Oracle Networking for Cloud

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Databases in the Cloud
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End of an Era
Networking in Cloud Era

“..80%+ of Google’s traffic internal facing..”
(Bikash Koley – Google)

“Every 1kB of external traffic entering the DC generates 93kB of internal traffic”
(Nathan Farrington – Facebook)

• Majority of Communication is Internal
  – Accelerated fast-path for VM-VM and VM-Storage (IP, RDMA and Verbs API)

• Cloud for Enterprise – Secure Multi-Tenant
  – Security Model that covers all bare-metal IaaS to virtualized PaaS/SaaS
Engineered Systems | The Family

- Expedited time to value
- Easier to manage and upgrade
- Lower cost of ownership
- Reduced change management risk
- Single Vendor Accountability
- Extreme performance
A New Kind of a Computer

Building an elastic cloud with InfiniBand

• Grid Architecture
  – Simple to scale
  – Open, standard

• Lossless Switched Fabric
  – Quality of Service
  – Secure Multi-Tenancy
  – Fault tolerance and Failover
  – Extreme Scalability → 10ks of Nodes
Traditional vs Oracle Exa* Architecture
InfiniBand as Oracle´s Private Cloud Fabric

• Highest Bandwidth and Lowest Latency: 100Gbps / 1us
• Constant Bandwidth Network – Predictable Performance
• “Zero” network administration – Pre-configured and automated
• Secure Multi-Tenancy for Bare-Metal and Virtualization
• Verbs API & RDMA
  → Oracle Red Stack Application Acceleration (RDMBS, RAC, FMW, Coh*, OVM)
• Seamless support of legacy Network & Storage apps
• Loss-Less fabric
• OPEN
  – Rich OS Support (Linux, Solaris, Windows, ESX)
Infiniband Performance Advantage

Up to 12x Performance

- **Network IO is critical**
  - #1 limiting factor for application performance and scale

- **Eliminate Buffer Copies**
  - From four to zero, less CPU

- **Use larger message sizes to reduce network overhead**
  - 64K instead of 4K packets

- **Oracle Red Stack optimized for InfiniBand and Verbs**
  - 3x-10x throughput over 10 GbE & 90% less latency

- **RDMA and Persistent Memory**

- **Full Virtualization Support: SR-IOV and PV**
Solid Roadmap

- **InfiniBand**
  - HDR
  - EDR
  - FDR
  - QDR
  - DDR
  - SDR

- **Ethernet**
  - 40G-SR/LR
  - 25G/50G-SR
  - 10G-Base-T

Timeline:
- 2000
- 2005
- 2010
- 2015
- 2020

Data Rate:
- 200G
- 100G
- 56G
- 40G
- 20G
- 10G
- 1G

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Proven Scalability
Oracle’s Networking
Engineered and Integrated to enhance the Oracle Red Stack

- High Performance, Low Latency InfiniBand and Ethernet Network Fabrics
- Wire-Once Software Defined Networking with Oracle SDN for your cloud
- Unified Management across network fabrics for IaaS/PaaS clouds

Deployed in Engineered Systems and in the Oracle Cloud

Shipped over 44K switches
Oracle Networking: Shipping Product Portfolio

**Oracle InfiniBand**
- InfiniBand Switch 36
- Versatile Leaf Switch
- Infiniband Gateway Switch
- 32-port Infiniband and 8 10GbE

**Oracle Ethernet**
- Oracle Switch ES2-64 & ES2-72
- 10/40 GbE switches
- Oracle Switch ES1-24
- 24-port 10GbE switch
- 10GbE Switch 72p
- 72 Port 10GbE switch

**Oracle Virtual Networking**
- Fabric Interconnect F1-15
- Converged Fabric
- Oracle Fabric Interconnect F1-4

**Software**
- Oracle EM
- Oracle Fabric Manager
- Oracle SDN
- OpenStack Plug-in

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OVN – Converged Fabric

- Migrate Server Profile on demand
- Connect any server (x86/SPARC) to any network and storage
- Run any OS or Hypervisor: Oracle Solaris, Oracle VM, VMware, Windows Hyper-V

QoS controls for predictable application performance

- Up to 80 Gbps per server.
  - Two cables
  - Wire once

Inflexible system configuration
Low resource utilization
Oracle SDN

• Ethernet Overlay across IB
  – Enable Ethernet L2 with IB and Ethernet hosts
• Server-to-server connectivity
  • 64M isolated virtual Ethernet networks between servers
• Accelerates throughput
  • Up to 100Gb/s server-to-server
  • Traffic remains entirely on fabric
• Flexible connectivity management
  • Fully software defined
  • Isolation without reliance on VLANs
Extend Oracle SDN with Virtual Network Services to achieve a fully Software Defined Cloud Enabled Datacenter

Oracle SDN + Virtual Network Services

Oracle SDN: Virtual Network Services

Core

Internet

Load Balancer

Ethernet

InfiniBand

Big Data

Database

Recovery
Oracle VNS (Virtual Network Services)

Define and Deploy Network Services Per Tenant

• Feature highlights
  – Stateful firewall with reflexive ACLs
  – Static and dynamic NAT mapping
  – Layer 4 server Load balancing
  – IPSEC VPN
  – Static routing & gateway services across subnets

• Single Virtual Instance per Tenant
• Redundancy built in with VRRP
• Managed from Oracle Fabric Manager
Breakthrough Silicon and Network Systems Design

Oracle Cloud, Your Data Center, Engineered Systems: Same Technology and Operating Model

- 100G Converged Fabric
- Oracle Application Acceleration in Fabric
- Engineered for deploying secure multi-tenant enterprise clouds
- Wire-once Software Defined Networking
- Resilient and Self-Healing
- Unified management across network fabrics for public and private clouds
Silicon Innovation - SPARC SoC with InfiniBand

- 8 SPARC 4th generation cores
- Optimized Cache Organization
- Advanced Software in Silicon features
  - Real-time Application Data Integrity (ADI)
  - Concurrent Memory Migration and VA Masking
  - DB query offload engines
- Integrated DDR4 memory
- Integrated PCIe Gen3
- Integrated InfiniBand HCA
- Scale-out IB interconnect
Oracle 100G SDN Fabric for Enterprise Clouds

**Speed**

100G Converged Fabric - Extreme Performance for Apps and Cloud

**Security**

Ground-Up Engineered for Secure Multi-Tenant Cloud:
- 64M Virtual Networks
- Secure End-Point Authentication
- Isolated Administrative Domains

**Efficiency**

SDN and virtualized IO services with a single network interface –
- Extreme Scale (500k Servers) –
- Breakthrough Oracle Integration & Efficiency

**Open**

OpenFabrics, OpenStack, InfiniBand, RDMA, LAN & SAN Interoperability
Oracle 100G Fabric - Fastest Converged Fabric
One Fabric for Network, Storage, and Inter-process Communication

• **100 Gb/s** Server and Storage connections
  – InfiniBand and Ethernet & Fibre Channel gateways

• Faster Fabric
  – 100G RDMA and Oracle SDN virtual Ethernet networks
  – 89% utilization (routing efficiency) at max load
  – Deterministic QoS and SLA independent of Scale

• Faster Provisioning of Network Infrastructure
  – Networks, Network Services, and Server I/O on-demand

• Faster Server, Storage and Applications
  – Application acceleration built-in to Network
Oracle 100G Fabric

Product Portfolio

• Switch and Virtual I/O Systems
  – Leaf Switch: Oracle InfiniBand Switch IS2-46
  – Spine Switch: Oracle InfiniBand Switch IS2-254
  – Fabric Virtualized I/O: Oracle Fabric Interconnect F2-12

• Server and Storage Interface
  – Oracle Dual Port EDR InfiniBand Adapter

• Fabric and I/O Management
  – Oracle Fabric Manager

• Virtual Networks and Network Services
  – Oracle SDN
Oracle 100G Fabric - Cloud Scale (500k Servers)

500k Nodes
3-Tier Clos Fat-Tree

Tier 1 (ToR)

POD #1

1
64

Tier 2 (Fabric)

POD #216

431
1
64

Tier 3 (Spine)

F2-12

SAN/Backup)

Network Service POD(s) (or F2-12 part of POD)
Oracle Networking: Best Network Fabric for your Cloud!

Efficient  Secure  Open

Fast  Low Cost
Hardware and Software
Engineered to Work Together