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SINGLE-CHIP PON

Storm Filtering Control Application Note
(CONFIDENTIAL: Development Partners Only)

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Realtek Semiconductor Corp.
No. 2, Innovation Road II, Hsinchu Science Park, Hsinchu 300, Taiwan
Tel.: +886-3-578-0211 Fax: +886-3-577-6047
www.realtek.com

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REVISION HISTORY

Revision	Release Date	Summary
1.0.0	2017/05/26	First Release

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1. Overview

The storm filtering control is a per port basis traffic control function. It supports 4 types of storm filtering control, including

- Broadcast storm
- Multicast storm
- Unknown destination address storm
- Unknown multicast storm
- ARP storm
- DHCP storm
- IGMP/MLD control frame storm

The type of storm filtering control is a per system control that applied to all ports. The storm filtering type should be configured at beginning.

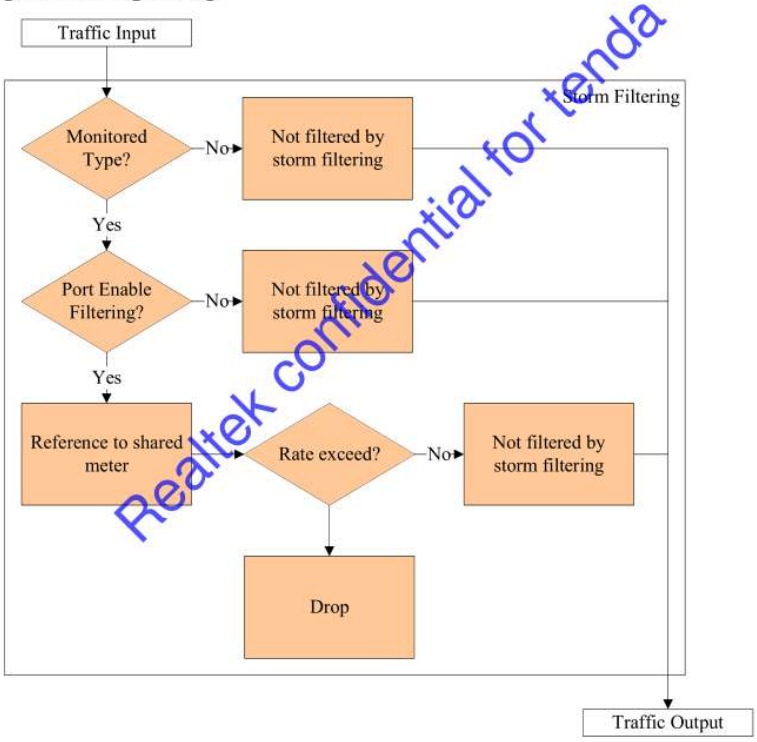

Figure 1. Flowchart of storm filtering control

Storm filtering control works when the specific type of traffic being received by ports. Once the traffic arrives at the port, it is checked with the storm filtering control's configuration to decide if it is the type that being monitored. Then the per-port enable/disable setting is checked. After that, one of the system-wised share meter index is referenced to limit the traffic rate. Overall flowchart is shown in. Figure 1.

There are some reserved multicast addresses defined in 802.1 for specific protocol usage. Sometimes those protocols should not be considered as the storm and being filtered as other multicast traffic. A per-system bypass configuration is provided to skip those addresses in the filter. This configuration make sure those protocol frames won't be filtered by storm filtering. The reserved multicast addresses are

shown in Table 1. Additionally the IGMP/MLD is also supported to bypass the storm filtering. Some of the multicast addresses share the same settings to bypass. For example, 01-08-C2-00-00-22~01-08-C2-00-00-2F share the same settings. For other multicast addresses, please reference to Table 1, the addresses in the same row share the same settings.

Table 1. Reserved Multicast Address

Assignment	Value	OP	DSFC	CKEEP	VLKY	PLKY
Bridge Group Address	01-80-C2-00-00-00	2 bits	1 bit	1 bit	1 bit	1 bit
IEEE Std 802.3， 1988 Edition， Full Duplex PAUSE operation	01-80-C2-00-00-01	2 bits	1 bits	1 bits	1 bits	1 bits
IEEE Std 802.3ad Slow Protocols-Multicast address	01-80-C2-00-00-02	2 bits	1 bits	1 bits	1 bits	1 bits
IEEE Std 802.1X PAE address	01-80-C2-00-00-03	2 bits	1 bits	1 bits	1 bits	1 bits
Reserved	01-80-C2-00-00-04 ~ 01-80-C2-00-00-07 & 01-80-C2-00-00-09 ~ 01-80-C2-00-00-0C& 01-80-C2-00-00-0F	2 bits	1 bits	1 bits	1 bits	1 bits
Provider Bridge Group Address	01-80-C2-00-00-08	2 bits	1 bits	1 bits	1 bits	1 bits
Provider Bridge GVRP Address	01-80-C2-00-00-0D	2 bits	1 bits	1 bits	1 bits	1 bits
IEEE Std. 802.1AB Link Layer Discovery Protocol multicast address	01-80-C2-00-00-0E	2 bits	1 bits	1 bits	1 bits	1 bits
All LANs Bridge Management Group Address	01-80-C2-00-00-10	2 bits	1 bits	1 bits	1 bits	1 bits
Load Server Generic Address	01-80-C2-00-00-11	2 bits	1 bits	1 bits	1 bits	1 bits
Loadable Device Generic Address	01-80-C2-00-00-12	2 bits	1 bits	1 bits	1 bits	1 bits
Reserved	01-80-C2-00-00-13 ~ 01-80-C2-00-00-17 & 01-80-C2-00-00-19 & 01-80-C2-00-00-1B ~ 01-80-C2-00-00-1F	2 bits	1 bits	1 bits	1 bits	1 bits
Generic Address for All Manager Stations	01-80-C2-00-00-18	2 bits	1 bits	1 bits	1 bits	1 bits
Generic Address for All Agent Stations	01-80-C2-00-00-1A	2 bits	1 bits	1 bits	1 bits	1 bits
GMRP Address	*01-80-C2-00-00-20*	2 bits	1 bits	1 bits	1 bits	1 bits
GVRP address	01-80-C2-00-00-21	2 bits	1 bits	1 bits	1 bits	1 bits
Undefined GARP address	01-80-C2-00-00-22 ~ 01-80-C2-00-00-2F	2 bits	1 bits	1 bits	1 bits	1 bits
CDP(Cisco Discovery Protocol)	01-00-0C-CC-CC-CC	2 bits	1 bits	1 bits	1 bits	1 bits
Cisco Shared Spanning Tree Protocol	01-00-0C-CC-CC-CD	2 bits	1 bits	1 bits	1 bits	1 bits

2. API

Realtek API provides a series of interface to let users setup the storm filtering control function without writing register and table directly. This section will discuss these APIs and gives the example.

2.1. Initialization

rtk_rate_init is the first API user should invoke before setup any configuration. This API initializes several modules including storm filtering control. It will disable all type of storm filtering and all ports' storm filtering, too. The configuration flow of storm filtering control is shown in Figure 2.

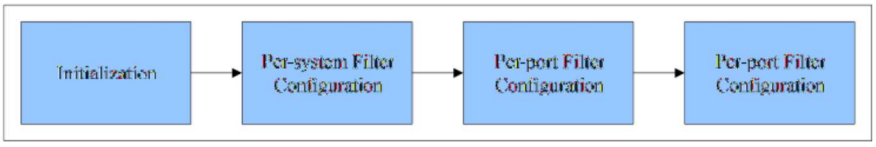

Figure 2. Configuration flow of storm filtering control

2.2. Per-system Storm Filters Configuration

The ***rtk_rate_stormControlEnable_set*** enable/disable the specified filter on the system. Example:

```
/*
 * Enable broadcast, unknown multicast storm filtering control
 */

int ret;
rtk_rate_storm_group_ctrl_t stormCtrl;

memset(&stormCtrl, 0, sizeof(rtk_rate_storm_group_ctrl_t));
stormCtrl.broadcast_enable = 1;
stormCtrl.unknown_multicast_enable = 1;

if((ret = rtk_rate_stormControlEnable_set(&stormCtrl)) != RT_ERR_OK)
{
    return ret;
}
```


One additional thing should be taken cared that every time invoke this API, the one being disabled will also disable all port for that filter.

2.3. Per-port Storm Filter Configuration

The ***rtk_rate_stormControlPortEnable_set*** enable/disable the specified filter of the port. Beware that the port filter enable should only apply to the filter that globally enabled. Otherwise an error will be return for the API. Example:

```
* Example of enable the system broadcast filter and
 * enable it on port 0 (zero based port index)
 */

int ret;
rtk_port_t cfgPort;
rtk_rate_storm_group_ctrl_t stormCtrl;

memset(&stormCtrl, 0, sizeof(rtk_rate_storm_group_ctrl_t));
/* Enable the system-wise broadcast filter only
 * All other filters are disabled
 */
stormCtrl.broadcast_enable = 1;

if((ret = rtk_rate_stormControlEnable_set(&stormCtrl)) != RT_ERR_OK)
{
    return ret;
}

/* Enable port broadcast filter on UTP port 0 (zero based port index) */
rtk_switch_phyPortId_get(RTK_PORT_UTP0,&cfgPort);
if((ret = rtk_rate_stormControlPortEnable_set(cfgPort,
                                              STORM_GROUP_BROADCAST,
                                              ENABLED)) != RT_ERR_OK)
{
    return ret;
}
```


2.4. Per-port Share Meter Configuration

The ***rtk_rate_stormControlMeterIdx_set*** set the share meter index of the specified filter of the port. Beware that the port filter enable should only apply to the filter that globally enabled. Otherwise an error will be return for the API. Example:

```
/* Example of enable the system Multicast filter and
 * configure its share meter index on port 0(zero based port index)
 */

int ret;
```

```
rtk_port_t cfgPort;
rtk_rate_storm_group_ctrl_t stormCtrl;

memset(&stormCtrl, 0, sizeof(rtk_rate_storm_group_ctrl_t));
/* Enable the system-wise Multicast filter only
 * All other filters are disabled
 */
stormCtrl.multicast_enable = 1;

if((ret = rtk_rate_stormControlEnable_set(&stormCtrl)) != RT_ERR_OK)
{
    return ret;
}

/*
 *Set multicast storm control meter index 1 on UTP port 0
*/
rtk_switch_phyPortId_get(RTK_PORT_UTP0,&cfgPort);
if((ret = rtk_rate_stormControlMeterIdx_set (cfgPort,
                                             STORM_GROUP_MULTICAST,
                                             1)) != RT_ERR_OK)
{
    return ret;
}

/*
 *Set meter entry index 1 for 10Mbps
*/
if((ret = rtk_rate_shareMeterMode_set(1, METER_MODE_BIT_RATE))
!=RT_ERR_OK)
{
    return ret;
}

if((ret    =    rtk_rate_shareMeter_set(pDot1RateMeter->meterId,    10*1000,
DISABLED)) !=RT_ERR_OK)
{
    return ret;
}
```

2.5. Per-system Bypass Configuration

The ***rtk_rate_stormBypass_set*** set the bypass configuration of the specific multicast address. Beware that some of the multicast address share the same settings.

```
/*
 *Example of bypass reserved multicast addresses
 */

int ret;
/*
 * Bypass bridge group address, load server generic address,
 * GMRP address and 01-80-C2-00-00-25 (undefined GVRP address)
 */

if((ret = rtk_rate_stormBypass_set(BYPASS_BRG_GROUP,
                                   ENABLED)) != RT_ERR_OK)
{
    return ret;
}

if((ret = rtk_rate_stormBypass_set(BYPASS_UNDEFINED_11,
                                   ENABLED)) != RT_ERR_OK)
{
    return ret;
}

if((ret = rtk_rate_stormBypass_set(BYPASS_UNDEF_GARP_25,
                                   ENABLED)) != RT_ERR_OK)
{
    return ret;
}
```

Realtek Semiconductor Corp.
Headquarters
No. 2, Innovation Road II, Hsinchu Science Park,
Hsinchu 300, Taiwan, R.O.C.
Tel: 886-3-5780211 Fax: 886-3-5776047
www.realtek.com