

Self-Organising Server Virtualisation

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Abstract:

Biological and natural systems are characterised as self-organising, adaptive and versatile. They offer an approach to addressing the increasing scale and complexity of human engineered systems. The talk will focus on designing self-organising server virtualisation technique for internet hosting centre by bio-mimicking a biological system.

Internet hosting centre co-host services on servers that are leased by its customers on a pay-per-use Service Level Agreement (SLA). A hosting centre thus must virtualise its servers amongst host services to maximise revenue on an ongoing basis. Optimising server virtualisation is challenging because of the limited number of servers, costs of migrating from one service to another, and unpredictability of future request loads.

The hosting centre virtualisation problem is remarkably similar to a problem in the natural world. Honey bee colonies must gather enough nectar during the summer to survive the winter. The colony must virtualise its foragers through orchestration amongst available flower patches to maximise nectar influx. We expose many close parallels between the two problems. Based on this homology, we develop a self-organising server virtualisation technique which dynamically orchestrates servers to satisfy the dynamic and unpredictable internet request loads.

We use trace data from a commercial service provider and synthetically generated requests to evaluate the virtualisation technique's performance. The experimental results show that our technique performs very well, indeed better than a conventional greedy and an omniscient static techniques, for highly variable request loads. In contrast, it is outperformed for some low variability access patterns. This suggests that real Money bee colony forager orchestration, which is suboptimal for static food sources, possesses a counterbalancing responsiveness to food source variability. Additional experimental tests find that the self-organising virtualisation technique is more resilient than the conventional greedy technique.