IBM Power 10 Private Cloud Rack for DB2 Warehouse Solution Deployment Guide

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INTRODUCTION

IBM recently announced the IBM Power 10 Private Cloud Rack for Db2 Warehouse Solution to optimize the total cost of ownership (TCO) of their environment. This document is intended to provide guidance in deploying Db2 Warehouse in the customer environment. It will explain the hardware, software, and infrastructure requirements for a successful Db2 Warehouse deployment on Power 10 based hardware infrastructure.

SOLUTION OVERVIEW

IBM has defined a Power 10-based architecture that, if deployed as described in this document, will ensure that Db2 Warehouse is configured to provide the highest level of performance and availability. IBM provides Expert Lab services for solution installation in the customer's data center and support after installation.

SOFTWARE

Db2 Warehouse runs on top of and requires the following software to be successfully deployed:

- Red Hat Enterprise Linux
- Red Hat OpenShift Container Platform (OCP)

HARDWARE

IBM has identified a reference architecture for the deployment of Db2 Warehouse solution on Power 10 based hardware infrastructure. A Db2 Warehouse Reference Architecture solution maximizes simplicity, minimizes time to value and ensures fully supported environments.

IBM also provides installation, support and maintenance services for reference architecture solutions. When the solution is procured from IBM, it also comes with a minimum level of performance guarantee.

SITE REQUIREMENTS

IBM provides extensive guidelines to help you prepare your site for the delivery and installation of the solution, including computer room location, electromagnetic compatibility, environmental design, power, cooling, and cabling requirements. These guidelines are available and are adhered to by the Expert Lab team when a solution is installed and set up by IBM.

IBM DB2WH Private Cloud Rack Site Survey V1.10

Electrical/Rack Line Cords

Notes: Rack Line Cords and Quantity are chosen by IBM eConfig based on country destination.

These are examples of Single-Phase cords based on Geography.

Feature Code	Part # [MFI BOM]	Wall Plug	Length	Rated Voltage (Vac)	Phase	Rated Amperage	Geography
Rack #1 Line Cord Options - Default Based on Geography							
6654	25R2555 [52P7314]	NEMA L6-30	4.3 m	200-208, 240	1	24 Amps	US, Canada, LA, Japan
6656	25R2553 [52P7316]	IEC 309, P+N+G, 32 A	4.3 m	230	1	24 Amps	EMEA
6657	25R2558 [52P7317]	PDL	4.3 m	230-240	1	24 Amps	Australia, New Zealand
6658	25R2559 [52P7318]	Korean plug	4.3 m	220	1	24 Amps	North and South Korea
Rack #2+ Line Cord Options - Default Based on Geography							
6492	25R2556 [52P7312]	IEC 309, 2P+G, 60 A	4.3 m	200-208, 240	1	48 Amps	US, Canada, LA, Japan
6491	25R2554 [52P7311]	IEC 309, P+N+G, 63 A	4.3 m	230	1	48 Amps	EMEA

See here for supported PDU power cords.

Rack PDU Config with Single phase 30A PDU/Line cords

Specification	North America	EMEA
Input normal voltage	200 - 208V ac	220 - 240 V ac
Frequency	50 or 60 Hz plus or minus 3 Hz	50 or 60 Hz plus or minus 3 Hz
Line load current	30 A plug (26 A derated)	
Power connection (from the rack's PDUs)		
PDUs/Power Circuits	4-8 (two redundant pairs)	4-8 (two redundant pairs)
Power requirement at site	● Four single-phase circuits. ● Each rack requires four drops.	
Power Cord length	14ft	4.3m

Config with Single Phase 60A PDU/Line cords

Specification	North America	EMEA
Input normal voltage	200 - 208V ac	220 - 240 V ac
Frequency	50 or 60 Hz plus or minus 3 Hz	50 or 60 Hz plus or minus 3 Hz
Line load current	60 A plug (48 A derated)	63A
Power connection (from the rack's PDUs)	IEC 60309 2P+E (60 A plug (48 A derated)) **(IBM 6491)**	IEC 309, P+N+G **(IBM 6492)**
PDUs/Power Circuits	Four (two redundant pairs)	Four (two redundant pairs)
Power requirement at site	● Four single-phase circuits. ● Each rack requires four drops.	
Power Cord length	14ft	4.3m

Electrical

Total Rack **Max** Power per Config: (safety rated max worst-case power only, **estimate @200V**)

- BRS [Rack:10.3kVA]
- BRM [Rack:16.8kVA]
- ERS [Rack: 9.2kVA]
- ERM [Rack: 12.8kVA]
- ERL [Rack: 17.65kVA]

- **ENVIRONMENTAL**

https://www.ibm.com/docs/en/power10/9105-22A?topic=rack-model-7965-s42-specifications

Environment (operating)[1]		
Properties	Recommended	Allowable[2,3,4]
ASHRAE class		A3 (Fourth edition)
Airflow direction	Front-to-back	
Temperature	18.0°C – 27.0°C (64.4°F – 80.6°F)	5.0°C – 40.0°C (41.0°F – 104.0°F)
Low end moisture	9.0°C (15.8°F) dew point	-12.0°C (10.4°F) dew point and 8% relative humidity
High end moisture	60% relative humidity and 15°C (59°F) dew point	85% relative humidity and 24.0°C (75.2°F) dew point
Maximum altitude		3050 m (10,000 ft)
Allowable environment (nonoperating)[5]		
Temperature	5°C – 45°C (41°F – 113°F)	
Relative humidity	8% to 85%	
Maximum dew point	27.0°C (80.6°F)	
Environment (shipping)		
Temperature	-40.0°C – 60.0°C (-40°F – 140°F)	
Relative humidity	5% – 100% (no condensation)	
Maximum wet bulb temperature	29.0°C (84.2°F)	
Environment (storage)		
Temperature	1°C – 60°C (33.8°F – 140°F)	
Relative humidity	5% – 80% (no condensation)	
Maximum wet bulb temperature	29.0°C (84.2°F)	

Notes:

1. IBM provides the recommended operating environment as the long-term operating environment that can result in the greatest energy efficiency and reliability. The allowable operating environment represents where the equipment is tested to verify functionality. Due to the stresses that operating in the allowable envelope can place on the equipment, these envelopes must be used for short-term operation, not continuous operation. There are a very limited number of configurations that must not operate at the upper bound of the A3 allowable range. For more information, consult your IBM technical specialist.
2. Must derate the maximum allowable temperature 1°C (1.8°F) per 175 m (574 ft) above 900 m (2953 ft) up to a maximum allowable elevation of 3050 m (10000 ft).
3. The minimum humidity level is the larger absolute humidity of the -12°C (10.4°F) dew point and the 8% relative humidity. These levels intersect at approximately 25°C (77°F). Below this intersection, the dew point (-12°C) represents the minimum moisture level, while above it, the relative humidity (8%) is the minimum. For the upper moisture limit, the limit is the minimum absolute humidity of the dew point and relative humidity that is stated.
4. The following minimum requirements apply to data centers that are operated at low relative humidity:
    - Data centers that do not have ESD floors and where people are allowed to wear non-ESD shoes might want to consider increasing humidity given that the risk of generating 8 kV increases slightly at 8% relative humidity, when compared to 25% relative humidity.
    - All mobile furnishings and equipment must be made of conductive or static dissipative materials and be bonded to ground.
    - During maintenance on any hardware, a properly functioning and grounded wrist strap must be used by any personnel who encounters information technology (IT) equipment.
5. Equipment that is removed from the original shipping container and is installed but is powered down. The allowable non-operating environment is provided to define the environmental range that an unpowered system can experience short term without being damaged.

o PHYSICAL SPACE

https://www.ibm.com/docs/en/power10/9105-22A?topic=rack-model-7965-s42-specifications

Each Config contained between 1-6 racks (7965-S42). Please contact IBM for config larger than 6 racks.

Total Rack Weight per Config: (**Estimate)**

- BRS [Rack: 496 kg (1,094 lbs.)]
- BRM [Rack: 689 kg (1,520 lbs.)]
- ERS [Rack: 457 kg (1,007 lbs.)]
- ERM [Rack: 568 kg (1,252 lbs.)]
- ERL [Rack: 711 kg (1,568 lbs.)]

SOFTWARE

Software stack:

- RedHat OpenShift (OCP)
- IBM Db2 Warehouse
- IBM Spectrum Scale
  - CSI
  - CNSA
  - Spectrum Scale (SS) (bare-metal NSD servers)

- RedHat Enterprise Linux (RHEL)
  - Used for Spectrum Scale NSD servers and OCP Bastion servers

Date	Db2	OCP	Spectrum Scale			RHEL
			CSI	CNSA	SS	
March 10 2025	12.1.1	4.16.20	2.12.1	5.2.1.1	5.2.1.1	8.10

While customers do have full control over what software versions they use, IBM strongly recommends using the fully validated set of versions listed above.

Db2 Warehouse

Db2 Warehouse database engine version: 12.1.1

Db2 Warehouse can be deployed in a Red Hat OpenShift cluster as a containerized micro-service, or pod, managed by Kubernetes. On Cloud Rack, OpenShift is used as the platform with Db2 Warehouse lifecycle managed via an Operator with version: s12.1.1.0-cn1

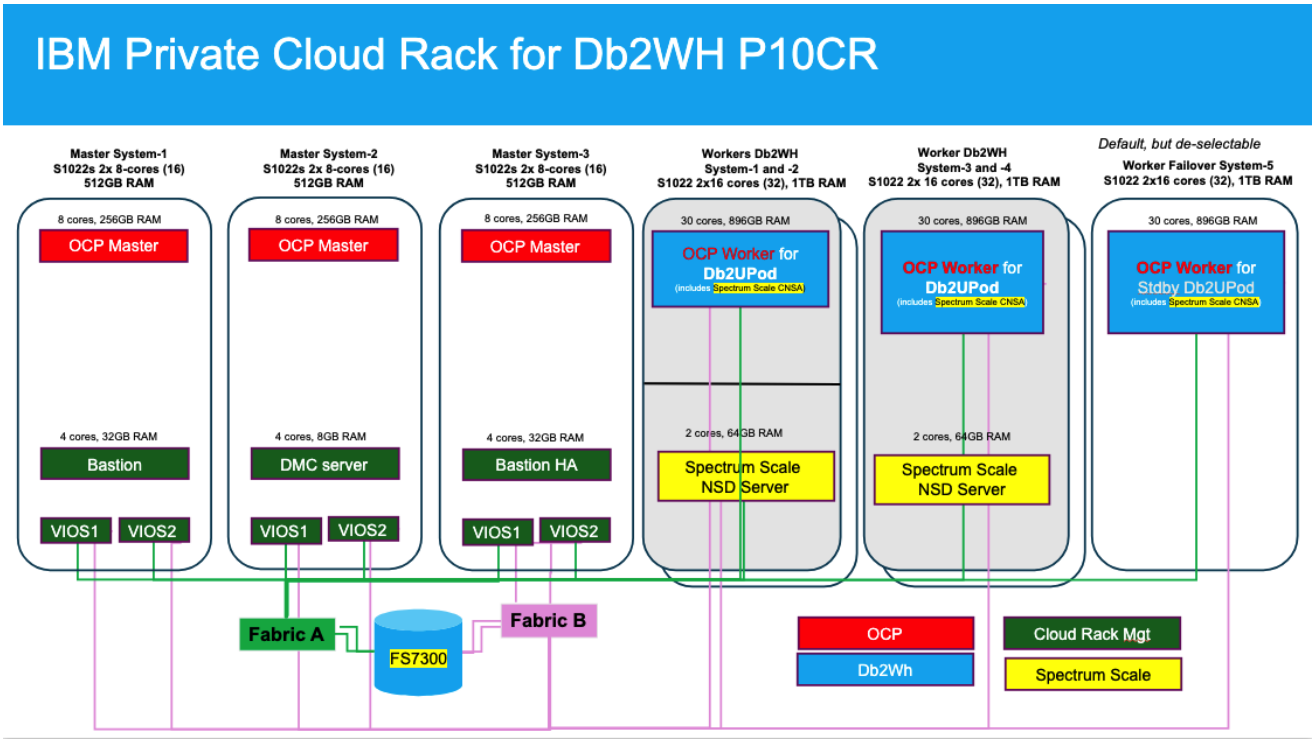
Spectrum Scale

A single rack configuration will contain the following file systems:

Scale file system name	**Size (TB)**	**Db2U storage area**	**Comments**
blumeta0	1	meta	PV shared across all pods
bludata0	216	data	PV per-partition (8 per pod)
db2archivelogs0	35	archivelogs	PV shared across all pods
db2temp0	47	tempts	PV per-pod

Reference: [Db2 Warehouse on Red Hat OpenShift and Kubernetes]

Cloud Rack for DB2 Minimum Configuration



o HARDWARE

The minimum configuration for a Power 10 reference architecture that has been defined by IBM for Db2 Warehouse consists of the following components:

- 3x S1022s Power 10 servers (Management nodes)
- 3x S1022 Power 10 servers (2 Active Worker nodes + 1 Stand-by Worker Node for HA)
- 1x Power 10 Hardware Management Console (HMC)
- 1x IBM 7316 Flat-panel console
- 1x IBM FlashSystem 7300 storage modules (with 16x9.6TB NVMe Flash Core Modules)
- 2x IBM 48x 1GbE + 2x 100Gb Ethernet switches
- 2x IBM SAN48B-7 SAN switches

..1 Management Nodes
Model S1022s (9105-22B)

- CPUs
  - 2x8-core Typical 3.00 to 3.90 Ghz (max) Power10 Processor
- Memory
  - 512GB – DDR5
- PCIe slots
  - (2) PCIe4 LP 2-port 100Gb No Crypto Connectx-6 DX QFSP56
  - (2) PCIe3 LP 32Gb 2-port Fibre Channel Adapter
  - (1) PCIe3 LP 32Gb 2-port Fibre Channel Adapter – Customer spare card for backup

- Solid State Drives
  - (2) 800GB PCIe Gen4 NVMe SSDs
  - (2) 1.6TB PCIe Gen4 NVMe SSDs

..2 Worker nodes
Model S1022 (9105-22A)

- CPUs
  - 2x16-core Typical 2.75 to 4.0 Ghz (max) Power10 Processor
- Memory
  - 1TB – DDR5
- PCIe slots
  - (2) PCIe4 LP 2-port 100Gb No Crypto Connectx-6 DX QFSP56
  - (2) PCIe3 LP 32Gb 2-port Fibre Channel Adapter
  - (2) PCIe3 LP 32Gb 2-port Fibre Channel Adapter *2 lowest servers in rack will have extra HBA for NSD function)
  - (1) PCIe3 LP 32Gb 2-port Fibre Channel Adapter – Customer spare card for backup
- Solid State Drives
  - (2) 800GB PCIe Gen4 NVMe SSDs
  - (2) 1.6TB PCIe Gen4 NVMe SSDs

..3 FlashSystem storage modules
Model FS7300 (4657-924)

- 40 cores per system
- 1.5TB of cache
- 1 to 3 Storage Pools

- 16 or 24 x 9.6TB NVMe Flash Core Modules; RAID6

  [Note: FS7300s has 16x9.6TB Flash Core Modules in BRS and BRM models, and 24x9.6TB Flash Core Modules in BRL, ERS, ERM and ERL models.]

..4 Management switches

IBM 8831-S52 -IBM Ethernet Switch (48x1Gb+4x10Gb) – Deployed in a pair of switches for redundancy.

..5 Fabric switches

IBM 8831-00M – IBM Ethernet Switch (32x100GbE) – Deployed in a pair of switches for redundancy.

..6 SAN switches

IBM SAN64B-7 (8960-P64) – Deployed in a pair of switches for redundancy.

..7 Provisioning server

The provisioning server to the OpenShift cluster is a bastion LPAR on management node 1.

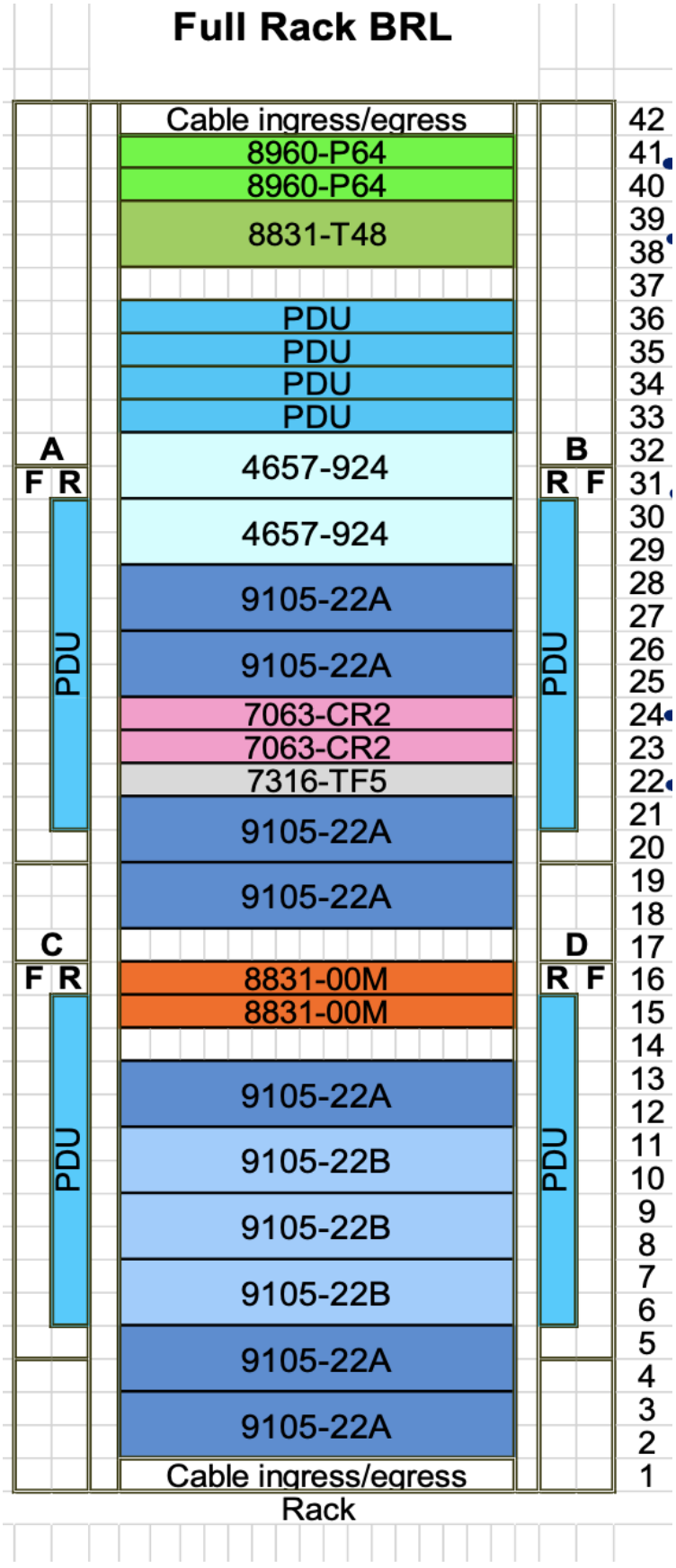
..8 Power Distribution Units (PDU)

Feature Code	Description	Quantity
7965-S42	ECJN High Function 12xC13 Single-Phase or Three-Phase Wye PDU plus	Quantity 4 in Model BRS Quantity 6 in Model BRM Quantity 8 in Models BRL, ERS, ERM and ERL. Note: Quantity listed is for 30A line chords. Adjust by half for 60A line chords.

..9 Hardware configuration

The following diagram shows the physical configuration of hardware components within the base-level [BRL].

Rear view of rack



SERVICE

o INSTALLATION

Project management is often the forgotten aspect of installation. So, IBM will provide Expert Lab Services for the installation and set-up of the IBM Power 10 Private Cloud Rack for Db2 Warehouse Solution in the customer's data center, including connecting the Solution into customer's network.

These Expert Lab Services will include the following components:

- Systems Expert Lab Services to install OCP, Storage Scale and SAN switch software at customer's site.
- Systems Expert Lab Services to physically install the Solution at the customer's site including connecting the Solution in the customer's network.
- Software Expert Lab Services to install Db2 Warehouse on the Solution at the customer's site including creating Db2 instances that are ready for use.
- Software Expert Lab Migration Assessment Services to develop a customized migration plan to meet Customer requirements, including scoping the migration work effort and documenting a migration strategy to meet the customer's downtime sensitivities for various applications.

Installation services give the customer a "gold-glove experience" from the moment a Solution is ordered until the Solution is up and running at the customer's site.

o MAINTENANCE

The customer reserves the rights to all the new version updates of firmware, OCP, Storage Scale and Db2 Software in the Solution.

Firmware updates – these are performed according to the general instructions provided in step 3 of https://www.ibm.com/docs/en/power10?topic=setup-completing-server-by-using-hmc.

IBM-managed maintenance

If desired, IBM-managed (IBM Expert Lab Services) maintenance can be purchased from IBM to handle software stack updates.

..1 Self-service maintenance

Before updating any or all parts of the software stack, please refer to the compatibility matrix which lists all the IBM validated and supported versions. The latest validated

software versions are listed in section 4.1.

OCP minor version updates

- OCP minor version updates are managed through channels. Unless explicitly recommended by IBM, the channel option should be stable. Refer to topic Understanding update channels and releases for more details.
- OCP minor version updates can be executed via Control plane web console or using OCP CLI. Note that Db2 Warehouse needs to run in the same configuration as originally deployed (for example if it was deployed with 6 pods, the same 6 pods need to be available during cluster/node updates). Therefore, rolling/canary updates are not recommended. Refer to following topics for more details on minor version updates.
    - Updating a cluster using the web console
    - Updating a cluster using the CLI

..2 IBM-managed maintenance

If desired, IBM-managed (IBM Expert Lab Services) maintenance can be purchased from IBM to handle software stack updates.

Spectrum Scale version updates

Spectrum Scale storage NSD servers are updated according to the IBM Knowledge Center instructions of the version being upgraded to. For example, if upgrading to Spectrum Scale 5.2.1, the upgrade instructions are located at https://www.ibm.com/docs/en/storage-scale/5.2.1?topic=upgrading

Spectrum Scale CNSA pods are updated according to the IBM Knowledge Center instructions of the version being upgraded to. For example, if upgrading to CNSA 5.2.1, the upgrade instructions are located at https://www.ibm.com/docs/en/scalecontainernative/5.2.1?topic=upgrading.

Db2 Warehouse Operator and Operand upgrades

Preparing to upgrade

Before upgrading to a newer version of Db2 Warehouse, it's recommended to execute the following steps:

- Backup your database(s)
- Stop all client applications

Upgrading Db2 Warehouse software on IBM Cloud Rack is comprise of two stages:

- Upgrading the Db2 Warehouse Operator. There are two options for this

- **[Using IBM Operator Catalog]** First step is to identify the Operator upgrade channel version. Then follow the process to upgrade Db2 Operator to the newer channel using IBM Operator Catalog.
- **[Using CASE bundle for Air Gapped Installs]** First step is to identify the CASE bundle version. Then follow the process in to upgrade Db2 Operator to the newer CASE using ibm-pak tool.

- Upgrading the Db2uInstance resource (**see note below**). After Db2 Operator is upgrade is completed, upgrade Db2uInstance resource to the newer version by changing the spec.version to the new version.

Upgrading Db2 Warehouse when the software stack has been upgraded from OpenShift 4.12 to 4.16

The current mitigations strategy is based on using a device-plugin driver injected into Db2 Warehouse Pod spec using resource requirements that allows visibility to the multipath devices associated with the Scale CSI volumes that pod is mounting. Any Cloud Rack upgraded to OCP 4.16 must deploy this power device plugin as a daemon set before upgrading Db2uInstance CR to the new version.

- power-dev-plugin code Git: https://github.com/IBM/power-device-plugin
- power-dev-plugin container image in quay (current **latest** version tag: v0.0.1): https://quay.io/repository/powercloud/power-dev-plugin?tab=tags
- README outlining how to install and uninstall the plugin: https://github.com/IBM/power-device-plugin?tab=readme-ov-file#steps

At the same time as changing the Db2uInstance CR `spec.version`, inject the power device-plugin as a new resource requirement.

```
spec:
  version: s12.1.1.0-cn1

....
  podTemplate:
    db2u:
      resource:
        db2u:
          limits:
            cpu: 192
            memory: 700Gi
            power-dev-plugin/dev: 1
          requests:
            cpu: 192
            memory: 700Gi
            power-dev-plugin/dev: 1
```

o PLANNING FOR ON-SITE INSTALLATION

IBM will provide a project manager to work with the client, the IBM account team, and the business partner (if applicable) to assist with planning the site prerequisites prior to delivery of the rack solution as well as prerequisites prior to on-site installation. The details for delivery and on-site installation will be contained within the document referred to as the Site Survey.

The prerequisites that will be planned prior to delivery of the system include:

Site Contacts: IBM will request the client to provide contact information for a team of people with the following roles (in some cases multiple roles may be shared by one person):

- Delivery - responsible for the shipping dock/storage access at the facility
- Hardware - responsible for hardware planning, rack placement on the data center floor
- Power - responsible for electricians, power infrastructure in data center
- Network - responsible for management of the data center network infrastructure
- Project Manager - responsible for providing coordination between the above client contacts

Site Access: IBM will request the client to provide site specific information to ensure the rack can safely be placed into the facility and any obstacles during delivery can be circumvented.

- Receiving dock - specifications of the dock and type of delivery truck required
- Elevators - (if applicable) elevators meet the height, width, and weight of the rack
- Doorways - (if applicable) doorways meet the height and width requirements of the rack
- Ramps - (if applicable) required to traverse raised floors and meet rack specifications
- Floor load - all floors leading to/at the install location are reinforced to support the rack weight
- Floor protection - (if applicable) type of material required to protect floors from rack wheels

The prerequisites that will be planned prior to on-site installation include:

Site Infrastructure: IBM will request the client to provide site specific information to ensure the rack can be installed correctly, remain operational in the environment, and be serviced/maintained safely.

- Service space - adequate space in front/behind the rack for IBM to service the equipment

- Power - quantity and type of power feeds that meet voltage/amp requirements of the rack
- Cooling - adequate cooling solution provided to meet the system cooling requirements

Network Connectivity: IBM will request the client to provide site specific information on the networking to ensure the system can be integrated into the client's environment and maintain connectivity to required management and update services.

- Network cables - qty and type to connect system components to the client's network
- Network information - Required number of IP addresses, hostnames, and domain information
- Network services - Connectivity information for the client's DNS, NTP, SMTP servers
- Access Ports - Firewall ports that must be opened for system connectivity and operation

On-site Access: IBM will request the client to provide site specific information on access requirements for the IBM install engineer to visit the site and perform installation activities.

- Site clearance - policies/protocols to secure clearance for IBM personnel to enter the site
- Site Security - Security clearance requirements/identification to enter the site
- Personal Devices - allowed electronic devices, storage media, physical media, tools
- Site Connectivity - cell phone reception, vendor Wi-Fi accessibility
- Hours - hours of operation/access for IBM install engineer to remain on site
- Escort - requirements on escorted/unescorted access into the facility

o ON SITE INSTALLATION EXECUTION

The IBM project manager will work with the client to ensure all prerequisites for on-site installation have been met (site readiness, completed site survey, customer availability). The project manager will then schedule an IBM install engineer to visit the site and perform on-site installation of the system. This includes all activities to ensure the system is operational, updated, healthy and connected to the client's network.

Physical Inspection:
The engineer will physically inspect the system to ensure the equipment is in working condition. This inspection includes the rack frame, doors, wheels and to ensure the rack is secured in place. The equipment inside the rack will be inspected, including servers, switches, cables, PDUs. All cabling will be reviewed to ensure any loose connections are remediated prior to powering on the system. If the system contains

multiple racks, the intra-rack cabling will be connected between racks.

Connecting Power:
The engineer will work with the data center electrician or hardware manager to connect power to the system. The engineer will ensure all breakers on the system PDUs are turned off prior to power connectivity, then they will bring the power connections for the rack PDUs outside the rack (either above or below) and allow the data center personnel to connect the cables to the data center power receptacles.

Powering on the System:
The engineer will turn on the PDU breakers and allow the system switches and storage to power on. The engineer will then power on the HMCs and connect their service laptop to the service port on the system management switch. From the service laptop the engineer will log into the HMC and verify the component list in the HMC. The power on procedure for components through the HMC will be as follows:
Management Servers
Spectrum Scale NSDs
Bastion Node
OpenShift Management Nodes
OpenShift Worker Nodes

System Verification:
The engineer will perform checks of all system components from the HMC and bastion node to verify healthy operation of all hardware, platform, and storage. This includes verifying hardware device health from management consoles, verifying storage availability to the cluster and verifying the cluster is online and healthy. The engineer will also perform network connectivity checks within the system's internal network to ensure all internal network connections are running at optimal speed and devices are reachable on internal data and management interfaces and to ensure.

Firmware Updates:
The engineer will verify all system firmware levels against current the IBM recommended firmware levels for the system. The engineer will perform any required firmware updates to all system hardware components via the HMC and management

consoles for each device.

Client Network Connectivity:
The engineer will use the client provided information in the site survey to configure network settings on the system devices that require management and/or data connectivity to the client's network. The engineer will then connect the client network cables to the system and perform connectivity tests to the client's network and management services (DNS, NTP, SMTP). The engineer will work with the client to troubleshoot connectivity issues from the system and resolve configuration issues on the system or advise on potential changes required on the data center network to allow connectivity from the system to required endpoints/services.

System Software Updates:
The engineer will perform system updates to the OpenShift cluster and operating systems to ensure they are at the latest recommended levels for system operation, performance, and reliability.

Accessibility:
The engineer will provide the client temporary access credentials to connect to the system and verify accessibility to the system endpoints. The engineer will work with the client to resolve accessibility issues.

Log collection:
The engineer will collect information from all system devices to capture a snapshot of the system configuration and health prior to handing the system over to the client.

Welcome Sheet:
The engineer will compile a welcome sheet to provide to the client. This sheet will include system OS/SW/FW versions, access credentials and network access information. Due to the sensitive nature of the information, the sheet will be shared with a limited audience at the client.

□ ORDERING

Hardware configuration for the IBM Private Cloud Rack for Db2 Warehouse is available in eConfig. Limited options for configuration are provided for things like PDU connection. Please contact your IBM Sales Representative or Business Partner based upon your requirements.