IDM System Overview

P1378

24 July 2017
DD3288946
Rev 01

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DAKTRONICS

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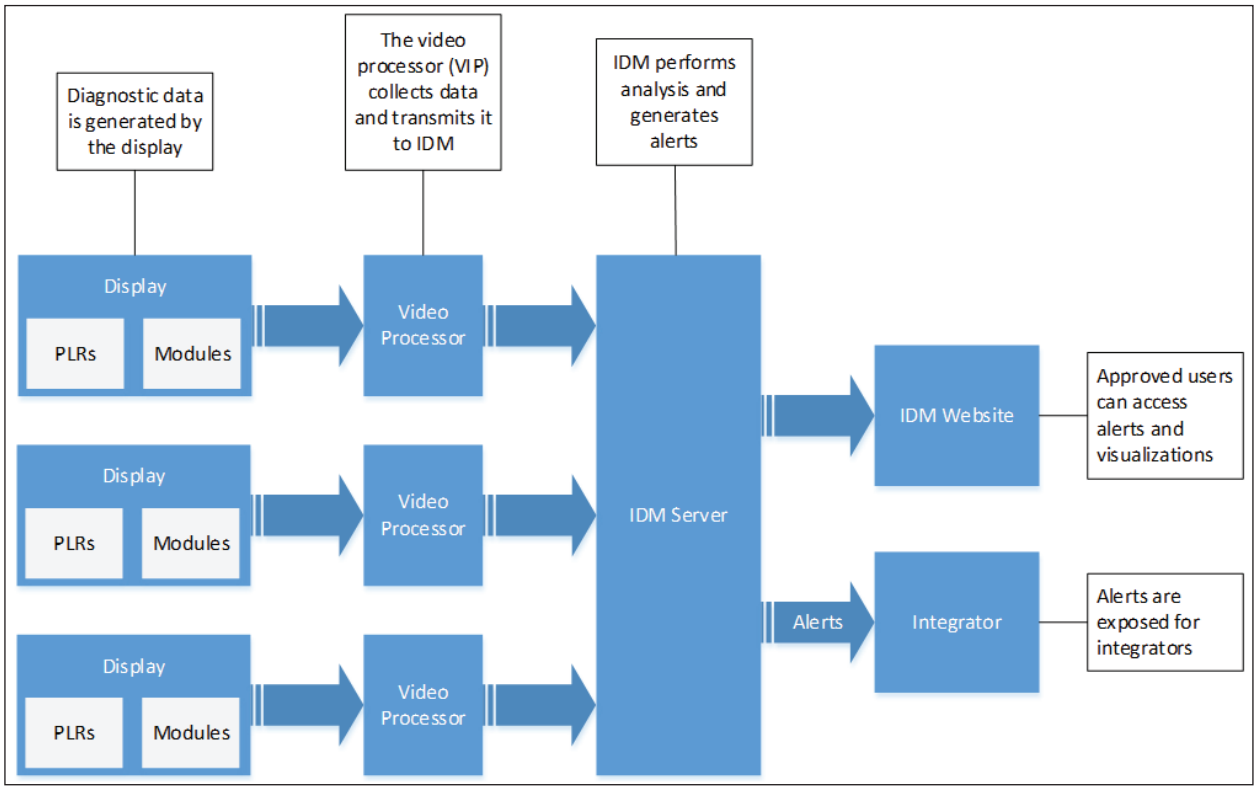
1 Overview of Daktronics IDM

Introduction

Use IDM, a telemetry system, to collect, analyze, and visualize diagnostic data generated by a Daktronics display.

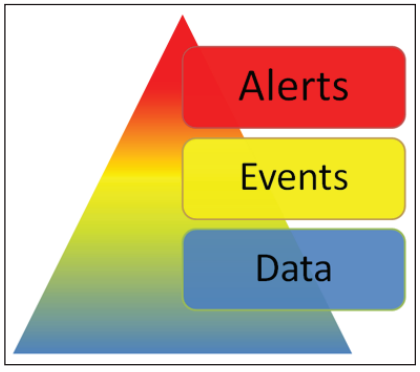
Data Collection

This diagram shows how diagnostic data flows through the IDM system:



A display contains ProLink Routers (PLRs) and modules that have diagnostic properties. PLRs assist with signal delivery and modules contain the LEDs for video reproduction. Each display is associated with a video processor (VIP) that is responsible for collecting diagnostic data from the display. The VIP resides on the network and can be queried for diagnostic data by the IDM server.

The IDM server requests data from each VIP on a configured interval (ex: 10 minutes). This data includes both the information collected from the display and information that describes the VIP itself. The IDM server then analyzes the data to generate events, alerts, and visual aids for troubleshooting.



Analysis

IDM supports events and alerts.

- Events are useful when servicing a display and tend to be higher in volume.
- Alerts are useful when monitoring a display, and tend to be lower in volume.

The relationship between events, alerts, and the data that IDM collects is shown in the diagram at right.

Data

IDM is built upon the diagnostic data sent by the display system. This raw data contains flags, counters, temperatures which are shown in different views in the website. Data is grouped by device within IDM, so each module in a display contains a distinct set of diagnostic data. This data describes the current state of the display and is analyzed by IDM to detect on-site events.

Events

Events are the first tier of analysis within IDM and serve two purposes:

1. Events represent the state of a system at a point in time.
2. Events are used as the basis for alerts

Events are granular and are defined by a type (ex: Loss of Sync), the specific device on which the event was detected (ex: module 16), and the time when the event was created. An issue may affect multiple devices, and will therefore create multiple events. Events can exhibit a cause-and-effect relationship. For example, a Reset event on one module will cause a Loss of Sync event on neighboring modules.

Events are also time sensitive and are closed automatically when the IDM server receives information that the issue was resolved or repaired. An intermittent issue creates multiple events, which allows a technician to determine the frequency at which an issue occurs. Access historical events to determine the state of the display at a previous point in time.

The granularity and immediacy of events make them well-suited for service and repair activities. For monitoring activities, IDM provides alerts which prioritize and aggregate events into objects that are easier to manage.

Alerts

Alerts represent the second tier of IDM analysis. Alerts are built on top of events (though it is not required for an event to have a corresponding alert). Alerts are designed to reduce the work required to monitor a display network. To accomplish this, IDM prioritizes and groups events such that the volume of alerts is lower than the volume of events.

Prioritization

Priority is determined by the alerts defined in the system. An alert definition includes an event type, a device type, and a sensitivity level. The sensitivity level is used to calibrate the system to improve accuracy and control volume. Examples:

1. A Thermal Dimming alert on a video processor (VIP) has a sensitivity of 1. This means that an alert is generated immediately upon receipt of data that indicates thermal dimming.
2. A Communication Failure alert on a module has a sensitivity of 2. This means that IDM must detect two occurrences of this event on a module before an alert is created.

Grouping

Events are grouped based on the event type and the device type. The following examples describe how this works (all examples assume an alert definition with a sensitivity of 1):

1. A Communication Failure event is detected on modules 1, 2, and 3 at 08:00. These events are grouped into a single alert at 08:00 because they share the same device

type and event type. If the same issue is detected on module 4 at 08:05, it will be added to the existing alert.

2. A Communication Failure event is detected on PLR 0 and module 2 at 08:00. These events generate two alerts because the device type is different.

3. A No Content event and a Photocell Failure event are detected on the VIP. This generates two alerts because the event type is different.

Alert Persistence

Alerts are more persistent than events and the server waits for multiple uploads of data indicating that the problem is no longer present before closing an alert. The delay in closing alerts is designed to reduce alert fragmentation resulting from intermittent issues. As described in the Events section, an intermittent issue creates and closes multiple events. By contrast an alert remains active longer to better encapsulate the issue. Consider the following timeline (again assuming an alert sensitivity of 1):

- 08:00 a Loss of Sync event is detected. IDM creates a corresponding alert
- 08:05 the Loss of Sync event is closed. The alert is still active
- 08:10 the Loss of Sync event is detected again. The alert is still active

The example above generates two events, but only one alert.

Alert Closure

The IDM server closes alerts.

XML Feed

Retrieve active alerts from IDM as an XML document. This document is generated by the server upon request. An example of the XML is provided below.

```
<?xml version="1.0" encoding="UTF-8"?>
- <alertfeed>
  - <entry>
      <id>92b16c24-8468-4129-a53d-65c72f7ed6c2</id>
      <title>Manual Dimming</title>
      <published>2014-11-18T16:31:32.0000000Z</published>
      <display>bisw10i54x22</display>
      <displayid>9f1b4884-3faa-7f9b-d04d-1095063b6ba6</displayid>
      <hardware>Vip5060</hardware>
    </entry>
  - <entry>
      <id>3e84db93-65fc-4f37-9cbc-2f02dd688274</id>
      <title>Photocell Failure</title>
      <published>2014-11-18T16:31:32.0000000Z</published>
      <display>bisw10i54x22</display>
      <displayid>9f1b4884-3faa-7f9b-d04d-1095063b6ba6</displayid>
      <hardware>Vip5060</hardware>
    </entry>
</alertfeed>
```

Each entry in the XML document matches one alert created by the Daktronics IDM system. The following information is provided for each entry:

<id>: The id element uniquely defines an alert in the IDM system.

<title>: The title element defines the type of alert detected.

<published>: The published element is a UTC timestamp documenting the creation time of the alert.

<display>: This is the name assigned to the video processor that generated the alert. This name can be changed at any time via the IDM website.

<displayid>: The display id uniquely defines the video processor that generated the alert. This value cannot be changed via the website, but may change if the video processor that collects diagnostic data is replaced.

<hardware>: The hardware element defines the type of hardware in the display (e.g. VIP-5060) that generated the alert.

The XML service is available here: https://<idmserveraddress>/services/alerts.ashx

Note that the service requires HTTP basic authentication with credentials matching a user account in the IDM system.

2 Alert Definitions

This section describes the alerts supported by IDM. Please note that this list is not final and that Daktronics may add, remove, or modify alerts following performance reviews.

VIP-5x60

Communication Failure
This alert indicates that communication to the VIP was lost for a significant duration. Service personnel should determine whether the VIP is still sending video to the display. If video output is functional, troubleshoot the network status and configuration. If video output is not functional, determine whether power was lost or if the VIP failed.

Non-External Display Mode
This alert indicates that the VIP was configured to play internal or local content, such as a test pattern. This means that the video inputs on the VIP are not in use. This commonly happens during maintenance. Service personnel should use the VIP configuration tool to select the correct video input when maintenance is complete.

Manual Dimming
This alert indicates that the VIP was configured to use manual control to dim and brighten the display. Service personnel may choose manual control while maintaining the display. This setting may also be chosen as a temporary solution if a photocell fails. When maintenance is complete, service personnel should use the VIP configuration tool to select the correct dimming control method.

No Content
This alert indicates that the VIP detected black video frames from a playback source. This may indicate a failure of the player connected to the VIP, or a content scheduling error. This alert may result in a false positive if there is an intentional gap in the content schedule.

Not Receiving Video
This alert indicates that the VIP is not receiving a video signal. This may indicate that the player connected to the VIP failed or was reset.

Over Temperature
This alert indicates that the temperature of the VIP is outside of defined tolerances. This condition may impact video playback and may also lead to the failure of the VIP. Service personnel should inspect the ventilation system that supports the VIP.

Photocell Failure
This alert indicates that the VIP is not receiving a valid reading from a photocell. This may occur if the photocell fails or is disconnected from the VIP. Depending on the configured backup method, the VIP may dim the display as a safety precaution. After determining the cause of the failure, service personnel should verify that the dimming method configured in the VIP is appropriate for both daytime and nighttime viewing.

Reset
This alert indicates that the VIP was reset or power-cycled. This may be due to the actions of service personnel, or intermittent power outages affecting the VIP.

Thermal Dimming
This alert indicates that the VIP dimmed the display because of higher than expected module temperatures. This feature protects the modules from thermal damage. The VIP reverts to the configured dimming method once the modules have cooled. Service personnel should inspect the ventilation system that supports the display.

ProLink Router (PLR)

Communication Failure
This alert indicates that the VIP cannot retrieve diagnostic data from one or more PLRs. Service personnel should consider whether the PLRs have lost power, or lost both Prolink6 (fiber) signal paths. If the alert affects a single PLR, it may have failed. The modules connected to the PLR may be dark. In a system with redundant PLRs, this may not cause a visual outage.

Loss of Sync
There are two different Loss of Sync alerts, one for port A and one for port B. These alerts indicate that a PLR has lost either the A or B ProLink5 (SATA) signal path. The signal redundancy system can withstand one Loss of Sync link per ProLink5 circuit, but two nodes (modules or PLRs) with Loss of Sync on the same circuit may cause a visual outage on the display.

Over Temperature
This alert indicates that the temperature of the PLR is outside of defined tolerances. This event rarely occurs in the field, as the thermal dimming feature of the VIP activates prior to the PLR reaching this threshold. Service personnel should inspect the ventilation system that supports the display.

Reset
This alert indicates that the PLR was power-cycled. This may be due to the actions of service personnel, or power outages at the display.

Voltage Error
This alert indicates that voltages measured within the PLR are outside of defined tolerances. The PLR may need to be replaced.

Wiring Error
This alert indicates that the PLR detected fewer modules than expected given the configuration of the display. While this can occur during service, this event is rarely seen outside of manufacturing.

Module

Communication Failure
This alert indicates that the VIP cannot retrieve diagnostic data from one or more modules. If this alert affects multiple modules, service personnel should determine whether the modules lost power, or if the ProLink5 (SATA) circuit was broken. If the alert affects a single module, it is also possible that the module failed. Modules affected by this alert may be dark.

Loss of Sync

There are two different Loss of Sync alerts, one for port A and one for port B. These alerts indicate that the module has lost either the A or B ProLink5 (SATA) signal path. The signal redundancy system withstands one Loss of Sync link per ProLink5 circuit, but two nodes (modules or PLRs) with Loss of Sync on the same circuit may cause a visual outage on the display.

Missed Frame

This alert indicates that one or more modules did not play all frames contained within the video signal from the VIP. This may negatively impact image quality. Service personnel should inspect the SATA cables leading to the module and the module itself.

Over Temperature

This alert indicates that the temperature of the module is outside of defined tolerances. This event rarely occurs in the field, as the thermal dimming feature of the VIP activates prior to the module reaching this threshold. Service personnel should inspect the ventilation system that supports the display.

Reset

This alert indicates that the module was power-cycled. This may be due to the actions of service personnel, or power outages at the display.

Voltage Error

This alert indicates that voltages measured within the module are outside of defined tolerances. The module may need to be replaced.

3 Performance Expectations

Detection Speed

The time it takes IDM to create an alert is based on several factors:

1. The interval at which IDM queries the VIPs
2. The sensitivity of the alert.
3. The persistence of the underlying issue (intermittent issues may take longer to detect)
4. The quality of the network connection between IDM and the VIP (poor connections may introduce delays)

Coverage

Service history indicates that most issues are detected by the IDM system. However, cases exist where the system failed to detect the issue. Misses fall into two categories: known gaps in coverage, and unknown failure modes.

Known coverage gaps include:

- IDM does not collect data from non-Daktronics playback devices.
- IDM cannot detect if the video sent to the VIP matches the expectation of the content control system. The software knows only that the VIP is receiving a video signal, and whether the video frames within that signal are black.
- IDM cannot detect if the calibration of a replacement module does not match the calibration of the other modules in the display.

Unknown failure modes are rare, but possible. IDM is built from the results of extensive testing in Daktronics reliability lab and from the analysis of performance data collected from the field. Even so, it is possible that a display component could fail in a fashion that was not discovered in the test lab and may be missed in IDM. In the event of an unknown failure, the IDM website offers features to help the Daktronics engineering team determine if analysis routines can be adjusted to detect future failures of that type.

Non-visual alerts

Some alerts may not immediately correspond to visible outages on the display. This may be due to the event type, the event frequency, or because the alert was a false positive.

Event Type

Certain event types may not be visible. Examples include:

- Loss of Sync – A single loss of sync error on a display is not visible because of the display's redundant signal feature. It is likely that a second loss of sync error on the same ProLink5 circuit will create a visual outage.
- Photocell Failure – A VIP dims the display when it cannot communicate with the photocell. This safety precaution protects against over-bright conditions. If the display is viewed in a low-light condition, it may not be immediately obvious that there is a problem, but as ambient light increases, the display will not brighten if the photocell failed.
- Reset – When responding to a reset alert, it is important to note that the device reporting a reset completed a power-cycle and while things may look ok after the reset, it is likely that a visual outage occurred prior to the alert being created.

Event Frequency

Alerts that are created from intermittent events may be only temporarily visible. For more information on how IDM handles intermittent issues, see the Alert Persistence topic above. The Event History view in IDM helps service personnel determine the frequency at which the issue is occurring.

False Positives

There are several scenarios that may result in a false positive:

- If a display is intentionally blank for scheduled periods, and the No Content alert is enabled, IDM creates a No Content alert when black frames are detected at the video processor.
- The diagnostic system may experience a failure which creates an alert. For example, a connector responsible for returning diagnostic data from a module to IDM may fail, resulting the creation of a Loss of Sync alert. This would result in a false positive if video data is still being delivered to the module on that connection.
- Although unlikely, it is possible that a firmware upgrade may require sensitivity adjustments in IDM.