Network Configuration Example

Inline Video Monitoring Using Media Delivery Index Metrics

Modified: 2016-12-13

Juniper Networks, Inc.
1133 Innovation Way
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

Network Configuration Example Inline Video Monitoring Using Media Delivery Index Metrics

The information in this document is current as of the date on the title page.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at http://www.juniper.net/support/eula.html. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

CHAPTER 1

Inline Video Monitoring Using Media Delivery Index Metrics

About This Network Configuration Example

This network configuration example provides an overview of inline video monitoring and an example of how to enable inline video monitoring on MX Series 3D Universal Edge Routers equipped with MPC line cards. You can use this document to familiarize yourself with the benefits of inline video monitoring for detecting and correcting video transmission problems. Inline video monitoring is available with Junos OS Release 14.1 and subsequent releases.

Introduction to Inline Video Monitoring

The Juniper Networks® Junos® operating system (Junos OS) supports inline video monitoring using Media Delivery Index (MDI) metrics.

Inline video monitoring is available on MX Series 3D Universal Edge Routers using the following MPCs:

- MPCE1
- MPCE2
- MPC-16XGE

You use the **video-monitoring** statement at the **[edit services]** hierarchy level to specify monitoring criteria for two key indicators of video traffic problems: delay factor and media loss rate (MLR). You also use this statement to apply these metrics to flows on designated interfaces.

The following sections describe terms related to inline video monitoring and contain an overview of the configuration.

Inline Video Monitoring Terminology

Before you use the inline video monitoring feature, ensure that you understand the following terms:

- **Media Delivery Index**—MDI metrics facilitate identification of buffering needs for streaming media. Buffering must be adequate to compensate for packet jitter, measured by the MDI delay factor, and quality problems indicated by lost packets, measured by the MDI media loss rate. By performing measurements under varying load conditions, you can identify sources of significant jitter or packet loss and take appropriate action.
- **Delay factor**—Delay factor is the maximum observed time difference between the arrival of media data and the drain of media data. The expected drain rate is the nominal, constant traffic rate for constant bit rate streams or the computed traffic rate of variable rate media stream packet data.

  For typical stream rates of 1 megabit per second and higher, an interval of 1 second provides an adequate sample time. The delay factor indicates how long a data stream must be buffered (delayed) at its nominal bit rate to prevent packet loss.

  The delay factor suggests the minimum size of the buffer required at the next downstream node. As a stream progresses, the variation of the delay factor indicates packet bunching or packet gaps (jitter). Greater delay factor values also indicate that more network latency is needed to deliver a stream due to the need to pre-fill a receive buffer before beginning the drain to guarantee no underflow.

  When the nominal drain bit rate at a receiving node is known, the delay factor's maximum indicates the size of buffer required to accommodate packet jitter.
- **Media rate variation (MRV)**—This value is the difference between the expected packet rate and actual packet rate expressed as a percentage of the expected packet rate.
- **Media loss rate (MLR)**—This value is the number of media packets lost over a configurable time interval (***interval-duration***), where the flow packets are packets carrying streaming application information. A single IP packet can contain zero or more streaming packets. For example, an IP packet typically contains seven 188-byte MPEG transport stream packets. In this case, a single IP packet loss results in seven lost packets counted (if those seven lost packets did not include null packets). Including out-of-order packets is important, because many stream consumer-type devices do not attempt to reorder packets that are received out of order.

Configuration Overview

To configure the monitoring process, define criteria templates and apply them to the interfaces and flows you want to monitor. Monitoring templates include the following criteria:

- Duration of each measurement cycle
- Flow rate information used to establish expected flow rates
- Threshold levels for media rate variation and media loss rate that trigger desired syslog alerts

For each interface you want to monitor, you can define one or more filters to select flows for monitoring. Flows are designated as input or output flows and are uniquely identified by:

- Source IP address
- Source port
- Destination IP address
- Destination port

Junos OS supports the definition of filters for up to 256 flows, which can consist of input flows, output flows, or a combination of input and output flows. These filters provide criteria for selecting flows for monitoring. If the selection criteria consist of lists of IP addresses or ports, you could exceed the maximum number of match conditions for flows. Video monitoring selects a widely variable number of flows based on flow filters. The total number of flows that can be measured at a time depends on the specific MPC card being used, as shown in Table 1 on page 7.

When you do not define input or output flow filters for a monitored interface, all flows on the interface are subject to monitoring.

Table 1: MPC Flow Monitoring Capacity by Model

MPC Model	Maximum Number of Flows Monitored Simultaneously
MPCE1	1000
MPCE2	2000
MPC-16XGE	4000

NOTE: Junos OS measures both UDP flows (by default) and RTP flows. Junos OS differentiates media traffic over UDP or RTP by inspecting the first byte in the UDP payload. If the first byte of the UDP payload is 0x47 (MPEG2-TS sync byte), the traffic is treated as media traffic over UDP. Traffic is treated as media traffic over RTP if the version field is 2 and the payload type is 33 in the RTP header. When neither of these criteria are met, the packet is not considered for video monitoring.

Example: Configuring Inline Video Monitoring Using Media Delivery Index Metrics

This example shows how to configure monitoring of video streaming efficiency using Media Delivery Index (MDI) metrics.

Requirements

This example uses the following hardware and software components:

- MX Series 3D Universal Edge Router
- One of the following MPC interface cards:
  - MPCE1
  - MPCE2
  - MPC-16XGE
- Junos OS Release 14.1 or later

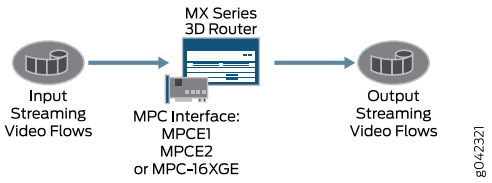
Overview

Junos OS Release 14.1 introduces support for video monitoring using MDI criteria. MDI information enables you to quickly identify devices causing excessive jitter or packet loss in streaming video applications.

Topology

The topology for inline video monitoring is shown in Figure 1 on page 8

Figure 1: Inline Video Monitoring



Configuration

CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them into a text file, remove any line breaks, change any details necessary to match your network configuration, copy and paste the commands into the CLI at the **[edit]** hierarchy level, and then enter **commit** from configuration mode.

```
set interfaces ge-2/0/6 unit 0 family inet address 60.0.0.1/24
set interfaces xe-2/2/1 unit 0 family inet address 20.0.0.1/24
set services video-monitoring templates t1 interval-duration 1
set services video-monitoring templates t1 inactive-timeout 30
set services video-monitoring templates t1 rate media 2972400
```

```
set services video-monitoring templates t1 delay-factor threshold info 100
set services video-monitoring templates t1 delay-factor threshold warning 200
set services video-monitoring templates t1 delay-factor threshold critical 500
set services video-monitoring templates t1 media-loss-rate threshold info percentage 5
set services video-monitoring templates t1 media-loss-rate threshold warning percentage
  10
set services video-monitoring templates t1 media-loss-rate threshold critical percentage
  20
set services video-monitoring templates t1 media-rate-variation threshold info 10
set services video-monitoring templates t1 media-rate-variation threshold warning 15
set services video-monitoring templates t1 media-rate-variation threshold critical 20
set services video-monitoring templates t1 media-packets-count-in-layer3 7
set services video-monitoring templates t1 media-packet-size 188
set services video-monitoring templates t2 interval-duration 1
set services video-monitoring templates t2 inactive-timeout 30
set services video-monitoring templates t2 rate media 2972400
set services video-monitoring templates t2 media-packets-count-in-layer3 7
set services video-monitoring templates t2 media-packet-size 188
set services video-monitoring interfaces xe-2/2/1.0 family inet input-flows f1 template
  t1
set services video-monitoring interfaces xe-2/2/1.0 family inet input-flows f1
  source-address 20.0.2.0/32 source-port 1024 destination-address 60.0.0.2
set services video-monitoring interfaces ge-2/0/6.0 family inet output-flows f2 template
  t2
```

Configuring Interfaces

Step-by-Step Procedure

To configure the interfaces for input flows, output flows, or both:

1. Define an interface for input media flow traffic.

   ```
   [edit]
   user@host# set interfaces xe-2/2/1 unit 0 family inet address 20.0.0.1/24
   ```

2. Define an interface for output media flow traffic.

   ```
   [edit]
   user@host# set interfaces ge-2/0/6 unit 0 family inet address 60.0.0.1/24
   ```

Configuring Selection of Flows for Monitoring

Step-by-Step Procedure

To configure input media flows, output media flows, or both for video monitoring:

1. Specify an interface subject to input flow monitoring, including the interface name, xe-2/2/1.0, the name of the flow definition, f1, the type of flows measured, input flows, and the name of the template used for defining the flows, t1.

   ```
   [edit]
   user@host# set services video-monitoring interfaces xe-2/2/1.0 family inet input-flows f1
   template t1
   ```

2. For the same interface, specify any selection criteria to limit the number of flows selected for monitoring.

   You can select based on any combination of source IP, source port, destination IP, and destination port. If you do not specify selection criteria, all flows containing media packets are monitored. In this example, we are limiting monitoring to flows with source IP 20.0.2.0/32, source port 1024, and destination IP 60.0.0.2

```
[edit]
user@host# set services video-monitoring interfaces xe-2/2/1.0 family inet input-flows f1
source-address 20.0.2.0/32 source-port 1024 destination-address 60.0.0.2
```

3. Specify an interface subject to output flow monitoring, including the interface name, ge-2/0/6.0, the name of the flow definition, f2, the type of flows measured, output flows, and the name of the template used for defining the flows, t2.

```
[edit]
user@host# set services video-monitoring interfaces ge-2/0/6.0 family inet output-flows
f2 template t2
```

4. For the same interface, specify any selection criteria to limit the number of flows selected for monitoring.

   In this example, no output flow selection criteria are specified, meaning that all output media flows are selected for monitoring.

Results From configuration mode, confirm your configuration by entering the **show services video-monitoring interfaces** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show services video-monitoring interfaces
xe-2/2/1.0 {
  family {
    inet {
      input-flows {
        f1 {
          source-address 20.0.2.0/32;
          destination-address 60.0.0.2;
          source-port 1024;
          template t1;
        }
      }
    }
  }
}
ge-2/0/6.0 {
  family {
    inet {
      output-flows {
        f2 {
          template t2;
        }
      }
    }
  }
}
```

Configuring Monitoring Templates for Input and Output Flows

Step-by-Step Procedure

You can configure monitoring templates specifying monitoring criteria to apply to selected flows. The monitoring templates specify expected flow rates and the number of media packets expected in an IP packet. The templates can also be used to specify threshold values for delay factor, media rate variation, and media loss rate. Log messages are created when the threshold values are exceeded.

To configure monitoring templates for input and output flows:

1. Configure measurement parameters for flows, including expected rate and packet size information, name the template t1, and include the duration of measuring intervals (in seconds).

   This template is used for input flows and includes the following information:

template name	t1
duration of measurement interval (seconds)	1
timeout (seconds of inactivity before concluding measurement of a flow)	30
expected media rate in bits per second	2972400
number of media packets in Layer 3 IP packet	7
size of a media packet in bytes	100

```
[edit]
user@host# set services video-monitoring templates t1 interval-duration 1
user@host# set services video-monitoring templates t1 timeout 30
user@host# set services video-monitoring templates t1 rate media 2972400
user@host# set services video-monitoring templates t1 media-packets-count-in-layer3 7
user@host# set services video-monitoring templates t1 media-packet-size 188
```

2. Configure threshold levels for generating SYSLOG messages.

   For each of the following optional thresholds, you specify the level of the SYSLOG message generated when the threshold is exceeded. The levels are critical, warning, and info; you can define 0 to 3 SYSLOG message thresholds for each measurement.

delay-factor (milliseconds) threshold info	100
delay-factor threshold warning	200
delay-factor threshold critical	500
media-loss-rate (percentage) threshold info	5
media-loss-rate threshold warning	10
media-loss-rate threshold critical	20

media-rate-variation threshold info	10
media-rate-variation threshold warning	15
media-rate-variation threshold critical	20

```
[edit]
user@host# set services video-monitoring templates t1 delay-factor threshold info 100
user@host# set services video-monitoring templates t1 delay-factor threshold warning
200
user@host# set services video-monitoring templates t1 delay-factor threshold critical 500
user@host# set services video-monitoring templates t1 media-loss-rate threshold info
percentage 5
user@host# set services video-monitoring templates t1 media-loss-rate threshold warning
percentage 10
user@host# set services video-monitoring templates t1 media-loss-rate threshold critical
percentage 20
user@host# set services video-monitoring templates t1 media-rate-variation threshold
info 10
user@host# set services video-monitoring templates t1 media-rate-variation threshold
warning 15
user@host# set services video-monitoring templates t1 media-rate-variation threshold
critical 20
```

3. Configure a template containing measurement parameters for output flows.

   In this example, template t2 is used to configure monitoring criteria that are applied to the output interface definition. This template does not specify threshold levels for SYSLOG messages, indicating that the user is interested only in monitoring statistics, error information, and flow statistics that are available via show commands.

   ```
   [edit]
   user@host# set services video-monitoring templates t2 interval-duration 1
   user@host# set services video-monitoring templates t2 timeout 30
   user@host# set services video-monitoring templates t2 rate media 2972400
   user@host# set services video-monitoring templates t2 media-packets-count-in-layer3 7
   user@host# set services video-monitoring templates t2 media-packet-size 188
   ```

Results From configuration mode, confirm your configuration by entering the **show services video-monitoring templates** command. If the output does not display the intended configuration, repeat the instructions in this example to correct the configuration.

```
user@host# show services video-monitoring templates
t1 {
    interval-duration 1;
    inactive-timeout 30;
    rate {
        media 2972400;
    }
    delay-factor {
        threshold {
            info 100;
            warning 200;
            critical 500;
        }
    }
```



```
    media-loss-rate {
      threshold {
        info {
          percentage 5;
        }
        warning {
          percentage 10;
        }
        critical {
          percentage 20;
        }
      }
    }
    media-rate-variation {
      threshold {
        info 10;
        warning 15;
        critical 20;
      }
    }
    media-packets-count-in-layer3 7;
    media-packet-size 188;
  }
  t2 {
    interval-duration 1;
    inactive-timeout 30;
    rate {
      media 2972400;
    }
    media-packets-count-in-layer3 7;
    media-packet-size 188;
  }
```

Verification

Confirm that the configuration is working properly.

Verifying Statistics Reporting

Purpose Verify that statistics are being reported.

Action From operational mode, enter the **show services video-monitoring mdi statistics** command.

```
user@router> show services video-monitoring mdi statistics fpc-slot 2
MDI Stats Information
FPC Slot: 2
Active Flows: 1, Total Inserted Flows: 1, Total Deleted Flows: 0
Total Packets Count: 746284, Total Bytes Count: 1013453672
DF alarm count: 0, Info level: 0, Warning level: 0, Critical level: 0
MLR alarm count: 0, Info level: 0, Warning level: 0, Critical level: 0
MRV alarm count: 0, Info level: 0, Warning level: 0, Critical level: 0
```

Meaning The output shows that inline video monitoring is operational.