

Kurt Salmon ✨



Demystifying the cloud

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INTRODUCTION

Cloud computing has been a high-profile topic among technology professionals for the past two years. Publications covering cloud computing have emphasized the public cloud offerings by companies like Google, Salesforce and Rackspace as an easy and cost-effective way to obtain application functionality.

However, cloud computing has much deeper implications for CIOs and their organizations. It bridges the gap between the need for more flexibility from users—location independence, ubiquitous access and efficient utilization of computing resources—and CFOs' need for fewer capital expenditures spent on IT to allow for more investments elsewhere in the company. By becoming a cloud services provider to their internal customers via a private cloud, IT organizations can provide better service at reduced cost and position their enterprises to be more agile and resilient organizations.

The transition to a private cloud impacts everything from the hardware, software, and storage in the computer centers to the skills, roles and responsibilities of IT personnel, as well as the governance processes by which the enterprise manages itself. This paper provides a clear path through the transformation, using insights drawn from real world experience. The simple but profound framework of “simplify, rationalize, optimize” provides both the broad perspective and the crucial first steps needed to achieve the benefits of the cloud inside the enterprise firewall.

The framework presented in this paper can enable IT organizations to set the direction and pace for the transformation to cloud computing, reach organizational maturity and achieve the most that the cloud model—public and private—has to offer.

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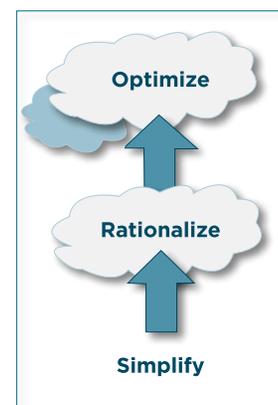
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DEMYSTIFYING THE CLOUD

Cloud computing is a high-profile topic for technology executives faced with increasing complexity of business support requirements, continued proliferation of applications and databases, constraints on capital expenditures, problems of brittle infrastructure and difficulties in attracting and retaining skilled technical expertise. A well-implemented cloud strategy has the potential to provide solutions for many of the most vexing problems facing IT organizations. At the same time, it will lead IT organizations to realign their relationship to the business and in many cases, their fundamental value proposition.

Coverage of cloud computing in popular literature has been dominated by discussions of the public cloud and commercial offerings from so-called cloud service providers such as Salesforce or Google. However, for enterprise IT organizations, most of the benefits of cloud computing will initially be realized through the aggressive adoption of cloud computing as an internal services delivery platform—first simplifying computing resources and then rationalizing software and data assets to create a private cloud. With the governance, risk management and compliance knowledge that results from the experience of implementing a private cloud, the enterprise can further optimize by leveraging the benefits of public cloud services in a way consistent with its corporate practices.



The resulting federated cloud architecture, which combines private and public cloud computing to optimize service delivery for business users, provides numerous benefits to the enterprise. Chief among them is better service to the user population and improved economics. User service is improved in this time of increased mobility and expectations of immediate service by the cloud's ability to seamlessly support self-service provisioning and to provide services anywhere that an internet connection is available. Economics are improved through more efficient allocation and use of computing resources and by a shift of budget from fixed capital expense to variable expense based on subscription or usage-based payments.

The capabilities of cloud computing will provide direct benefits to business and IT stakeholders. It will also accelerate changes already underway in the relationship of IT organizations to the businesses they support. Businesses, freed by ubiquitous standards-based access to business functionality, will increasingly source automation from third parties while focusing precious development resources on high-value differentiating capabilities. IT executives will spend less time on acquiring and managing physical resources and more time on evaluating and managing the providers of virtual resources. The transformation will change the role and the makeup of IT organizations while creating the environment for better alignment and partnership between business and IT.

In this paper we briefly discuss some key trends that make adoption of cloud computing a business imperative and subsequently outline the crucial initial steps in formulating a cloud computing strategy and initiating its successful implementation. In the strategic adoption of cloud computing for the enterprise, the first few steps are critical as the insights gained from the initial bottom-up effort will establish the governance policies, processes and practices that are essential to operate in concert with technology to create success.

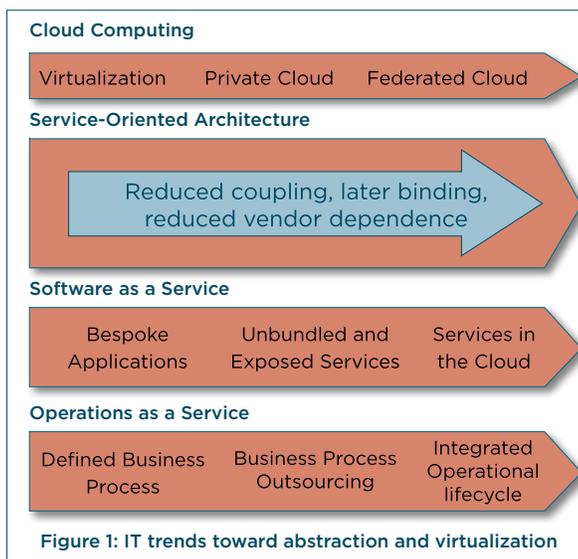
Cloud Computing—By Any Name, Inevitable

Cloud computing is a paradigm for allocating and delivering computing resources. It has emerged in response to business and technology pressures that are continually at work forcing change and adaptation.

As an approach for transparently providing hardware resources, software and information using internet technologies, cloud computing is the natural next step in the continuing process of abstraction and virtualization, depicted in Figure 1, which also includes Service-Oriented Architecture, Software as a Service (SaaS), and Operations as a Service. In the cloud, the details of physical processors, storage, software and geographical location are abstracted away from the consumers of computer services. Users of cloud-based services need not have expertise in creating or maintaining a technology infrastructure. Rather, they can provision new computing service capabilities accessed using Internet technologies through the web in the case of public cloud providers or via an intranet, in the case of a private cloud.

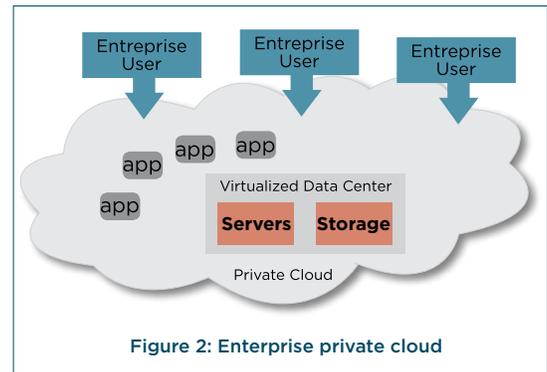
Market forces require business to continually innovate new products and services to maintain differentiation in an increasingly dynamic marketplace. Business responds by both creating differentiation through internal development as well as by exploring outside its walls for third party sources of innovation. The Information Technology that supports the business is similarly driven to continually innovate. IT organizations must keep pace with the insatiable demand of the business for new capabilities while simultaneously supporting the ever-growing catalog of existing capabilities and managing costs to remain competitive. Like business, technology organizations are increasingly looking beyond their firewalls for partners in providing technology capability to help cope with the pressures to innovate and control costs. The technology industry has responded to these challenges by

providing enhanced operability through definition and adoption of standards—the most pervasive of which are the standards that allow for ubiquitous connectivity through internet technologies—and by widespread support for practices such as virtualization that allows technology providers to logically separate and independently manage technology capabilities from the physical infrastructure providing those capabilities.



Private Clouds

As a capability within an IT organization, cloud computing enables a company to implement virtualized services that can be efficiently and economically delivered to its business users via a self-service model and independent of physical location. A private cloud implementation, like the one shown in Figure 2, is one where an enterprise IT organization retains the computing and network infrastructure as well as the technical expertise needed to maintain it.



This will become the new norm for IT organizations in response to the macro trends of omnipresent service, more rapid innovation, increasing standardization and relentless cost pressure. Private cloud computing uses the power of the cloud model to deliver “anytime, anywhere” benefits to its business users while taking full advantage of corporate infrastructure for data security, governance, and reliability. In addition, enterprises that create the internal infrastructure for offering their own applications via a private cloud will be well-positioned to best leverage the capabilities of the public cloud.

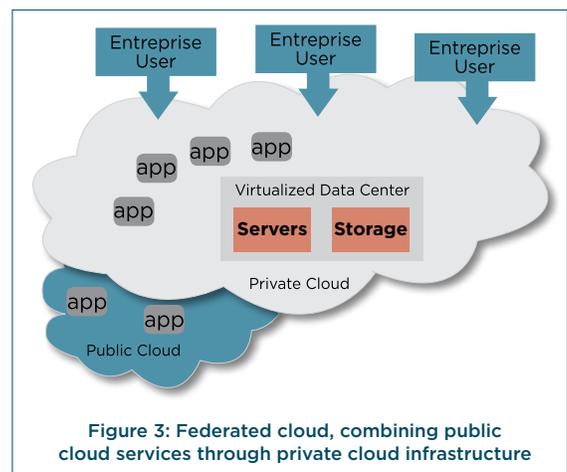
Public Cloud

Public cloud computing providers maintain computing infrastructure and technical expertise to provide business applications accessed by users via a web browser. In typical public cloud applications aimed squarely at business customers wishing to maintain an asset-light approach to computing infrastructure, users dynamically provision processor and storage capacity and software access on a self-service basis over the Internet and are billed depending on the business services they use, typically with a simple subscription or usage-based billing model.

The heart of this market today provides standard business software—groupware, customer relationship management, productivity tools—for small- to medium-sized businesses. However, thanks to market pressures prompting software vendors to unbundle and open application interfaces, standards of interconnection and interoperability such as web services and the increased attractiveness of SaaS encouraging vendors to create multi-tenant configurable software, business can look forward to an increasing catalog of standard services made available via the public cloud.

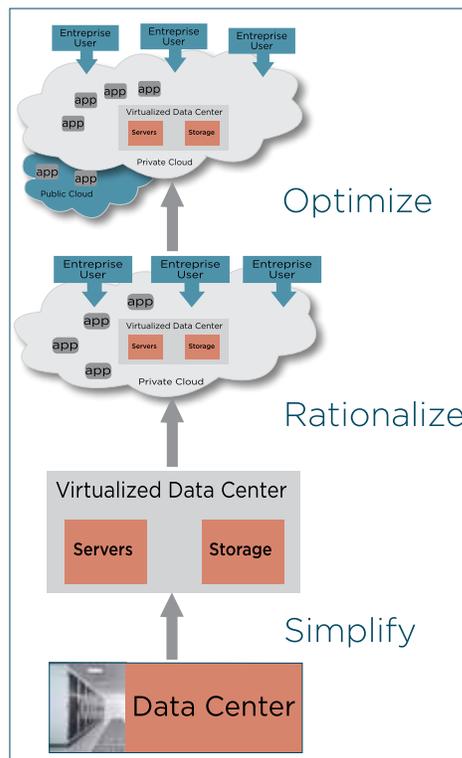
Federated Cloud

To be able to create the best technology response to business requirements, enterprises will increasingly extend the “build or buy” decision process to include rapid and seamless integration of cloud-based applications. As shown in Figure 3, such new applications could be deployed internally in the company’s private cloud where the existence of cloud infrastructure has the benefit of reducing the time, cost and effort of an internal deployment. Alternately, they might be accessed beyond the company’s firewall in a public cloud, in which case the company’s IT organization assumes responsibility for the management of a vendor relationship as well as stewardship of company data.



Getting Started

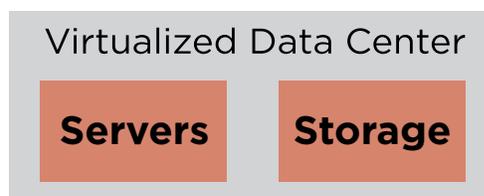
Enterprises with significant existing infrastructure and a large application portfolio will find that the federated cloud is the logical long-term solution for balancing the requirements of highly differentiating proprietary technologies and commodity computing needs. Private cloud infrastructure will provide the benefits of virtualization and all-around access. Market-differentiating services will likely remain in-house, but by designing them for delivery by the enterprise private cloud, organizations that do not provide differentiating enterprise value will be able to leverage standards to more rapidly create and disseminate functionality. Over time, standard application services will be sourced from public cloud-based providers, with IT organizations responsible for management and protection of information, intellectual property, configuration and security management and service level assurance. Also, some enterprise bespoke application services could be candidates for monetization via deployment in a SaaS model which can be delivered internally via the enterprise private cloud or externally by federation to one or more public clouds.



Creating a federated cloud from a collection of existing data centers and traditional software deployment models requires transformation of physical and logical infrastructure as well as of the business processes, policies and practices that govern the interaction of the IT organization and its business users. As we discuss in subsequent sections, each step of this transformation carries significant and measurable business benefits. Cost efficiencies allow the transformation to be largely self-funded. In addition, the governance and management lessons learned from implementing an enterprise private cloud will reveal the organizational governance maturity needed to incorporate the best of the public cloud while maintaining necessary controls on intellectual property and user service levels.

Simplify

The efficiencies promised by cloud computing are predicated on the sharing of common infrastructure by multiple entities. Cloud computing requires creation of virtual slices of computing resources from clusters of servers and storage devices according to the specific needs of specific users. The virtual resources are initially allocated according to the requirements of the intended users and can subsequently scale as user needs change. There is substantial benefit to both the business and the IT organization in implementing virtualization in storage, servers, databases, and operating systems.



With increasing independence from physical servers, the business can expect an improvement in service levels, resulting in better availability as well as more uniform access to necessary business services. Virtualized infrastructure creates greater resilience in business services. Additionally, using this stage of the transformation to introduce new pricing models for business automation services such as usage-based pricing gives the business more options to manage its automation-related costs and creates the environment for a fundamental rethinking of the relationship between business and IT.

At the same time, IT benefits from improved efficiencies through simplification of its infrastructure and standardization of certain services. To the extent that the resulting standardization affords the CIO the opportunity to right-source providers of computing resources and support services, IT should expect capital budget savings and efficiency of scale in its operating expenses. The overall reduction in complexity improves technical resilience while the reduction in capital and operating expenses results in lower computing costs for the business.

The simplification activity prior to creation of a private cloud is not solely a technical exercise. Rather, it is the initial stage of a transformation in how technology supports the business, comprising changes in technology infrastructure and in the business processes and governance surrounding applications. It is therefore important to engage stakeholders in working groups tasked with revisiting, revising and adopting new policies, processes and practices:

- Data Protection
- IT Services
- IT Budgeting and Service Costing
- Service Levels
- Intellectual Property Management
- Vendor Contracting and Management

Rationalize

With the availability of a virtualized infrastructure platform capable of supporting enterprise applications, the next step of the journey is the selection and migration of existing users and applications into this new infrastructure. Deployment of the existing application portfolio into the virtualized environment is essentially the creation of the private cloud for the enterprise. As illustrated, the creation of the private cloud in the virtualized infrastructure necessitates availability of some additional management capabilities on top of the virtualized servers and storage:

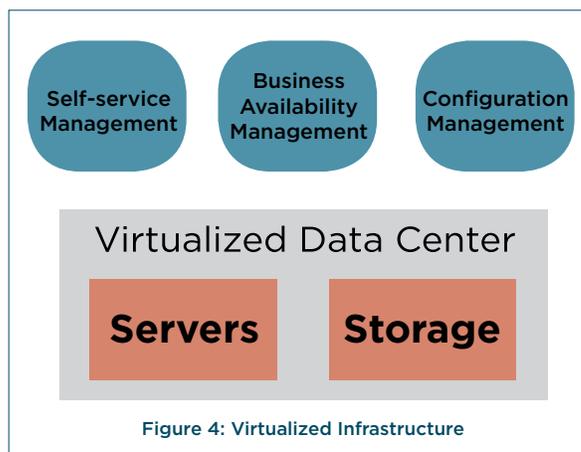


Figure 4: Virtualized Infrastructure

- **Self-Service Management**—providing users the tools required to support their business needs. This can be as simple as provisioning servers and storage required to ready an environment for a development project, or more complex such as self-service provisioning of a groupware environment for a new team.
- **Business Availability Management**—in a multi-tenant environment where server, storage and network hardware is shared among multiple users, it is critical to understand the business impact resulting from a physical event such as a server failure. By understanding the mapping between supported business activities, application components, databases and physical hardware, business availability management creates and maintains the virtual intelligence of service impacts.
- **Configuration Management**—with self-service administering of new service, cancelling of existing service and dynamic scaling of computing resources based on demand from active services, the amount of computing resources required from the underlying physical resources is in constant flux, with defragmentation and reconfiguration of servers and storage an ongoing challenge. Robust configuration management provides the information needed to intelligently re-stack applications and databases within the physical environment, optimizing server and storage usage and creating a more efficient and effective computing environment.

Along with the management capabilities in Figure 4, the private cloud will require additional security and compliance controls—processes and possibly tools that were identified in the stakeholder working groups formed in the Virtualization phase. These include core policies and practices for:

- Service-Level Management—agreements for setting, monitoring and managing service levels to business users including legal templates and practices for vendor contracts and relationships and service standards;
- Security Management—even in the private cloud behind the enterprise firewall, data protection is a core capability of allowing successful migration of applications from standalone servers and databases to a multi-tenant environment. Policies for management of intellectual property are also important as the possibility arises of using protected corporate properties for the configuration and operation of applications that exist outside the enterprise security boundary;
- IT Budgeting and Service Costing—one of the main advantages of cloud computing is the opportunity for the business to better control its costs through variable costing. This can affect the process for determining IT budgets, and could require that software for metering and billing be incorporated into the environment.

During rationalization there must be a coordinated program to “flatten the network” through planned network convergence and rationalization of firewalls and protection boundaries. What is found in most enterprises is a hodge-podge of firewall protected sub-networks which must be transformed to a more centrally managed open internal network, with security and protection migrating to the application and data level. This is needed to create the universal connectivity expected in a private cloud.

In concert with the network transformation will be a selection of a first set of applications most suitable to migration onto the new virtualized infrastructure and for delivery through the new enterprise private cloud. Selection and prioritization of candidate applications will be a shared effort with business and IT working groups creating criteria and then characterizing and grading applications for suitability. Best practices provide dozens of important criteria including:

- Business criticality
- Business revenue attributed to the application
- Annual total cost of ownership
- Potential security and compliance risks

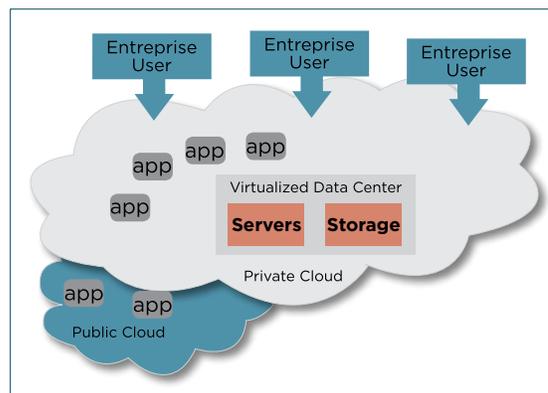
There is substantial benefit to both the business and the IT organization in the implementation of private cloud services and the careful but aggressive migration of applications. Business users will benefit from greater flexibility and accelerated time to market for new applications and capabilities. Businesses will be able to leverage the standards-based environment to access external applications providing business capability that can be rapidly branded and deployed. Conversely, businesses will be able to explore opportunities for alternative revenue streams or business models from existing intellectual property, offering internal applications via Software as a Service, or entire business processes via Operations as a Service.

The IT organization will benefit from the streamlined infrastructure which allows for faster provisioning of new service, greatly reduced time and effort for operations and maintenance and better management of security and availability. Numerous applications running in a highly virtualized environment provides for better allocation of computing resources and gives the IT organization more options for scaling resource availability rapidly to meet demand. Additionally, through robust configuration management and the proactive capacity management it enables, IT organizations will be able to more effectively manage capacity upgrades through a standard process.

Optimize

Successful creation of the private cloud accomplishes several crucial elements needed for leveraging the advantages of public cloud services via the federated cloud:

- Establishment of firm policies for protection of data and control of intellectual property;
- Business awareness of the benefits and costs of cloud-based resources, and a selection and prioritization methodology for determining candidates for the public cloud;
- Standards-based infrastructure and application policies optimally positioned to take advantage of cloud-based resources;
- Policies and practices for setting, monitoring and managing service levels in a highly virtualized environment.



With these underpinnings in place, the Optimization phase of cloud implementation involves continued migration of internal applications into the private cloud infrastructure and an ongoing process of evaluating, selecting and migrating appropriate application functionality to the public cloud, or sourcing it from the public cloud.

During this ongoing Optimization process, the IT organization will lead the work required to extend existing processes, policies and practices:

- Vendor management—qualification of cloud vendors and streamlining of contract processes, including standard contract provisions;
- Security and compliance policies and controls, including legal opinions—regulatory environments specific to industries and geographies create external constraints that are important considerations before placing corporate resources beyond corporate boundaries in a public cloud implementation. Such considerations will become a standard way of doing business in the emerging cloud environment;
- Internal workforce policies—increasingly, managing the “workforce” will focus on coordinating the availability and activities of knowledge workers
- Extension of workload mobility—within the constraints already noted, public cloud resources have the potential to provide “on demand” capacity elasticity

Commitment to the federated cloud delivery model offers substantial benefit to both the business and the IT organization. The business will be increasingly free to choose service providers based on quality of service and cost effectiveness, with less emphasis on the mechanics of software development and more on core business functionality. With the increased availability and control of intellectual property, there will be greater freedom in its prudent use, lowering barriers to enter new businesses and pursue opportunities. Business will benefit from the greater agility and reduced costs as it continues its pursuit of innovation and differentiation.

The IT organization will be transformed into a leaner and more agile organization, better aligned with the business in providing optimal solutions to business needs. The location and vendor independence offered by the cloud model will allow the IT organization to better optimize its service offerings as well as its computing and support resources.

CONCLUSION

Enterprises with significant existing infrastructure and a significant application portfolio will benefit from a federated cloud architecture that combines the benefits of the private and public clouds. Initially, implementing a private cloud provides infrastructure simplification and increased business agility. Selectively leveraging new functionality and business models available from the public cloud decreases costs and further increases business agility and resilience.

Cloud computing will also lead to realignment and revitalization of the relationship of IT to the business as the business benefits from greater choice and flexibility while the IT organization transforms into a leaner organization with greater emphasis on managing service levels, information, intellectual property and security.

As we have illustrated in this paper, the transformation to the federated cloud is a pragmatic, bottom-up effort. First, simplify a data center to accommodate the sharing of common infrastructure by multiple entities so important to the cost benefits of cloud computing. Next, rationalize the computing environment through selection and migration of existing users and applications into the new virtualized infrastructure, creating the private cloud for the enterprise. Finally, optimize the cloud strategy by continued migration of internal applications into the private cloud infrastructure, and by implementing an ongoing process of selective sourcing from public cloud providers.

The resulting federated cloud optimizes service delivery and improves the economics of providing technology capability to business users. The cloud's ability to seamlessly support self-service provisioning and to provide services anywhere that an internet connection is available increases user satisfaction in this time of increased requirements for mobility and immediate service. At the same time, economics are improved through more efficient allocation and use of computing resources, and by a shift of budget from fixed capital expense to variable expense based on subscription or usage-based payments. Together, improved economics and user service create the environment for increasing business innovation and differentiation and enhancing overall enterprise performance.

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