

Switch Abstraction Interface

Change Proposal

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| **Authors** | **Marvell Semiconductor Ltd.** |
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Contents

[List of Changes 3](#_Toc476856278)

[1 Overview 5](#_Toc476856279)

[2 Proposal 5](#_Toc476856280)

[2.1 TAM Microburst Objects 5](#_Toc476856281)

[2.2 Microburst statistics 6](#_Toc476856282)

[3 Specification 6](#_Toc476856283)

[3.1 Addition to file saitam.h 6](#_Toc476856284)

[3.1.1 Data Structures and Enumerations 6](#_Toc476856285)

[3.1.2 API 10](#_Toc476856286)

[3.2 Changes to saitypes.h 11](#_Toc476856287)

# List of Changes

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| --- | --- | --- | --- |
| Version | Changes | Name | Date |
| 1 | Proposal for SAI TAM Enhancements for Monitoring Microbursts | Marvell Semiconductor Ltd. | 25 Feb 2017 |
| 2 | Update after SAI workshop |  |  |

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# Overview

SAI has “Telemetry and Analytics” (TAM) provision for retrieving statistics data in bulk, as well as introduces a notification mechanism for monitoring statistics using thresholds.

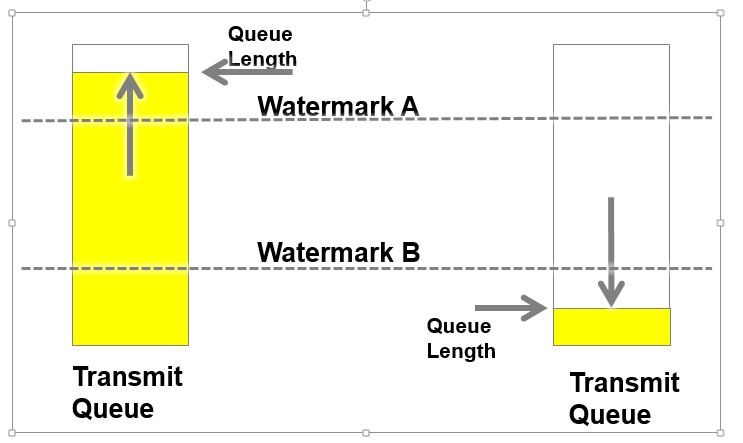
This document proposes a TAM enhancements for monitoring microbursts - retrieving statistics data on microbursts and microbursts durations. in bulk, as well as introduces a notification mechanism for monitoring statistics using thresholds. It uses the retrieving mechanism introduced in TAM Specification.

# Proposal

## TAM Microburst Objects

This document enhances TAM by adding Microburst objects, way to manage them and retrieving associated statistics.

The Microburst (uBurst) is an event in which a buffer-count (e.g., a queue length) crosses watermark A (from low to high) until it crosses watermark B (from high to low).



**Figure 1 Microburst Definition**

This spec supports microburst configuration via Microburst objects. Microburst objects are created via the **sai\_tam\_microburst\_create\_fn** API. The statistic associated with the threshold object and the associated breach levels are passed as attributes during the microburst object creation.

## Microburst statistics

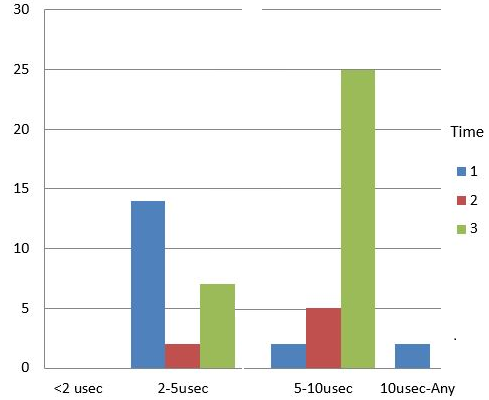
Microburst Duration is the time (in us) of microburst event (from cross A until it crosses B).

Microburst Duration Statistics:

* Last microburst duration
* Longest microburst duration (peak)
* Shortest microburst duration (min)
* Average duration of all microbursts
* Number of microbursts
* Microburst Durations histogram

Microburst Durations histogram statistics contain numbers of microbursts according to their durations in user-defined intervals:

* Duration-bin-a - number of microbursts with duration from 0 us to ‘a’ us
* Duration-bin-b (from ‘a’ to ‘b’)
* Duration-bin-c (from ‘b’ to ‘c’)
* Duration-bin-d (‘c’ to any)



**Figure 2 Example of Microburst Duration Histogram**

# Specification

## Addition to file saitam.h

### Data Structures and Enumerations

/\*\*

\* @brief Enum defining statistics for microburst.

\*/

typedef enum \_sai\_tam\_microburst\_stat\_t

{

/\*\* get/set last uBurst duration in us [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_LAST\_DURATION = 0x00000000,

/\*\* get/set longest uBurst duration in us [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_LONGEST\_DURATION = 0x00000001,

/\*\* get/set shortest uBurst duration in us [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_SHORTEST\_DURATION = 0x00000002,

/\*\* get/set average uBurst duration in us [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_AVERAGE\_DURATION = 0x00000003,

/\*\* get/set number of uBursts [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_NUMBER = 0x00000004,

/\*\* get/set number of uBursts histogram bin\_a [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_BIN\_A = 0x00000005,

/\*\* get/set number of uBursts histogram bin\_b [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_BIN\_B = 0x00000006,

/\*\* get/set number of uBursts histogram bin\_c [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_BIN\_C = 0x00000007,

/\*\* get/set number of uBursts histogram bin\_d [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_BIN\_D = 0x00000008,

/\*\* get/set histogram interval - value a [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_INTERVAL\_A = 0x00000009,

/\*\* get/set histogram interval - value b [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_INTERVAL\_B = 0x0000000a,

/\*\* get/set histogram interval - value c [uint64\_t] \*/

SAI\_TAM\_MICROBURST\_STAT\_HISTOGRAM\_INTERVAL\_C = 0x0000000b,

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

SAI\_TAM\_MICROBURST\_STAT\_CUSTOM\_RANGE\_BASE = 0x10000000

} sai\_tam\_microburst\_stat\_t;

/\*\*

\* TAM Microburst Attributes.

\*/

typedef enum \_sai\_tam\_microburst\_attr\_t {

/\*\*

\* @brief Start of Attributes

\*/

SAI\_TAM\_MICROBURST\_ATTR\_START,

/\*\*

\* @brief TAM Object

\*

\* @type sai\_object\_id\_t

\* @flags MANDATORY\_ON\_CREATE

\*/

SAI\_TAM\_MICROBURST\_ATTR\_TAM\_ID = SAI\_TAM\_MICROBURST\_ATTR\_START,

/\*\*

\* @brief Statistic for this microburst

\*

\* @type sai\_tam\_statistic\_id\_t

\* @flags MANDATORY\_ON\_CREATE

\*/

SAI\_TAM\_MICROBURST\_ATTR\_STATISTIC,

/\*\*

\* @brief Watermark Levels

\*

\* Breach levels for this microburst in number of bytes

\*

\* If not specified, the microburst is created without any

\* levels, which is effectively disabling the microburst

\* monitoring for the statistic

\*

\* @type uint64\_t

\* @flags CREATE\_AND\_SET

\* @allownull true

\*/

SAI\_TAM\_MICROBURST\_ATTR\_LEVEL\_A,

SAI\_TAM\_MICROBURST\_ATTR\_LEVEL\_B,

/\*\*

\* @brief Transporter Object

\*

\*

\* @type sai\_object\_id\_t

\* @allownull true

\*/

SAI\_TAM\_MICROBURST\_ATTR\_TRANSPORTER,

/\*\*

\* @brief Buffers/Statistics for inclusion in the snapshot

\* Specifies the Statistics/Types for the snapshot.

\* If not specified, all buffers tracked by

\* the associated TAM object are included in the snapshot.

\* When specified, the buffers requested for snapshot must be within the set

\* tracked by the associated TAM object.

\*

\* @type sai\_tam\_statistic\_id\_list xxx

\* @allownull true

\*/

SAI\_TAM\_MICROBURST\_ATTR\_STAT\_TYPES,

/\*\*

\* @brief End of Attributes

\*/

SAI\_TAM\_MICROBURST\_ATTR\_END

} sai\_tam\_microburst\_attr\_t;

### API

/\*\*

\* Routine Description:

\* @brief Create and return a microburst object

\*

\* This creates a microburst in the hardware with the associated statistic

\* passed via the attributes.

\*

\* Arguments:

\* @param[out] microburst\_id - microburst object

\* @param[in] attr\_list – preferences for creating a microburst

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t(\*sai\_tam\_microburst\_create\_fn) (

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

\_In\_ uint32\_t attr\_count,

\_In\_ sai\_attribute\_t \* attr\_list /\* sai\_tam\_microburst\_attr\_t \*/

);

/\*\*

\* Routine Description:

\* @brief Deletes a specified microburst object.

\*

\* Arguments:

\* @param[in] microburst\_id - microburst object to be removed.

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t(\*sai\_tam\_microburst\_remove\_fn) (

\_In\_ sai\_object\_id\_t \* microburst\_id

);

/\*\*

\* Routine Description:

\* @brief Get values for specified microburst attributes.

\*

\* Arguments:

\* @param[in] microburst\_id – microburst object 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\_tam\_microburst\_attribute\_get\_fn) (

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

\_In\_ uint32\_t attr\_count,

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

);

/\*\*

\* Routine Description:

\* @brief Set microburst attribute value(s).

\*

\* Arguments:

\* @param[in] microburst\_id - microburst object id

\* @param[in] attr\_list - attribute

\*

\* Return Values:

\* @return SAI\_STATUS\_SUCCESS on success

\* Failure status code on error

\*/

typedef sai\_status\_t(\*sai\_tam\_microburst\_attribute\_set\_fn) (

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

\_In\_ uint32\_t attr\_count,

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

);

## Add to sai\_tam\_api\_t:

/\* Microburst object API \*/

sai\_tam\_microburst\_create\_fn tam\_microburst\_create;

sai\_tam\_microburst\_remove\_fn tam\_microburst\_remove;

sai\_tam\_microburst\_attribute\_set\_fn tam\_microburst\_attribute\_set;

sai\_tam\_microburst\_attribute\_get\_fn tam\_microburst\_attribute\_get;

## Changes to saitypes.h

The following are the changes to the saitypes.h file.

* The union **sai\_object\_type\_t** is enhanced to include the following new object types:
  + **SAI\_OBJECT\_TYPE\_TAM\_MICROBURST**,