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Sistedes 2012

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Sociedad de Ingeniería de Software y Tecnologías de Desarrollo de Software

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Editores: Mª Valeria de Castro | José Manuel Gómez | Luis Iribarne

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Prólogo

El presente volumen contiene los artículos seleccionados para presentación en las *VIII Jornadas de Ciencias e Ingeniería de Servicios* (JCIS 2012) celebrado en Septiembre de 2012 en Almería, España.

El principal objetivo de las Jornadas es proporcionar un foro de discusión e intercambio de conocimiento y experiencias en el ámbito de la Ciencia de Servicios. El interés no sólo se centra en los nuevos avances científicos, sino también en las tecnologías existentes en torno a la computación orientada a servicios y los procesos de negocio, las nuevas prácticas de ingeniería de servicios y las lecciones aprendidas por medio de experiencias reales. Las JCIS, que celebran este año su octava edición, son el resultado de la integración de las Jornadas Científico-Técnicas en Servicios Web y SOA (JSWEB) y el Taller sobre Procesos de Negocio e Ingeniería de Servicios (PNIS). Seguir contando después de ocho años, y en el contexto de crisis en el que nos encontramos actualmente, con un foro de encuentro que nos permita intercambiar conocimiento y experiencias entre grupos de investigación de distintas Universidades españolas y profesionales de la Administración Publica y de la Industria, es sin duda un triunfo de nuestra comunidad que debemos y queremos destacar.

En esta edición se han recibido 22 contribuciones para su revisión, de las cuales 4 eran artículos publicados ya previamente en congresos y revistas de reconocido prestigio. Todos las contribuciones fueron revisadas por, al menos, dos miembros del comité de programa. Como resultado de este proceso de revisión, se seleccionaron 14 trabajos largos para su presentación en las jornadas y otros 3 como trabajos cortos. Los trabajos han sido organizados en seis sesiones temáticas dobles que se presentarán a lo largo de dos días de jornadas de los siguientes temas: “SOA, Tecnologías para Servicios Web y Aplicaciones”, “Ingeniería de Servicios” y “Procesos de Negocio”.

Nos gustaría agradecer a todos aquellos que de un modo u otro han contribuido a la organización de estas Jornadas. En primer lugar, a todos los autores de los artículos enviados a JCIS 2012, y a los miembros del Comité de Programa por su disponibilidad y dedicación a la hora realizar las revisiones. Agradecer además a nuestros colaboradores: SRII (Service Research & Innovation Institute), ATI, Novática, INES y la Red Científico-Tecnológica en Ciencias de los Servicios financiada por el Ministerio de Economía y Competitividad. Finalmente, agradecemos a la Sociedad de Ingeniería del Software y Tecnologías de Desarrollo del Software (SISTEDES) y a la organización por parte de los miembros de la Universidad de Almería. Conocemos la dificultad de la organización de este tipo de eventos, y máxime en la situación de crisis económica en la que nos encontramos, por lo que destacamos y agradecemos enormemente vuestro esfuerzo y dedicación en la realización de estas Jornadas.

Gracias a todos y esperamos que disfrutéis de las Jornadas y de vuestra estancia en Almería.

Almería, Septiembre 2012
Ma. Valeria de Castro y José Manuel Gómez
Presidentes del Comité científico

Prologo de la Organización

Las jornadas SISTEDES 2012 son un evento científico-técnico nacional de ingeniería y tecnologías del software que se celebra este año en la Universidad de Almería durante los días 17, 18 y 19 de Septiembre de 2012, organizado por el Grupo de Investigación de Informática Aplicada (TIC-211). Las Jornadas SISTEDES 2012 están compuestas por las XVII Jornadas de Ingeniería del Software y de Bases de Datos (JISBD'2012), las XII Jornadas sobre Programación y Lenguajes (PROLE'2012), y la VIII Jornadas de Ciencia e Ingeniería de Servicios (JCIS'2012). Durante tres días, la Universidad de Almería alberga una de las reuniones científico-técnicas de informática más importantes de España, donde se exponen los trabajos de investigación más relevantes del panorama nacional en ingeniería y tecnología del software. Estos trabajos están auspiciados por importantes proyectos de investigación de Ciencia y Tecnología financiados por el Gobierno de España y Gobiernos Regionales, y por proyectos internacionales y proyectos I+D+i privados. Estos encuentros propician el intercambio de ideas entre investigadores procedentes de la universidad y de la empresa, permitiendo la difusión de las investigaciones más recientes en ingeniería y tecnología del software. Como en ediciones anteriores, estas jornadas están auspiciadas por la Asociación de Ingeniería del Software y Tecnologías de Desarrollo de Software (SISTEDES).

Agradecemos a nuestras entidades colaboradoras, Ministerio de Economía y Competitividad (MINECO), Junta de Andalucía, Diputación Provincial de Almería, Ayuntamiento de Almería, Vicerrectorado de Investigación, Vicerrectorado de Tecnologías de la Información (VTIC), Enseñanza Virtual (EVA), Escuela Superior de Ingeniería (ESI/EPS), Almerimatik, ICESA, Parque Científico-Tecnológico de Almería (PITA), IEEE España, Colegio de Ingenieros Informática de Andalucía, Fundación Mediterránea, y a la Universidad de Almería por el soporte facilitado. Asimismo a D. Félix Faura, Director de la Agencia Nacional de Evaluación y Prospectiva (ANEP) de la Secretaría de Estado de I+D+i, Ministerio de Economía y Competitividad, a D. Juan José Moreno, Catedrático de la Universidad Politécnica de Madrid, presidente de la Sociedad de Ingeniería y Tecnologías del Software (SISTEDES), a D. Francisco Ruiz, Catedrático de la Universidad de Castilla-La Mancha, y a D. Miguel Toro, Catedrático de la Universidad de Sevilla, por su participación en la mesa redonda "*La investigación científica informática en España y el año Turing*"; a Armando Fox de la Universidad de Berkley (EEUU) y a Maribel Fernández del King's College London (Reino Unido), como conferenciantes principales de las jornadas, y a los presidentes de las tres jornadas por facilitar la confección de un programa de *Actividades Turing*. Especial agradecimiento a los voluntarios de las jornadas SISTEDES 2012, estudiantes del Grado de Ingeniería Informática y del Postgrado de Doctorado de Informática de la Universidad de Almería, y a todo el equipo del Comité de Organización que han hecho posible con su trabajo la celebración de una nueva edición de las jornadas JISBD'2012, PROLE'2012 y JCIS'2012 (jornadas SISTEDES 2012) en la Universidad de Almería.

Luis Iribarne
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Colaboradores JCIS

Índice de Contenidos

Chala Invitada

Sesión 1: SOA, Tecnologías para Servicios Web y Aplicaciones
Chair: Dr. José Manuel Gómez

Sesión 2: Ingeniería de Servicios
Chair: Dr. Pedro Alvarez

Sesión 3: Procesos de Negocio
Chair: Dr. Inmaculada Medina

Sesión 4: Ingeniería de Servicios II
Chair: Dr. Vicente Pelechano

Sesion 5: SOA, Tecnologías para Servicios Web y Aplicaciones II
Chair: Dr. Víctor Ayllón

Sesion 6: Procesos de Negocios II
Chair: Dr. Juan Manuel Vara

A proposal on service execution measures for the improvement of business processes realized by services

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Abstract. The realization of business processes (BPs) by means of services provides the basis for separating their definition from the technologies that implement them. Services can implement an activity, a sub-process or a complete BP, and can be integrated easily into the BP execution without the interoperability problems that had to be solved formerly for systems to achieve integration. A key aspect for the improvement of BPs is to measure their real execution to assess whether they are performing as expected, including the services realizing them. We have defined a BP Execution Measurement Model (BPEMM) in the context of MINERVA framework for the continuous improvement of BPs, which provides execution measures for BPs implemented by services. In this paper we present our vision for the measurement of services execution -for internal and external services- invoked from BPs.

Keywords: business process/services improvement, execution measurement

1 Introduction

"Measurement is the first step that leads to control and eventually to improvement. If you can't measure something, you can't understand it. If you can't understand it, you can't control it. If you can't control it, you can't improve it." [1]. This business principle defines the importance of measurement for improvement. An improvement effort has to support the identification of process deficiencies, for which measures for the execution of business processes (BPs), their activities, performance, resources, cost and results have to be defined, implemented, collected and analyzed on a regular basis. It is not enough to provide measures and the means to analyze them, including tool support, it is also essential to align measures with business strategy and business goals for the entire organization, with the ones that are specific to each BP. This will allow interpreting the information collected from their execution correctly.

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The Business Process Management (BPM) [2] [3] [4] paradigm has been used by the business discipline to define, manage, optimize and improve its BPs for many years now, supporting the BP lifecycle [2]. The realization of BPs by means of services with the Service Oriented Computing (SOC) paradigm [5] provides the basis for separating their definition from the technologies implementing them, supporting an horizontal vision of the organization. Moreover, it helps provide a better response to changes in either the definition and implementation of BPs, with minimum impact on the other by adding an intermediate service layer between them, which allows organizations to introduce changes in a more agilely way [6] [7].

MINERVA [8] framework is focused on the continuous improvement of BPs realized by services with a model-driven approach, based on their execution measurement. To provide support for the latter, we have defined a Business Execution Measurement Model (BPEMM) providing execution measures for BPs and services, and a process to guide the improvement effort, initially defined in [9]. In this paper we present our vision for the measurement of services execution, organized as follows: in section 2 the services execution view of BPEMM is presented, in section 3 the tool support for BPEMM execution measures analysis is shown. In section 4 related work is presented and in section 5 conclusions and future work are discussed.

2 Services execution view of BPEMM

BPEMM has been defined based on the Goal, Question, Metrics (GQM) [10] paradigm, the primary focus being first on understanding BPs business goals (i.e. performance, results, costs, etc.) and then measuring their business results against these goals. Following the GQM, several Goals are defined for the business and BPs with associated questions and execution measures, which are specified using the Software Measurement Ontology (SMO) [11] with base, derived and indicator measures. BPEMM is organized in a tridimensional way: Execution views (Generic BP, Lean BP and Services), "Devil's quadrant" dimensions (time, cost, flexibility and quality) [12] [13] and Granularity levels (activity instances, BP cases, BP). The service view contains measures regarding the execution of services realizing BPs, taking into account the Quality of Services (QoS) requirements for this type of software. Services measures are based on quality attributes such as: performance (i.e. response time: processing time and latency, throughput, capacity), security (i.e. confidentiality, integrity), dependability (i.e. availability, reliability), as defined mainly in [14] [15] [16]. Due to space limitations, in the following we present as an example execution measures for the time and quality dimensions.

2.1 Time dimension

To calculate the measures corresponding to the services execution view in the time dimension we have defined six times of interest for the activities and services execution to be registered in the BP execution. In the first place, in the BP activity we log the defined enabled time (t_1), the start time (t_2) corresponding to when a service is invoked, and the complete time (t_6) corresponding to when the service returns an

answer after processing the request. This is done in the same way as if they were times for manual activities, the only difference being that the resource executing it is a service. In the second place, in the service itself or in the infrastructure executing it, we need to log the times in which it received the invocation (t_3), starts its execution (t_4), and completes its execution (t_5), sending the result to the BP. These defined times are shown in Fig. 1. When we do not have the data on services execution, we can nevertheless use the times registered from the point of view of the BP, to obtain bounds for the response time, which includes communication latency, as well as latency and processing times. In Table 1 services execution measures defined for the time dimension - Response Time are shown.

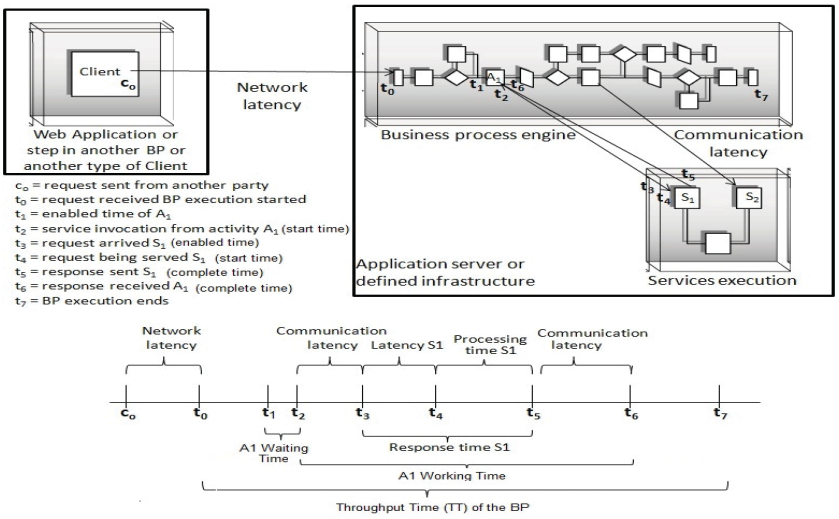

Fig. 1. Defined times for services execution and BP activities

Table 1. Measures for Service execution view & time dimension - Response Time

Goal	G1	**Guarantee (average) service response time to (L1) seconds (L1 label to be changed)**
Questions	Q1	**What is the actual (average) response time of the service**
Measures	M1 (base)	Invoke time of a service from BP (IT=timestamp in activity=ST)
	M2 (base)	Enabled time of a service (ET = timestamp in service)
	M3 (base)	Start time of a service (ST = timestamp in service)
	M4 (base)	Completion time of a service (CT = timestamp in service)
	M5 (base)	Failed time of a service (FT = timestamp in service)
	M6 (base)	Answer time from a service to the BP (AT=timestamp in activity)
	M7 (derived)	Service processing time (SPoT = CT - ST)
	M8 (derived)	Service latency time (SLaT = ST - ET)
	M9 (derived)	Service response time (SRpT = SPoT + SLaT)
	M10 (derived)	Service answer time from the BP (SAnT = AT - IT)
	M11 (indicator)	Service Processing time vs. Service Latency time index (STI = SLaT/SPoT) Decision criteria = Index DC

Goal	G1	**Guarantee (average) service response time to (L1) seconds (L1 label to be changed)**
	M12 (indicator)	Average service response time in all BP cases (ASRpT=∑(SRpT/
	M13 (indicator)	Total service executions all BPs) Decision criteria=Index DC Average service answer time in all BP cases (ASAnT=(SAnT /Total service executions all BPs) Decision criteria=Index DC
Decision criteria	Index DC	R1: 0<=TTI<= L1="LOW"=GREEN; R2: L1<= TTI< L2="MEDIUM"=YELLOW; R3: L2<= TTI="HIGH"=RED

2.2 Quality dimension

Most of the services execution measures data can only be gathered by implementing the log of the base measures in the services and/or the infrastructure, which is true for all quality attributes in this dimension, for example dependability. In Table 2 an example of service execution measures defined for the quality dimension regarding services availability and reliability of the dependability quality attribute.

Table 2. Measures for Service execution view & quality dimension – Dependability

Goal	G1	**Guarantee (A1) availability for the service (A1 label to be changed) - Dependability**
Questions	Q1	**What is the actual availability of the service**
Measures	M1 (derived)	Service downtime (SDT = ET - FT being ET the time when the service is back up, i.e. enabled again after failing)
	M2 (derived)	Total service downtime over the period P1 (TSDT=∑SDT in P1) Service Availability over the period P1(SA=(P1-TSDT)/ P1*100)
	M3 (indicator)	Decision Criteria = Percentage SR DC
Goal	G2	**Guarantee (R1) reliability for the service (R1 label to be changed) – Dependability**
Questions	Q1	**What is the actual reliability of the service**
Measures	M1 (base)	Number of service execution initiated in period P1 = NSEIP
	M2 (indicator)	Service Reliability (SR = NSECP/NSEIP*100) Decision criteria = Percentage SR DC (NSECP = service exec completed in P1)
Decision criteria	Percentage SR DC	R1:0<=TTI<=L1="LOW"= RED; R2: L1<= TTI< L2="MEDIUM"=YELLOW; R3:L2<= TTI="HIGH"=GREEN

3 Tool support for BPEMM execution measures analysis

BPs execution analysis is a key activity if we want to be able to find improvement opportunities for the BPs and the services realizing them, based on the measurement results from their execution. The ProM framework [17] applies process mining techniques on execution event logs to analyze BPs execution, for which we have developed our own prototype plug-in to support the BPEMM execution measures proposal, the ProM BPEMM plug-in. It provides support for the analysis of BPs and services execution, calculating and visualizing the execution measures in BPEMM. We have implemented for now only the time dimension of the BP Generic execution

view, so only the bounds for the service execution (as presented in section 2.1) can be analyzed from the BP activities point of view. This is shown in Fig. 2 for the activity "Receive request appointment" of the BP "Patient Major Ambulatory Surgery (MAS)" from the Hospital General de Ciudad Real (HGCR), which is implemented by a service, showing the waiting, working and total execution time in each BP case.

Fig. 3. ProM BPEMM plug-in time measures for the activity invoking a service

4 Related work

Several approaches exist for measuring services QoS characteristics, where several quality attributes and definitions are put together in [14], and a taxonomy for each one is defined. In [15] these quality attributes are analyzed in the context of a Service Oriented Architecture (SOA) providing specific insight into several characteristics that have to be taken into account when assessing services execution. [16] proposes several measures for QoS for Web Services (WS). Our work integrates existing concepts and execution measures mainly from the proposals above, adapting them for services realizing BPs, to provide a complete view on BPs execution for both manual and automated activities invoking services. Several other works have been analyzed but due to space limitations we have selected the most important for us.

5 Conclusions and future work

The BPEMM execution measurement model provides a set of measures for the execution of BPs realized by services, with a tridimensional organization based on three execution views: Generic BP, Lean and Services; the "Devil's quadrant" dimensions of time, cost, quality and flexibility and a three hierarchy level of

execution (activity instances, BP cases and BP). We have presented here the ones corresponding to the services execution view, providing our vision on the execution of BPs realized by services, which allow us to measure services execution both from the point of view of the BP invoking services, and within services themselves, when they are internal to the organization. This provides a complete view on the execution of BPs and their implementation with services, helping to find improvement opportunities, which are then integrated to generate a new version of the BP following the improvement activities we propose (not presented here). We have developed a prototype for the calculation and visualization of BPEMM execution measures for the ProM framework, the ProM BPEMM plug-in, and we are now extending it to include all the defined measures, to be able to assess the complete proposal in a case study.

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