Hortonworks Data Platform on IBM Power Deployment Guide

Version 0.9

Introduction

This document and provides a set of instructions, guidelines, and links to automation tools for deploying (provisioning) an IBM® Power-based cluster that is designed to host an installation of Hortonworks Data Platform (HDP). A complete solution consists of the cluster infrastructure and an installation of HDP software on that cluster infrastructure. The scope of this document covers the deployment of the cluster infrastructure – hardware (server, storage, network), systems software (operating systems), and management software. Installation of the HDP software is not covered by this document. It is recommended that a Hortonworks consultant be retained to accomplish the HDP software installation.

This document is part of a published toolkit – the "Hortonwork Data Platform on IBM Power Solution Toolkit" (hereafter referenced as the "HDP on Power Solution Toolkit") --, and this document contains references and links to other materials in that toolkit.

Configuration Overview

A variety of Power-based configurations are suitable for the cluster infrastructure for an HDP solution. This deployment guide selects a variant of the "Minimum Production Configuration" as the example configuration to deploy. Details of this configuration are listed in the "Bill of Materials" contained in the HDP on Power Solution Toolkit (see below) and in the "Design Overview"document.

The reference design section of the Hortonworks Data Platform on IBM Power – Reference Archtitecture and Design – Version 1.0 provides additional details and information regarding HDP on Power configurations generally.

Process Overview

The deployment process outlined in this document is supported and facilitated by various elements (e.g. scripts, playbooks, etc.) contained in the HDP on Power Solution Toolkit. The deployment process begins with a download of the HDP on Power Solution Toolkit which provides the detailed guidance (this document) and automation support to accomplish the deployment process.

This solution level toolkit depends upon the Cluster Genesis Toolkit and the Operations Manager Toolkit. Specifically, the HDP on Power Solution toolkit installs and customizes the Cluster Genesis Genesis toolkit to provide the deployment environment for HDP on Power, and the Operations Manager Toolkit is installed to accomplish ongoing management of the cluster infrastructure after deployment.

Deployment Steps

The following steps accomplish the deployment of this solution.

1	Download the HDP on Power Solution Toolkit
2	Define the Cluster Configuration
3	Acquire the Hardware and System Software
4	Rack and Cable the Hardware
5	Prepare the Switches
6	Prepare the Deployer Node
7	Install and Configure Toolkits
8	Deploy the Cluster
9	Configure Post-Deploy Features
10	Configure Operations Manager (OpsMgr)
11	Install Hortonworks Data Platform (HDP) (placeholder)

Step 1: Download the HDP on Power Solution Toolkit

The deployment process outlined in this document is supported and facilitated by various elements (e.g. documents, scripts, playbooks, etc.) contained in the HDP on Power Solution Toolkit. Begin the deployment process by downloading the solution toolkit from the following URL to a convenient location.

https://github.com/open-power-ref-design/hdp-solution/

This initial download provides access to documents referenced in the following steps. This solution toolkit is downloaded to the deployer node later to provide access to the machine readable content.

Step 2: Define the Cluster Configuration

This deployment guide selects a “Minimum Production Configuration” as the example configuration to be deployed. That selection fixes many configuration parameters. Further, within this configuration choice, many additional parameters are also pre-selected (e.g. the network configuration parameters such as IP subnets, address ranges, VLAN IDs, uplink configuration, etc.) These are documented in the “Build Parameters Worksheet” that is included with this solution toolkit.

Many of the parameters noted above can be altered for a deployment. General modification of these parameters is beyond the scope of this document, but the Build Parameter Worksheet indicates some of the parameters which may be altered, and later sections provide some additional guidance on modifications and customizations.

Step 3: Acquire the Hardware and System Software

Step 3a: Acquire the Hardware

The toolkit from Step 1 includes a bill of materials for the ‘Minimum Production Configuration’. Acquire the hardware components specified for this configuration.

For assistance with ordering and purchasing, access the following link to contact an IBM representative.

https://www-01.ibm.com/marketing/iwm/dre/signup?source=MAIL-power&disableCookie=Yes

Step 3b: Acquire System Software

Red Hat Enterprise Linux (RHEL) 7.2 is the system software (operating system) required for all nodes in this solution. Acquire a copy of the RHEL 7.2 iso.

RHEL 7.2 also requires a specific patch to properly support network boots on the particular servers used in this solution. See RHEL 7.2 Network install on IBM Power 8001-12C and 8001-22C and follow the instructions in sections 1.1 and 1.3 to rebuild the initramfs. Name the new file “initrd-i40e.img”. This file is required in later steps.

Step 4: Rack and Cable the Hardware

Step 4a: Rack the Servers and Switches

Physically install the servers and switches in the rack. See Figure 1 on page 5 for recommended rack locations for the servers and switches in this configuration.

Details to accomplish this step for the servers may be found in the IBM Knowledge Center in the following sections:

- "8001-12C (IBM Power System S821LC) > Installing and configuring the system > Installing the IBM® Power® System S821LC (8001-12C) system"
- "8001-22C (IBM Power System S822LC for Big Data) > Installing and configuring the system > Installing the system"

Details to accomplish this step for the switches may be found at the following links:

- http://systemx.lenovofiles.com/help/topic/com.lenovo.rackswitch.g8052.doc/G8052_IG.pdf
- http://www.mellanox.com/related-docs/user_manuals/1U_HW_UM_SX1710_SX1410.pdf

Single Rack
Minimum Production Config

HDP
1smn+ 3mn + 1en + 8wn

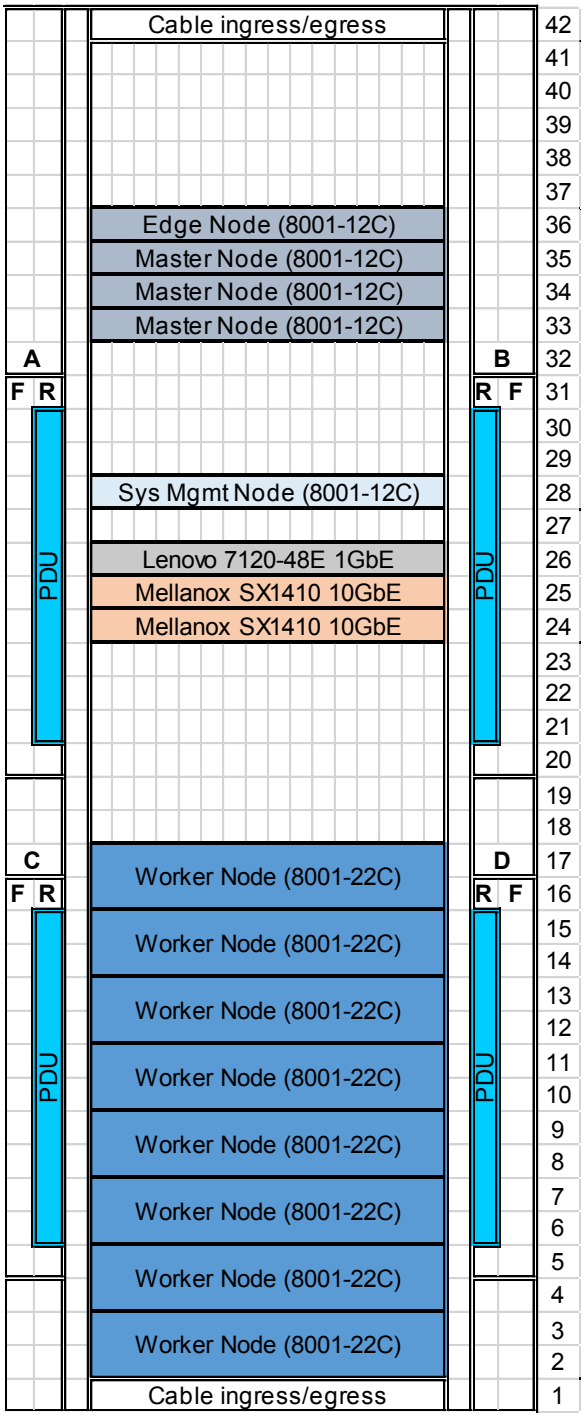

Figure 1. Recommended Rack Locations

Step 4b: Install Electrical Power Cables

Install the appropriate electrical power cables between the servers and switches and the PDUs *within the rack*. The links in Step 4a above include some guidance regarding the installation of these power cables.

Install the appropriate electrical power cables from the PDUs to the external electrical power source. **NOTE: Installation of these external electrical power cables and applying electrical power to the rack is beyond the scope of this document, and clients should retain a qualified electrician to accomplish this step.**

Step 4d: Install Network Cables

Install the network cables for the solution. See the "Cabling Specifications" spreadsheet for the network cabling connections required for this configuration.

Figure 2 on page 6 and Figure 3 on page 7 identify the location of the network ports referenced in the cabling spreadsheet for the servers. The 10GbE network adapter is shown installed in VIO Slot 1 for both server types in the following, but the 10GbE network adapter may be located in another PCI slot.

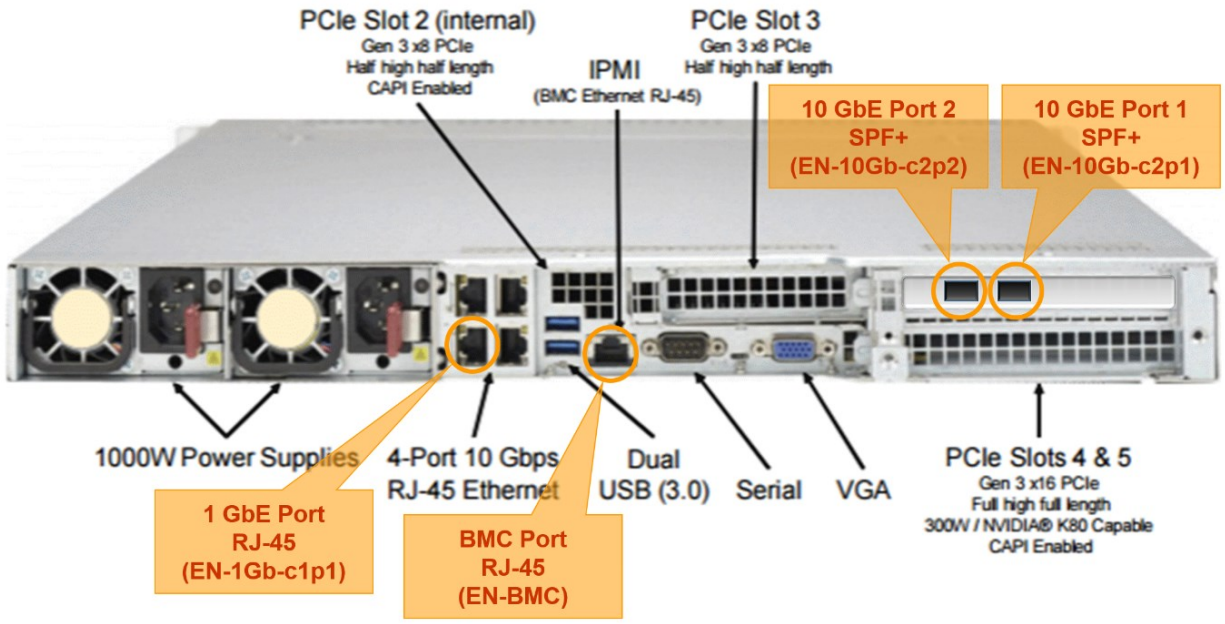

Figure 2. 8001-12C Network Port Locations

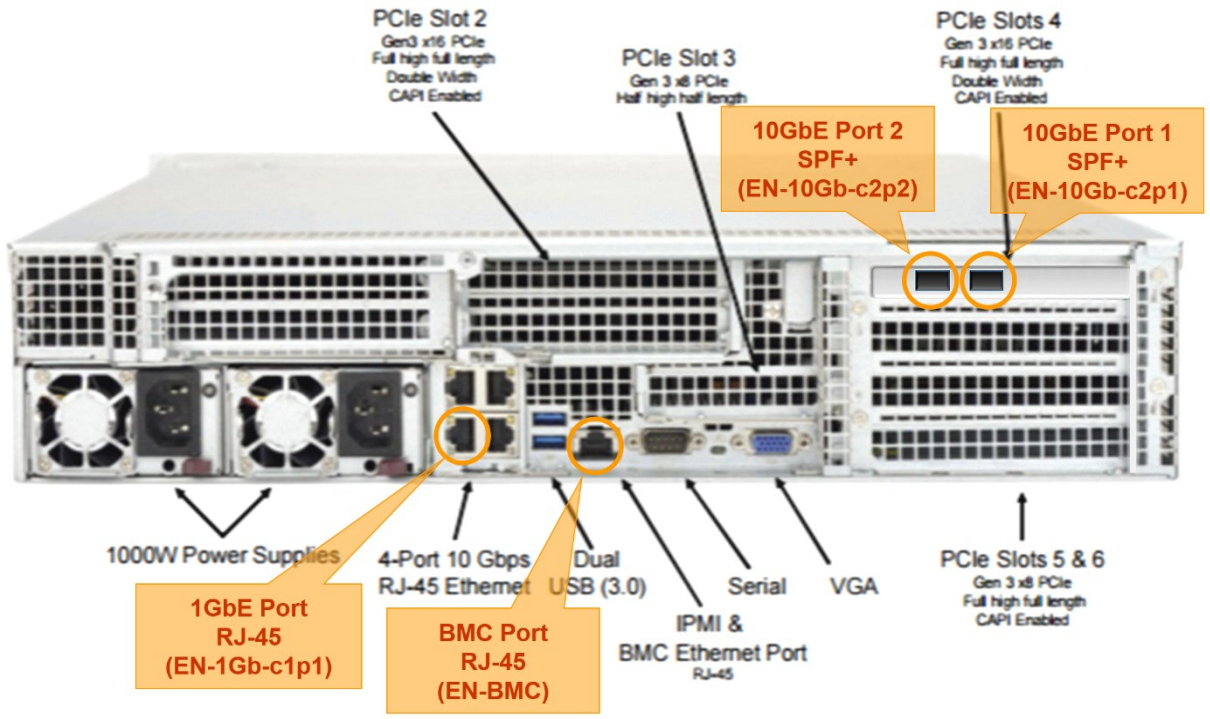

Figure 3. 8001-22C Network Port Locations

Figure 4 on page 7 and Figure 5 on page 8 depict the switches and the network port locations and allocations.

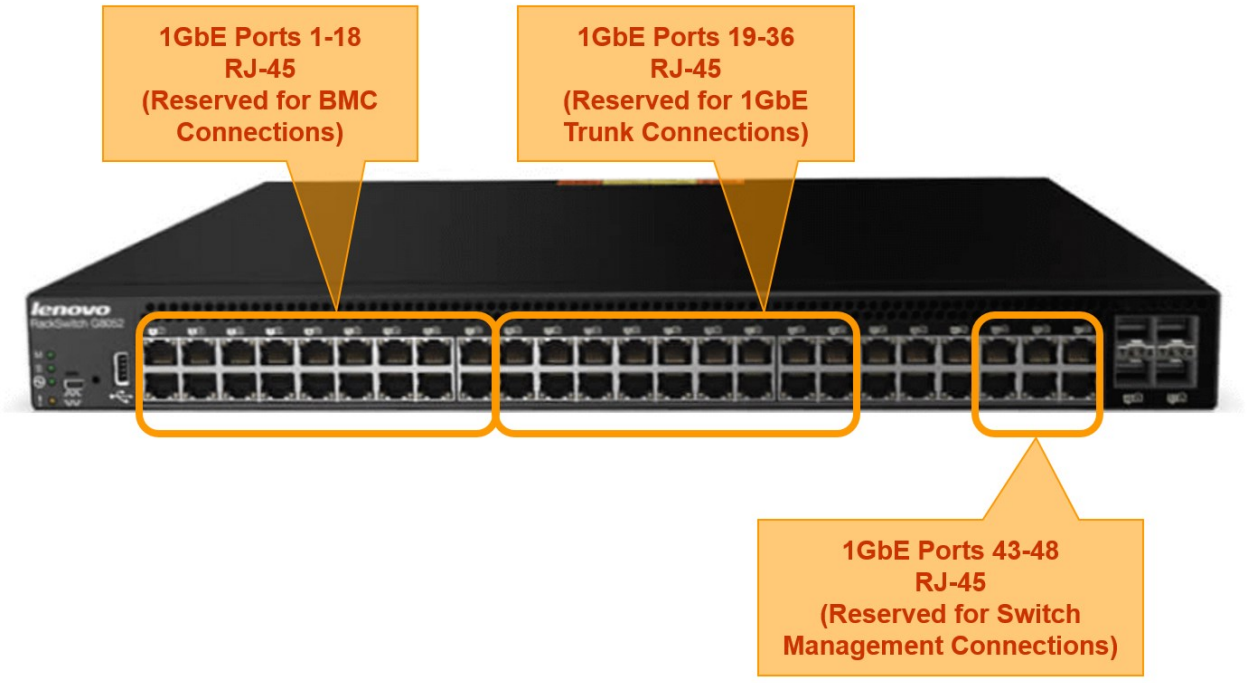

Figure 4. Management Switch (Lenovo G8052) Port Locations and Allocations

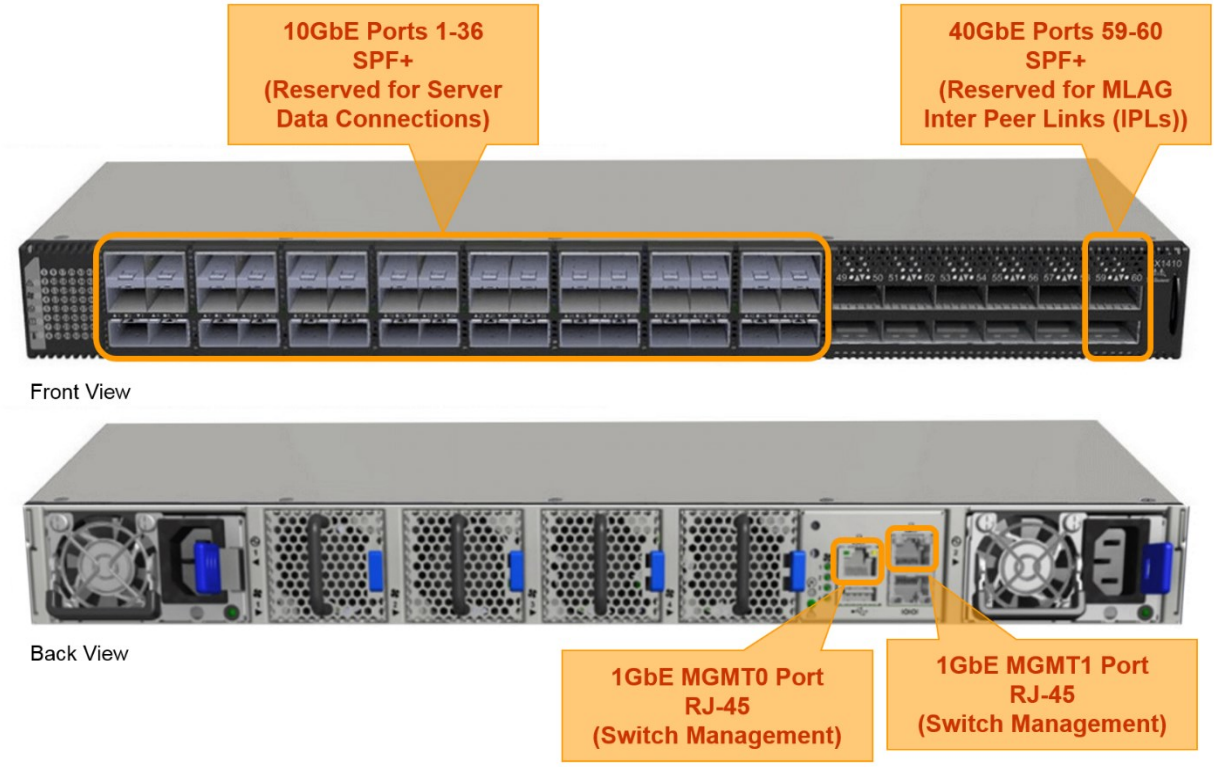

Figure 5. Data Switch (Mellanox SX1410) Port Locations and Allocations

Servers are idenitifed by role with a numeric suffix beginning with 1 and counting up from the bottommost to the topmost server for that role in the rack (e.g. Worker Node 1 is the bottommost server in the rack, Worker Node 2 is the next server above it, and so on).

Switches are identified by role with an alphabetic suffix of A for the bottommost (or only) switch for a particular role, and B for the uppermost switch in a redundant pair (e.g. DataSwitchA is the bottommost 10GbE switch, and DataSwitchB is the topmost 10GbE switch).

Step 5: Prepare the Switches

Prepare the network switches as follows to facilitate the deployment:

1. Reset the switches to factory default configurations
2. Configure IP addresses on each switch to allow admin access over the Management Network. (Refer to the Build Parameter Worksheet for values.)
   a. For the 1GbE switch, this is a general IP address within VLAN 1.
   b. For the 10GbE switches (Mellanox SX1410), create these IP addresses on the MGMT1 ports. The Genesis automation configures and uses the MGMT0 ports.

Step 6: Prepare the Deployer Node

Step 6a: Install RHEL 7.2

Install RHEL 7.2 on the deployer node. This may be accomplished in any manner convenient for the environment (e.g. manually using a USB storage device and serial connection).

Step 6b: Configure Base Networking

Configure base networking on the deployer node as follows:

1. Configure the physical port that is cabled to the 1GbE switch with an IP address for the Management Network (10.19.60.25). Do not configure any VLANs for this port. Genesis automation (later) uses this same physical port to configure additional network connections.
2. Disable Network Manager.

Step 7: Install and Configure Toolkits

Step 7a: Download the HDP on Power Solution Toolkit

On the deployer node, log in as a non-root user. Choose or create a workspace directory to contain the various toolkits and materials that are downloaded and created in following steps. Change to this directory as the shell working directory.

```
[admin@smn ~]$ mkdir toolkit-workspace
[admin@smn ~]$ cd toolkit-workspace
[admin@smn toolkit-workspace]$
```

Using git, download the HDP on Power Solution Toolkit into the workspace directory.

```
[admin@smn toolkit-workspace]$ git clone https://github.ibm.com/open-power-ref-design/hdp-solution
```

This toolkit provides scripts, updates, and other materials required in following steps.

Step 7b: Stage Inputs for the Install and Deployment Processes

Run the “stage_inputs.sh” script (from the HDP on Power Solution Toolkit) to stage the inputs required for the install, configuration, and update of the toolkits. The RHEL 7.2 iso and associated initrd.img created above are specified explicitly on the script invocation. The other input files are identified and created automatically.

```
[admin@smn toolkit-workspace]$ cd hdp-solution
[admin@smn hdp-solution]$ ./stage_inputs.sh --iso <path to RHEL-7.2 iso> --
initrd <path to modified initramfs file>
```

Example:

```
[admin@smn hdp-solution]$ ./stage_inputs.sh --iso /home/genesis/master/iso-
RHEL-7.2-GA/RHEL-7.2-20151030.0-Server-ppc64le-dvd1.iso -initrd
/home/genesis/master/images/RHEL-7.2-20151030.0-Server-ppc64le-dvd1/initrd-
i40e.img
```

The “hdp-solution-inputs” directory is created in the workspace directory, and all of the input files are staged within that directory.

```
[admin@smn hdp-solution]$ ll ..
total 4
drwxrwxr-x  4 genesis genesis 4096 Jun 24 12:04 hdp-solution
drwxrwxr-x  6 genesis genesis  117 Jun 24 12:07 hdp-solution-inputs
[admin@smn hdp-solution]$
```

Step 7c: Modify/Customize Inputs

At this point, all of the inputs required to guide and accomplish the remaining automation steps of the deployment are staged within the “hdp_solution_inputs” directory. If modifications or customizations to the deployment are desired, such changes must be done before proceeding with the next step. A variety of modifications/customizations are possible, but most are beyond the scope of this version of this deployment guide. See “Appendix A – Modifications” on page 13 for instructions to apply some common modifications.

Step 7d: Install Additional Toolkits

Install the Cluster Genesis and Operations Manager (OpsMgr) Toolkits using the “install_toolkits.sh” script.

```
[admin@smn hdp-solution]$ ./install_toolkits.sh
```

Step 7e: Update and Configure Toolkits

Update the toolkits for this solution using the “update_toolkits.sh” script.

```
[admin@smn hdp-solution]$ ./update_toolkits.sh
```

Step 8: Deploy the Cluster

Deploy the cluster using the Cluster Genesis “gen deploy” command.

```
[admin@smn hdp-solution]$ gen deploy
```

Step 9: Configure Post-Deploy Features

Step 9a: Apply Post-Deploy Configurations

Apply some post-deploy configurations using the Cluster Genesis “gen post-deploy” command.

```
[admin@smn hdp-solution]$ gen post-deploy
```

The primary effect of this command is the configuration of the Data Network and the server interfaces to that network.

Step 9b: Configure the User External Network Interface to the Cluster

Public access for HDP users to the cluster is directed through the Edge Node. On the Edge Node, configure an IP address for the Campus Network. This interface must be VLAN tagged by the node for the Campus Network, and this VLAN is typically part of the client’s existing environment, so this VLAN ID is typically chosen and provided by the client.

<<check opsmgr *config*>>

Step 10: Configure Operations Manager (OpsMgr)

Operations Manager (OpsMgr) is a packaged collection of open-source management tools that is configured to manage the cluster infrastructure (e.g. health monitoring, logging and data collection and analysis, and performance metrics). The primary components of OpsMgr are:

- Nagios Core
- Elasticsearch, Logstash, Kibana (ELK)

Step 10a: Access OpsMgr

With OpsMgrs installed and configured, users can access the Ops Portal by using a web browser and entering the deployer node IP address on the Management Network as the target URL:

```
https://<deployer node IP address>
```

Example:

```
https://10.19.60.25
```

Step 10b: Change the Administrator Superuser Password

A default user ID and password for the administrator superuser is generated at deployment time. It can be found by executing the following command as root on the deployment node:

```
[admin@smn hdp-solution]$ grep "keystone_auth_admin_password"
/etc/openstack_deploy/user_secrets.yml
```

ELK and Nagios have the following default user names and passwords:

- Nagios
  - Username: nagios
  - Password: nagios
- Kibana
  - Username: kibana
  - Password: kibana

It is strongly recommended to change passwords using the instructions available at the following link:

```
https://github.com/open-power-ref-design-
toolkit/opsmgr/blob/master/recipes/standalone/README.rst
```

Step 11: Install Hortonworks Data Platform (HDP)

To complete the deployment of the HDP on Power solution, Hortonworks Data Platform software must be installed on the cluster. The installation of the HDP software is beyond the scope of this document. It is recommended that a Hortworks consultant be retained to accomplish this step.

References

The following links and documents provide more information relevant to this document:

- Hortonworks Data Platform on IBM Power – Reference Architecture and Design – Version 1.0
- IBM Cluster Genesis Documentation
- IBM Operations Manager github Home Page

- Hortonworks HDP Home Page

Appendix A – Modifications

Following are some configuration parameters that may be modified and the process required to accomplish the change.

Change the Management IP Address of the Management Switch

There are two management IP addresses applied to the Management Switch. One is manually configured. To change that address:

1. Manually configure the desired address on the switch
2. Enter the same value in the config.yml file for the "ipaddr-mgmt-switch-external" parameter for the rack of interest

```
ipaddr-mgmt-switch-external:
    hdp-rack1: 10.19.60.11
```

The second management IP address is configured by Cluster Genesis. To change that address:

1. Enter the desire value in the config.yml file for the "ipaddr-mgmt-switch" parameter for the rack of interest.

```
ipaddr-mgmt-switch:
    hdp-rack1: 172.19.190.11
```

Change the Management IP Addresses of the Data Switches

There are two management IP addresses applied to each Data Switch. One is manually configured. To change that address:

1. Manually configure the desired addresses on the switches for the MGMT1 ports

The second management IP address is configured by Cluster Genesis. To change those addresses for both switches:

1. Enter the desire value in the config.yml file for the "ipaddr-data-switch" parameter for the rack of interest.

```
ipaddr-data-switch:
    hdp-rack1:
        - 172.19.190.13
        - 172.19.190.14
```

Change Subnet Definition and Static IP Address Range for the Data Network

For the Data Network, the config.yml contains the subnet definition and the static IP address range from which Cluster Genesis assigns addresses to the nodes. To change these parameters, in the "data" network section of the config.yml:

1. Enter the desired value for the subnet definition for the "addr" parameter.
2. Enter the desired values for the starting IP address and ending IP address for the static IP address range for the "available-ips" parameter.

```
networks:
    ...
    data:
        description: Data Network
        bond: bond1
        addr: 172.19.66.0/24
        available-ips:
            - 172.19.66.220 172.19.66.239
        ...
```

Printed in the United States of America May 2017

IBM Systems
294 Route 100, Building SOM4
Somers, NY 10589-3216

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Version 1.0
June 28, 2017