The New IT Solution:
A Converged System of Hybrid Computing

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Room 204
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9:30 AM-10:30 AM
Abstract

- Information Technology is essential to the modern business. But is "IT"? Every business is faced with the challenge of advantaging information technology to remain competitive. But that does not mean that every business will self-service their information technology needs from their own IT shop. Information technology needs vary greatly from business to business so for some, outsourcing IT may be the right answer; for others the answer could be cloud-sourcing; for some the answer could be a traditional IT shop; and for others the answer could be some mixture of "all of the above". The challenge of running an efficient and effective IT shop is huge. However, the challenge of running a good IT shop is one shared between the suppliers of IT technology and products and those who deploy those IT technologies and products. It is time for the vendors to step up because all too many IT shops are "underwater".

This presentation will take a look at the many "oars" that IBM has in the water to help IT shops address future challenges. This presentation will illustrate that when those many oars are synched and steered in the same direction a very plausible future datacenter takes shape that can be referred to as "The Inevitable IT Singularity that is Converged Hybrid Systems". The oars churning the information technology waters include the following:

- The Cloud Paradigm and IT as a Service
- Workload-centric requirements gradients
- Edge systems
- Systems of record
- Enclosed clusters
- Single system images
- Heterogeneous compute platforms (multi-platform)
- Hybrid compute capabilities (appliances)
- Adaptive hypervisors
- Workload-centric instrumentation
- Business metrics instrumentation
- IT Analytics
- Real-time workload-based platform optimization

This presentation will examine each "oar" in turn, expressing how when taken as a whole the "crew" that results is a multi-platform heterogeneous and hybrid single system image enclosed cluster that is self-optimizing and dynamically adaptive based upon flexible business and technology policies. In other words, it is just the tool a future IT shop needs to become and remain efficient and effective in delivering information technology capabilities to the business.

The Future of IT
The Future is Dismal… Unless its Bright

Traditional IT

IT in the Cloud (outsourced)

Service-driven (service delivery)
Efficient (cheap)
Flexible (fast)

Traditional IT

… but
Converged
Integrated
Simplified

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The Tides of Change in IT

- The Cloud Paradigm and IT as a Service
- Workload-centric Requirements Gradients
- Edge Systems and Systems of Record
- Enclosed clusters and Single system images
- Heterogeneous compute platforms (multi-platform)
- Hybrid compute capabilities (appliances)
- Adaptive hypervisors
- Workload-centric instrumentation
- Business metrics instrumentation
- IT Analytics
- Real-time workload-based platform optimization
IT Trends and Directions

Application Architecture Models

Computing Models

The Inevitable IT Singularity that is Converged Hybrid Computing

Computing Platform Models

IT Service Delivery Models

IT Management Models

Programming Models
IT Trends and Directions

Programming Models
- Java
- C++
- Object Oriented Programming
- C
- COBOL
- Assembler
- Procedural Programming
- Cross Platform Middleware - Based
- Middleware - Based
- Operating System - Based
- Parallel Programming
- Multi-Programming
- Serial Programming

Application Architectural Models
- The Inevitable IT Singularity that is Converged Hybrid Computing

IT Management Models

IT Service Delivery Models

Computing Models

Computing Platform Models

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### IT Trends and Directions

<table>
<thead>
<tr>
<th>Programming Models</th>
<th>Computing Models</th>
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<tbody>
<tr>
<td>HTTP Server</td>
<td>Web Services</td>
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<td>Client Server</td>
<td>SOA - ESB</td>
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<td>Presentation Application Data</td>
<td>REST</td>
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<tr>
<td>Monolithic</td>
<td>Mobile</td>
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**Application Architecture Models**
- The Inevitable IT Singularity that is Converged Hybrid Computing

**IT Management Models**
- IT Service Delivery Models

**IT Service Delivery Models**
- Mobile

**Computing Models**
- REST

**SHARE in Boston**

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IT Trends and Directions

- **Application Architecture Models**: The Inevitable IT Singularity that is Converged Hybrid Computing
- **Programming Models**
- **IT Management Models**
- **IT Service Delivery Models**

**Computing Models**
- Serial Computing
- Batch Processing
- Online - Interactive Processing
- Multi-Processing
- Transaction Processing
- Parallel Computing
- Analytic Processing
- Application Domain Computing
IT Trends and Directions

Application Architecture Models

The Inevitable IT Singularity that is Converged Hybrid Computing

Computing Models

Computing Platform Models

Programming Models

IT Management Models

IT Service Delivery Models

General Purpose Systems

Special Purpose Systems

Server Virtualization

Clusters

Appliances

Adaptive Hypervisors

Converged Engineered Systems

System z

POWER

x86

Sysplex

DataPower

Data Analytics Accelerator

zEnterprise – zBX - zURM

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The Inevitable
IT Singularity
that is
Converged
Hybrid
Computing

IT Trends and Directions

- Application Architecture Models
- Programming Models
- Computing Models
- IT Management Models
- IT Service Delivery Models
- The Open Heterogeneous Cloud
  - The Data Center
  - The Public Cloud
  - The Outsourcer
  - The Private Cloud
IT Trends and Directions

Program- ming Models

Application Architectur e Models

The Inevitable IT Singularity that is Converged Hybrid Computing

Computing Models

Computing Platform Models

IT Service Delivery Models

IT Manage- ment Models

Manual – Event Driven

Instrumentation-based Monitoring

Monitoring-based Automation

Policy-based Autonomics

Analytics-based Automation

zAware / Process-based F4P

WLM / SMS

SRM / System Automation MVS

SMF / RMF
The Inevitable IT Singularity
that is Converged Hybrid Computing

HTTP Server
Client Server
*Presentation Application Data*
Monolithic

Web Services
*SOA - ESB*
*REST - Mobile*
Patterns - Templates

Cross Platform Middleware - Based
Middleware - Based
Operating System - Based
Parallel Programming
Multi-Programming
Serial Programming

Parallel Computing
Serial Computing
Multi-Processing
Application Domain Computing

Serial Programming
Multi-Programming
Parallel Programming

The Open Heterogeneous Cloud

The Data Center
The Public Cloud
The Outsourcer
The Private Cloud

Analytics-based Automation
Policy-based Autonomics
Monitoring-based Automation
Instrumentation-based Monitoring
Manual – Event Driven

Converged Engineered Systems
Clusters
Appliances
Server Virtualization
General Purpose Systems
Special Purpose Systems

Computing Models

Computing Platform Models

IT Management Models

IT Service Delivery Models

Programing Models
The Inevitable IT Singularity that is Converged Hybrid Systems

Single System Image (Management) – Private Cloud
The Inevitable IT Singularity that is Converged Hybrid Systems

Enclosed Cluster - Private Network

Single System Image (Management) – Private Cloud
The Inevitable IT Singularity that is Converged Hybrid Systems

Enclosed Cluster - Private Network

Multiple Compute Models (Heterogeneous Systems)

Single System Image (Management) – Private Cloud
The Inevitable IT Singularity that is Converged Hybrid Systems

Enclosed Cluster - Private Network

Multiple Compute Models (Heterogeneous Systems)

Multiple Programming Models

Single System Image (Management) – Private Cloud
The Inevitable IT Singularity that is Converged Hybrid Systems

- Enclosed Cluster - Private Network
- Multiple Compute Models (Heterogeneous Systems)
- Single System Image (Management) – Private Cloud
- Systems of Record
- Multiple Programming Models
The Inevitable IT Singularity that is Converged Hybrid Systems

Enclosed Cluster - Private Network

Multiple Compute Models (Heterogeneous Systems)

Single System Image (Management) – Private Cloud

Edge Systems

Multiple Programming Models

Systems of Record
The Inevitable IT Singularity that is Converged Hybrid Systems

- Self-Optimized Dynamically Adaptive (Process-based F4P)
- Multiple Compute Models (Heterogeneous Systems)
- Enclosed Cluster - Private Network

- Edge Systems
- Systems of Record
- Multiple Programming Models
- Single System Image (Management) – Private Cloud

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The Inevitable IT Singularity that is Converged Hybrid Systems

- **Component Slot**: x86 Compute Node
  - Windows
  - Linux
  - Adaptive Hypervisor

- **Component Slot**: Appliance Node
  - IDAA
  - DP
  - Adaptive Hypervisor

- **Component Slot**: Storage Node
  - SSD
  - Disk
  - Adaptive Hypervisor

- **Component Slot**: POWER Compute Node
  - Linux
  - AIX
  - Adaptive Hypervisor

Private Network

Single System Image Management (Private Cloud Facilities et.al.)

- Components
- Patterns
- Placement
- Image
- Network
- Workload
- Availability
- Energy
- Instrumentation
- Analytics
- Mobility
- APIs
- etc
IT Decision Making (IBM Workshops)

- Functional Requirements (Architecture) Analysis
- Non-Functional Requirements Analysis
- Total Cost of Ownership Analysis
- Local Factors
- Cost Factors
- Options
- Fit for Purpose

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Fit for Purpose – Platform Decision Making

Platform List

Candidate Platform

Candidate Platform

Candidate Platform

Functional Requirements Analysis

Candidate Platform

Candidate Platform

Non-Functional Requirements

Candidate Platform

Candidate Platform

Total Cost of Ownership

Candidate Platform

Candidate Platform

Target Platform

Program Model

Compute Model

Middleware Container

Quality of Service

IT Strategy

Investments

Time & Budget

Workload Run-time Characteristics

Capacity Plan

Configuration

Unit Costs

Platform List

Candidate Platform

Candidate Platform

Candidate Platform

Functional Requirements Analysis

Candidate Platform

Candidate Platform

Non-Functional Requirements

Candidate Platform

Candidate Platform

Target Platform

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Process-based Fit for Purpose

Fit for Purpose (initial selection)
Target Platform
Deploy
QoS Test
Workload Run-time Characteristics
As Predicted?
Deploy to Production
N
Re-Deploy
Target Platform 2
Quality of Service Criteria
Non-Functional Requirements

• Response-Time Budget
  • Performance (seconds per transaction (or job (or whatever))
• Volumes (Scalability)
  • Transactions per second
• Resilience
  • Availability (anti-fragile)
• Security
  • Audit and compliance
• Workload Management
  • Performance Consistency
• Time to Market
  • Lifetime (expected useful life)
• Co-location
  • Proximity to Data (to integration points)
• Asset re-use
  • Re-use and/or modernization vs. invention (re-build)
Pattern-Based Dynamic Fit for Purpose

Platform Selection

Filter

Application

Build and Maintenance

Pattern-Based Dynamic Fit for Purpose

App

Products & Technology

Requirements Gradients

Pattern

Filter Build

Filter

Service Catalog

App

N

Y

N

(Re-)Deploy

Optimal

Metrics
### The Foundation – The zEnterprise Converged System

<table>
<thead>
<tr>
<th>General Purpose Computing</th>
<th>Main Frame</th>
<th>Hardware</th>
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Process-Based Filter-Based Re-Deploy
The Premise – The Question

• The Premise
  • Future zEnterprise could be the “IT Singularity” required by traditional IT to sustain the value proposition of traditional IT.

• The Question
  • What’s missing in the zEnterprise product (or roadmap) preventing it becoming the future “IT Singularity”?

• I’d love your feedback … today … or …
  • mbauman@us.ibm.com
The End
Presenter Biography

- Montgomery (Monte) Bauman
- IBM Columbus
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- 614-937-7076

- Title: IBM Certified Senior Consulting IT Specialist
- Role: System z Technical Support Specialist

Monte Bauman began his work in the IT industry in 1983 with the IBM Company in Endicott NY Glendale Processor Development Laboratory. Monte graduated from The Ohio State University with a BSEE that same year. From 1983 through 1991 Monte supported development of the 4300 and 9370 and 9221 product lines writing System Test code (assembler and PLX) and Hardware Management Console code (C). In 1991 Monte moved to Columbus, Ohio, becoming an IBM Large Systems Systems Engineer (SE). Since 1991, Monte's title has changed numerous times, but his role as a mainframe technical support advocate for mainframe customers in Ohio (and now across the Midwest and east coast) remains the same. Monte now concentrates the bulk of his efforts in supporting "new workloads" on the mainframe, including eBusiness (web 2.0), business intelligence (analytics), server consolidation (IT optimization), and application modernization (SOA and AD). Monte has also developed tools and methods supporting efficient and thorough total cost of ownership (TCO) analysis.

- Monte resides in Columbus, Ohio, with wife and four children. Monte's hobbies include woodworking, skiing, ATVing, and traveling.