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Switch Abstraction Interface

Change Proposal

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| --- | --- |
| **Title** | **SampleFlow API’s** |
| **Authors** | **DELL** |
| **Status** | **In Review** |
| **Type** | **Standards Track** |
| **Created** | **02/05/2015** |
| **SAI-Version** | **V0.9.2** |

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# List of Changes

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| Version | Changes | Name | Date |
| 0.9.2 | Proposal for sFlow – Version 1 |  | 2/5/15 |
| 0.9.2 | Version 2 Modified with the following changes   * Made SFLOW Enable/Disable a port based attribute * Removed the bit map definition for SFLOW Packet Type * Modified the comment for SFLOW Fast Path |  | 2/16/15 |
| 0.9.2 | Version 3 Removed the sFlow fast path attributes. Included in the appendix for future addition. |  | 3/11/15 |
| 0.9.2 | Version 4   * Removed the sFlow packet type attributes. Appendix section has the details. * Changed according to unified object id proposal |  | 3/17/15 |
| 0.9.3 | Version 5   * Added more details on the SAI\_SAMPLEFLOW\_ATTR\_SAMPLE\_RATE as per the discussions * Renamed sflow to sampleflow |  | 3/20/15 |

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# Overview

Proposal for saisampleflow.h interface

# Specification

**Mandatory**

Implements sampleflow management functions like

* Creating a sampleflow session
* Destroying the sampleflow session
* Adding ports to the session
* Removing ports from the session

## Changes to sai.h

typedef enum \_sai\_api\_t {

SAI\_API\_SAMPLEFLOW= 15, /\* sai\_sampleflow\_api\_t \*

} sai\_api\_t;

## Changes to saiport.h

typedef enum \_sai\_port\_attr\_t

{

/\* READ-WRITE \*/

/\* Sampleflow session [sai\_object\_id\_t] \*/

SAI\_PORT\_ATTR\_INGRESS\_SAMPLEFLOW\_ENABLE

/\* READ-WRITE \*/

/\* Sampleflow session [sai\_object\_id\_t] \*/

SAI\_PORT\_ATTR\_EGRESS\_SAMPLEFLOW\_ENABLE

} sai\_port\_attr\_t

## New definitions in saisampleflow.h

typedef enum \_sai\_sampleflow\_type\_t

{

/\* Copy the sample packets to CPU \*/

SAI\_SAMPLEFLOW\_SLOW\_PATH,

} **sai\_sampleflow\_type\_t**;

typedef enum \_sai\_sampleflow\_attr\_t

{

/\* READ-ONLY \*/

/\* READ-WRITE \*/

/\* MANDATORY\_ON\_CREATE | CREATE\_AND\_SET \*/

/\* sampleflow sampling rate of type uint32. Sample rate is a value N, where one packet in every N packets is sampled\*/

SAI\_SAMPLEFLOW\_ATTR\_SAMPLE\_RATE,

/\* MANDATORY\_ON\_CREATE | CREATE\_AND\_SET \*/

/\* sampleflow Enable/Disable of type bool \*/

SAI\_SAMPLEFLOW\_ATTR\_ADMIN\_STATE,

/\* CREATE\_ONLY \*/

/\* sampleflow switching type sai\_sampleflow\_type.

Default would be SAI\_SAMPLEFLOW\_SLOW\_PATH \*/

SAI\_SAMPLEFLOW\_ATTR\_TYPE,

} **sai\_sampleflow\_attr\_t**;

/\*

\* Routine Description:

\* Create sampleflow session.

\*

\* Arguments:

\* [out] session\_id - sampleflow session\_id

\* [in] attr\_count - number of attributes

\* [in] attr\_list - array of attributes

\*

\* Return Values:

\* SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_create\_sampleflow\_session\_fn)(

\_Out\_ sai\_object\_id\_t \*session\_id,

\_In\_ uint32\_t attr\_count,

\_In\_ const sai\_attribute\_t \*attr\_list);

/\*

\* Routine Description:

\* Delete sampleflow session.

\*

\* Arguments:

\* [in] session\_id - sampleflow session\_id

\*

\* Return Values:

\* SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_delete\_sampleflow\_session\_fn)(

\_In\_ sai\_object\_id\_t session\_id);

/\*

\* Routine Description:

\* Set sampleflow attributes on a port.

\*

\* Arguments:

\* [in] session\_id – session on which sampleflow should be set

\* [in] attr - attribute value

\*

\* Return Values:

\* SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_set\_sampleflow\_attribute\_fn)(

\_In\_ sai\_object\_id\_t session\_id,

\_In\_ const sai\_attribute\_t \*attr);

/\*

\* Routine Description:

\* Get sampleflow attributes on a port.

\*

\* Arguments:

\* [in] session\_id - session on which sampleflow attributes should bre

\* [in] attr\_count - number of attributes

\* [inout] attr\_list - array of attributes

\*

\* Return Values:

\* SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_get\_sampleflow\_attribute\_fn)(

\_In\_ sai\_object\_id\_t session\_id,

\_In\_ uint32\_t attr\_count,

\_Inout\_ sai\_attribute\_t \*attr\_list);

/\* SAMPLEFLOW method table retrieved with sai\_api\_query() \*/

typedef struct \_sai\_sampleflow\_api\_t

{

sai\_create\_sampleflow\_session\_fn create\_sampleflow\_session;

sai\_delete\_sampleflow\_session\_fn delete\_sampleflow\_session;

sai\_set\_sampleflow\_attribute\_fn set\_sampleflow\_attribute;

sai\_get\_sampleflow\_attribute\_fn get\_sampleflow\_attribute;

} **sai\_sampleflow\_api\_t**;

# Appendix

**From:** Manickam, Arunsubash   
**Sent:** Tuesday, March 17, 2015 8:31 AM  
**To:** 'Peter Phaal'; Srini Addepalli  
**Cc:** [Atit.Jain@caviumnetworks.com](mailto:Atit.Jain@caviumnetworks.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: [Opencompute-networking] SAI - SFLOW comments/recommendations

Thanks Peter for your feedback

* Yes I will remove the packet type option so all packets are sampled
* Yes there would be additional meta data that would be passed from packet handler to above layers. This would be defined as part of the Host If Spec. Any other get functionality that agent needs to fill in it headers we could add later

On counters there is no cache at SAI layer. The SAI would return what the NPU SDK returns. Currently there is no switch attribute to define the counter refresh interval

-Arun

The following provides a list of possible attributes that can be added if an NPU supports sFlow in HW

typedef enum \_sai\_sampleflow\_attr\_t

{

…..

/\* All the attributes below are mandatory for SAI\_SAMPLEFLOW\_FAST\_PATH \*/

/\* CREATE + READ-ONLY \*/

/\* sampleflow Source MAC Address [sai\_mac\_t]\*/

SAI\_SAMPLEFLOW\_ATTR\_SRC\_MAC\_ADDRESS,

/\* CREATE + READ-ONLY \*/

/\* sampleflow Destination MAC Address [sai\_mac\_t]\*/

SAI\_SAMPLEFLOW\_ATTR\_DST\_MAC\_ADDRESS,

/\* CREATE + READ-ONLY \*/

/\* sampleflow VLAN Id [sai\_vlan\_id\_t]\*/

SAI\_SAMPLEFLOW\_ATTR\_VLAN\_ID,

/\* CREATE + READ-ONLY \*/

/\* sampleflow collector’s next hop information. Destination port shall be retrieved by that information [sai\_object\_id\_t]\*/

SAI\_SAMPLEFLOW\_ATTR\_DST\_PORT,

/\* CREATE + READ-ONLY \*/

/\* sampleflow collector address required for hardware switching [sai\_ip\_address\_t] \*/

SAI\_SAMPLEFLOW\_ATTR\_SRC\_IP\_ADDRESS,

/\* CREATE + READ-ONLY \*/

/\* sampleflow agent address required for hardware switching [sai\_ip\_address\_t ] \*/

SAI\_SAMPLEFLOW\_ATTR\_DST\_IP\_ADDRESS,

/\* CREATE + READ-ONLY \*/

/\* sampleflow Header UDP information [uint16\_t] \*/

SAI\_SAMPLEFLOW\_ATTR\_L4\_UDP\_DST\_PORT,

/\* CREATE + READ-ONLY \*/

/\* sampleflow Header UDP source port [uint16\_t] \*/

SAI\_SAMPLEFLOW\_ATTR\_L4\_UDP\_SRC\_PORT,

/\* CREATE + READ-ONLY \*/

/\* sampleflow Header Datagram size [uint16\_t] \*/

SAI\_SAMPLEFLOW\_ATTR\_L4\_UDP\_DATAGRAM\_SIZE,

} **sai\_sampleflow\_attr\_t**;

Thanks Peter for your feedback

* Yes I will remove the packet type option so all packets are sampled
* Yes there would be additional meta data that would be passed from packet handler to above layers. This would be defined as part of the Host If Spec. Any other get functionality that agent needs to fill in it headers we could add later

On counters there is no cache at SAI layer. The SAI would return what the NPU SDK returns. Currently there is no switch attribute to define the counter refresh interval

-Arun

**From:** Peter Phaal [<mailto:peter.phaal@inmon.com>]   
**Sent:** Tuesday, March 17, 2015 12:27 AM  
**To:** Srini Addepalli  
**Cc:** Manickam, Arunsubash; [Atit.Jain@caviumnetworks.com](mailto:Atit.Jain@caviumnetworks.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** Re: [Opencompute-networking] SAI - SFLOW comments/recommendations

Hi All,

I have started looking at the SAI documents and following the discussion and have a few comments about the sFlow extension.

Firstly, I think a standard API for sFlow agents to interact with hardware is a very positive step that will help ensure consistency and reduce the effort of implementing sFlow agents to different hardware platforms.

The sFlow version 5 specification (<http://sflow.org/sflow_version_5.txt>) doesn’t permit selective / filtered sampling of packets. The standard requires that a random sample of all packets transiting the data source be sampled with an equal probability.  Removing the \_sai\_sflow\_packet\_type\_t configuration options will help ensure that sFlow exports are compliant with the specification and consistent between implementations.

However, there are additional packet meta data attributes that should be passed up with the sampled packet in order to fill in the sFlow flow\_sample and sampled\_header structures:

/\* flow\_sample, page 29 \*/

sampling\_rate, i.e. the actual rate implemented in hardware which may differ from configured rate SAI\_SFLOW\_ATTR\_SAMPLE\_RATE (unless the semantics are defined to be consistent with sFlowFsPacketSamplingRate, page 20).

sample\_pool

drops

input ifIndex

output ifIndex

/\* sampled\_header, page 35 \*/

header\_protocol

frame\_length

stripped

header<>, up to sFlowFsMaximumHeaderSize bytes of the packet header + number of header bytes (must not include any padding)

Note: Typically the driver sends up the whole packet and the sFlow agent extracts the header and fills in the frame\_length, stripped and header<> fields.

The following attributes could be passed up with the metadata, or queried by the sFlow agent:

/\* extended\_switch, page 37 \*/

src\_vlan

src\_priority

dst\_vlan

dst\_priority

/\* extended\_router, page 38 \*/

nexthop

src\_mask\_len

dst\_mask\_len

/\* extended\_gateway \*/

nexthop

as

src\_as

src\_peer\_as

dst\_as\_path

communities

localpref

There are additional required fields such as sequence numbers, sub\_agent and data\_source values, but these are added by the software agent.

The counter export is an important part of sFlow export and it looks like the \_sai\_port\_stat\_counter\_t enum lists the basic port counters needed to populate the sFlow if\_counters and ethernet\_counters structures. The ifSpeed is in \_sai\_port\_attr\_t, but I couldn’t find the duplex mode.

I couldn’t find a discussion of when the counters are actually retrieved from the ASIC/NPU registers. The sFlow spec requires that the time between retrieving counters from hardware and sending them as an sFlow datagram be no more than 1 second. If there is no caching by the driver, then this requirement is easily met. If counters are cached by the driver, then a method of bypassing the cache, or a notification of updates, would allow the sFlow agent to satisfy this timing requirement.

There are other counters that are relevant to the functionality exposed by the SAI. The sFlow LAG extension (<http://sflow.org/sflow_lag.txt>) exports LACP counters and LAG containment relationships. The Host sFlow counters (<http://sflow.org/sflow_host.txt>) provide additional information that the sFlow agent can gather and export from the host O/S.

The Host sFlow (<http://host-sflow.sourceforge.net/>) provides an open source implementation of an sFlow agent that could easily be ported to Open Network Linux (the agent also provides an example of the interactions with the underlying operating system and drivers needed to support sFlow export).

There was a suggestion to use a generic name instead of sFlow to describe the APIs. However, sFlow is very specific about the method of packet sampling, counter polling, the form and meaning of exported data structures, and the timing of data export by the agent. Specificity is important since it ensures consistency and accuracy of sFlow implementations on different hardware platforms and between different device vendors. If the API definitions aren’t clear and don’t reference the underlying sFlow specification documents then it is difficult to ensure that sFlow implementations built on top of the APIs conform to the specifications and interoperate (the primary goal of the sFlow license - <http://sflow.org/developers/licensing.php> ).

Peter

On Mar 16, 2015, at 6:44 AM, Srini Addepalli <[saddepalli@freescale.com](mailto:saddepalli@freescale.com)> wrote:

I agree.  It is very difficult to get the filtering granularity right via SAI API. Since, it is not mentioned in the sflow MIB,  it is safe to remove and let host do any filtering they deem necessary before sending the samples to collectors.

Thanks  
Srini

**From:** [Arunsubash\_Manickam@Dell.com](mailto:Arunsubash_Manickam@Dell.com) [<mailto:Arunsubash_Manickam@Dell.com>]   
**Sent:** Monday, March 16, 2015 3:54 AM  
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**Subject:** RE: SAI - SFLOW comments/recommendations

Yes I am fine to remove it. Looks like some NPU’s support this, so let’s wait to hear for any feedback on this before we remove it. Any nonstandard thing can be part of vendor extensions

-Arun

**From:** Jain, Atit [<mailto:Atit.Jain@caviumnetworks.com>]   
**Sent:** Monday, March 16, 2015 11:47 AM  
**To:** Manickam, Arunsubash; [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: SAI - SFLOW comments/recommendations

Hi Arun,

Yes, and this is based on the RFC understanding where there is no such object in the MIB. The datagram sent to collector has this information and collector makes a picture of network state based on it. The sampling is independent of the type.

Regards,  
Atit

**From:** [Arunsubash\_Manickam@Dell.com](mailto:Arunsubash_Manickam@Dell.com) [<mailto:Arunsubash_Manickam@Dell.com>]   
**Sent:** Monday, March 16, 2015 11:10 AM  
**To:** Jain, Atit; [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: SAI - SFLOW comments/recommendations

Are you suggesting any packet type should be monitored and not have a control of what packet type gets monitored or suggesting make this definition common

-Arun

**From:** Jain, Atit [<mailto:Atit.Jain@caviumnetworks.com>]   
**Sent:** Monday, March 16, 2015 10:40 AM  
**To:** Manickam, Arunsubash; [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: SAI - SFLOW comments/recommendations

Hi Arun,

Following is part of ver3 doc. My question was “(why) Also should we include the packet type(\_sai\_sflow\_packet\_type\_t) here”. I am also saying that the SAI api should not be aware. So we should remove following from the doc.

typedef enum \_sai\_sflow\_packet\_type\_t

{

    SAI\_SFLOW\_PACKET\_TYPE\_UNICAST ,

    SAI\_SFLOW\_PACKET\_TYPE\_MULTICAST,

    SAI\_SFLOW\_PACKET\_TYPE\_BROADCAST,

    SAI\_SFLOW\_PACKET\_TYPE\_UNKNOWN\_UNICAST ,

    SAI\_SFLOW\_PACKET\_TYPE\_UNREGISTERED\_MULTICAST ,

} **sai\_sflow\_packet\_type\_t**;

Regards,

Atit

**From:** [Arunsubash\_Manickam@Dell.com](mailto:Arunsubash_Manickam@Dell.com) [<mailto:Arunsubash_Manickam@Dell.com>]   
**Sent:** Monday, March 16, 2015 9:04 AM  
**To:** Jain, Atit; [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: SAI - SFLOW comments/recommendations

Hi Atit,

My understanding is at SAI the SFLOW packet would be transparently passed up/down based on the RX/TX so why should SAI be aware of the SFLOW packet type being send. Are you asking for the case where SFLOW is supported in HW and we can define the SFLOW packet fields

On your other question, we have a mode set attribute which would return an ERROR is we try to set Fast path on a NPU that does not support switch handling of SFLOW samples.

-Arun

**From:** Jain, Atit [<mailto:Atit.Jain@caviumnetworks.com>]   
**Sent:** Sunday, March 15, 2015 5:02 PM  
**To:** Manickam, Arunsubash; [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** RE: SAI - SFLOW comments/recommendations

Hi Arun,

One comment inline. Also should we include the packet type(\_sai\_sflow\_packet\_type\_t) here, Ideally the packet related aspects are part of datagram sent to the collector. If we see the RFC (version 5) the MIB doesn’t have this attribute. Once enabled on the port/source, all the packets should be sampled. Let mi know if I missed something.

Regards,

Atit

I would expect the sai\_api\_query() to return NULL method table for SFLOW in this case

<Atit> the query only returns the function table (struct) pointer. I think Srini meant the Switch’s capability of sending samples/datagrams directly to the collector.

**From:** [opencompute-networking-bounces@lists.opencompute.org](mailto:opencompute-networking-bounces@lists.opencompute.org) [<mailto:opencompute-networking-bounces@lists.opencompute.org>] **On Behalf Of**[Arunsubash\_Manickam@dell.com](mailto:Arunsubash_Manickam@dell.com)  
**Sent:** Sunday, March 15, 2015 3:17 PM  
**To:** [saddepalli@freescale.com](mailto:saddepalli@freescale.com); [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** Re: [Opencompute-networking] SAI - SFLOW comments/recommendations

Thanks for the feedback Srini

Comments inline

**From:** [opencompute-networking-bounces@lists.opencompute.org](mailto:opencompute-networking-bounces@lists.opencompute.org) [<mailto:opencompute-networking-bounces@lists.opencompute.org>] **On Behalf Of**Srini Addepalli  
**Sent:** Sunday, March 15, 2015 11:10 AM  
**To:** [opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
**Subject:** [Opencompute-networking] SAI - SFLOW comments/recommendations

Hi,

Few comments :

1.       Counter sampling is equally important as packet sampling.  Please consider adding counter sampling capability.

The header file would get to OCP Git gub in the next few weeks. You can propose this on top of that

2.       Sflow packet and counter record transport is simple and many NPUs can send those directly to collectors without any intervention from the host.  Was there any particular reason to move this to appendix?  We would like to see this in the API.

We wanted to make the interface in case the agent is supported by NPU to be complete and cover all cases. I could not get hold of any implementation that fully supports this functionality in NPU to provide a good interface and hence deferred for subsequent update

3.       Since some switches don’t support transporting the packets samples and counter records,  it is good to have it exposed as switch capability.

I would expect the sai\_api\_query() to return NULL method table for SFLOW in this case

-Arun

Thanks  
Srini

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
opencompute-networking mailing list  
Unsubscribe: <http://lists.opencompute.org/mailman/options/opencompute-networking>  
  
[opencompute-networking@lists.opencompute.org](mailto:opencompute-networking@lists.opencompute.org)  
<http://lists.opencompute.org/mailman/listinfo/opencompute-networking>

sFlow Header Datagram size [uint16\_t] \*/

SAI\_SFLOW\_ATTR\_L4\_UDP\_DATAGRAM\_SIZE,

} sai\_sflow\_attr\_t