Application driven IT service management for energy efficiency

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The impact of IT on the energy consumption is continuously increasing and IT is becoming a major energy consumer. Such trend is due not only to the pervasive diffusion of information systems, but also to the availability of IT services of common use, such as for instance search engines, file sharing, and social networking services. The cloud computing paradigm is starting to provide a basis for new ways of providing services over rented resources from infrastructure providers (Zhang et al., 2010). While offering the possibility of providing services more easily and without the need of heavy infrastructure investments by service providers, these trends are increasing the need of managing efficiently large computer centers: energy consumption becomes an important item of cost and also a limitation if the power supply is not adequate for serving requests in peak times.

In this abstract we focus in particular on the proposal of managing resources at all levels in a service center based on two main approaches: a) a flexible management of resources based on an intelligent information system for providing a context-aware adaptive behavior in the data center; b) a deep knowledge of the services provided in the service center, to be able to anticipate their needs of resources and manage them in an energy-efficient way (e.g., Ardagna et al., 2008, Ferreira et al., 2009).

Starting from the discussion introduced in (Watson et al. 2010), we propose a first analysis in the following table, to analyze some of the proposed research questions considering service centers and different aspects to be considered when managing information for a more efficient use of computing resources. In the following, we generalize the concept of sensor network to a more general concept of monitoring, the flow network in this case are service networks, sensitized objects are requested applications run in the service center. The information system in this case is an IS for assessment and control to drive the adaptive behavior of the service center.

	Monitoring	Service center	IS for assessment and control	applications
RQ 1: What is the optimum level of information granularity of the sensor network to optimize a given flow network?	Sensors, energy consumption models, aggregation of monitored information	adaptivity actions in the service center at different granularity levels	Evaluation of Green Performance Indicators (GPI) at different level of granularity	QoS requirements for applications and their components services, define optional services

RQ 2: What information granularity enables effective enforcement of energy policy?	Design the minimal monitoring infrastructure	Enable context-aware adaptivity actions	dependencies among GPIs	strategical and tactical goals
RQ 3: What information, and at what level of granularity, is required to optimize a given type of flow network?			Context-aware energy management rules (at application, platform, infrastructure and facility levels)	
RQ 4: What government policies and regulations will impel flow network managers to make them more energy efficient?		Eg apply EU code of conduct for data centers		
RQ 6: How can an information system integrate supply and demand data to increase energy efficiency?			Manage resources at a global level, considering both performance and energy efficiency	applications annotations to characterize energy consumption profile
RQ 9: What information do consumers need about the usage of the objects they own or manage to increase their energy efficiency?				needed resources for each application

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