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mim extensions™

Java™ Quick Start Guide

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Overview

This Quick Start Guide will aid in installing the software needed to build and edit your own MIM Extensions™ and run them within MIM®. This guide assumes you can read and understand Java™ code and are proficient with basic computer commands and the operation of MIM Software™.

Request Access to MIM Extensions™

Before downloading the MIM Extensions SDK, you must create a MIM training account.

NOTE: The request will be processed by a MIM representative and may take up to one business day.

1. Open a web browser and navigate to https://www.mimsoftware.com/portal/login.
2. Click **Request Access**.
3. Fill out the form and check **I would also like access to MIM Extensions**.
4. Click **Submit**.

Download & Install — MIM Software®

MIM software does not need to be installed on your computer to create MIM Extensions. However, there are two main benefits to having MIM installed on the same computer as the one you're developing the extension on:

- When the Apache Ant™ build script runs, the extension will automatically be copied to a directory that MIM Software searches for available extensions that can be run.
- You can test out your extension during development.

It is highly recommend that you install MIM Software on your computer solely for troubleshooting purposes. To install MIM:

1. Open a web browser and navigate to www.mimsoftware.com/download/.
2. Click the download link to begin downloading MIM Software. There are links to download MIM Software for either Windows® or Mac®.
3. To access the decryption password for the download, please choose one of the following:
    a. Call **866-421-2536** to talk to a MIM support representative.
    b. Open a web browser and navigate to https://www.mimsoftware.com/contact/.
        i. Fill out the form.
        ii. Check **Need Password.**
        iii. Click the **Submit** button.
        iv. Once MIM Software has received your request, it will be processed. If the request has been approved, you will be contacted by a sales representative with the password.
4. Launch the downloaded file and enter the decryption password when prompted.
5. Follow the steps on your screen to continue installing MIM Software.
6. After MIM has been installed on your system, click on the MIM icon to launch the software.

Download & Install — Oracle® Java™ SE Development Kit

MIM Extensions require the Java SE Development Kit (JDK) in order to run properly. Please follow the instructions corresponding to the OS you are using.

Create an Oracle Account

If you do not already have an Oracle account, you may need to create an account. This is required in order to download legacy versions of the JDK.

NOTE: Creating an Oracle account is not necessary if developing extensions for MIM version 6.6 or 6.7 on a Mac. This is because Oracle does not maintain a JDK 1.6 for macOS®.

To create an Oracle account:

1. Open a web browser and navigate to www.oracle.com.
2. Click **Sign In** at the top-right of the webpage and then click **Create an account** from the dropdown menu.
    a. Fill out your account information.
    b. Click **Create Account** at the bottom to finish creating your account.
    c. A verification email will be sent to the email address used to register for your account.
3. Log into the email address used to create the Oracle account and click **Verify email address**.

Downloading and Installing the JDK

After you have created an account, you will need to download the JDK. The version of MIM you're running and the OS you're using to develop the extension will determine which download of the JDK you will need. Click the appropriate link below.

MIM Version	Windows	macOS
6.6 – 6.7	Java 1.6	Java 1.6
6.8 and later	Java 1.8	Java 1.8

1. Scroll down to the first Java SE Development Kit section. This should be the latest update for the JDK. If it isn't the latest update for the JDK, please find the appropriate Java SE Development Kit section. (*Skip this step for Java 1.6 with macOS.*)
    a. Click the radial button next to Accept License Agreement.
    b. If using Windows 64-bit OS, click the download link next to Windows x64.
    c. If using Windows 32-bit OS, click the download link next to Windows x86.
        Note: 32-bit MIM installations are no longer supported for MIM versions 6.9 and later.
    d. If using Mac OS X, click the download link next to Mac OS X.
2. Log in to your Oracle account if prompted.

NOTE: You will only be prompted to log in if the version of Java you are trying to download is now a legacy version of Java.

3. The download should start automatically.
4. After the download has finished, install the JDK.

NOTE: The default options will be sufficient and all needed components will be installed.

NOTE: If you upgrade your Mac to a newer OS, Apple may uninstall Java and you will have to install it again.

Download & Install — Eclipse

Next, you need a Java development environment. MIM is compatible with many development environments, but MIM Software strongly recommends the graphical program Eclipse.

1. Go to https://www.eclipse.org/downloads/eclipse-packages/.
2. Find the **Eclipse IDE for Java Developers** package.

NOTE: You do not need Eclipse IDE for Java EE Developers.

3. Immediately to the right, select the appropriate version (32-bit or 64-bit) for your computer.
   Note: 32-bit MIM installations are no longer supported for MIM versions 6.9 and later.
4. On the next page, click **DOWNLOAD**.
5. If you are using a **Windows** computer, you will have to extract the downloaded zip file. MIM Software recommends extracting the contents to a folder.
   a. The application, **eclipse.exe**, can be found in the extracted folder's **eclipse** folder.
   b. You should then add **Eclipse** to the **Taskbar** for your convenience.
6. If you are using a **Mac** computer, you will have downloaded a **dmg** file.
   a. Open the **dmg** file and you will see **Applications** and **Eclipse**.
   b. Drag **Eclipse** into the **Applications** folder.
   c. You should then add **Eclipse** to the **Dock** for convenience.

Download — MIM Extensions SDK

1. Log into your MIM Training account (see the section Request Access to MIM Extensions™ if you have not yet created an account).

    a. Navigate to https://www.mimsoftware.com/portal/login.

    b. Log in with your email and password.

2. Click **Training**.
3. Select **MIM Extensions**.
4. Click the appropriate MIM Extensions link that matches the version of MIM you are using.

EXAMPLE: If you are running MIM 6.6.7, you will be developing for MIM 6.6 and therefore should download the latest MIM 6.6 version.

5. If you are using a Windows computer, you will have to extract the downloaded zip file to a folder. The folder's name should begin with **extensionDevelopment**. If you are using a Mac computer, the files will be extracted automatically.
6. The MIM Extensions SDK Folder will contain the following folders:

    - **compiledExtensionSamples** — Compiled MIM Extensions that are ready to be used in MIM.
    - **sampleWorkspace** — The source code for the compiled extensions.
    - **javaDoc** — Documentation on how to program MIM Extensions using Java.
    - **matlabDoc** — Documentation on how to program MIM Extensions using MATLAB®.

Setting Up — Eclipse

Selecting a Workspace

A workspace is a directory where future MIM Extensions projects will be saved.

1. Launch **Eclipse**.
2. You will be prompted to select a Workspace location. Browse to and select the sampleWorkspace folder.
3. Click **Launch.** This will finish loading **Eclipse**.
4. Close the **Welcome** page to reveal the default interface.

Importing an Existing Extension/Project into the Workspace

Selecting the **sampleWorkspace** folder does not actually import any projects into the workspace. The projects must be imported manually.

1. Click **File** and select **Import…**
2. Expand **General** and select **Existing Projects into Workspace**.
3. Click **Next**.
4. Click **Browse** next to **Select root directory**.
5. Navigate to the **sampleWorkspace** folder and click **Open**.
    a. You now should see all of the sample MIM Extensions Java Projects listed under **Projects**.
6. Make sure all the projects you want to import are selected and click **Finish**.
    a. You should now see all the selected projects under **Package Explorer**.

NOTE: Any or all sample MIM Extensions can be selected at this time. Please import javaSkeletalectomy.

Editing MIM Extensions

Once the project has been imported, you can modify the source code in **Eclipse**.

1. Expand the project you want to edit in the **Package Explorer**.
2. Expand the **src** folder.
3. Expand the **java package**.
4. Double-click to open the appropriate source code file. This file should have a file extension of **java**.

EXAMPLE: javaSkeletalectomy/src/sample/control/Skeletalectomy.java

5. Now you should see the source code of the extension and have the ability to edit it.

TIP: Make extensive use of the documentation included in the MIM Extensions SDK download in order to build your own MIM Extensions.

Building and Installing an Extension

After you have finished editing the source code of your extension, you must build your extension. Apache Ant is used to automate the build process. Apache Ant makes sure the source code is compiled into an extension and then moved into the correct MIM Extensions folder. See the table below for the locations of the MIM Extensions folder:

OS	MIM Extensions Folder
Windows	C:/ProgramData/MIM/extensions
Mac	Library/Application Support/MIM/extensions

Follow the steps below to build and install an extension:

1. Expand the project you want to build in the **Package Explorer**.
2. Right-click **build.xml**.
3. Select **Run As**.
4. Select **1 Ant Build**.

NOTE: Text will display in the Console View indicating the extension is currently being built.

5. The **Console View** will display **[java] Successfully copied extension to extension dir**. This means the build process has finished and the extension has been copied to the MIM Extensions folder. The extension will be a **zip** file.

Running an Extension

Session-based extensions can be manually launched from the MIM Toolbar or automatically launched through a MIM Workflow (even if that workflow is normally launched by MIM Assistant). Patient-list extensions can be launched manually from a patient list or automatically from a MIM Assistant rule. Message-based extensions can be automatically launched upon receiving an HL7 message. (See the *MIM Assistant User Guide* for additional details.)

To run a session-based extension from the MIM Toolbar, follow these steps:

1. Launch MIM.
2. **Skeletalectomy**, the sample extension we will run, requires a CT. Load any CT into a Session from a **Patient Data Source**.
3. If you have not used MIM Extensions before, you will need to add the MIM Extensions tool  to your toolbar. Click the gear icon  to the right of the toolbar and find and select the **Launch Extension** option.

   Then, launch the extension by clicking the MIM Extensions tool  in the toolbar.
4. After clicking the MIM Extensions icon, you will see the **Extension Launcher** window. This is where all installed extensions are listed along with extra information about each extension.
5. Select the extension you want to run from the list and click **Launch Extension**. For this example, select **Skeletalectomy**.
6. The **Variable Setup** window will appear. Assign the appropriate values to the variables.
   a. Each extension may have a different number of variables and the type of data they represent may be different.
   b. The **Skeletalectomy** extension requires one CT. We need to choose which CT will be used out of all the other series currently loaded in our session.
3. After mapping a value to each of the extension variables, click **OK**.
4. The extension will run and finish.

NOTE: The Skeletalectomy extension creates a new CT image from an initial CT image. Any voxels in the initial CT that have a value less than bone (400 HU) are replaced by air (-1024 HU) in the new CT image.

Editing and Rerunning the Skeletalectomy Extension

1. Follow the steps above to edit the **javaSkeletalectomy** extension.
2. Find the following code inside the section that loops over all of the voxels in the image:

```
float value = array.getFloatValue(point);
if(value < 400) {
        array.setValue(point, -1024); //if a voxel is less than bone, set it to air
}
```

3. The if-statement conditional, value < 400, compares the HU value of the voxel currently being evaluating to 400 HU (the density of bone). If the voxel's HU value is less than 400, the extension will then replace the voxel's HU value with -1024 (the density of air).
4. You can edit this extension by changing -1024 (the density of air) to 0 (the density of water).
5. Saving the file should automatically rebuild the extension. If it doesn't, you can build the extension as explained in the Building and Installing an Extension section of this document.

NOTE: When an extension is edited and rebuilt, it will overwrite the existing version.

6. After the extension has been successfully built, re-run the **Skeletalectomy** extension.
7. After the extension has run, a new image will be created. This image will change the original non-bone values to water density.