>X</td>
<td>-</td>
<td>generic</td>
<td>SCC</td>
<td>Workflow, CSP</td>
<td>SLA, Reqs</td>
<td>Full</td>
<td>?</td>
</tr>
<tr>
<td>Probablistic Reliability Assessment (Polimi)</td>
<td>X</td>
<td>-</td>
<td>X</td>
<td>-</td>
<td>Reliability</td>
<td>SCC</td>
<td>Markov chain model</td>
<td>Probabilistic Reqs</td>
<td>Full</td>
<td>?</td>
</tr>
</tbody>
</table>
Quality Prediction WG: Open issues

• Confidence / reliability / precision of quality of prediction
  – Can we rely on the predictions for triggering „pro-active“ adaptations?
    • E.g., replacing a service provider with another one (rebinding) might incur higher operational costs (e.g., because of a switch from a free to a commercial provider), or exhibit faults which were not observed in the original service.
  – What are the „quality“ indicators for a „reliable“ prediction?
    • Post-mortem assessment of prediction error doesn’t help in determining whether to adapt at the point in time when the actual prediction is made (we need to estimate the prediction error at the time of predicting)

• Testing mode for online testing
  – How can we perform online tests of services without interfering with their state / real world
  – Especially tricky for conversational services and services that are asynchronous / long-running (in which state changes are not triggered by the service users)