Managing the Rollup Health status by using iDRAC on the Dell EMC 14th generation and later PowerEdge servers

This technical white paper provides an overview of the Rollup Health status feature that indicates the server status by considering individual components' health status. The graphical user interface (GUI) and WS-Man methods to manage the Rollup health status is described.

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Contents

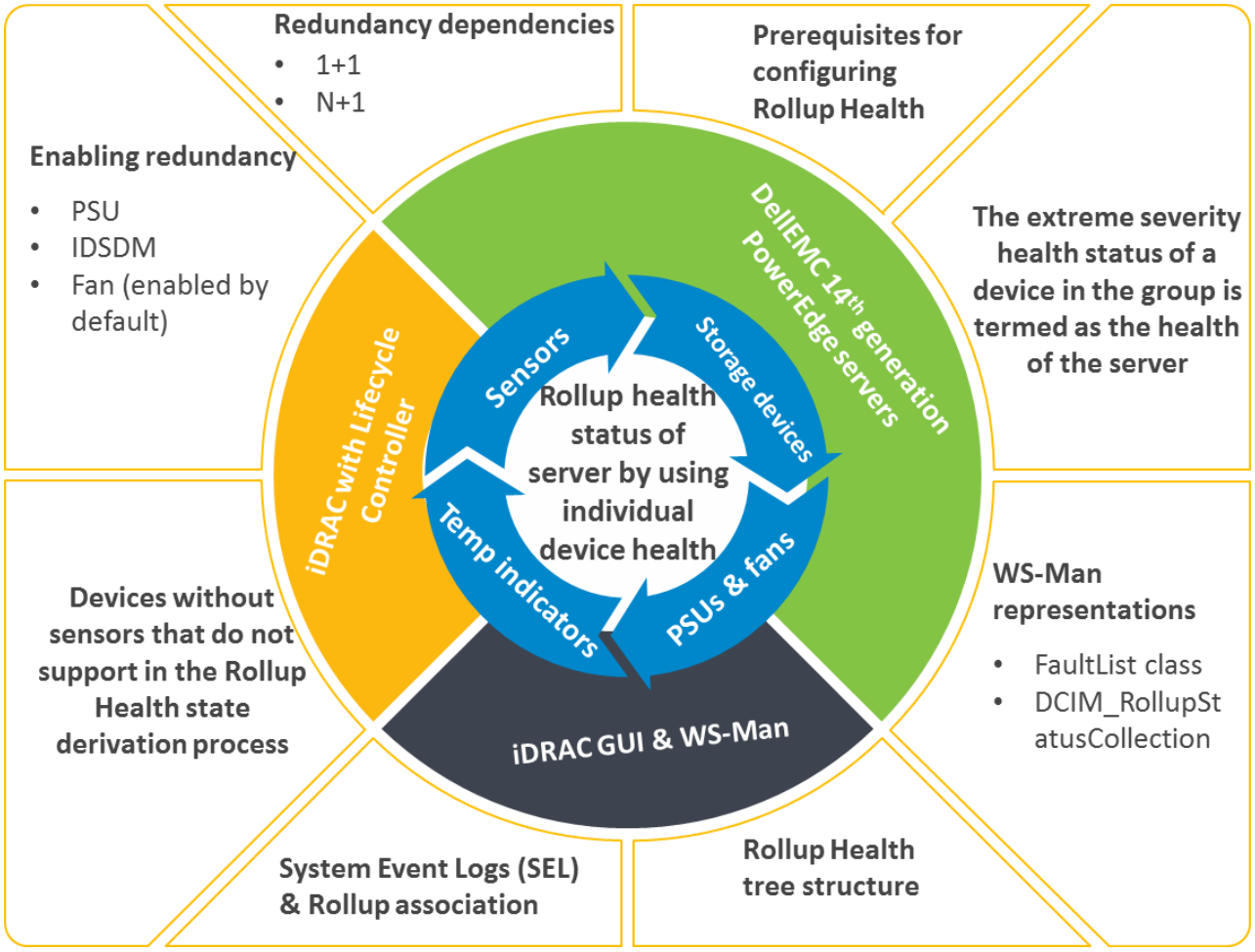
Revisions....2
Glossary....4
Executive summary....5
Introduction....6
Audience....7
Prerequisites for....7
configuring the Rollup health status feature....7
Rollup health....7
Global Rollup tree structure....8
Miscellaneous sensors contributing for Rollup Health status....8
System Rollup and Global Rollup....9
Redundancy dependencies....10
Enabling the power supply unit (PUS) redundancy....11
Enabling the Internal Dual SD Module Card (IDSDM) redundancy....12
Enabling the fan redundancy....12
Devices without sensor support....12
System LED status and rollup....13
System Event Logs (SEL) and Rollup association....15
SEL assertion, de-assertion, and logging....15
iDRAC GUI overview for the Rollup feature....16
WS-Man representations....18
FaultList class....18
DCIM_RollupStatusCollection class....20
Mapping between DCIM_RollupStatusCollection and DCIM_FaultList....21
Conclusion....22
Recommended references....22

Glossary

Term	Definition
iDRAC	Integrated Dell Remote Access Controller
Lifecycle Controller	Official marketing name for Maser
WS-Man	Web Services for Management – a web services protocol designed for manageability
Management application	The application a user would utilize to perform remote platform management tasks Ex: Open Manage Essentials
RollUp Status	individual component roll ups
Global RollUp Status	Integrated roll up status of Individual roll of status including storage
Individual Rollup Status	Individual device status along with redundancy status
IDSDM	Internal Dual SD Module
API	Application program interface
FQDD	Fully Qualified Descriptor
SNMP	Simple Network Management Protocol

Executive summary

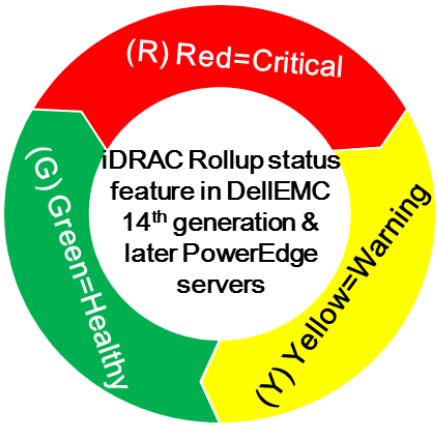
This technical whitepaper describes the methods by which the users of iDRAC with Lifecycle Controller can get the snapshot of system health by using the device-level Rollup. iDRAC with Lifecycle Controller in the Dell PowerEdge servers of 14th generation and later servers monitors system sensors and devices, and then provides both device-specific and an aggregated view of the health. This technical whitepaper provides information about the aggregated health information and correlating health events (cause of faults) with the reported device-level Rollup health.



Introduction

In a large heterogeneous data center, a management application helps you manage the data center assets by maintaining inventory, periodically collecting the health statistics, and providing incident management methods. Multiple applications from Dell EMC use the APIs provided by iDRAC for inventory, monitoring, and configuring the system.

One of the major functionalities of one-to-many (1xN) management applications is collecting health statistics of multiple servers in the data center. The management applications use SNMP, WS-Man, or REST APIs to collect data from multiple devices of the server. Commonly monitored devices are—sensors, storage devices, power supply units (PUSs), temperature indicators, and cooling fans. iDRAC provides a component-level health status and a cumulative health status called Rollup status. The Rollup status provides an overview of the subsystem and the overall system indicated by the following Infographics:



While the cumulative health status or aggregation of the individual component Rollup statistics of all the devices of a server is represented as Global Rollup status, in the 14th generation PowerEdge servers, Dell EMC has introduced new methods for health monitoring and reporting. These methods report the individual statuses of devices, their aggregated health, and the reasons for failure. For any health change, iDRAC logs the Lifecycle Controller event and error messages. For more information about using event and error messages, see the Event and Error Message Reference Guide for Dell EMC PowerEdge Servers.

Audience

This technical white paper is intended for server administrators, architects, and other stake holders in decision making capacities. The reader is expected to have basic knowledge about server management applications and troubleshooting techniques.

Prerequisites for configuring the Rollup health status feature

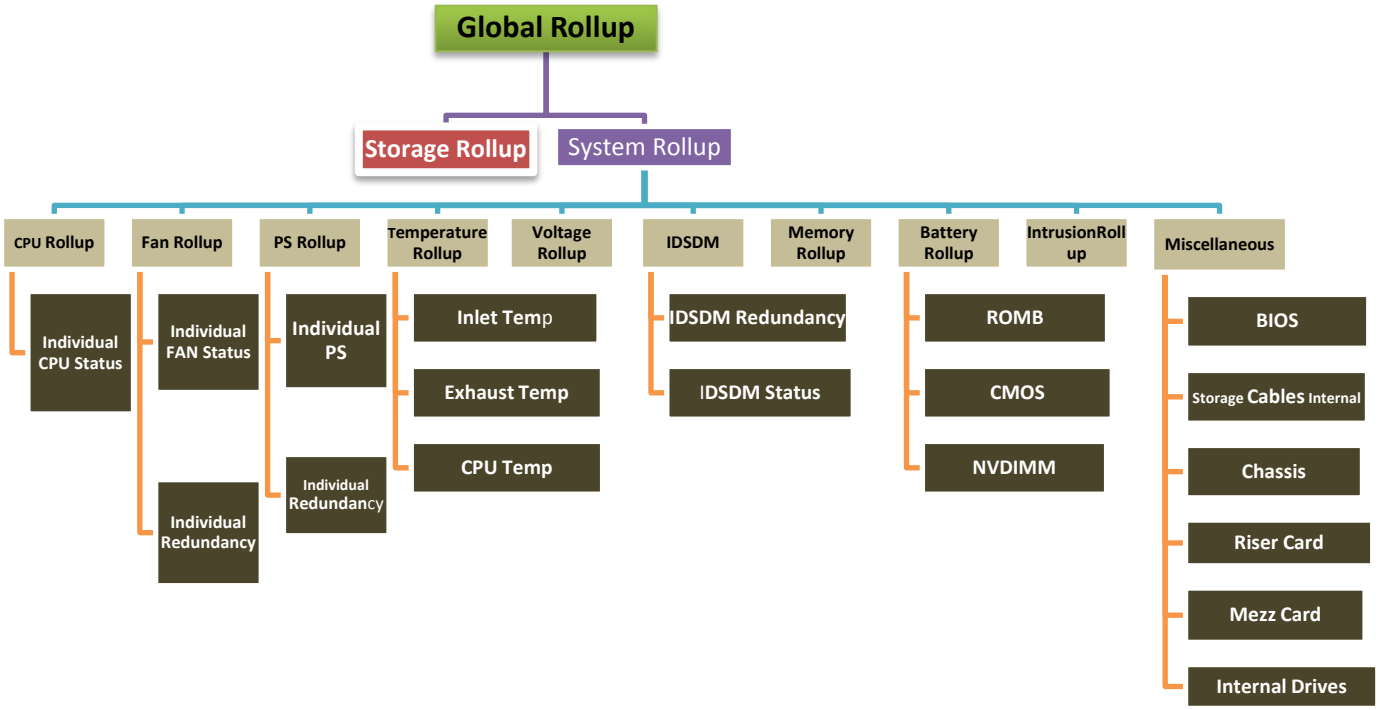
- Server must have a valid Service Tag (Seven characters)
- User must have necessary login privileges. See Devices without Sensor support.
- 14th generation and later versions of iDRAC

Figure 1 No licensing required

Rollup health

The rollup status of a device is derived by considering the health statuses of components in the server under consideration. The extreme severity level of a component is assigned to the overall health status of a server. For example, a server has a PSU in Warning state, but also has a fan in Critical state. Therefore, the Rollup health status of the server is considered to the extreme severe state which is Critical.

Global Rollup tree structure



Miscellaneous sensors contributing for Rollup Health status

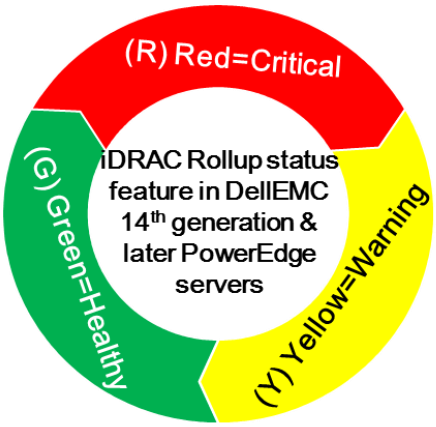
Some sensors that detect the following health statuses of a server also contribute in deriving the Rollup health status of a server:

- BIOS sensors
- Storage cables: SAS cable, signal cables, and power cables
- Riser card mismatch
- Riser missing
- Mezzanine card mismatch
- Mezzanine card missing
- Internal drive sensor events
- Chassis sensors (modular)

System Rollup and Global Rollup

The Global rollup health is an aggregation of the individual components' rollup statuses. There may be multiple components that may report either warning- or critical status. For each of such abnormal statuses, an associated Event and Error Message is present in the Lifecycle logs. The fault list contains the messages that are generated for a system failure state.

iDRAC provides a component-level health status and a cumulative health status called Rollup status. The rollup status provides an overview of the subsystem and the overall system health by using the following color legends:



Redundancy dependencies

- Some components such as fans, PSUs, and IDSDMs have redundancy components in the rollup process. These devices support either 1+1 or N+1 redundancy.
    - 1+1 redundancy: A failed component in a redundant subsystem will cause the redundancy to become critical (if no more redundancy option is left in the system environment).
    - N+1 redundancy: A failed component in a redundant subsystem will cause the redundancy to go critical (if no more redundancy option is left in the system environment). Or, warning/degraded if more redundancy is available. For example, if we have four PSUs and one fails, but we require only two for the system to be operational.
- iDRAC will always display the extreme-case component health, which will roll up to overall system health.
- If any component or sensor is critical then the overall health is status is R (red=critical).
- Else, if any component or sensor is in Warning state then overall system health is Y (yellow=warning).
- If the device has a redundancy sensor then the extreme-case rollup from the sensor will be percolated up.

The following table lists the PSU rollup behavior in a two-device redundancy that is currently available in iDRAC, at the release of this technical white paper.

PSU-1	PSU-2	Redundancy Sensor	Rollup status
OK	OK	OK	OK
OK	Warning	Critical	Critical
OK	Critical	Critical	Critical

If there is no redundancy set enabled then the Redundancy sensor will not be considered.

PSU-1	PSU-2	Redundancy Sensor	Rollup status
OK	OK	NA	OK
OK	Warning	NA	Warning
OK	Critical	NA	Critical

Enabling the power supply unit (PUS) redundancy

You can enable the PSU redundancy feature on the iDRAC graphical user interface (GUI) by clicking **Configuration→Power Management→Power Configuration→Redundancy Policy**.

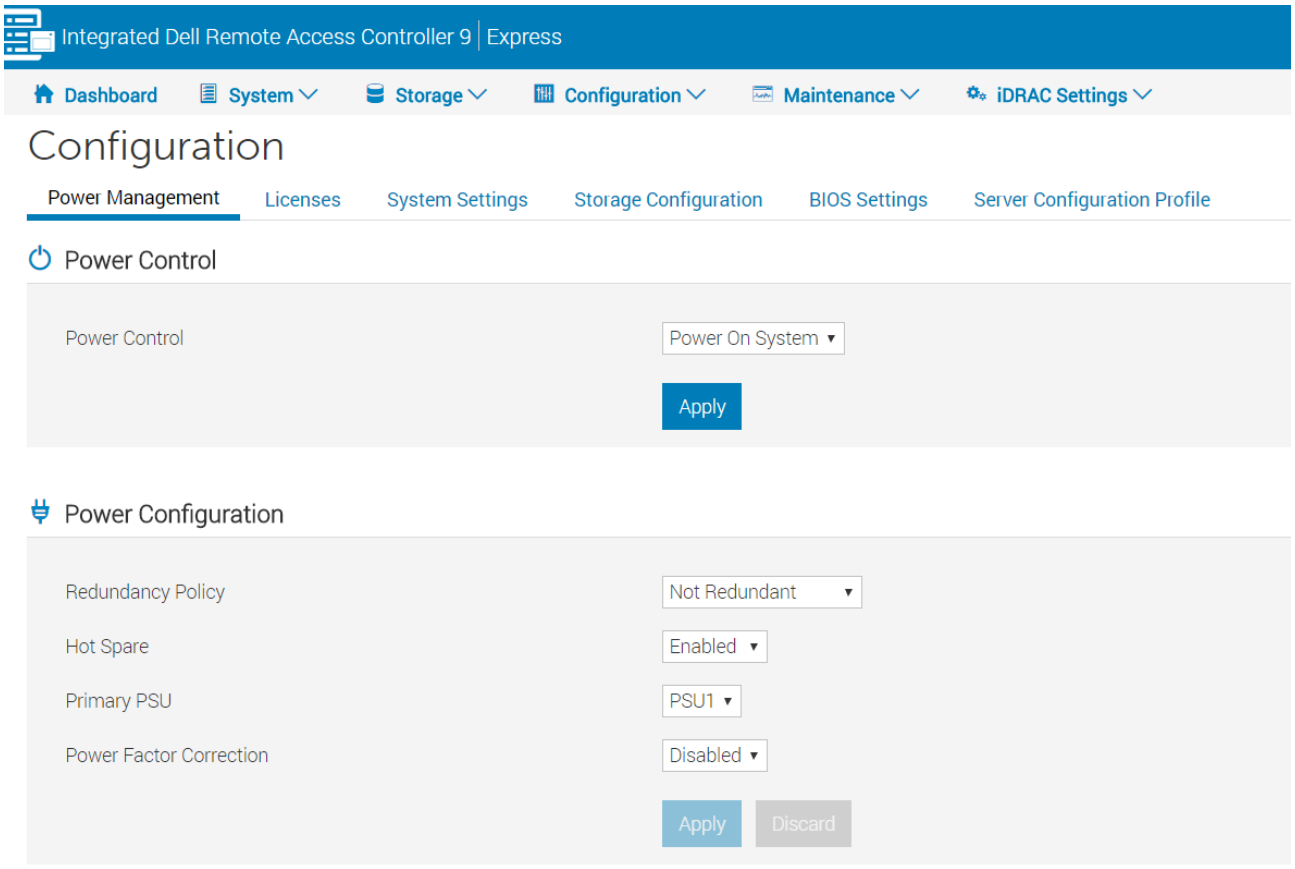


Figure 2 Enabling PSU Redundancy Policy on the iDRAC GUI

Enabling the Internal Dual SD Module Card (IDSDM) redundancy

You can enable the IDSDM redundancy on the BIOS setting page by selecting **BIOS setting→Integrated Devices → Internal SD card Redundancy**.

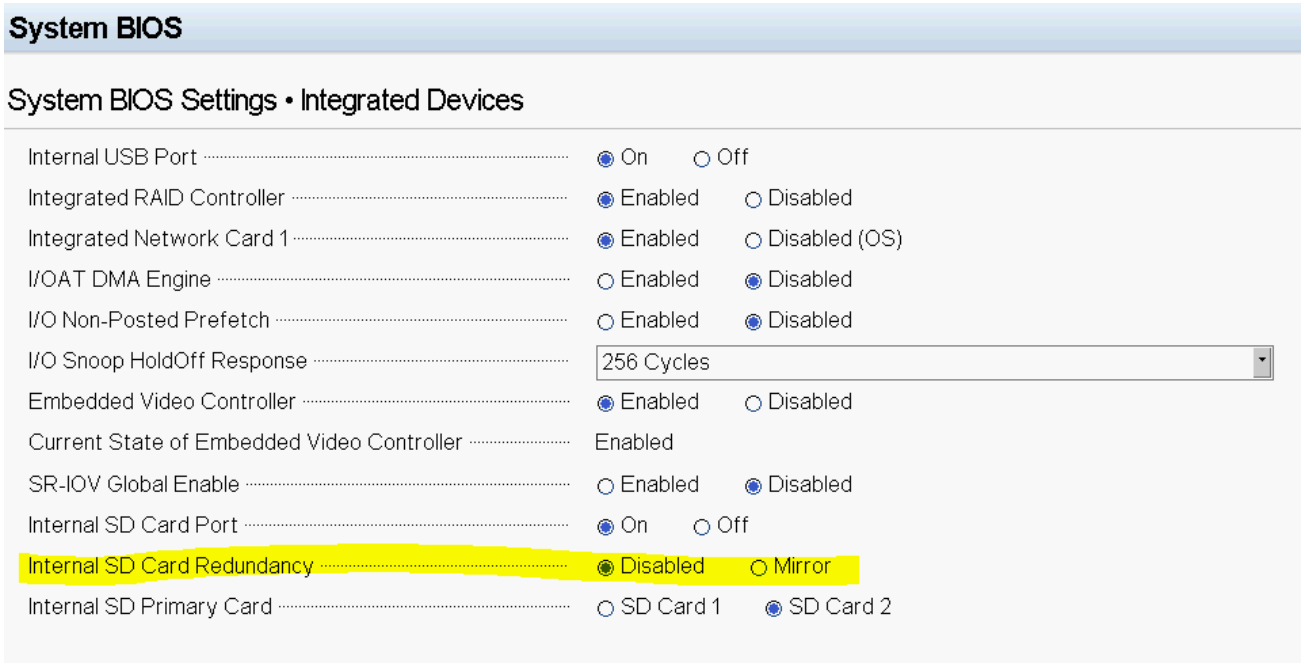


Figure 3 Enabling IDSDM by using the BIOS Settings

Enabling the fan redundancy

By default, the fan redundancy feature is always enabled on iDRAC that is installed on the 14th generation and later versions of PowerEdge servers supplied from the factory.

Devices without sensor support

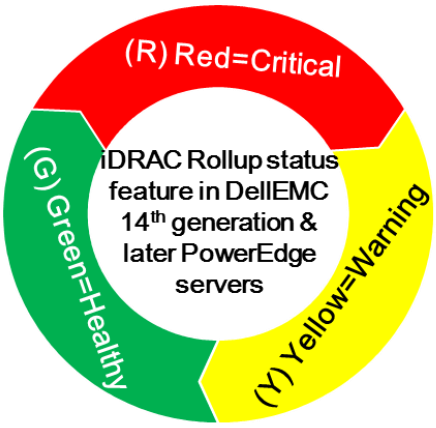
Certain devices such as cabled PSUs are used in servers but they do not report any health status. Without support from the Power Management Bus (PMBus), these PUSs are a part of the system inventory. However, these neither contributes to the health status nor report any sensor data. These devices are shown in the hardware inventory.

For cabled PSUs, the object will have the `IsPMBusCapable` property set to False. The status of the device will be “Ok”. The other properties of the PSU object are not populated. The device does not take part in the rollup calculations.
On the iDRAC GUI, the **Power Supply** page indicates that the PSU is present, but no information about the cabled PSU (firmware version and other data) is displayed.

System LED status and rollup

In iDRAC that is factory-installed on the 14th generation and later versions of PowerEdge servers, the GUI displays the rollup health with symbols on the **Dashboard** and **System Summary** page.

The rollup status provides an overview of the subsystem and the overall system health by using the following color legends:



On the **Dashboard** page, when you click a server name, comprehensive health status is displayed. A sample screen shot is given here.

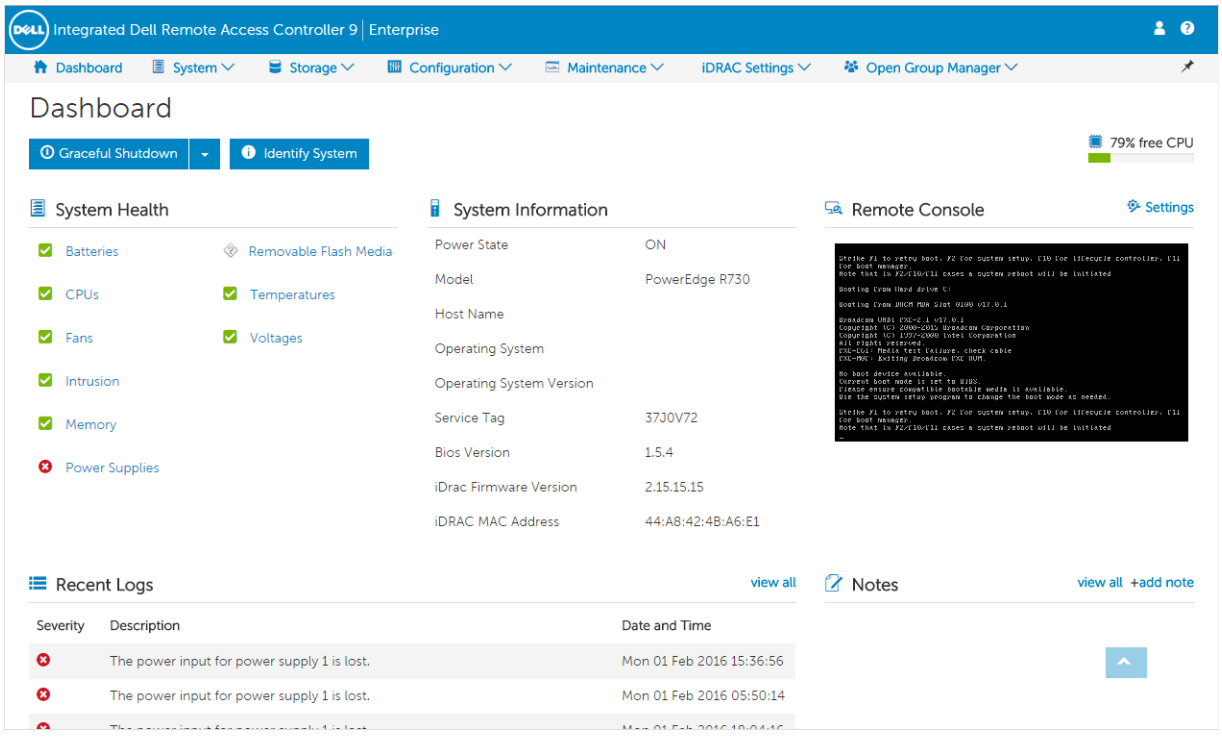


Figure 4 iDRAC System Health Dashboard

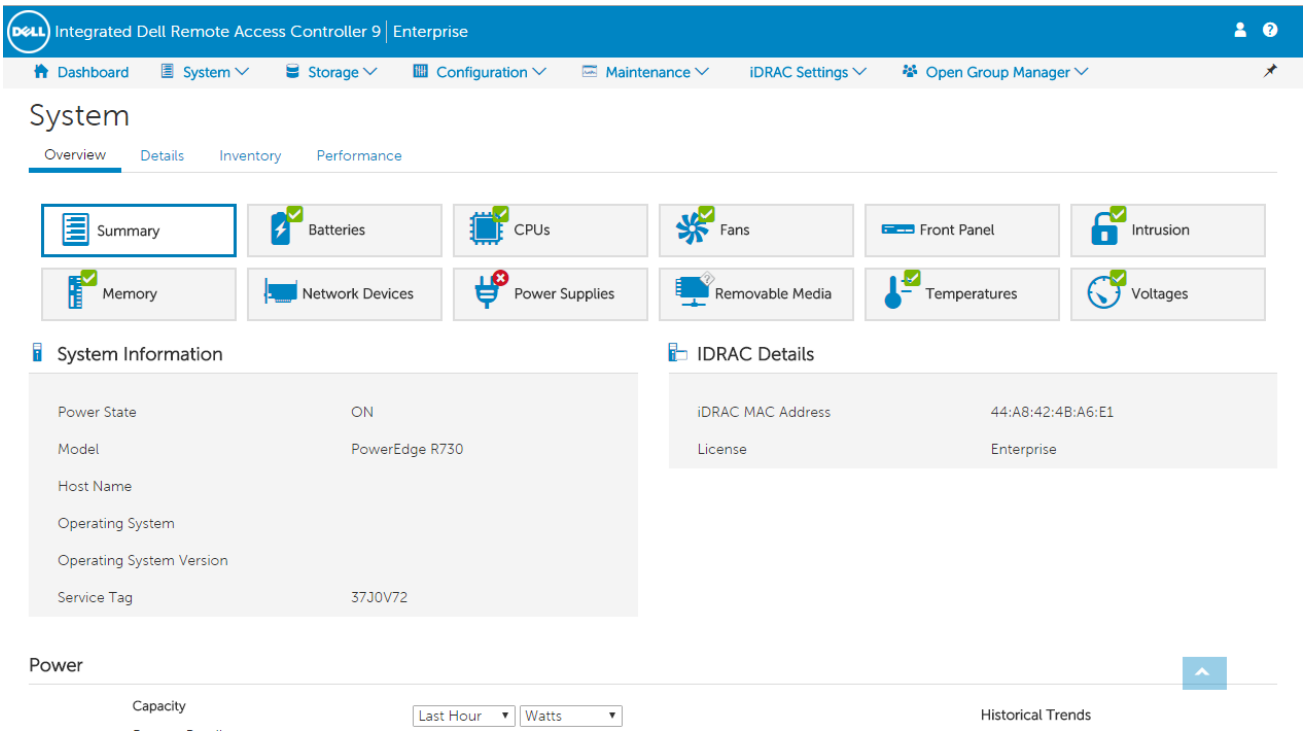


Figure 5 iDRAC System Health overview

System Event Logs (SEL) and Rollup association

SEL assertion, de-assertion, and logging

The changes in individual rollup health, and the corresponding rollup health are associated to the devices generating events in case of an irregularity. One change in the environment can initiate multiple events. For example, in a redundant (2-PSU redundancy) PSU server, if one PSU becomes abnormal (critical or warning), the redundancy sensor and PSU health sensor indicate critical status. Two Event and Error Messages are displayed in this case.

PSU	912	PSU0912	System Health		A failure detected on power unit <number>.
RDU	12	RDU0012	System Health	2473	Power supply redundancy lost.

For the above failures, there will be a contributing device with an associated FQDD. For example, `PSU.Slot.1`. The same information is percolated up to the interfaces that display the information based on request. If and when the device returns to a normal behavior, a de-assertion event is generated. An example is given in the table here.

RDU	11	RDU0011	System Health	2475	The power supply units are redundant

In the above scenario, the fault list will be refreshed and the errors will not be shown at the interface layers. The support for Fault lists for rolled-up statuses are extended to all components except Storage sub-systems.

iDRAC GUI overview for the Rollup feature

The iDRAC GUI displays the rollup health with symbols on the **Dashboard** and **System Summary** page. More information about a server health status and the fault list information is displayed when you click a device name on the GUI page. Also displayed are:

- FQDD of the faulty/offending device that leads to the Rollup health of the system
- The associated fault list in a particular server being monitored

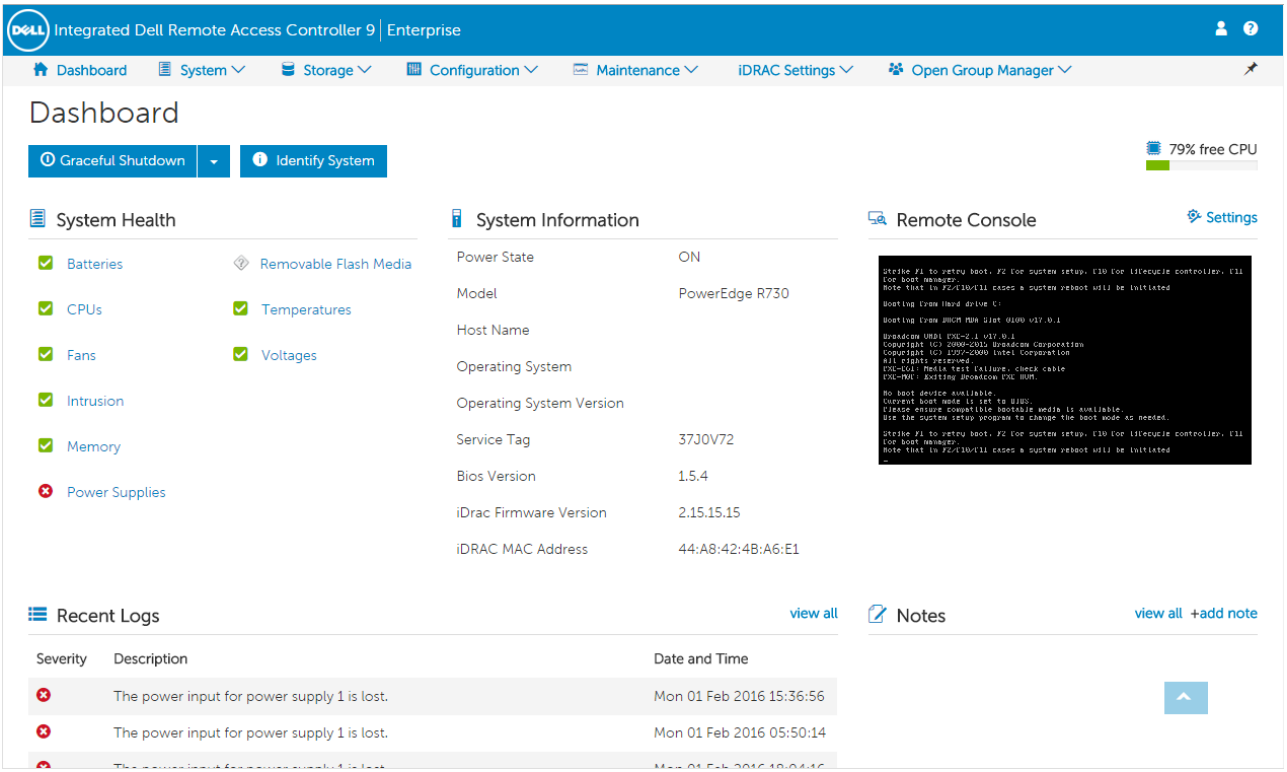


Figure 6 System health details on the Dashboard page

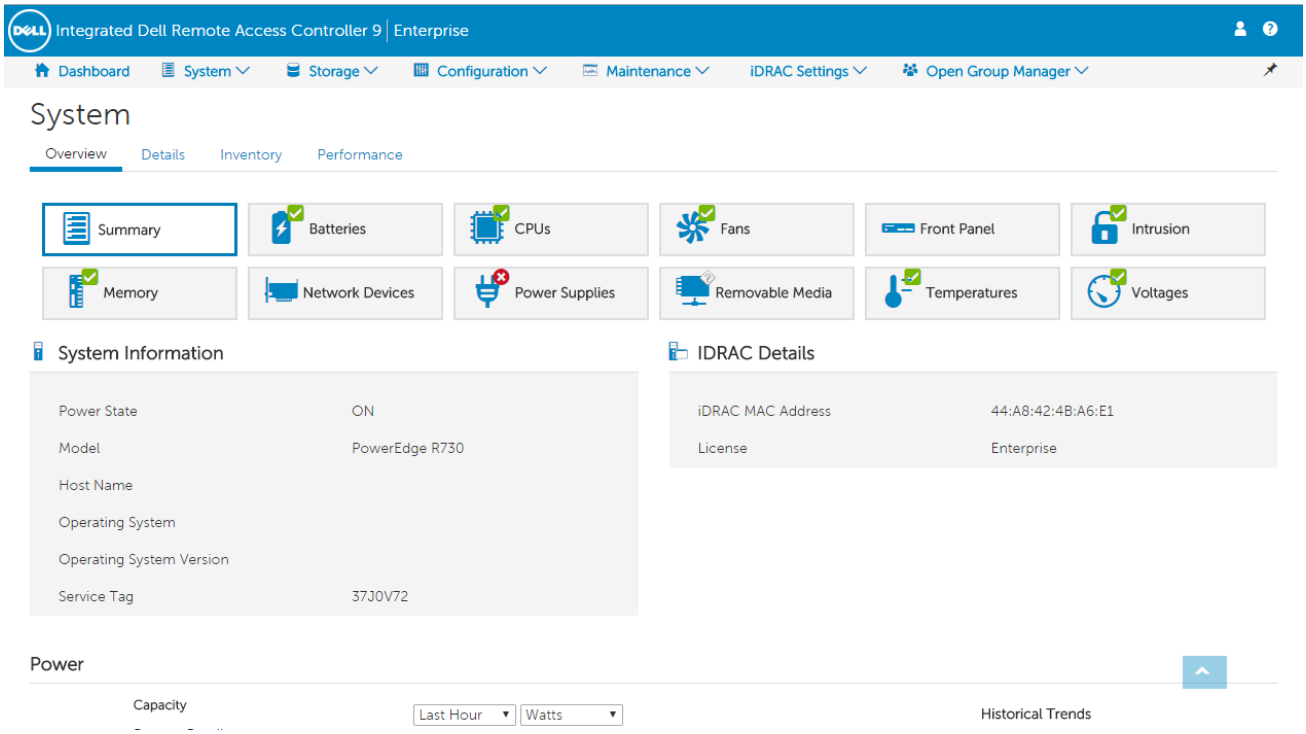


Figure 7 System components health overview

WS-Man representations

The DCIM Record Log provides the management capabilities to represent logs of a managed system element. This profile provides information about managing Lifecycle and System Event Logs (SELs). The log is modeled as referencing the managed system elements that populate the log.

WS-Man provides new classes—`DCIM_FaultList` and `DCIM_RollupStatusCollection`—with the collection of sub-component rollup statuses. The class contains one-to-many instances of sub-system rollup statuses.

FaultList class

The new `DCIM_FaultList` class is added under the `RecordLogProfile`. The class is a derivative of the `CIM_RecordLog` in the `DCIM_FaultList` class. Shows the faulty device the instances or devices, instead of all sub-systems.

Property name	Type	Property definition
SubSystem	`String`	Represents subsystem such as fans, PSUs, and I/O modules.
FQDD	`String`	Represents the FQDD of the device that the logged event relates to.
InstanceID	`String`	Represents the instance of the device that the logged event relates to.
Severity	`uint16`	Represents the severity of the logged event and has one of the following values: 2 (Information) 3 (Degraded/Warning) 4 (Minor) 5 (Major) 6 (Critical) 7 (Fatal/Non-Recoverable)
TimeStamp	`datetime`	Represents date and time
MessageID	`String`	Represents the message ID corresponding to the logged event.
Message	`String`	Represents the detailed description of the logged event.
MessageArguments[]	`String`	An array containing the dynamic content of the message.

The corresponding enumeration of this class will retrieve all the instance of fault entries contributing to the rollup health change.

Example output:

```
SubSystem = Cable
InstanceID = Fault#03200003#1
FQDD = Cable.Bay2.Power
Timestamp = 2016-03-26T15:29:08-0500
Message = The storage BP1 Power cable is not connected, or is improperly connected.MessageID =
IOM0001
MessageArguments = BP1 Power
MessageID = HWC2003
SubSystem = Memory
InstanceID=Fault#03200002#1
FQDD=DIMM.Socket.A1
Timestamp=2016-03-26T15:29:08-0500
Message = Correctable memory error logging disabled for a memory device at location DIMM_A1.
MessageArguments=DIMM_A1
MessageID=MEM8000
```

DCIM_RollupStatusCollection class

The new `DCIM_RollupStatusCollection` class is introduced in `RecordLogProfile` for collection of rollup statuses. The class is a derivative of the `CIM_Collection`. The `DCIM_RollupStatusCollection` class is an integrated class of the rollup statuses that are found in the `systemView` class.

Properties Name	*Type*	*Description*

CollectionName	String	This property shall represents the name of sub system. The name is appending "SubSystem" property value with the string "RollupStatus". For example,
		`PSURollupStatus`
		`FanRollupStatus`
		`TempRollupStatus`
		`CPURollupStatus`
		`MemoryRollupStatus`
		`StorageRollupStatus`

RollupStatus	Uint16	The property shall contain the sub system rollup status (for example, fan, and PSU) and contains one of the following values: • 0 (Unknown) • 1 (OK) • 2 (Degraded) • 3 (Error) RollupStatus provides a high level status value, intended to align with the Red-Yellow-Green type representation of status. See Rollup Health.
InstanceID	String	The property value shall represent the Instance of the device.
SubSystem	String	The property represents the "SubSystem" property value of "DCIM_FaultList" class for mapping between "DCIM_FaultList" and "DCIM_RollupStatusCollection" classes.

Mapping between DCIM_RollupStatusCollection and DCIM_FaultList

- The `DCIM_RollupStatusCollection` class is a consolidated view of the rollup statuses that are found in the `systemView` class. The individual rollup statuses are consolidated as instances under the class and the appropriate subsystem is marked.
- The “SubSystem” property is available in both the classes—`DCIM_RollupStatusCollection` and `DCIM_FaultList`.
- In the `RollupStatusCollection` class, the SEL-based rollups and miscellaneous sensor rollup health will be marked by `SEL/Misc`. The same will be applied to the system view where the devices which assert SEL will have a device change rollup status and the `SelRollupStatus` property.
- The console or WS-Man API consumer can get the “SubSystem” value by enumerating the `DCIM_RollupStatusCollection` class and filter the fault list in the `DCIM_FaultList` class to get only those instances instead of all.

Example: SubSystem = “PSU”.

Then, filter the list of sub-system “PSU” instances from the “DCIM_FaultList” class.

DCIM_FaultList:

```
SubSystem = PowerSupply

InstanceID = PSU.Slot.1

FQDD = PSU.Slot.1

Timestamp = 2016-04-26T15:29:08-0500

Message = Power input for power supply 1 is lost

MessageID = PSU0004

MessageArguments =1
```

DCIM_RollupStatusCollection:

```
CollectionName = PowerSupplyRollupStatus

  InstanceID = iDRAC.Embedded.1#SubSystem.1#PowerSupply

  RollupStatus = 0

  SubSystem = PowerSupply
```

Conclusion

This technical whitepaper describes the functionality by which the users of iDRAC with Lifecycle Controller can get the system health by rolling up subsystem level devices' health. iDRAC enables you to manage servers by periodically collecting the health statistics, and providing incident management methods by using GUI and WS-Man interfaces. Dell EMC consoles use the APIs provided by iDRAC for inventory, monitoring, and configuring the system.

- WS-Man Interface Guide for Linux: http://en.community.dell.com/techcenter/extras/m/white_papers/20066176.aspx
- WS-Man Interface Guide for Windows: http://en.community.dell.com/techcenter/extras/m/white_papers/20066174.aspx
- WS-Man command line open source for Linux (OpenWSMan): http://sourceforge.net/projects/openwsman/
- OpenWSMan installation instructions:
- http://en.community.dell.com/techcenter/systems-management/w/wiki/3567.instructions-installing-openwsman-cli-on-linux.aspx
- WS-Man command line for Windows (Winrm):
- http://msdn.microsoft.com/en-us/library/windows/desktop/aa384291(v=VS.85).aspx
- WS-Man scripts for the Dell Lifecycle Controller: http://en.community.dell.com/techcenter/systems-management/w/wiki/scripting-the-dell-lifecycle-controller.aspx

Recommended references

WS-Man scripts for the Dell Lifecycle Controller: http://en.community.dell.com/techcenter/systems-management/w/wiki/scripting-the-dell-lifecycle-controller.aspx