

DevOps for Oracle Forms Using Developer Cloud Service

Automating Application Deployment

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Introduction

Oracle Forms is an application development technology that dates back to the 1980's. Since that time, the product has evolved from a tool to create character mode applications to one which creates applications now being deployed in web architecture. Over time, applications developed with this technology have grown significantly in size and complexity. Today, these complex enterprise applications are deployed on servers around the world and to hundreds of thousands of end-users. With applications of such complexity and importance, the need for easier, faster, and low risk maintenance practices has become crucial to ensuring that these applications are stable, up to date, and secure. This is where modern DevOps practices can help.

With trends in application development aggressively moving toward a more "agile" model of development and deployment, the ability to manage Forms applications in this way will require modern tooling. Developer Cloud Service offers such a solution.

This paper aims to illustrate how Oracle Developer Cloud Service and Oracle Cloud Infrastructure can help to simplify version control and automate application deployment. Such automation can help to reduce the level of effort and risk involved in maintaining Forms applications.

In short, this is an introduction to Oracle Forms in a modern DevOps environment.



Overview

In any technical operation, the risk of introducing error or failure increases each time a step is executed by human hands. Misinterpretation of instructions or standards, typographical errors, and numerous other factors often lead to undesirable results. Such issues are not unique to Oracle Forms, but exist with any technology. By introducing automation into a process the risk of error or failure is greatly reduced. This is because within the automated process a fixed set of instructions and standards is included. In addition to gaining more predictable results, increased efficiency is also attained.

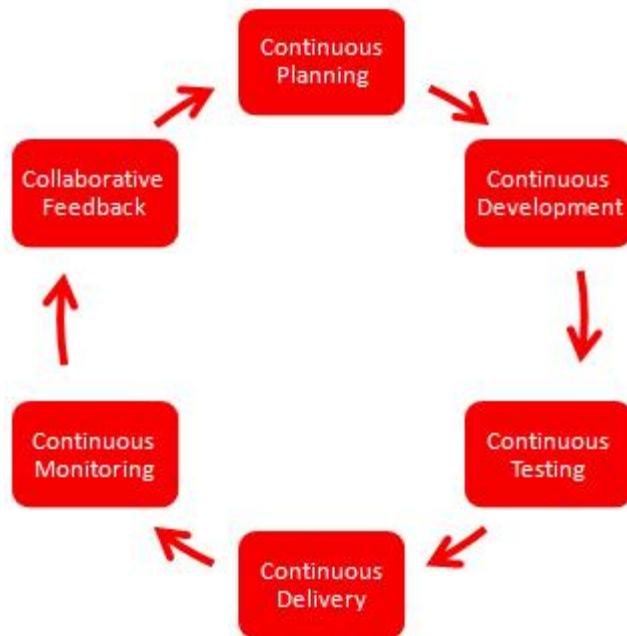
Although the concept of “DevOps” primarily focuses on continuous development and continuous delivery as an effort to roll out changes faster, it inherently will accomplish what is described above. If application changes can be processed, tested, and delivered automatically not only can application updates be delivered more frequently, but they can also be delivered with lower risk. Because a well established DevOps plan will also include a predictable release cycle, even if issues are introduced fixes can be included in the next automated release cycle. Of course, out of cycle updates are always possible.

In order to bring Oracle Forms into this automated style of application updating and/or maintenance, the use of Developer Cloud Service (DCS) and Forms Application Deployment Services (FADS) will be necessary. An overview of DCS and FADS is provided in the following sections. Refer the documentation list provided at the end of this paper for more information.

Oracle Developer Cloud Service

Oracle Developer Cloud Service (DCS) is an Oracle Cloud offering that provides many modern DevOps features in a single interface.

DevOps begins with the planning of an application and ends with the application being put into full service, before this cycle starts again. DCS brings the phases of this process into one interface, thereby making the process more streamlined and efficient. It also allows for easily linking several of these processes together in order to create an automated DevOps cycle.



DCS offers functionality including the following:

- Project configuration and user management
- Source control and artifact repositories through Git and Maven
- Issue tracking system to track tasks, bugs, and enhancements
- Development sprint planning, tracking, and reporting
- Code review platform
- Build automation with support for multiple build frameworks
- Continuous integration and deployment
- Document collaboration through wiki
- Team activity stream

While some of these features may not be useful for all use cases, those that are can provide functionality not previously possible without significant manual effort and/or separate tools.

Get more information about DCS on the Oracle web site:

https://cloud.oracle.com/en_US/developer-service

Forms Application Deployment Services

Introduced in version 12.2.1.3, Forms Application Deployment Services (FADS) allows administrators or developers to package Forms applications, and then deploy, configure, and store archived copies of the applications with just a few simple steps. Using the FADS web interface, the status of the deployment process can be monitored, deployment updates can be easily delivered, no longer needed applications can be deleted, and much more.

The screenshot displays the Oracle Forms Application Deployment Services (FADS) web interface. At the top, there is a navigation bar with the Oracle logo, the title 'Forms Application Deployment Services', and buttons for 'Dashboard' and 'Archives'. The main content area is divided into three sections:

- Applications:** A table listing applications with their status. The 'sales' application is 'In Progress', 'finance' is 'Deployed', and 'hr' is 'Failed'.
- Deploy:** A form for deploying an application. It includes fields for 'WLS Servers', 'Username', 'Password', and 'Database'. There is a 'Browse...' button for the 'Archive' field, which currently shows 'No file selected'. 'Deploy' and 'Reset' buttons are at the bottom.
- Contents:** A summary of the application's contents, showing counts for various file types: 6 FMBs, 1 MMBs, 0 OLBs, 0 PLLs, 0 User Exits, 1 SQL Files, 0 Client Files, 0 Server JARs, and 0 Misc. Files. The last modified date is '17 Sep 2018'.

A command line interface is also available, which can be helpful for Forms build integration and for scripting automated deployment jobs where using a web interface may not be possible.

The FADS command line interface (FADS-CLI) can be used in DCS to provide automated packaging and deployment functionality. The Forms compiler/generator can be used to perform automated build testing. Both of these Forms utilities are available in a specially designed software package (built into DCS) that is used to create a VM template which will be used in custom projects.

If deploying from Developer Cloud Service is desired, a full Forms 12.2.1.3 installation must be properly configured, patched, running, and accessible by Developer Cloud Service via HTTP/S requests. Be sure to carefully review the product Installation Guide, System Requirements Guide, and Release Notes to ensure the installation is configured and patched properly. The Forms 12.2.1.3 environment can be either an on-premise installation or one in Oracle Cloud Infrastructure (aka Compute).

Additional information about FADS can be found in the Forms Deployment Guide.

<https://docs.oracle.com/middleware/12213/formsandreports/deploy-forms>

Getting Set Up

Detailed instructions for using DCS can be found in the [DCS](#) documentation. This document includes references to [Git](#), a third party version control technology. Please refer to the [Git](#) documentation for details on how to use it.

Because DCS is a Cloud service, it is often updated. Therefore, the screenshots and steps provided in this document may differ from those needed to complete the tasks. This document should only be used as a general guide for using Forms in DCS. Refer to the latest DCS documentation for the latest usage information.

The Environment and Setup

One factor in making DevOps successful is the ability to track application changes. To do this, the application's source files must be included in a version control system. Git will be used for that purpose. Git will be the version control utility used in the developers' environments to ensure that application changes made on their local systems are synchronized with those stored in DCS.

This document will not go into detail on how to setup or use Git, but will include the basic steps associated with using Git with Forms and DCS in the context of its use with Forms.

Details about Git, how to use it, and how to download it can be found on these pages:

- » <https://git-scm.com>
- » <https://git-scm.com/book>

On most Unix/Linux machines, Git will likely be pre-installed. If not, you will need to install it. For Microsoft environments, download and install Git for Windows. Refer to the Git site mentioned for download locations.

- » <https://git-scm.com/downloads>

Initial Git and DCS Set Up

These are some of the basic steps for setting up a Git environment on Microsoft Windows. The steps will be the similar on other platforms, however references to directories and their qualified paths will differ. These steps assume you have already downloaded and installed Git.

Step 1: On the developer's machine, open the Git shell and verify that the ssh-agent is running. Run this command.

```
eval $(ssh-agent -s)
```

The expected response will be:

```
Agent pid <SOME NUMBER>
```

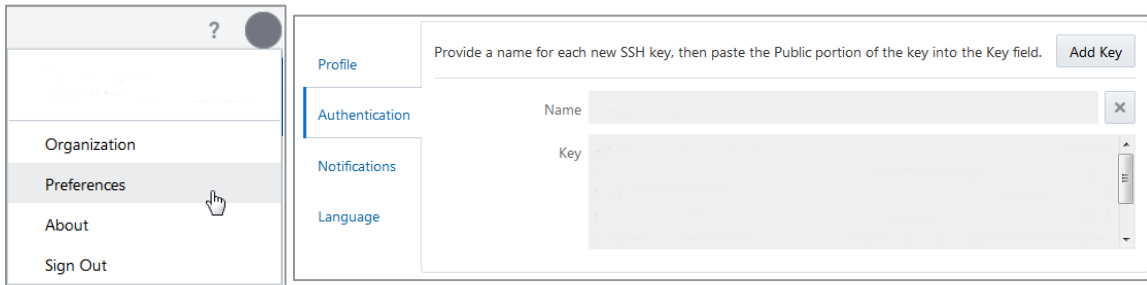
Step 2: Generate a Git SSH key pair. This step will generally only need to be accomplished once after the initial installation or if a change in the key type or user name chances. The new key files will be stored in a sub-directory, `.ssh` of the user home directory. Run this command.

```
ssh-keygen -t rsa -b 2048 -C "<ADD YOUR EMAIL ADDRESS HERE>"
```

Step 3: Add the newly created private key to the Git configuration. Run this command (this assumes a Microsoft Windows environment).

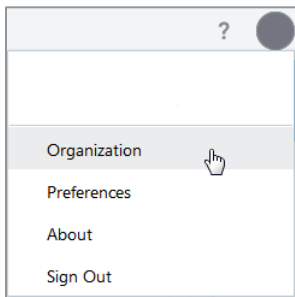
```
ssh-add /c/Users/<USER NAME>/.ssh/id_rsa
```


Step 4: Access the DCS environment and add the text from the newly created public key (e.g. id_rsa.pub) to the user's DCS profile. It will be used to allow the local Git to access the Cloud environment. In DCS, access User Preferences then select the Authentication tab and click on "Add Key". Provide a useful name for this public key and paste the contents of the public key file into the Key field. Click "Create" to commit this addition.

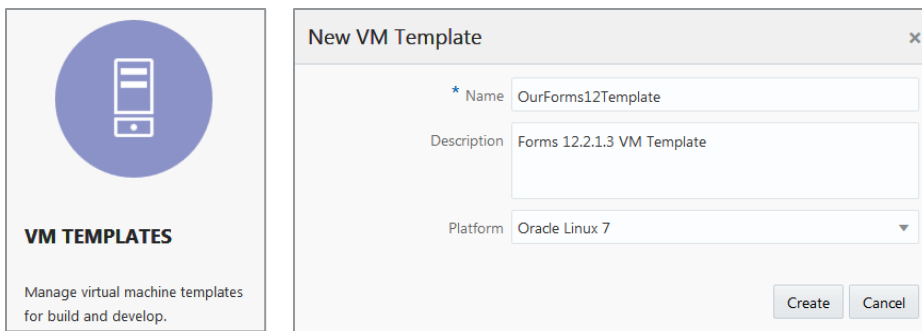


Steps 5 through 8 require DCS Organization Administrative privileges.

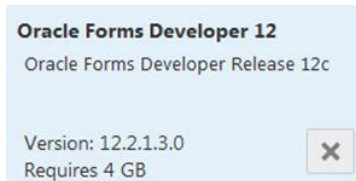
Step 5: Access the Organization configuration screen by clicking on the bubble on the upper right side of the DCS screen.



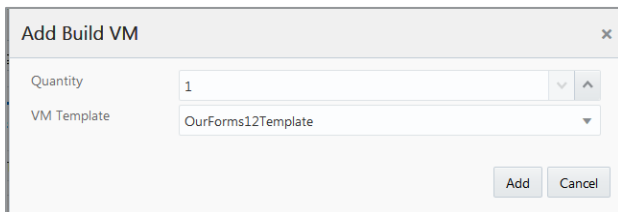
Step 6: Create a new VM Template. This VM Template will contain the Forms software needed to perform tasks like generating Forms modules, converting Forms xml files to binary, deploying the application from DCS to a target server, and so on. Enter a useful name and description and select the desired platform on which test builds will be executed then click on "Create". Because the Forms application generation process is essentially a validation of an application's PL/SQL and the same on all platforms, which platform you choose is irrelevant but should be one certified for use with Oracle Forms.



Step 7: Click the “*Configure Software*” button for this template. Choose “Oracle Forms Developer 12” from the list then click on “*Done*”.

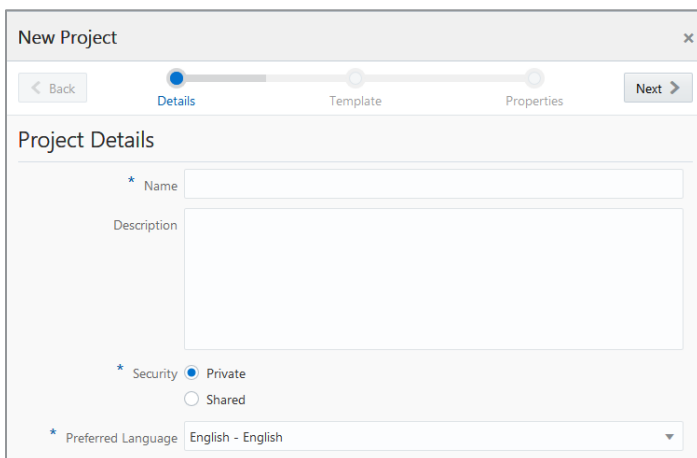


Step 8: Return to the Organization screen by clicking on the “*Organization*” breadcrumb. Click on Virtual Machine to access the Virtual Machine screen. On the Virtual Machine screen, click on the “*New VM*” button to create a new Virtual Machine. In the drop-down list, select the VM Template from the previous step then click on “*Add*”.

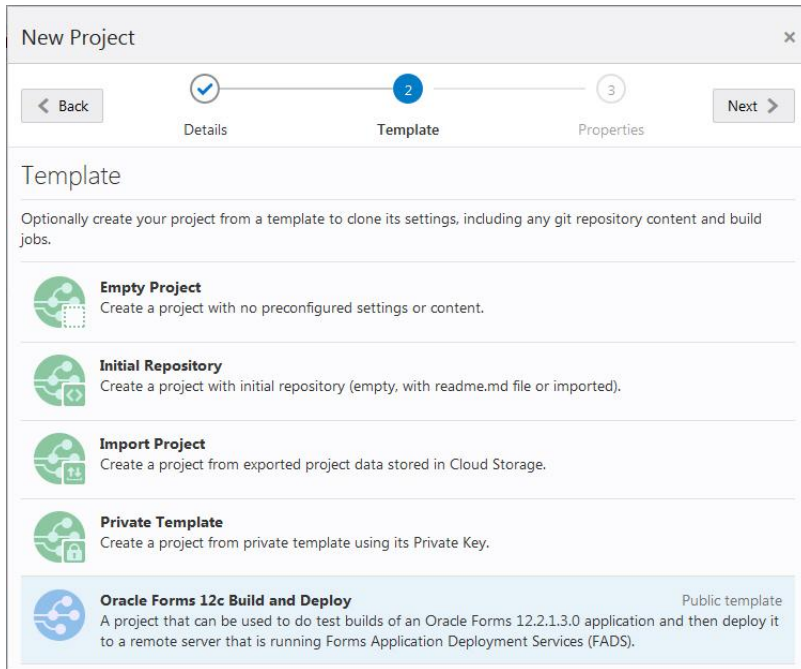


Creating a New Forms DCS Project

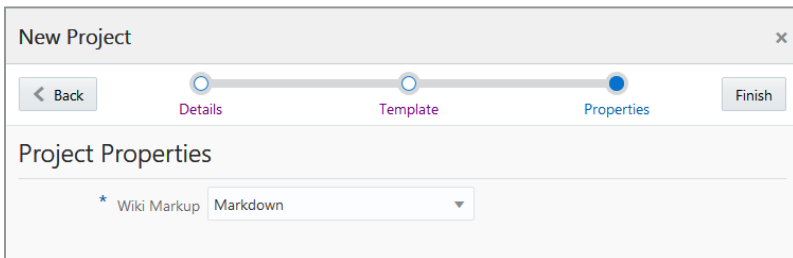
Step 1: In DCS, click on the “*New Project*” button to display the New Project wizard. Enter a useful Name and Description then click “*Next*”



Step 2: On the Template screen, select the “Oracle Forms 12c Build and Deploy” template. Click “*Next*”.
(The Forms template project may not be available in all global regions.)



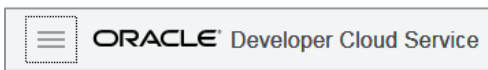
Step 3: Select “Markdown” for Wiki Markup then click “*Finish*” to create the project.



The creation of the new project will take a few moments. Once created, a few post creation configuration steps are required before it can be used.

Setting Up the New Project before First Use

Step 1: If the Project Navigator side panel is not displayed (left side), click on the hamburger button found next to the Developer Cloud Service branding near the upper left.



Step 2: Click on “*Build*” to access the Build Jobs provided with this Project Template.



Step 3: Click on the “Configure” button for the Compile_and_Package job.

Status	Weather	Job	Last Success	Last Unsuccess	Duration	Actions
		Compile_and_Package	N/A	N/A	< 1 Sec	
		Deploy_FAR_file	N/A	N/A	< 1 Sec	Configure

Step 4: The first time entering the project, the Software Configuration tab may be automatically displayed. If not, click the “Settings” gears icon/tab found on the left side vertical tab bar. Select the Software tab. In the “Software Template” drop-down field, select the VM Template created in the initial setup steps.

Step 5: Click on the tools icon/tab found on the left side vertical tab bar. Select the Source Control tab. Click “Add Source Control” and select Git. This will expose a Repository drop-down. From the drop-down, select the entry that includes your project name and ends with .git. . Click on “Save”.

Step 6: In the Project Navigator, click on “Build” again to return to the Jobs list. For the Deploy_FAR_File job, click on “Configure” button. Repeat Step 4 above, for the Deploy_FAR_File job.

Status	Weather	Job	Last Success	Last Unsuccess	Duration	Actions
		Compile_and_Package	N/A	N/A	< 1 Sec	
		Deploy_FAR_file	N/A	N/A	< 1 Sec	

If you plan to customize these Jobs, which is likely, it is recommended that they are copied and those copies be used for the following steps and customizations. To copy the Jobs, click on the “New Job” button and use the “Copy existing job” option to copy each of the two Jobs before making changes.

If a new Job is created as a copied from a pre-existing Job it is important that the Build Environment settings be reviewed and properly updated, as the copy will contain references to the originating Job. So as an example, if you create a new Job copied from “Compile_and_Package” and name the new Job “My Compile and Package”, it will be important that the “From job” value be changed from “Compile_and_Package” to the new Job, “My Compile and Package”. Not doing this will result in artifacts being taking from the origin Job and not the new one.

Jobs Overview > My Compile and Package > **Configure**

Job Configuration

Source Control Build Parameters **Build Environment** Builders Post Build

Configure Build Environment

Copy Artifacts

From job	My Compile and Package
Which build	Compile_and_Package Deploy_FAR_file My Compile and Package

Connecting the Local Git Repository with the DCS Project Git Repository

At this point the initial setup is complete, the DCS project has been created and all that remains is to create a local Git repository and connect it with the one in the DCS project.

These steps assume an existing local Git repository does not yet exist. It is possible to work with existing local directories and/or an existing repository, however these steps will not cover that configuration. Refer to the Git and DCS documentation for details on how to work with an existing local repository.

Step 1: On the developer's machine, create the desired top level directory for where the application's project top level directory will be inserted. The application modules will be stored in a sub-directory created in a later step. As an example, consider something like this: C:\Git\dcs\sales

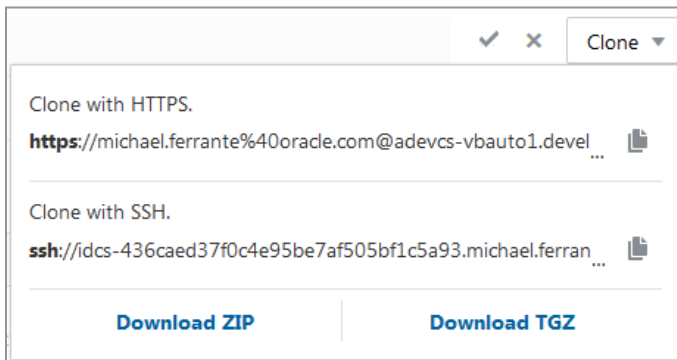
Step 2: Open a Git shell and change directory (i.e. cd) to the directory created in Step 1 above.

```
MINGW64 ~  
$ cd /c/Git/dcs/sales
```

Step 3: Leave the Git window open and temporarily return to the DCS browser window. In the Project Navigator, click on "Code".



Step 4: On the right hand side, click on the "Clone" drop-down. Choose either HTTPS or SSH and click on the "Copy to clipboard" icon to the right of the URL you plan to use. This will copy the Git location within DCS for this project. This URL will be needed in the next step. If a proxy server is used between the user's machine and the Internet, using the HTTPS option may be preferred over SSH.



Step 5: Return to the Git shell. Run this command:

```
git clone <PASTE THE CLIPBOARD CONTENTS HERE>
```

The successful execution of the above will create a sub-directory using the project name and copy the project's Code README.md file into this new sub-directory. The sub-directory with the project name will be referred to as the local repository and the place where application files for this project must be stored. This local repository and the DCS repository are now associated with each other.

```
MINGW64 /c/Git/dcs/sales/oracle-forms-12c-build-and-deploy (master)  
$ ls  
README.md
```

Integrating a Forms Application with Git and DCS

The above steps configured the local Git repository, created a new DCS project, and associated the local Git with the remote (DCS) Git. The following steps will be used to update the local and remote repository as files are changed. These steps represent an overview of how to add/update files in the repository. It will not go into rolling back changes, deleting changes, or branching code. Refer to the Git documentation for details on using these more advanced commands.

Inserting a Forms Application into the New Repository

In order to manage Forms application files through Git and eventually DCS, all files associated with the application must be created or copied into the repository directory mentioned in an earlier step above.

Step 1: Copy all existing application files into the repository directory for this project.

Step 2: In order to update the local repository index, run the following command in the Git shell. Remember that you must be in the repository directory before executing these command. This command simply notifies Git of pending changes. The changes have not been committed yet. In this example a wildcard (*) is used, however individual file names could be used instead. Using specific file names is helpful if additional changes to other files are expected.

```
git add *
```

Step 3: Run the following command to commit the changes flagged for updating in the above steps. It is strongly recommended that a comment be included with this command. Comments are included with the `-m` switch as shown below.

```
git commit -m "Enter a description of the changes here"
```

Step 4: The above steps updated the local repository. In order to sync these changes with DCS, run the following command. Note that "master" below is a reference to the master branch of the code. If the use of branching is implemented, this reference to master would instead reference the current branch receiving the changes.

```
git push origin master
```

Each time files in this repository are updated/added, be sure to complete steps 2 through 4 above. Refer the Git documentation for information on how to properly delete/remove a file. It may be best to delay executing any of the Git commands until all expected changes have been completed.

Putting Developer Cloud Service to Work

Now that the developer's machine has been configured, DCS has a new Project for the Forms application(s), and the two are tied together, it's time to let DCS get to work. The sample Project provided is setup to have its Jobs executed manually. However, forcing them to run automatically based on a schedule or detection of a code change is also possible.

Running Jobs Manually

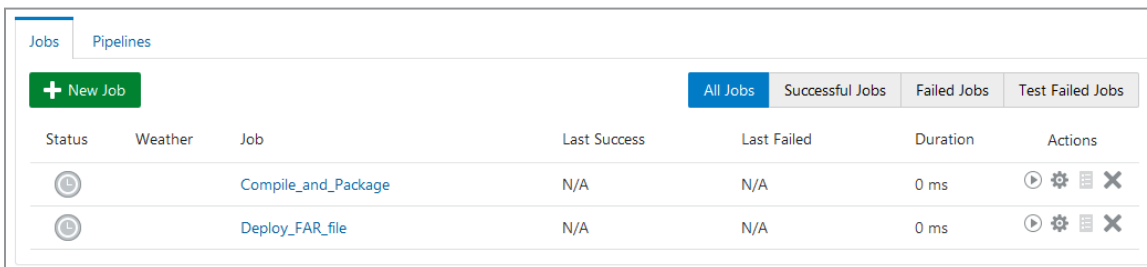
Because running any Build Job manually should be mostly self-explanatory, the level of detail provided here will be limited. Refer to the Project's Wiki, Readme for more information on the Job's parameters and values needed to execute either of the provided sample Jobs. Be sure to also review and understand the limitation of this sample Project, also explained in the Wiki Readme.

This sample Project provides two Build Jobs. The second ("Deploy_FAR_File") is dependent on the first ("Compile_and_Package"). In other words, you must run the first before you can run the second. If you run the second without having run the first, the application will be redeployed in its previous state the last time "Compile_and_Package" was successfully run. If the first Job has never been run or never run successfully, the second will fail.

Step 1: Open the Build page by clicking on "Build" from the Project Navigator. If the Navigator is not visible, click on the hamburger icon found next to the Oracle logo near the upper left of the page.



Step 2: Click on the "Run" button (▶) to the right of the "Compile_and_Package". This will display a parameter form. Fill in the blanks as described then click the "Build Now" button at the bottom of the parameter form. As mentioned, more information about the parameters and valid values can be found in the Wiki's Readme.

A screenshot of a web interface showing a table of jobs. The table has columns for Status, Weather, Job, Last Success, Last Failed, Duration, and Actions. Two jobs are listed: 'Compile_and_Package' and 'Deploy_FAR_file', both with a status of 'N/A' and a duration of '0 ms'. Each job row has a play button icon in the Actions column.

Status	Weather	Job	Last Success	Last Failed	Duration	Actions
⏪		Compile_and_Package	N/A	N/A	0 ms	▶ ⚙️ 📄 ✕
⏪		Deploy_FAR_file	N/A	N/A	0 ms	▶ ⚙️ 📄 ✕

Step 3: Assuming the "Compile_and_Package" has completed successfully, the "Deploy_FAR_file" can now be run. To run the "Deploy_FAR_file", follow the same process used for "Compile_and_Package", however use the "Run" button for "Deploy_FAR_file".

If both Jobs ran successfully, the table of Jobs will reflect that successful status with a green bubble centered with a white check (as seen below). The Weather column in the table represents an average of successful Jobs previously run and completed. More details about the information in each column can be found in the DCS documentation.

Jobs		Pipelines				
+ New Job		All Jobs	Successful Jobs	Failed Jobs	Test Failed Jobs	
Status	Weather	Job	Last Success	Last Failed	Duration	Actions
✓	☀️	Compile_and_Package	#11 October 29, 2018 8:05 PM -0400	N/A	45 s	⏪ ⚙️ 📄 ✕
✓	☀️	Deploy_FAR_file	#10 October 29, 2018 7:47 PM -0400	N/A	1 min 18 s	⏪ ⚙️ 📄 ✕

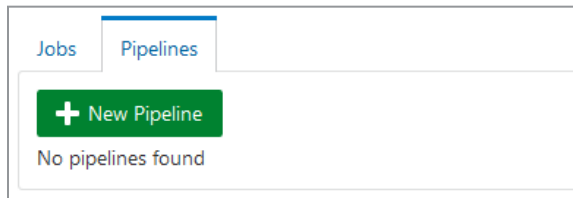
Running Jobs on a Schedule

Jobs can be configured to run automatically based on schedule or if a change is detected. It is also possible to chain Jobs together using a Pipeline. In this section we will show how to create a Pipeline and schedule both Jobs to run one after the other assuming the first finishes successfully. If a Pipeline is not desired, creating it can be skipped and each Job can be treated independently, however the “Deploy_FAR_file” Job cannot be triggered based on code change because there is no direct code related to the deployment process. Therefore, only manual execution or a scheduled time can be used with this Job if using a Pipeline is not desired.

Creating a Pipeline

In order to tie the two Jobs together and create an efficient automated process, a Pipeline must first be created.

Step 1: While on the Build page, click on the “Pipelines” tab. Then click on “New Pipeline”.



Step 2: Enter a useful name and Description for your Pipeline. Uncheck the box labeled “Auto start when pipeline jobs are built externally” if you do not want the Pipeline to run when you manually start a Job. Click on “Create” when finished.

Create Pipeline ✕

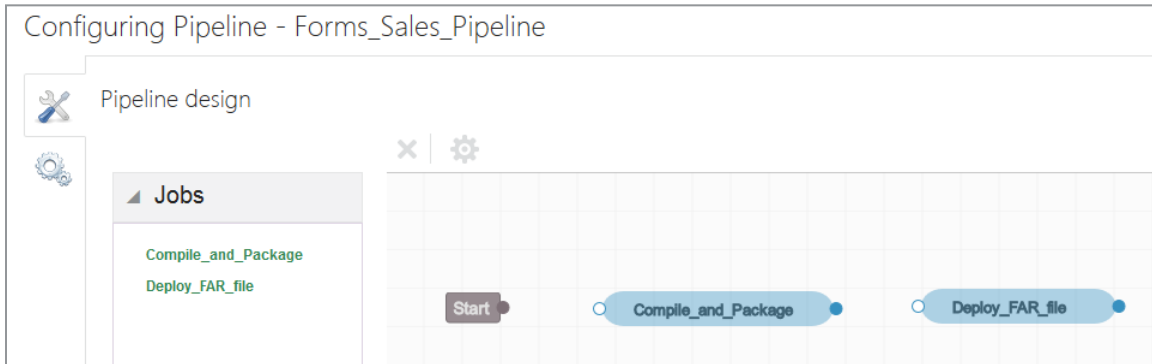
* Name:

Description:

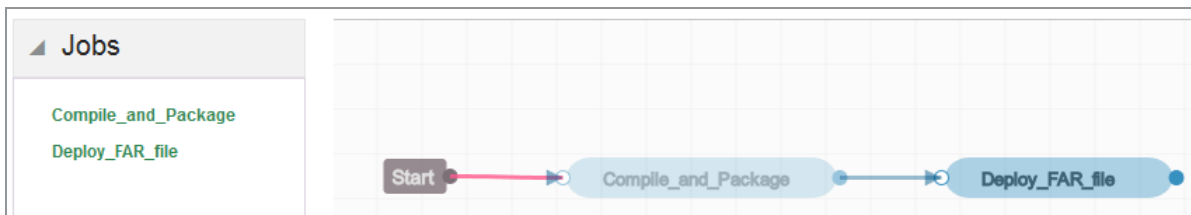
Auto start when pipeline jobs are built externally

Disallow pipeline jobs to build externally when the pipeline is building

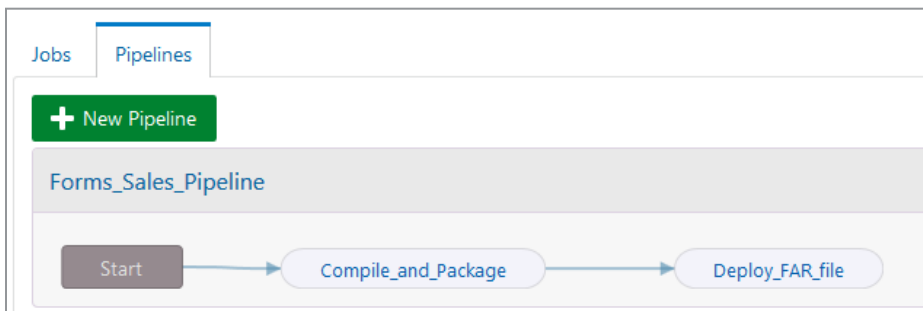
Step 3: Using the mouse, drag the “Compile_and_Package” Job from the Jobs pane into the drawing box, next to Start. Then drag “Deploy_FAR_file” next to it.



Step 4: Using the mouse and starting from the “Start” box, drag the connection dot/handle to connect each point to the next. This represents the flow of the process. By default, it is assumed that each Job completes successfully. Adding Jobs to handle a “failed” case can also be added. By double-clicking on the connector arrows, the Result Condition can be changed from “Success” to “Failed” or “Test Failed” as desired depending on the Job to which you are connecting. In this sample Project, a Job to handle a Failed case has not been provided. Click on “Save” when finished.



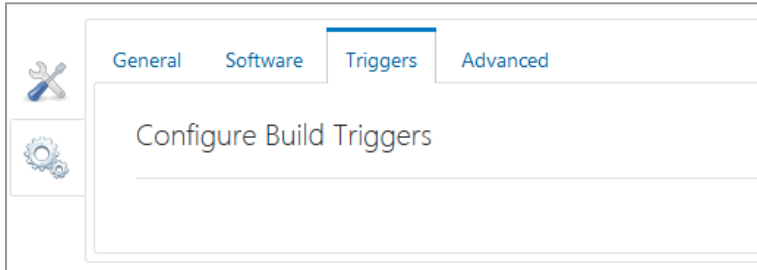
Step 5: The new Pipeline will now be presented in the Pipelines table. Click on the “Jobs” tab.



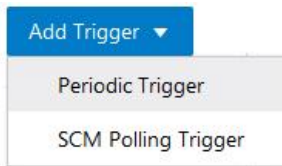
Schedule a Time to Run a Pipeline

There are two different types of schedules that can be set. Either a periodic schedule that will run regardless of whether or not there have been changes or a schedule that looks for changes in that time interval and only runs if changes are detected at that time. This schedule will only need to be created for the “Compile_and_Package” Job because the Pipeline will automatically start the second Job (“Deploy_FAR_file”) when the first finishes successfully.

Step 1: In the Jobs table, click the Configuration gear  for the “Compile_and_Package” Job. Once the Configuration tabs are displayed, click on the gears icon  on the vertical tab bar. Then click on the “Triggers” tab.



Step 2: On the right side of the Triggers tab, click to expand the “Add Trigger” drop-down. Choose either “Periodic Trigger” or “SCM Polling Trigger”. The Periodic Trigger will cause the Job to run based on the schedule or time period you choose regardless of whether or not code changes have been made. Alternatively, SCM Polling will check for changes based on the schedule or time period configured, but only run if changes are found. Regardless of which is selected, the scheduling screen presented is the same.



In this example, the trigger will execute once every 30 minutes. After scheduling the desired time, click on “Save” to commit the changes.

Schedules are set in UTC. To display the schedule in a different timezone, use 'View schedule' below.

Expert mode 0/30 * * * * #Every 30 minutes

Minute

Hour

Day of the Month

Month

Day of the Week

Comment

Setting Default Parameter Values

In order for a Pipeline of the provided sample Jobs to run without any user intervention, default values must be set for all the Job parameters. Parameters with multiple fixed choices (drop-downs) will use the first value in the list as the default value. Do the following for each of the two provided Jobs.

Step 1: Open the Job's Configuration screen and navigate to the "Build Parameters" tab. Enter a Default Value for each of the parameters on the page. Be sure to scroll down through all of them. When done, click on "Save".

The screenshot shows the 'Configure Build Parameters' interface with the following details:

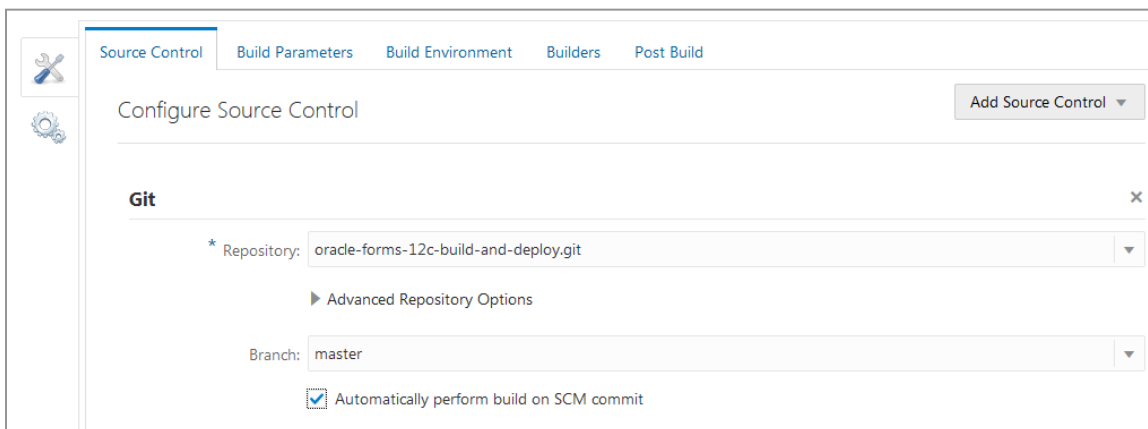
- Choice Parameter:**
 - Name: FILES_TO_BUILD
 - Choices: all, rebuild_changed_files, rebuild_failed_files, rebuild_since_success
 - Description: Determines which files should be built: all: Rebuild all files
- String Parameter:**
 - Name: APPLICATION_NAME
 - Default Value: Sales
 - Description: If the build is successful and this parameter is provided, it will be used as the name of the .FAR file that will be generated for deployment. Leave this blank if no .FAR file is desired.
- String Parameter:**
 - Name: APPLICATION_VERSION
 - Default Value: 1.0
 - Description: If a .FAR file is generated, this will be the application version number used.

Running Jobs When Code Changes Are Detected

Running Jobs or a Pipeline when code changes are detected is often desirable in a test environment, but can also be used in any desired case. To run Jobs when code changes are detected, do the following.

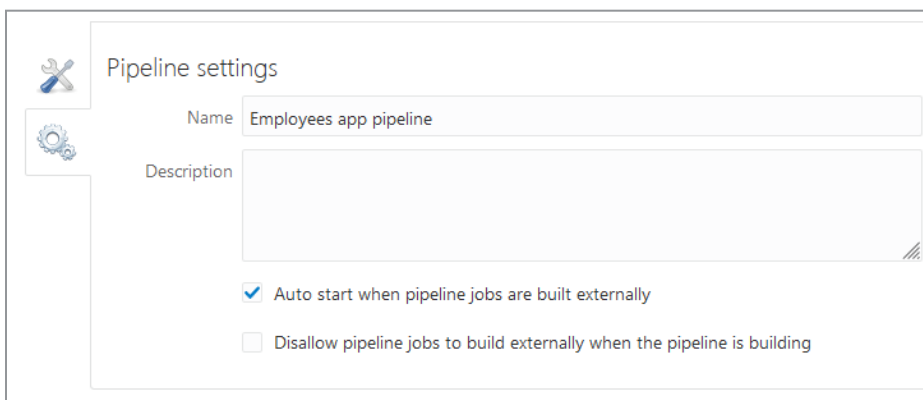
If you created schedules using the previously mentioned steps, keep those in mind when introducing the following steps. You may not want to run the Jobs for both scheduled triggers and upon change detection. If you do not want both, be sure to delete the previously created schedules.

Step 1: Open the Job's Configuration screen and navigate to the "Source Control" tab. Check the box labeled "Automatically perform build on SCM commit." Click "Save" to commit this change. This step is only necessary on the "Compile_and_Package" Job.



The screenshot shows the 'Configure Source Control' dialog box. The 'Source Control' tab is selected. The 'Git' provider is configured with the repository 'oracle-forms-12c-build-and-deploy.git' and the 'master' branch. The checkbox 'Automatically perform build on SCM commit' is checked.

Step 2: Return to the main Build page to show the complete "Jobs" table. Click on the "Pipelines" tab then the "Settings" sidebar tab. Check the box labeled "Auto start when pipeline jobs are built externally"



The screenshot shows the 'Pipeline settings' dialog box. The 'Name' field is 'Employees app pipeline'. The 'Description' field is empty. The checkbox 'Auto start when pipeline jobs are built externally' is checked.

The Pipeline will now run automatically when a code update is made to the DCS code repository. The code change can come from a change made directly in DCS or when synchronized from a local Git repository.

For more information on how to use the sample Jobs provided for the Forms template project, refer to the Project Wiki and specifically the included README.



References

<https://git-scm.com>

<https://docs.oracle.com/en/cloud/paas/developer-cloud>

<https://docs.oracle.com/middleware/12213/formsandreports/deploy-forms/oracle-forms-application-deployment-services-fads.htm>

<https://docs.oracle.com/middleware/12213/formsandreports/releasenotes-fnr/known-issues-and-workarounds.htm#FRREL-GUID-EC385A18-F70F-4699-8BCE-E648544F3726>



Conclusion

Modern DevOps allows organizations to more easily and quickly deliver application updates. Oracle Developer Cloud Service with Oracle Forms support helps to bring modern DevOps to your legacy applications. With a well thought out plan and powerful DevOps tools, applications can easily be updated, tested, and deployed faster than ever before. Keeping your application up to date by regularly fixing bugs and delivering the latest features needed by the organization's user community is will help to ensure that users are able to work as effectively as possible and ensure that accurate data is recorded.






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