



Intel IT Cloud 2013 and Beyond

Name
Title
Month, Day 2013

IT@Intel

Legal Notices

This presentation is for informational purposes only. INTEL MAKES NO WARRANTIES, EXPRESS OR IMPLIED, IN THIS SUMMARY.

Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries.
Copyright © 2012, Intel Corporation. All rights reserved.

Agenda

- Intel IT Details
- Cloud in the Industry
- Intel IT Cloud Maturity Model
- Our Results to Date
- Intel IT journey continued
- Recap and summary

2013 Intel IT Vital Statistics

6,500 IT employees

59 global IT sites

>95,200 Intel employees

164 Intel sites in 63 Countries

68 Data Centers

91 Data Centers in 2010

75% of servers virtualized

(42% virtualized in 2010, goal of 75%)

>147,000 Devices

85% of laptops encrypted

>38,500 handheld devices

41 mobile applications developed



What the Cloud Means to Intel IT

- Delivering a **highly available** computing environment where secure **services and data** are delivered **on-demand to authenticated devices** and users utilizing **a shared, elastic infrastructure** that concurrently supports **multiple tenants**

Attributes¹

- On-demand self-service
- Broad network access
- Rapid elasticity
- Measured service
- Resource pooling
- Shared multiple tenants

Service Models

- Software as a Service: on-demand packaged sw
- Platform as a Service: on-demand sw development and hosting
- Infrastructure as a Service: on-demand compute infrastructure

Delivery Models

Public, Private, or Hybrid

- ¹These attributes been adapted from National Institute of Standards and Technology, and reflects the key characteristics and business drivers for cloud computing within the Intel IT organization

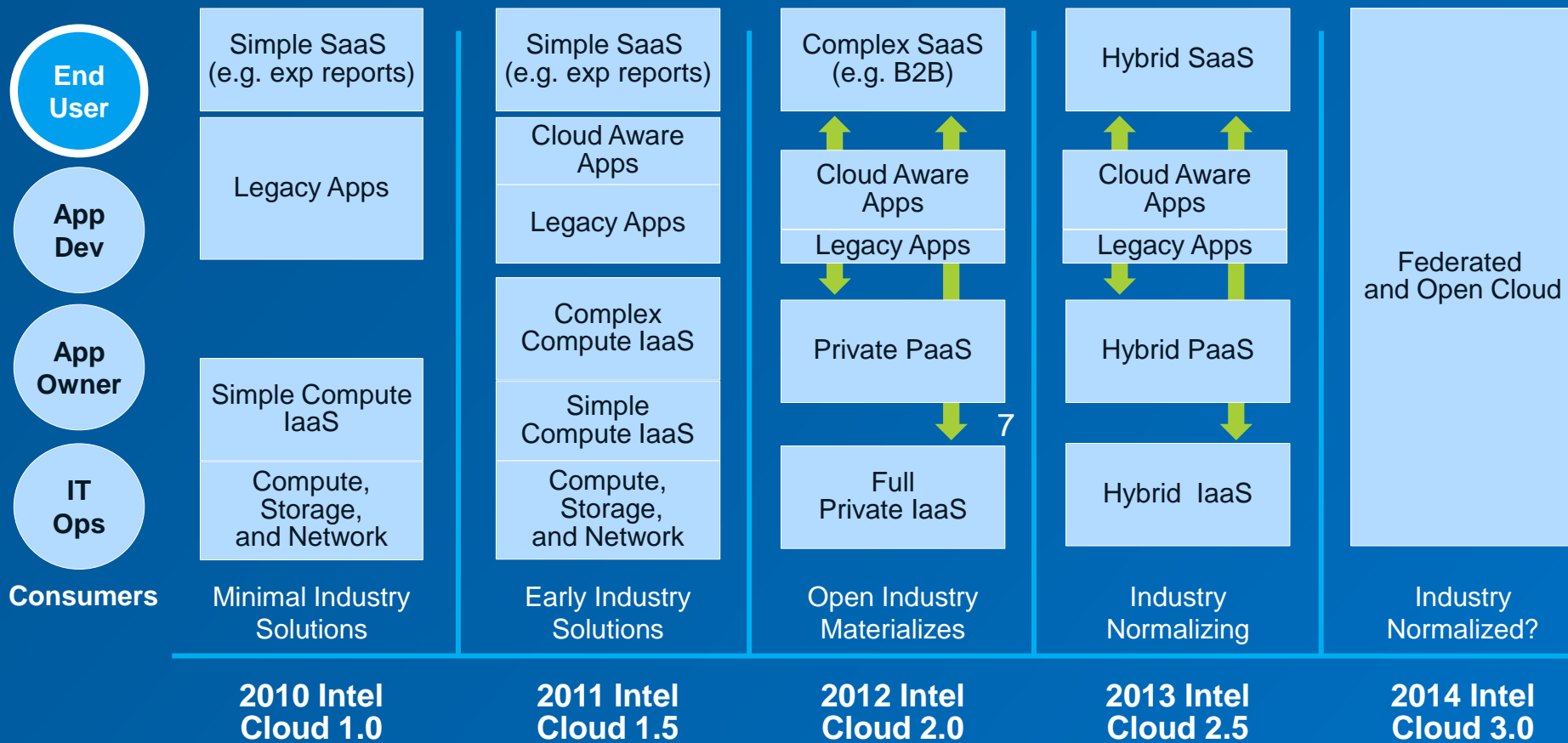
Intel® IT Cloud Strategic Direction

Deliver the necessary changes in how we expose applications/data to improve end user productivity

Drive the transformation to a large-scale automated Hybrid Cloud infrastructure

Accelerate the transformation of the Enterprise IT industry to Cloud

Intel and Industry Cloud Maturity



In 2013, Hybrid applications are the norm enabling low latency, lowest cost, improved security, and seamless data sharing between services for end user productivity.

Intel's Cloud Journey

Today



**Large
Private Cloud**

**Limited
Public Cloud**

- 76%+ Virtualized
- 80% of New Services in the Cloud
- Under 1 Hour to Deploy Infrastructure
- Small number of SaaS apps in usage

Tomorrow



Hybrid Cloud

- Land Applications in Minutes
- Automation: Lower Cost with Less Resources
- Open Cloud for Bursting Capacity
- SaaS for non-differentiated apps

What's Ahead for Cloud At Intel?

Past (2009)

Traditional Office & Enterprise



Design Grid



Current (2013)

Distinct Clouds

Office/Enterprise /Services



Design



Public



Future Goals

Federated Clouds



Public



**80% Effective
Asset Utilization**

- Pervasive virtualization (75%)
 - Enterprise app virtualization
 - Secure virtualization
- Larger pools in fewer data centers

**Velocity for Service
Provisioning**

- On-demand self-service the norm
- Innovative idea to production <day
- Provision VMs within minutes
- External Cloud for burst demand
- Automated sourcing decisions

Zero Business Impact

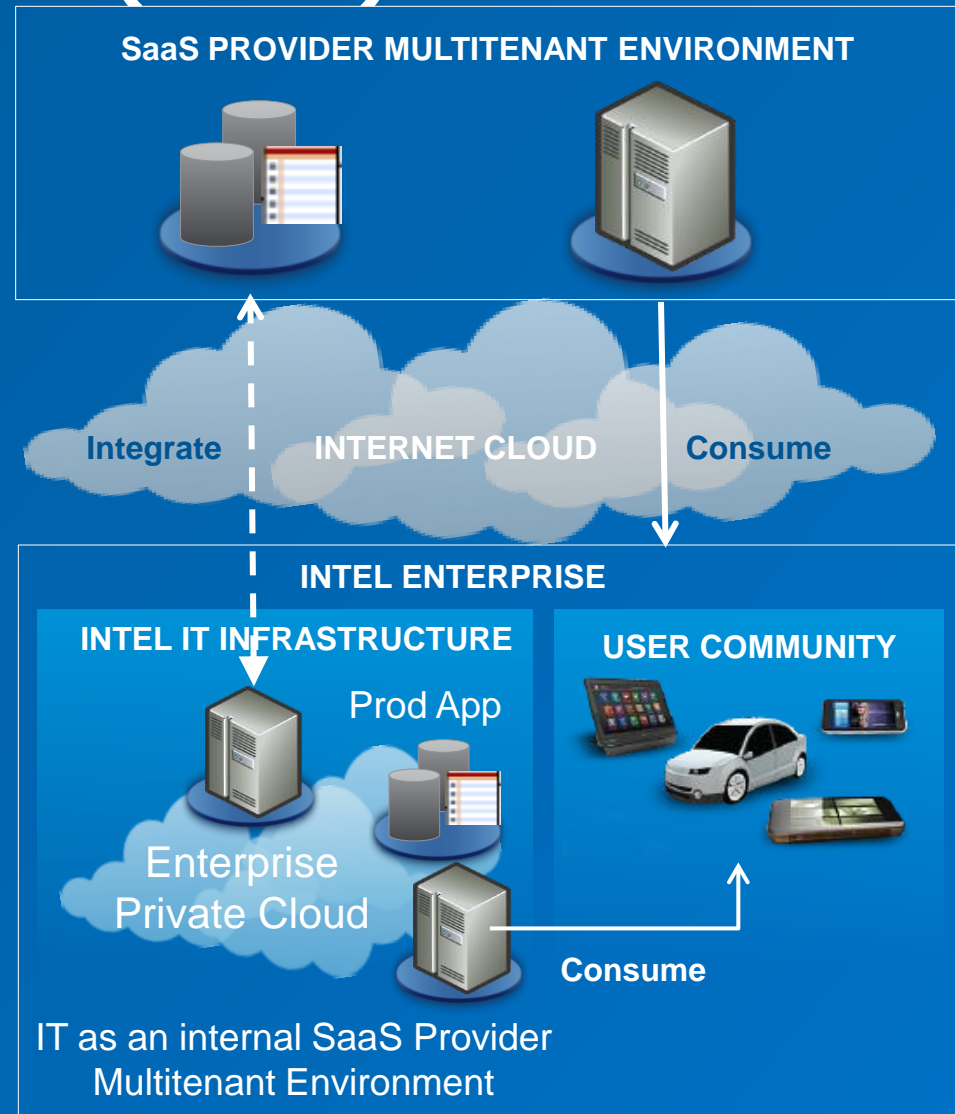
- Application design for failure
- Reduce MTTR
- Increase availability
- Automated, end-to-end service-managed Cloud

SaaS, PaaS, and IaaS details



Software as a Service (SaaS) for Intel IT

- Gartner: “software that's owned, delivered and managed remotely by one or more providers.”
- Public Cloud focus
- Should Intel deliver software internally in SaaS model?
 - On-demand, self service, metered, elastic, multi-tenant
 - Cost effective SW licensing
 - HTTP/HTTPS for all apps (no VPN) to enable BYO client devices



2013 Key Focus Areas

- Aggressively move more non-differentiating apps to SaaS
- Streamline on-boarding via an enterprise services gateway
- Get more value from apps by supporting a variety of client devices across the “compute continuum”

Presentation

Menu and navigation

User controls

Display and rendering

Reporting

Security

Identity and federation

Entitlement

Encryption

Regulatory controls

Authentication and single sign-on

Authorization and role-based access control

Application

User profile

Metadata services

Messaging

Notification and subscription

Metadata execution engine

Workflow

Exception handling

Orchestration

Data synchronization

Operations

Monitoring and alerting

Backup and restore

Provisioning

Configuration and customization

Performance and availability

Metering and indicators

Infrastructure

Database

Storage

Compute

Networking and Communications

Platform as a Service

What is Platform as a Service (PaaS)?

Developers code their app & deploy into production without IT assistance

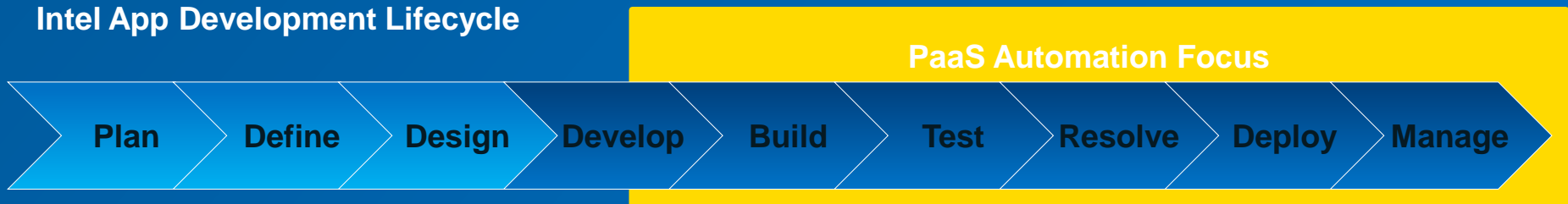
- Cloud tooling: self-service, on-demand, multi-tenant, metered
- Pre-provisioned common platform of abstracted middleware & infrastructure

Facilitates creation of cloud-ready applications

- Platform provides runtime container, elastic scaling and high availability
- Maximize resource sharing via multi-tenancy and reusable web services



Intel App Development Lifecycle

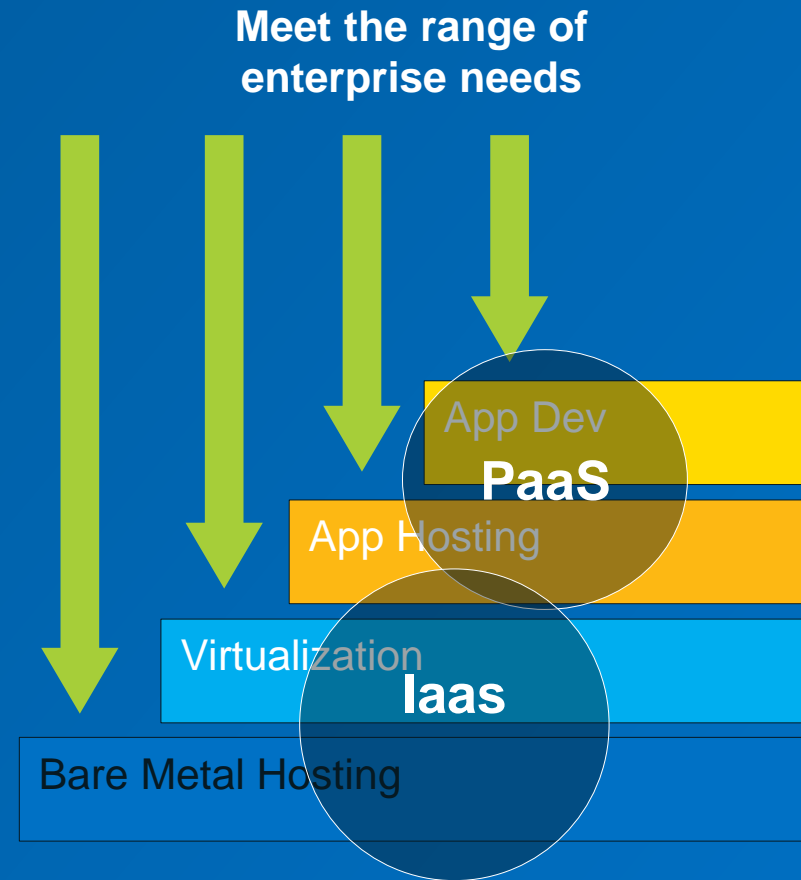


From innovative idea to production service in less than a day

Value Proposition

Allow Intel businesses to evolve more quickly through improved TTM of custom apps

- **Agility** - On-demand, self service development and hosting approach
- **Efficiency** - Standardization & automation of platform components and business processes
- **Extensibility** - Extend model to developers who write and host apps on Intel's behalf



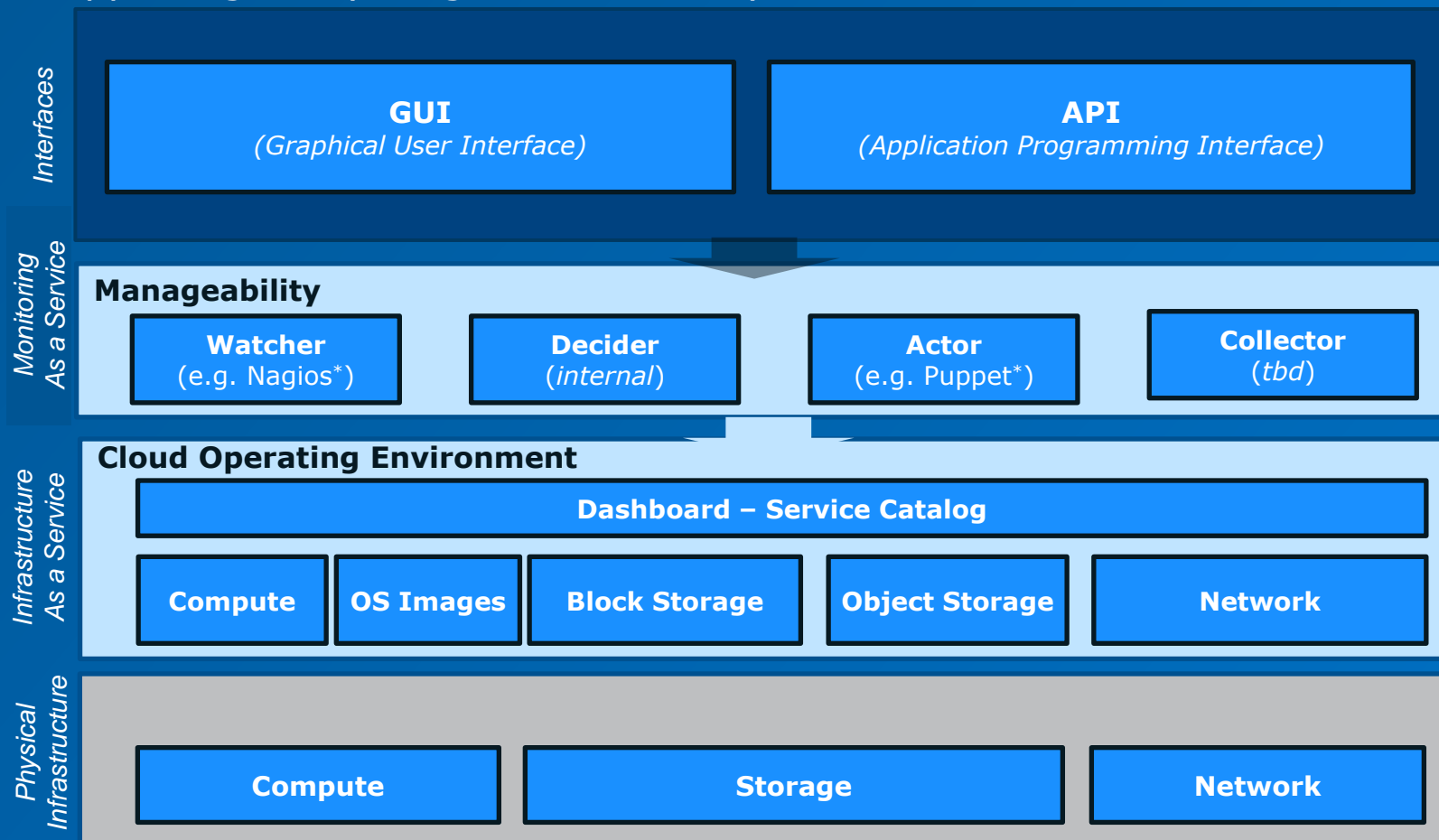
PaaS is next natural step in the evolution of our Private Cloud

Infrastructure as a Service

IaaS – What is it?

Developers/App Owners consuming all Infrastructure as Web Services

- Infrastructure exposed as APIs and UI to enable on-demand self-service
- Supporting everything from discovery, order, to deletion of Infrastructure services



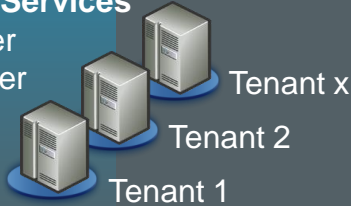
Intel IT Open Cloud - Details

OPEN CLOUD HOSTING ENVIRONMENT

COMPUTE NODES

Cloud Controller Services

- Volume Controller
- Network Controller
- Scheduler
- Databases
- API



Hosting Services

- Domain Controllers
- DNS
- Automation
- Security Services

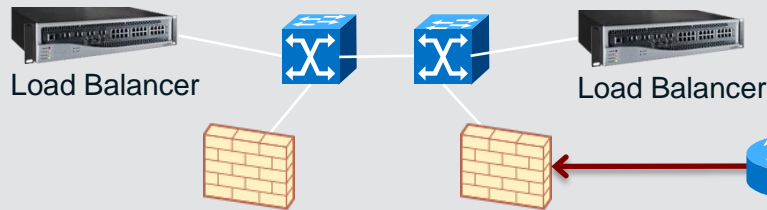


**STORAGE
NODES**



**REMOTE DESKTOP
SERVICE**

NETWORK FABRIC



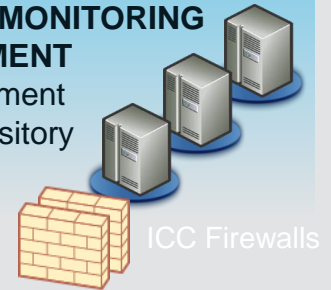
INTERNET

ICC VPN Tunnel

INTEL DMZ/ENCLAVE ENVIRONMENT

CENTRALIZED MONITORING AND MANAGEMENT

- Patch Management
- Package Repository
- Rialto-I
- Monitoring



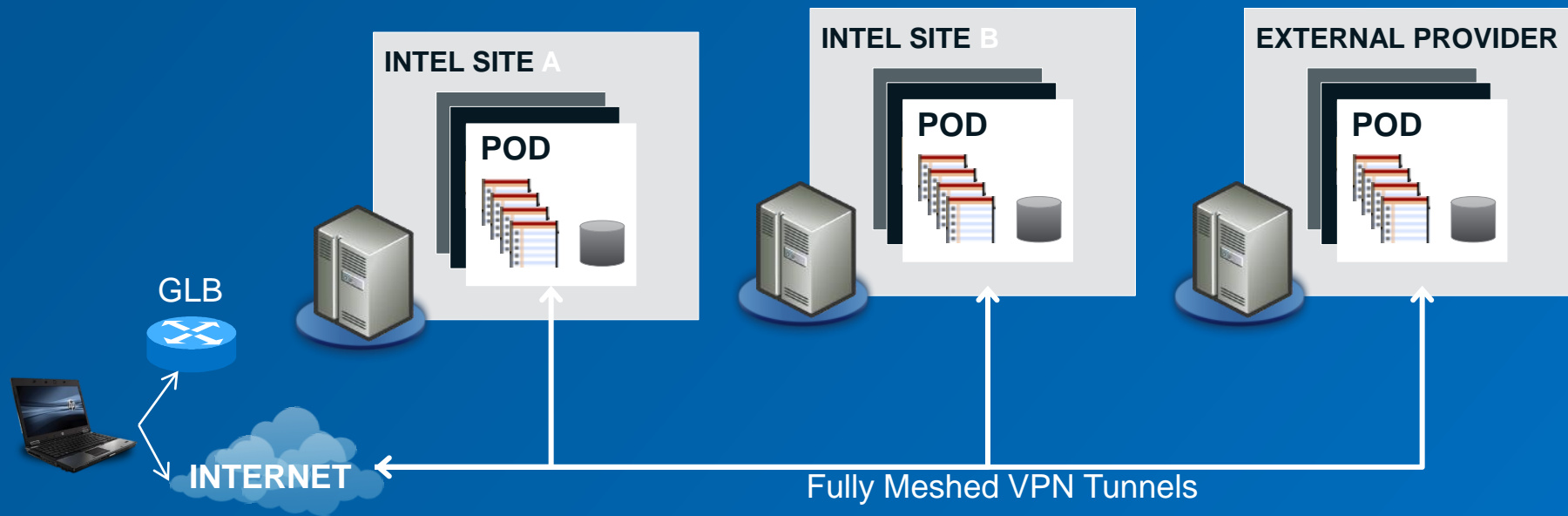
Key Technologies

- **Cloud** – OpenStack Essex
- **Monitoring** – Nagios
- **Configuration** – Puppet
- **Hosts** – Intel Xeon 5600 Blades
- **Network** – 10GBe
- **Storage** – Scale out on 2U

Integration with Support Desk and other Ops capabilities

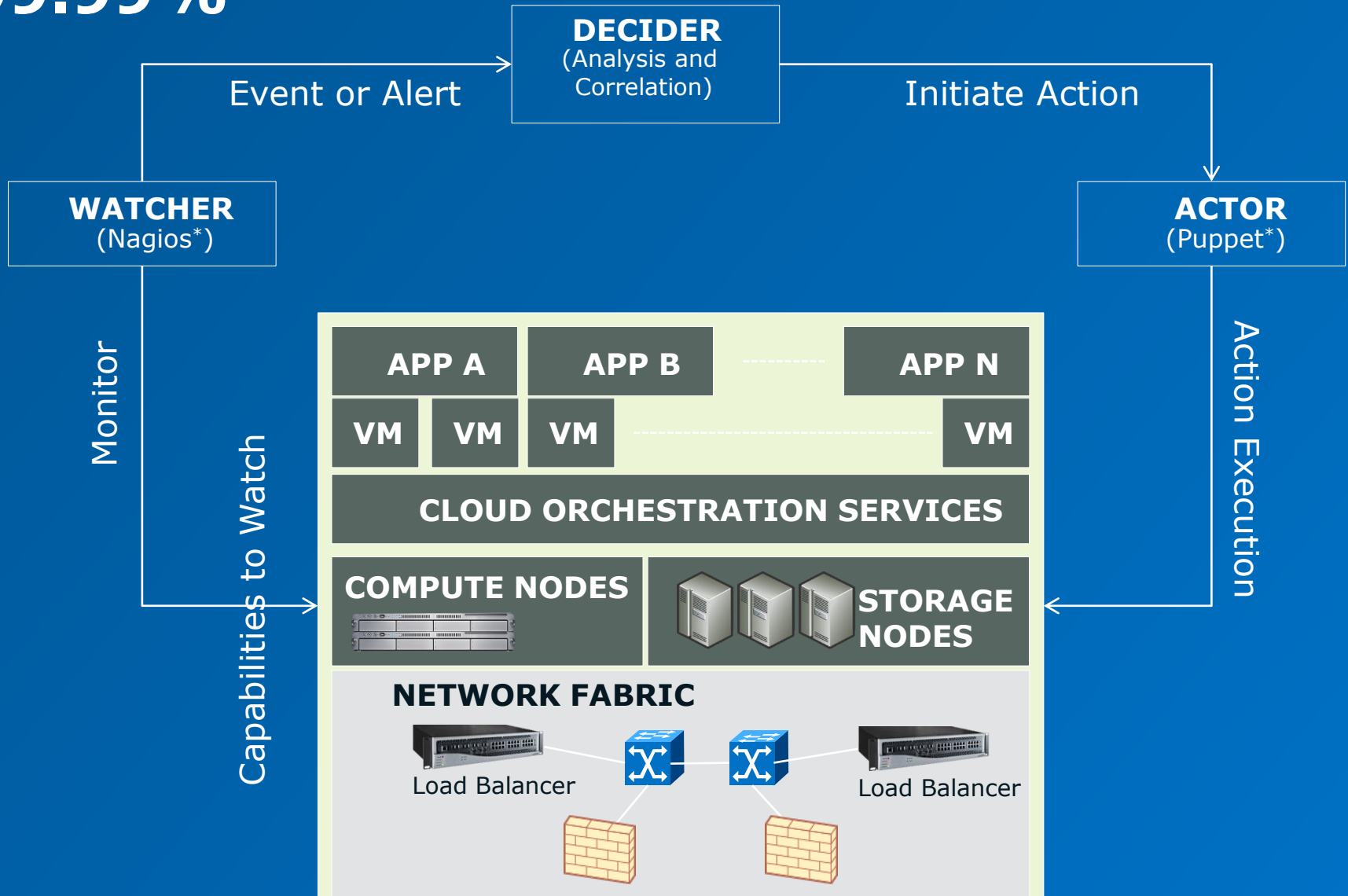
Running cutting edge Web Services, on a predominantly open source cloud.

Intel IT Hybrid Cloud



Focus Area	Key Aspects
Technical	Active/Active App Design- SW Design for Failure
	Unified Monitoring/Manageability/Authentication
	IT Service broker handling cloud on-boarding internal and external
Operational	IT handling basic IaaS container levels externally, covering all IaaS internally
Business	Single contract with Intel IT funding and showback to BUs
	Liability/Indemnification at acceptable levels for associated risk

Self Remediation Framework – for 99.99%



Rules of Cloud Aware Apps Software Developer Changes

<http://www.opendatacenteralliance.org/docs/DevCloudCapApp.pdf>

Shift to stateless cloud services

- Assume and design for failure at all layers

Scale horizontally

- Scaling up always has a break point, scaling horizontally ensures greater scalability (close to “infinite” if you remove app bottlenecks)

Eventual consistency at the data layer

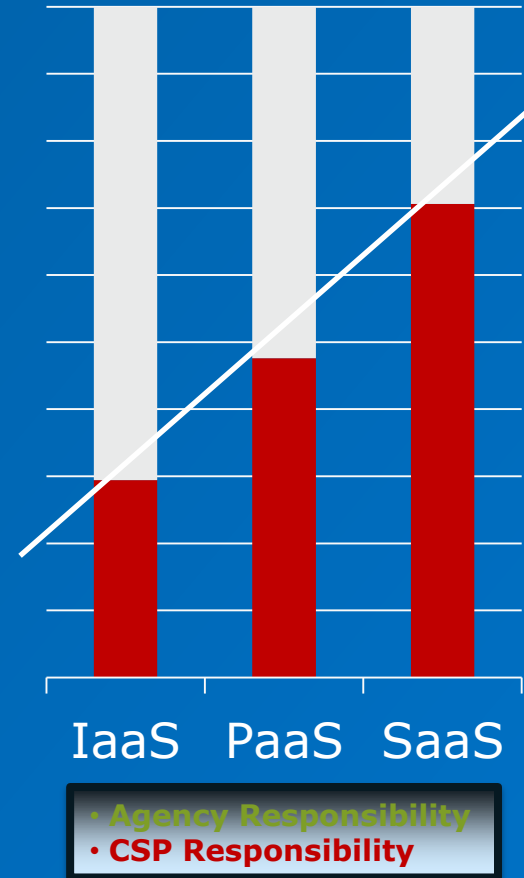
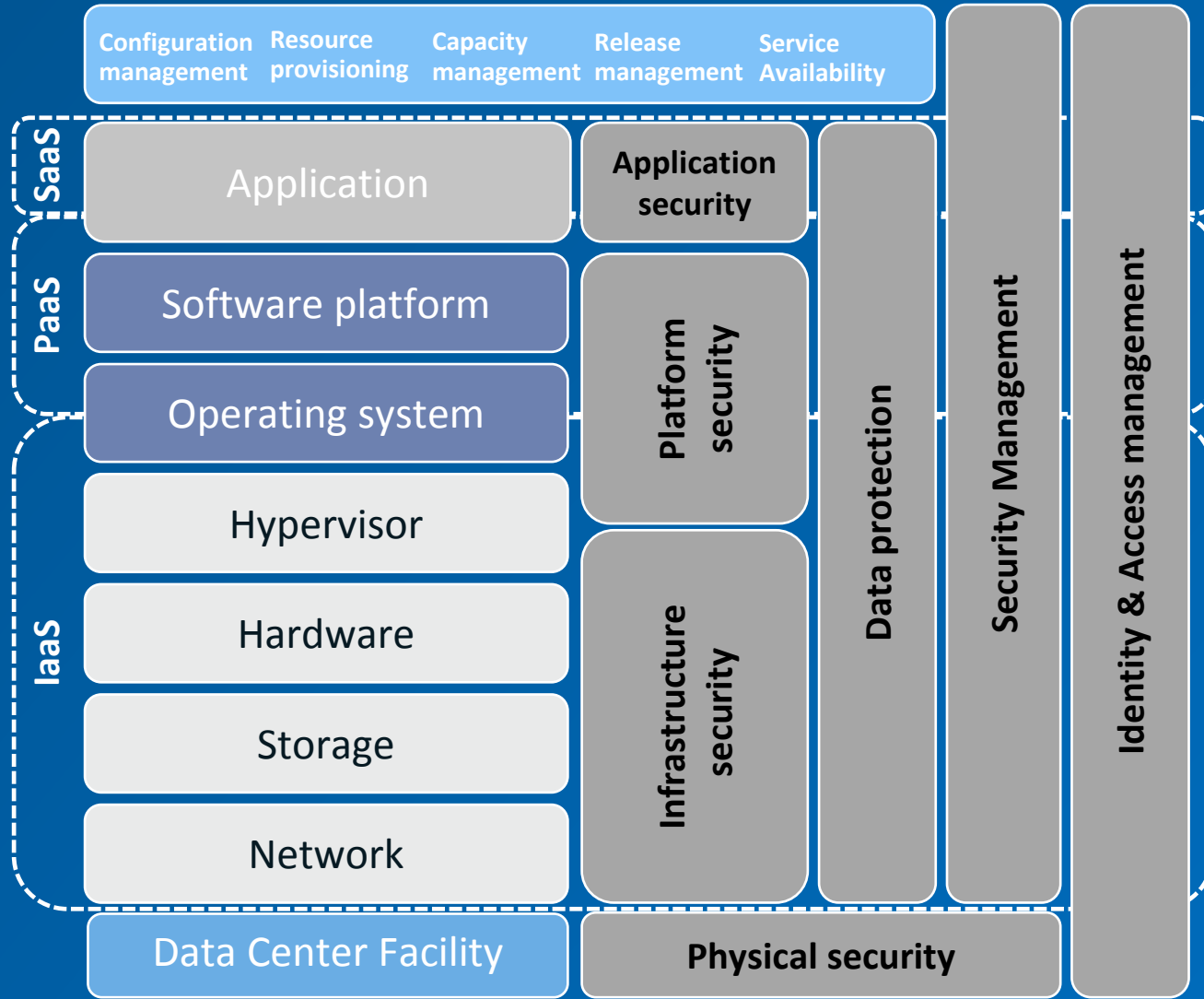
Shift to DevOps or NoOps model

- Set rules/automation for desired effects, utilize APIs, continue to assume failure
- Developers involved in creating automation/remediation for production
- Developer and IT partnered to create agile and highly available services
- Never wait on IT, never wait on other software developers
- IT Infrastructure team should seem invisible

Implement true Web services for consumption

Securing the Cloud Services

Cloud Security Control Stack



2 Separate Risk Areas



Determine **acceptable level** of Risk to Intel and then adjust controls at CSP And Tenant level to reach goal.

Risks and Controls for the Service Model (what the CSP provides) and for the Tenant usage must be measured separately.

IT Cloud Security Goals

Assign Provider and Tenant different classes of risk based on controls they can provide

Need to get a complete picture need to combine risk



Qualification	Usage	Example Required Controls
Bronze	Minimum Enterprise requirement	Cloud security provider poses minimal Tenant's application has minimum security controls
Silver	Business Important	CSP implements validated methods plus added controls (e.g., DDOS, code audits, certifications) Tenant's application has additional controls
Gold	Biz or Mission Critical or High data classification	CSP has implemented Enterprise requirements Tenant's application has well documented security implementation and controls
Platinum	Foundational Security services	CSP raises the bar, provides high assurance Tenant's application has maximum security controls.

Cloud Service Provider Controls

Governance

- Training, Regulatory Controls, Investigations, E-D, Audits...
- Secured Datacenters
- Data Location

Secured Brokers and Support Applications

- Tools, Automation and accounts are hardened and logically isolated privileged accounts
- Code Auditing

Data Protection

- Control of VM Images and Data
- Encryption*
- DLP

Monitoring

- Security Monitoring and Alerting
- Security Logging (including Infrastructure and Management component)

Intrusion Detection

- Network, Host, Management, intra-host

Hardened Management and Control Infrastructure

- Privileged Access Control
- Bastion Chokepoints
- Multi-factor access control
- Vulnerability Management
- Pen test of Infrastructure

Cloud Service Providers not only need specific controls but the controls must integrate with our enterprise controls.

Tenant Controls

Governance

- Cloud Security Training
- Regulatory Controls, Investigations, E-D, Audits...
- Data Location

Data Protection

- Control of VM Images and Data
- Encryption
- DLP

Identity Management

- Lifecycle
- Logging
- Multi-factor authentication
- Privilege of services and automation

Monitoring

- Security Monitoring and Alerting
- Security Logging (including Infrastructure and Management component)

Application Layer Intrusion Detection System

- Detect malicious activity at the application layer (WAF, mod security)

Granular Access Control

- Control over Privileged activity

Isolation (logical or physical)

- Security Groups, Vlans, VPC, else

Application and Platform Hardening

- SDLC, Pre-launch code audits, pen test

Tenants need to take some ownership of their own security controls and not rely on the provider

Recap and Summary

Intel IT Private Cloud Re-Cap

- Align IT strategy to business needs
- Cloud transition is a multi-year journey
- Business benefit will generate value
- Utilize a combination of SaaS, PaaS, and IaaS to solve your business requirements



Resources for You

- Engage with ODCA
- Learn about usage models
- Use the RFP Tool
- www.opendatacenteralliance.org



Over 300 Global IT leaders representing **over \$100B in annual IT spend**

2012-13 Intel IT Annual Report

Insight and Innovation



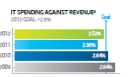
This year's IT Annual Performance Report provides insight into Intel's rapidly changing business environment and highlights the value IT continues to deliver. It has been a monumental year of transformation as Intel pursues new opportunities. We are re-inventing the PC through the Ultrabook™ device. We're shipping the first smartphones and tablets with Intel® processors inside. These new lines of business create urgent, unique IT demands—from manufacturing and supply chain to sales and marketing. By providing insight and innovation, Intel IT is influencing decision making by delivering technology solutions and systems of engagement across all of Intel's businesses. More than ever, IT is joined to advance our company's competitive advantage by delivering results for the unique and evolving business needs of Intel.

Our mission is to "Grow Intel's business through information technology." We did this in 2012 by applying business intelligence and cloud solutions across Intel's business units, resulting in faster time to market for our products and improved efficiency. At the same time, we demonstrated that embracing the consumption of IT and social computing results in increased employee productivity and collaboration.

2 Cover Photo: (Top) Tom Wick, Data Center Manager; (Bottom) Li Wang, LAN Services Manager

Our IT Environment

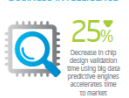
OVERVIEW



ENTERPRISE RISK



BUSINESS INTELLIGENCE



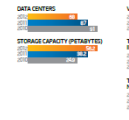
CLOUD COMPUTING



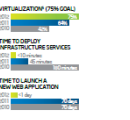
CONSUMERIZATION OF IT



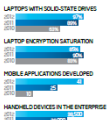
DATA CENTER



CLOUD COMPUTING



MOBILE



Note: Some 2012 data estimated at time of publishing. * Total employee count does not include wholly owned subsidiaries that Intel IT does not directly support. | * 2012 spending by business due to reorganization. | * 2012-2013 IT needed to exclude certain allocations. | * Percentage of applications installed in our Office and Enterprise environment.

Accelerating Business Growth through IT

2012-2013 Intel IT Performance Report



IT@Intel



Discover Intel IT's strategies and initiatives that are accelerating Intel's growth and delivering business value

www.intel.com/go/ITAnnualReport

IT@Intel

Sharing Intel IT Best Practices with the World





Accelerating Business Growth through IT

2012-2013 Intel IT Performance Report



IT@Intel

IT@Intel White Paper
 Intel IT
 IT Best Practices
 Program: Productivity and IT Innovation
 January 2011

Enabling Global Collaboration with Intel®-based Infrastructure

Executive Overview


With access to advanced collaboration tools deployed on Intel®-based infrastructure, Intel employees can easily and instantaneously share data, brainstorm new ideas, and work safely and collaboratively with team members and Intel's business partners around the world.

The collaboration tools we support are complex, have their own operational requirements, and have their own user collaboration. Personnel tasks include team meetings, one-to-one, and conferencing. Some have cloud-based content repositories, others have content and metadata. Internal and external collaboration users benefit to learn:

- **Increased employee productivity** through content sharing, unified ability to access, provide feedback and follow tracking work items
- **Increased agility** (collaborative) workflow processes (document and metadata) to help address issues the fast, fit the office, and address issues resulting from need for consistency while increasing flexibility
- **Greater job satisfaction** from repeat that being able to interact

Next Section:

- **Strategy: Finance Analyst, Intel IT**
- **Strategy: A. Wilson, Senior Data Center Architect, Intel IT**
- **Sharda Kirtikoppa, Senior Principal Engineer, Intel IT**
- **Stanley Durga, Principal Engineer, Intel IT**
- **Arifene Sarin, Project Manager, Intel IT**
- **Arifene Sarin, Project Manager, Intel IT**
- **Arifene Sarin, Project Manager, Intel IT**



IT@Intel White Paper
 Intel Information Technology
 Data Center Efficiency
 September 2009

Intel IT Data Center Solutions: Strategies to Improve Efficiency

Executive Overview

Over time, Intel IT has evolved our strategies to optimize our data center infrastructure to respond faster to business needs while enhancing the services and value IT brings to the business. Our new data center strategies shift the emphasis away from reducing the number of physical data center facilities to, instead, focusing on approaches that leverage the full potential of our data centers worldwide. This helps increase business value across the entire data center infrastructure. We expect our efforts to achieve a combined cost savings of about USD 1 billion by 2014.

Our long-term data center planning process will help us realize an estimated USD 1 billion in savings while enabling the ability to respond faster to business needs.

Our approach focuses on three strategic optimization, utilization, and energy efficiency initiatives. The key elements of these strategies include:

- Accelerating server refresh to take advantage of performance and power efficiency improvements.
- Consolidating and unloading our server resources.
- Upgrading facilities to improve facilities capability, utilization, and energy efficiency.
- Adopting capacity in real-time, capacity mix.
- Loading new data centers in aggregation sites whenever possible.
- Eliminating data centers where server health and financial value.

Optimizing IaaS configurations to substitute for localized data center capacity and to support remote data center services.

Scaling the server storage solution in the high-performance computing (HPC) era.

Our strategies are already yielding results. For example, from 2008 to 2009, the increased use of optimization tools, such as consolidation and server refresh, reduced data center facilities capital investment by 85 percent.

Our long-term planning process will help us continue to drive broader efficiencies across the data center environment as well as respond faster to business needs, which in turn enhances the services and value that IT brings to the business.

The server cost of USD 800 to 900 dollar.

Learn more about Intel IT's Initiatives at www.intel.com/IT





Thank You

