

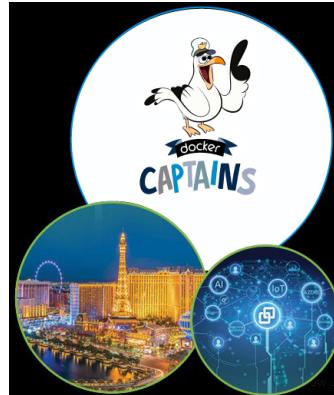
# Depend on Docker

## Get IT done with Docker on Azure



Microsoft Azure  
+ AI Conference

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a GE company



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# Some problems we care about



**Every 2  
Seconds**

A GE Jet engine takes  
off in the world



**~30%**

Of the world's power  
is produced by a GE  
turbine



**We are the first**

Fullstream O&G Company  
Exploration, Production,  
Transportation, Operations

## We need to model mission critical systems accurately

# Scale and complexity of industrial data

## O&G

**Drilling data**  
0.3GB/well/day

**Wireline data**  
5GB/well/day

**Fiber optic data**  
0.1GB/well/day

**ESP monitoring**  
0.4GB/well/day

**Seismic data**  
500GB/survey

## Aviation

**A flight from NY to London**  
~1 TB

**Atmospheric data**  
0.1GB/day

## Inspections

**Ultrasound: tubes**  
1.2TB/8 hours

**Corrosion monitoring**  
1GB/site/year  
**Pipeline inspection**  
1.5TB/600 km

## ERP Systems

**Transactional data**  
**Logistics reports**  
**Maintenance logs**  
**FSE reports**  
**Inventory reports**

**10 - 100x More volume**

**100 - 1000x More velocity**

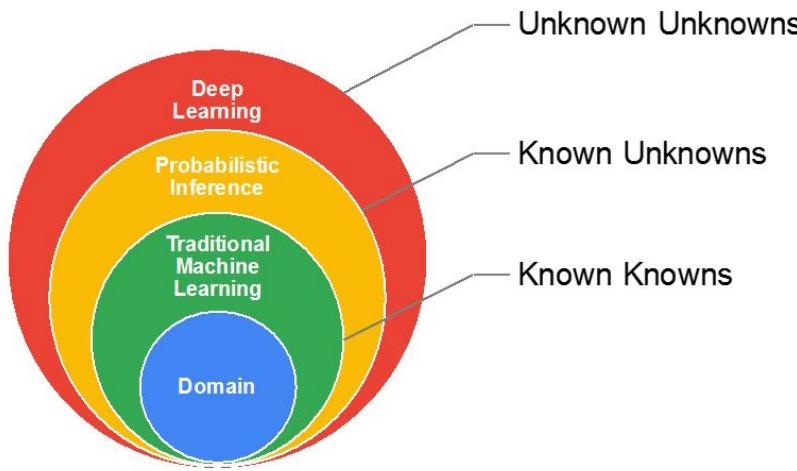
Hundreds of assets, multiple data silos

ERP  
Systems

Industrial

# Digital Twins

A live up-to-date digital representation of an asset, system, or process.



## Hybrid models

Physics-based



Probabilistics

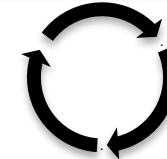


Deep learning  
(AI)

Known Knowns

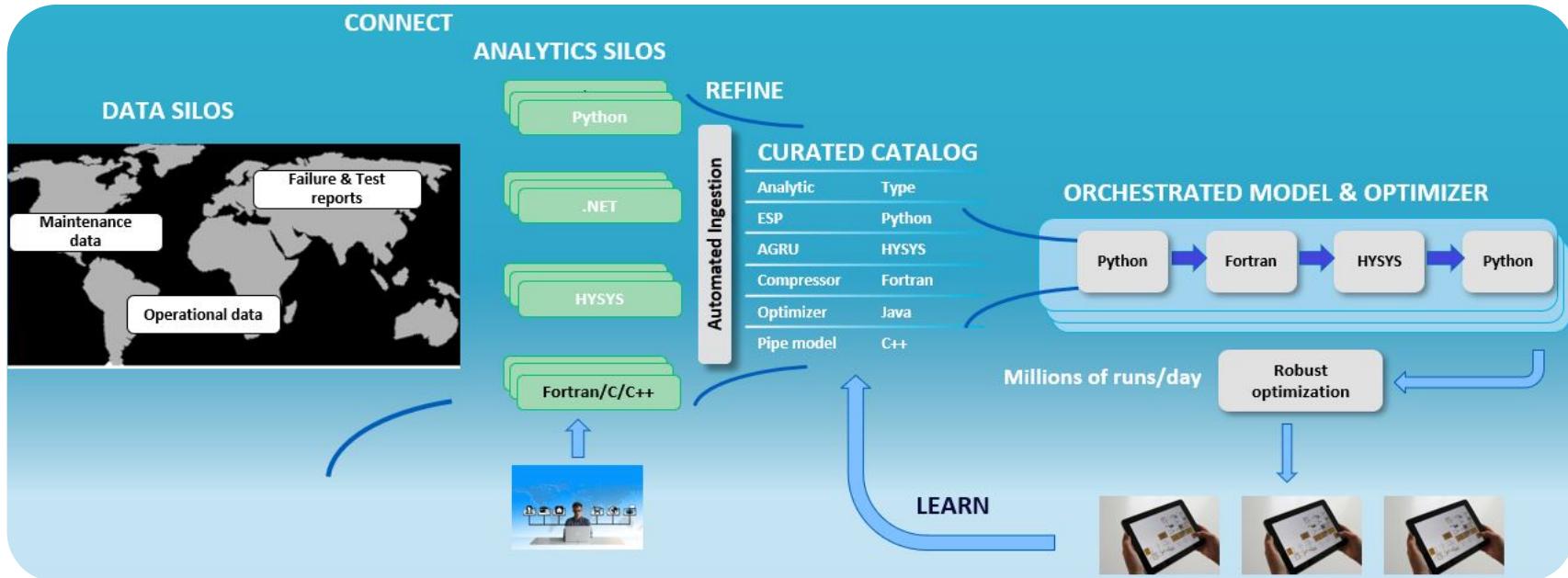
Known Unknowns

Unknown Unknowns



- Continuously tuned
- Scalable
- Adaptable

# Connecting Data & Analytics



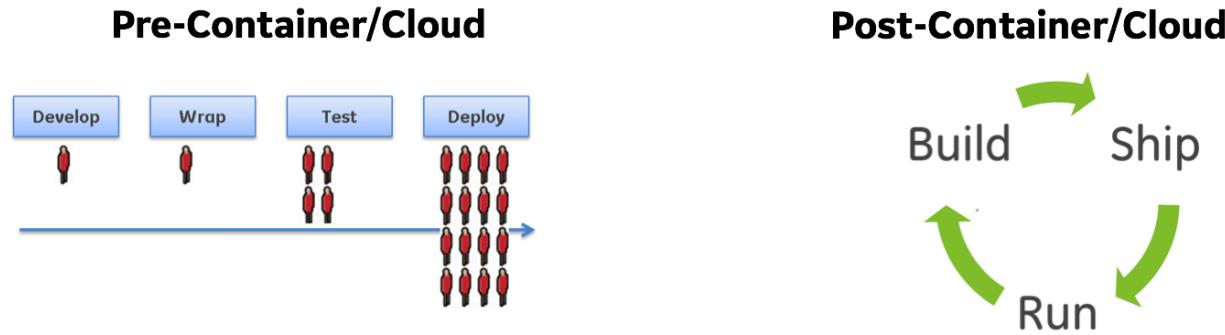
**SILOS OF DATA/ANALYTICS + FEDERATION + SCALE + CONSTANT LEARNING = SCALABLE COMPUTING**

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# Democratize analytics through containers and cloud



- Production deployment: 6-12 months
  - New developer setup: 1 week
  - Quarterly releases
- Production: ~ 1 hour
  - New developer setup: 1 hour
  - **Continuous releases**

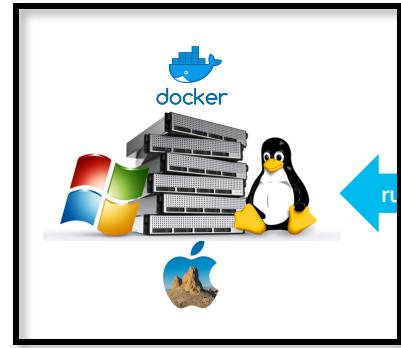
**Kubernetes allows polyglot auto-scaling and “self”-healing at scale**

# Scale up & down at will

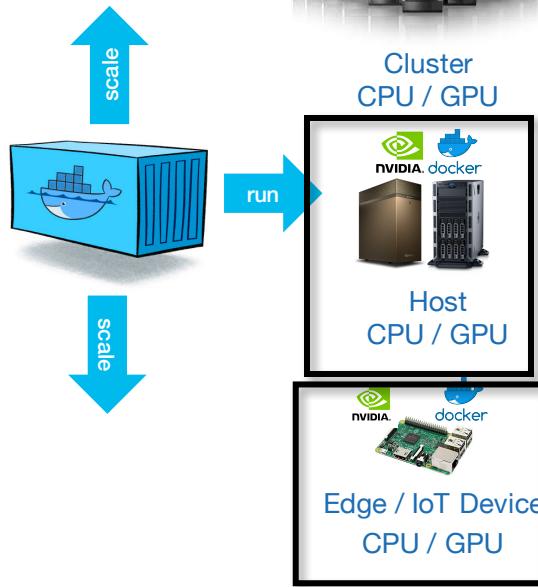
- Ship and Run anywhere

## Demo 1

### Analytics in Different OS



Operating System



Platform



MESOS



kubernetes

## Demo 4

### Scale Up / Down Containers



Infrastructure

## Demo 2

### Leverage GPU's



## Demo 3

### Encrypted Transfer

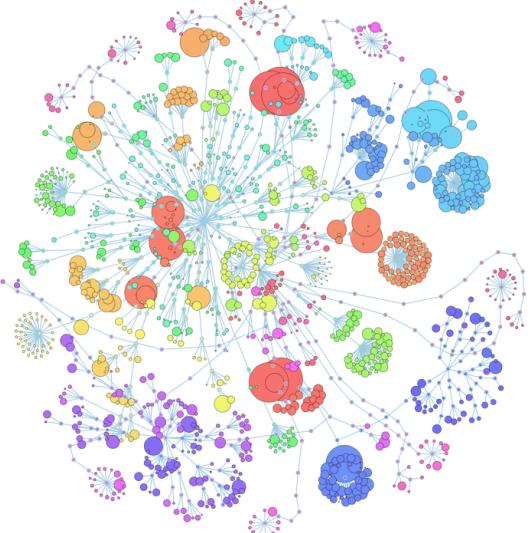


Orchestrator

# Depend on Docker (DoD)

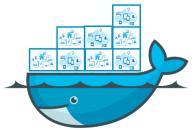
- A philosophy – don't install anything, build a container instead
- A type of project – needs only access to source and Docker
- Open source – <https://github.com/bhgedigital/depend-on-docker>
- Easy to use – create a new DoD project with a single command
- Flexible – defaults provided, but customizable
- Universal – works with Linux and Windows containers

# DOD Example - SEMTK



Example: semtk-opensource  
Code Flower

CONTAINERIZED



Containerized application  
{dependencies encapsulated,  
complexity reduced}

<https://github.com/ge-semtk/semtk>

```
> iankouls@1403111-C02T82RGGTFM:~/Projects/2018/github.com/iankoulski/semtk
> ./compose.sh up -d
Creating network "host_semtknet" with driver "bridge"
Creating host_semtk-sparqlgraph-results_1 ... done
Creating host_semtk-nodegroup-store_1 ... done
Creating host_semtk-ingestion_1 ... done
Creating host_semtk-hive_1 ... done
Creating host_semtk-sparqldb_1 ... done
Creating host_semtk-nodegroup_1 ... done
Creating host_semtk-dispatch_1 ... done
Creating host_semtk-nodegroup-execution_1 ... done
Creating host_semtk-sparql-query_1 ... done
Creating host_semtk-sparqlgraph-status_1 ... done
Creating host_semtk-sparqlgraph-web_1 ... done
Creating host_semtk-ontology-info_1 ... done
iankouls@1403111-C02T82RGGTFM:~/Projects/2018/github.com/iankoulski/semtk
> ./compose.sh ps
          Name           Command     State            Ports
-----  -----
host_semtk-dispatch_1   /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12053->8080/tcp
host_semtk-hive_1       /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12055->8080/tcp
host_semtk-ingestion_1  /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12091->8080/tcp
host_semtk-nodegroup-execution_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12058->8080/tcp
host_semtk-nodegroup-store_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12056->8080/tcp
host_semtk-nodegroup_1   /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12059->8080/tcp
host_semtk-ontology-info_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12057->8080/tcp
host_semtk-sparql_query_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12050->8080/tcp
host_semtk-sparqldb_1    /bin/sh -c /startup.sh        Up      0.0.0.0:1111->1111/tcp, 0.0.0.0:2420->8890/tcp
host_semtk-sparqlgraph-results_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12052->8080/tcp
host_semtk-sparqlgraph-status_1 /bin/sh -c cd /service; ls ...  Up      0.0.0.0:12051->8080/tcp
host_semtk-sparqlgraph-web_1 /bin/sh -c /usr/local/tomc ... Up      0.0.0.0:8860->8080/tcp
iankouls@1403111-C02T82RGGTFM:~/Projects/2018/github.com/iankoulski/semtk
> |
```

# Demo 1 – Depend on Docker Project

GitHub



<https://github.com/bhgedigital/depend-on-docker>

bitly

<http://bit.ly/dodockerw>

Docker Hub



`docker run bhgedigital/win-svn`

# Demo 1: Step 1 – View project on GitHub (copy command)

Screenshot of a GitHub repository named "depend-on-docker".

The repository has the following commit history:

File	Message	Date
windows	Update env.cmd	6 months ago
.gitignore	Add slides from DockerCon presentation	4 months ago
DoLogo.png	Add License and Logo	6 months ago
LICENSE	Add License and Logo	6 months ago
README.md	Added blog link to README	a month ago
create.bat	bhgedigital.org	6 months ago
create.sh	Add handling of relative paths to create.sh	6 months ago

The README.md file contains the following content:

**depend-on-docker**

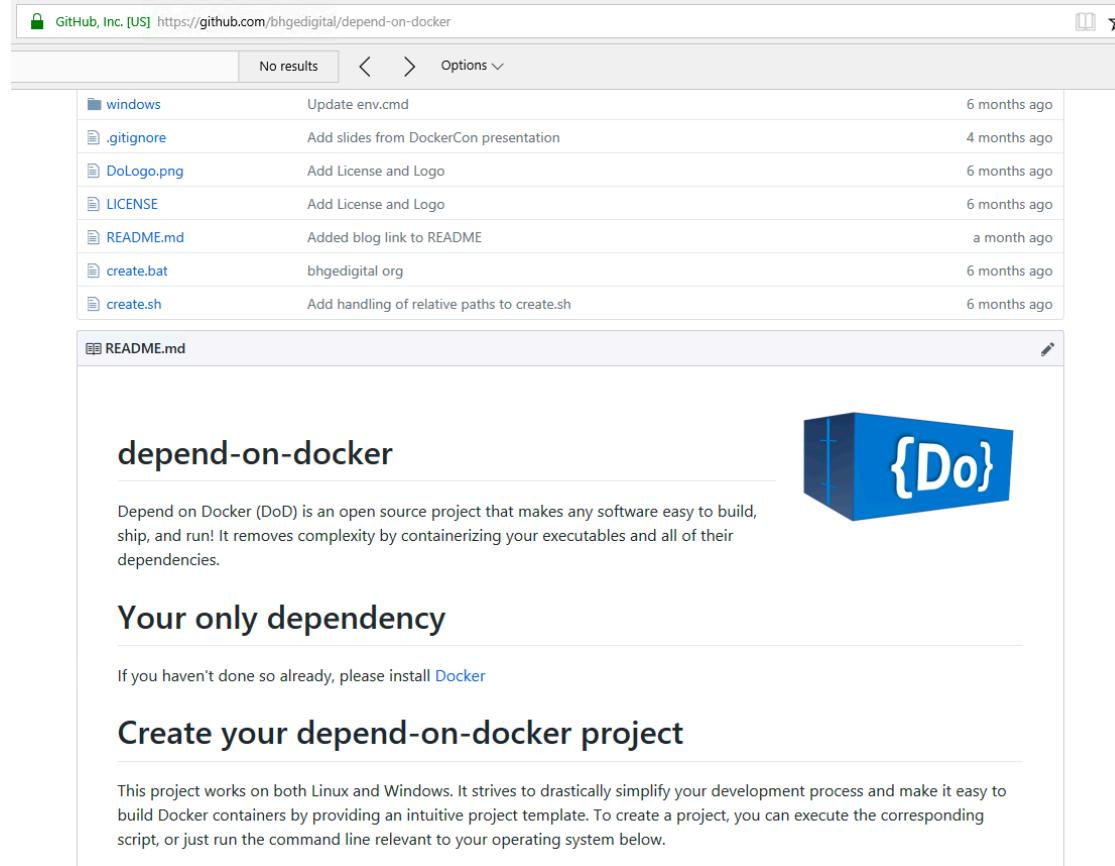
Depend on Docker (DoD) is an open source project that makes any software easy to build, ship, and run! It removes complexity by containerizing your executables and all of their dependencies.

**Your only dependency**

If you haven't done so already, please install [Docker](#)

**Create your depend-on-docker project**

This project works on both Linux and Windows. It strives to drastically simplify your development process and make it easy to build Docker containers by providing an intuitive project template. To create a project, you can execute the corresponding script, or just run the command line relevant to your operating system below.



# Demo 1: Step 2 – Execute command to get create.bat

```
Administrator: Command Prompt - cmd --help

C:\demo\depend-on-docker>curl -L http://bit.ly/dodockerw > create.bat
% Total    % Received % Xferd  Average Speed   Time     Time      Current
                                         Dload  Upload   Total   Spent   Left  Speed
100    167  100    167     0      0    668      0 --:--:-- --:--:-- --:--:--  668
100    276  100    276     0      0    630      0 --:--:-- --:--:-- --:--:--  630

C:\demo\depend-on-docker>dir
Volume in drive C is Windows
Volume Serial Number is 5010-2DA1

Directory of C:\demo\depend-on-docker

12/05/2018  10:10 PM    <DIR>        .
12/05/2018  10:10 PM    <DIR>        ..
12/05/2018  10:10 PM                276 create.bat
                           1 File(s)       276 bytes
                           2 Dir(s)  100,761,288,704 bytes free

C:\demo\depend-on-docker>
```

# Demo 1: Step 3 – Execute create.bat [new\_project\_path]

```
Administrator: Command Prompt - cmd --help

C:\demo\depend-on-docker>create.bat c:\demo\depend-on-docker\azureai
55ab9d1b4fee4c54fd84166c7cc1bbfafbc4daf666457d1ef9305eaa22848b6d
C:\demo\depend-on-docker>dir
Volume in drive C is Windows
Volume Serial Number is 5010-2DA1

Directory of C:\demo\depend-on-docker

12/05/2018  10:17 PM    <DIR>          .
12/05/2018  10:17 PM    <DIR>          ..
12/05/2018  10:17 PM    <DIR>          azureai
12/05/2018  10:10 PM                276  create.bat
                           1 File(s)        276 bytes
                           3 Dir(s)  100,760,715,264 bytes free

C:\demo\depend-on-docker>
```

# Demo 1: Step 4 – Customize your project

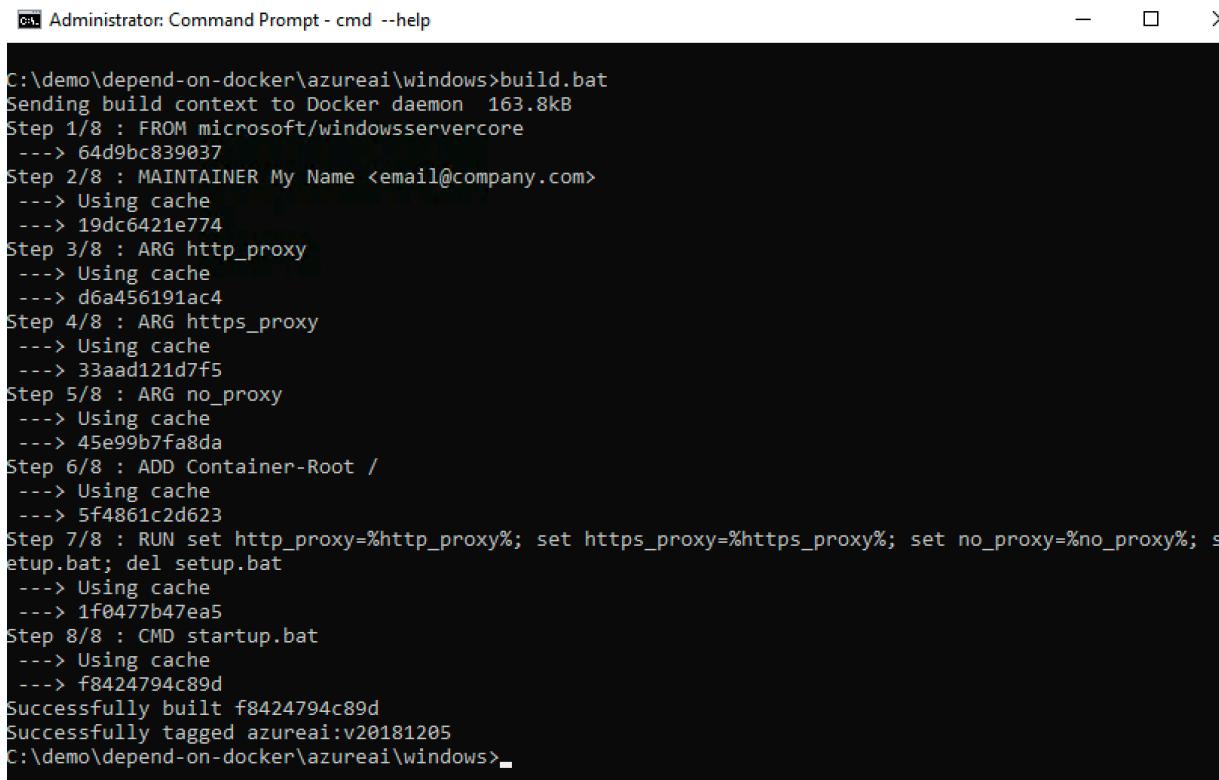
- **Dockerfile** – change base image and author info as needed
  - **env.cmd** – image and container settings
  - **setup.bat** – add commands to run while image is being built
  - **startup.bat** – add commands to run when the container starts up,
- Sample →

The screenshot shows the Visual Studio Code interface with two tabs open: 'env.cmd' and 'startup.bat'. The left sidebar displays the file tree under 'AZUREAI/windows'. The 'env.cmd' tab contains a script with comments explaining proxy settings and Docker image configuration. The 'startup.bat' tab contains a simple script that echoes a message and waits for ever.

```
env.cmd x
1 @echo off
2
3 rem Call helper functions
4 call fun
5
6 rem Note: To set any setting below to blank use the space character
7 rem example: set REGISTRY=
8
9 rem Proxy settings [optional] - set if your network requires a proxy
10 set http_proxy=
11 set https_proxy=
12 set no_proxy=localhost
13
14 rem Docker image settings
15 rem REGISTRY: [optional] - Docker registry path including trailing "
16 set REGISTRY=
17 rem IMAGE: <required> - Docker image name for this project. Example:
18 set IMAGE=azureai
19 rem VERSION: [optional] - Version tag for this Docker image. Example
20 set VERSION=%date:~0,4%-%date:~4,2%-%date:~7,2%
21 if "%VERSION%" == "" (
22     set TAG=
23 ) else (
24     set TAG=%VERSION%
25 )
26 rem BUILD_OPTS: [optional] - arguments for the docker image build command
27 set BUILD_OPTS--build-arg http_proxy=%http_proxy% --build-arg https_
28
29 rem Docker container runtime settings
30 rem CONTAINER_NAME: [optional] - Name of the Docker container included in the
31 set CONTAINER_NAME=%IMAGE%
32 set CONTAINER_NAME==name %CONTAINER%
33 rem Port map [optional] - Mapping of external to internal ports included in the
34 set PORT_MAP=-p 80:8080
35 rem Volume map [optional] - Mapping of external to internal paths included in the
36 set VOL_MAP=-v %cd%:::/wd
Ln 18, Col 18 Tab Size: 4 UTF-8 LF Batch ⚡
```

```
env.cmd x
1 @echo off
2
3 rem Container startup script
4
5 for /L %%n in () do (
6     echo.
7     echo "Depend on Docker for Windows!"
8     waitfor ever /t 3 2>NUL
9 )
```

# Demo 1: Step 5 – Build your project



```
Administrator: Command Prompt - cmd --help
C:\demo\depend-on-docker\azureai\windows>build.bat
Sending build context to Docker daemon 163.8kB
Step 1/8 : FROM microsoft/windowsservercore
--> 64d9bc839037
Step 2/8 : MAINTAINER My Name <email@company.com>
--> Using cache
--> 19dc6421e774
Step 3/8 : ARG http_proxy
--> Using cache
--> d6a456191ac4
Step 4/8 : ARG https_proxy
--> Using cache
--> 33aad121d7f5
Step 5/8 : ARG no_proxy
--> Using cache
--> 45e99b7fa8da
Step 6/8 : ADD Container-Root /
--> Using cache
--> 5f4861c2d623
Step 7/8 : RUN set http_proxy=%http_proxy%; set https_proxy=%https_proxy%; set no_proxy=%no_proxy%; setup.bat; del setup.bat
--> Using cache
--> 1f0477b47ea5
Step 8/8 : CMD startup.bat
--> Using cache
--> f8424794c89d
Successfully built f8424794c89d
Successfully tagged azureai:v20181205
C:\demo\depend-on-docker\azureai\windows>
```

# Demo 1: Step 6 – run.bat, status.bat, logs.bat, stop.bat

```
Administrator: Command Prompt - cmd --help

C:\demo\depend-on-docker\azureai\windows>run.bat
a7ad2ab7c853eccce8cfee14f31f331d57ddd8d8539ba19eb6f4ddfc6fc1fe65
C:\demo\depend-on-docker\azureai\windows>status.bat
a7ad2ab7c853      azureai:v20181205  "cmd /S /C startup.bat"  29 seconds ago  Up 4 seconds
      0.0.0.0:80->8080/tcp  azureai
C:\demo\depend-on-docker\azureai\windows>logs.bat

"Depend on Docker for Windows!"

"Depend on Docker for Windows!"

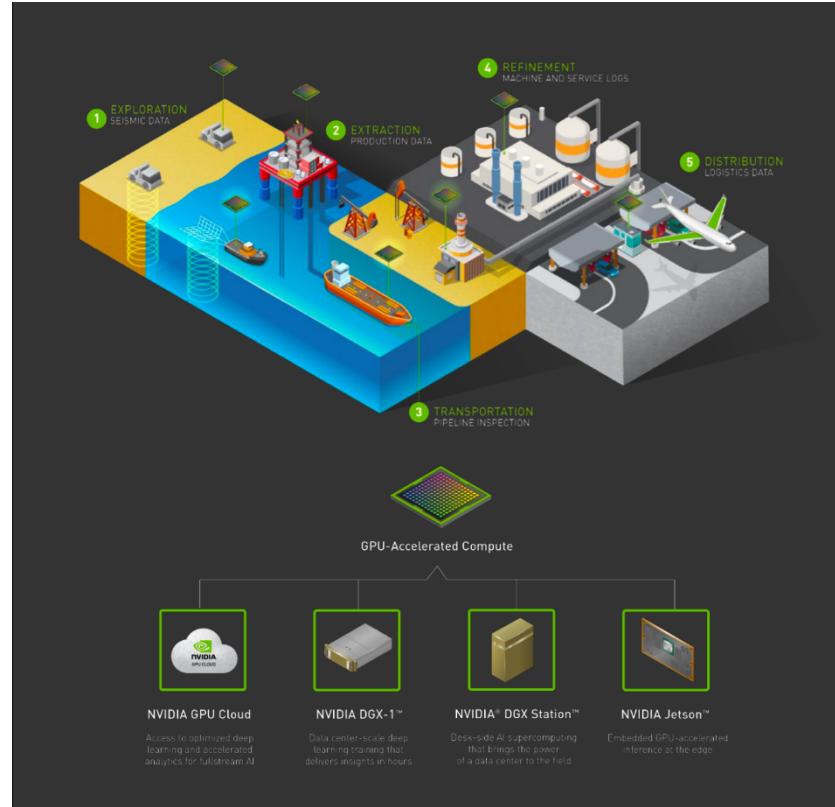
"Depend on Docker for Windows!"
Terminate batch job (Y/N)? Y

C:\demo\depend-on-docker\azureai\windows>stop.bat
azureai
C:\demo\depend-on-docker\azureai\windows>
```

# AI Impacts Oil & Gas End to End

Robust Fault Prediction  
Automated Inspection  
Reservoir Characterization  
Seismic Interpretation  
Automated Drilling  
Production Optimization

**GPU acceleration essential to realize business outcomes @ Scale**

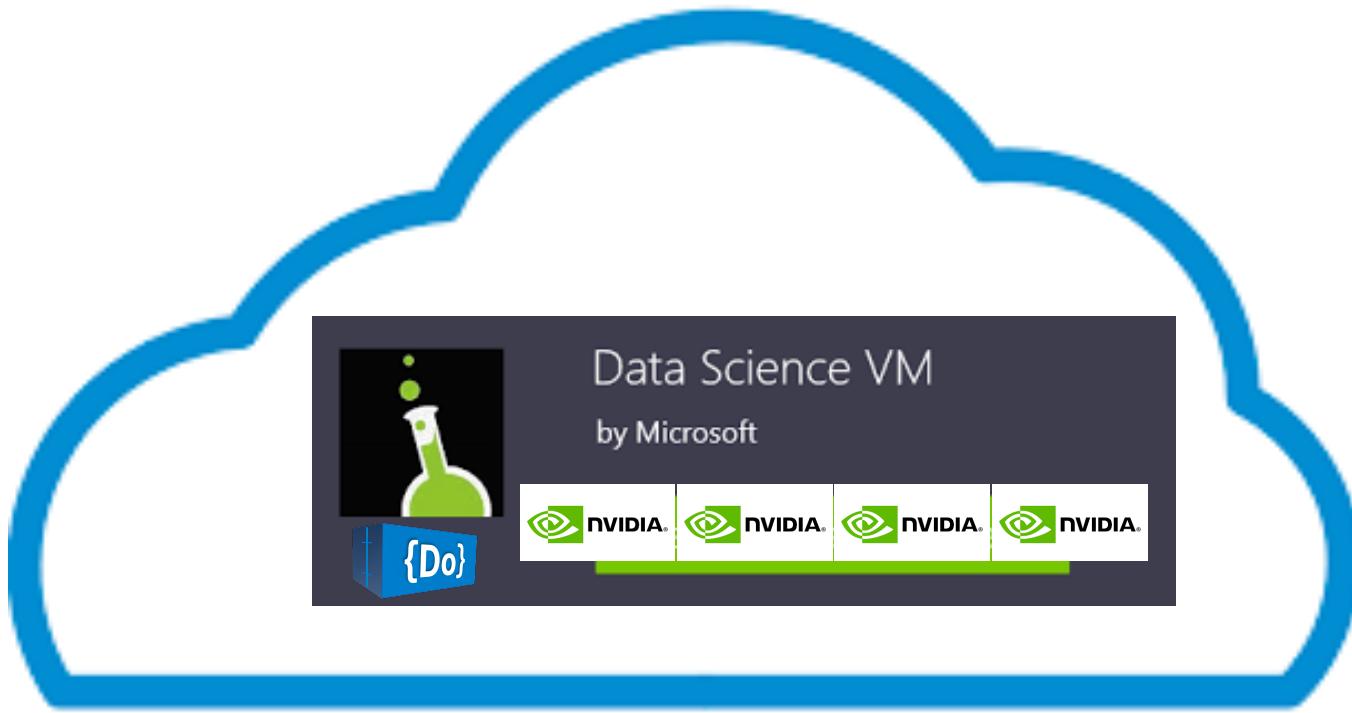


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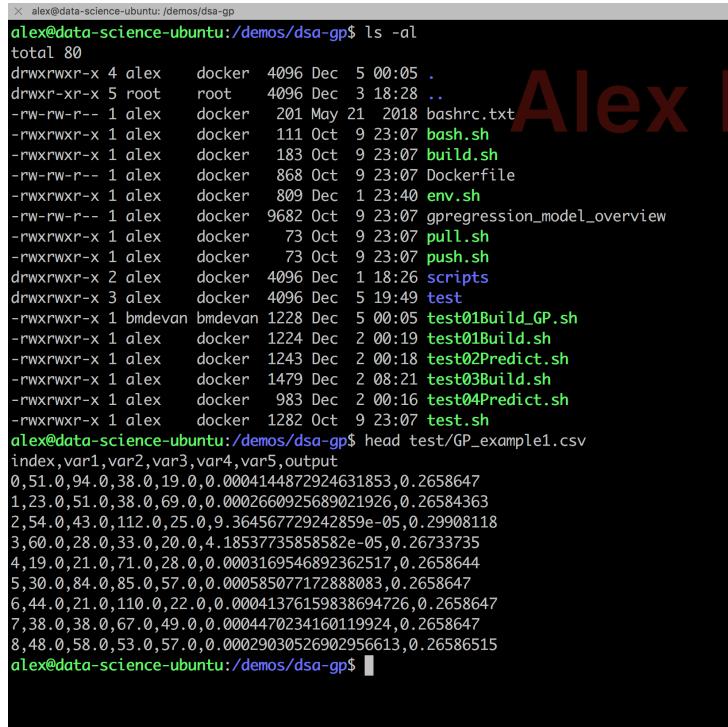
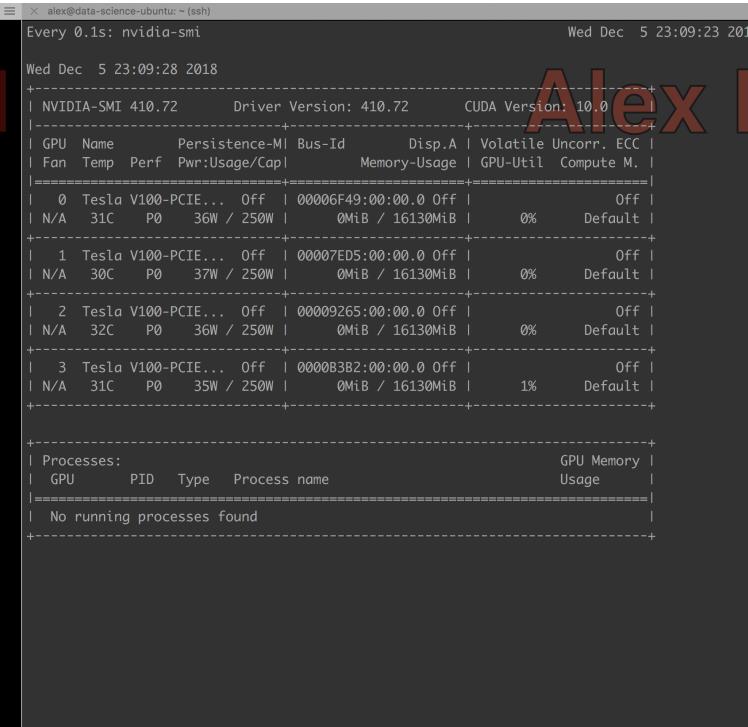
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# Demo 2 – Depend on Docker Time Series Model on NVIDIA Tesla V100 GPU



# Demo 2: Step 1 – Show Input Datafile and GPUs



```
alex@data-science-ubuntu:~/demos/dsa-gp$ ls -al
total 80
drwxrwxr-x 4 alex docker 4096 Dec 5 00:05 .
drwxr-xr-x 5 root root 4096 Dec 3 18:28 ..
-rw-rw-r-- 1 alex docker 201 May 21 2018 bashrc.txt
-rwxrwxr-x 1 alex docker 111 Oct 9 23:07 bash.sh
-rwxrwxr-x 1 alex docker 183 Oct 9 23:07 build.sh
-rw-rw-r-- 1 alex docker 868 Oct 9 23:07 Dockerfile
-rwxrwxr-x 1 alex docker 809 Dec 1 23:40 env.sh
-rw-rw-r-- 1 alex docker 9682 Oct 9 23:07 gpregression_model_overview
-rwxrwxr-x 1 alex docker 73 Oct 9 23:07 pull.sh
-rwxrwxr-x 1 alex docker 73 Oct 9 23:07 push.sh
drwxrwxr-x 2 alex docker 4096 Dec 1 18:26 scripts
drwxrwxr-x 3 alex docker 4096 Dec 5 19:49 test
-rwxrwxr-x 1 bmdevan bmdevan 1228 Dec 5 00:05 test01Build_GP.sh
-rwxrwxr-x 1 alex docker 1224 Dec 2 00:19 test01Build.sh
-rwxrwxr-x 1 alex docker 1243 Dec 2 00:18 test02Predict.sh
-rwxrwxr-x 1 alex docker 1479 Dec 2 08:21 test03Build.sh
-rwxrwxr-x 1 alex docker 983 Dec 2 00:16 test04Predict.sh
-rwxrwxr-x 1 alex docker 1282 Oct 9 23:07 test.sh
alex@data-science-ubuntu:~/demos/dsa-gp$ head test/GP_example1.csv
index,var1,var2,var3,var4,var5,output
0,51.0,94.0,38.0,19.0,0.0,0.0004144872924631853,0.2658647
1,23.0,51.0,38.0,69.0,0.0,0.002660925689021926,0.26584363
2,54.0,43.0,112.0,25.0,9.364567729242859e-05,0.29908118
3,60.0,28.0,33.0,20.0,4.18537735858582e-05,0.26733735
4,19.0,21.0,71.0,28.0,0.0,0.003169546892362517,0.2658644
5,30.0,84.0,85.0,57.0,0.0,0.0058077172888083,0.2658647
6,44.0,21.0,110.0,22.0,0.00041376159838694726,0.2658647
7,38.0,38.0,67.0,49.0,0.0,0.0004470234160119924,0.2658647
8,48.0,58.0,53.0,57.0,0.0,0.0029030526902956613,0.26586515
alex@data-science-ubuntu:~/demos/dsa-gp$
```

# Demo 2: Step 2 – Build model and see GPU0 load

```
alex@data-science-ubuntu: /demos/dsa-gp
alex@data-science-ubuntu:/demos/dsa-gp$ ./test01Build_GP.sh

Testing GP Regression Build ...

Running on GPU # 0

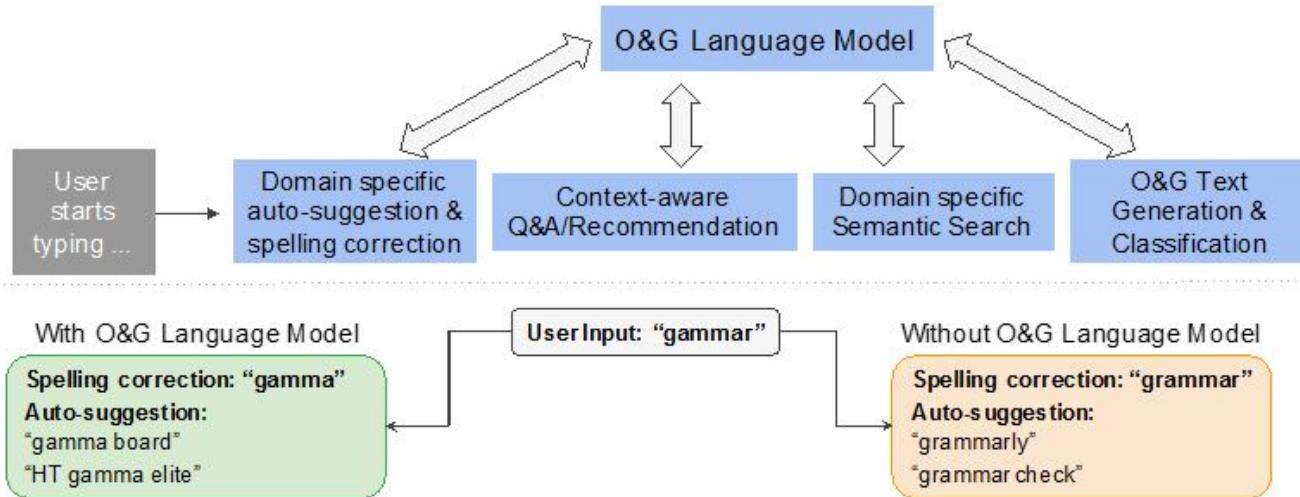
nvidia-docker run -it --name dsa-gp --rm=true -e CUDA_VISIBLE_DEVICES=0 --privileged -v /demos/dsa-gp/test/:/hostfiles aidocker.azurecr.io/dod/dsa-gp:CURRENT-SNAPSHOT python3 /localadm/scripts/GPregression.py /hostfiles/testInputGP.json
(10000, 5)
(10000, 1)
Starting
Centering output
Initializing model
2018-12-05 23:19:26.175848: I tensorflow/core/platform/cpu_feature_guard.cc:141] Your CPU supports instructions that this TensorFlow binary was not compiled to use: AVX2 FMA
2018-12-05 23:19:37.301660: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1405] Found device 0 with properties:
name: Tesla V100-PCIE-16GB major: 7 minor: 0 memoryClockRate(GHz): 1.38
pciBusID: 6f49:00:00.0
totalMemory: 15.75GiB freeMemory: 15.34GiB
2018-12-05 23:19:37.301719: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1484] Adding visible gpu devices: 0
2018-12-05 23:19:46.810942: I tensorflow/core/common_runtime/gpu/gpu_device.cc:965] Device interconnect StreamExecutor with strength 1 edge matrix:
2018-12-05 23:19:46.810997: I tensorflow/core/common_runtime/gpu/gpu_device.cc:971] 0
2018-12-05 23:19:46.811015: I tensorflow/core/common_runtime/gpu/gpu_device.cc:984] 0: N
2018-12-05 23:19:46.811315: I tensorflow/core/common_runtime/gpu/gpu_device.cc:1097] Created TensorFlow device (/job:localhost/replica:0/task:0/device:GPU:0 with 14844 MB memory) -> physical GPU (device: 0, name: Tesla V100-PCIE-16GB, pci bus id: 6f49:00:00.0, compute capability: 7.0)
/usr/local/GPFlow/gpflow/densities.py:89: UserWarning: Shape of x must be 2D at computation.
warnings.warn('Shape of x must be 2D at computation.')
Training
2018-12-05 23:20:00.610499: I tensorflow/core/kernels/cuda_solvers.cc:159] Creating CudaSolver handles for stream 0x57e1410
```

```
alex@data-science-ubuntu: ~ (ssh)
Every 0.1s: nvidia-smi
Wed Dec 5 23:20:20 2018
+-----+
| NVIDIA-SMI 410.72      Driver Version: 410.72      CUDA Version: 10.0 |
| GPU Name Persistence-MI Bus-Id Disp.A | Volatile Uncorr. ECC |
| Fan Temp Perf Pwr:Usage/Cap| Memory-Usage | GPU-Util Compute M. |
+-----+
| 0 Tesla V100-PCIE... Off | 00006F49:00:00.0 Off |          Off |
| N/A 44C P0 231W / 250W | 15448MiB / 16130MiB | 100% Default |
+-----+
| 1 Tesla V100-PCIE... Off | 00007ED5:00:00.0 Off |          Off |
| N/A 30C P0 37W / 250W | 0MiB / 16130MiB | 0% Default |
+-----+
| 2 Tesla V100-PCIE... Off | 00009265:00:00.0 Off |          Off |
| N/A 32C P0 36W / 250W | 0MiB / 16130MiB | 0% Default |
+-----+
| 3 Tesla V100-PCIE... Off | 0000B3B2:00:00.0 Off |          Off |
| N/A 32C P0 35W / 250W | 0MiB / 16130MiB | 5% Default |
+-----+
+-----+
| Processes:                               GPU Memory |
| GPU PID Type Process name               Usage     |
+-----+
| 0 72960 C python3                         15437MiB |
+-----+
```

# Demo 2: Step 3 – Show predictions

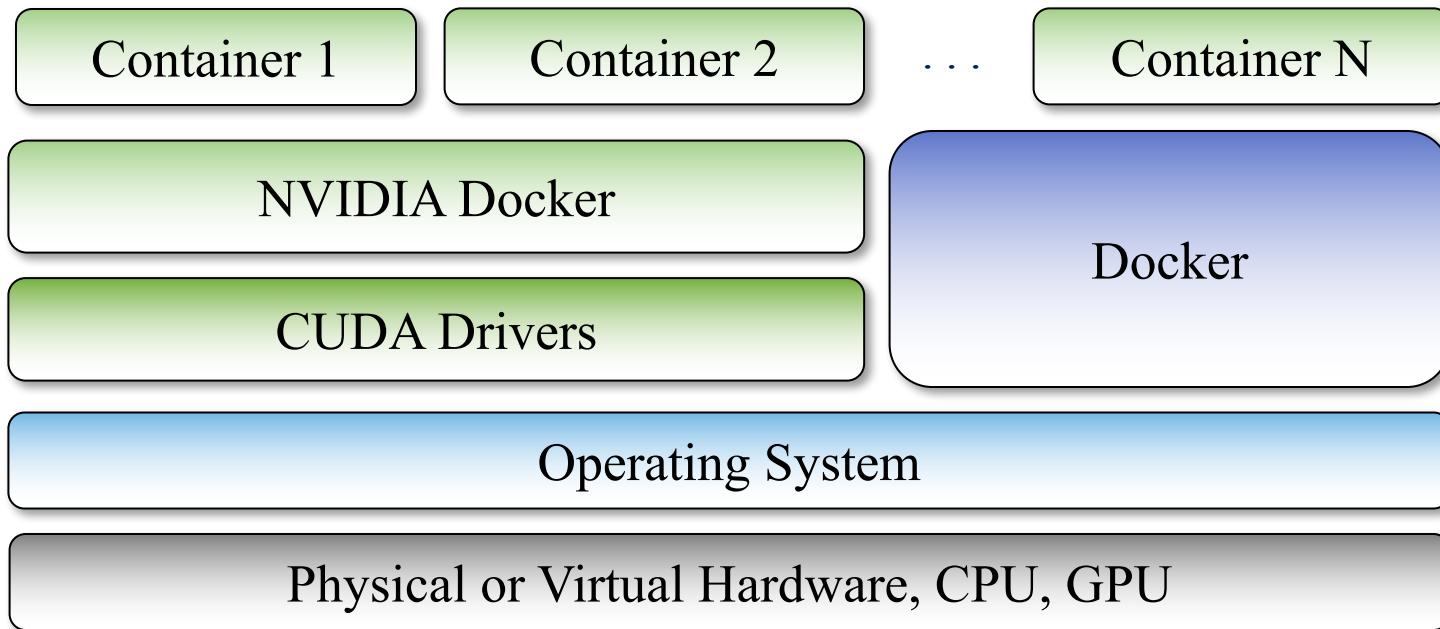
```
alex@data-science-ubuntu:/demos/dsa-gp$ head test/inputDataPredictions.csv
var1,var2,var3,var4,var5,output,predicted_mean,std,mean-2std,mean+2std
51.0,94.0,38.0,19.0,0,0.0004144872924631853,0.2658647,0.2658582944749971,0.009633429684119402,0.2465914351067583,0.2851251538432359
23.0,51.0,38.0,69.0,0,0.00026609256890219255,0.26584363,0.2651238765563399,0.009478730238340555,0.24616641607965878,0.284081337033021
54.0,43.0,112.0,25.0,9.36456772924286e-05,0.29908118,0.3017057737969125,0.008997593774711522,0.28371058624748946,0.3197009613463355
60.0,28.0,33.0,20.0,4.18537735858582e-05,0.26733735,0.27431720775941926,0.010539753728647116,0.253237700302125,0.2953967152167135
19.0,21.0,71.0,28.0,0,0.0003169546892362517,0.2658644,0.2692831633462853,0.00947443467514189,0.25033429399600154,0.2882320326965691
30.0,84.0,85.0,57.0,0,0.000585077172888083,0.2658647,0.2667686807995621,0.008898908341413502,0.2489708641167351,0.2845664974823891
44.0,21.0,110.0,22.0,0,0.00041376159838694726,0.2658647,0.2654815299610861,0.009122651118346212,0.24723622772439366,0.2837268321977785
38.0,38.0,67.0,49.0,0,0.0004470234160119924,0.2658647,0.26534452414889853,0.00910724288905884,0.24713003837078085,0.2835590099270162
48.0,58.0,53.0,57.0,0,0.00029030526902956613,0.26586515,0.26492327613253813,0.008960342488804124,0.2470025911549299,0.28284396111014637
alex@data-science-ubuntu:/demos/dsa-gp$ █
```

# Industry specific knowledge system

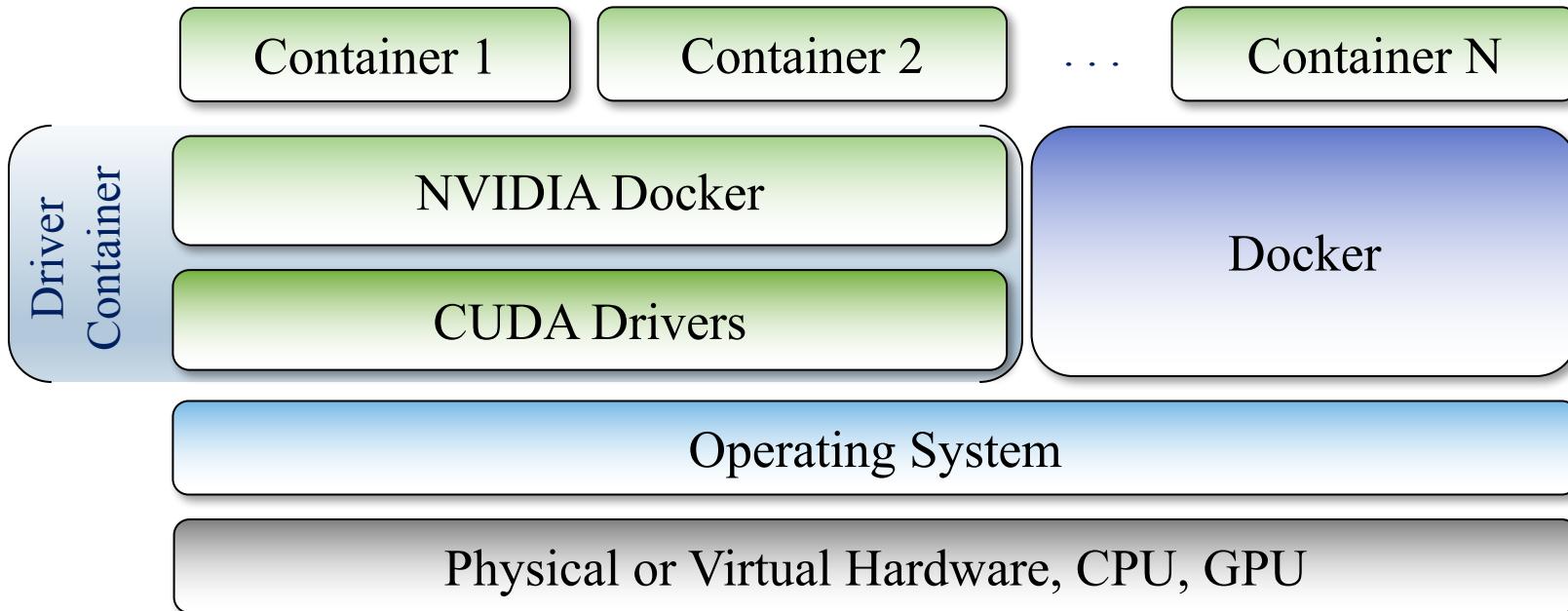


- Industry's first O&G-specific Language Model
- Unlock domain expertise from unstructured data in organizations

# GPU setup – a challenge at any scale



# GPU setup – a challenge at any scale



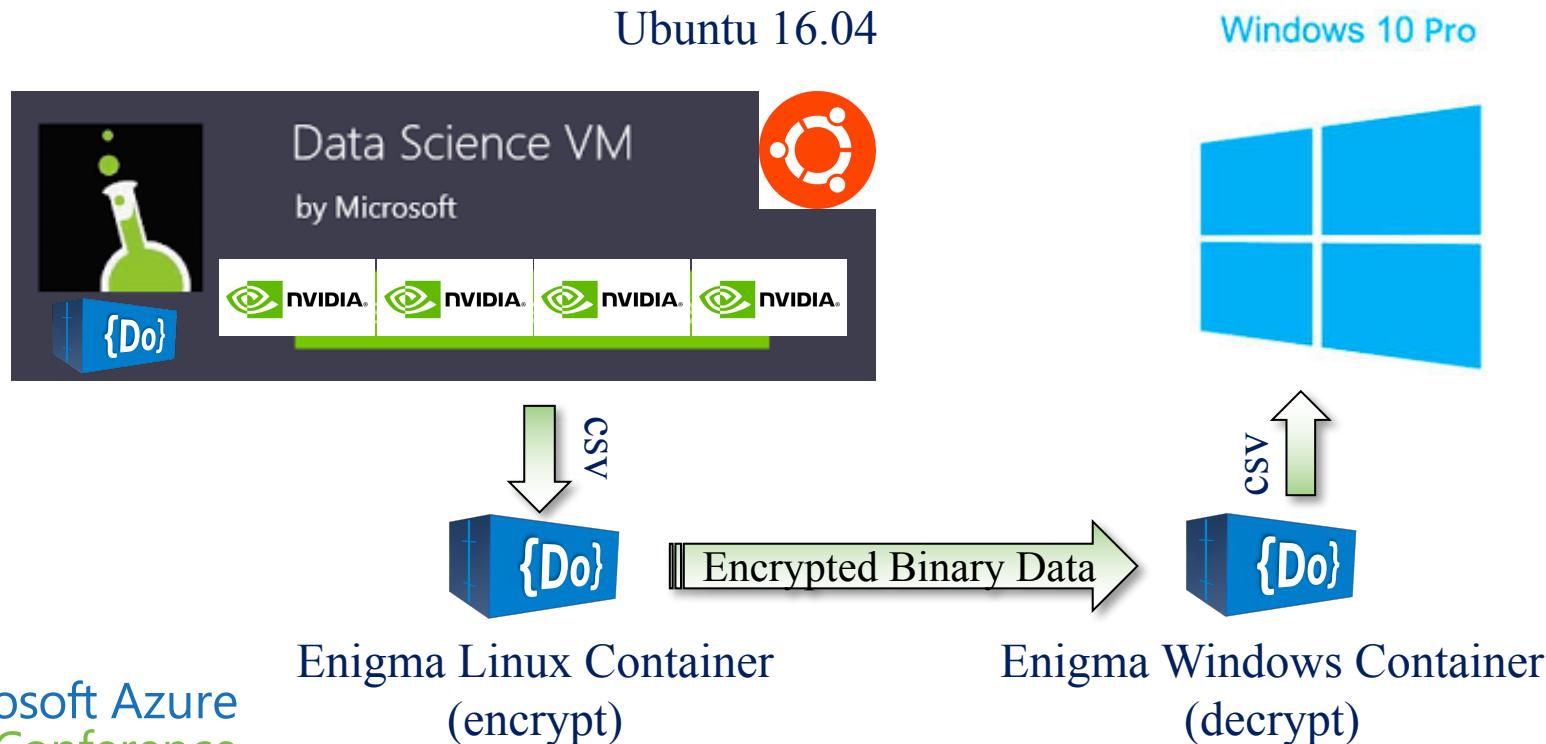
# Depend-on-Docker Example Enigma Project

<https://github.com/bhgedigital/enigma>

```
1. bash
> ls
Container-Root README.md      decrypt.sh    keys          push.sh
Dockerfile      build.sh      encrypt.sh    pull.sh
▶ iankouls@GC02T82RGTFME:~/Projects/2018/github.com/iankoulski/enigma
> ./encrypt.sh Depend-on-Docker
tt90QUp1uU80/4/TRaK+VpPx8vgSEKNHI12IGqKgHnJZ0HandwcFKlaoT02uRv/yAQWhVtaQwRnpv0DWwigG7V1
qL6zmZql6b4cHPpTDRCr0Lb6cTR5oDPeLtAmgZxfW3fUX/JcP+e+40vebYXw1MiwFtLojzV4uthT5SAgz7tZJoq
t0CN4TsD1dfkFMXrJr0VepPVpVP31I0DVwJP0YfQpUSRw6zUVa2t3YTEQGE6BNevAH060ZsUcgJcht7JPjMuRfq
Jt2JLukuBvSrp4A4W/mxj9y5/hHRgBR+r5IGby0kaVpAwnFKCS+BKDZCM3z1CQGKuYn03LE/bAtJeNcaQ==
▶ iankouls@GC02T82RGTFME:~/Proj
> █
```

```
1. bash
> ls
Container-Root README.md      decrypt.sh    keys          push.sh
Dockerfile      build.sh      encrypt.sh    pull.sh
▶ iankouls@GC02T82RGTFME:~/Projects/2018/github.com/iankoulski/enigma
> ./decrypt.sh tt90QUp1uU80/4/TRaK+VpPx8vgSEKNHI12IGqKgHnJZ0HandwcFKlaoT02uRv/yAQWhVtaQw
Rnpv0DWwigG7V1qL6zmZql6b4cHPpTDRCr0Lb6cTR5oDPeLtAmgZxfW3fUX/JcP+e+40vebYXw1MiwFtLojzV4ut
hT5SAgz7tZJoq t0CN4TsD1dfkFMXrJr0VepPVpVP31I0DVwJP0YfQpUSRw6zUVa2t3YTEQGE6BNevAH060ZsUcgJ
cht7JPjMuRfqJt2JLukuBvSrp4A4W/mxj9y5/hHRgBR+r5IGby0kaVpAwnFKCS+BKDZCM3z1CQGKuYn03LE/bAtJeNcaQ==
Depend-on-Docker
▶ iankouls@GC02T82RGTFME:~/Projects/2018/github.com/iankoulski/enigma
> █
```

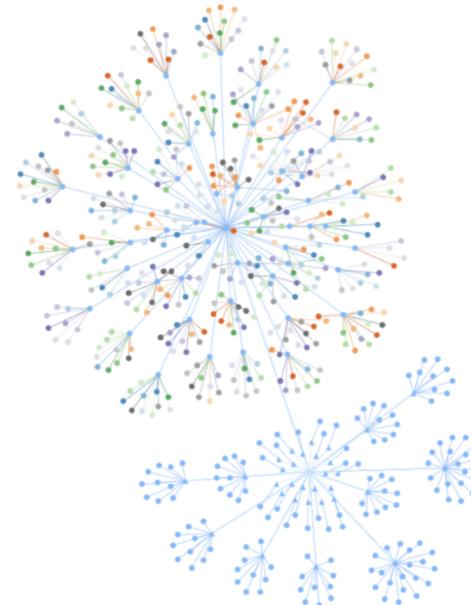
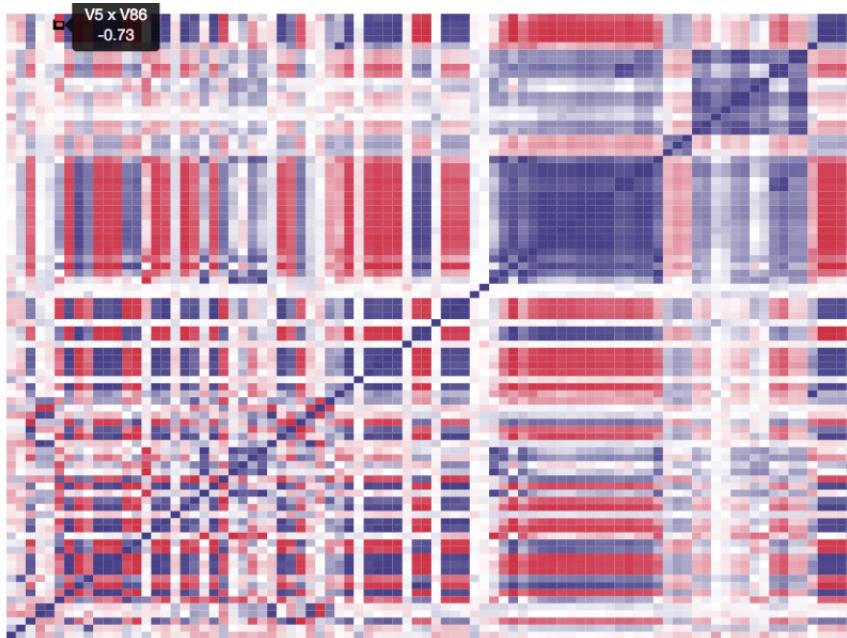
# Demo 3 – Data Security with Depend on Docker Enigma Container





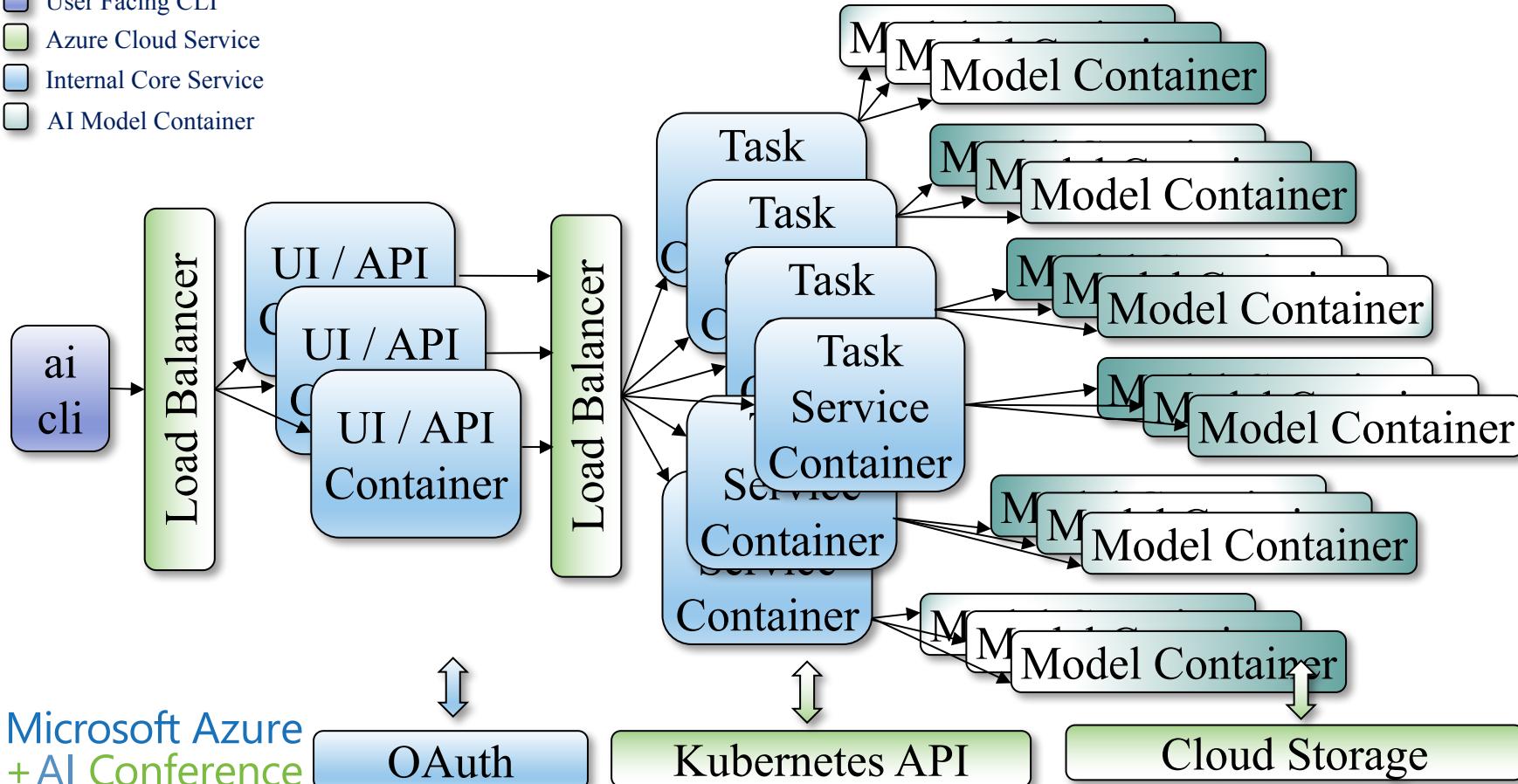


# Guided AI: Automatically build models



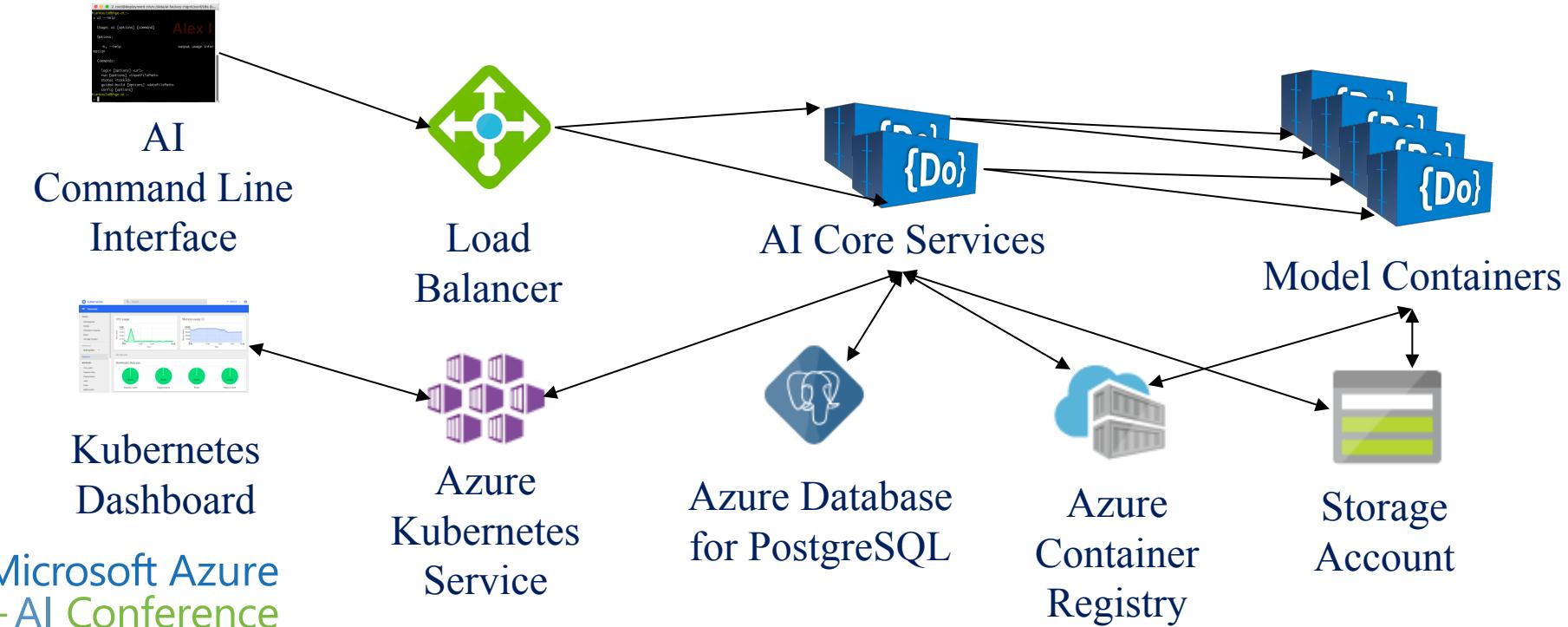
# Guided AI - Architecture

- User Facing CLI
- Azure Cloud Service
- Internal Core Service
- AI Model Container



# Demo 4 – Guided AI

## Scale up on Azure



# Demo 4: Step 1 – Logon to Kubernetes Dashboard

This customized version of the Kubernetes Dashboard has a Graph tab which allows us to visualize the workloads. The Task service is in the upper right part of the graph and is scaled to 20 pods.

The screenshot shows the Kubernetes Dashboard interface. The top navigation bar includes a Kubernetes logo, a search bar, and a '+ CREATE' button. The left sidebar is titled 'Workloads' and contains several sections: Cluster (Namespaces, Nodes, Persistent Volumes, Roles, Storage Classes), Namespace (default dropdown), Overview, Workloads (Cron Jobs, Daemon Sets, Deployments, Jobs, Pods, Graph, Replica Sets, Replication Controllers, Stateful Sets), Discovery and Load Balancing (Ingresses, Services), Config and Storage (Config Maps, Persistent Volume Claims, Secrets). The 'Graph' section is currently selected. The main content area is titled 'Graph' and displays a network diagram. At the top, there is a summary table for 'Pods Status':

Running	Pending	Total
58	0	58

The network graph itself consists of numerous blue circular nodes connected by light blue lines, forming a complex web-like structure. A specific cluster of nodes in the upper right quadrant is highlighted and labeled 'Task'. This indicates that the Task service is running 20 pods.

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# Demo 4: Step 2 – Submit dataset using AI CLI

```
alex@dod-ubuntu1804:/demo/ai-build$ ai guided-build -i 10 -e ./guided_build_1000.csv
{"uploaded": [{"filename": "guided_build_1000.csv", "id": "8f700b0e201542819c79c12c053bd9a2"}]}
```

Created: 0	Pending: 6000	Total: 6000
------------	---------------	-------------

Task f69d2c0e-a469-4020-bc18-ff72e6498cc0 created (20009 ms).

Created: 1	Pending: 5999	Total: 6000
------------	---------------	-------------

Task 06d7bf3a-1376-4844-ad11-ff95e999910f created (20043 ms).

Created: 2	Pending: 5998	Total: 6000
------------	---------------	-------------

Task ff560320-6888-4c52-805c-787be0e15824 created (20156 ms).

Created: 3	Pending: 5997	Total: 6000
------------	---------------	-------------

..  
Task 9bc79495-8e59-4eee-89b6-b89f5652aae5 created (34305 ms).

Created: 5996	Pending: 4	Total: 6000
---------------	------------	-------------

Task 597c1b32-665e-4d94-a7ef-7666b5f7b3f6 created (26186 ms).

Created: 5997	Pending: 3	Total: 6000
---------------	------------	-------------

Task 4494d20b-9088-4fba-9a16-712f681e6b5b created (39505 ms).

Created: 5998	Pending: 2	Total: 6000
---------------	------------	-------------

Task 61b7dc60-3378-43cf-ac82-4b51673202c9 created (22940 ms).

Created: 5999	Pending: 1	Total: 6000
---------------	------------	-------------

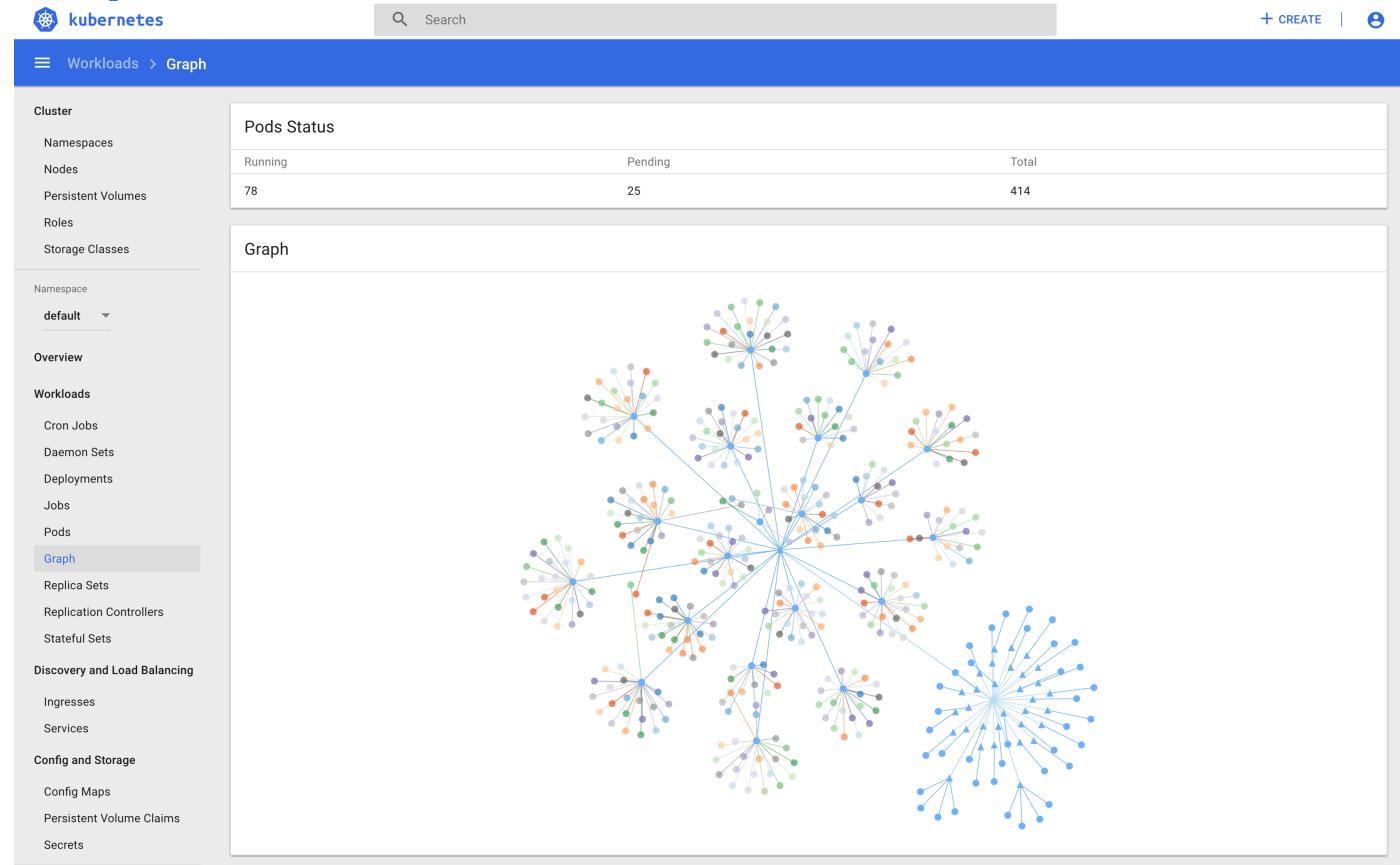
Task ad111432-fb88-40d1-87f0-50808986920c created (19931 ms).

Created: 6000	Pending: 0	Total: 6000
---------------	------------	-------------

```
alex@dod-ubuntu1804:/demo/ai-build$ 
```

# Demo 4: Step 3 – Observe new model containers

Each colorful dot is a model pod. Model pods are connected to their parent task service pod, which makes this workload visualization look like a fireworks explosion.

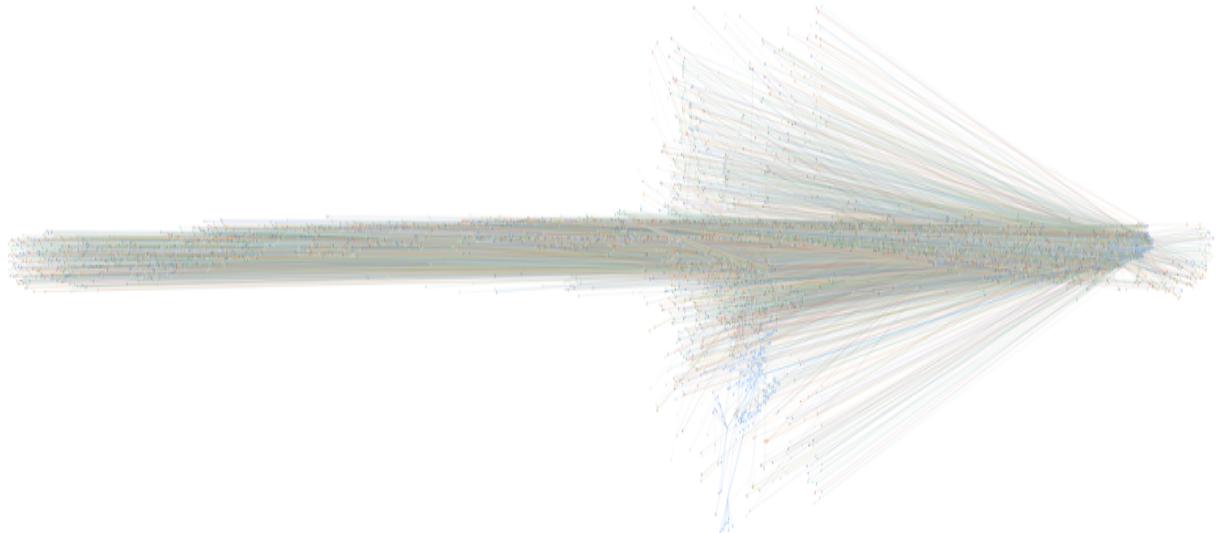


# 30,000 Models built concurrently

50 Nodes

4800 vCPUs

30 TB RAM



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# Places where you will find containers

- CI / CD Systems – Use Docker in Docker to build and ship container images
- Software Test execution – Create environment, execute test, remove container
- Development – IDE in a container, Cloud IDE, super easy developer onboarding
- CLI – e.g. Azure cli in Docker, SQL client in Docker
- Diagnostics, Troubleshooting, Support – Run Docker to collect diagnostic info
- Patching - Run Docker command to fix and patch installed software
- Backups – Run your backup job in a container
- Firmware updates via containers!
- Initialization scripts – run privileged to install software or do admin work on host

# Depend on Docker Summary

- It is easy to build Windows and Linux containers
- Just run, instead of “install first, and then run”
- You choose whether to run your workload on CPU or GPU
- Docker enables us to scale workloads up and down at will

Docker makes IT possible



# References

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- Container Hacks and Fun Images, Jessie Frazelle <https://www.youtube.com/watch?v=cYsVvV1aVss>
- GE SemTK Project - Paul Cudihy, Jenny Weisenberg, Justin McHugh, et.al. <https://github.com/ge-semtk/semtk>
- Enigma DoD Project – Yekta Yazdani <https://github.com/bhgedigital/enigma>
- Google Images <https://images.google.com/>
- Depend-on-Docker Project <https://github.com/bhgedigital/depend-on-docker>
- Depend on Docker DockerCon'18: <https://embed.vidyard.com/share/5hUnYnLyxkJGSuK89woNn>
- NVIDIA Driver Containers: [https://github.com/NVIDIA/nvidia-docker/wiki/Driver-containers-\(EXPERIMENTAL\)](https://github.com/NVIDIA/nvidia-docker/wiki/Driver-containers-(EXPERIMENTAL))
- Microsoft Azure: <https://azure.microsoft.com/en-us/>

# Questions?

*Please use EventsXD to fill out a session evaluation.*

Thank you!

