
What You Need to Know About Cloud Computing

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Cloud Computing Myths



Myth: Only megaproviders will win.

- **Fact:** There are diminishing returns to economies of scale, there are many fragmented markets that have good enough scale for smaller providers, and innovation makes provider agility a critical offsetter to size.



Myth: There will be a "big switch."

- **Fact:** There will be a slow migration (including development of private cloud services), the migration will take decades, and even then quite a bit of IT will stay in-house; in fact, most of the interesting stuff will be hybrid models.



Myth: Cloud computing is IT commoditization.

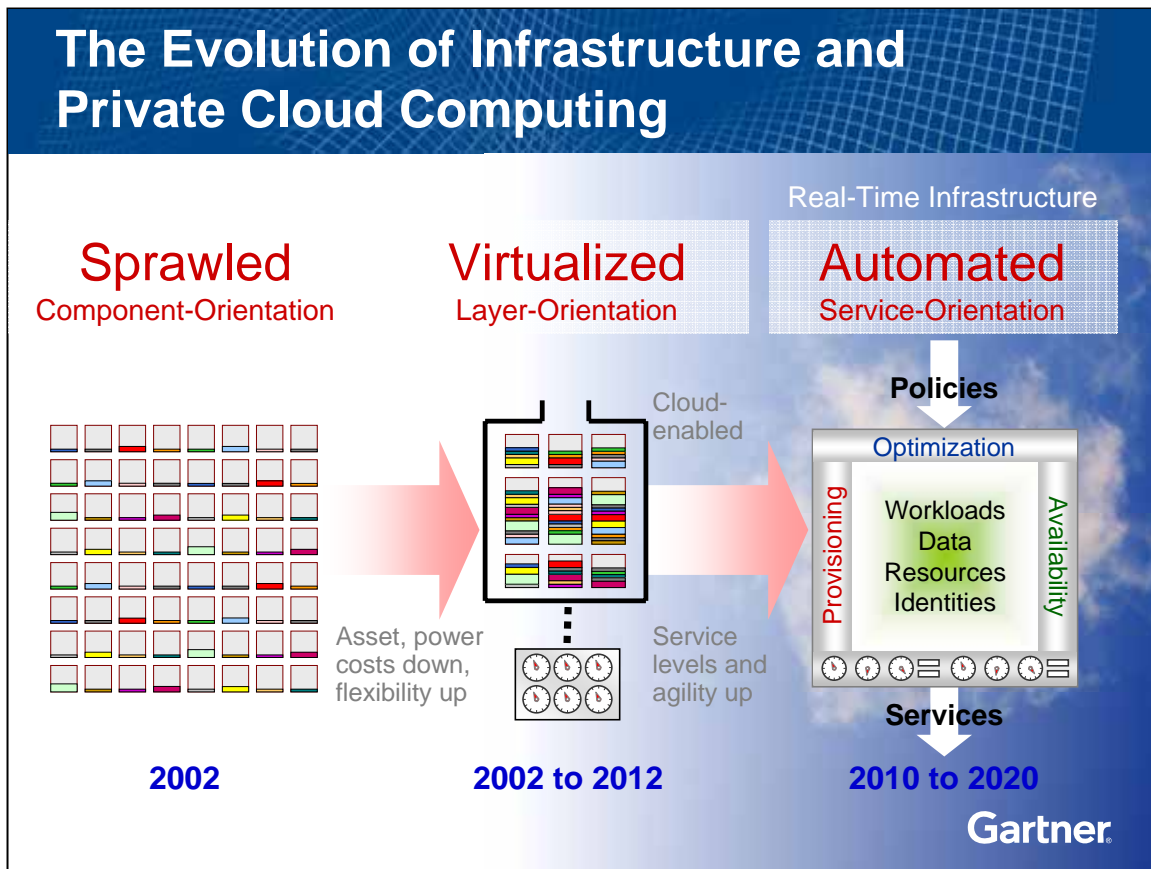
- **Fact:** While services offered in the cloud may be commoditizing, the *usage* of those services may not — new, innovative businesses, proprietary analysis of data in the cloud, etc. — *new applications matter*.

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Key Issues

1. What is cloud computing, and how will it evolve?
2. What is private cloud computing, and when should enterprises leverage it?

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Virtualization is having a huge impact on infrastructure architectures, processes and operations, people and skills, and the business. It will be the most important and impactful trend in infrastructure and operations through 2012 — changing how you manage, how/what you buy, how you deploy, how you plan and how you charge. It also shakes up the industry, in terms of licensing, pricing and component management. Infrastructure is on an inevitable shift from components that are physically integrated by vendors (for example, monolithic servers) or manually integrated by users, to logically composed "fabrics" of computing, I/O and storage components. However, virtualization is only an enabler to very important future trends. Virtualization creates a pool of manageable, flexible capacity. Automation and service centricity will take that pool of resources and do useful work based on business policies and service-level requirements. Also, the decoupling created by virtualization, combined with defined service offerings and automation, are great enablers of cloud computing. Essentially, real-time infrastructure (RTI) is a private cloud computing engine. The infrastructure engine in cloud service providers will be RTIs. Yet, more than that, the services-oriented interfaces created between an RTI and its customers enable an IT organization to leverage external cloud services, where appropriate. Cloud computing is the inevitable result of a service provider evolving to RTI, and the best customers of cloud computing will be startups, or IT organizations that are evolving toward RTI.

Strategic Guideline: Virtualization is a modernization catalyst, driving many of the same changes required for an effective cloud computing service relationship — especially cultural changes.

Virtualization Is a Modernization Catalyst and Unlocks Cloud Computing

Enables Economies of Scale

- Technology that enables sharing
- *Cloud-ready efficiency*

Decouples IT from Users

- Enables service-oriented shift
- Enables alternate sourcing
- Culture change
- *Cloud-ready interface*

Speed and Elasticity

- Low barrier to entry
- Faster deployments
- Rapid reaction to change
- *Cloud-ready speed*

Breaks Software Pricing and Licensing

- Fractional use, consolidated
- Dynamic change and movement
- Vendors realize — just don't want to be first
- *Cloud-ready software pricing*

Enables and Motivates Chargeback

- From fixed to variable use
- Danger of frictionless computing
- *Cloud-ready IT costing*

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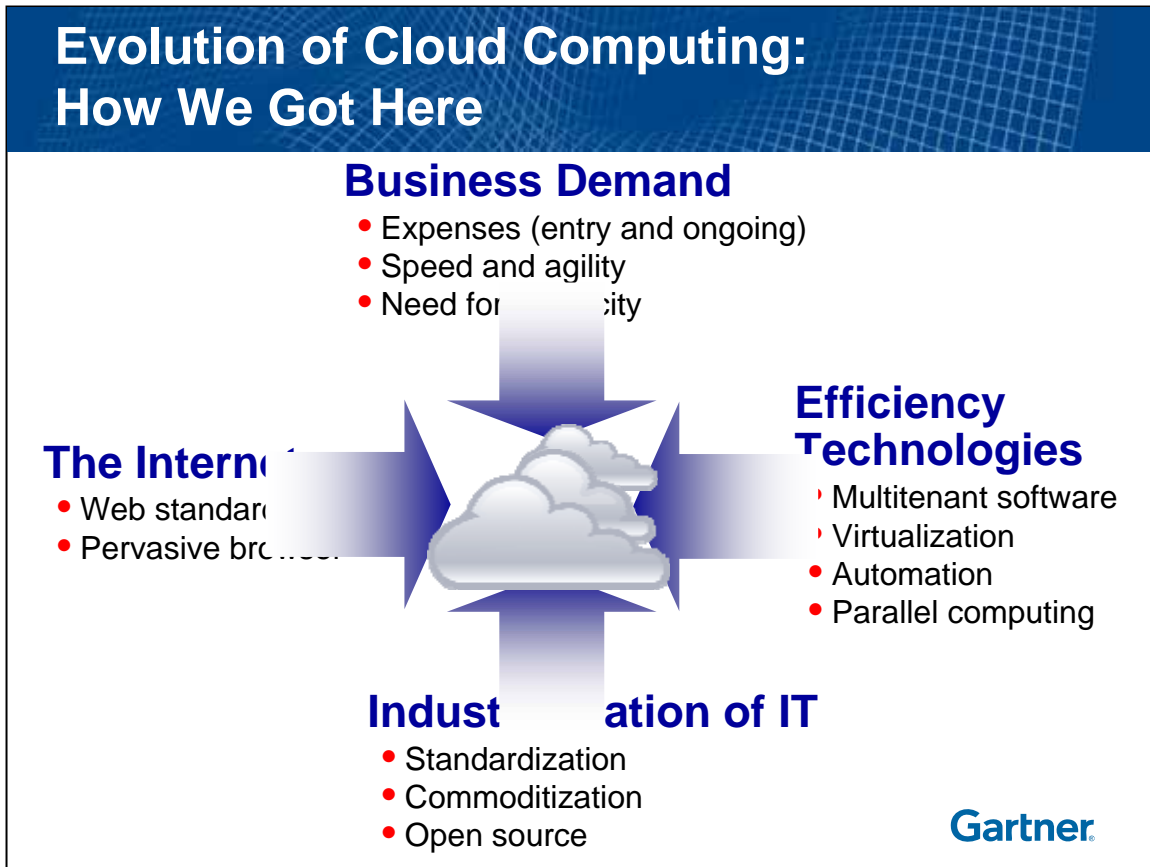
Key Issue: What is cloud computing, and how will it evolve?

Virtualization is not cloud computing, but it enables and forces the same changes required to effectively leverage cloud computing. Perhaps, the most important aren't even technology changes — they are cultural. For example, virtualization forces users to let go of the physical implementation of their services, and deal with their provider in terms of service levels and results. Many organizations don't have service-level agreements in place, and rely instead on constant interaction with their internal providers to ensure the right performance levels and resolution of issues. When your provider becomes a cloud computing provider, that intimacy is simply not there, and users will need to do a more complete job of describing their requirements in service terms.

Most organizations don't do chargeback. IT is considered a cost center, and is generally centrally funded. Cloud computing services are, by definition, charged based on usage (unless they are subsidized by advertising). Therefore, users need processes to manage their usage and pay per use. Virtualization is driving many organizations to mechanisms for usage-based accounting, and quite a few of them are moving to a full chargeback model.

What You Need to Know About Cloud Computing

Cloud computing is not simply the natural evolution of the Web — cloud computing is also being driven by changing business requirements (especially agility), the industrialization of IT (especially in terms of standardization and open source), and technologies that enable economies of scale.

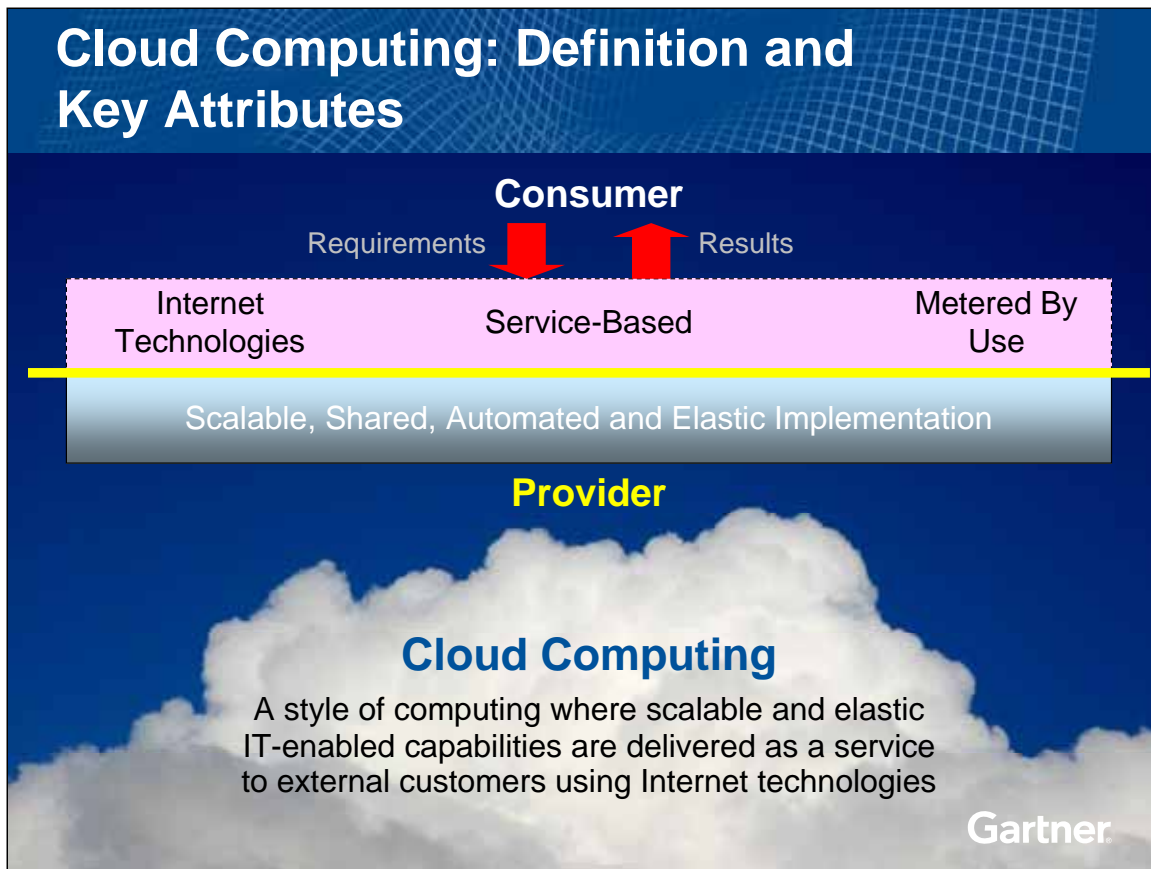


Key Issue: What is cloud computing, and how will it evolve?

The cloud computing phenomenon seems to have appeared in the market out of nowhere. Although the term is new (coined by Eric Schmidt of Google), the concepts are a natural evolution based on evolving technologies in infrastructures (mainly virtualization), new application technologies (Web 2.0 and parallel processing architectures, such as Hadoop), and expanding network connectivity and bandwidth. Leveraging these technologies, companies such as Google have built a new business model, currently subsidized mainly by Web-based advertising. Google has created a massively parallel architecture that can run queries on very large databases — for mapping, for Web search and so on. Many startup companies have leveraged "mega-data centers," such as SmugMug, using Amazon's Elastic Compute Cloud (EC2) and Simple Storage Service (S3). Although cost is a potential benefit for small companies, the biggest benefit is the built-in elasticity and scalability of cloud computing — not only reducing their barrier to entry, but also enabling these companies to grow quickly. As certain functions in IT are industrializing and become less customized (e-mail, for example), there are more possibilities for larger organizations to benefit from cloud computing, especially to offset their expenses in data center space and power.

What You Need to Know About Cloud Computing

Definition: Cloud computing is a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using Internet technologies.



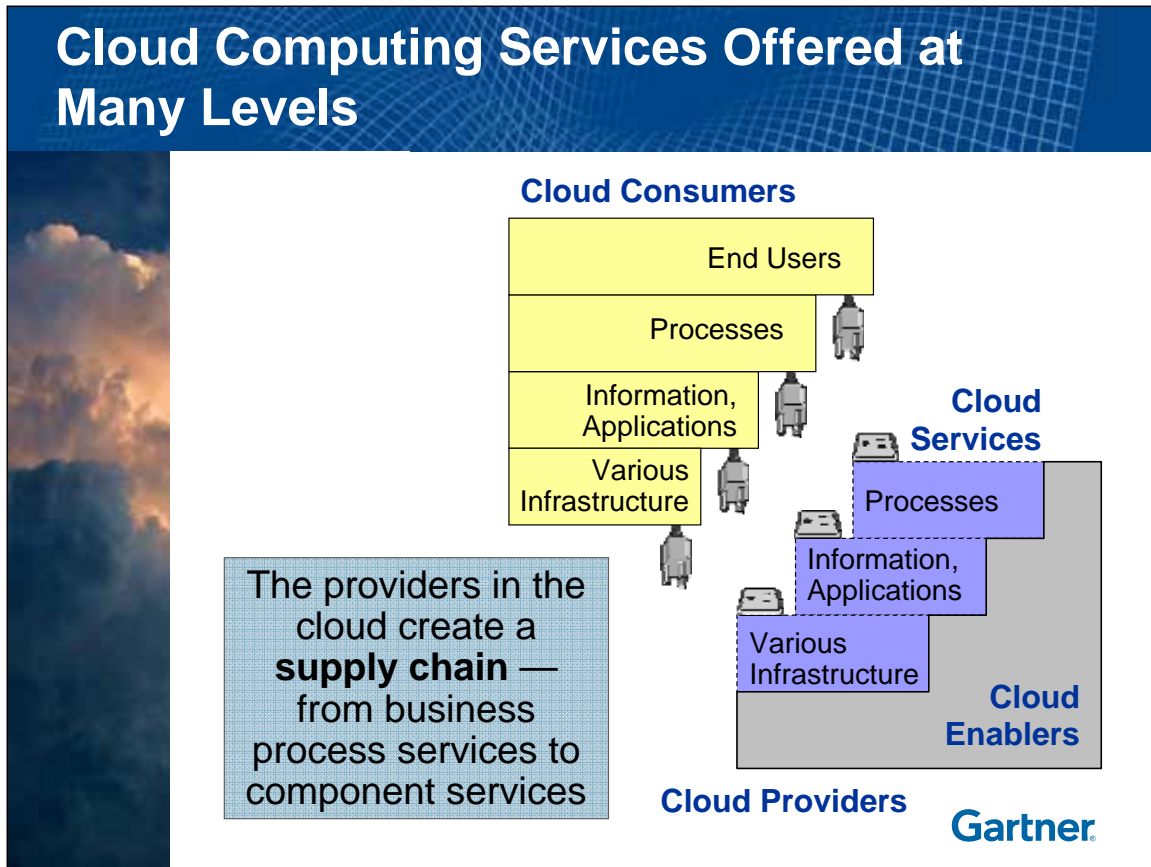
Key Issue: What is cloud computing, and how will it evolve?

Cloud computing is a major new trend in IT. We define it as follows: "Cloud computing is a style of computing where massively scalable IT-enabled capabilities are delivered as a service to external customers using Internet technologies." However, cloud computing is also a natural outcome of next-generation data centers.

Infrastructure and operation organizations are striving toward service orientation, a more variable pay-for-use chargeback model, and more-virtualized and automated architecture. Gartner's RTI continues to be the vision for many organizations. And RTI is essentially the engine for a cloud computing provider. Organizations that do not modernize their infrastructures will become nonviable compared with third-party providers that have new and modern RTIs with massive scale. On the other hand, organizations that do modernize will be able to make dynamic and intelligent business decisions about what to source from the cloud and what to maintain in-house. Cloud computing providers suffer from many of the same issues as internal infrastructure and operation organizations — how to standardize, virtualize, automate and yet manage more than a thin set of services, and how to manage services holistically at a service management level. Some providers, such as Google, have advanced scalability characteristics because their service offerings are so limited, and the architecture has been highly customized to those service offerings.

What You Need to Know About Cloud Computing

Strategic Guideline: The future of cloud services will be dynamic and fluid, with horizontal and vertical federation. Although highly integrated and proprietary vertical cloud services will exist, they will be a minority.

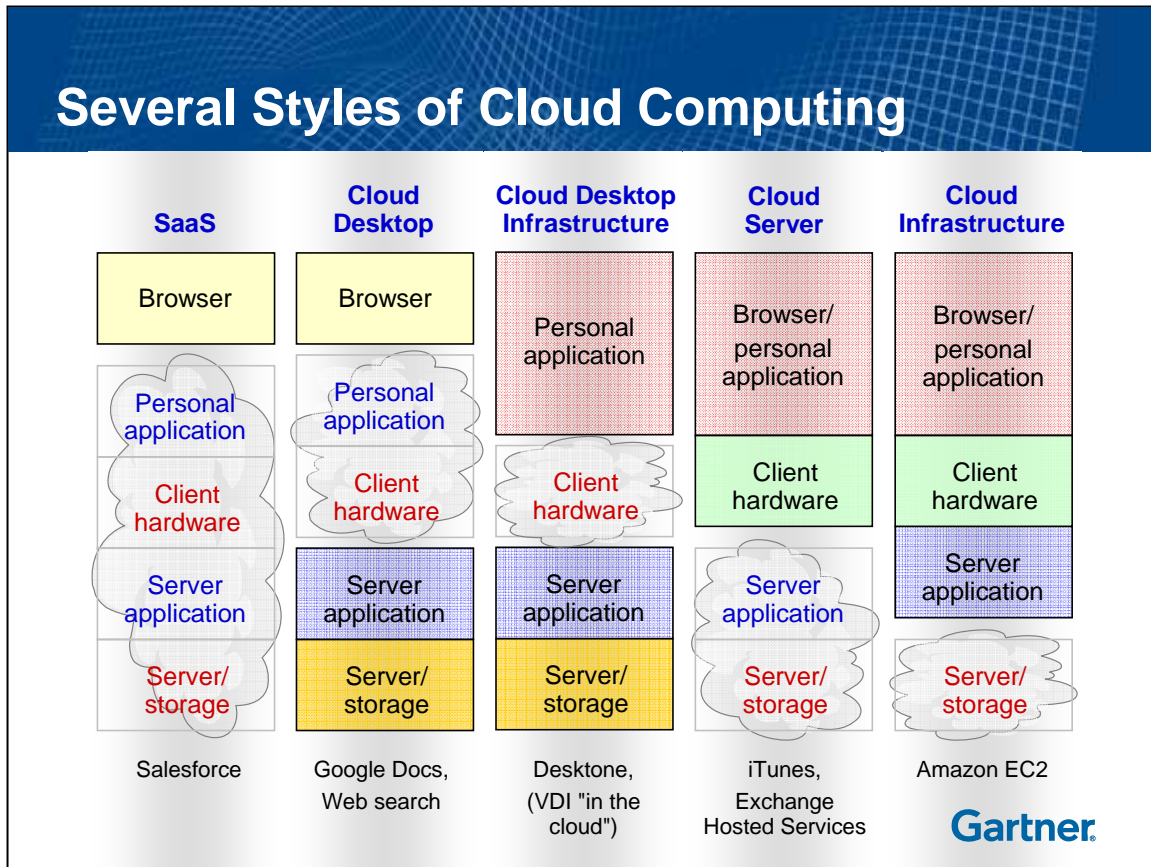


Key Issue: What is cloud computing, and how will it evolve?

Conceptually, cloud computing services can and will be provided at any layer of the IT computing stack, from raw compute services to business process services. So, conceptually, a cloud service might include a supply chain of cloud services — a cloud process provider using cloud software providers using cloud compute and storage providers, and others. However, that isn't what's happening. In these pioneer days, cloud service providers are doing it all. Software-as-a-service providers are building data centers filled with customized infrastructure — and in Google's case, highly customized and proprietary hardware. They are building, essentially, silos of vertically integrated solutions "in the cloud." This is exactly what happened to servers — they went from highly integrated and proprietary mainframes (proprietary hardware and limited applications) to midrange systems (with packaged software from third parties) to high-volume servers (hardware separated from operating systems separated from business applications). Mainframes have not gone away — but their role has certainly become a market niche. In the future, cloud services will be much more dynamic and fluid, with both horizontal and vertical federation. Although highly integrated and proprietary vertical cloud services will exist, they will be a minority — in fact, their competition will be fluid, federated solutions of smaller competitors that should be much more agile.

What You Need to Know About Cloud Computing

Tactical Guideline: Virtualization enables alternative delivery models that will create new modes of computing management and delivery during the next few years — and will fundamentally change how IT is managed and accessed.



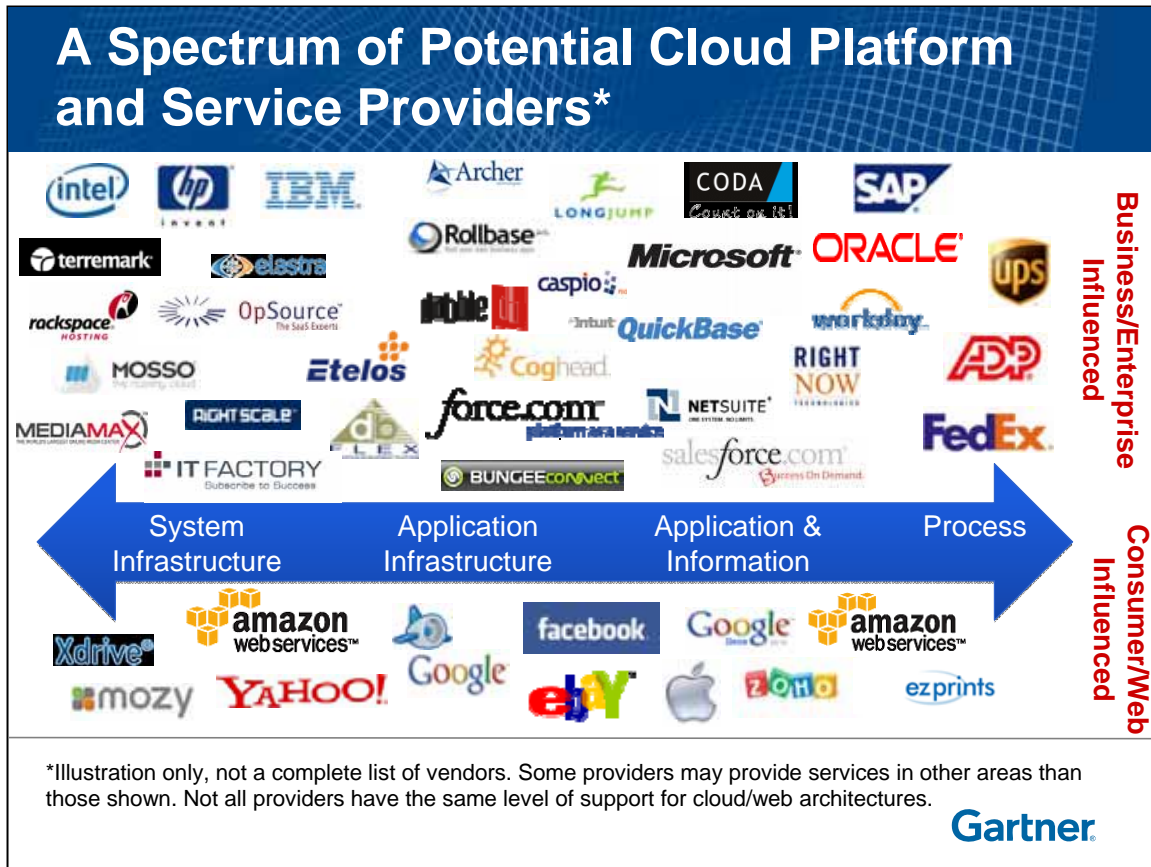
Key Issue: What is cloud computing, and how will it evolve?

From an infrastructure and operations perspective, several styles of cloud computing will emerge, based on decoupling technologies such as virtualization:

- **Software as a service:** This could leverage some software on the client device.
- **Cloud desktop:** The client application and processing power are in the cloud, although they access enterprise-owned server assets.
- **Client desktop infrastructure:** The client is a hosted desktop in the cloud (for example, virtual desktop infrastructure offerings) — but still accesses enterprise-owned server assets.
- **Cloud server:** This involves client/server computing, with the "server" in the cloud.
- **Cloud infrastructure:** The user owns the back-end software, but uses cloud computing for processing and/or storage (for example, for excess capacity or for hosting virtual machines).

What You Need to Know About Cloud Computing

Web platform service providers will come from many different perspectives: traditional IT vendors, Web-centric vendors or vendors' business services (for example, ADP) that are not traditional technology providers.



Key Issue: What is cloud computing, and how will it evolve?

The consumer/Web-influenced vendors are most mature in being what we call a "cloud/Web platform" from technology and community perspectives. Google and Amazon are two innovators that are leading the industry to the new cloud-based computing style. The business/enterprise influenced vendors have rich business services and are, at times, very mature on selling business services but do not necessarily provide a cloud/Web platform today (for example, ADP and UPS). Some Web platform vendors may provide nothing more than access to their applications via a Web browser with the application being hosted at the vendor; others may include a SOAP interface to pieces of the application and others may provide a full-range of services. Recently, IBM and Microsoft had made multibillion dollar investments to establish an independent footprint for their own renditions of cloud computing. SAP and Oracle pledged that the next generation of their business applications will be cloud-enabled and available optionally as SaaS.

The Web platform service market is multilayered and complex. Hosting-oriented offerings (from IBM, Dell, RackSpace, OpSource and others) will compete with new utility offerings from Amazon.com, MediaMax and others. The applications from Workday, NetSuite, RightNow and salesforce.com run over their own platforms, but many smaller and newer application ISVs build on the growing availability of development and runtime environments for the cloud, including Force.com, Rollbase, LongJump, Bungee Connect and others. In time, this variety of offerings will likely consolidate, but not in the immediate future, where we expect a continuing emergence of new innovative players and offerings.

Strategic Planning Assumption: Through 2012, more than 75% of enterprise use of cloud computing will be devoted to very large data queries, short-term massively parallel workloads, or IT use by startups with little to no IT infrastructure.

Risks of Cloud Computing: What Scares Enterprises?



- ❖ Service availability, capacity and performance guarantees
- ❖ Uncertain failure remediation
- ❖ No transparency to provider operations; hidden supply chain (subcontracting by provider)
- ❖ Commitment requirements, lock-in
- ❖ Ability to customize
- ❖ Data ownership, security and protection
- ❖ Provider security, privacy and disaster recovery
- ❖ Regulatory requirements
- ❖ Support for e-discovery and investigations
- ❖ Integration with on-premises systems
- ❖ Immaturity of vendors, standards
- ❖ Immaturity of application development skills
- ❖ Licensing issues
- ❖ Unproven financial model and real costs

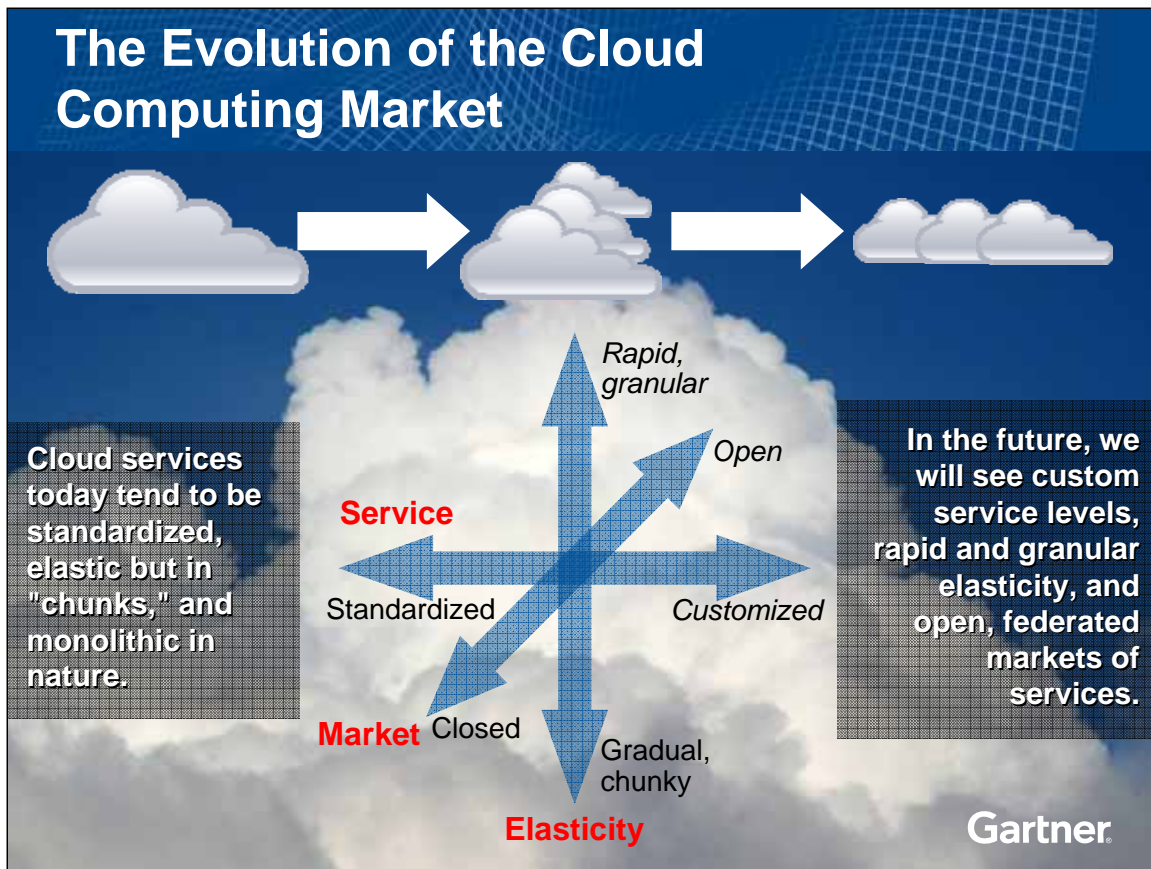
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Key Issue: What is cloud computing, and how will it evolve?

Although the economies of scale and lower barriers to entry being created by large cloud computing providers are compelling for small companies and for less-critical workloads in large organizations, there are certainly limitations — many of which are the same issues that large enterprises are facing. Many IT organizations would like to change their relationships with the business in terms of funding and chargeback, but many business customers are not willing to pay for IT "like a utility," even if the IT organization has the capability to do so. Culture certainly plays a role. Cloud computing is ideal for large-scale, common, standard IT functions. Customization is anathema to cloud computing, or at least there is little value in placing a highly customized service requirement in the cloud today. Although many "free" services can be appealing, the business model for many cloud computing providers is to track your behavior and sell that as business intelligence, or to subsidize the services through advertising. This might be acceptable for certain IT services, but not all. Although the economies of scale of Google is appealing, leveraging that economy of scale is only possible if your application can be highly parallelized (using MapReduce Hadoop, or perhaps Web services for new applications written for parallelism). The biggest hurdle for many organizations will be the lack of service management capabilities, to ensure quality of service (QoS) similar to what could be delivered in-house.

What You Need to Know About Cloud Computing

Strategic Guideline: The cloud computing market will expand from proprietary megaproviders (today), to ecosystems and supply chains of providers, to thousands of smaller providers that rely on agility and standards for interoperability to compete.



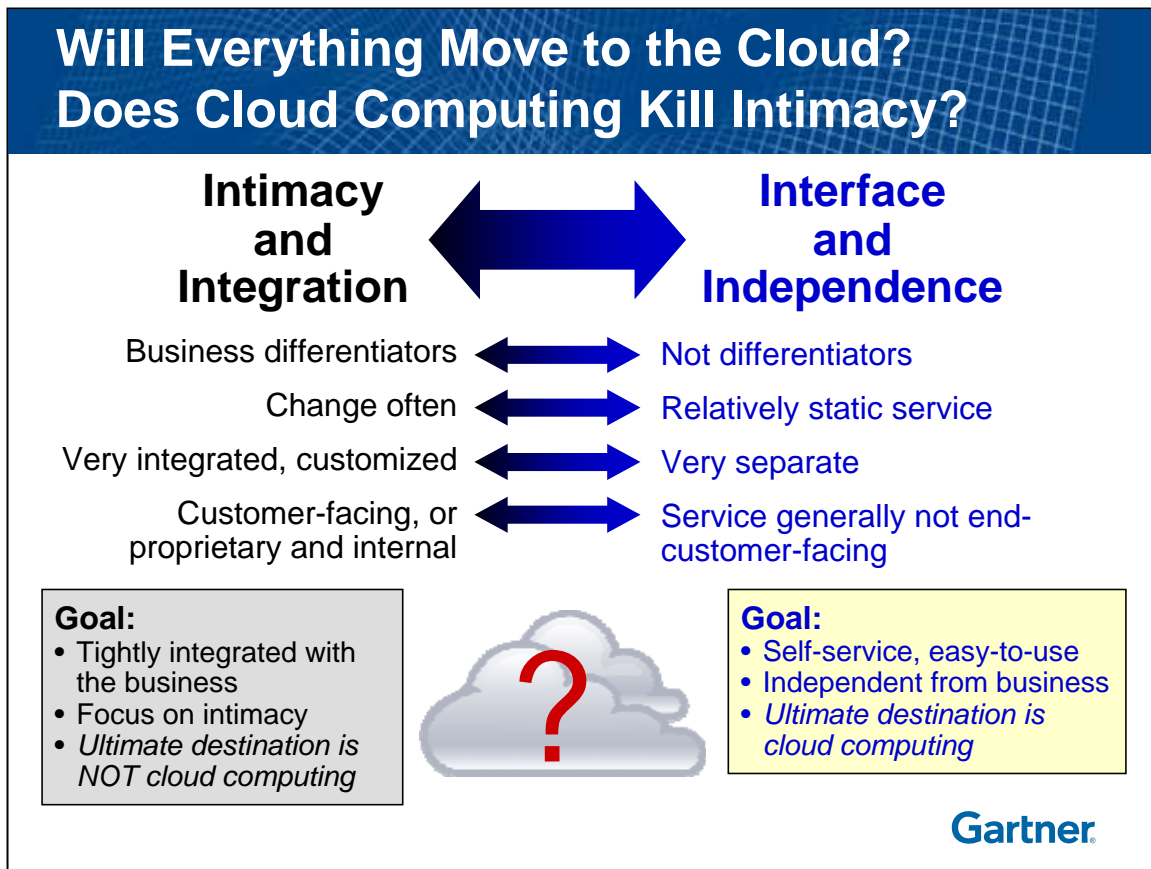
Key Issue: What is cloud computing, and how will it evolve?

The cloud computing service market is embryonic, and the future market will look nothing like the market of 2009. In many ways, it mirrors the evolution of the server market — starting with vertically integrated, proprietary mega-solutions, growing into ecosystems of partners and supply chains, and then opening up to more competition at every layer. At a high level, there are three phases:

Phase 1: Monolithic (Early). Early cloud computing services will be based on proprietary/internal architectures — islands of cloud services delivered by megaproviders. This is what Google, salesforce.com and Microsoft look like today.

Phase 2: Vertical Supply Chain (2 or More Years). Over time, some cloud providers will leverage cloud services from other providers (for example, ISVs moving into SaaS on top of Microsoft's Azure Services Platform, use of Force.com and use of Google App Engine). Still proprietary islands, but ecosystems starting to build.

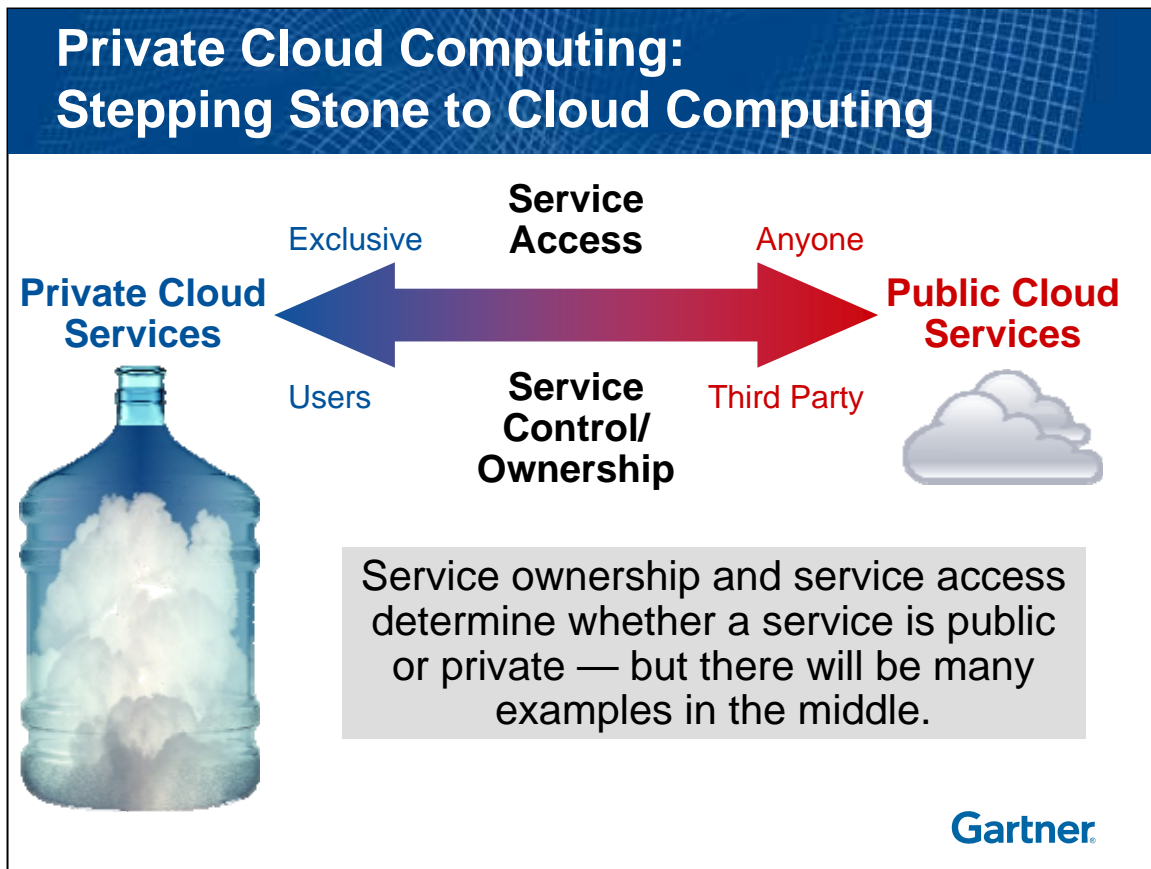
Phase 3: Horizontal Federation (4 or More Years). Smaller providers will federate horizontally to gain economies of scale (and efficient use of assets) — also, enterprises will leverage horizontal federation for peak capacity (overdraft protection, cloudbursting). There will be more choices at each layer of cloud computing, and standards will gain momentum. Monolithic providers will not go away, but they will be surrounded by more agile, focused competitors who rely on standards for interoperability.



IT services can fall somewhere between two ends of a spectrum:

- At one end are IT services that are business differentiators and should become tightly integrated with the business. These services change often. They may be very end-customer-facing for the business. You aren't just turning knobs; you are adding new ones that are unique to the business. You make this as efficient, virtualized and automated as you can, but, by necessity, more manual and custom intervention is involved. Being well-run means better integration (process, skills, analytics and strategies) and intimacy with the business. They become an extension of the business. They may incorporate a range of standardized cloud services (for example, payment processing), or use some lower-level cloud services, but the resulting aggregate service will be enterprise unique. These will not be cloud service candidates.
- At the other end of the spectrum are services that might be valuable, might be important, but are standard across businesses, more commodity. Not differentiators. The data they manipulate might be business- and security-critical, but the services are not unique to the business. There are knobs to turn, and they are turned often, but you aren't adding new knobs, and they are common with other enterprises. A well-run service focuses on creating a self-service, easy-to-use, relatively static interface. With standardized knobs, you can automate everything behind the interface. These services are separated from the business — independent, not customized and not integrated. The ultimate destination for these services is the public cloud — the only question is when.

Strategic Planning Assumption: Through 2012, IT organizations will spend more money on private cloud computing investments than on offerings from public cloud providers.



Key Issue: What is private cloud computing, and when should enterprises leverage it?

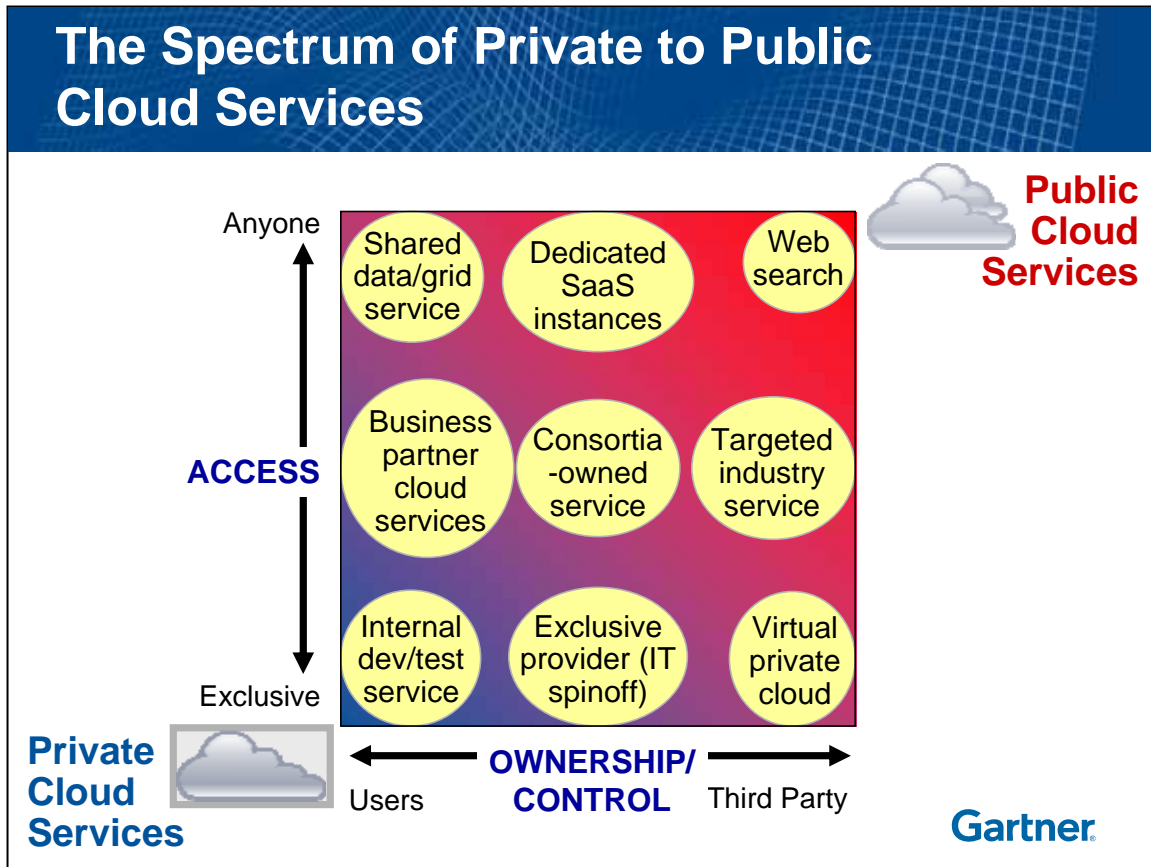
Gartner defines "private cloud computing" as *a style of computing where scalable and elastic IT-enabled capabilities are delivered as a service to internal customers using Internet technologies.*

Some services are destined to become a tighter part of the business. Some services are destined to be "outsourced" as cloud services. Private cloud services are a natural stepping stone for these services before the external offerings are ready. The biggest difference between the two types of services is intimacy and integration vs. interface and independence.

Appropriate investments in private cloud computing will also make it easier for enterprises to gradually use public cloud services as needed, if/when the services mature. Because public cloud computing is years from fulfilling many enterprise needs, it is likely that IT organizations will spend more money through 2012 on private cloud computing investments than on offerings from public cloud providers.

For services destined to be cloud sourced at some point in the future, enterprises should evaluate the return on investment in developing private cloud services while waiting on external offerings to mature.

Strategic Guideline: Cloud computing services will come in many forms, from public cloud services to private cloud services to everything in between.



Key Issue: What is private cloud computing, and when should enterprises leverage it?

There are two relative dimensions that determine how "private" or how "public" a cloud service really is:

Service Control/Ownership: There are two ends of a spectrum here — complete implementation ownership, and complete lack of ownership and control of implementation. However, there will be many examples in between of partial control, shared ownership and others.

Service Access: There are two ends to this spectrum — at one end, usage is extremely exclusive, while at the other end, anyone who chooses can access the service. Again, there will be many examples in between of limited access, industry-only access, controlled partner access and others.

These two dimensions are coupled at the extremes, but there are many variations in between. Each has different security/privacy, cost, customization and elasticity attributes.

Many of the cloud services that emerge in the next few years will fall somewhere in the middle (consider the customers choosing Exchange Online Dedicated, or paying for Reserved Instances from Amazon.com).

Understanding the trade-offs and options is critical.

Strategic Guideline: Private cloud computing has the same benefits as cloud computing from external providers, except it also enables easier migration to public cloud services when the services are ready.

Private Cloud Computing: Benefits

- **Low barrier to entry.** A service-oriented interface backed by virtualization and automation enables a customer to acquire services quickly and easily.
- **Elastic and scalable.** A shared architecture that is virtualized and automated responds to customer needs at the speed of automation, based on policies set by the customer.
- **Lower cost and pay per use.** A shared architecture is more efficient, and larger enterprises can leverage technologies that enable economies of scale (although smaller than very large public cloud providers).
- **Ease of sourcing migration.** A service-oriented interface makes it easier to eventually migrate the sourcing of a service to a public cloud service, or even support a hybrid model (partly private cloud service and partly public cloud service). It also helps to maintain control of the cloudsourcing interface within a central sourcing organization.

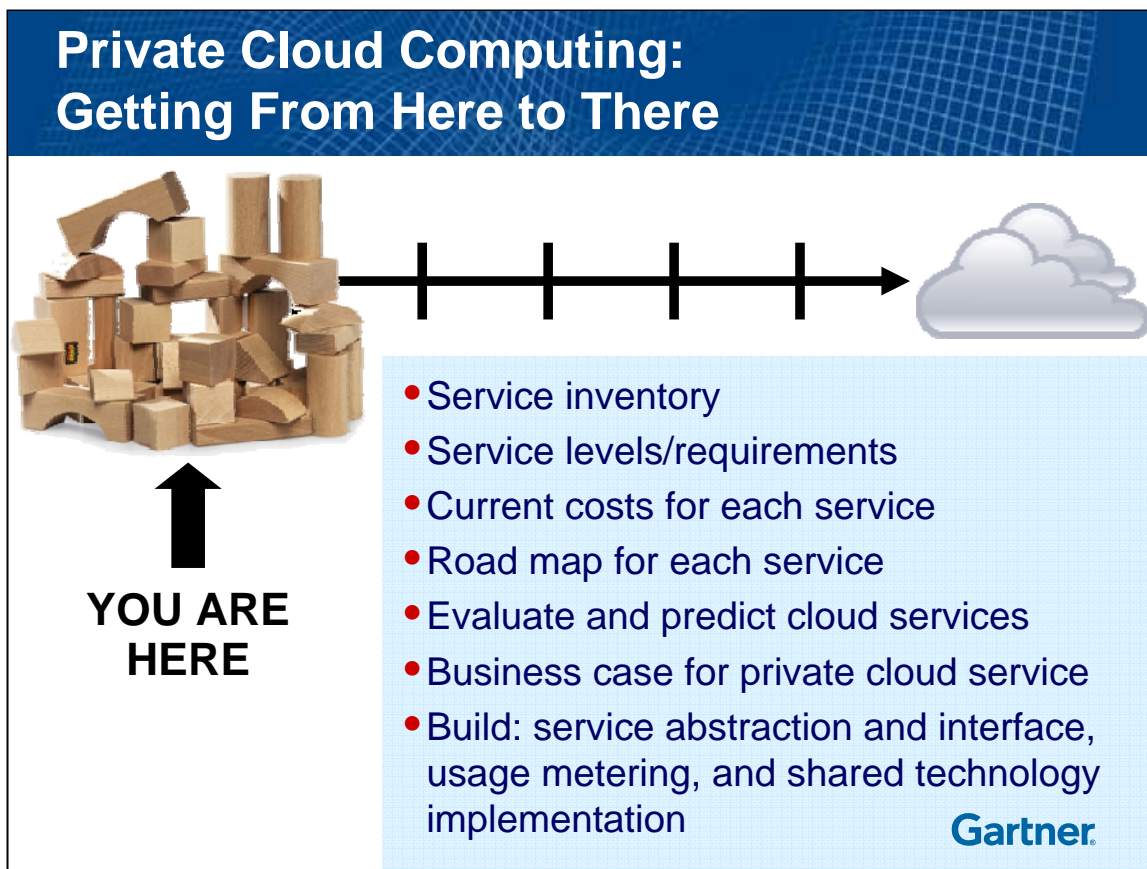
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Key Issue: What is private cloud computing, and when should enterprises leverage it?

In some cases, the public cloud services exist, and enterprises should migrate there soon. But, for the majority of these IT services, cloud services do not exist, are not proven, do not meet service-level requirements, do not meet regulatory or legal requirements, are not secure enough, or all the above. It may be many years before some of these cloud services meet enterprise requirements.

Why should large IT organizations invest in private cloud services, when cloud computing providers are creating services themselves? 1) Cloud computing is evolving rapidly, but it is very immature, there's little competitive pressure in the market so far, and services are limited in scope and depth. 2) For many enterprises, the IT service levels their customers have come to expect are not yet commonly supported by public cloud providers, introducing an element of risk that may far exceed the reward. 3) Many of the investments in private cloud computing will prepare the enterprise for public cloud computing. These investments aren't just technology changes — they are also process, cultural and business interface changes. Changes like building a service catalog and a service interface to the business, and moving to a chargeback model helps the enterprise understand their real service needs and their real service costs. These changes will help enterprises make better cloudsourcing decisions and potentially make for an easier transition to public cloud computing in the future.

Strategic Guideline: Developing private cloud computing services is a question of ROI — does it make more business sense to wait for mature cloud services to appear, or can the enterprise get more value by developing private cloud services sooner.



Key Issue: What is private cloud computing, and when should enterprises leverage it?

Private cloud services are not right for every enterprise, or every enterprise service. It's a question of return on investment.

Understanding your current state is key: What services do you offer? What are the explicit or implied service-level requirements (and do you over-provision)? What does it cost you to deliver that service? Are you competitive?

Each service will have a different road map for the future — some should be focused on tighter integration, intimacy, customization and differentiation for the business. Others should be focused on independence, easy interfaces, standardization and eliminated customization. The latter services are potential cloud service candidates.


For each of those candidates, offerings in the cloud should be evaluated. If they don't exist or aren't ready, users should predict when those services might meet their needs. Based on that time window, the enterprise should build and evaluate a business case for investing in private cloud services, or simply wait for the public cloud service to mature.

Strategic Guideline: By 2012, large enterprises should have a dynamic sourcing team in place that is responsible for ongoing cloud sourcing decisions and management.

Future Challenge: Managing Cloudsourcing

Client/Server: Customer-driven

- Costs skyrocketed, little integration



Service Brokers

- *Small enterprises*
- Evolution of today's system integrators, VARs
- Orchestrates cloud providers to meet needs
- Industry-specific, etc.

Cloud computing: Going around IT

- Lots of choices, little integration, little understanding of real service requirements
- Failures will be rampant, unless IT is involved

Dynamic Sourcing Team

- *Large enterprises*
- New team, new skills (business- and IT-savvy)
- Manages day-to-day sourcing decisions

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Key Issue: What is private cloud computing, and when should enterprises leverage it?

Business customers will be confronted with the same kind of opportunity they faced in the early days of client/server — IT says "no," so the business customers went out and bought their own servers and packaged software. If business customers start making these decisions in the cloud, because they often don't understand their service-level requirements to the level of detail needed to cloudsource, then the failures will be rampant.

Two entities will be created to respond to this. 1) In large enterprises, they will create a dynamic sourcing team that makes day-to-day decisions about sourcing. They orchestrate the services in the cloud to meet business needs. This team needs to be business- and technology-savvy — a rare mix of skills that we need to generate to cloudsource effectively. 2) Smaller businesses are even more likely to rely on cloudsourcing, but they will not have the skills needed to orchestrate cloud services efficiently. For them, a breed of service brokers will emerge. These service brokers will be an evolution of today's VARs/resellers/system integrators. They will take responsibility for the overall service-level requirements in the business. They will likely be skilled in specific industries (and perhaps their unique regulatory requirements). They will be able to monetize their value by having deeper skill in the cloud market than small businesses can muster, and by leveraging a rapidly changing market to continue to find the best deals to keep costs as low as possible (and still meet service-level requirements).

Recommendations

Use virtualization to drive modernization.

Architecture, culture, process.

Understand your services.

Inventory, needs, strategy.

Cloud computing is embryonic.

Time to experiment.

Cloud computing is a natural evolution.

Private cloud services may be a part of that.

Sourcing will become dynamic and granular.

Managing cloudsourcing will be a critical new skill.

Cloud computing creates new opportunities.

Keep your eyes open.

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