Anatomy of Cisco Unified Computing System

T-VT4/ L3

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Building Blocks of Cisco UCS

An Integrated System Optimizes Data Center Efficiency

**UCS Manager**
- Embedded – Manages entire system
- 20 Chassis Scale (160 servers total including rack mounts)

**UCS Fabric Interconnect – UCS 6100**
- 20x 10GE Ports – 1 RU
- 40x 10GE Ports – 2 RU
- Ethernet or FC Expansion Modules

**UCS Fabric Interconnect – UCS 6200**
- 48x Unified Ports (Eth/FC) – 1 RU
- 96x Unified Ports (Eth/FC) – 2 RU
- 32/48x base and 16x expansion(s)

**UCS Fabric Extender – UCS 2104**
- 8x 10GE Downlinks to Servers
- 4x 10GE Uplinks to Fabric Interconnects

**UCS Fabric Extender – UCS 2204/8**
- 16/32x 10GE Downlinks to Servers
- 4/8x 10GE Uplinks to FIs

**UCS Blade Server Chassis**
- Flexible Bay Configuration
- Houses blades based on Industry-standard architecture

**UCS Rack Servers**
- Identical stateless model to UCS blades
- Additional PCIe/Disk options
- 1 RU / 2 RU / 4 RU Options

**Adapters - M81KR VIC, M72KR, etc.**
- Up to 2x 10GE ports
- M81KR: Up to 128 virtual interfaces
- 3rd party adapters (Qlogic, Emulex, Intel, Broadcom, etc)

**Adapter - UCS VIC 1240/80**
- Up to 4/8x 10GE ports
- Up to 256 virtual interfaces
UCS Cable Connections

UCS System

Cluster Heartbeat

- Fabric A link
- Fabric B link
- Ethernet
- Mgmt
- FCoE
- IP

8 x 8

Up to 20 Chassis
Cisco Unified Computing System

One Logical Chassis to Manage
(Blade Chassis Management, Server Management, Network and Storage Connectivity Management)
<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B200 M2</td>
<td>2 Socket Intel 5600, 2 SFF Disk, 12 DIMM</td>
</tr>
<tr>
<td>B250 M2</td>
<td>2 Socket Intel 5600, 2 SFF Disk, 48 DIMM</td>
</tr>
<tr>
<td>B230 M2</td>
<td>2 Socket Intel E7, 2 SSD Disk, 32 DIMM</td>
</tr>
<tr>
<td>B440 M2</td>
<td>4 Socket Intel E7, 4 SFF Disk, 32 DIMM</td>
</tr>
<tr>
<td>C200 M2</td>
<td>2 Socket Intel 5600, 4 or 8 Disks, 12 DIMM, 2 PCIe 1U</td>
</tr>
<tr>
<td>C210 M2</td>
<td>2 Socket Intel 5600, 16 Disks, 12 DIMM, 5 PCIe 2U</td>
</tr>
<tr>
<td>C250 M2</td>
<td>2 Socket Intel 5600, 8 Disks, 48 DIMM, 5 PCIe 2U</td>
</tr>
<tr>
<td>C260 M2</td>
<td>2 Socket Intel E7, 16 Disks, 32-64 DIMM, 7 PCIe 2U</td>
</tr>
<tr>
<td>C460 M2</td>
<td>4 Socket Intel E7, 12 Disks, 64 DIMM, 10 PCIe 4U</td>
</tr>
</tbody>
</table>
# Compute options: Xeon E5 based

## Industry-leading compute without compromise

### Scale Out
- **UCS C24 M3**: Entry, expandable rack server for storage intensive workloads
- **UCS C22 M3**: Entry rack server for distributed & web infrastructure applications
- **UCS B22 M3**: Entry blade server for IT infrastructure and web applications

### Enterprise Performance
- **UCS C240 M3**: Ideal platform for Big Data, ERP and database applications
- **UCS C220 M3**: Versatile, general purpose enterprise infrastructure and application server
- **UCS B200 M3**: Optimal choice for VDI, Private Cloud or dense virtualization / consolidation workloads

### Intensive / Mission Critical
- **UCS C420 M3**: Unified Computing in an Enterprise Class, 4-socket rack server for large, memory intensive bare metal & virtualized applications
- **UCS B420 M3**: Unified Computing in an Enterprise Class, 4-socket blade for large, memory intensive bare metal & virtualized applications

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**Cisco UCS**: Many Server Form Factors, One System
UCS Fabric Infrastructure Portfolio Expansion

<table>
<thead>
<tr>
<th>Year</th>
<th>Fabric Interconnects</th>
<th>Blade Chassis IO Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>UCS 6120 Ethernet and FC Expansion Modules</td>
<td>UCS 2104 IO Module</td>
</tr>
<tr>
<td>2011</td>
<td>UCS 6248UP (Unified Ports) 16 Unified Ports</td>
<td>UCS 2208 IO Module</td>
</tr>
<tr>
<td>2012</td>
<td>UCS 6296UP (Unified Ports)</td>
<td>UCS 2204 IO Module</td>
</tr>
</tbody>
</table>
UCS 6200 Series Networking Fabric
48 Unified Port Fabric Interconnect

• **Performance** for improved Workload Density
  o High Density 48 Ports in 1RU
  o Increased 1Tbps Switching Performance

• **Flexibility** to defer port usage type and number at design time rather than purchase time
  o Flexibility to configure any port at Ethernet (1/10 Gigabit with SFP+) or FCoE or Native FC Ports (8/4/2/1G with FC Optics)
  o All Ports usable as uplinks/ downlinks

• **Latency** Lowered to 2.0us within Switch

• **Power** Optimized with 80 PLUS Gold Efficiency

• **Investment Protection** with Backward and Forward Compatibility

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**FLEXIBILITY, UTILIZATION**

AND

**BETTER APP. PERFORMANCE**
UCS 6200 Series Networking Fabric
96 Unified Port Fabric Interconnect

- **Performance** for improved Workload Density
  - High Density 96 Ports in 2RU
  - Increased 2Tbps Switching Performance
- **Flexibility** to defer port usage type and number at design time rather than purchase time
  - Flexibility to configure any port at Ethernet (1/10 Gigabit with SFP+) or FCoE or Native FC Ports (8/4/2/1G with FC Optics)
  - All Ports usable as uplinks/ downlinks
- **Latency** Lowered to 2.0us within Switch
- **Power** Optimized with 80 PLUS Gold Efficiency
- **Investment Protection** with Backward and Forward Compatibility
UCS 2208 IO Module
Enable Dual 40 Gbps to Each Blade Server

UCS-IOM-2208XP
- **Bandwidth increase** for improved response esp for bursty Applications
  - 80G to the Network
  - 320G to the Host Redundant
    (4x10G/ Half width slot; 8x10G/ Full width slot)
- **Latency** Lowered to 0.5us within IOM
- **Investment Protection** with Backward and Forward Compatibility
UCS 2204 IO Module
Enable Dual 20 Gbps to Each Blade Server

UCS-IOM-2204XP

- **Bandwidth increase** for improved response esp for bursty Applications
  - 40G to the Network
  - 160G to the Host Redundant
    (2x10G/ Half width slot; 4x10G/ Full width slot)
- **Latency** Lowered to 0.5us within IOM
- **Investment Protection** with Backward and Forward Compatibility
Increased Bandwidth Access to the Blades

4 LINKS, DISCREET—1st Gen

Available Bandwidth Per Blade—10 Gb (5gb Per Side)

- Statically pinned to Individual fabric links
- Deterministic Path

8 LINKS, DISCREET

Available Bandwidth Per Blade—20 Gb (10 Gb Per Side)

- Statically pinned to Individual fabric links
- Deterministic Path
- No oversubscription, each blade gets 20 Gb

8 LINKS, PORT-CHANNEL

Available Bandwidth Per Blade—up to 160 Gb (80 Gb Per Side)

- Statically pinned to Port-channel
- Shared bandwidth, better bandwidth utilization.
UCS VIC 1200 Series—80 Gbps to the Host
Adapter and Virtual Machine Fabric Extender

PORT DENSITY TO MATCH CORE DENSITY
• Dual 40 Gbps to a single half-width slot
• Easy upgrade path for BW to server blade
• Uses 4x10 EtherChannel, HW 40Gb Capable
• vNICs/vHBAs NOT limited to 10Gb

PCIE & NETWORK INTERFACE VIRTUALIZATION
• Up to 256 PCIe devices and associated switch interfaces
• OS independent PCIe Virtualization

VM FEX MODE
• Virtual and physical collapsed into a single network
• VMs get dedicated switch interface (vEth)
• Full network visibility (span, statistic) at vEth level

VIRTUAL SERVICE CAPABLE
• Hardware support for vPath (for Virtual Services)
Backplane lanes for M1/M2 Blades

All 4 KR lanes go to the single Mezz Slot

Mezz Slot
Only one available on M1/M2
B200 M3 I/O Block Diagram
Modular LOM and Mezzanine slot

PCIe lanes from each socket

Mezzanine Slot

Modular LOM Slot

CPU # 1

CPU # 0

PCH-B

QPI
Backplane lanes for B200 M3

2 KR lanes go to the mLOM slot
2 KR lanes go to the Mezz Slot
IOM 2104 with VIC1240 in B200M3

VIC 1240 has Dual 2x10 10Gb KR ports

BW to half width slot = Dual 10Gb

Only *valid* adapter option with IOM 2104
IOM 2208 with VIC1240 in B200M3

- IOM 2208 has 4 KR lanes to each server slot
- VIC 1240 has Dual 2x10 10Gb KR ports

BW to half width slot = Dual 2x10Gb
IOM 2208 with VIC1240 & Port Exp Card in B200M3

Port Expander for VIC 1240 enables 2 additional ports of VIC 1240 ASIC to each fabric

BW to half width slot = Dual 4x10Gb

Full BW of 2nd Gen VIC ASIC exposed
**IOM 2208 with VIC1240 & **VIC 1280** in B200M3**

- **Unconnected ports of VIC 1280**

- **BW to half width slot**
  - Dual 2x10Gb + Dual 2x10Gb
  - Each ASIC forms its own Ether channel

- **Adapter level “Redundancy” available with M3 blades**

- **VIC1280 is a PCIe device**
IOM 2208 with VIC1240 & **Gen 3 Mezz** in B200M3

Gen 3 Mezzs are dual 10GB

- **B200M3**
  - Gen 3 Mezz
  - Mezz Slot
  - Gen 3 Mezz

- **CPU # 0**
- **CPU # 1**
- **Port 0**
- **Port 1**
- **ASIC**
- **mLOM Slot**
- **VIC 1240**

- **BW to half width slot**
  = Dual 2x10Gb + Dual 10Gb

- **Flexibility to choose a 3rd party Mezz to complement VIC 1240**

Gen3 Mezz are PCIe device
IOM 2208 **Gen 3 Mezz** in B200M3

BW to half width slot = Dual 10Gb

Flexibility to choose a 3rd party Mezz without VIC
FusionIO Mezzanine Card for UCS B-Series
Expanding the Unified Computing Blade Option Portfolio

Fusion ioDrive2 architected into Cisco UCS blade servers allow storage performance to be decoupled from capacity through the integration of a powerful new memory tier uniquely designed to accelerate applications

- Create new ultra-low latency storage tiers
- Boost in-server application performance with Database and Virtualization workloads
- Specs:
  - 785 GB MLC Flash capacities (365 GB MLC 2nd Phase)
  - 1.5GB/s Bandwidth (1MB Read)
  - 1.1GB/s Bandwidth (1MB Write)
  - 141,000 IOPS (512B Random Read)
  - 535,000 IOPS (512B Random Write)
  - 15µs Write Latency, 68µs Read Latency
- HW supported: All M3 Blades
- SW supported: UCSM 2.1 (Del Mar)
LSI Nytro™ WarpDrive™ for UCS B-Series
Expanding the Unified Computing Blade Option Portfolio

LSI Nytro™ WarpDrive™ acceleration solutions allow storage performance to be decoupled from capacity through the integration of **a powerful new memory tier uniquely designed to accelerate applications**

- Create new ultra-low latency storage tiers
- Boost in-server application performance with Database and Virtualization workloads
- **Specs:**
  - 400GB SLC Flash capacities
  - 1041 MB/s Read Bandwidth (256KB, 20% compressible data)
  - 882 MB/s Write Bandwidth (256KB, 20% compressible data)
  - 79K+ Random Read IOPS (8KB)
  - 14K+ Random Write IOPS (8KB)
  - < 50μs Average Latency
- HW supported: All M3 Blades
- SW supported: UCSM 2.1 (Del Mar)
- Option with EMC XtremSW

EMC XtremSW: [http://www.emc.com/vfcache](http://www.emc.com/vfcache)
What Sets Cisco Unified Computing Apart…
… and how does that impact OpEx

1. Single Logical Blade Chassis
   versus mini racks

2. Cisco FEX architecture
   versus lots-of-little-switches

3. Stateless Server Provisioning
   Service Profiles

4. Open API for management

5. Advanced Networking Features
   Virtual Interface Card (Palo)
   QoS versus Rate-Limiting
What Sets Cisco Unified Computing Apart…

1. **Single Logical Blade Chassis**
   
   *versus mini racks*

2. **Cisco FEX-Link architecture**
   
   *versus lots-of-little-switches*

3. **Stateless Server Provisioning**
   
   *Service Profiles*

4. **Open API for management**

5. **Advanced Networking Features**
   
   *Virtual Interface Card (Palo)*
   
   *QoS versus Rate-Limiting*
Does this look familiar

Storage Array Structure

• Storage Controllers:
  • Manage internal structure
  • Present LUNs to the network
  • Implement intelligence
    • Remote copy
    • Backup
    • De-duplication
    • Thin provisioning
    ...

Network
Cisco Unified Computing System

- UCS Fabric Interconnect:
  - Manage internal structure
  - Present Service Profiles to the network
  - Implement intelligence
    - Provisioning
    - Virtualisation optimization
    - Firmware management
    - Power capping
  ...

Network
Modern Systems Architecture

Core

Network

Capacity
What Sets Cisco Unified Computing Apart…

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Fabric Extender Evolution
Distributed Modular System to the ToR, server and Virtual Machine

One Network
Parent Switch to Top of Rack

FEX Architecture
- Consolidates network management
- FEX managed as line card of parent switch
- Uses Pre-standard IEEE 802.1BR

Many applications require multiple interfaces

Legacy

Network Administrator
Fabric Extender Evolution
Distributed Modular System to the ToR, server and Virtual Machine

One Network
Parent Switch to Adapter

Many applications require multiple interfaces

Adapter FEX
- **Consolidates** multiple interfaces into a single 10Gb interface
- Extends network into server
- Uses Pre-standard IEEE 802.1BR

Consolidates multiple interfaces into a single 10Gb interface

Extends network into server

Uses Pre-standard IEEE 802.1BR
Fabric Extender Evolution
Distributed Modular System to the ToR, server and Virtual Machine

One Network
Virtual Same As Physical

VM-FEX
- Consolidates virtual and physical network
- Each VM gets a dedicated port on switch
- Uses Pre-standard IEEE 802.1BR

Network Administrator

Legacy
Adapter FEX
VM-FEX

VM network managed by Server administrator
Fabric Extender Evolution
Distributed Modular System to the ToR, server and Virtual Machine

One Network
Parent Switch to Application
Single Point of Management

FEX Architecture
- **Consolidates** network management
- FEX managed as line card of parent switch

Adapter FEX
- **Consolidates** multiple interfaces into a single 10Gb interface
- Extends network into server

VM-FEX
- **Consolidates** virtual and physical network
- Each VM gets a dedicated port on switch

Manage network all the way to the OS interface – Physical and Virtual
VM-FEX: Operational model

VC Deploys VMs with port groups

UCSM exports Port Profiles to VC

Port Profiles Defined in UCSM
- WEB Apps
- HR
- DB
- Compliance
VM-FEX: Host view – One network

VM-FEX Basics
- Fabric Extender for VMs
- Hypervisor vSwitch removed
- Each VM assigned a PCIe device
- Each VM gets a virtual port on physical switch

VM-FEX: One Network
- Collapses virtual and physical switching layers
- Dramatically reduces network management points by eliminating per host vSwitch
- Virtual and Physical traffic treated the same

Host CPU Cycles Relief
- Host CPU cycles relieved from VM switching
- I/O Throughput improvements
What Sets Cisco Unified Computing Apart…

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   Service Profiles

4. Open API for management

5. Advanced Networking Features
   Virtual Interface Card (Palo)
   QoS versus Rate-Limiting
## Stateless Computing

Legacy Servers require lots of manual intervention

### Server Identity & Personality

<table>
<thead>
<tr>
<th>NIC MACs</th>
<th>Call Home</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBA WWNs</td>
<td>Template Association</td>
</tr>
<tr>
<td>Server UUID</td>
<td>Org &amp; Sub Org Assoc.</td>
</tr>
<tr>
<td>VLAN Assignments</td>
<td>Server Pool Association</td>
</tr>
<tr>
<td>VLAN Tagging</td>
<td>Statistic Thresholds</td>
</tr>
<tr>
<td>FC Fabrics Assignments</td>
<td>BIOS scrub actions</td>
</tr>
<tr>
<td>FC Boot Parameters</td>
<td>Disk scrub actions</td>
</tr>
<tr>
<td>Number of vNICs</td>
<td>BIOS firmware</td>
</tr>
<tr>
<td>Boot order</td>
<td>Adapter firmware</td>
</tr>
<tr>
<td>PXE settings</td>
<td>BMC firmware</td>
</tr>
<tr>
<td>IPMI Settings</td>
<td>RAID settings</td>
</tr>
<tr>
<td>Number of vHBAs</td>
<td>Advanced NIC settings</td>
</tr>
<tr>
<td>QoS</td>
<td>Serial over LAN settings</td>
</tr>
</tbody>
</table>

### SAN

- BIOS Settings
- RAID settings
- Advanced NIC settings
- Serial over LAN settings
- BIOS Settings
Stateless Computing
UCS Service Profiles reduce complexity and deployment speed

To build our server...
Make one or more unique profile copies from a template

Associate a single profile to a single server. Repeat for more servers as needed

Rapidly deploy any number of servers in just a few clicks!
Service Profiles
Flexibility, Agility – Operation Efficiency

ESX Server
Service Profile Template

ESX Server 1
Service Profile
Hardware

ESX Server 2
Service Profile
Hardware

ESX Server 3
Service Profile

ESX Server 4
Service Profile

My new Servers (booted)

My Servers (not booted)

Cisco UCS

Pool of Blades

1 Logical Chassis

Fabric Interconnect A
- Multi-chassis Server Identity Manager
- Server Health Monitoring
- Blade & Chassis Management
- Ethernet
- Fiber Channel

Fabric Interconnect B
- Servers 1-8
- Servers 9-16
- Servers 17-24
- Servers 25-32
- Servers 33-40
- Servers 41-48
- Servers 49-56
- Servers 57-64
- Servers 65-72
- Servers 73-80
- Servers 81-88
- Servers 89-96
- Servers 97-104
- Servers 105-112
- Servers 113-120
- Servers 121-128
- Servers 129-136
- Servers 137-144
- Servers 145-152
- Servers 153-160
What Sets Cisco Unified Computing Apart…

1. Single Logical Blade Chassis
   versus mini racks

2. Cisco FEX-Link architecture
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3. Stateless Server Provisioning
   Service Profiles

4. Open API for management

5. Advanced Networking Features
   Virtual Interface Card (Palo)
   QoS versus Rate-Limiting
UCS Manager

**Embedded device manager**
- Discovery, Inventory, Monitoring, Diagnostics, Statistics Collection, Configuration, Access Control, Power Capping, etc.

**Unifies many UCS HW components into a single, cohesive, system**
- Adapters, blades, chassis, fabric extenders, fabric interconnects

**APIs for integration with new and existing data center infrastructure**
- SMASH-CLP, IPMI, SNMP
- XML SDK for commercial & custom implementations

**Key Feature: Service Profiles**
- Coordinated deployment to managed endpoints
Multidomain Management
UCS Management Ecosystem Overview

Manage UCS with Industry Standard Tools

- Application Stack
- OS and Software Management
- UCS Visibility and Control

Third Party Management
- Service Orchestration
- Provisioning and Configuration
- Monitoring and Analysis

Cisco UCS Manager
- Unified Control API
- Service Profiles
- Cisco UCS Pools
UCS Platform Emulator

- Full featured UCSM Emulator, installed as a VM
- Support for all XML API calls, including Object Browser
- Import & replicate existing live UCS Manager physical inventory
- Drag-n-drop hardware builder to create customer physical inventory
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Cisco VIC – Adapter Failover included

Fabric Interconnect A → Fabric Interconnect B

Chassis FEX / IOM

LAN

Fabric Interconnect A

Fabric Interconnect B

Blade

Operating System

??NIC TEAMING??
Cisco VIC – Virtual Interfaces

Fabric Interconnect A

Fabric Interconnect B

Chassis FEX / IOM

Chassis FEX / IOM

10GE

10GE

Cisco VIC

vNIC vNIC vNIC 56 vNIC vNIC vNIC vNIC

Cisco VIC -> 56
Cisco VIC1280 -> 116
Cisco VIC1280 – 80G per half-blade

Fabric Interconnect A

Fabric Interconnect B

Chassis FEX / IOM

Chassis FEX / IOM

LAN

Cisco VIC1280 Blade

10GE 10GE 10GE 10GE 10GE 10GE 10GE 10GE

vNIC vNIC vNIC 116 vNIC vNIC vNIC vNIC

Cisco VIC   -> 56
Cisco VIC1280 -> 116
Bandwidth and the Control & Management of it

Cisco QoS:
Guaranteed minimum (your lane), burst to max bandwidth

Alternative Approach – Rate Limit
Guaranteed fixed bandwidth (limited to your lane)

UCS QoS - Business Benefits:
Service Level differentiation
Utilize available capacity (no need to over engineer the network)
Flexibility and Agility, with Control
More satisfied customers

Cisco QoS:
8 classes, bandwidth schedulers, weighted round robin, TX & RX metering, no drop
### Unified Computing System Innovations

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated Design</td>
<td>Performance optimized for any type of workload</td>
</tr>
<tr>
<td>Service Profiles</td>
<td>Agility and reduced time to deploy and provision applications</td>
</tr>
<tr>
<td>UCS Manager</td>
<td>Role-based management, automation, ease of integration</td>
</tr>
<tr>
<td>UCS Central</td>
<td>Centralized, multi-domain management, alerting and visibility</td>
</tr>
<tr>
<td>Unified Fabric</td>
<td>Simplified infrastructure</td>
</tr>
<tr>
<td>Virtualized I/O</td>
<td>Security isolation per application, scale, improved performance</td>
</tr>
<tr>
<td>Form Factor Independence</td>
<td>Supports both blades and rack mount servers in a single domain</td>
</tr>
<tr>
<td>Memory Scale</td>
<td>Cost effective application performance, scale, full capacity not dependent on CPU</td>
</tr>
</tbody>
</table>
EMC Xtrem - anatomy

Luděk Šafář, EMC
EMC Xtrem family

**XtremSF**
HW kapacitní PCIe karta o výkonu až milion IOPS. Je instalována přímo v serveru. Může být použita jako lokální kapacita nebo cache.

**XtremSW cache**
SW řešení umožňující využívat lokální flash kapacitu jako cache pro transakčně aktivní data.

**XtremIO**
scale-out All-flash array nové generace pracující s in-line deduplikací, pro systémy s vysokými nároky na výkon a nízkou latencí.
Flash

PCIe Server Flash
SSD Array Flash

Hard Drive
Performance
Nearline

<100μS – 500μS
1 ms

Latence
**Flash**
- PCIe Server Flash
- SSD Array Flash

**Hard Drive**
- Performance
- Nearline

**10K – 200K**

**200**

**IOPS**
Flash
- PCIe Server Flash
- SSD Array Flash

Hard Drive
- Performance
- Nearline

10X

$ / GB
100X  5X  X

IOPS / "$
XTREM SF
ACCELERATING APPLICATION PERFORMANCE

XtremSF

- PCIe X8 Architecture For Superior Bandwidth
- Advanced Garbage Collection Reduces Spikes
- Optimized For Real World, 4K & 8K Workloads
- Range Of Capacities in MLC & SLC Flash
- Offload Engine Reduces CPU Consumption
XTREM SW
SERVER FLASH DAS BECOMES CACHE

XtremSW Cache 1.5
- Write-Through Cache
- De-Duplication
- VMAX Management Integration
- Works On All XtremSF Cards

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Real World Application Testing Results

Solution architecture consists of an Oracle Database, Cisco UCS C-460 server and an EMC VMAX. EMC tested the capabilities of VFCache. Testing employed a standard TPC-C like OLTP workload with a 1.2 TB database and a 70-30% read/write mix with 250 GB of hot data. VFCache enabled on all data LUNs, but not on log LUNs. No tuning of Oracle database. VMAX storage system: 4 Engines, 512GB of mirrored cache; 16 x 250 GB Data LUNs on 64 x 450 GB 15K RPM FC drives (RAID 5), 4 x 200 GB Log LUNs on 16 x 450 GB 15K RPM FC drives (RAID 5); Database buffer cache 4GB, Server connected to VMAX using 4 x 8Gbps Fibre Channel.

Relative Application Level Latency

Time

1.0

0.4

60% BETTER RESPONSE TIMES

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Solution architecture consists of an Oracle Database, Cisco UCS C-460 server and an EMC VMAX. EMC tested the capabilities of VFCache. Testing employed a standard TPC-C like OLTP workload with a 1.2 TB database and a 70-30% read/write mix with 250 GB of hot data. VFCache enabled on all data LUNs, but not on log LUNs. No tuning of Oracle database. VMAX storage system: 4 Engines, 512GB of mirrored cache; 16 x 250 GB Data LUNs on 64 x 450 GB 15K RPM FC drives (RAID 5), 4 x 200 GB Log LUNs on 16 x 450 GB 15K RPM FC drives (RAID 5); Database buffer cache 4GB, Server connected to VMAX using 4 x 8Gbps Fibre Channel.
Real World Application Testing Results

Solution architecture consists of Microsoft SQL Server 2008 R2, Cisco UCS C-460/M1 rack mount server and an EMC VNX5300. EMC tested the capabilities of VFCache. Testing employed a standard TPC-E like OLTP workload with a 750GB database and a 90/10% read/write mix. VFCache enabled on all data LUNs, but not on log LUNs. No tuning of SQL database. Configuration Details: Read Cache on VNX5300 = 700MB, Write Cache on VNX5300 = 2000MB; 20 x 260 GB Data LUNs on 100 x 300 GB 10K RPM SAS drives (RAID 5), 1 x 500GB Log LUN on 4 x 300 GB 10K RPM SAS drives (RAID 10); Database buffer cache size 10GB; Server connected to VNX storage system using 4 x 8Gbps Fibre Channel.
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100% transparent caching
VFCache driver extends your SAN performance
## XtremSF+SW Cache architektura

<table>
<thead>
<tr>
<th>Server</th>
<th>Network</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>CPU</td>
<td>PCIe Flash Card</td>
</tr>
</tbody>
</table>

- Čtení aktivních dat je realizováno z Xtrem SF
- Zápisy jsou ukládány na diskové pole (cache)
Automatický tiering od A do Z
Rozšíření FAST Architektury

Fast algoritmus
Řídí uložení dat od ExtremeSF až po SATA/NL-SAS kapacity
Nejaktivnější data jsou uložena v ExtremeSF.
XtremSF/SW Cache Split Card Mode

Cache

Local Storage

Data 1

Data 2

Temp DB

Microsoft SQL Server

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Inline Cache de-duplikace
Větší kapacita za stejnou cenu

• **Efektivnější cena/GB:** efektivní kapacita větší než kapacita fyzická

• **Prodloužení životnosti:** snížení počtu zápisů a přepisů pamětí

<table>
<thead>
<tr>
<th>Velikost VFcache</th>
<th>Kapacita</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fyzická kapacita</td>
<td>300 GB</td>
</tr>
<tr>
<td>Efektivní kapacita (20% de-duplikační poměr)</td>
<td>360 GB</td>
</tr>
</tbody>
</table>

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Nejlepší výkon a kapacita ve své třídě

<table>
<thead>
<tr>
<th></th>
<th>550 GB eMLC</th>
<th>2.2 TB eMLC</th>
<th>350 GB SLC</th>
<th>700 GB SLC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Bandwidth</td>
<td>1.36 GB/s</td>
<td>2.47 GB/s</td>
<td>2.9 GB/s</td>
<td>2.9 GB/s</td>
</tr>
<tr>
<td>Write Bandwidth</td>
<td>512 MB/s</td>
<td>1.1 GB/s</td>
<td>756 MB/s</td>
<td>1.8 GB/s</td>
</tr>
<tr>
<td>Random 4K Read IOPS</td>
<td>174K</td>
<td>343K</td>
<td>715K</td>
<td>712K</td>
</tr>
<tr>
<td>Random 4K Write IOPS</td>
<td>49K</td>
<td>105K</td>
<td>95K</td>
<td>197K</td>
</tr>
<tr>
<td>Random 4K Mixed IOPS</td>
<td>96K</td>
<td>206K</td>
<td>267K</td>
<td>411K</td>
</tr>
<tr>
<td>Read Access Latency</td>
<td>87 µs</td>
<td>87 µs</td>
<td>50 µs</td>
<td>50 µs</td>
</tr>
<tr>
<td>Write Access Latency</td>
<td>37 µs</td>
<td>30 µs</td>
<td>13 µs</td>
<td>13 µs</td>
</tr>
</tbody>
</table>

- Nejlepší výkon eMLC kapacitní karty—**340K IOPS** a **30µs** latence
- Rozměrově nejmenší karta v poměru ke kapacitě na trhu
Otázky a odpovědi
Prosíme, ohodnoťte tuto přednášku.
Děkujeme za pozornost.