To many people, skydiving is for daredevils, potentially risky, and very scary at first. To get over the initial anxiety many people shut their eyes and jump blindly out the doors, at which point they begin to relax and have a chance to actually think about what they are doing. For some, approaching infrastructure design and implementation is similar to a blind jump; but it doesn’t have to be. While there are choices to be made and hurdles to overcome, a cloud-based solution is frequently a better alternative to traditional IT solutions. And with a little work, you’ll be able to answer the important questions like who will be your partner when leaping from the plane? What equipment do you choose? What will your dive consist of? Is it an all-inclusive package or are you simply pushed from the plane and forced to figure it out yourself? And who will be there with you when you make a safe landing?

As you skydive through the cloudy thoughts of implementing an infrastructure strategy, it’s important to reflect on the options available and choose the best strategy to “hit the ground running.” In this paper, we aim to help you traverse your journey through infrastructure and cloud computing, much the same way a skydiver views the ground rushing up to meet them. By the time you reach land, you should have ideas, goals and strategies ready to help you take action.

This paper will:
- Explain the term “cloud computing” and traditional hosted/in-house infrastructures
- Define the different types of “clouds”
- Show the benefits of different cloud types
- Give you questions to ask both internally and to cloud providers
- Help you make a decision on what type of cloud is best for your business

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Understanding the Clouds [at 10,000 feet]

So what is Cloud Computing exactly? The term has been used and misused not only within the IT industry but also well into the public name space. And it isn’t getting any easier to understand. The most important thing to first understand is its general definition and characteristics. Gartner, a leading information technology research and advisory company, defines Cloud Computing as:

“A style of computing where scalable and elastic IT-related capabilities are provided ‘as a service’ to customers using Internet Technologies”

Let’s break down this definition a bit into components that are easier to understand and add other items that are critical to understanding this evolutionary IT movement.

What is Cloud Computing?
True cloud computing, or “cloud” as people like to now generically call it, consists of the following characteristics:

- **Service Based** – essentially, infrastructure, devices, frameworks and operating systems are abstracted and provided “as a service.” The key component here is the service aspect, which is contrary to how IT was traditionally provisioned, physically and definitely not “on demand.”

- **Scalable and Elastic** – as compute, storage or networking resources are required, they can be increased or decreased to meet the demand of the environment. Virtualized servers can be scaled horizontally (e.g., “cloning” or additional deployments) or vertically (e.g., adding more RAM or CPU allocations).

- **Shared** – core to most cloud environments is the concept of resources being shared to build economies of scale or greater financial discounts to the end user.

- **Metered by Use** – services are billed based on usage via a variety of different methods. Typically you only pay for what you use instead of having to project usage and the associated costs therein.

- **Internet Technologies** – typically the services are delivered through Internet identifiers, formats and protocols and tend to avoid proprietary transport mechanisms.

Also within the general term “cloud computing” there exist three distinct service layers that are most typically associated with cloud, specifically:

- **Cloud Applications** – Software-as-a-Service (SaaS)
- **Cloud Platforms** – Platform-as-a-Service (PaaS)
- **Cloud Infrastructure** – Infrastructure-as-a-Service (IaaS)

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Cloud Applications contain applications that offer web-based SaaS. This layer typically is the most widely used by consumers. Examples include Salesforce.com or Gmail. Within the SaaS layer, end users are fairly restricted to using just the functionality that the web-based application provides with little to no control over its functionality or capabilities.

Cloud Platforms provide the end user with more flexibility and control as compared to the Cloud Application layer. Typically, at the platform layer, specific frameworks like Java, Ruby or .NET are exposed and can be utilized by a developer. However, the underlying infrastructure is abstracted away from the end users and is typically managed by the platform provider.

Cloud Infrastructure is considered to be the foundation of the Cloud Pyramid and is frequently used to host other Cloud Platforms or Cloud Applications to supplement and often times even replace a company’s infrastructure. At this level, entire infrastructure components like servers, firewalls, load balancers, storage and other components typically associated with complex infrastructure environments are provided “as a service” from the provider. Cloud Infrastructure can be provided as Public or Private clouds.

Who is the cloud for and why do companies need it?

Clouds are developing quickly, and as you skydive through them at 100 miles per hour, you may feel like there isn’t much time to think. But as you plunge through, you need to consider how clouds can be used and who they are for. The short answer is: cloud computing is for anyone who needs infrastructure. Of course, that can be applied to just about any business or organization.

If the cloud is potentially for any organization, why have some companies been slow to adopt this revolutionary technology? Let’s explore some of the barriers to adoption. Fueled by the F.U.D. (Fear, Uncertainty and Doubt) being pushed by an under-educated or skeptical media, corporations are quick to point to “security” as a potential shortcoming to cloud computing. While organizations as a whole are resisting this cloud migration, there are indeed departments or business units that are adopting them on a project or a workload basis. Despite the fact that there have not been any major exploits or “hacking” of the main public clouds, larger corporations still seem to be concerned.

Most major public cloud computing providers take security as a core component of their offerings. The virtualization (hypervisor) layer is often completely abstracted away from any possible exploit by a third party. Similarly, multiple management layers further isolate cloud environments not only from the powering infrastructure, but also between cloud user accounts themselves. Several providers utilize Distributed Denial of Service (DDoS) prevention and mitigation services; DDoS attacks are the most common type of “attack” a company may encounter. Also, most providers employ extremely technically savvy personnel to manage the environments running in the cloud. These are just a few examples.

There will always be corporations that will simply not adopt cloud computing because of security concerns. These corporations frequently have extremely strict security or performance requirements, or may have specific hardware devices that are required. However, generally speaking, most companies can benefit from adopting a cloud computing strategy and many are fully embracing its advantages over traditional managed hosting or doing it themselves.

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2 “The Cloud Pyramid” http://pyramid.gogrid.com
As we are discussing infrastructure, the remainder of this document will talk to exactly that, Infrastructure as a Service (a.k.a. Cloud Infrastructure or IaaS) and traditional infrastructure. When IaaS first emerged, many first-run cloud implementations were for proof-of-concept or greenfield applications. And typically, it was the financially constrained start-ups, Web 2.0 companies or developers who were adopting the on-demand, flexible and scalable technology that cloud computing offered. With little more than a web browser, a credit card and an idea, new services, sites, applications or products were developed with minimal expense.

Times have changed since the early adopters trumpeted cloud computing. In this day and age, the cloud offers previously unseen advantages over traditional physical infrastructure deployments. Some of these advantages include:

- **Economies of Scale** – underutilization and misappropriated hardware become a thing of the past. The cloud enables compute, storage and RAM resources to be more efficiently managed, provisioned and scaled, all within a shared environment.

- **Cost Control** – knowing exactly what you are using and how much that usage will cost you allows for a much stricter control over expenditures.

- **“Disposable IT”** – companies have the ability to create, use and destroy infrastructure based on their business needs.

- **Burstable Workloads** – scaling based on demand allows organizations to efficiently use infrastructure in a timely basis.

- **Avoiding Capital Expenditure** – with cloud computing, infrastructure becomes an operating expense with no need to amortize hardware costs over time.

Take some time to compare these advantages with the shortcomings discussed in the next section for traditional infrastructure deployments. You will start to see the differences. Let’s keep skydiving through the clouds.
Different Types of Infrastructures
(at 1,000 feet)

What is the best strategy to approach building out computing infrastructure? What solution gives the best return on investment? And what implementation is best positioned for growth? When considering a new infrastructure roll-out, these are some of the important high-level questions to consider.

There are two clear cut ways to be potentially successful— one way has been around for decades and the other has been revolutionizing the IT industry as a whole:

1) Collocating or hosting your own infrastructure

2) Utilizing Cloud Computing

If you are a battle-worn and seasoned IT professional, you understand the risks of collocating or hosting your own infrastructure. And as the previous section outlined, Cloud Infrastructure services represent a new way of delivering IT services in a more efficient and timely manner. Physical hosting of infrastructure can be comprised of creating and managing an in-house data center, or collocating this infrastructure at a third party data center. Either choice of collocated or in-house infrastructure hosting is daunting, time consuming, expensive in terms of both costs and resources, and potentially a liability.

Any type of new infrastructure rollout should not be taken lightly, especially if you are “doing it yourself” and building out your physical IT within a data center. There are some clear hurdles and potential roadblocks than can slow down or even prevent a successful implementation. A few things to consider when implementing a physical infrastructure deployment are listed below:

- **High CapEx requirements** – building out a data center and the infrastructure therein has high capital expenditure costs and is a potentially lengthy approval process.

- **Requires tremendous thought and planning** – any infrastructure development project needs to be thoroughly planned and vetted by multiple units within an organization.

- **Building a deployment team** – for a successful implementation, you need to have a team of trained professionals (internal or consultants or both) behind you.

- **Train a network operations team** – once the data center is built out, there needs to be yet another team that manages the operations flawlessly and 24x7.

- **Not easily scalable** – once the IT footprint is established, growing it based on internal or external demands is not always the easiest process. Can your physical infrastructure handle seasonal bursts?

The Cloud Computing revolution, an evolutionary rethinking and new utilization of technology, meets all of the challenges of the “old way” of deploying infrastructure head on. Each and every point listed above is inherently solved through the use of the cloud, specifically “cloud infrastructure,” which is discussed throughout this document.

Cloud computing infrastructure offers the benefits and functionality of traditional infrastructure delivery but in a much less risky model as well as a much timelier manner.
Types of Cloud Infrastructures

We previously defined Cloud Computing and the various layers of the Cloud Pyramid, much of the discussion from this point on will focus on the infrastructure layer as this is the foundation that other applications, services and workloads are built upon. Cloud infrastructure provides corporations with deep and robust control over creating, deploying and managing infrastructure in an on-demand and scalable basis.

But what if your company has requirements or concerns that potentially eliminate a public cloud infrastructure deployment? There are now some clear and advantageous solutions available in the marketplace that enable corporations to fully deploy a cloud infrastructure for use within their control alone and not within a shared environment. These are called “Private Clouds.”

But even within the Private Cloud arena, there are differences, both positive and negative.

Which cloud is for you? (at 100 feet)

So now you have many options. Hopefully you know that traditional infrastructure can be time-intensive to deploy, costly to setup and maintain, and difficult to grow as your business grows. Public clouds resolve this by hitting all of those pain-points dead on, and private clouds offer public cloud advantages within a single-tenant environment.

In a poll conducted in January 2011 by Unisys, 44 percent of participants said that cloud computing is the top priority for IT investment. In another Unisys poll conducted in December 2010, 45 percent of respondents were focusing on private cloud implementation, 21 percent on hybrid clouds and 15 percent on public cloud deployments.3

But it is important to explore the differences between public and private clouds and what they can provide to your organization.

Public vs Private

Whether your organization chooses to implement an environment within a public cloud or decides to gain some additional benefits of a private cloud, you are faced with a decision. Before we dive into this process, it is important to fully understand the benefits that each cloud environment provides. At this point, the members of your organization should be ready to fully dissect and grasp the needs of your organization and identify the “must haves,” “nice to haves” and “not important” capabilities of each environment.

The matrix on the next page outlines some of the main differences between the two types of infrastructure clouds (public and private). It is set up as a table of questions you should ask the decision makers within your organization.

---

<table>
<thead>
<tr>
<th>Question</th>
<th>Public Cloud</th>
<th>Private Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you need your infrastructure to be self-service for your organization?</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do you want to avoid capital expenditures when deploying infrastructure?</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do you need the ability to scale your infrastructure on-demand?</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do you need the ability to support burstable workloads?</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do you only want to pay for what you use, when you use it?</td>
<td>X</td>
<td>partial</td>
</tr>
<tr>
<td>Does your organization need rigorous usage controls for infrastructure deployments?</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Does your organization have concerns related to using a shared platform?</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Do you need more rigorous control over the physical infrastructure of your cloud?</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

The questions above merely outline some of the high-level differences between public and private clouds. For many organizations, a public cloud will be more than sufficient to satisfy their infrastructure needs. For others needing more control and less public visibility on completely isolated hardware, a private cloud represents a potentially better solution.

### Private cloud differentiation matrix

Since the private cloud is a relatively new segment of the cloud computing marketplace, vendor offerings can be extremely varied, and if you don’t fully understand the nuances and read the fine print, you may make a choice that could be quite limiting in terms of growth and manageability. As was discussed in previous sections, there are different manners of implementing a private cloud. To define it extremely simply, you can build a private cloud yourself or you can have someone do it for you.

If you build a private cloud yourself (an In-House Private Cloud), you follow much the same path as you would if you were to do a pure physical hardware rollout. Frequently, that includes the data center setup and management that was discussed at the beginning of this document – but, with an added layer of complexity. Not only do you have to do the build out, but you also have to choose a virtualization vendor (e.g., VMware or Citrix) and fully understand the underpinnings of their product offerings. This is where your choice becomes critical and costly. As with any IT decision, that IT needs to be deployed, managed and supported.

Another private cloud to consider is a Hosted Private Cloud. Hosted Private Clouds provide all of the benefits of a public cloud, but on non-shared infrastructure. Similar
to public clouds, they give companies a self-service cloud, complete with scalability, on-demand, IaaS, but also allow organizations to save on costly capital expenditures typically associated with in-house private cloud implementations.

But this is not the only difference. The chart below shows some interesting nuances between public, in-house private clouds and hosted private clouds:

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Public Cloud</th>
<th>On-Prem Private Cloud</th>
<th>Hosted Private Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower upfront costs – CAPEX to OPEX</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Greatly reduced implementation times</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Lower ongoing operations costs</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Highly scalable infrastructure</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Flexible management tools</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Clear upgrade paths – hardware and software</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High availability and business continuity</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Highly virtualized server environment</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
<tr>
<td>Fast implementation of security patches and updates</td>
<td>✔</td>
<td>❓</td>
<td>✔</td>
</tr>
</tbody>
</table>

There are a series of unknowns when it comes to on-premises or in-house/installed private clouds. For starters, your operating expenses could increase when you factor in the need to manage the infrastructure that contains your private cloud. Similarly, building out your in-house private cloud to support more departments or business units within your organization may prove to be both costly and time-consuming. While many virtualization vendors do provide management tools, you have to license that software in order to receive regular upgrades and new features. And, of course, there is the ever-daunting implementation timeline.

Public clouds and hosted private clouds alleviate those pain-points, allowing corporations to focus on WHAT they put in their private cloud and HOW they use it, instead of dwelling on HOW to simply implement their private cloud. Another way to think of this scenario is comparing it to a utility like power. An in-house private cloud is like getting your power from a generator. You have to put fuel in it and keep it running and maintained so that it is always available and simply works. A hosted private cloud is more akin to plugging into the wall socket and consuming power immediately.
Questions to Ask

By now, your cloud skydiving toolkit should be fairly full with ideas and strategies to help you pursue a successful public or private cloud implementation strategy. At this point, you need to begin evaluating the vendors who provide infrastructure services and which type of cloud best fits your organization's business, strategic and technology requirements.

But, as the ground is rapidly approaching, you need to be prepared to ask the right questions to the proper people in order to bring the ground (your strategy) into finer focus.

Internal questions for your company

When planning your migration or rollout strategy to the cloud, be sure to ask many of the following questions internally:

1. How many groups, organizations or business units will the infrastructure be supporting?
2. What are the features, characteristics and size of an IT requirement within those groups?
3. How frequently is new infrastructure required to be deployed or taken down?
4. What appliances (e.g., servers, load balancers, firewalls, networks, etc.) need to be supported?
5. What security requirements do you have? Is a shared environment acceptable or does your cloud infrastructure need to be single-tenant?
6. How much visibility into your infrastructure usage is required?
7. What are some of the different use cases that need to be supported?
8. How big is your budget?
9. Who will manage the implementation?
10. Are there regulatory requirements to consider?

Any serious cloud infrastructure provider can assist you in other important questions or scenarios that must be answered prior to choosing a cloud partner for this type of implementation. Ask them for help!

Questions to ask your cloud provider

Once you have identified a short-list of cloud infrastructure providers, it is important that you conduct your due-diligence with them. Ask them any or all of the following questions:

1. Does the company providing you with a cloud solution consider themselves to be a partner or simply a provider?
2. Is their solution easy to use, understand and implement?
3. Is it a scalable solution from both a company-installation standpoint and an end-user usage standpoint?
4. Is it built with "best of breed" technology?
5. Are they simply a reseller of someone else’s technology or are they an innovator in the space?

6. Are they cost competitive?

7. Do they require capital expenditures?

8. Do they manage the solution, or will you be doing that yourself?

9. Do they provide technical expertise when creating the implementation?

10. Is their service supported 24x7x365?

11. Is their offering based on industry standards or are you required to re-architect your infrastructure designs to meet THEIR requirements?

12. Do they provide a short implementation timeline of days to weeks or is it much longer?

13. Is their offering backed by a Service Level Agreement (SLA) or is the burden of supporting the private cloud on your shoulders alone?

Armed with these and other questions and just being seconds from landing on the ground having traversed the clouds, you are ready to embrace your IT strategy.

**Hitting the Ground Running**

Once you make a solid landing with your feet on the ground, it’s time to implement your cloud strategy. This skydive through the clouds presented key differentiators between in-house infrastructure, public cloud and private clouds. The ultimate strategy is yours alone, as is your success or failure at its implementation; and hopefully, it won’t involve jumping blindly from a plane to make that decision.

**About GoGrid**

GoGrid is the world’s largest pure-play Infrastructure-as-a-Service (IaaS) provider specializing in Cloud Infrastructure solutions. Currently powering over ten thousand customers globally, we make complex infrastructure easy by enabling businesses to revolutionize their IT environments with the Cloud. In just minutes, GoGrid customers can deploy and begin managing existing or new applications and workloads on our proven, secure and reliable hosted cloud platform. GoGrid has a long history of managing IT infrastructure and introduced one of the world’s first cloud computing platforms in March of 2008. With a proven track record of innovation, GoGrid offers one of the highest performing, standards-based, flexible and robust cloud solutions in the market. The GoGrid Hosted Private Cloud solution builds upon our experiences and strengths in delivering public cloud solutions.

Based in Silicon Valley with operations globally, GoGrid is 100% dedicated to leading the advancement of the Infrastructure-as-a-Service marketplace. Our commitment to our customers and partners is to continue developing infrastructure technology and solutions that substantially benefit the IT community.