# EXECUTIVE SUMMARY

Internet infrastructure providers facilitate the operation of the global internet. These providers operate the nuts and bolts that make the internet work. These businesses range in size from sole proprietorships to global internet businesses known worldwide. What differentiates internet infrastructure providers from other aspects of the internet is their relative anonymity. These businesses generally operate behind the scenes facilitating businesses as diverse as your dry cleaner to your bank.

Infrastructure providers can generally be placed in one of five main categories:

- Shared hosting
- Standard managed hosting
- Complex managed hosting
- Cloud infrastructure
- Colocation

The underlying forms and the level of management that comes with the service define these five segments.

## Internet Infrastructure Forms

The internet infrastructure services market is best understood in terms of the underlying forms used by the service provider to deliver services to the end user. There are three components to this these underlying forms:

- **Facility** - The facility, commonly referred to as a data center, is the basic physical building block of an internet infrastructure provider. It may be owned by the infrastructure provider or operated by a third party. This facility houses the routers and switches that connect to the internet along with the servers -- physical and virtual -- that host content, data and applications.

- **Physical server** - The physical server lives in a cabinet or rack housed in a data center. It is where content and applications are stored and secured.

- **Virtual server** - The virtual server is a virtualized partition of a physical server. The virtual server acts and performs just like a physical server with a marginal difference in performance. A single server can literally house up to dozens of virtual servers.

## Internet Infrastructure Categories

### SHARED HOSTING

Shared hosting is shared space on a physical server with no isolation between users and the absence of defined resource allocation. The finite resources of a physical server are shared -- often unevenly -- among all the customers that reside on it. Providers can literally host hundreds of customers on a single server.

Shared hosting is commonly used to publish static or dynamic website content. Blogging platforms like WordPress and simple e-commerce applications often run in shared hosting environments and are enabled with automated installation.

A shared hosting account typically comes with server access, bandwidth, local storage and technical support. Users manage their account with a control panel and the service is procured and provisioned in a highly automated fashion.

Shared hosting is easy to use, provisions quickly, and basically runs without much interference. It is also very affordable and can be purchased with a wide range of supporting services. Organizations with very limited resources use shared hosting to communicate and build a presence on the internet.

Shared hosting typically exists at the lower end of the infrastructure market. Typical users are:

- Consumers
- Small and home offices
- Hobbyists
- Bloggers
- Small businesses
- Designers
- Developers

Shared hosting users typically use these services for relatively basic content such as:

- Brochure or personal website
- Blog
- Small business website
- Small business e-commerce site
- Email and messaging
- Domain hosting, parking

## STANDARD MANAGED HOSTING

An infrastructure provider who provides standard managed hosting typically leases dedicated physical servers (sometimes referred to as bare metal servers) or virtual servers housed in the infrastructure provider's data center facilities. Customers typically lease the server resources on a fixed contractual basis.

In standard managed hosting, customers have root access to the server and typically self-manage. The infrastructure provider provides a basic level of support and handles certain but limited management tasks such as hardware maintenance, backups and installation of operating system and web server software. Additional services such as security, storage, monitoring and patch management are typically purchased on an a la carte basis. In standard managed hosting, the application layer is left entirely to the customer.

The actual server is owned by the provider and leased to the customer. As a result, the customer does not face an IT refresh cycle. They can simply move to another server that fits their requirements. They do not pay for hardware refreshes or have any obligation to stay on the server they have leased.

Customers manage severs through an API or web-based control panel. Provisioning is typically automated due to the relatively standardized nature of managed hosting, and infrastructure can be available in a few hours, if not minutes. Standard managed hosting tends to involve smaller deployments: typically less than six servers and often just a single server.

Standard managed hosting is designed to accommodate relatively straightforward configurations and workloads. Small businesses use standard managed hosting as an alternative to buying and installing IT assets. Mid-tier organizations and enterprises use it as a way to offload commodity infrastructure requirements internally. Standard managed hosting is a way both to save money and optimize the process of buying, setting up and managing IT resources.

Standard managed hosting typically exists at the lower to lower middle of the infrastructure market. Typical users are:

- SMBs
- Designers
- Bloggers
- Developers
- Mid-tier enterprises
- Enterprises

Standard managed hosting users typically use these services for relatively complex content such as:

- Proprietary applications
- Software development
- High-traffic blogs and websites
- Small infrastructure providers that resell server capacity
- Storage

## COMPLEX MANAGED HOSTING

Complex managed hosting also applies to both physical dedicated servers and virtual servers. There are many similarities between standard and complex managed hosting, but the key difference is the level of administrative and engineering support that the customer pays for. These differences are due to both the increased size and complexity of the infrastructure deployment. The infrastructure provider steps in to take over most of the management.

Complex managed hosting involves a wide range of expertise and capabilities in the areas of systems administration, database management, security, monitoring, log management, disaster recovery, and backup. The management services can even extend to the application layer, though this tends to be rare outside the most standard enterprise applications. In many cases, the customer manages the application. Very Some infrastructure providers augment their standard offerings by providing consulting services that go above and beyond the standard managed services layer.

Managed hosting handles heavier and i/o-intensive workloads and therefore leans to brand name hardware, though not exclusively. A typical managed hosting deployment will have a number of additional devices, including databases, application and web servers, firewalls, and load balancers. Instead of local storage, customers often use network-attached or storage area networks. They will also purchase backup and replication services or set up disaster recovery scenarios.

In complex managed hosting multi-year contracts are the norm and typically run for 2-3 years. There are options to scale the contract if infrastructure requirements change. Unlike standard managed hosting, there are no single-server deployments in complex managed hosting. A typical managed hosting deployment starts at about 5-6 servers and can scale up to literally hundreds of servers.

Smaller organizations use complex managed hosting as a company-wide outsourcing strategy. In large enterprises, the decision to use hosting is made by individual departments or groups within their defined budgets. In many cases complex managed hosting is a way to offload existing on-premise data center requirements.

When it comes to complex managed hosting, the hosting relationship tends to be limited to a small number of applications versus the total that actually exist within the enterprise. Complex managed hosting is in many ways used as an extension to the on-premise data center.

Complex managed hosting is used for large and complex configurations and workloads. It is also an option when organizations need very specific and specialized capabilities such as security and compliance. Managed hosting is an alternative to buying and installing IT assets and has a cost savings component. It is a way to relieve the burden on internal IT staff and free up resources.

Complex managed hosting typically exists at the mid to upper end of the infrastructure market. Typical users are:

- SMBs
- Mid-tier enterprises
- Enterprises

Complex managed hosting users typically use these services for very complex content such as:

- Proprietary applications
- Software development
- Software-as-a-service
- E-commerce sites
- High-traffic websites
- Managed storage, backup
- Disaster recovery
- Messaging, Microsoft Exchange
- Database servers

## CLOUD INFRASTRUCTURE

Cloud infrastructure is basically a more flexible and scalable form of virtual server hosting. One of the main differences is the resource availability. A virtual server does not change in size. The infrastructure resources are constant, and the user can't alter them unless they upgrade plans -- a process that takes some time. Cloud infrastructure is very different. The size of a server can be scaled up and down either on the fly or within a very short time frame. So instead of a set amount of resources, the end user can adjust infrastructure capacity according to demand (or lack of).

The other main difference is the consumption model. Managed servers -- physical or virtual -- are paid for on a monthly basis. Cloud enables utility-based consumption. Typically, cloud is consumed by the hour, but it is beginning to be billed in minute-by-minute increments. Some providers have minimum commitments, and there can be an array of additional costs for network bandwidth usage, storage, and other features or services.

There are other attributes that characterize cloud computing:

- On-demand provisioning: provision a server in literally minutes

- Automated procurement: buy without human interaction; just use credit card

- Automated self-service: manage without human interaction

- Self-management: control and management through API or control panel

- Outsourced data center: cloud infrastructure resides in a data center that is operated by a third party; customer does not have physical interaction with it

The other defining feature of cloud is complete abstraction between the physical server and the compute and storage resources enabled through virtualization. In a virtual hosting environment this level of abstraction does not exist. A physical server is partitioned into virtual machines that do not move, change in any way or interact with each other. The virtual machine is still very much defined by the host physical server. With cloud, that virtual machine is a unit of compute and storage with no relationship to the physical host it resides in. The compute and storage unit can be built from resources that reside on more than one physical machine. It has the flexibility to move around and restart somewhere else.

The flexibility of cloud guarantees another defining cloud characteristic: multi-tenancy. There are some infrastructure providers who have set up controls to limit access to a cloud. This is done to address concerns about sharing infrastructure. Cloud infrastructure can come in two standard options. Just like physical server and virtual server hosting, cloud infrastructure can be standard or complex (managed or unmanaged) based on the availability and quality of management services.

Clouds run on both commodity and brand name gear depending on the target audience, use case, and price point. Self-service and management is handled programmatically through an API or with a web-based control panel.

Cloud infrastructure has a unique and compelling value proposition. The scalability of cloud allows organizations to use infrastructure in an extremely efficient manner -- more closely aligning capacity requirements with what is actually consumed. They can scale up as needed and dial it back literally whenever it becomes necessary. This is ideally suited to "bursty," scale-out and unpredictable workloads or short-term projects and test environments. Cloud enables organizations to deploy faster. Gone are the hours or days required to procure infrastructure. Cloud is available on demand and can be shut off just as quickly. Cloud is also highly resilient with no single point of failure. Cloud resources are mobile and can automatically fail over to another physical host. They can be restarted anywhere at any time with the right toolset and capabilities. This flexibility enables cloud to be integrated in hybrid environments in any data center -- outsourced or on-premise.

Cloud hosting has no particular defining market characteristic – it is used by the customers of infrastructure providers for virtually all types of content. Typical users are:

- Developers
- SMBs
- Mid-tier enterprises
- Enterprises

Typical uses are:

- Test and development
- Short-term requirements
- Rapid scale-out applications
- High-traffic websites
- Software development
- Bulk storage
- Hybrid
- Backup
- Disaster recovery

## COLOCATION

Colocation is the supply of data center capacity for organizations that need a place offsite to house or "colocate" servers, storage, and networking gear they own and manage. The basic building blocks of colocation are space, power, cooling and internet connectivity. internet access runs into data center facilities over optical fiber and is made available to customers as part of a service contract. The degree of network density in a facility is a defining characteristic of colocation. Data centers that serve multiple providers are carrier-neutral. Data centers that are home to a single carrier are carrier-specific.

In the colocation model, the customer has access to a designated area within a facility -- either a rack or cage that houses multiple racks (cages go anywhere from 500-5k sq. ft.) -- where they install gear they own and purchased. The

colocation provider does not touch or supply the gear. It focuses on maintaining the integrity and security of the entire physical infrastructure, delivering and managing power and cooling capacity and ensuring network availability. Many customers are not actually present at the facility a great deal of the time and rely on remote management. Many colocation providers offer remote management and monitoring services. Some providers lease equipment to customers.

Colocation comes in two principal categories: retail and wholesale. In retail colocation, the data center facility is shared between multiple tenants. They can consume anything from a single rack, to a private cage with dozens of racks, to an entire pod (loosely defined as a substantial part of a data center: 5-10k sq. ft. or around 500kW to 1MW of power). In wholesale colocation a facility is leased to a single or small number of clients that commit to substantial-sized footprints. A rough dividing line between retail and wholesale colocation is 1MW.

Colocation typically requires a minimum 2-3 year contract, with wholesale contracts having terms of anywhere from 5-15 years. Billing is often by the rack or square foot. Even when quoted in terms of space, power is the most important variable when determining price. Metered power is becoming more common.

Colocation is a good fit for organizations who want to maintain control over the procurement, maintenance and management of IT assets, and have specialized needs and requirements only then can (or prefer to) handle.

Colocation is a compelling option for organizations looking to avoid the capital expenditure outlay required to build and maintain data centers and turn it into an operating expense. Using colocation gives organizations access to premium-grade facilities at a fixed and predictable cost. They avoid the expense and resources required to maintain and refresh data center equipment and the facility itself, while saving on staffing costs. Like servers, facilities have a shelf life. A colocation customer lets the provider evaluate, test and procure new technology and equipment and deliver attractive cost through volume purchasing capabilities. Colocation also enables organizations to plan more judiciously by leasing just the space and power they need and growing incrementally. There is much less risk of over-building capacity.

Colocation users are typically large, sophisticated businesses, who essentially run their operations at an infrastructure provider's colocation facility. They typically use these facilities for:

- Web Hosts
- MSPs
- Telecommunications carriers
- Mid-sized enterprises
- Enterprises
- Large-scale internet content providers
- Financial institutions
- Government agencies
- IT outsourcers
- Network, mobile operators

Typical uses are:

- Outsourced data center
- Disaster recovery and business continuity

## Segments within the Five Categories

The reality of the internet infrastructure industry can become more complex, as infrastructure service segments continue to blur. For example, the line between standard managed hosting and complex managed hosting is increasingly unclear as providers move up-market and expand into value-added services. The same can be said for the line between managed hosting -- of the virtual server variety -- and cloud infrastructure. A number of virtual server hosting offerings look like cloud infrastructure. They might not have all the characteristics of cloud, but display enough to blur the line and create some grey areas.

## Other sub-segments

The market is diverse, and there are some segments that do not appear in the description. These sub-segments include: VPS; bare metal cloud; private cloud; dedicated hosting; and utility computing.

## About the Internet Infrastructure Coalition

The internet Infrastructure Coalition supports those who build the nuts and bolts of the internet, and we treat it like the noble profession that it is. We believe the continued growth of the internet is vital for growing an environment of innovation in America and seek to engage in ways to foster success of the internet and internet infrastructure industry. We seek to influence decision makers to weigh decisions on whether they are good or bad for the internet economy and its foundational industries. In short, we seek to foster growth within the internet infrastructure industry by driving others to harness the internet's full potential.

This paper is based on Structure Research's 2012 Internet Infrastructure Taxonomy, and is used with permission. Structure Research is an independent research and consulting firm with a special focus on the hosting and cloud segments within the internet infrastructure market. It is devoted to understanding, tracking and projecting the future of hosting and cloud infrastructure service providers. Structure Research is based in Toronto, Canada and was founded in September 2011 by Managing Director Philbert Shih.