



Python Wrangling for SAP HANA Application Developers

DAT-368

Exercises / Solutions

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BEFORE YOU START

System Host: wdflbmt0794.wdf.sap.corp

System Instance Number: 00

System User ID: DAT368

All Passwords: WelcomeSAP2018

XSA Organization: TECHED

XSA Development Space: DEV

Getting Help

If you need addition help resources beyond this document, we would suggest the following content:

- The Online Help at <https://help.sap.com/viewer/4505d0bda4948449b7f7379d24d0f0d/2.0.03/en-US/8d786ec8ab964145a7453c1f53f452db.html>

Source Code Solutions

The source code repository for the first part of this exercise with the python module disabled can be found in the following webpage.

<https://github.com/alundesap/TechEd2018.DAT368>

In exercise #3 we will switch to another branch of the project where the python module is enabled.

Open the browser and enter the following URL to access the python enabled solution web page

<https://github.com/alundesap/TechEd2018.DAT368/tree/solution>

Updated versions of this exercise document and presentation are available here.

[DAT368 Exercises](#)

[DAT368 Presentation](#)

Time Considerations

If you are familiar with the SAP HANA Web IDE and the xs command line interface, you may consider skipping some sections of the exercises in the interests of time.

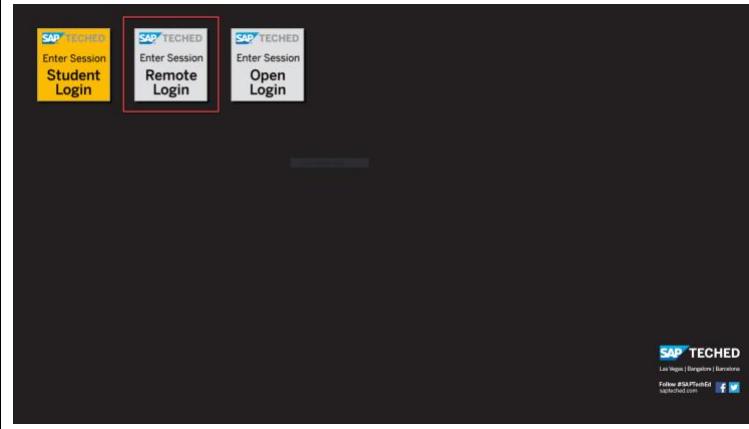
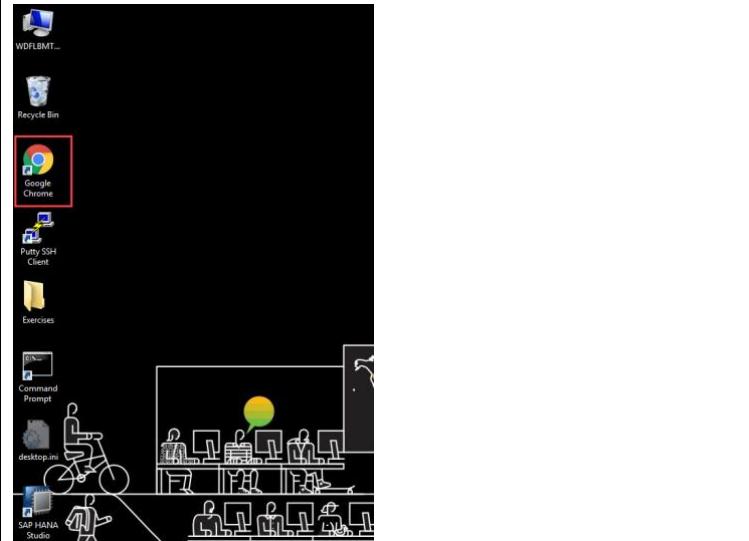
Be sure to start with the first exercise and complete all the steps until you come to a Time Check: notation. Skip ahead to the point indicated and continue with the steps until you come to another Time Check:. This insures that you've completed the required steps and have read the supporting discussion.

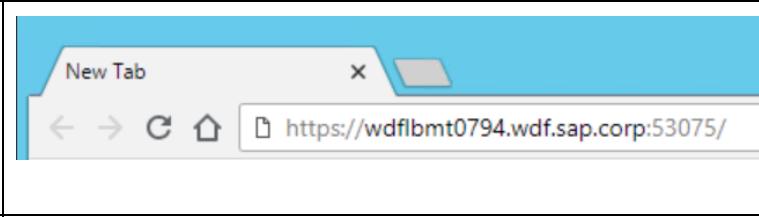
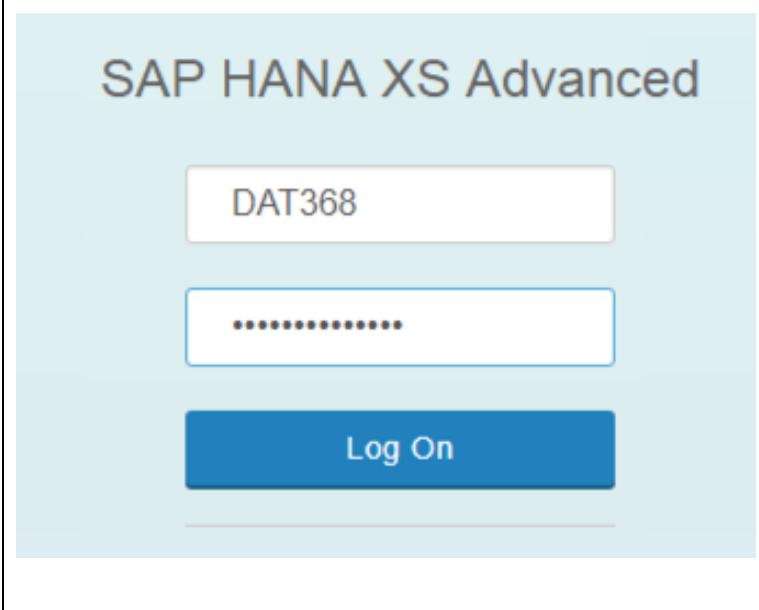
EXERCISE 1

During this exercise it's important to understand that the primary tool that SAP provides for micro-service application development is a convenient front end to the server's underlying activities. We can perform the same activities manually with the command line interface by ssh'ing into the server itself. We will be jumping back and forth from the Web IDE and the XS CLI in order to get you comfortable with the concepts and our action's effects. First we'll start with a project that doesn't contain a Python module to get the feel of things.

Time Check: If you are familiar with the functioning of the Web IDE you can save time by skipping to [Exercise 1.2.](#)

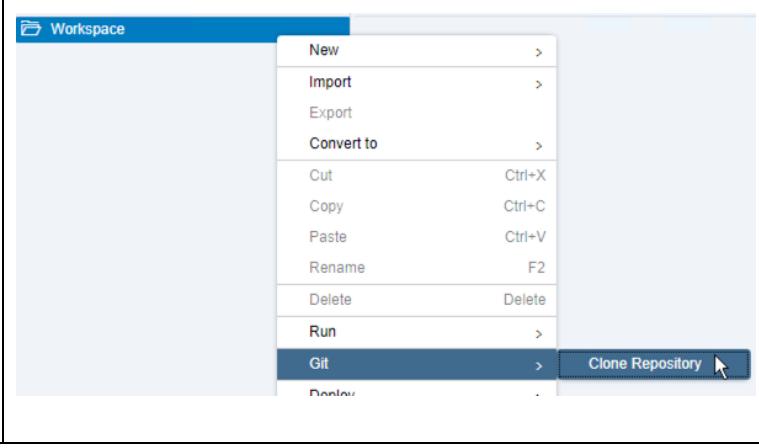
Exercise 1.1: MTA Project - Web IDE Usage and Limitations

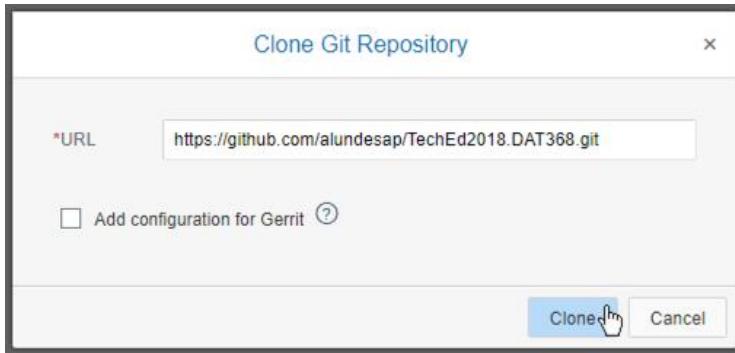
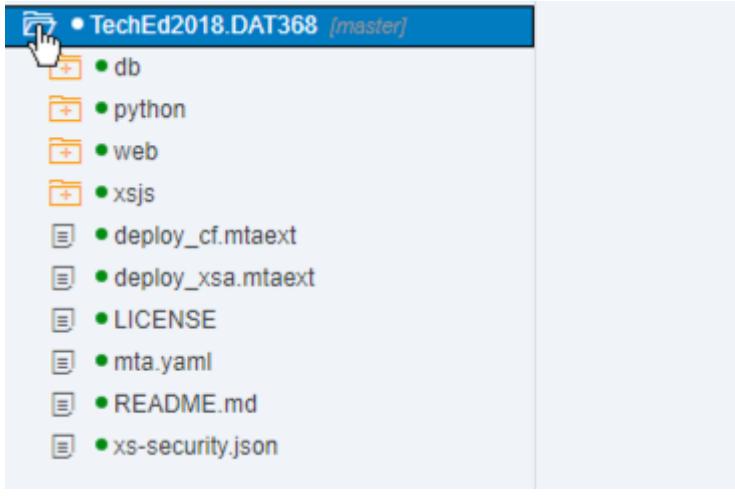
Explanation	Screenshot
<p>1. Please click on the Remote Login tile. You will be asked for username and password - please enter: .\student with password: Welcome18</p>	
2. From your desktop launch the Google Chrome web browser.	

<p>Launch the SAP Web IDE for SAP HANA at the following URL in your web browser.</p> <p>https://wdflbmt0794.wdf.sap.corp:53075/</p>	
3. User: DAT368 Password: WelcomeSAP2018	

Note: If the Tips and Tricks dialog window appears, just close it by clicking the **Close** button.

Since the point of this exercise is to illustrate what the Web IDE does for us, we will begin by importing an existing MTA project into the workspace.

4. Right-click on Workspace and select Git->Clone Repository	
--	--

<p>5. Use the following URL. https://github.com/alundesap/TechEd2018.DAT368.git and click Clone</p>	
<p>6. Expand the TechEd2018.DAT368 project to show its modules.</p>	

Notice that there are module folders named db, python, web, and xsjs. While the db, web, and xsjs modules were created with the Web IDE, the python folder is just a simple folder with python files in it. If you right click on the db, web, or xsjs folders, you'll see there there is build option available. If you do the same with the python folder, no build option is present. This is because the Web IDE currently doesn't recognize modules of the type python.

Now let's examine the mta.yaml file that defines the project's modules and relations to each other and to other services. The Web IDE provides a graphical editor to yaml files, but we will want to look at the file in the code editor.

<p>7. Right-click on the mta.yaml file and select Open With -> Code Editor.</p>	
---	--

8. Scroll the mta.yaml file in the editor window and notice that the lines pertaining to the python module are commented out with # at the beginning of the line. Yaml allows for comments so these lines will not be processed.

```

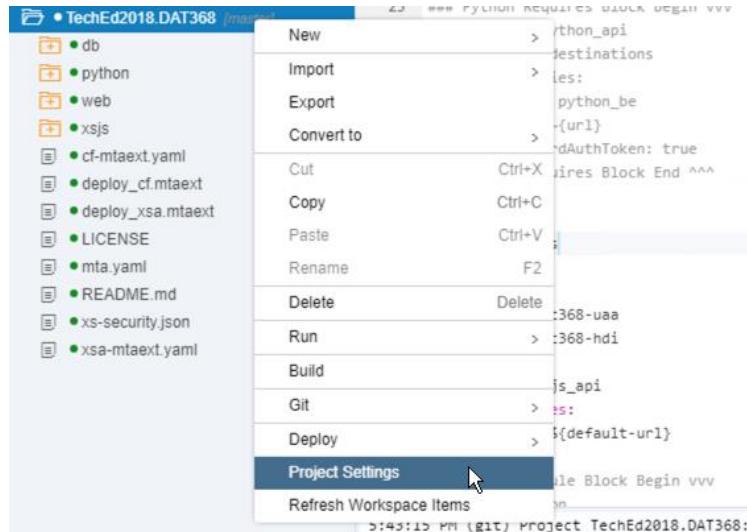
42     ## Python Module Block Begin vvv
43     # - name: python
44     #   type: python
45     #   path: python
46     #   requires:
47     #     - name: dat368-uaa
48     #       - name: dat368-hdi
49     #     provides:
50     #       - name: python_api
51     #     properties:
52     #       url: ${default-url}
53     ## Python Module Block End ^^^
54
55

```

9. Let's build the db module.

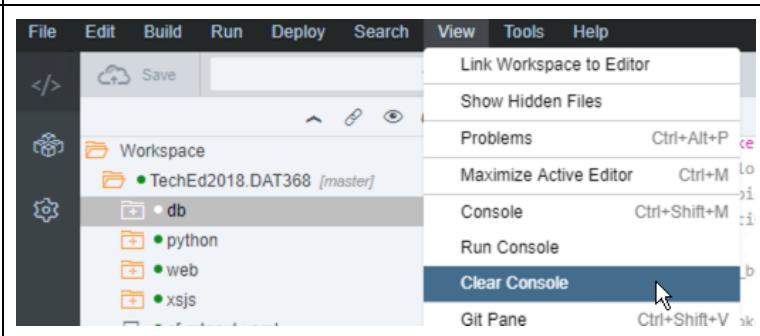
However, since we've just imported this project, the system needs to know what space to associate the project with.

Right-click on the project level and then click **Project Settings**.



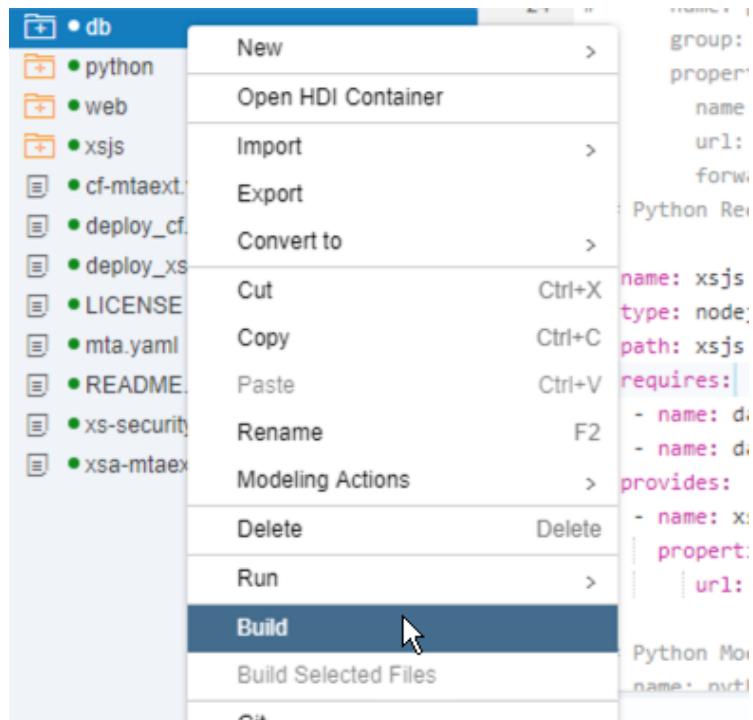
10. Select **Space**.



11. And select DEV from the Space dropdown. Then click the Save button, then Close .	 <p>The screenshot shows the SAP HANA Studio interface. At the top, there is a dropdown menu labeled "Space" with "DEV" selected. Below the menu, there are two buttons: "Save" (highlighted with a mouse cursor) and "Close".</p>
12. Before initiating a build operation, it's handy to clear out the contents of the console window first. From the menu, select View->Clear Console . This removes any prior build output lines so you are not confused by them.	 <p>The screenshot shows the SAP HANA Studio interface with the "View" menu open. The "Clear Console" option is highlighted with a blue selection bar and a mouse cursor is hovering over it. Other options in the menu include "Link Workspace to Editor", "Show Hidden Files", "Problems", "Maximize Active Editor", "Console", "Run Console", "Git Pane", and keyboard shortcuts for each.</p>

13. Now we can build.

Right-click on the db folder and select **Build**.

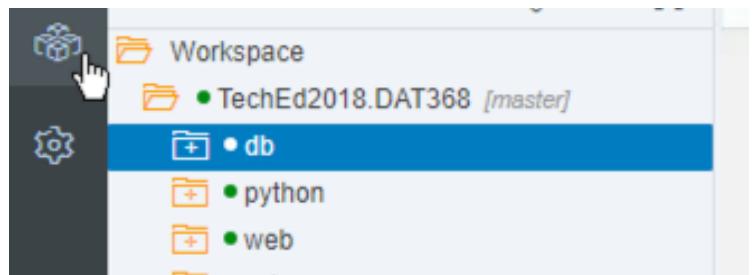


If the build went well, you should see the following lines at the bottom of the console output.

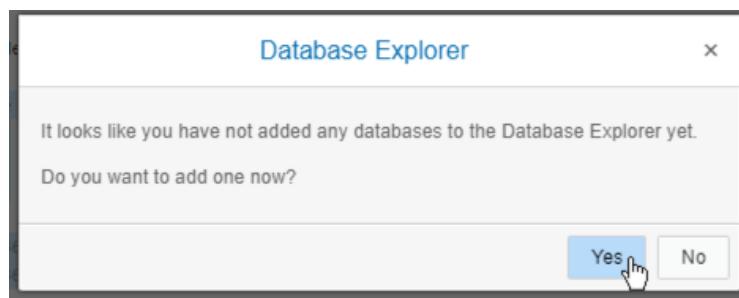
```
11:34:24 PM (DIBuild) ***** End of /TechEd2018.DAT368/db Build Log *****
11:34:24 PM (DIBuild) Build results link: https://wdflbmt0794.wdf.sap.corp:53075/che/bu
11:34:24 PM (Builder) Build of /TechEd2018.DAT368/db completed successfully.
```

What really is going on is that a special nodejs module is being run that reads the files in the db folder and produces a private schema in the database with all the tables and views you've defined as well as a system generated user and password for access. This isolates the data from other schemas that may be deployed in the system. After the nodejs is done running, it stops but the resulting schema remains. We can connect to it and explore its artifacts.

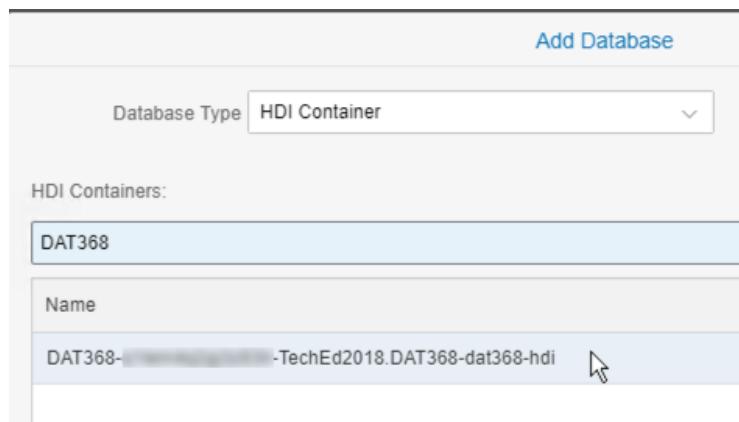
14. Click on the DB Explorer icon.



15. Since no DB connections have yet been made, click **Yes**.



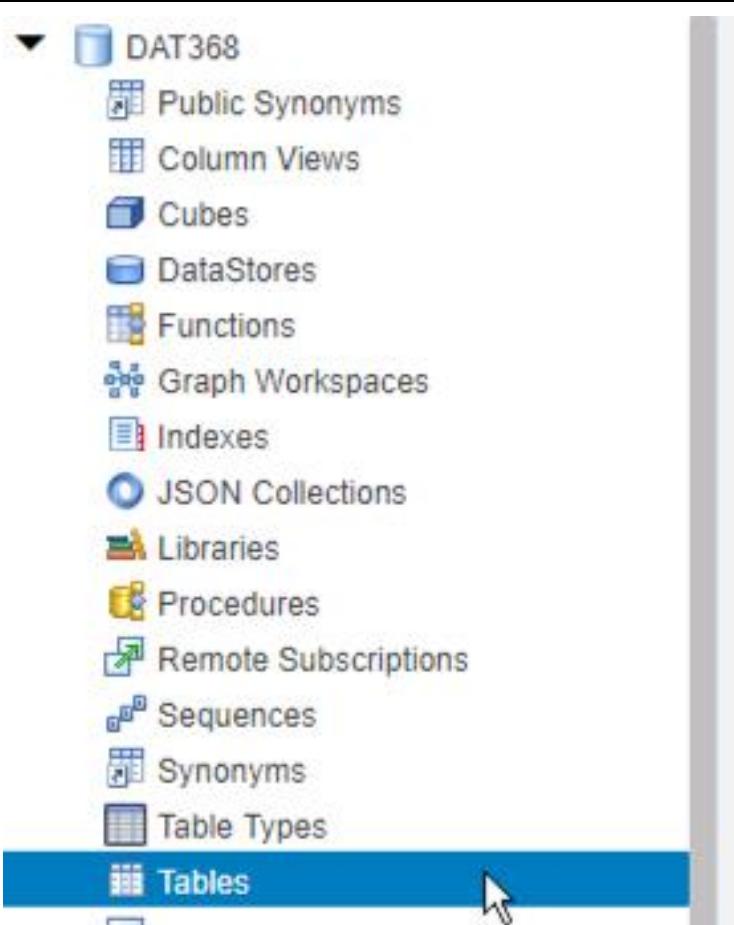
16. Enter **DAT368** in the HDI Containers field to narrow the list, and then select the line that starts with DAT368.



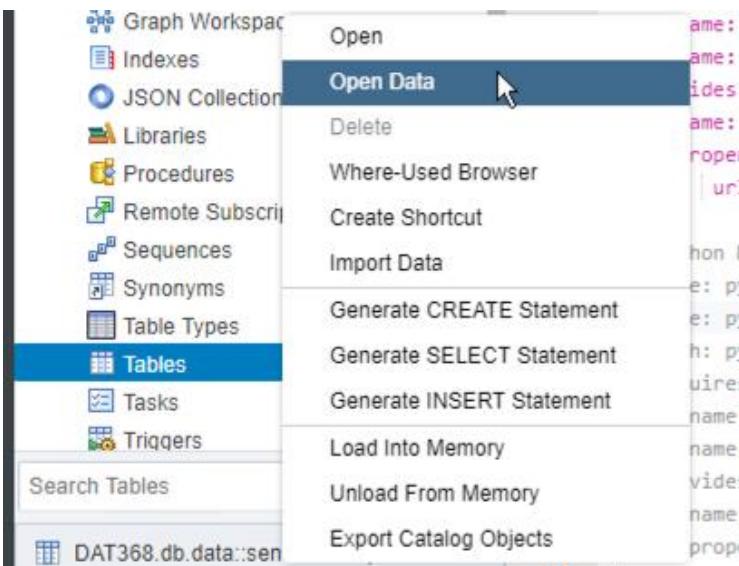
17. Remove the long suggested name and enter **DAT368** in the Name to Show in Display field and then click the **OK** button.



18. Left-click on Tables. Notice that a table named DAT368.db.data::sensors.tem p appears in the list below.



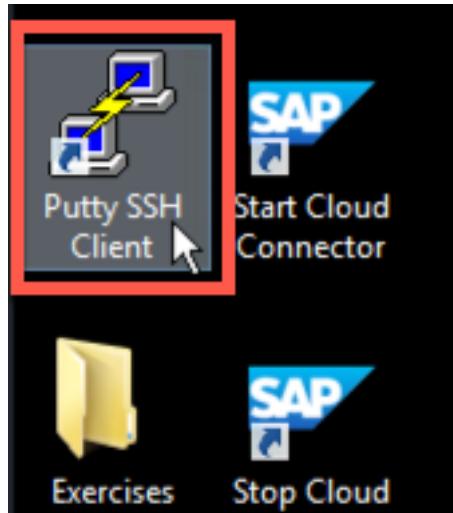
19. Right-click on the DAT368.db.data::sensors.tem p table and select **Open Data**.



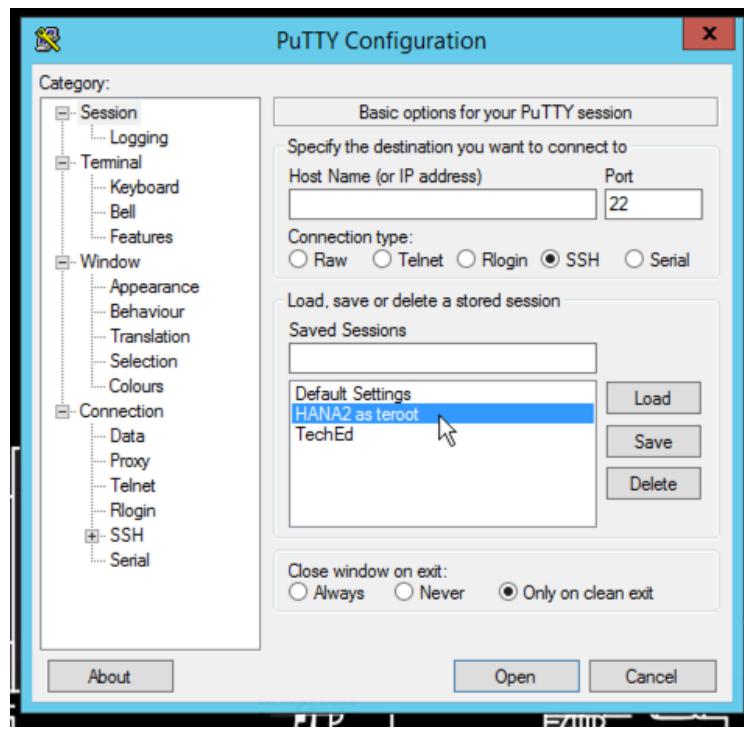
You will see the table's contents in the window to the right. There is currently one row of data with tempVal of 100 that exists in a single table. This was inserted as part of the processing of the db module.

Exercise 1.2: Using the XS CLI

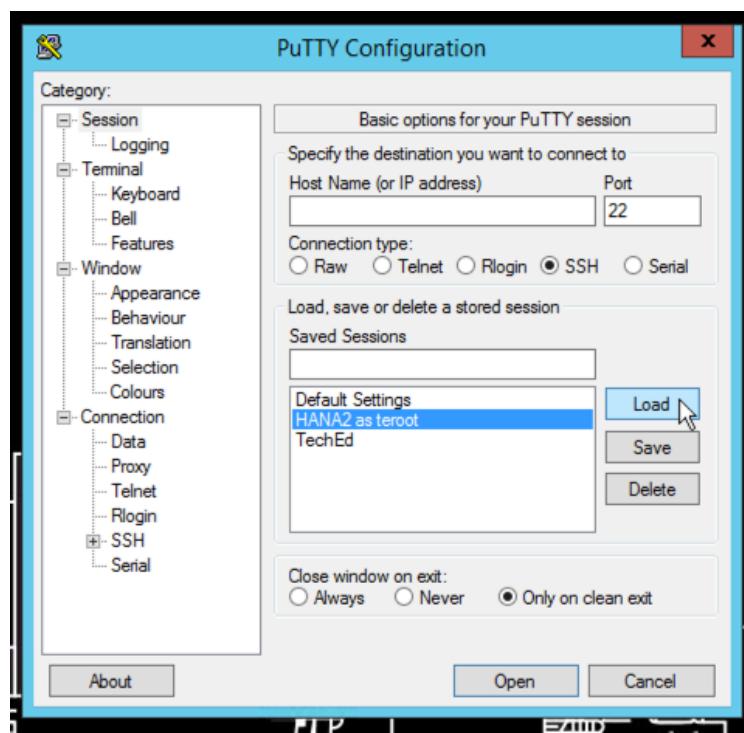
We will use a common windows Secure Shell tool called Putty SSH to inspect the underlying system with the XS Command Line Interface(CLI). While it's possible to install the XS CLI on the local workstation, it's often better to work on the server itself so that the environment that you're building with is similar to the environment you will deploy into.

Explanation	Screenshot
<ol style="list-style-type: none">1. Return to the desktop and double-click on the Putty SSH Client icon.	 A screenshot of a Windows desktop. A red box highlights the 'Putty SSH Client' icon, which features a blue and white icon of two computer monitors. To the right of the icon is the text 'Putty SSH Client'. Below the icon is a cursor arrow pointing towards it. To the right of the icon are two other items: a blue 'SAP' icon labeled 'Start Cloud Connector' and a yellow folder icon labeled 'Exercises'. At the bottom right is another blue 'SAP' icon labeled 'Stop Cloud'.

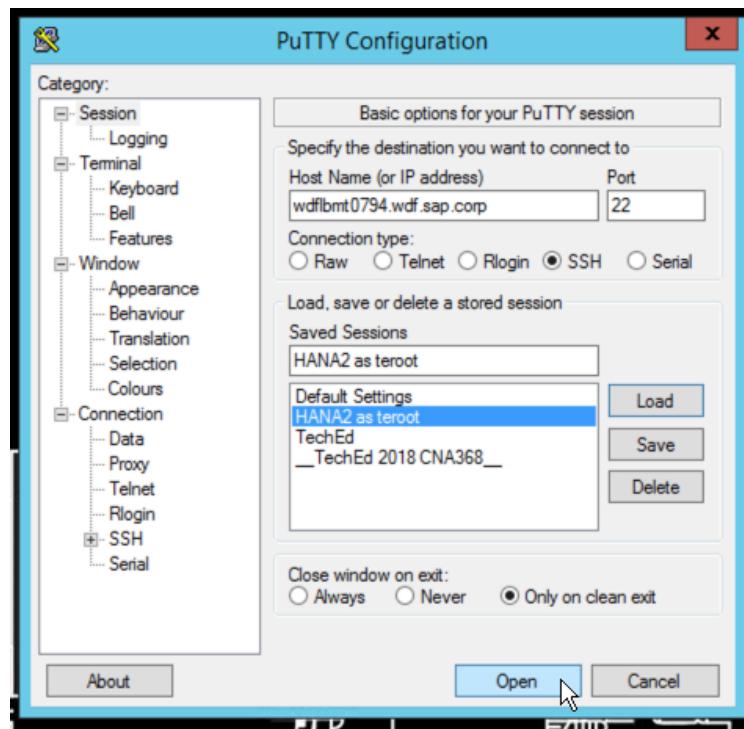
2. Select the **HANA2 as teroot** line from the Saved Sessions.



3. Then click **Load**.

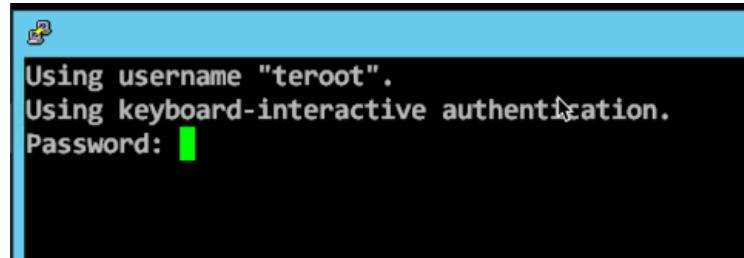


4. And finally **Open**.



5. A putty window will open and you'll be prompted to enter a password.

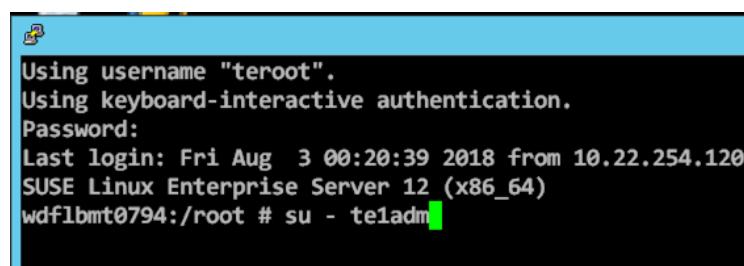
Password: **Welcome18**



6. Become the user te1adm with the command.

su - te1adm

This is the DB administration user for the TE1 tenant DB and we'll use this user for subsequent commands.



You may want to open multiple Putty session windows, just repeat the prior login.

Note: Putty will copy text into the copy buffer by simply selecting it. You can then past the text in Windows with Ctrl-V. To perform the opposite, use Ctrl-C in Windows and then right-click in the Putty console to paste the copy buffer into the command line.

Be very careful not to pick up any whitespace when selecting text! Double check after pasting!

7. Verify the xs cli is set correctly.

xs api

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs api
API endpoint: https://wdflbmt0794.wdf.sap.corp:30030
SSL trust: The authenticity of host 'wdflbmt0794.wdf.sap.corp' router/default.root.crt.pem' certificate.

te1adm@wdflbmt0794:/usr/sap/TE1/HDB00>
```

If you find the api not set properly, you can reset it with this command.

```
xs api https://wdflbmt0794.wdf.sap.corp:30030 --cacert
/hana/shared/TE1/xs/controller_data/controller/ssl-pub/router/default.root.crt.pem
```

8. Log in as the XSA_ADMIN user.

xs login -u XSA_ADMIN -p WelcomeSAP2018

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs login -u XSA_ADMIN -p WelcomeSAP2018
API_URL: https://wdflbmt0794.wdf.sap.corp:30030
USERNAME: XSA_ADMIN
Authenticating...
ORG: TechEd
SPACE: DEV
API endpoint: https://wdflbmt0794.wdf.sap.corp:30030 (API version: 1)
User: XSA_ADMIN
Org: TechEd
Space: DEV
```

9. If the space is not DEV then select the DEV space with the xs target command.

xs t -s DEV

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs t -s DEV
API endpoint: https://wdflbmt0794.wdf.sap.corp:30030 (API version: 1)
User: XSA_ADMIN
Org: TechEd
Space: DEV

te1adm@wdflbmt0794:/usr/sap/TE1/HDB00>
```

Time Check: If you are familiar with how to use the xs cli you can skip to [Exercise 1.3](#).

10. Use the xs apps command to list all the applications(modules) in the space.

xs apps

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs apps
Getting apps in org "TechEd" / space "DEV" as XSA_ADMIN...
Found apps:
name requested state instances memory disk urls
----- -----
hrtt-service STARTED 1/1 512 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51009
sqlanlz-svc STARTED 1/1 256 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51010
sqlanlz-ui STARTED 1/1 128 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51011
hrtt-core STARTED 1/1 512 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51012
di-local-npm-registry STARTED 1/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51015
di-core STARTED 1/1 2.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51016
devx-uuis STARTED 1/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51017
di-npmui STARTED 1/1 2.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51020
di-cert-admin-ui STOPPED 0/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51021
di-space-enablement-ui STOPPED 0/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51022
tools STARTED 1/1 128 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51023
webide STARTED 1/1 512 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:53075
xsa-admin-backend STARTED 1/1 128 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51026
xsa-admin STARTED 1/1 128 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51025
xsa-cockpit STARTED 1/1 512 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51027
di-builder STARTED 1/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51006
sapui5_fesv4 STARTED 1/1 256 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51024
sapui5_sb STARTED 1/1 128 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51028
web-console STARTED 1/1 1.00 GB <unlimited> https://wdflbmt0794.wdf.sap.corp:51029
TechEd2018CentralDB.core_db STOPPED 0/1 256 MB <unlimited> <none>

te1adm@wdflbmt0794:/usr/sap/TE1/HDB00>
```

Note that there are quite a few applications. Some of them are system tools and would normally be installed in a different space. In order to focus on our application we will often filter the output with grep. As an example, let's look at the apps with xsa in their name. I'll use the shorthand for the apps command (a).

<p>11. Enter this command.</p> <pre>xs a grep xsa</pre>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs a grep xsa xsa-admin-backend STARTED 1/1 128 MB xsa-admin STARTED 1/1 128 MB xsa-cockpit STARTED 1/1 512 MB te1adm@wdflbmt0794:/usr/sap/TE1/HDB00></pre>
<p>12. Let's list the services that are in the space. Again, I'll use the shorthand(s) and filter out all but our container.</p> <pre>xs s grep DAT368</pre> <p>Note: If you had skipped ahead, you won't see this service.</p>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs s grep DAT368 DAT368--TechEd2018.DAT368-dat368-hdi hana te1adm@wdflbmt0794:/usr/sap/TE1/HDB00></pre>
<p>13. And finally the (r)outes that apps in this space have registered.</p> <pre>xs r</pre>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> xs r Getting routes in org "TechEd" / space "DEV" as XSA_ADMIN... host domain port path type apps -----+ wdflbmt0794.wdf.sap.corp 51009 / HTTP hrtt-service wdflbmt0794.wdf.sap.corp 51010 / HTTP sqlanlz-svc wdflbmt0794.wdf.sap.corp 51011 / HTTP sqlanlz-ui wdflbmt0794.wdf.sap.corp 51012 / HTTP hrtt-core wdflbmt0794.wdf.sap.corp 51015 / HTTP di-local-npm-registry wdflbmt0794.wdf.sap.corp 51016 / HTTP di-core wdflbmt0794.wdf.sap.corp 51017 / HTTP devx-ui5 wdflbmt0794.wdf.sap.corp 51020 / HTTP di-runner wdflbmt0794.wdf.sap.corp 51021 / HTTP di-cert-admin-ui wdflbmt0794.wdf.sap.corp 51022 / HTTP di-space-enablement-ui wdflbmt0794.wdf.sap.corp 51023 / HTTP tools wdflbmt0794.wdf.sap.corp 53075 / HTTP webide</pre>

We can see by listing the services that there is one named DAT368--....dat368-hdi that matches the name of the container that we viewed using the DB Explorer function in the Web IDE. Keep in mind that while the Web IDE provides a nice GUI, the underlying actions can also be performed with the xs command line tool.

Exercise 1.3: Cloning the project into the server's file space

We will need a copy of the same example project in the te1adm's home directory as well so that we can perform the tasks for building the project with the python module. Enter the following git clone command.

```
git clone https://github.com/alundesap/TechEd2018.DAT368.git
```

This can take about a 1 1/2 minutes.

<p>1. Use git to clone the repo.</p> <pre>git clone https://github.com/alundesap/TechEd2018.DAT368.git</pre>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> git clone https://github.com/alundesap/TechEd2018.DAT368.git Cloning into 'TechEd2018.DAT368'... remote: Counting objects: 109, done. remote: Compressing objects: 100% (92/92), done. remote: Total 109 (delta 31), reused 64 (delta 8), pack-reused 0 Receiving objects: 100% (109/109), 31.16 KiB 0 bytes/s, done. Resolving deltas: 100% (31/31), done. te1adm@wdflbmt0794:/usr/sap/TE1/HDB00></pre>
---	--

2. List the files and folders in the current directory.

ls

Make sure you see the **TechEd2018.DAT368** folder.

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> ls
HDB      HDBSettings.csh  Python_3.6.5.tar.gz  XS_
HDBAdmin.sh  HDBSettings.sh  TechEd2018.DAT368  bac
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00>
```

3. Change into the git cloned directory.

cd TechEd2018.DAT368

and list the files.

ls -1

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> ls -1
LICENSE
README.md
db
deploy_cf.mtaext
deploy_xsa.mtaext
mta.yaml
python
web
xs-security.json
xsjs
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

The reason we need to clone the project in the filesystem as well is that we need to reference the **xs-security.json** file when setting up our application's authorization service.

The Web IDE can't create an authentication service instance for us so we need to create one for ourselves. In addition, we will pass a configuration file that defines the role our application will need. Perform this **xs** command to manually create the xsuaa service instance with the **xs-security.json** configuration file.

Note: We set up the authentication service instance ahead of time so that we can create the needed role collections and assign them to our user before deploying our full application.

4. Create the service instance.

xs cs xsuaa default dat368-uaa -c /xs-security.json

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs cs xsuaa
Creating service "dat368-uaa"...
OK
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Exercise 1.4: Role Collection Setup

Once the xsuaa service instance is created, the system understands the roles that you've defined in the xs-security.json file. We need to create role collections to contain these roles that we will then assign to users. To do so, we will need to access the XSA Cockpit utility. Find it's url by using the xs cli.

Note: Normally the xsa-cockpit tool will not be installed in the same space you would be targeting for development. However, for this workshop the tool is installed here so we don't have to change to a new space to get details about it.

- Query the xsa-cockpit app for the urls that it's registered.

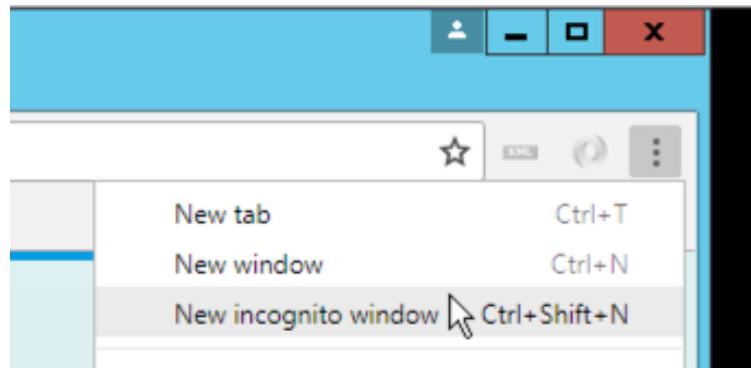
xs app xsa-cockpit --urls

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs app xsa-cockpit --urls
https://wdflbmt0794.wdf.sap.corp:51027
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █
```

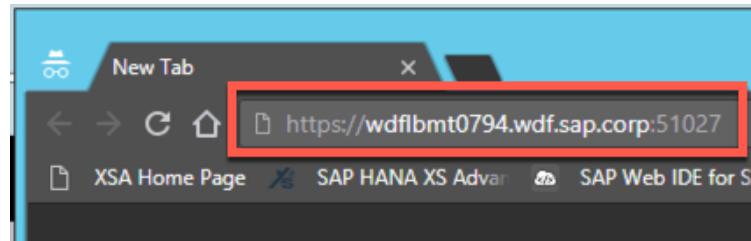
Double check that the URL that's returned matches this one and adjust the port number if yours differs.

<https://wdflbmt0794.wdf.sap.corp:51027>

- In the Chrome browser, open a new incognito window by using the key combination Ctrl+Shift+N or clicking on the stacked dots icon in the upper-right corner of the browser window.



- Paste the URL into the browser making sure the port number is what was returned above.



4. Log in but this time use the XSA_ADMIN user.

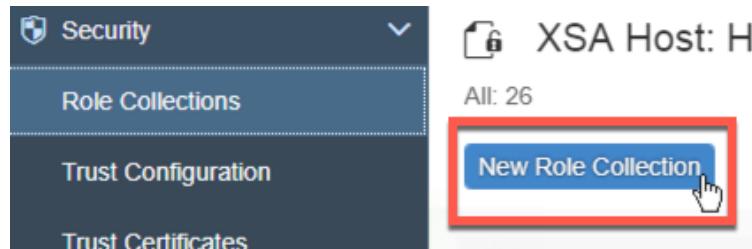
User: **XSA_ADMIN**
Password: **WelcomeSAP2018**

Note: You may want to type in the user and password by hand in order to avoid accidentally getting any whitespace characters when cutting and pasting.

SAP HANA XS Advanced

The image shows the SAP HANA XS Advanced login interface. It has two input fields: one for the username 'XSA_ADMIN' and one for the password, which is currently masked with dots. Below the password field is a large blue 'Log On' button.

5. Under **Security**, select **Role Collections** and **New Role Collection**.



6. Give it a name and description and click **Save**.

Name: **DAT368_MGR**
Description: **DAT368 Manager Role Collection**

The screenshot shows a 'New Role Collection' dialog box. It has two input fields: one for 'Name' containing 'DAT368_MGR' and another for 'Description' containing 'DAT368 Manager Role Collection'. At the bottom, there are 'Save' and 'Cancel' buttons, with 'Save' highlighted with a red box and a cursor icon pointing to it.

7. Click on the DAT368_MGR link.



8. Click on **Add Role**.



9. You will get a dialog box with 3 dropdowns. Starting with the top one, select DAT368.

10. Then for Role Template, select **DAT368Manager**.

11. Then for Role, select **DAT368Manager**.

12. And finally, click **Save**.

Note: If the Application Identifier dropdown doesn't list DAT368, there was an issue with the creation of the xsuaa service instance. Go back and delete the dat368-uaa with "xs ds dat368-uaa" and re-create it making sure to pass the ./xs-security.json configuration file.

Go back to [Home](#) and create a **New Role Collection** as before this time calling it **DAT368_USR** with Description **DAT368 User Role Collection**.

13. Click **Save** when finished.

New Role Collection

*Name:	DAT368_USR
Description:	DAT368 User Role Collection
<input style="background-color: #0070C0; color: white; font-weight: bold; border: none; padding: 5px 10px; margin-right: 10px;" type="button" value="Save"/> <input style="border: none; padding: 5px 10px;" type="button" value="Cancel"/>	

14. Click on the DAT368_USR link.



15. Click **Add Role** and select these values from the dropdowns and click **Save**.

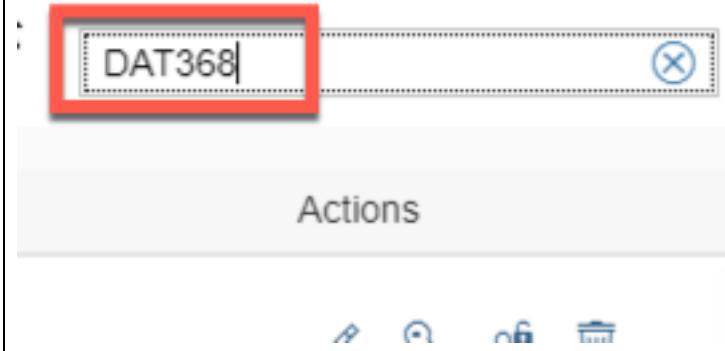
Add Role

*Application Identifier:	DAT368
*Role Template:	DAT368User
*Role:	DAT368User
<input style="background-color: #0070C0; color: white; font-weight: bold; border: none; padding: 5px 10px; margin-right: 10px;" type="button" value="Save"/> <input style="border: none; padding: 5px 10px;" type="button" value="Cancel"/>	

Now that we've added roles to our role collections, we need to assign the role collection to a user. We'll use the **DAT368** user for this.

Click the [Home](#) link near the top of the page and **User Management**. In the search box type **DAT368**. This will limit the users being displayed.

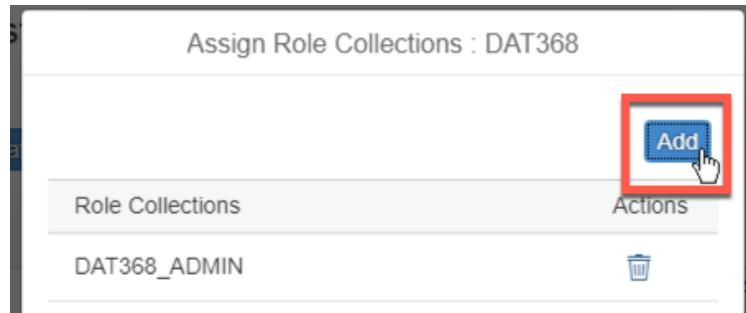
16. In the search box type **DAT368**.



17. On the line with User Name DAT368, select the Assign Role Collections icon.

User Name	Name	Role Collections	Actions
DAT368		DAT368_ADMIN, TECHED_TECHED_DAT368, WEBIDE_ADMINISTRATOR, XS_CONTROLLER_ADMIN, XS_USER_PUBLIC DAT368_ADMIN, WEBIDE_ADMINISTRATOR	

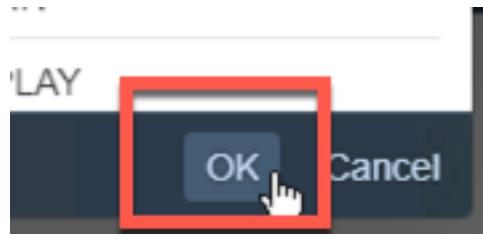
18. Click the **Add** button.



19. Select the **DAT368_MGR** Role Collection by checking the checkbox.



20. And click **OK**.



21. Verify that DAT368_MGR is in the list and click the **Save** button.

Assign Role Collections : DAT368

Add

Role Collections Actions

DAT368_ADMIN



DAT368_MGR



TECHED



TECHED_DAT368



WEBIDE_ADMINISTRATOR



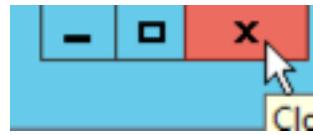
XS_CONTROLLER_ADMIN



XS_USER_PUBLIC

**Save** **Cancel**

22. Close this incognito window.



This is a good time to verify that the user indeed has a proper role collection.

Time Check: If you are running short on time, feel free to skip ahead to the [next exercise](#).

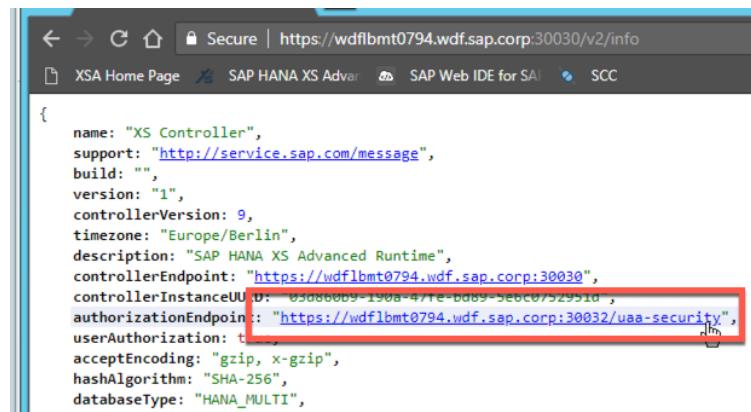
The best way to do this is to open a new incognito window and log into the authorization endpoint for our server. We need to dig out some information to do this.

First, find the api endpoint with the "xs api" command and then append /v2/info and browse to that URL. I've done this for you and here is the full URL.

<https://wdflbmt0794.wdf.sap.corp:30030/v2/info>

Paste this url into your fresh incognito browser window. The server will respond with a JSON file. If the browser you're using doesn't format json automatically, it may be difficult to read. Look for the [authorizationEndpoint](#) and select the URL that follows it.

23. Open a new incognito window and browse to the URL above.

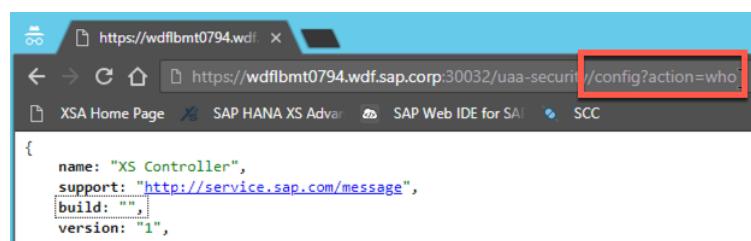


```
{
  "name": "XS_Controller",
  "support": "http://service.sap.com/message",
  "build": "",
  "version": "1",
  "controllerVersion": 9,
  "timezone": "Europe/Berlin",
  "description": "SAP HANA XS Advanced Runtime",
  "controllerEndpoint": "https://wdflbmt0794.wdf.sap.corp:30030",
  "controllerInstanceUUID": "03d06009-1908-47fe-bd09-5ebc07529510",
  "authorizationEndpoint": "https://wdflbmt0794.wdf.sap.corp:30032/uaa-security",
  "userAuthorization": true,
  "acceptEncoding": "gzip, x-gzip",
  "hashAlgorithm": "SHA-256",
  "databaseType": "HANA_MULTI",
}
```

Open a new tab and paste the URL in the incognito window but don't hit Enter yet. Append "/config?action=who" to it first.

<https://wdflbmt0794.wdf.sap.corp:30032/uaa-security/config?action=who>

24. Replace the URL with the one above.



```
{
  "name": "XS_Controller",
  "support": "http://service.sap.com/message",
  "build": "",
  "version": "1",
}
```

25. This time log in with the following.

User: **DAT368**
 Password: **WelcomeSAP2018**



<p>26. Verify that the DAT368.view and DAT368.create authorities are in the authorities array. This confirms that the user has the proper role collection.</p>	
<p>27. Close this incognito window.</p>	

EXERCISE 2

Exercise 2.1: Building an MTAR

At this point we've been using the Web IDE to build the Database container and the XS CLI to create the authorization service instance. If the Web IDE could support the Python module type then we would be able to use it to build the python module from within the Web IDE. As of the time this workshop was created, this was not possible.

In order to get around this limitation we will use a command line tool to build the project's mtar file and deploy it with the xs cli. This gives us more control over the deploy process and will also work with the python module type.

But first, if you followed Exercise 1, let's remove the HDI container we created earlier. Otherwise skip the [next two steps](#).

Time Check: Exercise 2 builds the project without the python module being enabled. If you want to save time and are familiar with building an MTAR file you can skip to [Exercise 3](#).

Return to the Putty console window.

Explanation	Screenshot
<p>1. Find the HDI container we created earlier in the Web IDE by searching for the a service instance with the name DAT368 in it.</p> <p>xs s grep DAT368</p>	

-
2. Delete it with the `ds` command.

```
xs ds DAT368-xxxxx-
TechEd2018.DAT368-dat368-hdi -f
```

Note that your name will differ.
Replace the `xxxxx` with your system generated value. The easiest way to do this is to manually type `xs ds` and then cut/paste the `DAT368...` name and add a `-f`.



```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs ds DAT368-xxxxx-TechEd2018.DAT368-dat368-hdi...
Deleting service instance "DAT368-xxxxx-TechEd2018.DAT368-dat368-hdi"...
OK
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

DO NOT delete the `dat368-uaa` service instance as we've already used it to set up our application's role collections.

In the following steps we'll be using a command line tool called the MTA builder. This tool can be found at the following URL.

<https://tools.hana.ondemand.com/#cloud>

Find it under the section:

Multi-target Application Archive Builder

Note that the MTA Build Tool is provided as a java jar file. I've created a simple bash script to wrap it called `mta` and placed it in the path so that it can be used within any project folder. I've done this on the server for you, but you can substitute `java -jar mta_archive.jar` for `mta` and get the same result.

When you run the MTA build tool, it will invoke various build tools for the different types of modules that reside in your project. Since our project contains some nodejs modules, the nodejs package manager(npm) will be called to pull in the needed dependencies. In order to make sure that npm finds the versions of the packages we want it to, it's important to set up the environment so that it finds sap packages first from the sap repository. Run this command to make sure this is the case.

```
npm config set @sap:registry "https://npm.sap.com/" ; npm config set registry "https://registry.npmjs.org/" ; npm config set strict-ssl true
```

-
3. Run the npm commands.

```
npm config set @sap:registry "https://npm.sap.com/"
npm config set registry "https://registry.npmjs.org/"
npm config set strict-ssl true
```



```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> npm config set @sap:regi
stry "https://npm.sap.com/" ; npm config set registry "https://registry.npmjs.org/" ; npm config set strict-ssl true
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Now let's use the MTA build tool to create an MTA Archive(mtar) file for our project.

- Create a target folder to store the mtar file that will get generated.

```
mkdir -p target
ls -1
```

```
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> mkdir -p target
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> ls -1
LICENSE
README.md
db
deploy_cf.mtaext
deploy_xsa.mtaext
mta.yaml
mtthon
target
web
xs-security.json
xsjs
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

- Invoke the build tool with the following.

```
mta --build-target XSA --mtar
target/dat368_xsa.mtar build
```

Note: The mta build should take just over a minute.

```
>    +- veror@1.10.0
>      +- yallist@2.1.2
>      +- yauzl@2.6.0
>      `-- yazl@2.4.1
>
> npm WARN xsjs@1.0.0 No repository field.
> npm WARN xsjs@1.0.0 No license field.
Module "xsjs": zipping directory xsjs
Generating archive /hana/shared/TE1/HDB00/TechEd2018.DAT368/target/dat368_xsa.mtar
Done
MTA Build Finished
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Exercise 2.2: Deploying the MTAR.

Notice that the mta builder pulls all the dependencies for NodeJS based modules as part of the mtar packaging process.

Now we are going to deploy our mtar file to the system using an mta extension file.

The Multi-Target Application approach is designed to allow a developer to specify much of the applications requirements and organization. However, when deploying it in different environments, the specifics of module naming, buildpack names, service names/ports, or the module's environment, etc. can vary. To allow flexibility after a developer has handed the application over to the dev-ops person, the MTA allows for an MTA extension file. This enables adjusting things without needing to modify the mta.yaml file and re-building the mtar package.

We use the --use-namespaces param to give our application modules more unique names and we use the --no-namespaces-for-services to make our service instances names simpler. The mtaext file gets merged with the mtad.yaml file that is derived from the mta.yaml file and specifies additional information for this particular deployment. We would then typically use a different mtaext file when deploying to Cloud Foundry. Exercise 4 illustrates this.

Time Check: If you are running short on time, skip to [Exercise 3](#).

1. Deploy the mtar file.

```
xs deploy target/dat368_xsa.mtar
--use-namespaces --no-
namespaces-for-services -e
deploy_xsa.mtaext
```

```
Application "DAT368.web" started and available at "https://wdflbmt0794.wdf.sap.corp:51030/"
Publishing public provided dependencies for application "DAT368.web" ...
Creating subscriptions...
Registering service URLs...
Deleting discontinued subscriptions...
Deleting discontinued published dependencies...
Unregistering discontinued service URLs...
Creating service brokers...
Updating subscribers...
Process finished.
Use "xs diag -i 22591" to download the logs of the process.
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Watch the deploy process output carefully. It tells you what's going on behind the scenes.

Some things to note. When you see this line.

Omitting npm install: node_modules directory is already present and rebuild is not enabled, using dependencies as provided

This lets you know that the dependencies were packages with the mtar and that the deployer will not run npm install again (and possibly fail if the Internet was not available).

The deploy will take approximately 10 minutes. You may want to take a break and stretch your legs at this time.

<p>2. Verify the deploy completed successfully by seeing output similar to the following.</p>	<pre>1 of 1 instances running (1 running) Application "DAT368.web" started and available at "https://wdflbmt0794.wdf.sap.corp:51030" Publishing public provided dependencies for application "DAT368.web"... Creating subscriptions... Registering service URLs... Deleting discontinued subscriptions... Deleting discontinued published dependencies... Unregistering discontinued service URLs... Creating service brokers... Updating subscribers... Process finished. Use "xs dmol -i [REDACTED]" to download the logs of the process. te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █</pre>
<p>3. Check that's it's listed in the mta list.</p> <p>xs mtas</p>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs mtas Getting multi-target apps in org "TechEd" / space "DEV" as XSA_ADMIN... Found multi-target apps: mta id version ----- com.sap.xsa.admin 1.6.5 com.sap.ui5.dist.sapui5-dist-xsa.XSAC_UI5_FESV4 1.52.14 com.sap.devx.webide 4.3.26 webConsole 1.0.2 com.sap.core.account 1.1.7 TechEd2018CentralDB 1.1.2018 com.sap.xsa.hrtt 2.6.43 DAT368 0.0.1 com.sap.ui5.dist.sapui5-dist-xsa.XSAC_UI5_SB 1.0.2 com.sap.devx.di.builder 4.3.26 te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █</pre>
<p>4. List it's app modules</p>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs a grep DAT368 DAT368.db STOPPED 0/1 256 MB <unlimited> <none> DAT368.xsjs STARTED 1/1 96.0 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51031 DAT368.web STARTED 1/1 96.0 MB <unlimited> https://wdflbmt0794.wdf.sap.corp:51030 te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █</pre>
<p>5. And it's services.</p> <p>xs s grep dat368</p> <p>Notice that the HDI container has been re-created and that the uaa service still exists.</p>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs dat368-uaa xsuaa default dat368-hdi hana hdi-sh te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █</pre>
<p>6. Get the web module's URL. Note the port number may differ for you.</p> <p>xs app DAT368.web --urls</p>	<pre>te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs app DAT368.web --urls https://wdflbmt0794.wdf.sap.corp:51030 te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> █</pre>

7. Cut the URL and paste it into a new Chrome incognito browser window.

DAT368

[ODATA Links](#) Provided by the XSJS module in XSJS compatibility mode.(Re)

[python/links](#) Provided by the Python module, Test Links.

[python/test](#) Provided by the Python module, Unauthorized Test.

[python/db_only](#) Provided by the Python module, Unauthorized DB Test.

[auth_python/db_valid](#) Provided by the Python module, Authorized DB with

Authorization troubleshooting hint:

8. Click on the **ODATA Links** link. This will prompt you for login since the nodejs module requires authentication.

DAT368

[ODATA Links](#) Provided by the XSJS module in XSJS .

[python/links](#) Provided by the Python module, Test L

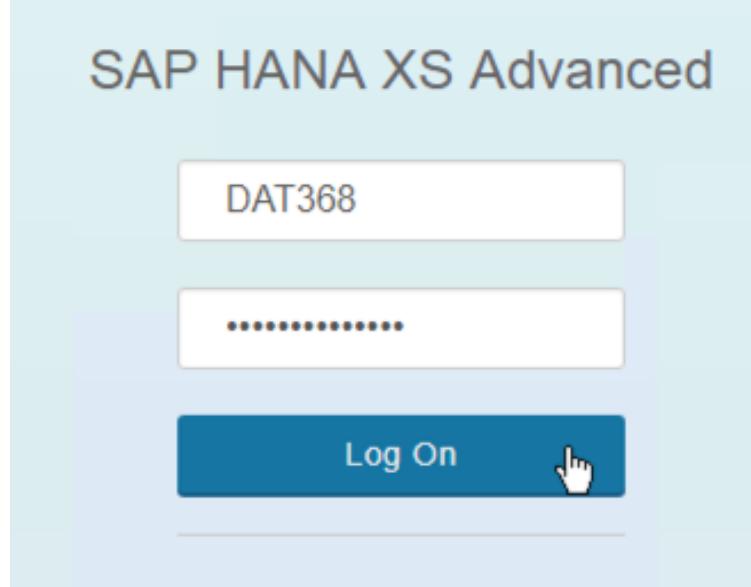
[python/test](#) Provided by the Python module, Unauth

[python/db_only](#) Provided by the Python module, Un

[auth_python/db_valid](#) Provided by the Python mod

Authorization troubleshooting hint:

9. Use **DAT368** with password WelcomeSAP2018



10. This is a list of links that trigger various ODATA operations. Click the **All Temps** link to see the ODATA json result of the data in to table. Note that the results will be opened in a new tab in the browser.

[Metadata](#)
[Service Doc](#)
[Top 5 Temps](#)
[First Temp](#)
[All Temps](#)
[Temps > 99](#)
[Temps > 99 no Time Fields](#)
[Post Temp](#)

11. Notice that there will initially only be one row as we noted above when we were exploring the data in the Web IDE.

```
{
  - d: {
    - results: [
      - {
        - __metadata: {
          uri: "https://wdflbmt0794.wdf.sap.corp:510
          type: "default.tempType"
        },
        tempId: 1,
        tempVal: 100,
        ts: "/Date(1454328000000)/",
        created: "/Date(1454328000000)/"
      }
    ]
  }
}
```



12. User the browser's back button to return to the list of links. Click on the **Post Temp** link to invoke an AJAX script that inserts a random temp value into the table via an ODATA Post.

[First Temp](#)
[All Temps](#)
[Temps > 99](#)
[Temps > 99 no Time Fields](#)
[Post Temp](#)

13. In a new browser tab, you'll see what the request looks like in the browser and the response(not pictured).

==Begin Request==

```
POST to sensors.xsodata/temp
Request Header: Content-Type = application/json
Request Header: Accept = application/json
```

Request Body:

```
{
    "tempId": 0,
    "tempVal": 100,
    "ts": "/Date(1533578628614)/",
    "created": "/Date(1234567890123)/"
}
```

==End Request==

Note that none of the python links will work at this point since we haven't build the python module yet(You'll get a "Not Found" message. We'll get into that in the next exercise.

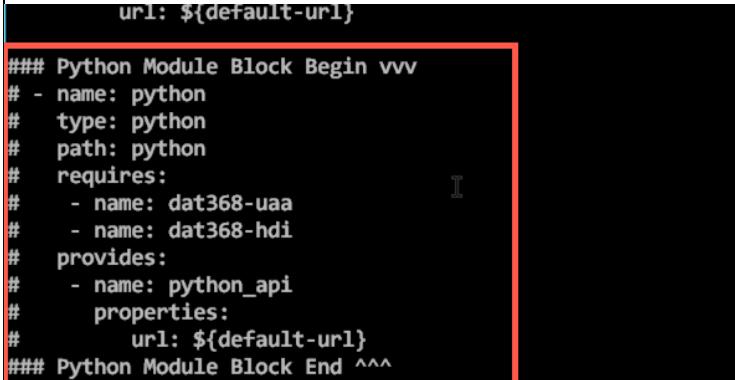
EXERCISE 3

Note: This exercise takes approximately 60 minutes to complete.

In this exercise we will turn our attention getting python running on our system and exercising the python runtime with our application project.

Exercise 3.1: Compile the Python Runtime

Return to the Putty console window.

Explanation	Screenshot
<p>1. Examine the contents of the mta.yaml file by catenating it to the console.</p> <p>cat mta.yaml</p> <p>Scroll and notice that lines pertaining to python modules are commented out with #. This is to allow the project to work in the Web IDE while you may be editing other files, etc.</p>	 <pre>url: \${default-url} ### Python Module Block Begin vvv # - name: python # type: python # path: python # requires: # - name: dat368-uaa # - name: dat368-hdi # provides: # - name: python_api # properties: # url: \${default-url} ### Python Module Block End ^^^</pre>

At this point we would uncomment the python module related lines and adjust the application's app-router table to accommodate enabling the python module. In order to keep things moving and avoid typo's we will instead switch to another branch in the repo that has the python related changes already made.

- Switch to the solution branch.

```
git checkout solution
```

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> git checkout solution
Branch solution set up to track remote branch solution from origin.
Switched to a new branch 'solution'
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

- Again show the mta.yaml file.

```
cat mta.yaml
```

Notice that the comments have been removed.

```
### Python Module Block Begin vvv
- name: python
  type: python
  path: python
  requires:
    - name: dat368-uaa
    - name: dat368-hdi
  provides:
    - name: python_api
      properties:
        url: ${default-url}
### Python Module Block End ^^^
```

The now enabled python module requires Python runtime version 3.6.5. This was the most current version at the time this workshop was created.

As of HANA2 SPS03, a python buildpack is available in XS Advanced. List the installed buildpacks with the xs buildpacks command.

- Run the buildpacks command.

```
xs buildpacks
```

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs buildpacks
Getting buildpacks...
buildpacks          version  position  enabled  locked
-----
sap_java_buildpack  1.6.23   1         true
sap_nodejs_buildpack 3.4.3    2         true
sap_python_buildpack 0.2.2    4         true
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

The buildpack coordinates the assembling of the native language files of a module with its dependencies and runtime environment. While runtimes are available for java and nodejs, by default there are no python runtimes available.

5. Run the runtimes command.

```
xs runtimes
```

Notice that while a buildpack exists for coordinating python module deployment, a runtime for python doesn't exist yet.

type	version	id	resolved	active	description	bound apps
hanaJdbc1	120.35	7	true	true	SAP HANA JDBC Driver 1.120.35	0
hanaJdbc2	3.33	6	true	true	SAP HANA JDBC Driver 2.3.33	6
node6.14	0.1	5	true	true	Node.js 6.14.0.1 for Linux x86-64	5
node8.9	3.6	4	true	true	Node.js 8.9.3.6 for Linux x86-64	19
sapJvm8	1.38	8	true	true	SAP JVM 8 Patchlevel 38 for Linux x86-64	1
sapJvm8_jre	1.38	3	true	true	SAP JVM JRE 8 Patchlevel 38 for Linux x86-64	8
tomcat8	5.23	1	true	true	Apache Tomcat Web Container 8.5.23	9
tomee1.7_jaxrs	5	2	true	true	Apache TomEE jaxrs 1.7.5	0

Normally you would download the python source using wget, but we have done that for you.

```
wget https://www.python.org/ftp/python/3.6.5/Python-3.6.5.tgz
```

6. Change up to the parent directory and list the files.

```
cd ..  
ls -1
```

te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cd ..
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00> ls -1
HDB
HDBAdmin.sh
HDBSettings.csh
HDBSettings.sh
Python-3.6.5.tgz
TechEd2018.DAT368
XS_PYTHON00_0-70003433.ZIP
backup
del_DAT368.sh
exe
hdbenv.csh
hdbenv.sh
set_python_env.sh
wdf1bmt0794.wdf.sap.corp
work
xterms
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00>

7. Untar the tar-zipped source file.

```
tar xzvf Python-3.6.5.tgz
```

Python-3.6.5/Objects/object.c
Python-3.6.5/Objects/abstract.c
Python-3.6.5/Objects/listobject.c
Python-3.6.5/Objects/bytes_methods.c
Python-3.6.5/Objects/dictnotes.txt
Python-3.6.5/Objects/typeslots.inc
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00>

8. Create a folder that will hold the compiled python files, change into the Python source folder and run the configure script.

```
md python_3_6_5
```

```
cd Python-3.6.5
```

```
/configure --  
prefix=/usr/sap/TE1/HDB00/python_3_6_5/ --exec-prefix=/usr/sap/TE1/HDB00/python_3_6_5 ; make -j4 ; make altinstall
```

This will take about 3 minutes to complete.

```
Creating directory /usr/sap/TE1/HDB00/python_3_6_5/share/man  
Creating directory /usr/sap/TE1/HDB00/python_3_6_5/share/man/man1  
/usr/bin/install -c -m 644 ./Misc/python.man \  
    /usr/sap/TE1/HDB00/python_3_6_5/share/man/man1/python3.6.1  
if test "xupgrade" != "xno" ; then \  
    case upgrade in \  
        upgrade) ensurepip="--altinstall --upgrade" ;; \  
        install|*) ensurepip="--altinstall" ;; \  
    esac; \  
    ./python -E -m ensurepip \  
        $ensurepip --root=/ ; \  
fi  
Collecting setuptools  
Collecting pip  
Installing collected packages: setuptools, pip  
Successfully installed pip-9.0.3 setuptools-39.0.1
```

You should see this at the end of the output.

Successfully installed pip-9.0.3 setuptools-39.0.1

In order to perform this compilation, the server must have various development tool packages. This has already been done in this case, but your server may need to have them installed. The following is a list for your reference based on a SuSE Linux system.

```
zypper search -t pattern  
zypper search -t pattern | grep Devel
```

```
zypper install --type pattern Basis-Devel (182 Packages)
```

```
zypper install tk-devel  
zypper install tcl-devel  
zypper install libffi-devel  
zypper install openssl-devel  
zypper install readline-devel  
zypper install sqlite3-devel  
zypper install ncurses-devel  
zypper install xz-devel  
zypper install zlib-devel
```

The compilation left versions of the executables with version numbers. Most tools expect the binaries to not have them. We'll fix this by creating some symbolic links to unversioned names.

9. Change into our python target directory and create the following symbolic links.

```
cd ./python_3_6_5/bin
```

```
In -s easy_install-3.6 easy_install  
In -s pip3.6 pip  
In -s pydoc3.6 pydoc  
In -s python3.6 python  
In -s pyvenv-3.6 pyvenv
```

```
on-3.6.5> cd ./python_3_6_5/bin  
on_3_6_5/bin>  
on_3_6_5/bin> ln -s easy_install-3.6 easy_install  
on_3_6_5/bin> ln -s pip3.6 pip  
on_3_6_5/bin> ln -s pydoc3.6 pydoc  
on_3_6_5/bin> ln -s python3.6 python  
on_3_6_5/bin> ln -s pyvenv-3.6 pyvenv
```

**In -s python3.6 python
In -s pyvenv-3.6 pyenv**

10. Now that python has been prepared, install it into the system as a runtime.

**xs create-runtime -p
/usr/sap/TE1/HDB00/python_3_6_5/**

```
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/python_3_6_5/bin> xs create-runtime -p /usr/sap/TE1/HDB00/python_3_6_5/
Creating runtime ...
Uploading "/usr/sap/TE1/HDB00/python_3_6_5/" ...
Checking which files to upload from '/usr/sap/TE1/HDB00/python_3_6_5' ...
Skipping symbolic link: /usr/sap/TE1/HDB00/python_3_6_5/bin/easy_install
Skipping symbolic link: /usr/sap/TE1/HDB00/python_3_6_5/bin/pip
Skipping symbolic link: /usr/sap/TE1/HDB00/python_3_6_5/bin/pydoc
Skipping symbolic link: /usr/sap/TE1/HDB00/python_3_6_5/bin/python
Skipping symbolic link: /usr/sap/TE1/HDB00/python_3_6_5/bin/pyenv
-> "/usr/sap/TE1/HDB00/python_3_6_5/" consists of 7457 files.
Uploading 7435 new or modified files (179 MB) ...
Uploading "/usr/sap/TE1/HDB00/python_3_6_5/" finished in 13.5 s.

Resolving runtime ...
resolved runtime: python3 6.5
  type: python3
  version: 6.5
  id: 9
  description: Python 3.6.5
  resolved: true
  active: true
  bound apps: <none>
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/python_3_6_5/bin>
```

Note: When setting up python on your own server: If you find that the pip command below fails with an inability to import the _socket library, it's because the configure/build process under some variations of linux leaves some important libraries in an unexpected location. Change into the directory where the target python was installed.

cd python_3_6_5

Copy the files in the lib64 folder into the lib folder

cp -avp lib64/* lib

Uninstall the runtime. By first finding it's ID and then deleting it.

**xs runtimes
xs delete-runtime -i <id> -f**

Re-create it.

xs create-runtime -p python_3_6_5

11. Check that it installed correctly.

xs runtimes

```
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/python_3_6_5/bin> xs runtimes
Getting runtimes...
-----
```

type	version	id	resolved	active	description	bound apps
hanaJdbc1	120.35	7	true	true	SAP HANA JDBC Driver 1.120.35	0
hanaJdbc2	3.33	6	true	true	SAP HANA JDBC Driver 2.3.33	6
node6.14	0.1	5	true	true	Node.js 6.14.0.1 for Linux x86-64	5
node8.0	2.6	4	true	true	Node.js 8.0.2.6 for Linux x86-64	10
python3	6.5	9	true	true	Python 3.6.5	0
sapjvm8_jre	1.38	3	true	true	SAP JVM 8 Patchlevel 38 for Linux x86-64	8
tomcat8	5.23	1	true	true	Apache Tomcat Web Container 8.5.23	9
tomee1.7_jaxrs	5	2	true	true	Apache TomEE jaxrs 1.7.5	0

```
te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/python_3_6_5/bin>
```

12. Move back up to the home directory.

```
cd ..
```

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/python_3_6_5/bin> cd ../..
```

Exercise 3.2: Set up Python Libraries

SAP provides a set of python libraries for validating requests, connecting to HANA DB, etc. These are typically provided by downloading them from support site.

<https://launchpad.support.sap.com/#/softwarecenter/search/XS PYTHON>

To save trouble, they have been download for you.

Unzip the libraries into a directory called sap_dependencies (matches the [official docs](#))

Note: We will be using two of the SAP supplied python libraries ([sap_xssec](#) and [hdbcli](#)). There are some additional libraries they you might consider, but we won't be covering their use in these exercises.

[sap_instance_manager \(doc page\)](#)

[sap_audit_logging \(doc page\)](#)

[sap_cf_logging \(doc page\)](#) Cloud Foundry specific logging.

We would like to see an XSA service for application logging that follows the [ELK](#) stack compatible with the Cloud Foundry app-logging service, but this is not available as of the creation of this workshop.

13. Unzip

unzip XS_PYTHON00_0-70003433.ZIP -d sap_dependencies

```
inflating: sap_dependencies/hdbcli-2.3.14-cp36-cp36m-linux_x86_64.whl
inflating: sap_dependencies/hdbcli-2.3.14-cp36-cp36m-macosx_10_6_x86_64.whl
inflating: sap_dependencies/hdbcli-2.3.14-cp36-cp36m-win_amd64.whl
inflating: sap_dependencies/README.md
inflating: sap_dependencies/sap_audit_logging-0.3.0-py2.py3-none-any.whl
inflating: sap_dependencies/sap_instance_manager-0.2.1-py2.py3-none-any.whl
inflating: sap_dependencies/sap_py_jwt-1.1.0-py2.py3-none-any.whl
inflating: sap_dependencies/sap_xssec-1.1.5-py2.py3-none-any.whl
inflating: sap_dependencies/SIGNATURE.SMF
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00>
```

When your module is deployed, it runs in its own isolated container with this specific version of python available to it.

You can develop and test your python module locally before deploying by setting up the python environment to use the version of python just installed.

14. Run this command to set up the environment.

. set_python_env.sh

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> . set_python_env.sh
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00> tecneaz018.DA1568/python>
```

Note: That's dot space
set_python_env.sh

This will relocate you into the python module of your project.

Create a vendor directory to hold the python libraries your module needs.

As mentioned in the presentation, it's important to bring all the libraries that your python module requires into the project so that you can control the versions of the python dependencies.

15. Run mkdir.

mkdir -p vendor

```
$ python> mkdir -p vendor  
$ python>
```

The python dependencies are specified in the requirements.txt file in the project. While most of these dependencies will be provided by the public python repository [PyPi](#) some are SAP libraries made available when you unzipped the XS PYTHON00_0-70003433.ZIP file above. This is why specifying the --find-links is important, otherwise the SAP libraries won't be found when trying to gather all the needed libraries and their dependencies.

We use a folder called vendor because the python buildpack looks for this folder and assumes that everything the python module needs will be found in there. During deployment, the deployer will not make any additional attempts to find missing dependencies and will fail otherwise. This is an important thing to consider when working with python modules.

Use the python packaging tool(pip) to download the dependencies found in the requirements.txt

16. Run pip.

```
pip download -d vendor -r requirements.txt --find-links ..../sap dependencies
```

You can safely ignore the yellow upgrade warning.

```
Collecting idna<2.7,>=2.5 (from requests==2.18.4->sap_xssec->-r requirement)
  Using cached https://files.pythonhosted.org/packages/27/cc/6dd9a3869f15c...
one-any.whl
  Saved ./vendor/idna-2.6-py2.py3-none-any.whl
Successfully downloaded Flask cfenv sap-py-jwt sap-xssec hdbcli itsdangerous
dict certifi chardet urllib3 idna
You are using pip version 9.0.3, however version 18.0 is available.
You should consider upgrading via the 'pip install --upgrade pip' command.
tcladm@wdflbmt0794:~/usr/sap/TE1/HDB00/TechEd2018.DAT368/python>
```

17. See what pip downloaded, change into the vendor folder.

cd vendor

ls -1

You should see a bunch of files with .whl .gz extensions.

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python> cd vendor
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor> ls -1
Flask-1.0.2-py2.py3-none-any.whl
Jinja2-2.10-py2.py3-none-any.whl
MarkupSafe-1.0.tar.gz
Werkzeug-0.14.1-py2.py3-none-any.whl
certifi-0.18.4.16-py2.py3-none-any.whl
Cfenv-0.5.3-py2.py3-none-any.whl
chardet-3.0.4-py2.py3-none-any.whl
click-6.7-py2.py3-none-any.whl
furl-1.2.tar.gz
hdbcli-2.3.14-cp36-cp36m-linux_x86_64.whl
idna-2.6-py2.py3-none-any.whl
itsdangerous-0.24.tar.gz
orderedmultidict-1.0.tar.gz
requests-2.18.4-py2.py3-none-any.whl
sap_py_jwt-1.1.0-py2.py3-none-any.whl
sap_xssec-1.1.5-py2.py3-none-any.whl
six-1.11.0-py2.py3-none-any.whl
urllib3-1.22-py2.py3-none-any.whl
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor>
```

Exercise 3.3: Build the Python Module and Redeploy

Now when we run the mta builder again, it will bundle these python dependencies up with the rest of your application.

18. Return to the project directory.

cd ..

Run the following commands to build and deploy your project's mtar again(or for the first time if you skipped here to save time).

19. Run the mta command again.

mta --build-target XSA --mtar target/dat368_xsa.mtar build

Notice that the python folder is just zipped and no dependencies are pulled in during the mtar assembly. Also the nodejs npm commands don't take as much time since they've already pulled their dependencies. This can take a couple minutes to complete.

```
HDB00/TechEd2018.DAT368/python/vendor> cd ../..
HDB00/TechEd2018.DAT368>
```

```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> mta --build-target XSA --mtar target/dat368_xsa.mtar build
MTA Build Starting
SAP Multitarget Application Archive Builder 1.1.2
Module "db": /hana/shared/TE1/HDB00/TechEd2018.DAT368/db/package.json already exists
Module "db": invoking npm
Module "python": zipping directory python
Module "xsjs": invoking npm
Module "web": invoking npm
Module "db": command output
> npm WARN deploy@ No description
> npm WARN deploy@ No repository field.
> npm WARN deploy@ No license field.
Module "db": zipping directory db
Module "web": command output
> npm WARN web-approuter@ No description
> npm WARN web-approuter@ No repository field.
> npm WARN web-approuter@ No license field.
Module "web": zipping directory web
Module "xsjs": command output
> npm WARN xsjs@1.0.0 No repository field.
> npm WARN xsjs@1.0.0 No license field.
Module "xsjs": zipping directory xsjs
Generating archive /hana/shared/TE1/HDB00/TechEd2018.DAT368/target/dat368_xsa.mtar
Done
MTA Build Finished
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

20. And run the deploy command again.

```
xs deploy target/dat368_xsa.mtar --use-namespaces --no-namespaces-for-services -e deploy_xsa.mtaext
```

Note this will take about 12 minutes this time so you may want to take another break.

21. At this point you should see your application's modules.

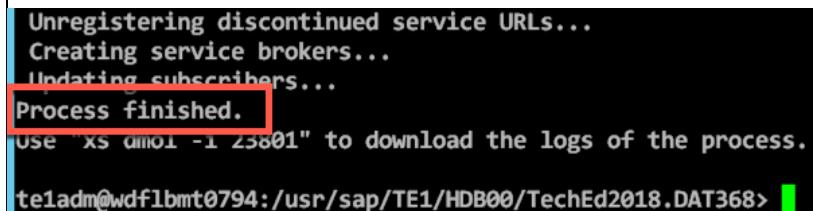
```
xs a | grep DAT368
```

This includes your python module. Also check that all but the db module are running.

22. Get the app-router URL.

```
xs app DAT368.web --urls
```

Paste it an incognito browser window.



```
Unregistering discontinued service URLs...
Creating service brokers...
Updating subscribers...
Process finished.
Use "xs amo1 -i 23001" to download the logs of the process.

te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```



```
te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> xs a | grep DAT368
DAT368.db STOPPED 0/1 256 MB <unlimited>
DAT368.xsjs STARTED 1/1 96.0 MB <unlimited>
DAT368.web STARTED 1/1 96.0 MB <unlimited>
DAT368.python STARTED 1/1 96.0 MB <unlimited>

te1adm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```



You can click on the ODATA Links which will open up a new browser tab and present you with a list of links to trigger various ODATA operations. If you want to quickly add a few lines of data to the database, click on the Post Temp link and reload the page a few times. This will add rows of data to the table with random temperature values.

23. Click on any of the python links.
The first three don't require authorization. Use the browser's back button to return to this list.

DAT368

[ODATA Links](#) Provided by the XSJS module

[python/links](#) Provided by the Python module
[python/test](#) Provided by the Python module
[python/db_only](#) Provided by the Python module
[auth_python/db_valid](#) Provided by the Python module

Authorization troubleshooting hint:

24. Click on the last link
[auth_python/db_valid](#).

DAT368

[ODATA Links](#) Provided by the XSJS module in XSJS core

[python/links](#) Provided by the Python module, Test Link
[python/test](#) Provided by the Python module, Unauthorized
[python/db_only](#) Provided by the Python module, Unauthorized
[auth_python/db_valid](#) Provided by the Python module, Authorized

25. This link requires authorization.
Enter **DAT368** with password
WelcomeSAP2018

SAP HANA XS Advanced

DAT368

.....

Log On



26. Note the following output.

See that the user is authorized for this operation.

Here is the code that does the authorization check.

Notice that the module will abort if the proper authorization isn't provided in the request.

```

https://wdflbmt0794.wdf.sap.corp:51030/auth_python/db_valid
XSA Home Page SAP HANA XS Advanced SAP Web IDE for SAP SAP CP SCC
Python Authorized DB Validated Request.

Receiving module should check that it came from our approuter and verify or abort if otherwise.

get_logon_name: DAT368
get_email: DAT368@sap.com
get_identity_zone: uaa
schema: 104CAAB001D1C405F82100ECA3C6A34C
host: wdflbmt0794.wdf.sap.corp
port: 30015
user: 164EA4081D1C405F82188EACA3C6A34C_3A2A7YCER2EV0JNSYAT76SX5_RT
pass: Fb4JH_voVgUUssQfkhs1_pfijsTrcMbpNzSh6px9DHw3DcqThAJFc3NYCfxt53C__rL83niINK7D7PyQuFkU1-8wXdNk
sensor_val: 100 at: 2016-02-01 12:00:00
sensor_val: 100 at: 2018-08-06 18:03:48.614000

```

Here is an excerpt of the server.py code with the request verification code in yellow.

```
# If there is a request for a auth_python/db_valid, return Testing message and then check JWT and connect to the data service and retrieve some data
```

```
@app.route('/auth_python/db_valid')
def auth_db_valid():
    output = 'Python Authorized DB Validated Request. \n'
    output += '\n'
    output += 'Receiving module should check that it came from our approuter and verify or abort if otherwise.\n'
    output += '\n'
    svcs_json = str(os.getenv("VCAP_SERVICES", 0))
    svcs = json.loads(svcs_json)

    # Verify the JWT before proceeding. or refuse to process the request.
    # https://jwt.io/ JWT Debugger Tool and libs for all languages

    uaa_service = env.get_service(label='xsuaa').credentials
    access_token = request.headers.get('authorization')[7:]

    security_context = xssec.create_security_context(access_token, uaa_service)
    isAuthorized = security_context.check_scope('openid')
    if not isAuthorized:
        abort(403)

    ...
}
```

27. Also notice that the python module had connected to the DB and returned the rows of data from the table. The code that follows illustrates this.

```

https://wdflbmt0794.wdf.sap.corp:51030/auth_python/db_valid
XSA Home Page SAP HANA XS Advanced SAP Web IDE for SAP SAP CP SCC
Python Authorized DB Validated Request.

Receiving module should check that it came from our approuter and verify or abort if otherwise.

get_logon_name: DAT368
get_email: DAT368@sap.com
get_identity_zone: uaa
schema: 16AEAA4081D1C405F82188EACA3C6A34C
host: wdflbmt0794.wdf.sap.corp
port: 30015
user: 16AEAA4081D1C405F82188EACA3C6A34C_3A2A7YCER2EVOJNSYAT76SX5_RT
pass: EbA7H_vnV8uUllcrOfkhS1_nfj15t+cmBPN7NshGox9DHw3DcqThAJFc3NYCfxt53C_rL83niNK7D7PyQuFkU1-8iWxDNk
sensor_val: 100 at: 2016-02-01 12:00:00
sensor_val: 100 at: 2018-08-06 18:03:48.614000

```

If there is a request for a auth_python/db_valid, return Testing message and then check JWT and connect to the data service and retrieve some data

```
@app.route('/auth_python/db_valid')
def auth_db_valid():
```

```
...
```

```

# # Connect to the python HANA DB driver using the connection info
connection = dbapi.connect(host,int(port),user,password)
# # Prep a cursor for SQL execution
cursor = connection.cursor()
# # Form an SQL statement to retrieve some data
cursor.execute('SELECT "tempId", "tempVal", "ts", "created" FROM "' + schema +
'".DAT368.db.data::sensors.temp"')
# # Execute the SQL and capture the result set
sensor_vals = cursor.fetchall()

# # Loop through the result set and output
for sensor_val in sensor_vals:
    output += 'sensor_val: ' + str(sensor_val[1]) + ' at: ' + str(sensor_val[2]) + '\n'
#
# # Close the DB connection
connection.close()
#
# Return the results
return output

```

EXERCISE 4 (OPTIONAL)

Note: This exercise takes approximately 30 minutes to complete.

Deploying to Cloud Foundry is actually not much different from deploying to XSA as long as you pay attention to MTA best practices and abstract away specifics of the deployment environment. You must also keep in the back of your mind that in Cloud Foundry based landscapes you are in a shared environment and that this situation has implications for the uniqueness of naming of urls and role definitions and authentication mechanisms.

In the case of this workshop we will use a single Cloud Foundry account that will be shared across all participants. The reason this isn't a problem is because each participant will deploy into a unique space. All the isolation is provided by the HDI deploy process. However, there are a few things you will need to customize in order to avoid name collisions. We recommend that you replicate the workshop project on your own HANA Express system and adjust it to deploy with your own SAP Cloud Platform Cloud Foundry account when you get the opportunity.

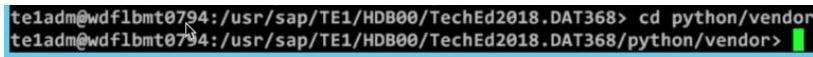
Note: In the following instructions, xx or XX has been replaced with a variable \${space} that will be resolved by the deployer as the current space name. This resolved the name collisions issue just mentioned.

<https://www.sap.com/developer/topics/sap-hana-express.html>

At the time this workshop was created, the HANA database could be made available in SAP Cloud Platform Cloud Foundry in one of two ways. The account could be provisioned with a HANA database instance or you as the account owner could create a HANA as a Service(HaaS) instance yourself. When you use provisioned HANA instances the python libraries will work properly because these instances don't require the connection to HANA to be encrypted. However, when you use HaaS created instances, they are configured to require encrypted connections. The python libraries provided as of this date don't have the ability to create encrypted connections. In order to overcome this limitation a more updated python library must be used.

Exercise 4.1: Build and Deploy to Cloud Foundry

Return to the Putty console window.

Explanation	Screenshot
<p>1. Change into the python/vendor folder.</p> <pre>cd python/vendor</pre>	

<p>2. List the library package files.</p> <pre>ls -l</pre> <p>Notice the hdblci-...whl file is version 2.3.14</p>	<pre>te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor> ls -l total 36332 -rw-r-- 1 teladm sapsys 91364 Aug 23 20:09 Flask-1.0.2-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 126381 Aug 23 20:09 Jinja2-2.10-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 14356 Aug 23 20:09 MarkupSafe-1.0.tar.gz -rw-r-- 1 teladm sapsys 322863 Aug 23 20:09 Werkzeug-0.14.1-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 146520 Aug 23 20:09 certifi-2018.8.13-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 4538 Aug 23 20:09 cfenv-0.5.3-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 133356 Aug 23 20:09 chardet-3.0.4-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 71175 Aug 23 20:09 click-6.7-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 24755 Aug 23 20:09 furl-1.2.1.tar.gz -rw-r-- 1 teladm sapsys 19078429 Aug 23 20:09 hdblci-2.3.14-cp36-cp36m-linux_x86_64.whl -rw-r-- 1 teladm sapsys 56450 Aug 23 20:09 idna-2.6-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 46541 Aug 23 20:09 itsdangerous-0.24.tar.gz -rw-r-- 1 teladm sapsys 19740 Aug 23 20:09 orderedmultidict-1.0.tar.gz -rw-r-- 1 teladm sapsys 88704 Aug 23 20:09 requests-2.18.4-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 16782108 Aug 23 20:09 sap_py_jwt-1.1.0-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 16878 Aug 23 20:09 sap_xssec-1.1.5-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 10702 Aug 23 20:09 six-1.11.0-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 132332 Aug 23 20:09 urllib3-1.22-py2.py3-none-any.whl te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor></pre>
<p>3. Delete this file.</p> <pre>rm -f hdblci-2.3.14-cp36-cp36m-linux_x86_64.whl</pre>	<pre>> rm -f hdblci-2.3.14-cp36-cp36m-linux_x86_64.whl ></pre>
<p>4. Copy the newer python lib file from the update folder to the current folder.</p> <pre>cp ../../update/hdblci-2.3.112.tar.gz .</pre> <p>Don't worry that the new file has an extension of tar.gz instead of .whl, both variations are allowed.</p>	<pre>> cp ../../update/hdblci-2.3.112.tar.gz . ></pre>
<p>5. Verify that the 2.3.112 version is available and the 2.3.14 version is deleted.</p> <pre>ls -l</pre>	<pre>te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor> ls -l total 61624 -rw-r-- 1 teladm sapsys 91364 Aug 23 20:09 Flask-1.0.2-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 126381 Aug 23 20:09 Jinja2-2.10-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 14356 Aug 23 20:09 MarkupSafe-1.0.tar.gz -rw-r-- 1 teladm sapsys 322863 Aug 23 20:09 Werkzeug-0.14.1-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 146520 Aug 23 20:09 certifi-2018.8.13-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 4538 Aug 23 20:09 cfenv-0.5.3-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 133356 Aug 23 20:09 chardet-3.0.4-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 71175 Aug 23 20:09 click-6.7-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 24755 Aug 23 20:09 furl-1.2.1.tar.gz -rw-r-- 1 teladm sapsys 44974129 Aug 29 23:43 hdblci-2.3.112.tar.gz -rw-r-- 1 teladm sapsys 56450 Aug 23 20:09 idna-2.6-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 46541 Aug 23 20:09 itsdangerous-0.24.tar.gz -rw-r-- 1 teladm sapsys 19740 Aug 23 20:09 orderedmultidict-1.0.tar.gz -rw-r-- 1 teladm sapsys 88704 Aug 23 20:09 requests-2.18.4-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 16782108 Aug 23 20:09 sap_py_jwt-1.1.0-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 16878 Aug 23 20:09 sap_xssec-1.1.5-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 10702 Aug 23 20:09 six-1.11.0-py2.py3-none-any.whl -rw-r-- 1 teladm sapsys 132332 Aug 23 20:09 urllib3-1.22-py2.py3-none-any.whl te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor></pre>
<p>6. Change back to the project folder.</p> <pre>cd ..</pre>	<pre>te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor> cd ../.. te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368/python/vendor></pre>

<p>7. Run the MTA command again but this time specify that the output is targeted to Cloud Foundry.</p> <pre>mta --build-target CF --mtar target/dat368_cf.mtar build</pre>	<pre>Generating archive /hana/shared/TE1/HDB00/TechEd2018.DAT368/target/dat368_cf.mtar Done MTA Build Finished teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>8. See that there are now 2 mtar files in the target folder.</p> <pre>ls -l target</pre>	<pre>teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> ls -l target total 234088 -rw----- 1 teladm sapsys 119852364 Aug 23 20:38 dat368_cf.mtar -rw----- 1 teladm sapsys 119852435 Aug 23 20:11 dat368_xsa.mtar teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>9. Connect to the US10 Cloud Foundry landscape.</p> <pre>cf api https://api.cf.us10.hana.ondemand.com</pre>	<pre>teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cf api https://api.cf.eu10.hana.ondemand.com Setting api endpoint to https://api.cf.eu10.hana.ondemand.com... OK api endpoint: https://api.cf.eu10.hana.ondemand.com api version: 2.115.0 Not logged in. Use 'cf login' to log in. teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>10. Log in as this user.</p> <p>User: primaryuser01@gmail.com Password: PrimaryUs3r01</p> <pre>cf login -u primaryuser01@gmail.com -p PrimaryUs3r01 -o tecched_dat368 -s dev00</pre>	<pre>teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cf login -u primaryuser01@gmail.com -p PrimaryUs3r01 -o tecched_dat368 -s dev00 API endpoint: https://api.cf.us10.hana.ondemand.com Authenticating... OK Targeted org tecched_dat368 Targeted space dev00 API endpoint: https://api.cf.us10.hana.ondemand.com (API version: 2.115.0) User: primaryuser01@gmail.com Org: tecched_dat368 Space: dev00 teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>11. Target the space that corresponds to the number you were assigned at the beginning of this workshop by replacing the "XX" with your number.</p> <p>If you don't know your number, raise your hand and ask for assistance</p> <pre>cf t -s devXX</pre>	<pre>teladm@wdflbmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cf t -s devXX api endpoint: https://api.cf.us10.hana.ondemand.com api version: 2.115.0 user: primaryuser01@gmail.com org: tecched_dat368 space: dev</pre>
<p>12. Check to see that a service called dat368-hdi is available in this space.</p> <pre>cf s</pre>	<pre>teladm@wdflbmt0794:/usr/sap/TE1/HDB00> cf s Getting services in org tecched_dat368 / space dev03 as primaryuser01@gmail.com... OK name service plan bound apps last operation dat368-hdi hana hdi-shared create succeeded teladm@wdflbmt0794:/usr/sap/TE1/HDB00></pre>

When deploying to Cloud Foundry, you need to coordinate your application with the space and sub-account that you are deploying into. This is done in the deploy_cf.mtaext file that is passed into the deploy operation.

Note: In the following instructions, xx or XX has been replaced with a variable \${space} that will be resolved by the deployer as the current space name.

In this case, we are deploying into a sub-account that has a sub-domain called dat368. The url endpoint of the approuter module(dat368-xx-web.cfapps.us10.hana.ondemand.com) must include the sub-domain name. This is enabled with a special environment variable called TENANT_HOST_PATTERN which contains a regular expression. The first matching group needs to match the same string as the sub-domain.

^(.*).cfapps.(.*).hana.ondemand.com

dat368-00-web.cfapps.eu10.hana.ondemand.com

13. Examine the deploy_cf.mtaext file to confirm that the regular expression matches and that the host parameter of the web module starts with dat368.

cat deploy_cf.mtaext

```
modules:  
- name: web  
parameters:  
  memory: 128MB  
  disk: 256M  
  host: dat368-xx-web  
properties:  
  TENANT_HOST_PATTERN: '^(.*)-(.*).cfapps.(.*).hana.ondemand.com'
```

As mentioned above, in order to avoid resource name collisions we need to edit the deploy_cf.mtaext so that once the mtar is deployed into the Cloud Foundry account, it will have unique urls.

If you've forgotten your two digit number, raise your hand and we'll help you find it.

The deploy_cf.mtaext file includes the space name that includes your two digit number.

14. Now build the mtar file but this time targeting Cloud Foundry.

mta --build-target CF --mtar target/dat368_cf.mtar build

```
> npm WARN xsjs@1.0.0 No repository field.  
> npm WARN xsjs@1.0.0 No license field.  
Module "xsjs": zipping directory xsjs  
Generating archive /hana/shared/TE1/HDB00/TechEd2018.DAT368/target/dat368_cf.mtar  
Done  
MTA Build Finished  
te1adm@wdflbm0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Note: The following deploy operation will take approximately 12 minutes. The initial file upload takes at nearly 3 minutes without displaying any progress indication so don't worry that the process has hung. Once you see some output from the deploy process you may want to take a break and return in about 10 minutes.

15. Deploy the mtar using your modified deploy_cf.mtaext file.

cf deploy target/dat368_cf.mtar --use-namespaces --no-namespaces-for-services -e deploy_cf.mtaext

```
Deleting discontinued published dependencies...  
Unregistering discontinued service URLs...  
Creating service brokers...  
Updating subscribers...  
Process finished.  
Use "cf dmol -i 51934880" to download the logs of the process.  
te1adm@wdflbm0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368>
```

Once deployed, the system will understand the roles that your application has defined. As we did earlier, you would need to log into your Cloud Foundry account and create role collections and assign roles to them. You then would need to assign the created role collection to your users. Because we can't give you access to the Cloud Foundry account we're using, we will have to do this for you.

If you get to this point in the exercise, raise your hand and a facilitator will add your role to the role collection for the primaryuser01@gmail.com user.

If you were doing this in your own account, you would first create a new DAT368 role collection and add the DAT368Manager and DAT368_XX User roles to it(not pictured).

The screenshot shows the SAP Cloud Platform Cockpit interface. On the left, there is a navigation sidebar with the following items:

- Overview
- Spaces
- Subscriptions
- Connectivity
- Destinations
- Security
- Administrators
- Role Collections** (this item is highlighted with a dotted border)
- Trust Configuration

The main content area is titled "Subaccount: DAT368us - Role Collections". It displays a table with one row, which is highlighted with a red box. The table has two columns: "Name" and "Description". The "Name" column contains the value "DAT368". The "Description" column is partially visible as "Learn more about building roles and mair".

Then you would go into Trust Configuration and select the SAP ID Service.

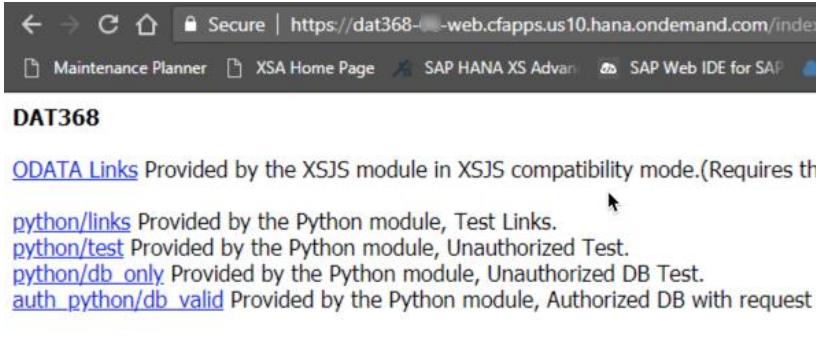
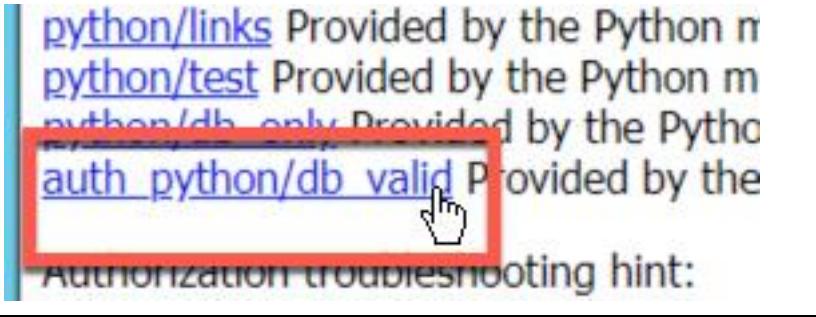
The screenshot shows the SAP Cloud Platform Cockpit interface. On the left, a sidebar menu includes 'Overview', 'Spaces', 'Subscriptions', 'Connectivity', 'Destinations', 'Security', 'Administrators', 'Role Collections', **Trust Configuration** (which is selected and highlighted in blue), and 'Quota Plans'. The main content area is titled 'Subaccount: DAT368us - Trust Configuration' and shows 'All: 1'. A button labeled 'New Trust Configuration' is visible. Below it is a table with columns 'Status', 'Name', and 'Description'. It contains two rows: 'Default' (Status: Active) and 'SAP ID Service' (Status: Active). The 'SAP ID Service' row has a red box around it. A note at the bottom right says 'Learn more about how to [configure trust](#) and [map roles](#)'.

And then you would explicitly enter the username and select “Show Assignments” and then “Add Assignment” for each user that you’d like to give access to your application.

The screenshot shows the SAP Cloud Platform Cockpit interface under 'Role Collection Assignment'. The main content area is titled 'Trust Configuration: SAP ID Service - Role Collection Assignment' and shows 'All: 1'. It displays a table with a single row for 'DAT368'. In the top bar, there is a search field with the placeholder '*User: primaryuser01@gmail.com' and two buttons: 'Show Assignments' and 'Add Assignment', which are both enclosed in a red box.

This process will be somewhat different if you have defined your own Identity Provider as you would create a group to role collection mapping instead. This is beyond the scope of this exercise.

...continuing.

<p>16. Verify that the url of the approuter(web) module starts with dat368.</p> <p>cf a</p>	<pre>te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cf a Getting apps in org teched_dat368 / space dev00 as primaryuser01@gmail.com... OK name requested state instances memory disk urls DAT368.db stopped 0/1 256M 1G DAT368.xsjs started 1/1 128M 1G dat368-00-xsjs.cfapps.eu10.hana.ondemand.com DAT368.python started 1/1 128M 1G dat368-00-python.cfapps.eu10.hana.ondemand.com DAT368.web started 1/1 128M 1G dat368-00-web.cfapps.eu10.hana.ondemand.com te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>17. Also verify that the approuter(web) module has the TENANT_HOST_PATTERN regex set properly.</p> <p>cf env DAT368.web</p>	<pre>MTA SHARED SERVICES: [] TENANT HOST PATTERN: (.*)(.*)(.*).cfapps.(.*).hana.ondemand.com destinations: [{ "forwardAuthToken": true, "name": "xsjs_be", "url": "https://dat368-00-xsjs.cfapps.eu10.hana.ondemand.com" }, { "forwardAuthToken": true, "name": "python_be", "url": "https://dat368-00-python.cfapps.eu10.hana.ondemand.com" }]</pre>
<p>18. Get the url of the approuter(web) module.</p> <p>cf a grep DAT368.web</p>	<pre>te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368> cf a grep DAT368.web DAT368.web started 1/1 128M 1G dat368-00-web.cfapps.eu10.hana.ondemand.com te1adm@wdf1bmt0794:/usr/sap/TE1/HDB00/TechEd2018.DAT368></pre>
<p>19. Paste it into an incognito browser window.</p>	 <p>The screenshot shows a browser window with the following content:</p> <ul style="list-style-type: none"> ODATA Links Provided by the XSJS module in XSJS compatibility mode.(Requires th python/links Provided by the Python module, Test Links. python/test Provided by the Python module, Unauthorized Test. python/db_only Provided by the Python module, Unauthorized DB Test. auth_python/db_valid Provided by the Python module, Authorized DB with request
<p>20. Click on the auth_python/db_valid link.</p>	 <p>The screenshot shows a browser window with the following content:</p> <p>auth_python/db_valid Provided by the</p> <p>Authorization troubleshooting hint:</p>

21. Login with this.

User: **primaryuser01@gmail.com**
 Password: **PrimaryUs3r01**

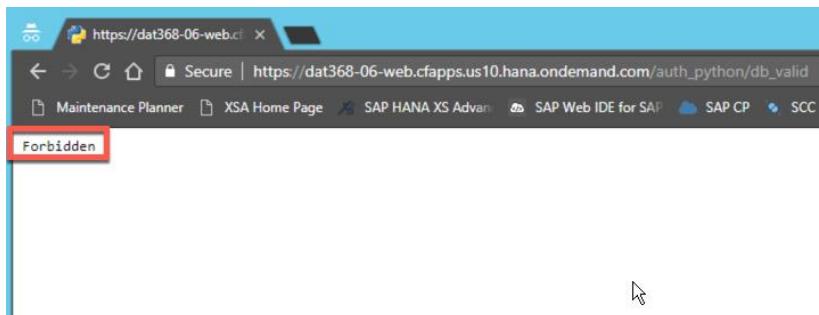
Welcome to DAT368us!

primaryuser01@gmai

Log On



22. If you get a white screen with "Forbidden" it's because the facilitator hasn't yet added your application's role to the role collection for the user. Raise your hand and ask that your role be added.



23. Verify that the user is logged in and that output similar to this is returned.

```
Secure | https://dat368-06-web.cfapps.us10.hana.ondemand.com/auth_python/db_valid
Python Authorized DB Validated Request.

Receiving module should check that it came from our approuter and verify or abort if otherwise.

get_logon_name: primaryuser01@gmail.com
get_email: primaryuser01@gmail.com
get_identity_zone: b2f4a89a-b86d-4297-9936-b26b4276279d
schema: ADFB05A593374844A7B95522674EBFAD
host: zeus.hana.prod.us-east-1.whitney.dbaaS.ondemand.com
port: 20106
user: ADFB05A593374844A7B95522674EBFAD_8V40DCS5TMKBFUIS0TZMCQ5OU_RT
pass: Wo8qpDjWzaQrq04s7h6EkJt94wc0hFKF7Tt3SuN2Wr8z6B1RuVoumvz59Th7ghemyCJkL2UcBd5N9RP.iq7Sf0FRt80.Z_5b
sensor_val: 100 at: 2016-02-01 12:00:00
sensor_val: 94 at: 2018-08-30 21:38:37.325000
```

This completes the Cloud Foundry deployment exercise.

Conclusion:

While this example use of python is very simple, it illustrates the two most important functions that any module should provide.

1. Insure that the request that is being serviced comes from your application's app-router and contains the needed authorizations.
2. If needed, connect to the DB in order to read data to be processed and write the results back.

Another thing that is commonly done in a python application module is to log the module's activity to either the audit log and/or application log service. While we didn't cover this in these exercises, you can find details here.

[sap_instance_manager \(doc page\)](#)
[sap_audit_logging \(doc page\)](#)
[sap_cf_logging \(doc page\)](#) Cloud Foundry specific logging.

This concludes the python wrangling for today.

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