Cautions and Pre-Requisites:

This document applies to versions 6.7.0 and newer only.

Currently (as of 8.2.0) the platform allows the addition and/or removal of Web/Application/Linux/Load Manager/Database nodes via the Platform Installer, but ZooKeeper and Cache nodes must remain static.

Adding or Removing of Cache and ZooKeeper nodes is a manual process and may require platform downtime. **This procedure is not normally recommended under regular circumstances. Every effort must be made to backup/snapshot the existing platform prior to attempting the following processes. In the event of a failure during these procedures, a full platform restore may be required. It is advised to execute your planned procedure in a lab environment first to insure the process is understood before executing the steps in a platform that is in use for production or development.**

For either Cache Nodes or ZooKeeper Nodes, all server operating system and role based pre-requisites must be applied prior to adding the node(s) to the platform. See the "Preparing for the Apprenda Platform" document relevant to the version in use.

Adding / Removing ZooKeeper Nodes

If plans are to both add and remove ZooKeeper nodes, it is recommended to add new ZooKeeper nodes to the platform before removing any to ensure the platform remains functional.

NOTE: The current ZooKeeper Connection string is limited to 128 characters in SQL so it may be necessary to add one and remove one at a time in order to be able to fit the hostnames in the column and remain below the 128 character limit.

IMPORTANT CONSIDERATIONS PRIOR TO ADDING OR REMOVING ZOOKEEPER NODES TO REDUCE APPLICATION DOWNTIME:

The fundamental "problem" with adding or removing ZooKeeper nodes is that the connection to ZooKeeper is established on workload startup. This means that if the ZooKeeper nodes are changed, workloads will be trying to use nodes that no longer exist and not using the new nodes. In addition to guest application workloads, this will also affect Apprenda's Windows services.

The ZooKeeper client is designed to tolerate node failure so may not be necessary to restart the workloads to establish new connections if at least one of the original nodes remains present. There is a trade-off, however, in that clients will only use the nodes that are known. If, for example, only one node remains from before the change and that node goes offline, any workloads running before the change will lose their connection completely until that specific node is back online.

Basically, there is a trade-off to be made here. You can either keep everything up and avoid guest application downtime, or you can have the best future availability if one of the ZooKeeper nodes becomes unreachable.

What needs to be restarted?

- Load Managers
- Host Controllers
- Windows Containers
- Linux Containers
- WCF Services
- IIS App Pools
- Wars

Are there any methods to avoid guest app downtime?

If there are enough available resources, it is possible to use a deployment policy and the Move functionality to reduce or prevent guest application downtime.

- · Create a Custom Property named 'Available' with values 'Yes' and 'No' that applies to Applications and Servers and has the default 'Yes'
- · Create a 'Must Match' Deployment Policy that uses the 'Available' property
- · For each server
    - o Change the 'Available' property to 'No'
    - o Use the Move functionality to move all workloads off the server
    - o Restart any Apprenda services on that node
    - o Change the 'Available' property back to 'Yes'
- · Remove the Deployment Policy and Custom Property

If workloads can be moved without affecting the application (this should be possible as long as they have no in-memory state), this process should result it no perceptible downtime for the guest applications and a fully transitioned platform.

To Add ZooKeeper Nodes:
1. Edit the SaaSGrid Core.dbo.Cloud table's ZooKeeperConnectionString column to add the desired hosts in the following format:
    a. UPDATE Cloud SET ZooKeeperConnectionString = ZooKeeperConnectionString + 'NewHost1(nextId):2181,NewHost2(nextId):2181' etc.
    b. NOTE: make note of all values in the Cloud table as you will need them later during step 3 when updating the Load Manager config file
2. Add an entry to the SaaSGrid Core.dbo.Artifact_Host table to reflect the metadata of the new host:
    a. Right click and edit Artifact Host, and insert a row with Type 32 that matches the Platform Version and settings for other ZK Hosts.
3. Deploy the Zookeeper Service on the Host:
    a. Make a backup of the environmentDescriptor.json file located in the root of the Apprenda directory in the repo.
    b. Edit the zooKeeperConnectionString property of the file to match the value set in the previous step.
    c. Add a host definition to the environment that includes the id, name and role of the host you are planning to add:
        i. The Id should be 0
        ii. The name should be the hostname of the server
        iii. The roles array should add "smart" denoting it as a zookeeper host.
    d. Open the registry editor on an existing Load Manager/App/Web/Database server, locate and export the HKEY_LOCAL_MACHINE\SOFTWARE\Apprenda branch. Import this key on the new cache node
    e. Open the Certificate Manager MMC on the same node. In the Local Computer/Personal/Certificates store locate the certificate with ApprendaSecretEncryption in the name. Export this with the extended properties and the private key. Import this on the new cache node.
        i. Modify the Private Key permissions to allow the Apprenda Service Account and the LOCAL SERVICES builtin account to have Read access to the private key.
    f. Copy the ZooKeeper msi from the repo over to the target host (\\reposerver\Apprenda\version\System\Nodes\ZooKeeper)
    g. Open powershell as administrator, change directory to the location you saved the msi. Run the msi, select install and point it to the environmentDescriptor.json file. (\\reposerver\Apprenda\environmentDescriptor.json)
    h. After the installer succeeds, you should see the Zookeeper Service running on the host.
4. On the Load Manager nodes, go to the %ApprendaPlatform%\LoadManager folder and open the Apprenda.LoadManagement.exe.config file
5. Change the value for key="ZookeeperConnectionString" to reflect the current value in the Cloud table.
6. One at a time, restart the Apprenda ZooKeeper service on each of the old nodes.

7. Wait until data has all propagated to the new ZooKeeper service(s).
8. Wait at least five minutes and use the ZkBrowser executable to connect to the new ZooKeeper instances to ensure they have communicated to the other services.

To Remove ZooKeeper Nodes:
1. Edit the SaaSGrid Core.dbo.Cloud table from above to remove the hosts no longer needed. Do not worry if the host IDs do not start at (1).
2. Edit the SaaSGrid Core.dbo.Artifact_Host table to mark the ZK host as Removed:
    a. Update [SaaSGrid Core].[dbo].[Artifact_Host] set NodeState = 3 where type = 32 and hostname = 'HostToRemove'
3. Remove the other ZooKeeper services that are no longer needed:
    a. Copy the msi from the repo over to the target host
    b. Run the msi and select remove
    c. the installer succeeds, you should no longer see the Zookeeper Service running on the host.
4. Restart every node.
5. Test basic platform functionality to ensure everything has gone smoothly and there are no issues with deploying UIs, & services, promotions, etc.

Adding / Removing Cache Nodes:
Prior to adding or Removing Cache Nodes please review and complete the items in the Cautions and Pre-Requites section of this document.

Adding Cache Nodes:
1. Edit the SaaSGrid Core.dbo.CacheNode table to add desired hosts. There is one entry for each host/port combination chosen in the installer.
2. Add an entry to the SaaSGrid Core.dbo.Artifact_Host table to reflect the metadata of the new host:
3. Right click and edit Artifact Host, and insert a row with Type 16 that matches the Platform Version and settings for other Cache Hosts.
4. Deploy the CacheService on the Host:
    a. Make a backup of the environmentDescriptor.json file located in the root of the Apprenda directory in the repo.
    b. Add a host definition to the environment that includes the id, name and role of the host you are planning to add:
        i. The Id should be 0
        ii. The name should be the hostname of the node
        iii. The roles array should add "cache" denoting it as a cache host.
    c. Open the registry editor on an existing Load Manager/App/Web/Database server, locate and export the HKEY_LOCAL_MACHINE\SOFTWARE\Apprenda branch. Import this key on the new cache node
    d. Open the Certificate Manager MMC on the same node. In the Local Computer/Personal/Certificates store locate the certificate with ApprendaSecretEncryption in the name. Export this with the extended properties and the private key. Import this on the new cache node.
    e. Modify the Private Key permissions to allow the Apprenda Service Account and the LOCAL SERVICES builtin account to have Read access to the private key.
    f. Copy the msi from the repo over to the target host (\\reposerver\Apprenda\version\System\Nodes\Caching)
    g. Open powershell as administrator, change directory to the location you save the msi. Run the msi, select install and point it to the environmentDescriptor.json file. (\\reposerver\Apprenda\environmentDescriptor.json)
    h. After the installer succeeds, you should see the Caching Service running on the host.
5. Shut down all deployed Cache services and bring them all back up.
6. To check that data has propagated to them, you can independently browse them via Redis Desktop Manager, which you can find at http://redisdesktop.com/. Check every cache node to make sure data has propagated to them.

Removing Cache Nodes:

1. Edit the SaaSGrid Core.dbo.CacheNode table from above to delete the entries for hosts you no longer wish to have as Cache nodes.
2. the SaaSGrid Core.dbo.Artifact_Host table to mark the Cache host as Removed:
3. Update [SaaSGrid Core].[dbo].[Artifact_Host] set NodeState = 3 where type = 16 and hostname = 'HostToRemove'
4. Remove the other Cache services that are no longer needed:
5. Copy the msi from the repo to the target host (\\reposerver\Apprenda\version\System\Nodes\Caching)
6. Run the msi and select remove
7. After the removal succeeds, you should no longer see the Cache Service running on the host.
8. Ideally, restart every node. If not possible, at least shut down all Cache services together and bring them back up.
9. Check that the Apprenda Cache Browser works in the SOC and make sure data is propagating to each cache service by using Cache Browser or Redis Desktop Manager with only one Cache service started at a time. Optionally, telnet into each host via whichever cache port(s) to ensure the service is running on all the proper ports.