Cloud Computing, Grids, and the coming IT Cambrian Explosion

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The Internet: Industrial Knowledge Economy
Internet Evolution - 1996

World Wide Web

e-business
e-business = Web + IT

**Industrial Strength**
- Database
- Transactions
- Scalability
- Systems Mgmt
- Availability
- Security

**Universal Connectivity**
- TCP/IP
- Standards
- HTML
- SSL
- Browsers
- GUIs
- Java
- Web Servers
Internet Evolution – 2002

Distributed Virtual Systems

Information

Communications

Networking

Grid Computing
On Demand
Virtualization

Physical Internet

computing power
storage
applications
files
data
Virtualization: Grid Computing
Accessing and Sharing Resources over the Internet, or Private Intranets, based on Open Protocols
IT Merges with the Physical World

*Pervasive Computing*
Virtual Access to Computing

Utilities

Remote Data Centers

Departmental Systems

Devices

Virtual services

virtual services

virtual services

virtual services

virtual services
Internet Evolution – 2008

- Distributed Virtual Systems
- Information
- Communications
- Networking
- Cloud Computing
- New Enterprise Data Center

Massive Scalability
Services, Information, Devices
Accelerating Advances in Information Technologies

Source: Kurzweil 1999 – Moravec 1998
Accelerating Advances in Information Technologies

Driving Costs Steadily Downward

Source: Kurzweil 1999 – Moravec 1998
A Stream of Disruptive Innovations

- Globalization
- Services Sciences
- Mobile Devices
- Offshoring
- Flat World
- Ubiquitous Sensors
- Virtual Worlds
- Petaflop supercomputers
- Real-time Information
- Emerging Economies
- Energy & Environment
- Web 2.0
- Commoditization
- Energy & Environment
Cambrian Explosions
Massive Scalability, Rich Diversity

Business and Consumer Services

Real-time Information

New Enterprise Data Centers
Systems, servers and storage

People, Devices, Sensors
Cambrian Explosions
Business and Consumer Services
Cambrian Explosions

Real-time Information
Cambrian Explosions

Devices, Sensors, etc
Cambrian Explosions
New Enterprise Data Centers
The IT Complexity Crisis

Classic Complex Data Center
Data Center “Ensemble” Approach To IT Simplification
Virtualized, Federated Ensembles – SOA/Grid Protocols

- Mainframe service
- SAP application service
- Hybrid service
- Database service
- WebSphere service
- File system service
- DMZ appliance service
- Storage backup, archive... service
- x86 service
- Virtual Client service
- Unix service
- Consolidation service
New Enterprise Data Center - Blue Cloud

Business & IT Infrastructure

Ensembles
Critical Requirements
Flexible, Adaptable Architectural Frameworks

Integration
Virtualization
Efficiency
Management
Autonomic Computing

Self-protecting

Self-healing

Self-optimizing

Self-configuring
New Enterprise Data Centers = Clouds + IT

Industrial Strength, Universal Connectivity
- Content
- Browsers
- Transactions
- Web Servers
- Security
- Java
- Systems Mgmt
- Availability

Massive Scalability, Rich Diversity
- Business Services
- Devices
- Real-time Information
- Sensors
- Autonomic Mgmt
- Computing Capacity
- Consumer Services
- Storage & Content
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