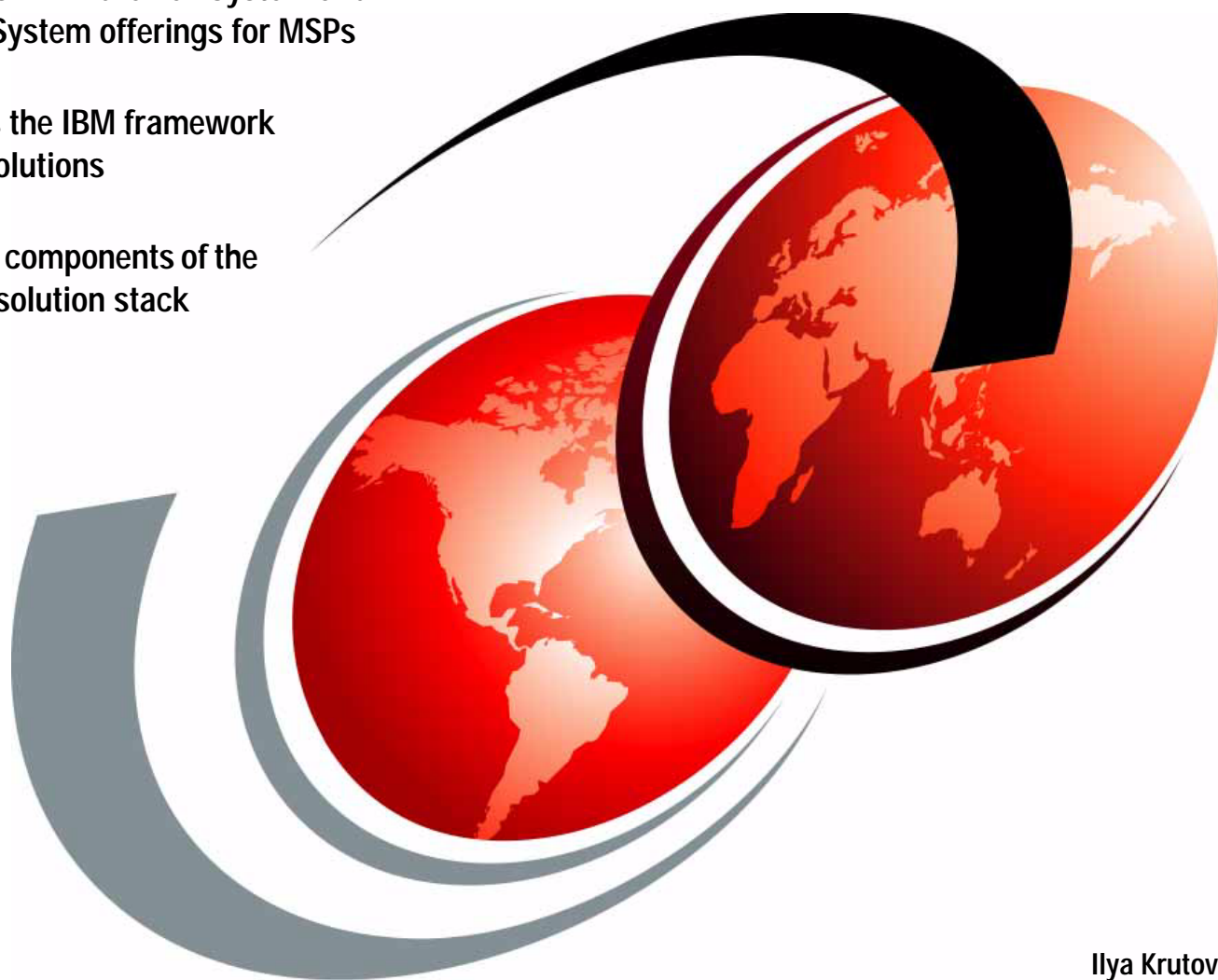


IBM PureFlex System Solutions for Managed Service Providers

Introduces IBM PureFlex System and
IBM Flex System offerings for MSPs

Discusses the IBM framework
for MSP solutions

Describes components of the
IBM MSP solution stack



Ilya Krutov



International Technical Support Organization

IBM PureFlex System Solutions for Managed Service Providers

February 2013

Note: Before using this information and the product it supports, read the information in “Notices” on page v.

First Edition (February 2013)

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Preface

Organizations are looking for ways to get more out of their already strained IT infrastructure as they face new technological and economic pressures. They are also trying to satisfy a broad set of users (internal and external to the enterprise) who demand improvements in their quality of service (QoS), regardless of increases in the number of users and applications. Cloud computing offers attractive opportunities to reduce costs, accelerate development, and increase the flexibility of the IT infrastructure, applications, and services.

Infrastructure as a service (IaaS) is the typical starting point for most organizations when moving to a cloud-computing environment. IaaS can be used for the delivery of resources such as compute, storage, and network services through a self-service portal. With IaaS, IT services are delivered as a subscription service, eliminating up-front costs and driving down ongoing support costs. Businesses can improve their competitive position by moving to these cloud-based technologies.

This IBM® Redpaper™ discusses IBM solutions for managed service providers (MSPs). This paper is for IT professionals who are involved in managed and cloud services solution planning.

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Managed and cloud services

This chapter introduces managed and cloud service offerings, discusses challenges that managed service providers (MSPs) are facing, describes IBM framework for MSP solutions to address these challenges, and outlines IBM solution components that are used in the cloud-enabled data center solution for MSPs.

The following topics are covered:

- ▶ 1.1, “Managed service providers” on page 2
- ▶ 1.2, “MSP solutions framework” on page 4
- ▶ 1.3, “IaaS and the cloud enabled data center” on page 6
- ▶ 1.4, “IBM cloud solution stack components” on page 10

1.1 Managed service providers

Managed service provider (MSP) is a business that delivers a defined set of technology solutions or services to MSP clients with a *pay-as-you-go* model. MSPs are largely used by customers who want to take advantage of cloud technologies but lack the internal IT skills, resources, and time.

For example, smaller hospitals might still be challenged with adopting electronic medical records. Many healthcare providers are turning to the MSP model, where an MSP can quickly help the small healthcare provider to build and manage a service to process patient data and make that information available securely. In this way, the healthcare provider has more time to focus more on the patient.

Mid-sized businesses might also look for the possibilities to better control their capital spending, increase operational efficiency, and gain better market insights. These possibilities enable companies to be able to identify and deliver new products and services ahead of competition, generate new revenue streams, and provide cost savings without a need to make significant investments in IT.

With an increased demand for managed services offerings, the number of MSPs and competition among them is also increasing, while the services that are offered become more commoditized. This change creates certain challenges in achieving revenue and profit growth, especially when the cash flow is limited.

Today, MSPs need a clear competitive differentiation to be able to reach business goals and expand market presence. This approach might require a change in the entire MSP business model: a shift from the traditional managed or hosted IT approach toward cloud service delivery model.

The competitive business considerations for MSPs include branding, differentiation, trustworthiness, efficiency, experience, and expertise:

- ▶ Brand value

The objective of brand is to retain and strengthen the service provider's position even when other service providers emerge. The provider's brand is bolstered by the availability of both the correct quantity and quality of the managed services offered. Exclusivity, breadth of recognized services, and timely availability of new services enhance the perception of a market leading brand.

- ▶ Offering differentiation

Many service providers have similar service offerings. Differentiation for the common offerings is based on customer experience in activities such as ease of product selection, ordering, and usage. Beyond the commonly available services, differentiation is enhanced by inclusion of interesting niche (and therefore higher value) products and vertical market enablement.

- ▶ Efficiency of delivery

Cost and operational efficiency are key considerations in both initial and long-term competitiveness. Customers evaluate their return on investment (ROI) for the use of cloud services relative to other solutions, including on-premises solutions. Automation is a significant factor in delivering consistency in the cost to deliver cloud services and to realize efficiencies of scale.

- ▶ Customer trust

Managed services are available from many venues. Customers consider trust a significant factor in selecting a provider, especially when the customers are generating financial transactions. Cloud computing deployments might be a complex environment, with third-party payment providers, and layered service providers. The cloud service providers that manage this environment in a trustworthy manner earn the trust of their customers while MSPs enable the flexibility of operating an aggregate business.

- ▶ Experience and expertise in cloud computing

Cloud computing is a business of scale, with most initial deployments as targeted offerings. The typical business model envisions service provider scale deployment and transaction levels. To be positioned well, a service provider should provide the following capabilities:

- Ensure access control (secure user access).
- Offer a breadth of compelling services in each market segment that is selected to compete in.
- Provide an end-to-end delivery experience for users of cloud services.

The management infrastructure of the deployment environment and support systems are key elements of supporting this scale of deployment.

To address MSP business challenges, IBM is taking its collaboration with MSPs and its global ecosystem one step further by enabling MSPs to build innovative solutions and services on advanced technologies such as IBM SmartCloud, IBM PureSystems™, and analytics. IBM also provides the MSPs with access to IBM experts that have deep technical skills at four new global centers of excellence. IBM offers an unmatched set of programs to support MSP marketing efforts to help MSPs build their brands, generate demand for their services, and grow their marketing skills. Additionally, IBM offers affordable financing options through IBM Global Financing to help MSPs acquire new technologies.

IBM offers comprehensive initiatives for MSPs:

- ▶ Access to Global Centers of Excellence

Global Centers of Excellence provide MSPs with access to deep technical expertise to develop innovative cloud services and solutions on the IBM open stack to address industry-specific client needs. In this way, MSPs can have hands-on technical expertise in building skills on technologies such as IBM SmartCloud™, PureSystems, storage, security, and collaboration. MSPs can also have access to IBM Innovation Centers worldwide for joint client engagements. In addition, IBM plans to launch a virtual briefing center that provides an ongoing forum for MSPs to share ideas and knowledge around industry challenges that clients are facing today.

- ▶ Dedicated marketing and sales support

IBM marketing and sales support is designed to help MSPs grow their businesses, build their brands, and create demand for their capabilities. Additionally, MSPs will gain access to IBM analytics capabilities to help them identify new customers and capture additional opportunities with their existing customers.

- ▶ Seizing the opportunity with PureSystems

PureSystems provides a new, integrated, by-design platform for MSPs to tune hardware and software resources for data-intensive workloads. The integration of the PureSystems platform, coupled with the patterns of expertise technology and the flexibility to configure an application for either an on-premise or hosted environment, makes the PureSystems platform a natural choice for MSPs.

- ▶ Building on the advanced capabilities of IBM SmartCloud

MSPs can take advantage of IBM SmartCloud, including an option to integrate the offering as a solution that is backed by IBM or under their own brand in the market to expand the services they offer. IBM can also work with new MSPs to design and develop their data center strategies, by using years of IBM experience in data center best practices.

- ▶ Financing options through IBM Global Financing

MSPs can acquire new technology solutions and services to support their growth with flexible, affordable payment plans for IBM systems, software and services. A payment plan from IBM Global Financing can provide MSPs with low monthly payment options while avoiding large, up-front cash payments, the ability to upgrade their systems mid-lease and improve IT asset management.

- ▶ Expanding the ecosystem

Members of IBM ecosystem, which includes independent software vendors, systems integrators, value-added resellers, and MSPs are collaborating with IBM to take advantage of higher value capabilities of IBM such as IBM SmartCloud, PureSystems, and analytics to build industry-specific cloud services.

IBM developed an evolutionary approach for MSPs to build or transform their cloud-enabled data centers. It defines an MSP solutions framework for MSP growth, which spans from the basic *infrastructure as a service (IaaS)* offerings to the advanced *business process as a service (BPaaS)* expertise. IBM framework allows MSPs to build scalable, building block-based service delivery infrastructure that can support a broad range of services to satisfy growing diverse customer needs in a cost efficient way.

1.2 MSP solutions framework

MSPs need a structured approach to implement a comprehensive set of solutions to deliver a rich portfolio of services, and thus grow the business. Solutions framework includes the following items:

- ▶ Service enablement platform

This platform is a highly available foundation that includes core infrastructure (network, servers, storage, and virtualization layers) and infrastructure management (that is, service provisioning, monitoring, and usage based accounting).

- ▶ Managed/hosted services

These traditional services are offered by MSPs in dedicated or shared environments.

- ▶ Cloud services

Cloud computing drives significant new revenue streams and strengthens the customer relationship by broadening the MSP's portfolio of services. The expanded portfolio can provide capabilities, such as productivity, test and development, infrastructure, and business process services.

MSPs build managed/hosted or cloud services on top of the service enablement platform. This framework is shown in Figure 1-1.

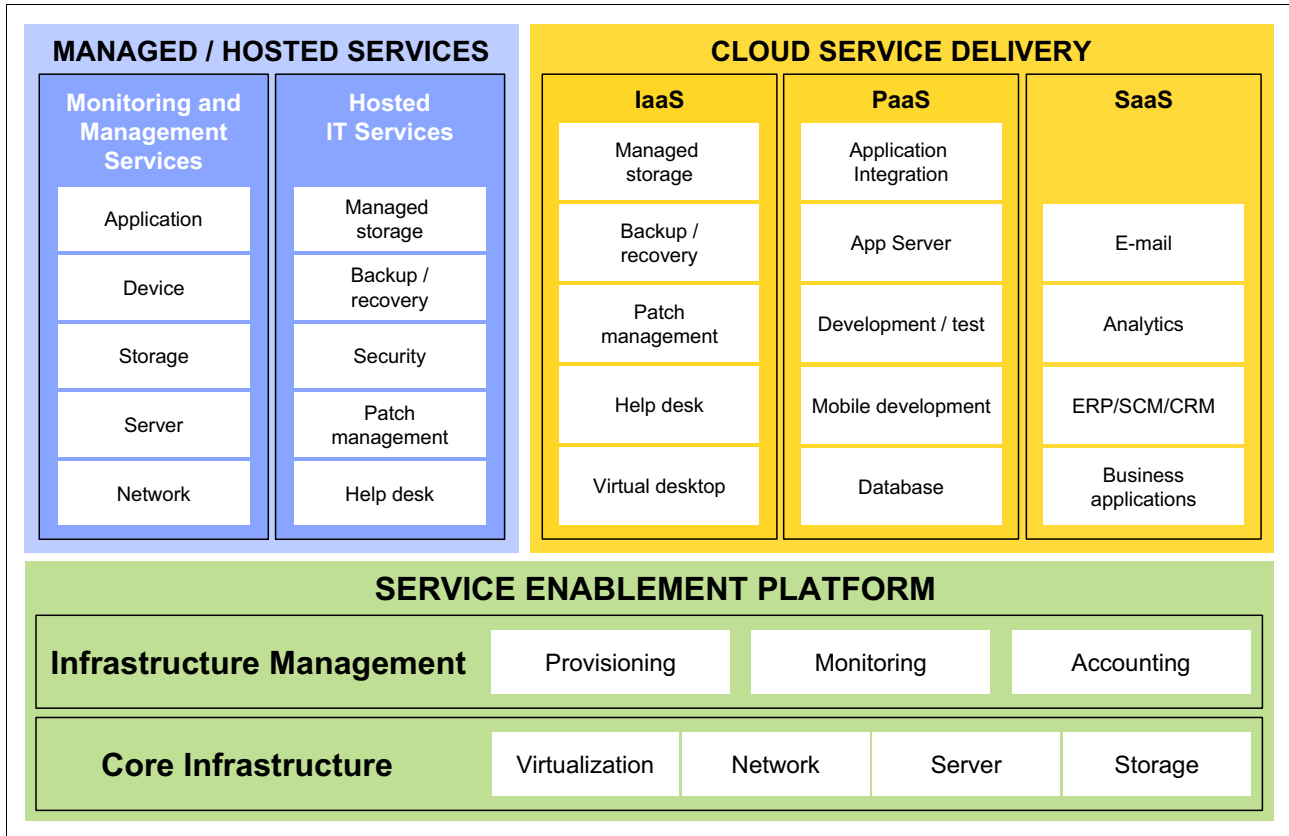


Figure 1-1 MSP solutions framework

Cloud services offer attractive opportunities to reduce costs, accelerate development, and increase the flexibility of the IT infrastructure, applications, and services:

- ▶ **Infrastructure as a service (IaaS)**
IaaS delivers compute, storage, and network resources from the cloud service provider to customers or partners to operate applications and access those applications as services. The pricing model is typically based on a cost per unit of resources used.
- ▶ **Platform as a service (PaaS)**
Platform as a service is usually an extension of the IaaS model, where charges are applied based on the resources used. Because PaaS includes additional services (development tools and services) and platform support (for example, application server or database), the cost per resource unit that is used is typically higher. This higher charge per unit that is used allows coverage of acquisition, license, and management costs.
- ▶ **Software as a service (SaaS)**
SaaS application charging is often based on user value (for example, monthly per seat charge). SaaS applications run in the cloud and are commonly accessed by users through a web interface. The pricing model is typically based on a subscription model and can also include charges for functions used.
- ▶ **Business process as a service (BPaaS)**
Many businesses develop business processes that interact with many applications to complete their tasks. For example, a payroll processing process interacts with timesheet,

tax, benefits, and human resources systems to produce paychecks for employees. BPaaS provides the means to implement these business processes as services. BPaaS processes are managed in the same manner as SaaS applications.

IaaS is the typical starting point for most MSPs when moving to a cloud computing environment. IaaS can be used for the delivery of resources such as compute, storage, and network services through a self-service portal. With IaaS, IT services are delivered as a subscription service, eliminating up-front costs and driving down ongoing support costs for clients.

Managed storage, backup and recovery, patch management, help desk, and virtual desktop infrastructure services are among those that are expected to be in a most demand by the clients.

1.3 IaaS and the cloud enabled data center

IBM defined the Cloud Computing Reference Architecture (CCRA) based on years of experience of working with customers who have implemented cloud-computing solutions. The IBM CCRA is a blueprint or guide for architecting cloud-computing implementations. It is driven by functional and nonfunctional requirements that are collected from many cloud-computing implementations. IBM CCRA provides guidelines and technical work products, such as service and deployment models, and has defined the overarching implementations as *adoption patterns*. An adoption pattern embodies the architecture patterns that represent the ways that organizations are implementing cloud-computing solutions. An adoption pattern can help guide the definition of your cloud-computing solution.

The adoption pattern for IaaS, as defined by the CCRA, is called the *Cloud Enabled Data Center adoption pattern*. The Cloud Enabled Data Center adoption pattern contains prescriptive guidance for how to architect, design, and implement an IaaS solution. It also defines the core requirements and provides guidance on adding new capabilities as they are needed.

A cloud-enabled data center has the following main benefits:

- ▶ Faster provisioning with lower cost
By using high levels of automation in a shared environment, IT resources are made available faster, repeatedly, accurately, and cost efficiently.
- ▶ Establish a utility service
A cloud-enabled data center provides a *pay-as-you-use* model, which can be used to measure and charge individual clients for their IT usage.
- ▶ Support dynamic scaling
A scale-up and scale-down elastic infrastructure is required to support a business service. When a business experiences periods of high demand, a new IT infrastructure can be provisioned to meet temporary increases in workloads. The provisioned IT infrastructure can be deprovisioned when it is no longer required. This approach adds enormous flexibility to the IT environment and ensures optimal utilization of resources.
- ▶ Greater level of control and visibility
Every task that is done by the cloud enabled data center solution is monitored and reported so that MSPs have greater visibility to the use of IT resources.

The following list describes the key functional layers for the MSP's cloud-enabled data center, built on top of each other, starting with the simplest layer:

- ▶ Virtual Machine (VM) Provisioning

This layer is the entry point in the IaaS cloud space. You can use it to start building a multitenant cloud infrastructure and model that delivers simple VMs (configured with the appropriate network and storage) that cover the most common business needs for cloud computing.

- ▶ Cloud Management

This layer complements the VM provisioning layer by adding management capabilities that you can use to manage such requirements as service-level agreements (SLAs), security, resiliency, and capacity planning. It helps you further optimize the IT processes, manage complexity of virtualization and automation, and increase efficiency for both the infrastructure that provides the cloud and the cloud service itself. This layer addresses requirements in the area of reliability, availability, and basic security.

- ▶ IT Service Management

This layer defines a cloud computing environment that integrates with the existing enterprise applications, systems, and processes. This integration is accomplished by including the cloud infrastructure and services in the enterprise IT management processes.

Figure 1-2 shows a schematic view of these layers and their key capabilities. It also shows how these layers stack one on top of the other to build more sophisticated cloud enabled data center solutions.

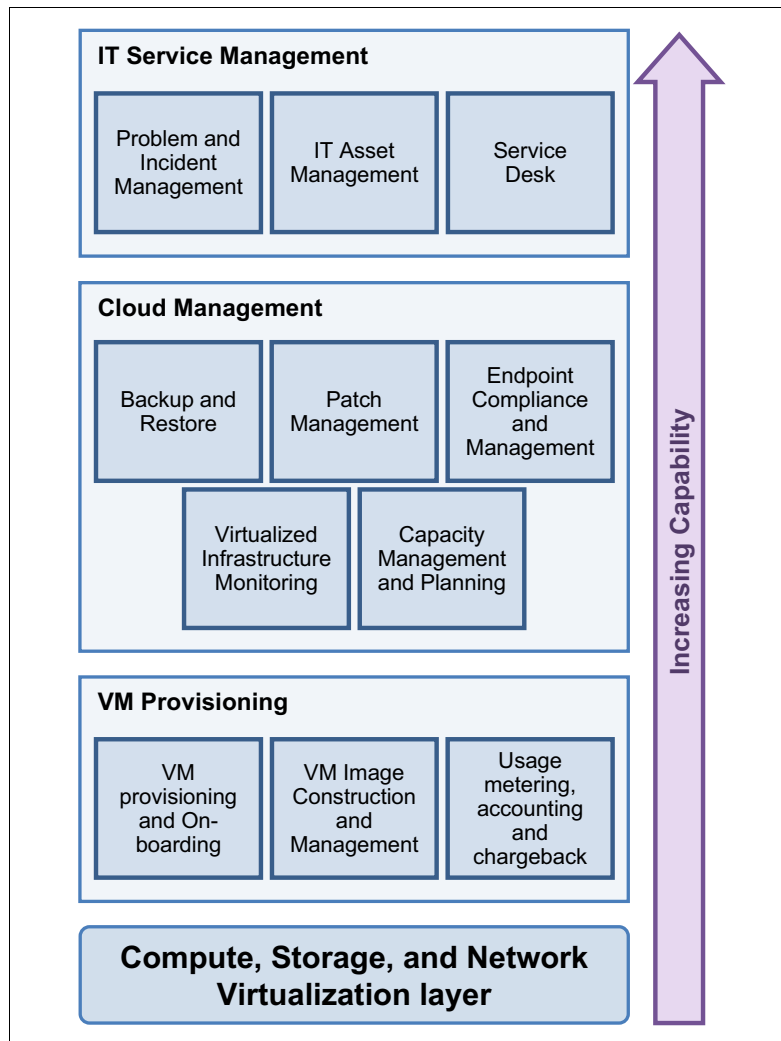


Figure 1-2 Cloud-enabled data center components

A cloud-enabled data center includes the following key components:

- ▶ Virtualization capabilities are provided through hypervisors. Hypervisors are a prerequisite function for the IBM cloud management solutions.
- ▶ VM provisioning encompasses the automatic policy-based deployment and configuration of VMs, properly configured with their storage and network requirements from a self-service catalog. This subsystem also includes components that allow creating standard virtual image templates and managing their lifecycle.
- ▶ Metering and chargeback measures services usage to help you understand who is using the services and how they are using the services. The service usage is the basis for eventually billing the user.
- ▶ By using monitoring, you can effectively manage the health status of a cloud infrastructure by providing the services that are necessary to deliver the expected QoS and SLAs.

- ▶ Capacity management is used to project future cloud infrastructure needs to support planning for capacity growth, changes, or both.
- ▶ The backup and restore services are provided for the cloud management infrastructure and for the VMs and storage that are created by the IaaS solution. This feature helps with improving the reliability, availability, and serviceability (RAS) aspects of an IaaS solution.
- ▶ Patch management and security compliance component helps to maintain and secure all the VMs that are created in your cloud environment. It ensures that the VMs are aligned to the latest upgrade and fix levels and are compliant with the required enterprise security policies.
- ▶ IT Service Management integrates the cloud services with IT management processes such as problem management, service desk, and asset management.

The capabilities that are provided by each functional block are mapped to the appropriate IBM software components that are used to implement them, as described in 1.4, “IBM cloud solution stack components” on page 10.

1.4 IBM cloud solution stack components

Figure 1-3 highlights IBM solution stack components that can be used in the cloud-enabled data center (Figure 1-2 on page 8). They can be added, if necessary, to address specific customer needs.

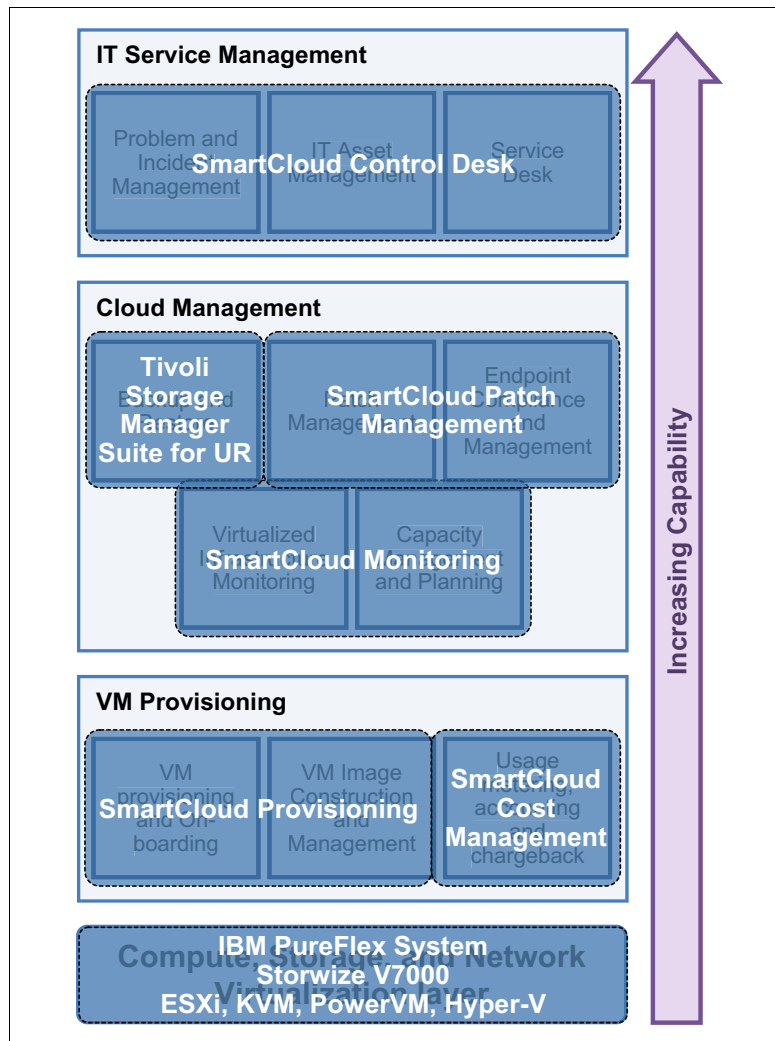


Figure 1-3 IBM solution stack for the cloud-enabled data center

1.4.1 Core infrastructure

IBM PureFlex™ System is a comprehensive infrastructure system that provides an expert integrated computing system, combining servers, enterprise storage, networking, virtualization, and management into a single structure. Its built-in expertise enables organizations to simply manage and flexibly deploy integrated patterns of virtual and hardware resources through unified management.

IBM PureFlex is designed to deliver value in the following ways:

- ▶ Built-in expertise helps you to address complex business and operational tasks automatically.
- ▶ Integration-by-design helps you to tune systems for optimal performance and efficiency.
- ▶ Simplified experience, from design to purchase to maintenance, creates efficiencies quickly.

As a virtualized storage system, IBM Storwize® V7000 system offers robust enterprise-class storage capabilities including thin provisioning, automated tiering, internal and external virtualization, clustering, replication, multiprotocol support, and a next-generation graphical user interface. The Storwize V7000 Unified system is flexible enough to support entry-level environments, but can also be scaled to support enterprise-level environments.

These offerings are optimized for performance and virtualized for efficiency. These systems offer a no-compromise design with system-level upgradeability. The capability is built for cloud, containing “built-in” flexibility and simplicity.

1.4.2 VM provisioning

The following IBM software components can be used to implement the VM provisioning layer (Figure 1-3 on page 10):

- ▶ IBM SmartCloud Provisioning

This component is the key component of the cloud-enabled data center solutions. It combines infrastructure and platform capabilities to deliver elastic workload management, image lifecycle management, and resilient, high scale provisioning on heterogeneous hypervisor and hardware platforms. With this solution, you gain workload optimized virtualization and cloud infrastructure management. IBM SmartCloud Provisioning provides the following features:

- Rapid application deployment with a repeatable composite application throughout private and public clouds
- Rich image and analytics to manage virtual environments for great efficiency and control over VM sprawl
- Choice of hardware and hypervisor, such as kernel-based VM (KVM), IBM PowerVM®, Microsoft Hyper-V, and Xen Hypervisor, so that you can reduce the cost of licenses, hardware, and labor
- High scalability to meet business growth with nearly instant deployment of hundreds of VMs
- Low-touch infrastructure that reduces manual errors, enhances security and compliance, and increases administrator productivity
- Possibility to create more sophisticated cloud solutions that include two or more VMs that are configured to work together to implement a specific application or middleware pattern delivered as a cloud service

- ▶ IBM SmartCloud Cost Management

This component helps deliver cost-transparency to track, manage, and allocate IT resource usage accurately by providing visibility into the usage and cost of your infrastructure and other resources that are not IT-related.

IBM SmartCloud Cost Management provides the following key capabilities:

- Can meter the usage of cloud resources such as processor, random access memory (RAM), storage, and network bandwidth; the usage can be tracked per user and for groups of users.
- Provides users with visibility into the cost implications of the services that they are requesting; supports IT departments to bring down the cost while delivering IT services more efficiently.
- Provides a reliable mechanism for cloud service providers to support cloud showback and chargeback processes with an accurate metering and cost rating tool for tracking business offering processes against budgets.

1.4.3 Cloud management

The following IBM software products are used to implement the Cloud Management layer (Figure 1-3 on page 10):

▶ IBM SmartCloud Monitoring

This software monitors the health and performance of a cloud infrastructure, including environments that contain physical and virtualized components. This software provides the tools that are needed to assess current health and capacity and model expansion, as needed. IBM SmartCloud Monitoring provides the following capabilities:

- Visibility into the cloud infrastructure, including environments that contain physical and virtualized components
- Monitoring of heterogeneous environments for visibility and control into all areas of the infrastructure, such as physical, virtual, and cloud
- Policy-driven analytics for intelligent workload placement
- What-if capacity planning to accommodate capacity growth while optimizing the usage of the existing environment

▶ IBM Tivoli® Storage Manager Suite for Unified Recovery

This product is a bundle of Tivoli Storage Manager products and provides backup and restore capabilities for the entire cloud environment. It can efficiently back up VMs and storage infrastructures, and restores them if a failure occurs.

▶ IBM SmartCloud Patch Management

This product manages patches automatically for multiple operating systems and applications across physical and virtual servers regardless of location, connection type, or status. IBM SmartCloud Patch Management provides the following benefits:

- Reduces security risks by reducing remediation cycles, especially in development and test environments, where virtual machines that are not patched increase the risk of hacking and virus exposure.
- Improves performance with reliable, nonstop cloud computing that can automatically tolerate and recover from software and hardware failures.
- Saves IT costs by automating provisioning operations and providing a service interface.
- Reduces complexity through ease of implementation, use, and simplified cloud administration.

1.4.4 IT Service Management

The IBM SmartCloud Control Desk software components are used to implement the IT service management that is integrated with the IT management processes (Figure 1-3 on page 10). IBM SmartCloud Control Desk is a solution that is ITIL compliant and includes the following capabilities:

- ▶ An efficient service desk can handle service requests and manage incidents.
- ▶ A self-service catalog helps users solve their own problems and provides an intuitive self-help portal and a complete catalog of services.
- ▶ Change, configuration, and release management provides advanced impact analysis and automated change procedures to reduce risk and support integrity of services.
- ▶ IT asset lifecycle management provides inventory management and software license compliance capabilities; it helps to manage assets throughout their lifecycle, optimizing usage of digital and physical assets, and minimizing compliance risks.

IBM SmartCloud Provisioning, IBM SmartCloud Cost Management, and IBM SmartCloud Monitoring represent a *Cloud Service Delivery* foundation.

1.4.5 IBM SmartCloud Desktop Infrastructure

IBM SmartCloud Desktop Infrastructure offers robust, cost effective, and manageable virtual desktop solutions for a wide range of clients, user types, and industry segments. These solutions can help to increase business flexibility and staff productivity, reduce IT complexity, and simplify security and compliance.

IBM SmartCloud Desktop Infrastructure provides functionality of the VM provisioning and Cloud management layers, as shown in Figure 1-2 on page 8. It offers the following key capabilities:

- ▶ The connection broker manages the authentication function and ensures that only valid users are allowed access to the infrastructure. When authenticated, it directs the clients to their assigned desktops. If the virtual desktop is unavailable, the connection broker works with the management and provisioning services to have the VM ready and available.
- ▶ The management and provisioning services allow the centralized management of the virtual infrastructure, providing a single console to manage multiple tasks. They provide image management, lifecycle management, and monitoring for hosted VMs.
- ▶ High availability (HA) services ensure that the VM is up and running even if a critical software or hardware failure occurs.



IBM PureFlex System and IBM Flex System

This chapter discusses IBM PureFlex System and IBM Flex System™ offerings and capabilities that make these platforms a reasonable choice for MSP environments.

The following topics are covered:

- ▶ 2.1, “IBM PureFlex System” on page 16
- ▶ 2.2, “IBM Flex System building blocks” on page 19
- ▶ 2.3, “PureFlex System and Flex System as a platform for MSPs” on page 21

2.1 IBM PureFlex System

To meet today's complex and changing business demands, you need a solid foundation of server, storage, networking, and software resources. Furthermore, it must be simple to deploy, and able to quickly and automatically adapt to changing conditions. You must also have access to, and the ability to take advantage of, broad expertise and proven guidelines in systems management, applications, hardware maintenance, and more.

IBM PureFlex System is a comprehensive infrastructure system that provides an expert integrated computing system. It combines servers, enterprise storage, networking, virtualization, and management into a single structure. Its built-in expertise enables organizations to manage and flexibly deploy integrated patterns of virtual and hardware resources through unified management. These systems are ideally suited for customers who want a system that delivers the simplicity of an integrated solution, while still able to tune middleware and the runtime environment. Figure 2-1 shows IBM PureFlex System.



Figure 2-1 IBM PureFlex System

IBM PureFlex System uses workload placement that is based on virtual machine (VM) compatibility and resource availability. By using built-in virtualization across servers, storage, and networking, the infrastructure system enables automated scaling of resources and true workload mobility.

IBM PureFlex System went through significant testing and experimentation so that it can mitigate IT complexity without compromising the flexibility to tune systems to the tasks that businesses demand. By offering both flexibility and simplicity, IBM PureFlex System can

provide extraordinary levels of IT control, efficiency, and operating agility. With this combination, businesses can rapidly deploy IT services at a reduced cost. Moreover, the system is built on decades of expertise. This expertise enables deep integration and central management of the comprehensive, open-choice infrastructure system. It also dramatically reduces the skills and training that are required for managing and deploying the system.

The PureFlex System offers many advantages:

- ▶ Configurations that ease acquisition experience and match your needs
- ▶ Optimized to align with targeted workloads and environments
- ▶ Designed for cloud with SmartCloud Entry included on Standard and Enterprise
- ▶ Choice of architecture, operating system, and virtualization engine
- ▶ Designed for simplicity with integrated, single-system management across physical and virtual resources
- ▶ Simplified ordering that accelerates deployment into your environments
- ▶ Sent as a single integrated entity directly to you
- ▶ Includes factory integration and lab services optimization

IBM PureFlex System combines advanced IBM hardware and software, and patterns of expertise. It integrates them into three optimized configurations that are simple to acquire and deploy so you get fast time-to-value.

The IBM PureFlex System is offered in the following configurations:

- ▶ Express, which is the infrastructure system for small-sized and mid-sized businesses, and the most cost-effective entry point.
- ▶ Standard, which is the infrastructure system for application servers with supporting storage and networking.
- ▶ Enterprise, which is the infrastructure system that is optimized for scalable cloud deployments. Enterprise has built-in redundancy for highly reliable and resilient operation to support critical applications and cloud services.

A PureFlex System configuration has these main components:

- ▶ Preinstalled and configured IBM Flex System Enterprise Chassis
- ▶ Compute nodes with either IBM POWER® or Intel Xeon processors
- ▶ IBM Flex System Manager, preinstalled with management software and licenses for software activation
- ▶ IBM Storwize V7000 external storage unit or IBM Flex System V7000 Storage Node
- ▶ All hardware components preinstalled in an IBM PureFlex System 42U rack
- ▶ Choice of the following items:
 - Operating system: IBM AIX®, IBM i, Microsoft Windows, Red Hat Enterprise Linux, or SUSE Linux Enterprise Server
 - Virtualization software: IBM PowerVM, KVM, VMware vSphere, or Microsoft Hyper V
 - IBM SmartCloud Entry
- ▶ Complete preintegrated software and hardware
- ▶ Onsite services that are included to get the system up and running quickly

These configurations are summarized in Table 2-1.

Table 2-1 IBM PureFlex System configurations

Component	IBM PureFlex System Express	IBM PureFlex System Standard	IBM PureFlex System Enterprise
IBM PureFlex System 42U Rack	1	1	1
IBM Flex System Enterprise Chassis	1	1	1
IBM Flex System Fabric EN4093 10Gb Scalable Switch	1	1	2 (with both port-count upgrades)
IBM Flex System FC3171 8Gb SAN Switch, or IBM Flex System FC5022 24-port 16Gb ESB SAN Scalable Switch	1	2	2
IBM Flex System Manager Node	1	1	1
IBM Flex System Manager software license	IBM Flex System Manager (with one-year service and support)	IBM Flex System Manager Advanced (with three-year service and support)	Flex System Manager Advanced (with three-year service and support)
Chassis Management Module	2	2	2
Chassis power supplies (standard/maximum)	2/6	4/6	6/6
Chassis 80 mm fan modules (standard/maximum)	4/8	6/8	8/8
IBM Storwize V7000 Disk System or IBM Flex System V7000 Compute Node	Yes (redundant controller)	Yes (redundant controller)	Yes (redundant controller)
IBM Storwize V7000 Software	Base with one-year software maintenance agreement	Base with three-year software maintenance agreement	Base with three-year software maintenance agreement

The fundamental building blocks of IBM PureFlex System solutions are the IBM Flex System Enterprise Chassis complete with compute nodes, networking, and storage.

2.2 IBM Flex System building blocks

IBM PureFlex System and IBM PureApplication System are built from reliable IBM technology that supports open standards and offer confident road maps, IBM Flex System. IBM Flex System is designed for multiple generations of technology, supporting your workload today while being ready for the future demands of your business.

IBM Flex System is shown in Figure 2-2



Figure 2-2 IBM Flex System

2.2.1 Management

IBM Flex System Manager is designed to optimize the physical and virtual resources of the IBM Flex System infrastructure while simplifying and automating repetitive tasks. It provides easy system set-up procedures with wizards and built-in expertise, and consolidated monitoring for all of your resources, including compute, storage, networking, virtualization, and energy. IBM Flex System Manager provides core management functionality along with automation. It is an ideal solution that allows you to reduce administrative expense and focus your efforts on business innovation.

A single user interface controls the following features:

- ▶ Intelligent automation
- ▶ Resource pooling
- ▶ Improved resource utilization
- ▶ Complete management integration
- ▶ Simplified setup

2.2.2 Compute nodes

The compute nodes are designed to take advantage of the full capabilities of IBM POWER7® and Intel Xeon processors. This configuration offers the performance you need for your critical applications.

With support for a range of hypervisors, operating systems, and virtualization environments, the compute nodes provide the foundation for the following environments:

- ▶ Virtualization solutions
- ▶ Database applications
- ▶ Infrastructure support
- ▶ Line-of-business applications

2.2.3 Storage

The storage capabilities of IBM Flex System give you advanced functionality with storage nodes in your system, and take advantage of your existing storage infrastructure through advanced virtualization.

IBM Flex System simplifies storage administration with a single user interface for all your storage. The management console is integrated with the comprehensive management system. These management and storage capabilities allow you to virtualize third-party storage with nondisruptive migration of your current storage infrastructure. You can also take advantage of intelligent tiering so you can balance performance and cost for your storage needs. The solution also supports local and remote replication, and snapshots for flexible business continuity and disaster recovery capabilities.

2.2.4 Networking

The range of available adapters and switches to support key network protocols allow you to configure IBM Flex System to fit in your infrastructure. However, you can do so without sacrificing being ready for the future. The networking resources in IBM Flex System are standards-based, flexible, and fully integrated into the system. This combination gives you no-compromise networking for your solution. Network resources are virtualized and managed by workload. And these capabilities are automated and optimized to make your network more reliable and simpler to manage.

IBM Flex System gives you the following key networking capabilities:

- ▶ Supports the networking infrastructure that you have today, including Ethernet, Fibre Channel, and InfiniBand.
- ▶ Offers industry-leading performance with 1 Gb and 10 Gb Ethernet; 8 Gb and 16 Gb Fibre Channel; and FDR InfiniBand.
- ▶ Provides pay-as-you-grow scalability so you can add ports and bandwidth when needed.

2.2.5 Enterprise Chassis

The IBM Flex System Enterprise Chassis is the foundation of the offering, supporting intelligent workload deployment and management for maximum business agility. The 14-node, 10U chassis delivers high-performance connectivity for your integrated compute, storage, networking, and management resources. The chassis is designed to support multiple generations of technology, and offers independently scalable resource pools for higher utilization and lower cost per workload.

2.3 PureFlex System and Flex System as a platform for MSPs

IBM PureFlex System and IBM Flex System enable MSPs to achieve faster time to monetize with its agility, simplicity, and superior efficiency attributes. Fast deployment, simple to manage, easily scalable as workload grows, lower total cost of ownership, security, and resiliency are the key attributes that make the IBM PureFlex System a great choice for deployment by MSPs. IBM Flex System, as a building block of IBM PureFlex System, offers highly customizable and flexible component selection to meet specific MSP needs.

Table 2-2 summarizes attributes of IBM PureFlex System and IBM Flex System.

Table 2-2 IBM PureFlex System and IBM Flex Systems attributes

Attribute	IBM PureFlex System	IBM Flex System
Flexibility	Predefined subset of the solution components	The entire set of components is available for selection
Customization	Only selected components are configurable.	The entire set of solution components can be configured.
Deployment	Rack-level preintegrated and factory build; IBM installation services included to help with the onsite deployment	Chassis-level and compute node-level factory integration; onsite assembly by the client or IBM Business Partner
Management	Has centralized management with unified tools.	
Scalability	Scales elastically to meet workload demands.	
Availability and resiliency	Is designed for continuous business operations.	
Security	Maintains integrity, privacy, and multi-tenant isolation.	
Energy efficiency	Has shared architecture with energy efficient components.	

Adopting an IBM cloud foundation on IBM PureFlex System enables MSPs to more swiftly deploy innovative, differentiated, and high quality services to their customers. An IBM cost-efficient IT platform is highly resilient, supporting the most stringent regulatory requirements, and provides the highest level of security.

IBM PureFlex System and IBM Flex System based cloud solutions can provide a cost-efficient, secure, scalable platform for diverse workloads, which can offer the following benefits:

- ▶ Accelerate time-to-value: Accelerate deployment, speed response to changing business needs, and improve productivity with a range of pre-integrated/configured and optimized infrastructure solutions.
- ▶ Maximize IT availability: Improve overall customer service and satisfaction with a cloud infrastructure that is designed for continuous operation.
- ▶ Scale elastically with better provisioning of resources: Enhance service quality and delivery with innovative technologies and scalable offerings, which enable highly dynamic and fluid, just-in-time and online resource configuration to optimize cloud delivery for a wider-range of workloads.

- ▶ Ensure security: Deliver a comprehensive security solution to mitigate risk by maintaining integrity, privacy, and multi-tenant isolation of sensitive services and data in a cloud across the entire stack.
- ▶ Reduce IT costs: Reduce overall costs and improve the ROI of IT for cloud delivery with integrated solutions that enable consolidation, better usage, and better and easier management of capital assets.

IBM PureFlex and IBM Flex System are designed to support MSPs for cloud, hosted and managed IT deployment models of various sizes with predefined small, medium, and large reference configurations.

2.3.1 IBM x86 reference configurations

IBM x86 reference configurations are based on IBM Flex System x240 compute nodes, as shown in Table 2-3.

Table 2-3 IBM x86 reference configurations

Component	Small	Medium	Large
PureFlex Edition	Express	Standard	Enterprise
Number of VMs	128	640	2176
Number of x240 compute nodes	2	10	34
Total cores for the compute nodes	32	160	544
Total memory for the compute nodes	256 GB	1.25 TB	4.25 TB
Raw storage capacity	9.2 TB	19.2 TB	40.4 TB

2.3.2 IBM Power Systems reference configurations

For the environments where IBM Power Systems™ are currently being used, IBM Flex System p260 and p460 compute nodes can also be used as a part of the solution, as shown in Table 2-4.

Table 2-4 Power Systems reference configurations

Component	Small	Medium	Large
PureFlex Edition	Express	Standard	Enterprise
Number of VMs	640	3200	5440
Number of p260 compute nodes	2	10	-
Number of p460 compute nodes	-	-	17
Total cores for the compute nodes	32	160	544
Total memory for the compute nodes	1 TB	5.1 TB	17.4 TB

For more information about the reference configurations, see the IBM TechLine Repository:

<http://www.ibm.com/partnerworld/techlinerepository>



IBM SmartCloud solutions

This chapter describes IBM SmartCloud solutions that represent building blocks of the cloud enabled data center for MSPs.

The following solutions are covered:

- ▶ 3.1, “IBM SmartCloud Provisioning” on page 24
- ▶ 3.2, “IBM SmartCloud Cost Management” on page 28
- ▶ 3.3, “IBM SmartCloud Monitoring” on page 31
- ▶ 3.4, “IBM SmartCloud Patch Management” on page 35
- ▶ 3.5, “Tivoli Storage Manager Suite for Unified Recovery” on page 37
- ▶ 3.6, “IBM SmartCloud Control Desk” on page 42
- ▶ 3.7, “IBM SmartCloud Desktop Infrastructure” on page 46

3.1 IBM SmartCloud Provisioning

IBM SmartCloud Provisioning combines infrastructure and platform capabilities to deliver elastic workload-aware management, image lifecycle management, and resilient, high-scale provisioning across heterogeneous platforms.

IBM SmartCloud Provisioning provides true infrastructure-management capabilities to reduce costs through a highly scalable, rapid-deployment environment for running applications and reacting to dynamic changes in user resource demands. IBM SmartCloud Provisioning builds on the infrastructure-management foundation to deliver platform-management features including repeatable middleware patterns to standardize applications. It is an easy first step toward cloud computing, providing an approach that is independent of hardware and hypervisors, and that integrates with other IBM solutions for comprehensive service management.

MSPs can optimize their virtualized environments and build a workload-optimized cloud for faster time-to-market and increased operational efficiency through this flexible and scalable solution. Cloud solution manages mixed environments, providing highly scalable provisioning and lifecycle-management capabilities. It serves as a foundation for extending into advanced cloud-orchestration capabilities, including monitoring and cost management as business needs grow.

3.1.1 Solution value

Virtualization introduces new challenges around VM sprawl, especially in MSP cloud environments, and dictates new IT requirements:

- ▶ Manage virtual environment for greater efficiency and reduced cost:
 - Reduce costs that are associated with maintaining large number of virtual servers.
 - Keep track of VM templates and maintain compliance and software patches or upgrades.
- ▶ Increase resource utilization for reduced cost of license, labor, and hardware:
 - Easily scale virtual environments to expand and shrink automatically based on business needs.
 - Intuitive workload placement and use existing hardware and hypervisors for increased resource utilization.
- ▶ Minimize manual intervention for zero downtime and outages
 - Easy to use the self-service portal to request resources for cloud users and administrators.
 - Provision all resources for new application with a single click of button.

IBM SmartCloud Provisioning helps to address these challenges and meet the MSP requirements:

- ▶ Increase business agility by building the workload-optimized cloud:
 - Accelerate application deployment with workload-aware management.
 - Manage virtual environment with rich image management and analytics.
 - Improve agility with robust, automated, high-scale provisioning.
- ▶ Accelerate time to market with repeatable, composite application deployment across private and public clouds:
 - Deploy business applications in minutes.
 - Dynamic, policy-based management of elastic and scalable workloads.
 - Enable third-party software deployments to “build once” and deploy across private and public clouds.
- ▶ Manage virtual environments with rich image lifecycle management and analytics:
 - Image construction and composition tool simplifies the complex and time-consuming process of creating virtual images and deployment through a simple graphical tool.
 - Federated image library allows management of VM image sprawl, drift, and image complexity across multiple image repositories and hypervisors.
 - Detect vulnerabilities exposures in images to ensure that no virtual machines (VM) are created without the proper level of security patches.
 - Images are stored in hypervisor-neutral format, avoiding duplication and allowing conversion to mix and match hypervisor technologies.
- ▶ Lower the operational costs by using IBM PureFlex hardware and hypervisors:
 - Single management platform across infrastructures reduces complexity and operational cost.
 - Support deployment of virtual servers with multiple platforms on POWER and VMWare.
 - Design and deploy consistent and repeatable composite applications into a cloud of virtualized hardware running a supported hypervisor: KVM, Xen, Hyper V, PowerVM.
 - Integrate compute, network, storage and application delivery; enable organizational integration.

3.1.2 Solution overview

Figure 3-1 shows a typical IBM SmartCloud Provisioning environment.

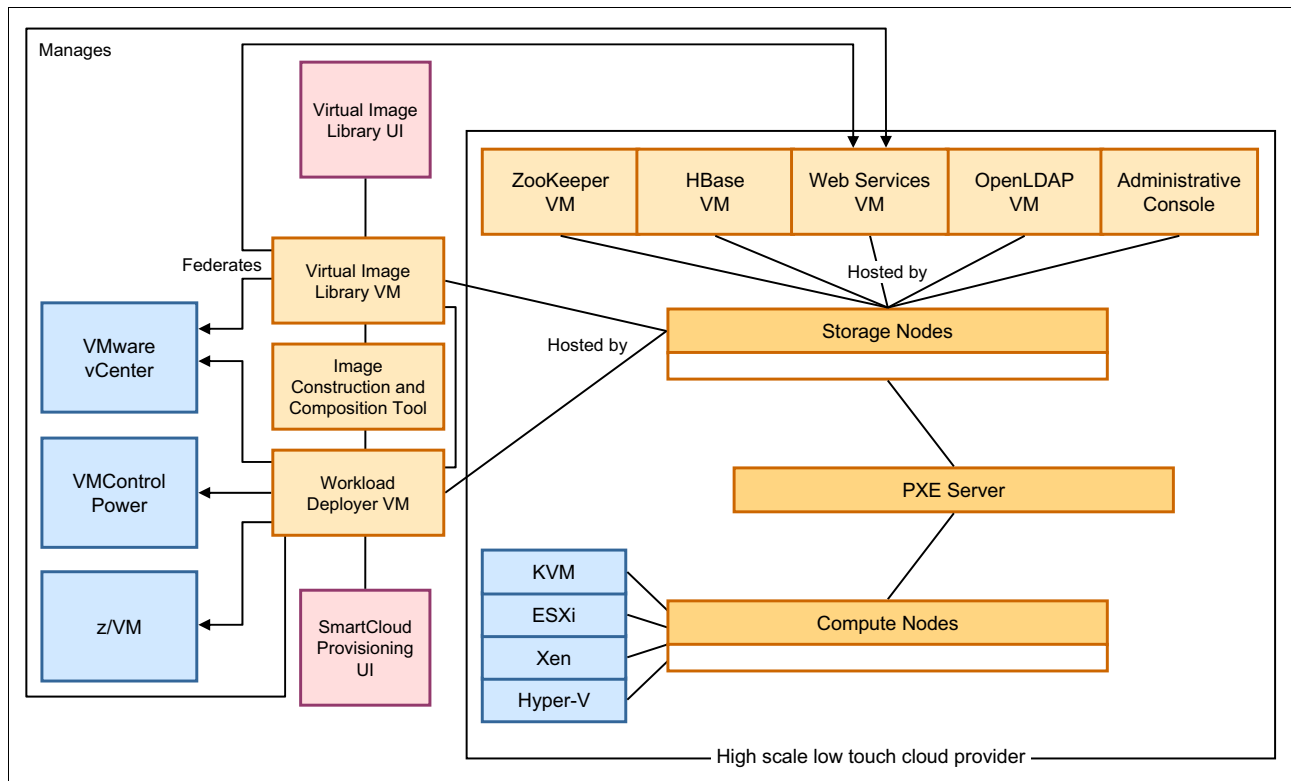


Figure 3-1 IBM SmartCloud Provisioning environment

IBM SmartCloud Provisioning has the following components:

- ▶ PXE Server

PXE Server provides DHCP, DNS, HTTP, and TFTP services. It is used to quickly set up all IBM SmartCloud Provisioning components over the network.

- ▶ Zookeeper

Zookeeper is part of the Apache Hadoop project. It is a scalable resilient distributed lock service. It must be deployed in odd numbers of servers with a minimum of three nodes, as shown in the figure.

- ▶ Web Service

All administrative and user access to IBM SmartCloud Provisioning is provided through a RESTful web service interface. At least one copy of this VM must be running. Multiple copies can run in parallel with a load balancer (virtual machine or physical device) spreading out HTTP traffic to the group.

- ▶ LDAP Server

The LDAP Server provides user authentication. If you have no LDAP server, the SmartCloud Provisioning installer can help you install an LDAP server.

- ▶ Hadoop and HBase

HBase is part of the Apache Hadoop project. It is a distributed, scalable, column-oriented data store modeled after Google's BigTable. HBase has dependency on Hadoop Distributed File System (HDFS). To guarantee high availability of the service, in an environment that has one compute node and two storage nodes, the minimum recommended deployment is three copies of the HBase VM.

- ▶ REST Server

The REST Server is a gateway for the HBase cluster. All requests to HBase are processed by this component. The minimum is one node, but you can have more nodes for balance purpose.

- ▶ Storage nodes

The storage nodes provide images and volumes services through the iSCSI Target Server. The default iSCSI Target Server is Linux `tgt`. The minimum is two nodes. Each storage node is equipped with a *storage bot*, which is an agent that manages all storage-oriented resources and tasks.

- ▶ Compute nodes

The compute nodes host the deployed virtual images. The minimum is one node but, depending on your environment and forecasted workload (memory, CPU, hard disk, network configuration, and the VMs you intend to run), you can have more nodes. Each compute node is equipped with a *compute bot*, which is an agent that manages all computing-oriented resources and tasks.

- ▶ Virtual Image Library

The Virtual Image Library component provides image management services, such as federation, comparison, inventory, search, versioning, and replication through a public programming interface. This component is mandatory and is always installed.

- ▶ Image Construction and Composition Tool

This component helps you build images that are reusable, self-descriptive, customizable, shareable, and manageable. Images can contain the basic operating system plus additional software bundles. This tool can be installed optionally.

- ▶ Workload Deployer

Workload Deployer provides access to software virtual images and patterns, which can be used, or customized, and then securely deployed, managed, and maintained in the cloud.

Consider the following information for a typical deployment:

- ▶ The PXE Server is installed on a physical "box" (machine), which is also referred to as the *First Box*, but it can also be installed on a VM.
- ▶ The storage nodes are deployed on physical machines to improve their performances.
- ▶ The compute nodes are deployed on physical machines.
- ▶ If you choose VMware ESXi Server as system for the compute node, a management virtual machine is created to host the compute bot on the VMware ESXi Server.
- ▶ The other components, including ZooKeeper, Hadoop plus HBase, REST Server, Web Service, Virtual Image Library, and Administrative Console are all installed on VMs. These VMs, often referred to as *kernel services*, can run in any physical machine that is installed as KVM host, but the CPU of the physical machine must support virtualization.

3.1.3 Ordering information

Table 3-1 shows ordering information for IBM SmartCloud Provisioning.

Table 3-1 IBM SmartCloud Provisioning ordering information

PID	Description
D0IFCLL	IBM SmartCloud Provisioning Resource Value Unit License + SW Subscription & Support 12 Months
D0IFELL	IBM SmartCloud Provisioning Resource Value Unit Initial Fixed Term License + SW Subscription & Support 12 Months

3.1.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Provisioning product page
<http://www.ibm.com/software/tivoli/products/smartcloud-provisioning/>
- ▶ IBM SmartCloud Provisioning Information Center
http://pic.dhe.ibm.com/infocenter/tivihelp/v48r1/topic/com.ibm.scp.doc_2.1.0/welcome.html

3.2 IBM SmartCloud Cost Management

IBM SmartCloud Cost Management offers to the cloud service providers cost management capabilities for their infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS) by using internal and external data sources.

With IBM SmartCloud Cost Management, you gain visibility into the usage and costs of the business infrastructure and other non-IT resources. It can help manage business costs by using advanced analytics and showback reporting, which includes a detailed list that is categorized by organizational structures. You can automate the chargeback of the internal organization and external clients by integrating with accounting and billing systems.

IBM SmartCloud Cost Management delivers advanced analytics through IBM Cognos® based common reporting, and broadens usage metering coverage for virtualization, storage, and network.

IBM SmartCloud Cost Management can help MSPs manage the cost of the cloud and IT services in the following ways:

- ▶ Helping to determine and provide visibility of IT costs with features that are designed to measure, analyze, report, and invoice the utilization and costs of physical, virtualized, and cloud computing resources, storage and network resources, applications, and other non-IT cost drivers.
- ▶ Facilitating the collection of data on servers, cloud and virtualized servers, storage, networks, databases, email messaging, and many other shared services.

- ▶ Allowing users to organize and restructure collected data into reports that can help track and allocate resources and manage capacity according to business needs and provide a detailed list that is categorized by organizational structures.
- ▶ Automating showback reporting or the chargeback to internal organizations and external clients by integrating with accounting and billing systems.

3.2.1 Solution value

IBM SmartCloud Cost Management delivers solutions for the following challenges:

- ▶ IT departments face increasing pressure to reduce cost while pressure is increasing to deliver IT services more efficiently.
- ▶ Users have no visibility into the cost implications they are requesting. They cannot see the service rates, the actual costs incurred for services based on key performance indicators (KPIs) and volume selected.
- ▶ IT organizations and their customers are not able to control resource provisioning versus budgets or view budget burn-down reports by customer and line of business (LOB).
- ▶ IT business analysts cannot explore alternatives to optimize the investment in their services that are offered to optimize return on investment.
- ▶ IT service providers have no insight into how to cover the costs and set competitive service rates.
- ▶ IT does not have the ability to accurately assess usage in virtualized environments. It is hard to assess which IT resources are being used, how much they are being used, and who is using them in the cloud and virtualized environments.

IBM SmartCloud Cost Management provides MSPs with the tools necessary to report on IT service costs, consumption billing, and plan for future IT expenditures:

- ▶ MSPs have visibility of summary and detailed showback reports for their cloud infrastructure.
- ▶ MSPs are able to control resource provisioning against budgets, and are able to view up-to-date showback reports on account actuals versus budgets.
- ▶ Service providers can optimize their cost model to make a profit on the services they provide.
- ▶ Cloud service providers have flexibility in how they want to price their cloud offerings and change them, over time, to better reflect market opportunity. The rating engine capability gives them the flexibility to charge different prices for offering variations such as level of service, server size, volume tiers, and so on.

3.2.2 Solution overview

IBM SmartCloud Cost Management helps to manage IT costs by collecting, analyzing, reporting, and billing based on usage and costs of shared Windows, UNIX (AIX, HP/UX, Oracle Solaris), Linux (Red Hat and Novell SUSE), IBM i5/OS™, VMware, and mainframe computing resources. IBM SmartCloud Cost Management helps you improve IT cost management.

With IBM SmartCloud Cost Management you can understand your costs and track, allocate, and invoice based on actual resource use by department, user, and many additional criteria.

IBM SmartCloud Cost Management consolidates a wide variety of usage data with data collectors that are associated with cloud and virtualization management systems, operating systems, databases, Internet infrastructure, email systems, network & printing, and customized usage data import collection from any application or system.

IBM SmartCloud Cost Management consists of the following components:

- ▶ Application server

The IBM SmartCloud Cost Management application server contains the following key components: IBM SmartCloud Cost Management Data Collectors, Administration Console, and IBM SmartCloud Cost Management Processing Engine. With these components, you can collect, administer, and process the resource usage data for your organization.

- ▶ Database server

The database stores administration information and also the Ident, Detail, and Summary records that are produced by IBM SmartCloud Cost Management Processing Engine.

- ▶ Windows Web Reporting

This component is a fully featured reporting solution for IBM SmartCloud Cost Management. It contains a full set of reports but runs only on the Windows platform.

- ▶ Cognos based Tivoli Common Reporting

The Cognos based Tivoli Common Reporting application provides comprehensive cost accounting, chargeback, and resource reporting in an easy-to-use, browser-based environment.

- ▶ Tivoli Integrated Portal

Web-based products that are built on the Tivoli Integrated Portal framework share a common user interface where you can launch applications and share information.

3.2.3 Ordering information

Table 3-2 shows ordering information for IBM SmartCloud Cost Management applicable to IBM PureFlex System and IBM Flex System.

Table 3-2 IBM SmartCloud Cost Management ordering information

Part number	Description
D0SZWLL	IBM SmartCloud Cost Management per Resource Value Unit Lic + SW S&S 12 Mo
E0EEKLL	IBM SmartCloud Cost Management per Resource Value Unit Annual SW S&S Rnwl
D0SZXLL	IBM SmartCloud Cost Management per Resource Value Unit SW S&S Reinstate 12 Mo
D0IUSLL	IBM SmartCloud Cost Management Enterprise per Install Lic + SW S&S 12 Mo
E0BTPLL	IBM SmartCloud Cost Management Enterprise per Install Annual SW S&S Rnwl
D0IUTLL	IBM SmartCloud Cost Management Enterprise per Install SW S&S Reinstate 12 Mo

3.2.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Cost Management product page
<http://www.ibm.com/software/tivoli/products/smartcloud-cost-mgmt/>
- ▶ IBM SmartCloud Cost Management Information Center
http://pic.dhe.ibm.com/infocenter/tivihelp/v3r1/topic/com.ibm.sccm.doc_2.1/welcome.htm

3.3 IBM SmartCloud Monitoring

IBM SmartCloud Monitoring delivers sophisticated end-to-end performance, availability, and capacity management capabilities to help you optimize your virtualized cloud and hybrid environments. With this offering, you can more intelligently assess and optimize workload placement, taking into account constraints of the infrastructure and business policies, instead of relying solely on resource availability in the cloud or virtual host infrastructure. With prebuilt Web 2.0 dashboards, IBM SmartCloud Monitoring allows you to visualize, rapidly assess performance and availability, and balance resources across server, storage, and network components in your physical and virtual environment.

Even the smallest virtualized or cloud infrastructure requires levels of automation and workload density that demands sophisticated capacity planning. Gone are the days when operators simply place new VMs onto the “least busy” hosts and trust that plenty of overlap exists in pooled resources to prevent contention. Today, through the use of powerful capacity analytics and “what-if” placement modeling tools in IBM SmartCloud Monitoring, architects and administrators can now make better decisions about where to place workloads and how to model expansion scenarios.

Assuring the performance and availability of the virtualized cloud infrastructure is only half of the cloud management story. Over-provisioning and under-provisioning of allocated virtual resources (server, network, and storage) are key challenges that threaten cost savings or cause service performance problems. By monitoring VMs at the operating system level, performance data of the cloud infrastructure and the individual cloud workloads can be correlated to help improve configurations and placement.

3.3.1 Solution value

Performance monitoring and reporting are vital to understanding how VMs are behaving and how they are utilizing shared host resources. Utilization reporting can identify resources that tend to run out of capacity, and what-if analysis can determine how many more VMs can be added to a cluster or host. In addition, availability monitoring can be used to help find problems with critical resources and alert operations teams before users are adversely affected. Specific benefits include:

- ▶ Improved application availability by helping to provide a smoothly running cloud delivery platform, using proactive problem identification features, such as predictive trending and historical context for performance alerts.
- ▶ Holistic monitoring of the infrastructure and VMs, positioning the virtualized infrastructure as a true cloud delivery platform.
- ▶ Reduced labor costs spent on capacity analysis and planning through enhanced IBM Cognos based, what-if analysis.
- ▶ Reduced time for problem resolution through launch-in-context problem identification.
- ▶ Reduced hardware costs by improving utilization and deferring purchases, while providing workload placement guidance.
- ▶ Reduced risk of switching hypervisor platforms with comprehensive management that covers a broad spectrum of hypervisors and applications.

3.3.2 Solution overview

IBM SmartCloud Monitoring is a bundle of established IBM Tivoli infrastructure management products, including IBM Tivoli Monitoring and IBM Tivoli Monitoring for Virtual Environments. This software delivers dynamic usage trending and health alerts for pooled hardware resources in the cloud infrastructure. The software includes sophisticated analytics, and capacity reporting and planning tools. You use these tools to ensure that the cloud is handling workloads quickly and efficiently.

IBM Tivoli Monitoring products monitor the performance and availability of distributed operating systems and applications. These products are based on a set of common service components, referred to collectively as Tivoli Management Services. Tivoli Management Services components provide security, data transfer and storage, notification mechanisms, user interface presentation, and communication services in an agent-server-client architecture.

A typical IBM SmartCloud Monitoring environment is shown in Figure 3-2.

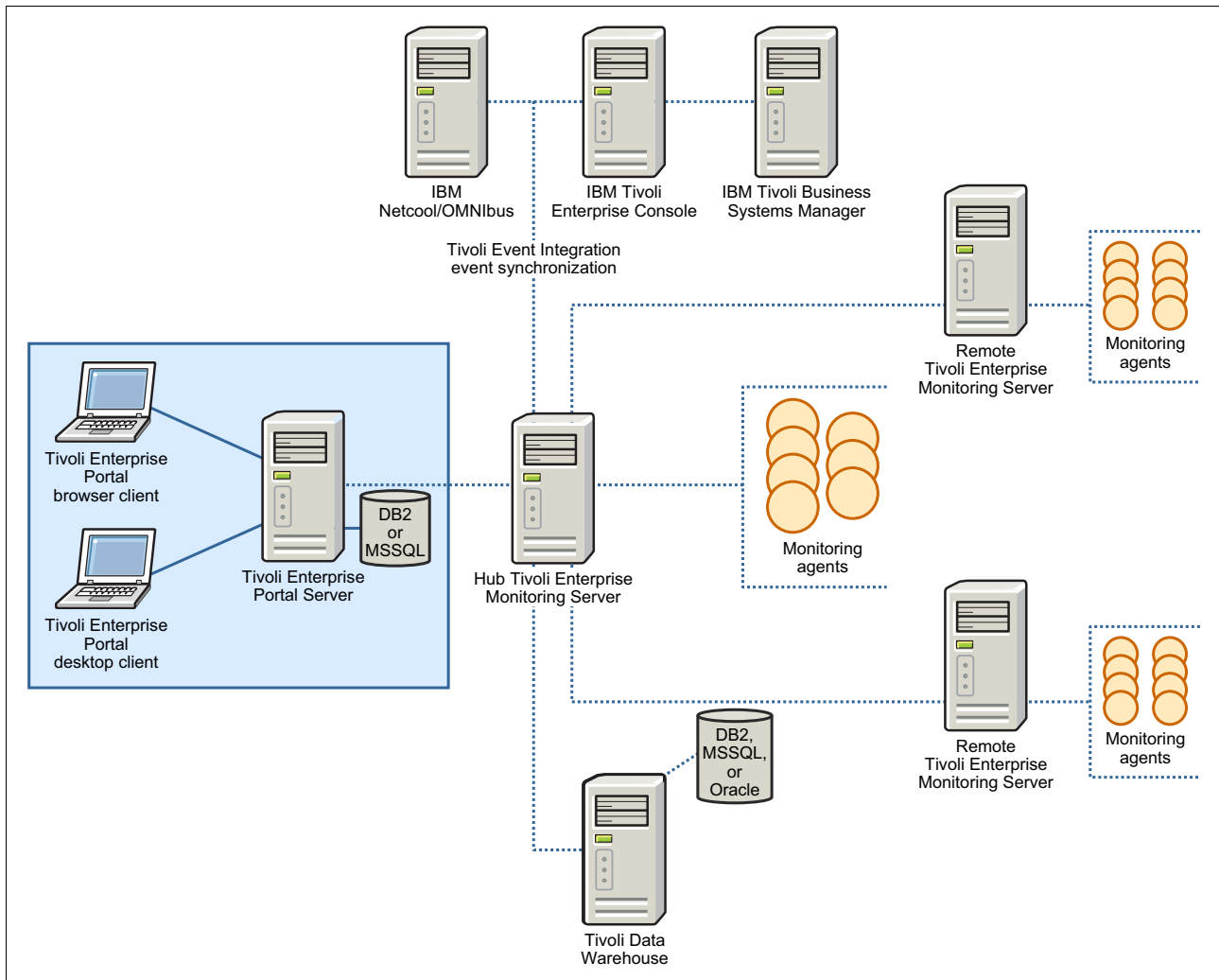


Figure 3-2 IBM Tivoli Monitoring environment

A typical IBM Tivoli Monitoring environment consists of the following components:

- ▶ One or more Tivoli Enterprise Monitoring Servers, which act as a collection and control point for alerts that are received from the agents, and collect their performance and availability data. The monitoring server also manages the connection status of the agents. One server in each environment must be designated as the hub.
- ▶ A Tivoli Enterprise Portal Server, which provides the core presentation layer for retrieval, manipulation, analysis, and pre-formatting of data. The portal server retrieves data from the hub monitoring server in response to user actions at the portal client, and sends the data back to the portal client for presentation. The portal server also provides presentation information to the portal client so that it can render the user interface views suitably.
- ▶ One or more Tivoli Enterprise Portal clients, with a Java-based user interface for viewing and monitoring your enterprise. Tivoli Enterprise Portal offers two modes of operation: desktop and browser.

- ▶ Tivoli Enterprise Monitoring Agents, which is installed on the systems or subsystems you want to monitor. These agents collect data from monitored, or managed, systems and distribute this information either to a monitoring server or to an SNMP Event Collector.
- ▶ An Eclipse Help Server for presenting help for the portal and all monitoring agents for which support was installed.

An installation optionally includes the following components:

- ▶ Tivoli Data Warehouse for storing historical data collected from agents in your environment. The data warehouse is located on an IBM DB2® for Linux, UNIX, and Windows, Oracle, or Microsoft SQL database. To store data in this database, you must install the Warehouse Proxy Agent. To do aggregation and pruning functions on the data, you must also install the Summarization and Pruning Agent.
- ▶ Event synchronization component, which is the Event Integration Facility, that sends updates to situation events that were forwarded to an IBM Tivoli Enterprise Console® event server back to the monitoring server.
- ▶ Tivoli Performance Analyzer for predictive capability with Tivoli Monitoring so you can monitor resource consumption trends, anticipate future performance issues, and avoid or resolve problems more quickly.

IBM SmartCloud Monitoring for Virtual Environments includes the following agents for comprehensive monitoring of virtual environments:

- ▶ Virtual Infrastructure (VI) agent: Remote performance and availability monitoring of VMware ESX, ESXi, and vCenter Server environments. The VI agent remotely monitors the VMware infrastructure by connecting to the Virtual Center or to stand-alone ESX and ESXi hosts. This agent has been certified by VMware in the VMware Ready program.
- ▶ KVM agent: Remote performance and availability monitoring to visualize availability, performance, and capacity trends for KVM and hosts. This agent remotely monitors KVM by connecting to each host.
- ▶ PowerVM agents (CPC, UNIX, VIOS, HMC): These agents monitor the health, availability, and resource consumption of the shared frame, LPARs, shared memory and CPU pools, shared network and storage resources and AIX processes.
- ▶ NetApp Storage agent: Remote performance and availability monitoring to visualize capacity, latency, and throughput performance metrics of NetApp and IBM N series storage systems. This offering monitors the Data Fabric Manager Server (DFM) and remotely connects to the DFM server to obtain performance metrics.

Other add-on components to IBM Tivoli Monitoring for Virtual Environments can be purchased to further extend the breadth of virtual environment coverage:

- ▶ Citrix XenApp agent: Monitoring of Citrix XenApp environments. This agent is installed on the server or VM running Citrix XenApp.
- ▶ Citrix XenServer agent: Remote performance and availability monitoring for XenServer pools, hosts, and VMs to include pool master transitions and XenServer license expiration notifications. Each agent instance connects to a XenServer Pool containing 1 - 16 XenServer hypervisors or, optionally, a stand-alone XenServer hypervisor. This agent is certified by Citrix in the Citrix Ready program.
- ▶ Citrix XenDesktop agent: Performance and availability monitoring for Citrix XenDesktop virtual desktop infrastructure.

3.3.3 Ordering information

Table 3-3 shows ordering information for IBM SmartCloud Monitoring.

Table 3-3 IBM SmartCloud Monitoring ordering information

Part number	Description
D0NMMLL	IBM SmartCloud Monitoring per Virtual Server Lic + SW S&S 12 Mo
E0DFJLL	IBM SmartCloud Monitoring per Virtual Server Annual SW S&S Rnwl
D0NMNLL	IBM SmartCloud Monitoring per Virtual Server SW S&S Reinstate 12 Mo

3.3.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Monitoring product page
<http://www.ibm.com/software/tivoli/products/smartcloud-monitoring/>
- ▶ IBM SmartCloud Monitoring information center
http://pic.dhe.ibm.com/infocenter/tivihelp/v15r1/topic/com.ibm.scm.doc/welcome_scm71.html

3.4 IBM SmartCloud Patch Management

IBM SmartCloud Patch Management combines endpoint patch management with cloud computing to help you configure and manage your physical, virtual, and cloud computing assets. The software optimizes the patch cycle, and helps you gain visibility and control of your systems regardless of context, location or connectivity.

IBM SmartCloud Patch Management offers the following features:

- ▶ Automatic patch assessment and management of multiple operating systems and applications over physical and virtual servers
- ▶ Reduced complexity through ease of implementation, use and simplified cloud administration
- ▶ Highly scalable and rapid cloud delivery

3.4.1 Solution value

In their environments, MSPs typically face the following challenges that are related to the endpoint management:

- ▶ Software and the threats against it are constantly evolving.
- ▶ System administrators are often responsible for tens or hundreds of thousands of endpoints that are running various operating systems and software applications.
- ▶ Endpoints can include servers, notebooks, desktops, and specialized equipment such as point-of-sale (POS) devices, and self-service kiosks.

These challenges dictate specific requirements for MSP environments:

- ▶ MSPs need an effective way to assess, deploy, and manage a constant flow of patches for many types of operating systems and applications in heterogeneous environments.
- ▶ MSPs need ways to patch online and offline VMs so that virtual and cloud environments have the same level of security as physical systems.
- ▶ Patch management can easily overwhelm already strained budgets and staff.

IBM SmartCloud Patch Management offers the following capabilities to address these challenges and meet the requirements:

- ▶ Continuous endpoint enforcement ensures that endpoints remain updated.
- ▶ Acquires, tests, packages, and distributes many patch policies directly for users, removing considerable patch management overhead.
- ▶ Largely automated process provides a consistent, high-quality patch in a timely manner.
- ▶ Security in both physical and virtual environments is enhanced.

3.4.2 Solution overview

IBM SmartCloud Patch Management combines the benefits of two of the IBM leading systems management solutions to improve the management of physical, virtual, and cloud environments.

- ▶ IBM SmartCloud Provisioning is a breakthrough platform so companies can enable cloud computing faster. It allows standardization of IT processes for new levels of operational efficiency, and it serves as a foundation for advanced cloud capabilities to provide end-to-end service management. See 3.1, “IBM SmartCloud Provisioning” on page 24 for more information.
- ▶ IBM Endpoint Manager for Patch Management is a centralized solution that enables unified management of patch compliance across your physical and virtual systems in near real time. The unified IBM endpoint management approach offers benefits of unmatched visibility and control of your systems, regardless of context, location, or connectivity.

IBM SmartCloud Patch Management solution has the following capabilities:

- ▶ Automatically manages patches for multiple operating systems and applications across hundreds of thousands of endpoints regardless of location, connection type or status.
- ▶ Reduces security and compliance risk by slashing remediation cycles from weeks to days or hours.
- ▶ Gains greater visibility into patch compliance with flexible, real-time monitoring, reporting.
- ▶ Patches online and offline VMs to improve security in virtual environments.

IBM Endpoint Manager for Patch Management, built on BigFix technology, gives organizations access to comprehensive capabilities for delivering patches for Microsoft Windows, UNIX, Linux, and Apple Mac OS operating systems; third-party applications from vendors including Adobe, Mozilla, Apple and Java; and customer-supplied patches to endpoints, regardless of their location, connection type, or status. Endpoints can include servers, notebooks, desktops, and specialized equipment such as point-of-sale (POS) devices, and self-service kiosks. In addition, online and offline VMs can be patched so that virtual and cloud environments have the same level of security as physical systems. The offline VMs are brought online in a secure environment where only Endpoint Manager has access to them, ensuring that patches can be applied before the endpoints are made available for use.

3.4.3 Ordering information

Table 3-4 shows ordering information for IBM SmartCloud Patch Management.

Table 3-4 IBM SmartCloud Patch Management ordering information

Part number	Description
D0TEFLL	IBM SmartCloud Patch Management per Resource Value Unit Lic + SW S&S 12 Mo
E0EL5LL	IBM SmartCloud Patch Management per Resource Value Unit Annual SW S&S Rnwl
D0TEGLL	IBM SmartCloud Patch Management per Resource Value Unit SW S&S Reinstate 12 Mo
D0TEHLL	IBM SmartCloud Patch Management FTL per Resource Value Unit Initl FT Lic+S&S 12 Mo
E0EL6LL	IBM SmartCloud Patch Management FTL per Resource Value Unit SubSq FT Lic+S&S 12 Mo

3.4.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Patch Management product page
<http://www.ibm.com/software/products/us/en/ibmsmarpatcmana>
- ▶ IBM Tivoli Endpoint Manager Information Center
http://pic.dhe.ibm.com/infocenter/tivihelp/v26r1/topic/com.ibm.tem.doc_8.2/welcome/welcome.html

3.5 Tivoli Storage Manager Suite for Unified Recovery

IBM Tivoli Storage Manager Suite for Unified Recovery is a bundle of ten proven data protection and recovery software products (see Figure 3-3 on page 39). This bundle helps MSPs meet a wide range of data management challenges for complex, distributed infrastructures. You can deploy the advanced management tools that you need for each of your individual data protection requirements without having to worry about individual product licenses.

Tivoli Storage Manager Suite for Unified Recovery offers the following features:

- ▶ Provides extensive data protection for a wide range of systems including VMs, file servers, email, databases, mainframes and even desktops. This bundled solution allows you to use the correct data protection tool for each of your requirements.
- ▶ Reduces costs and simplifies procurement and deployment with per-terabyte capacity licensing. You can deploy any of 10 separate solution components, in any location and quantity, with a simplified license that measures only the amount of data that is managed.
- ▶ Scales to meet the recovery needs of any size organization by managing up to four billion data objects on a single server. This solution supports more than 50 operating system versions and hundreds of server and storage devices.
- ▶ Manages the entire suite of products from a single user console. You can configure, manage, upgrade, report and monitor all ten products from a single administration interface.

3.5.1 Solution value

IBM Tivoli Storage Manager Suite for Unified Recovery is packaged to address the following challenges:

- ▶ Various technologies are needed to protect various types of systems, applications, and data in various locations, to help meet the service level requirements of the business.
- ▶ Procurement and management of multiple data recovery point solutions from separate vendors, or even multiple add-on products from the same vendor, can stress IT staff and introduce additional risk of human error.

IBM Tivoli Storage Manager Suite for Unified Recovery provides a full suite of products with a licensing model that is easy to measure:

- ▶ Centralized and simplified management: One user interface (UI) provides access to control and monitor a wide range of data backup and recovery processes across the enterprise
- ▶ Simplified procurement: One part number provides access to unlimited use of ten separate solution components
- ▶ Easier and more straightforward budget control: Predicting future requirements can be easier.

3.5.2 Solution overview

Tivoli Storage Manager Suite for Unified Recovery includes ten proven data protection and recovery software products. Each component can be deployed as needed in any quantity to meet specific service-level requirements with no per-product licensing charges.

This advanced, highly scalable suite helps increase the efficiency of your IT operations and helps cut costs that are related to storage management. These improved efficiencies and cost-cuts are done by providing a wide range of data protection, recovery management and monitoring capabilities by using policy-based automation, including the following items:

- ▶ Backup and recovery, and archive and retrieval
- ▶ Snapshots for online database and application protection
- ▶ Disaster recovery planning and replication
- ▶ Bare machine recovery
- ▶ Data deduplication and space management

The components of the suite are shown in Figure 3-3.

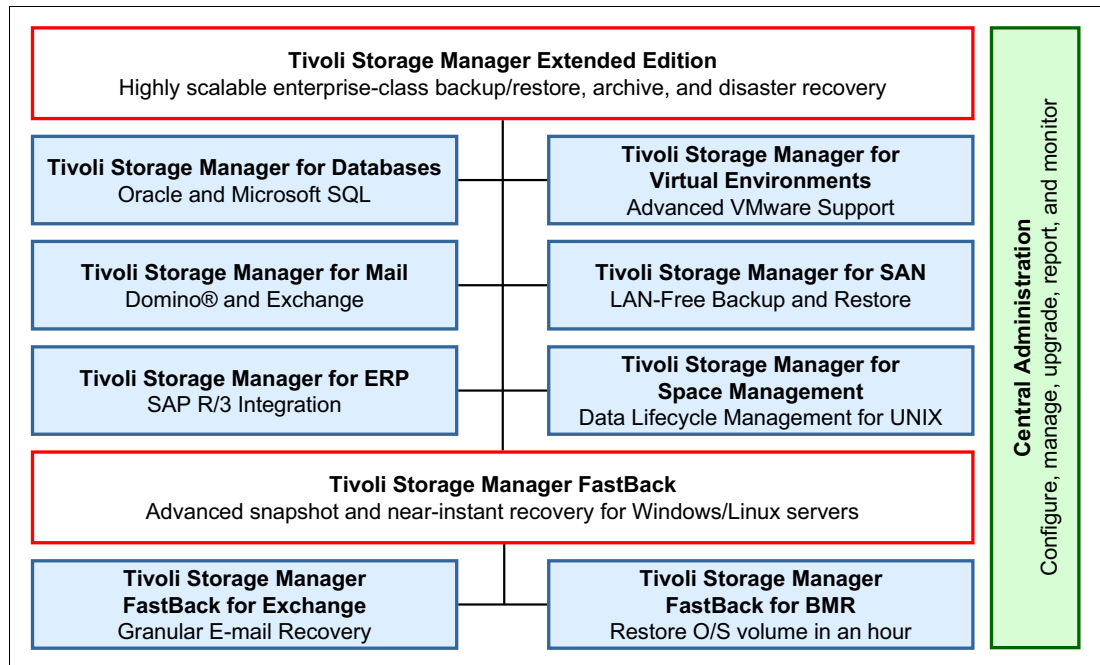


Figure 3-3 Tivoli Storage Manager Suite for Unified Recovery

The individual products included in this comprehensive package are as follows:

- ▶ **Tivoli Storage Manager Extended Edition**
Provides core backup and restore operations for a wide range of operating systems; broad support for tiers of storage; network data management protocol (NDMP), IBM DB2R and IBM Informix® support; source and target deduplication; and advanced disaster recovery planning and replication.
- ▶ **Tivoli Storage Manager for Databases**
Performs online, consistent, and centralized backups for Oracle and SQL to avoid downtime, protect vital enterprise data infrastructures, and minimize operation costs.
- ▶ **Tivoli Storage Manager for Enterprise Resource Planning**
Performs online, consistent, and centralized backups for SAP environments.
- ▶ **Tivoli Storage Manager for Mail**
Protects data on email servers that are running IBM Lotus® Domino® or Microsoft Exchange, with granular restoring of Exchange email objects.
- ▶ **Tivoli Storage Manager for Virtual Environments**
Automatically discovers and protects VMware virtual machines, offloads backup workloads to a centralized server, and enables flexible, near-instant recovery.
- ▶ **Tivoli Storage Manager for Space Management**
Moves inactive data to reclaim online disk space for important active data, frees administrators from manual file system pruning tasks, and defers the need to purchase additional disk storage.

- ▶ Tivoli Storage Manager for Storage Area Networks
Provides high-performance backup and restore operations by removing data transfer from the local area network (LAN).
- ▶ IBM Tivoli Storage Manager FastBack®
Provides efficient block-level incremental backup and near-instant restore operations for critical Microsoft Windows and Linux servers and applications, both in the data center and in remote offices.
- ▶ Tivoli Storage Manager FastBack for Microsoft Exchange
Enables the recovery of individual Microsoft Exchange objects such as email, attachments, calendar entries, contacts, and tasks.
- ▶ Tivoli Storage Manager FastBack for Bare Machine Recovery
Provides operating system volume recovery following a disaster or catastrophic server failure, fully restoring Windows and Linux systems within an hour.

Tivoli Storage Manager Suite for Unified Recovery delivers centralized administration and intelligent data move-and-store techniques to help ease storage management. The product scales from small to very large installations, managing up to four billion data objects in a single server. It supports more than 50 operating system versions and hundreds of server and storage devices. It also facilitates a multitude of connections, including Internet, wide area networks (WANs), LANs, and storage area networks (SANs).

3.5.3 Ordering information

Table 3-5 shows ordering information for Tivoli Storage Manager Suite for Unified Recovery.

Table 3-5 Tivoli Storage Manager Suite for Unified Recovery

Part number	Description
D0BM1LL	Per Terabyte (1-100) License and SW S&S 12 Months
E084XLL	Per Terabyte (1-100) Annual SW S&S Renewal
D0BM2LL	Per Terabyte (1-100) SW S&S Reinstatement 12 Months
D0BM9LL	Per Terabyte (101-250) License and SW S&S 12 Months
E0851LL	Per Terabyte (101-250) Annual SW S&S Renewal
D0BMALL	Per Terabyte (101-250) SW S&S Reinstatement 12 Months
D0BMBLL	Per Terabyte (251-500) License and SW S&S 12 Months
E0852LL	Per Terabyte (251-500) Annual SW S&S Renewal
D0BMCLL	Per Terabyte (251-500) SW S&S Reinstatement 12 Months
D0BMJLL	Per Terabyte (501-750) License and SW S&S 12 Months
E0856LL	Per Terabyte (501-750) Annual SW S&S Renewal
D0BMLLL	Per Terabyte (501-750) SW S&S Reinstatement 12 Months
D0BMKLL	Per Terabyte (751-1,250) License and SW S&S 12 Months
E0857LL	Per Terabyte (751-1,250) Annual SW S&S Renewal
D0BMMLL	Per Terabyte (751-1,250) SW S&S Reinstatement 12 Months
D0BMULL	Per Terabyte (1,251-2,000) License and SW S&S 12 Months
E085BLL	Per Terabyte (1,251-2,000) Annual SW S&S Renewal
D0BMWLL	Per Terabyte (1,251-2,000) SW S&S Reinstatement 12 Months
D0BMVLL	Per Terabyte (2,001+) License and SW S&S 12 Months
E085CLL	Per Terabyte (2,001+) Annual SW S&S Renewal
D0BMXLL	Per Terabyte (2,001+) SW S&S Reinstatement 12 Months

3.5.4 Related information

For more information, see the following resources:

- ▶ Tivoli Storage Manager Suite for Unified Recovery product page
<http://www.ibm.com/software/products/us/en/tivostormanasuitforunifreco/>
- ▶ Tivoli Storage Manager Suite for Unified Recovery information center
http://pic.dhe.ibm.com/infocenter/tsminfo/v6r4/topic/com.ibm.itsm.nav.doc/c_tsm_sur.html

3.6 IBM SmartCloud Control Desk

IBM SmartCloud Control Desk is an integrated IT service management solution. With it, MSPs are able to offer a comprehensive management of IT processes, services, and assets to their clients. Clients have the control to maintain configuration integrity in response to planned changes and unplanned incidents and problems that occur throughout this complex IT landscape, ensuring continuity of service, speed of response, and efficiency of management.

The product features innovative, industry-leading functionality in many areas:

- ▶ A simple, easy-to-use service catalog and self service interface
- ▶ Tools for easily reporting problems and requesting services
- ▶ Applications that enable IT staff to be productive and responsive in prioritizing, tracking, and resolving user issues
- ▶ Change, configuration, release, incident, problem, and asset management
- ▶ Policy-based automation of job plans, task assignments, notifications, and workflows to reduce labor costs
- ▶ Integrated service, asset, and configuration management
- ▶ Built-in integrations with IBM and third-party applications
- ▶ Advanced reports and analytics tools that provide insight into your environment and help you manage change more efficiently

With IBM SmartCloud Control Desk, you can do basic system configurations, rather than coding, to quickly adapt the product user interface, data model, and workflows to the client's particular environment and business needs. Rapid Environment Setup (REST) application programming interfaces enable you to easily integrate with other client applications.

IBM SmartCloud Control Desk offers improved visibility of the infrastructure; increased control of resources, processes, and changes; and automation to reduce costs and improve the consistency, efficiency, and effectiveness of crucial processes.

3.6.1 Solution value

IBM SmartCloud Control Desk helps to address the following challenges:

- ▶ In dynamic environments, industry demands various delivery models based on various customer needs and on how customers want to manage and install (virtual machine, SaaS, and traditional install).
- ▶ Siloed IT systems that handle service requests, incidents, problems, and changes, all lead to increased costs.
- ▶ Customer services reach beyond normal IT boundaries and IT managers are being challenged to manage the entire business, not only what is within the traditional IT environment. They want and need a holistic service management solution.
- ▶ Higher total cost of ownership (TCO) and inflexible functions can cause customers to implement various customizations.
- ▶ Rigid pricing and licensing structure for the customer can cause difficulty in assigning employees to tasks within a product.

IBM SmartCloud Control Desk offers the following benefits:

- ▶ Users can more easily request services and have the request fulfilled through full ITIL-compliant process automation.
- ▶ Building an internal Electronic App Store is easier through standard IBM SmartCloud Control Desk and IBM Tivoli Endpoint Manager integration, and integration with cloud provisioning tools (VMware, IBM SmartCloud Provisioning, and so on).
- ▶ Improves the productivity and responsiveness of the IT staff with new features and improved usability.
- ▶ Offers more social opportunity with social media integration.
- ▶ Bridges the gap between the configuration and asset management domains, allowing customers to accomplish more with fewer resources.
- ▶ Breaks down the siloed systems, reducing cost and providing a more simplified, holistic view across the IT environment.
- ▶ Offers a new price model that is single-user-based and gives the customer the flexibility to assign their users to any function within the product.
- ▶ Delivers simplification enhancements.
- ▶ Expands implementation choices through SaaS, VM image, and standard custom install options.
- ▶ Offers ease of use and adoption, improved time-to-value, and lower TCO.

3.6.2 Solution overview

IBM SmartCloud Control Desk includes a range of components, shown in Figure 3-4, that contribute to your ability to manage your IT environment effectively and efficiently.

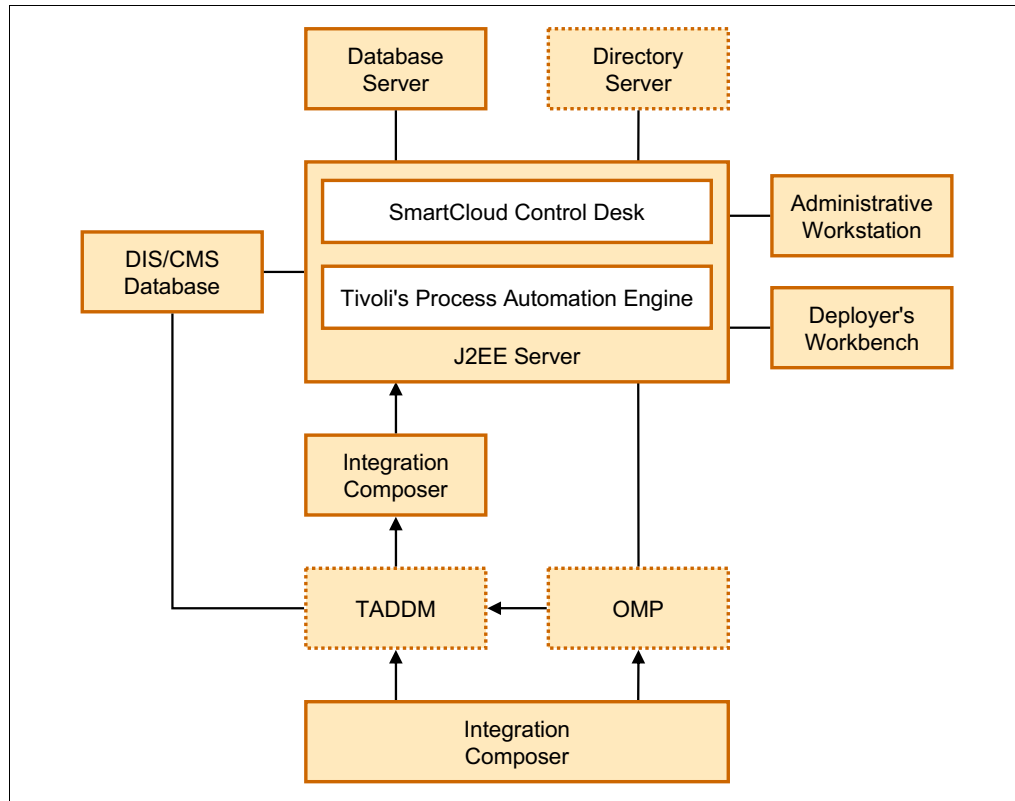


Figure 3-4 IBM SmartCloud Control Desk components

IBM SmartCloud Control Desk solution components are as follows:

- ▶ Service Request management

This component provides single point of entry for handling incidents and requests, and serves as an interface for other service management processes. A service request can be opened to resolve an issue, obtain a new service, obtain information, or change a current service.

- ▶ Incident management

With this component, you can restore normal service operation as quickly as possible after an incident is reported, and minimize the adverse effects on business operations.

- ▶ Problem management

With this component, you can resolve the root causes of incidents to minimize the impact on the enterprise, and to prevent a recurrence.

- ▶ Service catalog

The service catalog provides a complete end-to-end set of functions that permit the definition of different types of requests for services, a way to shop for those services, and a structured process that manages the delivery of these services.

- ▶ **Configuration management**
With this component, you can identify, control, maintain, and verify the configuration items (CIs) that you manage.
- ▶ **Change management**
With this component, you can create and carry out well defined processes for making various types of changes to your IT environment.
- ▶ **Release management**
With this component, you can manage, audit, and coordinate simple and complex releases.
- ▶ **Procurement management**
This component enables the creating, routing, and managing of requests, purchase orders, contracts, and terms and conditions.
- ▶ **License management**
This component provides for an auditable, reportable lifecycle of various license types and terms.
- ▶ **IT asset management**
This component provides inventory, financial, and contractual functions to support lifecycle management and strategic decision making for the IT environment.
- ▶ **Base services**
The base services within IBM SmartCloud Control Desk provide common functions for use by all applications.
- ▶ **Deployer's Workbench**
The Deployer's Workbench is a separately installed, Eclipse-based workbench that provides tools that can help you create configuration item (CI) spaces for managing configuration items effectively and efficiently.
- ▶ **Integration Composer**
Integration Composer is a separately installed integration tool that transforms and imports data about deployed hardware and software.

The IBM SmartCloud Control Desk - Service Provider Edition contains all of the features and functionality described previously and includes applications and capabilities that are specifically designed for service providers who are managing the data centers of multiple customers.

3.6.3 Ordering information

For ordering information, see the IBM SmartCloud Control Desk Announcement Letter:

<http://ibm.com/common/ssi/cgi-bin/ssialias?infotype=dd&subtype=ca&&htmlfid=897/ENU S213-062>

3.6.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Control Desk product page
<http://www.ibm.com/software/products/us/en/smartcloudcontroldesk/>
- ▶ IBM SmartCloud Control Desk information center
<http://pic.dhe.ibm.com/infocenter/tivihelp/v50r1/index.jsp>

3.7 IBM SmartCloud Desktop Infrastructure

The IBM SmartCloud Desktop Infrastructure offers robust, cost-effective, and manageable virtual desktop solutions for a wide range of clients, user types, and industry segments. These solutions can help to increase business flexibility and staff productivity, reduce IT complexity, and simplify security and compliance. Based on a reference architecture approach, this infrastructure supports various hardware, software, and hypervisor platforms.

3.7.1 Solution value

Several key factors influence virtual desktops in today's business climate:

- ▶ Data security and compliance concerns
- ▶ Complexity and costs of managing existing desktop environments
- ▶ An increasingly mobile workforce
- ▶ The changing ownership of end-point devices with bring-your-own-device (BYOD) programs
- ▶ The need for rapid recovery from theft, failure, and disasters

IBM SmartCloud Desktop Infrastructure offers the following advantages:

- ▶ Simplifies desktop administration, support, and management.
- ▶ Enhances security and compliance management.
- ▶ Improves availability and reliability.
- ▶ Enables users to work anytime, anywhere quickly and easily regardless of location or device.
- ▶ Better supports growth initiatives for mobility and flexible work locations.

3.7.2 Solution overview

The IBM SmartCloud Desktop Infrastructure solution with IBM Virtual Desktop running on IBM Flex System includes the following components:

- ▶ User access devices
 - Desktop PCs
 - Thin clients
 - Notebooks
 - Other handheld mobile devices
- ▶ Virtual infrastructure software
 - Citrix XenDesktop
 - Virtual Bridges VERDE (Virtual Enterprise Remote Desktop Environment)
 - VMware View
- ▶ Hardware platform
 - IBM PureFlex System
 - IBM Flex System
 - IBM System Storage®

Figure 3-5 shows the functional components of the IBM SmartCloud Desktop Infrastructure solution.

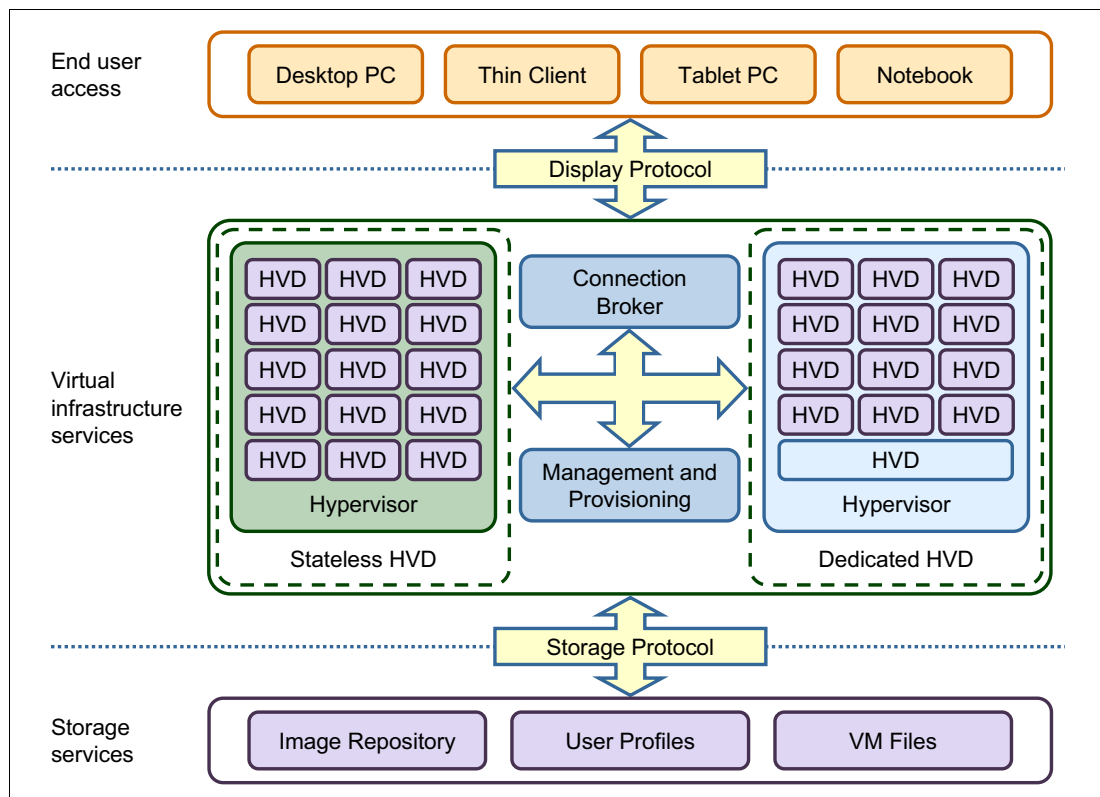


Figure 3-5 IBM SmartCloud Desktop Infrastructure solution components

The IBM SmartCloud Desktop Infrastructure solution consists of three functional layers:

- ▶ User access layer
This layer is a user entry point into the virtual infrastructure. It includes traditional desktop PCs, thin clients, notebooks, and other handheld mobile devices.
- ▶ Virtual infrastructure services layer
This layer provides the secure, compliant, and highly available desktop environment to the user. The user access layer interacts with the virtual infrastructure layer through display protocols. The RDP, SPICE, and NX+ display protocols are available in IBM Virtual Desktop.
- ▶ Storage services layer
This layer stores user persona, profiles, gold master images, and actual virtual desktop images. The storage protocol is an interface between virtual infrastructure services and storage services. The storage protocols include Network File System (NFS), Common Internet File System (CIFS), iSCSI, and Fibre Channel.

The virtual infrastructure services layer has the following key functional components:

- ▶ Hypervisor
The hypervisor provides a virtualized environment for running virtual machines (VMs) with the desktop operating systems in them. These VMs are called hosted virtual desktops.
- ▶ Hosted virtual desktops
A hosted virtual desktop (HVD) is a VM that runs a user desktop operating system and applications.
- ▶ Connection broker
The connection broker is the point of contact for the client access devices that request the virtual desktops. The connection broker manages the authentication function and ensures that only valid users are allowed access to the infrastructure. When authenticated, it directs the clients to their assigned desktops. If the virtual desktop is unavailable, the connection broker works with the management and provisioning services to have the VM ready and available.
- ▶ Management and provisioning services
The management and provisioning services allow the centralized management of the virtual infrastructure, providing a single console to manage multiple tasks. They provide image management, lifecycle management, and monitoring for hosted VMs.
- ▶ High availability services
High availability (HA) services ensure that the VM is up and running even if a critical software or hardware failure occurs. HA can be a part of connection broker function for stateless HVDs or a separate failover service for dedicated HVDs.

A *dedicated* (or *persistent*) HVD is assigned permanently to the specific user (similar to a traditional desktop PC). Users log in to the same virtual desktop image every time they connect. All changes that they make and each application that they install are saved when the user logs off. The dedicated desktop model is best for users who need the ability to install more applications, store data locally, and retain the ability to work offline.

A *stateless* (*pooled* or *non-persistent*) HVD is allocated temporarily to the user. After the user logs off, changes to the image are discarded (reset). Then, the desktop becomes available for the next user, or a new desktop is created for the next user session. A *persistent user experience* is the ability to personalize the desktop and save data. This experience is achieved through user profile management, folder redirection, and similar approaches.

Specific individual applications can be provided to nonpersistent desktops by using application virtualization technologies, if required.

Functional layers and components are supported by a hardware infrastructure platform that must provide the following features:

- ▶ Sufficient computing power to support demanding workloads
- ▶ Scalability to satisfy future growth requirements
- ▶ Reliability to support business continuity and 24x7 operations
- ▶ High-speed, low-latency networking for a better user experience
- ▶ Cost-efficient storage to handle large amounts of VM and user data
- ▶ Centralized management of combined physical and virtual infrastructure from a single user interface to simplify and automate deployment, maintenance, and support tasks

IBM Flex System is a “future-proof,” integrated platform that satisfies these requirements.

In summary, because of its integrated capabilities, IBM Flex System and IBM PureFlex System in an IBM SmartCloud Desktop Infrastructure solution can help to achieve the following advantages:

- ▶ Better VM density because of large memory and I/O capacity support
- ▶ Lower communication latency because of integrated switching capabilities for a better user experience
- ▶ Simplified deployment and management of both physical and virtual infrastructures because of integrated design and IBM Flex System Manager™ capabilities

3.7.3 Ordering information

For ordering information, contact your IBM representative.

3.7.4 Related information

For more information, see the following resources:

- ▶ IBM SmartCloud Desktop Infrastructure IBM Redbooks Solution Guides
<http://www.redbooks.ibm.com/redbooks.nsf/searchsite?SearchView&query=SDI>
- ▶ IBM SmartCloud Desktop Infrastructure product page
<http://www.ibm.com/systems/virtualization/desktop-virtualization>
- ▶ IBM SmartCloud Desktop Infrastructure Reference Architecture
http://www.ibm.com/partnerworld/wps/servlet/RedirectServlet?cmsId=stg_ast_eis_sdi_infrastructure&attachmentName=ibm_smartcloud_desktop_infrastructure_reference_architecture.pdf

Abbreviations and acronyms

BPaaS	business process as a service
BYOD	bring your own device
CCRA	Cloud Computing Reference Architecture
CIFS	Common Internet File System
CI	configuration item
CPC	central processor complex
DFM	Data Fabric Manager Server
HA	high availability
HMC	Hardware Management Console
ITSO	International Technical Support Organization
IaaS	infrastructure as a service
KPIs	key performance indicators
KVM	kernel-based VM
LAN	local area network
LOB	line-of-business
MSP	managed service provider
NDMP	network data management protocol
NFS	Network File System
POS	point-of-sale
PaaS	platform as a service
QoS	quality of service
RAM	random access memory
RAS	reliability, availability, and serviceability
REST	Rapid Environment Setup
ROI	return on investment
SAN	storage area network
SaaS	software as a service
UI	user interface
VI	Virtual Infrastructure
VIOS	Virtual I/O Server
VM	virtual machine
WAN	wide area network

Related publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this paper.

IBM Redbooks

The following IBM Redbooks publications provide additional information about the topic in this document. Note that some publications referenced in this list might be available in softcopy only.

- ▶ *IBM SmartCloud: Building a Cloud Enabled Data Center*, REDP-4893
- ▶ *IBM SmartCloud: Becoming a Cloud Service Provider*, REDP-4912
- ▶ *Implementing SmartCloud Entry on an IBM PureFlex System*, SG24-8102

You can search for, view, download or order these documents and other Redbooks, Redpapers, Web Docs, draft and additional materials, at the following website:

ibm.com/redbooks

Online resources

These websites are also relevant as further information sources:

- ▶ IBM PartnerWorld - Managed Service Providers
<https://www.ibm.com/partnerworld/msp/>
- ▶ IBM SmartCloud
<http://www.ibm.com/cloud-computing/us/en/>
- ▶ IBM PureFlex System
<http://www.ibm.com/pureflex/>

Help from IBM

IBM Support and downloads

ibm.com/support

IBM Global Services

ibm.com/services



IBM PureFlex System Solutions for Managed Service Providers



Introduces IBM PureFlex System and IBM Flex System offerings for MSPs

Discusses the IBM framework for MSP solutions

Describes components of the IBM MSP solution stack

Organizations are looking for ways to get more out of their already strained IT infrastructure as they face new technological and economic pressures. They are also trying to satisfy a broad set of users (internal and external to the enterprise) who demand improvements in their quality of service (QoS), regardless of increases in the number of users and applications. Cloud computing offers attractive opportunities to reduce costs, accelerate development, and increase the flexibility of the IT infrastructure, applications, and services.

Infrastructure as a service (IaaS) is the typical starting point for most organizations when moving to a cloud-computing environment. IaaS can be used for the delivery of resources such as compute, storage, and network services through a self-service portal. With IaaS, IT services are delivered as a subscription service, eliminating up-front costs and driving down ongoing support costs. Businesses can improve their competitive position by moving to these cloud-based technologies.

This IBM Redpaper discusses IBM solutions for managed service providers (MSPs). This paper is for IT professionals who are involved in managed and cloud services solution planning.

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