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Supporting Lustre Community Testing

September, 24th 2012 | Frank Heckes, JSC, FZ-Jülich

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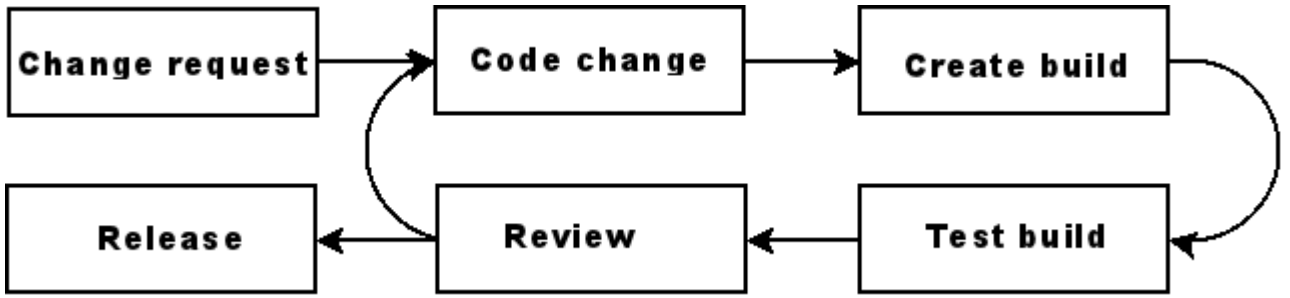
Outline

- ***Overview***
- ***Test cluster description and experience***
- ***Improvements***

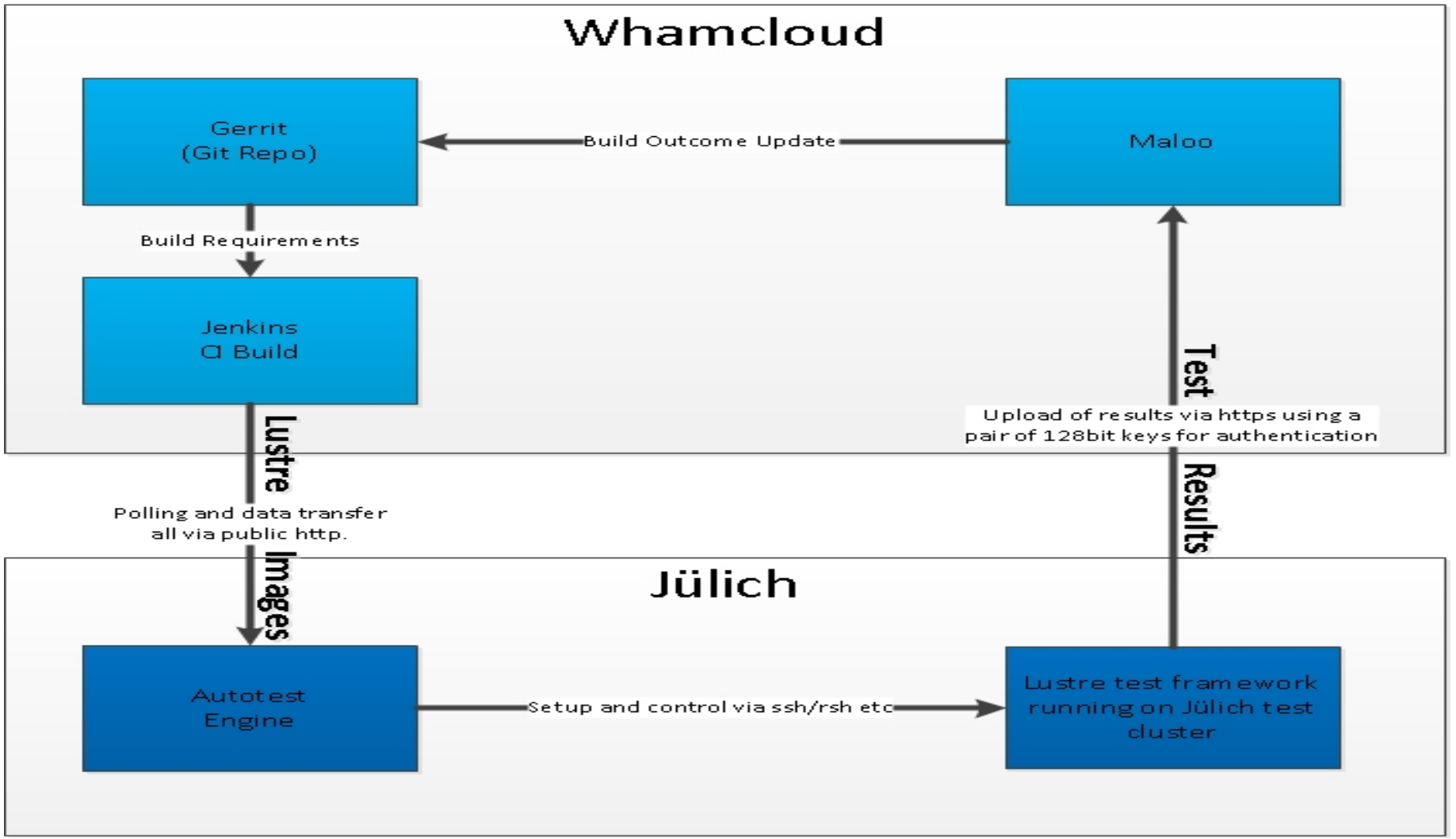
Lustre Community Test Cluster

- ***Whamcloud established new development model for Lustre:***



- ***Software Test performed with automated test frame-work***
- ***Chance to contribute to Lustre development by providing test infrastructure***

Lustre Community Test Cluster (logical view)



By courtesy of Chris Gearing, Whamcloud

Lustre Community Test Cluster

- ***Compiled requirement list together with Lustre engineering***
  - *At least 2 OSS, MDS nodes, (failover test)*
  - *At least 2 client nodes*
  - *Dedicated Infiniband fabric*
  - *Enough disk capacity for large LUN testing*
  - *CPU with virtualization capabilities*
  - *Sufficient memory*

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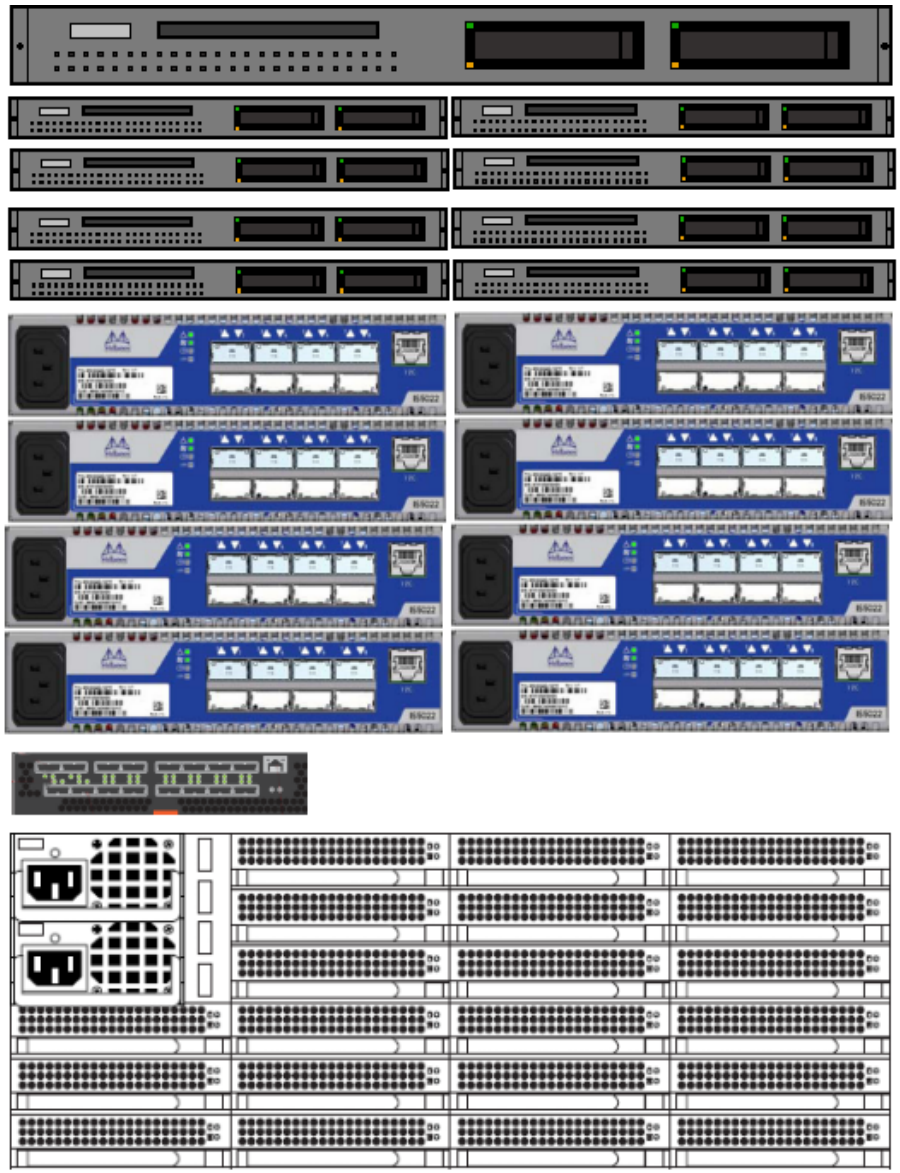
Lustre Community Test Cluster

- ***Hardware (SGI)***
  - *1 x Head Node*
  - *4 x Server Nodes, 4 x Client Nodes*
  - *8 x Mellanox Switches 8 Port Switches (small Full FAT tree)*
  - *SAS Switch*
  - *2 x JBOD (9 x 3 TB, 25 x 2 TB disks)*
- ***Configuration***
  - *Storage allocation via SAS zoning*
  - *Different autotest configuration map to different test cases (e.g.: large LUN testing, failover testing,..)*

Lustre Community Test Cluster



head node — autotest master, steer installation, send results

client nodes

OSS nodes

MDS nodes

Lustre Test Nodes

IB Switches

Lustre Network
JSC IB Test Network

SAS switch

JBOD

Lustre
Backend
Storage

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Lustre Community Test Cluster

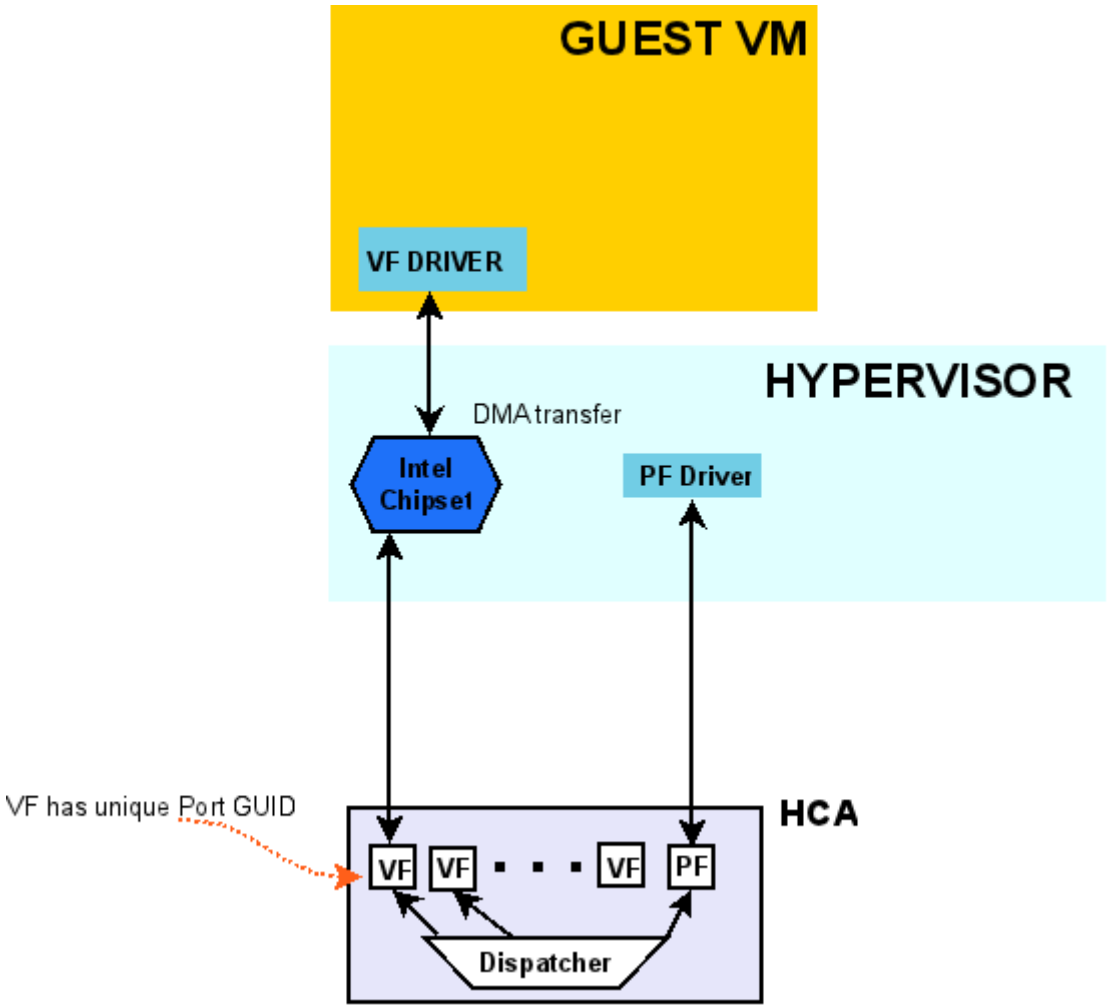
- ***Project Details***
  - *Small full FAT tree Infiniband fabric*

    → JSC tool development & IB hands on
  - *1'st Community Installation*
    - *Chris Gearing, Whamcloud (onside)*
    - *2 days for installation: Cobbler + autotest + infrastructure*
    - *Framework RHEL (CentOS) centric*
    - *Used in hundreds of test cases for Release 2.2*
    - *(see http://maloo.whamcloud.com → test result → user 'Juelich autotest')*
- ***Experience***
  - *Low administrative effort (< 1 Hour / month; on the average)*

Lustre Community Test Cluster

- ***Drawback***
  - *Test small test coverage due to small number of components*
  - *Need for Improvement*
- ***Mellanox provided (alpha version) Driver to virtualize HCA***
- ***Practical consequences:***
  - *Test coverage can be increased (factor 4-8)*
  - *Decomposition of test sets → Testing in parallel → reduced test time*
  - *Installation time can be reduced*
  - *Convenient way to use virtual machines for kernel debugging*
  - *Avoid NUMA I/O, Storage virtualization, client check-pointing*

Lustre Community Test Cluster



- ***Technical aspects***
  - *PF driver makes VF available*
  - *Guest use VF for direct communication*
  - *VF visible as HCA in guest OS*
  - *Each VF communicate 'independent' from the other*
  - *Up to 256 VF*

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- ***Hardware Requirements:***
  - *SR-IOV Support of mainboard*
  - *CPU Virtualization (Intel)*
  - *HCA: ConnectX2, ConnectX3 ASIC*
  - *Nice to have: IRQ remapping*
- ***Software Requirements***
  - *RHEL AS 6.2 (CentOS)*
  - *Kernel 2.6.32-220.13.1*
  - *KVM shipped with RHEL AS 6.2 (CentOS 6.2)*

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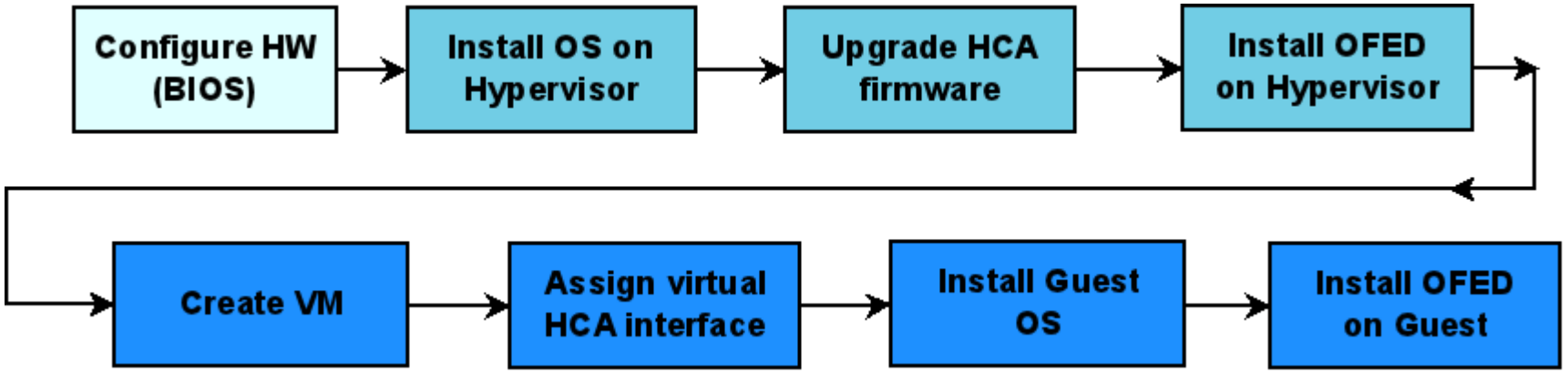
Software Changes

- ***HCA***
  - *FW (2.10.2000) has to be flashed*
- ***OFED***
  - *Need to run opensmd shipped with HCA (alpha) driver*
  - *(on hypervisor or network management node)*



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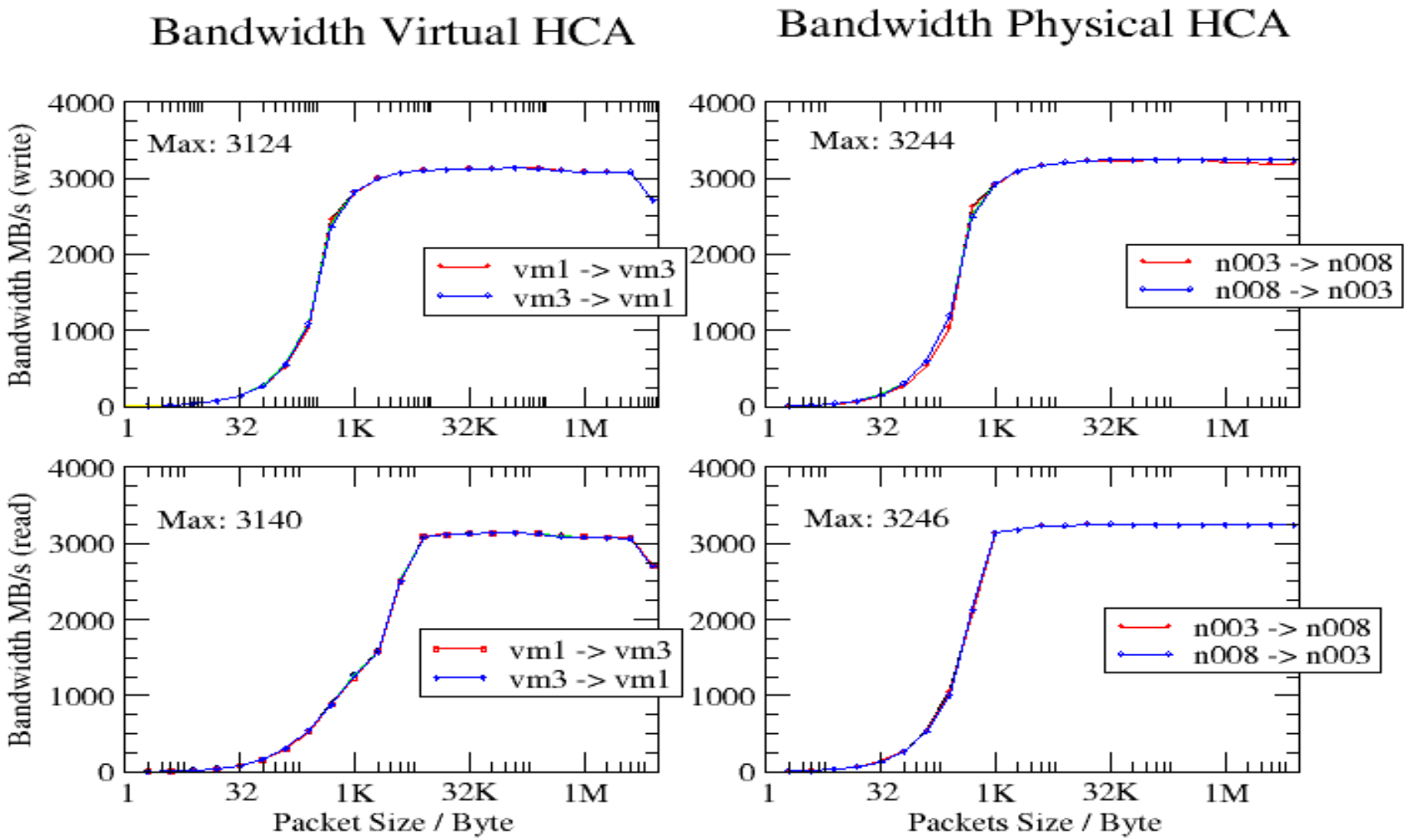
- ***Bandwidth using ib_{read,write}_bw***



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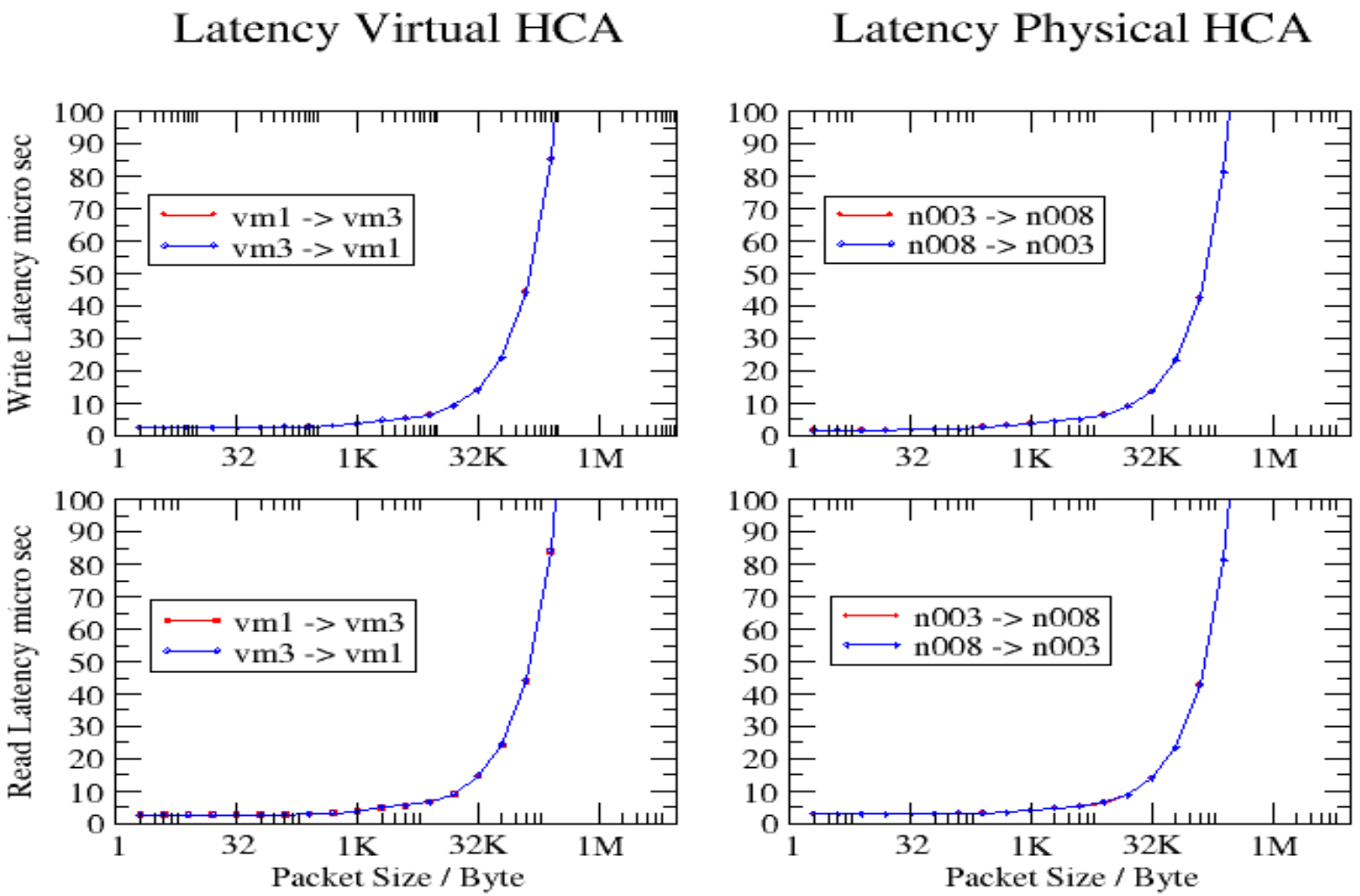
- ***Latency (using ib_{read,write}_lat***



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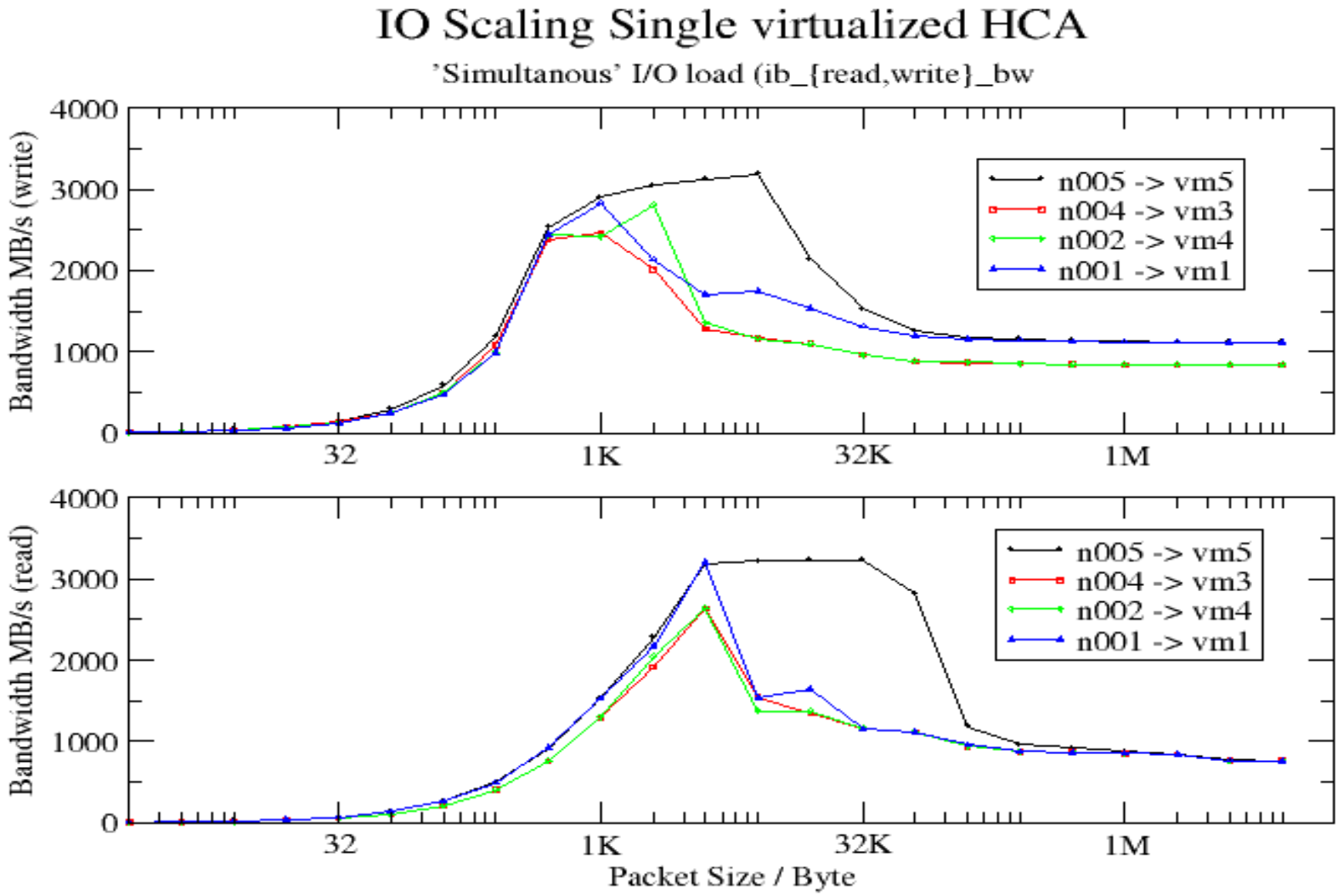
- ***Simultaneous IO to 4 VF from 4 HCA***



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- ***Todo***
  - *Solve missing 'support' for guest PXE boot for* `cobbler`
  - *'Framework' in autotest to handle resource allocation for different test scenarios*
    - *Only physical nodes*
    - *Only virtualized nodes*
    - *Mixture between physical / virtualized nodes*
  - *Get official Mellanox offical HCA firmware + OFED*
  - *Compile Lustre against Mellanox OFED*

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Lustre Community Test Cluster

- ***References***
  - *Lustre Test Results*
  - *http://maloo.whamcloud.com*
  - *SR-IOV*
    - *Specification:*
      http://www.pcisig.com/specifications/iov/
    - *Intel Video:*
      http://communities.intel.com/community/wired/blog/2010/09/07/sr-iov-explained
  - *KVM Bug*
    https://bugzilla.redhat.com/show_bug.cgi?id=715555

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- ***Acknowledgment***

Chris Gearing (Whamcloud)

Thomas Husemann (Mellanox)
→ Providing SR-IOV HCA driver

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Questions ?