

## Exascale Data Center

### Exascale Computing Lab

The next decade will mark the beginning of the “exascale” computing era, during which computing systems will be designed to perform an exponential increase in calculations, called floating-point operations or “flops.” While the fastest machine today has a peak performance of approximately 1 petaflop, the new breed of machine will operate in exaflops – 1,000 times faster than a petaflop – handling  $10^{18}$ , or a million trillion, flops per second.

In the exascale era, as more applications and services move into the cloud and run on ever-larger-scale data centers, it will become increasingly important to minimize the total costs of deploying, operating and managing complex computing infrastructures. A rich collection of new applications will continually raise the bar for data center performance, manageability, flexibility and reliability.

To meet these challenges, researchers at HP Labs, the central research and development arm of HP, are working to create a next-generation data center infrastructure that will deliver a significantly improved customer experience at dramatically lower costs.

The core of this exascale data center will be a radically efficient, flexibly managed computing substrate. A computing substrate consists of the hardware and the lowest levels of the software stack that, together, support a mix of applications of all sizes and kinds.

The exascale data center’s substrate will be composed of cost-efficient compute building blocks – the products of the systematic redesign of today’s platform elements – that can be dynamically shared and configured as needed to meet specific workloads. As well as reducing costs, these building blocks will be optimized for future developments in power and cooling technology, and ready for dynamic, flexible configuration and deployment. An intelligent management layer will coordinate the building blocks and dynamically monitor and manage resources for global efficiency and enhanced capabilities.

The Exascale Data Center project will achieve this ambitious vision through interdisciplinary research spanning fields such as platforms architecture, networking, virtualization and management software. From the start, this radical rethink of the data center incorporates efficiency, management, sharing and dynamism in the design of the system, leading to better economy, scalability and manageability.

The project can give HP technology leadership in three important growth areas: developing markets, small- and medium-sized businesses and Web 2.0 applications – all of which require significantly lower costs.

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