



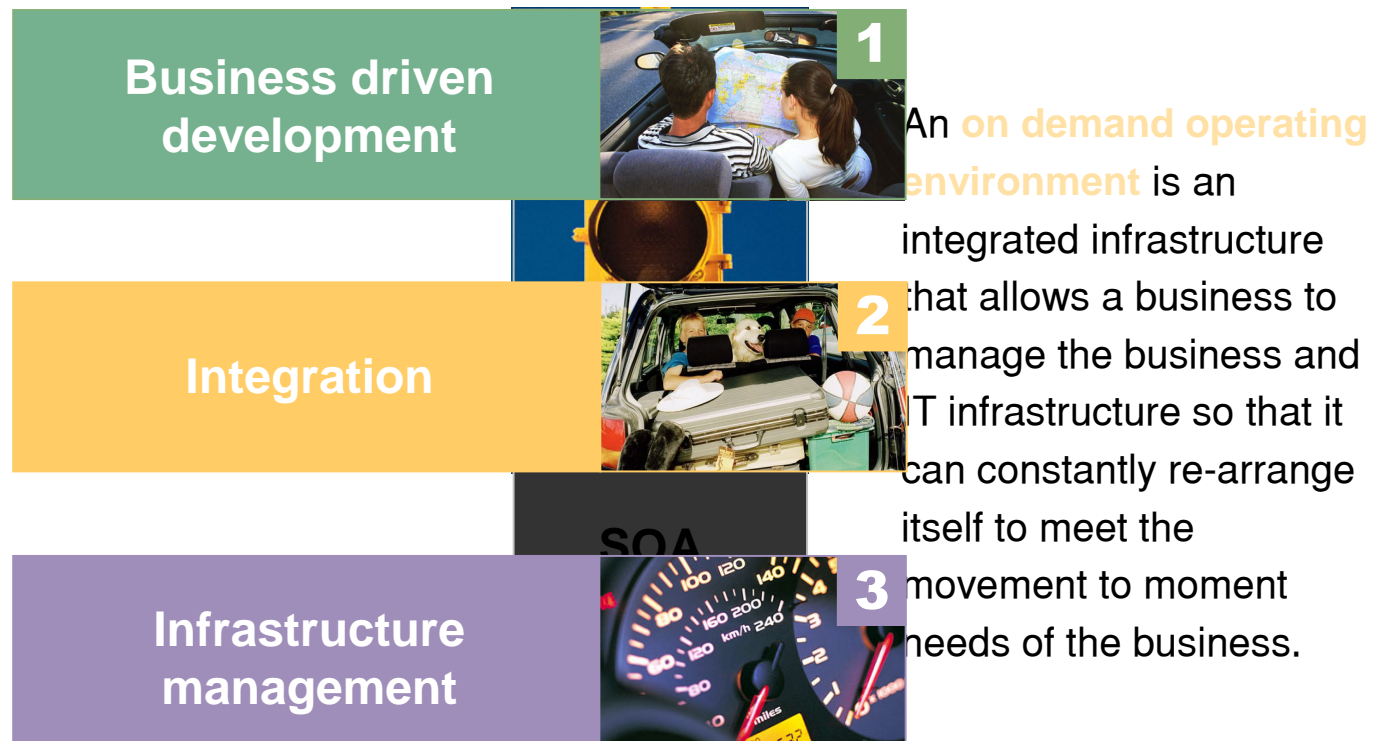
IBM Systems and Technology Group

# G18 on demand Operating Environment: Getting Started

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# On Demand Operating Environment



# Infrastructure management is more than technology



# Stages of deployment

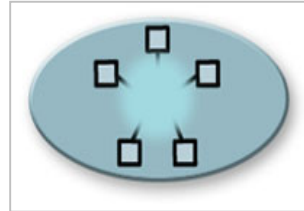
Always 'on'

**Orchestrate Infrastructure:** Sense and respond to changes based on business policies



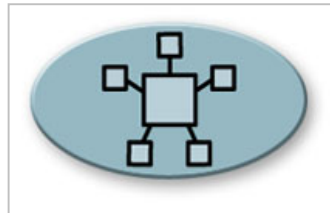
**Virtualize Outside The Enterprise:** Suppliers, partners, customers and external resources

**Secure Cross Enterprises:** Enable internal and external integration and resources.

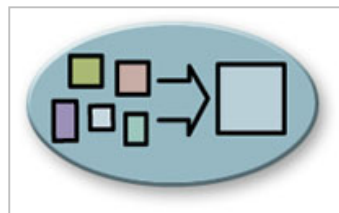


**Virtualize The Enterprise:** Enterprise wide Grids and Global Fabrics

**Automate Workflows:** Tasks like change/ configuration, ITIL processes



**Virtualize Unlike Resources:** Heterogeneous systems, application based Grids and networks



**Virtualize Like Resources:** Homogenous systems, storage and networks

Updated IT Governance and Management Processes

## ■ Provisioning

- Reduce the time/cost to re-purpose IT resources to meet business requirements and service levels evolving to dynamic assignment of resources to needs (How-to # 6)
- Provision system resources (How-to # 10)

## ■ Optimization

- Optimize utilization and pool resources across heterogeneous environments (How-to # 9)
- Monitor and alert systems to allow establishment of business SLAs and automated detection and remediation of violations (How-to # 5)

# Reduce the time/cost to re-purpose IT resources to meet business requirements and service levels evolving to dynamic assignment of resources to needs

## The Challenge:

One important characteristic of an on demand operating environment is its ability to adapt and configure itself to changes in the infrastructure, with minimal human intervention, based on goals and policies specified by the offering or provider administrator

## Goal / Benefit:

Provide adaptable capabilities to automate the management of IT resources

Evolve these capabilities to encompass autonomic policy-based self-configuration as well as orchestrated management of systems and solutions

## Capabilities Required:

- Automate the management of IT resources
- Provisioning and Orchestration framework
- Optimization of resource allocation and scheduling
- Autonomic, policy-based, self-configuration of IT resources

# Reduce the time/cost to re-purpose IT resources to meet business requirements and service levels evolving to dynamic assignment of resources to needs

## IBM Offerings – Available Today:

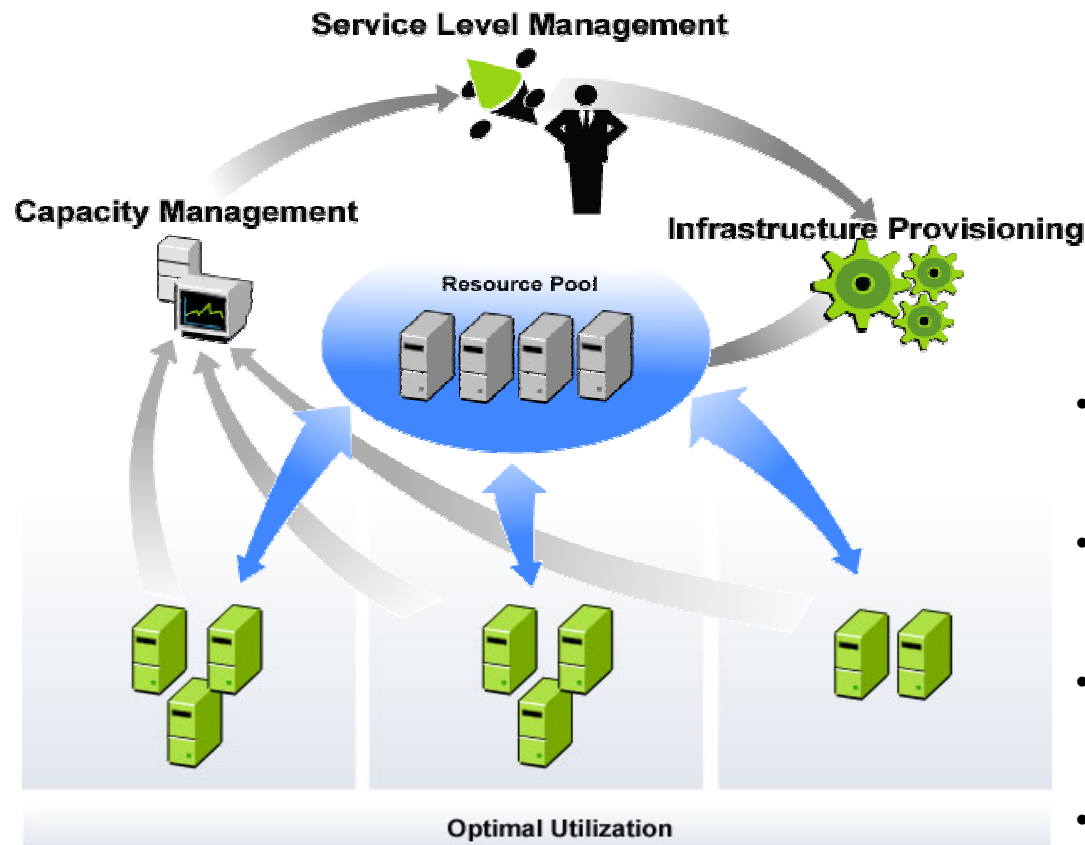
- IBM Tivoli Provisioning Manager
- IBM Tivoli Intelligent ThinkDynamic Orchestrator
- WebSphere & WebSphere Network Deployment
- IBM Tivoli Configuration Manager
- IBM Director
- eServer – platform provisioning
- Clustering Solutions

## What you can expect:

- IBM Tivoli Intelligent ThinkDynamic Orchestrator will evolve to
  - provide provisioning support to encompass more applications, middleware, operating systems and networks
  - become more tightly integrated with operating systems, applications, networks and storage provisioning through standards such as the Open grid Services Architecture (OGSA)
- Continued integration of management functions and capabilities to orchestrate and dynamically provision IT resources
- Systems Provisioning capability in the IBM Virtualization Engine

# Automation of Orchestration and Provisioning

## Key Concepts



- Repository to store data center resources and their state (Data Center Model)
  - Resources - servers, storage, network devices, software (OS, middleware, applications)
  - Resource relationships and dependencies
  - Application Topologies
  - Resource pooling
  - Operational capabilities
- Monitoring of resources
  - Extensible to monitor resource specific metrics
- Policy-based resource optimization
  - Optimal allocation of resources to applications based on policies
- Workflows
  - Resource/Function specific implementation provisioning actions
- Separation of interfaces from implementation
  - Provide standard interfaces to resource types and provisioning actions (Logical Operations)
  - Workflows can implement interfaces



## IBM Tivoli Orchestration and Provisioning Products

- **May 2003:** ThinkDynamics Acquisition – technology basis for orchestration and provisioning components of our automation architecture
- Provides the infrastructure to build autonomic systems – Monitor, Analyze, Plan, and Execute

### IBM Tivoli Intelligent ThinkDynamic Orchestrator

- Sense and respond analytics to optimize service delivery
- Dynamic, cross-domain, automated, policy-based management
- Packaging includes the Provisioning Manager

### IBM Tivoli Provisioning Manager

- Includes workflow builder, workflow engine, and data store
- Out-of-the-box automated provisioning for networks, servers, storage, middleware and application services

Network provisioning	Server provisioning	Storage provisioning	Middleware provisioning
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### “Orchestrator Policy Module for”

- Modules enable dynamic policy-based responses to solution specific “scenarios”

“Orchestrator for...”

“Orchestrator for ...N”



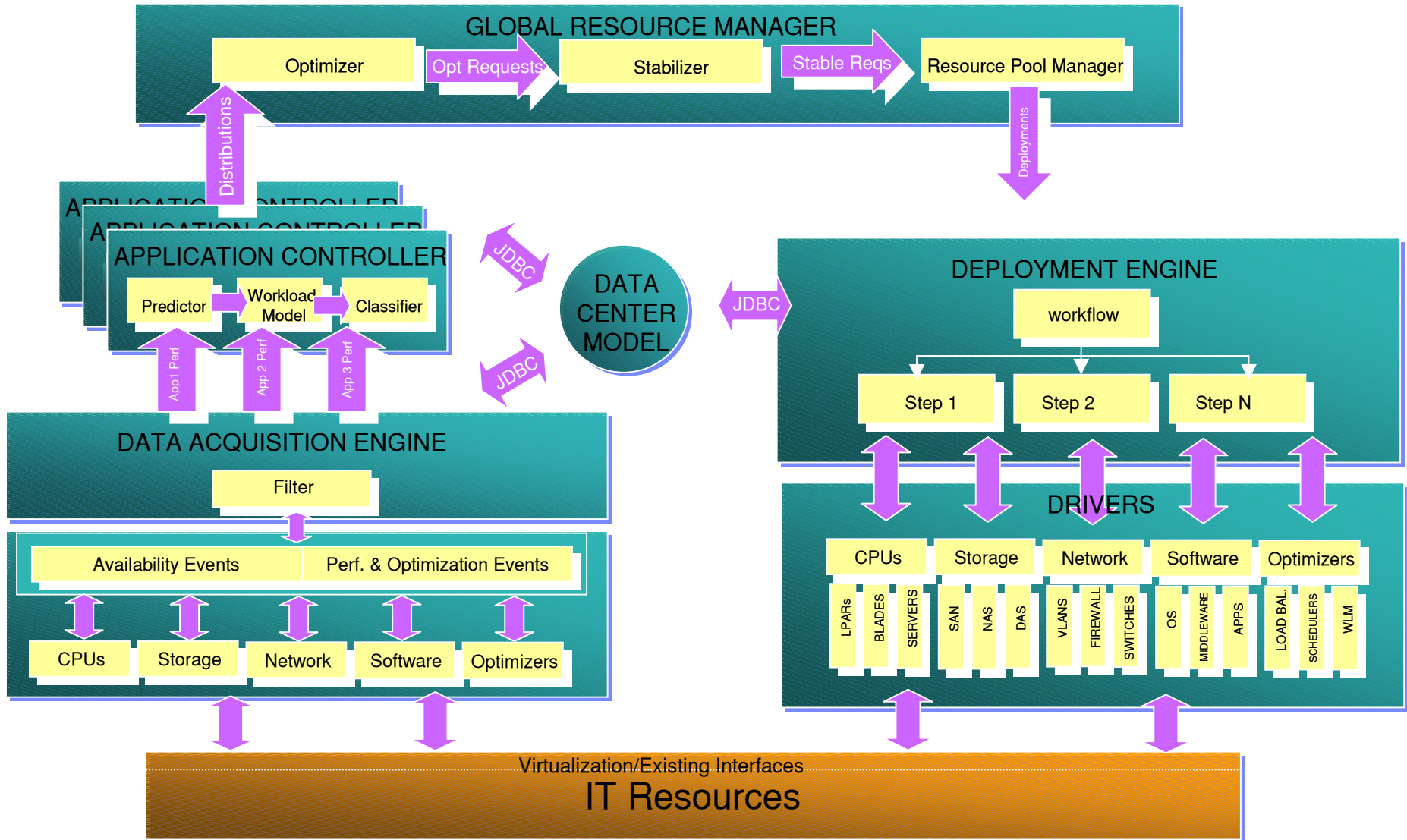
### “Provisioning for” Modules

- Modules expand supported for solution elements

“Provisioning for (e.g.SAP)”

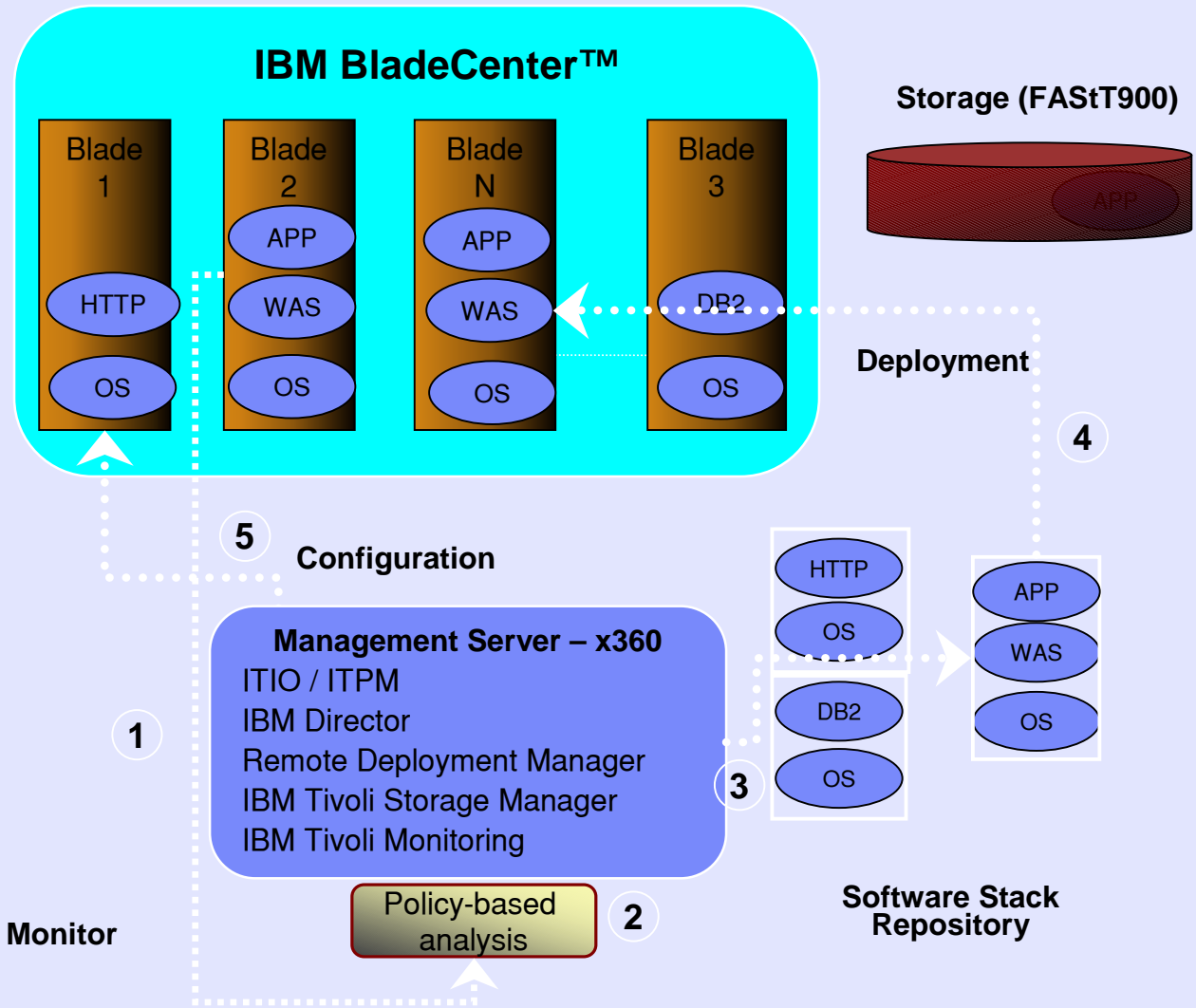
“Provisioning for ...”

# Intelligent Orchestrator – Architecture Overview



# WebSphere Infrastructure Orchestration Overview

1. Websphere App server workloads exceed established performance thresholds (SLA violation)
2. Policy-based analysis determines corrective actions
3. Mgmt Server chooses app server software stack
4. Software stack deployed on new blade
5. HTTP Servers signaled with new App server info



# Provision System Resources



## The Challenge:

- Need to automatically deploy/redeploy resources in response to changing business objectives in a heterogeneous environment
- Spikes in utilization overload resources in a specific pool causing system outages

## Goal / Benefit:

- Make better use of system resources, without systems interruption
- Provision new resources as business demands dictate
- Automatically provision existing resources to compensate for rapid changes in demand

## Capabilities Required:

- Servers and storage that allow quick acquisition of additional capacity without down time
- Hardware that allows resources to be dynamically reconfigured to allocate them to services based on business demands
- Ability to direct partitioning across multiple resources quickly and effectively

# Provision System Resources



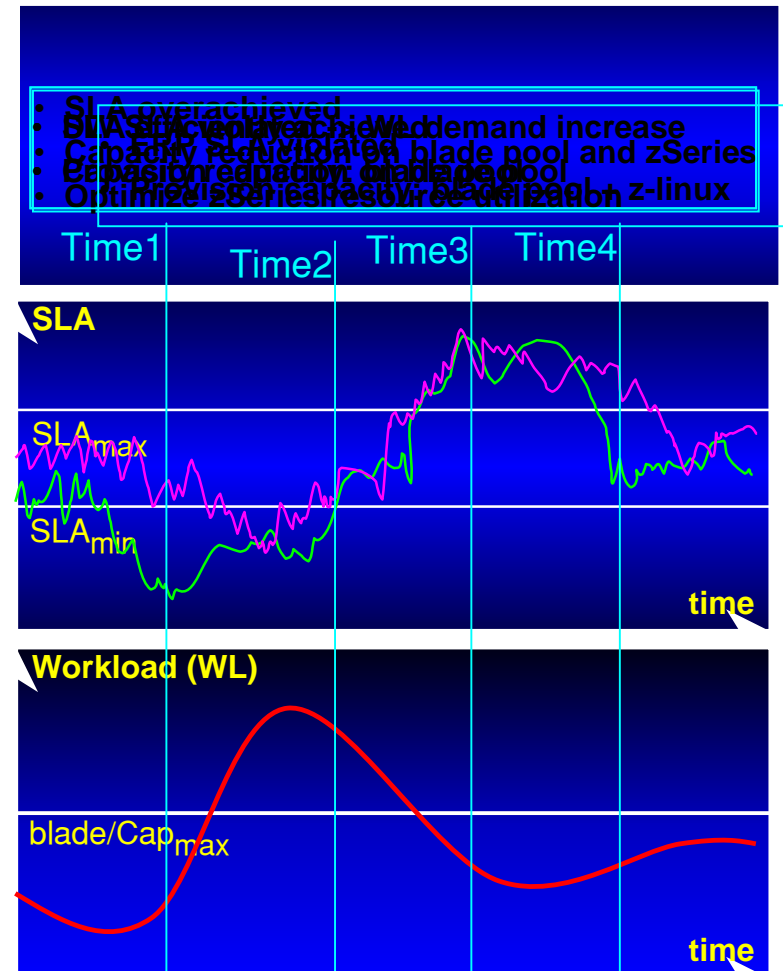
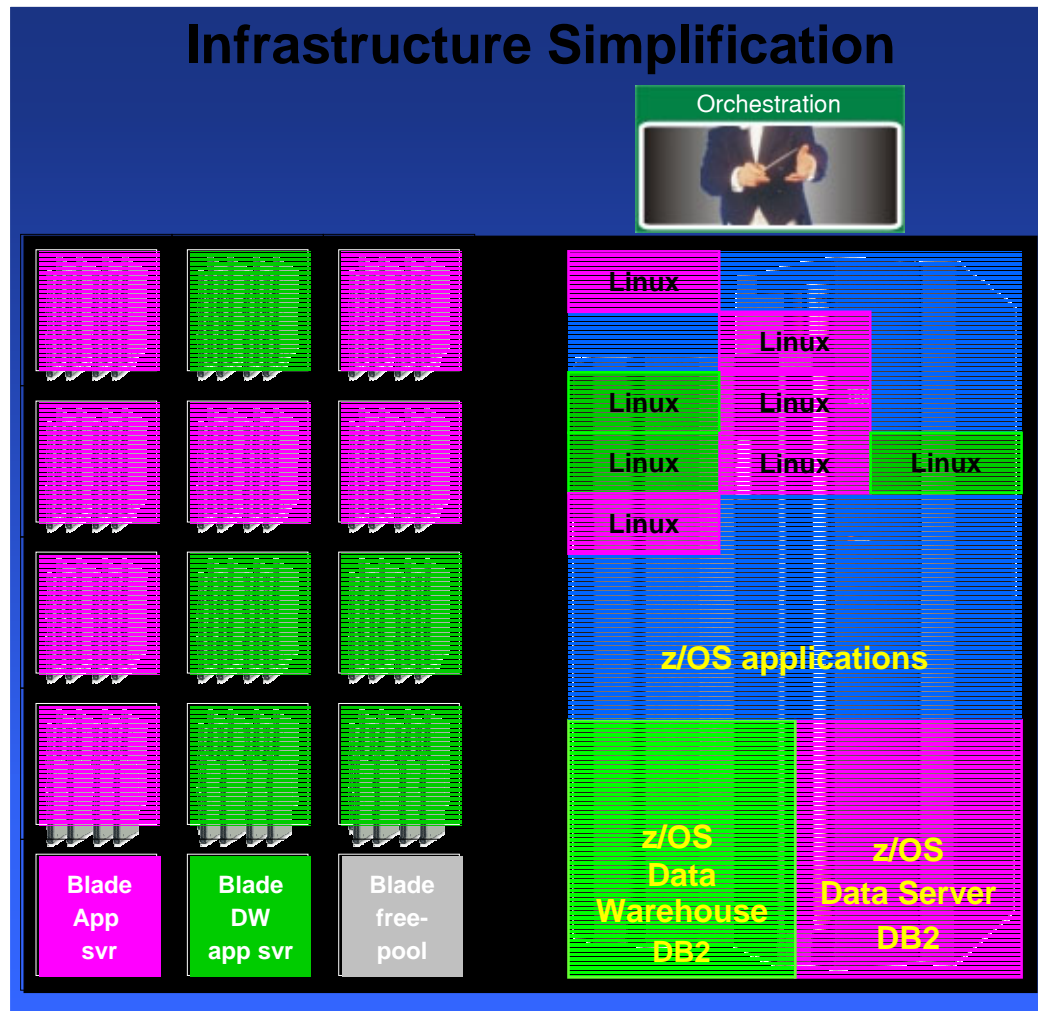
## IBM Offerings – Available Today:

- Capacity on Demand for disk and tape
- Connectivity on Demand
- Capacity Upgrade on Demand
- Standby Capacity Upgrade on Demand
- On/Off Capacity on Demand
- Capacity BackUp
- IBM Director
- Tivoli Intelligent Orchestrator

## What you can expect:

- Advancements in provisioning with orchestration allowing more sophisticated levels of systems provisioning
- Open interfaces to create and maintain relationships with other provisioning tools
- Billing and metering capabilities
- Systems provisioning in the IBM Virtualization Engine (powered by TPM)

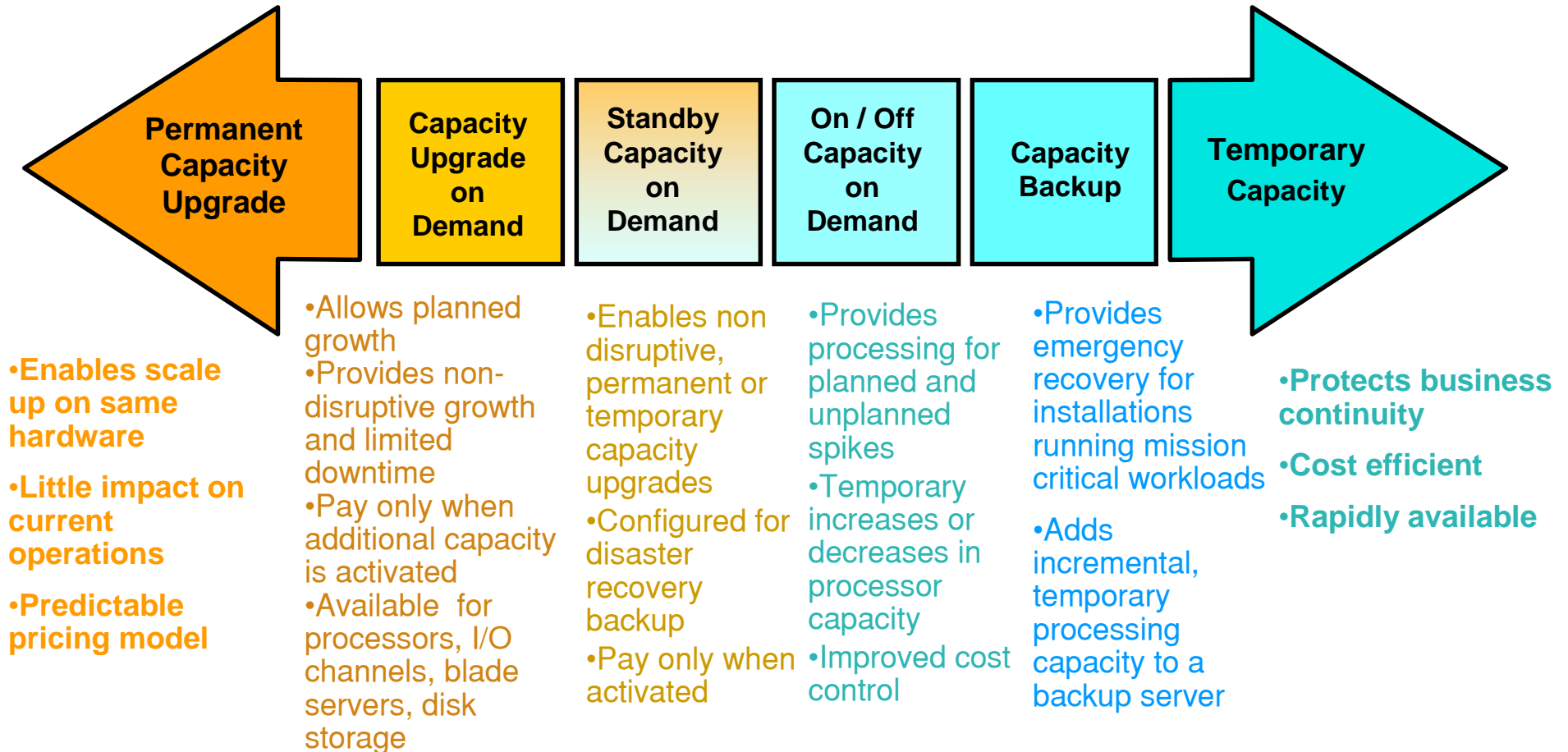
# Application Server Provisioning and Virtualization Illustrated with zSeries and BladeCenter



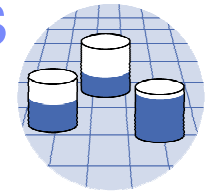
# Flexible Delivery - Capacity on Demand

**Predictable Workloads**

**Unpredictable or Variable Workloads**



# Optimize Utilization and Pool Resources Across Heterogeneous Environments



## The Challenge:

Utilization of transactions that span multiple heterogeneous servers need to be optimized to ensure that established policies regarding known workload spikes, application performance, and service level objectives are maintained

## Goal / Benefit:

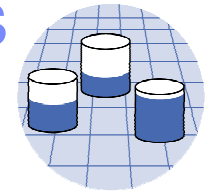
Manage and optimize transactions and resources across the enterprise, instead of within each individual system in order to maximize ROI

## Capabilities Required:

- Enhanced ability to dynamically move resources to service the most important work
- Ability to monitor and correlate the events for a transaction
- Speed up problem determination
- Higher level services such as scheduling, brokering, and accounting that spans heterogeneous environments



# Optimize Utilization and Pool Resources Across Heterogeneous Environments



## IBM Offerings – Available Today:

- IBM TotalStorage Virtualization
- IBM TotalStorage SAN Volume Controller
- zSeries with Intelligent Resource Director and Workload Manager (WLM) across LPARs
- Virtual Machines ... zVM, VMWare
- IBM Grid Toolbox
- IBM Grid Offering for Risk Management (offering)

## Open Standards

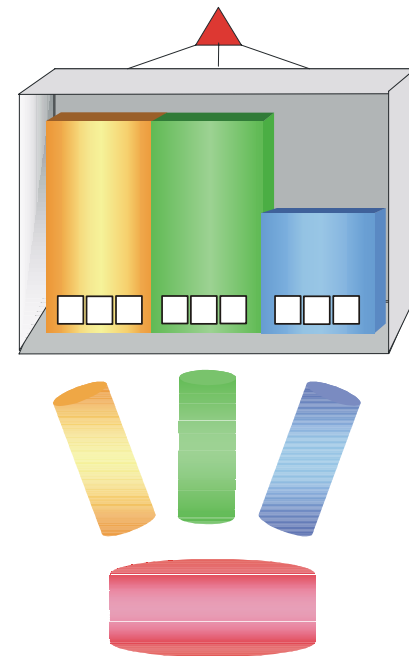
- Open Grid Services Architecture (OGSA)
- Global Grid Forum (GGF)

## What you can expect:

- Evolution of the OGSA (Open Grid Services Architecture) standard
- Orchestration of Grid services
- Enterprise Workload Management and Converged Systems Management to enable systems to dynamically participate in a heterogeneous, networked environment
- Tivoli products continue to be enhanced to support workload management that spans hardware, middleware and applications
- IBM Virtualization Engine

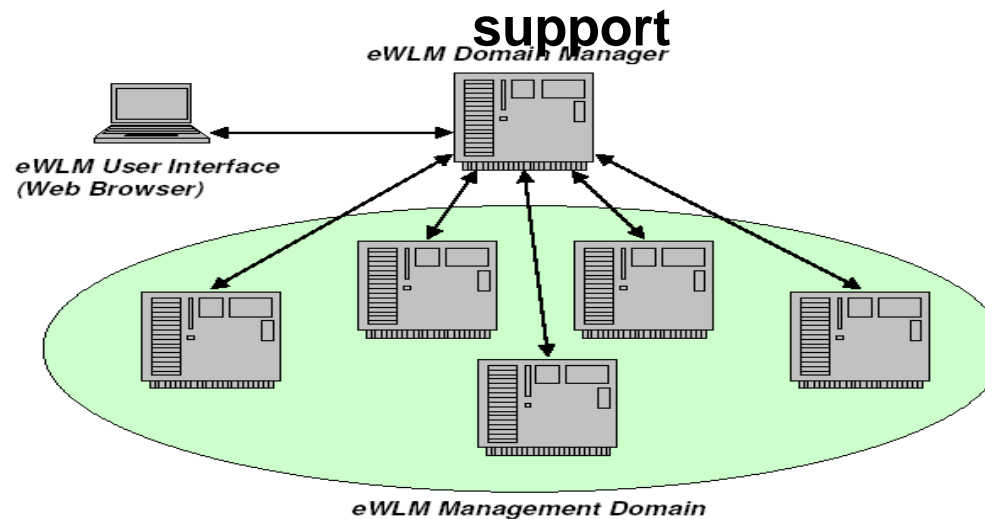
## zSeries w/ IRD & WLM

- **Goal-oriented management of LPAR resources**
  - ▶ Processors & Channels
- **Integration of**
  - ▶ PR/SM
  - ▶ Workload Manager
  - ▶ Channel Subsystem
  - ▶ Parallel Sysplex
- **Providing**
  - ▶ LPAR CPU management
  - ▶ Dynamic channel path management
  - ▶ Channel subsystem priority queuing



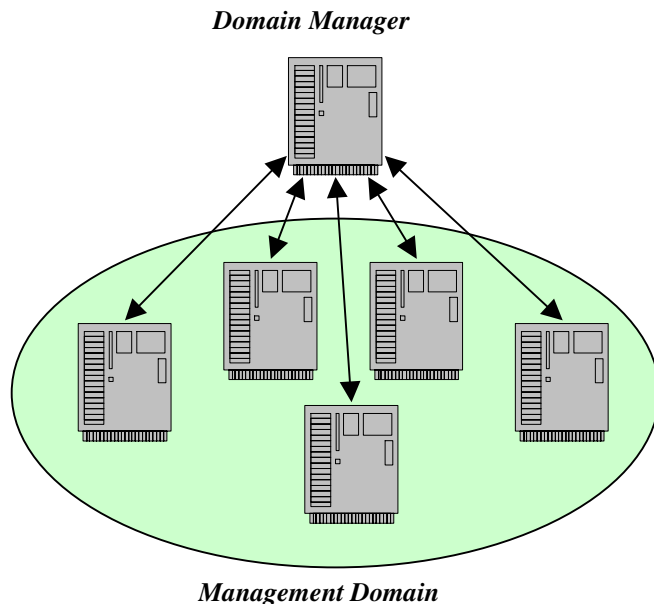
## EWLM Management Domain

### Single OS to heterogeneous geographically-distributed infrastructure

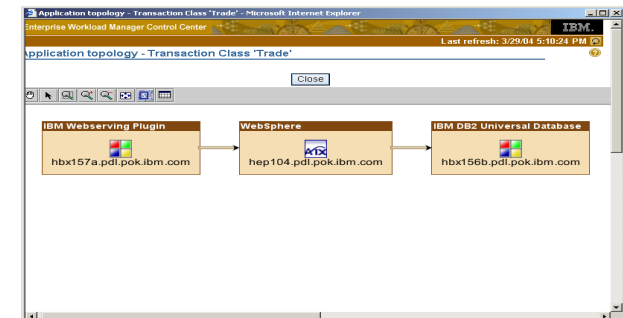


- Local
  - Manage a single OS instance from within that instance
- Cluster
  - Manage a cluster of homogeneous systems
- Partitioned
  - Manage a set of logical partitions
  - May or may not be the same OS on all partitions
- Heterogeneous
  - Mixed OS and Server environment

# Java™ Language-based Applications can Benefit from VE



- **EWLM uses open interfaces based on ARM**
  - Websphere & DB2 instrumented to use ARM
  - Applications inherit the benefit of Websphere & DB2
  - ARM-enablement
- **Customer defines transaction class & policy**
  - Definitions portable across all supported platforms
- **EWLM monitors operating system, Websphere & DB2**
  - Provides input for workload balancing decisions – server utilization, trans response time & topology



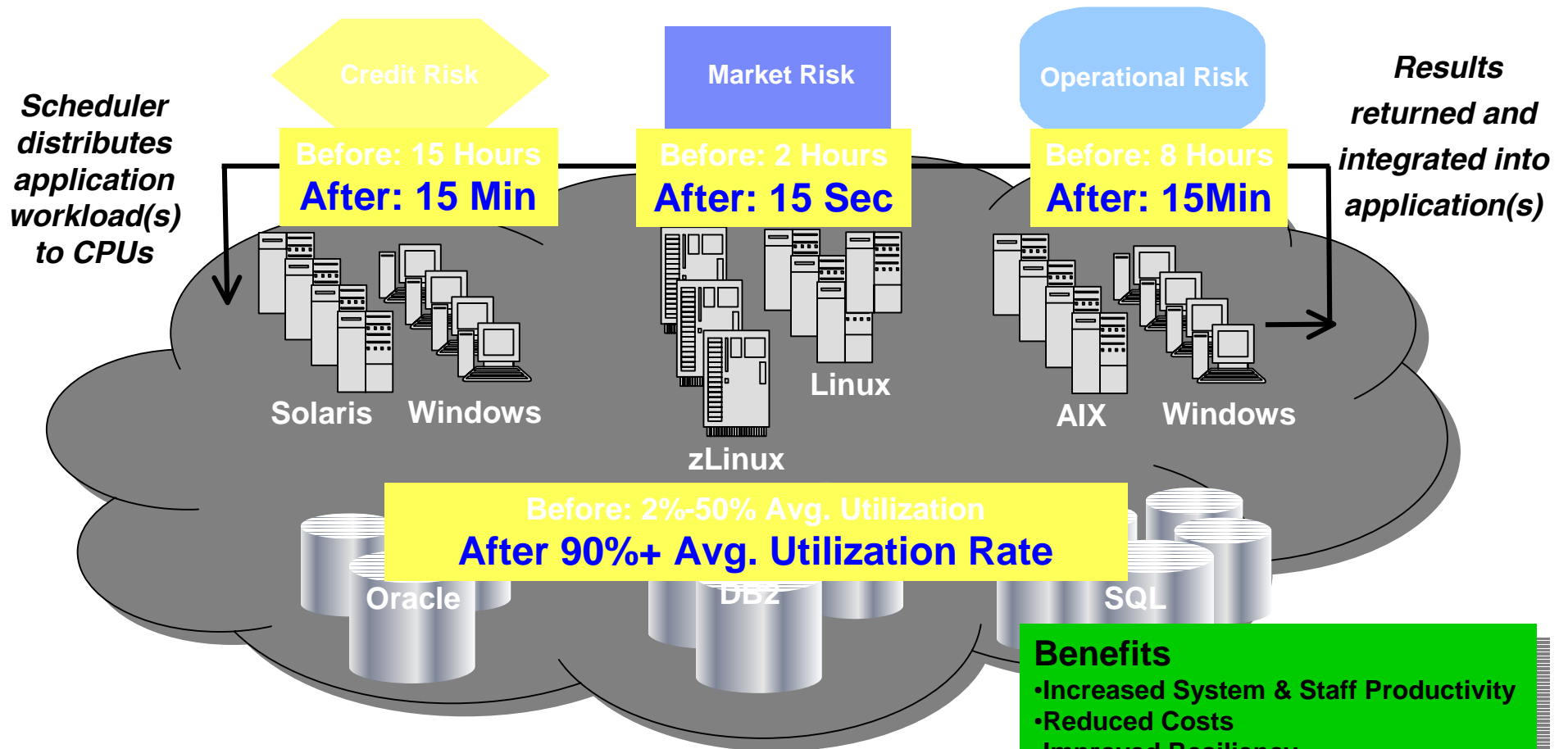
***Provides consistent information across supported platforms***

Java is a registered trademark of Sun Microsystems, Inc.

**Example: Financial Markets**

# Grid Computing is about virtualizing and sharing resources

Decoupling applications from infrastructure

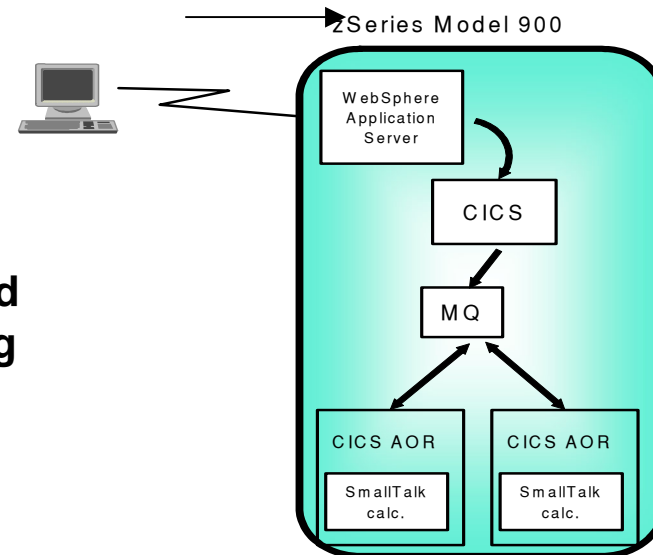


- Benefits**
- Increased System & Staff Productivity
  - Reduced Costs
  - Improved Resiliency
  - Simplified Scalability

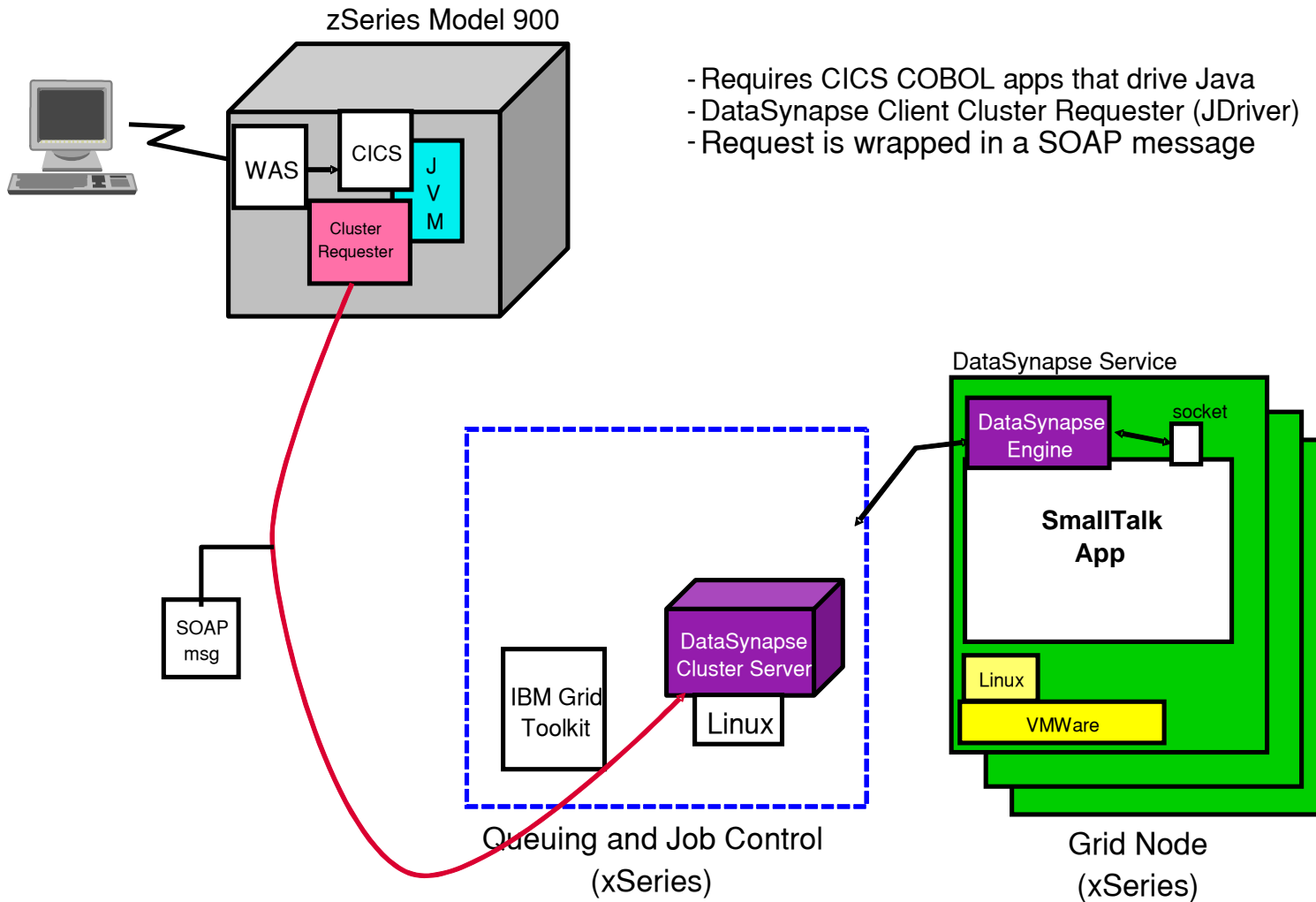
## Customer Example, Hewitt

- Customer Background
  - Global HR and Benefits outsourcing and consulting firm
  - Handles pension management for many large firms including IBM
- Design Center Objectives
  - Develop a utility computing model based on advanced IBM technologies including Grid, Web services, and Linux.
  - Offload a compute intensive application to a more cost effective platform while maintaining equivalent or better application response time.
  - Longer term production objective: Use Globus 3 Toolkit to wrapper the application to become Globus Resource Allocation Manager (GRAM) aware.

### Original Implementation



# DataSynapse Cluster Requester on zSeries

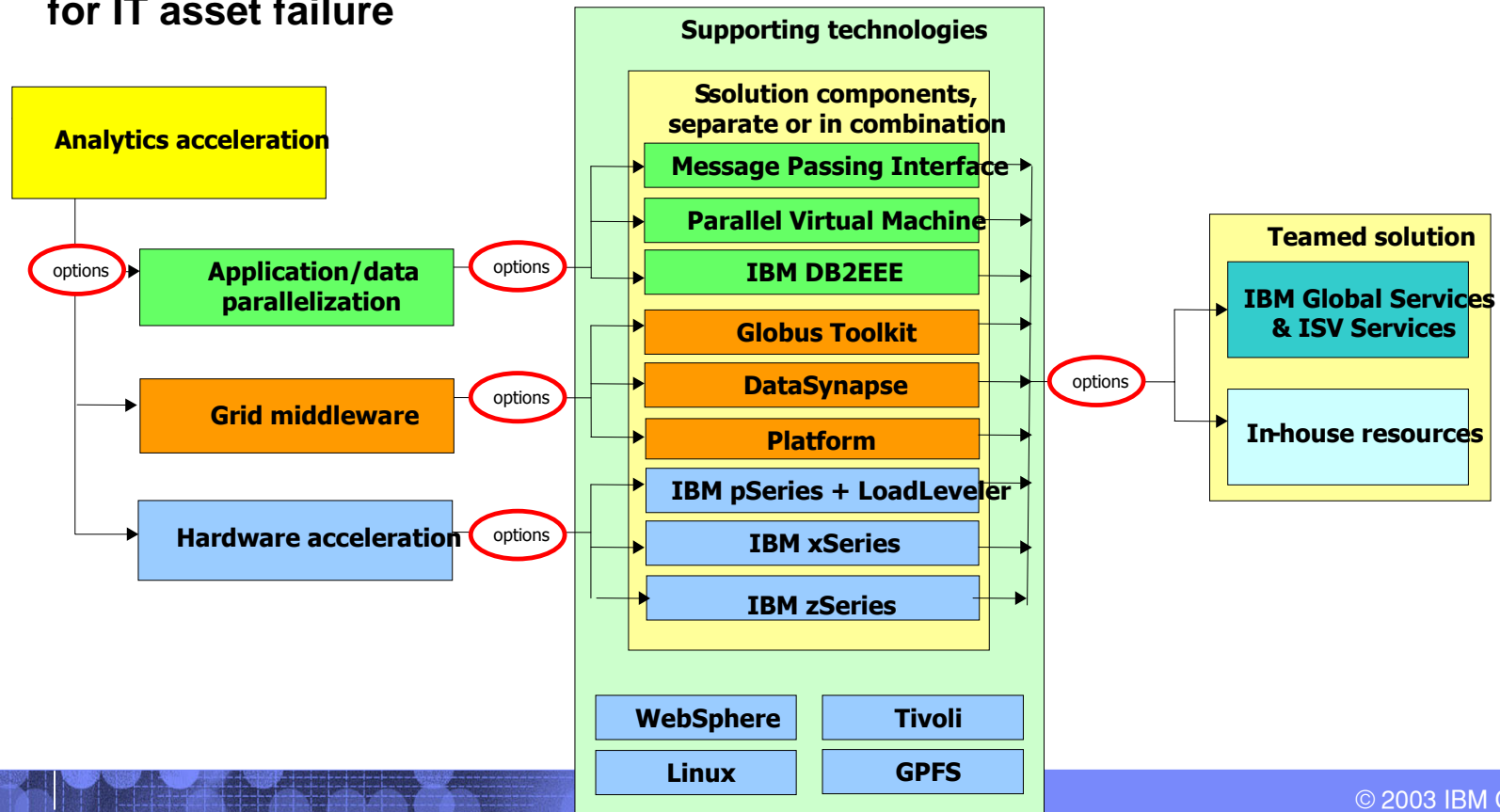


# Business Analytics: Financial Markets

## IBM Grid Offering for Analytics Acceleration

Enhances competitiveness and agility in the financial trading market by:

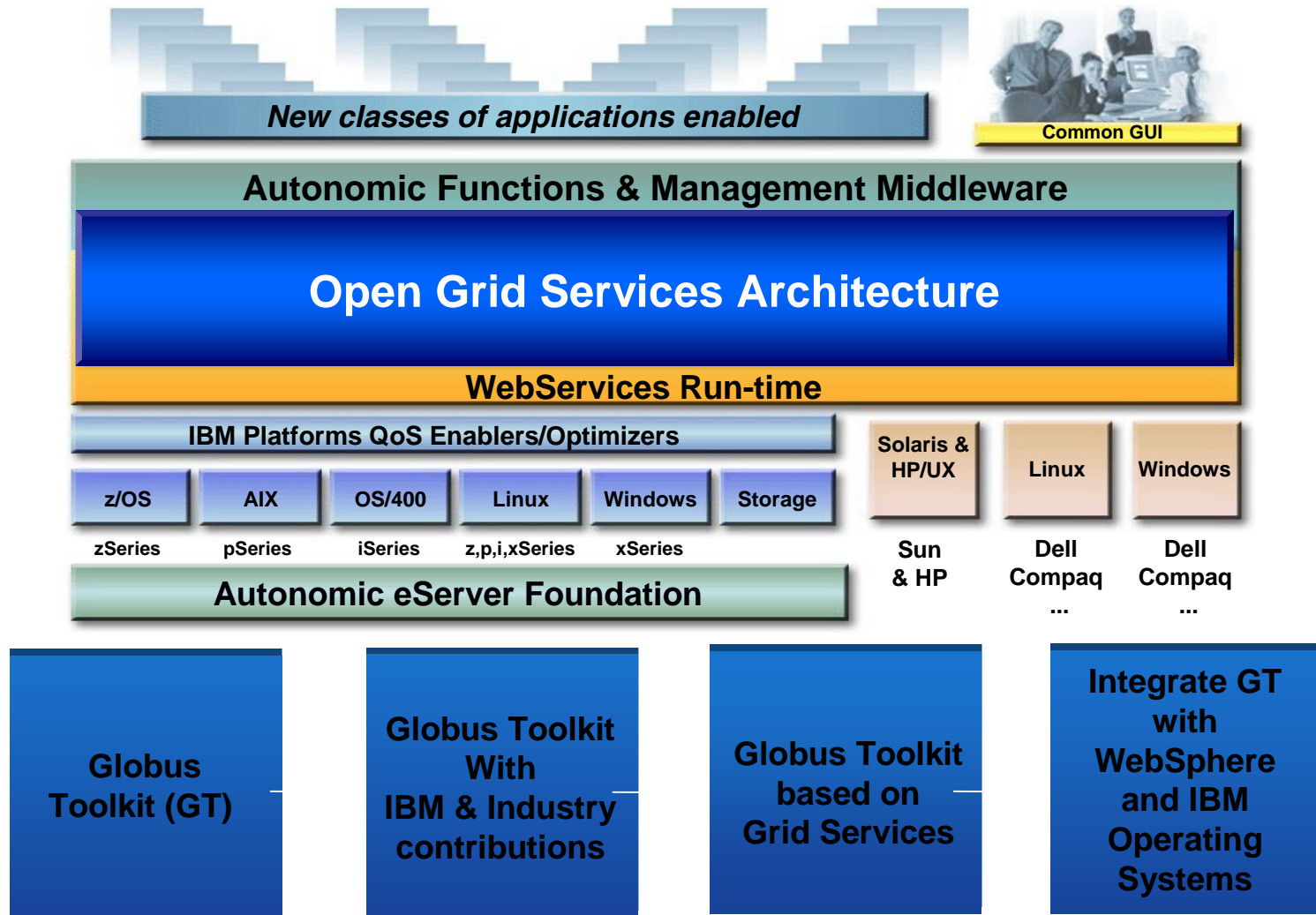
- Reducing statistical margin of error, faster trade decisions and increased number of scenarios and parameter space
- Providing affordable, effective IT for a sophisticated trade portfolio and tolerance for IT asset failure



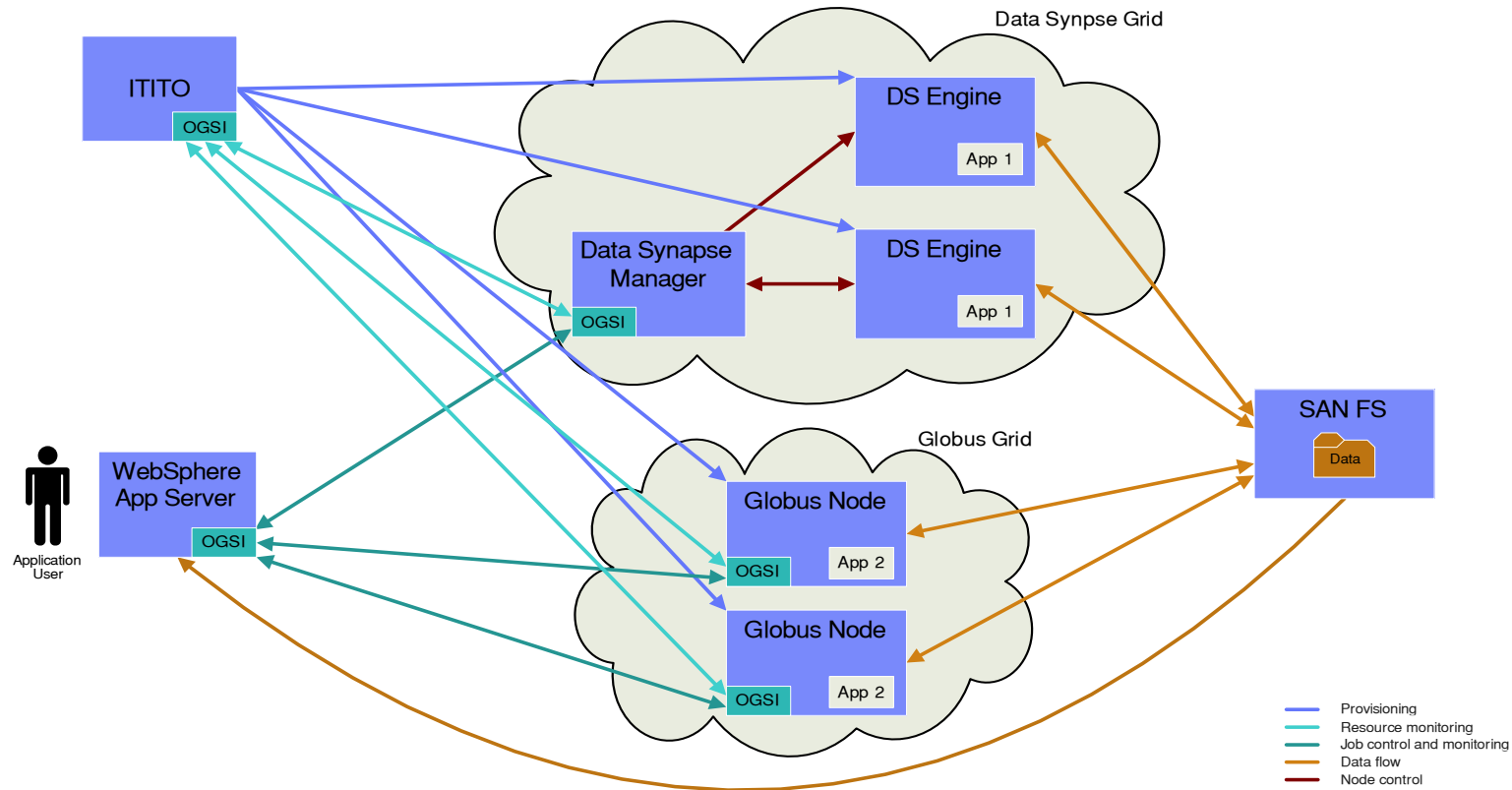


# Open Grid Services Architecture

<http://www.globus.org/research/papers/ogsa.pdf>

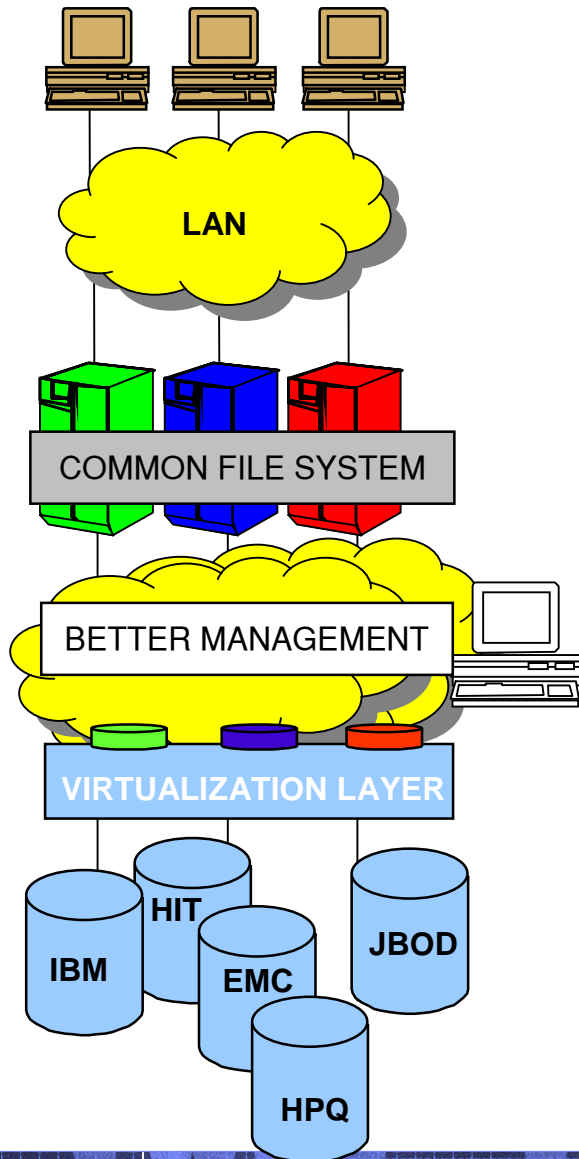


# Grid implementation of Analytics Acceleration using VE systems services



- **Virtualized Grid - multiple types of pluggable Grid Managers coexist**
- **TPM provisions resources to Grids – Systems provisioning**

# IBM Storage Software: Improving storage deployments today



- 1) Simplify the deployment and administration, while increasing utilization, of physical storage assets in their environments

IBM TotalStorage SAN Volume Controller  
 IBM TotalStorage SAN Integration Server  
 IBM TotalStorage SAN Volume Controller  
 Storage Software for Cisco MDS 9000

- 2) Bring local data (files and databases) management capabilities to the entire SAN

IBM TotalStorage SAN File System  
*based on Storage Tank™ technology*

- 3) Manage all their storage assets with a single, comprehensive management suite

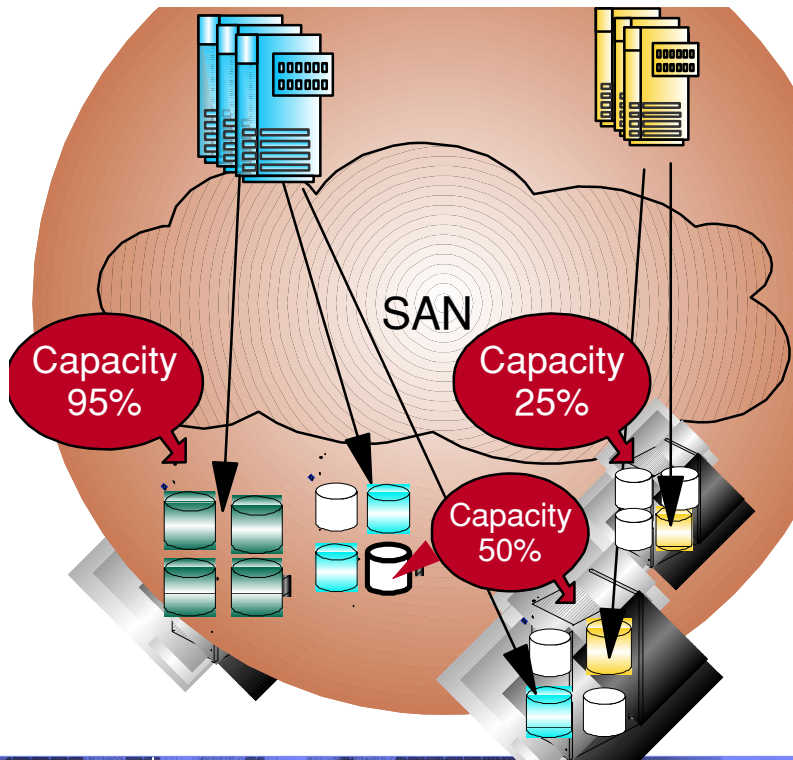
Future

IBM Multiple Device Manager  
 IBM Tivoli Storage Manager  
 IBM Tivoli Storage Resource Manager  
 IBM Tivoli SAN Manager

# Utilize SAN Storage Capacity More Efficiently

## SANs Today

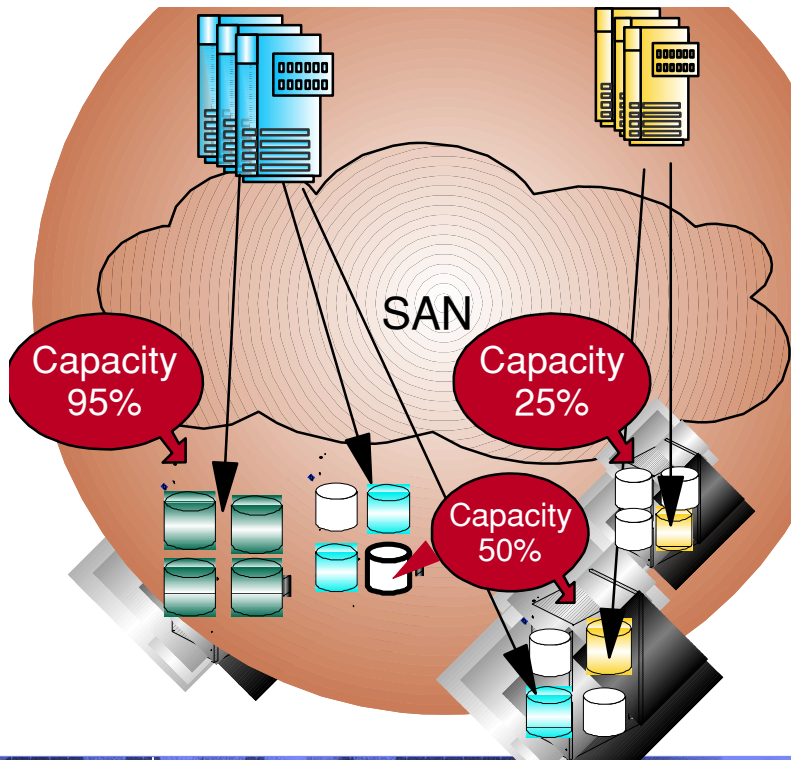
- Shared physical network, but capacity sharing is very limited in heterogeneous environments
- Resulting in poor utilization of storage assets
- Configuration changes are very complex
- Data center consolidations exacerbate issues
- **Purchase capacity for each storage array island**



# Utilize SAN Storage Capacity More Efficiently

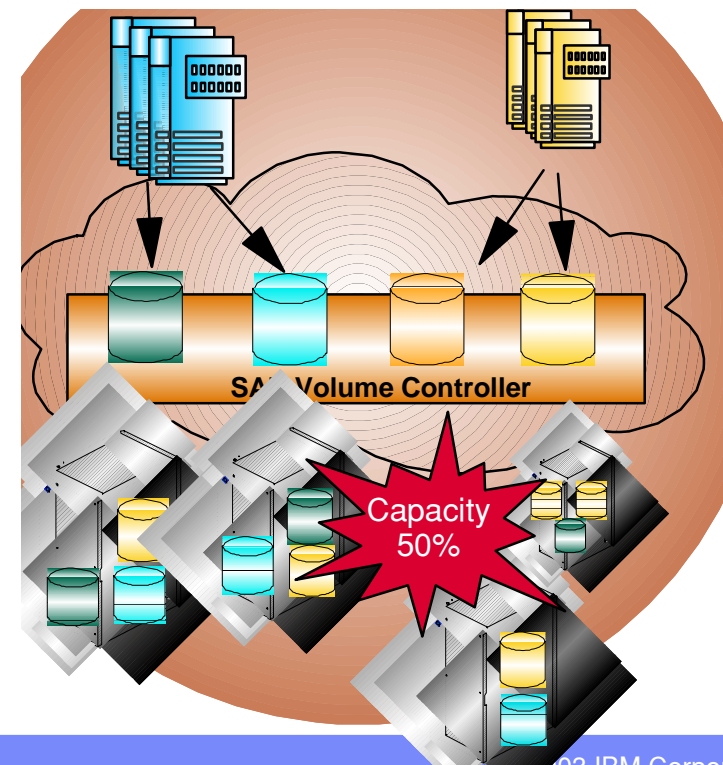
## SANs Today

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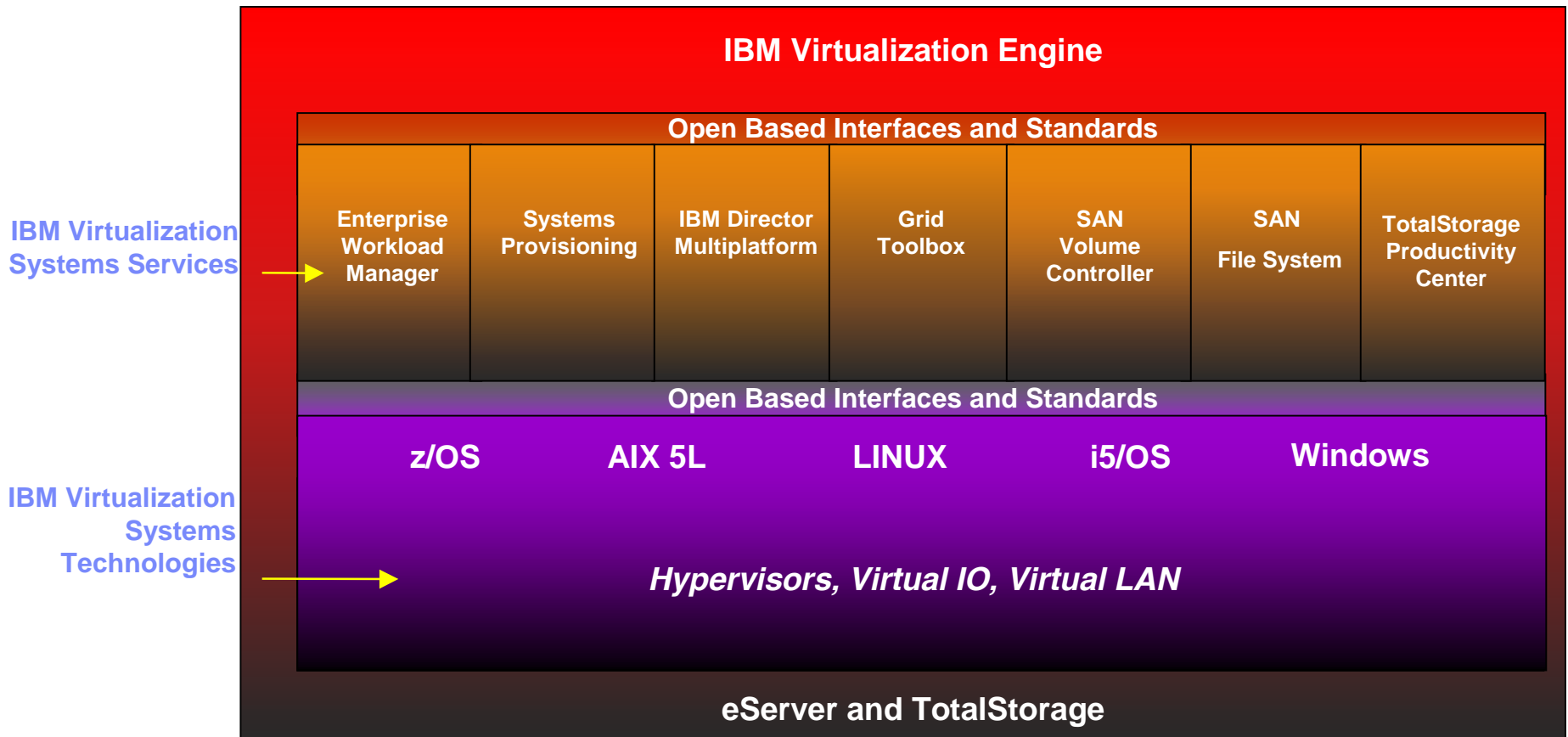
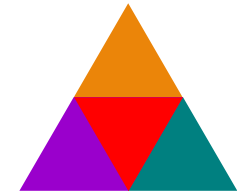
## SAN Volume Controller

- Hosts use virtual disks, not managed disks
- Virtual disks consist of managed disks from any device within the storage pools
- Unused capacity can be easily reallocated to help dramatically improve capacity utilization
- Defer storage purchase until total SAN capacity approaches utilization trigger points



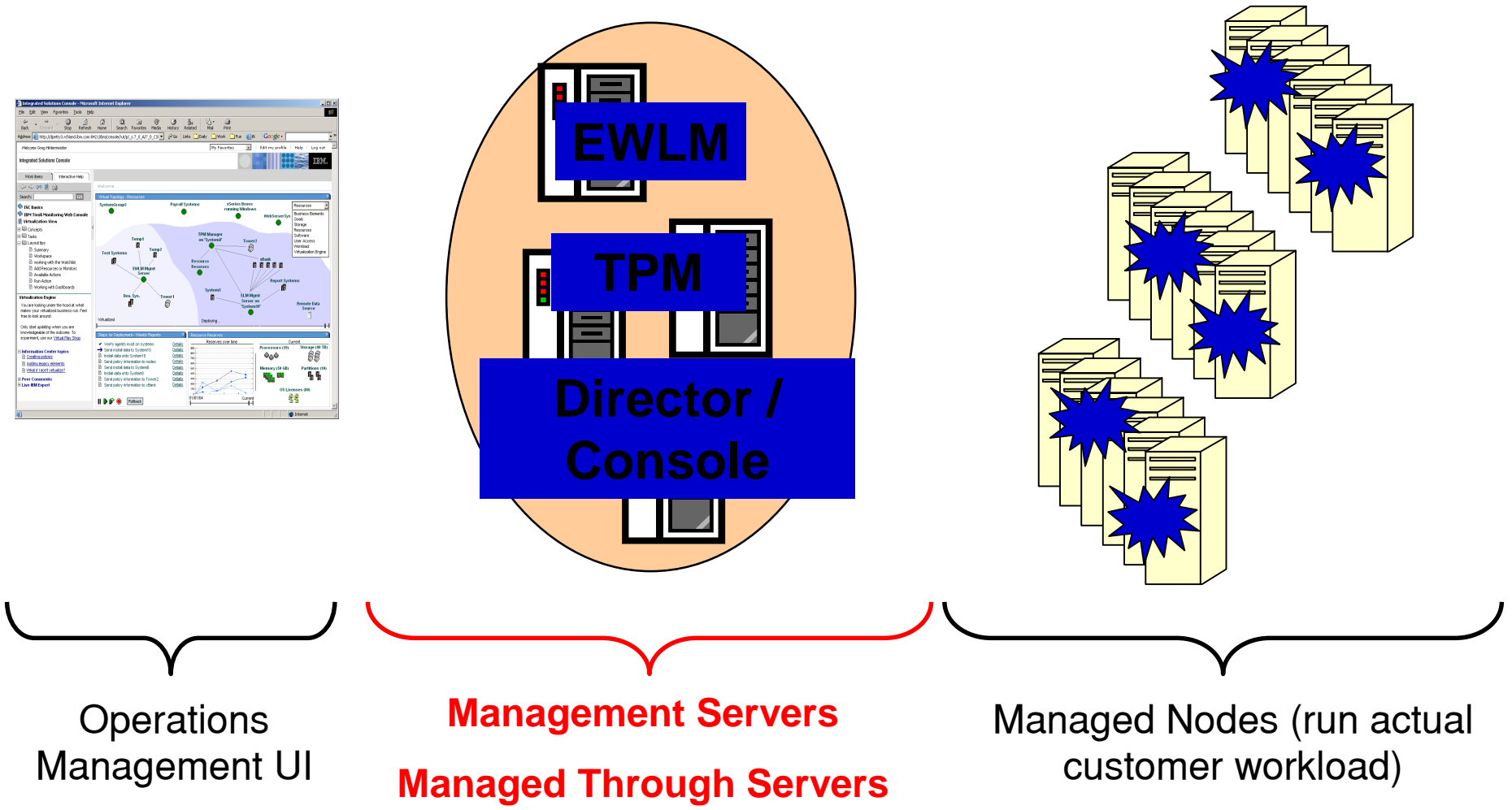
# The IBM Virtualization Engine™

## A look under the hood



Support for select non-IBM platforms via managed nodes

# Virtualization Engine Topology



# Monitor and alert systems to allow establishment of business SLAs and automated detection and remediation of violations

## The Challenge:

Monitor and alert systems need to be managed, autonomically, based on a variety of Service Level Objectives (SLO), Service Level Agreements (SLA), policies, and rules

## Goal / Benefit:

All operational aspects of the on demand operating environment and all of its provisioned components need to be dynamically managed through their lifecycle (creation, operation, removal) to optimize solution delivery in conjunction with meeting business performance and SLAs

## Capabilities Required:

- Dynamic, scalable monitoring of business processes and solutions
- Instrumentation to generate relevant metrics
- Rules based management of monitored data and events
- Provisioning and Orchestration framework



## Monitor and alert systems to allow establishment of business SLAs and automated detection and remediation of violations

### IBM Offerings – Available Today:

IBM Tivoli Monitoring for Transaction Performance

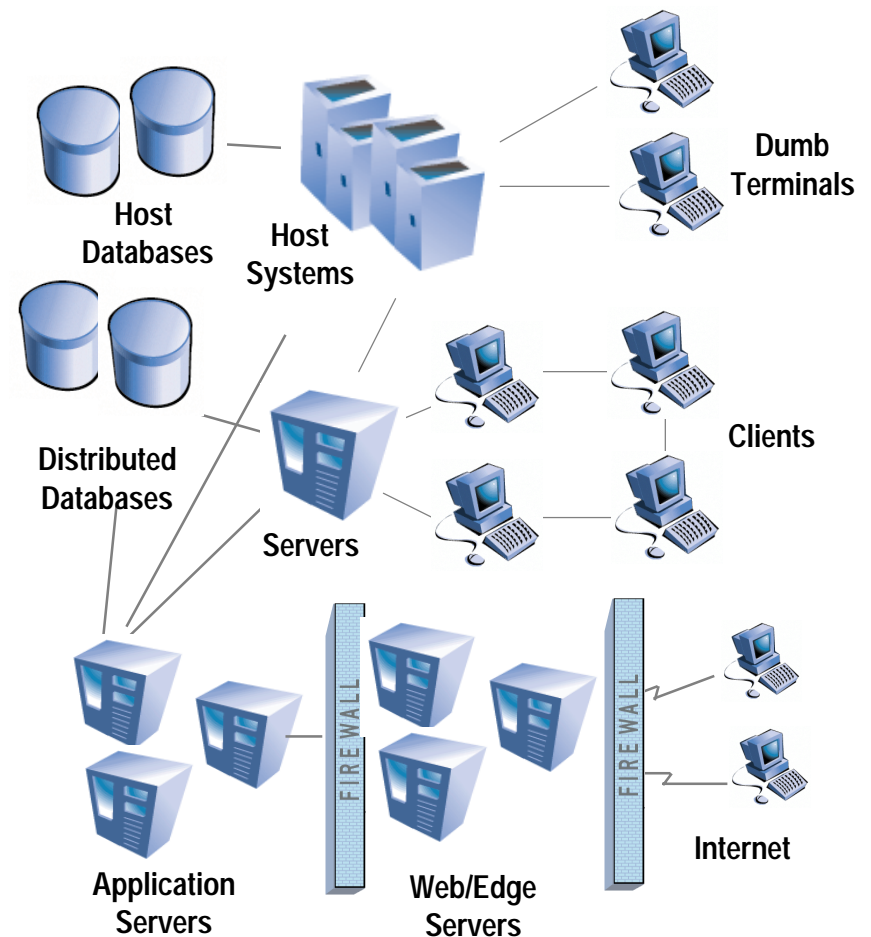
- IBM Tivoli Service Level Advisor
- IBM Tivoli Business Systems Manager
- IBM Tivoli Enterprise Console
- IBM Tivoli Data Exchange
- IBM Tivoli Intelligent ThinkDynamic™ Orchestrator

### What you can expect:

- IBM's support for defining, monitoring, enforcing and negotiating SLA's will continue to evolve into a policy driven model
- SLA specs will continue to evolve to support metrics and deeper capabilities to facilitate interactions between service providers and consumers
- Self-managing autonomic systems that integrate SLA awareness across all aspects of IT and business components and process lifecycles as well as management
- EWLM driving utilization based on business policy

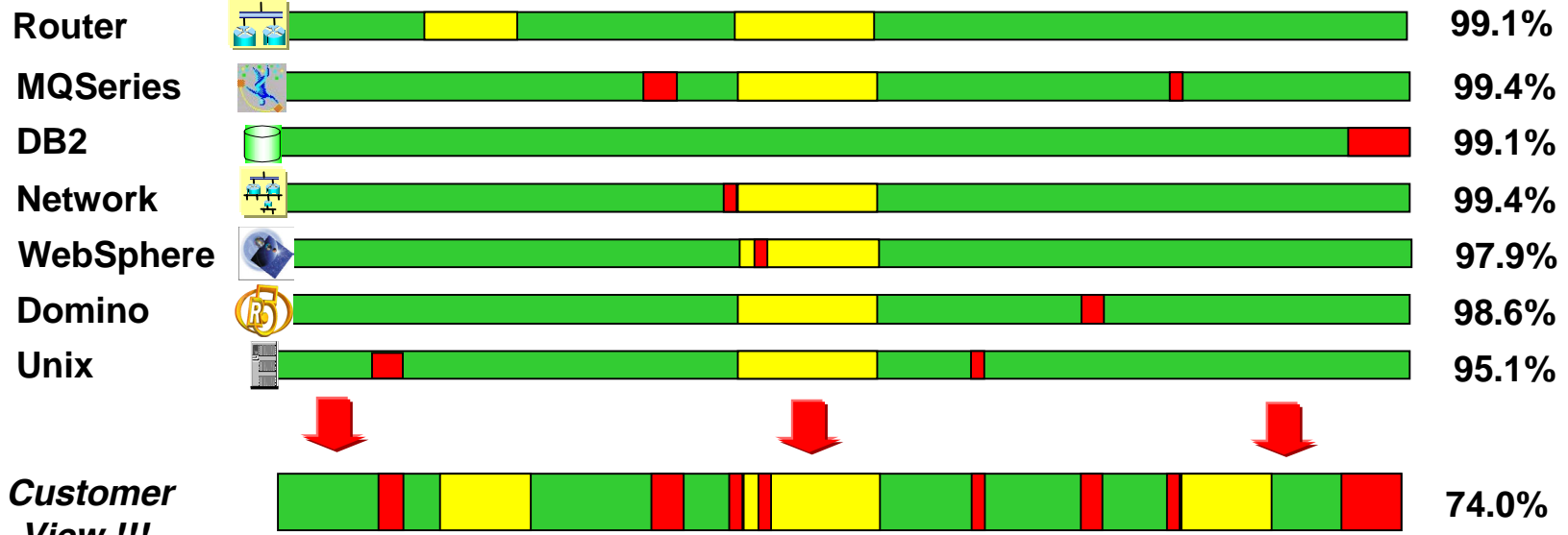
## Managing the Complexity

- IT consolidation requires supporting multiple technologies and vendors
- Management tools only cover specific technologies
- IT management is largely **REACTIVE**
- Inability to associate IT components with business objectives
- There is a shortage of skilled IT resources



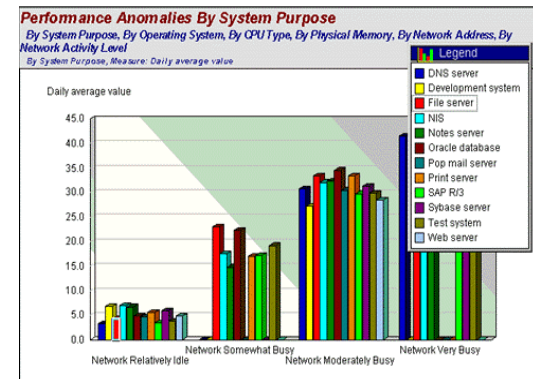
# The Service Level Management Problem

*IT View*

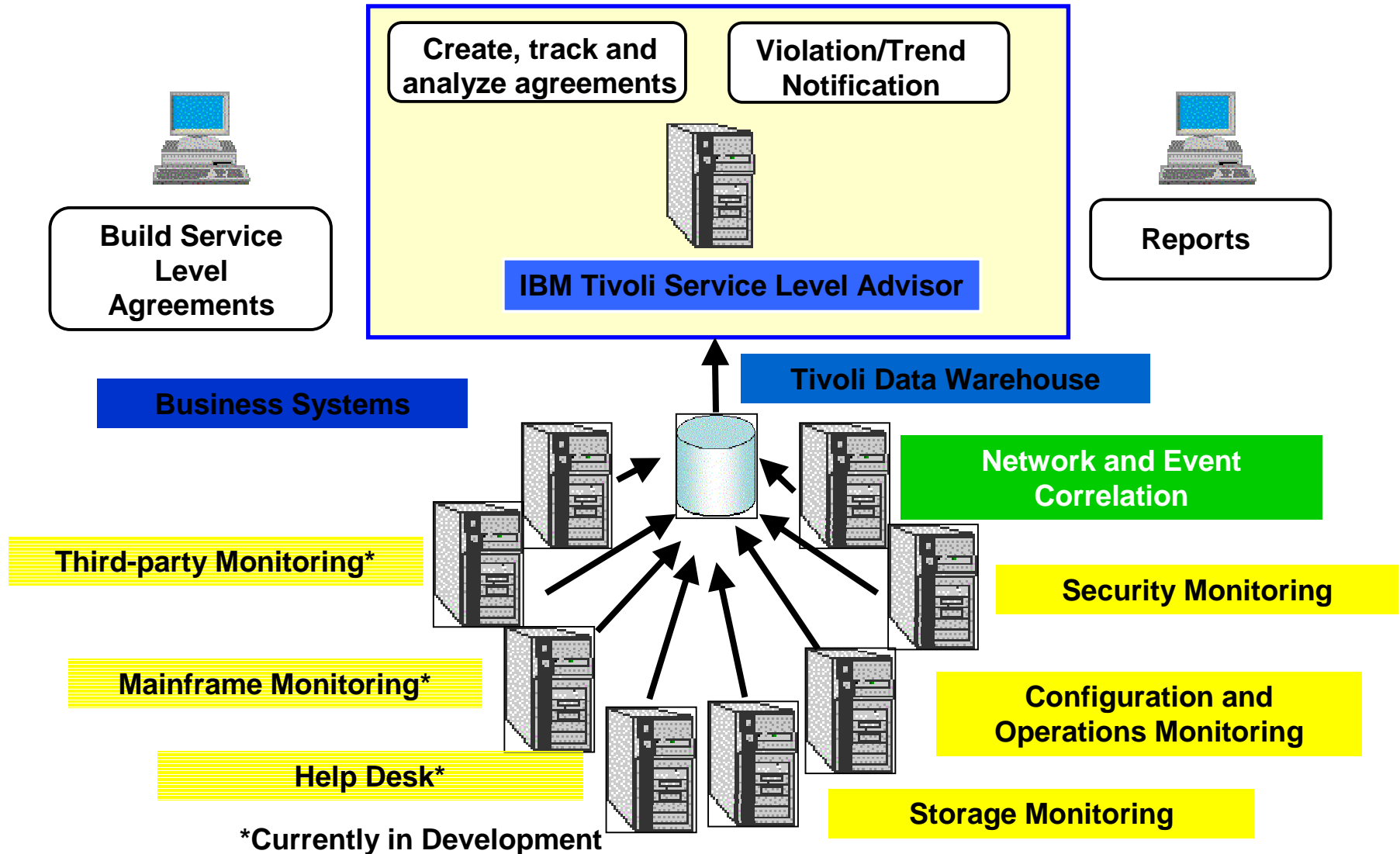


## Service management needs

- Set Priorities
- What to Automate
- Impact Analysis
- Capacity Planning
- Measure Service Levels



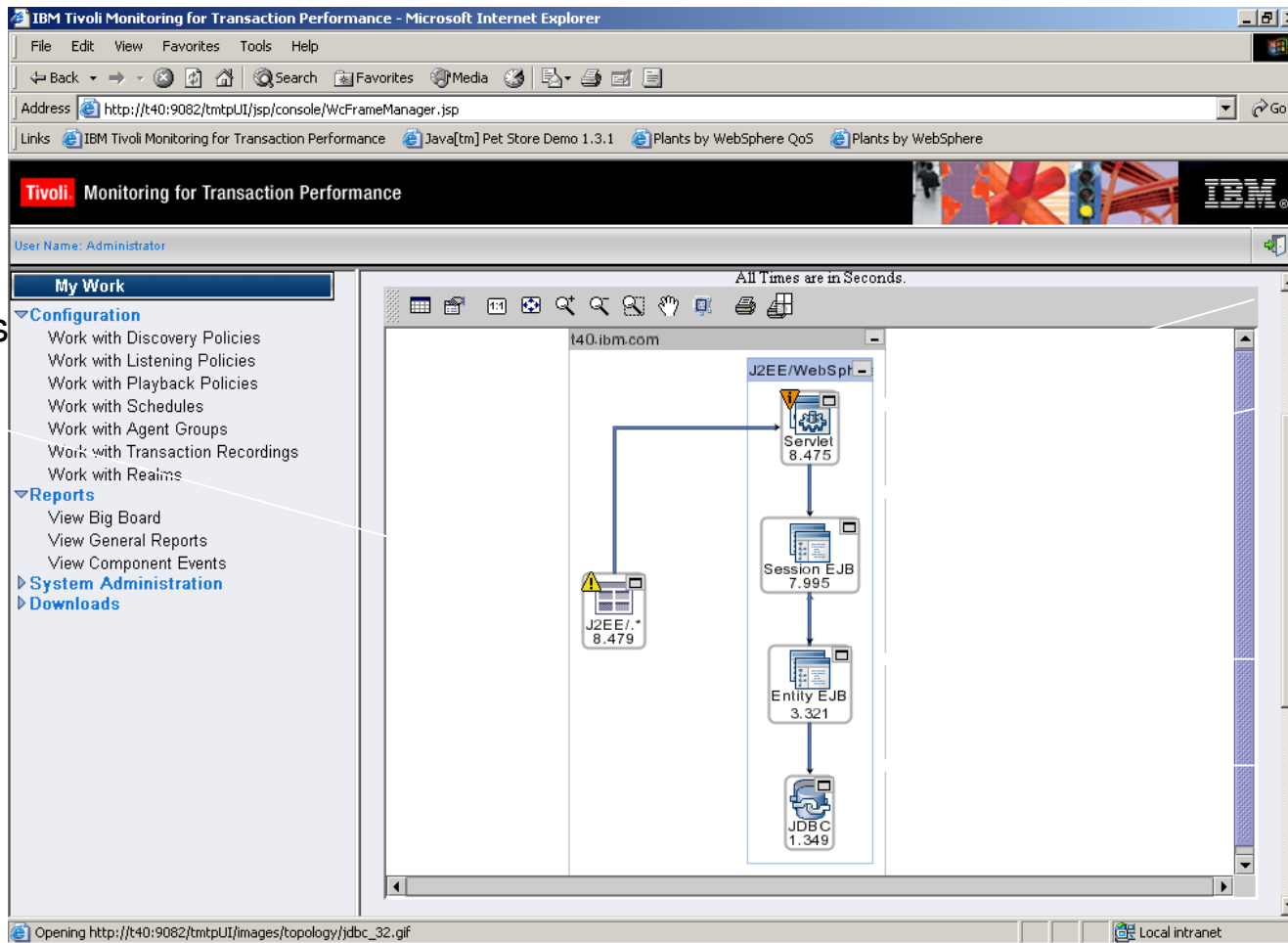
# Open Architecture for End-to-End SLAs



# Performance - Transaction Decomposition

## IBM Tivoli Monitoring for Transaction Performance

J2EE  
Transaction  
Time: 8.479s



Servlet: 8.475s

Session  
Bean: 7.995s

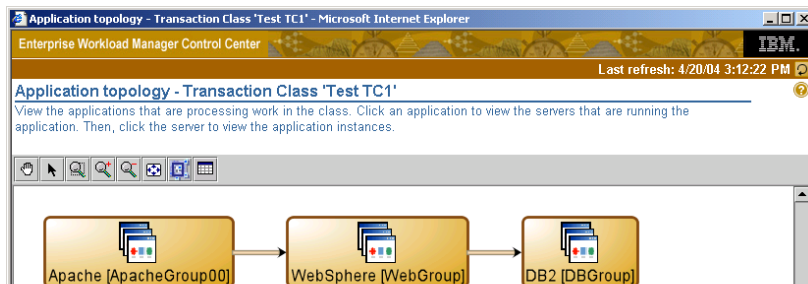
Entity  
Bean: 3.321s

JDBC  
Call: 1.349s

# Enterprise Workload Manager

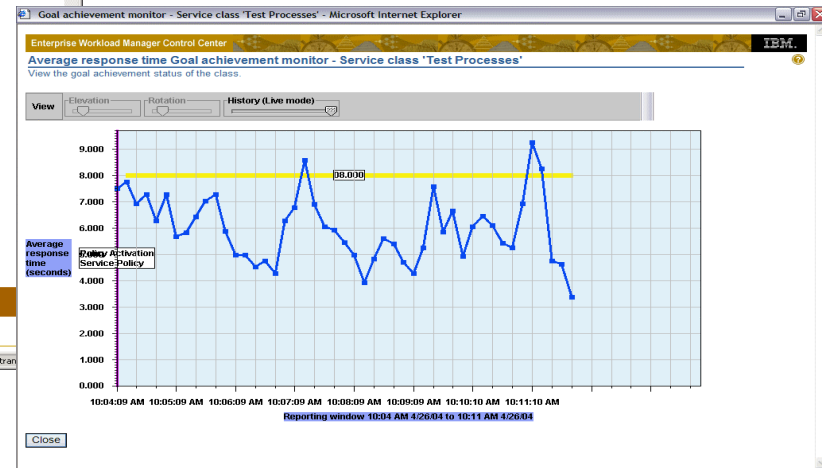
## Automated Workload Management for Distributed Heterogeneous Infrastructures

- Manage business process service levels
- Improve utilization of IT resources



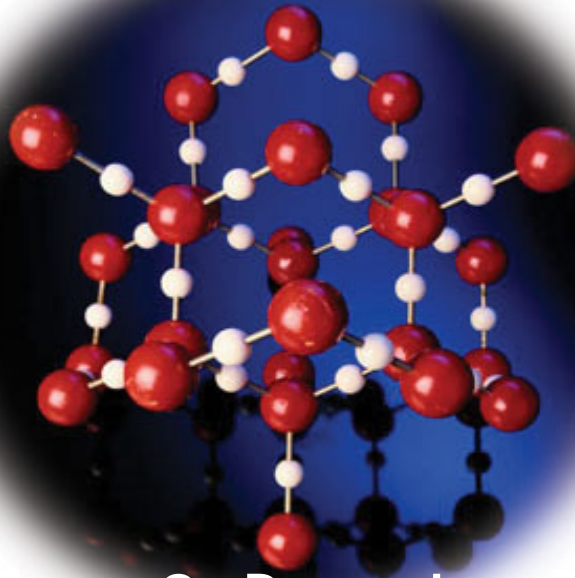
This screenshot shows the 'New Service Class' configuration window. The configuration includes:

- Name:** Hot Web Work
- Description:** fastest, most important web work
- Workloads:** Web Site Applications
- Goal type:** Percentile Response Time
- Importance:** Highest
- Target:** 85 % (1-99)
- Time:** 00 Hours, 00 Minutes, 02 Seconds, 000 Milliseconds



# Operating Environment

*A journey achieved through incremental steps adopted to meet customer's needs*



**On Demand**

Evolution      Modular  
Dynamic      Business Flexibility  
IT Simplification

- On demand weaves technology into the fabric of business
- Modularity – leading to flexibility and simplification – drives breakthroughs
- Integration and infrastructure management are the operating environment capabilities that deliver business flexibility and IT simplification
- On demand capabilities exist in real products and technologies that IBM sells today