Outline

- Overview of Software Components and usage model
- Management Software Details
  - Management Agents, Administration
  - Fabric Diagnostic and Debug Features
  - Scalable Fabric management GUI
- Command Line Tools Details
  - Monitoring & Diagnostics
  - Configuration and Management
- Usage Examples
  - Host verification
  - Performance analysis
Familiar fabric management components

- **Fabric management stack**
  - Runs on OPA-connected management nodes
    - or switch embedded processor
  - Initializes, configures and monitors the fabric’s routing, QoS, security, and performance features
  - New management agents
    - Runs on OPA-managed host and switch nodes
    - In-band management datagrams

- **Host Command Line (CLI) tools**
  - New tools. Monitoring/control of local/fabric OPA resources
  - Includes updated FastFabric toolkit for configuration, monitoring, diags, and repair

- **Fabric Management Graphical User Interface (GUI)**
  - New interface. Exposes OPA features
  - Provides interactive GUI access to Fabric Management features (configuration, monitoring, diagnostics, element management drill down)
Intel® Omni-Path integrates with the OpenFabrics stack.

- Leverages existing stacks for each type of management
- Supports 3rd party unified management consoles
- Provides a scalable centralized fabric management framework
INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES

Fabric Management components

Fast Fabric

SA Clients

PA Clients

FM GUI

Subnet Admin
Subnet Mgr

Perf Admin
Perf Mgr

TCP/IP

In-Band

Int Mgd Chassis

Ext Mgd Chassis

SM Agent
PM Agent

Interconnect HFI and Switch ASICs

OpenFabrics Alliance Workshop 2016
Fabric Manager’s Subnet Management

- **Traditional responsibilities**
  - Initialization, QoS/policy definitions, topology discovery, LID assignment, routing, change monitoring, etc
- **Traditional exchanges of SMI packets with SMA management agents**
  - Directed route, LID-route, hybrids
- **Traditional run time database support for SA queries**
  - ‘opasaquery’, ‘opareport’

Some OPA differences

- **Scaling efficiencies**
  - 2k, aggregates, multi-port (MADs)
- **Topology verification**
- **Advanced traffic features**
- **vFabrics**

The FM implements a complete Intel® Omni-Path Architecture-compliant Subnet Manager (SM)
FM Topology verification
- From install spreadsheet (or known good snapshot)
- Create punch-lists during install
- Monitor for unauthorized changes during operations
- FM can warn, quarantine incorrect links
- FastFabric online and offline topology analysis

Extensive cable FRU management support built-in
- Link Quality Indicator
  - “5 bars” instantaneous view of link quality
  - In every HW port, monitored by FM, FastFabric Tools, FM GUI
- Port type information
  - QSFP/Standard, Fixed/Backplane, Variable, Disconnected, …
- QSFP CableInfo
  - shows all key cable /transceiver info
  - Vendor, model, length, technology, date, etc
  - Fully integrated into FM, FastFabric tools, FM GUI
- Link Down Reason
  - LinkDownReason and NeighborLinkDownReason – most recent reason link went down

Addressing the sysadmin challenge of managing cable FRUs
- In a typical cluster, the majority of fabric FRUs are cables
### INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES

#### Some OPA differences - Advanced Traffic Features

<table>
<thead>
<tr>
<th>Description</th>
<th>Benefits</th>
</tr>
</thead>
</table>
| **Traffic Flow Optimization**        | - Optimizes Quality of Service (QoS) in mixed traffic environments, such as storage & MPI  
- Transmission of lower-priority packets can be paused so higher priority packets can be transmitted | - Ensures high priority traffic is not delayed  
  - Faster time to solution  
- Deterministic latency  
  - Lowers run-to-run timing inconsistencies |
| **Packet Integrity Protection**      | - Allows for rapid recovery of transmission errors on an Intel® OPA link with low latency for both corrupted and uncorrupted packets  
- Resends 1056-bit bundles rather than entire packet | - Fixes happen at the link level rather than end-to-end level  
- Much lower latency than Forward Error Correction (FEC) defined in the InfiniBand specification  
  \(^{1}\) |
| **Dynamic Lane Scaling**             | - Maintain link continuity in the event of a failure of one of more physical lanes  
- Operates with the remaining lanes until the failure can be corrected at a later time | - Enables a workload to continue to completion.  
- Enables service at appropriate time. |

---

1 Lower latency based on the use of InfiniBand with Forward Error Correction (FEC) Mode A or C in the public presentation titled “Option to Bypass Error Marking (supporting comment #205),” authored by Adee Ran (Intel) and Oran Sela (Mellanox), January 2013. Link: [www.ieee802.org/3/bj/public/jan13/ran_3bj_01a_0113.pdf](www.ieee802.org/3/bj/public/jan13/ran_3bj_01a_0113.pdf)
vFabrics
- Permit multiple applications to be run on the same fabric at the same time with limited interference
- Administrator controls the degree of isolation

A vFabric consists of
- A group of applications that run on a group of devices.
- For each vFabric the operational parameters of the vFabric can be selected

Using vFabrics
- Defaults to simple Admin, Default vFabrics
- Administrator may further slice up the physical fabric into many overlapping virtual fabrics

Typical usage
- Separating a cluster into multiple vFabrics so that independent applications can run with minimal or no effect on each other
- Separating classes of traffic. For example, compute, storage, mgmt sharing same wire for all networking
Fabric Manager’s Performance Manager

- **Traditional responsibilities**
  - Gathers port counter info
    - Data counters
    - Error counters
    - Per port, per VL
    - Configurable
  - Monitors error levels against defined alarm
  - Archives for post-event data analysis

- **Traditional exchange of GSI packets with PMA management agents**
  - LID routed

- **Traditional run time database support for PA queries**
  - ‘opapaquery’, ‘opareport’, ‘opatop’

**Some OPA differences**

- ‘Short term’ (24-hour) history, supports historical queries e.g. “what was happening 3 hours ago”
- Filter by user defined device-groups, sweep images, other criteria
- PM/PA database sync – PM data retained during FM failover

The FM implements a complete Intel® Omni-Path Architecture-compliant Performance Manager (PM)
Management GUI

- Offers “big picture” of a fabric
- Queries SA, PA data through FE

Subnet Summary

- Statistics
- Status
- Health trend
- Worst nodes

Subnet performance

- Utilization group
- Counter Categories group

Fabric Management GUI accesses FM data through FE interface
Outline

- Overview of Software Components and usage model
- Management Software Details
  - Management Agents, Administration
  - Fabric Diagnostic and Debug Features
  - Scalable Fabric management GUI
- Command Line Tools Details
  - Monitoring & Diagnostics
  - Configuration and Management
- Usage Examples
  - Host verification
  - Performance analysis
- **Familiar command scope**
  - Local – Host fabric interface (HFI) ports/agents management
  - Platform – e.g. Edge/DCS switch element management
  - Fabric – query fabric’s FM databases, filtered results

- **OPA command line tools**
  - Intel-supplied BASIC/IFS tools packaging for common distros (rpm)
    - Or build from source (github)
  - Similarities to IB commands, patterned after TrueScale, but OPA-specific
    - ‘--help’
    - ‘man’ pages
    - Install guides, user guides, command references (PDF)
## INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES

### Extensive CLI tools

<table>
<thead>
<tr>
<th>Category</th>
<th>CLIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring and Diagnostics</td>
<td>Intel® Omni-Path Fabric Suite FastFabric TUI</td>
</tr>
<tr>
<td></td>
<td>Intel® Omni-Path Fabric Suite Fabric Manager GUI</td>
</tr>
<tr>
<td></td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opatop, opalinkanalysis,</td>
</tr>
<tr>
<td></td>
<td>opallanalysis (opachassisanalysis, opaesmanalysis, opahostsmanalysis,</td>
</tr>
<tr>
<td></td>
<td>opafabricanalysis)</td>
</tr>
<tr>
<td>High Level Analysis/Monitoring</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opareports, opareport,</td>
</tr>
<tr>
<td></td>
<td>opaextractbadlinks, opaextractlink, opaextractselllinks, opaextractstat2,</td>
</tr>
<tr>
<td></td>
<td>opafabricinfo</td>
</tr>
<tr>
<td>Mid-Tier CLI Analysis/Diagnosis</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opaextractlids,</td>
</tr>
<tr>
<td></td>
<td>opaextracterror, opaextractperf, opaextractstat, opashowallports</td>
</tr>
<tr>
<td>Lower Level CLI Diagnosis</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opafequery,</td>
</tr>
<tr>
<td></td>
<td>opafirmware, opahfirev, opapmaquery, opasmaquery, opaportinfo,</td>
</tr>
<tr>
<td></td>
<td>opasaquery, opashowmc, opapaquery</td>
</tr>
</tbody>
</table>

**Extensive set of command tools available from day 1**
## Extensive CLI tools

<table>
<thead>
<tr>
<th>Management</th>
<th>Intel® Omni-Path Fabric Suite FastFabric CLI: opaswitchadmin, opagenswitches</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-Switch External Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opachassisadmin, opacmdall, opapingall, opagenchassis, opagenesmchassis, opasetupsssh</td>
</tr>
<tr>
<td>Multi-Switch Internal Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opacmdall, opapingall, opadownloadall, opauploadall, opafindgood, opahostadmin, opascpall, opasetupsssh, opaverifyhosts</td>
</tr>
<tr>
<td>Multi-Host Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opaconfig opa_config_ff, opa_config_fm</td>
</tr>
<tr>
<td>Installation</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opaconfig opa_config_ff, opa_config_fm</td>
</tr>
<tr>
<td>Link and Port Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opaenableports, opadisableports, (opaeextractbadlinks, opaeextractsellinks generate input format for opaenable/disableports), opadisablehosts, opainfo, opaportinfo, opapmquery, opasmaquery, opaportconfig, opaswdisableall</td>
</tr>
<tr>
<td>Fabric Manager (FM) Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opafmcmd, opafmcmdall, opafmconfigcheck, opafmconfigdiff service opafm</td>
</tr>
<tr>
<td>Topology Analysis and Management</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opareport -o verify*, opagentopology, opareport -o links, opaeextractlink, opaeextractsellinks</td>
</tr>
<tr>
<td>SRP IOUs</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opareport -o ious</td>
</tr>
</tbody>
</table>
| Link Issue Analysis                             | Intel® Omni-Path Fabric Suite FastFabric TUI
Intel® Omni-Path Fabric Suite Fabric Manager GUI
Intel® Omni-Path Fabric Suite FastFabric CLI: opatop, opaanalysis, opaeextractbadlinks, opareport (-o errors, slow* mis*), opashowallports |

continued...
# INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES

## Extensive CLI tools

<table>
<thead>
<tr>
<th>Category</th>
<th>CLIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>QoS Analysis</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opareport (-o vfinfo, vfmember, bfrcrtl), opasmaquery, opasaquery -o vfinfo, opasaquery -o path, other opasaqueries for sc, sl, vl tables, opareport -V -o comps -d 10 (dumps all QoS config)</td>
</tr>
<tr>
<td>Routing Analysis</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opareport (-o portusage, treepathusage, pathusage, portgroups, validateroutes, validatepgs, validatecredloops, linear, mcast)</td>
</tr>
<tr>
<td>Customer Support Data Gathering Host and Switch</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opacaptureall, opacapture</td>
</tr>
<tr>
<td>Topology Generation and Conversions</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opagentopology, opareport -o topology, opaxlattopology, opaxlattopology_cust, opaxlmgenerate</td>
</tr>
<tr>
<td>General XML File Utilities</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opaxmlexport, opaxmlfilter, opaxmlindent</td>
</tr>
<tr>
<td>Verify Fabric (VF) query for launch integration</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opagetvf, opagetvf_env</td>
</tr>
<tr>
<td>Distributive Subnet Administrator (SA)</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opa_osd_dump, opa_osd_exercise, opa_osd_perf, opa_osd_query</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
</tr>
<tr>
<td>Wireshark</td>
<td>Intel® Omni-Path Fabric Suite FastFabric CLI: opapacketcapture</td>
</tr>
</tbody>
</table>
Ease of use

- **Textual User Interface (TUI) options available**
  - Stepwise installation, fabric verification assistance
    - `opaconfig`, `opafastfabric` (examples)

Intel OPA 10.0.1.0.21 Software

1) Show Installed Software
2) Reconfigure OFA IP over IB
3) Reconfigure Driver Autostart
4) Generate Supporting Information for Problem Report
5) FastFabric (Host/Chassis/Switch Setup/Admin)
6) Uninstall Software

X) Exit

Intel FastFabric OPA Tools

Version: 10.0.1.0.21

1) Chassis Setup/Admin
2) Externally Managed Switch Setup/Admin
3) Host Setup
4) Host Verification/Admin
5) Fabric Monitoring

X) Exit

Of course –
Direct command line options available for the more expert user
Fabric Scope, Local Scope

- Fabric scope examples
  - opareport, opatop, opaextractselllinks, opaextractlids, opasaquery, opapaquery, more
  - TrueScale lineage: iba_report, iba_top
    (similarities to ibdiagnet, iblinkinfo, ibnodes, ibhosts, ibswitches, sminfo)
  - Spreadsheet friendly ‘CSV’ output options available
Example:

- `opaextractlids -F nodetype:SW`
  get LID info on all switches present in fabric, output in CSV format

```
[hds1fnb8301 ~]$ opaextractlids -F nodetype:SW
0x00117501026a5694;0;SW,hds1swba221;0x0003
0x00117501026a55c7;0;SW,hds1swba231;0x0006
0x00117501026b0d0f;0;SW,hds1swb8241;0x0007
0x00117501026bb1d;0;SW,hds1swb8231;0x0008
0x00117501026a569a;0;SW,hds1swb9211;0x000d
0x00117501026a562f;0;SW,hds1swb9221;0x000e
0x00117501026bd24;0;SW,hds1swb9231;0x0013
0x00117501026bb24;0;SW,hds1swb9241;0x0014
0x00117501026a5676;0;SW,hds1swb9411;0x0015
```
Filtered query of the FM’s SA

- **opasaquery** – detailed fabric SA info
  - Multiple otype options
    - e.g. systeguid, nodeguid, portguid, lid, desc, path, node, portinfo, sminfo, swinfo, link, slsc, scsl, vlarb, pkey, service, mcmember, inform, vfinfo, fabricinfo, quarantine, conginfo, bfrctrl, cableinfo, portgroup, etc.
  - Multiple query options
    - E.g. by lid, pkey, vfindex, serviceld, SL, type, guid, gid, name/description, etc.

[RHEL7.1 hds1fnb8301 20160328_2218 ~]# opasaquery -o fabricinfo
Number of HFIs: 131
Number of Switches: 9
Number of Links: 255
Number of HFI Links: 131 (Internal: 0  External: 131)
Number of ISLs: 124 (Internal: 0  External: 124)
Number of Degraded Links: 0 (HFI Links: 0  ISLs: 0)
Number of Omitted Links: 0 (HFI Links: 0  ISLs: 0)
Filtered query of the FM’s PA

- **opapaquery** – detailed fabric PA info
  - Multiple otype options
    - e.g. portCounters, focusPorts, vfList, vfInfo, vfPortCounters, groupList, groupInfo, groupConfig, imageInfo, freezeImage, renewImage, releaseImage, etc.
  - Multiple query options
    - E.g. by lid, port, time delta, start, range, image number, etc.

```bash
# opapaquery -o vfList
Getting VF List...
  Number of VFs: 2
  VF 1: Default
  VF 2: Admin
opapaquery completed: OK

# opapaquery -o groupList
Getting Group List...
  Number of Groups: 3
  Group 1: All
  Group 2: HFIs
  Group 3: SWs
opapaquery completed: OK
```
Local Scope (basic) examples

- Basic CLI commands, applicable to all hosts
- **opainfo, opaportinfo, opaportconfig, opasmaquery, opapmaquery, more**
  - TrueScale lineage: iba_info, ibv_devinfo, iba_portinfo, iba_portconfig
    (similarities to ibstat, ibv_devinfo, ibstatus, ibportstate)

**Example:**
- ‘opainfo’ – basic sma/pma port and cable info at a glance

```
[RHEL7.1 hds1fnb8301 20160328_0300 ~]# opainfo
hfi1_0:1 PortGID:0xfe80000000000000:001175010165add0
  PortState: Active
  LinkSpeed  Act: 25Gb    En: 25Gb
  LinkWidth  Act: 4       En: 4
  LinkWidthDnGrd ActTx: 4  Rx: 4  En: 3,4
  LCRC       Act: 14-bit  En: 14-bit,16-bit,48-bit  Mgmt: True
  LID: 0x00000022-0x00000022  SM LID: 0x00000022  SL: 0
  QSFP: PassiveCu, 1m FCI Electronics P/N 10131941-2010LF  Rev 2
  Xmit Data: 41758 MB  Pkts: 12850115
  Recv Data: 46742 MB  Pkts: 12858817
  Link Quality: 5 (Excellent)
```
INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES

Local Scope Command Line Tools (sma)

- opasmaquery – detailed local SMA info
  - Multiple otype options
    - e.g. bfrctrl, cableinfo, congifno, desc, hficoncog, hficonlog, hficonset, linfdb, mcfdb, portgroup, nodeaffr, nodededesc, nodeinfo, portinfo, pstateinfo, pkey, slsc, scsl, scsc, scvlt, sminfo, swaggr, swconlog, swconset, swinfo, swportcong, vlarb, ledinfo, etc.
  - Scriptable “grep” friendly output (with -g option)

```bash
$ opasmaquery -o portinfo | more
Port 1 Info
Subnet: fe80000000000000
LocalPort: 1
PhysicalState: LinkUp
OfflineDisabledReason: None
IsSMAConfigurationStarted: True
NeighborNormal: True
BaselID: 0x00000002
LMI: 0
PortType: Standard
Interface: 32 us, 536 ms
M: 0x0000000000000000
M: Lease: 0 s Protect: Read-only
LinkWidth: Act: 4
LinkWidthDnGrd Act: 25Gb Rx: 4
LinkSpeed: Act: 25Gb
LinkMode: Act: STL
PortMode: Act: 14-bit
NeighborMode: MgmtAllowed: Yes FWAuthBypass: On NeighborNodeType: Switch
NeighborNodeGuid: 0x00017501018265bb0d
NeighborPortNum: 1
Capability: 0x00410022: CN CM APIM SM
Capability3: 0x000b: SS
SM TrapQP: 0x0 SA QP: 0x1
IPAddr IPV6/IPAddr IPv4: ::/0.0.0.0
```

[OpenFabrics Alliance Workshop 2016]
opapmaquery
detailed local PMA info

- Multiple otype options
  - e.g. getportstatus, getdatacounters, geterrorinfo, etc.
- Includes options for per-VL details
  - Counters
  - Errors

```bash
[RHEL7.1 hds1fnb8301 20160328_0303 ~]# opapmaquery -o getportstatus
Port Number  1
VL Select Mask  0x00008001

Performance: Transmit
- Xmit Data: 41759 MB
- Xmit Pkts: 12853526
- MC Xmt Pkts: 29

Performance: Receive
- Rcv Data: 46746 MB
- Rcv Pkts: 12862230
- MC Rcv Pkts: 3096

Performance: Congestion
- Xmit Wait
- Congestion Discards: 0
- Xmit Time Congestion: 0
- Mark FECN: 0
- Rcv FECN: 0
- Rcv BECN: 0

Performance: Bubbles
- Rcv Bubble: 0
- Xmit Wasted BW: 0
- Xmit Wait Data: 0

Link Qual Indicator: 5 (Excellent)

Errors: Signal Integrity
- Local Link Integ Err: 0
- Rcv Errors: 0
- Exc. Buffer Overrun: 0
- Link Error Recovery: 0
- Link Downed: 0
- Uncorrectable Errors: 0
- FM Config Errors: 0

Errors: Security
- Xmit Constraint: 0
- Rcv Constraint: 0

Errors: Other
- Rcv Sw Relay Err: 0
- Xmit Discards: 0
- Rcv Rmt Phys Err: 0
```
Outline

- Overview of Software Components and usage model
- Management Software Details
  - Management Agents, Administration
  - Fabric Diagnostic and Debug Features
  - Scalable Fabric management GUI
- Command Line Tools Details
  - Monitoring & Diagnostics
  - Configuration and Management
- Usage Examples
  - Host verification - opareport
  - Performance analysis - opatop
‘opareport’ & ‘opatop’ – full-featured fabric diag tools

- opareport
  - Multiple otype options
    - e.g. comp, bromp, node, bnode, ious, lids, links, extlinks, slowlinks, slowconfiglinks, slowconnlinks, misconfiglinks, misconnlinks, errors, otherports, linear, mcast, portusage, pathusage, treepathusage, portgroups, quarantinednodes, validateroutes, validatepgs, validatecreditloops, vfinfo, vfmember, verifyfis, verifyfsws, verifynodes, verifyfis, verifyfsws, verifylinks, verifyextlinks, verifyall, all, route, bfrctl, snapshot, topology, etc.
  - Multiple query options
    - e.g. live vs saved snapshot/topology, query FM or agents direct, output to screen or xml file, rich point syntax for filtered reports, more.

```
[hds1fmb8301 ~]$ opareport -o validatecreditloops
Getting All Node Records...
Done Getting All Node Records
Done Getting All Link Records
Done Getting All Cable Info Records
Done Getting All SM Info Records
Getting All FDB Tables...
Done Getting All FDB Tables
Validate Credit Loop Routes
Done Building All Routes
Fabric summary: 140 devices, 131 HFI; 9 switches,
510 connections, 18202 routing decisions,
17030 analyzed routes, 0 incomplete routes
Done Building Graphical Layout of All Routes
Routes are deadlock free (No credit loops detected)
```
**INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES**

**OpenFabrics Alliance Workshop 2016**

**Opareport – viewing a mismatch configuration**

**Command:** `opareport -o verifysws -T topologyFile.xml`  
(Or `opalinkanalysis verifysws`)

**Example of properly configured**

Getting All Node Records...  
Done Getting All Node Records  
Done Getting All Link Records  
Done Getting All Cable Info Records  
Done Getting All SM Info Records  
Parsing `topology_sw-wip.xml`...  
SWs Topology Verification

SWs Found with incorrect configuration:  
2 of 2 Fabric SWs Checked

SWs Expected but Missing or Duplicate in input:  
2 of 2 Input SWs Checked

Total of 0 Incorrect SWs found  
0 Missing, 0 Unexpected, 0 Duplicate, 0 Different

**Example with missing cable**

`opareport -o verifylinks -T topology_sw-wip.xml`  
Getting All Node Records...  
Done Getting All Node Records  
Done Getting All Link Records  
Done Getting All Cable Info Records  
Done Getting All SM Info Records  
Parsing `topology_sw-wip.xml`...  
Links Topology Verification

Links Found with incorrect configuration:  
2 of 2 Fabric Links Checked

| Links Expected but Missing, Duplicate in input or Incorrect: |
|---------------------------------|--------------------|
| Rate MTU | NodeGUID | Port or PortGUID | Type Name | Cable: CableLabel | CableLen | CableDetails |
| 100G | 1 | | | FI phkpst1032 hf1_0 | 37 | SW OmniPth<GUID-Value> |

- **Missing Link**

3 of 3 Input Links Checked

Total of 1 Incorrect Links found  
1 Missing, 0 Unexpected, 0 Misconnected, 0 Duplicate, 0 Different
Command: opareport –o errors

- Rapid fabric wide error analysis
- Quickly identify any bad cables/ports
- Configurable error thresholds
- Point in time, or interval analysis
- Concise summary of bad link to check
  - Name, port#, speeds, etc

```
[REHEL6.4 rh210 20150408_1443 shin]# opareport -o errors
Getting all Node Records...
Done Getting All Node Records
Done Getting All Link Records
Done Getting All SM Info Records
Getting all Port Counters...
Done Getting all Port Counters
Links with errors > threshold Summary

Configured Error Thresholds:
  LinkQualityIndicator  3
  LinkErrorRecovery  3
  LinkDowned  3
  PortRcvErrors  100
  PortXmitDiscards  100
  PortXmitConstraintErrors  10
  PortRcvConstraintErrors  10
  LocalLinkIntegrityErrors  3
  ExcessiveBufferOverruns  3

2304 of 2304 Links Checked, 0 Errors found
```

No Error thresholds exceeded on this fabric
‘opatop’ - Command line TUI for performance analysis

- Top level view shows fabric, and per PA-group summaries
- Multiple levels of drill-down
  - Study areas of interest, drill down to particular ports
- Full access to PM on-line history
- Review data from the past
  - Freeze/bookmark a timeslice (image) for study for as long as needed

**Opatop - Usage examples**

- **opatop** - Command line TUI for performance analysis
  - Top level view shows fabric, and per PA-group summaries
  - Multiple levels of drill-down
    - Study areas of interest, drill down to particular ports
  - Full access to PM on-line history
  - Review data from the past
    - Freeze/bookmark a timeslice (image) for study for as long as needed

### Opatop: Thu May 8 23:35:41 2014, Live

Group Info Sel: All
Int NumPorts: 73 Rate Min: any Max: 100g
Ext NumPorts: 0
Group BW Summary (W)
Group Err Summary (E)
Group Config (C)

W,E,C provides different group views
### Opatop - Usage examples

```
Group Err Stats:HFI  Criteria:Integ   Number:10

<table>
<thead>
<tr>
<th>Ext</th>
<th>Max</th>
<th>0%</th>
<th>25%</th>
<th>50%</th>
<th>75%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrity</td>
<td>27</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Congestion</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>SmaCongest</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Security</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Routing</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Congest %:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discard %:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ineffic %:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adapt Rt %:0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

1 hfi Port has Integrity Errors at least 25% of threshold
Can Drilldown into Details (D)

opatop: Img:Thu May 8 23:35:41 2014, Live
Group Info Sel: All
Int NumPorts: 73 Rate Min: any Max: 100g
Ext NumPorts: 0
Group BW Summary (W)
Group Err Summary (E)
Group Config (C)

W,E,C provides different group views
**INTEL® OMNI-PATH™ FABRIC MANAGEMENT AND TOOLS FEATURES**

**Opatop - Usage examples**

```plaintext
Group Focus:HFIs NumPorts:3 Number:10

<table>
<thead>
<tr>
<th>Ix</th>
<th>LIDx</th>
<th>Port</th>
<th>Integrity</th>
<th>Node GUID 0x</th>
<th>NodeDesc</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0001</td>
<td>1</td>
<td>27</td>
<td>0011750000FF8F4C</td>
<td>Intel1A hfi1_0</td>
</tr>
<tr>
<td>&lt;-</td>
<td>0002</td>
<td>20</td>
<td>0</td>
<td>00066A00D900045F</td>
<td>MySwitchR7</td>
</tr>
<tr>
<td>1</td>
<td>0003</td>
<td>1</td>
<td>0</td>
<td>00066A0098006F74</td>
<td>Intel1B hfi1_0</td>
</tr>
<tr>
<td>&lt;-</td>
<td>0002</td>
<td>19</td>
<td>0</td>
<td>00066A00D900045F</td>
<td>MySwitchR7</td>
</tr>
<tr>
<td>2</td>
<td>0004</td>
<td>2</td>
<td>0</td>
<td>0002C90300000798</td>
<td>Intel1C hfi1_0</td>
</tr>
<tr>
<td>&lt;-</td>
<td>0002</td>
<td>18</td>
<td>0</td>
<td>00066A00D900045F</td>
<td>MySwitchR7</td>
</tr>
</tbody>
</table>

Quit up Live/rRev/fFwd/bookmrked Bookmrk Unbookmrk ?help | sS cC N0-n P0-n:
```

Node Intel1A has Integrity Errors Can Drilldown into Port Stats
- **Release Notes and supporting documentation**
  

- **The Intel® Omni-Path Architecture (Intel® OPA) Basic software**
  - Intel® Omni-Path Fabric Host Software
  - Intel® Omni-Path Architecture (Intel® OPA) User tools
  - Installation tools including Text User Interface (TUI)
  - Intel® Omni-Path Host Fabric Interface (Intel® OP HFI) components and drivers
  - Open MPI, MVAPICH2, and Intel® MPI Library optimized for Intel® OP HFIs

- **The Intel® OPA IFS software**
  - Intel® Omni-Path Fabric Suite
  - FastFabric tools including Text User Interface (TUI)
  - Fabric Manager tools

Additional information:

LEGAL DISCLAIMERS

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

A "Mission Critical Application" is any application in which failure of the Intel Product could result, directly or indirectly, in personal injury or death. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MISSION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PRODUCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products.

Results have been estimated or simulated using internal Intel analysis or architecture simulation or modeling, and provided to you for informational purposes. Any differences in your system hardware, software or configuration may affect your actual performance.

Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families: Go to: Learn About Intel® Processor Numbers

All products, computer systems, dates and figures specified are preliminary based on current expectations, and are subject to change without notice.

The products described in this document 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.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: http://www.intel.com/design/literature.htm

The High-Performance Linpack (HPL) benchmark is used in the Intel® FastFabrics toolset included in the Intel® Fabric Suite. The HPL product includes software developed at the University of Tennessee, Knoxville, Innovative Computing Libraries.

Intel, Intel Xeon, Intel Xeon Phi™ are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States or other countries.

Copyright © 2016, Intel Corporation
**Optimization Notice**

Intel's compilers may or may not optimize to the same degree for non-Intel microprocessors for optimizations that are not unique to Intel microprocessors. These optimizations include SSE2, SSE3, and SSE3 instruction sets and other optimizations. Intel does not guarantee the availability, functionality, or effectiveness of any optimization on microprocessors not manufactured by Intel.

Microprocessor-dependent optimizations in this product are intended for use with Intel microprocessors. Certain optimizations not specific to Intel microarchitecture are reserved for Intel microprocessors. Please refer to the applicable product User and Reference Guides for more information regarding the specific instruction sets covered by this notice.

Notice revision #20110804
THANK YOU

James Wright

Intel