# High Availability Embedded etcd

**WARNING**

Embedded etcd (HA) may have performance issues on slower disks such as Raspberry Pis running with SD cards.

▸ Why An Odd Number Of Server Nodes?

An HA K3s cluster with embedded etcd is composed of:

- Three or more **server nodes** that will serve the Kubernetes API and run other control plane services, as well as host the embedded etcd datastore.
- Optional: Zero or more **agent nodes** that are designated to run your apps and services
- Optional: A **fixed registration address** for agent nodes to register with the cluster

**NOTE**

To rapidly deploy large HA clusters, see Related Projects

To get started, first launch a server node with the `cluster-init` flag to enable clustering and a token that will be used as a shared secret to join additional servers to the cluster.

```
curl -sfL https://get.k3s.io | K3S_TOKEN=SECRET sh -s - server \
    --cluster-init \
    --tls-san=<FIXED_IP> # Optional, needed if using a fixed registration
address
```

After launching the first server, join the second and third servers to the cluster using the shared secret:

```
curl -sfL https://get.k3s.io | K3S_TOKEN=SECRET sh -s - server \
    --server https://<ip or hostname of server1>:6443 \
    --tls-san=<FIXED_IP> # Optional, needed if using a fixed registration
address
```

Check to see that the second and third servers are now part of the cluster:

```
$ kubectl get nodes
NAME        STATUS   ROLES                       AGE   VERSION
server1     Ready    control-plane,etcd,master   28m   vX.Y.Z
server2     Ready    control-plane,etcd,master   13m   vX.Y.Z
server3     Ready    control-plane,etcd,master   10m   vX.Y.Z
```

Now you have a highly available control plane. Any successfully clustered servers can be used in the `--server` argument to join additional server and agent nodes. Joining additional agent nodes to the cluster follows the same procedure as servers:

```
curl -sfL https://get.k3s.io | K3S_TOKEN=SECRET sh -s - agent --server
https://<ip or hostname of server>:6443
```

There are a few config flags that must be the same in all server nodes:

- Network related flags: `--cluster-dns`, `--cluster-domain`, `--cluster-cidr`, `--service-cidr`
- Flags controlling the deployment of certain components: `--disable-helm-controller`, `--disable-kube-proxy`, `--disable-network-policy` and any component passed to `--disable`
- Feature related flags: `--secrets-encryption`

# Existing single-node clusters

If you have an existing cluster using the default embedded SQLite database, you can convert it to etcd by simply restarting your K3s server with the `--cluster-init` flag. Once you've done that, you'll be able to add additional instances as described above.

If an etcd datastore is found on disk either because that node has either initialized or joined a cluster already, the datastore arguments (`--cluster-init`, `--server`, `--datastore-endpoint`, etc) are

ignored.

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