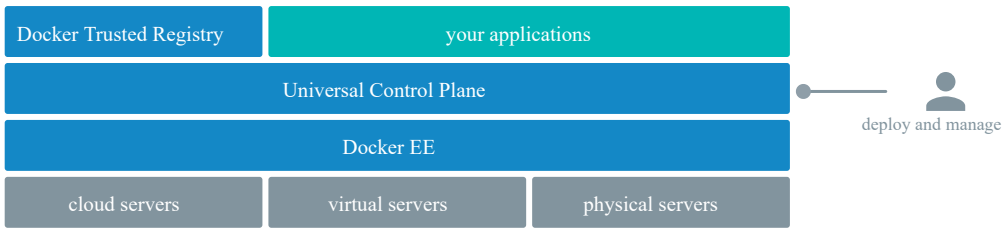
UCP architecture

Estimated reading time: 7 minutes

> **These are the docs for UCP version 2.2.18**
>
> To select a different version, use the selector below.
>
> 2.2.18

Universal Control Plane is a containerized application that runs on Docker Enterprise Edition (https://docs.docker.com/ee/) and extends its functionality to make it easier to deploy, configure, and monitor your applications at scale.

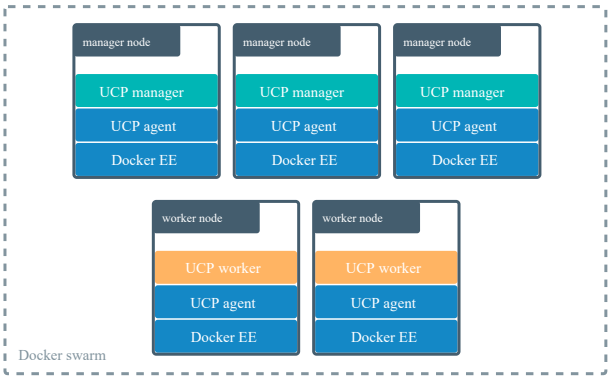
UCP also secures Docker with role-based access control so that only authorized users can make changes and deploy applications to your Docker cluster.



Once Universal Control Plane (UCP) instance is deployed, developers and IT operations no longer interact with Docker Engine directly, but interact with UCP instead. Since UCP exposes the standard Docker API, this is all done transparently, so that you can use the tools you already know and love, like the Docker CLI client and Docker Compose.

Under the hood

Docker UCP leverages the clustering and orchestration functionality provided by Docker.



A swarm is a collection of nodes that are in the same Docker cluster. Nodes (https://docs.docker.com/engine/swarm/key-concepts/) in a Docker swarm operate in one of two modes: Manager or Worker. If nodes are not already running in a swarm when installing UCP, nodes will be configured to run in swarm mode.

When you deploy UCP, it starts running a globally scheduled service called `ucp-agent`. This service monitors the node where it's running and starts and stops UCP services, based on whether the node is a manager or a worker node (https://docs.docker.com/engine/swarm/key-concepts/).

If the node is a:

- **Manager**: the `ucp-agent` service automatically starts serving all UCP components, including the UCP web UI and data stores used by UCP. The `ucp-agent` accomplishes this by deploying several containers (/datacenter/ucp/2.2/guides/architecture/#ucp-components-in-manager-nodes) on the node. By promoting a node to manager, UCP automatically becomes highly available and fault tolerant.
- **Worker**: on worker nodes, the `ucp-agent` service starts serving a proxy service that ensures only authorized users and other UCP services can run Docker commands in that node. The `ucp-agent` deploys a subset of containers (/datacenter/ucp/2.2/guides/architecture/#ucp-components-in-worker-nodes) on worker nodes.

UCP internal components

The core component of UCP is a globally-scheduled service called `ucp-agent`. When you install UCP on a node, or join a node to a swarm that's being managed by UCP, the `ucp-agent` service starts running on that node.

Once this service is running, it deploys containers with other UCP components, and it ensures they keep running. The UCP components that are deployed on a node depend on whether the node is a manager or a worker.

> **OS-specific component names**
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> Some UCP component names depend on the node's operating system. For example, on Windows, the `ucp-agent` component is named `ucp-agent-win`. Learn about architecture-specific images (https://docs.docker.com/datacenter/ucp/2.2/guides/admin/install/architecture-specific-images/).

UCP components in manager nodes

Manager nodes run all UCP services, including the web UI and data stores that persist the state of UCP. These are the UCP services running on manager nodes:

UCP component	Description
ucp-agent	Monitors the node and ensures the right UCP services are running
ucp-reconcile	When ucp-agent detects that the node is not running the right UCP components, it starts the ucp-reconcile container to converge the node to its desired state. It is expected for the ucp-reconcile container to remain in an exited state when the node is healthy.
ucp-auth-api	The centralized service for identity and authentication used by UCP and DTR

UCP component	Description
ucp-auth-store	Stores authentication configurations and data for users, organizations, and teams
ucp-auth-worker	Performs scheduled LDAP synchronizations and cleans authentication and authorization data
ucp-client-root-ca	A certificate authority to sign client bundles
ucp-cluster-root-ca	A certificate authority used for TLS communication between UCP components
ucp-controller	The UCP web server
ucp-dsinfo	Docker system information collection script to assist with troubleshooting
ucp-kv	Used to store the UCP configurations. Don't use it in your applications, since it's for internal use only
ucp-metrics	Used to collect and process metrics for a node, like the disk space available
ucp-proxy	A TLS proxy. It allows secure access to the local Docker Engine to UCP components
ucp-swarm-manager	Used to provide backwards-compatibility with Docker Swarm

UCP components in worker nodes

Worker nodes are the ones where you run your applications. These are the UCP services running on worker nodes:

UCP component	Description

UCP component	Description
ucp-agent	Monitors the node and ensures the right UCP services are running
ucp-dsinfo	Docker system information collection script to assist with troubleshooting
ucp-reconcile	When ucp-agent detects that the node is not running the right UCP components, it starts the ucp-reconcile container to converge the node to its desired state. It is expected for the ucp-reconcile container to remain in an exited state when the node is healthy.
ucp-proxy	A TLS proxy. It allows secure access to the local Docker Engine to UCP components

Volumes used by UCP

Docker UCP uses these named volumes to persist data in all nodes where it runs:

Volume name	Description
ucp-auth-api-certs	Certificate and keys for the authentication and authorization service
ucp-auth-store-certs	Certificate and keys for the authentication and authorization store
ucp-auth-store-data	Data of the authentication and authorization store, replicated across managers
ucp-auth-worker-certs	Certificate and keys for authentication worker
ucp-auth-worker-data	Data of the authentication worker

Volume name	Description
ucp-client-root-ca	Root key material for the UCP root CA that issues client certificates
ucp-cluster-root-ca	Root key material for the UCP root CA that issues certificates for swarm members
ucp-controller-client-certs	Certificate and keys used by the UCP web server to communicate with other UCP components
ucp-controller-server-certs	Certificate and keys for the UCP web server running in the node
ucp-kv	UCP configuration data, replicated across managers
ucp-kv-certs	Certificates and keys for the key-value store
ucp-metrics-data	Monitoring data gathered by UCP
ucp-metrics-inventory	Configuration file used by the ucp-metrics service
ucp-node-certs	Certificate and keys for node communication

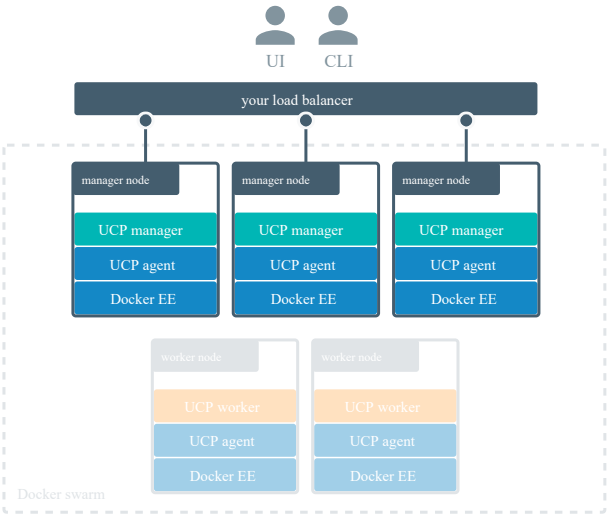
You can customize the volume driver used for these volumes, by creating the volumes before installing UCP. During the installation, UCP checks which volumes don't exist in the node, and creates them using the default volume driver.

By default, the data for these volumes can be found at `/var/lib/docker/volumes/<volume-name>/_data` .

How you interact with UCP

There are two ways to interact with UCP: the web UI or the CLI.

You can use the UCP web UI to manage your swarm, grant and revoke user permissions, deploy, configure, manage, and monitor your applications.



UCP also exposes the standard Docker API, so you can continue using existing tools like the Docker CLI client. Since UCP secures your cluster with role-based access control, you need to configure your Docker CLI client and other client tools to authenticate your requests using client certificates (https://docs.docker.com/datacenter/ucp/2.2/guides/user/access-ucp/) that you can download from your UCP profile page.

Where to go next

- System requirements (https://docs.docker.com/datacenter/ucp/2.2/guides/admin/install/system-requirements/)
- Plan your installation (https://docs.docker.com/datacenter/ucp/2.2/guides/admin/install/system-requirements/)

ucp (https://docs.docker.com/glossary/?term=ucp), architecture (https://docs.docker.com/glossary/?term=architecture)