Contents

IBM Business Automation Workflow Pattern

IBM Business Automation Workflow Pattern is a pattern configuration of Business Automation Workflow that provides business process management capabilities that are configured for typical business process management projects.

Every organization uses business processes to accomplish work. A *business process* is a set of business activities that represent the required steps to achieve a business objective. For example, you might have a business process that handles credit card disputes. In this case, the business objective is to resolve the dispute in an efficient and accurate way to minimize cost to your organization and to retain customer satisfaction. The process might be activities like receiving the claim, examining the validity of the claim, deciding whether to remove the charge, and informing the customer of the decision.

By using Business Automation Workflow Pattern, you can automatically and repeatedly deploy systems that include one or more virtual machines. You can deploy solutions faster and eliminate problems that are caused by manual configuration processes.

Business Automation Workflow Pattern provides topology-based virtual system patterns that run on IBM Cloud Pak System and the functions of Business Automation Workflow.

What's new

Learn what's new in IBM Business Automation Workflow Pattern 19.0.0.3.

Cloud Pak System certification

Business Automation Workflow Pattern 19.0.0.3 is certified with IBM Cloud Pak System Version 2.3.2.0.

Introducing IBM Business Automation Workflow Pattern

IBM Business Automation Workflow Pattern provides common patterns that enable the Business Automation Workflow environment to run in a private cloud, which efficiently runs workloads, manages all integrated components, monitors the health of the system, and deploy applications.

Business Automation Workflow Pattern uses business process virtualization as a process model that has business requirements. From IBM Workflow Center, you can centrally deploy business processes for your organization. Business Automation Workflow Pattern provides business process management capabilities that are configured for typical business process management projects.

To implement a business process management solution, understand the pattern configurations including what pattern types are and which artifacts are available:

pattern type
A collection of plug-ins that define artifacts that are packaged in a `.tgz` file. Business Automation Workflow Pattern uses artifacts based on the pattern type to create a Business Automation Workflow environment. Business Automation Workflow Pattern has the following pattern types:

- Business Automation Workflow Pattern 19.0.0.3 for Virtual System 1.0.0.2

virtual system pattern
One or more middleware-centric virtual images, which can include script packages, that implement a deployment topology. A virtual system pattern is a shared topology definition used for repeatable deployment. To create a Business Automation Workflow environment, you start by creating and deploying a virtual system pattern. For example, a virtual system pattern can contain a deployment manager, one or more custom nodes, an IBM HTTP Server, and configuration scripts for installing applications to the topology.

With Business Automation Workflow, you can either build your own virtual system pattern or use a predefined virtual system pattern. By using predefined patterns, you can quickly set up complex, highly available Business Automation Workflow environments.

Because Business Automation Workflow Pattern provides a standardized solution for you to reuse, after you build a virtual system pattern you can deploy the virtual system pattern and manage it in a cloud environment. A deployed pattern is called an *instance*. A deployed pattern is converted from a logical model to a topology of virtual machines that are deployed to the cloud.

You build a Business Automation Workflow Pattern, for example, by using Business Automation Workflow Pattern 19.0.0.3 for Virtual System 1.0.0.2 and by using the following artifacts:

software components
Business Automation Workflow software, such as the Business Automation Workflow 19.0.0.3 Workflow Server deployment manager software component.

script packages
Configuration scripts to configure software components, such as the Business Automation Workflow 19.0.0.3 Config Security Directory Server script package, which you use to configure IBM Security Directory Server to work with Business Automation Workflow.

link
A representation of data dependencies between the attributes of two software components, ensuring that the attributes between software components that have data dependencies have the same value. The first software component or script package depends on the second software component or script package. The first software component or script package runs after the second software component or script package.

policy
A quality-of-service level for artifacts in patterns that are applied to a software component to configure specific behavior in the deployed virtual instance. For example, to alleviate heavy workloads when a pattern is deployed, you can add a base-scaling policy to the Business Automation Workflow 19.0.0.3 custom node software component to add more than one custom node.

add-on
An additional service or feature that IBM Cloud Pak System provides for Business Automation Workflow Pattern. For example, to provide more storage to the provisioned virtual machine you can add a default add-disk add-on to one software component.

IBM Business Automation Workflow Pattern on IBM Cloud Pak System

IBM Cloud Pak System is a hybrid cloud application platform that you use to deploy enterprise applications and middleware with quality of service. IBM Business Automation Workflow Pattern is optimized to run on IBM Cloud Pak System.

By using IBM Cloud Pak System, you can deploy enterprise applications on the cloud with flexibility to move workloads between on-premises and off-premises systems without changes. The quality of service includes scaling policies to increase configuration capacity, high availability and disaster recovery capabilities, monitoring of virtual application environments, license management, centralized logging to troubleshoot and diagnose problems, and security.

Based on your business requirements, you can deploy your IBM Business Automation Workflow Pattern on IBM Cloud Pak System or IBM Cloud Pak System Software.

Cloud Pak System is an integrated hardware and software system that provides system-centric and application-centric computing models in a cloud environment. Cloud Pak System determines the underlying infrastructure and middleware that is required for the Business Automation Workflow Pattern environment and adjusts the infrastructure and middleware to ensure that the quality-of-service levels are maintained. Quality-of-service levels are set for the Business Automation Workflow environment.

By using Cloud Pak System Software, you can use your own hardware on your own infrastructure. It helps you manage resources in a cloud-computing environment.

By deploying your Business Automation Workflow Pattern on IBM Cloud Pak System, you can efficiently manage complex applications, tasks, and processes that the application starts. The system implements a virtual-computing environment in which different resource configurations are tailored to different workloads.

Related information

IBM Cloud Pak System Knowledge Center: Working with virtual patterns

IBM Cloud Pak System Software Knowledge Center

IBM Business Automation Workflow Pattern requirements and contents

Understand the requirements for and contents of IBM Business Automation Workflow Pattern packages on IBM Cloud Pak System.

Business Automation Workflow Pattern 19.0.0.3 that runs on IBM Cloud Pak System supports the platforms on AIX® and Red Hat Enterprise Linux® Server. For detailed information about the system requirements, including the supported operating systems, related software, hypervisors, and hardware requirements, go to Software Product Compatibility Reports and select **IBM Pattern**.

Important: Business Automation Workflow Pattern uses the operating system from IBM Cloud Pak System. Therefore, virtual machines and operating systems are no longer prerequisites.

To run Business Automation Workflow Pattern on IBM Cloud Pak System Software Version 2.3.2.0, you must have 64-bit Red Hat OS image 7.5 and IBM Db2® Pattern V1.2.11.0.

If your Business Automation Workflow Pattern does not have 64-bit Red Hat OS image 7.5, you can either prepare it on your own or buy a 64-bit Red Hat OS image 7.5 of IBM Cloud Pak System Software. For information about purchasing 64-bit Red Hat OS image 7.5, contact your IBM sales representative.

If you do not have the required Db2 Pattern, download it from Passport Advantage® and import it into your Cloud Pak System product.

Business Automation Workflow pattern packages are approximately 10.4 GB and provide the following contents:

- Business Automation Workflow Installation Manager repository
- Business Automation Workflow 19.0.0.3 installation media
- Business Automation Workflow pattern type definition
- Business Automation Workflow pattern plug-ins

The operating system is not packaged with the Business Automation Workflow pattern packages. Instead, Cloud Pak System provide the common base image of the operation system.

Installing and upgrading IBM Business Automation Workflow Pattern

You can download and install IBM Business Automation Workflow Pattern from a local directory or by using a remote URL. You can also upgrade IBM Business Automation Workflow Pattern.

About this task

You can use the following part numbers to download the IBM Business Automation Workflow Pattern from the Passport Advantage website based on your operating system:

- CC96VML for IBM Business Automation Workflow 19.0.0.3 Pattern on Red Hat Enterprise Linux
- CC96WML for IBM Business Automation Workflow 19.0.0.3 Pattern on AIX

Related tasks

Uploading an emergency fix

You can upload emergency fixes to have them applied to running virtual instances. You can also add emergency fixes to your virtual system patterns before you deploy the patterns.

Applying fixes to a virtual system instance
You can apply emergency fixes, interim fixes, or cumulative fixes to your IBM Business Automation Workflow virtual system instances that are running in your cloud.

Related information

Passport Advantage website

Download Director

Installing IBM Business Automation Workflow Pattern

As the cloud administrator, you can download and install IBM Business Automation Workflow Pattern packages from IBM Passport Advantage for use in IBM Cloud Pak System. Then, as the runtime administrator, you can load patterns to IBM Cloud Pak System by importing Business Automation Workflow Pattern 19.0.0.3 and provide access to users.

About this task

Note: If you delete the IBM Business Automation Workflow pattern types and then reinstall the pattern types in later steps, ensure that the predefined pattern components are removed before you reinstall the pattern types.

Installing IBM Business Automation Workflow Pattern from a local directory

If you do not have a remote file server, you can install IBM Business Automation Workflow Pattern from a local directory.

Before you begin

Restriction: You must have the permissions to do the following tasks on IBM Cloud Pak System to install Business Automation Workflow Pattern:

- Deploy patterns in the cloud
- Create patterns
- Create catalog content
- Manage workload resources with full permissions

Procedure

1. Go to the Passport Advantage website and locate the IBM Business Automation Workflow pattern package.

   Choose one of the following pattern packages to download, which depends on the operation system that you use:

   - `BAW_PATTERN_V19003_RHEL.tgz`
   - `BAW_PATTERN_V19003_AIX.tgz`
2. Log in to IBM Cloud Pak System.
3. Click **Download Tooling** > **Download command line tool**.
4. Extract the command-line tool that you downloaded.
5. Call the command-line interface by typing the following command:

   ```
   ../pure.cli/bin/pure -h hostname -u userID -p password -a
   ```

   where *hostname* is the host name of IBM Cloud Pak System, *userID* is the ID of the user, and *password* is the password of the user.

6. In the command-line interface, upload the pattern package, for example, by typing the following text:

```
>>>deployer.patterntypes.create('E:\\BAW_PATTERN_V19003_RHEL.tgz')
```

7. Select **Catalog** > **Pattern Types**.
8. From the left side of the **Pattern types** window, select **Business Automation Workflow Pattern 19.0.0.3 for Virtual System 1.0.0.2**, accept the licenses, and enable the pattern type.

Installing IBM Business Automation Workflow Pattern by using a remote URL

If you have a remote file server, you can install IBM Business Automation Workflow Pattern by using a remote URL.

Before you begin

Restriction: You must have permission to complete the following tasks on IBM Cloud Pak System to install Business Automation Workflow Pattern:

- Deploy patterns in the cloud
- Create patterns
- Create catalog content
- Manage workload resources with full permissions

Procedure

1. Go to the Passport Advantage website and locate the IBM Business Automation Workflow Pattern package.

   Choose one of the following pattern packages to download, which depends on the operation system that you use:

   - `BAW_PATTERN_V19003_RHEL.tgz`
   - `BAW_PATTERN_V19003_AIX.tgz`
2. Download the pattern package to a remote file server.

   Note the location so that you can refer to the web address during the installation process.
3. Log in to IBM Cloud Pak System.
4. Click **Catalog** > **Pattern Types**.
5. Click **New**.
6. On the **Remote** tab, enter the web address where you downloaded the pattern package.
7. From the left side of the **Pattern Types** window, select **Business Automation Workflow Pattern 19.0.0.3 for Virtual System 1.0.0.2**, accept the licenses, and enable the pattern type.
8. Click **Patterns** > **Virtual System Patterns** to verify the installation by locating the predefined patterns.

Applying fixes

There are two types of fixes. One is IBM Business Automation Workflow Pattern emergency fix, and the other is IBM Business Automation Workflow interim fix. Business Automation Workflow Pattern emergency fixes resolve Business Automation Workflow Pattern problems, and Business Automation Workflow interim fixes resolve Business Automation Workflow problems.

Before you begin

Ensure that you have access to IBM Fix Central. Also, ensure that you have permission to create catalog content or the Appliance Administrator role with full permissions to administer emergency fixes.

About this task

You can assign a Business Automation Workflow Pattern emergency fix or Business Automation Workflow interim fix to a pattern before you deploy the pattern to the cloud. When you deploy the pattern to the cloud, the emergency fix or the interim fix is applied to the virtual instance. You can also apply an emergency fix or an interim fix to a running deployed virtual instance.

Uploading an emergency fix

You can upload emergency fixes to have them applied to running virtual instances. You can also add emergency fixes to your virtual system patterns before you deploy the patterns.

Before you begin

Ensure that you have permission to create catalog content or the Appliance administration role with full permissions to add emergency fixes.

About this task

Download emergency fixes from IBM Fix Central. Then, upload the emergency fixes to the catalog.

Procedure

1. Go to IBM Fix Central and locate the emergency fixes for your specific product, type, and platform.
2. Choose to download the emergency fix from a list of emergency fixes.
3. Click **Catalog** > **Emergency Fixes** to open the emergency fix page.
4. Click **New**.
5. Enter the information about the fix and click **OK**.

   The fix is shown in the left panel of the **Emergency Fixes** window and information about the fix is shown in the right panel.
6. Click **Browse** to locate the emergency fix and click **Upload**.
7. Under **Applicable to**, select **plugin.baw** in the **Plugins** field so that the emergency fix can be applied to the IBM Business Automation Workflow Pattern plug-in.
8. Complete the information about the emergency fix.

Results

The emergency fix is in the catalog and available to be applied to IBM Business Automation Workflow Pattern.

Related tasks

Installing and upgrading IBM Business Automation Workflow Pattern
You can download and install IBM Business Automation Workflow Pattern from a local directory or by using a remote URL. You can also upgrade IBM Business Automation Workflow Pattern.

Applying fixes to a virtual system instance
You can apply emergency fixes, interim fixes, or cumulative fixes to your IBM Business Automation Workflow virtual system instances that are running in your cloud.

Related information

Required interim fixes for IBM Business Process Management products

Fix Central

Uploading an interim fix

You can upload interim fixes to have them applied to running virtual instances. You can also add interim fixes to your virtual system patterns before you deploy the patterns.

Before you begin

Ensure that you have permission to create catalog content or the Appliance administration role with full permissions to add interim fixes.

About this task

Download interim fixes from IBM Fix Central. Then, upload the interim fixes to the catalog.

Procedure

1. Go to IBM Fix Central and locate the interim fixes for your specific product, type, and platform.
2. Choose to download the interim fix from a list of interim fixes.
3. Click **System** > **IBM Installation Manager Repository** to open the interim fix page.
4. Click **Add New**.
5. Select **Add New Category**, and enter the category name in the **Category name** field.
6. Click **Add** to close the **Add New Category** window.
7. Click **Add New**, and select **Add New Software Package**.
8. Click **Browse** to choose the interim fix package that you want to upload, and select a category that you created.
9. Click **Add** to close the **Add New Software Package** window.

Results

The interim fix is in the catalog and available to be applied to the pattern.

Applying fixes to a virtual system instance

You can apply emergency fixes, interim fixes, or cumulative fixes to your IBM Business Automation Workflow virtual system instances that are running in your cloud.

Before you begin

Ensure that the following prerequisites are met:

- You have all access to the virtual system instance or the Appliance administration role with Full permissions.
- The virtual system instance is started.
- The fix is added to the catalog.

Important:

- The virtual system instance is unavailable when fixes are being installed because Business Automation Workflow runtime instances are restarted during the process.

About this task

When you add a fix, you define the pattern types that the fix applies to. When you schedule a service request, the list of available fixes contains the fixes that are applicable to the pattern type that is used to create your virtual system instance.

Procedure

To apply a fix, complete the following steps from the **Virtual System Instances** window:

1. Select the virtual system instance that you want to apply the fix to.
2. Click **Maintain** to set the virtual system instance to maintenance mode.
3. Click **Manage**.
4. Click the **Operations** tab.
5. From the left panel of the **Operations** page, click the **MAINTENANCE** role type.
6. From the **Fundamental** section in the right panel, click **Maintenance fixes** and select the fix.
7. Click **Submit**.
8. After the fix is successfully applied, click **Maintenance mode** to turn off maintenance mode.

Results

Important: If you apply a fix to a virtual system instance and then scale out custom nodes in that virtual system instance, the new custom nodes also contain the fix that you installed if the fix package remains on IBM Cloud Pak System.

What to do next

After applying an interim fix, you should check the readme file for any manual steps that need to be performed. Similarly, after applying a cumulative fix, you should check the technote "Installing IBM Business Automation Workflow 19.0.0.3 Cumulative Fix" for any post-upgrade steps. For both interim fixes and cumulative fixes, you should perform any manual or post-upgrade steps with the user `virtuser` rather than the user `root`.

Related tasks

Installing and upgrading IBM Business Automation Workflow Pattern

You can download and install IBM Business Automation Workflow Pattern from a local directory or by using a remote URL. You can also upgrade IBM Business Automation Workflow Pattern.

Uploading an emergency fix

You can upload emergency fixes to have them applied to running virtual instances. You can also add emergency fixes to your virtual system patterns before you deploy the patterns.

Preparing to use IBM Business Automation Workflow Pattern

Before you use IBM Business Automation Workflow Pattern, first ensure that you have sufficient resources to run the patterns and accept the licenses.

Procedure

To prepare to use the Business Automation Workflow patterns on the appliance, complete the following steps:

1. Check to ensure that you have sufficient storage and space to install and run the predefined virtual system patterns.

   The requirements for creating your own patterns are different but Table 1 on page 8 shows the requirements for the predefined virtual system patterns.

Table 1. Requirements for predefined virtual system patterns

Predefined virtual system pattern	IP	Memory (GB)	Disk (GB)	CPU
Business Automation Workflow 19.0.0.3 Workflow Center in Single Virtual Machine	1	16	150	2
Business Automation Workflow 19.0.0.3 Workflow Server in Single Virtual Machine	1	16	150	2
Business Automation Workflow 19.0.0.3 Workflow Center with Db2 HADR for Production	7	106	1524	32

Table 1. Requirements for predefined virtual system patterns (continued)				
Predefined virtual system pattern	**IP**	**Memory (GB)**	**Disk (GB)**	**CPU**
Business Automation Workflow 19.0.0.3 Workflow Server with Db2 HADR for Production	7	106	1524	46

2. Accept the licenses.

   To prepare the virtual patterns for use, select the pattern type in the **Pattern Types** window, and from the **License agreement** field, click **Accept**. Page through, read, and accept the licenses.

What to do next

As the runtime administrator, you configure the appropriate roles and access levels for users of the patterns. Then, you can grant the users access to the virtual system patterns.

Upgrading IBM Business Automation Workflow Pattern

You can upgrade your IBM Business Automation Workflow Pattern 19.0.0.3 by uploading the IBM Business Automation Workflow fix pack to IBM Cloud Pak System Installation Manager repository, and add the fix pack to the pattern or select the fix pack from the operation console.

Before you begin

Make sure that you have the permission to upload the fix pack to the Installation Manager repository IBM Cloud Pak System.

About this task

You can download Business Automation Workflow Pattern version delta fix pack, add the fix pack to a pattern, and then deploy one instance with the fix pack. Alternatively, you can download Business Automation Workflow Pattern version delta fix pack, and apply the fix pack to a running instance.

Related information

Fix Central

Uploading the fix pack of Business Automation Workflow Pattern

You can download the fix pack of Business Automation Workflow Pattern and upload the fix pack to the Installation Manager repository in IBM Cloud Pak System.

Before you begin

Make sure that you have the permission to upload the fix pack to the Installation Manager repository.

Procedure

1. Locate the fix pack of Business Automation Workflow Pattern in IBM Fix Central, and check if this fix pack needs a WebSphere® Application Server fix pack as a dependency.
2. If the Business Automation Workflow fix pack needs a WebSphere Application Server fix pack as a dependency, download the WebSphere Application Server fix pack to your local directory.
3. Download the Business Automation Workflow fix pack to your local directory.
4. If Business Automation Workflow fix pack needs a WebSphere Application Server fix pack as a dependency, upload WebSphere Application Server fix pack.

   For more information about uploading WebSphere Application Server fix pack, see Uploading WebSphere Application Server fix pack.
5. Click **System** > **IBM Installation Manager Repository**.
6. Click **Add New** > **Add New Software Package**.
7. Click **Browse** to select the downloaded Business Automation Workflow fix pack.

8. Select **BAW** in the **Category** field, and click **Add**.

   Note: Before you move to the next step, wait until the fix pack is uploaded.
9. Click **Catalog** > **System Plug-ins**, and select the **plugin.baw.19003 1.0.0.2** plug-in.
10. Click **Configure**, and enter the dependency into the blank field. For example,

    ```
    ibm.bpm/19003->ibm.websphere.ND/85517
    ```

    which means Business Automation Workflow 19.0.0.3 depends on WebSphere Application Server Version 8.5.5.17.

What to do next

You can deploy one instance with the fix pack by adding it to a pattern and deploying the pattern. You can also upgrade one existing instance by applying the fix pack to a running instance.

Uploading WebSphere Application Server fix pack

If your Business Automation Workflow fix pack needs a WebSphere Application Server fix pack as a dependency, upload WebSphere Application Server fix pack.

Procedure

1. Click **System** > **IBM Installation Manager Repository**.
2. Click **Add New** > **Add New Software Package**.
3. Click **Browse** to select the downloaded WebSphere Application Server fix pack.
4. Select **BAW** in the **Category** field, and click **Add**.

   Note: Before you continue to upload the fix pack of Business Automation Workflow, wait until WebSphere Application Server fix pack is completed.

What to do next

You can continue to upload Business Automation Workflow version delta fix pack

Deploying an instance with fix pack

When you build a pattern, you can add one uploaded fix pack to the related software component. After that, you can deploy a pattern and get a running instance with the fix pack installed.

Before you begin

Make sure that you have the permission to create a pattern.

Procedure

To deploy an instance with fix pack, complete the following steps in the **Virtual System Patterns** window:

1. You can either create a new pattern or open an existing pattern to add the uploaded fix pack.
2. In the **Pattern Builder** window, select a different version of software component from the left panel.

   For example, you can drag a Business Automation Workflow deployment manager software component V19.0.0.3.

   Note: Alternatively, you can click **Version** to choose the version that you want.
3. Click **Save** to save the pattern.
4. In the **Virtual System Patterns** window, click **Deploy** to deploy the pattern with the fix pack that you added.

Results

You get a running instance with the fix pack installed.

Upgrading an existing instance

To upgrade an existing IBM Business Automation Workflow virtual system instance that is running in your cloud, apply a fix pack to the existing virtual system instance.

Before you begin

Ensure that the following prerequisites are met:

- You have the access to the virtual system instance or the appliance administration role with full permissions.
- Both the virtual system instance and dmgr server are started.
- Upload the fix pack to the catalog or upload the pattern package of the next version. For information about uploading a fix pack to the catalog, see "Uploading the fix pack of Business Automation Workflow Pattern" on page 9.
- If the virtual system instance is a highly available deployment manager environment which contains a standby deployment manager, ensure that the primary deployment manager server is started.
- To upgrade your Business Process Manager V18.0.0.2 instance to IBM Business Automation Workflow V19.0.0.3, check whether the version of your IBM Cloud Pak System is 2.3.2.0. If you deployed your virtual system instance in IBM Cloud Pak System prior to V2.3.2.0, complete the following steps to update the IBM Installation Manager of the Business Automation Workflow instance to V1.8.5:

  1. Update your IBM Cloud Pak System to V2.3.2.0.
  2. Log in to a Business Automation Workflow deployment manager virtual machine.
  3. Run the following commands based on the platform that Business Automation Workflow runs on:
     - For AIX:

       ```
       mkdir /tmp/im185
       cd /tmp/im185
       curl --insecure https://<user>:<password>@<Cloud Pak System IP>/storehouse/admin/files/
       vsys/im/agent.installer.aix.gtk.ppc_1.8.0.20140902_1503.tar.gz -o ./im180.tar.gz
       gunzip -c im185.tar.gz | tar xvf -
       sudo -u virtuser ./userinstc -acceptLicense
       ```

     - For Red Hat Enterprise Linux Server:

       ```
       mkdir /tmp/im185
       cd /tmp/im185
       curl --insecure https://<user>:<password>@<Cloud Pak System IP>/storehouse/admin/files/
       vsys/im/agent.installer.linux.gtk.x86_1.8.0.20140902_1503.tar.gz -o ./im180.tar.gz
       gunzip -c im185.tar.gz | tar xvf -
       sudo -u virtuser ./userinstc -acceptLicense
       ```

  4. Repeat Step 2 and Step 3 for each deployment manager virtual machine and custom node virtual machine.
  5. Apply the required cumulative fixes, for example, to upgrade to V19.0.0.3. For more information, see the following support topic:
     - Upgrading profiles from IBM Business Process Manager Version 8.6.0 to IBM Business Automation Workflow V19.0.0.3

Important:

- The virtual system instance is unavailable when fix packs are being installed because Business Automation Workflow runtime instances are restarted during the process.
- Do not click the **Check for updates** button in the **Pattern type** property to upgrade an existing Business Automation Workflow Pattern instance, because it is not supported by Business Automation Workflow Pattern.

About this task

After you upload a fix pack to the catalog, you can schedule a service request if the offering ID of the fix pack is compatible with IBM Business Automation Workflow or WebSphere Application Server product. The fix pack that you uploaded, which is in the list of available fix packs, is applicable to the pattern type. You can use the fix pack to upgrade your virtual system instance.

Procedure

To apply a fix pack to a virtual system instance, complete the following steps from the **Virtual System Instances** window:

1. Select the virtual system instance that you want to apply the fix pack to.
2. Click **Maintain** to set the virtual system instance to maintenance mode.
3. Click **Manage**.
4. Click the **Operations** tab.
5. From the left panel of the **Operations** window, click the **MAINTENANCE** role type.
6. From the **Fundamental** section in the panel at the right, click **Maintenance fixpacks** and select the fix pack.
7. Click **Submit**.
8. Click **Maintenance mode** to turn off maintenance mode.

Results

Important: If you apply a fix pack to a virtual system instance and then scale out custom nodes in the virtual system instance, the new custom nodes also contain the fix pack that you installed if the fix package remains on IBM Cloud Pak System.

Managing virtual system patterns

To create an IBM Business Automation Workflow environment to run in your IBM Cloud Pak System private cloud, create a virtual system pattern and configure the software components and any policies you need.

Related reference

Software components

Software components provide the installation of software and operations for creating an operational Business Automation Workflow environment.

Pattern assets

Business Automation Workflow Pattern 19.0.0.3 for Virtual System 1.0.0.2 provides assets that define a running Business Automation Workflow environment after the pattern is deployed.

Software components

Software components provide the installation of software and operations for creating an operational Business Automation Workflow environment.

Business Automation Workflow software components and component properties

To provide a working Business Automation Workflow environment in the cloud, you define the properties of the related components. When the patterns that contain those software components are deployed, the software components become virtual machines in the virtual system instance. All Business Automation Workflow software components are under the **Software Components** section on the left panel of the **Pattern Builder** window when you are editing a pattern.

Related tasks

Managing virtual system patterns

To create an IBM Business Automation Workflow environment to run in your IBM Cloud Pak System private cloud, create a virtual system pattern and configure the software components and any policies you need.

Business Automation Workflow 19003 Workflow Center deployment manager software component

IBM Workflow Center 19003 deployment manager software component is the administrative manager of an IBM Workflow Center deployment cell.

You can define the following properties of the Business Automation Workflow 19003 Workflow Center deployment manager software component:

Business Automation Workflow deployment environment administrator user name
The administrative user ID for the IBM Business Automation Workflow deployment environment.

Business Automation Workflow deployment environment administrator password
The password for the IBM Business Automation Workflow deployment environment administrative user.

Customized Business Automation Workflow Config properties file
You can upload the properties file that you customized to create a customized deployment environment.

The existing root certificate
You can upload the root certificate that you customized.

The alias of root certificate
Specifies the alternative name of the root certificate you uploaded.

The password of root certificate
Specifies the password of the root certificate.

Business Automation Workflow 19003 Workflow Server deployment manager software component

Business Automation Workflow 19003 Workflow Server deployment manager software component is the administrative manager of an IBM Workflow Server deployment cell.

You can define the following properties of the Business Automation Workflow 19003 Workflow Server deployment manager software component:

Business Automation Workflow Deployment Environment administrator user name
The administrative user ID for the IBM Business Automation Workflow deployment environment.

Business Automation Workflow Deployment Environment administrator password
The password for the IBM Business Automation Workflow deployment environment administrative user.

Process Server usage
Specifies the mode in which the Workflow Server runs. The following modes are provided:

- Non-Production
- Unrestricted

Process Server offline package
The application package that you want to install to a pattern for deployment. Click **Browse** to select a package.

- Click the **Local** tab to install an application package from your local system to the Workflow Server.
- Click the **HTTP/HTTPS** tab to provide the URL and location of an application package that is on a server. You can also specify the URL of an application package that is on a Workflow Center to export the package as an offline package. You can then deploy the package to the Workflow Server.

Customized Business Automation Workflow Config properties file
You can upload the properties file that you customized to create a customized deployment environment.

The existing root certificate
You can upload the root certificate that you customized.

The alias of root certificate
Specifies the alternative name of the root certificate you uploaded.

The password of root certificate
Specifies the password of the root certificate.

Business Automation Workflow 19003 Custom Node software component

A custom node contains a node agent and managed Business Automation Workflow servers, which are federated to a Business Automation Workflow deployment manager.

You can define the following property of the Business Automation Workflow 19003 Business Automation Workflow custom node software component:

Enable Monitoring
Enables WebSphere Application Servers that are configured in the virtual machine to be monitored by IBM Tivoli® Composite Application Manager.

Production features
Select one of the following production features to be installed:

- Workflow Center
- Workflow Server
- Workflow Server non-production

Business Automation Workflow 19003 HTTP Server software component

Composed of a web server instance, the Business Automation Workflow 19003 HTTP Server software component distributes the work among the nodes in a Business Automation Workflow pattern.

You can define the following properties of the Business Automation Workflow 19003 HTTP Server software component:

Business Automation Workflow server type
Specifies the type of server that is used in the pattern that contains this software component. The following values are valid:

- Workflow Center
- Workflow Server

Enable Monitoring
Enables the HTTP Server to be monitored by IBM Tivoli Composite Application Manager.

Script packages

When the IBM Business Automation Workflow Pattern packages are installed on IBM Cloud Pak System, script packages are included that are added to virtual system pattern topology parts to customize their behavior. Script packages contain executable files and artifacts.

The following Business Automation Workflow Pattern script packages are available:

`BAW 19003 Config Custom Node`
This script configures a Business Automation Workflow custom node. Use the `BAW 19003 Config Custom Node` script with the Business Automation Workflow 19003 Custom Node software component to define the following attributes:

- **`Deployment manager host name`** - You can define a deployment manager host name by adding a reference to a component-level or a pattern-level parameter. The parameter that you refer to is

used as the value for the **Deployment manager host name** property. A data dependency is created between the BAW 19003 Config Custom Node script and the pattern or component that contains the parameter that is referred to.

- **Deployment manager root password**

  Note: To deploy the custom nodes in a separate pattern, define this attribute. Otherwise, don't define it.

- **Standby deployment manager host name**
- **Configure node agent into a different core group**

BAW 19003 Config Db2

This script configures IBM Db2 for Business Automation Workflow. Use this script with the Database Server software to define the following attributes by adding a reference to a component-level or a pattern-level parameter. The parameters that you refer to is used as the value for the attributes. A data dependency is created between the BAW 19003 Config Db2 script package and the pattern or component that contains the parameter that is referred to.

- **Instance name**
- **Db2 instance port**
- **Db2 user**
- **Db2 user password**
- **Workflow Server DB**
- **Workflow Server DB schema**
- **Common DB**
- **Common DB schema**
- **Performance Data Warehouse DB**
- **Performance Data Warehouse DB schema**
- **Create Db2 table space and schema**
- **IBM BPM Cell administrator user name**
- **IBM BPM Deployment Environment administrator user name**
- **Enable Db2 tuning**
- **BPM server type**
  - Process Center
  - Process Server

BAW 19003 Config IHS

This script configures a Business Automation Workflow HTTP server. Use the BAW 19003 Config IHS script with the IBM BAW 19003 HTTP Server to define the following attributes:

- **Deployment manager hostname**
- **Deployment manager root password**

  Note: To deploy IBM HTTP Server (IHS) in a separate pattern, define this attribute. Otherwise, don't define it.

- **Standby deployment manager host name**
- **IBM HTTP server administrator user name**
- **IBM HTTP server administrator password**

BAW 19003 Config Process Center Dmgr on Db2

This script configures IBM BAW 19003 Workflow Center Deployment Manager on Db2. Use the BAW 19003 Config Process Center Dmgr on Db2 script with the IBM BAW 19003 Workflow Center Deployment Manager software component to define the following attributes that are applied to Db2:

- **IBM BPM Cell name**

- **IBM BPM Cell administrator user name**
- **IBM BPM Cell administrator password**
- **IBM BPM Deployment Environment administrator user name**
- **IBM BPM Deployment Environment administrator password**
- **BPM database schema creation approach**
  - Create schema and preload data
  - Preload data
  - Do nothing

  Note: Preload data is selected by default.
  - If you select **Create Db2 table space and schema** in the `BAW 19003 Config Db2` script package, the `BAW 19003 Config Db2` script package creates the Business Automation Workflow database schema. Then, ensure that **Preload data** is selected for this attribute so that only the Business Automation Workflow bootstrap data is loaded into the database.
  - To deploy a target Business Automation Workflow for migration, select **Do nothing**.
- **Enable BPM tuning** - For information about the parameters that are used if you select **Enable BPM tuning**, see "Performance-tuning parameters" on page 19.
- **Db2 host name**
- **Db2 instance port**
- **Db2 user**
- **Db2 user password**
- **Workflow Server DB**
- **Workflow Server DB schema**
- **Common DB**
- **Common DB schema**
- **Performance Data Warehouse DB**
- **Performance Data Warehouse DB schema**
- **Db2 standy server host name**
- **Db2 standy server port**

BAW 19003 Config Process Server Dmgr on Db2

This script configures BAW 19003 Workflow Server Deployment Manager on Db2. Use the `BAW 19003 Config Process Server Dmgr on Db2` script with the IBM BAW 19003 Workflow Server Deployment Manager software component to define the following attributes that are applied to a Db2 database:

- **IBM BPM Cell name**
- **IBM BPM Cell administrator user name**
- **IBM BPM Cell administrator password**
- **IBM BPM Deployment Environment administrator user name**
- **IBM BPM Deployment Environment administrator password**
- **Environment type of Workflow Server**
  - Production
  - Test
  - Staging
- **Workflow server name**
- **BPM database schema creation approach**

  - Create schema and preload data
  - Preload data
  - Do nothing
- **Enable BPM tuning**- For information about the parameters that are used if you select **Enable BPM tuning**, see "Performance-tuning parameters" on page 19.
- **Db2 host name**
- **Db2 instance port**
- **Db2 user**
- **Db2 user password**
- **Workflow Server DB**
- **Workflow Server DB schema**
- **Common DB**
- **Common DB schema**
- **Performance Data Warehouse DB**
- **Performance Data Warehouse DB schema**
- **Db2 standby server host name**
- **Db2 standby server port**
- **Workflow Center URL**
- **Workflow Center administrator user name**
- **Workflow Center admin password**

BAW 19003 Config Security Directory Server
This script configures Security Directory Server for Business Automation Workflow. Place the BAW 19003 Config Security Directory Server script package after the deployment manager script package. In a clustered pattern, you can add this script to the Workflow Center Deployment Manager or the Workflow Server Deployment Manager software component. Define the following attributes for LDAP connection. Confirm that the LDAP server is ready and that the following attributes match the LDAP server:

- **Security directory server host name**
- **Security directory server port**
- **SSL enabled**
- **Bind DN**
- **Bind password**
- **Base DN**

This script is used for IBM Security Directory Server connection. You can manually edit the code in the script package to connect to other types of LDAP server, such as Microsoft Windows Active Directory.

BAW 19003 Config Transaction Log into Db2
This script configures the Business Automation Workflow transaction log to a Db2 database. To define the following attributes, place the BAW 19003 Config Transaction Log into Db2 script package after the BAW 19003 Config Custom Node script package to define the following attributes:

- **Db2 host name**
- **Db2 instance port**
- **Db2 user**
- **Db2 user password**
- **Db2 database name**
- **Db2 standby server host name**

- **Db2 standby server port**

BAW 19003 Config Transaction Log into File System
This script configures Business Automation Workflow transaction log into the file system to define the **Transaction log path** property.

BAW 19003 Post Config
To make configurations after the deployment environment is set up, place the `BAW 19003 Post Config` script package after the config deployment manager script package and define the following attributes:

- **IBM BPM Deployment Environment administrator user name**
- **IBM BPM Deployment Environment administrator password**

BAW 19003 Config Standby Deployment Manager
This script configures a standby deployment manager for the Workflow Server or Workflow Center deployment manager software component. Use the `IBM BAW 19003 Config Standby Deployment Manager` script to define the following attributes:

- **Deployment manager host name**
- **Deployment manager root password**

  Note: To deploy the standby deployment manager in a separate pattern, define this attribute. Otherwise, don't define it.
- **IBM BPM deployment environment administrator user name**
- **IBM BPM deployment environment administrator password**

CreateDB_OLTP
This script creates online transaction processing (OLTP) database. Use the `CreateDB_OLTP` script with the Db2 Server software component or the Database Server software component to define the following attributes:

- **Instance name**
- **Database name**
- **Description**
- **Database image**
- **Database user**
- **Database user password**
- **Data mount point**
- **Database territory**
- **Database codeset**
- **Database page size**
- **Database collate**

BAW 19003 Config PFS Federation
This script configures the integration between Process Federation Server and Business Automation Workflow. Use the `BAW 19003 Config PFS Federation` script to define the following attributes:

- **IBM BPM Deployment Environment administrator user name**
- **IBM BPM Deployment Environment administrator password**
- **IBM Process Federation Server host name**
- **IBM Process Federation Server port**
- **IBM Process Federation Server administrator user name**
- **IBM Process Federation Server administrator password**
- **Set the CORS content for PFS and BPM**

Note: You use cross-origin resource sharing (CORS) to enable a browser to trust the cross-origin requests. You can set the specific CORS host for Process Federation Server and Business Automation Workflow. By default, it is set to *, which means that it is set to any host.

- **Reuse the IHS in PFS environment**

  Note: So that Business Automation Workflow reuses the IHS from the Process Federation Server environment, select **Reuse the IHS in PFS environment**. As a result, your web application can access the entire federated system through only the IHS of Process Federation Server, which simplifies the security configuration. You need to set only CORS on IHS of Process Federation Server and trust the certificate from IHS of Process Federation Server. You don't need to set CORS for Process Federation Server and Business Automation Workflow or trust the certificates from Process Federation Server and Business Automation Workflow for your client system.

BAW 19003 Config Federated Portal
This script configures the federated portal of Business Automation Workflow. Use the `BAW 19003 Config Federated Portal` script to define the following attributes:

- **IBM BPM Deployment Environment administrator user name**
- **IBM BPM Deployment Environment administrator password**
- **IBM Process Federation Server host name**
- **IBM Process Federation Server port**
- **IBM Process Federation Server administrator user name**
- **IBM Process Federation Server administrator password**

Performance-tuning parameters

If you select **Enable BPM Tuning** for the `BAW 19003 Config Workflow Center Dmgr on Db2` and `BAW 19003 Config PWorkflow Server Dmgr on Db2` performance tuning parameters are automatically applied to the pattern when it is deployed.

For the performance-tuning parameters that are applied when you enable tuning, see the following tables:

Table 2. Business Automation Workflow performance tuning parameters for JVM heap sizes

JVM	**Heap sizes**					
Parameters	Minimum (-Xms)		Maximum (-Xmx)		Nursery (min/max MB)	
Before/After tuning	Before	After	Before	After	Before	After
Deployment manager	768 MB	256 MB	2048 MB	1024	Default	Default
Node agent	N/A	128 MB	N/A	768	Default	Default
Support server	768 MB	256 MB	2048 MB	1024	Default	Default
Message engine server	N/A	256 MB	N/A	1024	Default	Default
Process center application server	768 MB	1.5 GB	2048 MB	2.5 GB	N/A	256/768

Table 2. Business Automation Workflow performance tuning parameters for JVM heap sizes (continued)						
JVM	**Heap sizes**					
Process server application server	768 MB	1.5 GB	2048 MB	2.5 GB	N/A	256/768

Table 3. Business Automation Workflow performance tuning parameters for JVM WLE tuning						
JVM	**WLE tuning**					
Parameters	bpd-queue-capacity		max-thread-pool-size		send-external-email	
Before/After tuning	Before	After	Before	After	Before	After
Process center application server	Default	Default	Default	Default	True	False
Process server application server	40	10 * #VCPUs, cap to 80	70	10 * #VCPUs +30, capped at 80+30	True	False

Table 4. Business Automation Workflow performance tuning parameters for maximum connection of topic connection factory				
JVM	**Maximum connection of topic connection factory**			
Parameters	jms/TWClientConnectionFactory		tw.jms.cacheMessageConnectionFactory	
Before/After tuning	Before	After	Before	After
Process center application server	200	Default	200	Default

Table 5. Business Automation Workflow performance tuning parameters for JVM thread pool		
JVM	**Thread pool**	
Parameter	Default (min/max)	
Before/After tuning	Before	After
Process center application server	20/20	10/40
Process server application server	20/20	10/40

Table 6. Business Automation Workflow performance tuning parameters for JVM WLE_SCA activation specification		
JVM	**WLE_SCA activation specification**	
Before/After tuning	Before	After
Process server application server	10/1	20/8

Table 7. Business Automation Workflow performance tuning parameters for SystemOut.log/SystemErr.log				
JVM	**SystemOut.log/SystemErr.log**			
Parameter	Verbosegc enabled		Verbosegc rotation enabled	
Before/After tuning	Before	After	Before	After
Deployment manager	False	True	False	True
Node agent	False	True	False	True
Support server	False	True	False	True
Message engine server	False	True	False	True
Process center application server	False	True	False	True
Process server application server	False	True	False	True

Table 8. Business Automation Workflow performance tuning parameters for Xgc: preferred heap base		
JVM	**Xgc: preferred heap base**	
Before/After tuning	Before	After
Process center application server	N/A	0x100000000
Process server application server	N/A	0x100000000

Table 9. Business Automation Workflow performance tuning parameters for maximum data sources connections for Process Center/Process Server application server	
Data sources	**Maximum connections**
jdbc/BPEDB	30
jdbc/mashupDS	10
jdbc/WPSDB	10
jdbc/CommonDB	10
jdbc/mediation/messageLog	10
jdbc/ECMDB	200
jdbc/ECMDBXA	200
jdbc/SharedDB (Messaging data source)	200
jdbc/PerformanceDB	200
jdbc/TeamWorksDB	200

Base scaling policy

You can add a base scaling policy to the software component to enable dynamic vertical scaling for an instance. This policy can be applied globally at the system level, or specified for individual components.

The following properties of the base scaling policy can be defined to apply to both automatic and manual scaling:

Number of Instances
Enables multiple Business Automation Workflow HTTP Servers and custom nodes support by specifying the number of instances.

Instance number range of scaling in and out
Specifies the number of instances for scaling in and scaling out.

Maximum vCPU count per virtual machine
Specifies the maximum number of virtual CPUs (vCPUs) that is allowed for each virtual machine.

Maximum memory size per virtual machine (GB)
Specifies the maximum memory size that is allowed for each virtual machine.

The following properties are applied only to automatic scaling:

CPU-based
Enables CPU usage to be scaled automatically.

Scaling in and out when CPU usage is out of threshold range (%)
Specifies a threshold range to scale CPU usage. If CPU usage is outside of the threshold range that you specify, scaling is automatically applied.

Minimum time (seconds) to trigger add or remove
Specifies the minimum time to trigger automatic scaling.

scaling by
Specifies how scaling is applied. You can choose one of the following options:

- add vCPU only.
- add or remove nodes.
- add or remove nodes; add vCPU first and then add nodes.

Memory-based
Enables memory usage to be scaled automatically.

Scaling in and out when memory usage is out of threshold range (%)
Specifies a threshold range to scale memory usage. If memory usage is outside of the threshold range that you specify, scaling is automatically applied.

Minimum time (seconds) to trigger add or remove
Specifies the minimum time to trigger the automatic scaling.

scaling by
Specifies how scaling is applied. You can choose one of the following options:

- add virtual memory only.
- add or remove nodes.
- add or remove nodes; add virtual memory first and then add nodes.

Related tasks

Adding a base scaling policy to software components

You can use the automatic scaling policy on software components in a virtual system pattern to alleviate heavy workloads when the pattern is deployed as a virtual system instance. Use the scaling policy to set thresholds at which the number of virtual CPUs of IBM HTTP Server and custom nodes, or the number of IBM HTTP Server and custom nodes in a virtual system instance, or both, are automatically increased.

Predefined virtual system patterns

You can use predefined virtual system patterns that help you quickly set up complex, highly available Business Automation Workflow environments. For each type of predefined virtual system pattern, there are default values for virtual machines and patterns.

Default virtual machine configuration

When you use predefined virtual system patterns, the virtual machines that are set for virtual system patterns have default settings.

A predefined virtual system pattern includes virtual machines with the virtual CPU and virtual machine memory that are shown in Table 10 on page 23.

Table 10. Default values of virtual machines for predefined virtual system patterns

Virtual machine	Default virtual CPU	Default virtual machine memory (GB)
Workflow Center or Workflow Server deployment manager	1	6.0
IBM HTTP Server (Workflow Center or Workflow Server)	1	2.0
Workflow Center custom node	2	6.0
Workflow Server custom node	2	6.0
Workflow Center database	2	4.0
Workflow Server database	4	4.0

Note: If you increase the virtual machine memory for the custom node, the JVM heap size of the Business Automation Workflow application server is tuned to be bigger. For example, the JVM heap size of the Business Automation Workflow application server is 2.5 GB if the virtual machine memory is 6 GB by default. When the virtual machine memory increases to 12 GB, the JVM heap size of the Business Automation Workflow application server is tuned to 5 GB automatically. Therefore, increase the added disk size before the deployment to make sure the added disk size is big enough for the possible dump files. You can simply count the size of the dump files as the triple of JVM heap sizes.

Related tasks

Managing virtual machines

When a pattern is deployed in a private cloud, the components in the patterns become running virtual machines in the resulting virtual system instance. You view and manage the virtual machines in a virtual system instance of your Business Automation Workflow environment.

Predefined patterns configuration

You can use predefined virtual system patterns with default settings for quick deployment.

In the **Virtual System Patterns** window, you can see the following predefined virtual system patterns:

Business Automation Workflow 19.0.0.3 Workflow Center in Single Virtual Machine
The predefined pattern to deploy a Workflow Center, which consists of IBM Db2 and Business Automation Workflow single cluster in a single virtual machine.

Business Automation Workflow 19.0.0.3 Workflow Server in Single Virtual Machine
The predefined pattern to deploy a Workflow Server, which consists of IBM Db2 and Business Automation Workflow single cluster in a single virtual machine.

Business Automation Workflow 19.0.0.3 Workflow Center with Db2 HADR for Production
The predefined pattern to deploy a Workflow Center in the golden topology with Db2 HADR, IHS, and resources for production.

Business Automation Workflow 19.0.0.3 Workflow Server with Db2 HADR for Production
The predefined pattern to deploy a Workflow Server in the golden topology to set up a production environment with Db2 HADR and highly available IHS.

Predefined virtual system patterns include the default settings that are shown in Table 11 on page 24.

Table 11. Default settings for predefined virtual system patterns

Predefined virtual system patterns	Block storage	Transaction log in DB	Transaction log on GPFS	Node number	IHS number
Business Automation Workflow 19.0.0.3 Workflow Center in Single Virtual Machine	No	No	No	1	0
Business Automation Workflow 19.0.0.3 Workflow Server in Single Virtual Machine	No	No	No	1	0
Business Automation Workflow 19.0.0.3 Workflow Center with Db2 HADR for Production	No	Yes	No	2	2
Business Automation Workflow 19.0.0.3 Workflow Server with Db2 HADR for Production	No	Yes	No	2	1

Important: All of the predefined virtual system patterns are read-only. Therefore, if you want to modify the properties of a predefined virtual system pattern, you must first clone the predefined virtual system pattern that you want, and then modify the properties of the cloned virtual system pattern.

Creating virtual system patterns

You can either create a new pattern or create a cloned pattern.

Before you begin

To create a Business Automation Workflow virtual system pattern, the Business Automation Workflow image must be installed in the IBM Cloud Pak System environment. You must also be assigned the required user access for creating patterns.

Creating a new virtual system pattern

You can create a new virtual system pattern with the software components that are provided in the IBM Business Automation Workflow Pattern package.

Procedure

To create a Business Automation Workflow virtual system pattern, complete the following steps in the **Virtual System Patterns** window:

1. In the left panel, click **Create New**.
2. Enter a name and version number for the pattern to create.
3. Optional: Select a template to use to create your pattern.
4. Click **Start building**.
   The **Pattern Builder** window opens.

What to do next
You can edit the new pattern.

Creating a cloned virtual system pattern

You can create a virtual system pattern by cloning a pattern that exists in the **Virtual System Patterns** window.

Procedure

To create a cloned Business Automation Workflow virtual system pattern, complete the following steps in the **Virtual System Patterns** window:

1. In the left panel, select an existing pattern that you want to copy.
2. In the right panel, click **Clone**.

   An exact copy will be created window opens.
3. Enter a name and version for the pattern to copy.
4. Click **OK**.

   The pattern that you cloned is displayed in the left panel.

What to do next
You can open and edit the cloned pattern.

Editing virtual system patterns

You can edit unlocked IBM Business Automation Workflow virtual system patterns that you have access to.

About this task
The patterns that come predefined with the Business Automation Workflow virtual images cannot be edited. However, if you copied a predefined pattern or created a new pattern, you can edit the pattern and work with the parts that it contains.

Procedure

To edit a copied or created virtual system pattern, complete the following steps in the **Virtual System Patterns** window:

1. From the left panel of the **Virtual System Patterns** window, select a pattern to edit.

   You can edit only unlocked patterns that you have access to.
2. Click **Open**.

   The **Pattern Builder** window opens.
3. In the **Assets** list on the left panel, select the software components that you want to add and drop them onto the editing panel.

   The following software components are required if you are creating either a Business Automation Workflow clustered IBM Workflow Center pattern or a Business Automation Workflow clustered IBM Workflow Server pattern:

   - IBM BAW 19003 Process Center Deployment Manager
   - IBM BAW 19003 Process Server Deployment Manager
   - IBM BAW 19003 Custom Node
   - IBM BAW 19003 HTTP Server

   If a required component is missing from your pattern, a warning message lists the required components for the pattern that you are creating.

4. In the **Assets** list on the left panel, select the scripts that you want, and drop them under the software components in the editing panel.
5. Optional: You can remove software components, and move software components and scripts up or down in the editing panel.
6. Optional: To view and change the start order for one virtual machine, or change the start order for the topology between components across virtual machines, click **Ordering** at the top of the page.

   You can drag components or ordering lines in the ordering window.

What to do next

You can further edit the pattern and then deploy the pattern.

Adding a base scaling policy to software components

You can use the automatic scaling policy on software components in a virtual system pattern to alleviate heavy workloads when the pattern is deployed as a virtual system instance. Use the scaling policy to set thresholds at which the number of virtual CPUs of IBM HTTP Server and custom nodes, or the number of IBM HTTP Server and custom nodes in a virtual system instance, or both, are automatically increased.

Before you begin

You must have a virtual system pattern open in the **Pattern Builder** window and the software components in the pattern must be properly configured.

About this task

The scaling policy is activated when the virtual system pattern is deployed in the cloud as a running virtual system instance.

Procedure

To add the automatic scaling policy to software components in a pattern and configure the threshold parameters, complete the following steps in the **Virtual System Builder** window:

1. Select the software component to add the policy to.
2. From the software component to which you are adding the policy, click the **Add a Component Policy** icon.
3. Click **Base Scaling Policy**.
4. Click the scaling policy in the software component to display the parameters to define in the panel at the right side.
5. Set the scaling threshold values on the parameters.
6. Save your changes.

Results

A scaling policy is added to the virtual system pattern, and the pattern is ready to be deployed to the cloud.

Related reference

Base scaling policy

You can add a base scaling policy to the software component to enable dynamic vertical scaling for an instance. This policy can be applied globally at the system level, or specified for individual components.

Customizing patterns

Customizing patterns feature enables you to customize a cluster name, WebSphere Application Server server name, a database capability, and other Business Automation Workflow settings.

Preparing a customized property file by customizing DMGR script packages

To prepare a customized Business Automation Workflow configuration property file, you need to customize deployment manager script packages by adding or removing keys that are based on your own requirements.

Procedure

1. Click **Catalog** > **Script Packages**.
2. Select the script package that you want to customize.

   You can see the environment keys of the script package in the panel at the right.

   Tip: You may find it useful to clone a script package, and then customize the cloned script package.
3. Optional: Select the environment keys that you don't need, and click **remove**.

   Important: The **DB_Scenarios** key and **Is_Tuning** key must not be removed.
4. Enter the names and values of new environment keys in the **Add variable** field, and click **Add**.
5. Add your customized keys to replace the property values in the customized property file. Each key is enclosed in braces, with a dollar sign before the first brace, ${}, around the customized key.

   Note: During deployment, the property values in placeholder, ${}, are replaced with script package keys based on your input.

What to do next

After you prepare a customized property file, you can upload the customized property file to a deployment manager software component.

Uploading a customized property file

You can upload the Business Automation Workflow property file that you customized to Business Automation Workflow 19003 Workflow Center or to IBM BAW 19003 Workflow Server deployment manager software component.

Procedure

To upload a customized property file, complete the following steps in the **Pattern Builder** window:

1. Select the deployment manager software component to which you want to upload customized property file.
2. In the properties panel, click **Browse** in the **Customized IBM BPM Config properties file** field.

   The **Select File** window opens.
3. Locate the property file that you want to upload.

   The property file that you select is uploaded and installed on the component.

   Note: You can upload the following types of files that are supported:

   - A `.properties` file, which is a customized configuration property file.
   - A `.zip` file, which can include a `.properties` file and other artifacts that are referenced in the configuration property file. This option is used for migration deployment. When you prepare the `.zip` file, make sure that only one configuration property file with `.properties` is included in the `.zip` file.
4. Save your changes.

What to do next

After you upload the customized property file, get the customized script package and add it to the deployment manager virtual machine.

Adding a customized script package

After you upload the customized property file, you need to add the deployment manager script package to the deployment manager virtual machine.

About this task

To add the script package that you customized, from the left panel in the **Pattern Builder** window, select the script package you customized, and drop it under the deployment manager virtual machine that you want to use.

What to do next

Add other components that you need, and deploy the customized pattern.

Customizing a script package after deployment

To do customization after the deployment environment is deployed, you can customize the `BAW 19003 Post Config` script package that is run when the Business Automation Workflow deployment environment is fully configured.

About this task

For the Workflow Server pattern, you can use the `BAW 19003 Post Config` script package to install a process application package when the deployment environment is completed.

If you want to do some customization after the deployment environment is deployed, you can customize the `BAW 19003 Post Config` script package by adding your own code to the script package.

Procedure

To customize the `BAW 19003 Post Config` script package, complete the following steps in the **IBM Workload Deployer** window:

1. Click **Catalog** > **Script Packages**.
2. Select **BAW 19003 Post Config**, and click the **Export** icon in the panel at the right to export this script package to your local directory.
3. Extract the `BPM_PostConfig.zip` file that you downloaded, and open `config.py` file to add your own customization code, which is called when the **BAW 19003Post Config** script package is run.
4. After you customize the script package, select **BAW 19003 Post Config** in the **IBM Workload Deployer - Script Packages** window, and click **Upload** in the **Script package file** field.
5. Locate the script package file, and upload it.
6. Save your changes.

What to do next

The **BAW 19003Post Config** script package that you customized can be run when Business Automation Workflow deployment environment is fully configured.

Deploying virtual system patterns

Deploying virtual system patterns into the cloud provides a running IBM Business Automation Workflow environment, or *virtual system instance*. You can deploy the predefined patterns that are available with the Business Automation Workflow pattern type, or deploy patterns that you created.

Before you begin

To deploy a virtual system pattern, you must have either a predefined pattern or a custom pattern that is complete with all of its required parts.

About this task

Deploying a pattern creates a virtual system, or a newly provisioned Business Automation Workflow runtime environment, that is running in the cloud. Virtual machines are created from the parts in the pattern and the virtual machines start when the deployment to the cloud is complete.

Procedure

To deploy a Business Automation Workflow pattern to run in your private cloud, complete the following steps:

1. Click **Patterns** > **Virtual System Patterns**.
2. Click **Deploy** in the **Actions** column of the pattern that you want to deploy.

   The **Deploy Pattern** window is displayed. If your virtual system pattern contains script packages that have license agreements that are not accepted, the **Deploy** icon is not available. Ensure that all license agreements in script packages are accepted before you attempt to deploy a pattern.
3. Complete the fields in the **Deploy Pattern** window. The parameters that are required differ depending on the defined configuration and any associated script packages.
   a) In the **Name** field, enter a name for the virtual system instance.
   b) In the **Environment Profile** area, select the type of environment profile that you are deploying the pattern to.
   c) In the **Pattern attributes** area, specify the attributes for the software components in your pattern.
4. Optional: Add Secure Shell (SSH) access and schedule a time for deploying your pattern.
   - To add SSH access, enter an SSH key in the **SSH Key** field. Either click **Generate** for the system to generate an SSH key, or provide your public SSH key.
   - To specify when the virtual system pattern is to be deployed and for how long, use the options in the **Schedule deployment** area.
5. Click **Quick Deploy**.

Results

The deployment process creates and starts virtual machines for the parts that are defined and provides links to the required consoles. The virtual system status is shown as `started` after all virtual machines are started. The time that is required for the deployment depends on the complexity of the pattern that you are deploying. A deployed pattern is a virtual system, or a newly provisioned Business Automation Workflow runtime environment.

What to do next

You can view the status of your instance from the **Virtual System Instances** window. When deployment is complete, you can begin to administer the instance.

Managing virtual system instances

When you deploy a virtual system pattern into the cloud, the resulting virtual system instance is a working IBM Business Automation Workflow environment. The virtual system instance contains running virtual machines that were created from the parts in the pattern.

About this task

You run some virtual system instance management tasks on the virtual system instance itself. You run other tasks to manage the virtual system instance on the virtual machines in the virtual system instance.

Restriction: Do not start or stop Business Automation Workflow servers with root user because this might change the privilege of Business Automation Workflow files. Other non-root users might have problems when they start or stop Business Automation Workflow servers later.

Managing virtual machines

When a pattern is deployed in a private cloud, the components in the patterns become running virtual machines in the resulting virtual system instance. You view and manage the virtual machines in a virtual system instance of your Business Automation Workflow environment.

Before you begin

To manage virtual machines, ensure that the virtual system instance is put into maintenance mode by clicking the **Maintain** tab in the right panel.

About this task

Virtual machines are created and started when a virtual system instance is provisioned. You can manage virtual system instances by using the virtual machines, the endpoints in the virtual system instances, and the virtual system itself. You can use the **Middleware perspective** and **Virtual machine perspective** section to view and to manage endpoints and virtual machines.

Clicking the linked name of a virtual machine from either view opens the **Virtual Machines** window for that virtual machine. Clicking **Log** from either view opens the log viewer for that virtual machine.

Procedure

To manage virtual machines, you can do the following Business Automation Workflow tasks from either the **Middleware perspective** section or the **Virtual machine perspective** section of the **Virtual System Instances** window.

- View the processor usage and the memory usage of a virtual machine.

  Click the linked name of a virtual machine to open the **Virtual Machines** window for that virtual machine. The **Virtual Machines** window shows the details about the virtual machine you selected.
- Start a virtual machine from the **Virtual machine perspective**.
  a) Click **Manage** under the Action column in the row of the virtual machine that you want to start.
  b) Click the **Start** icon.

  When the virtual machine is started, the virtual machine operating system is functional.
- Stop a running virtual machine from the **Virtual machine perspective**.
  a) Click **Manage** under the Action column in the row of the virtual machine you want to stop.
  b) Click the **Stop** icon.
- Configure a virtual machine from the **Virtual machine perspective**.
  a) Click **Manage** under the Action column in the row of the virtual machine you want to configure.
  b) Click the **Configure** icon to configure the processor count and memory size for the virtual machine.

Related reference

Default virtual machine configuration

When you use predefined virtual system patterns, the virtual machines that are set for virtual system patterns have default settings.

Checking IHS endpoints with console links

In a running virtual system instance with Business Automation Workflow HTTP Server, you can check IHS endpoints by accessing console links for administering.

Procedure

To check IHS endpoints with console links, complete the following steps in the **Virtual System Instances** window:

1. Select the virtual system that contains the virtual machine from which you want to check IHS endpoints.
2. Click **Virtual machine perspective** in the right panel.
   The list expands showing virtual machines.
3. Select a virtual machine for Workflow Server IHS or Workflow Center IHS.
4. Under **Consoles**, click the endpoints to which you want to link.

   Note: The following console links to endpoints are for Workflow Server IHS:

   - Business Rules Manager
   - Process Admin
   - Performance Admin
   - Business Process Choreographer Explorer
   - Process Portal

   The following console links to endpoints are for Workflow Center IHS:

   - Business Rules Manager
   - Process Admin
   - Performance Admin
   - Business Process Choreographer Explorer
   - Process Portal
   - Process Center

Changing the processor count or memory size

When a pattern is deployed to a private cloud, the parts in the pattern become running virtual machines. You can change the settings on virtual machines to meet the needs of your business environment.

Before you begin

To manage virtual machines, ensure that the virtual system instance is put into maintenance mode, by clicking the **Maintain** tab in the panel at the right.

About this task

You can change the settings of a virtual machine to increase performance or meet the needs of your environment. In a IBM Cloud Pak System environment, you can change the processor count or memory size on a virtual machine while it is running.

Procedure

To change the settings on a virtual machine, complete the following steps in the **Virtual System Instances** window:

1. Select the virtual system that contains the virtual machine for which you want to change the settings.
2. Click **Virtual machines**.
   The list expands, showing the virtual machines in the virtual system instance.
3. To access the configuration for a virtual machine, click **Actions** > **Manage**.
4. On the toolbar, click **Configure**.
5. Configure the memory and processor settings on the virtual machine.
   You can configure the following fields:

   CPU count
   Enter a numeric value for the processor count.

Virtual memory (MB)
Enter a numeric value, in megabytes, to change the memory size.

6. Click **OK**.

Manually scaling virtual system instances

Virtual machines run computing workloads in the virtual system instance. To maximize the workload in your IBM Business Automation Workflow Pattern virtual system instances, you can manually scale the virtual machines in the instance.

About this task

You can manually scale a IBM Business Automation Workflow Pattern virtual system instance either *horizontally* or *vertically*. To scale horizontally, you add or remove IHS and custom nodes. To scale vertically, you increase or decrease processor usage or memory on the virtual machines in your virtual system instance.

Manually scaling nodes

IBM HTTP Server nodes and custom nodes are virtual machines that are running computing workloads in your virtual system instances. You can scale your virtual system instance *horizontally* by adding or removing IHS and custom nodes.

Procedure

To add or remove IHS and custom nodes from an Business Automation Workflow virtual system instance, begin in the **Virtual System Instances** window, and complete the following steps:

1. Select a virtual system instance.
2. Click **Manage**.
3. In the **Instance Console** window, click the **Operations** tab.
4. Select the virtual machine to scale.

   The left panel of the **Operations** page shows a table that contains two columns. The left column lists the role name of each virtual machine in the virtual system instance and the right column shows the role type. For role type, both IHS and custom node are displayed as **Image**. You can select any role name that has a role type **Image**.

   The Business Automation Workflow IHS or custom node that you selected is displayed in the right panel.
5. Click **Manual Scaling**.
6. Add nodes or remove a node.
   - To add IHS and custom nodes, click **Horizontal Scaling - Add nodes**. In the **Instance count** field, specify the number of instances to be scaled out at one time. Then, in the **Lock time (minute)** field, specify how long the manually created nodes are kept before automatic scale-in resumes.
   - To remove IHS and custom nodes, click **Horizontal Scaling - Remove nodes**.
7. Click **Submit**.

Results

IBM Cloud Pak System scales your virtual system instance:

Scale Out
IBM Cloud Pak System adds new IHS and custom nodes to your virtual system instance. You might have to wait for a few minutes for your virtual system instance to be scaled out.

Scale In
IBM Cloud Pak System scales in your virtual system instance by deleting an IHS and custom node. The IHS and custom node are removed based on the following criteria:

- A virtual machine is stopped or has failed.
- A virtual machine that has a status other than `RUNNING`, such as `LAUNCHING`, `INITIALIZING`, or `STARTING`.
- A virtual machine that has the least CPU usage.
- A random virtual machine, except for the master, is removed.

The **Operation Execution Results** section, on the bottom of the **Operations** page, shows the status of the operation. The status might show, for example, a successful notification and the names of the new custom nodes or the name of the custom node that was removed.

Pausing or restarting automatic scaling in a virtual system instance

If a scaling policy was set on components in a virtual system pattern that you deployed into the cloud, you can pause or resume the scaling in the resulting virtual system instance.

Procedure

To pause or resume the scaling policy settings on the virtual machines in a virtual system instance, begin from the **Virtual System Instances** window and complete the following steps:

1. Select the virtual system instance on which you want to pause or resume scaling.
2. Click **Manage** to open the **Instance Console** window.
3. Click the **Operations** tab.
4. From the left panel of the **Operations** page, click the **AUTOSCALING** operation.
5. From the **Auto-scaling** section in the right panel, choose one of the following tasks:
   - To pause the auto-scaling on the virtual machines in this virtual system instance, click **Pause** and then click **Submit**.
   - To resume the auto-scaling on the virtual machines in this virtual system instance, click **Resume** and then click **Submit**.

Installing a process application package to a virtual system instance

You can install process application packages to your IBM Business Automation Workflow Pattern virtual system instance to use the application in a cloud environment.

About this task

You can install a process application package that is one of the following types of compressed files:

.zip
The package installation operation installs the `.zip` file on Business Automation Workflow. You cannot install multiple process application package files in one `.zip` file package.

.ear
The package installation operation installs the `.ear` file on Business Automation Workflow.

.tgz

- If the `.tgz` package includes an `install.sh` file, the installation operation calls the `install.sh` file, and you can see the parameters for dmgr hostname, dmgr username, and dmgr password.
- If the `.tgz` package includes an `install.py` file, enter the following command:

```
wsadmin.sh -f install.py
```

- If the `.tgz` package does not include either an `install.sh` file or an `install.py` file, the package installation operation installs the `.zip` files and `.ear` files that are extracted from it.

Procedure

To install the process application package, complete the following steps:

1. In IBM Cloud Pak System, click **Patterns** > **Virtual System Instances**.
2. In the Name column, click a virtual system instance.
3. Click **Manage**.
4. In the **Instance Console** window, click **Operations**.
5. Select an IBM Workflow Server to install the process application package to.

   The left panel of the **Operations** page shows a table that contains two columns. The left column lists the role name of each virtual machine in the virtual system instance and the right column shows the role type. You can select any role name that has a role type of **BAW_19003_PS_DMGR**.

   The Business Automation Workflow node that you selected is displayed in the panel at the right.
6. Expand **Install Offline Package**.
7. Click **Browse**, and then select the process application package to install.
8. Click **OK**, and then click **Submit**.

Results

You can view the results of the **Install Offline Package** in the **Operation Execution Results** table at the bottom of the **Operations** page.

Setting a virtual host for Business Automation Workflow

A virtual host is set as a Business Automation Workflow default endpoint that faces an external environment, and external applications can access the BPM pattern by the virtual host.

Procedure

To set a virtual host for Business Automation Workflow from a deployed virtual system pattern with deployment manager software component, begin in the **Virtual System Instances** window, and complete the following steps:

1. Select a virtual system instance.
2. Click **Manage**.
3. In the **Instance Console** window, click the **Operations** tab.
4. Select the virtual machine to set a virtual host.

   The left panel of the **Operations** page shows a table that contains two columns. The left column lists the role name of each virtual machine in the virtual system instance and the right column shows the role type. For role type, select **BAW_19003_PS_DMGR** or **BAW_19003_PC_DMGR**.

   The **Fundamental** window is displayed in the right panel.
5. Click **Set BPM Virtual Host**.
6. Set the virtual host of Business Automation Workflow in **Virtual Host URL** field.
7. Click **Submit**.

Results

The **Operation Execution Results** section, on the bottom of the **Operations** page, shows the status of the operation. The status might show, for example, a successful notification and the name of virtual host URL.

Starting and stopping servers

Learn how to start and stop the deployment manager server, node agent server, and all the application servers.

About this task

- If you must start or stop any servers directly by running the commands on the virtual machines, change to the virtuser user before you run the commands.
- If you have problems when you start a server by running the commands, clear the cache for the Open Services Gateway Initiative by running the **<WAS HOME>/bin/osgiCfgInit.sh -all** command and then restart the server.

Procedure

Complete the following steps:

1. In IBM Cloud Pak System, click **Patterns** > **Virtual System Instances**.
2. In the Name column, click a virtual system instance.
3. Click **Manage**.
4. In the **Instance Console** window, click **Operations**.
5. To start or stop the deployment manager server, click **BAW_19003_PS_DMGR** > **start deploy manager server** or **BAW_19003_PS_DMGR** > **stop deploy manager server**, and then click **Submit**.
6. To start or stop all the application servers, click **BAW_19003_NODE** > **start all application servers** or **BAW_19003_NODE** > **stop all application servers**, and then click **Submit**.
7. To start or stop node agent server, click **BAW_19003_NODE** > **start node agent server** or **BAW_19003_NODE** > **stop node agent server**, and then click **Submit**.

Troubleshooting and support

Troubleshooting and support information for IBM Business Automation Workflow Pattern helps you understand, isolate, and resolve problems.

Related information

PVU table

Checking log files

If you provide an IBM Business Automation Workflow virtual system pattern and the resulting instance is not as you expected or if there are errors, check the log files.

About this task

You can view the virtual system instance log files. You can also download the log files.

Procedure

To view and download the log files, complete the following steps in the **Virtual System Instances** window:

1. Select the virtual system instance from the listing.

   The system instance opens.
2. Click **Manage** from the system instance.
3. Click **Logging** from the left side at the top.
4. Click a virtual machine.

The log type of the virtual machine expands.

5. Optional: Download the log file.

   After you expand the log type and select a log, you can click the green arrow  to download the log.

   Tip: When you use some versions of the Microsoft Internet Explorer web browser, you might receive the following error message: `Unable to download. Internet Explorer was unable to open this site. The requested site is either unavailable or cannot be found. Try again later.` This limitation is a web browser limitation. A workaround for several versions of the Microsoft Internet Explorer web browser is provided on the Microsoft support page.

Related information

Microsoft support page: Browser workaround support

Methods of tracking license use

You can track IBM Business Automation Workflow Pattern licenses either by tracking the processor value units (PVUs) or by setting up license awareness.

- You can track the licenses by enabling PVU tracking with the IBM License Metric Tool. IBM License Metric Tool tracks the server licenses according to the PVUs that are used by the virtual machines that are deployed in the system. For more information, see Tracking license usage.
- You can track the licenses by setting up license awareness to monitor your license use and to verify that your systems do not exceed the number of licenses that you have. In addition, you can change the part numbers of the deployment manager, a custom node, or IBM HTTP server after a pattern deploys if you have IBM Cloud Pak System V2.3.2.0. For more information, see Enabling license awareness.