Agenda

- Fundamentals of Enterprise Cloud Computing
- IT & Cloud Computing
  - Requirements
  - Challenges
- Why Intel
Intel + Cisco... Stronger Together

- **Shared Vision:** Intel shares a common vision of the need to evolve the data center.
- **Customer Options:** Intel wants to provide the customer base the best options to solve its data center challenges.
- **Foster Innovation:** Intel desires to promote innovation in the data center and Cisco’s UCS does just that.
A Rich History of Collaboration
Collaboration Across UCS

Intel brings

Memory
Xeon 5500 with integrated memory controller
Memory extender technology

Unified Fabric
DCE compliant 10GbE controller
10GbE Unified fabric solution

Virtualization
Xeon 5500 with enhanced VT-c and VTx2 virtualization capabilities
VN-Link solution and Hypervisor bypass

Power Management
Xeon 5500 with 5x low power states
Innovative chassis and system level power management

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Data Center Trends:
Paradigm Shift to the Enterprise Cloud

- **Enterprise Cloud:** Virtualization 3.0
  Automation and Resource Scalability

- **Flexible Resource Management:** Virtualization 2.0
  Dynamic Resource Allocation

- **Consolidation:** Virtualization 1.0
  Operational Expense Efficiency

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A Fully Realized Cloud

Federated
Data and services seamlessly and securely span clouds

Automated
Dynamically allocates resources to manage service level and optimize power

Client-Aware
Secure access and optimal experience across a range of devices

Requires an Simplified, Efficient, Secure and Open Architecture

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Requirements of a Cloud Architecture

Efficient
World class energy efficiency

Secure
Data protected at rest and in flight

Simplified
Flexible IA infrastructure and a unified network

Open
Multi-vendor innovation and solution compatibility

Driving Technology Leadership to Enable the Cloud

Intel® Xeon® for servers & storage
Deploy 10GbE

Refresh with Intel® Xeon® 5600 and Node Manager
IT and Cloud Computing Transition

Traditional IT Architecture  Cloud Architecture

Traditional IT  Private Cloud

Enterprise/Private

Enterprise DC evolution

Examples

“Off-the-shelf”

Outsourced IT & Web  Cloud Service Providers

Large Custom deployments

Virtualization – the core element between Legacy and Cloud

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Consider Cloud Deployment Today

“Private Clouds”

Virtual Private and Hybrid clouds

Best for:
- Security
- Compliance and Governance
- Interoperability

Example: ERP, business intelligence

“Public Clouds”

Services via public internet, multi-tenant

Best for:
- Rapid Deployment
- Reduced Capital Expenditure
- External vendor expertise

Example: batch jobs, HR apps

Intel IT Strategy: develop private clouds while adopting selective best of breed public cloud services
Intel IT Findings on Cloud Computing

Benefits

- **Agility**
  - Biggest benefit
  - Project acceleration SaaS & IaaS
  - Outsourced expertise
  - Flexibility; Scale up & down
  - Temporary new capabilities to gather requirements

- **TCO**
  - Overall lower costs for SaaS
  - Rent versus buy
  - Pay based on consumption

- **User Experience**
  - Good responsiveness & accessibility
  - Natural extension of the enterprise
  - On-demand, self service approach

Challenges

- **Security**
  - Up-front due diligence & contract
  - Risk assessment based on data classification
  - Identity and access management
  - Resource isolation for multi-tenancy

- **Manageability**
  - Systems monitoring & enforcing service level agreements
  - Self-service provisioning
  - Single sign-on

- **Data Exchange**
  - Biggest challenge cited by our project teams
  - Highly structured data exchanges moving to real time
  - Ownership, use and storage
  - Clarification over Intel/Supplier roles

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Intel IT Cloud Computing Strategy

**Current:** Grow internal cloud

**Interim:** Transform existing environment to internal cloud

**Future:** Move between internal and external cloud

Grow the Cloud from the inside out
## Why Enterprises Want Cloud Computing?

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Line of Business</th>
<th>Data Center Manager</th>
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<tbody>
<tr>
<td>Self-Service Provisioning</td>
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<tr>
<td>Virtualized</td>
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</tr>
<tr>
<td>Resource Utilization</td>
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<td>✓</td>
</tr>
</tbody>
</table>

*Value of Cloud = OpEx + Self-Service = Data Center Efficiencies*
Data Center Complexity Growing

Virtualization Complexity

Public Cloud Emergence

DC Capacity Limitations

OPEX Cost Pressures

All Drive need for the Enterprise Data Center to evolve

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Cloud Flexibility is a Game Changer

*Internal Customers expect rapid service delivery today*

1. They are in control
   - New email account in less than a minute

2. They get it fast
   - Deploy new app in hours not days

3. They use as much as they want
   - Dynamically allocate storage capacity

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Driving New Expectations and Challenges for the Enterprise

Business Unit Expectations

1. Illusion of infinite resource
2. Sense of ownership & security
3. Self-service

Data Center Requirement

- Massive Scale
- Multi-tenancy
- Low TCO

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Driving New Expectations and Challenges for the Enterprise

Data Center Requirement

Massive Scale
Multi-tenancy
Low TCO

Virtualization
Security
Performance
Efficiency

Technology Drivers
For the Enterprise Cloud

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Driving New Expectations and Challenges for the Enterprise

Data Center Requirement
Massive Scale
Multi-tenancy
Low TCO

Virtualization
Security
Performance
Efficiency

Technology Drivers For the Enterprise Cloud
Intel® Xeon® Processor 5600 Series

Delivering on Virtualization Performance Needs

Higher Raw Performance†

Greater Virtualization Efficiency:

Virtualization Performance‡‡

† Source: Published/submitted/measured for SPEint*_rate_2006 as of Feb, 2010. See www.spec.org for more details. Xeon® 5600 performance based on internal Intel measurements.

‡‡ Best published VMmark results as of 10/19/09 except Xeon® 5500 processor scores, which are Intel Measurements May 2009. Xeon® 5600 VMmark performance: Intel Xeon processors X5680 (12 M Cache, 3.33 Ghz, 6.40 GT/s Intel® QPI), 96 GB memory (12x 8 GB DDR3-800 Reg ECC DIMMs), VMware ESX* V4.0 Update 1. Performance measured at 32.25@ 26 tiles.

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Xeon® 7500: Meeting the Highest Virtualization Needs

**Xeon® 7500**
- 8C/16 threads per socket
- 2-256 socket scaling
- 256GB memory per skt
- 2X I/O capacity
- Mission Critical RAS

**Intel Platform Virtualization Technologies**
- Intel® VT-x
- Intel® VT For Directed I/O
- Intel® VT For Connectivity

**Intel® VT Flex Migration**

**Large Scale, Mission Critical Virtualization (>8GB)**

**Infrastructure Consolidation (of multi-tier Applications)**

**Headroom for Peak & Unpredictable Demand**

**Live Migration of Big Workloads**

Optimized for the most demanding virtualization workloads

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Driving New Expectations and Challenges for the Enterprise

Data Center Requirement

Massive Scale
Multi-tenancy
Low TCO

Virtualization
Security
Performance
Efficiency

Technology Drivers For the Enterprise Cloud

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Security in the Enterprise Cloud

Cloud / Virtualization
- Higher Utilization
- Fast Provisioning
- Flexibility
- Consolidation
- Multi-Tenancy

Security
- Cost of Downtime / Data Loss
- Risk of Company Image
- Concentration of Assets
- Compliance, Regulatory

Cloud Deployment requires Balancing Security Tensions

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New Security Features with Intel® Xeon® Processor 5600

**Advanced Encryption Standard New Instructions (AES-NI)**

- ORACLE
- Microsoft
- McAfee

Enables broad usage of encryption throughout the enterprise

**Intel® Trusted Execution Technology (TXT)**

- VMware
- Parallels
- HyTrust

Prevents the insertion of malicious software prior to VMM launch

Ready for Today

Prepared for Tomorrow
Intel® Virtualization & Security Technologies

Establishing the Foundation for More Secure IT Services

Isolate

Intel® VT & Intel® TXT
protects VM isolation and provides a more secure platform launch

Enforce

Intel® TXT
establishes “trusted” status to enable migration based on security policy

Encrypt

Intel® AES-NI
delivers built-in encryption acceleration for better data protection

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Industry Leadership & Investment

Intel engaged broadly across the emerging Cloud Computing industry

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