Introduction

This document describes how the Cisco Digital Content Manager (DCM) handles incoming Program Clock Reference (PCR) packets and provides guidelines to configure and troubleshoot PCR dejittering.

Program Clock Reference

When the Cisco DCM handles an incoming Transport Stream (TS), it locks on the incoming TS and then uses a PCR that is available in that TS. The Cisco DCM needs correct PCRs (as per the MPEG2 specification) to synchronize on the incoming stream, to calculate the incoming bitrate and to multiplex the services.

Note: When multiplexing, the Cisco DCM does not regenerates the PCR values from the scratch, but recalculates the PCR value based on the incoming PCRs.

Buffer overflows

The incoming TS can contain an out of specification PCR caused by a fault in the device that re-encodes the TS. Network jitter might delay the arrival of PCR packets.

When the Cisco DCM passes the services to the output, it passes the Elementary Stream Packets in a buffer using the speed calculated from the inserted PCR clock. Issues with PCR on the incoming services can result in buffer overflow or underflow messages and buffer reset is seen in the Cisco DCM board logs. The Cisco DCM performs a buffer reset that moment and that results in output faults.

Configure (Best Practices)

These configuration guidelines help to configure a stable input configuration. It also helps to make
changes when input problems are seen.

Time Base Selection

The first configuration decision is whether to perform dejittering on a CBR (Constant Bit Rate) stream or a VBR (Variable Bit Rate) stream.

CBR dejittering

When choosing **CBR-Auto, CBR-Auto Ref. PCR or CBR-Forced PCR de-jittering** mode, the stream bitrate is only estimated if the stream is acquired. This means that the stream is expected to have a constant bitrate. The advantage of using CBR dejittering is that small PCR faults not result in a buffer reset.

VBR dejittering

The Cisco DCM continuously measures the incoming PCR when it is configured in **Auto, Auto Ref PCR or Forced PCR** mode. This mode must be used when the incoming stream is a VBR stream.

**Warning:** Independent of the dejitter choice, an incoming Multiple Program Transport Stream (MPTS) always needs to be a CBR stream.

PCR Packet ID (PID) Choice

The Cisco DCM has three configuration modes to choose the PCR PID that is used for dejittering the incoming stream.

**Auto mode**

In the default auto mode the Cisco DCM looks for the first incoming PID that contains a packet with a PCR flag. The selected PID is used for further dejittering of the stream until it disappears or times out.

A problem can occur when the service has also packets with an incorrect PCR value (example: merge of a radio service on a video service).
Auto Ref mode: Referenced in PMT mode

A recommended setting is the **Reference** mode. In this case the DCM looks up the PID that is referenced in the Program Map Table (PMT) of the incoming TS.

**Forced mode**

It is possible that some PCR's PIDs are out of spec. To avoid that these PIDs are used, the user can also manually configure a PID to be used. The disadvantage in this configuration is that the PID can disappear from the MPTS due to source reconfigurations.

**Latency Setting**

The source is expected to insert a PCR within 100 ms when encoding, transrating or transcoding a service. The insertion of a PCR packet is called the PCR repetition. In order to calculate the bitrate it is necessary that the DCM has a buffer larger than the PCR window (2 PCR packet). If this is not the case, a PCR discontinuity error occurs. A default buffer of 110 ms is used in the Cisco DCM; 10 ms are added to cope with network and packetization jitter.

It is possible that to increase the buffer to a value of 180 ms that can avoid resets when the network introduces some network jitter, causing a delay in packet arrival.

**Configuration**

The configuration is a board setting. Changes can be made in the **Default Settings** tab of the board.

**Troubleshoot**

When buffer resets are seen in the Cisco DCM alarms, some investigation must be done in order to identify the root cause of the resets as they can lead to picture and audio faults.

For Root Cause analysis of the dejitter issues you can gather this data
Alarms

Use your management system or use the DCM alarm history to identify dejitter buffer alarms. These alarms show the incoming multicast IP address and the board/port where the stream arrives. This info can be used to find back the TS Index (needed to find the information in the logs), for example, as shown in this table.

<table>
<thead>
<tr>
<th>Dejitter Buffer Reset</th>
<th>Board 2, Port 1, TS 232.13.201.23:9900</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dejitter Buffer Reset</td>
<td>Board 2, Port 1, TS 232.13.201.23:9900</td>
</tr>
</tbody>
</table>

TS index/TS ident

With the above information, the TS index/TS ident can be found in the status/diagnostics/stream Info page.

Numerically Controlled Oscillator (NCO) buffer reset

The Cisco DCM traces that are located in the Help/Traces page show more detail on the error that occurred. You can use the words resetting NCO and the TS index/TS Ident to find the error. These are 2 examples of resets displayed in the logs taken on a DCM version 16 release:

Gigabit Ethernet (Gbe) Board Log

The Gbe board shows resets of TS index 4 with a buffertime of 231674.

```
Sep 2 01:54:17 board2 DCM_IO[2789]: ** ERR-MIN: ResetCounter=5;TsIndex=4;BufferTime=231674;NrResets=3896;resetting_NCO
Sep 2 01:54:17 board2 DCM_IO[2789]: !! ERR-MIN: 0: virtual bool CApplicFW_GBE_Dejittering::ResetNCO
Sep 2 01:54:17 board2 DCM_IO[2789]: ** ERR-MIN: Resetting NCO buffers of TS Index 4
```
Media Interface Card (MIC) Log

On the MIC card or 10 gigabit card of a version 16 DCM the Stream Ident is used to show what streams had input problems that resulted in Buffer Resets.

Jun 12 19:38:55 board2 DCM_IO[3568]: !! TRA-INF:MuxCore: StreamIn Ident 462 -> void
MuxCore::CGbeStreamIn::TriggerDejitterBufferResetAlarm
Jun 12 19:38:55 board2 DCM_IO[3568]: ** TRA-INF: Detecting Dejitter Buffer Reset...

PCR Graph

The Cisco DCM has a possibility to make a graph of the dejitter buffer level if you have a version 15 or higher. This information might be useful to see the behavior of the incoming stream over a longer period of time. The graph configuration and display is reachable form the status/diagnostics/stream info page.

Input Captures

Analyzing the incoming IP packets and transport stream is a necessity to find the root cause. Cisco TAC can assist on this. It is important to capture a transport stream when the problem is seen. The Cisco DCM has the possibility to capture the TS.

This procedure shows you how to capture the TS using the Cisco DCM.

1. Select Capture TS from the incoming TS or navigate to Help/Maintenance
2. With this you can start a capture and stop the capture if you see a problem. The capture functionality gives you the option of automatic stop when the issue has been seen. For this you need to use data that is logged in the board traces. The capture is stopped when the Resetting NCO log occurs in the Board2 trace, as shown in this image.

3. When the capture is stopped you can download it to a local PC by pressing the Folder icon under the Capture Settings Overview option.

**TAC Assistance**

If the assistance from Cisco TAC is needed, this data must be provided after opening a Service Request.

- Complete logs of the DCM
- TS index of the incoming transport stream
- The PCR graph if available
- An IP input capture when the problem has been seen