Welcome to:
Brunch and Learn

Today's session will begin shortly

Friday 28th June 2024
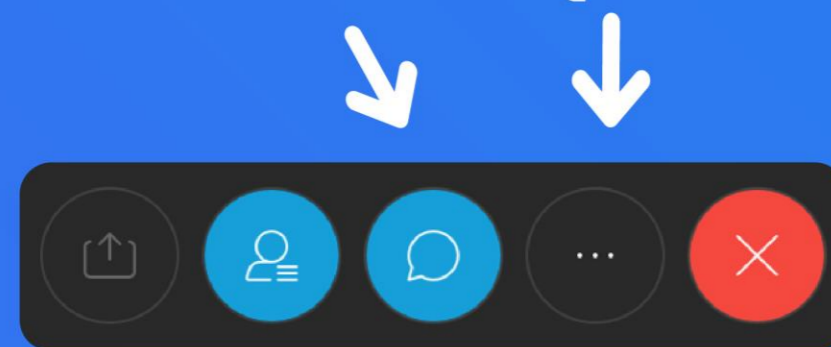How to set up a single node OpenShift environment
Paul Chapman: Global Power Modernisation Technical Lead

Note:
Upon joining, you are **muted** and **cannot see other attendees**
Feel free to use the **Chat** or **Q&A** functions (panel on RHS of screen)

Systems UKI

IBM UKI Brunch & Learn

Webinar
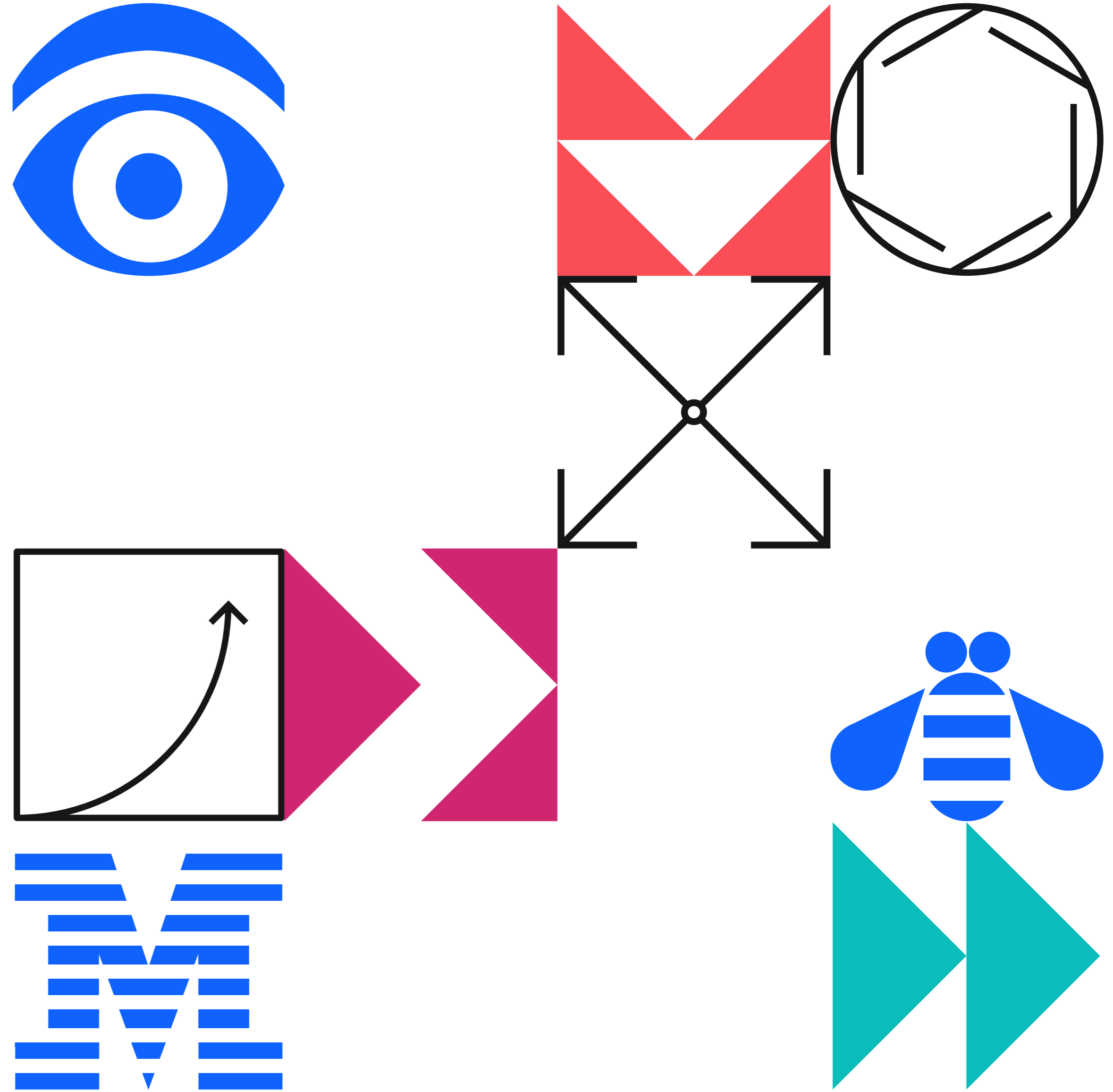28 June 2024

Single Node OpenShift

[Paul Chapman](#)
IBM, Global Power Modernization Technical Lead

With credit to colleagues:
[Daniel Casali](#)
[Federico Vagnini](#)
[Sylvain Delabarre](#)

Agenda

Single Node OpenShift

About OpenShift on a single node

You can create a single-node cluster with standard installation methods. OpenShift Container Platform on a single node is a specialized installation that requires the creation of a special Ignition configuration file. The primary use case is for edge computing workloads, including intermittent connectivity, portable clouds, and 5G radio access networks (RAN) close to a base station. The major tradeoff with an installation on a single node is the lack of high availability.

> ❗ **IMPORTANT**
> The use of OpenShiftSDN with single-node OpenShift is not supported. OVN-Kubernetes is the default network plugin for single-node OpenShift deployments.

- **Production-grade server:** Installing OpenShift Container Platform on a single node requires a server with sufficient resources to run OpenShift Container Platform services and a production workload.

Table 1. Minimum resource requirements

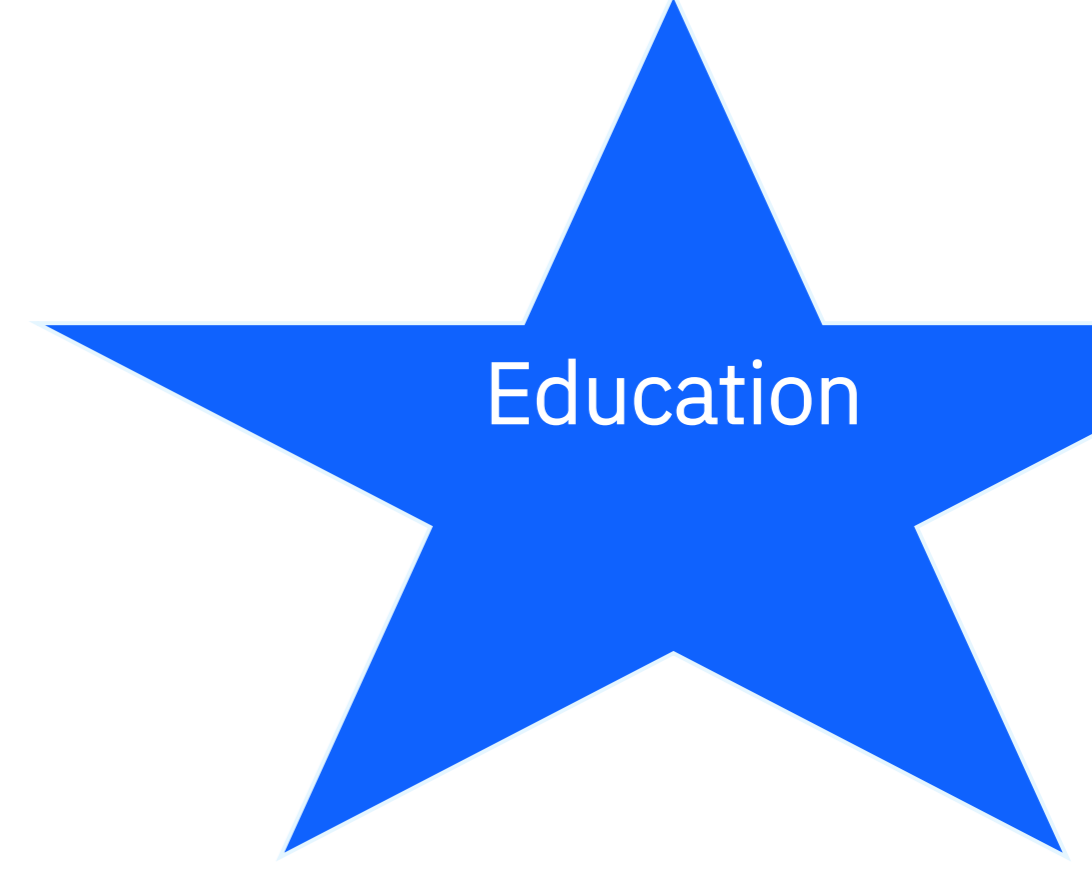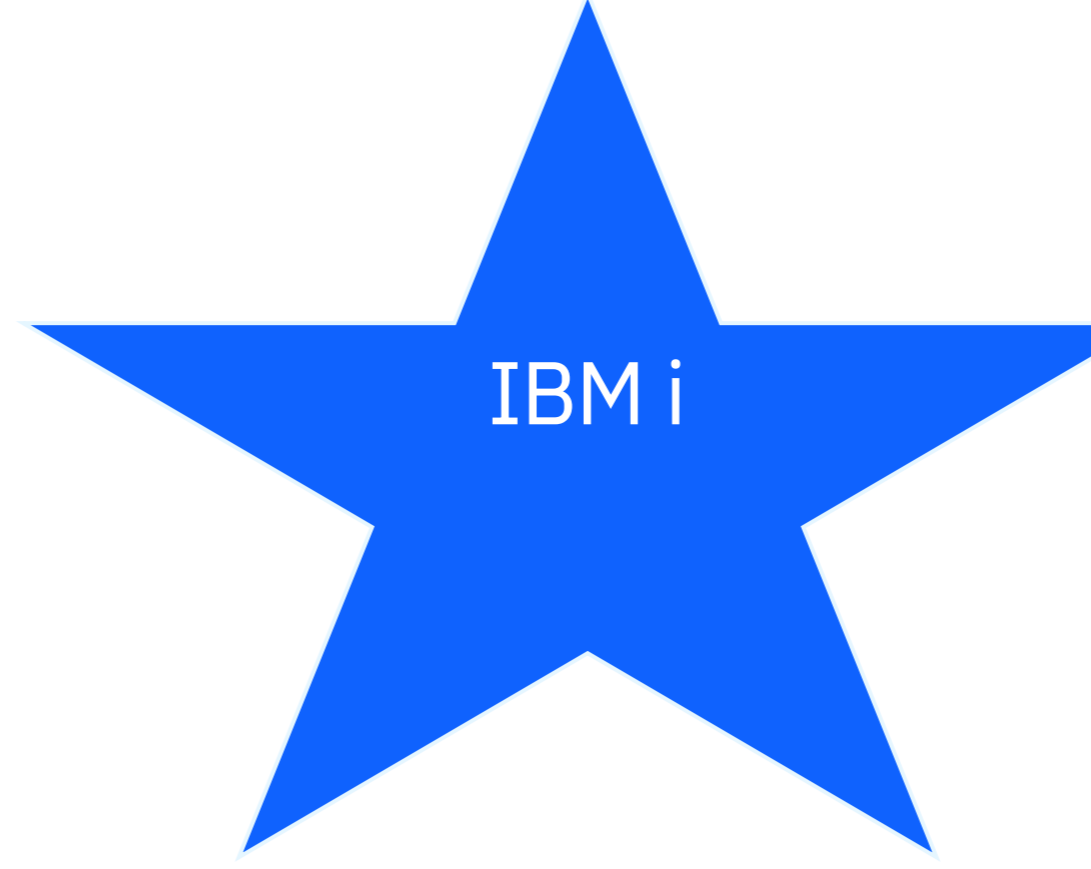| Profile	vCPU	Memory	Storage
Minimum	8 vCPU cores	16 GB of RAM	120 GB
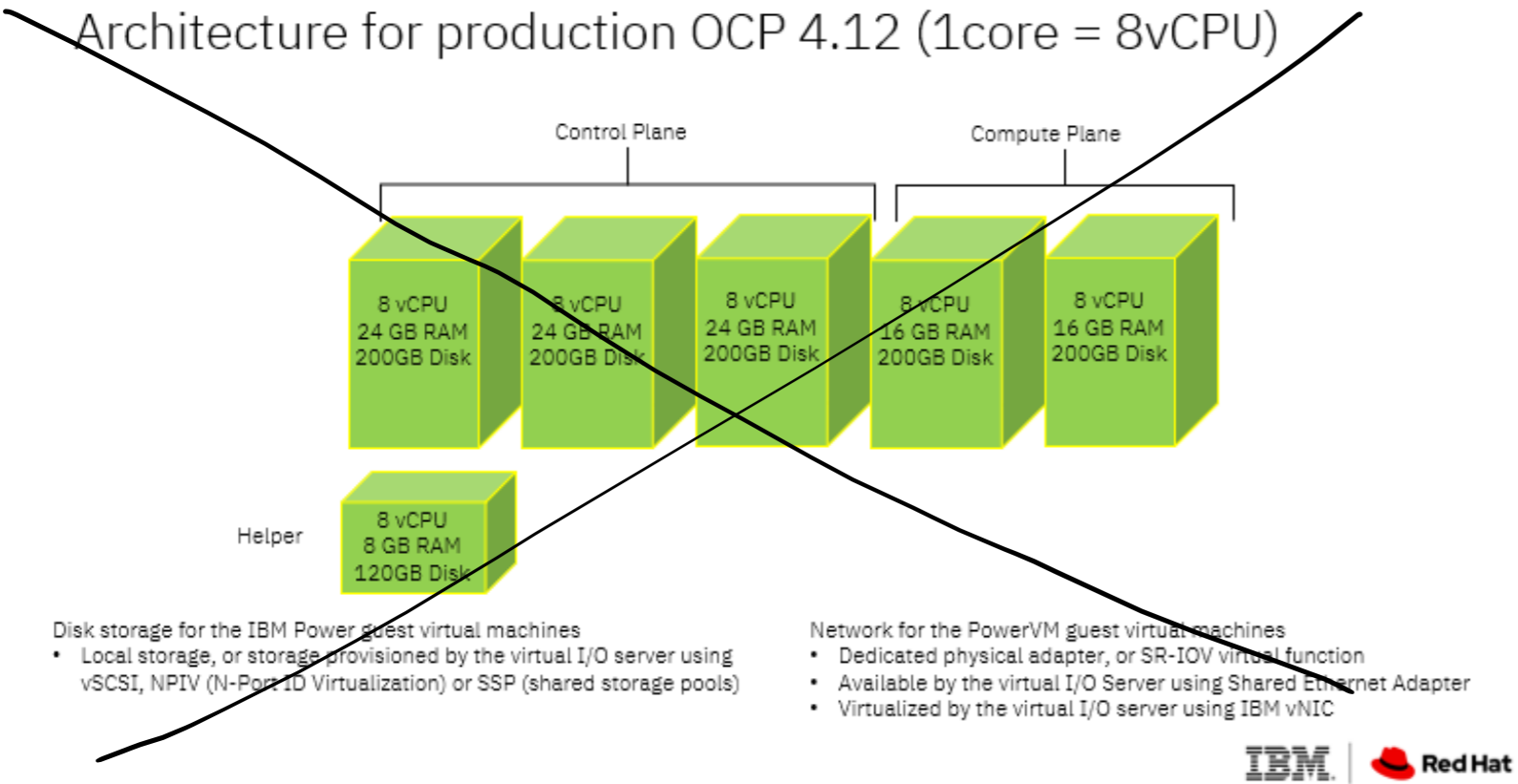
> ℹ️ **NOTE**
> - One vCPU is equivalent to one physical core when simultaneous multithreading (SMT), or hyperthreading, is not enabled. When enabled, use the following formula to calculate the corresponding ratio:
>
>   (threads per core × cores) × sockets = vCPUs
>
> - Adding Operators during the installation process might increase the minimum resource requirements.

Architecture for production OCP 4.12 (1core = 8vCPU)

Control Plane / Compute Plane

8 vCPU 24 GB RAM 200GB Disk
8 vCPU 24 GB RAM 200GB Disk
8 vCPU 24 GB RAM 200GB Disk
8 vCPU 16 GB RAM 200GB Disk
8 vCPU 16 GB RAM 200GB Disk

Helper 8 vCPU 8 GB RAM 120GB Disk

Disk storage for the IBM Power guest virtual machines
- Local storage, or storage provisioned by the virtual I/O server using vSCSI, NPIV (N-Port ID Virtualization) or SSP (shared storage pools)

Network for the PowerVM guest virtual machines
- Dedicated physical adapter, or SR-IOV virtual function
- Available by the virtual I/O Server using Shared Ethernet Adapter
- Virtualized by the virtual I/O server using IBM vNIC

IBM | Red Hat

Single Node OpenShift
Key Notes

- Single Node OpenShift
  - x86 available with v4.9
  - Power available with v4.14

  - 8 vCPU 1 SMT8 Proc Core
  - 16GB Memory
  - 120GB Storage

  - Standard OCP Subscription

  - 45-60 minutes install time

  - Bootstrap restarts after installation and becomes bastion

- Full Production Support

- Managed by RHACM

- Normal upgrade procedure

- CP4D v5.0 SNO certification

- Bare metal only
  - not VMware (for production)

- No High Availability included

- Single Architecture

Use Cases?

.

EDGE · Telco 5G · Retail · Dev · Demo · MERLIN · IBM i · Education

Agenda

01 About Single Node OpenShift

02 Installation - Scripts

03 Installation - Ansible

04 Installation - Assisted Installer

Installation - Scripts

- [Install SNO on Power](#)

- [OCP 4.14.15 Dependencies](#)

- [OCP 4.14 Clients](#)

- [Pull Secret](#)

Installation Scripts

1_sno_install.bsh

Install DHCP, TFTP & HTTP

Configure Grub & DHCP

Start Services

Obtain Red Hat dependencies

Download Client & installation files

Create SNO ignition

\# Network boot via SMS

2_sno_post_install.bsh

Install client binaries

Save config files

3_sno_check_install.bsh

Check installation status

Share credentials

Share console URL

Installation Scripts

Unique Config Requirements

<SUBNET>
<NETMASK>
<GATEWAY>
<BASE-DOMAIN>
<BASTION_IP>
<MASTER_MAC>
<MASTER_IP>
<MASTER_ALIAS>
<NAMESERVER#1>
<NAMESERVER#2>
<CLUSTER_NAME>
<PULL_SECRET>
<SSH_PUBLIC_KEY>

dhcp_config

<SUBNET>

<NETMASK>

<GATEWAY>

<BASE-DOMAIN>

<NAMESERVER#1>

<BASTION_IP>

<MASTER_MAC>

<MASTER_IP>

<MASTER_ALIAS>

grub_config

<MASTER_MAC>

<MASTER_IP>

<GATEWAY>

<NETMASK>

<MASTER_ALIAS>

<NAMESERVER#1>

<NAMESERVER#2>

<BASTION_IP>

install-config.yaml_config

<BASTION_IP>

<CLUSTER_NAME>

<PULL_SECRET>

<SSH_PUBLIC_KEY>

Installation Scripts

dhcp_config

```
default-lease-time 900;
max-lease-time 7200;
subnet <SUBNET> netmask <NETMASK> {
        option routers <GATEWAY>;
        option subnet-mask <NETMASK>;
        option domain-search "<BASE-DOMAIN>";
        option domain-name-servers <NAMESERVER>;
        next-server <BASTION>;
        filename "boot/grub2/powerpc-ieee1275/core.elf";
}

allow bootp;
option conf-file code 209 = text;
host bootstrap {
        hardware ethernet <MASTER_MAC>;
        fixed-address <MASTER_IP>;
        option host-name <MASTER ALIAS>;
        allow booting;
}
```

Installation Scripts

grub_config

```
if [ ${net_default_mac} == <MASTER_MAC> ]; then
default=0
fallback=1
timeout=1
menuentry "Bootstrap CoreOS (BIOS)" {
echo "Loading kernel Bootstrap"
linux "/rhcos-4.14.15-ppc64le-live-kernel-ppc64le" rd.neednet=1
ip=<MASTER_IP>::<GATEWAY>:<NETMASK>:<MASTER_ALIAS>::none
nameserver=<NAMESERVER#1> nameserver=<NAMESERVER#2> console=hvc0
ignition.firstboot ignition.platform.id=metal
coreos.live.rootfs_url=http://<BOOTSTRAP>/rhcos-4.14.15-ppc64le-live-
rootfs.ppc64le.img ignition.config.url=http://<BOOTSTRAP>/bootstrap-in-
place-for-live-iso.ign
echo "Loading initrd"
initrd "/rhcos-4.14.15-ppc64le-live-initramfs.ppc64le.img"
}
fi
```

Installation Scripts

install-config.yaml_config

```
apiVersion: v1
baseDomain: "<BASE_DOMAIN>"
compute:
- name: worker
  replicas: 0
controlPlane:
  name: master
  replicas: 1
metadata:
  name: <CLUSTER_NAME>
networking:
  clusterNetwork:
  - cidr: 10.128.0.0/14
    hostPrefix: 23
  machineNetwork:
  - cidr: 10.0.0.0/16
  networkType: OVNKubernetes
  serviceNetwork:
  - 172.30.0.0/16
platform:
  none: {}
bootstrapInPlace:
  installationDisk: /dev/sda
pullSecret: '<PULL_SECRET https://console.redhat.com/openshift/install/pull-secret>'
sshKey: |
  <SSH_PUBLIC_KEY 'cat ~/.ssh/id_rsa.pub'>
```

Installation Scripts

Master Resources

Processor

⊟ Save   ◇ Cancel

Displays properties of the logical partition that is using shared or dedicated processors. You can assign the logical partition to be either in capped or uncapped mode. Select the required values to set the Processing Units and Virtual Processors for the logical partition.

Learn More ➔

Processor Mode :   Shared

Shared Processor Pool :   [　　　　　　　 ▼]   **Available Processing Units in Pool :**   0.0

Capped ◀ ▶ Uncapped   **Weight :**   [128]

Virtual Processors

Maximum	4 ▲▼
Allocated	2 ▲▼
Minimum	2 ▲▼

Processing Units

Maximum	4 ▲▼
Allocated	2 ▲▼
Minimum	2 ▲▼

Memory Allocation

Maximum(GB)	128 ▲▼
Allocated(GB)	64 ▲▼
Minimum(GB)	64 ▲▼

Installation Scripts

Bastion Resources

Processor

Displays properties of the logical partition that is using shared or dedicated processors. You can assign the logical partition to be either in capped or uncapped mode. Select the required values to set the Processing Units and Virtual Processors for the logical partition.

Learn More →

Processor Mode :   Shared

Shared Processor Pool :   [▼]   **Available Processing Units in Pool :**   0.0

Capped ◄ ▶ Uncapped   **Weight :** [128]

Virtual Processors

Maximum	4
Allocated	2
Minimum	2

Processing Units

Maximum	0.4
Allocated	0.2
Minimum	0.2

Memory Allocation

Maximum(GB)	8
Allocated(GB)	4
Minimum(GB)	4

Save   Cancel

Agenda

01 About Single Node OpenShift

02 Installation - Scripts

03 Installation - Ansible

04 Installation - Assisted Installer

Installation Ansible

GitHub
sno-ppc-install

[vagfed/sno-ppc-install (github.com)](vagfed/sno-ppc-install)

Installation Ansible

🔗 sno-ppc-install

Automated install of OpenShift Single Node on IBM Power LPAR using Ansible.

Requirements:

- an existing RHEL9 installed on Power
- a POWER9/10 LPAR for OpenShift (it can be defined manually or using provided Ansible scripts)
- HMC credentials to poweron (and create) LPARs
- network connectivity between RHEL9 and OpenShift
- internet connectivity
- RedHat "pullsecret" to download and use OpenShift binaries

The scripts in this repositories must be copied on the RHEL9 environment on Power.

Architecture

The RHEL9 will be configured with all software required to network install the new OpenShift partition. It will provide BOOTP, TFTP and HTTP services for installation. The OpenShift partition will contact the RHEL9 environment at boot time and will start installation without human interaction in about 60 minutes. RHEL9 and OpenShift may be located on different servers on in different networks.

Installation Ansible

Initial setup

Create a new user called "ansible" and allow it to run as root with sudo. You can use the following commands as root:

```
useradd ansible
echo 'ansible ALL=(ALL) NOPASSWD: ALL' > /etc/sudoers.d/ansible
chmod 644 /etc/sudoers.d/ansible
```

Then switch as user ansible using `su - ansible`.

Now clone the repository as ansible user.

The required packages are installed running (once) the script `setup_ansible.sh`

> **IMPORTANT**
>
> Please update RHEL9 before starting installation using `yum update`. There are cases where installation of LPAR fails and halts in `grub>` prompt.

Installation Ansible

LPAR creation (optional)

You need to provide access to HMC and the LPAR configuration by editing the `lpar.yml` and `hmc.yml` files located into the `vars` directory. The files are already filled with sample data.

LPAR creation is done running `ansible-playbook create_sno_lpar.yml`.

The LPAR creation process will provide you the WWPNs of the LPAR's virtual fibre channel. You need to configure your SAN environment (storage and SAN switch) to provide a single LUN of at least 150GB to those WWPNs. You will need the WWN of that LUN for the installation.

LPAR deletion (optional)

You can delete the LPAR reusing the data provided in the `lpar.yml` and `hmc.yml` files located into the `vars` directory.

LPAR deletion is done running `ansible-playbook delete_sno_lpar.yml`.

> **WARNING**: The deletion is immediate with no confirmation.

Installation Ansible

OpenShift installation

Assuming that LPAR has been created, you must be sure that the LPAR configuration and HMC definitions are current in the `lpar.yml` and `hmc.yml` files located into the `vars` directory.

> Make sure that slot_number is the slot number of the LPAR's network adapter

The partition where Ansible scripts are executed will be configured ad BOOTP, TFTP and HTTP servers. The OCP LPAR will be installed using those protocols and firewall must not stop them.

The `network.yml` file located into the `vars` directory provides the network configuration of the network hosting the OCP LPAR and the IP address of the partition used for installation (bastion, thw host where ansible scripts will be run).

The `ocp.yml` file located into the `vars` directory provides the OpenShift installation data.

You need to provide your RedHat pull secret in the `vars/pullsecret` file to enable the installation. Please be sure that the file is made by **only one line** of data.

OpenShift SNO installation is done running `ansible-playbook install_sno.yml`.

Installation will take about 1 hour and the LPAR will be rebooted several times.

OpenShift credentials will be stored in the `sno_data` directory.

Installation Ansible

OpenShift Installation continued

Once Ansible has completed the configuration steps, the actual installation takes place. If you want to have a feeling of the progress of the installation you have two options:

- open a virtual console from HMC. You can not login but you will see console logs
- use ssh to log on OpenShift as core user

> Wait for ansible scipt to complete before opening a virtual console.
>
> If you see more than 5 time the line `FAILED - RETRYING: [localhost]: Wait for SSH to be active` the installation is not progressing. Please run `yum update` and restart installation: we encontered a RHEL9 bug that was fixed by updating RHEL. If installation halts open a virtual terminal on the LPAR and press enter: if you see `grub>` prompt the installation halted.

In order to connect to the node during installation use the following command:

```
ssh -i sno_data/<lpar name>/id_rsa -o StrictHostKeyChecking=no -o UserKnownHostsFile=/dev/null core@<lp
```

You will see after logon a suggested `journalctl` command to use for logging purposes.

Installation Ansible

Customization

The installed OpenShift node has a default configuration and needs to be customized. You can follow the sample customization page.

Known installation issues

OpenShift code is not always configured with the proper authorization to run on a LPAR with virtual cores (it depends on OpenShift version). If you see on the HMC an error code BA060030 installation will not continue. In that case use HMC to modify the LPAR to use dedicated cores and restart the installation.

Once OpenShift is installed, you can power off the LPAR and change the configuration to use virtual cores. When you start the LPAR again OpenShift will correctly work.

Sample log output

You can find a sample installation log into file sample_log.md

Installation Ansible

Master Resources

Installation Ansible

Bastion Resources

Processor

Displays properties of the logical partition that is using shared or dedicated processors. You can assign the logical partition to be either in capped or uncapped mode. Select the required values to set the Processing Units and Virtual Processors for the logical partition.

Learn More →

Processor Mode :   Shared

Shared Processor Pool :   [▼]   **Available Processing Units in Pool :**   0.0

Capped ◄ ► Uncapped   **Weight :**   128

Virtual Processors

Maximum	4
Allocated	2
Minimum	2

Processing Units

Maximum	4
Allocated	2
Minimum	2

Memory Allocation

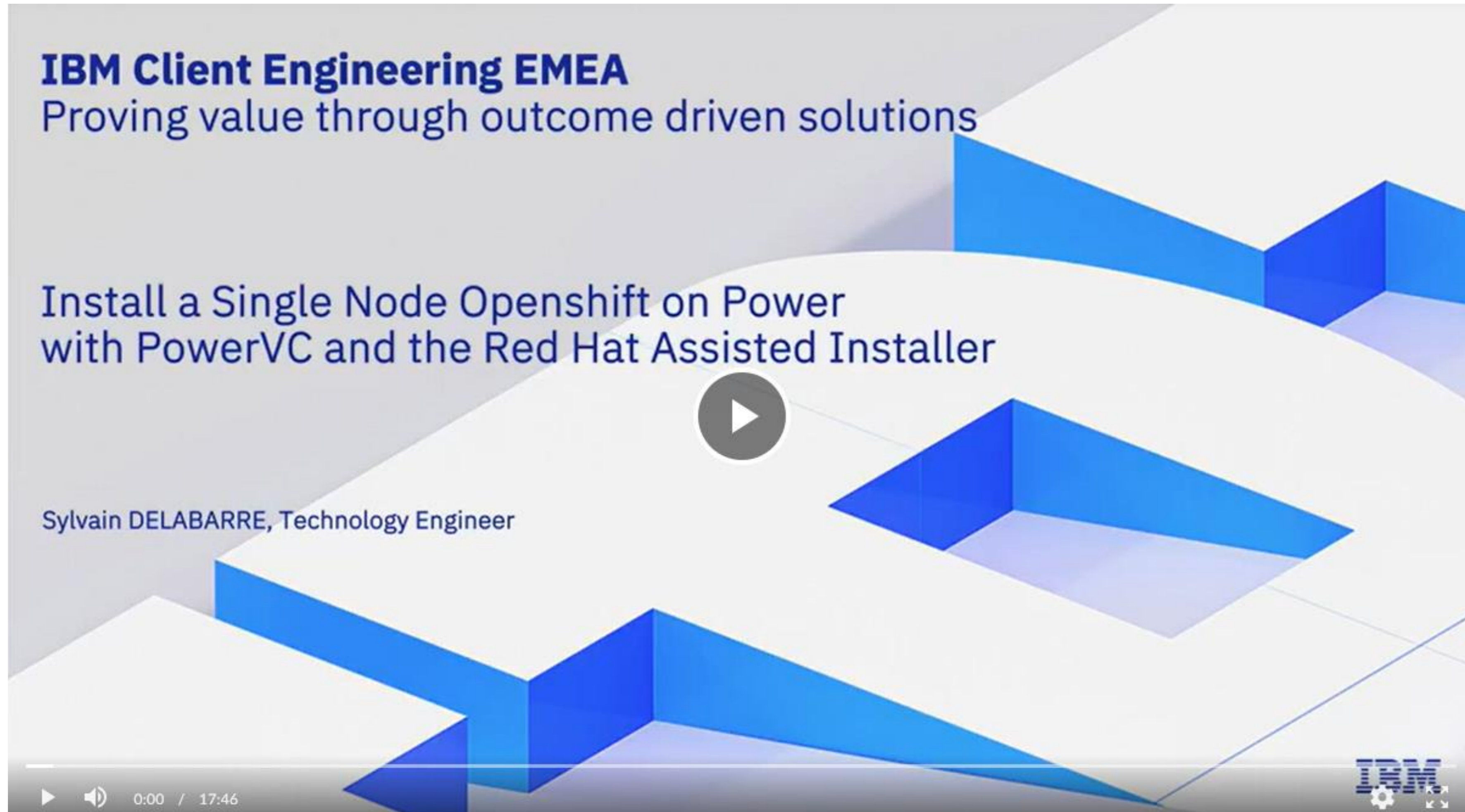|	
Maximum(GB)	128
Allocated(GB)	64
Minimum(GB)	64

Agenda

01 About Single Node OpenShift

02 Installation - Scripts

03 Installation - Ansible

04 Installation - Assisted Installer

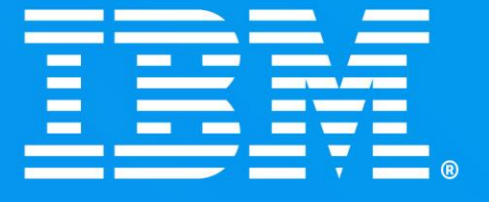# Installation - Red Hat Installer

– .

Thank You

Paul Chapman
IBM, Global Power Modernization Technical Lead

PaulChapman@uk.ibm.com

Join us again...

More sessions coming...

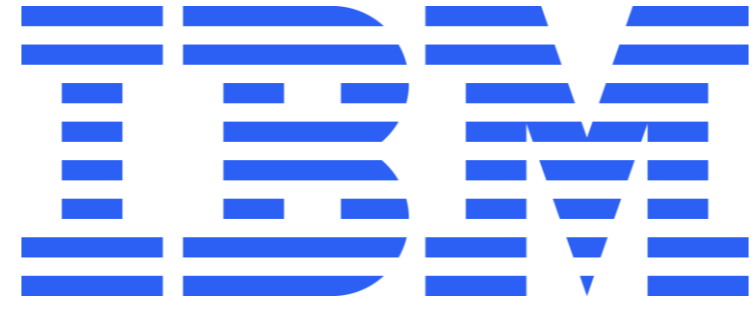If you have questions, please contact Paul Bentley bentlep@uk.ibm.com

Register now:

https://ibm.biz/BdPYQH

Watch 100+ recordings:

https://video.ibm.com/channel/s4Dub4uP9ku

IBM

Systems UKI

Notices and disclaimers

This document is distributed "as is" without any warranty, either express or implied. In no event shall IBM be liable for any damage arising from the use of this information, including but not limited to, loss of data, business interruption, loss of profit or loss of opportunity.

Customer examples are presented as illustrations of how those customers have used IBM products and the results they may have achieved. Actual performance, cost, savings or other results in other operating environments may vary.

Workshops, sessions and associated materials may have been prepared by independent session speakers, and do not necessarily reflect the views of IBM.

Not all offerings are available in every country in which IBM operates.

Any statements regarding IBM's future direction, intent or product plans are subject to change or withdrawal without notice.

IBM, the IBM logo, and ibm.com are trademarks of International Business Machines Corporation, registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at: www.ibm.com/legal/copytrade.shtml.

Certain comments made in this presentation may be characterized as forward looking under the Private Securities Litigation Reform Act of 1995.

Forward-looking statements are based on the company's current assumptions regarding future business and financial performance. Those statements by their nature address matters that are uncertain to different degrees and involve a number of factors that could cause actual results to differ materially. Additional information concerning these factors is contained in the Company's filings with the SEC.
Copies are available from the SEC, from the IBM website, or from IBM Investor Relations.

Any forward-looking statement made during this presentation speaks only as of the date on which it is made. The company assumes no obligation to update or revise any forward-looking statements except as required by law; these charts and the associated remarks and comments are integrally related and are intended to be presented and understood together.