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Switch Abstraction Interface

Change Proposal

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| --- | --- |
| **Title** | **L2MC** |
| **Authors** | **CENTEC** |
| **Status** | **In Review** |
| **Type** | **Standards Track** |
| **Created** | **17/10/2015** |
| **SAI-Version** | **0.9.3** |

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# List of Changes

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| --- | --- | --- | --- |
| Version | Changes | Name | Date |
| Initial Version | Base version |  | 17/10/2015 |
| 0.2 | Changes after meeting review |  | 01/07/2016 |
| 0.7 | Extend FDB to implement L2Multicast | Min Yao | 20/07/2016 |
| 0.8 | * change the next\_hop\_group to some group containers for general purpose that the container contains a group of objects and has the attribute type e.g. ECMP or L2MC. * Make a generic group type that defines the list of port for multicast FDB entry * Add Switch-level attribute to define whether switch supports IP based L2 multicast. (RO) | Min Yao | 25/08/2016 |
| 0.9 | * Classify unknown multicast into several different types | Min Yao | 18/09/2016 |

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# Overview

L2 Multicast, a basic layer 2 feature, which provides a security solution by isolating flooding domain from VLAN to l2multicast group. Meanwhile, it decreases the traffic load on a Layer 2 switch. L2 multicast can be implemented by multicast fdb lookup table (referred to as MAC based L2 multicast) or SG/\*G lookup table (referred to as IP based L2 multicast, known as snooping). This document covers the implementation of MAC based L2 multicast.

# Specification

This section describes the details of the proposed interface/API

## Change to sai.h

/\*\*

\*

\* Defined API sets have assigned ID's. If specific api method table changes

\* in any way (method signature, number of methods), a new ID needs to be

\* created (e.g. VLAN2) and old API still may need to be supported for

\* compatibility with older adapter hosts.

\*

\*/

typedef enum \_sai\_api\_t

{

…

~~SAI\_API\_NEXT\_HOP\_GROUP = 8, /\*\*< sai\_next\_hop\_group\_api\_t \*/~~

**SAI\_API\_GROUP = 8, /\*\*< sai\_group\_api\_t \*/**

…

} sai\_api\_t;

## Change to saitypes.h

/\*\*

\* @brief sai object type

\*/

typedef enum \_sai\_object\_type\_t {

…

~~SAI\_OBJECT\_TYPE\_NEXT\_HOP\_GROUP = 5,~~

**SAI\_OBJECT\_TYPE\_GROUP = 5,**

…

~~SAI\_OBJECT\_TYPE\_NEXT\_HOP\_GROUP\_MEMBER = 43,~~

**SAI\_OBJECT\_TYPE\_GROUP\_MEMBER = 43,**

…

} sai\_object\_type\_t;} sai\_api\_t;

## Change to sainexthopgroup.h

Rename file name to saigroup.h

/\*

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\* Microsoft would like to thank the following companies for their review and

\* assistance with these files: Intel Corporation, Mellanox Technologies Ltd,

\* Dell Products, L.P., Facebook, Inc

\*

\* Module Name:

\*

\* saigroup.h

\*

\* Abstract:

\*

\* This module defines generic SAI object Group API

\*

\*/

#if !defined (\_\_SAIGROUP\_H\_)

#define \_\_SAIGROUP\_H\_

#include <saitypes.h>

/\*\* \defgroup SAIGROUP SAI - Generic object group specific API definitions.

\*

\* \{

\*/

/\*\*

\* @brief Generic object group type

\*/

typedef enum \_sai\_group\_type\_t

{

/\*\* Group members are ECMP nexthops \*/

SAI\_GROUP\_TYPE\_ECMP,

**/\*\* Group members are outputs of a L2 multicast group \*/**

**SAI\_GROUP\_TYPE\_L2MC,**

/\*\* Other types of group to be defined in the future, e.g., WCMP \*/

} sai\_group\_type\_t;

/\*\*

\* @brief Attribute id for generic group

\*/

typedef enum \_sai\_group\_attr\_t

{

SAI\_GROUP\_ATTR\_START,

/\*\* READ-ONLY \*/

/\*\* Number of members in the group [uint32\_t] \*/

SAI\_GROUP\_ATTR\_MEMBER\_COUNT = SAI\_GROUP\_ATTR\_START,

/\*\* Member list [sai\_object\_list\_t] \*/

SAI\_GROUP\_ATTR\_MEMBER\_LIST,

/\*\* READ-WRITE \*/

/\*\* Generic group type [sai\_group\_type\_t] (MANDATORY\_ON\_CREATE|CREATE\_ONLY) \*/

SAI\_GROUP\_ATTR\_TYPE,

SAI\_GROUP\_ATTR\_END,

/\* Custom range base value \*/

SAI\_GROUP\_ATTR\_CUSTOM\_RANGE\_BASE = 0x10000000

} sai\_group\_attr\_t;

typedef enum \_sai\_group\_member\_attr\_t

{

SAI\_GROUP\_MEMBER\_ATTR\_START,

/\*\* READ\_WRITE \*/

/\*\* Generic Group ID [sai\_object\_id\_t] (MANDATORY\_ON\_CREATE|CREATE\_ONLY) \*/

SAI\_GROUP\_MEMBER\_ATTR\_GROUP\_ID = SAI\_GROUP\_MEMBER\_ATTR\_START,

/\*\* Group Member Object ID [sai\_object\_id\_t] (MANDATORY\_ON\_CREATE|CREATE\_ONLY)

\* When group type is ECMP, the member should be a nexthop object

**\* When group type is L2MC, the member should be a port/LAG/… object** \*/

SAI\_GROUP\_MEMBER\_ATTR\_MEMBER\_ID,

/\*\* Member Weights [sai\_uint32\_t] (CREATE\_AND\_SET)

\* Applicable when group type is ECMP (default to 1) \*/

SAI\_GROUP\_MEMBER\_ATTR\_WEIGHT,

SAI\_GROUP\_MEMBER\_ATTR\_END,

/\*\* custom range base value \*/

SAI\_GROUP\_MEMBER\_ATTR\_CUSTOM\_RANGE\_BASE = 0x10000000

} sai\_group\_member\_attr\_t;

/\*\*

\* Routine Description:

\* @brief Create generic group

\*

\* Arguments:

\* @param[out] group\_id - generic group id

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

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

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_create\_group\_fn)(

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

\_In\_ uint32\_t attr\_count,

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

);

/\*\*

\* Routine Description:

\* @brief Remove generic group

\*

\* Arguments:

\* @param[in] group\_id - generic group id

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_remove\_group\_fn)(

\_In\_ sai\_object\_id\_t group\_id

);

/\*\*

\* Routine Description:

\* @brief Set Generic Group attribute

\*

\* Arguments:

\* @param[in] sai\_object\_id\_t - generic group id

\* @param[in] attr - attribute

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

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

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

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

);

/\*\*

\* Routine Description:

\* @brief Get Generic Group attribute

\*

\* Arguments:

\* @param[in] sai\_object\_id\_t - group\_id

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

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

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

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

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

\_In\_ uint32\_t attr\_count,

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

);

/\*\*

\* Routine Description:

\* @brief Create generic group member

\*

\* Arguments:

\* @param[out] group\_member\_id - generic group member id

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

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

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_create\_group\_member\_fn)(

\_Out\_ sai\_object\_id\_t\* group\_member\_id,

\_In\_ uint32\_t attr\_count,

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

);

/\*\*

\* Routine Description:

\* @brief Remove generic group member

\*

\* Arguments:

\* @param[in] group\_member\_id - generic group member id

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_remove\_group\_member\_fn)(

\_In\_ sai\_object\_id\_t group\_member\_id

);

/\*\*

\* Routine Description:

\* @brief Set Generic Group Member attribute

\*

\* Arguments:

\* @param[in] sai\_object\_id\_t - group\_member\_id

\* @param[in] attr - attribute

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_set\_group\_member\_attribute\_fn)(

\_In\_ sai\_object\_id\_t group\_member\_id,

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

);

/\*\*

\* Routine Description:

\* @brief Get Generic Group Member attribute

\*

\* Arguments:

\* @param[in] sai\_object\_id\_t - group\_member\_id

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

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

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t (\*sai\_get\_group\_member\_attribute\_fn)(

\_In\_ sai\_object\_id\_t group\_member\_id,

\_In\_ uint32\_t attr\_count,

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

);

/\*\*

\* @brief Generic group methods table retrieved with sai\_api\_query()

\*/

typedef struct \_sai\_group\_api\_t

{

sai\_create\_group\_fn create\_group;

sai\_remove\_group\_fn remove\_group;

sai\_set\_group\_attribute\_fn set\_group\_attribute;

sai\_get\_group\_attribute\_fn get\_group\_attribute;

sai\_create\_group\_member\_fn create\_group\_member;

sai\_remove\_group\_member\_fn remove\_group\_member;

sai\_set\_group\_member\_attribute\_fn set\_next\_member\_attribute;

sai\_get\_group\_member\_attribute\_fn get\_next\_member\_attribute;

} sai\_group\_api\_t;

/\*\*

\* \}

\*/

#endif // \_\_SAIGROUP\_H\_

## Changes to saifdb.h

/\*\*

\* @brief Attribute Id for fdb entry

\*/

typedef enum \_sai\_fdb\_entry\_attr\_t

{

SAI\_FDB\_ENTRY\_ATTR\_START,

/\*\* READ-ONLY \*/

/\*\* READ-WRITE \*/

/\*\* FDB entry type [sai\_fdb\_entry\_type\_t] (MANDATORY\_ON\_CREATE|CREATE\_AND\_SET) \*/

SAI\_FDB\_ENTRY\_ATTR\_TYPE = SAI\_FDB\_ENTRY\_ATTR\_START,

~~/\*\* FDB entry port id [sai\_object\_id\_t] (MANDATORY\_ON\_CREATE|CREATE\_AND\_SET)~~

~~\* The port id here can refer to a generic port object such as SAI port object id,~~

~~\* SAI LAG object id and etc. or to a tunnel next hop object in case the entry is~~

~~\* l2 tunnel \*/~~

~~SAI\_FDB\_ENTRY\_ATTR\_PORT\_ID,~~

**/\*\* FDB entry output id [sai\_object\_id\_t] (CREATE\_AND\_SET)**

**\* This attribute only takes effect when SAI\_FDB\_ENTRY\_ATTR\_PACKET\_ACTION is set to FORWARD.**

**\* The OUTPUT\_ID here can refer to a generic port object such as SAI port object id,**

**\* SAI LAG object id and etc. or to a tunnel next hop object in case the entry is l2 tunnel.**

**\* It can also refer to a genric group with type SAI\_GROUP\_TYPE\_L2MC. If the group has no member, packets will be discarded.**

**\* (MANDATORY\_ON\_CREATE when SAI\_FDB\_ENTRY\_ATTR\_PACKET\_ACTION = SAI\_PACKET\_ACTION\_FORWARD)**

**\* /**

**SAI\_FDB\_ENTRY\_ATTR\_OUTPUT\_ID,**

/\*\* FDB entry packet action [sai\_packet\_action\_t] (MANDATORY\_ON\_CREATE|CREATE\_AND\_SET) \*/

SAI\_FDB\_ENTRY\_ATTR\_PACKET\_ACTION,

/\*\* User based Meta Data

\* [sai\_uint32\_t] (CREATE\_AND\_SET)

\* Value Range SAI\_SWITCH\_ATTR\_FDB\_DST\_USER\_META\_DATA\_RANGE \*/

SAI\_FDB\_ENTRY\_ATTR\_META\_DATA,

/\* -- \*/

SAI\_FDB\_ENTRY\_ATTR\_END,

/\* Custom range base value \*/

SAI\_FDB\_ENTRY\_ATTR\_CUSTOM\_RANGE\_START = 0x10000000,

/\* --\*/

SAI\_FDB\_ENTRY\_ATTR\_CUSTOM\_RANGE\_END

} sai\_fdb\_entry\_attr\_t;

## Changes to saivlan.h

/\*\*

\* @brief Attribute Id in sai\_set\_vlan\_attribute() and

\* sai\_get\_vlan\_attribute() calls

\*/

typedef enum \_sai\_vlan\_attr\_t

{

SAI\_VLAN\_ATTR\_START,

/\*\* READ-ONLY \*/

/\*\* List of vlan members in a VLAN [sai\_object\_list\_t]\*/

SAI\_VLAN\_ATTR\_MEMBER\_LIST = SAI\_VLAN\_ATTR\_START,

/\*\* READ-WRITE \*/

/\*\* Maximum number of learned MAC addresses [uint32\_t]

\* zero means learning limit disable. (default to zero).

\*/

SAI\_VLAN\_ATTR\_MAX\_LEARNED\_ADDRESSES,

/\*\* STP Instance that the VLAN is associated to [sai\_object\_id\_t]

\* (default to default stp instance id)\*/

SAI\_VLAN\_ATTR\_STP\_INSTANCE,

/\*\* To disable learning on a VLAN. [bool] (CREATE\_AND\_SET)

\* (default set to false)

\* This should override port learn settings. If this is set to true on a vlan,

\* then the source mac learning is disabled for this vlan on a member port even

\* if learn is enable on the port(based on port learn attribute)

\*/

SAI\_VLAN\_ATTR\_LEARN\_DISABLE,

**/\*\* VLAN Exception IGMP packet enable [bool] (CREATE\_AND\_SET)**

**\*(default is disabled)\*/**

**SAI\_VLAN\_ATTR\_EXCEPTION\_IGMP\_EN,**

**/\*\* VLAN Exception MLD packet enable [bool] (CREATE\_AND\_SET)**

**\*(default is disabled)\*/**

**SAI\_VLAN\_ATTR\_EXCEPTION\_MLD\_EN,**

**/\*\* Generic group object id [sai\_object\_id\_t] (CREATE\_AND\_SET)**

**\* Indicating the output ports/LAGs for unknown non-ip multicast packets.**

**\* This attribute only takes effect when one of the following conditions is met:**

**\* (1)non-ip multicast packet**

**\* (2)IPv4 multicast packet && not linklocal && IPv4 mcast snooping disabled for vlan**

**\* (3)IPv6 multicast packet && not linklocal && IPv6 mcast snooping disabled for vlan**

**\* If not set, unknown multicast packets will be discarded – default action.**

**\* If the group has no member, unknown multicast packets will be discarded. \*/**

**SAI\_VLAN\_ATTR\_UNKNOWN\_NON\_IP\_MCAST\_OUTPUT\_GROUP\_ID,**

**/\*\* Generic group object id [sai\_object\_id\_t] (CREATE\_AND\_SET)**

**\* Indicating the output ports/LAGs for unknown IPv4 multicast packets.**

**\* This attribute only takes effect when the following condition is met:**

**\* (1)IPv4 multicast packet && not linklocal && IPv4 mcast snooping enabled for vlan**

**\* If not set, unknown multicast packets will be discarded – default action.**

**\* If the group has no member, unknown multicast packets will be discarded. \*/**

**SAI\_VLAN\_ATTR\_UNKNOWN\_IPv4\_MCAST\_OUTPUT\_GROUP\_ID,**

**/\*\* Generic group object id [sai\_object\_id\_t] (CREATE\_AND\_SET)**

**\* Indicating the output ports/LAGs for unknown IPv6 multicast packets.**

**\* This attribute only takes effect when the following condition is met:**

**\* (1)IPv6 multicast packet && not linklocal && IPv6 mcast snooping enabled for vlan**

**\* If not set, unknown multicast packets will be discarded – default action.**

**\* If the group has no member, unknown multicast packets will be discarded. \*/**

**SAI\_VLAN\_ATTR\_UNKNOWN\_IPv6\_MCAST\_OUTPUT\_GROUP\_ID,**

**/\*\* Generic group object id [sai\_object\_id\_t] (CREATE\_AND\_SET)**

**\* Indicating the output ports/LAGs for unknown linklocal multicast packets.**

**\* This attribute only takes effect when the following condition is met:**

**\* (1) IPv4 multicast packet && linklocal address && IPv4 mcast snooping enabled for vlan**

**\* (2) IPv6 multicast packet && linklocal address && IPv6 mcast snooping enabled for vlan**

**\* If not set, unknown multicast packets will be discarded – default action.**

**\* If the group has no member, unknown multicast packets will be discarded. \*/**

**SAI\_VLAN\_ATTR\_UNKNOWN\_LINKLOCAL\_MCAST\_OUTPUT\_GROUP\_ID,**

/\*\* User based Meta Data

\* [sai\_uint32\_t] (CREATE\_AND\_SET)

\* Value Range SAI\_SWITCH\_ATTR\_VLAN\_USER\_META\_DATA\_RANGE \*/

SAI\_VLAN\_ATTR\_META\_DATA,

SAI\_VLAN\_ATTR\_END,

/\*\* Custom range base value \*/

SAI\_VLAN\_ATTR\_CUSTOM\_RANGE\_START = 0x10000000,

/\* --\*/

SAI\_VLAN\_ATTR\_CUSTOM\_RANGE\_END

} sai\_vlan\_attr\_t;

# Examples

Create a l2mc group with multiple output port and associate the l2mc group with multicast fdb entry.

## Create a generic group

sai\_api\_query(SAI\_API\_GROUP, &group\_api);

sai\_object\_id\_t l2mc\_group\_id = 0;

sai\_attribute\_t attr[2] = {0};

attr[0].id = SAI\_GROUP\_ATTR\_TYPE;

attr[0].value.s32 = SAI\_GROUP\_TYPE\_L2MC;

group\_api->create\_group(&l2mc\_group\_id, 1, attr);

## Create group members

sai\_object\_id\_t l2mc\_group\_member\_id1 = 0;

sai\_object\_id\_t l2mc\_group\_member\_id2 = 0;

attr[0].id = SAI\_GROUP\_MEMBER\_ATTR\_GROUP\_ID;

attr[0].value.oid = l2mc\_group\_id;

attr[1].id = SAI\_GROUP\_MEMBER\_ATTR\_MEMBER\_ID;

attr[1].value.oid = port1\_obj; /\* some valid port object\*/

group\_api->create\_group\_member (&l2mc\_group\_member\_id1, 2, attr);

attr[0].id = SAI\_GROUP\_MEMBER\_ATTR\_GROUP\_ID;

attr[0].value.oid = l2mc\_group\_id;

attr[1].id = SAI\_GROUP\_MEMBER\_ATTR\_MEMBER\_ID;

attr[1].value.oid = port2\_obj; /\* some valid port object\*/

group\_api->create\_group\_member(&l2mc\_group\_member\_id2, 2, attr);

## Create a multicast fdb entry associated with the group

sai\_api\_query(SAI\_API\_FDB, &sai\_fdb\_api);

sai\_fdb\_entry\_t fdb\_entry;

sai\_attribute\_t attr[3] = {0};

fdb\_entry.vlan\_id = 10;

fdb\_entry.mac\_address = {0x01, 0x00, 0x5e, 0x00, 0x02, 0x00}; /\* multicast\*/

attr[0].id = SAI\_FDB\_ENTRY\_ATTR\_TYPE;

attr[0].value.s32 = SAI\_FDB\_ENTRY\_STATIC;

attr[1].id = SAI\_FDB\_ENTRY\_ATTR\_PACKET\_ACTION;

attr[1].value.s32 = SAI\_PACKET\_ACTION\_FORWARD;

attr[2].id = SAI\_FDB\_ENTRY\_ATTR\_OUTPUT\_ID;

attr[2].value.obj = l2mc\_group\_id;

sai\_fdb\_api->sai\_create\_fdb\_entry\_fn(&fdb\_entry, 3, attr);