Stream Reservation Class in MSRPv0 (AVB)

- Two SR Classes: Class A and Class B - both for CBS
- SR Class parameters - consistent in the domain
  - `srClassID`: fixed, no managed objects, only deployed in domain discovery
  - `measurement interval`: fixed, no managed objects
  - `priority`: default values defined, configurable by management

<table>
<thead>
<tr>
<th>AVB (for CBS)</th>
<th>SR Class (ID)</th>
<th>Class measurement interval</th>
<th>Priority</th>
<th>Traffic Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A  6</td>
<td>125 µs</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>B  5</td>
<td>250 µs</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 35-7: fixed
Clause 34.4: fixed
Table 6-5: default
Table 34-1: default

*domain-wide consistent*
Stream Reservation Class in MSRPv1 (Qcc)

- two managed objects added to Class A and B for CBS
  - classMeasurementInterval - read & write
  - srClassId - read-only

- But no SR class defined for the new TSN shapers other than CBS
  - streams demanding non-CBS shaping need to be handled by CNC
  - different shaping among bridges for the same stream is not supported in the fully distributed model

<table>
<thead>
<tr>
<th>Qcc D1.0 (for CBS)</th>
<th>SR Class (ID)</th>
<th>Class measurement interval</th>
<th>Priority</th>
<th>Traffic Class</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>125 μs</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>250 μs</td>
<td>2</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 35-7: fixed (readable)  
Clause 34.4: fixed->default  
Table 6-5: default  
Table 34-1: default
Industrial Requirements for Configurable SR Class

Intended configuration flow in the industrial TSN networks

- SR classes are defined during the network planning and configured onto the network per management (network engineering)
- configured SR class parameters are propagated to end stations
- end stations request streams with SRP using the SR classes configured in the network

Benefits of using SR Class in industrial TSN network

- easier mapping of application requirements to network service classes
- reduced complexity in designing the stream reservation protocol for TSN

Requirements for configurable SR Class

- SR class parameters are configurable per management
- shaper assignment for a SR class is bridge-specific and configurable per management
Information Flow in an Industrial TSN Network

Applications

Network Planning

1. SRClass Configuration on network (offline by management)

2. SRClass Parameters to end-station (runtime by protocol@UNI)

3. SRClass-based Stream Reservation (runtime by SRP)

Applications => Service Classes (prio, shaper, etc.)
Proposals for Configurable SR Class

- make SR class parameters configurable
- allow flexible assignment of shaper to SR class
- not mandate consistent shaping for the same SR class

**Domain wide consistent**

**SR Class Configuration**
- srClassID
- priority
- class measurement interval

**Bridge local**

- priority => traffic class (q)
- traffic class (q) => shaper

SR Class Parameters

SRP Talker Advertise
( DA, Vlan, **priority**, Tspec, ... )
Example SR Class Configuration

SR Class configuration

**SR Class X**
- srClassID = 1
- Prio = 5
- Interval = 125 μs

**SR Class Y**
- srClassID = 2
- Prio = 4
- Interval = 500 μs

Domain SR Class X
- Prio 5 => T.C. 7
- Qav

Domain SR Class Y
- Prio 4 => T.C. 6
- Qav

SRP Talker Advertise (DA, Vlan, **Prio 5**, Tspec, ...)

(srClassID=1, Prio = 5, 125μs)

(srClassID=2, Prio=4, 500μs)
Dependencies of SRP Attributes and Bridge Configuration

**SRP Bridge Configuration**

- **DA**
- **VID**
- **Prio.**
- **TSpec**

**SR Class**
- **priority**
- **Class Measurement Interval**

**FDB (forwarding)**

**Queue & Shaper**

**Bandwidth Configuration**

**Latency Calculation**

**Bridge Management**

**Data Frame**
- **DA**
- **VID**
- **Prio.**

**Ingress Policing**

**Forwarding Port**

**Egress Queue**

**Shaper**

**HW Data Plane**
Conclusion

Proposals for configurable SR Class in TSN

- configurable SR Class parameters
  - srClassID, measurement interval and priority
- flexible shaper assignment for SR class
  - allow use of the new TSN shaper in SR class
  - allow different shaping among bridges on the same SR class

Only **minimal changes** in the SRP Protocol are required to support configurable SR Classes and new TSN shapers
Thank you for your attention!

Feng Chen
Siemens AG
Digital Factory Division
Technology and Innovations
Gleiwitzer Str. 555
90475 Nuremberg, Germany

Phone: +49 (911) 895-4955
E-Mail: chen.feng@siemens.com

siemens.com/answers