MATLAB® Compiler SDK™

MATLAB® Production Server™ Testing Guide

MATLAB®

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MATLAB Production Server Integration Testing

Write a Test Client

Integration testing with the MATLAB embedded server instance requires a client that calls the compiled MATLAB functions. The client can be coded using any of the MATLAB Production Server client APIs.

At a minimum, the client must:

1 Instantiate the client runtime.
2 Connect to the embedded server instance using the port specified in the Production Server Compiler app.
3 Call the functions being tested with appropriate data.

For information on writing client code, see:

- "Create a Java Client" on page 4-2
- "Create a C# Client" on page 4-6
- "Create a Python Client" on page 4-10
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Test Client Data Integration Against MATLAB

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This example shows you how to test your RESTful API or Java® client for deployment against MATLAB Production Server using the testing interface in the **Production Server Compiler** app. For testing purposes, you will create and use MATLAB function called addmatrix that accepts two numeric matrices as inputs and returns their sum as an output.

The testing interface can be accessed by clicking the **Test Client** button in the **Production Server Compiler** app. The **Production Server Compiler** app is part of MATLAB Compiler SDK.

Create a MATLAB Function

1 Write a MATLAB function called addmatrix that accepts two numeric matrices as inputs and returns their sum as an output. Save this file as addmatrix.m.

   addmatrix.m

   ```
   function a = addmatrix(a1, a2)
   a = a1 + a2;
   ```
2 Test the function at the MATLAB command prompt.

   ```
   a = [10 20 30; 40 50 60];
   b = [100 200 300; 400 500 600];
   c = addmatrix(a,b)

   c =

      110    220    330
      440    550    660
   ```

Prepare for Testing

1 Open the **Production Server Compiler** app by typing the following at the MATLAB command prompt:

```
productionServerCompiler
```
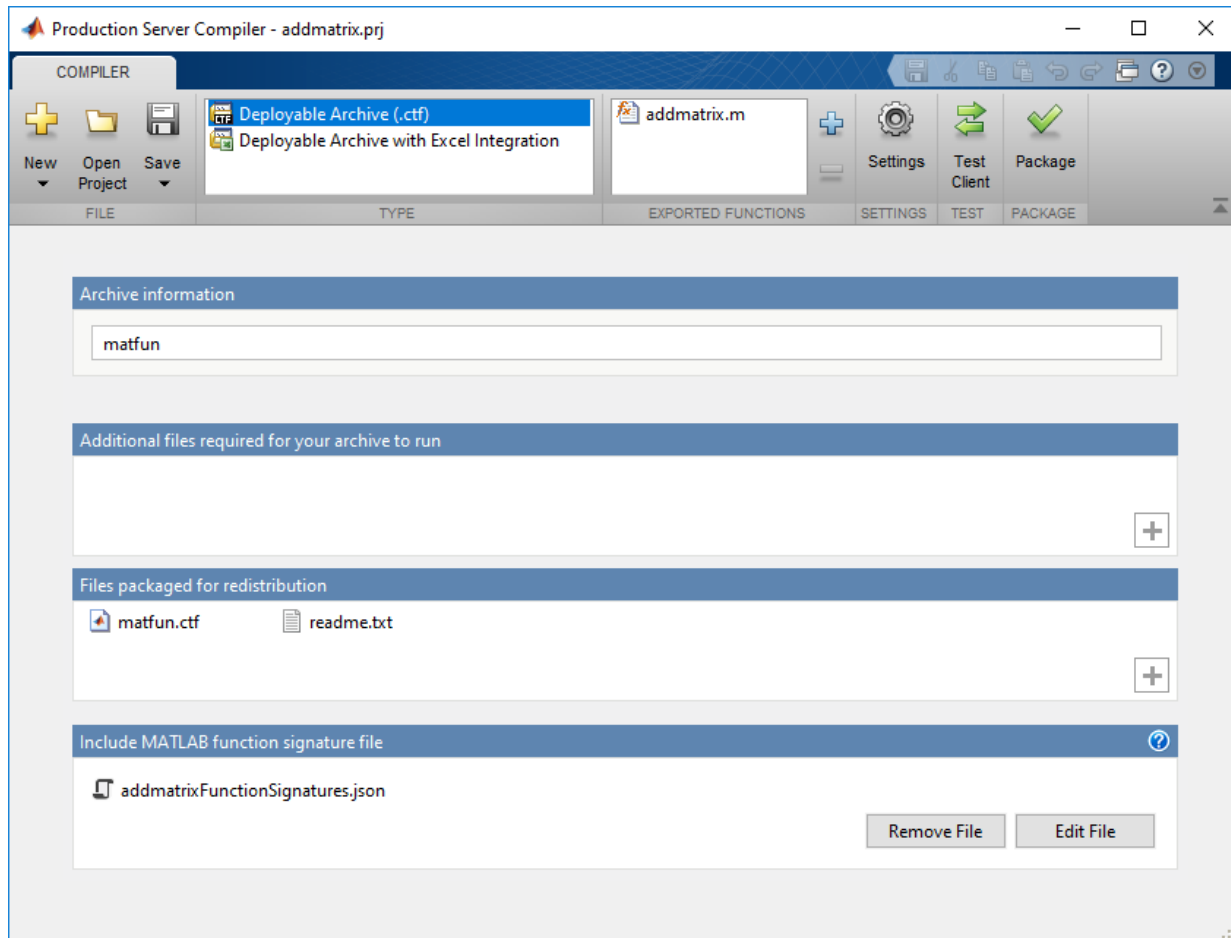

2 In the **Type** section of the toolstrip, select **Deployable Archive (.ctf)** from the list.
3 Specify the MATLAB functions to deploy.

    a In the **Exported Functions** section of the toolstrip, click the plus button.

    b   Using the file explorer, locate and select the `addmatrix.m` file.

4   In the section titled **Include MATLAB function signature file**, click the **Create File** button. This will create an editable JSON file that contains the function signatures of the functions included in the archive. By editing this file you can specify argument types and/or sizes of inputs and outputs, and also provide help information for each of the inputs. For more information, see "MATLAB Function Signatures in JSON" (MATLAB Production Server).

If you have an existing JSON file with function signatures, click the **Add Existing File** button to add that file instead of the **Create File** button.

By including this information in your archive, you can use the discovery service functionality on the server.

Note Only the MATLAB Production Server RESTful API supports the discovery service. For more information, see "RESTful API" (MATLAB Production Server).

5   Click the **Test Client** button. The app will switch to the **TEST** tab.
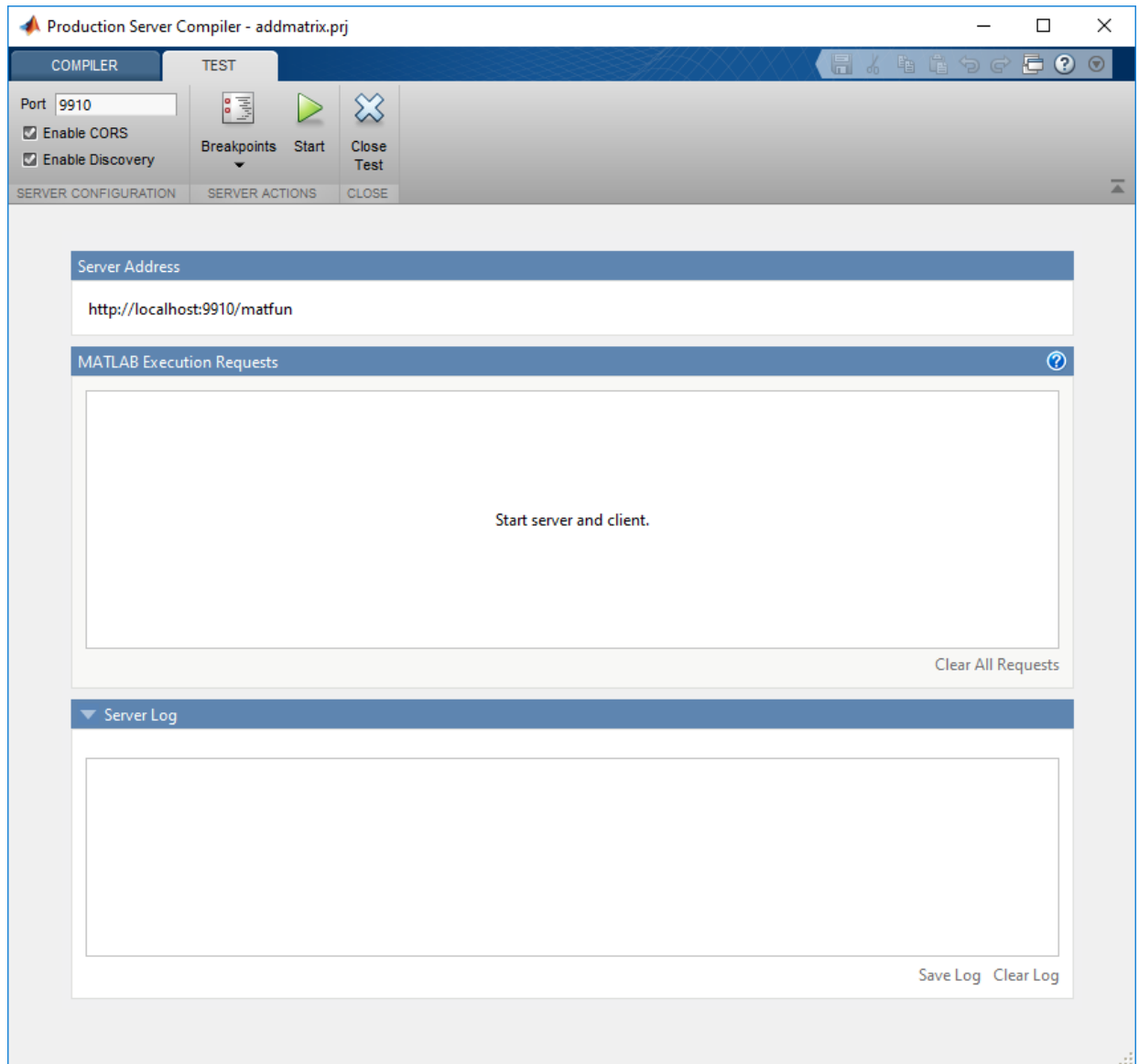
   a Check the value of the **Port** field.

     It must be:

- an available port
- the same port number the client is using

For this example, the client will use port 9910.

b Check the box to **Enable CORS**. This option needs to be enabled if you are using a client that uses JavaScript®. By enabling CORS the server will accept requests from different domains.

c Check the box to **Enable Discovery**. This option needs to be enabled to use the discovery service. The discovery service returns information about deployed MATLAB functions as a JSON object.

6 Click **Start**.

Test Using RESTful API

This example uses the MATLAB "HTTP Interface" (MATLAB) to invoke the RESTful API and make requests to the testing interface. You can use other tools such cURL or JavaScript XHR.

Test Discovery Service

1 Import the MATLAB HTTP Interface packages, setup the request, and send the request to the testing interface.

```
% Import MATLAB HTTP Interface packages
import matlab.net.*
import matlab.net.http.*
import matlab.net.http.fields.*

% Setup request
requestUri = URI('http://localhost:9910/api/discovery');
options = matlab.net.http.HTTPOptions('ConnectTimeout',20,...
    'ConvertResponse',false);
request = RequestMessage;
request.Header = HeaderField('Content-Type','application/json');
request.Method = 'GET';

% Send request
response = request.send(requestUri, options);
```

2 View the response body.

```
response.Body.Data
```

```
ans =

    "{"discoverySchemaVersion":"1.0.0","archives":{"matfun":{"archiveSchemaVersion"
```

The response body has been snipped to fit the page. A formatted version of the response body can be found by expanding `ans`.

ans

```
{
  "discoverySchemaVersion": "1.0.0",
  "archives": {
    "matfun": {
      "archiveSchemaVersion": "1.1.0",
      "archiveUuid": "",
      "functions": {
        "addmatrix": {
          "signatures": [
            {
              "help": "",
              "inputs": [
                {
                  "help": "input matrix 1",
                  "mwsize": [],
                  "mwtype": "double",
                  "name": "a1"
                },
                {
                  "help": "input matrix 2",
                  "mwsize": [],
                  "mwtype": "double",
                  "name": "a2"
                }
              ],
              "outputs": [
                {
                  "help": "output matrix",
                  "mwsize": [],
                  "mwtype": "double",
                  "name": "a"
                }
              ]
            }
          ]
        }
```

```
        },
        "matlabRuntimeVersion": "9.6.0"
      }
    }
}
```

To test using JavaScript XHR you can use the following code:

JavaScript XHR Code for Testing Discovery Service

```javascript
var data = null;
var xhr = new XMLHttpRequest();
xhr.addEventListener("readystatechange", function () {
  if (this.readyState === 4) {
    console.log(this.responseText);
  }
});
xhr.open("GET", "http://localhost:9910/api/discovery");
xhr.send(data);
```

Testing Data Exchange

1   Start a separate session of the MATLAB desktop. This is because you cannot send a
    POST request from the same MATLAB session that is running the testing interface.
2   Import the MATLAB HTTP Interface packages, setup the request, and send the
    request to the testing interface.

```matlab
% Import HTTP interface packages
import matlab.net.*
import matlab.net.http.*
import matlab.net.http.fields.*

% Setup message body
body = MessageBody;
a = [10 20 30; 40 50 60];
b = [100 200 300;400 500 600];
payload = mps.json.encoderequest({a,b});
body.Payload = payload;

% Setup request
requestUri = URI('http://localhost:9910/matfun/addmatrix');
options = matlab.net.http.HTTPOptions('ConnectTimeout',20,...
    'ConvertResponse',false);
request = RequestMessage;
request.Header = HeaderField('Content-Type','application/json');
```

```
request.Method = 'POST';
request.Body = body;

% Send request
response = request.send(requestUri, options)
```

3 View the response body.

```
response.Body.Data

ans =

    "{"lhs":[[[110,220,330],[440,550,660]]]}"
```

To test using JavaScript XHR you can use the following code:

JavaScript XHR Code for Testing Data Exchange

```
var data = JSON.stringify({
  "rhs": [[[10,20,30],[40,50,60]],[[100,200,300],[400,500,600]]],
  "nargout": 1,
  "outputFormat": {
    "mode": "small",
    "nanType": "string"
  }
});
var xhr = new XMLHttpRequest();
xhr.addEventListener("readystatechange", function () {
  if (this.readyState === 4) {
    console.log(this.responseText);
  }
});
xhr.open("POST", "http://localhost:9910/matfun/addmatrix");
xhr.setRequestHeader("Content-Type", "application/json");
xhr.send(data);
```

Examine Data

1 Switch to the **Production Server Compiler** app.

MATLAB Execution Requests

ID	Function	Status
0	[a]=**addmatrix**(a1,a2)	✓ Complete

Input

Name	Size	Bytes	Class
a1	2x3	48	double array
a2	2x3	48	double array

Output

Name	Size	Bytes	Class
a	2x3	48	double array

Clear All Requests

2   In the testing interface, under **MATLAB Execution Requests**, click the completed message in the app to see the values exchanged between the client and MATLAB.

3   Click **Input** to view the arrays passed into MATLAB.

4   Click **Output** to view the array returned to the client.

Set Breakpoints

1   In the testing interface of the **Production Server Compiler**, click **Breakpoints > Break on MATLAB function entry**.

2   In the separate MATLAB session, resend a POST request to the server.

3   When the MATLAB editor opens, note that a breakpoint is set at the first line in the function and that processing has paused at the breakpoint.
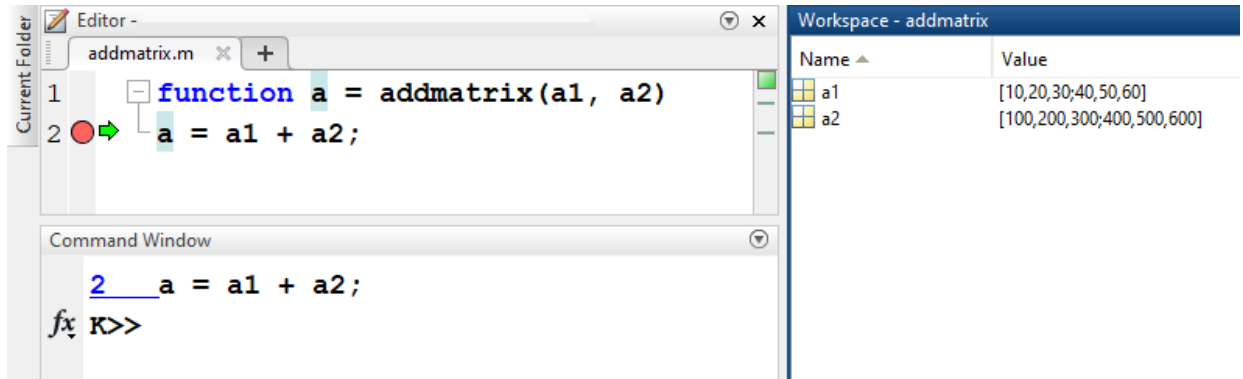
You now can use all of the MATLAB debugging tools to step through your function.

Note You can create a timeout error in the client if you take a long time stepping through the MATLAB function.

---

4 Note that variables `a1` and `a2` are displayed in the MATLAB workspace.

5 In the MATLAB editor, click **Continue** to complete the debug process.

The **Server Requests** section of the app shows that the request completed successfully.

6 Click **Stop** to shutdown the test server.

7 Click **Close Test**.

Testing Using Java Client Application

1 Create a Java file `MPSClientExample.java` with following client code:

MPSClientExample.java

```
import java.net.URL;
import java.io.IOException;
import com.mathworks.mps.client.MWClient;
import com.mathworks.mps.client.MWHttpClient;
import com.mathworks.mps.client.MATLABException;

interface MATLABAddMatrix
  {
    double[][] addmatrix(double[][] a1, double[][] a2)
        throws MATLABException, IOException;
  }

public class MPSClientExample {
```

```java
public static void main(String[] args){

    double[][] a1={{1,2,3},{3,2,1}};
    double[][] a2={{4,5,6},{6,5,4}};

    MWClient client = new MWHttpClient();

    try{
        MATLABAddMatrix m = client.createProxy(new URL("http://localhost:9910/addmatrix"),
                                               MATLABAddMatrix.class);
        double[][] result = m.addmatrix(a1,a2);

        // Print the magic square

        printResult(result);

    }catch(MATLABException ex){

        // This exception represents errors in MATLAB
        System.out.println(ex);
    }catch(IOException ex){

        // This exception represents network issues.
        System.out.println(ex);
    }finally{

        client.close();
    }
}

private static void printResult(double[][] result){
    for(double[] row : result){
        for(double element : row){
            System.out.print(element + " ");
        }
        System.out.println();
    }
}
}
```

2 At the system command prompt, compile the Java client code using the `javac` command.

```
javac -classpath "matlabroot\toolbox\compiler_sdk\mps_clients\java\mps_client.jar" MPSClientExample.java
```

3 At the system command prompt, run the Java client.

```
java -classpath .;"matlabroot\toolbox\compiler_sdk\mps_clients\java\mps_client.jar" MPSClientExample
```

Note You cannot run the Java client from the MATLAB command prompt.

The application returns the following at the console:

```
110.0   220.0   330.0
440.0   550.0   660.0
```

You can debug the data exchanged between the client and MATLAB using the same steps listed under "Test Using RESTful API" on page 1-7.

See Also

Related Examples

- "Write a Test Client" on page 1-2
- "Package Deployable Archives with Production Server Compiler App"

Functions — Alphabetical List

productionServerCompiler

Test, build and package functions for use with MATLAB Production Server

Syntax

```
productionServerCompiler
productionServerCompiler project_name
productionServerCompiler -build project_name
productionServerCompiler -package project_name
```

Description

`productionServerCompiler` opens the Production Server Compiler app for the creation of a new compiler project.

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

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

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

Examples

Create a New Production Server Project

Open the Production Server Compiler app to create a new project.

```
productionServerCompiler
```

Package a Deployable Archive using an Existing Project

Open the appropriate compiler app to package an existing project file.

productionServerCompiler `-package my_magic`

Input Arguments

project_name — name of the project to be compiled
character array or string

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

Introduced in R2014a

Apps — Alphabetical List

Production Server Compiler

Package MATLAB programs for deployment to MATLAB Production Server

Description
The **Production Server Compiler** app tests the integration of client code with MATLAB functions. It also packages MATLAB functions into archives for deployment to MATLAB Production Server.

Open the Production Server Compiler App

- MATLAB Toolstrip: On the **Apps** tab, under **Application Deployment**, click the app icon.
- MATLAB command prompt: Enter `productionServerCompiler`.

Examples

- "Create a Deployable Archive for MATLAB Production Server" (MATLAB Production Server)
- "Create and Install a Deployable Archive with Excel Integration For MATLAB Production Server" (MATLAB Production Server)

Parameters

`type` — type of archive generated
Deployable Archive | Deployable Archive with Excel Integration

Type of archive to generate as a character array.

`exported functions` — functions to package
list of character arrays

Functions to package as a list of character arrays.

`archive information` — name of the archive
character array

Name of the archive as a character array.

`files required for your archive to run` — files that must be included with archive
list of files

Files that must be included with archive as a list of files.

`files packaged with the archive` — optional files installed with archive
list of files

Optional files installed with archive as a list of files.

Settings

`Additional parameters passed to MCC` — flags controlling the behavior of the compiler
character array

Flags controlling the behavior of the compiler as a character array.

`testing files` — folder where files for testing are stored
character array

Folder where files for testing are stored as a character array.

`end user files` — folder where files for building a custom installer are stored
character array

Folder where files for building a custom installer are stored are stored as a character array.

`packaged installers` — folder where generated installers are stored
character array

Folder where generated installers are stored as a character array.

Programmatic Use

```
productionServerCompiler
```

See Also

Topics

"Create a Deployable Archive for MATLAB Production Server" (MATLAB Production Server)
"Create and Install a Deployable Archive with Excel Integration For MATLAB Production Server" (MATLAB Production Server)

Introduced in R2013b

Client Programming

Create a Java Client

This example shows how to write a MATLAB Production Server client using the Java client API. In your Java code, you will:

- Define a Java interface that represents the MATLAB function.
- Instantiate a proxy object to communicate with the server.
- Call the deployed function in your Java code.

To create a Java MATLAB Production Server client application:

1   Create a new file called `MPSClientExample.java`.
2   Using a text editor, open `MPSClientExample.java`.
3   Add the following import statements to the file:

```
import java.net.URL;
import java.io.IOException;
import com.mathworks.mps.client.MWClient;
import com.mathworks.mps.client.MWHttpClient;
import com.mathworks.mps.client.MATLABException;
```

4   Add a Java interface that represents the deployed MATLAB function.

The interface for the `addmatrix` function

```
function a = addmatrix(a1, a2)

a = a1 + a2;
```

looks like this:

```
interface MATLABAddMatrix {
      double[][] addmatrix(double[][] a1, double[][] a2)
        throws MATLABException, IOException;
  }
```

When creating the interface, note the following:

- You can give the interface any valid Java name.
- You must give the method defined by this interface the same name as the deployed MATLAB function.
- The Java method must support the same inputs and outputs supported by the MATLAB function, in both type and number. For more information about data type

conversions and how to handle more complex MATLAB function signatures, see "Java Client Programming" (MATLAB Production Server).

- The Java method must handle MATLAB exceptions and I/O exceptions.

5 Add the following class definition:

```
public class MPSClientExample
{
}
```

This class now has a single main method that calls the generated class.

6 Add the `main()` method to the application.

```
public static void main(String[] args)
{
}
```

7 Add the following code to the top of the `main()` method:

```
double[][] a1={{1,2,3},{3,2,1}};
double[][] a2={{4,5,6},{6,5,4}};
```

These statements initialize the variables used by the application.

8 Instantiate a client object using the `MWHttpClient` constructor.

```
MWClient client = new MWHttpClient();
```

This class establishes an HTTP connection between the application and the server instance.

9 Call the client object's `createProxy` method to create a dynamic proxy.

You must specify the URL of the deployable archive and the name of your interface `class` as arguments:

```
MATLABAddMatrix m = client.createProxy(new URL("http://localhost:9910/addmatrix"),
                                       MATLABAddMatrix.class);
```

The URL value (`"http://localhost:9910/addmatrix"`) used to create the proxy contains three parts:

- the server address (`localhost`).
- the port number (`9910`).
- the archive name (`addmatrix`)

For more information about the `createProxy` method, see the Javadoc included in the *matlabroot*/toolbox/compiler_sdk/mps_client folder.

10 Call the deployed MATLAB function in your Java application by calling the public method of the interface.

```
double[][] result = m.addmatrix(a1,a2);
```

11 Call the client object's `close()` method to free system resources.

```
client.close();
```

12 Save the Java file.

The completed Java file should resemble the following:

```
import java.net.URL;
import java.io.IOException;
import com.mathworks.mps.client.MWClient;
import com.mathworks.mps.client.MWHttpClient;
import com.mathworks.mps.client.MATLABException;

interface MATLABAddMatrix
  {
    double[][] addmatrix(double[][] a1, double[][] a2)
        throws MATLABException, IOException;
  }

public class MPSClientExample {

    public static void main(String[] args){

        double[][] a1={{1,2,3},{3,2,1}};
        double[][] a2={{4,5,6},{6,5,4}};

        MWClient client = new MWHttpClient();

        try{
            MATLABAddMatrix m = client.createProxy(new URL("http://localhost:9910/addmatrix"),
                                                   MATLABAddMatrix.class);
            double[][] result = m.addmatrix(a1,a2);

            // Print the magic square

            printResult(result);

        }catch(MATLABException ex){

            // This exception represents errors in MATLAB
            System.out.println(ex);
        }catch(IOException ex){

            // This exception represents network issues.
            System.out.println(ex);
        }finally{

            client.close();
        }
    }

    private static void printResult(double[][] result){
```

```
            for(double[] row : result){
                for(double element : row){
                    System.out.print(element + " ");
                }
                System.out.println();
            }
        }
    }
```

13 Compile the Java application, using the `javac` command or use the build capability of your Java IDE.

For example, enter the following:

```
javac -classpath "matlabroot\toolbox\compiler_sdk\mps_client\java\mps_client.jar" MPSClientExample.java
```

14 Run the application using the `java` command or your IDE.

For example, enter the following:

```
java -classpath .;"matlabroot\toolbox\compiler_sdk\mps_client\java\mps_client.jar" MPSClientExample
```

The application returns the following at the console:

```
5.0 7.0 9.0
9.0 7.0 5.0
```

Create a C# Client

This example shows how to call a deployed MATLAB function from a C# application using MATLAB Production Server.

In your C# code, you must:

- Create a Microsoft® Visual Studio® Project.
- Create a Reference to the Client Run-Time Library.
- Design the .NET interface in C#.
- Write, build, and run the C# application.

This task is typically performed by .NET application programmer. This part of the tutorial assumes you have Microsoft Visual Studio and .NET installed on your computer.

Create a Microsoft Visual Studio Project

1 Open Microsoft Visual Studio.
2 Click **File > New > Project**.
3 In the New Project dialog, select the project type and template you want to use. For example, if you want to create a C# Console Application, select **Windows** in the **Visual C#** branch of the **Project Type** pane, and select the **C# Console Application** template from the **Templates** pane.
4 Type the name of the project in the **Name** field (`Magic`, for example).
5 Click **OK**. Your `Magic` source shell is created, typically named `Program.cs`, by default.

Create a Reference to the Client Run-Time Library

Create a reference in your `MainApp` code to the MATLAB Production Server client run-time library. In Microsoft Visual Studio, perform the following steps:

1 In the Solution Explorer pane within Microsoft Visual Studio (usually on the right side), select the name of your project, `Magic`, highlighting it.
2 Right-click `Magic` and select **Add Reference**.
3 In the Add Reference dialog box, select the **Browse** tab. Browse to the MATLAB Production Server client runtime, installed at *matlabroot*\toolbox \compiler_sdk\mps_client\dotnet. Select `MathWorks.MATLAB.ProductionServer.Client.dll`.

4 Click **OK**. `MathWorks.MATLAB.ProductionServer.Client.dll` is now referenced by your Microsoft Visual Studio project.

Design the .NET Interface in C#

In this example, you invoke `mymagic.m`, hosted by the server, from a .NET client, through a .NET interface.

To match the MATLAB function `mymagic.m`, design an interface named `Magic`.

For example, the interface for the `mymagic` function:

```
function m = mymagic(in)
    m = magic(in);
```

might look like this:

```
 public interface Magic
        {
           double[,] mymagic(int in1);
        }
```

Note the following:

- The .NET interface has the same number of inputs and outputs as the MATLAB function.
- You are deploying one MATLAB function, therefore you define one corresponding .NET method in your C# code.
- Both MATLAB function and .NET interface process the same types: input type `int` and the output type two-dimensional `double`.
- You specify the name of your deployable archive (`magic`, which resides in your `auto_deploy` folder) in your URL, when you call `CreateProxy` (`"http://localhost:9910/magic"`).

Write, Build, and Run the .NET Application

Create a C# interface named `Magic` in Microsoft Visual Studio by doing the following:

1 Open the Microsoft Visual Studio project, `MagicSquare`, that you created earlier.
2 In `Program.cs` tab, paste in the code below.

> **Note** The URL value ("`http://localhost:9910/mymagic_deployed`") used to create the proxy contains three parts:
>
> - the server address (`localhost`).
> - the port number (`9910`).
> - the archive name (`mymagic_deployed`)

```
using System;
using System.Net;
using MathWorks.MATLAB.ProductionServer.Client;

namespace Magic
{
    public class MagicClass
    {

    public interface Magic
    {
        double[,] mymagic(int in1);
    }

    public static void Main(string[] args)
    {
        MWClient client = new MWHttpClient();
        try
        {
            Magic me = client.CreateProxy<Magic>
                    (new Uri("http://localhost:9910/mymagic_deployed"));
            double[,] result1 = me.mymagic(4);
            print(result1);
        }
        catch (MATLABException ex)
        {
          Console.WriteLine("{0} MATLAB exception caught.", ex);
          Console.WriteLine(ex.StackTrace);
        }
        catch (WebException ex)
        {
          Console.WriteLine("{0} Web exception caught.", ex);
          Console.WriteLine(ex.StackTrace);
        }
        finally
        {
          client.Dispose();
        }
        Console.ReadLine();
    }

    public static void print(double[,] x)
    {
```

```
        int rank = x.Rank;
        int [] dims = new int[rank];

        for (int i = 0; i < rank; i++)
        {
           dims[i] = x.GetLength(i);
        }

        for (int j = 0; j < dims[0]; j++)
        {
           for (int k = 0; k < dims[1]; k++)
           {
              Console.Write(x[j,k]);
              if (k < (dims[1] - 1))
              {
                 Console.Write(",");
              }
           }
           Console.WriteLine();
        }
      }
   }
}
```

3   Build the application. Click **Build > Build Solution**.

4   Run the application. Click **Debug > Start Without Debugging**. The program
returns the following console output:

```
16,2,3,13
5,11,10,8
9,7,6,12
4,14,15,1
```

Create a Python Client

This example shows how to write a MATLAB Production Server client using the Python client API. The client application calls the `addmatrix` function you compiled in "Package Deployable Archives with Production Server Compiler App" and deployed in "Share a Deployable Archive on the Server Instance" (MATLAB Production Server).

Create a Python MATLAB Production Server client application:

1 Copy the contents of the *matlabroot*`\toolbox\compiler_sdk\mps_clients` `\python` folder to your development environment.
2 Open a command line,
3 Change directories into the folder where you copied the MATLAB Production Server Python client.
4 Run the following command.

```
python setup.py install
```
5 Start the Python command line interpreter.
6 Enter the following import statements at the Python command prompt.

```
import matlab
from production_server import client
```
7 Open the connection to the MATLAB Production Server instance and initialize the client runtime.

```
client_obj = client.MWHttpClient("http://localhost:9910")
```
8 Create the MATLAB data to input to the function.

```
a1 = matlab.double([[1,2,3],[3,2,1]])
a2 = matlab.double([[4,5,6],[6,5,4]])
```
9 Call the deployed MATLAB function.

You must know the following:

- Name of the deployed archive
- Name of the function

```
client_obj.addmatrix.addmatrix(a1,a2)
```

```
matlab.double([[5.0,7.0,9.0],[9.0,7.0,5.0]])
```

The syntax for invoking a function is `client.`*archiveName*`.`*functionName*`(`*arg1*, *arg2*, `.., [nargout=`*numOutArgs*`])`.

10 Close the client connection.

```
client_obj.close()
```

Create a C++ Client

This example shows how to write a MATLAB Production Server client using the C client API. The client application calls the addmatrix function you compiled in "Package Deployable Archives with Production Server Compiler App" and deployed in "Share a Deployable Archive on the Server Instance" (MATLAB Production Server).

Create a C++ MATLAB Production Server client application:

1 Create a file called addmatrix_client.cpp.

2 Using a text editor, open addmatrix_client.cpp.

3 Add the following include statements to the file:

```
#include <iostream>
#include <mps/client.h>
```

> **Note** The header files for the MATLAB Production Server C client API are located in the *matlabroot*/toolbox/compiler_sdk/mps_client/c/include/mps folder. folder.

4 Add the main() method to the application.

```
int main ( void )
{
}
```

5 Initialize the client runtime.

```
mpsClientRuntime* mpsruntime = mpsInitializeEx(MPS_CLIENT_1_1);
```

6 Create the client configuration.

```
mpsClientConfig* config;
mpsStatus status = mpsruntime->createConfig(&config);
```

7 Create the client context.

```
mpsClientContext* context;
status = mpsruntime->createContext(&context, config);
```

8 Create the MATLAB data to input to the function.

```
double a1[2][3] = {{1,2,3},{3,2,1}};
double a2[2][3] = {{4,5,6},{6,5,4}};

int numIn=2;
mpsArray** inVal = new mpsArray* [numIn];
```

```
inVal[0] = mpsCreateDoubleMatrix(2,3,mpsREAL);
inVal[1] = mpsCreateDoubleMatrix(2,3,mpsREAL);

double* data1 = (double *)( mpsGetData(inVal[0]) );
double* data2 = (double *)( mpsGetData(inVal[1]) );

for(int i=0; i<2; i++)
{
  for(int j=0; j<3; j++)
  {
    mpsIndex subs[] = { i, j };
    mpsIndex id = mpsCalcSingleSubscript(inVal[0], 2, subs);
    data1[id] = a1[i][j];
    data2[id] = a2[i][j];
  }
}
```

9 Create the MATLAB data to hold the output.

```
int numOut = 1;
mpsArray **outVal = new mpsArray* [numOut];
```

10 Call the deployed MATLAB function.

Specify the following as arguments:

- client context
- URL of the function
- Number of expected outputs
- Pointer to the `mpsArray` holding the outputs
- Number of inputs
- Pointer to the `mpsArray` holding the inputs

```
mpsStatus status = mpsruntime->feval(context,
    "http://localhost:9910/addmatrix/addmatrix",
    numOut, outVal, numIn, (const mpsArray**)inVal);
```

For more information about the `feval` function, see the reference material included in the *matlabroot*/toolbox/compiler_sdk/mps_client folder.

11 Verify that the function call was successful using an `if` statement.

```
if (status==MPS_OK)
{
}
```

12 Inside the `if` statement, add code to process the output.

```
double* out = mpsGetPr(outVal[0]);

for (int i=0; i<2; i++)
{
  for (int j=0; j<3; j++)
  {
    mpsIndex subs[] = {i, j};
    mpsIndex id = mpsCalcSingleSubscript(outVal[0], 2, subs);
    std::cout << out[id] << "\t";
  }
  std::cout << std::endl;
}
```

13 Add an `else` clause to the `if` statement to process any errors.

```
else
{
  mpsErrorInfo error;
  mpsruntime->getLastErrorInfo(context, &error);
  std::cout << "Error: " << error.message << std::endl;
  switch(error.type)
  {
    case MPS_HTTP_ERROR_INFO:
      std::cout << "HTTP: " << error.details.http.responseCode << ": "
          << error.details.http.responseMessage << std::endl;
    case MPS_MATLAB_ERROR_INFO:
      std::cout << "MATLAB: " << error.details.matlab.identifier
          << std::endl;
      std::cout << error.details.matlab.message << std::endl;
    case MPS_GENERIC_ERROR_INFO:
      std::cout << "Generic: " << error.details.general.genericErrorMsg
          << std::endl;
  }

  mpsruntime->destroyLastErrorInfo(&error);
}
```

14 Free the memory used by the inputs.

```
for (int i=0; i<numIn; i++)
  mpsDestroyArray(inVal[i]);
delete[] inVal;
```

15 Free the memory used by the outputs.

```
    for (int i=0; i<numOut; i++)
      mpsDestroyArray(outVal[i]);
    delete[] outVal;
```

16 Free the memory used by the client runtime.

```
    mpsruntime->destroyConfig(config);
    mpsruntime->destroyContext(context);
    mpsTerminate();
```

17 Save the file.

The completed program should resemble the following:

```
#include <iostream>
#include <mps/client.h>

int main ( void )
{
  mpsClientRuntime* mpsruntime = mpsInitializeEx(MPS_CLIENT_1_1);

  mpsClientConfig* config;
  mpsStatus status = mpsruntime->createConfig(&config);

  mpsClientContext* context;
  status = mpsruntime->createContext(&context, config);

  double a1[2][3] = {{1,2,3},{3,2,1}};
  double a2[2][3] = {{4,5,6},{6,5,4}};

  int numIn=2;
  mpsArray** inVal = new mpsArray* [numIn];
  inVal[0] = mpsCreateDoubleMatrix(2,3,mpsREAL);
  inVal[1] = mpsCreateDoubleMatrix(2,3,mpsREAL);
  double* data1 = (double *)( mpsGetData(inVal[0]) );
  double* data2 = (double *)( mpsGetData(inVal[1]) );
  for(int i=0; i<2; i++)
  {
    for(int j=0; j<3; j++)
    {
      mpsIndex subs[] = { i, j };
      mpsIndex id = mpsCalcSingleSubscript(inVal[0], 2, subs);
      data1[id] = a1[i][j];
      data2[id] = a2[i][j];
    }
  }

  int numOut = 1;
  mpsArray **outVal = new mpsArray* [numOut];

  status = mpsruntime->feval(context,
              "http://localhost:9910/addmatrix/addmatrix",
              numOut, outVal, numIn, (const mpsArray **)inVal);

  if (status==MPS_OK)
  {
    double* out = mpsGetPr(outVal[0]);

    for (int i=0; i<2; i++)
    {
```

4-15

```
      for (int j=0; j<3; j++)
      {
        mpsIndex subs[] = {i, j};
        mpsIndex id = mpsCalcSingleSubscript(outVal[0], 2, subs);
        std::cout << out[id] << "\t";
      }
      std::cout << std::endl;
    }
  }
  else
  {
    mpsErrorInfo error;
    mpsruntime->getLastErrorInfo(context, &error);
    std::cout << "Error: " << error.message << std::endl;

    switch(error.type)
    {
    case MPS_HTTP_ERROR_INFO:
      std::cout << "HTTP: "
          << error.details.http.responseCode
          << ": " << error.details.http.responseMessage
          << std::endl;
    case MPS_MATLAB_ERROR_INFO:
      std::cout << "MATLAB: " << error.details.matlab.identifier
          << std::endl;
      std::cout << error.details.matlab.message << std::endl;
    case MPS_GENERIC_ERROR_INFO:
      std::cout << "Generic: "
          << error.details.general.genericErrorMsg
          << std::endl;
    }
    mpsruntime->destroyLastErrorInfo(&error);
  }

  for (int i=0; i<numIn; i++)
    mpsDestroyArray(inVal[i]);
  delete[] inVal;

  for (int i=0; i<numOut; i++)
    mpsDestroyArray(outVal[i]);
  delete[] outVal;

  mpsruntime->destroyConfig(config);
  mpsruntime->destroyContext(context);
  mpsTerminate();
}
```

18 Compile the application.

To compile your client code, the compiler needs access to `client.h`. This header file is stored in *matlabroot*`/toolbox/compiler_sdk/mps_client/c/include/mps/`.

To link your application, the linker needs access to the following files stored in *matlabroot*`/toolbox/compiler_sdk/mps_client/c/`:

Files Required for Linking

Windows	UNIX®/Linux	Mac OS X
$arch\lib \mpsclient.lib	$arch/lib/ libprotobuf.so	$arch/lib/ libprotobuf.dylib
	$arch/lib/ libcurl.so	$arch/lib/ libcurl.dylib
	$arch/lib/ libmwmpsclient.so	$arch/lib/ libmwmpsclient.dyli b
	$arch/lib/ libmwcpp11compat.so	

19 Run the application.

To run your application, add the following files stored in *matlabroot*/toolbox/
compiler_sdk/mps_client/c/ to the application's path:

Files Required for Running

Windows	UNIX/Linux	Mac OS X
$arch\lib \mpsclient.dll	$arch/lib/ libprotobuf.so	$arch/lib/ libprotobuf.dylib
$arch\lib \libprotobuf.dll	$arch/lib/ libcurl.so	$arch/lib/ libcurl.dylib
$arch\lib \libcurl.dll	$arch/lib/ libmwmpsclient.so	$arch/lib/ libmwmpsclient.dyli b
	$arch/lib/ libmwcpp11compat.so	

The client invokes addmatrix function on the server instance and returns the
following matrix at the console:

```
5.0 7.0 9.0
9.0 7.0 5.0
```

RESTful API JSON Encode and Decode Functions

mps.json.encode

Convert MATLAB data to JSON text using MATLAB Production Server JSON schema

Syntax

```
text = mps.json.encode(data)
text = mps.json.encode(data,Name,Value)
```

Description

`text = mps.json.encode(data)` encodes MATLAB data and returns JSON text in JSON schema for MATLAB Production Server. You can use this JSON text on multiple platforms to encode content for MATLAB Production Server.

`text = mps.json.encode(data,Name,Value)` specifies additional options with one or more name-value pair arguments for specific input cases. For example, you can decide to encode `data` in the large or small format defined for representing data types.

Examples

Convert a Matrix to JSON Schema for MATLAB Production Server

Encode a 3-by-3 magic square in the JSON format.

```
mps.json.encode(magic(3))

ans =
    '[[8,1,6],[3,5,7],[4,9,2]]'
```

Convert a Matrix and Specify Format for JSON Schema for MATLAB Production Server

Encode a 3-by-3 magic square in JSON using the `large` format option.

```
mps.json.encode(magic(3),'Format','large')

ans =
    '{"mwdata":[8,3,4,1,5,9,6,7,2],"mwsize":[3,3],"mwtype":"double"}'
```

Convert an Array Containing NaN, Inf, or -Inf to JSON Schema for MATLAB Production Server

Encode an array containing -Inf, NaN, and Inf in JSON using 'object' in 'NanInfType' option.

```
mps.json.encode([-Inf NaN Inf],'NaNInfType','object','Format','large')

ans =
    '{"mwdata":[{"mwdata":"-Inf"},{"mwdata":"NaN"},{"mwdata":"Inf"}], "mwsize":[1,3],"mwtype":"double"}'
```

Input Arguments

data — MATLAB data that MATLAB Production Server supports
numeric | character | logical | structure | cell

MATLAB data that MATLAB Production Server supports, specified as a numeric, character, logical, structure, or cell.

Name-Value Pair Arguments

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

Example: mps.json.encode(data,'Format','large')

Format — Format to encode data
'small' (default) | 'large'

Format to encode MATLAB data, specified as the comma-separated pair consisting of 'Format' and the format 'small' or 'large'.

The `small` format is a more simple representation of MATLAB data types in JSON, whereas the `large` format is a more generic representation. For more information, see "JSON Representation of MATLAB Data Types".

NaNInfType — Format to encode NaN, Inf, and -Inf in data
'string' (default) | 'object'

Format to encode `NaN`, `Inf`, and `-Inf` in `data`, specified as a comma-separated pair consisting of `'NaNInfType'` and the JSON data-types `'string'` or `'object'`.

PrettyPrint — Format text for readability
false (default) | true

Format `text` for readability, specified as a comma-separated pair consisting of `'PrettyPrint'` and logical `'true'` or `'false'`.

`PrettyPrint` enables better readability for a user when set to `true`. Syntax is `mps.json.encode(magic(3),'PrettyPrint',true)`.

Output Arguments

text — JSON-formatted text
character vector

JSON-formatted text for JSON schema for MATLAB Production Server, returned as a character vector.

See Also
`mps.json.decode` | `mps.json.decoderesponse` | `mps.json.encoderequest`

Introduced in R2018a

mps.json.decode

Convert a character vector or string in MATLAB Production Server JSON schema to MATLAB data

Syntax

```
data = mps.json.decode(text)
```

Description

`data = mps.json.decode(text)` parses JSON schema for MATLAB Production Server to convert it to MATLAB data.

Examples

Decode JSON-Formatted Text for a Matrix

```
mps.json.decode('[[8,1,6],[3,5,7],[4,9,2]]')

ans =
     8     1     6
     3     5     7
     4     9     2
```

Decode a Matrix in JSON That Uses `large` Format

```
mps.json.decode('{"mwdata":[1,4,3,2],"mwsize":[2,2],"mwtype":"double"}')
```

```
ans =
     1     3
     4     2
```

Input Arguments

`text` — JSON text following the schema for MATLAB Production Server
character vector (default) | string

JSON following the schema for MATLAB Production Server, specified as a character vector or string.

`text` can be in various formats like `small`, `large`, `NaNInfType`, and `PrettyPrint`, as explained in "Name-Value Pair Arguments" on page 5-3 on the `mps.json.encode` page.

Output Arguments

`data` — MATLAB data
any MATLAB data type

MATLAB data decoded from MATLAB Production Server JSON text returned as the data-type encoded in `text`.

See Also

`mps.json.decoderesponse` | `mps.json.encode` | `mps.json.encoderequest`

Introduced in R2018a

mps.json.encoderequest

Convert MATLAB data in a server request to JSON text using MATLAB Production Server JSON schema

Syntax

```
text = mps.json.encoderequest(rhs)
text = mps.json.encoderequest(rhs,Name,Value)
```

Description

`text = mps.json.encoderequest(rhs)` encodes the request that is input to the deployed MATLAB function using JSON schema for MATLAB Production Server. It builds a server request that includes MATLAB variables and options, such as `'Nargout'` and `'OutputFormat'`, that are needed to make a call to MATLAB Production Server.

`text = mps.json.encoderequest(rhs,Name,Value)` specifies additional options with one or more name-value pair arguments for specific input cases.

Examples

Write MATLAB Production Server Payload

```
mps.json.encoderequest({[1 2 3 4]})
```

```
ans =
    '{"rhs":[[[1,2,3,4]]],"nargout":1,"outputFormat":{"mode":"small","nanType":"string"}}'
```

Write MATLAB Production Server Payload, and Set Output Parameters

Let `rhs = {['Red'], [15], [1 3; 5 7], ['Green']}`.

```
mps.json.encoderequest(rhs, 'Nargout', 3, 'OutputFormat', 'large')
```

```
ans =
    '{"rhs":["Red",15,[[1,3],[5,7]],"Green"],"nargout":3,"outputFormat":{"mode":"large","nanType":"string"}}'
```

Write a MATLAB Function as MATLAB Production Server Payload

Use the MATLAB function `horzcat` that horizontally concatenates two matrices.

```
a = [1 2; 5 6];
b = [3 4; 7 8];
mps.json.encoderequest({horzcat(a,b)})
```

```
ans =
    '{"rhs":[[[1,2,3,4],[5,6,7,8]]],"nargout":1,"outputFormat":{"mode":"small","nanType":"string"}}'
```

Read Response from a `sortstudent` Function Deployed on MATLAB Production Server

Execute `mps.json.encoderequest` and `mps.json.decoderesponse` to call a function deployed on MATLAB Production Server using `webwrite`. In this case, student names and their corresponding scores are deployed to MATLAB Production Server to the `sortstudents` function that sorts students based on their scores. The result returned is the equivalent to calling the function `sortstudents(struct('name', 'Ed', 'score', 83), struct('name', 'Toni', 'score', 91))` from MATLAB.

```
data = {struct('name', 'Ed', 'score', 83), struct('name', 'Toni', 'score', 91)};
body = mps.json.encoderequest(data);

options = weboptions;

% Create a weboptions object that instructs webread to return JSON text
options.ContentType = 'text';

% Create a weboptions object that instructs webwrite to encode character vector data as JSON to post it to a web service
options.MediaType = 'application/json';

response = webwrite('http://localhost:9910/studentapp/sortstudents', body, options);

result = mps.json.decoderesponse(response);
```

Input Arguments

`rhs` — Input arguments for deployed MATLAB function that is called
cell vector of any MATLAB data type supported by MATLAB Production Server

Input arguments for a MATLAB function deployed on MATLAB Production Server that is called, specified as a cell vector.

Name-Value Pair Arguments

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

Example: `mps.json.encoderequest(rhs, 'Format', 'large')`

Nargout — Number of output arguments for function deployed on MATLAB Production Server
1 (default) | any positive integer

Number of output arguments for function deployed on MATLAB Production Server, specified as comma-separated pair consisting of '`Nargout`' and number of output arguments.

`mps.json.encoderequest(rhs, 'Nargout', 3)`.

Format — Format to encode `rhs`
'small' (default) | 'large'

Format to encode `rhs`, specified as comma-separated pair consisting of '`Format`' and the format '`small`' or '`large`'.

The `small` format is a simpler representation of MATLAB data types in JSON, whereas the `large` format is a more generic representation. For more information, see "JSON Representation of MATLAB Data Types".

NaNInfType — Format to encode `NaN`, `Inf`, `-Inf` in `rhs`
'string' (default) | 'object'

Format to encode `NaN`, `Inf`, `-Inf` in `rhs`, specified as comma-separated pair consisting of '`NaNInfType`' and JSON data types '`string`' and '`object`'.

OutputFormat — Format for response from MATLAB function deployed on MATLAB Production Server
'small' (default) | 'large'

Format for response from MATLAB function deployed on MATLAB Production Server, specified as comma-separated pair consisting of `'OutputFormat'` and the format `'small'` or `'large'`.

Output format is set using `mps.json.encoderequest(rhs, 'OutputFormat', 'large')`.

`OutputNanInfType` — Type for response from MATLAB function deployed on MATLAB Production Server containing NaN, Inf, -Inf
'string' (default) | 'object'

Type for response from MATLAB function deployed on MATLAB Production Server containing `NaN`, `Inf`, `-Inf`, specified as comma-separated pair consisting of `'OutputNaNInfType'` and JSON data type `'string'` and `'object'`.

NaN-type for output response is set using `mps.json.encoderequest(rhs, 'OutputNaNInfType', 'object')`.

`PrettyPrint` — Format text for readability
false (default) | true

Format `text` for readability, specified as a comma-separated pair consisting of `'PrettyPrint'` and logical `'true'` or `'false'`. Syntax is `mps.json.encoderequest(rhs,'PrettyPrint',true)`.

Output Arguments

`text` — JSON text
character vector

JSON-formatted text for JSON schema for MATLAB Production Server, returned as a character vector.

See Also
`mps.json.decode` | `mps.json.decoderesponse` | `mps.json.encode`

Introduced in R2018a

mps.json.decoderesponse

Convert JSON text from a server response to MATLAB data

Syntax

```
lhs = mps.json.decoderesponse(response)
error = mps.json.decoderesponse(response)
```

Description

`lhs = mps.json.decoderesponse(response)` reads the JSON payload of the output arguments returned from a successful MATLAB function call.

`error = mps.json.decoderesponse(response)` reads the JSON payload of the MATLAB error thrown from a failed MATLAB function call.

Examples

Read from MATLAB Production Server Payload

```
mps.json.decoderesponse('{"lhs":[[[1, 2, 3, 4]]]}')

ans =
  1x1 cell array
    {1x4 double}
```

Read response from a `sortstudent` function deployed on MATLAB Production Server

Execute `mps.json.encoderequest` and `mps.json.decoderesponse` to call a function deployed on MATLAB Production Server using `webwrite`. In this case, student names and their corresponding scores are deployed to MATLAB Production Server to the `sortstudents` function that sorts students based on their scores. The result returned is the equivalent to calling the function `sortstudents(struct('name', 'Ed', 'score', 83), struct('name', 'Toni', 'score', 91))` from MATLAB.

```
data = {struct('name', 'Ed', 'score', 83), struct('name', 'Toni', 'score', 91)};
body = mps.json.encoderequest(data);

options = weboptions;

% Create a weboptions object that instructs webread to return JSON text
options.ContentType = 'text';

% Create a weboptions object that instructs webwrite to encode character vector data as JSON to post it to a web service
options.MediaType = 'application/json';

response = webwrite('http://localhost:9910/studentapp/sortstudents', body, options);

result = mps.json.decoderesponse(response);
```

Input Arguments

`response` — JSON result from a MATLAB function call
char (default)

JSON result from a MATLAB function call specified as JSON text.

Output Arguments

`lhs` — Cell vector of output arguments
Cell vector

Cell vector of output arguments that are from a MATLAB function called from MATLAB Production Server.

`error` — Generated output when request results in a MATLAB error
struct array

Generated output when request to MATLAB function called from MATLAB Production Server results in a MATLAB error returned as a `struct` array.

See Also

`mps.json.decode` | `mps.json.encode` | `mps.json.encoderequest`

Introduced in R2018a

6

Persistence Functions

mps.cache.Controller

Manage the life cycle of a persistence service in a MATLAB testing environment

Description

`mps.cache.Controller` is used to manage the life cycle of a persistence service in a MATLAB testing environment. You can perform various actions such as starting and stopping the service using the object.

Creation

Create a `mps.cache.Controller` object using `mps.cache.control`.

Properties

ActiveConnection — Connection indicator
True | False

This property is read-only.

Indicates whether the connection to the persistence provider is active or not. The value is `True` when the persistence service is attached to the MATLAB session, otherwise it is `False`.

Example: `ActiveConnection: False`

ManageService — Service management indicator
True | False | Unknown

This property is read-only.

Indicates whether the controller object is managing the persistence service or not. `ManageService` is `True` if the persistence service is started using the controller's `start` method and `False` if the MATLAB session is attached to the persistence service using the controller's `attach` method. In all other cases, the value is set to `Unknown`.

If `ManageService` is `True`, destroying the controller object via `delete` or exiting MATLAB will stop the persistence service.

Example: `ManageService: True`

Host — Host name
character vector

This property is read-only.

Name of the system hosting the persistence service.

This property is not displayed when you create a controller that uses MATLAB as a persistence provider.

Example: `Host: 'localhost'`

Port — Port number
positive scalar

This property is read-only.

Port number for persistence service.

This property is not displayed when you create a controller that uses MATLAB as a persistence provider.

Example: `Port: 4519`

ProviderName — Name of persistence provider
`'Redis' | 'MatlabTest'`

This property is read-only.

Name of the persistence provider.

Currently, Redis™ is the only supported persistence provider.

You can also use MATLAB as a persistence provider for testing purposes. If you use MATLAB as a persistence provider, the provider name is displayed as `'MatlabTest'`.

Example: `ProviderName: 'Redis'`

Example: `ProviderName: 'MatlabTest'`

ConnectionName — Name of connection
character vector | string

This property is read-only.

Name of connection to persistence service.

Example: ConnectionName: 'myRedisConnection'

Folder* — Storage folder path
character vector

This property is read-only.

Storage folder path. The folder displayed is used as a database.

* This property is displayed only when you create a controller that uses MATLAB as a persistence provider.

Example: Folder: 'c:\tmp'

Object Functions

mps.cache.control	Create a persistence service controller object
start	Start a persistence service and attach it a to MATLAB session
stop	Stop a persistence service and detach it from a MATLAB session
restart	Restart a persistence service and attach it to a MATLAB session
attach	Connect a MATLAB session to a persistence service that is already running
detach	Disconnect MATLAB session from a persistence service that is already running
ping	Test whether the persistence service is reachable
version	Version number for persistence provider

Examples

Create a Redis Service Controller

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519)
```

```
ctrl =

  Controller with properties:

    ActiveConnection: False
       ManageService: Unknown
                Host: 'localhost'
                Port: 4519
          Operations: "read | write | create | update"
        ProviderName: 'Redis'
      ConnectionName: 'myRedisConnection'
```

Create a MATLAB Service Controller

```
mctrl = mps.cache.control('myMATFileConnection','MatlabTest','Folder','c:\tmp')

mctrl =

  Controller with properties:

    ActiveConnection: False
       ManageService: Unknown
              Folder: 'c:\tmp'
          Operations: "read | write | create | update"
        ProviderName: 'MatlabTest'
      ConnectionName: 'myMATFileConnection'
```

See Also
mps.cache.DataCache

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

mps.cache.DataCache

Represent cache concept in MATLAB code

Description

`mps.cache.DataCache` represents the concept of cache in MATLAB code. It is an abstract class that serves as a superclass for each persistence provider-specific data cache class.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Creation

Create a persistence provider-specific subclass of `mps.cache.DataCache` using `mps.cache.connect`.

Properties

See provider-specific subclasses for properties.

Object Functions

mps.cache.connect	Connect to cache, or create a cache if it doesn't exist
bytes	Return the number of bytes of storage used by value stored at each key
clear	Remove all keys and values from cache
flush	Write all locally modified keys to the persistence service
get	Fetch values of keys from cache
getp	Get the value of a public cache property
isKey	Determine if the cache contains specified keys
keys	Get all keys from cache

length	Number of key-value pairs in the data cache
purge	Flush all local data to the persistence service
put	Write key-value pairs to cache
remove	Remove keys from cache
retain	Store remote keys from cache locally or return locally stored keys

Examples

Connect to a Redis Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection')

c =

RedisCache with properties:

          Host: 'localhost'
          Port: 4519
          Name: 'myCache'
    Operations: "read | write | create | update"
     LocalKeys: {}
    Connection: 'myRedisConnection'

Use getp instead of dot notation to access properties.
```

See Also
mps.cache.Controller

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

mps.sync.TimedMATFileMutex

Represent a MAT-file persistence service mutex

Description

`mps.sync.TimedMATFileMutex` is synchronization primitive used to protect data in a MAT-file database from being simultaneously accessed by multiple workers.

Creation

Create a `mps.sync.TimedMATFileMutex` object using `mps.sync.mutex`.

Properties

`Expiration` — Duration of lock in seconds
positive integer

This property is read-only.

Duration of advisory lock in seconds.

Example: `10`

`ConnectionName` — Name of connection
character vector

This property is read-only.

Name of connection to persistence service.

Example: `'myRedisConnection'`

`MutexName` — Name of lock
character vector

This property is read-only.

Name of advisory lock, specified as a character vector.

Example: `'myMutex'`

Object Functions

mps.sync.mutex	Create a persistence service mutex
acquire	Acquire advisory lock on persistence service mutex
own	Check ownership of advisory lock on a persistence service mutex object
release	Release advisory lock on persistence service mutex

Examples

Create a MAT-File Lock Object

```
mctrl = mps.cache.control('myMATFileConnection','MatlabTest','Folder','c:\tmp')
start(mctrl)
lk = mps.sync.lock('myMATFileMutex','Connection','myMATFileConnection')

lk =

  TimedMATFileMutex with properties:

        Expiration: 10
    ConnectionName: 'myMATFileConnection'
         MutexName: 'myMATFileMutex'
```

See Also

acquire | mps.sync.TimedRedisMutex | mps.sync.mutex | own | release

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

mps.sync.TimedRedisMutex

Represent a Redis persistence service mutex

Description

`mps.sync.TimedRedisMutex` is a synchronization primitive used to protect data in a Redis persistence service from being simultaneously accessed by multiple workers.

Creation

Create a `mps.sync.TimedRedisMutex` object using `mps.sync.mutex`.

Properties

`Expiration` — Duration of lock in seconds
positive integer

This property is read-only.

Duration of advisory lock in seconds.

Example: `10`

`ConnectionName` — Name of connection
character vector

This property is read-only.

Name of connection to persistence service.

Example: `'myRedisConnection'`

`MutexName` — Name of mutex
character vector

This property is read-only.

Name of mutex, returned as a character vector.

Example: `'myMutex'`

Object Functions

mps.sync.mutex	Create a persistence service mutex
acquire	Acquire advisory lock on persistence service mutex
own	Check ownership of advisory lock on a persistence service mutex object
release	Release advisory lock on persistence service mutex

Examples

Create a Redis Lock Object

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
lk = mps.sync.mutex('myMutex','Connection','myRedisConnection')

lk =

  TimedRedisMutex with properties:

        Expiration: 10
    ConnectionName: 'myRedisConnection'
         MutexName: 'myMutex'
```

See Also

acquire | mps.sync.TimedMATFileMutex | mps.sync.mutex | own | release

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

acquire

Acquire advisory lock on persistence service mutex

Syntax

```
TF = acquire(lk,timeout)
```

Description

`TF = acquire(lk,timeout)` acquires an advisory lock and returns a logical `1 (true)` if the lock was successful, and a logical `0 (false)` otherwise. If the lock is unavailable, `acquire` will continue trying to acquire it for `timeout` seconds.

Examples

Apply Advisory Lock

First, create a persistence service controller object and use that object to start the persistence service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
```

Use the connection name to create a persistence service mutex.

```
lk = mps.sync.lock('myDbLock','Connection','myRedisConnection')
```

Try to acquire advisory lock. If lock is unavailable, retry acquiring for 20 seconds.

```
acquire(lk, 20);

TF =

  logical
```

1

Input Arguments

`lk` — Mutex object
persistence service mutex object

A persistence service specific mutex object. If you use Redis as your persistence provider, `lk` will be a `mps.sync.TimedRedisMutex` object. If you use a MATLAB as your persistence provider, `lk` will be a `mps.sync.TimedMATFileMutex` object.

Output Arguments

`TF` — Logical value
logical array

TF has a logical `1` (`true`) if acquiring the advisory lock was successful, and a logical `0` (`false`) otherwise.

See Also
`mps.sync.TimedMATFileMutex` | `mps.sync.TimedRedisMutex` | `mps.sync.mutex` | `own` | `release`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

attach

Connect a MATLAB session to a persistence service that is already running

Syntax

```
attach(ctrl)
```

Description

attach(ctrl) connects a MATLAB session to a persistence service that is already running.

Examples

Connect a MATLAB Session to a Persistence Service

Attach MATLAB code to a persistence service.

Start a persistence service outside your MATLAB session from system command line using or using the dashboard. Assuming your started the service using a connection name myOutsideRedisConnection at port 8899, attach your MATLAB session to it from the MATLABdesktop.

```
ctrl = mps.cache.control('myOutsideRedisConnection','Redis','Port',8899);
attach(ctrl)
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a mps.cache.Controller object.

Example: attach(ctrl)

See Also
detach | restart | start | stop

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

bytes

Return the number of bytes of storage used by value stored at each key

Syntax

```
b = bytes(c,keys)
```

Description

`b = bytes(c,keys)` returns the number of bytes of storage used by value stored at each key.

Examples

Get the Number of Bytes of Storage Used by a Value in the Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache and then get the number of bytes of storage used by a value stored at each key in the cache. Represent the keys and the bytes used by each value of key as a MATLAB table.

```
put (c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
b = bytes(c,{'keyOne','keyTwo','keyThree','keyFour','keyFive'})
tt = table(keys(c), bytes(c,keys(c))','VariableNames',{'Keys','Bytes'})

b =

    72    72    72    80   264
```

```
tt =

  5×2 table

      Keys         Bytes

    _____   _____

    'keyFive'       264
    'keyFour'        80
    'keyOne'         72
    'keyThree'       72
    'keyTwo'         72
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

keys — Keys
cell array of character vectors

A list of all the keys, specified as a cell array of character vectors.

Example: `{'keyOne','keyTwo','keyThree','keyFour','keyFive'}`

Output Arguments

b — Number of bytes
numeric row vector

Number of bytes used by each value associated with a key, returned as a numeric row vector.

The byte counts in the output vector appear in the same order as the corresponding input keys. `b(i)` is the byte count for `keys(i)`.

See Also

get | keys | length | put

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

clear

Remove all keys and values from cache

Syntax

```
n = clear(c)
```

Description

`n = clear(c)` removes all keys and values from cache and returns the number of keys cleared from the cache in `n`.

`clear` removes both local and remote keys and values.

Examples

Clear All Keys and Values from Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache and display them as a MATLAB table.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})
```

```
tt =

  5×2 table

      Keys           Values
    _____    _____
```

```
'keyFive'     [5×5 double]
'keyFour'     [1×2 double]
'keyOne'      [        10]
'keyThree'    [        30]
'keyTwo'      [        20]
```

Clear the cache and check if it is empty.

```
n = clear(c)
k = keys(c)

n =

  int64

   5


k =

  0×1 empty cell array
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

Output Arguments

n — Number of key-value pairs
integer

Number of key-value pairs removed, returned as an integer.

Example: 5

See Also

flush | keys | purge | put | remove | retain

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

detach

Disconnect MATLAB session from a persistence service that is already running

Syntax

```
detach(ctrl)
```

Description

detach(`ctrl`) disconnects MATLAB session from a persistence service that is already running.

Examples

Disconnect MATLAB Code

Disconnect MATLAB code from a persistence service.

First, create a persistence service controller object and use that object to start the persistence service. Once you have a persistence service running, you can connect MATLAB code to it. You can then disconnect the code from the service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
attach(ctrl)
detach(ctrl)
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a mps.cache.Controller object.

Example: `detach(ctrl)`

See Also

`attach` | `restart` | `start` | `stop`

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

flush

Write all locally modified keys to the persistence service

Syntax

```
modKeys = flush(c)
```

Description

`modKeys = flush(c)` writes all locally modified data in `c` to the persistence service and returns a list of keys that have been modified.

`flush` does not clear the list of retained keys.

Examples

Write All Locally Modified Data to the Persistence Service

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache and display them as a MATLAB table.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})
```

```
tt =

  5×2 table

      Keys          Values
    _____    _____
```

```
'keyFive'     [5×5 double]
'keyFour'     [1×2 double]
'keyOne'      [        10]
'keyThree'    [        30]
'keyTwo'      [        20]
```

Retain a single key locally and verify that it shows up as a local key in the cache object.

```
retain(c,'keyOne')
display(c)


c =

RedisCache with properties:

          Host: 'localhost'
          Port: 4519
          Name: 'myCache'
    Operations: "read | write | create | update"
     LocalKeys: {'keyOne'}
    Connection: 'myRedisConnection'

Use getp instead of dot notation to access properties.
```

Modify the local key and flush it to the remote cache. Display the keys and values in the cache as a MATLAB table.

```
put(c,'keyOne',rand(3))
modKeys = flush(c)
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})

modKeys =

  1×1 cell array

    {'keyOne'}

tt =

  5×2 table

      Keys          Values
```

```
     _____      _____
    'keyFive'       [5×5 double]
    'keyFour'       [1×2 double]
    'keyOne'        [3×3 double]
    'keyThree'      [        30]
    'keyTwo'        [        20]
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

Output Arguments

modKeys — Modified keys
cell array of character vectors

A list of the modified keys that were written to the persistence service, returned as a cell array of character vectors.

See Also
`clear` | `keys` | `purge` | `remove` | `retain`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

get

Fetch values of keys from cache

Syntax

```
values = get(c,keys)
```

Description

`values = get(c,keys)` fetches values of keys specified by `keys` from the cache specified by `c`. Values are returned in the same order as input variables as a cell array.

Examples

Get Values for Keys from Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Get all the keys and associated values and display them as a MATLAB table.

```
k = keys(c)
v = get(c,{'keyOne','keyTwo','keyThree','keyFour','keyFive'})
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})

k =

  5×1 cell array
```

```
    {'keyFive' }
    {'keyFour' }
    {'keyOne'  }
    {'keyThree'}
    {'keyTwo'  }


v =

  1×5 cell array

    {[10]}    {[20]}    {[30]}    {1×2 double}    {5×5 double}


tt =

  5×2 table

        Keys          Values
      _____    _____

    'keyFive'      [5×5 double]
    'keyFour'      [1×2 double]
    'keyOne'       [       10]
    'keyThree'     [       30]
    'keyTwo'       [       20]
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: c

keys — Keys
cell array of character vectors

A cell array of keys whose values you want to retrieve from cache.

Example: {'keyOne','keyTwo','keyThree','keyFour','keyFive'}

Output Arguments

values — Values
cell array

A list of values associated with keys, returned as a cell array.

See Also
getp | keys | length | put

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

getp

Get the value of a public cache property

Syntax

```
value = getp(c,property)
```

Description

`value = getp(c,property)` gets the value of a public cache property.

Ordinarily, you would be able to access the public properties of a cache object using the dot notation. For example: `c.Connection`. However, all cache objects use dot reference and dot assignment to refer to keys stored in the cache rather than cache object properties. Therefore, `c.Connection` refers to a key named `Connection` in the cache instead of the cache's `Connection` property.

There is no `setp` method since all cache properties are read-only.

Examples

Get the Value of a Named, Public, Hidden Property

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Retrieve the connection name.

```
getp(c,'Connection')
```

```
ans =

    'myRedisConnection'
```

Input Arguments

`c` — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

`property` — Property name
character vector

Property name, specified as a character vector. The common public cache properties are `Name`, `LocalKeys`, and `Connection`. Provider-specific cache objects may have additional properties. For example, `mps.cache.RedisCache` has the properties `Host` and `Port`.

Example: `'Connection'`

Output Arguments

`value` — Property value
valid value

A valid property value.

See Also
`get` | `keys` | `put`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

isKey

Determine if the cache contains specified keys

Syntax

```
TF = isKey(c,keys)
```

Description

`TF = isKey(c,keys)` returns a logical `1 (true)` if `c` contains the specified key, and returns a logical `0 (false)` otherwise.

If `keys` is an array that specifies multiple keys, then `TF` is a logical array of the same size, and `TF{i}` is `true` if `keys{i}` exists in cache `c`.

Examples

Determine if the Cache Contains Specified Keys

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Determine if the cache contains specified keys.

```
TF = isKey(c,{'keyOne','keyTW00','keyTREE','key4','keyFive'})
```

```
TF =
```

```
1×5 logical array

 1   0   0   0   1
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

keys — Keys to search for
character vector | string | cell array of character vectors or strings

Keys to search for in the cache object `c`, specified as a character vector, string, or cell array of character vectors or strings. To search for multiple keys, specify `keys` as a cell array.

Example: `{'keyOne','keyTW00','keyTREE','key4','keyFive'}`

Output Arguments

TF — Logical value
logical array

A logical array of the same size as `keys` indicating which specified keys were found in the data cache. `TF` has a logical `1` (`true`) if `c` contains a key specified by `keys`, and a logical `0` (`false`) otherwise.

See Also
get | keys | length | put

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

keys

Get all keys from cache

Syntax

```
k = keys(c)
```

Description

`k = keys(c)` returns a list of all the keys in a data cache as a cell array.

Examples

Get Keys from Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Get all keys.

```
k = keys(c)

k =

  5×1 cell array

    {'keyFive' }
    {'keyFour' }
```

```
{'keyOne'  }
{'keyThree'}
{'keyTwo'  }
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

Output Arguments

k — Keys
cell array of character vectors

Keys from cache, returned as a cell array of character vectors.

See Also

bytes | get | isKey | length | put

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

length

Number of key-value pairs in the data cache

Syntax

```
num = length(c)
num = length(c,location)
```

Description

`num = length(c)` returns the total number of key-value pairs in the data cache `c`.

`num = length(c,location)` returns the numbers of key-value pairs in the data cache `c` stored remotely or locally as specified by `location`.

Examples

Count the Number of Key-Value Pairs

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Retain a few keys locally.

```
retain(c, {'keyOne','keyTwo'})
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Count the number of keys-value pairs.

```
numTotal = length(c)
numRemote = length(c,'Remote')
numLocal = length(c,'Local')

numTotal =

  int64

   5

numRemote =

  int64

   3

numLocal =

  int64

   2
```

Since `keyOne` and `keyTwo` were retained before being written to the cache, they were never written to the persistence service. They are stored locally until flushed or purged to the persistence service.

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: c

location — Location name
`'Remote'` | `'Local'`

Location of keys specified as an enumerated member of the class `mps.cache.Location`. The valid location options are either `'Remote'` or `'Local'`.

Example: `'Remote'`

Output Arguments

num — Number of keys
integer

Total number of key-value pairs in the data cache or the number stored remotely or locally, returned as an integer.

See Also

bytes | get | isKey | keys | put

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

mps.cache.connect

Connect to cache, or create a cache if it doesn't exist

Syntax

```
c = mps.cache.connect(cacheName)
c = mps.cache.connect(cacheName,'Connection',connectionName)
```

Description

`c = mps.cache.connect(cacheName)` connects to a cache when there's a single connection to a persistence service.

`c = mps.cache.connect(cacheName,'Connection',connectionName)` connects to a cache using the connection specified by `connectionName` when there are multiple connections to a persistence service.

Examples

Create a Cache When There is a Single Connection to a Persistence Service

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

When you have a single connection, you do not need to specify the connection name to `mps.cache.connect`.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519)
start(ctrl)
c = mps.cache.connect('myCache');

c =
```

```
RedisCache with properties:

          Host: 'localhost'
          Port: 4519
          Name: 'myCache'
    Operations: "read | write | create | update"
     LocalKeys: {}
    Connection: 'myRedisConnection'

Use getp instead of dot notation to access properties.
```

Create a Cache When There are Multiple Connections to a Persistence Service

When you have multiple connections to a persistence service, create a cache by specifying the connection name associated with the service you want to use.

```
ctrl_1 = mps.cache.control('myRedisConnection1','Redis','Port',4519)
start(ctrl_1)
ctrl_2 = mps.cache.control('myRedisConnection2','Redis','Port',4520)
start(ctrl_2)
c = mps.cache.connect('myCache','Connection','myRedisConnection1')

c =

RedisCache with properties:

          Host: 'localhost'
          Port: 4519
          Name: 'myCache'
    Operations: "read | write | create | update"
     LocalKeys: {}
    Connection: 'myRedisConnection1'

Use getp instead of dot notation to access properties.
```

Input Arguments

cacheName — Cache name to connect to or create
character vector

Cache name to connect to or create, specified as a character vector.

Example: `'myCache'`

`connectionName` — Name of connection
character vector

Name of connection to persistence service, specified as a character vector.

Example: `'Connection','myRedisConnection'`

Output Arguments

`c` — Data cache object
persistence provider-specific data cache object

A persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

See Also
`mps.cache.DataCache`

Introduced in R2018b

mps.cache.control

Create a persistence service controller object

Syntax

```
ctrl = mps.cache.control(connectionName,Provider,'Port',num)
ctrl = mps.cache.control(connectionName,Provider,'Folder',
folderPath)
```

Description

`ctrl = mps.cache.control(connectionName,Provider,'Port',num)` creates a persistence service controller object using a connection to a persistence service specified by `connectionName`, a persistence provider specified by `Provider`, and a port number `num` for the service.

`ctrl = mps.cache.control(connectionName,Provider,'Folder',
folderPath)` creates a persistence service controller object that uses a folder specified by `folderPath` as a database.

Use this syntax when you want to use MATLAB as a persistence provider for testing purposes.

Examples

Create a Redis Service Controller

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519)

ctrl =

  Controller with properties:

    ActiveConnection: False
```

```
     ManageService: Unknown
              Host: 'localhost'
              Port: 4519
        Operations: "read | write | create | update"
      ProviderName: 'Redis'
    ConnectionName: 'myRedisConnection'
```

Create a MATLAB Service Controller

```
mctrl = mps.cache.control('myMATFileConnection','MatlabTest','Folder','c:\tmp')

mctrl =

  Controller with properties:

    ActiveConnection: False
       ManageService: Unknown
              Folder: 'c:\tmp'
          Operations: "read | write | create | update"
        ProviderName: 'MatlabTest'
      ConnectionName: 'myMATFileConnection'
```

Input Arguments

connectionName — Name of the connection
character vector | string

Name of the connection to the persistence service, specified as a character vector.

The connectionName links a MATLAB session to a persistence service.

Example: 'myRedisConnection'

Provider — Name of the persistence provider
'Redis' | 'MatlabTest'

Name of the persistence provider, specified as a character vector.

You can use MATLAB as a persistence provider for testing purposes. If you use MATLAB as a persistence provider, specify the provider name as 'MatlabTest'.

Example: 'Redis'

Example: `'MatlabTest'`

num — Port number
positive scalar

Port number for the persistence service.

Example: `'Port', 4519`

folderPath — Storage folder path
character vector

Storage folder path, specified as a character vector.

Specify this input only when you want to use MATLAB as a persistence provider for testing purposes. A folder specified by `folderPath` serves as a database.

Example: `'Folder','c:\tmp'`

Output Arguments

ctrl — Persistence provider service controller object
`mps.cache.Controller` object

Persistence provider service controller returned as a `mps.cache.Controller` object.

See Also
`mps.cache.Controller` | `restart` | `start` | `stop`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

mps.sync.mutex

Create a persistence service mutex

Syntax

```
lk = mps.sync.lock(mutexName,'Connection',connectionName,Name,Value)
```

Description

`lk = mps.sync.lock(mutexName,'Connection',connectionName,Name,Value)` creates a database advisory lock object.

Examples

Create a Redis Mutex

First, create a persistence service controller object and use that object to start the persistence service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
```

Use the connection name to create a persistence service mutex.

```
lk = mps.sync.mutex('myMutex','Connection','myRedisConnection')

lk =

  TimedRedisMutex with properties:

        Expiration: 10
```

```
    ConnectionName: 'myRedisConnection'
          MutexName: 'myMutex'
```

Input Arguments

mutexName — Mutex name
character vector

Name of persistence service mutex, specified as a character vector.

Example: `'myMutex'`

connectionName — Name of connection
character vector

Name of connection to persistence service, specified as a character vector.

Example: `'Connection','myRedisConnection'`

Name-Value Pair Arguments

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

Example: `'Expiration', 10`

Expiration — Time in seconds
positive integer

Expiration time in seconds after the lock is acquired.

Other clients will be able to acquire the lock even if you do not release it.

Example: `'Expiration', 10`

Output Arguments

lk — Mutex object
persistence service mutex object

A persistence service mutex object. If you use Redis as your persistence provider, `lk` will be a `mps.sync.TimedRedisMutex` object. If you use MATLAB as your persistence provider, `lk` will be a `mps.sync.TimedMATFileMutex` object.

Tips

*   A persistence service mutex allows multiple clients to take turns using a shared resource. Each cooperating client creates a mutex object with the same name using a connection to a shared persistence service. To gain exclusive access to the shared resource, a client attempts to acquire a lock on the mutex. When the client finishes operating on the shared resource, it releases the lock. To prevent lockouts should the locking client crash, all locks expire after a certain amount of time.
*   Acquiring a lock on a mutex prevents other clients from acquiring a lock on that mutex but it does not lock the persistence service or any keys or values stored in the persistence service. These locks are advisory only and are meant to be used by cooperating clients intent of preventing data corruption. Rogue clients will be able to corrupt or delete data if they do not voluntarily respect the mutex locks.

See Also
`acquire` | `mps.sync.TimedMATFileMutex` | `mps.sync.TimedRedisMutex` | `own` | `release`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

own

Check ownership of advisory lock on a persistence service mutex object

Syntax

`TF = own(lk)`

Description

`TF = own(lk)` returns a logical `1` (`true`) if you own an advisory lock on the persistence service mutex, and returns a logical `0` (`false`) otherwise.

Examples

Check If You Own the Advisory Lock

First, create a persistence service controller object and use that object to start the persistence service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
```

Use the connection name to create a persistence service mutex.

```
lk = mps.sync.lock('myDbLock','Connection','myRedisConnection')
```

Check if you own the advisory lock.

```
TF = own(lk)

TF =

  logical
```

```
0
```

Input Arguments

lk — Mutex object
persistence service mutex object

A persistence service specific mutex object. If you use Redis as your persistence provider, lk will be a `mps.sync.TimedRedisMutex` object. If you use a MATLAB as your persistence provider, lk will be a `mps.sync.TimedMATFileMutex` object.

Output Arguments

TF — Logical value
logical array

TF has a logical `1` (`true`) if you own the advisory lock on the persistence service mutex, and a logical `0` (`false`) otherwise.

See Also
`acquire` | `mps.sync.TimedMATFileMutex` | `mps.sync.TimedRedisMutex` | `mps.sync.mutex` | `release`

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

ping

Test whether the persistence service is reachable

Syntax

```
ping(ctrl)
```

Description

ping(ctrl) tests whether the persistence service is reachable. In order to ping a persistence service, it must be started and attached to yourMATLAB session.

Examples

Ping Persistence Service

Test whether the persistence service is reachable.

First, create a persistence service controller object and use that object to start the persistence service. Once you have a persistence service running, you can ping the service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
ping(ctrl)

Sending ping to Redis on localhost:4519.
Redis service running on localhost:4519.

ans =

  logical
```

```
1
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a mps.cache.Controller object.

Example: ping(ctrl)

See Also

restart | start | stop

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

purge

Flush all local data to the persistence service

Syntax

```
purgedKeys = purge(c)
```

Description

`purgedKeys = purge(c)` flushes all local data to the persistence service and removes it locally.

Examples

Flush All Local Data to the Persistence Service

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Retain a few keys locally. For more information, see `retain`.

```
retain(c, {'keyOne','keyTwo'})
```

Modify the local keys and purge the data. Display the keys and values in the cache as a MATLAB table.

```
put(c,'keyOne',rand(3),'keyTwo', eye(10))
purgedKeys = purge(c)
```

```
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})
display(c)

purgedKeys =

  2×1 cell array

    {'keyOne'}
    {'keyTwo'}


tt =

  5×2 table

      Keys           Values

    _____    _____

    'keyFive'     [ 5×5  double]
    'keyFour'     [ 1×2  double]
    'keyOne'      [ 3×3  double]
    'keyThree'    [          30]
    'keyTwo'      [10×10 double]


c =

RedisCache with properties:

          Host: 'localhost'
          Port: 4519
          Name: 'myCache'
    Operations: "read | write | create | update"
     LocalKeys: {}
    Connection: 'myRedisConnection'

Use getp instead of dot notation to access properties.
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

Output Arguments

purgedKeys — Purged keys
cell array of character vectors

List of keys that were written to the persistence service, returned as a cell array of character vectors.

See Also

`clear` | `flush` | `keys` | `length` | `remove` | `retain`

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

put

Write key-value pairs to cache

Syntax

```
put(c,key1,value1,...,keyN,valueN)
put(c,keySet,valueSet)
```

Description

`put(c,key1,value1,...,keyN,valueN)` writes key-value pairs to cache. You can store any type of MATLAB data in a cache.

`put(c,keySet,valueSet)` writes key-value pairs to cache with keys from by `keySet`, each mapped to a corresponding value from `valueSet`. The input arguments `keySet` and `valueSet` must have the same number of elements, with `keySet` having elements that are unique.

Examples

Write a Series of Key-Value Pairs to Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache and display them as a MATLAB table.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})

tt =
```

```
    5×2 table

        Keys              Values
      _____       _____

      'keyFive'         [5×5 double]
      'keyFour'         [1×2 double]
      'keyOne'          [          10]
      'keyThree'        [          30]
      'keyTwo'          [          20]
```

Write a Set of Keys and Corresponding Values to Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add a set of keys and corresponding values to the cache and display them as a MATLAB table.

```
keySet = {'keyOne','keyTwo','keyThree','keyFour','keyFive'}
valueSet = {10, 20, 30, [400 500], magic(5)}
put(d,keySet,valueSet)
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})
```

```
tt =

    5×2 table

        Keys              Values
      _____       _____

      'keyFive'         [5×5 double]
      'keyFour'         [1×2 double]
      'keyOne'          [          10]
```

```
'keyThree'     [          30]
'keyTwo'       [          20]
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: c

key — Key
character vector

Key to add, specified as a character vector.

Example: `'keyFour'`

value — Value
array

Value, specified as an array. `value` can be any valid MATLAB data type.

Example: [400, 500]

keySet — Keys
cell array of character vectors

Keys, specified as a cell array of character vectors.

Example: {'keyOne','keyTwo','keyThree','keyFour','keyFive'}

valueSet — Values
cell array

Values, specified as comma-separated cell array. Each value may be any valid MATLAB data type.

Example: {10, 20, 30, [400 500], magic(5)}

See Also

bytes | clear | get | keys | length | remove

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

release

Release advisory lock on persistence service mutex

Syntax

```
TF = release(lk)
```

Description

`TF = release(lk)` releases an advisory lock on a persistence service mutex. If the lock expires before you release it, `release` returns a logical `0` `(false)`. If this occurs, it may indicate potential data corruption.

Examples

Release Advisory Lock

First, create a persistence service controller object and use that object to start the persistence service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
```

Use the connection name to create a persistence service mutex.

```
lk = mps.sync.lock('myDbLock','Connection','myRedisConnection')
```

Try to acquire advisory lock. If lock is unavailable, retry acquiring for 20 seconds.

```
acquire(lk, 20);
```

Release lock.

```
TF = release(lk)
```

```
TF =

  logical

   1
```

Input Arguments

lk — Mutex object
persistence service mutex object

A persistence service specific mutex object. If you use Redis as your persistence provider, lk will be a mps.sync.TimedRedisMutex object. If you use a MATLAB as your persistence provider, lk will be a mps.sync.TimedMATFileMutex object.

Output Arguments

TF — Logical value
logical array

TF has a logical 1 (true) if releasing the advisory lock was successful, and a logical 0 (false) otherwise.

See Also
acquire | mps.sync.TimedMATFileMutex | mps.sync.TimedRedisMutex | mps.sync.mutex | own

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

remove

Remove keys from cache

Syntax

```
num = remove(c,keys)
```

Description

`num = remove(c,keys)` removes keys and associated values from cache. There is no way to recover removed keys.

Examples

Remove Keys from Cache

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache and display them as a MATLAB table.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})

tt =

  5×2 table

     Keys          Values
    _____    _____

    'keyFive'    [5×5 double]
```

```
    'keyFour'      [1×2 double]
    'keyOne'       [        10]
    'keyThree'     [        30]
    'keyTwo'       [        20]
```

Remove two keys from cache `c` and display the remaining keys and values in the cache as a MATLAB table.

```
num = remove(c,{'keyThree','keyFour'})
tt = table(keys(c), get(c,keys(c))','VariableNames',{'Keys','Values'})

num =

  int64

   2


tt =

  3×2 table

     Keys           Values
    _____     _____

    'keyFive'    [5×5 double]
    'keyOne'     [        10]
    'keyTwo'     [        20]
```

Input Arguments

c — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: c

keys — Keys to remove
cell array of character vectors

Keys to remove from cache, specified as a cell array of character vectors.

Example: {'keyThree','keyFour'}

Output Arguments

num — Number of keys removed
integer

Number of keys removed, returned as an integer.

See Also

clear | get | keys | purge | put | retain

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

restart

Restart a persistence service and attach it to a MATLAB session

Syntax

```
restart(ctrl)
```

Description

`restart(ctrl)` restarts a persistence service represented by `ctrl`. You only restart a services you originally started using `start`.

Examples

Restart a Persistence Provider

Restart a persistence service.

First, create a persistence service controller object and use that object to start the persistence service. Once you have a persistence service running, you can then restart it.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
restart(ctrl)
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a `mps.cache.Controller` object.

Example: `restart(ctrl)`

See Also

attach | detach | start | stop

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

retain

Store remote keys from cache locally or return locally stored keys

Syntax

```
retain(c,remoteKeys)
localKeys = retain(c)
```

Description

`retain(c,remoteKeys)` stores keys from cache locally.

`localKeys = retain(c)` returns a cell array of keys stored locally.

Examples

Store Keys from Cache Locally and Check Local Keys

Start a persistence service that uses Redis as the persistence provider. The service requires a connection name and an open port. Once the service is running, you can connect to the service using the connection name and create a cache.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
c = mps.cache.connect('myCache', 'Connection', 'myRedisConnection');
```

Add keys and values to the cache.

```
put(c,'keyOne',10,'keyTwo',20,'keyThree',30,'keyFour',[400 500],'keyFive',magic(5))
```

Retain a few keys locally and check local keys.

```
retain(c,{'keyThree','keyFour'})
localKeys = retain(c)

localKeys =
```

```
1×2 cell array

  {'keyThree'}    {'keyFour'}
```

Input Arguments

`c` — Data cache
persistence provider specific data cache object

A data cache represented by a persistence provider specific data cache object.

Currently, Redis and MATLAB are the only supported persistence providers. Therefore, the cache objects will be of type `mps.cache.RedisCache` or `mps.cache.MATFileCache`.

Example: `c`

`remoteKeys` — Keys
cell array of character vectors

Remote keys to store locally, specified as a cell array of character vectors.

Example: `{'keyThree','keyFour'}`

Output Arguments

`localKeys` — Keys
cell array of character vectors

Locally stored keys, returned as a cell array of character vectors.

Tips

- As a performance optimization you may choose to temporarily store a set of keys and their values in your MATLAB session or worker instead of the persistence service. Keys *retained* in the this fashion will be automatically written to the persistence service (see `flush`) when MATLAB exits or when the first function call returns.
- Manually control the lifetime of retained keys with the `flush` and `purge` methods.

See Also

clear | flush | purge | remove

Topics

"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

start

Start a persistence service and attach it a to MATLAB session

Syntax

```
start(ctrl)
```

Description

`start(ctrl)` starts a persistence service represented by `ctrl` and attaches it to a current MATLAB session.

- To make a persistence service available in a MATLAB session, the service must be started and then attached to the MATLAB session. `start` performs both these actions.
- If a persistence service has already been started, there is no need to call `start`. Use `attach` instead.
- `start` and `stop`, `attach` and `detach` must be used in pairs.
- If you connected a persistence service to your MATLAB session with `start`, you must disconnect with `stop`.
- If you connected with `attach`, you must disconnect with `detach`.

Examples

Start a Persistence Service

Start a persistence service.

First, create a persistence service controller object and use that object to start the persistence service.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a `mps.cache.Controller` object.

Example: `start(ctrl)`

See Also
attach | detach | restart | stop

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

stop

Stop a persistence service and detach it from a MATLAB session

Syntax

```
stop(ctrl)
```

Description

`stop(ctrl)` stops a persistence service represented by `ctrl` and detaches it from a current MATLAB session.

- You cannot stop a service that has not been started.
- You can only stop a service that has been started using `start`.
- Exiting MATLAB will automatically call `stop` on all persistence services that were started using `start`.

Examples

Stop a Persistence Service

Stop a persistence service.

First, create a persistence service controller object and use that object to start the persistence service. Once you have a persistence service running, you can then stop it.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
stop(ctrl)
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a mps.cache.Controller object.

Example: stop(ctrl)

See Also

attach | detach | restart | start

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b

version

Version number for persistence provider

Syntax

```
version(ctrl)
```

Description

`version(ctrl)` returns the version number for the persistence provider. In order to get the version number of the persistence provider, the persistence service must be started and attached to yourMATLAB session.

Examples

Get Version Number

Get the version number of the persistence provider that the persistence service is connected to.

First, create a persistence service controller object and use that object to start the persistence service. Once you have a persistence service running, you can get the version number.

```
ctrl = mps.cache.control('myRedisConnection','Redis','Port',4519);
start(ctrl)
version(ctrl)
```

```
Redis version: 3.0.504
```

Input Arguments

ctrl — Service controller
mps.cache.Controller object

Persistence service controller, represented as a `mps.cache.Controller` object.

Example: `version(ctrl)`

See Also

restart | start | stop

Topics
"Use a Data Cache to Persist Data" (MATLAB Production Server)

Introduced in R2018b