



IBM Transformation: Large IT Virtualization Initiative

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IBM Virtualization – Enterprise Data Center Journey

- **IBM's IT Infrastructure Transformation**
- **Enterprise Virtualization and Progress**
- **Program Model and Workload Selection**
- **Business Case and Benefits**
- **Lessons Learned/Critical Success Factors**



Project 'Big Green'



Double compute capacity with no increase in consumption or impact by 2010

Major proof point for Project Big Green

IBM'S PROJECT BIG GREEN SPURS GLOBAL SHIFT TO LINUX ON MAINFRAME

ARMONK, NY, August 1, 2007

IBM to reallocate \$1 billion each year

- Accelerate 'green' technology / services
- Client energy roadmap / IBM capabilities
- Global 'green' team

Re-affirming IBM commitment

- 40% reduction in CO2 emissions and \$250M energy savings / 15 years
- Commit to invest \$100M/yr infrastructure to support best 'green' practices

- *IBM will consolidate and virtualize thousands of server images onto IBM System z™ mainframes*
- *Substantial savings: energy, software and systems support costs*
- *80% less energy, 85% less floor space*
- *Enabled by virtualization capability*



Think what we could do for you

IBM's own Transformation Experience

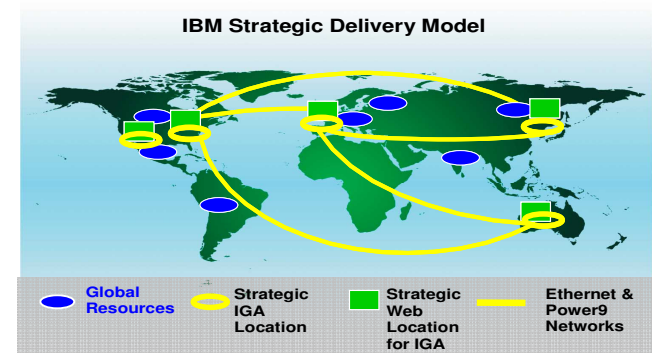
IBM IT Transformation

- ✓ *IBM's own IT investments over the past 5 years have delivered a cumulative benefit yield of \$4.1B*

	<u>1997</u>	<u>Today</u>
CIOs	128	1
Host data centers	155	7
Web hosting centers	80	5
Network	31	1
Applications	15,000	4,700

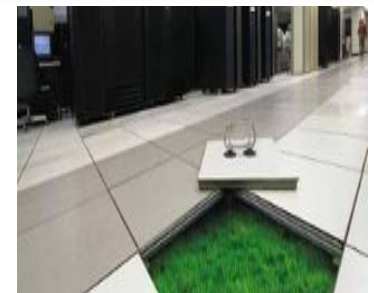
Data Center Efficiencies Achieved

- ✓ *Consolidation of infrastructure, applications*
- ✓ *Optimize resources, Globally Integrated Enterprise*

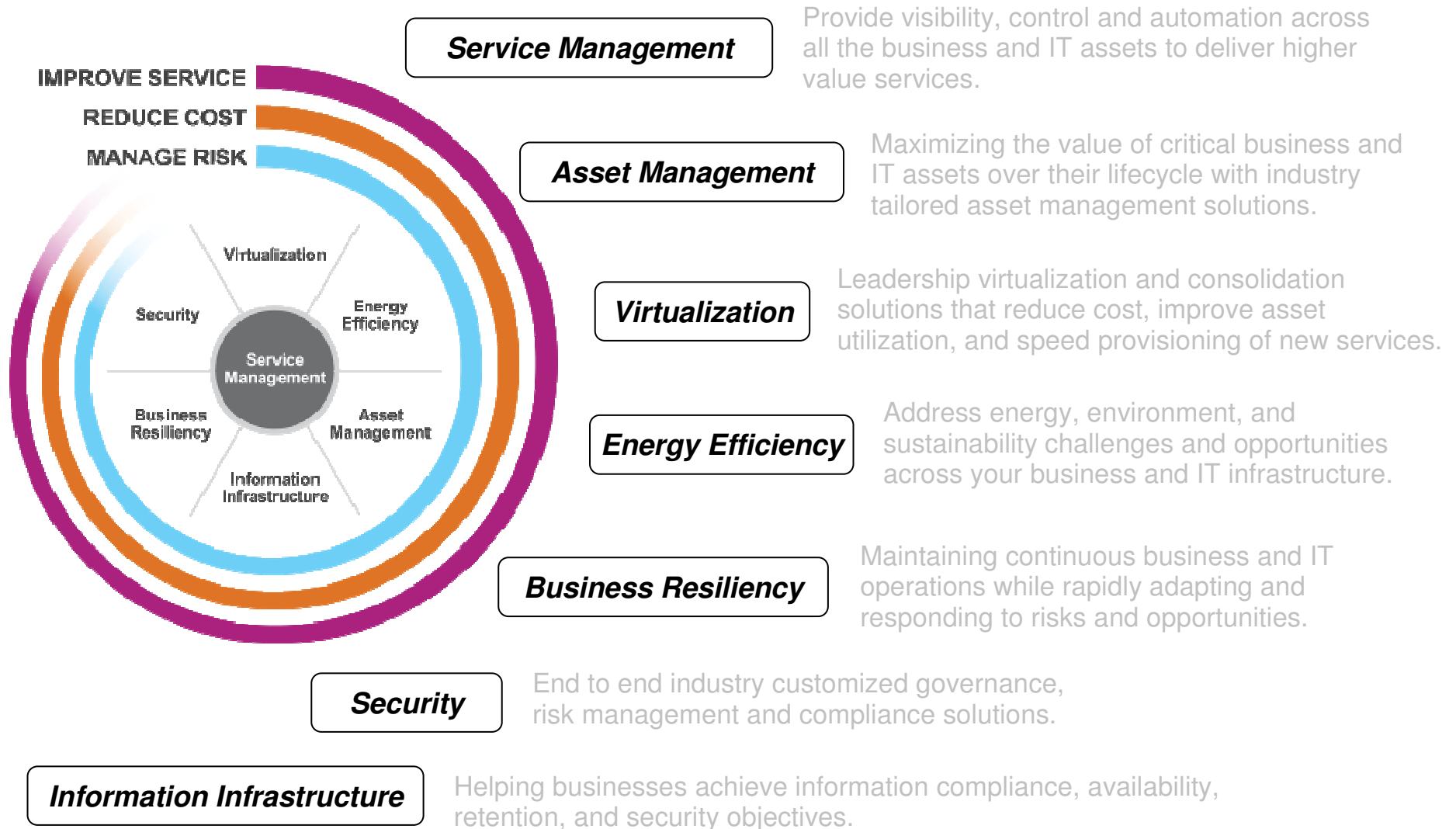


Next Level of Infrastructure Challenge

- ✓ *Floor space, underutilized and outdated assets*
- ✓ *Continued infrastructure cost pressure*
- ✓ *Increase % IT spending to transformation initiatives*



IBM's ongoing journey to a Dynamic Infrastructure



Enterprise Business Value – Expectations



Business case

- Early modeling identified significant potential for savings
- TCO virtualization assessment as cross-IBM effort
- Leverage IBM technology and capabilities



Energy savings

- Annual energy usage to be reduced by 80%
- Total floor space to be reduced by 85%



Quality service

- Leverage maturity of System z - availability, resiliency
- Reduce complexity, centralize service mgmt
- Dynamic allocation of compute power, provisioning

Comparison of Annual Energy Usage for Workloads

	Distributed Solution		System z Solution	
	Kilowatt hours (K)	Cost* (\$K)	Kilowatt hours (K)	Cost* (\$K)
Power	24,000	\$2,400	4,796	\$479
Cooling**	14,400	\$1,440	2,877	\$287
Total Energy	38,400	\$3,840	7,673	\$767

* Electrical cost calculated at rate of .10 per kW ** Cooling is 60% of power cost

Virtualization Benefits Significant; Migration Management Critical

Expected Benefits of Virtualization

- **Substantial savings: energy, software and system support costs**
- **Save 80% energy, 85% floor space**
- **Inventory hygiene, map applications**
- **Dramatically faster provisioning**
- **Improved security and resiliency**
- **Quality – simple, stable, available**

Large Scale Migration Challenges Exist

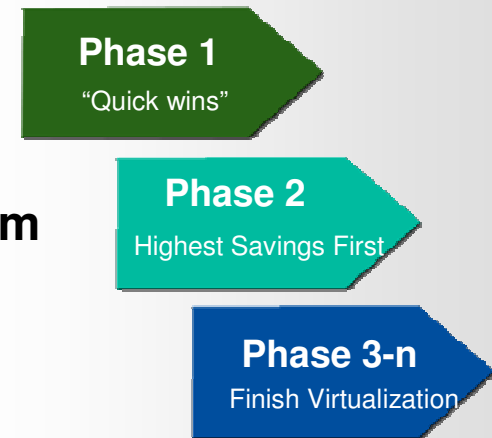
- **Decision-Making: Business Unit versus Enterprise view**
- **Mindset distributed vs. mainframe**
- **Workload selection**
- **Incomplete inventory records**
- **Detailed internal business case**
- **Integrating project / program priorities**



Clients are able to leverage IBM experience and capabilities to accelerate value

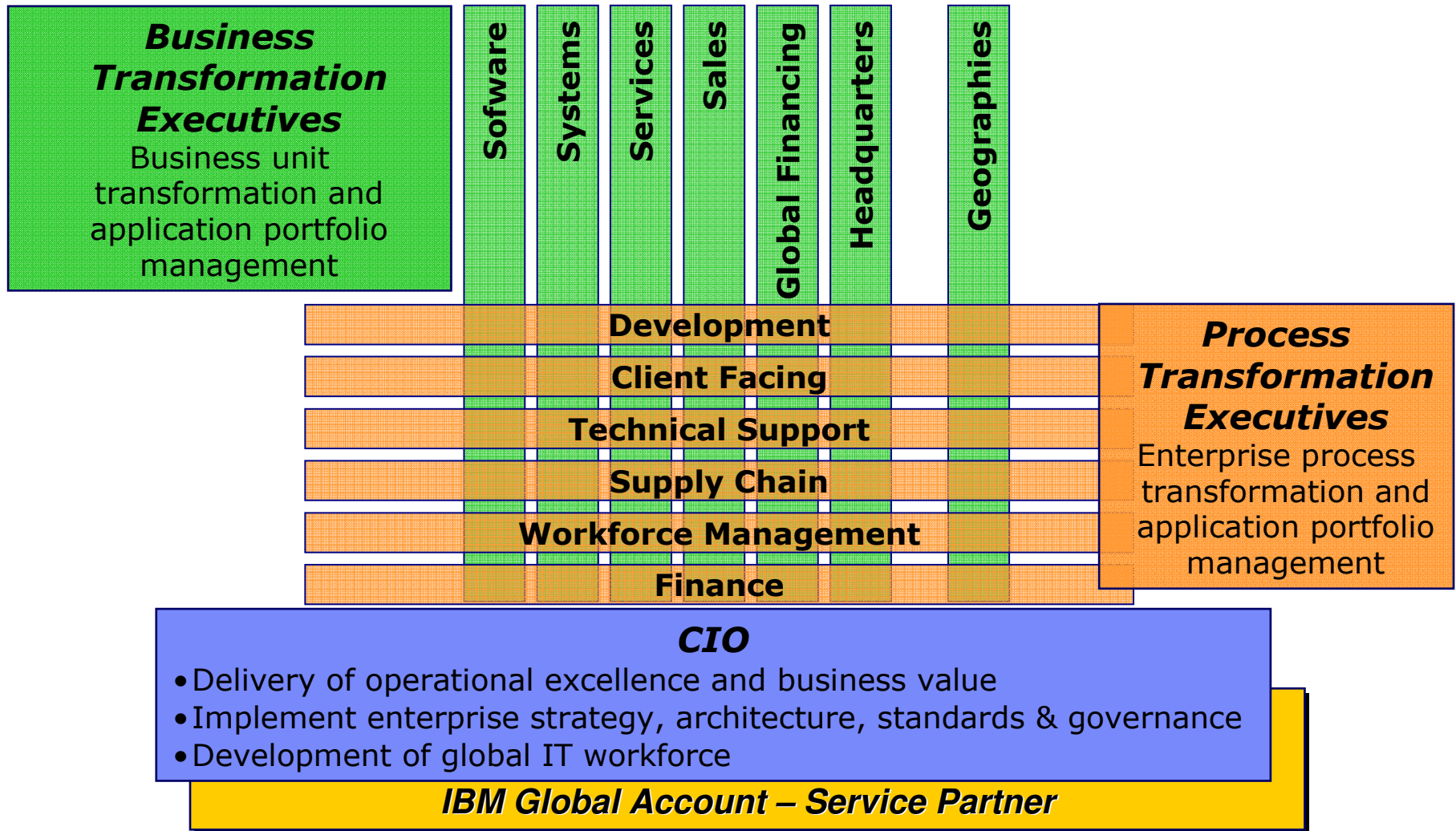
IBM System z Linux Virtualization Progress

- **Established phased approach**
- **Comprehensive project plan and management system**
- **Benefits are on track with expectations**
- **Technical solution, education plan and operational plan**
- **IBM Time to Value initiatives, integrated into IBM capabilities**
- **Highest level of support from IBM senior executive team**



IBM Global Account Scope – Clients

IBM's Business Transformation & Information Technology Community



IBM is Using a 'Work in Process' Approach to Manage the Migration

Management Approach and Reporting

- Process approach borrowed from factory line management
- Metrics for each sub-process
- Process fallout – tracked by cause
- Daily status calls issue resolution
- Weekly CIO management reviews

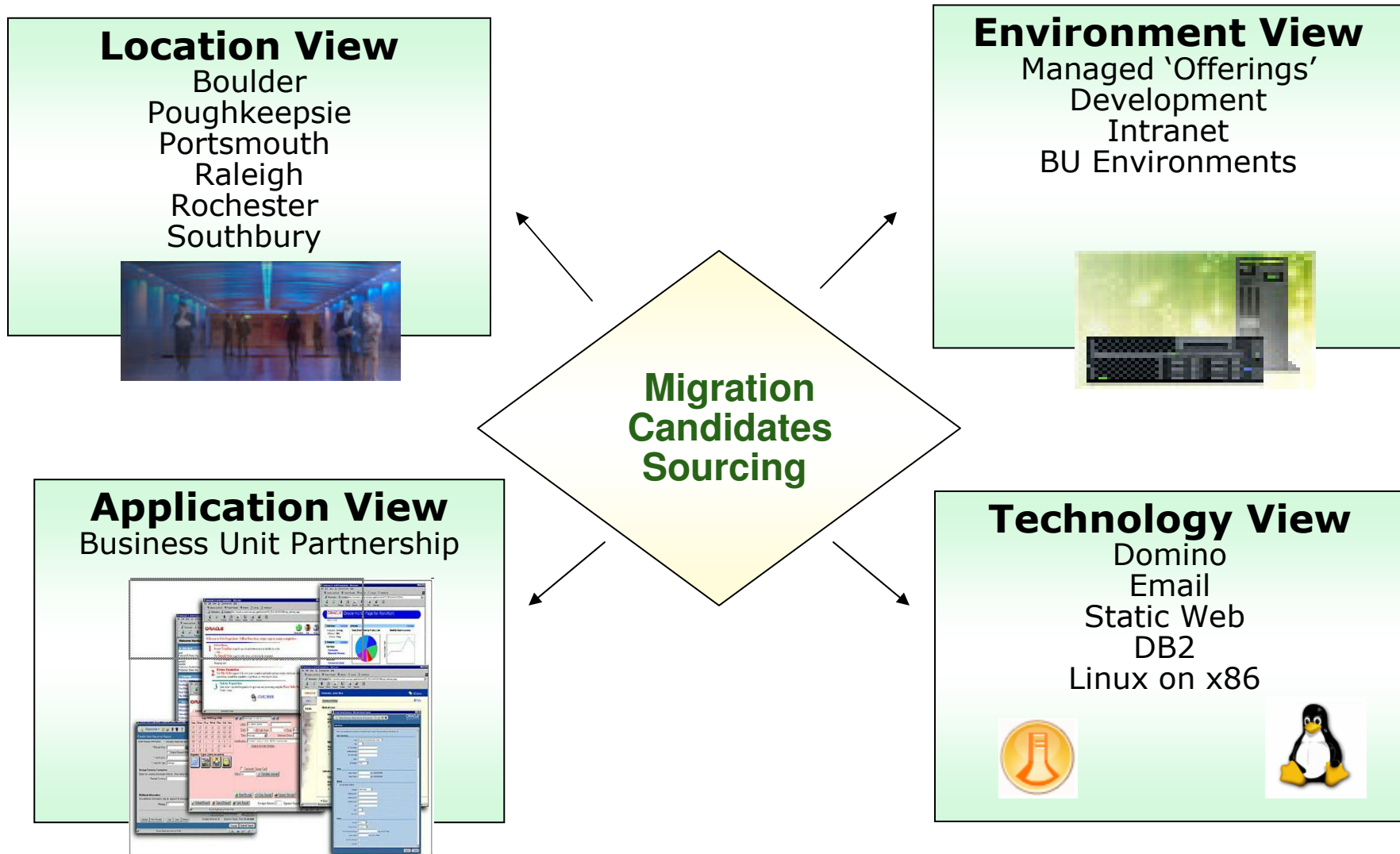
Weekly Pipeline Summary - Server Metrics

IBM ECM End to End Process

Project Phase	Server Inventory Verification	Server / Application Qualification	Migration Planning	Server / Application Migration	Post Production	Total Servers In Pipeline
Ph 1: US						
Ph 2: US						
Ph 3: Americas						
Ph 4: Europe						
Ph 5: AP/Japan						
Total						

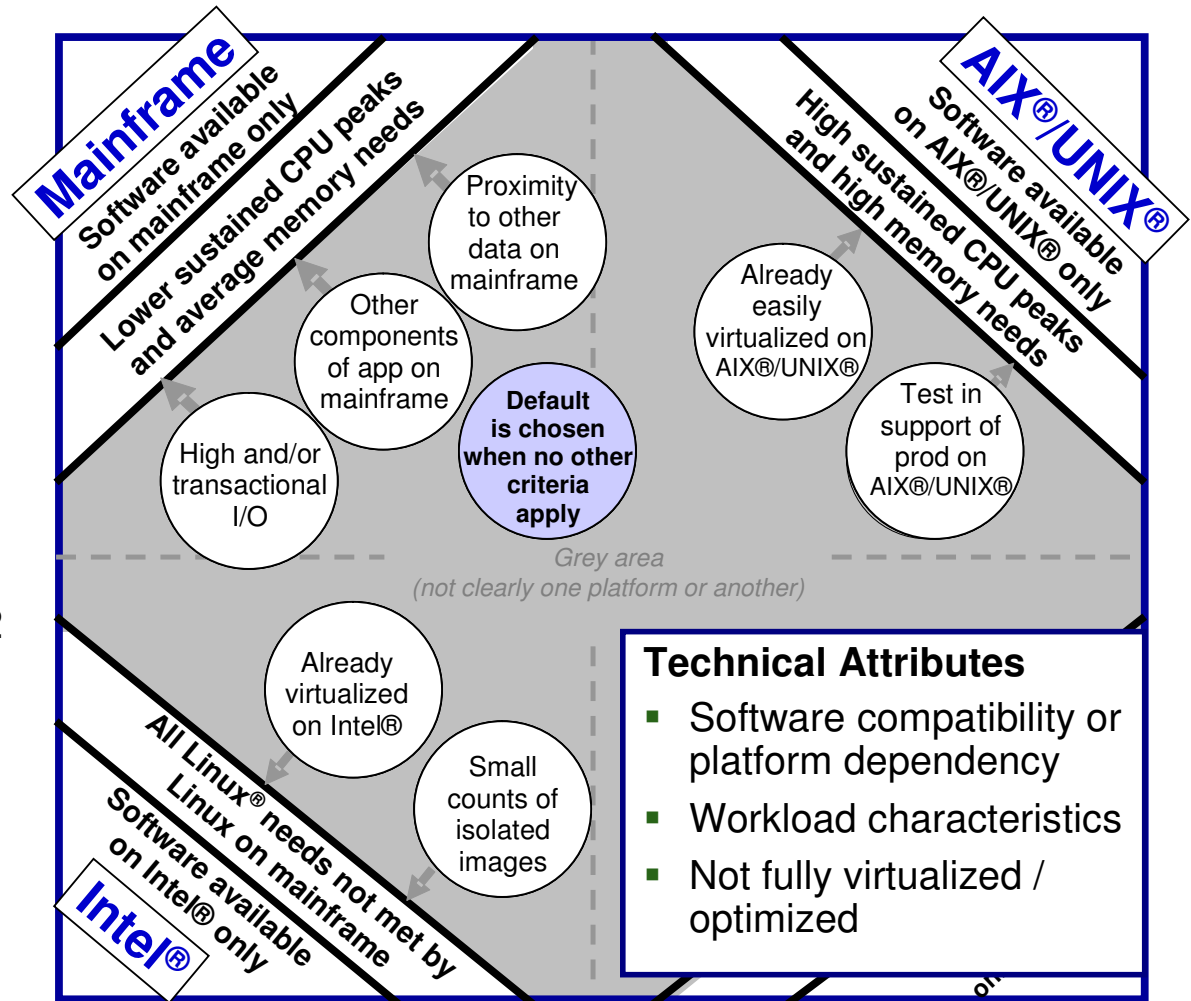
Pipeline Management	Finance	Comms	Process	Technical Solution
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Enterprise Approach to Workload Migration



Each Workload is Evaluated for Suitability Based on Technical Attributes

- **Fit for Purpose**
- Workloads matched to platform: fit for purpose
- Consider compatibility, performance, costs
- **Priority Workloads for z Virtualization:**
- WebSphere®, Domino®, DB2 Universal Database®, WebSphere MQ®
- Selected tools: Tivoli®, WebSphere® and internally developed



Business critical applications, such as IBM's intranet portal, are successfully moving to System z Linux

Business Challenge

- Employees rely on IBM's intranet portal, the On Demand Workplace, for access to critical business applications. With up to 1.3 million views daily (and growing), it was critical to reduce server sprawl, operating costs and energy footprint while maintaining performance, resiliency and growth.

Solution

- Move the On Demand Workplace development and production environments from distributed to virtualized IBM System z Linux environment.

Benefits

- Reduce data center footprint, realize additional savings from reduction in energy use and staff needed to manage the environment.

Virtualization and consolidation can help reduce the total data center footprint and associated energy use while improving the efficiency of the energy that is used.

**– The Enterprise of the Future,
Implications for the CIO
IBM 2008**



Business Case Leveraged RACE Tool, Iterative Approach



Utilized RACE modeling tool

- Foundation for internal business case, constructed specific environmental variables

. Created financial plan for “known universe”

- Identified relevant sample (5-10%) of most likely servers to be migrated and gathered financial profile information for each

Engaged SME’s within IBM

- Provided business case assumptions (i.e. depreciation/maintenance), modified as appropriate

Iterative Process

- Continuously engaged with core SME’s to ensure most current information

Project Metrics

- Weekly report of migrated servers and their disposition status (reuse or disposal using GARS*) and Energy Certificate status
- Working to incorporate actuals into the Business Case such that we can refresh our assumptions

**IBM Global Asset Recovery Services*

TCO: A Range of IT Cost Factors – Often Not Considered

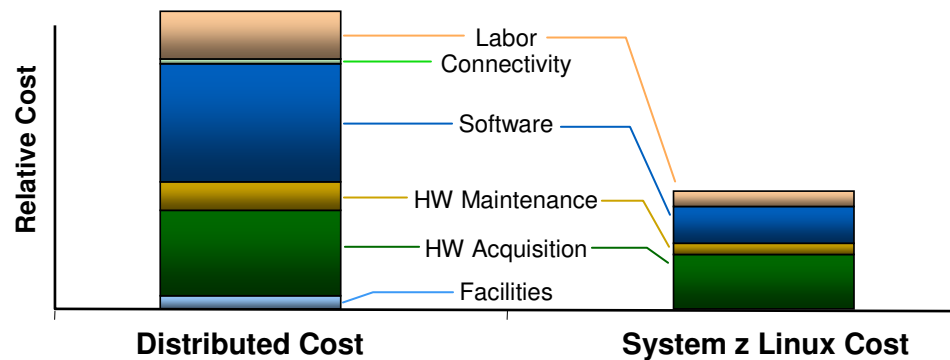
- **Availability**
 - High availability
 - Hours of operation
- **Backup / Restore / Site Recovery**
 - Backup
 - Disaster Scenario
 - Restore
 - Effort for Complete Site Recovery
 - SAN effort
- **Infrastructure Cost**
 - Space
 - Power
 - Network Infrastructure
 - Storage Infrastructure
 - Initial Hardware Costs
 - Software Costs
 - Maintenance Costs
- **Additional development/implementation**
 - Investment for one platform – reproduction for others
- **Controlling and Accounting**
 - Analyzing the systems
 - Cost
- **Operations Effort**
 - Monitoring, Operating
 - Problem Determination
 - Server Management Tools
 - Integrated Server Management – Enterprise Wide
- **Security**
 - Authentication / Authorization
 - User Administration
 - Data Security
 - Server and OS Security
 - RACF vs. other solutions
- **Deployment and Support**
 - System Programming
 - Keeping consistent OS and SW Level
 - Database Effort
 - Middleware
 - SW Maintenance
 - SW Distribution (across firewall)
 - Application
 - Technology Upgrade
 - System Release change without interrupts
- **Operating Concept**
 - Development of an operating procedure
 - Feasibility of the developed procedure
 - Automation
- **Resource Utilization and Performance**
 - Mixed Workload / Batch
 - Resource Sharing
 - shared nothing vs. shared everything
 - Parallel Sysplex vs. Other Concepts
 - Response Time
 - Performance Management
 - Peak handling / scalability
- **Integration**
 - Integrated Functionality vs. Functionality to be implemented (possibly with 3rd party tools)
 - Balanced System
 - Integration of / into Standards
- **Further Availability Aspects**
 - Planned outages
 - Unplanned outages
 - Automated Take Over
 - Uninterrupted Take Over (especially for DB)
 - Workload Management across physical borders
 - Business continuity
 - Availability effects for other applications / projects
 - End User Service
 - End User Productivity
 - Virtualization
- **Skills and Resources**
 - Personnel Education
 - Availability of Resources



Routinely Assessed Cost Factors

Client View of TCO Comparison for Similar Distributed Workload vs. System z Linux results in Potential 60-75% Gross Costs Savings / 5 yrs

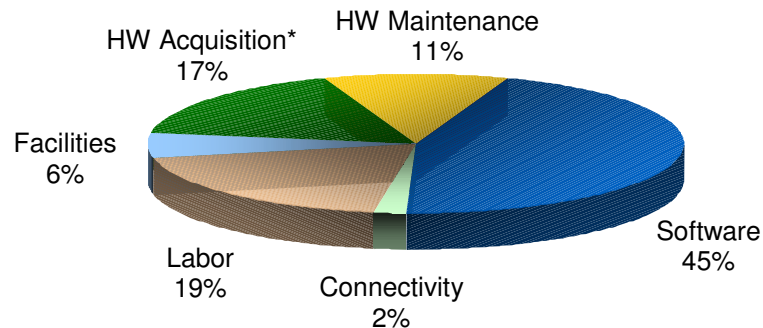
Operating Cost: Distributed vs. Mainframe



Dramatic Simplification

Unit	Distributed	System z Linux	% Reduction
Software Licenses	26,700	1,800	93%
Ports	31,300	960	97%
Cables	19,500	700	96%
Physical Network Connections	15,700	7,000	55%

Potential Savings: Categories as a % of Gross Savings



* HW Acquisition compares server/disk refresh of distributed environment to the cost of acquiring new mainframes/storage

Results will vary based on several factors including # of servers and work load types

In addition to compelling savings through virtualization, operational benefits are being realized

From application owner perspective ...



- **Speed: Rapidly clone environment - hours vs. days vs. weeks**
- **On demand resources: Add system resources (memory, cpu) as needed**
- **Scalable growth: I/O intensive workloads and cyclical applications**
- **Enable new business models: Significantly reduced need for dedicated development and test servers**

From infrastructure owner perspective...



- **System stability: Server reboot/recycling greatly reduced**
- **Simplification: Less hardware and related features to manage**
- **Improved change management: Significantly less security patches to apply**
- **Increased agility: Managed change during freeze windows**

Infrastructure Transformation – Lessons Learned



Preparation

- Enlist a Senior Executive Sponsor for enterprise view
- Motivate Business Units through benefits and incentives
- Build business case and gather data – financial, inventory



Start-Up

- Start with small number of servers, build enterprise view
- Run ops while transforming w/strong PM, dedicated team
- Define reference architecture for ‘to be’ environment



Execution

- Integrate waves / resources, leverage existing processes
- Enterprise criteria and strategy, communicate real-time
- Drive cultural change needed to support transformation

Critical Success Factors

- **Sponsor with an enterprise view**
- **Strategic investment for migration**
- **Clear goals, dedicated team, inclusive leadership for execution of migration**
- **Leveraging talent and capability across all of IBM to drive rapid results**



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