




WSO2 API Manager 4.1.0 Fundamentals - Integration Profile

Artifact Deployment



WSO2 Training

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Module Objective

At the end of this module, attendees will be able to:

- Understand how integration artifacts are packaged for deployment.
- Understand how artifacts are deployed in a VM environment.
- Understand how artifacts are deployed in container environments.
- Externalize parameters in integration artifacts using environment variables.
- Manage environment-specific artifacts across different environments.
- Understand the basics of using a CICD pipeline for the WSO2 Micro Integrator on Kubernetes.



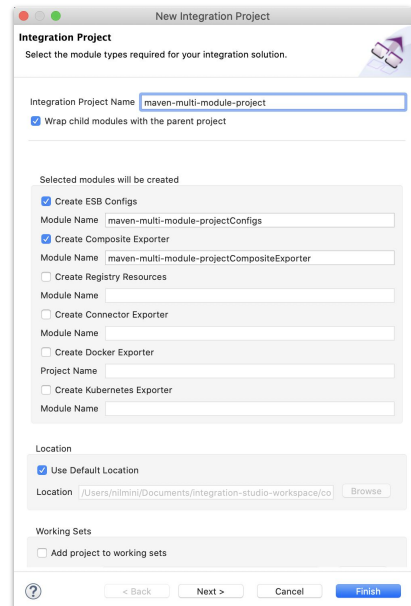


Integration Project



Integration Project

- The Integration Project you create from WSO2 Integration Studio is a **Maven Multi Module** project.
- Use this project's POM file to build the integrations solutions for your deployment.
 - Build a **composite application** for a VM deployment.
 - Build **Docker images** for a container deployment.

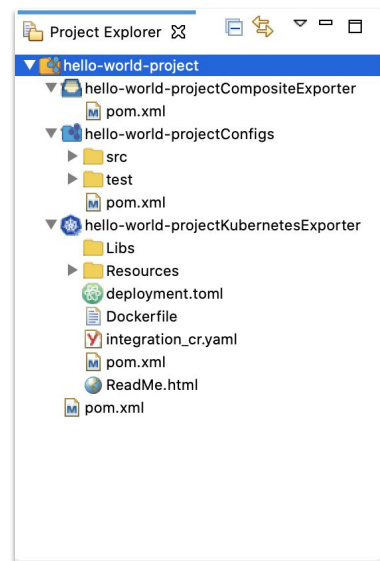


The screenshot shows the 'New Integration Project' dialog box in WSO2 Integration Studio. The title bar reads 'New Integration Project'. The main heading is 'Integration Project' with a subtitle 'Select the module types required for your integration solution.' Below this, there is a text field for 'Integration Project Name' containing 'maven-multi-module-project' and a checked checkbox for 'Wrap child modules with the parent project'. A section titled 'Selected modules will be created' contains several options: 'Create ESB Configs' (checked), 'Create Composite Exporter' (checked), 'Create Registry Resources' (unchecked), 'Create Connector Exporter' (unchecked), 'Create Docker Exporter' (unchecked), and 'Create Kubernetes Exporter' (unchecked). Each option has an associated 'Module Name' text field. Below this is a 'Location' section with 'Use Default Location' checked and a 'Location' text field showing '/Users/nilmini/Documents/integration-studio-workspace/co' with a 'Browse' button. At the bottom is a 'Working Sets' section with 'Add project to working sets' unchecked. Navigation buttons at the bottom include a help icon, '< Back', 'Next >', 'Cancel', and 'Finish'.

Integration Project

This project includes:

- Modules with integration artifacts.
 - ESB Configs
 - Connector Configs
 - Registry Resources
- Composite Exporter that packages the integration solutions in a CApp.
- Modules with deployment resources for Docker and/or Kubernetes.



Integration Project

You can build individual maven profiles for the required deployment.

Profile Name	Description
Solution	Builds the integration artifacts stored in the ESB Config and Composite Exporter sub projects.
Docker	Builds the integration artifacts stored in the ESB Config , Composite Exporter and Docker sub projects.
Kubernetes	Builds the integration artifacts stored in the ESB Config , Composite Exporter and Kubernetes sub projects.

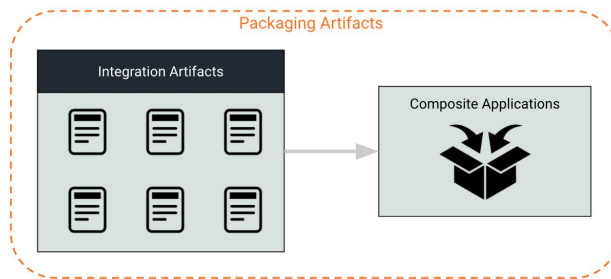


Centralized Deployment



Packaging Integration Artifacts

Integration artifacts stored in your ESB Config module and supporting modules (Connector Exporter and/or Registry Resources) should be package in a **Composite Exporter** for deployment.



Composite Application

The composite exporter module in the integration project includes the packaged composite application of your integration solution.

Composite Exporter

Artifacts added as dependencies

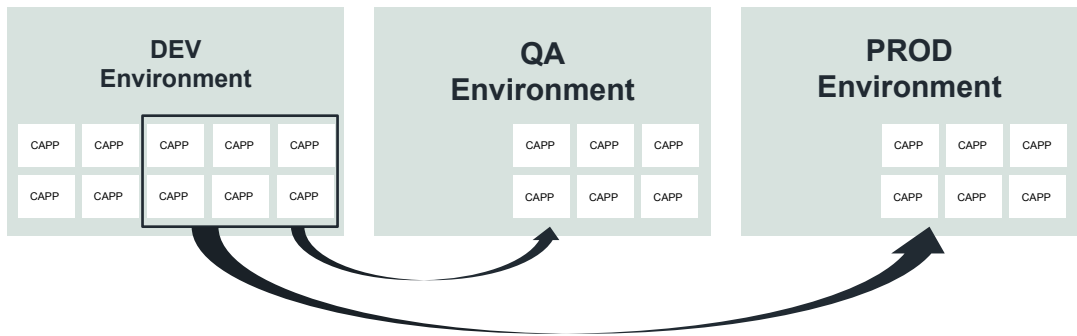
The screenshot shows the SAP Studio IDE with the 'data-mappingCompositeExporter' project selected. The Project Explorer on the left shows the project structure, with 'data-mappingCompositeExporter' highlighted. The main editor displays the project details, including Group Id, Artifact Id, Version, and Description. A red box highlights the 'Dependencies' section, which lists 'data-mappingConfigs' and 'data-mappingRegistryResources' as dependencies.

Artifact	Server Role	Version
data-mappingConfigs	--	1.0.0
data-mappingRegistryResources	--	1.0.0



Deploy in a VM

Integration solutions are deployed to VM environments by deploying the composite applications (CApps) that include the relevant artifacts.





Microservices Deployment



Docker Exporter

The Docker exporter module generates the Docker image with the Integration solution. This is required for your HELM-based container deployment.

The screenshot displays the IDE interface for the `docker-projectDockerExporter` module. On the left, the **Project Explorer** shows the project structure with `docker-projectDockerExporter` selected, and its `Dockerfile` file highlighted. On the right, the **docker-projectDockerExporter** configuration page is shown with the following fields:

- Group Id:** `wso2.sampleHelloWorldDocker`
- Artifact Id:** `docker-projectDockerExporter`
- Version:** `1.0.0`
- Description:** `docker-projectDockerExporter`
- Base Image:** `wso2/wso2mi:1.2.0`
- Target Repository:** `docker_username/repository`
- Target Tag:** `v1.0.0`
- Deployment Configurations:** ☒ Automatically deploy configurations (supports Micro-Integrator-1.1.0 upwards)
- Enable Cipher Tool:** ☐ Required for secrets encryption and decryption
- Dependencies:**
 - Artifact:** `wso2.sampleHelloWorldDocker_-_docker-projectCompositeExporter`
 - Version:** `1.0.0`

Red lines connect the labels to the corresponding elements in the screenshot:

- Docker File** points to the `Dockerfile` in the Project Explorer.
- Base Docker Image & Target Docker Image Repository** points to the `Base Image` and `Target Repository` fields.
- Composite Application** points to the `wso2.sampleHelloWorldDocker_-_docker-projectCompositeExporter` artifact in the Dependencies section.

Kubernetes Exporter

The Kubernetes Exporter is used to generate the Docker image and also to create the deployment in a Kubernetes cluster.

The screenshot shows the IntelliJ IDEA interface with the Project Explorer on the left and the Run/Debug configuration for the `kubernetes-projectKubernetesExporter` on the right. Red boxes and arrows highlight the following elements:

- Docker File:** Points to the `Dockerfile` file in the `kubernetes-projectKubernetesExporter` directory in the Project Explorer.
- Kubernetes Deployment File:** Points to the `deployment.yml` file in the `kubernetes-projectKubernetesExporter` directory in the Project Explorer.
- Base Docker Image & Target Docker Image Repository:** Points to the `Base Image` field in the Run/Debug configuration, which is set to `wso2/wso2mi:1.2.0`.
- Composite Application:** Points to the `Artifact` field in the Dependencies section, which is set to `wso2.sampleHelloWorldKubernetes_kubernetes-projectCompositeExporter`.

The Run/Debug configuration for `kubernetes-projectKubernetesExporter` shows the following details:

- Group Id: `wso2.sampleHelloWorldKubernetes`
- Artifact Id: `kubernetes-projectKubernetesExporter`
- Version: `1.0.0`
- Description: `kubernetes-projectKubernetesExporter`
- Base Image: `wso2/wso2mi:1.2.0`
- Target Repository: `docker_username/repository`
- Target Tag: `v1.0.0`
- Deployment Configurations: ☒ Automatically deploy configurations (supports Micro-Integrator-1.1.0 upwards)
- Enable Cipher Tool: ☐ Required for secrets encryption and decryption
- Dependencies:

Artifact	Version
<input checked="" type="checkbox"/> wso2.sampleHelloWorldKubernetes_kubernetes-projectCompositeExporter	1.0.0



Deploying Microservices in Containers

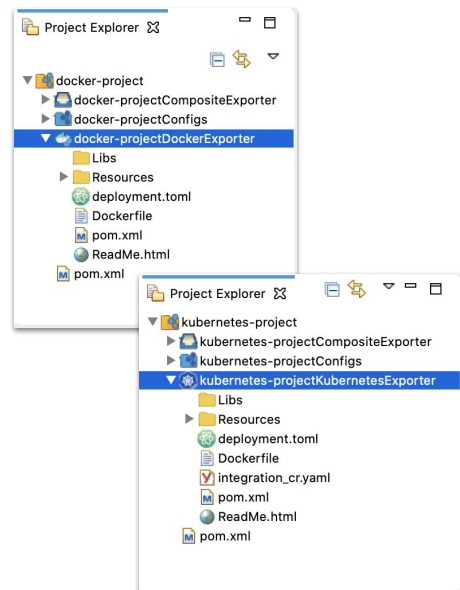
A microservices deployment can be done in two ways:

- Using Helm Charts
- Using the Elixir-Kubernetes Operator



Using the EI-Kubernetes Operator

- Use the Kubernetes Exporter in WSO2 Integration Studio to create a portable Docker image.
- Use a base Micro Integrator image from the WSO2 Docker registry.
- Use the **integration_cr.yaml** file in the Kubernetes Exporter to specify the Kubernetes deployment.
- Use the EI-K8s operator to create the deployment in Kubernetes.



Using HELM Charts

- Helm charts for a WSO2 Micro Integrator deployment are available in the *WSO2 Helm Repository*.
 - ◉ <https://artifacthub.io/packages/helm/wso2/micro-integrator>
- Use the **Docker Exporter** in WSO2 Integration Studio to create a portable Docker image.
- Use the **values.yaml** of the HELM package to specify the Kubernetes deployment.





Let's try it out!

Deploying on Kubernetes using the EI-K8s Operator



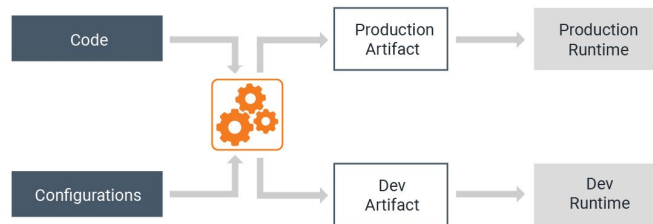


Artifact Governance



Managing Artifact Configurations

Configuration parameters such as endpoint URLs change from environment to environment. This requires a new build and a new test cycle for every change.





Using Environment Variables and Files

- Use environment variables or files to externalize parameter values.
- Specially useful when deploying in containerized environments.
- Dynamically inject the parameter values to container environments.



Injecting Endpoint Parameters

1. Parameterize the config using `$SYSTEM:{variable name}`:

```
<?xml version="1.0" encoding="UTF-8"?>
<endpoint xmlns="http://ws.apache.org/ns/synapse" name="JSON_EP">
  <address uri="$SYSTEM:VAR" />
</endpoint>
```

Use `$FILE:{variable name}` if you want to inject endpoint parameters via a file.

2. Define variable name as an environment variable.

```
export VAR=http://localhost:61616/...
```





Supported Parameters

The following list of configuration parameters support this feature:

<https://apim.docs.wso2.com/en/4.1.0/integrate/develop/injecting-parameters/#supported-parameters>





Let's try it out!

Injecting Parameters Dynamically





Continuous Integration Continuous Deployment





Continuous Integration/Continuous Delivery (CI/CD)

What is CI/CD?

- **Continuous Integration (CI)** is the process of automatically detecting, pulling, building, and running unit testing as your integration solutions are periodically changed.
- **Continuous Delivery (CD)** is the overall chain of processes (pipeline) that automatically detects changes and runs them through build, test, packaging, and related operations to produce a deployable integration solutions.





VM CICD Pipeline

Integration Project Build Job

- Maintain one Jenkins job per Integration Project repository.
- The build phase will build the project and run the unit tests.
- The release phase of the job will publish the CApps to the Nexus repository and create a release tag in GitHub.

Deployment Descriptor Build Job

- Maintain one Jenkins job per Environment.
- There will be descriptor files for each project inside a separate folder.
- Use a new version/rollback to a previous version by defining the change inside the descriptor and commit to the branch.
- This job contains only the build phase.



Kubernetes CICD Pipeline

Integration Project Build Job

- Maintain one Jenkins job per Integration Project repository.
- The build phase will build the Integration project and run the unit tests.
- The release phase generates Docker images, name and project version and pushes the image to the configured Docker registry and creates a release tag in GitHub.

Deployment Descriptor Build Job

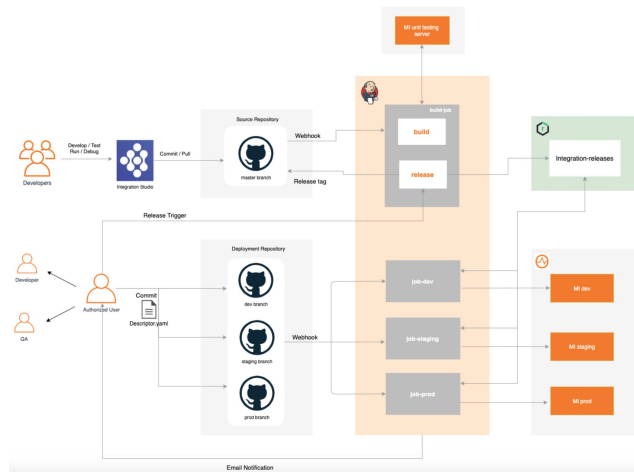
- Maintain one Jenkins job per Environment.
- There will be descriptor files generated for each project inside a separate folder.
- To use a new version/rollback to a previous version, define the version inside the `integration_cr.yaml` or `integration_k8s.yaml` and commit to the branch.
- This job contains only the build phase.



VM Micro Integrator CI/CD Pipeline

Tools in the VM CI/CD Pipeline of WSO2 Micro Integrator:

- **CI/CD Tool:**
 - Jenkins
- **Artifact Repository:**
 - Nexus



Kubernetes Micro Integrator CI/CD Pipeline

Tools in the Kubernetes CI/CD Pipeline of WS02 Micro Integrator:

- **CI/CD Tool:**
 - Jenkins
- **Artifact Repository:**
 - Docker Registry

