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## VIDEO



[Q&A WITH SPEAKER](#) [SPEAKER BIO](#)



**Jim White**  
CTO  
IoTech Systems

Jim White is CTO of IoTech Systems – a UK based IoT software products and solutions company. He serves on the technical advisory committee of the Linux Foundation's LF Edge project. Prior to joining IoTech, Jim was a Distinguished Engineer and IoT Platform Development Team Lead for Dell Technologies. There he created and architected the project that became EdgeX Foundry – one of Dell's largest ever open source efforts. He remains a member of the EdgeX project serving as vice-chair of the Technical Steering Committee. EdgeX is an open framework for building industrial IoT edge computing systems.

## SLIDES



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## VIDEO



### Q&A WITH SPEAKER SPEAKER BIO



**Jim White**  
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Jim White is CTO of IoTech Systems – a UK based IoT software products and solutions company. He serves on the technical advisory committee of the Linux Foundation's LF Edge project. Prior to joining IoTech, Jim was a Distinguished Engineer and IoT Platform Development Team Lead for Dell Technologies. There he created and architected the project that became EdgeX Foundry – one of Dell's largest ever open source efforts. He remains a member of the EdgeX project serving as vice-chair of the Technical Steering Committee. EdgeX is an open framework for building industrial IoT edge computing systems.

## SLIDES

### Agenda

- What is edge management (requirements)
- Cloud / enterprise solutions versus edge management
- An open source approach
  - Benefits of the solution
- Demo
- Challenges and Lessons Learned



IoTech





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SLIDES



# Demo time



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## VIDEO



```

+ sys-mgmt-server-component git:(6aed94f) # docker ps

```

CONTAINER ID	IMAGE	COMMAND	CREATED	STATUS	PORTS
b00a6337279f	iotechsys/awx_task:9.2.0	"/tini -- /bin/sh -c."	3 minutes ago	Up 3 minutes	0.0.0.0:8052->80
52/tcp		awx_task			
9773eddfcb6b	iotechsys/awx_web:9.2.0	"/tini -- /bin/sh -c."	3 minutes ago	Up 3 minutes	0.0.0.0:80->8052
/tcp		awx_web			
309de478f148	grafana/grafana	"/run.sh"	3 minutes ago	Up 3 minutes	0.0.0.0:3000->30
00/tcp		grafana			
de7f4538f1ac	memcached:alpine	"docker-entrypoint.s."	3 minutes ago	Up 3 minutes	0.0.0.0:11211->1
1211/tcp		memcached_alpine			
f42568a772eb	prom/prometheus:v2.1.0	"/bin/prometheus --c."	3 minutes ago	Up 3 minutes	0.0.0.0:9090->90
90/tcp		prometheus			
5adce36534ec	postgres:10	"docker-entrypoint.s."	3 minutes ago	Up 3 minutes	0.0.0.0:5432->54
32/tcp		awx_postgres			
c2017525c952	ansible/awx_rabbitmq:3.7.4	"docker-entrypoint.s."	3 minutes ago	Up 3 minutes	5671-5672/tcp, 1
5671-15672/tcp, 0.0.0.0:4369->4369/tcp, 25672/tcp		awx_rabbitmq			
ecd2b65c7f3e	portainer/portainer:1.23.1	"/portainer -H unix:."	3 minutes ago	Up 3 minutes	0.0.0.0:8000->80
00/tcp, 0.0.0.0:9000->9000/tcp		portainer			
bf69a816ffda	iotechsys/edgexpert-mqtt-broker:1.6	"/bin/sh -c mosquitto"	About an hour ago	Up About an hour	0.0.0.0:1883->18
83/tcp		mqtt-broker			

```

+ sys-mgmt-server-component git:(6aed94f) #

```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toms-MBP -- ./sys-mgmt-cli -- -zsh -- 139x36

➤ sys-mgmt-cli git:(a90a7e3) # ./sys-mgmt-cli
The system management cli used to provision and deploy remote nodes

Usage:
  sys-mgmt-cli [flags]
  sys-mgmt-cli [command]

Available Commands:
  app      Manage containerised apps
  help     Help about any command
  node     Manage nodes
  template Manage templates of containerised apps
  version  Show the version information

Flags:
  -h, --help  help for sys-mgmt-cli

Use 'sys-mgmt-cli [command] --help' for more information about a command.
➤ sys-mgmt-cli git:(a90a7e3) #
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- zsh -- 139x36

+ sys-mgmt-cli git:(d90a7e3) * ./sys-mgmt-cli
The system management cli used to provision and deploy remote nodes

Usage:
  sys-mgmt-cli [flags]
  sys-mgmt-cli [command]

Available Commands:
  app      Manage containerised apps
  help     Help about any command
  node     Manage nodes
  template Manage templates of containerised apps
  version  Show the version information

Flags:
  -h, --help  help for sys-mgmt-cli

Use 'sys-mgmt-cli [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d90a7e3) * ./sys-mgmt-cli node
Manage nodes

Usage:
  sys-mgmt-cli node [flags]
  sys-mgmt-cli node [command]

Available Commands:
  add  Add edge node/s
  rm   Remove edge node/s
  view View edge node/s

Flags:
  -h, --help  help for node

Use 'sys-mgmt-cli node [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d90a7e3) * 
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- zsh -- 139x36

template  Manage templates of containerised apps
version   Show the version information

Flags:
-h, --help  help for sys-mgmt-cli

Use 'sys-mgmt-cli [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node
Manage nodes

Usage:
sys-mgmt-cli node [flags]
sys-mgmt-cli node [command]

Available Commands:
add      Add edge node/s
rm       Remove edge node/s
view     View edge node/s

Flags:
-h, --help  help for node

Use 'sys-mgmt-cli node [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node add
Add edge node/s

Usage:
sys-mgmt-cli node add [flags]

Flags:
--address string      Edge node IP address
--description string  Edge node description
-f, --filename string Edge nodes configuration file name (JSON format)
-h, --help            help for add
--name string         Edge node name
+ sys-mgmt-cli git:(d90a7e3) #
```



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## VIDEO



```
Terminal Shell Edit View Window Help
app@mgmt-ctl: ~$ docker-compose up -d
[+] Running 3/3
 ⬇️ db
 ⬇️ redis
 ⬇️ app

app@mgmt-ctl: ~$ docker-compose logs
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: starting PostgreSQL 15.1 on x86_64-pc-linux-gnu, compiled by gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0, 64-bit
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on IPv4 address '0.0.0.0', port 5432
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on IPv6 address ':::0.0.0.0', port 5432
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on Unix socket '/var/run/postgresql/.s.PGSQL.5432'
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: could not open log file '/var/log/postgresql/postgresql-15.1.log': No such file or directory
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: using default log file 'stderr'
db      | 2023-04-19 10:00:00.000000 UTC [1] LOG: database system is ready to accept connections
redis   | 6.0.13
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: starting PostgreSQL 15.1 on x86_64-pc-linux-gnu, compiled by gcc (Ubuntu 11.4.0-1ubuntu1~22.04) 11.4.0, 64-bit
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on IPv4 address '0.0.0.0', port 5432
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on IPv6 address ':::0.0.0.0', port 5432
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: listening on Unix socket '/var/run/postgresql/.s.PGSQL.5432'
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: could not open log file '/var/log/postgresql/postgresql-15.1.log': No such file or directory
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: using default log file 'stderr'
app     | 2023-04-19 10:00:00.000000 UTC [1] LOG: database system is ready to accept connections
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- zsh -- 139x36

-h, --help    help for node

Use 'sys-mgmt-cli node [command] --help' for more information about a command.
[*] sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node add
Add edge node/s

Usage:
  sys-mgmt-cli node add [flags]

Flags:
  --address string      Edge node IP address
  --description string  Edge node description
  -f, --filename string Edge nodes configuration file name (JSON format)
  -h, --help            help for add
  --name string         Edge node name

[*] sys-mgmt-cli git:(d90a7e3) # cat config/vnodes-config.json
{
  "NodeConfig": [
    {
      "name": "vEdge1",
      "address": "192.168.99.167",
      "description": "virtual node 1 (docker machine)"
    },
    {
      "name": "vEdge2",
      "address": "192.168.99.168",
      "description": "virtual node 2 (docker machine)"
    },
    {
      "name": "vEdge3",
      "address": "192.168.99.169",
      "description": "virtual node 3 (docker machine)"
    }
  ]
}
[*] sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node add -f config/vnodes-config.json
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- zsh -- 139x36

Flags:
--address string      Edge node IP address
--description string  Edge node description
-f, --filename string  Edge nodes configuration file name (JSON format)
-h, --help            help for add
--name string         Edge node name

+ sys-mgmt-cli git:(a90a7e3) # cat config/vnodes-config.json
{
  "NodeConfig": [
    {
      "name": "vEdge1",
      "address": "192.168.99.167",
      "description": "virtual node 1 (docker machine)"
    },
    {
      "name": "vEdge2",
      "address": "192.168.99.168",
      "description": "virtual node 2 (docker machine)"
    },
    {
      "name": "vEdge3",
      "address": "192.168.99.169",
      "description": "virtual node 3 (docker machine)"
    }
  ]
}

+ sys-mgmt-cli git:(a90a7e3) # ./sys-mgmt-cli node add -f config/vnodes-config.json
AWX host '192.168.99.167' is added
Portainer endpoint 'vEdge1' is added
AWX host '192.168.99.168' is added
Portainer endpoint 'vEdge2' is added
AWX host '192.168.99.169' is added
Portainer endpoint 'vEdge3' is added
Deploying and Pairing Portainer Edge Agents
+ sys-mgmt-cli git:(a90a7e3) #
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- zsh -- 139x36

    "address": "192.168.99.169",
    "description": "virtual node 3 (docker machine)"
  }
}
}
}
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node add -f config/vnodes-config.json
AWX host '192.168.99.167' is added
Portainer endpoint 'vEdge1' is added
AWX host '192.168.99.168' is added
Portainer endpoint 'vEdge2' is added
AWX host '192.168.99.169' is added
Portainer endpoint 'vEdge3' is added
Deploying and Pairing Portainer Edge Agents
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node
Manage nodes

Usage:
  sys-mgmt-cli node [flags]
  sys-mgmt-cli node [command]

Available Commands:
  add      Add edge node/s
  rm       Remove edge node/s
  view     View edge node/s

Flags:
  -h, --help  help for node

Use 'sys-mgmt-cli node [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node view -a
NAME      ADDRESS      DESCRIPTION      STATUS
vEdge1    192.168.99.167  virtual node 1 (docker machine)  Unassociated
vEdge2    192.168.99.168  virtual node 2 (docker machine)  Unassociated
vEdge3    192.168.99.169  virtual node 3 (docker machine)  Unassociated

+ sys-mgmt-cli git:(d90a7e3) #
```



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## VIDEO



```
Terminal Shell Edit View Window Help
sys-mgmt-cli -- tf@Toma-MBP -- ./sys-mgmt-cli -- -zsh -- 139x36

AWX host '192.168.99.167' is added
Portainer endpoint 'vEdge1' is added
AWX host '192.168.99.168' is added
Portainer endpoint 'vEdge2' is added
AWX host '192.168.99.169' is added
Portainer endpoint 'vEdge3' is added
Deploying and Pairing Portainer Edge Agents
[* sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node
Manage nodes

Usage:
  sys-mgmt-cli node [flags]
  sys-mgmt-cli node [command]

Available Commands:
  add      Add edge node/s
  rm       Remove edge node/s
  view     View edge node/s

Flags:
  -h, --help  help for node

Use 'sys-mgmt-cli node [command] --help' for more information about a command.
[* sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node view -a
```

NAME	ADDRESS	DESCRIPTION	STATUS
vEdge1	192.168.99.167	virtual node 1 (docker machine)	Unassociated
vEdge2	192.168.99.168	virtual node 2 (docker machine)	Unassociated
vEdge3	192.168.99.169	virtual node 3 (docker machine)	Unassociated

```

[* sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli node view -a
```

NAME	ADDRESS	DESCRIPTION	STATUS
vEdge1	192.168.99.167	virtual node 1 (docker machine)	Associated
vEdge2	192.168.99.168	virtual node 2 (docker machine)	Associated
vEdge3	192.168.99.169	virtual node 3 (docker machine)	Associated

```

[* sys-mgmt-cli git:(d90a7e3) #
```



Questions? Ask the Events team on the #1-helpdesk Slack channel

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## VIDEO



Portainer

Ansible AWX | DASHBOARD

Home - Grafana

localhost:9000/#/home

☆ ⓘ ⋮

portainer.io

Home

SETTINGS

Extensions

Users

Endpoints

Registries

Settings

Home

Endpoints

Portainer support

admin

[my account](#)

[log out](#)

Endpoints

Refresh

Search by name, group, tag, status, URL...

primary 2020-04-15 15:31:28

1 stack

0 services

9 containers - 0 / 0 / 0

9 volumes

304 images

6 2.2 GB - No tags

Group: Unassigned

Swarm 19.03.8

/var/run/docker.sock

vEdge1 associated

No snapshot available

192.168.99.367, VPNHosts, IoTech

Group: Unassigned

vEdge2 associated

No snapshot available

192.168.99.368, VPNHosts, IoTech

Group: Unassigned

vEdge3 associated

No snapshot available

192.168.99.369, VPNHosts, IoTech

Group: Unassigned



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Portainer

Ansible AWX | JOBS

Home - Grafana

localhost:8080/jobs/?job\_search=page\_size:20;order\_by:-finished;not\_launch\_type:sync

AWX

admin

JOBS

JOBS 1

SEARCH

KEY

Compact Expanded Finish Time (Descending)

1 - Setup\_Portainer\_Edge Playbook Run

ITEMS 1 - 1



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## VIDEO



1080x1080



Portainer | Ansible AWX | HOSTS | Home - Grafana

localhost:8/inventories/inventory/2/hosts?inventory\_search=page\_size:20;order\_by:name

AWX

admin

INVENTORIES / IoTTech / HOSTS

IoTTech

DETAILS PERMISSIONS GROUPS **HOSTS** SOURCES COMPLETED JOBS

SEARCH [ ] KEY [ ] RUN COMMANDS [ ]

	HOSTS *	DESCRIPTION	RELATED GROUPS	ACTIONS
<input type="checkbox"/>	192.168.99.167	virtual node 1 (docker mach...	vphosts	
<input type="checkbox"/>	192.168.99.168	virtual node 2 (docker mach...	vphosts	
<input type="checkbox"/>	192.168.99.169	virtual node 3 (docker mach...	vphosts	

PAGE 1 - 3

INVENTORIES HOSTS

SEARCH [ ] KEY [ ]

	NAME *	TYPE	ORGANIZATION	ACTIONS
	Demo Inventory	Inventory	Default	
	IoTTech	Inventory	Default	

PAGE 1 - 2



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## VIDEO



AWX

Views

Dashboard

Jobs

Schedules

My View

RESOURCES

Templates

Credentials

Projects

Inventories

Inventory Scripts

ACCESS

Organizations

Users

Teams

ADMINISTRATION

Credential Types

Notifications

Management Jobs

Instance Groups

Applications

Settings

DASHBOARD

4

HOSTS

0

FAILED HOSTS

2

INVENTORIES

0

INVENTORY SYNC FAILURES

2

PROJECTS

0

PROJECT SYNC FAILURES

JOB STATUS

PERIOD: LAST MONTH

JOB TYPE: ALL

VIEW: ALL

RECENTLY USED TEMPLATES

NAME	ACTIVITY	ACTIONS
Setup_Portainer_Edge	<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div>	

[VIEW ALL](#)

RECENT JOB RUNS

NAME	TIME
Setup_Portainer_Edge	15/4/2020 15:34:29

[VIEW ALL](#)

ERRORS



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## VIDEO



sys-mgmt-cli — t@Toms-MBP — ./sys-mgmt-cli — zsh — 139x36

SQL Server	1	16	Microsoft SQL Server Developer for Windows containers
SQL Server Express	1	17	Microsoft SQL Server Express for Windows containers
IronFunctions API	1	18	Open-source serverless computing platform
IronFunctions UI	1	19	Open-source user interface for IronFunctions
Solr	1	20	Open-source enterprise search platform
Redis	1	21	Open-source in-memory data structure store
RabbitMQ	1	22	Highly reliable enterprise messaging system
Ghost	1	23	Free and open-source blogging platform
Plesk	1	24	WebOps platform and hosting control panel
Joomla	1	25	Another free and open-source CMS
Drupal	1	26	Open-source content management framework
Plone	1	27	A free and open-source CMS built on top of Zope
Magento 2	1	28	Open-source e-commerce platform
Semaphore Docker Agent	1	29	Collect logs, metrics and docker events
Datadog agent	1	30	Collect events and metrics
Mautic	1	31	Open-source marketing automation platform
Wowza	1	32	Streaming media server
Jenkins	1	33	Open-source continuous integration tool
Redmine	1	34	Open-source project management tool
Odoo	1	35	Open-source business apps
Urbackup	1	36	Open-source network backup
File browser	1	37	A web file manager
CommandBox	1	38	ColdFusion (CFML) CLI
ContentBox	1	39	Open-source modular CMS
Portainer Agent	2	40	Manage all the resources in your Swarm cluster
OpenFaaS	2	41	Serverless functions made simple
IronFunctions	2	42	Open-source serverless computing platform
CockroachDB	2	43	CockroachDB cluster
Wordpress	2	44	Wordpress setup with a MySQL database
Wordpress	3	45	Wordpress setup with a MySQL database
Microsoft OMS Agent	2	46	Microsoft Operations Management Suite Linux agent.
Semaphore Docker Agent	2	47	Collect logs, metrics and docker events
Datadog agent	2	48	Collect events and metrics
Sonatype Nexus3	1	49	Sonatype Nexus3 registry manager

• sys-mgmt-cli git:(d70a7e3) #

cli-config — t@Toms-MBP — zsh — 139x34

cli-config git:(master) # docker-machine ls

AWX

VIEWS

- Dashboard
- Jobs
- Schedules
- My View

RESOURCES

- Templates
- Credentials
- Projects
- Inventories
- Inventory

ACCESS

- Organization
- Users
- Teams

ADMINISTRATION



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## VIDEO



```
• sys-mgmt-cli git:(d90a7e1) #
```

```
cli-config — tf@Toms-MBP — zsh — 139x34
```

```
..sa/cli-config
```

```
..ver-component
```

```
mosquito_sub
```

```
• cli-config git:(master) # docker-machine ls
```

NAME	ACTIVE	DRIVER	STATE	URL	SWARM	DOCKER	ERRORS
vnodel	-	virtualbox	Running	tcp://192.168.99.167:2376		v19.03.5	
vnodel2	-	virtualbox	Running	tcp://192.168.99.168:2376		v19.03.5	
vnodel3	-	virtualbox	Running	tcp://192.168.99.169:2376		v19.03.5	

```
• cli-config git:(master) # cat edgexpert-template-stack-config.json
```

```
{
  "StackConfig": [
    {
      "type": 2,
      "title": "EdgeXpert",
      "description": "EdgeXpert Deployment",
      "note": "Deploys an instance of EdgeXpert used in the Project Sprit demo",
      "categories": ["Edge"],
      "platform": "linux",
      "logo": "http://www.iotechsys.com/cmsfiles/iotech_systems/docs/edgexpert/_images/EdgeXpertLogo.png",
      "repository": {
        "url": "https://github.com/TonFlem/edgexpert-compose",
        "stackfile": "docker-compose.yml"
      }
    }
  ]
}
```

```
• cli-config git:(master) #
```





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## VIDEO



```
sys-mgmt-cli template add [+flags]
```

Flags:

```
-f, --filename string  Swarm stack(s) configuration file name (JSON format)
-h, --help             help for add
```

```
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli template add -f /Users/tf/Projects/sys-mgmt-demos/cli-config
```

cli-config

cli-config

cli-config

```
+ cli-config git:(master) # docker-machine ls
```

NAME	ACTIVE	DRIVER	STATE	URL	SWARM	DOCKER	ERRORS
vnodel	-	virtualbox	Running	tcp://192.168.99.167:2376		v19.03.5	
vnodel2	-	virtualbox	Running	tcp://192.168.99.168:2376		v19.03.5	
vnodel3	-	virtualbox	Running	tcp://192.168.99.169:2376		v19.03.5	

```
+ cli-config git:(master) # cat edgexpert-template-stack-config.json
```

```
{
  "StackConfig": [
    {
      "type": 2,
      "title": "EdgeXpert",
      "description": "EdgeXpert Deployment",
      "note": "Deploys an instance of EdgeXpert used in the Project Sprit demo",
      "categories": ["Edge"],
      "platform": "linux",
      "logo": "http://www.iotechsys.com/cmsfiles/iotech_systems/docs/edgexpert/_images/EdgeXpertLogo.png",
      "repository": {
        "url": "https://github.com/TomFlem/edgexpert-compose",
        "stackfile": "docker-compose.yaml"
      }
    }
  ]
}
```

```
+ cli-config git:(master) # pwd
```

```
/Users/tf/Projects/sys-mgmt-demos/cli-config
```

```
+ cli-config git:(master) #
```





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## VIDEO



```
+ sys-mgmt-cli git:(master) ./sys-mgmt-cli template add
Add template(s) to portainer

Usage:
  sys-mgmt-cli template add [flags]

Flags:
  -f, --filename string  Swarm stack(s) configuration file name (JSON format)
  -h, --help              help for add
+ sys-mgmt-cli git:(master) ./sys-mgmt-cli template add -f /Users/tf/Projects/sys-mgmt-demos/cli-config/edgexpert-template-stack-config.json

cli-config -- 10@Toms-MBP -- ssh -- 139x34

+ cli-config git:(master) docker-machine ls
NAME      ACTIVE   DRIVER        STATE     URL                  SWARM   DOCKER   ERRORS
vnode1   -        virtualbox    Running   tcp://192.168.99.167:2376           v19.03.5
vnode2   -        virtualbox    Running   tcp://192.168.99.168:2376           v19.03.5
vnode3   -        virtualbox    Running   tcp://192.168.99.169:2376           v19.03.5
+ cli-config git:(master) cat edgexpert-template-stack-config.json
{
  "StackConfig": [
    {
      "type": 2,
      "title": "EdgeXpert",
      "description": "EdgeXpert Deployment",
      "note": "Deploys an instance of EdgeXpert used in the Project Sprit demo",
      "categories": ["Edge"],
      "platform": "linux",
      "logo": "http://www.iotechsys.com/cmsfiles/iotech_systems/docs/edgexpert/_images/EdgeXpertLogo.png",
      "repository": {
        "url": "https://github.com/TomFlem/edgexpert-compose",
        "stackfile": "docker-compose.yml"
      }
    }
  ]
}
```

```
+ cli-config git:(master) pwd
/Users/tf/Projects/sys-mgmt-demos/cli-config
```



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## VIDEO



```
usage:
  sys-mgmt-cli template add [flags]

Flags:
  -f, --filename string  Swarm stack(s) configuration file name (JSON format)
  -h, --help              help for add

+ sys-mgmt-cli git:(090a7e3) x ./sys-mgmt-cli template add -f /Users/tf/Projects/sys-mgmt-demos/cli-config/edgexpert-template-stack-config.json
Template 'EdgeXpert' is added
Completed processing Stack(s) from '/Users/tf/Projects/sys-mgmt-demos/cli-config/edgexpert-template-stack-config.json'
+ sys-mgmt-cli git:(090a7e3) x

cli-config — 09/09/2019 — 13:03:34

+ cli-config git:(master) x docker-machine ls
NAME      ACTIVE   DRIVER        STATE     URL                  SWARM   DOCKER   ERRORS
vnode1    -        virtualbox    Running   tcp://192.168.99.167:2376           v19.03.5
vnode2    -        virtualbox    Running   tcp://192.168.99.168:2376           v19.03.5
vnode3    -        virtualbox    Running   tcp://192.168.99.169:2376           v19.03.5

+ cli-config git:(master) x cat edgexpert-template-stack-config.json
{
  "StackConfig": [
    {
      "type": 2,
      "title": "EdgeXpert",
      "description": "EdgeXpert Deployment",
      "note": "Deploys an instance of EdgeXpert used in the Project Sprit demo",
      "categories": ["Edge"],
      "platform": "linux",
      "logo": "http://www.iotechsys.com/cmsfiles/iotech_systems/docs/edgexpert/_images/EdgeXpertLogo.png",
      "repository": {
        "url": "https://github.com/TomFlem/edgexpert-compose",
        "stackfile": "docker-compose.yaml"
      }
    }
  ]
}
```

```
+ cli-config git:(master) x pwd
/Users/tf/Projects/sys-mgmt-demos/cli-config
```



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## VIDEO



Terminal

```
Microsoft SQL Server Express for Windows containers
Open-source serverless computing platform
Open-source user interface for GraphQL
Open-source enterprise search platform
Open-source streaming data structure store
Highly reliable enterprise messaging system
Free and open-source blogging platform
Webpage platform and hosting control panel
Another free and open-source CMS
Open-source content management framework
A free and open-source CMS built on top of Django
Open-source e-commerce platform
Collect logs, metrics and cluster events
Collect events and metrics
Open-source marketing automation platform
Streaming media server
Open-source continuous integration tool
Open-source project management tool
Open-source business apps
Open-source network backup
A web file manager
GraphQL (GQL) UI
Open-source webjar CMS
Manage all the resources in your AWS cluster
Serverless functions made simple
Open-source serverless computing platform
CockroachDB cluster
WordPress setup with a MySQL database
WordPress setup with a MySQL database
Microsoft Operations Management Suite Linux Agent
Collect logs, metrics and cluster events
Collect events and metrics
Sonatype Nexus3 registry manager
Edgexers Deployers
```

Terminal

```
root@aws-ec2:~# docker-machine ls
NAME    ACTIVITY    DRIVER    STATE    URL    SWARM    DOCKER    ERRORS
vm001   -           virtualbox    running    tcp://192.168.99.101:2376    v19.03.5
vm002   -           virtualbox    running    tcp://192.168.99.102:2376    v19.03.5
vm003   -           virtualbox    running    tcp://192.168.99.103:2376    v19.03.5
```

Terminal

```
root@aws-ec2:~# cat /tmp/edgexers-deployers-config.yml
edgexers-deployers:
  type: z
  title: Edgexers
  description: Edgexers Deployers
  notes: Deploy an instance of Edgexers used to the Project Sprint deck
  categories: [Edge]
  platform: Linux
  tags: [http://www.edgexers.com/docs/edgexers/docs/edgexers_images/EdgexersImage.png]
  repository:
    url: https://github.com/edgexers/edgexers-deployers
    stackfile: stackfile.yml
```

Terminal

```
root@aws-ec2:~# cd /tmp
root@aws-ec2:~/tmp# cd /tmp/projects/edgexers-deployers/
root@aws-ec2:~/tmp/projects/edgexers-deployers# cd /tmp
```

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OVERVIEW

4 JOBS

0 FAILED JOBS

2 UNFINISHED

0 SCHEDULES (TIME FAILED)

2 PROJECTS

0 PROJECTS (TIME FAILED)

JOB STATUS

STATUS: ALL JOBS: ALL VIEW: ALL

RECENTLY USED TEMPLATES

VIEW ALL

NAME	ACTIVITY	ACTIONS
Setup_Portalist_02	✓	✎

RECENT JOB RUNS

VIEW ALL

NAME	TIME
Setup_Portalist_02	15/03/2019 11:34:29



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## VIDEO



```
-h, --help    help for sys-mgmt-cli
```

Use 'sys-mgmt-cli [command] --help' for more information about a command.

```
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli app
```

Manage containerised apps

Usage:

```
sys-mgmt-cli app [flags]
sys-mgmt-cli app [command]
```

Available Commands:

```
add      Deploy containerised application
rm        Undeploy containerised application/s
view     View containerised application/s
```

Flags:

```
-h, --help    help for app
```

Use 'sys-mgmt-cli app [command] --help' for more information about a command.

```
+ sys-mgmt-cli git:(d90a7e3) # ./sys-mgmt-cli app add --template EdgeXpert --type 2 -a
```

```
cli-config -- tfg@Toms-MBP -- zsh -- 130x34
./os/cli-config  ver-component  mosquit
```

```
+ cli-config git:(master) # docker-machine ls
```

NAME	ACTIVE	DRIVER	STATE	URL	SWARM	DOCKER	ERRORS
vnodel	-	virtualbox	Running	tcp://192.168.99.167:2376		v19.03.5	
vnodel2	-	virtualbox	Running	tcp://192.168.99.168:2376		v19.03.5	
vnodel3	-	virtualbox	Running	tcp://192.168.99.169:2376		v19.03.5	

```
+ cli-config git:(master) # cat edgexpert-template-stack-config.json
```

```
{
  "StackConfig": [
    {
```





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## VIDEO



```
view view containerised application/s
```

### Flags:

```
-h, --help help for app
```

Use 'sys-mgmt-cli app [command] --help' for more information about a command.

```
* sys-mgmt-cli git:(d90a7e3) x ./sys-mgmt-cli app add --template EdgeXpert --type 2 -a
```

```
Node 'vEdge1', (Swarm) App 'EdgeXpert' is successfully deployed
```

```
Node 'vEdge2', (Swarm) App 'EdgeXpert' is successfully deployed
```

```
sys-mgmt-server-component -- mosquito_sub -t export-data -h 192.168.1.215 -- mosquito_sub -t export-data -h 192.168.1.215 -- 139x34
```

```
./os/cli-config
```

```
./ver-component
```

```
mosquito_sub mosquito_sub -t export-data -h 192.168.1.215
```

```
* sys-mgmt-server-component git:(6aed94f) x mosquito_sub -t export-data -h 192.168.1.215
```

```
{ "id": "e8eedf35-7df2-4a0d-84d6-c886c3dfa8db", "device": "Random-Integer-Device", "origin": 1586962879925677207, "readings": [ { "origin": 1586924015554, "device": "Random-Integer-Device", "name": "Int64", "value": "-3608034904066074692" } ], "commandName": "Int64" }
```

```
{ "id": "39cf281e-784b-492b-bc7a-731d083e6fdb", "device": "Random-Integer-Device", "origin": 1586962879930384118, "readings": [ { "origin": 1586926316374, "device": "Random-Integer-Device", "name": "Int8", "value": "-31" } ], "commandName": "Int8" }
```

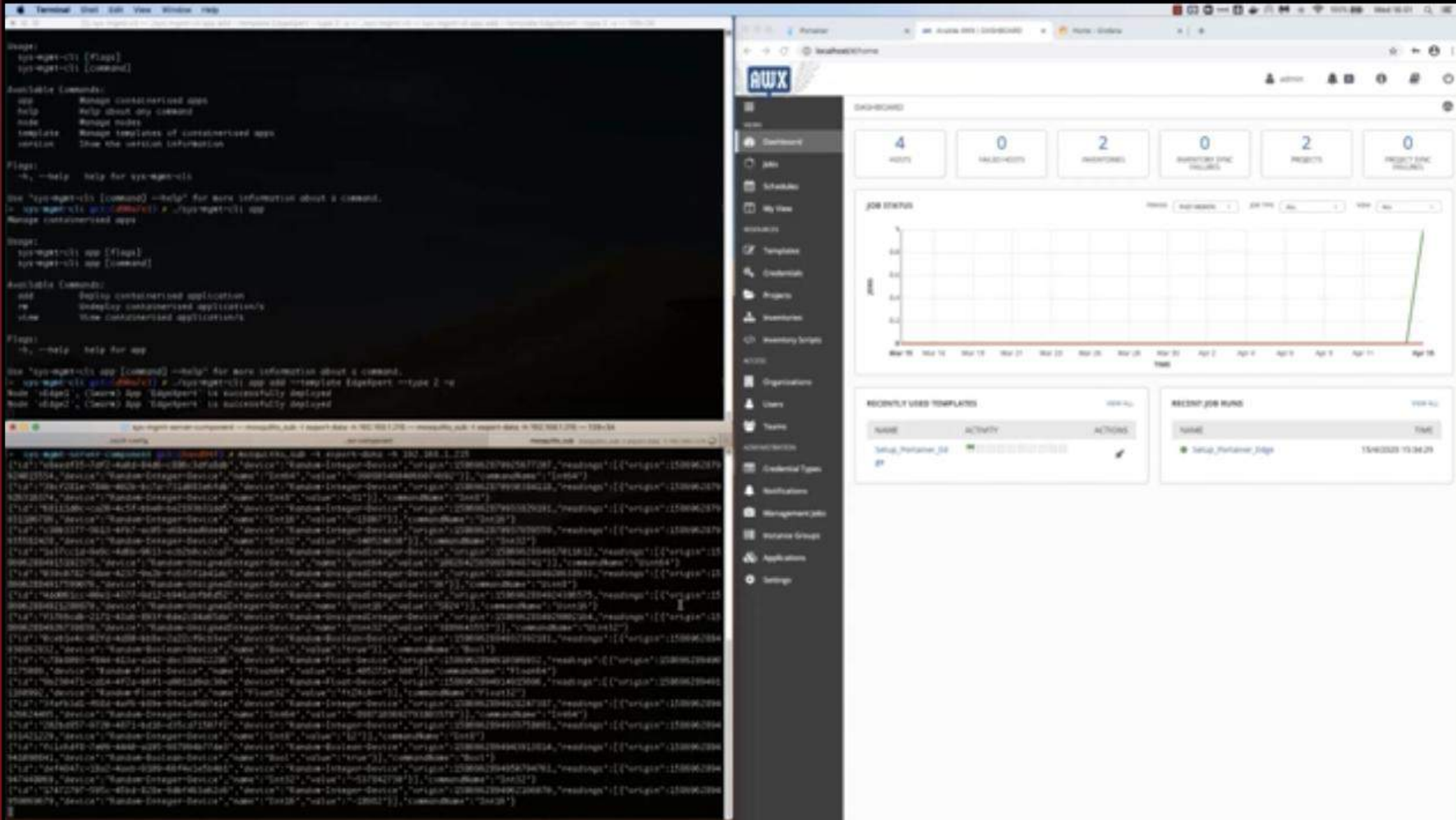
```
{ "id": "68111d0c-ca20-4c5f-bbe0-be2193b31dd5", "device": "Random-Integer-Device", "origin": 1586962879933829191, "readings": [ { "origin": 1586931106786, "device": "Random-Integer-Device", "name": "Int16", "value": "-13807" } ], "commandName": "Int16" }
```

```
{ "id": "c30b3377-5613-4fb7-ac05-a68edad9de4b", "device": "Random-Integer-Device", "origin": 1586962879937659559, "readings": [ { "origin": 1586935582428, "device": "Random-Integer-Device", "name": "Int32", "value": "-340524630" } ], "commandName": "Int32" }
```





## VIDEO



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## VIDEO



Portainer

Ansible AWX | DASHBOARD

Home - Grafana

localhost:9000/#/stacks

portainer.io

Home

VEGCE1

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Stacks

Portainer support admin

my account 209.2nd

Stacks

Settings

Remove Add stack

Search...

<input type="checkbox"/>	Name ↕	Type	Control	Ownership
<input type="checkbox"/>	EdgeXpert_v[edge]	Swarm	Total	private

Items per page 10





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## VIDEO

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<input type="checkbox"/>	Name	State	Quick actions	Stack	Image	Create
<input type="checkbox"/>	EdgeXpert_vEdge1_core-consul...	running		EdgeXpert_vEdge1	consul:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_export-distr...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-export-distro:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_device-virtu...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-device-virtual:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_core-metadat...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-core-metadata:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_core-command...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-core-command:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_export-clien...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-export-client:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_core-data.1...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-core-data:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_redis.1xmrv...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-redis:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_xpert-manage...	running		EdgeXpert_vEdge1	iotechsys/edgexpert-iotech-manager:1.6	2020-C
<input type="checkbox"/>	node-metric-exporter	running		-	prom/node-exporter	2020-C
<input type="checkbox"/>	portainer_edge_agent.1km7hdiy...	running		-	portainer/agent:latest	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_edgexpert-pr...	stopped		EdgeXpert_vEdge1	iotechsys/sys-mgmt-demo-prov:0.1	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_edgexpert-pr...	stopped		EdgeXpert_vEdge1	iotechsys/sys-mgmt-demo-prov:0.1	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_export-distr...	stopped		EdgeXpert_vEdge1	iotechsys/edgexpert-export-distro:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_core-metadat...	stopped		EdgeXpert_vEdge1	iotechsys/edgexpert-core-metadata:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_core-command...	stopped		EdgeXpert_vEdge1	iotechsys/edgexpert-core-command:1.6	2020-C
<input type="checkbox"/>	EdgeXpert_vEdge1_export-clien...	stopped		EdgeXpert_vEdge1	iotechsys/edgexpert-export-client:1.6	2020-C







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## VIDEO



Terminal Shell Edit View Window Help

sys-mgmt-cli — @Toms-MBP — ./sys-mgmt-cli — zsh — 130x36

```
-h, --help    help for app

Use 'sys-mgmt-cli app [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d98a7e3) # ./sys-mgmt-cli app add --template EdgeXpert --type 2 -o
Node 'vEdge1', (Swarm) App 'EdgeXpert' is successfully deployed
Node 'vEdge2', (Swarm) App 'EdgeXpert' is successfully deployed
Node 'vEdge3', (Swarm) App 'EdgeXpert' is successfully deployed
+ sys-mgmt-cli git:(d98a7e3) # ./sys-mgmt-cli app
Manage containerised apps

Usage:
  sys-mgmt-cli app [flags]
  sys-mgmt-cli app [command]

Available Commands:
  add      Deploy containerised application
  rm       Undeploy containerised application/s
  view     View containerised application/s

Flags:
  -h, --help    help for app

Use 'sys-mgmt-cli app [command] --help' for more information about a command.
+ sys-mgmt-cli git:(d98a7e3) # ./sys-mgmt-cli app view
View containerised application/s

Usage:
  sys-mgmt-cli app view [flags]

Flags:
  -h, --help                help for view
  --node-name string        Edge node name
  --template string         Template title
  --type string              Template type: container or 1, swarm or 2, compose or 3. Only type 2 (swarm) and 3 (compose) are currently supported
+ sys-mgmt-cli git:(d98a7e3) # ./sys-mgmt-cli app view --template EdgeXpert --type 2
```

Portainer

localhost

portainer.io

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▼ VEDGE1

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### Home

Endpoints

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#### Endpoints

[Refresh](#)

Search by name, group, tag, status, URL...

**primary**

2020-04-15 16:01:26

1 stack 0 services 9 containers - 9 0 / 0 0 0 9 volumes 304 images

6 MB 2.1 GB - No tags

Group: Unassigned

Swarm 19.03.8

/var/run/docker.sock

**vEdge1** associated

No snapshot available

192.168.99.167, VPNHosts, IoTech

Group: Unassigned

**vEdge2** associated 2020-04-15 16:04:24

1 stack 12 services 31 containers - 11 20 / 0 0 0 7 volumes 13 images

192.168.99.168, VPNHosts, IoTech

Group: Unassigned

Swarm 19.03.5

**vEdge3** associated

No snapshot available

192.168.99.169, VPNHosts, IoTech

Group: Unassigned

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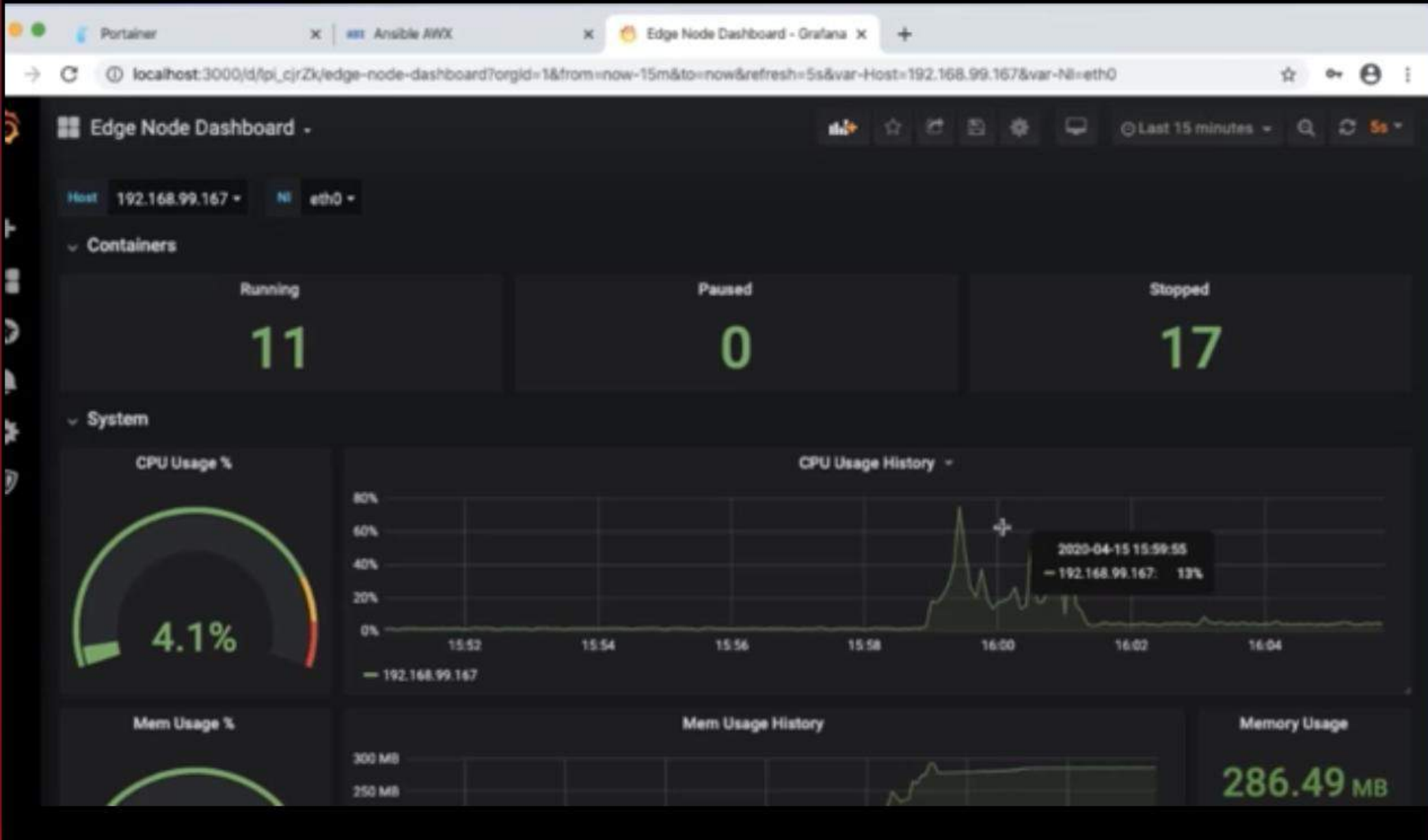


Questions? Ask the Events team on the #1-helpdesk Slack channel

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## VIDEO



### Containers

Running

11

Paused

0

Stopped

17

### System

CPU Usage %



CPU Usage History



Mem Usage %



Mem Usage History



Memory Usage

286.36 MB

2020-04-15 16:03:20

— 192.168.99.167: 285.4 MB Memory Limit

1.0 GB

Disk Usage %

Disk Usage History



Disk Usage



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## VIDEO



Memory Usage

286.36 MB

2020-04-15 16:03:20  
— 192.168.99.167: 285.4 MB

Memory Limit

1.0 GB



Disk Usage

788.39 MB

Disk Usage

19.16 GB

Network Throughput



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The screenshot displays the EdgeNode Dashboard interface. At the top, it shows the title 'EdgeNode Dashboard' and a navigation bar. Below the navigation bar, there are three main status cards: 'Running' with a value of 11, 'Failed' with a value of 0, and 'Stopped' with a value of 17. Under the 'System' section, there are two circular progress indicators: 'GPU Usage %' at 4.6% and 'Mem Usage %' at 286.34 MB. To the right of these indicators is a line graph titled 'GPU Usage History' showing usage over time. Below the graph, there is a section titled 'Step 1' with a sub-header 'Cloud Architecture Overview'. This section contains a diagram illustrating the cloud architecture. The diagram shows a central cloud labeled 'SAAS-Cloud' connected to various services. On the left, 'ITWeb-UI' and 'ITWeb' are connected to 'Initial Software Provisioning'. On the right, 'Mobile Visualization' and 'Mobile App' are connected to 'Mobile Portal'. In the center, 'Management Portal' and 'Configuration' are connected to 'Applications Management'. Below the cloud, there is a section labeled 'EDGE' which contains a diagram of the edge architecture. This diagram shows 'Application Containers' (labeled 'edgeX') connected to 'Management Agent' and 'Monitor Agent'. These agents are connected to the 'Docker / Docker Engine' layer, which sits on top of the 'OS / Linux' layer. The entire edge architecture is supported by 'x86\_64 / ARM 32 / ARM 64 Hardware'.



The screenshot displays the Edge Node Dashboard with the following components:

- System Metrics:**
  - Running: 11
  - Paused: 0
  - Stopped: 17
  - System: GPU Usage % (3.6%)
  - GPU Usage History: A line graph showing usage over time.
  - Memory Usage: 286.33 MB / 1.0 GB
- Diagram:**
  - Cloud:** Contains services like IoT Telemetry, IoT Hub, Azure IoT Hub, and Azure IoT Hub.
  - Edge Node:**
    - Device Management:** Includes IoT Telemetry, IoT Hub, and Azure IoT Hub.
    - Application Management:** Includes Management Portal, Monitor Portal, and Azure IoT Hub.
    - OS / Linux:** Contains the Management Agent and Monitor Agent.
    - Hardware:** x86\_64 | ARM 32 | ARM 64 Hardware.





The screenshot shows the Edge Node Dashboard with the following details:

- Header:** Edge Node Dashboard - Status
- Host:** 192.168.99.107 - ubuntu
- Containers:** 11 Running, 0 Pending, 17 Stopped
- System:**
  - CPU Usage %:** 3.5% (indicated by a green gauge)
  - CPU Usage History:** A line graph showing usage over time, with a peak around 10:00.
  - Mem Usage %:** (indicated by a blue gauge)
  - Mem Usage History:** A line graph showing memory usage over time.
  - Memory Gauge:** 286.51 MB



[illegible]



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## VIDEO



## ABSTRACT

While the development of edge and IoT applications is advancing, one of the challenges organizations are facing is how to get their applications to the edge while also monitoring and managing them. How do you get the bits to the box? There are some proprietary solutions and many have attempted to use cloud native deployment tools (like Kubernetes) with mixed results. There is also a plethora of open source tools to assist deploy, orchestrate, manage and monitor applications. In this presentation, come learn about an effort to stitch together a collection of open source tools and technologies to create an edge management solution. What worked and what did not? What tools can scale to IoT sizes but at the same time work in resource constrained edge environments? Why proprietary solutions may or may not work for managing your edge/IoT deployments.

In this session, learn

- What does edge management do?

## SLIDES

# Challenges and Lessons Learned

### Scale

- Enterprise/Cloud scale != Edge scale
- Not in volume of traffic, etc. but in the # of nodes
- How do you provision and configure thousands of nodes (creating a file with 80K IP addresses is not going to work)
- How do you even test for edge scale?

### Still need agent(s) at the edge

- How to get them there
- Coordination among the multiple agents

### Applications aren't one thing, it's a collection of services

- Deploying/orchestrating micro service (vs something like Cockroach DB or Datadog)
- Apps / services have configuration specific to each node

### How to onboard sensors

- Communicating with edge/IOT applications (standardization needed)
- Provision may include drivers/firmware

### Tech debt of enterprise/cloud solutions shines through in the scale of edge

### Application metrics and how to collect (standardization needed)

### Many UIs (good and bad)

- +: familiarity
- -: lots of UIs



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