
AIMMS User's Guide - Deploying End-User Applications

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Chapter 16

Deploying End-User Applications

After a successful development phase of your AIMMS application, you have to start thinking about its deployment. For the application to become a successful end-user application too, you, as the application developer, need to consider issues like *protecting your intellectual property*, *authenticating your end-users*, and *distribution* of your application. AIMMS offers various tools to help you in all of these areas.

Deployment considerations

AIMMS offers several levels of protection that can be applied to your application. To protect the content of your model from being viewed by the unauthorized users, AIMMS allows you to encrypt (parts of) your model. To protect the application against unauthorized access you can equip your AIMMS application with a VAR license to tie it to a particular AIMMS license, or a range of AIMMS licenses. To further arrange the appropriate level of access within an organization, you can associate a user database with your AIMMS application, which can then be used to authenticate individual users and provide their level of access to your application. In addition, you can equip your project with a developer password to prevent unauthorized access to the developer version of your application. Protecting your AIMMS application and authenticating its use are discussed in full detail in Chapter 21.

Application protection and authentication

To be able to run an AIMMS project, your users will need a copy of the project itself. To support easy project distribution, an AIMMS project can be compacted and distributed as a single-file project. In addition, your users need to have installed AIMMS on their computer. In order to enter input data and/or run the model, end-users need a commercial license of AIMMS.

Application distribution

To support users who only need to view the results of your model, without the need to (re-)run the model, a completely *free* AIMMS version is available, called the *AIMMS Viewer*. The AIMMS Viewer offers sufficient functionality to allow a user to interactively view the results of an AIMMS application, and even to update data based on *selections* made by the user in the end-user GUI. This makes the AIMMS viewer an ideal tool to demonstrate an end-user application (and its optimization results) to someone else.

The AIMMS Viewer

This chapter gives some background on AIMMS end-user mode, and discusses .aimmspack project files, which you can use to distribute your AIMMS project as a single file. In addition, you will also find a description of the features of the AIMMS Viewer version, as well as the steps necessary to make your project AIMMS Viewer compatible.

This chapter

16.1 Running end-user applications

An AIMMS project can run in two different modes, *developer* mode and *end-user* mode. While the developer mode allows you to use the full functionality described in this User's Guide, the end-user mode only allows you to access the end-user pages of the AIMMS project that were created in developer mode.

Running end-user projects

The AIMMS end-user mode lacks the essential tools for creating and modifying model-based applications. More specifically, the following tools are not available in end-user mode:

Disabled functionality

- the **Model Explorer**,
- the **Identifier Selector**,
- the **Page Manager**,
- the **Template Manager**,
- the **Menu Builder**, and
- the **Data Management Setup** tool.

Thus, in end-user mode, there is no way in which an end-user can modify the contents of your AIMMS-based application.

AIMMS end-users can only perform tasks specified by you as an application developer. Such tasks must be performed through data objects, buttons and the standard, or custom, end-user menus associated with the end-user pages in your project. They include:

Allowed usage

- modifying the input data for your model in the end-user interface,
- executing procedures within your model to read data from an external data source, or performing a computation or optimization step,
- viewing model results in the end-user interface,
- writing model results to external data sources or in the form of printed reports, and
- performing case management tasks within the given framework of data categories and case types.

Thus, an end-user of your application does not need to acquire any AIMMS-specific knowledge. The only requirement is that the interface that you have created around your application is sufficiently intuitive and clear.


Before you can distribute your AIMMS model as an end-user application, two requirements have to be fulfilled:

Requirements

- you must ensure that your modeling application starts up in end-user mode, either using the **Options** dialog box (see Section 22.1) or by *VAR licensing* your application (see Section 21.2), and
- you need to associate a *startup page* with your application which will be displayed when your application is started by an end-user.

For every end-user project, you must associate a single page within the project so that it becomes the project's *startup page*. Such an association can either be made directly by selecting a page for the 'Startup Page' option in the AIMMS **Options** dialog box (see Section 22.1), or implicitly as the first opened page in the *startup procedure* of the project using a call to the PageOpen function.

Assigning a startup page

After opening your project in end-user mode, AIMMS will display the startup page. As all communication between the end-user and your model is conducted through end-user pages of your design, this first page and/or its menus must provide access to all the other parts of your AIMMS application that are relevant for your end-users. If all pages are closed during a session, the end-user can still re-open the startup page using the first page button  on the **Project** toolbar, or via the **View-First Page** menu.

Role of startup page

In addition to a startup page you can also provide a startup procedure in the project-related AIMMS options. Inside the startup procedure you can perform any initializations necessary for an end-user to start working with the project. Such initializations can include setting up date or user related aspects of the project, or reading the data for particular identifiers from a database.

Startup procedure

By default, AIMMS will display a splash screen during startup. When you are opening AIMMS with a particular project, you can replace AIMMS' own splash screen with a bitmap of your choice. If the project directory contains a bitmap (.bmp) file with the same name as the project file, AIMMS will display this bitmap file on the splash screen. In such a bitmap you can display, for instance, version information about your project.

Replacing the splash screen

16.2 Preparing an AIMMS application for distribution

A complete AIMMS application consists of several files (see Section 2.5 for an overview of these files), all of which should also be distributed to the user of the application. To make the distribution of an AIMMS application easier, AIMMS offers the possibility to distribute your project as a single-file project, by packing all relevant files into a single file with the .aimmspack extension.

.aimmspack project files ...

Note that these packed AIMMS files can be used for end-user as well as developer projects. For example, a single-file project is a convenient way to provide your colleague-developer with a copy of your project.

*... for end-user
and developer*

Turning your project into a single-file project is very straightforward. Just select the **File-Export** menu command which will open the **Project Export** dialog box shown in Figure 16.1. Selecting the 'To a Single File' option and pressing the **Export** button will open the **Select Files for Export** dialog box illustrated in Figure 16.2, which allows you to specify the exact list of files to be included in the .aimmspack file.

*Creating a
.aimmspack file*

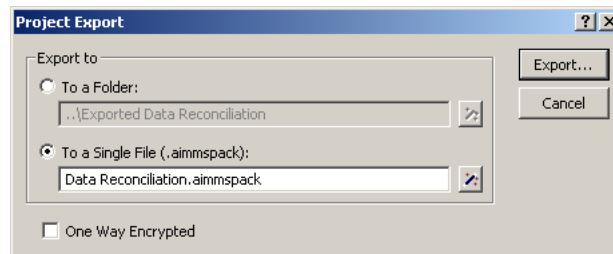


Figure 16.1: The **Project Export** dialog box

If you use the export functionality to distribute your AIMMS project to end-users, then AIMMS offers the option to irreversibly encrypt the project. If you choose this option, and your project does not yet have a VAR license, AIMMS will automatically create a VAR license for the exported project, and lets you (optionally) restrict the access to the exported project as described in Section 21.1.

*One way
encryption*

By default AIMMS will select all files in the project directory to be included in the .aimmspack file while ignoring all files in the Backup and Log directories. All files associated with referenced library projects will also be included. The project (.prj) and model (.amb) files are mandatory while the settings for all other files can be changed through the **Select Files for Export** dialog box (see Figure 16.2). Note that only include files (and folders) that are contained in the main project folder and folders of library projects. If your project refers to files in other locations you must make sure that these files exist on the destination computer.

*The .aimmspack
file contents*

The .aimmspack project files are dealt with as if they were ordinary AIMMS project files. Both the developer and end-user version of AIMMS as well as the AIMMS Viewer are capable of running both .prj and .aimmspack files. Projects that are opened in the Viewer must have been made *viewable* by the developer of the project (see Section 16.3.2 for more details).

*Running a
.aimmspack
project file*

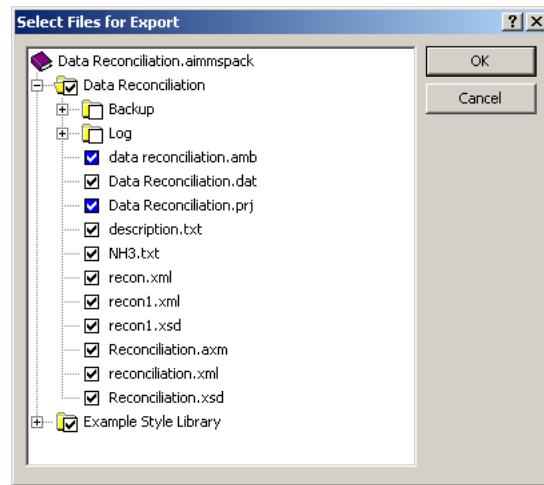


Figure 16.2: The **Select Files for Export** dialog box

When a developer opens a `.aimmspack` project file, he will always be prompted for a location where to unpack the `.aimmspack` project file. When an end-user opens a `.aimmspack` project file for the first time, he will be prompted for a location where to unpack too. Any subsequent time he opens the `.aimmspack` file, AIMMS will look whether the location where the `.aimmspack` file was unpacked previously contains the unpacked version of the same `.aimmspack` file. If so, AIMMS will open the unpacked version without user interaction. Otherwise, AIMMS will prompt the end-user for a (new) location, unpack the `.aimmspack` project and run it with AIMMS. So, when you send your end-user an updated version of a packed project, AIMMS will notice the version change and prompt the end-user with a question whether or not to overwrite the existing project with the new version.

Location of an unpacked .aimmspack project file

When only the AIMMS Viewer has been installed on your computer, the Viewer will be opened upon double clicking `.prj` and `.aimmspack` files. When a developer or end-user version of AIMMS has been installed this version will be used to run the `.prj` and `.aimmspack` files, regardless of whether the Viewer has been installed on the computer. Note that all AIMMS distribution also include a viewer. You can select the particular AIMMS version to use on a `.prj` or `.aimmspack` file through the right-mouse popup menu in Windows Explorer.

Selecting an AIMMS version

16.3 The AIMMS Viewer

The AIMMS Viewer is a freely distributable AIMMS version, which allows everyone to browse the results of an AIMMS-based optimization application via the AIMMS end-user interface of the application. Combined with a single project `.aimmspack` file, the Viewer provides you with a convenient means to distribute

Viewer features

a single file containing a complete interactive report, ready for everyone to view. To protect the confidential data in your report, you can restrict access to the AIMMS project either through the common VAR licensing scheme of AIMMS, or by password protecting the project.

Through an AIMMS Viewer file anyone can display the results of one or more sets of input data or scenarios of your optimization application. It is very suitable to share your results with management without the need to generate reports using specialized reporting tools or to buy additional AIMMS licenses. The AIMMS Viewer can also be used to demonstrate your AIMMS application to potential customers.

Intended usage

Creating a single-file viewable project is similar to creating a single-file project. Instead of selecting the **File-Export** menu command, just select the **File-Export Viewer Project** menu command. This will open the **Export Viewer Project** dialog box shown in Figure 16.3. The dialog box that is opened not only allows you to specify a name for the exported viewable `.aimmspack` file, in addition you can specify the data manager file and startup case to be used when the viewable project is opened. If not specified, the startup case as specified in the project settings is used.

Creating a viewable .aimmspack file

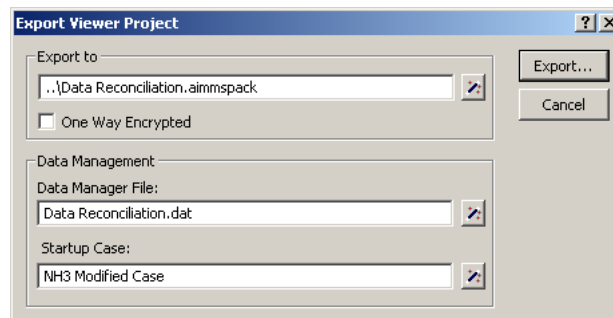


Figure 16.3: The **Export Viewer Project** dialog box

To allow an end-user of a project to present results by means of viewable project (e.g to management) too, the end-user is also allowed to export the project including all changed data through the **File-Export Viewer Project** menu command. When the project has been started from an ordinary `.prj` file, the exported `.aimmspack` file will be created based on the (contents of the) current project folder. The **Select Files for Export** dialog box (see Figure 16.2) will appear and allows the end-user to specify the exact list of files to be included in the exported `.aimmspack` file. When on the other hand the project has been started from an `.aimmspack` file, the exported `.aimmspack` file will be created from the current `.aimmspack` file with the newly selected data manager file and/or startup case as specified by the end-user.

Redistributing a viewable .aimmspack file

16.3.1 Viewer restrictions and features

The AIMMS Viewer will run your existing model with the following global restrictions:

Restricted functionality

- model data can only be read from AIMMS case files stored within your project (see also Chapter 17 for a description of cases),
- writing of data to other files or applications is prohibited,
- the Viewer does not support solving optimization problems, and
- in the end-user GUI of a Viewer project, numerical, set and string data cannot be changed (with a number of exceptions explained below).

All other functionality, including procedural and non-procedural execution will function as in ordinary AIMMS developer and end-user versions.

To enforce the global restrictions outlined in the previous paragraph, the following language functionality is disabled in the AIMMS Viewer.

Language restrictions

- read from and write to databases,
- read from and write to files (except reading from a project user file),
- read from and write to XML,
- PUT and DISPLAY statements,
- saving a case or dataset,
- all EXCEL interface functions, and
- the function `CaseCreateDifferenceFile`.

Execution of related language commands will be skipped without warning in the AIMMS Viewer

GUI control is restricted such that page objects cannot be used to enter data, with the exceptions of data changes that are typically used to control other page objects. To be more specific, no editing of values by data entry is allowed with the following exceptions:

GUI restrictions

- an element parameter or subset can be edited through any page object,
- a selection object can edit the underlying identifier,
- a pivot table with checkboxes can edit the underlying identifier,
- a table with the '0-1 values' property set can edit the underlying identifier, and
- a date time picker can edit the underlying identifier.

All other page objects are read-only except for scrolling and zooming actions (e.g. identifiers that used to specify the bounds of the x -axis of a Gantt chart will be updated upon scrolling).

Communication with external programs has been restricted by disabling the usage of

External restrictions

- external functions (including multi-agent & calls to web services),
- the AIMMS API,
- the AIMMS COM interface,
- the AIMMS Excel Add-In, and
- AIMMS web services.

Using the AIMMS Viewer it is not possible to solve mathematical programs. The AIMMS Viewer

Math program restrictions

- contains no solvers,
- will not execute the SOLVE statement, and
- cannot use any of the GMP functions as described in Chapter 21 of the Language Reference.

Only solutions of mathematical programs that are saved in an AIMMS case using a developer or end-user version can be viewed.

When you want to make a distinction in your application based on whether your application is running in the AIMMS Viewer or not, you can use the AIMMS function `IsRunningAsViewer()`. For example, the result of this function can be assigned to a binary parameter, which, in turn, can be used to disable particular statements in your model (e.g. a SOLVE statement), or to hide particular pages and/or page objects (e.g. buttons) in your end-user interface.

The function IsRunningAsViewer

The project title as specified in the **AIMMS Option** dialog box will be prefixed by the words “AIMMS Viewer” when a project is run using the free AIMMS Viewer.

Project title in viewer mode

In case your original application has been protected by a VAR license (see Section 21.2 for a detailed overview on VAR licensing), the VAR license will also be used by the Viewer, and hence, you have to supply a VAR license for the viewable project as well. Internally, each AIMMS Viewer uses the fixed license number 255.255.003.00x for the Viewer corresponding with AIMMS version 3.x. If you want your project to be viewable by any AIMMS Viewer version, you can supply a VAR license for license 255.255.003.000.

Creating a viewer VAR license

The installation of an AIMMS developer, end-user or component version will include the installation of the AIMMS Viewer. A separate AIMMS Viewer installation is available from the download area of our website www.aimms.com. The AIMMS Viewer installation is substantially smaller than regular AIMMS installations because it does not include for example the AIMMS documentation, solvers, and the Excel Add-In.

Installing the AIMMS Viewer

16.3.2 Enabling a project to be used in the AIMMS viewer

Before an AIMMS project can be opened in the AIMMS Viewer it has to be made *viewable*. To do so, just open the **Project Security** dialog form the **Settings** menu end check the 'Allow to be opened in the Aimms Viewer' option (see Figure 16.4). In addition, you can choose to restrict Viewer access by protecting your project with a password that the user should enter when the project is being opened.

Making a project viewable

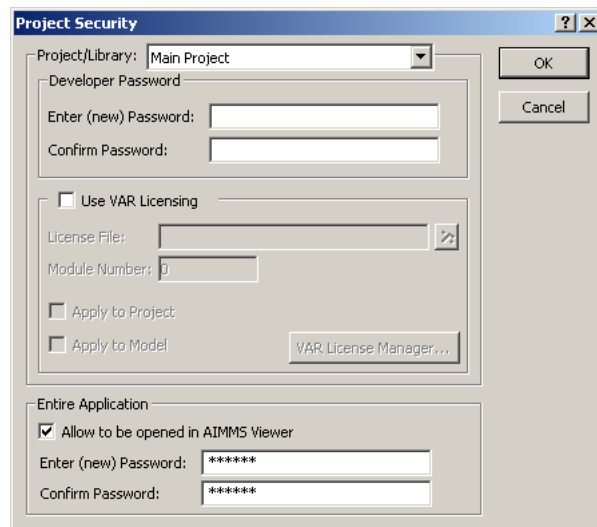


Figure 16.4: The **Project Security** dialog box

When developing an AIMMS project that you want to turn into a viewable project, you need to keep several issues in mind. In general you have to make sure that your application can function normally keeping in mind all restrictions listed in the previous section. Some specific tips are:

Issues to keep in mind

- Make sure that all necessary data (input as well as results) are stored in cases.
- Make sure that functionality that is not available in the AIMMS Viewer is not called or at least, that no error is generated when such code is called. For example, you could consider to use the function `IsRunningAsViewer()` to skip a call to a database read.
- Make sure to provide access to the **File-Export** menu if you want the end-user to be able to create an `.aimmspack` file himself.

The AIMMS developer version also contains a *Viewer Test Mode*. This mode allows you as a developer to check the behavior of your model as if it was running in the AIMMS Viewer. The *Viewer Test Mode* is available from the **Tools** menu.

The Viewer test mode

The option `warning_viewer_mode` can be used to specify the behavior of your application in Viewer test mode when AIMMS encounters a statement or function call that is not allowed to be executed in the Viewer version. The option is located in the **AIMMS - Progress, errors & warnings - Warnings** category in the **AIMMS Options** dialog box and can be set to *'Off'*, *'Warning'* or *'Error'* (with default value *'Warning'*).

Viewer related options

To distribute a viewer enabled project, you are recommended to export it as an `.aimmspack` file. Having done so, you can send this `.aimmspack` file to your end-user together with a link to the AIMMS website (<http://www.aimms.com/>) where he or she can find detailed instructions on how to download and install the viewer.

Distributing a viewer enabled project