QoS Setup Guide
Application Note 306 – QoS Setup Procedure

QoS Set-up Guide
This application note describes how to set up QoS on Transition Networks ION modules that support Layer-2 switch QoS functions of priority classification, queuing and remarking.

1. Port Priority Queues:
Each port contains 4 different classes of output priority queues.

<table>
<thead>
<tr>
<th>Priority Queue</th>
<th>Frame Type</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Best Effort</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>Background</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>Excellent Effort</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Critical Applications</td>
<td>8</td>
</tr>
</tbody>
</table>

The packets will be transmitted from these queues in the weighted round-robin fashion with the weights of 8:4:2:1 for the class queues 3, 2, 1 and 0.

2. Classification:
Incoming packets to a port can be classified based on L2 CoS (IEEE 802.1p) or L3 IP DiffServ (IPv4/IPv6) priority field or port default priority. Section-5 details how port/L2/L3 classification can be configured per port.

IEEE priority re-mapping:
When a packet is classified by L2 CoS priority, it will be re-mapped to another L2 priority value as defined in the per-port priority re-mapping table in Figure-3.

IP priority re-mapping:
When a packet is classified by IP priority, it will be re-mapped by the global IP remapping table in Figure-2. The re-mapped 2 bit priority value would be used for 2 purposes:

1) These 2 bit class values would directly map to the output queue of the egress port
2) Egress priority re-marking of the frame. When the packet is eligible for remarking, it would be scaled-up to 3-bits, by borrowing the least significant bit of the port default priority.
3. Queuing:
Once the incoming packet is classified/re-mapped based on port/L2/L3 priority, the packet would be queued to the egress port queue based on the global system queue remapping table.

3.1) L2 priority
Packet classified by port L2 default or frame L2 priority will be queued based on the “IEEE Priority Class” re-mapping table in Figure-1.

3.2) IP priority
Packet classified by IP priority will be queued based on the “IP Traffic Class” remapping table in Figure-2.

4. Classification and Queuing configuration options:
The following classification/queuing options are available and this is configured per port.

4.1) port default priority
This can be enabled per port by disabling “IEEE Priority Class” and “IP Traffic Class”. All the frames would be assigned to the port default priority. In the following example, port default priority has been set to “4”.

<table>
<thead>
<tr>
<th>Priority Forwarding Rules</th>
</tr>
</thead>
<tbody>
<tr>
<td>Default Priority</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

4.2) IEEE priority only
This can be configured per port by enabling “IEEE Priority Class” and disabling “IP Traffic Class”. All untagged frames (including IP) would be assigned to the port default priority.

<table>
<thead>
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<tbody>
<tr>
<td>Default Priority</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

4.3) IP priority only
This can be configured per port by enabling “IP Traffic Class” and disabling “IEEE Priority Class”. Tagged and non-IP frames would be assigned to the port default priority.
4.4) IP and IEEE priority with the precedence of IP
This can be configured per port by enabling both “IEEE Priority Class” and “IP Traffic Class” and “Priority Precedence” set to “Use IP”.

Note: The Tagged IP packet would get queued to one of the egress port priority queues as per the global IP-remapping table. However, the remapped IEEE priority value will be used for re-marking the packet.

4.5) IP and IEEE priority with the precedence of IEEE
This can be configured per port by enabling both “IEEE Priority Class” and “IP Traffic Class” and “Priority Precedence” set to “Use IEEE.”

Note: Tagged IP packet would get queued on the egress port as per the global IEEE remapping table.

Option (4) and (5) differs only in which how a packet gets queued. The frame re-marking priority would work in the same way for both options.

5. Priority Override:
The initial re-mapped priority value can be further over-ridden by VLAN or per frame SA/DA.
The following one or more overrides can be enabled per port. Should more than one override match, the following order of priority is applied (i.e., DA would override all other):

1) VID Priority Override
2) SA Priority Override
3) DA Priority Override

The higher order 2 bits of the VID/MAC priority will be used as the queue re-mapped priority.

6.1) VID Priority Override
This requires the VLAN entry to be configured with the desired priority in the VLAN database.
In the above example, the VLAN 100 packets egress on port with the priority marked/remarked to priority “7”. The higher 2 bits of the VID priority (0x7) will be used as the queue priority. Hence, the packets will get queued to the output queue “3”.

6.2) SA/DA Priority Override
Priority override for SA/DA must be added to the MAC table as a static entry with the desired priority.
7. Remarking:
Packet IEEE priority could be re-marked with the value assigned during the ingress classification/priority override. This would require proper VLAN configuration with the egress port defined as ”memEgressTag” in the VLAN DB. Please refer to the VLAN configuration application note (App Note 302) for VLAN configuration details.
8. Appendix – Figures

Figure (1) – “IEEE Priority Class” – System level queue priority remapping table.
Figure (2) – “IP Traffic Class” – System Level IP Traffic class remapping table
Figure (3) – “User Priority” – Port level IEEE priority remapping table