PEGA PLATFORM

Pega Platform 7.4

Upgrade Guide

Trademarks

For information about the third-party software that is delivered with the product, refer to the third-party license file on your installation media that is specific to your release.

Notices

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Overview

Use the Pega documentation to install, upgrade, or update your system.

This guide describes how to upgrade an existing instance of PRPC version 5.x, 6.x, or 7.x to Pega 7.4.

To install a new version of Pega Platform, see the *Pega 7.4 Installation Guide* for your database and application server platform. To update from Pega 7.1.x or Pega 7.2.x, see the *Pega Platform Update Guide*.

Caution: This release introduces new features and functionality that might cause compatibility issues with your existing application. You might need to take additional actions before deploying.

Related information

The Pega Discovery Network (PDN) at https://pdn.pega.com is Pega's online documentation and information site. To access the latest documentation, use the Support menu.

- *Platform Support Guide* — Lists the databases, drivers and application servers supported for this release.
- Deployment guides — Includes the latest installation, upgrade, and update guides.
- Release notes — Include information about deploying the Pega Platform that supplement the instructions in this guide. Review the release notes before you continue.
- Updated help files
- *Multitenancy Administration Guide* — Describes how to configure Pega Platform in multitenant mode after deploying.
- *Business Intelligence Exchange User Guide* — Describes how to install the Business Intelligence Exchange (BIX) product. BIX is included in the full distribution image, but has a separate installer.
- *System Management Application Reference Guide* — Describes how to use the optional System Management Application to monitor and control caches, agents, requesters, and listeners.

Differences between updates and upgrades

An update is a new distribution image that contains cumulative fixes and enhancements to the product since Pega 7.0; it is not a full product release. In contrast, upgrades are full product releases. If you need to move from any version prior to Pega 7.0, you must upgrade. To move from any Pega 7.x version to the most current release, you can either update or upgrade.

The following list identifies the major differences between updates and upgrades. For more information, see PDN > Support to determine if you can update, or if you need the full upgrade:

- Many updates can be reversed. You can reverse an out-of-place, split-schema update on a development system with Oracle Database, Microsoft SQL Server, or PostgreSQL. Upgrades and other updates cannot be reversed.
- Updates manage superseded hotfixes. The update process contains specialized error handling for superseded hotfixes. If your system contains a hotfix that is newer than the hotfix provided in the update, the update exits.

  For information about how to force an update, see the *Pega Platform Update Guide*.
- Updates do not include updated help. The prhelp.war file is not included in an update. You can download the file from the update page of the PDN or use the online version.

- Both the update and upgrade consist of a series of ANT targets, executed in sequence. However, the update process omits the following ANT targets:
  - UpgradeJavaSyntax — This step upgrades snippets of Java code to be compatible with Pega Platform.
  - RemapDatabaseTables — This step maps some Data-Admin-DB-Tables to PegaDATA, which is not necessary for Pega Platform.
- Updates do not include additional products. If your system includes Pega Web Mashup (formerly Internet Application Composer (IAC)) or Business Intelligence Exchange (BIX), you can update Pega Platform, and then use the upgrade distribution image to add just the latest version of the additional products to your system.

Plan your deployment

Pega Platform supports several configuration options that can affect the choices that you make during the deployment. Before beginning, read this section thoroughly.

- Do not change your environment while you are deploying Pega Platform. For example, if you are making changes to your application server or database server, do so before you deploy Pega Platform.
- Choose a configuration type: single-schema or split-schema configuration. Pega recommends a split-schema configuration. See Split-schema and single-schema configurations. For split-schema configurations, choose whether you will maintain separate tablespaces for the data schema and rules schema. This decision depends on your database configuration.
- Choose whether to use the standard product edition or the multitenancy edition. The multitenancy edition has different requirements, different run-time behaviors, and different administrative procedures from the standard edition. Before you select the multitenancy edition, review the *Multitenancy Administration Guide* on the PDN.

  Upgrading and updating from one edition to another is not supported. The schema DDLs for the two editions are not compatible. For example, if you install the standard edition and later decide to use the multitenant edition, you must either drop and re-create the database or create a new database.
- For Apache Tomcat, choose a clustering topology: Hazelcast or Apache Ignite; standard embedded mode or client-server mode. Embedded Hazelcast is the default clustering topology. If you want to use Apache Ignite clustering topology, enable Apache Ignite cluster protocol in the **`prconfig.xml`** file. You can use Apache Ignite embedded mode only for small clusters. To use Apache Ignite client-server mode, force the Pega Platform node to start in client mode and open ports for Apache Ignite. See Apache Ignite client-server clustering topology.
- Verify that the version of Business Intelligence Exchange (BIX) is the same as the version of Pega Platform. BIX is included in the full distribution image, but has a separate installer. For information about installing BIX, see the *Pega Platform BIX User Guide*.
- Choose a deployment type: UI tool or command line. See Deployment methods.
- Choose whether to use Kerberos functionality. Kerberos is a computer network authentication protocol that allows nodes communicating over a non-secure network to prove their identity to one another in a secure manner. If you enable Kerberos authentication, you must use the command line method to deploy Pega Platform. For more information, see your installation guide.
- Consult your database administrator to determine whether to have the deployment process make changes directly to the database. You can either have Pega Platform apply changes directly to your database, or generate DDL files of changes for your database administrator to apply. For information about manually generating and applying DDL, see Appendix C — Optional: Generating and applying DDL.
- Choose whether to cluster the Pega Platform nodes. Pega Platform supports clustered nodes without special configuration, but you will make different choices about ports, indexes, and clock synchronization depending on your node configuration.
- Conduct a site-specific analysis of Pega Platform and any custom applications to determine the size of your database tablespace.
- Choose either dual-user or single-user configuration. In a dual-user configuration, an Admin user is granted full privileges, and a Base user is granted a smaller subset of privileges. In the single-user configuration, a single Base user is granted full privileges. For more information about user configuration, see your installation guide.
- If you are using the PostGIS extension on a PostgreSQL database, ensure that it has not been applied to the Rules or Data schemas because it will cause the deployment to fail.

Split-schema and single-schema configurations

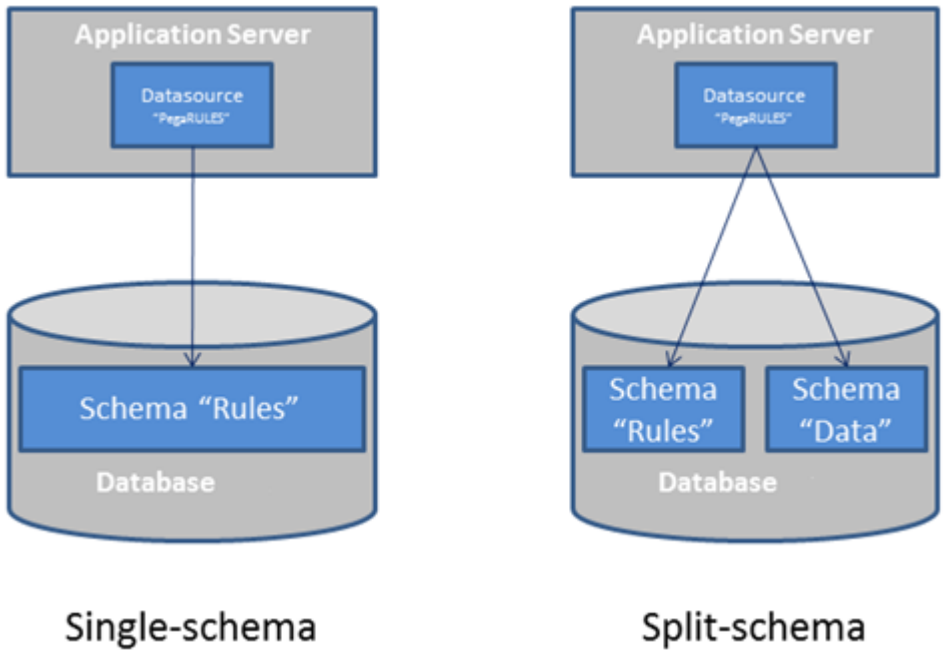
There are two configuration types: single schema and split-schema. Pega recommends split-schema configurations, particularly in critical development environments such as quality assurance, staging, and production.

- Single-schema configuration — One schema contains all rules and data objects.
- Split-schema configuration — The rules and data objects reside on separate schemas:
  - A Rules schema contains rules tables and associated data and objects.
  - A Data schema contains transaction data, including work objects.

  With a split-schema configuration, you can upgrade one environment, and then migrate the upgraded objects to other environments.

  In a split-schema configuration, Pega Platform uses the Java Naming and Directory Interface (JNDI) standard to identify and access the appropriate schema. One of the benefits of using JNDI is that it allows Pega Platform to access different schemas while using only a single data source.

  The following diagram illustrates the difference between a single-schema configuration and a split-schema configuration.



If you plan to use a Pegasystems-supplied application and would like to store any non-Pega-specific data in an separate schema, you can optionally configure a separate customer data schema in addition to the default Pega data schema.

If you plan to change from a single-schema configuration to a split-schema configuration, do so before beginning the deployment.

Apache Ignite client-server clustering topology

You can deploy Pega Platform in a client-server mode that uses Apache Ignite. Client-server mode provides greater cluster stability in large clusters and supports the ability for servers and clients to be separately scaled up. Use client-server mode for large production environments that consist of more than five cluster nodes or if you experience cluster instability even in clusters that contain fewer nodes. The

number of nodes in the cluster that can lead to cluster instability depends on your environment, and switching to client-server mode should be determined individually.

Client-server mode is a clustering topology that separates Pega Platform processes from cluster communication and distributed features. Clustering technology has separate resources and uses a different JVM from Pega Platform.

- Client nodes - Pega Platform nodes that perform application jobs and call the Apache Ignite client to facilitate communication between Pega Platform and the Apache Ignite servers.
- Servers - The stand-alone Apache Ignite servers that provide base clustering capabilities, including communication between the nodes and distributed features. You must have at least three Apache Ignite servers for one cluster.

For more information about enabling client-server mode, see Appendix E — Rolling restart and Apache Ignite client-server mode.

Deployment methods

You can deploy Pega Platform either with the UI tool or from the command line. This guide includes instructions for both methods.

- Use the UI-based Installation and Upgrade Assistant to upgrade either the rulebase or the rulebase and the schema. The Installation and Upgrade Assistant (IUA) leaves intact any customizations to the database schema. You can run the IUA once to upgrade both the database schema and the rulebase, or use the command-line script to update the schema, and then run the IUA to upgrade only the rulebase.
- Command line – Run scripts to deploy Pega Platform.

Regardless of which method you use, you might need to edit the **`setupDatabase.properties`** file that controls the behavior of several scripts:

- The **`generateddl.bat`** or **`generateddl.sh`** script generates an SQL file that your database administrator can use to apply schema changes to the database. You can run this script regardless of whether you use the IUA or the command-line script.
- The **`upgrade.bat`** or **`upgrade.sh`** script performs the following functions:
  - Deploys the most recent version of Pega Platform.
  - Specifies whether to generate a DDL file of changes to the database.
  - Enables Kerberos authentication.

  If you use the IUA to upgrade, you do not use the **`upgrade.bat`** or **`upgrade.sh`** script.

In-place and out-of-place upgrades

In an in-place upgrade, the existing schemas are updated, and no new schemas are created. These upgrades require significant downtime because they directly modify the schemas in production.

Note: If you are performing an in-place upgrade, do not use Pega Platform while the upgrade is running.

Out-of-place upgrades require a temporary upgrade schema that can reside either on the production database or on a second temporary database. The upgrade scripts run on the temporary schema. After the upgrade is complete, a script moves the upgrades to the schemas in the production system. This minimizes the length of time during which the production system is unavailable. As a best practice, use out-of-place upgrades for split-schema configurations.

Environment considerations

Consider your application customization, libraries, database, and special site requirements before continuing.

- Custom applications — If you are using any custom applications, confirm whether your custom applications are supported for this version of the Pega Platform. It might be necessary to upgrade your versions of the custom applications to work with the new version of the Pega Platform.
- Customized Pega Platform database — If you made changes to the Pega Platform database schema, incorporate those changes into the database after you upgrade the database schema. In particular, you should merge any changes to triggers, views, or stored procedures that you made in the previous version, and review any custom rules or work tables that you created. The upgrade procedure leaves tables you have added to the schema in place, but you might need to modify the tables to match changes in Pega ' schema.

  Also verify that schema references in triggers, stored procedures, and views correctly reflect the new schema names.
- Third-party or custom libraries — If you have integrated third-party or custom libraries into your system, make sure you have a copy of them before upgrading. The upgrade might overwrite your deployed libraries.
- Special site requirements — Your site might have special deployment, integration, or security requirements. Schedule an early review of the upgrade procedure with the appropriate system and database administrators.

System requirements

Before you deploy, ensure that your system meets the following minimum requirements.

UI-based tool requirements

If you plan to use the UI-based Installation and Upgrade Assistant, ensure that the system meets these minimum system requirements in addition to all other requirements.

- Windows or Linux operating system
- 1.25 GB minimum available memory
- 10 GB minimum disk space plus at least 8 GB available space in the temporary directory of the root file system
- Java Platform, Standard Edition Development Kit (JDK)

Application server requirements

Install only Pega Platform on the application server. The application server must meet the minimum requirements listed in the *Platform Support Guide* on the PDN and in this section.

- RedHat JBoss systems require a Web browser — required to deploy the Pega Platform applications from the Red Hat JBoss Management Console.
- Oracle systems require an Oracle JDBC type 4 driver, such as **`ojdbc7.jar`**. For more information about supported drivers, see the *Platform Support Guide*.
- All systems require a supported 64-bit JDK. See the *Platform Support Guide* on the PDN for a list of supported versions.

IBM WebSphere Network Deployment requires that the deployment manager, the node agent, and the application servers are all on the same JDK version.

- 1 GB minimum free disk space. You might need additional storage space for debugging and logging.
- Memory requirements: Pega Platform runs in memory (heap) on Java Virtual Machines (JVMs). In general, all activity is distributed over multiple JVMs (nodes) on the application server.
  - Standard suggested system heap size is 4 - 8 GB based on monitoring of memory usage and garbage collection frequency.
  - Larger heaps are advisable if your applications allow a high number of concurrent open tasks per session or cache a large collection of transaction or reference data.
  - Do not deploy Pega Platform in an environment where the heap size exceeds the vendor-specific effectiveness limit.
  - Oracle and IBM JDKs use compression to minimize the cost of large heaps:
    - Oracle - The compression option is labeled CompressedOOPS and is effective up to 32 GB.
    - IBM - The compression option is labeled CompressedRefs and is effective up to 28 GB.

    In current 64-bit JVMs, compression is enabled by default.
  - The host application server memory size must be at least 4 GB larger than the Pega Platform heap size to allow space for the operating system, monitoring tools, operating system network file buffering, and JVM memory size (-XMX option). The minimum host application server memory size is 8 GB:

    4 GB heap + 4 GB for native memory, operating system, and buffering

    If the server does not have enough memory allocated to run Pega Platform, the system can hang without an error message. The correct memory settings depend on your server hardware, the number of other applications, and the number of users on the server, and might be larger than these recommendations.

Database server requirements

Your database server must meet the minimum requirements listed in this section and in the *Platform Support Guide* on the PDN.

For Oracle systems, also verify that your database server includes:

- 8 GB minimum RAM
- A supported version of the JDBC4 driver for your version of the database
- 10 GB minimum initial tablespace set to auto-extend
- 50 MB logfile size — This default size is sufficient for the initial installation, but will need to be resized to run the application server workload.
- If you are using Oracle 11g, do not use the UCP (Universal Connection Pool) feature in your database. Oracle BUG 8462305 causes a failure when an application tries to call a stored procedure. This error causes Pega Platform to work incorrectly with a database that uses UCP. To determine if UCP is in use, check for the `ucp.jar` file in the classpath of the application server.

Database connection information

When you configure the data source resources, you need the correct database connection URL. To determine the database connection URL, obtain the following information from your database administrator:

- Connection method — Service or SID
- Service or SID name
- Host name
- Port number

When you configure the application server, enter the connection string, pega.jdbc.url. Replace items in *italics* with the values for your system:

- To connect to Oracle — Use one of the following formats:
  - jdbc:oracle:thin:@localhost:*port*/*service-name*
  - jdbc:oracle:thin:@localhost:*port*:*SID*
- To connect to Microsoft SQL Server

```
url="jdbc:sqlserver:// server:port;DatabaseName= database;selectMethod=cursor;
          sendStringParametersAsUnicode=false"
```

- To connect to IBM Db2 for Linux, UNIX and Windows

```
jdbc:db2://server:port/database
```

- To connect to PostgreSQL —

```
jdbc:postgresql://server:port/database
```

Upgrading from Pega 7.2.2: exporting the agent schedules for the standard Pega Platform agents

If you are upgrading from Pega 7.2.2 or later and used the Node Classification feature, export the agent schedules for the standard Pega Platform agents.

If you are upgrading from a version prior to Pega 7.2.2, skip this section.

If you did not use the Node Classification feature in Pega 7.2.2, skip this section.

Before you continue, export all the agent schedules that you customized for the standard Pega Platform agents. Any customizations that you made in Pega 7.2.2 are lost when you deploy the new version, and you must manually update the agent schedules after the deployment. Use the exported .zip file as your reference; the zip file cannot be imported to the new system.

To export the agent schedules, complete the following steps:

1. Create a product rule by clicking **Records > SysAdmin > Product > +Create**. For more information, see the product rule help.
2. On the **Contents** tab, in the **Individual instances to include** section, select the `Data-Agent-Queue` class.
3. Click **Query** to get the list of all the `Data-Agent-Queue` instances in the system.
4. Select the instances that you want to export.
5. Click **Submit**.
6. Click **Save**.
7. Click **Create product file**, and download the .zip file.

Prepare your application server

This section describes how to prepare your application server for the upgrade.

Commit hotfixes

Before you deploy, commit any uncommitted hotfixes on your system. If there are uncommitted hotfixes when you deploy, the hotfixes will be overwritten and will not be included in the system. For information about committing hotfixes, see the help.

Port configuration

Before you configure your application server, ensure that the following ports are open and available:

- Search (Elasticsearch) — one TCP port in the range 9300-9399 (default 9300). This port is used for internal node-to-node communication only, and should not be externally accessible.
- Cluster communication — leave open the port range 5701-5800. By default, the system begins with port 5701, and then looks for the next port in the sequence (5702, followed by 5703 and so on). To override the default port range, set a different value for the initialization/cluster/ports setting in the **`prconfig.xml`** file.
- If you switch to Apache Ignite client-server clustering topology, you must additionally open ports in the range of 47100-47109 for Apache Ignite stand-alone server communication.

  Pega Platform can include multiple servers, or nodes, and each node can contain multiple Java Virtual Machines (JVMs). The number of available ports in this range needs to be greater than or equal to the greatest number of JVMs on any one node in the cluster. For example, if there are three JVMs on one node, and seven JVMs on another node, there must be at least seven ports available.

Setting the JVM security parameter for LINUX or UNIX

If you use UNIX or LINUX, set security to urandom.

1. Open the configuration file or console for your application server:
   - Apache Tomcat — **`setenv.bat`** or **`setenv.sh`**
   - IBM WebSphere — Use the IBM WebSphere Administrative Console
   - IBM WebSphere Application Server Liberty Core — **`jvm.options`**
   - JBoss Red Hat EAP — **`standalone.conf`** or **`standalone.conf.bat`**
   - Oracle WebLogic Server — **`setenv.bat`** or **`setenv.sh`**
2. Enter the following argument to set security to urandom:

   ```
   -Djava.security.egd=file:///dev/urandom
   ```

3. Save the changes.

Oracle WebLogic Server: Web SSO with encrypted assertions

Configure your Oracle WebLogic Server web SSO with encrypted assertions. Add the following JAR files to the endorsed directory of the application server:

- **`xercesImpl-2.10.0.jar`** — This file is included in the **Pega-image`\scripts\lib`** directory.
- **`xml-apis-1.4.01.jar`** —This file is included in the **Pega-image`\scripts\lib`** directory.
- **`xalan-2.7.1.jar`** —Obtain this file from the Apache Software Foundation Xalan project. For more information about the Apache Software Foundation Xalan project, see https://xalan.apache.org/.

Preparing your database

Before you begin preparing your database, see the *Platform Support Guide* on the PDN to verify that your database is supported. Modify your Pega Platform database configuration to match these requirements:

- The target and source database must be at the same version.
- Enable Java in the database. For Microsoft SQL Server, enable CLR.
- Define an instance name.
- Configure your database server and application server to use the same time zone and character encoding to avoid conflicts.
- Enable support for user-defined functions (UDF) installed by Pega Platform.
- Additional requirements for Oracle:
  - If your system includes synonyms to Pega-supplied tables, drop the synonyms before you upgrade. If necessary, reapply the synonyms after the deployment is complete.
  - Verify that the system includes:
    - 8 GB minimum RAM.
    - 10 GB minimum initial tablespace set to auto extend for the Rules user.

      Note: The Rules user and the Data user can share the same tablespace. If you create separate tablespaces for the Rules user and the Data user, base the size of the Data user tablespace on the estimated number of work objects in the application.
    - 50 MB logfile size — This default size is sufficient for the initial upgrade, but will need to be resized to run the application server workload.
  - If you are using Oracle 11g, do not use the UCP (Universal Connection Pool) feature in your database. Oracle BUG 8462305 causes a failure when an application tries to call a stored procedure. This error causes Pega Platform to work incorrectly with a database that uses UCP. To determine if UCP is in use, check for the **`ucp.jar`** file in the classpath of the application server.
- Additional requirement for PostgreSQL: Ensure that Java is enabled in the database if you plan to use user-defined functions (UDFs).
- Additional requirement for Microsoft SQL Server: Enable the common language run time (CLR) on the database to enable user-defined functions (UDFs). To check whether CLR is enabled, run the following script:

  ```
  select value from sys.configurations where name ='clr enabled'
  ```

  If the return value is 1, CLR is enabled.

  If you do not enable CLR, you can install the UDF later. See Appendix D — Installing user-defined functions.
- Additional requirement for IBM Db2 for Linux, UNIX, and Windows:
  - Define Operating System-level users with the appropriate authorizations. See Database users.
  - Increase the LOGFILSIZ parameter to at least 4096 pages before you upgrade the rulebase. The default logfile size is 1000 pages.

    Note: After making the change to the LOGFILSIZ parameter, restart the database to make sure the settings are loaded into the database correctly.

Backing up your system and database

Updating or upgrading modifies both the data schema and the rules data; use a backup procedure that preserves both schemas. Back up the existing database, your applications, and the system.

1. Verify that all rules are checked in.
2. Shut down the Pega Platform application server.
3. Use your database utilities to back up the Pega Platform database.
4. If you edited any of the following Pega Platform configuration files in the **APP- INF\classes** directory of an EAR deployment or the **WEB-INF\classes** directory of a WAR deployment, include these in the backup:
   - **prbootstrap.properties**
   - **prconfig.xml**
   - logging file: **prlogging.xml** or **prlog4j2.xml**
   - **web.xml**
   - **pegarules.keyring** or any other .keyring files

   Note: For upgrades from PRPC 6.1 SP2 or earlier if you added System Settings to your **prbootstrap.properties** or **prconfig.xml** files, convert them to Dynamic-System-Settings Data- instances. See Upgrading from PRPC 6.1 SP2 and earlier: moving system settings.
5. Back up any third-party or custom JAR files on your system. Redeploying the Pega Platform applications might delete these from your application server.

Optional: Increasing upgrade speed by removing old rulesets

In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.

Run the **cleanup.bat** or **cleanup.sh** script to generate an SQL script to clean up the rulebase. You can either have the cleanup script automatically apply the SQL, or have your database administrator make the changes.

Caution: Running this command after you complete the upgrade might delete needed rule sets.

1. Open the **setupDatabase.properties** file in the scripts directory of your distribution image: *Directories.distributionDirectory*\scripts\setupDatabase.properties
2. Configure the connection properties. See Properties file parameters for more information.

```
# Connection Information
            pega.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
            pega.jdbc.driver.class=database driver class
            pega.database.type=database vendor type
            pega.jdbc.url=URL of the database
            pega.jdbc.username=Deployment user name
            pega.jdbc.password=password
            rules.schema.name=rules-schema-name
```

```
data.schema.name=data-schema-name
```

3. Specify whether to automatically apply the SQL changes.
   - To automatically remove the rules, set:`run.ruleset.cleanup=true`
   - To have your database administrator apply the SQL script to remove the rules, set: `run.ruleset.cleanup=false`
4. Save and close the file.
5. Run **`cleanup.bat`** or **`cleanup.sh`**.
6. Optional: If you set `run.ruleset.cleanup=false`, give the SQL script to your database administrator to remove the rules.

Verifying that your Oracle database is ready for localization

Oracle supports two types of character semantics, BYTE and CHAR. CHAR supports international character sets.

Before you upgrade, verify that Oracle semantics is set to CHAR to support localization:

1. On the database server, open the file **`SPFILE`** *BNAME* **`.ora`** in the database directory.
2. Verify that the settings are as follows:

```
NLS_LENGTH_SEMANTICS=CHAR scope=both;
            NLS_CHARACTERSET=AL32UTF8;
            NLS_NCHAR_CHARACTERSET=AL16UTF16;
```

3. If the semantics settings differ, migrate the database character set. For more information, see your Oracle documentation and the PDN article Migrating Database Character Sets for Oracle.

Upgrades from Pega 7.3 on MSSQL: Preventing failures by renaming the pc_work_agile.pzPvStream column

Skip this section if you are not using Microsoft® SQL Server® or if you are not upgrading or updating from Pega Platform 7.3.

In Pega Platform 7.3, the capitalization for the column name pc_work_agile.pzPvStream is incorrect. The correct capitalization is pzPVStream. To prevent deployment failures, run the following command from the Microsoft SQL Server Management Studio (SSMS) to rename the column:

```
EXEC sp_rename 'data-schema-name.pc_work_agile.pzPvStream', 'pzPVStream', 'COLUMN'
```

Upgrading multitenant systems from Pega 7.1.5 and later

Follow the steps in this section to upgrade or update a multitenant system from Pega 7.1.5 or later. If you are upgrading or updating from a version prior to Pega 7.1.5, skip this section. If you do not have a multitenant system, skip this section.

The multitenant table architecture requires an additional column, pzTenantID. Several tables are now tenant-qualified; deploying the new version of Pega Platform automatically adds the multitenant column to these tables.

SQL databases do not allow the addition of a non-null column to an existing table unless the table is empty. Therefore, if the tables contain data, upgrading or updating systems on those databases displays an error "Table must be empty to add column" and the deployment fails. For most tables, truncating the data is acceptable; however, the pr_data_admin_product table includes important data. Pega provides a script to add the pzTenantID column to the pr_data_admin_product table without losing data.

To prepare the tables, follow these steps before you upgrade or update. The specific steps depend on your starting version of the Pega Platform.

1. Log in to the data schema.
2. For upgrades from Pega 7.1.9 and earlier, add the column to the pr_data_admin_product table without truncating the data:
   a) Navigate to the AdditionalUpgradeScripts directory:

   ```
   Pega-image/ResourceKit/AdditionalUpgradeScripts/MT/719AndEarlier/
   ```

   b) Run the script for your database:

   ```
   database_mt_upgrade_tables.sql
   ```

3. For upgrades from Pega 7.2 and Pega 7.2.1, run the vendor-specific script:
   a) Navigate to the AdditionalUpgradeScripts directory:

   ```
   Pega-image/ResourceKit/AdditionalUpgradeScripts/MT/72And721/
   ```

   b) Run the script for your database:

   ```
   database_mt_upgrade_tables_d_a_tag_relevantrecord.sql
   ```

Upgrading from PRPC 6.1 SP2 and earlier: move system settings

If you are upgrading from 6.1 SP2 or earlier, move any custom System Settings from the **`prconfig.xml`** or **`prbootstrap.properties`** configuration files to the Dynamic System Settings (Data-Admin-System-Settings). Settings in env elements in your current **`prconfig.xml`** or **`prbootstrap.properties`** files continue to work, and this task can be done at any time.

Pega provides a utility to move the settings from the configuration files to Data-Admin-System-Settings instances. See "Upgrading Configuration Settings from Prior Versions to Version 6.2" in the Configuration Settings Reference Guide on the PDN for details. Note that the instructions on how to run this utility are the same for Pega 7.4 as they are for version 6.2.

Moving these settings to the database has several advantages.

- Since the settings are stored as Data- instances, they can be read from the database by all nodes running your installation. All nodes will have the same setting values, unlike the values in the **`prconfig.xml`** file, which apply only to the node where that file is located.
- The values of the dynamic system settings can be viewed and modified from Designer Studio. Alternately, values stored in the configuration files must be changed by editing the file, which can require restarting the application nodes.

Upgrading from PRPC 5.4 and earlier: disabling indexing

If you are upgrading from PRPC 5.5 or later, skip this section.

If you are upgrading from PRPC 5.4 or earlier, you must create a Dynamic System Setting to control indexing; otherwise, the upgrade fails with the following error message:

```
Class not defined in dictionary: System-Work-Indexer aClassName
```

Before you upgrade, follow these steps to disable indexing.

1. In Designer Studio, click **App**.
2. Right-click **SysAdmin** and select **+Create > Dynamic System Settings.**
3. In the **Short description** field, enter `index/dataEnabled`.
4. In the **Owning Ruleset** field, enter the application name.
5. In the **Setting Purpose** field, enter `index/dataEnabled`.
6. Click **Create and open**.
7. In the **Value** field, enter `false`.
8. Click **Save**.

After you upgrade, follow the instructions in Upgrading from PRPC 5.4 and earlier: re-enabling indexing to re-enable indexing.

Database users

This section describes deployment and runtime users and lists all required permissions.

- Upgrade users — These users perform actions only during the upgrade.
  - Deployment user — The user who runs the upgrade. After the upgrade, you can remove this user.
  - Oracle users — Because Oracle has a one-to-one relationship between users and schemas, if you have a split-schema configuration, you must have separate users for the rules schema and the data schema.
    - Oracle rules schema owner — Only used to create the schema. The Oracle rules schema owner can be associated with either individual tablespaces or a common tablespace. Pegasystems recommends separate tablespaces for each user in critical SDLC environments.
    - The Oracle data schema owner is the Base runtime user.
- Run-time users — These users perform actions on the Pega Platform after the deployment. In a dual-user configuration, an Admin user is granted full privileges, and a Base user is granted a smaller subset. Pega recommends the dual-user configuration:
  - Base user — The user who runs the Pega Platform. Most run-time operations use the Base user and associated data source.

    The Base user is the Oracle data schema user.

    Because PostgreSQL does not permit two users to have the same schema owner privileges, the Deployment user is the same as the Admin user.

  Pega recommends that you use the dual-user configuration with separate Admin and Base users; however, you can create a single Base user with both sets of privileges. If there is no separate Admin user, the Pega Platform uses the Base user for all run-time operations.

Note: If you have only a Base user, the system cannot perform automatic schema-change operations.

IBM Db2 operating-system users

Skip this section if you are not using IBM Db2 for Linux, UNIX, and Windows. All IBM Db2 users must also exist at the operating system level. Before you create the database user accounts, define the operating-system-level users and authorizations:

- Deployment user - This user must have Administrative privileges on the operating system. For example, in Windows this user is a member of the Administrators Group.
- Admin – This user must have Administrative privileges on the operating system. For example, in Windows this user is a member of the Administrators Group.
- Base – This user must not have Administrator privileges on the operating system. If the Base user is associated with the operating systems Administrators group, the database reports an error.

Creating user accounts for IBM Db2 for Linux, UNIX, and Windows

Create user accounts. The permissions needed for your database users depend on whether you have a split-schema or a single-schema configuration, and whether you are using the recommended dual Admin/Base user configuration.

In a split-schema configuration, the Deployment user owns both the data and rules schemas until the deployment is complete. After the deployment, the Admin user owns both schemas. If there is no Admin user, the Base user owns the schemas after the deployment.

In a single-schema configuration, the Deployment user owns the single schema until the deployment is complete. After the deployment, the Admin user owns the schema. If there is no Admin user, the Base user owns the schema.

Use the Data Studio to create the Base user and Admin user accounts:

1. Ensure that the accounts are defined at the Operating System level.
2. In the **Administration Explorer**, expand the newly created database and the section named **Users and Groups**.
3. Right click **Users** and select **Add and Manage User**.
4. In the **General** tab, enter the **Name** of the database user.
5. Select **Privileges** and select the appropriate privileges. For example, for the Base user, select **CONNECT** and **DATAACCESS**. Keep the remaining default values.

   Note: The Base user must not have Administrator privileges on the operating system. If the user is associated with the operating systems Administrators group, the database reports an error.
6. Execute the **Change Plan.**

   Note: Repeat these steps if you are planning to use a dual Base and Admin user configuration.
7. Optional: If you have both a Base and Admin user, repeat these steps for the remaining user.

General user permissions

The following table describes the general permissions for each user and the purpose of each permission.

Pega recommends the dual-user configuration. For a single-user configuration, the Base user also requires the permissions listed for the Admin user.

Permission	Deployment User	Base User	Admin User
Insert/select/update/delete on data and rules tables	The deployment process saves instances to data and rules tables.	User has basic read and write access to data and rules tables.	
Select data and rule schema metadata	The deployment process reads metadata about tables and other objects to determine the most efficient way to access and store data.	PegaRULES reads metadata about tables and other objects to determine the most efficient way to access and store data.	
Execute stored procedures in data and rules schemas	The deployment process uses stored procedures for system operations.	PegaRULES uses stored procedures for system operations.	
Create/update/drop tables, indexes, and constraints in data and rules schema	The deployment process installs the tables, indexes, and constraints used by PegaRULES.		Various system management tools allow you to create and modify tables and indexes. For data schemas, various facilities in decisioning create short-lived tables to assist with strategy analysis.
Create/update/drop views in data and rules schemas	The deployment process installs the views used by PegaRULES.		Various facilities in decisioning create short-lived views to assist with strategy analysis. Import also requires this when importing views.
Create/update/drop stored procedures, triggers, and functions	The deployment process installs stored procedures, triggers, and functions used by PegaRULES.		
Enable and disable triggers on rule tables	The installation and upgrade processes disable triggers in order to save large amounts of records more quickly.		
Truncate rule and data tables	Various tables must be truncated during a PegaRULES upgrade.		
Grant object-level privileges on rules schema to data user	When the install and upgrade processes create tables and other objects in the rules schema, they must grant the Base user access to these objects.		When system management utilities create tables and other objects in the rules schema, they must grant the Base user access to these objects.

Note: If you plan to manually install the user-defined functions (UDFs) from Pega, the database user who will install the UDFs cannot have the sysadmin role. Having the sysadmin role changes the default schema name and causes installation problems. For more information about UDFs, see Installing user-defined functions.

Microsoft SQL Server user permissions

The permissions needed for your database users depend on whether you have a split-schema or a single-schema system, and whether you are using the recommended dual Admin/Base user configuration.

Split-schema configuration

	Deployment User	Base User *	Admin User
Schemas owned by this user	PegaDATA PegaRULES	none	PegaDATA PegaRULES
Privileges	CREATE TABLE CREATE PROCEDURE CREATE VIEW CREATE ASSEMBLY CREATE FUNCTION	SELECT ON SCHEMA *data-schema* INSERT ON SCHEMA *data-schema* UPDATE ON SCHEMA *data-schema* DELETE ON SCHEMA *data-schema* EXECUTE ON SCHEMA *data-schema* SELECT ON SCHEMA *rules-schema* INSERT ON SCHEMA *rules-schema* UPDATE ON SCHEMA *rules-schema* DELETE ON SCHEMA *rules-schema* EXECUTE ON SCHEMA *rules-schema*	CREATE TABLE CREATE PROCEDURE CREATE VIEW CREATE ASSEMBLY CREATE FUNCTION

* Pega recommends the dual-user configuration. For a single-user configuration, the Base user also requires the permissions listed for the Admin user.

Single schema configuration

	Deployment User	Base User *	Admin User
Schema owned by this user	Pega schema	none	Pega schema
Privileges	CREATE TABLE CREATE PROCEDURE CREATE VIEW CREATE ASSEMBLY CREATE FUNCTION	SELECT ON SCHEMA *schema* INSERT ON SCHEMA *schema* UPDATE ON SCHEMA *schema* DELETE ON SCHEMA *schema* EXECUTE ON SCHEMA *schema*	CREATE TABLE CREATE PROCEDURE CREATE VIEW CREATE ASSEMBLY CREATE FUNCTION

* Pega recommends the dual-user configuration. For a single-user configuration, the Base user also requires the permissions listed for the Admin user.

Oracle user permissions

Use either an SQL command or the Oracle Enterprise Manager to create users with the privileges and roles listed in this section. Because Oracle maintains a one-to-one relationship between schemas and database users, creating users also creates the schemas.

All Oracle database users require unlimited tablespace. For information about creating the users with unlimited tablespace privileges, see Creating Oracle users from an SQL statement. For information about using the Oracle Enterprise Manager to create users and assign privileges and roles, see Creating Oracle users by using the Enterprise Manager.

Deployment user privileges and roles

The Oracle rules schema owner requires only unlimited tablespace and is only used for deployment.

The Deployment user requires the following privileges and roles for all configurations:

- UNLIMITED TABLESPACE
- CREATE SESSION
- CREATE ANY TABLE
- ALTER ANY TABLE
- INSERT ANY TABLE WITH ADMIN OPTION
- SELECT ANY TABLE
- UPDATE ANY TABLE
- DELETE ANY TABLE
- CREATE ANY INDEX
- CREATE ANY PROCEDURE
- EXECUTE ANY PROCEDURE
- CREATE ANY VIEW
- CREATE ANY TYPE
- CREATE ANY TRIGGER
- ALTER ANY TRIGGER
- GRANT ANY OBJECT PRIVILEGE
- DROP ANY PROCEDURE
- DROP ANY TRIGGER
- DROP ANY TABLE
- DROP ANY VIEW
- DROP ANY INDEX
- ANALYZE ANY
- ANALYZE ANY DICTIONARY
- SELECT_CATALOG_ROLE (This is a role, not a privilege.)

  Note: For custom applications, you must grant the SELECT_CATALOG_ROLE to the Deployment or Admin user. Some custom applications use triggers, so the user will need the SELECT_CATALOG_ROLE to drop triggers that read from the update cache and rule view tables. The deployment automatically drops custom triggers. Manually re-create custom triggers after you deploy Pega Platform.

- SESSIONS_PER_USER: When the upgrade begins to import rules, it opens multiple parallel connections. Consider setting SESSIONS_PER_USER to UNLIMITED to avoid an error similar to the following:

```
Exceeded simultaneous SESSIONS_PER_USER limit
```

Run-time users — privileges and roles

The run-time users require different permissions depending on whether you have a dual-user configuration.

Note: The run-time users of the rules and data schemas can share the same tablespace. If you create separate tablespaces for the rules schema and the data schema users, base the size of the tablespace on the estimated number of work objects in the application.

Dual-user configuration — Admin and Base users

In a dual-user configuration, grant these privileges and roles:

- Admin user
  - UNLIMITED TABLESPACE
  - CREATE SESSION
  - CREATE ANY TABLE
  - ALTER ANY TABLE
  - INSERT ANY TABLE WITH ADMIN OPTION
  - SELECT ANY TABLE
  - UPDATE ANY TABLE
  - DELETE ANY TABLE
  - CREATE ANY INDEX
  - CREATE ANY PROCEDURE
  - EXECUTE ANY PROCEDURE
  - CREATE ANY VIEW
  - CREATE ANY TYPE
  - CREATE ANY TRIGGER
  - ALTER ANY TRIGGER
  - GRANT ANY OBJECT PRIVILEGE
  - DROP ANY PROCEDURE
  - DROP ANY TRIGGER
  - DROP ANY TABLE
  - DROP ANY VIEW
  - DROP ANY INDEX
  - ANALYZE ANY
  - ANALYZE ANY DICTIONARY
  - SELECT_CATALOG_ROLE (This is a role, not a privilege.)
- Base user—The Base user is the Oracle data schema owner.
  - Basic read and write access to data and rules tables including rules resolution.
  - UNLIMITED TABLESPACE
  - CREATE SESSION

Single-user configuration— Base user only

The Base user is the Oracle data schema owner.

Note: Pega recommends that you create an Admin user separate from the Base user; if you opt for a single Base user, the system cannot perform automatic schema-change operations.

- Basic read and write access to data and rules tables including rules resolution.
- UNLIMITED TABLESPACE
- CREATE SESSION

Creating Oracle users from an SQL statement

Use SQL statements to create users. For information about using the Oracle Enterprise Manager to create users and assign privileges and roles, see your Oracle documentation.

1. On the database server, run the following SQL statement to create users and grant the users unlimited access to the default USERS tablespace.

```
ALTER USER <user> DEFAULT TABLESPACE USERS QUOTA UNLIMITED ON USERS;
```

2. Use the Oracle tools to assign the appropriate roles and privileges to this user.
3. Repeat steps 1 and 2 for the remaining users:
   - Oracle schema users:
     - For single schemas, create one Oracle schema user
     - For split-schemas, create separate Oracle rules and data schema users.
   - Deployment user
   - Base user
   - Admin user (for dual-user configurations)

Creating Oracle users by using the Enterprise Manager

Follow these steps to create a user:

1. Log in to the Enterprise Manager using the URL provided by the Database Configuration Assistant. The URL is usually in the form: `https://`*host*`:5501/em`
2. Enter the user name and password and click **Login**.
   - User name = sys
   - Password = *password*
3. Select **Security > Users**.
4. Select **Actions > Create User**. Accept the other defaults.
5. On the User Account step, enter the name and password for the user you are creating.
6. Click the right arrow.
   a) If you created a dedicated tablespace, choose that tablespace from the menu.
   b) Accept the other defaults.
7. Click the right arrow.
8. Select the privileges for this user and click **OK**.
9. Repeat these steps to configure the remaining users.

PostgreSQL user permissions

The permissions needed for your database users depend on whether you have a split-schema or a single-schema configuration, and whether you are using the recommended dual Admin/Base user configuration.

Because PostgreSQL does not permit two users to have the same schema owner privileges, the Deployment user is the same as the Admin user.

Split-schema configuration

	Base User *	Admin/Deployment User
Schemas owned by this user	None	PegaDATA PegaRULES
Privileges	• USAGE ON SCHEMA *data-schema* • USAGE ON SCHEMA *rules-schema* • ALTER DEFAULT PRIVILEGES FOR USER *admin-user* IN SCHEMA *data-schema* GRANT ALL ON TABLES TO *base-user* • ALTER DEFAULT PRIVILEGES FOR USER *admin-user* IN SCHEMA *rules-schema* GRANT ALL ON TABLES TO *base-user* • IN SCHEMA *data-schema* GRANT EXECUTE ON FUNCTIONS • IN SCHEMA *rules-schema* GRANT EXECUTE ON FUNCTIONS	Because the Admin/Deployment user is the owner of the schema, they do not need any additional privileges.

* Pega recommends the dual-user configuration. For a single-user configuration, the Base user also requires the permissions listed for the Admin user.

Single schema configuration

	Base User *	Admin/Deployment User
Schema owned by this user	None	Pega schema
Privileges	• USAGE ON SCHEMA *schema* • ALTER DEFAULT PRIVILEGES FOR USER *admin-user* IN SCHEMA *schema* GRANT ALL ON TABLES TO *base-user*	Because the Admin/Deployment user is the owner of the schema, they do not need any additional privileges.

* Pega recommends the dual-user configuration. For a single-user configuration, the Base user also requires the permissions listed for the Admin user.

Creating database users by using PostgreSQL tools

To create database accounts in PostgreSQL, either use the pgAdmin tool which provides a graphical interface or the PSQL tool which provides a command-line interface. The instructions for using pgAdmin are included in this guide. See the PostgreSQL documentation for information about PSQL.

- For dual-user configurations, create:
  - A Base user with read and write permission and the ability to run stored procedures and UDFs.
  - An Admin user with full access including permission to create and alter tables.

- If you want to use one account, create a user with the same authority and privileges as the Admin user described above.

To use the pgAdmin tool:

1. Launch the pgAdmin tool.
2. Double-click the PostgreSQL instance that you want to configure.

   Note: You must enter the password for the administrator account that was configured when PostgreSQL was installed.
3. Right-click **Login Roles** and select **New Login Role**.
4. In the **Role Name** field, enter the name for your database user.
5. On the **Definition** tab, enter the password for this user.
6. On the **Role Privileges** tab, grant permissions to this user. When using a single database user, you must grant at least the **Can create database objects permission**.
7. Click **OK**.
8. To add a second database user, repeat steps 3 - 7.

Editing the setupDatabase.properties file

Edit the **`setupDatabase.properties`** file to configure deployment scripts.

Skip this section if your deployment meets all the following criteria:

- You will use the Installation and Upgrade Assistant.
- You will allow the Installation and Upgrade Assistant to automatically apply the schema changes and do not need to create a DDL file.
- You will not enable Kerberos authentication.

If your deployment does not meet all these criteria, follow the steps in this section to edit the **`setupDatabase.properties`** file. The **`setupDatabase.properties`** file controls scripts which perform the following tasks:

- Upgrade Pega Platform and enable Kerberos authentication. Use the **`upgrade.bat`** or **`upgrade.sh`** script.
- Generate a DDL file of schema changes. Use the **`generateddl.bat`** or **`generateddl.sh`** script. You can use the generateddl script regardless of whether you use the IUA or the command-line script.
- Generate user-defined functions. Use the **`generateudf.bat`** or **`generateudf.sh`** script.
- Migrate schemas. Use the **`migrate.bat`** or **`migrate.sh`** script.

1. Open the **`setupDatabase.properties`** file in the scripts directory of your distribution image: *Directories.distributionDirectory*`\scripts\setupDatabase.properties`
2. Specify the properties for your system. For each property, add the appropriate value after the equal sign. See Database connection properties and script arguments.
3. Optional: If you are repeating a failed upgrade, configure the resume property:
   - To resume from the last successful step, set `automatic.resume=true`.
   - To restart from the beginning, set `automatic.resume=false`.
4. Save and close the file.

Database connection properties and script arguments

The database connection properties in the **setupDatabase.properties** file specify the settings needed to connect to the database. The script arguments specify the same settings when you use command-line scripts.

Script argument	Property	Description
--driverJAR	pega.jdbc.driver.jar	Path and file name of the JDBC driver.
--driverClass	pega.jdbc.driver.class	Class of the JDBC driver
--dbType	pega.database.type	Database vendor type. Enter the correct database vendor: • IBM Db2 for Linux, UNIX, and Windows: `udb` • Microsoft SQL Server: `mssql` • Oracle: `oracledate` • PostgreSQL or Enterprise DB: `postgres`
--dbURL	pega.jdbc.url	The database JDBC URL. For more information, see Obtaining database connection information.
--dbUser	pega.jdbc.username	User name of the Deployment user.
--dbPassword	pega.jdbc.password	Password of the Deployment user. For encrypted passwords, leave this blank.
--adminPassword	pega.admin.password	For new installations only.
--rulesSchema	rules.schema.name	In a single schema environment, sets rules schema and data schema. In a split-schema configuration, sets the rules schema only.
--dataSchema	data.schema.name	For split-schema configurations only, sets the data schema name.
--customerDataSchema	customerdata.schema.name	An optional customer data schema separate from the default Pega data schema.
	user.temp.dir	Optional: The location of the temp directory. Set this location to any accessible location. For example, C:\TEMP.
--mtSystem	multitenant.system	Specifies whether this a multitenant system.

Additional upgrade and update properties

The properties in the **setupDatabase.properties** file help you to customize the upgrade or update.

The following table describes additional properties in the **setupDatabase.properties** file that you might need to edit only for upgrades and updates.

Property	Description
bypass.pega.schema	To bypass both creating the upgrade schema and automatically generating the user-defined functions, set **bypass.pega.schema** to `true`. This implies that the upgrade DDL is already applied. To create the upgrade schema and automatically generate the UDFs, leave this property blank or set it to `false`.
bypass.udf.generation	If you set **bypass.pega.schema** to `false` to create the upgrade schema, but still want to bypass automatically generating the user-defined functions, set **bypass.udf.generation** to `true`.
rebuild.indexes	Rebuilds database rules indexes after the rules load to improve database access performance. If **rebuild.indexes**=`false`, you can rebuild the indexes later by running the stored procedure SPPR_REBUILD_INDEXES. The amount of time this process adds to the upgrade depends on the size of your database.
update.existing.applications	Set to true to run the Update Existing Applications utility. Run the Update Existing Application utility to ensure that your existing applications take advantage of new functionality in Pega Platform. Run the utility first on your development system and test the changes. Then, run the utility again on the production system. The specific actions required for your application depend on your current version. You can also run this utility later from the Designer Studio. The default setting is false.
update.applications.schema	Specifies whether to run the Update Applications Schema utility to update the cloned rule, data, work, and work history tables with the schema changes in the latest base tables as part of the upgrade or update. You can also run this utility later from the **`prpcUtils.bat`** or **`prpcUtils.sh`** script, or from Designer Studio. The default setting is false.
run.ruleset.cleanup	Removes older rules. In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.
reversal.schema.file.name	Schema file name to be used for reversal.
automatic.resume	If the upgrade or update fails, specifies whether the system restarts the upgrade or update from the step where the failure occurred. The default value is true.

Upgrading a split-schema system

If you have an existing split-schema configuration, follow the instructions in this section to upgrade. The rules schema upgrade occurs out-of-place, and the data schema upgrade occurs in place.

Note: To minimize downtime, use the High Availability features. For more information about High Availability, see the Pega Platform High Availability Administration Guide.

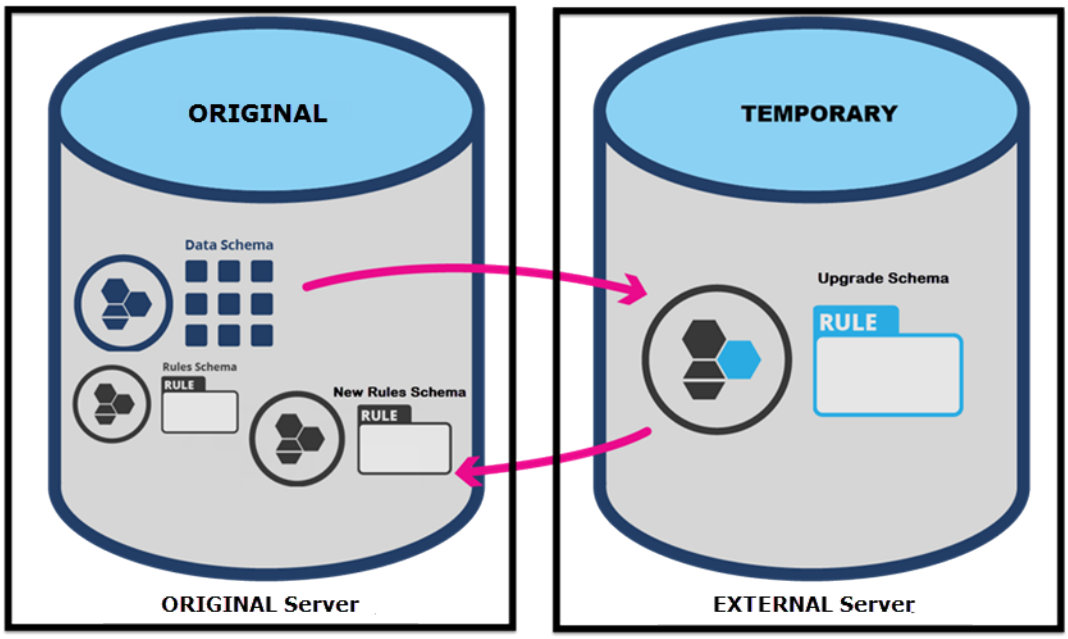
This upgrade involves four schemas:

- Data schema - your current data schema. This will be your data schema after the upgrade as well.
- Rules schema - your current rules schema. This schema will be replaced after the upgrade.
- Temporary upgrade schema - a temporary schema used for staging the upgrade. This will include the rules and data tables during the upgrade.
- New rules schema- the new rules schema. This will become the rules schema after the upgrade.

The generic process for upgrading a split-schema configuration can be summarized in the following steps:

1. Disable rule creation on the rules schema. See Disabling rule creation on the rules schema.
2. Create blank schemas. If you are upgrading with one database, you need one blank schema. If you are upgrading with two databases, you need two blank schemas. See Create two new physical schemas on two databases.
3. Understand the migrate scripts and properties. See Migrate scripts.
4. Migrate only the rules from the current rules schema to the temporary upgrade schema. See Migrating the existing rules schema.
5. Upgrade the temporary upgrade schema. See Upgrade methods for the migrated rules schema.
6. Migrate the upgraded temporary upgrade schema to the new rules schema. See Migrating to the new rules schema.
7. Shut down the existing system and then upgrade the data schema. See Upgrading the data schema.

The diagram below displays the schemas used in this scenario.



Consider the following:

- For upgrades from Pega 7.x, disable rule creation on the system during the upgrade. During the upgrade, you can still use the original system, but any rules created after the migration will be lost when you switch to the upgraded rules schema. The data schema retains all new data and work.
- Always maintain a backup of your system, especially before performing an upgrade.
- Except for creating new schemas, it is highly recommended that you use the migration scripts and not database vendor tools.
- Always upgrade a staging system rather than applying an upgrade directly to the production system.
- The upgrade process requires additional space approximately equal to twice the size of your rules schema. Ensure that your database can allocate enough space to perform this upgrade. Some versions of Microsoft SQL Server Express have a 10 GB limit, which might not be sufficient for large systems.

Disabling rule creation on the rules schema

If you are using the recommended High Availability option, you can disable rule creation on the rules schema to speed the deployment. If you are not using the High Availability option, skip this section.

Before you deploy, commit all uncommitted hotfixes. After you begin the deployment, ensure that no changes to the rules, including hotfixes, are applied until after the deployment is complete.

1. Log in as a user with the PegaRULES:HighAvailabilityAdministrator role.
2. Navigate to **System > High Availability > HA Cluster Settings**.
3. Under **Cluster Upgrade**, select **Cluster Upgrading - Disable saving of rules**.
4. Click **Submit**.
5. Log out.

Create two new physical schemas on two databases

To use two databases for an out-of-place upgrade, create a new database and two new schemas, for example:

- Create the temporary database of the same type and version as your current database.
- Create the temporary upgrade schema in the temporary database.
- Create the new rules schema in your original database.

Migrate scripts

The migrate script, **migrate.bat** or **migrate.sh** migrates the rules objects from the existing schema to a new rules schema, and generates and applies rules schema objects after upgrading the new rules schema. Edit the **migrateSystem.properties** file to configure the migrate script. The Deployment user performs the migrations.

Note: Pega strongly recommends that you use the **migrate.bat** or **migrate.sh** script to perform these steps. The use of vendor tools is not recommended.

The migrate script is designed to automate many aspects of the data movement process, including:

- Export of appropriate tables and data objects from the source system schema;
- Generation and application of DDL to the target system schema;
- Import of appropriate tables and data objects to the target system schema.

Common properties

The following common properties must be configured in the **migrateSystem.properties** file to log on to the databases used for each schema. If you are using one database for each schema, these properties will be the same for each step. However, if you are using different databases for the rules schema and the temporary upgrade schema, these properties will be different, depending on which database the schema is hosted on.

The table below lists the common properties, their descriptions, and valid values. Source properties apply to the system being migrated from, and target properties apply to the system being migrated to. Set the properties by adding the appropriate value after the equals sign in the properties file. Set the properties by adding the appropriate value after the equals sign in the properties file.

Property	Description
pega.source.jdbc.driver.jar pega.target.jdbc.driver.jar	The path to the JDBC JAR file. For databases that use multiple JDBC driver files (such as IBM Db2), specify semicolon-separated values.
pega.source.jdbc.driver.class pega.target.jdbc.driver.class	Valid values are: • IBM Db2 for Linux, UNIX, and Windows and IBM Db2 for z/OS — `com.ibm.db2.jcc.DB2Driver` • Microsoft SQL Server — `com.microsoft.sqlserver.jdbc.SQLServerDriver` • Oracle — `oracle.jdbc.OracleDriver` • PostgreSQL — `org.postgresql.Driver`
pega.source.database.type pega.target.database.type	Valid values are: mssql, oracledate, udb, db2zos, or postgres.

Property	Description
pega.source.jdbc.url pega.target.jdbc.url	The database connection URL. For more information, see Obtaining database connection information.
pega.source.jdbc.username pega.target.jdbc.username	Deployment user name.
pega.source.jdbc.password pega.target.jdbc.password	Deployment user password.

Custom properties

The following properties are used during migration to configure custom settings.

Property	Description
pega.source.jdbc.custom.connection.properties pega.target.jdbc.custom.connection.properties	Any custom connection properties.
pega.source.data.schema pega.target.data.schema pega.source.rules.schema pega.target.rules.schema	Used to correctly schema-qualify tables in stored procedures, views and triggers. These properties are not required if migrating before performing an upgrade.
pega.target.bypass.udf	Set this property to bypass UDF generation on the system.

Migration directory properties

Set the directories for migration objects.

Property	Description
pega.bulkmover.directory	The full path to the directory where output from the bulk mover will be stored. This directory will be cleared when pega.bulkmover.unload.db is run. This property must be set if either pega.bulkmover.unload.db or pega.bulkmover.load.db is set to true.
pega.migrate.temp.directory	The full path to the temporary directory that is created by the migrate system utilities.

Operational properties

Use the following properties to migrate Rules objects. Set to true or false.

Property	Description
pega.move.admin.table	Migrate the admin tables required for an upgrade with the rules tables.
pega.clone.generate.xml	Generate an XML document containing the definitions of tables in the source system. It will be found in the schema directory of the distribution image.
pega.clone.create.ddl	Create DDL from the generated xml document. This DDL can be used to create copies of rule tables found on the source system.
pega.clone.apply.ddl	Apply the generated clone DDL to the target system.

Property	Description
pega.bulkmover.unload.db	Unload the data from the rules tables on the source system into the pega.bulkmover.directory.
pega.bulkmover.load.db	Load the data onto the target system from the pega.bulkmover.directory.

Rules schema object properties

This table describes operations to run when migrating upgraded rules:

Property	Description
pega.rules.objects.generate	Generate the rules schema objects (views, triggers, procedures, and functions). The objects will be created in the pega.target.rules.schema but will contain references to the pega.target.data.schema where appropriate.
pega.rules.objects.apply	Apply the rules schema objects (views, triggers, procedures, and functions) to pega.target.rules.schema.

Migrating the existing rules schema

Use the migrate script to migrate the rules tables and other required database objects from the existing schema to the new rules schema.

You will also use the migrate script later to generate and apply rules objects after the upgrade, but the property settings will be different. The Deployment user performs the migrations.

Note: Pega strongly recommends that you use the migration script. The use of vendor tools to manage this step is not recommended. If you do not use the migrate script to migrate the schema, there are additional manual steps required that are not documented here.

This process depends on whether the system has access to both the original and temporary databases.

Migrating the rules schema when the system has access to both databases

If the system has access to both the temporary and original databases, run the migrate script once to migrate the rules schema.

1. Use a text editor to edit the **`migrateSystem.properties`** file in the scripts directory:
   Pega-image`\scripts\migrateSystem.properties`
2. Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
              pega.source.jdbc.driver.jar=full path/DRIVER.jar
              pega.source.jdbc.driver.class=database driver class
              pega.source.database.type=database vendor type
              pega.source.jdbc.url=URL of database
              pega.source.jdbc.username=Deployment user name
              pega.source.jdbc.password=password
              pega.source.rules.schema=original rules schema name
              pega.source.data.schema=original data schema name
```

3. Configure the target properties. See Properties file parameters for more information. Leave the target data schema name blank:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
                pega.target.jdbc.driver.class=database driver class
                pega.target.database.type=database vendor type
                pega.target.jdbc.url=database URL
                pega.target.jdbc.username=Deployment user name
                pega.target.jdbc.password=password
```

```
pega.target.rules.schema=temporary upgrade schema
```

```
pega.target.data.schema=
```

Note: If pega.target.data.schema is blank, the rules schema is used by default.

4. Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

5. Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

6. Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
              pega.clone.generate.xml=true
              pega.clone.create.ddl=true
              pega.clone.apply.ddl=true
              pega.bulkmover.unload.db=true
              pega.bulkmover.load.db=true
```

7. Disable the operations as shown below:

```
pega.rules.generate=false
              pega.rule.objects.apply=false
```

8. Save the properties file.
9. Open a command prompt, and navigate to the scripts directory.
10. Type **`migrate.bat`** or **`./migrate.sh`** to run the script.

Pega Platform writes command-line output to a file in the **Pega-image`\scripts\logs`** directory.

Migrating the rules schema when the system has access to one database

If the system can only access one database at a time (for example, if there is a firewall between the two servers), run the migration script twice: first on a system that can access the original source database, and then where it can access the temporary target database.

Make sure that the system that accesses the temporary database has access to the bulkmover directory and the DDL generated from the source database.

1. On a system that can access the original database, export rules from the original database.

a) Use a text editor to edit the **migrateSystem.properties** file in the scripts directory:
Pega-image\scripts\migrateSystem.properties

b) Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
                  pega.source.jdbc.driver.jar=full path/DRIVER.jar
                  pega.source.jdbc.driver.class=database driver class
                  pega.source.database.type=database vendor type
                  pega.source.jdbc.url=URL of database
                  pega.source.jdbc.username=Deployment user name
                  pega.source.jdbc.password=password
                  pega.source.rules.schema=original rules schema name
                  pega.source.data.schema=original data schema name
```

c) Configure the target properties. See Properties file parameters for more information. Leave the target data schema name blank:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
                    pega.target.jdbc.driver.class=database driver class
                    pega.target.database.type=database vendor type
                    pega.target.jdbc.url=database URL
                    pega.target.jdbc.username=Deployment user name
                    pega.target.jdbc.password=password
```

```
pega.target.rules.schema=temporary upgrade schema
```

```
pega.target.data.schema=
```

Note: If pega.target.data.schema is blank, the rules schema is used by default.

d) Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

e) Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

f) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
                  pega.clone.generate.xml=true
                  pega.clone.create.ddl=true
                  pega.clone.apply.ddl=false
                  pega.bulkmover.unload.db=true
                  pega.bulkmover.load.db=false
                  pega.rules.generate=false
                  pega.rule.objects.apply=false
```

g) Save the properties file.

h) Open a command prompt, and navigate to the scripts directory.

i) Type **migrate.bat** or **./migrate.sh** to export the rules.

2. On a system that can access the temporary database, import the rules to the temporary database.

a) Copy the **migrateSystem.properties** file you created in step 1 to a system that can access the temporary database.

b) Verify that the source, target, bulkmover, and temporary directory properties remain the same as in step 1.

c) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
                  pega.clone.generate.xml=false
                  pega.clone.create.ddl=false
                  pega.clone.apply.ddl=true
                  pega.bulkmover.unload.db=false
                  pega.bulkmover.load.db=true
                  pega.rules.generate=false
                  pega.rule.objects.apply=false
```

d) Save the properties file.

e) Open a command prompt, and navigate to the scripts directory.

f) Run **migrate.bat** or **./migrate.sh** to import the rules.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Upgrade methods for the migrated rules schema

Use one of these methods to upgrade the migrated rules schema:

- Installation and Upgrade Assistant
- Command line script: **upgrade.bat** or **upgrade.sh**

Prior to loading the rulebase, the upgrade attempts to validate that each database table space has a buffer pool size large enough to accommodate the generated SQL DDL. The utility generates a report and stops if it finds any table space that requires an increased buffer pool size. The report identifies all table spaces requiring an increased buffer pool size. Have the database administrator correct the table space buffer pool issues and rerun the tool.

Note: To minimize the time required to upgrade, run the upgrade from the same data center as the database server.

Upgrading the migrated rules schema by using the Installation and Upgrade Assistant

For a UI-based upgrade experience, use the Installation and Upgrade Assistant.

Because of the large volume of data, run the IUA on the same network as the database server. If this is not possible, run the tool on a system with fast, direct access to the database server. The Deployment user performs these steps.

The upgrade can last for several hours and the time can vary widely based on network proximity to the database server.

1. Double-click the **PRPC_Setup.jar** file to start the IUA.

   Note: If JAR files are not associated with Java commands on your system, start the IUA from the command line. Navigate to the directory containing the **PRPC_Setup.jar** file, and type `java -jar PRPC_Setup.jar`.

   The IUA loads and the Pega icon is displayed in your task bar.

2. Click **Next** to display the license agreement.
3. Review the license agreement and click **Accept**.
4. Optional: If you are resuming after a previous failed upgrade and the **Resume Options** screen is displayed, select either **Resume** or **Start Over**.
   - If you select **Resume**, the system uses the previously entered database configuration information to resume the upgrade from the last successful process. Continue these instructions at step 8.
   - If you select **Start Over**, continue at step 5 to reenter the configuration information.
5. On the **Installer Mode** screen, choose **Upgrade** and click **Next**.
6. Choose your database type and click **Next**.
7. Configure the database connection. The JDBC drivers allow the Pega Platform application to communicate with the database. Specify the new rules schema name for both the **Rules Schema Name** and **Data Schema Name** fields. For more information, see Appendix A — Properties files.

   Note: Some of the fields on the **Database Connection** screen are pre-populated based on the type of database you selected. If you edit these or any other fields on this screen, and then later decide to change the database type, the IUA might not populate the fields correctly. If this occurs, enter the correct field values as documented below, or exit and rerun the IUA to select the intended database type. If you are resuming after a failed upgrade, some pre-populated values might be disabled.

   - **JDBC Driver Class Name** — Verify that the pre-populated values are correct.
   - **JDBC Driver JAR Files** — Click **Select Jar** to browse to the appropriate driver files for your database type and version.
   - **Database JDBC URL** — Verify that the pre-populated value is accurate.
   - **Database Username and Password** — Enter the Deployment user name and password.
   - **Rules Schema Name** — Enter the new rules schema name.
   - **Data Schema Name** — Enter the new rules schema name.
8. Click **Test Connection**. If the connection is not successful, review your connection information, correct any errors, and retest. When the connection is successful, click **Next** to choose how to apply the data schema.

   On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, **Test Connection** does not verify that the schemas exist. Instead, the schemas are automatically generated when the first CREATE TABLE statement executes after the deployment is complete.
9. Specify whether you will have your database administrator manually apply the DDL changes to the schema. These changes include the user-defined functions (UDF) supplied by Pega. By default, the IUA generates and applies the schema changes to your database.
   - To generate and apply the DDL outside the IUA, select **Bypass Automatic DDL Application** and continue the deployment. After you complete the deployment, manually generate and apply the DDL and UDF. For more information, see Optional: Generating and applying DDL and Optional: Installing user-defined functions.
   - To have the IUA automatically apply the DDL changes and the UDF, clear **Bypass Automatic DDL Application**.
10. Click **Next**.
11. Select the upgrade options and click **Next**:
    - Optional: Select **Run rulebase cleanup** to permanently remove old rules. In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are

upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.

- Optional: Select **Update existing applications** to modify your existing applications to support the upgraded version of the Pega Platform. The specific actions depend on your current version of PRPC. If you do not automatically update the applications as part of the IUA, follow the instructions in Updating existing applications to update the applications as part of the post-upgrade process.
- Optional: Select **Rebuild database indexes** to have the IUA to rebuild the database indexes after the rulebase loads. The IUA rebuilds the database indexes to ensure good performance in the upgraded system. The amount of time this process adds to the upgrade procedure depends on the size of your database.

12. Click **Start** to begin loading the rulebase. During the upgrade, the log window might appear inactive when the IUA is processing larger files.
13. Click **Back** to return to the previous screen, and then click **Exit** to close the IUA.

Pega Platform writes command-line output to a file in the **Pega-image**`\scripts\logs` directory.

Continue at Migrating to the new rules schema.

Upgrading the rules schema from the command line

To use the command line, configure the `setupDatabase.properties` file and run either `upgrade.bat` or `upgrade.sh`. The Deployment user runs these scripts.

1. If you have not done so already, edit the `setupDatabase.properties` file.
   a) Open the `setupDatabase.properties` file in the scripts directory of your distribution image: *Directories.distributionDirectory*`\scripts\setupDatabase.properties`
   b) Configure the connection properties. Use the temporary upgrade schema name for both the rules schema and data schema names. See Properties file parameters for more information.
   c) Optional: If you are repeating a failed upgrade, configure the resume property:
      - To resume the upgrade from the last successful step, set `automatic.resume=true`.
      - To restart the upgrade from the beginning, set `automatic.resume=false`.
   d) Save and close the file.
2. Open a command prompt and navigate to the scripts directory.
3. Run either `upgrade.bat` or `upgrade.sh`.

The rulebase upgrade can take several hours, depending on the proximity of the database to the system running the script.

Pega Platform writes command-line output to a file in the **Pega-image**`\scripts\logs` directory.

Continue at Migrating to the new rules schema.

Migrating to the new rules schema

Migrate to the new rules schema. Use the `migrate.bat` or `migrate.sh` script again for this process, but with different properties in the `migrateSystem.properties` file. The Deployment user runs these scripts.

Note: Pega strongly recommends that you use the migration script. The use of vendor tools to manage this step is not recommended. If you do not use the migrate script to migrate the schema, there are additional manual steps required that are not documented here.

This process depends on whether the system has access to both the original and temporary databases.

Migrating to the new rules schema when the system has access to both databases

If your system has access to the temporary and original databases, run the migrate script once to migrate to the new rules schema.

1. Use a text editor to edit the **migrateSystem.properties** file in the scripts directory:
   Pega-image\scripts\migrateSystem.properties
2. Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
        pega.source.jdbc.driver.jar=full path/DRIVER.jar
        pega.source.jdbc.driver.class=database driver class
        pega.source.database.type=database vendor type
        pega.source.jdbc.url=database URL
        pega.source.jdbc.username=Deployment user name
        pega.source.jdbc.password=password
        pega.source.rules.schema=temporary upgrade schema
        pega.source.data.schema=original data schema name
```

3. Configure the target properties. See Properties file parameters for more information:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
        pega.target.jdbc.driver.class=database driver class
        pega.target.database.type=database vendor type
        pega.target.jdbc.url=database URL
        pega.target.jdbc.username=Deployment user name
        pega.target.jdbc.password=password
        pega.target.rules.schema=new rules schema
        pega.target.data.schema=original data schema name
```

   Note: If `pega.target.data.schema` is blank, the rules schema is used by default.

4. Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

5. Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

6. If the system has access to both the original and temporary databases, configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=false
pega.clone.generate.xml=true
        pega.clone.create.ddl=true
        pega.clone.apply.ddl=true
        pega.bulkmover.unload.db=true
        pega.bulkmover.load.db=true
        pega.rules.objects.generate=true
        pega.rules.objects.apply=true
```

7. Save the properties file.
8. Open a command prompt, and navigate to the scripts directory.

9. Type **migrate.bat** or **./migrate.sh** to run the script.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Migrating to the new rules schema when the system has access to one database at a time

If the system can only access one database at a time (for example, if there is a firewall between the two servers), run the migration script twice: first on a system that can access the original source database, and then on a system that can access the temporary target database.

Make sure that the system that accesses the temporary database has access to the bulkmover directory and the DDL generated from the source database.

1. On a system that can access the original database, export rules from the original database.
   a) Use a text editor to edit the **migrateSystem.properties** file in the scripts directory:
   Pega-image\ scripts\migrateSystem.properties
   b) Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
              pega.source.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
              pega.source.jdbc.driver.class=database driver class
              pega.source.database.type=database vendor type
              pega.source.jdbc.url=URL of database
              pega.source.jdbc.username=Deployment user name
              pega.source.jdbc.password=password
              pega.source.rules.schema=temporary upgrade schema
              pega.source.data.schema=original data schema name
```

   c) Configure the target properties. See Properties file parameters for more information:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
              pega.target.jdbc.driver.class=database driver class
              pega.target.database.type=database vendor type
              pega.target.jdbc.url=database URL
              pega.target.jdbc.username=Deployment user name
              pega.target.jdbc.password=password
              pega.target.rules.schema=new rules schema
              pega.target.data.schema=original data schema name
```

   Note: If pega.target.data.schema is blank, the rules schema is used by default.

   d) Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

   e) Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

   f) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=false
pega.clone.generate.xml=true
        pega.clone.create.ddl=true
```

```
        pega.clone.apply.ddl=false
        pega.bulkmover.unload.db=true
        pega.bulkmover.load.db=false
        pega.rules.objects.generate=true
        pega.rules.objects.apply=true
```

g) Save the properties file.

h) Open a command prompt, and navigate to the scripts directory.

i) Type **migrate.bat** or **./migrate.sh** to export the rules.

2. On a system that can access the temporary database, import the rules to the temporary database.

a) Copy the **migrateSystem.properties** file you created in step 1 to a system that can access the temporary database.

b) Verify that the source, target, bulkmover, and temporary directory properties remain the same as in step 1, but set the source rules schema to the original rules schema:

```
pega.source.rules.schema=original rules schema name
```

c) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
pega.clone.generate.xml=false
        pega.clone.create.ddl=false
        pega.clone.apply.ddl=true
        pega.bulkmover.unload.db=false
        pega.bulkmover.load.db=true
        pega.rules.objects.generate=true
        pega.rules.objects.apply=true
```

d) Save the properties file.

e) Open a command prompt, and navigate to the scripts directory.

f) Type **migrate.bat** or **./migrate.sh** to import the rules.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Upgrading the data schema

The Deployment user runs a script to upgrade the data schema.

1. Shut down your system.
2. If you have not already done so, configure the connection properties. Use your current data schema name for **data.schema.name**. Use the new rules schema name for **rules.schema.name**. For more information, see Editing the setupDatabase.properties file.

```
# Connection Information
                pega.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
                pega.jdbc.driver.class=database driver class
                pega.database.type=database vendor type
                pega.jdbc.url=URL of the database
                pega.jdbc.username=Deployment user name
                pega.jdbc.password=password
                rules.schema.name=new rules schema
                data.schema.name=current data schema
```

3. Disable the Pega Platform access to the data schema.
4. Open a command prompt, and navigate to the scripts directory.
5. Run **upgrade.bat** or **./upgrade.sh** for Linux, passing in the --dataOnly argument and true parameter, for example:

```
upgrade.bat --dataOnly true
```

Pega Platform writes command-line output to a file in the **Pega-image**`scripts\logs` directory.

Upgrading from a single-schema to split-schema configuration

If you have a single schema, Pega recommends that you upgrade to a split-schema configuration. To keep your single-schema configuration, see Appendix B — Performing a single-schema upgrade.

Your single schema currently includes both rules and data. After you split the schema, your system will have two schemas: a data schema and a separate rules schema.

Note: To minimize downtime, use the High Availability features. For more information about High Availability, see the *Pega Platform High Availability Administration Guide.*

This upgrade involves three schemas:

- Current rules and data schema - your current single schema. This will be your data schema after the upgrade as well.
- Temporary upgrade schema - a temporary schema used for staging the upgrade. This will include the rules and data tables during the upgrade.
- New rules schema- the new rules schema. This will become the rules schema after the upgrade.

The generic process for upgrading a split-schema configuration can be summarized in the following steps. The specific steps depend on whether your system has one database or two databases:

1. Disable rule creation on your original schema.
2. Create blank schemas. If you are upgrading with one database, you need one blank schema. If you are upgrading with two databases, you need two blank schemas.
3. Migrate only the rules from the existing single schema to the new rules or upgrade schema.
4. Upgrade the new rules schema.
5. Use the migrate script to generate the rules schema objects and establish the links between the new rules schema and the data schema. If you are upgrading with two databases you will also need to migrate the upgraded schema to the new rules schema.
6. Shut down the existing system and then upgrade the data schema.

Upgrade with one database

For non-production systems, follow the instructions in this section to perform an out-of-place upgrade with one database. For production systems, use two different systems and databases. See Upgrading with two databases for details.

Note: The two-database approach allows you to take advantage of high availability features for upgrades that require minimal downtime.

1. If you are using the High Availability option, disable rule creation on the existing schema. See Disabling rule creation on the rules schema.
2. Unless you are using IBM Db2 for Linux, UNIX, and Windows, create a single schema. See Create a new rules schema. On IBM Db2 for Linux, UNIX, and Windows, the schema is automatically created when the first CREATE TABLE statement executes after the deployment is complete.
3. Migrate the rules tables to the new schema. See Migrating the rules tables with one database.
4. Use either the Installation and Upgrade Assistant, or the command line to upgrade the migrated rules schema. See Upgrade methods for the migrated rules schema.

Disabling rule creation on the rules schema

If you are using the recommended High Availability option, you can disable rule creation on the rules schema to speed the deployment. If you are not using the High Availability option, skip this section.

Before you deploy, commit all uncommitted hotfixes. After you begin the deployment, ensure that no changes to the rules, including hotfixes, are applied until after the deployment is complete.

1. Log in as a user with the PegaRULES:HighAvailabilityAdministrator role.
2. Navigate to **System > High Availability > HA Cluster Settings**.
3. Under **Cluster Upgrade**, select **Cluster Upgrading - Disable saving of rules**.
4. Click **Submit**.
5. Log out.

Create a new rules schema

Unless you are using IBM Db2 for Linux, UNIX, and Windows, or IBM Db2 for z/OS, create a blank schema. On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, the schema is automatically created when the first CREATE TABLE statement executes after the deployment is complete.

Migrating the rules tables with one database

Use the migrate script to migrate the rules tables and other required database objects from the existing rules schema to the new rules schema. You will also use this script later to generate and apply rules objects after the upgrade. The Deployment user performs the migrations.

Pega strongly recommends that you use the migration script. The use of vendor tools to manage this step is not recommended. If you do not use the migrate script to migrate the schema, there are additional manual steps required that are not documented here.

1. Use a text editor to edit **Pega-image\scripts\migrateSystem.properties**.
2. Configure the source properties. See Properties file parameters for more information. Leave the source data schema blank:

```
# Connection Information
            pega.source.jdbc.driver.jar=full path/DRIVER.jar
            pega.source.jdbc.driver.class=database driver class
            pega.source.database.type=database vendor type
            pega.source.jdbc.url=URL of database
            pega.source.jdbc.username=Deployment user name
            pega.source.jdbc.password=password
            pega.source.rules.schema=original single-schema name
```

3. Configure the target properties. See Properties file parameters for more information:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
              pega.target.jdbc.driver.class=database driver class
              pega.target.database.type=database vendor type
              pega.target.jdbc.url=database URL
              pega.target.jdbc.username=Deployment user name
              pega.target.jdbc.password=password
              pega.target.data.schema=new rules schema name
              pega.target.rules.schema=new rules schema name
```

Note: If pega.target.data.schema is blank, the rules schema is correctly used by default.

4. Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

5. Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

6. Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
            pega.clone.generate.xml=true
            pega.clone.create.ddl= true
            pega.clone.apply.ddl=true
            pega.bulkmover.unload.db=true
            pega.bulkmover.load.db=true
            pega.rules.objects.generate=false
            pega.rules.objects.apply=false
```

7. Save the script.
8. Open a command prompt, and navigate to the scripts directory.
9. Type **migrate.bat** or **./migrate.sh** to run the script.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Upgrade methods for the migrated rules schema

Use one of these methods to upgrade the migrated rules schema:

- Installation and Upgrade Assistant
- Command line script: **upgrade.bat** or **upgrade.sh**

Prior to loading the rulebase, the upgrade attempts to validate that each database table space has a buffer pool size large enough to accommodate the generated SQL DDL. The utility generates a report and stops if it finds any table space that requires an increased buffer pool size. The report identifies all table spaces requiring an increased buffer pool size. Have the database administrator correct the table space buffer pool issues and rerun the tool.

Note: To minimize the time required to upgrade, run the upgrade from the same data center as the database server.

Upgrading the migrated rules schema by using the UI tool

Use the Installation and Upgrade Assistant to upgrade the migrated rules schema. Otherwise use the upgrade script.

Because of the large volume of data, run the IUA on the same network as the database server. If this is not possible, run the tool on a system with fast, direct access to the database server. The Deployment user performs these steps.

Note:

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

The upgrade can last for several hours and the time can vary widely based on network proximity to the database server.

1. Double-click the **PRPC_Setup.jar** file to start the IUA.

Note: If JAR files are not associated with Java commands on your system, start the IUA from the command line. Navigate to the directory containing the **PRPC_Setup.jar** file, and type `java -jar PRPC_Setup.jar`.

The IUA loads and the Pega icon is displayed in your task bar.

2. Click **Next** to display the license agreement.
3. Review the license agreement and click **Accept**.
4. If you are resuming after a previous failed upgrade and the **Resume Options** screen is displayed, select either **Resume** or **Start Over**.
   - If you select **Resume**, the system uses the previously entered database configuration information to resume the upgrade from the last successful process. Continue these instructions at step 8.
   - If you select **Start Over**, continue at step 5 to reenter the configuration information.
5. On the **Installer Mode** screen, choose **Upgrade** and click **Next**.
6. Choose your database type and click **Next**.
7. Configure the database connection. The JDBC drivers allow the Pega Platform application to communicate with the database. Specify the new rules schema name for both the **Rules Schema Name** and **Data Schema Name** fields. For more information, see Appendix A — Properties files.

   Note: Some of the fields on the **Database Connection** screen are pre-populated based on the type of database you selected. If you edit these or any other fields on this screen, and then later decide to change the database type, the IUA might not populate the fields correctly. If this occurs, enter the correct field values as documented below, or exit and rerun the IUA to select the intended database type. If you are resuming after a failed upgrade, some pre-populated values might be disabled.

   - **JDBC Driver Class Name** — Verify that the pre-populated values are correct.
   - **JDBC Driver JAR Files** — Click **Select Jar** to browse to the appropriate driver files for your database type and version.
   - **Database JDBC URL** — Verify that the pre-populated value is accurate.
   - **Database Username and Password** — Enter the Deployment user name and password.
   - **Rules Schema Name** — Enter the new rules schema name.
   - **Data Schema Name** — Enter the new rules schema name.
8. Click **Test Connection**. If the connection is not successful, review your connection information, correct any errors, and retest. When the connection is successful, click **Next** to choose how to apply the data schema.

   On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, **Test Connection** does not verify that the schemas exist. Instead, the schemas are automatically generated when the first CREATE TABLE statement executes after the deployment is complete.
9. Optional: Specify whether you will have your database administrator manually apply the DDL changes to the schema. These changes include the user-defined functions (UDF) supplied by Pegasystems. By default, the IUA generates and applies the schema changes to your database.
   - To generate and apply the DDL outside the IUA, select **Bypass Automatic DDL Application** and continue the deployment. After you complete the deployment, manually generate and apply the DDL and UDF. For more information, see Generating the DDL file and Appendix D — Installing user-defined functions.
   - To have the IUA automatically apply the DDL changes and the UDF, clear **Bypass Automatic DDL Application** .
10. Click **Next**.

11. Select the upgrade options and click **Next**:
    - Select **Run rulebase** cleanup to permanently remove old rules. In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.
    - Select **Rebuild database indexes** to have the IUA to rebuild the database indexes after the rulebase loads. The IUA rebuilds the database indexes to ensure good performance in the upgraded system. The amount of time this process adds to the upgrade procedure depends on the size of your database.
    - Select **Update existing applications** to modify your existing applications to support the upgraded version of the Pega Platform. The specific actions depend on your current version of PRPC. If you do not automatically update the applications as part of the IUA, follow the instructions in Updating existing applications to update the applications as part of the post-upgrade process.
12. Click **Start** to begin loading the rulebase.

    Upgrade logs display in the log window and are also stored in the Pega-image\scripts\logs directory. During the upgrade, the log window might appear inactive when the IUA is processing larger files.
13. Click **Back** to return to the previous screen, and then click **Exit** to close the IUA.

Upgrading the rules schema from the command line

To upgrade from the command line, configure the **`setupDatabase.properties`** file and run either **`upgrade.bat`** or **`upgrade.sh`**. The Deployment user runs these scripts.

1. If you have not done so already, edit the **`setupDatabase.properties`** file.
   a) Open the *Directories.distributionDirectory* file.
   b) Configure the connection properties. Use the new rules schema name for both the rules schema name and data schema name. For more information about the connection properties, see Appendix A — Properties files.

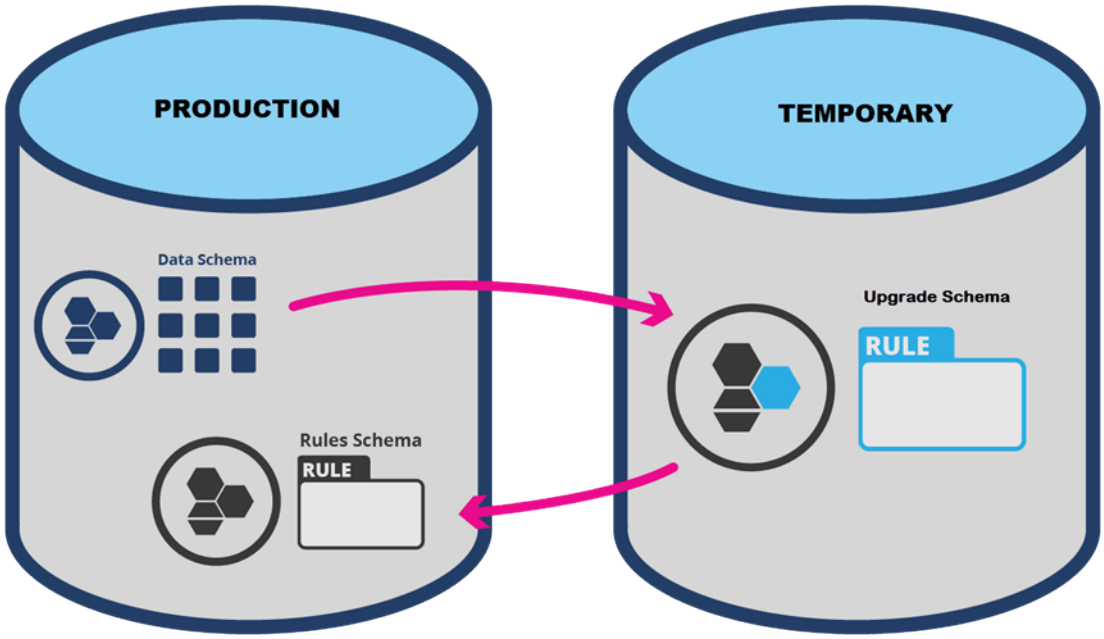
```
# Connection Information
pega.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
         pega.jdbc.driver.class=database driver class
         pega.database.type=database vendor type
         pega.jdbc.url=URL of the database
         pega.jdbc.username=Deployment user name
         pega.jdbc.password=password
         rules.schema.name=new-rules-schema-name
         data.schema.name=new-rules-schema-name
```

   c) Optional: If you are repeating a failed upgrade, configure the resume property:
      - To resume the upgrade from the last successful step, set `automatic.resume=true`.
      - To restart the upgrade from the beginning, set `automatic.resume=false`
   d) Save and close the file.
2. Open a command prompt and navigate to the scripts directory.
3. Run either **`upgrade.bat`** or **`upgrade.sh`**.

Pega Platform writes command-line output to a file in the **Pega-image`\scripts\logs`** directory.

Upgrade with two databases

As an alternative to upgrading with one database, you can set up your temporary upgrade schema on a different database server, as shown below. Because the source and target systems are different configure the common properties correctly to access each database.



Migrate rules objects from the data schema to another database to be upgraded (called the temporary upgrade schema in the figure). Then migrate the updated rules from the upgrade schema into a new rules schema on the database containing the data schema. After the upgrade, delete the temporary upgrade schema.

Caution: Ensure that no changes to the rules, including hotfixes, are applied until after the upgrade is complete.

These are the general steps for upgrading from a single schema to a split schema with two databases:

1. If you are using the High Availability option, disable rule creation on the existing schema. See Disabling rule creation on the rules schema.
2. Unless you are using IBM Db2 for Linux, UNIX, and Windows, create two schemas. See Create two new blank rules schemas. On IBM Db2 for Linux, UNIX, and Windows, the schemas are automatically created when the first CREATE TABLE statement executes after the deployment is complete.
3. Migrate the rules tables to the new rules schema. See Migrating the rules tables.
4. Use either the Installation and Upgrade Assistant, or the command line to upgrade the migrated rules schema. See Upgrade the rules schema with two databases.
5. Migrate and generate the rules schema objects. See Migrating and generating rules schema objects.
6. Upgrade the data schema. See Upgrading the data schema.

Disabling rule creation on the rules schema

If you are using the recommended High Availability option, you can disable rule creation on the rules schema to speed the deployment. If you are not using the High Availability option, skip this section.

Before you deploy, commit all uncommitted hotfixes. After you begin the deployment, ensure that no changes to the rules, including hotfixes, are applied until after the deployment is complete.

1. Log in as a user with the PegaRULES:HighAvailabilityAdministrator role.
2. Navigate to **System > High Availability > HA Cluster Settings**.
3. Under **Cluster Upgrade**, select **Cluster Upgrading - Disable saving of rules**.
4. Click **Submit**.
5. Log out.

Create two new blank rules schemas

Unless you are using IBM Db2 for Linux, UNIX, and Windows, or IBM Db2 for z/OS, create two new blank rules schemas. On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, the schemas are automatically created when the first CREATE TABLE statement executes after the upgrade is complete.

If you manually create the schemas, set the permissions for the new schemas to be identical to the permissions for the existing schema. See your installation guide for information about user permissions.

- Create one new schema in the database you will use for your split-schema configuration.
- Create the second new schema in the temporary database.

Migrating the rules tables

Use the migrate script to migrate the rules tables and other required database objects from the existing schema (the data schema in the picture above) to the new rules schema. You will also use this script later to generate and apply rules objects after the upgrade. The Deployment user performs the migrations.

Note: Pega strongly recommends that you use the migration script. The use of vendor tools to manage this step is not recommended. If you do not use the migrate script to migrate the schema, there are additional manual steps required that are not documented here.

This process depends on whether the system has access to both the original and temporary databases. Follow the instructions in the correct section for your environment:

- If your system has access to both databases, see Migrating the rules tables when the system has access to both databases.
- If your system has access to only one database, see Migrating the rules tables when the system has access to one database.

Migrating the rules tables when the system has access to both databases

If the system can access both the original and temporary databases, run the migration script once to migrate the rules tables to the new schema.

1. Use a text editor to edit **Pega-image**`\scripts\migrateSystem.properties` .
2. Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
          pega.source.jdbc.driver.jar=full path/DRIVER.jar
          pega.source.jdbc.driver.class=database driver class
          pega.source.database.type=database vendor type
          pega.source.jdbc.url=URL of database
          pega.source.jdbc.username=Deployment user name
          pega.source.jdbc.password=password
```

```
pega.source.rules.schema=original data schema name
```

3. Configure the target properties. See Properties file parameters for more information. Leave the target data schema name blank:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
pega.target.jdbc.driver.class=database driver class
pega.target.database.type=database vendor type
pega.target.jdbc.url=database URL
pega.target.jdbc.username=Deployment user name
pega.target.jdbc.password=password
pega.target.rules.schema=new rules schema name
pega.target.data.schema=
```

Note: If pega.target.data.schema is blank, the rules schema is correctly used by default.

4. Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

5. Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

6. Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
pega.clone.generate.xml=true
pega.clone.create.ddl=true
pega.clone.apply.ddl=true
pega.bulkmover.unload.db=true
pega.bulkmover.load.db=true
pega.rules.objects.generate=false
pega.rules.objects.apply=false
```

7. Save the script.
8. Open a command prompt, and navigate to the scripts directory.
9. Run either **migrate.bat** or **migrate.sh**.

Continue at Upgrading the rules schema with two databases.

Migrating the rules tables when the system has access to one database

If the system can only access one database at a time (for example, if there is a firewall between the two servers), run the migration script twice: first on a system that can access the original source database, and then where it can access the temporary target database.

Make sure that the system that accesses the temporary database has access to the bulkmover directory and the DDL generated from the source database.

1. On a system that can access the original database, export rules from the original database.
   a) Use a text editor to edit **Pega-image\scripts\migrateSystem.properties** .
   b) Configure the source properties. See Properties file parameters for more information:

```
# Connection Information
```

```
pega.source.jdbc.driver.jar=full path/DRIVER.jar
pega.source.jdbc.driver.class=database driver class
pega.source.database.type=database vendor type
pega.source.jdbc.url=URL of database
pega.source.jdbc.username=Deployment user name
pega.source.jdbc.password=password
pega.source.rules.schema=original data schema name
```

c) Configure the target properties. See Properties file parameters for more information. Leave the target data schema name blank:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
pega.target.jdbc.driver.class=database driver class
pega.target.database.type=database vendor type
pega.target.jdbc.url=database URL
pega.target.jdbc.username=Deployment user name
pega.target.jdbc.password=password
pega.target.rules.schema=new rules schema name
pega.target.data.schema=
```

Note: If pega.target.data.schema is blank, the rules schema is correctly used by default.

d) Configure the bulkmover directory:

```
pega.bulkmover.directory=full path to output directory
```

e) Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

f) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
pega.clone.generate.xml=true
pega.clone.create.ddl=true
pega.clone.apply.ddl=false
pega.bulkmover.unload.db=true
pega.bulkmover.load.db=false
pega.rules.objects.generate=false
pega.rules.objects.apply=false
```

g) Save the properties file.

h) Open a command prompt, and navigate to the scripts directory.

i) Run **migrate.bat** or **./migrate.sh** to export the rules.

2. On a system that can access the temporary database, import the rules to the temporary database.

a) Copy the **migrateSystem.properties** file you created in step 1 to a system that can access the temporary database.

b) Verify that the source, target, bulkmover, and temporary directory properties remain the same as in step 1.

c) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=true
pega.clone.generate.xml=false
pega.clone.create.ddl=false
```

```
pega.clone.apply.ddl=true
pega.bulkmover.unload.db=false
pega.bulkmover.load.db=true
pega.rules.objects.generate=false
pega.rules.objects.apply=false
```

d) Save the properties file.

e) Open a command prompt, and navigate to the scripts directory.

f) Run **migrate.bat** or **./migrate.sh** to import the rules.

Continue at Upgrading the rules schema with two databases.

Upgrade the rules schema with two databases

Next, upgrade the migrated rules schema. Use one of these methods:

- Command line **upgrade.bat** or **upgrade.sh** script
- Installation and Upgrade Assistant

Prior to loading the rulebase, the upgrade attempts to validate that each database table space has a buffer pool size large enough to accommodate the generated SQL DDL. The utility generates a report and stops if it finds any table space that requires an increased buffer pool size. The report identifies all table spaces requiring an increased buffer pool size. Have the database administrator correct the table space buffer pool issues and rerun the tool.

Note: To minimize the time required to upgrade, run the upgrade from the same data center as the database server.

Upgrading the migrated rules schema by using the Installation and Upgrade Assistant

For a UI-driven upgrade, use the Installation and Upgrade Assistant to upgrade the migrated rules schema.

Because of the large volume of data, run the IUA on the same network as the database server. If this is not possible, run the tool on a system with fast, direct access to the database server. The Deployment user performs these steps.

Note:

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

The upgrade can last for several hours and the time can vary widely based on network proximity to the database server.

To run the IUA:

1. Double-click the **PRPC_Setup.jar** file to start the IUA.

   Note: If JAR files are not associated with Java commands on your system, start the IUA from the command line. Navigate to the directory containing the **PRPC_Setup.jar** file, and type `java -jar PRPC_Setup.jar`.

   The IUA loads and the Pega icon is displayed in your task bar.
2. Click **Next** to display the license agreement.
3. Review the license agreement and click **Accept**.
4. If you are resuming after a previous failed upgrade and the **Resume Options** screen is displayed, select either **Resume** or **Start Over**.

- If you select **Resume**, the system uses the previously entered database configuration information to resume the upgrade from the last successful process. Continue these instructions at step 8.
- If you select **Start Over**, continue at step 5 to reenter the configuration information.

5. On the **Installer Mode** screen, choose **Upgrade** and click **Next**.
6. Choose your database type and click **Next**.
7. Configure the database connection. The JDBC drivers allow the Pega Platform application to communicate with the database. Specify the new rules schema name for both the **Rules Schema Name** and **Data Schema Name** fields. For more information, see Appendix A — Properties files.

   Note: Some of the fields on the **Database Connection** screen are pre-populated based on the type of database you selected. If you edit these or any other fields on this screen, and then later decide to change the database type, the IUA might not populate the fields correctly. If this occurs, enter the correct field values as documented below, or exit and rerun the IUA to select the intended database type. If you are resuming after a failed upgrade, some pre-populated values might be disabled.

   - **JDBC Driver Class Name** — Verify that the pre-populated values are correct.
   - **JDBC Driver JAR Files** — Click **Select Jar** to browse to the appropriate driver files for your database type and version.
   - **Database JDBC URL** — Verify that the pre-populated value is accurate.
   - **Database Username and Password** — Enter the Deployment user name and password.
   - **Rules Schema Name** — Enter the new rules schema name.
   - **Data Schema Name** — Enter the new rules schema name.
8. Click **Test Connection**. If the connection is not successful, review your connection information, correct any errors, and retest. When the connection is successful, click **Next** to choose how to apply the data schema.

   On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, **Test Connection** does not verify that the schemas exist. Instead, the schemas are automatically generated when the first CREATE TABLE statement executes after the deployment is complete.
9. Click **Next**.
10. Select the upgrade options and click **Next**:
    - Optional: Select **Run rulebase cleanup** to permanently remove old rules. In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.
    - Optional: Select **Rebuild database indexes** to have the IUA rebuild the database indexes after the rulebase loads. The IUA rebuilds the database indexes to ensure good performance in the upgraded system. The amount of time this process adds to the upgrade procedure depends on the size of your database.
    - Optional: Select **Update existing applications** to modify your existing applications to support the upgraded version of the Pega Platform. The specific actions depend on your current version of PRPC. If you do not automatically update the applications as part of the IUA, follow the instructions in Updating existing applications to update the applications as part of the post-upgrade process.
11. Click **Start** to begin loading the rulebase.

    Upgrade logs display in the log window and are also stored in the Pega-image\scripts\logs directory. During the upgrade, the log window might appear inactive when the IUA is processing larger files.

12. Click **Back** to return to the previous screen, and then click **Exit** to close the IUA.

Upgrading the rules schema from the command line

To use the command line, configure the **setupDatabase.properties** file and run either **upgrade.bat** or **upgrade.sh**. The Deployment user runs these scripts.

1. If you have not done so already, edit the **setupDatabase.properties** file.
   a) Open the **setupDatabase.properties** file in the scripts directory of your distribution image: *Directories.distributionDirectory***\scripts\setupDatabase.properties**
   b) Configure the connection properties. Use the temporary upgrade schema name for both the rules schema and data schema names. See Properties file parameters for more information.
   c) Optional: If you are repeating a failed upgrade, configure the resume property:
      - To resume the upgrade from the last successful step, set `automatic.resume=true`.
      - To restart the upgrade from the beginning, set `automatic.resume=false`.
   d) Save and close the file.
2. Open a command prompt and navigate to the scripts directory.
3. Run either **upgrade.bat** or **upgrade.sh**.

The rulebase upgrade can take several hours, depending on the proximity of the database to the system running the script.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Continue at Migrating to the new rules schema.

Migrating and generating rules schema objects

Use the migrate script to migrate the temporary upgrade schema into the rules schema and generate rules schema objects. The Deployment user performs the migrations.

Pega strongly recommends that you use the migration script. The use of vendor tools to manage this step is not recommended. If you do not use the migrate script to migrate the schema, there are additional manual steps required that are not documented here.

This process depends on whether the system has access to both the original and temporary databases. Follow the instructions in the correct section for your environment:

- If your system has access to both databases, see Migrating and generating rules schema objects when the system has access to both databases.
- If your system has access to only one database, see Migrating and generating the rules schema objects when the system has access to one database.

Pega Platform writes command-line output to a file in the **Pega-image\scripts\logs** directory.

Migrating and generating rules schema objects when the system has access to both databases

If the system can access both the temporary and original databases at the same time, run the migrate script once to migrate and generate the rules schema objects.

1. Use a text editor to edit **Pega-image\scripts\migrateSystem.properties** .

2. Configure the source properties. See Properties file parameters for more information. Leave the data schema name blank.

```
# Connection Information
               pega.source.jdbc.driver.jar=/path-to-the-temporary-upgrade-schema-JAR-file/DRIVER.jar
               pega.source.jdbc.driver.class=database driver class
               pega.source.database.type=database vendor type
               pega.source.jdbc.url=URL of database
               pega.source.jdbc.username=Deployment user name
               pega.source.jdbc.password=password
               pega.source.rules.schema=temporary upgrade schema
               pega.source.data.schema=
```

3. Configure the target properties. See Properties file parameters for more information:

```
pega.target.jdbc.driver.jar=path-to-the-rules-schema-JAR-file/DRIVER.JAR
               >pega.target.jdbc.driver.class=database driver class
               pega.target.database.type=database vendor type
               pega.target.jdbc.url=URL-of-the-database
               pega.target.jdbc.username=Deployment user name
               pega.target.jdbc.password=password
               pega.target.rules.schema=new rules schema
```

4. Configure the target data schema. In this case, the target is the original schema on your single-schema system. This will become your data schema.

```
pega.target.data.schema=original single-schema name
```

5. Configure the bulkmover directory.

```
pega.bulkmover.directory=full path to output directory
```

6. Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

7. Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=false
               pega.clone.generate.xml=true
               pega.clone.create.ddl=true
               pega.clone.apply.ddl=true
               pega.bulkmover.unload.db=true
               pega.bulkmover.load.db=true
               pega.rules.objects.generate=true
               pega.rules.objects.apply=true
```

8. Save and close the file.
9. Open a command prompt, and navigate to the scripts directory.
10. Type **`migrate.bat`** or **`./migrate.sh`** to run the script.

Migrating and generating the rules schema objects when the system has access to one database

If the system can only access one database at a time (for example, if there is a firewall between the two servers), run the migration script twice: first on a system that can access the original source database, and then where it can access the temporary target database.

Make sure that the system that accesses the temporary database has access to the bulkmover directory and the DDL generated from the source database.

1. On a system that can access the original database, export rules from the original database.
   a) Use a text editor to edit **Pega-image\scripts\migrateSystem.properties** .
   b) Configure the source properties. See Properties file parameters for more information.

```
# Connection Information
                  pega.source.jdbc.driver.jar=full path/DRIVER.jar
                  pega.source.jdbc.driver.class=database driver class
                  pega.source.database.type=database vendor type
                  pega.source.jdbc.url=URL of database
                  pega.source.jdbc.username=
                  Deployment user name
                  pega.source.jdbc.password=password
                  pega.source.rules.schema=upgraded rules schema name
```

   c) Configure the target properties. See Properties file parameters for more information. Set the target data schema name to the original single-schema name. This will become your data schema after the upgrade:

```
pega.target.jdbc.driver.jar=full path/DRIVER.JAR
                  pega.target.jdbc.driver.class=database driver class
                  pega.target.database.type=database vendor type
                  pega.target.jdbc.url=database URL
                  pega.target.jdbc.username=Deployment user name
                  pega.target.jdbc.password=password
                  pega.target.rules.schema=new rules schema name
                  pega.target.data.schema=original single schema name
```

   d) Configure the bulkmover directory.

```
pega.bulkmover.directory=full path to output directory
```

   e) Configure a temporary directory:

```
pega.migrate.temp.directory=full path to temporary directory
```

   f) Configure the operations to be performed by the utility as shown below:

```
pega.move.admin.table=false
                  pega.clone.generate.xml=true
                  pega.clone.create.ddl=true
                  pega.clone.apply.ddl=false
                  pega.bulkmover.unload.db=true
                  pega.bulkmover.load.db=false
                  pega.rules.objects.generate=false
                  pega.rules.objects.apply=false
```

g) Save the properties file.

h) Open a command prompt, and navigate to the scripts directory.

i) Type **migrate.bat** or **./migrate.sh** to export the rules.

2. On a system that can access the temporary database, import the rules to the temporary database.

a) Copy the **migrateSystem.properties** file you created in step 1 to a system that can access the temporary database.

b) Verify that the source, target, bulkmover, and temporary directory properties remain the same as in step 1.

c) Configure the operations to import the rules:

```
pega.move.admin.table=false
                  pega.clone.generate.xml=false
                  pega.clone.create.ddl=false
                  pega.clone.apply.ddl=true
                  pega.bulkmover.unload.db=false
                  pega.bulkmover.load.db=true
                  pega.rules.objects.generate=true
                  pega.rules.objects.apply=true
```

d) Save the properties file.

e) Open a command prompt, and navigate to the scripts directory.

f) Type **migrate.bat** or **./migrate.sh** to import the rules.

Upgrading the data schema

The Deployment user runs a script to upgrade the data schema.

1. Shut down your system.
2. If you have not already done so, configure the connection properties. Use your current data schema name for **data.schema.name**. Use the new rules schema name for **rules.schema.name**. For more information, see Editing the setupDatabase.properties file.

```
# Connection Information
                pega.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
                pega.jdbc.driver.class=database driver class
                pega.database.type=database vendor type
                pega.jdbc.url=URL of the database
                pega.jdbc.username=Deployment user name
                pega.jdbc.password=password
                rules.schema.name=new rules schema
                data.schema.name=current data schema
```

3. Disable the Pega Platform access to the data schema.
4. Open a command prompt, and navigate to the scripts directory.
5. Run **upgrade.bat** or **./upgrade.sh** for Linux, passing in the --dataOnly argument and true parameter, for example:

```
upgrade.bat --dataOnly true
```

Pega Platform writes command-line output to a file in the **Pega-image**`scripts\logs` directory.

Post-upgrade configuration

This section describes additional tasks to perform after you finish upgrading the system.

Upgrading from PRPC 6.1 SP2 and earlier: updating ruleset columns

When upgrading from any release prior to PRPC 6.2, you must run additional scripts to update the ruleset columns.

1. Navigate to **ResourceKit\AdditionalUpgradeScripts** and locate the scripts for your database:
   - *database*`_rulesetversion_columns_data.sql`
   - *database*`_rulesetversion_columns_rules.sql`

   For example, `oracle_rulesetversion_columns_data.sql`
2. Run the scripts:
   - For split schema environments:
     - Run *database*`_rulesetversion_columns_data.sql` against the data schema.
     - Run *database*`_rulesetversion_columns_rules.sql` against the rules schema.
   - For single schema environments, run both scripts against the single schema.

Depending upon the database platform and the size of the database the script might require significant time and resources to execute.

For Docker, multiple VMs, or multiple NICs: Setting the public address

If the cluster is set up in Docker, uses separate virtual machines (VMs), or multiple network interfaces (NICs), set the public address in the `prconfig.xml` file for each Pega Platform node.

1. Open the `prconfig.xml` configuration file in the prweb/WEB-INF/classes subdirectory of the application server directory. For more information, see the PDN article *How to change prconfig.xml file settings*.
2. Modify the `prconfig.xml` file. Add the following setting to set the public address:

   ```
   <env name=" identification/cluster/public/address" value=" IP address " />
   ```

   For example, if the IP address of the computer on which you run the Pega Platform node is 10.254.34.210, add the following setting:

   ```
   <env name=" identification/cluster/public/address" value="10.254.34.210" />
   ```

   The new setting controls the address that is used by the Pega Platform node.
3. Save and close the `prconfig.xml` file.
4. Repeat steps 1 to 3 for the remaining nodes.

Reconfiguring the application server

To use the upgraded rules schema, you must reconfigure the application server. The process is different for each application server.

After out-of-place-upgrades on RedHat JBoss, IBM WebSphere, and Tomcat: Redefine default schemas

For RedHat JBoss, IBM WebSphere, IBM Liberty, and Tomcat, redefine the default schemas if you performed an out-of-place upgrade. For Oracle WebLogic, you reconfigure the default settings as part of redeploying the WAR or EAR file. If your configuration includes the optional customer data schema separate from the Pega data schema, configure that as well.

Apache Tomcat: Defining default schemas

If you performed an out-of-place upgrade on Apache Tomcat, redefine your default schema names. Define the default schemas in the **`context.xml`** file.

Follow these steps to define the default schemas:

1. Open **`context.xml`**.
2. In the <context> element, insert the following lines to define the default schemas. Replace *RULES* with your rules schema name and replace *DATA* with your data schema name. For single-schema systems, use the rules schema name for both *RULES* and *DATA*.

```
<Environment name="prconfig/database/databases/PegaRULES/defaultSchema"
             value="RULES" type="java.lang.String" />
             <Environment name="prconfig/database/databases/PegaDATA/
defaultSchema" value="DATA"
             type="java.lang.String" />
```

3. Optional: If your customer data schema is different than your PegaDATA schema, insert the following entry to specify the customer data schema name. Replace *customer-data-schema* with your customer data schema name.

```
<Environment name="prconfig/database/databases/CustomerData/defaultSchema"
 value="customer-data-schema" type="java.lang.String"/>
```

4. Save the file.

Redhat JBoss EAP: Defining default schemas

Define the default schemas in the standalone configuration file.

Follow these steps to define the default schemas:

1. Open the configuration file, for example: **`standalone.xml`**.
2. In the <context> element, insert the following lines to define the default schemas. Replace *RULES* with your rules schema name and replace *DATA* with your data schema name. For single-schema systems, use the rules schema name for both *RULES* and *DATA*.

```
<Environment name="prconfig/database/databases/PegaRULES/defaultSchema"
             value="RULES" type="java.lang.String" />
             <Environment name="prconfig/database/databases/PegaDATA/
defaultSchema" value="DATA"
             type="java.lang.String" />
```

3. Optional: If your customer data schema is different than your PegaDATA schema, insert the following entry to specify the customer data schema name. Replace *customer-data-schema* with your customer data schema name.

```
<Environment name="prconfig/database/databases/CustomerData/defaultSchema"
 value="customer-data-schema" type="java.lang.String"/>
```

4. Save the file.

IBM WebSphere: Defining default schemas

If you performed an out-of-place upgrade on IBM WebSphere, redefine your default schema names. Create binding identifiers to define the default values for the rules schema and the data schema.

1. In the IBM WebSphere Administrative Console, select `Environment > Naming > Name Space Bindings` to display the **Name space bindings** page.
2. Create the rules schema binding identifier:
   a) For the **Scope**, select **server**, and click **New**.
   b) For the binding type, select **String** and click **Next**.
   c) On the **Step 2: Specify basic properties** screen, enter the following values:
      - Binding identifier: `PegaRULESDefaultSchema`
      - Name in the name space relative to lookup name prefix: `prconfig/database/databases/PegaRULES/defaultSchema`
      - String Value: the schema name of your rules schema.
   d) Click **Next**.
   e) On the **Summary** panel, click **Finish**.
   f) Click **Save** in the **Messages** box at the top of the **Name Space Bindings** screen.
3. Repeat step 2 to create the data schema binding identifier, but specify the following properties on the **Step 2: Specify basic properties** screen:
   - Binding identifier: `PegaDATADefaultSchema`
   - Name in the name space relative to lookup name prefix: `prconfig/database/databases/PegaDATA/defaultSchema`
   - String Value: the schema name of your data schema
4. Optional: For dual-user configurations, repeat step 2 to add a binding identifier for the Admin user on the data schema. Specify the following properties on the **Step 2: Specify basic properties** screen:
   - Binding identifier: `PegaDATADataSourceAdmin`
   - Name in the name space relative to lookup name prefix: `prconfig/database/databases/PegaDATA/dataSourceAdmin`
   - String Value: the JNDI name of the Admin data source for your data schema
5. Optional: For dual-user configurations, repeat step 2 to add a binding identifier for the Admin user on the rules schema. Specify the following properties on the **Step 2: Specify basic properties** screen:
   - Binding identifier: `PegaRULESDataSourceAdmin`
   - Name in the name space relative to lookup name prefix: `prconfig/database/databases/PegaRULES/dataSourceAdmin`
   - String Value: the JNDI name of the Admin data source for your rules schema

6. Repeat step 2 to create the customer data schema binding identifier, but specify the following properties on the **Step 2: Specify basic properties** screen:
   - Binding identifier: `PegaCustomerdataDefaultSchema`
   - Name in the name space relative to lookup name prefix: `prconfig/database/databases/CustomerData/defaultSchema`
   - String Value: the JNDI name of the Admin data source for your customer data schema
7. Click **Save** in the **Messages** box at the top of the **Name Space Bindings** screen.

Continue at IBM WebSphere default packages.

Redeploying the Pega Platform WAR or EAR files

Remove the existing Pega Platform core application files, including the System Management Application and help, from your application server and deploy the new files. Also redeploy any custom applications.

These are the core applications and file names:

Pega Platform

`prweb.war` or **`prpc_j2ee14*.ear`**

System Management Application

`prsysmgmt.war`

Help

`prhelp.war`

Note: When the server restarts after the applications deploy, the first node you bring up becomes the default search node.

Note: Do not start the redeployed applications while the rulebase deployment is running. By default, your application server might start the applications automatically when they are deployed. If you deploy and start the applications before creating the database, the applications generate an error and fail to start. This error is not harmful, and you can restart the application successfully when the database is available.

Apache Tomcat: Redeploying Pega Platform

Deploy Pega Platform, the help, and optionally the System Management Application.

1. Make sure that these applications are not running:
   - **`prweb.war`** or the **`prpc_j2ee14_ws.ear`** file for your application server
   - **`prhelp.war`**
   - **`prsysmgmt.war`**
2. Remove each of the current versions of the applications.
   a) In the **Tomcat Web Application Manager** page, find the row for each application and select **Undeploy**.
   b) In the **WEBAPPS** directory, delete any remaining folders or WAR files.
3. Copy these files from the **Pega-image`\archive\`** directory to the *Tomcat_home*`\webapps\` directory:
   - **`prweb.war`**
   - **`prsysmgmt.war`**
   - **`prhelp.war`**
4. Restart the application server.

5. After the applications are deployed, shut down the server and delete the **prweb.war** file from the *Tomcat_home*\webapps\ directory to prevent Tomcat from redeploying the application each time the server restarts.
6. Verify that any third-party or custom JAR files that you installed with the applications are still in place on the application server. Restore any JAR files that were deleted when the Pega Platform redeployed.

IBM WebSphere: Redeploying Pega Platform

Deploy the Pega Platform application using the **prweb.war** or **prpc_j2ee14_ws.ear** file included in your distribution image.

The application server starts the application when it deploys. When the application starts, you might see error messages for missing resources and references. Ignore these messages; you supply these resources as you deploy. Stop the application after deploying.

When you restart the server after you deploy the application archives, the first node you bring up becomes the default search node. If you are deployed in a multi-node environment, the search node is node 1 and must be started first.

1. Make sure that these applications are not running:
   - **prweb.war** or the **prpc_j2ee14_ws.ear** file for your application server
   - **prhelp.war**
   - **prsysmgmt.war**
2. Use the IBM WebSphere Administrative Console to remove each of the current versions of the applications.
   a) Navigate to **Applications > Application Types > WebSphere Enterprise Applications** to see a list of the installed applications. Select each of the applications and click **Uninstall**.
   b) When you click **Uninstall** on a package, IBM WebSphere empties the ./installedApps/* directories. To complete the uninstall, delete the following directories:
      - **./config/temp/***
      - **./wstemp/***
      - **./temp**
3. Delete everything in the temporary directory. This is the directory that you specified for the JNDI location **url/initialization/explicittempdir.**
4. From the left frame of the IBM WebSphere Administrative Console, select **Applications > New Application**.
5. Click **New Enterprise Application**.
6. Click **Browse** and select **prweb.war** from the archives directory.
7. Click **Open**, and then click **Next**.
8. Select **Detailed - Show me all installation options and parameters**.
   This option allows you to review all the deployment options for the application, including the default bindings and resource mappings.
9. Click **+** to expand **Choose to generate default bindings and mappings**.
10. Complete this page.
    - Check **Generate Default Bindings**.
    - Check **Use default virtual host name for Web and SIP modules**.

- Leave the other default settings unchanged, and click **Next**.

11. Scroll to the bottom on this page and click **Continue** to display a wizard where you can specify deployment options.

    This security file allows the Pega Platform to run when Java EE Security Checking is enabled.

    This section of the deployment is a series of steps under the general heading of **Install New Application**.

12. For Step One, accept the defaults and click **Next**.
13. Continue through the next steps, either accepting the defaults, or customizing for your organization, as needed.
14. In the **Map context roots for Web Modules** step, enter `prclusterservice` as the context root, and click **Next**.
15. Locate the step where you **Map resource references to resources**.
16. In the **Map resource references to resources** step, there are three rows that include "explicittempdir" in the Resource Reference column. Use the find tool on your browser to find the correct rows for:
    - **EJB EngineCMT bean**
    - **EngineBMT beans**
    - **prweb.war module**
17. For each of the three rows, change the value in the **Target Resource JNDI Name** field to the temp directory, for example **url/initialization/explicittempdir**.

    This maps the location you specified in the URL provider you created to the corresponding Resource Reference in the application, so that the application will use the location for the **PegaTempDir**. Use the Browse button and Apply to change each of the three values.

18. Click **Next**.

    Depending on your configuration, you might see a set of warnings related to missing resource references. These warnings are informational. Review the warnings, and then continue.

    Note: These are resource references that are defined in **`web.xml`**, the deployment configuration files for the application, but not mapped to resource definitions in your application. In the page, **Map resources to references**, they are mapped to the Target Resource JNDI Name **url/pega/none**, indicating that they are not used. Pegasystems provides these references for Java EE compliance, but their use is optional. You can continue with the deployment.

19. At the bottom of the Warnings page, click **Continue**.
20. Click **Next** as needed to continue through the remaining steps, accepting the defaults, or setting them to the requirements of your organization.
21. On the **Summary** page, click **Finish**.

    The system begins deploying the EAR file, which can take a few minutes. When the deployment completes successfully, WebSphere displays a success message similar to the following: "Application Pega Platform installed successfully."

22. Click **Save directly to the master configuration**.
23. Stop the application.

Deploying the System Management Application and on-line help on IBM WebSphere

In addition to the Pega Platform application, you must also deploy the online help application, **`prhelp.war`**, and the System Management Application, **`prsysmgmt.war`**.

For more details on the System Management Application, see the *System Management Application Reference Guide* on the PDN.

Complete the following steps to deploy **prsysmgmt.war** and **prhelp.war**.

1. In the **Preparing for the application installation** screen, select **Local file system** and click **Browse** to select the **prsysmgmt** file.
   If you do not see the **Preparing for the application installation** screen, from the left frame, select **Applications > New Application.**
2. Click **Browse** and navigate to select the application file, either **prsysmgmt.war** or **prsysmgmt.ear** from the archives directory.
3. Click **Open**, and then click **Next** to begin the deployment.
4. Click **Detailed - Show all installation options and parameters**.
5. Expand **Choose to generate default bindings and mappings**.
6. Select **Generate Default Bindings**, and leave the other settings at their defaults.
7. Click **Next**. You might see some security warnings. These are informational only.
8. Click **Continue** to bypass the warnings. The **Install New Application** opens.
9. Accept the defaults and click **Next** until you get to the **Map context roots for Web Modules** step.
10. In the **Map context roots for Web Modules** step, enter `prsysmgmt` as the context root, and click **Next**.
11. Accept the defaults and click **Next** on the remaining steps.
12. On the Summary page, click **Finish**.
    IBM WebSphere displays a message, **Installing . . .**, and updates it with information during the deployment. When the deployment is complete, you see a success message.
13. Click **Save** to save the changes to the master configuration and return to the first page.
14. Repeat steps 2 - 13 to deploy **prhelp.war** using the same procedure as for **prsysmgmt.war**. Use the name of the file, **prhelp**, as the context root and deploy to the same server.
15. Verify that any third-party or custom JAR files that you installed with the applications are still in place on the application server. Restore any JAR files that were deleted when the Pega Platform redeployed.

Oracle WebLogic Server: Redeploying Pega Platform

Oracle WebLogic Server requires a Deployment Plan for split-schema configurations. When you restart the server after you deploy the application archives, the first node you bring up becomes the default search node. If you are deployed in a multi-node environment, the search node is node 1 and must be started first.

Preparing to redeploy

Before you redeploy, remove current versions of the applications and delete the temporary directory.

1. Make sure that these applications are not running:
   - **prweb.war** or **prpc_wls_jee4.ear**
   - **prhelp.war**
   - **prhelp.war**
2. Remove each of the current versions of the applications.
   a) Click **Deployments** to see the **Summary of Deployments** page.
   b) Click **Lock & Edit** in the **Change Center**.

c) Select each application, and click **Delete**.

3. Delete everything in the temporary directory. This is the directory that you specified for the JNDI location: **`url/initialization/explicittempdir`**

Configuring split-schema configurations

For split-schema configurations, Oracle WebLogic Server uses a Deployment Plan to configure the JNDI setting in the application archive. A Deployment Plan is a user-configurable XML file that captures environment-specific configuration properties. If you plan to use a split-schema configuration, follow these steps.

1. Create or edit a Deployment Plan.
2. Configure a specific directory structure for the Deployment Plan and the EAR/WAR archive.
3. Deploy (or redeploy) the application archive and Deployment Plan using the Oracle WebLogic Server administration console or the command line.
4. Verify that any third-party or custom JAR files that you installed with the applications are still in place on the application server. Restore any JAR files that were deleted when the Pega Platform redeployed.

Editing the Oracle WebLogic Server Deployment Plan

Oracle WebLogic Server requires a Deployment Plan for split-schema configurations. The Pega Platform includes a sample deployment plan that you can use for your environment.

The deployment plan is located in the following directory:

WAR: **Pega-image`\archives\prpc\weblogic\war\plan\Plan.xml`**

EAR: **Pega-image`\archives\prpc\weblogic\ear\plan\Plan.xml`**

1. Make a backup of the sample plan, in case you need to back out your changes.
2. Open **`Plan.xml`** in a text editor, and edit the sample plan with your values.
   a) Locate the elements named `defaultDataSchema` and `defaultRulesSchema`. Add the values for your schema in the <value> element, for example:

```
<variable>
<name>defaultDataSchema</name>
<value>DATA</value>
</variable>
<variable>
<name>defaultRulesSchema</name>
<value>RULES</value>
</variable>
```

b) Locate the element named `dataSourceAdminJndiName`. Add the value for your administrative JNDI datasource in the <value> element, for example:

```
<variable>
<name>dataSourceAdminJndiName</name>
<value>jdbc/AdminPegaRULES</value>
</variable>
```

3. Save **`Plan.xml`**.

Configuring the directory structure

If you plan to deploy the Oracle WebLogic Server archive and Deployment Plan using the Oracle WebLogic Server administration console, you must use a specific directory structure.

The Pega Platform includes a preconfigured structure. You do not must re-create the required directories. However, if you maintain your Oracle WebLogic Server EAR files (or WAR files) in a separate location, you must replicate the proper directory structure.

For example: the directory structure for EAR file deployments is:

```
your_directory
\app\prpc_wls_jee4.ear
```

```
your_directory
\plan\Plan.xml
```

Note: The names of *your_directory* and the EAR file can change, but the deployment plan must be named exactly **`Plan.xml`** and must be located in the *your_directory* \plan\ directory.

Deploying the archive by using the Deployment Plan

To deploy the Oracle WebLogic Server archive with a Deployment Plan using the administration console, log in to the console and deploy the archive.

However, instead of selecting the EAR or WAR file, select *your_directory*. For example, select either:

- WAR: **Pega-image** \archives\prpc\weblogic\war
- EAR: **Pega-image** \archives\prpc\weblogic\ear

Oracle WebLogic Server includes both the WAR or EAR file and the deployment plan, **`Plan.xml`**, when you select the directory. You can also deploy the archive and deployment plan using the command line tool, weblogic.Deployer. For more information, see the Oracle WebLogic Server documentation.

Deploying single-schema configurations

These instructions assume that the Pega Platform is installed on the default schema of the database user. If this is not the case, follow the instructions for Configuring split-schema configurations and specify the same schema name for both the `defaultDataSchema` and `defaultRulesSchema`. Deploy either the WAR file or the EAR file.

Deploying the Pega Platform WAR file

Skip this procedure if you are planning to deploy the Pega Platform EAR file.

1. In the Domain Structure section, click **Deployments.**
2. If Configuration editing is not enabled, click **Lock & Edit** to unlock the page. In the Deployments table, click **Install**.
3. In the **Install Application Assistant**, click the link **upload your file(s)**.
4. Click the **Browse** button next to the **Deployment Archive** field and navigate to **Pega-image**`\archives\prpc\weblogic\war\app\`.
5. Select the `prweb.war` file and click **Open**.
6. When the file name is displayed in the **Deployment Archive** field, click **Next**.
7. Make sure the radio button next to `prweb.war` is selected and click **Next**.
8. Select **Install this deployment as an application** and click **Next** to display the optional settings page.
9. Make sure the **Name** is prweb and click **Next** to accept the defaults.
10. Select **Yes, take me to the deployment's configuration screen** and review the other settings. Then, click **Finish** to begin deploying the application.

    When the WAR file has deployed, you are returned to the application Settings page.
11. Review the **Overview** page to confirm that the settings are as expected.
12. Click on the **Targets** tab and verify that the target server is correct.
13. Click **Save** in the Assistant or **Activate Changes** in the Change Center to save the configuration.
14. In the **Domain Structure** panel, click **Deployments** again deploy `prsysmgmt.war` and `prhelp.war`.

Deploying the Pega Platform EAR file

Skip this procedure if you have deployed the Pega Platform WAR file.

1. In the **Domain Structure** panel, click **Deployments**.
2. If Configuration editing is not enabled, click **Lock & Edit** to unlock the page. Click **Install**.
3. Click **upload your file(s)**.
4. Next to the **Deployment Archive** field, click the **Browse** button and use the file dialog to navigate to the archives directory of the Pega Platform distribution image. Select the `prpc_j2ee14_*.ear`. When the file name is displayed in the Deployment Archive field, click **Next**.
5. On the **Install Application Assistant**, confirm the upload path and that the radio button next to the archive name is selected and click **Next**.
6. Select **Install this deployment as an application** and click **Next** to display the optional settings page:
7. Click **Next** to accept the defaults.
8. Select **Yes, take me to the deployment's configuration screen** and review the other settings. Then, click **Finish** to begin deploying the application.

    When the archive deploys, you return to the application's Settings page.
9. Review the **Overview** page to confirm that the settings are correct.
10. Click on the **Targets** tab to verify that the target server for the application is correct.
11. Click on the **Overview** tab again, and click **Save**.
12. In **Domain Structure**, click on **Deployments** to return to the Summary of Deployments page.
13. Continue with the deployments of the prsysmgmt.war and prhelp.war applications.

Deploying the System Management Application and help

Repeat the procedure described for prweb above to deploy the two other Pega Platform applications, **prsysmgmt.war** and **prhelp.war**. Do not start these applications after deployment.

Red Hat JBoss EAP: Redeploying Pega Platform

Use either the Red Hat JBoss Management Console or the command line to deploy the applications from the **Pega-image** \archives directory.

When you restart the server after you deploy the application archives, the first node you bring up becomes the default search node. If you are deployed in a multi-node environment, the search node is node 1 and must be started first.

Deploying from the Red Hat JBoss Management Console

1. Make sure that these applications are not running:
   - **prweb.war** or the EAR file for your application server
   - **prhelp.war**
   - **prsysmgmt.war**
2. Use your application server administrative utilities to remove each of the current versions of the applications.
3. Delete everything in the temporary directory. This is the directory that you specified for the JNDI location **url/initialization/explicittempdir**.
4. Start the application server.
5. Log in to Management Console as a user with administrative rights.
6. Select **Runtime** view if not already selected.
7. Select **Server > Manage Deployments**.
8. Add and deploy each application file. Repeat this step for each of the three applications: PegaRules, System Management, and help:
   a) Click **Add** and specify an application file.
   b) Click **Save**.
   c) Highlight the application and select **En/Disable**.
   d) Click **Confirm** to deploy the application.
   e) Repeat this step for the remaining applications.
9. Verify that any third-party or custom JAR files that you installed with the applications are still in place on the application server. Restore any JAR files that were deleted when the Pega Platform redeployed.

Deploying from the command line

1. Enter this command to deploy an application file:

```
$JBOSS_EAP_HOME/bin/jboss-cli.bat|sh -c
```

```
deploy
  Pega_HOME
/archives/
file name
```

```
quit
```

Where **Pega_HOME** is the home directory for the Pega Platform and *file name* is the name of the file to deploy.

2. Repeat step 1 to deploy all three applications: prweb, SMA, and help.
3. Verify that any third-party or custom JAR files that you installed with the applications are still in place on the application server. Restore any JAR files that were deleted when the Pega Platform redeployed.

For upgrades from Pega 7.x: Enabling rule creation on the production system

If you are upgrading from PRPC 5.x or PRPC 6.x, skip this section.

For upgrades from Pega 7.x, enable rule creation on the production system:

1. Log in as a user with the PegaRULES:HighAvailabilityAdministrator role.
2. Navigate to **System > High Availability> HA Cluster Settings**.
3. Under **Cluster Upgrade**, clear **Cluster Upgrading - Disable saving of rules**.
4. Click **Submit**.
5. Log out.

Upgrades from 7.2.2 and earlier: Port Apache logging file customizations to the new logging file

Starting with Pega 7.3, the Pega Platform uses the Apache Log4j 2 logging service. Prior to Pega 7.3, the Pega Platform used Apache Log4j 1. Because of the change to the logging service, the name of the logging configuration file has changed from **`prlogging.xml`** to **`prlog4j2.xml`** and the format has changed considerably. If you customized your **`prlogging.xml`** file, port the customizations to the new **`prlog4j2.xml`** file. If you do not edit the new **`prlog4j2.xml`** file, the Pega Platform uses the default **`prlog4j2.xml`** file and disregards your customized **`prlogging.xml`** file. For upgrades to systems that were using the default logging configuration, no changes are needed.

Pega Platform supports all appenders and layouts supported by Apache Log4j 2. The following commonly-customized appenders define the logging file locations, names, and archiving policy:

- **RollingRandomAccessFile** – Configures the **`PegaRULES.log`** file that includes all logs except alerts
- **RollingRandomAccessFileAlert** – Configures the **`PegaRULES-ALERT.log`** file that includes all performance alerts
- **RollingRandomAccessFileAlertSecurity** – Configures the date and time-stamped **`PegaRULES-ALERTSECURITY`** log file that includes all security alerts

For more information about customizing these appenders, see the Apache Log4j 2 documentation.

Restarting Pega Platform

Restarting the Pega Platform

1. Stop and restart the application server.

2. Ensure that all the Pega Platform applications have started.
   - **prweb.war** or **prpc_ *.ear** file
   - **prhelp.war**
   - **prsysmgmt.war**
3. Access the Pega Platform through a browser. Enter the URL for the Pega Platform application:

   `http://` *server:portnumber/context_root*

   For example: `http://prpc-server:8080/prweb`
4. Log in as administrator@pega.com.

The **What's New** section of the page includes a welcome message and links to application development tools.

Logging in and changing the administrator password

To test the deployment and index the rules, log in to Pega Platform web application. For security, you must change the administrator password.

1. Navigate to the PRServlet URL, replacing the *server* and *port* values with your specific values.

   ```
   http://server:port/prweb
   ```
2. Use the following credentials to log in the first time:
   - User ID — `administrator@pega.com`
   - Password — the password you set when you installed

   After logging in, Pega Platform indexes the rules in the system to support full-text search. During the index process, there might be a delay in the responsiveness of Pega Platform user interface. The process usually takes from 10 to 15 minutes to complete depending on your system configuration.

   If the index process ends without generating an error message, the deployment is successful.
3. Immediately after the index process completes, change the administrator password. Because the default password is widely published, it is important to protect your system after an installation by changing the password. The new password must be at least 10 characters long.

   If the system does not prompt you to change your password, follow these steps:

   a) From the **Operator Menu** located to the right of the Designer Studio header, select the **Profile**.

   b) Click **Change Password**.

   c) Verify the **Current Password**, and then enter and confirm the **New Password**.

   d) Click **Save**.

Locking and rolling ruleset versions

After an upgrade, lock your existing rule set and roll them into new versions before continuing development. This ensures that future development is based on the upgraded rule sets and that your applications consistently reference the latest features.

Note: The upgrade process automatically updates any prerequisite for Pega-ProCom to the highest version of the rule set in the system.

1. Select **Designer Studio > Application > Structure >Other Applications** .

This page displays all applications in the system and lists the rule sets and rule set versions that make up each application including those inherited from any built-on applications.

2. For each application, click **Lock and Roll** to display the application page.
3. Select **+** next to **Prerequisites** to see the ruleset version prerequisites for the application rule set. Click the name of the rule set version to open and modify its rule form.
4. Select the **Lock** box and select **Update my application to include the new rule set versions**.
5. Enter the **Password** for this rule set version and select the **Roll** box.
6. In the **Roll to Version** field, enter a new Rule Set Version or accept the default version which increments the current version by one.
7. In the **NEW** section of the **Prerequisites** you can modify the rule set prerequisites. By default, they are the same as the current prerequisite. You can select different prerequisites, add additional prerequisites, and/or delete prerequisites from the new list.
8. Click **Run** to apply the changes to your rule set.
9. Repeat these steps for each application in your system.

Optional: Upgrading from Pega 7.1.6 and earlier: Configuring the default search nodes and storage directory

If you are upgrading from Pega 7.1.6 or earlier, you can manually build the Elasticsearch indexes and configure the search index host node settings to configure the default initial search node and index storage directory.

Starting in Pega 7.1.7, the underlying platform for full-text search transitioned from Lucene to Elasticsearch. Elasticsearch provides a more robust, fault-tolerant search capability and does not require manual configuration of switchover activities. Existing search customizations through Pega Platform APIs are intact and used exactly the same way with Elasticsearch; only the search query generation changes from Lucene to Elasticsearch.

Indexing starts when you start the application server. The first node that starts after the deployment becomes the default initial search node. You can configure a different search node and can also configure multiple search nodes.

The default index directory is PegaSearchIndex in your temporary directory. The contents of this directory might be deleted. As a best practice, store your indexes in a more permanent location accessible to all search nodes.

Follow these steps to build the indexes, configure search nodes, and update the index directory:

1. Check your directory sizes. Ensure that the directories for all Elasticsearch host nodes have sufficient free space to hold the Elasticsearch indexes.
   - Ensure that the host node directories have sufficient free space to hold the Elasticsearch indexes. Elasticsearch indexes are approximately three times the size of the Lucene indexes.
   - Ensure that the directory for the initial host node has sufficient space to initially hold both the Lucene index and the Elasticsearch index.
2. Use the prpcUtils tool to reindex the rules:
   a) On the node that you want to index, open the **`prpcUtils.properties`** file in the Pega_HOME\scripts\utils directory.

b) Configure the connection properties. For more information about parameter values, see Properties file parameters.

```
# Connection Information
                pega.jdbc.driver.jar=/path-to-the-database-JAR-file/DRIVER.jar
                pega.jdbc.driver.class=database driver class
                pega.database.type=database vendor type
                pega.jdbc.url=URL of the database
                pega.jdbc.username=Deployment username
                pega.jdbc.password=password
```

c) Optional. Configure a directory to store the new indexes; by default, indexes are created in the directory specified in the `user.temp.dir` property.

```
indexing.indexdirectory=full-path/index/
```

d) Configure the indexing type parameter in the **SETTINGS FOR FULL TEXT INDEXER TOOL** section; leave all other indexing parameters commented out:

```
indexing.indextype=Rule
```

e) Save and close the **`prpcUtils.properties`** file.

f) Run the **`prpcUtils.bat`** or **`prpcUtils.sh`** script to reindex the rules. For example:

```
prpcUtils.bat indexing
```

3. Repeat step 2 to reindex the data files. Set the index type to Data:

```
indexing.indextype=Data
```

4. Repeat step 2 to reindex the work files. Set the index type to Work:

```
indexing.indextype=Work
```

5. Use Designer Studio to delete the existing index nodes:

a) Open the **Designer Studio > System > Settings> Search** landing page and expand **Search Index Host Node Setting**.

b) Click the **X** to the right of each node to delete all existing nodes.

c) Click **Submit**.

6. Use Designer Studio to add the host nodes. The system replicates the indexes on the new nodes.

Note:

- Configure a minimum of two Elasticsearch host nodes. Pegasystems recommends that you configure a minimum of three nodes for maximum fault tolerance. You might need more than three nodes depending on the size of your cluster.
- You can specify that a node is either always an index host node or that it never becomes an index host node even if it is the first node that is started after installation using the `-Dindex.directory` JVM setting. To specify that a node is always an index host node specify the directory name. To specify that a node is never an index host node, leave this setting blank. For more information about configuring index host nodes, see Managing Elasticsearch index host nodes outside of the Search landing page on the PDN.

a) Open the **Designer Studio > System > Settings> Search** landing page and expand **Search Index Host Node Setting**.

b) Enter the information for the primary host node. The first node you enter is the node on which Elasticsearch indexes will be built.

- Enter the Search index host node ID on which you built the indexes.

  For example:

```
                    /dsk01/tomcat7/system7/work/Catalina/localhost/prweb/
PegaSearchIndex
```

- In the Search index file directory, enter the directory in which prpcUtils saved the indexes.

c) Optional: Add any needed additional host nodes.

d) Verify the **Search Index Host Node ID** and the **Search Index File Directory**.

e) Expand **Automated Search Alerts**, and enable **Automatically Monitor Files**.

f) Click **Submit** to save the settings.

7. To enable communication between Elasticsearch host nodes in the cluster, open a TCP port in the range 9300-9399 on each node. (By default, Elasticsearch uses port 9300.) These ports are used for internal node-to-node communication only, and should not be externally accessible.

Do not stop or bring down the default node until the search indexes build completely. The Search Landing Page displays the status. After the search indexes are completely built, you can change the default settings.

Final Rules Conflict Report

The Final Rules Conflict Report lists rules in your system that reference Pega rules that have been made Final in this release. The rules listed vary depending on the specific release from which you are upgrading.

Rules that are marked Final can no longer be overridden. If you have custom rules in your applications that override default rules and your custom rules are final, your existing rules will continue to execute correctly. However, you will not be able to modify them after you upgrade to the new RuleSet.

Note: If you modify and try to save a custom rule that overrides a Final rule, validation fails and you receive an error message. To resolve the conflict, you must delete application rules that override Final system rules, and replace the functionality in your application with other rules. If you are unsure how to respond to a Final rule, see PDN > Support.

To run the report, select **Designer Studio > System > Release> Upgrade > Final Conflicts** .

For upgrades from Pega 7.2.2 and earlier: Adopting APIs and rules for Pega Survey

If you are upgrading from Pega 7.2.2 or earlier, update your application to use the latest survey features. Skip this section if you are upgrading from a version that is later than Pega 7.2.2, or if your application does not use Pega Survey.

You cannot revert surveys to their original implementation after you adopt the rules and APIs that are provided in the `Pega-Survey` ruleset.

For each application that uses survey capabilities, repeat the following steps:

1. Remove the reference to the legacy `PegaSurvey` ruleset.
   a. In the header of Designer Studio, click **[Your application name] > Definition** to open the Application form.
   b. In the **Application rulesets** section, delete the entry for the `PegaSurvey` ruleset.
   c. Click **Save**.
2. Upgrade your overrides and custom rules that rely on standard rules that have been renamed.
   a. Click **Designer Studio > Application > Tools > Validation** to open the tool that finds rules with invalid references.
   b. Click **Validate an Application**.
   c. In the **Select Application** list, select the name of your application.
   d. Click **Run Validation**.
   e. Review the list of rules with invalid references, and resolve each invalid reference by performing one of the following tasks:
      - Redirect the invalid reference to a valid rule in the `Pega-Survey` ruleset.

        Because only prefixes were added to the names of standard rules, you can inspect the ruleset for a rule name that is similar to your invalid reference.
      - Recreate your override by copying the renamed version of the rule in the `Pega-Survey` ruleset.

        Ensure that all references to your original override are redirected to your new override, before you delete the original override.
   f. Manually review and update your application for references, such as Java steps in an activity, that are not detected by the validation tool.
3. Upgrade the rules that support the surveys in your application.
   a. Click **Designer Studio > System > Release > Upgrade > Validate** to access tools for validation.
   b. Click **Revalidate and Save**.
   c. In the **Update Rule Forms** dialog box, enter values in the fields to perform validation on the following classes:
      - `Rule-PegaQ-Question`
      - `Rule-PegaQ-QuestionCollection`
      - `Rule-PegaQ-QuestionGroup`
      - `Rule-PegaQ-Questionnaire`

   For more information about the options that you can choose while running the Revalidate and Save tool, see the Pega Platform help.
4. Find the surveys in your application that run on an embedded page instead of the context, or primary page, of the parent flow.
   a. In the Application Explorer, expand **Survey > Survey** to display a list of surveys in your application.
   b. Click a survey name to open the Survey form.
   c. Click **Actions > View references** to find the flow that calls your survey.
   d. Click the **Open** icon next to the flow name.
   e. On the flow diagram, inspect the configuration of the Subprocess shape that calls your survey.
   f. If the **Define flow** field is set to **On embedded page**, note the value in the **Page property** field.

g. Repeat steps b through f for each survey in your application.

5. Customize the upgrade utility so that it finds and updates the correct pages for in-flight surveys.

   If you do not have any surveys that run on embedded pages, you can skip this step.

   a. Find the `Work-.pyUpgradeSurveyProperties` data transform by searching for it or by using the Application Explorer.

   b. Save a copy of the rule to an unlocked ruleset version in your application.

   c. On the **Definition** tab of the Data Transform form, use the **Update Page** action to set the current page to the embedded page that you noted from step 3.

   d. Enclose the **Update Page** action with a **When** action if only some surveys run on the embedded page.

   e. Repeat steps c through d for each embedded page that you noted from step 3.

   f. Click **Save**.

6. Run the upgrade utility for in-flight surveys.

   a. Click **Designer Studio > System > Release > Upgrade > Upgrade Tools** .

   b. Click **Update Survey Work Objects**.

   c. In the **Upgrade survey work objects** dialog box, select the check box next to each class that defines a survey.

   d. Click **Run utility**.

7. Update your references to deprecated APIs.

   For more information about deprecated APIs and the APIs that supersede them, see the release notes for version 7.3 of the Pega Platform.

Scheduling column population jobs

Upgrading the Pega Platform exposes the pxApplication column on all Work object tables. Because the expose process may temporarily degrade performance, it is a best practice to schedule this process to run during off-peak hours.

You can specify a start time for the job and a timeout length. When the job reaches the end of the timeout, it stops and restarts the next day at the same point. The job continues to recur until all tables are updated. The number of times the job runs depends on the amount of data in your work tables.

For more information about scheduling jobs, see the help for agent schedule and Data-Agent-Queue.

Users must have the SysAdm4 role to schedule column population jobs.

1. Configure the start time for the column population:

   a. In the Explorer panel, click **Records > SysAdm > Agent Schedule**.

   b. Filter the list. In the **Key Contains** box at the top of the screen, enter `Pega-ImportExport` and click **Run**.

   c. Click any instance of **Pega-ImportExport**.

   Note: You can edit any instance of Pega-ImportExport. Check the **NODE NAME** field for information about the node associated with each instance.

   d. Click **Advanced** next to the pxAutomaticColumnPopulation activity line.

   e. Enter the start time and schedule for the job and click **OK**.

f. In the `Column Pattern` area, select **Recurring**.

g. Select **Enabled**.

h. Click **Save**.

2. Optional: Configure the timeout to set the maximum length of time the column population job will run.

a. In the Explorer panel, click **Records > SysAdm > Dynamic System Settings**.

b. In the **Owning Ruleset** field, click the filter icon, enter `ImportExport`, and click **Apply**.

c. Double-click **AutomaticColumnOptimization/Timeout**.

d. Enter the timeout value in minutes.

Note: The default setting is 120 minutes. Change the timeout to reflect the duration of your off-peak schedule. For example, if your lowest usage occurs from 9 P.M. EST until 4 A.M. EST, start this job at 9 P.M. and have it run for 420 minutes.

e. Click **Save**.

Upgrading from Pega 7.2.2 or earlier: Upgrading access role names to enable notifications

When upgrading from any release prior to Pega 7.2.2, you must upgrade all the user access role names of an application with specific classes so that users can receive notifications.

Update the user access role names for these classes:

- `Data-Notification-Parameters`
- `Pega-Notification`
- `Data-Notification-Recipient`
- `Data-Preference-Operator`

To save time, clone any access role name that contains the preceding classes and assign it to application users instead of updating the access role names manually. For more information on how to clone an access role name, see the help.

To update access role names:

1. In the Records Explorer, click **Security > Access Role Name**.
2. Open the access role name that needs to be updated.
3. Click the **Plus** icon to open the **Add Access Role Object** dialog box.
4. In the **Class** field, enter the class name that you want to add to the access role name.
5. Under Access Control, enter `5` in all the fields to provide access to this access role name.
6. Click **Save**.
7. Perform steps 3 through 6 for each of the remaining classes.

Upgrading from PRPC 5.4 and earlier: enabling the service-level agreement agent

Skip this section if you are upgrading from PRPC 5.5 or later.

To allow the new service-level agreement agent to process existing work objects constructed in PRPC 5.4, import the 54WorkAgentProcessing.jar file after the application server restarts.

1. Open your application in Designer Studio.
2. Navigate to **Application > Distribution > Import**.
3. Import the **54WorkAgentProcessing.jar** file from the resource kit in the installation directory.
4. Save the application.

Upgrading from PRPC 5.4 and earlier: re-enabling indexing

If you are upgrading from PRPC 5.5 or later, skip this section.

If you are upgrading from PRPC 5.4 or earlier, you created the index/dataEnabled Dynamic System Setting (DSS) to disable indexing before the upgrade. (For more information, see Upgrading from PRPC 5.4 and earlier: disabling indexing.)

Because the upgrade is complete, follow these steps to enable indexing:

1. From Designer Studio, click **Records > SysAdmin> Dynamic System Settings**.
2. Select **index/dataEnabled**.
3. In the **Value** field, enter `true`.
4. Click **Save**.

Enabling access to environmental information

Prior to Pega 7.3, all roles included access to environmental information for the current node. This information can include version numbers of third-party platforms and JVM information. This access appears as a flaw in some security audits. With Pega 7.3, the new `@baseclass.pxViewSystemInfo` privilege controls access to environmental information. Only the PegaRULES:SysAdm4 role has this privilege by default.

After upgrading from any version prior to Pega 7.3, add the `@baseclass.pxViewSystemInfo` privilege to all system administrator roles that need access to environmental information.

1. Click **Designer Studio > Org & Security > Tools > Security > Role Names**.
2. In the pop-up window that displays roles, click the role that you want to update.
3. In the Designer Studio click the `@baseclass` class in the **Access Class** column.
4. In the **Privileges** section, click the **Plus** icon and select the `pxViewSystemInfo` privilege in the **Name** column.
5. Enter `5` for the production level in the **Level** column. Production level 5 provides the highest security.
6. Click **Submit**.
7. Repeat steps 1 - 6 for each role that requires modification.

Optional: Leveraging the current UI Kit rules

The UI Kit ruleset contains rules and skins that you can use for building or customizing user interfaces for your applications. Employing the UI Kit ruleset provides you with the latest standard user interface

elements, including templates and icons. Add the latest version of the UIKit application as a built-on application to take advantage of the latest features and styles.

Enabling operators

Pega Platform deployment security requires an administrator to enable new operators shipped with Pega Platform and requires password changes after the first login.

The administrator and new operators shipped with Pega Platform must change their passwords when they first log in:

- Batch@pega.com
- DatabaseAdmin@pega.com
- ExternalInviteUser
- IntSampleUser
- PRPC_SOAPOper
- PortalUser@pega.com
- UVUser@pega.com
- External

For more information about changing the administrator password, see Logging in and changing the administrator password.

1. In Designer Studio, select **> Org & Security > Authentication > Operator Access**.
2. In the **Disabled operators** list, click the link for the Pega-provided operator that you want to enable. The following standard operators are installed but disabled by default. When these standard operators first log on, they are required to change their passwords. Enable only those operators you plan to use:
   - Batch@pega.com
   - DatabaseAdmin@pega.com
   - ExternalInviteUser
   - IntSampleUser
   - PRPC_SOAPOper
   - PortalUser@pega.com
   - UVUser@pega.com
   - External
3. On the **Edit Operator ID** page, on the Security tab, select **Force password change on next login** and clear **Disable Operator**.
4. Select **Update password**.
5. Enter a password that conforms to your site standards and click **Submit**.
6. Click **Save** and close the operator page.
7. Repeat steps 2 through 6 for the remaining operators.

Running upgrade utilities

The Pega Platform includes several upgrade utilities to help you to upgrade your application to use new features. Run all of the upgrade utilities, even though some utilities might not return results for your application:

1. Log in as the administrative user.
2. Click **Designer Studio > System > Release > Upgrade > Upgrade Tools > General Utilities** .
3. Click each utility and then click **Run utility**.

Cleaning up unused tables

Pegasystems recommends that you drop unused rules tables in the data schema after deploying a split-schema. If you have only one database, also drop unused data tables in the rules schema.

1. Verify that you have the correct privileges to view and edit the **Optimize Schema** landing page. Set these parameters to true:
   - ViewAndOptimizeSchema
   - Dynamic System Setting (DSS) databases/AutoDBSchemaChanges
   - ViewSchemaOnImport
   - SchemaImport
2. To open the optimize schema wizard, click **Designer Studio > System > Database > Optimize Schema.**
3. Select the PegaDATA database.
4. Click **view the unused tables** to display a list of Pega Platform tables without class mappings. Either select the ones you want to delete and click **Proceed with Changes** to have Pega Platform drop the tables, or drop them manually in your database.
5. Repeat steps 3 and 4 for the PegaRULES database.

For upgrades from Pega 7.x: Updating your custom applications

If you are upgrading from PRPC 5.x or PRPC 6.x, skip this section; the system automatically updates your custom applications. For upgrades from Pega 7.x, if you did not run the IUA to update your custom applications automatically, Run the Update Existing Application utility to ensure that your existing applications take advantage of new functionality in Pega Platform. Run the utility first on your development system and test the changes. Then, run the utility again on the production system. The specific actions required for your application depend on your current version.

1. Open your development system.
2. Navigate to **DesignerStudio>System>Release>Upgrade>Update Existing Applications** to open the Application Update Utility.

   The utility lists the actions that will be performed, the number of records that will be modified, and an estimate of how long each action will take.
3. Click **Run** to start the utility.

The system displays a progress bar and displays the current action. When the actions are complete, the system displays a completion message.

4. Test the application. If the test results are acceptable, repeat these steps on your production system.

Review log files

The upgrade creates a series of log files in the **Pega-image** \scripts\logs directory. After you upgrade, even if the upgrade is successful, review the log file.

In particular, review the Prebuild Conclusion for messages about conclusions that cannot be built. These messages do not indicate a problem with the upgrade but rather identify issues with the Pega Platform application that you must correct.

This is a sample of the Prebuild Conclusions section:

```
Prebuild Conclusions:
```

```
[java] May 1, 2015 1:00:21 PM
 com.pega.pegarules.internal.bootstrap.PRBootstrapDataSource
```

```
[java] 19830421: Loading bootstrap properties from file:///e:\temp/
PegaInstallTemp-24-November-2014-11.07.15/prbootstrap.properties
```

```
[java] May 1, 2015 1:00:21 PM
 com.pega.pegarules.internal.bootstrap.SettingReaderJNDI
```

```
[java] 19830421: Could not find java:comp/env/prbootstrap/ in the local JNDI
 context, skipping prconfig setting lookup
```

Look for any warning or error messages. One common issue is that a conclusion cannot be built because a class is invalid, for example:

```
[java] 2015-05-01 13:13:52,911 [  STANDARD] [ ] (ionary.ClassInfoConclusionImpl)
 WARNING  -
```

```
[java]  Unable to initialize a ClassInfoConclusion for PEGACARD-CPM-WORK-
GENERALCUSTOMERCASE, classDef=null, classRule=null
```

The warning or error message includes information about the invalid class. See the PDN for information. If you cannot resolve the issue, see the Support section of the PDN.

Test your applications

The post-upgrade procedures remove the known compatibility issues between Pega Platform and earlier versions. However, depending on your development methods, you might discover additional modifications that need to be made in your existing applications when they are upgraded to Pega Platform. Perform full testing of your application functionality after the upgrade.

Enabling server-side screen captures for application documents

Regardless of which application server platform you use, you must set up a Tomcat server to support taking and storing screen captures on a server rather than on a client. By taking and storing screen captures on a server, you avoid client-side limitations, such as browser incompatibilities or client software requirements.

As a best practice, virtually install Tomcat and deploy the **prScreenShot.war** file on the same server that is running Pega Platform. Otherwise, use a standalone Linux or Windows server. If you use a Linux server, you must include the following components:

- fontconfig
- freetype
- libfreetype.so.6
- libfontconfig.so.1
- libstdc++.so.6

You can include screen captures in an application document that is generated by the Document Application tool. Screen captures provide stakeholders with a realistic picture of an application's user interface. Install a PhantomJS REST server to include screen captures in an application document.

1. Download the following WAR file: **Pega_DistributionImage\Additional_Products\PhantomJS\prScreenShot.war**
2. Deploy the WAR file on a Tomcat server.
3. Update the **tomcat-users.xml** file to add the following role and user. This file is located at \apache-tomcat-XX\conf\ tomcat-users.xml.

   ```
   <role rolename="pegascreencapture" /> <user username="restUser" password="rules"
    roles="pegascreencapture" />
   ```

4. Start the Tomcat server. The service is hosted at http://*IPaddress*:*port*/prScreenShot/rest/capture, where *IPaddress* is the address of the system where Tomcat is hosted, and *port* is the port on which the service is deployed.
5. Log in to your Pega Platform application and make the following updates:
   a) Update the Data-Admin-System-Setting instance *Pega-AppDefinition* - *CaptureScreenshotsResourcePath* with the URL of the service, for example, `http://10.224.232.91:8080/prScreenShot/rest/capture`.
   b) Update the Data-Admin-Security-Authentication profile instance CaptureScreenshotsAuthProfile with the user that you created in step 3.

Continue at Configuring PhantomJS REST server security for including screen captures in an application document.

Configuring PhantomJS REST server security for including screen captures in an application document

To ensure a secure installation of Pega Platform, enable the PhantomJS REST server to take and store server-side screen captures. In application documents generated by the Document Application tool, screen captures provide stakeholders with a realistic picture of the application's user interface.

1. Obtain the SSL certificate from the Pega Platform administrator.
2. Add the SSL certificate to the list of trusted certificates:
   a) Double-click the certificate.
   b) Click **Install certificate** to start the **Certificate Import** wizard.
   c) Click **Next**, and select **Place all certificates in the following store**.
   d) Click **Browse**, select **Trusted Root certificate**, and click **OK**.
   e) Click **Next**, and then click **Finish** to complete the wizard.
3. Add the certificate to the truststore of the JVM on which the REST server is installed:
   a) Open a command prompt.
   b) Change the root directory to the security folder in the Java installation folder. For example, `C:\Program Files (x86)\Java\jre7\lib\security`.
   c) Run the following command:

   ```
   keytool -keystore cacerts -importcert -alias certificate alias -file certificate name
   ```

   d) When prompted, enter the password for the cacerts keystore. The default password is `changeit`.

Adding special privileges to access the Requester Management landing page

To access the Requester Management landing page in your application, you need to add privileges to the `@baseclass` and `Pega-Landing` access classes in your access roles.

Add the following privileges for the type of access that is needed:

- `pzSystemOperationsObserver` – Required to access the Requester Management landing page and to view performance and trace entry details.
- `pzSystemOperationsAdministrator` – Required to access the Requester Management landing page and perform most actions on requestors. To trace requestors and view the clipboard you also need to have the `pzDebugRemoteRequestor` privilege.

To add the privileges, complete the following steps:

1. Click the **Operator** menu in the Designer Studio header and select **Operator**.
2. In the **Application Access** section, expand an access group and click the role that you need to modify.
3. Click the `@baseclass` class in the **Access Class** column.
4. In the **Privileges** section, click the **Plus** icon and select the appropriate privilege in the **Name** column.
5. Enter `5` for the production level in the **Level** column. Production level 5 provides the highest security.
6. Click **Submit**.
7. Click the `Pega-Landing` class in the **Access Class** column and repeat steps 4 through 6.

   Note: If the `Pega-Landing` class is not in the table, add it by clicking the **Plus** icon at the end of the table and entering `Pega-Landing` in the **Class** field.
8. Save the access role form.

Upgrading from Pega 7.2.2: customizing the agent schedules for the standard Pega Platform agents

Manually update all the agent schedules that you customized in Pega 7.2.2 for standard Pega Platform agents. You can update the agent schedules after starting a node with a node type, when the agent schedule is re-created. This topic applies only for agent schedules developed on Pega 7.2.2 with the Node Classification feature.

If you did not develop agent schedules with the Node Classification feature of Pega 7.2.2, skip this section.

1. Click **Designer Studio > System > Operations > Node Classification**.
2. On the **Agents** tab, in the **Associated with Node type** column, click the name of the node type that is associated with the agent for which you want to update an agent schedule.

   Note: If the agent schedule has not been generated, you can create it by clicking **+Create** in the **Agent schedule** column.
3. In the agent schedule form, modify any settings that need to be updated. For more information, see the help for the agent schedule data instances.
4. Click **Save**.

Updating the service email for Pulse email replies

If you have a service email that you created to configure replies to Pulse email notifications, you must add the Message–ID, In–Reply–To, and References fields to the message header to ensure that these replies are posted in Pulse. Adding the fields allows the system to interact with email clients by using email headers when users reply to Pulse emails.

1. Search for the service email that you created to configure replies to Pulse email notifications:
   a) Open the Records Explorer.
   b) Expand the **Integration-Services** category and click **Service Email**.
   c) Click the service email that you created for Pulse email replies.
2. In the **Message header** section on the **Request** tab of the service email, add the following fields:

Field name	Description	Map to	Map to key
Message–ID	Message–ID	Clipboard	`.pyInboundEmail.pyMessageID`
In–Reply–To	In-Reply–To	Clipboard	`.pyInboundEmail.pyInReplyTo`
References	References	Clipboard	`.pyInboundEmail.pyReferences`

3. Save the service email.
4. Restart the email listener that is configured with the service email.

Appendix A — Properties files

The Pega Platform properties files include several database-specific properties.

This list of supported values is organized by database:

IBM Db2 for Linux, UNIX and Windows

- JDBC driver JAR file — **`db2jcc4.jar`**
- Database driver class — com.ibm.db2.jcc.DB2Driver
- Database vendor type — udb
- JDBC URL — url="jdbc:db2:// *host:port/dbname*

Microsoft SQL Server

- JDBC driver JAR file — **`sqldbc.jar`**
- Database driver class — com.microsoft.sqlserver.jdbc.SQLServerDriver
- Database vendor type — mssql
- JDBC URL — url="jdbc:sqlserver:// *host:port* ;databaseName= *dbName* ;SelectMethod=cursor;SendStringParametersAsUnicode=false"

Oracle

- JDBC driver JAR file — **`ojdbc7.jar`**
- Database driver class — oracle.jdbc.OracleDriver
- Database vendor type — oracledate
- JDBC URL — Use either the service name or the SID:
  - url="jdbc:oracle:thin:@ *host:port/service-name* "
  - url="jdbc:oracle:thin:@ *host:port:SID* "

PostgreSQL

- JDBC driver JAR file:
  - PostgreSQL 9.3 — **`postgresql-9.3.1103.jdbc3.jar`**
  - PostgreSQL 9.4 — **`postgresql-9.4.1207.jre6.jar`**, **`postgresql-9.4.1207.jre7.jar`**, or **`postgresql-9.4.1207.jar`**
  - PostgreSQL 9.5 — **`postgresql-9.4.1211.jre7.jar`** or **`postgresql-9.4.1211.jar`**
  - PostgreSQL 9.6 — **`postgresql-9.4.1212.jre7.jar`** or **`postgresql-9.4.1212.jar`**
- Database driver class — org.postgresql.Driver
- Database vendor type — postgres
- JDBC URL — url="jdbc:postgresql:// *host:port/dbname* "

Appendix B — Performing a single-schema upgrade

It is a best practice to upgrade your single schema to a split-schema configuration. For information about splitting the schema, see Migrating from a single schema to a split-schema configuration.

To upgrade an existing single-schema configuration, follow the steps in this section.

1. If you plan to use the command-line method, and you have not done so already, edit the **setupDatabase.properties** file.
   a) Open the **setupDatabase.properties** file in the scripts directory of your distribution image: *Directories.distributionDirectory***scripts\setupDatabase.properties**
   b) Configure the connection properties. For more information, see Appendix A — Properties files.

```
# Connection Information
```

```
pega.jdbc.driver.jar=
/path-to-the-database-JAR-file/DRIVER.jar
```

```
pega.jdbc.driver.class=
database driver class
```

```
pega.database.type=
database vendor type
```

```
pega.jdbc.url=
URL of the database
```

```
pega.jdbc.username=
Deployment user name
```

```
pega.jdbc.password=
password
```

```
rules.schema.name=
single-schema-name
```

```
data.schema.name=
single-schema-name
```

c) Optional: If you are repeating a failed upgrade, configure the resume property:

- To resume the upgrade from the last successful step, set `automatic.resume=true`.
- To restart the upgrade from the beginning, set `automatic.resume=false`.

d) Save and close the file.

2. Ensure that the application server is not running.
3. Optional: Generate DDL and have your database administrator apply the changes to your database. See Optional Generating and applying DDL
4. Upgrade the database and the rulebase. See Upgrading the schema.
5. Upgrade the applications:

a) Review the application server configuration described in the Pega 7.4 Installation Guide for your application.

b) Undeploy the current Java applications:

- **`prweb.war`** or the EAR file appropriate to your application server
- **`prsysmgmt.war`**
- **`prhelp.war`**

c) Deploy the new Pega Platform applications.

6. Configure the Pega Platform; log in to the system and complete the upgrade configuration steps.

Single-schema upgrade methods

Your existing schema needs to be updated to be compatible with Pega 7.4. The schema can be updated in one of the following methods. Each method is designed to preserve any prior customization to the database.

- UI tool – the UI-based Installation and Upgrade Assistant automatically updates the schema leaving any customizations intact. See Running the Installation and Upgrade Assistant.
- Command-line script – Use the **`upgrade.bat`** or **`upgrade.sh`** script. See Upgrading from the command line.

These methods require a JDBC connection to the database and can be run from any Windows, UNIX, Linux or Linux on IBM z/OS systems with Java 8 or later. The Deployment user should perform these actions.

Prior to loading the rulebase, the upgrade attempts to validate that each database table space has a buffer pool size large enough to accommodate the generated SQL DDL. The utility generates a report and stops if it finds any table space that requires an increased buffer pool size. The report identifies all table spaces requiring an increased buffer pool size. Have the database administrator correct the table space buffer pool issues and rerun the tool.

Upgrading a single schema by using the Installation and Upgrade Assistant (IUA)

Because of the large volume of data, run the IUA on the same network as the database server. If this is not possible, run the tool on a system with fast, direct access to the database server. The Deployment user performs these steps.

Pega Platform writes command-line output to a file in the **Pega-image**`\scripts\logs` directory.

The process can last for several hours and the time can vary widely based on network proximity to the database server.

To run the IUA:

1. Double-click the **`PRPC_Setup.jar`** file to start the IUA.

   Note: If JAR files are not associated with Java commands on your system, start the IUA from the command line. Navigate to the directory containing the **`PRPC_Setup.jar`** file, and type `java -jar PRPC_Setup.jar`.

   The IUA loads and the Pega icon is displayed in your task bar.
2. Click **Next** to display the license agreement.
3. Review the license agreement and click **Accept**.
4. If you are resuming after a previous failed upgrade and the **Resume Options** screen is displayed, select either **Resume** or **Start Over**.
   - If you select **Resume**, the system uses the previously entered database configuration information to resume the upgrade from the last successful process. Continue these instructions at step 8.
   - If you select **Start Over**, continue at step 5 to reenter the configuration information.
5. On the **Installer Mode** screen, choose **Upgrade** and click **Next**.
6. Choose your database type and click **Next**.
7. Configure the database connection. The JDBC drivers allow the Pega Platform application to communicate with the database.

   Note: Some of the fields on the **Database Connection** screen are pre-populated based on the type of database you selected. If you edit these or any other fields on this screen, and then later decide to change the database type, the IUA might not populate the fields correctly. If this occurs, enter the correct field values as documented below, or exit and rerun the IUA to select the intended database type.

   Note: If you are resuming after a failed upgrade, some pre-populated values might be disabled.

   - **JDBC Driver Class Name** — Verify that the pre-populated value is accurate:
     - IBM Db2 for Linux, UNIX, and Windows and IBM Db2 for z/OS — `com.ibm.db2.jcc.DB2Driver`
     - Microsoft SQL Server — `com.microsoft.sqlserver.jdbc.SQLServerDriver`
     - Oracle — `oracle.jdbc.OracleDriver`
     - PostgreSQL — `org.postgresql.Driver`
   - **JDBC Driver JAR Files** — Click **Select Jar** to browse to the appropriate driver files for your database type and version. For a list of supported drivers, see the *Platform Support Guide*.
   - **Database JDBC URL** — Verify that the pre-populated value is accurate.

     For information about URLs, see Obtaining database connection information.

- To connect to Oracle — Use one of the following formats:
  - `jdbc:oracle:thin:@localhost:1521/service-name`
  - `jdbc:oracle:thin:@localhost:1521:SID`
- To connect to Microsoft SQL Server —

```
jdbc:microsoft:sqlserver://server:1433;database=dbName
 ;SelectMethod=cursor;SendStringParametersasUnicode=false
```

- To connect to IBM Db2 for Linux, UNIX and Windows —

```
jdbc:db2://server:50000/database:fullyMaterializeLobData=true;fullyMaterializeInputStre
```

- To connect to PostgreSQL —

```
jdbc:postgresql://server:5432/database
```

- **Database Username and Password** — Enter the user name and password that you created for the Deployment user on your database.
- **Rules Schema Name** — Enter the name of the rules schema in the database.
- **Data Schema Name** — Enter the name of the data schema in the database. For single-schema configurations, and all upgrades from PRPC 5.x and 6.x, the data schema name is identical to the rules schema name.
- **Customer Data Schema Name** — Optional: Enter the name of the customer data schema if it is separate from the data schema.

8. Click **Test Connection**. If the connection is not successful, review your connection information, correct any errors, and retest. When the connection is successful, click **Next**.

   On IBM Db2 for Linux, UNIX, and Windows, and IBM Db2 for z/OS, **Test Connection** does not verify that the schemas exist. Instead, the schemas are automatically generated when the first CREATE TABLE statement executes after the deployment is complete.

9. Optional: Specify whether you will have your database administrator manually apply the DDL changes to the schema. These changes include the user-defined functions (UDF) supplied by Pegasystems. By default, the tool generates and applies the schema changes to your database.
   - To generate and apply the DDL outside the UI tool, select **Bypass Automatic DDL Application** and continue the deployment. After you complete the deployment, manually generate and apply the DDL and UDF. For more information, see Optional: Generating and applying DDL and Optional: Installing user-defined functions.
   - To have the tool automatically apply the DDL changes and the UDF, clear **Bypass Automatic DDL Application**.
10. Select the upgrade options and click **Next**:
    - Optional: Select **Run rulebase cleanup** to permanently remove old rules. In most cases, removing older rules decreases the overall upgrade time. Running the cleanup script permanently removes rules older than the current version from which you are upgrading. For example, if you are upgrading from PRPC 6.2 SP2 (06-02-20) to 7.4, cleanup removes rules of version 06-01-99 and older.

- Optional: Select **Update existing applications** to modify your existing applications to support the upgraded version of the Pega Platform. The specific actions depend on your current version of PRPC. If you do not automatically update the applications as part of the IUA, follow the instructions in Updating existing applications to update the applications as part of the post-upgrade process.
- Optional: Select Update applications schema to run the Update Applications Schema utility to update the cloned rule, data, work, and work history tables with the schema changes in the latest base tables as part of the update. If you do not automatically update the applications, you can also run the update applications schema utility later from the prpcUtils.bat or prpcUtils.sh script, or from Designer Studio. For information about using the Update Applications Schema utility, see the online help.
- Optional: Select **Rebuild database indexes** to have the IUA to rebuild the database indexes after the rulebase loads. The IUA rebuilds the database indexes to ensure good performance in the upgraded system. The amount of time this process adds to the upgrade procedure depends on the size of your database.

11. Click **Start** to begin loading the rulebase.

    Logs display in the log window and are also stored in the **Pega-image** \scripts\logs directory. During the deployment, the log window might appear inactive when the IUA is processing larger files.

12. Click **Back** to return to the previous screen, and then click **Exit** to close the IUA.

Determine the next step:

- If you opted to have the IUA automatically apply the schema changes, and you will not enable Kerberos authentication, configure the application server.
- If your database administrator will apply DDL manually, or if you will enable Kerberos authentication, continue at Editing the setupDatabase.properties file.

Upgrading a single-schema from the command line

To upgrade from the command line, configure the **`setupDatabase.properties`** file and run either **`upgrade.bat`** or **`upgrade.sh`**. The Deployment user runs these scripts.

The rulebase upgrade can take several hours, depending on the proximity of the database to the system running the script.

1. If you have not done so already, edit the **`setupDatabase.properties`** file.
   a) Open the **`setupDatabase.properties`** file in the scripts directory of your distribution image: *Directories.distributionDirectory*`\scripts\setupDatabase.properties`
   b) Configure the connection properties. Use the new rules schema name for both the rules schema name and data schema name. For more information about the connection properties, see Appendix A — Properties files.

```
# Connection Information
```

```
pega.jdbc.driver.jar=
/path-to-the-database-JAR-file/DRIVER.jar
```

```
pega.jdbc.driver.class=
```

```
database driver class
```

```
pega.database.type=
database vendor type
```

```
pega.jdbc.url=
URL of the database
```

```
pega.jdbc.username=
Deployment user name
```

```
pega.jdbc.password=
password
```

```
rules.schema.name=
new-rules-schema-name
```

```
data.schema.name=
new-rules-schema-name
```

c) Optional: If you are repeating a failed upgrade, configure the resume property:

- To resume the upgrade from the last successful step, set `automatic.resume=true`.
- To restart the upgrade from the beginning, set `automatic.resume=false`.

d) Save and close the file.

2. Open a command prompt and navigate to the scripts directory.
3. Run either **`upgrade.bat`** or **`upgrade.sh`**.

Appendix C — Optional: Generating and applying DDL

If you opted not to have the Installation and Upgrade Assistant automatically apply the DDL, generate and apply the DDL manually.

1. Optional: If you are upgrading or updating out-of-place, migrate the rules:

   a) Clone the DDL. For details about running the migrate script, see Migrating the existing rules schema.

   1. Edit the **migrateSystem.properties** file to set the source schema names:

      ```
      pega.source.rules.schema=original rules schema name
                          pega.source.data.schema=original data schema name
      ```

   2. Edit the **migrateSystem.properties** file to set the target schema names. The settings depend on whether you have one database or two databases:

      - One database:

        ```
        pega.target.rules.schema=new rules schema name
                                 pega.target.data.schema=new rules schema name
        ```

      - Two databases:

        ```
        pega.target.rules.schema=upgrade schema name
                                 pega.target.data.schema=upgrade schema name
        ```

   3. Edit the **migrateSystem.properties** file to create the DDL:

      ```
      pega.move.admin.table=true
                          pega.clone.generate.xml=false
                          pega.clone.create.ddl=true
                          pega.clone.apply.ddl=false
                          pega.bulkmover.unload.db=false
                          pega.bulkmover.load.db=false
                          pega.rules.objects.generate=false
                          pega.rules.objects.apply=false
      ```

   4. Run the **migrate.sh** or **migrate.bat** script to create the DDL.

   b) Have the database administrator apply the DDL.

   c) Populate the tables. For details about running the migrate script, see Migrating the existing rules schema.

   1. Leave the source and target schema properties as in step 1a.

   2. Edit the **migrateSystem.properties** file to populate the table:

      ```
      pega.move.admin.table=true
                          pega.clone.generate.xml=false
                          pega.clone.create.ddl=false
                          pega.clone.apply.ddl=false
                          pega.bulkmover.unload.db=true
                          pega.bulkmover.load.db=true
                          pega.rules.objects.generate=false
      ```

```
pega.rules.objects.apply=false
```

3. Run the **migrate.sh** or **migrate.bat** script to populate the table.

2. Upgrade the rules schema and apply the DDL for the rule schema changes:

a) Create the DDL of changes to the rules schema. For more information about the scripts, see Generating the DDL file.

1. Edit the **setupDatabase.properties** file to set the rules and data schema names:

- One database:

```
rules.schema.name=new rules schema name
data.schema.name=new rules schema name
```

- Two databases:

```
pega.target.rules.schema=upgrade schema name
pega.target.data.schema=upgrade schema name
```

2. Optional: If your customer data schema is different than your PegaDATA schema, insert the following entry to specify the customer data schema name. Replace *customer-data-schema* with your customer data schema name.

```
pega.customerdata.schema=customer-data-schema
```

3. Run the **generateddl.bat** or **generateddl.sh** script.

b) Have the database administrator apply the DDL.

c) Use the command line to upgrade the rules schema. For more information, see Upgrading the rules schema from the command line.

1. Edit the **setupDatabase.properties** file to bypass the schema upgrade because the DDL is already applied:

```
bypass.pega.schema=true
```

2. Leave the rules and data schema names as in step 2a.

3. Run the **upgrade.bat** or **upgrade.sh** script.

3. Migrate the changes to the new rules schema; create rules schema objects, and create links between the new rules schema and the data schema.

a) Clone the DDL. For details about running the migrate script, see Migrating the existing rules schema.

1. Edit the **migrateSystem.properties** file to set the source and target schema properties:

```
pega.source.rules.schema=upgrade schema name
pega.source.data.schema=upgrade schema name
```

```
pega.target.rules.schema=new rules schema
pega.target.data.schema=original data schema
```

2. Edit the **migrateSystem.properties** file to create the DDL:

```
pega.move.admin.table=false
pega.clone.generate.xml=false
pega.clone.create.ddl=true
```

```
pega.clone.apply.ddl=false
pega.bulkmover.unload.db=false
pega.bulkmover.load.db=false
pega.rules.objects.generate=false
pega.rules.objects.apply=false
```

3. Run the **migrate.sh** or **migrate.bat** script to create the DDL.

b) Give the DDL to the database administrator to apply.

c) Populate the tables. For details about running the migrate script, see Migrating the existing rules schema.

1. Leave the source and target schema properties as in step 3a.
2. Edit the **migrateSystem.properties** file to populate the table:

```
pega.move.admin.table=false
pega.clone.generate.xml=false
pega.clone.create.ddl=false
pega.clone.apply.ddl=false
pega.bulkmover.unload.db=true
pega.bulkmover.load.db=true
pega.rules.objects.generate=true
pega.rules.objects.apply=false
```

3. Run the **migrate.sh** or **migrate.bat** script to populate the table.

d) Give the DDL to the database administrator to apply the rules objects.

4. Upgrade the data schema and apply the DDL for the data schema changes:

a) Create the DDL of changes to the rules schema. For more information about the scripts, see Generating the DDL file.

1. Edit the **setupDatabase.properties** to set the rules and data schema names:

```
rules.schema.name=new rules schema
data.schema.name=original data schema
```

2. Optional: If your customer data schema is different than your PegaDATA schema, insert the following entry to specify the customer data schema name. Replace *customer-data-schema* with your customer data schema name.

```
pega.customerdata.schema=customer-data-schema
```

3. Run the **generateddl.bat** or **generateddl.sh** script with the --upgradeDataOnly argument and true parameter, for example:

```
generateddl.bat --upgradeDataOnly true
```

b) Have the database administrator apply the DDL to the data schema.

c) Use the command line to upgrade the data schema. Follow the instructions in Upgrading the data schema.

1. Edit the **setupDatabase.properties** file to bypass the schema upgrade because the DDL is already applied:

```
bypass.pega.schema=true
```

2. Run the **upgrade.bat** or **update.sh** script with the --dataOnly argument and true parameter, for example:

```
upgrade.bat --dataOnly true
```

Generating the DDL file

Follow these steps to generate a DDL file for your database administrator to apply manually.

1. Edit the **setupDatabase.properties** file.
   a) Configure the connection properties. For more information about parameter values, see Properties file parameters. The customer data schema is optional.

```
# Connection Information
                pega.jdbc.driver.jar=\path-to-the-database-JAR-file\DRIVER.jar
                pega.jdbc.driver.class=database driver class
                pega.database.type=database vendor type
                pega.jdbc.url=URL of the database
                pega.jdbc.username=Deployment username
                pega.jdbc.password=password
                rules.schema.name=rules-schema-name
                data.schema.name=data-schema-name
                customerdata.schema.name=customer-data-schema
```

   b) Save and close the file.
2. At a command prompt, navigate to the **Pega-image** \scripts directory.
3. Run **generateddl.bat** or **generateddl.sh** and pass in the required --action argument:

```
#generateddl.bat --action upgrade
```

If you do not specify an output directory, the script writes the output to the default directory: **Pega-image\schema\generated**

Note: The output directory is deleted and re-created each time the generateddl script runs. To save a copy of the DDL, rename the directory before you run the script.

Applying the DDL file

Before you continue, have your database administrator follow these general steps to apply the schema changes; these schema changes can include changes to user-defined functions:

1. Review the DDL file in the output directory and make any necessary changes. The default directory is:

   Pega-image\schema\generated\database*database_type*

   where *database_type* is udb, mssql, oracledate, postgres, or db2zos
2. Apply the DDL file.
   a) Register the DDL file with the database:
   - For Oracle, PostgreSQL, and IBM Db2 for Linux, UNIX, and Windows, register the .jar file with the database.
   - For Microsoft SQL Server, enable the user-defined functions and register the C# .cs code files with the database.

b) Apply the **CREATE FUNCTION** DDL.

The output directory is deleted and re-created each time the generateddl script runs. To save a copy of the DDL, rename the directory before you rerun the script.

Editing the setupDatabase.properties file to bypass DDL generation

After your database administrator applies the changes to your database, configure the **setupDatabase.properties** file to bypass applying a schema that already exists. Reapplying an existing schema would cause the deployment to fail.

1. Open the **setupDatabase.properties** file in the scripts directory of your distribution image: *Directories.distributionDirectory***scripts\setupDatabase.properties**
2. Set the property `bypass.pega.schema=true`.
3. Save and close the file.

Appendix D — Installing user-defined functions

The user-defined functions (UDFs) enable the Pega Platform to read data directly from the BLOB without creating and exposing columns. Skip this section if you installed the UDFs when you deployed Pega Platform.

There are several ways you might have bypassed generating and installing the UDFs when you deployed:

- Setting either `bypass.pega.schema=true` or `bypass.udf.generation=true` in the **`setupDatabase.properties`** file
- Setting `pega.target.bypass.udf=true` in the **`migrateSystem.properties`** file
- Selecting **Bypass Automatic DDL Application** from the Installation and Upgrade Assistant

Before you install the UDFs, verify that you have the appropriate user permissions.

For more information about user permissions, see your Pega Platform installation guide.

1. Edit the **`setupDatabase.properties`** file.
   a) Configure the connection properties. For more information about parameter values, see Properties file parameters.

```
# Connection Informationpega.jdbc.driver.jar=
                  \path-to-the-database-JAR-file\DRIVER.jar
                  pega.jdbc.driver.class=database driver class
                  pega.database.type=database vendor type
                  pega.jdbc.url=URL of the database
                  pega.jdbc.username=Deployment user name
                  pega.jdbc.password=password
                  rules.schema.name= rules-schema-name
                  data.schema.name=data-schema-name
```

   b) Save and close the file.
2. On the rules schema, navigate to the **Pega-image** \scripts directory and run the following commands to remove any partially installed UDFs:

```
DROP FUNCTION rules-schema-name.pr_read_from_stream;
             DROP FUNCTION rules-schema-name.pr_read_decimal_from_stream;
             DROP FUNCTION rules-schema-name.pr_read_int_from_stream;
```

3. Optional: If you have a split-schema, on the data schema, navigate to the **Pega-image** \scripts directory and run the following commands:

```
             DROP FUNCTION data-schema-name.pr_read_from_stream;
             DROP FUNCTION data-schema-name.pr_read_decimal_from_stream;
             DROP FUNCTION data-schema-name.pr_read_int_from_stream;
```

4. From the **Pega-image** \scripts directory, run the **`generateudf.bat`** or **`generateudf.sh`** script with the `--action install` argument.

```
generateudf.bat --action install --dbType database_type
```

Where *database_type* is mssql, oracledate, udb, db2zos, or postgres.

Appendix E — Rolling restart and Apache Ignite client-server mode

You can upgrade Pega Platform to use Apache Ignite client-server clustering topology to separate the Pega Platform processes from cluster communication and distributed features. Clustering technology has separate resources and uses a different JVM from Pega Platform. For more information, see Apache Ignite client-server clustering topology.

To enable client-server mode, follow the rolling restart process with additional steps for enabling client-server mode. See Performing the rolling restart.

To switch back from client-server mode to embedded mode, follow the rolling restart process with additional steps for disabling client-server mode. See Performing the rolling restart.

Performing the rolling restart

You can use a rolling restart process to enable Apache Ignite client-server mode or to switch back to embedded mode from client-server mode. For more details, see Apache Ignite client-server clustering topology.

Perform a rolling restart to keep your system always available during upgrade. You remove nodes from the load balancer, shut them down, upgrade, and start them again one by one. You do not add them back to the load balancer until you have upgraded half the nodes.

To perform a rolling restart, complete the following steps.

1. Prepare the database.
   a) Disable rule saving. For more information, see Disabling rule creation on the rules schema.
   b) Migrate the PegaRULES schema to a temporary schema. For more information, see Migrating the existing rules schema.
   c) Update the new rules schema, for example, a framework or application update. For more information, see Upgrading the migrated rules schema.
   d) Copy the new rule schema to the production database. For more information, see Migrating to the new rules schema.
2. Optional: To switch to Apache Ignite client-server mode, start the stand-alone Apache Ignite servers before upgrading the nodes. For more information, see Deploying and starting the Apache Ignite servers.
3. Upgrade half of the nodes one by one.
   a) Configure the load balancer to disable a node.
      - Disabling the node does not allow new connections, but it allows existing users and services to complete work.
      - Quiescing a Pega Platform node that has not been disabled in the load balancer results in error conditions for users of that Pega Platform node, because new users cannot log in. The Pega Platform must be disabled in the load balancer so that new users are redirected to another active Pega Platform node.
   b) Quiesce the Pega Platform node, by using the Autonomic Event Services (AES), System Management Administrator (SMA), or high availability landing pages. For more information, see the help for Cluster management and quiescing.

c) Ensure that all requestors are passivated and the system run state is set to "Quiesce Complete", by using the HA Cluster Management landing page.

d) Shut down the node.

e) Update the data source to connect to the updated schema (to reflect changes made in step 1). For more information, see Upgrading the data schema.

f) Optional: To enable Apache Ignite client-server mode, modify the **prconfig.xml** file to switch the Apache Ignite cluster protocol and force the node to start in client mode.

g) Edit the **prconfig.xml** file and add the following settings:

```
<env name="cluster/clientserver/clientmode" value="true " />
                        <env name="identification/cluster/protocol"
value="ignite " />
```

4. Optional: To switch back to embedded mode from client-server mode, modify the **prconfig.xml** file and remove the following settings that were added during the switch to client-server mode.

```
<env name="cluster/clientserver/clientmode" value="true " />
                      <env name="identification/cluster/protocol"
value="ignite " />
```

5. Optional. To specify the technology that you want to use in embedded mode, enter the appropriate setting for the cluster protocol (Hazelcast or Ignite) instead of removing it.>
6. Start the node.
7. Perform any needed post-upgrade activities and tests. For more information, see Post-upgrade configuration.
8. After you upgrade half of the nodes, disable the remaining non-upgraded nodes in the load balancer.
9. Add all the upgraded nodes, which you upgraded in step 3, back to the load balancer to start taking traffic.
10. Upgrade the remaining half of the nodes (the non-upgraded nodes) one by one.
    a) Perform steps 3 b through 3 g.
    b) Add the node back to the load balancer to start taking traffic.
11. Optional: To switch back to embedded mode from client-server mode, shut down all stand-alone Apache Ignite servers after all the nodes are upgraded and no longer use the stand-alone Apache Ignite server cluster.

Deploying and starting the Apache Ignite servers

To use client-server clustering, deploy and start the Apache Ignite servers before you deploy and start the Pega cluster. The Apache Ignite servers provide base clustering capabilities, including communication between nodes. You must have a minimum of three stand-alone Apache Ignite servers for one cluster.

Perform the following procedure on each Apache Ignite server.

1. Make sure that the JAVA_HOME environment variable points to a valid Java installation directory (JRE or JDK).
2. Copy the **prcluster_service.war** file, which is used to start the cluster service, to the webapps directory on the Apache Tomcat server. The **prcluster_service.war** file is located in the Archives directory of the Pega Platform distribution image.

3. Edit the cluster protocol in the **`prconfig.xml`** file located in the **`/WEB-INF/classes/`** directory or the **`prcluster_service.war`** file. The Hazelcast cluster protocol is the default configuration.
   a) Add the following setting to the **`prconfig.xml`** file: `<env name="identification/cluster/protocol" value="ignite" />`
   b) Pass the following JVM argument to the application server:

```
-DNodeSettings=identification/cluster/protocol=ignite
```

4. Start the JVM.

After a successful startup, you can review the topology snapshot in the **`PegaRULES`** log files. By default, the log files are generated in the ../work/Catalina/localhost/prcluster_service/ directory and are accessible only from a terminal window.

Optional. Set up ELK (Elasticsearch, Logstash, and Kibana) for a convenient way to access and analyze the log files. For more information about configuring ELK, see the *Configuring Elasticsearch, Logstash, and Kibana (ELK) for log management* article on the PDN.

Appendix F — Troubleshoot upgrade errors

Use the information in this section to troubleshoot upgrade errors.

Error logs are displayed in the Installation and Upgrade Assistant window and are also stored in the **Pega-image\scripts\logs** directory.

Upgrades from PRPC 5.4 and earlier: System-Work-Indexer not found in dictionary

If you are upgrading from PRPC 5.4 or earlier, an indexing error can cause the upgrade to fail with a class not defined message.

```
Class not defined in dictionary: System-Work-Indexer    aClassName
```

To fix the problem, first follow the instructions in Upgrading from PRPC 5.4 and earlier: setting indexing, and then repeat the upgrade.

Resuming or restarting after a failed deployment

If the deployment fails, you can opt to either resume or start over:

- **Resume** — The system uses the previously-entered configuration information to resume a failed deployment from the last successful step. This is the default behavior.
- **Start Over** — The system discards all previously-entered configuration information, drops the database schema, and starts the deployment from the beginning.

1. Review the failure message for information about the source of the error. Use the information in the error message to correct the error before you continue.
2. Optional. If you used the IUA, the select either **Resume** or **Start Over** when the system displays the **Resume Options** screen.
3. Optional. If you used the command-line script, set the automatic.resume property in the **setupDatabase.properties** file:
   - To resume the deployment from the last successful step, set `automatic.resume=true`.
   - To start over, set `automatic.resume=false`.
4. Repeat the deployment. Use the same procedure that you used for the initial deployment.

Recovering from a faulty split-schema migration

If the split-schema migration fails, run the migration recovery scripts to remove duplicate rules.

The migration recovery scripts remove duplicate rules created as a result of a faulty split schema migration, where indexes and primary keys were not created on rules tables. To check for this issue, see if your rules tables, such as pr4_base and pr4_rule, are missing primary keys.

Running the migration script on Microsoft SQL Server, Oracle, or PostgreSQL

Use the cleanup scripts to recover from a faulty split schema migration on Microsoft SQL Server, Oracle, or PostgreSQL.

1. Take down any application servers that use the failed schema.
2. Backup your database.
3. In **ResourceKit\AdditionalUpgradeScripts\MigrationRecoveryScripts***database***_cleanDups.sql**, replace all instances of @RULES_SCHEMA with the name of the schema that contains the pr4_base table.
4. Use your vendor tools to run the *database***_cleanDups.sql** script on the database.
5. In *database***_fix_vw_table.sql**, replace all instances of @RULES_SCHEMA with the name of the schema that contains the pr4_base table.
6. Use your vendor tools to run the *database***_fix_vw_table.sql** script on the database.
7. Use the **generateddl.bat** or **generateddl.sh** script to generate and apply the DDL. See Appendix C — Optional: Generating and applying DDL.
8. Use your vendor tools to rebuild the indexes for the tables in your rules schema.

Running the migration script on IBM Db2 for Linux, UNIX, or Windows, or IBM Db2 for z/OS

Use the cleanup scripts to recover from a faulty split schema migration on IBM Db2 systems.

1. Take down any application servers that use the failed schema.
2. Backup your database.
3. Use your vendor tools to run the **ResourceKit\AdditionalUpgradeScripts\MigrationRecoveryScripts***database***_cleanDups.sql** script on the database.
4. Run the query `Call CLEANSE_RULES_DUPS('`*rulesSchema*`');` where *rulesSchema* is the name of schema that contains the pr4_base table.
5. Drop the CLEANSE_RULES_DUPS procedure.
6. In *database***_fix_vw_table.sql**, replace all instances of @RULES_SCHEMA with the name of the schema that contains the pr4_base table.
7. Use your vendor tools to run the *database***_fix_vw_table.sql** script on the database.
8. Use the **generateddl.bat** or **generateddl.sh** script to generate and apply the DDL. See Appendix C — Optional: Generating and applying DDL.
9. Use your vendor tools to rebuild the indexes for the tables in your rules schema.

Your database is ready for you to re-run the upgrade.

PEGA0055 alert — clocks not synchronized between nodes

The Pega Platform validates time synchronization to ensure proper operations and displays a PEGA0055 alert if clocks are not synchronized between nodes.

For information about how to reference a common time standard, see the documentation for your operating system.