

Autonomic Computing: Research Challenges and Opportunities

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The wide deployment of Internet technology has resulted in exponential growth in Internet application services (e.g., content hosting for data with web-based access, shared payroll applications, firewall-based security services, email and shared file services). The management and control of these application services is a challenging research problem due to the huge amount of data that needs to be collected and coordinated, the heterogeneity and the independence of resources and components required by these services and the fact that they run under different organizations and administration policies. This complexity has led to a situation where the cost to manage such systems is actually a lot more than the actual systems themselves. Consequently, the growing complexity of the IT infrastructure threatens to undermine the very benefits information technology aims to provide.

A potential solution to these challenging research problems is Autonomic Computing that calls for designing distributed information systems that can automatically configure, deploy, secure, tolerate faults, optimize, and anticipate loads by themselves without the manual involvement of human administrators. This approach has been inspired by the human autonomic nervous system that has the ability to self-configure, self-tune and even repair themselves without any human conscience involvement. The concept of developing the next era of computing systems is driven by the convergence between the biological systems and the digital computing systems. In this presentation, I will review the basic principles of autonomic computing, related research projects in industry and academia and future research directions and opportunities. In addition, I will describe our on-going research projects to develop *Autonomia: An Autonomic Control and Management Environment*.