Intel® Cloud Builders Program
Reference Architectures (RA)
A Starting Point from Which to Build and Optimize Cloud Infrastructure

http://www.intel.com/cloudbuilders
RA Development Process

**Deliverables**
- **Exploration**
  - ~2 weeks
  - Establish Business and Technical Objectives

- **Planning**
  - ~2 weeks
  - Product Information Exchange
  - Test Bed requirements and use case development

- **Integration**
  - ~2 weeks
  - Map Solutions to Test Cases and Test Bed configuration

- **Testing**
  - ~1 week
  - Run Test Cases

- **Development**
  - ~3 weeks
  - Develop Reference Architecture Document

**What is a Reference Architecture?**
- Detailed how-to guides
- Practical guidance for building and enhancing cloud infrastructure
- Best-known methods learned through hands-on lab work
Results!

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Reference Architecture
Case Study # 1 - Efficient Power Management
Data Center Power Management

Monitor and Control Server Power

- Report system level power
- User-defined input to control individual SERVER power consumption

Manage and Coordinate at Data Center Level

1. Control power used by each RACK (e.g. 6kW due to circuit breaker)
2. Control total power dissipation in each ROW (e.g., 95kW due to CRAC)
3. Dynamic Power Management on the Server, Rack, and Data Center Level
Power Management Use Cases

- **Save Money**: Real Time Monitoring, Optimized Workloads & Energy Reduction
- **Scale Farther**: Power Guard Rail & Optimization of Rack Density
- **Prepare for the Worst**: Disaster Recovery/Business Continuity
Power Management RA: Overview

Enterprise Energy Reporting

JouleX Energy Manager
- Discovery & Measurement
- Analysis & Simulation
- Policy & Control
- Reporting & Decision Support

JouleX Energy Manager
Power Management RA: Implementation View

**Node1:**
Dell PowerEdge C1100*

**Node2:**
Dell PowerEdge C2100*

**Node3-5:**
Dell PowerEdge C6100*

* Intel® Intelligent Power Node Manager enabled

JouleX Energy Manager

Real Time Monitoring and Power Capping

Intel® DCM SDK

Intel Cloud Builders Guide: Cloud Design and Deployment on Intel Platforms: Data Center Energy Management with Intel, Dell, and JouleX

* Intel® Intelligent Power Node Manager enabled
Monitoring, Reporting, Analysis

Insight into energy use and efficiency, CO2 emissions
Rack Density Optimization & Power Guard Rail

• Enables more servers deployed per rack
• Improves opex cost of power delivery per system
• Extends capex data center investment with increased node deployments
Disaster Recovery / Business Continuity

• Policy based power throttling per node to bring the data center back to life more quickly and safely

• Next step: Inlet temperature monitoring and response based on thermal events
  - (Already available in Intel® Intelligent Power Node Manager)
Workload-Power Optimization

- Identifies optimal power reduction without performance impact
- Customized analysis required as each workload draws power differently
Reference Architecture
Case Study # 2 - Enhanced Cloud Security
Trend: Shift in types of attack
- Platform as a target, not just SW
- Stealth and control as objectives

Trend: Increases in compliance concerns
- HIPPA, Payment Card Industry (PCI), etc. require security enforcement and auditing

Trend: Changes in architectures require new protections
- Virtualization and multi-tenancy
- 3rd party dependencies
- Location Identification
Trustable Compute Pools Usage Models
Compliance and Trust in the Cloud

Compliance in the Cloud

- Multi-tenancy complicates compliance
- Need software trust despite physical abstraction
- Compliance requires effective reporting

Enforce VM Migration Based on Security Policy

 VM1  VM2

VMM ??

??
Intel-VMware*-HyTrust* Enables Trusted Compute Pools

Request!
Migrate VM2c to Server 2

Policy check:
VM2c requires trusted platform

Alert!
Fail Policy
Stop Move
Report error

Outcome
Data integrity secure
No compliance violation
Intel® Trusted Execution Technology

Intel® TXT enforces platform control

- Allows greater control of launch stack
- Enables isolation in boot process
- Complements runtime protections
- Reduces support and remediation costs
- Hardware based trust provides verification useful in compliance
**How it Works**

**Scenario #1:**
Software can be measured and verified as known good

Power on platform
System firmware verified by TXT prior to boot

- Firmware / BIOS match? Yes

Launch VMs, OS, etc

Hypervisor code measured by TXT and compared to known good value prior to allowing launch

- Hypervisor measure match? Yes

**Scenario #2:**
Unknown software is measured, detected and can be blocked

Power on platform
System firmware verified by TXT prior to boot

- Firmware / BIOS match? Yes

Hypervisor code measured by TXT and compared to known good value prior to allowing launch

- Hypervisor measure match? No

TXT blocks launch of Rootkit Hypervisor
HyTrust* Appliance – Enforces Policy

A virtual appliance that provides unified access control, policy enforcement, and audit-quality logging for the administration of virtual infrastructure.

- Allows “tagging” of hosts, virtual servers, appliances, switches, etc.
- Rules written to determine relationships among tagged objects
- Eliminates possibility of unwanted changes (e.g. powering down core switch, moving test/dev server into production, etc.)
- Capability to assess and remediate misconfigurations in order to harden hosts

Solution to Pro-actively Control and Audit Virtualized Data Centers
Other names and brands may be claimed as the property of others.

Intel® Cloud Builders

Proven, Open, Interoperable Solutions Optimized For IA Capabilities

Build a Cloud

Fujitsu Primergy with VMware vCloud
Cloud On-boarding with CloudSwitch
HP ProLiant SL* & Enomaly Elastic Computing Platform
Huawei SingleCLOUD*
IBM® CloudBurst
Inspur* IaaS
Joyent SmartDataCenter
Microsoft System Center VM Manager Self-Service Portal 2.0*
Neusoft Aclome* Cloud
Nimbula* Cloud Operating System & Nimbula Director*
Novell® Cloud Manager
Oracle® Optimized Solution for Enterprise Cloud
Parallels® Elastic IT Solution Developer Cloud
Powerleader Power Rack Server* with Microsoft*
Red Hat* Cloud Foundations
StackIQ Rocks+ Management Software
Ubuntu Enterprise Cloud
Univa UD*
VMware VCloud* Director

Enhance a Cloud

Client Aware Cloud with RES Virtual Desktop Extender
Balanced Compute Model with NetSuite & Gproxy Design
Cisco® Virtualized Multi-Tenant Data Center
Cloud Gateway Security on Intel Platforms
Cloud On-Boarding with Citrix NetScaler®
Dell & VMware® Policy Based Power Management
EMC® Atmos® Scale-out Storage Usage Models
Enhanced Cloud Security with HyTrust and VMware
JouleX Energy Management Solution
NetApp® Unified Storage and Networking
Parallels® Trusted Compute Pools for Cloud Computing
VMware Enhanced Server Platform Security
* Coming Soon: Client Aware with Stoneware

Solutions Available Today To Make It Easier To Build And Optimize Cloud Infrastructure

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Easing Cloud Deployments via Proven, Interoperable Solutions for IT

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- Intel, processors, chipsets, and desktop boards may contain design defects or errors known as errata, which may cause the product to deviate from published specifications. Current characterized errata are available on request.
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