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Process Quality of Service Specification

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Extended Abstract

Workflow management systems (WfMSs) have been used to support various types of business processes for more than a decade now. In e-commerce processes, suppliers and customers define a binding agreement or contract between the two parties, specifying quality of service (QoS) items such as products or services to be delivered, deadlines, quality of products, and cost of service. Management of such QoS directly impacts success of organizations participating in e-commerce. Organizations operating in modern markets require an excellent degree of quality of service management. Products and services must be available to customers with well-defined specifications. A good management of quality leads to the creation of quality products and services, which in turn fulfill customer expectation and achieve customer satisfaction. Therefore, when services or products are created or managed using workflow processes, the underlying WfMS must accept the specification, be able to predict, monitor, and control the QoS rendered to customers. To achieve these objectives the first step is to develop an adequate QoS model for workflow processes.

QoS models have been deployed for various domains, such as networking, multimedia, and middleware. Our past work on deploying workflow applications made use aware of the need for workflow process QoS management. Additionally we realized that workflow processes have a particular set of requirements, which are domain dependent and that needs to be account for when creating a QoS model. Other researchers have also identified the need for a QoS process model. A good example is DAML-S specification, which supplies an ontology to semantically describe business processes (as composition of Web services). The use of an ontology allows and facilitate process interoperability between trading partners involved in e-commerce activities. The specification includes constructs to specify quality of service parameters, such as quality guarantees, quality rating, and degree of quality. While DAML-S has identified specification for Web service and business processes as a key specification component, the QoS model adopted should be significantly improved to supply a realistic solution to its users. One current limitation of DAML-S' QoS model is that every process needs to have QoS metrics specified by the user, and so far it does not provide a solution for the automatic computation of QoS metrics of processes based on sub-processes' QoS metrics.

Let's try to better understand the impact and span of this problem. Workflows and processes are often composed of tens to hundreds of sub-processes (also known as composite process or network tasks). Processes can be represented using a tree structure, where the root node corresponds to the main or top process, and the intermediate nodes and leaves correspond to sub-process and atomic processes (also known as atomic tasks) respectively. We believe that QoS metrics should be specified for the leaves (atomic processes) if at all possible. Then, using an appropriate algorithm, the QoS values of the leaves are used to compute QoS value for intermediate nodes (sub-processes) until the root node is reached. For organizations setting the QoS for an atomic process can be a complex procedure, but far more complex is to compute the QoS of a process composed by hundreds sub-processes. Our work targets this computation, which based of atomic task' QoS attributes, computes the quality of service for process automatically. The use of such methodology to derive QoS for processes has one important requirement-- the quality dimensions represented in the QoS model needs to be computable, i.e. it must exist as a function at each node of the process tree that can be applied to its children. From this observation we developed a QoS model for which all its dimensions are computable. We have investigated relevant work to determine which dimensions would be relevant to compose our wQoS model, and based on previous studies as well as our experience in the workflow domain, we have constructed a model composed of the following dimensions: *time*, *cost*, *fidelity*, and *reliability*. We hope this work will provide an input to the area of Web service specification related standards efforts, as well as E-services and process realization though composition of Web services.