



Intel's vision for the ongoing shift to cloud computing

Cloud computing promises large gains in efficiency and flexibility at a time when demands on data centers are growing exponentially. Intel's vision for the future of this technology focuses on key principles to make the vision a reality.



Rather than a revolution, cloud computing is an important transition, a paradigm shift in IT delivery. Cloud computing has the potential to transform the design, development, and deployment of next-generation technologies—enabling flexible, pay-as-you-go business models that reach from mobile platforms to the data center.

The cloud computing model is a step beyond virtualization, one driven by the ever-increasing demands placed on data centers. Initially, virtualization allowed organizations to consolidate server infrastructure to help reduce costs. Next, resource management technologies enabled dynamic resource allocation to help further reduce costs while increasing flexibility and performance. Now, cloud computing offers automation and scalability to help organizations rapidly deploy and optimize use of resources, increase operational efficiency, and reduce costs. In Intel's vision of cloud computing, a fully realized cloud infrastructure can provide competitively significant IT agility, flexibility, and adaptability through systems that are efficient, simplified, secure, and based on open standards.

Key elements of cloud computing

Intel's vision for cloud computing over the next five years centers on three key characteristics (see Figure 1):

- **Federated:** Data and services should move easily within and across cloud computing infrastructures. Today, the industry is just reaching the point where enterprises can move workloads within and between their own data centers. Intel's cloud computing vision calls for a level of federation that enables data and workload migration between service providers, burst implementations between internal private cloud and public cloud providers, and secure and reliable data flow across vendors, partners, and clients.
- **Automated:** Cloud computing services and resources should be specified, located, and securely provisioned with little or no human interaction. Today, the industry faces many gaps in automation. Intel's cloud computing vision calls for automation that dynamically allocates resources to agreed-upon service levels and optimizes the data center for maximum resource utilization and power efficiency.
- **Client aware:** Cloud computing solutions should adapt seamlessly to end-user devices and usage

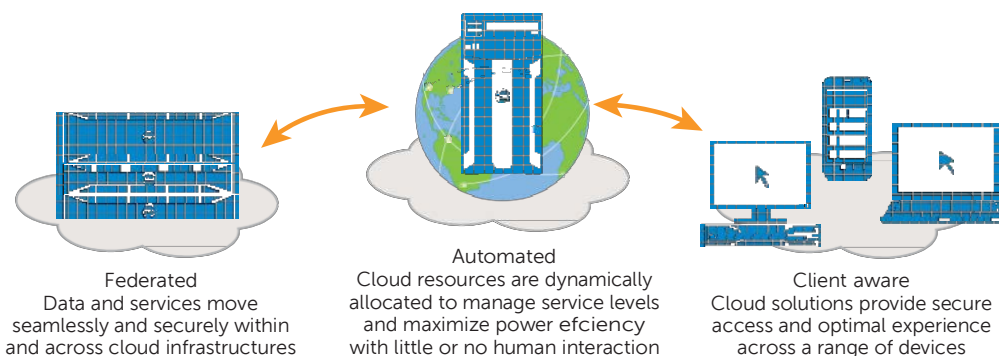


Figure 1. Intel's cloud computing vision

models. Today, some frameworks exist that allow a certain level of this intelligence, but they are neither consistently applied nor ubiquitous. Intel's cloud computing vision calls for data centers and service providers to enable secure access and optimal experience across a range of devices by making the cloud knowledgeable about attributes such as device capabilities, location, policies, and connectivity.

Principles for evolving infrastructure

Intel believes that, to realize the full potential of cloud computing, individual organizations and the IT industry as a whole must focus on four principles:

- **Efficiency:** While the need for computing throughput increases exponentially, resources such as space, power, cooling capacity, qualified IT professionals, and funding for infrastructure and operations are limited. Doing more with existing resources requires increased infrastructure and process efficiency.
- **Simplification:** Multiple architectures complicate management, increased server utilization raises network bandwidth requirements, and systems from different vendors often present integration complications. To deliver on their promise, cloud architectures and practices must simplify IT.
- **Security:** In an environment with abundant traditional security issues, cloud computing creates new challenges by moving data in new ways, often outside traditional physical boundaries. Successful cloud computing requires new security models to meet these challenges.

- **Open standards:** When multiple providers act independently, poor interoperability and lack of flexibility are the natural results—directly contradicting the main promises of cloud computing. The evolution of cloud computing requires carefully constructed open standards that support increased interoperability.

Intel's role in achieving the cloud computing vision

To help meet the challenges that IT architects and managers face, Intel is providing leadership and advancing efforts based on each of these four principles. A prime example is the Intel® Cloud Builder program. Created by Intel in conjunction with key independent cloud software vendors—including Canonical, Citrix, Enomaly, Microsoft, Parallels, Red Hat, Univa, VMware, and others—this program delivers cloud reference architectures that combine Intel Xeon® processor-based servers with leading software to help simplify cloud infrastructure deployment.

Intel's efforts extend across the cloud computing ecosystem, from silicon to platforms to software architecture to data center design. And by bringing engineering resources, a large network of global relationships, significant market development investments, and industry-specific expertise, Intel also acts as a major catalyst working with the industry to develop effective, open standards. This combination of vision and know-how can be immediately useful to IT professionals as they consider and implement their own cloud computing infrastructures. ^{PS}

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