

WHITEPAPER

Computing in a virtual world

Cloud Computing

Just what is cloud computing anyway? Skeptics might say it is nothing but industry hyperbole, visionaries might say it is the future of IT. In reality, both statements are true—cloud computing has been embellished by the tech industry, but it does hold real potential for new types of on-demand dynamic IT services.

Cloud computing is an innovative technology platform that has the potential to transform how IT services are delivered and managed. Offering the promise of computing as a utility, Cloud computing is a fresh approach that offers significant cost savings, diminished IT complexity, and increased flexibility in managing IT and responding to market changes. Unlike many technologies, cloud computing has evolved in response to customer needs and builds on established trends for driving the cost out of the delivery of services while increasing the speed and agility with which services are deployed.

If we look at it from one perspective, cloud computing offers nothing new as it uses approaches, concepts, and best practices that have already been established and used in different forms. From another perspective, the whole concept is new because cloud computing completely changes how organizations invent, develop, deploy, scale, update, maintain, and pay for applications and the infrastructure on which they run.

The adoption rate of cloud computing is soaring. Today 30 percent of respondents to a survey conducted by CIO Research said they are already using cloud computing. By 2012, 80 percent of Fortune 1000 enterprises will pay for cloud computing service, and 30 percent will pay for a cloud-computing infrastructure, according to Gartner Research.

Defining Cloud Computing

According to The National Institute of Standards and Technology's (NI ST) Information Technology Laboratory – 'Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.'

Gartner defines Cloud Computing as 'a style of computing where massively scalable IT-related capabilities are provided 'as a service' across the Internet to multiple external customers.'

Today, Cloud computing has taken on multifaceted definitions - For the line-of-business executive, cloud computing is a buyer-centric view of technology in which applications are available through purchase, rental, or development (Software as a Service). For the chief financial officer, the cloud offers an approach to consume technology in a pay-as-you-go model (utility computing) that delivers the cost benefits of variable pricing without a costly investment in hardware. And for the CIO, cloud computing provides a comprehensive virtualization model for technology that stretches from infrastructure design through application testing and delivery (Platform as a Service).

The cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models.

Cloud Computing - Essential characteristics

Enhanced Flexibility

Cloud computing offers elasticity i.e., ability to scale resources up and down as needed. The cloud appears to be infinite to the consumer giving the flexibility to purchase as much or as little computing power as needed.

Measured Service

In a measured service, different parts of the cloud service are controlled and monitored by the cloud provider. This is crucial for billing, access control, resource optimization, capacity planning and other tasks.

On-Demand Self-Service

The on-demand and self-service aspects of cloud computing mean that a consumer can use cloud services i.e., network storage, server time as needed without any human interaction with the cloud provider.

Wide Network Access

This means that the cloud provider's capabilities are available over the network and can be accessed through standard mechanisms by both thick and thin clients.

Resource Pooling

Resource pooling allows a cloud provider to serve its consumers via a multi-tenant model. Physical and virtual resources are assigned and reassigned according to consumer demand. There is a sense of location independence in that the customer generally has no control or knowledge over the exact location of the provided resources but may be able to specify location at a higher level of abstraction (e.g., country, state, or data center).

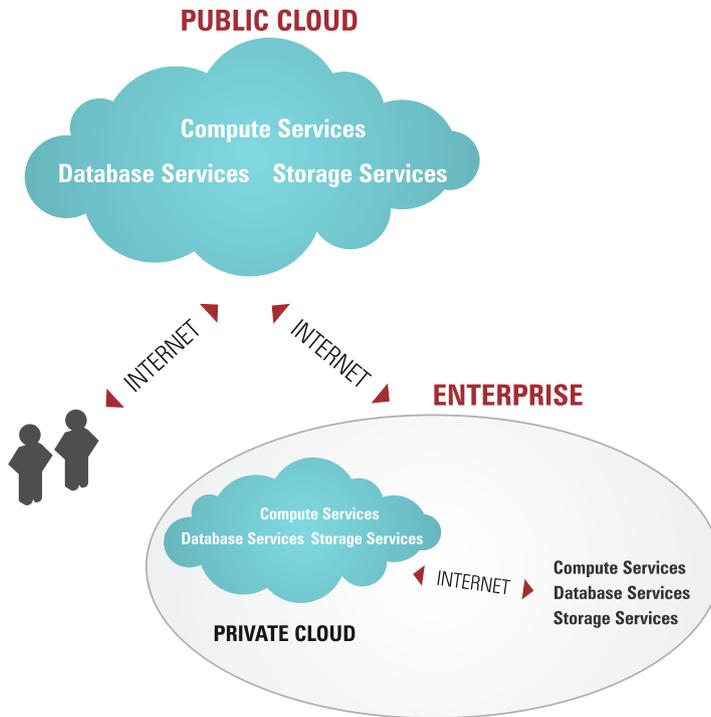
The industry abounds with many diverse definitions. We see it as a collection of resources – computing power, memory, storage capacity, applications, and managed services – delivered as a service over the Internet or over a private network connection. Essentially, it's your very own private, staffed data center without walls. The key benefits of cloud computing are:

- Pay-as-you-go billing
- Scalability
- Flexibility
- Efficiency
- Cost-Effectiveness

Cloud Computing - Deployment Models

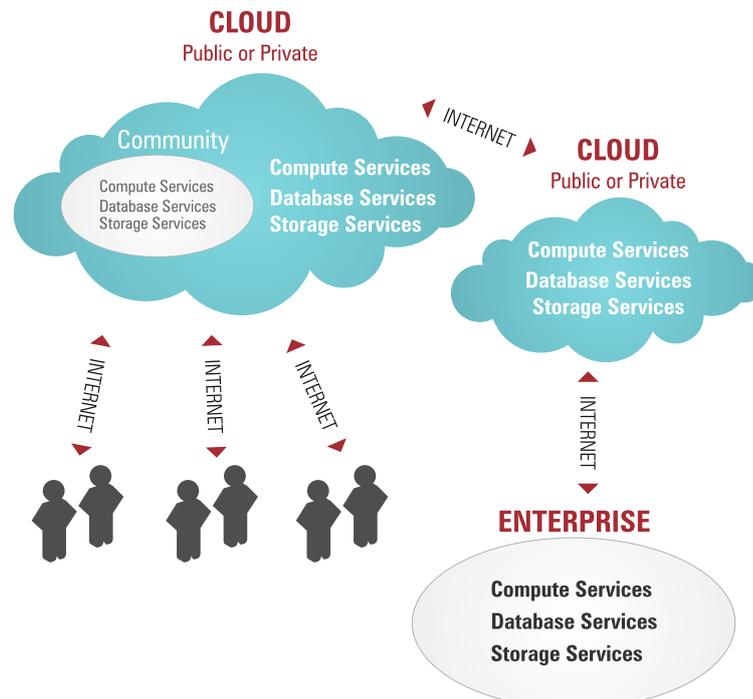
Private Cloud

The cloud infrastructure is operated solely for an organization. It may be managed by the organization or a third party and may exist on premise or off premise.



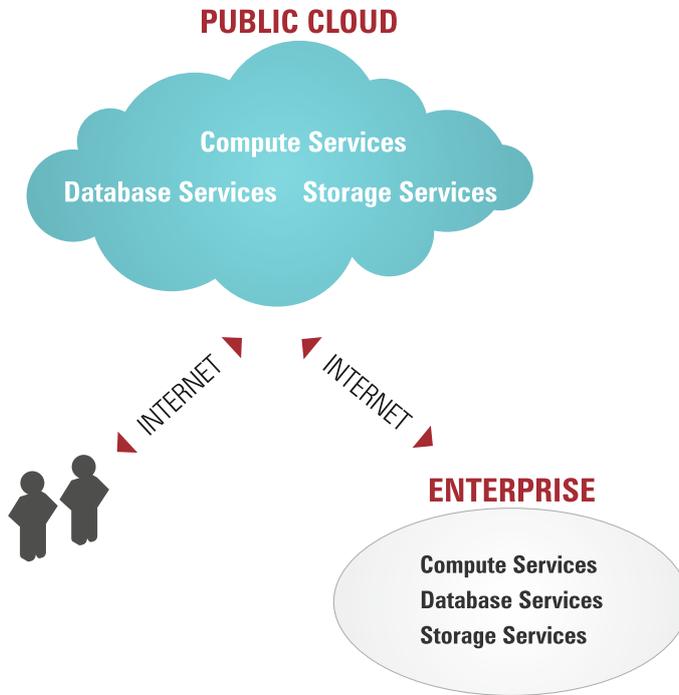
Community Cloud

The cloud infrastructure is shared by several organizations and supports a specific community that has shared concerns (e.g., mission, security requirements, policy, and compliance considerations). It may be managed by the organizations or a third party and may exist on premise or off premise.



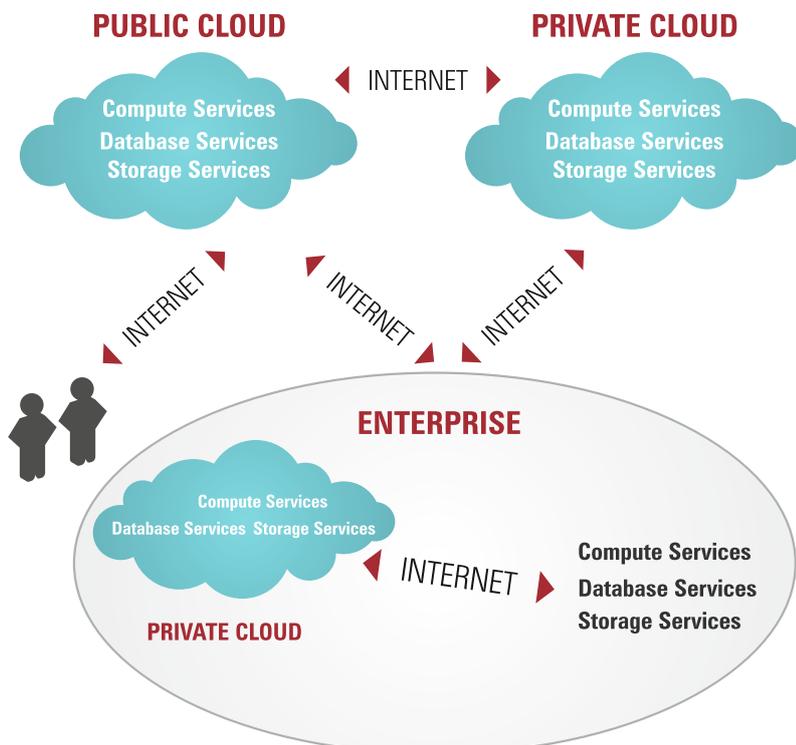
Public Cloud

The cloud infrastructure is made available to the general public or a large industry group and is owned by an organization selling cloud services.



Hybrid Cloud

The cloud infrastructure is a composition of two or more clouds (private, community, or public) that remain unique entities but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load-balancing between clouds).



The three service models of Cloud Computing

The three service models of Cloud Computing are:

Software As A Service (SAAS)

The consumer uses an application, but does not control the operating system, hardware or network infrastructure on which it's running. The provider installs, manages and maintains the software. The provider does not necessarily own the physical infrastructure in which the software is running. Regardless, the consumer does not have access to the infrastructure; they can access only the application.

Enterprise potential:

Already established. This is the most mature cloud-based service model. SaaS is targeted at enterprises looking to gain efficiencies by standardizing certain functions (customer relationship management [CRM], payroll, and other accounting functions) on a common software platform that can be delivered through the cloud. SaaS is a good option for enterprise applications that don't require a great deal of customization.

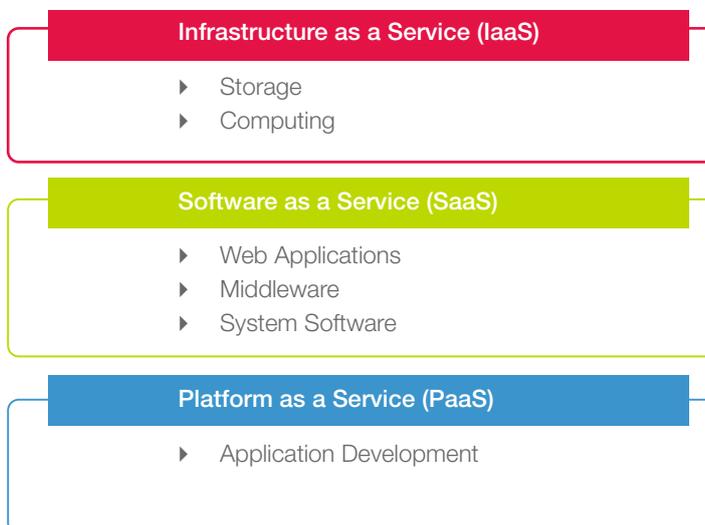
Platform As A Service (PAAS)

The consumer uses a hosting environment for their applications. The consumer controls the applications that run in the environment (and possibly has some control over the hosting environment), but does not control the operating system, hardware or network infrastructure on which they are running. The platform is typically an application framework. The provider manages the cloud infrastructure for the platform, typically a framework for a particular type of application. The consumer's application cannot access the infrastructure underneath the platform.

Enterprise potential:

Growing acceptance. PaaS was originally targeted at independent developers who didn't have the resources to build and manage their own data centers. Enterprise developers are finding these tools to be useful up to the point of deployment, when they may need to move the application to a more enterprise-oriented hosting environment.

Cloud computing builds upon current IT trends like data center consolidation and server virtualization. Enterprises will follow a pragmatic path to the cloud by adopting new technologies, transitioning from physical to virtual IT assets, and adapting existing IT best practices to a new dynamic world.



SOA Provides Integration

Utility computing allows organizations to create flexible environments that can be expanded and contracted based on the workload and target performance factors. The ability to use and pay for only the resources used shifts the risk of how much infrastructure to purchase from the organization developing the application to the cloud provider.

Service	Definition	Target Audience
Platform as a Service	Platform that enables the development and/or deployment of applications without the costs of purchasing, installing, and managing the supporting hardware and software systems.	Independent developers who don't have the resources to build and manage their own data centers; enterprise developers working on web applications.
Software as a Service	Software is deployed as a hosted service delivered over the Internet, typically using a subscription model with fees based on usage.	Enterprises looking to gain efficiencies by standardizing certain functions like CRM, payroll, etc., on a common software platform that can be provided as needed.
Infra structure as a Service	Infrastructure is delivered as a utility over the Internet, creating a shared pool of resources that can be allocated to any application as needed by the enterprise.	Companies of all sizes that don't want to be in the business of managing hardware.

The Pay-As-You-Use Model - Utility Computing

The pay-as-you-use model of cloud computing or utility computing is an extension of established trends. From an enterprise perspective, utility computing or the pay-as-you-go model supports the performance and capacity aspects of service-level objectives. Utility computing allows organizations to create flexible environments that can be expanded and contracted based on the workload and target performance factors.

Virtualization is a key feature of this model. Virtualization allows organizations to quickly and easily create copies of existing environments - sometimes involving multiple virtual machines - to support test, development, and staging activities. The cost of these environments is minimal because they can coexist on the same servers as production environments because they use few resources.

Cloud computing extends this trend through automation. Instead of negotiating with an IT organization for resources on which to deploy an application, utility computing offers a self-service proposition where compute cycles can be purchased, and a Web interface or API is used to create virtual machines and establish network relationships between them. Instead of requiring a long-term contract for services with an IT organization or a service provider, clouds work on a pay-by-use model where an application may exist to run a job for a few minutes or hours, or it may exist to provide services to customers on a long-term basis.

The ability to use and pay for only the resources used shifts the risk of how much infrastructure to purchase from the organization developing the application to the cloud provider.

Benefits of utility computing

The benefits go beyond reduced capital costs and operating costs. Utility computing can deliver more efficient business operations, improve the responsiveness of IT to changing business needs, and reduce the complexities of managing IT, from sourcing to integration to upgrades and maintenance.

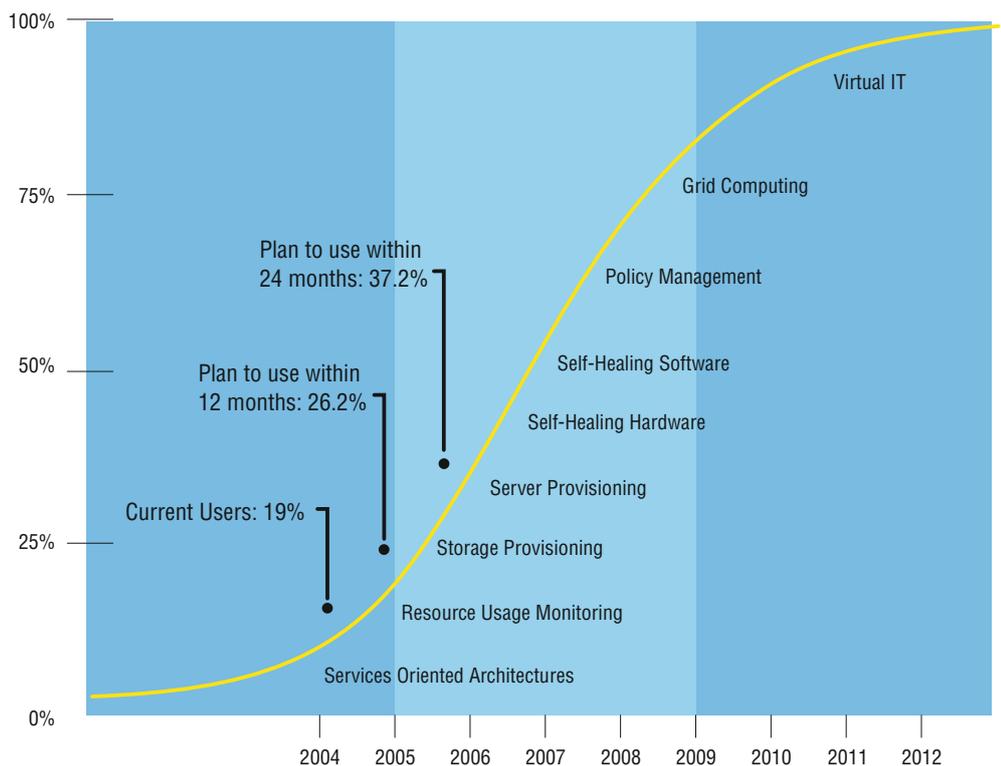
Short -Term Benefits

For those companies and IT departments that are ready and willing to embrace utility computing, short-term benefits (in 12 months or less) can be gained. For example, these are some possible short-term benefits:

- ▶ Leveraging next-generation technologies
- ▶ Spreading IT costs over the lifetime of a project or application
- ▶ Aligning IT infrastructure costs with revenue stream and business growth
- ▶ Obtaining tailored solutions delivered via a secure, end-to-end architecture
- ▶ Simplifying IT and operating with greater efficiency
- ▶ Transforming IT from a fixed operating expense to a variable one (probably the greatest benefit of all)

Pay-As-You-Go Services Adoption Leading Utility Computing

Phase I - Early Adoption	Phase II - Mainstream	Phase III - Mature
<ul style="list-style-type: none"> ▶ Base-level IT and business services (CPU, storage, applications) ▶ Pure-play vendors offering shared infrastructure ▶ Early Pricing options 	<ul style="list-style-type: none"> ▶ Vertical end-to-end and SMB application with increased customization ▶ Large ISVs enter SaS market ▶ More flexible pricing 	<ul style="list-style-type: none"> ▶ Information Utility



Long Term Benefits

Efficiency and cost control In the modern world, organizations need to provide consistent, reliable access to internal applications, external websites, and customer portals. In a traditional computing environment, this creates the need to build and maintain redundant systems, which can be expensive and difficult to manage. In cloud computing, this function is moved to the cloud, where service providers can leverage economies of scale to provide a highly reliable platform with greater cost and management efficiency.

For most organizations, the most appealing feature of cloud computing is the flexible capacity it offers. Access to large amounts of scalable computing power gives organizations the freedom to adjust capacity up and down with the natural cycles of business and pay for these as per their need. Resources can be added, turned off, or reassigned whenever necessary. The cloud eliminates the need for 'over-provisioning' and the unnecessary hardware, software, maintenance, and electricity costs it incurs.

Better Business Support

The advantages of cloud computing are especially clear when looked at from a business perspective. By reducing the time and effort required to launch new applications, cloud computing helps IT become more responsive to the pace and dynamic nature of business.

For IT, deploying a new business application is a major undertaking. Without sufficient time to assemble the necessary resources (human and financial), IT becomes a bottleneck to projects that could benefit the business. Applications supported by the cloud don't require the deployment of a large infrastructure at the customer's location, which dramatically reduces the upfront commitment of resources. New applications can be approved and deployed more quickly, making it easier to satisfy the needs of business managers throughout the organization.

Lower cost of entry

There are a number of attributes of cloud computing that help to reduce the cost to enter new markets:

- ▶ Since infrastructure is rented, not purchased, the cost is controlled, and the capital investment can be almost nil. In addition to the lower costs of purchasing compute cycles and storage 'as per use,' the massive scale of cloud providers helps to minimize cost, helping to further reduce the cost of entry.
- ▶ Applications are developed more by assembly than programming. This rapid application development is the norm, helping to reduce the time to market, potentially giving organizations deploying applications in a cloud environment a head start against the competition.

Stronger IT focus

Cloud computing creates an opportunity for IT departments to change their focus from deploying and supporting applications to managing the services that those applications provide. By transferring the responsibility for monitoring and maintenance activities to a third party, the IT department can focus more on high-value activities that align with and support the business goals of the enterprise.

Instead of being primarily reactive and operations-focused, the chief information officer (CIO) can function more as a technology strategist, working with business units to understand their business needs and advising them on how best to use technology to accomplish their objectives.

Cloud computing provides some strong benefits and economic incentives. Selecting a public, private, hybrid or community cloud implementation will depend on a customer's specific application, performance, security and compliance requirements. Proper deployment can provide significant savings, better IT services and a higher level of reliability.

Competitive advantage leads to business agility

Cloud computing allows organizations to deliver highly-scalable and reliable applications more quickly and cost effectively. This yields tremendous advantage for organizations that depend on or benefit from large-scale applications. With cloud-based applications in place, these enterprises are freed to deliver new products to their customers more rapidly. Because they are able to 'think big,' unencumbered by the constraints of scale, they are also able to make better business decisions by applying sophisticated analyses to the wealth of data available within them.

At the same time, the dramatic reduction in the complexity of the IT environment, the reduced provisioning times, and the ability to shift the allocation of cloud resources in response to changing market conditions creates a more flexible IT organization and a more agile enterprise. And because the enterprise is empowered to align IT infrastructure investments with project benefits, overall risk is reduced and the enterprise is able to invest in more strategic initiatives.

Immaculate planning and vendor selection is the key to success

A successful cloud implementation will ride on matching the company's needs with the service provider's capabilities. There is no one-size-fits-all implementation strategy; the installation will be unique to each individual business.

Before choosing a service provider, an organization must consider how long the service provider has been in business, review available financials to assess health and viability, and carefully examine the provider's record of service offerings.

Cloud computing will be the driving force behind the next wave of technology innovation. However, it's also a sound business strategy that enables organizations to adopt better financial management practices and creates a more sustainable, cost-efficient model for supporting IT services. While valid concerns exist, they can be managed with proper planning. Detailed planning can help determine when and how an organization should move its IT infrastructure to the cloud. Careful evaluation of vendors can help an organization select a service provider whose solution is enterprise ready in key areas such as security, availability, and control.

Conclusion

With its convenient, on-demand model for network access to a shared pool of configurable computing resources, cloud computing is rapidly emerging as a viable alternative to traditional approaches. Costs are being significantly reduced, along with personnel time spent on computing issues. Storage availability increases, high automation eliminates worries about keeping applications up to date, and flexibility and mobility are heightened, allowing organizations to access information anytime, anywhere.

Cloud computing can be rapidly provisioned and released with minimal management effort or service provider interaction. Ultimately, with its offering of scalable, real-time, internet-based information technology services and resources, the cloud can satisfy the computing needs of a universe of users, without the users incurring the costs of maintaining the underlying infrastructure.

References:

- ▶ *Cloud Computing Use Cases by Cloud Computing Use Case Discussion Group*
- ▶ *Envisioning the Cloud: The Next Computing Paradigm by Jeffrey F. Rayport and Andrew Heyward*
- ▶ *Security Among The Cloud – Pricewaterhouse Coopers*

Moving to a cloud computing model can help your organization to survive in a tough economic climate, equipping you with the latest business tools and giving you access to advanced technologies at a fraction of the cost of purchasing and running the same systems in-house. Check that your provider can deliver the type/s and quality of service you require.

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