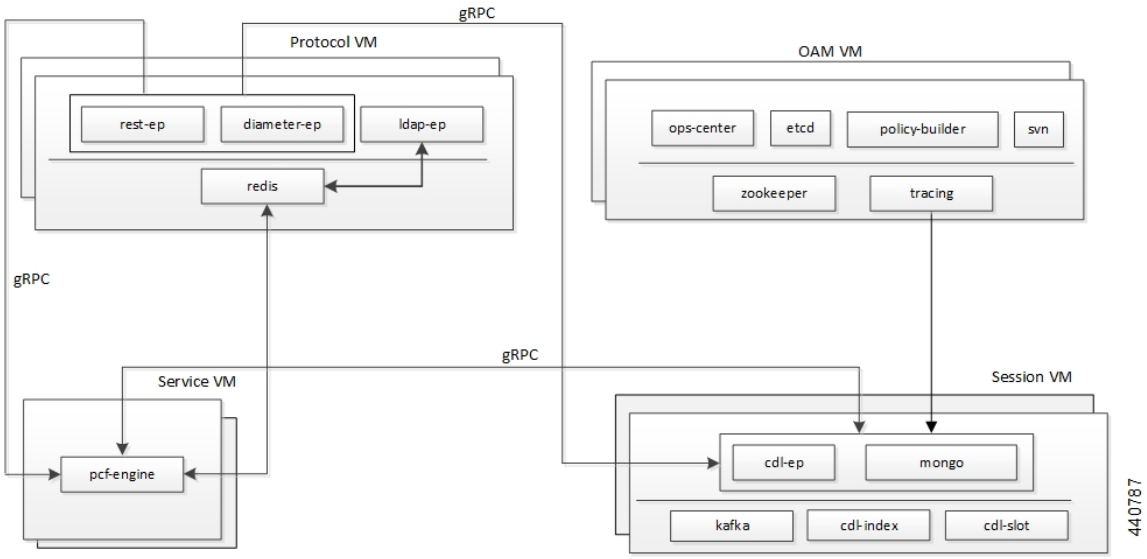
Pods and services

CPC pods and services overview

Depending on your deployment environment, CPC deploys the pods on the virtual machines that you have configured. Pods operate through the services that are responsible for the intrapod communications. If the machine hosting the pods fail or experiences network disruption, the pods are terminated or deleted. However, this situation is transient and CPC spins new pods to replace the invalid pods.

This workflow provides a high-level visibility into the host machines, and the associated pods and services. It also represents how the pods interact with each other. The representation might defer based on your deployment infrastructure.

Figure 1: Communication Workflow of Pods



The Protocol VM hosts the rest-ep, diameter-ep, and ldap-ep pod that governs the ingress (incoming) and egress (outgoing) traffic on the interfaces. The pods responsible for the operations and management processes reside in the OAM VM and, the Service VM hosts the pcf-engine. The session VMs hosts the pods that operate as the databases to store the data accessed by the pods. The illustration also depicts the services which the pods use to channel the interactions. The pods communicate over the gRPC interface.

Note Typically, multiple instances of the Protocol and OAM VMs are created to ensure resiliency.

Kubernetes deployment includes the kubectl command-line tool to manage the resources in the cluster. You can manage the pods, nodes, and services using the CLI.

For performing the maintenance activities, you can use the **kubectl drain** command to withdraw a node voluntarily. This command prepares the node by evicting or assigning the associated pods to another node with sufficient resources. You can run the **kubectl drain** on individual or multiple nodes concurrently.

Pods

Kubernetes deploys one or multiple pods on a single node which can be a physical or virtual machine. Each pod has a discrete identity with an internal IP address and port space. However, the containers within a pod can share the storage and network resources.

This table lists the pod names and the hosts on which they are deployed depending on the labels that you assign.

Table 1: CPC Pods

Pod Name	Description	Host Name
admin-db	Acts as the MongoDB router pod for the Admin database.	Session
api-pcf-ops-center	Functions as the confD API pod for the CPC Ops Center.	OAM
cdl-ep-session-c1	Provides an interface to the CDL. **Note** Configuration changes to the CDL endpoint cause the endpoint to restart automatically. Cisco recommends making such changes only within the maintenance window.	Session
cdl-index-session	Preserves mapping information of the keys to the session pods.	Session
cdl-slot-session-c1	Operates as the CDL Session pod to store the session data.	Session
cps-license-manager	Acts as the CPC License Manager.	OAM

Pod Name	Description	Host Name
crd-api-pcf-pcf-engine-app-pcf-<*n*>-mjgxp	Hosts the CRD APIs.	Protocol
db-admin	Acts as the replica set pod for the Admin database.	Session
db-admin-config	Acts as the replica set pod that stores the Admin database configuration.	Session
db-spr-config	Operates as the replica set pod that stores the SPR database configuration.	Session
db-spr1	Functions as the replica set pod that preserves the SPR database.	Session
diameter-ep-rx-rx	Contains the Diameter stack details and acts as the endpoint. **Note** Configuration changes to the diameter endpoint cause the endpoint to restart automatically. Cisco recommends making such changes only within the maintenance window.	Protocol
documentation	Contains the documentation.	OAM
etcd-pcf-etcd-cluster	Hosts the etc-d for the CPC application.	OAM
grafana-dashboard-cdl	Contains the Grafana metrics for CDL.	OAM
grafana-dashboard-pcf	Contains the Grafana metrics for CPC.	OAM
kafka	Hosts the Kafka details for the CDL replication.	Protocol
ldap-ep	Operates as an LDAP client to establish communication with an external LDAP server. **Note** Configuration changes to the LDAP endpoint cause the endpoint to restart automatically. Cisco recommends making such changes only within the maintenance window.	Protocol
network-query	Operates as the utility pod to determine the route IP for the Diameter outbound messages.	OAM
ops-center-pcf-ops-center	Acts as the CPC Ops Center.	OAM
patch-server-pcf-cnat-cps-infrastructure	Operates as the utility pod for patching the CPC JAR files.	OAM

Pod Name	Description	Host Name
pcf-day0-config-pcf-pcf -engine-<*n*>-rchg2	Dedicated for performing the Day-0 configuration for CPC.	OAM
pcf-engine-pcf-pcf-engine-app-pcf	Operates as the CPC Engine. **Note** Configuration changes to the CPC Engine endpoint cause the endpoint to restart automatically. Cisco recommends making such changes only within the maintenance window.	Service
pcf-rest-ep	Operates as a REST endpoint for CPC. **Note** Configuration changes to the REST endpoint cause the endpoint to restart automatically. Cisco recommends making such changes only within the maintenance window.	Protocol
policy-builder-pcf-pcf-engine-app	Operates as the Policy Builder for CPC.	OAM
redis-keystore	Operates as the REDIS Index.	Protocol
redis-queue	Operates as the REDIS IPC.	Protocol
rs-controller-admin	Responsible for the replication controller for Admin database.	Session
rs-controller-admin-config	Operates as a replication controller for the Admin database configuration.	Session
rs-controller-spr-config	Operates as a replication controller for SPR database configuration.	Session
rs-controller-spr1	Operates as a replication controller for the SPR database.	Session
smart-agent-pcf-ops-center	Operates as the utility pod for the CPC Ops Center.	OAM
svn	Stores all the CPC XMI configuration files.	OAM
svn-ldap	Stores the LDAP endpoint configuration which is configured through the ops-center.	Protocol
swift-pcf-ops-center	Operates as the utility pod for the CPC Ops Center.	OAM
traceid-pcf-pcf-engine	Stores the subscriber tracing details.	OAM
zookeeper	Assigned for the Zookeeper.	OAM

Services

This table describes the CPC services and the pod on which they run.

Table 2: CPC Services and Pods

Service Name	Pod Name	Description
admin-db	admin-db-0	Serves to process the MongoDB-specific router messages.
cps-diameter-inbound-rx-rx-rx	cps-diameter-ep	Transmits the Rx messages to the Diameter endpoint. You can set an external IP address for the service.
crd-api-pcf-pcf-engine-app-pcf	crd-api	Processes the CRD API calls.
datastore-ep	datastore-ep	Processes the CDL endpoint calls.
datastore-ep-session	ngn-datastore-ep	Responsible for the CDL session.
datastore-notification-ep	pcf-engine	Responsible for sending the notifications from the CDL to the engine.
diameter-engine	pcf-engine	Acts as the Diameter endpoint to pcf-engine.
documentation	documentation	Processes the documentation API calls.
etcd	pcf-etcd-cluster	Processes the etc-d API.
etcd-pcf-etcd-cluster-<n>	pcf-etcd-cluster	Processes the etc-d stateful sets.
grafana-dashboard-cdl	grafana-dashboard-cdl	Responsible for managing the Grafana dashboard for inputs from the CDL.
grafana-dashboard-pcf	grafana-dashboard-pcf	Manages the Grafana dashboard for CPC.
helm-api-pcf-ops-center	helm-api	Manages the Ops Center API.
kafka	kafka	Processes the Kafka messages.
mongo-admin-<n>	db-admin-0	Responsible for the Admin database stateful sets.
mongo-admin-config-<n>	db-admin-config-0	Responsible for the Admin database configuration stateful sets.
mongo-spr-config-<n>	db-spr-config-0	Responsible for the SPR database configuration stateful sets.
mongo-spr1-<n>	db-spr1-0	Responsible for the SPR database stateful sets
ops-center-pcf-ops-center	ops-center	Manages the CPC Ops Center.

Service Name	Pod Name	Description
patch-server-pcf-cnat-cps-infrastructure	patch-server	Maintains the patch repository.
pcf-day0-config-pcf-pcf-engine-app-pcf	pcf-day0-config	Manages the Day-0 configuration.
pcf-engine	pcf-engine	Processes the API calls to pcf-engine.
pcf-rest-ep	pcf-rest-ep	Acts as the http2 request/response to the REST endpoint. You can set an external IP address for the service.
policy-builder-pcf-pcf-engine-app-pcf	policy-builder	Manages the Policy Builder's request/response messages.
redis-keystore-<n>	redis-keystore-0	Manages the REDIS keystore stateful set.
redis-queue-<n>	redis-queue-0	Processes the REDIS queue stateful set.
rs-admin	replica-set admin	Manages the replica set for Admin database.
rs-admin-config	replica-set admin-config	Manages the replica set for the Admin database configuration.
rs-spr-config	replica-set spr-conifg	Manages the replica set for the SPR configuration.
rs-spr1	replica-set sp1	Manages the replica set for the SPR database.
smart-agent-pcf-ops-center	smart-agent-pcf-ops-center	Responsible for the Ops Center API.
svn	cps-subversion	Responsible for the SVN API calls.
swift-pcf-ops-center	swift-pcf-ops-center	Responsible for the Ops Center API.

Limitations

When removing a node using the `kubectl` drain command, the pods managing the inbound traffic such as `pcf-rest-ep`, `pcf-ldapserver-ep`, and `diameter-ep-rx-protocol` cannot be assigned to another node. The workload of these pods cannot be scheduled to another node since the traffic is routed through persistent connections that do not support load balance. As a result, the Grafana dashboard does not display the Transaction Per Second (TPS) for these pods.

Associate pods to nodes

After you have configured a cluster, you can associate pods to the nodes through labels. This association enables the pods to get deployed on the appropriate node based on the key-value pair.

Labels are required for the pods to identify the nodes where they must get deployed and to run the services. For example, when you configure the protocol-layer label with the required key-value pair, the pods get deployed on the nodes that match the key-value pair.

To associate pods to the nodes through the labels, use this configuration:

SUMMARY STEPS

1. Enter the label configuration for each node layer.

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	Enter the label configuration for each node layer.	`config`
		`  label`
		`  cdl-layer`
		`  key key_value`
		`  value value`
		`  oam-layer`
		`  key key_value`
		`  value value`
		`  protocol-layer`
		`  key key_value`
		`  value value`
		`  service-layer`
		`  key key_value`
		`  value value`
		`  end`
		NOTES:
		• If you opt not to configure the labels, then CPC assumes the labels with the default key-value pair.
		• **cdl-layer** — configures the key-value pair parameters for the CDL (Cisco Data Layer).
		• **oam-layer** — configures the key-value pair parameters for the OAM (Operations, Administration, and Maintenance) layer.
		• **protocol-layer** — configures the key-value pair parameters for the protocol layer.
		• **service-layer** — configures the key-value pair parameters for the service layer.

Sample configuration

```
pcf# show running-config label
label protocol-layer key smi.cisco.com/node-type-1
label protocol-layer value protocol
label service-layer key smi.cisco.com/node-type-2
label service-layer value service
label cdl-layer key smi.cisco.com/node-type-3
label cdl-layer value session
label oam-layer key smi.cisco.com/node-type
label oam-layer value oam
pcf#
```

View pod details and status

If a service requires additional pods, CPC creates and deploys the pods. You can view the list of pods participating in your deployment through the CPC Ops-Center.

You can run **kubectl** commands from the control-plane node to manage Kubernetes resources.

SUMMARY STEPS

1. To view a summary of pod details filtered by namespace, run one of the commands.
   - View pods across all namespaces filtered by CPC namespace:

     ```
     kubectl get pods -A | grep cpc-namespace
     ```

   - View pods with wide output including node assignment:

     ```
     kubectl get pods -A -owide | grep cpc-namespace
     ```

   - View all pods that are not in a Running state:

     ```
     kubectl get pods -A | grep -iv running
     ```

DETAILED STEPS

Procedure

	Command or Action	Purpose

Step 1	To view a summary of pod details filtered by namespace, run one of the commands.
	• View pods across all namespaces filtered by CPC namespace:
	`kubectl get pods -A | grep cpc-namespace`
	• View pods with wide output including node assignment:
	`kubectl get pods -A -owide | grep cpc-namespace`
	• View all pods that are not in a Running state:	

	Command or Action	Purpose
	`kubectl get pods -A | grep -iv running`	

Pod states

Understanding a pod's state lets you determine current health and prevent potential risks.

Table 3: Pod states

State	Description
Running	The pod is healthy and deployed on a node. It contains one or more containers.
Pending	The application is in the process of creating the container images for the pod.
Succeeded	All containers in the pod have successfully terminated. These pods cannot be restarted.
Failed	One or more containers in the pod have failed the termination process. The failure occurred because a container either exited with a non-zero status or the system terminated the container.
Unknown	The state of the pod could not be determined. This state typically occurs because the node where the pod resides was not reachable.