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Master Thesis

Visualizing the Execution of Long-Running Activiti BPMN 2.0 Business Process Instances

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Ich versichere hiermit eidesstattlich, dass ich die vorliegende Arbeit selbstständig angefertigt, alle Zitate als solche kenntlich gemacht sowie alle benutzten Quellen und Hilfsmittel angegeben habe.

München, den 13. Juli 2013

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(Unterschrift des Kandidaten)

Zusammenfassung

Diese Arbeit wurde bei der 1&1 Internet AG in München mit dem Ziel angefertigt, die Ausführung lange laufender BPMN 2.0-Geschäftsprozesse zu visualisieren, die in der Activiti Prozess-Engine zur Ausführung gebracht wurden. Mit der Business Process Model & Notation 2.0 gibt es seit 2011 einen Standard, der eine graphische Prozessnotation mit XML-Definitionen für Ausführungsdetails kombiniert. Damit werden Prozessmodelle ermöglicht, die von Personal fachlicher und technischer Natur gleichermaßen verstanden und verwendet werden können. Das erlaubt die effektive Kombination von Prozessmodellen und Ausführungsdaten zum Zwecke einer Prozessinstanz-Visualisierung, was in dieser Arbeit untersucht wird.

Die durchgeführte Auswertung aktueller Forschung zur Prozessvisualisierung und existierender Visualisierungstools zeigt, dass BPMN-Diagramme im Kontext einer Instanzvisualisierung nur oberflächliche Verwendung finden. Anwendungen nutzen überwiegend andere Formen der Datendarstellung wie tabellarische Ansichten oder klassische Schaubilder. Für die systematische Erstellung einer an Prozessdiagrammen ausgerichteten Visualisierung werden zunächst interne Interviews mit Mitarbeitern des Monitorings und Operatings durchgeführt. Anhand der Ergebnisse werden anschließend funktionale Anforderungen abgeleitet und definiert. Die Konzeption der Visualisierung wird mit der Entwicklung einer formalen Definition der aus Activiti-Prozessen extrahierbaren, visualisierbaren Daten vorbereitet. Unter Berücksichtigung funktionaler und technischer Anforderungen wird das Konzept eines Prototyps entworfen und beschrieben, welcher später in die bei 1&1 intern verwendete Monitoring-Software integriert und eingesetzt werden soll.

Anhand des entwickelten Entwurfs wird die Visualisierung implementiert. Der umgesetzte Prototyp [redacted] visualisiert Instanz-Informationen auf dem zugehörigen BPMN 2.0-Diagramm. Er zeigt Ausführungszustand, -dauer und -frequenz sowie Fehler jedes Prozesselements an. Editierbare Prozessvariablen und die Ausführungsstränge (*Executions*) der Engine werden gelistet. Ein Replay-Modus ermöglicht ein schrittweises Nachvollziehen des bisherigen Ausführungsverhaltens. Ein History-Modus visualisiert aggregierte Daten mehrerer Instanzen und erlaubt den Vergleich einer Instanz mit Durchschnittsdaten. Weitere funktionale Anforderungen sind noch zu integrieren, insbesondere Manipulationstools für Operating-Aufgaben. Für detailreichere Daten wird empfohlen, zusätzlichen Code in die Prozess-Engine zu injizieren. Zudem wird vorgeschlagen, weitere Forschung zu rollenabhängigen Perspektiven auf visualisierte laufende Prozessinstanzen zu betreiben.

Abstract

This thesis has been created at the 1&1 Internet AG in Munich with the objective of visualizing the execution of long-running BPMN 2.0 business process instances executed in the Activiti process engine. In 2011, the Business Process Model & Notation 2.0 brought a standard that combines a graphical process notation with an XML definition for execution details, thus enabling process models that can be read and utilized by both business and IT users with equal comprehension. This allows for an effective use of process models together with execution data for the purposes of a process instance visualization, which is examined by this thesis.

An initial evaluation of current research on process visualization and existing process visualization tools reveals that there is only superficial use of BPMN diagrams in the context of visualizing the state of running instances. Current applications mostly use other forms of data presentation, like tabular views and classic charts. For the methodical creation of a diagram-oriented process visualization, several in-house interviews with process monitoring and operating employees are conducted. On the basis of the results, functional requirements are derived and defined. The conception of the application is prepared by the development of a formal definition of visualizable data accessible in Activiti processes. In consideration of the functional and technical requirements, the concept for a prototype is devised and described. The prototype is to be integrated into internal 1&1 monitoring solutions and deployed in the company later.

With the help of the concept, the visualization application is implemented. The realized prototype [redacted] visualizes process instance state information on top of the corresponding BPMN 2.0 diagram. It indicates the execution state of each process element, shows their execution duration and frequency and indicates error occurrences with error details. It shows editable process variables and Activiti execution thread information. A replay mode enables a step-by-step reconstruction of the previous execution behavior. A history mode visualizes aggregated data from multiple instances and enables comparing one instance against average figures. Further functional requirements are still to be integrated, especially manipulation options for process operations tasks. For more detailed visualizable data, the injection of additional code into the process engine is suggested. Furthermore, research on combining role-based perspectives with running process instances is suggested.

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