

MOVING TO THE CLOUD WITH PERVASIVE PSQL

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Introduction and Summary

This paper considers and discusses Pervasive PSQL Vx Server, the new edition of Pervasive PSQL. Its contents are summarized below:

- For ISVs, OEMS, and IT users, cloud computing is both a compelling reality and a challenge. The rapid adoption of cloud computing among all categories of software developers and software users testifies to the opportunity it presents. Nevertheless, there are challenges in many areas, such as IT security, software migration, software licensing issues, and data integration.
- Cloud computing does not pose the same challenges for all cloud users. For ISVs and OEMs, software is the foundation of their business and hence cloud computing is critical to their success. For most other IT users, software is not the main thrust of their business, but it is an important enabler and a significant cost.
- The trend to cloud computing is driven primarily by the cost advantage. As a rough rule of thumb, running software applications in the cloud is at least 50 percent less expensive and that cost advantage is increasing.
- A general pattern to cloud adoption and migration has emerged with many companies implementing a private cloud (a virtual machine deployment capability within their own data center) and then using public cloud services like Amazon Web Services (AWS) or Microsoft Windows Azure as an extension of the data center. The combined use of a private cloud and a public cloud is referred to as a hybrid cloud.
- Migrating database applications to the cloud presents a particular challenge, partly because databases are the most difficult part of an application to migrate and partly because of the inflexibility of most database software licenses. Pervasive Software has thought deeply about this and with its release of PSQL Vx Server has made its PSQL database cloud-aware and cloud-ready.
- Pervasive PSQL Vx Server is a good fit for ISVs, OEMs, and IT users who wish to implement an orderly migration to the cloud. It provides the tools, the technology, and the licensing model to make the cloud implementation of a database simple. It is designed to accommodate the customer's environment of choice, whether that is:
 - On a server in the data center
 - In a private cloud
 - In the public cloud
 - In a hybrid cloud environment
- Pervasive PSQL Vx Server's implementation and licensing caters to all these situations, allowing its users to move at their own pace in their adoption of cloud computing. Applications do not require any rewriting, and the Pervasive PSQL Vx Server software license accommodates every situation in a simple and customer-friendly way. This will be particularly valuable to ISVs and OEMs whose use of a database is strategic to their business.

With Pervasive PSQL Vx Server, Pervasive Software is enabling all its customers to leverage the opportunities of cloud computing and keep in step with the rapid march of information technology.



The Cloud Possibilities

In overview, cloud computing is relatively easy to understand. The term “cloud computing” was first popularized when Eric Schmidt, then CEO of Google, used it to describe Google’s approach to software as a service. The term was quickly adopted by Amazon to describe its AWS resource rental service. Pretty soon almost everyone was talking about cloud computing as though the term had been in use for years.

In general there are three distinct cloud services:

- **Software as a Service (SaaS):** The customer rents the use of software which is implemented in the data center of the provider. Such services have been available from about 1999, with Salesforce.com being the most notable provider. After 2006, all such activity was referred to as “cloud computing” and many more ISVs started to provide cloud services.
- **Infrastructure as a Service (IaaS):** The customer rents the use of computer resources from the provider’s data center. Again, such services have been available, primarily for running web sites, since around 1996. With AWS, Amazon’s main innovation was to allow such resources to be rented by the hour. This increased the popularity of such services considerably and led to a massive growth in the use of such resources.
- **Platform as a Service (PaaS):** The customer rents the use of development tools, which are hosted and deployed by the provider. These services emerged in 2010 and include Microsoft Windows Azure and VMware’s CloudFoundry. The advantage lies in the ability to increase the number of people who can develop, maintain, and deploy web applications.

With the advent of cloud computing, new vendors moved into the SaaS market with many of the smaller software vendors using AWS to run their SaaS environments. Other vendors, notably Rackspace and Microsoft, started to give Amazon competition. Salesforce.com extended its business model, launching Force.com to provide an environment for third-party developers to build products that were compatible with Salesforce.com’s CRM software. The whole cloud movement became a bandwagon and many IT vendors leapt onto it as quickly as they could.

The rapid growth in the popularity of the cloud came from two simple facts:

1. Cloud services, whether software, infrastructure, or platform, are easily and quickly adopted.
2. Cloud-based services are usually inexpensive.

Virtual Machines and Private Clouds

In the wake of Amazon adopting the term “cloud computing,” VMware, the primary vendor of virtual machine software, began to refer to the deploying and management of virtual machines across grids of computers as a “private cloud.” Although this use of the term contradicted the idea that cloud computing was “off premises,” it had some justification.

A virtual machine is a virtual computer that only uses some of the resources of a host computer; part of the CPU chip, some of the memory, some of the I/O channel bandwidth, and some of the networking bandwidth. A hypervisor – a program that behaves like an

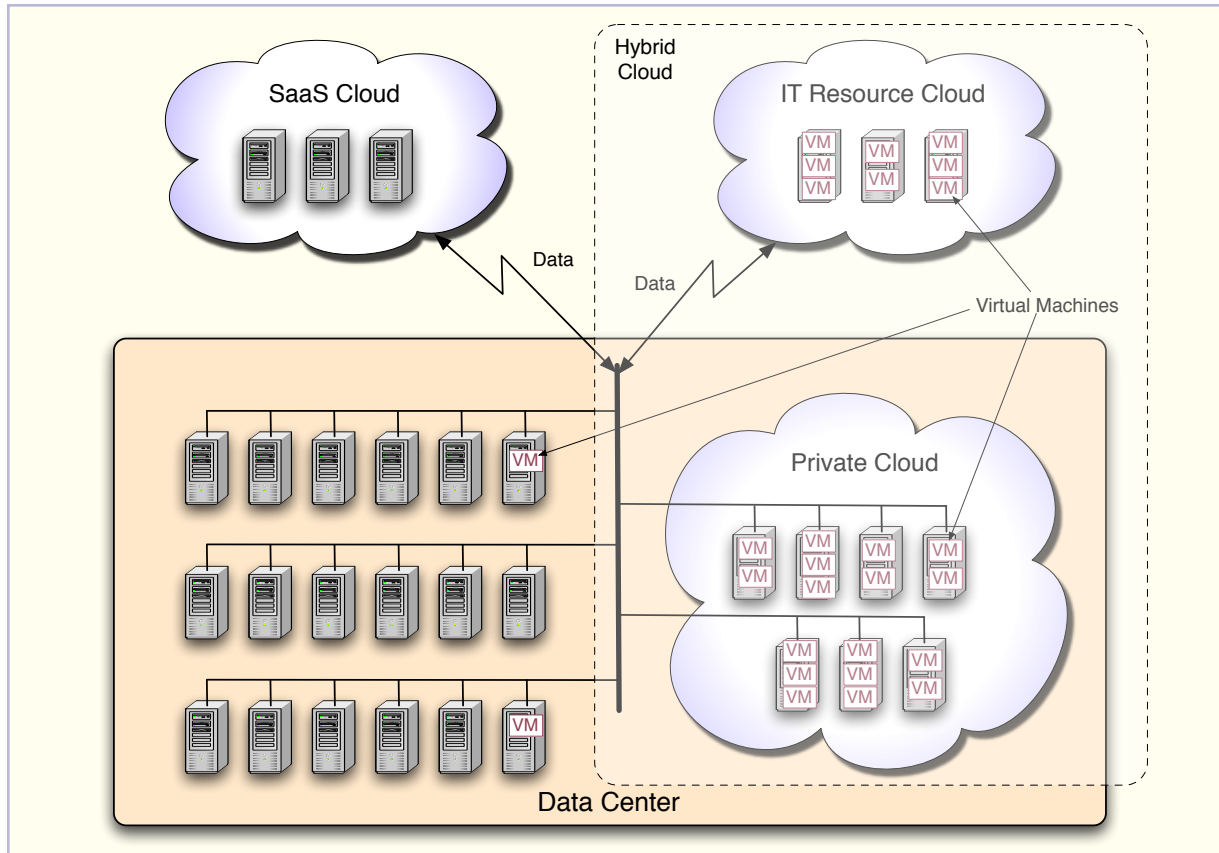


Figure 1. Public and Private Clouds

operating system – is loaded onto the host computer. It directly controls the computer’s resources and runs other programs, called virtual machines (VMs). It can run many VMs on a single host, dividing up the resources of the host computer. Each VM loads an operating system and can run applications.

As far as the application is concerned, it runs no differently than if it ran on a whole computer. Because computer hardware has become so powerful you can configure many VMs on a single computer, and most applications work as well as they would if they had a computer all to themselves.

When VM software emerged, web hosting companies began to use it to host small web sites. When Amazon launched AWS, it initially sold only VM partitions running either Linux or Windows. VMs had become the easiest way to partition computer resource. Amazon enabled the customer to buy and configure a dedicated VM in a few minutes and start to use it immediately. Amazon provided a well-managed pool of hardware resources ready to be deployed and software that could be used over the Internet to book, deploy, and pay for a VM. The private clouds that IT departments began to build worked in exactly the same way, except that there was no need for a payment mechanism.

Figure 1 depicts the emerging reality of the private cloud, public clouds, and the hybrid cloud. VMs can reside on individual servers in the data center or a specially configured pool of hardware resources called a private cloud or in the public cloud.



The Hybrid Cloud

On the one hand, many companies began to deploy grids of cheap server hardware (private clouds) within their data centers, and on the other, companies like Amazon and Microsoft were providing an inexpensive resource in the cloud. One of the beauties of this situation was that companies could treat the cloud, to some degree, as an extension of their data center. One of the conveniences of VMs is that you can save the whole VM as a disk image. You can transfer that disk image, possibly along with the data it needs access to, to another place. That could be to another server in your private cloud or to a VM somewhere in the public cloud. And it can be done quickly. This kind of situation is referred to as a hybrid cloud.

There are two reasons for using a hybrid cloud.

1. Some companies may want to gradually move all their applications that can run on VMs into the cloud. It may be a sensible ambition, but it is probably not a good idea to do so all at once. The company uses the private cloud as a staging area where it prepares to move the application into the public cloud. Once it is confident that the application works well in the private cloud, it can take an image of the VM and transfer that to the public cloud.
2. Other companies simply want to use the cloud as an overflow resource for their data center. Data center costs may be expensive, but some companies are committed to such costs for years. They also know that some of their applications, running on mainframes, for example, will not be moving to the cloud any time soon – because there is currently no cloud service that can accommodate such applications. They use the public cloud for software development, software testing, and perhaps for some applications. When data center workloads are heavy they can move more applications into the cloud and when they diminish they can move them back into the data center. If the activity is well planned, the company may never run out of data center space.

Software vendors need to be particularly mindful of the opportunities and pitfalls of cloud computing. Pervasive Software serves as a good model in that respect. In preparing Pervasive PSQL Vx Server to be appropriate for deployment and use in the cloud, both for its ISV and end-user customers, Pervasive Software has sought to allow for every variety of cloud usage.

Pervasive PSQL Vx Server will happily work within a VM. As such it can be deployed in a private cloud and that instance of PSQL can be transferred to a public cloud and back, if desired. It can work in public, private, and hybrid environments. It can also be deployed, as it is likely to be by ISVs, in a SaaS manner to serve ISV customers from the cloud.

The Cloud Challenges

Cloud is compelling, but it is not all roses. There are pitfalls that need to be understood which we now discuss.

Service Limitations

At the time of writing this most cloud resource rental services run Windows or Linux. Few services cater to other environments, although such cloud services will inevitably become more available in time. Cloud providers need, for business reasons, to ensure a homogeneity of usage among its customers. For that reason they impose limitations on the hardware they



deploy, the size of VMs, networking speeds, which OS versions are supported, and all other management software that they use. They offer a standard capability to access and manage any application or resource it makes available.

Although they vary from one cloud provider to another, all of these constraints need to be considered carefully. You may discover, for example, that although you can deploy a set of applications effectively in a private cloud, it may not be possible to transfer them to a specific public cloud because of limitations it imposes.

Security

Every cloud data center will be protected by IT security in various ways to prevent attacks by intruders, infection by viruses, and all other security threats. For a cloud provider, any successful security breach will be bad for business, so there is no reason to expect IT security in the public cloud to be poor. Nevertheless, there will inevitably be some providers that will fail in this area.

Some cloud vendors have IT security certification. For example, Google, Amazon, and Microsoft have received FISMA certification (a U.S. government standard) for the security of their cloud services. Not all cloud providers have the comprehensive IT security systems that some security conscious IT organizations have implemented. At the very least, cloud adopters need to know what levels of protection are provided, and they need to understand the security risks.

There is also the security of the Internet itself to consider as well as the security of the cloud provider's data center. This can be addressed using cloud virtual private network (VPN) technology, but the customer needs to be sure that it this will work with the cloud service it intends to use.

There is a specific security organization that is devoted to assisting with cloud security issues. The Cloud Security Alliance (cloudsecurityalliance.org), a member-driven organization that promotes best practices in cloud security and provides both education and guidance. It is well worth visiting their web site.

Identity and Access Management

Ideally you will want to preserve the same identity and access management standards in the cloud as are implemented in your data center. What can be done in this area depends to some extent on what the cloud provider allows, but this rarely causes problems. Because a cloud service is exposed to the Internet, strong authentication is desirable and access rights need to be reviewed both for access to the service and at the application level. User interactions need to be logged and access capabilities and permissions need to be actively managed so that they are provisioned and de-provisioned promptly.

Reliability, Service Levels, Performance

The level of service promised by the cloud provider needs to be well understood. Computer hardware fails and applications fail. In April 2011, AWS had a highly publicized outage. It made the news because it disabled or degraded many popular web business including Reddit, Foursquare, and Netflix. It was bad publicity for Amazon, even though Amazon was



not in breach of its promised service levels. There are two distinct levels of service available with AWS, one of which is far more reliable because it provides failover. Those businesses that drove the headlines never chose to buy the “premium” service.

For companies that are renting VM resources, especially if you are moving an application from a private cloud to a public cloud, it is important to understand that you have no control over how much actual computer resource you will be allocated in the public cloud unless your service contract specifically defines what resources you will be allocated. As a consequence, it is important to know the service levels (levels of availability and response times) that your application currently experiences and monitor how well the cloud service performs.

For ISV’s who are intending to provide their applications from the public cloud on a SaaS basis this is doubly important, because it will not be so easy to shift the applications and their users from one cloud platform to another if the service levels are poor.

The Management of Applications

Within the data center it is possible to provide very sophisticated application management capabilities, providing automated backups, network monitoring, application failover, database administration, resource monitoring, and so on. Within the cloud you may not be able to implement such a comprehensive environment. Each area of application management needs to be looked at to see how it will operate in the cloud. For ISVs who wish to host applications in the cloud for their customers, this is critically important.

Integration

There are two types of integration that need to be considered: Data integration and program-to-program integration. Most applications share their data and will need to transfer and possibly receive data from elsewhere. That may be between applications in the cloud or to and from the data center. If large amounts of data must be regularly transferred, the feasibility of such transfers needs to be investigated. There might not be sufficient reliable bandwidth to ensure that it works or the resources purchased may simply be inadequate. With program-to-program integration, performance is the primary concern. If, for example, you locate two related applications on the same server in your private cloud for the sake of efficiency, they may not be placed so conveniently when transferred to a public cloud so performance could suffer.

Software Licensing

Licensing is a particularly difficult area simply because software licenses vary considerably and some of them do not even mention VMs or implementation in the cloud. To make matters worse, some software license management tools are not built to discover VM deployments or cloud deployments. This means that some of the key benefits of VMs – namely live migration – are eclipsed. Manual and automated migrations alike can become problematic if such changes cause the license to be disabled or generate unreasonable costs. The situation gets more complex when you consider a suite of applications that needs to work together but doesn’t have compatible licenses in respect to VM and cloud deployment. For ISVs the situation can become very frustrating, especially in the area of the database.



Databases can be priced per user, per server, per processor, and corporate wide – each with different conditions attached. If the IT department fails to track the number of database instances or resources used, according to the workload, it may never be quite sure if and when it strays from being compliant with its software licenses. Together, VMs and the cloud allow for the rapid creation and deployment of application and database instances. Without built-in controls, the possibility of over deploying or overshooting the licensing budget can easily become a reality. For the ISV who may wish to deploy a database in the cloud, the situation is even more complex, simply because there will be so many more instances. In some situations, the ISV may wish to configure a multi-tenant arrangement where more than one customer shares the same database instance, but the software license may make that impossible.

Cloud Administration

Applications that live in the data center do not need to be administered in the same way that cloud applications and cloud services do. Paying for a service means ensuring you get what you pay for. It will help if the cloud provider logs all usage of the applications and/or resources being paid for – and if that’s not the case, you need to be certain that your company is formally logging usage and other aspects of the cloud service so that they can be reconciled against the charges.

Planning and Set-Up

If you take all the above points into consideration, it becomes clear that the adoption of cloud computing needs to be thought through. While it may be possible to use some SaaS products and rent some virtual resources without a great deal of planning and investigation, it is not advisable to consider migrating a large number of production systems to the cloud without doing the proper groundwork.

This is especially the case for ISVs and OEMs that wish to build a thriving business in the cloud. The cloud may be very appealing but a cloud-based operation needs to be secure, guarantee a reliable service, and have a low cost base. If it doesn’t, it may prove to be a very risky venture.

Pervasive PSQL in the Cloud: Pervasive PSQL Vx Server

Pervasive has an exemplary record of support for PSQL in the Linux, Windows, and Novell NetWare environments, offering support for new service packs and minor version upgrades within 60 days of release. It was quick to enable PSQL to exploit 64-bit implementations and to exploit multicore x86 chips as they became available. It has paid the same level of attention in its support of cloud computing. In Pervasive PSQL Vx Server, Pervasive has created a new edition of its database specifically tailored for VM environments, either in the data center or in the cloud.

Virtual Machine Support

Pervasive PSQL Vx Server is fully compatible with PSQL v11 Server so there is no need to make any significant changes to migrate applications from PSQL V11 Server to Pervasive PSQL Vx Server. In fact, as Pervasive PSQL Vx Server can run on a physical server outside a



VM, it could be upgraded in place. Pervasive PSQL Vx Server supports partial virtualization, paravirtualization and full virtualization environments from VMware, Microsoft, and Citrix (see Table 1).

As regards support for specific cloud services, Pervasive PSQL Vx Server has been proven in both Amazon (AWS) and Microsoft (Azure) cloud services. Any service that offers Linux or Windows and a compatible VM environment will probably work fine.

Virtual Machine Possibilities

The VM environment is complex but Pervasive PSQL Vx Server enables IT users and ISVs to stay focused on their application. The database can be moved simply from a physical server to a virtual server or a virtual server in a private cloud or a virtual sever in the public cloud. This applies to complex virtual environments where, for example, a VM may be moved automatically from one server to another when workloads increase or decrease. Instances of Pervasive PSQL Vx Server can be cloned or copied with appropriate licensing, and it can be configured for high availability or complete fault tolerance. While the user still shoulders the management of environment, PSQL Vx Server is optimized for alignment.

Because of this flexibility, the Pervasive PSQL Vx Server user can choose different strategies for deployment, according to circumstance. For example, an application can be run in the data center but be duplicated for reporting purposes in the public cloud. Applications could be gradually migrated to the public cloud after being tested in the private cloud. Back-office applications could be retained in the data center while the front office was situated in the public cloud. To meet peak demand requirements, applications could be scaled up and down in the cloud, according to resource availability in the data center. Applications could be moved from one public cloud to another if there was a need to switch between cloud providers. This flexibility of deployment spans every private cloud, public cloud, or hybrid cloud strategy.

For the ISV or OEM user of Pervasive PSQL, the possibilities multiply because Pervasive PSQL Vx Server can do all of the things just described for their customers, and it also enables them to build their own cloud service and hence deliver a flexible SaaS arrangement to make life simple for their customers who wish to move to the cloud at their own pace and in their own way.

As we noted when we described the cloud challenges, data transfer to and from the cloud needs to be thoroughly considered. When replicating data – copying data from one instance of Pervasive PSQL to another – most ISVs are likely to prefer to use Pervasive’s Data Exchange, which is well tailored for use with PSQL. Data integration, or moving from Pervasive PSQL Vx Server to another database or application in the cloud, requires some kind

Table 1: Hypervisor Feature Support
VMware: vSphere with vMotion and vLockstep
<ul style="list-style-type: none"> • VMware Distributed Resource Scheduling • VMware High Availability • VMware Fault Tolerance • VMware Site Recovery Manager • VMware View • VMware ThinApp
Microsoft
<ul style="list-style-type: none"> • Hyper-V with live migration • App-V
Citrix
<ul style="list-style-type: none"> • XenServer with XenMotion • XenApp



of transformation. In this case, most ISVs may prefer to use Pervasive Data Integrator. Data transfer should be an integral part of any VM migration strategy as the data integration or replication software needs to be adjusted to reflect any transfer of PSQL Vx Server from one environment to another.

The Pervasive PSQL Vx Server License

Pervasive PSQL Vx Server edition is a separate product from both PSQL Server and PSQL Workgroup, requiring its own installation and covered by a distinctly different software license that has been designed to make private cloud, public cloud, and hybrid cloud deployments convenient and trouble free from a licensing perspective.

The current versions of Pervasive PSQL Server and Pervasive PSQL Workgroup can both run in VMs, but they implement hardware and software component matching as part of the licensing validation process to do so. For that reason, live migration of VMs and applications using these products requires almost identical hardware configurations and can involve a good deal of planning. The same is true for many other database products from other software vendors.

Pervasive PSQL Vx Server's licensing validation process makes moving VMs with PSQL Vx Server instances simple. Authorization requires only the presence of an Internet connection and that the virtual hostname and all virtual MAC addresses remain unchanged. Pervasive PSQL Vx server periodically connects to the Pervasive licensing server to validate the state of the PSQL Vx Server installation.

Pervasive Software can also provide a flexible deployment license which allows multiple installations of PSQL Vx Server to be authorized with a single product key no matter where the instances are located. This works in the following way.

The flexible deployment key authorizes multiple installations of PSQL Vx Server. For example, if you purchase a license that allows six instances, and you are running five instances, you can launch one more instance at any time. After that you would have to take one instance down in order to launch another one or alternatively you need to upgrade the license.

Flexible deployment keys are particularly helpful where VM templates or VM pools are being heavily used with new VMs frequently being added or taken down. They can also be applied to cloned or copied databases.

Flexible deployment keys are particularly useful for ISVs and OEMs, especially those that are offering or intend to offer a SaaS cloud service. The ISV can indulge in very complex deployments on behalf of multiple customers, utilizing failover strategies and gradual cloud migrations, and the whole operation can be controlled under a single licensing arrangement.

Capacity and Time-Based Licensing

Pervasive PSQL Vx Server introduces a new form of database licensing particularly suited to use in the cloud. The new licensing model features two dimensions:

- Capacity based
- Time-based variations to the license



The ability of thousands of users to access applications via a browser and VM abstraction of the physical hardware layer means that traditional licensing measures such as user count and per-CPU will rarely be a good fit in a cloud environment. Pervasive's capacity-based licensing allows customers to choose a database configuration by the amount of work the database engine is able to perform, irrespective of the number of users accessing the data or the hardware where the database runs.

A capacity-based license is defined in Pervasive PSQL Vx Server licensing terms as a combination of active database sessions and the combined size of opened database files. An active session corresponds to any connection to the database engine which puts files or tables in use. In effect, the license applies to the highest number of such concurrent connections and not to a user count. So Pervasive PSQL Vx Server is licensed by the number of active sessions and the size of the files being accessed by the database engine, and this greatly simplifies licensing issues associated with applications in the cloud.

Additionally, there is the factor of time. Most businesses try to optimize their applications to meet peak demands, allowing some headroom for system failures during times of high business volumes. Perpetually running to meet peak capacity is not always necessary, and it is costly. Many businesses are cyclical in their IT capacity needs. A good example is the retail industry. According to the National Retail Federation, 25 to 40 percent of business is done solely in the last two months of the year in the holiday season. This varies with some retailers; some e-commerce sites having even higher IT capacity peaks.

With the ability to rapidly configure and deploy application instances using VMs, it becomes relatively simple to expand capacity to meet seasonal or cyclical demands. So, to help businesses meet short-term peak demand for the database, Pervasive has included time-based licenses for Pervasive PSQL Vx Server that allow for the addition of data or session capacity for 30-day increments at a fraction of the full license price. Time-based licensing will help customers reduce costs by licensing capacity only when it is needed.

The Cloud Payoff

The primary attraction of cloud services is the cost. From the cloud user's perspective, adoption can be fast, the service involves no capital outlay, and rental costs are low. AWS, for example, has a fairly complex charging system based on several factors, but costs are uniformly low. At the moment, it even includes a free usage tier (for a year) for very low usage. Modest server usage costs are measured in cents. Microsoft's Windows Azure service has similarly low pricing with hourly rental costs for a single instance coming in anywhere between \$0.04 and \$0.96 per hour.

Resource providers like Amazon and Microsoft achieve massive economies of scale by building very large data centers in geographical locations where land, power, and labor costs are all low. Because they provide a standard service, the labor support and management costs per unit of computer power are far lower than for a traditional data center. The same is true of power costs, because they can negotiate favorable rates due to the large amount of electricity they use. They can, and do, build their data centers from the ground up to minimize power and cooling costs, and they can negotiate favorable prices for the commodity hardware that they deploy.



No normal data center can possibly achieve such economies of scale. Because cloud services are very competitive, providers pass most of the saving on to the consumer. Case studies suggest that a cloud service such as Amazon's EC2 or Microsoft's Azure is somewhere between 50 to 70 percent cheaper than the typical data center.

SaaS cloud vendors like Google and Salesforce.com that run their own highly scaled data center have similar cost advantages, further helped by the fact that they run just a few applications in a standard way. However most SaaS vendors have chosen not to build their own data centers. Instead they use the public clouds of vendors such as Amazon and Microsoft because the costs are lower. This is the road the vast majority of ISVs that offer a cloud service have taken.

Cloud Trends

One way to assess the growth in cloud computing is to take a look at Amazon, which is currently the dominant provider of cloud computing resources. In the space of four years (2007 to 2011), Amazon has grown a cloud business from zero to generate an estimated \$500 million per year. (Amazon doesn't provide exact figures in its annual reports so this is an estimate.) It is currently growing its service at well over 100 percent per year.

Merrill Lynch estimates that the market for cloud services will amount to \$160 billion in 2011. AMI Research estimated that small and medium-sized business (SMB) cloud spending alone will reach \$100 billion by 2014. Other analysts provide similar estimates. Cloud computing is already big business, although how big depends to some degree on what you classify as a cloud service. Nevertheless, there can be no doubt that cloud services are growing fast and, as time passes, more IT users and ISVs are moving to the cloud. All surveys agree on this.

Regarding what the cloud is being used for, a 2010 survey of Global 2000 organizations by newScale Inc. and Hyperstratus provides a clue. It reports that 47 percent of companies surveyed used the public cloud with 32 percent of that 47 percent using it just for software development tasks, while 15 percent also use it for production environments. A full 91 percent of those surveyed (including those not yet using the public cloud) regarded hybrid clouds as important or very important, while only 9 percent said that they were not important. It is worth reflecting on the fact that this survey only polled large companies, and it is widely acknowledged that cloud usage is greater in smaller organizations.

If you combine the two factors of low pricing and the trend to cloud adoption, it is inevitable that almost all companies will be using the cloud in a few years time and some will move completely to cloud operation. We have noted the challenges that organizations face, but none of them are insuperable.

IT Users in the Cloud

For IT users, cloud computing is attractive. This is especially so for SMBs that have neither the need nor the expert staff required to run an efficient data center. That's why the uptake of cloud computing has been high in the SMB market.

For slightly larger organizations, the motivation is also strong:

- The cloud is an almost perfect resource for software development and particularly software testing because it is so easy to create, use, and archive VMs.

- Hybrid clouds are not expensive to establish. They decrease data center costs in their own right because they make better use of hardware resources and they can act as a proving ground for the public cloud.
- The public cloud can become an overflow resource for the data center, and in time, most if not all applications can be moved to the cloud where operating costs will be lower.

ISVs and OEMs in the Cloud

Most of the large software vendors, including Microsoft, Oracle, and even Intuit, moved quickly to the cloud both because of the simple economics of offering such a service and because, in their view, it offered a competitive advantage in attracting customers. Pervasive Software itself was quick to move into the cloud, using AWS, and it now provides a variety of data services via its DataCloud2 platform.

In our view ISVs and OEMs that have not yet made the move should consider doing so soon.

There are very few software applications that cannot make the transition. Indeed, most “big data” databases – even Hadoop – are now available as cloud services.

We provide Table 2 as a general step-by-step guide to cloud migration. It begins with the introduction of VMs and a private cloud, graduating to the use of a public cloud service. The key aspect of cloud migration once a private and public cloud capability have been established is deciding which applications and database instances to move to the public cloud. A sensible place to begin is to consider operational applications and reporting applications separately as they present distinctly different workloads and are likely to involve different security considerations.

Once the initial deployment has been tested and implemented, the decision on how to evolve the cloud usage depends critically on monitoring performance and costs. At that point the cloud has become a natural extension to the data center and an integral part of providing services to the customer.

The trend is toward buying software as a service and IT users increasingly expect at least a choice between on premises and cloud deployment. There is both threat and opportunity in this trend. Those who move quickly may win new customers at the expense of those who don't. The upfront costs are not expensive and, with Pervasive PSQL Vx Server, there's very little technical effort needed to make the move.

In Summary

The cloud is an attractive prospect for most organizations whether IT users or ISVs and the trend toward the use of the cloud is very strong. Pervasive Software has thought deeply about this. Aside from moving into the cloud itself, it has worked hard to make its products cloud-ready and cloud-aware.

1	Implement VMs within the data center
2	Implement a private cloud within the data center
3	Move suitable applications to private cloud
4	Identify candidate applications or parts of applications for migration to public cloud
5	Migrate those applications to the public cloud
6	Monitor cloud performance and costs and adjust cloud deployments accordingly



Pervasive PSQL Vx Server is a good fit for those ISVs, OEMs, and IT users who wish to implement a considered and orderly migration to the cloud. It provides the tools, the technology, and the licensing model to make the cloud implementation of database simple. It is designed to work well in the customers environment of choice, whether that is:

- On a server in the data center
- In a private cloud
- In the public cloud
- In a hybrid cloud environment

There is nothing in Pervasive PSQL Vx Server's implementation or license that favors any of these situations. It has been engineered and licensed in a manner that allows its users to move at their own pace within the cloud computing strategy they have adopted. Applications do not require any rewriting and the PSQL Vx Server software license caters to every situation. This will be particularly valuable to ISVs and OEMs whose use of databases is strategic to their business and whose need to provide a cloud computing option to their customers is paramount.

Pervasive PSQL Vx Server paves the way to cloud computing no matter which route its users choose to take.

About The Bloor Group

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