Applying the Palladio tool in a SOA Project

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Agenda

- Introduction
- Project Context
- PCM Use Cases
- Conclusion
- Outlook
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Introduction

- An-Institut Technische Universität München
- Application-oriented research institute
- Industry collaboration to improve the applicability of research results in practice

- Performance analysis and prediction
- Performance Management Work
- Focus on complex enterprise applications
Agenda

• Introduction
• **Project Context**
  – Goals
  – Technology
  – Performance Challenges
  – Performance Evaluation Approaches
  – Model Driven Development Process
• PCM Use Cases
• Conclusion
• Outlook
Project Context

Goals

• Current IT landscape
Project Context

Goals

• Target IT landscape
Project Context

Technology

• Oracle WebLogic Application Server 11g
• Oracle Application Development Framework (ADF)
  – JavaServer Faces (JSF) based web-applications using Enterprise Java Beans (EJB)
• Oracle Service-oriented Architecture (SOA) Suite
  – Service Component Architecture (SCA)-based web-service components
  – Sometimes plain web-service implementations
  • Facades in front of legacy systems
• Oracle Service Bus (OSB)
  – Enterprise Service Bus
Project Context

Performance Challenges

• Estimating resource requirements and response times for:
  – User interfaces
  – Enterprise Service Bus (ESB)
  – Web services

• How to handle the dynamic workload?
  – ~13,400 concurrent users of the system between 9 and 12 am during weekdays – otherwise much lower load

• Further challenges:
  – Maximum CPU utilization in production 40%
  – SAML authentication performance
  – Web service operation granularity (ESB roundtrip overhead)
Project Context

Performance Evaluation Approaches

• Load Tests:
  – Evaluate response times and resource utilization for running components

• Performance models:
  – Evaluate the expected response times for the new applications based on monitoring data for existing web services
  – Evaluate architectural changes (e.g. with or without ESB)
  – Capture data about workloads, resource demands and response times
  – Support the sizing process for the new infrastructure-components (especially in the UI-Layer and for the web services)
Project Context
Model Driven Development Process

- Process Representations by the field specialists
- Combining Process and IT Views (e.g. dependency from processes to services)
- Navigation Rules for the UI
- Performance Models

Diagram:
- ARIS - EPC
  - manual transformation
  - MID Innovator
    - automated transformation
    - Oracle ADF Task Flows
      - (semi-)automated transformation
      - PCM
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• **PCM Use Cases**
  – Data Store
  – Use Case Modeling
  – Software Performance Curves
  – Resource Estimation
• Conclusion
• Outlook
PCM Use Cases

Data Store

• PCM models offer a good way to store performance data in a structured form
  – reuse performance data gathered during the software engineering process
  – The ability to make use of this data by simulating the environment motivates people to invest time in it

- Propabilities for user interactions
- Resource demands for specific components
- Response times for different web service operations
PCM Use Cases

Use Case Modeling

- PCM usage models are used to discuss probabilities for using certain functionalities with the users of the system
  - PCM repository models are generated based on ADF Task Flows
  - Probabilities represented in these usage models are used to support the creation of load test scripts as well
PCM Use Cases

Software Performance Curves

• The web services are facades in front of existing legacy systems:
  – No access to the backend (legacy) systems
  – No possibility to install monitoring functionalities

• Introduced in PCM by Alexander Wert, Jens Happe, Dennis Westermann
PCM Use Cases

Resource Estimation

- UI layer is a Java EE web application based on the Oracle Application Development Framework (ADF)
  - JSF, Servlets, JSPs, EJBs, Web services
  - Extract components, component relationships and resource demands from a running Java EE application (different approach than Brosig et al. 2009, 2011)

User Interface (Oracle ADF web applications)

- Components (Java EE-predefined):
  - Servlets, Java Server Pages (JSP), Enterprise Java Beans (EJB)
- Component Relationships
- Components Resource Demand
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- Conclusion
  - What works?
  - What does not work?
  - What can be improved? aka feature wishlist ;-)  

- Outlook
Conclusion

What works?

• PCM allows to create performance models that are easily comprehensible by technical staff in an organisation
  – Thanks to the UML alignment and the different views on the system

• PCM models allow to store performance related information that often will not be documented otherwise

• User behaviour modeling in usage models

• SimuCom works reliable once the model has been established

• Evaluating design alternatives
Conclusion

What does not work?

• Creating repository models and their associated RDSEFFS requires a lot of effort
  – Hard to capture the resource demands for the different components
    • … it is mostly a technical and an organizational challenge to get the required data
    • … sometimes the effort to get the data for PCM is higher than the benefit

• Representing memory would be beneficial especially for sizing Java EE environments

• Some workflow cases can not be properly represented in PCM usage models

• Simulation result visualizations are difficult to use for discussions with non-PCM experts
Conclusion

What can be improved? aka feature wishlist ;-)  

- **RDSEFF and Usage Model Editors** need some enhancements in terms of:
  - Representing branches within branches within branches…
  - Integrating capabilities to stop complete flows on certain conditions (like return to caller)
  - Referencing usage models from usage models (as of today we’re using SEFFs)
- **Often the PCM results do not contain data for all sensors**
  - specific RDSEFF results are missing
- **It would be great to have a downloadable Windows 64bit version**
  - The tool seems to be much more stable and faster on MacOS
- **Better migration support for existing models**
  - Apart from Anne Koziorek’s migration script (e.g. for diagrams as well)
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Outlook

What are we working on?

• Better visualization of the simulation results, e.g.:
  – Generate graphs that are easily comprehendable by non-palladio specialists
    • Instead of exporting results into CSV files and doing it in Excel…
    • Remove ramp up times

• Automated PCM-model creation:
  – From ADF Task Flows for early design cycle discussions
    • Capturing user behaviour
  – From running Java EE applications for resource estimation in later cycles
    • Representing application components and their resource demands
Thanks for your attention!

Questions?
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