

# **MATLAB<sup>®</sup> Coder<sup>™</sup> Release Notes**

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*MATLAB® Coder™ Release Notes*

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## R2014a

Code generation for additional Image Processing Toolbox and Computer Vision System Toolbox functions .....	2
Code generation for additional Signal Processing Toolbox, Communications System Toolbox, and DSP System Toolbox functions and System objects .....	3
Code generation for <code>fminsearch</code> optimization function and additional interpolation functions in MATLAB .....	4
Conversion from project to MATLAB script for command-line code generation .....	4
Code generation for <code>fread</code> function .....	5
Automatic C/C++ compiler setup .....	5
Compile-time declaration of constant global variables ....	5
Enhanced code generation support for <code>switch</code> statements .....	6
Code generation support for value classes with <code>set.prop</code> methods .....	7
Code generation error for property that uses <code>AbortSet</code> attribute .....	7
Independent configuration selections for standard math and code replacement libraries .....	7
Restrictions on bit length for integer types in a <code>coder.HardwareImplementation</code> object .....	10
Change in location of interface files in code generation report .....	11
Compiler warnings in code generation report .....	11
Removal of date and time comment from generated code files .....	11
Removal of two's complement guard from <code>rtwtypes.h</code> ...	11
Removal of <code>TRUE</code> and <code>FALSE</code> from <code>rtwtypes.h</code> .....	12
Change to default names for structure types generated from entry-point function inputs and outputs .....	12
Toolbox functions supported for code generation .....	13
Fixed-point conversion enhancements .....	15
Check bug reports for issues and fixes .....	17

Code generation for Statistics Toolbox and Phased Array	
System Toolbox .....	20
Toolbox functions supported for code generation .....	20
parfor function for standalone code generation, enabling	
execution on multiple cores .....	21
Persistent variables in parfor-loops .....	21
Random number generator functions in parfor-loops ...	21
External code integration using	
coder.ExternalDependency .....	22
Updating build information using	
coder.updateBuildInfo .....	22
Generation of simplified code using built-in C types .....	22
Conversion of MATLAB expressions into C constants using	
coder.const .....	23
Highlighting of constant function arguments in the	
compilation report .....	23
Code Generation Support for int64, uint64 data types .....	23
C99 long long integer data type for code generation .....	23
Change to passing structures by reference .....	24
coder.runTest new syntax .....	25
coder.target syntax change .....	25
Changes for complex values with imaginary part equal to	
zero .....	25
Subfolder for code generation interface files .....	26
Support for LCC compiler on Windows 64-bit machines ..	26
Fixed-Point conversion enhancements .....	27
Check bug reports for issues and fixes .....	29

Automatic fixed-point conversion during code generation	
(with Fixed-Point Designer) .....	32
File I/O function support .....	32
Support for nonpersistent handle objects .....	33
Structures passed by reference to entry-point functions ..	33
Include custom C header files from MATLAB code .....	33
Load from MAT-files .....	34
coder.opaque function enhancements .....	34
Automatic regeneration of MEX functions in projects .....	35
MEX function signatures include constant inputs .....	35

Custom toolchain registration .....	36
Complex trigonometric functions .....	37
parfor function reduction improvements and C support ..	37
Support for integers in number theory functions .....	37
Enhanced support for class property initial values .....	38
Optimized generated code for $x=[x \ c]$ when $x$ is a vector .....	39
Default use of Basic Linear Algebra Subprograms (BLAS) libraries .....	40
Changes to compiler support .....	40
New toolbox functions supported for code generation .....	41
Functions being removed .....	42
Check bug reports for issues and fixes .....	44

## **R2012b**

parfor function support for MEX code generation, enabling execution on multiple cores .....	46
Code generation readiness tool .....	46
Reduced data copies and lightweight run-time checks for generated MEX functions .....	46
Additional string function support for code generation ...	46
Visualization functions in generated MEX functions .....	47
Input parameter type specification enhancements .....	47
Project import and export capability .....	48
Package generated code in zip file for relocation .....	49
Fixed-point instrumentation and data type proposals .....	49
New toolbox functions supported for code generation .....	50
New System objects supported for code generation .....	50
Check bug reports for issues and fixes .....	52

## **R2012a**

Code Generation for MATLAB Classes .....	54
Dynamic Memory Allocation Based on Size .....	54
C/C++ Dynamic Library Generation .....	54
Automatic Definition of Input Parameter Types .....	54
Verification of MEX Functions .....	55
Enhanced Project Settings Dialog Box .....	55

Projects Infer Input Types from assert Statements in Source Code .....	56
Code Generation from MATLAB .....	56
New Demo .....	56
Check bug reports for issues and fixes .....	57

## **R2011b**

Support for Deletion of Rows and Columns from Matrices .....	60
Code Generation from MATLAB .....	60
Check bug reports for issues and fixes .....	61

## **R2011a**

New User Interface for Managing Projects .....	64
Migrating from Real-Time Workshop emlc Function .....	64
New coder.Type Classes .....	68
New coder.Package Functions .....	68
Script to Upgrade MATLAB Code to Use MATLAB Coder Syntax .....	69
Embedded MATLAB Now Called Code Generation from MATLAB .....	69
MATLAB Coder Uses rtwTargetInfo.m to Register Target Function Libraries .....	69
New Getting Started Tutorial Video .....	70
New Demos .....	70
Functionality Being Removed in a Future Version .....	71
Function Elements Being Removed in a Future Release ..	71
Check bug reports for issues and fixes .....	73

# R2014a

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**Version: 2.6**

**New Features: Yes**

**Bug Fixes: Yes**

## Code generation for additional Image Processing Toolbox and Computer Vision System Toolbox functions

### Image Processing Toolbox

<code>affine2d</code>	<code>im2uint16</code>	<code>imhist</code>
<code>bwpack</code>	<code>im2uint8</code>	<code>imopen</code>
<code>bwselect</code>	<code>imbothat</code>	<code>imref2d</code>
<code>bwunpack</code>	<code>imclose</code>	<code>imref3d</code>
<code>edge</code>	<code>imdilate</code>	<code>imtophat</code>
<code>getrangefromclass</code>	<code>imerode</code>	<code>imwarp</code>
<code>im2double</code>	<code>imextendedmax</code>	<code>mean2</code>
<code>im2int16</code>	<code>imextendedmin</code>	<code>projective2d</code>
<code>im2single</code>	<code>imfilter</code>	<code>strel</code>

See “Image Processing Toolbox™”.

### Computer Vision System Toolbox

- `detectHarrisFeatures`
- `detectMinEigenFeatures`
- `estimateGeometricTransform`

See “Computer Vision System Toolbox™”.



## Code generation for additional Signal Processing Toolbox, Communications System Toolbox, and DSP System Toolbox functions and System objects

### Signal Processing Toolbox

- `findpeaks`
- `db2pow`
- `pow2db`

See “Signal Processing Toolbox™”.

### Communications System Toolbox

- `comm.OFDMModulator`
- `comm.OFDMDemodulator`

See “Communications System Toolbox™”.

### DSP System Toolbox

<code>ca2tf</code>	<code>firhalfband</code>	<code>ifir</code>	<code>iirnotch</code>
<code>c12tf</code>	<code>firlpnorm</code>	<code>iircomb</code>	<code>iirpeak</code>
<code>firceqrip</code>	<code>firminphase</code>	<code>iirgrpdelay</code>	<code>tf2ca</code>
<code>fireqint</code>	<code>firnyquist</code>	<code>iirlpnorm</code>	<code>tf2cl</code>
<code>firgr</code>	<code>firpr2chfb</code>	<code>iirlpnormc</code>	<code>dsp.DCBBlocker</code>

See “DSP System Toolbox™”.

## **Code generation for `fminsearch` optimization function and additional interpolation functions in MATLAB**

### **Optimization Functions in MATLAB**

- `fminsearch`
- `optimget`
- `optimset`

See “Optimization Functions in MATLAB®”.

### **Interpolation and Computational Geometry in MATLAB**

- `interp3`
- `mkpp`
- `pchip`
- `ppval`
- `spline`
- `unmkpp`
- 'spline' and 'v5cubic' interpolation methods for `interp1`
- 'spline' and 'cubic' interpolation methods for `interp2`

See “Interpolation and Computational Geometry in MATLAB”.

### **Conversion from project to MATLAB script for command-line code generation**

Using the `-tocode` option of the `coder` command, you can convert a MATLAB Coder™ project to the equivalent MATLAB code in a MATLAB script. The script reproduces the project in a configuration object and runs the `codegen` command. With this capability, you can:

- Move from a project workflow to a command-line workflow.

- Save the project as a text file that you can share.

The following command converts the project named `myproject` to the script named `myscript.m`:

```
coder -tocode myproject -script myscript.m
```

If you omit the `-script` option, the `coder` command writes the script to the Command Window.

See “Convert MATLAB Coder Project to MATLAB Script”.

## Code generation for fread function

In R2014a, you can generate code for the `fread` function.

See “Data and File Management in MATLAB”.

## Automatic C/C++ compiler setup

Previously, you used `mex -setup` to set up a compiler for C/C++ code generation. In R2014a, the code generation software locates and uses a supported installed compiler. You can use `mex -setup` to change the default compiler. See “Changing Default Compiler”.

## Compile-time declaration of constant global variables

You can specify that a global variable is a compile-time constant. Use a constant global variable to:

- Generate optimized code.
- Define the value of a constant without changing source code.

To declare a constant global variable in a MATLAB Coder project:

- 1 On the **Overview** tab, click **Add global**. Enter a name for the global variable.

- 2 Click the field to the right of the global variable name.
- 3 Select Define Constant Value.
- 4 Enter the value in the field to the right of the global variable name.

To declare a constant global variable at the command-line interface, use the `-globals` option along with the `coder.Constant` function.

In the following code, `gConstant` is a global variable with constant value 42.

```
cfg = coder.config('mex');  
globals = {'gConstant', coder.Constant(42)};  
codegen -config cfg myfunction -globals globals
```

See “Define Constant Global Data”.

## Enhanced code generation support for switch statements

Code generation now supports:

- Switch expressions and case expressions that are noninteger numbers, nonconstant strings, variable-size strings, or empty matrices
- Case expressions with mixed types and sizes

If all case expressions are scalar integer values, the code generation software generates a C `switch` statement. If at run time, the switch value is not an integer, the code generation software generates an error.

When the case expressions contain noninteger or nonscalar values, the code generation software generates C `if` statements in place of a C `switch` statement.

## Code generation support for value classes with `set.prop` methods

In R2014a, you can generate code for value classes that have `set.prop` methods.

## Code generation error for property that uses `AbortSet` attribute

**Compatibility Considerations: Yes**

Previously, when the current and new property values were equal, the generated code set the property value and called the `set` property method regardless of the value of the `AbortSet` attribute. When the `AbortSet` attribute was true, the generated code behavior differed from the MATLAB behavior.

In R2014a, if your code has properties that use the `AbortSet` attribute, the code generation software generates an error.

## Compatibility Considerations

Previously, for code using the `AbortSet` attribute, code generation succeeded, but the behavior of the generated code was incorrect. Now, for the same code, code generation ends with an error. Remove the `AbortSet` attribute from your code and rewrite the code to explicitly compare the current and new property value.

## Independent configuration selections for standard math and code replacement libraries

**Compatibility Considerations: Yes**

In R2014a, you can independently select and configure standard math and code replacement libraries for C and C++ code generation.

- The language selection (C or C++) determines the available standard math libraries.

- In a project, the **Language** setting on the **All Settings** tab determines options that are available for a new **Standard math library** setting on the **Hardware** tab.
- In a code configuration object, the `TargetLang` parameter determines options that are available for a new `TargetLangStandard` parameter.
- Depending on the your language selection, the following options are available for the **Standard math library** setting in a project and for the `TargetLangStandard` parameter in a configuration object.

<b>Language</b>	<b>Standard Math Libraries (TargetLangStandard)</b>
C	C89/C90 (ANSI) – default C99 (ISO)
C++	C89/C90 (ANSI) – default C99 (ISO) C++03 (ISO)

- The language selection and the standard math library selection determine the available code replacement libraries.
  - In a project, the **Code replacement library** setting on the **Hardware** tab lists available code replacement libraries. The MATLAB Coder software filters the list based on compatibility with the **Language** and **Standard math library** settings and the product licensing. For example, Embedded Coder® offers more libraries and the ability to create and use custom code replacement libraries.
  - In a configuration object, the valid values for the `CodeReplacementLibrary` parameter depend on the values of the `TargetLang` and `TargetLangStandard` parameters and the product licensing.

## Compatibility Considerations

In R2014a, code replacement libraries provided by MathWorks® no longer include standard math libraries.

- When you open a project that was saved with an earlier version:
  - The **Code replacement library** setting remains the same unless previously set to C89/C90 (ANSI), C99 (ISO), C++ (ISO), Intel IPP (ANSI), or Intel IPP (ISO). In these cases, MATLAB Coder software sets **Code replacement library** to None or Intel IPP.
  - MATLAB Coder software sets the new **Standard math library** setting to a value based on the previous **Code replacement library** setting.

If Code replacement library was set to:	Standard Math Library is set to:
C89/C90 (ANSI), C99 (ISO), or C++ (ISO)	C89/C90 (ANSI), C99 (ISO), C++03 (ISO), respectively
GNU99 (GNU), Intel IPP (ISO), Intel IPP (GNU), ADI TigerSHARC (Embedded Coder only), or MULTI BF53x (Embedded Coder only)	C99 (ISO)
A custom library (Embedded Coder), and the corresponding registration file has been loaded in memory	A value based on the BaseTf1 property setting
Any other value	The default standard math library, C89/C90 (ANSI)

- When you load a configuration object from a MAT file that was saved in an earlier version:
  - The **CodeReplacementLibrary** setting remains the same unless previously set to Intel IPP (ANSI) or Intel IPP (ISO). In these cases, MATLAB Coder software sets **CodeReplacementLibrary** to Intel IPP.
  - MATLAB Coder software sets the new **TargetLangStandard** setting to a value based on the previous **CodeReplacementLibrary** setting.

<b>If CodeReplacementLibrary was set to:</b>	<b>TargetLangStandard is set to:</b>
Intel IPP (ANSI)	C89/C90 ANSI
Intel IPP (ISO)	C99 (ISO)
Any other value	The default standard math library, C89/C90 (ANSI)

- The generated code can differ from earlier versions if you use the default standard math library, C89/C90 (ANSI), with one of these code replacement libraries:

GNU99 (GNU)  
 Intel IPP (GNU)  
 ADI TigerSHARC (Embedded Coder only)  
 MULTI BF53x (Embedded Coder only)

To generate the same code as in earlier versions, change TargetLangStandard to C99 (ISO).

- After you open a project, if you select a code replacement library provided by MathWorks, the code generation software can produce different code than in previous versions, depending on the **Standard math library** setting. Verify generated code.
- If a script that you used in a previous version sets the configuration object CodeReplacementLibrary parameter, modify the script to use both the CodeReplacementLibrary and the TargetLangStandard parameters.

## **Restrictions on bit length for integer types in a coder.HardwareImplementation object**

In R2014a, the code generation software imposes restrictions on the bit length of integer types in a coder.HardwareImplementation object. For example, the value of ProdBitPerChar must be between 8 and 32 and less than or equal to ProdBitPerShort. If you set the bit length to an invalid value, the code generation software reports an error.

See coder.HardwareImplementation.



## Change in location of interface files in code generation report

The code generation software creates and uses interface files prefixed with `_coder`. For MEX code generation, these files appear in the code generation report. Previously, these files appeared in the **Target Source Files** pane of the **C code** tab of the code generation report. They now appear in the **Interface Source Files** pane of the **C code** tab. The report is now consistent with the folder structure for generated files. Since R2013b, the interface files are in a subfolder named **interface**.

## Compiler warnings in code generation report

For MEX code generation, the code generation report now includes C and C++ compiler warning messages. If the code generation software detects compiler warnings, it generates a warning message in the **All Messages** tab. Compiler error and warning messages are highlighted in red on the **Target Build Log** tab.

See “View Errors and Warnings in a Report”.

## Removal of date and time comment from generated code files

Previously, generated code files contained a comment with the string `C source code generated on` followed by a date and time stamp. This comment no longer appears in the generated code files. If you have an Embedded Coder license, you can include the date and time stamp in custom file banners by using code generation template (CGT) files.

## Removal of two’s complement guard from `rtwtypes.h`

`rtwtypes.h` no longer contains the following code:

```
#if ((SCHAR_MIN + 1) != -SCHAR_MAX)
#error "This code must be compiled using a 2's complement representation for signed integer values"
#endif
```

You must compile the code that is generated by the MATLAB Coder software on a target that uses a two's complement representation for signed integer values. The generated code does not verify that the target uses a two's complement representation for signed integer values.

## **Removal of TRUE and FALSE from rtwtypes.h**

**Compatibility Considerations: Yes**

When the target language is C, `rtwtypes.h` defines `true` and `false`. It no longer defines `TRUE` and `FALSE`.

### **Compatibility Considerations**

If you integrate code generated in R2014a with custom code that references `TRUE` or `FALSE`, modify your custom code in one of these ways:

- Define `TRUE` or `FALSE` in your custom code.
- Change `TRUE` and `FALSE` to `true` and `false`, respectively.
- Change `TRUE` and `FALSE` to `1U` and `0U`, respectively.

## **Change to default names for structure types generated from entry-point function inputs and outputs**

**Compatibility Considerations: Yes**

In previous releases, the code generation software used the same default naming convention for structure types generated from local variables and from entry-point function inputs and outputs. The software used `struct_T` for the first generated structure type name, `a_struct_T` for the next name, `b_struct_T` for the next name, and so on.

In R2014a, the code generation software uses a different default naming convention for structure types generated from entry-point function inputs and outputs. The software uses `struct0_T` for the first generated structure type name, `struct1_T` for the next name, `struct2_T` for the next name, and so on. With this new naming convention, you can more easily predict the structure type name in the generated code.

## Compatibility Considerations

If you have C or C++ code that uses default structure type names generated from an entry-point function in a previous release, and you generate the entry-point function in R2014a, you must rewrite the code to use the new structure type names. However, subsequent changes to your MATLAB code, such as adding a variable with a structure type, can change the default structure type names in the generated code. To avoid compatibility issues caused by changes to default names for structure types in generated code, specify structure type names using `coder.cstructname`.

## Toolbox functions supported for code generation

See “Functions and Objects Supported for C and C++ Code Generation — Alphabetical List” and “Functions and Objects Supported for C and C++ Code Generation — Categorical List”.

### Communications System Toolbox

- `comm.OFDMModulator`
- `comm.OFDMDemodulator`

### Computer Vision System Toolbox

- `detectHarrisFeatures`
- `detectMinEigenFeatures`
- `estimateGeometricTransform`

### Data and File Management in MATLAB

`fread`

### DSP System Toolbox

<code>ca2tf</code>	<code>firhalfband</code>	<code>ifir</code>	<code>iirnotch</code>
<code>cl2tf</code>	<code>firlpnorm</code>	<code>iircomb</code>	<code>iirpeak</code>

<code>firceqrip</code>	<code>firminphase</code>	<code>iirgrpdelay</code>	<code>tf2ca</code>
<code>fireqint</code>	<code>firnyquist</code>	<code>iirlpnorm</code>	<code>tf2cl</code>
<code>firgr</code>	<code>firpr2chfb</code>	<code>iirlpnormc</code>	<code>dsp.DCBlocker</code>

### **Image Processing Toolbox**

<code>affine2d</code>	<code>im2uint16</code>	<code>imhist</code>
<code>bwpack</code>	<code>im2uint8</code>	<code>imopen</code>
<code>bwselect</code>	<code>imbothat</code>	<code>imref2d</code>
<code>bwunpack</code>	<code>imclose</code>	<code>imref3d</code>
<code>edge</code>	<code>imdilate</code>	<code>imtophat</code>
<code>getrangefromclass</code>	<code>imerode</code>	<code>imwarp</code>
<code>im2double</code>	<code>imextendedmax</code>	<code>mean2</code>
<code>im2int16</code>	<code>imextendedmin</code>	<code>projective2d</code>
<code>im2single</code>	<code>imfilter</code>	<code>strel</code>

### **Interpolation and Computational Geometry in MATLAB**

- `interp2`
- `interp3`
- `mkpp`
- `pchip`
- `ppval`
- `polyarea`
- `rectint`
- `spline`
- `unmkpp`

### **Matrices and Arrays in MATLAB**

`flip`

## Optimization Functions in MATLAB

- `fminsearch`
- `optimget`
- `optimset`

## Polynomials in MATLAB

- `polyder`
- `polyint`
- `polyvalm`

## Signal Processing Toolbox

- `findpeaks`
- `db2pow`
- `pow2db`

## Fixed-point conversion enhancements

These capabilities require a Fixed-Point Designer™ license.

### Overflow detection with scaled double data types in MATLAB Coder projects

The MATLAB Coder Fixed-Point Conversion tool now provides the capability to detect overflows. At the numerical testing stage in the conversion process, the tool simulates the fixed-point code using scaled doubles. It then reports which expressions in the generated code produce values that would overflow the fixed-point data type. For more information, see “Detect Overflows Using the Fixed-Point Conversion Tool” and “Detecting Overflows”.

You can also detect overflows when using the `codegen` function. For more information, see `coder.FixptConfig` and “Detect Overflows at the Command Line”.

## Support for MATLAB classes

You can now use the MATLAB Coder Fixed-Point Conversion tool to convert floating-point MATLAB code that uses MATLAB classes. For more information, see “Fixed-Point Code for MATLAB Classes”.

## Generated fixed-point code enhancements

The generated fixed-point code now:

- Uses subscripted assignment (the colon(:) operator). This enhancement produces concise code that is more readable.
- Has better code for constant expressions. In previous releases, multiple parts of an expression were quantized to fixed point. The final value of the expression was less accurate and the code was less readable. Now, constant expressions are quantized only once at the end of the evaluation. This new behavior results in more accurate results and more readable code.

For more informations, see “Generated Fixed-Point Code”.

## Fixed-point report for float-to-fixed conversion

In R2014a, when you convert floating-point MATLAB code to fixed-point C or C++ code, the code generation software generates a fixed-point report in HTML format. For the variables in your MATLAB code, the report provides the proposed fixed-point types and the simulation or derived ranges used to propose those types. For a function `my_fcn` and code generation output folder `out_folder`, the location of the report is `out_folder/my_fcn/fixpt/my_fcn_fixpt_Report.html`. If you do not specify `out_folder` in the project settings or as an option of the `codegen` command, the default output folder is `codegen`.

## Check bug reports for issues and fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at [www.mathworks.com/support/bugreports/](http://www.mathworks.com/support/bugreports/). Use the Saved Searches and Watched Bugs tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers.

The bug reports are an integral part of the documentation for each release. Examine periodically all bug reports for a release, as such reports may identify inconsistencies between the actual behavior of a release you are using and the behavior described in this documentation.

In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2014a Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2014a&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2014a&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2014a&product=ME](http://www.mathworks.com/support/bugreports/?release=R2014a&product=ME)





# R2013b

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**Version: 2.5**

**New Features: Yes**

**Bug Fixes: Yes**

## **Code generation for Statistics Toolbox and Phased Array System Toolbox**

Code generation now supports more than 100 Statistics Toolbox™ functions. For implementation details, see Statistics Toolbox Functions.

Code generation now supports most of the Phased Array System Toolbox™ functions and System objects. For implementation details, see Phased Array System Toolbox Functions and Phased Array System Toolbox System Objects.

## **Toolbox functions supported for code generation**

For implementation details, see Functions Supported for C/C++ Code Generation — Alphabetical List.

### **Data Type Functions**

- `narginchk`

### **Programming Utilities**

- `mfilename`

### **Specialized Math**

- `psi`

### **Computer Vision System Toolbox Classes and Functions**

- `extractFeatures`
- `detectSURFFeatures`
- `disparity`
- `detectMSERFeatures`
- `detectFASTFeatures`
- `vision.CascadeObjectDetector`
- `vision.PointTracker`

- `vision.PeopleDetector`
- `cornerPoints`
- `MSERRegions`
- `SURFPoints`

## **parfor function for standalone code generation, enabling execution on multiple cores**

You can use MATLAB Coder software to generate standalone C/C++ code from MATLAB code that contains `parfor`-loops. The code generation software uses the Open Multi-Processing (OpenMP) application interface to generate C/C++ code that runs in parallel on multiple cores on the target hardware.

For more information, see `parfor` and Accelerate MATLAB Algorithms That Use Parallel for-loops (`parfor`).

## **Persistent variables in parfor-loops**

You can now generate code from parallel algorithms that use persistent variables.

For more information, see `parfor`.

## **Random number generator functions in parfor-loops**

You can now generate code from parallel algorithms that use the random number generators `rand`, `randn`, `randi`, `randperm`, and `rng`.

For more information, see `parfor`.

## External code integration using `coder.ExternalDependency`

You can define the interface to external code using the new `coder.ExternalDependency` class. Methods of this class update the compile and build information required to integrate the external code with MATLAB code. In your MATLAB code, you can call the external code without needing to update build information. See `coder.ExternalDependency`.

## Updating build information using `coder.updateBuildInfo`

You can use the new function `coder.updateBuildInfo` to update build information. For example:

```
coder.updateBuildInfo('addLinkFlags', '/STACK:1000000');
```

adds a stack size option to the linker command line. See `coder.updateBuildInfo`.

## Generation of simplified code using built-in C types Compatibility Considerations: Yes

By default, MATLAB Coder now uses built-in C types in the generated code. You have the option to use predefined types from `rtwtypes.h`. To control the data type in the generated code:

- In a project, on the Project Settings dialog box **Code Appearance** tab, use the **Data Type Replacement** setting.
- At the command line, use the configuration object parameter `DataTypeReplacement`.

The built-in C type that the code generation software uses depends on the target hardware.

For more information, see [Specify Data Type Used in Generated Code](#).

## Compatibility Considerations

If you use the default configuration or project settings, the generated code has built-in C types such as `double` or `char`. Code generated prior to R2013b has predefined types from `rtwtypes.h`, such as `real_T` or `int32_T`.

## Conversion of MATLAB expressions into C constants using `coder.const`

You can use the new function `coder.const` to convert expressions and function calls to constants at compile time. See `coder.const` and Constant Folding.

## Highlighting of constant function arguments in the compilation report

The compilation report now highlights constant function arguments and displays them in a distinct color. You can display the constant argument data type and value by placing the cursor over the highlighted argument. You can export the constant argument value to the base workspace where you can display detailed information about the argument.

For more information, see [Viewing Variables in Your MATLAB Code](#).

## Code Generation Support for `int64`, `uint64` data types

You can now use `int64` and `uint64` data types for code generation.

## C99 long long integer data type for code generation

If your target hardware and compiler support the C99 long long integer data type, you can use this data type for code generation. Using long long results in more efficient generated code that contains fewer cumbersome operations and multiword helper functions. To specify the long long data type for code generation:

- In a project, on the Project Settings dialog box **Hardware** tab, use the following production and test hardware settings:
    - **Enable long long:** Specify that your C compiler supports the long long data type. Set to **Yes** to enable **Sizes: long long**.
    - **Sizes: long long:** Describe length in bits of the C long long data type supported by the hardware.
  - At the command line, use the following hardware implementation configuration object parameters:
    - **ProdLongLongMode:** Specify that your C compiler supports the long long data type. Set to **true** to enable **ProdBitPerLongLong**.
    - **ProdBitPerLongLong:** Describes the length in bits of the C long long data type supported by the production hardware.
    - **TargetLongLongMode:** Specifies whether your C compiler supports the long long data type. Set to **true** to enable **TargetBitPerLongLong**.
    - **TargetBitPerLongLong:** Describes the length in bits of the C long long data type supported by the test hardware.
- For more information, see the class reference information for `coder.HardwareImplementation`.

## **Change to passing structures by reference**

**Compatibility Considerations: Yes**

In R2013b, the option to pass structures by reference to entry-point functions in the generated code applies to function outputs and function inputs. In R2013a, this option applied only to inputs to entry-point functions.

### **Compatibility Considerations**

If you select the pass structures by reference option, and a MATLAB entry-point function has a single output that is a structure, the generated C function signature in R2013b differs from the signature in R2013a. In R2013a, the generated C function returns the output structure. In R2013b, the output structure is a pass by reference function parameter.

If you have code that calls one of these functions generated in R2013a, and then you generate the function in R2013b, you must change the call to the function. For example, suppose `S` is a structure in the following MATLAB function `foo`.

```
function S = foo()
```

If you generate this function in R2013a, you call the function this way:

```
S = foo();
```

If you generate this function in R2013b, you call the function this way:

```
foo(&S);
```

## **coder.runTest new syntax**

Use the syntax `coder.runTest(test_fcn, MEX_name_ext)` to run `test_fcn` replacing calls to entry-point functions with calls to the corresponding MEX functions in the MEX file named `MEX_name_ext`. `MEX_name_ext` includes the platform-specific file extension. See `coder.runTest`.

## **coder.target syntax change**

The new syntax for `coder.target` is:

```
tf = coder.target('target')
```

For example, `coder.target('MATLAB')` returns true when code is running in MATLAB. See `coder.target`.

You can use the old syntax, but consider changing to the new syntax. The old syntax will be removed in a future release.

## **Changes for complex values with imaginary part equal to zero**

**Compatibility Considerations: Yes**

In R2013b, complex values with an imaginary part equal to zero become real when:

- They are returned by a MEX function.
- They are passed to an extrinsic function.

See Expressions With Complex Operands Yield Complex Results.

## Compatibility Considerations

MEX functions generated in R2013b return a real value when a complex result has an imaginary part equal to zero. MEX functions generated prior to R2013b return a complex value when a complex result has an imaginary part equal to zero.

In R2013b, complex values with imaginary part equal to zero become real when passed to an extrinsic function. In previous releases, they remain complex.

## Subfolder for code generation interface files

Previously, interface files for MEX code generation appeared in the code generation output folder. In R2013b, these interface files have the prefix `_coder`, appear in a subfolder named `interface`, and appear for all code generation output types.

## Support for LCC compiler on Windows 64-bit machines

The LCC-win64 compiler is shipping with MATLAB Coder for Microsoft® Windows® 64-bit machines. For Windows 64-bit machines that do not have a third-party compiler installed, MEX code generation uses LCC by default.

You cannot use LCC for code generation of C/C++ static libraries, C/C++ dynamic libraries, or C/C++ executables. For these output types, you must install a compiler. See [http://www.mathworks.com/support/compilers/current\\_release/](http://www.mathworks.com/support/compilers/current_release/).



## Fixed-Point conversion enhancements

These capabilities require a Fixed-Point Designer license.

### Fixed-Point conversion option for codegen

You can now convert floating-point MATLAB code to fixed-point code, and then generate C/C++ code at the command line using the option `-float2fixed` with the `codegen` command. See `codegen` and Convert Floating-Point MATLAB Code to Fixed-Point C Code Using `codegen`.

### Fixed-point conversion using derived ranges on Mac platforms

You can now convert floating-point MATLAB code to fixed-point C code using the Fixed-Point Conversion tool in MATLAB Coder projects on Mac platforms.

For more information, see Automated Fixed-Point Conversion and Propose Fixed-Point Data Types Based on Derived Ranges.

### Derived ranges for complex variables in MATLAB Coder projects

Using the Fixed-Point Conversion tool in MATLAB Coder projects, you can derive ranges for complex variables. For more information, see Propose Fixed-Point Data Types Based on Derived Ranges

### Fixed-point conversion workflow supports designs that use enumerated types

Using the Fixed-Point Conversion tool in MATLAB Coder projects, you can propose data types for enumerated data types using derived and simulation ranges.

For more information, see Propose Fixed-Point Data Types Based on Derived Ranges and Propose Fixed-Point Data Types Based on Simulation Ranges.

### Fixed-point conversion of variable-size data using simulation ranges

Using the Fixed-Point Conversion tool in MATLAB Coder projects, you can propose data types for variable-size data using simulation ranges.

For more information, see [Propose Fixed-Point Data Types Based on Simulation Ranges](#).

### **Fixed-point conversion test file coverage results**

The Fixed-Point Conversion tool now provides test file coverage results. After simulating your design using a test file, the tool provides an indication of how often the code is executed. If you run multiple test files at once, the tool provides the cumulative coverage. This information helps you determine the completeness of your test files and verify that they are exercising the full operating range of your algorithm. The completeness of the test file directly affects the quality of the proposed fixed-point types.

For more information, see [Code Coverage](#).

## Check bug reports for issues and fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at [www.mathworks.com/support/bugreports/](http://www.mathworks.com/support/bugreports/). Use the Saved Searches and Watched Bugs tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers.

The bug reports are an integral part of the documentation for each release. Examine periodically all bug reports for a release, as such reports may identify inconsistencies between the actual behavior of a release you are using and the behavior described in this documentation.

In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2013b Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2013b&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2013b&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2013b&product=ME](http://www.mathworks.com/support/bugreports/?release=R2013b&product=ME)



# R2013a

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**Version: 2.4**

**New Features: Yes**

**Bug Fixes: Yes**

## Automatic fixed-point conversion during code generation (with Fixed-Point Designer)

You can now convert floating-point MATLAB code to fixed-point C code using the fixed-point conversion capability in MATLAB Coder projects. You can choose to propose data types based on simulation range data, static range data, or both.

---

**Note** You must have a Fixed-Point Designer license.

---

During fixed-point conversion, you can:

- Propose fraction lengths based on default word lengths.
- Propose word lengths based on default fraction lengths.
- Optimize whole numbers.
- Specify safety margins for simulation min/max data.
- Validate that you can build your project with the proposed data types.
- Test numerics by running the test file with the fixed-point types applied.
- View a histogram of bits used by each variable.

For more information, see [Propose Fixed-Point Data Types Based on Simulation Ranges](#) and [Propose Fixed-Point Data Types Based on Derived Ranges](#).

### File I/O function support

The following file I/O functions are now supported for code generation:

- `fclose`
- `fopen`
- `fprintf`

To view implementation details, see [Functions Supported for Code Generation — Alphabetical List](#).

## Support for nonpersistent handle objects

You can now generate code for local variables that contain references to handle objects or System objects. In previous releases, generating code for these objects was limited to objects assigned to persistent variables.

## Structures passed by reference to entry-point functions

You can now specify to pass structures by reference to entry-point functions in the generated code. This optimization is available for standalone code generation only; it is not available for MEX functions. Passing structures by reference reduces the number of copies at entry-point function boundaries in your generated code. It does not affect how structures are passed to functions other than entry-point functions.

To pass structures by reference:

- In a project, on the Project Settings dialog box **All Settings** tab, under **Advanced**, set **Pass structures by reference to entry-point functions** to Yes.
- At the command line, create a code generation configuration object and set the `PassStructByReference` parameter to `true`. For example:

```
cfg = coder.config('lib');  
cfg.PassStructByReference=true;
```

## Include custom C header files from MATLAB code

The `coder.cinclude` function allows you to specify in your MATLAB code which custom C header files to include in the generated C code. Each header file that you specify using `coder.cinclude` is included in every C/C++ file generated from your MATLAB code. You can specify whether the `#include` statement uses double quotes for application header files or angle brackets for system header files in the generated code.

For example, the following code for function `foo` specifies to include the application header file `mystruct.h` in the generated code using double quotes.

```
function y = foo(x1, x2)
%#codegen
coder.cinclude('mystruct.h');

...
```

For more information, see `coder.cinclude`.

## Load from MAT-files

MATLAB Coder now supports a subset of the `load` function for loading run-time values from a MAT-file while running a MEX function. It also provides a new function, `coder.load`, for loading compile-time constants when generating MEX or standalone code. This support facilitates code generation from MATLAB code that uses `load` to load constants into a function. You no longer have to manually type in constants that were stored in a MAT-file.

To view implementation details for the `load` function, see [Functions Supported for Code Generation — Alphabetical List](#).

For more information, see `coder.load`.

## `coder.opaque` function enhancements

When you use `coder.opaque` to declare a variable in the generated C code, you can now also specify the header file that defines the type of the variable. Specifying the location of the header file helps to avoid compilation errors because the MATLAB Coder software can find the type definition more easily.

You can now compare `coder.opaque` variables of the same type. This capability helps you verify, for example, whether an `fopen` command succeeded.

```
null = coder.opaque('FILE*', 'NULL', 'HeaderFile', 'stdio.h');
ftmp = null;
ftmp = coder.ceval('fopen', fname, permission);
```



```
if ftmp == null
    % Error - file open failed
end
```

For more information, see `coder.opaque`.

## Automatic regeneration of MEX functions in projects

When you run a test file from a MATLAB Coder project to verify the behavior of the generated MEX function, the project now detects when to rebuild the MEX function. MATLAB Coder rebuilds the MEX function only if you have modified the original MATLAB algorithm since the previous build, saving you time during the verification phase.

## MEX function signatures include constant inputs

### Compatibility Considerations: Yes

When you generate a MEX function for a MATLAB function that takes constant inputs, by default, the MEX function signature now contains the constant inputs. If you are verifying your MEX function in a project, this behavior allows you to use the same test file to run the original MATLAB algorithm and the MEX function.

## Compatibility Considerations

In previous releases, MATLAB Coder removed the constants from the MEX function signature. To use these existing scripts with MEX functions generated using R2013a software, do one of the following:

- Update the scripts so that they no longer remove the constants.
- Configure MATLAB Coder to remove the constant values from the MEX function signature.

To configure MATLAB Coder to remove the constant values:

- In a project, on the Project Settings dialog box **All Settings** tab, under **Advanced**, set **Constant Inputs** to Remove from MEX signature.
- At the command line, create a code generation configuration object, and, set the ConstantInputs parameter to 'Remove'. For example:

```
cfg = coder.config;  
cfg.ConstantInputs='Remove';
```

## Custom toolchain registration

### Compatibility Considerations: Yes

MATLAB Coder software enables you to register third-party software build tools for creating executables and libraries.

- The software automatically detects supported tool chains on your system.
- You can manage and customize multiple tool chain definitions.
- Before generating code, you can select any one of the definitions using a drop-down list.
- The software generates simplified makefiles for improved readability.

For more information:

- See Custom Toolchain Registration.
- See the Adding a Custom Toolchain example.

### Compatibility Considerations

If you open a MATLAB Coder project or use a code generation configuration object from R2012b, the current version of MATLAB Coder software automatically tries to use the toolchain approach. If an existing project or configuration object does not use default target makefile settings, MATLAB Coder might not be able to upgrade to use a toolchain approach and will emit a warning. For more information, see Project or Configuration is Using the Template Makefile.

## Complex trigonometric functions

Code generation support has been added for complex `acosD`, `acotD`, `acscD`, `asecD`, `asinD`, `atanD`, `cosD`, `cscD`, `cotD`, `secD`, `sinD`, and `tanD` functions.

## `parfor` function reduction improvements and C support

When generating MEX functions for `parfor`-loops, you can now use `intersect` and `union` as reduction functions, and the following reductions are now supported:

- Concatenations
- Arrays
- Function handles

By default, when MATLAB Coder generates a MEX function for MATLAB code that contains a `parfor`-loop, MATLAB Coder no longer requires C++ and now honors the target language setting.

## Support for integers in number theory functions

Code generation supports integer inputs for the following number theory functions:

- `cumprod`
- `cumsum`
- `factor`
- `factorial`
- `gcd`
- `isprime`
- `lcm`
- `median`

- mode
- nchoosek
- nextpow2
- primes
- prod

To view implementation details, see [Functions Supported for Code Generation — Alphabetical List](#).

## Enhanced support for class property initial values

**Compatibility Considerations: Yes**

If you initialize a class property, you can now assign a different type to the property when you use the class. For example, class `foo` has a property `prop1` of type `double`.

```
classdef foo %#codegen
    properties
        prop1= 0;
    end
    methods
        ...
    end
end
```

Function `bar` assigns a different type to `prop1`.

```
function bar %#codegen
    f=foo;
    f.prop1=single(0);
    ...
```

In R2013a, MATLAB Coder ignores the initial property definition and uses the reassigned type. In previous releases, MATLAB Coder did not support this reassignment and code generation failed.

## Compatibility Considerations

In previous releases, if the reassigned property had the same type as the initial value but a different size, the property became variable-size in the generated code. In R2013a, MATLAB Coder uses the size of the reassigned property, and the size is fixed. If you have existing MATLAB code that relies on the property being variable-size, you cannot generate code for this code in R2013a. To fix this issue, do not initialize the property in the property definition block.

For example, you can no longer generate code for the following function bar.

Class foo has a property prop1 which is a scalar double.

```
classdef foo %#codegen
    properties
        prop1= 0;
    end
    methods
        ...
    end
end
```

Function bar changes the size of prop1.

```
function bar %#codegen
    f=foo;
    f.prop1=[1 2 3];
    % Use f
    disp(f.prop1);
    f.prop1=[1 2 3 4 5 6 ];
```

## Optimized generated code for $x=[x \ c]$ when $x$ is a vector

MATLAB Coder now generates more optimized code for the expression  $x=[x \ c]$ , if:

- $x$  is a row or column vector.
- $x$  is not in  $c$ .

- `x` is not aliased.
- There are no function calls in `c`.

In previous releases, the generated code contained multiple copies of `x`. In R2013a, it does not contain multiple copies of `x`.

This enhancement reduces code size and execution time. It also improves code readability.

## **Default use of Basic Linear Algebra Subprograms (BLAS) libraries**

**Compatibility Considerations: Yes**

MATLAB Coder now uses BLAS libraries whenever they are available. There is no longer an option to turn off the use of these libraries.

### **Compatibility Considerations**

If existing configuration settings disable BLAS, MATLAB Coder now ignores these settings.

## **Changes to compiler support**

**Compatibility Considerations: Yes**

MATLAB Coder supports these new compilers.

- On Microsoft Windows platforms, Visual C++® 11.
- On Mac OS X platforms, Apple Xcode 4.2 with Clang.

MATLAB Coder no longer supports the gcc compiler on Mac OS X platforms.

MATLAB Coder no longer supports Watcom for standalone code generation. Watcom is still supported for building MEX functions.

## Compatibility Considerations

- Because Clang is the only compiler supported on Mac OS X platforms, and Clang does not support Open MP, `parfor` is no longer supported on Mac OS X platforms.
- MATLAB Coder no longer supports Watcom for standalone code generation. Use Watcom only for building MEX functions. Use an alternative compiler for standalone code generation. For a list of supported compilers, see [http://www.mathworks.com/support/compilers/current\\_release/](http://www.mathworks.com/support/compilers/current_release/).

## New toolbox functions supported for code generation

To view implementation details, see [Functions Supported for Code Generation — Alphabetical List](#).

### Bitwise Operation Functions

- `flintmax`

### Computer Vision System Toolbox Classes and Functions

- `binaryFeatures`
- `insertMarker`
- `insertShape`

### Data File and Management Functions

- `computer`
- `fclose`
- `fopen`
- `fprintf`
- `load`

## Image Processing Toolbox Functions

- `conndef`
- `imcomplement`
- `imfill`
- `imhmax`
- `imhmin`
- `imreconstruct`
- `imregionalmax`
- `imregionalmin`
- `iptcheckconn`
- `padarray`

## Interpolation and Computational Geometry

- `interp2`

## MATLAB Desktop Environment Functions

- `ismac`
- `ispc`
- `isunix`

## Functions being removed

### Compatibility Considerations: Yes

These functions have been removed from MATLAB Coder software.

Function Name	What Happens When You Use This Function?
<code>emlc</code>	Errors in R2013a.
<code>emlmex</code>	Errors in R2013a.



## **Compatibility Considerations**

`emlc` and `emlmex` have been removed. Use `codegen` instead. If you have existing code that calls `emlc` or `emlmex`, use `coder.upgrade` to help convert your code to the new syntax.

## Check bug reports for issues and fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at [www.mathworks.com/support/bugreports/](http://www.mathworks.com/support/bugreports/). Use the Saved Searches and Watched Bugs tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers.

The bug reports are an integral part of the documentation for each release. Examine periodically all bug reports for a release, as such reports may identify inconsistencies between the actual behavior of a release you are using and the behavior described in this documentation.

In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2013a Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2013a&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2013a&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2013a&product=ME](http://www.mathworks.com/support/bugreports/?release=R2013a&product=ME)

# R2012b

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**Version: 2.3**

**New Features: Yes**

**Bug Fixes: Yes**

## **parfor function support for MEX code generation, enabling execution on multiple cores**

You can use MATLAB Coder software to generate MEX functions from MATLAB code that contains `parfor`-loops. The generated MEX functions can run on multiple cores on a desktop. For more information, see `parfor` and Acceleration of MATLAB Algorithms Using Parallel for-loops (`parfor`).

## **Code generation readiness tool**

The code generation readiness tool screens MATLAB code for features and functions that are not supported for code generation. The tool provides a report that lists the source files that contain unsupported features and functions and an indication of how much work is needed to make the MATLAB code suitable for code generation.

For more information, see `coder.screener` and Code Generation Readiness Tool.

## **Reduced data copies and lightweight run-time checks for generated MEX functions**

MATLAB Coder now eliminates data copies for built-in, non-complex data types. It also performs faster bounds checks. These enhancements result in faster generated MEX functions.

## **Additional string function support for code generation**

The following string functions are now supported for code generation. To view implementation details, see [Functions Supported for Code Generation — Alphabetical List](#).

- `deblank`
- `hex2num`
- `isletter`

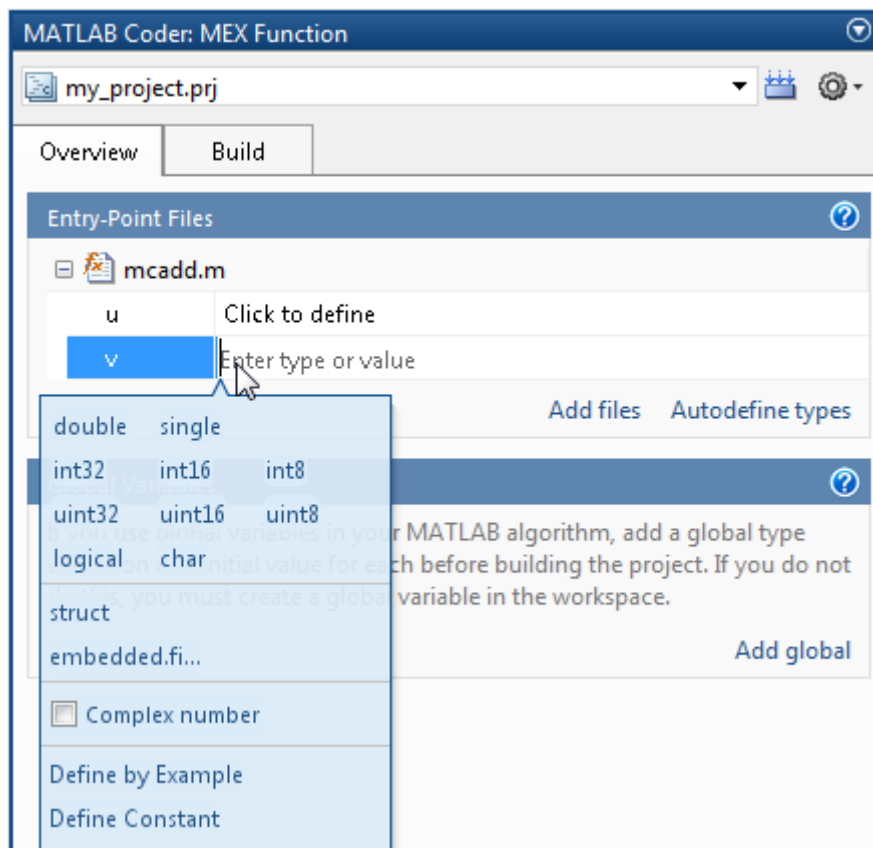
- `isspace`
- `isstrprop`
- `lower`
- `num2hex`
- `strcmpi`
- `strjust`
- `strncmp`
- `strncmpi`
- `strtok`
- `strtrim`
- `upper`

## **Visualization functions in generated MEX functions**

The MATLAB Coder software now detects calls to many common visualization functions, such as `plot`, `disp`, and `figure`. For MEX code generation, MATLAB Coder automatically calls out to MATLAB for these functions. For standalone code generation, MATLAB Coder does not generate code for these visualization functions. This capability reduces the amount of time that you spend making your code suitable for code generation. It also removes the requirement to declare these functions extrinsic using the `coder.extrinsic` function.

## **Input parameter type specification enhancements**

The updated project user interface facilitates input parameter type specification.



## Project import and export capability

You can now export project settings to a configuration object stored as a variable in the base workspace. You can then use the configuration object to import the settings into a different project or to generate code at the command line with the `codegen` function. This capability allows you to:

- Share settings between the project and command-line workflow
- Share settings between multiple projects
- Standardize on settings for code generation projects

For more information, see [Share Build Configuration Settings](#).

## Package generated code in zip file for relocation

The `packNGo` function packages generated code files into a compressed zip file so that you can relocate, unpack, and rebuild them in another development environment. This capability is useful if you want to relocate files so that you can recompile them for a specific target environment or rebuild them in a development environment in which MATLAB is not installed.

For more information, see [Package Code For Use in Another Development Environment](#).

## Fixed-point instrumentation and data type proposals

MATLAB Coder projects provide the following fixed-point conversion support:

- Option to generate instrumented MEX functions
- Use of instrumented MEX functions to provide simulation minimum and maximum results
- Fixed-point data type proposals based on simulation minimum and maximum values
- Option to propose fraction lengths or word lengths

You can use these proposed fixed-point data types to create a fixed-point version of your original MATLAB entry-point function.

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**Note** Requires a Fixed-Point Toolbox™ license.

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For more information, see [Fixed-Point Conversion](#).

## **New toolbox functions supported for code generation**

To view implementation details, see [Functions Supported for Code Generation — Alphabetical List](#).

### **Computer Vision System Toolbox**

- `integralImage`

### **Image Processing Toolbox**

- `bwlookup`
- `bwmorph`

### **Interpolation and Computational Geometry**

- `interp2`

### **Trigonometric Functions**

- `atan2d`

## **New System objects supported for code generation**

The following System objects are now supported for code generation. To see the list of System objects supported for code generation, see [System Objects Supported for Code Generation](#).

### **Communications System Toolbox**

- `comm.ACPR`
- `comm.BCHDecoder`
- `comm.CCDF`
- `comm.CPMCarrierPhaseSynchronizer`
- `comm.GoldSequence`



- `comm.LDPCDecoder`
- `comm.LDPCEncoder`
- `comm.LTEMIMOChannel`
- `comm.MemorylessNonlinearity`
- `comm.MIMOChannel`
- `comm.PhaseNoise`
- `comm.PSKCarrierPhaseSynchronizer`
- `comm.RSDecoder`

### **DSP System Toolbox**

- `dsp.AllpoleFilter`
- `dsp.CICDecimator`
- `dsp.CICInterpolator`
- `dsp.IIRFilter`
- `dsp.SignalSource`

## Check bug reports for issues and fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at [www.mathworks.com/support/bugreports/](http://www.mathworks.com/support/bugreports/). Use the Saved Searches and Watched Bugs tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers.

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In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2012b Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2012b&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2012b&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2012b&product=ME](http://www.mathworks.com/support/bugreports/?release=R2012b&product=ME)

# R2012a

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**Version: 2.2**

**New Features: Yes**

**Bug Fixes: No**

## Code Generation for MATLAB Classes

In R2012a, there is preliminary support for code generation for MATLAB classes targeted at supporting System objects defined by users. For more information about generating code for MATLAB classes, see [Code Generation for MATLAB Classes](#). For more information about generating code for System objects, see the [DSP System Toolbox](#), [Computer Vision System Toolbox](#) or the [Communications System Toolbox](#) documentation.

## Dynamic Memory Allocation Based on Size

**Compatibility Considerations: Yes**

By default, dynamic memory allocation is now enabled for variable-size arrays whose size exceeds a configurable threshold. This behavior allows for finer control over stack memory usage. Also, you can generate code automatically for more MATLAB algorithms without modifying the original MATLAB code.

### Compatibility Considerations

If you use scripts to generate code and you do not want to use dynamic memory allocation, you must disable it. For more information, see [Controlling Dynamic Memory Allocation](#).

## C/C++ Dynamic Library Generation

You can now use MATLAB Coder to build a dynamically linked library (DLL) from the generated C code. These libraries are useful for integrating into existing software solutions that expect dynamically linked libraries.

For more information, see [Generating C/C++ Dynamically Linked Libraries from MATLAB Code](#).

## Automatic Definition of Input Parameter Types

MATLAB Coder software can now automatically define input parameter types by inferring these types from test files that you supply. This capability

facilitates input type definition and reduces the risk of introducing errors when defining types manually.

To learn more about automatically defining types:

- In MATLAB Coder projects, see [Autodefining Input Types](#).
- At the command line, see the `coder.getArgTypes` function reference page <http://www.mathworks.com/help/releases/R2012a/toolbox/coder/ref/coder.getargtyp>

## Verification of MEX Functions

MATLAB Coder now provides support for test files to verify the operation of generated MEX functions. This capability enables you to verify that the MEX function is functionally equivalent to your original MATLAB code and to check for run-time errors.

To learn more about verifying MEX function behavior:

- In MATLAB Coder projects, see [How to Verify MEX Functions in a Project](#).
- At the command line, see the `coder.runTest` function reference page <http://www.mathworks.com/help/releases/R2012a/toolbox/coder/ref/coder.runtest.h>

## Enhanced Project Settings Dialog Box

The **Project Settings** dialog box now groups configuration parameters so that you can easily identify the parameters associated with code generation objectives such as speed, memory, and code appearance. The dialog boxes for code generation configuration objects, `coder.MexCodeConfig`, `coder.CodeConfig`, and `coder.EmbeddedCodeConfig`, also use the same new groupings.

To view the updated **Project Settings** dialog box:

- 1 In a project, click the **Build** tab.
- 2 On the **Build** tab, click the More settings link to open the **Project Settings** dialog box.

For information about the parameters on each tab, click the **Help** button.

To view the updated dialog boxes for the code generation configuration objects:

- 1 At the MATLAB command line, create a configuration object. For example, create a configuration object for MEX code generation.

```
mex_cfg = coder.config;
```

- 2 Open the dialog box for this object.

```
open mex_cfg
```

For information about the parameters on each tab, click the **Help** button.

## Projects Infer Input Types from assert Statements in Source Code

MATLAB Coder projects can now infer input data types from `assert` statements that define the properties of function inputs in your MATLAB entry-point files. For more information, see *Defining Inputs Programmatically in the MATLAB File*.

## Code Generation from MATLAB

For details about new toolbox functions and System objects supported for code generation, see the *Code Generation from MATLAB Release Notes*.

## New Demo

The following demo has been added:

Demo...	Shows How You Can...
<code>coderdemo_reverb</code>	Generate a MEX function for an algorithm that uses MATLAB classes.

## Check bug reports for issues and fixes

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In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2012a Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2012a&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2012a&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2012a&product=ME](http://www.mathworks.com/support/bugreports/?release=R2012a&product=ME)





# R2011b

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**Version: 2.1**

**New Features: Yes**

**Bug Fixes: No**

## **Support for Deletion of Rows and Columns from Matrices**

You can now generate C/C++ code from MATLAB code that deletes rows or columns from matrices. For example, the following code deletes the second column of matrix  $X$ :

```
X(:,2) = [];
```

For more information, see [Diminishing the Size of a Matrix](#) in the MATLAB documentation.

## **Code Generation from MATLAB**

For details of new toolbox functions and System objects supported for code generation, see [Code Generation from MATLAB Release Notes](#).

## Check bug reports for issues and fixes

Software is inherently complex and is not free of errors. The output of a code generator might contain bugs, some of which are not detected by a compiler. MathWorks reports critical known bugs brought to its attention on its Bug Report system at [www.mathworks.com/support/bugreports/](http://www.mathworks.com/support/bugreports/). Use the Saved Searches and Watched Bugs tool with the search phrase “Incorrect Code Generation” to obtain a report of known bugs that produce code that might compile and execute, but still produce wrong answers.

The bug reports are an integral part of the documentation for each release. Examine periodically all bug reports for a release, as such reports may identify inconsistencies between the actual behavior of a release you are using and the behavior described in this documentation.

In addition to reviewing bug reports, you should implement a verification and validation strategy to identify potential bugs in your design, code, and tools.

### Search R2011b Bug Reports

Known Bugs for Incorrect Code Generation:

[www.mathworks.com/support/bugreports/?product=ALL&release=R2011b&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2011b&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2011b&product=ME](http://www.mathworks.com/support/bugreports/?release=R2011b&product=ME)



# R2011a

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**Version: 2.0**

**New Features: Yes**

**Bug Fixes: No**

## New User Interface for Managing Projects

The new MATLAB Coder user interface simplifies the MATLAB to C/C++ code generation process. Using this user interface, you can:

- Specify the MATLAB files from which you want to generate code
- Specify the data types for the inputs to these MATLAB files
- Select an output type:
  - MEX function
  - C/C++ Static Library
  - C/C++ Executable
- Configure build settings to customize your environment for code generation
- Open the code generation report to view build status, generated code, and compile-time information for the variables and expressions in your MATLAB code

### To Get Started

You launch a MATLAB Coder project by doing one of the following:

- From the MATLAB main menu, select **File > New > Code Generation Project**
- Enter `coder` at the MATLAB command line

To learn more about working with MATLAB Coder, see [Generating C Code from MATLAB Code Using the MATLAB Coder Project Interface](#).

### Migrating from Real-Time Workshop `emlc` Function Compatibility Considerations: Yes

In MATLAB Coder, the `codegen` function replaces `emlc` with the following differences:

## New codegen Options

Old emlc Option	New codegen Option
-eg	-args
emlcoder.egc	coder.Constant
emlcoder.egs	<p>coder.typeof(a,b,1) specifies a variable-size input with the same class and complexity as a and same size and upper bounds as the size vector b.</p> <p>Creates coder.Type objects for use with the codegen -args option. For more information, see coder.typeof.</p>
-F	Nocodegen option available. Instead, use the default fimath. For more information, see the Fixed-Point Toolbox documentation.
-global	<p>-globals</p> <hr/> <p><b>Note</b> -global continues to work with codegen</p>
-N	This option is no longer supported. Instead, set up numericType in MATLAB.
-s	<p>-config</p> <p>Use with the new configuration objects, see “New Code Generation Configuration Objects” on page 66.</p>
-T rtw:exe	<p>-config:exe</p> <p>Use this option to generate a C/C++ executable using default build options. Otherwise, use -config with a coder.CodeConfig or coder.EmbeddedCodeConfig configuration object.</p>

Old emlc Option	New codegen Option
-T mex	-config:mex  Use this option to generate a MEX function using default build options. Otherwise, use -config with a coder.MexCodeConfig configuration object.
-T rtw -T rtw:lib	-config:lib  Use either of these options to generate a C/C++ library using default build options. Otherwise, use -config with a coder.CodeConfig or coder.EmbeddedCodeConfig configuration object.

### New Code Generation Configuration Objects

The codegen function uses new configuration objects that replace the old emlc objects with the following differences:

Old emlc Configuration Object	New codegen Configuration Object
emlcoder.MEXConfig	coder.MexCodeConfig
emlcoder.RTWConfig emlcoder.RTWConfig('grt')	coder.CodeConfig  The SupportNonFinite property is now available without an Embedded Coder license.  The following property names have changed: <ul style="list-style-type: none"> <li>• RTWCompilerOptimization is now CCompilerOptimization</li> <li>• RTWCustomCompilerOptimization is now CCustomCompilerOptimization</li> <li>• RTWVerbose is now Verbose</li> </ul>



Old emlc Configuration Object	New codegen Configuration Object
emlcoder.RTWConfig('ert')	coder.EmbeddedCodeConfig The following property names have changed: <ul style="list-style-type: none"> <li>• MultiInstanceERTCode is now MultiInstanceCode</li> <li>• RTWCompilerOptimization is now CCompilerOptimization</li> <li>• RTWCustomCompilerOptimization is now CCustomCompilerOptimization</li> <li>• RTWVerbose is now Verbose</li> </ul>
emlcoder.HardwareImplementation	coder.HardwareImplementation

### The codegen Function Has No Default Primary Function Input Type

In previous releases, if you used the emlc function to generate code for a MATLAB function with input parameters, and you did not specify the types of these inputs, by default, emlc assumed that these inputs were real, scalar, doubles. In R2011a, the codegen function does not assume a default type. You must specify at least the class of each primary function input. For more information, see [Specifying Properties of Primary Function Inputs in a Project](#).

### Compatibility Considerations

If your existing script calls emlc to generate code for a MATLAB function that has inputs and does not specify the input types, and you migrate this script to use codegen, you must modify the script to specify inputs.

### The codegen Function Processes Compilation Options in a Different Order

In previous releases, the emlc function resolved compilation options from left to right so that the right-most option prevailed. In R2011a, the codegen function gives precedence to individual command-line options over options

specified using a configuration object. If command-line options conflict, the right-most option prevails.

## Compatibility Considerations

If your existing script calls `emlc` specifying a configuration object as well as other command-line options, and you migrate this script to use `codegen`, `codegen` might not use the same configuration parameter values as `emlc`.

## New `coder.Type` Classes

MATLAB Codegen includes the following new classes to specify input parameter definitions:

- `coder.ArrayType`
- `coder.Constant`
- `coder.EnumType`
- `coder.FiType`
- `coder.PrimitiveType`
- `coder.StructType`
- `coder.Type`

## New `coder` Package Functions

The following new package functions let you work with objects and types for C/C++ code generation:

Function	Purpose
<code>coder.config</code>	Create MATLAB Codegen code generation configuration objects
<code>coder.newtype</code>	Create a new <code>coder.Type</code> object

Function	Purpose
<code>coder.resize</code>	Resize a <code>coder.Type</code> object
<code>coder.typeof</code>	Convert a MATLAB value into its canonical type

## Script to Upgrade MATLAB Code to Use MATLAB Coder Syntax

The `coder.upgrade` script helps you upgrade to MATLAB Coder by searching your MATLAB code for old commands and options and replacing them with their new equivalents. For more information, at the MATLAB command prompt, enter `help coder.upgrade`.

## Embedded MATLAB Now Called Code Generation from MATLAB

MathWorks is no longer using the term *Embedded MATLAB* to refer to the language subset that supports code generation from MATLAB algorithms. This nomenclature incorrectly implies that the generated code is used in embedded systems only. The new term is *code generation from MATLAB*. This terminology better reflects the full extent of the capability for translating MATLAB algorithms into readable, efficient, and compact MEX and C/C++ code for deployment to both desktop and embedded systems.

## MATLAB Coder Uses `rtwTargetInfo.m` to Register Target Function Libraries

In previous releases, the `emlc` function also recognized the customization file, `s1_customization.m`. In R2011a, the MATLAB Coder software does not recognize this customization file, you must use `rtwTargetInfo.m` to register a Target Function Library (TFL). To register a TFL, you must have Embedded Coder software. For more information, see [Use the `rtwTargetInfo` API to Register a CRL with MATLAB Coder Software in the Embedded Coder documentation](#).

## New Getting Started Tutorial Video

To learn how to generate C code from MATLAB code, see the “Generating C Code from MATLAB Code” video in the MATLAB Coder Getting Started demos.

## New Demos

The following demos have been added:

Demo...	Shows How You Can...
Hello World	Generate and run a MEX function from a simple MATLAB program
Working with Persistent Variables	Compute the average for a set of values by using persistent variables
Working with Structure Arrays	Shows how to build a scalar template before growing it into a structure array, a requirement for code generation from MATLAB.
Balls Simulation	Simulates bouncing balls and shows that you should specify only the entry function when you compile the application into a MEX function.
General Relativity with MATLAB Coder	Uses Einstein’s theory of general relativity to calculate geodesics in curved space-time.
Averaging Filter	Generate a standalone C library from MATLAB code using <code>codegen</code>
Edge Detection on Images	Generate a standalone C library from MATLAB code that implements a Sobel filter
Read Text File	Generate a standalone C library from MATLAB code that uses the <code>coder.ceval</code> , <code>coder.extrinsic</code> and <code>coder.opaque</code> functions.

Demo...	Shows How You Can...
“Atoms” Simulation	Generate a standalone C library and executable from MATLAB code using a code generation configuration object to enable dynamic memory allocation
Replacing Math Functions and Operators	Use target function libraries (TFLs) to replace operators and functions in the generated code
	<hr/> <p><b>Note</b> To run this demo, you need Embedded Coder software.</p> <hr/>
Kalman Filter	<ul style="list-style-type: none"> <li>• Generate a standalone C library from a MATLAB version of a Kalman filter</li> <li>• Accelerate the Kalman filter algorithm by generating a MEX function</li> </ul>

## Functionality Being Removed in a Future Version

Compatibility Considerations: Yes

This function will be removed in a future version of MATLAB Coder software.

Function Name	What Happens When You Use This Function?	Compatibility Considerations
emlc	Still runs in R2011a	None

## Function Elements Being Removed in a Future Release

**Compatibility Considerations: Yes**

<b>Function or Element Name</b>	<b>What Happens When You Use the Function or Element?</b>	<b>Use This Element Instead</b>
<code> %#eml</code>	Still runs	<code> %#codegen</code>
<code> eml.allowpcode</code>	Still runs	<code> coder.allowpcode</code>
<code> eml.ceval</code>	Still runs	<code> coder.ceval</code>
<code> eml.cstructname</code>	Still runs	<code> coder.cstructname</code>
<code> eml.extrinsic</code>	Still runs	<code> coder.extrinsic</code>
<code> eml.inline</code>	Still runs	<code> coder.inline</code>
<code> eml.nullcopy</code>	Still runs	<code> coder.nullcopy</code>
<code> eml.opaque</code>	Still runs	<code> coder.opaque</code>
<code> eml.ref</code>	Still runs	<code> coder.ref</code>
<code> eml.rref</code>	Still runs	<code> coder.rref</code>
<code> eml.target</code>	Still runs	<code> coder.target</code>
<code> eml.unroll</code>	Still runs	<code> coder.unroll</code>
<code> eml.varsizes</code>	Still runs	<code> coder.varsizes</code>
<code> eml.wref</code>	Still runs	<code> coder.wref</code>

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[www.mathworks.com/support/bugreports/?product=ALL&release=R2011a&keyword=Incorrect+Code+Generation](http://www.mathworks.com/support/bugreports/?product=ALL&release=R2011a&keyword=Incorrect+Code+Generation)

All Known Bugs for This Product:

[www.mathworks.com/support/bugreports/?release=R2011a&product=ME](http://www.mathworks.com/support/bugreports/?release=R2011a&product=ME)