

Accepted Manuscript

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PII: S0167-739X(16)30257-6
DOI: <http://dx.doi.org/10.1016/j.future.2016.08.007>
Reference: FUTURE 3120

To appear in: *Future Generation Computer Systems*

Received date: 11 April 2016
Revised date: 12 August 2016
Accepted date: 13 August 2016

Please cite this article as: B. Balis, R. Brzoza-Woch, M. Bubak, M. Kasztelnik, B. Kwolek, P. Nawrocki, P. Nowakowski, T. Szydło, K. Zielinski, Holistic approach to management of IT infrastructure for environmental monitoring and decision support systems with urgent computing capabilities, *Future Generation Computer Systems* (2016), <http://dx.doi.org/10.1016/j.future.2016.08.007>

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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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