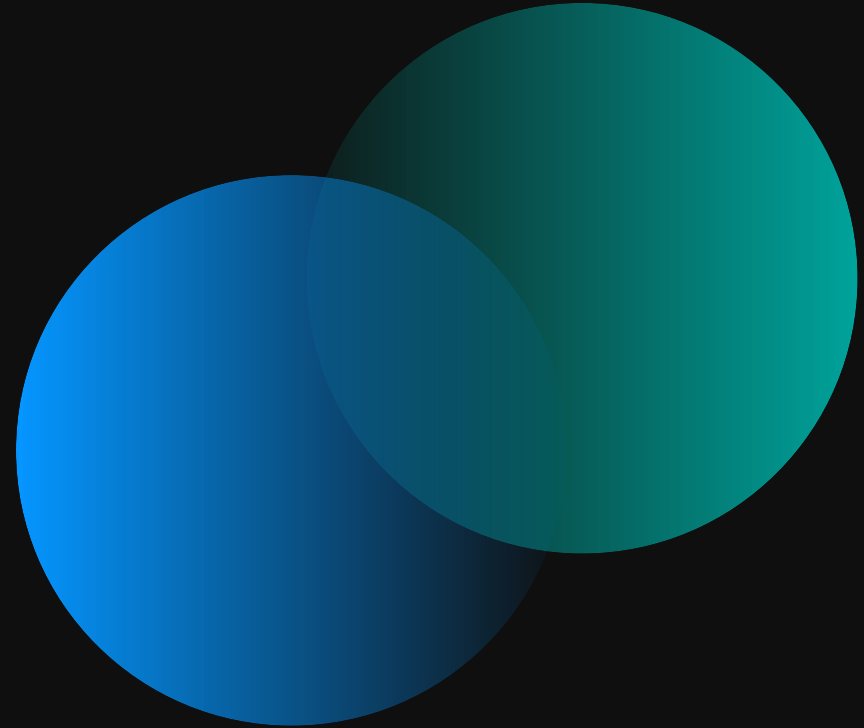


Container & Kubernetes HPC

Hands-on deep dive to
modern simulation,
AI & analytics



Why the HPC community loves Containers

And so should you!



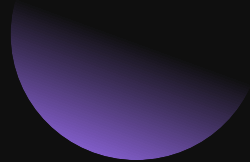
Mobility / Portability

- Compute resources are flexible
 - Laptop
 - Workstation
 - HPC
 - Cloud
- Encapsulated SW stack



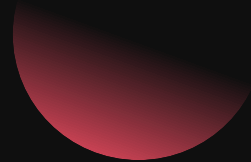
User-supplied applications

- Growing demand
- Helps with contradictory requirements
- "Works on my machine"
- Novel applications
 - Latest Ubuntu vs Enterprise Linux
- Legacy code
 - Fortran @CentOS5



Reproducibility

- Collaboration
- Passing on the SW environment
- Simplifies reproducibility
- Defined SW stack in container („immutability“)
- Standardization



Performance

- Very low overhead
- Performance close to bare metal
- Lots of research on the subject, including our own

Kubernetes (K8s)

If one says containers, he typically means Kubernetes

State-of-the-art Open-source system for **automating deployment, scaling, and management** of containerized applications - aka "Container Orchestration"

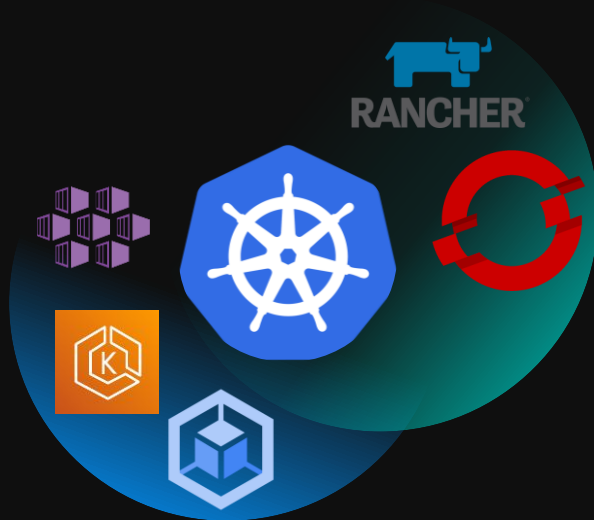
Commercial representatives

- Red Hat OpenShift, SUSE Rancher, ...

Also available at the Hyperscaler of your choice

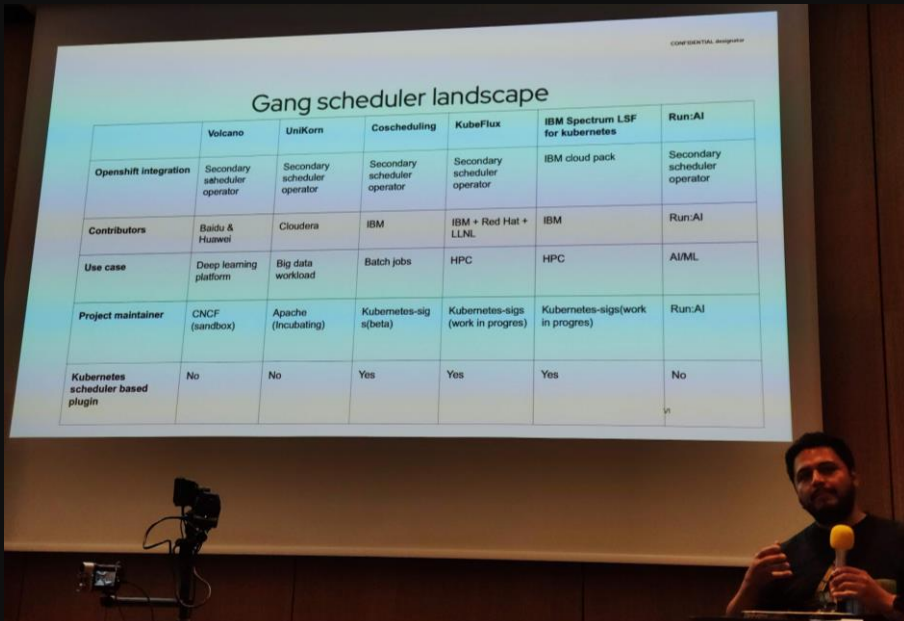
- AKS@Azure, EKS@AWS, GKE@GCP

However...



Kubernetes and HPC

Much harder than it sounds



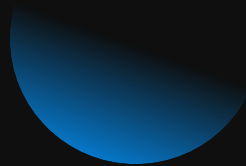
Source: ISC 2022 - High Performance Container Workshop - Kubernetes + HPC - Eduardo Arango

Kubernetes was primarily designed with **cloud native scalable services** in mind

- Typical HPC applications behave differently
 - No dynamic auto-scaling
 - Use of MPI
 - Requirements for HPC interconnects (Infiniband, ...)
 - ...
- **Ongoing efforts** to make *K8s HPC-aware*
 - Variety of gang schedulers for HPC/Batch/AI+ML
 - MPI Operator
- **Nimbix invested lots of effort** to bring the two worlds together

Platform Maturity

Nimbix Jarvice in numbers

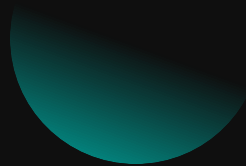


Started 2010

Before the rise of Docker +
Kubernetes

Much less to build on than
nowadays

Goal: Solution made for
HPC – for small and large
customers

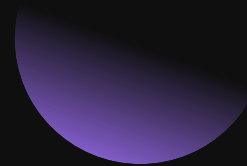


Development Effort

Up to 40 man years

Containerization,
Integration, Applications on
HyperHub

Goal: Containers as easy as
it gets



Intellectual Property

8 patents and counting

Invention	Patents
Dynamic creation and execution of containerized applications in cloud computing	U.S. Patent No. 9973566
Method and system for preemptible coprocessing	U.S. Patent No. 10235207
Reconfigurable cloud computing	U.S. Patent Nos. 8775576, 9094404, 9794343, 10389813
System and method for managing heterogeneous data for cloud computing applications	U.S. Patent No. 10142417
Dynamic creation and execution of containerized applications in cloud computing	U.S. Patent No. 10616312



Source: <https://atos.net/en/solutions/high-performance-computing-hpc/nimbix-patents>

Nimbix JARVICE™

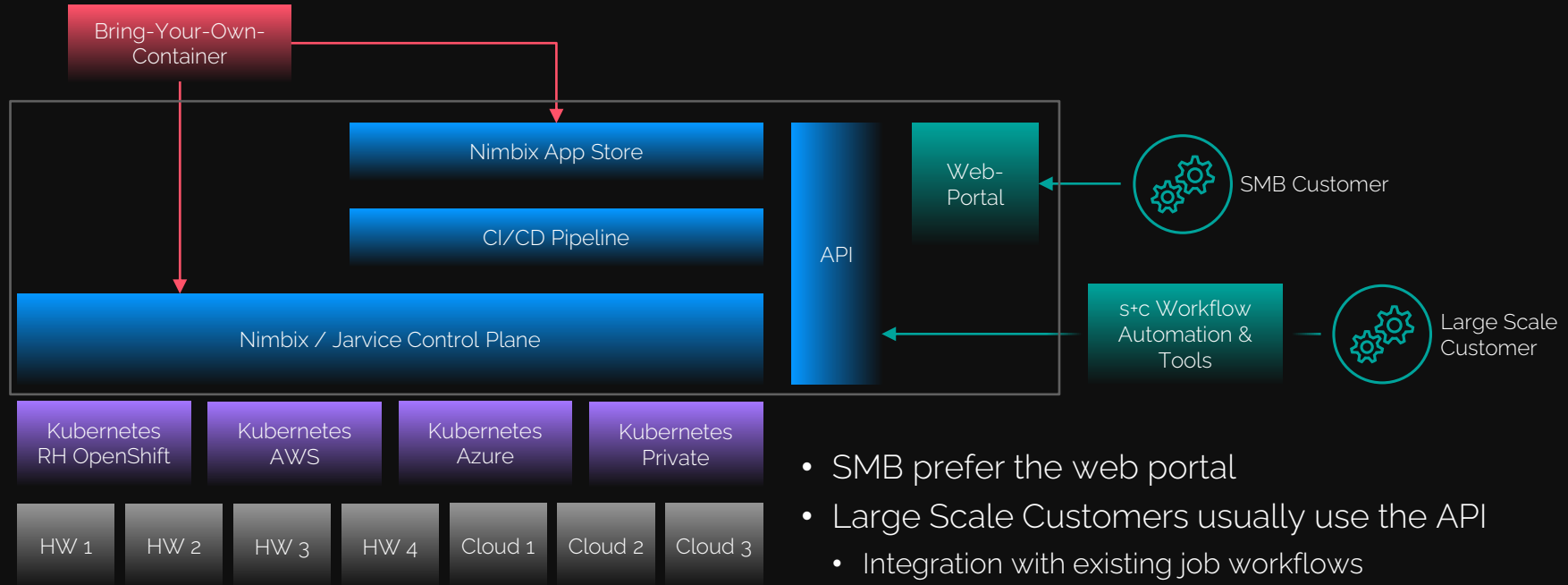
is a container-based solution for multi-site, multi-cloud HPC workloads with an integrated App marketplace and ready to use click-to-run workflows of typically used simulation applications and community AI tools.

Nimbix Supercomputing Suite

HPC in Kubernetes – simplified architecture

-  **Dedicated:** Bare Metal as-a-Service
-  **Federated:** Unifies all compute zones

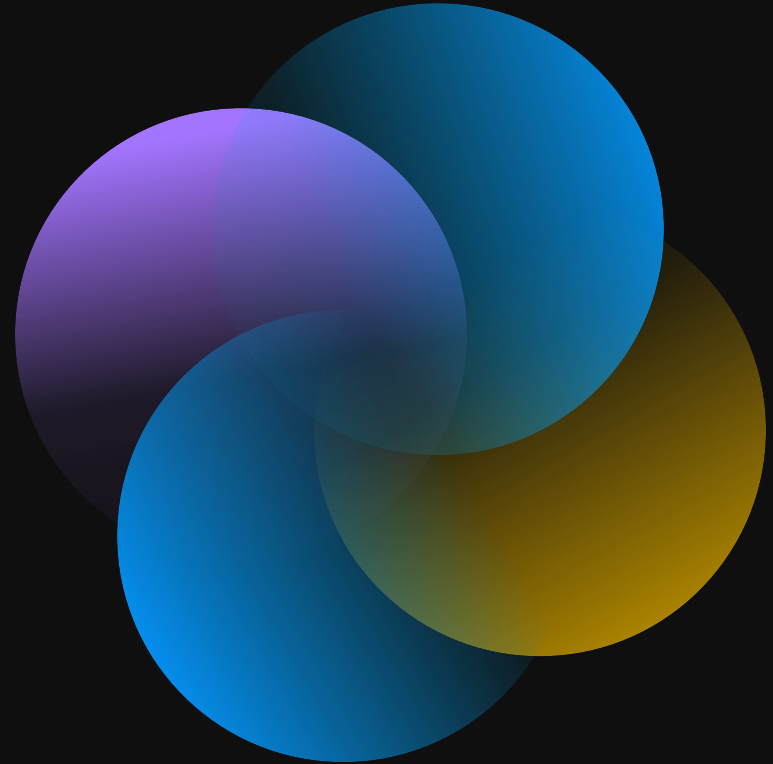
Nimbix enables HPC with containers on Kubernetes based infrastructure



- SMB prefer the web portal
- Large Scale Customers usually use the API
 - Integration with existing job workflows

Nimbix Demo

Online Version



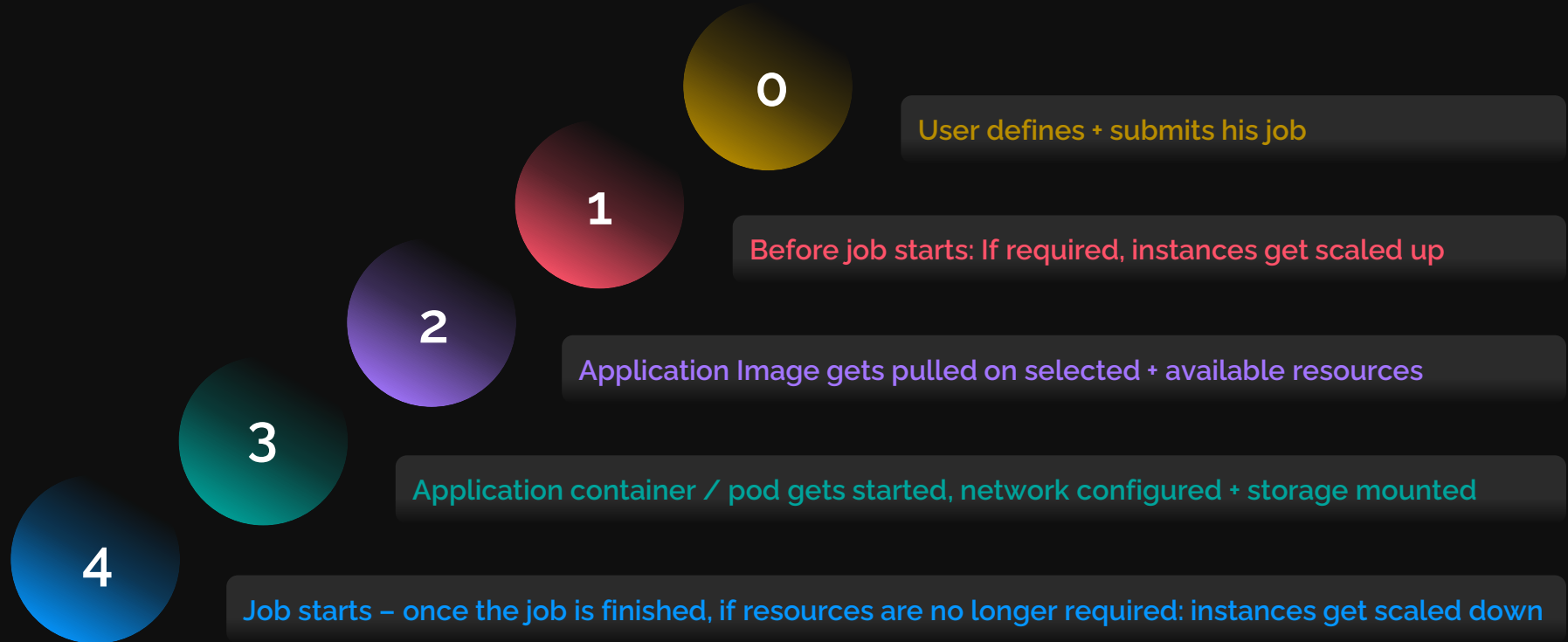
Content

Of Online Demo

- General Look & Feel, User Interface, HyperHub
- Filemanager
- Desktop Session
- Abaqus - Submit via Web Interface
- Abaqus - Submit via API
- OpenFOAM – motorBike example
- TensorFlow – moon_dataset

Behind the scenes

From job submit to running simulation



API Abaqus

Job Submit

```
jarvice@app-VirtualBox:~/demo$ find
.
./call.py
./json
./json/submit.json
jarvice@app-VirtualBox:~/demo$
```

```
jarvice@app-VirtualBox:~/demo$ cat json/submit.json
{
  "app": "jarvice-abaqus2021",
  "staging": false,
  "checkedout": false,
  "application": {
    "command": "Analysis",
    "geometry": "1770x834",
    "parameters": {
      "-inputfile": "/Abaqus-Job/abaqus_static.inp",
      "-version": "2021"
    }
  },
  "machine": {
    "type": "n3",
    "nodes": 1
  },
  "vault": {
    "name": "persistent",
    "readonly": false,
    "force": false
  },
  "user": {
    "username": "user",
    "apikey": "b24e3a1770cd4d9c9d6e961f77a02059ea3f8a00"
  }
}
```

API Abaqus Job Submit

```
jarvice@app-VirtualBox:~/demo$ ./call.py submit
### FQDN:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/submit

### Requested:
{'app': 'jarvice-abaqus2021', 'staging': False, 'checkedout': False, 'application': {'command': 'Analysis', 'geometry': '1770x834', 'parameters': {'-inputfile': '/Abaqus-Job/abaqus_static.inp', '-version': '2021'}}, 'machine': {'type': 'n3', 'nodes': 1}, 'vault': {'name': 'persistent', 'readonly': False, 'force': False}, 'user': {'username': 'root', 'apikey': 'b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00'}}

/usr/lib/python3/dist-packages/urllib3/connectionpool.py:999: InsecureRequestWarning: Unverified HTTPS request is being made to host 'gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io'. Adding certificate verification is strongly advised. See: https://urllib3.readthedocs.io/en/latest/advanced-usage.html#ssl-warnings
  warnings.warn(
### Payload:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/submit
{'User-Agent': 'python-requests/2.22.0', 'Accept-Encoding': 'gzip, deflate', 'Accept': '/*/*', 'Connection': 'keep-alive', 'Content-Length': '406', 'Content-Type': 'application/json'}
b'{"app": "jarvice-abaqus2021", "staging": false, "checkedout": false, "application": {"command": "Analysis", "geometry": "1770x834", "parameters": {"-inputfile": "/Abaqus-Job/abaqus_static.inp", "-version": "2021"}}, "machine": {"type": "n3", "nodes": 1}, "vault": {"name": "persistent", "readonly": false, "force": false}, "user": {"username": "root", "apikey": "b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00"}}'

### RAW:
< POST /api/jarvice/submit HTTP/1.1
< Host: gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io
< User-Agent: python-requests/2.22.0
< Accept-Encoding: gzip, deflate
< Accept: /*/*
< Connection: keep-alive
< Content-Length: 406
< Content-Type: application/json
<
< {"app": "jarvice-abaqus2021", "staging": false, "checkedout": false, "application": {"command": "Analysis", "geometry": "1770x834", "parameters": {"-inputfile": "/Abaqus-Job/abaqus_static.inp", "-version": "2021"}}, "machine": {"type": "n3", "nodes": 1}, "vault": {"name": "persistent", "readonly": false, "force": false}, "user": {"username": "root", "apikey": "b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00"}}
> HTTP/1.1 200 OK
> Content-Length: 84
> Content-Type: application/json
> Date: Thu, 17 Feb 2022 11:52:31 GMT
> Vary: Accept-Encoding
>
{
  "name": "20220217115229-6X7RW-jarvice-abaqus2021-root_s1",
  "number": 102
}

### Response:
{'name': '20220217115229-6X7RW-jarvice-abaqus2021-root_s1', 'number': 102}
jarvice@app-VirtualBox:~/demo$
```

API Abaqus

Query Status

```

jarvice@app-VirtualBox:~/demo$ ./call.py status
### FQDN:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/status

### Requested:
{'username': 'root', 'apikey': 'b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00', 'number': '102'}

/usr/lib/python3/dist-packages/urllib3/connectionpool.py:999: InsecureRequestWarning: Unverified HTTPS request is being made to host 'gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io'. Adding certificate verification is strongly advised. See: https://urllib3.readthedocs.io/en/latest/advanced-usage.html#ssl-warnings
  warnings.warn(
### Payload:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/status?username=root&apikey=b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00&number=102
{'User-Agent': 'python-requests/2.22.0', 'Accept-Encoding': 'gzip, deflate', 'Accept': '/*/*', 'Connection': 'keep-alive'}
None

### RAW:
< GET /api/jarvice/status?username=root&apikey=b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00&number=102 HTTP/1.1
< Host: gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io
< User-Agent: python-requests/2.22.0
< Accept-Encoding: gzip, deflate
< Accept: /*/*
< Connection: keep-alive
<
> HTTP/1.1 200 OK
> Content-Length: 360
> Content-Type: application/json
> Date: Thu, 17 Feb 2022 12:00:15 GMT
> Vary: Accept-Encoding
>
{
  "102": {
    "job_name": "20220217115229-6X7RW-jarvice-abaqus2021-root_s1",
    "job_status": "COMPLETED",
    "job_start_time": 1645099072,
    "job_end_time": 1645099403,
    "job_submit_time": 1645090751,
    "job_application": "jarvice-abaqus2021",
    "job_command": "Analysis",
    "job_walltime": "00:05:31"
  }
}

### Response:
[{'102': {'job_name': '20220217115229-6X7RW-jarvice-abaqus2021-root_s1', 'job_status': 'COMPLETED', 'job_start_time': 1645099072, 'job_end_time': 1645099403, 'job_submit_time': 1645090751, 'job_application': 'jarvice-abaqus2021', 'job_command': 'Analysis', 'job_walltime': '00:05:31'}}]
jarvice@app-VirtualBox:~/demo$
    
```

1:00 pm –
1:15 pm

Welcome

Matthias Schempp, Vorstand / Head of Atos science + computing

1:15 pm –
2:00 pm

HPC Cloud & As a Service - Key to flexible high-end IT resources or insecure cost-trap?

Marcus Camen, Chief Technology Officer

2:00 pm –
2:30 pm

Nimbix – Unified On Demand HPC As a Service

Steve Hebert, VP Global Head of Atos Nimbix HPC Cloud Competency Center

3:00 pm –
3:30 pm

Container & Kubernetes HPC - Hands-on deep dive to modern simulation, AI & analytics

Janina Dynowski, Head of science + computing Nimbix Cloud
Holger Gantikow, Chief HPC Landscape Architect

3:30 pm –
4:00 pm

Cloud Security - Is your engineering data at risk?

Peter Curth, Head of Atos Cloud Operations

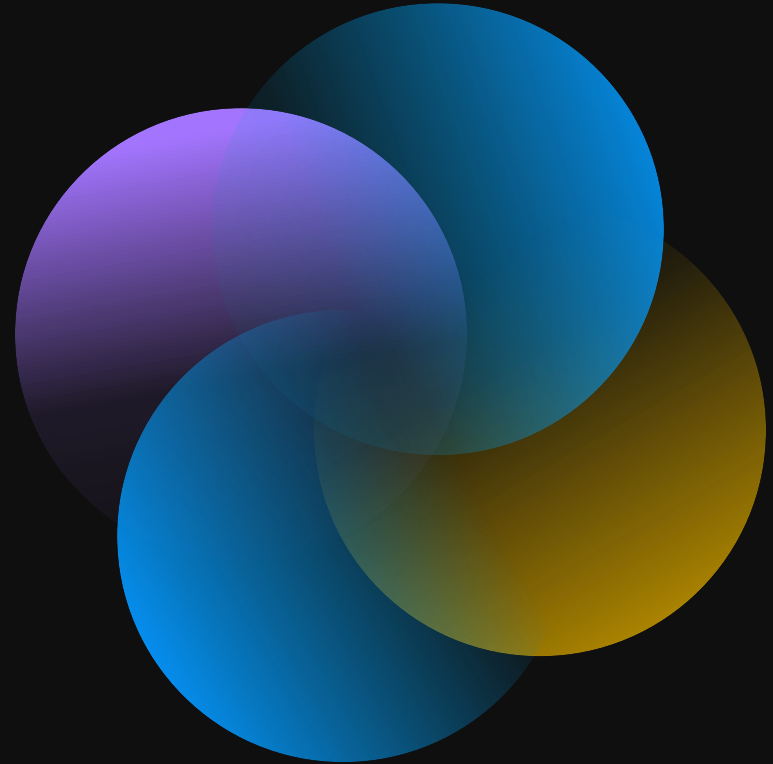
4:00 pm –
4:30 pm

Migration Cheat Sheet - Pitfalls and best practices

Open Panel

Nimbix Demo

Offline Version



First Steps

HyperHub

Where it all begins

The screenshot displays the NIMBIX HyperHub interface. The top navigation bar includes 'Compute', the instance name 'demo-nimbix-eu-eks-downstream-01', the user 'Demo User <demo01.nimbix@science-computing.de>', and the NIMBIX logo. A sidebar on the left contains 'Filter Applications' with options for 'License Included', 'File Manager', 'All Applications' (highlighted with a red circle), 'My Applications', 'Categories', and 'Vendors'. The main area features a grid of application tiles, each with a logo, name, version, and pricing. A red circle highlights the 'Compute' button in the top right sidebar. The 'Recent' section on the right lists applications like TensorFlow, OpenFOAM, JARVICE File Manager, and SIMULIA.

Application	Version	Price
ANSYS® Platform R19.2	ANSYS, Inc.	from \$1.00/hr + license
ANSYS® Structures 2019 R1	ANSYS, Inc.	from \$1.00/hr + license
ANSYS® Structures 2019 R2	ANSYS, Inc.	from \$1.00/hr + license
ANSYS® Structures 2019 R3	ANSYS, Inc.	from \$1.00/hr + license
ANSYS® Structures 2020 R1	ANSYS, Inc.	from \$1.00/hr + license
Ansys® Structures 2020 R2	ANSYS, Inc.	from \$1.00/hr + license
Ansys® Structures 2021 R1	ANSYS, Inc.	from \$1.00/hr + license
Ansys® Structures 2021 R2	ANSYS, Inc.	from \$1.00/hr + license
Ansys® Structures 2022 R1	ANSYS, Inc.	from \$1.00/hr + license
Ansys® Structures R19.2	ANSYS, Inc.	from \$1.00/hr + license
b<>com [SDR-HDR Converter]	b<>com / Accelize	
Blender® Blender Foundation		from \$1.00/hr
Canu Pipeline 1.5	Canu	
Canu Pipeline 1.6	Canu	
Canu Pipeline 1.7.1	Canu	from \$1.00/hr
Canu Pipeline 1.8	Canu	from \$1.00/hr
CentOS Linux desktop	Nimbix, Inc.	from \$1.00/hr
COMSOL® 5.4	COMSOL Inc.	from \$1.00/hr + license
COMSOL® 5.5	COMSOL Inc.	from \$1.00/hr + license
COMSOL® 5.6	COMSOL Inc.	from \$1.00/hr + license
CUDA 9.1 (Ubuntu)	NVIDIA	
FFmpeg	ffmpeg.org	from \$1.00/hr
GNU Octave	Nimbix, Inc.	
H2o3	h2o.ai	
H2o3 3.20.0.7	h2o.ai	from \$1.00/hr
HPC Test Environment	Nimbix, Inc.	
HPC Test Environment with Slurm	20.11.7 Nimbix, Inc.	from \$1.00/hr
JARVICE File Manager	Nimbix, Inc.	
Keysight ADS 2020 Update 2	Keysight Technologies, Inc.	from \$1.00/hr + license
Keysight ADS 2020 Update 1	Keysight Technologies, Inc.	from \$1.00/hr + license
Keysight EMPro 2020	Keysight Technologies, Inc.	from \$1.00/hr + license
Keysight EMPro 2021	Keysight Technologies, Inc.	from \$1.00/hr + license
MATLAB® R2020b	MathWorks	from \$1.00/hr + license
MATLAB® R2021a	MathWorks	from \$1.00/hr + license

Desktop Session

Desktop Session

Ubuntu Linux Desktop Session

The screenshot displays the Nimbix Compute application marketplace interface. At the top, the header shows 'Compute', the instance ID 'demo-nimbix-eu-eks-downstream-01', and the user 'Demo User2 <demo02.nimbix@science-computing.de>'. The Nimbix logo is in the top right corner.

On the left, a sidebar titled 'Filter Applications' includes options for 'License Included', 'File Manager', 'All Applications', 'My Applications', 'Categories', and 'Vendors'.

The main area features a search bar with 'Ubuntu' entered. Below the search bar, the text 'Search For "Ubuntu"' is displayed. The search results are shown as a grid of application cards:

- CUDA 9.1 (Ubuntu) NVIDIA**: Includes the NVIDIA logo.
- H2o3 3.20.0.7 Ubuntu16 x86_64 h2o.ai**: Includes the H2O.ai logo and a price of 'from \$1.00/hr'.
- nvidia/cuda 8.0-cudnn7-devel-ubuntu16.04 NVIDIA**: Includes the NVIDIA logo.
- Ubuntu Linux for ARM Nimbix, Inc.**: Includes the Ubuntu logo.
- Ubuntu Linux for Intel Nimbix, Inc.**: Includes the Ubuntu logo and a price of 'from \$1.00/hr'.

On the right side, a vertical navigation menu contains 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out'. Below this is a 'Recent' section showing previously used applications:

- OpenFOAM@ 7 OpenCFD Ltd**: Includes the OpenCFD logo and a price of 'from \$1.00/hr'.
- TensorFlow (CPU only) - Community version tensorflow.org**: Includes the TensorFlow logo.
- Ubuntu Linux for Intel Nimbix, Inc.**: Includes the Ubuntu logo.

Ubuntu Desktop Session

Select Server for traditional GUI session – Batch, Kiosk Mode also supported

The screenshot displays the Nimbix cloud management interface. On the left, a sidebar contains navigation options: 'Compute', 'Filter Applications', 'License Included', 'File Manager', 'All Applications', 'My Applications', 'Categories', and 'Vendors'. The main area features a window titled 'Ubuntu Linux for Intel From \$1.00/hr'. The window content shows a desktop environment with a red and orange background, a dock on the left, and a terminal window at the bottom. Below the desktop preview, there are three buttons: 'Batch', 'GUI', and 'Server'. On the right side of the interface, a 'NIMBIX' header is visible above a navigation menu with items: 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out'. Below the menu is a 'Recent' section listing applications like 'OpenFOAM® 7 OpenCFD Ltd' and 'TensorFlow (CPU only) - Community version', each with a price of 'from \$1.00/hr'.

Ubuntu Desktop Session

Scale your resources according to your demand

The screenshot displays the Nimbix interface for configuring a server session. The main window is titled "Ubuntu Linux for Intel" and "From \$1.00/hr". Below the title, there is a "Server" section with a description: "Launch a session with all boot services, including SSH (if installed). Connection address and credentials will appear in your web browser once available." The interface is divided into four tabs: "GENERAL", "OPTIONAL", "STORAGE", and "PREVIEW SUBMISSION". Under the "GENERAL" tab, the "Machine" section is visible. It includes a "Machine type" dropdown menu set to "aws m5a large 1 core 8 GB (CPU only) (n100-eu-m5a-large)". Below this, there is a "Cores" slider control. The slider is currently set to 1 core, with a price of \$1.00/hr. The slider range goes from 1 to 4 cores. Below the slider, it indicates "1 node, 6GB RAM". A green "SUBMIT" button is located at the bottom right of the configuration window. The background shows the Nimbix dashboard with a sidebar on the left containing "Filter Applications" (License Included, File Manager, All Applications, My Applications, Categories, Vendors) and a main area with "Compute", "Dashboard", "PushToCompute™", "Account", "About", "Log Out", and "Recent" sections. The "Recent" section lists "OpenFOAM® 7 OpenCFD Ltd" and "TensorFlow (CPU only) - Community version tensorflow.org".

Ubuntu Desktop Session

Utilizing 2 cores for this basic example

The screenshot displays the Nimbix console interface for configuring a server session. The main window is titled "Ubuntu Linux for Intel" and shows the "Server" configuration page. The "Machine" section is expanded, showing the selected machine type: "aws m5a large 1 core 8 GB (CPU only) (n100-eu-m5a-large)". Below this, a slider for "Cores" is set to 2, with a price of \$2.00/hr. The interface includes a sidebar with navigation options like "Compute", "Filter Applications", and "Recent".

Server Configuration Details:

- Machine type:** aws m5a large 1 core 8 GB (CPU only) (n100-eu-m5a-large)
- Cores:** 2 (Slider range: 1 to 4)
- Price:** \$2.00/hr
- Additional Info:** 2 nodes, 12GB RAM

Navigation and Sidebar:

- Compute:** License Included, File Manager, All Applications, My Applications, Categories, Vendors
- Recent:** OpenFOAM® 7 (OpenCFD Ltd), TensorFlow (CPU only) - Community version, Ubuntu Linux for Intel

Ubuntu Desktop Session

[Click here to connect!](#)

The screenshot shows the Nimbix dashboard interface. At the top, the navigation bar includes 'Dashboard', the instance name 'demo-nimbix-eu-eks-downstream-01', the user 'Demo User2 <demo02.nimbix@science-computing.de>', and the NIMBIX logo. The left sidebar contains sections for 'Jobs' (Current, History, By Label, Reports) and 'Stats' (My stats, JOBS RUN: 5, COMPUTE \$, 08:14:43, demo02.nimbix@science-computing.de). The main content area is titled 'Current' and displays details for a job: 'Ubuntu Linux for Intel(293)' with a status of 'Processing'. A red circle highlights the text 'Click here to connect' at the bottom of the job details. The right sidebar shows a 'Compute' section with a 'Dashboard' button and a 'Recent' section listing 'OpenFOAM® 7' and 'TensorFlow (CPU only) - Community version'.

Desktop Session

3, 2, 1 – Start Working

The screenshot shows a desktop environment with two windows. The top-left window is a terminal titled "Terminal - nimbix@jarvice-job-123-5bds6: --" with a menu bar (File, Edit, View, Terminal, Tabs, Help). It displays two ASCII art figures: a robot on the left and a taller robot on the right. The top-right window is a Mozilla Firefox browser titled "IT services for complex computer environments - Atos". The address bar shows "https://atos.net/de/deutschland/sc". The page content includes the Atos logo, navigation links (Industries, Solutions, Insights and News, About us), and a main banner with the text "science + computing" and "IT services for complex computer environments". A "scVenus Customer Portal" button is visible at the bottom of the browser window. The desktop taskbar at the bottom shows a taskbar icon for "N" and two open windows: "IT services for comple..." and "Terminal - nimbix@jar...".

Jarvice XE provides 2D/3D remote visualization relying on openVNC/OpenGL/libglvnd
Full screen in-browser view & live thumbnails
Can leverage EGL acceleration for GPU cards

Roadmap: alternative using Atos eXtrem Remote Visualizer solution.

File Manager

You can upload and download your data at any time whether you are running jobs or not. Transfer data on Nimbix:

- Using Vaults over HTTPS (recommended)
- Secure FTP protocol (SFTP)
- Nimbix File Manager

File Manager

Start small

The screenshot displays the JARVICE File Manager interface. At the top, it says "JARVICE File Manager" with a close button. Below this is the "File Manager" title and a subtitle: "Launch this service to upload and download files via your web browser." There are four tabs: "GENERAL", "OPTIONAL", "STORAGE", and "PREVIEW SUBMISSION".

The "Machine" section features a dropdown menu for "Machine type" set to "aws m5a large 1 core 8 GB (CPU only) (n100-eu-m5a-large)". Below this is a slider for "Cores" ranging from 1 to 4, with a current value of 1. The price is listed as "\$1.00/hr" and "1 node, 6GB RAM". A green "SUBMIT" button is located at the bottom right of the configuration area.

The background shows a sidebar with navigation options: "Compute", "Filter Applications", "License Included", "File Manager", "All Applications", "My Applications", "Categories", and "Vendors". The main area displays application cards for "Electronics 2021 R2 ANSYS, Inc.", "Electronics 2022 R1 ANSYS, Inc.", "Electronics R19.2 ANSYS, Inc.", "16 ANSYS, Inc.", "ANSYS® Fluent Benchmarks R19.2 ANSYS, Inc.", "ANSYS® Fluids 2019 R1 ANSYS, Inc.", "ANSYS® Fluids 2019 R2 ANSYS, Inc.", "ANSYS® Fluids 2019 R3 ANSYS, Inc.", "TensorFlow (CPU only) - Community version tensorflow.org", and "Ubuntu Linux for Intel".

On the right side, there is a "NIMBIX" header and a navigation menu: "Compute", "Dashboard", "PushToCompute™", "Account", "About", "Log Out", and a "Recent" section listing "OpenFOAM® 7 OpenCFD Ltd" and "TensorFlow (CPU only) - Community version tensorflow.org".

File Manager

File Manager gets *queued*...

The screenshot displays the NIMBIX dashboard interface. At the top, the navigation bar shows 'Dashboard', the cluster name 'demo-nimbix-eu-eks-downstream-01', the user 'Demo User2 <demo02.nimbix@science-computing.de>', and the NIMBIX logo. The left sidebar contains sections for 'Jobs' (Current, History, By Label, Reports) and 'Stats' (My stats, JOBS RUN: 5, COMPUTE \$, 08:14:43, demo02.nimbix@science-computing.de). The main content area is titled 'Current' and features a job card for 'JARVICE File Manager(292)' with a status of 'Queued...' and 'x 1 node'. A 'Recent' list on the right shows 'OpenFOAM® 7' by 'OpenCFD Ltd'. An Outlook notification window in the bottom right corner displays the 'JARVICE Job Status' message: 'Your Job has been Submitted for Processing. Caution! External email. Do not open attachments or click links, unless this e...'. The notification window includes icons for 'Löschen', 'Kennzeichnen', and 'Schließen'.

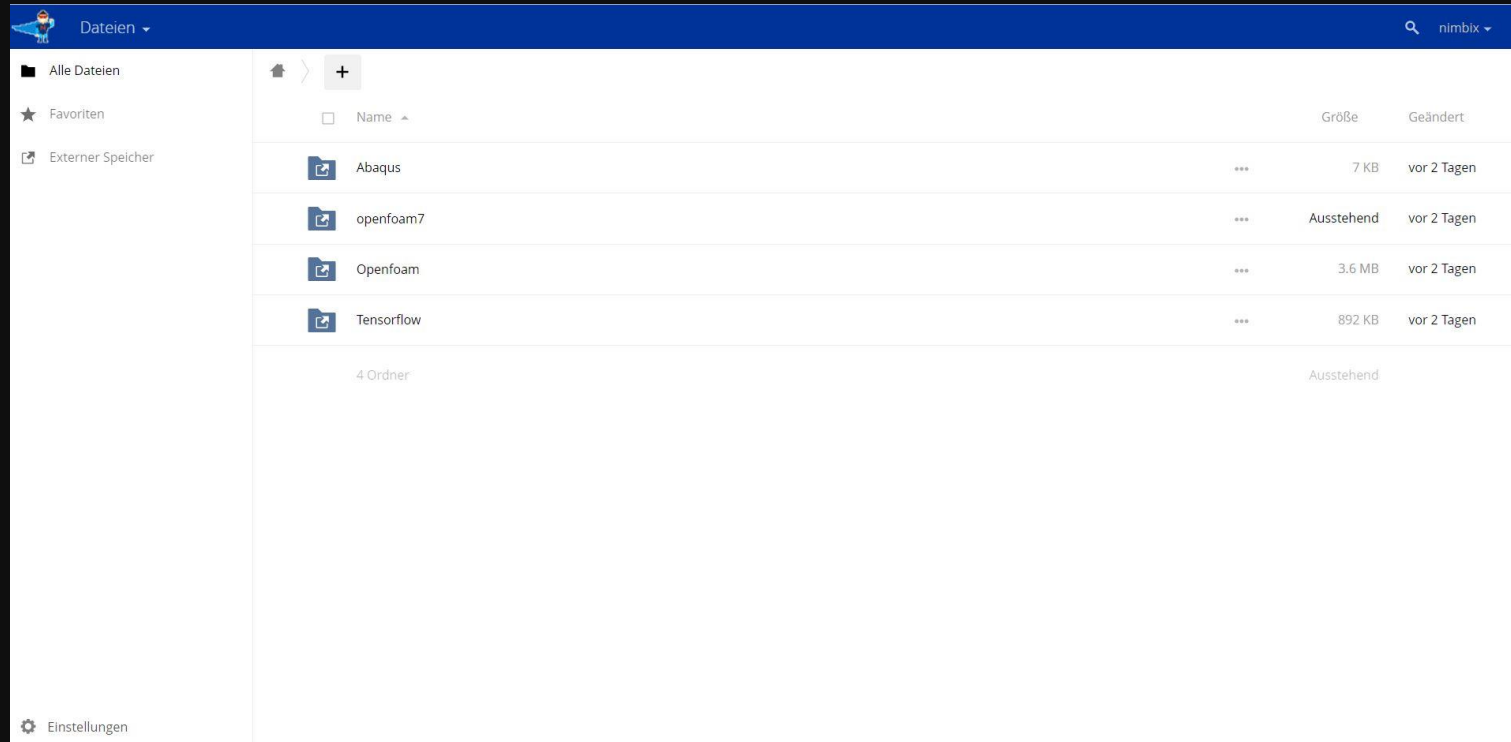
File Manager

... and is *ready to connect*

The screenshot displays the Nimbix dashboard interface. At the top, the navigation bar includes 'Dashboard', the user identifier 'demo-nimbix-eu-eks-downstream-01', the user name 'Demo User2 <demo02.nimbix@science-computing.de>', and the NIMBIX logo. The left sidebar contains a 'Jobs' section with 'Current', 'History', 'By Label', and 'Reports' options, and a 'Stats' section with a dropdown menu for 'My stats' and a 'JOBS RUN' counter showing '5'. The main content area is titled 'Current' and features a job card for 'JARVICE File Manager(292)'. The job card includes a command 'filemanager', status 'Processing', utilization '-', and address 'none'. It also shows a progress bar, a timer '00:00', and 'x 1 node'. A 'Click to copy password to clipboard' link is present. Below the job card, a large 'Click here to connect' button is visible. The right sidebar contains a navigation menu with 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out', followed by a 'Recent' section listing 'OpenFOAM® 7 OpenCFD Ltd' (from \$1.00/hr), 'TensorFlow (CPU only) - Community version tensorflow.org', and 'Ubuntu Linux for Intel'.

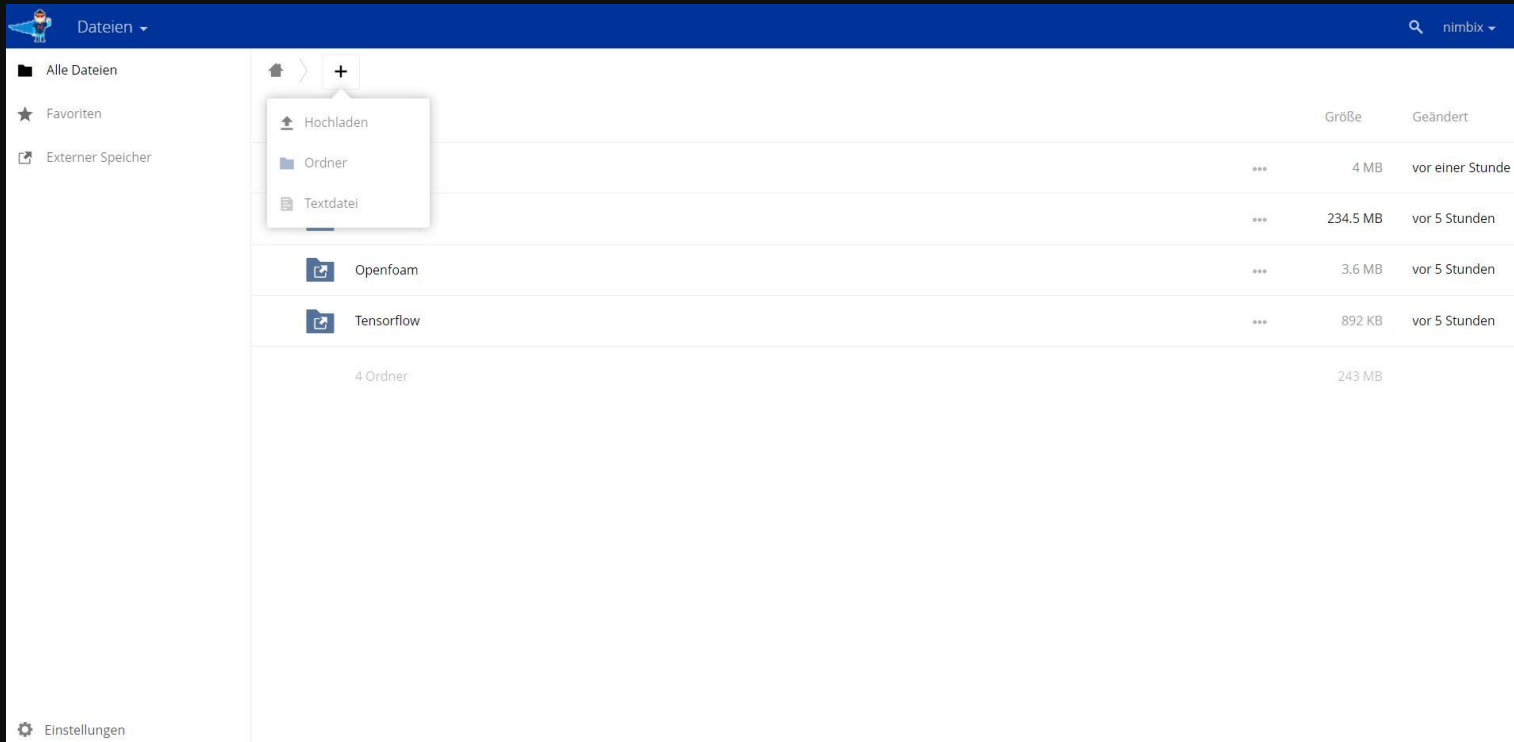
File Manager

Familiar look and feel



File Manager

Familiar look and feel



Abaqus

Abaqus

Application Selector

≡ Compute
demo-nimbix-eu-eks-downstream-01 ▾
Demo User <demo01.nimbix@science-computing.de>
NIMBIX

Filter Applications

🔑 License Included

📁 File Manager

☰ All Applications

👤 My Applications

🗑 Categories ▾

🗑 Vendors ▾

Search For "Abaqus"

Simcenter™ STAR-CCM+™ / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 13 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2019.1.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2019.2 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2019.2 / Abaqus CoSim SIEMENS / 3DS
Simcenter™ STAR-CCM+™ 2019.2.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2019.3 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2019.3.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2020.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2020.1.1 / Abaqus CoSim SIEMENS / 3DS
Simcenter™ STAR-CCM+™ 2020.2 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2020.2.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2020.3.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2021.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2021.1.1 / Abaqus CoSim SIEMENS / 3DS
Simcenter™ STAR-CCM+™ 2021.2.1 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2021.3 / Abaqus CoSim SIEMENS / 3DS	Simcenter™ STAR-CCM+™ 2021.3.1 / Abaqus CoSim SIEMENS / 3DS	SIMULIA® Abaqus Unified FEA 2018.HF6 Dassault Systems	SIMULIA® Abaqus Unified FEA 2019 Dassault Systems
SIMULIA® Abaqus Unified FEA 2020 Dassault Systems	SIMULIA® Abaqus Unified FEA 2021 Dassault Systems	SIMULIA® Abaqus Unified FEA 2022 Dassault Systems		

Compute

Dashboard

PushToCompute™

Account

About

Log Out

Recent

TensorFlow (CPU only) - Community version tensorflow.org

OpenFOAM® 7 OpenCFD Ltd

JARVICE File Manager Nimbix, inc.

SIMULIA®

Abaqus

Let's start a job!

The screenshot displays the SIMULIA® Abaqus Unified FEA 2021 software interface. The main window shows a 3D model of a sailboat. A license agreement window is open in the foreground, titled 'AbaqusCAE 2017'. The license agreement text includes: 'AbaqusCAE 2017', 'Based on 2016_20_27_21_24_19_130036', '© Dassault Systèmes, 2016', 'The Abaqus Software is a product of Dassault Systèmes Simulia Corp., 300 Hill Street, Providence, RI, USA. It is available only under license from Dassault Systèmes or its subsidiaries and may be used or reproduced only in accordance with the terms of such license.', 'The Abaqus Software is available only under license from Dassault Systèmes or its subsidiaries and may be used or reproduced only in accordance with the terms of such license.', 'Abaqus, the AED logo, SIMULIA, CATIA, and Unified FEA are trademarks or registered trademarks of Dassault Systèmes or its subsidiaries in the United States and/or other countries.', 'Other company, product, and service names may be trademarks or service marks of their respective owners. For additional information concerning trademarks, copyrights, and patents, see the legal notices in the documentation and the Program Credits for the release.', 'The Abaqus Software and its documentation include processes under U.S. Patent 6,764,818 and 6,842,012 and 6,817,770. Copyright 2016 by its subsidiaries may also have other patents or pending patent applications, trademarks, copyrights, or other intellectual property rights covering Abaqus Software and/or its documentation. No license of such patents, trademarks, copyrights, or other intellectual property rights is provided as support material in this document pursuant to a written license agreement from Dassault Systèmes or its subsidiaries.', 'File Name: 16', 'AbaqusCAE 2017 - [Model Database: Home\simulia\downloads\FEM_Plasticity_Characteristics_Coatings.cae [Manager: 1]]', 'Model Database', 'Models (2)', 'Ball Coating', 'Ball Spring', 'Copper Coating Millen', 'Copper Coating Millen', 'Clear or Copper Ink', 'Anisotropic', 'Jobs (2)', 'Adaptivity Processes', 'Convergence', 'Optimization Processes', 'SIMULIA® Abaqus Unified FEA 2021', 'Dassault Systèmes', 'The Abaqus Unified FEA product suite offers powerful and complete solutions for both routine and sophisticated engineering problems covering a vast spectrum of industrial applications', 'Abaqus Standard/Explicit', 'Abaqus CAE', 'SIMULIA® Abaqus Unified FEA 2020', 'Dassault Systèmes', 'SIMULIA® Abaqus Unified FEA 2021', 'Dassault Systèmes', 'SIMULIA® Abaqus Unified FEA 2022', 'Dassault Systèmes', 'SIMULIA® Abaqus Unified FEA 2019', 'Dassault Systèmes'

SIMULIA®
Abaqus Unified
FEA 2020
Dassault
Systèmes

SIMULIA®
Abaqus Unified
FEA 2021
Dassault
Systèmes

SIMULIA®
Abaqus Unified
FEA 2022
Dassault
Systèmes

The NIMBIX dashboard sidebar contains the following elements:

- Compute
- Dashboard
- PushToCompute™
- Account
- Administration
- About
- Log Out
- Recent
 - SIMULIA® Abaqus Unified FEA 2021 Dassault Systèmes
 - JARVICE File Manager Nimbix, Inc.
 - SIMULIA® Abaqus Unified FEA 2019 Dassault Systèmes

Abaqus

Insert input data, Resource selection – will be *scaled up on demand*

The screenshot displays the SIMULIA® Abaqus Unified FEA 2021 configuration window. The window is titled "Abaqus Standard/Explicit" and includes a subtitle "Run a Standard or Explicit analysis on an input file". It features four tabs: "GENERAL", "OPTIONAL", "STORAGE", and "PREVIEW SUBMISSION". The "GENERAL" tab is selected and circled in red. Under the "Machine" section, the "Machine type" is set to "DEMO; 7 core, 32GB RAM (CPU Only) t2.2xlarge (n4)". The "Cores" section shows a slider set to 14, with a range from 7 to 1792 and a label "2 nodes, 60GB RAM". The "Parameters" section has the "Input file (*.inp)" field set to "/Abaqus-Job/abaqus_static.inp" and circled in red. The "Version" is set to "2021". A green "SUBMIT" button is located at the bottom right of the window. The background shows a dashboard with various application tiles, including "SIMULIA® Abaqus Unified FEA 2020", "SIMULIA® Abaqus Unified FEA 2021", "SIMULIA® Abaqus Unified FEA 2022", and "SIMULIA® Abaqus Unified FEA 2019".

Abaqus

Job starts *processing*

Dashboard demo-nimbix-eu-eks-downstream-01 Demo User <demo01.nimbix@science-computing.de> NIMBIX

Jobs

- Current
- History
- By Label
- Reports

Stats

My stats

JOBS RUN




8

COMPUTE \$

01:45:34

demo01.nimbix@science-computing.de

Current

 SIMULIA® Abaqus Unified FEA 2022(364)   00 00 x 2 nodes

Command Analysis

Status **Processing**

Utilization CPU: 0% MEM: 0.07 of 320GB

Address none

Click to copy password to clipboard

```
INIT[1]: Waiting for job configuration before executing application...
INIT[1]: hostname: jarvice-job-364-cms94
INIT[1]: Configuring system to start JARVICE ping-based health check
INIT[S7]: HOME=/home/nimbix

#####
INFO: Using license server: http://110150.lic.nimbix.net/
Parallel workers ready in 24 seconds
Generating SSH2 RSA host key: D[60G][0:32m OK D[0:39m]
Generating SSH2 ECDSA host key: D[60G][0:32m OK D[0:39m]
Generating SSH2 ED25519 host key: D[60G][0:32m OK D[0:39m]
INFO: Running Abaqus with input: abaqus_static.inp
INFO: Job label: abaqus_static-20220615073629-XS2JQ-jarvice-abaqus2022-demo_user
Analysis initiated from SIMULIA established products
Abaqus JOB abaqus_static-20220615073629-XS2JQ-jarvice-abaqus2022-demo_user_1
Abaqus 2022
```

Compute

Dashboard





PushToCompute™

Account

About

Log Out

Recent

- TensorFlow (CPU only) - Community version tensorflow.org 
- OpenFOAM® 7 OpenCFD Ltd  from \$1.00/hr
- JARVICE File Manager Nimbix, Inc. 
- SIMULIA® Abaqus Unified FEA 2022 Dassault Systems  from \$1.00/hr + license

Abaqus

Job completed

Dashboard demo-nimbix-eu-eks-downstream-01 Demo User <demo01.nimbix@science-computing.de> NIMBIX

Jobs

- Current
- History
- By Label
- Reports

Stats

My stats

JOBS RUN


9

COMPUTE \$

01:56:20

demo01.nimbix@science-computing.de

Recent

 Job No: 364 SIMULIA® Abaqus Unified FEA 2022 : Analysis Completed

Start time: 2022-06-15 09:43:38


Stop time: 2022-06-15 09:49:01


Output:


```
THE ABOVE EQUILIBRIUM EQUATIONS HAVE CONVERGED.
ITERATION SUMMARY FOR THE INCREMENT:  3 TOTAL ITERATIONS, OF WHICH
0 ARE SEVERE DISCONTINUITY ITERATIONS AND 3 ARE EQUILIBRIUM ITERATIONS
TIME INCREMENT COMPLETED  1.00  , FRACTION OF STEP COMPLETED  1.00
STEP TIME COMPLETED  1.00  , TOTAL TIME COMPLETED  1.00
RESTART INFORMATION WRITTEN IN STEP  1 AFTER INCREMENT  1
THE ANALYSIS HAS BEEN COMPLETED
ANALYSIS SUMMARY:
TOTAL OF
1 INCREMENTS
0 CYCLES IN AUTOMATIC INCREMENTATION
3 ITERATIONS INCLUDING CONTACT ITERATIONS IF PRESENT
3 PASSES THROUGH THE EQUATION SOLVER OF WHICH
3 INVOLVE MATRIX DECOMPOSITION, INCLUDING
0 DECOMPOSITION(S) OF THE MASS MATRIX
1 REORDERING OF EQUATIONS TO MINIMIZE WAVEFRONT
0 ADDITIONAL RESIDUAL EVALUATIONS FOR LINE SEARCHES
0 ADDITIONAL OPERATOR EVALUATIONS FOR LINE SEARCHES
0 WARNING MESSAGES DURING USER INPUT PROCESSING
0 WARNING MESSAGES DURING ANALYSIS
0 ANALYSIS WARNINGS ARE NUMERICAL PROBLEM MESSAGES
0 ANALYSIS WARNINGS ARE NEGATIVE EIGENVALUE MESSAGES
0 ERROR MESSAGES


JOB TIME SUMMARY
USER TIME (SEC) = 12.240
```

Recent

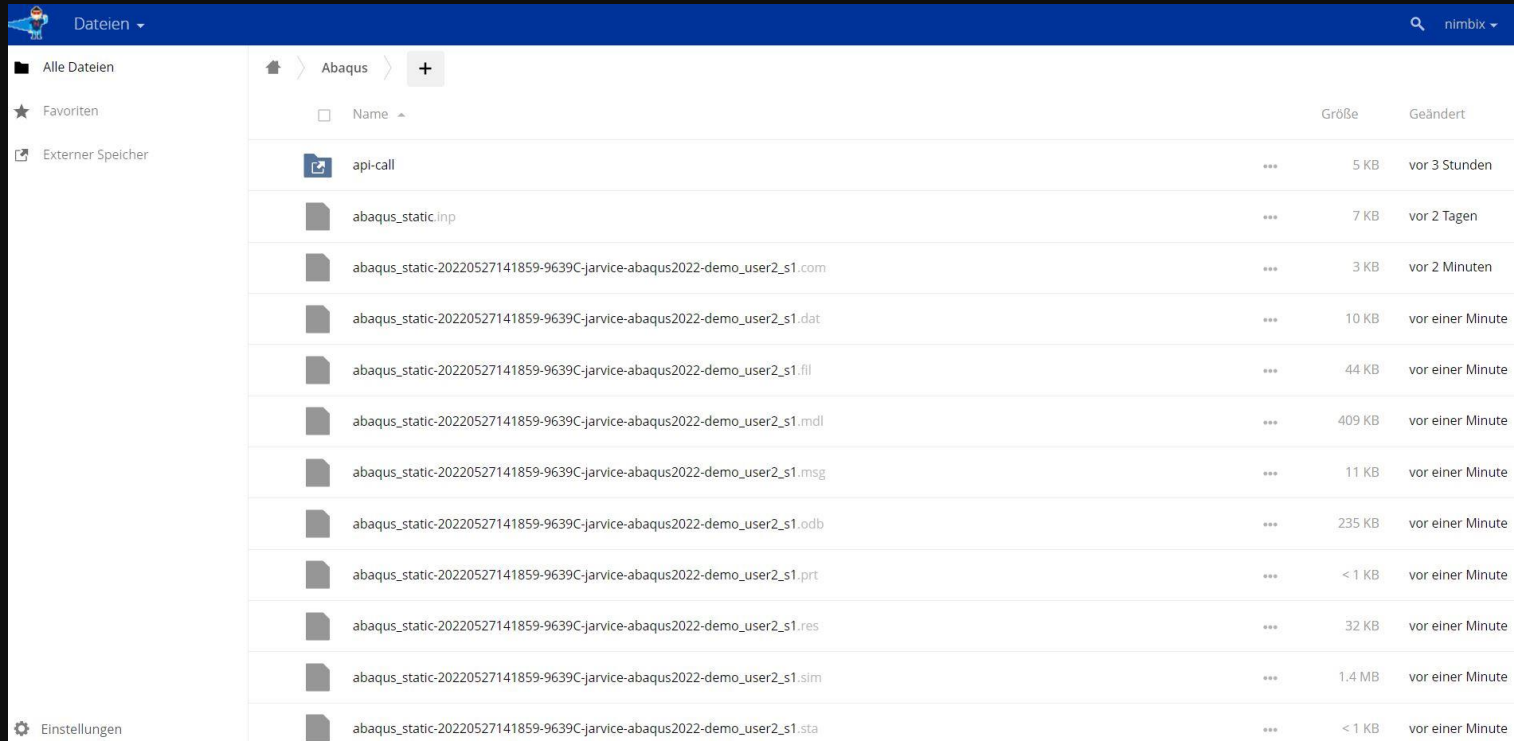
SIMULIA® Abaqus Unified FEA 2022 Dassault Systems 
from \$1.00/hr + license

TensorFlow (CPU only) - Community version tensorflow.org 

OpenFOAM® 7 OpenCFD Ltd 
from \$1.00/hr

JARVICE File Manager Nimbix, Inc. 

Abaqus Job Output Files



The screenshot shows a file explorer window with a blue header bar. The title bar reads 'Dateien' and 'nimbix'. The left sidebar contains 'Alle Dateien', 'Favoriten', and 'Externer Speicher'. The main area shows a folder named 'Abaqus' containing a list of files. The files are sorted by name and include an 'api-call' folder and several files with names starting with 'abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.'. The columns are 'Name', 'Größe', and 'Geändert'.

Name	Größe	Geändert
api-call	5 KB	vor 3 Stunden
abaqus_static.inp	7 KB	vor 2 Tagen
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.com	3 KB	vor 2 Minuten
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.dat	10 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.fil	44 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.mdl	409 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.msg	11 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.odb	235 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.prt	< 1 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.res	32 KB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.sim	1.4 MB	vor einer Minute
abaqus_static-20220527141859-9639C-jarvice-abaqus2022-demo_user2_s1.sta	< 1 KB	vor einer Minute

Autoscale

Before, Autoscale, After

Instances (6) Info

Search

gdc X Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IP...	Public IPv4 ...
gdc-jarvice-eu-jxedockerbuild-eks...	i-07f5d3c4d20aff5f7	Running	t2.2xlarge	2/2 checks passed	No alarms	eu-central-1a	ec2-35-157...	35.157.218.12
gdc-jarvice-eu-default-eks_asg	i-0ecc5ff720fe042fa	Running	t2.small	2/2 checks passed	No alarms	eu-central-1a	ec2-3-124...	3.124.209.213
gdc-jarvice-eu-jxesystem-eks_asg	i-068954a9c27785ae7	Running	m5.4xlarge	2/2 checks passed	No alarms	eu-central-1a	ec2-54-93...	54.93.116.157
gdc-jarvice-eu-jxesystem-eks_asg	i-00568797e803426eb	Running	m5.4xlarge	2/2 checks passed	No alarms	eu-central-1b	ec2-52-58...	52.58.74.60
gdc-jarvice-eu-jxecompute00-eks...	i-081b7eee8f0732145	Running	t2.2xlarge	2/2 checks passed	No alarms	eu-central-1b	ec2-3-120...	3.120.206.249
gdc-jarvice-eu-default-eks_asg	i-0558933b148e67d28	Running	t2.small	2/2 checks passed	No alarms	eu-central-1b	ec2-3-120...	3.120.225.3

Events:

Type	Reason	Age	From	Message
Warning	FailedScheduling	<unknown>	jarvice-system	[jarvice-system-jobs/100]: not enough nodes available (up to 1 needed)
Normal	TriggeredScaleUp	93s	cluster-autoscaler	pod triggered scale-up: [{"gdc-jarvice-eu-jxecompute002022011116352224400000027 1->2 (max: 16)}]

Instances (7) Info

Search

gdc X Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IP...	Public IPv4 ...
gdc-jarvice-eu-jxedockerbuild-eks...	i-07f5d3c4d20aff5f7	Running	t2.2xlarge	2/2 checks passed	No alarms	eu-central-1a	ec2-35-157...	35.157.218.12
gdc-jarvice-eu-default-eks_asg	i-0ecc5ff720fe042fa	Running	t2.small	2/2 checks passed	No alarms	eu-central-1a	ec2-3-124...	3.124.209.213
gdc-jarvice-eu-jxesystem-eks_asg	i-068954a9c27785ae7	Running	m5.4xlarge	2/2 checks passed	No alarms	eu-central-1a	ec2-54-93...	54.93.116.157
gdc-jarvice-eu-jxecompute00-eks...	i-0206492a2867ab021	Running	t2.2xlarge	2/2 checks passed	No alarms	eu-central-1a	ec2-3-64-0...	3.64.8.144
gdc-jarvice-eu-jxesystem-eks_asg	i-00568797e803426eb	Running	m5.4xlarge	2/2 checks passed	No alarms	eu-central-1b	ec2-52-58...	52.58.74.60
gdc-jarvice-eu-jxecompute00-eks...	i-081b7eee8f0732145	Running	t2.2xlarge	2/2 checks passed	No alarms	eu-central-1b	ec2-3-120...	3.120.206.249
gdc-jarvice-eu-default-eks_asg	i-0558933b148e67d28	Running	t2.small	2/2 checks passed	No alarms	eu-central-1b	ec2-3-120...	3.120.225.3

API

API Abaqus

Job Submit

```
jarvice@app-VirtualBox:~/demo$ find
.
./call.py
./json
./json/submit.json
jarvice@app-VirtualBox:~/demo$
```

```
jarvice@app-VirtualBox:~/demo$ cat json/submit.json
{
  "app": "jarvice-abaqus2021",
  "staging": false,
  "checkedout": false,
  "application": {
    "command": "Analysis",
    "geometry": "1770x834",
    "parameters": {
      "-inputfile": "/Abaqus-Job/abaqus_static.inp",
      "-version": "2021"
    }
  },
  "machine": {
    "type": "n3",
    "nodes": 1
  },
  "vault": {
    "name": "persistent",
    "readonly": false,
    "force": false
  },
  "user": {
    "username": "user",
    "apikey": "b24e3a1770cd4d9c9d6e961f77a02059ea3f8a00"
  }
}
```


API Abaqus Job Submit

```
jarvice@app-VirtualBox:~/demo$ ./call.py submit
### FQDN:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/submit

### Requested:
{'app': 'jarvice-abaqus2021', 'staging': False, 'checkedout': False, 'application': {'command': 'Analysis', 'geometry': '1770x834', 'parameters': {'-inputfile': '/Abaqus-Job/abaqus_static.inp', '-version': '2021'}}, 'machine': {'type': 'n3', 'nodes': 1}, 'vault': {'name': 'persistent', 'readonly': False, 'force': False}, 'user': {'username': 'root', 'apikey': 'b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00'}}

/usr/lib/python3/dist-packages/urllib3/connectionpool.py:999: InsecureRequestWarning: Unverified HTTPS request is being made to host 'gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io'. Adding certificate verification is strongly advised. See: https://urllib3.readthedocs.io/en/latest/advanced-usage.html#ssl-warnings
  warnings.warn(
### Payload:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/submit
{'User-Agent': 'python-requests/2.22.0', 'Accept-Encoding': 'gzip, deflate', 'Accept': '/*/*', 'Connection': 'keep-alive', 'Content-Length': '406', 'Content-Type': 'application/json'}
b'{"app": "jarvice-abaqus2021", "staging": false, "checkedout": false, "application": {"command": "Analysis", "geometry": "1770x834", "parameters": {"-inputfile": "/Abaqus-Job/abaqus_static.inp", "-version": "2021"}}, "machine": {"type": "n3", "nodes": 1}, "vault": {"name": "persistent", "readonly": false, "force": false}, "user": {"username": "root", "apikey": "b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00"}}'

### RAW:
< POST /api/jarvice/submit HTTP/1.1
< Host: gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io
< User-Agent: python-requests/2.22.0
< Accept-Encoding: gzip, deflate
< Accept: /*/*
< Connection: keep-alive
< Content-Length: 406
< Content-Type: application/json
<
< {"app": "jarvice-abaqus2021", "staging": false, "checkedout": false, "application": {"command": "Analysis", "geometry": "1770x834", "parameters": {"-inputfile": "/Abaqus-Job/abaqus_static.inp", "-version": "2021"}}, "machine": {"type": "n3", "nodes": 1}, "vault": {"name": "persistent", "readonly": false, "force": false}, "user": {"username": "root", "apikey": "b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00"}}
> HTTP/1.1 200 OK
> Content-Length: 84
> Content-Type: application/json
> Date: Thu, 17 Feb 2022 11:52:31 GMT
> Vary: Accept-Encoding
>
{
  "name": "20220217115229-6X7RW-jarvice-abaqus2021-root_s1",
  "number": 102
}

### Response:
{'name': '20220217115229-6X7RW-jarvice-abaqus2021-root_s1', 'number': 102}
jarvice@app-VirtualBox:~/demo$
```

API Abaqus

Query Status

```

jarvice@app-VirtualBox:~/demo$ ./call.py status
### FQDN:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/status

### Requested:
{'username': 'root', 'apikey': 'b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00', 'number': '102'}

/usr/lib/python3/dist-packages/urllib3/connectionpool.py:999: InsecureRequestWarning: Unverified HTTPS request is being made to host 'gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io'. Adding certificate verification is strongly advised. See: https://urllib3.readthedocs.io/en/latest/advanced-usage.html#ssl-warnings
  warnings.warn(
### Payload:
https://gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io/api/jarvice/status?username=root&apikey=b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00&number=102
{'User-Agent': 'python-requests/2.22.0', 'Accept-Encoding': 'gzip, deflate', 'Accept': '/*/*', 'Connection': 'keep-alive'}
None

### RAW:
< GET /api/jarvice/status?username=root&apikey=b24e3a9880cd4d9c9d6e961f77a02059ea3f8a00&number=102 HTTP/1.1
< Host: gdc-jarvice-eu.eu-central-1.eks.jarvice.18.184.204.232.nip.io
< User-Agent: python-requests/2.22.0
< Accept-Encoding: gzip, deflate
< Accept: /*/*
< Connection: keep-alive
<
> HTTP/1.1 200 OK
> Content-Length: 360
> Content-Type: application/json
> Date: Thu, 17 Feb 2022 12:00:15 GMT
> Vary: Accept-Encoding
>
{
  "102": {
    "job_name": "20220217115229-6X7RW-jarvice-abaqus2021-root_s1",
    "job_status": "COMPLETED",
    "job_start_time": 1645099072,
    "job_end_time": 1645099403,
    "job_submit_time": 1645090751,
    "job_application": "jarvice-abaqus2021",
    "job_command": "Analysis",
    "job_walltime": "00:05:31"
  }
}

### Response:
[{'102': {'job_name': '20220217115229-6X7RW-jarvice-abaqus2021-root_s1', 'job_status': 'COMPLETED', 'job_start_time': 1645099072, 'job_end_time': 1645099403, 'job_submit_time': 1645090751, 'job_application': 'jarvice-abaqus2021', 'job_command': 'Analysis', 'job_walltime': '00:05:31'}}]
jarvice@app-VirtualBox:~/demo$
    
```

OpenFOAM

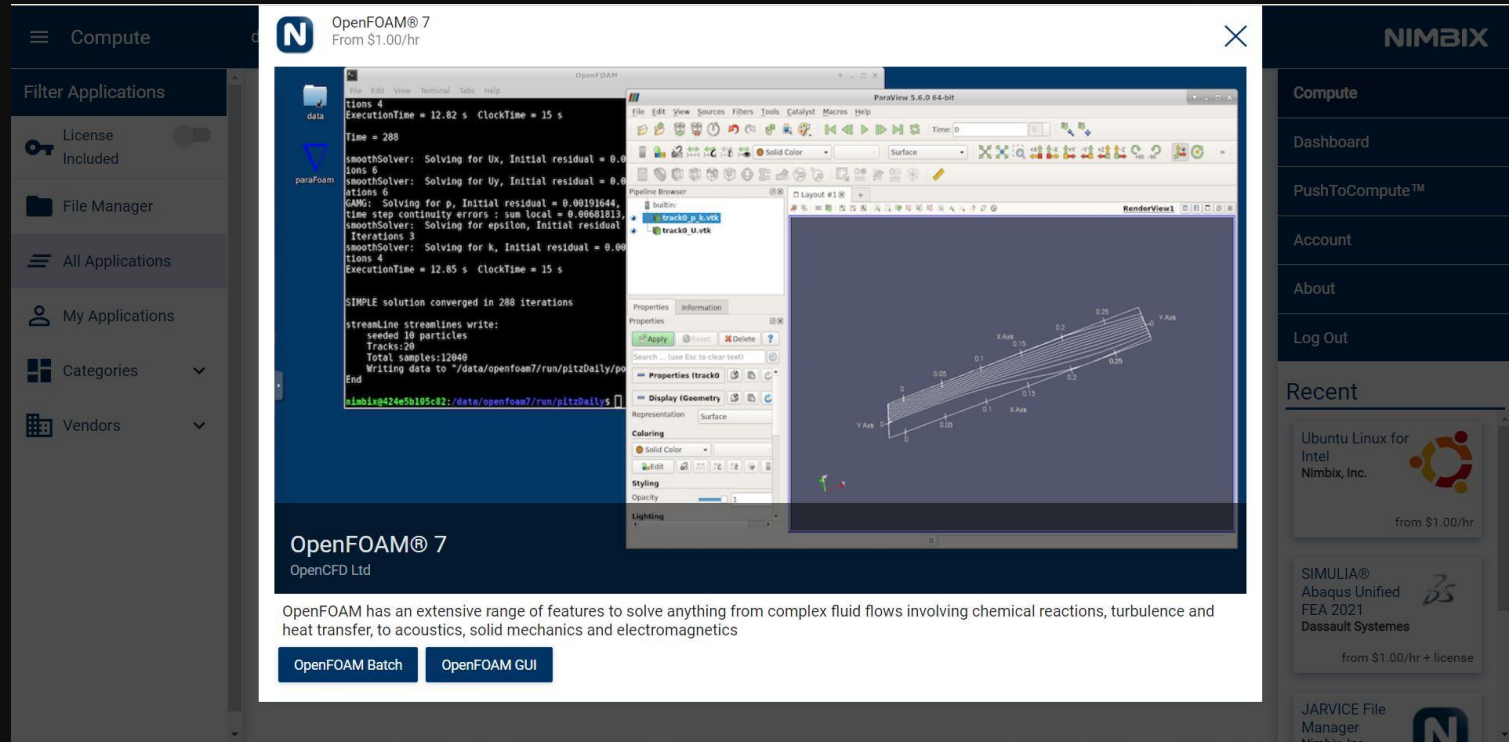
OpenFOAM Job

Find your OpenFOAM version

The screenshot displays the Nimbix application marketplace interface. At the top, the header includes 'Compute', the instance name 'demo-nimbix-eu-eks-downstream-01', the user 'Demo User2 <demo02.nimbix@science-computing.de>', and the Nimbix logo. A left sidebar contains navigation options: 'Filter Applications' (with a 'License Included' toggle), 'File Manager', 'All Applications', 'My Applications', 'Categories', and 'Vendors'. The main content area features a search bar with 'openfoam' entered. Below the search bar, the results are titled 'Search For "Openfoam"' and list four application cards: 'OpenFOAM® 7 OpenCFD Ltd' (with a price of 'from \$1.00/hr'), 'OpenFOAM® 8 The OpenFOAM Foundation Ltd', 'OpenFOAM® 8 for AMD64 OpenCFD Ltd', and 'OpenFOAM® 9 OpenCFD Ltd'. Each card includes a logo and a downward-pointing triangle icon. On the right side, a vertical navigation menu includes 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out'. Below this menu is a 'Recent' section showing 'Ubuntu Linux for Intel Nimbix, Inc.' (from \$1.00/hr) and 'SIMULIA® Abaqus Unified FEA 2021 Dassault Systemes' (from \$1.00/hr + license).

OpenFOAM Job

Start either Batch or GUI



The screenshot displays a Nimbix dashboard interface. On the left, a sidebar contains navigation options: Compute, Filter Applications, License (Included), File Manager, All Applications, My Applications, Categories, and Vendors. The main content area features a job card for 'OpenFOAM@ 7' from 'OpenCFD Ltd'. The job card includes a terminal window showing the following output:

```
ExecutionTime = 12.82 s ClockTime = 15 s
Time = 288
smoothSolver: Solving for Ux, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
smoothSolver: Solving for Uy, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
smoothSolver: Solving for Uz, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
GAMG: Solving for p, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
smoothSolver: Solving for epsilon, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
smoothSolver: Solving for k, Initial residual = 0.00191644,
time step continuity errors : sum local = 0.00681813,
ExecutionTime = 12.85 s ClockTime = 15 s

SIMPLE solution converged in 288 iterations

streamLine streamLines write:
  seeded 10 particles
  Tracks:20
  Total samples:12040
  Writing data to "/data/openfoam7/run/pitzDaily/pitzDaily.pvt"
End
```

Next to the terminal is a 3D visualization window titled 'ParaView 3.6.0.64-bit'. It shows a 3D model of a duct with streamlines, indicating fluid flow simulation. The interface includes various toolbars and a Properties panel.

Below the job card, there are two buttons: 'OpenFOAM Batch' and 'OpenFOAM GUI'.

On the right side of the dashboard, there is a 'Recent' section listing other applications: 'Ubuntu Linux for Intel Nimbix, Inc.' (from \$1.00/hr) and 'SIMULIA® Abaqus Unified FEA 2021 Dassault Systems' (from \$1.00/hr + license).

OpenFOAM Job

Scale your resources according to your demand

The screenshot shows the Nimbix interface for configuring an OpenFOAM job. The main window is titled "OpenFOAM GUI" and includes a description: "Run OpenFOAM® with the ParaView/paraFoam graphical user interface (GUI). Case will be run from /data/openfoam7/run (\$FOAM_RUN)".

Navigation tabs include: GENERAL, OPTIONAL, STORAGE, and PREVIEW SUBMISSION.

Machine configuration:

- Machine type:
- Cores: (Slider range: 36 to 720, 1 node, 160GB RAM)
- Price: \$1.00/hr

A green **SUBMIT** button is located at the bottom right of the configuration area.

The background interface shows a sidebar with "Compute" and "Filter Applications" (License Included, File Manager, All Applications, My Applications, Categories, Vendors) and a right-hand navigation menu with "Compute", "Dashboard", "PushToCompute™", "Account", "About", "Log Out", and "Recent" (listing Ubuntu Linux for Intel Nimbix, Inc., SIMULIA® Abaqus Unified FEA 2021, and JARVICE File Manager).

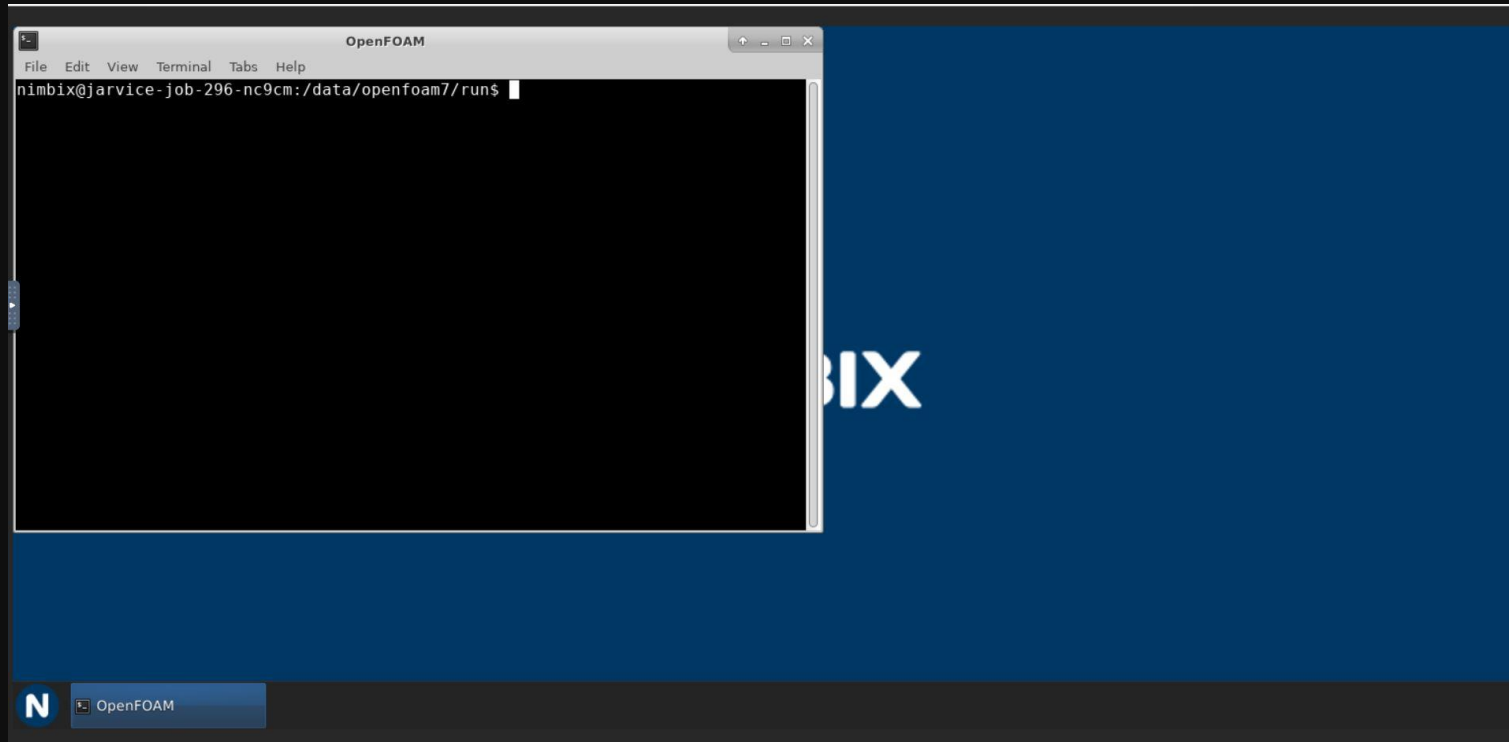
OpenFOAM Job

Click to connect

The screenshot displays the NIMBIX dashboard interface. At the top, the navigation bar includes 'Dashboard', the instance name 'demo-nimbix-eu-eks-downstream-01', the user 'Demo User2 <demo02.nimbix@science-computing.de>', and the NIMBIX logo. The left sidebar contains navigation options for 'Jobs' (Current, History, By Label, Reports) and 'Stats' (My stats). The main content area shows the 'Current' job details for 'OpenFOAM® 7(296)'. The job status is 'Processing' and is running on 'x 1 node'. Utilization is shown as 'CPU: 0% MEM: 0.13 of 160GB'. A 'Click to copy password to clipboard' link is present. A large 'Click here to connect' button is centered in the job details area. The right sidebar features a menu with 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out', along with a 'Recent' section listing software licenses like 'Ubuntu Linux for Intel Nimbix, Inc.' and 'SIMULIA® Abaqus Unified FEA 2021'.

OpenFOAM Job

Ready to run a simulation (GUI mode here)



OpenFOAM Job

Running simulation

```
OpenFOAM
File Edit View Terminal Tabs Help
Marked for refinement due to explicit features      : 447 cells.
Determined cells to refine in = 0.04 s
Selected for feature refinement : 539 cells (out of 2414)
Edge intersection testing:
  Number of edges      : 20616
  Number of edges to retest : 16350
  Number of intersected edges : 3115
Refined mesh in = 0.04 s
After refinement feature refinement iteration 3 : cells:6187 faces:20616 points:8337
Cells per refinement level:
  0  1252
  1   159
  2   359
  3   841
  4  3576

Feature refinement iteration 4
-----

Marked for refinement due to explicit features      : 1726 cells.
Determined cells to refine in = 0.1 s
Selected for feature refinement : 2001 cells (out of 6187)
```

BIX



OpenFOAM

OpenFOAM Job

Simulation finished

```
time step continuity errors : sum local = 1.45828e-05, global = 3.14279e-07, cumulative = 0.000210449
smoothSolver: Solving for omega, Initial residual = 2.73512e-05, Final residual = 1.58849e-06, No Iterations 3
smoothSolver: Solving for k, Initial residual = 0.00027936, Final residual = 2.19144e-05, No Iterations 3
ExecutionTime = 644.43 s  ClockTime = 645 s

streamLine streamLines write:
  seeded 20 particles
  Tracks:20
  Total samples:20521
  Writing data to "/data/openfoam7/run/motorBike/postProcessing/sets/streamLines/500"
forceCoeffs forceCoeffs1 write:
  Cm   = 0.159025
  Cd   = 0.41371
  Cl   = 0.0661771
  Cl(f) = 0.192114
  Cl(r) = -0.125937

End

nimbix@jarvice-job-296-nc9cm:/data/openfoam7/run/motorBike$
```

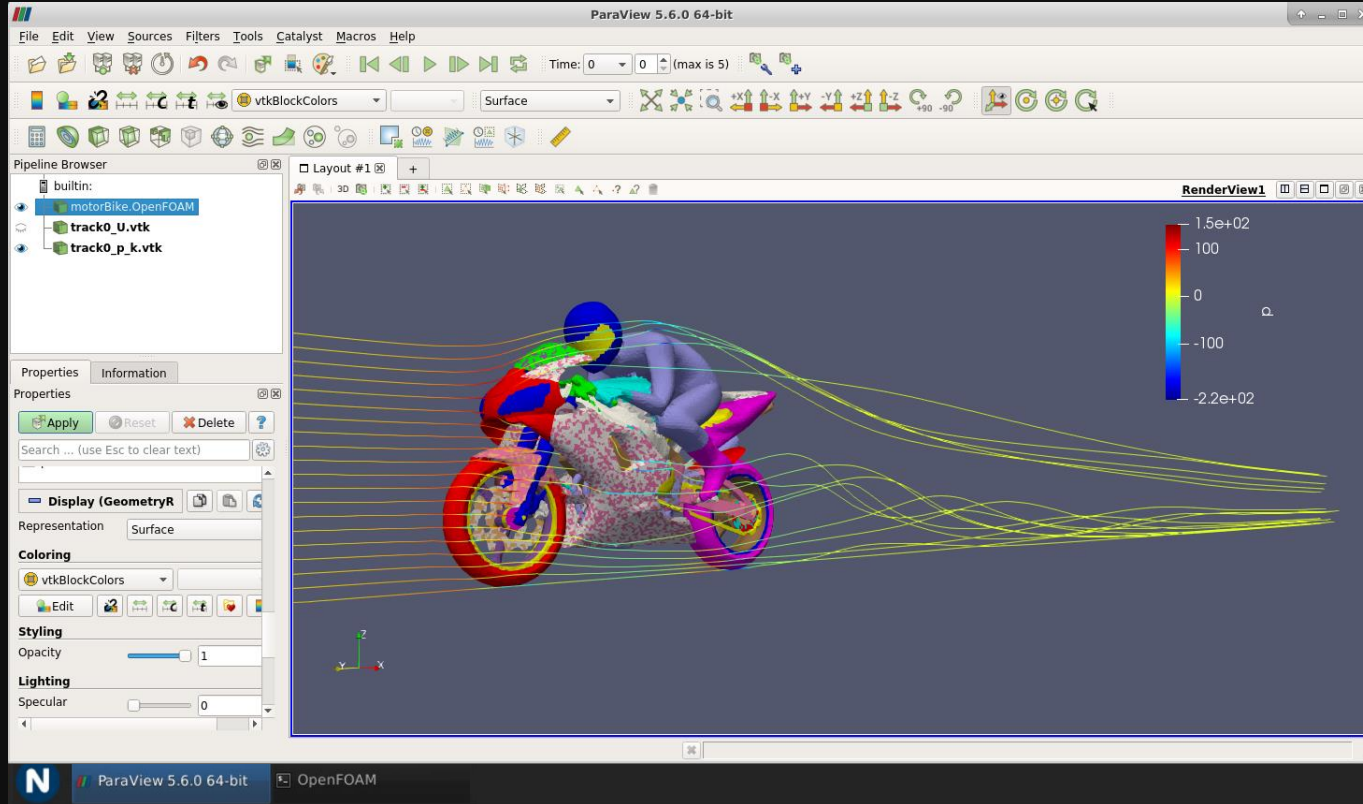
BIX



OpenFOAM

OpenFOAM Job

Visualization using ParaView



Tensorflow

Tensorflow Job

Select the Tensorflow version of your choice

The screenshot displays the Nimbix application marketplace interface. At the top, the header includes 'Compute', the instance name 'demo-nimbix-eu-eks-downstream-01', and the user 'Demo User2 <demo02.nimbix@science-computing.de>'. The left sidebar contains navigation options: 'Filter Applications' (with a 'License Included' toggle), 'File Manager', 'All Applications', 'My Applications', 'Categories', and 'Vendors'. The main content area features a search bar with 'tensorflow' entered. Below the search bar, the results are titled 'Search For "Tensorflow"' and list three options: 'TensorFlow (CPU only) - Community version tensorflow.org', 'TensorFlow (GPU) - Community version tensorflow.org', and 'TensorFlow 2.2.2 GPU Notebook Nimbix, Inc.'. The right sidebar shows a navigation menu with 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out', followed by a 'Recent' section listing 'SIMULIA® Abaqus Unified FEA 2021' and 'OpenFOAM® 7'.

Tensorflow Job

Select Server mode for full desktop session

The screenshot displays the NIMBIX application interface. On the left, a sidebar menu includes 'Compute', 'Filter Applications', 'License Included', 'File Manager', 'All Applications', 'My Applications', 'Categories', and 'Vendors'. The main area shows a modal window titled 'TensorFlow (CPU only) - Community version'. The modal features a blue-tinted server rack background with the 'NIMBIX' logo in white. Below the logo, the text reads 'TensorFlow (CPU only) - Community version' and 'tensorflow.org'. A description states: 'Community version of TensorFlow for x86 CPU only, pulled from tensorflow/tensorflow:latest'. At the bottom of the modal, there are three buttons: 'Batch', 'GUI', and 'Server'. The right sidebar of the NIMBIX interface contains navigation links: 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out'. Below these is a 'Recent' section listing applications like 'SIMULIA® Abaqus Unified FEA 2021' and 'OpenFOAM® 7'.

Tensorflow Job

Scale your resources according to your demand

TensorFlow (CPU only) - Community version

Server

Launch a session with all boot services, including SSH (if installed). Connection address and credentials will appear in your web browser once available.

GENERAL OPTIONAL STORAGE PREVIEW SUBMISSION

Machine

Machine type

Cores 720 \$1.00/hr

1 node, 160GB RAM

SUBMIT

NIMBIX

Compute

Dashboard

PushToCompute™

Account

About

Log Out

Recent

SIMULIA®
Abaqus Unified
FEA 2021
Dassault Systems
from \$1.00/hr + license

OpenFOAM® 7
OpenCFD Ltd
from \$1.00/hr

Ubuntu Linux for
Intel

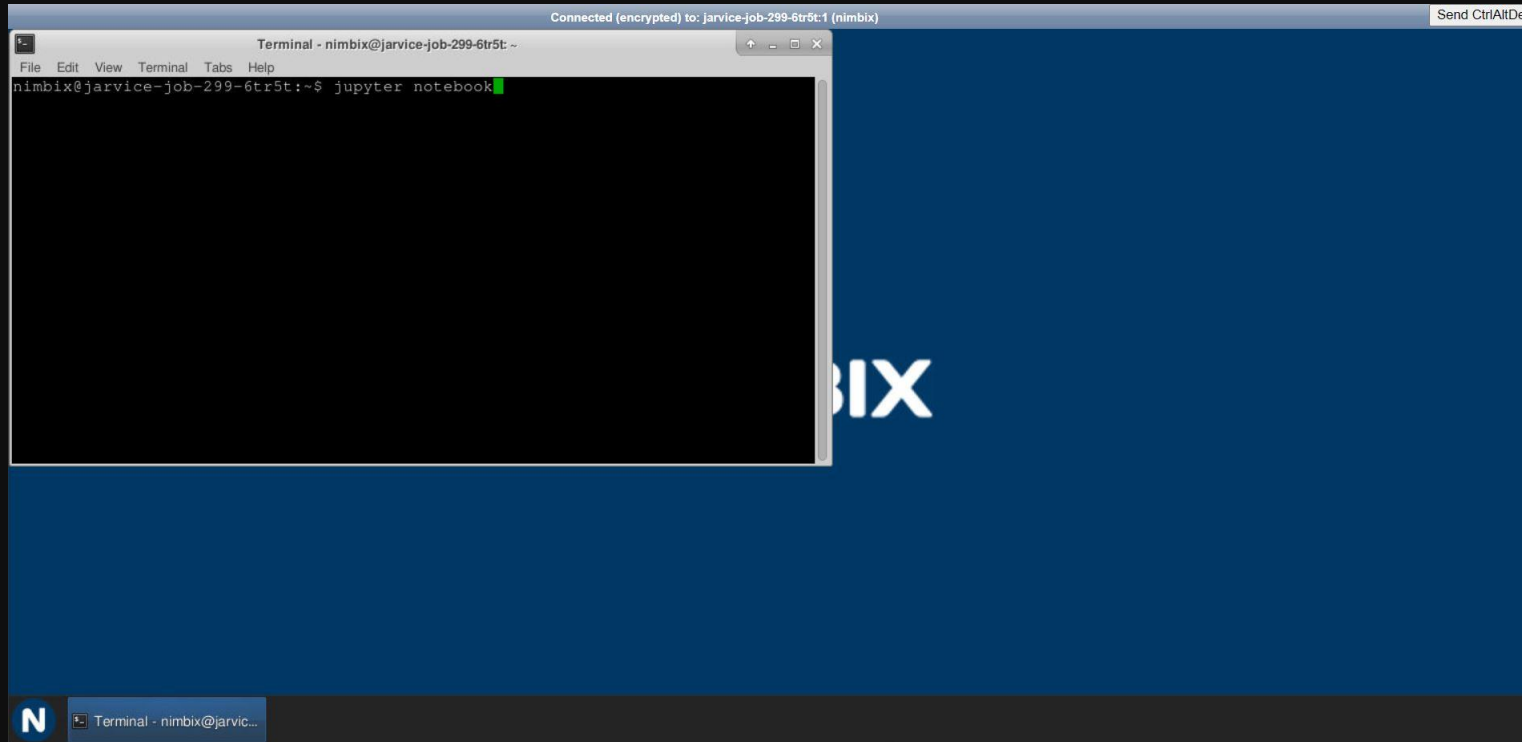
Tensorflow Job

Click to connect

The screenshot displays the NIMBIX dashboard interface. At the top, the navigation bar includes 'Dashboard', the user identifier 'demo-nimbix-eu-eks-downstream-01', and the user name 'Demo User2 <demo02.nimbix@science-computing.de>'. The left sidebar contains menu items for 'Jobs' (Current, History, By Label, Reports) and 'Stats' (My stats, JOBS RUN: 9, COMPUTE \$, 11:12:01, demo02.nimbix@science-computing.de). The main content area is titled 'Current' and features a job card for 'TensorFlow (CPU only) - Community version(299)'. The job card includes a TensorFlow logo, a bar chart icon, a copy icon, an info icon, a power icon, and a progress indicator showing 'x 1 node'. Below the job title, the following details are listed: Command: Server, Status: Processing, Utilization: -, and Address: none. A link 'Click to copy password to clipboard' is provided. A large 'Click here to connect' button is centered at the bottom of the job card. The right sidebar contains a vertical menu with 'Compute', 'Dashboard', 'PushToCompute™', 'Account', 'About', and 'Log Out', followed by a 'Recent' section listing 'SIMULIA® Abaqus Unified FEA 2021' and 'OpenFOAM® 7'.

Tensorflow Job

Start a jupyter-notebook



Tensorflow Job

Select your input data

The screenshot displays a JupyterLab environment. On the left, a terminal window shows the following output:

```
nimbix@jarvice-job-299-6tr5t:~$  
[I 14:09:12.176 Notebo  
ata/jupyter/runtime/not  
[I 14:09:12.368 Notebo  
x  
[I 14:09:12.368 Notebo  
[I 14:09:12.368 Notebo  
[I 14:09:12.368 Notebo  
3019ded6f44e8546378d211  
[I 14:09:12.368 Notebo  
kernels (twice to skip  
[C 14:09:12.369 Notebo  
  
Copy/paste this URL  
to login with a tok  
http://localhos  
1195f  
[I 14:09:13.729 Notebo  
rom 127.0.0.1  
█
```

The main interface is the JupyterLab file browser, showing the path `/ data / Tensorflow`. It contains a table of files:

	Name	Last Modified
<input type="checkbox"/>	..	seconds ago
<input type="checkbox"/>	moon_dataset.ipynb	2 days ago

Tensorflow Job Ready to run

The screenshot shows a Jupyter Notebook environment. On the left, a terminal window displays the execution of a notebook, showing various status messages and timestamps. The main area shows a code cell with the following Python code:

```
In [1]: # Import packages
import numpy as np
import matplotlib.pyplot as plt
import tensorflow as tf
from tensorflow.contrib.layers import fully_connected
from sklearn.datasets import make_moons
from sklearn.model_selection import train_test_split
%matplotlib inline

# create moon dataset with 500 data points
np.random.seed(0)
X, Y = make_moons(500, noise=0.2)

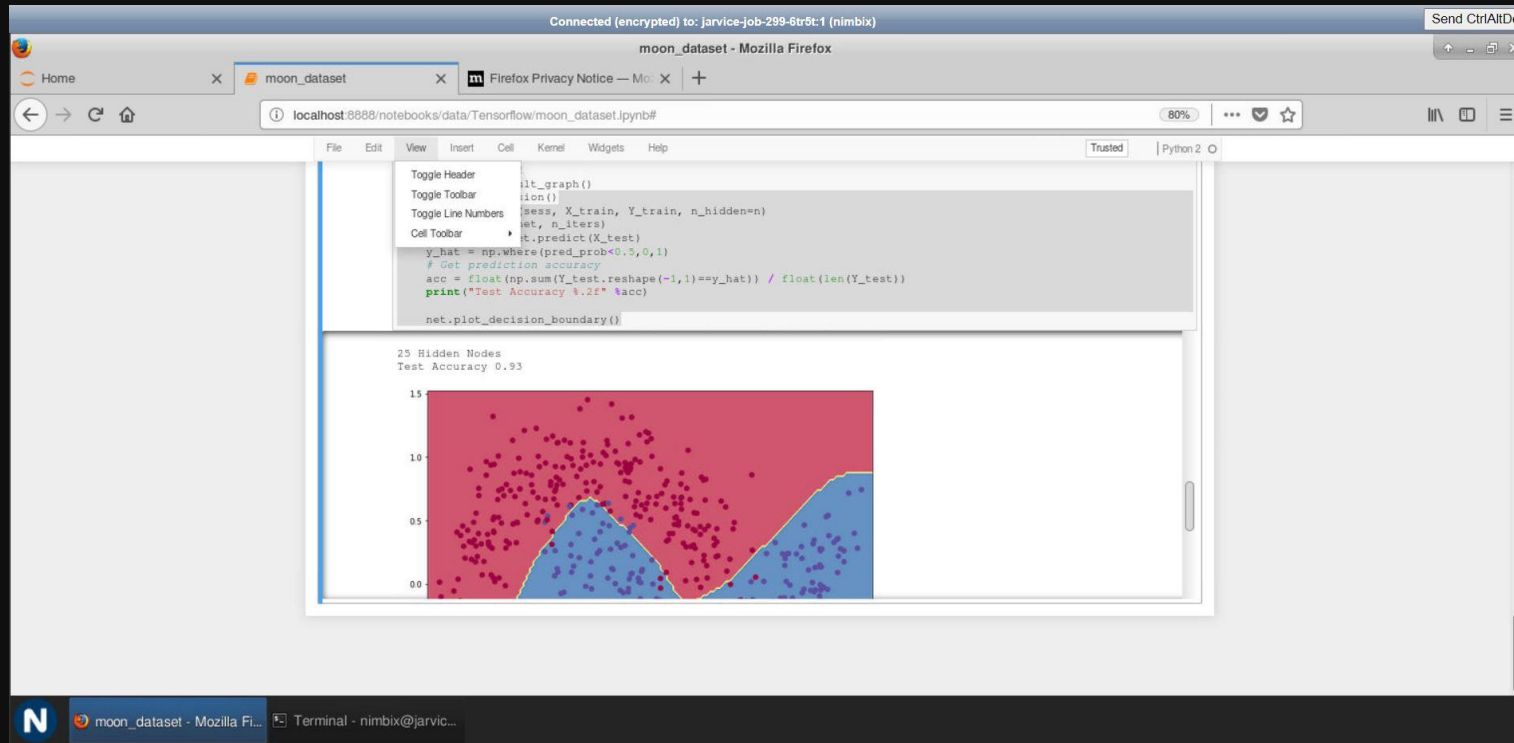
# Split into test and training data
X_train, X_test, Y_train, Y_test = train_test_split(X, Y, test_size=0.25, random_state=73)

# Define network dimensions
n_inputs = X_train.shape[0]
n_input_dim = X_train.shape[1]

# Layer size
n_hidden = 1 # Number of hidden nodes
```

Tensorflow Job

Visualisation of results



The screenshot shows a Jupyter Notebook interface in a Firefox browser. The notebook is titled 'moon_dataset - Mozilla Firefox' and is running on 'localhost:8888/notebooks/data/Tensorflow/moon_dataset.ipynb#'. The code in the notebook is as follows:

```
plt_graph()
plt.show()
sess, X_train, Y_train, n_hidden=n)
set, n_iters)
it.predict(X_test)
Y_hat = np.where(pred_prob<0.5,0,1)
# Get prediction accuracy
acc = float(np.sum(Y_test.reshape(-1,1)==Y_hat)) / float(len(Y_test))
print("Test Accuracy %.2f" %acc)
net.plot_decision_boundary()
```

The output of the notebook shows the following text:

```
25 Hidden Nodes
Test Accuracy 0.93
```

Below the text is a scatter plot with a decision boundary. The plot shows two classes of data points (blue and red) distributed in a non-linear, crescent-like shape. The decision boundary is a yellow line that separates the two classes. The x-axis ranges from 0.0 to 1.0, and the y-axis ranges from 0.0 to 1.5.