1-iloRestBasics

September 7, 2021

1 iLOrest: The HPE Redfish Swiss knife

Version 0.61

1.1 What is iLOrest?

- Command line Redfish client, primarily designed to managed HPE iLO 4 and iLO 5 based servers
- Python oriented
- Sources on GitHub (python-redfish-utility)
- Packaged binaries available for several Operating Environments (.deb, .rpm, .msi and .pkg)
- Windows and RPM packages available on HPE Customer Support Center

1.1.1 Extreme flexibility

- Interactive mode allows you to save and load settings from a file with command completion (tab key) and command recall (up and down arrows)
- Script mode: easy integration with bash, PowerShell or DOS
- File-based mode: allows you to save, customize and then deploy settings
- Extensible (See tutorial video)
- In-band and out-of-band management
- Useful for debugging Python and PowerShell scripts
- Rich ecosystem with videos and articles

1.2 Interactive out-of-band (remote) mode demo

1.2.1 Command completion and recall with help description

Open a `Terminal` from a Jupyter Launcher and issue the following commands. To ease this exercise, you can open a New View for this notebook by right clicking on its tabulation:

```
# Invoke iLOrest with no arguments
ilorest

# Type beginning of command and hit the Tab key to complete the command
ilorest > he (tab)

# Recall help command with up-arrow
```

```
# login remote iLO as user student. If password is not suppplied, iLOrest asks for password in h
iLOrest > login ilo5 -u student -p P@ssw0rd!
```

1.2.2 Data/Resource Types

Redfish resources are associated with a data type. The list of all iLO 5 data types can be retrieved with the `types` command. Each data type and its content is present in the API Reference document.

```
# List all data types
iLOrest > types
```

Data types with prefix `Hpe` are Oem/Hpe specific types. Others are standard Redfish types. The following cell lists all data types present in the Redfish service, selects the `Bios` data type and shows all the resources associated with that type.

```
# Select the Bios type
iLOrest > select Bio(Tab)

# View selected type
iLOrest > select

# Show resources associated to the selected type
iLOrest > get

# Retrieve a single reseource from another type in json format
iLOrest > get SecurityState --json --select HpeSecurityService.

# Logout: close session. Local cache will be removed automatically.
iLOrest > logout
iLOrest > exit
```

1.2.3 In-band (local) management demo: Modification of a BIOS attribute

NOTE: Only a **privileged instructor** can perform the following commands

```
ssh root@16.31.86.72

# When logged as root and when iLO 5 security mode/state is Production, no need to provide crede
ilorest login

# Retrieve and modify Bios parameter
ilorest get AdminName --select Bios.  # Return status in JSON format: Useful for parsing
ilorest set AdminName="John Deuf"
ilorest status

# Commit modification
ilorest commit
```

```
# Reset cache and view modification
ilorest select Bios. --refresh
ilorest get AdminName

# Logout (complete cache removal)
ilorest logout
```

1.3 Script mode examples

1.3.1 Environment preparation

The following cell sets environment variables and checks the connectivity toward the various BMCs used in this notebook.

[1]:
```
########## Environment preparation (Version: 0.30) ############


# Set Student ID number
export stdid=601
Id=$(id --user --name)

# location and ports variables
ObmcBasePort=44000
iLO5DlBasePort=45000
iLO5SyBasePort=46000
let OpenBmcPort=${ObmcBasePort}+${stdid}
let iLO5DlSimulatorPort=$iLO5DlBasePort+${stdid}
let iLO5SySimulatorPort=${iLO5SyBasePort}+${stdid}
let ilo5Port=443

CacheDir="${HOME}/.iLOrest"          # Default Cache Directory
CacheDlDir="${PWD}/iLOrestCacheDl"
CacheSyDir="${PWD}/iLOrestCacheSy"
LogDir="${PWD}"
LogFile="${LogDir}/iLOrest.log"

iLO5DlSimulatorIP=ilo5simulators
iLO5SySimulatorIP=ilo5simulators
OpenBmcIP=openbmcsimulators

iLO5DlSimulator=${iLO5DlSimulatorIP}:${iLO5DlSimulatorPort}
iLO5DlSimulatorURI=https://${iLO5DlSimulator}
iLO5SySimulator=${iLO5SimulatorIP}:${iLO5SySimulatorPort}
iLO5SySimulatorURI=https://${iLO5SySimulator}

OpenBmc="${OpenBmcIP}:${OpenBmcPort}"
OpenBmcURI="https://${OpenBmc}"
```

```
ilo5IP="ilo5"
ilo5="${ilo5IP}:${ilo5Port}"
ilo5URI="https://${ilo5}"

# Credentials
User="student"
Password=P@ssw0rd!

# Miscellaneous
w=$(basename $PWD)
alias ResetSimulators="../create-globalbmc.shc.x &>/dev/null ; sleep 1"
alias ilorest="ilorest --nologo"

# Verify we can reach the remote Bmcs on the right HTTPS ports.
for bmc in OpenBmc ilo5 iLO5DlSimulator iLO5SySimulator ; do
    ip="${bmc}IP" ; port="${bmc}Port"
    nc -vz  $(eval echo "\$${ip}") $(eval echo "\$${port}") &> /dev/null &&
        echo "$bmc is reachable" \
        || echo "WARNING: Problem reaching $bmc"
done

echo
# Retrieve iLO firmware versions from ServiceRoot (no credentials needed)
for bmc in ilo5 iLO5DlSimulator iLO5SySimulator ; do
    ip="${bmc}IP" ; port="${bmc}Port"
    echo -n "$bmc firmware version: "
     curl --silent --insecure -X GET https://$(eval echo \$${ip}):$(eval echo␣
 ↪\$${port})/redfish/v1 | \
         jq  '[.Oem.Hpe.Manager[]] | .[] | .ManagerFirmwareVersion'
done

echo
# Print ilorest version
ilorest --version
```

```
OpenBmc is reachable
ilo5 is reachable
iLO5DlSimulator is reachable
iLO5SySimulator is reachable

ilo5 firmware version: "2.44"
iLO5DlSimulator firmware version: "2.44"
iLO5SySimulator firmware version: "2.47"

RESTful Interface Tool 3.2.2
```

1.3.2 Log into a real iLO 5 to populate the cache directory

iLOrest populates a cache directory during the execution of the `login` command just after a successul authentication. However, the DMTF Redfish simulator used in this workshop does not implement authentication and returns an error to the `login` command, preventing iLOrest to populate its cache.

To overcome this problem you will first log into a physical iLO 5 and then hack the cache to make it point to the DMTF iLO 5 simulator.

[2]:
```
ilorest login $ilo5 -u $User -p $Password
head ${CacheDir}/cache/* | grep url | sort -u                    # extract URL␣
 ↪target in cache

# Copy cache in a safe location before logging out to
# minimize opened sessions. iLO 5 is limited to 15 concurrent
# sessions.
mv ${CacheDir}/cache{,-bck}
ilorest logout

# Move back the cache
mv ${CacheDir}/cache{-bck,}

# Redirect cache to point to the iLO 5 DL360 Gen10 Simulator
sed -i "s.${ilo5URI}.${iLO5DlSimulatorURI}." ${CacheDir}/cache/*
head ${CacheDir}/cache/* | grep url | sort -u                    # extract URL␣
 ↪target in cache
```

```
Discovering data...Done
    "url": "https://ilo5:443",
Logging session out.
    "url": "https://ilo5simulators:45601",
```

1.4 Get multiple properties with single request

The following request retrieves all firmware versions and description with a single command. Note that DMTF includes computer firmware in the `SoftwareInventory` collection.

> **NOTE**: iLOrest versions 3.0, 3.1.0, 3.1.1 and 3.2.1 return an `ERROR: list index out of range` message. Make sure your version of ilorest isn 3.2.2 or greater

[3]:
```
IloRestVersion=$(ilorest --version | awk '{print $NF}')

if [[ "${IloRestVersion}" > "3.2.1" ]] ; then
   ilorest get Name Version --select SoftwareInventory
else
  echo "iLOrest version $IloRestVersion fails when getting multiple properties␣
 ↪with a single request."
fi
```

```
echo
```

```
Name=firmware-hdd-b8a60fbe9a
Version=HPD5-2.1

Name=Power Supply Firmware
Version=1.00

Name=Embedded Video Controller
Version=2.5

Name=Innovation Engine (IE) Firmware
Version=0.2.1.2

Name=Server Platform Services (SPS) Descriptor
Version=1.2 0

Name=HPE Smart Storage Energy Pack 1 Firmware
Version=0.70

Name=Drive
Version=HPD5

Name=Intelligent Provisioning
Version=3.64.2

Name=Drive
Version=HPD6

Name=Drive
Version=HPD6

Name=HPE Ethernet 1Gb 4-port 331i Adapter - NIC
Version=20.14.54

Name=Intelligent Platform Abstraction Data
Version=9.5.0 Build 15

Name=ilorest
Version=3.2.2-32

Name=Power Management Controller Firmware
Version=1.0.4

Name=Power Management Controller FW Bootloader
Version=1.1
```

```
Name=System ROM
Version=U32 v2.10 (05/21/2019)

Name=System Programmable Logic Device
Version=0x2E

Name=Redundant System ROM
Version=U32 v2.10 (05/21/2019)

Name=Power Supply Firmware
Version=1.00

Name=Drive
Version=HPD6

Name=HPE Smart Array P408i-a SR Gen10
Version=1.99

Name=Server Platform Services (SPS) Firmware
Version=4.1.4.296

Name=sut
Version=2.7.1-15.linux

Name=iLO 5
Version=2.44 Apr 30 2021

Name=amsd
Version=2.3.0-1443.35.rhel8

Name=Firmware Inventory Collection

Name=Software Inventory Collection
```

1.4.1 Change iLO time zone

Searching for keywords `time zone` or `timezone` in the API Reference document leads to **two** properties. A BIOS and an iLO related property. We will focus on the iLO property.

The iLO `TimeZone` property is associated to the `HpeiLODateTime` data type. The next cells select this data type and then modify it.

[4]:
```
# select type
ilorest select HpeiLODateTime
```

```
# Get all resources from the selected data type without reserved properties␣
 ↪(@odata.* and Action properties)
# NOTE: ilorest 3.2.2 has a problem and displays reserved properties. This will␣
 ↪be fixed in a future version
#ilorest get --json
```

[5]:
```
# List all resources associated to this data type with reserved properties␣
 ↪(@odata.* and Actions properties)
ilorest list --json --select HpeiLODateTime
```


```
{
  "@odata.context": "/redfish/v1/$metadata#HpeiLODateTime.HpeiLODateTime",
  "@odata.etag": "W/\"C12C2A02\"",
  "@odata.id": "/redfish/v1/Managers/1/DateTime",
  "@odata.type": "#HpeiLODateTime.v2_0_0.HpeiLODateTime",
  "ConfigurationSettings": "Current",
  "DateTime": "2021-07-22T13:06:17Z",
  "Id": "DateTime",
  "Links": {
    "EthernetNICs": {
      "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces"
    }
  },
  "NTPServers": [
    "",
    ""
  ],
  "Name": "iLO Date and Time Settings",
  "PropagateTimeToHost": false,
  "StaticNTPServers": [
    "0.0.0.0",
    "0.0.0.0"
  ],
  "TimeZone": {
    "Index": 15,
    "Name": "Greenwich Mean Time, Casablanca, Monrovia",
    "UtcOffset": "+00:00",
    "Value": "GMT-0"
  },
  "TimeZoneList": [
    {
      "Index": 0,
      "Name": "International Date Line West",
      "UtcOffset": "-12:00",
      "Value": "GMT+12:00"
    },
    {
```

```
  "Index": 1,
  "Name": "Midway Island, Samoa",
  "UtcOffset": "-11:00",
  "Value": "SST+11:00"
},
{
  "Index": 2,
  "Name": "Hawaii",
  "UtcOffset": "-10:00",
  "Value": "HST+10:00"
},
{
  "Index": 3,
  "Name": "Marquesas",
  "UtcOffset": "-09:30",
  "Value": "MART+9:30"
},
{
  "Index": 4,
  "Name": "Alaska",
  "UtcOffset": "-09:00",
  "Value": "AKST+9:00AKDT+08:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 5,
  "Name": "Pacific Time(US & Canada), Tijuana, Portland",
  "UtcOffset": "-08:00",
  "Value": "PST+8:00PDT+07:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 6,
  "Name": "Arizona, Chihuahua, La Paz, Mazatlan, Mountain Time (US & Canad",
  "UtcOffset": "-07:00",
  "Value": "MST+7:00MDT+06:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 7,
  "Name": "Central America, Central Time(US & Canada)",
  "UtcOffset": "-06:00",
  "Value": "CST+6:00CDT+05:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 8,
  "Name": "Bogota, Lima, Quito, Eastern Time(US & Canada)",
  "UtcOffset": "-05:00",
  "Value": "EST+5:00EDT+04:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
```

```
  "Index": 9,
  "Name": "Caracas, Georgetown",
  "UtcOffset": "-04:00",
  "Value": "VET+4:00"
},
{
  "Index": 10,
  "Name": "Atlantic Time(Canada), Santiago",
  "UtcOffset": "-04:00",
  "Value": "AST+4:00ADT+03:00:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 11,
  "Name": "Newfoundland",
  "UtcOffset": "-03:30",
  "Value": "NST+3:30NDT+02:30:00,M3.2.0/02:00:00,M11.1.0/02:00:00"
},
{
  "Index": 12,
  "Name": "Brasilia, Buenos Aires, Greenland",
  "UtcOffset": "-03:00",
  "Value": "ART+3:00"
},
{
  "Index": 13,
  "Name": "Mid-Atlantic",
  "UtcOffset": "-02:00",
  "Value": "GST+2:00"
},
{
  "Index": 14,
  "Name": "Azores, Cape Verde Is.",
  "UtcOffset": "-01:00",
  "Value": "CVT+1:00"
},
{
  "Index": 15,
  "Name": "Greenwich Mean Time, Casablanca, Monrovia",
  "UtcOffset": "+00:00",
  "Value": "GMT-0"
},
{
  "Index": 16,
  "Name": "Dublin, London",
  "UtcOffset": "+00:00",
  "Value": "WET-0WEST-1,M3.5.0/01:00:00,M10.5.0/02:00:00"
},
{
```

```
  "Index": 17,
  "Name": "Amsterdam, Berlin, Bern, Rome, Paris, West Central Africa",
  "UtcOffset": "+01:00",
  "Value": "CET-1:00CEST-02:00:00,M3.5.0/01:00:00,M10.5.0/01:00:00"
},
{
  "Index": 18,
  "Name": "Athens, Bucharest, Cairo, Jerusalem",
  "UtcOffset": "+02:00",
  "Value": "EET-2:00EEST-03:00:00,M3.5.0/01:00:00,M10.5.0/01:00:00"
},
{
  "Index": 19,
  "Name": "Baghdad, Kuwait, Riyadh, Moscow, Istanbul, Nairobi",
  "UtcOffset": "+03:00",
  "Value": "AST-3:00"
},
{
  "Index": 20,
  "Name": "Tehran",
  "UtcOffset": "+03:30",
  "Value": "IRST-3:30IRDT-04:30:00,80/00:00:00,264/00:00:00"
},
{
  "Index": 21,
  "Name": "Abu Dhabi, Muscat, Baku, Tbilisi, Yerevan",
  "UtcOffset": "+04:00",
  "Value": "GST-4:00"
},
{
  "Index": 22,
  "Name": "Kabul",
  "UtcOffset": "+04:30",
  "Value": "AFT-4:30"
},
{
  "Index": 23,
  "Name": "Ekaterinburg, Islamabad, Karachi, Tashkent",
  "UtcOffset": "+05:00",
  "Value": "YEKT-5:00"
},
{
  "Index": 24,
  "Name": "Chennai, Kolkata, Mumbai, New Delhi",
  "UtcOffset": "+05:30",
  "Value": "IST-5:30"
},
{
```

```
  "Index": 25,
  "Name": "Kathmandu",
  "UtcOffset": "+05:45",
  "Value": "NPT-5:45"
},
{
  "Index": 26,
  "Name": "Almaty, Dhaka, Sri Jayawardenepura",
  "UtcOffset": "+06:00",
  "Value": "ALMT-6:00"
},
{
  "Index": 27,
  "Name": "Rangoon",
  "UtcOffset": "+06:30",
  "Value": "MMT-6:30"
},
{
  "Index": 28,
  "Name": "Bangkok, Hanio, Jakarta, Novosibirsk, Astana, Krasnoyarsk",
  "UtcOffset": "+07:00",
  "Value": "ICT-7:00"
},
{
  "Index": 29,
  "Name": "Beijing, Chongqing, Hong Kong, Urumqi, Taipei, Perth",
  "UtcOffset": "+08:00",
  "Value": "CST-8:00"
},
{
  "Index": 30,
  "Name": "Eucla",
  "UtcOffset": "+08:45",
  "Value": "ACWST-08:45"
},
{
  "Index": 31,
  "Name": "Osaka, Sapporo, Tokyo, Seoul, Yakutsk",
  "UtcOffset": "+09:00",
  "Value": "JST-9:00"
},
{
  "Index": 32,
  "Name": "Adelaide, Darwin",
  "UtcOffset": "+09:30",
  "Value": "ACST-9:30ACDT-10:30:00,M10.1.0/02:00:00,M4.1.0/02:00:00"
},
{
```

```
    "Index": 33,
    "Name": "Canberra, Melbourne, Sydney, Guam, Hobart, Vladivostok",
    "UtcOffset": "+10:00",
    "Value": "AEST-10:00AEDT-11:00:00,M10.1.0/02:00:00,M4.1.0/02:00:00"
  },
  {
    "Index": 34,
    "Name": "Lord Howe",
    "UtcOffset": "+10:30",
    "Value": "LHST-10:30LHDT11:00"
  },
  {
    "Index": 35,
    "Name": "Chatham",
    "UtcOffset": "+10:45",
    "Value": "CHAST-10:45CHADT-11:45"
  },
  {
    "Index": 36,
    "Name": "Magadan, Solomon Is., New Caledonia",
    "UtcOffset": "+11:00",
    "Value": "MAGT-11:00"
  },
  {
    "Index": 37,
    "Name": "Auckland, Wellington, Fiji, Kamchatka, Marshall Is.",
    "UtcOffset": "+12:00",
    "Value": "NZST-12:00NZDT-13:00:00,M9.5.0/02:00:00,M4.1.0/02:00:00"
  },
  {
    "Index": 38,
    "Name": "Nuku'alofa",
    "UtcOffset": "+13:00",
    "Value": "TKT-13:00"
  },
  {
    "Index": 39,
    "Name": "Line Islands",
    "UtcOffset": "+14:00",
    "Value": "LINT-14:00"
  },
  {
    "Index": 40,
    "Name": "Unspecified Time Zone",
    "UtcOffset": "+00:00",
    "Value": "GMT-0"
  }
]
```

```
}
```

[6]:
```
# You can get more info about a specific property.
# Note the "READ-ONLY" attribute.
ilorest info TimeZone
```

```
NAME
    TimeZone


DESCRIPTION
    The currently selected time zone.


TYPE
    object


READ-ONLY
    False


SUB-PROPERTIES
    Index, Name, UtcOffset, Value
```

[7]:
```
# Set iLO TimeZone to "New Delhi"
ilorest set TimeZone/Name="New Delhi"

# View changed settings
ilorest status
```

```
Added the following patch:
{
  "TimeZone/Name": "New Delhi"
}
Current changes found:
HpeiLODateTime.v2_0_0(/redfish/v1/Managers/1/DateTime/) (Currently selected)
        TimeZone/Name=New Delhi
```

NOTE: The following cells returns an ERROR because the simulator does not answer properly to the `commit` command.

[8]:
```
# Commit changes in Redfish server
ilorest commit
echo
```

```
Committing changes...
ERROR: expected string or bytes-like object
```

NOTE: A successful `commit` against a real iLO 5 clears pending changes in the cache. However, our simulator does not behave like a real iLO 5 and we need to clean up the cache manually to mimic a real successful commit.

[9]:
```
echo "Querying cache status"
ilorest status

echo -e "\nRefreshing cache"
ilorest select HpeiLODateTime --refresh

echo -e "\nVerifying that cache is empty"
ilorest status
```

```
Querying cache status
Current changes found:
HpeiLODateTime.v2_0_0(/redfish/v1/Managers/1/DateTime/) (Currently selected)
        TimeZone/Name=New Delhi

Refreshing cache

Verifying that cache is empty
No changes found
```

1.4.2 Use of the –filter option

In this example you will use the iLOrest `--filter` option to retrieve only the IPv4 address of the iLO Dedicated Network Port.

Searching for keywords `dedicated` or `shared` in the API Reference document leads to the `EthernetInterface` data type. The following cell logs into a remote iLO 5 and retrieves all the data types containing the string `Ethernet`.

[10]:
```
ilorest types | grep Ethernet
```

```
EthernetInterface.v1_4_1
EthernetInterfaceCollection
```

Data types with suffix `Collection` group similar resources usually represented in an array of `Members` links. The following cell lists all the ethernet interfaces in a system: System Interfaces (4) and Manager Interfaces (3).

[11]:
```
ilorest list --json --select EthernetInterfaceCollection
```

```
[
  {
    "@odata.context":
"/redfish/v1/$metadata#EthernetInterfaceCollection.EthernetInterfaceCollection",
    "@odata.etag": "W/\"96E00A2C\"",
```

```
    "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces",
    "@odata.type": "#EthernetInterfaceCollection.EthernetInterfaceCollection",
    "Description": "Collection of System Ethernet Interfaces",
    "Members": [
      {
        "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces/1"
      },
      {
        "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces/2"
      },
      {
        "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces/3"
      },
      {
        "@odata.id": "/redfish/v1/Systems/1/EthernetInterfaces/4"
      }
    ],
    "Members@odata.count": 4,
    "Name": "System Ethernet Interfaces"
  },
  {
    "@odata.context":
"/redfish/v1/$metadata#EthernetInterfaceCollection.EthernetInterfaceCollection",
    "@odata.etag": "W/\"E589C4BF\"",
    "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces",
    "@odata.type": "#EthernetInterfaceCollection.EthernetInterfaceCollection",
    "Description": "Configuration of Manager Network Interfaces",
    "Members": [
      {
        "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces/1"
      },
      {
        "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces/2"
      },
      {
        "@odata.id": "/redfish/v1/Managers/1/EthernetInterfaces/3"
      }
    ],
    "Members@odata.count": 3,
    "Name": "Manager Network Interfaces"
  }
]
```


To retrieve the IPv4 address of the dedicated iLO network port you need to find a unique property characterizing the iLO Dedicated Network Port. The following cells select the `EthernetInterface` data type and prints the `Name` property of each and every ethernet port in the server to verify whether it is a good candidate for a filter criteria.

[12]:
```
ilorest select EthernetInterface
ilorest list Name
```

```
Name=eno1

Name=Manager Virtual Network Interface

Name=eno4

Name=eno3

Name=eno2

Name=Manager Dedicated Network Interface

Name=Manager Shared Network Interface

Name=System Ethernet Interfaces

Name=Manager Network Interfaces
```

The output of the previous command shows that Dedicated iLO Network Interface can be uniquely identified using the `Name` property. The following command displays the IPv4 configuration of the Dedicated iLO Network Interface using the `--filter` option.

[13]:
```
ilorest get IPv4Addresses --filter Name="Manager Dedicated Network Interface"
```

```
IPv4Addresses=
               Address=16.31.87.100
               AddressOrigin=DHCP
               Gateway=16.31.84.1
               SubnetMask=255.255.252.0
```

[14]:
```
ilorest get IPv4Addresses/Address --filter Name="Manager Dedicated Network␣
 ↪Interface"
```

```
IPv4Addresses=
               Address=16.31.87.100
```

Note: The `Oem/Hpe/InterfaceType` property could have been used as well.

[15]:
```
ilorest get IPv4Addresses/Address --filter Oem/Hpe/InterfaceType="Dedicated"
```

```
IPv4Addresses=
               Address=16.31.87.100
```

1.5 Use of the iLOrest debug mode

This paragraph explains how the iLOrest debug mode can help you to troubleshoot your Python, Bash or PowerShell Redfish scripts.

Imagine you have difficulties to develop a Python or Bash/cURL script modifying the system boot order in order to stop the next reboot of a server at RBSU/Bios Setup.

You can use iLOrest and its `bootorder` macro command in debug mode to understand how it perfoms this task and then reproduce it in your own programs.

The next cell prepares the environment. It removes log file if any, login and modify the cache files.

The help of the `bootorder` extension provides the syntax to send a `OneTimeBoot` command

[16]:
```
ilorest help bootorder | grep 'onetime'
echo
```

```
        example: bootorder --onetimeboot=Hdd
```

The `bootorder` extension with no argument returns the list of all possible `OneTimeBoot` options.

[17]:
```
ilorest bootorder
```

```
bootname is : Boot Order Current Settings

bootname is : Boot Order Pending Settings

bootpath is : /redfish/v1/systems/1/bios/boot/settings/


Current Persistent Boot Order:
1. HD.EmbRAID.1.3 (CentOS Linux)
2. Unknown.Unknown.200.3 (CentOS)
3. Unknown.Unknown.200.2 (Red Hat Enterprise Linux)
4. Unknown.Unknown.200.1 (grub)
5. Generic.USB.1.1 (Generic USB Boot)
6. HD.EmbRAID.1.4 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 -
Size:279.3 GiB Port:1I Bay:3 Box:1)
7. HD.EmbRAID.1.5 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 -
Size:279.3 GiB Port:1I Bay:4 Box:1)
8. HD.EmbRAID.1.6 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 - 1 TiB,
RAID0 Logical Drive 1(Target:0, Lun:0))

Continuous and one time boot options:
1. None
2. Cd
3. Hdd
4. Usb
5. SDCard
```

```
6. Utilities
7. Diags
8. BiosSetup
9. Pxe
10. UefiShell
11. UefiHttp
12. UefiTarget

Continuous and one time boot uefi options:
1. HD.EmbRAID.1.3 (CentOS Linux)
2. Unknown.Unknown.200.3 (CentOS)
3. Unknown.Unknown.200.2 (Red Hat Enterprise Linux)
4. Unknown.Unknown.200.1 (grub)
5. Generic.USB.1.1 (Generic USB Boot)
6. HD.EmbRAID.1.4 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 -
Size:279.3 GiB Port:1I Bay:3 Box:1)
7. HD.EmbRAID.1.5 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 -
Size:279.3 GiB Port:1I Bay:4 Box:1)
8. HD.EmbRAID.1.6 (Embedded RAID 1 : HPE Smart Array P408i-a SR Gen10 - 1 TiB,
RAID0 Logical Drive 1(Target:0, Lun:0))
```

The following cell sends the desired `bootorder` command and retrieves the list of all modified parameters. This is interesting information but you may need more detail to understand exactly how to send the request to the remote iLO 5.

[18]:
```
ilorest bootorder --onetimeboot=BiosSetup
ilorest status
echo
```

```
bootname is : Boot Order Pending Settings

bootname is : Boot Order Current Settings

bootpath is : /redfish/v1/systems/1/bios/boot/

Added the following patch:
{
  "Boot/BootSourceOverrideTarget": "BiosSetup"
}
Added the following patch:
{
  "Boot/BootSourceOverrideEnabled": "Once"
}
Current changes found:
ComputerSystem.v1_10_0(/redfish/v1/Systems/1/) (Currently selected)
        Boot/BootSourceOverrideTarget=BiosSetup
        Boot/BootSourceOverrideEnabled=Once
```

The following command commits the changes in **debug mode** in the remore iLO 5.

Debug messages are redirected a log file, `stdout` and `stderr`. However, `stdout` and `stderr` are discarded to `/dev/null` in the next cell to keep a clean output.

[19]:
```
# Cleanup log file if any
rm ${LogFile} &> /dev/null
echo
ilorest --debug commit &> /dev/null

# Cleaning manually pending changes in the cache to mimic a real iLO 5
ilorest select $(ilorest select | awk '{print $NF}') --refresh
```

1.5.1 Debug file analysis

An `iLOrest.log` file should appear soon in your left Jupyter Sidebar. Double click on it and search (CTRL-f) for string : `PATCH`

Analyze the PATCH request. Interesting for your debugging are:

- PATH / target URI: `/redfish/v1/Systems/1/`
- BODY / Payload request: `{"Boot": {"BootSourceOverrideTarget": "BiosSetup", "BootSourceOverrideEnabled": "Once"}}`

  NOTE: In this simulator environment, we don't get any Response code. Instead, the connection is dropped and cannot recover. Hence, we cannot validate that the command has been commited. On a real iLO 5, issue the following commands to validate your changes.

[20]:
```
ilorest get Boot/BootSourceOverrideTarget Boot/BootSourceOverrideEnabled
```

```
Boot=
      BootSourceOverrideTarget=None
      BootSourceOverrideEnabled=Disabled
```

1.6 File-based mode

In this section, you will study the `save/load` and `serverclone` commands. Note that the `iloclone` command is being deprecated.

To deploy / load configuration files in parallel towards multiple targets, you can read this article.

1.6.1 Save/load a specific data type configuration

In this section, you will the `save` and `load` macro iLOrest commands to save and then deploy a specific or multiple data types.

By default, the output of the save macro command is written in the `ilorest.json` file in the current directory. This can be altered by the `-f` command option.

The following cell retrieves the `Chassis`and `ManagerNetworkProtocol` data types. After its execution, you will see file `ilorest.json` appearing in your left sidebar. It can take 10-15 seconds to appear in the left sidebar.

[21]:
```
# Note: there is NO space character between list items
ilorest save --multisave Chassis,ManagerNetworkProtocol
```

```
Saving configuration...
Configuration saved to: ilorest.json
```

You can double click on the `ilorest.json` file to review its content. In addition to the `Chassis` and `ManagerNetworkProtocol` data types, it contains a `Comments` section with "administrative" properties.

The following cell modifies two parameters (`IndicatorLED` and `AlertMailEmail`) in the `ilorest.json` file.

[22]:
```
sed -i -e 's/\("IndicatorLED": \).*/\1"Lit",/ ; s/\("AlertMailEmail": \).*/
 ↪\1"John Deuf",/' ilorest.json
```

The following cell loads the modified configuration files into its cache, displays the modifications and commits them to the managed server.

[23]:
```
echo "Loading modified properties into target system"
ilorest load

echo -e "\nPrint Status"
ilorest status

echo -e "\nCommit changes"
ilorest commit

# Clean up manually pending changes in the cache to mimic a real iLO 5
ilorest select ManagerNetworkProtocol. --refresh
ilorest select Chassis. --refresh
```

```
Loading modified properties into target system
Loading configuration...
Committing changes...
ERROR: expected string or bytes-like object

Print Status
Current changes found:
Chassis.v1_10_2(/redfish/v1/Chassis/1/)
        IndicatorLED=Lit

Commit changes
```

```
Committing changes...
ERROR: expected string or bytes-like object
```

1.6.2 Save/load the entire configuration of a server

The `serverclone save` and `serverclone load` commands respectively create from a server or restore to a server a JSON formatted file containing most of its configuration settings (Smart Array configuration is not saved by default). The default output file is `ilorest_clone.json` but can be altered with the command `-f` parameter. Smart Array controller settings and logical drive configurations can be optionally included for saving.

By default the `serverclone save` command asks the user to provide inputs (i.e passwords) to be included in the output configuration file. If you don't want to supply them manually during the save operation, you can provide the `--auto` parameter like in the following cell. A placeholder will be inserted in the output file for later editing.

The following cell retrieves the configuration parameters of a remove iLO 5 based server without the SSA parameters.

[24]:
```
# Retrieve server configuration including SSA parameters but without Bios␣
 ↪parameters.
ilorest serverclone save --auto --nobios --ilossa
```

```
Saving properties of type: AccountService, path: /redfish/v1/AccountService
Saving properties of type: ComputerSystem, path: /redfish/v1/Systems/1
Saving properties of type: EthernetInterface, path:
/redfish/v1/Managers/1/EthernetInterfaces/3
Saving properties of type: EthernetInterface, path:
/redfish/v1/Managers/1/EthernetInterfaces/2
Saving properties of type: EthernetInterface, path:
/redfish/v1/Managers/1/EthernetInterfaces/1
Saving properties of type: HpeESKM, path:
/redfish/v1/Managers/1/SecurityService/ESKM
Saving properties of type: HpeServerBootSettings, path:
/redfish/v1/systems/1/bios/boot/settings/
Saving properties of type: HpeiLODateTime, path: /redfish/v1/Managers/1/DateTime
Saving properties of type: HpeiLOFederationGroup, path:
/redfish/v1/Managers/1/FederationGroups/DEFAULT
License Key Found ending in: DDNMM
License Key Found ending in: DDNMM
Saving properties of type: HpeiLOLicense, path:
/redfish/v1/Managers/1/LicenseService/1
Saving properties of type: HpeiLOSSO, path:
/redfish/v1/Managers/1/SecurityService/SSO
Saving properties of type: HpeiLOSnmpService, path:
/redfish/v1/Managers/1/SnmpService
Saving properties of type: Manager, path: /redfish/v1/Managers/1
Remember to edit password for user: 'student', login name: 'student'.
Saving properties of type: ManagerAccount, path:
```

```
/redfish/v1/AccountService/Accounts/3
Remember to edit password for user: 'demopaq', login name: 'demopaq'.
Saving properties of type: ManagerAccount, path:
/redfish/v1/AccountService/Accounts/2
Remember to edit password for user: 'Administrator', login name:
'Administrator'.
Saving properties of type: ManagerAccount, path:
/redfish/v1/AccountService/Accounts/1
Saving properties of type: ManagerNetworkProtocol, path:
/redfish/v1/Managers/1/NetworkProtocol
Saving properties of type: SecureBoot, path: /redfish/v1/Systems/1/SecureBoot
Unhandled exception(s) occurred: 'ServerCloneCommand' object has no attribute
'smartarrayobj'
Type: SmartStorageConfig, path:
/redfish/v1/systems/1/smartstorageconfig/settings/ does not contain any
modifiable properties on this system.
Saving of clone file to 'ilorest_clone.json' is complete.
```

You can edit the `ilorest_clone.json` file, modify it and load it in suitable servers. The `--auto` parameter avoids manual inputs. When the entire file has been loaded, a server reset is automatically performed.

> Note: The HTTP responses of the iLO 5 simulator may not be identical to the responses of a real iLO 5.

[25]:
```
ilorest serverclone load --auto -f ilorest_clone.json

# Clean up of pending changes in the cache to mimic a real iLO 5
ilorest select SmartStorageConfig. --refresh
```

```
This system has iLO Version iLO 5 v2.44.
This system has BIOS Version U32.
BIOS Versions are compatible.
This system has has iLO 5 with firmware revision 2.44.
iLO Versions are fully compatible.
Attempting system clone from a 'ProLiant DL360 Gen10' to a 'ProLiant DL360
Gen10'.
Type '#AccountService.v1_5_0.AccountService' is compatible with this system.
Type '#ComputerSystem.v1_10_0.ComputerSystem' is compatible with this system.
Type '#EthernetInterface.v1_4_1.EthernetInterface' is compatible with this
system.
Type '#HpeESKM.v2_0_0.HpeESKM' is compatible with this system.
Type '#HpeServerBootSettings.v2_0_0.HpeServerBootSettings' is compatible with
this system.
Type '#HpeiLODateTime.v2_0_0.HpeiLODateTime' is compatible with this system.
Type '#HpeiLOFederationGroup.v2_0_0.HpeiLOFederationGroup' is compatible with
this system.
Type '#HpeiLOLicense.v2_3_0.HpeiLOLicense' is compatible with this system.
Type '#HpeiLOSSO.v2_0_0.HpeiLOSSO' is compatible with this system.
```

```
Type '#HpeiLOSnmpService.v2_3_0.HpeiLOSnmpService' is compatible with this
system.
Type '#Manager.v1_5_1.Manager' is compatible with this system.
Type '#ManagerAccount.v1_3_0.ManagerAccount' is compatible with this system.
Type '#ManagerNetworkProtocol.v1_0_0.ManagerNetworkProtocol' is compatible with
this system.
Type '#SecureBoot.v1_0_0.SecureBoot' is compatible with this system.
---Check special loading for entry---
type: #AccountService.v1_5_0.AccountService
path: /redfish/v1/AccountService/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #ComputerSystem.v1_10_0.ComputerSystem
path: /redfish/v1/Systems/1/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #EthernetInterface.v1_4_1.EthernetInterface
path: /redfish/v1/Managers/1/EthernetInterfaces/3
Unhandled exception(s) occurred: Path:
'/redfish/v1/Managers/1/EthernetInterfaces/3' is invalid/not identified on this
server.

---Special loading complete for entry---.
---Check special loading for entry---
type: #EthernetInterface.v1_4_1.EthernetInterface
path: /redfish/v1/Managers/1/EthernetInterfaces/2
Unhandled exception(s) occurred: Path:
'/redfish/v1/Managers/1/EthernetInterfaces/2' is invalid/not identified on this
server.

---Special loading complete for entry---.
---Check special loading for entry---
type: #EthernetInterface.v1_4_1.EthernetInterface
path: /redfish/v1/Managers/1/EthernetInterfaces/1
Unhandled exception(s) occurred: Path:
'/redfish/v1/Managers/1/EthernetInterfaces/1' is invalid/not identified on this
server.

---Special loading complete for entry---.
---Check special loading for entry---
type: #HpeESKM.v2_0_0.HpeESKM
path: /redfish/v1/Managers/1/SecurityService/ESKM/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #HpeServerBootSettings.v2_0_0.HpeServerBootSettings
path: /redfish/v1/systems/1/bios/boot/settings/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
```

```
type: #HpeiLODateTime.v2_0_0.HpeiLODateTime
path: /redfish/v1/Managers/1/DateTime/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #HpeiLOFederationGroup.v2_0_0.HpeiLOFederationGroup
path: /redfish/v1/Managers/1/FederationGroups/DEFAULT
Changing Federation account: 'DEFAULT's key
[204] The operation completed successfully.
Adding privs to Federation account: 'DEFAULT'
Unhandled exception(s) occurred: Invalid session. Please logout and log back in
or include credentials.
---Special loading complete for entry---.
---Check special loading for entry---
type: #HpeiLOLicense.v2_3_0.HpeiLOLicense
path: /redfish/v1/Managers/1/LicenseService/1/
Attempting to load a license key to the server.
The operation completed successfully.
---Special loading complete for entry---.
---Check special loading for entry---
type: #HpeiLOSSO.v2_0_0.HpeiLOSSO
path: /redfish/v1/Managers/1/SecurityService/SSO/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #HpeiLOSnmpService.v2_3_0.HpeiLOSnmpService
path: /redfish/v1/Managers/1/SnmpService/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #Manager.v1_5_1.Manager
path: /redfish/v1/Managers/1/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #ManagerAccount.v1_3_0.ManagerAccount
path: /redfish/v1/AccountService/Accounts/3
The operation completed successfully.
Changing account password for 'student'.
Unhandled exception(s) occurred: Password length is invalid. Use at least 8
characters.
---Special loading complete for entry---.
---Check special loading for entry---
type: #ManagerAccount.v1_3_0.ManagerAccount
path: /redfish/v1/AccountService/Accounts/2
Changing account password for 'demopaq'.
Unhandled exception(s) occurred: Password length is invalid. Use at least 8
characters.
---Special loading complete for entry---.
---Check special loading for entry---
type: #ManagerAccount.v1_3_0.ManagerAccount
path: /redfish/v1/AccountService/Accounts/1
```

```
Changing account password for 'Administrator'.
Unhandled exception(s) occurred: Password length is invalid. Use at least 8
characters.
---Special loading complete for entry---.
---Check special loading for entry---
type: #ManagerNetworkProtocol.v1_0_0.ManagerNetworkProtocol
path: /redfish/v1/Managers/1/NetworkProtocol/
Special entry not applicable...reserving for patch loading stage.
---Check special loading for entry---
type: #SecureBoot.v1_0_0.SecureBoot
path: /redfish/v1/Systems/1/SecureBoot/
Special entry not applicable...reserving for patch loading stage.
Patching remaining data.
Patching '#AccountService.v1_5_0.AccountService'.
Loading configuration...
No differences identified from current configuration.
Patching '#ComputerSystem.v1_10_0.ComputerSystem'.
Loading configuration...
No differences identified from current configuration.
Patching '#EthernetInterface.v1_4_1.EthernetInterface'.
Loading configuration...
Skipping property links, not found in current server.
Property is read-only skipping '@odata.etag'
Property is read-only skipping '@odata.id'
Property is read-only skipping 'Description'
Property is read-only skipping 'Id'
Property is read-only skipping 'Name'
Property is read-only skipping 'PermanentMACAddress'
Property is read-only skipping 'InterfaceType'
Property is read-only skipping 'NICSupportsIPv6'
Skipping property permanentmacaddress, not found in current server.
Skipping property links, not found in current server.
Skipping property description, not found in current server.
Skipping property oem, not found in current server.
Unhandled exception(s) occurred: list index out of range
Patching '#EthernetInterface.v1_4_1.EthernetInterface'.
Loading configuration...
Skipping property fullduplex, not found in current server.
Skipping property maxipv6staticaddresses, not found in current server.
Skipping property autoneg, not found in current server.
Skipping property fqdn, not found in current server.
Skipping property dhcpv4, not found in current server.
Skipping property statelessaddressautoconfig, not found in current server.
Skipping property dhcpv6, not found in current server.
Skipping property speedmbps, not found in current server.
Skipping property hostname, not found in current server.
Skipping property vlan, not found in current server.
Skipping property gateway, not found in current server.
```

```
Unhandled exception(s) occurred: list index out of range
Patching '#EthernetInterface.v1_4_1.EthernetInterface'.
Loading configuration...
Skipping property fullduplex, not found in current server.
Skipping property maxipv6staticaddresses, not found in current server.
Skipping property dhcpv4, not found in current server.
Skipping property statelessaddressautoconfig, not found in current server.
Skipping property dhcpv6, not found in current server.
Skipping property hostname, not found in current server.
Skipping property vlan, not found in current server.
Unhandled exception(s) occurred: list index out of range
Patching '#HpeESKM.v2_0_0.HpeESKM'.
Loading configuration...
No differences identified from current configuration.
Patching '#HpeServerBootSettings.v2_0_0.HpeServerBootSettings'.
Loading configuration...
No differences identified from current configuration.
Patching '#HpeiLODateTime.v2_0_0.HpeiLODateTime'.
Loading configuration...
No differences identified from current configuration.
Patching '#HpeiLOSSO.v2_0_0.HpeiLOSSO'.
Loading configuration...
No differences identified from current configuration.
Patching '#HpeiLOSnmpService.v2_3_0.HpeiLOSnmpService'.
Loading configuration...
No differences identified from current configuration.
Patching '#Manager.v1_5_1.Manager'.
Loading configuration...
No differences identified from current configuration.
Patching '#ManagerNetworkProtocol.v1_0_0.ManagerNetworkProtocol'.
Loading configuration...
No differences identified from current configuration.
Patching '#SecureBoot.v1_0_0.SecureBoot'.
Loading configuration...
No differences identified from current configuration.
Resetting the server...
An invalid response body was returned: Expecting value: line 1 column 1 (char
0)No error message returned or unable to parse error response.
```

1.7 Raw commands

iLOrest allows you to get and set parameters directly in the Redfish tree using the following "raw" commands: `rawdelete`, `rawget`, `rawput`, `rawpost`, `rawhead` and `rawpatch`.

The use of raw commands is not recommended as it assumes the resource URIs. Resource URIs can change over time as explained in this article. However, in some specific cases or for troubleshooting they can be useful.

1.7.1 Raw get

The `rawget` command fetches the content of the supplied URI. Refer to the API Reference Document to find the location of your desired URI. Additional tools have to be used to filter specific properties.

The following cell intends to retrieve the IPv4 address of the iLO Dedicated Network port, assuming it is the first NIC in the collection. It uses the popular JsonQuery (`jq`) utility to filter desired parameters.

[26]:
```
# Get the Name and the IPv4 address parameters of the first iLO NIC.
ilorest rawget "/redfish/v1/Managers/1/EthernetInterfaces/1" | jq '.Name, .
 ↪IPv4Addresses[].Address'
```

```
The operation completed successfully.
"Manager Dedicated Network Interface"
"16.31.87.100"
```

1.7.2 Raw patch, put and post

The `rawpatch`, `rawput` and `rawpost` commands require a target location URI and a "body/workload" companion json file containing the parameters to patch, put or post.

> **NOTE**: The body/workload file format has changed between iLOrest versions 2.X and 3. Issue `ilorest help rawpatch` to get the file format suitable for your iLOrest version.

The following cell creates a .json file containing the body of a patch request asking the next reboot to stop at RBSU. The content of this file comes from the debug paragraph studied earlier.

Then, it executes a `rawpatch` command of this file as input. As we are using an iLO 5 simulator, the response message may not be the one received by a real physical iLO 5.

> Note: The `ilorest status` command returns "No changes found" because the `rawpatch` command is not cached.

[27]:
```
cat > RawPatchFile.json << __EOF__
{
   "/redfish/v1/Systems/1":
   {
     "Boot": {
             "BootSourceOverrideTarget": "Utilities",
             "BootSourceOverrideEnabled": "Once"
             }
   }
}
__EOF__

# Send the PATCH workload
ilorest rawpatch RawPatchFile.json

# rawpatch bypasses the cache files. Hence ilorest will not detect any changes.
```

```
ilorest status

# However, changes are effective:
echo
ilorest bootorder | grep 'Current one time'
```

```
The operation completed successfully.
Current changes found:
EthernetInterface.v1_4_1(/redfish/v1/Managers/1/EthernetInterfaces/1/)
        IPv4Addresses/0/Address=16.1.15.1
        IPv4Addresses/0/SubnetMask=255.255.255.252
        MACAddress=0A:CA:FE:F0:0D:04
```

1.7.3 Logout

It is always a good practice to logout when the work is done

[28]:
```
ilorest logout
```

```
Logging session out.
```

1.8 Summary

In this workshop, you discovered the HPE iLOrest command line interface and its three operational modes: interactive, scripted and file based. More examples can be studied in the next Jupyter Notebook.