Opportunities in Cloud Computing
Discussion at ISTC Summit

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http://www.istc-cc.cmu.edu/
Cloud Computing Driven by:
More users, more devices, more data, more storage, more traffic...

55%
Growth in Unstructured data (e-mail, video, images, social media etc.)

670%
GROWTH IN STORAGE CAPACITY SHIPPED

>1000
EXABYTES OF TRAFFIC

Forecast

1. IDC “The Internet Reaches Late Adolescence” Dec 2009, extrapolation by Intel for 2015
2. ECG “Worldwide Device Estimates Year 2020 - Intel One Smart Network Work” forecast
3. IDC
Growth Opportunity

>2X in 5 YEARS

CPU Volume TAM

- Networking*
- Storage
- High-Performance Computing
- Cloud
- Workstations
- Small & Medium Business
- Infrastructure & Mission Critical

* Reported in ECG
Cloud 2015 Vision

**FEDERATED**
Share data securely across public and private clouds

**AUTOMATED**
IT can focus more on innovation and less on management

**CLIENT AWARE**
Optimizing services based on device capability

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Desktops  Laptops  Netbooks  Personal Devices  Smartphones  Smart TVs  Embedded
From Vision to Action

User Requirements: Define and Prioritize IT Requirements

Products & Technologies: Take Advantage of New Capabilities in Intel Platforms

Intel® Cloud Builders: Utilize Proven Reference Solutions to Ease Your Deployments
Cloud Customer Challenges Today
Open Data Center Alliance Member Survey

What is your organization’s biggest cloud challenge?

- Migration strategy for moving applications to the cloud: 31%
- Maintaining security SLAs with cloud solutions: 20%
- New security requirements with emerging...: 20%
- Simplified and more capable management infrastructure for cloud...: 11%
- Moving initial apps to the cloud (either internal or with a service provider): 8%
- Complex regulatory engagement with use of public cloud resources: 7%
- Managing power and carbon footprint: 2%

Security is a critical cloud concern
Convergence & Flexibility in Cloud Infrastructure

1. Programmable platforms for compute, network & storage
2. Most secure, efficient and simple to deploy
3. Common interfaces to manage

Multi-Tenant Security
- Execution integrity
- VM data privacy
- Secure DC federation

Cloud Server
- Secure
- Efficient
- Automated

Optimized Data Center
- High efficiency, High Temp, Low PUE
- Management integration with facility

Group Level Mgt.
- Simple node control
- QoS enforced
- Consistent API

Scalable Cloud Storage
- Low-latency scale-out
- Accelerated by NVM tiers

Network Platform
- Std. high-volume hardware
- Programmable OS
- Open Mgt. APIs

System Fabric
- Connects servers + storage
- Cost-effective bandwidth, low-latency
- Shared I/O and NVM

Opportunity to enable greater platform programmability
Application Optimized Servers

Mainstream
- Search workloads
- Caching tiers
- Data tiers

Highly Parallel
- Visualization
- Real-time Analytics
- Video processing

Light Weight
- Web access tier
- Web hosting

Spread Core Form-Factor
4S Mid-range
Half-width Board Form-Factor
Microserver

Need scheduling approach for managing heterogeneous environment
Client Aware Cloud
Service optimized based on context, content and capability

- Compute
- Graphics
- Media
- Connectivity
- Security
- Location

HD or SD
Flash or HTML5
Compressed or uncompressed
Secure Content & Commerce

Implications for both cloud service and client / device design
Client Aware Cloud Services
Example: Lenovo Secure Cloud Access

- Enhanced Authentication
- Aware of Device Capabilities
- Optimized Service Delivery

Opportunities include simplified service development, increasing security and optimized execution
Cloud 2015: 15 Billion Connected Devices
Intelligent Connected Systems

Opportunity for analytics and big data beyond client-devices
Great Cloud Opportunity

1. Platform “Convergence” & programmability
2. Rising importance of security
3. Holistic approach to workload optimization
4. Easier approach to developing x-device services
5. Big Data beyond consumer devices