Remote Power Management of Dell™ PowerEdge™ M1000e with Chassis Management Controller (CMC) Using Windows® Remote Management (WinRM)

A Dell™ Technical White Paper

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Dell Engineering
September 2013
Revisions (required)

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>September 2013</td>
<td>Initial release</td>
</tr>
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</table>

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Executive Summary

This white paper describes the remote power management of servers using the Windows Remote Management (WinRM) tool, the remote management capabilities available through a secure and standards-based Web Services–Management (WS-MAN) interface of the Chassis Management Controller (CMC) on Dell™ M1000e Chassis. The target audience of this white paper is a Console application developer who has some WS-MAN knowledge to understand terminologies used in this white paper.
1 Introduction
The Dell™ Chassis Management Controller (CMC) provides Chassis monitoring and control, and remote access features for blade servers. CMC software solution is designed to provide secure, simple, scriptable, and standards-based remote management capability through Web Services for Management (WSMAN) for Dell PowerEdge™ M1000e chassis systems.

1.1 Problem Statement
The power required to support a modular or dense server module is very high. Data centers increasing in density and requiring more performance per Watt, more power at a higher efficiency is required. Increasing power costs is a top concern for data center managers. Microsoft’s Windows Remote Management (WinRM) tool allows administrators to remotely manage and remotely execute programs on windows machines. WinRM tool is used by Power Console Administrators for remote power management of Dell PowerEdge™ M1000e chassis systems. Administrator need to construct WinRM commands related to all managed power features which demands investment of good amount of time. This white paper offers information about simplifying power management of the Dell Chassis Management Controller using WinRM commands and also troubleshoot commonly occurring errors in using this tool.
2 Solution with WS–Man

Web Services for Management (WS–Man) is a SOAP-XML–based protocol for exchanging system management information. Windows Remote Management (WinRM) tool is a Windows command line utility which allows remote management of servers by using WS–Management protocol. WinRM lets datacenter managers to access, edit, and update data from remote servers. It is possible to obtain hardware data from WS–Management protocol implementations running on non-Windows operating systems such as Linux. This allows operating systems from diverse vendors to function together.

This document provides necessary information to understand power management of Dell PowerEdge™ M1000e chassis systems by using WinRM tool.

<table>
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<tr>
<th>Table 1</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Helps in reducing power-related costs with efficient secure remote power management through WS–MAN.</td>
</tr>
<tr>
<td>2</td>
<td>Readily available tested WinRM commands for power management of Dell™ M1000e Chassis helps you to save time.</td>
</tr>
<tr>
<td>3</td>
<td>Scriptable remote power management through WS–MAN helps in developing Automation framework by Python Scripts and common APIs which can be utilized by management console developers.</td>
</tr>
</tbody>
</table>
3 Chassis Power Management

This white paper covers newly implemented power features in CMC WS–Man software solution. Typical remote management setup is shown in Figure 1. WinRM client on management system remotely connects to WS–Man service running on CMC for remote power management. For WinRM configuration and legacy remote power management features through WS–Man, refer to Chassis Management section of:


3.1 Enabling or Disabling Server Performance Over Power Redundancy

In some scenarios, Power Console admin need to prioritize between power consumption and server performance in data centers. Enable the Server Performance Over Power Redundancy option to prioritize the server performance and server power-up over maintaining the power redundancy policy. If disabled:

- The system prioritizes the power redundancy policy over server performance.
- Some servers are not provided sufficient power for full performance, or are not turned on.

Current status need to be checked before enabling or disabling ServerPerformanceOverPowerRedundancyEnabled property of the DCIM_ModularChassisView class.

<table>
<thead>
<tr>
<th>Class name</th>
<th>DCIM_ModularChassisView</th>
<th>Single instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property 1</td>
<td>ServerPerformanceOverPowerRedundancyEnabled</td>
<td>The feature is enabled when value is &quot;TRUE&quot;, or disabled when value is &quot;FALSE&quot;.</td>
</tr>
</tbody>
</table>


Sample Output:
DCIM_ModularChassisView

AssetTag = 00000
Caption = null
ChassisDefaultLowerPowerCap = 2715
ChassisDefaultUpperPowerCap = 16685
ChassisExternalPowerCap = 16685
Description = null
ElementName = chassis view
FQDD = System.Chassis.1
FlexFabricState = false, false, false, false
FlexFabricStateDescription = Fabric A, Fabric B, Fabric C, iDRAC
Generation = null
HostName = cmc-5Q1B42S
IPv4Address = <IDRAC_IP_ADDRESS>
InstanceID = dcim:System.Chassis.1
Location = [UNDEFINED]
MgmtControllerFirmwareVersion = 4.40.A00.201305160535
PhysicalLocationAisle
PhysicalLocationChassisName = CMC-5Q1B42S
PhysicalLocationDataCenter
PhysicalLocationDeviceSize = 10U
PhysicalLocationRack
PhysicalLocationRackSlot
PowerState = 2
PrimaryStatus = 3
PwrInputInfrastructureAllocation = 449
PwrInputSystemConsumption = 808
SNMPCommunityBladeIRAlert
SNMPDestinationBladeIRAlert
ServerBasedPowerMgmtEnableTime = 19691231180000.000000-360
ServerBasedPowerMgmtEnabled = false

ServerPerformanceOverPowerRedundancyEnabled = true

ServiceTag = 5Q1B42S
SystemPSUInputPower = 4444
SystemPSUOutputPower = 3789
UseHostNameForSlotName = true

From the sample output shown here, we see that ServerPerformanceOverPowerRedundancyEnabled is equal to 'true', which implies that the feature is enabled.

3.2 Disabling Server Performance Over Power Redundancy

Table 2  Method specification

<table>
<thead>
<tr>
<th>Class name</th>
<th>DCIM_ModularChassisView</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method Name</td>
<td>SetBIOSAttributes</td>
</tr>
<tr>
<td>AttributeName</td>
<td>ServerPerformanceOverPowerRedundancyEnabled</td>
</tr>
<tr>
<td>AttributeValue</td>
<td>FALSE</td>
</tr>
<tr>
<td>SystemFQDD</td>
<td>System.Chassis.1</td>
</tr>
<tr>
<td>FQDD</td>
<td>System.Chassis.1</td>
</tr>
</tbody>
</table>


Sample output:

SetBIOSAttributes_OUTPUT

  ReturnValue = 0

  SetResult = 2

Sample output:

SetBIOSAttributes_OUTPUT

  ReturnValue = 0
Remote Power Management of Dell™ PowerEdge™ M1000e with Chassis Management Controller (CMC) Using Windows® Remote Management (WinRM)

SetResult = 2

A sample input XML to describe the method input parameters:

```xml
  <p:FQDD>System.Chassis.1</p:FQDD>
  <p:AttributeName>ServerPerformanceOverPowerRedundancyEnabled</p:AttributeName>
  <p:AttributeValue>FALSE</p:AttributeValue>
</p:SetBIOSAttributes_INPUT>
```

Validate the output by viewing property ServerPerformanceOverPowerRedundancyEnabled of the DCIM_Modularchassisview class. Property value should be “false”.

3.3 Enabling Server Performance Over Power Redundancy

Table 3    Method specification

<table>
<thead>
<tr>
<th>Class name</th>
<th>Method Name</th>
<th>AttributeName</th>
<th>AttributeValue</th>
<th>SystemFQDD</th>
<th>FQDD</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCIM_ModularChassisView</td>
<td>SetBIOSAttributes</td>
<td>ServerPerformanceOverPowerRedundancyEnabled</td>
<td>TRUE</td>
<td>System.Chassis.1</td>
<td>System.Chassis.1</td>
</tr>
</tbody>
</table>


Sample output:

SetBIOSAttributes_OUTPUT

```
ReturnValue = 0
SetResult = 2
```

A sample input XML to describe the method input parameters:

```xml
</p:SetBIOSAttributes_INPUT>
```
3.4 Changing the Chassis External Power Cap

The Chassis External Power Cap is the Maximum input power that the system is allowed to allocate to servers and chassis infrastructure.

Table 4  Method specification

<table>
<thead>
<tr>
<th>Class name</th>
<th>DCIM_MgmtControllerService</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method Name</td>
<td>SetChassisExternalPowerCap</td>
</tr>
<tr>
<td>PowerCapValue</td>
<td>The external chassis power cap value in Watts.</td>
</tr>
<tr>
<td>ForceMode</td>
<td>Enable the force mode when set to &quot;TRUE&quot;, or disable the mode when set to &quot;FALSE&quot;. Enable force mode limits the Chassis power consumption to the set value regardless of whether or not the Chassis blades need to be throttled to achieve this.</td>
</tr>
</tbody>
</table>

C:\>winrm invoke SetChassisExternalPowerCap

Sample output:

SetChassisExternalPowerCap_OUTPUT

ReturnValue = 0

A sample input XML to describe the method input parameters:

  <p:PowerCapValue>14000</p:PowerCapValue>
  <p:ForceMode>FALSE</p:ForceMode>
</p:SetChassisExternalPowerCap_INPUT>
Validate output by viewing property `ChassisExternalPowerCap` of `DCIM_ModularChassisView` class.

```
```

Sample output:

```
DCIM_ModularChassisView

   AssetTag = 00000
   Caption = null
   ChassisDefaultLowerPowerCap = 2715
   ChassisDefaultUpperPowerCap = 16685
   ChassisExternalPowerCap = 14000
   Description = null
   ElementName = chassis view
   FQDD = System.Chassis.1
   FlexFabricState = false, false, false, false
   FlexFabricStateDescription = Fabric A, Fabric B, Fabric C, iDRAC
   Generation = null
   HostName = cmc-5Q1B42S
   IPv4Address = <IDRAC_IP_ADDRESS>
   InstanceID = dcmi:System.Chassis.1
   Location = [UNDEFINED]
   MgmtControllerFirmwareVersion = 4.40.A00.201305160535
   PhysicalLocationAisle
   PhysicalLocationChassisName = CMC-5Q1B42S
   PhysicalLocationDataCenter
   PhysicalLocationDeviceSize = 10U
   PhysicalLocationRack
```
PhysicalLocationRackSlot
PowerState = 2
PrimaryStatus = 3
PwrInputInfrastructureAllocation = 449
PwrInputSystemConsumption = 760
SNMPCommunityBladeIRAlert
SNMPDestinationBladeIRAlert
ServerBasedPowerMgmtEnableTime = 19691231180000.000000-360
ServerBasedPowerMgmtEnabled = false
ServerPerformanceOverPowerRedundancyEnabled = false
ServiceTag = 5Q1B42S
SystemPSUInputPower = 13332
SystemPSUOutputPower = 5683
UseHostNameForSlotName = true

3.5 Avg/Min/Max Input Power
Average, minimum, or maximum input power consumption reading. The period of measurement extends between reset events. Three instances of the Dell_AggregationPCPwrMetricValue classes will provide Average, Minimum and Maximum metrics.

<table>
<thead>
<tr>
<th>Class name</th>
<th>Dell_AggregationPCPwrMetricValue</th>
<th>Three instances for Avg, Min and Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell_AggregationPCPwrMetricValue</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AggregationDuration = null</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AggregationTimeStamp = 20130716012600.937960-300</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BreakdownDimension = null</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
BreakdownValue = null
Caption = null
ClassId = Dell:LoPCAmv
Description = null
Duration = null
ElementName = null
Generation = null
InstanceID = Dell:LoPCAmv
MeasuredElementName = null

MetricDefinitionId = System Power Consumption: PCLow Watermark
MetricValue = 0
TimeStamp = null
Volatile = false

Dell_AggregationPCPwrMetricValue
AggregationDuration = null
AggregationTimeStamp = 20130717071316.045196-300
BreakdownDimension = null
BreakdownValue = null
Caption = null
ClassId = Dell:HiPCAmv
Description = null
Duration = null
ElementName = null
Generation = null
InstanceID = Dell:HiPCAmv
MeasuredElementName = null
MetricDefinitionId = System Power Consumption: PCHigh Watermark

MetricValue = 1004

TimeStamp = null
Volatile = false

Dell_AggregationPCPwrMetricValue
AggregationDuration = null
AggregationTimeStamp = 20130717083828.050308-300
BreakdownDimension = null
BreakdownValue = null
Caption = null
ClassId = Dell:AvgPCAmv
Description = null
Duration = null
ElementName = null
Generation = null
InstanceId = Dell:AvgPCAmv

MeasuredElementName = null

MetricDefinitionId = System Power Consumption: PCAverage Watermark

MetricValue = 792

TimeStamp = null
Volatile = false

3.6 Resetting Power Metrics

<table>
<thead>
<tr>
<th>Class name</th>
<th>Method name</th>
<th>Property 1</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dell_PowerMetricService</td>
<td>ControlMetrics</td>
<td>MetricCollectionEnabled</td>
<td>uint16 possible values: 4 = Reset</td>
</tr>
<tr>
<td>Dell_AggregationPCPwrMetricValue</td>
<td>Reference to the</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sample output:

ControlMetrics_OUTPUT

   ReturnValue = 0

A sample input XML to describe the method input parameters:

```xml
xmlns:wsman="http://schemas.dmtf.org/wbem/wsman/1/wsman.xsd" >

    <p:Definition> 

        <wsa:ReferenceParameters>


            <wsman:SelectorSet>

                <wsman:Selector Name="__cimnamespace"><USERNAME>/dell/cmc</wsman:Selector>

            </wsman:SelectorSet>

        </wsa:ReferenceParameters>

    </p:Definition>

    <p:MetricCollectionEnabled>4</p:MetricCollectionEnabled>

</p:ControlMetrics_INPUT>
```
## Quickview of Major Power Properties

Single instance of the **DCIM_ModularChassisView** class provides quick view of most frequently monitored power properties in data center for power management.

<table>
<thead>
<tr>
<th>Class name</th>
<th>DCIM_ModularChassisView</th>
<th>Single Instance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Property 1</td>
<td>PwrInputInfrastructureAllocation</td>
<td>Uint32, The total input power the CMC allocates to the chassis infrastructure (fans, IO modules, iKVM, CMC, standby CMC, and iDRAC servers). Unit is in watts.</td>
</tr>
<tr>
<td>Property 2</td>
<td>PwrInputSystemConsumption</td>
<td>Uint32, The total input power consumption for all modules in the chassis as measured from the input side of the power supplies. Unit is in watts.</td>
</tr>
<tr>
<td>Property 3</td>
<td>ServerBasedPowerMgmtEnabled</td>
<td>Boolean, ServerBasedPowerMgmtEnabled reports whether the power management of modular servers are controlled by software component outside of the chassis management firmware. The feature is enabled when value is &quot;TRUE&quot;, or disabled when value is &quot;FALSE&quot;.</td>
</tr>
<tr>
<td>Property 4</td>
<td>ServerBasedPowerMgmtEnableTime</td>
<td>Datetime, ServerBasedPowerMgmtEnableTime reports the date and time server-based power management was enabled.</td>
</tr>
<tr>
<td>Property 5</td>
<td>SystemPSUInputPower</td>
<td>Uint16, The property shall represent the upper bound for the external power consumption by power supply units in Watts.</td>
</tr>
<tr>
<td>Property 6</td>
<td>SystemPSUOutputPower</td>
<td>Uint16, The property shall</td>
</tr>
<tr>
<td>Property 7</td>
<td>ServerPerformanceOverPowerRedundancyEnabled</td>
<td>Boolean, This property shall represent whether the blade server performance over the chassis power redundancy (SPOR) feature is enabled.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Property 8</td>
<td>ChassisDefaultLowerPowerCap</td>
<td>Uint32, Default Chassis Lower Power Input capping value</td>
</tr>
<tr>
<td>Property 9</td>
<td>ChassisDefaultUpperPowerCap</td>
<td>Uint32, Default Chassis Upper Power Input capping value</td>
</tr>
<tr>
<td>Property 10</td>
<td>ChassisExternalPowerCap</td>
<td>Uint32, ChassisExternalPowerCap indicates the current chassis external (wall) power budget cap value. This value can be changed through the DCIM_MgmtControllerService.SetChassisExternalPowerCap() method</td>
</tr>
</tbody>
</table>


Sample output:

DCIM_ModularChassisView

    AssetTag = 00000
    Caption = null

**ChassisDefaultLowerPowerCap = 2715**

**ChassisDefaultUpperPowerCap = 16685**

**ChassisExternalPowerCap = 14000**

    Description = null
ElementName = chassis view
FQDD = System.Chassis.1
FlexFabricState = false, false, false, false
FlexFabricStateDescription = Fabric A, Fabric B, Fabric C, iDRAC
Generation = null
HostName = cmc-5Q1B42S
IPv4Address = <IDRAC_IP_ADDRESS>
InstanceID = dcim:System.Chassis.1
Location = [UNDEFINED]
MgmtControllerFirmwareVersion = 4.40.A00.201305160535
PhysicalLocationAisle
PhysicalLocationChassisName = CMC-5Q1B42S
PhysicalLocationDataCenter
PhysicalLocationDeviceSize = 10U
PhysicalLocationRack
PhysicalLocationRackSlot

PowerState = 2
PrimaryStatus = 3

PwrInputInfrastructureAllocation = 449
PwrInputSystemConsumption = 760
SNMPCommunityBladeIRAlert
SNMPDestinationBladeIRAlert

ServerBasedPowerMgmtEnableTime = 19691231180000.000000-360
ServerBasedPowerMgmtEnabled = false
ServerPerformanceOverPowerRedundancyEnabled = false
ServiceTag = 5Q1B42S
SystemPSUInputPower = 13332

SystemPSUOutputPower = 5683

UseHostNameForSlotName = true
Summary

With increasing power costs as a primary issue for data center managers, efficient remote power management by secure, simple, and scriptable WinRM client will directly improve the operating cost and the reduce power consumption in data centers. The software Web service management features provided by CMC enables remote power management capabilities of the DellTM PowerEdgeTM M1000e Chassis.
For More Information

About PowerEdge™ M1000e Chassis

http://www.dell.com/support/Manuals/us/en/19/Product/poweredge-m1000e

About windows Remote Management