Bio-inspired Future Service Environments

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The rise in the popularity of the Internet over the last number of years has been phenomenal. Driven by increasing numbers of users, networked devices and services, the Internet has developed into a dominant social tool as well as a critical business environment. A number of trends in research today (e.g. Service Oriented Architectures) point towards a Future Internet which is very much service centric, with large numbers of diverse, dynamic and distributed services. At the same time, the move towards cloud and utility-based computing models, as well as the emergence of resource-light mobile devices, suggest a Future Internet highly reliant on large-scale data-centres.

A service centric Future Internet such as this brings with it a number of significant management challenges for the operator/provider. In our work it is proposed that a biologically-inspired service model is capable of helping solve many of these issues, in an autonomic and distributed manner. This model is applied to a number of service management problems that will be particularly pertinent to Future Internet service environments. Specifically, service discovery, service composition, and service load balancing and adaptation are discussed, where biological mechanisms are used to autonomically alleviate some of these issues. Finally, the growing problem of the sustainability and energy consumption of the Internet is addressed, which is exacerbated by the increasing reliance on power-hungry data-centres. In particular, the ability of bio-inspired services to migrate is exploited, in order to move service workload to data-centres with better renewable energy profiles and cooling efficiency.