



Mathcad Calculation Server Installation and Administration Guide

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About This Guide

- ◆ About Mathcad Calculation Server
- ◆ Before You Install

About Mathcad Calculation Server

Introduction to Mathcad Calculation Server

The *Mathcad Calculation Server Installation and Administration Guide* contains important information about installing and administrating Mathcad Calculation Server.

Mathcad Calculation Server is a Web-based product that allows Mathcad users within an organization to distribute Mathcad worksheets to a broad audience, with minimal effort and low IT system management. Incorporated with Mathcad, the Mathcad Calculation Server helps you to capture, manage, and share calculations, data, and engineering knowledge throughout — or even beyond — the enterprise.

Using a standard Web browser, users can view and interact with Mathcad documents located on the Mathcad Calculation Server. Users work interactively with worksheets, changing variables through the use of HTML form fields, rather than the Mathcad live editor, thus removing any requirements for either learning Mathcad or installing Mathcad on client systems. The Mathcad Calculation Server supports all built-in math functionality within Mathcad for faithful presentation of worksheets, in addition to support for installed user EFIs. Mathcad Calculation Server does not replace the full power and interactivity of Mathcad on the desktop, but rather is a way to present Mathcad content to users without requiring the use of Mathcad.

Mathcad Calculation Server gives users the ability to recalculate worksheets with different parameters without requiring any special plug-ins installed on the client's computer system. During a user session, previously authored Mathcad worksheets, hosted on the server, are calculated and delivered to the user's browser. Users define designated input parameters through the use of HTML form fields. Updates are sent to the server, which recalculates the worksheet and updates the Web page with the new results. Users are free to recalculate Mathcad documents an unlimited number of times in a single browser session.

Other Sources of Information

The following other sources of information may prove helpful as you install, configure, and administer Mathcad Calculation Server:

- The *Mathcad Calculation Server Home Page*: a map of your Mathcad Calculation Server Web site. This page includes links to sample worksheets, the *Administration Tool* for controlling the appearance of presented worksheets, and the *Authoring Guide* for customizing worksheets for use with Mathcad Calculation Server.
- The *Mathcad User's Guide*: an overview of the features available in Mathcad to help users create effective worksheets. A PDF version is under the **Help** menu.

- *Mathcad Online Help*: detailed information to help users take advantage of Mathcad features with links to example files.
- The Technical Support *Mathcad Knowledge Base*: a listing of known issues with Mathcad and licensing, their causes, and applicable solutions (login required):

<http://www.ptc.com/go/mathsoft/support/kb/>.

Technical Support

Contact PTC Technical Support if you encounter problems using the software. Contact information for PTC Technical Support is available on the PTC Customer Support Site:

<http://www.ptc.com/support/>

You must have a Service Contract Number (SCN) to receive technical support. If you do not have an SCN, contact PTC using the instructions found in the *PTC Customer Service Guide* under “Technical Support.”

http://www.ptc.com/support/cs_guide.

Comments

We welcome your suggestions and comments on our documentation. Please submit your feedback to mathcad-doc@ptc.com.

When you submit feedback, remember to include the release number and name of the documentation piece with your comments.

Before You Install

Server Software Requirements

- Windows[®] 2003 Server.
- Internet Information Services (IIS) 5.0 or later.
- Microsoft Data Access Component (MDAC) 2.6 or later.*
- Microsoft .NET Framework 2.0.*
- DirectX 9 or later.*
- MS XML 4.0 SP2 or later.*

* Prerequisite software is included on the Mathcad Calculation Server CD.

Client Software Requirements

- Internet Explorer 6.0 or later. Other HTML 4.01-compliant browsers may work, but are not supported.

Internet Explorer 6.0 is provided on the Mathcad Calculation Server CD.

Authoring Requirements

- Mathcad Calculation Server requires the use of Web Controls for user interaction. Web Controls are available in Mathcad 11 Enterprise Edition Service Release 1, and Mathcad 12 and higher versions.

Information on using Web Controls is available from the *Authoring Guide*, found on your Mathcad Calculation Server Web site and in the on-line Mathcad help.

Server Hardware Requirements

Because the Mathcad Calculation Server is an IIS add-in, you should rely on Microsoft's recommendations to calculate loads. The Mathcad Calculation Server allows for up to 20 simultaneous active users (or 20 active one-minute long Mathcad sessions in which worksheets are being recalculated and rendered). You can use a computer that meets the minimum system requirements in the table below. If you anticipate more activity, the Mathcad Calculation Server should run on a system with the recommended resources listed below. The number of simultaneous active users can be increased or decreased by tuning the server.

Minimum System Requirements	Recommended System Requirements
800 MHz processor	Dual 2 GHz processors
512 MB RAM	1 GB RAM

- 550 MB free disk space for Mathcad Calculation Server installation, plus space for worksheet storage.
- CD-ROM or DVD drive.

Information on session loads can be found in "Performance Tuning" on page 8.

Mathcad Calculation Server

- ◆ Installing Mathcad Calculation Server
- ◆ Administrating Mathcad Calculation Server

Installing Mathcad Calculation Server

Things to Know Before You Install

- Mathcad Calculation Server should not be installed on any computer that is used as a Mathcad workstation.
- A MCSUser account will be created for installation. These are permissions and settings applied:

DCOM (Mathcad Calculation Server, AppID
{6771DD99-583C-4f13-9601-FDBBBF27B90F})

- Identity (RunAs): MCSUser
- Launch permission: Granted to ASPNET (IIS5)/Network Service (IIS6)
- Access permission: Granted to ASPNET (IIS5)/Network Service (IIS6)

NTFS Permissions on the [Mathcad application root]\Sessions directory:

- Grant full control to MCSUser
- Grant full control to ASPNET (IIS5)/Network Service (IIS6)

If you want to use a different user, you must match the above settings and permissions.

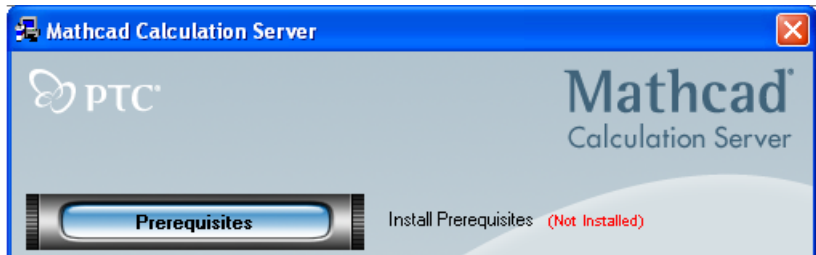
- Installation may require a reboot.
- If you are installing Mathcad Calculation Server on Windows 2003 Server/Advanced Server, you must disable the Internet Explorer Enhanced Security Configuration. To do so, open the **Add or Remove Programs** control panel and click **Add/Remove Windows Components**. In the **Windows Components Wizard**, deselect the “Internet Explorer Enhanced Security Configuration” option and click **Next**. Click **Finish** to exit the wizard.
- The MCS Authors user group is created during installation. Add authenticated users who will require access to the administration tool to this group. See “Administration Tool and Query String Override” on page 13.

Mathcad Calculation Server Prerequisite Installation

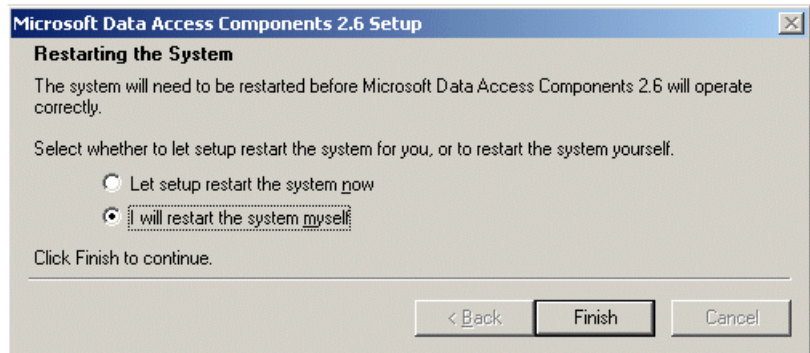
To begin installing prerequisite software:

1. Log in as a user with full administrative privileges (a member of, at least, the local system’s Administrator group).

2. Load the Mathcad Calculation Server CD. If the Installation Wizard does not automatically launch, browse to the root directory of the CD and double-click **setup.exe**.
3. Confirm the prerequisites. When the installer initializes, it checks for the correct versions of Microsoft Internet Information Service (IIS), Microsoft Data Access Components (MDAC), DirectX, and .NET Framework. If the infrastructure components are in place, a green **Installed** notation is displayed beside the **Prerequisites** button. If one or more of the elements are missing, a red **Not Installed** notation is displayed, as shown below.



4. If the **Not Installed** notation is displayed, click **Prerequisites** to obtain the latest version of any prerequisite software from the Microsoft Web site.
 - a) If MDAC is to be installed a dialog box may appear advising you to shutdown Microsoft Internet Information Service and **svchost.exe**. For installation to proceed properly, do **NOT** shut down these applications.



- b) Once you install MDAC, you may be prompted to restart your system. Select “I will restart the system myself.”
- c) Follow the prompts to install any remaining prerequisite applications.
- d) Installation of MDAC or DirectX 9 **requires a system reboot** at this time. If neither application was installed during this process, proceed to the installation of the Mathcad Calculation Server software.

Mathcad Calculation Server Software Installation

Upgrading from Mathcad Application Server

If you are installing Mathcad Calculation Server over an existing Mathcad Application Server installation, you should first manually uninstall Mathcad Application Server. To do so:

1. Back up the contents of your **Worksheets** directory (for example, “C:\Inetpub\wwwroot\MAS\Worksheets”).
2. Uninstall the Web Components for Mathcad Application Server.
3. Uninstall Mathcad Application Server.

Once you uninstall Mathcad Application Server, confirm that the contents of the Web service folder (for example, “C:\Inetpub\wwwroot\MAS”) and application folder (for example, “C:\Program Files\Mathsoft\Mathcad 13”) have been deleted, and proceed with the following installation instructions.

To begin installation of Mathcad Calculation Server:

1. Click **Mathcad Calculation Server** to install.
2. Click **Next** on the Mathcad Calculation Server Setup Wizard to begin installation.
3. Accept terms of the license agreement by selecting “I accept the terms of the license agreement,” and click **Next**. If you do not agree with the terms of the agreement, click **Cancel** to halt installation.
4. Select a destination location., and click **Next**.
5. Click **Install** to begin the installation of files.
6. Click **Finish** and proceed to installation of Mathcad Calculation Server Web Components.

Mathcad Calculation Server Web Components Set Up

1. Click **Mathcad Web Components** to begin installation.
2. Select the language for the installed documentation, and click **Install**. Installed documentation includes this *Installation and Administration Guide* and the *Authoring Guide*. This setting affects neither the appearance of the Mathcad Calculation Server Web site, nor the worksheets you serve with it.
3. Click **Next** to enter the Mathcad Calculation Server Setup Wizard.
4. Select the virtual directory and Site to create for your Mathcad Calculation Server installation. In most situations, the default entries should be acceptable.
5. Follow the remaining on-screen instructions until installation is complete.
6. You may be required to reboot the system.

To test the installation of Mathcad Calculation Server, launch Internet Explorer and enter <http://localhost/mcs> in the address bar. You *must* open the page through an HTTP path, rather than directly through Windows Explorer. Internet Explorer should open the Mathcad Calculation Server home page:

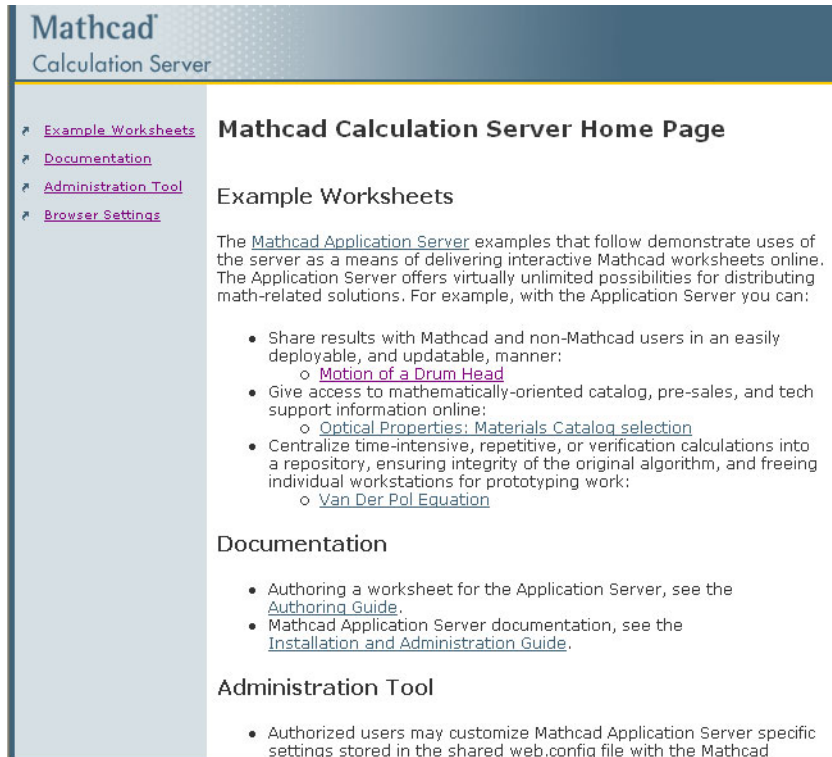


Figure 1: The Mathcad Calculation Server home page contains links to sample worksheets, documentation, and administration tools.

Completing an Upgrade from Mathcad Application Server

If you upgraded from Mathcad Application Server, copy your Application Server **Worksheets** directory (C:\inetpub\wwwroot\MAS\Worksheets\) to your Mathcad Calculation Server installation (C:\inetpub\wwwroot\MCS\Worksheets\). Instruct users to point to the Mathcad Calculation Server Web site.

Troubleshooting

If you are having problems with ASP.NET configuration, refer to the Microsoft library at <http://msdn.microsoft.com/library/> and search for ASP.NET configuration.

Adminstrating Mathcad Calculation Server

How It Works

Mathcad Calculation Server allows users to view and interact with Mathcad worksheets through a Web browser. Worksheets authored with Mathcad are saved to the server in a supported format — either MCD, XMCD, or XMCDZ — and dynamically rendered as HTML by Mathcad Calculation Server when requested by a client browser via the HTTP protocol. Interactivity is enabled through the use of Web Controls (list boxes, text boxes, and so on), which must be defined in the Mathcad worksheet when authored with Mathcad. Mathcad Calculation Server processes the Mathcad worksheet with data received from these controls whenever the end user submits a request, and returns the calculated response to the Web browser for display.

Mathcad Calculation Server runs on Windows Server or Advanced Server under IIS. The installation creates a virtual directory in an existing IIS web site. Several further subdirectories are also installed to store important working elements of the software including the MCS Custodian Service, the configuration file (**Web.config**) for customization of ASP.NET and Mathcad Calculation Server-specific settings, and suggested folders for storing the site's Mathcad worksheets and template files. The configuration file may be edited in a text editor and its author-specific settings can be manipulated through the Administration Tool.

The following sections will guide you through installation, customization, and end user support. Mathcad authors looking for information about creating Mathcad Calculation Server-ready files should view the *Authoring Guide* under the **Documentation** subfolder of the Server installation.

Mathcad Calculation Server Components

Custodian Service

The installation program sets up a service, **MCSCustodian**, that controls Mathcad resource usage and monitors and corrects the health of Mathcad instances.

Performance Tuning

Each user session serviced by Mathcad Calculation Server is associated with a running instance of the computation engine (**MCServer.exe**). A user session begins when the browser makes its first request for a Mathcad worksheet and ends after approximately one minute of inactivity. A recalculation request from a browser within the one-minute timeout period will reset the timeout clock to zero. Therefore a user can theoretically keep a session (and its associated calculation engine) alive indefinitely by making at least one request per minute. In order to preserve CPU bandwidth, server RAM, and other limited system resources, the MCSCustodian service places an upper limit on the number of computation engine instances that can be running simultaneously. Once this upper limit has been reached, the next incoming request will wait for an existing instance to shut down through the timeout process before proceeding. If this has not occurred within 180 seconds, the request will fail with a "Server Busy" error. Since more capable server hardware will, in general, be able to service more sessions

simultaneously, this upper limit parameter is configurable by the system administrator. To change this setting:

1. In the Mathcad Calculation Server **bin** subfolder (usually **C:\inetpub\wwwroot\MCS\bin**), find the file named **MCSCustodian.exe.config**.
2. Open this file in Notepad.
Add the following XML tag(s) to the file (the <configuration> and <appSettings> tags may already exist).

```
<configuration>
  <appSettings>
    <add key="MaxServerInstances" value="25"/>
  </appSettings>
</configuration>
```

The `value="25"` attribute defines the upper limit of computation engine instances to be 25. Substitute a value appropriate for your server hardware and the computational complexity of the worksheets being served.

3. Stop and restart the MCSCustodian service by issuing the following commands in a Command Prompt window:

```
NET STOP MCSCustodian
NET START MCSCustodian
```

Mathcad Calculation Server

Configuring and maintaining a Mathcad Calculation Server requires an understanding of three main areas:

1. Mathcad Calculation Server directory structure.
2. Server settings.
3. Application settings in **Web.config**.

Directory Structure

The Mathcad Calculation Server installer creates a fixed directory structure under an existing IIS web site. This directory structure contains several important working elements:

- The **AppData** subdirectory caches the compiled calculations for accessed worksheets.
- The **bin** subdirectory contains .NET assemblies.
- The **Documentation** subdirectory contains technical material for installers, administrators, and Mathcad authors.
- The **image_cache** subdirectory stores the PNG or JPEG representations of math regions for improved performance when redisplaying a worksheet.
- The **Images** subdirectory contains static graphics files used by the provided templates. When uploading your own templates, you can store any associated graphics here as well.
- The **Sessions** subdirectory contains temporary per-session files.

- The **Templates** subdirectory contains sample Mathcad templates.
- The **Worksheets** subdirectory contains sample worksheets and other subdirectories for worksheet organization.
- **ConfigEditor.aspx**, the Administration Tool for the Mathcad Calculation Server Web site. See “Administration Tool and Query String Override” on page 13.
- **Web.config**, an ASP.NET XML configuration file that defines ASP.NET settings and customizable Mathcad computation engine behaviors. See “The Web.config Configuration File” on page 11.

Note The **Templates** and **Worksheets** directories are created on installation to serve as a working model of a functional directory structure. Alternative directories or subdirectories can be created for template and worksheet organization.

Server Settings

In addition to creating these subdirectories and installing control files, a number of other server and IIS settings are manipulated during the initial installation:

- A Windows service, the **Mathcad Calculation Server Custodian Service**, is installed with the service name **MCSCustodian**. It runs as SYSTEM and provides resource allocation and server health monitoring services to the Calculation Server. The service is set to run automatically when Windows starts up and is required for the Calculation Server to function.
- A user account called **MCSUser** is created. The Mathcad computation engine runs under this account, which is a member of the local Users group.
- **DCOM Identity settings**. The Mathcad computation engine (MCServer.exe) is set to run under the MCSUser account.
- **DCOM Launch and Access privilege settings**. The .NET classes interact with Mathcad via DCOM automation. Because ASP.NET runs under a non-privileged user account (ASPNET/Network Service), this user must have permission to launch and access the Mathcad computation engine, and these are considered DCOM privileges despite running on the same machine.
- A Windows event source named **MCS** is created to allow the server to log errors to the Windows Event Log.
- Both the **MCSUser** and **ASPNET/Network Service** accounts receive NTFS privileges granting them full control over the Sessions subdirectory. Temporary per-session subdirectories are created to store HTML and image files generated by the Mathcad computation engine as it converts the worksheets for the client browser.
- In the IIS metabase settings, the .mcd, .xmcd, .xmcdz, and .masfolder file extensions, which have specific meanings to Mathcad Calculation Server, are mapped to the aspnet_isapi.dll ISAPI filter.

Note When equations in worksheets are converted to graphics for display, they are converted at the resolution of the server's screen display. Therefore, the screen display settings should be set to a high, but standard, resolution to ensure that graphics are both legible and in an appropriate physical size within a browser window.

The Web.config Configuration File

Web.config allows for the customization of ASP.NET and Mathcad Calculation Server-specific settings. **Web.config** defines the default settings for the entire website and can specify override information for directories or individual worksheets that require configurations different from the default. Setting overrides for any particular subdirectory will cascade down to all files and subdirectories below.

A sample **Web.config** file is shown below. The file sets the default settings for the entire Mathcad Calculation Server in the upper <mcsSettings> element, and for a specific worksheet that uses unique settings in the second <mcsSettings> element that is nested within the <location path ... > element.

```

<?xml version="1.0" encoding="UTF-8"?>
<configuration>
  <mcsSettings>
    <rendering>
      <imageOptions format="jpg" quality="75"/>
      <fontOptions unit="px"/>
      <layoutOptions mode="fixed">
        <template path="templates\Report.mlt">
      </layoutOptions>
    </rendering>
    <worksheetSecurity>
      <scriptableRegions enable="false"/>
    </worksheetSecurity>
  </mcsSettings>
  <location path="onefile.xmcd">
    <mcsSettings>
      <rendering>
        <imageOptions format="png"/>
        <fontOptions unit="pt"/>
      </rendering>
    </mcsSettings>
  </location>
  <location path="worksheets/testLibrary">
    <mcsSettings>
      <rendering>
        <template
          path="worksheets\testLibrary\kdstemplate.mlt"/>
        <fontOptions unit="px"/>
        <imageOptions format="png"/>
      </rendering>
    </mcsSettings>
  </location>
</configuration>

```

Within each `<mcsSettings>` element, subelement tags control:

- **Rendering** – how the worksheet is converted to HTML and image files.
- **Worksheet security** – whether scriptable regions within the worksheet are allowed to run.

For more information on ASP.NET-specific settings (for example, configuring custom security settings), visit <http://msdn.microsoft.com/>.

Note Modifications to worksheet rendering and security can be made by directly editing **Web.config**. Worksheet rendering can be controlled by adjusting these settings via the Administration Tool. Worksheet rendering can also be altered on a case-by-case basis within a browser by embedding a query string override within the URL. For more information see “Administration Tool and Query String Override” on page 13.

Rendering Subelement

The Rendering subelement may contain these subelements:

- **<imageOptions format>** specifies how images in the Mathcad worksheet or folder are rendered. Valid settings are **png** or **jpg**.

If **jpg** is used, the image's relative quality may be specified as an integer in the range of 1 to 100, with 100 being the highest quality.

Example:

```
<imageOptions format="jpg" quality="100"/> or
<imageOptions format="png"/>
```

- **<fontOptions unit>** determines how type in the worksheet is rendered, as a fixed number of pixels or as a point size. Valid settings are **px** (for pixels) or **pt** (for points). Mathcad Calculation Server renders equation regions as images, either **jpg** or **png**, as mentioned above. The physical image size as viewed in the browser depends on the resolution of both server and client screens. For example, if the resolution of the client screen is higher than that of the server, the images may appear small. If **pt** is specified there is the possibility of a mismatch between text and math regions, though text will be appropriately sized for client systems.

Example:

```
<fontOptions unit="px"/>
```

- **<template path>** specifies the path to, and name of, the template file to impose on worksheets. The template path is a file system path, not a URL. It will be relative to the web application root (for example, "c:\inetpub\wwwroot\mcs").

Example:

```
<template path "templates\corporate.mlt">
```

worksheetSecurity Subelement

The `worksheetSecurity` subelement contains one subelement, `<scriptableRegions>`, which determines whether scriptable regions within a worksheet may be executed. It allows one attribute, `enable`; valid settings are **true** or **false**.

Example:

```
<scriptableRegions enable="true">
```

Note It is possible to embed data-threatening or malicious code within a script in a worksheet. If you have any doubt about the trustworthiness of the worksheets, this setting should be set to **false**.

Administration Tool and Query String Override

All authors of Mathcad worksheets being processed by Mathcad Calculation Server can be entered into the group MCS Authors, created during installation. Users in this group can use the administration tool to update settings for how a particular Mathcad worksheet displays or to specify the use of a particular template. Users outside of the MCS Authors group can change settings for an individual worksheet by modifying the query string for the worksheet's URL:

```
http://[yourAppServerdomain/path/  
yourworksheet].xmc?TemplatePath=  
templates\mytemplate.mlt
```

The template path is a file system path relative to the Web application root (for example, "c:\inetpub\wwwroot\mcs").

Users can also change the default settings for image type and font rendering when worksheets are displayed to the browser, either through the configuration files or through a query string override embedded within the URL.

- ImageFormat=png or ImageFormat=jpg
- For jpg, set ImageQuality=XX (between 1 and 100)
- FontUnit=px (pixels) or FontUnit=pt (points)
- TemplatePath=templates\mytemplate.mlt

Assign multiple attributes separated by an ampersand:

```
http://domain/mcs/worksheet.xmc?ImageFormat=jpg&ImageQuality=70
```

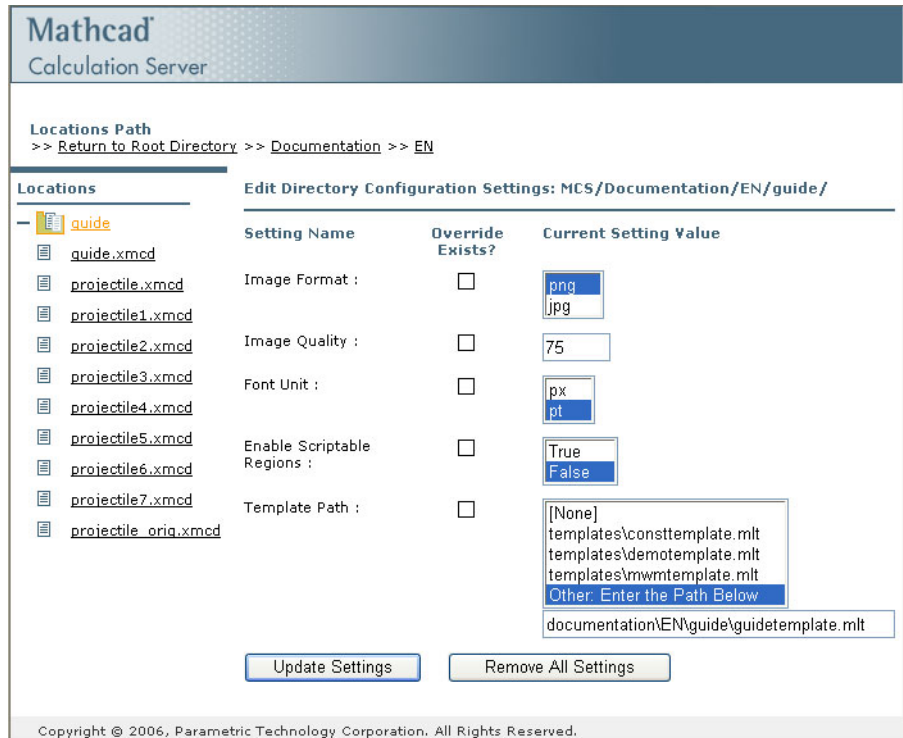



Figure 2: The Mathcad Calculation Server Administration Tool can be used to modify settings for how Mathcad worksheets are displayed.

Supporting End Users

The following section details information that may be useful in supporting Mathcad authors as well as end users of Mathcad Calculation Server.

Client Software

End users may browse worksheets on Mathcad Calculation Server using Internet Explorer 6.0 or later. Other HTML 4.01-compliant browsers may work but are not supported. The following browser settings must be observed:

- Javascript support must be *enabled*.
- Cookies must be *allowed* for the Mathcad Calculation Server Web site. Session cookies are used to keep track of users and worksheet interaction.
- If the browser is set up to refresh the screen display from a locally cached page, inaccurate calculations may result when a worksheet is recalculated. To prevent this, configure the browser to refresh the display on every visit to the page.

You may want to note this requirement on a cover or directory page in the worksheet storage area so that users learn about the requirement when they enter the Mathcad Calculation Server environment.

Authoring

Mathcad users require Mathcad 11 Enterprise Service Release 1, or Mathcad 12 or higher to insert the Web Controls that allow worksheets to be used with Mathcad Calculation Server. Instructions for using the Web Controls are included in the *Mathcad Calculation Server Authoring Guide*, installed as part of the Mathcad Calculation Server documentation and located in the Documentation folder, which is available online from the home page of your Mathcad Calculation Server installation.

Please note that the following features do not work when used in a worksheet viewed with Mathcad Calculation Server:

- Components that interface with third-party applications, such as Microsoft Excel and Intergraph SmartSketch components.
- Animation.
- Creating or editing of math or text regions.
- Editing plot settings.
- Entering data into or editing input tables or scrolling data tables.

After they creating their worksheets, authors need to upload their files to the server. This process depends entirely on your particular file structure and security concerns. A few possibilities include allowing authors to:

- FTP files to the server.
- Map a shared folder on the server to save the files directly.
- Email the worksheets to the webmaster or administrator for upload.