Proposition de recherche doctorale

A QoI-aware Framework for Adaptive Monitoring

Mots clés :

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Résumé du projet de recherche (Langue 1)

Computing systems has undergone a clear shift towards a larger scale. Highly distributed systems are the standard, people and companies have now a pervasive access to a massive and continuous information flow through a wide variety of devices and systems. While high-level protocols attempt to tame the fast evolution of hardware and software technologies, challenges of reliability, flexibility, openness and 24/7 availability lead to crucial needs of dynamic control and adaptation over all large-scale distributed systems. In this context, monitoring application services becomes more and more a transverse key activity. Beyond traditional system administration and load control, new activities such as autonomic management and decision making systems raise the stakes over monitoring requirements. These systems are now organized around Service Level Agreements referring to some Quality of Service (QoS) criteria. With very different systems consuming monitoring data, requirements on these data also vary in terms of lifespan, precision or granularity. This is referred as Quality of Information (QoI), i.e., an expression of the properties required from the monitored QoS. While monitoring systems with different objectives are proposed to tackle some of the identified issues, the contribution of this PhD thesis is ADAMO, a QoS-aware framework for ADAptive MOnitoring. This framework tackles user provided quality of information (QoI)-aware data queries over dynamic data streams and transforms them into probe configuration settings under resource constraints. In a monitoring system, trade-offs are often needed between QoI, which is required by decision making systems, against system resources when too high QoI impairs system performance. Multiple consumers also tend to share data sources with different on QoI requirements. Thus, the proposed framework relies on a constraint-solving approach in order to provide static and dynamic mechanisms with flexible data access for multiple clients with different QoI needs, as well as generation and configuration of QoS and QoI handling components. Besides, the ADAMO framework factors out the common structure and behavior of monitoring systems in component architecture, so that they can be reusable and extensible. It also provides several extension points which can be altered to support new features. Different parts of the architecture are configurable, or can be partly generated from high-level descriptions of the monitoring requirements. The monitoring framework also dynamically adapts itself to resource constraints. This self-adaptation mechanism is built using all mechanisms of the framework itself, therefore illustrating its own capabilities. Keywords: Monitoring, Adaptive systems, Quality of information, Component framework