IBM Blockchain Platform

Tutorial A6: Upgrading a smart contract

Estimated time: `20 minutes`

In the previous tutorial, we built and tested a TypeScript application that interacted with a Hyperledger Fabric network. In this tutorial we will:

- Make a change to a smart contract
- Package and deploy a new version of the new smart contract
- Try out the new smart contract

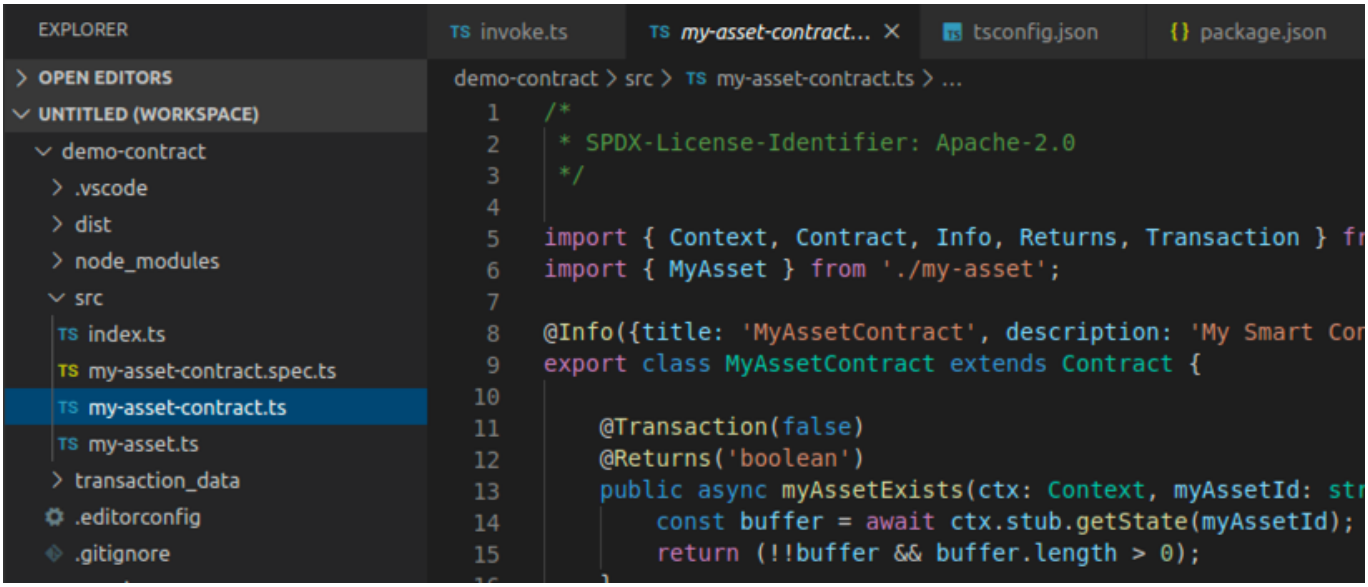
In order to successfully complete this tutorial, you must have first completed tutorial A5: Invoking a smart contract from an external application in the active workspace.

`A6.1`: Expand the first section below to get started.

▶ **Modify the smart contract**

`A6.2`: Focus the VS Code editor on the *my-asset-contract.ts* file.

You should be able to switch directly to this tab as it should still be loaded from earlier tutorials. If it is not, use the Explorer side bar to navigate to my-asset-contract.ts in the src folder of the demo-contract project.



We're going to add a new method to our smart contract which will return all of the available assets with an identifier between '000' and '999'.

A smart contract package has a version, and as smart contracts within a package evolve, the version number of the package should be incremented to reflect this change. So far, we've been working with version 0.0.1 of

the demo-contract package.

We're going to learn about the smart contract package upgrade process as we enhance the MyAsset smart contract within the package. We are going to increment the package version to reflect this change.

> **Smart contract evolution**
> Because the transactions created by a smart contract live forever on the blockchain, when a package is re-versioned, all the previously created states persist unchanged, and accessible by the new package. It means that a smart contract needs to maintain data compatibility between version boundaries as it will be working with state data created in all previous versions.
> Practically speaking, it makes sense to use extensible data structures where possible, and to have sensible defaults when values are missing.

Our new transaction will not modify any data structures, so we do not need to consider cross-version compatibility.

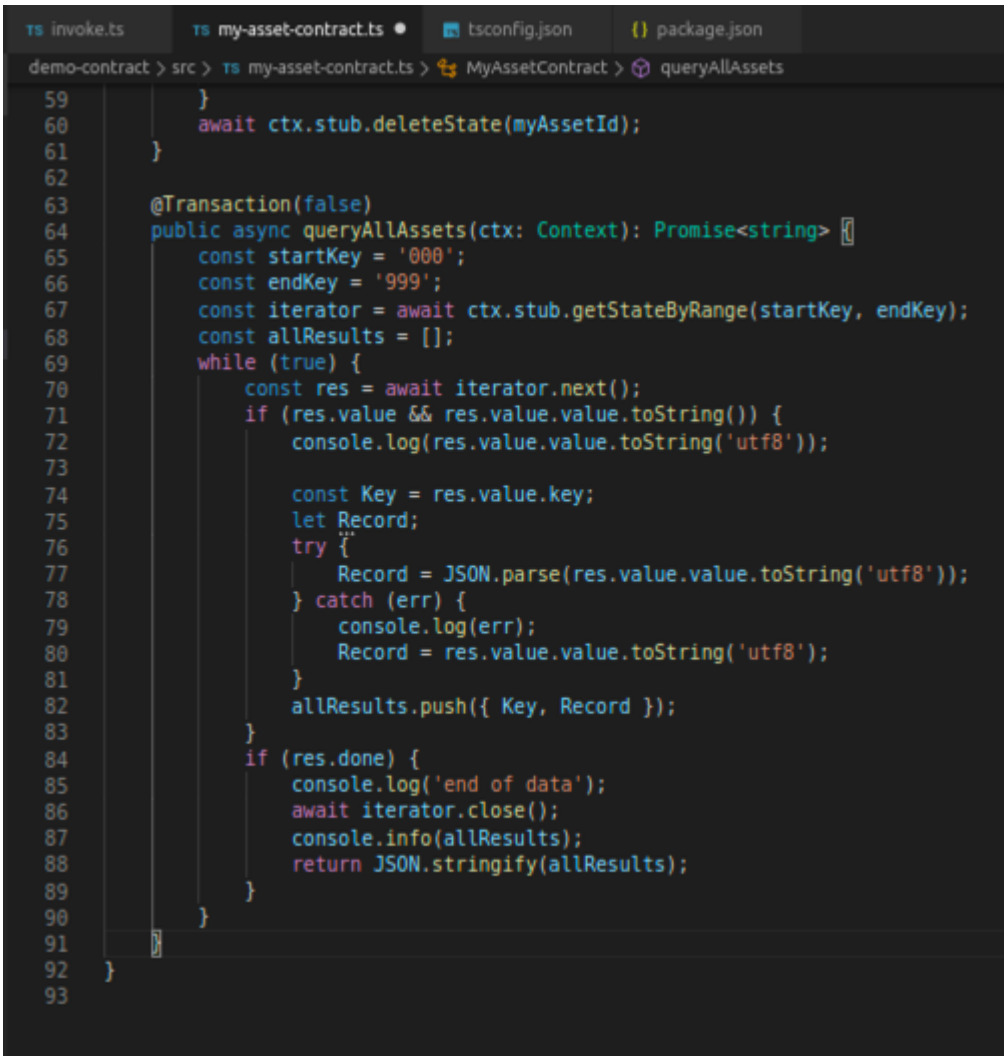
A6.3: Using copy and paste, insert the following method after the closing brace of the deleteMyAsset method, but before the final closing brace of the whole file:

```
    @Transaction(false)
    public async queryAllAssets(ctx: Context): Promise<string> {
        const startKey = '000';
        const endKey = '999';
        const iterator = await ctx.stub.getStateByRange(startKey, endKey);
        const allResults = [];
        while (true) {
            const res = await iterator.next();
            if (res.value && res.value.value.toString()) {
                console.log(res.value.value.toString());

                const Key = res.value.key;
                let Record;
                try {
                    Record = JSON.parse(res.value.value.toString());
                } catch (err) {
                    console.log(err);
                    Record = res.value.value.toString();
                }
                allResults.push({ Key, Record });
            }
            if (res.done) {
                console.log('end of data');
                await iterator.close();
                console.info(allResults);
                return JSON.stringify(allResults);
            }
        }
    }
```

You can also get the source for this method from here.

Your source file should now look similar to this:



- A6.4: Save the updated file ('File' -> 'Save').

There should be no compilation errors.

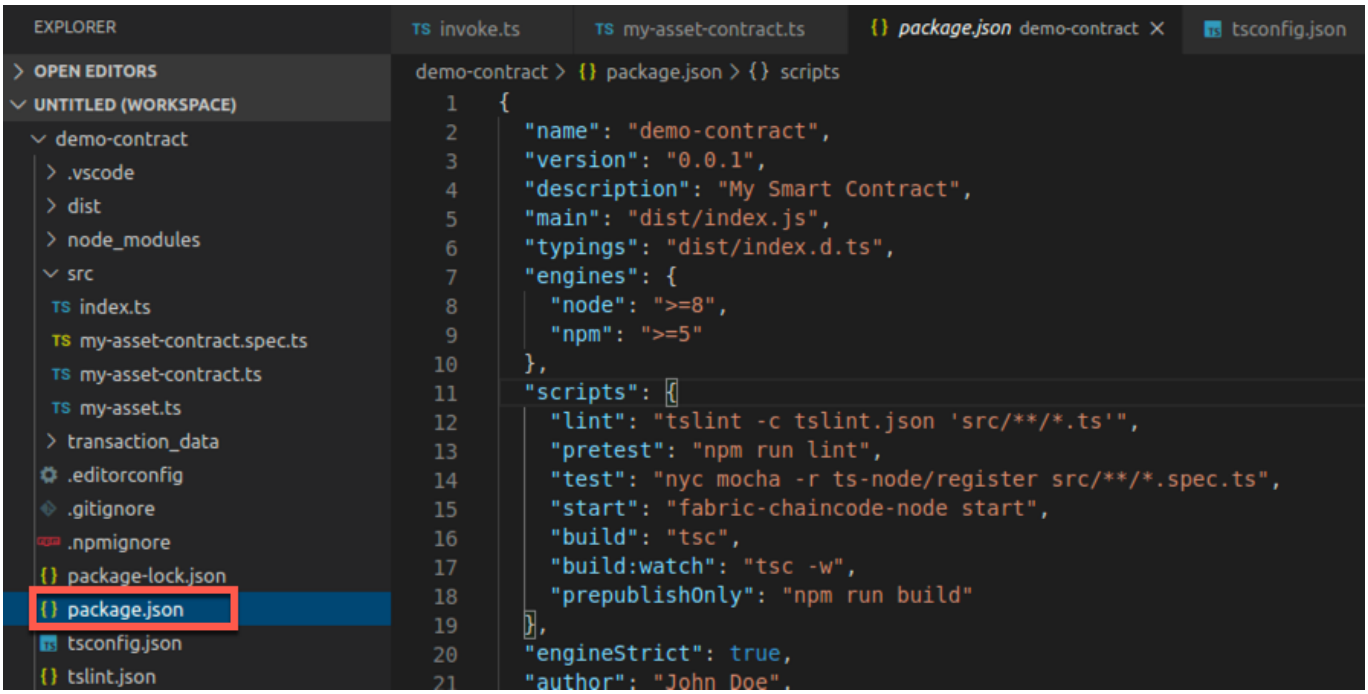
Before we can package our new smart contract, we need to update the package version number. In a production environment, an automated process would typically do this, but we will update the necessary file manually.

> **Updating smart contract package versions is mandatory**
> The IBM Blockchain Platform VS Code extension uses the version number in package.json to create the smart contract package with a unique name. It further uses the version number as the suggested default when deploying the package to the peer. The default value can be changed at deploy time, but note that Hyperledger Fabric requires that unique version numbers are used as part of the smart contract lifecycle.

- A6.5: Switch to the editor for the demo-contract *package.json* file.

Again, this should be already loaded from earlier tutorials. If not, use the Explorer side bar to navigate to package.json in the root of the demo-contract project.

Take care to load the *demo-contract* copy of the file; you will recall that we created another package.json for demo-application.



- [ ] A6.6: Edit the value of the version tag to `"0.0.2"`.

- [ ] A6.7: Save the changes ('File' -> 'Save').

In the next section we will deploy the new smart contract to our peer.

- [ ] A6.8: Expand the next section of the tutorial to continue.

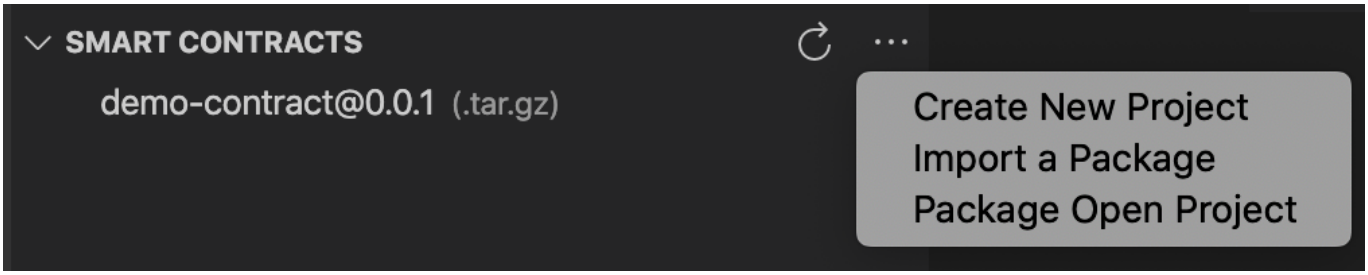
▶ Deploy the upgraded smart contract

In this section we will package the smart contract and deploy it to the peer. The upgrade process is the same as the initial deploy process from tutorial A3: Deploying a smart contract.

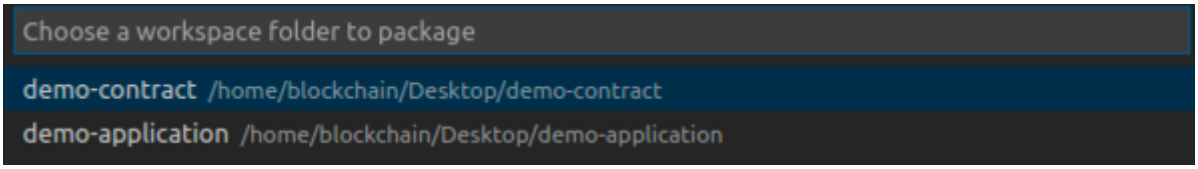
Package the smart contract

A6.9: Click the IBM Blockchain Platform activity bar icon to show the IBM Blockchain Platform side bar.

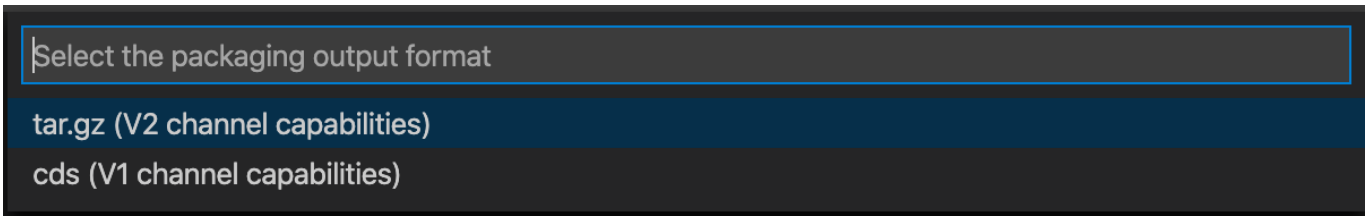
A6.10: Hover the mouse over the Smart Contracts view, click '...' and select 'Package Open Project'.



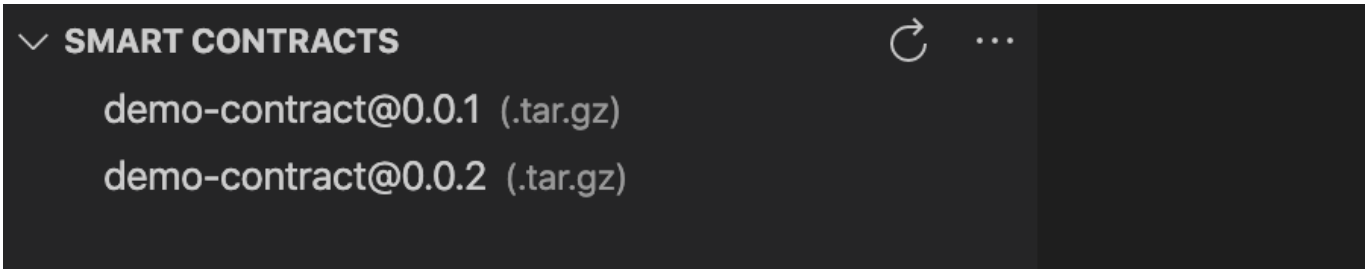
A6.11: Select 'demo-contract'.



Select "tar.gz (V2 channel capabilities)".



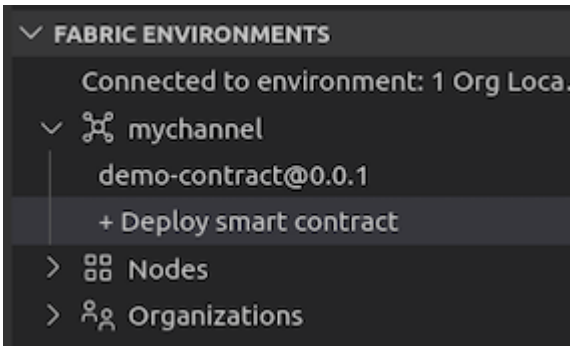
After a brief pause while the packaging completes, the newer version of demo-contract will be shown in the Smart Contracts view underneath the older one:



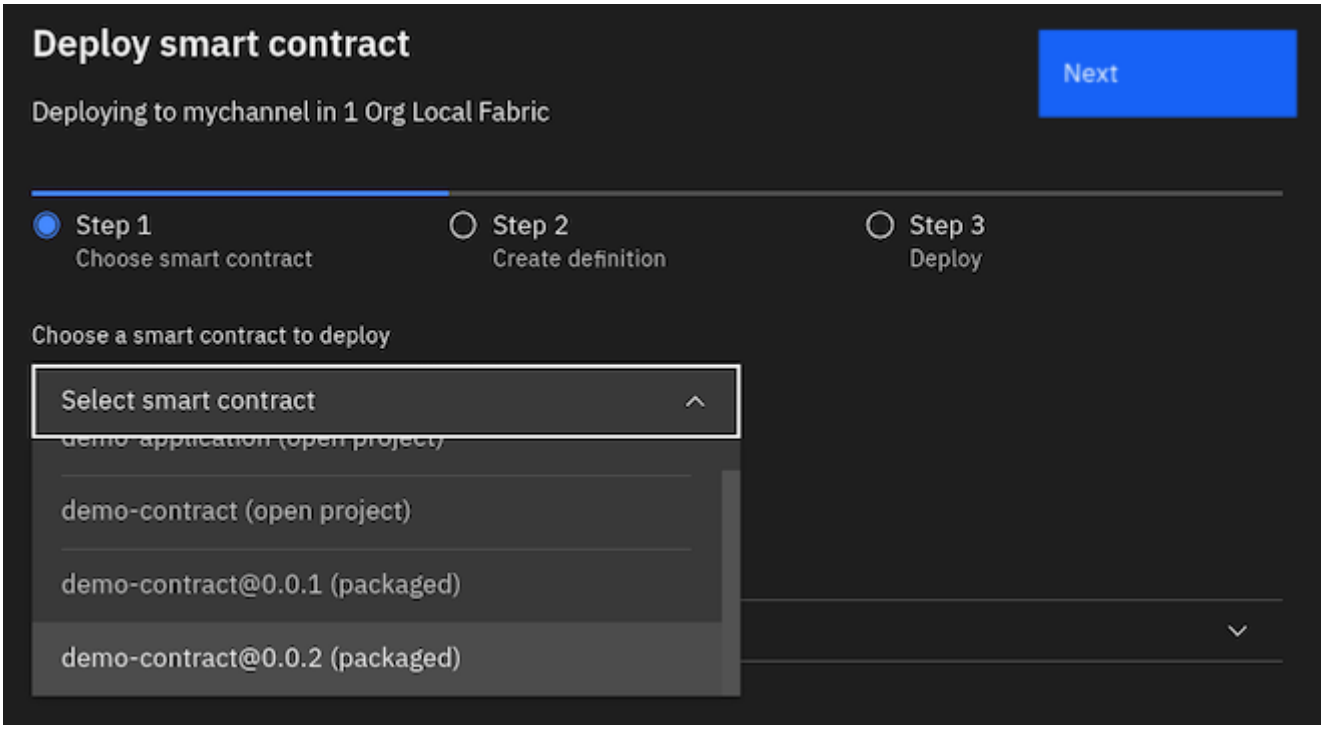
Deploy the smart contract

A6.12: In the Fabric Environments view, expand "mychannel" and click "+ Deploy smart contract".

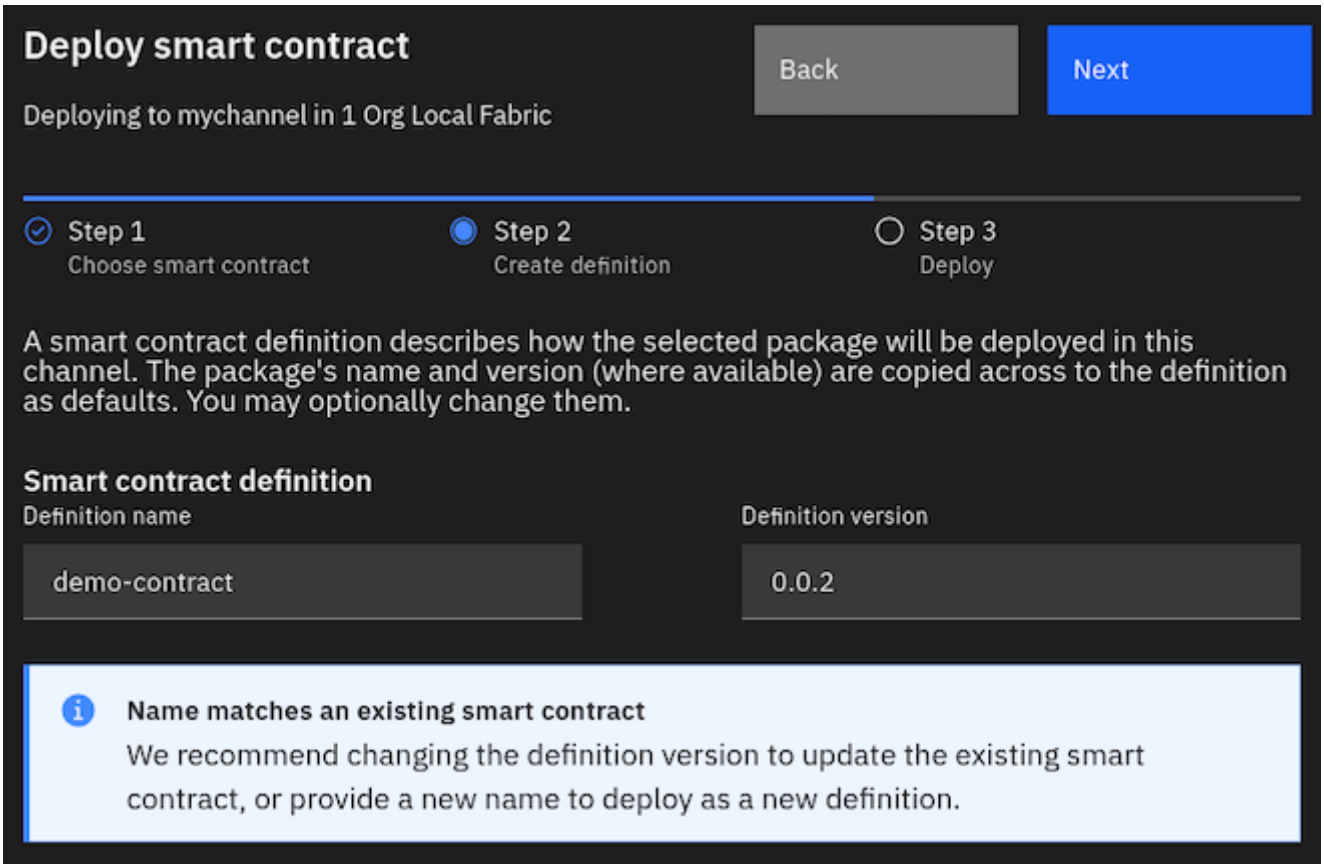
The local Fabric environment needs to be running in order to do this. If it is stopped for any reason, you will need to first click the '1 Org Local Fabric' environment in the Fabric Environments view to start it.



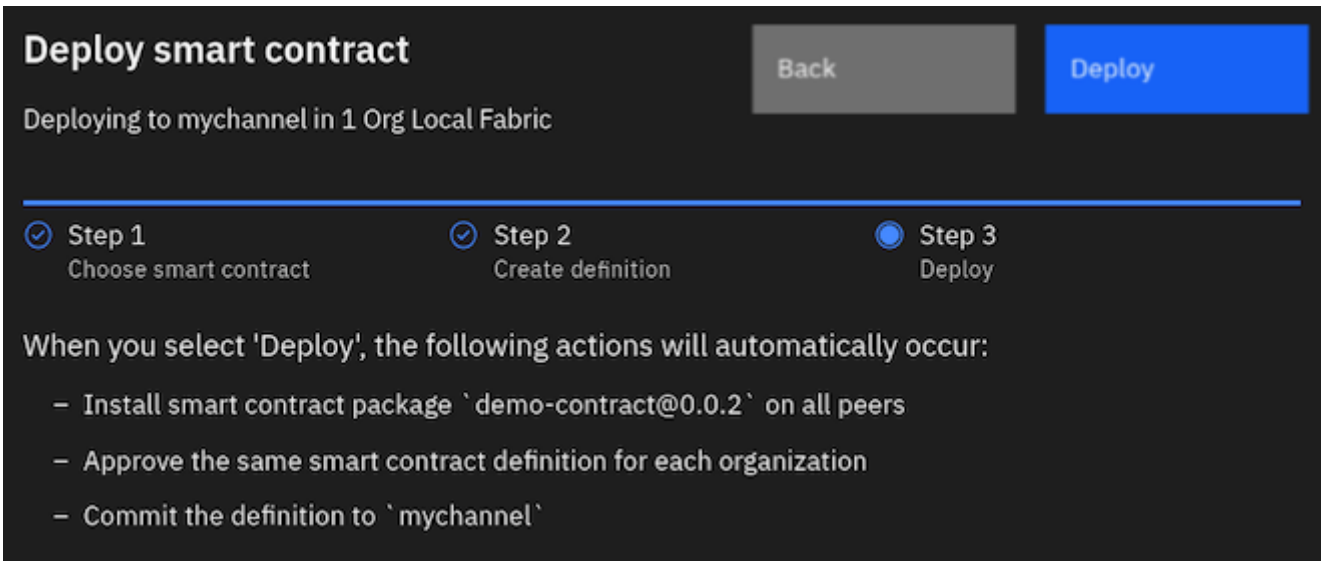
A6.13: In the Deploy Smart Contract form, select 'demo-contract@0.0.2' from the drop down list, and click 'Next'.



A6.14: In step 2 of the form, default values for Definition name and version of the updated contract are provided, click 'Next' to move to Step 3 of the deploy.

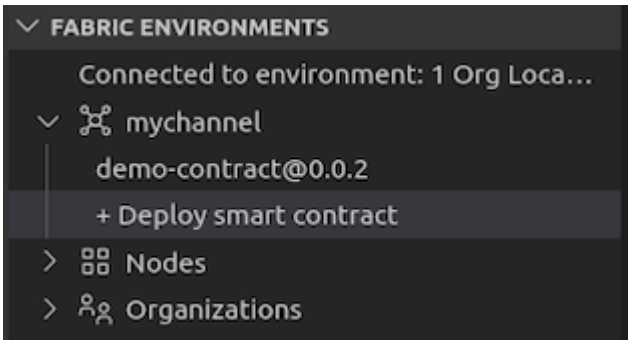


A6.15: In step 3 of the form, the automated steps of the deploy are sumarized, click 'Deploy' to start the deployment.



Deployment of the upgraded contract may take a few minutes to complete.

When the deployment is complete the upgraded version of the smart contract will be displayed in the Fabric Environments view under mychannel.



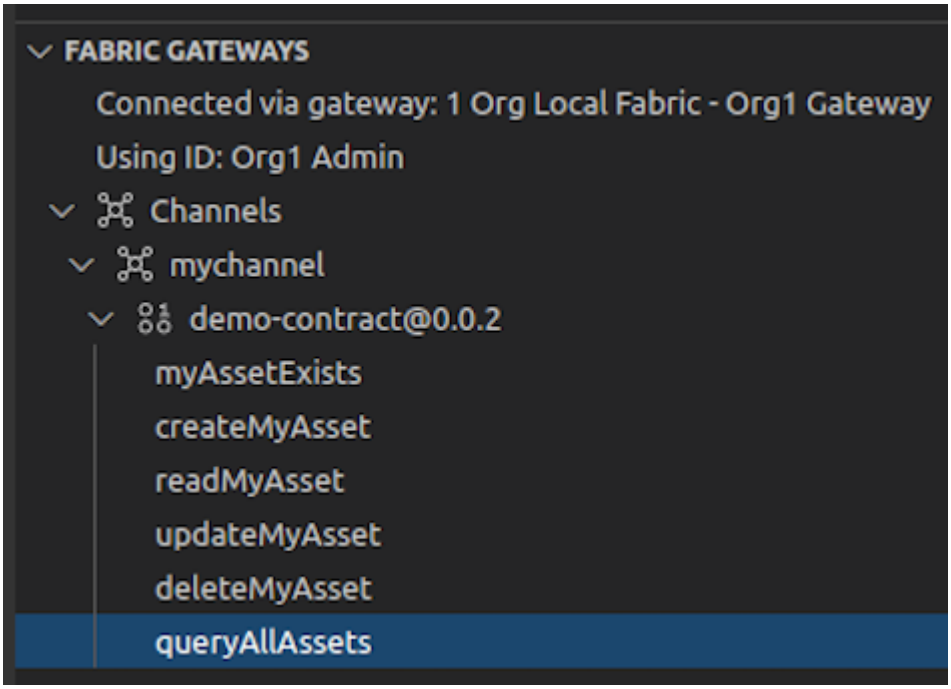
A6.16: Expand the next section of the tutorial to continue.

▶ **Try out the upgraded smart contract**

Finally in this tutorial we will try out the new *queryAllAssets* method to make sure it works. We will do this using the Fabric Gateways view.

A6.17: In the connected Fabric Gateways view, expand 'Channels' -> 'mychannel' -> 'demo-contract@0.0.2'.

You will see the new *queryAllAssets* transaction listed among the others.



If you have completed all the previous steps in this set of tutorials, your blockchain world state will only contain one asset at this point ('002'), as we deleted asset '001' at the end of tutorial A4: Invoking a smart contract from VS Code.

Therefore, to prove that we can return multiple values from our new transaction, we will first create a new asset '003'.

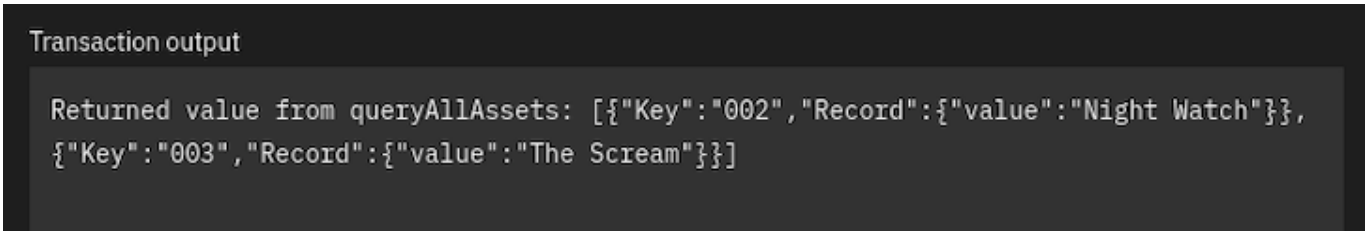
A6.18: If you have an existing Transaction View open - close it now. Click on the *createMyAsset* transaction to open a new updated Transaction view. Submit a transaction for createMyAsset and supply the JSON Transaction arguments `{"myAssetId": "003","value": "The Scream"}`. There is no transient data and no peer selection required.

The Transaction arguments presented by the Transaction view are formatted with 1 pair per line, but the whitespace is not important and they can be supplied in a single line.

With the new asset created, we will now try out the queryAllAssets transaction. It is a read-only transaction and so we can invoke it using the *evaluate* option.

A6.19: Select *queryAllAssets* from the Transaction name dropdown, leave the Transaction arguments empty `{}` and click Evaluate transaction.

You will see the results of the transaction displayed in the Transaction output field; particularly, records for asset '002' and '003'. (Output is also available at bottom of the screen.)



Congratulations, you queried all the assets on the ledger!

Summary

In this tutorial, we looked at the smart contract upgrade process in Hyperledger Fabric v2.x. We started by making a change to our existing smart contract, then we packaged it and deployed the new version of it. We then tried it out.

In the next tutorial, we will look at some features in the IBM Blockchain Platform VS Code extension that makes the debugging of smart contracts easier.

→ Next: A7: Debugging a smart contract