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Abstract

Modern environmental monitoring and decision support systems are based on complex IT infrastructures comprising multiple hardware and software subsystems that need to provide a variety of Quality of Service (QoS) guarantees required for *urgent computing* services, essential in emergency situations. Such IT infrastructures need to be managed in order to maintain the quality of service, which – especially when operating in the urgent mode – involves optimization of multiple, often conflicting, objectives and making trade-offs between them. Existing approaches do not solve this issue optimally because they focus on delivering quality of service within individual subsystems in isolation. We propose a holistic approach to system management which takes into account knowledge about the system as a whole – in particular the interplay of conflicting objectives and configuration options across all subsystems. We argue that such an approach produces a better configuration of the involved subsystems, improving the resolution of trade-offs between cost, energy and performance objectives, leading to their better overall fulfillment in comparison with the non-holistic approach in which individual subsystems are managed in isolation. We validate our approach using a prototype implementation of the holistic optimization algorithm – the Holistic Computing Controller, and applying it to

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