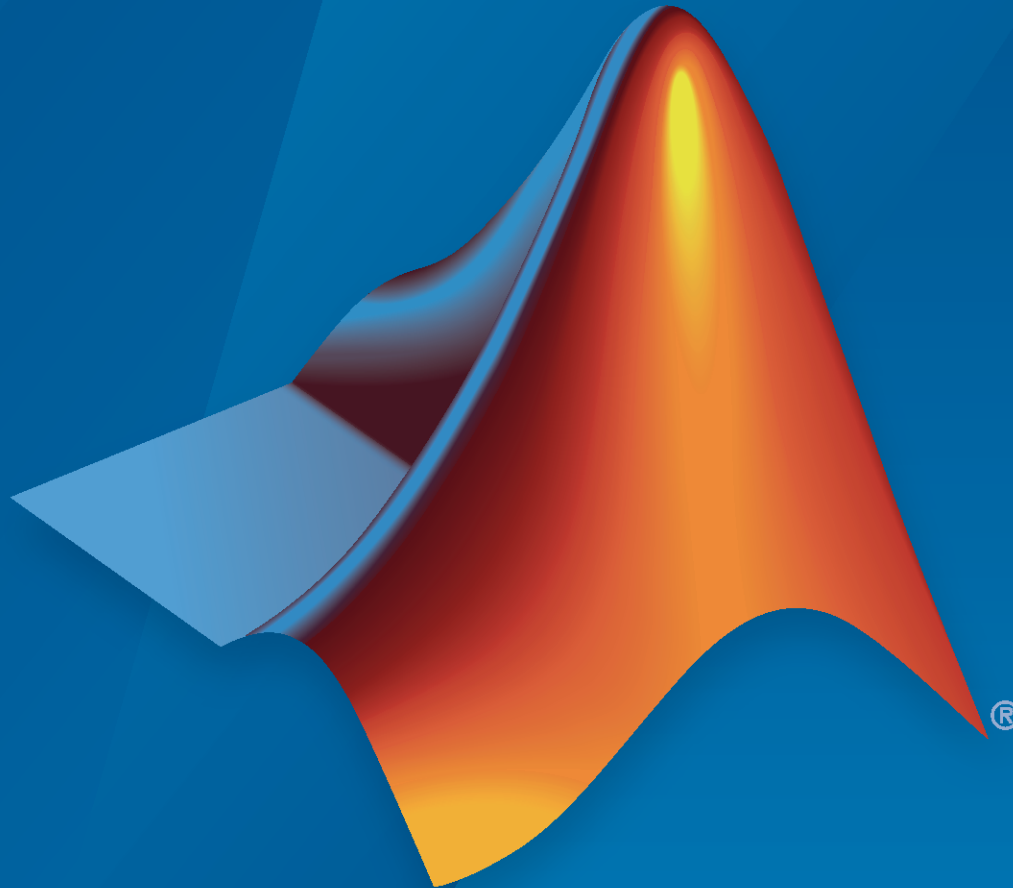


**MATLAB® Compiler™**

Web Apps



**MATLAB®**

R2020a



# How to Contact MathWorks



Latest news: [www.mathworks.com](http://www.mathworks.com)  
Sales and services: [www.mathworks.com/sales\\_and\\_services](http://www.mathworks.com/sales_and_services)  
User community: [www.mathworks.com/matlabcentral](http://www.mathworks.com/matlabcentral)  
Technical support: [www.mathworks.com/support/contact\\_us](http://www.mathworks.com/support/contact_us)



Phone: 508-647-7000



The MathWorks, Inc.  
1 Apple Hill Drive  
Natick, MA 01760-2098

*MATLAB® Compiler™ Web Apps*

© COPYRIGHT 2020 by The MathWorks, Inc.

The software described in this document is furnished under a license agreement. The software may be used or copied only under the terms of the license agreement. No part of this manual may be photocopied or reproduced in any form without prior written consent from The MathWorks, Inc.

FEDERAL ACQUISITION: This provision applies to all acquisitions of the Program and Documentation by, for, or through the federal government of the United States. By accepting delivery of the Program or Documentation, the government hereby agrees that this software or documentation qualifies as commercial computer software or commercial computer software documentation as such terms are used or defined in FAR 12.212, DFARS Part 227.72, and DFARS 252.227-7014. Accordingly, the terms and conditions of this Agreement and only those rights specified in this Agreement, shall pertain to and govern the use, modification, reproduction, release, performance, display, and disclosure of the Program and Documentation by the federal government (or other entity acquiring for or through the federal government) and shall supersede any conflicting contractual terms or conditions. If this License fails to meet the government's needs or is inconsistent in any respect with federal procurement law, the government agrees to return the Program and Documentation, unused, to The MathWorks, Inc.

## Trademarks

MATLAB and Simulink are registered trademarks of The MathWorks, Inc. See [www.mathworks.com/trademarks](http://www.mathworks.com/trademarks) for a list of additional trademarks. Other product or brand names may be trademarks or registered trademarks of their respective holders.

## Patents

MathWorks products are protected by one or more U.S. patents. Please see [www.mathworks.com/patents](http://www.mathworks.com/patents) for more information.

## Revision History

March 2018	Online only	New for Version 6.6 (Release 2018a)
September 2018	Online only	Revised for Version 7.0 (Release R2018b)
March 2019	Online only	Revised for Version 7.0.1 (Release R2019a)
September 2019	Online only	Revised for Version 7.1 (Release R2019b)
March 2020	Online only	Revised for Version 8.0 (Release R2020a)

## System Requirements

### 1

#### System Requirements for Development Version of MATLAB Web App

<b>Server</b> .....	<b>1-2</b>
Supported Platforms .....	<b>1-2</b>
Hardware Requirements .....	<b>1-2</b>
Software Requirements .....	<b>1-2</b>

## Install and Configure MATLAB Web App Server

### 2

<b>Install the Development Version of MATLAB Web App Server</b> .....	<b>2-2</b>
Online Installation .....	<b>2-2</b>
Limited Internet Connectivity Installation .....	<b>2-3</b>
<b>Configure the Development Version of MATLAB Web App Server</b> .....	<b>2-5</b>
<b>Supported Browsers and Platform Incompatibilities</b> .....	<b>2-10</b>
Supported Browsers .....	<b>2-10</b>
Platform Incompatibilities .....	<b>2-10</b>
<b>Start the Server Application</b> .....	<b>2-11</b>

## Create, Run, and Diagnose Web Apps

### 3

<b>Create Web App</b> .....	<b>3-2</b>
App Designer Prerequisite .....	<b>3-2</b>
Steps to Package and Create a Web App .....	<b>3-2</b>
<b>Deploy Web App</b> .....	<b>3-4</b>
Deploy a Web App by Copying .....	<b>3-4</b>
Deploy a Web App by Uploading (Available Only with MATLAB Web App Server Product) .....	<b>3-4</b>
<b>Run Web App</b> .....	<b>3-6</b>
<b>Diagnostics</b> .....	<b>3-7</b>

<b>Web App Session Log</b> .....	<b>3-8</b>
<b>Limitations and Unsupported Functionality</b> .....	<b>3-9</b>

## Security

### 4

<b>Enabling HTTPS</b> .....	<b>4-2</b>
<b>MATLAB Web App Server Security</b> .....	<b>4-3</b>
<b>Potential Risks</b> .....	<b>4-4</b>
<b>Authoring Secure Web Apps</b> .....	<b>4-6</b>
Authentication and Authorization .....	<b>4-6</b>
Do Not Call eval() .....	<b>4-6</b>
Limit Free-Text User Input .....	<b>4-6</b>
Sanitize User Input .....	<b>4-6</b>
Sanitize Data Read from Files .....	<b>4-6</b>
Minimize File System Write Operations .....	<b>4-6</b>
Verify Trustworthiness of Third-Party Code .....	<b>4-7</b>
Reduce Exposure Level .....	<b>4-7</b>
<b>Securely Deploying Web Apps</b> .....	<b>4-8</b>

## Apps

### 5

## Functions

### 6

## Web App Examples

### 7

<b>Simple Mortgage Calculator Web App</b> .....	<b>7-2</b>
Prerequisites .....	<b>7-2</b>
Package and Create Web App .....	<b>7-2</b>
Deploy Web App .....	<b>7-3</b>
Run Web App .....	<b>7-3</b>
<b>Simulink Simulation Web App</b> .....	<b>7-5</b>
Prerequisites .....	<b>7-5</b>
Package and Create Web App .....	<b>7-5</b>

Deploy Web App .....	<b>7-6</b>
Run Web App .....	<b>7-6</b>



# System Requirements

---

## System Requirements for Development Version of MATLAB Web App Server

System requirements for the development version of MATLAB Web App Server™ (Available in MATLAB Compiler™).

### Supported Platforms

Windows®, Linux®, macOS

### Hardware Requirements

The server can be installed on all hardware platforms and operating systems that MATLAB supports. The hardware requirements are:

- Minimum 60 GB of disk capacity to accommodate the server software installation and log files.
- Minimum 1GB of RAM per worker.

The server only supports a maximum of 32 workers.

- Allocation of 1 processor core (or virtual core) per 4 workers; 2 cores minimum.

### Software Requirements

- An installation of MATLAB Runtime. The MATLAB Runtime version number must match the version of MATLAB you used to package the web app archive (.ctf file).
- MATLAB Compiler is required to package MATLAB apps as web app archives (.ctf files) to run on the server.
- MATLAB App Designer.

### See Also

#### More About

- “Install the Development Version of MATLAB Web App Server” on page 2-2
- “Create and Run a Simple App Using App Designer” (MATLAB)



# Install and Configure MATLAB Web App Server

---

## Install the Development Version of MATLAB Web App Server

**Warning** The development version of MATLAB Web App Server must be installed in a trusted intranet environment on dedicated hardware. The only purpose of the physical or virtual machine where the server is installed must be to host web apps that connect to the server. The server must never be exposed to the open Internet. For more information, see “MATLAB Web App Server Security” on page 4-3.

The development version of MATLAB Web App Server hosts web apps packaged using the **Web App Compiler** app. For web apps to work the server must be installed and configured. The server mediates the HTTP/HTTPS communication between the client web browser and the packaged MATLAB web app. It has a home page listing all the available hosted web apps. The home page can be accessed from a browser using a URL.

You can use an online installation workflow to install the server if your computer is connected to the Internet. Otherwise, follow the steps in the limited internet connectivity installation workflow.

### Online Installation

- 1 Navigate to the folder containing the MATLAB Web App Server installer.

Platform	Default Location of Installer
Windows	C:\Program Files\MATLAB\R2020a\toolbox\compiler\deploy\win64\MATLABWebAppServerSetup
Linux	/usr/local/MATLAB/R2020a/toolbox/compiler/deploy/glnxa64/MATLABWebAppServerSetup
macOS	/Applications/MATLAB_R2020a.app/toolbox/compiler/deploy/maci64/MATLABWebAppServerSetup

- 2 Run the installer to install the MATLAB Web App Server and MATLAB Runtime.

Platform	Steps
Windows (Administrator)	Right-click MATLABWebAppServerSetup.exe, and select <b>Run as administrator</b> .
Linux	At the shell prompt, type:  ./MATLABWebAppServerSetup.install  <b>Note</b> On Debian® based Linux distributions, type:  gksudo ./MATLABWebAppServerSetup.install
macOS	Double-click the app MATLABWebAppServerSetup.app

For information on how to start and configure the server, see “Configure the Development Version of MATLAB Web App Server” on page 2-5.

**Note Windows** : Make sure that MATLAB Runtime appears before any installed version of MATLAB in the Windows Path environment variable.

## Limited Internet Connectivity Installation

If the computer where you want to run the development version of MATLAB Web App Server is not connected to the Internet, installing the server is a two part process.

First, you need to download MATLAB Runtime from a computer that is connected to the Internet. After downloading MATLAB Runtime installer, you will need to transfer the installer to the computer that is not connected to the Internet. MATLAB Runtime is a standalone set of shared libraries that enables the execution of compiled MATLAB applications or components on computers that do not have MATLAB installed.

Second, you need to copy the zip file containing the MATLAB Web App Server application from an installation of the MATLAB Compiler product and unzip the server application to a local folder on the computer that is not connected to the Internet.

### Procedure

- 1 Download the MATLAB Runtime installer from the MathWorks® website or the MATLAB desktop. You will need a computer with access to the Internet to complete this step.

Option	Steps
MathWorks Website	Select the appropriate platform and release specific installer from:  <a href="https://www.mathworks.com/products/compiler/matlab-runtime.html">https://www.mathworks.com/products/compiler/matlab-runtime.html</a>
MATLAB Desktop	At the MATLAB command prompt, type:  <code>compiler.runtime.download</code>

Transfer the installer to the computer that is not connected to the Internet.

- 2 Install MATLAB Runtime using the installer. For installation instructions, see “Install and Configure the MATLAB Runtime”.
- 3 On a computer that has the MATLAB Compiler product installed, navigate to the folder containing the file `MATLABWebAppServer.zip` and copy it to a local folder on the computer that is not connected to the Internet.

Platform	Default Location
Windows	<code>C:\Program Files\MATLAB\R2020a\toolbox\compiler\deploy\win64\MATLABWebAppServerSetup\offline</code>
Linux	<code>/usr/local/MATLAB/R2020a/toolbox/compiler/deploy/glnxa64/MATLABWebAppServerSetup/offline</code>
macOS	<code>/Applications/MATLAB_R2020a.app/toolbox/compiler/deploy/maci64/MATLABWebAppServerSetup/offline</code>

- 4 Unzip/Extract the copied zip file `MATLABWebAppServer.zip`. You can now access the MATLAB Web App Server application.

For information on how to start and configure the server, see “Configure the Development Version of MATLAB Web App Server” on page 2-5.

---

**Note Windows** : Make sure that MATLAB Runtime appears before any installed version of MATLAB in the Windows Path environment variable.

---

### See Also

#### More About

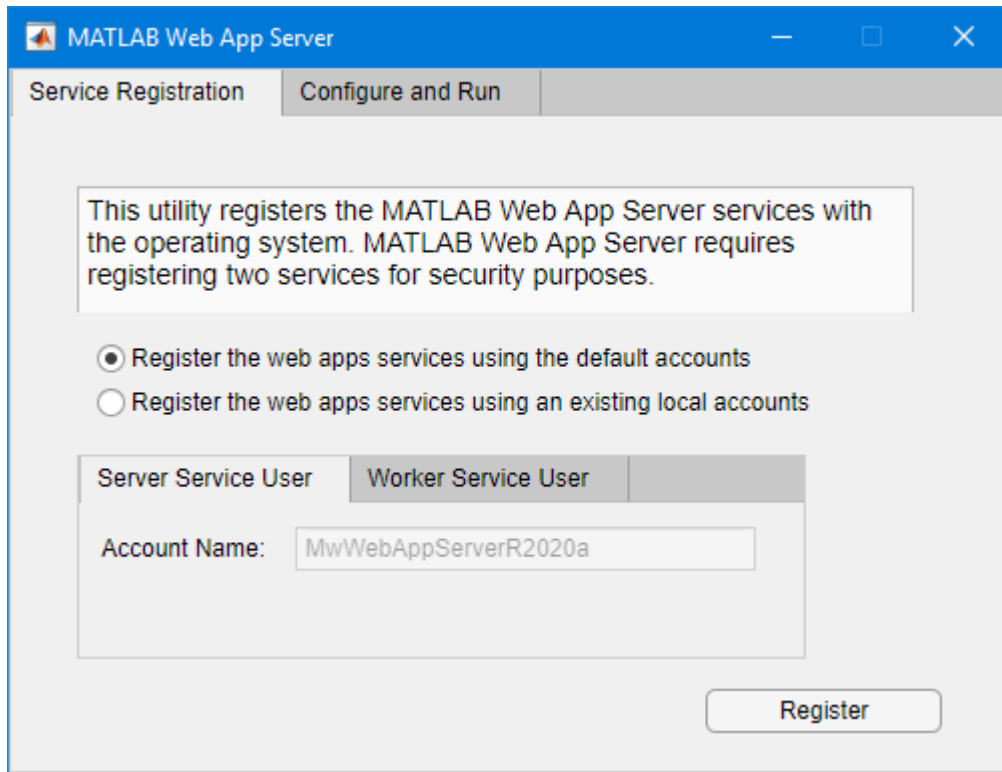
- “Configure the Development Version of MATLAB Web App Server” on page 2-5
- “MATLAB Web App Server Security” on page 4-3
- “Potential Risks” on page 4-4

## Configure the Development Version of MATLAB Web App Server

To configure the development version of MATLAB Web App Server:

- 1 Navigate to the development version of MATLAB Web App Server installation location and run the server application. For information about installing the server, see “Install the Development Version of MATLAB Web App Server” on page 2-2.

Platform	Steps
Windows <i>(Administrator)</i>	<p>Default location of the server application is:</p> <p>C:\Program Files\MATLAB\MATLABWebAppServer\R2020a\application</p> <p>Right-click MATLABWebAppServer.exe and select <b>Run as administrator</b>.</p>
Linux	<p>Default location of the server application is:</p> <p>/usr/local/MATLAB/MATLABWebAppServer/R2020a/application</p> <p>At the shell prompt, type:</p> <pre>run_MATLABWebAppServer.sh &lt;MATLAB_Runtime_Location&gt;</pre> <p><i>For example:</i></p> <pre>run_MATLABWebAppServer.sh /usr/local/MATLAB/MATLAB_Runtime/v98</pre>
macOS	<p>Default location of the server application is:</p> <p>/Applications/MATLAB/MATLABWebAppServer/R2020a/application</p> <p>Double-click the app MATLABWebAppServer.app</p>



2 Click the **Service Registration** tab, and select one of two options:

- **Register the web apps services using the default accounts**

Selecting this option registers two services:

- A service to run the server represented by the tab **Server Service User**.
- A service to run the apps represented by the tab **Worker Service User**.

Operating System	Server Service Information	Apps Service Information
Windows	<p><b>Account Name:</b> MwWebAppServerR2020a</p> <p><b>Service Name:</b> mw-webapps - R2020a</p>	<p><b>Account Name:</b> MwWebAppWorkerR2020a</p> <p><b>Service Name:</b> mw-webapps-launcher-R2020a</p>

Operating System	Server Service Information	Apps Service Information
Linux	<p><b>Account Name:</b> MwWebAppsServerR2020a</p> <p><b>Service Name:</b> mw-webapps-R2020a</p> <p><b>Service File:</b> /etc/systemd/system/mw-webapps-R2020a.service</p>	<p><b>Account Name:</b> MwWebAppsWorkerR2020a</p> <p><b>Service Name:</b> mw-webapps-launcher-R2020a</p> <p><b>Service File:</b> /etc/systemd/system/mw-webapps-launcher-R2020a.service</p>
macOS	<p><b>Account Name:</b> MwWebAppsServerR2020a</p> <p><b>Service Name:</b> com.mathworks.mw-webapps-R2020a</p> <p><b>Service File:</b> /Library/LaunchDaemons/com.mathworks.mw-webapps-R2020a.plist</p>	<p><b>Account Name:</b> MwWebAppsWorkerR2020a</p> <p><b>Service Name:</b> com.mathworks.mw-webapps-launcher-R2020a</p> <p><b>Service File:</b> /Library/LaunchDaemons/com.mathworks.mw-webapps-launcher-R2020a.plist</p>

- **Register the web apps services using existing local accounts**

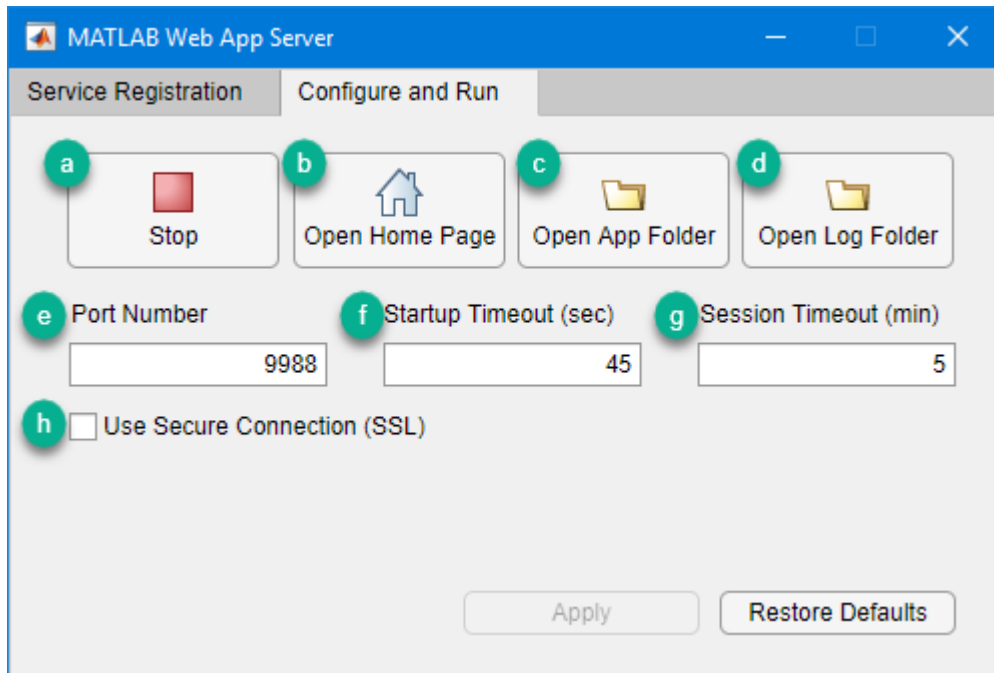
Selecting this option requires you to register two services represented by the tabs **Server Service User** and **Worker Service User** using two local account names and passwords.

Register the web apps services using the default accounts  
 Register the web apps services using an existing local accounts

Server Service User    Worker Service User

Account Name:   
 Password:

- 3 You can start or stop the installed service from the **Configure and Run** tab. The service is automatically started once the service is successfully registered. If the service does not start automatically, click **Start**.



- a Start/Stop the server.
  - b Open the web apps home page.
  - c Open the app folder containing the web app archive (.ctf) files.
  - d Open the server log folder.
  - e Specify the port number. Default port is 9988.
  - f **Startup Timeout (sec)**: Defines the maximum time to prepare a new session for the requested app, in seconds. If server is under heavy load or hardware is not adequate, you may need to tweak this setting. Default value is 45 seconds.
  - g **Session Timeout (min)**: Defines the time interval in minutes after which session will be stopped on the server. When session is running and browser tab is opened, periodic heartbeat messages will let server know that user is still interested in the session. If session was abandoned for reasons like computer going to sleep or network disconnected, this interval will define for how long the session will be kept alive on the server. Default value is 5 minutes.
  - h Enable SSL and use HTTPS. For more information, see “Enabling HTTPS” on page 4-2.
- 4 Once you have installed and started the server, click the **Open App Folder** button to open the folder where compiled web apps are served from. Then serve your web apps by dropping their *appName*.ctf files in this folder. If the path specified for **App Path** does not exist, it is created after you start the service.
  - 5 To open your web apps home page, click **Open Home Page**.

You can also configure the service by specifying:

- the port number used for your web apps
- timeout values for the session and for startup time

After making any changes, click **Apply** to save your configuration.



- 6 To stop the service, go to the **Configure and Run** tab, and click **Stop**.
- 7 To unregister the service, go to the **Service Registration** tab, and click **Unregister**.

---

**Note**

- 1 The maximum number of sessions that the server supports is limited to 32. However, the amount of RAM on the machine may limit you to fewer than 32 sessions.
  - 2 The server limits the number of MATLAB Compiler licensed users who can upload and run web apps to 10.
- 

**See Also****More About**

- “Install the Development Version of MATLAB Web App Server” on page 2-2
- “Enabling HTTPS” on page 4-2
- “MATLAB Web App Server Security” on page 4-3

# Supported Browsers and Platform Incompatibilities

## Supported Browsers

Web apps are compatible with commonly used browsers like Google Chrome™, Safari, Firefox®, Microsoft Edge®.

For browsers that update automatically, the current stable version is supported.

Web apps are also supported on the Safari browser on iPads, and the Chrome™ browser on Chromebooks.

## Platform Incompatibilities

MATLAB Web App Server cannot be installed on Red Hat® Enterprise Linux 6.

Linux systems require the `systemd` software suite.

## See Also

### More About

- “Install the Development Version of MATLAB Web App Server” on page 2-2
- “Configure the Development Version of MATLAB Web App Server” on page 2-5

## Start the Server Application

To start the server application in the development version of MATLAB Web App Server follow the platform specific instructions.

Platform	Steps
Windows <i>(Administrator)</i>	Default location of the server application is: C:\Program Files\MATLAB\MATLABWebAppServer\R2020a\application Right-click MATLABWebAppServer.exe and select <b>Run as administrator</b> .
Linux	Default location of the server application is: /usr/local/MATLAB/MATLABWebAppServer/R2020a/application At the shell prompt, type: run_MATLABWebAppServer.sh <MATLAB_Runtime_Location> <i>For example:</i> run_MATLABWebAppServer.sh /usr/local/MATLAB/MATLAB_Runtime/v98
macOS	Default location of the server application is: /Applications/MATLAB/MATLABWebAppServer/R2020a/application Double-click the app MATLABWebAppServer.app

### See Also

### More About

- “Configure the Development Version of MATLAB Web App Server” on page 2-5
- “Install the Development Version of MATLAB Web App Server” on page 2-2



# Create, Run, and Diagnose Web Apps

---

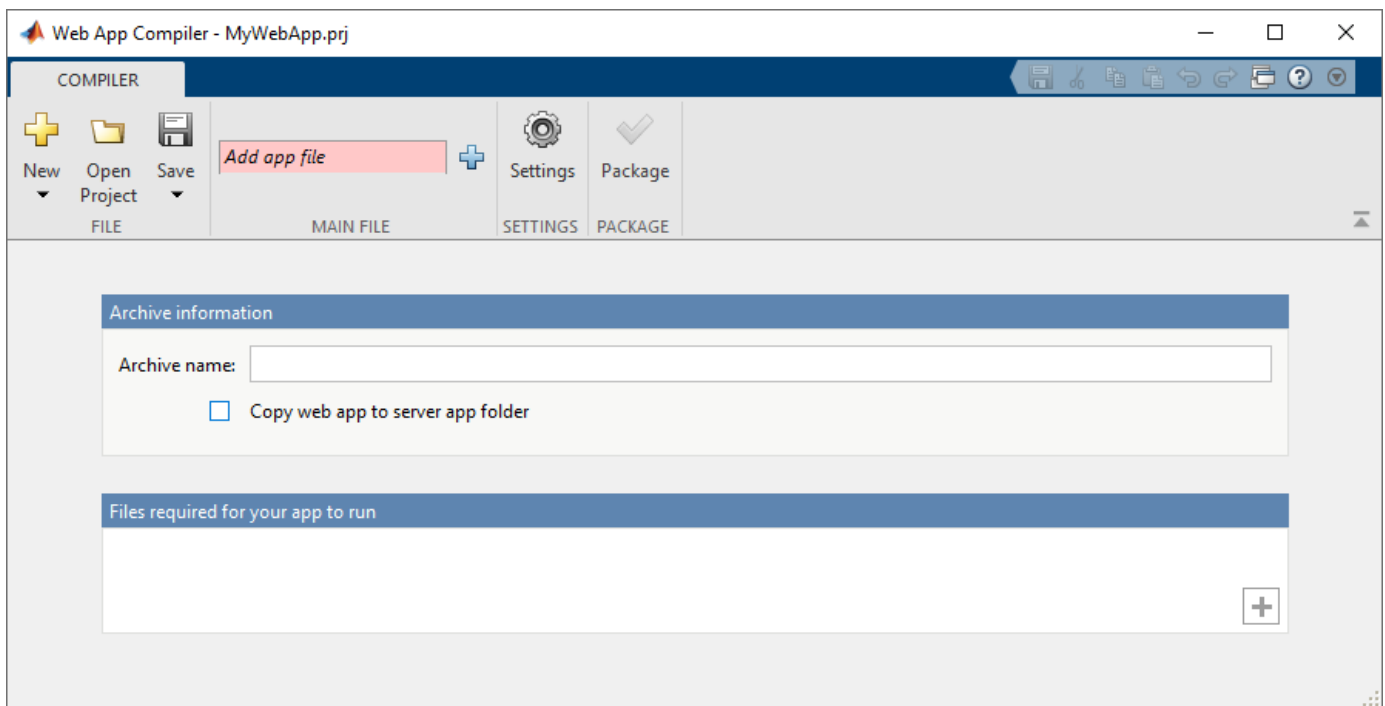
## Create Web App


### App Designer Prerequisite

Before you can package and then deploy a web app, you need to create an app using MATLAB App Designer. For more information, see “Create and Run a Simple App Using App Designer” (MATLAB).

### Steps to Package and Create a Web App

- 1 Type `webAppCompiler` at the MATLAB command line to open the **Web App Compiler** app.



- 2 In the **MAIN FILE** section of the toolbar, click the  button to add your App Designer `.mlapp` file to the project. The Web App Compiler automatically resizes to include an **App details** section that contains information about the app such as app name, author, summary, description, and version. You can edit information about the app in App Designer by clicking **Edit App Details**. Click **Refresh** to update Web App Compiler with any changes you have made.
- 3 (Optional) Select **Copy web app to server app folder** check box and specify the path to the app folder on the server where you want the web app archive (`.ctf` file) to be automatically copied. If you leave this check box cleared, the Web App Compiler will create the web app archive (`.ctf` file) in the project folder. You must manually copy or upload the web app archive (`.ctf` file) to the app folder on the server. For more information, see “Configure the Development Version of MATLAB Web App Server” on page 2-5.
- 4 Add supporting files, if any, in the **Files required for your app to run** section. Supporting files include any MAT-files, images used by your web app, or user-written MATLAB functions not found by MATLAB Compiler.
- 5 Click **Package** to package the app, and create a web app archive (`.ctf` file).

In the **Save Project** dialog box that opens, specify a project name and a location where you want to save the web app project. Web App Compiler saves your project and opens a **Package** dialog box.

- 6 Once packaging is complete, in the **Package** dialog box, click **Open output folder**. This step opens the project folder which contains the following files:
  - *webAppArchiveName.ctf*
  - *mccExcludedFiles.log*
  - *PackagingLog.html*
  - *requiredMCRProducts.txt*

You can view the log file, *PackagingLog.html*, to see the exact *mcc* syntax used to package and create the web app archive.

- 7 To use the web app, deploy the web app archive file, *webAppArchiveName.ctf*. For more information, see “Deploy Web App” on page 3-4.

## See Also

### More About

- “Limitations and Unsupported Functionality” on page 3-9
- “Deploy Web App” on page 3-4
- “Run Web App” on page 3-6
- “Simple Mortgage Calculator Web App” on page 7-2

## Deploy Web App

You can deploy web apps to the development version of MATLAB Web App Server in one of two ways:

- Copy the web app archive (.ctf file) generated by Web App Compiler (in MATLAB Compiler) to the apps folder configured by the server.
- Upload the web app archive (.ctf file) generated by Web App Compiler (in MATLAB Compiler) to the apps folder configured by the server. This deployment option is available only if you have the MATLAB Web App Server product installed. For more information, see “Install or Uninstall MATLAB Web App Server Product” (MATLAB Web App Server).

### Deploy a Web App by Copying

- 1 Navigate to the project folder generated by Web App Compiler (in MATLAB Compiler) during the packing process.
- 2 Copy the file `webAppArchiveName.ctf` to the app folder configured by the MATLAB Web App Server. If you selected the **Copy web app to server app folder** check box in the Web App Compiler while creating the web app, your web app archive (.ctf file) is automatically be copied to the app folder configured by the server.

You can access the app folder by clicking the **Open App Folder** button in the MATLAB Web App Server utility.

---

**Note** You must have write permissions to the app folder to copy a web app archive (.ctf file) to folder.

---

Your web app is now deployed and can be accessed from the web apps home page. For more information, see “Run Web App” on page 3-6.

### Deploy a Web App by Uploading (Available Only with MATLAB Web App Server Product)

#### Prerequisites

- Verify that you have the MATLAB Web App Server product installed. For more information, see “Install or Uninstall MATLAB Web App Server Product” (MATLAB Web App Server).
- Verify that “Authentication” (MATLAB Web App Server) and “Role-Based Access” (MATLAB Web App Server) are enabled on the server.
- Verify that you are designated as an *author* while configuring “Role-Based Access” (MATLAB Web App Server).



#### Procedure

- 1 Navigate to the web apps home page configured by the server. You can obtain the URL to the home page by executing `webapps - status` at the system command-line or by getting the URL from an individual who is administering the server. The format of the home page URL is:

`http://webAppServer:PortNumber/webapps/home/index.html`



Here, *webAppServer* is your web app server hostname, and *PortNumber* is the port specified when configuring the server.

- 2 Click  on the web apps home page to open the *Manage Apps* page.
- 3 Click  and navigate to the project folder generated by Web App Compiler (in MATLAB Compiler) during the packaging process.
- 4 Select the file *webAppArchiveName.ctf* and click **Open** to upload the web app. You get a confirmation that the *webAppArchiveName.ctf* was successfully uploaded to the server.

## See Also

### More About

- “Run Web App” on page 3-6
- “Create Web App” on page 3-2

# Run Web App

---

**Note** To run a web app, you must also have the development version of MATLAB Web App Server running. For more information, see “Install the Development Version of MATLAB Web App Server” on page 2-2 and “Configure the Development Version of MATLAB Web App Server” on page 2-5.

---

Using a web browser, you can access web apps running on the server by navigating to the web apps home page.

You can obtain the URL to the home page by clicking **Open Home Page** in the server application in the development version of MATLAB Web App Server. The format of the home page URL is:

```
http://webAppServer:PortNumber/webapps/home/index.html
```

Here, *webAppServer* is your web app server hostname, and *PortNumber* is the port specified when configuring the server.

- 1 To run a web app, click the web app tile on the home page.
- 2 To see a list of all web apps with their status and diagnostic messages, click the **Diagnostics** link on the top-right corner of the home page.
- 3 To go back to the home page of your web apps, click **MATLAB Web Apps** on the breadcrumb trail at the top of the page.

## See Also

### More About

- “Create Web App” on page 3-2
- “Deploy Web App” on page 3-4

## Diagnostics

Click **Diagnostics** on the web apps home page to get information about each web app.

When you click **Diagnostics**, you see a page with all the web apps deployed to the server along with their status. The various statuses are:

- **OK**—The web app is available to run.
- **Corrupt CTF**—The deployed web app archive file cannot be read.
- **Required Runtime Unavailable**—The web app uses a different version of MATLAB Runtime than the one on the server.
- **Not a Web App**—The deployed `.ctf` file is not a web apps `.ctf` file.

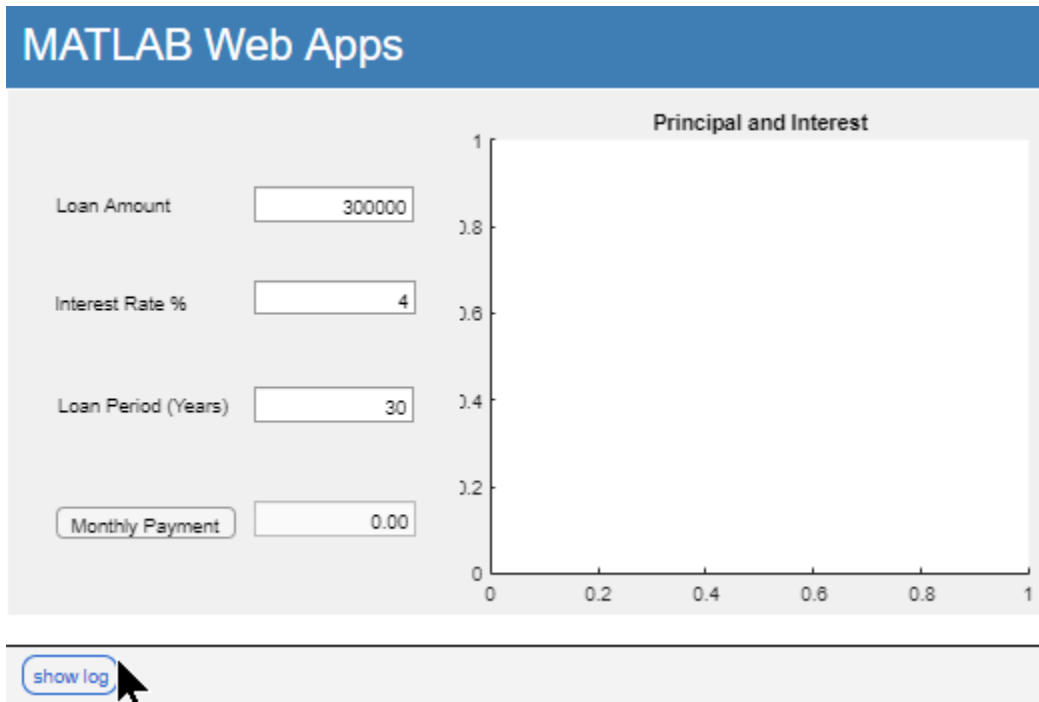
### See Also

#### More About

- “Web App Session Log” on page 3-8
- “Run Web App” on page 3-6

## Web App Session Log

The web app session log captures all interaction associated with each web app. If you encounter any issues, you can check the log for more information. You can pass this information to the server administrator for troubleshooting. You can access the log by clicking the **show log** link at the bottom left corner of the browser.



### See Also

#### More About

- "Diagnostics" on page 3-7

## Limitations and Unsupported Functionality

When packaging a MATLAB app into a web app consider the following functional limitations. Using certain functions may result in an error or unexpected behavior.

- Multiwindow apps
  - Multiple calls to `figure` or `uifigure` are not supported.
  - Dialog boxes: `dialog`, `msgbox`, `errorDlg`, `warnDlg`, `helpDlg`, `listDlg`, `questDlg`, `inputDlg`, `uicolor`, and `UIFont` are not supported. However, `uiAlert`, `uiConfirm`, and `uiProgressDlg` are supported.
- Although you can upload and download files from a local system in a deployed web app using `uigetfile` and `uiputfile`, you cannot download files while an external application is writing them. Opening a folder selection dialog box on the client using `uigetdir` is not supported.
- Setting the `WindowState` property on a figure has no effect on a web app.
- Printing: `print`, `printpreview` are not supported.
- Graphics root object properties: `MonitorPositions`, `PointerLocation`, `ScreenDepth`, `ScreenPixelsPerInch`, `ScreenSize` are not supported.
- Figure properties: `CloseRequestFcn`, `Position`, `InnerPosition`, `Resize`, `Visible` are not supported.
- System Commands: The system commands `computer`, `ispc`, `isunix`, `ismac`, and `listfonts` will execute but they will not return client-side state information. Only server-side state information is returned.
- Tooltips: Data tips for graphics are not supported.
- Axes toolbar interactions: Data brushing is not supported.

These limitations are in addition to App Designer graphics limitations. For more information, see “Display Graphics in App Designer” (MATLAB).

### See Also

#### More About

- “Create Web App” on page 3-2
- “Authoring Secure Web Apps” on page 4-6



# Security

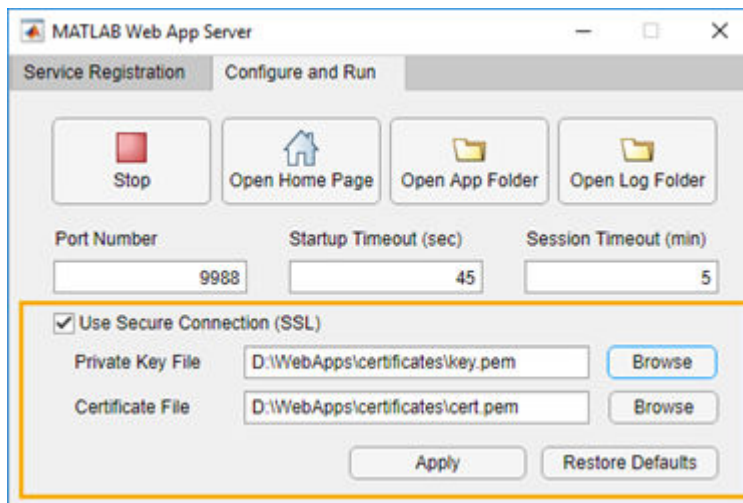
---

## Enabling HTTPS

- 1 Navigate to the MATLAB Web App Server installation location and run the server application.

Platform	Steps
Windows <i>(Administrator)</i>	Default location of the application is:  C:\Program Files\MATLAB\MATLABWebAppServer\R2020a\application  Right-click MATLABWebAppServer.exe and select <b>Run as administrator</b> .
Linux	Default location of the application is:  /usr/local/MATLAB/MATLABWebAppServer/R2020a/application  At the shell prompt, type:  run_MATLABWebAppServer.sh <MATLAB_Runtime_Location>
macOS	Default location of the application is:  /Applications/MATLAB/MATLABWebAppServer/R2020a/application  Double-click the app MATLABWebAppServer.app

- 2 Select the **Configure and Run** tab.



- 3 Check the option **Use Secure Connection (SSL)** in the MATLAB Web App Server.
- 4 Enter the location of the private key file and the certificate file. Click **Apply**.

The browser opens the web apps home page using HTTPS.

### See Also



# MATLAB Web App Server Security

---

**Caution** It is strongly recommended that you consult with your IT system administrator and discuss the security implications of installing the development version of MATLAB Web App Server.

---

Installing and running the server on your network exposes your network and file system to risks. The machine running the server is most at risk from accidental or deliberate misuse of deployed web applications. Therefore, you must install the server software only on dedicated hardware. This machine can be a physical or virtual machine whose only purpose is to host web applications that connect to the server software. Using a physical or virtual machine limits the risk in the event that the machine is compromised.

Setting up of the development version of MATLAB Web App Server creates two low-privileged user accounts on the host machine—one for the server and one for applications. However, you can choose to use the same account. However, using the same account can introduce additional risks. In addition, through a process known as *privilege escalation*, attackers may be able to exploit bugs in the operating system or network to obtain the privileges of ordinary or even administrative users. They can then attempt to access files or other intellectual property without permission.

The development version of the server relies on the authentication and authorization scheme of its host machine and network. Other than supporting HTTPS, it does not contain any additional mechanisms for authenticating or authorizing web application users. For more information, see “Enabling HTTPS” on page 4-2.

You may be able to mitigate some of these risks by taking these precautions:

- *Restrict network access.* Only trusted users can access the server and its associated applications.
- *Execute only trusted applications.* Trust applications developed by only well-known, trusted, and authenticated sources.
- *Limit application functionality.* Include in the application only those features of MATLAB required for the application to perform its function. For more information, see “Authoring Secure Web Apps” on page 4-6.

For a list of additional risks, see “Potential Risks” on page 4-4.

## See Also

### More About

- “Potential Risks” on page 4-4
- “Enabling HTTPS” on page 4-2
- “Authoring Secure Web Apps” on page 4-6
- “Securely Deploying Web Apps” on page 4-8

## Potential Risks

- The MATLAB Web App Server has no specific mechanism to prevent HTTP request capture and replay.
- The development version of MATLAB Web App Server has no mechanism for authentication or authorization other than HTTPS.

Any user with access to the network can run any application created with this software and read any data the application is authorized to access.

If you want authentication and role-based access capabilities, you need to purchase the MATLAB Web App Server product.

- Installation of the MATLAB Web App Server creates two low-privileged user accounts on the host machine.

These low-privileged accounts may inherit privileges given to all users. Care should be taken to restrict privileges given to all users.

- While the server and applications run under two different low-privileged user accounts, all applications hosted by the server run under the same low-privileged user account.

If multiple copies of the same application run simultaneously, they might interfere with each other. This situation happens if the application writes data to any shared resource, for example, a file or a non-concurrent database.

- When deploying multiple applications to the server, the server shares cookies across sessions, which can result in crosstalk between applications for a single user accessing more than one application.

This situation could allow unintentional crosstalk between multiple applications run by the same user.

- Deployed web applications are potentially vulnerable to *data* or *code injection* attacks whereby malicious or malformed inputs can be used to attempt to subvert the system. The server does not contain explicit protection against either type of injection attack. Certain MATLAB features, particularly the `eval()` function, can increase the risk of injection attacks. A common countermeasure is input sanitization or input whitelisting. MATLAB contains functions like `regexp` and `regexprep` that can assist in validating untrusted input.
  - Your application may indirectly call `eval()`, potentially making it vulnerable to code-injection attacks.
  - Other MATLAB functions may exhibit the same code injection vulnerabilities; any function that processes code-like input (XML, SQL, JSON, to name a few) is potentially vulnerable to code injection.
  - Any application that accesses the operating system via MATLAB `system()`, `dos()`, or `unix()` commands might also be vulnerable to code injection.

---

**Note** This list identifies known risks and is not meant to be comprehensive.

---

## See Also

### More About

- “Enabling HTTPS” on page 4-2
- “Authoring Secure Web Apps” on page 4-6
- “Securely Deploying Web Apps” on page 4-8
- “MATLAB Web App Server Security” on page 4-3

## Authoring Secure Web Apps

Most of the potential risk associated with deploying web apps comes from the code in each app. By limiting the features that your app uses and by following the secure coding practices listed here, you can reduce the potential risk to your applications.

### Authentication and Authorization

If your app requires access to sensitive data or performs potentially dangerous actions, you can consider implementing your own authentication and authorization schemes. Consult your network security group for advice.

### Do Not Call `eval()`

The MATLAB `eval()` function turns text strings into commands. This powerful function allows users to execute arbitrary MATLAB code. This code can, in turn, enable execution of any installed program that is available to the low-privileged user or access to any file or data that the low-privileged users has access to. Applications created for web deployment and access must not contain calls to `eval()`. See “Alternatives to the `eval` Function” (MATLAB) for ways to eliminate `eval()` from your web app code. Relying on input sanitization can help mitigate the risk of any indirect calls to `eval()`. See “Sanitize User Input” (MATLAB Web App Server).

### Limit Free-Text User Input

Use menus, sliders, dials, and buttons instead of editable text fields in your app user interface. In addition to providing a better user experience, this practice limits the types of input users can provide, and the risks such inputs might introduce.

### Sanitize User Input

To a security expert, user supplied data is considered untrusted because user input is a common attack vector for hackers. If your app must accept free-text input, the app must carefully examine the input for potential code injection attacks—text that contains special characters that coerce the app to interpret the input as commands rather than data.

In MATLAB, code injection attacks are most likely to be directed against XML, JSON, SQL, and other similar types of structured input. If your app accepts structured input, consult your IT or security group for suggestions on how to sanitize that input. It is never a good idea to allow the user to directly enter any type of code (such as MATLAB, Java®, or JavaScript®) for immediate evaluation.

### Sanitize Data Read from Files

Reading data from files exposes the app to the same types of risk as collecting interactive user input. The same countermeasures apply. Also, you can protect read-only data files from tampering by a cryptographically secure hashing algorithm to digitally fingerprint files.

### Minimize File System Write Operations

Limiting your application to read-only access greatly reduces the potential risk associated with your application. If you must write to the file system, remember that the server runs multiple copies of

your application simultaneously if multiple users access it at the same time. You must manage simultaneous writes either through the use of runtime-generated unique file names or the use of a database that can typically handle multiple simultaneous accesses. If simultaneous writes are not properly managed, data corruption may occur.

## **Verify Trustworthiness of Third-Party Code**

If your app includes MATLAB files, shared libraries, Java classes, or any other type of code developed by a third party, you must make sure that code is free of viruses, worms, Trojan horses, and other web-based attack and infiltration vectors. You can discuss this issue with the author of the code and your IT and security staff. In the case of binaries or Java classes, consider running a virus scanner or other security software on the code before including it in your deployed app.

## **Reduce Exposure Level**

One way to reduce exposure is to limit the time that the app is running to only those times when it is needed. For example, do not run it continuously from your desktop.

## **See Also**

### **More About**

- “Potential Risks” on page 4-4
- “Enabling HTTPS” on page 4-2
- “Securely Deploying Web Apps” on page 4-8
- “MATLAB Web App Server Security” on page 4-3

## Securely Deploying Web Apps

- Install the MATLAB Web App Server on a dedicated physical or virtual machine, and do not use this machine for any other purpose.
- Run web apps behind your organization firewall. Do not allow access from the open Internet.
- Install web apps only from trusted and verified people and organizations.
- Limit the features and functionality you build into the web apps you develop.
  - Do not call the MATLAB function `eval()`.
  - Avoid free-text input where you can, and use menus, lists, buttons, and other affordances instead.
  - Sanitize input from the app user interface and data files.
  - Limit file, network, and other resource access to the minimum required by your app.
  - Verify the trustworthiness of any third-party code included in your app.
- If your application accesses sensitive data, use in-application authentication to limit access.
- Reduce exposure level by limiting the time that the app runs to only those times when it is needed. For example, do not run it 24 hours a day, 7 days a week from your desktop.

### See Also

#### More About

- “Authoring Secure Web Apps” on page 4-6
- “Potential Risks” on page 4-4
- “Enabling HTTPS” on page 4-2
- “MATLAB Web App Server Security” on page 4-3

# Apps

---

## Web App Compiler

Package App Designer apps for web deployment

### Description

The **Web App Compiler** app lets you package MATLAB App Designer apps for web deployment. The app takes an App Designer `.mlapp` file and packages it as a web app archive `.ctf` file. You deploy the web app by copying the `.ctf` file to the apps folder in the MATLAB Web App Server. Once deployed, you can use the web app in a browser.

### Open the Web App Compiler App

- MATLAB Toolstrip: On the **Apps** tab, under **Application Deployment**, click the **Web App** icon.
- MATLAB command prompt: Enter `webAppCompiler`.
- App Designer: In App Designer toolstrip, click the **Share** button, and select **Web App**.

### Examples

- “Simple Mortgage Calculator Web App” on page 7-2

### Programmatic Use

`webAppCompiler`

### See Also

**Apps**

**Functions**

**Topics**

“Simple Mortgage Calculator Web App” on page 7-2

**Introduced in R2018a**



# Functions

---

# webAppCompiler

Package App Designer apps for web deployment

## Syntax

```
webAppCompiler  
webAppCompiler project_name
```

## Description

`webAppCompiler` opens the **Web App Compiler** for the creation of a new project. For more information on the app, see **Web App Compiler**.

`webAppCompiler project_name` opens the **Web App Compiler** with the project preloaded. If the project does not exist, an error will be generated, and the program will exit.

## Examples

### Create a New Web App Project

Open the **Web App Compiler** to create a new project.

```
webAppCompiler
```

### Open an Existing Web App Project

Open an existing web app project.

```
webAppCompiler myWebApp
```

## Input Arguments

**project\_name** — name of the project to be opened or packaged  
character array or string

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

## Compatibility Considerations

### -package option will be removed

*Not recommended starting in R2020a*

The `-package` option will be removed. To package MATLAB apps into web apps, use the **Web App Compiler** app.

## **See Also**

**Web App Compiler** | [deploytool](#) | [mcc](#)

**Introduced in R2018a**



# Web App Examples

---

## Simple Mortgage Calculator Web App

This example shows how to create a web app and host it on the development version of MATLAB Web App Server. The example uses the simple calculator app from App Designer as a basis for the web app. For information about the app and the numerical values you can enter, see “App that Calculates and Plots Data Based on Numerical Input” (MATLAB). In the workflow, you:


- Package the simple calculator app from App Designer using the Web App Compiler app in MATLAB Compiler. This step creates a web app archive (.ctf) file.
- Deploy the web app archive (.ctf) file to the development version of MATLAB Web App Server.
- Run the web app from the web apps home page.

### Prerequisites

- 1 Install and configure the development version of MATLAB Web App Server.
  - For information on installing the server, see “Install the Development Version of MATLAB Web App Server” on page 2-2.
  - For information on configuring the server, see “Configure the Development Version of MATLAB Web App Server” on page 2-5.
- 2 Copy the App Designer file `Mortgage.mlapp` to your current working directory. The default location of the file is:

Operating System	Default File Location
Windows	C:\Program Files\MATLAB\R2020a\examples\matlab\main\Mortgage.mlapp
Linux	/usr/local/MATLAB/R2020a/examples/matlab/main/Mortgage.mlapp
macOS	/Applications/MATLAB/R2020a.app/examples/matlab/main/Mortgage.mlapp

### Package and Create Web App

- 1 Start MATLAB.
- 2 Type `webAppCompiler` at the MATLAB command line to open the **Web App Compiler** app.
- 3 In the **MAIN FILE** section of the toolstrip, click the  button to add the `Mortgage.mlapp` file to the project. The Web App Compiler automatically resizes to include an **App details** section that contains information about the app such as app name, author, summary, description, and version. You can edit information about the app in App Designer by clicking **Edit App Details**. Click **Refresh** to update Web App Compiler with any changes you have made.
  - (Optional) Make sure to use a display name that is easy to distinguish when your web app is deployed to the server.
  - (Optional) Provide a version number for tracking purposes. The version number is visible on the web apps home page.
  - (Optional) Add a description for your web app in the **Summary** field. This description is visible on the web apps home page.

- 4 In the **Archive information** section, specify the archive name as myMortgageWebApp.
- 5 Click **Package** to package the app, and create a web app archive (.ctf file).

In the **Save Project** dialog box that opens, specify a project name and a location where you want to save the web app project. **Web App Compiler** saves your project and opens a **Package** dialog box.

- 6 Once packaging is complete, in the **Package** dialog box, click **Open output folder**. This opens the project folder, which contains the following files:
  - myMortgageWebApp.ctf
  - mccExcludedFiles.log
  - PackagingLog.html
  - requiredMCRProducts.txt

You can view the log file, PackagingLog.html, to see the exact mcc syntax used to package and create the web app archive.

## Deploy Web App

- 1 Navigate to the project folder generated by Web App Compiler during the packaging process.
- 2 Copy the web app archive file myMortgageWebApp.ctf to the app folder configured by the server. The default location is:

Operating System	Apps Folder Location
Windows	%ProgramData%\MathWorks\webapps\R2020a\apps
Linux	/local/MathWorks/webapps/R2020a/apps
macOS	/Library/Application Support/MathWorks/webapps/R2020a/apps

You can also open the apps folder by clicking the **Open App Folder** button in the server application. For more information, see “Start the Server Application” on page 2-11.

- 3 Click the **Open Home Page** button in the server application.

This action opens the web apps home page using your default web browser. You see a tile displaying the simple mortgage calculator web app. Your web app is now deployed.

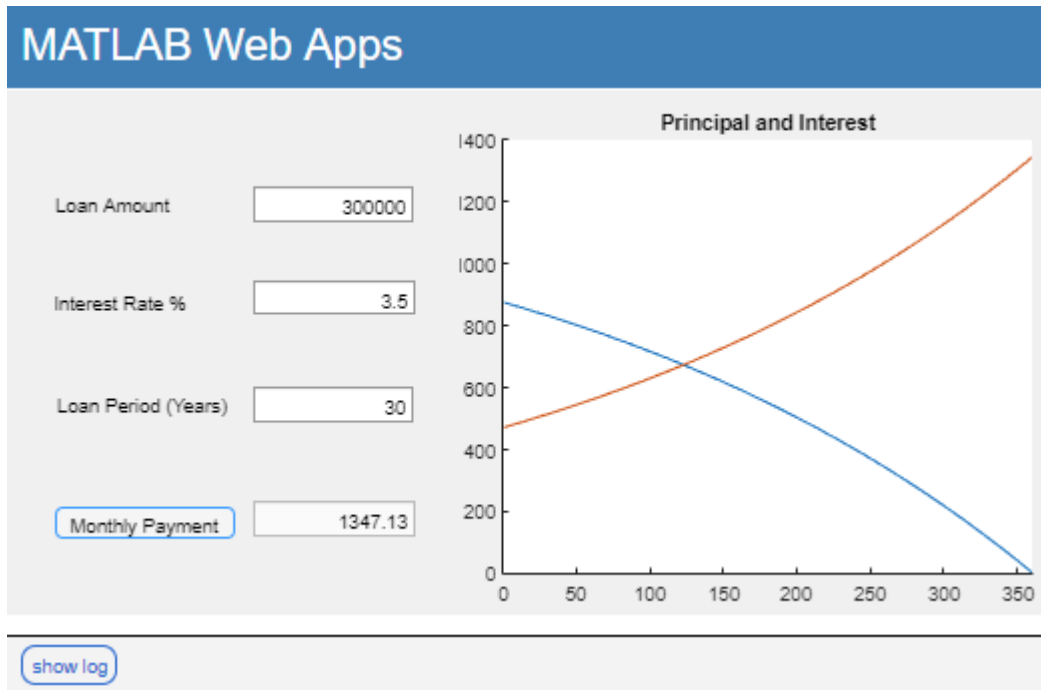
## Run Web App

- 1 To run a web app, click the myMortgageWebApp tile on the web apps home page.

The web app opens in a new tab.

- 2 Click the **Monthly Payment** button to get the monthly payment and the principal and interest graph.

You have successfully created, deployed, and run a web app.



## See Also

### More About

- “Create Web App” on page 3-2
- “Deploy Web App” on page 3-4
- “Run Web App” on page 3-6
- “Simulink Simulation Web App” on page 7-5



## Simulink Simulation Web App

This example shows how to create a web app containing a Simulink simulation and host it on the development version of MATLAB Web App Server. The example uses the mass spring damper model in Simulink and a MATLAB app that invokes the model as a basis for the web app. The APIs for creating a simulation can be found in the Simulink Compiler product. In the workflow, you:

- Package the MATLAB app containing Simulink simulation using the Web App Compiler app in MATLAB Compiler. This step creates a web app archive (.ctf) file.
- Deploy the web app archive (.ctf) file to the development version of MATLAB Web App Server.
- Run the web app from the web apps home page.

### Prerequisites

---

**Note** This example requires the Simulink Compiler product. For details, see “Simulink Compiler Workflow Overview” (Simulink Compiler).


---

- 1 Install and configure the development version of MATLAB Web App Server.
  - For information on installing the server, see “Install the Development Version of MATLAB Web App Server” on page 2-2.
  - For information on configuring the server, see “Configure the Development Version of MATLAB Web App Server” on page 2-5.
- 2 Copy the Simulink model file `MassSpringDamperModel.slx` and the corresponding MATLAB app `MassSpringDamperApp.mlapp` to your current working directory. The default location for the files is:

Operating System	Default Location for Files
Windows	C:\Program Files\MATLAB\R2020a\examples\simulinkcompiler\main\
Linux	/usr/local/MATLAB/R2020a/examples/simulinkcompiler/main
macOS	/Applications/MATLAB/R2020a.app/examples/simulinkcompiler/main

- 3 Open the `MassSpringDamperApp.mlapp` in MATLAB App Designer and switch to **Code View**. Verify that the Simulink Compiler APIs to create a simulation are present in the `SimulateButtonPushed` callback.

### Package and Create Web App

- 1 Start MATLAB.
- 2 Type `webAppCompiler` at the MATLAB command line to open the **Web App Compiler** app.
- 3 In the **MAIN FILE** section of the toolstrip, click the  button to add the `MassSpringDamperApp.mlapp` file to the project. The Web App Compiler automatically resizes to include an **App details** section that contains information about the app such as app name, author, summary, description, and version. You can edit information about the app in App

Designer by clicking **Edit App Details**. Click **Refresh** to update Web App Compiler with any changes you have made.

- *(Optional)* Make sure to use a display name that is easy to distinguish when your web app is deployed to the server.
  - *(Optional)* Provide a version number for tracking purposes. The version number is visible on the web apps home page.
  - *(Optional)* Add a description for your web app in the **Summary** field. This description is visible on the web apps home page.
- 4** In the **Archive information** section, specify the archive name as `mySimulinkSimulationWebApp`.
  - 5** Click **Package** to package the app, and create a web app archive (`.ctf` file).

In the **Save Project** dialog box that opens, specify a project name and a location where you want to save the web app project. **Web App Compiler** saves your project and opens a **Package** dialog box.

- 6** Once packaging is complete, in the **Package** dialog box, click **Open output folder**. This opens the project folder, which contains the following files:
  - `mySimulinkSimulationWebApp.ctf`
  - `mccExcludedFiles.log`
  - `PackagingLog.html`
  - `requiredMCRProducts.txt`

You can view the log file, `PackagingLog.html`, to see the exact `mcc` syntax used to package and create the web app archive.

## Deploy Web App

- 1** Navigate to the project folder generated by Web App Compiler during the packaging process.
- 2** Copy the web app archive file `mySimulinkSimulationWebApp.ctf` to the app folder configured by the server. The default location is:

You can also open the apps folder by clicking the **Open App Folder** button in the server application. For more information, see “Start the Server Application” on page 2-11.

- 3** Click the **Open Home Page** button in the server application.

This action opens the web apps home page using your default web browser. You see a tile displaying the simple mortgage calculator web app. Your web app is now deployed.

## Run Web App

- 1** To run a web app, click the `mySimulinkSimulationWebApp` tile on the web apps home page.  
The web app opens in a new tab.
- 2** Click the **Simulate** button to run the simulation.

You have successfully created, deployed, and run a web app.

## **See Also**

### **More About**

- “Create Web App” on page 3-2
- “Deploy Web App” on page 3-4
- “Run Web App” on page 3-6
- “Simple Mortgage Calculator Web App” on page 7-2

