Cloud Computing: Save Time, Money, and Resources with a Private Test Cloud

Redguides
for Business Leaders

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- Optimize your test infrastructure environment
- Reduce capital and operational expenses
- Enable self-service provisioning of resources

Like many companies, your business probably has a test environment encompassing multiple, diverse information technology assets that require significant staff and budget to configure and manage. This complexity poses challenges to your testing organization as they try to keep pace with the ever-shortening testing cycle.

Testing an application before entrusting your business to it is essential. IT test environments are necessary, but often their resources are underutilized; industry estimates suggest by as much as 50 to 70%. A test environment can be a drain on resources in a number of ways. An overbuilt test environment will be costly, and will sit idle most of the time. Other problems result when an enterprise underspends and therefore underbuilds the test environment.

Examination of real-world scenarios reveal some common problems that occur when test environments are not planned and sized appropriately.[1] For example, 30% of all defects are caused by wrongly configured test environments. And, although test environments are sometimes viewed as being expensive and providing little real business value, 30 to 50% of all servers within a typical IT environment are dedicated to test. At the same time, most test servers run at less than 10% utilization, leaving expensive resources idle. On the other hand, many IT staffers report a top challenge is finding available resources on which to perform tests. Testing backlog is often very long and is reportedly the single biggest factor in the delay of new application deployments.

What is needed is a way to provide your users with rapid access to dynamically scalable IT resources. Fortunately, cloud computing has the elements of on-demand self-service, rapid scalability up and down, ubiquitous network access, location-independent resource pooling, rapid elasticity, and pay per use.

Cloud computing can help you organize and streamline your test environment. The business model of cloud computing facilitates better use of existing resources, allowing you to do more with fewer resources. As a result, you can achieve a highly simplified and efficient test environment with fewer provisioning processes—helping to reduce overall costs. You can lower your capital and operating expenses with fewer IT purchases and staff. This is possible through physical consolidation, virtualization, and better IT management.

[1] "Industry Developments and Models – Global Testing Services: Coming of Age," IDC, 2008 and IBM® Internal Reports

How cloud computing helps your test environment

The characteristics of cloud computing are a natural fit for enhancing your test environment. You have the choice of a public or private test environment. A *public test cloud* is owned and managed by a service provider, and access is by subscription. It offers a set of standardized business process, application, and infrastructure services on a flexible price-per-use basis. Advantages of a public test cloud include standardization, capital preservation, flexibility, and a shorter time to deploy applications. A *privately owned and managed test cloud* is accessible only by your company and your partner network. A private test cloud provides more ability to customize, drives efficiency, and retains the ability to standardize and implement best practices. Other advantages include availability, resiliency, security, and privacy. This guide discusses the *private* test cloud environment.

Currently, before a new application is tested, developers often spend days, weeks, or even months to procure and configure appropriate hardware, networking, software, and storage. A test cloud can automate this process, thus speeding it up dramatically. Figure 1 shows a typical cloud test life cycle that includes the procurement process.

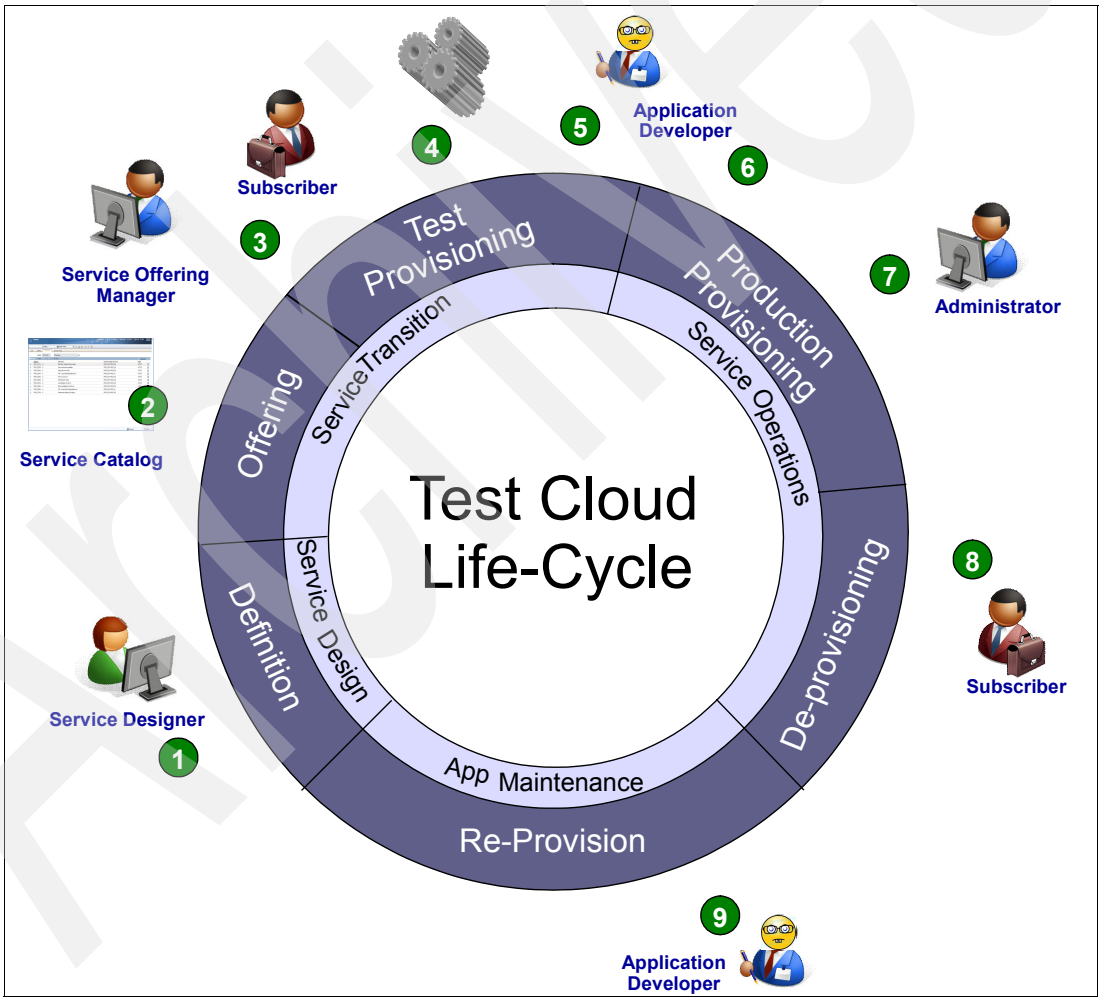

Figure 1 Test life cycle with provisioning/deprovisioning

A typical test life cycle consists of the following steps:

1. Define services in the catalog
2. Services are released to end users

3. Resource request initiated by user
4. Provision test resources
5. Create application image
6. Change test resource
7. Promote to production
8. De-provision test resources
9. Re-provision test resources

A well-implemented test cloud can significantly reduce operational and capital costs and improve quality throughout the life cycle. By contrast, when done manually, these steps can take a significant amount of time. A cloud environment dramatically reduces this complexity by implementing automation, business workflows, and resource abstraction that allows a user to browse a catalog of IT services and submit the order. After an administrator approves the order, the cloud does the rest. This process reduces the time required to make those resources available to the client from months to minutes.

Major savings include efficient use of hardware resources, software license savings, provisioning cost savings, and productivity improvement. Additional savings may be gained from reducing the cost of managing inactive OS instances. Table 1 shows the benefits resulting from cloud computing attributes and characteristics.

Table 1 Attributes and benefits of cloud computing in a test environment

Common Attributes	Characteristics	Benefits
Advanced virtualization	Test resources are pooled and virtualized.	Providing efficient implementation independent infrastructure.
Rapid provisioning	Test resources are provisioned on demand.	Reducing test setup and execution time and eliminating errors
Service catalog ordering	Test environments are readily available.	Enabling visibility, control and automation.
Elastic scaling	Test environments scale down and up by large factors as the need changes.	Optimizing resource utilization.
Flexible pricing	Test resources are priced on supported topology and project phases.	Offering pricing options tailored to user resource needs.
Metering and billing	Test resources used and reserved are charged back to LOBs.	Prioritizing innovative projects.

Achieving return on investment with cloud computing

A test cloud may reduce capital and operating expenses in your test environment, while improving the quality of tested offerings. IBM offers an analysis tool to estimate return on investment and identify areas of savings.

Areas of savings

The major areas where implementing a cloud solution can result in savings are as follows:

- Hardware: Virtualization by boosting hardware utilization through stacking multiple virtual servers in a physical server.
- Software: Clients are charged for operating systems and other software by the number of physical servers instead of the number of instances. Hence fewer physical servers require fewer licenses.

- System administration: Reduced system administration and operation costs in cloud infrastructure with fewer physical servers.
- Provisioning process: Labor savings in service request management and fulfillment from automation and standardization.
- Improvements in tester productivity: Reduce idle and waiting time; increase flexibility in testing plan.

The IBM Test Cloud ROI tool highlights the savings that might be achieved by implementing a cloud environment. These include a reduction of total cost of ownership of data center infrastructure and reduced capital expenditure due to improved utilization. Other benefits may include reduced operations expenditure and lower costs for facilities, maintenance, energy, IT service delivery, and labor. Other areas of potential savings are reduced risk, less idle time, acceleration of innovation projects, and enhanced client service.

A fully automated provisioning process that is security compliant and automatically customized to users' needs provides many advantages. A key one is the significantly reduced time to introduce technologies and innovations, including new and innovative services. This results in a request-driven delivery of test environment infrastructure and associated services including operating system, middleware, storage, network, images, and data. Equally important is the cost-savings. These include savings in labor for designing, procuring, and building hardware and software platforms, as well as savings by avoiding human error in the configuration of security, networks, and the software provisioning process. Clients can cut capital and operational costs without impacting mission-critical production applications.

Clients who have used a test cloud have achieved significant improvements in their test environment. Table 2 identifies some of these improvements, as reported by actual clients.

Table 2 Real improvements from client implementations

Capability	From	To
Server/Storage utilization	10-20%	70-90%
Self service	None	Unlimited
Test provisioning	Weeks	Minutes
Change management	Months	Days/Hours
Release management	Weeks	Minutes
Metering/Billing	Fixed cost model	Granular
Payback period for new services	Years	Months

Some of the benefits that clients have experienced include increasing their effective testing capacity using existing resources while decreasing the time it takes to fulfill requests for IT-enabled resources. In addition, they have reduced or eliminated change and configuration errors in the test environment.

Business use case: China Cloud Computing Center at Wuxi

The city of Wuxi, located about 100 miles outside of Shanghai, China, is engaged in an economic development project to establish a software park. This specialized zone provides substantial tax incentives for businesses that open new offices in the software park. One challenge facing startups in Wuxi was the high up-front investment in IT infrastructure they needed to make before being able to accept business from enterprise clients.

To address this issue and attract companies to the software park, the municipal government of Wuxi worked with IBM to build a cloud computing center based on the dynamic infrastructure model. Tenants in the software park can rent software development and test environments in this data center.

Besides automatically provisioning operating systems like Linux® Red Hat® on both System x® and System p®, and middleware like WebSphere® Application Server and DB2® Enterprise Server Edition, this solution also makes it possible to automatically provision many Rational® products to provide software companies with best-in-class test environments. Some of these products are:

- IBM Rational for Multiplatform
- IBM Rational Performance Tester for Multiplatform
- IBM Rational PurifyPlus™ Enterprise Edition for Multiplatform
- IBM Rational Software Architect for Multiplatform

Because multiple clients are hosted within one environment, this solution requires exceptionally effective network isolation and security. In this virtualized environment, hosts from one physical server may have VMs used for multiple projects; one project might also span multiple hosts. Virtual private network (VPN) technology is used to make sure each client has its own isolated network. When resources are provisioned, additional networks/bridges are configured on either the Xen host or virtual I/O server.

Now let's examine two examples where clients have studied the benefits of a cloud environment. These real-world examples demonstrate the cost-effectiveness of an IBM cloud solution.

Client proposal example A

A leading bank partnered with IBM to implement a private test cloud, citing a number of benefits. Implementing cloud computing will enable the bank to reduce the number of physical servers from over 400 to just over 200. Cost savings will be realized primarily in the areas of system administration (41%) and provisioning (38%), as well as in testing process overhead. This client is making an initial investment of $1.3M to move to a cloud environment, which will yield much lower operating costs for the following years. A 474% ROI is predicted within three years based on the extensive ROI modeling done of their existing test environment, and payback is estimated to be around 6 months.

Figure 2 on page 6 compares their current IT model with a test cloud model.

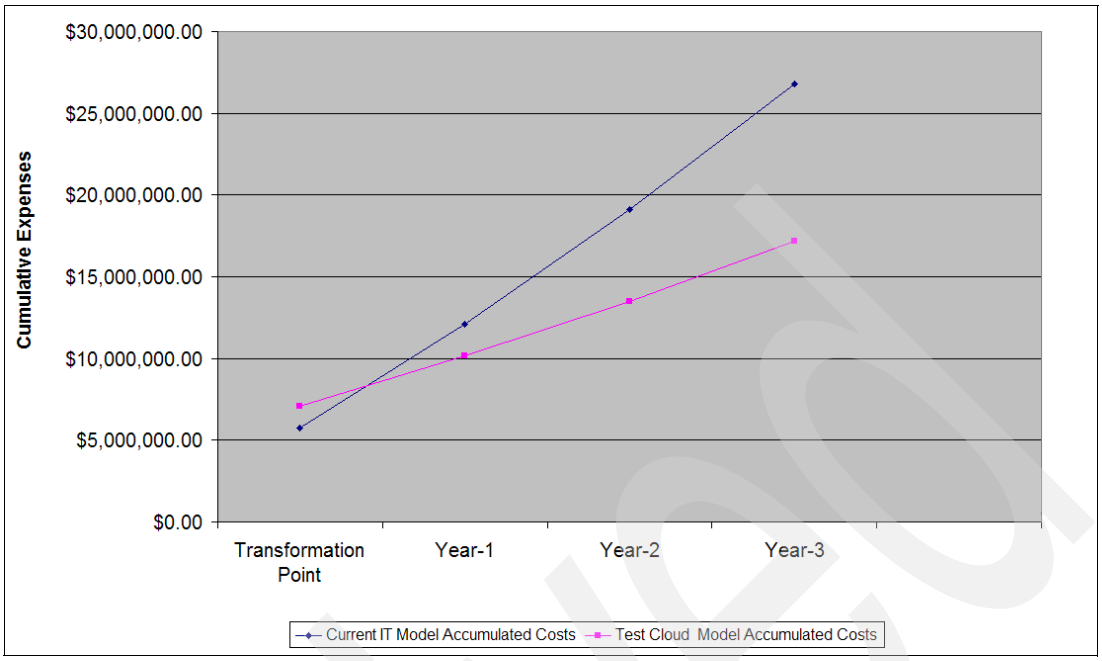

Figure 2 Cost comparison of current and test cloud models

Client proposal example B

A national lending organization is facing a number of common business challenges. They need to increase flexibility and scalability of their test environment while reducing total cost of ownership. They want to increase efficiency of their testing processes because of booming application growth. Lastly, they plan to update and increase the scope of their existing hosting agreement with IBM. They did not start out with a cloud solution in mind, but have now decided to increase the efficiency and expand the capacity of their test environment with a Smart Business Test Cloud.

They chose IBM because of an existing trusted relationship, where IBM currently manages their production and test environments and because the solution was technically innovative without adding new hardware. In fact, the solution might allow the client to reduce their total number of system images, but more importantly, the client can increase the number of projects going through their test environment without increasing the number of system images. The solution is a private test cloud that IBM will host and manage for the client as a dedicated private cloud. It includes a fixed base monthly price, plus variable monthly costs based on consumption. It will standardize the test environments with resulting lower costs.

Technical solution description

A test cloud consists of a dynamically provisioned and scaled runtime environment that provides everything needed to develop and test an application. The private test cloud provides services that integrate people, processes, information, and tools to streamline the request, the fulfillment, and the management of the client's IT test cloud landscape (such as servers, operating systems, middleware, storage, network, images, and data).

Operating systems within the cloud are managed using OS images. To provide an operating system as part of the private cloud, the administrator first creates a master system, configures it, and installs any required software. The administrator then captures an image of this system into the cloud environment. The method of capture will differ depending on the

hypervisor technology in use. Images can also be created as a composite of OS images and software products that cannot be installed as part of an image. These software products would be packaged by the administrator and then grouped with an OS image. If an existing image for an operating system exists, for example an AIX® mksysb, it can easily be imported into the cloud without the need for further image capture. The administrator can choose to publish a service offering that allows the consumer to select the operating system image, or can have the cloud select the appropriate operating system based on request parameters. If an image needs modification, a new image can be captured at any time. Images within the cloud are treated similarly to other resources. The administrator adds them to the cloud environment, and then the cloud management software uses them as part of request fulfillment based on embedded rules and customer input.

Now we examine the private test cloud architecture from two different perspectives: a cloud functional services view and a cloud systems view.

Cloud functional services view

The functions and services offered by cloud computing start with the needs of the consumer, who makes a request for services and resources through a Self-Service portal. Cloud applications then search for resources to match the request using a portfolio of cloud services. Access is provided back to the consumer through the portal.

Services are made available to the consumer by the administrator. The administrator uses the Admin Portal to publish the services that are offered as part of the cloud, as well as to prepare resources for use within the cloud. This portal is the interface to a number of tools and reports as well, as shown in Figure 3.

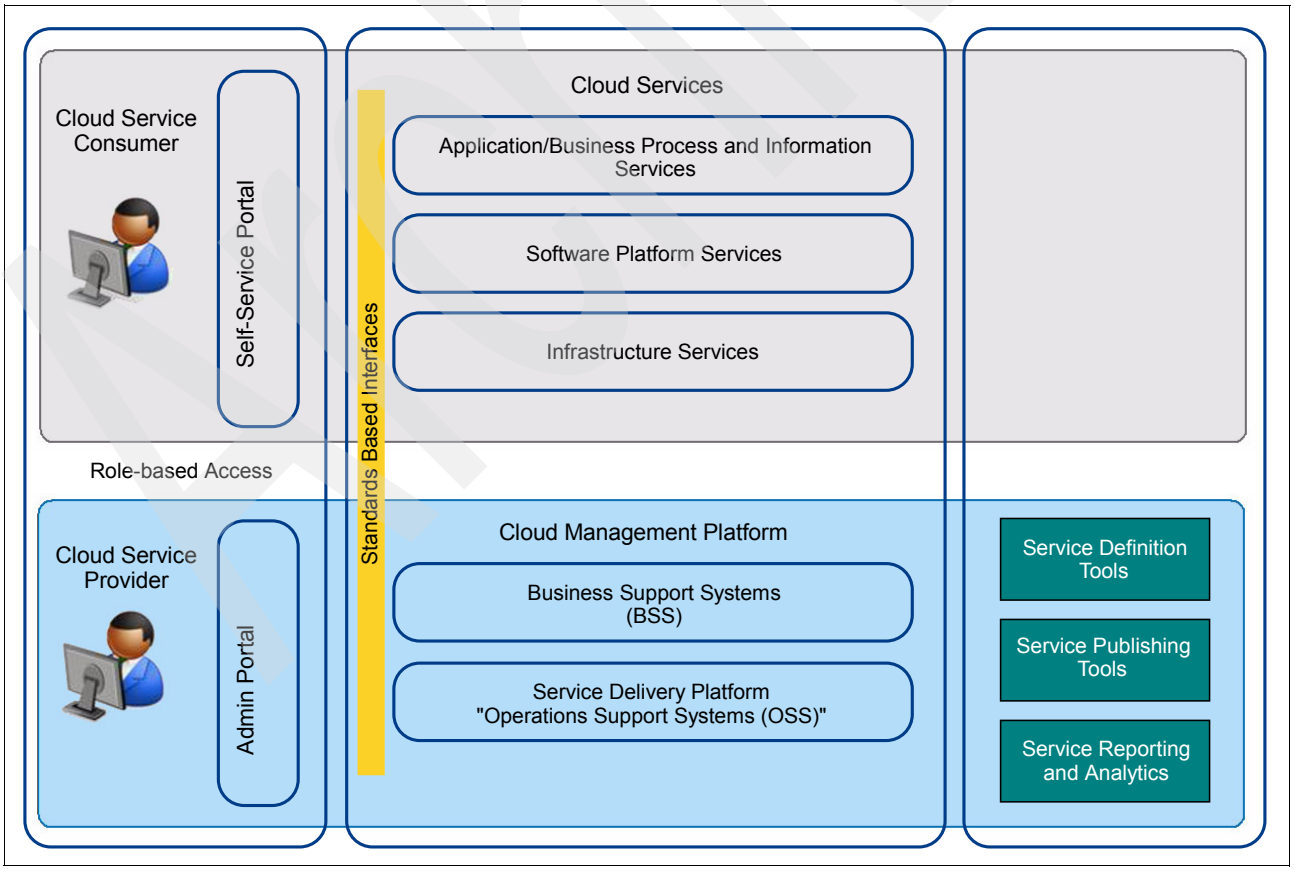

Figure 3 Cloud technical solution: Functional services view

Service and request operations

There is a self-service portal to provide the consumer with a modern and easy to use interface to request resources from the cloud. It provides access to service offerings that allow the consumer to manage cloud resources.

This portal provides a set of standard requests to the cloud consumer. By enforcing standardization, the cloud can help improve the consistency of communication with the IT department and improve business perception of IT's ability to respond to their needs. The cloud provides a layer of abstraction between the underlying process and the consumer. This allows the data center as a whole to be viewed as a pool of resources.

Making these self-service offerings available to the users removes the burden on IT of locating and scheduling an admin to fulfill the requests. User satisfaction climbs and administration costs fall. The IT organization also gains the benefits of standardization, because standardized service offerings reduce the cost of support.

Cloud services

Business process services and information services

Business process services are focused on providing existing business processes through a cloud. If there is an existing process with steps that are known, it can be provided as a service within the catalog. This allows the service provider to automate any steps within the process while leaving the changes transparent to the customer.

A private test cloud's information services deliver information as a service. This allows organizations to improve the relevance and cost effectiveness of their information. It becomes available to people, processes, and applications across the business, thus improving its operational impact in driving innovation.

Software platform services

Software platform services allow a consumer to select a specific software instance that they want created, without the need to be aware of where and how it will be hosted. For example, a developer can request a new database instance without having to be aware of what OS or hardware the database will run on. This allows the consumer to focus on the characteristics of the application and gives the provider the freedom to fulfill the request with any resources that will meet the need. This capability is known as “software as a service” (SaaS).

Platform service offerings include workflow facilities for design, development, testing, deployment, and hosting, as well as services that enable team collaboration, Web service integration and marshalling, database integration, security, scalability, storage, persistence, state management, application versioning, application instrumentation, and developer community facilitation. These services are provisioned as an integrated solution over the Web.

Key components of software platform services include tools and services for developers, dynamic software usage and accounting, and optimized middleware – application servers, database servers, and portal servers.

Infrastructure services

Infrastructure services allow for the provisioning of standardized compute resources. They allow a consumer to request and receive a new computer instance without needing to focus on IT concerns such as network placement and hardware availability.

Cloud management platform

The cloud management platform is the set of tools and capabilities that provide services to the consumer. Most of the previous items were about services that were consumed. Cloud management is about providing resources to the system so that services can be consumed.

Cloud service provider

The Cloud service provider role includes the following:

- **Service operations managers:** Manage technical infrastructure required for providing cloud services.
- **Service business managers:** Offer all types of services created by the service developer.
- **Service transition managers:** Responsible for enabling a client to use the cloud service, including on-boarding, integration, and process adoption.

The Cloud service provider performs the following tasks:

- Build services by (optionally) consuming services provided by other service providers.
- Offer services based on a management infrastructure.
- Host services created by other service creators (on top of their own services).

Admin portal

The Admin portal provides administrators with the capability to add, manage, support, and administer private test cloud services and resources in order to fulfill consumer requests. The functions of the Admin portal are to:

- Manage growth, outages, changes, and other life cycle aspects of the cloud.
- Automate actions in the cloud based on monitoring metrics and threshold measurements.
- Control the process workflow to be documented, record approvals, and measure key performance indicators for SLA adherence.

Business support systems

The Business support systems (BSS) element of the architecture refers to the “business systems” dealing with clients, supporting processes such as taking orders, processing bills, and collecting payments. It includes the components used to run business operations that are client-facing.

Service delivery platform

The Service delivery platform includes the components that provide the service delivery architecture for the private test cloud. The business objective of implementing the service delivery platform is to enable rapid development and deployment of services. The service delivery platform includes Operations support systems (OSS) that support IT service management processes.

Service definition tools

Service definition tools enable the administrator to create or modify service offerings that will be available to the consumer. They allow the administrator to define what information is required from a consumer for a request, which manual and automated tasks need to be performed to fulfill the request, and what resources within the data center will be used. In addition, they allow the administrator to set SLAs and costs associated with the overall request as well as the steps within the request.

Service publishing tools

Service publishing tools allow the administrator to publish or remove request types from the service catalog once they have been created or modified with the service definition tools. The administrator can also set restrictions on who can see or request a service.

Service reporting and analytics

These reports can help give service owners and service requesters visibility into the performance of the services. The analytics provided can help set SLA expectations that are in line with what the service is capable of delivering and can also identify trends to help predict problems within the system.

Cloud systems view: Managing and managed environments

A cloud is made up of the managing and the managed environments, as shown in Figure 4.

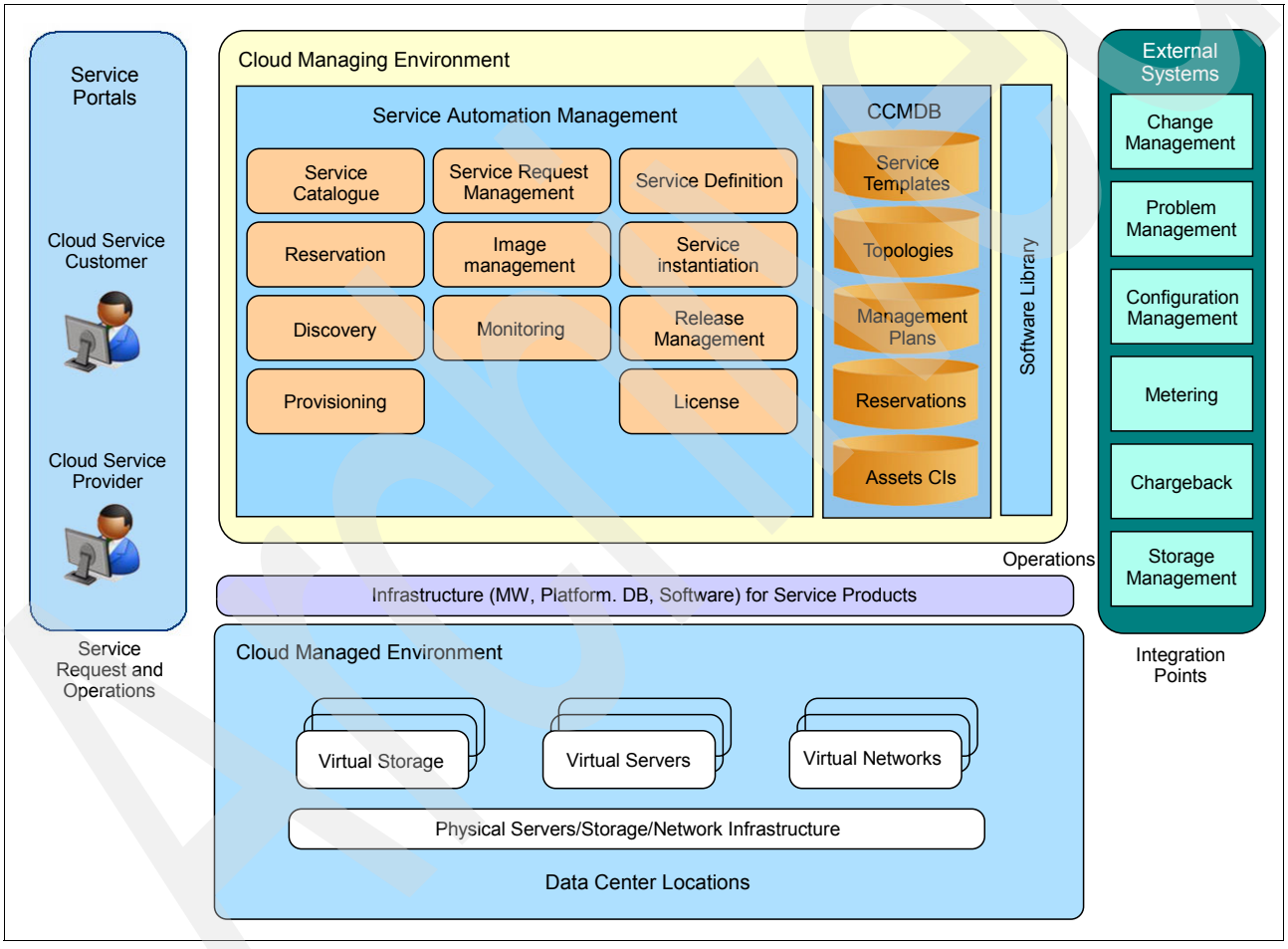

Figure 4 Cloud technical solution: System view

Service portals

The service portals provide an easy-to-access, secure method for private test cloud service consumers and service providers to configure and request services from the cloud.

Cloud service products

The service products layer includes the private test cloud service offerings. Refer to “Cloud functional services view” on page 7 for detailed information.

Cloud managing environment

The managing environment supports the management of cloud services throughout their life cycle. The Private Test Cloud management layer acts like the brain or control center to efficiently manage the resources in the entire cloud environment. The combination of the managing layer and the managed layer ensures that resources in a data center are efficiently managed and can be provisioned, deployed, and configured rapidly. This environment allows the provisioning process to be shortened by up to four weeks. Key components of the managing environment are described in this section.

Service automation management

The products and services that make up service automation management provide automated provisioning, management, and de-provisioning of IT landscapes, which can consist of hardware servers, networks, operating systems, middleware, and application-level software. They assist in managing service offerings related to selected IT landscapes and help to define and automate services that are life-cycle oriented.

Service automation management typically includes many of the following sub-components:

- Service catalog
- Service request management
- Service definition
- Reservation
- Image management
- Service instantiation
- Discover
- Monitoring
- Release management
- Provisioning
- License management

Tivoli Change and Configuration Management Database (CCMDB)

The Change and Configuration Management Database is the store of information related to the components of the information management system. The CCMDB contains the data required to support service automation management, typically including the following elements:

- Service templates
- Topologies
- Management plans
- Reservations
- Assets and configuration items

Software library

The software library is a repository that stores authorized versions of software packages and images.

Cloud managed environment

The managed environment is managed by the service management infrastructure. The managed environment includes the physical hardware layer and the virtual layer. This provides a flexible, adaptive platform to improve resource utilization.

In a virtualized environment, computing environments can be dynamically created, expanded, reduced, or moved as demand varies. Virtualization is required for a dynamic cloud infrastructure because it provides important advantages in sharing, manageability, and isolation (that is, multiple users and applications can share physical resources without affecting one another). Virtualization allows a set of underutilized physical servers to be

consolidated into a smaller number of more fully utilized physical servers, contributing to significant cost savings.

The virtual layer provides the abstraction of logical resources away from their underlying physical resources in order to improve agility and flexibility, reduce costs, and thus enhance business value. There are many forms of virtualization commonly in use in today's IT infrastructures. A common interpretation of server virtualization is the mapping of a single physical resource to multiple logical representations or partitions. Logical partitions (LPARs) and virtual machines (VMs) are examples of this.

Virtualization technology is not limited to servers; it can also be applied to storage, networking, and applications.

External systems

The external systems layer represents integration points between the private test cloud and the existing client environment. A few examples of typical integration points are:

- Change management
- Problem management
- Configuration management
- Metering
- Charge back
- Storage management

IBM products in the test cloud architecture

A cloud consists of a number of hardware and software elements. A few of the common ones are identified in this section.

Hardware

Server platforms can include, but are not limited to, IBM System z®, IBM System p, IBM System x, and IBM BladeCenter®. Storage and networking products also play roles in a cloud environment. A key benefit of the IBM Service management platform is its broad support for a wide variety of hardware and operating system platforms from IBM and third-party vendors.

Software

One of the major software components in a test cloud is Tivoli® Service Automation Manager (TSAM). It is the focal point for cloud activities. Figure 5 on page 13 shows how other components interact within TSAM. A license for TSAM also includes Tivoli Provisioning Manager (TPM), the configuration database (CCMDB), Tivoli Release and Process Manager and IBM Tivoli Monitoring.

TSAM and TPM work together to implement the cloud environment. TSAM is used to automate and manage business processes; TPM is used to automate datacenter operations. When TSAM is executing a Service Catalog request, some of the processes (such as authorization, scheduling, and so forth) are handled by TSAM. When TSAM requires that a change be made to the data center environment (for example, to create a VM or LPAR) TSAM communicates this request to TPM, and TPM performs the steps in the data center to accomplish this (such as communicating with Virtual Center or HMC to create the VM or LPAR).

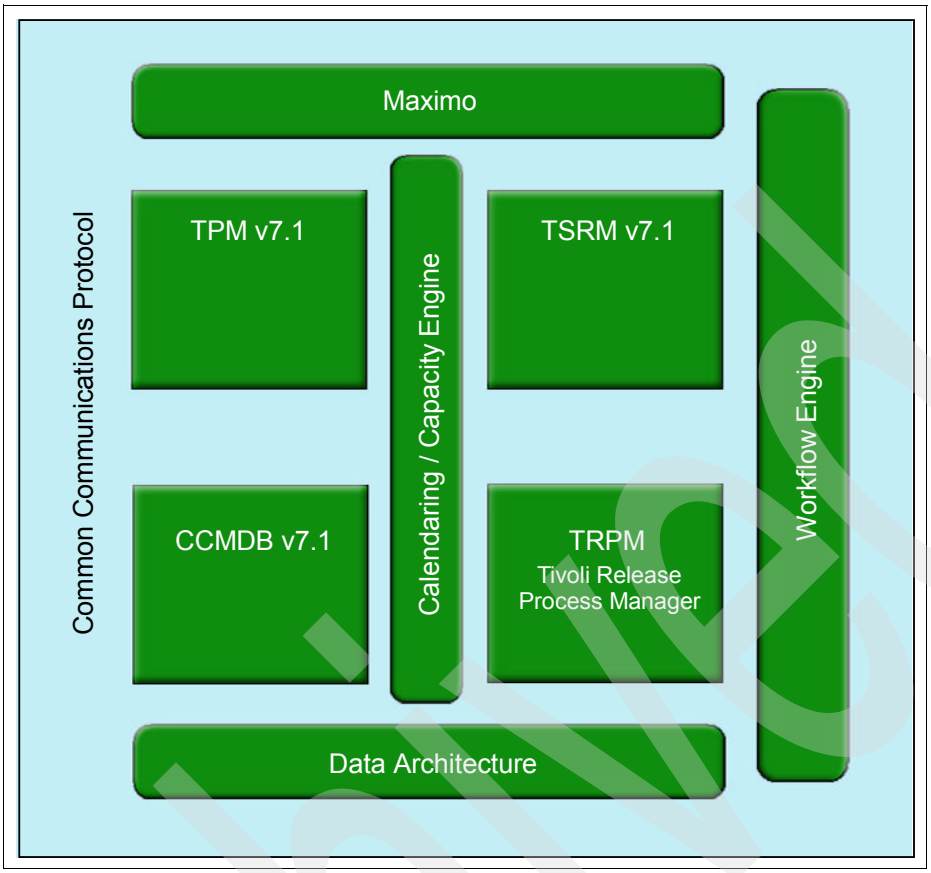

Figure 5 TSAM components

The following sections provide additional detail about TSAM and TPM.

Tivoli Service Automation Manager

Tivoli Service Automation Manager is built on top of the IBM Service Management Platform. It orchestrates technology, processes, people, and data to provide cloud computing services and service management of cloud computing. This enables IT to support business innovation while efficiently controlling IT operational costs. It includes these capabilities:

- Service-Oriented Architecture (SOA) services, notification, escalation, governance, integration.
- A simplified and easy-to-use interface for users to design and request an IT service.
- Enables IT providers to automate and fulfill the users' requests for services provided by IT.
- Service management of the underlying IT infrastructure in accordance with the ITIL® service life cycle model. This includes monitoring events and management of those events in an integrated fashion.
- Process management of the end-to-end life cycle.

It contains these components:

- Tivoli Service Request Manager® (TSRM)
- Tivoli Process Automation Engine (TPAE), which handles workflows, work and job management, and role-based access

Tivoli Provisioning Manager

Tivoli Provisioning Manager provides rapid provisioning of physical and virtual resources.

Infrastructure administration is one of the major challenges in a virtualized environment. Simply building a virtualization environment without the proper approach to administration can increase complexity and thus generate added costs—costs high enough to cancel out the cost savings derived from virtualization in the first place.

Automation is the key to managing these concerns. It is critical that a cloud environment be equipped with tools that facilitate, simplify, and enable management of the physical environment that provides the virtual server resources.

Automation is an important technique that is applied to two of the most frequently performed tasks in a dynamic data center: the onboarding and offboarding of applications. *Onboarding* is the process of installing and configuring the operating system and additional software on servers so that they can be made available to do useful work. *Offboarding* refers to the steps necessary to automatically reclaim a server so that it is available for other purposes.

Onboarding an application typically starts with provisioning servers. When done manually, onboarding is a time- and labor-consuming process consisting of many complex steps, such as installation of the operating system and software and configuration of the network and storage. These tasks are error prone, and typically require highly skilled administrators specializing in the areas of system, storage, and network. Furthermore, applications typically have unique installation and configuration steps, and here, too, the potential for human error is a significant risk. Mitigating that risk is possible through automation, by which the many complex tasks involved in onboarding can be carried out on a completely consistent basis.

IBM Tivoli Provisioning Manager is a key component of IBM's cloud computing solution. It enables cloud administrators to write workflows that automate the installation and configuration of new servers, middleware, and applications, and thus it delivers the speedy and efficient construction and management of IT resources.

IBM CloudBurst offering

IBM CloudBurst™ is a family of pre-integrated service delivery platforms that includes the hardware, storage, networking, virtualization, and service management software to rapidly create a smart business test cloud environment, transform data centers, and build dynamic infrastructures that deliver new levels of service at reduced cost. IBM CloudBurst joins the WebSphere CloudBurst Appliance in the CloudBurst family, an integrated appliance to manage WebSphere images in the cloud.

This offering is meant for situations that call for a quick and easy cloud implementation. IBM CloudBurst allows rapid, cost-effective setup of a cloud environment and management infrastructure. After a study of the client's needs and current environment is completed, a cloud environment can be set up in just a few days. After setup, a developer can log into a self-service portal, select resources required and a time frame, select an image to provision from the service catalog, and be ready to go in hours as opposed to months.

CloudBurst features include:

- Self-service portal: Allows developers self-service access to IT infrastructure.
- Service catalog: Provides a list of pre-configured services from which developers can chose.
- Automation: Automatically provisions required server, storage, and software when needed by testers, without human intervention. Automatically de-provisions unused capacity, making it available for other users and increasing efficiency of data center assets.

- Built-in virtualization: Leverages the full capacity of server technology up to hundreds of virtual machines.

Implementing a private test cloud solution using IBM services

Automation of a test environment requires the cloud infrastructure to have access to all components and elements of all systems. Therefore implementation must be done with a great deal of thought and care.

IBM has been working with leading-edge clients around the world, such as Google and the Government of Wuxi in China, to define best practices for running data centers with workloads ranging from Web 2.0 applications to mission-critical transaction processing systems. Specifically, IBM has been defining and enhancing a cloud computing framework for running large-scale data centers that enables key functionality for hosting a wide range of applications. This framework now includes automation for the complex, time-consuming processes of provisioning servers, networks, storage, operating systems, and middleware. It also provides support for extremely data-intensive workloads and supports requirements for resiliency and security.

IBM Smart Business Test Cloud services

If cloud computing sounds attractive, you might wonder how to get started. Like many organizations, you probably have a test environment encompassing multiple, diverse IT assets that require significant staff and budget to configure and manage. This complexity can result in long test cycles that delay the timing of your application or product launches. Cloud computing can help you organize and streamline your environment.

IBM Smart Business Test Cloud

The Smart Business Cloud Test objective is to provide a dynamically provisioned and scaled runtime environment that provides everything needed to develop and test application code.

A Smart Business Cloud Test environment links together existing system resources to function as a complete virtual test system. The test workloads run on whatever resources are free at the moment. This resource pooling eliminates the need for redundant resources and allows the remaining resources to be managed efficiently.

The result is a secure, private cloud environment that clients can use to test applications before sending them to production. It creates a more efficient test environment that improves productivity and reduces costs. It includes an operating system, middleware, storage, network and virtual images, along with a pre-integrated set of services, from planning through implementation. Clients can use their existing systems or the IBM CloudBurst offering.

There are a number of client benefits. A test cloud can reduce IT labor cost by over 50%, including reduced labor for configuration, operations, management, and monitoring of the test environment. It can result in over 75% improvement in capital utilization, along with a significant license cost reduction. It can reduce test provisioning cycle times from weeks to minutes. Finally, it can reduce risk and improve quality. For example, it can eliminate over 30% of all defects that come from faulty configurations.

IBM cloud services offerings

IBM offers two levels of services. To help you get started, the *solution approach* level is available. This offering leads your implementation team through a study of your current environment, develops a strategy to migrate to a cloud environment, and identifies a solution.

The *full implementation* level includes the solution approach, and adds additional phases with activities to design and deploy the desired solution. Both levels are shown in Figure 6, with the solution approach level in the shaded area.

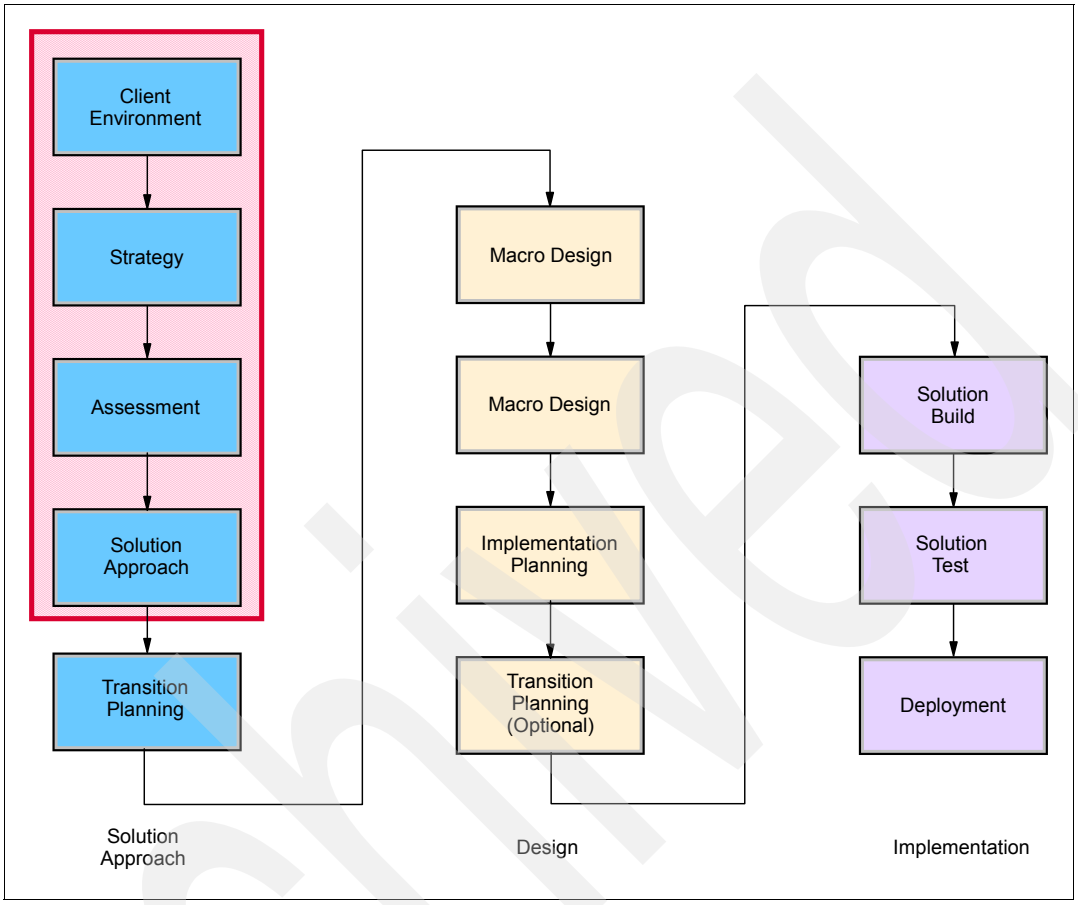

Figure 6 A work breakdown structure diagram for two levels of IBM services

The Solution approach level includes a scoping workshop, a business value definition, and an ROI evaluation that shows an estimate of the quantifiable projected savings. The Design phase includes a definition of the cloud delivery platform, a plan for integrating the cloud environment with the existing infrastructure and applications, a definition of processes and roles, and a full design documentation set. The Implementation phase includes creating an implementation and integration plan, installing and configuring the cloud delivery platform and underlying infrastructure, creating and configuring the service portal and catalog, and the activities of testing, deploying, and training. In short, the full implementation level is a complete end-to-end services offering.

IBM CloudBurst Quickstart offering

The IBM CloudBurst is a way to quickly and simply gain experience with cloud computing. Services are include with the product, so it can be deployed from a single installation. With CloudBurst, there is no need to spend hours of IT operations staff time architecting, configuring, assembling, and building from many servers, storage, and software products. The offering provides clients what they need when they need it, including self-service and resource delivery in the same day rather than in weeks. It also provides the lowest per-unit cost, true hands-free operation, and frees skilled personnel from mundane tasks.

Why partner with IBM to implement a cloud solution

What sets IBM apart is leadership—in skills, in the range of technologies, and in the tools they support, including performance management, capacity planning, and testing tools. IBM has the experience to help a client plan, test, and optimize IT environments for the successful deployment of enterprise-wide business initiatives. IBM supports hardware platforms such as IBM System x, IBM System p, IBM System z, and IBM BladeCenter. Likewise we support operating systems such as Microsoft Windows, Linux (all platforms), and AIX. Other platforms that use the same infrastructure and tools are also supported.

Over the years, IBM has developed services delivery methods for design and deployment of integrated cloud solutions to clients, supplemented with experiences from their own internal transformation. IBM is known as a trusted source that is here to stay. Their worldwide resources include executive briefing centers, centers for proofs of concept and benchmarking, cloud computing centers, and patent-making research centers.

Summary

This redguide has discussed the business need for increasing the efficiency and effectiveness of the provisioning process in a test and development environment. We have shown how a Smart Business Test Cloud can offer a solution. The architecture of cloud computing makes it especially attractive for setting up test environments, with these resulting benefits:

- Improved service response time to configuration change requirements in test environment
- Optimized systems resources to keep developers productive
- Reduced capital and licensing expenses—as much as 50 to 75 percent—by on demand provisioning of virtualized test resources
- Decreased operating and labor costs—as much as 30 to 50 percent—by automated provisioning and configuration of test environments
- Facilitated innovation and shorter time to market by improving test provisioning from weeks to minutes and reducing test cycle time
- Improved quality by reducing defects that result from faulty configurations and poor modeling—as much as 15 to 30 percent

Working with IBM benefits businesses in a number of ways. For example, IBM offers a pre-integrated set of services that covers planning through management of your test environment, along with industry-leading testing skills and best practices in a test environment, as well as integrated solutions architecture and tools for accelerating deployment.

IBM offers a broad range of services, systems, storage, and software to create a cloud portfolio, and they have real-world cloud experience. IBM offers IT transformation cloud computing centers serving over 100,000 professionals, and they have been involved in hundreds of successful cloud computing engagements.

Where to get more information

Consult your IBM representative for further information. In addition, the following Web sites provide more details about the topics presented in this guide:

- Smart business (private) test cloud:

  http://www.ibm.com/cloud/smart_business/index.html

- IBM Services offerings:

  http://www.ibm.com/ibm/cloud/smart_business/
- Introduction to cloud computing:

  http://www.ibm.com/cloud/
- Clouds and security:

  http://www-304.ibm.com/businesscenter/cpe/html0/173215.html

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