IBM z Systems Technology Summit

Hybrid? Private? Driving Value in the Cloud

Track 5 Session 3 :

z Systems provide key capabilities for optimizing workloads on Private/Hybrid Clouds

DC • Costa Mesa • Chicago • Cincinnati • Toronto • Atlanta • NYC • San Francisco • Dallas

Rapid growth of next generation technologies supported seamlessly on zEnterprise

System z scaling model and security to manage and optimize both

- Business Transactions
- Quality of Service
- Command & Control
- Facts and data “source of truth”
- z/OS

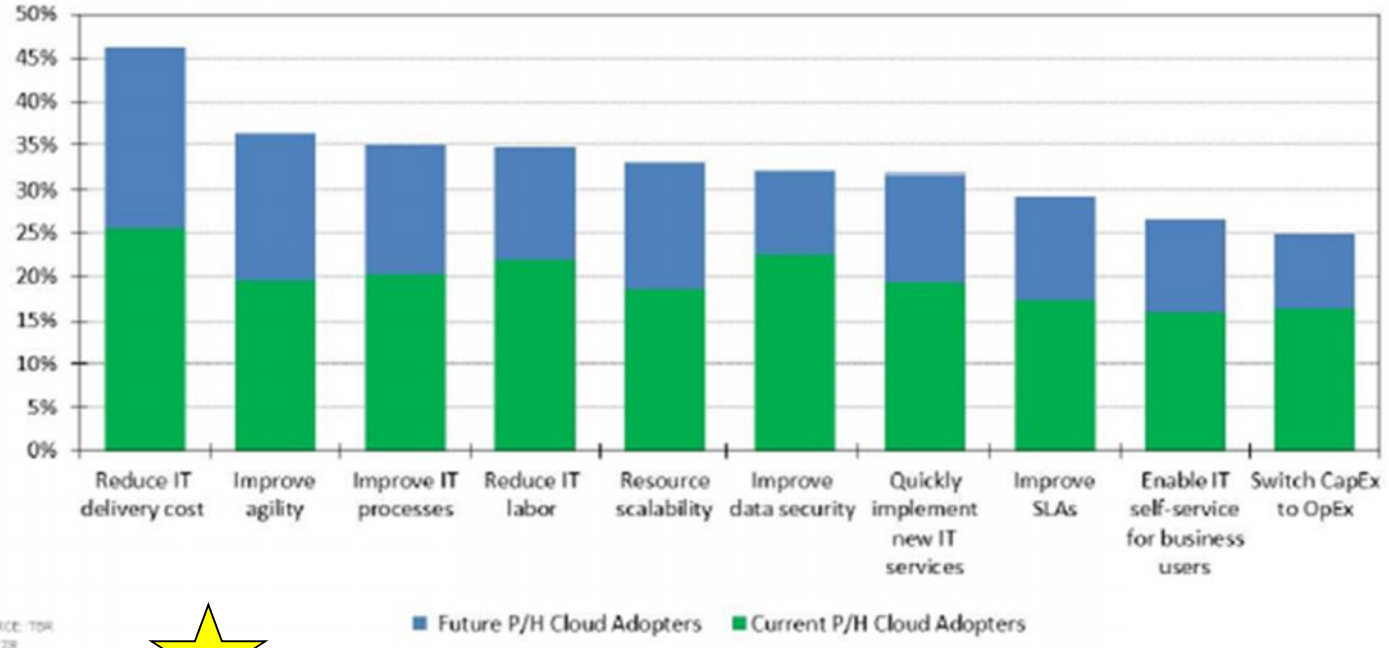
- Mobile and Social
- Dynamic
- Interactions and Collaboration
- Insight, trends, analytics
- Linux on System z

What are we hearing: top cloud adoption drivers

Path to Private/Hybrid Cloud Purchasing

TBR

Purchasing Drivers for Adopters and Future Adopters of Private/Hybrid Cloud



SOURCE: TBR
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- **Reduce IT Delivery Cost**
- **Improve Agility**
- **Improve IT processes**

Source: TBR Private/Hybrid Workload Adoption Report, 2012

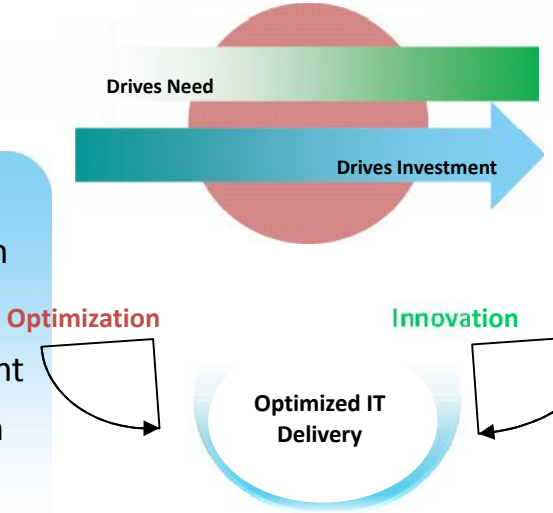
Mission of IT Process Automation

"We want to Accelerate the Pace of your Business Innovation"

Optimize

Focus on Operational Costs

- Consolidation and modernization
- Operations Automation
- Risk and compliance Management
- Manual policy to analytics driven optimization



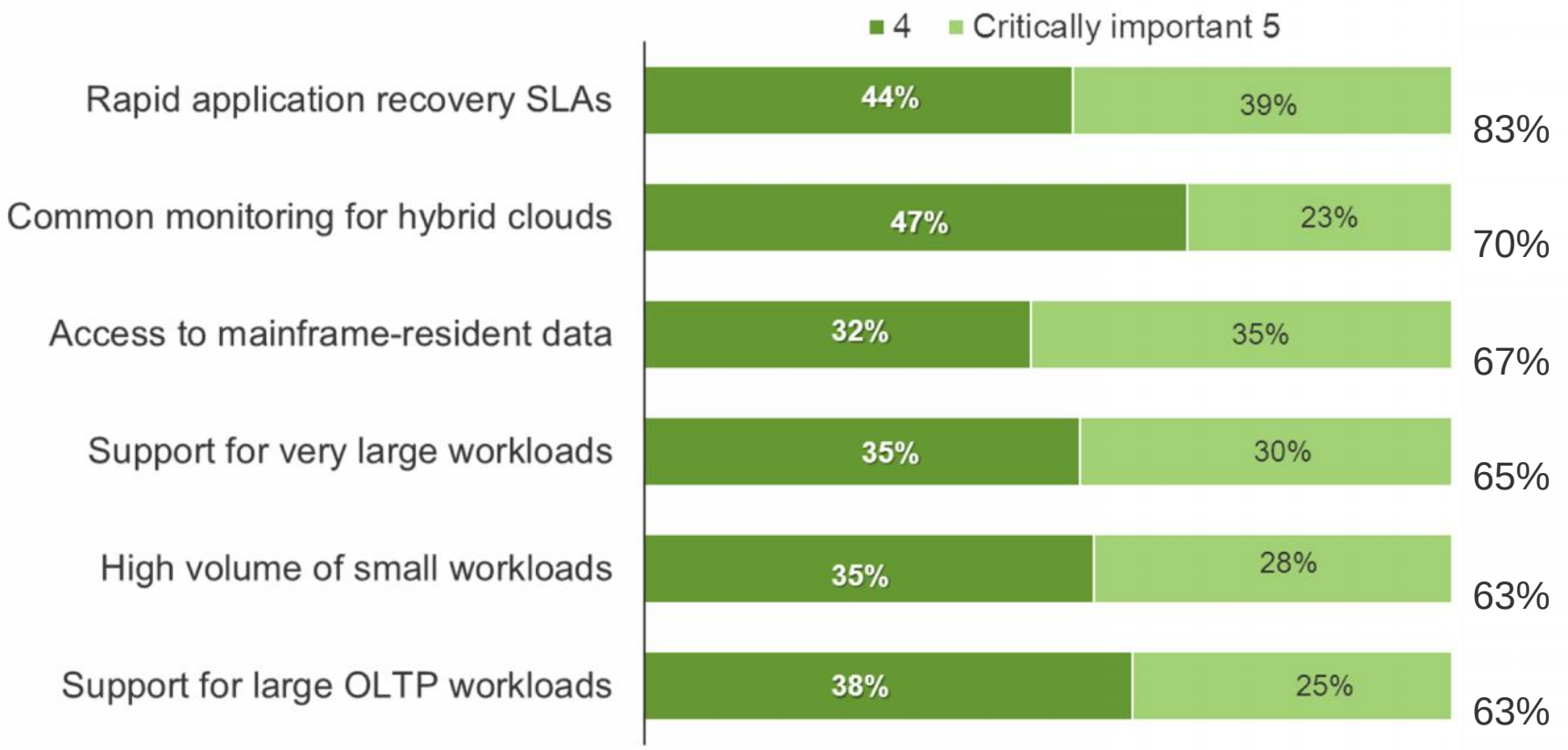
Innovate

Focus on Speed and Agility

- Assemble solutions from verified components and services
- Fast deployment and redeployment
- Agile to DevOps model
- User first delivery model

Forrester shows importance of mainframe infrastructure services in support of cloud workloads

How important is it for your cloud platform to have the following workload characteristics? (Top 6 factors)



Base: 200 North American and European hardware and infrastructure decision-makers

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, October, 2012

Differentiation for Deploying Clouds on z Systems

90%+ utilization
Increased Productivity

- Advanced workload management that provisions resources on the fly for 90%+ utilization and maximizes ROI
- Significant software license savings due to zEnterprise power/scale
- 79% less TCA vs. leading public cloud alternatives

100K virtual servers
Higher Utilization

- Maintain service levels with up to 100% CPU utilization
- “Shared everything” architecture
- Manage up to 100,000 diverse virtual servers
- Unmatched scalability with 24X more scale than x86

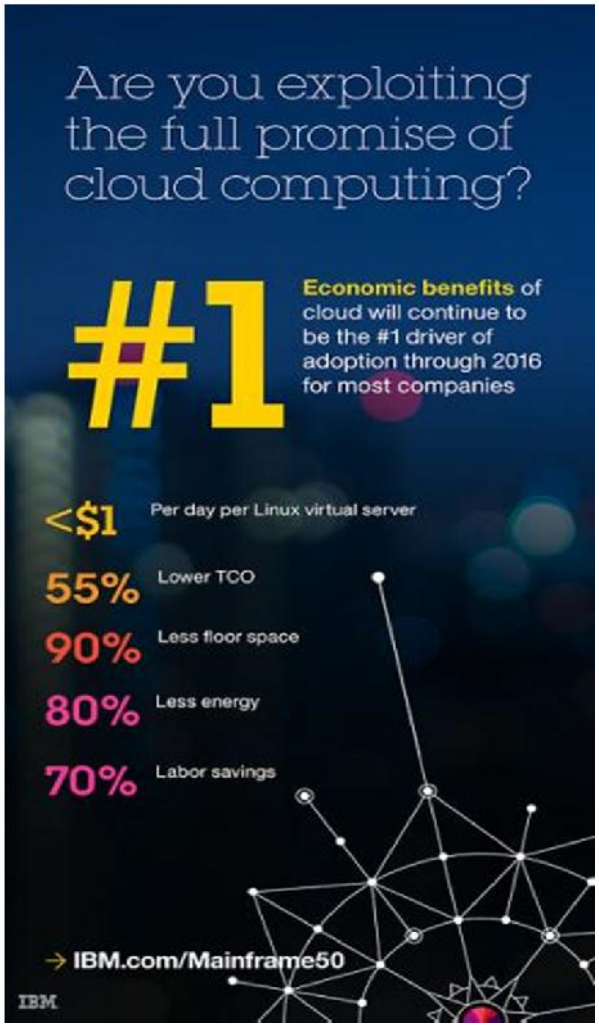
80% less energy
More Efficient Data Center

- Up to 80% less energy than existing distributed servers
- Less floor space
- Fewer parts to manage

Greater Reliability, Availability

- Built-in hardware redundancy
- Decades of RAS innovation
- Real time capacity on demand to manage growth and handle workload spikes
- Highest security rating for any commercially available server

Advantage even clearer with z13



Trusted Cloud
Increased speed of data encryption

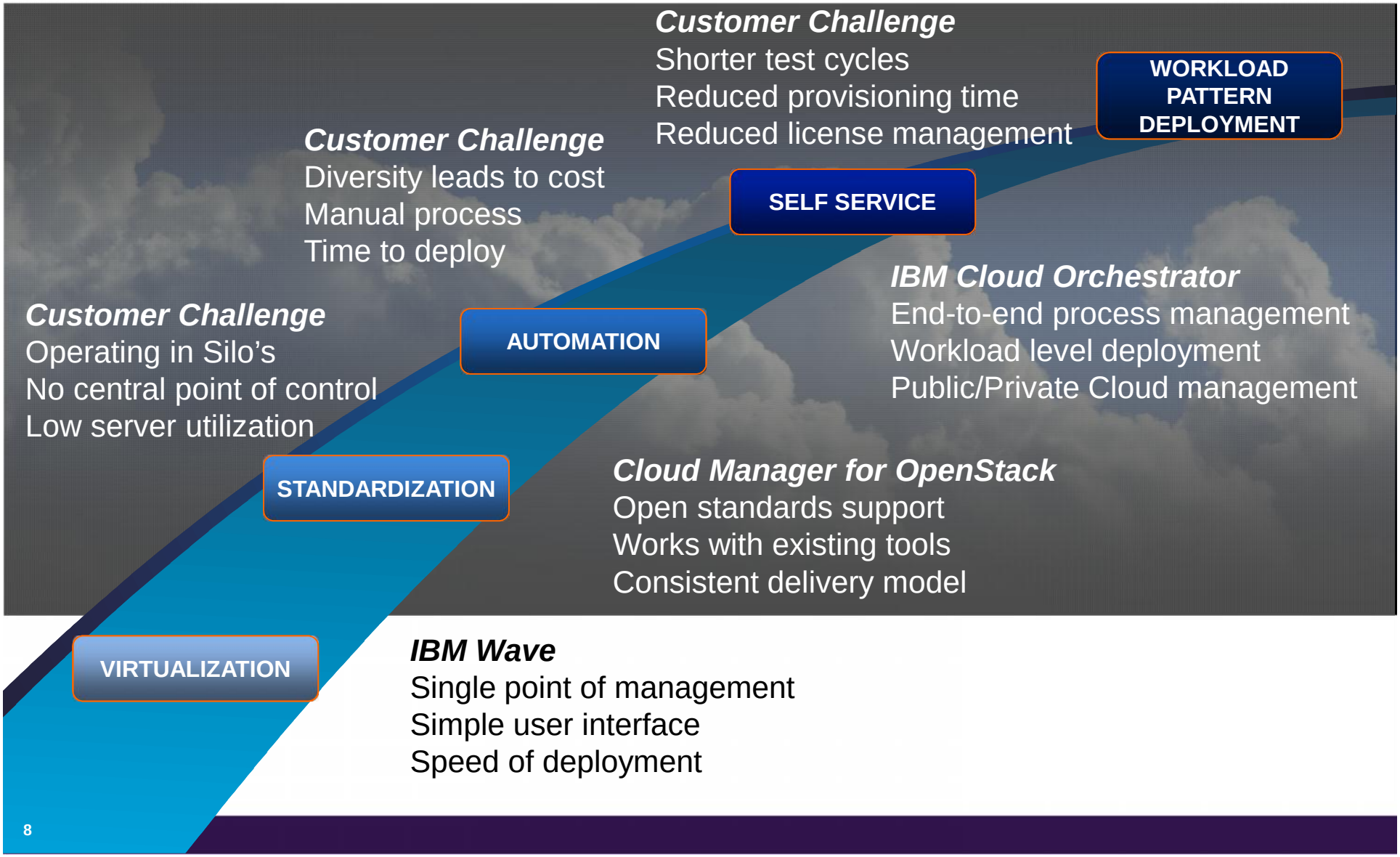
- New cryptographic security, open platform (Linux, OpenStack, and more)
- Maintain service levels with up to 100% CPU utilization
- Able to process 30,000 transactions per second, or 2.5 billion transactions per day

Higher Efficiency
8,000 VMs

- 32% less expensive than comparable x86 environments and 60% less expensive than public cloud
- World's fastest processor, 300% more memory and 100% more bandwidth
- Run 8,000 virtual servers – more than 50 virtual servers per core

*The world's most efficient and trusted **cloud** system that transforms the economics of IT*

IBM Tools Enhance the Evolving Customer Cloud Journey



Complete Solution for Administration and Management of the z/VM and Linux on System z Environment

Integrated Infrastructure Management

Linux on System z

OMEGAMON XE on z/VM and Linux

Performance monitoring of z/VM and Linux guest

Tivoli Storage Manager

File Level backup and recovery for Linux Virtual Machines

z/VM

IBM Wave

Simple, intuitive, graphical z/VM management tool

Operations Manager for z/VM

Facilitate automated operations, take action based on events

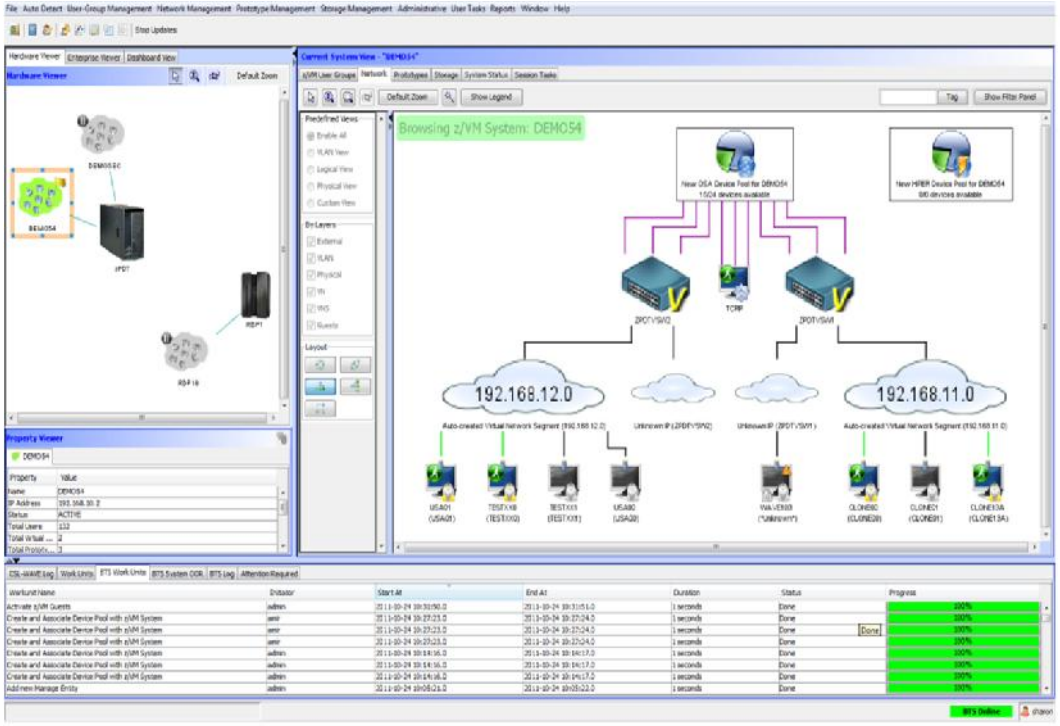
Backup and Restore Manager for z/VM

Backup and restore full z/VM environment

IBM Wave for z/VM
Web Administration VM Environments

IBM Wave provides a graphical interface that simplifies and helps to automate the management of z/VM and Linux on System z virtual servers.

- **Monitors and manages virtual servers and resources** from a single graphical interface
- **Simplifies and Automates** tasks
- **Provisions virtual resources** (Guests, Network, Storage)
- **Supports advanced z/VM capabilities** such as:
  - Single System Image (SSI) and
  - Live Guest Relocation (LGR)
- **Allows delegation of administrative capabilities** to the appropriate teams
- Competitive and **comparable** to other **v**irtualization **center** solutions

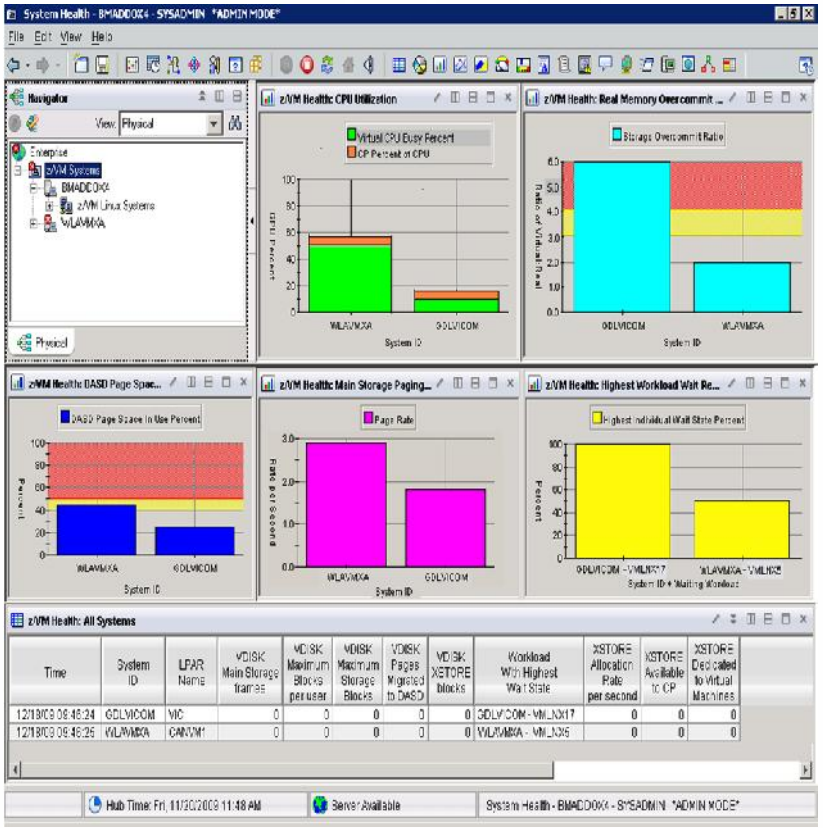


A simple, intuitive graphical tool providing management, provisioning, and automation for a z/VM environment, supporting Linux virtual servers.

OMEGAMON XE on z/VM and Linux

Bringing z/VM and Linux monitoring into the Enterprise View

Enterprise-Ready Cloud Monitoring



Increased Performance & Availability

- Provides insight into the health and performance of z/VM and Linux
  - Rich collections of attributes monitor thresholds for z/VM and Linux best practices.
  - Reflex automation provides timely resolution and/or notification.
  - Lightweight visibility to the z/VM hypervisor, Linux OS, and Linux Log data in one tool.
  - Deep integration with Cloud and Smarter Infrastructure Suite integrating z/VM and Linux data to the Enterprise view (Cross platform workflow management).
  - Persistent Historical views allows management of real and virtual resources across peak periods and downtimes for clear view of resource usage and constraints.

IBM offers hybrid/private cloud across platforms with open "fit for purpose" approach

z Systems secure cloud for data	Power Systems for compute intensive applications	System x reduced cost & data→ insight	Pure Systems for workload optimized design
			
z Systems	*Power 770, Power 780, Power 795*	*System x eX5, x3640*	*Pure Systems*

Flexibility to choose platform that meets business requirements

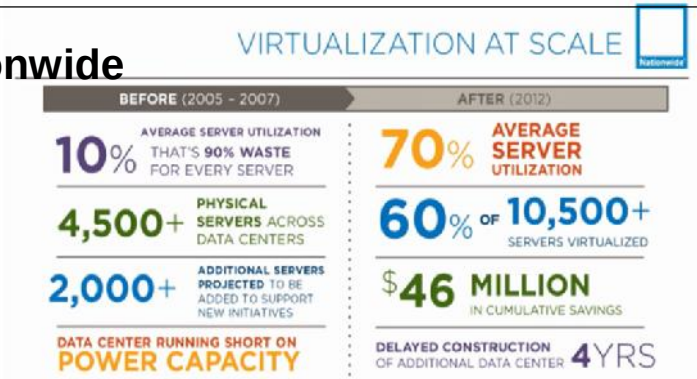
- Management tools are **consistent** and **interoperable** across platforms
- Open standards approach avoids vendor lock-in
- Common tools translate to low learning curve

Benefits:

- Reduced administration costs and increased staff productivity
- Lower total cost of ownership including software licensing savings
- Decreased risk with improved automation and workload consolidation

Linux on z Systems IT Economics client successes

Nationwide



Benefits Realized:

- With virtualization the server utilization increased from 10% to 70%
- Developed more capabilities, grew the environment and achived a higher level of virtualization
- Cloud-based solution reduced power, cooling and floor space requirements by 80% and saved the company an estimated $46 million to date

"*By moving workload from thousands of distributed processors to a very small number of powerful mainframe processors, we have made enormous savings in software licensing costs ...*

More significantly, z/VM also gives us the ability to create new virtual servers within minutes, boosting the ability of the business to respond to new challenges and opportunities quickly and effectively.

-- Brian Callaghan, VP of middleware-emerging technologies at Nationwide

Sicoob

Benefits Realized:

- Enormous growth within the same physical and environmental footprint
  - Enabled growth of 600% in mobile, 200% in internet, and 60% in in-branch transactions
- Delivers new services faster
- Avoiding USD 1.5 million in electricity costs annually

"*We have reduced the complexity of our technology, with fewer servers, less administration, lower software maintenance costs, and a significant reduction in energy consumption.* --
Marcos Vinicius, Head of Technology Infra, Sicoob

"*… we are spending 400% less on power than if we had a distributed environment instead.*

-- Ricardo Antonio, CIO at Sicoob

Optimizing IT and Service Management

- ***Increase delivery velocity and quality*** of new business services
- ***Resolve problems faster*** for increased quality of service and reduced costs
- ***Predict & prevent issues*** before they impact end users
- ***Drive efficiencies*** in business processes and asset utilization

Stakeholder Dashboards

- IT Operations
- Development
- Line of Business

Operations

Provide end-to-end insight for smarter business decisions

Performance

Applications | Infrastructure

Ensure right availability of your critical business solutions

Automation

Service Desk | Process | Workload

More agility, with lower cost and risk

Analytics

Proactive outage avoidance and faster problem resolution

Key Adjacencies

Endpoint Management

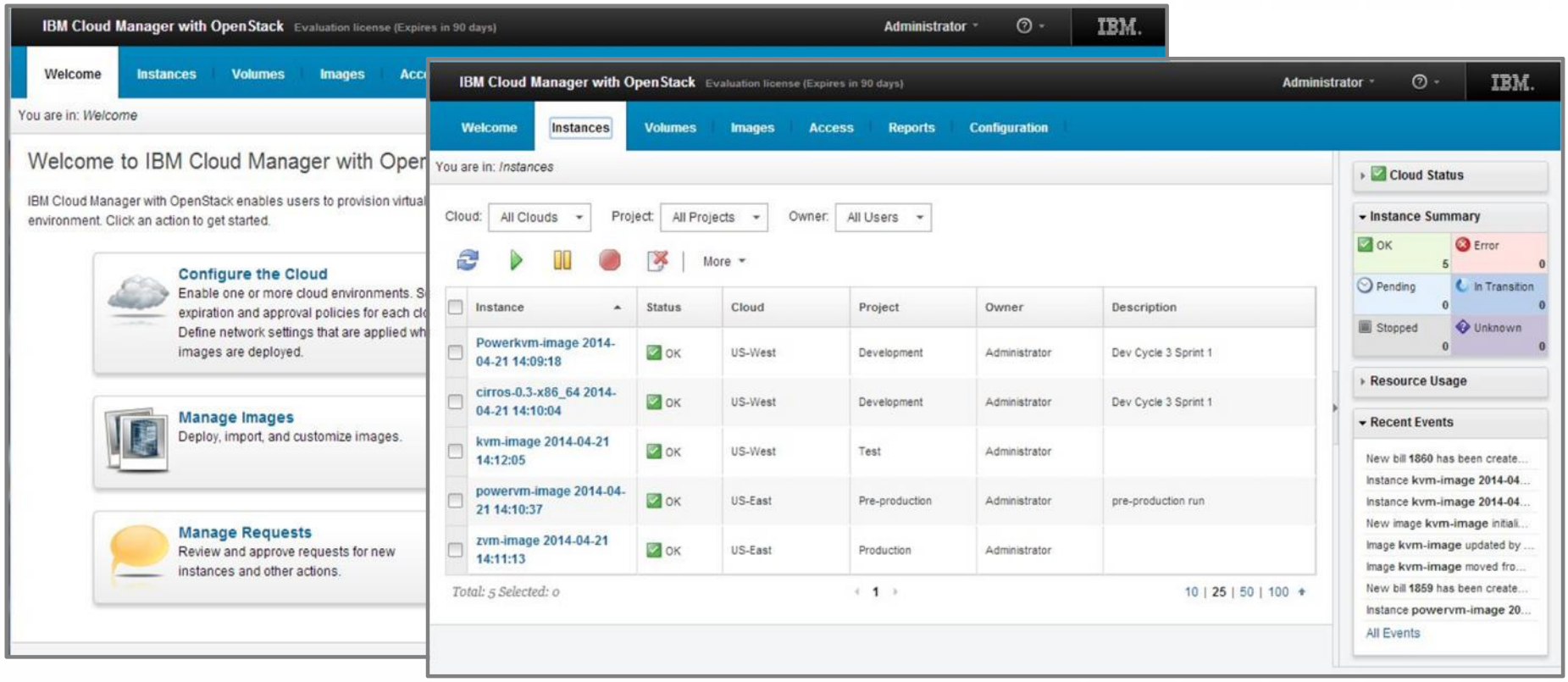
Storage Management

Hybrid

On Premise *Cloud*

Applications | Systems | Middleware | Wireless | Network | Buildings | Security | Storage | Assets

IBM Cloud Manager w/ OpenStack delivers benefits for users and administrators



Users

- Easy to access, easy to use Service Request Catalog
- Hides underlying infrastructure from user, shifts focus to services delivered
- Enables the ability to provide standardized and lower cost services

Administrators

- Tailor workload options for users and groups
- Monitor usage with workload metering
- Provides project level customization

IBM systems management offerings support multiple user roles

- The transition to cloud has empowered end users to perform tasks previously restricted to admins
- A distinct cloud admin role has emerged (separate from virtual/physical resource management)
- Skilled virtual resource management is required for virtual compute, storage and network infrastructure
- As always, skilled physical resource managers (either offsite or on-premise) are as critical as ever

IBM Cloud Manager with Openstack supports these user types

End users

Self-service IT requests via mobile & Web clients	**Manage cloud workloads Manage cloud users Manage cloud environment**
Manage physical resources (servers, storage and networking)	**Manage virtualized resources (servers, storage and networking)**

Cloud manager

Platform manager

Virtualization manager

Standardization and Automation

IBM Cloud Manager with OpenStack is an easy to deploy, simple to use cloud management software offering **based on OpenStack with open cloud APIs**

IBM enhancements: self-service portal for **workload provisioning, virtual image management, and monitoring**

New with V4.2:

Heterogeneous management support

- System z managing Power and x86 servers
- Central management across multiple hypervisors & domains
- All **IBM server architectures** & major hypervisors supported

Pattern support

- **Chef-based patterns** based on OpenStack Heat pattern engine is now supported on System z
- **Workload deployment** based on patterns speeds delivery of new services

Hybrid Cloud support

- **Hybrid Clouds** on and off premise options via SoftLayer support

- **Accelerate Time to Market:** Establish Cloud environments quickly
- **Integrated Management:** Approvals, metering, billing, users and projects through a single 'pane of glass'
- **Flexible, modular design:** Based upon OpenStack IaaS - Access to OpenStack APIs. Extensible via REST API allowing partners to easily customize the UI

Custom Pattern List

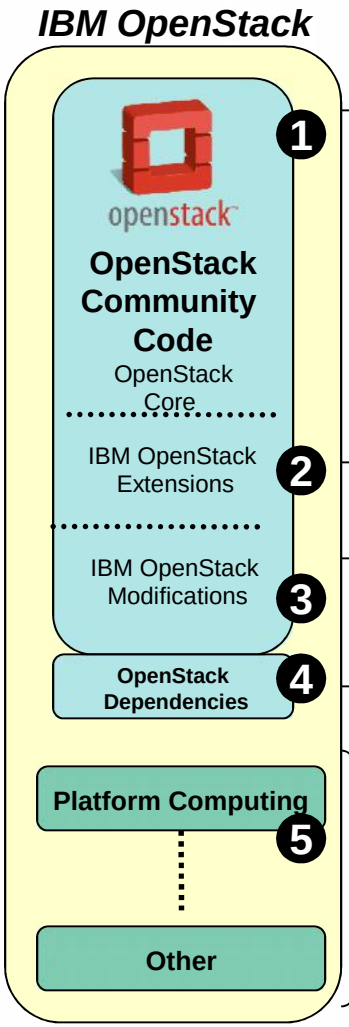
January 14th announcement – Custom Patterns significantly increase the patterns available for Linux on z

- WAS Network Deployment
- WAS Liberty Core
- DB2 Enterprise Server Edition
- WebSphere MQ
- IBM Integration Bus
- IBM Operational Decision Manager

- IBM Business Process Manager
- IBM Business Monitor
- MobileFirst Platform Foundation
- WebSphere Portal
- Cognos Business Intelligence

Orderable parts created for each product enabling base product plus custom pattern capability

ICM 4.2 is Based on OpenStack Juno but better than community



OpenStack Community Code (Core)

- Based on Community Juno release, with Nova, Cinder, Neutron, Keystone, Glance, Heat, Trove, Sahara, Horizon, Ceilometer
- Based on Redhat 6.5
- IBM certified function list and support matrix

IBM OpenStack Plug-ins / Extensions

- Simple Token for single sign on
- VMware native driver (preview)
- PowerVC driver
- GPFS, XIV, SVC cinder driver
- z/VM driver

IBM OpenStack Core Modifications

- IBM Config strategy to active IBM i and AIX image
- dynamic flavors, DB2 support, and globalization support for enterprise
- password obfuscation
- security enhancement
- Reliability enhancement

OpenStack Dependencies

- RabbitMQ as the message queue service
- OVS for network performance improvement
- Packaging for IPv6 and L3 network

IBM OpenStack Value-Add

- IBM SCE GUI for self service portal
- IBM PRS for smart scheduling
- IBM PCM for bare metal provisioning (preview)
- IBM GPFS

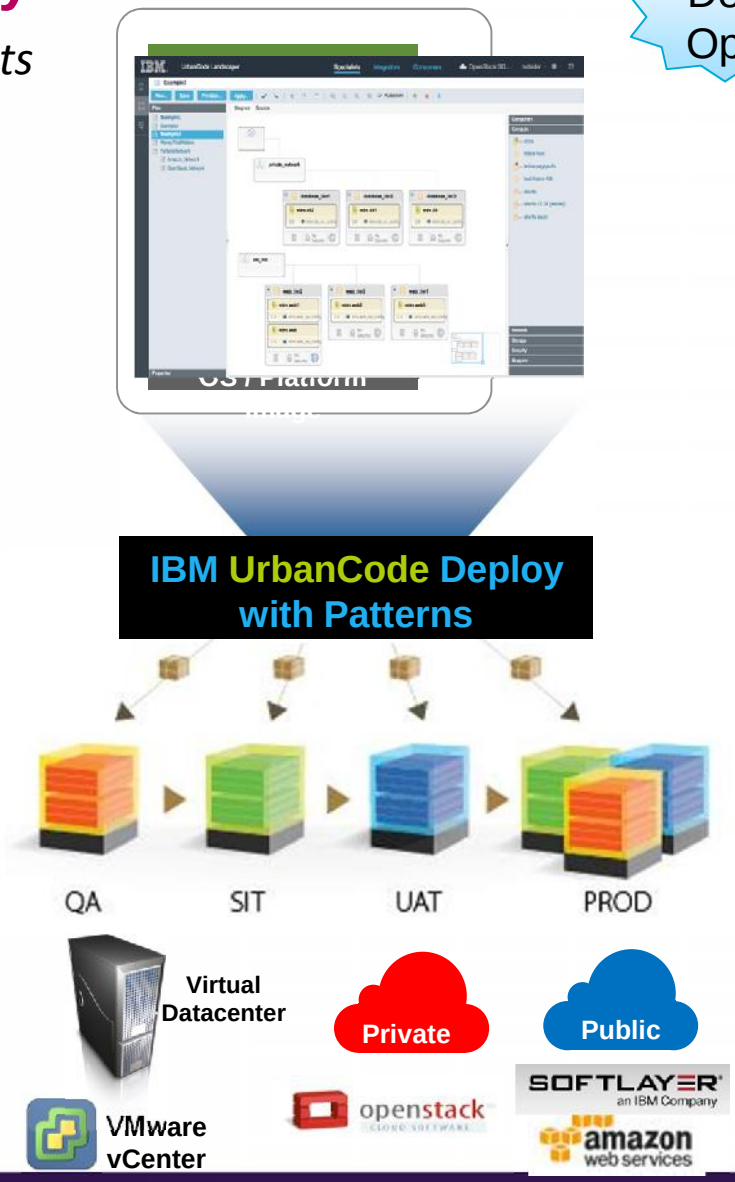
Introducing IBM UrbanCode Deploy with Patterns

Dev Ops

Design and deploy full stack application environments for multiple clouds

- ✓*Pattern designer*
  - – Design open, full stack application environments in a diagram or textual editor
- ✓*Design once, deploy anywhere*
  - – Deploy full stack environments to multiple clouds, Supports OpenStack HEAT
- ✓*Environment lifecycle management*
  - – Manage infrastructure change and easily apply changes to existing environments
- ✓*Delivery process automation*
  - – Automated delivery process with integrated full stack environments

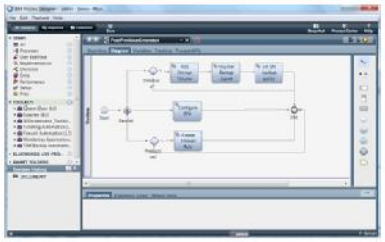
https://ibm.biz/BdFc2X



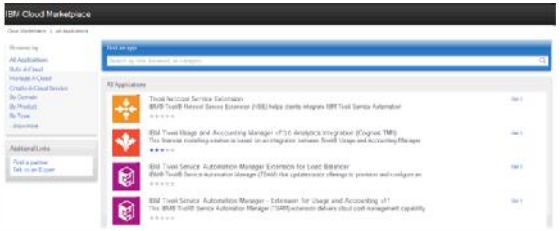
Orchestration & Optimization - IBM Cloud Orchestrator

An open and scalable cloud platform

An easy to use orchestrator for cloud service automation



A marketplace for automation packages sharing and re-use

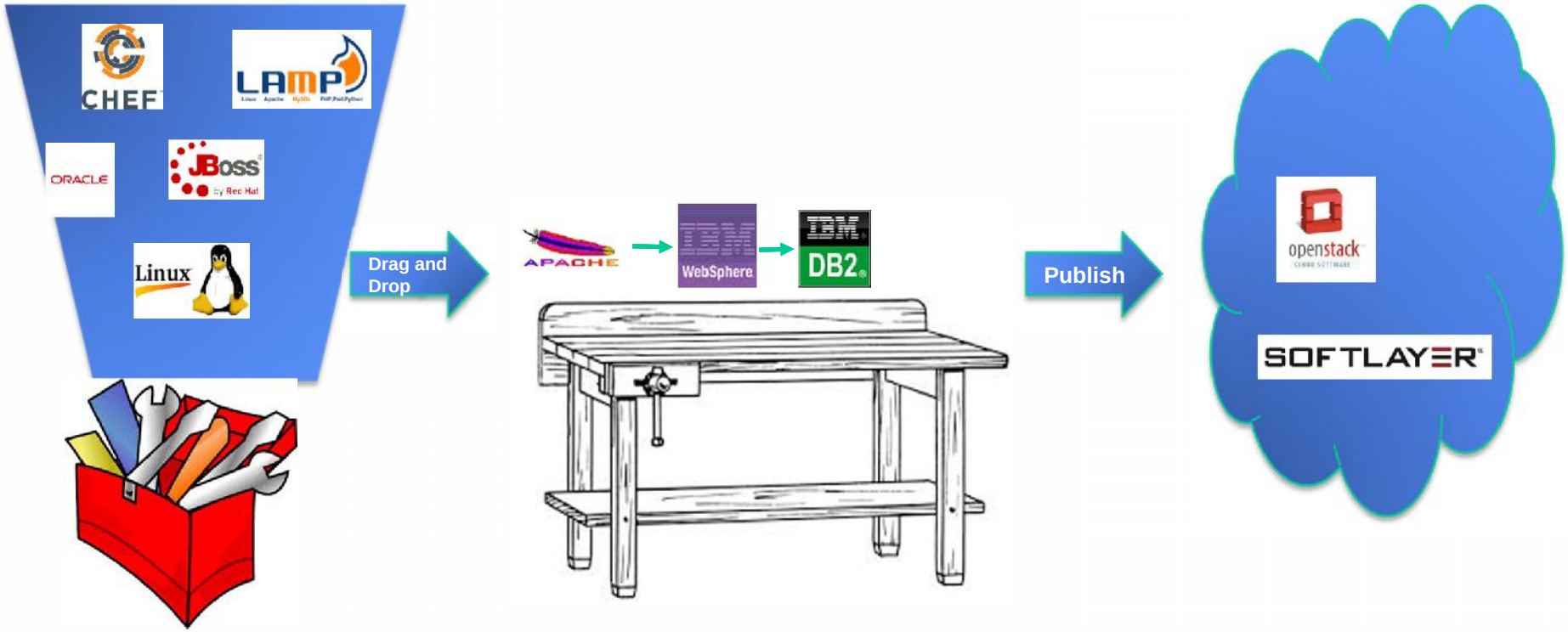


A rich set of ready to use automation packages

Consolidate and Virtualize → **Automate and Standardize** → **Optimise and Orchestrate** → **Cloud Service Management**

Workload Orchestration

- Easy to build and maintain **multi-tier topology patterns** through a simple to use pattern technology provided by IBM's advanced patterns engine
- Access **Marketplace** for out of the box patterns that speed delivery of new services
- Growing IBM and **third party ecosystem** of federated automation content for fast deployment of services



Positioning Cloud Management Solutions from IBM

Modular Capabilities – Common Cloud Management Services

IBM Cloud Orchestrator

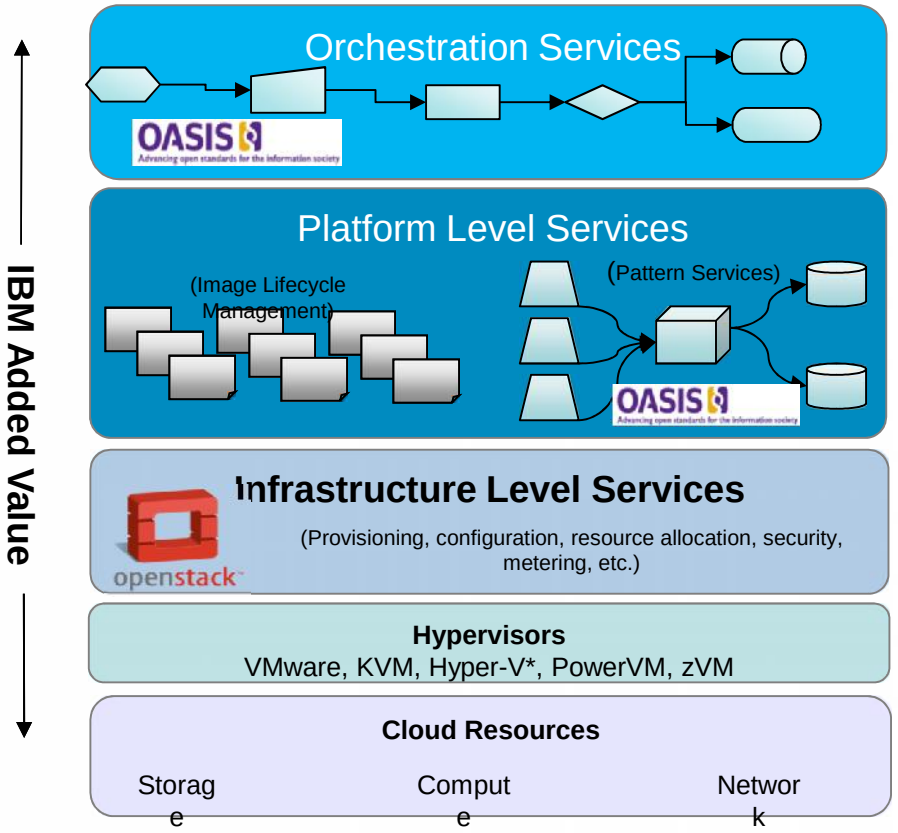
Enables Infrastructure, Platform & Advanced Orchestration Services:

- Eases coordination of complex tasks and workflows, necessary to deploy applications
- Deploy application topologies or patterns
- Take advantage of the pattern library

IBM Cloud Manager with OpenStack

Enables basic Infrastructure Cloud Services:

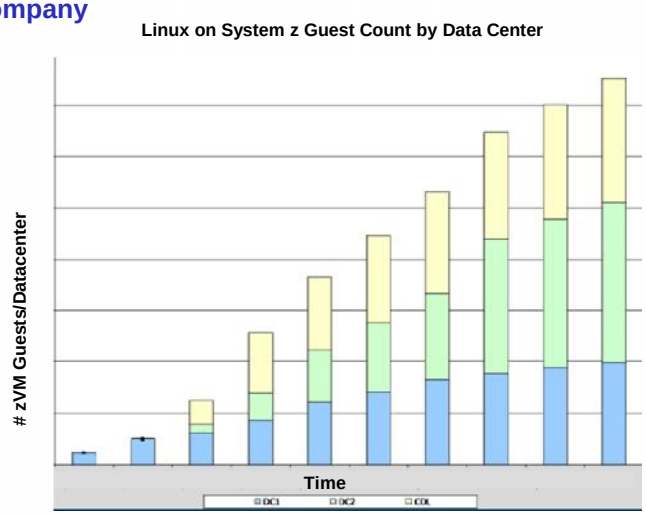
- Cloud provisioning and automation based on OpenStack
- Simplified implementation, lifecycle management, resource management, self-service portal, monitoring & metering
- Full access to OpenStack APIs – All IBM server architectures and major hypervisors now available to choose from
- Integrated platform management, backed by IBM enterprise-grade lab services and support



* On IBM Cloud Manager with OpenStack today
IBM Cloud Orchestrator for System z planned for 2014

Linux on System z IT Economics client successes

Finance Company



Benefits Realized:

- Software savings – Savings ($$ millions) via Core and PVU based software license fees
- Environmentals – Savings ($$ millions) and Cost avoidance ($$ more millions): Power, Cooling, Cabling, Switches, Data Center expansion
- Enhanced D/R capabilities with LPAR/Guest replication
- Improved Flexibility with Capacity on Demand
- Perf / Response times 50-500% response time & throughput improvement
- 2x throughput improvement on JAVA-based Payroll Application
- RAS: Not uncommon for LPAR's supporting hundreds of guests to be up for 6-8 months without an IPL

L3C LLP

Benefits Realized:

- Using an Infrastructure-as-a-Service (IaaS) model, IBM Business Partner L3C LLP provides robust reliability, security and affordability of a System z server running Linux for its cloud customers
- Midsized companies can benefit from mainframe-caliber services at a cost that's sized for their business
- Saves customers money by eliminating hardware acquisition and licensing costs
- Reduces customers' economic risk through an innovative "proof of concept" engagement

Deliver reliability and cost savings to cloud customers with IBM System z

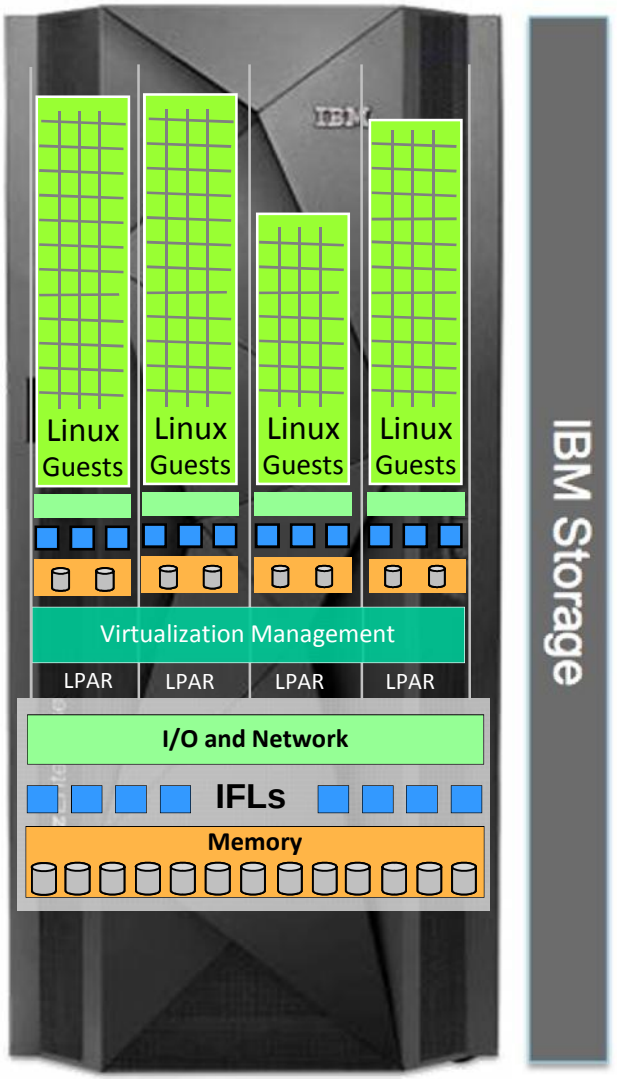
"*System z hosting a virtualized Linux environment differentiates L3C in level and quality of service.*

-- Lubo Cheynatov
Founder and co-owner, L3C LLP

Introduction to IBM Enterprise Cloud System

Converged Infrastructure-as-a-Service solution, providing a highly available, secure, cloud platform based on System z technology

- **Pre-configured and integrated system**
  - Includes Processor, Disk, Hypervisor, Cloud Management Software and Services
  - Pre-installed cloud management software that leverages open source such OpenStack and Linux to deliver orchestration, provisioning and monitoring
  - Integration performed at IBM's Customized Solution Center and onsite by STG Lab-Based Services
- **Flexible configurations**
  - No fixed sizes - flexibility on hardware configurations allow customers to choose the right amount of resources for their workload
  - Sample configurations will be provided to Sales Team as guidance and comparison



IBM Enterprise Cloud System

Announced on April 2014
Availability in June 2014

- **Pre-Configured and Integrated system**
  - Processor, Network, Disk, Hypervisor, and Cloud Management Software integration
- **Cloud Management Software Stack**
  - Pre-installed cloud management software that leverages open Standards such OpenStack to deliver orchestration, provisioning and monitoring.
- **Simplified Pricing / Growth / Ordering**
  - 6 Reference configurations with view of the price (pay what they use)
  - IBM MSP Utility Pricing for z System – 'Pay-as-You-Grow'
- **Hardware**
  - z13 / zEC12 / zBC12
  - IBM DS8870 or Storwize V7000
- **Virtualization Management**
  - z/VM 6.3, incl. DirMaint, RACF, PerfTK, SSI (requires ECKD)
  - IBM Wave for z/VM
- **Cloud Management, Automation and Backup Software:**
  - Cloud Management Suite for System z:
    - IBM Cloud Orchestrator
    - OMEGAMON XE for z/VM and Linux
    - Tivoli Storage Manager
  - Operations Manager for z/VM
  - Backup and Restore Manager for z/VM

Service Management z System support continues to evolve with new capability for cloud, analytics and mobile

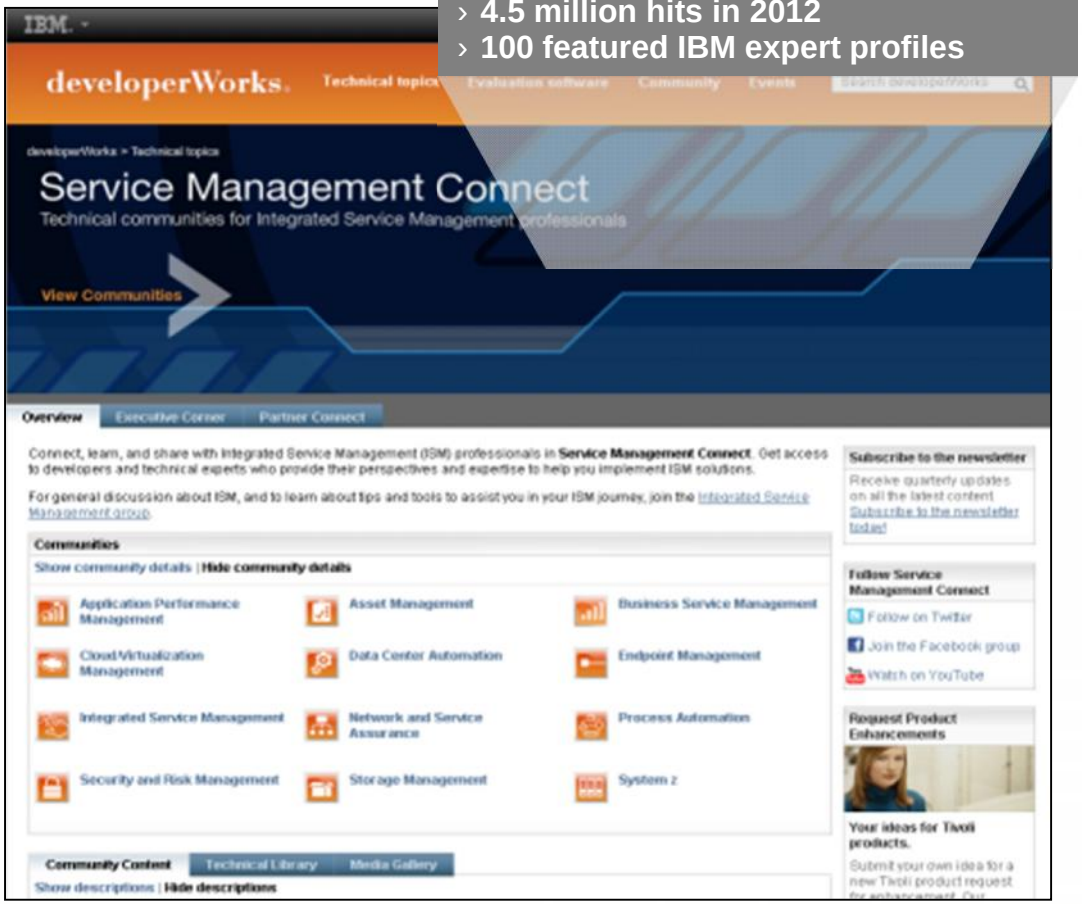
- zEnterprise supports both Systems of Record and Systems of Engagement, including Cloud on z System
- IBM z System cloud support based on open standards with fit for purpose capability
- Continuing to enhance z System Visibility, Control and Automation capabilities for cloud based on key customer requirements and enhanced zEnterprise

Service Management Connect

Connecting future of service management

- Transparent development
- Product roadmaps
- Code downloads and demos
- Access to the System z experts
  - Forums
  - Blogs
  - Wikis
- Best practices
- Submit requirements

› **250+ System z blog entries from the IBM experts**
› **4.5 million hits in 2012**
› **100 featured IBM expert profiles**



Thank You

Executive presentation are available for downloading at

http://www-01.ibm.com/software/os/systemz/itsm/

Virtualization and Cloud Portfolio for Linux on System z

Virtualization	Entry Level Cloud	Advanced Cloud
Infrastructure & Virtualization Management	Standardization & Automation	Orchestration & Optimization

zEnterprise: z13, zEC12, zBC12

- Massively scalable
- Characterized by great economics / efficiencies
- Highly secure / available

z/VM 6.3

- Support more virtual servers than any other platform in a single footprint
- Integrated OpenStack support

Linux on z System

- Distributions available from RedHat and SUSE

IBM Infrastructure Suite for z/VM and Linux

- Administrate, manage and automate the zVM environment
- Backup / restore for zVM and Linux on System z resources.
- Includes IBM Wave for virtualization management

Virtualization

Cloud Manager with OpenStack

- A simple entry level cloud management stack
- Available to run on System z ("manage from" support)
- Also available to run from Linux x86 or Power, "manage to" Linux x86, Power, and System z environments
- Based on OpenStack
- Can deploy CHEF and HEAT based Patterns
- Formerly known as SmartCloud Entry

Standardization

IBM Cloud Orchestrator

- Based on OpenStack
- Builds on functionality of **Cloud Manager with OpenStack** and adds runbook automation and middleware pattern support for workload deployment
- Formerly known as SmartCloud Orchestrator
- Run from Linux 86 or Softlayer “manage to” Linux x86, Power, and System z environments.

Orchestration and Optimization

Track, allocate and report resource usage accurately including chargeback

Cloud Cost Management

Assess shared computing resource usage

- Insights into relationships between virtualized and physical IT assets
- Usage metering coverage to help determine costs based on allocation and utilization.
- End user visibility into cost implications of services requesting .
- Mechanism for chargeback with accurate metering and cost rating tool
- Integrates secure cloud usage reporting with the cloud provisioning and management so users can manage infrastructure costs

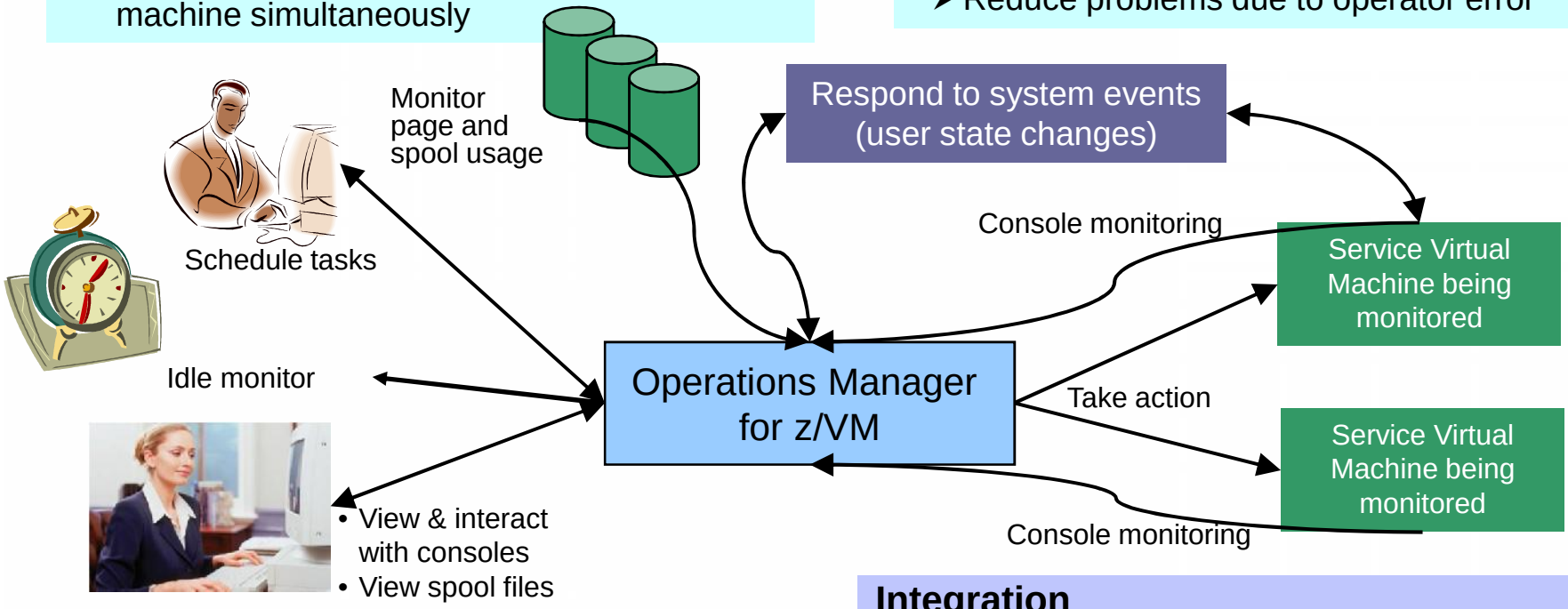
Operations Manager for z/VM

Increase productivity

- Authorized users to view and interact with monitored virtual machines without logging onto them
- Multiple users view/interact with a virtual machine simultaneously

Improve system availability

- Monitor virtual machines and processes
- Take automated actions based on console messages
- Reduce problems due to operator error



Automation

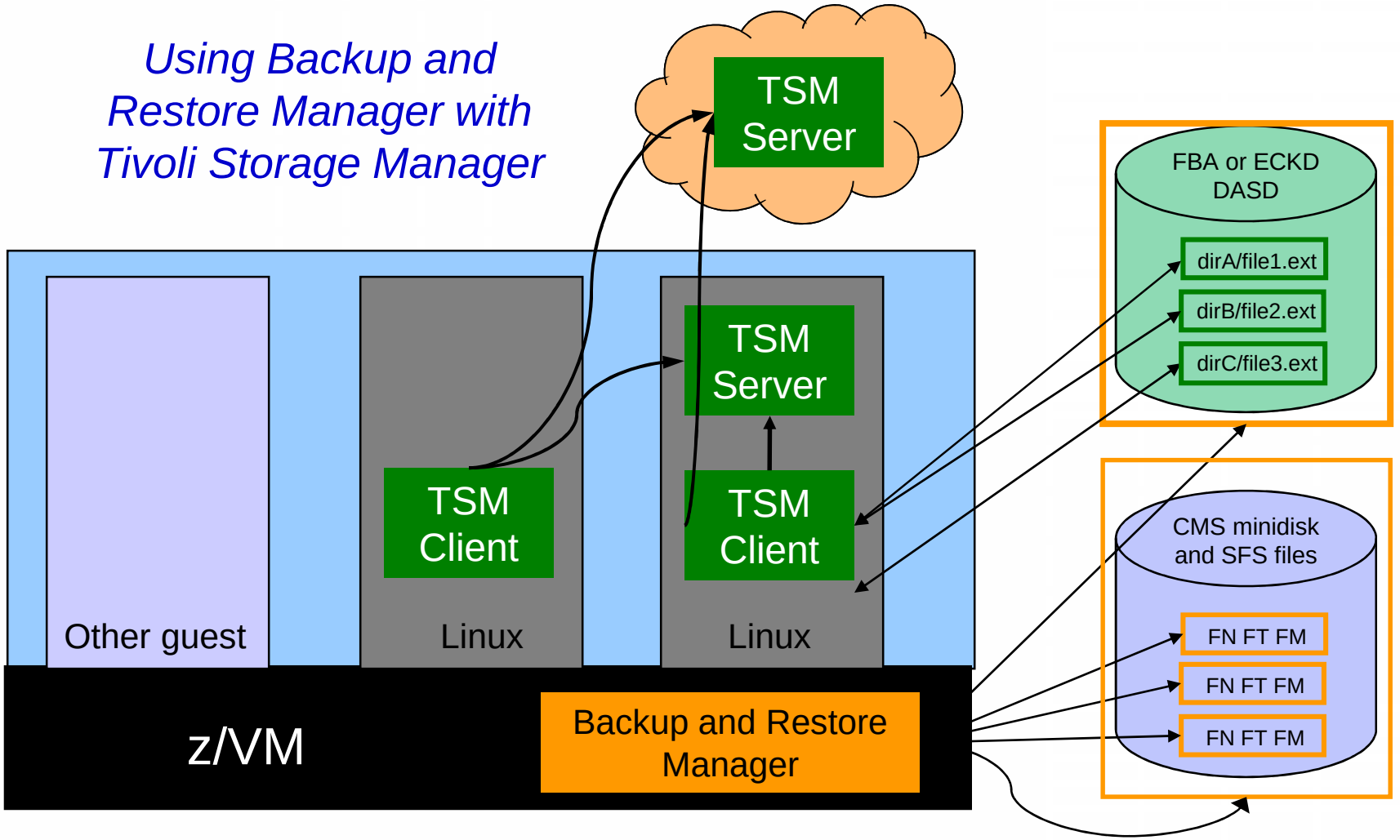
- Routine activities done more effectively with minimal operations staff
- Schedule tasks to occur on a regular basis

Integration

- Fulfill take action requests from performance monitoring products (e.g. OMEGAMON XE on z/VM and Linux)
- Send alerts to email, central event management systems (e.g. Netcool\OMNIbus), etc.

Complete backup and recovery solution

Using Backup and Restore Manager with Tivoli Storage Manager



Backup and recovery with Tivoli Storage Manager Extended Edition

Backup/Recovery

Performance: High-performance, scalable backups and restores that minimize network traffic

Disaster recovery: Performs automated, scheduled asynchronous replication of backup data and metadata

Flexibility: Data protection and disaster recovery for more than 500 different disk, tape and virtual tape storage

Scalability and reliability Management of up to four billion data objects on single server architecture built on IBM DB2®

Backup and Restore Manager for z/VM

- **Backup**
  - Requested by administrators
  - Full or incremental
  - Flexible selection of disks and files to back up
  - Review job before submitting for backup
- **Restore**
  - Restore data via full screen interface or commands
  - Performed by users for their own data
    - Extended to other users available via exit
  - Performed by administrators for any data

- **Integration with Tape Manager for z/VM**
- **Optional compression of data during backup via exits**
  - **Call your own compression algorithm**
  - **Use IBM provided routine**
- **Encryption available via exits**
  - **Call your own routine**
  - **Use vendor-written routine, such as V/Soft Software's Encrypt/Backup for z/VM**
  - **Use encryption capable tape devices**