Before you can stand up controllers for a Kubernetes cluster, you must first build an etcd cluster across your Kubernetes control nodes. This lesson provides a demonstration of how to set up an etcd cluster in preparation for bootstrapping Kubernetes. After completing this lesson, you should have a working etcd cluster that consists of your Kubernetes control nodes.

Here are the commands used in the demo (note that these have to be run on *both* controller servers, with a few differences between them):

```
wget -q --show-progress --https-only --timestamping \
  "https://github.com/coreos/etcd/releases/download/v3.3.5/etcd-v3.3.5-linux-amd64.tar.gz"
tar -xvf etcd-v3.3.5-linux-amd64.tar.gz
sudo mv etcd-v3.3.5-linux-amd64/etcd* /usr/local/bin/
sudo mkdir -p /etc/etcd /var/lib/etcd
sudo cp ca.pem kubernetes-key.pem kubernetes.pem /etc/etcd/
```

Set up the following environment variables. Be sure you replace all of the <placeholder values> with their corresponding real values:

```
ETCD_NAME=<cloud server hostname>
INTERNAL_IP=$(curl http://169.254.169.254/latest/meta-data/local-ipv4)
INITIAL_CLUSTER=<controller 1 hostname>=https://<controller 1 private ip>:2380,<controller 2
hostname>=https://<controller 2 private ip>:2380
```

Create the `systemd` unit file for etcd using this command. Note that this command uses the environment variables that were set earlier:

```
cat << EOF | sudo tee /etc/systemd/system/etcd.service
[Unit]
Description=etcd
Documentation=https://github.com/coreos

[Service]
ExecStart=/usr/local/bin/etcd \\
  --name ${ETCD_NAME} \\
  --cert-file=/etc/etcd/kubernetes.pem \\
  --key-file=/etc/etcd/kubernetes-key.pem \\
  --peer-cert-file=/etc/etcd/kubernetes.pem \\
  --peer-key-file=/etc/etcd/kubernetes-key.pem \\
  --trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-trusted-ca-file=/etc/etcd/ca.pem \\
  --peer-client-cert-auth \\
  --client-cert-auth \\
  --initial-advertise-peer-urls https://${INTERNAL_IP}:2380 \\
  --listen-peer-urls https://${INTERNAL_IP}:2380 \\
  --listen-client-urls https://${INTERNAL_IP}:2379,https://127.0.0.1:2379 \\
  --advertise-client-urls https://${INTERNAL_IP}:2379 \\
  --initial-cluster-token etcd-cluster-0 \\
  --initial-cluster ${INITIAL_CLUSTER} \\
  --initial-cluster-state new \\
  --data-dir=/var/lib/etcd
Restart=on-failure
RestartSec=5

[Install]
WantedBy=multi-user.target
EOF
```

Start and enable the etcd service:

```
sudo systemctl daemon-reload
sudo systemctl enable etcd
sudo systemctl start etcd
```

You can verify that the etcd service started up successfully like so:

```
sudo systemctl status etcd
```

Use this command to verify that etcd is working correctly. The output should list your two etcd nodes:

```
sudo ETCDCTL_API=3 etcdctl member list \
  --endpoints=https://127.0.0.1:2379 \
  --cacert=/etc/etcd/ca.pem \
  --cert=/etc/etcd/kubernetes.pem \
  --key=/etc/etcd/kubernetes-key.pem
```