



How to Build a World Class AI Factory

Adam Tetelman, Principal Product Architect | GTC 2024

David Dean, P.E. Senior Solutions Architect



Agenda

- Demo

- Hardware

- Software

- Summary

- Q & A

Demonstration of an AI Factory for Generative AI

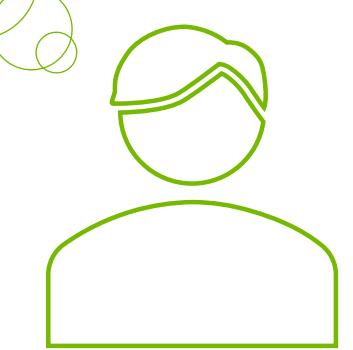
AI PLATFORM CONSIDERATIONS

Factors impacting AI platform decisions

DEVELOPER PRODUCTIVITY



*"Must get started now,
line of business wants to deliver
results yesterday"*



SCALING PERFORMANCE



*"I want the most GPU bang for
the buck"*



TOTAL COST OF OWNERSHIP



*"I have limited budget, need
lowest up-front cost possible"*



AI Factory - Training + Scaled Inference

An AI Factory must produce models before it can serve models

The screenshot shows the NVIDIA Base View interface with the title "NVIDIA Base View" at the top. The left sidebar contains a navigation menu with the following items:

- Switches
- DHCP Leases
- Provisioning
- Grouping
- Devices
- Datacenter Infrastructure
- HPC
 - Workload Management Clusters
 - Workload Management Wizard
 - Jobs
 - Chargeback requests
- Cloud
 - AWS
 - Azure
 - OCI
 - CMJob
 - Containers
 - Docker

The "Workload Management Wizard" item under the HPC section is highlighted. The main content area displays the "Workload Management Wizard" configuration screen. The breadcrumb navigation shows the current step: Manager Selection > GPU Settings > Node Selection > Settings > Health Checks > Other Settings > **Summary** > Deploy.

Summary

Wlm setup wizard has been completed, however the specified Wlm deployment configuration has not been deployed to the cluster yet. This can be done automatically by clicking the 'Deploy' button below. Alternatively, clicking the 'Show' button will produce a YAML configuration file which can be further customized, if needed, and then used as the input configuration file for either the cm-wlm-setup command line utility, or loaded to this wizard at a later time.

Overview

Name	slurm
Server role nodes	at-gtc
Primary server node	at-gtc
Client role nodes	default
Submit role nodes	default, at-gtc
Accounting role node	at-gtc

Automatically deploying the configuration will take several minutes, during which a log window will be shown displaying the progress of the deployment.

Ready for deployment

Press 'Deploy' to start deployment.

At the bottom right, there are buttons for "Show config", "Help", "Back", and a green "Deploy" button.

Model Store - Foundational Models and Customizations

Generative AI models are larger and rely more on LLMOps and FMOps than traditional workloads

NVIDIA NGC | PRIVATE REGISTRY

Adam Tetelman
nemo-microservice / ea-par...

CATALOG

CONSOLE

PRIVATE REGISTRY

Collections

Containers

Helm Charts

Models

Resources

Private Registry > Models

Models

mixtral-8x7b
Mixtral 8x7B Instruct is a language model that can follow instructions, complete requests, and generate creative text...
[Learn More](#)

NV-GPT-43B-instruct
NV-GPT-43B-instruct model published by NVIDIA
[View Labels](#) [Learn More](#)

NV-GPT-43B-chat
NV-GPT-43B-chat model published by NVIDIA
[View Labels](#) [Learn More](#)

StarCoderPlus
StarCoderPlus model published by BigCode
[View Labels](#) [Learn More](#)

StarCoder
StarCoder model published by BigCode
[View Labels](#) [Learn More](#)

Llama-2-13b-Chat
Llama-2-13b-Chat model published by Meta
[View Labels](#) [Learn More](#)

Llama-2-13b
Llama-2-13b model published by Meta
[View Labels](#) [Learn More](#)

mistral-7b-instruct
Mistral-7B-Instruct is a language model that can follow instructions, complete requests, and generate creative text...
[Learn More](#)

?

Collapse

NGC Private Registry v0.77.11

NVIDIA

Scale Inference on Kubernetes

Inferences is done at scale on Kubernetes, with the help of several operators

The screenshot shows the NVIDIA Base View interface with the title "NVIDIA® Base View". The left sidebar contains a navigation menu with sections like Switches, DHCP Leases, Provisioning, Grouping, Devices, Datacenter Infrastructure, HPC, Cloud, Containers, Docker, and Kubernetes. The "Containers" section is expanded, showing sub-options: Kubernetes Wizard, Kubernetes Clusters, Kubernetes Add User, and Kubernetes Remove Cluster. The main content area is titled "Kubernetes wizard" and shows a progress bar: Introduction > Cluster settings > Network & port settings > Node settings > Storage class > Other settings > Addons > Summary. The "Other settings" step is currently active. The main content is titled "Operator packages" and asks "Choose the operator packages you would like to install". It lists several options with checkboxes: MetallLB (checked), NVIDIA GPU Operator (checked), NVIDIA GPU Operator NVAIE (unchecked), NetQ (unchecked), Network Operator (checked), Network Operator NVAIE (unchecked), Prometheus Adapter (checked), Prometheus Operator Stack (checked), Run:ai (unchecked), cm-jupyter-kernel-operator (unchecked), cm-kubernetes-mpi-operator (unchecked), postgresql-operator (unchecked), and spark-operator (unchecked). Below this, it says "Choose NVIDIA GPU Operator version" and lists three radio button options: v22.9.0, v22.9.1, and v22.9.2. At the bottom are buttons for "Show config", "Help", "Back", and "Next".

Deploy a RAG Pipeline

The NVIDIA RAG LLM Operator provides the easiest way to consume NVIDIA NeMo Microservices

NVIDIA DOCS HUB Search all documentation

NVIDIA Developer Blog Forums [Join](#)

For more information or to adjust the configuration, refer to [Install NVIDIA GPU Operator](#) and [Fine-tuning or customizing services](#) in the NVIDIA GPU Operator documentation.

Topics

- NVIDIA Enterprise RAG LLM Operator
- Enterprise RAG LLM Operator
 - Platform Support
 - Install
 - Sample RAG Pipeline
 - Sample Chat Bot
 - Uninstall
 - Vector Database
 - Release Notes

Install the RAG LLM Operator

1. Add the NeMo LLM RAG Operator repository:

```
$ helm repo add rag-operator https://helm.ngc.nvidia.com/ohlfw0olaadg/ea-rag-examples \
--username "\$oauthToken" --password <ngc-api-key>
```
2. Install the Operator:

```
$ helm install rag-operator rag-operator/rag-operator \
-n rag-operator --create-namespace --set images.registry.imagePullSecret.password=<ngc-api-key>
```
3. Optional: Confirm the controller pod is running:

```
$ kubectl get pods -n rag-operator
```

Example Output

NAME	READY	STATUS	RESTARTS	AGE
rag-operator/k8s-rag-operator-controller-manager-6b546f57d5-g4zgg	2/2	Running	0	35h

Next Steps

Refer to [Sample RAG Pipeline](#) to install and configure the inference and embedding services.

Chat With All Your Models

Launch, test, and scale multiple models for token generation that immediately benefits end users



Converse Knowledge Base ☀

What is a Kubernetes Operator?

Failed to get response from /generate endpoint of chain-server. Check if the fastapi server in chain-server is up. Refer to chain-server logs for details.

What is the difference between MLOps and LLMOps?

The Kubernetes GPU Operator automates the management of NVIDIA GPUs within a Kubernetes cluster, simplifying the deployment, maintenance, and monitoring of GPU-accelerated applications by handling the necessary drivers and software stack installations.

Synthesized Speech

Use knowledge base Enable TTS output

ASR and TTS Settings

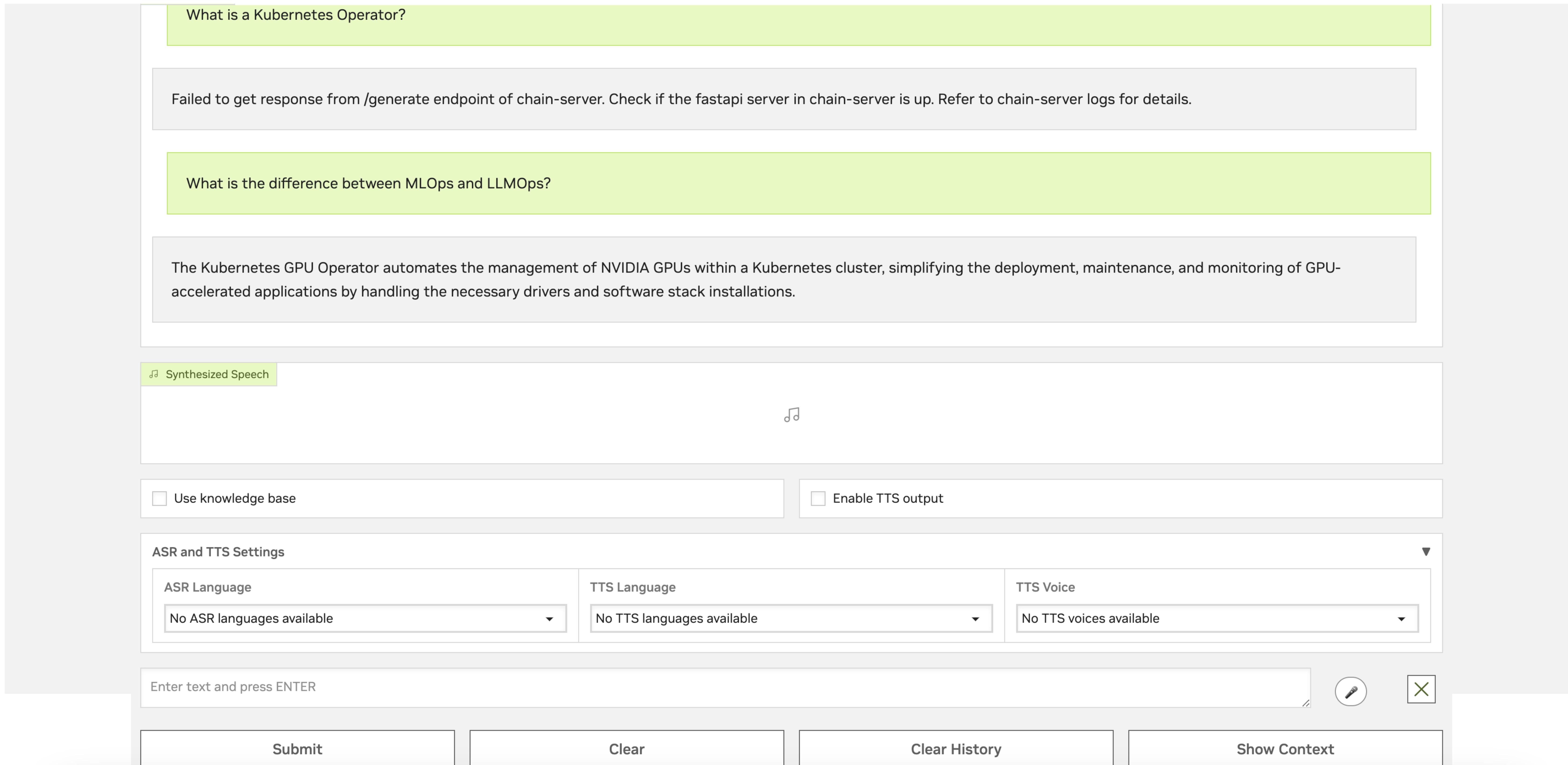
ASR Language: No ASR languages available

TTS Language: No TTS languages available

TTS Voice: No TTS voices available

Enter text and press ENTER

Submit Clear Clear History Show Context



Give Models Extra Data

RAG allows admins to upload and connect data for additional context

Knowledge Base Management

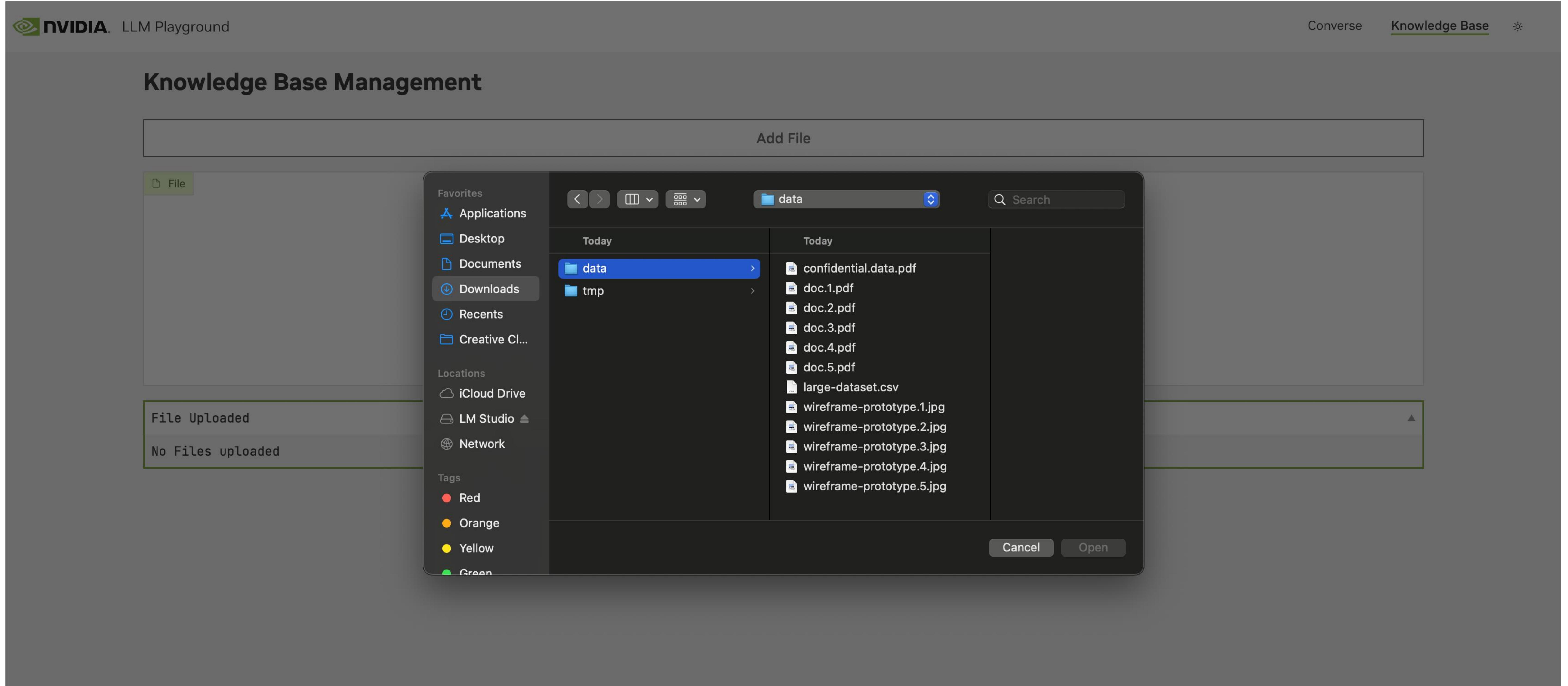
Add File

 File



Any Data!

Keep everything within your AI Factory, including proprietary data



Base Command Manager Enables AI Factories

Powerful tooling under the hood to manage everything from the OS to the application

The screenshot displays the NVIDIA Base View interface, specifically the Kube Cluster management section. The left sidebar shows a navigation tree with categories like Cluster, Networking, Provisioning, Grouping, Devices, Datacenter Infrastructure, HPC, Cloud, Containers, Docker, and Kubernetes. Under Kubernetes, there are sub-options: Kubernetes Wizard, Kubernetes Clusters, Kubernetes Add User, and Kubernetes Remove Cluster. The main area shows a "Kube Cluster list" with one entry: "default". On the right, the "Kube Cluster default" details page is open, featuring tabs for Overview, Settings, Overview, Resources, Jobs, and Pods. The Overview tab shows the cluster name is "default" and its version is "1.27". The Resources tab provides a summary of the cluster's components:

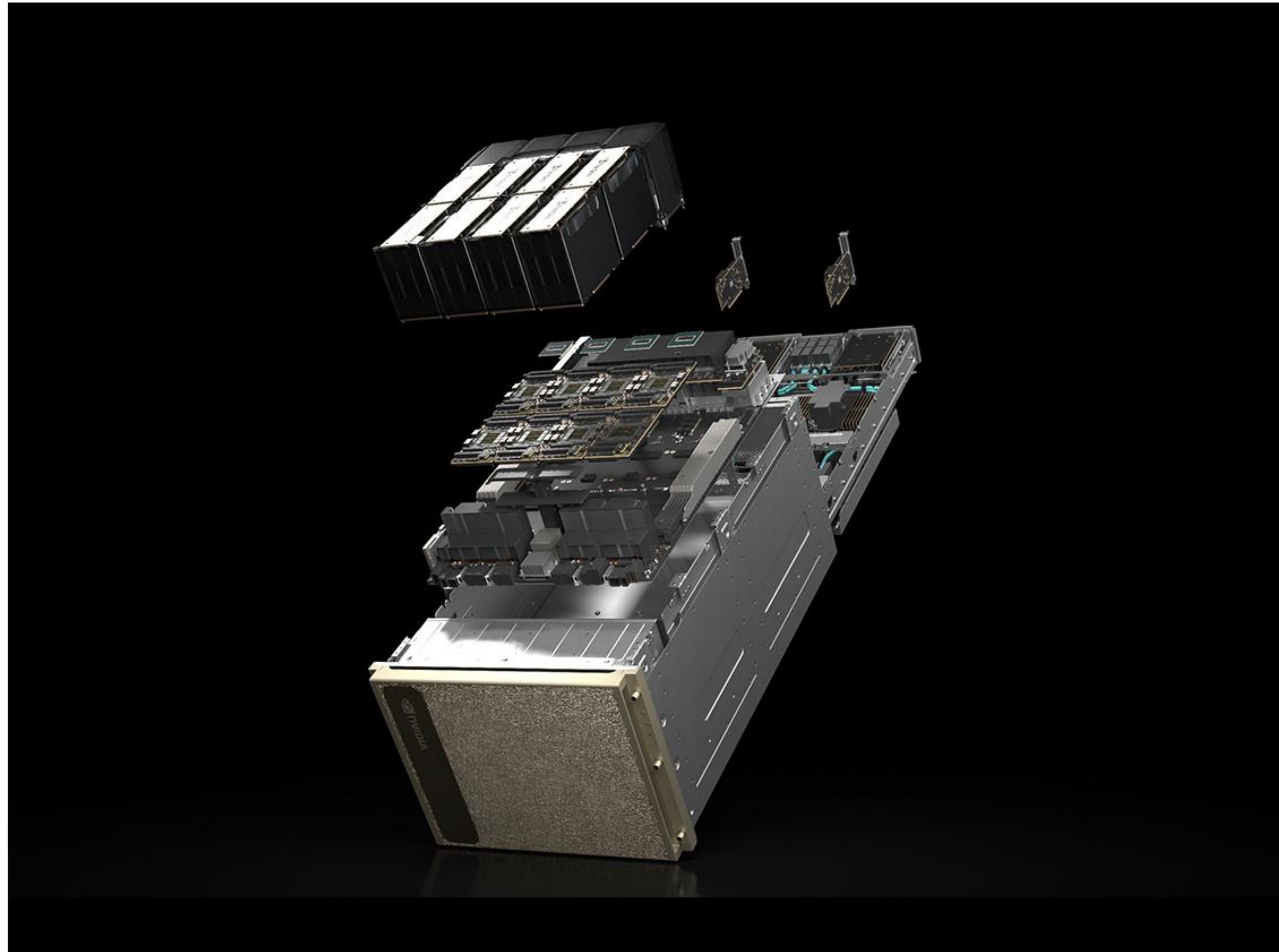
NAME ↑	NUMBER
Number of namespaces	16
Number of nodes	2
Number of persistent volumes	3
Number of persistent volum...	3
Number of replication contro...	0
Number of services	40

The Jobs and Pods sections both show "No Rows To Show". At the bottom, there are "BACK" and "+ ADD" buttons.

Hardware

NVIDIA DGX H100: The Proven Choice for Enterprise AI

The gold standard for AI infrastructure



NVIDIA DGX H100

The world's first AI system with the NVIDIA H100 Tensor Core GPU

- 8x NVIDIA H100 GPUs With 640 Gigabytes of Total GPU Memory
 - 18x NVIDIA NVLink connections per GPU, 900 gigabytes per second of bidirectional GPU-to-GPU bandwidth
 - 24 TB/s memory bandwidth
- 4x NVIDIA NVSwitches
 - 7.2 terabytes per second of bidirectional GPU-to-GPU bandwidth, 1.5X more than previous generation
- 10x NVIDIA ConnectX-7 400 Gigabits-Per-Second Network Interface
 - 1 terabyte per second of peak bidirectional network bandwidth
- Dual 56-core 4th Gen Intel® Xeon® Scalable Processors and 2 TB System Memory
 - Powerful CPUs and massive system memory for the most intensive AI jobs
- 30 Terabytes NVMe SSD
 - High speed storage for maximum performance
- 32 petaFLOPS AI performance

Delivering the AI Center of Excellence for Enterprise

Best of breed infrastructure for AI development built on NVIDIA DGX

NVIDIA DGX H100

The World's First AI System with NVIDIA H100



8x NVIDIA H100 GPUs | 32 PFLOPS FP8 (6X) | 0.5 PFLOPS FP64 (3X)
640 GB HBM3 | 3.6 TB/s (1.5X) BISECTION B/W

4th Generation of the World's Most Successful Platform Purpose-Built for Enterprise AI

DGX SuperPOD WITH DGX H100

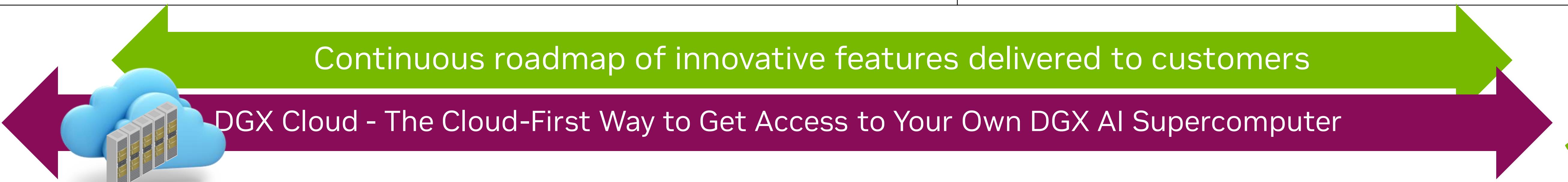
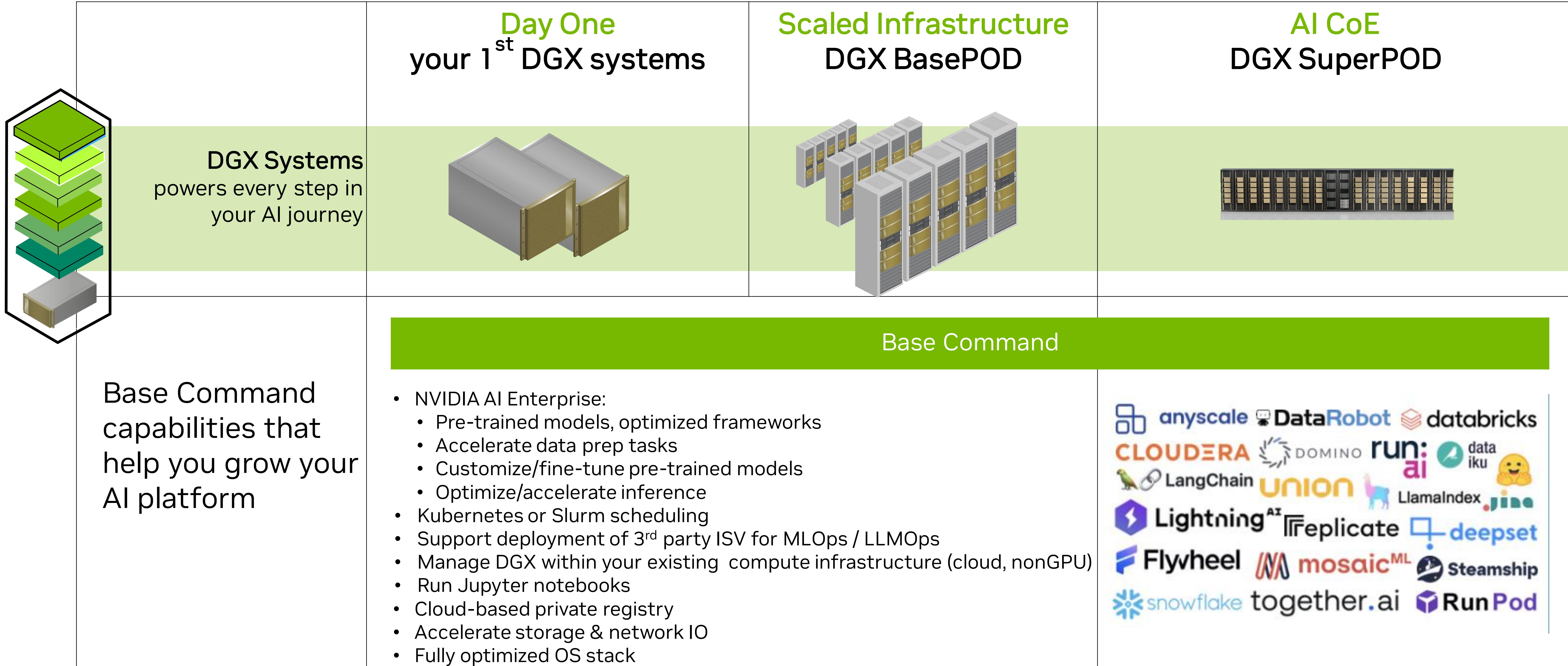


32 DGX H100 | 1 EFLOPS AI
NVLINK SWITCH SYSTEM | QUANTUM-2 IB | 20TB HBM3 | 70 TB/s BISECTION B/W (11X)

1 ExaFLOPS of AI Performance in 32 Nodes
Scale as Large as Needed in 32 Node Increments

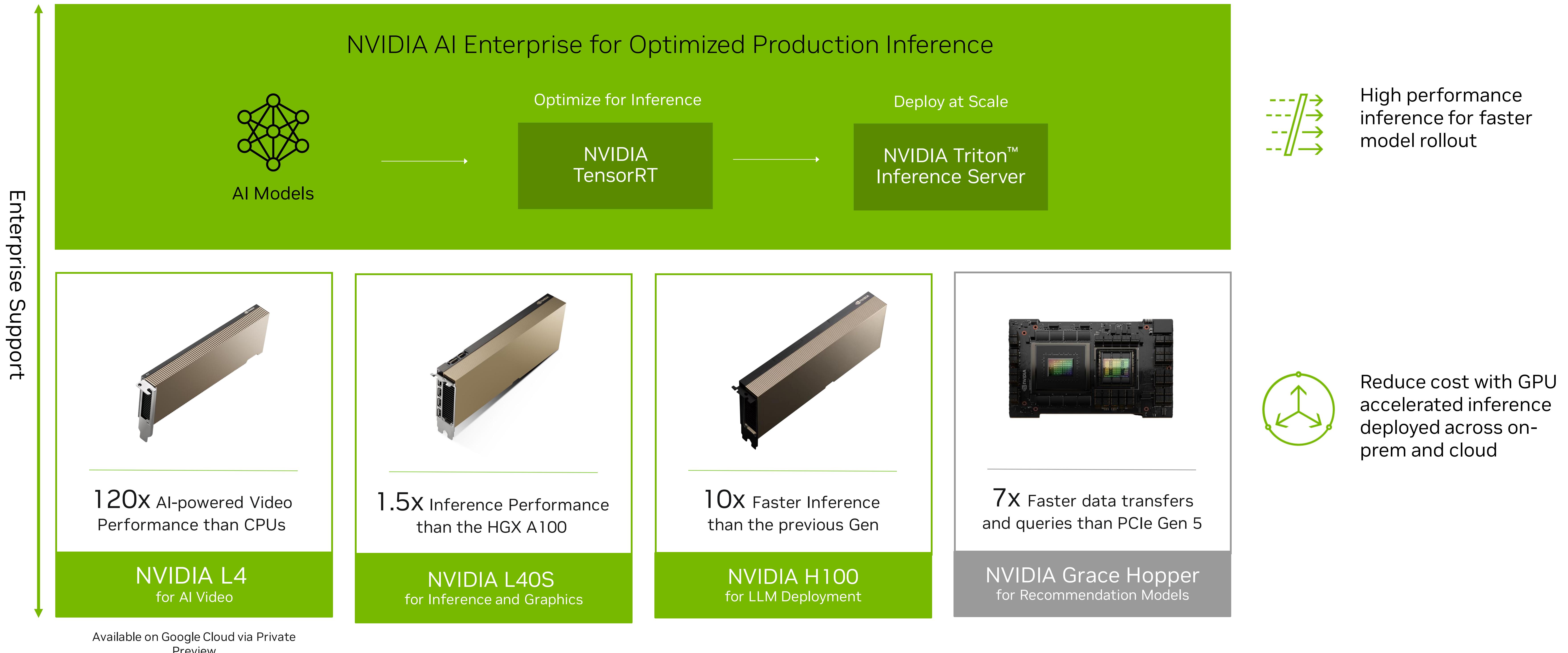
Powering Your AI Journey End-to-End

Delivering incremental value for your DGX data center, as your needs grow



Inference Platforms for Diverse AI Workloads

Full Stack Inference Software for Emerging AI Applications



NVIDIA-Certified Systems

Simplifies Deployment of Accelerated Computing at Scale

SYSTEM DESIGN OPTIONS



NVIDIA DATA CENTER GPUs

Built on the NVIDIA Hopper architecture, NVIDIA H100 now includes NVIDIA AI Enterprise



NVIDIA SMARTNICs AND DPUs



MAINSTREAM ACCELERATED SERVERS



Validates the Best Baseline Configuration for



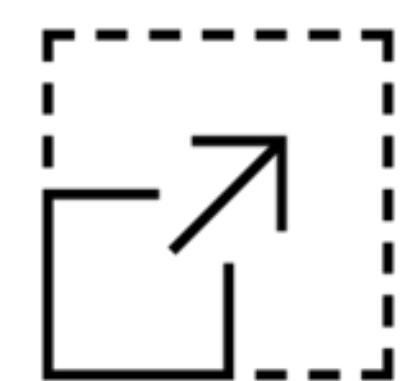
PERFORMANCE



MANAGEABILITY



SECURITY



SCALABILITY

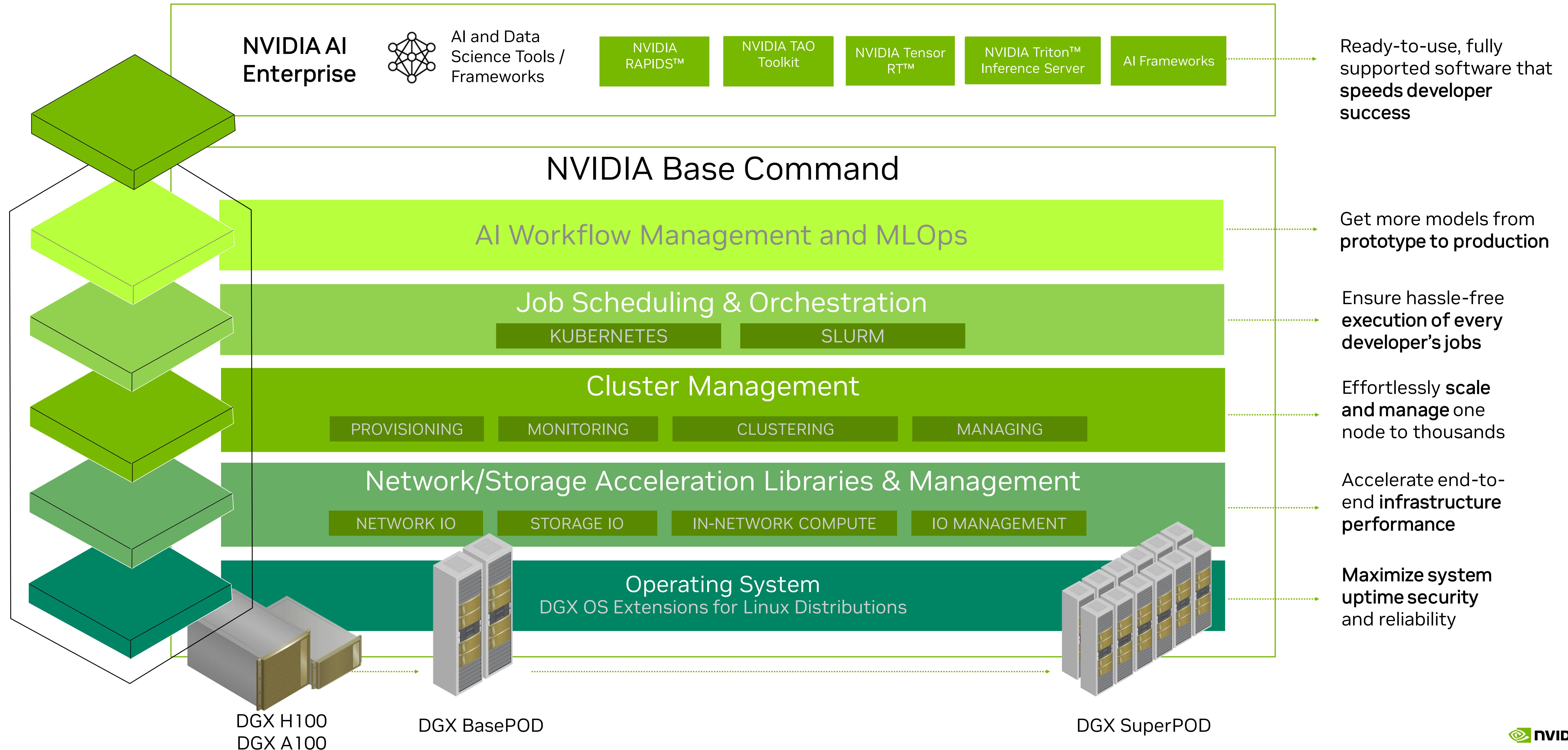
NVIDIA AI Enterprise is supported on over 400 NVIDIA-Certified Systems

List of [NVIDIA-Certified Systems](#) that are NVIDIA AI Enterprise Compatible

Software

NVIDIA Software Stack

Enterprises tools that drive the value of AI investment



DGX Operating System

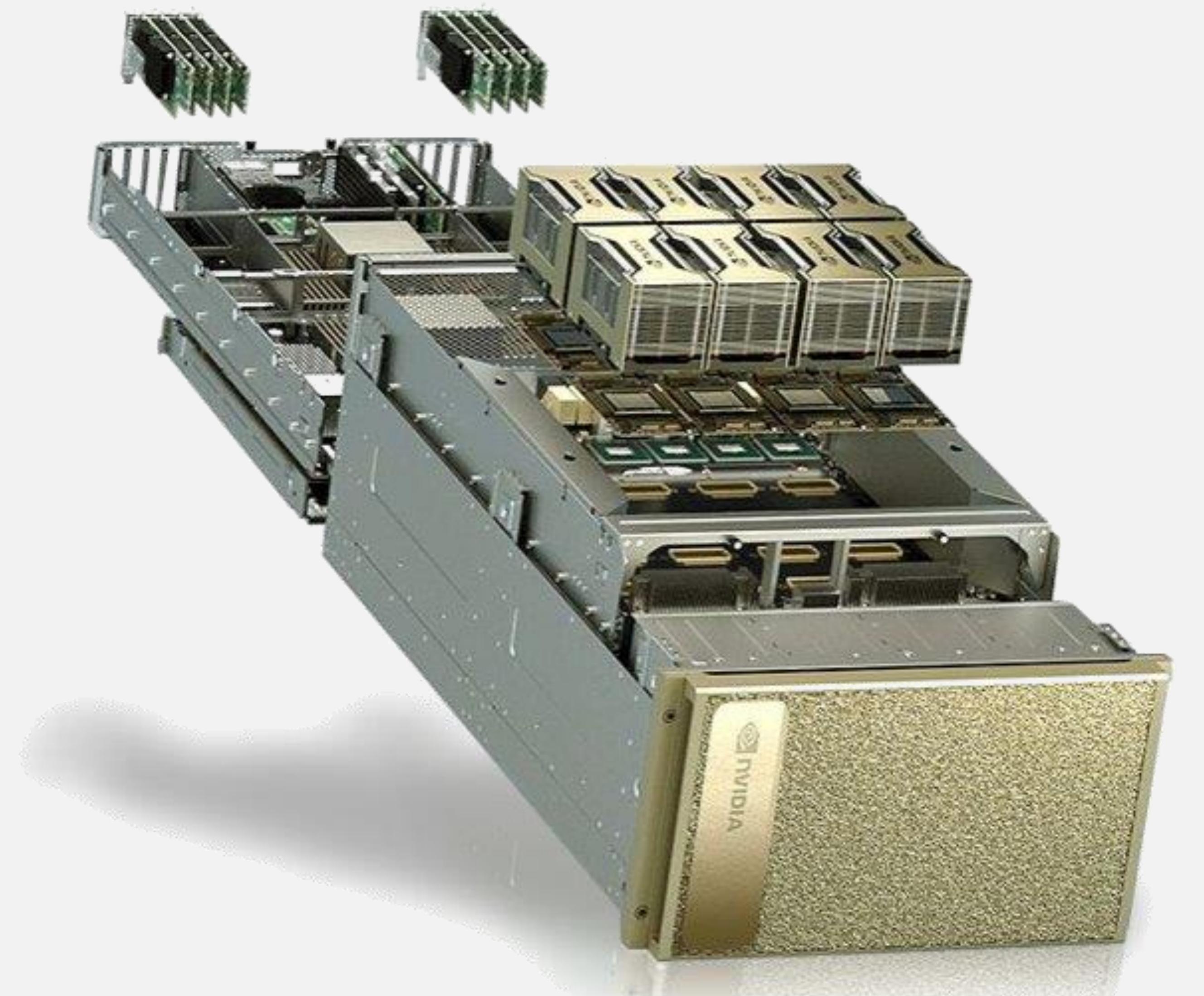
A fully supported and validated software stack
that turns the DGX into an appliance

Overview:

- Pre-installed on all DGX systems
- Based on Ubuntu 20.04
 - DGX OS 5.x
 - Standard Ubuntu tools and debugging strategies apply
- Updateable with apt-get upgrade
 - Updates regularly provided by NVIDIA

Uses:

- Verified stack includes
 - Drivers
 - Networking configuration
- Easy to debug and well supported
 - Tested and known by NVIDIA support and NVIDIA Solution Architects
 - nvidia-smi -q
 - nvsm



Magnum IO: Accelerated Infrastructure in DGX Systems

Optimizing IO Performance

Faster Data Access

- Magnum IO provides a high-speed data path between the DGX system's GPUs and storage devices.
- Faster data access and reduced latency achieved through techniques such as :
 - Direct GPU access to storage, GPUDirect RDMA (Remote Direct Memory Access)
 - NVMe-oF (NVMe over Fabrics) protocols.



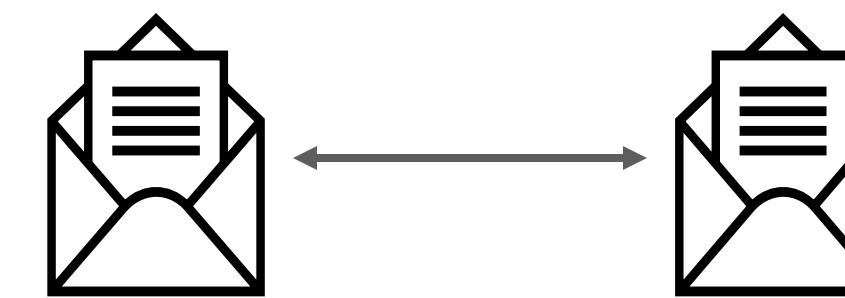
Improved Resource Utilization

- Magnum IO can also help improve resource utilization in a DGX system.
- With GPUDirect Storage, data can be transferred directly from storage to GPU memory, reducing the CPU's involvement and freeing up CPU resources for other tasks



Efficient Data Transfer

- Magnum IO includes tools like GPUDirect P2P (Peer-to-Peer) and NVLink, which allow for efficient data transfer between GPUs in a DGX system.
- This can help improve overall system performance and reduce bottlenecks.



Management Tools and Telemetry

- Deep telemetry and advanced troubleshooting techniques.
- Real-time telemetry, performance analysis and failure detection provide insight into the run-time behaviors of the system.



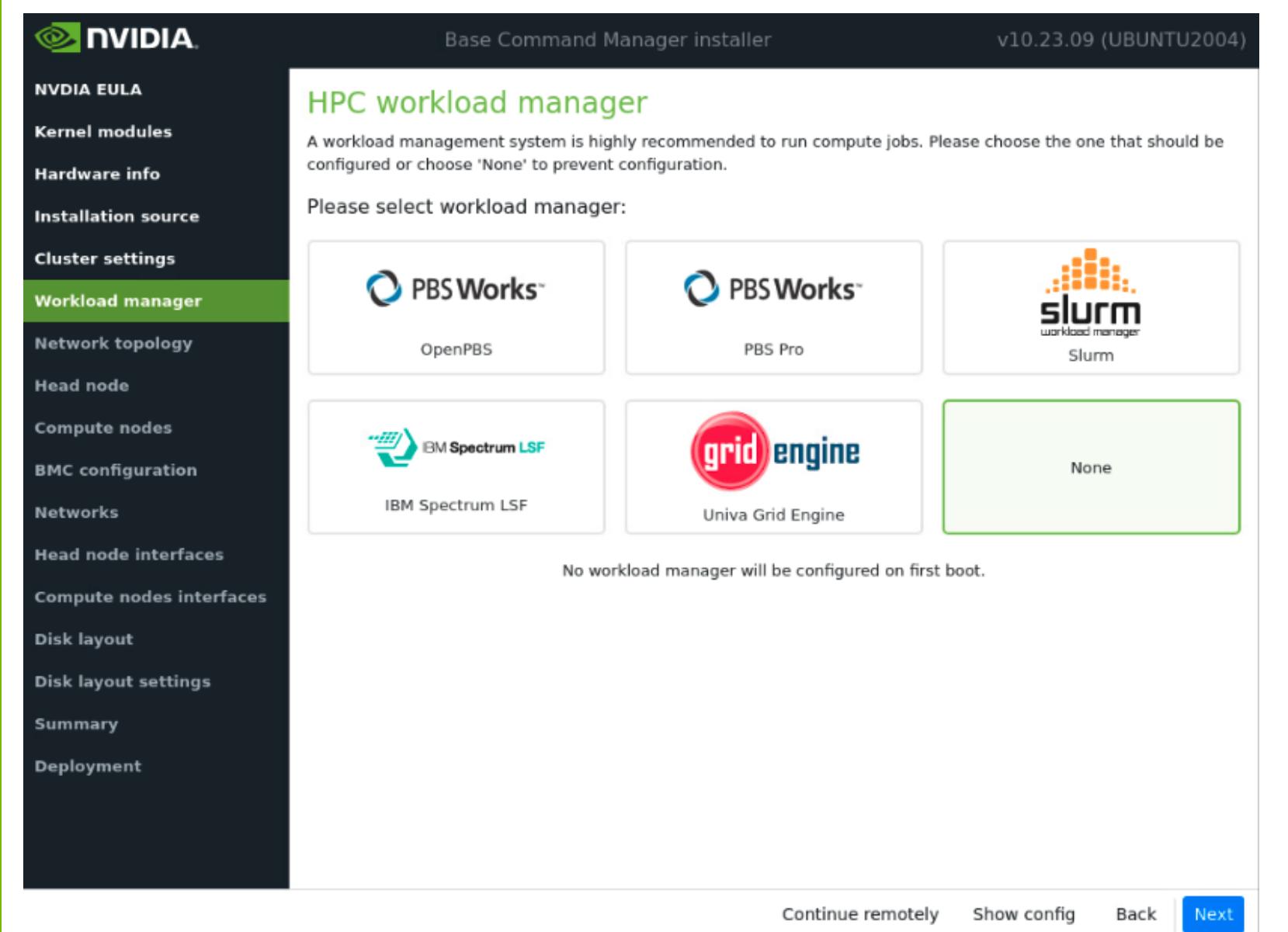
Base Command Manager

Cluster Management

BCM makes cluster management easy

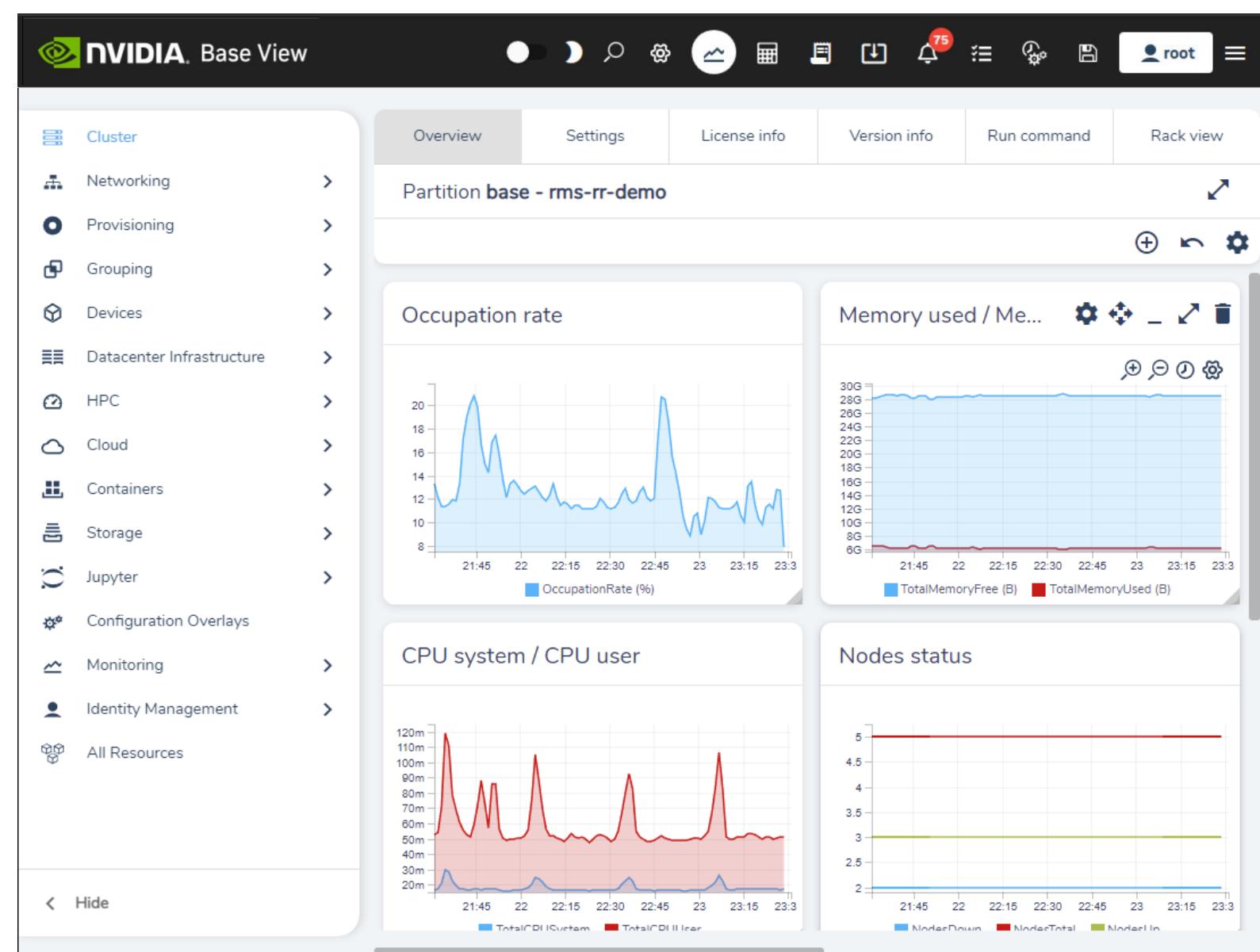
Easy to install

- A graphical interface with wizards that walks the user through the steps in each task.
- The installation can be done remotely or via a command line interface.



Easy to manage

- Single system view for managing all hardware and software aspects of the cluster
- Intuitive, visual interface allows the administrator to see and respond to what is going on in the cluster any time



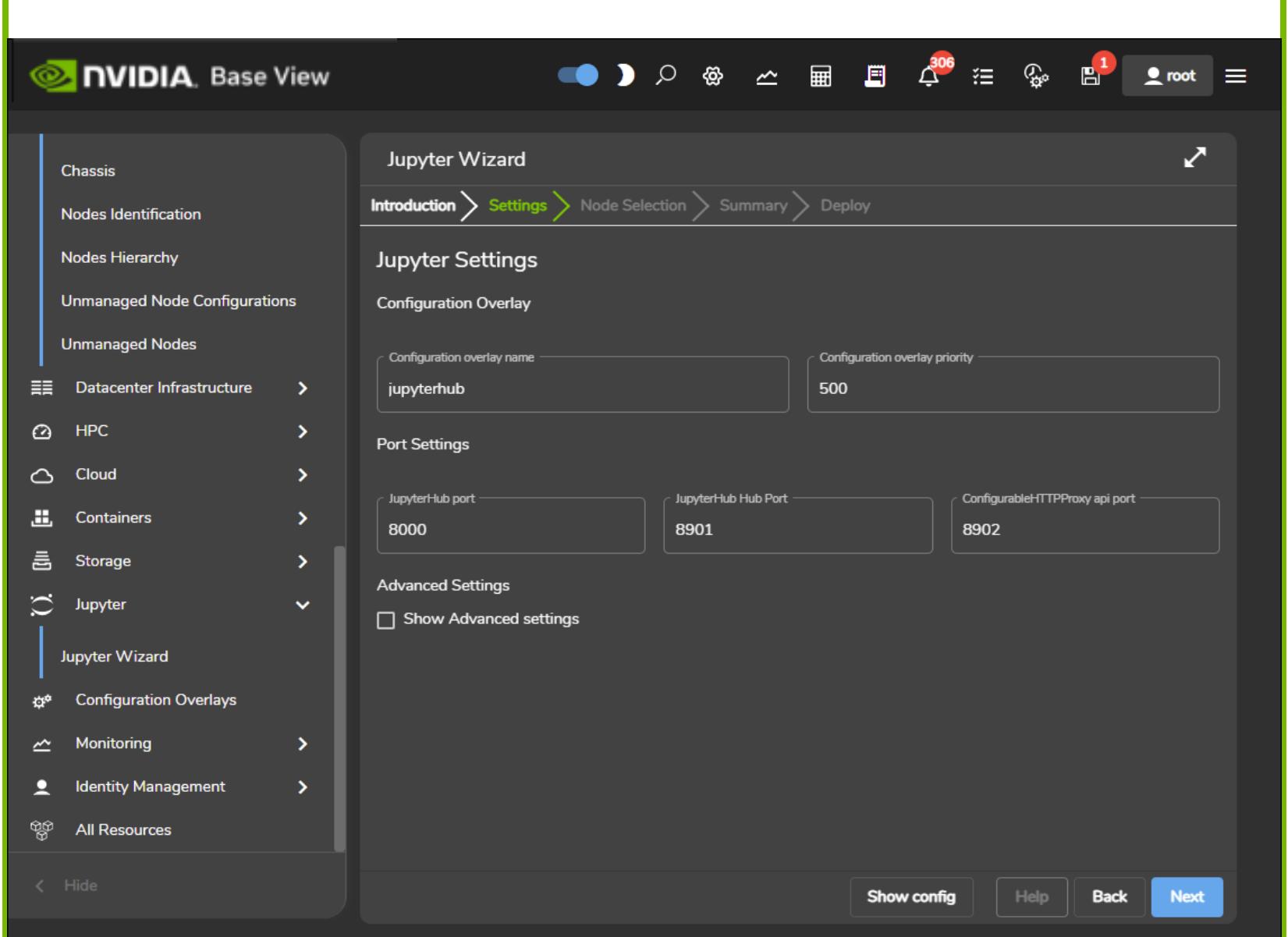
Easy to interact

- CMSH (Cluster Management Shell) command line administration tool.
- CMSH is usually preferred by experienced users as it allows to operate on multiple nodes simultaneously.

```
[rms-rr-demo->device[cnode001]]% show Parameter Value
Cloud ID i-03a9200ef44ce69b4
Device height
Device position
Hostname cnode001
IP 10.0.178.66
Network vpc-0-private
Revision
Type
Tag
Mac
Use exclusively for
Category
Cloud settings
Activation
Rack
Container index
Roles
Software image
Node installer disk
Install boot record
Install mode
Next install mode
Time zone
Management network
Data node
Disk setup
Hardware RAID configuration
Initialize script
Finalize script
BIOS setup
Provisioning associations
Allow networking restart
PXE Label
Europe/Amsterdam (partition:base)
vpc-0-private
no
<64 bytes> (category:k8s)
<0B>
<0B>
<0B>
<0 bytes> (category:k8s)
<0 internally used>
no
```

Easy to extend

- BCM core services can be easily integrated with other solutions
- Integration with Jupyter provides an easy interface for users to submitting jobs to a cluster.



BASE COMMAND MANAGER

Installation Wizards

- Installation Wizards for:
- BCM Installation
- Kubernetes
- Docker
- Distributed Storage
- Cloud Extension
- Edge Computing

The screenshot shows the NVIDIA Base View interface with the title "AWS Wizard" at the top. The left sidebar has a tree view with categories like "Generic Devices", "Rack Sensors", "Lite Nodes", "Chassis", "Nodes Identification", "Nodes Hierarchy", "Unmanaged Node Configurations", "Unmanaged Nodes", "Firmware upgrade", "Installer interactions", and "MIG Status Info". Under "Cloud", there are sections for "Datacenter Infrastructure", "HPC", and "Cloud". The "Cloud" section is expanded, showing "AWS Wizard", "FSx Instances", "Azure", "OCI", and "CM.Job". The main content area displays the "Cluster Extension Setup Wizard" with the sub-section "AWS Wizard". It includes instructions for "Cluster Extension cloud bursting requires:" (activation of a cluster license), "Alternative Deployments" (using AWS Direct Connect / Azure Express Route), and "An Amazon Web Services account". At the bottom, there are buttons for "Load config", "Show config", "Help", "Back", and "Next".

BASE COMMAND MANAGER

Easy Setup

- Easy to deploy.
- Utilizes an installation wizard to initially setup and configure Base Command Manager
- Ansible Installation is an alternative method
- Typical setup in less than an hour once the installation has started.

The screenshot shows the NVIDIA Base Command Manager installer interface. The top bar displays the NVIDIA logo, the title "Base Command Manager installer", and the version "v10.23.10 (UBUNTU2004)". The left sidebar contains a list of configuration sections: NVIDIA EULA, Kernel modules, Hardware info, Installation source, Cluster settings, Workload manager, Network topology, Head node, Compute nodes, BMC configuration, Networks, Head node interfaces, Compute nodes interfaces, Disk layout, Disk layout settings, Summary (which is highlighted in green), and Deployment. The main right panel is titled "Summary" and contains a table of selected installation settings:

Below is a brief summary of some of the installation settings that were selected:	
Primary external interface IP:	DHCP
Primary external interface Netmask:	DHCP
Primary external interface Gateway:	DHCP
Primary internal interface IP:	10.141.255.254
Primary internal interface Netmask:	16
Nameservers:	
Timezone:	Europe/Amsterdam
Time servers:	0.pool.ntp.org, 1.pool.ntp.org, 2.pool.ntp.org
Workload manager	Slurm
Head node hardware vendor	Other
Compute nodes hardware vendor	Other
Install drives	/dev/vda
Head node BMC type	No BMC
Compute nodes BMC type	No BMC

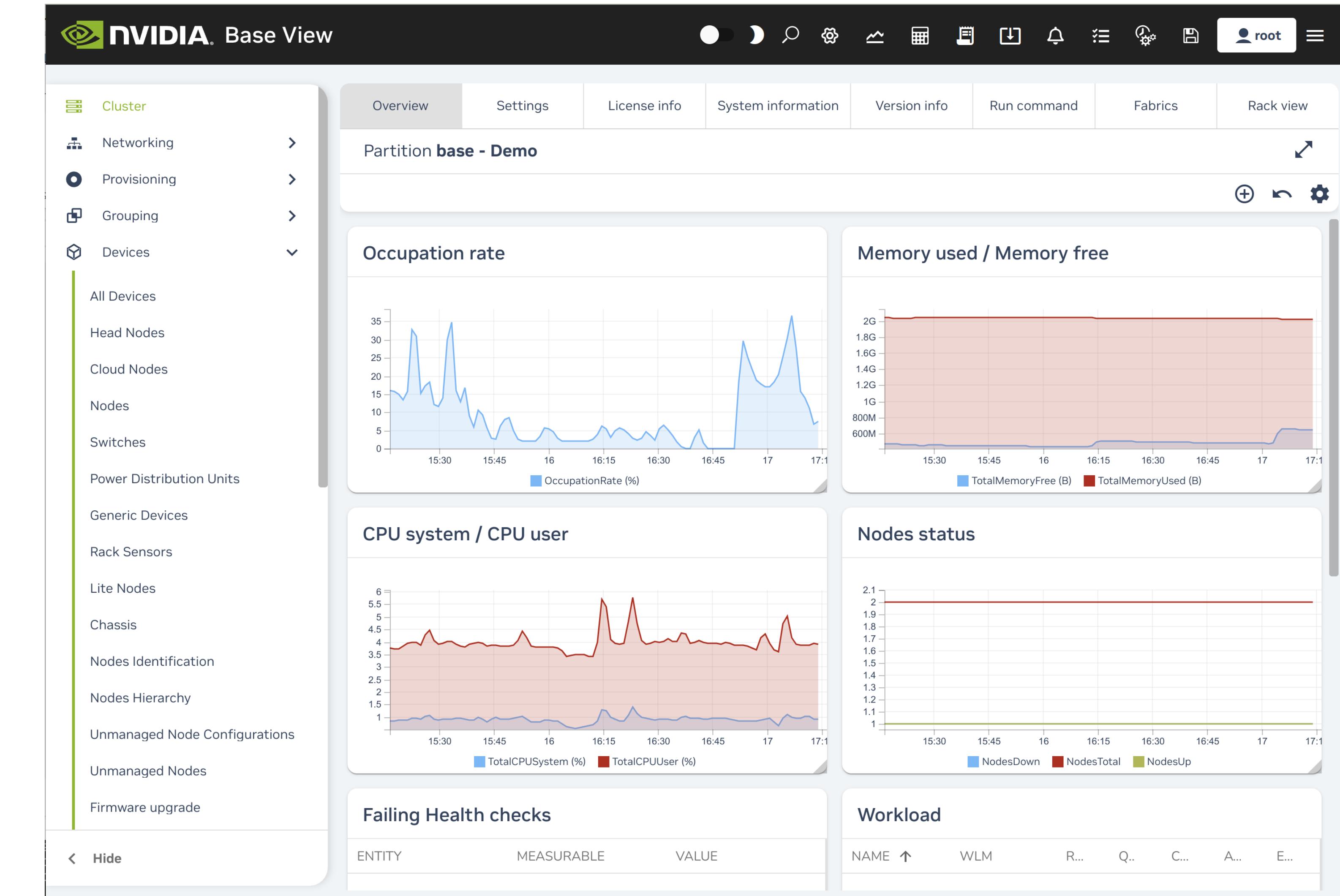
At the bottom of the screen are buttons for "Continue remotely", "Show config", "Back", and a blue "Start" button.

BASE COMMAND MANAGER

Two User Interfaces

- **Graphical User Interface (GUI)**
- **Offers administrator full cluster control**
- **Standalone desktop application**
- **Manages multiple clusters simultaneously**
- **Runs natively on Linux, Windows and OS X**

- **Cluster Management Shell (CMSH)**
- **All GUI functionality also available through Cluster Management Shell**
- **Interactive and scriptable in batch mode**



BASE COMMAND MANAGER

Multiple ways to monitor status

Provides detailed health checks, monitoring and automated corrective actions to prevent outages and accelerate problem resolution



NVIDIA Base View interface showing a 3D rack view of two server units. The left sidebar shows navigation options like Cluster, Networking, Provisioning, Grouping, and Devices. The main panel displays a 'Health check overview > Count' section.

HOSTNAME	S...	MAC	CATEGORY	IP	NETWORK
node001	FA:16:3E:16:8...	default	10.141.0.1	internalnet	
node002	FA:16:3E:19:F...	default	10.141.0.2	internalnet	
node003	FA:16:3E:C2:C...	default	10.141.0.3	internalnet	
node004	FA:16:3E:4B:1...	default	10.141.0.4	internalnet	
node005	FA:16:3E:20:3...	default	10.141.0.5	internalnet	

NVIDIA Base View interface showing a 'Unmanaged Devices room' visualization. It consists of a grid of red squares, each representing an unmanaged device. The left sidebar shows navigation options like Cluster, Networking, Provisioning, Grouping, and Devices.

BASE COMMAND MANAGER

Multiple ways to monitor status

Provides detailed health checks, monitoring and automated corrective actions to prevent outages and accelerate problem resolution

The screenshot shows the NVIDIA Base View interface. The top navigation bar includes the NVIDIA logo, a search icon, a gear icon, a refresh icon, a download icon, a bell icon, and a user 'root' icon. The main area has a title 'Physical Nodes' and a table with the following data:

<input type="checkbox"/>	HOSTNAME	S...	MAC	CATEGORY	IP	NETWORK	<input type="checkbox"/>
<input type="checkbox"/>	node001	↑	FA:16:3E:16:8...	default	10.141.0.1	internalnet	<input type="checkbox"/>
<input type="checkbox"/>	node002	↑	FA:16:3E:19:F...	default	10.141.0.2	internalnet	<input type="checkbox"/>
<input type="checkbox"/>	node003	↑	FA:16:3E:C2:C...	default	10.141.0.3	internalnet	<input type="checkbox"/>
<input type="checkbox"/>	node004	↑	FA:16:3E:4B:1...	default	10.141.0.4	internalnet	<input type="checkbox"/>
<input type="checkbox"/>	node005	↑	FA:16:3E:20:3...	default	10.141.0.5	internalnet	<input type="checkbox"/>

The left sidebar contains a tree view with the following branches:

- Cluster
- Networking
- Provisioning
- Grouping
- Devices
 - All Devices
 - Head Nodes
 - Cloud Nodes
 - Nodes
 - Nodes
 - Switches
 - Power Distribution Units
 - Generic Devices
 - Rack Sensors
 - Lite Nodes
 - Chassis
 - Nodes Identification
 - Nodes Hierarchy
 - Unmanaged Node Configurations
 - Unmanaged Nodes
 - Firmware upgrade

At the bottom of the sidebar are 'Hide' and '+ ADD' buttons.

BASE COMMAND MANAGER

Easily check status

The screenshot shows the NVIDIA Base View interface. The top navigation bar includes the NVIDIA logo, 'Base View' title, and various icons for settings and monitoring. The left sidebar has a tree view with categories like Cluster, Networking, Provisioning, Grouping, Devices (selected), All Devices, Head Nodes, Cloud Nodes, Nodes, Switches, Power Distribution Units, Generic Devices, Rack Sensors, Lite Nodes, Chassis, Nodes Identification, Nodes Hierarchy, Unmanaged Node Configurations, Unmanaged Nodes, and Firmware upgrade. The main content area is titled 'Physical Nodes' and displays a table with the following data:

	HOSTNAME	S...	MAC	CATEGORY	IP	NETWORK	Actions
<input type="checkbox"/>	node001	↑	FA:16:3E:16:8...	default	10.141.0.1	internalnet	<input type="checkbox"/> ▾
<input type="checkbox"/>	node002	↑	FA:16:3E:19:F...	default	10.141.0.2	internalnet	<input type="checkbox"/> ▾
<input type="checkbox"/>	node003	↑	FA:16:3E:C2:C...	default	10.141.0.3	internalnet	<input type="checkbox"/> ▾
<input type="checkbox"/>	node004	↑	FA:16:3E:4B:1...	default	10.141.0.4	internalnet	<input type="checkbox"/> ▾
<input type="checkbox"/>	node005	↑	FA:16:3E:20:3...	default	10.141.0.5	internalnet	<input type="checkbox"/> ▾

A red circle highlights the edit icon for the third node (node003). At the bottom of the main area, there is a green '+ ADD' button.

BASE COMMAND MANAGER

Easily check status

The screenshot shows the NVIDIA Base View application window. The title bar reads "NVIDIA. Base View". The top navigation bar includes icons for search, settings, and system status, along with a user icon labeled "root". The left sidebar has a tree view under "Provisioning" with categories like "Devices", "Grouping", and "All Devices". The main content area is titled "Device list" and displays a table titled "Latest health checks". The table has columns: AGE, STATE, ENTITY, MEASURABLE, TYPE, and VALUE. The data shows 19 rows of health check results, all of which are currently "PASS". A "Close" button is at the bottom right of the table overlay.

AGE	STATE	ENTITY	MEASURABLE	TYPE	VALUE
1m 8s	Active	ansibletarget	exports	Disk	PASS
1m 8s	Active	ansibletarget	lustre	Disk	PASS
1m 8s	Active	ansibletarget	opalinkhealth	Network	PASS
1m 8s	Active	ansibletarget	ssh2node	network	PASS
1m 8s	Active	ansibletarget	ntp	Internal	PASS
1m 8s	Active	ansibletarget	chrootprocess	OS	PASS
1m 8s	Active	ansibletarget	dmesg	OS	PASS
1m 8s	Active	ansibletarget	defaultgateway	Network	PASS
1m 8s	Active	ansibletarget	ManagedServicesOk	Internal	PASS
1m 8s	Active	ansibletarget	mounts	Disk	PASS
1m 8s	Active	ansibletarget	mysql	OS	PASS
1m 8s	Active	ansibletarget	ib	OS	PASS
1m 8s	Active	ansibletarget	cuda-dcgm	OS	PASS
5m 8s	Active	ansibletarget	cmsh	Internal	PASS
1m 8s	Active	ansibletarget	interfaces	Network	PASS
1m 8s	Active	ansibletarget	ldap	OS	PASS
1m 8s	Active	ansibletarget	oomkiller	OS	PASS
1m 8s	Active	ansibletarget	diskspace	Disk	PASS

BASE COMMAND MANAGER

- Over 200 metrics
- 19 health checks
- Create your own
- Perform actions based on metric values or failing health checks (self-healing)



Metrics & Health Checks

NVIDIA Base View

Monitoring Data Producer list

NAME ↑	TYPE
Xilinx FPGA	Monitoring D...
ceph_global	Monitoring D...
chrootprocess	Monitoring D...
cimc	Monitoring D...
cmha-status	Monitoring D...
cmsh	Monitoring D...
cuda-dcgm	Monitoring D...
defaultgatew...	Monitoring D...
diskspace	Monitoring D...
dmesg	Monitoring D...
exports	Monitoring D...
failedprejob	Monitoring D...
gpuhealth_q...	Monitoring D...

Monitoring Data Producer Single Line Health Check Script `diskspace`

Search settings inputs

JUMP TO

Node execution filters Execution multiplexer

Name and 7 others

Name: diskspace	Maximal age: 0
Maximal samples: 4,096	Startup delay: 0
Consolidator: default	Disabled
Disable triggers	Only when idle

When and 3 others

Gap and 4 others

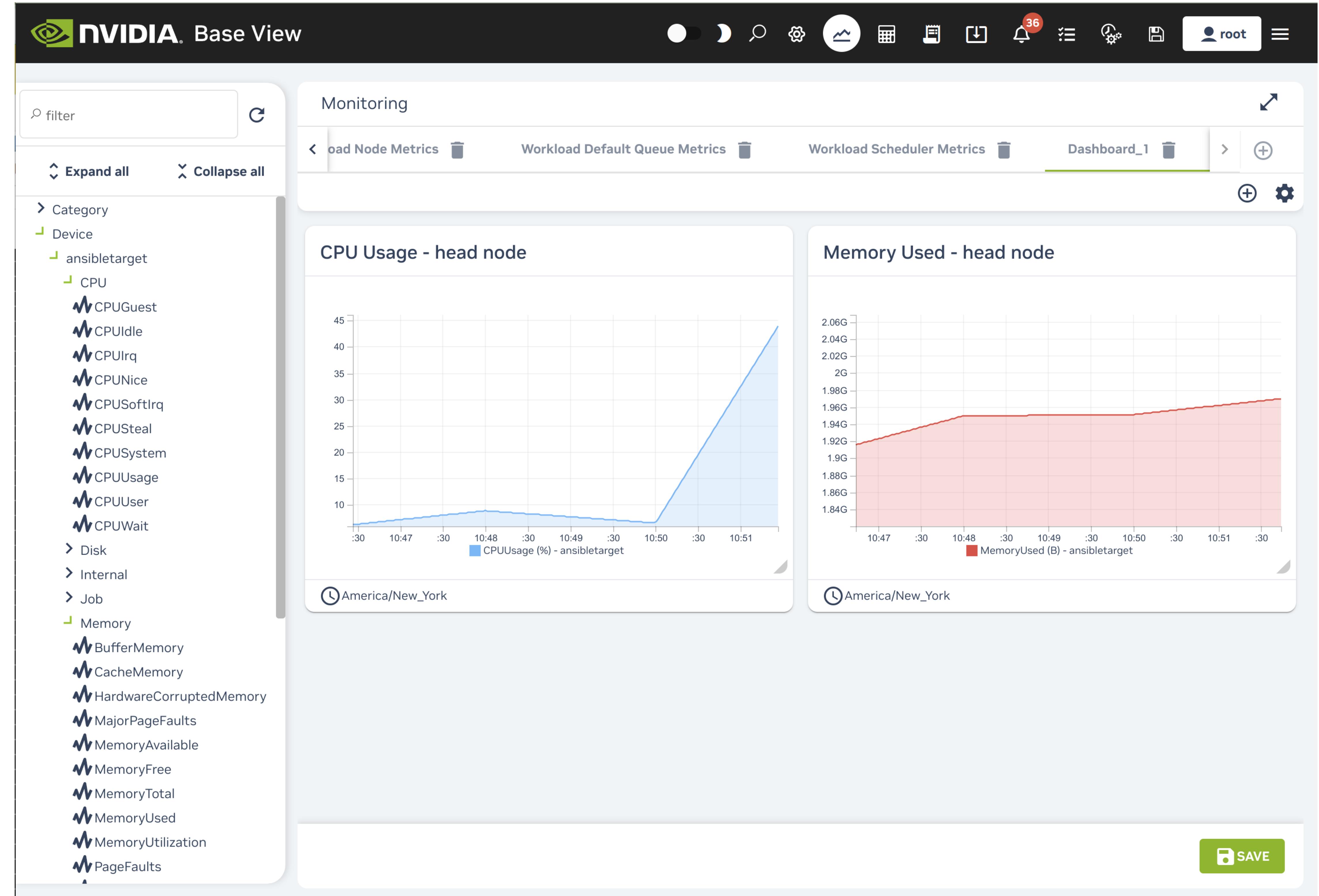
+ ADD REVERT DELETE BACK REVERT DELETE SAVE



BASE COMMAND MANAGER

Metrics & Health Checks

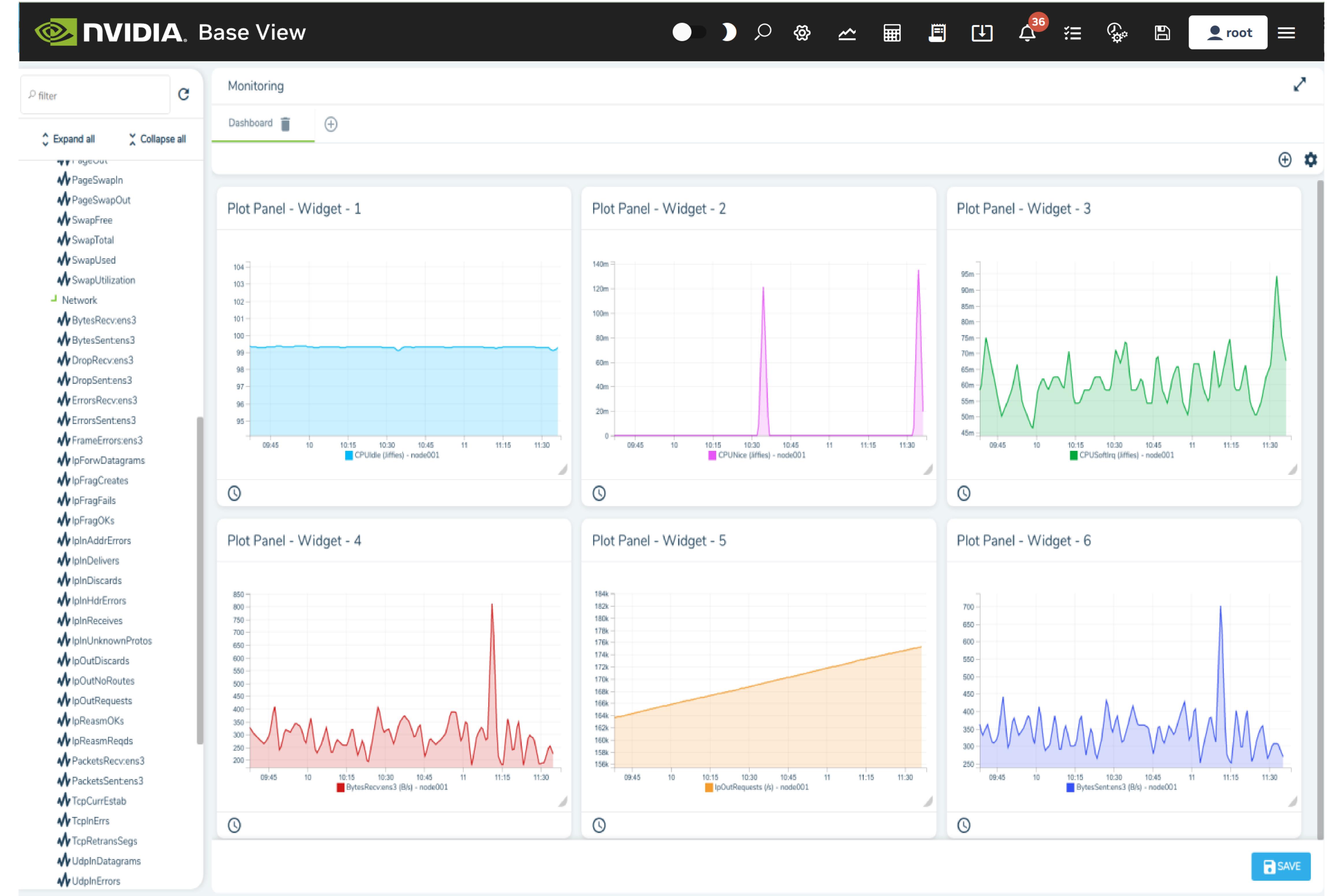
- Over 200 metrics
- 19 health checks
- Create your own
- Perform actions based on metric values or failing health checks
(self-healing)



BASE COMMAND MANAGER

Metrics & Health Checks

- Over 200 metrics
- 19 health checks
- Create your own
- Perform actions based on metric values or failing health checks
(self-healing)



BASE COMMAND MANAGER

Workload Management

The screenshot shows the NVIDIA Base View interface with the title "Workload Management". The left sidebar has a "HPC" section expanded, showing "Workload Management Clusters" and "Workload Management Wizard". The main area displays the "Wlm Cluster list" for the "Slurm Wlm Cluster slurm". The cluster details include:

- Primary Server: ansibletarget
- Topology switches: Topology switches
- Enable prejob: Enabled

Below these are sections for "Power Saving Enabled and 5 others" and "Module File Template and 12 others". At the bottom are "REVERT" and "SAVE" buttons.

- Integrated with all major workload managers
 - Slurm, Open PBS, PBS Pro, UGE, Platform LSF
- Built-in tools are available to use if desired
 - E.g. sview, sacctmgr, squeue
- Run jobs in cgroups to gather job based metrics

BASE COMMAND MANAGER

Workload Management

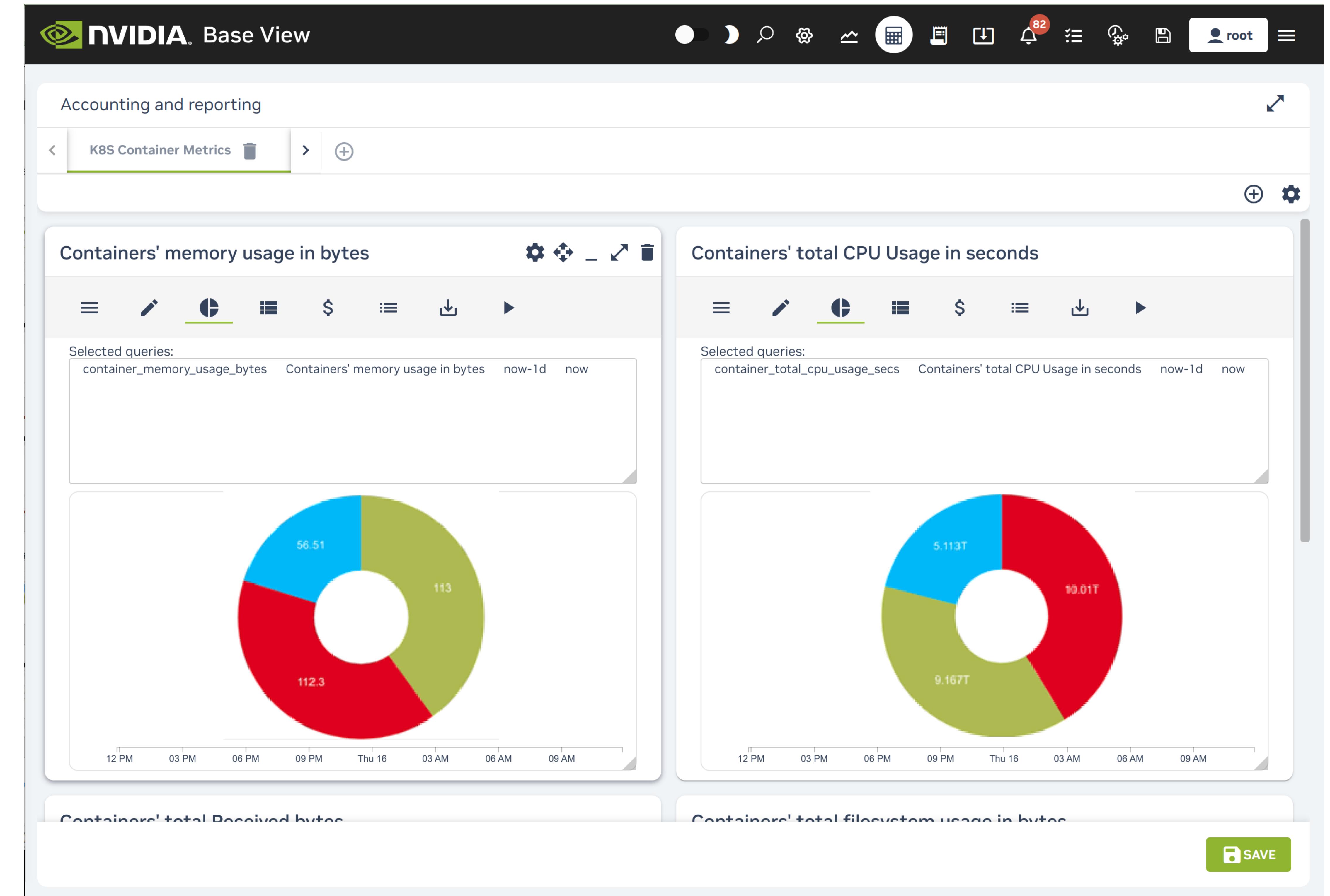
The screenshot shows the NVIDIA Base View interface with the title "Workload Management". The left sidebar includes sections for Cluster, Networking, Provisioning, Grouping, Devices, Datacenter Infrastructure, and HPC (which is expanded to show Workload Management Clusters, Workload Management Wizard, Jobs, Chargeback requests, Cloud, Containers, Storage, Jupyter, Configuration Overlays, Monitoring, and Identity Management). The main area displays the "Wlm Cluster list" with columns for selection, name, state, start time, end time, and cluster type, showing entries for "slurm", "ansi...", "nod...", and "nod...". The top navigation bar has icons for search, settings, and other system functions, along with a user icon for "root". The bottom right corner features a green "+ ADD" button. The "Job Queues" tab is selected in the top navigation bar, and the right panel shows the "Slurm Wlm Cluster slurm" configuration with options for NAME, AWS Queue, LLM Team Queue, and defq.

- Integrated with all major workload managers
 - Slurm, Open PBS, PBS Pro, UGE, Platform LSF
- Built-in tools are available to use if desired
 - E.g. sview, sacctmgr, squeue
- Run jobs in cgroups to gather job based metrics

BASE COMMAND MANAGER

Workload Accounting and Reporting

- Provides detailed insight on how system resources are being consumed



BASE COMMAND MANAGER

Workload Accounting and Reporting

- Uses cgroups with PromQL to extract job information
- Report by user
- Report by project
- See results in charts or tables
- Download results
 - csv or xls

The screenshot shows the NVIDIA Base View interface with the title "Workload Accounting and Reporting". The left sidebar includes sections for Datacenter Infrastructure, HPC, Cloud, Containers, Storage, Jupyter, Configuration Overlays, Monitoring (selected), Data Producers, Measurables, Consolidators, Actions, Triggers, Health Status, All Health Checks, Standalone Monitored Entities, PromQL Queries (selected), Resources, Types, and Identity Management.

The main area displays a "Prometheus Query list" table with 13 rows, showing queries like "account_job..." and "accounts_us...". A "Prometheus Query" card for "account_job_effective_cpu_seconds" is shown, containing fields for Name (account_job_effective_cpu_seconds), Class (accounting), Alias (now), Query type (Instant), Start time (now), Description (CPU seconds effectively used by account i), and PromQL Query (sum by(account) (max_over_time(job_cpusacct_usage_seconds[\$period]) * on(wlm, job_id, hostname) group_right())). Buttons for + ADD, BACK, REVERT, DELETE, and SAVE are at the bottom.

BASE COMMAND MANAGER

Identity Management and Admin Profiles

- Identity Management via Secure LDAP, or connection to campus LDAP/AD
- Administrator capabilities can be customized with profile tokens



NVIDIA Base View

User list

	NAME ↑	ID	L...	HOME DI...
<input type="checkbox"/>	Francis	1002	Nov...	/home/Fran...
<input type="checkbox"/>	Grace	1004	Nov...	/home/Grace
<input type="checkbox"/>	Niels	1003	Nov...	/home/Niels
<input type="checkbox"/>	Robert	1001	Nov...	/home/Robe...
<input type="checkbox"/>	cmsupport	1500	Nov...	/home/cms...

Cluster
Networking
Provisioning
Grouping
Devices
Datacenter Infrastructure
HPC
Cloud
Containers
Storage
Jupyter
Configuration Overlays
Monitoring
Identity Management

Users
Groups
Profiles
Certificates
Requests

+ ADD

https://10.11.1.95:8081/base-view/#

BASE COMMAND MANAGER

Identity Management and Admin Profiles

- Identity Management via Secure LDAP, or connection to campus LDAP/AD
- Administrator capabilities can be customized with profile tokens

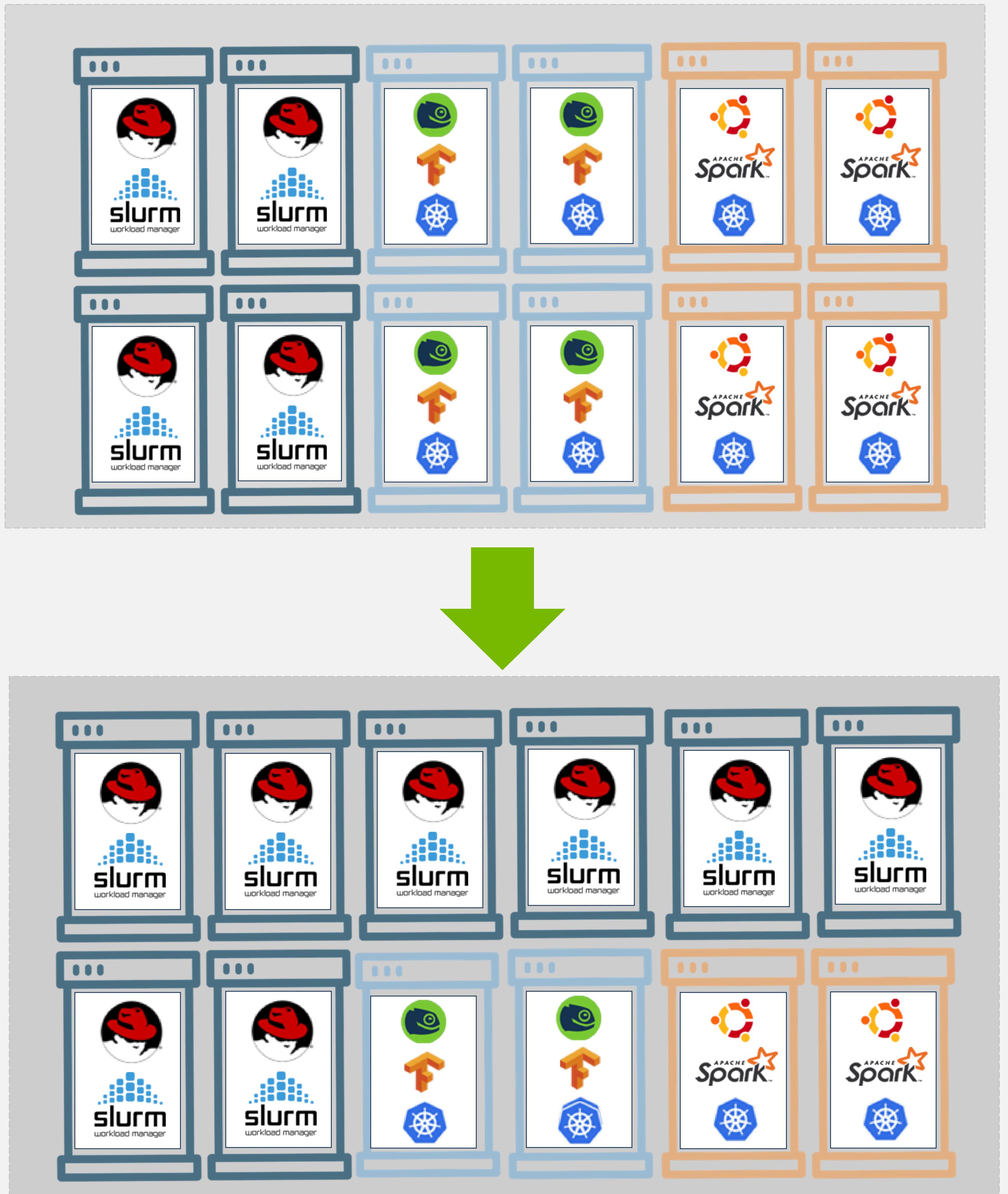


The screenshot shows the NVIDIA Base View interface with the following details:

- Left Sidebar:** Contains navigation links for Cluster, Networking, Provisioning, Grouping, Devices, Datacenter Infrastructure, HPC, Cloud, Containers, Storage, Jupyter, Configuration Overlays, Monitoring, and Identity Management (which is expanded, showing sub-links for Users, Groups, Profiles, Certificates, and Requests).
- Profile list:** A table listing profiles with columns for NAME, ACCESS S..., and a dropdown menu. Profiles listed include admin, bootstrap, cloudjob, cmhealth, cmpam, litenode, monitoringp..., node, portal, power, and readonly.
- Profile cloudjob:** A detailed view of the 'cloudjob' profile. It includes:
 - Name:** cloudjob (with a 'Non user' toggle switch)
 - Services:** CMCloud, CMMain
 - Tokens:** SUBMIT_CLOUD_JOB_DESCRIPTION_TOKEN, GET_CLOUD_JOB_DESCRIPTION_TOKEN
- Bottom Navigation:** Includes buttons for Hide, + ADD, BACK, REVERT, DELETE, and SAVE.
- URL:** https://10.11.1.95:8081/base-view/#

Auto Scaler provides Cluster Flexibility

- Auto Scaler dynamically scales scheduler queues and Kubernetes namespaces based on workload demand, subject to configured policies
- Increases cluster throughput and allows mission-critical workloads to run sooner
- Works on-prem, at the edge and in the cloud
- Makes your cluster agile and flexible, quickly and automatically responding to changes in workload demand

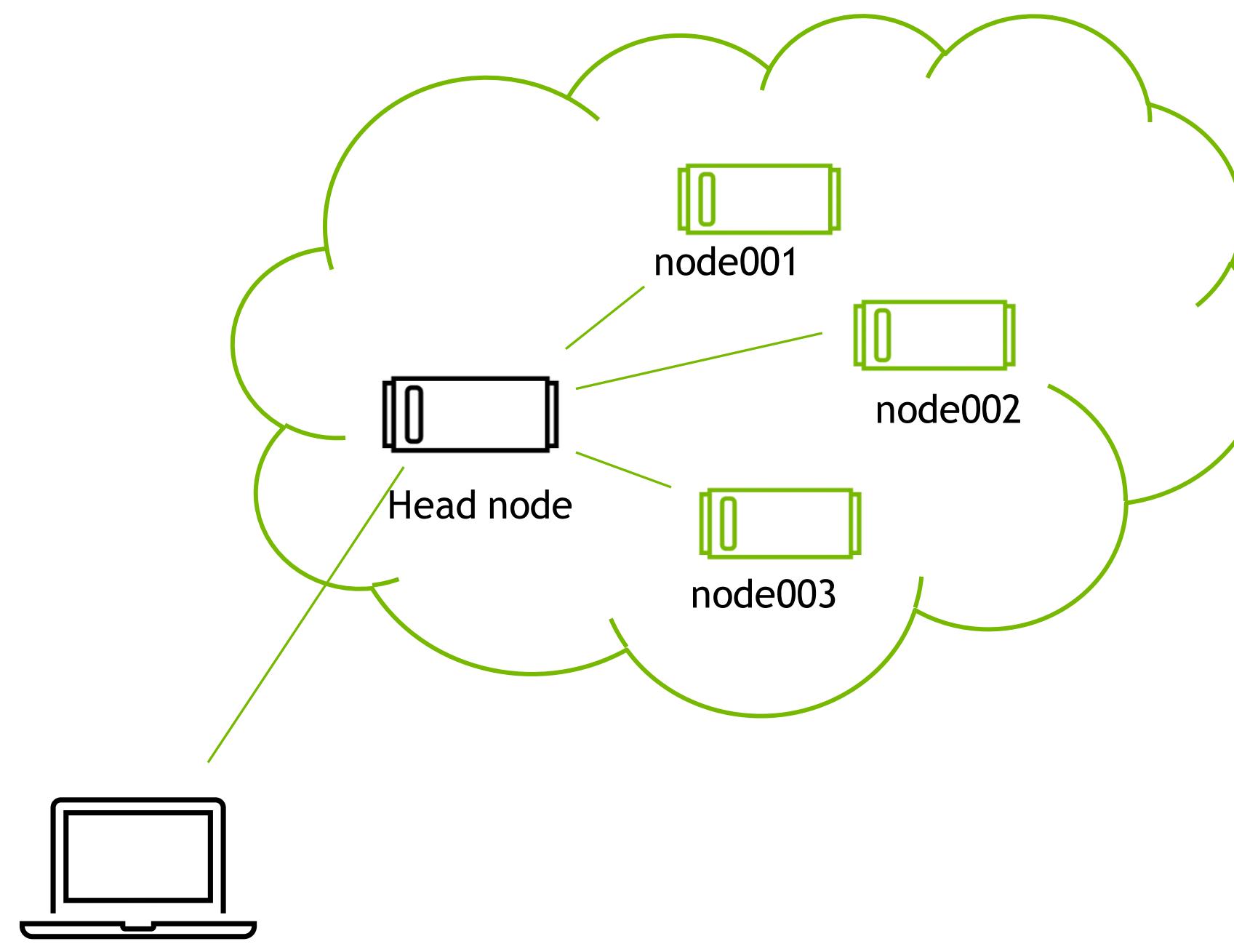


BASE COMMAND MANAGER

Cloud

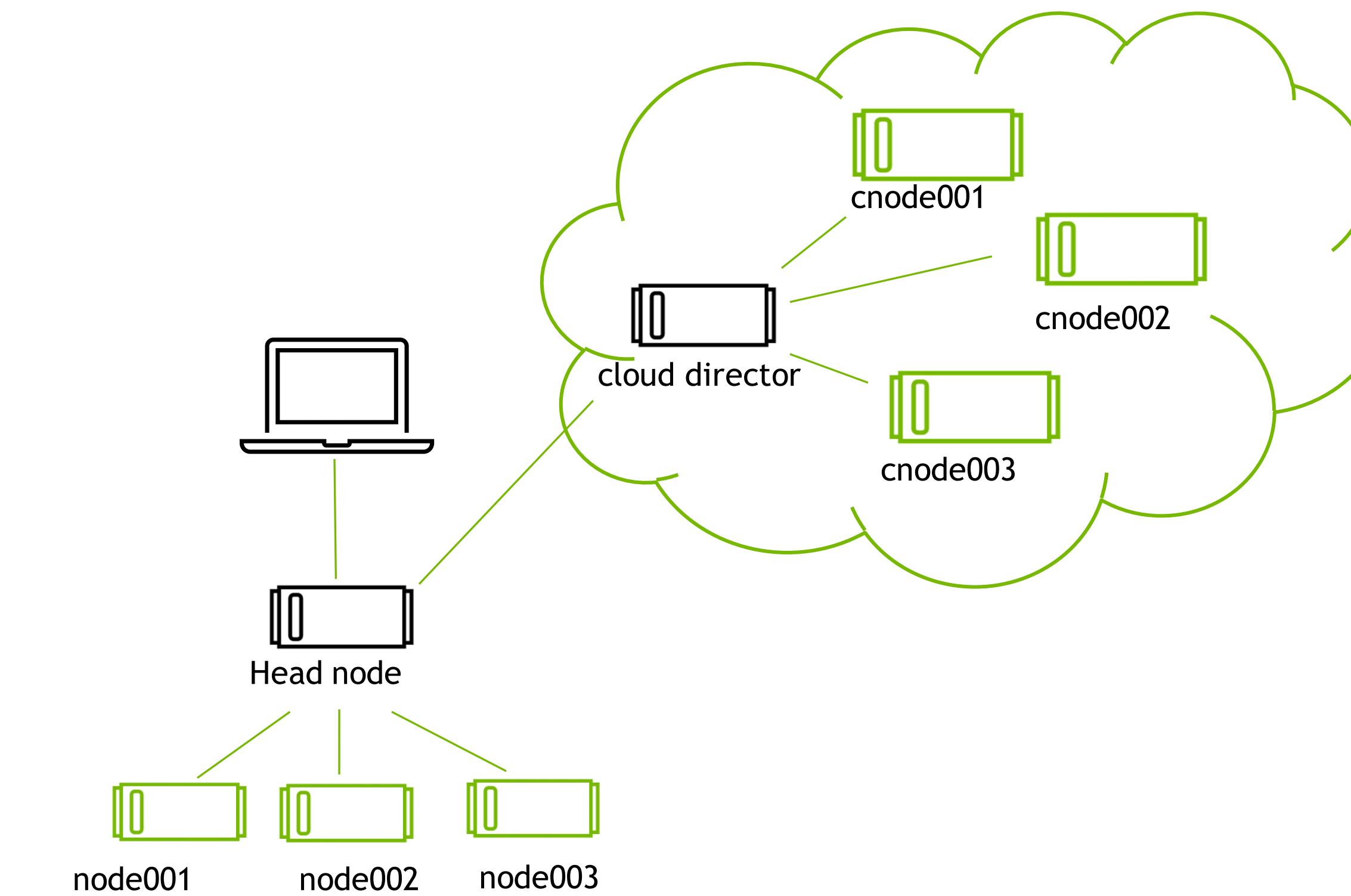
Cluster-as-a-Service (all in the cloud)

- Entire cluster is running in a cloud
- Used for HPCaaS, development and training
- Supported Cloud Service Providers are AWS, Azure and VMWare



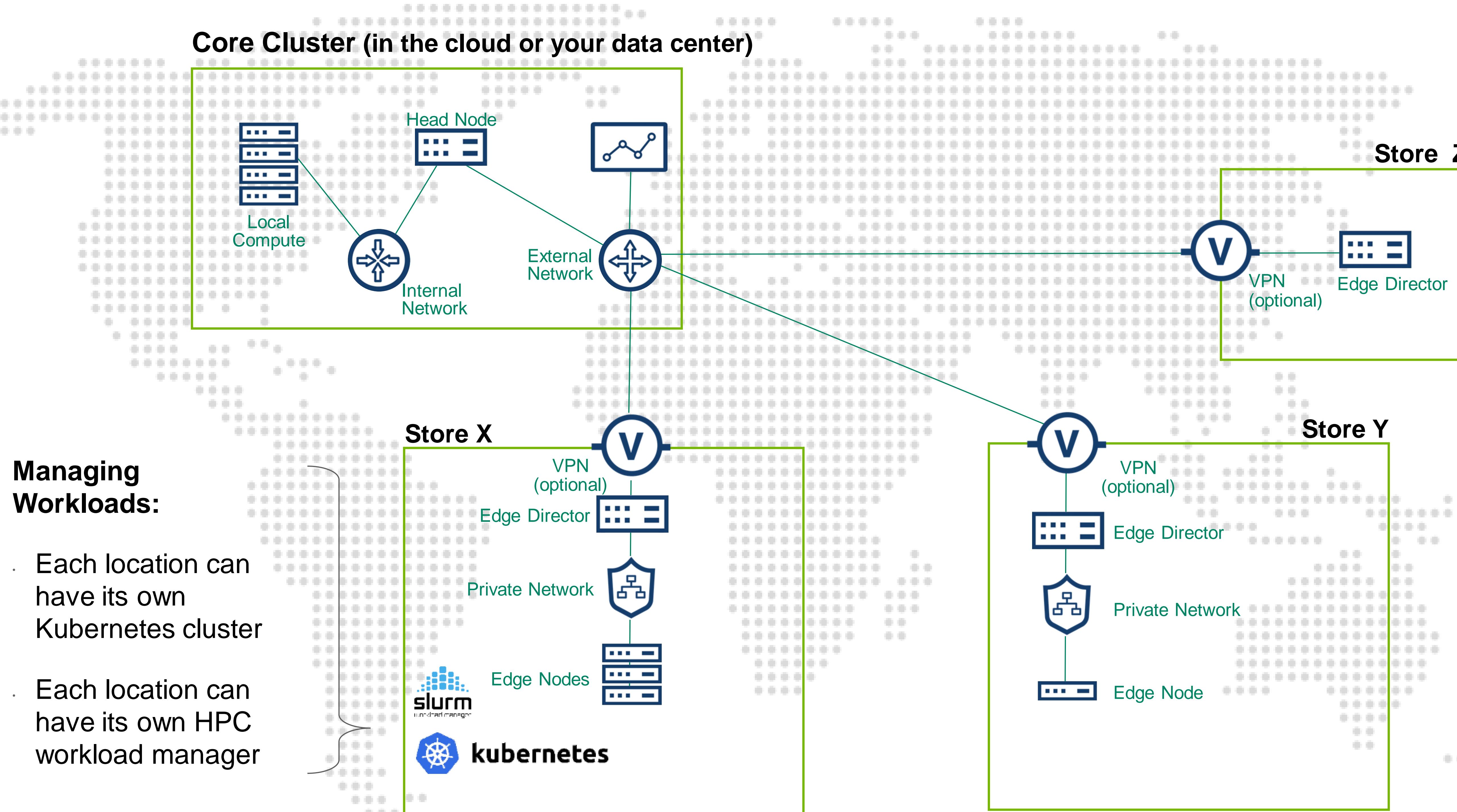
Cluster Extension (hybrid cloud)

- An on-prem cluster is extended to the cloud (hybrid cloud)
- Users can burst to the cloud for extra capacity
- Cloud director acts as a pseudo head node for the cloud nodes in its region



BASE COMMAND MANAGER

On the Edge



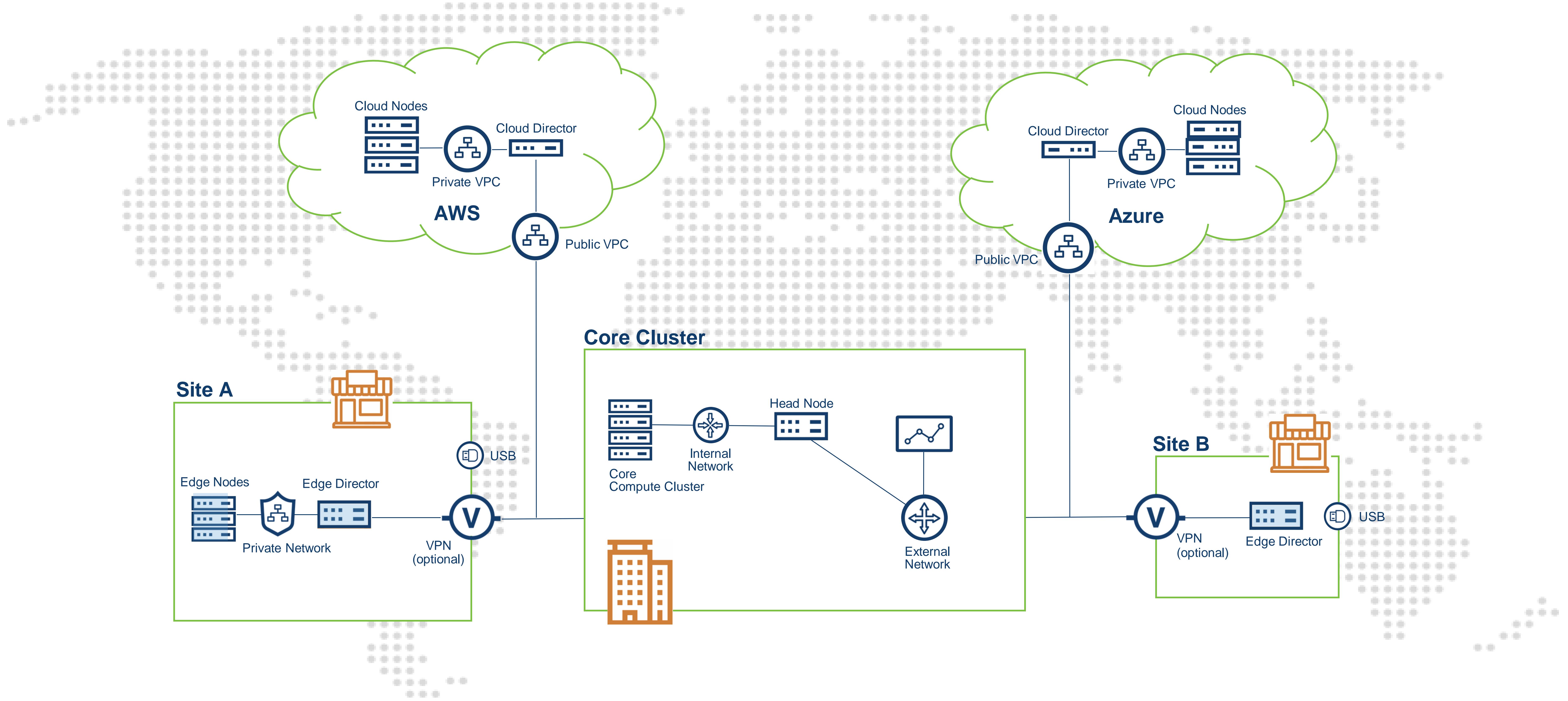
Edge Director: an edge node that acts as a proxy head node for an edge location

- Can contain GPUs and perform work
- Is provisioned by booting from BMC or local media
- Authenticates to central head node using unique SSL key
- Runs PXE servers to facilitate booting edge nodes (*may also boot from BMC or local media*)
- Provisions other local edge nodes (if used)

Retail locations may have 1 node (Edge Director that also performs work), or many nodes (Edge Director + Edge Nodes) depending on the store's workload

BASE COMMAND MANAGER

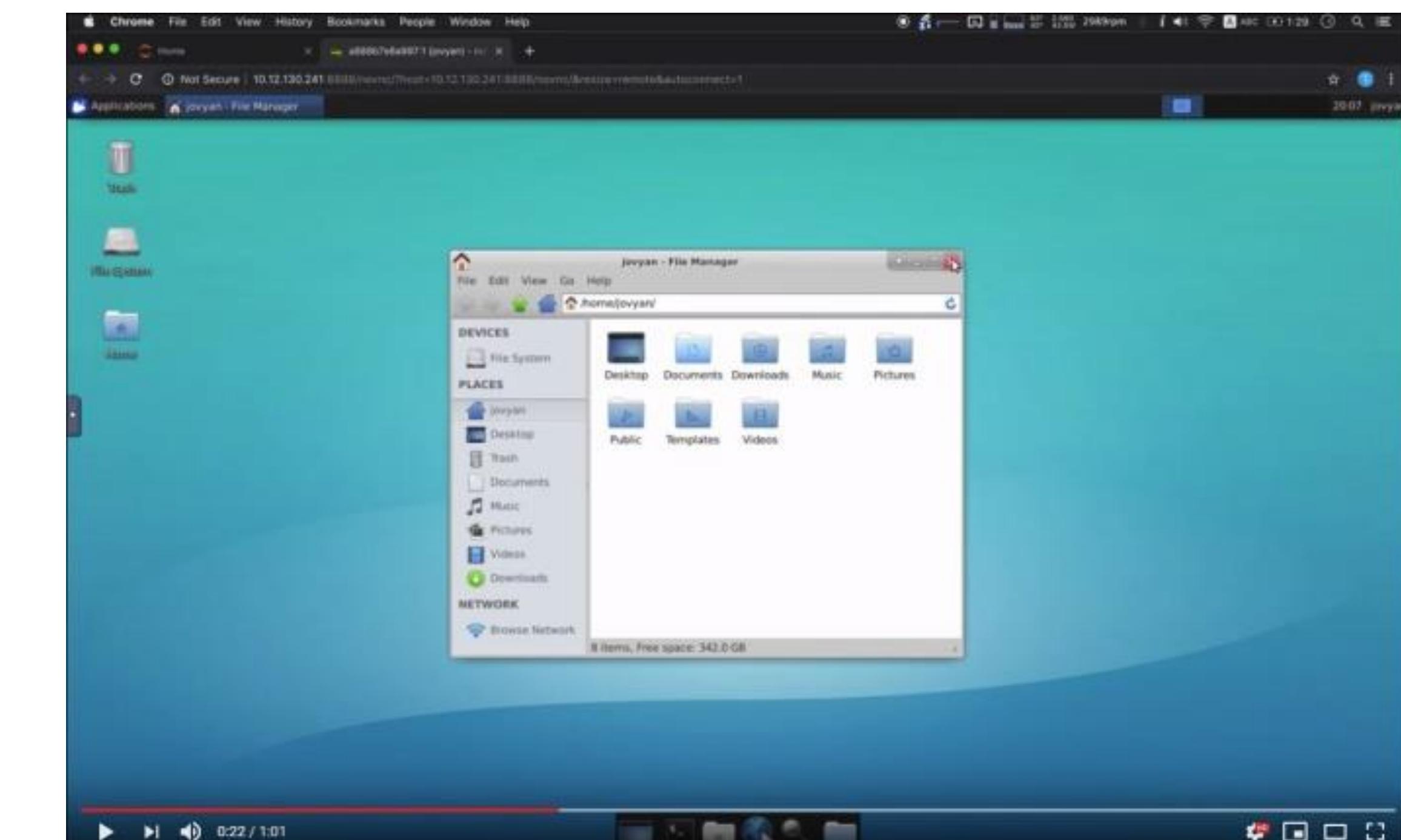
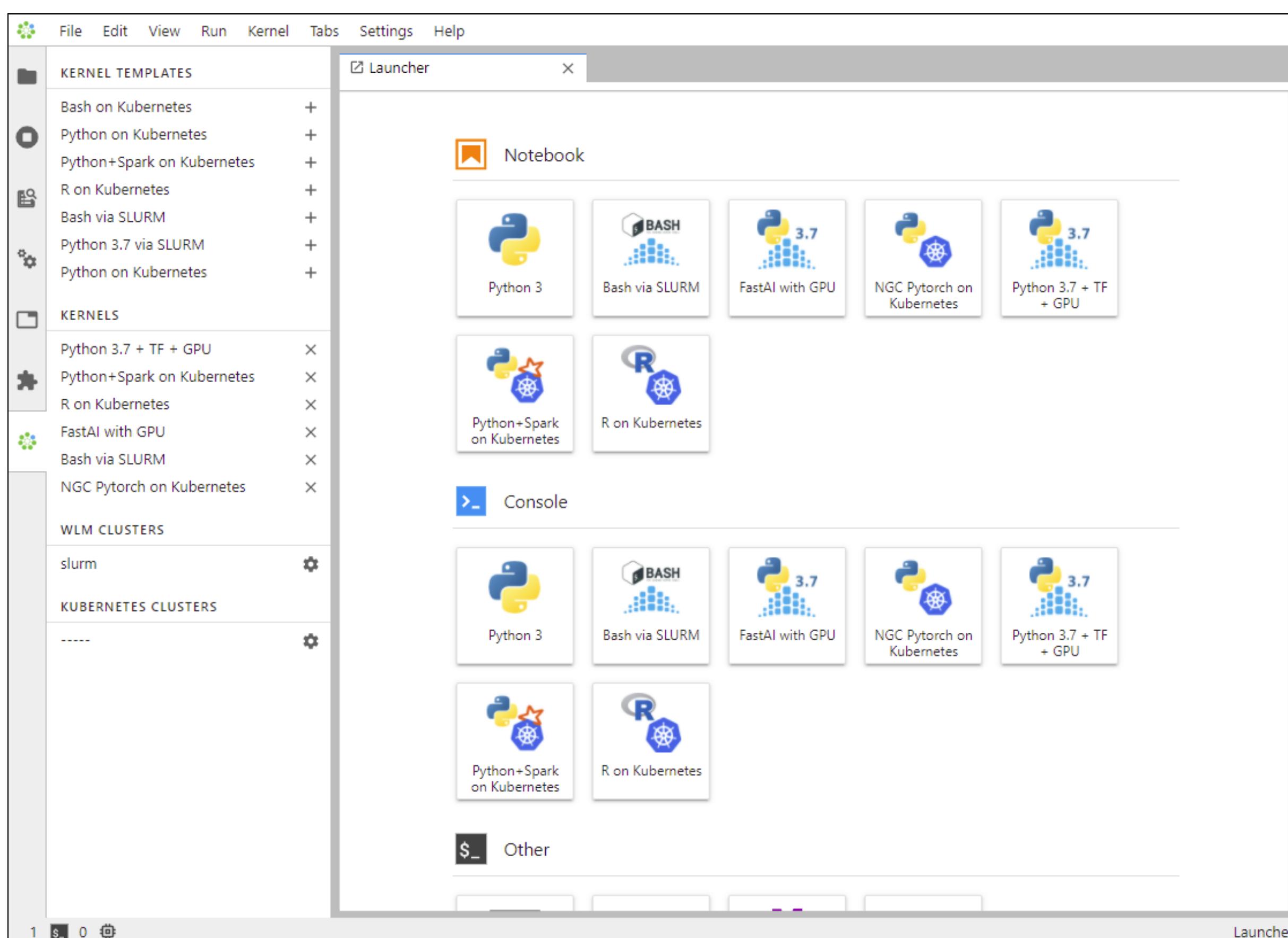
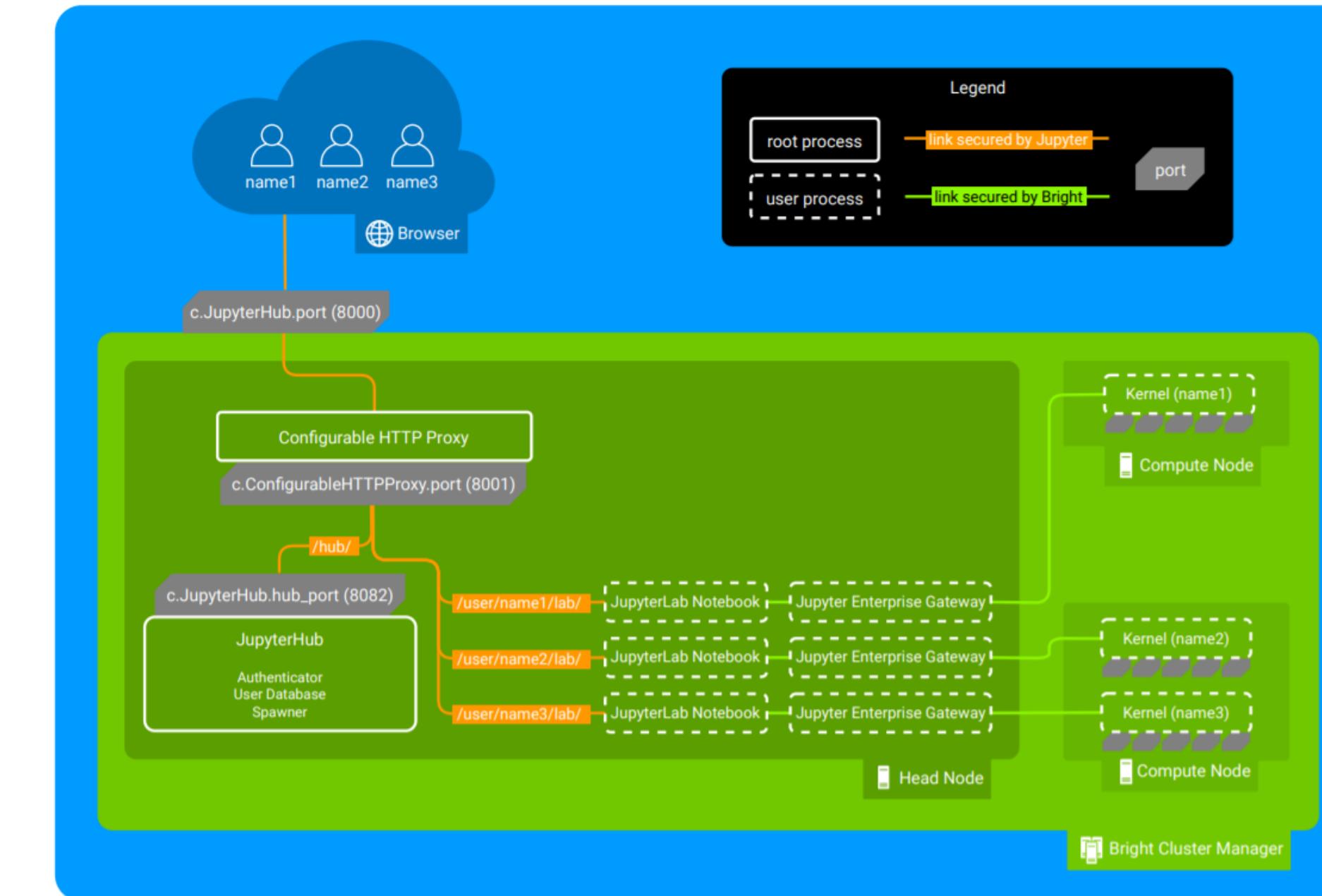
From Edge to Core to Cloud



BASE COMMAND MANAGER

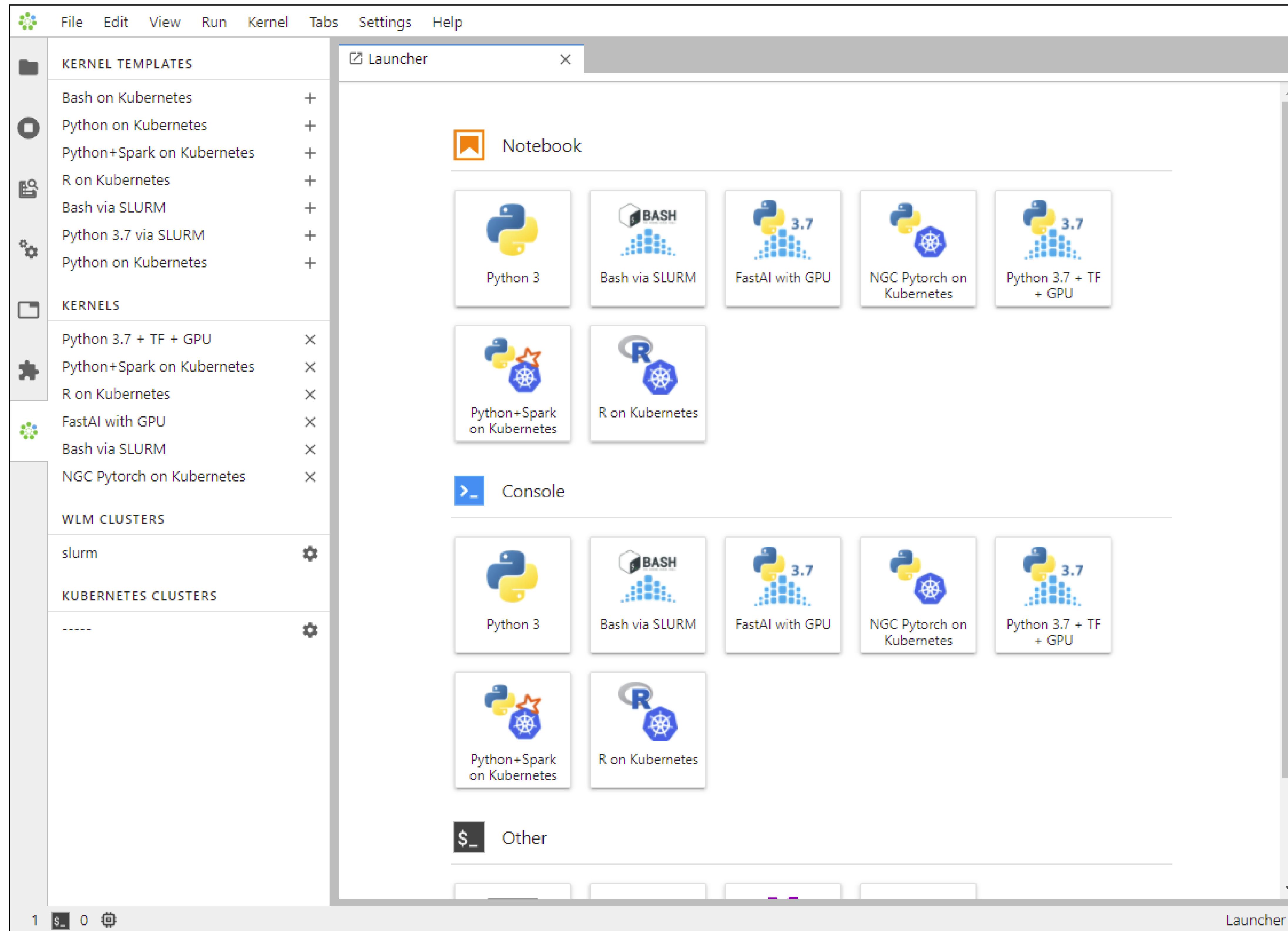
Adding a graphical user interface with Jupyter

- Use JupyterLab as the default user interface
 - start terminal or desktop sessions
 - run workload in Slurm, Kubernetes and Spark (other HPC WLMs to follow)



BASE COMMAND MANAGER

Jupyter kernel creation



BASE COMMAND MANAGER

Jupyter kernel creation

The screenshot shows the Base Command Manager interface with a focus on Jupyter kernel creation. On the left, there's a sidebar with sections for KERNEL TEMPLATES, KERNELS, WLM CLUSTERS, and KUBERNETES CLUSTERS. The KERNEL TEMPLATES section includes options like Bash on Kubernetes, Python on Kubernetes, Python+Spark on Kubernetes, R on Kubernetes, Bash via SLURM, Python 3.7 via SLURM, and Python on Kubernetes. The KERNELS section lists Python 3.7 + TF + GPU, Python+Spark on Kubernetes, R on Kubernetes, FastAI with GPU, Bash via SLURM, NGC Pytorch on Kubernetes, and slurm. The WLM CLUSTERS and KUBERNETES CLUSTERS sections show 'slurm' and '-----' respectively.

A central panel titled 'Launcher' displays four categories: Notebook, Console, and Other, each with icons for Python 3, Bash via SLURM, FastAI with GPU, and R on Kubernetes. Below these are sections for 'Python+Spark on Kubernetes' and 'R on Kubernetes'.

A modal window titled 'New kernel' is open on the right, containing fields for Kernel name (jupyter-eg-kernel-slurm-1e82d2v7), Modules loaded for spawned job (shared, slurm, jupyter-eg-kernel-slurm-py37), Number of tasks to run (16), List of generic consumable resources (gpu), Prefix of the job name (jupyter-eg-kernel-slurm-py36), Display name of the kernel (Python 3.7 via SLURM), Home directory of the running kernel (/home/cmssupport/), Partition for the resource allocation (defq), and a checkbox for 'The job allocation can over-subscribe resources with other running jobs'. There are 'Cancel' and 'Create' buttons at the bottom.

BASE COMMAND MANAGER

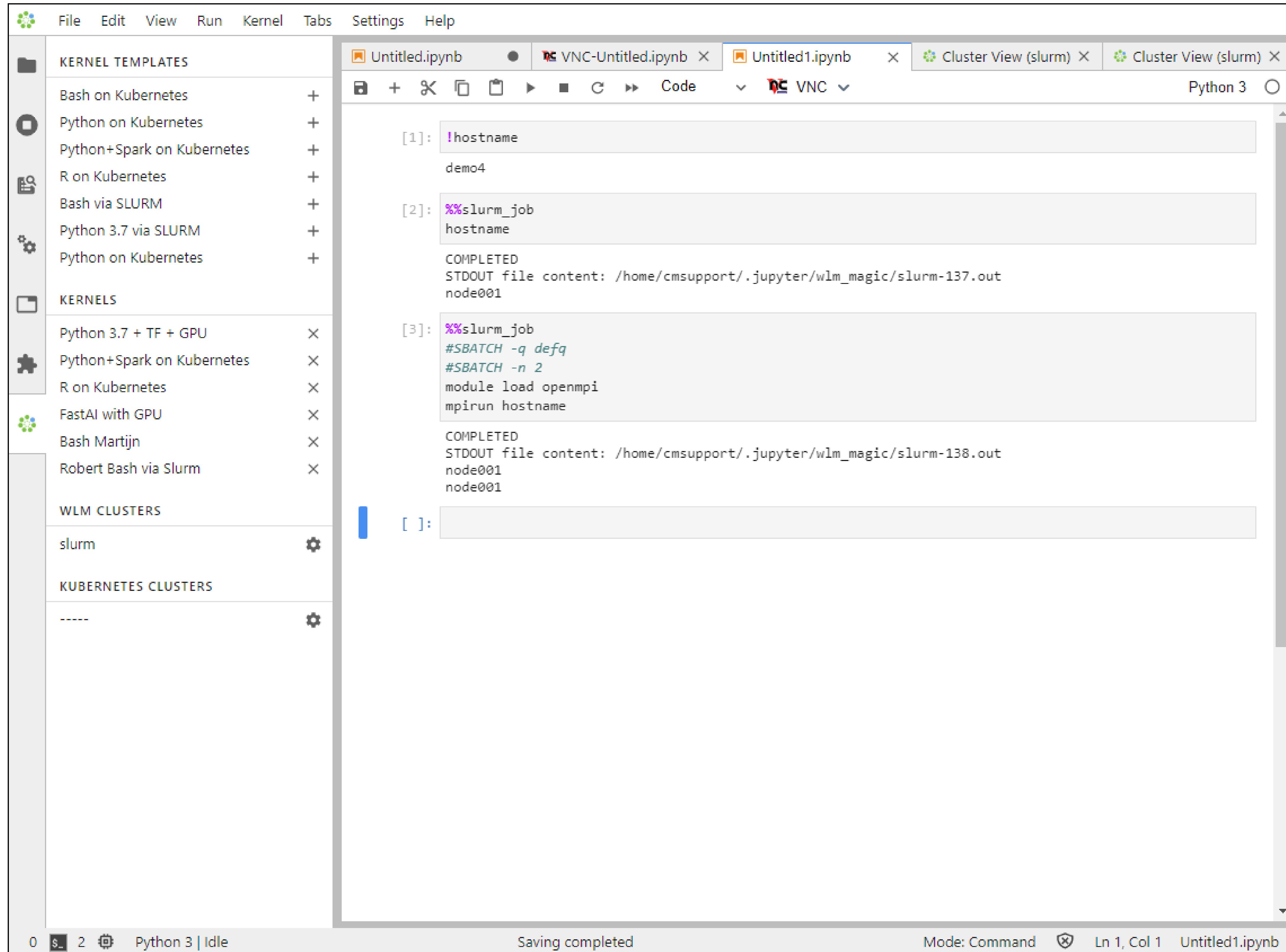
View and manage jobs from Jupyter

The screenshot shows the 'Cluster View (slurm)' tab in a Jupyter Notebook. The interface includes a top navigation bar with File, Edit, View, Run, Kernel, Tabs, Settings, and Help. Below the navigation bar is a tab bar with Untitled.ipynb, VNC-Untitled.ipynb, Untitled1.ipynb, Cluster View (slurm), and Cluster View (slurm). On the left, there's a sidebar with sections for KERNEL TEMPLATES, KERNELS, and WLM CLUSTERS, each containing various kernel options. The main area displays a table of jobs. The table has columns for JobID, name, User, and Status. The status column shows entries like CANCELLED by 100, COMPLETED, and RUNNING. A context menu is open over the first job in the table, showing options: Refresh, Actions (with sub-options Suspend, Hold, Release, Kill), All, Running, Queued, Completed, Failed, Filter, and 25. The job with JobID 136 is currently selected, indicated by a blue background and a checked checkbox in the Actions menu. The bottom of the interface shows a footer with tabs for 0, \$, 2, and Cluster View (slurm), and status messages Saving completed and Cluster View (slurm).

JobID	name	User	Status
8	jupyter-eg-kernel-slurm-py37-9...	cmsupport	CANCELLED by 100
8	ch	cmsupport	COMPLETED
8	ch	cmsupport	COMPLETED
9	ch	cmsupport	COMPLETED
105	sbatch	cmsupport	COMPLETED
115	sbatch	cmsupport	COMPLETED
117	sbatch	cmsupport	COMPLETED
126	sbatch	cmsupport	COMPLETED
136	jupyter-eg-kernel-slurm-py37-1...	cmsupport	RUNNING
138	sbatch	cmsupport	COMPLETED

BASE COMMAND MANAGER

Submit jobs from Jupyter



The screenshot shows a Jupyter Notebook interface with the following details:

- Kernel Templates:** Bash on Kubernetes, Python on Kubernetes, Python+Spark on Kubernetes, R on Kubernetes, Bash via SLURM, Python 3.7 via SLURM, Python on Kubernetes.
- Kernels:** Python 3.7 + TF + GPU, Python+Spark on Kubernetes, R on Kubernetes, FastAI with GPU, Bash Martijn, Robert Bash via Slurm.
- WLM Clusters:** slurm.
- Kubernetes Clusters:** ----.

The main notebook area contains three cells:

- [1]: `!hostname`
Output: demo4
- [2]: `%%slurm_job`
Output:
COMPLETED
STDOUT file content: /home/cmssupport/.jupyter/wlm_magic/slurm-137.out
node001
- [3]: `%%slurm_job`

```
#SBATCH -q defq
#SBATCH -n 2
module load openmpi
mpirun hostname
```

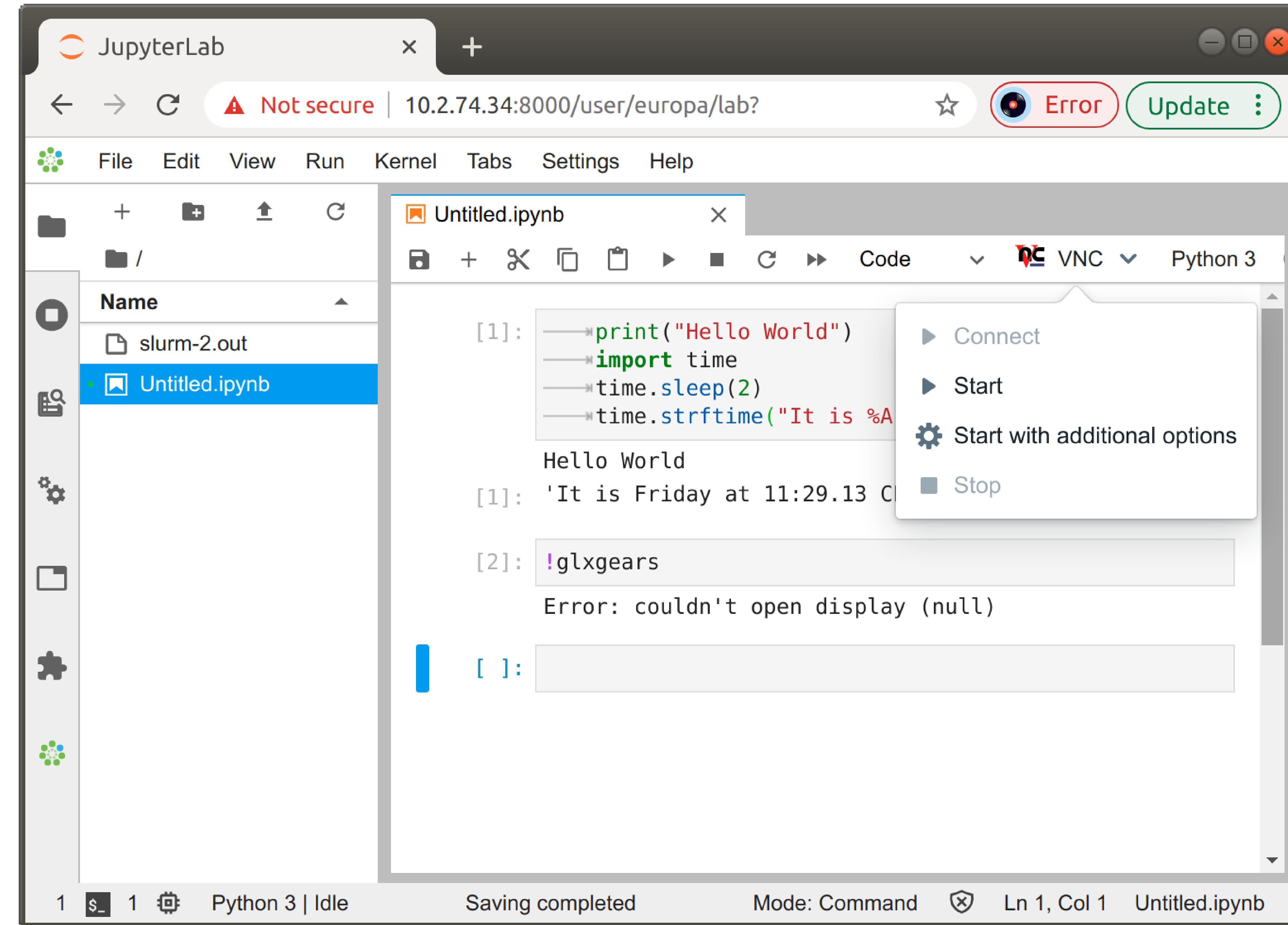

Output:
COMPLETED
STDOUT file content: /home/cmssupport/.jupyter/wlm_magic/slurm-138.out
node001
node001

At the bottom of the interface:

- 0 \$ 2 Python 3 | Idle
- Saving completed
- Mode: Command
- Ln 1, Col 1 Untitled1.ipynb

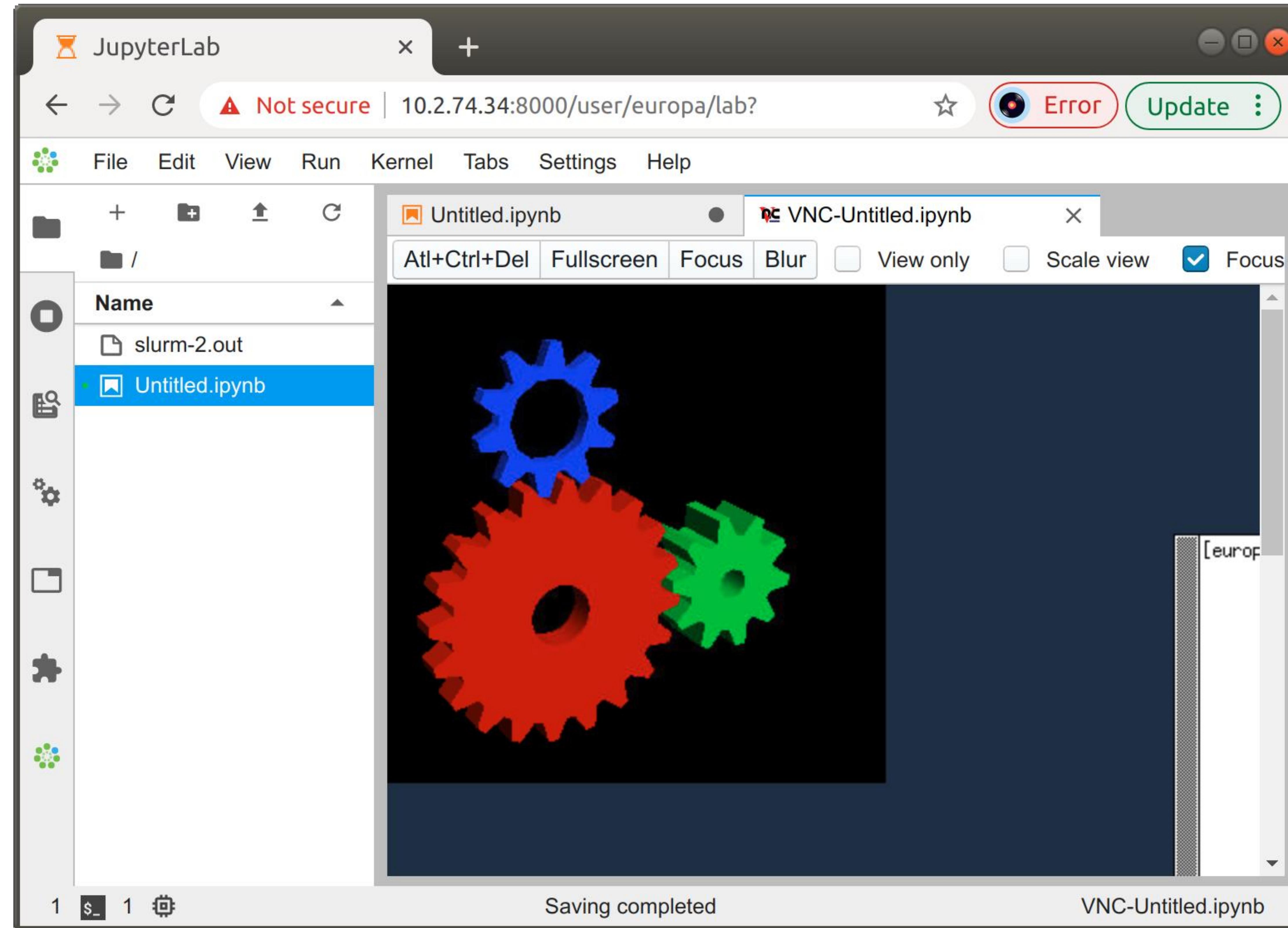
BASE COMMAND MANAGER

Jupyter with VNC



BASE COMMAND MANAGER

Jupyter with VNC

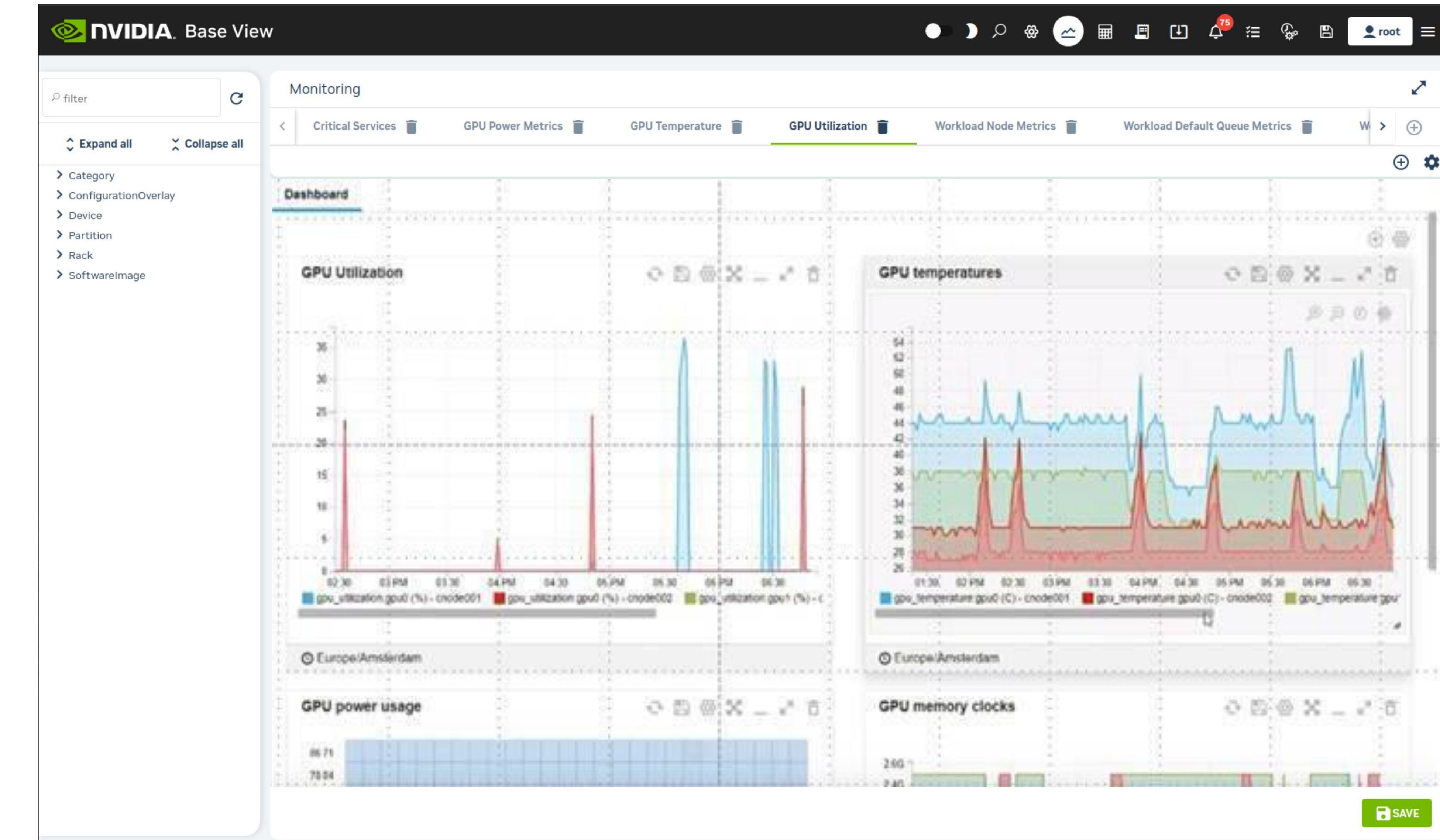


BASE COMMAND MANAGER

Tight Integration with NVIDIA GPUs

GPU MONITORING

- Sample and monitor metrics from supported GPUs and GPU Computing Systems
- Examples of supported metrics:
 - GPU temperatures
 - GPU exclusivity modes
 - GPU fan speeds
 - System fan speeds
 - PSU voltages and currents
 - System LED states
 - GPU ECC statistics
 - GPU utilization
 - GPU memory usage
- Built-in support for GPU computing with CUDA and OpenCL libraries

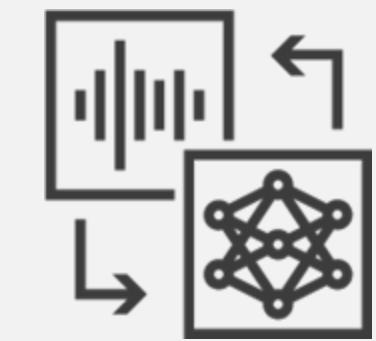


NVIDIA AI Enterprise

Designed for Enterprises that Run their Business on AI

NVIDIA AI Enterprise: Production-Grade Software for AI

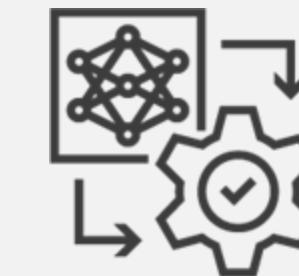
Accelerated Computing
increases productivity while
lowering TCO



Generative AI

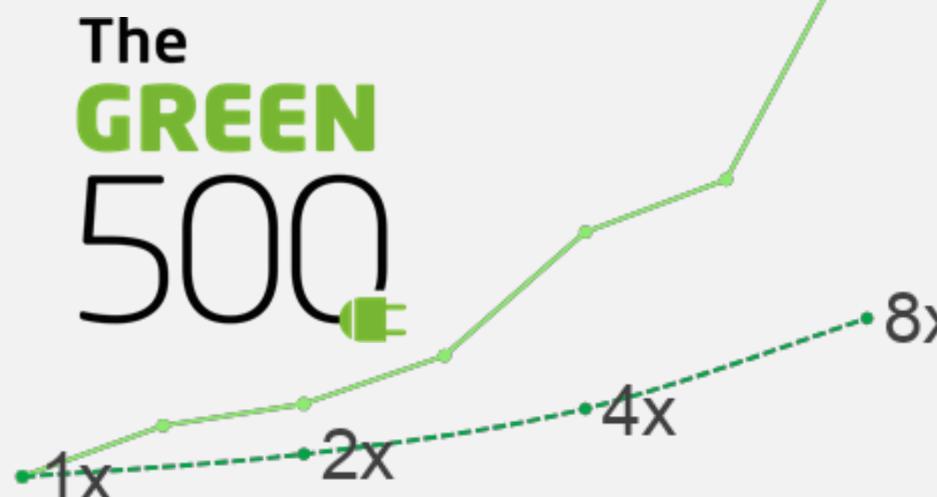


ETL/Spark



Inference

#1



Enterprise-Grade
security, stability,
manageability & support



CVE Patching



API Stability

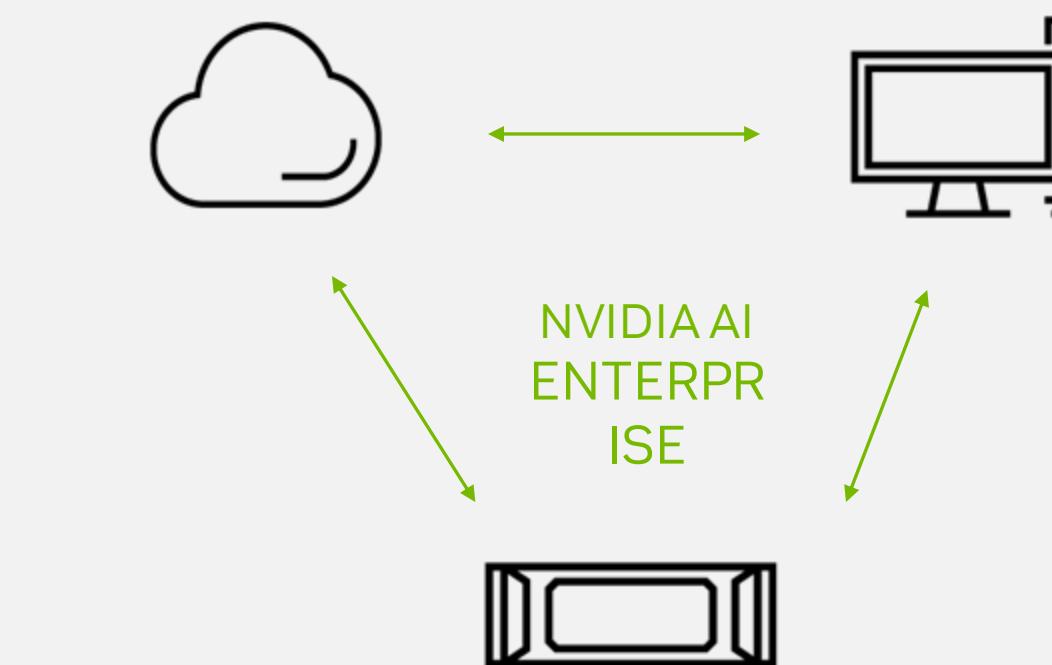


End-to-End
Manageability



SLAs with
NVIDIA Support

Cloud Native & Certified
to run everywhere



RTX 6000 Ada- H100 - DGX



Microsoft Azure

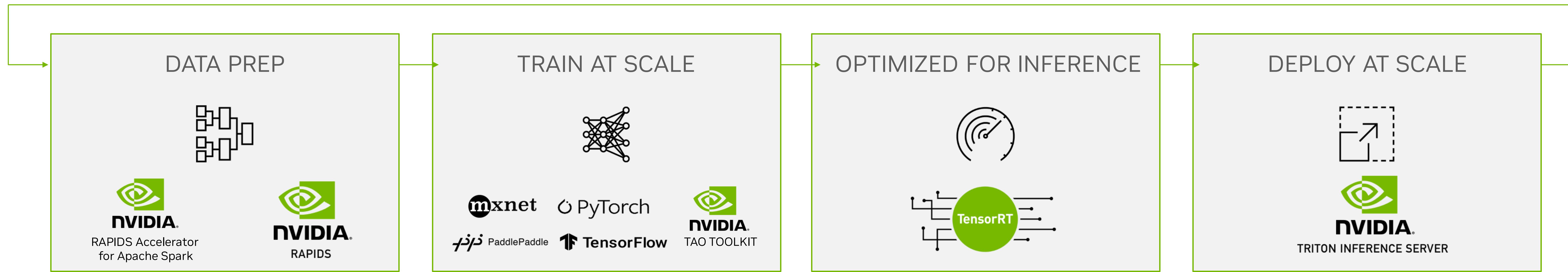


Hewlett Packard
Enterprise

Lenovo

NVIDIA End-to-End AI Software Suite

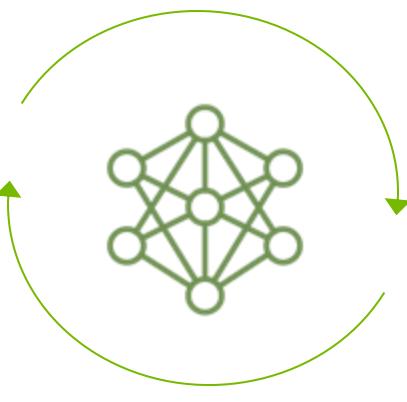
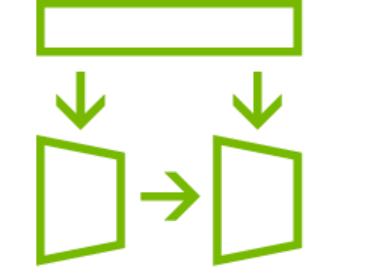
Deep Learning Streamlined From Conception to Production at Scale



- Reduces data science processes from hours to seconds
- 5x faster data processing than CPU-only configuration
- 4x cost saving than CPU-only configuration
- Train, Adapt, Optimize Models in hours vs. months
- Open-source ML frameworks optimized for GPU
- Integrated w/ NVIDIA RAPIDS to simplify development
- Maximize throughput for latency-critical apps w/ compiler & runtime
- Optimize every network (CNNs, RNNs, & Transformers)
- Optimizes use of GPU memory bandwidth
- Fast & scalable AI to applications
- Support for all major AI frameworks
- Up to 146x performance increase over CPU-only
- Triton with FIL backend delivers best inference performance for tree-based models on GPUs

NVIDIA AI Workflows

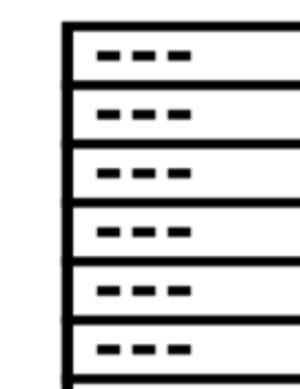
Prepackaged reference applications to rapidly automate your business with AI

Generative AI Knowledge Base Chatbot 	Intelligent Virtual Assistant 	Audio Transcription 	Digital Fingerprinting Threat Detection 	Spear Phishing Detection 	Route Optimization 	Next Item Prediction 
Generate accurate real-time responses from the company's knowledge base	Engaging contact center assistance 24/7 for lower operational costs	World-class, accurate transcripts based on GPU-optimized models	Cybersecurity threat detection and alert prioritization to identify and act faster	Use generative AI to improve the detection of spear phishing emails	Vehicle and robot routing optimization to reduce travel times and fuel costs	Personalized product recommendations for increased customer engagement and retention

NVIDIA AI Enterprise



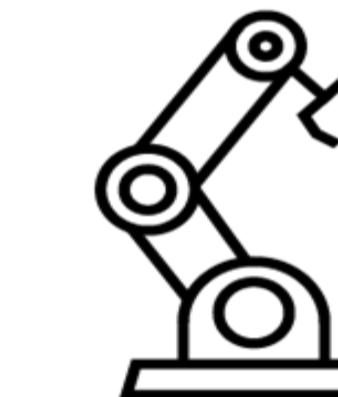
Cloud



Data Center



Edge

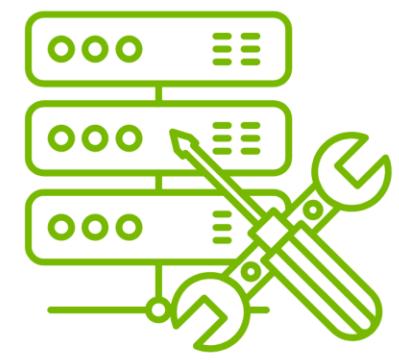


Embedded

NVIDIA Enterprise Services

Delivering Customer Success

Support Services



Included Support

- ✓ Standard SLA
- ✓ Access to NVIDIA AI Experts
- ✓ Long Term Branch Support (LTS)
- ✓ Priority Notifications

Value Add Support

- Business Critical Support**
 - ✓ 24/7 Support
 - ✓ 1 hour response SLA
- Technical Account Manager (TAM)**
 - ✓ Customer champion
 - ✓ Designated support
 - ✓ Performance reviews and support plans

Professional Services



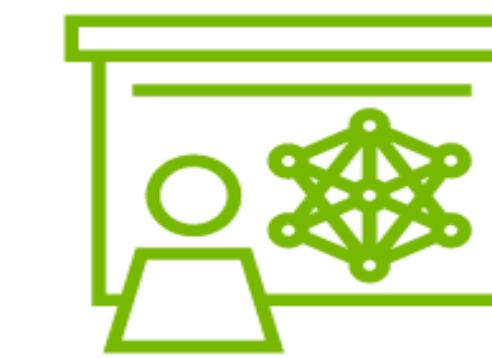
AI Workload Onboarding

- ✓ Guidance and support to onboard AI workloads
- ✓ Specific use case instruction and best practices for running workloads

Custom Engagement

- ✓ Expert Guidance

Education Services



- ✓ NVIDIA AI Enterprise Administration Public Bootcamp
- ✓ Introduction to AI in the Data Center
- ✓ Accelerated Computing, Data Science, Deep Learning, and Graphics (Self-paced & Instructure-led)

Business Continuity

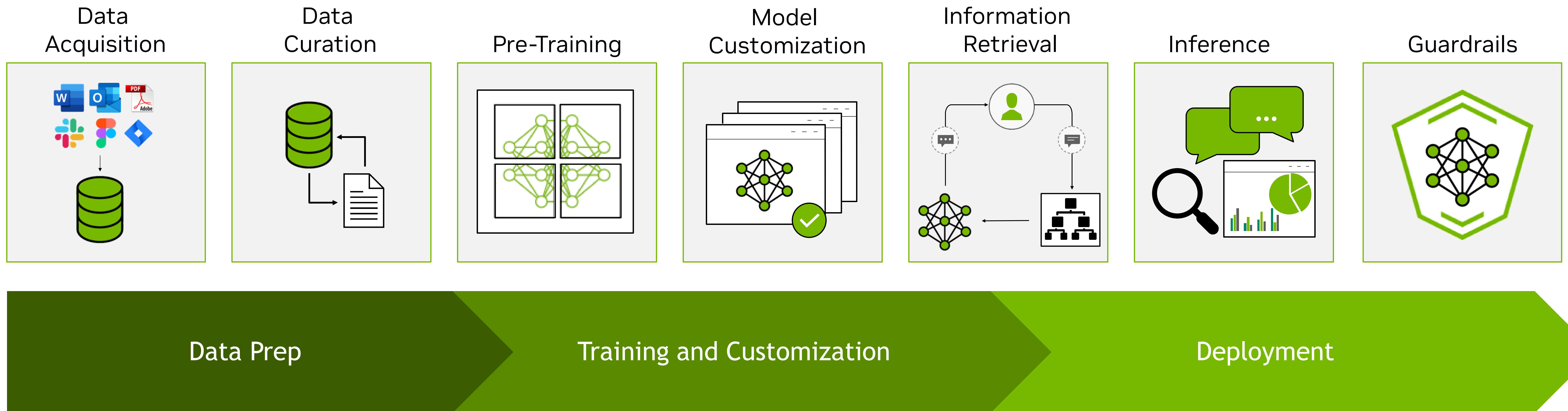
Speed to Value

Return on Investment

Summary

Building AI Applications for the Enterprise

End-to-end framework to build, customize and deploy generative AI models



Q & A

