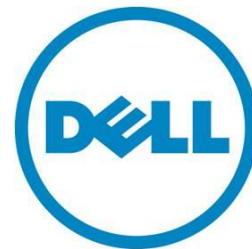

Configuration XML Workflows

This Dell Technical White Paper addresses how to effectively use server configuration XML files to perform various server management operations or achieve console workflows.

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Executive summary

With Lifecycle Controller 2 version 1.2, a snapshot of server configuration can be generated in XML format with an “Export Server Configuration” operation. Any configuration changes can be specified via XML and can be applied to one or more systems via the “Import Server Configuration” operation.

For a system administrator, this means he or she no longer needs to remember multiple commands so as to configure multiple aspects of the system. Rather, they have a single command and can specify the aspects of what needs to be configured on multiple components via an XML file. For a console application developer, this means he or she no longer needs to remember various operations to be performed in sequence to achieve a desired end state. Rather, the end state can be specified in human readable XML format. Read on to see how you can use this new feature to efficiently perform frequent configuration operations or console use-cases.

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Would not the difficulties of system administration be alleviated if there were only one command to remember and if you could specify how you wanted a target system to be configured via human readable configuration files? The latest 12G Dell Servers powered with Lifecycle Controller 2 Version 1.2 provide this exciting feature. Read on to learn more.

Introduction

Lifecycle Controller 2 version 1.2 adds the ability to Export Server Configuration to an XML file and to Import Server Configuration from an XML file. The Export operation captures a snapshot of the system configuration to XML file format and exports it to a network share. The Configuration XML file can be edited to change one or multiple configuration settings spanning different device classes, and be imported to one or more target systems.

Several console workflows can be made efficient by making appropriate edits to the input XML. This is very useful, because you do not need to perform multiple operations to effect multiple component configurations or console workflows. Instead, you can use a single Import Configuration XML operation with the changes in the input XML file. This document describes how you can use Lifecycle Controller 2 version 1.2 to perform the most common configuration tasks as identified by management consoles using Configuration XML.

Relevant Links

XML Configuration Feature - XML File Structure

http://en.community.dell.com/techcenter/extras/m/white_papers/20269601.aspx

The corresponding files can be found at the following link:

http://en.community.dell.com/techcenter/extras/m/white_papers/20269604.aspx

Configuration XML Workflows (this doc)

http://en.community.dell.com/techcenter/extras/m/white_papers/20269586.aspx

The corresponding scripts are at the following link:

http://en.community.dell.com/techcenter/extras/m/white_papers/20269591.aspx

Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

FQDD

Fully Qualified Device Descriptor is used to identify a particular component in a system. This is a consistent and generic identifier that clearly represents a physical or logical device that abstracts the underlying architecture and implementation.

Real Time configuration changes

Configuration changes that can be made effective without requiring a system reboot.

Stacking



Multiple operations can be stacked onto one workflow. For example, a VD can be created, initialized and a hot spare assigned to it. Three individual RAID operations are stacked here.

Attribute Registry

Database of configuration settings (attributes), grouped by device type.

<http://en.community.dell.com/techcenter/systems-management/w/wiki/1979.lifecycle-controller.aspx>

Event / Exception Message Registry

Database of error message IDs, messages and recommended response actions for various iDRAC / LC errors.

<http://support.dell.com/support/edocs/software/smsom/7.1/en/eventmsg/eventmsgs.pdf>

Command Line Syntax

WinRM Commands to exercise WSMAN API

Exporting Configuration XML:

System Configuration can be exported to NFS (0) or CIFS (2) shares, as specified by the “ShareType” parameter. The share where the exported file as specified by “FileName” should reside is specified in the “ShareName” parameter. In the case of CIFS shares, credentials to access the share should also be specified by the “UserName” and “Password” parameters.

```
winrm i ExportSystemConfiguration http://schemas.dmtf.org/wbem/wscim/1/cim-schema/2/root/dcim/DCIM_LCService?SystemCreationClassName=DCIM_ComputerSystem+CreationClassName=DCIM_LCService+SystemName=DCIM:ComputerSystem+Name=DCIM:LCService -u:root -p:calvin -r:https://192.168.1.2/wsman -SkipCNCheck -SkipCACheck -encoding:utf-8 -a:basic @){IPAddress="192.168.1.3";ShareName="/nfs";ShareType="0";FileName="Export.xml"}
```

Importing Configuration XML:

System Configuration can be imported from NFS (0) or CIFS (2) shares, as specified by the “ShareType” parameter. The share where the exported file as specified by “FileName” should reside is specified in the “ShareName” parameter. In the case of CIFS shares, credentials to access the share should also be specified by the “UserName” and “Password” parameters. If the import file “Import.xml” specifies some configuration changes that require a system reboot (as in BIOS, NIC, RAID or FC configuration), the user also needs to specify whether a Graceful (0) or a Forced (1) shutdown of the system is required, via the “ShutdownType” parameter. The default behavior is to shut down the system gracefully. If Graceful shutdown has been specified, the user could optionally specify a time to wait until the system shuts down via the “TimeToWait” parameter. The default “TimeToWait” is 300 seconds or 5 minutes. The maximum allowed “TimeToWait” is 3600 seconds or 60 minutes. After the configuration changes are applied, the user can specify whether the target system



should be left powered on (1) or powered off (0), via the “EndHostPowerState” parameter. The “ShutdownType”, “TimeToWait” and “EndHostPowerState” are optional parameters and the user is not required to use them to invoke the Import method.

```
winrm i ImportSystemConfiguration http://schemas.dmtf.org/wbem/wscim/1/cim-  
schema/2/root/dcim/DCIM_LCService?SystemCreationClassName=DCIM_ComputerSystem+CreationClassName=DCIM_LCService+SystemName=DCIM:ComputerSystem+Name=DCIM:LCService -u:root -p:calvin -r:https://192.168.1.2/wsman -SkipCNCheck -  
SkipCACheck -encoding:utf-8 -a:basic  
@{IPAddress="192.168.1.3";ShareName="/nfs";ShareType="0";FileName="Import.xml";ShutdownType="0";TimeToWait="300";EndHostPowerState="1"}
```

Command to check job status:

Both the ExportSystemConfiguration and ImportSystemConfiguration commands return a Lifecycle Job ID. The following command can be used to get status and details about the job.

```
winrm g "http://schemas.dmtf.org/wbem/wscim/1/cim-  
schema/2/DCIM_LifecycleJob?InstanceID=JID_186409478164+__cimnamespace=root/dcim" -u:root -p:calvin -r:https://192.168.1.2/wsman -encoding:utf-8 -a:basic -  
SkipCNcheck -SkipCACheck
```

RACADM Commands

Exporting Configuration XML to a CIFS share:

```
racadm get -f file -t xml -u myuser -p mypass -l //10.1.12.13/share
```

Exporting Configuration XML to an NFS share:

```
racadm get -f file -t xml -l 10.1.12.13:/myshare
```

Importing Configuration XML from a remote CIFS share:

```
racadm set -f myfile.xml -t xml -u myuser -p mypass -l //10.1.2.3/myshare
```

Importing Configuration XML from a remote NFS share:

```
racadm set -f myfile.xml -t xml -l 10.1.2.3:/myshare
```

Additional Racadm command options:

-b : Specifies the shutdown type for the host after the import operation completes. The parameters are "Graceful" and "Forced" for graceful and forced shutdown respectively. If this parameter is not specified, graceful shutdown is taken as the default.



-w : Maximum time to wait for the graceful shut down to occur. This has to be given in seconds. The maximum accepted value is 3600 seconds (one hour). The default value is 300 seconds (5 minutes).

-s : Power state of the host when the import operation completes. The parameters are "On" and "Off" for Powered ON and Powered OFF respectively. If this parameter is not specified, power ON is taken as default.

Workflows

1. Creating a virtual disk and initializing it
2. Assigning Hot Spares
3. RAID operations and BIOS operations
4. Updating the BIOS system and setup password
5. Setting BIOS, UEFI or HDD boot order
6. Setting One time boot order
7. Creating a bootable device and booting to that target
8. Enabling CNA partitioning and configuring partition attributes
9. Various Real time configuration workflows

General guidelines

- The XML file to be used as input for "Import Configuration" should be valid XML and adhere to the schema published in the Dell Lifecycle Controller Schema guide.
- The feature performs more efficiently if the input is only those attributes that are being changed. For example, if NIC configuration is intended, it would be more efficient if the input consisted of just the NIC XML snippets. Additional components and their attributes do not pose a problem and will not cause changes on the target, but the job will take longer to complete as the implementation compares the current settings on the target to the input.
- If only RAID configuration is being performed, the RAID excerpt needs to have the enclosing Controller component node, even if VD or PD configuration is being performed. Ordering of attributes within a component node is not required as the implementation processes the attributes in a defined order. For example, if RAIDResetConfig is specified in the input XML regardless of where it is located, it is performed as the first RAID operation. VDs, on the other hand, get created based on the order in which they were specified in the input XML. As VD FQDDs are decided by the target controller, post import, the VD FQDD may not match that specified in the XML.
- The user is expected to look up the various attribute registries for valid values, ranges for the various attributes. An alternate method to lookup all possible values for attributes is by enumerating the various WSMAN attribute classes.



RAID Stacking: Creating a Virtual Disk and Initializing it

Configuration XML can be used to create a Virtual Disk and initialize it. The following XML snippet illustrates how this can be specified.

The highlighted attributes identify the component to be operated on and the RAID operations to be performed on it. The other attributes serve as input parameters for creating the virtual disk.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="RAID.Slot.2-1">
    <Component FQDD="Disk.Virtual.0:RAID.Slot.2-1">
      <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.0:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
      <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.9:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
      <Attribute Name="RAIDAction">Create</Attribute>
      <Attribute Name="RAIDinitOperation">Fast</Attribute>
      <Attribute Name="DiskCachePolicy">Default</Attribute>
      <Attribute Name="RAIDdefaultWritePolicy">WriteBack</Attribute>
      <Attribute Name="RAIDdefaultReadPolicy">Adaptive</Attribute>
      <!-- <Attribute Name="Cachecade">Not a Cachecade Virtual
Disk</Attribute> -->
      <Attribute Name="Name">xmlconfig</Attribute>
      <Attribute Name="Size">146163105792</Attribute>
      <Attribute Name="StripeSize">128</Attribute>
      <Attribute Name="SpanDepth">1</Attribute>
      <Attribute Name="SpanLength">2</Attribute>
      <Attribute Name="RAIDTypes">RAID 1</Attribute>
    </Component>
  </Component>
</SystemConfiguration>
```

RAID Stacking: ResetConfig, CreateVD and assigning HotSpares

Multiple RAID operations can be combined further. The following XML sample illustrates how to Reset Config, Create a VD, assign a dedicated spare to the VD and assign a PD as a global hot spare.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="RAID.Slot.2-1">
    <Attribute Name="RAIDresetConfig">True</Attribute>
    <Component FQDD="Disk.Virtual.0:RAID.Slot.2-1">
      <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.0:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
```




```

        <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.9:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
        <Attribute
Name="RAIDDedicatedSpare">Disk.Bay.5:Enclosure.External.0-0:RAID.Slot.2-
1</Attribute>
        <Attribute Name="RAIDAction">Create</Attribute>
        <Attribute Name="DiskCachePolicy">Default</Attribute>
        <Attribute Name="RAIDdefaultWritePolicy">WriteBack</Attribute>
        <Attribute Name="RAIDdefaultReadPolicy">Adaptive</Attribute>
        <!-- <Attribute Name="Cachecade">Not a Cachecade Virtual
Disk</Attribute> -->
        <Attribute Name="Name">xmlconfig</Attribute>
        <Attribute Name="Size">146163105792</Attribute>
        <Attribute Name="StripeSize">128</Attribute>
        <Attribute Name="SpanDepth">1</Attribute>
        <Attribute Name="SpanLength">2</Attribute>
        <Attribute Name="RAIDTypes">RAID 1</Attribute>
    </Component>
    <Component FQDD="Enclosure.External.0-0:RAID.Slot.2-1">
        <Component FQDD="Disk.Bay.4:Enclosure.External.0-0:RAID.Slot.2-1">
            <Attribute Name="RAIDHotSpareStatus">Global</Attribute>
            <!-- <Attribute Name="RAIDPDState">Ready</Attribute> -->
        </Component>
    </Component>
</Component>
</SystemConfiguration>

```

The highlighted attributes identify the component to be operated on and the RAID operations to be performed on it. The other attributes serve as input parameters for creating the virtual disk.

To mark a particular physical disk as a dedicated hot spare for the virtual disk to be created, the value for the “RAIDDedicatedSpare” attribute is set to the FQDD of the PD. The attribute is listed under the VD component node.

To mark a particular physical disk as a global hot spare, the value for the “RAIDHotSpareStatus” attribute is set to “Global”. The attribute is listed under the PD component node. “Dedicated” is not a valid value for the “RAIDHotSpareStatus” attribute and will result in an error.

RAID Stacking with BIOS attributes

It is possible to modify BIOS, NIC or any other component configuration along with RAID components. The XML sample below illustrates how to configure one BIOS attribute along with RAID operations such as Reset Config, Create VD and assign dedicated hotspare.

```

<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
    <Component FQDD="BIOS.Setup.1-1">
        <Attribute Name="EmbNic1Nic2">Enabled</Attribute>
    </Component>

```



```

</Component>
<Component FQDD="RAID.Slot.2-1">
  <Attribute Name="RAIDresetConfig">True</Attribute>
  <Component FQDD="Disk.Virtual.0:RAID.Slot.2-1">
    <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.0:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
    <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.9:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
    <Attribute Name="RAIDdedicatedSpare">Disk.Bay.5:Enclosure.External.0-
0:RAID.Slot.2-1</Attribute>
    <Attribute Name="RAIDaction">Create</Attribute>
    <Attribute Name="DiskCachePolicy">Default</Attribute>
    <Attribute Name="RAIDdefaultWritePolicy">WriteBack</Attribute>
    <Attribute Name="RAIDdefaultReadPolicy">Adaptive</Attribute>
    <!-- <Attribute Name="Cachecade">Not a Cachecade Virtual
Disk</Attribute> -->
    <Attribute Name="Name">xmlconfig</Attribute>
    <Attribute Name="Size">146163105792</Attribute>
    <Attribute Name="StripeSize">128</Attribute>
    <Attribute Name="SpanDepth">1</Attribute>
    <Attribute Name="SpanLength">2</Attribute>
    <Attribute Name="RAIDTypes">RAID 1</Attribute>
  </Component>
</Component>
</SystemConfiguration>

```

Setting, Changing or Deleting the BIOS system and setup passwords

BIOS system and setup passwords can be set, changed or deleted via Import Configuration.

It is also important to note that if the password jumper is not correctly set on the planar, the attributes corresponding to the BIOS system and setup passwords are not supported and hence will not be exported in the XML.

The following excerpts illustrate how the BIOS system and setup passwords can be set, changed or deleted.

Setting BIOS passwords

The “OldSysPassword” attribute should be uncommented and the value should be left blank as the system password has not been set previously. The “NewSysPassword” attribute should be uncommented and a value (clear text, ASCII format) should be provided. Invalid values will cause an error.



The PasswordStatus attribute must be set to “Unlocked” when setting the System Password.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="BIOS.Setup.1-1">
    <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
    <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
    <Attribute Name="OldSysPassword"></Attribute>
    <Attribute Name="NewSysPassword">new password value</Attribute>
    <!-- <Attribute Name="OldSetupPassword">*****</Attribute> -->
    <!-- <Attribute Name="NewSetupPassword">*****</Attribute> -->
    <Attribute Name="PasswordStatus">Unlocked</Attribute>
    <Attribute Name="TpmSecurity">Off</Attribute>
  </Component>
</SystemConfiguration>
```

Changing BIOS passwords

The “OldSysPassword” attribute should be uncommented and the value should be the current system password. The “NewSysPassword” attribute should be uncommented and a value (clear text, ASCII format) should be provided. Invalid values will cause an error.

The PasswordStatus attribute must be set to “Unlocked” when setting the System Password.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="BIOS.Setup.1-1">
    <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
    <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
    <Attribute Name="OldSysPassword">current BIOS system password
  </Attribute>
    <Attribute Name="NewSysPassword">new password value</Attribute>
    <!-- <Attribute Name="OldSetupPassword">*****</Attribute> -->
    <!-- <Attribute Name="NewSetupPassword">*****</Attribute> -->
    <Attribute Name="PasswordStatus">Unlocked</Attribute>
    <Attribute Name="TpmSecurity">Off</Attribute>
  </Component>
</SystemConfiguration>
```

Deleting BIOS passwords

The “OldSysPassword” attribute should be uncommented and the value should be the current system password. The “NewSysPassword” attribute should be uncommented and the value should be left empty.



The PasswordStatus attribute must be set to “Unlocked”.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="BIOS.Setup.1-1">
    <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
    <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
    <Attribute Name="OldSysPassword">current BIOS system
password</Attribute>
    <Attribute Name="NewSysPassword"></Attribute>
    <!-- <Attribute Name="OldSetupPassword">*****</Attribute> -->
    <!-- <Attribute Name="NewSetupPassword">*****</Attribute> -->
    <Attribute Name="PasswordStatus">Unlocked</Attribute>
    <Attribute Name="TpmSecurity">Off</Attribute>
  </Component>
</SystemConfiguration>
```

Setting, Changing or Deleting BIOS Setup passwords

Steps would be similar to those outlined in sections 6.5.1-6.5.3 except that the user would need to uncomment and modify the “OldSetupPassword” and “NewSetupPassword” attributes appropriately.

The “PasswordStatus” attribute has no bearing on the “SetupPassword” attributes.

Setting BIOS, UEFI or HDD boot order

The BIOS, UEFI or HDD boot order can be modified through Import Configuration. The sample below illustrates this. The highlighted attributes indicate the component and attributes to be modified.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
  <Component FQDD="BIOS.Setup.1-1">
    <Attribute Name="BootMode">Bios</Attribute>
    <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
    <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
    <!-- <Attribute Name="UefiBootSeq">NIC.Integrated.1-1-1,
NIC.Integrated.1-2-1, NIC.Integrated.1-3-1, NIC.Integrated.1-4-1,
Floppy.iDRACVirtual.1-1, Optical.iDRACVirtual.1-1</Attribute> -->
    <!-- <Attribute Name="BiosBootSeq">NIC.Integrated.1-2-1,
NIC.Integrated.1-1-1, NIC.Integrated.1-4-1, NIC.Integrated.1-3-1,
Floppy.iDRACVirtual.1-1, Optical.iDRACVirtual.1-1</Attribute> -->
    <!-- <Attribute Name="HddSeq"></Attribute> -->
    <!-- <Attribute Name="OneTimeBiosBootSeq"></Attribute> -->
    <!-- <Attribute Name="OneTimeUefiBootSeq"></Attribute> -->
    <!-- <Attribute Name="OneTimeHddSeq"></Attribute> -->
  </Component>
```



```
</SystemConfiguration>
```

In order to change the BIOS, UEFI or HDD boot order, the appropriate boot order attribute must be uncommented first (BiosBootSeq, UefiBootSeq or HddSeq respectively). The “BootMode” attribute should be also set appropriately.

For example, to set the BIOS Boot Order, the “BiosBootSeq” attribute must be uncommented and the “BootMode” must be set to “Bios”. The value of the “BiosBootSeq” attribute can be a comma separated list of FQDDs or a single FQDD of the device to boot to. If only one device is specified, then this device will be the first device in the boot order and other devices move down in the boot sequence.

Only one boot order attribute can be configured at a time. However, to this is that the BIOS and HDD boot order can be set at the same time.

Setting one time boot order

The BIOS, UEFI or HDD one time boot order can also be modified via an appropriate XML excerpt. The highlighted attributes indicate the component and attributes to be modified.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
<Component FQDD="BIOS.Setup.1-1">
  <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
  <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
  <!-- <Attribute Name="UefiBootSeq">NIC.Integrated.1-1-1,
NIC.Integrated.1-2-1, NIC.Integrated.1-3-1, NIC.Integrated.1-4-1,
Floppy.iDRACVirtual.1-1, Optical.iDRACVirtual.1-1</Attribute> -->
  <!-- <Attribute Name="BiosBootSeq">NIC.Integrated.1-2-1,
NIC.Integrated.1-1-1, NIC.Integrated.1-4-1, NIC.Integrated.1-3-1,
Floppy.iDRACVirtual.1-1, Optical.iDRACVirtual.1-1</Attribute> -->
  <!-- <Attribute Name="HddSeq"></Attribute> -->
  <!-- <Attribute Name="OneTimeBiosBootSeq"> NIC.Integrated.1-1-
1</Attribute> -->
  <!-- <Attribute Name="OneTimeUefiBootSeq"></Attribute> -->
  <!-- <Attribute Name="OneTimeHddSeq"></Attribute> -->
</Component>
</SystemConfiguration>
```

Only one type of one time boot attribute can be changed at a given time. Irrespective of what current boot mode is set to, one time boot can be performed to any device in the appropriate list.

For example, if the BIOS boot mode is set to UEFI, the “OneTimeBiosBootSeq” attribute can be set to the FQDD of a DOS bootable USB key.



As another example, here is how the BIOS boot sequence can be set to boot once to a BIOS bootable device, viz., one time boot to the first NIC port in the BIOS boot order which is set to PXE. Uncomment the “OneTimeBiosBootSeq” attribute and set it to “NIC.Integrated.1-1-1” value from the “BiosBootSeq” attribute. The “BiosBootSeq” attribute lists all the BIOS bootable devices.

Creating a bootable target and booting into that target

A bootable device can be created and booted to in a single import job. The FQDD of the bootable device being created should be predetermined and included in the appropriate boot sequence or one time boot attribute.

A bootable device can be created in one of the following ways:

- Create a VD using directions in Section 6.1 or Section 6.2.
- Set a NIC target as iSCSI or PXE or iBFT bootable target depending on the feature supported by the NIC card.

The XML snapshot below illustrates how to create a bootable target and boot to that target. The highlighted attributes indicate the component and attributes to be modified.

As an example, consider enabling a NIC port as a bootable PXE target and booting to it. The excerpt below enables PXE boot on the first NIC port and sets the NIC port as the first device in the boot order. As highlighted, under FQDD for “NIC.Integrated.1-1-1”, the “LegacyBootProto” attribute is set to “PXE”. The “BiosBootSeq” attribute is set to “NIC.Integrated.1-1-1”, to indicate that the NIC port is the first device in the Bios Boot order.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
<Component FQDD="BIOS.Setup.1-1">
  <Attribute Name="BootMode">Bios</Attribute>
  <!-- <Attribute Name="MemRefreshRate">1x</Attribute> -->
  <!-- <Attribute Name="MemVolt">AutoVolt</Attribute> -->
  <!-- <Attribute Name="UefiBootSeq">NIC.Integrated.1-1-1,
NIC.Integrated.1-2-1, NIC.Integrated.1-3-1, NIC.Integrated.1-4-1,
Floppy.iDRACVirtual.1-1, Optical.iDRACVirtual.1-1</Attribute> -->
  <Attribute Name="BiosBootSeq">NIC.Integrated.1-1-1</Attribute>
  <!-- <Attribute Name="HddSeq"></Attribute> -->
  <!-- <Attribute Name="OneTimeBiosBootSeq"> NIC.Integrated.1-1-
1</Attribute> -->
  <!-- <Attribute Name="OneTimeUefiBootSeq"></Attribute> -->
  <!-- <Attribute Name="OneTimeHddSeq"></Attribute> -->
</Component>

<Component FQDD="NIC.Integrated.1-1-1">
  <!-- <Attribute Name="SecondTgtChapId"></Attribute> -->
  <!-- <Attribute Name="SecondTgtChapPwd"></Attribute> -->
  <Attribute Name="LegacyBootProto">PXE</Attribute>
```



```

    <Attribute Name="LnkSpeed">100MbpsHalf</Attribute>
  </Component>
</SystemConfiguration>

```

The following XML excerpt will create a virtual disk that does not exist locally on the controller (RAID 0 Virtual Disk) and assign it as the first device in the BIOS boot sequence. Under the component with FQDD “Disk.Virtual.0:RAID.Integrated.1-1”, the “RAIDAction” is set to “Create”. Under the component with FQDD “BIOS.Setup.1-1”, the “BootMode” attribute is set to “Bios” and the “BiosBootSeq” attribute is set to “HardDisk.List.1-1”.

If an export is performed on a host where no VDs are created, the RAID excerpt corresponding to “Disk.Virtual.0:RAID.Integrated.1-1” will not exist. To create a VD, the user needs to add the appropriate RAID XML excerpt. Only the “RAIDTypes” and the “RAIDAction” attributes are highlighted, but the other attributes are also required for creating the VD. For reference, the user could use an XML from a system that already has VDs created.

```

<SystemConfiguration Model="PowerEdge R620" ServiceTag="CDVB7R1"
TimeStamp="Sun Sep 23 05:44:57 2012">
  <Component FQDD="BIOS.Setup.1-1">
    <Attribute Name="BootMode">Bios</Attribute>
    <Attribute Name="BiosBootSeq">HardDisk.List.1-1</Attribute>
  </Component>
  <Component FQDD=RAID.Integrated.1-1">
    <Component FQDD="Disk.Virtual.0:RAID.Integrated.1-1">
      <Attribute Name="RAIDAction">Create</Attribute>
      <Attribute Name="DiskCachePolicy">Default</Attribute>
      <Attribute Name="RAIDdefaultWritePolicy">WriteThrough</Attribute>
      <Attribute Name="RAIDdefaultReadPolicy">NoReadAhead</Attribute>
      <Attribute Name="Cachecade">Not a Cachecade Virtual Disk</Attribute>
      <Attribute Name="Name">RAID ZERO</Attribute>
      <Attribute Name="Size">0</Attribute>
      <Attribute Name="StripeSize">128</Attribute>
      <Attribute Name="SpanDepth">1</Attribute>
      <Attribute Name="SpanLength">2</Attribute>
      <Attribute Name="RAIDTypes">RAID 0</Attribute>
    </Component>
    <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.1:Enclosure.Internal.0-
1:RAID.Integrated.1-1</Attribute>
    <Attribute
Name="IncludedPhysicalDiskID">Disk.Bay.0:Enclosure.Internal.0-
1:RAID.Integrated.1-1</Attribute>
  </Component>
</Component>
</SystemConfiguration>

```

Enabling NIC partitions and configuring partition attributes



This section primarily pertains to the Broadcom cards that support partitioning (57800 or 57810 chipset).

Partitions can be enabled and partition attributes can be configured via Import Configuration. The snapshot below illustrates how this can be done. The highlighted attributes indicate the component and attributes to be modified.

QLogic cards have partitions enabled, but configuring partition attributes would be similar.

Enabling partitions and configuring partition attributes can be done in two ways:

- Configuration can be exported from a system with similar cards and partitioning enabled. The exported configuration can then be imported to a system where partitioning is disabled. Post import, the target system would have partitioning enabled and partitions configured appropriately.
- XML can be manually edited to enable partitioning on a NIC device by setting the value of the "NicPartitioning" attribute to "Enabled". If partitioning has not been enabled for any NIC card, then the partition attributes will not be visible. The partition attributes and values need to be added in to the XML. Exported configuration from a system that has similar cards can be used as a reference for a list of partition attributes.

In the sample below, the FQDD NIC.Slot.3-1-1 corresponds to the 57810 Broadcom NDC.

```
<SystemConfiguration Model="PowerEdge R620" ServiceTag="HPGBDV1"
TimeStamp="Fri Jul 20 10:12:55 2012">
<Component FQDD="NIC.Slot.3-1-1">
  <!-- <Attribute Name="UseIndTgtName">Disabled</Attribute> -->
  <Attribute Name="NicPartitioning">Enabled</Attribute>
  <Attribute Name="FlowControlSetting">Tx/RxFlow</Attribute>
  <Attribute Name="NicMode">Enabled</Attribute>
  <Attribute Name="iScsiOffloadMode">Enabled</Attribute>
  <Attribute Name="MinBandwidth">25</Attribute>
  <Attribute Name="MaxBandwidth">50</Attribute>
  <Attribute Name="FCoETgtBoot">Enabled</Attribute>
  <Attribute Name="FCoEFirstHddTarget">Disabled</Attribute>
  <Attribute Name="FCoELnkUpDelayTime">0</Attribute>
  <Attribute Name="FCoELunBusyRetryCnt">0</Attribute>
  <Attribute Name="FCoEFabricDiscoveryRetryCnt">4</Attribute>
  <!-- <Attribute Name="ConnectFirstFCoETarget">Disabled</Attribute> -->
  <!-- <Attribute
Name="FirstFCoEWWPNTarget">00:00:00:00:00:00:00:00</Attribute> -->
  <!-- <Attribute Name="FirstFCoEBootTargetLUN">0</Attribute> -->
</Component>
<Component FQDD="NIC.Slot.3-1-2">
  <Attribute Name="NicMode">Enabled</Attribute>
  <Attribute Name="iScsiOffloadMode">Enabled</Attribute>
  <!-- <Attribute Name="MacAddr">00:10:18:D0:31:D4</Attribute> -->
  <!-- <Attribute Name="VirtMacAddr">00:10:18:D0:31:D4</Attribute> -->
  <!-- <Attribute Name="IscsiMacAddr">00:10:18:D0:31:D5</Attribute> -->
  <!-- <Attribute Name="VirtIscsiMacAddr">00:10:18:D0:31:D5</Attribute> -
-->
```




```

    <!-- <Attribute Name="PCIDeviceID">16AE</Attribute> -->
    <!-- <Attribute Name="BusDeviceFunction">05:00:02</Attribute> -->
    <Attribute Name="MinBandwidth">26</Attribute>
    <Attribute Name="MaxBandwidth">50</Attribute>
</Component>
<Component FQDD="NIC.Slot.3-1-3">
    <Attribute Name="NicMode">Enabled</Attribute>
    <!-- <Attribute Name="iScsiOffloadMode">Disabled</Attribute> -->
    <!-- <Attribute Name="MacAddr">00:10:18:D0:31:D8</Attribute> -->
    <!-- <Attribute Name="VirtMacAddr">00:10:18:D0:31:D8</Attribute> -->
    <!-- <Attribute Name="IscsiMacAddr">00:10:18:D0:31:D9</Attribute> -->
    <!-- <Attribute Name="VirtIscsiMacAddr">00:10:18:D0:31:D9</Attribute> -->
->
    <!-- <Attribute Name="PCIDeviceID">16AE</Attribute> -->
    <!-- <Attribute Name="BusDeviceFunction">05:00:04</Attribute> -->
    <Attribute Name="MinBandwidth">20</Attribute>
    <Attribute Name="MaxBandwidth">50</Attribute>
</Component>
<Component FQDD="NIC.Slot.3-1-4">
    <Attribute Name="NicMode">Enabled</Attribute>
    <!-- <Attribute Name="iScsiOffloadMode">Disabled</Attribute> -->
    <!-- <Attribute Name="MacAddr">00:10:18:D0:31:DC</Attribute> -->
    <!-- <Attribute Name="VirtMacAddr">00:10:18:D0:31:DC</Attribute> -->
    <!-- <Attribute Name="IscsiMacAddr">00:10:18:D0:31:DD</Attribute> -->
    <!-- <Attribute Name="VirtIscsiMacAddr">00:10:18:D0:31:DD</Attribute> -->
->
    <!-- <Attribute Name="PCIDeviceID">16AE</Attribute> -->
    <!-- <Attribute Name="BusDeviceFunction">05:00:06</Attribute> -->
    <Attribute Name="MinBandwidth">26</Attribute>
    <Attribute Name="MaxBandwidth">50</Attribute>
</Component>
</SystemConfiguration>

```

Various Real time configuration workflows

In previous LC releases, various real time configurations have been effected through WSMAN in 2 ways:

- SetAttributes and CreateConfigJob: In this case, the configuration changes can be scheduled to be applied either now or at a future time. The attributes are required to be set in the order that satisfies the attribute dependencies in order for the SetAttributes to be successful.
- ApplyAttributes: In this case, the attribute changes are applied immediately. As in the case of SetAttributes, the attributes should be set in an order that satisfies the attribute dependencies.

Racadm has a number of commands that can be used to tweak various settings, the usual syntax is:

```
racadm config -g <groupname> -o <objectname> <objectvalue>
```



The user needs to know both the group and the object name of the property that is being configured.

Unlike configuration changes that require a reboot, there are no visible time savings (as compared to the previous release) for real time configuration changes. However, with the “Import Configuration” feature, there are 2 key advantages:

- The attributes do not need to be specified in the order of dependencies in the input.
- There is a single command from both WSMAN and racadm to configure any attribute.

In the following subsections, XML snippets to be used as input for various configuration commands are shown.

Configuring and un-configuring iDRAC Users

Configuring iDRAC users is a task that is performed on initial system setup or redeployment. User attributes have dependencies, and therefore the user name and password of a user had to be configured first before the other attributes could be configured. With the new “Import XML configuration” feature, adhering to the order in the input XML is not mandatory. For import, the password is specified in clear text, but it is obfuscated on export.

Sample XML to configure user #3:

```
<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="iDRAC.Embedded.1">
  <Attribute Name="Users.3#UserName">user3</Attribute>
  <Attribute Name="Users.3#Password">user3</Attribute>
  <Attribute Name="Users.3#Privilege">511</Attribute>
  <Attribute Name="Users.3#IpmlanPrivilege">Administrator</Attribute>
  <Attribute Name="Users.3#IpmlSerialPrivilege">Administrator</Attribute>
  <Attribute Name="Users.3#Enable">Enabled</Attribute>
  <Attribute Name="Users.3#SolEnable">Disabled</Attribute>
  <Attribute Name="Users.3#ProtocolEnable">Enabled</Attribute>
  <Attribute Name="Users.3#AuthenticationProtocol">SHA</Attribute>
  <Attribute Name="Users.3#PrivacyProtocol">AES</Attribute>
</Component>
</SystemConfiguration>
```

Sample XML to un-configure user #3:

In previous LC releases, to un-configure a user, all the user attributes had to be specified in the reverse order of the “configuring users” workflow. With “Import Configuration”, leaving the username blank and specifying the user to be Disabled, will cause all settings for that user to go back to the defaults, this effectively un-configuring the user.



```

<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="iDRAC.Embedded.1">
  <Attribute Name="Users.3#UserName"></Attribute>
  <Attribute Name="Users.3#Enable">Disabled</Attribute>
</Component>
</SystemConfiguration>

```

Ensuring power consumption stays low - setting Power Cap

In order to ensure that the total power draw stays under a given threshold, Power Capping can be enabled and a user defined limit (in Watts) set for the PowerCap, as illustrated by the following XML snippet.

```

<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="System.Embedded.1">
  <Attribute Name="ServerPwr.1#PowerCapSetting">Enabled</Attribute>
  <Attribute Name="ServerPwr.1#PowerCapValue">247</Attribute>
</Component>
</SystemConfiguration>

```

Configuring SNMP and Email Alert destinations

When the iDRAC senses a platform event such as an environmental warning or a component failure, SNMP traps can be sent to up to 8 destinations. Destinations can be specified by IP address (IPv4 or IPv6) or FQDN. The following XML snippet illustrates how to configure various trap destinations and enable them and also how to set email alert destinations.

```

<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<!-- 8 SNMP destinations and 4 Email alert destinations can be configured -->
<Component FQDD="iDRAC.Embedded.1">
  <Attribute Name="SNMPAlert.1#Destination">192.168.1.2</Attribute>
  <Attribute Name="SNMPAlert.1#State">Enabled</Attribute>
  <Attribute
Name="SNMPAlert.2#Destination">3ffe:1900:4545:3:200:f8ff:fe21:67cf</Attribute>
  <Attribute Name="SNMPAlert.2#State">Enabled</Attribute>
  <Attribute Name="SNMPAlert.3#Destination">trapsink.dell.com</Attribute>
  <Attribute Name="SNMPAlert.3#State">Enabled</Attribute>
  <Attribute Name="EmailAlert.1#Enable">Enabled</Attribute>
  <Attribute Name="EmailAlert.1#Address">admin@mycompany.com</Attribute>
  <Attribute Name="EmailAlert.1#CustomMsg">Alert</Attribute>
</Component>
</SystemConfiguration>

```



Configuring Time Zone and NTP

Network time protocol can be enabled and the reference time servers and time zone can be configured via the following XML snippet. Modifying the time zone changes the iDRAC time only if NTP is enabled and the iDRAC has obtained the time from the NTP server.

```
<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="iDRAC.Embedded.1">
  <Attribute Name="Time.1#TimeZone">US/Central</Attribute>
  <Attribute Name="NTPConfigGroup.1#NTP1">192.168.2.3</Attribute>
  <Attribute Name="NTPConfigGroup.1#NTP2">192.168.1.3</Attribute>
  <Attribute
Name="NTPConfigGroup.1#NTP3">3ffe:1900:4545:3:200:f8ff:fe21:67cf
</Attribute>
  <Attribute Name="NTPConfigGroup.1#NTPEnable">Enabled</Attribute>
  <Attribute Name="NTPConfigGroup.1#NTPMaxDist">16</Attribute>
</Component>
</SystemConfiguration>
```

Configuring Static IP

In contrast to previous LC releases, static IP can be configured for the target even when DHCP is enabled. The following XML snippet illustrates this.

```
<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="iDRAC.Embedded.1">
  <Attribute Name="IPv4Static.1#Address">192.168.0.120</Attribute>
  <Attribute Name="IPv4Static.1#Netmask">255.255.255.0</Attribute>
  <Attribute Name="IPv4Static.1#Gateway">192.168.0.1</Attribute>
</Component>
</SystemConfiguration>
```

Configuring Thermal Monitoring Alert Generation Interval

If the system operating temperature continually exceeds the expected threshold limits then a warning or critical event is generated. The following attributes can be configured to set the alert generation interval (in days). XML snippet below:

```
<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="System.Embedded.1">
  <Attribute Name="ThermalConfig.1#EventGenerationInterval">60</Attribute>
  <Attribute
Name="ThermalConfig.1#CriticalEventGenerationInterval">45</Attribute>
</Component>
```



```
</SystemConfiguration>
```

Configuring System Location

Once a system has been deployed, an admin can configure the system location so that it can be easily located in case there is a problem. XML snippet below:

```
<SystemConfiguration Model="PowerEdge R720" ServiceTag="FJGDNX1"
TimeStamp="Wed Oct 10 01:11:37 2012">
<Component FQDD="System.Embedded.1">
  <Attribute Name="ServerTopology.1#DataCenterName">Super Secret
DC</Attribute>
  <Attribute Name="ServerTopology.1#AisleName">Aisle 3</Attribute>
  <Attribute Name="ServerTopology.1#RackName">Rack 2</Attribute>
  <Attribute Name="ServerTopology.1#RackSlot">3</Attribute>
  <Attribute Name="ServerTopology.1#RoomName">Lab 2</Attribute>
</Component>
</SystemConfiguration>
```

Troubleshooting

Prerequisites for running Export / Import Configuration

- Lifecycle Controller State attribute must be “Enabled”.
- Installed USC version should have appropriate capabilities (XML configuration, Shutdown Job). The minimum versions of iDRAC and Lifecycle Controller that have the appropriate capabilities are: iDRAC 1.30.30, A00 and Lifecycle Controller 1.1.0.1109, A00.
- The Remote Configuration feature should be enabled in the installed license.
- The user executing the operations should have the Server Control privilege.
- Only one export / import operation can run at any given time. Export / Import operations cannot be scheduled.
- Other configuration / update jobs cannot be running.

Checklist

The following is a checklist of items that can be used to ensure there are no user errors if “Export / Import Configuration” is not working as expected.

- If the Import Configuration job fails with a schema validation failure error:

Ensure that the input XML is well formed and adheres to the schema published in the Dell Lifecycle Controller Schema Guide. The Lifecycle logs may contain additional information about the line at which invalid characters are encountered. This is not possible if the invalid characters are Unicode characters, in this case, viewing the XML in a browser will give an indication of where the problem is.



- If Export Configuration job fails with one or more components not found:

Ensure that the system has been updated to the recommended versions of iDRAC, USC and BIOS. After the recommended versions are installed, ensure that CSIOR is complete after the system powers on.

Errors

The Lifecycle Controller Profile lists the various errors that can be returned from an Export / Import operation. After an Export / Import job has been created, there are some cases where the job could fail. The possible errors are listed below.

Table 1 – Error messages from Export / Import

Message ID	Message
SYS044	Unable to export one or more component configurations.
SYS045	Unable to copy the system configuration XML file to the network share.
SYS046	Unable to import the system configuration XML file from the network share.



Message ID	Message
SYS047	Input file for system configuration XML is not compliant with configuration schema.
SYS048	System configuration XML input file contains invalid characters, <character> at line <line>.
SYS050	The system configuration XML file for import configuration is not compliant with schema nesting checks.
SYS051	The system could not be shut down within the specified time.



Message ID	Message
SYS062	Input file for import configuration operation is invalid. The expected XML root element was not found.
SYS064	Input file for import configuration operation is invalid at line <line>.
SYS065	Input file for import configuration operation cannot be found or opened.
SYS071	System configuration XML export operation timed-out.
SYS072	System configuration XML import operation timed-out.

For a complete list of all errors, please lookup the error message registry.



Results of applying configuration

Both successful configuration changes and failures to effect the configuration changes are logged to Lifecycle Log and can be retrieved via WSMAN operations to retrieve them for a particular job id (GetConfigResults). Here are some samples of ConfigResults:

In this case, the input file for Import Configuration contained 2 attributes. The first attribute had a bad value and the second attribute was misspelled.

```
<ConfigResults>
  <JobID>JID_461686954303</JobID>
  <FQDD>System.Embedded.1</FQDD>
  <JobName>Import Configuration</JobName>
  <JobDisplayName>Configure: Import system configuration XML
file</JobDisplayName>
  <Operation name="CHANGE">
    <DisplayValue>Event Generation Interval</DisplayValue>
    <Name>ThermalConfig.1#EventGenerationInterval</Name>
    <Detail>
      <OldValue>30</OldValue>
    </Detail>
    <MessageID>RAC007</MessageID>
    <Message>Input out of Range</Message>
    <Status>Failure</Status>
    <ErrCode>9219</ErrCode>
  </Operation>
  <Operation name="CHANGE">
    <DisplayValue></DisplayValue>
    <Name>ThermalConfig.1#CriticalEventGenerationInter</Name>
    <Detail>
      <OldValue></OldValue>
    </Detail>
    <MessageID>RAC014</MessageID>
    <Message>Invalid Attribute was entered</Message>
    <Status>Failure</Status>
    <ErrCode>9235</ErrCode>
  </Operation>
</ConfigResults>
```

The input contained an invalid character, making the XML invalid. The output shows the message logged in this case.

```
<ConfigResults>
  <JobID>JID_461683071407</JobID>
  <JobName>Import Configuration</JobName>
  <Messages>
    <MessageID>SYS048</MessageID>
    <Message>Systemconfiguration XML input file contains invalid
characters, AMPERSAND at line 12</Message>
  </Messages>
</ConfigResults>
```



Conclusion

In summary, the ability to export a configuration snapshot to a human readable XML format, modify it and import it to one or more target systems significantly alleviates the tasks of a system administrator or a console application developer. The system administrator or console application developer no longer needs to grapple with multiple profile documents or commands to configure different aspects of the system and does not need to know or adhere to specific sequences of steps to achieve a desired end state.

Learn more

Visit Dell.com/PowerEdge for more information on Dell's enterprise-class servers.

Also lookup the Lifecycle Controller page on Dell Tech Center (www.delltechcenter.com/lc) for the following documents:

Dell Lifecycle Controller Schema Guide

Server Configuration XML File (Document takes a sample snapshot and explains various pseudo attributes, dependencies and why some attributes are commented)

Best Practices Guide (Document describes best practices for achieving console workflows, referred to for a comparison of how a particular workflow can be accomplished with the new feature vs. best practices in LC 2.0)

Dell Profile Documents

Sample XMLs, Batch files and Sample Video

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