Profile Building-Blocks

IEEE P802.1DG
Automotive TSN Profile
Modular Profile Overview
Time Sync Automotive .1AS Profile

- Bridge: support at least 2 Domains (IDs configurable, same “accuracy”)
  - CMLDS (one way)
- End Station (time receiver): Single Domain required only (ID configurable)
- Try to align with Aerospace/Autosar
  - one way pDelay
  - continued Sync from Bridge after lost input
  - no BMCA - external Port Configuration only
  - no Announce
  - default message rates (Sync: 125ms, pDelay: 31.25ms)
  - Exclude Signalling Messages
- No requirements on the GM (ARB or TAI)
- Exclude ASdm - Redundancy
- Exclude ASds - 10BASE-T1S
Basic TSN Profile Extension - Page 1

- Strict Priority Queuing
  - Minimum Number of Queues (TCs) per egress Port: 8
  - Default mapping of PCP to TC Priority (.1Qci interaction?)
- Policing using .1Qci (max. Frame Size, max. Frame Rate - i.e. per Observation interval, ...)
- Assume VLAN Global ARL (not per VLAN ID)
- Enable .1Qci Queue selection per ingress Port (for SPQ, CBS, and ATS!)
  - Minimum number of Destination MAC and VLAN (“Null Stream”) Ident.: 128 (define wildcards!)
  - Minimum number of Source MAC and VLAN Stream Ident.: 64
  - Minimum number of IP Stream Ident.: 128 (need to define ARP and VLAN wildcards!)
  - Minimum number of Mask-and-match Stream identification: 0
  - Minimum number of Active Destination MAC and VLAN Stream identification: 0
<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>32</td>
<td>128</td>
<td>= MIN(256; $C$1 + MAX(0; A19*B$1-$C$1))</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>m:</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td></td>
<td>128</td>
</tr>
<tr>
<td>7</td>
<td>4</td>
<td></td>
<td>128</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td></td>
<td>160</td>
</tr>
<tr>
<td>9</td>
<td>6</td>
<td></td>
<td>192</td>
</tr>
<tr>
<td>10</td>
<td>7</td>
<td></td>
<td>224</td>
</tr>
<tr>
<td>11</td>
<td>8</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>12</td>
<td>9</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>13</td>
<td>10</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>14</td>
<td>12</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>15</td>
<td>14</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>16</td>
<td>16</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>18</td>
<td>20</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>19</td>
<td>30</td>
<td></td>
<td>256</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Credit Based Shaper (CBS)
  • Minimum number of CBS enabled Queues (TCs): 2
  • Default Priority Setting as per AVB (.1Qci interaction)
  • Configuration via OperIdleSlope (not Observation Interval) - min. granularity per Line Rate?

• Asynchronous Traffic Shaper (ATS)
  • Minimum number of ATS enabled Queues (TCs) per egress Port: 2
  • Minimum number of Shapers per number of ingress Ports per Queue (TC): 8
  • Minimum number of Shaper Groups (TC) per egress Port: 8
Applicability to Talkers (vs. Bridges)

• All “egress features” for a single egress Port apply
• “Ingress Ports” equate to “Applications”?
• Policing via .1Qci mandatory
Profile Extension TAS

• Add Time Aware Shaper (TAS):
  • Minimum timing accuracy per Line Rate (10MB, 100MB, 1G, 2.5G) and Mode
  • Number of Entries per Control List per Mode
  • Require continuous GateOpenTimes (per Gate OperCycleTime, i.e. allow integer multiplexing)

• Support of Phased Mode (CQF and Bus supported):
  • Minimum Number of Entries per Control List per TC per egress Port: 32

• Support of Bus Mode (CQF supported):
  • Minimum Number of Entries per Control List per TC per egress Port: 8

• Support of CQF Mode (only!):
  • Minimum Number of Queues per Port: 2

• Allow with eMAC Extension? No
• Point out dependencies on ARP, PTP, ...
• Give Latency and Configuration restrictions
Profile Extension eMAC

- Preemption
  - Minimum Number of Queues Supported for express-MAC: 1
  - Require Policing via 1Qci:
    - Frame Size
    - Frame Rate

- No shaping in eMAC queues
- Describe latency impact
- Allow with TAS Extension? No
In NONE of the Profile Blocks for Version 1

The following features are currently not mandatory for compliance with any profile extension:

• Security
• Any run-time configuration via any communication protocol (LLDP, LLRP, MAAP, NetConf, SRP, MRP, RAP, SOME/IP, UDS, ...)
• No Requirement to implement YANG or MIB DBs - Configuration parameters are “abstract”
• Enhanced Transmission Selection not required
• Frame-Replication and Frame-Recovery (“Redundancy”)
Max Turner
Utrechtseweg 75
NL-3702AA Zeist
The Netherlands
+49 177 863 7804
max.turner@ethernovia.com