

Smarter Computing:
What's Next. Ready Now.

Private Cloud On Pure Systems

Smarter Computing Briefing 2013



IBM PureSystems - A Family Of Expert Integrated Systems For Building A Private Cloud

- Built-in expertise to address complex business and operational tasks automatically
- Integration by design to accelerate system setup and application management
- Simplified experience from purchase to maintenance

PureFlex System

- Pre-integrated and optimized infrastructure
- Management integration across compute, storage and networking – both physical and virtual
- No compromise design with system level upgradeability
- Designed for cloud with flexibility and simplicity



PureApplication System

- Optimized for performance and virtualized for efficiency
- Designed for transactional web applications and enabled for cloud
- Application-aware workload management



Go Beyond Blades With IBM Flex System

Building Blocks: IBM Flex System components

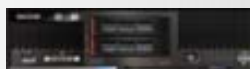
Chassis

14 half-wide
bays for nodes



Compute Nodes

Power 2S/4S
x86 2S/4S



Storage Node

V7000 (optional)



Management Appliance (Optional)



Networking

10/40GbE, FCoE,
IB 8/16Gb FC



Expansion

PCIe, Storage



Build to Order
(Choice of Compute Node, Storage
and Networking)

Flex System



- Flexible choice
- Integrated design
- Pre-assembled hardware
- On-site set up services

Combine Blade Flexibility And Patterns Of Expertise With IBM PureFlex System

Built with Choice of Compute Nodes,
Storage and Networking

Flex System



**Custom Built (wide
choice of components)**

Pre-configured PureFlex System



- Factory integrated and pre-configured
- Built-in Patterns of Expertise (Infrastructure Patterns)
- Faster deployment and lower cost
- Includes cloud management

**Express, Standard and
Enterprise Configurations**

Flex And PureFlex System Provides A Choice Of Compute Nodes And Operating Systems

IBM POWER7

8 cores per socket
4 threads per core

p260
p24L



2-socket
16 cores
64 threads

New p260+
based on Power7+
announced 11/13/12

p460



4-socket
32 cores
128 threads



Intel Sandy Bridge EP/EN

8 cores per socket
2 threads per core

x220
x240



2-socket
16 cores
32 threads

x440



4-socket
32 cores
64 threads



Linux = Both SUSE and RHEL

PureFlex System Offers Flexibility And Customer Choice



**IBM
PureFlex™
System**

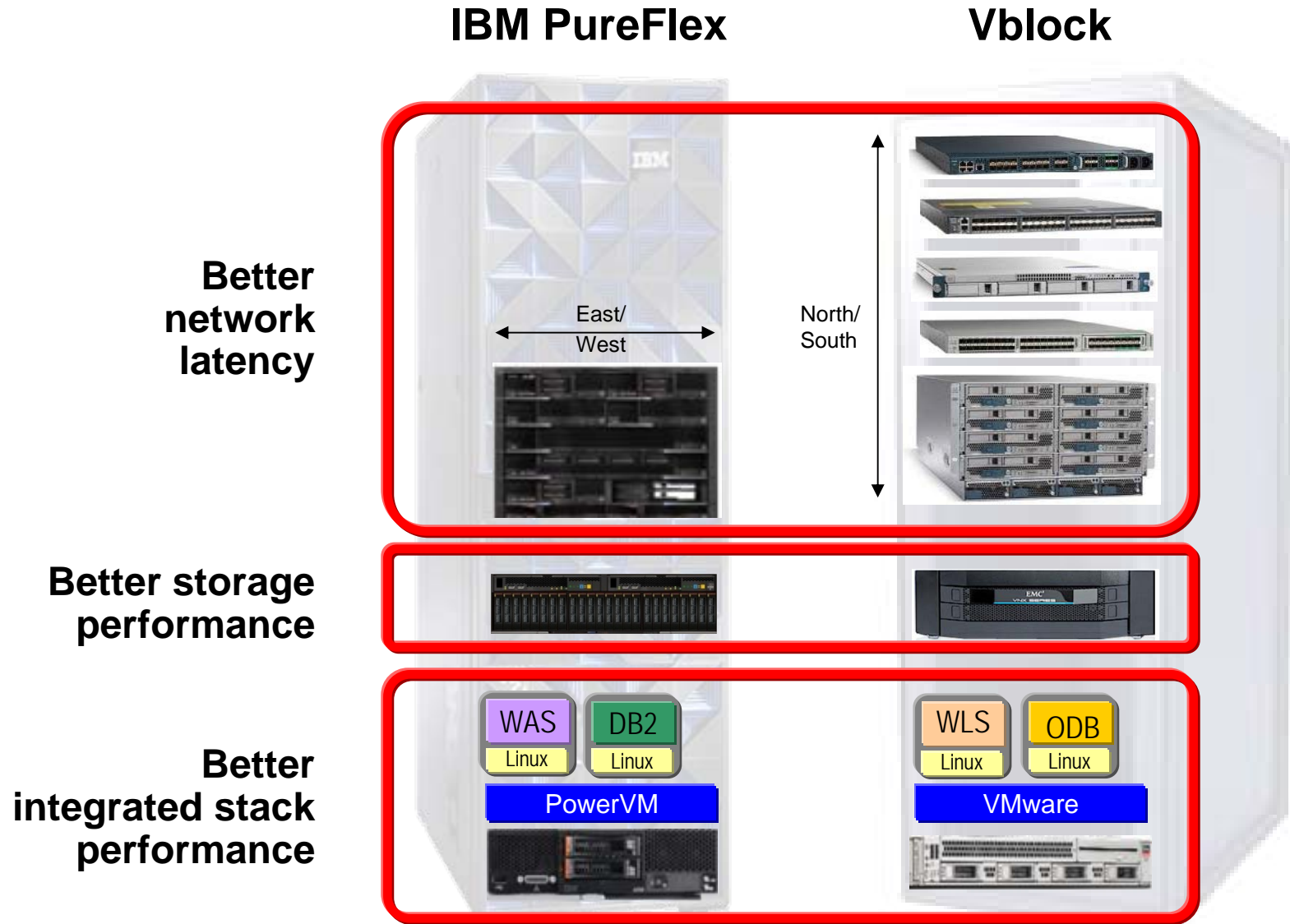


**VCE
Vblock**

	IBM PureFlex™ System	VCE Vblock
Compute Nodes	X86 (Sandy Bridge) or POWER	X86 Westmere EP/EX or Sandy Bridge
Network Protocols Node to Node	1GbE/10GbE, IB, 8/16 Gb FC, FCoE Intra-Chassis communication	No Infiniband, No 16Gb FC Top of rack switch only
Storage	Ability to integrate and virtualize external storage	Vblock storage only
Workload support	Native and virtualized	Virtualized with restricted native support
Hypervisor support	VMware, KVM, Hyper-V, PowerVM	VMware only
Cloud Management	IBM Smart Cloud Entry pre-loaded	vCloud Suite separate purchase and install
Acquisition options	Build to order or Pre-defined starter configurations (Express/Standard/Enterprise)	Built-to-order
Upgrade options	Flexible upgrades across compute nodes, networking, storage	Fixed upgrade increments

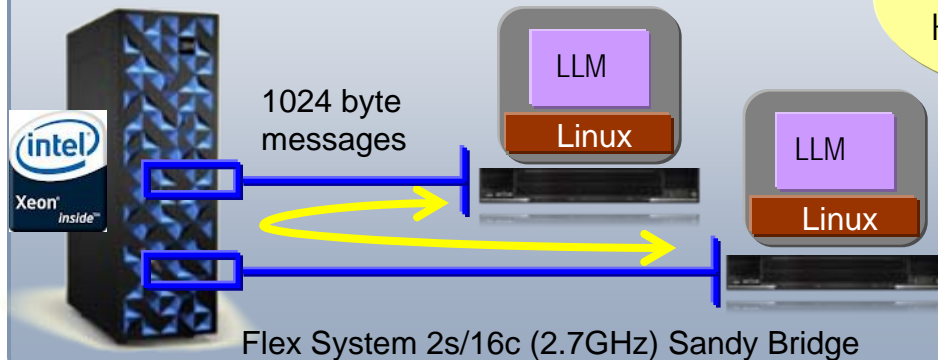
Competitor choices are based on published configurations

IBM PureFlex Offers Superior Performance Across A Variety Of Cloud Workloads



PureFlex Networking Intra-Chassis Network Fabric Is Better

PureFlex System (Intel)



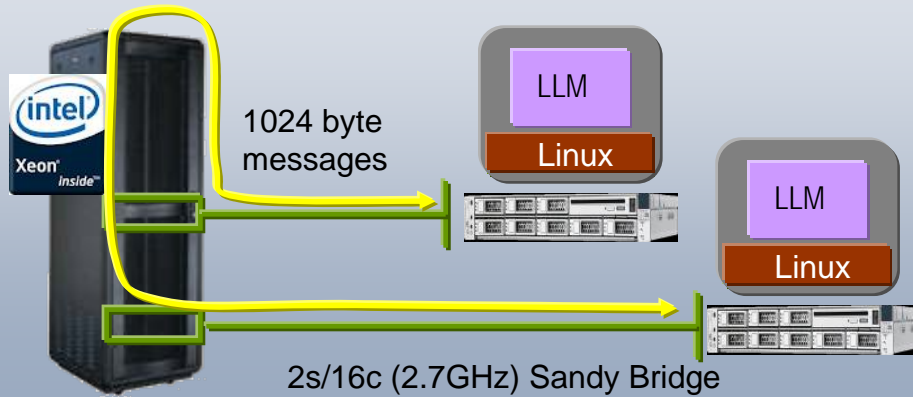
2.3X
Higher Throughput

27.5 Microseconds
latency per
message

9.4 Microseconds
latency due to
network

18,803 Messages per
second

Coalition Competitor (Intel)



63.0 Microseconds
latency per
message

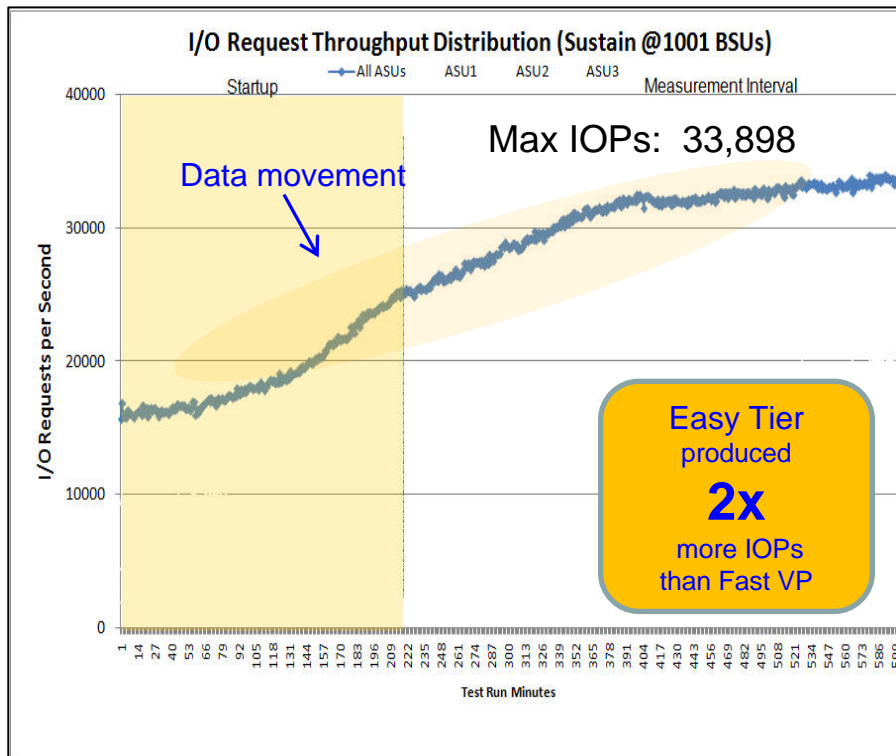
40.0 Microseconds
latency due to
network

7,920 Messages per
second

This is an IBM internal study of IBM PureFlex System solution designed to replicate a typical IBM customer workload usage in the marketplace. The results were obtained under laboratory conditions, and not in an actual customer environment. IBM's internal workload studies are not benchmark applications, nor are they based on any benchmark standard. As such, customer applications, differences in the stack deployed, and other systems variations or testing conditions may produce different results and may vary based on actual configuration, applications, specific queries and other variables in a production environment. Prices, where applicable, are based on published US list prices for both IBM and competitor, and the cost calculation compares the cost per request for the 3yr life of the machine. 3 year total cost of acquisition comparisons are based on similar expected hardware, software, service & support offerings

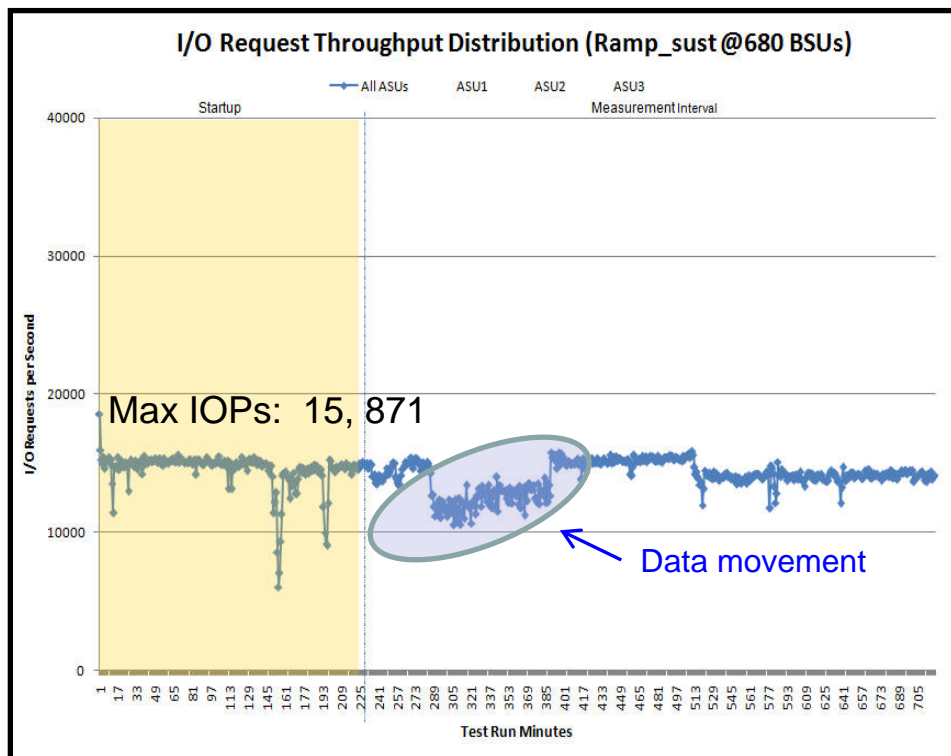
PureFlex Delivers More IOPS With Minimal Performance Impact

PureFlex on Intel – Storwize V7000 with Easy Tier (Native)



- Final sustained IOPS of: 33,898
- As Easy Tier learned the workload, performance increased and was sustained
- Storage use – 6 vdisks (4 x 1.86TB, 2 x 800 GB)

Vblock – VNX 5300 with FAST (Native)



- Final sustained IOPS of: 15,871
- VNX/ Vblock shows a loss in performance as data movement commences
- Storage use – 6 vdisks (4 x 1.86TB, 2 x 800 GB)

And I/O Intensive Database Workloads Demonstrate PureFlex Storage Performance Advantage

PureFlex System (Intel)

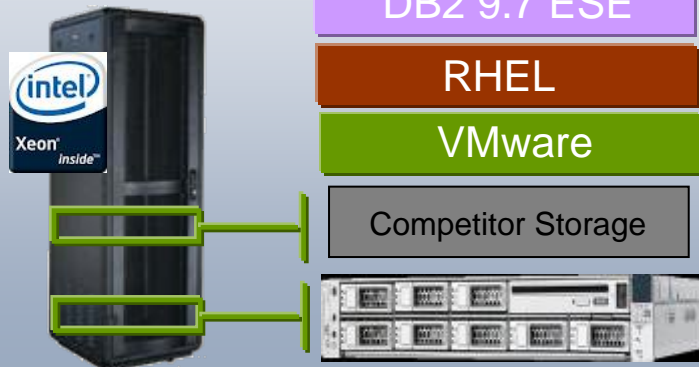


3.3x More throughput
71% Lower cost per tps

2913 Transactions per second

\$385 Per transaction per second

Coalition Competitor



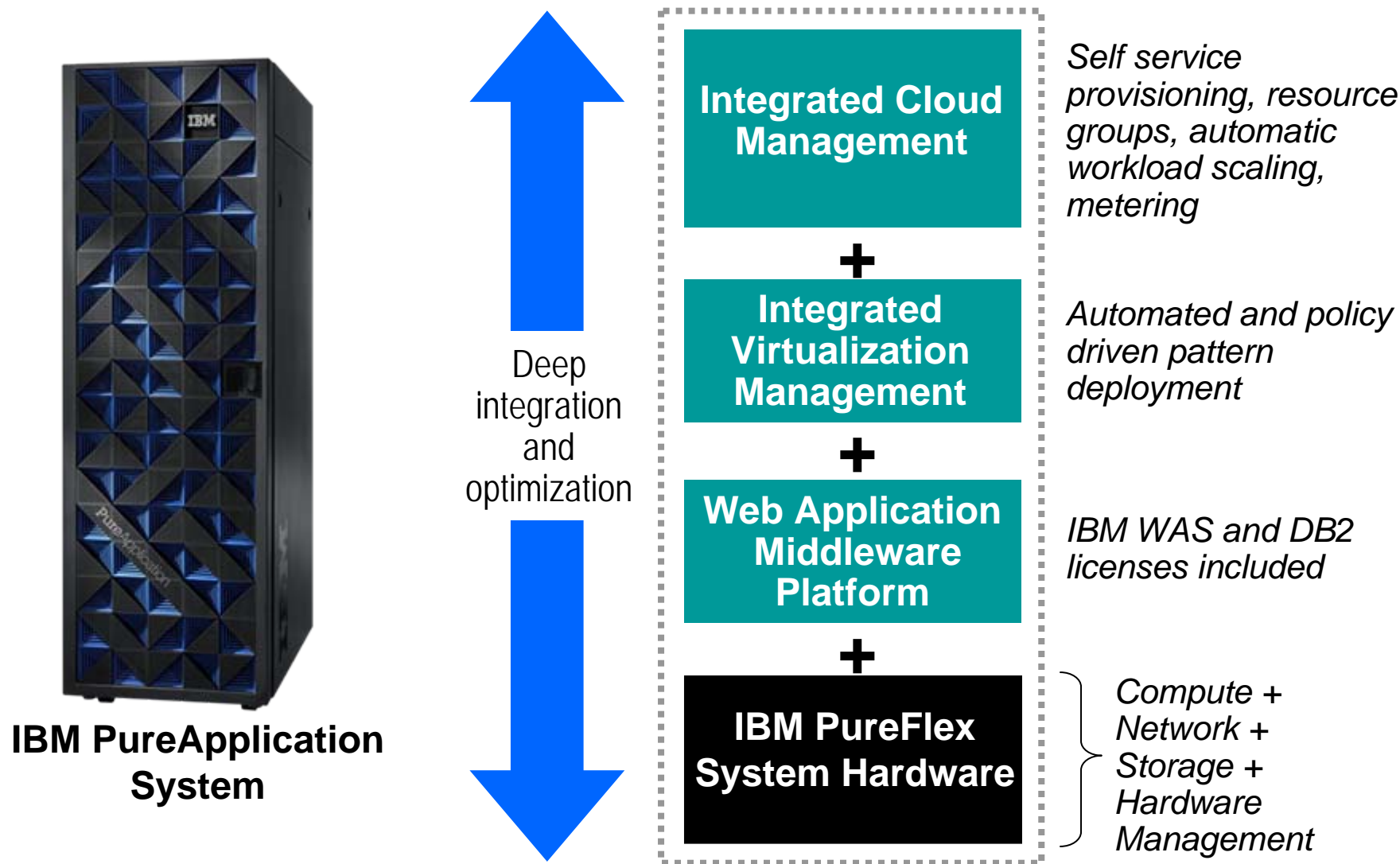
2s/16 (2.70 GHz)
Sandy Bridge

893 Transactions per second

\$1,345 Per transaction per second


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IBM PureApplication System - *Optimized For Speed, Simplification, And Less Customer Labor*



Procure And Design Process Is Simple Resulting In Faster Set Up Times

PureApplication



IBM Team
+ Customer


<4 hours

- Single Part Number
- Pre-integrated, pre-tested, ready to run

Includes (at no additional cost):

- ✓ Hardware set-up and configuration
- ✓ Software set-up and configuration
- ✓ First workload deployment

Vblock 300 EX



Partner HW Engineers

Hardware Set-Up and Configuration
(6 days*)

Partner SW Engineers

Software Set-Up and Configuration
(5 days*)

Customer

First Workload Deployment
(1 day*)

+

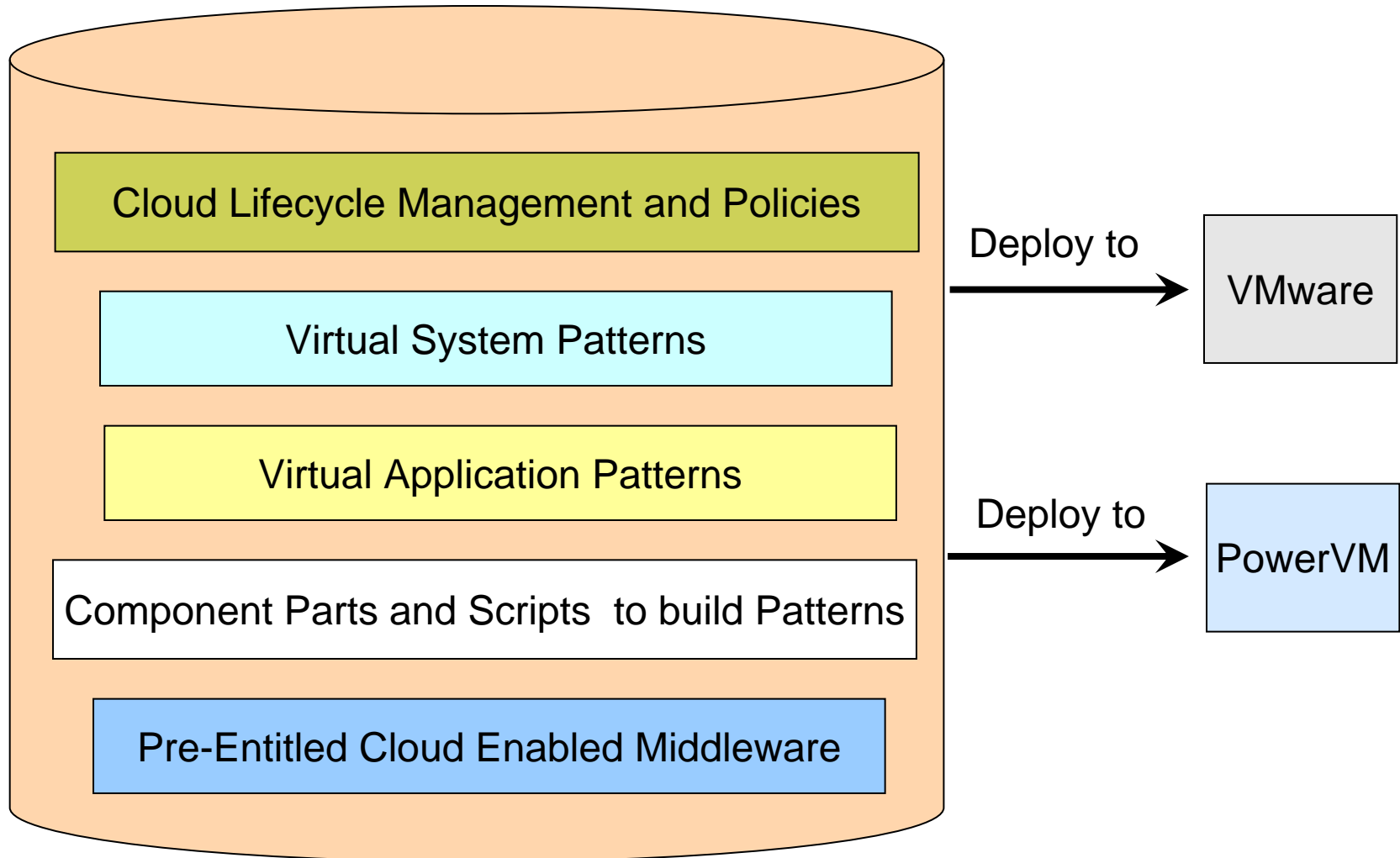
Partner SW Engineer

Cloud Set-Up and Configuration¹
(5 days*)

17 days*

Team of 7 VCE partner experts do this work

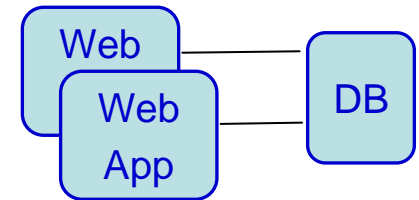
Labor Savings - PureApplication System Comes With Expertise



Building A Production Environment Can Be A Time Consuming Laborious Process

Typical Manual Process Steps – Small Cluster of Two Application Servers and DB

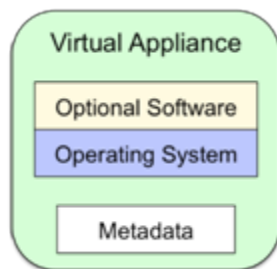
1. Install Operating System with fixes and test
2. Install Application Servers and required fixes and test
3. Configure the HTTP server and security settings
4. Configure HTTP servers for high availability
5. Create an application cluster with session replication to support failover
6. Install a database and required fixes and test
7. Install the DB schema and populate the DB
8. Configure DB for high availability (cluster)
9. Connect the Application Server with the DB with JDBC drivers and test
10. Deploy the application to the cluster and test
11. Set up the access rights for the cluster, log files and test
12. Final test and performance tuning



This process can easily take 15 hours or more *

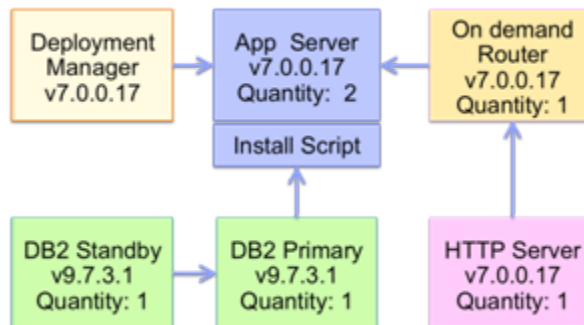
Automated deployment of patterns automates these steps

PureApplication Has Faster Deployment With Built-In Expertise For Multiple Workload Pattern Types



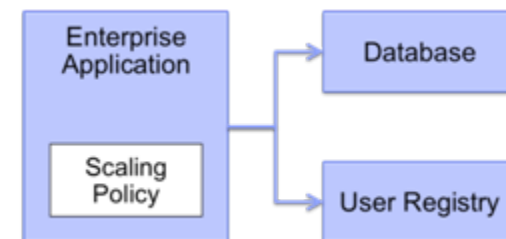
Virtual Appliance

- Standard software installation and configuration on OS
- Images created through extend/capture
- Traditional administration and management model
- Single server



Virtual System

- Flexibility and control over the middleware topology
- Script packages and administrator customizations
- Topology awareness
- Administrator driven scaling
- Multi-server



Virtual Application

- Client describes application and IBM creates the topology for the deployed application
- Application awareness
- Policy-driven scaling
- Multi-server

Configuration flexibility
High skill level required
More labor

Easiest to use
Lower skill level required
Administrator productivity

Complete Solution Based Patterns Of Expertise That Are Available On PureApplication System

Web and SOA Applications

- * **IBM Web Application Pattern**
- * **IBM WebSphere Application Server Hypervisor Edition** for RHEL
- **IBM Web Experience Patterns for WebSphere Portal Server** for Red Hat Enterprise Linux
- **IBM Web Experience Patterns for Web Content Manager** for Red Hat Enterprise Linux
- **IBM SOA Policy Pattern**
- **IBM SOA Policy Gateway Pattern** for Red Hat

Connecting Your World

- **IBM Connections Hypervisor Edition**
- **IBM WebSphere Message Broker Hypervisor Edition** for Red Hat Enterprise Linux Server
- **WebSphere MQ Hypervisor Edition V7.5** for Red Hat Enterprise Linux
- **IBM Messaging Extension** for Web Application Pattern
- **IBM WebSphere Transformation Extender with Launcher Hypervisor Edition**
- **IBM PureApplication System virtual application for SAP CRM**

Processes and Decisions

- **IBM BPM Pattern** (Process Center Hypervisor Edition on RHEL)
- **IBM BPM Pattern** (Process Server Hypervisor Edition on RHEL)
- **IBM Operational Decision Manager Pattern** (Decision Center Hypervisor Edition on RHEL)
- **IBM Operational Decision Manager Pattern** (Decision Server Hypervisor Edition on RHEL)

Business Intelligence and Analytics

- **IBM Business Intelligence Pattern (Cognos)**
- **IBM InfoSphere Information Server** for production
- **IBM InfoSphere Information Server** for non production environments

Data and Transactions

- * **IBM DB2 Enterprise Server Edition**
- * **IBM Transactional Database Pattern**
- * **IBM Data Mart Pattern**
- **IBM Informix Hypervisor Edition**

* **Pre-loaded in PureApplication catalog and entitled for full capacity of system**

Pre-Built Patterns Available From IBM And A Broad Ecosystem of Partners

Over **191** optimized solutions
from **170** leading ISV partners

PureSystems Centre is the gateway to IBM
and certified partner expertise

ibm.com/puresystems/centre

- **developerWorks** enables the developer ecosystem

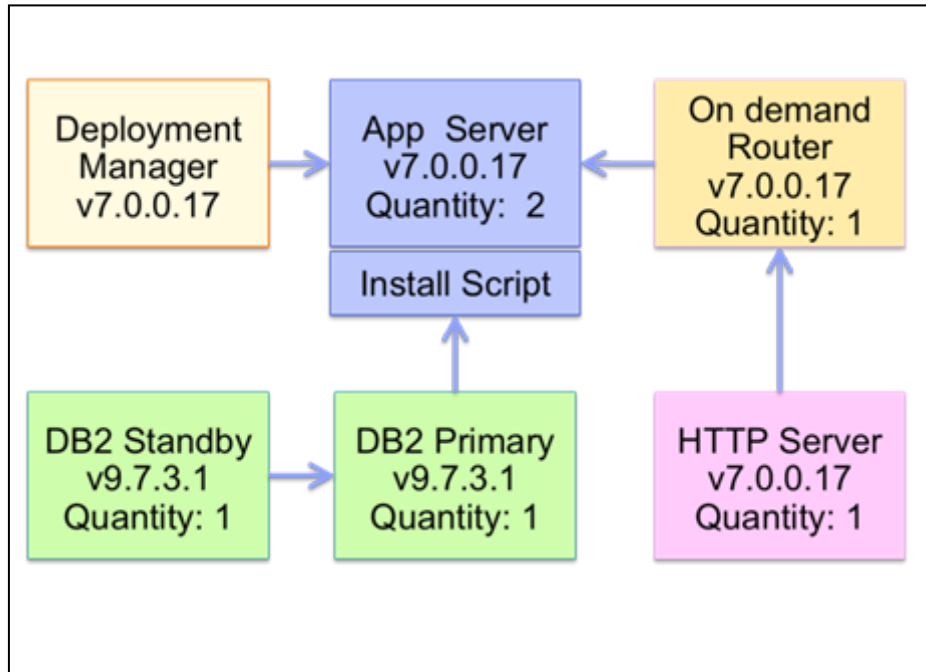
ibm.com/developerworks/puresystems



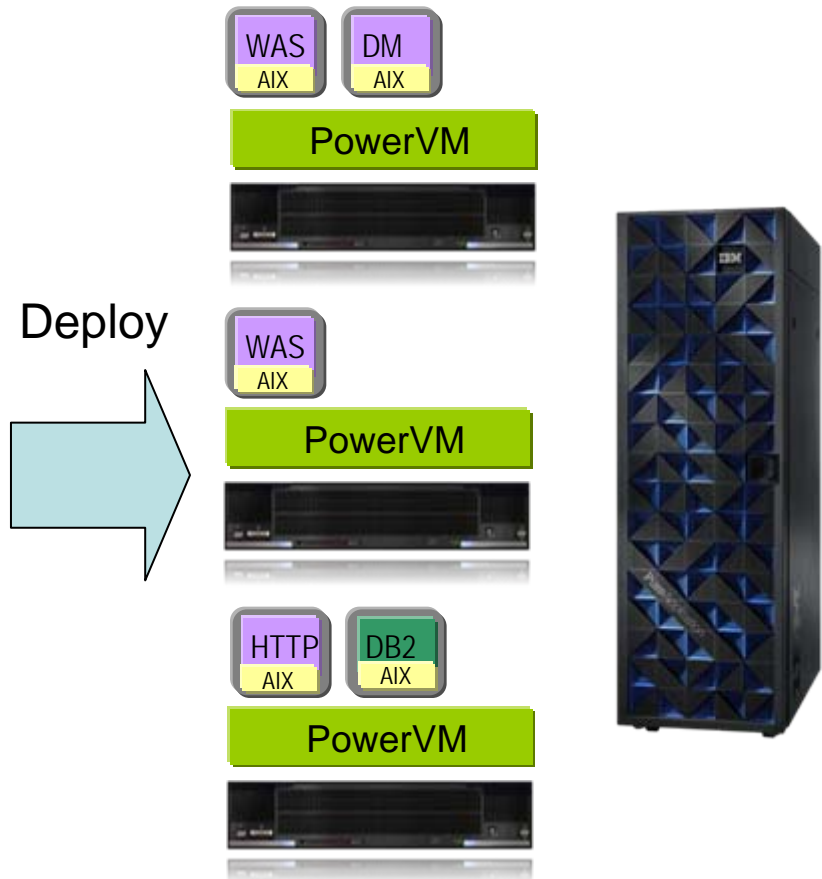
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Virtual System Patterns Speed Up Workload Deployment

Select Virtual System Pattern



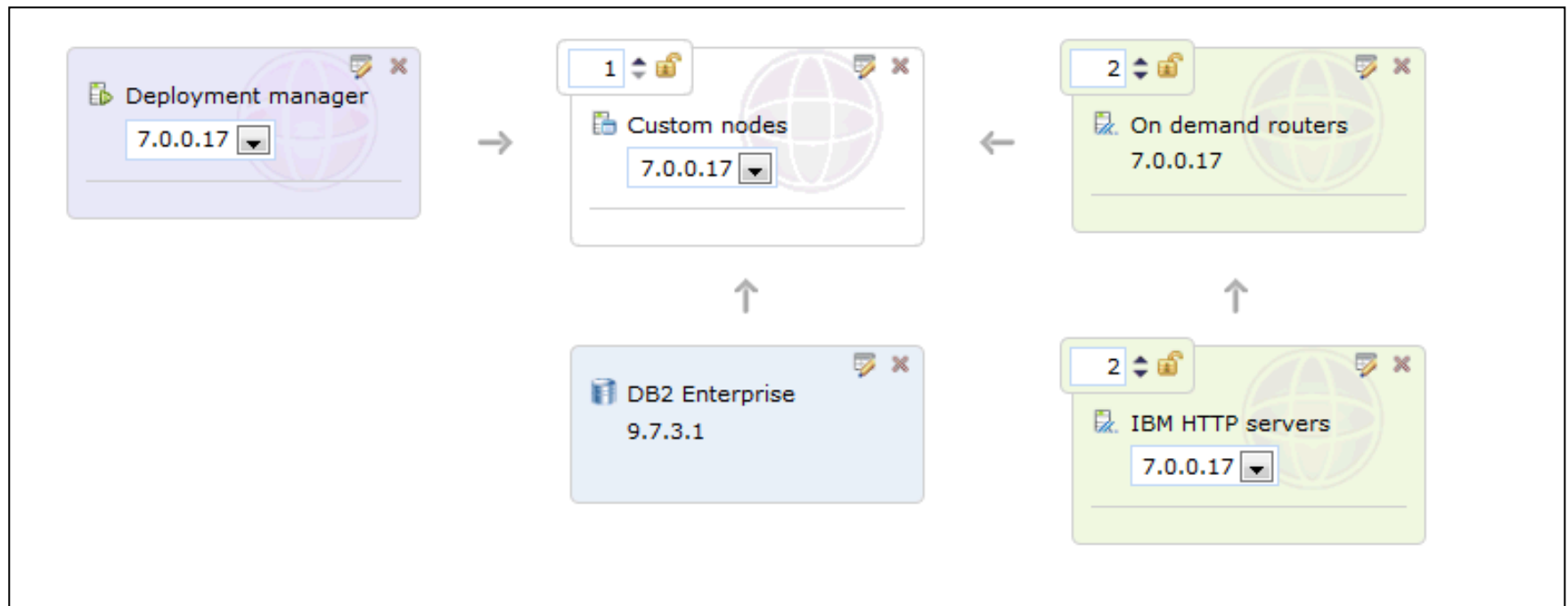
Describes virtual machines,
network connections, software
stacks and configurations



PureApplication Manager
deploys virtual machine images

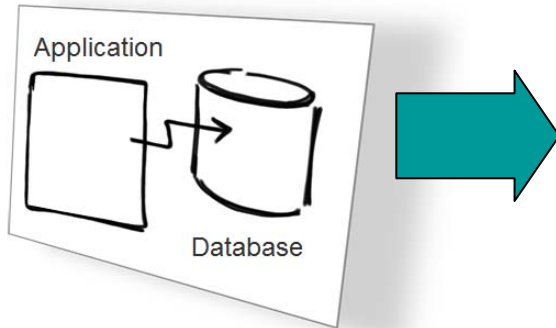
DEMO: Using PureApplication Virtual System Patterns To Build And Deploy A Web Application

- A full production Web Application is quickly built by dragging and dropping components on to the pattern editor
- A Virtual System pattern is created and deployed



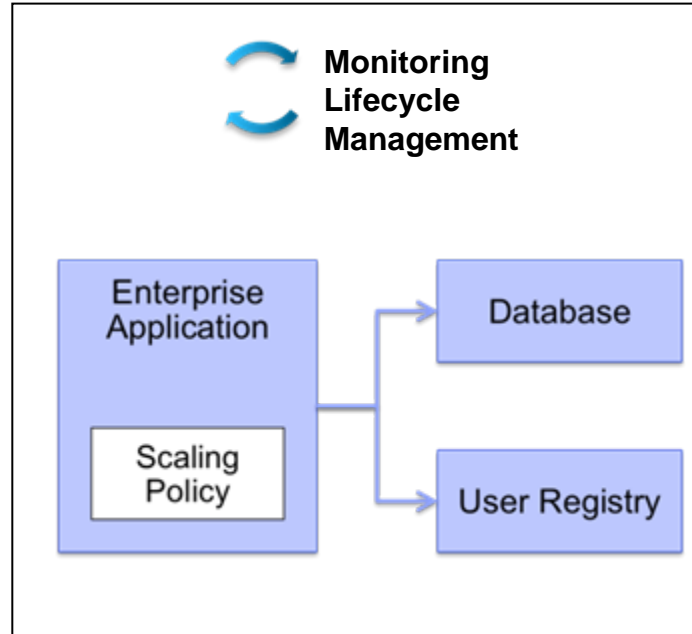
Virtual Application Patterns Further Simplify Deployment

What the business wants...



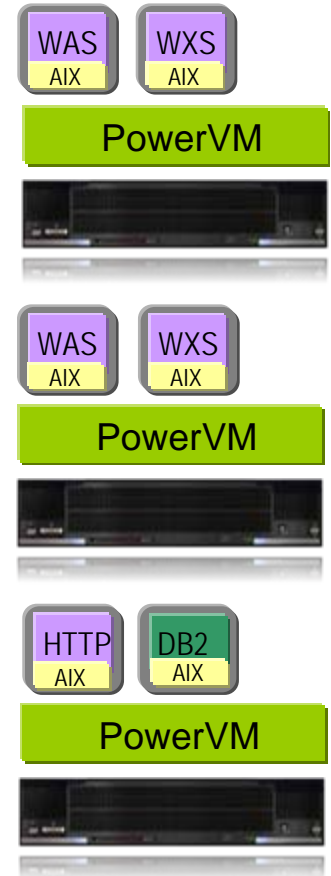
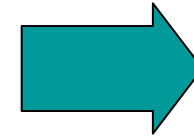
Virtual Application Pattern

Just provide application code, DDL, and specify policies



PureApplication Manager constructs and deploys this pattern

Deploy



Incident And Capacity Management In Action - Elasticity With Service Policies

Create **Policies** That Provide Guaranteed Highest Quality Of Service

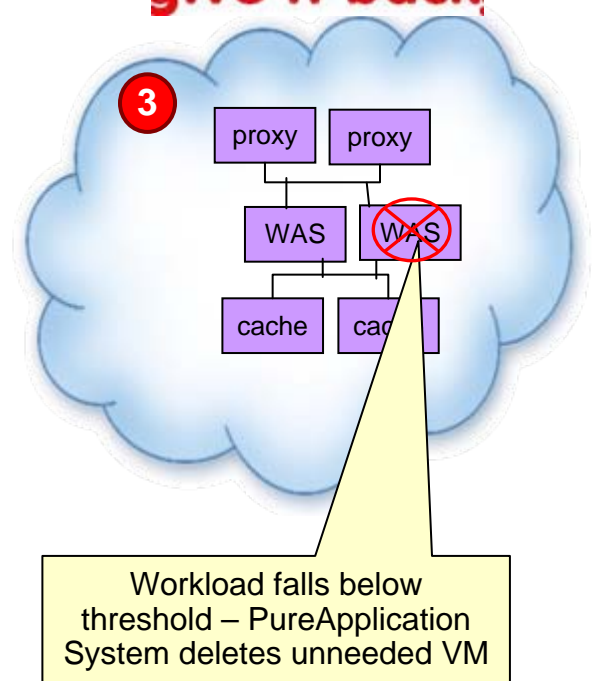
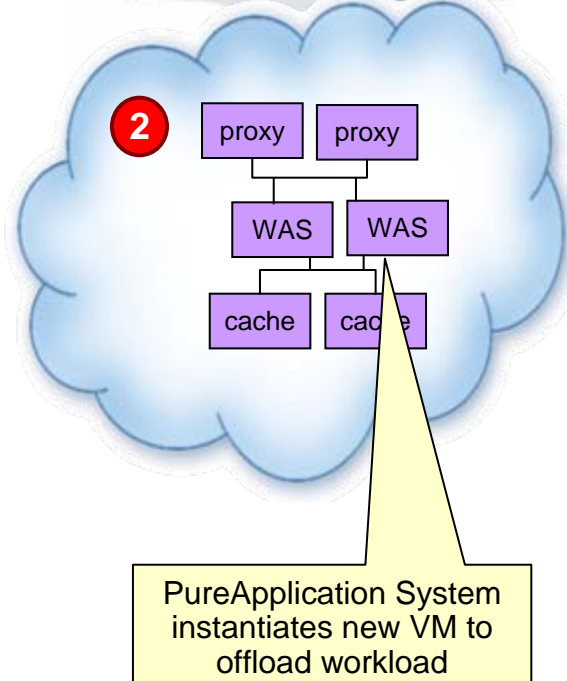
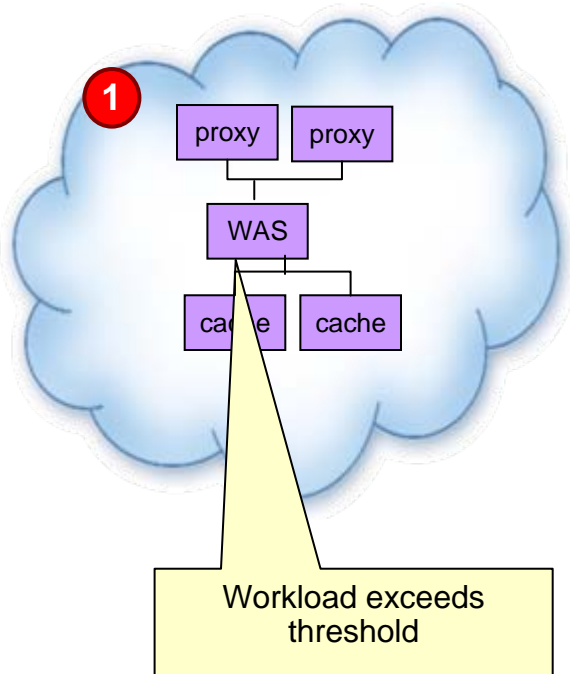
- Define service level goals with policies
 - ▶ Routing Policy, Log Policy, JVM Policy, Scaling Policy
- **Scaling policies** specify the **response time goals** and the relative importance of the service policy relative to other service policies
 - ▶ Static, CPU based, Response time based, Web to DB
- Application requests are mapped to service policies based on rules

Policies define the relative importance and response time goals of application services

WebLogic cannot do this! Exalogic cannot do this!

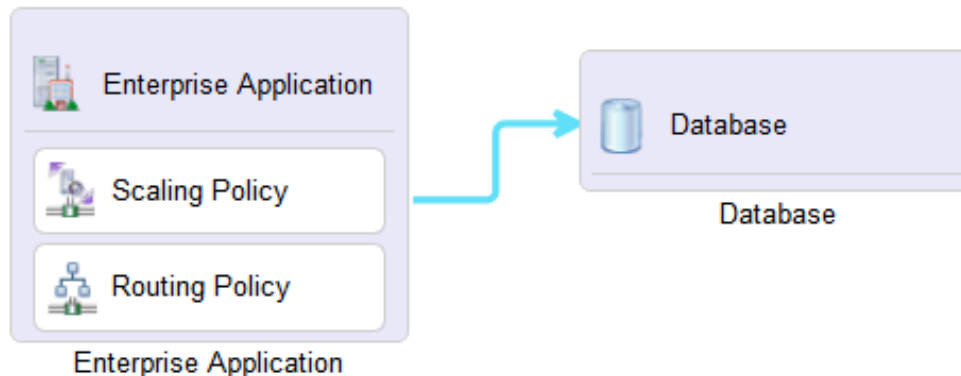
Scaling Policies Can Dynamically Meet Workload Performance Goals

PureApplication System automatically scales the WebSphere application platform up/down as the load changes according to policies defined



DEMO: Using PureApplication Virtual Application Patterns To Quickly Deploy With A Service Policy

1. Build a Virtual Application Pattern using PureApplication Expertise
2. Assign a service policy (scaling) to assure your image will maintain Service Level Agreements (SLA)



▼ Scaling Type

Response Time Based

Scaling in/out when Web response time is out of threshold range(ms):

0 10000

Range: 1000 - 5000

Instance number range of scaling in/out: *

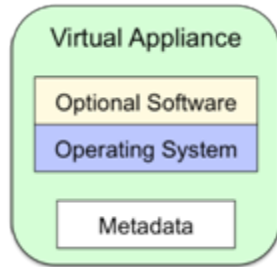
1 50

Range: 1 - 10

Minimum time (sec) to trigger add/remove: *

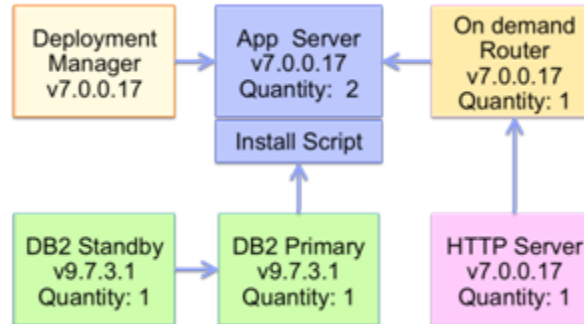
120

Competitors Lack Support for Patterns With Built-In Expertise



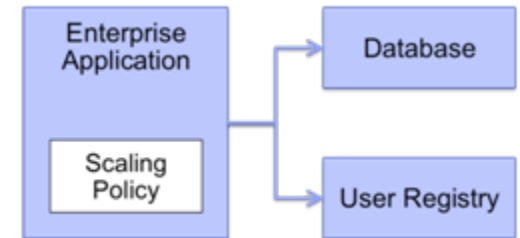
Virtual Appliance

- Standard software installation and configuration on OS
- Images created through extend/capture
- Traditional administration and management model
- Single server



Virtual System

- Flexible and control of the middle topology
- Scripted administrative optimizations
- Topology-driven
- Administrator driven scaling
- Multi-server



Virtual Application

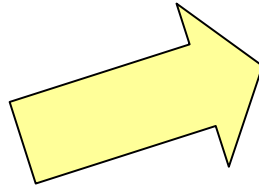
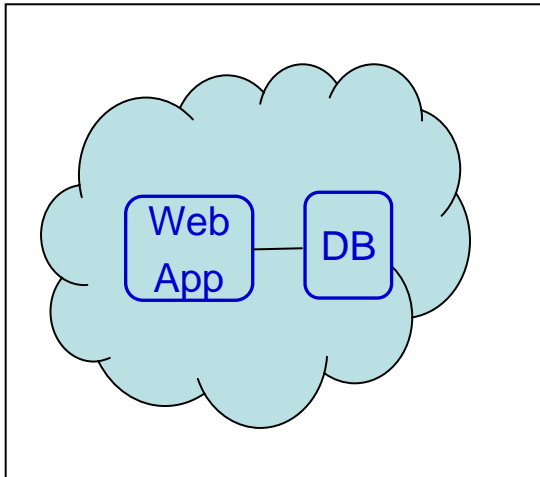
- Client describes application and IBM provides the tool for the deployment
- Application lifecycle
- Policy-driven
- Multi-server

Configuration flexibility
High skill level required
More labor

Easiest to use
Lower skill level required
Administrator productivity

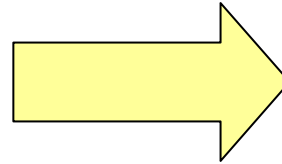
Now Compare The Labor Costs To Manage 72 Web-Facing Workloads

72 Web-facing Workloads



9 blades, 144 cores

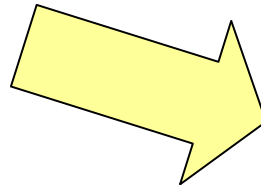
Do-It-Yourself (DIY)



1/4 Rack Web
(6 nodes used)

Full Rack Data + 1/2 Rack Data
(8 nodes + 4 nodes)

Pre-integrated Web Competitor
Pre-integrated Database Competitor

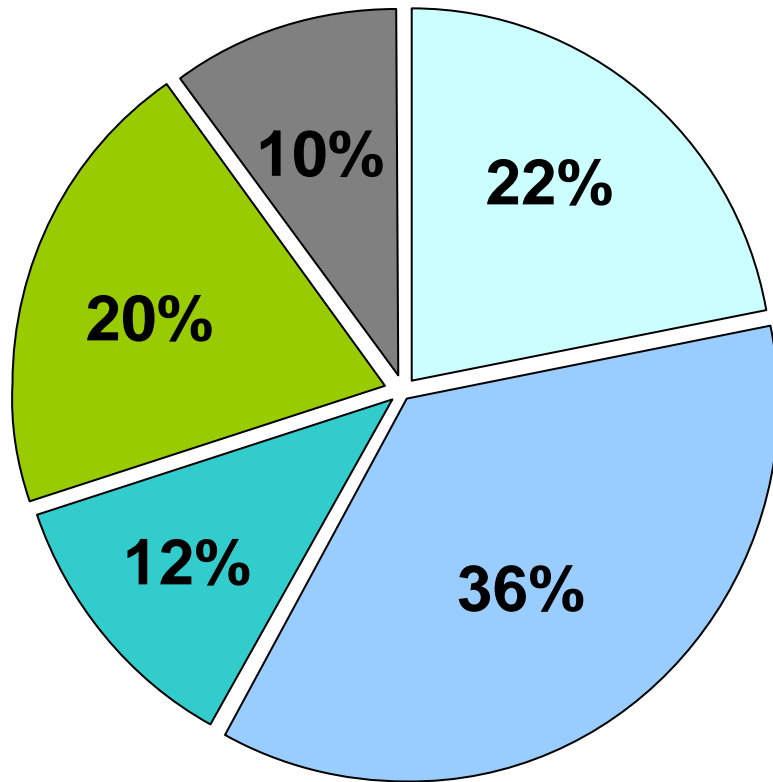


PureApplication
System - Small
(3 nodes, 96 cores)

PureApplication on Power

Which option requires the least labor?

Five Key IT Management Processes Impacted By PureApplication System



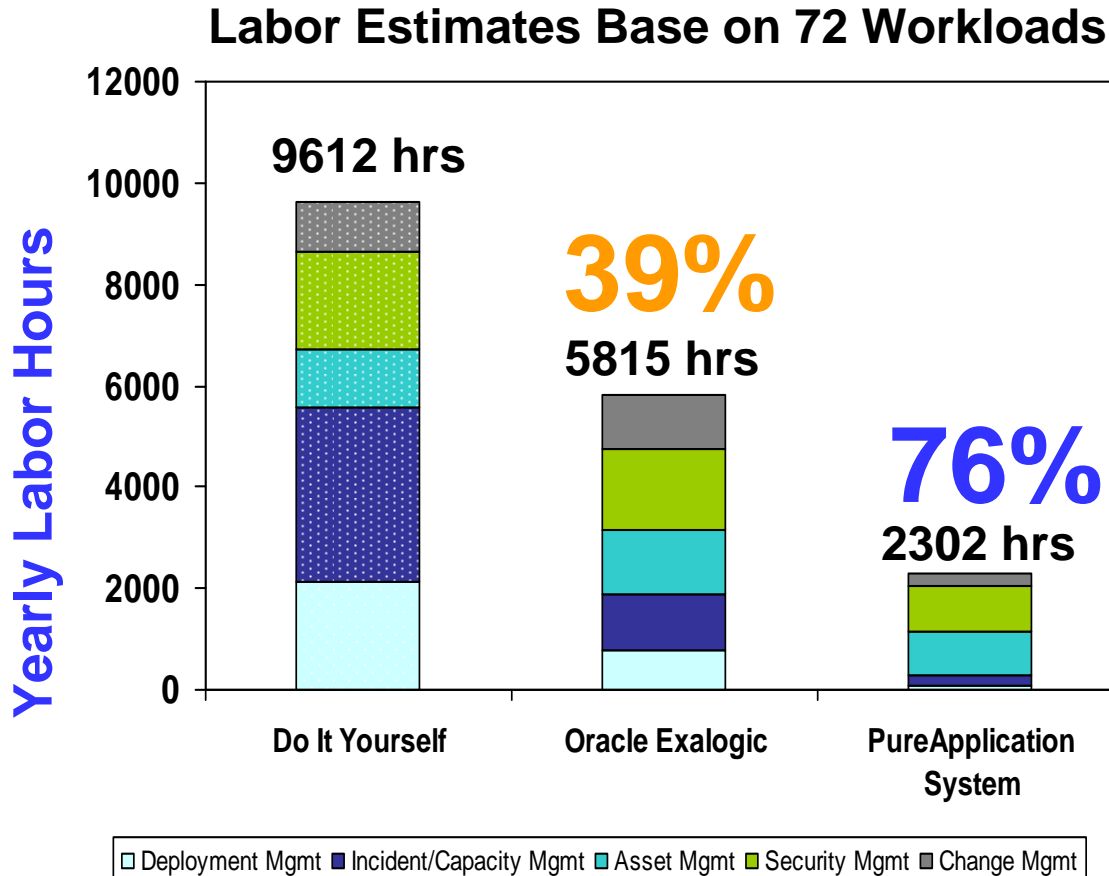
Typical percentage of time administrators spend on each task category

Allocation based on customer data from IBM study

- Deployment Management**
– Hardware set-up and software deployment
- Incident/Capacity Management**
– Monitor and respond automatically
- Asset Management**
– Hardware and software asset tracking
- Security Management**
– Access control
- Change Management**
– Hardware and software changes

ITIL = Information Technology Infrastructure Library

IBM PureApplication System Significantly Reduces Overall Labor Costs



Note: Do It yourself used 9 Intel blades (144 cores). Oracle used 18 nodes (288 cores). IBM PureApplication System used 3 Power nodes (96 cores). Each system has the capacity to run 72 workloads where each workload can sustain a peak throughput of 1720 page elements per second.

PureApplication Contributors to Labor Savings

- **Deployment**
 - ▶ Fully assembled and configured
 - ▶ Pre-installed management software
 - ▶ Fast pattern-based deployment
- **Incident/capacity**
 - ▶ Centrally monitor and resolve issues with automatic scaling
- **Asset**
 - ▶ Track license usage of products
- **Security**
 - ▶ Centralized access control
- **Change**
 - ▶ Visibility into relationships of virtual images in a workload
 - ▶ Automatically apply changes to desired virtual servers

The labor savings and assumptions herein are estimates based on a labor model that uses data obtained on the percentage of time customers spend on certain IT lifecycle tasks. It is not a benchmark. As such, actual customer results will vary based on customer applications, differences in stack deployed and other systems variations as well as actual configuration, applications, specific queries and other variables in a production environment.

PureApplication System (Power) Provides Platform For Superior Performance

PureApplication (Intel)



- State-of-the-art management
- Fastest deployment
- Best practices workload patterns
- Dynamic workload management
- Lowest cost of labor for private clouds

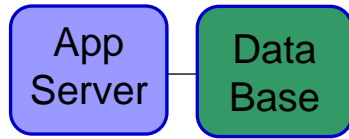
PureApplication (Power)



Same capabilities as Intel version, but adds:

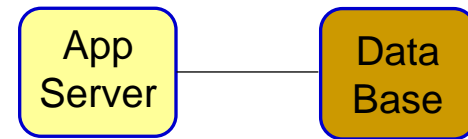
- **Power7+ processors**
- **Thread density**
- **PowerVM efficiency**
- **IBM software optimized**
- **Superior performance and price/performance**

Run Web And Database Workloads On The Same System With PureApplication System



IBM PureApplication
System

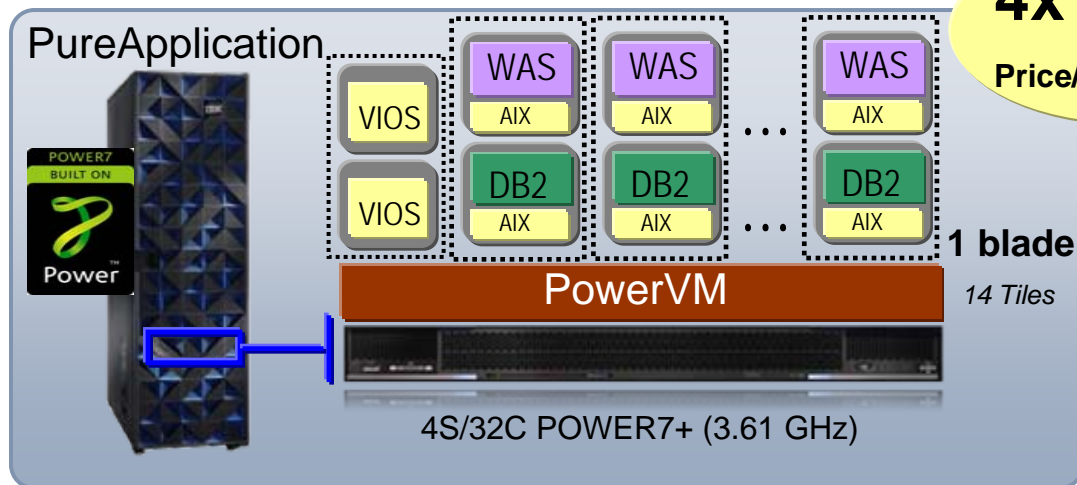
- Storwize V7000 is block storage with Easy Tier SSD for optimal database support
- Co-location of database on the same system delivers better performance and lower cost per workload



Exalogic Exadata

- Exalogic storage is Network Attached Storage (NAS) and not optimal for database support
- Oracle recommends use of separate Exadata system for database workloads
- Leads to higher cost per application workload

PureApplication Power Beats Native Pre-integrated Competitor In Web Application Case Study



4x Better
Price/Performance

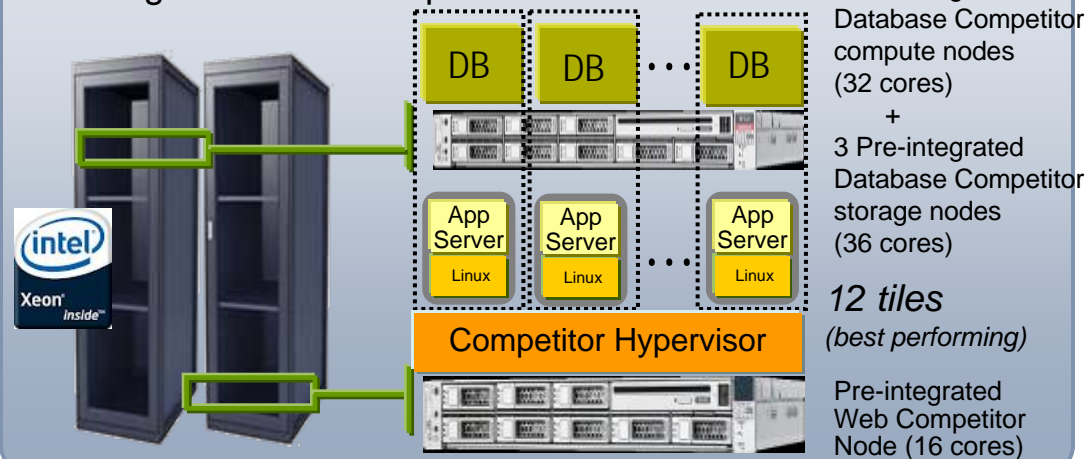
42,816 Pages per sec

1,338 Pages per sec per core

\$31 Per page element/sec

14 Pairs WAS+DB2 on platform

Pre-integrated Database Competitor V3
Pre-integrated Web Competitor V3



22,580 Page elements per sec

269 Page elements per sec per core

\$130 per page element/sec

12 Pairs App Server on Pre-integrated Web Competitor and DB on Pre-integrated Database Competitor

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Build A Private Cloud Faster And At Lower Cost With IBM PureSystems

	IBM	Oracle
Initial Set up: Faster time-to-value	Yes	No
Built in best practice pattern expertise for faster deployments	Yes	No
Policies built into the patterns for monitoring lifecycle management	Yes	No
Reduces labor required for entire life cycle management	Yes	No
Fastest Performance at the lowest costs	Yes	No
More size choices for all customers	Yes	No