15th ANNUAL WORKSHOP 2019

High Speed Networking Monitoring Enhancements

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GOALS

1. Collect port level traffic bandwidth on cluster fabrics (switch and network card)
2. Collect switch forwarding tables for whole fabric
3. Send and store data for trend analysis
4. Targeting our largest clusters
5. Focus on Intel Omni Path first
6. Integrate with existing monitoring software
7. Higher granularity – 10 seconds or less

HSNMON OVERVIEW

EXISTING MONITORING SOFTWARE: HSNMON

- **Daemon that runs on Fabric Manager (FM) node**
- **Fails over with FM**
- **Collection of scripts that check for various error conditions**
  - Error counters
  - Performance counters
- **Uses FastFabric tools for gathering data (`opaextractperf`)**
- **Logs results to syslog**
- **Written by Jesse Martinez based on design of IBmon**
  - Susan Coulter

HSNMON SCRIPTS

Most scripts located at /usr/local/hsnmon/

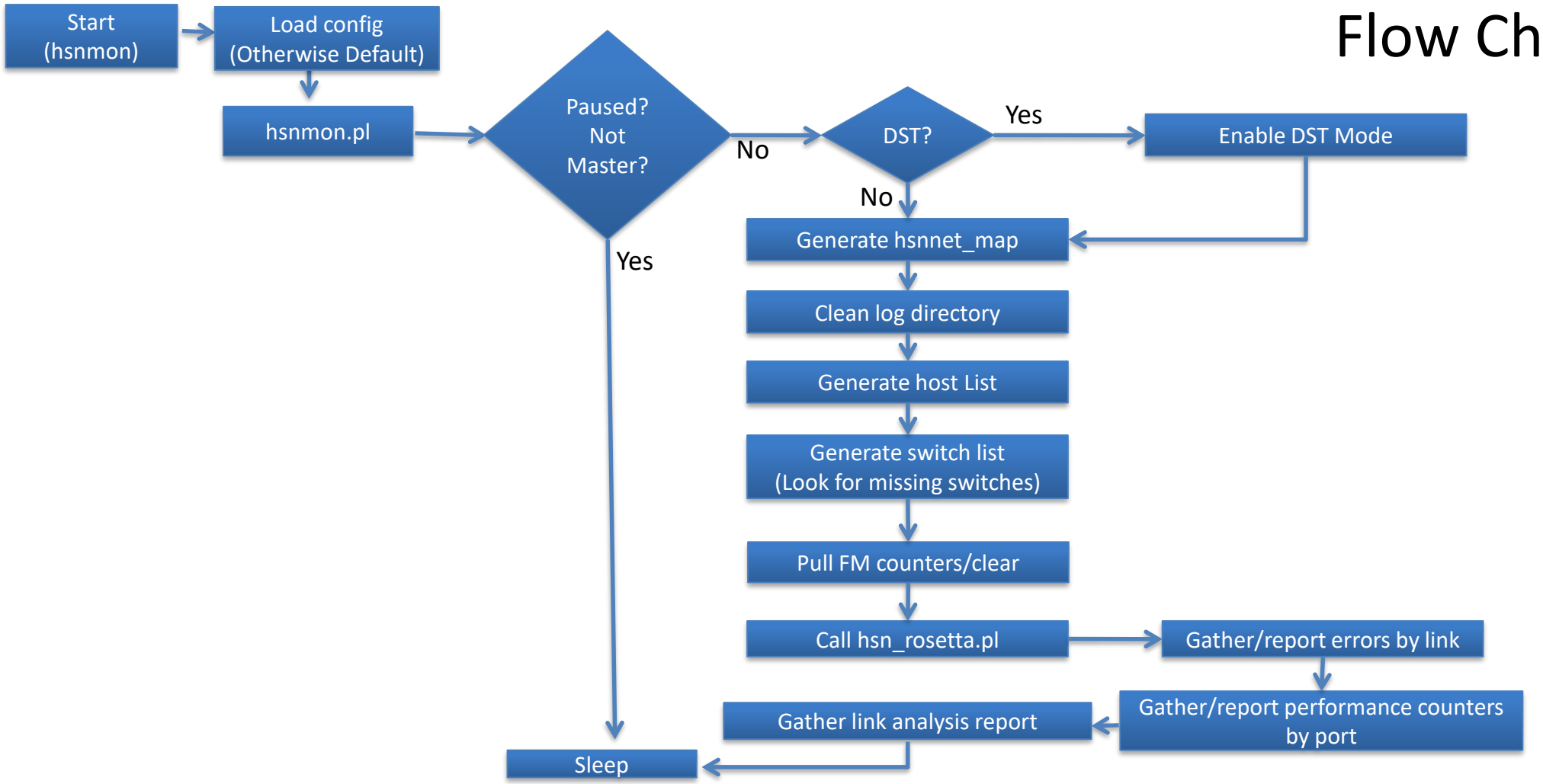
- `hsnmon.pl`
  - Main script, calls other scripts
  - Runs as daemon
  - Runs every X minutes, configurable
- `hsn_rosetta.pl`
  - Collects counters using `opaextractperf` and parses it into readable format
  - Looks up local/remote devices

HSNMON SCRIPTS

- `hsn_counters.sh`
  - Calls FM to dump counters/clear
- `hsnmon_init.pm`
  - Read in config, define shared functions
- `fabric_status.sh`
  - Pulls FM information to determine if master
- `create_netmap.pl`
  - Generated hsnnet_map from fabric links

EXISTING MONITORING SOFTWARE: HSNMON

Flow Chart



EXISTING MONITORING SOFTWARE: HSNMON

```
Usage: /usr/libexec/hsnmon {start|stop|status|dst-start|dst-stop|pause|clear-counters|help}
--
Parameters:
   start           - Start or resume hsnmon (DST mode, if enabled, will resume)
   stop            - Stop hsnmon (DST mode, if enabled, will remain enabled)
   status          - Report current status of hsnmon
   dst-start       - Enables DST Mode
                   - Disables error logging ONLY (if enabled)
                   - Performance/fabric monitoring will continue (if enabled)
                   - DST mode can be enabled with or without hsnmon running
   dst-stop        - Disables DST Mode
                   - Resumes error logging if enabled
                   - Clears counters
                   - DST mode can be disabled with or without hsnmon running
   pause           - Disables/halts HSNmon from executing, upon resume (start), will
clear counters
   clear-counters - Clears all counters in FM (configured in OPA config)
   help, -h        - Displays this usage information
--
For more information, please read the README: /usr/local/hsnmon/README
For license information, please read the License: /usr/local/hsnmon/License
```

*Above output for “service” on RHEL6, will be modified for SystemDB

HSNMON MODIFICATIONS

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Challenges:

- HSNmon takes ~1 minute to run on target clusters
- Underlying FastFabric tools are too slow on target clusters
  - (`opaextractperf` takes >10s to run)
- FastFabric does not provide the ability to gather both port counters and an accurate “sweep time” from PM at speed
- Syslog fails on target clusters with performance counter volume

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  - Use AMQP to send data to destination for analysis

NEW HSNMON CODE

- `get_port_counters.c`
  - Uses OPAMGT API to poll for counters and accurate counter time
- `pipe_to_rmq.py`
  - Sends stream or file via AMQP using Pika
- `hsn_send_if_diff.sh`
  - Executes argument, saves output to file and sends file if different from last run (used to send LFT)

NEW HSNMON CODE

Usage:

get_port_counters [poll frequency in seconds]

Sample Output

```
Node="edge1" Port=38 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=30197 RcvData=33089
Node="edge1" Port=39 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=363279 RcvData=364887
Node="edge1" Port=40 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=351113 RcvData=350227
Node="edge1" Port=41 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=370357 RcvData=369490
Node="edge1" Port=42 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=337909 RcvData=337060
Node="edge1" Port=43 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=2 RcvData=3
Node="edge1" Port=44 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=2 RcvData=3
Node="edge1" Port=45 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=364560 RcvData=363670
Node="edge1" Port=46 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=353995 RcvData=353111
Node="edge1" Port=47 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=370840 RcvData=371142
Node="edge1" Port=48 Image_Start="Mon Mar 11 10:24:54 2019" Image_Duration=0.108s Image_ID=0x800003b40d110000 XmitData=348041 RcvData=351410
Duplicate image [0x800003b40d110000] skipping...
Duplicate image [0x800003b40d110000] skipping...
Duplicate image [0x800003b40d110000] skipping...
Duplicate image [0x800003b40d110000] skipping...
```

NEW HSNMON CODE

Usage:

get_port_counters [poll frequency in seconds]

Sample Output

```
Node="kit-master hfi1_0" Port=1 Image_Start="Mon Mar 11 10:47:19 2019" Image_Duration=0.003s Image_ID=0x800003b40d110000 XmitData=6667175826338873344 RcvData=0
Node="kit-fe hfi1_0" Port=1 Image_Start="Mon Mar 11 10:47:19 2019" Image_Duration=0.003s Image_ID=0x800003b40d110000 XmitData=6667175826338873344 RcvData=0
Node="kit-io1 hfi1_0" Port=1 Image_Start="Mon Mar 11 10:47:19 2019" Image_Duration=0.003s Image_ID=0x800003b40d110000 XmitData=6667175826338873344 RcvData=0
…
Node="core1" Port=40 Image_Start="Mon Mar 11 10:46:19 2019" Image_Duration=0.002s Image_ID=0x800003b407110004 XmitData=6667175568640835584 RcvData=0
Node="core1" Port=41 Image_Start="Mon Mar 11 10:46:19 2019" Image_Duration=0.002s Image_ID=0x800003b407110004 XmitData=6667175568640835584 RcvData=0
Node="core1" Port=42 Image_Start="Mon Mar 11 10:46:19 2019" Image_Duration=0.002s Image_ID=0x800003b407110004 XmitData=6667175568640835584 RcvData=0
Duplicate image [0x800003b40d110000] skipping...
Duplicate image [0x800003b40d110000] skipping...
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```

Non-counter data is written to stderr for easy parsing

HSNMON MODIFICATIONS

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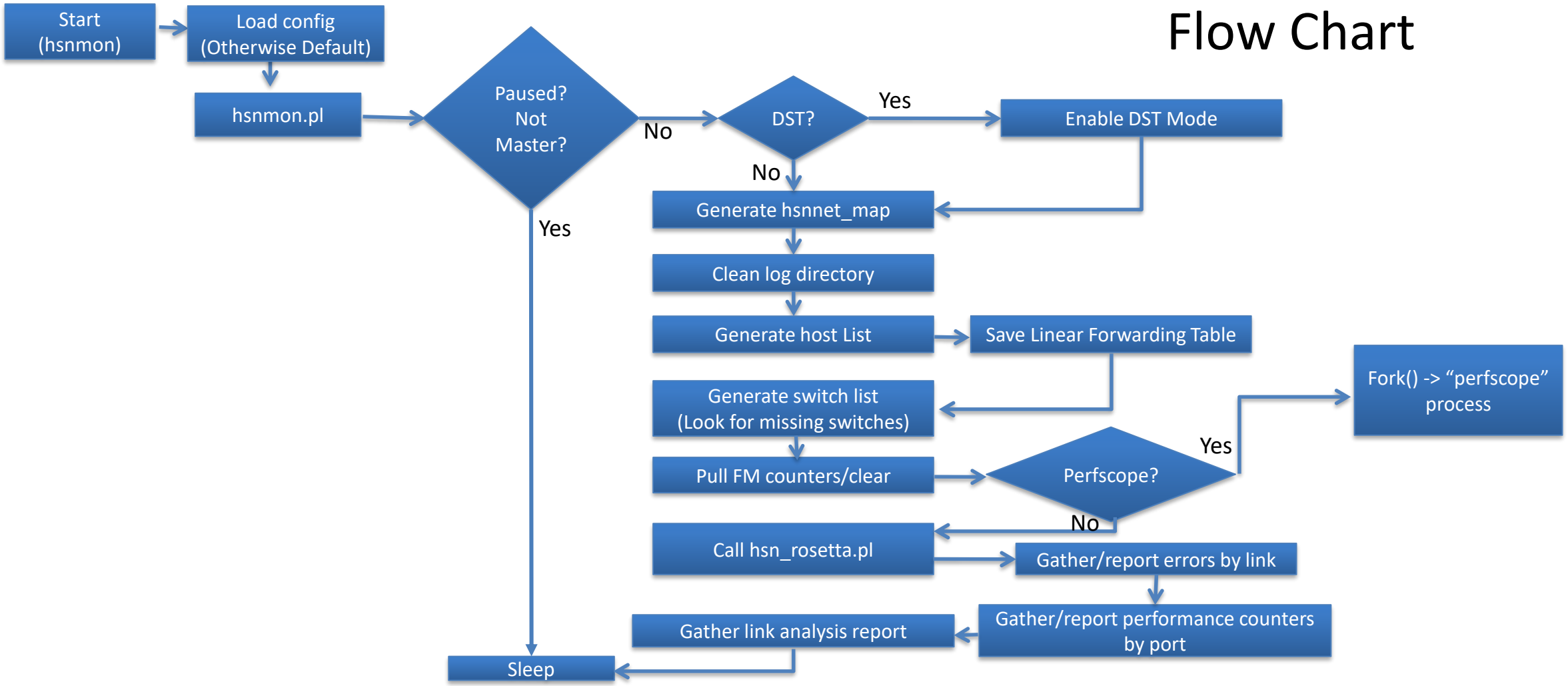

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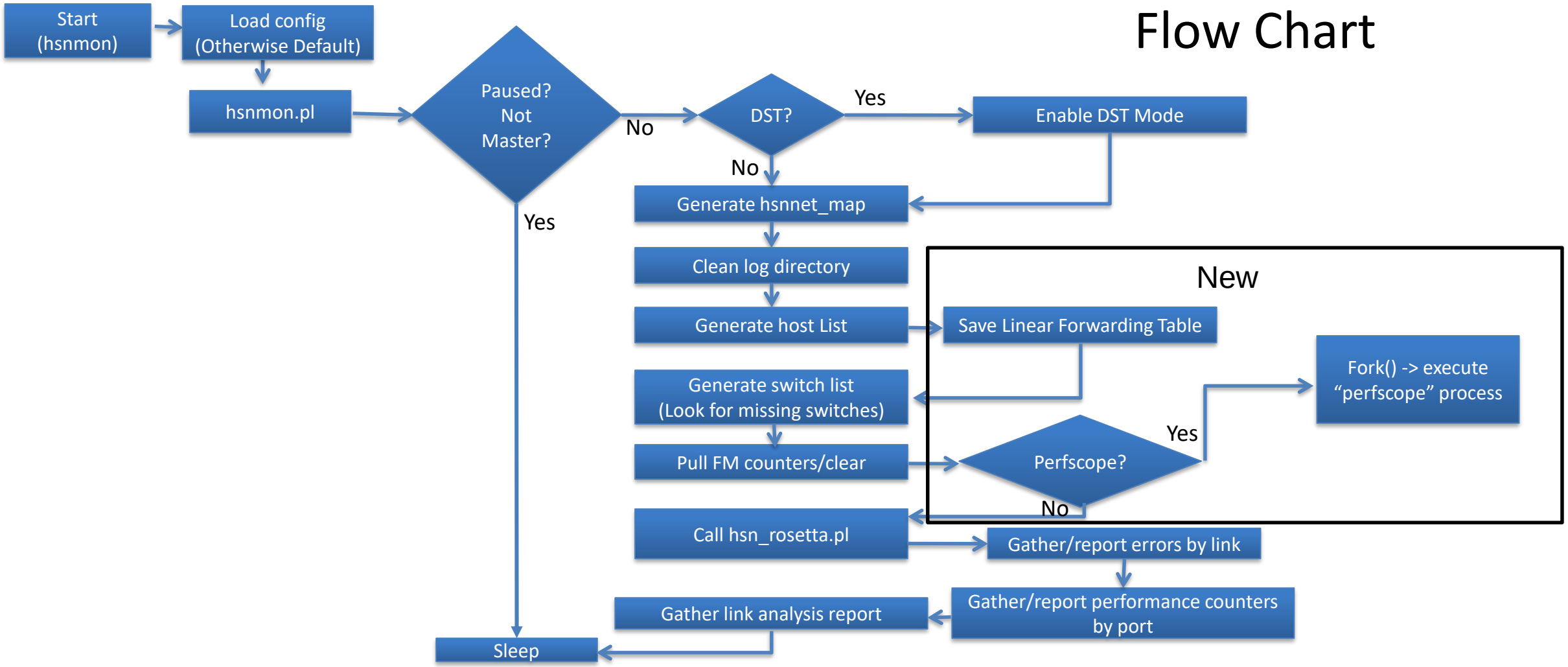
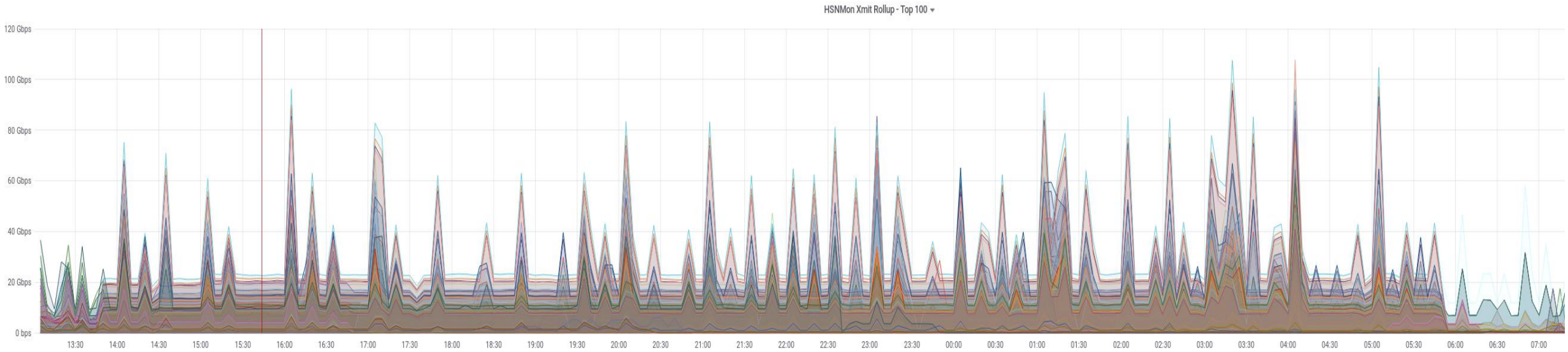
Flow Chart



NEW HSNMON DATA



*legend not shown

FUTURE WORK

FUTURE WORK

HSNMON Work:

- Continue deploying on clusters
- Find way to track when PM sweep times out
  - data integrity
- Make open source

Applications To InfiniBand:

- Apply lessons learned to IBmon
  - Share new HSNmon scripts (if they are helpful)
- Look into making an OpenSM Perfmanager Event Plugin

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THANK YOU

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