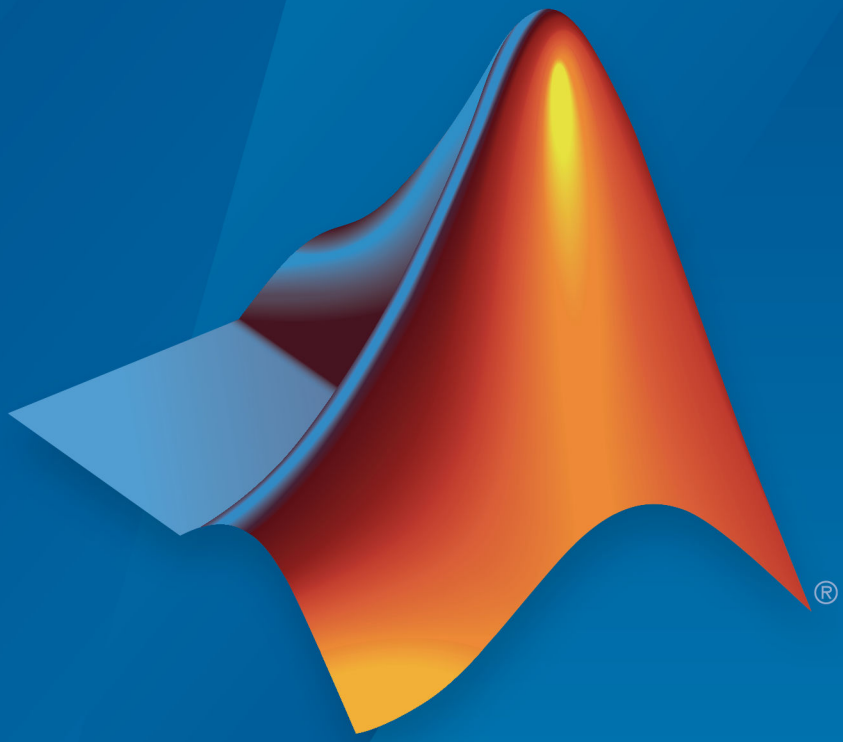
MATLAB® Compiler SDK™

MATLAB® Code Deployment Guide



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MATLAB® Compiler SDK™ MATLAB® Code Deployment Guide

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Overview

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- “MEX-Files, DLLs, or Shared Libraries” on page 1-3
- “Dependency Analysis” on page 1-4
- “Deployable Archive” on page 1-6

How Does MATLAB Deploy Functions?

To deploy MATLAB functions, the compiler performs these tasks:

1. Analyzes files for dependencies using a dependency analysis function. Dependencies affect deployability and originate from functions called by the file. Deployability is affected by:

   - File type — MATLAB, Java®, MEX, and so on.
   - File location — MATLAB, MATLAB toolbox, user code, and so on.

   For more information about how the compiler does dependency analysis, see “Dependency Analysis” on page 1-4.

2. Validates MEX-files. In particular, `mexFunction` entry points are verified.

   For more details about MEX-file processing, see “MEX-Files, DLLs, or Shared Libraries” on page 1-3.

3. Creates a deployable archive from the input files and their dependencies.

   For more details about deployable archives see “Deployable Archive” on page 1-6.

4. Generates target-specific wrapper code.

5. Generates target-specific binary package.

   For library targets such as C++ shared libraries, Java packages, or .NET assemblies, the compiler invokes the required third-party compiler.

MEX-Files, DLLs, or Shared Libraries

When you compile MATLAB functions containing MEX-files, ensure that the dependency analyzer can find them. Doing so allows you to avoid many common compilation problems. In particular, note that:

- Since the dependency analyzer cannot examine MEX-files, DLLs, or shared libraries to determine their dependencies, explicitly include all executable files these files require. To do so, use either the `mcc -a` option or the **Files required for your application to run** field in the compiler app.
- If you have any doubts that the dependency analyzer can find a MATLAB function called by a MEX-file, DLL, or shared library, then manually include that function. To do so, use either the `mcc -a` option or the **Files required for your application to run** field in the compiler app.
- Not all functions are compatible with the compiler. Check the file `mccExcludedFiles.log` after your build completes. This file lists all functions called from your application that you cannot deploy.

Dependency Analysis

In this section...
“Function Dependency” on page 1-4 “Data File Dependency” on page 1-4

MATLAB Compiler™ uses a dependency analysis function to determine the list of necessary files to include in the generated package. Sometimes, this process generates a large list of files, particularly when MATLAB object classes exist in the compilation and the dependency analyzer cannot resolve overloaded methods at package time. Dependency analysis also processes `include`/`exclude` files on each pass.

Tip To improve package time performance and lessen application size, prune the path with the `mcc` command’s `-N` and `-p` flags. You can also specify **Files required for your application** in the compiler app.

Function Dependency

The dependency analyzer searches for executable content such as:

- MATLAB files
- P-files

  Note If the MATLAB file corresponding to the p-file is not available, the dependency analysis cannot determine the p-file’s dependencies.
- `.fig` files
- MEX-files

Data File Dependency

In addition to executable content listed above, MATLAB Compiler can detect and automatically include files that your MATLAB functions access by calling any of these functions: `audioinfo`, `audioread`, `csvread`, `daqread`, `dlmread`, `fileread`, `fopen`, `imfinfo`, `importdata`, `imread`, `load`, `matfile`, `mmfileinfo`, `open`, `readtable`, `type`, `VideoReader`, `xlsfinfo`, `xlsread`, `xmlread`, and `xslt`.

If you are using the compiler app, these data files are automatically added to the **Files required for your application to run** area of the app.

See Also

`applicationCompiler` | `mcc`

More About

- Application Compiler

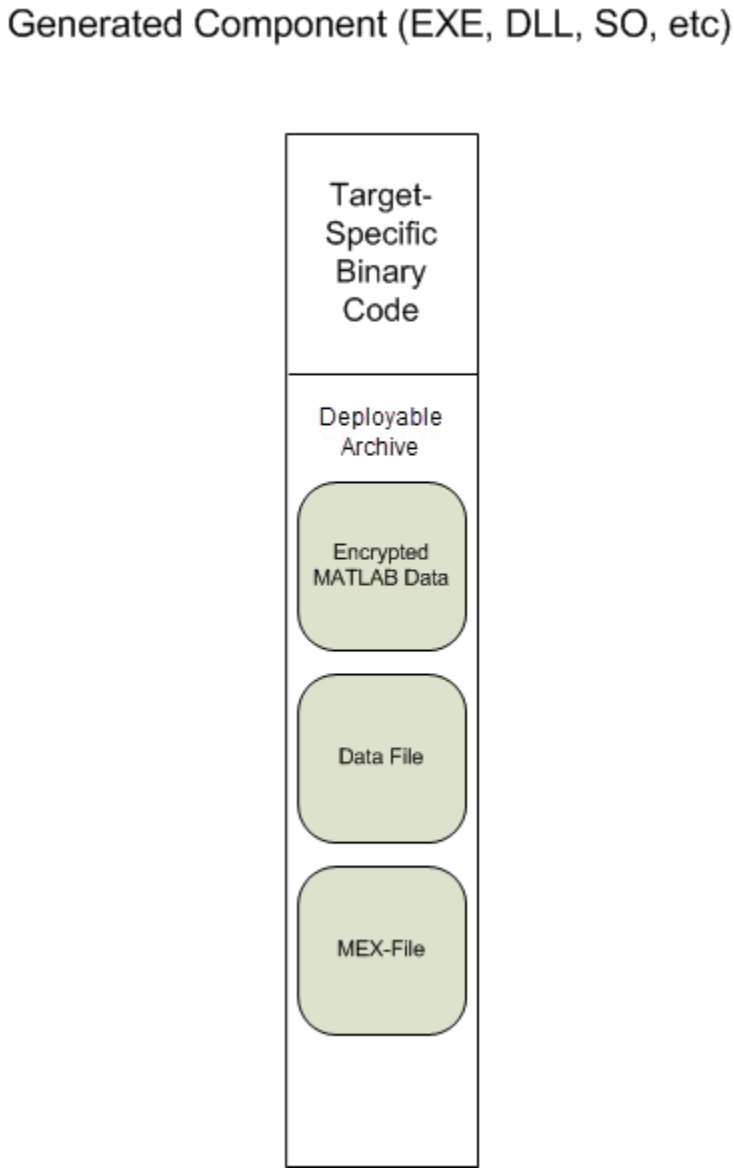
Deployable Archive

Each application or shared library you produce using the compiler has an embedded deployable archive. The archive contains all the MATLAB based content (MATLAB files, MEX-files, and so on). All MATLAB files in the deployable archive are encrypted using the Advanced Encryption Standard (AES) cryptosystem.

If you choose to extract the deployable archive as a separate file, the files remain encrypted. For more information on how to extract the deployable archive refer to the references in the following table.

Information on Deployable Archive Embedding/Extraction and Component Cache

Product	Refer to
MATLAB Compiler SDK C/C++ integration	“MATLAB Runtime Component Cache and Deployable Archive Embedding”
MATLAB Compiler SDK .NET integration	“MATLAB Runtime Component Cache and Deployable Archive Embedding”
MATLAB Compiler SDK Java integration	“Deployable Archive Embedding and Extraction”
MATLAB Compiler Excel® integration	“MATLAB Runtime Component Cache and Deployable Archive Embedding” (MATLAB Compiler)


Generated Component (EXE, DLL, SO, etc)
Target-Specific Binary Code
Deployable Archive
Encrypted MATLAB Data
Data File
MEX-File

Additional Details

Multiple deployable archives, such as those generated with COM components, .NET assemblies, or Excel add-ins, can coexist in the same user application. You cannot, however, mix and match the MATLAB files they contain. You cannot combine encrypted and compressed MATLAB files from multiple deployable archives into another deployable archive and distribute them.

All the MATLAB files from a given deployable archive associate with a unique cryptographic key. MATLAB files with different keys, placed in the same deployable archive, do not execute. If you want to generate another application with a different mix of MATLAB files, recompile these MATLAB files into a new deployable archive.

The compiler deletes the deployable archive and generated binary following a failed compilation, but only if these files did not exist before compilation initiates. Run `help mcc -K` for more information.

Caution Release Engineers and Software Configuration Managers: Do not use build procedures or processes that strip shared libraries on deployable archives. If you do, you can possibly strip the deployable archive from the binary, resulting in run-time errors for the driver application.

Write Deployable MATLAB Code

- “Write Deployable MATLAB Code” on page 2-2
- “State-Dependent Functions” on page 2-6
- “Calling Shared Libraries in Deployed Applications” on page 2-9
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Write Deployable MATLAB Code

In this section...
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“Packaged Applications Do Not Process MATLAB Files at Run Time” on page 2-2
“Do Not Rely on Changing Directory or Path to Control the Execution of MATLAB Files” on page 2-3
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“Do Not Create or Use Nonconstant Static State Variables” on page 2-4
“Get Proper Licenses for Toolbox Functionality You Want to Deploy” on page 2-5

Packaged Applications Require Functions

Applications implemented with MATLAB Compiler SDK and MATLAB Production Server™ access MATLAB code through APIs generated from MATLAB functions. All MATLAB code packaged for use in these applications must be written as a MATLAB function.

Packaged Applications Do Not Process MATLAB Files at Run Time

The compiler secures your code against unauthorized changes. Deployable MATLAB files are suspended or frozen at the time of compilation. This does not mean that you cannot deploy a flexible application—it means that *you must design your application with flexibility in mind*. If you want the end user to be able to choose between two different methods, for example, both methods must be available in the deployable archive.

The MATLAB Runtime only works on MATLAB code that was encrypted when the deployable archive was built. Any function or process that dynamically generates new MATLAB code will not work against the MATLAB Runtime.

Some MATLAB toolboxes, such as the Deep Learning Toolbox™ product, generate MATLAB code dynamically. Because the MATLAB Runtime only executes encrypted MATLAB files, and the Deep Learning Toolbox generates unencrypted MATLAB files, some functions in the Deep Learning Toolbox cannot be deployed.

Similarly, functions that need to examine the contents of a MATLAB function file cannot be deployed. HELP, for example, is dynamic and not available in deployed mode. You can use LOADLIBRARY in deployed mode if you provide it with a MATLAB function prototype.

Instead of compiling the function that generates the MATLAB code and attempting to deploy it, perform the following tasks:

1. Run the code once in MATLAB to obtain your generated function.
2. Package the MATLAB code, including the generated function.

Tip Another alternative to using EVAL or FEVAL is using anonymous function handles.

If you require the ability to create MATLAB code for dynamic run-time processing, your end users must have an installed copy of MATLAB.

Do Not Rely on Changing Directory or Path to Control the Execution of MATLAB Files

In general, good programming practices advise against redirecting a program search path dynamically within the code. Many developers are prone to this behavior since it mimics the actions they usually perform on the command line. However, this can lead to problems when deploying code.

For example, in a deployed application, the MATLAB and Java paths are fixed and cannot change. Therefore, any attempt to change these paths (using the `cd` command or the `addpath` command) fails.

If you find you cannot avoid placing `addpath` calls in your MATLAB code, use `ismcc` and `isdeployed`. See “Use isdeployed Functions To Execute Deployment-Specific Code Paths” on page 2-3 for details.

Use isdeployed Functions To Execute Deployment-Specific Code Paths

The `isdeployed` function allows you to specify which portion of your MATLAB code is deployable, and which is not. Such specification minimizes your compilation errors and helps create more efficient, maintainable code.

For example, you find it unavoidable to use `addpath` when writing your `startup.m`. Using `ismcc` and `isdeployed`, you specify when and what is packaged and executed.

Gradually Refactor Applications That Depend on Noncompilable Functions

Over time, refactor, streamline, and modularize MATLAB code containing non-compilable or non-deployable functions that use `isdeployed`. Your eventual goal is “graceful degradation” of non-deployable code. In other words, the code must present the end user with as few obstacles to deployment as possible until it is practically eliminated.

Partition your code into design-time and run-time code sections:

- Design-time code is code that is currently evolving. Almost all code goes through a phase of perpetual rewriting, debugging, and optimization. In some toolboxes, such as the Deep Learning Toolbox product, the code goes through a period of self-training as it reacts to various data permutations and patterns. Such code is almost never designed to be deployed.
- Run-time code, on the other hand, has solidified or become stable—it is in a finished state and is ready to be deployed by the end user.

Consider creating a separate directory for code that is not meant to be deployed or for code that calls undeployable code.

Do Not Create or Use Nonconstant Static State Variables

Avoid using the following:

- Global variables in MATLAB code
- Static variables in MEX-files
- Static variables in Java code

The state of these variables is persistent and shared with everything in the process.

When deploying applications, using persistent variables can cause problems because the MATLAB Runtime process runs in a single thread. You cannot load more than one of these non-constant, static variables into the same process. In addition, these static variables do not work well in multithreaded applications.

When programming against packaged MATLAB code, you should be aware that an instance of the MATLAB Runtime is created for each instance of a new class. If the same class is instantiated again using a different variable name, it is attached to the MATLAB Runtime created by the previous instance of the same class. In short, if an assembly contains *n* unique classes, there will be maximum of *n* instances of MATLAB Runtime created, each corresponding to one or more instances of one of the classes.

If you must use static variables, bind them to instances. For example, defining instance variables in a Java class is preferable to defining the variable as `static`.

Get Proper Licenses for Toolbox Functionality You Want to Deploy

You must have a valid MathWorks® license for toolboxes you use to create deployable MATLAB code.

See Also

`isdeployed` | `ismcc`

More About

- MATLAB Compiler support for MATLAB and toolboxes

State-Dependent Functions

MATLAB code that you want to deploy often carries state—a specific data value in a program or program variable.

Does My MATLAB Function Carry State?

Example of carrying state in a MATLAB program include, but are not limited to:

- Modifying or relying on the MATLAB path and the Java class path
- Accessing MATLAB state that is inherently persistent or global. Some example of this include:
  - Random number seeds
  - Handle Graphics® root objects that retain data
  - MATLAB or MATLAB toolbox settings and preferences
- Creating global and persistent variables.
- Loading MATLAB objects (MATLAB classes) into MATLAB. If you access a MATLAB object in any way, it loads into MATLAB.
- Calling MEX files, Java methods, or C# methods containing static variables.

Defensive Coding Practices

If your MATLAB function not only carries state, but *relies on it* for your function to properly execute, you must take additional steps (listed in this section) to ensure state retention.

When you deploy your application, consider cases where you carry state, and safeguard against that state's corruption if needed. *Assume* that your state may be changed and code defensively against that condition.

The following are examples of "defensive coding" practices:

Reset System-Generated Values in the Deployed Application

If you are using a random number seed, for example, reset it in your deployed application program to ensure the integrity of your original MATLAB function.

Validate Global or Persistent Variable Values

If you must use global or persistent variables, always validate their value in your deployed application and reset if needed.

Ensure Access to Data Caches

If your function relies on cached replies to previous requests, for instance, ensure your deployed system and application has access to that cache outside of the MATLAB environment.

Use Simple Data Types When Possible

Simple data types are usually not tied to a specific application and means of storing state. Your options for choosing an appropriate state-preserving tool increase as your data types become less complicated and specific.

Avoid Using MATLAB Callback Functions

Avoid using MATLAB callbacks, such as `timer`. Callback functions have the ability to interrupt and override the current state of the MATLAB Production Server worker and may yield unpredictable results in multiuser environments.

Techniques for Preserving State

The most appropriate method for preserving state depends largely on the type of data you need to save.

- Databases provide the most versatile and scalable means for retaining stateful data. The database acts as a generic repository and can generally work with any application in an enterprise development environment. It does not impose requirements or restrictions on the data structure or layout. Another related technique is to use comma-delimited files, in applications such as Microsoft® Excel.
- Data that is specific to a third-party programming language, such as Java and C#, can be retained using a number of techniques. Consult the online documentation for the appropriate third-party vendor for best practices on preserving state.

Caution Using MATLAB `LOAD` and `SAVE` functions is often used to preserve state in MATLAB applications and workspaces. While this may be successful in some

circumstances, it is highly recommended that the data be validated and reset if needed, if not stored in a generic repository such as a database.

Calling Shared Libraries in Deployed Applications

The `loadlibrary` function in MATLAB allows you to load shared library into MATLAB.

Loading libraries using header files is not supported in compiled applications. Therefore, to create an application that uses the `loadlibrary` function with a header file, follow these steps:

1. Create a prototype MATLAB file. Suppose that you call `loadlibrary` with the following syntax.

   ```
   loadlibrary(library, header)
   ```

   Run the following command in MATLAB only once to create the prototype file:

   ```
   loadlibrary(library, header, 'mfilename', 'mylibrarymfile');
   ```

   This creates *`mylibrarymfile`*`.m` in the current folder. If you are on Windows®, another file named `library_thunk_pcwin64.dll` is also created in the current folder.
2. Change the call to `loadlibrary` in your MATLAB to the following:

   ```
   loadlibrary(library, @mylibrarymfile)
   ```
3. Compile and deploy the application.

   - If you are integrating the library into a deployed application, specify the library's `.dll` along with `library_thunk_pcwin64.dll`, if created, using the `-a` option of `mcc` command. If you are using Application Compiler or Library Compiler apps, add the `.dll` files to the **Files required for your application to run** section of the app.
   - If you are providing the library as an external file that is not integrated with the deployed application, place the library `.dll` file in the same folder as the compiled application. If you are on Windows, you must integrate `library_thunk_pcwin64.dll` into your compiled application.

     The benefit of this approach is that you can replace the library with an updated version without recompiling the deployed application. Replacing the library with a different version works only if the function signatures of the function in the library are not altered. This is because *`mylibrarymfile`*`.m` and `library_thunk_pcwin64.dll` are tied to the function signatures of the functions in the library.

Note You cannot use `loadlibrary` inside MATLAB to load a shared library built with MATLAB. For more information on `loadlibrary`, see “Limitations to Shared Library Support” (MATLAB).

Note Operating systems have a `loadlibrary` function, which loads specified Windows operating system module into the address space of the calling process.

See Also

`loadlibrary`

Related Examples

- “Call C Functions in Shared Libraries” (MATLAB)

MATLAB Data Files in Compiled Applications

In this section...
“Explicitly Including MATLAB Data files Using the %#function Pragma” on page 2-11 “Load and Save Functions” on page 2-11

Explicitly Including MATLAB Data files Using the %#function Pragma

The compiler excludes MATLAB data files (MAT-files) from dependency analysis by default. See “Dependency Analysis” on page 1-4.

If you want the compiler to explicitly inspect data within a MAT file, you need to specify the `%#function` pragma when writing your MATLAB code.

For example, if you are creating a solution with Deep Learning Toolbox, you need to use the `%#function` pragma within your code to include a dependency on the `gmdistribution` class, for instance.

Load and Save Functions

If your deployed application uses MATLAB data files (MAT-files), it is helpful to code `LOAD` and `SAVE` functions to manipulate the data and store it for later processing.

- Use `isdeployed` to determine if your code is running in or out of the MATLAB workspace.
- Specify the data file by either using `WHICH` (to locate its full path name) define it relative to the location of `ctfroot`.
- All MAT-files are unchanged after `mcc` runs. These files are not encrypted when written to the deployable archive.

For more information about deployable archives, see “Deployable Archive” on page 1-6.

See the `ctfroot` reference page for more information about `ctfroot`.

Use the following example as a template for manipulating your MATLAB data inside, and outside, of MATLAB.

Using Load/Save Functions to Process MATLAB Data for Deployed Applications

The following example specifies three MATLAB data files:

- `user_data.mat`
- `userdata\extra_data.mat`
- `..\externdata\extern_data.mat`

1. Navigate to *`matlab_root`*`\extern\examples\compiler\Data_Handling`.
2. Compile `ex_loadsave.m` with the following `mcc` command:

```
mcc -mv ex_loadsave.m -a 'user_data.mat' -a
     '.\userdata\extra_data.mat' -a
     '..\externdata\extern_data.mat'
```

ex_loadsave.m

```
function ex_loadsave
% This example shows how to work with the
% "load/save" functions on data files in
% deployed mode. There are three source data files
% in this example.
%    user_data.mat
%    userdata\extra_data.mat
%    ..\externdata\extern_data.mat
%
% Compile this example with the mcc command:
%     mcc -m ex_loadsave.m -a 'user_data.mat' -a
%     '.\userdata\extra_data.mat'
%         -a '..\externdata\extern_data.mat'
% All the folders under the current main MATLAB file directory will
%    be included as
% relative path to ctfroot; All other folders will have the
%    folder
% structure included in the deployable archive file from root of the
%     disk drive.
%
% If a data file is outside of the main MATLAB file path,
%     the absolute path will be
% included in deployable archive and extracted under ctfroot. For example:
%   Data file
%     "c:\$matlabroot\examples\externdata\extern_data.mat"
%     will be added into deployable archive and extracted to
%  "$ctfroot\$matlabroot\examples\externdata\extern_data.mat".
%
% All mat/data files are unchanged after mcc runs. There is
% no encryption on these user included data files. They are
% included in the deployable archive.
%
% The target data file is:
%   .\output\saved_data.mat
```

```
%   When writing the file to local disk, do not save any files
%    under ctfroot since it may be refreshed and deleted
%   when the application isnext started.

%==== load data file ============================
if isdeployed
    % In deployed mode, all file under CTFRoot in the path are loaded
    % by full path name or relative to $ctfroot.
    % LOADFILENAME1=which(fullfile(ctfroot,mfilename,'user_data.mat'));
    % LOADFILENAME2=which(fullfile(ctfroot,'userdata','extra_data.mat'));
    LOADFILENAME1=which(fullfile('user_data.mat'));
    LOADFILENAME2=which(fullfile('extra_data.mat'));
    % For external data file, full path will be added into deployable archive;
    % you don't need specify the full path to find the file.
    LOADFILENAME3=which(fullfile('extern_data.mat'));
else
    %running the code in MATLAB
    LOADFILENAME1=fullfile(matlabroot,'extern','examples','compiler',
                                     'Data_Handling','user_data.mat');
    LOADFILENAME2=fullfile(matlabroot,'extern','examples','compiler',
                               'Data_Handling','userdata','extra_data.mat');
    LOADFILENAME3=fullfile(matlabroot,'extern','examples','compiler',
                                      'externdata','extern_data.mat');
end

% Load the data file from current working directory
disp(['Load A from : ',LOADFILENAME1]);
load(LOADFILENAME1,'data1');
disp('A= ');
disp(data1);

% Load the data file from sub directory
disp(['Load B from : ',LOADFILENAME2]);
load(LOADFILENAME2,'data2');
disp('B= ');
disp(data2);

% Load extern data outside of current working directory
disp(['Load extern data from : ',LOADFILENAME3]);
load(LOADFILENAME3);
disp('ext_data= ');
disp(ext_data);

%==== multiple the data matrix by 2 ==============
result = data1*data2;
disp('A * B = ');
disp(result);

%==== save  the new data to a new file ===========
SAVEPATH=strcat(pwd,filesep,'output');
if ( ~isdir(SAVEPATH))
    mkdir(SAVEPATH);
end
SAVEFILENAME=strcat(SAVEPATH,filesep,'saved_data.mat');
```

```
disp(['Save the A * B result to : ',SAVEFILENAME]);
save(SAVEFILENAME, 'result');
```

Share MATLAB Runtime Instances

In this section...
“What Is a Singleton MATLAB Runtime?” on page 2-15 “Advantages and Disadvantages of Using a Singleton” on page 2-15

What Is a Singleton MATLAB Runtime?

You create an instance of the MATLAB Runtime that can be shared among all subsequent class instances within a component. This is commonly called a shared MATLAB Runtime instance or a Singleton runtime.

Advantages and Disadvantages of Using a Singleton

In most cases, a singleton MATLAB Runtime will provide many more advantages than disadvantages. Following are examples of when you might and might not create a shared MATLAB Runtime instance.

When You Should Use a Singleton

If you have multiple users running from a specific instance of MATLAB, using a singleton will most likely:

- Utilize system memory more efficiently
- Decrease MATLAB Runtime start-up or initialization time

When You Might Avoid Using a Singleton

Using a singleton may not benefit you if your application uses a large number of global variables. This causes crosstalk.

Package a C/C++ Shared Library

- “Install an ANSI C or C++ Compiler” on page 3-2
- “Create a C Shared Library with MATLAB Code” on page 3-4
- “Create a C++ Shared Library with MATLAB Code” on page 3-10
- “Create C/C++ Shared Libraries from Command Line” on page 3-16
- “Distribute C/C++ Shared Libraries to Application Developers” on page 3-19

Install an ANSI C or C++ Compiler

Install supported ANSI® C or C++ compiler on your system. Certain output targets require particular compilers.

To install your ANSI C or C++ compiler, follow vendor instructions that accompany your C or C++ compiler.

Note If you encounter problems relating to the installation or use of your ANSI C or C++ compiler, consult your C or C++ compiler vendor.

Supported ANSI C and C++ Windows Compilers

Use one of the following C/C++ compilers that create Windows dynamically linked libraries (DLLs) or Windows applications:

- Microsoft Visual C++® (MSVC).
  - The only compiler that supports the building of COM objects and Excel plug-ins is Microsoft Visual C++.
  - The only compiler that supports the building of .NET objects is Microsoft Visual C# Compiler for the Microsoft .NET Framework.
- Microsoft Windows SDK 7.1

Note For an up-to-date list of all the compilers supported by MATLAB, see the MathWorks Technical Support notes at https://www.mathworks.com/support/compilers/current_release/

Supported ANSI C and C++ UNIX Compilers

MATLAB Compiler and MATLAB Compiler SDK support the native system compilers on:

- Linux®
- Linux x86-64
- Mac OS X

MATLAB Compiler and MATLAB Compiler SDK supports `gcc` and `g++`.

Common Installation Issues and Parameters

When you install your C or C++ compiler, you sometimes encounter requests for additional parameters. The following tables provide information about common issues occurring on Windows and UNIX® systems where you sometimes need additional input or consideration.

Windows Operating System

Issue	Comment
Installation options	(Recommended) Full installation.
Installing debugger files	For the purposes of MATLAB Compiler and MATLAB Compiler sdk, it is not necessary to install debugger (DBG) files.
Microsoft Foundation Classes (MFC)	Not needed.
16-bit DLLs	Not needed.
ActiveX®	Not needed.
Running from the command line	Make sure that you select all relevant options for running your compiler from the command line.
Updating the registry	If your installer gives you the option of updating the registry, perform this update.
Installing Microsoft Visual C++ Version 6.0	To change the install location of the compiler, change the location of the `Common` folder. Do not change the location of the `VC98` folder from its default setting.

UNIX Operating System

Issue	Comment
Determine which C or C++ compiler is available on your system.	See your system administrator.
Determine the path to your C or C++ compiler.	See your system administrator.
Installing on `Maci64`	Install X code from installation DVD.

Create a C Shared Library with MATLAB Code

Supported platform: Windows, Linux, Mac

This example shows how to create a C shared library using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Functions in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, open `addmatrix.m`, `multiplymatrix.m`, and `eigmatrix.m` located in *`matlabroot`*`\extern\examples\compilersdk\c_cpp\matrix`.

`addmatrix.m`

```
function a = addmatrix(a1, a2)
%ADDMATRIX Add two matrices
%    This function adds the two matrices passed as input. This function is
%    used to demonstrate the functionality of MATLAB Compiler SDK. Refer to the
%    documentation for MATLAB Compiler SDK C/C++ shared library for more information.

% Copyright 2003-2017 The MathWorks, Inc.

a = a1 + a2;
```

At the MATLAB command prompt, enter `addmatrix([1 4 7; 2 5 8; 3 6 9], [1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
     2     8    14
     4    10    16
     6    12    18
```

`multiplymatrix.m`

```
function m = multiplymatrix(a1, a2)
%MULTIPLYMATRIX Multiplies two matrices
%    This function multiplies the two matrices passed as input. This
%    function is used to demonstrate the functionality of MATLAB Compiler SDK.
%    Refer to the MATLAB Compiler SDK C/C++ shared library documentation for more
```

```
%    information.

% Copyright 2003-2016 The MathWorks, Inc.

m =  a1*a2;
```

At the MATLAB command prompt, enter `multiplymatrix([1 4 7; 2 5 8; 3 6 9], [1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
    30    66   102
    36    81   126
    42    96   150
```

eigmatrix.m

```
function e = eigmatrix(a1)
%EIGMATRIX Returns the eigenvalues of the given matrix
%    This function returns the eigenvalues of the input matrix. This
%    function is used to demonstrate the functionality of MATLAB Compiler SDK.
%    Refer to the MATLAB Compiler SDK C/C++ shared library documentation for more
%    information.

% Copyright 2003-2016 The MathWorks, Inc.

    try
        %Tries to calculate the eigenvalues and return them.
        e = eig(a1);
    catch
        %Returns a -1 on error.
        e = -1;
end
```

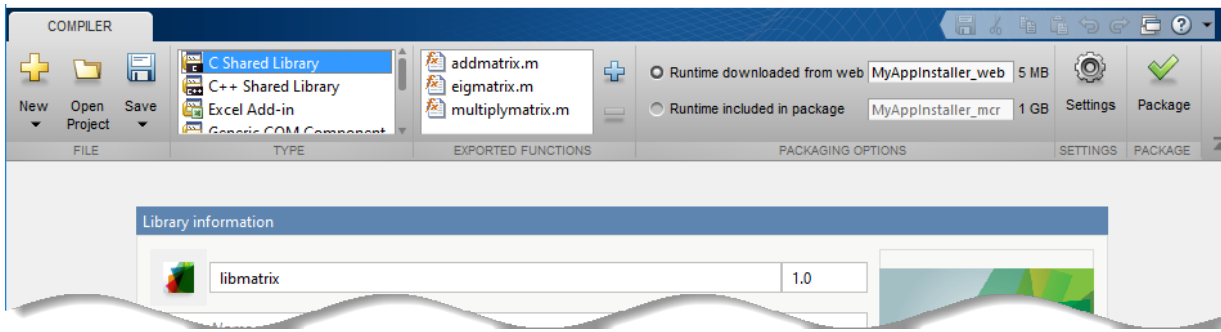
At the MATLAB command prompt, enter `eigmatrix([1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
   16.1168
   -1.1168
   -0.0000
```

Create a C Shared Library Using the Library Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **C Shared Library**.



   Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

   Add all three functions to the list of main files.

3. Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4 In the **Library Name** field, rename the packaged shared library as `libmatrix`. The same name is followed through in the implementation of the shared library.

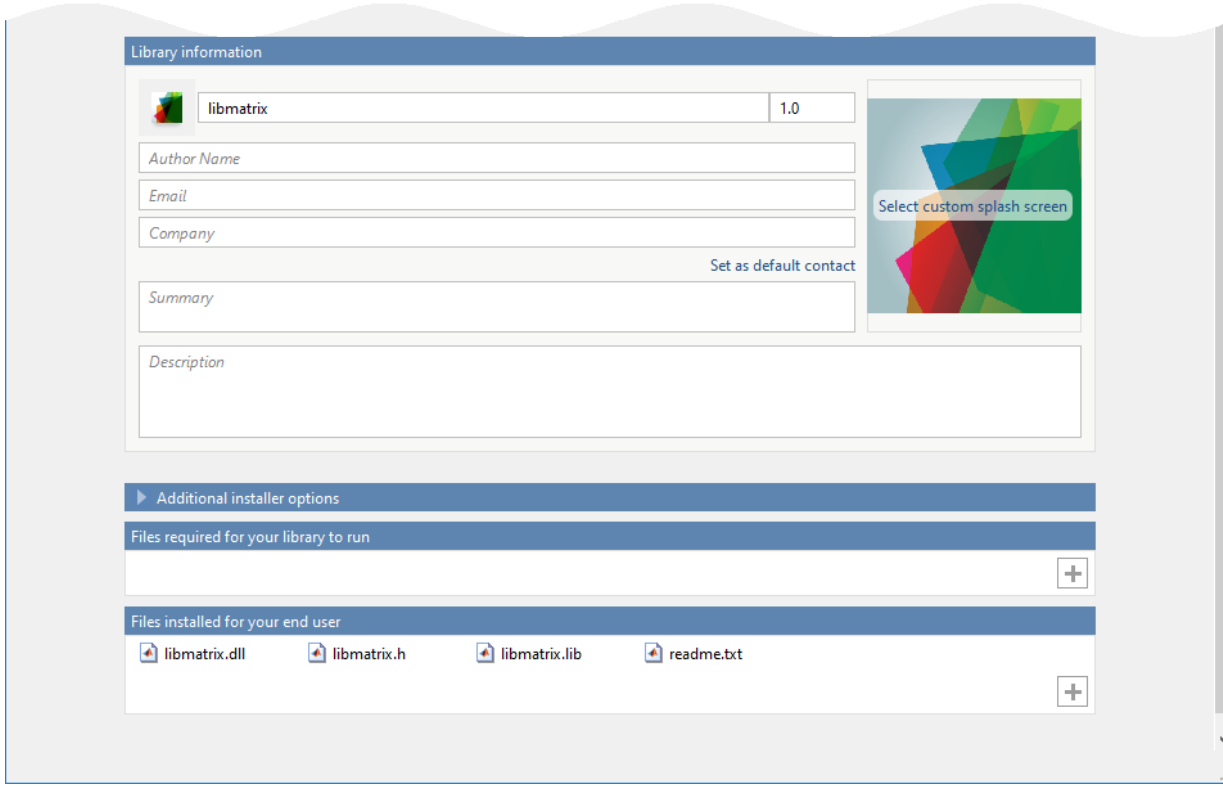
Customize the Application and Its Appearance

You can customize the installer, customize your application, and add more information about the application as follows:

- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.
- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

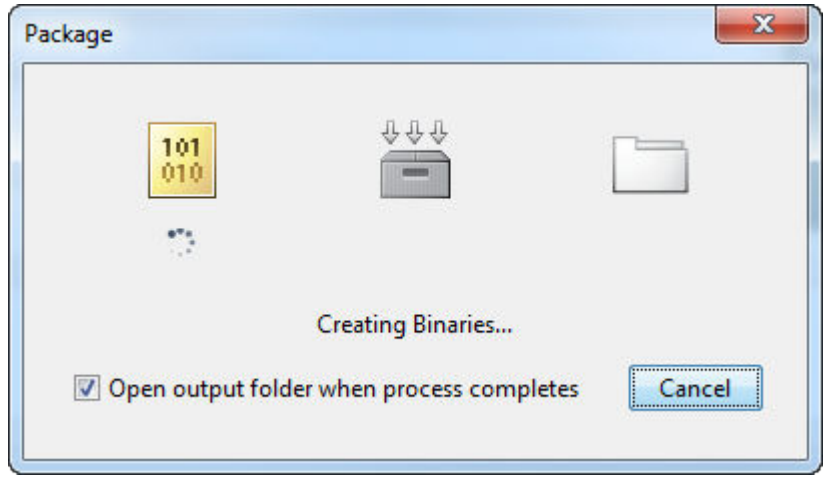
  See “Specify Files to Install with Application”



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

See Also

`deploytool` | `libraryCompiler` | `mcc`

Related Examples

- “Create C/C++ Shared Libraries from Command Line” on page 3-16
- “Implement a C Shared Library with a Driver Application”

Create a C++ Shared Library with MATLAB Code

Supported platform: Windows, Linux, Mac

This example shows how to create a C++ shared library using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Functions in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, open `addmatrix.m`, `multiplymatrix.m`, and `eigmatrix.m` located in *`matlabroot`*`\extern\examples\compilersdk\c_cpp`.

`addmatrix.m`

```
function a = addmatrix(a1, a2)
%ADDMATRIX Add two matrices
%    This function adds the two matrices passed as input. This function is
%    used to demonstrate the functionality of MATLAB Compiler SDK. Refer to the
%    documentation for MATLAB Compiler SDK C/C++ shared library for more information.

% Copyright 2003-2017 The MathWorks, Inc.

a = a1 + a2;
```

At the MATLAB command prompt, enter `addmatrix([1 4 7; 2 5 8; 3 6 9], [1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
     2     8    14
     4    10    16
     6    12    18
```

`multiplymatrix.m`

```
function m = multiplymatrix(a1, a2)
%MULTIPLYMATRIX Multiplies two matrices
%    This function multiplies the two matrices passed as input. This
%    function is used to demonstrate the functionality of MATLAB Compiler SDK.
%    Refer to the MATLAB Compiler SDK C/C++ shared library documentation for more
```

```
%    information.

% Copyright 2003-2016 The MathWorks, Inc.

m =  a1*a2;
```

At the MATLAB command prompt, enter `multiplymatrix([1 4 7; 2 5 8; 3 6 9], [1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
    30    66   102
    36    81   126
    42    96   150
```

eigmatrix.m

```
function e = eigmatrix(a1)
%EIGMATRIX Returns the eigenvalues of the given matrix
%    This function returns the eigenvalues of the input matrix. This
%    function is used to demonstrate the functionality of MATLAB Compiler SDK.
%    Refer to the MATLAB Compiler SDK C/C++ shared library documentation for more
%    information.

% Copyright 2003-2016 The MathWorks, Inc.

    try
        %Tries to calculate the eigenvalues and return them.
        e = eig(a1);
    catch
        %Returns a -1 on error.
        e = -1;
end
```

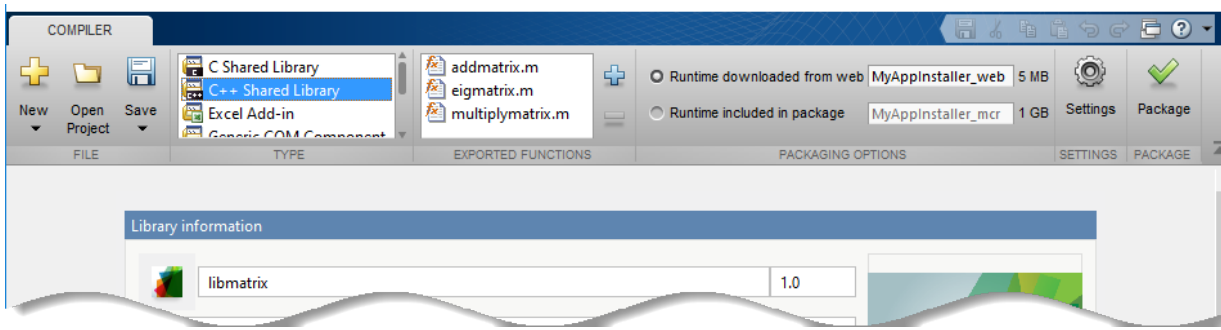
At the MATLAB command prompt, enter `eigmatrix([1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
   16.1168
   -1.1168
   -0.0000
```

Create a C++ Shared Library using the Library Compiler App

1 On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **C++ Shared Library**.



Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2 In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1 In the **Exported Functions** section of the toolstrip, click .

   2 In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

   Add all three functions to the list of main files.

3 Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4 In the **Library Name** field, rename the packaged shared library as `libmatrix`. The same name is followed through in the implementation of the shared library.

Customize the Application and Its Appearance

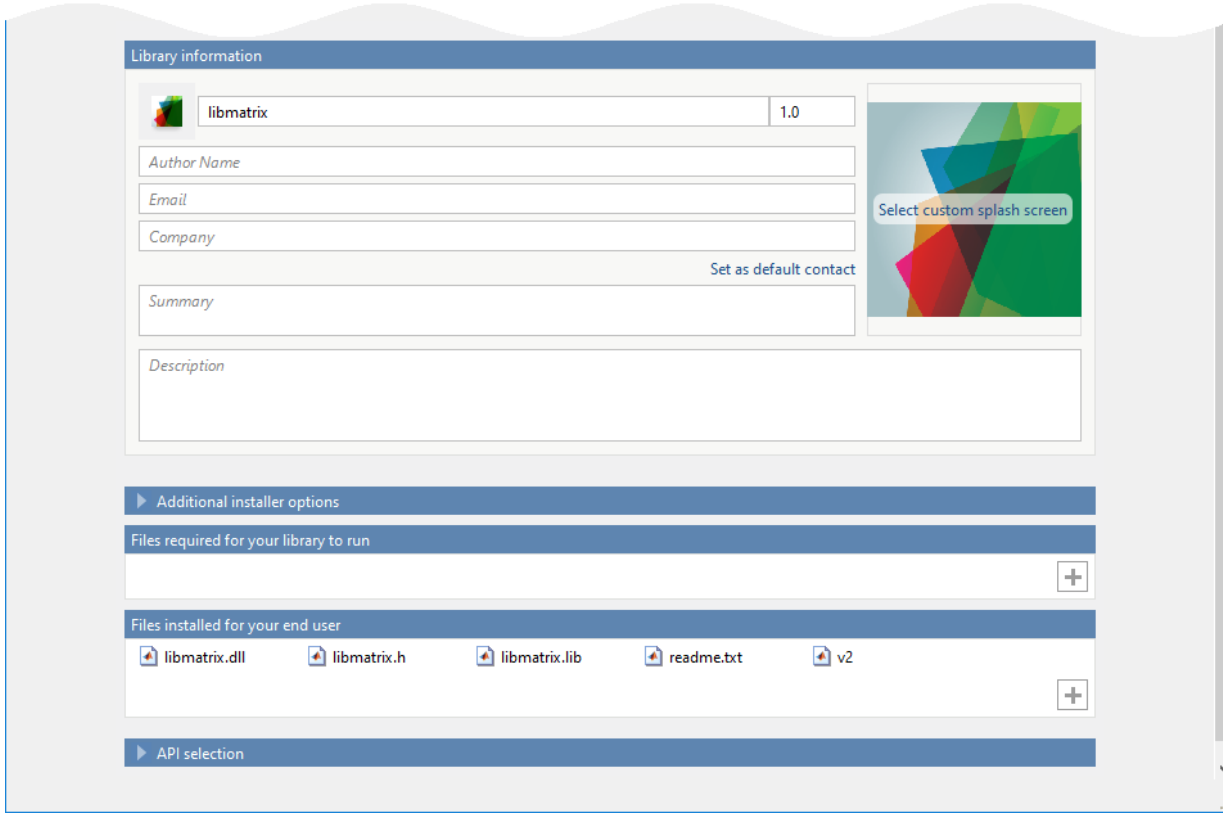
You can customize the installer, customize your application, and add more information about the application as follows:

- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.
- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

  See “Specify Files to Install with Application”

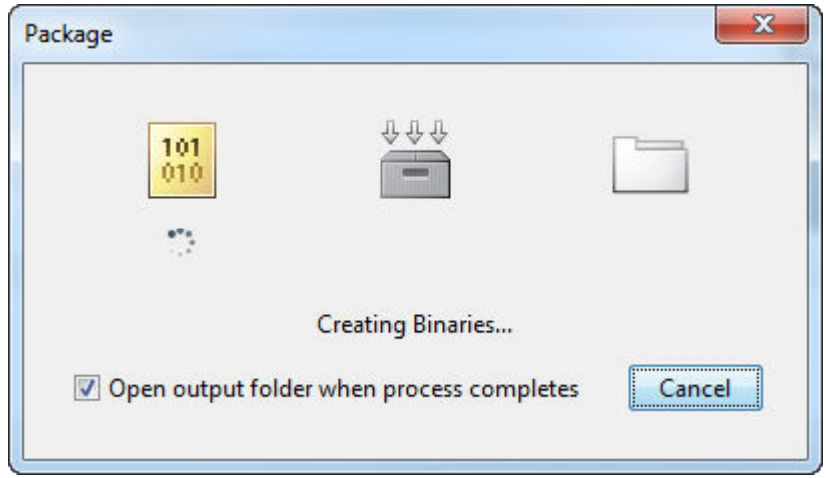
- **API selection** — You can select the type of API for the generated C++ shared libraries. For more information, see “API Selection for C++ Shared Library”.



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

See Also

`deploytool` | `libraryCompiler` | `mcc`

Related Examples

- “Implement a C++ mwArray API Shared Library with a Driver Application”
- “Implement a C++ MATLAB Data API Shared Library with a Driver Application”

Create C/C++ Shared Libraries from Command Line

In this section...
“Execute Compiler Projects with deploytool” on page 3-16
“Package a Shared Library with mcc” on page 3-16
“Differences Between Compiler Apps and Command Line” on page 3-17

You can package C/C++ applications at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Package a Shared Library with mcc

The `mcc` command invokes MATLAB Compiler to create a deployable application at the command prompt and provides fine-level control while packaging the application. It does not package the results in an installer.

To invoke the compiler to generate a library, use the `-l` flag with `mcc`. The `-l` flag creates a C/C++ shared library that you can integrate into applications developed in C or C++.

Use the following `mcc` options to package a shared library.

Option	Description
`-W lib:`*`libname`* `-T link:lib`	Generate a C shared library. Equivalent to using `-l`. The `-W lib:<libname>` option tells the compiler to generate a function wrapper for a shared library and call it `libname`. The `-T link:lib` option specifies the target output as a shared library. Note the directory where the product puts the shared library because you will need it later on.
`-W cpplib:`*`libname`* `-T link:lib`	Generate a C++ shared library. The `-W lib:<libname>` option tells the compiler to generate a function wrapper for a shared library and call it `libname`. The `-T link:lib` option specifies the target output as a shared library. Note the directory where the product puts the shared library because you will need it later on.
`-a` *`filePath`*	Add the file or files on the path to the generated binary.
`-d` *`outFolder`*	Specify the folder for the packaged applications.

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

- “Create a C Shared Library with MATLAB Code”
- “Create a C++ Shared Library with MATLAB Code”
- “Implement a C Shared Library with a Driver Application”

Distribute C/C++ Shared Libraries to Application Developers

Distribute the following to the application developer integrating the shared library:

- Function signatures of the deployed MATLAB functions
- Generated shared library and header file
- MATLAB Runtime installer

The Library Compiler app generates an installer that packages all of the binary artifacts required for distributing a shared library. The installer is located in the `for_redistribution` folder of the compiler project.

Package a .NET Assembly

- “Create a .NET Assembly with MATLAB Code” on page 4-2
- “Package .NET Assemblies from Command Line” on page 4-10
- “Distribute .NET Assemblies to Application Developers” on page 4-13

Create a .NET Assembly with MATLAB Code

Supported platform: Windows

This example shows how to create a .NET Assembly using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Function in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, open `makesquare.m` located in *`matlabroot`*`\toolbox\dotnetbuilder\Examples\VS`*`Version`*`\NET\MagicSquareExample\MagicSquareComp`.

```
function y = makesquare(x)

y = magic(x);
```

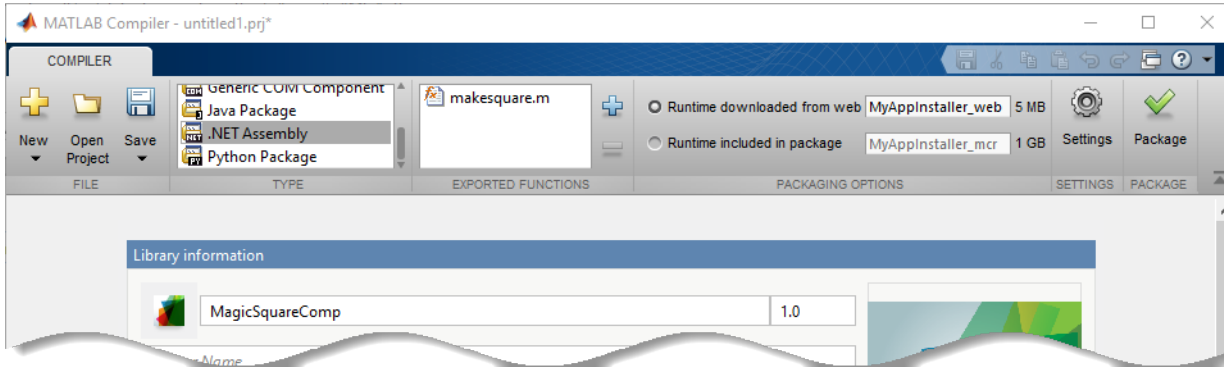
At the MATLAB command prompt, enter `makesquare(5)`.

The output is:

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

Create .NET Assembly Using Library Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **.NET Assembly**.



Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

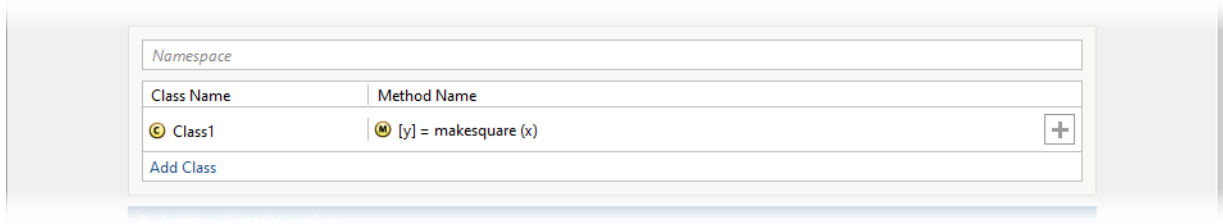
   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

3. Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

   Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4. In the **Library Name** field, replace `makesquare` with `MagicSquareComp`.
5. Verify that the function defined in `makesquare.m` is mapped into `Class1`.



Customize the Application and Its Appearance

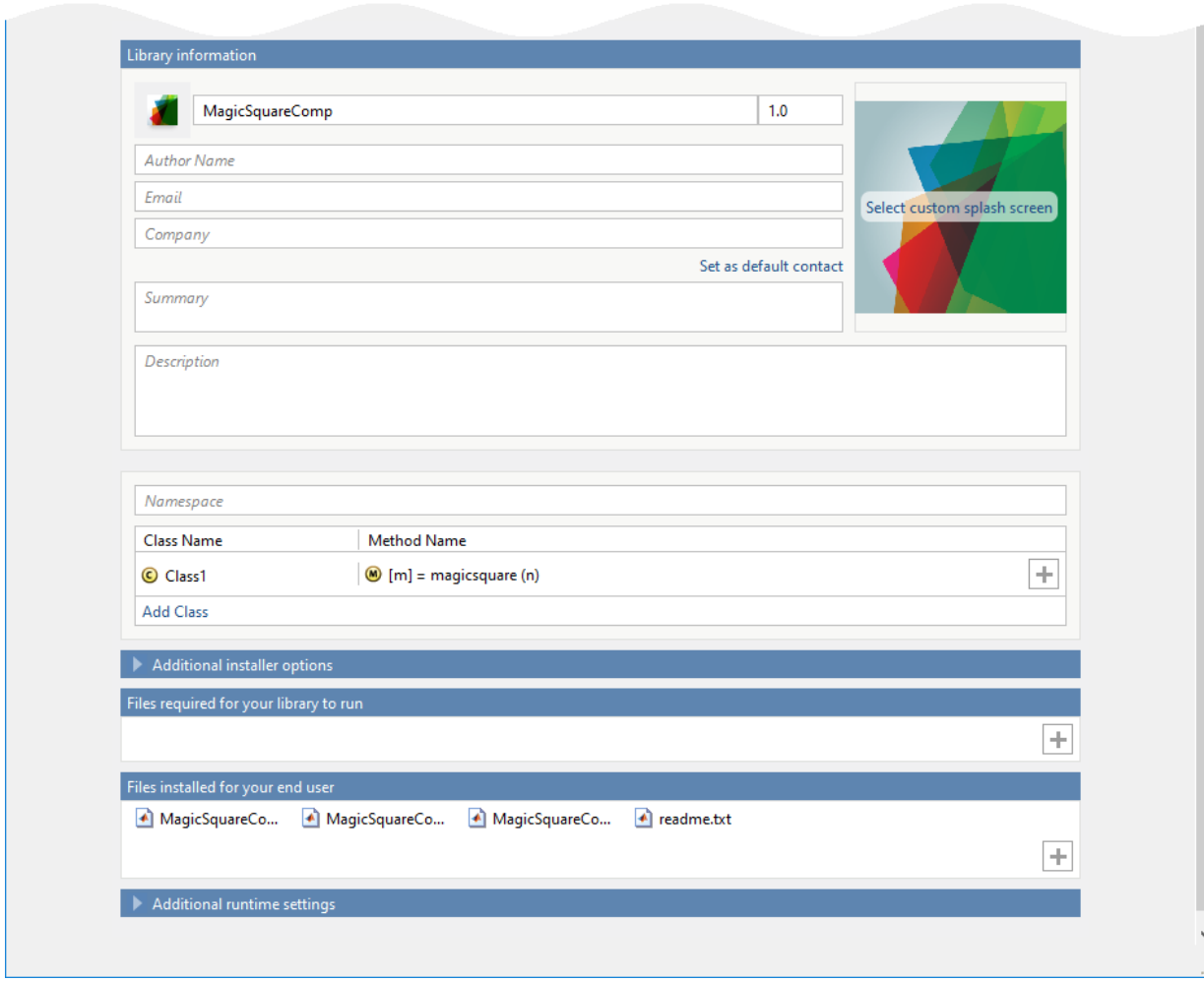
You can customize the installer, customize your application, and add more information about the application as follows:

- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.
- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

  See “Specify Files to Install with Application”

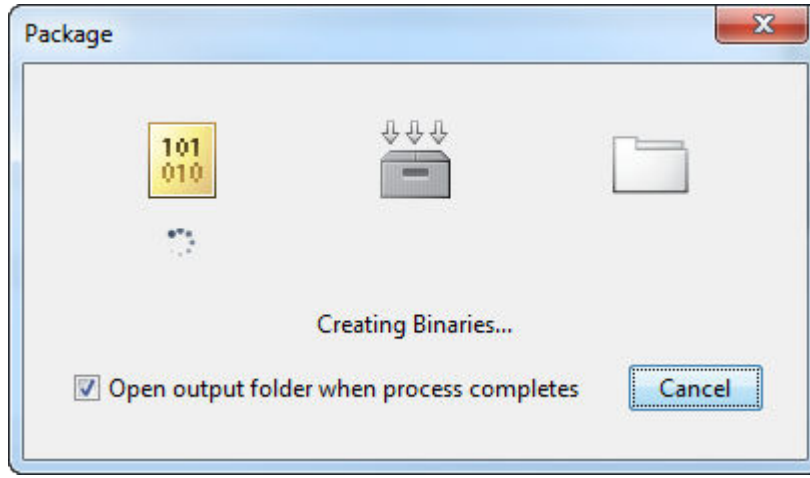
- **Additional runtime settings** — Platform-specific options for controlling the generated executable. See “Additional Runtime Settings”.



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

Build a .NET Application

1 Install the .NET assembly from the `for_redistribution` folder.

The generated shared libraries and support files are located in the `for_testing` folder.

2 Open Microsoft Visual Studio® and create a project. For this example, create a C# Console Application called **MainApp**, and create a reference to your assembly file `MagicSquareComp.dll`.

Ensure that the assembly is located in the application folder created where you installed the component.

3. Create a reference to the `MWArray` API. The location of the API within MATLAB Runtime is:

   matlabroot`MATLAB Runtime\`*v##*`\toolbox\dotnetbuilder\bin\`*arch*`\`*version*`\MWArray.dll`

4. Go to **Build** > **Configuration Manager**, and change the platform from **Any CPU** to **x64**.
5. Copy the following C# code into the project, and save it.

C# Code to Implement Application

```
// Make .NET Namespaces available to your generated component.
using System;

using MagicSquareComp;
using MathWorks.MATLAB.NET.Arrays;


// Initialize your classes before you use them.
namespace MainApp
{
  class Program
  {
    static void Main(string[] args)
    {
      MLTestClass obj = null;
      MWNumericArray input = null;
      MWNumericArray output = null;
      MWArray[] result = null;

      // Because class instantiation and method invocation make their exceptior
      // you should enclose your code in a try-catch block to handle errors.
      try
      {
        // Instantiate your component class.
        obj = new MLTestClass();

        // Invoke your component.
        input = 5;
        result = obj.makesquare(1, input);

        // Extract the Magic Square you created from the first index of result
        output = (MWNumericArray)result[0];

        // print the output.
        Console.WriteLine(output);
      }
      catch
      {
        throw;
      }
   }
```

```
    }
}
```

6 After you finish writing your code, build and run it with Microsoft Visual Studio.

See Also

`deploytool` | `libraryCompiler` | `mcc`

More About

- “Integrate a .NET Assembly Into a C# Application”

Package .NET Assemblies from Command Line

In this section...
“Execute Compiler Projects with deploytool” on page 4-10
“Create .NET Assemblies with mcc” on page 4-10
“Differences Between Compiler Apps and Command Line” on page 4-12

You can package .NET assemblies at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Create .NET Assemblies with mcc

The `mcc` command invokes MATLAB Compiler to create a .NET assembly at the command prompt and provides fine-level control while packaging the application. It does not package the results in an installer.

The following command defines the complete `mcc` command syntax with all required and optional arguments used to create a .NET assembly. Brackets indicate optional parts of the syntax.

```
mcc -W 'dotnet:component_name,class_name, 0.0|framework_version,
Private|Encryption_Key_Path,local|remote' file1 [file2...fileN]
[class{class_name:file1 [,file2,...,fileN]},...[-d output_dir_path]-T
link:lib
```

.NET Bundle

You can simplify the command line used to create .NET assemblies. To do so, use the bundle named `dotnet`. Using this bundle still requires that you pass in the five parts (including `local|remote`) of the `-W` argument text string; however, you do not have to specify the `-T` option.

The following example creates a .NET assembly called `mycomponent` containing a single .NET class named `myclass` with methods `foo` and `bar`.

```
mcc -B 'dotnet:mycomponent,myclass,2.0,
    encryption_keyfile_path,local'
    foo.m bar.m
```

In this example, the compiler uses the .NET Framework version 2.0 to package the component into a shared assembly using the key file specified in `encryption_keyfile_path` to sign the shared component.

Creating a .NET Namespace

The following example creates a .NET assembly from two MATLAB files `foo.m` and `bar.m`.

```
mcc -B
'dotnet:mycompany.mygroup.mycomponent,myclass,0.0,Private,local'
 foo.m bar.m
```

The example creates a .NET assembly named `mycomponent` that has the following namespace: `mycompany.mygroup`. The component contains a single .NET class `myclass`, which contains methods `foo` and `bar`.

To use `myclass`, place the following statement in your code:

```
using mycompany.mygroup;
```

Adding Multiple Classes to an Assembly

The following example creates a .NET assembly that includes more than one class. This example uses the optional `class{...}` argument to the `mcc` command.

```
mcc -B 'dotnet:mycompany.mycomponent,myclass,2.0,Private,local' foo.m bar.m
class{myclass2:foo2.m,bar2.m}
```

The example creates a .NET assembly named `mycomponent` with two classes:

- `myclass` has methods `foo` and `bar`
- `myclass2` has methods `foo2` and `bar2`

See `NET.isNETSupported` to check for a supported version of Microsoft .NET framework.

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

- “Create a .NET Assembly with MATLAB Code”

Distribute .NET Assemblies to Application Developers

Distribute the following to the application developer integrating the .NET assembly:

- Function signatures of the deployed MATLAB functions
- *assemblyName*`.xml` — generated documentation files
- *assemblyName*`.dll` — generated assembly file
- *assemblyName*`.pdb` — optionally generated program database file containing debugging information
- MATLAB Runtime installer

The Library Compiler app generates an installer that packages all of the binary artifacts required for distributing a .NET assembly. The installer is located in the `for_redistribution` folder of the compiler project.

Package a Java Application

- “Configure Your Java Environment” on page 5-2
- “Create a Java Package with MATLAB Code” on page 5-5
- “Package Java Applications from Command Line” on page 5-12
- “Map Functions to Java Class Methods” on page 5-15
- “Distribute Java Applications to Application Developers” on page 5-18

Configure Your Java Environment

In this section...
“Install the Required JDK” on page 5-2 “Set JAVA_HOME” on page 5-3 “Set the CLASSPATH” on page 5-3 “Configure the Native Library Path Variables” on page 5-3

Before you can package MATLAB functions into Java applications or use the generated Java application in a Java development environment, you must ensure that your Java environment is properly configured. You should verify that:

- Your system uses the same version of the Java Developer’s Kit (JDK™) as MATLAB.
- `JAVA_HOME` is set to the folder containing the system’s JDK installation.
- `CLASSPATH` contains all of the MATLAB library JAR files and the JAR files for the applications containing your packaged MATLAB code.
- The MATLAB native library paths are properly configured.

Note For updated Java system requirements, including versions of Java Developer's Kit (JDK) and Java Runtime Environment (JRE), see the supported compiler page at https://www.mathworks.com/support/compilers/current_release/.

Install the Required JDK

To install the proper version of the JDK:

1. Verify the version of Java your MATLAB installation is using by running the following MATLAB command:

   ```
   version -java
   ```
2. Download the matching version Java Developer's Kit (JDK) from https://www.oracle.com/technetwork/java/javase/downloads/index.html.
3. Install the JDK, following the instructions provided by Oracle®.

Note If you are not developing applications or compiling MATLAB code, you can use the Java Runtime Environment (JRE) instead of the JDK.

Set JAVA_HOME

1. Set the system environment variable, `JAVA_HOME`, to point to your JDK installation.
2. At the MATLAB command prompt, type `getenv JAVA_HOME` to verify that MATLAB is reading the correct version of `JAVA_HOME`.
3. Verify that the folder containing your Java installation has been added to your system `PATH` environment variable.

Set the CLASSPATH

To build and run a Java application that uses a MATLAB Compiler SDK generated package, the system must locate:

- JAR files containing the MATLAB libraries
- Applications that you have developed and built with the compiler

Java classes generated by the MATLAB Compiler SDK software use classes contained in the `com.mathworks.toolbox.javabuilder` package. To use the compiled classes, you should include a file called `javabuilder.jar` on the Java class path. You can find this file in one of the following folders:

MATLAB installed on your system	*`matlabroot`*`/toolbox/javabuilder/jar`
MATLAB Runtime installed on your system	*`mcrroot`*`/toolbox/javabuilder/jar`

Note *`matlabroot`* refers to the root folder into which the MATLAB installer has placed the MATLAB files. *`mcrroot`* refers to the root folder under which MATLAB Runtime is installed.

In addition, you should add to the JAR files created by the compiler to the class path.

Configure the Native Library Path Variables

The operating system uses the native library path to locate native libraries that are needed to run your Java class. See the following list of variable names according to operating system:

Windows	`PATH`
Linux	`LD_LIBRARY_PATH`
Macintosh	`DYLD_LIBRARY_PATH`

The native MATLAB or MATLAB Runtime files needed to execute the packaged MATLAB functions called from the Java code must be included on the paths listed by your system's native library path variable.

Create a Java Package with MATLAB Code

Supported platform: Windows, Linux, Mac

This example shows how to create a Java package using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Function in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, open `makesqr.m` located in *`matlabroot`*`\toolbox\javabuilder\Examples\MagicSquareExample\MagicDemoComp`.

```
function y = makesqr(x)

y = magic(x);
```

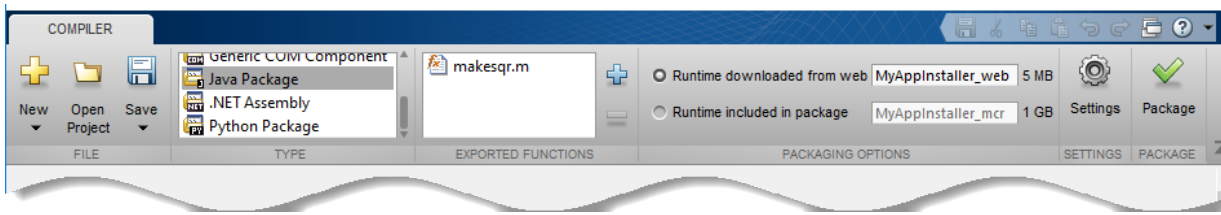
At the MATLAB command prompt, enter `makesqr(5)`.

The output is:

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

Create Java Application Using Library Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **Java Package**.



Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

3. Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

   Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4. Verify that the function defined in `makesqr.m` is mapped into `Class1`.

Customize the Application and Its Appearance

You can customize the installer, customize your application, and add more information about the application as follows:

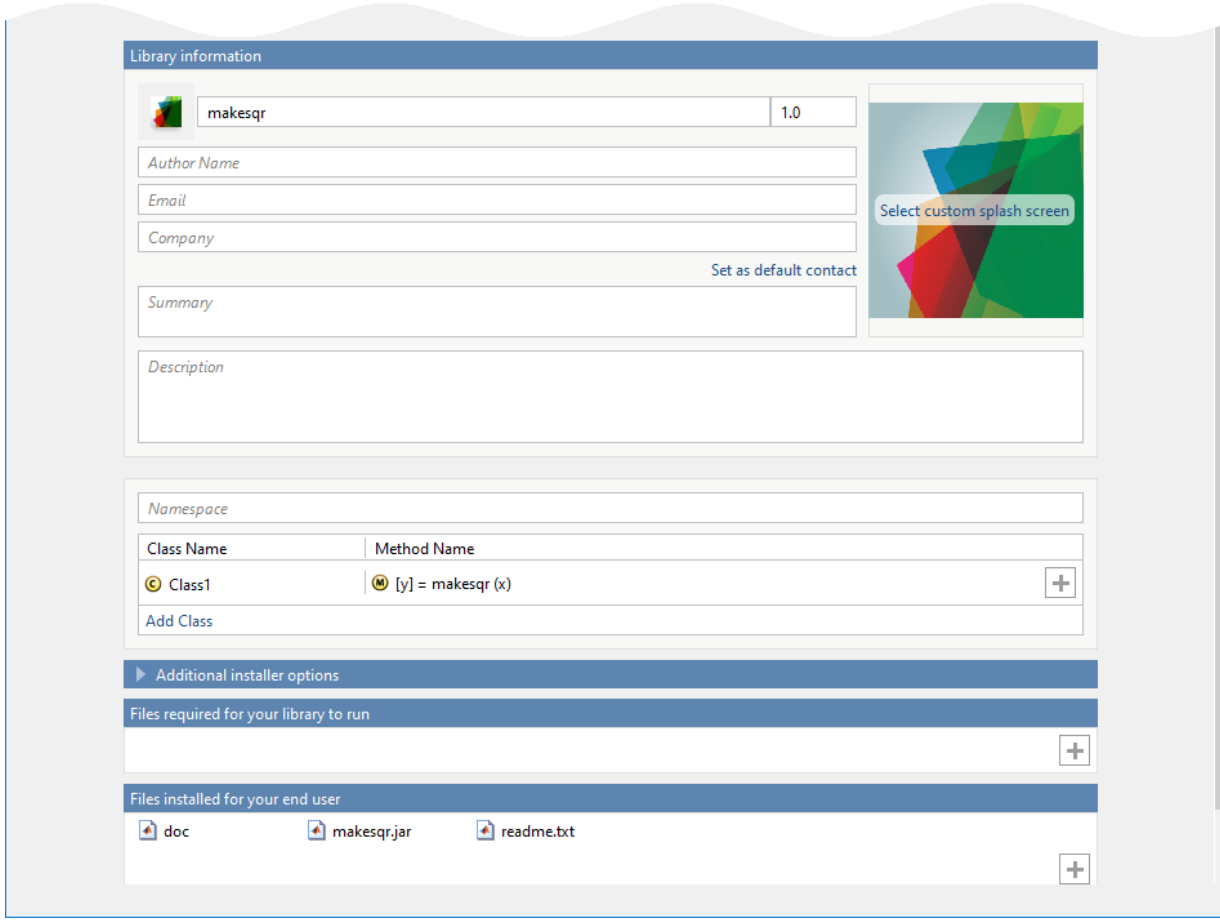
- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and

splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.

- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

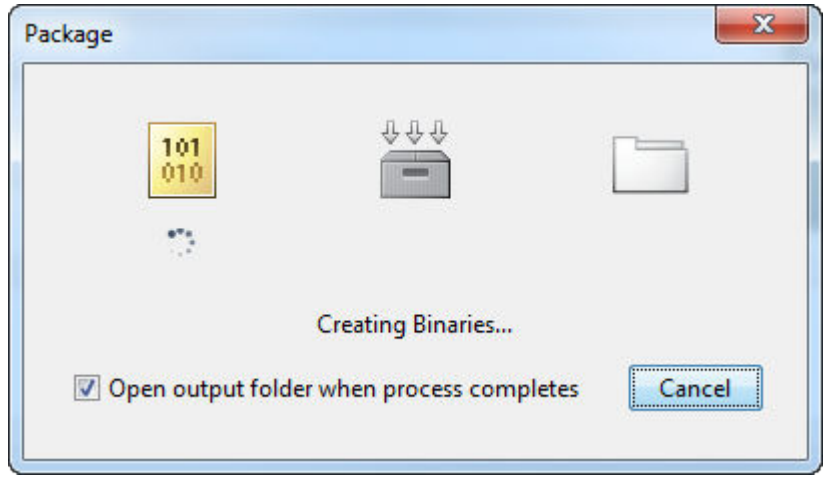
  See “Specify Files to Install with Application”



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

Install and Implement MATLAB Generated Java Application

1 To install the Java application, in the `for_redistribution` folder, double-click `MyAppInstaller_web` file.
2 After the installation is complete, locate the folder containing the generated JAR files, and create a file called `getmagic.java`.
3 Open `getmagic.java` using a text editor, and paste the following code into the file.

Java Code to Implement Application

```
import com.mathworks.toolbox.javabuilder.*;
import makesqr.*;

class getmagic
{
   public static void main(String[] args)
   {
      MWNumericArray n = null;
      Object[] result = null;
      Class1 theMagic = null;

      if (args.length == 0)
      {
        System.out.println("Error: must input a positive integer");
        return;
      }

      try
      {
         n = new MWNumericArray(Double.valueOf(args[0]),
                                      MWClassID.DOUBLE);

         theMagic = new Class1();

         result = theMagic.makesqr(1, n);
         System.out.println(result[0]);
      }
      catch (Exception e)
      {
         System.out.println("Exception: " + e.toString());
      }
      finally
      {
         MWArray.disposeArray(n);
         MWArray.disposeArray(result);
         theMagic.dispose();
      }
   }
}
```

4 Compile the Java application using `javac`.

```
javac -classpath "mcrroot\toolbox\javabuilder\jar\javabuilder.jar";.\makesqr.jar .\
```

Note On UNIX platforms, use colon (`:`) as the class path delimiter instead of semicolon (`;`).

`mcrroot` is the path to the MATLAB Runtime installation on your system. If you have MATLAB installed on your system instead, you can use the path to your MATLAB installation.

5 From the system command prompt, run the application.

```
java -classpath .;"mcrroot\toolbox\javabuilder\jar\javabuilder.jar";.\makesqr.jar g
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

Place a dot (`.`) in the first position of the class path. If it is not there, you get a message stating that Java cannot load the class.

Note On UNIX platforms, use colon (`:`) as the class path delimiter instead of semicolon (`;`).

See Also

`deploytool` | `libraryCompiler` | `mcc`

Package Java Applications from Command Line

In this section...
“Execute Compiler Projects with deploytool” on page 5-12
“Package a Java Application with mcc” on page 5-12
“Differences Between Compiler Apps and Command Line” on page 5-13

You can package Java applications at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Package a Java Application with mcc

The `mcc` command invokes MATLAB Compiler to create a deployable application at the command prompt and provides fine-level control while packaging the application. It does not package the results in an installer.

To invoke the compiler to generate a Java application, use the `-W java:`*`packageName`*`,`*`className`* flag with `mcc`. This flag creates a Java application

named *packageName*. The application contains a class *className* with methods for each of the provided MATLAB functions.

Package Java applications using the following options.

Option	Description
`-a` *filePath*	Add any files on the path to the generated binary.
`-d` *outFolder*	Specify the folder into which the results of packaging are written.
`-S`	Specify that the generated classes instantiate a singleton MATLAB Runtime.
`class{`*className*`:`*mfilename*`...}`	Specify that an additional class is generated that includes methods for the listed MATLAB files.

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

- “Create a Java Package with MATLAB Code”

Map Functions to Java Class Methods

In this section...
“Map Functions to Java Classes with the Library Compiler App” on page 5-15
“Map Functions to Java Classes with mcc” on page 5-16

Map Functions to Java Classes with the Library Compiler App

The Library Compiler app presents a visual class mapper for mapping MATLAB functions to Java classes. The class mapper is located between the **Application Information** and the **Additional Installer Options** sections of the app.

The **Namespace** field at the top of the class browser specifies the name of the application into which the generated classes are placed. By default, the name of the first listed MATLAB file is used as the application name. You can change the application name to fit the naming conventions used by your organization.

The table used to match functions to classes is below the application name. The **Class Name** column specifies the name of the generated Java class. The **Method Name** column specifies the list of MATLAB functions that are mapped into methods of the generated class.

Add a New Class to a Java Application

To add a class to a Java application:

1. Click **Add Class**.
2. Rename the class as described in “Rename a Java Class” on page 5-16.
3. Add one or more methods to the class as described in “Add a Method to a Java Class” on page 5-16.

Rename a Java Class

To rename a Java class:

1. Select the name of the class to be renamed.
2. Open the context menu.
3. Select **Rename**.
4. Enter the new class name.

   The class name must follow the Java naming guidelines. It cannot contain any special characters, dots, or spaces.

Delete a Class from a JavaApplication

To delete a class from a Java application:

1. Select the name of the class to be deleted.
2. Open the context menu.
3. Select **Delete**.

Add a Method to a Java Class

To add a method to a Java class:

1. In the **Method Name** column of the row for the class to which the method is being added, click the plus button.
2. Select the name of the function to add.

Delete a Method from a Java Class

To delete a method from a Java class:

1. Select the name of the function to be deleted.
2. Open the context menu.
3. Select **Delete**.

Tip You can also delete the method using the **Delete** key.

Map Functions to Java Classes with mcc

When using `mcc` to generate Java applications, you map your MATLAB functions into Java classes based on the list into which they are placed on the command line. Class groupings

are specified by adding one or more `class{`*`className`*`:`*`mfilename`*`...}` entries to the command line. All of the files not included in a class grouping are added to the class specified by the `-W java:`*`packageName`*`,`*`className`* flag.

For example, `mcc –W java:myPackage,MyClass fun1.m fun2.m fun3.m` generates a Java application `myPackage` that contains a single class `MyClass`. `MyClass` has three methods: `fun1`, `fun2`, and `fun3`.

However, `mcc –W java:myPackage,MyClass fun1.m fun2.m class{MyOtherClass:fun3.m}` generates a Java application `myPackage` that contains two classes: `MyClass` and `MyOtherClass`. `MyClass` has two methods: `fun1` and `fun2`. `MyOtherClass` has one method `fun3`.

Distribute Java Applications to Application Developers

Distribute the following to the application developer integrating the application:

- Function signatures of the deployed MATLAB functions
- Generated application
- MATLAB Runtime installer

The Library Compiler app generates an installer that packages all of the binary artifacts required for distributing a Java application. The installer is located in the `for_redistribution` folder of the compiler project.

Package a Python Application

- “Create a Python Package with MATLAB Code” on page 6-2
- “Package Python Applications from Command Line” on page 6-8
- “Distribute Python Applications to Application Developers” on page 6-10

Create a Python Package with MATLAB Code

Supported platform: Windows, Linux, Mac

This example shows how to create a Python package using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Function in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, write a function `makesqr.m` as follows:

```
function y = makesqr(x)

y = magic(x);
```

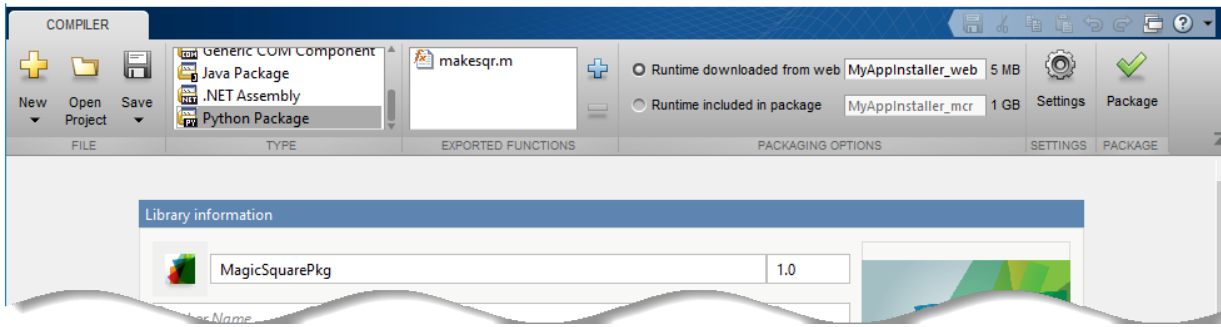
At the MATLAB command prompt, enter `makesqr(5)`.

The output is:

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

Create Python Application Using Library Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **Python Package**.



Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

3. Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

   Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4. In the **Library Name** field, replace `makesqr` with `MagicSquarePkg`. For more information on naming requirements for the Python package, see “Import Compiled Python Packages”.

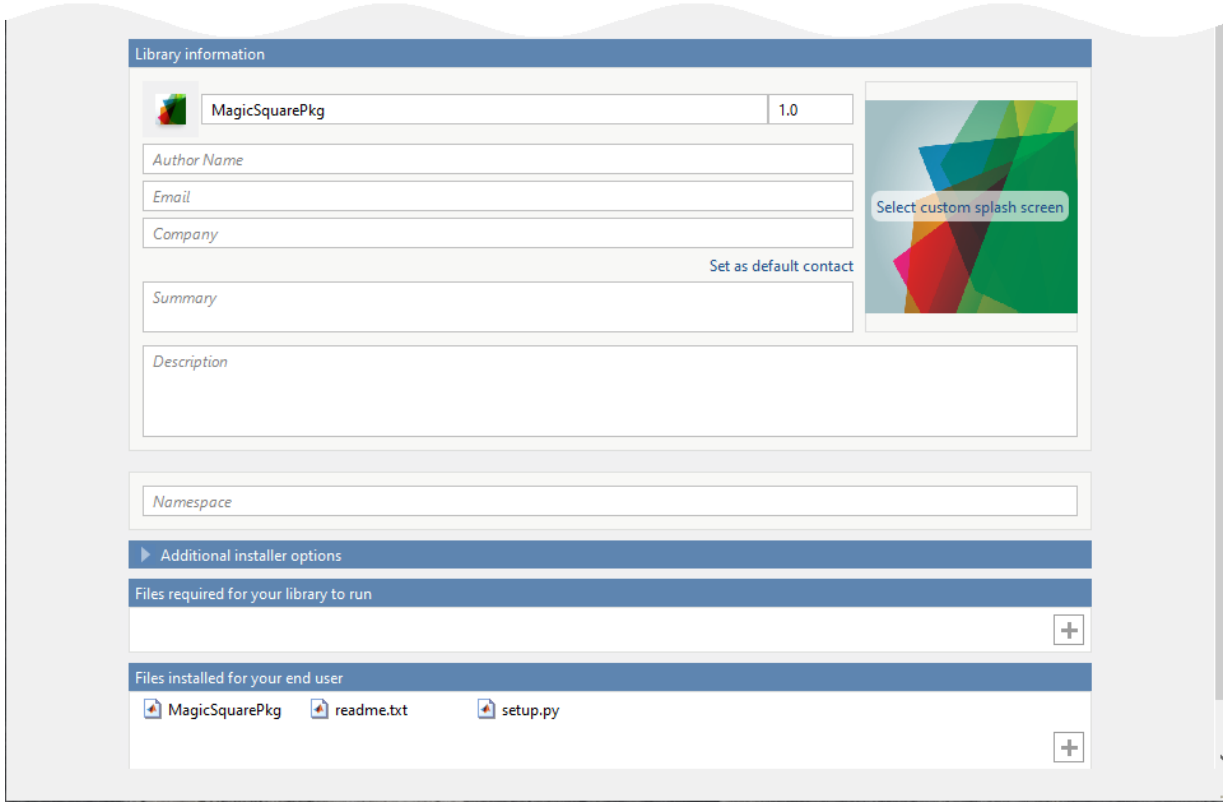
Customize the Application and Its Appearance

You can customize the installer, customize your application, and add more information about the application as follows:

- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.
- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

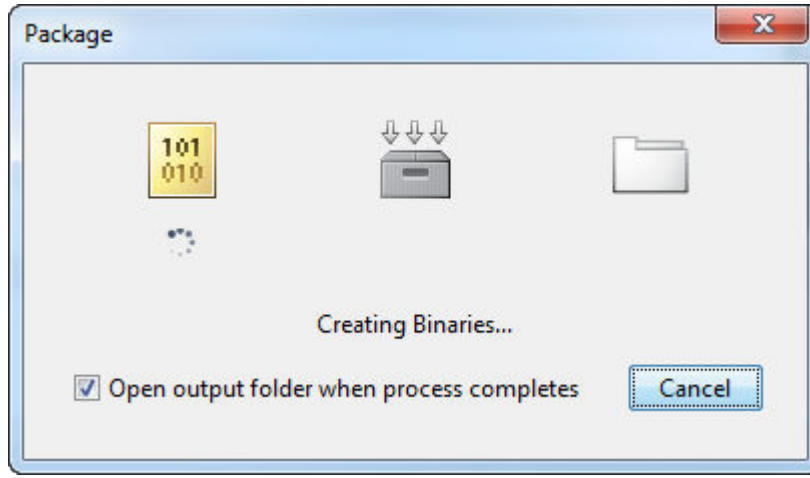
  See “Specify Files to Install with Application”



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

Install and Run MATLAB Generated Python Application

1 To install the Python application, open a command prompt in the `for_redistribution_files_only` folder and run the script:

```
python setup.py install
```

2 Create a file called `getmagic.py`, and include the following code in it.

```
import MagicSquarePkg
myMagic = MagicSquarePkg.initialize()
```

```
print(myMagic.makesqr(3))
myMagic.terminate()
```

3 At the system command prompt, navigate to the folder containing `getmagic.py` and run the application as follows:

```
python getmagic.py
```

The following output is displayed:

```
[[8.0,1.0,6.0],
[3.0,5.0,7.0],
[4.0,9.0,2.0]]
```

Note On Mac OS X, you must use the `mwpython` script. The `mwpython` script is located in the *`matlabroot`*`/bin` folder. *`matlabroot`* is the location of your MATLAB installation.

For example, `mwpython getmagic.py`

See Also

`deploytool` | `libraryCompiler` | `mcc` | `mwpython`

Package Python Applications from Command Line

In this section...
“Execute Compiler Projects with deploytool” on page 6-8
“Package a Python Application with mcc” on page 6-8
“Differences Between Compiler Apps and Command Line” on page 6-9

Note MATLAB Compiler SDK cannot package MATLAB code that uses the MATLAB Python interface.

You can package Python applications at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Package a Python Application with mcc

The `mcc` command invokes MATLAB Compiler to create a deployable application at the command prompt and provides fine-level control while packaging the application. It does not package the results in an installer.

To invoke the compiler to generate a Python application, use the `-W python:*namespace.packageName*` flag with `mcc`. This flag creates a Python package named *`packageName`* with methods for each of the provided MATLAB functions.

For packaging Python applications, you can also use the following options.

Option	Description
`-a` *`filePath`*	Add any files on the path to the generated binary.
`-d` *`outFolder`*	Specify the folder into which the results of packaging are written.

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

- “Create a Python Package with MATLAB Code”

Distribute Python Applications to Application Developers

Distribute the following to the application developer integrating the application:

- Function signatures of the deployed MATLAB functions
- Generated application
- Generated `setup.py`
- MATLAB Runtime installer

The Library Compiler app generates an installer that packages all the binary artifacts required for distributing a Python application. The installer is located in the `for_redistribution` folder of the compiler project.

7

Compile a Deployable Archive for MATLAB Production Server

- “Package Deployable Archives with Production Server Compiler App” on page 7-2
- “Package Deployable Archives from Command Line” on page 7-6
- “Build Excel Add-In and Deployable Archive” on page 7-8

Package Deployable Archives with Production Server Compiler App

Supported platform: Windows, Linux, Mac

This example shows how to create a deployable archive from a MATLAB function. You can then hand the generated archive to a system administrator who will deploy it into MATLAB Production Server.

Create Function In MATLAB

In MATLAB, examine the MATLAB program that you want packaged.

For this example, write a function `addmatrix.m` as follows.

```
function a = addmatrix(a1, a2)
%ADDMATRIX Add two matrices
%    This function adds the two matrices passed as input. This function is
%    used to demonstrate the functionality of MATLAB Compiler SDK. Refer to the
%    documentation for MATLAB Compiler SDK C/C++ shared library for more information.

% Copyright 2003-2017 The MathWorks, Inc.

a = a1 + a2;
```

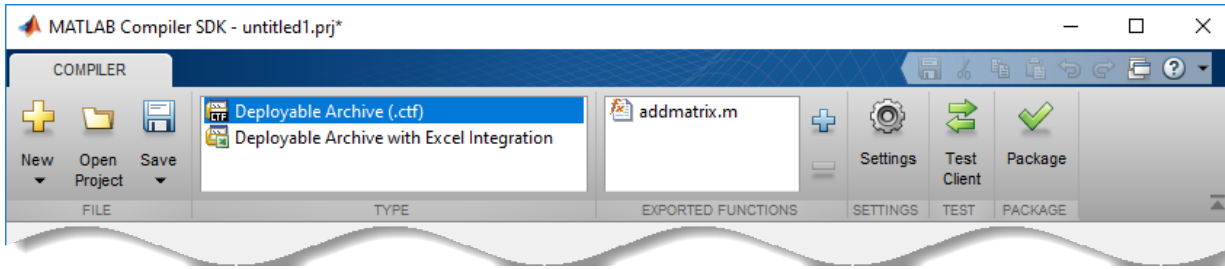
At the MATLAB command prompt, enter `addmatrix([1 4 7; 2 5 8; 3 6 9], [1 4 7; 2 5 8; 3 6 9])`.

The output is:

```
 ans =
     2     8    14
     4    10    16
     6    12    18
```

Create Deployable Archive with Production Server Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Production Server Compiler**. In the **MATLAB Compiler SDK** project window, click **Deployable Archive (.ctf)**.



Alternately, you can open the **Production Server Compiler** app by entering `productionServerCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler SDK** project window, specify the main file of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

   The function `addmatrix.m` is added to the list of main files.

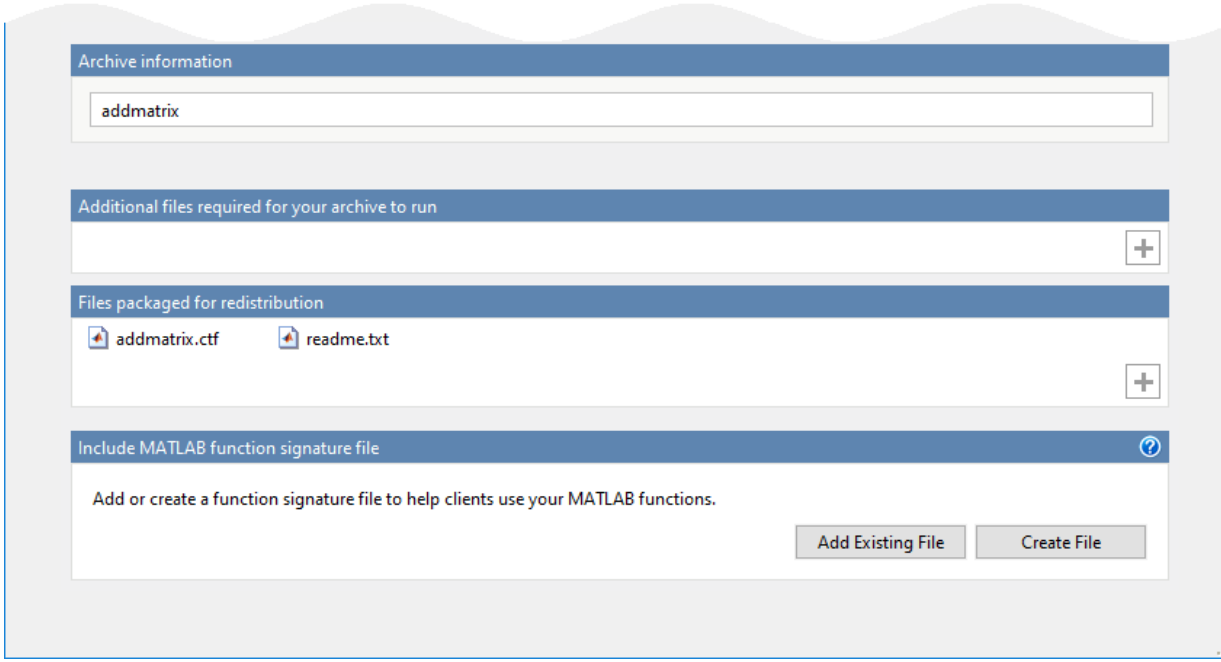
Customize the Application and Its Appearance

You can customize your deployable archive, and add more information about the application as follows:

- **Archive information** — Editable information about the deployed archive.
- **Additional files required for your archive to run** — Additional files required by the generated archive to run. These files are included in the generated archive installer. See “Manage Required Files in Compiler Project”.
- **Files packaged for redistribution** — Files that are installed with your application. These files include:

  - Generated deployable archive
  - Generated `readme.txt`

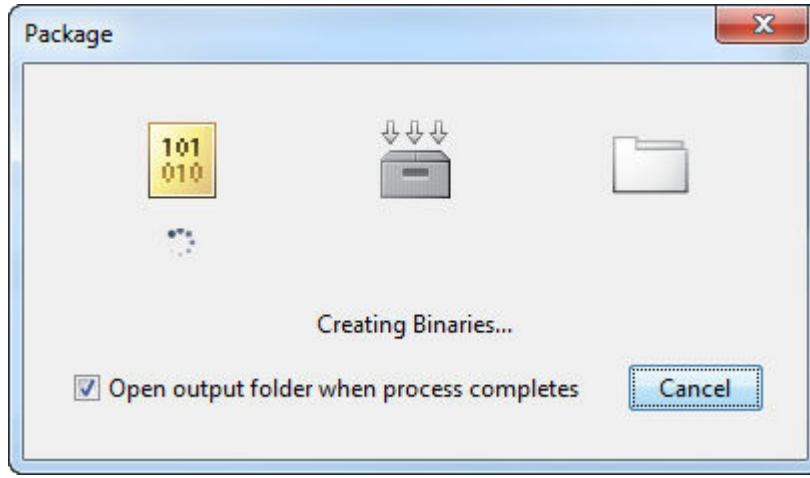
  See “Specify Files to Install with Application”
- **Include MATLAB function signature file** — Add or create a function signature file to help clients use your MATLAB functions.



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — A folder containing the installer to distribute the archive.
- `for_testing` — A folder containing the raw generated files to create the installer
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

See Also

`deploytool` | `mcc` | `productionServerCompiler`

More About

- Production Server Compiler

Package Deployable Archives from Command Line

In this section...
“Execute Compiler Projects with deploytool” on page 7-6
“Package a Deployable Archive with mcc” on page 7-6
“Differences Between Compiler Apps and Command Line” on page 7-7

You can package deployable archives at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Package a Deployable Archive with mcc

The `mcc` command invokes the MATLAB Compiler and provides fine-level control over the packaging of the deployable archive. It, however, cannot package the results in an installer.

To invoke the compiler to generate a deployable archive, use the `-W CTF:`*`component_name`* flag with `mcc`. The `-W CTF:`*`component_name`* flag creates a deployable archive called *`component_name`*`.ctf`.

For packaging deployable archives, you can also use the following options.

Option	Description
`-a` *`filePath`*	Add any files on the path to the generated binary.
`-d` *`outFolder`*	Specify the folder into which the results of packaging are written.
`class{`*`className`*`:`*`mfilename`*`...}`	Specify that an additional class is generated that includes methods for the listed MATLAB files.

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

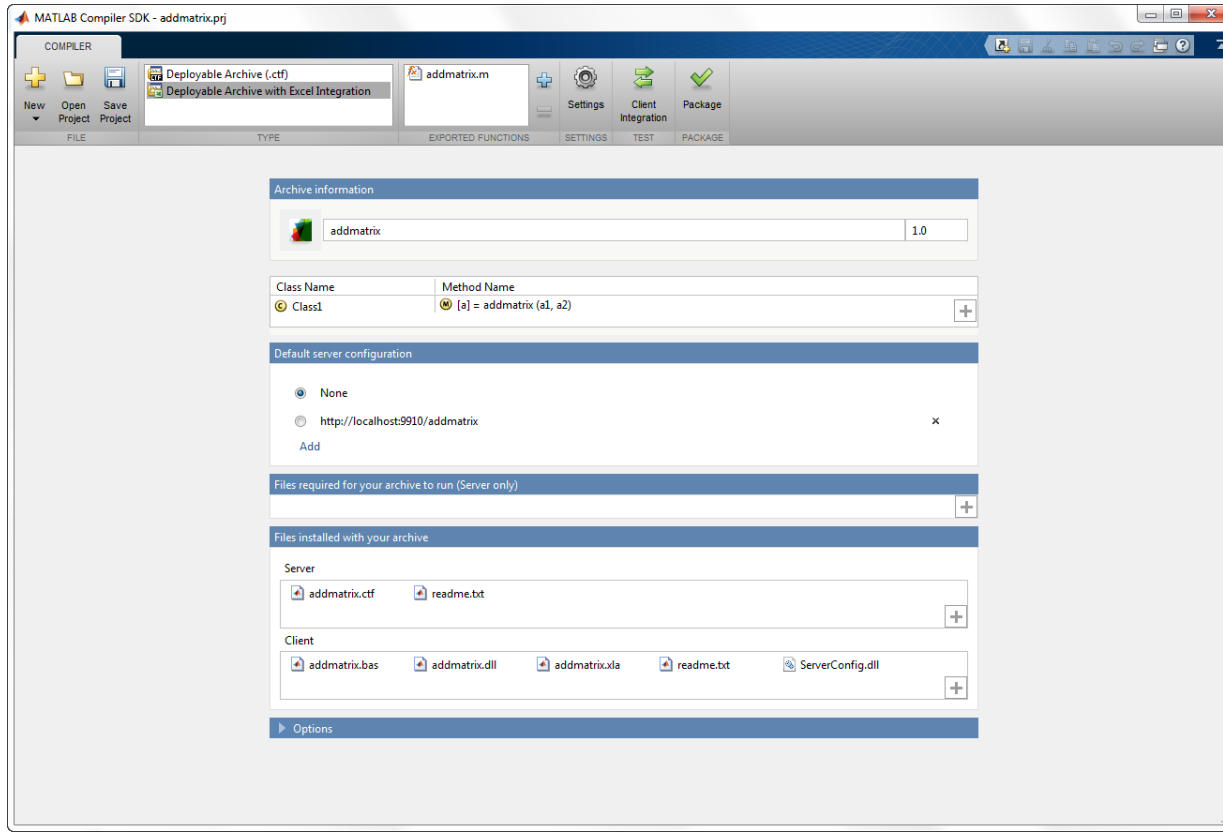
- “Package Deployable Archives with Production Server Compiler App” on page 7-2

Build Excel Add-In and Deployable Archive

Note Excel add-in can be packaged using 64 bit Windows and can be deployed on either 32 or 64 bit Excel.

To create an Excel add-In that integrates with MATLAB Production Server:

1. Ensure that the setting **Trust access to the VBA project object model** is selected in the Excel Trust Center.
2. Open the Production Server Compiler app.
   a. On the toolstrip, select the **Apps** tab.
   b. Click the arrow at the far right of the tab to open the apps gallery.
   c. Click **Production Server Compiler** to open the project window.



3. In the **Application Type** section of the toolstrip, select **Deployable Archive with Excel Integration** from the list.
4. Specify the MATLAB functions you want to deploy.

   a. In the **Exported Functions** section of the toolstrip, click the plus button.
   b. In the file explorer that opens, locate and select the desired files.
   c. Click **Open** to select the files and close the file explorer.

   The selected files are added to the list of files and a minus button appears under the plus button.

Note Functions that return a variable number of outputs are not supported by add-ins that use code running on a MATLAB Production Server instance.

5. Inspect the **Archive Information** section of the app.

   The first text field is the name of the archive. The name of the archive determines the names of the generated artifacts and the URL used to connect to the server.
6. Inspect the class mapping table to ensure that all desired functions are being compiled.
7. If you need to change the marshaling rules for a function, select **Data Conversion Properties** from the function name's context menu.

   For more information, see "Data Marshaling Rules".
8. Optionally configure the default server configuration packaged with the installer.

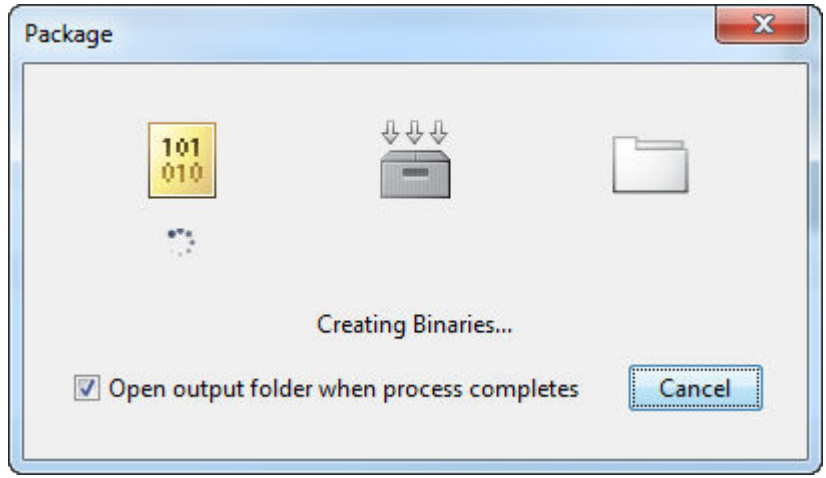
   The server configuration defines the connection to the MATLAB Production Server instance running the MATLAB code.

   a. Search the **Default Server Configuration** table for the URL to package with the installer.
   b. If it is in the table, select it.
   c. If not, click **Add** to add it to the table.
9. Inspect the **Files required for your archive to run** and **Files installed with your archive** sections of the app.

   These sections of the app list all of the files that are packaged with the compiled code.

   Files required for your archive to run lists the files on which your function is dependent. They are packaged into the deployable archive and are only for the server. See "Manage Required Files in Compiler Project" (MATLAB Production Server).

   Files installed with your archive includes sections for both the client and the server. The files listed are generated by the compiler and should be delivered to the person installing the application.
10. Click **Package** to generate the add-in and the deployable archive.



11 Select the **Open output folder when process completes** check box to display the generated output.

When the deployment process is complete, a file explorer opens and displays the generated output.

12 Click **Close** on the Package window.

13 Verify the contents of the generated output:

- `for_redistribution` — A `client` folder containing the generated installer and a `server` folder containing a `.zip` file
- `for_testing` — A `client` folder containing the raw files generated for the add-in and a `server` folder containing the raw files generated for the deployable archive
- `for_redistribution_files_only` — A `client` folder containing only the files needed to redistribute the add-in and a `server` folder containing only the files needed to redistribute the deployable archive
- `PackagingLog.txt` — A log file generated by the compiler

Package a COM Component

- “Create a Generic COM Component with MATLAB Code” on page 8-2
- “Package COM Components from Command Line” on page 8-7
- “Distribute COM Components to Application Developers” on page 8-12

Create a Generic COM Component with MATLAB Code

Supported platform: Windows

This example shows how to create a generic COM component using a MATLAB function. You can then pass the generated package to the developer who is responsible for integrating it into an application. The target system does not require a licensed copy of MATLAB.

Create Function in MATLAB

In MATLAB, examine the MATLAB code that you want packaged. For this example, open `makesquare.m` located in *`matlabroot`*`\toolbox\dotnetbuilder\Examples\VS`*`Version`*`\COM\MagicSquareExample\MagicSquareComp`.

```
function y = makesquare(x)

y = magic(x);
```

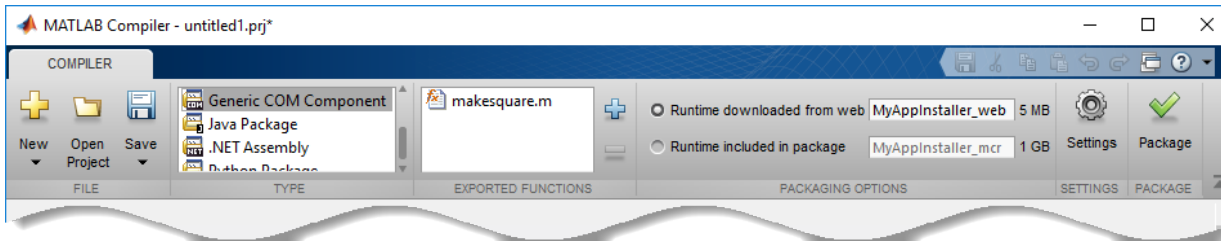
At the MATLAB command prompt, enter `makesquare(5)`.

The output is:

```
    17    24     1     8    15
    23     5     7    14    16
     4     6    13    20    22
    10    12    19    21     3
    11    18    25     2     9
```

Create Generic COM Component Using Library Compiler App

1. On the **MATLAB Apps** tab, on the far right of the **Apps** section, click the arrow. In **Application Deployment**, click **Library Compiler**. In the **MATLAB Compiler** project window, click **Generic COM Component**.



Alternately, you can open the **Library Compiler** app by entering `libraryCompiler` at the MATLAB prompt.

2. In the **MATLAB Compiler** project window, specify the files of the MATLAB application that you want to deploy.

   1. In the **Exported Functions** section of the toolstrip, click .
   2. In the **Add Files** window, browse to the example folder, and select the function you want to package. Click **Open**.

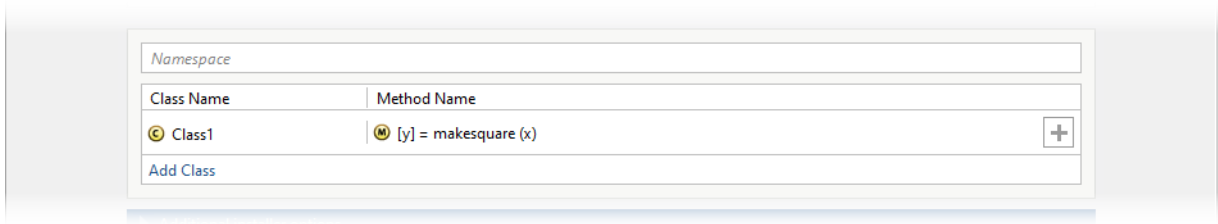
   The function is added to the list of exported function files. Repeat this step to package multiple files in the same application.

3. Decide whether to include the MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section:

   - **Runtime downloaded from web** — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.
   - **Runtime included in package** — Generates an application that includes the MATLAB Runtime installer.

   Note The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

4. In the **Library Name** field, replace `makesquare` with `MagicSquareComp`.
5. Verify that the function defined in `makesquare.m` is mapped into `Class1`.



Customize the Application and Its Appearance

You can customize the installer, customize your application, and add more information about the application as follows:

- **Library information** — Editable information about the deployed application. You can also customize the applications appearance by changing the application icon and

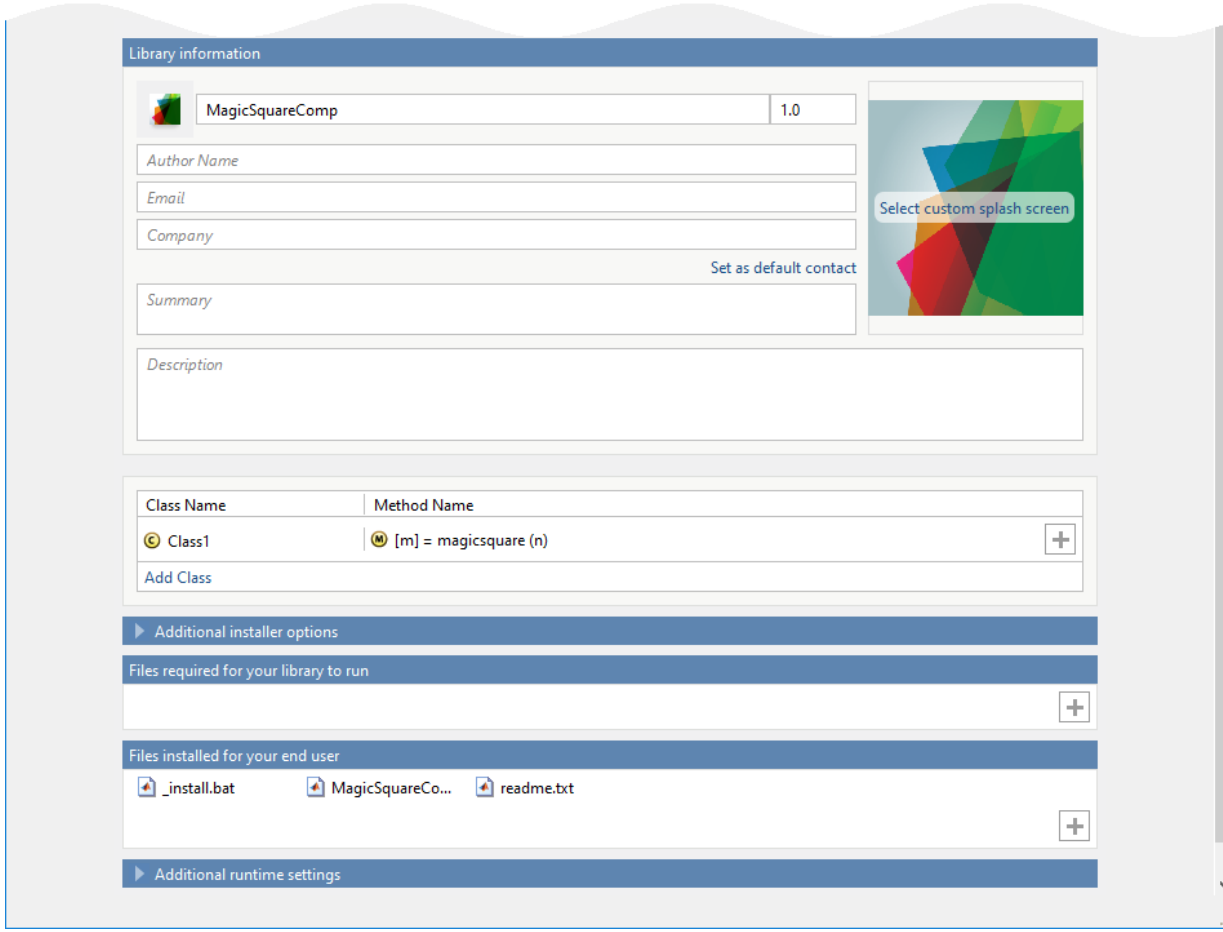
splash screen. The generated installer uses this information to populate the installed application metadata. See “Customize the Installer”.

- **Additional installer options** — Edit the default installation path for the generated installer and selecting custom logo. See “Change the Installation Path” .
- **Files required for your library to run** — Additional files required by the generated application to run. These files are included in the generated application installer. See “Manage Required Files in Compiler Project”.
- **Files installed for your end user** — Files that are installed with your application. These files include:

  - Generated `readme.txt`
  - Generated executable for the target platform

  See “Specify Files to Install with Application”

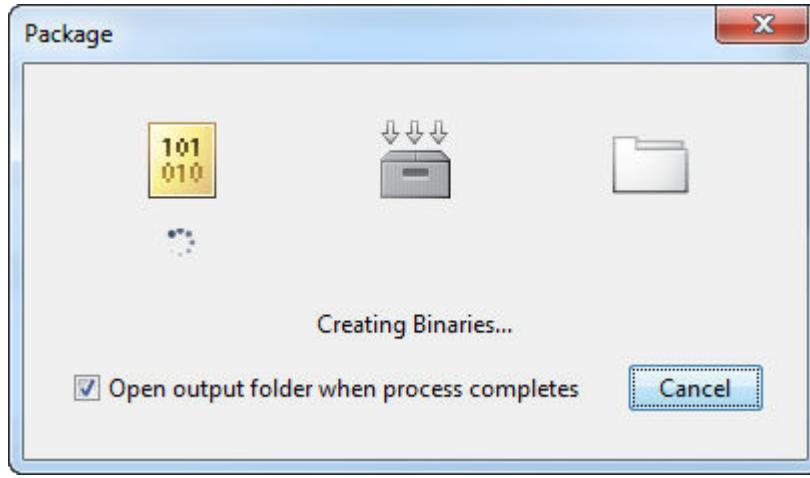
- **Additional runtime settings** — Platform-specific options for controlling the generated executable. See “Additional Runtime Settings”.



Package the Application

1 To generate the packaged application, click **Package**.

In the Save Project dialog box, specify the location to save the project.



2 In the **Package** dialog box, verify that **Open output folder when process completes** is selected.

When the deployment process is complete, examine the generated output.

- `for_redistribution` — Folder containing the file that installs the application and the MATLAB Runtime.
- `for_testing` — Folder containing all the artifacts created by `mcc`, such as binaries and JAR, header, and source files for a specific target. Use these files to test the installation.
- `for_redistribution_files_only` — Folder containing the files required for redistributing the application. Distribute these files to users who have MATLAB or MATLAB Runtime installed on their machines.
- `PackagingLog.txt` — Log file generated by MATLAB Compiler.

See Also

`deploytool` | `libraryCompiler` | `mcc`

More About

- “Call COM Objects in Visual C++ Programs”

Package COM Components from Command Line

You can package COM components at the MATLAB prompt or your system prompt using either of these commands.

- `deploytool` invokes the Application Compiler app to execute a saved compiler project.
- `mcc` invokes the MATLAB Compiler to create a deployable application at the command prompt.

Execute Compiler Projects with deploytool

The `deploytool` command has two flags that invoke one of the compiler apps to package an already existing project without opening a window.

- `-build` *`project_name`* — Invoke the correct compiler app to build the project but not generate an installer.
- `-package` *`project_name`* — Invoke the correct compiler app to build the project and generate an installer.

For example, `deploytool -package magicsquare` generates the binary files defined by the `magicsquare` project and packages them into an installer that you can distribute to others.

Create COM Component with mcc

The `mcc` command invokes MATLAB Compiler to create a COM component at the command prompt and provides fine-level control while packaging the component. It does not package the results in an installer.

A MATLAB class cannot be directly packaged into a COM object. You can, however, use a user-generated class inside a MATLAB file and build a COM object from that file. You can use the MATLAB command-line interface instead of the Library Compiler app to create COM objects. Do this by issuing the `mcc` command with options. If you use `mcc`, you do not create a project.

The following table provides an overview of some `mcc` options related to components, along with syntax and examples of their usage.

Action to Perform	Description
Create component that has one class.	**`mcc` option to use:** `-W com` The `W` option with `com` as the type controls the generation of wrapper files, which you can use to support components.
	Syntax `mcc -W 'com:<component_name>[,<class_name>[,<major>.<minor>]]'` An unspecified `<class_name>` defaults to `<component_name>`, and an unspecified version number defaults to the latest version built or 1.0, if there is no previous version.
	Example `mcc -W 'com:mycomponent,myclass,1.0' -T link:lib foo.m bar.m` The example creates a COM component called `mycomponent`, which contains a single COM class named `myclass` with methods `foo` and `bar`, and a version of 1.0.
Add additional classes to a COM component.	**`mcc` option to use:** Not needed A separate COM named `<class_name>` is created for each class argument that is passed. Following the `<class_name>` parameter is a comma-separated list of source files that are encapsulated as methods for the class.
	Syntax `class{<class_name>:[file, [file,...]]}`

Action to Perform	Description
	Example `mcc -B 'com:mycomponent,myclass,1.0' foo.m bar.m class{myclass2:foo2.m, bar2.m}` The example creates a COM component named `mycomponent` with two classes: `myclass` has methods `foo` and `bar`, and `myclass2` has methods `foo2` and `bar2`. The version is version 1.0.
Simplify the command-line input for components.	**`mcc` option to use:** `-B com:` Uses the bundle.
	Syntax `mcc -B '<bundle>'[:<a1>,<a2>,...,<an>]`
	Example `mcc -B 'com:mycomponent,myclass,1.0' foo.m bar.m`

Action to Perform	Description
Control how each COM class uses the MATLAB Runtime.	**mcc option to use:** `-S` By default, a new MATLAB Runtime instance is created for each instance of each COM class in the component. Use `-S` to change the default. This option tells the compiler to create a single MATLAB Runtime at the time when the first COM class is instantiated. This MATLAB Runtime is reused and shared among all subsequent class instances, resulting in more efficient memory usage and eliminating the MATLAB Runtime startup cost in each subsequent class instantiation. When using `-S`, note that all class instances share a single MATLAB workspace and share global variables in the MATLAB files used to build the component. Therefore, properties of a COM class behave as static properties instead of instance-wise properties. **Note** The default behavior dictates that a new MATLAB Runtime be created for each instance of a class, so when the class is destroyed, the MATLAB Runtime is destroyed as well. If you want to retain the state of global variables (such as those allocated for drawing figures, for instance), use the `-S` option. **Example** `mcc -S -B 'com:mycomponent,myclass,1.0' foo.m bar.m` The example creates a COM component called `mycomponent` containing a single COM class named `myclass` with methods `foo` and `bar`, and a version of 1.0. When multiple instances of this class are instantiated in an application, only one MATLAB Runtime is initialized, and it is shared by each instance.

Action to Perform	Description
Create subfolders needed for deployment and copy associated files to them.	**`mcc` option to use:** `-d` The `\src` and `\distrib` subfolders are used to package components.
	Syntax `-d` *`foldername`*

Differences Between Compiler Apps and Command Line

You perform the same functions using either the compiler apps or the `mcc` command-line interface. The interactive menus and dialog boxes used in the compiler apps build `mcc` commands that are customized to your specification. As such, your MATLAB code is processed the same way as if you were packaging it using `mcc`.

If you know the commands for the type of application you want to deploy and do not require an installer, it is faster to execute `mcc` than go through the compiler app workflow.

Compiler app advantages include:

- You can perform related deployment tasks with a single intuitive interface.
- You can maintain related information in a convenient project file.
- Your project state persists between sessions.
- You can load previously stored compiler projects from a prepopulated menu.
- You can package applications for distribution.

See Also

`deploytool` | `mcc`

More About

- “Create a Generic COM Component with MATLAB Code”

Distribute COM Components to Application Developers

Distribute the following to the application developer integrating the component:

- Function signatures of the deployed MATLAB functions
- Generated COM component
- `mwcomutil.dll`
- MATLAB Runtime installer

The Library Compiler app generates an installer that packages all of the binary artifacts required for distributing a COM component. The installer is located in the `for_redistribution` folder of the compiler project.

Customizing a Compiler Project

- “Customize the Application” on page 9-2
- “Manage Support Packages” on page 9-9

Customize the Application

You can customize the application in several ways: customize the installer, manage files in the project, or add a custom installer path using the **Application Compiler** app or the **Library Compiler** app.

Customize the Installer

Change Application Icon

To change the default icon, click the graphic to the left of the **Library name** or **Application name** field to preview the icon.

Click **Select icon**, and locate the graphic file to use as the application icon. Select the **Use mask** option to fill any blank spaces around the icon with white or the **Use border** option to add a border around the icon.

To return to the main window, click **Save and Use**.

Add Library or Application Information

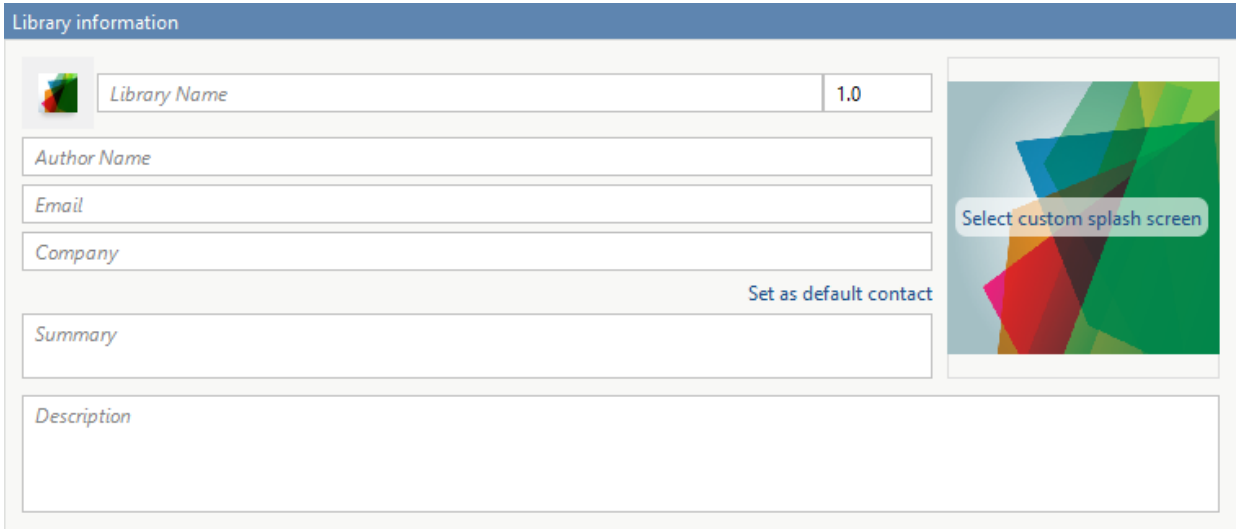
You can provide further information about your application as follows:

- Library/Application Name: The name of the installed MATLAB artifacts. For example, if the name is `foo`, the installed executable is `foo.exe`, and the Windows start menu entry is **foo**. The folder created for the application is *`InstallRoot`*`/foo`.

  The default value is the name of the first function listed in the **Main File(s)** field of the app.
- Version: The default value is 1.0.
- Author name: Name of the developer.

- Support email address: Email addess to use for contact information.
- Company name: The full installation path for the installed MATLAB artifacts. For example, if the company name is `bar`, the full installation path would be *`InstallRoot`*`/bar/`*`ApplicationName`*.
- Summary: Brief summary describing the application.
- Description: Detailed explanation about the application.

All information is optional and, unless otherwise stated, is only displayed on the first page of the installer. On Windows systems, this information is also displayed in the Windows **Add/Remove Programs** control panel.



Change the Splash Screen

The installer splash screen displays after the installer has started. It is displayed along with a status bar while the installer initializes.

You can change the default image by clicking the **Select custom splash screen**. When the file explorer opens, locate and select a new image.

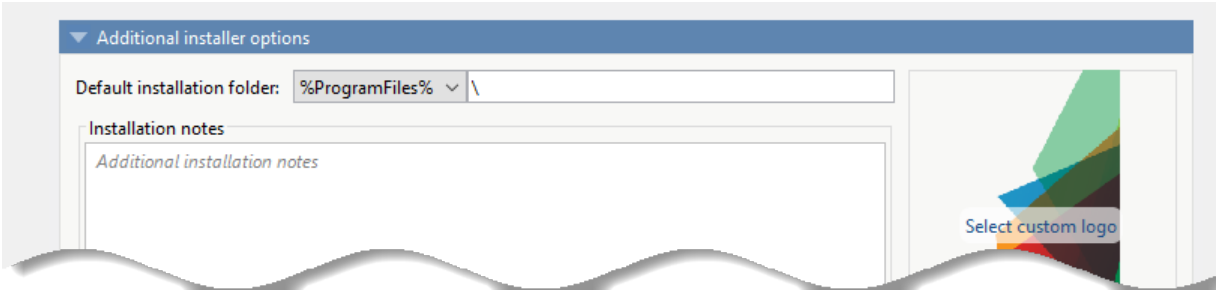
You can drag and drop a custom image onto the default splash screen.

Change the Installation Path

This table lists the default path the installer uses when installing the packaged binaries onto a target system.

Windows	`C:\Program Files\`*`companyName`*`\`*`appName`*
Mac OS X	`/Applications/`*`companyName`*`/`*`appName`*
Linux	`/usr/`*`companyName`*`/`*`appName`*

You can change the default installation path by editing the **Default installation folder** field under **Additional installer options**.



A text field specifying the path appended to the root folder is your installation folder. You can pick the root folder for the application installation folder. This table lists the optional custom root folders for each platform:

Windows	`C:\Users\`*`userName`*`\AppData`
Linux	`/usr/local`

Change the Logo

The logo displays after the installer has started. It is displayed on the right side of the installer.

You change the default image in **Additional Installer Options** by clicking **Select custom logo**. When the file explorer opens, locate and select a new image. You can drag and drop a custom image onto the default logo.

Edit the Installation Notes

Installation notes are displayed once the installer has successfully installed the packaged files on the target system. They provide useful information concerning any additional setup that is required to use the installed binaries and instructions for how to run the application.

Manage Required Files in Compiler Project

The compiler uses a dependency analysis function to automatically determine what additional MATLAB files are required for the application to package and run. These files are automatically packaged into the generated binary. The compiler does not generate any wrapper code that allows direct access to the functions defined by the required files.

If you are using one of the compiler apps, the required files discovered by the dependency analysis function are listed in the **Files required for your application to run** or **Files required for your library to run** field.

To add files, click the plus button in the field, and select the file from the file explorer. To remove files, select the files, and press the **Delete** key.

Caution Removing files from the list of required files may cause your application to not package or not to run properly when deployed.

Using mcc

If you are using `mcc` to package your MATLAB code, the compiler does not display a list of required files before running. Instead, it packages all the required files that are discovered by the dependency analysis function and adds them to the generated binary file.

You can add files to the list by passing one or more `-a` arguments to `mcc`. The `-a` arguments add the specified files to the list of files to be added into the generated binary. For example, `-a hello.m` adds the file `hello.m` to the list of required files and `-a ./foo` adds all the files in `foo` and its subfolders to the list of required files.

Specify Files to Install with Application

The compiler packages files to install along with the ones it generates. By default the installer includes a readme file with instructions on installing the MATLAB Runtime and configuring it.

These files are listed in the **Files installed for your end user** section of the app.

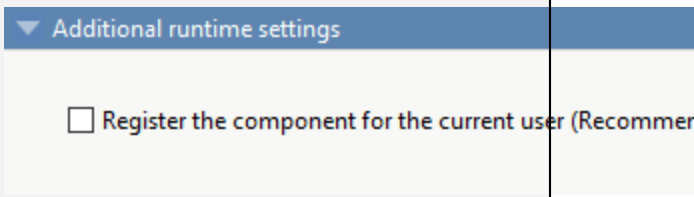
To add files to the list, click , and select the file from the file explorer.

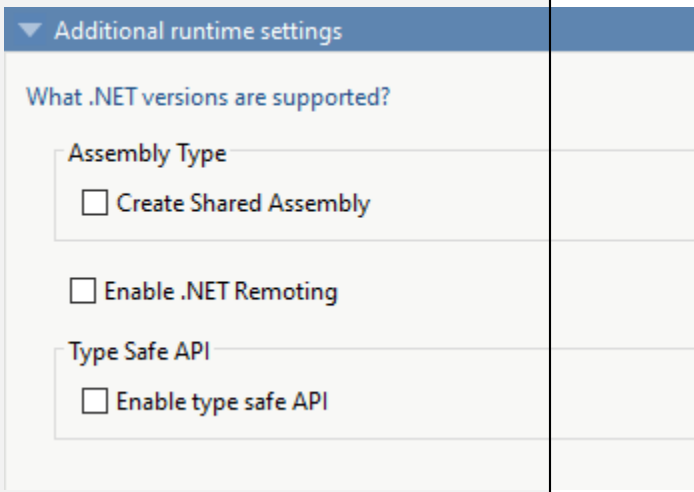
JAR files are added to the application class path as if you had called `javaaddpath`.

Caution Removing the binary targets from the list results in an installer that does not install the intended functionality.

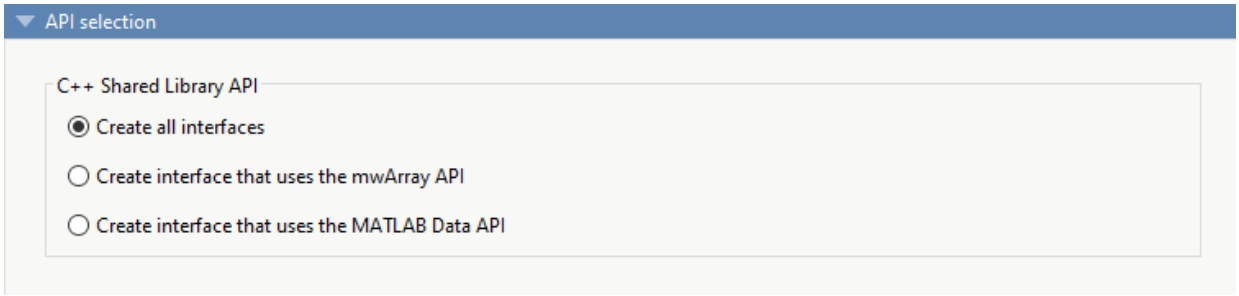
When installed on a target computer, the files listed in the **Files installed for your end user** are saved in the `application` folder.

Additional Runtime Settings

Type of Packaged Application	Description	Additional Runtime Settings Options
Generic COM Components	• **Register the component for the current user (Recommended for non-admin users)** —This option enables registering the component for the current user account. It is provided for users without admin rights.	

Type of Packaged Application	Description	Additional Runtime Settings Options
.NET Assembly	• **Create Shared Assembly** — Enables sharing MATLAB Runtime installer instances for multiple .NET assemblies. • **Enable .NET Remoting** — Enables you to remotely access MATLAB functionality, as a part of a distributed system. For more information, see “Create a Remotable .NET Assembly”. • **Enable Type Safe API** — Enables the type safe API for the packaged .NET assembly.	

API Selection for C++ Shared Library



- **Create all interfaces** — Creates interfaces for shared libraries using both the `mwArray` API and the MATLAB Data API.
- **Create interface that uses the mwArray API** — Creates an interface for a shared library using the `mwArray` API. The interface uses C-style functions to initialize the MATLAB Runtime, load the compiled MATLAB functions into the MATLAB Runtime, and manage data that is passed between the C++ code and the MATLAB Runtime. The interface only supports C++03 functionality.For more information, see “Implement a C ++ mwArray API Shared Library with a Driver Application”.
- **Create interface that uses the MATLAB Data API** — Creates an interface for a shared library using MATLAB Data API. It uses a generic interface that has modern C ++ semantics. The interface supports C++11 functionality. For more information, see “Implement a C++ MATLAB Data API Shared Library with a Driver Application”.

See Also

`libraryCompiler`

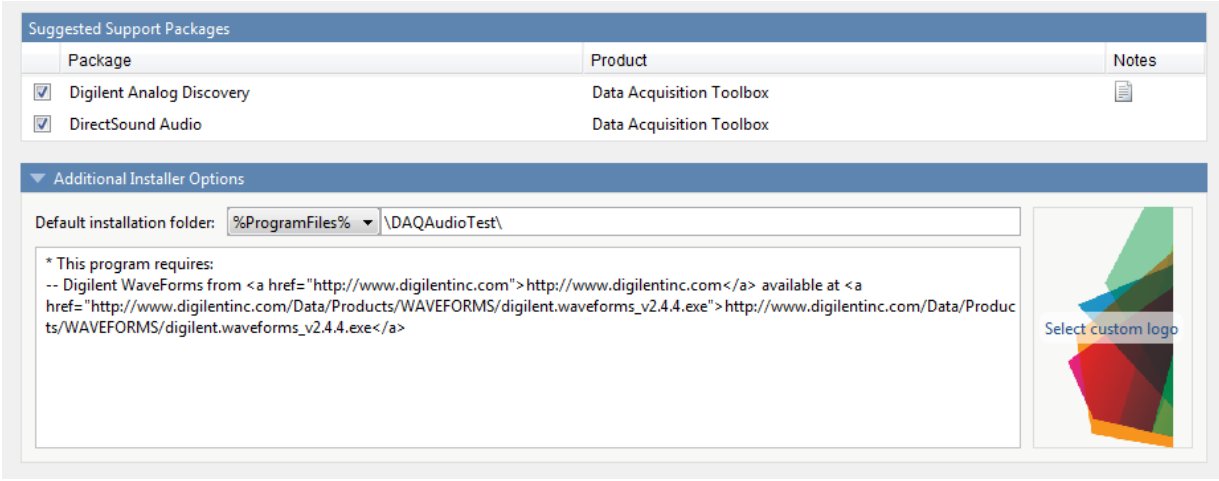
More About

- “Create a C Shared Library with MATLAB Code”
- “Create a C++ Shared Library with MATLAB Code”
- “Create a .NET Assembly with MATLAB Code”
- “Create a Generic COM Component with MATLAB Code”
- “Create a Java Package with MATLAB Code”
- “Create a Python Package with MATLAB Code”

Manage Support Packages

Using a Compiler App

Many MATLAB toolboxes use support packages to interact with hardware or to provide additional processing capabilities. If your MATLAB code uses a toolbox with an installed support package, the app displays a **Suggested Support Packages** section.



The list displays all installed support packages that your MATLAB code requires. The list is determined using these criteria:

- the support package is installed
- your code has a direct dependency on the support package
- your code is dependent on the base product of the support package
- your code is dependent on at least one of the files listed as a dependency in the `mcc.xml` file of the support package, and the base product of the support package is MATLAB

Deselect support packages that are not required by your application.

Some support packages require third-party drivers that the compiler cannot package. In this case, the compiler adds the information to the installation notes. You can edit

installation notes in the **Additional Installer Options** section of the app. To remove the installation note text, deselect the support package with the third-party dependency.

Caution Any text you enter beneath the generated text will be lost if you deselect the support package.

Using the Command Line

Many MATLAB toolboxes use support packages to interact with hardware or to provide additional processing capabilities. If your MATLAB code uses a toolbox with an installed support package, use the `-a` flag with `mcc` command when packaging your MATLAB code to specify supporting files in the support package folder. For example, if your function uses the `OS Generic Video Interface` support package, run the following command:

```
mcc -m -v test.m -a C:\MATLAB\SupportPackages\R2016b\toolbox\daq\supportpackages\daqauc
```

Some support packages require third-party drivers that the compiler cannot package. In this case, you are responsible for downloading and installing the required drivers.

Advanced Uses of the Command Line Compiler

- “Simplify Compilation Using Macros” on page 10-2
- “Invoke MATLAB Build Options” on page 10-4
- “MATLAB Runtime Component Cache and Deployable Archive Embedding” on page 10-7

Simplify Compilation Using Macros

In this section...
“Macros” on page 10-2 “Working With Macros” on page 10-2

Macros

The compiler, through its exhaustive set of options, gives you access to the tools you need to do your job. If you want a simplified approach to compilation, you can use one simple *macro* that allows you to quickly accomplish basic compilation tasks. Macros let you group several options together to perform a particular type of compilation.

This table shows the relationship between the macro approach to accomplish a standard compilation and the multioption alternative.

Macro	Bundle	Creates	Option Equivalence Function Wrapper |Output Stage ||
`-l`	`macro_option_l`	Library	`-W lib -T link:lib`
`-m`	`macro_option_m`	Standalone application	`-Wmain-Tlink:exe`

Working With Macros

The `-m` option tells the compiler to produce a standalone application. The `-m` macro is equivalent to the series of options

```
-W main -T link:exe
```

This table shows the options that compose the `-m` macro and the information that they provide to the compiler.

-m Macro

Option	Function
`-W main`	Produce a wrapper file suitable for a standalone application.
`-T link:exe`	Create an executable link as the output.

Changing Macros

You can change the meaning of a macro by editing the corresponding `macro_option` file in *`matlabroot`*`\toolbox\compiler\bundles`. For example, to change the `-m` macro, edit the file `macro_option_m` in the `bundles` folder.

Note This changes the meaning of `-m` for all users of this MATLAB installation.

Specifying Default Macros

As the `MCCSTARTUP` functionality has been replaced by bundle technology, the `macro_default` file that resides in `toolbox\compiler\bundles` can be used to specify default options to the compiler.

For example, adding `-mv` to the `macro_default` file causes the command:

```
mcc foo.m
```

to execute as though it were:

```
mcc -mv foo.m
```

Similarly, adding `-v` to the `macro_default` file causes the command:

```
mcc -W 'lib:libfoo' -T link:lib foo.m
```

to behave as though the command were:

```
mcc -v -W 'lib:libfoo' -T link:lib foo.m
```

Invoke MATLAB Build Options

In this section...
“Specify Full Path Names to Build MATLAB Code” on page 10-4
“Using Bundles to Build MATLAB Code” on page 10-5

Specify Full Path Names to Build MATLAB Code

If you specify a full path name to a MATLAB file on the `mcc` command line, the compiler

1. Breaks the full name into the corresponding path name and file names (`<path>` and `<file>`).
2. Replaces the full path name in the argument list with “`-I <path> <file>`”.

Specifying Full Path Names

For example:

```
mcc -m /home/user/myfile.m
```

would be treated as

```
mcc -m -I /home/user myfile.m
```

In rare situations, this behavior can lead to a potential source of confusion. For example, suppose you have two different MATLAB files that are both named `myfile.m` and they reside in `/home/user/dir1` and `/home/user/dir2`. The command

```
mcc -m -I /home/user/dir1 /home/user/dir2/myfile.m
```

would be equivalent to

```
mcc -m -I /home/user/dir1 -I /home/user/dir2 myfile.m
```

The compiler finds the `myfile.m` in `dir1` and compiles it instead of the one in `dir2` because of the behavior of the `-I` option. If you are concerned that this might be happening, you can specify the `-v` option and then see which MATLAB file the compiler parses. The `-v` option prints the full path name to the MATLAB file during the dependency analysis phase.

Note The compiler produces a warning (`specified_file_mismatch`) if a file with a full path name is included on the command line and the compiler finds it somewhere else.

Using Bundles to Build MATLAB Code

Bundles provide a convenient way to group sets of compiler options and recall them as needed. The syntax of the bundle option is:

```
-B <bundle>[:<a1>,<a2>,...,<an>]
```

where bundle is either a predefined string such as `cpplib` or `csharedlib` or the name of a file that contains a set of `mcc` command-line options, arguments, filenames, and/or other `-B` options.

A bundle can include replacement parameters for compiler options that accept names and version numbers. For example, the bundle for C shared libraries, `csharedlib`, consists of:

```
-W lib:%1% -T link:lib
```

To invoke the compiler to produce the C shared library `mysharedlib` use:

```
mcc -B csharedlib:mysharedlib myfile.m myfile2.m
```

In general, each `%n%` in the bundle will be replaced with the corresponding option specified to the bundle. Use `%%` to include a `%` character. It is an error to pass too many or too few options to the bundle.

Note You can use the `-B` option with a replacement expression as is at the DOS or UNIX prompt. If more than one parameter is passed, you must enclose the expression that follows the `-B` in single quotes. For example,

```
>>mcc -B csharedlib:libtimefun weekday data tic calendar toc
```

can be used as is at the MATLAB prompt because `libtimefun` is the only parameter being passed. If the example had two or more parameters, then the quotes would be necessary as in

```
>>mcc -B 'cexcel:component,class,1.0' ...
weekday data tic calendar toc
```

Available Bundle Files

Bundle File	Creates	Contents
`cpplib`	C++ library	`-W cpplib:`*`library_name`* `-T link:lib`
`csharedlib`	C library	`-W lib:`*`library_name`* `-T link:lib`
`ccom`	COM component	`-W com:`*`component_name`*`,`*`className`*`,`*`version`* `-T link:lib`
`cexcel`	Excel Add-in	`-W excel:`*`addin_name`*`,`*`className`*`,`*`version`* `-T link:lib`
`cjava`	Java package	`-W java:`*`packageName`*`,`*`className`*
`dotnet`	.NET assembly	`-W dotnet:`*`assembly_name`*`,`*`className`*`,`*`framework_version`*`,`*`security`*`,`*`remote_type`* `-T link:lib`

MATLAB Runtime Component Cache and Deployable Archive Embedding

In this section...
“Overriding Default Behavior” on page 10-8 “For More Information” on page 10-9

Deployable archive data is automatically embedded directly in compiled components and extracted to a temporary folder.

Automatic embedding enables usage of MATLAB Runtime Component Cache features through environment variables.

These variables allow you to specify the following:

- Define the default location where you want the deployable archive to be automatically extracted
- Add diagnostic error printing options that can be used when automatically extracting the deployable archive, for troubleshooting purposes
- Tuning the MATLAB Runtime component cache size for performance reasons.

Use the following environment variables to change these settings.

Environment Variable	Purpose	Notes
MCR_CACHE_ROOT	When set to the location of where you want the deployable archive to be extracted, this variable overrides the default per-user component cache location. This is true for embedded `.ctf` files only.	Does not apply

Environment Variable	Purpose	Notes
MCR_CACHE_VERBOSE	When set to any value, this variable prints logging details about the component cache for diagnostic reasons. This can be very helpful if problems are encountered during deployable archive extraction.	Logging details are turned off by default (for example, when this variable has no value).
MCR_CACHE_SIZE	When set, this variable overrides the default component cache size.	The initial limit for this variable is 32M (megabytes). This may, however, be changed after you have set the variable the first time. Edit the file `.max_size`, which resides in the file designated by running the `mcrcachedir` command, with the desired cache size limit.

You can override this automatic embedding and extraction behavior by compiling with the “Overriding Default Behavior” on page 10-8 option.

Caution If you run `mcc` specifying conflicting wrapper and target types, the deployable archive will not be embedded into the generated component. For example, if you run:

```
mcc -W lib:myLib -T link:exe test.m test.c
```

the generated `test.exe` will not have the deployable archive embedded in it, as if you had specified a `-C` option to the command line.

Overriding Default Behavior

To extract the deployable archive in a manner prior to R2008b, alongside the compiled .NET assembly, compile using the `mcc`'s `-C` option.

You might want to use this option to troubleshoot problems with the deployable archive, for example, as the log and diagnostic messages are much more visible.

For More Information

For more information about the deployable archive, see “Deployable Archive” (MATLAB Compiler).

Work with the MATLAB Runtime

- “MATLAB Runtime Startup Options” on page 11-2
- “Using the MATLAB Runtime User Data Interface” on page 11-5
- “Display the MATLAB Runtime Initialization Messages” on page 11-7

MATLAB Runtime Startup Options

Retrieve MATLAB Runtime Startup Options

Use these functions to return data about the MATLAB Runtime state when working with shared libraries.

Function and Signature	When to Use	Return Value
`bool mclIsMCRInitialized()`	Use `mclIsMCRInitialized()` to determine whether or not the MATLAB Runtime has been properly initialized.	Boolean (`true` or `false`). Returns `true` if MATLAB Runtime is already initialized, else returns `false`.
`bool mclIsJVMEnabled()`	Use `mclIsJVMEnabled()` to determine if the MATLAB Runtime is started with an instance of a Java Virtual Machine (JVM™).	Boolean (`true` or `false`). Returns `true` if MATLAB Runtime has been started with a JVM instance, else returns `false`.
`const char* mclGetLogFileName()`	Use `mclGetLogFileName()` to retrieve the name of the log file used by the MATLAB Runtime.	Character string representing log file name used by the MATLAB Runtime, preceded by the character.

Function and Signature	When to Use	Return Value
`bool mclIsNoDisplaySet()`	Use `mclIsNoDisplaySet()` to determine if `-nodisplay` option is enabled.	Boolean (`true` or `false`). Returns `true` if `-nodisplay` is enabled, else returns `false`. **Note** `false` is always returned on Windows systems since the `-nodisplay` option is not supported on Windows systems. When running on Mac, if `-nodisplay` is used as one of the options included in `mclInitializeApplication`, then the call to `mclInitializeApplication` must occur before calling `mclRunMain`.

Note All of these attributes have properties of write-once, read-only.

Retrieve Information About MATLAB Runtime Startup Options

The following example demonstrates how to pass options to a C or C++ shared library and how to retrieve the corresponding values after they are set.

```
const char* options[4];
   options[0] = "-logfile";
   options[1] = "logfile.txt";
   options[2] = "-nojvm";
   options[3] = "-nodisplay";
   if( !mclInitializeApplication(options,4) )
   {
       fprintf(stderr,
               "Could not initialize the application.\n");
       return -1;
   }
   printf("MCR initialized : %d\n", mclIsMCRInitialized());
   printf("JVM initialized : %d\n", mclIsJVMEnabled());
```

```
printf("Logfile name : %s\n", mclGetLogFileName());
printf("nodisplay set : %d\n", mclIsNoDisplaySet());
fflush(stdout);
```

Using the MATLAB Runtime User Data Interface

The MATLAB Runtime User Data Interface lets you easily access MATLAB Runtime data. It allows keys and values to be passed between a MATLAB Runtime instance, the MATLAB code running on the MATLAB Runtime, and the host application that created the instance. Through calls to the MATLAB Runtime User Data Interface API, you access MATLAB Runtime data by creating a per-instance associative array of `mxArray`s, consisting of a mapping from string keys to `mxArray` values. Reasons for doing this include, but are not limited to the following:

- You need to supply run-time profile information to a client running an application created with the Parallel Computing Toolbox™. You supply and change profile information on a per-execution basis. For example, two instances of the same application may run simultaneously with different profiles. See “Use Parallel Computing Toolbox in Deployed Applications” for more information.
- You want to set up a global workspace, a global variable or variables that MATLAB and your client can access.
- You want to store the state of any variable or group of variables.

The API consists of:

- Two MATLAB functions callable from within deployed application MATLAB code
- Four external C functions callable from within deployed application wrapper code

MATLAB Functions

Use the MATLAB functions `getmcruserdata` and `setmcruserdata` from deployed MATLAB applications. They are loaded by default only in applications created with the MATLAB Compiler or MATLAB Compiler SDK products.

Tip `getmcruserdata` and `setmcruserdata` will produce an `Unknown function` error when called in MATLAB if the MCLMCR module cannot be located. This can be avoided by calling `isdeployed` before calling `getmcruserdata` and `setmcruserdata`. For more information about the `isdeployed` function, see the `isdeployed` reference page.

Set and Retrieve MATLAB Runtime Data for Shared Libraries

There are many possible scenarios for working with MATLAB Runtime data. The most general scenario involves setting the MATLAB Runtime with specific data for later retrieval, as follows:

1. In your code, include the MATLAB Runtime header file and the library header generated by MATLAB Compiler SDK.
2. Properly initialize your application using `mclInitializeApplication`.
3. After creating your input data, write or “set” it to the MATLAB Runtime with `setmcruserdata`.
4. After calling functions or performing other processing, retrieve the new MATLAB Runtime data with `getmcruserdata`.
5. Free up storage memory in work areas by disposing of unneeded arrays with `mxDestroyArray`.
6. Shut down your application properly with `mclTerminateApplication`.

Display the MATLAB Runtime Initialization Messages

You can display a console message for end users that informs them when MATLAB Runtime initialization starts and completes.

To create these messages, use the `-R` option of the `mcc` command.

You have the following options:

- Use the default start-up message only (`Initializing MATLAB runtime version` *`x.xx`*)
- Customize the start-up or completion message with text of your choice. The default start-up message will also display prior to displaying your customized start-up message.

Some examples of different ways to invoke this option follow:

This command:	**Displays:**
`mcc -R -startmsg`	Default start-up message `Initializing MATLAB Runtime version` *`x.xx`*
`mcc -R -startmsg,'`*`user customized message`*`'`	Default start-up message `Initializing MATLAB Runtime version` *`x.xx`* and *`user customized message`* for start-up
`mcc -R -completemsg,'`*`user customized message`*`'`	Default start-up message `Initializing MATLAB Runtime version` *`x.xx`* and *`user customized message`* for completion
`mcc -R -startmsg,'`*`user customized message`*`' -R -completemsg,'`*`user customized message`*`"`	Default start-up message `Initializing MATLAB Runtime version` *`x.xx`* and *`user customized message`* for both start-up and completion by specifying `-R` before each option
`mcc -R -startmsg,'`*`user customized message`*`',-completemsg,'`*`user customized message`*`'`	Default start-up message `Initializing MATLAB Runtime version` *`x.xx`* and *`user customized message`* for both start-up and completion by specifying `-R` only once

Best Practices

Keep the following in mind when using `mcc -R`:

- When calling `mcc` in the MATLAB command window, place the comma inside the single quote.

  ```
  mcc -m hello.m -R '-startmsg,"Message_Without_Space"'
  ```

- If your initialization message has a space in it, call `mcc` from the system command window or use `!mcc` from MATLAB.

Limitations and Restrictions

- “Limitations” on page 12-2
- “Functions not supported by MATLAB Compiler / MATLAB Compiler SDK ” on page 12-9

Limitations

Packaging MATLAB and Toolboxes

MATLAB Compiler SDK supports the full MATLAB language and almost all toolboxes based on MATLAB except:

- Most of the prebuilt graphical user interfaces included in MATLAB and its companion toolboxes.
- Functionality that cannot be called directly from the command line.
- Symbolic Math Toolbox™
- Cross-platform compatibility of applications. For example, you cannot run an application compiled in Windows on Linux.

Compiled applications can run only on operating systems that run MATLAB. However, components generated by the MATLAB Compiler SDK cannot be used in MATLAB. Also, since the MATLAB Runtime is approximately the same size as MATLAB, applications built with MATLAB Compiler SDK need specific storage memory and RAM to operate. For the most up-to-date information about system requirements, go to the MathWorks website.

To see the full list of MATLAB Compiler SDK limitations, visit: `https://www.mathworks.com/products/compiler/compiler_support.html`.

Note For a list of functions not supported by the MATLAB Compiler SDK See “Functions not supported by MATLAB Compiler / MATLAB Compiler SDK” on page 12-9.

Fixing Callback Problems: Missing Functions

When MATLAB Compiler SDK creates a standalone application, it packages the MATLAB files that you specify on the command line. In addition, it includes any other MATLAB files that your packaged MATLAB files call. MATLAB Compiler SDK uses a dependency analysis, which determines all the functions on which the supplied MATLAB files, MEX-files, and P-files depend.

Note If the MATLAB file associated with a p-file is unavailable, the dependency analysis cannot discover the p-file dependencies.

The dependency analysis cannot locate a function if the only place the function is called in your MATLAB file is a call to the function in either of the following:

- Callback string
- Character array passed as an argument to the `feval` function or an ODE solver

> **Tip** Dependent functions can also be hidden from the dependency analyzer in `.mat` files that are loaded by compiled applications. Use the `mcc -a` argument or the `%#function` pragma to identify `.mat` file classes or functions that are supported by the `load` command.

MATLAB Compiler SDK does not look in these text character arrays for the names of functions to package.

Symptom

Your application runs, but an interactive user interface element, such as a push button, does not work. The compiled application issues this error message:

```
An error occurred in the callback: change_colormap
The error message caught was    : Reference to unknown function
                change_colormap from FEVAL in stand-alone mode.
```

Workaround

There are several ways to eliminate this error:

- Using the `%#function pragma` and specifying callbacks as character arrays
- Specifying callbacks with function handles
- Using the `-a` option

Specifying Callbacks as Character Arrays

Create a list of all the functions that are specified only in callback character arrays and pass these functions using separate `%#function` pragma statements. This overrides the product dependency analysis and instructs it to explicitly include the functions listed in the `%#function` pragmas.

For example, the call to the `change_colormap` function in the sample application `my_test` illustrates this problem. To make sure MATLAB Compiler SDK processes the `change_colormap` MATLAB file, list the function name in the `%#function` pragma.

```
function my_test()
% Graphics library callback test application

%#function change_colormap

peaks;

p_btn = uicontrol(gcf,...
                  'Style', 'pushbutton',...
                  'Position',[10 10 133 25 ],...
                  'String', 'Make Black & White',...
                  'CallBack','change_colormap');
```

Specifying Callbacks with Function Handles

To specify the callbacks with function handles, use the same code as in the example above, and replace the last line with:

```
'CallBack',@change_colormap);
```

For more information on specifying the value of a callback, see the MATLAB Programming Fundamentals documentation.

Using the -a Option

Instead of using the `%#function` pragma, you can specify the name of the missing MATLAB file on the MATLAB Compiler SDK command line using the `-a` option.

Finding Missing Functions in a MATLAB File

To find functions in your application that need to be listed in a `%#function` pragma, search your MATLAB file source code for text specified as callback character arrays or as arguments to the `feval`, `fminbnd`, `fminsearch`, `funm`, and `fzero` functions or any ODE solvers.

To find text used as callback character array, search for the characters “Callback” or “fcn” in your MATLAB file. This search finds all the `Callback` properties defined by graphics objects, such as `uicontrol` and `uimenu`. In addition, it finds the properties of figures and axes that end in `Fcn`, such as `CloseRequestFcn`, that also support callbacks.

Suppressing Warnings on the UNIX System

Several warnings might appear when you run a standalone application on the UNIX system.

To suppress the `libjvm.so` warning, set the dynamic library path properly for your platform. See “MATLAB Runtime Path Settings for Run-Time Deployment”.

You can also use the compiler option `-R -nojvm` to set your application's `nojvm` run-time option, if the application is capable of running without Java.

Cannot Use Graphics with the -nojvm Option

If your program uses graphics and you compile with the `-nojvm` option, you get a run-time error.

Cannot Create the Output File

If you receive this error, there are several possible causes to consider.

`Can't create the output file` *`filename`*

Possible causes include:

- Lack of write permission for the folder where MATLAB Compiler SDK is attempting to write the file (most likely the current working folder).
- Lack of free disk space in the folder where MATLAB Compiler SDK is attempting to write the file (most likely the current working folder).
- If you are creating a standalone application and have been testing it, it is possible that a process is running and is blocking MATLAB Compiler SDK from overwriting it with a new version.

No MATLAB File Help for Packaged Functions

If you create a MATLAB file with self-documenting online help and package it, the results of following command are unintelligible:

`help` *`filename`*

Note For performance reasons, MATLAB file comments are stripped out before MATLAB Runtime encryption.

No MATLAB Runtime Versioning on Mac OS X

The feature that allows you to install multiple versions of the MATLAB Runtime on the same machine is not supported on Mac OS X. When you receive a new version of MATLAB, you must recompile and redeploy all your applications and components. Also, when you install a new MATLAB Runtime on a target machine, you must delete the old version of the MATLAB Runtime and install the new one. You can have only one version of the MATLAB Runtime on the target machine.

Older Neural Networks Not Deployable with MATLAB Compiler

Loading networks saved from older Deep Learning Toolbox versions requires some initialization routines that are not deployable. Therefore, these networks cannot be deployed without first being updated.

For example, deploying with Deep Learning Toolbox Version 5.0.1 (2006b) and MATLAB Compiler Version 4.5 (R2006b) yields the following errors at run time:

```
??? Error using ==> network.subsasgn
"layers{1}.initFcn" cannot be set to non-existing
 function "initwb".
Error in ==> updatenet at 40
Error in ==> network.loadobj at 10

??? Undefined function or method 'sim' for input
arguments of type 'struct'.
Error in ==> mynetworkapp at 30
```

Restrictions on Calling PRINTDLG with Multiple Arguments in Packaged Mode

In compiled mode, only one argument can be present in a call to the MATLAB `printdlg` function (for example, `printdlg(gcf)`).

You cannot receive an error when making at call to `printdlg` with multiple arguments. However, when an application containing the multiple-argument call is packaged, the action fails with the following error message:

```
Error using = => printdlg at 11
PRINTDLG requires exactly one argument
```

Packaging a Function with which Does Not Search Current Working Folder

Using `which`, as in this example, does not cause the current working folder to be searched in deployed applications. In addition, it may cause unpredictable behavior of the `open` function.

```
function pathtest
which myFile.mat
open('myFile.mat')
```

Use one of the following solutions as an alternative:

- Use the `pwd` function to explicitly point to the file in the current folder, as follows:

  ```
  open([pwd '/myFile.mat'])
  ```

- Rather than using the general `open` function, use `load` or other specialized functions for your particular file type, as `load` explicitly checks for the file in the current folder. For example:

  ```
  load myFile.mat
  ```

- Include your file in the **Files required for your application to run** area of the **Compiler** app or the `-a` flag using `mcc`.

Restrictions on Using C++ SETDATA to Dynamically Resize an mwArray

You cannot use the C++ `SETDATA` function to dynamically resize `mwArray`s.

For instance, if you are working with the following array:

```
[1 2 3 4]
```

you cannot use `SETDATA` to increase the size of the array to a length of five elements.

See Also

More About

- “Functions not supported by MATLAB Compiler / MATLAB Compiler SDK” on page 12-9

Functions not supported by MATLAB Compiler / MATLAB Compiler SDK

Note Due to the number of active and ever-changing list of MathWorks products and functions, this is not a complete list of functions that cannot be compiled. If you have a question as to whether a specific MathWorks product's function is able to be compiled or not, the definitive source is that product's documentation. For an updated list of such functions, see Support for MATLAB and Toolboxes.

Functions that cannot be compiled fall into the following categories:

- Functions that print or report MATLAB code from a function, for example, the MATLAB `help` function or debug functions, do not work.
- Simulink® functions, in general, do not work.
- Functions that require a command line, for example, the MATLAB `lookfor` function, do not work.
- `clc`, `home`, and `savepath` do not do anything in deployed mode.
- Only certain tools that allow run-time manipulation of figures are supported, for example, adding legends, selecting data points, zooming in and out, etc.

Returned values from standalone applications are 0 for successful completion or a nonzero value otherwise.

In addition, there are functions and programs that have been identified as nondeployable due to licensing restrictions.

`mccExcludedFiles.log` lists all the functions and files excluded by `mcc` if they cannot be compiled. It is created after each attempted build if there are functions or files that cannot be compiled.

List of Unsupported Functions and Programs

`add_block`
`add_line`
`checkcode`
`close_system`
`colormapeditor`
`commandwindow`
Control System Toolbox™ prescale GUI
`createClassFromWsdl`
`dbclear`
`dbcont`
`dbdown`
`dbquit`
`dbstack`
`dbstatus`
`dbstep`
`dbstop`
`dbtype`
`dbup`
`delete_block`
`delete_line`
`depfun`
`doc`
`echo`
`edit`
`fields`
`figure_palette`
`get_param`
`help`
`home`

```
inmem
keyboard
linkdata
linmod
mislocked
mlock
more
munlock
new_system
open_system
pack
pcode
plotbrowser
plotedit
plottools
profile
profsave
propedit
propertyeditor
publish
rehash
restoredefaultpath
run
segment
set_param
sim
sldebug
type
```

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Functions

%#function

Pragma to help MATLAB Compiler locate functions called through `feval`, `eval`, Handle Graphics callback, or objects loaded from MAT-files

Syntax

`%#function` *`function1`* [*`function2 ... functionN`*]

`%#function` *`object_constructor`*

Description

The `%#function` pragma informs MATLAB Compiler that the specified function(s) will be called through an `feval`, `eval`,Handle Graphics callback, or objects loaded from MAT-files.

Use the `%#function` pragma in standalone applications to inform MATLAB Compiler that the specified function(s) should be included in the compilation, whether or not MATLAB Compiler's dependency analysis detects the function(s). It is also possible to include objects by specifying the object constructor.

Without this pragma, the product's dependency analysis will not be able to locate and compile all MATLAB files used in your application. This pragma adds the top-level function as well as all the local functions in the file to the compilation.

Examples

Example 1

```
function foo
  %#function bar

     feval('bar');

  end %function foo
```

By implementing this example, MATLAB Compiler is notified that function `bar` will be included in the compilation and is called through `feval`.

Example 2

```
function foo
   %#function bar foobar

      feval('bar');
      feval('foobar');

   end %function foo
```

In this example, multiple functions (`bar` and `foobar`) are included in the compilation and are called through `feval`.

Example 3

```
function foo
   %#function ClassificationSVM

      load('svm-classifier.mat');
      num_dimensions = size(svm_model.PredictorNames, 2);

    end %function foo
```

In this example, an object from the class `ClassificationSVM` is loaded from a MAT-file. For more information, see “MATLAB Data Files in Compiled Applications” (MATLAB Compiler).

Introduced before R2006a

componentinfo

Query system registry about COM component created with MATLAB Compiler SDK

Syntax

```
info = componentinfo
info = componentinfo(component_name)
info = componentinfo(component_name, major_revision_number)
info = componentinfo(component_name, major_revision_number,
minor_revision_number)
```

Arguments

component_name	MATLAB character array naming the COM component created by MATLAB Compiler SDK. Names are case sensitive. If the argument is not supplied, information is returned on all installed components.
major_revision_number	Component major revision number. If the argument is not supplied, information is returned on all major revisions.
minor_revision_number	Component minor revision number. Default value is `0`.

Description

`info = componentinfo` returns information for all components installed on the system.

`info = componentinfo(`*component_name*`)` returns information for all revisions of *component_name*.

`info = componentinfo(`*component_name*`, `*major_revision_number*`)` returns information for the most recent minor revision corresponding to *major_revision_number* of *component_name*.

`info = componentinfo(component_name, major_revision_number, minor_revision_number)` returns information for the specific major and minor version of `component_name`.

The return value is an array of structures representing all the registry and type information needed to load and use the component.

When you supply a component name, `major_revision_number` and `minor_revision_number` are interpreted as shown next.

Value	Information Returned
`> 0`	Information on a specific major and minor revision.
`0`	Information on the most recent revision. When omitted, `minor_revision_number` is assumed to be `0`.
`< 0`	Information on all versions.

This table describes the fields in `componentinfo`.

Registry Information Returned by componentinfo

Field	Description
`Name`	Component name.
`TypeLib`	Component type library.
`LIBID`	Component type library GUID.
`MajorRev`	Major version number .
`MinorRev`	Minor version number.
`FileName`	Type library file name and path. Since all the compiler components have the type library bound into the DLL, this file name is the same as the DLL name and path.
`Interfaces`	An array of structures defining all interface definitions in the type library. Each structure contains two fields: • `Name` - Interface name. • `IID` - Interface GUID.

Field	Description

`CoClasses`	An array of structures defining all COM classes in the component. Each structure contains these fields:
	• Name - Class name.
	• CLSID - GUID of the class.
	• ProgID - Version-dependent program ID.
	• VerIndProgID - Version-independent program ID.
	• InprocServer32 - Full name and path to component DLL.
	• Methods - A structure containing function prototypes of all class methods defined for this interface. This structure contains four fields:
	  • IDL - An array of Interface Description Language function prototypes.
	  • M - An array of MATLAB function prototypes.
	  • C - An array of C-language function prototypes.
	  • VB - An array of VBA function prototypes.
	• Properties - A cell array containing the names of all class properties.
	• Events - A structure containing function prototypes of all events defined for this class. This structure contains four fields:
	  • IDL - An array of Interface Description Language function prototypes.
	  • M - An array of MATLAB function prototypes.
	  • C - An array of C-language function prototypes.
	  • VB - An array of VBA function prototypes.

Examples

Function Call	Returned Information
`Info = componentinfo`	Information for all installed components.
`Info = componentinfo('mycomponent')`	Information for all revisions of `mycomponent`.
`Info = componentinfo('mycomponent', 1,0)`	Information for revision 1.0 of `mycomponent`.

Tips

Use the `componentinfo` function to get information (such as class name, program ID) to pass on to users of a component that you create.

The `componentinfo` function also provides a record of changes made to the registry on your development machine. This information might be useful for debugging if you run into problems.

Introduced before R2006a

ctfroot

Location of files related to deployed application

Syntax

```
root = ctfroot
```

Description

`root = ctfroot` returns the name of the folder where the deployable archive for the application is expanded.

Use this function to access any file that the user would have included in their project (excluding the ones in the packaging folder).

Examples

Determine location of deployable archive

```
appRoot = ctfroot;
```

Output Arguments

`root` — Path to expanded deployable archive
character vector

Path to expanded deployable archive returned as a character vector in the form: *`application_name`*`_mcr`. .

Introduced in R2006a

deploytool

Compile and package functions for external deployment

Syntax

```
deploytool
deploytool project_name
deploytool -build project_name
deploytool -package project_name
```

Description

`deploytool` opens a list of the compiler apps.

`deploytool project_name` opens the appropriate compiler app with the project preloaded.

`deploytool -build project_name` runs the appropriate compiler app to build the specified project. The installer is not generated.

`deploytool -package project_name` runs the appropriate compiler app to build and package the specified project. The installer is generated.

Examples

Create a New Compiler Project

Open the compiler to create a new project.

```
deploytool
```

Package an Application using an Existing Project

Open the compiler to build a new application using an existing project.

```
deploytool -package my_magic
```

Input Arguments

`project_name` — name of the project to be compiled

character array or string

Name of the project to be compiled, specified as a character array or string.The project must be on the current path.

Introduced in R2006b

figToImStream

Stream figure as byte array encoded in specified format

Syntax

```
output = figToImStream
output = figToImStream (Name,Value)
```

Description

`output = figToImStream` creates a signed byte array with the PNG data for the current figure. The size and position of the printed output depends on the figure's `PaperPosition[mode]` properties.

`output = figToImStream (Name,Value)` creates a byte array with the image data for the specified figure. You can specify the encoding format for the image and if the byte array is signed or unsigned. The size and position of the printed output depends on the figure's `PaperPosition[mode]` properties.

Examples

Convert current figure to a signed PNG formatted byte array

```
surf(peaks)
bytes = figToImStream
```

Convert a specific figure to a bitmap stored in an unsigned byte array

```
f = figure;
surf(peaks);
bytes = figToImStream('figHandle',f,...
                      'imageFormat','bmp',...
                      'outputType','uint8');
```

Input Arguments

Name-Value Pair Arguments

Specify optional comma-separated pairs of `Name,Value` arguments. `Name` is the argument name and `Value` is the corresponding value. `Name` must appear inside quotes. You can specify several name and value pair arguments in any order as `Name1,Value1,...,NameN,ValueN`.

Example: `'figHandle', f, 'imageFormat', 'bmp', 'outputType', 'uint8'` specifies the figure `f` is streamed into an unsigned byte array as a bitmap.

`figHandle` — Figure to stream
empty character array or string (default) | figure handle

Figure to stream, specified as the comma-separated pair consisting of `'figHandle'` and a figure handle.

`imageFormat` — Encoding format
png (default) | jpg | bmp | gif

Encoding format, specified as the comma-separated pair consisting of `'imageFormat'` and one of these values:

- `png` — encode the image using the Portable Network Graphics (PNG) format
- `jpg` — encode the image using the JPEG format
- `bmp` — encode the image as a bitmap
- `gif` — encode the image using the Graphics Interchange Format (GIF)

`outputType` — Type of bytes to store the image stream
int8 (default) | uint8

Type of bytes to store the image stream, specified as the comma-separated pair consisting of `'outputType'` and one of these values:

- `int8` — use a signed byte array
- `uint8` — use an unsigned byte array

Output Arguments

`output` — Encoded figure data
byte array

Encoded figure data returned as a byte array.

Introduced in R2009b

getmcruserdata

Retrieve MATLAB array value associated with a given key

Syntax

```
function_value = getmcruserdata(key)
```

Description

The `function_value = getmcruserdata(key)` command is part of the MATLAB Runtime User Data interface API. It returns an empty matrix if no such key exists.

Examples

```
function_value =
            getmcruserdata('ParallelProfile');
```

See Also

`setmcruserdata`

Introduced in R2008b

isdeployed

Determine whether code is running in deployed or MATLAB mode

Syntax

```
x = isdeployed
```

Description

`x = isdeployed` returns true (1) when the function is running in deployed mode and false (0) if it is running in a MATLAB session.

If you include this function in an application and compile the application, the function will return true when the application is run in deployed mode. If you run the application containing this function in a MATLAB session, the function will return false.

Introduced before R2006a

ismcc

Test if code is running during compilation process (using `mcc`)

Syntax

```
x = ismcc
```

Description

`x = ismcc` returns true when the function is being executed by `mcc` dependency checker and false otherwise.

When this function is executed by the compilation process started by `mcc`, it will return true. This function will return false when executed within MATLAB as well as in deployed mode. To test for deployed mode execution, use `isdeployed`. This function should be used to guard code in `matlabrc`, or `hgrc` (or any function called within them, for example `startup.m` in the example on this page), from being executed by MATLAB Compiler (`mcc`) or MATLAB Compiler SDK.

In a typical example, a user has `ADDPATH` calls in their MATLAB code. These can be guarded from executing using `ismcc` during the compilation process and `isdeployed` for the deployed application as shown in the example on this page.

Examples

```
`% startup.m
    if ~(ismcc || isdeployed)
       addpath(fullfile(matlabroot,'work'));
    end
```

See Also

`isdeployed` | `mcc`

libraryCompiler

Build and package functions for use in external applications

Syntax

```
libraryCompiler
libraryCompiler project_name
libraryCompiler -build project_name
libraryCompiler -package project_name
```

Description

`libraryCompiler` opens the Library Compiler app for the creation of a new compiler project

`libraryCompiler project_name` opens the Library Compiler app with the project preloaded.

`libraryCompiler -build project_name` runs the Library Compiler app to build the specified project. The installer is not generated.

`libraryCompiler -package project_name` runs the Library Compiler app to build and package the specified project. The installer is generated.

Examples

Create a New Project

Open the Library Compiler app to create a new project.

```
libraryCompiler
```

Package a Function using an Existing Project

Open the Library Compiler app using an existing project.

```
libraryCompiler -package my_magic
```

Input Arguments

`project_name` — name of the project to be compiled

character array or string

Specify the name of a previously saved project. The project must be on the current path.

Introduced in R2013b

mbuild

Compile and link source files against MATLAB generated shared libraries

Syntax

```
mbuild [option1 ... optionN] sourcefile1 [... sourcefileN]
   [objectfile1 ... objectfileN] [libraryfile1 ... libraryfileN]
```

Description

`mbuild` compiles and links customer written C or C++ code against MATLAB generated shared libraries.

Some of these options (`-f`, `-g`, and `-v`) are available on the `mcc` command line and are passed along to `mbuild`. Others can be passed along using the `-M` option to `mcc`. For details on the `-M` option, see the `mcc` reference page.

Supported Source File Types

Supported types of source files are:

- `.c`
- `.cpp`

Arguments to `mbuild` that are not options and do not belong to one of the supported source file types are assumed to be library names, and are passed to the linker.

Options

This table lists the set of `mbuild` options. If no platform is listed, the option is available on both UNIX and Windows.

Option	Description
`@<rspfile>`	(Windows only) Include the contents of the text file `<rspfile>` as command line arguments to `mbuild`.
`-c`	Compile only. Creates an object file only.
`-D<name>`	Define a symbol name to the C preprocessor. Equivalent to a `#define <name>` directive in the source.
`-D<name>=<value>`	Define a symbol name and value to the C preprocessor. Equivalent to a `#define <name> <value>` directive in the source.
`-f <optionsfile>`	Specify location and name of options file to use. Overrides the `mbuild` default options file search mechanism.
`-g`	Create an executable containing additional symbolic information for use in debugging. This option disables the `mbuild` default behavior of optimizing built object code (see the `-O` option).
`-h[elp]`	Print help for `mbuild`.
`-I<pathname>`	Add `<pathname>` to the list of folders to search for `#include` files.
`-l<name>`	Link with object library. On Windows systems, `<name>` expands to `<name>.lib` or `lib<name>.lib` and on UNIX systems, to `lib<name>.so` or `lib<name>.dylib`. Do not add a space after this switch. **Note** When linking with a library, it is essential that you first specify the path (with `-I<pathname>`, for example).
`-L<folder>`	Add `<folder>` to the list of folders to search for libraries specified with the `-l` option. On UNIX systems, you must also set the run-time library paths. Do not add a space after this switch.
`-n`	No execute mode. Print out any commands that `mbuild` would otherwise have executed, but do not actually execute any of them.

Option	Description
`-O`	Optimize the object code. Optimization is enabled by default and by including this option on the command line. If the `-g` option appears without the `-O` option, optimization is disabled.
`-outdir <dirname>`	Place all output files in folder `<dirname>`.
`-output <resultname>`	Create an executable named `<resultname>`. An appropriate executable extension is automatically appended. Overrides the `mbuild` default executable naming mechanism.
`-setup`	Interactively specify the C/C++ compiler options file to use as the default for future invocations of `mbuild` by placing it in the user profile folder (returned by the `prefdir` command). When this option is specified, no other command line input is accepted.
`-setup -client mbuild_com`	Interactively specify the COM compiler options file to use as the default for future invocations of `mbuild` by placing it in the user profile folder (returned by the `prefdir` command). When this option is specified, no other command line input is accepted.
`-U<name>`	Remove any initial definition of the C preprocessor symbol `<name>`. (Inverse of the `-D` option.)
`-v`	Verbose mode. Print the values for important internal variables after the options file is processed and all command line arguments are considered. Prints each compile step and final link step fully evaluated.

Option	Description
`<name>=<value>`	Supplement or override an options file variable for variable `<name>`. This option is processed after the options file is processed and all command line arguments are considered. You may need to use the shell's quoting syntax to protect characters such as spaces that have a meaning in the shell syntax. On Windows double quotes are used (e.g., `COMPFLAGS="opt1 opt2"`), and on UNIX single quotes are used (e.g., `CFLAGS='opt1 opt2'`). It is common to use this option to supplement a variable already defined. To do this, refer to the variable by prepending a `$` (e.g., `COMPFLAGS="$COMPFLAGS opt2"` on Windows or `CFLAGS='$CFLAGS opt2'` on UNIX shell). For the MinGW-w64 compiler, which is based on gcc/g++, use single quotes (`'`).

Examples

To change the default C/C++ compiler for use with MATLAB Compiler SDK, use

```
mbuild -setup
```

To compile and link an external C program `foo.c` against `libfoo`, use

```
mbuild foo.c -L. -lfoo (on UNIX)
mbuild foo.c libfoo.lib (on Windows)
```

This assumes both `foo.c` and the library generated above are in the current working folder.

Introduced before R2006a

mcc

Compile MATLAB functions for deployment

Syntax

```
mcc options mfilename1 mfilename2...mfilenameN

mcc -l options mfilename1 mfilename2...mfilenameN
mcc -c options mfilename1 mfilename2...mfilenameN
mcc -W cpplib:library_name[,{all|legacy|generic}] options mfilename1
mfilename2...mfilenameN

mcc -W com:component_name,className -T link:lib options
class{className:mfilename1 mfilename2...mfilenameN}

mcc -W
dotnet:assembly_name,className,framework_version,security,remote_typ
e -T link:lib options mfilename1 mfilename2...mfilenameN
mcc -W
dotnet:assembly_name,className,framework_version,security,remote_typ
e -T link:lib options class{className:mfilename1
mfilename2...mfilenameN}

mcc -W java:packageName,className options mfilename1
mfilename2...mfilenameN
mcc -W java:packageName,className options class{className:mfilename1
mfilename2...mfilenameN}

mcc -W python:namespace.packageName -T link:lib options mfilename1
mfilename2...mfilenameN

mcc -W CTF:archive_name -U options mfilename1
mfilename2...mfilenameN

mcc -W mpsxl:addin_name,className,version input_marshaling_flags
output_marshaling_flags -T link:lib options mfilename1
mfilename2...mfilenameN
```

Description

`mcc options mfilename1 mfilename2...mfilenameN` compiles the functions as specified by the options.

The options used depend on the intended results of the compilation. For information on compiling:

- standalone applications, Excel add-ins, or Hadoop® jobs see `mcc` for MATLAB Compiler

`mcc -l options mfilename1 mfilename2...mfilenameN` compiles the listed functions into a C shared library and generates C wrapper code for integration with other applications.

This syntax is equivalent to `-W lib:`*`libname`* `-T link:lib`.

`mcc -c options mfilename1 mfilename2...mfilenameN` generates C wrapper code for the listed functions.

This is equivalent to `-W lib:`*`libname`* `-T codegen`.

`mcc -W cpplib:`*`library_name`*`[,{all|legacy|generic}] options mfilename1 mfilename2...mfilenameN` compiles the listed functions into a C++ shared library and generates C++ wrapper code for integration with other applications.

- *`library_name`* — Specifies the name of the shared library.
- `all`— Generates shared libraries using both the `mwArray` API and the generic interface that uses the MATLAB Data API. This is the default.
- `legacy`— Generates shared libraries using the `mwArray`API.
- `generic`— Generates shared libraries using the MATLAB Data API.

`mcc -W com:`*`component_name`*`,`*`className`* `-T link:lib options class{`*`className`*`:mfilename1 mfilename2...mfilenameN}` compiles the listed functions into a generic Microsoft COM component.

- *`component_name`* — Specifies the name of the COM component.
- *`className`* — Specifies the name of the class.

`mcc -W dotnet:`*`assembly_name`*`,`*`className`*`,`*`framework_version`*`,`*`security`*`,`*`remote_typ`*

e `-T link:lib options mfilename1 mfilename2...mfilenameN` creates a .NET assembly with a single class from the specified files.

- *`assembly_name`* — Specifies the name of the assembly preceded by its namespace, which is a period-separated list, such as `companyname.groupname.component`.
- *`className`* — Specifies the name of the .NET class to be created.
- *`framework_version`* — Specifies the version of the Microsoft .NET Framework you want to use to compile the assembly. Specify either:
  - `0.0` — Use the latest supported version on the target machine.
  - *`version_major.version_minor`* — Use a specific version of the framework.

  Features are often version-specific. Consult the documentation for the feature you are implementing to get the Microsoft .NET Framework version requirements.
- *`security`* — Specifies whether the assembly to be created is a private assembly or a shared assembly.
  - To create a private assembly, specify `Private`.
  - To create a shared assembly, specify the full path to the encryption key file used to sign the assembly.
- *`remote_type`* — Specifies the remoting type of the assembly. Values are `remote` and `local`.

`mcc -W dotnet:`*`assembly_name`*`,`*`className`*`,`*`framework_version`*`,`*`security`*`,`*`remote_type`*` -T link:lib options class{`*`className`*`:mfilename1 mfilename2...mfilenameN}` creates a .NET assembly with multiple classes from the specified files.

- *`assembly_name`* — Specifies the name of the assembly and its namespace, which is a period-separated list, such as `companyname.groupname.component`.
- *`className`* — Specifies the name of the .NET class to be created.

  Note You can include multiple class specifiers.
- *`framework_version`* — Specifies the version of the Microsoft .NET Framework you want to use to compile the assembly. Specify either:
  - `0.0` — Use the latest supported version on the target machine.

- *version_major*.*version_minor* — Use a specific version of the framework.

  Features are often version-specific. Consult the documentation for the feature you are implementing to get the Microsoft .NET Framework version requirements.

- *security* — Specifies whether the assembly to be created is a private assembly or a shared assembly.

  - To create a private assembly, specify `Private`.
  - To create a shared assembly, specify the full path to the encryption key file used to sign the assembly.

- *remote_type* — Specifies the remoting type of the assembly. Values are `remote` and `local`.

`mcc -W java:`*packageName*`,`*className* `options mfilename1 mfilename2...mfilenameN` creates a Java package from the specified files.

- *packageName* — Specifies the name of the Java package and its namespace, which is a period-separated list, such as `companyname.groupname.component`.
- *className* — Specifies the name of the class to be created. If you do not specify the class name, `mcc` uses the last item in *packageName*.

`mcc -W java:`*packageName*`,`*className* `options class{`*className*`:mfilename1 mfilename2...mfilenameN}` creates a Java package with multiple classes from the specified files.

- *packageName* — Specifies the name of the Java package and its namespace, which is a period-separated list, such as `companyname.groupname.component`.
- *className* — Specifies the name of the class to be created. If you do not specify the class name, `mcc` uses the last item in *packageName*.

Note You can include multiple class specifiers.

`mcc -W python:`*namespace*`.`*packageName* `-T link:lib options mfilename1 mfilename2...mfilenameN` creates a Python package from the specified files.

- *namespace* — Specifies the optional namespace for the package, which is a period-separated list, such as `companyname.groupname.component`
- *packageName* — Specifies the name of the Python package.

`mcc -W CTF:`*`archive_name`* `-U options mfilename1 mfilename2...mfilenameN` instructs the compiler to create a deployable archive (`.ctf` file) for use with a MATLAB Production Server instance.

The syntax also creates the server-side deployable archive (`.ctf` file) for Microsoft Excel add-ins.

`mcc -W mpsxl:`*`addin_name`*`,`*`className`*`,`*`version input_marshaling_flags output_marshaling_flags`* `-T link:lib options mfilename1 mfilename2...mfilenameN` creates a client-side Microsoft Excel add-in from the specified files that can be used to send requests to MATLAB Production Server from Excel. Creating the client-side add-in *must* be preceded by creating a server-side deployable archive (`.ctf` file) from the specified files. A purely client side add-in is not viable.

- *`addin_name`* — Specifies the name of the add-in and its namespace, which is a period-separated list, such as `companyname.groupname.component`.
- *`className`* — Specifies the name of the class to be created. If you do not specify the class name, `mcc` uses the *`addin_name`* as the default.
- *`version`* — Specifies the version of the add-in specified as *`major`*`.`*`minor`*.
  - *`major`* — Specifies the major version number. If you do not specify a version number, `mcc` uses the latest version.
  - *`minor`* — Specifies the minor version number. If you do not specify a version number, `mcc` uses the latest version.
- *`input_marshaling_flags`* — Specifies options for how data is marshaled between Microsoft Excel and MATLAB.
  - `-replaceBlankWithNaN` — Specifies that a blank in Microsoft Excel is mashaled into NaN in MATLAB. If you do not specify this flag, blanks are marshaled into 0.
  - `-convertDateToString` — Specifies that dates in Microsoft Excel are marshaled into MATLAB character vectors. If you do not specify this flag, dates are marshaled into MATLAB doubles.
- *`output_marshaling_flags`* — Specifies options for how data is marshaled between MATLAB and Microsoft Excel.
  - `-replaceNaNWithZero` — Specifies that NaN in MATLAB is marshaled into a 0 in Microsoft Excel. If you do not specify this flag, NaN is marshalled into `#QNAN` in Visual Basic®.

- `-convertNumericToDate` — Specifies that MATLAB numeric values are marshaled into Microsoft Excel dates. If you do not specify this flag, Microsoft Excel does not receive dates as output.

Examples

Compile a C++ shared library

Use the `mwArray` API

```
mcc -W 'cpplib:mymagic,legacy' mymagic.m
```

Use the MATLAB Data API

```
mcc -W 'cpplib:mymagic,generic' mymagic.m
```

Use both the `mwArray` API and the MATLAB Data API

```
mcc -W 'cpplib:mymagic,all' mymagic.m
```

OR

```
mcc -W 'cpplib:mymagic' mymagic.m
```

Compile a Java package containing multiple classes

```
mcc -W 'java:myMatrix,add' class{add:add.m} class{sub:minus.m}
```

Compile a Python package

```
mcc -W python:myMagic -T link:lib magic.m
```

Input Arguments

`mfilename1 mfilename2...mfilenameN` — Files to be compiled
list of filenames

One or more files to be compiled, specified as a space-separated list of filenames.

`options` — Options for customizing the output

-a | -b | -B | -C | -d | -f | -g | -G | -I | -K | -m | -M | -n | -N | -o | -p | -R | -S | -T | -u | -U | -v | -w | -W | -Y

Options for customizing the output, specified as a list of character vectors or string scalars.

- **`-a`**

  Add files to the deployable archive using `-a path` to specify the files to be added. Multiple `-a` options are permitted.

  If a file name is specified with `-a`, the compiler looks for these files on the MATLAB path, so specifying the full path name is optional. These files are not passed to `mbuild`, so you can include files such as data files.

  If a folder name is specified with the `-a` option, the entire contents of that folder are added recursively to the deployable archive. For example,

  ```
  mcc -m hello.m -a ./testdir
  ```

  specifies that all files in `testdir`, as well as all files in its subfolders, are added to the deployable archive. The folder subtree in `testdir` is preserved in the deployable archive.

  If the filename includes a wildcard pattern, only the files in the folder that match the pattern are added to the deployable archive and subfolders of the given path are not processed recursively. For example,

  ```
  mcc -m hello.m -a ./testdir/*
  ```

  specifies that all files in `./testdir` are added to the deployable archive and subfolders under `./testdir` are not processed recursively.

  ```
  mcc -m hello.m -a ./testdir/*.m
  ```

  specifies that all files with the extension `.m` under `./testdir` are added to the deployable archive and subfolders of `./testdir` are not processed recursively.

  Note * is the only supported wildcard.

When you add files to the archive using `-a` that do not appear on the MATLAB path at the time of compilation, a path entry is added to the application's run-time path so that they appear on the path when the deployed code executes.

When you use the `-a` option to specify a full path to a resource, the basic path is preserved, with some modifications, but relative to a subdirectory of the runtime cache directory, not to the user's local folder. The cache directory is created from the deployable archive the first time the application is executed. You can use the `isdeployed` function to determine whether the application is being run in deployed mode, and adjust the path accordingly. The `-a` option also creates a `.auth` file for authorization purposes.

Caution If you use the `-a` flag to include a file that is not on the MATLAB path, the folder containing the file is added to the MATLAB dependency analysis path. As a result, other files from that folder might be included in the compiled application.

Note If you use the `-a` flag to include custom Java classes, standalone applications work without any need to change the `classpath` as long as the Java class is not a member of a package. The same applies for JAR files. However, if the class being added is a member of a package, the MATLAB code needs to make an appropriate call to `javaaddpath` to update the `classpath` with the parent folder of the package.

- **`-b`**

  Generate a Visual Basic file (`.bas`) containing the Microsoft Excel Formula Function interface to the COM object generated by MATLAB Compiler. When imported into the workbook Visual Basic code, this code allows the MATLAB function to be seen as a cell formula function.

- **`-B`**

  Replace the file on the `mcc` command line with the contents of the specified file. Use

  ```
  -B filename[:<a1>,<a2>,...,<an>]
  ```

  The bundle `filename` should contain only `mcc` command-line options and corresponding arguments and/or other file names. The file might contain other `-B` options. A bundle can include replacement parameters for compiler options that accept names and version numbers. See “Using Bundles to Build MATLAB Code” on page 10-5.

- **`-C`**

  Do not embed the deployable archive in binaries.

  Note The `-C` flag is ignored for Java libraries.

- **`-d`**

  Place output in a specified folder. Use

  ```
  -d outFolder
  ```

  to direct the generated files to *`outFolder`*.

- **`-f`**

  Override the default options file with the specified options file. It specifically applies to the C/C++ shared libraries, COM, and Excel targets. Use

  ```
  -f filename
  ```

  to specify `filename` as the options file when calling `mbuild`. This option lets you use different ANSI compilers for different invocations of the compiler. This option is a direct pass-through to `mbuild`.

- **`-g`**, **`-G`**

  Include debugging symbol information for the C/C++ code generated by MATLAB Compiler SDK. It also causes `mbuild` to pass appropriate debugging flags to the system C/C++ compiler. The debug option lets you backtrace up to the point where you can identify if the failure occurred in the initialization of MATLAB Runtime, the function call, or the termination routine. This option does not let you debug your MATLAB files with a C/C++ debugger.

- **`-I`**

  Add a new folder path to the list of included folders. Each `-I` option adds a folder to the beginning of the list of paths to search. For example,

  ```
  -I <directory1> -I <directory2>
  ```

  sets up the search path so that `directory1` is searched first for MATLAB files, followed by `directory2`. This option is important for standalone compilation where the MATLAB path is not available.

If used in conjunction with the `-N` option, the `-I` option adds the folder to the compilation path in the same position where it appeared in the MATLAB path rather than at the head of the path.

- **`-K`**

  Direct `mcc` to not delete output files if the compilation ends prematurely due to error.

  The default behavior of `mcc` is to dispose of any partial output if the command fails to execute successfully.

- **`-m`**

  Direct `mcc` to generate a standalone application.

- **`-M`**

  Define compile-time options. Use

  ```
  -M string
  ```

  to pass `string` directly to `mbuild`. This option provides a useful mechanism for defining compile-time options, for example, `-M "-Dmacro=value"`.

  Note Multiple `-M` options do not accumulate; only the rightmost `-M` option is used.

- **`-n`**

  The `-n` option automatically identifies numeric command line inputs and treats them as MATLAB doubles.

- **`-N`**

  Passing `-N` clears the path of all folders except the following core folders (this list is subject to change over time):

  - *`matlabroot`*`\toolbox\matlab`
  - *`matlabroot`*`\toolbox\local`
  - *`matlabroot`*`\toolbox\compiler`
  - *`matlabroot`*`\toolbox\shared\bigdata`

  Passing `-N` also retains all subfolders in this list that appear on the MATLAB path at compile time. Including `-N` on the command line lets you replace folders from the original path, while retaining the relative ordering of the included folders. All

subfolders of the included folders that appear on the original path are also included. In addition, the `-N` option retains all folders that you included on the path that are not under *`matlabroot`*`\toolbox`.

When using the –`N` option, use the –`I` option to force inclusion of a folder, which is placed at the head of the compilation path. Use the –`p` option to conditionally include folders and their subfolders; if they are present in the MATLAB path, they appear in the compilation path in the same order.

- **`-o`**

  Specify the name of the final executable (standalone applications only). Use

  ```
  -o outputfile
  ```

  to name the final executable output of MATLAB Compiler. A suitable platform-dependent extension is added to the specified name (for example, `.exe` for Windows standalone applications).

- **`-p`**

  Use in conjunction with the option `-N` to add specific folders and subfolders under *`matlabroot`*`\toolbox` to the compilation MATLAB path. The files are added in the same order in which they appear in the MATLAB path. Use the syntax

  ```
  -N -p directory
  ```

  where `directory` is the folder to be included. If `directory` is not an absolute path, it is assumed to be under the current working folder.

  - If a folder is included with `-p` that is on the original MATLAB path, the folder and all its subfolders that appear on the original path are added to the compilation path in the same order.
  - If a folder is included with `-p` that is not on the original MATLAB path, that folder is ignored. (You can use `-I` to force its inclusion.)

- **`-R`**

  Provide MATLAB Runtime options. This option is relevant only when building standalone applications using MATLAB Compiler. The syntax is as follows:

  ```
  -R option
  ```

Option	Description	Target
`-logfile,`*`filename`*	Specify a log file name.	MATLAB Compiler
`-nodisplay`	Suppress the MATLAB `nodisplay` run-time warning.	MATLAB Compiler
`-nojvm`	Do not use the Java Virtual Machine (JVM).	MATLAB Compiler
`-startmsg`	Customizable user message displayed at initialization time.	MATLAB Compiler Standalone Applications
`-completemsg`	Customizable user message displayed when initialization is complete.	MATLAB Compiler Standalone Applications

Caution When running on Mac OS X, if you use `-nodisplay` as one of the options included in `mclInitializeApplication`, then the call to `mclInitializeApplication` must occur before calling `mclRunMain`.

Note If you specify the `-R` option for libraries created from MATLAB Compiler SDK, `mcc` still compiles without errors and generates the results. But the `-R` option doesn't apply to these libraries and does not do anything.

- **`-S`**

  The standard behavior for the MATLAB Runtime is that every instance of a class gets its own MATLAB Runtime context. The context includes a global MATLAB workspace for variables, such as the path and a base workspace for each function in the class. If multiple instances of a class are created, each instance gets an independent context. This ensures that changes made to the global or base workspace in one instance of the class does not affect other instances of the same class.

  In a singleton MATLAB Runtime, all instances of a class share the context. If multiple instances of a class are created, they use the context created by the first instance which saves startup time and some resources. However, any changes made to the

global workspace or the base workspace by one instance impacts all class instances. For example, if `instance1` creates a global variable `A` in a singleton MATLAB Runtime, then `instance2` can use variable `A`.

Singleton MATLAB Runtime is only supported by the following products on these specific targets:

Target supported by Singleton MATLAB Runtime	Create a Singleton MATLAB Runtime by....
Excel add-in	Default behavior for target is singleton MATLAB Runtime. You do not need to perform other steps.
.NET assembly	Default behavior for target is singleton MATLAB Runtime. You do not need to perform other steps.
COM component	• Using the Library Compiler app, click **Settings** and add `-S` to the **Additional parameters passed to MCC** field. • Using `mcc`, pass the `-S` flag.
Java package	

- **`-T`**

  Specify the output target phase and type.

  Use the syntax `-T` *`target`* to define the output type.

Target	Description
`compile:exe`	Generate a C/C++ wrapper file, and compile C/C++ files to an object form suitable for linking into a standalone application.
`compile:lib`	Generate a C/C++ wrapper file, and compile C/C++ files to an object form suitable for linking into a shared library or DLL.
`link:exe`	Same as `compile:exe` and also link object files into a standalone application.

Target	Description
`link:lib`	Same as `compile:lib` and also link object files into a shared library or DLL.

- **`-u`**

  Register COM component for the current user only on the development machine. The argument applies only to the generic COM component and Microsoft Excel add-in targets.

- **`-U`**

  Build deployable archive (`.ctf` file) for MATLAB Production Server.

- **`-v`**

  Display the compilation steps, including:

  - MATLAB Compiler version number
  - The source file names as they are processed
  - The names of the generated output files as they are created
  - The invocation of `mbuild`

  The `-v` option passes the `-v` option to `mbuild` and displays information about `mbuild`.

- **`-w`**

  Display warning messages. Use the syntax

  ```
  -w option [:<msg>]
  ```

  to control the display of warnings.

Syntax	Description
`-w list`	List all of the possible warnings that `mcc` can generate.
`-w enable`	Enable all warnings.

Syntax	Description
`-w disable[:<string>]`	Disable specific warnings associated with `<string>`. See “Warning Messages” (MATLAB Compiler) for a list of the `<string>` values. Omit the optional `<string>` to apply the `disable` action to all warnings.
`-w enable[:<string>]`	Enable specific warnings associated with `<string>`. See “Warning Messages” (MATLAB Compiler) for a list of the `<string>` values. Omit the optional `<string>` to apply the `enable` action to all warnings.
`-w error[:<string>]`	Treat specific warnings associated with `<string>` as an error. Omit the optional `<string>` to apply the `error` action to all warnings.
`-w off[:<string>] [<filename>]`	Turn off warnings for specific error messages defined by `<string>`. You can also narrow the scope by specifying warnings be turned off when generated by specific `<filename>`s.
`-w on[:<string>] [<filename>]`	Turn warnings on for specific error messages defined by `<string>`. You can also narrow scope by specifying warnings be turned on when generated by specific `<filename>`s.

You can also turn warnings on or off in your MATLAB code.

For example, to turn off warnings for deployed applications (specified using `isdeployed`) in `startup.m`, you write:

```
if isdeployed
    warning off
end
```

To turn on warnings for deployed applications, you write:

```
if isdeployed
    warning on
end
```

- **`-W`**

  Control the generation of function wrappers. Use the syntax

`-W type`

to control the generation of function wrappers for a collection of MATLAB files generated by the compiler. You provide a list of functions, and the compiler generates the wrapper functions and any appropriate global variable definitions.

- **`-Y`** Use

  ```
  -Y license.lic
  ```

  to override the default license file with the specified argument.

Note The `-Y` flag works only with the command-line mode.

```
>>!mcc -m foo.m -Y license.lic
```

See Also

`mbuild`

Introduced before R2006a

mcrinstaller

Display version and location information for MATLAB Runtime installer corresponding to current platform

Syntax

```
[INSTALLER_PATH, MAJOR, MINOR, PLATFORM] = mcrinstaller;
```

Description

Displays information about available MATLAB Runtime installers using the format: `[INSTALLER_PATH, MAJOR, MINOR, PLATFORM] = mcrinstaller;` where:

- *`INSTALLER_PATH`* is the full path to the installer for the current platform.
- *`MAJOR`* is the major version number of the installer.
- *`MINOR`* is the minor version number of the installer.
- *`PLATFORM`* is the name of the current platform (returned by `COMPUTER(`*`arch`*`)`).

If no MATLAB Runtime installer is found, you are prompted to download an installer using the command `compiler.runtime.download`.

Note You must distribute the MATLAB Runtime library to your end users to enable them to run applications developed with MATLAB Compiler or MATLAB Compiler SDK.

See “Install and Configure the MATLAB Runtime”for more information about the MATLAB Runtime installer.

Examples

Find MATLAB Runtime Installer Location

Display the location of MATLAB Runtime installers for a particular platform. This example shows output for a `win64` system. The release number is called `R20xxx` indicating the release for which the MATLAB Runtime installer has been downloaded.

```
mcrinstaller
```

```
C:\Program Files\MATLAB\R20xxx\toolbox\compiler\deploy\win64\MCR_R20xxx_win64_installer
```

For example, for R2018b, the path would be:

```
C:\Program Files\MATLAB\R2018b\toolbox\compiler\deploy\win64\MCR_R2018b_win64_installer
```

Introduced in R2009a

mcrversion

Determine version of installed MATLAB Runtime

Syntax

```
[major, minor] = mcrversion;
```

Description

The MATLAB Runtime version number consists of two digits, separated by a decimal point. This function returns each digit as a separate output variable: `[major, minor] = mcrversion;` Major and minor are returned as integers.

If the version number ever increases to three or more digits, call `mcrversion` with more outputs, as follows:

```
[major, minor, point] = mcrversion;
```

At this time, all outputs past “minor” are returned as zeros.

Typing only `mcrversion` will return the major version number only.

Examples

```
mcrversion
ans =
     7
```

Introduced in R2008a

productionServerCompiler

Test, build and package functions for use with MATLAB Production Server

Syntax

```
productionServerCompiler
productionServerCompiler project_name
productionServerCompiler -build project_name
productionServerCompiler -package project_name
```

Description

`productionServerCompiler` opens the Production Server Compiler app for the creation of a new compiler project.

`productionServerCompiler project_name` opens the appropriate compiler app with the project preloaded.

`productionServerCompiler -build project_name` runs the appropriate compiler app to build the specified project. The installer is not generated.

`productionServerCompiler -package project_name` runs the appropriate compiler app to build and package the specified project. The installer is generated.

Examples

Create a New Production Server Project

Open the Production Server Compiler app to create a new project.

```
productionServerCompiler
```

Package a Deployable Archive using an Existing Project

Open the appropriate compiler app to package an existing project file.

```
productionServerCompiler -package my_magic
```

Input Arguments

`project_name` — name of the project to be compiled

character array or string

Specify the name of a previously saved project. The project must be on the current path.

Introduced in R2014a

setmcruserdata

Associate MATLAB data value with a key

Syntax

void setmcruserdata(*key*, *value*)

Description

The *void* setmcruserdata(*key*, *value*) command is part of the MATLAB Runtime User Data interface API.

See Also

Introduced in R2008a

webfigure

Export a figure to a deployed application

Syntax

```
exportFigure = webfigure(h)
```

Description

`exportFigure = webfigure(h)` exports the figure identified by the handle h to a deployed application for use as a WebFigure. How the deployed application manages the exported figure is specific to the target language. The WebFigure feature is supported by Java and .NET.

Examples

Export a Figure

```
function returnFigure = getWebFigure()
        h = figure;
        set(h, 'Visible', 'off');
        surf(peaks);
        set(h, 'Color', [.8,.9,1]);
        returnFigure = webfigure(h);
        close(h);
```

Input Arguments

h — handle of the figure to be exported
figure handle

Specify the figure to be exported as a figure handle.

Output Arguments

`exportFigure` — exported figure
structure

Specifies the exported figure in a language specific structure.

Introduced in R2008a

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Apps

Library Compiler

Package MATLAB programs for deployment as shared libraries and components

Description

The **Library Compiler** app packages MATLAB functions to include MATLAB functionality in applications written in other languages.

Open the Library Compiler App

- MATLAB Toolstrip: On the **Apps** tab, under **Application Deployment**, click the app icon.
- MATLAB command prompt: Enter `libraryCompiler`.

Examples

- “Create Excel Add-In from MATLAB” (MATLAB Compiler)
- “Create a C Shared Library with MATLAB Code”
- “Create a C++ Shared Library with MATLAB Code”
- “Create a .NET Assembly with MATLAB Code”
- “Create a Generic COM Component with MATLAB Code”
- “Create a Java Package with MATLAB Code”
- “Create a Python Package with MATLAB Code”

Parameters

type — type of library generated

C Shared Library | C++ Shared Library | Excel Add-in | Generic COM Component | Java Package | .NET Assembly | Python Package

Type of library to generate.

`exported functions` — functions to package
list of character vectors

Functions to package as a list of character vectors.

`packaging options` — method for installing the MATLAB Runtime with the compiled library
MATLAB Runtime downloaded from web (default) | MATLAB Runtime included in package

You can decide whether or not to include the MATLAB Runtime fallback for MATLAB Runtime installer in the generated application by selecting one of the two options in the **Packaging Options** section. Including the MATLAB Runtime installer in the package significantly increases the size of the package.

Runtime downloaded from web — Generates an installer that downloads the MATLAB Runtime and installs it along with the deployed MATLAB application.

Runtime included in package — Generates an installer that includes the MATLAB Runtime installer.

The first time you select this option, you are prompted to download the MATLAB Runtime installer or obtain a CD if you do not have internet access.

`files required for your library to run` — files that must be included with library
list of files

Files that must be included with library as a list of files.

`files installed for your end user` — optional files installed with library
list of files

Optional files installed with library as a list of files.

Settings

`Additional parameters passed to MCC` — flags controlling the behavior of the compiler
character vector

Flags controlling the behavior of the compiler as a character vector.

`testing files` — folder where files for testing are stored
character vector

Folder where files for testing are stored as a character vector.

`end user files` — folder where files for building a custom installer are stored
character vector

Folder where files for building a custom installer are stored are stored as a character vector.

`packaged installers` — folder where generated installers are stored
character vector

Folder where generated installers are stored as a character vector.

Library Information

`library name` — name of the installed library
character vector

Name of the installed library as a character vector.

The default value is the name of the first function listed in the **Exported Functions** field of the app.

`version` — version of the generated library
character vector

Version of the generated library as a character vector.

`splash screen` — image displayed on installer
image

Image displayed on installer as an image.

`author name` — name of the library author
character vector

Name of the library author as a character vector.

`e-mail` — e-mail address used to contact library support
character vector

E-mail address used to contact library support as a character vector.

`summary` — brief description of library
character vector

Brief description of library as a character vector.

`description` — detailed description of library
character vector

Detailed description of library as a character vector.

Additional Installer Options

`default installation folder` — folder where artifacts are installed
character vector

Folder where artifacts are installed as a character vector.

`installation notes` — notes about additional requirements for using artifacts
character vector

Notes about additional requirements for using artifacts as a character vector.

Programmatic Use

`libraryCompiler`

See Also

Topics

“Create Excel Add-In from MATLAB” (MATLAB Compiler)
“Create a C Shared Library with MATLAB Code”
“Create a C++ Shared Library with MATLAB Code”
“Create a .NET Assembly with MATLAB Code”
“Create a Generic COM Component with MATLAB Code”
“Create a Java Package with MATLAB Code”

“Create a Python Package with MATLAB Code”

Production Server Compiler

Package MATLAB programs for deployment to MATLAB Production Server

Description

The **Production Server Compiler** app tests the integration of client code with MATLAB functions. It also packages MATLAB functions into archives for deployment to MATLAB Production Server.

Open the Production Server Compiler App

- MATLAB Toolstrip: On the **Apps** tab, under **Application Deployment**, click the app icon.
- MATLAB command prompt: Enter `productionServerCompiler`.

Examples

- "Create a Deployable Archive for MATLAB Production Server" (MATLAB Production Server)
- "Create and Install a Deployable Archive with Excel Integration For MATLAB Production Server" (MATLAB Production Server)

Parameters

`type` — type of archive generated
Deployable Archive | Deployable Archive with Excel Integration

Type of archive to generate as a character array.

`exported functions` — functions to package
list of character arrays

Functions to package as a list of character arrays.

`archive information` — name of the archive
character array

Name of the archive as a character array.

`files required for your archive to run` — files that must be included with archive
list of files

Files that must be included with archive as a list of files.

`files packaged with the archive` — optional files installed with archive
list of files

Optional files installed with archive as a list of files.

Settings

`Additional parameters passed to MCC` — flags controlling the behavior of the compiler
character array

Flags controlling the behavior of the compiler as a character array.

`testing files` — folder where files for testing are stored
character array

Folder where files for testing are stored as a character array.

`end user files` — folder where files for building a custom installer are stored
character array

Folder where files for building a custom installer are stored are stored as a character array.

`packaged installers` — folder where generated installers are stored
character array

Folder where generated installers are stored as a character array.

Programmatic Use

```
productionServerCompiler
```

See Also

Topics

“Create a Deployable Archive for MATLAB Production Server” (MATLAB Production Server)
“Create and Install a Deployable Archive with Excel Integration For MATLAB Production Server” (MATLAB Production Server)

Introduced in R2013b