



Leveraging Cloud: A Case Study

Tivoli's IT Transformation

IBM Software

PCTY2010



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Optimizing the World's Infrastructure
[27th May - London]



Agenda

- Introduction
- Approach
- Lessons learned
- Implementation detail
- 2010 strategy



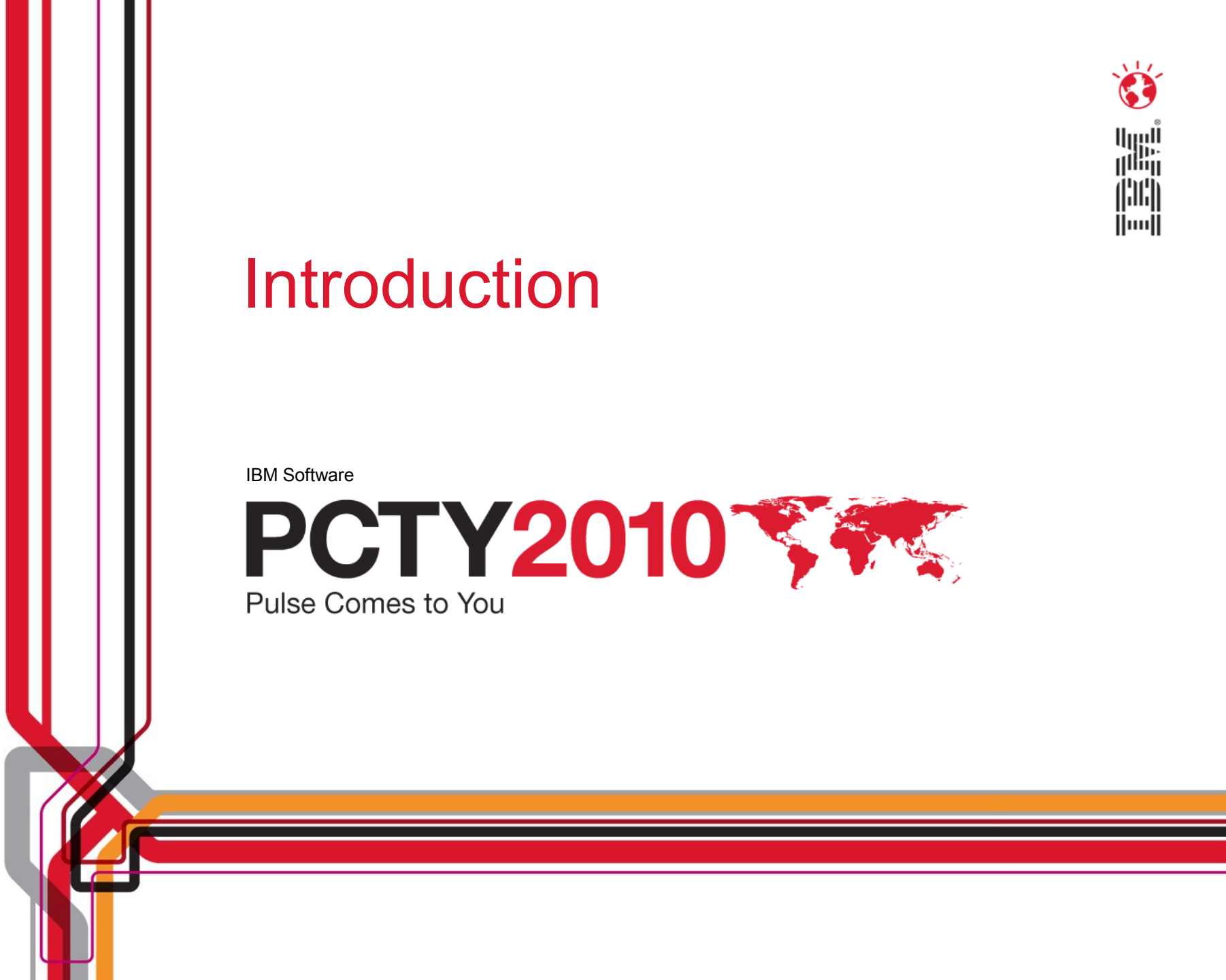
Introduction

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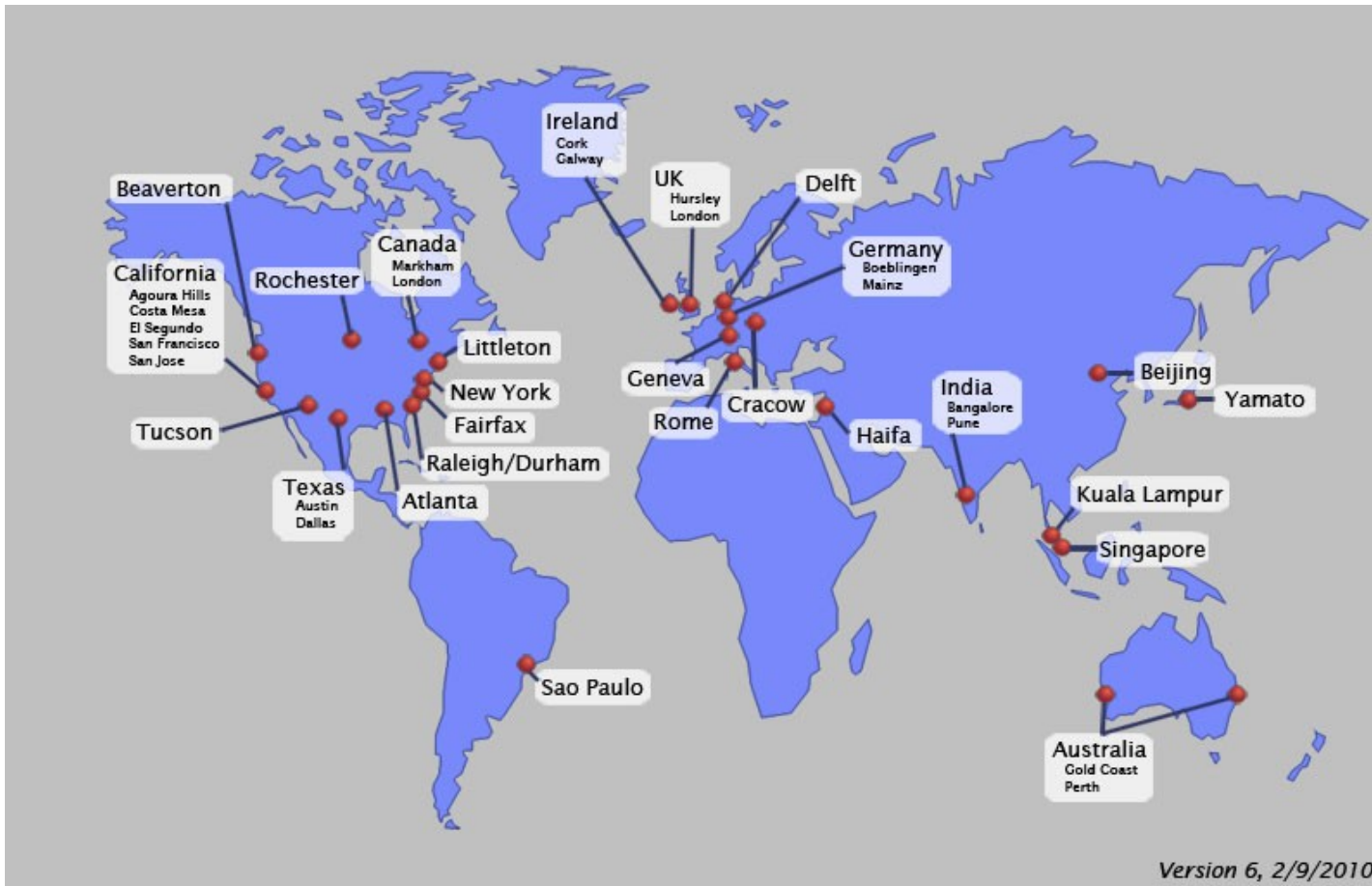
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Tivoli Test and Development



➔ • Geographically dispersed team of ~4000 team members

Tivoli's approach to delivering IT needed to become smarter... about delivery 'services'



- IT footprint expanded to 38 labs through growth and acquisitions, creating inefficiencies, increased capital & operational expense
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- The growing complexity of our IT systems demanded that sprawling processes become standardized services that are efficient, secure and easy to access
-
-
- A **Service Management System** to provide *visibility, control and automation* across IT and business services to ensure consistent delivery
-
- New model consumption and delivery for IT services



Key business challenges

- **Reduce capital expense and maximize existing investment**
 - Underutilized hardware: average of 5-9% utilization per server
 - Duplication in the capital request and procurement process
- **Standardize & Automate end-user services and mitigate schedule risk**
 - Provide predictable, rapid access to reserve, provision and deploy servers
 - Development and IT labs had a variety of tooling from homegrown to matured implementations
 - Teams heavily leveraging hypervisor mgmt tools, images were everywhere!!
 - Infrastructure and virtualization strategies not unified
 -
- **Learn how to more to effectively manage resources and IT services in the cloud with Tivoli Service Management**
 - Our teams needed educating on Tivoli's solution capability
 - Development, Test teams saw the face of IT as a 'ticket system'



We had lots of questions.....

-
-
- Where do we start
-
- How do we get from point A to B to C....?
-
- What business process changes will we need to plan for?
-
- How do we approach ROI measurements?
-
- What does cloud mean for our business?
-
- How do we mirror what IBM do for customers so we can use our efforts to help drive client value?



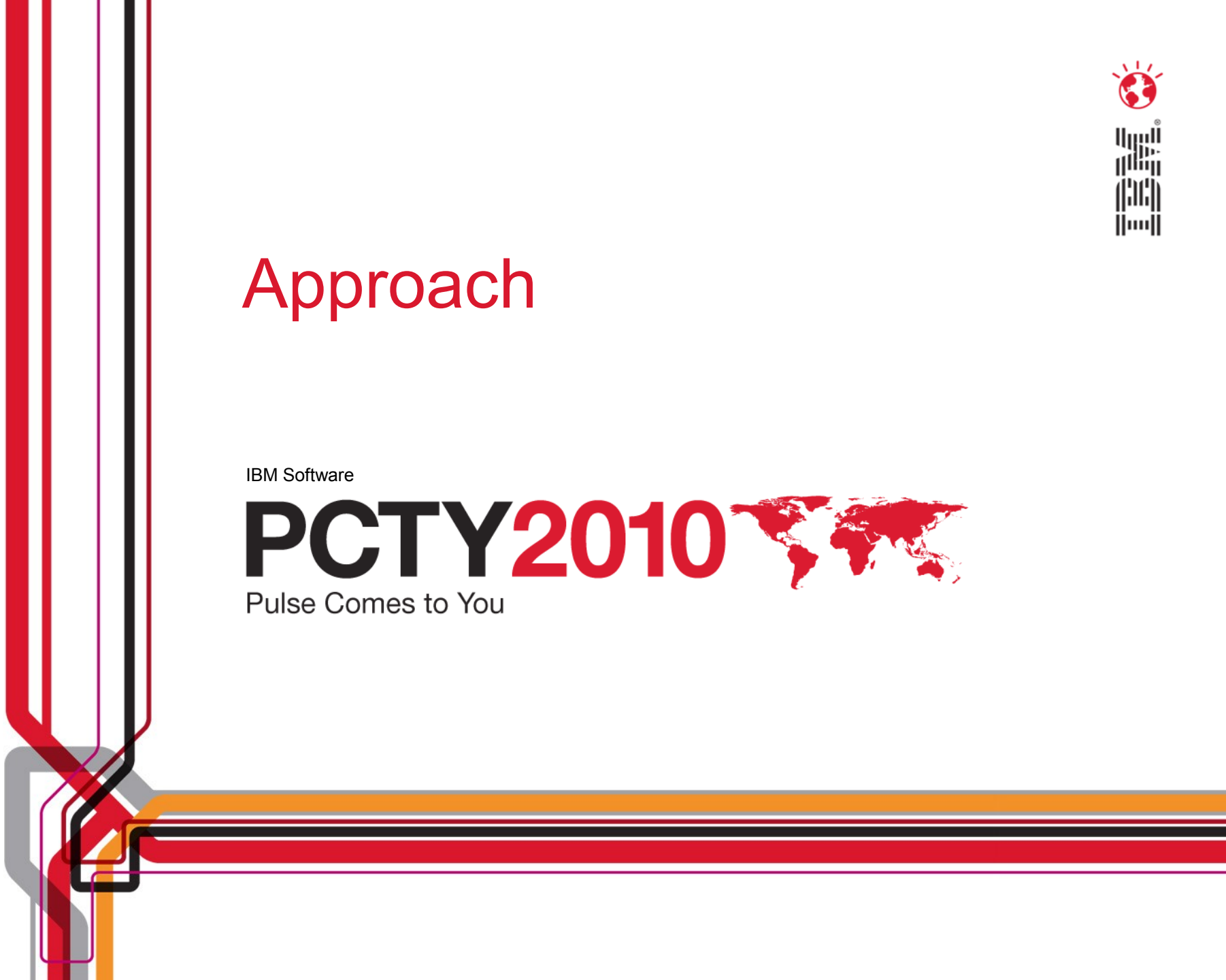
Approach

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- Consolidate underutilized IT resources into larger, denser, scalable clusters
- Pool resources
- Manage and control pooled resources

- Reserve resources for applications through standardized images
- Provision and de-provision resources based on reservations
- Manage workloads with advanced scheduling, integrated security and information virtualization

Centralize

Infrastructure Anchor Sites

- Establish an enterprise data center strategy that aligns with the business needs, continuity requirements and geopolitical considerations
- Implement strategy to all locations and geographies including site relocation, consolidation, and new construction

Consolidate

Lab Consolidation Plan

Virtualize

Implement vCells

- Define virtual resources to separate physical IT resources from its use to deliver services
- Establish single management system for virtual resources
- Integrate security and workload management
- Schedule and control virtual resources based on application requirements and SLAs

Automate

Utilize TSAM

Orchestrate

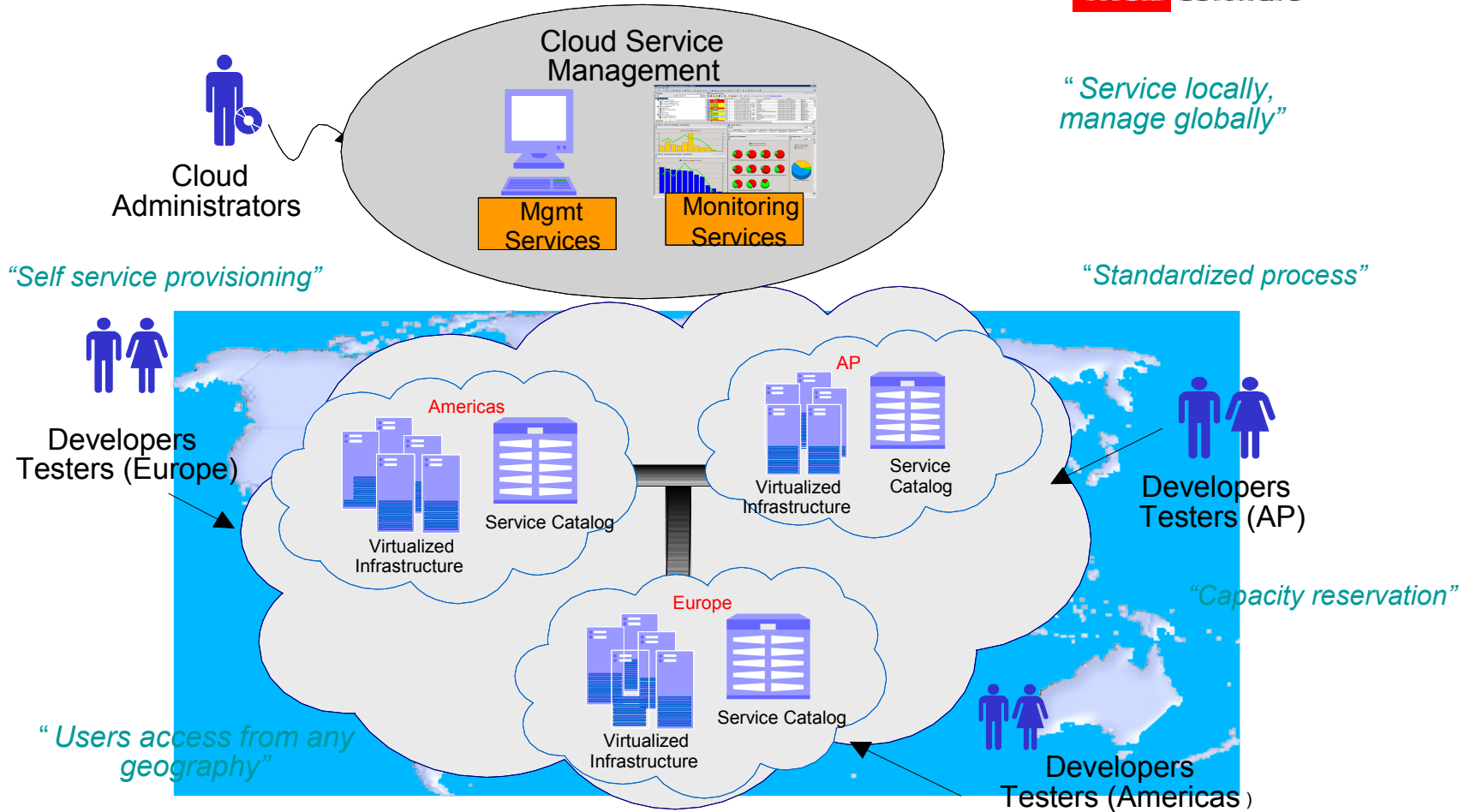
Leverage ISM Stack

- Optimize workloads to maximize performance and efficiency
- Prioritize workloads to attain SLAs
- Move workloads to appropriate virtualized infrastructures to reduce costs
- Define policies for workload management
- Schedule and orchestrate workloads based on policies

Tivoli's private cloud

"Ability to snapshot and share images"

Tivoli software





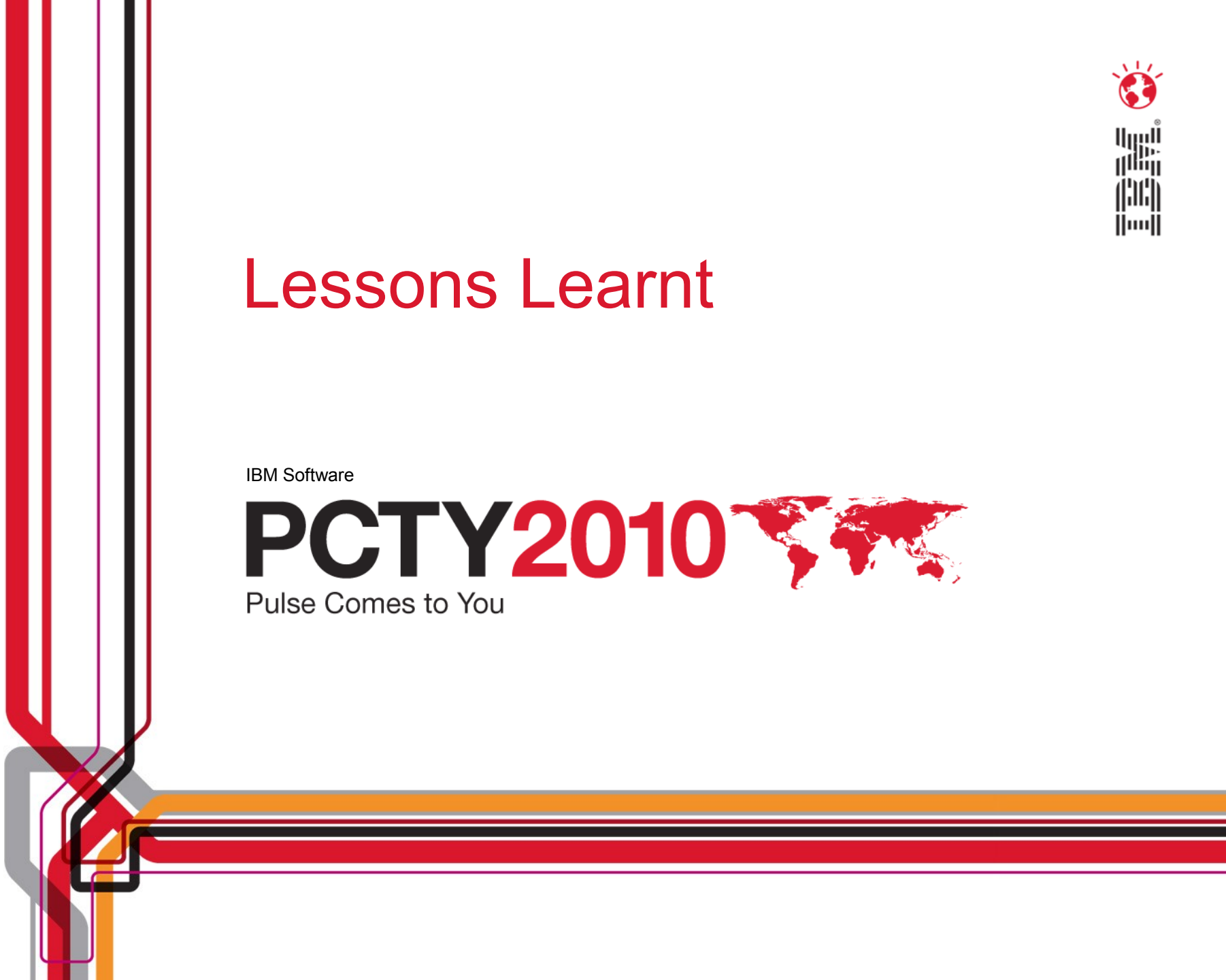
Lessons Learnt

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Lessons learnt – Cloud transformation

-
- **Architecture is key**
 - Delivering a cloud solution requires integration of multiple products with existing and new business processes and the consumability of that solution is the critical factor in success
 -
- **Use cases must be clearly identified**
 - Cloud infrastructures have multiple dimensions with a broad set of roles
 - Validate that you are addressing everyone's needs and not just a particular role
 - Not everything can be tested/developed in a cloud environment*
-
- **Implementation should be phased**
 - Establishing a cloud is a true transformation of both IT and Development business processes
 - The alignment of IT and Development operational strategies is key
-
- **Return on Investment**
 - Engage early and often on the topic of ROI – Trust but Verify!!!

Lessons learnt – Business process transformation

-
- **Financial Processes – (Smarter investment strategy)**
 - Appointed single capital approver operating across Tivoli pillars
 - Virtualization is default and physical machines require exception approval
-
-
- **Development Processes - (Efficiency)**
 - Education on self-service provisioning technologies
 - Understanding what workloads to transition
 - Think about images rather than physical machines
 - Think about capacity at planning stages of a project
-
-
- **Cloud Service Provider Processes**
 - Went from ticket based system to self service
 - Full ISM education program worked into schedule
 - Move homegrown and use of Hypervisor Mgmt tools into IBM service management



Lessons learnt – Not all testing/development can be done in a cloud

-
- **Test objectives that are best suited for the Cloud are those focused on functionality:**
 - Agile development methodologies work exceptionally well
 - Unit, functional and build verification testing
 - Testing of integration/interoperability points between software products
 - Install, upgrade, and migration testing
 - Globalization, security, time-to-value, and serviceability testing
 -
-
- **Physical machines are still needed:**
 - Many of our clients still use physical machines
 - For large customer simulations (high load, long duration)
 - For performance, scalability, and capacity planning studies
 - In support of “persistent test configurations” which don't benefit from the flexibility of virtualization
-
- **It's important to understand that not all testing can be achieved with virtualization**

User experiences

- **Developer & IT Specialist Efficiency**

- “When using the cloud service for a complex SVT scenario of 7 machines, the total lifecycle took 2.5 hours. In our own lab we’d have had to find the machines, install & configure the OS, patch the OS, potentially network. (assuming person availability, hardware capacity & parallel bootloads), this represents an improvement of ~70% on the time it would have taken us.”

- The ISM stack gives me single point visibility into the cloud storage and utilization allowing me to focus on increasing our service with additional offerings

- **Process Optimization**

- “It is certainly easier, quicker and more logical than any capital ordering process!”

- “For standard specification machines i no longer need to raise an IT ticket”

- **Dynamic Infrastructure**

- “I can request a machine and within a couple hours it will be available. That is really nice and makes it easier to give up the machine when testing is done

- “A great thing about the cloud is that you can request for more memory and disk space when you need to expand the system.”



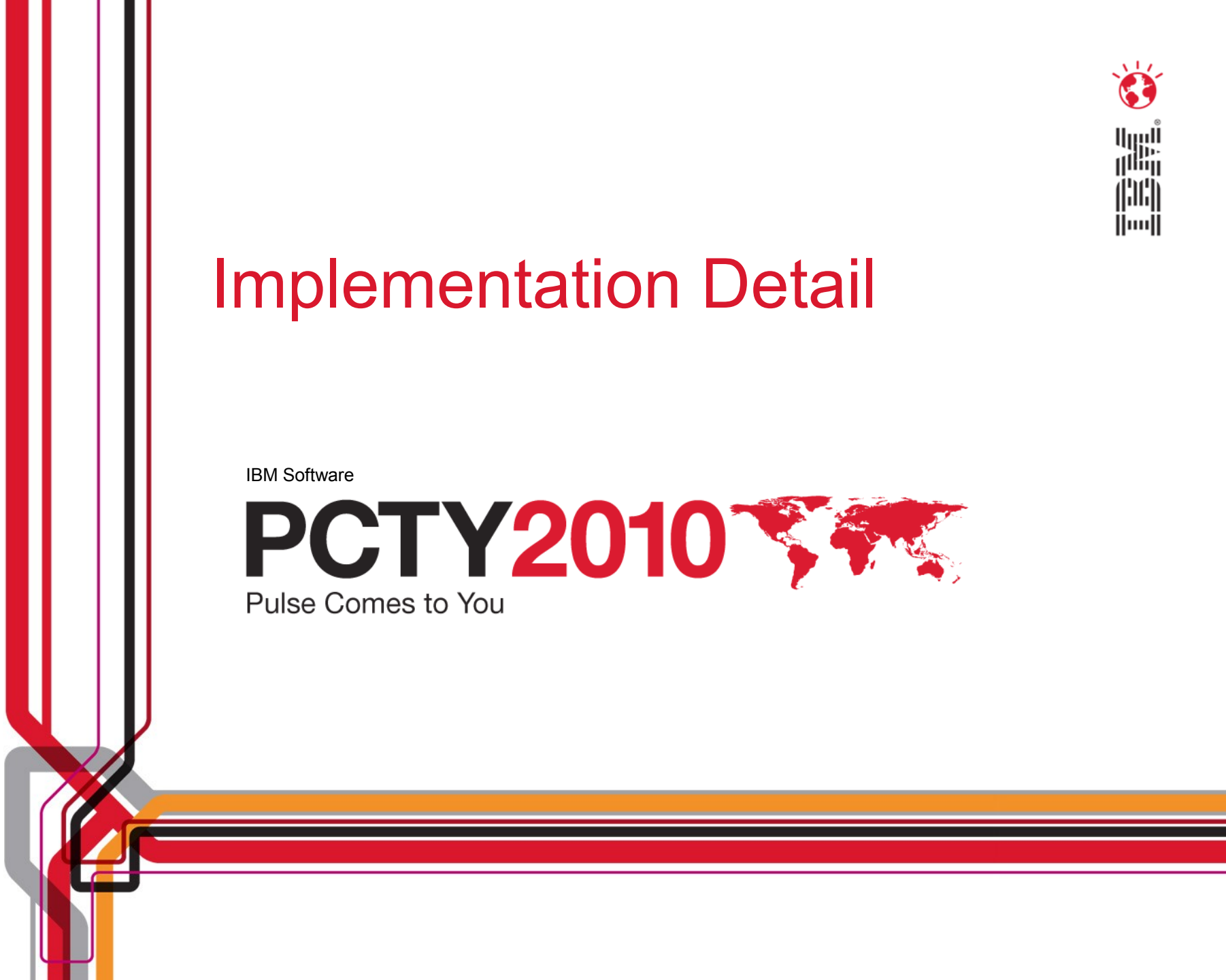
Implementation Detail

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Executive Dashboard - (TBSM)

Tivoli. View: All tasks Welcome dmatt Help | Logout

vCell Top L... | vCell DataS...
--- Select Action ---

vCell Top Level

Service	State	Events	#VMs	#VMs On	Avg CPU	Avg Mem
ISST	■	■	208	158	21.0 %	50.75 %
Krakow	■	■	380	259	54.667 %	68.167 %
Rome GymLab	■	■	376	115	22.0 %	64.833 %
Singapore	■	■	169	70	9.333 %	42.167 %
vCell #1 (RTP)	■	■	461	355	23.667 %	39.778 %
vCell #2 (Austin)	■	■	616	540	42.875 %	66.889 %
vCell #3 (RTP)	■	■	321	242	13.444 %	36.667 %

#VMs by Project (Top Ten)

Project	#VMs
IBM Tivoli Monitoring	54
IBM Change and Configuration Management Database	45
Content Delivery System	40
IBM Tivoli Identity Manager	25
IBM Tivoli Business Service Manager	20
IBM Tivoli Composite Application Manager for Response Time	18
Common Agent Services	18
IBM Tivoli Workload Scheduler	17
IBM Tivoli Application Dependency Discovery Manager	17
IBM Tivoli Asset Management for IT	16

Service Viewer

File Edit View Restore

Tivoli Development Cloud Top Level

CPU (Percent)

Memory (Percent)

Storage (Percent)

Temperature (C)

Power (Watts)

Humidity (Percent)

VMs On: 1739.0
Total VMs: 2531.0
Virtual Machines

Service Details

SLA **Events** Rules

https://tdstbsm.tivlab.raleigh.ibm.com:16316/RawEvents_70

Node	BSM_Identity	
VM:rtlvragen-gym1	VM:rtlvragen-gym1:ESX	
VM:ausvcell8-ausvh	VM:ausvcell8-ausvhost80:ESX	Austin_Datastore_Freesp
VM:rtpvcell7-rtpvhos	VM:rtpvcell7-rtpvhost70:ESX	RTP_Datastore_Freespac

29/29 All[29/29]

29 Rows Matched dmatttdstbsm.tivlab.raleigh.ibm.com:16316

Operational Dashboard - (TBSM)

Tivoli View: All tasks Welcome landersm Help | Logout IBM

vCell Top Level Dashboard

vCell Overview

Service	State	Events	#VMs	#VMs On	Avg CPU	Avg Mem
POC vCell (RTP/Aus)	✗	✗	85	56	15.875 %	31.875 %
DataStores POC	✓	✓	0	0	0.0 %	0.0 %
rtpvhelm60.tivlab.raleigh.ibm.com						
VM:rtpvhelm6-ausvhost62:ESX	✓	✓	26	9	19.0 %	42.0 %
VM:rtpvhelm6-ausvhost63:ESX	✓	✓	10	8	31.0 %	35.0 %
VM:rtpvhelm6-ausvhost64:ESX	✓	✓	12	9	9.0 %	30.0 %
VM:rtpvhelm6-ausvhost65:ESX	✓	✓	13	13	12.0 %	41.0 %
VM:rtpvhelm6-rtpvhost60:ESX	✓	✓	3	3	7.0 %	27.0 %
VM:rtpvhelm6-rtpvhost61:ESX	✓	✓	3	3	8.0 %	30.0 %
VM:rtpvhelm6-rtpvhost90:ESX	✓	✓	13	6	24.0 %	32.0 %
VM:rtpvhelm6-rtpvhost91:ESX	✗	✗	5	5	17.0 %	18.0 %

vCell Infrastructure

POC Cell (Averages):

- CPU (Percent): 15.875
- Memory (Percent): 31.875
- Storage (TB): 15.875
- Temperature (F): 15.875
- Power (Watts): 15.875
- Humidity (Percent): 15.875

Status refresh in 27 seconds...

#VMs by Project (Top Ten)

Project	#VMs
IBM Tivoli Monitoring	56
IBM Change and Configuration Management Database	46
Content Delivery System	40
IBM Tivoli Identity Manager	27
IBM Tivoli Workload Scheduler	21
IBM Tivoli Business Service Manager	20
IBM Tivoli Composite Application Manager for Response Time	18
Common Agent Services	18
IBM Tivoli Application Dependency Discovery Manager	17
IBM Tivoli Asset Management for IT	16

Service Details

SLA Events Rules

https://tdstbsm.tivlab.raleigh.ibm.com:16316/RawEvents_672

Node	BSM_Identity	KVM_Se
VM:rtpvhelm6-rtpvh...	VM:rtpvhelm6-rtpvhost91:ESX	KVM_Se
VM:rtpvhelm6-rtpvh...	VM:rtpvhelm6-rtpvhost91:ESX	KVM_Se
VM:rtpvhelm6-rtpvh...	VM:rtpvhelm6-rtpvhost91:ESX	KVM_Se
VM:rtpvhelm6-rtpvh...	VM:rtpvhelm6-rtpvhost91:ESX	KVM_Se
VM:rtpvhelm6-rtpvh...	VM:rtpvhelm6-rtpvhost91:ESX	KVM_Se

5 Rows Matched landersmtdstbsm.tivlab.raleigh.ibm.com:16316

Standardized Cloud Service Interface - (TSAM)

Tivoli Service Automation Manager

Welcome Denis Mattimoe | About | Help | Logout

Home > Request a New Service > Virtual Server Management

- Manage Users
- Modify Project
- Modify Server
- Cancel Project
 - Use this task to cancel a project. All of its virtual servers will be returned and made available for other users. Any saved images will also be deleted.
- Create Project with VMware Servers

My Requests

Resolved (275) Failed (31) Total (306)

Recent Activity

- Add VMware Servers My Project Resolved
- Create Project with VMware Servers DM Project 2 Resolved
- Create Project with VMware Servers OLI-eenew Resolved
- Create Project with VMware Servers My Project Resolved
- Create Project with VMware Servers OLI-senew Resolved

Manage Requests...

My Projects

Operational (12) Decommissioned (73)
Canceled (10) In Transition (2) Total (97)

Recent Activity

- DM Project 2 Operational
- olitest Decommissioned
- OLI-eenew Operational
- My Project Operational
- OLI-senew Operational

Upcoming Projects

No upcoming projects

Manage Projects... | Manage Servers...

Create Project with VMware Servers

*Project Name: My Project | *Team to Grant Access: VCELLTM

Project Description: This is my project

*Start Date: 4/13/2010 | *End Date: Until this date (4/27/2010)

Requested Image

Resource Group Used to Reserve Resources: RTP vCell03 | Monitoring Agent to be Installed:

Virtual Machine Usage (DDC): BVT | Tivoli Product List (DDC): IBM Tivoli Business Serv

*Image to be Deployed

Select	Name	Hypervisor	CPUs	Memory	Storage
<input checked="" type="radio"/>	RHEL 5.4 64bit	VMware	1	1 GB	8 GB
<input type="radio"/>	Windows XP 32 bit	VMware	1	1 GB	6 GB
<input type="radio"/>	Windows XP 64 bit	VMware	1	1 GB	6 GB
<input type="radio"/>	Windows 2008 EE 32 bit	VMware	1	1 GB	27 GB
<input type="radio"/>	Test - Sles 9u4 32 bit	VMware	1	1 GB	21 GB

Resources

To adjust the settings of the requested resources, press the setting button. After making the necessary adjustment, press the setting button to save the configuration.

Servers *Number of Servers to be Provisioned: 1 (563 available at above configuration and schedule)

CPU	Memory	Disk
Virtual 2 Physical 0.1	Main 2.000 GB Swap 0.000 GB	Local 8 GB

OK Cancel

Usage & Accounting Management (TUAM)

Invoice [Publish](#) [Close](#) [Help](#)

1 of 4 100% Find | Next Select a format Export

Document Map

- [-] Invoice
 - [-] DEPT_43BG3 019868758
 - [-] DEPT_43BG3 041246758
 - [-] DEPT_43BG3 I69792754
 - [-] DEPT_43BG3 PMRDPCAUSR

Usage and Accounting Manager

Invoice

Invoice Number 1

Date Range: 01/02/2010 to 08/02/2010

TDS

Building 510

3901 S MIAMI BLVD

RTP, North Carolina

United States of America

DEPT_43BG3 019868758

	<u>Units</u>	<u>Rate</u>	<u>Charge</u>
TivSAM - Assigned CPU hours	1,485.40	0.25000000	371.33
TivSAM - Assigned server hours	1,485.40	0.50000000	742.71
TivSAM - Assigned memory in MBs per hour	1,521,051.56	0.00300000	4,563.26
TivSAM			5,677.30
Total for: DEPT_43BG3 019868758			5,677.30

Run On: 10 February 2010

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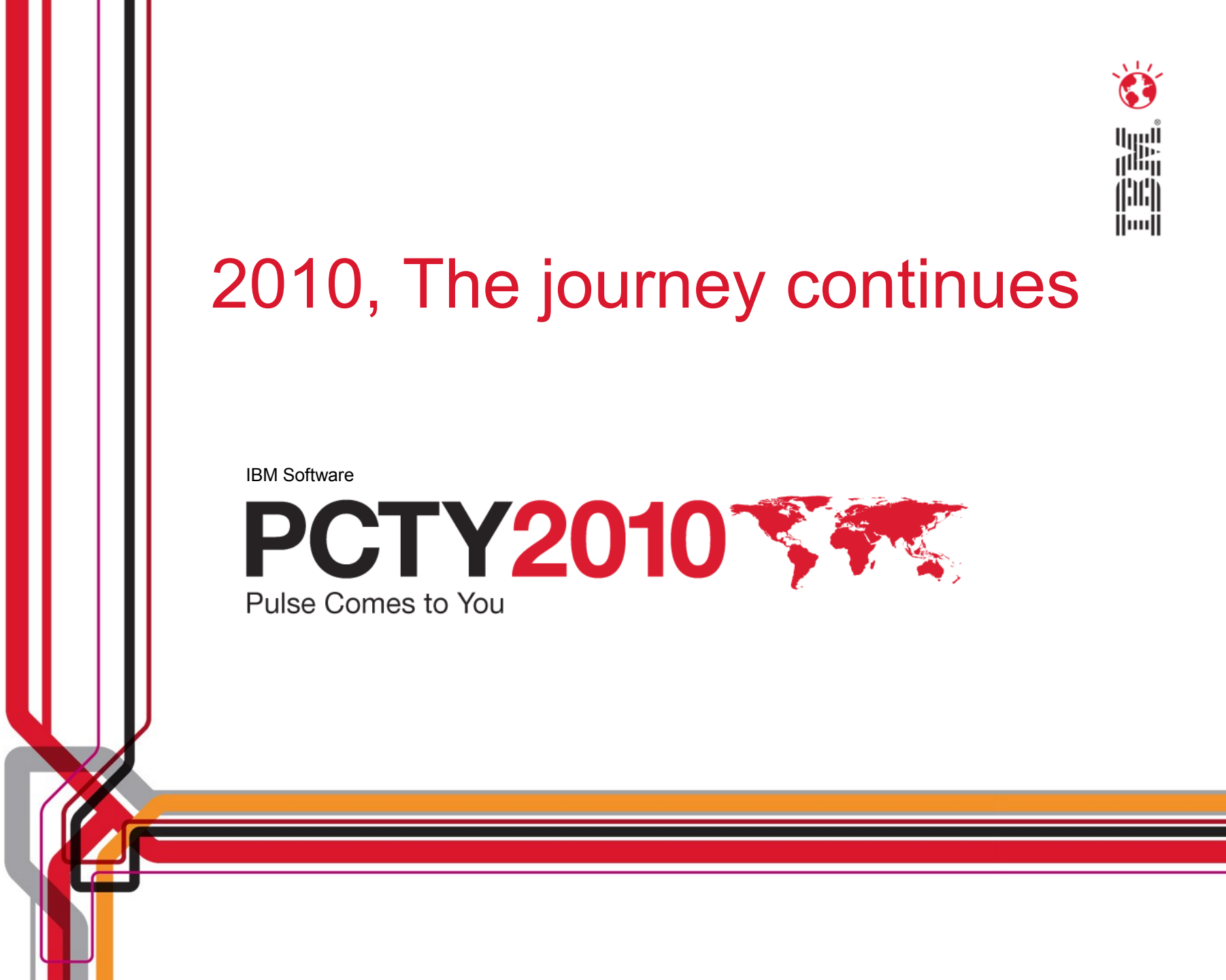
2010, The journey continues

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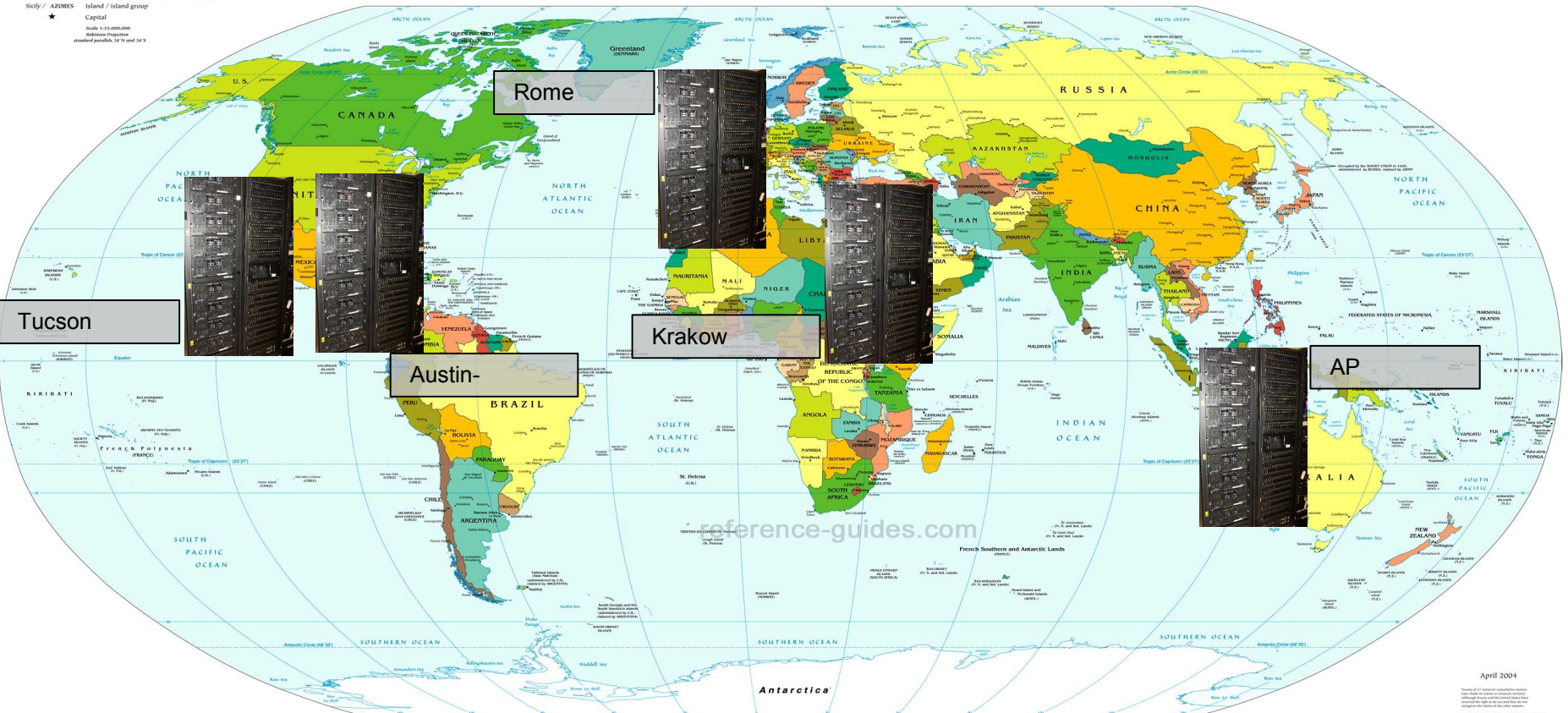


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2010 Consolidation & Virtualization

Stacy / AZORES
★ Island / Island group
Capital
Scale: 1:11,000,000
Reference: Progression
standard parallels: 30° N and 30° S



- Physical footprint reduction target 1500
- Current capacity 1800 VMs across RTP, Rome, Austin
- Krakow, Tucson, Rome and China cells launched - By YE2010 will have 5000 VMs
- Continued consolidation of IT from 8 labs

2010 Automation & optimization

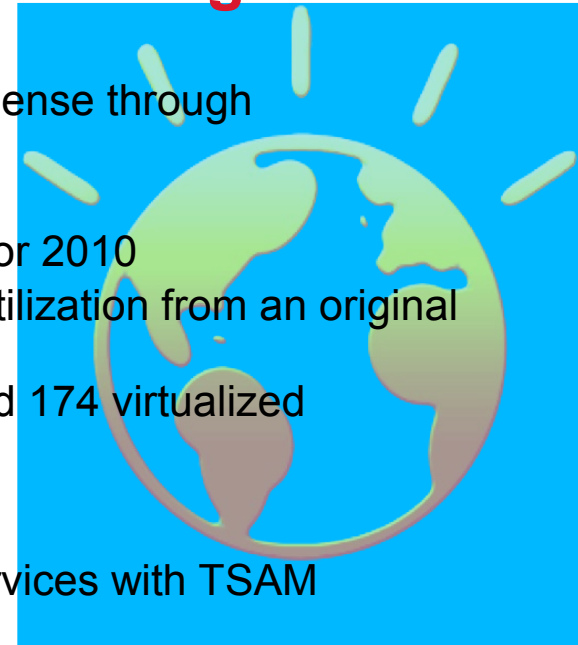


- **TSAM 7.2 deployed and used as the standardised interface for accessing cloud services**
-
- **zVM linux on LPAR offering**
-
- **Standardized implementations of ITNM, TADDM, TAM-IT at key anchor sites**
-
- **TUAM rolled into production to provide on demand usage reports**
-
- **Federated image library & TPMxImages to convert image formats**
-
- **Saas Pilot – Rational Team Concert**

Tivoli's IT has become *smarter...* about delivering

- **Consolidate & Virtualize**

- During 2009, avoided over 40% capital and 15% in expense through consolidation and virtualization
- Single Development, Test & IT infrastructure strategy
- Seven sites had IT consolidated, further eight in plan for 2010
- Virtualised infrastructure running an average of 60% utilization from an original average of 5-9% utilization per server
- 1055 servers have been relocated, 280 'scrapped', and 174 virtualized
-



- **Standardize & Automate**

- Process for accessing provisioning and scheduling services with TSAM
- Process for managing IT services with ISM
- With automation reduced time to provision a server from 12 hrs to ~15mins
- Rapid deployment of image based configurations, reduction in debugging phases

- **Optimization**

- IT staff have bandwidth to focus on continued service improvements
- Over 1800 users, growing daily!
- 2200 VMs in use and growing as more servers are virtualized