Opening up OpenSM with the Subnet Monitoring Tools

OFS User Group Workshop

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Subnet Monitor Tools

- Introduce the **smt-gui** via a million screenshots
  - part of the Subnet Monitor Tool Suite (SMT)
  - top and trace route example
- Explain the motivation for another set of tools
  - fundamentally different (pros & cons)
- Describe the OpenSM Monitoring Service (OMS)
  - design and implementation
Why do we need another set of IB Tools?

- We use:
  - ibutils
  - infiniband-diags
  - pragmatic-infiniband-utilities
  - opensm console
  - opensm.log

- None designed for continuous monitoring
  - long term comprehensive interrogation
  - benign (minimal fabric disturbance)
  - accessible
    - local/remote
    - should not require root
  - interactive and/or programmatic
  - does not require ninja skills
  - safe and secure
How should IB be monitored?

- Information Aggregation
  - One entity responsible for periodically sweeping and gathering fabric information for all to share
- Minimal fabric disturbance (deterministic)
- OpenSM (untapped wealth of information)
  - Subnet manager
  - Subnet administrator
  - Performance manager
- Service (1 to many sharing)
  - Authentication, authorization, encryption
  - Multiple concurrent clients
  - Application interface
  - Platform independent (sort of)

OpenSM Monitoring Service (OMS)
OMS/SMT Software Stack

- OMS is a service that runs on the management node
- SMT commands are OMS clients
- SMT commands can be invoked on the management node or remote system
Subnet Monitor Tools (SMT)

- OMS Clients
  - Inherits all the pros and cons
- Tool set is just a collection of commands
  - New commands are relatively easy to build
  - Growing list...
- Uses a common code base
  - Raw OMS api, plus SMT convenience and analysis libraries
- Most commands operate on one or more OMS snapshots
  1. Connection to OMS on port 10011
     - Authenticated, encrypted, and compressed binary data
  2. An OMS history file
     - Compressed binary data
List of Subnet Monitor Tools

13:13:50 > **smt -?**

usage: smt <command> [-?] [?] [<command args>]

This command provides access to some of the most commonly used SMT commands. Most commands should be invoked directly using the form "smt-<command>", but can be invoked here for convenience.

-?,--Help                  print this message
-abt,--about              smt-about,   - software package information
-c,--config               smt-config,   - checks or modifies the SMT configuration
-con,--console            smt-console,  - a curses application for viewing OMS information
-e,--event                smt-event,    - shows SM events, traps, and exceptions
-f,--fabric               smt-fabric,   - provides fabric level information
-fn,--file                smt-file,     - provides information about OMS files
-gui,--gui                 smt-gui,     - a gui fabric exploration tool
-h,--help                  smt-help,     - a gui help tool
-id,--id                   smt-id,       - an identification tool (name resolver)
-l,--link                   smt-link,    - provides link level information
-lf,--logFile <file name>  the file name or pattern to use for log files
-ll,--logLevel <log level> the verbosity level for log files
-m,--multicast            smt-multicast, - a multicast group tool
-n,--node                  smt-node,     - provides node level information
-p,--port                  smt-port,     - provides port level information
-part,--partition          smt-partition, - a partition tool
-pv,--priv                 smt-priv,     - a set of privileged commands
-r,--route                 smt-route,    - routing table tools
-rC,--readConfig <filename> reads the specified configuration file
-rcd,--record              smt-record,   - saves OMS information (flight recorder)
-t,--top                   smt-top,      - shows top errors and traffic
-v,--version               print the version

examples:
> smt -?                  - provides this help
> smt --node ?            - provides help for the node command (no dash for its args)
> smt --multicast pn 10013 - multicast status for service on port 10013

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smt-record: the flight recorder

- collects and saves OMS snapshots (history)
  - an OMS snapshot contains everything provided by OMS
- requires an OMS connection
- specify host, port, number to collect and file name

```
11:23:27 > smt-record -pn 10013 -nh 3 -wH hype3H.his
OMS_Collection
fabric name:     hype355.llnl.gov
first timestamp: Mar 04 11:23:40 2015
last timestamp:  Mar 04 14:20:40 2015
ave secs between records:  180
# secs between pfmgr sweeps: 180
# records in collection:  60
# nodes:                  164
# ports:                  759
# links:                  287
```
smt-file

- determines file type and attributes
- can manipulate or convert files
- specify file(s)

14:39:53 > ls -lah *3H.his
-rw-r----- 1 meier3 meier3 3.1M Mar  4 14:23 hype3H.his
-rw-r----- 1 meier3 meier3 95M Feb 25 13:55 sierra3H.his

14:40:01 > smt-file -i sierra3H.his
OMS_Collection
fabric name:                  sierra7.llnl.gov
first timestamp:             Feb 25 10:35:08 2015
ave secs between records:    150
# secs between pfmgr sweeps: 150
# records in collection:     72
# nodes:                     2188
# ports:                     11638
# links:                     5768

14:40:46 > smt-file -i hype3H.his
OMS_Collection
fabric name:                 hype355.llnl.gov
first timestamp:             Mar 04 11:23:40 2015
last timestamp:              Mar 04 14:20:40 2015
ave secs between records:    180
# secs between pfmgr sweeps: 180
# records in collection:     60
# nodes:                     164
# ports:                     759
# links:                     287
smt-gui

- exploration and visualization
- development and testing
- postmortem analysis

modes -
- on-line
  - connected to OMS
- off-line
  - flight recorder file
  - almost identical behavior

comprehensive -
- dynamic (time based)
- includes functionality of other SMT commands
- visual analytics (charts, graphs, trees, etc.)
smt-gui
major gui components

- Title bar
  - Shows the fabric name and details of the mode of operation
- Menu bar
  - Provides access to general or global functions
- Fabric Tree panel – left side
  - Hierarchical view of the nodes (navigable & selectable)
- Diagnostic Panel
  - Message area (various threads)
  - Graph controls
- Play Bar
  - Move through the OMS collection
  - Start/stop, step, and play at desired rate
- Main Panel
  - Details of selected object
  - Analysis results
  - Graphs, tables, trees
  - Etc...
### Nodes: 2191

- Switches nodes: 270
- Leaf nodes: 1921

### Ports: 11641

#### State
- **Disabled**: switch ports: 152, leaf ports: 0
- **Active**: switch ports: 9543, leaf ports: 1921
- **Down**: switch ports: 177, leaf ports: 0

#### Width
- 4x: switch ports: 9543, leaf ports: 1921

#### Speed
- QDR: switch ports: 9543, leaf ports: 1921

### Links: 5732

#### Width
- 4x: switch links: 3811, leaf links: 1921

#### Speed
- QDR: switch links: 3811, leaf links: 1921

#### Rate
- 40 Gb/s: switch links: 3811, leaf links: 1921

---

OpenSM version: **OpenSM 3.3.19-1chaos**
OMS Plugin version: **OMS_JNI_Plugin 2.0.0-33 (Feb 25 2015 at 14:02:03)**
OMS version (server side): **OsmClientServer null (null)**
SMT version: **SubnetMonitorTool 2.0.0-43-b4740 (2015-03-02 11:15:56)**
detailed information
### Fabric Route Tables

- **routing tables:** 270
- **fabric name:** sierra7.llnl.gov
- **total table size:** 573154
- **type:** Unicast
- **time stamp:** Mar 05 10:38:28 2015
- **num lids:** 2191
- **min lid:** 0x1 (1)
- **max lid:** 0x1234 (4660)
- **num Channel Adapters:** 1921

#### num Switches (with a routing table): 270

- sw table: ibsw8
- sw table: ibcore2 L204
- sw table: ibsw45
- sw table: ibcore2 L126
- sw table: ibsw44
- sw table: ibcore2 L201
- sw table: ibcore3 L108
- sw table: ibsw22
- sw table: ibsw107
- sw table: ibsw64
- sw table: ibcore3 L109
- sw table: ibsw89
- sw table: ibcore1 L226
- sw table: ibcore1 L102
- sw table: ibcore1 L208
- sw table: ibcore1 L220
- sw table: ibsw63
- sw table: ibsw1
- sw table: ibsw56
- sw table: ibsw62
- sw table: ibsw43
- sw table: ibcore1 L224
- sw table: ibcore2 L101
- sw table: ibcore1 L108
- sw table: ibsw7
- sw table: ibsw55
node tree
port tree

Port Tree

- port #: 8
- rate: 40 Gb/s
- lid: 0xef (254)
- speed: QDR
- state: Active
- width: 4x
- more: 36
- errors: true
- this port address: 0006:6a00:e300:2ce1.8
- linked port address: 0011:7500:0079:91ce:1
- link <::1b55.8>->sierra979 qib0.1
- depth: 0
- counters Mar 05 10:45:58 2015
  - suppressed counters: [rcv_rem_phys_err, rcv_switch_relay_err]
  - symbol_err_cnt: 0
  - link_err_recover: 0
  - link_downed: 2
  - rcv_err: 0
  - xmit_discards: 0
  - xmit_constraint_err: 0
  - rcv_constraint_err: 0
  - link_integrity: 0
  - buffer_overrun: 0
  - mls_dropped: 0
  - xmit_data: 4684654140
  - rcv_data: 371939442
  - xmit_pkts: 89519041
  - rcv_pkts: 11349728
  - unicast_xmit_pkts: 0
  - unicast_rcv_pkts: 0
  - multicast_xmit_pkts: 0
  - multicast_rcv_pkts: 0
  - xmit_wait: 0
- port # 8: 1 CA route, 0 SW routes, total=1
Link Tree

- link: ibsw55 = 0006:6a00:e300:2ce1:8 <-> sierra979 qib0 = 0011:7500:0079:91ce:1
  - state: Active
  - rate: 40 Gb/s
  - speed: QDR
  - width: 4x
  - depth: 0
  - endpoint1: 8
    - lid: 254
    - more: 31
    - errors: true
      - this port address: 0006:6a00:e300:2ce1:8
      - linked port address: 0011:7500:0079:91ce:1
      - depth: 1
      - counters: Mar 05 10:45:58 2015
  - endpoint2: 1
    - lid: 279
    - more: 31
    - errors: false
      - this port address: 0011:7500:0079:91ce:1
      - linked port address: 0006:6a00:e300:2ce1:8
      - depth: 0
      - counters: Mar 05 10:45:59 2015
## Top Traffic Ports

<table>
<thead>
<tr>
<th>#</th>
<th>level</th>
<th>name</th>
<th>guid</th>
<th>port #</th>
<th>xmit MB/s</th>
<th>recv MB/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>sierra1136 qib0</td>
<td>0011.7510-0079.86000</td>
<td>1</td>
<td>551</td>
<td>571</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>sierra261 qib0</td>
<td>0011.7510-0079.86000</td>
<td>1</td>
<td>553</td>
<td>545</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>sierra1041 qib0</td>
<td>0011.7510-0079.89000</td>
<td>1</td>
<td>513</td>
<td>479</td>
</tr>
<tr>
<td>4</td>
<td>0</td>
<td>sierra992 qib0</td>
<td>0011.7510-0079.92000</td>
<td>1</td>
<td>479</td>
<td>488</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>sierra1034 qib0</td>
<td>0011.7510-0079.86000</td>
<td>1</td>
<td>469</td>
<td>487</td>
</tr>
<tr>
<td>6</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>14</td>
<td>1</td>
<td>315</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>13</td>
<td>315</td>
<td>0</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>31</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>30</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>35</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>11</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>36</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>33</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>32</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>ibcore3 L102</td>
<td>0006-6a00-ec00:2a01</td>
<td>34</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>ibsw50</td>
<td>0006-6a00-ec00:2002</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>ibsw50</td>
<td>0006-6a00-ec00:2002</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>ibsw50</td>
<td>0006-6a00-ec00:2002</td>
<td>5</td>
<td>570</td>
<td>550</td>
</tr>
<tr>
<td>18</td>
<td>2</td>
<td>ibcore1 L124</td>
<td>0006-6a00-ec00:2b25</td>
<td>5</td>
<td>236</td>
<td>0</td>
</tr>
<tr>
<td>19</td>
<td>2</td>
<td>ibcore1 L124</td>
<td>0006-6a00-ec00:2b25</td>
<td>6</td>
<td>167</td>
<td>202</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>ibcore1 L124</td>
<td>0006-6a00-ec00:2b25</td>
<td>2</td>
<td>9</td>
<td>153</td>
</tr>
</tbody>
</table>
port counter
### Top Error Links

**Links with Errors: 138**

<table>
<thead>
<tr>
<th>#</th>
<th>Level</th>
<th>Link Identification</th>
<th>Delta Error/Period = p1, p2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>ibsw2 0006 6a00 e300 2c17 32 -&gt; 0006 6a00 ec00 2801 2 -&gt; ibcore1 L102</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>ibsw38 0006 6a00 e300 2bcc 21 -&gt; 0006 6a00 ec00 2a03 2 -&gt; ibcore1 L225</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>ibsw52 0006 6a00 e300 2cd8 21 -&gt; 0006 6a00 ec00 2a03 16 -&gt; ibcore1 L225</td>
<td>symbol.err.err_cnt = 0.3</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>ibsw24 0006 6a00 e300 2b92 19 -&gt; 0006 6a00 ec00 2914 6 -&gt; ibcore1 L107</td>
<td>symbol.err.err_cnt = 0.2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>ibsw34 0006 6a00 e300 2e86 19 -&gt; 0006 6a00 ec00 2914 16 -&gt; ibcore1 L107</td>
<td>symbol.err.err_cnt = 0.2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>ibsw51 0006 6a00 e300 307b 17 -&gt; 0006 6a00 e300 0122 7 -&gt; ibcore2 L128</td>
<td>symbol.err.err_cnt = 0.6</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>ibsw71 0006 6a00 e300 2b67 16 -&gt; 0006 6a00 ec00 0122 17 -&gt; ibcore2 L127</td>
<td>symbol.err.err_cnt = 0.2</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>ibsw72 0006 6a00 e300 2ab9 16 -&gt; 0006 6a00 ec00 0122 18 -&gt; ibcore2 L127</td>
<td>symbol.err.err_cnt = 0.7</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>ibsw66 0006 6a00 e300 2c07 3 -&gt; 0006 6a00 ec00 2923 12 -&gt; ibcore2 L123</td>
<td>symbol.err.err_cnt = 0.5</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>ibsw58 0006 6a00 e300 2ecb 20 -&gt; 0006 6a00 ec00 2b25 4 -&gt; ibcore1 L124</td>
<td>symbol.err.err_cnt = 0.34</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>ibsw38 0006 6a00 e300 1bce 32 -&gt; 0006 6a00 ec00 2b17 2 -&gt; ibcore3 L224</td>
<td>symbol.err.err_cnt = 0.5</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>ibsw2 0006 6a00 e300 2c17 35 -&gt; 0006 6a00 ec00 2997 2 -&gt; ibcore2 L104</td>
<td>symbol.err.err_cnt = 1.0</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>ibsw23 0006 6a00 e300 2b50 35 -&gt; 0006 6a00 ec00 2b30 5 -&gt; ibcore3 L119</td>
<td>symbol.err.err_cnt = 0.2</td>
</tr>
<tr>
<td>14</td>
<td>1</td>
<td>ibsw59 0006 6a00 e300 2cb3 35 -&gt; 0006 6a00 ec00 2b31 5 -&gt; ibcore3 L121</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>15</td>
<td>1</td>
<td>ibsw99 0006 6a00 e300 2b60 35 -&gt; 0006 6a00 ec00 2b31 9 -&gt; ibcore3 L221</td>
<td>symbol.err.err_cnt = 0.2</td>
</tr>
<tr>
<td>16</td>
<td>1</td>
<td>ibsw106 0006 6a00 e300 2cab 35 -&gt; 0006 6a00 ec00 2b31 16 -&gt; ibcore3 L221</td>
<td>symbol.err.err_cnt = 0.9</td>
</tr>
<tr>
<td>17</td>
<td>1</td>
<td>ibsw9 0006 6a00 e300 2a53 17 -&gt; 0006 6a00 ec00 2733 9 -&gt; ibcore2 L106</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>19</td>
<td>1</td>
<td>ibsw10 0006 6a00 e300 2b12 34 -&gt; 0006 6a00 ec00 2b33 1 -&gt; ibcore1 L119</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>20</td>
<td>1</td>
<td>ibsw30 0006 6a00 e300 2752 34 -&gt; 0006 6a00 ec00 2b33 12 -&gt; ibcore3 L110</td>
<td>symbol.err.err_cnt = 0.1</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>ibsw14 0006 6a00 e300 2c36 2 -&gt; 0006 6a00 ec00 29cd 14 -&gt; ibcore1 L106</td>
<td>symbol.err.err_cnt = 1.0</td>
</tr>
</tbody>
</table>
link tree
port error

symbol_err_cnt [ibcore1 L124]
Port Counter Activity (150 sec. delta)

<table>
<thead>
<tr>
<th>name</th>
<th>time</th>
<th>value</th>
<th>units</th>
</tr>
</thead>
<tbody>
<tr>
<td>counts</td>
<td>11:17:39</td>
<td>5,826 absolute value</td>
<td></td>
</tr>
<tr>
<td>delta</td>
<td>11:20:09</td>
<td>25 change/period</td>
<td></td>
</tr>
</tbody>
</table>
atlas
prism
hype
grove
dynamic fabric graph
path selection
path selection (decorated)
path selection (revealed)
path tree (trace route)
### Path Utilization

#### Transmit Path (to dst):

<table>
<thead>
<tr>
<th>hop</th>
<th>node</th>
<th>output port</th>
<th>xmit delta (counts)</th>
<th>xmit rate</th>
<th>units</th>
<th>% rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>src-0</td>
<td>sierra7 qib0</td>
<td>0011:7500:0079:917c:1</td>
<td>12104328</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>1</td>
<td>ibsw1</td>
<td>0006:ea00:e300:2a7f:1</td>
<td>217792717</td>
<td>0</td>
<td>MB/s</td>
<td>0.02 %</td>
</tr>
<tr>
<td>2</td>
<td>ibcore1 Li05</td>
<td>0006:ea00:ee00:29cc:21</td>
<td>11176330</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>3</td>
<td>ibcore1 Li15B</td>
<td>0006:ea00:e800:29c8:28</td>
<td>557086</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>4</td>
<td>ibcore1 Li26</td>
<td>0006:ea00:ee00:29cf:18</td>
<td>1211663</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>5</td>
<td>ibsw54</td>
<td>0006:ea00:e300:2cd6:26</td>
<td>13201556081</td>
<td>479</td>
<td>MB/s</td>
<td>11.09 %</td>
</tr>
<tr>
<td>dst-6</td>
<td>sierra957 qib0</td>
<td>0011:7500:0079:91aa</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Receive Path (from dst):

<table>
<thead>
<tr>
<th>hop</th>
<th>node</th>
<th>output port</th>
<th>xmit delta (counts)</th>
<th>xmit rate</th>
<th>units</th>
<th>% rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>src-0</td>
<td>sierra957 qib0</td>
<td>0011:7500:0079:918a:1</td>
<td>141345839713</td>
<td>513</td>
<td>MB/s</td>
<td>12.04 %</td>
</tr>
<tr>
<td>1</td>
<td>ibsw54</td>
<td>0006:ea00:e300:2c65:1</td>
<td>1843381</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>2</td>
<td>ibcore1 Li21</td>
<td>0006:ea00:ee00:2959:19</td>
<td>279035</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>3</td>
<td>ibcore1 Li13A</td>
<td>0006:ea00:e800:2a77:11</td>
<td>6019342</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>4</td>
<td>ibcore1 Li04</td>
<td>0006:ea00:ee00:2964:1</td>
<td>7609414</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>5</td>
<td>ibsw1</td>
<td>0006:ea00:e300:2a78:8</td>
<td>12101012</td>
<td>0</td>
<td>MB/s</td>
<td>0.00 %</td>
</tr>
<tr>
<td>dst-6</td>
<td>sierra7 qib0</td>
<td>0011:7500:0079:917c</td>
<td></td>
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</table>

\[xmit\_data: 11.99\%\]
Concluding Remarks

- OpenSM maintains a substantial amount of fabric information
- smt-gui is only one of many SMT commands
- most commands are NOT gui based
- most commands have dual operating modes
- all rely on the OpenSM Monitor Service (OMS)
- future plans?
  - smt-agents for other monitoring, analysis and visualization tools (such as SPLUNK and other internal LLNL systems)
  - enhanced support for congestion management, partitions, multicast groups, etc.
- open to other ideas
- availability?
  - included in the TOSS distribution
  - expected to be on GitHub this year
Questions?
Thank You