Business white paper

Agility by easily tapping new capacity

Bursting with HP CloudSystem

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Introduction: the CIO's conundrum

It's no secret that businesses are racing to embrace the cloud. Currently employees, especially tech-savvy ones, are attracted to having immediate access to rich pools of inexpensive computing resources. In fact, CIOs and IT departments are being left behind. And their carefully crafted schemes for safeguarding sensitive data risk being subverted by "shadow IT" as line-of-business users throughout the organization connect company-issued laptops to inexpensive public cloud resources available to anyone with a credit card.

It's a conundrum troubling many CIOs: *I know the public cloud is good for business, but how can I take advantage of the vast array of cloud resources while retaining control and governance? How can I make public and hybrid cloud sourcing part of my IT strategy? And how can I possibly manage it all?*

HP CloudSystem offers the answer. Part of the HP Converged Cloud architecture, HP CloudSystem lets you safely burst workloads to cloud resources when you need additional computational headroom or when you want to take advantage of additional capabilities.

This white paper discusses why you'd want to take advantage of HP CloudSystem's "dual bursting" to local and public cloud resources. You'll learn how bursting can bring your business users and IT back into strategic alignment as you jointly exploit new business opportunities enabled by private, public, and hybrid clouds.

The problem: unifying business and IT around public cloud use

Information technology must be able to support the needs of business and deliver capacity as needed. A big part of that need is leveraging public clouds. But public cloud usage within most enterprises today is a far cry from what's needed by the enterprise CIO:

Public cloud today	Ideal public cloud
Agile and cost-effective	Still agile and more cost-effective
Isolated, ad hoc usage	Usage integrated and leveraged across the enterprise
"Shadow IT," under the radar	Managed with governance and control
Tactical tool	Strategic asset
Setting business and IT at cross-purposes	Business and IT aligned

In the ideal IT world, public clouds will become true strategic assets. And when IT can embrace public cloud usage, IT and business users can align behind common goals that benefit everyone. To achieve this idealized goal, you'll need to:

- Find a way to work with private and public cloud resources—ideally from a single management environment that enables you to work with private and public cloud resources in the same way
- Control all of your cloud services across their full lifecycles, from initial design through deployment and ongoing monitoring and management
- Implement clear governance and control over public cloud resource use with flexible policies that may differ from those you apply within your private cloud
- Enable and manage a wide range of private, public, and hybrid cloud deployment use cases
- Manage services across multiple public clouds from different providers—a list of providers that will grow, shrink, and change over time
- Leverage investments you've already made in infrastructure and enterprise management technologies

Let's see how HP CloudSystem can help you achieve all these goals.

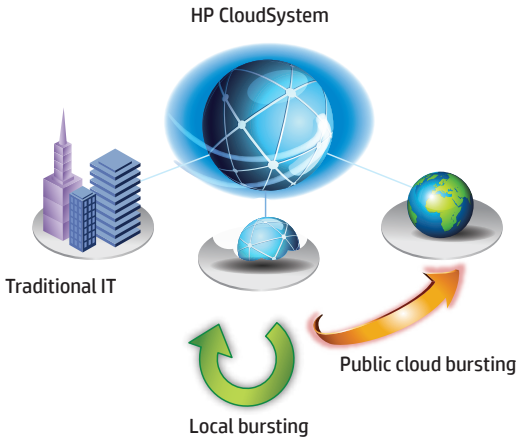
The answer: bursting from HP CloudSystem

Based on proven, market-leading HP Cloud Service Automation and Converged Infrastructure, HP CloudSystem is tailored for the requirements of enterprises and service providers at various stages of cloud maturity with three offerings:

- Entry configuration for infrastructure as a service (IaaS) with **HP CloudSystem Matrix** that lets IT customers provision infrastructure and applications in minutes
- Full-scale deployment of private and hybrid cloud environments with **HP CloudSystem Enterprise**, which lets customers unify management across private, public, and hybrid clouds and adds advanced infrastructure-to-application lifecycle management
- Advanced capabilities for service providers with **HP CloudSystem Service Provider**, facilitating deployment of public and hosted private clouds that deliver complete service aggregation and management

Integrated bursting capabilities bring hybrid cloud management—and the ability to burst to public clouds—to the CloudSystem solution portfolio and directly into the hands of IT. HP CloudSystem is part of HP Converged Cloud, a common architectural foundation across traditional IT and private, managed, and public clouds that helps you deliver information anywhere, applications anywhere, and infrastructure anywhere for a cloud environment that's flexible and change-ready—and tailored to your business.

Figure 1.
HP CloudSystem can burst locally or to public clouds—or provide both types of bursting. And it can manage those cloud resources, along with traditional IT, from a single management environment.



What is bursting?

Bursting with HP CloudSystem lets you tap additional resources as you need them—perhaps because you need more processing power to deal with a sudden spike in demand, or maybe because of specialized requirements such as keeping a particular workload secure or within a certain geographic area.

Bursting through cloud is a technique used by enterprises to provide additional resources on an as-needed basis to easily manage uneven service demands. The resources may be Utility Ready Computing (URC) resources from HP or public or virtual private cloud services from cloud service providers such as HP or HP CloudAgile bursting partners. Whether these additional resources are located onsite or off the premises, they are always poised and ready to go into action on demand, eliminating the need to go out and purchase them before deployment.

Advantages of bursting with HP CloudSystem

Bursting from HP CloudSystem offers a number of significant advantages:

- **Single management environment**
  HP CloudSystem lets you control resources originating in CloudSystem itself—as well as resources from public clouds and traditional IT—under a single management umbrella.
- **Unlimited headroom**
  With bursting, your server capacity almost never runs out. You acquire the peace of mind that comes from knowing your compute capacity is virtually unlimited.
- **Added capabilities**
  Bursting lets you add capabilities that make your business more competitive, such as establishing a necessary presence in countries where you don't own a data center or helping you adhere to a specific set of regulatory guidelines.
- **OPEX flexibility**
  You can slash up-front capital expenses and shift budget from capital expense to more flexible operational expense.
- **Smooth acquisition**
  Procurement is easy—you simply dial up added capacity on the fly to quickly deal with growth and surges in demand from your business and customers.
- **Usage-based billing**
  Metered usage lets you apply the right resources at the right time and pay for them as you use them.
- **Improved ROI**
  Bursting brings higher efficiency to your IT infrastructure and better return on your IT investment.

Types of bursting

For HP CloudSystem, we've developed two types of bursting that have uniquely different capabilities and usage models: **local bursting** to a set of in-house resources, and **bursting to public clouds** that are offered by service providers. HP CloudSystem easily handles both types. In fact, with HP CloudSystem you can burst to locally hosted resources, to public resource pools, or to any combination of the two.

Local bursting with HP Utility Ready Computing

Local bursting means you use excess infrastructure capacity on your site that you can switch on (and pay for) only when it's needed. Local bursting is a great solution if you can't, or don't want to, use public bursting—perhaps because your application contains sensitive business data or your company policies prohibit use of public clouds for other security and compliance reasons.

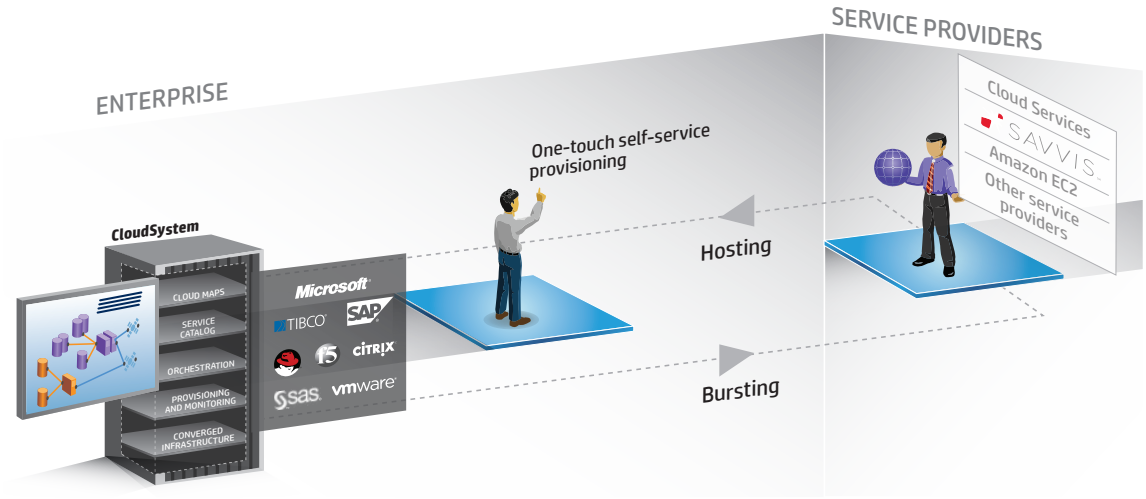
HP CloudSystem employs HP Utility Ready Computing as its local bursting solution. This is a service that essentially delivers computing capacity configured to your specific needs, yet you pay for it only when (or if) you use it. The bursting capacity is installed right along with your HP CloudSystem solution, but it's held in reserve until you need it. URC lets you ignite local capacity on demand, enabling the added computing capacity at an hourly blade price.

In normal circumstances, HP CloudSystem cruises along in the digital fast lane, effortlessly crunching billions of numbers and delivering data by the petabyte. But sometimes—perhaps because of a month-end close, a sudden spike in orders, or the need to grow in response to business conditions—the system needs additional computing power. At times like these, HP CloudSystem can burst to URC's speedy, secure resources to handle the overload.

With HP URC, you pay only for the amount of added capacity and the time you employ it. HP CloudSystem can automatically power servers on and off as they are needed, so there's no need for you to do any manual switching.

For more details about HP Utility Ready Computing, see **hp.com/go/utilityreadycomputing**

Figure 2.
Bursting with HP CloudSystem magnifies the value of public clouds by integrating them into a hybrid cloud service environment.



Bursting to public clouds from HP CloudSystem

HP CloudSystem also supports out-of-the-box public cloud bursting, in which HP CloudSystem provisions resources from a public cloud service provider. With this hybrid cloud solution, the depth of resources available to CloudSystem can be virtually unlimited, and payment for public cloud resources is on a pay-as-you-go basis. Of critical importance to IT, bursting to public clouds from HP CloudSystem brings public clouds into the sphere of IT governance and control, and makes them accessible and manageable from the same environment that is used to access and manage private clouds. This unique approach to bursting with CloudSystem ushers in the era of hybrid computing in a way that enables enterprises to embrace public clouds fully and to make hybrid clouds fundamental to enterprise IT architecture and provisioning strategies.

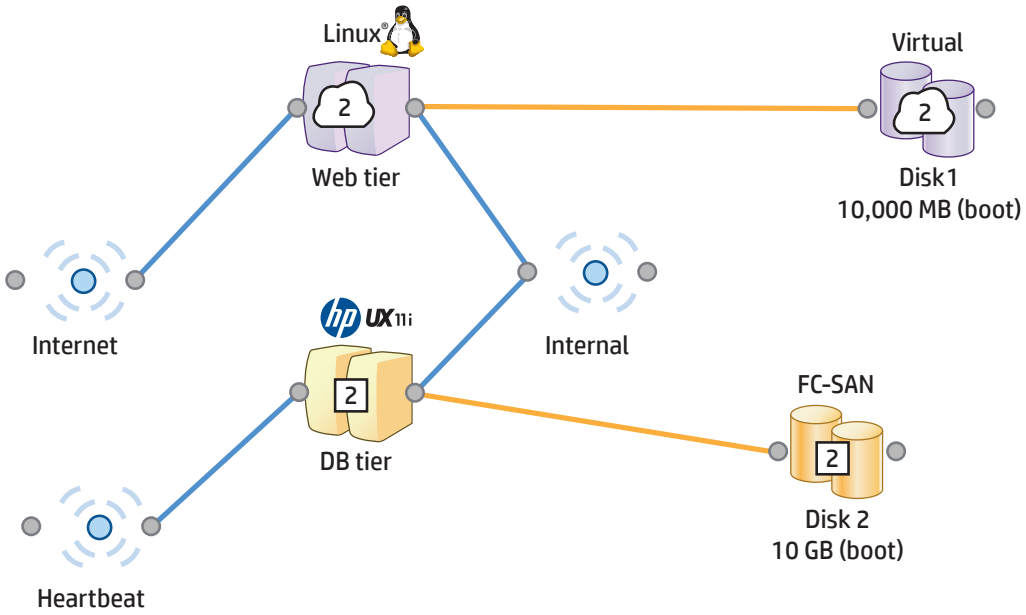
Bursting to a public cloud lets you create a mix of resources from HP CloudSystem and from public cloud providers, dramatically increasing the system's already excellent capacity and flexibility. In operation, your users simply select the expanded resources, where they appear alongside HP CloudSystem's internal computing infrastructure. When needed, services can be provisioned to those public cloud resources without the need for IT department action or involvement. You also have the ability to include an approval process before provisioning to a public cloud.

Like local bursting, bursting to a cloud service provider can offer added compute capacity to deal with usage spikes. More broadly, this bursting model allows CloudSystem users to leverage public cloud services to address a wide range of business needs. Some reasons for using a public cloud provider might be:

- **Geographical**
  For legal reasons, you need to have certain workloads held within the boundaries of a certain country, such as Japan. So you engage a bursting partner with international presence and deploy to that partner's Japanese cloud.
- **Regulatory**
  You lack the in-house capability to conform to all the requirements of privacy regulations such as HIPAA in the U.S., or the Data Protection Directive in the European Union. You can link to a partner whose cloud includes a resource set approved for that use.
- **Business-related**
  To win a contract, you need to demonstrate a particularly secure and hardened computing environment, perhaps a military grade one, that can also adhere to specific SLAs in the face of large computational surges. Access to a bursting partner can help demonstrate to your potential customer that you can satisfy extraordinary requirements.

Bursting to public clouds from HP CloudSystem enables enterprises to more fully realize these and other benefits by integrating public cloud access, governance, and control into a unified hybrid cloud services environment.

Figure 3.
This template is used to deploy Web applications in a hybrid configuration: The Web tier will be deployed to public cloud resources, while the database tier will be deployed in the private cloud.



About HP CloudSystem public bursting destinations

As an open platform, HP CloudSystem is designed to burst to a variety of destinations, including HP Cloud Services and other public clouds. Multiple destinations can be supported, enabling you to use different providers to meet different needs simultaneously or over time, while managing all of them from the same CloudSystem environment.

- **HP Cloud Services**
  Burst from HP CloudSystem to HP Cloud Services for an end-to-end HP solution for hybrid cloud computing. HP's public cloud services are based on HP's industry-leading hardware and software, with key elements of HP Converged Infrastructure and HP Software. HP Cloud Services are delivered via an open source-based architecture and are backed by world-class support.
- **Savvis**
  HP CloudSystem can also burst to Savvis, an HP CloudAgile Service Provider partner. The company offers Savvis Symphony Virtual Private Data Center (VPDC) solutions that feature multi-tiered security and a set of predefined service levels. Savvis also offers a global data center footprint, along with network options ranging from Tier-1 public IP access to private, low-latency connectivity.
- **Amazon Web Services**
  Bursting from CloudSystem to Amazon's Elastic Compute Cloud (EC2) allows you to provision servers to any EC2 instance type, across any availability zone, and to any geographic region supported by Amazon. For added security, you can configure Amazon firewall settings and burst to Amazon Virtual Private Cloud resources.
- **Bursting to additional providers**
  We're also building out our constellation of CloudAgile bursting partners that are approved for connecting to HP CloudSystem. HP provides these partners with technology, services, and programs to support their development and delivery of the vital connectors between HP CloudSystem and these partners' cloud services. Featuring differentiated value propositions, CloudAgile partners offer CloudSystem customers options for addressing various cloud service needs. HP CloudSystem may also offer limited support for bursting to select service providers outside of the CloudAgile partner ecosystem.

Designing services for bursting to public clouds

In order to leverage the advantages of public and private cloud resources, you need a solution that provides the greatest flexibility. It's important to understand how resources from different clouds may impact your services, and then build service designs around those ideal use cases.

Examples of bursting scenarios

CloudSystem bursting can be used to support both private and hybrid cloud deployment architectures. Each architecture brings with it a set of its own advantages and disadvantages. Depending on the types of services being deployed, each service design will have specific requirements. For services that will run on both private and public clouds, it's important to include those capabilities upfront in the design considerations.

- **Single cloud provisioning**
  In this scenario, a complete service instance—including all server groups and their attendant components—is provisioned to resources from a single cloud. If additional servers are needed to scale up capacity, those servers are also provisioned to the same cloud. With CloudSystem, resources could be provisioned entirely from a private cloud or entirely from a public cloud. The latter use case is an example of bursting. Being contained within one cloud, these services can be easier to design, deploy, and manage than those that use hybrid cloud architectures.
- **Hybrid cloud provisioning**
  In a hybrid deployment scenario, a single service is deployed across multiple clouds. A hybrid deployment can span private and public clouds, or it can span multiple public clouds. CloudSystem supports hybrid provisioning of services that comprise multiple server groups by allowing different server groups to be provisioned to different clouds. For example, the ad campaign service template illustrated in Figure 3 describes a two-tiered Web application that could be deployed in a hybrid configuration: the Web tier, comprising virtual servers and storage, will be deployed to a public cloud, while the back-end database tier will be deployed to private cloud resources.

Service template design considerations for bursting

When designing a service that will be deployed, in whole or in part, to a public cloud, be sure to consider the following:

- **Provider capabilities**
  Compared to your internal resources, those available to you via bursting to public clouds may differ substantially. For example, most public cloud service providers do not offer the option to access physical server resources, which may make them inappropriate as deployment destinations for some servers. Public cloud server configuration options—including memory and disk size, scalability factors, networking capabilities, and supported operating systems—may be more or less constrained than what you are accustomed to working with internally. Service levels, including performance and availability guarantees, are defined and delivered by each service provider. As a result, they may vary from each other. Different service levels may even be supported from a single provider. And, of course, the cost of resources available from different sources will reflect the different value levels that each is designed to provide. Use the strengths represented in these differences to your advantage and keep in mind provider limitations when you design services for deployment to public clouds.
- **Location**
  You may have several locations available to choose from when deploying to public cloud resources. Consider the benefits of deploying to specific locations, like the possibility of improving application performance to users in a particular region, when you design a service template. Think also about how you will manage challenges that may arise with remote server deployments—for example, does your service require local access to large data sets that would need to be uploaded and downloaded to distant public cloud resources? Hybrid service deployments require especially thoughtful design. Remember to allow for latency between servers running in different locations and keep in mind any needs for load balancing, server clustering, data replication, or similar distributed systems features that can be challenging to implement in a multi-cloud environment.
- **Service lifecycle management**
  From initial provisioning, through subsequent scaling, and on to eventual service de-provisioning, CloudSystem relies on information built into the template to manage the full lifecycle of a service. Be sure that the architecture, deployment options, and workflows that you build into your service templates will perform well over the full lifecycle of a service.

Step by step: bursting for IT and business users

With CloudSystem bursting, IT and business users also play a role in driving effective use of public cloud resources. IT defines server pools for public clouds and implements policies around their governance and control, such as assigning access privileges to them. Line-of-business end users make decisions about public cloud usage based on business needs. A business user may, for example, elect to deploy an ad campaign to a public cloud located in Asia when a new product is being rolled out in that part of the world, and to deploy a different ad campaign to a cloud in Europe where a different product is being introduced.

HP CloudSystem makes it easy to burst to an external service provider. Capacity available from a service provider is assigned to pools in CloudSystem and appears right alongside internal resource pools.

Here's how it looks in practice:

Step by step
Bursting for IT and business users

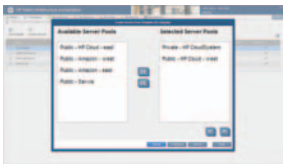
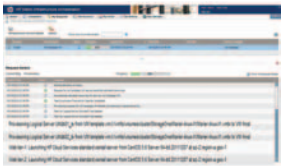
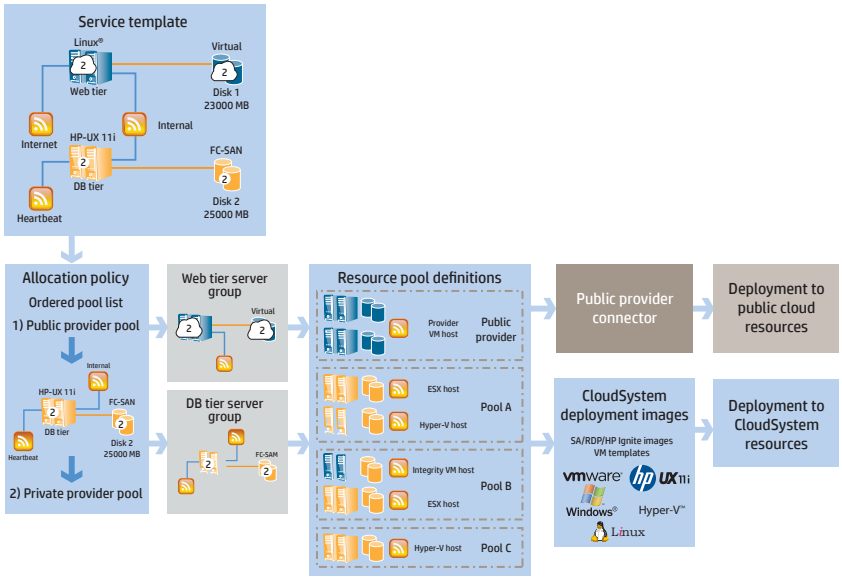
IT defines cloud resource pools	
Using HP CloudSystem, an IT administrator creates both private and public cloud server pools, which are groups of virtual machines or capacity pools. The administrator links public cloud capacity from a service provider to a CloudSystem server pool in much the same way that internal resources are associated with cloud server pools. Access to the public cloud server pools can be assigned to individual users or to groups of users by an IT administrator.	
Template Designer builds public cloud into service definition	
At template design time, the service architect determines whether a server group will ultimately be deployed to private or to public cloud resources. The architect also chooses the software image that will be deployed for each server and the networks to which the server will be attected. CloudSystem makes public cloud resource selection easy for designers by automatically querying all configured public clouds for software images and network resources, then presenting those resources to the service designer through the service designer interface.	 
Business selects destination of deployment time	
The business user begins by choosing a service template, such as an advertising campaign, then selects one or more of the available server pools from which to provision the service components. The user then picks the server pools that will best satisfy their business needs.	
The user selects from available server pools, whether they are sourced from private or public clouds, in the same way by choosing entries from the Available Server Pools list. Based on constraints defined in the service template, HP CloudSystem will attempt to provision servers to resource pools in the order established in the Selected Server Pools list.	
The service components are deployed to a private or public cloud based on the service requirements defined in the template. Here, the VM-based Web tier of the application always goes to the HP Cloud Services public cloud. But because the database tier, as defined in this template, cannot be provisioned to the public cloud, it will instead be provisioned to the first private cloud server pool that can accommodate its needs.	
The user can see which services are being run on private, public, or hybrid resources. All services are managed and monitored simultaneously with a single dashboard display.	

Figure 4.
HP CloudSystem provisions servers to private and public cloud resources based on service template requirements.



Behind the scenes

As you've seen, bursting in HP CloudSystem is a straightforward, uniform experience, even though the system is calling on both private and public cloud resources. And behind the scenes, private and public resources are—for the most part—handled consistently, too. In this section, we'll explore why it's necessary for CloudSystem to sometimes treat those resources differently and how these necessary and appropriate differences are managed.

Inventory management

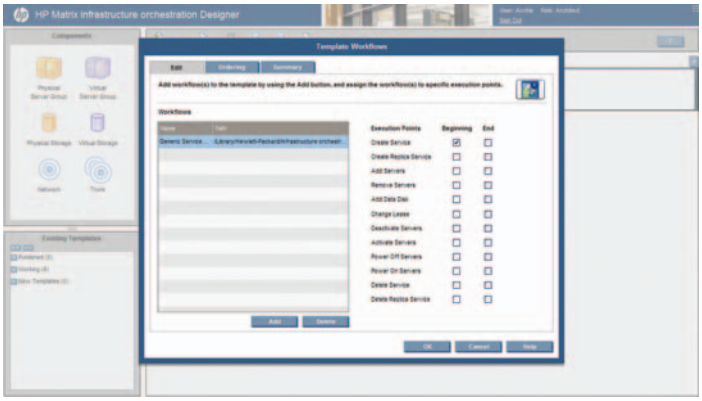
Within HP CloudSystem, private cloud resources are explicitly defined physical and virtual machines, storage, and networking components. However, the system must view public cloud resource pools somewhat differently. In particular, physical resources are not directly accessible or visible as components of a public cloud resource pool. Instead, the public cloud provider exposes only the characteristics of those public cloud resources to HP CloudSystem. Moreover, unlike private cloud resources managed by CloudSystem, most public clouds offer only virtual servers; they may also be more limited in terms of the operating systems they provide. For reasons like these, HP CloudSystem simply treats public cloud resources as virtual resource pools with unlimited capacity.

Allocation policy

CloudSystem uses a simple allocation policy to determine where to provision resources. Moving through the ordered list of server pools selected by the end user, CloudSystem allocates resources from the first server pool that can accommodate the needs of a server group. This allocation step is repeated for each server group described in the service template, and the service can finally be deployed once all server groups have been through the allocation process.

In the service provisioning example illustrated in Figure 4, a two-tiered Web application template (see Figure 3) has been selected by the user, along with both public and private cloud server pools. The Web server tier of the service will use a group of virtual servers, running the Linux® operating system and Oracle WebLogic Application Server software. The database tier of the service will run on a group of physical servers running HP-UX and Oracle Database software. CloudSystem will pass each of these server groups through the allocation process, checking first to see if the server group can be deployed to the public cloud, which is the first server pool on the ordered pool list. In this case, CloudSystem will discover that the virtual resources provided by the public cloud pool can accommodate the Web tier server group, but cannot satisfy the physical server, software image, and networking requirements of the database server group. Therefore, CloudSystem will allocate resources from the public cloud for the Web tier, and will continue to look for an appropriate resource pool for the database server group. CloudSystem will check Private Pool B, the second pool on the ordered pool list, next. Private Pool B does have the resources needed to deploy the database tier of this service, so resources will be allocated for the back-end server group from Private Pool B. Once resources are allocated for both server groups in the service, provisioning will begin.

Figure 5.
Using workflows in HP CloudSystem, service designers can customize the provisioning of private, public, and hybrid cloud services.



Provisioning to a public cloud

On the surface, provisioning is similar for both internal and external resource pools: HP CloudSystem provisions servers, deploys the operating system image, adds data disks, and applies networking to servers and storage as described in the service template. During and after provisioning, the system monitors progress and reports status for all cloud services, regardless of whether they are provisioned using private, public, or hybrid cloud resources. Behind the scenes, however, provisioning to a public cloud provider involves a few extra steps.

CloudSystem passes provisioning calls to public clouds via CloudSystem bursting connectors. Connectors are provider-specific: a connector translates calls from CloudSystem into calls that a particular public cloud understands. Depending on the provider's public cloud implementation, the connector may also implement additional customization needed to enable successful deployment to the public cloud.

Once CloudSystem provisioning calls are received by the public cloud, they are processed by the public cloud. The public cloud service provisions servers and storage, deploys images, and networks service components together in much the same way that CloudSystem provisioning occurs. It uses resources located at the public cloud data center. Sometimes, the software images requested by CloudSystem will be custom images that are not generally supplied as part of the public cloud service offering, but rather created by service designers at the enterprise. These images must be uploaded from the enterprise to the public cloud prior to bursting.

Customizing bursting

HP CloudSystem allows solution designers to extend a service definition with customized workflows (see Figure 5). These workflows can be attached to pre- and post-provisioning actions, and are automatically triggered by CloudSystem as part of the provisioning process. Workflows offer a wealth of possibilities for customizing—for example, besides provisioning virtual servers, the system can be configured to upload data to the provisioned server, or to configure the applications deployed there, as supported by the provider.

Workflows are created and edited in HP Operations Orchestration, the portion of HP CloudSystem that enables users to visually compose workflows to automate tasks and processes in the data center. Workflows are then attached to provisioning events as part of a service design. They become part of a service template and are a key enabler of CloudSystem service customization for both private and public cloud applications.

Preparing to burst to a public cloud

Setting up your environment to support bursting to public clouds is straightforward. You will first need to:

1. Set up an account with your public cloud service provider
2. Activate HP CloudSystem bursting to your public cloud account

Account setup and activation processes may differ from one service provider to another. Contact your HP account representative for details about how to set up and activate bursting accounts with your provider. Once these steps are completed, HP CloudSystem can connect to your service provider's cloud.

Next, prepare your CloudSystem service templates for deployment to your public cloud. This step may involve creating provider-appropriate images for any software that you will want to deploy to the public cloud and uploading those images to the public cloud. Depending on the service provider you are bursting to, you may need to perform additional steps as required to support bursting through that provider's bursting connector. When your images are ready to go, you should be able to provision CloudSystem services to your provider's cloud.

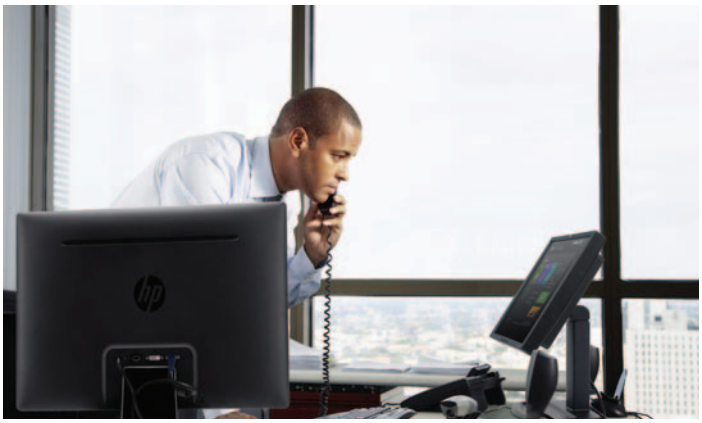
Of course, HP CloudSystem gives you plenty of flexibility when it comes to working with public clouds. Over time, you may want to burst to additional accounts with your service provider, burst to more service providers, or add or modify images that you deploy to public clouds. You can re-implement these preparatory steps at any time to accommodate your changing needs.

Summing up

HP CloudSystem is the most complete and integrated open platform that enables enterprises and service providers to build and manage services across private, public, and hybrid cloud environments. Based on proven, market-leading HP Cloud Service Automation and Converged Infrastructure, HP CloudSystem integrates servers, storage, networking, security, and management to automate the application-to-infrastructure lifecycle for hybrid service delivery management. The result is a complete cloud solution that lets enterprises gain agility and speed, and allows service providers to drive top-line growth. As a part of the HP Converged Cloud architecture, clients have a simplified, integrated architecture that is easier to manage and provides flexibility and portability between private, public, and managed clouds.

And with public cloud usage in the enterprise growing, often bypassing IT with ad hoc, tactical, "under the radar" cloud usage by individuals and departments, you need to make all forms of cloud sourcing—including bursting to private, public, and hybrid clouds—an integral part of your IT strategy.

HP CloudSystem can help. With HP CloudSystem, you can employ bursting in a way that taps both local and public cloud resources and administer bursting from a single management environment. You can control your cloud services across their full lifecycles, and maintain clear governance and control over your public cloud resource use. You can take advantage of a wide range of private, public, and hybrid cloud deployment use cases, and profit from the growing number of CloudAgile bursting partners and service providers. Plus you can do all this while protecting the IT investments you've already made. With bursting, you gain the agility required to respond quickly to business changes, increase the efficiency of your CloudSystem solution, and undertake new market opportunities. Contact HP today for more information on how to begin bursting from HP CloudSystem.



Where to go from here

- For more about HP CloudSystem bursting options, see **hp.com/go/cloudsystem**
- To learn more about local bursting with HP Utility Ready Computing, see **hp.com/go/utilityreadycomputing**
- To learn more about how to become an HP CloudAgile partner, visit **hp.com/go/cloudagile**

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