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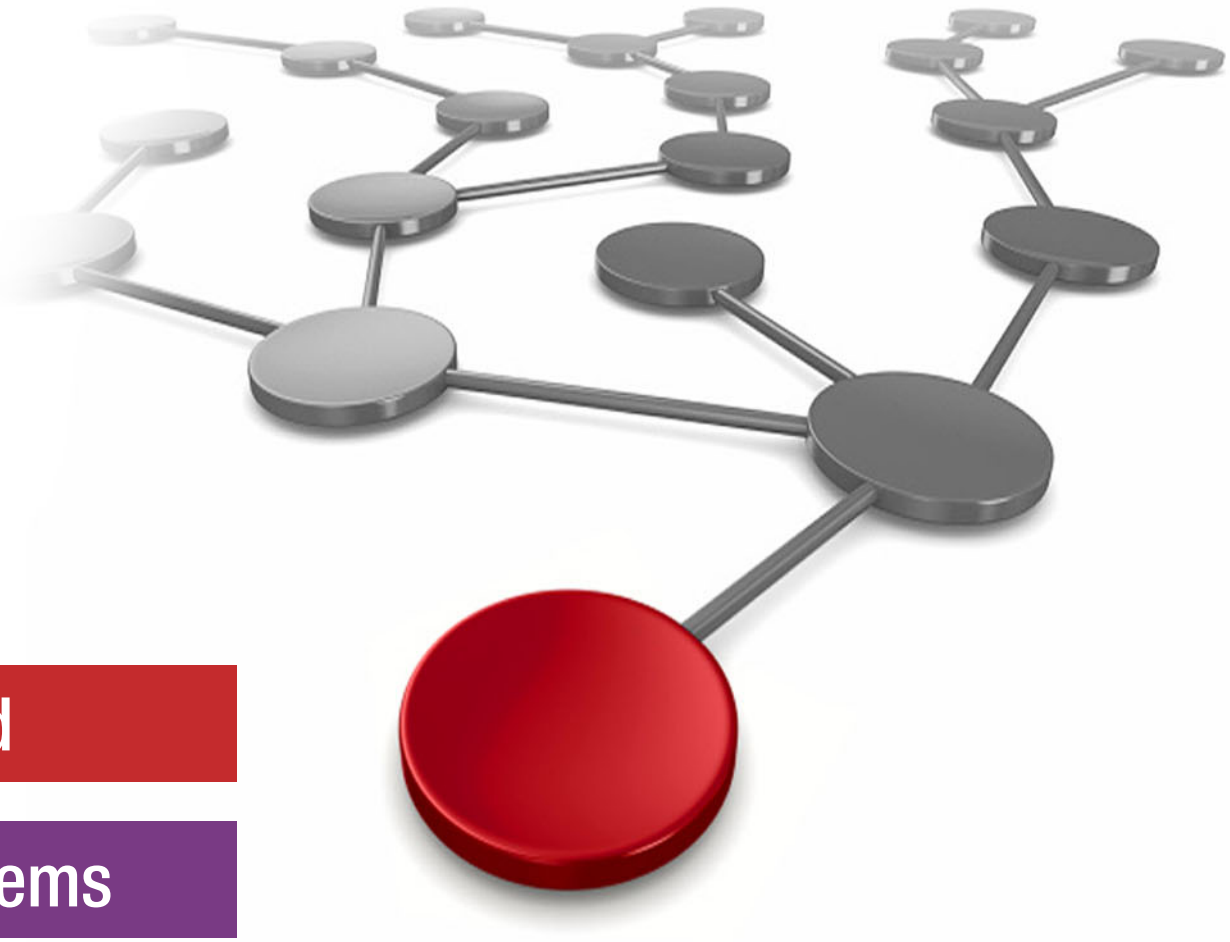
Secure Hybrid Cloud Architecture with the PureApplication Family

Addison Goering



Cloud

PureSystems

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Solution Guide

Secure Hybrid Cloud Architecture with the PureApplication Family

Hybrid cloud is a cloud solution that involves services from any combination of on-premises, off-premises, public, and private services. This IBM® Redbooks® Solution Guide outlines how products in the IBM PureApplication® family, IBM Cloud Orchestrator, and Open technologies can be designed to create a secure hybrid cloud solution, as shown in Figure 1.

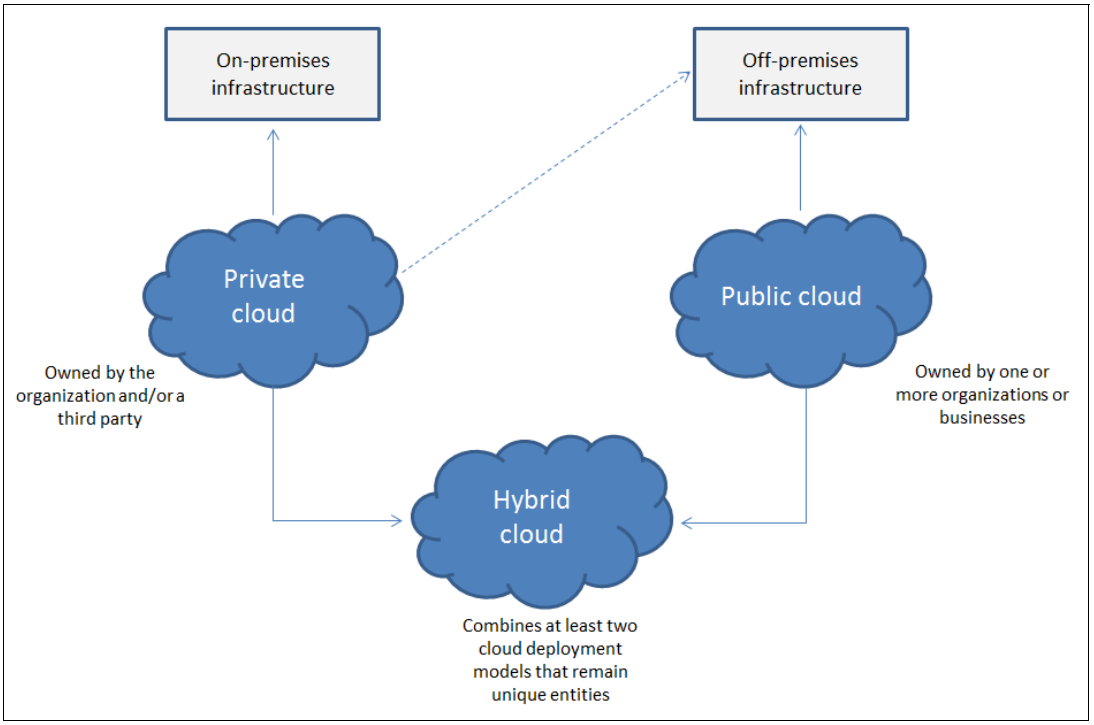

Figure 1 Hybrid cloud deployment models

Did you know?

The IBM PureApplication family includes three products that provide a full approach to building a hybrid cloud solution, as shown in Figure 2.

- IBM PureApplication System
- IBM PureApplication Service
- IBM PureApplication Software

These products can also be integrated with IBM Cloud Orchestrator, IBM Bluemix™, Docker, Chef, and OpenStack.

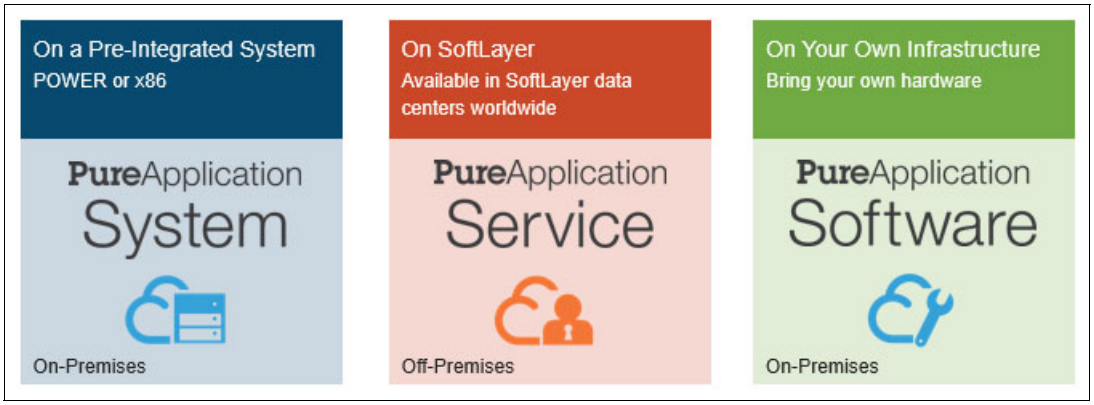

Figure 2 IBM PureApplication System family

Business value

Why move toward hybrid cloud? The reasons vary among enterprises, but several common factors are part of the decision-making process:

- Improve time to market. The need to bring products and services to the consumer quickly is a driver for considering cloud services.
- Tight budgets. Cloud services can often reduce costs while they decrease the level of complexity to service an enterprise's line of business.
- Reduce risk. Cloud providers can offer integrated solutions, such as networking, storage, and operating systems. Therefore, the responsibility for maintenance, security, and so on shifts from the enterprise to the cloud provider.
- Repeatability. Many enterprises want the capability to reproduce an environment for different reasons:
  - Training
  - Troubleshooting
  - Deployment (pre-production) testing

Why move toward hybrid cloud by using products from the IBM PureApplication family? A hybrid cloud might be an option if you are looking for security, isolation, and compliance that are built into your solution. Off-premises solutions, with or without managed services, often include security, isolation (physical or logical), and coordinated help to comply with standards, such as the PCI Data Security Standard (PCI DSS) and the Health Insurance Portability and Accountability Act (HIPAA). The IBM PureApplication family offers these capabilities because of their tight integration or options for tight integration with the underlying hardware and network.

Solution overview

Establishing a hybrid cloud solution is not a trivial undertaking for the enterprise, and it requires a solid strategy. Significant changes are introduced to the enterprise at different levels:

- Infrastructure
- Security
- Application development
- System management

Adopting a hybrid cloud solution typically follows a five-step iterative adoption roadmap, as shown in Figure 3.

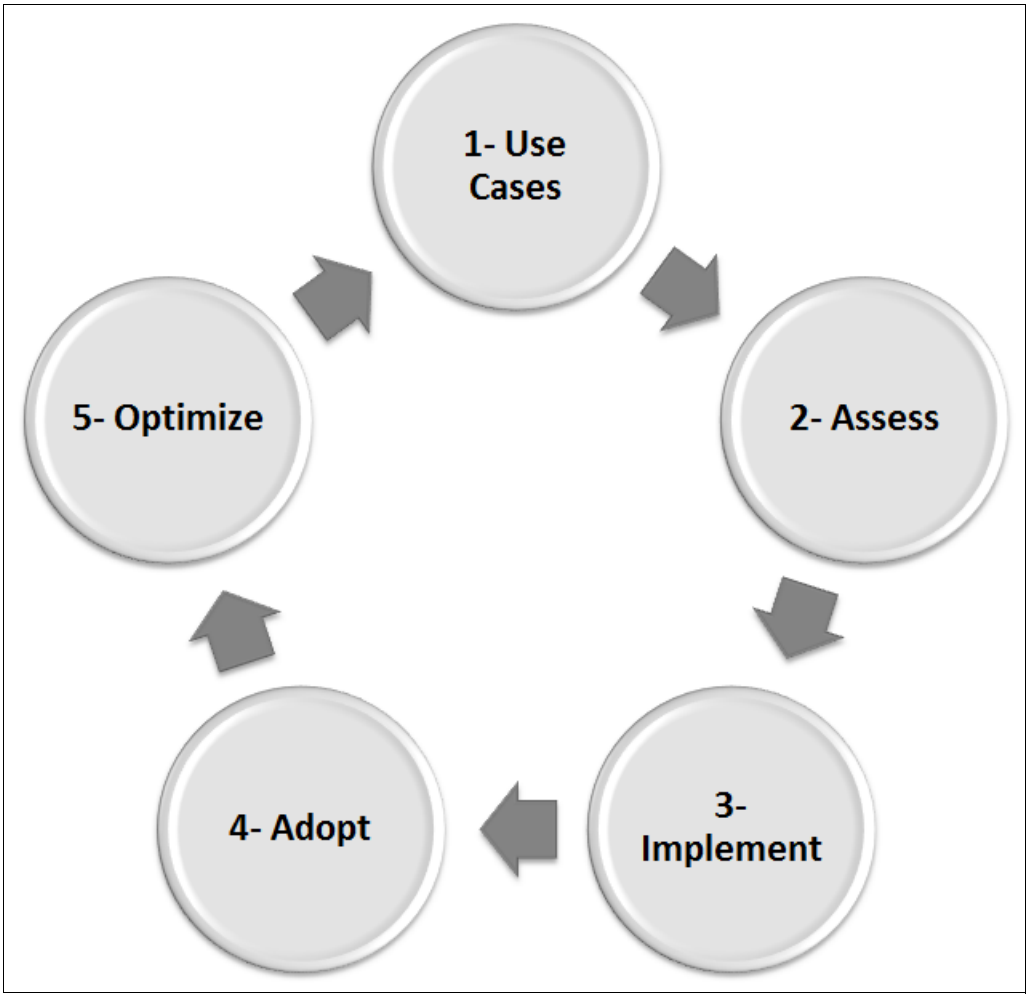

Figure 3 Roadmap to adopt a hybrid cloud

The following steps explain the five-step roadmap to adopt a hybrid cloud:

1. Use cases: From a business perspective, use cases represent business goals. The hybrid cloud is the enabler to implement use cases.
2. Assess: The assessment phase helps the enterprise understand its resources, such as applications and infrastructure.
3. Implement: The implementation phase is far reaching. Consider the software delivery pipeline and how it might be affected. Security is an enormous concern, and it can be grouped by areas of intervention (functional, infrastructure, operational, and physical). Networking is also important because it establishes a bridge between private and public clouds.
4. Adopt: Adopting a cloud computing strategy is not only a technology issue; the change influences the organization, too. Hybrid cloud implementation affects all IT departments. It is crucial to define clear and measurable objectives.
5. Optimize: The roadmap to establishing a hybrid cloud requires an iterative approach that requires a continuous alignment of everyday activities.

Solution architecture

No single, comprehensive architectural solution exists for establishing a secure hybrid cloud. The PureApplication family can provide a hybrid cloud infrastructure. PureApplication System and Software are key building blocks to implementing the on-premises side of a hybrid cloud. All of the offerings of the PureApplication family support the “network access everywhere” condition of being a cloud, and PureApplication Service provides further advantages that are inherent in the IBM SoftLayer® backbone.

The three PureApplication products share a number of core technologies. Patterns and the pattern engine are the primary ways that they achieve application portability in a hybrid cloud scenario. Patterns make it possible to design once and deploy an application everywhere, from PureApplication System to PureApplication Software or Service. The pattern engine provides the technological infrastructure to develop and deploy patterns.

In addition to patterns, all IBM PureApplication products implement shared services, for example, a shared monitoring or caching service. These services can be used by all of the virtual machines that are running in one environment.

IBM Bluemix and IBM Cloud Orchestrator are complementary products that intersect with the IBM PureApplication family. IBM Cloud Orchestrator provides cloud management when the infrastructure is heterogeneous, such as OpenStack platforms and IBM Power. IBM Cloud Orchestrator provides workflow and approval logic. IBM Bluemix is a Platform as a Service (PaaS) that speeds up the delivery of cloud-native applications and is available as either off-premises or on premises.

Figure 4 shows a summary of the integration of the IBM PureApplication family, IBM Cloud Orchestrator, and IBM Bluemix.

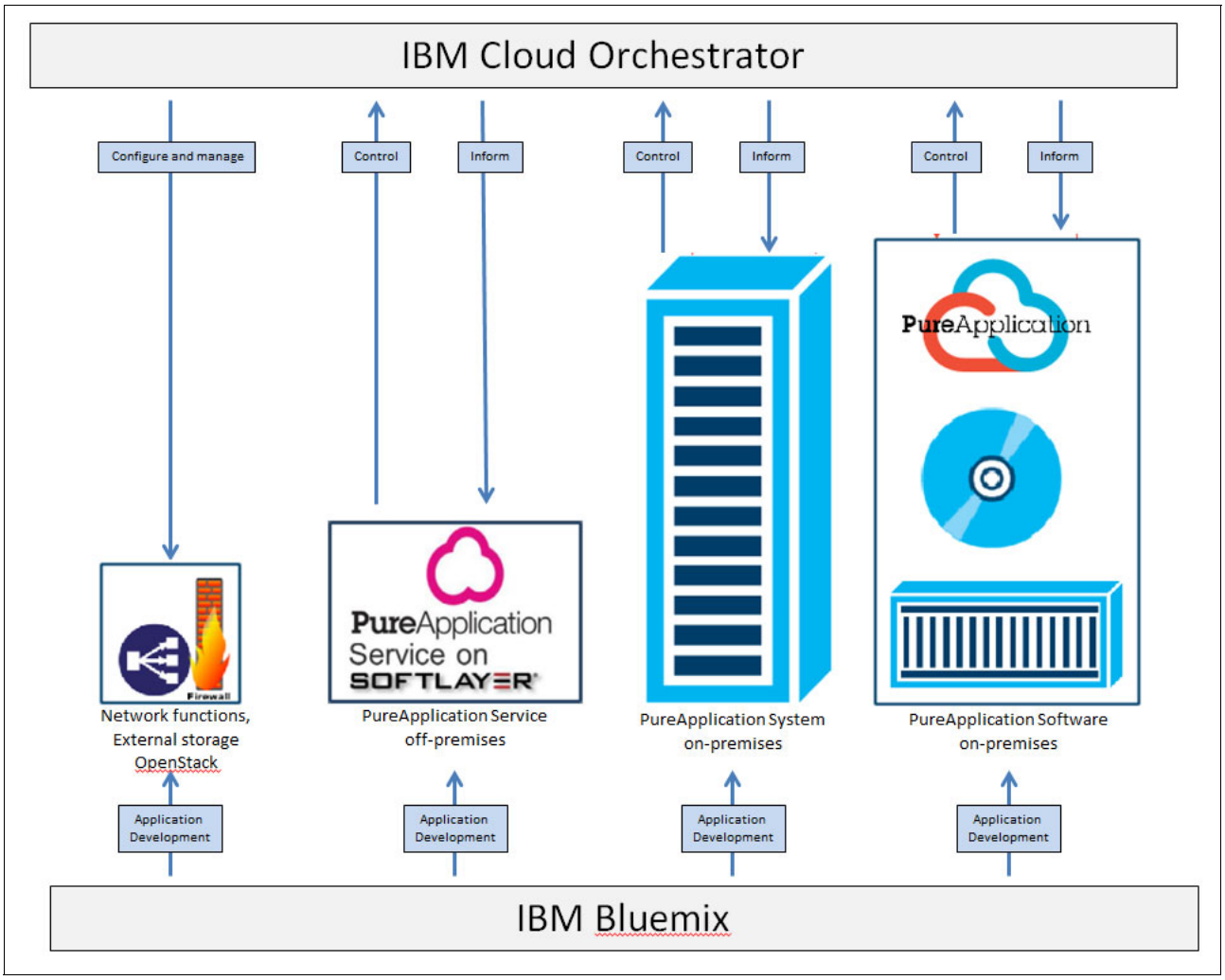

Figure 4 Example of a secure hybrid cloud

Usage scenarios

The reasons for using the hybrid cloud model vary widely among enterprises. Six usage scenarios are described in Chapter 3 of IBM Redbooks publication, *Establishing a Secure Hybrid Cloud with IBM PureApplication family*, SG24-8284, and they are summarized here. The Redbooks publication describes the business value, architecture, and technology that are associated with these usage scenarios.

Scenario 1: Development, testing, and running a pilot on a public cloud, and then moving the application on premises

This scenario describes how a company can support a project that relies on a public cloud service for the development environment. The cloud environment can gradually evolve with additional resources to support testing, eventually leading to a pilot project. The important advantage in this use case is the capability to rapidly destroy and redeploy a development or test environment in identical configurations.

Scenario 2: Front-end application off-premises and back-end application on premises

Developing a business application where the front-end components are off-premises and the back-end services are on premises clearly embodies the essence of the hybrid cloud. In this scenario, a financial services client wants the benefits of cloud, but the client cannot allow data in the cloud. Consider these important points:

- The distance between the on-premises data center and the cloud service provider's data center
- Network bandwidth requirements between the front end and the back end
- Information types that are exchanged between the front end and the back end
- Security requirements for the cloud service provider and the data center on premises
- Communication protocols that are used between the front-end components and the back-end components

Scenario 3: Quick delivery of an application for marketing campaign

This scenario outlines the requirements to develop and deliver an application quickly for a limited time period, with known start and end dates. Examples for this scenario are Black Friday, a once-a-year auction, or a specific time period in which many people need to apply for healthcare.

Provisioning the environment off-premises reduces time, money, and resources. The ability to restore and rebuild previously created environments quickly is an advantage in this type of a scenario.

From an architectural perspective, development and testing are performed on premises. To deploy, the application (web server, database, and application) is ported to the off-premises platform. After the system is no longer needed, the pattern instances are stopped and deleted. At the end of this period, the off-premises compute environment is stopped and returned to the cloud provider or reused for other purposes. Additionally, ordering a temporary increase in capacity for storage or compute power is applicable to this use case.

Scenario 4: An SMB starts small on a public cloud and as it grows, invests on premises

In this scenario, a small and medium business (SMB) enterprise launches the business in the public cloud quickly, moves to a private cloud with IBM PureApplication System for more stability, and eventually brings the entire environment on premises. This scenario relies on the advantages of portability when you use common IBM PureApplication technology to build an off-premises and on-premises cloud.

Important considerations are system management capabilities, such as length of operating system (OS)-level maintenance, middleware maintenance, and environment monitoring.

This scenario builds a solution to deliver the initial requirements while simultaneously offering the flexibility to expand with an evolving cloud environment.

Scenario 5: Starting on premises and going all-in cloud as part of a corporate strategy

In this scenario, the enterprise begins with either no off-premises (cloud) applications or a limited number of off-premises applications and eventually moves all on-premises applications to an off-premises cloud.

The strategy of this scenario is to begin with less critical applications and gradually move business applications off-premises until all applications are moved. This strategy can reduce IT operational costs while it keeps the security of customers in mind.

Consider this scenario for the following reasons:

- Cost concerns to maintain the on-premises hardware
- Training costs to support the infrastructure
- Requirement to remain up-to-date and in the technological vanguard
- Management concerns about moving all workloads at one time to off-premises

Another situation that supports this scenario is when a new enterprise wants to develop solutions for its customers, but it does not have the budget to support an on-premises solution. By using this scenario, the enterprise can build and use cloud-centric applications on premises and deploy them directly to the cloud.

Scenario 6: Primary business on premises and disaster recovery off-premises

In the final scenario, the on-premises components of the hybrid are used for production or production-like setups. The off-premises configuration is reserved solely if a disaster strikes the enterprise's data centers and applications must be moved offsite temporarily.

This scenario is a disaster recovery setup; therefore, it is activated only in a disaster or a major outage at the production sites. This scenario assumes that not all applications can be recovered. The only applications that are moved offsite are the applications that are needed to keep the business running until a complete recovery occurs.

Integration

The key word when you describe a hybrid cloud solution is integration, specifically, the integration of Open technologies and the PureApplication family. The IBM PureApplication family has a continuous strategy to integrate with open technologies, such as Docker and Chef, in environments by using existing middleware assets, applications, and databases. Additionally, the IBM Pattern Engine, which is central to the development and deployment of patterns to IBM PureApplication, supports OpenStack Heat and HOT application programming interface (API).

Docker and PureApplication

The PureApplication family supports the use of Docker containers through patterns in PureApplication System over Intel and Linux platforms and on PureApplication Software and Service on Linux platforms.

With the Docker Pattern type installed and enabled in PureApplication System, Service, and Software, you can use Docker containers as software components of virtual system patterns. Docker images can be referenced that are stored on Docker Hub or in a private Docker registry that runs inside PureApplication System, Service, and Software.

Chef and PureApplication

Chef is open source software that is used for a DevOps solution for infrastructure automation and configuration management so that users can automate the build and configuration of servers. By using Chef, you can configure from a base operating system, start necessary system services, and install and configure middleware and applications.

Chef integrates with PureApplication System, Software, and Service in two situations:

- A Chef server can be used as a central repository to manage chef configuration data, such as cookbooks, policy files, and run-lists.
- A Chef client can retrieve chef configuration data assets from the Chef server and send them to a virtual system pattern. These assets describe how to define, provision, and configure application resources.

OpenStack (Heat and HOT)

The OpenStack Service in PureApplication System enables the deployment of OpenStack workloads that improve portability across multiple cloud platforms. For instance, to move an off-premises workload on premises (PureApplication System) and another cloud provider is involved, the referred workload deployment can be referred into PureApplication System by using HOT templates.

Supported platforms

Table 1 on page 9 through Table 5 on page 10 show the supported platforms for PureApplication System and PureApplication Software.

PureApplication System

PureApplication System is supported on Intel x86, IBM POWER7+™, and IBM POWER® 8 platforms. On these platforms, PureApplication System comes in various configurations.

Table 1 Intel - x86 Mini systems

Model	Compute	Memory per core	Storage
W2500-32m	32 cores	16 GB	2.4 TB solid-state drive (SSD) 24 TB hard disk drive (HDD)
W2500-64m	64 cores	16 GB	2.4 TB SSD 24 TB HDD
W2500-96m	96 cores	16 GB	2.4 TB SSD 24 TB HDD
W2500-128m	128 cores	16 GB	2.4 TB SSD 24 TB HDD

Table 2 Intel - x86 Enterprise systems

Model	Compute	Memory per core	Storage
W2500-32	32 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-64	64 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-96	96 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-128	128 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-160	160 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-192	192 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-224	224 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-320	320 cores	32 GB	6.4 TB SSD 48 TB HDD
W2500-384	384 cores	32 GB	6.4 TB SSD 48 TB HDD

Table 3 IBM POWER7+ Mini systems

Model	Compute	Memory per core	Storage
W2700-32m	32 cores	16 GB	2.4 TB SSD 24 TB HDD
W2700-64m	64 cores	16 GB	2.4 TB SSD 24 TB HDD
W2700-96m	96 cores	16 GB	2.4 TB SSD 24 TB HDD
W2700-128m	128 cores	16 GB	2.4 TB SSD 24 TB HDD

Table 4 IBM POWER7+ Enterprise Systems

Model	Compute	Memory per core	Storage
W2700-32	32 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-64	64 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-96	96 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-128	128 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-160	160 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-192	192 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-224	224 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-320	320 cores	32 GB	6.4 TB SSD 48 TB HDD
W2700-384	384 cores	32 GB	6.4 TB SSD 48 TB HDD

Table 5 IBM POWER 8 Enterprise Systems

Model	Compute	Memory per core	Storage
W3700-40	40 cores	32 GB	6.4 TB SSD 96 TB HDD
W3700-80	40 cores	32 GB	6.4 TB SSD 96 TB HDD
W3700-120	40 cores	32 GB	6.4 TB SSD 96 TB HDD
W3700-160	40 cores	32 GB	6.4 TB SSD 96 TB HDD
W3700-200	40 cores	32 GB	6.4 TB SSD 96 TB HDD

For detailed PureApplication System requirements, see the following IBM Knowledge Center article:

http://www.ibm.com/support/knowledgecenter/SSCR9A_2.1.1/doc/iwd/gsr_prerequs.dita

PureApplication Software

With PureApplication Software, you can bring your own hardware and VMware platform. PureApplication Software can be installed in a virtualized or non-virtualized (bare metal) environment. Table 6 on page 11 provides a list of general requirements.

Table 6 Overview of PureApplication Software requirements

Requirement	Notes
CPU	Minimum of eight cores.
Memory	Minimum 80 GB.
Partitions	Three disks.
Red Hat YUM	Configured YUM repositories Red Hat Enterprise Linux Version 6.6 and extra packages for Enterprise Linux.
RPM packages	Several RPM packages are automatically installed from YUM repositories.
Inbound ports	Several inbound ports are required for inbound traffic.
Ports for internal communication	Several ports are required for communication between components.
Compute nodes	No more than 32.
Networking requirements	

The key component to use PureApplication Software is the virtualization environment. You must configure the virtualization environment before you install PureApplication Software. Table 7 and Table 8 outline the requirements.

Table 7 Installation requirements for PureApplication Software Version x86 Version 2.1.1

PureSystem Manager Red Hat Enterprise Linux version	vCenter version	ESXi version
x86 64-bit Red Hat Enterprise Linux Version 6.6 with the latest updates	vCenter server V5.1U2a or vCenter server V5.5 U2	ESXi V5.1 U2 or ESXi V5.5 U2

For detailed PureApplication Software requirements, see the following IBM Knowledge Center article:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.1/intel/getstart/sysreqs.dita

Table 8 Installation requirements for PureApplication Software Version Power Version 2.1.1

PureSystem Manager Red Hat Enterprise Linux version	PowerVC version	Hardware Management Console (HMC) version	Virtual I/O Server (VIOS) version
x86 64-bit Red Hat Enterprise Linux Version 6.6 with the latest updates	PowerVC V1.2.3.2	HMC V8R8 3.0.1 (Release 8.3.0 Service Pack 1) with the latest fixes, specifically, program temporary fix (PTF) MH01565	VIOS V2.2.3.52

For detailed PureApplication Software requirements, see the following IBM Knowledge Center article:

http://www.ibm.com/support/knowledgecenter/SSL5ES_2.1.1/power/getstart/sysreqs.dita

PureApplication Service

Table 9 lists the available infrastructure options on PureApplication Service.

Table 9 Available infrastructure options on PureApplication Service

	eSeries (e24)	mSeries (m128)	sSeries (s256)
Processor	Single processor quad core Xeon 3450	Single processor octo core Xeon 2670	Single processor octo core Xeon 2670
Processor speed	2.66 GHz	2.60 GHz	2.60 GHz
Processor cache	8 MB	20 MB	20 MB
Cores	Four cores	Eight cores	16 cores
Processor value units (PVUs)	280 PVUs (4 x 70 PVU)	560 PVUs (8 x 70 PVU)	1120 PVUs (16 x 70 PVU)
Memory type	Dynamic device reconfiguration 3 (DDR3) registered 1333	DDR3 registered 1333	DDR3 registered 1333
Memory amount	24 GB	128 GB	256 GB
Public bandwidth	Unlimited bandwidth	Unlimited bandwidth	Unlimited bandwidth
Uplink port speed	1 Gbps Private 1 Gbps Public	2 Gbps Private 2 Gbps Public	2 Gbps Private 2 Gbps Public
Storage type	HDD storage area network (SAN) Internet Small Computer System Interface (iSCSI)	HDD SAN (iSCSI)	HDD SAN (iSCSI)
Storage amount	1 TB	1 TB	1 TB
Storage redundancy	RAID 50	RAID 50	RAID 50

Ordering information

These products are only available through IBM Passport Advantage®. For more information, contact your PureApplication marketing representative or organizational Passport Advantage representative.

PureApplication System

Table 10 shows the ordering information for PureApplication System.

Table 10 PureApplication System ordering part numbers and feature codes

Program name	PID number	Charge unit description
PureApplication System W2500	5725-Q93	Per appliance installation
PureApplication System W2700	5725-Q94	Per appliance installation

PureApplication Software

Table 11 shows the Ordering information for PureApplication Software.

Table 11 PureApplication Software ordering part number and feature code

Program name	PID number	Charge unit description
PureApplication Software	5725-Q52	For 12-month software subscription

IBM PureApplication Service

IBM PureApplication Service is priced based on your requirements. For ordering information, see the following website:

http://www.ibm.com/ibm/puresystems/us/en/hybrid-cloud/buyit.html

IBM Bluemix

IBM Bluemix is priced based on two models: Instant Runtimes and Containers. Instant Runtimes are priced based on language, memory, instances, users, and HTTP requests. Containers are priced based on container memory, IP addresses, and storage. For pricing and ordering information for IBM Bluemix, see this website:

https://console.ng.bluemix.net/pricing/

IBM Cloud Orchestrator

For an IBM Cloud Orchestrator demonstration and purchasing information, see this website:

https://www.ibmserviceengage.com/cloud-orchestration/buy

Related information

For more information, see the following documents:

- IBM PureApplication family

  http://www.ibm.com/ibm/puresystems/uk/en/pf_pureapplication.html

- IBM Offering Information page (to search on announcement letters and sales manuals)

  http://www.ibm.com/common/ssi/index.wss?request_locale=en

  On this page, enter `PureApplication`, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

- IBM Redbooks publication, *Establishing a Secure Hybrid Cloud with IBM PureApplication family*, SG24-8284

  http://www.redbooks.ibm.com/abstracts/sg248284.html

- Integrating Docker and PureApplication System

  http://www.ibm.com/support/knowledgecenter/SSNLXH_2.1.1/doc/iwd/pac_docker_ov.dita

- Integrating Docker and PureApplication Software

  http://ibm.co/1jDbzL9

- Integrating Docker and PureApplication Service

  https://www.ibm.com/support/knowledgecenter/SSNS6R_2.1.1/doc/topics/pac_docker_ov.dita?lang=en

- Integrating Chef and PureApplication System

  http://www.ibm.com/support/knowledgecenter/SSNLXH_2.1.1/doc/iwd/pac_chef_ov.dita
- Integrating Chef and PureApplication Software

  http://ibm.co/1ItjJkU
- Integrating Chef and PureApplication Service

  https://www.ibm.com/support/knowledgecenter/SSNS6R_2.1.1/doc/topics/pac_chef_ov.dita?lang=en
- Configuring Open Stack services and deploying HOT templates into PureApplication System

  https://www.ibm.com/support/knowledgecenter/SSCRSX_2.1.1/doc/systemconsole/t_configopenstack.dita
- IBM Cloud Orchestrator wiki

  https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20SmartCloud%20Orchestrator/page/Welcome
- IBM Bluemix

  http://www.ibm.com/cloud-computing/bluemix/index-b.html
- IBM Bluemix on local

  http://www.ibm.com/cloud-computing/bluemix/hybrid/local/

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This Solution Guide was produced at the International Technical Support Organization, Raleigh Center.

Addison Goering is a Certified IT Specialist with the WebSphere® Education team. His main specialty is the design, development, and delivery of courses in the WebSphere product family. He developed and delivered courses that range from webinars to week-long workshops on products, such as WebSphere Enterprise Service Bus (ESB), IBM Workload Deployer, WebSphere Application Server, WebSphere Business Services Fabric, and WebSphere Business Process Management (BPM). He is the lead developer on the WebSphere Education team that is developing education for IBM PureApplication System. Addison holds a B.S. in Education from Keene State College in New Hampshire, mainframe certification from DePaul University in Chicago, and several certifications from IBM.

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