



Pulse2011



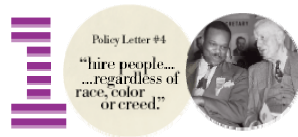
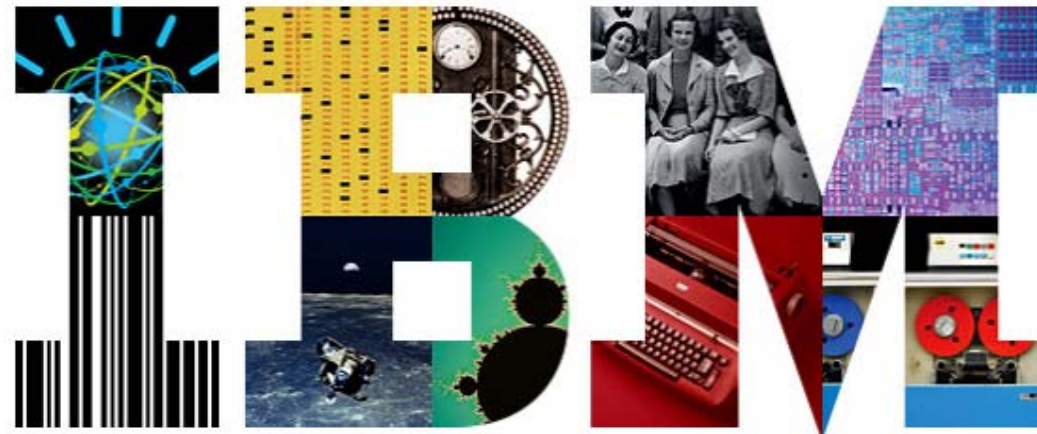
KVM – An Open Virtualization Solution for Linux and Beyond

Adam Jollans

Program Director, Linux and Open
Virtualization Strategy, IBM

Melbourne - 28th July 2011

100 years of Innovation and Progress



IBM and Open Software

Investment and commitment to open source



The Apache Foundation



The Eclipse Foundation



IBM and Virtualization

A brief history of virtualization



System x & Blade Center

KVM goes upstream

Red Hat & IBM start KVM investment



Power Systems

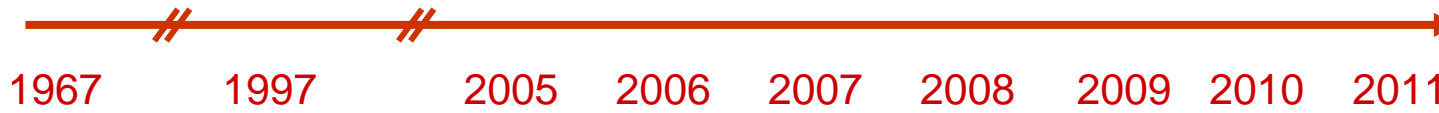
Intel adds x86 hardware virtualization

Virtualization on POWER



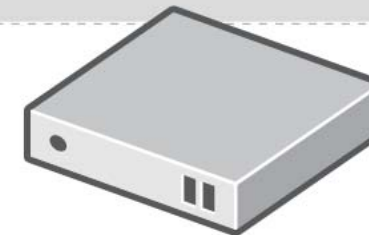
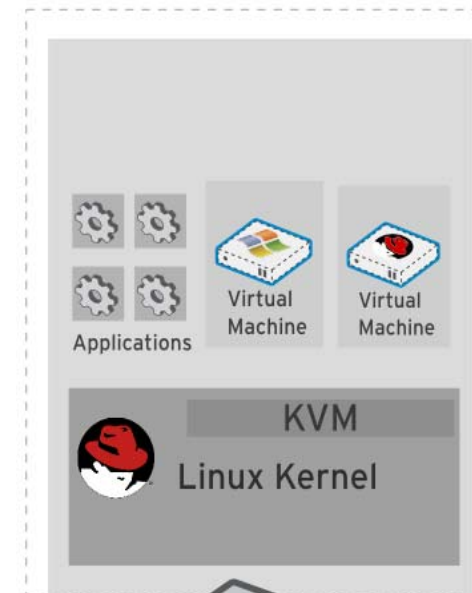
System z

Virtualization on IBM mainframes



Kernel Based Virtual Machine (KVM)

- Third generation hypervisor technology
- Designed based on modern x86 hardware
 - Offloads work to CPU via VT-x technologies
 - No need to use binary translation or paravirtualized kernels
- Leverages Linux kernel
 - “Don't reinvent the wheel”
 - Uses mature, stable and proven kernel
 - Delivered as a loadable kernel module
 - Highly modular, reducing overhead and attack surface
- KVM Project started in October 2006 by Qumranet
 - Submitted to Kernel maintainers in December 2006
 - Around 40k lines of code added to Linux
 - Accepted in upstream kernel 2.6.20 (January 2007)
 - No separate kernel required
 - Shipped as part of all modern Linux distributions



x86 Hardware



IBM and KVM Development

Over 60 IBM programmers working on KVM as part of the community

Core KVM
Development

Performance
and Memory

Networking
and I/O

Cloud Early
Deployment

Systems
Management

Data Center
Networking

Security and
Reliability



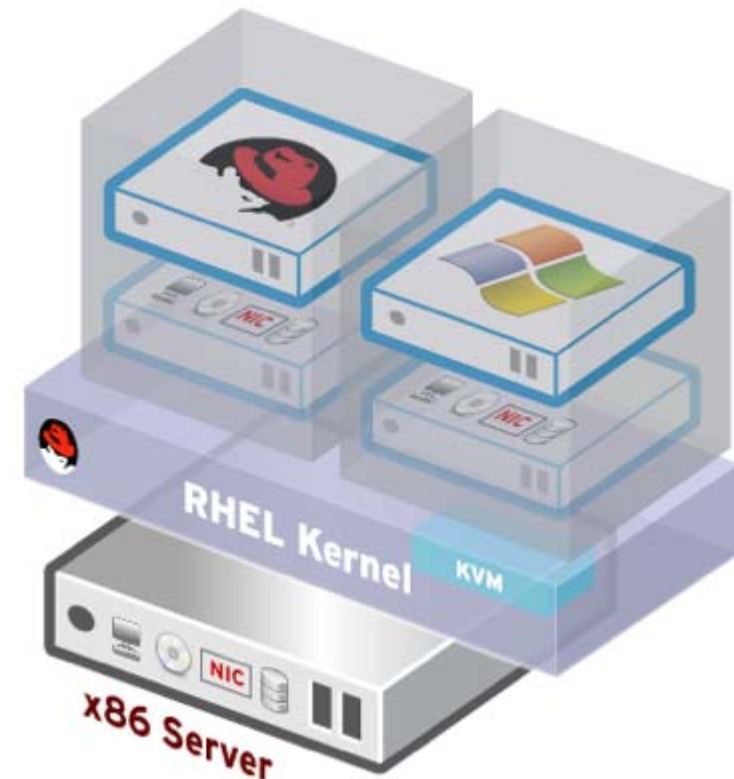
Contributions to KVM in
Linux 2.6 kernel

Company	Changes	Rate
Red Hat	352	31.8%
Intel	155	14.0%
IBM	149	13.5%
Qumranet	143	12.9%
AMD	97	8.8%



How to get KVM

- As part of a Linux distribution
 - Full Linux including virtualization
 - Available as
 - Red Hat Enterprise Linux
 - RHEL 5.4 and above
 - SUSE Linux Enterprise Server
 - SLES 11 SP1 and above
 - Canonical Ubuntu
 - Ubuntu 10.04 LTS and above
- As a standalone hypervisor
 - Optimized, stripped-down hypervisor
 - Available as.
 - Red Hat Enterprise Virtualization – Hypervisor
 - RHEV-H 2.2 and above



Open Virtualization



Choice

Availability of hypervisor from multiple sources



Lower costs

No license fees and competitive subscription costs



Interoperability

Wide range of guest operating systems supported, including both Linux and Windows



Open Virtualization Alliance

Announced at OSBC - May 17th, 2011

- Consortium formed by IBM, Red Hat, Intel, Attachmate SUSE, HP, BMC and Eucalyptus
- Commitments include:
 - Fostering the adoption of KVM as an open virtualization alternative
 - Accelerating the emergence of an ecosystem of third party solutions around KVM
 - Increasing overall awareness and understanding of KVM
 - Encouraging interoperability, promoting best practices, and highlighting customer successes
- Complements existing open source communities managing KVM development

Governing Members:



Members:



Open Virtualization Alliance

Momentum Announcement – June 23rd, 2011

- 65 new members have signed since OVA launch on 5/17/11
- Includes Brocade, Dell, EnterpriseDB, Fujitsu Frontech, Information Builders, Montavista, Vyatta
- Companies span a wide spectrum of hardware, software, services and cloud computing
- Areas include virtualization management, cloud computing, storage management, datacenter automation, network management and business solutions



The screenshot shows the Open Virtualization Alliance website. The header features the text "OPEN VIRTUALIZATION ALLIANCE" in large yellow letters. Below the header is a navigation menu with links for HOME, NEWS & EVENTS, JOIN/CONTACT US, FAQs, and MEMBERS. The main content area is divided into two columns. The left column is titled "NEWS & EVENTS" and features a headline: "OPEN VIRTUALIZATION ALLIANCE GARNERS STRONG PARTICIPATION WITH 65 NEW MEMBERS". Below the headline is a sub-headline: "Fast-growing industry consortium promoting the KVM ecosystem and educating the market". The main text of the article begins with "SAN FRANCISCO, JUNE 23, 2011 – The Open Virtualization Alliance, a consortium committed to fostering the adoption of open virtualization technologies, including Kernel-based Virtual Machine (KVM), today announced broad industry support and adoption with the addition of 65 new members to the consortium. With this, the consortium has achieved nearly ten-fold growth in membership since its establishment just one month ago, and today includes members across a wide spectrum of hardware, software, services and cloud computing businesses." The right column is titled "RECENT ITEMS" and lists two items: "Open Virtualization Alliance Garners Strong Participation with 65 New Members" and "BMC Software, Eucalyptus, HP, IBM, Intel, Red Hat and SUSE Create Open Virtualization Alliance".

KVM

What makes a hypervisor ready for prime time?

- ✓ Performance & Scalability
- ✓ Security & Quality of Service
- ✓ Virtualization Management



"We believe that Kernel-based Virtual Machine (KVM) is a truly high-performance virtualization technology, which fully exceeds our needs"

Anja Schaffer

Director, Data Center International

Cortal Consors



CORTAL CONSORS
BNP PARIBAS

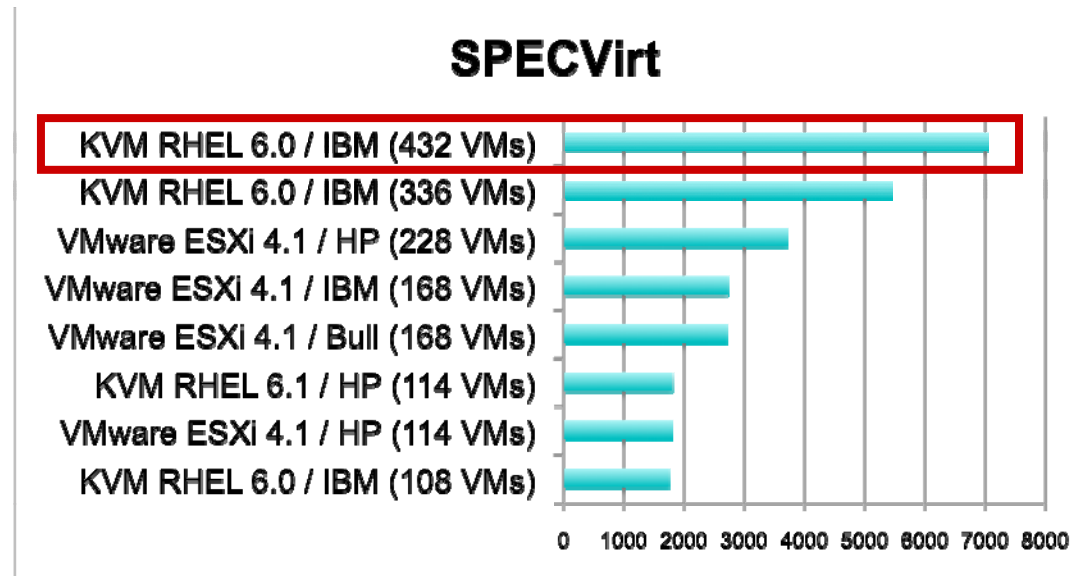


KVM – Enterprise Qualities

Performance, Scalability, Security and Quality of Service

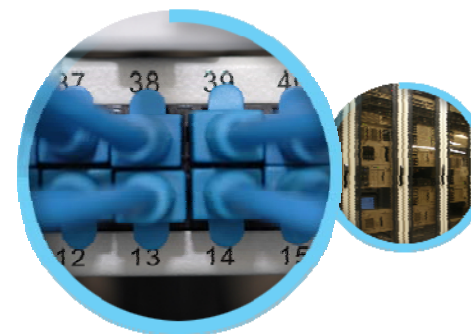
Performance

KVM leverages Linux kernel scalability to achieve the highest published virtualization benchmark



Security

SELinux enables KVM to provide Mandatory Access Control security between virtual machines



KVM - Management

IBM and Red Hat Delivering Virtualization Management for KVM

End to End Systems Management

- Tivoli Service Automation Manager
- Tivoli Provisioning Manager



Multi-Systems Management

- IBM System Director – VMControl
- Red Hat Enterprise Virtualization - Management



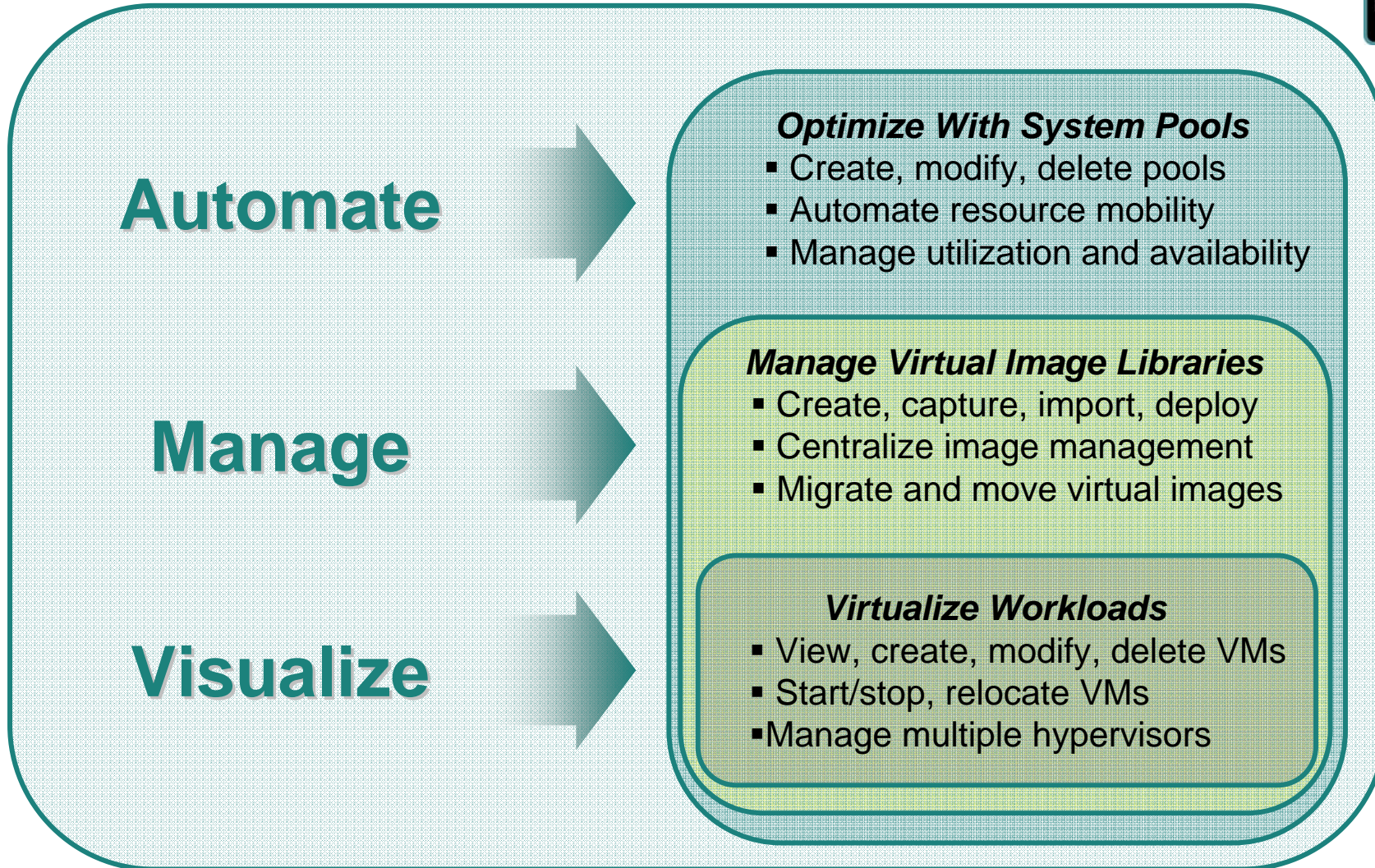
Single System Management

- Various open source tools

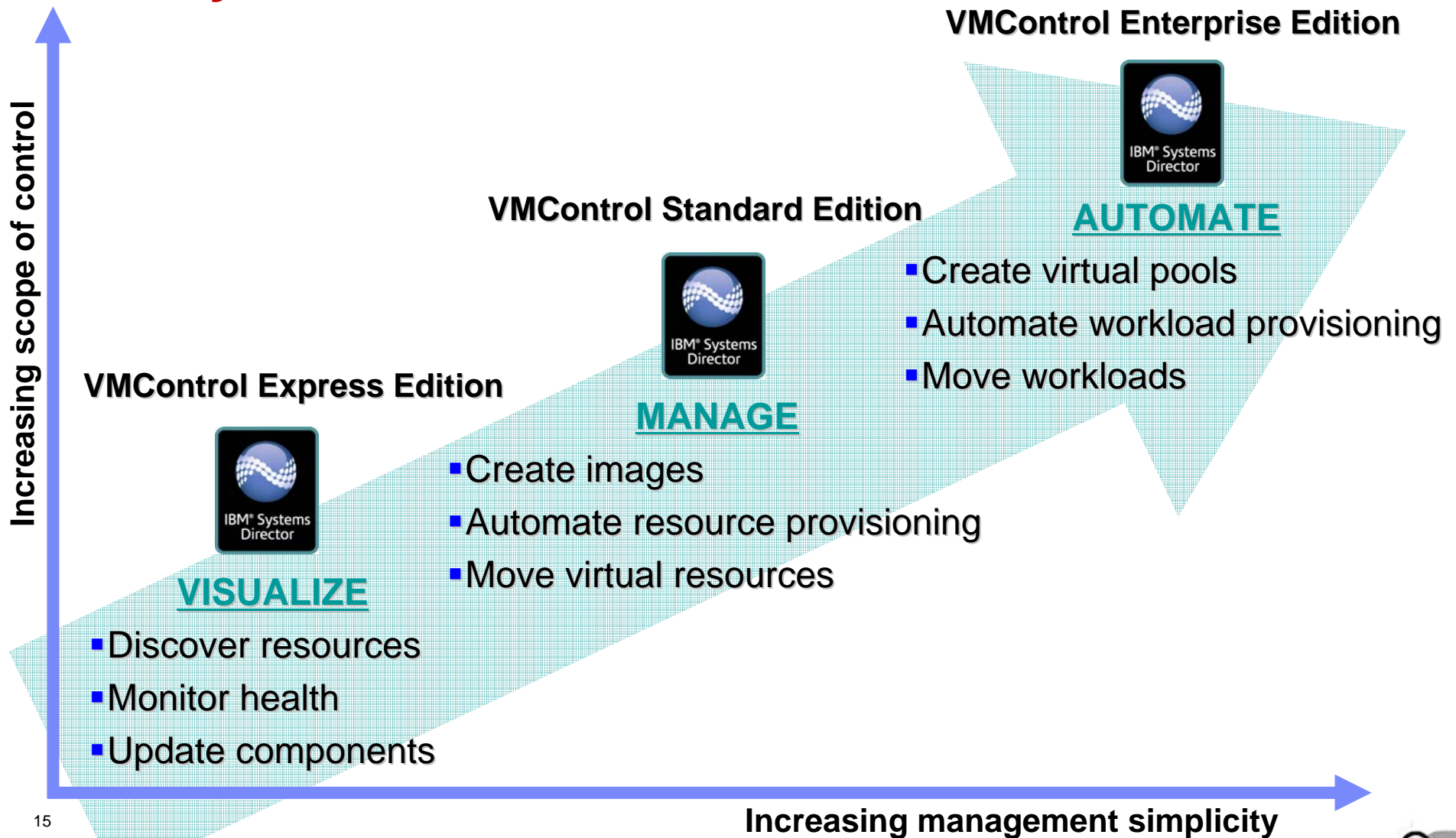




Key Areas of Virtualization Management



IBM Systems Director: VMControl





VMControl Capabilities and Platforms

VMControl Express Edition

- PowerVM
- **KVM**
- Microsoft Hyper-V
- VMware vSphere
- z/VM

■ VMControl Standard Edition

- PowerVM
- **KVM (planned)**
- Other platforms (in future)

■ VMControl Enterprise Edition

- PowerVM
- **KVM (planned)**
- Other platforms (in future)

	VMControl Express Edition	VMControl Standard Edition	VMControl Enterprise Edition
Discovery	✓	✓	✓
Inventory and topology	✓	✓	✓
Health monitoring	✓	✓	✓
Metric thresholds	✓	✓	✓
Power operations	✓	✓	✓
Relocation		✓	✓
Create and manage virtual servers		✓	✓
Deploy and manage workloads		✓	✓
Manage virtual images		✓	✓
Manage virtual resource pools			✓



VMControl Express Edition

Monitor and control all virtualized resources



- Multi-platform management
 - View virtual and physical assets
 - Virtualized life-cycle management
 - Topology maps

- Edit virtual resources
 - Edit physical hosts
 - Edit virtual machines
 - Use GUI or command line

- Relocate virtual machines
 - Execute live relocation
 - Plan for relocation

The screenshot displays the IBM Systems Director interface. At the top, a window titled 'Virtual Servers and Hosts' shows a table of resources:

Select	Name	State	Access	Problems	Compliance	IP Address	CPU Utilization	Processors
<input checked="" type="checkbox"/>	vsmesx1-host	Stopped	OK	OK	OK	9.5.23.51	1%	2
<input type="checkbox"/>	2003Server_Base	Stopped	OK	OK	OK		0%	2
<input type="checkbox"/>	2003Server_gw59a	Suspended	OK	OK	OK		0%	2
<input type="checkbox"/>	bws_fc8	Suspended	OK	OK	OK		0%	1
<input type="checkbox"/>	hatteras	Stopped	OK	OK	OK		0%	1
<input type="checkbox"/>	Ken	Stopped	OK	OK	OK		0%	1
<input type="checkbox"/>	MIKE	Stopped	OK	OK	OK		0%	1

Below the table is the 'Create Virtual Server' wizard. The 'Welcome' screen displays the following text:

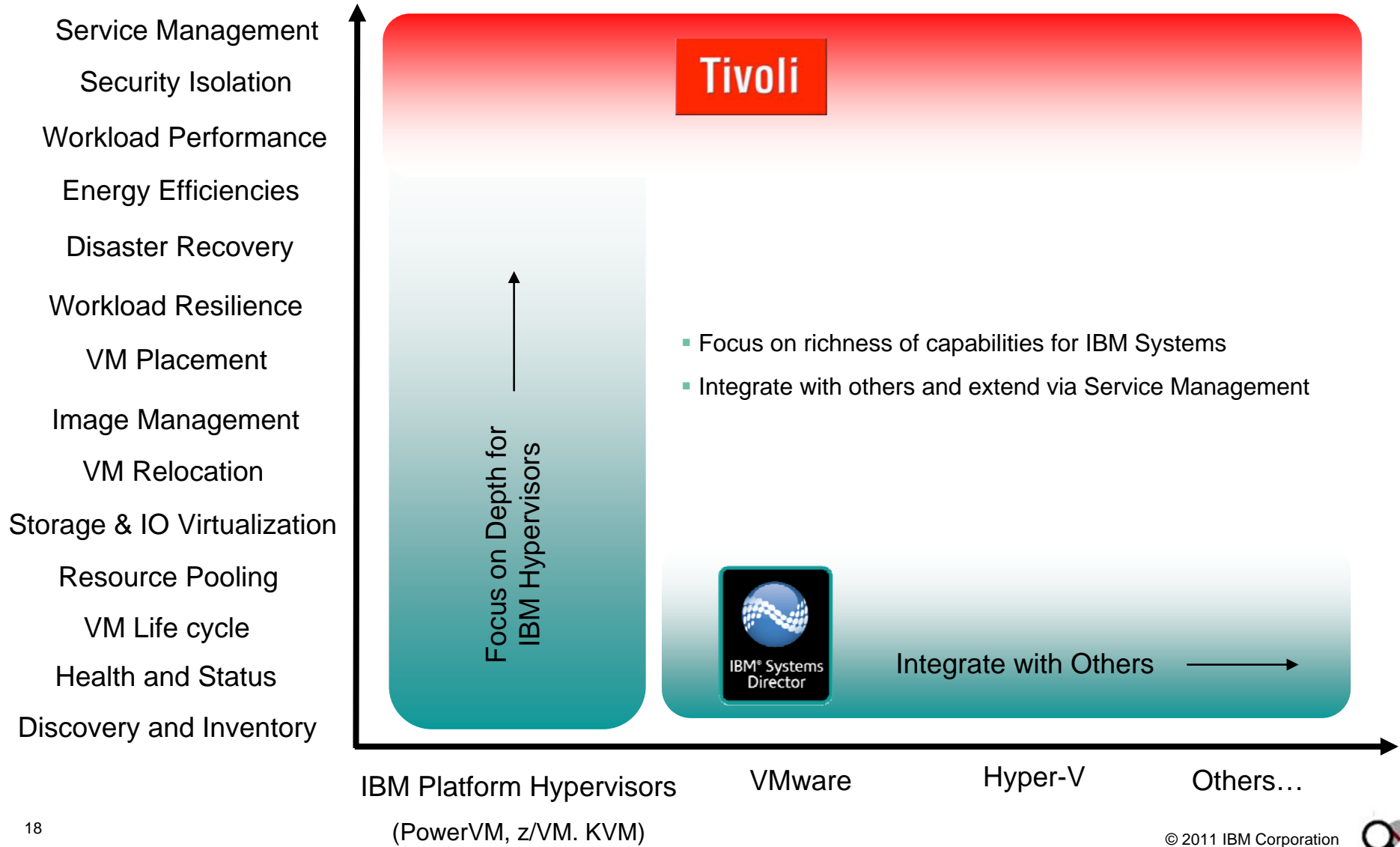
Welcome to the Create Virtual Server wizard.

This wizard will help you create a virtual server on a host. It will guide you through the following tasks:

- Selecting the host where your virtual server will be created

The wizard also shows a 'Resource Navigator' window displaying a topology map of the system, including hosts like 'hc031_520' and various virtual machines and networks.

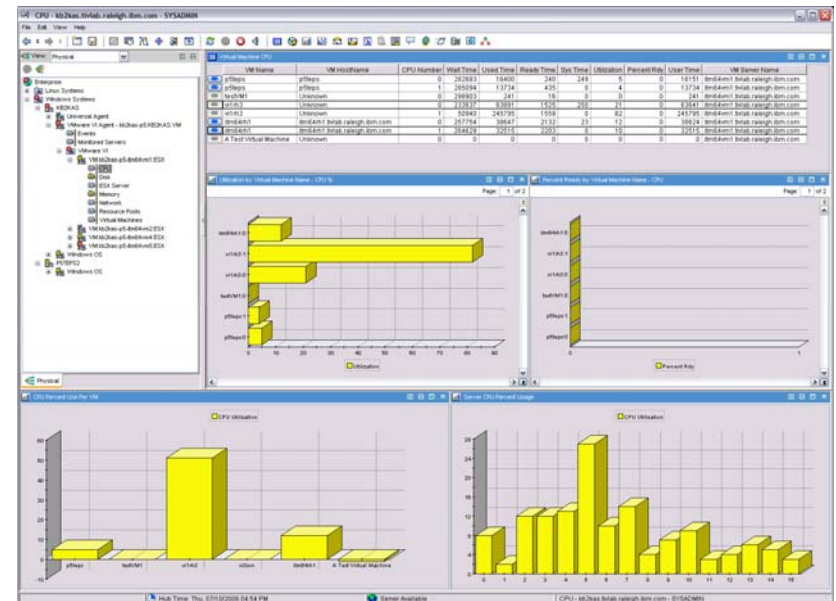
Tivoli, Systems Director, and Hypervisor Support



IBM Tivoli Monitoring for Virtual Servers

IBM Tivoli Monitoring helps prioritize consolidation decisions by visualizing the actual virtual server utilization against historical trends. It automates a customer's best practices in response to system events

- Collect key performance and availability metrics.
 - Application, Response time, OS, Hypervisor, Storage, Web Services, and more.
- Dynamic thresholds; predictive trends & alerts
- Side-by-side real-time and historical data assists in separating intermittent problems from reoccurring problems from peak workloads
- Warehouse data and reporting – capacity planning
- Monitoring for z/VM, Power Systems, Hyper-V, Solaris, Citrix, KVM and VMware virtual environments



Tivoli Provisioning Manager

- End-to-end automation capabilities for physical and virtual servers and software
 - Discover and track data center resources to enable highly accurate server provisioning and software deployments
 - Create hundreds of virtual machines simultaneously
 - Facilitate efforts to consistently follow your own policies and preferred configurations, in support of corporate and regulatory compliance efforts
 - Automatically provision software and configurations to Linux servers

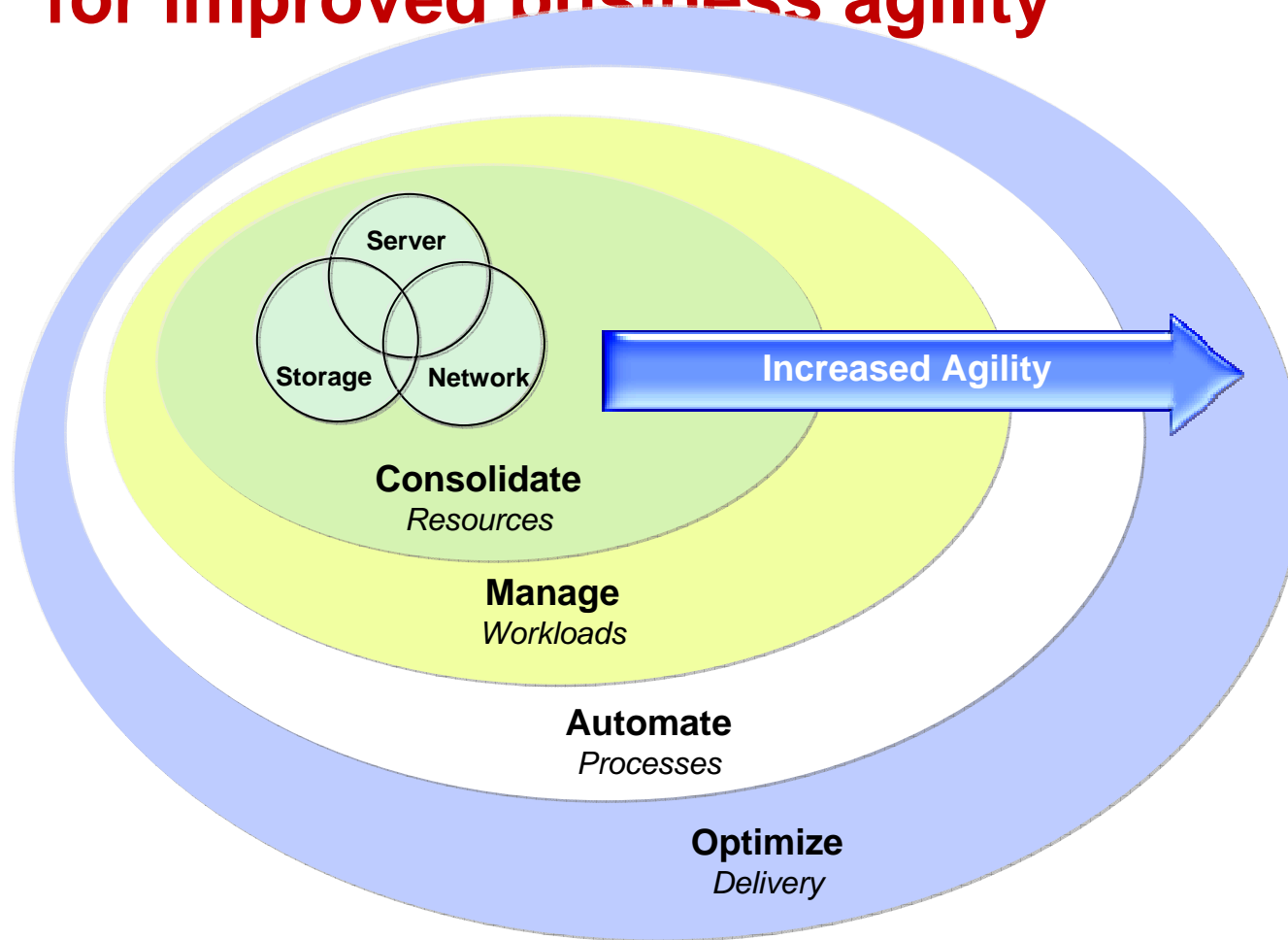


Tivoli Service Automation Manager

- Automate requesting, deployment, monitoring and management of cloud computing services
 - Lowers cost of service delivery through automation and reduced skill requirements
 - Deploys IT services faster to meet the increased need for development, test, preproduction and production systems
 - Delivers a higher degree of standardization and automation for deployment and management of IT services while reserving skilled IT staff members' time for other high-value tasks



Virtualization with Integrated Service Management for improved business agility



Consolidate Resources

- Improved efficiency and utilization of IT resources

Manage Workloads

- Improved IT staff productivity with integrated systems management dashboard

Automate Processes

- Consistent and repeatable processes based on best practices, business priorities and service level agreements

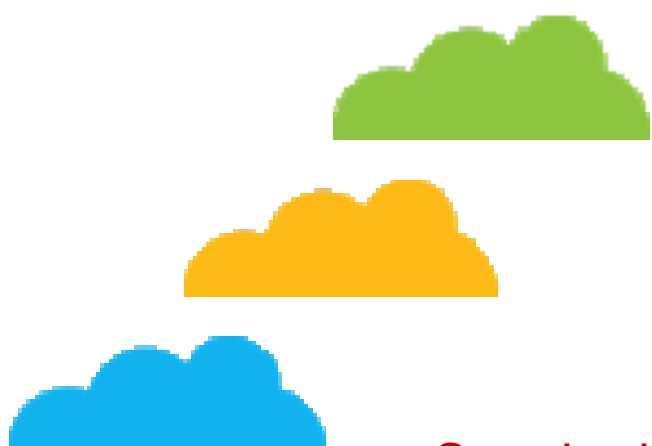
Optimize Delivery

- Self provisioned by users based on business imperatives, unconstrained by physical barriers or location.



KVM in the Cloud

Enables a Lower-Cost, More Scalable, Open Cloud



Automation – agility and reducing risks

- Lower virtualization management costs
- Multi-tenant security

Standardization – higher quality services

- Supports both Windows and Linux
- Guaranteed quality of service for virtual machines

Virtualization – doing more with less

- Economy of scale through low unit cost of KVM
- Higher densities of virtual machines delivers scalability



IBM Research Compute Cloud uses KVM



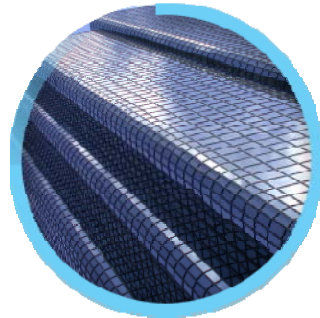
First and largest Cloud inside IBM

- Worldwide, on-demand and always available
- KVM chosen for cost, performance and stability of environment
- RC2 migrated from Xen to KVM with no disruption
- Over 200 iDataplex Nodes using KVM
- 2,000 concurrent Instances
- 600+ Custom images in Cloud Catalog
- Thousands of RC2 users across 39 countries
- IBM internal chargeback on RC2 usage



KVM

An Open Source Solution Comes of Age



Open Virtualization

- Choice
- Low-Cost

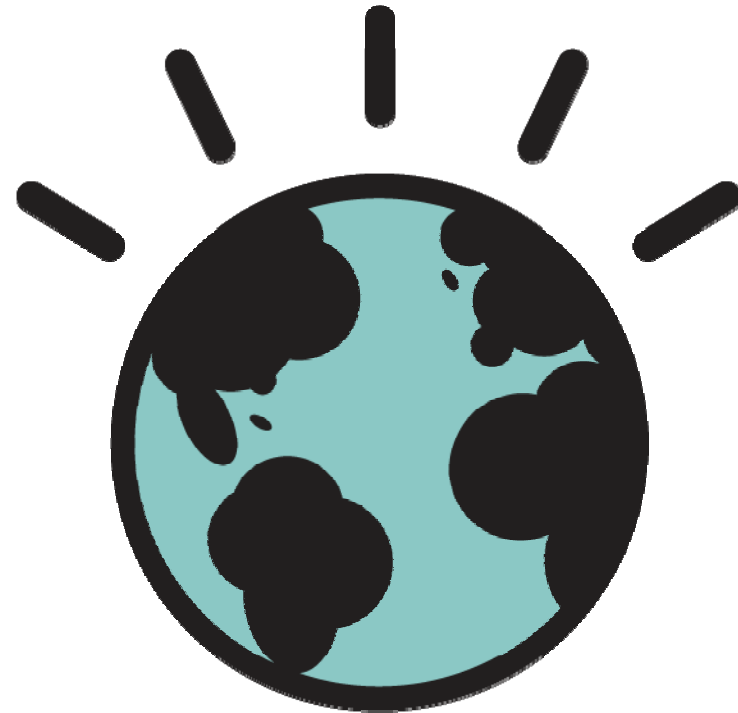


Ready for Business

- High Performance
- Secure



**...We can build
a smarter planet**



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