



GIGAOM RESEARCH

Steps for finding the best route to the cloud

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This report underwritten by: CoreSite

a cloud report

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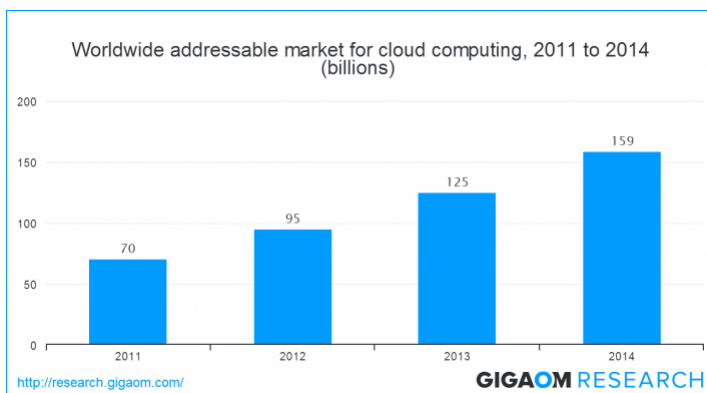
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As enterprises of all sizes move to the cloud, the number of failed cloud implementations continues to climb. Enterprises are still looking for ways to gain control over the chaos of ad hoc, unplanned, and unmanaged adoption of cloud services, and those in enterprise IT are discovering that understanding requirements are critical to the success of cloud computing in most businesses, as are the creation of a holistic plan and architecture.

The growth of cloud computing is clear. GigaOM Research estimates that the addressable market of cloud computing will reach almost \$160 billion by 2014 (Figure 1). In 2013, the addressable market will be about \$125 billion.



Source: GigaOM Pro/Robert DeFrancesco

No single path to the cloud is right for every company; a growing assortment of available services could suit most use cases. Emerging cloud computing solution patterns include:

- Direct peering implementations
- One-stop shops that offer most cloud-based services
- Cloud services brokerages that offer migration to specific cloud applications
- Co-location and hosting providers that create cloud exchanges or marketplaces

Since a well-defined use case will determine the correct services, organizations moving to the cloud should understand where they are, where they need to go, and the best technological path to get there. They must also be willing to understand the existing state of enterprise IT at the most primitive levels. With that understanding, they must break apart the problem domains into component parts that they can

understand, evaluate, and perhaps move to cloud-based platforms — if that proves the best path for the business.

Of course, the path a company takes is dependent on many factors, including:

- The type of business and information under management
- Governance, security, and compliance requirements
- User expectations about ease of use and performance

While no single path to the cloud fits all organizations, many paths will allow a company to create its own thread through emerging best practices.

This research paper will provide enterprises with an understanding of the emerging paths to cloud computing as well as a methodology they can use to find their own best way to the cloud. The paper leverages information gathered through interviews with those who are working on these problems and incorporates existing research about how small and large companies have migrated to cloud-based platforms. The objective is to provide those in enterprise IT with sufficient information to begin down the path to cloud computing, with the best likelihood of success.

Feature image courtesy Flickr user([rinse](#))

Understanding a company's requirements

Cloud user interview

Question: How does your enterprise go about understanding your own requirements for moving to cloud-based platforms?

Answer: In short, know your existing applications and future plans. The needs of business applications for scalability and full life cycle agility drive functionality, with security and governance requirements added to ensure compliance. You have to work from the bottom up, from the applications and data to the business requirements to the target architecture. Then you select the IT components that are good candidates for moving to the cloud, place them in priority order, and take them on one at a time.

As this interview question and answer illustrate, understanding the core business and system requirements is key to the success of moving to the cloud. Indeed, most successful case studies follow the same path. Four core business requirements drive the growth of cloud computing:

- The desire to leverage a platform that supports better agility and expansion capabilities
- The need to reduce costs, or at least align costs with productivity
- The need to consolidate applications and data assets
- The need to leverage new and emerging platforms, such as mobile computing

The requirements that one company leverages for its business will vary from those of other enterprises moving to cloud computing, so a critical success factor for each company is to understand its own requirements. This typically means breaking existing systems down functionally for the purpose of understanding their applications, data, services, security, and governance, then migrating existing systems to the cloud or creating new systems on cloud-based platforms. This process should consider the following concepts:

- **Applications.** Understanding all core business applications that exist within a specific problem domain, or perhaps within the entire enterprise, typically an application inventory, including the mission of the applications, data managed by the applications, users, and data shared with other systems.
- **Data.** All data existing within the specific problem domain being analyzed, including physical and logical data models and an understanding of the core data semantics.
- **Processes.** Inventory of these processes, including those that exist within or between applications; it must understand the applications and data that are bound to these processes.

- **Infrastructure.** The existing network, storage, and compute services in place. Most importantly, the network should be analyzed for its ability to handle the increased data transport load that cloud computing will likely bring.
- **Application development, deployment, and testing.** Understanding how applications are defined, designed, created, and deployed within the enterprise; that is, understanding the approach to application development, including the programming languages leveraged, links to data, and application staging. Testing the applications before they are deployed should include white-box and black-box approaches, as well as the use of tools and technology.
- **Security.** When moving to cloud computing, security — that is, existing security models, as well as the specific technologies employed — typically means moving from traditional and centralized security models to those that manage identities. Governance may also come into the mix, including dealing with services and data governance.
- **Performance.** This refers to existing performance expectations and how those performance expectations will translate as the existing systems move into the cloud or as new cloud-based systems are built. Performance is typically not a problem that can be solved by tossing hardware and software at it. Instead, performance issues are usually solved at the time of design. Thus, the earlier in the process an enterprise understands performance expectations, the more likely it is to meet those expectations as it migrates to the cloud.

Matching requirements to the path

Cloud user interview

Question: How does your enterprise match your requirements to the best products that lead you to the right path to cloud-based platforms?

Answer: For the most part, I think the initial investigation of “the path to cloud” is highly experimental and varies based on the individual company’s culture and skills. We see very few commit to using outside services companies at first, though some do after they figure out they’re not sure how to proceed. The best path we’ve found is to understand your requirements in great detail and match the cloud solution to those requirements. It seems basic, but many enterprises miss this step as a core concept.

In the following text, we explain the four basic cloud computing solutions patterns, or paths to the cloud.

Direct peering implementations

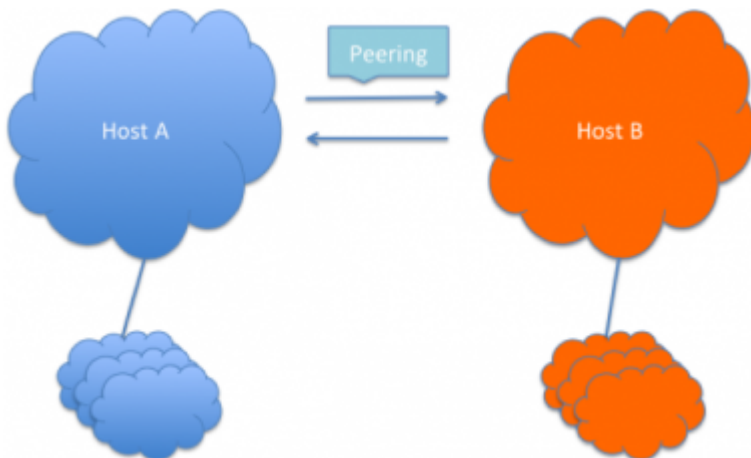
Direct peering implementations involve the exchange between two independent cloud providers and networks to benefit the customers of each network (see Figure 2). Peering typically happens without the exchange of money, making it a low-cost alternative to third-party networks; the benefits of peering are cost, latency, and redundancy.

Examples of providers that offer peering include CoreSite and Colocation America.

CoreSite's Open Internet Exchange, which aggregates popular internet exchanges and offers CoreSite customers more interconnection and peering opportunities through simple direct connections, is an example of this approach. The major exchanges it supports include Any2, AMS-IX, NYIIX, and DE-CIX.

The cost is typically lower considering that CoreSite's Open Internet Exchange avoids using one or more third-party networks. The latency is lower because of the faster and more direct flow of data that avoids network hops. Finally, redundancy is a benefit because of improved routing, efficiency, and fault tolerance from increasing available paths.

Figure 2. Direct peering types of clouds are made up of two independent cloud providers and networks



Source: GigaOM Pro

One-stop shops that offer most cloud-based services

With one-stop shops, users can pick and choose the services they require from a single hosting

environment, which provides a number of cloud services. These shops include cloud providers that mesh communities of cloud service providers and enterprises, and they are purpose-built for the delivery of cloud-based IT resources and applications. These are typically made up of the network, infrastructure, service management, and onboarding capabilities from a variety of providers.

Examples of one-stop shops include Terremark and Savvis.

One-stop shops include hosting providers that also provide cloud services, which may exist inside or outside the hosting service. Accessing these services typically means invoking local services that redirect the invocation to local or remote cloud services. These services are typically managed and metered by the host, with a single bill delivered to the consumer.

As part of your analysis, you need to consider that many of these providers leverage a self-service approach. Moreover, they may be lacking services required to get to a successful implementation, thus you need to consider these limitations in your analysis of providers.

Cloud services brokerages that offer migration to specific cloud applications

Cloud services brokerages serve as an intermediary between the enterprise and its cloud service provider by aggregating multiple cloud service providers behind a single logical interface. They also integrate these cloud services with in-house applications and customize the cloud services to meet the enterprise's needs.

Examples of cloud services brokerages include ComputeNext and Cordys.

Examples of cloud services brokerages include any hosting provider that can link to cloud-based platforms, such as Software-as-a-Service-based (SaaS) enterprise accounting systems. They also deal with data migration issues, including onetime migration of data upon implementation and ongoing operational data migration as required by the business.

Co-location and hosting providers that create cloud exchanges or marketplaces

Co-location and hosting providers that create cloud exchanges or marketplaces are co-location data centers where equipment space and bandwidth are rented to retail customers. Co-location facilities provide space, power, cooling, and physical security for other firms' servers, storage, and networking equipment. Some of these co-location providers also offer cloud exchanges or marketplaces that allow those who leverage the co-location centers to leverage remote public cloud computing services or perhaps become a cloud service provider themselves.

Examples of co-location and hosting providers include CoreSite and Contegix.

CoreSite's Open Cloud Exchange is an example; it can mesh communities of cloud service providers and enterprises. This service is purpose-built specifically for the delivery of cloud-based IT resources and applications, offering cloud services from a range of cloud providers. CoreSite provides the networking infrastructure, then layered infrastructure and service management and onboarding capabilities from providers like CENX, RightScale, RiverMeadow, and Brocade.

Trade-offs among different approaches in moving to cloud-based platforms

Cloud user interview

Question: What are the trade-offs between the different approaches in moving to cloud-based platforms? Direct peering types of implementation? One-stop shops that offer most cloud-based services? Cloud services brokerages that offer migration to specific cloud applications? Co-location and hosting providers that create cloud exchanges or marketplaces?

Answer: Important components are flexibility-of-use models, richness of ecosystem, and cost-effectiveness. Direct peering that supports inclusion of our on-premise systems and data is important, and thus we find that model compelling. However, as we progress with cloud computing, we suspect that we'll mix and match different types of solutions based on our changing needs and requirements.

Each of the approaches presented in the previous section has specific types of value for specific types of requirements. Therefore understanding the trade-offs of each approach is important. Following are the positive and negatives of each approach.

Direct peering implementations

Positives:

- Improved network performance because the peering provides a more direct path for interconnectivity
- Reduction in the amount of bandwidth used in the direct peering connection
- Improved connectivity to on-premise systems

Negatives:

- Can be expensive. Direct peering requires that the peering be established at a cost, as well as the creation of a long-term contract. Moreover, there are operational costs to consider as well costs of maintaining the peering services.
- Security can be complex, considering that the direct peering may make some systems more vulnerable through the peer connection. Thus, you need to both understand the security issues around leveraging this architecture and take steps to ensure that the information is secure during operations.

One-stop shops that offer most cloud-based services

Positives:

- The shops offer the ability to access a number of cloud-based services through a single provider.
- They also provide the ability to mix and match cloud-based services that are aggregated by the single provider.

Negatives:

- Use of these services is more complex and difficult to manage, because hundreds — and in some case thousands — of services require security and governance approaches as well as the technology to manage those services.
- In many instances, the cost of leveraging these services can be higher than it would be if they were accessed directly, because in the long term, the agreements through the hosting provider may not be favorable to the consumer of those cloud services.

Cloud services brokerages that offer migration to specific cloud applications

Positives:

- Dealing with migration issues using a third-party broker means that much of the hard work associated with the migration of applications and data is left to those who are most experienced and have a proven track record of success.
- They offer the ability to locate the optimal cloud application for the business need.

Negatives:

- They can be expensive, considering that an enterprise is dealing with an intermediary. Much like the issues raised with one-stop shops, the agreements through an intermediary may not be to the company's ultimate advantage.
- They can be difficult to manage longer term; the system could be more complex because the enterprise is leveraging an intermediary to broker the applications or services.

Co-location and hosting providers that create cloud exchanges or marketplaces

Positives:

- They provide one-stop shopping for those wanting to leverage a co-location provider as a way to produce services with access to a marketplace or exchange.
- There are many cost advantages of traditional hosting, considering that the company is leveraging a co-location provider that can offer hosting services at less cost. This is because it can support a higher concentration of systems per data center space and then pass along the cost savings to customers.

Negatives:

- It's a complex solution, where security and governance may be a challenge. The enterprise is leveraging external cloud computing services; each service added makes service governance that much more challenging and adds security vulnerabilities that must be managed.
- Dependency on a single marketplace or exchange could be problematic in the long term, because the enterprise is limiting its choices to those cloud services that are provided through that marketplace.

- Thus, a company must select a co-location provider that is able to offer the widest array of services, at the best possible price point and service level agreements (SLA).

Building a cloud strategy for the long term

End user interview

Question: What is the best approach to building a cloud strategy for your enterprise?

Answer: Start with the business. A sound business case that defines the benefits in terms of dollars saved or an increase in revenue goes a long way. Then move to the technology solutions that will get us to that end-state benefit. Planning is key, including planning down to the small details. This should be both short term (less than a year), and long term (one to five years).

After you understand the technological options for moving to the cloud, it is a good time to define the path to the cloud in more detail. A sound approach includes the following steps:

1. Building a business case
2. Creating the vision
3. Defining core solution patterns
4. Selecting core technology
5. Considering security
6. Considering governance
7. Considering performance
8. Considering the user
9. Defining the road map

Building a business case for cloud computing, which is the process of defining the ultimate business benefits of cloud computing and putting numbers with those benefits, should be the first step in an enterprise's approach to cloud computing. A business must spend money to make the migration from traditional systems to the cloud and is not likely to spend that money unless it can see a proven benefit. (Key economic benefits are discussed in more detail in the next section of this paper.)

Creating the vision is defining the ultimate objective for the use of cloud computing, including the role that cloud computing will play in IT in the short term and long term. Creating a vision creates a common

understanding of the benefits and purposes of this technology so the organization can have a consistent level of understanding.

Defining core solution patterns is defining the business and technology problems (as discussed above), as well as the solutions to those problems, leveraging cloud computing or a mix of technologies. The solution patterns should be defined in terms of business patterns — or ultimately, how the optimized business processes should function — as well as the right target for those processes, which includes the use of cloud computing technology.

Selecting core technology is just that. Once a company has defined the solutions patterns, including the patterns of technology, it selects, validates, and tests the cloud computing technology to prove that it lives up to the defined solutions in the previous step.

Considering security typically means rethinking the security models currently leveraged and understanding the applicability of those models when leveraging cloud computing, as well as new models that should be employed. In most cases, considering security means moving to an identity-based security model and leveraging the appropriate technology to support identity-based security. Enterprises now deal with cloud services, people, applications, and data as separate identities, thus allowing the security administrator to define the roles of each identity, mixing and matching the authorized service consumers with the authorized service providers.

Considering governance means that, like security, the enterprise must define the approach and the technology to manage the cloud-hosted business processes. Cloud-computing systems are typically complex and distributed, with many API or service interconnections and dependencies that must be monitored and proactively managed. This management usually means having processes and technology in place to track the use of cloud services and data, including managing change and placing policies around core components (data, services) to manage use of those components during runtime.

Considering performance refers to the process of understanding the performance requirements of the cloud-based system and making sure those performance expectations are met through performance modeling and testing. The single largest issue that end users have with cloud computing is that latency issues, typically caused by network latency, result in productivity issues. Performance is typically something that is engineered into the cloud-based system or systems, and it cannot be easily fixed if it is an issue discovered after implementation.

Considering the user refers to the process of understanding the expectations of the end users, or those who will leverage the cloud-based system to do their jobs. If the cloud-based system does not provide value in this area, the users will view the addition of the cloud-based systems as nonproductive, and the implementation is likely to fail.

Defining the road map means creating a solid plan for the business to leverage cloud computing technology over a period of time, typically two to five years. Detail is important when creating road

maps, including the order in which the new cloud-based systems will be implemented, system and data migrations, security migrations, implementation of new governance practices and technology, and so on. This will serve as a single platform for understanding what will occur in the near and distant future, and it is used to drive consensus, as well as to understand the path to be taken and the resources that are to be leveraged.

Economic considerations for a route to the cloud

End user interview

Question: What are the core economic considerations of moving to cloud-based platforms?

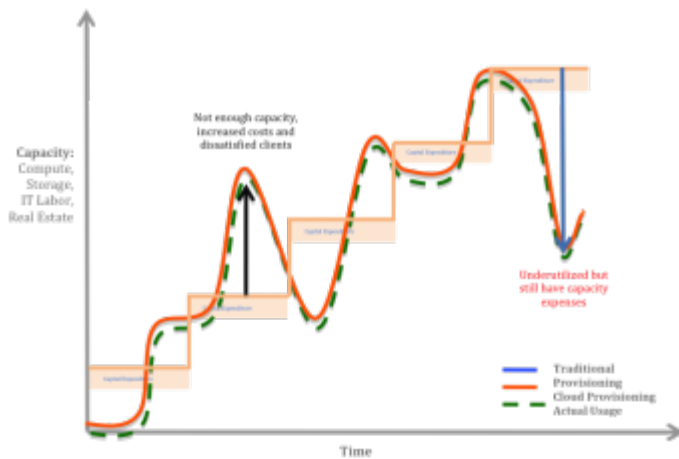
Answer: The short version is variability of workload (more variability means cloud computing is more economical than owned infrastructure), though variability can mean a limited life span and/or regularly changing loads during the lifetime of the app. Another aspect, however, is the desirability for a cash-flow-centric payment model (cloud) versus a total cost-centric model (ownership).

Cloud computing has core areas of benefit, including the ability to become more cost-efficient, the ability to avoid capital costs, and the ability to provide business agility. An analysis of each follows.

- **The ability to become more cost-efficient** is the ability to operate the business of IT at a lower cost than leveraging traditional systems. For the most part, this concept is easy to understand in cloud computing. The enterprise eventually leverages fewer hardware and software resources to support the same business applications, data, and processes.
- **The ability to avoid capital costs** occurs because the enterprise can leverage hardware and software that it consumes as a service, thereby not needing to purchase it to support its business. This reduces the capital budget and reduces overall costs. Figure 3 illustrates the curve of capacity versus utilization. The model shows the central idea of cloud-based services enabled through an on-demand business-provisioning model that meets actual usage, so an enterprise can align costs directly with its changing business needs. This concept is the foundation of the business value of cloud computing, though an enterprise must consider other concepts when dealing with the economics of cloud computing.
- **The ability to provide business agility** is perhaps the largest benefit of cloud computing, but it is the least understood. An enterprise that can quickly change IT services around new business opportunities can take advantage of those opportunities. Cloud computing allows a company to provision resources as it needs them, and those resources are highly elastic. The latency that typically exists around IT's ability to align with business is much reduced when it leverages cloud computing.

To understand the initial concept of cloud economics, a company should define these concepts in detail as related to the individual business and/or problem domain.

Figure 3. Cloud computing can align directly with business need



Source: GigaOM Pro

The first step in this process is defining the metrics for success: create an initial list of items that, if accomplished, will define the success of cloud computing for the enterprise. Typically, these are specific items, such as:

- Reduce IT capital expenditures by 30 percent by 1/1/15
- Increase sales productivity by 20 percent by 6/1/14
- Provide the ability to change IT around mergers within three months by 3/1/14

This type of list allows the enterprise to measure the benefits of cloud computing around solving real problems and providing real value. The trade-off is selecting metrics that are real indicators of progress but are achievable in the time allotted.

Once a company has established some reasonable metrics, it is ready to create the initial business case. This means expressing the metrics in terms of money to be made or saved by the use of cloud computing, as well as the amount of investment required. While the business case for each enterprise will vary, the objective is to define a return on investment (ROI) of 5 to 1. That is, for every dollar invested, the company should see a return of \$5 in some reasonable amount of time. Two years is typical.

A common question is why 5 to 1 and not 2 to 1, or even 1 to 1? The reality is that a company needs to add in the cost of risk (defined next), as well as the cost of the distraction. Cloud computing is disruptive

technology, disruptive in a good way as well as bad. The disruption is good in that cloud computing can enhance a business through the better utilization of IT assets, but it's bad in that a certain level of distraction is a byproduct of moving to the cloud.

Before defining the cost of risk, a company must understand two forms of risk when moving to the cloud.

- First is the **risk of project failure**. This typically means the risk that some factor will be missed in the analysis outlined in this paper and thus the resulting solution will somehow miss expectations. The best approach is to calculate the chance of failure and the associated financial impact.
- Second is the **risk of operational failure**. This means that systemic problems during operations have to be addressed, including small projects required to fix operational issues such as outages and performance.

Conclusion

The path to cloud computing is complex, with many options and decisions to be made. Most enterprises opt to follow the crowd and pick what seems to be popular, typically the most hyped technology.

However, what seems popular is not always the right path for every enterprise. Thus, for each enterprise to understand its own business and technology requirements is key, as is understanding the available solutions or approaches to cloud computing.

An enterprise that wants to understand and analyze the available solutions must do some up-front work, as described in this paper. Criteria such as application, data, security, governance, and performance requirements (just to name a few) must be understood before selecting the right approach.

The enterprise should also have a clear understanding of the economics of cloud computing. It must understand the process of building a business case for the cloud that justifies the cost of development and migration, as well as how to create metrics that will validate success. While many believe that the cost of cloud computing is always justified, that may not be the case for the problems every business wants to solve. Again, understanding the requirements, the business case, and the approaches along with the technology are critical to the success of cloud computing within an enterprise.

About David S. Linthicum

David S. Linthicum is an internationally recognized industry expert and thought leader in the world of cloud computing and the author or co-author of 15 books on computing, including the best-selling *Enterprise Application Integration* and his latest book, *Cloud Computing and SOA Convergence*. He is a blogger for InfoWorld, Intelligent Enterprise, eBizq.net, and *Forbes*, and he conducts his own podcast, the Cloud Computing Podcast. His industry experience includes tenure as the CTO and CEO of several successful software companies and upper-level management positions in Fortune 100 companies. In addition, Linthicum was an associate professor of computer science for eight years and continues to lecture at major technical colleges and universities.

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