

Foglight[®] for Container Management 1.2.0 User and Administration Guide



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Legend

- **WARNING:** A WARNING icon indicates a potential for property damage, personal injury, or death.
- **CAUTION:** A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.
- i IMPORTANT NOTE, NOTE, TIP, MOBILE, or VIDEO: An information icon indicates supporting information.

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Understanding Foglight[®] for Container Management

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- Sizing Your Monitored Environment
 - Foglight Management Server Requirements
 - Kubernetes Agent Requirements
 - Docker Swarm Agent Requirements
- Getting Started
 - Prerequisite
 - Creating and Activating Agent
 - Configuring data collection interval

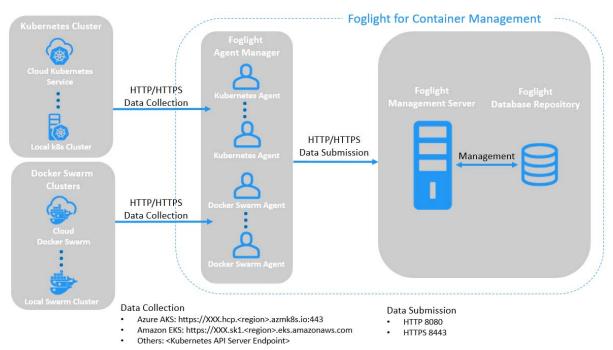
About Foglight for Container Management

Containers are a method of operating system virtualization that allow you to run an application and its

dependencies in resource-isolated processes. Foglight[®] for Container Management simplifies this process by tracking each container, the resources it consumes, and the remaining compute of the container host, as well as providing you with the cluster information and pre-configured rules with notifications identifying the problem of your clusters.

Architecture





Foglight for Container Management consists of three main components:

- Foglight Management Server and Foglight Database Repository Responsible for managing, alerting, and viewing the collected data. Both components can be set to run on the same machine or reside on separate machines.
- Agent Manager Hosts the monitoring Kubernetes agents.
- Docker Swarm clusters Manages containerized applications in a clustered environment.
- Kubernetes clusters Manages containerized applications in a clustered environment.

Sizing Your Monitored Environment

Consider the possibility of a great amount of objects being collected, analyzed, and maintained by the application, several aspects of the underlying server must be taken into account. The sizing of the supporting clusters and containers depends on the complexity of the underlying environment. Sufficient processing power and CPU memory are required to support effective collection, server data handling, and analytics.

NOTE: Currently Quest validates the environment with up to 10000 containers. If your environment beyonds this scale, contact Quest Support.

Foglight Management Server Requirements

The minimum system requirements of the Foglight Management Server vary from the scale of clusters. The scale of clusters is determined by running containers.

Operating	Maximum	Foglight		Agent Manager	
System	Containers	JVM Settings	# of CPUs	JVM Settings	# of CPUs
Windows 64-bit	1000	Xms Xmx=4G	2	Xms Xmx=4G	2
	5000	Xms Xmx=8G	4	Xms Xmx=8G	4
	10000	Xms Xmx=12G	6	Xms Xmx=12G	6
Linux 64-bit	1000	Xms Xmx=4G	2	Xms Xmx=4G	2
	5000	Xms Xmx=8G	4	Xms Xmx=8G	4
	10000	Xms Xmx=12G	6	Xms Xmx=12G	6

Table 1. Foglight Management Server requirements

If you are using an embedded Agent Manager, make sure to use the sum resources of both Foglight and Agent Manager.

Kubernetes Agent Requirements

Kubernetes Agent collects inventory and metrics every 5 minutes by default. Refer to Configuring data collection interval for details about how to change the collection interval.

Table 2. Kubernetes Agent requirements

Maximum Containers	Kubernetes Agent Col	lection Interval (minutes)	
	Inventory	Metrics	
500	5	5	
1000	10	10	
5000	30	30	
10000	60	60	

Table 2 is the recommendations for local Kubernetes clusters. If you deploy Kubernetes clusters on the Cloud Provider Kubernetes Service, consider your network rate and change your configurations based on different Cloud Provider and different region/zone of your cluster.

Docker Swarm Agent Requirements

Docker Swarm Agent collects inventory and metrics every 5 minutes by default. Refer to Configuring data collection interval for details about how to change the collection interval.

Table 3. Docker Swarm Agent requirements

Maximum Containers	Docker Swarm Agent Collection	nterval (minutes)
	Inventory	Metrics
500	5	5
1000	10	10
5000	30	30

Table 3 is the recommendations for local Docker Swarm clusters. For cloud environment, consider network rate and change configurations based on different Cloud Provider and different region/zone.

Foglight for Container Management 1.2.0 User and Administration Guide Understanding Foglight[®] for Container Management

Getting Started

- Prerequisite
 - Kubernetes Agent
 - Preparing the Kubernetes credential
 - Enabling Heapster service in monitored environment
 - Docker Swarm Agent
 - Preparing Docker Swarm Agent credentials
 - Enabling Docker Remote API for monitored docker host
 - Uploading Docker Swarm Agent credentials
- Creating and Activating Agent
 - Creating and Activating a Kubernetes Agent
 - Creating and Activating a Docker Swarm Agent
- Configuring data collection interval

Prerequisite

Kubernetes Agent

Each Kubernetes Agent monitors the assets inside the selected Kubernetes Service Providers. To enable the data collection, complete the following prerequisites before create agent.

- Preparing the Kubernetes credential
- · Enabling Heapster service in monitored environment

Preparing the Kubernetes credential

The Kubernetes configuration file named *KubeConfig* is a standard configuration of Kubernetes and is required for Kubernetes agents to access the cluster. Foglight for Container Management verifies and supports the local Kubernetes and the following Cloud Kubernetes Service Providers. Based upon your environment, select either of approaches to get your *KubeConfig* file:

- **NOTE:** Data from different Kubernetes Agents with the same cluster name will be merged into one cluster.
 - Local Kubernetes
 - Azure Kubernetes Service (AKS)
 - Amazon Elastic Container Service for Kubernetes (EKS)
 - Google Cloud Platform Container Engine (GKE)
 - IBM Cloud Kubernetes Service
 - Openshift Origin

Local Kubernetes

If you build a Kubernetes cluster locally, find this *KubeConfig* file under the /etc/kubernetes/admin.kubeconfig on your master node.

Azure Kubernetes Service (AKS)

Before generating the Kubernetes credentials, record the following information:

- Azure Username
- Azure Password
- Azure Subscription Number
- The name of your AKS Cluster Resource Group
- The name of your AKS cluster

Download the Azure Command Line Interface and install it in your local platform, and then follow steps below to generate your Kubernetes credential:

1 Run the command *az* login.

Then a browser shows up, directing you to the Azure Portal where you should enter your Azure Username and Password to complete the authentication.

- 2 Run the command: az account set --subscription <azure subscription number>
- 3 Run the command: az aks get-credentials --resource-group <azure resource group name> --name <azure cluster name>
- 4 Find the Kubernetes configuration file under <USER_HOME>/.kube/config on your local platform.

NOTE: The token in this Kubernetes configuration file will get expired after two years. If you don't want the credential gets expired, refer to Foglight Container Tools for detail.

Amazon Elastic Container Service for Kubernetes (EKS)

Follow the Amazon EKS offical guide Getting Started with Amazon EKS. Follow the guide and complete Create a kubeconfig for Amazon EKS. in the end of the guide.

NOTE: If you don't want the credential gets expired, refer to Foglight Container Tools for detail.

Google Cloud Platform Container Engine (GKE)

Download the Google Cloud Client tool and install it in your local platform, and then follow steps below to generate your Kubernetes credential:

- 1 Generate the intermediate Kubernetes credential for your cluster.
 - a Log into your Kubernetes cluster, click **Connect** next to your cluster name.

Kubernetes cluste	rs	+ CREATE CLUS	TER 🕂 D	EPLOY C R	EFRESH	DELETE		
A Kubernetes cluster is a m Filter by label or name	nanaged group of	uniform VM <mark>in</mark> star	nces for running	Kubernetes. Learn r	nore			
Name A	Location	Cluster size	Total cores	Total memory	Notifications	Labels		
🗌 🥝 –gke-demo	us-central1-a	2	2 vCPUs	4.00 GB			Connect	/ :

b Click to copy the command below, and then run this command.



- c Find the intermediate Kubernetes configuration file under *<USER_HOME>/.kube/config* on your local platform. The following is the example of this intermediate Kubernetes configuration file.
 - **i** NOTE: This Kubernetes configuration file cannot be used as the agent credential because the token in this file will get expired soon and "*cmd-path*" of the token directs to your local platform.

rind: Config
preferences: {}
19679
- name: gke_dulcet-bucksaw-208510_us-central1-a_jane-gke-demo
user:
auth-provider:
config:
access-token: ya29.GlzuBVkzkoVc1VUV 7yXM50DpQ7z7ahGzFA f2008FhxZjDICXRFdAw5ytBc9dHBT90yYK
cmd-args: config config-helperformat=json
cmd-path: C:\Users\jwang7\AppData\Local\Google\Cloud SDK\google-cloud-sdk\bin\gcloud.cmd
expiry: 2018-07-04T06:44:592
expiry-key: '{.credential.token_expiry}'
<pre>token-key: '{.credential.access_token)'</pre>
name: gcp

- d Open Google Cloud Client tool and run the following commands to create a Kubernetes service account that grants with the *cluster-admin* role and the access to your Google Kubernetes Engine (GKE) cluster.
 - a kubectl create serviceaccount <service account name>
 - b kubectl create clusterrolebinding <cluster role binding name> --clusterrole=cluster-admin serviceaccount=default:<service account name>

"default" in the above command is the namespace name of this service account name. The name space name will be "default" if you do not change it. You can also change to other namespace names, as needed.

c kubectl describe serviceaccount <service account name>

You will get the response similar as below. Record the <secret name> for later use.

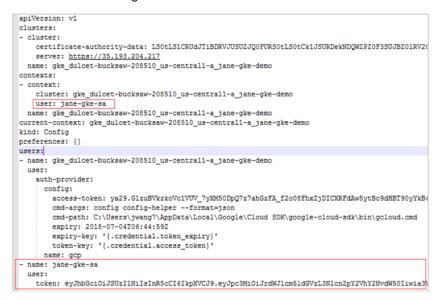
C:\>kubectl describe	serviceaccount jane-gke-sa
Name:	jane-gke-sa
Namespace:	default
Labels:	<none></none>
Annotations:	<none></none>
Image pull secrets: Mountable secrets:	jane-gke-sa-token-x2n6w
Tokens:	jane-gke-sa-token-x2n6w
Events:	<none></none>

d kubectl describe secret <secret name>

You will get response similar as below. Record the token value (exclude "token:") for later use.

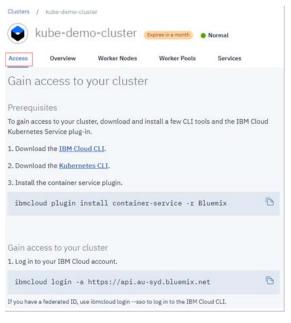
	jane-gke-sa-token-x2n6w default <none> kubernetes.io/service-account.name=jane-gke-sa kubernetes.io/service-account.uid=9f16c355-7f4f-11e8-9c03-42010a</none>
0032	
Type: kubern	etes.io/service-account-token
Data ====	
ca.crt: 1 namespace: 7	
token: pY2VhY2NvdW50	yJhbGciOiJSUzI1NiIsInR5cCI6IkpXUCJ9.eyJpc3MiOiJrdWJ1cm51dGUzL3N1c I iwia3UiZXJuZXR1cy5pby9zZXJ2aWN1YWNjb3UudC9uYW11c3BhY2UiOiJkZWZhd(
	ZXR1cy5pby9zZXJ2aWN1YWNjb3UudC9zZWNyZXQubmFtZSI6ImphbmUtZ2t1LXNhL I iwia3UiZXJuZXR1cy5pby9zZXJ2aWN1YWNjb3UudC9zZXJ2aWN1LWFjY291bnQub
tZSI6ImphbmUt	Z2t1LXNhI iwia3UiZXJûZXR1cv5pbv9zZXJŽaWN1YWNjb3UudC9zZXJŽaWN1LWFjY
	OWY×NmMzNTUtN2YØZiØ×MWU4LŤlĴMĎMtNDIwMTBhODAਔMDMyIiwic3UiIjoic3lždu Y2NvdW5ØOmRlZmF1bHQ6amFuZS1na2Utc2EifQ.VdRPWHLCqU3taWU5dyjZf4PPcQ
	tUPkgoyEWRQZOK9ebPCfOm-4h31oIBSNuq8TokcZiU5K6nf6gToJ1iNAQEuNBwJ5z,
JumCzfilpOjMP	cTm6kF2BhhrvFkKnXNCaJRSmCIhHLBqtB4rqWKCdtJU8yfJTŘ253c8n2-gtT3XwPL
/ELLUZEXFr-vi	aK7wDD_jFbLEyTRSmKQGiixIW1Tfea8scwops9_cJx6LRY92FnucdwMrpnxU3aIXW

e Open the intermediate Kubernetes configuration file under <USER_HOME>/.kube/config, and then add the user and change the token to the new one.



IBM Cloud Kubernetes Service

If you have created your cluster on IBM Cloud Kubernetes Service, get the access from the console as described on the cluster's *Access* view. You will get a .pem file and a .yml file after you performing the steps.



By default IBM Cloud Kubernetes Service uses certificate authority file and token/refresh token. However, certificate authority data and service account token should be used in the Kubernetes Agent credential. After you successfully test your connection through "kubectl get nodes", follow the steps below to generate the Kubernetes Agent credential.

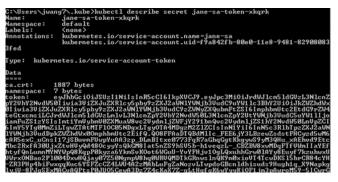
1 Run the command *kubectl config view -minify=true -flatten -o json*. You will get an output similar as below, then record the *<certificate authority data>* for later use.

C:\Users\jwang7\.kube>kubectl config viewminify=trueflatten -o json
"kind": "Config",
"apiVersion": "v1",
"preferences": (),
"clusters": [
"name": "kube-demo-cluster",
"cluster": <
"server": "https://130.198.66.34:30244",
"certificate-authority-data": "LSØtLS1CRUdJTiBDRUJUSUZJQØFURSØtL
SØtCk1JSUZSUENDQXkyZØF3SUJBZØ1KQUx5SmdFOUA2NmkrTUEvRØNTcUdTSWIzRFFFQkN3UUFNRGt4T
npBMUJnT1YKQkFNTUxtUXpNa114WUdZeE5HRXpPUFExTTJGaU1XUTJabU16TXpjd09UaGhZUEF6TFd0M
U I tUn I i bUYyWI hNdAyZMkÜ 3SGh i TKI UZ3dOe kÉyTU RUdØSUUTNX aGNOT KRUE EI ŬSX hNRFU 3TI RRMI da@
TUNUGN3T1FZRFZRUURE9zUrCk16STJNUØZtTURSaE16azBOUE5oWWpGbE5tWmpNekØzTURrNF1XRXdNe
TFyZFdKbGNtNWxkR1Z6TFdOaE1JSUMKSWpBTkJna3Foa21HOXcwQkFRRUZBQU9DQWc4QU1JSUNDZ0tDQ
WdFQX1Idk4xL1pwc09CckJHTH1PT0wvenBpRwo5M3RtYUUveGtYMnIvcjMzc1ZUTU5aY1R6a21xQjUMU
zVØRkFkTUFQNEVYRGJmZmpHckx3M20zZkxDL2huMnhvCjNRQTQ0V254ZIRRU1ErK0R2MUk3WkQzcD1pT
zZzY2JUanErckFUL3g1NXFtanRRcmprUGoxN1UzTjZSzEvdUsKY1pvSUdQOU5WSEMxOHFaZXNkQ3Jja
FNI dEv@K2N3NXQvNEZvQ3dRb1N1TVUnVXBYWFREMKxTd05veXvXOVxZRvvvM2FraHQ3OSs5Y211U1BGR
3BQb2FBZXdOSiBQY0x5eDJDcmFsNG1DTHJxREZ6M3UMWUM3TFhtNEFhMys2OEUxCkM3Uzk0NUhBTW96U
GouSXZUZT LuOŬE3UFBDc0pKYT 1PM0910110b25p0n1EK1BZcExkRzdTZŐN3VTFJaXc1ZzOKaU10dU04S
zŘjektPSnluK2ltR1d6QUpPei94ejk2dy94Tm14Uk1IUkNPe2RzTUg1N3hPS3pqN1Jvb2E3bGpPZAoyL
3Znb1Z0QkpxT1UPWU9QUEhybitjS09ZZ1Q5cmh2cWxXemtQT1JzOFp1RD1gMmk4WURNeEd2L2ŽybThRT
npUCkdu¥kxuckdWZUZČRØc3cG1tbXRZSUBvOCtGYnFxbmtGUTZ5d2NXOTFgSnZ6ST1vZEp6ZnQ4Zk91Z
kRNcjBteFgKR05aNlpHSU1FU1ZZU3JNTUt2RCtMT01lSzBgRH1hRWpaYe80dU14R3YrU3NLMWZrc0JUW
UJvbWdBaDĬvRC9UcApwNUU3SXI1NkcvL2Y3UGFHc3NDMTZBK2J0Z1ŽONk9o0UUsTXvHQUhTWWR6ZndBR
3dxc.iB4NHRMU1U2c3A2U1dFC1BZSEU@RØJMbEY4M@5XcEMzeFUDQXdFQUFbT1FNRTŘ3SFFZRFZSME9CQ
11FBkcxcUEvaz9xZ21TcndIdX1tBkMKdzdsbWt1cE5N9ihH9TFUZE13UU1N9mFBBkcxcUEvaz9xZ21Tc
ndIdX1tRkN3N2xta2VwTk1Bd0dBMVVkRXdRRgpNQU1CQWY4d0RRWUpLb1pJaHZjTkFRRUxCUUFEZ2dJQ
kFGc29JbWFvd.jJRc.kc4TTNKa.jQ5andUb2N0d21UU1JTC1NFd1RwanRvbWtGdEdÖdW9EW1UMbUMwS.jRWa
3q5Vm9nRkUxZØYzb3ZPb1NFWFI4T316UGsxT24wZy9kbVUsQVwKajBHUVFoUEhCdG1HVVdtSy91cK1Ta
21ZOUJjQ3RvYU1oeUpvZTdnOXhIU3p2MzRQeTExOÚtnazE5YWZSYKRrQwo1UmpuQQ11cWpCTWdZOHZtU
UlieTMwMDa1Ni9pNjlZR1RXdT1FU10Z0S9WTGZnajNg0XA2Q21zMzIre1IwTUQ5CjZPcjd1bU0yL0YvM
0V1dmRSRGNtbjZQN1dnaDE4dWRDd2tnWno0T0ppbzJ00DBM0UdESnRTLytuNzF0VVUHNĞcKMUU5TTEzT
F1T0W1KdTUwSIIHb3p0S08zc0UCNmg4cTVZY2joMXhhZmEvR1Byc1N2SmNBNEgwVFd2Rk8yUmhNcQp5U
0ZIM jBRbzlaK3hHQ2ULUk10Y jFkY2×6akt×0FQvK3JXK25vTi9FU0ZIZ1BIWmdiWV9UR3djYit6SjZha
HR1CmJWIWRzaUZSK0pCQUdmUj1XIE0vcFZnTG1YSDdrZkM4QjFaQ1NOcEZ2d0Z0eXNyQIk2RD1Id2tmS
GpvZ1J2eUAKaWxSRFŽ4eHB60ĞowWTRkc2hDancwZnFyeW1EL3UMTWNZRjFTU2NZT1BaTUwvUGN2cUNFe
Fd1Z293REZqcjJIMQp2YnhpL31xcnpIZUJNMjgrZ1VWRERIazJXWWczUIZqQnU3b3Y4QWNWbFhxY2NQU
ØZoNU 10R1djeŬdWdjĥFZUN4CkR0dEŨHTk1hRĨŽMSnY1eUhUb25TMØJ3Z25ŘUTh2RWYzNGw3a29TZk1LR
1kxZWMØSDhvaWZaT3pvMEtØVEIxakMKOUBoNFZTS1Ixa2ZrCiØtLSØtRU5EIENFU1RJRk1DQURFLSØtL
SØK''

- 2 Run the command kubectl create serviceaccount < service account>.
- 3 Run the command *kubectl describe serviceaccount <service account>*. You will get a response similar as below, then record <service account secret> (in this sample, it is jane-sa-token-xkqrk) for later use.

C:\Users\jwang7\.kube>kubectl describe serviceaccount jane-sa Name: jane-sa Namespace: default Labels: <none> Annotations: <none> Image pull secrets: <none> Mountable secrets: jane-sa-token-xkgrk</none></none></none>
Labels: <none> Annotations: <none> Image pull secrets: <none></none></none></none>
Annotations: Image pull secrets: Inone>
Image pull secrets: <none></none>
Mountable secrets: jane-sa-token-xkgrk
Tokens: jane-sa-token-xkqrk
Events: <none></none>

4 Run the command *kubectl describe secret <service account secret>*. You will get a response similar as below, then record <service account token> for later use.



5 Open the .yml file generated previously, which looks like below.

apiVersion: v1	
clusters:	
- name: kube-demo-cluster	
cluster:	
certificate-authority: ca-mel01-kube-demo-cluster.pem	
server: https://130.198.66.34:30244	
contexts:	
- name: kube-demo-cluster	
context:	
cluster: kube-demo-cluster	
user: Jane.Wang@quest.com	
namespace: default	
current-context: kube-demo-cluster	
kind: Config	
users:	
- name: Jane.Wang&quest.com	
user:	
auth-provider:	
name: oidc	
config:	
client-id: bx	
client-secret: bx	
id-token: eyJraWQiOiIyMDE3MTAzMC0wMDowMDowMCIsImFs2yI6IIJTMj	023
idp-issuer-url: https://iam.ng.bluemix.net/kubernetes	
 refresh-token: J1B9J8mzGdOecQbYvbmh7csxFZ5j1C9QEJxgWP7E157db 	_ws

6 Change the certificate authority to the data <certificate authority data> of this authority and change the users section to use <service account token>. Save your changes, and then you will get a credential file like below. This file will be used as the Kubernetes Agent credential to connect to your IBM cloud Kubernetes service cluster.



Openshift Origin

If you could access the /etc/origin/master/admin.kubeconfig on the master node, download this file which can be used as the Kubernetes Agent credential.

If you could not access the /etc/origin/master/admin.kubeconfig on the master node, follow instructions below to generate a permanent credential file.

Before generating the permanent Kubernetes credentials, record the following information and ensure you have granted the privilege for accessing the cluster-wide resources:

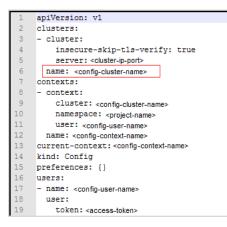
- Openshift Username
- Openshift Password

Download the Openshift Command Line Interface and install it in your local platform, and then follow steps below to generate your Kubernetes credential:

- 1 Log into Openshift and generate an intermediate Kubernetes configuration file.
 - 1 After logging into Openshift, click **Command Line Tools** on the upper right.
 - 2 Click the button next to the Session token field, copy the command, and then paste it in your local Command Line Tool. Make sure to find the intermediate Kubernetes configuration file under </br>USER_HOME>/.kube/config on your local platform.

enShift Web Console ×		
C A Not secure Https://10.4.120.18/8443/console/command-line	Ŷ	0 0
ENSHIFT ORIGIN C	D-	h huar
Command Line Tools		
With the OpenShift command line interface (CU), you can crease applications and manage OpenShift projects from a terminal. You can download the ac clien using the links below. For more information about downloading and installing it, please refer to the Get Started with the CU documentation.	tool	
Download or :		
Eveninging of t		
Latest Release if		
	ame	
Latest Release of After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang. If you want to log into the CLI using the s	ame	5
Latest Release t? After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang : If you want to log into the CLI using the s session tolen:		5
Latest Release if After downloading and installing it, you can start by logging in. You are currendy logged into this console as Nhuang : If you want to log into the CLI using the s session taken: or login https://10.4.120.18.8443 -token+chidden> A token is a form of a password. Do not share your API token. To reveal your token, press the copy to clipboard button and then pasts the clipboar		
Latest Release of After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang. If you want to log into the CLI using the s session token: oc login https://10.4.320.18.8443-soken=Hrhidden> M A token is a form of a password. Do not share your API token. To reveal your token, press the copy to clipboard button and then paste the clipboard contents.		
Lates Release if. After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang: If you want to log into the CLI using the s session token: or log: https://10.4.120.18.8443 -usiken-indidens After you login to your account you will get a list of projects that you can switch between;	8	
Latest Release if. After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang. If you want to log into the CLI using the s session toben: in log hopp/170.4.120.18.843 -usken-indiden> After you login to your account you will get a list of projects that you can switch between: oc project -project-names	8	
Letest Release if After downloading and installing it, you can start by logging in. You are currently logged into this console as Nhuang . If you want to log into the CLI using the s session takes: set logn https://10.4.120.188.043—obten:ethidden> Ataken is a form of a password. Do not share your API token. To reveal your token, press the copy to clipboard button and then passe the clipboar Ataken is a form of a password. Do not share your API token. To reveal your token, press the copy to clipboard button and then passe the clipboar Ataken is a form of a password. Do not share your API token. To reveal your token, press the copy to clipboard button and then passe the clipboar Atter you login to your account you will get a list of projects that you can switch between: or project-orapicet-name> If you do not have any existing projects, you can create one:	•	

3 On your local platform, browse to open this configuration file. You may see the context similar to the following. Record *<config-cluster-name>* for later use.



- 2 The token generated in step 1 will be expired after 4 hours, however Foglight for Container Management needs a permanent Kubernetes credential. So you need to create a service account with "cluster-admin" role, and then get the authorization code (not expired) of this service account to generate our permanent Kubernetes credential.
 - 1 Run the command oc project <project-name>.
 - 2 Run the command oc create serviceaccount <service-account-name>.

You can check if your service account has been created successfully using the command: *kubectl get serviceaccounts*

3 Run the command *oc serviceaccounts get-token <service-account-name*. Then you will get a token *<service-account-token>* like below. Record this token for later use.

"eyJhbGciOiJSUzI1NiIsInR5cCI6IkpXVCJ9.eyJpc3MiOiJrdWJlcm5ldGVzL3NlcnZpY2V hY2NvdW50Iiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9uYW1lc3BhY2UiOiJkZWZh dWx0Iiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9zZWNyZXQubmFtZSI6Im9zLWFkb WluLXRva2VuLWY0a2ZsIiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9zZXJ2aWNlLW FjY291bnQubmFtZSI6Im9zLWFkbWluIiwia3ViZXJuZXRlcy5pby9zZXJ2aWNlYWNjb3VudC9 zZXJ2aWNlLWFjY291bnQudWlkIjoiODMzNGU0NTQtNzQ1Yy0xMWU4LWFmNmEtMDA1MDU2YjY3 NDFhIiwic3ViIjoic3lzdGVtOnNlcnZpY2VhY2NvdW500mRlZmF1bHQ6b3MtYWRtaW4ifQ.RW H_AoXy2U1elkHN_Bs9IR1xo0zNCJlwcY0h3zuQnrkOFi8gVpX1177uhAPp7oIjPqDSWkUAN9F 6mP_tNdGwJsqRmHYEMOtCLnnIM61BYxIcABvwr66a0Z3Gn0D7EM5M_7XgKDC160N3W5NaH0D8 DpVTYqxkQ49u3qt4gqrcjVCaSsDNWlgGXY4K0IDrUbKkdgaRKzeD9o4Bv9VbYICqyxwoUebku JAcHiXGIcSe-ozS_zroPi1tT5HW-RY0Pn3Fp3zBnydiokna0-mXot5lqoYc-R6E1U9YSrAOhWm9Q8ipiut60czXbmLPM4DYve6dmHi_j5FquCqhod-QlA7aPw"

- 4 Run the following command to grant your service account with the "cluster-admin" privilege: kubectl create clusterrolebinding <cluster-role-binding-name> -clusterrole=cluster-admin --serviceaccount=default:<service-accountname>.
- 3 Generate a permanent Kubernetes configuration file and save it under <USER_HOME>/.kube/config file/credential.
 - 1 Open and edit the intermediate configuration file.
 - 2 Use kubectl to add user credentials, create new context, in the end change the existing contexts to the ones that you added in step 2. For example,

kubectl config set-credentials <credential-name> --token=<serviceaccount-token> kubectl config set-context <new-context-name> --cluster=<config-cluster-</pre>

kubectl config use-context <new-context-name>

3 Save the current Kubernetes configuration file.

Enabling Heapster service in monitored environment

There are various approaches to enable Heapster on your Kubernetes cluster. Visit Heapster official website to determine the approach that you are going to deploy your Heapster service, or you can follow instructions in https://github.com/foglight/container to deploy your service.

name> --user=<credential-name> --namespace=<project-name>

Some of the cloud platform Kubernetes service has enabled Heapster service for the cluster. If you have connected to the cluster, run the following command to check: *kubectl cluster-info*

Docker Swarm Agent

Each Docker Swarm Agent monitors the assets in one docker host. Docker Remote API needs to be enabled for the Docker Swarm Agent collecting data from the docker host. If TLS is enabled to secure the Docker Remote API, credential for Docker Swarm Agent needs to be prepared. Complete the following prerequisites before create agent.

- · Preparing Docker Swarm Agent credentials
- · Enabling Docker Remote API for monitored docker host
- Uploading Docker Swarm Agent credentials

Preparing Docker Swarm Agent credentials

If TLS enabled to secure Docker Remote API, then complete the following guide to get the credentials for Docker Swarm Agent for the docker host. Otherwise, continue with Enabling Docker Remote API for monitored docker host on page 16

Refer to the <u>official guide</u> to generate the keys. Be aware that, during generating the keys, the Foglight Agent Manager host address should be in the allow access list.

Docker Swarm Agent needs following credentials, you can get them when you finish the official guide.

- CA Public Key (ca.pem in official guide)
- Client Public Key (cert.pem in official guide)
- Client Private Key (key.pem in official guide)

Enabling Docker Remote API for monitored docker host

Change *ExecStart* in docker service startup script as below.

Non-TLS secured

```
ExecStart=/usr/bin/dockerd -H tcp://0.0.0.0:2375 -H
unix:///var/run/docker.sock
```

NOTE: Access should be allowed to the TCP port 2375

TLS secured

If TLS enabled, complete Preparing Docker Swarm Agent credentials on page 15 first, then you will get the ca.pem, server-cert.pem and server-key.pem mentioned in the <u>official guide</u>.

```
ExecStart=/usr/bin/dockerd --tlsverify --tlscacert=ca.pem --tlscert=server-
cert.pem --tlskey=server-key.pem -H tcp://0.0.0.0:2375 -H
unix:///var/run/docker.sock
```

i NOTE: Access should be allowed to the TCP port 2375

Then restart docker service.

Uploading Docker Swarm Agent credentials

If TLS is enabled to secure Docker Remote API, go through this section to upload the credential for Docker Swarm Agent. Otherwise, skip this section.

When complete Preparing Docker Swarm Agent credentials on page 15, following credentials should be generated.

- CA Public Key
- Client Public Key
- Client Private Key

These are the credentials for Docker Swarm Agent, complete the following steps to upload the credentials.

On the **Administration > Credentials > Manage Credentials** dashboard, click **Add**, and then select Docker CA Public Key or Docker Client Public Key or Docker Client Private Key to upload related credentials. Take Docker CA Public Key as an example.

Navigation <	T Credentials > Manage Credentials
⊞ Expert View ▼	A credential is the information that gains access to system resou
Bookmarks There are no bookmarks Homes	a Credentialis dire information dial gains access to system resou patterning criteria that best suit your needs. For example, map a
Dashboards Active Directory Administration Agents Credentials Data Integration Management Server Rest API Rules & Notifications Schedules Setup Support Tooling Users & Security Alarms Apache BMK Remedy	E Select the Type of Credential to Add A Challense Response Challense Response Docker CA Public Key Docker Client Private Key Docker Client Public Key Docker Client Public Key Domain, User Name, and Password (Windows) DSA Key Kube Config RSA Key Storage SNMP SUDO with Custom Password SUD with Password -

In the Add a New "Docker CA Public Key" Credential dialog box, specify the following values:

- Credential Properties: Click Load from file to import Docker CA Public Key, and then click Next.
- Credential Name And Lockbox: Specify a unique name for this credential, and then click Next.
- Resource Mapping: Click Add. In the New Resource Mapping Condition dialog box, choose Target Host Name or Target Host Address for the monitored docker host.

Credential Properties		Resource Mapping		
Credential Name And L	New Resource Mapping Condition			
 Resource Mapping Policies 		l cannot access. The c es. Docker Credential	ombination of these conditio	an be used to access. They can also be used to list the ons tells the system which Credentials can be used to
	Equal or Not Equal		Target Host Name	Access a resource using the name of the host where it resid
	Matching Type	Domain Name 🗸	Target Host Address	Access a resource using the IP of the host where it resides.
	Evaluate This Condition	0		
	Matching Values (Combined Using Logica 'OR' Operator)	Add a New D		
	and a part of the second	Use the above Ad		
			the logic	al 'OR' operator.

If choose Target Host Name, then enter the host name of the monitored docker host.

New Resource Mapping Cor	New Resource Mapping Condition		
	sed to relate this Credential to the resources it can be used to access. They can also be used to list t cannot access. The combination of these conditions tells the system which Credentials can be used t s.		
Usage Access Resources Using Equal or Not Equal	Docker Credential ↓ Target Host Name ↓		
Matching Type Evaluate This Condition 🧕	Domain Name → 9 🗹		
Matching Values (Combined Using Logical 'OR' Operator)	O Add a New Domain Name	_	
	General distagent quest com		

If choose Target Host Address, then enter the IP address of the monitored docker host.

New Resource Mapping Co	New Resource Mapping Condition				
resources the Credential	Mapping conditions are used to relate this Credential to the resources it can be used to access. They can also be used to list the resources the Credential cannot access. The combination of these conditions tells the system which Credentials can be used to access different resources.				
Usage Access Resources Using Equal or Not Equal Matching Type	Docker Credential ↓ Target Host Address ↓				
Evaluate This Condition					
Matching Values (Combined Using Logical	Add a New IP Address				
'OR' Operator)	IP Address 🔺				

Then click **Add** to finish editing **New Resource Mapping Condition** and back to **Resource Mapping**. Then click **Finish**.

Then **Docker CA Public Key** has been uploaded and mapped to the docker host. To monitor this docker host, **Docker Client Public Key** and **Docker Client Private Key** also need to be uploaded following the above steps.

Creating and Activating Agent

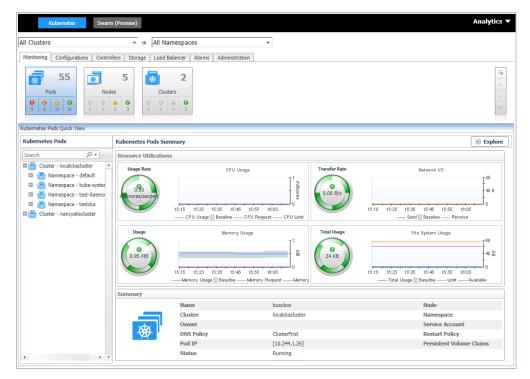
Foglight for Container Management supports Kubernetes Agent and Docker Swarm Agent.

- Creating and Activating a Kubernetes Agent
- Creating and Activating a Docker Swarm Agent

Creating and Activating a Kubernetes Agent

To create a Kubernetes agent on a monitored host:

- 1 Log in to the Foglight browser interface and make sure the left Navigation panel is open.
- 2 On the navigation panel, from **Standard View** click **Container Environment** or from **Expert View** click **Dashboards > Container**. Then the Container dashboard will display as below.



Foglight for Container Management 1.2.0 User and Administration Guide Understanding Foglight[®] for Container Management 3 In the Container dashboard, click **Administration** tab, and then click **Create Docker Agent**. The **Create Docker Agent** wizard opens.

Kubernetes	Swarm (Preview)							Analytic
All Clusters		All Namespaces		v				
Monitoring Configuration	ns Controllers Storage	Load Balancer Alarms	Administration					
C Agents	Docker Agent							
Add 😕 Refresh 🛛 🕖	Activate Deactivate Sta			Remove ata Collection	Alarms	Edit Properties	Download Log	Agent Version
			1	2		2		Version Up To Date

4 Orchestration and Agent Manager: specify the following values, and then click Next.

Cre	ate Docker Agent	×
	Orchestration and Agent Manager	Orchestration and Agent Manager
0	Agent Properties	Enter the cluster name and select the orchestration of the container you will be monitoring. If necessary, select the agent manager.
0	Credential Verification	Cluster Name
a	Summary	The cluster name that you would like to create. nancyakscluster Agent Manager Orchestration Type Kubernetes

- Cluster Name: unique name for the monitored cluster.
- Agent Manager: select an Agent Manager which manages the agent.
- Orchestration Type: container orchestration.

5 Agent Properties

Create Docker	Agent	<u></u> 0	×
✓ Orchestra	tion and Agent Manager	Agent Properties	
Agent Pr Credentia Summary	l Verification	Agent Name Kubernetes API Service End Point Kubernetes Version Heapster Service Namespace Heapster Service Name Enable Proxy Proxy Type Proxy Server Address Proxy Server Port Collector Configuration	Monitor@nancyakscluster 1.7 kube-system heapster Image: State of the system 8081 defaultSchedule ▼

- Kubernetes API Service End Point: Get this information from the KubeConfig file. For more
 information, see Enabling Heapster service in monitored environment on page 15.
- Kubernetes Version: 1.7 by default.
 - **i** NOTE: Only need to change for OpenShift clusters.

 Heapster Service Namespace/Heapster Service Name: Get both values from the Heapster service configuration. For more information, see Enabling Heapster service in monitored environment on page 15.

If you deploy the Heapster service using:

- HTTP: Namespace of Heapster should be <heapster service namespace> and Heapster Service Name should be <heapster service name>.
- HTTPS: Namespace of Heapster should be <heapster service namespace> and Heapster Service Name should be https:<heapster service namespace>:.
- Enable Proxy: To enable the proxy, select the checkbox. Enter the Proxy Server Address and Proxy Server Port information.
- 6 Credential Verification
 - Do not configure a credential: click Next.
 - Add cluster to a new credential.
 - Credential Type: Kube Config is chosen by default. Click Next.

Create Docker Agent			
 Orchestration and Agent Manager Agent Properties 		ential Type ect the credential type fror	n the list below.
Credential Verification			
		Credential Type	Description
 Credential Type 	۲	Kube Config	Update kubernetes configuration file or copy/paste it to following text ar
 Credential Properties 			
Oredential Name and Lockhov			

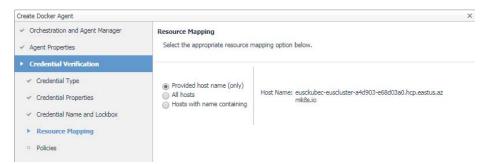
• Credential Properties: click Load from file to upload the credential, and click Next.

 Orchestration and Agent Manager Agent Properties 	Credential Properties Enter the properties for this credential.		
Credential Verification	Update kubernetes configuration file or copy/paste it to following text area.		
✓ Credential Type	Kube Config Calcoad from file		
Credential Properties	apiVersion: v1	*	
 Credential Name and Lockbox 	- cluster: certificate-authority-data:		
 Resource Mapping 	LS0tLS1CRUdJTIBDRVJUSUZJQ0FURS0tLS0tCk1JSUV5RENDQXJDZ0F3SUJBZ0lSQUxa MnFOOFU3TFp4MnZvZnF6NmNGL1J3RFFZSktvWklodmNOQVFFTEJRQXcKRFRFTE1Ba		
• Policies	0dBMVVFQXhNQ1kyRXdIaGNOTVRneE1ERTVNRGMwT0RVMFdoY05NakF4TURFNE1E YzBPRFUwV2pBTgpNUXN3Q1F2RrZRUURFd0pgWVRDQ0FpSXdEUVIKS29aSWh2Y05B		
Summary	UUVCQ/FBRGdn5VBBRENDQWdvQ2dn5UJBTGh6CnR1ek1tUvp1MWtZmx5TQzR1BE NX2220hDOYzTldQU0tHRTZUWEkzeF45WJQZFJ1K2c4WGdvQW13eDRLN0QKe5s1d EzwRzhwTKNW1hVMVb5EZnR2rdnnkZkFCdHlayzRRT21ZVUV3MIBZeGE5S3BlaTY1		
	bnAxZGROU2Q0MQo0M1NTcGU3RFB6eWNFcmxYN3dIaVdWc2pnemtnOXVIZnk5VFla eTBGOXIPR2NmalhMVHEwNk90eWV3R1JBRnpvCnM4Y0x2aTdwVFJuUmRTWDJFejRH		
	NzRsZHhsejVoSzhFaExLQ21jTllpckZyMjhpSGRhTERWeTZTY21ja2ttcFAKTUtlVkRyVWF HaXh1dkRpO1kxYWxEWG9pUFBIYk1vdlF4WkN3KzdvRmR1WTZOMU9UMXh2TmFsUVI	+	

 Credential Name and Lockbox: give a name for the credential, choose a lockbox, then click Next.

Create Docker Agent			
 Orchestration and Agent Manager Agent Properties 	Credential Name and Lockbox These properties identify the credential on the Management Server.		
 Credential Verification 	Please provide a unique name to identify this	credential.	
✓ Credential Type	sample.kubeconfig		
 Credential Properties 	A Lockbox contains a collection of encrypted credentials and the keys used for their encryption and decryp		
Credential Name and Lockbox	Lockbox 🔺	Password Required	
	 System 	No	
 Resource Mapping 			
• Policies			
 Summary 			

Resource Mapping: click Next.



- Add cluster to an existing credential.
 - Credential: choose credential, then click Next.

Create Docker Agent			×
 Orchestration and Agent Manager Agent Properties 	Credential Select the Credential that will contain this resource.		
Credential Verification	Credential 🔺	Password Required	10
 Credential 	System	No	*
Resource Mapping	nancyakskubeconfig		
• Summary			

• Resource Mapping: click Next.

Create Docker Agent		X
 Orchestration and Agent Manager Agent Properties 	Resource Mapping Select the appropriate resource n	napping option below.
Credential Verification	-	
🛩 Credential Type	Provided host name (only)	
 Credential Properties 	All hosts Hosts with name containing	Host Name: eusckubec-euscluster-a4d903-e68d03a0.hcp.eastus.az mk8s.io
 Credential Name and Lockbox 	U Hote manale containing	
Resource Mapping		
• Policies		

7 Summary: click Finish.

Create Docker Agent							
 Orchestration and Agent Manager 	Summary						
 Agent Properties 	Cluster	nancyakscluster					
	Agent Manager	AND IN THE ADDRESS OF ADDRES					
 Credential Verification 	Orchestration Type	Kubernetes					
Summary	Agent Name	Monitor@nancyakscluster					
	Kubernetes API Service End Point	The contract of the second sec					
	Kubernetes Version	1.7					
	Heapster Service Namespace	kube-system					
	Heapster Service Name	heapster					
	Enable Proxy	true					
	Proxy Type	HTTP					
	Proxy Server Address	and all all all all all all all all all al					
	Proxy Server Port	8,081					
	Collector Configuration	defaultSchedule					
	Credential	kubeconfig.nancyakscluster					
	Lockbox	System					
	New or Existing Credential	New					
	Lockbox Password	The Lockbox is not a password secured Lockbox.					

8 Then, the agent will be created and activated automatically.

Creating and Activating a Docker Swarm Agent

Each Docker Swarm Agent monitored one docker host. If the docker host belongs to a Docker Swarm cluster, it will be considered as a manager/worker node. Otherwise, it will be considered to be a standalone docker host.

i NOTE: For a Docker Swarm cluster, you should create one Docker Swarm Agent for one host in the cluster, and if you want to monitor the whole cluster environment, you need to create all the Docker Swarm Agents for all the hosts in the cluster.

To create a Docker Swarm agent on a monitored host:

- 1 Login in to the Foglight browser interface and make sure the left navigation panel is open.
- 2 On the navigation panel, under **Dashboards**, click **Administration > Agents > Agent Status**.

The Agent Status dashboard opens.

3 In the Agent Status dashboard, click Create Agent.

The Create Agent wizard opens.

4 Host Selector. Select the monitored host that you want to monitor with the Docker Swarm agent instance that you are about to create, and then click **Next**.

NOTE: In order to select the host, the Foglight Agent Manager must be installed and running on the monitored host.

- 5 Agent Type and Instance Name: Specify the following values, and then click Next.
 - Agent Type: Select DockerSwarmAgent from the agent type list.
 - Agent Name: Specify the name of the agent instance that you are about to create using either of the following approaches:
 - Generic Name: This option is selected by default. A generic name is a combination of the host name and the agent type and uses the following syntax: agent_type@host_name.
 - Specify Name: Type that name in the Name field. For example, MyAgent.
- 6 On the Summary page, review the choices you have made, and then click Finish.

The Agents table refreshes automatically, showing the new Docker Swarm Agent.

- 7 On the *Agents* table, select the Docker Swarm Agent that you create, click **Edit Properties**, and then click **Modify the private properties for this agent**.
- 8 In the *Agents* properties view, check if the following values have been configured based upon your environment:

T. Agent Status > Edit Properties		G+ Tuesday, April 23, 2019 12:43 PM - 4:43 PM 4	4 hours 👻 📔 🖪 Repo
Name	Host	Туре	Tags
testagent	Internet and a second second second	DockerSwarmAgent	
This agent is currently using pr	operties for DockerSwarmAgent agents.		
🖏 Modify properties for this a	igent only.		
🔇 Modify the properties for a	I DockerSwarmAgent agents.		
Configuration			
Name	docker		
Host Name	localhost		
Docker Remote API End Point	Mary 1947 Detroited With		
Swarm			
Swarm Name	default		
Data Collection Scheduler			
Collector Config	defaultSchedule	Edit Clone Delete	

- Name: give a name to the monitored docker host, it should be unique.
- Host Name: IP address or host name of the monitored docker host.

- Docker Remote API End Point. Docker Remote API endpoint of the monitored docker host. For more information, see Enabling Docker Remote API for monitored docker host on page 16.
- Swarm Name: specify the swarm cluster name for display. If the swarm name is kept as "default", then the cluster name will be displayed as "default (cluster ID)" on the dashboard. If a customized name is input here, then the customized cluster name will be displayed on the dashboard.
- **NOTE:** Ensure that the docker host inside the same cluster has the same configuration for Swarm Name.
- 9 Return back to the *Agents* table, select the above property changed Docker Swarm Agent, and then click **Activate**.

The new Docker Swarm Agent is created and data will be shown on the **Monitoring** tab after a few minutes.

Configuring data collection interval

The default data collection interval of agents is set to 5 minutes by default. Foglight for Container Management enables you to change this collection interval as needed.

i NOTE: Changing the data collection interval will take effect for all Kubernetes agents and Docker Swarm agents.

To configure the data collection interval:

- 1 On the navigation panel, under **Dashboards**, select **Administration > Agents > Agent Status**.
- 2 On the *Agent Status* dashboard, select the Kubernetes agent that you use to monitoring the container environment, and then click **Edit Properties**.
- 3 In the Edit Properties dashboard, click Edit next to the Collector Config field.
- 4 In the KubernetesAgent or DockerSwarmAgent Collector Config dialog box, change the following values, as needed:
 - Inventory Collector: Specifies the interval for collecting components.
 - Metrics Collector. Specifies the interval for collecting metrics.
- 5 Click Save.

Using Foglight for Container Management

- Kubernetes
 - Monitoring Kubernetes Pods
 - Monitoring Kubernetes Nodes
 - Monitoring Kubernetes Clusters
 - Monitoring Kubernetes Other Components
 - Alarms
- Docker Swarm
 - Monitoring Docker Containers
 - Monitoring Docker Hosts
 - Monitoring Docker Swarm Clusters
 - Monitoring Docker Swarm Services
 - Alarms
- Analytics
 - Kubernetes analytics
 - Heatmap analytics
 - Scatter Plot analytics
 - Docker Swarm analytics
 - Heatmap analytics
 - Scatter Plot analytics
- Metrics
 - Kubernetes metrics
 - Docker Swarm metrics

Kubernetes

Monitoring Kubernetes Pods

A pod contains one or multiple containers, such as Docker containers, which contains storage/network and the specification about how to run the containers. The *Kubernetes Pods Quick View*, which appears after clicking **Monitoring > Pods**, shows the data collected about the selected clusters and namespaces. This view consists of the following two panes:

- The Kubernetes Pods tree view, which appears on the left of Kubernetes Pods Quick View, lists the pods existing in the monitored Kubernetes environment.
- The Kubernetes Pods Summary view, which appears on the right after you select an individual pod in the **Kubernetes Pods** tree view.

Kubernetes Pods Summary view

The **Kubernetes Pods Summary** view appears on the right when you select a cluster in the **Kubernetes Pods** tree view.

Figure 2. Kubernetes Pods Summary view

Kubernetes Swarn	n (Preview)				A	Analytics v
All Clusters	▼ → All Nam	espaces	-			
Monitoring Configurations Contro						
Formed and the control of the control	mers Storage Load bala		1			
55 👼	5 🔜	2				==
Pods Nod	les Cluster					<u> </u>
						-
5 6 13 31 0 0	2 3 0 0 0					•
	2 3 0 0 0	2				_
Kubernetes Pods Quick View	1]
Kubernetes Pods	Kubernetes Pods Sumn	ary				Explore
Search 🔎 🗸	Resource Utilizations					
Cluster - localckacluster	Usage Rate	CPU Usage	2	Transfer Rate	Network I/0	
 Ramespace - default Ramespace - kube-syster 			I ¹ a			I ⁸⁰
Namespace - test-daemo	0.00 milicores/second		millicores	0.00 B/s		40 B
Namespace - testcka			0			t
Cluster - nancyakscluster		5:15 15:25 15:35 15:45 — CPU Usage Baseline — CI	15:55 16:05 PU Request —— CPU Limit		15:15 15:25 15:35 15:46 15:55 16:05	
	Usage	Memory Usa	ge T2	Total Usage	File System Usage	T 80
	(\circ)			(\circ)		40 🔛
	0.95 MB			24 KB		+
			15:55 16:05		15:15 15:25 15:35 15:45 15:55 16:05	-10
		- Memory Usage Baseline N	vlemory Request — Memory		—— Total Usage 📃 Baseline —— Limit —— Ava	ilable
	Summary					
		Name	busybox		Node	
		Cluster	localckacluster		Namespace	
	ARX I	Owner DNS Policy	ClusterFirst		Service Account Restart Policy	
		Pod IP	[10.244.1.26]		Restart Policy Persistent Volume C	laims
		Status	Running		i Gastat Volume d	
4]					

The Kubernetes Pods Summary view displays the following data:

- *Resource Utilizations*: The resource utilization for the selected Kubernetes Pod over a selected period of time, which includes the following:
 - *CPU Usage*: Shows the CPU utilization summary for the selected Kubernetes Pod based on its total capacity during a selected time period.
 - Transfer Rate: Shows the network utilization summary for the selected Kubernetes Pod, including the average rate of network throughput, and the amounts of data sent to and received from the network.
 - Memory Usage: Shows the physical memory utilization summary for the selected Kubernetes Pod, broken into the amounts of memory that is swapped to disk, actively used, and allocated, all during a selected time period.
 - File System Usage: Shows the file system resource utilization summary for the selected Kubernetes Pod, including the available/total/limited file system resource.
- Summary: Displays the detailed information about the selected Kubernetes Pod, including Name, Node, Cluster, Namespace, Owner, Pod IP, Service Account, DNS Policy, Restart Policy, and Status.

Click **Explore** on the upper right of the **Kubernetes Pods Summary** view to open the Pods Explorer view, which shows more detailed information about this Kubernetes cluster.

Pods Explorer view

The *Pods Explorer* view opens when you click **Explore** in the Kubernetes Pods Summary view, which includes the following tabs:

• General tab: The General tab displays the overall information of the selected Kubernetes Pod over a selected period of time, including the *Summary and Resource Information* table, the *Containers* table, and the *Init Containers* table. For more information, see Pod metrics on page 52.

Figure 3. Kubernetes Pods Explorer view General Tab

	K	ibernetes Pod: bus	whor		Alarms Severity Fatal Alarms Count	Critical W	Varning
General	Metrics		Sybox				
Summary	y and Re	source Information					
Cluster		localckacluster		Namespace	default		
Name		busybox		Node	kubeckaworker		
Labels				Annotations			
Service A	ccount	default		Scheduler Name	default-scheduler		
Restart P	olicy	Always		DNS Policy	Always		
Hostnam	e			Subdomain			
Active De	adline S	econds		Host IPC			
Host PID				Host Network			
Persisten	it Volum	e Claim		Status	Running		
Containe	rs						-
Name	Status	Image	Working Directory	Command	Arguments	Environm Variable	
busybox	running	busybox:1.28		sleep 3600			

Metrics tab: The *Metrics* tab displays a *Metric Selector* allowing you to choose the metrics to be plotted on this dashboard. Charts of *CPU Usage, Memory Usage,* and *Network I/O* are presented by default.

Figure 4. Kubernetes Pods Explorer view Metrics Tab

T. Container Environment > Kubernetes Pod: busybox		G+ Tuesday, April 23, 2019 1:29:50 PM - Now 60 minutes 👻 📋 🛅 Reports
Kubernetes Pod: b	usybox	Alarms Seventy Fatal Critical Warning := Alarms Count
General Metrics		
CPU Usage	-1	Memory Usage
	Metric Selector ×	
	Select All Select None Search	
	CPU Usage	
2	CPU Usage Rate	
13:30 13:35 13:40 13:45 13:50 13:55 14:00 14:05	1 Filesystem Inode Usage	5 13:50 13:55 14:00 14:05 14:10 14:15 14:20 14:25
CPU Request CPU Limit -	Filesystem Usage	mory Usage Memory Request Memory Limit
	Memory Page Faults	
Network 10	Memory Page Faults Rate	Pilozof and Barray
Network I/O	Memory Rss	Filesystem Usage T ⁸⁰
	Memory Usage	+
	Memory Working Set	160
	Network I/O	- 40 🔛
	Network I/O Errors	‡20
	Network I/O Errors Rate	+
13:30 13:35 13:40 13:45 13:50 13:55 14:00 14:05	1 🔲 Network I/O Rate 🔻	5 13:50 13:55 14:00 14:05 14:10 14:15 14:20 14:25
Network Send Bytes Netwo	rk neserve bytes	Total Usage — Limit — Available

Monitoring Kubernetes Nodes

A node, previously known as a minion, is a worker machine in Kubernetes. A node may be a VM or physical machine, depending on the cluster. Each node has the services necessary to run pods and is managed by the master components. The *Kubernetes Nodes Quick View*, which appears after clicking **Monitoring > Nodes**, shows the data collected about the selected clusters and namespaces. This view consists of the following two panes:

- The **Kubernetes Nodes** tree view, which appears on the left of *Kubernetes Nodes Quick View*, lists the nodes existing in the monitored Kubernetes environment.
- The Kubernetes Nodes Summary view, which appears on the right after you select an individual node in the **Kubernetes Nodes** tree view.

Kubernetes Nodes Summary view

The **Kubernetes Nodes Summary** view appears on the right when you select a node in the **Kubernetes Nodes** tree view.

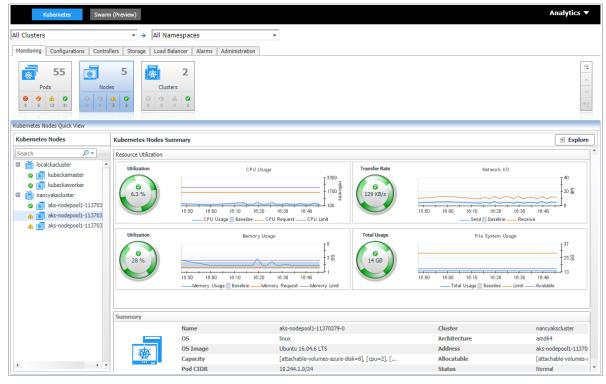


Figure 5. Kubernetes Nodes Summary view

The Kubernetes Nodes Summary view displays the following data:

- Resource Utilizations: The resource utilization for the selected Kubernetes node over a selected period of time, which includes the following:
 - CPU Utilization: Shows the CPU utilization summary for the selected Kubernetes node based on its total capacity during a selected time period.
 - Transfer Rate: Shows the network utilization summary for the selected Kubernetes node, including the average rate of network throughput, and the amounts of data sent to and received from the network.
 - Memory Utilization: Shows the physical memory utilization summary for the selected Kubernetes node, broken into the amounts of memory that is swapped to disk, actively used, and allocated, all during a selected time period.

- File System Usage: Shows the file system resource utilization summary for the selected Kubernetes Pod, including the available/total/limited file system resource.
- Summary: Displays the detailed information about the selected Kubernetes node, including Name, Pod CIDR, OS, Architecture, OS Image, Address, Capacity, Allocatable, and Status.

Click **Explore** on the upper right of the **Kubernetes Nodes Summary** view to open the Nodes Explorer view, which shows more detailed information about this Kubernetes node.

i NOTE: If the virtual machines belong to the Container cluster, and they are monitored by other cartridges at the same time, for example, VMware, AWS, or Azure. Then, the collected data will come from that cartridge directly and the **Kubernetes Nodes Summary** view will be different from the screenshot above. See Figure 6 for detailed information.

Figure 6. Kubernetes Nodes Summary view for VMware

Container Environment	G• Monday, May 20, 2019 12:15:43 AM - 1:15:43 AM 60 minutes 💌 📔 Reports 👻
Kubernetes Swarm (Preview)	Analytics 🔻
All Clusters V > All Namespaces V	
Monitoring Configurations Controllers Storage Load Balancer Capacity Management Alarms Administration	
76 8 3 Pods 0 0 0 0 0 0 0 3 Oldes Nodes Outsters 0 </th <th></th>	
Kubernetes Nodes Quick View	
Kubernetes Nodes Kubernetes Nodes Summary	Explore to VMware VM Explore
Search P Resource Utilization	
CPU Usilization CPU Utilization CPU Utilization	Network Utilization
Image: Second	0020 0030 0040 0050 0150 0150
Imancyalscluster Memory Memory Utilization Datastore I/O	Datastore Utilization
Image: Second specific state Image: Second specific state <td< th=""><th>Distastore Unitization</th></td<>	Distastore Unitization

- *Explore to VMware VM*: Click the button to open the *VMware Explorer* view, which is the same view from VMware cartridge. The *Explore to xx* button varies from the cartridge that is monitoring the machines. Currently, the supported cartridges include: VMware, AWS, and Azure.
- Resource Utilizations: The displayed metrics will be slight different among different monitoring cartridges.

Nodes Explorer view

The *Nodes Explorer* view opens when you click **Explore** in the Kubernetes Nodes Summary view, which includes the following tabs:

General tab: The General tab displays the overall information of the selected Kubernetes node over a
selected period of time, including the Summary and Resource Information table and the Pods table. For
more information, see Node metrics on page 53.

Figure 7. Kubernetes Nodes Explorer view General Tab

Kubernete	s Node: ak	s-nodepool1-11	370379-0	Alarms Severity Alarms Count	Fatal	Critical	Warning 1
General Metrics	ion						
Name	aks-nodepool1-1137	20270.0	Kubalat Fada siat	10.250			
vame Architecture	amd64	/03/9-0	Kubelet Endpoint	10,250 linux			
Architecture Kernel Version			Operating System Container Runtime Versio		0.4		
Cube Proxy Version				v1.12.6	J. 4		
Soot ID		0 -625 -23625-59941	Kubelet Version Machine ID	V1.12.6 31e6dcedd	Th 4760-	E00E0h.	£10
Pod CTDR	f3ad1377-088d-42e8-a625-c37f25e58841 10.244.1.0/24			Sieducedu	55047100500	1390603000	
Provider ID		ns/a4d9037c-b740-4205-ad1	External ID Unschedulable	false			
abels		os=linux], [kubernetes.az	Annotations		e umes.kubernetes.io/controller-managed		managed.
avers		Annotations	-			/olumes-azure-disk=8], [cpu=19	
anacity	[attachable-volumes	-azure-dick=81 [cnu=2] [Allocatable	[attachable	volumes-az	ure-dick-8] [cnu=19
Status	[attachable-volumes Normal	s-azure-disk=8], [cpu=2], [Allocatable	[attachable	-volumes-az	ure-disk=8], [cpu=19
Capacity Status Addresses Hostname			Allocatable	[attachable 10.240.0.4	-volumes-az	ure-disk=8], [cpu=1!
Status Addresses	Normal				-volumes-az	ure-disk=8], [cpu=1!
Addresses Hostname	Normal		InternalIP			ontainers	
tatus uddresses lostname bods Search P • Name	Normal aks-nodepool1-11370	379-0	InternalIP	10.240.0.4			
tatus ddresses lostname ods Search Name kibana-logging-7444956bf8-finmps	Normal aks-nodepool1-11370 Status	379-0 Cluster	InternalIP	10.240.0.4			5
tatus ddresses tostname Pods Search P • Name kibana-logging-7444956bf8-fnmps tunnelfront-86695c8665-776xp	Normal aks-nodepool1-11370 Status Running	379-0 Cluster nancyakscluster	InternalIP Namespace kube-system	10.240.0.4 Containers			5
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tatus ddresses lostname ods Search Name kibana-logging-7441956bf8-fnmps tunnelfront-86695c8665-776xp coredns-79c89b8f4-vkfsh fve-768c8c4678-6cbtw	Normal aks-nodepool1-11370 Status Running Running Running	379-0 Cluster nancyakscluster nancyakscluster nancyakscluster	InternalIP Namespace kube-system kube-system kube-system kube-system kube-system	10.240.0.4			5 0 0 0
tatus ddresses tostname ods Search Name kibana-logging-7444956/f8-frmps tunnelfront-86695c8665-776xp coredns-79639b8f4-vkfsh fve-768c8c4678-6cbtw kube-proxy-rstrq	Normal aks-nodepool1-11370 Status Running Running Running Running	379-0 Cluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster	InternalIP Namespace kube-system kube-system kube-system questive	10.240.0.4			5 0 0 0 0
tatus ddresses lostname Name Name Name Name Name Name variation Name Name variation Name Name variation Name	Normal aks-nodepool1-11370 Status Running Running Running Running Running	379-0 Cluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster	InternalIP Namespace kube-system kube-system questive questive	10.240.0.4			s 0 0 0 0 0
tatus ddresses tostname bods Search P ~ Name kibana-logging-74+14956bf8-fnmps tunnelfront-86695c8665-776xp coredns-79689b8f4-vkfsh Tvk-758c8c4678-6cbtw kube-proxy-rstrq kube-proxy-rstrq kube-svc-redirect-bqb9q coredns-79c89b8f4-ghvrb	Normal aks-nodepool1-11370 Status Running Running Running Running Running Running	379-0 Cluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster nancyalscluster	InternalIP Namespace kube-system kube-system questfixe questfixe kube-system	10.240.0.4			5 0 0 0 0 0 0 0 0
tatus ddresses tostname tods Search P • Name kibana-logging-7444956bf8-fnmps tunnelfront-86695c8665-776xp coredns-79c89b8f4-vkfsh	Normal aks-nodepool1-11370 Status Running Running Running Running Running Running Running	379-0 Cluster nancyakscluster nancyakscluster nancyakscluster nancyakscluster nancyakscluster nancyakscluster nancyakscluster nancyakscluster	InternalIP Namespace kube-system kube-system questfve kube-system kube-system kube-system kube-system kube-system	10.240.0.4			; 0 0 0 0 0 0 0 0 0 0 0 0

• *Metrics tab:* The *Metrics* tab displays a *Metric Selector* allowing you to choose the metrics to be plotted on this dashboard. Charts of *CPU Usage, Utilization, Memory Usage,* and *Network I/O* are presented by default.

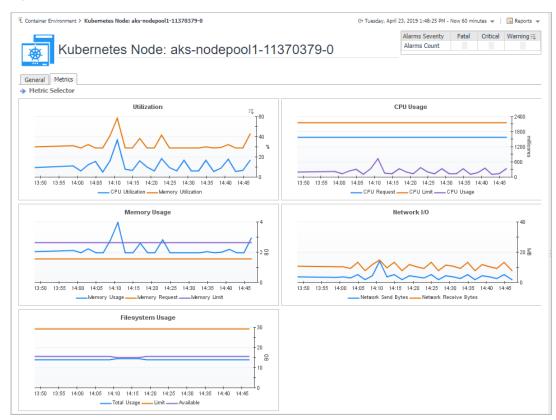


Figure 8. Kubernetes Nodes Explorer view Metrics Tab

Monitoring Kubernetes Clusters

Kubernetes cluster is a group of kubernetes resources. There are two kinds of nodes inside a cluster, Kubernetes master and Kubernetes nodes. Kubernetes master is responsible for maintaining the desired state of your cluster which Kubernetes node is responsible to run your application and cloud workflows. The *Kubernetes Cluster Quick View*, which appears after clicking **Monitoring > Clusters**, shows the data collected about the selected clusters and namespaces. This view consists of the following two panes:

- The **Kubernetes Clusters** tree view, which appears on the left of *Kubernetes Clusters Quick View*, lists the clusters existing in the monitored Kubernetes environment.
- The Kubernetes Clusters Summary view, which appears on the right after you select an individual cluster in the **Kubernetes Clusters** tree view.

Kubernetes Clusters Summary view

The **Kubernetes Clusters Summary** view appears on the right when you select a node in the **Kubernetes Clusters** tree view.

Figure 9. Kubernetes Clusters Summary view

Kubernetes Swar	m (Preview)					Analytics v
All Clusters	▼ → All Na	mespaces	*			
Monitoring Configurations Contro	ollers Storage Load B	alancer Alarms Administrat	on			
Pods Not 0 ◆ ▲ ○ 0 5 6 13 Xubernetes Clusters Quick View		2 ers 0 2				12
Kubernetes Clusters	Kubernetes Clusters	Summary			着 Viev	v Topology 🛛 🕒 Explore
Search 🔎 ᠇ 🚟	Resource Utilization	s				
localckacluster nancyaksduster	Usage Rate	15:55 10:05 10:15	CPU Usage	Usage	Memory Usag 15:55 10:05 10:15 10:25 Memory Usage Baseline — Memo	18:35 18:45
	Summary					
		Name	nancyakscluster		Version	1.12
		Pods	35		Nodes	3
	A	Deployments	19		Stateful Sets	1
		Jobs	3		Replica Sets	33
		Cron Jobs	1		Replication Controllers	1

The Kubernetes Clusters Summary view displays the following data:

- *Resource Utilizations*: The resource utilization for the selected Kubernetes cluster over a selected period of time, which includes the following:
 - Usage Rate: Shows the CPU usage summary for the selected Kubernetes cluster based on its total capacity during a selected time period.
 - Memory Usage: Shows the physical memory utilization summary for the selected Kubernetes node, broken into the amounts of memory that is swapped to disk, actively used, and allocated, all during a selected time period.
- Summary: Displays the detailed information about the selected Kubernetes cluster, including Name, Version, Pods, Nodes, Deployments, Stateful Sets, Jobs, and Replica Sets.

Click **Explore** on the upper right of the **Kubernetes Clusters Summary** view to open the Cluster Explorer view, which shows more detailed information about this Kubernetes cluster.

Click **View Topology** on the upper right of the **Kubernetes Clusters Summary** view to open the Cluster Topology view, which shows the topology graph from the application accessible aspect.

Cluster Explorer view

The *Cluster Explorer* view opens when you click **Explore** in the Kubernetes Clusters Summary view, which includes the following tabs:

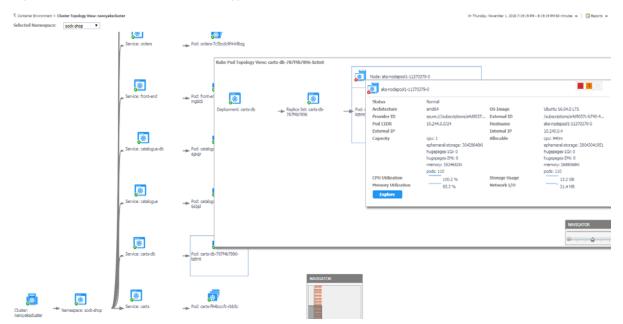
 Metrics tab: The Metrics tab displays a Metric Selector allowing you to choose the metrics to be plotted on this dashboard. Charts of CPU Usage and Memory Usage are presented by default.



	Alarms Severity Fatal Critical Warning
🙀 🛾 Kubernetes Cluster: nancyakscluster	Alarms Count
<u> </u>	
etrics	
Metric Selector	
CPU Usage	Memory Usage
Topo T	[°
+ 4000 3	4
- 4000	
	2
-	+
	13:55 14:00 14:05 14:10 14:15 14:20 14:25 14:30 14:35 14:40 14:45 14:50
13:55 14:00 14:05 14:10 14:15 14:20 14:25 14:30 14:35 14:40 14:45 14:50	13:55 14:00 14:05 14:10 14:15 14:20 14:25 14:30 14:35 14:40 14:45 14:50

Cluster Topology view

Figure 11. Kubernetes Clusters Topology view



The *topology view* visualizes the relationships between the objects from the pods accessible aspect in your environment through an interactive dependency map. The map illustrates how different components relate to each other, and the levels of the available resources available to them. Click on Pod, another sub topology view will popup to show the relationship from pods controller to storage for the selected Pod. Click other components or click the Pod inside the sub topology view, an information view will popup to show alarms, basic information, some metrics. From the information popup view of Pod, Node and Cluster, click the Explore button will navigate to the explorer view of the selected Pod/Node/Cluster. The **NAVIGATOR** in the bottom-right corner allows you to easily set the zoom level by dragging the slider into the appropriate position.

Monitoring Kubernetes Other Components

Kubernetes other components here including pods controllers, services, ingresses, persistent volumes, secrets and so on. All these components are grouped and displayed in tabs.

- Configurations
- Controllers
- Storage

Load Balancer

Configurations

Figure 12. Kubernetes Configuration Dashboard

Kubernetes Swarm (Prev	iew)				An	alytics v
All Clusters	▼ → All Name	espaces	•			
Monitoring Configurations Controllers	Storage Load Bala	ncer Alarms Admini	stration			
Config Map Secret						
					Search	<i>p</i> -
Name	Cluster 🔺	Namespace	Labels	Annotations	Configured Data Keys	
cluster-info	localckacluster	kube-public			kubeconfig	
coredns	localckacluster	kube-system			Corefile	
extension-apiserver-authentication	localckacluster	kube-system			client-ca-file, requestheader-extra-headers-prefix, request	header-die
kube-flannel-cfg	localckacluster	kube-system	[app=flannel], [tier=node]		net-conf.json, cni-conf.json	
kube-proxy	localckacluster	kube-system	[app=kube-proxy]		config.conf, kubeconfig.conf	
kubeadm-config	localckacluster	kube-system			ClusterStatus, ClusterConfiguration	
kubelet-config-1.13	localckacluster	kube-system			kubelet	
metrics-server-config	localckacluster	kube-system	[addonmanager.kubernetes.io/m		NannyConfiguration	
fair-lambkin-elasticsearch-curator-config	nancyakscluster	default	[heritage=Tiller], [app=fair-lamb		config.yml, action_file.yml	
impressive-llama-mariadb-master	nancyakscluster	default	[heritage=Tiller], [app=mariadb		my.cnf	
impressive-llama-mariadb-slave	nancyakscluster	default	[component=slave], [release=im		my.cnf	
impressive-llama-mariadb-tests	nancyakscluster	default			run.sh	
metricbeat-config	nancyakscluster	default	[k8s-app=metricbeat], [app=fair		metricbeat.yml	
metricbeat-modules	nancyakscluster	default	[component=fair-lambkin-elastic		system.yml, kubernetes.yml	
sysdig-agent	nancyakscluster	default		[kubectl.kubernetes.io/last-appli	dragent.yaml	
understood-zebra-elasticsearch-curator-config	nancyakscluster	default	[release=understood-zebra], [he		action_file.yml, config.yml	
aks-nodepool1-11370379-0-config-5fat4dhcbf	nancvakscluster	kube-system			kubelet	

The Configurations dashboard includes Kubernetes Secret and Config Map.

- A Kubernetes Secret is an object that contains a small amount of sensitive data, such as a password, a token, or a key. Such information might otherwise be put in a Pod specification or in an image; putting it in a Secret object allows for more control over how it is used, and reduces the risk of accidental exposure.
- A Kubernetes Config Map binds configuration files, command-line arguments, environment variables, port numbers, and other configuration artifacts to your Pods' containers and system components at runtime. Config maps allow you to separate your configurations from your Pods and components, which helps keep your workloads portable, makes their configurations easier to change and manage, and prevents hardcoding configuration data to Pod specifications.

Controllers

	Kube	metes Swarm (Preview)											Analytics 🔻
All Clu	usters	✓ → All Nan	espaces			-							
Monit		onfigurations Controllers Storage Load Ba	ancer Alarms	Administratio									
Monii		storage Load Ba	ancer Alarms	Administratio				_					
E.	Deploymen	Replica Set Replication Cor	troller D	aemon Set		Statef	ul Set		Job	C	ron Job		
													Search 🔎 🗸
larms	Status	Name	Cluster 🔺	Namespace	Replica	s Pods	Replica Sets	Is Paused	Min Ready Seconds	Progress Deadline Seconds	Revision History Limit	Rollback To Revision	Strategy
3	Normal	fglam	localckacluster	default	1	1	1	False		2,147,483,647	2,147,483,647		[RollingUpdate]Max Surge:1,Max Unavailable:1
9	Normal	fve-app	localckacluster	default	1	1	2	False	5	600	10		[RollingUpdate]Max Surge:25%,Max Unavailable:25%
	Normal	postgresql	localckacluster	default	1	1	1	False		2,147,483,647	2,147,483,647		[RollingUpdate]Max Surge:1,Max Unavailable:1
4	Normal	coredns	localckacluster	kube-system	2	2	1	False		600	10		[RollingUpdate]Max Surge:25%,Max Unavailable:1
	Normal	heapster	localckacluster	kube-system	1	1	1	False		2,147,483,647	2,147,483,647		[RollingUpdate]Max Surge:1,Max Unavailable:1
•	Abnormal	metrics-server-v0.3.1	localckacluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:25%,Max Unavailable:25
•	Normal	[Status Detail]									10		[RollingUpdate]Max Surge:25%,Max Unavailable:25
<u> </u>	Normal	Progressing:True, Reason:NewReplicaSetAvailable	, Message:Replic	aSet "metrics-s	erver-v0	.3.1-8	455848d4	tc" has	successfull	у	10		[RollingUpdate]Max Surge:25%,Max Unavailable:25
5	Normal	progressed. Available:False, Reason:MinimumReplicasUnavaila	bla MassanarDar	aloumant door	not have	minin	ium auai	lability		647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
•	Normal	Replicas Detail	ble, message:De	proyment does	not nave	e minin	num avai	ability.		647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
•	Normal	Replicas:1								647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
•	Normal	Unavailable Replicas:1									10		[RollingUpdate]Max Surge:1,Max Unavailable:1
•	Normal	alternating-jackal-nginx-ingress-default-backend	nancyakscluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
4	Normal	coredns	nancyakscluster	kube-system	2	2	2	False		2,147,483,647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
	Normal	coredns-autoscaler	nancyakscluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
2	Normal	heapster	nancyakscluster	kube-system	1	1	2	False		2,147,483,647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
2	Normal	kibana-logging	nancyakscluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:25%,Max Unavailable:25
2	Normal	kilted-unicorn-nginx-ingress-controller	nancyakscluster	kube-system	2	2	1	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
	Normal	kilted-unicorn-nginx-ingress-default-backend	nancyakscluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
Δ	Normal	kubernetes-dashboard	nancyakscluster	kube-system	1	1	4	False		600	10		[RollingUpdate]Max Surge:0,Max Unavailable:1
2	Normal	metrics-server	nancyakscluster	kube-system	1	1	4	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
2	Normal	tiller-deploy	nancyakscluster	kube-system	1	1	1	False		600	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
	Normal	tunnelfront	nancyakscluster	kube-system	1	1	2	False		2,147,483,647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
۶.	Abnormal	invalidimage	nancyakscluster	test	2	2	1	False		2,147,483,647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1
	Normal	unabletoschedule	nancyakscluster	test	1	1	1	False		2,147,483,647	10		[RollingUpdate]Max Surge:1,Max Unavailable:1

Figure 13. Kubernetes Controllers Dashboard

A controller manages a set of pods and ensures that the cluster is in the specified state. Instead of manually creating a pod, controllers can be used to create pods and to manage the pods. For example, the pods maintained by a replication controller are automatically replaced if they fail, get deleted, or are terminated. The *Controllers* dashboard presents the information related to the following controller types: *Deployment, Replica Set, Replication Controller, Daemon Set, Stateful Set, Job,* and *Cron Job.*

Storage

Figure 14. Kubernetes Storage Dashboard

	Kubernetes	Swarm (Preview)				Ana	alytics 🔻
All Cluster	rs	▼ → All Namespac	es		•		
Monitoring	g Configurat	tions Controllers Storage Load Balancer	Alarms Adminis	tration			
Persiste	ent Volume	Persistent Volume Claim Stor	age Class				
						S	earch
Alarms	Status	Name	Cluster 🔺	Reclaim Policy	Claim	Storage Class	Source Type
9	Bound	pv-sc-no-sc-customize	localckacluster	Retain	pvc-sc-pv-customize-sc	no-sc-customize	HostPath
	Available	pv-sc-default	localckacluster	Retain		default	HostPath
9	Available	pv-sc-invalid-provisioner	localckacluster	Retain		sc-invalid-provisio	HostPath
	Bound	pv-invalid-nfs	localckacluster	Recycle	pvc-invalid-sc-pv	slow	NFS
9	Available	pv-pvc-oversize	localckacluster	Retain		sc-oversize	HostPath
0	Available	pv-pvc-acm1	localckacluster	Retain		sc-pvc-acm1	HostPath
9	Bound	pvc-2b95e22d-dc28-11e8-b2ed-befa22179703	nancyakscluster	Delete	data-mehdb-1	default	AzureDis
0	Bound	pvc-45f1fe1e-5f54-11e9-b660-16063de8b09f	nancyakscluster	Delete	data-elasticsearch-2	default	AzureDis
2	Bound	pvc-59cb23a5-fd17-11e8-adf4-de8994810bc3	nancyakscluster	Delete	data-elasticsearch-0	default	AzureDis
3	Bound	pvc-7049bcb8-fd17-11e8-adf4-de8994810bc3	nancyakscluster	Delete	data-elasticsearch-1	default	AzureDisk
9	Bound	pvc-90f76a94-2e94-11e9-810c-0a130f143c9f	nancyakscluster	Delete	alertmanager-prom-prometheus-operator-alertmanager-db-al	default	AzureDis
0	Bound	pvc-9727fba6-2e94-11e9-810c-0a130f143c9f	nancvakscluster	Delete	prometheus-prom-prometheus-operator-prometheus-db-prom	default	AzureDisk

The Kubernetes storage contains volumes, storage class, persistent volume, and persistent volume claim. Volumes are on-disk files used by the containers for persistent their data as well as sharing with other containers. The *Storage* dashboard shows the information about the following storage classes:

- Storage Class provides a way for the administrator to describe the "class" of storage they offer.
- Persistent Volume subsystem provides an API for users and administrators that abstracts details of how storage is provided from how it is consumed.
- *Persistent Volume Claim* is used for dynamic volume provisioning which allow storage volumes to be created on-demand.

Load Balancer

Figure 15. Kubernetes Load Balancer Dashboard

iontainer E	nvironment			G+ Tuesda	ay, April 23, 2019 2:0	1:30 PM - 3:01:30 PM 6	0 minutes 👻	Reports
	Kubernetes Swarm (Preview)						Ana	alytics 🔻
All Cluste	ers 🔻 🔸	II Namespaces		•				
Monitorin	g Configurations Controllers Storage	oad Balancer Alarm	s Administra	ation				
Se	ervice Ingress Endp	oint						
Alarms	Name	Cluster 🔺	Namespace	Туре	Cluster IP	External IPs	External Name	IP Address
0	fve	localckacluster	default	NodePort	10.103.174.0			
0	fve-app	localckacluster	default	ClusterIP	10.111.36.15	-141-281-281		
0	kubernetes	localckacluster	default	ClusterIP	10.96.0.1			
0	postgresql	localckacluster	default	ClusterIP	10.98.70.60			
0	test	localckacluster	default	ClusterIP	10.99.240.162			
0	heapster	localckacluster	kube-system	ClusterIP	10.110.175.65			
0	kube-dns	localckacluster	kube-system	ClusterIP	10.96.0.10			
0	metrics-server	localckacluster	kube-system	ClusterIP	10.109.149.172			
0	kubernetes	localkubecluster159	default	ClusterIP	10.96.0.1			
0	kube-dns	localkubecluster159	kube-system	ClusterIP	10.96.0.10			
0	azure-vote-back	nancyakscluster	default	ClusterIP	10.0.71.228			
0	azure-vote-front	nancyakscluster	default	LoadBalancer	10.0.116.152			
0	hello-nginx	nancvakscluster	default	NodePort	10.0.28.128			

The *Load Balancer* dashboard includes information about Kubernetes service, endpoint, and ingress. A Kubernetes ingress can provide load balancing, SSL termination, and name-based virtual hosting. A Kubernetes service is an abstraction which defines a logical set of pods and a policy by which to access them - sometime called micro-services. Kubernetes will update the endpoint whenever the set of pods in a service changes.

Alarms

Figure 16. Kubernetes Alarms Dashboard

Cont	ainer Envi	ronment								G+ Wednesday, May	15, 2019 12:51:05	AM - 1:51:05 AM 60 minutes 👻	Report	ts
	ŀ	Kubernet	es	s	warm (Preview)							Ап	alytics v	ſ
All	Clusters	;			•	→ All N	amespace	s	*					
Mo	onitoring	Config	urations	C	ontrollers Storag	ge Load	Balancer	Alarms Administratio	in					
() Ala	arms	;											
~					Age	ents	Cluster	s Nodes	Pods	Controllers	Storages	Load Balancers		
									6 10 6	3 2	12			
Se	elect All U	Inselect A	ll Ackr	owle	dge Clear							Search	+ 🔍	
	Time 🔻	Severity			Impacting	Source		Alarm Message						
	5/15/19 1:22 AM		false	*	etcd- kubeckamaster	KubePod	Kubernetes Pod Memory	The cpu usage 131.2	mb of pod etcd-kub	eckamaster in namesp	ace kube-system	n in cluster localckacluster o	ver threshold	11
	5/15/19 1:11 AM	<u>^</u>	false	•	postgresql- 6558cdf45c- 4s59k	KubePod	Kubernetes Pod Memory	The cpu usage 245.9	mb of pod postgreso	ql-6558cdf45c-4s59k ii	n namespace que	estfve in cluster nancyaksch	uster over thr	re
	5/14/19 11:36 PM	8	false		fve-app- 76cccb864c- 968z6	KubePod	Kubernetes Pod Memory	The memory utilization	on 99.32% of pod fv	e-app-76cccb864c-96	3z6 in namespac	e default in cluster localcka	cluster reach	es
	5/14/19 11:36 PM	8	false		kube-flannel-ds- amd64-j5n62	KubePod	Kubernetes Pod Memory	The memory utilization 90.00%.	on 94.75% of pod ku	ube-flannel-ds-amd64-	j5n62 in namesp	oace kube-system in cluster	localcluster1	59
	5/14/19 11:36 PM	8	false	•	kube-apiserver- kubeckamaster	KubePod	Kubernetes Pod Memory	The memory usage 5	49.9mb of pod kube	e-apiserver-kubeckama	ister in namespa	ice kube-system in cluster lo	ocalckacluster	r o
	5/14/19 11:36 PM	8	false	*	fglam-f7f795b8- 65k2c	KubePod	Kubernetes Pod Memory	The memory usage 8	68.2mb of pod fglar	n-f7f795b8-65k2c in n	amespace defau	lt in cluster localckacluster	over threshol	d
	5/14/19 11:36 PM	8	false	•	fve-app- 76cccb864c- 968z6	KubePod	Kubernetes Pod Memory	The memory usage 3	.9gb of pod fve-app	-76cccb864c-968z6 in	namespace defa	ault in cluster localckacluste	r over thresh	ol
	5/14/19 11:36 PM	8	false	•	tqa-loadtest- jmeter-slaves- 768d8c4dc9-sk	KubePod	Kubernetes Pod Memory	The memory usage 1 512.0mb.	003.4mb of pod tqa	-loadtest-jmeter-slave	s-768d8c4dc9-sk	chbk in namespace tqa in cl	uster localclu	st
	5/14/19 11:36		false	•	jmeter-operator- 784bd76967- kfyrx	KubePod	Kubernetes Pod Memory	The memory usage 3 256.0mb.	86.6mb of pod jmet	er-operator-784bd769	67-kfvrx in name	espace kube-system in clust	ter localcluste	er

The *Alarms* dashboard displays a list of alarms generated against the monitored Kubernetes environment. Use this view to quickly identify any potential problems related to a specific Kubernetes component.

Administration

ontainer Environment				G+ Tu	uesday, April 23, 2019	2:27:17 PM - 3:27:17	PM 60 minutes 👻 📔 Report
Kubernetes	Swarm (Preview)						Analytics •
ll Clusters	👻 🌛 🛛 All Namespa	ces		Ŧ			
Monitoring Configurations	Controllers Storage Load Balancer	Alarms	Administration				
Tasks:							
Agents							
🕑 Add 🤹 Refresh 🛛 🕛 Activ	ate 🕕 Deactivate 📄 Start Data Collecti	ion 📕 Stop	p Data Collection 🧯	Remove	👚 Update Agent	Search	۶ ج
Agent Name 🔺	Foglight Agent Manager Host	Active	Data Collection	Alarms	Edit Properties	Download Log	Agent Version
		8	1		1		A
Monitor@localckacluster		82	2			_	🧭 Version Up To Date
Monitor@localckacluster Monitor@localkubecluster15	3	**************************************	2 2		2	-	Version Up To Date

The Administration dashboard supports new agent creation and existing agents management. Use Create Docker Agent or Add to create a new agent. See Creating and Activating a Kubernetes Agent on page 18 for more information. Use Activate, Deactivate, Start Data Collection, Stop Data Collection, Remove, and Update Agent to manage the agent. Click Edit Properties to update the properties of the chosen agent.

i NOTE: The Administration dashboard can be accessed only when the users have both the Administrator role and the Container Administrator role. To grant the users with the Container Administrator role, go to Administration > Users & Security management under Administer Server > Manage Users, Groups, Roles > Roles tab.

Docker Swarm

The *Docker Container Quick View* appears after clicking **Monitoring > Containers**. Click **Swarm (Preview)** from the header on top to switch to Docker Swarm dashboard.

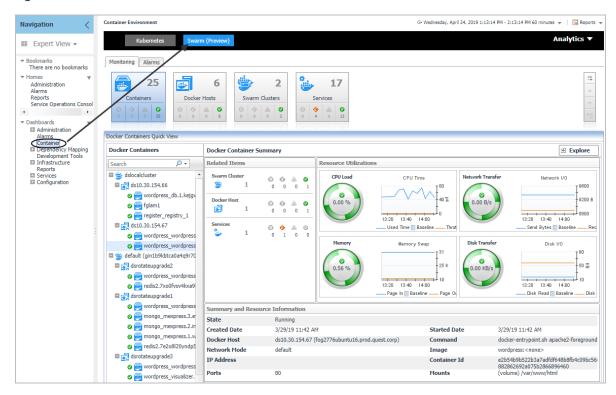


Figure 18. Docker Swarm Dashboard

Monitoring Docker Containers

This view consists of the following two panes:

- The Docker Containers tree view, which appears on the left of Docker Containers Quick View, lists the
 containers existing in the monitored Docker environment. The containers in the tree view are grouped by
 cluster > docker host > container.
- The Docker Container Summary view, which appears on the right after you select an individual container in the Docker Containers tree view.

Docker Container Summary view

The **Docker Container Summary** view appears on the right when you select a container in the **Docker Containers** tree view.

ontainer Environment				G+ We	dnesday, April 24, 2019 1	:13:14 PM - 2:13:14 PM 60 minutes 👻 📔 Repor
Kubernetes Swarn	n (Preview)					Analytics 🔻
Containers Containers Containers Containers Containers Containers			17 Services			
oocker Containers Quick View	Docker Container Sur					(9) Explore
Search	Related Items	lindry	Resource Utilization	s		Explore
 dslocalcluster dslocalcluster dslocalcluster dslocalcluster gregister_registry_1 gregister_register_registry_1 gregister_gregister_register_register_gregister_register_register_gregis	Swarm Cluster 1 Docker Host 1 Services 1 Services	Image: symbol of the	CPU Load 0.00 % Memory 0.56 %	CPU Time 13:20 13:40 14:00 Used Time Baselin Memory Swap 13:20 13:40 14:00 Page In Baseline	різк тр 25 к 19	B/s 000 000 000 000 000 000 000 000 000 0
mongo_mexpress.3.e	Summary and Resour	ce Information Running				
🛛 👼 mongo_mexpress.2.in	Created Date	3/29/19 11:42 A	м		Started Date	3/29/19 11:42 AM
🛛 🚍 mongo_mexpress.1.w	Docker Host		(fog2776ubuntu16.prod.	quest.corp)	Command	docker-entrypoint.sh apache2-foregro
🛛 🕞 redis2.7e2o8l20yndp5	Network Mode	default		1	lmage	wordpress: <none></none>
dsrotateupgrade3	IP Address				Container Id	e2b54b9b522b3a7adfdf648b8fb4c09b
 wordpress_wordpress wordpress_visualizer. 	Ports	80			Mounts	882862692a075b2866896460 (volume) /var/www/html

Figure 19. Docker Container Summary view

The Docker Container Summary view displays the following data:

- Related Items: Shows the related Docker components grouped by type as well as the associated alarms.
- Resource Utilizations: The resource utilization for the selected Docker Container over a selected period of time, which includes the following:
 - CPU Load: Shows the CPU utilization of the selected container.
 - CPU Time: Shows the used time and throttled time of the selected container.
 - Network Transfer. Shows the transfer bytes rate of the selected container over a selected period of time.
 - Network I/O: Shows the total send/receive bytes of the selected container.
 - Memory: Shows the memory utilization of the selected container.
 - Memory Swap: Shows the mounts of memory pages that are swapped to disk.
 - Disk Transfer. Shows the disk transfer bytes rate of the selected container over a selected period of time.
 - Disk I/O: Shows the disk read/write bytes of the selected container.
- Summary and Resource Information: Displays the detailed information about the selected Container, including State, Command, Created Time, Started Time, Image, and so on.

Click **Explore** on the upper right of the **Docker Container Summary** view to open the Container Explorer view, which shows more detailed information about this container.

Container Explorer view

The *Container Explorer* view opens when you click **Explore** in the Docker Container Summary view, which includes the following tabs:

Monitoring tab: The *Monitoring* tab displays the overall information of the selected container over a selected period of time, including the *Summary and Resource Information* table, Resource Management table as well as the Metrics list. To set the Metrics list displayed, go to **Action > General > Metric Selector**. For more information, see Container metrics on page 53.

Figure 20. Docker Container Explorer view Monitoring Tab

Monitoring	ordpress_wordpress.2.vqrerlbjvasmbyuipors	12107		General Design Help • Actions
Summary and Resource Inf	ormation		*	 Properties Bookmark
State	Running			Other Actions
Freated Date	4/3/19 3:47 AM	Started Date	4/3/19 3:47	New window
ocker Host	localdshost67	Container Id	2fadf74a87d	Create dashboard
mage	wordpress: <none></none>	Command	docker-entry	Reports
letwork Mode	default	IP Address		▼ Metric Selector
orts	80	Mounts	(volume) /va	Select All Select None Search 🔎 🗸
	WORDPRESS_DB_PASSWORD-wordpress WORDPRESS_DB_USRR-wordpress PATH=/usr/local/sbin/jusr Chin/usr/bin/sbin/zbin PHPJEZ_DEPS-autoconf dpkg-dev file g++ gcc libc-dev make pkg-config re2c PHP_DITA_DIR=/stc/apache2 APACHE_CONFIDR=/stc/apache2/envrats PHP_DETTA_BUIL_DIPS-apache2-dev PHP_DETTA_BUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTA_SUIL_DIPS-apache2-dev PHP_DETTAS_SUIL_DIPS-apache2-dev	1	com.docker. com.docker. com.docker. com.docker. com.docker. com.docker. dpress.2.vqr	CPU Time Used CPU Utilization Memory Consumed Memory Swap Memory Wilization Network Bytes Network Packets Network Transfer Bytes Disk Bytes Disk Bytes Vistor Transfer Bytes
warm Information	8a9b68b4cbt2192			
warm Cluster	localdscluster (w120ohdn6fy27msxhonwmgf24)	Swarm Service	wordpress_v	
warm Node	fog2776ubuntu16 (avmi06px91fzcsv3uztyk3ici)			
esource Management			*	
СРІ	Utilization Me	mory Utilization		

Monitoring Docker Hosts

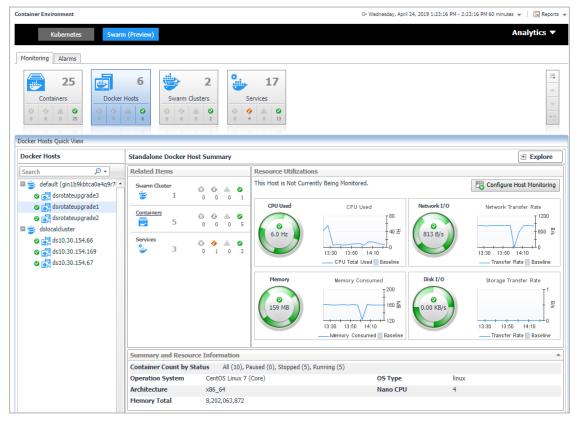
This view consists of the following two panes:

- The Docker Hosts tree view, which appears on the left of Docker Hosts Quick View, lists the docker hosts existing in the monitored Docker environment. The docker hosts in the tree view are grouped by cluster > docker host.
- The Docker Host Summary view appears on the right after you select an individual docker host in the Docker Hosts tree view.

Docker Host Summary view

The **Docker Host Summary** view appears on the right when you select a docker host in the **Docker Hosts** tree view.





The Docker Host Summary view displays the following data:

- Related Items: Shows the related Docker components grouped by type as well as the associated alarms.
- *Resource Utilizations*: The resource utilization for the selected docker host over a selected period of time, which includes the following:
 - CPU Load: Shows the CPU utilization of the selected docker host.
 - CPU Used: Shows the used CPU resources aggregated from the containers running on the docker host.
 - Network I/O and Network Transfer Rate: Shows the transfer bytes rate of the selected docker host
 aggregated from the containers running on the docker host over a selected period of time.
 - Memory and Memory Consumed: Shows the memory consumed bytes aggregated from the containers running on the docker host.
 - Disk I/O and Disk Transfer: Shows the disk transfer bytes rate of the selected docker host
 aggregated from the containers running on the docker host over a selected period of time.
- Summary and Resource Information: Displays the detailed information about the selected docker host, including Container Count by Status, Operating System, Memory Total, and so on.

Click **Explore** on the upper right of the **Docker Host Summary** view to open the Docker Host Explorer view, which shows more detailed information about this container.

Docker Host Explorer view

The *Docker Host Explorer* view opens when you click **Explore** in the Docker Host Summary view, which includes the following tabs:

- *Monitoring* tab: The *Monitoring* tab displays the overall information of the selected docker host over a selected period of time, including the *Summary and Resource Information* table, *Containers* table, *Images* table, and *Volumes* table.
 - **NOTE:** All the docker host metrics are calculated from the aggregated metrics of the containing containers on the docker host.

Figure 22. Docker Host Explorer view Monitoring Tab

ocker	Host: dsrotateupgrade3										
Monitori											
	and Resource Information										
	er Count by Status All (22), Paused (0), Stopp	ad (0) Duracia	- (12)								
	All (22), Paused (0), stopp on System CentOS Linux 7 (Core)	ied (9), Runnin	ig (15)	Host	dsrotateupgrade3 (10.4.11	7 155)					
1emory	1.8 GB			Nano CPU	1	/.155)					
ocker \				Cgroup Driver	cgroupfs						
	lost Swarm Information			cgroup briver	cgroupia						
Swarm (m1ie)		Swarm Role	Manager						
warm N)	Swarm Node Status	[ready]						
			·		0/3						
Container	s										
Alarms	Name			Id				Ima	ge		Netwo Mod
\odot	voting_result.1.m1ab9gkqai8l1krg24oudykdt		aa25171d29a8	076e9a0a076340a967927a	237cccdc066b6e460c4e44d1a	d2979 do	ckersamples	/exampleve	otingapp_re	sult: <none></none>	defau
0	voting_vote.2.ua654o33tdvqp7fn3pvyqo0rb		133ae0269871	fbe90b894be92719216e9b	ef2d46328c5d849a5acec025c	d4b4 do	ckersamples	/examplev	otingapp_vo	ote: <none></none>	defau
\bigcirc	wordpress_wordpress.3.3d78lukeu8t9evlzq3mpt8e	hr	7b6b79b24d5c	7efa67e4ac707fc1efcc696d	af36c6205dae4fd1645123d3d	ec2 wo	rdpress: <no< td=""><td>one></td><td></td><td></td><td>defau</td></no<>	one>			defau
0	voting_redis.1.awis611hu72gyxl5hl5epjy6v		288e8a1dde3a	0e893913559c7e2202e96f	2a88fadfe5b862d4b6988a735	d896 red	lis: <none></none>				defau
\bigcirc	voting_vote.1.deivdnggt0nlrcb8qo0b8r1hd		f5eca4b5aec92	94745fe742a2eb9e12ee26	13699edbc473cc6b334d9e78	bc5d do	ckersamples	/exampleve	otingapp_vo	ote: <none></none>	defau
\bigcirc	redis2.xypq2vtwrx4cztdyo16cjg9v3.vrubg5q34jlaq	3fih21mg6xex	149fa7578f49f	332fed8ac292d61cd19dc8e	afecdf45a1b3482201312fadf0	e6 red	lis: <none></none>				defau
0	mongo_mongo.1.95ak9qe8gp158etdue4pwfu2w		78a7e75c36a9	056c9abc9eba4d636f2a155	8ff236873d67bd114f21df12aa	d2d mo	mongo: <none></none>				
\bigcirc	mysql_phpmyadmin.1.0c2dfj4k6ghuo4n463mf8qj7	'n	f89221041f8dd	icdb2c594bf9a304af3924d8	b1f26700ecc794f7173b52e47	od7 ph	pmyadmin/p	- nyadmin/phpmyadmin: <none></none>			
\odot	wordpress_db.1.7c7fttk36oijtcspb6zr1tjoh		1711d54e6f153	255a20e37685ccf85ad6a36	56beae84bf9ce44cb763d29d7	34a2 my	sql: <none></none>				defau
\bigcirc	wordpress_visualizer.1.drlgdbtulabsbze5eriegdjq7		d1af858af9554	6c4db25fc7218dc89bfe4c9	9b73980d746a2eea9dd74a489	719 do	ckersamples	/visualizer:	<none></none>		defau
\bigcirc	voting_visualizer.1.nwq4l4jm8bwpyvmh9wn30qdd	у	16b274edf0a97	72a313b61f785e3473571cf	a6f380ef1a57991cc64fc53dddl	ob9 do	ckersamples	/visualizer:	<none></none>		defau
\odot	mysql_mysql.1.mrroqco2fs7qm5pjk9y4bnjke		2c27187424e0	82060de9cbc9da6d2e9dac	40cdbc50ffa626ed45157698c	c722 my	sql: <none></none>				defau
\bigcirc	voting_db.1.8eol3l95f710l50jrvpq4j9hu		7a60a959fb3af	a27006ed3383d69e966ae2	5270c1502f9f95127c6696ae2	26db po	stgres: <non< td=""><td>e></td><td></td><td></td><td>defau</td></non<>	e>			defau
4											×
mages											
State	Name			Id		Size	Virtual Size	Comment	Containers	Not Upda Duratio	
~	dockersamples/examplevotingapp_result: <none></none>	sha256:e10df	791f13c3ac17e	fa123dfce57e3297fcea05a3	4b3bbf305749f22a9b3c83	216.0 ME	216.0 MB		1	2 minute(s)	
~	phpmyadmin/phpmyadmin: <none></none>	sha256:c6ba3	363e7c9bba3bc9	96aa490e31da3e266e6f7e5	d8c525fb8a36df2544c2aa54	158.2 ME	158.2 MB		1	2 minute(s)	
~	mongo: <none></none>	sha256:0d18	:0d183f48c313d863d26aed97c27a0fb73833674c87da2576b6282de2439a144c 389.5 MB 34						1	2 minute(s)	
Ē	nate/dockviz:latest	sha256:93b5	259c1e18862e1	c1e18862e1434e39678640cbdd555d1b8e2742bc6f4da9c2b78acd8ab 6.3 MB 6.3 M					0		
~	mysql: <none></none>	sha256:7bb2	586065cd50457	e315a5dab0732a87c45c5fa	d619c017732f5a13e58b51dd	454.8 MB	454.8 MB		2	2 minute(s)	
~	redis: <none></none>	sha256:d4de	ec2c521cdae045	0218bd53c69611bacd2eb1	0838057a5de7dcb341c66cf5	144.2 MB	144.2 MB		1	2 minute(s)	
~	postgres: <none></none>	sha256:d7cf9	8b297166b40ef	ca50ff11ef9c7e801d45a0f6	c1ba316854984229667578	214.9 ME	214.9 MB		1	2 minute(s)	
alpine: <none> sha256:5cb3aa00f89934411fba5c053a9bc98ace875d8f92e77d0029543d9f2ef4ad0 5.2 MB 5.2 MB 0</none>											

- Containers table: Includes the containers on this docker host.
- Images table: Includes the images pulled onto this docker host.
 - □ ■: Indicates this image is using by a container.
 - $\overline{\mathbf{m}}$: Indicates no container is using this image and the image can be recycled.
- Volumes table: Includes the volumes created on this docker host.
 - □ ■: Indicates this volume is using by a container.
 - $\overline{\mathbf{m}}$: Indicates no container is using this volume and the volume can be recycled.

Figure 23. Docker Host Explorer view Images table and Volumes table under Monitoring tab

State	Name			Id		Size	Virtual Size	Comment Containers	Not Update	ed Duration
-	dockersamples/visualizer: <none></none>		sha256	8dbf7c60cf8866bc03ac941f2462615ef	21ddb791304475ad3dbdca9fadc2557	141.3 MB	141,3 MB	2	3 minute(s))
~	dockersamples/examplevotingapp_v	ote: <none< td=""><td>> sha256</td><td>f6e8af4562c14ab06a2c9f3698e39efa6</td><td>8a6c78a3074b88f539d124e674c8077</td><td>79.7 MB</td><td>79.7 MB</td><td>2</td><td>3 minute(s)</td><td>)</td></none<>	> sha256	f6e8af4562c14ab06a2c9f3698e39efa6	8a6c78a3074b88f539d124e674c8077	79.7 MB	79.7 MB	2	3 minute(s))
面	mongo-express: <none></none>		sha256	376d1d9e09954917b9d53d7550728ca	45eab173b8e039ff9cee40e672a99f882	91.5 MB	91.5 MB	0		
~	phpmyadmin/phpmyadmin: <none></none>	Docker Ho	ost Explore Cor	tainers				× 1	3 minute(s))
Î	nate/dockviz:latest							ių 0		
~	dockersamples/examplevotingapp_r	Alarms		Name	Id			1	3 minute(s))
~	redis: <none></none>	0	wordpress_vi	sualizer.1.drlgdbtulabsbze5eriegdjq7	d1af858af95546c4db25fc7218dc89bfe4c9	b73980d74	a2eea9dd7	• 1	3 minute(s))
~	redis: <none></none>	0	voting_visual	izer.1.nwq4l4jm8bwpyvmh9wn30qddy	16b274edf0a972a313b61f785e3473571cf	6f380ef1a5	991cc64fc5	1	3 minute(s))
~	mongo: <none></none>							1	3 minute(s))
~	wordpress: <none></none>							1	3 minute(s))
m	alpine: <none></none>							0		
~	postgres: <none></none>							1	3 minute(s))
-	mysql: <none></none>							2	3 minute(s))
	mysql: <none></none>								3 minute(s))
	mysql: <none></none>								3 minute(s))
	mysql: <none></none>									
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olumes	Name	1					•	2 Labels .stack.namespace:		Containers
olumes State	Name wordpress_db-data		bfbfa89531	/var/lib/docker/volumes/5387a2aca9	16ffb3450b27537e984df356kf043bfbfa89531	412.0 M		2 Labels .stack.namespace:		Containers
olumes State	Name wordpress_db-data 95a60485f40181d593bf7cf987343	4df35bf043			7bfb3450b27537e994df35bf043bfbfa89531 0a54d06ee6c6e04f9c22cae1217b4806d9e4			2 Labels .stack.namespace:		Containers
olumes State	Name wordpress_db-data 95a60485f40181d593bf7cf987343 5387a2aca97bffb3450b27537e89-	4df35bf043			0a54d06ee6c6e04f9c22cae1217b4806d9e4		3	2 Labels .stack.namespace:	wordpress 1	Containers
state	Name wordpress_db-data 95a60-48540181d593bf7cf987343 5387a2aca97bffb3450b27537e98- c62c5e37af00a54d06ee6c6e04f9c	4df35bf043 22cae1217	b4806d9e40	/var/lib/docker/volumes/c62c5e37af0 /var/lib/docker/volumes/voting_db-da	0a54d06ee6c6e04f9c22cae1217b4806d9e4	0.0 B 35.4 ME	3	Labels Labels	wordpress 1	Containers 1 1 1 1
olumes State V V V V	Name wordpress_db-data 95a60485f40181d593bf7cf987343 5387a2aca97bffb3450b27537e98 c62c5e37af00a54d06ee6c6e04f9c voting_db-data	4df35bf043 22cae1217 596cf82e28	b4806d9e40	/var/lib/docker/volumes/c62c5e37af0 /var/lib/docker/volumes/voting_db-da /var/lib/docker/volumes/92c4ebb4a3	0a54d06ee6c6e04f9c22cae1217b4806d9e4 ita/_data	0.0 B 35.4 ME	3 com.do	Labels Labels	wordpress 1 1 2 voting 1	Containers 1 1 1 1
state	Name wordpress_db-data 95a60485f40181d593b7cf987343 5387a2aca97bftb3450b27537c694 c62c5e37af00a54d06ee6c6e04f9c voting_db-data 92c4ebb4a373d969d18e7140e085	4df35bf043 22cae1217 596cf82e28 170cd2bab0	b4806d9e40 064094128 13ad9eaf824	/var/lib/docker/volumes/c62c5e37af0 /var/lib/docker/volumes/voting_db-da /var/lib/docker/volumes/92c4ebb4a3 /var/lib/docker/volumes/8f9606b95a0	0a54d06ee6c6e04f9c22cae1217b4806d9e4 tta/_data 73d969d18e7140e08596cf82e28064094128	0.0 B 35.4 MB 0.0 B 164.3 M	3 com.do	Labels Labels	wordpress 1 1 2 voting 1	Containers 1 1 1 1 1 1 1
olumes State V V V V	Name wordpress_db-data 95a60485f40181d593bf7cf987343 5387a2aca97bffb3450b27537e98- c62c5e37af0b34406eec6e049p voting_db-data 92c4ebb4a373d963418e7140e085 89606b95a0b05416dcb6170d539	4df35bf043 22cae1217 596cf82e28 170cd2bab0 337a559bd0	b4806d9e40 064094128 13ad9eaf824 ce7e8b92fc5	/var/lib/docker/volumes/c62c5e37af0 /var/lib/docker/volumes/voting_db-da /var/lib/docker/volumes/92c4ebb4a33 /var/lib/docker/volumes/8f9606b95a0 /var/lib/docker/volumes/c053ac30f84	0a54d06ee6c6e04f9c22cae1217b4806d9e4 tta/_data 73d969d18e7140e08596cf82e28064094128 b05416dcb6170d53970cd2bab03ad9eaf82	0.0 B 35.4 MB 0.0 B 164.3 M 38.1 MB	3 com.do	Labels Labels	wordpress 2 2 voting 2 0	Containers 1 1 1 1 1 1 1

By clicking the number in the *Containers* column, a *Docker Host Explore Containers* view will open, which lists the containers using this image or this volume. Click the Name or ID of the container and an explore page of the container will appear.

 Metrics tab: The Metrics tab displays the Metrics list. To set the Metrics list displayed, go to Action > General > Metric Selector. For more information about the description of the metrics, see Container metrics on page 53.

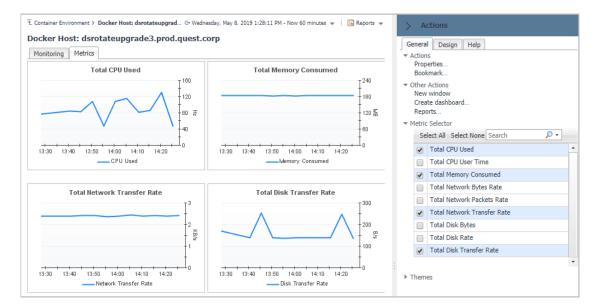


Figure 24. Docker Host Explorer view Metrics Tab

Monitoring Docker Swarm Clusters

This view consists of the following two panes:

- The **Swarm Clusters** tree view, which appears on the left of *Swarm Clusters Quick View*, lists the docker swarm clusters existing in the monitored *Docker* environment.
- The Docker Swarm Cluster Summary view, which appears on the right after you select an individual docker swarm cluster in the Swarm Clusters tree view.

Docker Swarm Cluster Summary view

The **Docker Swarm Cluster Summary** view appears on the right when you select a docker swarm cluster in the **Swarm Clusters** tree view.

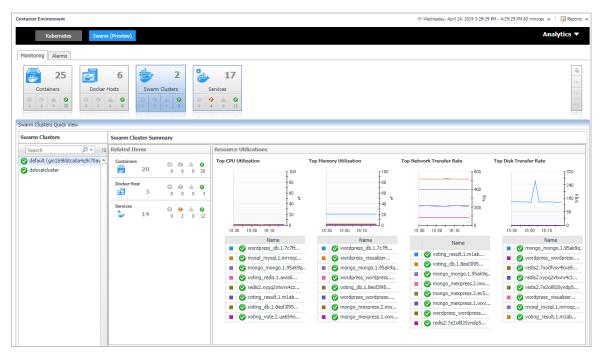


Figure 25. Docker Swarm Cluster Summary view

The Docker Swarm Cluster Summary view displays the following data:

- Related Items: Shows the related Docker components grouped by type as well as the associated alarms.
- *Resource Utilizations*: Shows CPU Utilization, Memory Utilization, Network Transfer Rate, Disk Transfer Rate metrics of the containers running in this docker swarm cluster in descending order.

Monitoring Docker Swarm Services

This view consists of the following two panes:

- The Swarm Services tree view, which appears on the left of Swarm Services Quick View, lists the docker swarm services existing in the monitored Docker environment.
- The Docker Swarm Service Summary view, which appears on the right after you select an individual docker swarm service in the Swarm Services tree view.

Docker Swarm Service Summary view

The **Docker Service Summary** view appears on the right when you select a docker swarm service in the **Docker Services** tree view.

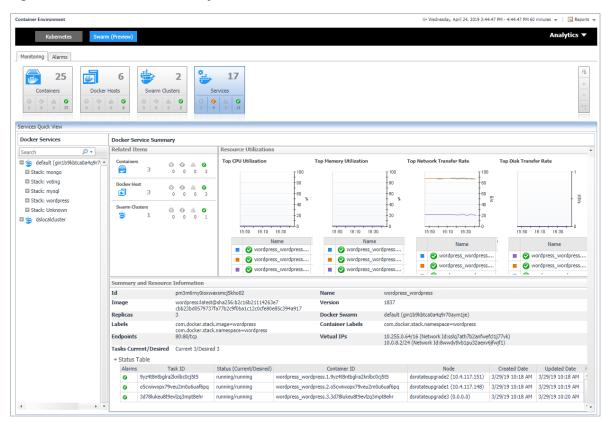


Figure 26. Docker Service Summary view

The Docker Service Summary view displays the following data:

- Related Items: Shows the related Docker components grouped by type as well as the associated alarms.
- *Resource Utilizations*: Shows CPU Utilization, Memory Utilization, Network Transfer Rate, Disk Transfer Rate metrics of the containers running in this docker swarm service in descending order.
- Summary and Resource Information: Shows the summary information of the docker swarm service, including Labels, Image, Mount Volumes, Ports, Container Status and so on.

Alarms

ontainer Environment							G+ Wednesday, May 15, 2019 1:17:24 AM - 2:17:24 AM 60 minute	is 👻 📄 Repor
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Monitoring Alarms								
🖸 Alarms								
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			ar	Impacting		2 Rule Name	Search	

Figure 27. Docker Swarm Alarms Dashboard

Foglight for Container Management 1.2.0 User and Administration Guide Using Foglight for Container Management The *Alarms* dashboard displays a list of alarms generated against the monitored Docker environment. Use this view to quickly identify any potential problems related to a specific Docker component.

Analytics

Foglight for Container Management provide analytics feature for Kubernetes and Docker Swarm.

Heat Map is a two-dimensional representation of data in which values are represented by colors. Showing collected metrics with elaborate heat maps allows you to understand complex data sets and the monitored cluster environment well.

Scatter Plot is used to display values in points using two variables for a set of data. The points is color-coded also, Color Metric can be used to display one additional variable.

- Kubernetes analytics
 - Heatmap analytics
 - Scatter Plot analytics
- Docker Swarm analytics
 - Heatmap analytics
 - Scatter Plot analytics

Kubernetes analytics

In the Container dashboard, choose **Kubernetes** from the header. Then click **Analytics** from the header, a drop down view will display with **Heatmap** and **Scatter** on it. Click **Heatmap** will navigate to the Kubernetes **Heatmap Analytics** dashboard, while click **Scatter** will navigate to the Kubernetes **Scatter Plot Analytics** dashboard.

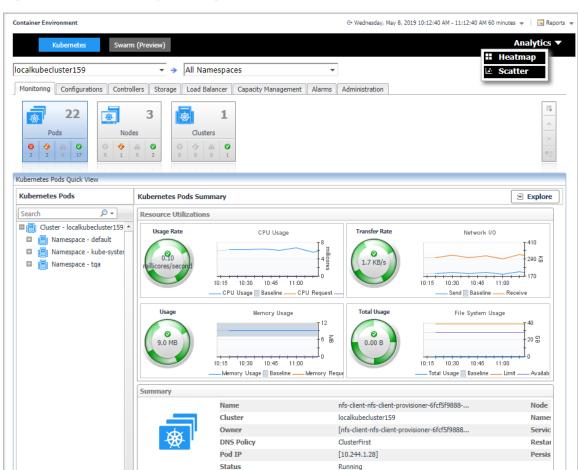


Figure 28. Kubernetes analytics Navigation

Heatmap analytics

Figure 29. Kubernetes Heatmap Analytics Dashboard

											G	+ Friday, Nov	ember 2, 21	018 2:54 AM High	- 4:18 AM 1.	4 hours 👻	🖪 Report	5 -
opology Type Kube Pod 🔻 Cluster All Clu	usters 🔻 Namespa	ace All Namespa	ces 🔻 Selected I	Metric CPU Usag	e		▼ Color M	letric Men	nory Usage		•	Color Patte	m	High				
Heatmap Chart																		
wordpress-db8f78568-72zff																	tunnelfront	
																	fluentd-ela	ısti
																	heap	fue
Kube Pods																		
Kube Pods Pod Name	CPU Usage Rate	CPU Usage	CPU Request	CPU Limit	Memory Usage	Memory Working Set	Memory RSS	Memory Request	Memory Limit	Memory Page Faults	Memory Page Faults Rate	Memory Major Page Faults	Faults	Network Send Bytes	Network Receive Bytes	Network Transfer	Network Send Rate	Ne Ri I
Pod Name	CPU Usage Rate	CPU Usage 0.0 millicores	CPU Request	CPU Limit 0.0 millicores		Working			Limit	Page	Page Faults Rate	Major Page	Major Page	Sella	Bytes	Network Transfer 70.0 B	Seliu	Ne Ri I
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Pod Name ojnv-rząz izure-vote-front-5df9b79c56-z49nz nehdb-1 vordpress-db8f78568-72zff	0.0 millicores/second 0.0 millicores/second 0.0 millicores/second	0.0 millicores 0.0 millicores 0.0 millicores 841.6 millicores	0.0 millicores 100.0 millicores 0.0 millicores	0.0 millicores 250.0 millicores 0.0 millicores 0.0 millicores	Usage 2.0 MB 53.3 MB 3.4 MB	Working Set 2.0 MB 52.6 MB 3.2 MB	R55 1.4 MB 44.8 MB 2.6 MB 77.8 MB	0.0 B 128.0 MB 0.0 B	Limit 0.0 B 256.0 MB 0.0 B	Page Faults 0.0 count 0.0 count 0.0 count 0.0 count	Page Faults Rate 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s	Major Page Faults 0.0 count 0.0 count 0.0 count	Major Page Faults Rate 0.0 c/s 0.0 c/s 0.0 c/s	0.0 B 15.3 KB 45.3 KB 23.0 KB	70.0 B 28.1 KB 69.3 KB 35.0 KB	70.0 B 43.5 KB 114.6 KB 58.0 KB	0.0 B/s 52.3 B/s 154.5 B/s	R() 9 23
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Pod Name nginv-rzągz zuze-ote-front-5df9b79c56-z49nz mehdb-1 vordpress-db8778568-72zff zuze-ote-back-6659c6bf44-J5tz scs-helloworld-punk-worm-57b8bb98cf-9d4bd	0.0 millicores/second 0.0 millicores/second 0.0 millicores/second 14.0 millicores/second 0.0 millicores/second	0.0 millicores 0.0 millicores 0.0 millicores 841.6 millicores 0.2 millicores	0.0 millicores 100.0 millicores 0.0 millicores 0.0 millicores 100.0 millicores	0.0 millicores 250.0 millicores 0.0 millicores 0.0 millicores 250.0 millicores 0.0 millicores	Usage 2.0 MB 53.3 MB 3.4 MB 126.1 MB 9.0 MB 37.1 MB	Working Set 2.0 MB 52.6 MB 3.2 MB 123.4 MB 9.0 MB 37.0 MB	R55 1.4 MB 44.8 MB 2.6 MB 77.8 MB 8.4 MB	Request 0.0 B 128.0 MB 0.0 B 0.0 B 128.0 MB	Limit 0.0 B 256.0 MB 0.0 B 0.0 B 256.0 MB 0.0 B	Page Faults 0.0 count 0.0 count 0.0 count 0.0 count	Page Faults Rate 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s	Major Page Faults 0.0 count 0.0 count 0.0 count 0.0 count 0.0 count	Major Page Faults Rate 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s	0.0 B 0.0 B 15.3 KB 45.3 KB 23.0 KB 366.0 B	70.0 B 28.1 KB 69.3 KB 35.0 KB 506.0 B 140.0 B	70.0 B 43.5 KB 114.6 KB 58.0 KB 872.0 B	Selid Rate 0.0 B/s 52.3 B/s 154.5 B/s 78.6 B/s 1.0 B/s 1.0 B/s	Ne R() 9 23 11
Pod Name sginx-rzągz zuze-vote-front-5d/9b79c56-z49nz mehdb-1 wordpress-db8/78568-72zff zuze-vote-back-66595cbf44-j5tz zcs-helloworld-punk-worm-57b8bb98cf-9d4bd wordpress-mysgl-7b4ftb6fb4-zabtm	0.0 millicores/second 0.0 millicores/second 0.0 millicores/second 14.0 millicores/second 0.0 millicores/second 0.0 millicores/second	0.0 millicores 0.0 millicores 0.0 millicores 841.6 millicores 0.2 millicores 0.0 millicores	0.0 millicores 100.0 millicores 0.0 millicores 100.0 millicores 0.0 millicores 0.0 millicores	0.0 millicores 250.0 millicores 0.0 millicores 0.0 millicores 250.0 millicores 0.0 millicores	Usage 2.0 MB 53.3 MB 3.4 MB 126.1 MB 9.0 MB 37.1 MB	Working Set 2.0 MB 52.6 MB 3.2 MB 123.4 MB 9.0 MB 37.0 MB	R55 1.4 MB 44.8 MB 2.6 MB 77.8 MB 8.4 MB 32.0 MB	Request 0.0 B 128.0 MB 0.0 B 128.0 MB 128.0 MB 0.0 B	Limit 0.0 B 256.0 MB 0.0 B 256.0 MB 0.0 B 0.0 B	Page Faults 0.0 count 0.0 count 0.0 count 0.0 count 0.0 count	Page Faults 0.0 c/s	Major Page Faults 0.0 count 0.0 count 0.0 count 0.0 count 0.0 count 0.0 count	Major Page Faults Rate 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s 0.0 c/s	Selid Bytes 0.0 B 15.3 KB 15.3 KB 23.0 KB 366.0 B 0.0 B 0.0 B 0.0 B	Receive Bytes 70.0 B 28.1 KB 69.3 KB 35.0 KB 506.0 B 140.0 B 70.0 B	Transfer 70.0 B 43.5 KB 114.6 KB 58.0 KB 872.0 B 140.0 B 70.0 B	Selid Rate 0.0 B/s 52.3 B/s 154.5 B/s 78.6 B/s 1.0 B/s 0.0 B/s	Ne Ri
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Heat maps will be refreshed automatically when you change either of the following fields:

- *Topology Type:* Indicates the monitored topology object, including Kubernetes Pod, Kubernetes Node, and Kubernetes Cluster.
- Cluster: Lists all clusters available in the monitored Kubernetes environment.
- · Namespace: Lists all namespaces available in the monitored Kubernetes environment.
- Selected Metric: Populates a rectangle based upon the selected metrics. For example, if you select Memory Usage from the Selected Metric drop-down list, the rectangle area will be populated based on the used memory for the selected topology object. For more information about metrics, refer to Kubernetes metrics on page 52.
- Rendering related metrics: For example, if you select *CPU Usage Rate* and Red to Green, the rectangle of the topology object that has larger value of CPU Usage Rate will be rendered in red.
 - Color Metric: Renders the color of rectangle based upon the selected color metric.
 - Color Pattern: Offers two patterns, Red to Green (larger value shows in red) or Green to Red (larger value shows in green).

Figure 29 shows an example of heat map. This sample diagram represents the "wordpress-db8f78568-72zff" has the maximum amounts of CPU usage, while "fluentd-elastic-ef455uh68-72cfe" has a higher Memory Usage. If you switch the Color Pattern, then "wordpress-db8f78568-72zff" will turn to red. Clicking the object name on the heat map directs you to the relevant object *Explorer* dashboard. For more information, see:

- Pods Explorer view on page 26
- Pod metrics on page 52
- Nodes Explorer view on page 28
- Node metrics on page 53
- Cluster Explorer view on page 31

• Cluster metrics on page 53

Scatter Plot analytics

Figure 30. Kubernetes Scatter Plot Analytics Dashboard

Container Environment > Kube														naay, noren			19 AM 1.4 hou		High
pology Type Kube Pod	Cluster nancyaksclu	ster 🔻 Namespac	e All Namespace	es 🔻 X Axis:	CPU Usage	8		 Y Axis: 	CPU Usag	e		 Color ! 	Metric Ne	twork Tra	nsfer	•	Color Patt	tern 🔘	High
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000 millicores																			
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ibe Pods																			
Pod Name	CPU Usage Rate	CPU Usage	CPU Request	CPU Limit	Memory Usage	Memory Working Set	Memory RSS	Memory Request	Memory Limit	Memory Page Faults	Memory Page Faults Rate	Memory Major Page Faults	Memory Major Page Faults Rate	Network Send Bytes	Network Receive Bytes	Network Transfer	Network Send Rate	Network Receive Rate	Netwo Transfe Rate
ordpress-db8f78568-72zff Jentd-elasticsearch-6tf9m	14.0 millicores/second			0.0 millicores				0.0 B		0.0 count		0.0 count	0.0 c/s	23.0 KB	35.0 KB			119.3 B/s	
uentd-elasticsearch-6tf9m unnelfront-595448b4cc-k52	0.2 millicores/second ls 0.4 millicores/second		100.0 millicores							0.0 count 0.0 count		0.0 count				411.3 KB 20.0 MB	522.8 B/s		

The points on the chart will be refreshed automatically when you change either of the following fields:

- *Topology Type:* Indicates the monitored topology object, including Kubernetes Pod, Kubernetes Node, and Kubernetes Cluster.
- *Cluster:* Lists all clusters available in the monitored Kubernetes environment.
- Namespace: Lists all namespaces available in the monitored Kubernetes environment.
- X Axis: Indicates which metrics will be plotted on X axis.
- Y Axis: Indicates which metrics will be plotted on Y axis.
- Rendering related metrics:
 - Color Metric: Renders the color of circle based upon the selected metrics.
 - *Color Pattern*: Offers two patterns, Red to Green (larger value shows in red) or Green to Red (larger value shows in green).

Figure 30 shows an example of Scatter Plot analytics. The purple circle in the middle represents the following: "wordpress-db8f78568-72zff" CPU Usage is around 0.85 cores, its Memory Usage is around 121MB, and its value of Network Transfer Bytes is not high. For more information, see:

- Pods Explorer view on page 26
- Pod metrics on page 52
- Nodes Explorer view on page 28
- Node metrics on page 53
- Cluster Explorer view on page 31
- Cluster metrics on page 53

Docker Swarm analytics

In the Container dashboard, choose **Docker Swarm** from the header. Then click **Analytics** from the header, a drop down view will display with **Heatmap** and **Scatter** on it. Click **Heatmap** will navigate to the Docker Swarm **Heatmap Analytics** dashboard, while click **Scatter** will navigate to the Docker Swarm **Scatter Plot Analytics** dashboard.

ontainer Environment				G+ Wednesday, May 8, 2019	9:50:02 AM - 10:50:02	AM 60 minutes 👻 📔 🖬 Reports
Kubernetes Swarn	m (Preview)					Analytics ▼ Heatmap Scatter
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Docker Containers Quick View						(
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Figure 31. Docker Swarm Analytics Navigation

Heatmap analytics

Figure 32. Docker Swarm Heatmap Analytics Dashboard

					High		
logy Type Docker Container V Cluster All Clusters V Selected Metric CP	20 Utilization	▼ Color	Metric Memory Utilizatio	on 🔻 Color	Pattern		
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itmap Chart							
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	CPU Utilization	CPU Time Used	Memory Utilization	Network Transfer Rate	Disk Transfer Rate	voting_redis.1.nv Memory Swap Page In	
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tainer Name 1g_redis.1.nwfx2moecimr7v5sb3gmqgtmk						Memory Swap Page In	Memory Swap Page Ot
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ainner Name g_reds.1.nvh.2moecim/VSeb3gmagtmk g_vote.1.io318mmgavpbudcs2Avbvd99 g_vote.2.vh7xt16y4f6r402sdzysginrm	2.9 % 0.0 %	57 ms 0 ms	0.1 %	154.6 KB/s 0.0 B/s	0.0 KB/s 0.0 KB/s	Memory Swap Page In 485.0 count 22.5 K	Memory Swap Page Or 422.0 count 7.2 K
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Heat maps will be refreshed automatically when you change either of the following fields:

- Topology Type: Indicates the monitored topology object, including Docker Container and Docker Host.
- · Cluster: Lists all clusters available in the monitored Docker Swarm environment.
- Selected Metric: Populates a rectangle based upon the selected metrics. For example, if you select Memory Time Used from the Selected Metric drop-down list, the rectangle area will be populated based on the used CPU time for the selected topology object. For more information about metrics, refer to Docker Swarm metrics on page 53.
- Rendering related metrics: For example, if you select *CPU Utilization* and Red to Green, the rectangle of the topology object that has larger value of CPU Utilization will be rendered in red.
 - Color Metric: Renders the color of rectangle based upon the selected color metric.
 - Color Pattern: Offers two patterns, Red to Green (larger value shows in red) or Green to Red (larger value shows in green).

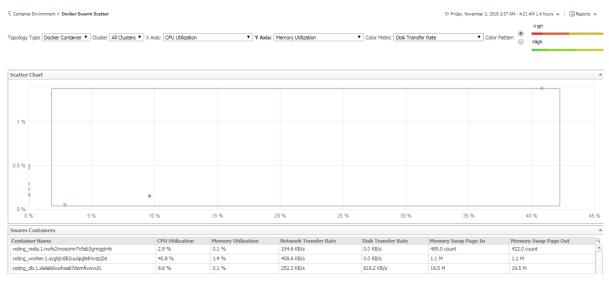
Figure 32 shows an example of heat map. This sample diagram represents the

"voting_redis.1.nwfx2moecimr7v5sb3gmqgtmk" has the maximum amounts of CPU Utilization which is the largest in size, and also it has the higher Memory Utilization since it is in Red. If you switch the Color Pattern, then "voting_redis.1.nwfx2moecimr7v5sb3gmqgtmk" will turn to green. Clicking the object name on the heat map directs you to the relevant object *Explorer* dashboard. For more information, see:

- Container Explorer view on page 39
- Docker Host Explorer view on page 41
- Container metrics on page 53

Scatter Plot analytics

Figure 33. Docker Swarm Scatter Plot Analytics Dashboard



The points on the chart will be refreshed automatically when you change either of the following fields:

- Topology Type: Indicates the monitored topology object, including Docker Container and Docker Host.
- Cluster: Lists all clusters available in the monitored Docker Swarm environment.
- X Axis: Indicates which metrics will be plotted on X axis.
- Y Axis: Indicates which metrics will be plotted on Y axis.
- · Rendering related metrics:
 - Color Metric: Renders the color of circle based upon the selected metrics.
 - Color Pattern: Offers two patterns, Red to Green (larger value shows in red) or Green to Red (larger value shows in green).

Figure 33 shows an example of Scatter Plot analytics. The purple circle in the middle represents the following: "voting_redis.1.nwfx2moecimr7v5sb3gmqgtmk" CPU Utilization is 2.9%, its Memory Usage is 0.1%, and its value of Network Transfer Bytes is not high. For more information, see:

- Container Explorer view on page 39
- Docker Host Explorer view on page 41
- Container metrics on page 53

Metrics

Kubernetes metrics

Pod metrics

Table 4. Pod metrics

Metric name	Description
CPU Usage	CPU usage on all cores in millicores.
CPU Usage Rate	CPU usage rate on all cores in millicores/second.
CPU Request	CPU request (the guaranteed amount of resources) in millicores.
CPU Limit	CPU hard limit in millicores.
CPU Utilization	Percentage of CPU usage / CPU limit if user configured CPU limit for this pod.
Memory Usage	Total memory usage in bytes.
Memory Working Set	Total working set usage. Working set is the memory being used and not easily dropped by the kernel.
Memory Rss	RSS memory usage.
Memory Request	Memory request (the guaranteed amount of resources) in bytes.
Memory Limit	Memory hard limit in bytes.
Memory Page Faults	Number of page faults.
Memory Major Page Faults	Number of major page faults.
Memory Page Faults Rate	Number of page faults per second.
Memory Major Page Faults Rate	Number of major page faults per second.
Memory Utilization	Percentage of Memory usage / Memory limit if user configured Memory limit for this pod.
Network Send	Total send bytes.
Network Receive	Total receive bytes.
Network Send Rate	Total send bytes per second.
Network Receive Rate	Total receive bytes per second.
Network Send Errors	Total send errors count.
Network Receive Errors	Total receive errors count.
Network Send Errors Rate	Total send errors count per second.
Network Receive Errors Rate	Total receive errors count per second.
Network Transfer	Total send and receive bytes.
Network Transfer Rate	Total send and receive bytes per second.

Node metrics

Table 5. Node metrics

Metric name	Description
CPU Usage	CPU usage on all cores in millicores.
CPU Usage Rate	CPU usage rate on all cores in millicores/second.
CPU Request	CPU request (the guaranteed amount of resources) in millicores.
CPU Limit	CPU hard limit in millicores.
CPU Utilization	CPU utilization as a share of node allocatable.
Memory Usage	Total memory usage in bytes.
Memory Working Set	Total working set usage. Working set is the memory being used and not easily dropped by the kernel.
Memory RSS	RSS memory usage.
Memory Request	Memory request (the guaranteed amount of resources) in bytes.
Memory Limit	Memory hard limit in bytes.
Memory Page Faults	Number of page faults.
Memory Major Page Faults	Number of major page faults.
Memory Page Faults Rate	Number of page faults per second.
Memory Major Page Faults Rate	Number of major page faults per second.
Memory Utilization	Memory utilization as a share of memory allocatable.

Cluster metrics

Table 6. Cluster metrics

Metric name	Description
CPU Usage	CPU usage on all cores in millicores.
CPU Usage Rate	CPU usage rate on all cores in millicores/second.
CPU Request	CPU request (the guaranteed amount of resources) in millicores.
CPU Limit	CPU hard limit in millicores.
Memory Usage	Total memory usage in bytes.
Memory Request	Memory request (the guaranteed amount of resources) in bytes.
Memory Limit	Memory hard limit in bytes.

Docker Swarm metrics

Container metrics

Table 7. Container metrics

Metric name	Description
CPU Utilization	CPU utilization.
CPU Time Used	Total CPU time that a container used.
CPU Throttled Time	Total time that a container's CPU usage was throttled.
Memory Page Fault	Total page fault count of a container's Memory.
Memory Consumed	Total memory consumed of a container in bytes.

Table 7. Container metrics

Metric name	Description
Memory Utilization	Memory utilization.
Memory PageIn Rate	Total page in count of a container's Memory.
Memory PageOut Rate	Total page out count of a container's Memory.
Disk Read Bytes	Total disk read bytes.
Disk Write Bytes	Total disk write bytes.
Disk Transfer Rate	Sum of total disk read and write bytes.
Network Send Packets	Total network send packets count.
Network Receive Packets	Total network receive packets count.
Network Send Bytes	Total network send bytes.
Network Receive Bytes	Total network receive bytes.
Network Inbound Dropped Packets	Total dropped packet count of all the packets coming into the container.
Network Outbound Dropped Packets	Total dropped packet count of all the packets going out from the container.
Network Transfer Rate	Sum of network send bytes and receive bytes per seconds during a specific period.

We are more than just a name

We are on a quest to make your information technology work harder for you. That is why we build communitydriven software solutions that help you spend less time on IT administration and more time on business innovation. We help you modernize your data center, get you to the cloud quicker and provide the expertise, security and accessibility you need to grow your data-driven business. Combined with Quest's invitation to the global community to be a part of its innovation, and our firm commitment to ensuring customer satisfaction, we continue to deliver solutions that have a real impact on our customers today and leave a legacy we are proud of. We are challenging the status quo by transforming into a new software company. And as your partner, we work tirelessly to make sure your information technology is designed for you and by you. This is our mission, and we are in this together. Welcome to a new Quest. You are invited to Join the Innovation[™].

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Technical support is available to Quest customers with a valid maintenance contract and customers who have trial versions. You can access the Quest Support Portal at https://support.quest.com.

The Support Portal provides self-help tools you can use to solve problems quickly and independently, 24 hours a day, 365 days a year. The Support Portal enables you to:

- Submit and manage a Service Request.
- View Knowledge Base articles.
- Sign up for product notifications.
- Download software and technical documentation.
- View how-to-videos.
- Engage in community discussions.
- Chat with support engineers online.
- View services to assist you with your product.