

Network Requirements

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Each host (Controller, Worker, and Gateway) in the EPIC platform must include at least one 10Gb Ethernet card, which will be used for both hosts (Management network) and communications between the virtual nodes in EPIC clusters. Further, all hosts must be on the same subnet.

EPIC assigns IP addresses to virtual nodes (containers) that fall within the floating IP range(s) specified during and/or after installation. These address ranges can be either routable or non-routable. EPIC versions 2.6 and previous supported routable addresses, where users can directly access the containers over the corporate network. There may be some situations where reserving one or more range(s) of IP addresses exclusively for the EPIC platform is difficult or impossible. EPIC 3.0 adds support for non-routable networks, where users must access containers via the Gateway hosts using HAproxy. Network requirements vary depending on whether your virtual node/container network will use routable or non-routable floating IP address ranges.

- For networks with non-routable floating address ranges, see [Private, Non-routable Virtual Node/Container Addresses](#), below.
- For networks with routable IP addresses, see [Public, Routable Virtual Node/Container Addresses](#), below.

Private, Non-routable Virtual Node/Container Addresses

When EPIC is configured to use a private, non-routable network for virtual nodes that requires container access via Gateway hosts, the Controller, Compute hosts, and Gateway hosts must all be on the same subnet. EPIC maintains a list of the virtual nodes and ports that users may need to connect to and makes those ports available through one or more Gateway host(s). Each Gateway host maps a range of ports to services running on the containers within the EPIC platform. A user who needs to access a container uses the hostname of the Gateway host and a port number. The hostname can be either the name of a Gateway host or of a physical load balancer. For example, assume that the EPIC platform has a Gateway worker with the hostname gateway-1.mycompany.com. In this example, the port mappings could appear as follows:

- virtualnode-1.bdlocal
 - **Hive thrift server:** gateway-1.mycompany.com:10020
 - **MySQL server:** gateway-1.mycompany.com:10018

- **Spark master:** spark//gateway-1.mycompany.com:10019
 - **SSH:** gateway-1.mycompany.com:10017
- virtualnode-2.bdlocal
 - SSH:** gateway-1.mycompany.com:10022
- virtualnode-3.bdlocal
 - SSH:** gateway-1.mycompany.com:10024



*Note: Users can determine the Gateway node and port number to use by looking in the **Services** column of the table on the **Cluster Details** screen. See [The Cluster Details Screen](#).*



Note: Large EPIC platforms may need multiple Gateway nodes. If these nodes share a hostname, then EPIC will perform round-robin load balancing among the available Gateway nodes.

Public, Routable Virtual Node/Container Addresses

EPIC may be installed on a variety of DHCP and non-DHCP networks. Your network must be able to support two subnets in order for EPIC to manage the hosts and run jobs.

- gratuitous-ARP must be turned on in order to allow the network switch to learn the MAC addresses of the virtual nodes. This is needed to ensure communications between the virtual nodes in the EPIC cluster(s).
- If the hosts have two Ethernet cards, then one will be used for the hosts and the other for containers. If the hosts have one Ethernet card, then the single NIC will be divided into two subnets so that the NIC can be shared for the hosts and for the containers.
- All hosts must use the same NIC interface. For example, if the Controller host has uses an interface named eth0, then all the other hosts must also have this interface named eth0. For online installation, this NIC must have Internet access.
- EPIC requires each host within the cluster platform to always have the same IP address and host name in order for the Controller and Worker nodes to communicate reliably.
- If your network does not support DHCP, then you will need to manually assign one public LAN IP address and a host name to each host in the EPIC platform.
- If your network does support DHCP, then it must support either of the following schemas in order to be able to guarantee that each host will have the same IP addresses and host name at all times:
 - Assignment of IP addresses by MAC address.
 - Reserved pool of static IP addresses that can be assigned to each of the hosts.

You will not be able to install EPIC on a DHCP network that does not support one of these two options.

- Network CIDR assigned and managed by EPIC for use by virtual clusters. This subnet must be able to communicate with the hosts where EPIC is installed. The size of the CIDR determines the number of virtual instances that can be created on the system. The external switch acts as the gateway for that CIDR.
- Each host acts as a router for the virtual clusters located on that host.

This image explains the networking terms used by EPIC.

In this image:

- EPIC assigns an IP address to each virtual node (1) when that node is spun up. Each address will fall within the Floating IP range, which is defined in EPIC by the **Floating IP Range Start**, **Floating IP Range End**, and **CIDR** values. You may assign multiple address ranges; however, all ranges must fall within the same subnet.
- EPIC passes communications between virtual nodes through the internal gateway (2). The best practice is to assign the first IP address in the floating range to the internal gateway using the **Internal Gateway IP** value in EPIC.
- Communications between nodes that reside on different hosts pass through the Ethernet interface (3) on each host. Each host must use the same interface, such as eth0. This is defined by the **Floating IP External interface** value.
- Physical hosts use the next hop IP address (4) for communications to the broader corporate network and/or the Internet. This is typically the address of the external switch and will normally be the first IP address of the range assigned to the physical host(s) that make up the EPIC platform. It is defined in EPIC using the **Floating IP Next hop** value. You can find the next hop gateway IP address by executing the command `route -n` at the shell prompt. In the table that appears, the **Gateway** for **Destination 0.0.0.0** is normally the next hop IP address.
- Gateway hosts are not needed, provided that users can access EPIC virtual nodes from the corporate network. However, there may be situations where firewall configuration or other restrictions prevent direct access to EPIC hosts from the corporate network. In this scenario, you may use Gateway hosts to access the virtual nodes.

EPIC supports four routable networking scenarios:

- **Scenario 1:** Single NIC with one subnet CIDR. See [Scenario 1](#).
- **Scenario 2:** Single NIC with two subnet CIDRs. See [Scenario 2](#).
- **Scenario 3:** Two physical NICs with two subnet CIDRs. See [Scenario 3](#).
- **Scenario 4:** One physical NIC with two VLAN interfaces. See [Scenario 4](#).

Scenario 1

Single NIC, with only one subnet provided by the network team. This subnet is used for both physical hosts and containers/virtual nodes. In this situation, the single subnet CIDR must be divided into two subnet CIDRs. For example, assume that the single network subnet is 172.16.1.0/24 (where /24 is the CIDR being split). Configure the two subnet CIDRs as follows:

- 172.16.1.0/25 for the physical hosts, which means they be assigned IP addresses in the range 172.16.1.2-172.16.1.128.
- 172.16.1.129/25 for containers.

In this example, include the following parameters when installing EPIC:

- **Floating IP Range Start:** 172.16.1.130
- **Floating IP Range End:** 172.16.1.254
- **Floating IP Mask:** 25 (This is the CIDR)
- **Floating IP External interface:** eth0
- **Floating IP Next hop:** 172.16.1.1 (first IP address of the physical host IP range)
- **Internal Gateway IP:** 172.16.1.129 (first IP address of the container IP range)

Scenario 2

Single NIC, with two subnet CIDRs provided by the network team, where each subnet CIDR has its own external gateway. For example, assume the following:

- 172.16.1.0/24 for the physical hosts, with the gateway at 172.16.1.1. Hosts will be assigned IP addresses in the range 172.16.1.2-172.16.1.254.
- 172.16.2.0/24 for containers, with the gateway at 172.16.2.1.

In this example, include the following parameters when installing EPIC:

- **Floating IP Range Start:** 172.16.2.3
- **Floating IP Range End:** 172.16.2.254
- **Floating IP Mask:** 24
- **Floating IP External interface:** eth0
- **Floating IP Next hop:** 172.16.2.1
- **Internal Gateway IP:** 172.16.2.2

Scenario 3

Two physical NICs, with two subnet CIDRs and container external traffic being routed through the second NIC, where eth0 and eth1 are the NIC interfaces and:

- 172.16.1.0/24 is used for the physical hosts on eth0, with the gateway at 172.16.1.1. Hosts will be assigned IP addresses in the range 172.16.1.2-172.16.1.25.
- 172.16.2.0/24 is used for containers on eth1, with the gateway at 172.16.2.1. In this case, do not assign an IP address to eth1.

In this example, include the following parameters when installing EPIC:

- **Floating IP Range Start:** 172.16.2.3
- **Floating IP Range End:** 172.16.2.254
- **Floating IP Mask:** 24
- **Floating IP External interface:** eth1
- **Floating IP Next hop:** 172.16.2.1
- **Internal Gateway IP:** 172.16.2.2

Scenario 4

One physical NIC with 2 VLAN interfaces (eth0.40 and eth0.50) and two subnet CIDRs, with container external traffic being routed through the through the second VLAN interface. For example:

- 172.16.1.0/24 on eth0.40 for the physical hosts, with the gateway at 172.16.1.1. Hosts will have to be assigned IP addresses in the range 172.16.1.2-172.16.1.254.
- 172.16.2.0/24 on eth0.50 for containers, with the gateway at 172.16.2.1. Do not assign any IP addresses to eth0.50.

In this example, include the following parameters when installing EPIC:

- **Floating IP Range Start:** 172.16.2.3
- **Floating IP Range End:** 172.16.2.254
- **Floating IP Mask:** 24
- **Floating IP External interface:** eth0.50
- **Floating IP Next hop:** 172.16.2.1

- **Internal Gateway IP:** 172.16.2.2