Tech Note:

CPPM & iDRAC7 Enterprise (SoL / IPMI) User Guide

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Overview

The following document has been produced to aid field engineering, customers and partners to understand how ClearPass Customers running on the DELL R620 server can take advantage of the DELL Integrated Remote Access Controller remote management features. The Integrated Dell Remote Access Controller 7 (iDRAC7) with Lifecycle Controller technology allows administrators to monitor, manage, update, troubleshoot, and remediate Dell servers from any location—without the use of agents, and regardless of the presence or state of an operating system or hypervisor.

Below is a list of the major functions available to customers using Enterprise iDRAC7, this is not the complete list, but the most popular and widely used.

- Virtual Console and Media with user collaboration
- Dedicated Ethernet NIC 1Gbps
- Advanced security features such as private key and two-factor authentication
- Directory Services support
- Part replacement
- Remote Syslog
- Crash video playback
- Boot capture
- Millisecond power capping and platform power monitoring
- Virtual Console and Media with user collaboration

See here for more detail on these and additional functions.....
http://en.community.dell.com/techcenter/extras/m/white_papers/20065812/download.aspx

At the end of the document, we have briefly included sections covering Serial over LAN and IPMI to give the reader an additional view on some of the remote management options available.
What’s new in iDRAC7 Enterprise

We updated the CPPM CP-HW-25K shipping hardware in Q2 2013 to the new DELL R620 platform (previously DELL R610). At this time we took the option to update the underlying iDRAC hardware and software. Previously the more basic Express version was packaged, now the R620 platform ships with the Enterprise version. One of the key features this provides is a dedicated 1GB Ethernet port. See the pictures below of the rear of the new DELL R620 server hardware compared to that of the previous R610. Pay attention to the dedicated iDRAC Ethernet slot on the right-hand-side in the lower picture.

![Figure 1 - Rear of DELL R610](image1)

![Figure 2 - Rear of DELL R620](image2)

**Note:** Currently we only support the use of the first TWO Ethernet ports on the on-board 4-port Ethernet adapter. The other two slots are reserved for future enhancements.
Configuration and Setup

iDRAC Default Network Values
The default shipping configuration pre-configures the dedicated iDRAC port with a static IP address of 192.168.0.120/24. This is a DELL default, not an Aruba one.

The default Username and Password are root/calvin.

iDRAC Configuration
The following section guides you through configuring your own private IP address.

The boot process will take you through the following screens.... Connect a VGA screen and USB keyboard to the server as normal.

Figure 3 - Initial power on message

Figure 4 - BiOS Interface, Press F10

When you see the above screen, press F10 to enter the Lifecycle controller configuration. From here you will find options to configure iDRAC.
Tech Note: Configuring the iDRAC Enterprise for CPPM

Figure 5 - iDRAC booting

![Figure 5 - iDRAC booting](image)

Figure 6 - Last boot message before iDRAC GUI interface

Below is the initial screen you see when entering the Lifecycle Controller, it is from here iDRAC is configured. The default menu takes you into 'LC Settings'. This is NOT where you need to go. If you continue here the next screen shows the network configuration for the 4-port Ethernet card, not the dedicated 1-port iDRAC Ethernet card.

**Note:** Do not go to the Hardware Configuration, this can be used but it is a LONG drawn out hardware wizard. I do not recommend using the wizard.

![Figure 6 - Last boot message before iDRAC GUI interface](image)

Figure 7 - Initial Lifecycle configuration screen

![Figure 7 - Initial Lifecycle configuration screen](image)
If you accidentally go into ‘LC Settings’ the below configuration screen shows the 4-port Ethernet card, as noted previous you will not see the dedicated iDRAC interface in this list.

![Lifecycle Controller Settings](image)

**Figure 8 - Ethernet 4-port configuration...not these ports**

From the initial configuration page, take the option for ‘**System Setup**’, and then ‘**Advanced Hardware Configuration**’ as shown below.

![System Setup for Lifecycle (iDRAC included)](image)
From this next menu you have the option to finally configure the iDRAC adapter settings......

![System Setup](image)

**Figure 10 - iDRAC Configuration**

From the System Setup menu, select **iDRAC Settings**, then as below **Network**

![iDRAC Settings](image)

**Figure 11 - iDRAC Network configuration**

From this menu you can change the hardware port mapped to the iDRAC feature. The default is to use the dedicated hardware as shown below. It could be changed to one of the unused Ethernet ports on the 4-port adapter (ports 3 or 4), but I cannot think of a reason to do this. Be aware if we enable these ports in a later software release this could cause complications for customers.
There are multiple pages under the **Network Settings**, scroll down to modify as required. On the first page in addition to selecting the adapter, the speed/duplex settings can be set.

Scrolling down to the next page shows the option to modify the default IP address used by iDRAC. You see the default IP address of **192.168.0.120**. If required but not shown, further down this menu is the ability to add a VLAN ID-tag.

That completes the configuration of the iDRAC network settings.
Configuring Serial over LAN (SOL) for console access

One of the advantages of having the dedicated out-of-band management is the ability to access the serial interface in the server. This gives us direct access to CPPM’s cli as if we were physically connected to the server if a problem exists. An example when this may occur is if normal IP connectivity is interrupted, an error is made in CPPM’s configuration, an hardware adapter fails or CPPM fails to boot successfully to load the configuration or underlying hardware drivers. Having cli access allows us to login with appadmin or arubasupport to diagnose and hopefully fix the underlying issues.

The next few steps show you how to enable and configure the underlying SOL functionality.

Previously, we went into the iDRAC Settings to setup the IP connectivity. This time enter the System BIOS menu.

![Figure 14 - BiOS Menu for SOL settings](image)

Several changes are required here as highlighted below.

Serial Communication – ‘On with Console Redirection via COM2’
Serial Port Address – ‘Serial Device1=Com2, Serial Device2=COM1’
External Serial Connector – ‘Remote Access Device’

![Figure 15 - Setting underlying COM definitions for SOL](image)
Finally, enable the IPMI Over LAN options. IPMI is discussed in the Chapter ‘What is IPMI?’.

![Figure 16 - Enabling IPMI over LAN](image)
How to Use iDRAC

Now that we have configured our basic iDRAC network information, what can we do with this feature?

I would suggest that the key functions that SE’s or customers will want to use will be remote access to the appliance for hardware status, inventory and power management plus access can be gained to CPPM’s serial CLI. Use a standard browser to gain access to the GUI. A couple of example management items are below.

Figure 17 - iDRAC signin page

Sign-in, the default Username & Password are ‘root’ & ‘calvin’. Options to create your own user’s are shown below, if required iDRAC can be added to an Windows Active Directory.

Figure 18 - Configuring local users or AD
As can be seen from the side-navigation menu multiple physical objects can be managed/reported, Power Supplies, Alerts, Batteries, CPU, Memory, Front Panel etc. etc.

Some of the menu items above provide a detailed inventory of the hardware component and some provide very detailed management information. An example below of the CPU inventory and then the power supply management information that can be obtained.

![CPU Inventory detail](image)

Figure 19 - CPU Inventory detail
To launch the Virtual Console, go to ‘Server’, ‘Console’, ‘Launch Virtual Console’….. also if you intend to use MSFT IE browser, ensure that the Plug-in Type is set to ‘Native’. I won’t go through all the headaches and the current industry backlash against Java, but I actually had more success using Active-X, I had multiple difficulties working with the Java version.

**Figure 21 - Launching a Virtual Console**

*Note:* Launching the Active-X (Native) based client for the first time will request the installation of a Dell Active-X plugin which you need to accept.

This is the Virtual Console landing page.
Figure 22 - Virtual Console

The Java/Active-X screen above provides similar functions as the browser interface above however not all options are available on both screens.

Within the VC session, you have additional options from the menu highlighted above to map Virtual Media media, Force power-cycles’, select next boot device etc.

From the GUI this is the same menu as seen previous when we were configuring the iDRAC to change its network settings.
CPPM CLI access via Serial Over LAN - SOL

Most likely one of the advantages of having iDRAC is the ability to obtain cli access, this provides the ability to directly access CPPM’s cli as **appadmin** or **arubasupport**.

The configuration for this is fairly easy but does require multiple steps to get it going.

The firmware that currently ships on the R620 hardware (July 2013) and is installed on the iDRAC7 card is version **1.23.23**, during the configuration process I upgraded this to the latest version as multiple major fixes exist in the latest release. The latest iDRAC firmware can be obtained from here…..


Download the latest version, as of August 2013 the latest version available is **1.40.40** released on 6/7/2013. This zip-file needs to be un-zipped and the .d7 file uploaded as shown below under **Firmware Update and Rollback**.

![Figure 23 - Updating iDRAC firmware](image)

Ensure that under **Network, Serial Over LAN** is enabled. We also changed the Baud Rate to 115.2kbps.
Tech Note: Configuring the iDRAC Enterprise for CPPM

To access the CPPM cli via the SOL feature..... you have to `ssh` to the host as shown below. Use the default Username & Password *(root/calvin)*, unless you have amended these.

![Figure 24 - Enabling Serial Over LAN (SOL)](image)

Then using the command *‘console com2’* you can connect to the CPPM cli as shown below.

![Figure 25 - SSH to the iDRAC adapter](image)

At this point you can login with your usual CPPM cli userid/password.
What is IPMI?

DELL’s iDRAC7 is built and based upon the latest Intelligent Platform Management Interface (IPMI) v2.0. IPMItool is a utility for managing and configuring devices that support the Intelligent Platform Management Interface (IPMI) version 1.5 and version 2.0 specifications. IPMI is an open standard for monitoring, logging, recovery, inventory, and control of hardware that is implemented independent of the main CPU, BIOS, and OS. The service processor (or Baseboard Management Controller, BMC) is the brain behind platform management and its primary purpose is to handle the autonomous sensor monitoring and event logging features. IPMI provides the ability to extend the remote management of the underlying DELL hardware. IPMI is an open standard and cross-platform tool that exists to allow you to interoperate with the IPMI agent that is part of the iDRAC function. IPMI is supported by multiple large corporations such as HP, Intel, IBM, NEC & DELL.

Windows Install

A windows tool can be downloaded from this DELL support site.


This windows zip file needs to be un-zipped and installed like any other typical windows application.

To use this utility require a command window (DoS). The default path may change but on a Winows7 device it is located in c:\Program Files _x86\Dell\SysMgt\bmc

CentOS Install

IPMI is supported across many platforms including many Linux Distributions. I have done some basic testing with CentOS.

To install IPMI use the following command

```
yum install OpenIPMI OpenIPMI-tools
chkconfig ipmi on
service ipmi start
```

Once the software is installed we can use the `ipmitool` command in a similar way to windows to perform remote management functions.
IPMI Example Commands

There are some minor differences between the client commands. For example under CentOS we can include the password in the command. Some commands are generic, like the first command below, others are specific to Dell like the second command.

Windows Command – example ipmtool command, displaying the chassis

```
C:\Program Files (x86)\Del\SysMgt\bmc> ipmitool -I lanplus -U root -H 192.168.0.120 chassis status
Password: ******
System Power       : on
Power Overload     : false
Power Interlock    : inactive
Main Power Fault   : false
Power Control Fault: false
Power Restore Policy: previous
Last Power Event   :
Chassis Intrusion  : inactive
Front-Panel Lockout: inactive
Drive Fault        : false
Cooling/Fan Fault  : false
Sleep Button Disable: not allowed
Diag Button Disable: allowed
Reset Button Disable: not allowed
Power Button Disable: allowed
Sleep Button Disabled: false
Diag Button Disabled: true
Reset Button Disabled: false
Power Button Disabled: false
```

CentOS Command – example ipmtool command, showing the Ethernet Interfaces

```
[root@localhost ~]# ipmitool -I lanplus -U root -H 192.168.0.120 delloem mac
Password: ******

System LOMs
NIC Number  MAC Address  Status
0           90:b1:1c:45:2a:6f  Enabled
1           90:b1:1c:45:2a:70  Enabled
2           90:b1:1c:45:2a:6d  Enabled
3           90:b1:1c:45:2a:6e  Enabled

iDRAC7 MAC Address e0:db:55:01:4f:f4
```

CentOS Command – example ipmtool command, showing the Temp across the server

```
[root@localhost ~]# ipmitool -I lanplus -U root -H 192.168.0.120 sdr type Temperature
Password: ******

Inlet Temp      | 04h | ok | 7.1 | 22 degrees C
Exhaust Temp    | 01h | ok | 7.1 | 40 degrees C
Temp            | 0Eh | ok | 3.1 | 69 degrees C
Temp            | 0Fh | ok | 3.2 | 58 degrees C
```
**Note:** The command option `-I` has two important options we will mention here, `lan` and `lanplus`. Essentially `lan` commands tie into the earlier IPMI version 1.5 specifications, `lanplus` align to the subsequent and latest release version of the IPMI 2.0 specification.

Appendix to all `lanplus` interface Commands:

```
[root@localhost ~]# ipmitool -I lanplus -U root -H 192.168.0.120
Password: ******
No command provided!
```

- **raw**: Send a RAW IPMI request and print response
- **i2c**: Send an I2C Master Write-Read command and print response
- **spd**: Print SPD info from remote I2C device
- **lan**: Configure LAN Channels
- **chassis**: Get chassis status and set power state
- **power**: Shortcut to chassis power commands
- **event**: Send pre-defined events to MC
- **mc**: Management Controller status and global enables
- **sdr**: Print Sensor Data Repository entries and readings
- **sensor**: Print detailed sensor information
- **fru**: Print built-in FRU and scan SDR for FRU locators
- **gendev**: Read/Write Device associated with Generic Device locators
- **sdr**: Print Sensor Data Repository entries and readings
- **sel**: Print System Event Log (SEL)
- **pef**: Configure Platform Event Filtering (PEF)
- **sol**: Configure and connect IPMIv2.0 Serial-over-LAN
- **tsol**: Configure and connect with Tyan IPMIv1.5 Serial-over-LAN
- **isol**: Configure IPMIv1.5 Serial-over-LAN
- **user**: Configure Management Controller users
- **channel**: Configure Management Controller channels
- **session**: Print session information
- **sunoem**: OEM Commands for Sun servers
- **kontronoem**: OEM Commands for Kontron devices
- **picmg**: Run a PICMG/ATCA extended cmd
- **fwum**: Update IPMC using Kontron OEM Firmware Update Manager
- **firewall**: Configure Firmware Firewall
- **delloem**: OEM Commands for Dell systems
- **shell**: Launch interactive IPMI shell
- **exec**: Run list of commands from file
- **set**: Set runtime variable for shell and exec
- **hpm**: Update HPM components using PICMG HPM.1 file
- **ekanalyzer**: run FRU-Ekeying analyzer using FRU files

*Figure 27 - List of IPMI commands*
Accessing CPPM CLI through IPMI

So just one final option I want to cover. IPMI also supports the option to access the host cli through the `ipmitool` and a SOL connection, previously we ssh’d to iDRAC then launched a separate in band connection, this option goes directly in to the CLI. Remember, we previous enabled IPMI over LAN, the screen below is just as a reminder of the configuration.

```
C:\Program Files (x86)\Dell\SysMgt\bmc> ipmitool -I lanplus -U root -H 192.168.0.120 sol info
Password: ******
Info: SOL parameter 'Payload Channel (7)' not supported - defaulting to 0x0e
Set in progress : set-complete
Enabled : true
Force Encryption : true
Force Authentication : false
Privilege Level : ADMINISTRATOR
Character Accumulate Level (ms) : 50
Character Send Threshold : 100
Retry Count : 7
Retry Interval (ms) : 480
Volatile Bit Rate (kbps) : 115.2
Non-Volatile Bit Rate (kbps) : 115.2
Payload Channel : 14 (0x0e)
Payload Port : 623
```

Figure 28 - Enabling IPMI over LAN

We use a combination of the `ipmitool` to open a channel to the serial com port on the server. This com port though is mapped in the BiOS on the iDRAC hardware.

To start lets take a look at the SOL configuration on the iDRAC using the `ipmitool`…..

```
Figure 29 - Displaying SOL configuration via ipmitool
```

The above screen output has a couple of changes we have made to the default configuration. We have modified the `Authentication` to `false`, we have modified the `Privilege Level` to `ADMINISTRATOR`.
The commands to change these settings are as follows:

```
ipmitool -I lanplus -U root -H 192.168.0.120 sol set force-authentication false
nipmitool -I lanplus -U root -H 192.168.0.120 sol set privilege-level admin
```

**Figure 30 - Setting up IPMI for SOL access**

Once the above configuration has been changed the following `ipmitool` command plus options can be used to connect you to the host serial interface...aka CPPM’s cli.

```
% ipmitool -I lanplus -U {userid} -H {host IP@} sol activate
Password: ******
```

[SOL Session operational. Use ~? for help]

Aruba Networks PolicyManager 6.0.1.46054

*************************
* Policy Manager is running with factory default configuration. Refer to *
* Quick Start Guide for configuration instructions.            *
*************************

localhost.localdomain login:

Aruba Networks PolicyManager 6.0.1.46054

*************************
* Policy Manager is running with factory default configuration. Refer to *
* Quick Start Guide for configuration instructions.            *
*************************

localhost.localdomain login:

**Figure 31 - Starting the SOL connection with the ipmitool**

**Conclusion**

The power of the DELL iDRAC complements the awesome power and function of Aruba’s ClearPass. Using the remote facilities built into the DELL hardware provide users with the necessary tools and functionality to monitor, troubleshoot, and repair servers wherever they are located.