

Tools Manual for Open AT® V3.04

Revision: 002
Date: June 2006

OPEN AT

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Tools Manual for Open AT® V3.04

Revision: 002

Date: June 16, 2006

Reference: WM_DEV_OAT_UGD_00051

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Document History

Index	Date	Versions	
001	January 10 2006	Creation	
002	June 16, 2006	Update from Open AT®V3.03 to Open AT®V3.04	

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1 Introduction

1.1 Purpose

This document is the user's guide for the Open AT® Software Development Kit.

1.2 References

I. Basic Development Guide for Open AT® V3.04(ref WM_DEV_OAT_UGD_00052 rev.002 for Open AT®3.04)

II. Getting Started with Open AT® (ref WM_DEV_OAT_CTI_00005 rev.002 for Open AT®3.04)

III. Tutorial for Open AT® V3.04 (ref WM_DEV_OAT_UGD_00050 rev.002 for Open AT®3.04)

IV. ADL User Guide for Open AT® V3.04 (ref WM_DEV_OAT_UGD_00053 rev.002 for Open AT®3.04)

V. AT Command Interface Guide for OS 6.61 release (ref WM_DEV_OAT_UGD_00016 rev.008 for AT OS 6.61 release)

1.3 Glossary

AT commands	Set of standard modem commands.
Embedded application	User application sources to be compiled and run on a Wavecom GSM product.
Embedded OS	Software that includes the Embedded application and the Wavecom library.
Embedded software	User application binary: set of Embedded application sources + Wavecom library.
External application	Application external to the Wavecom product that sends AT commands through the serial link.
Target	Open AT® compatible product supporting an Embedded Application.
Target Monitoring Tool	Set of utilities used to monitor a Wavecom product.
Remote Application	Set of libraries with which the User application can be run on a PC.
Wavecom library	Library delivered by Wavecom to interface Embedded application sources with Wavecom OS functions.

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AT commands	Set of standard modem commands.
Wavecom OS	Set of GSM and open functions supplied to the User.

1.4 Abbreviations

API	Application Programming Interface
CPU	Central Processing Unit
FCM	Flow Control Manager
IR	Infrared
KB	Kilobyte
OS	Operating System
PDU	Protocol Data Unit
RAM	Random-Access Memory
ROM	Read-Only Memory
RTK	Real-Time Kernel
SMA	SMall Adapter
SMS	Short Message Services
SDK	Software Development Kit

1.5 Notation conventions

In this document, the following notations will be used :

- Command line : `wmmake <filename>`.
- Environment or makefile variable : **WMATHOME**
- File name : appli.c
- Directory name : **AppliName**

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2 Open AT® SDK elements

2.1 Open AT® SDK directory structure

After the Open AT® SDK installation, the following structure is generated :

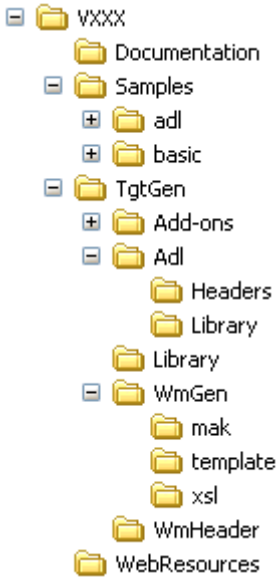


Figure 1: Open AT® SDK Directory Architecture

These files are installed in a directory referenced by the **WMATHOME** environment variable (Default value : **C:\OpenAT\V304**).

This setting may be changed using the Open AT® Settings application.

2.2 Compatibility

The current version of Open AT® is compatible with

- the compiler suite "**ARM suite ADS 1.2", and**
- **the arm-elf GCC cross-compiler**.

See the ARM or GCC compiler installation procedure in the Getting Started with Open AT® (Ref. II).

IMPORTANT WARNING 1 : Wavecom does not guarantee proper operation if software is built with any other compiler/linker versions.

IMPORTANT WARNING 2 : The provided GCC compiler runs only on Windows NT/2000/XP versions (it is not supported on Windows 95/98/ME systems).

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2.3 SDK elements

2.3.1 Documentation

The "\Documentation" directory contains the whole documentation set of the current Open AT® installed version.

2.3.2 Samples

The "\Samples" directory contains the sources and compiled versions of the samples provided with the current Open AT® installed version.

2.3.3 TgtGen

The "\TgtGen" directory contains :

- the Open AT® libraries for all supported compilers,
- the header files to be included by applications source code
- the Remote Task Environment kernel for this version
- the Wavecom utilities needed to build Open AT® applications
- the add-on libraries set compatible with the current version of the SDK (including libraries for all supported compilers and related header files)

2.3.4 Wavecom OS

The "\Wavecom OS" directory contains the AT OS versions compatible with the current Open AT® version, for each supported product.

2.4 Wavecom OS

All the Target Wavecom OS related files (debug information, Remote Task Environment executable kernel, Wavecom OS .dwl files) are installed by the Open AT® SDK setup in a directory referenced by the **WMCOREHOME** environment variable (default value: **C:\OpenAT\Tools\CoreSw**)

This setting, and the currently used OS may be changed using the Open AT® Settings application.

2.5 GCC compiler

The GCC compiler is installed by the Open AT® SDK setup in a directory referenced by the **WMGCCHOME** environment variable (default value : C:\OpenAT\Tools\GCC\{Version}, where {Version} is the GCC compiler version provided on the SDK) .

This setting may be changed using the Open AT® Settings application.

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2.6 Software Generation Toolkit (SGT)

SGT is the Wavecom compilation environment (based on the `make` program) used to build Target applications. It is installed by the Open AT® SDK setup in a directory referenced by the **SGT_DIR** environment variable (default value : **C:\OpenAT\Tools\SGT\v1.2.11**).

This setting may be changed using the Open AT® Settings application.

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3 Open AT® Settings

3.1 Tool description

The Open AT® SDK setup installs an "Open AT® Settings" application on the system. The application may be started from the Start menu shortcut (Wavecom\Open AT\Open AT Settings).



Figure 2 : Open AT® Settings application

This application may be used to change the currently used version of Open AT® SDK, SGT, or other paths, but also to set the default compilation options.

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3.2 Available settings

3.2.1 Open AT® libraries path

This path is the current used SDK location (where are installed Libraries, Header files and Generation tools.

The Open AT® settings application will automatically browse for all installed versions in a provided directory (for example, if **C:\OpenAT\V301** and **C:\OpenAT\V310** versions are installed on the system, the application will automatically fill the choice list with all found versions).

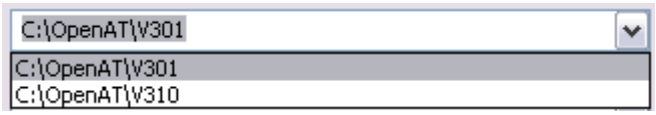


Figure 3: Available SDK installed versions sample

The browse button  should also be used to find the required SDK version.

3.2.2 Open AT® Tools path

This path is the root directory were Open AT® related tools (as GCC compiler and SGT) will be installed. Further install processes (with the Open AT® SDK setup program) will use this directory to install new tools versions.

The history  and browse  buttons should be used to find the required tools path.

3.2.3 Add-on libraries path

This path is the root directory were Add-on libraries (as TCPIP, DTL or GRL) are installed. By default this directory is the "\TgtGen\Add-ons" Open AT® libraries path sub-directory; it should be updated to another location if needed. Please note that each time the Open AT® libraries path is modified, the Add-on libraries path will automatically be updated to the related "\TgtGen\Add-ons" sub-directory.

The history  and browse  buttons should be used to find the required add-on libraries path.

3.2.4 SGT path

This path is the current used SGT version location.

The Open AT® settings application will automatically browse for all installed versions in a provided directory (for example, if **C:\OpenAT\Tools\SGT\1.2.4_c**

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and **C:\OpenAT\Tools\SGT\1.2.11** versions are installed on the system, the application will automatically fill the choice list with all found versions).

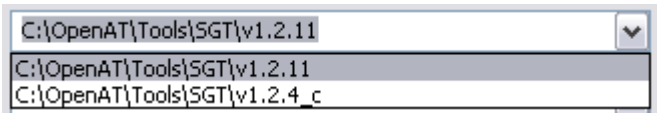


Figure 4: Available SGT installed versions sample

The browse button  should also be used to find the required SGT version.

3.2.5 GCC compiler path

This path is the current used GCC compiler version location.

The history  and browse  buttons should be used to find the required GCC compiler path.

3.2.6 Wavecom OS Root path

This path is the location where all Wavecom OS packages are installed.

The history  and browse  buttons should be used to find the required Wavecom OS root location.

3.2.7 Synchronized Workspaces

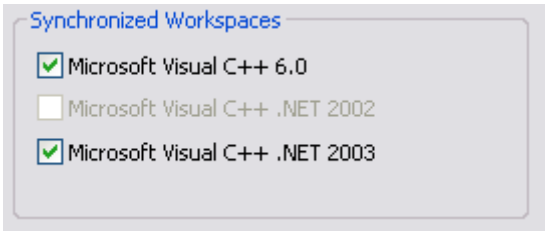


Figure 5: Synchronized workspaces options

The Synchronized Workspaces checkbox set allows to enable the Open AT® workspaces generation for each of the supported environment. If an environment is not currently installed on the system, the check box is disabled (as Microsoft Visual C++ .NET 2002 in the sample figure above).

When the Project Wizard builds an Open AT® application workspace, it will build project files for each of the selected environments.

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Currently supported environments are :

- Microsoft Visual C++ 6.0 (<Project>.dsw file is generated) ;
- Microsoft Visual C++ .NET 2002 (<Project>_2002.sln file is generated) ;
- Microsoft Visual C++ .NET 2003 (<Project>.sln file is generated).

3.2.8 Target Settings

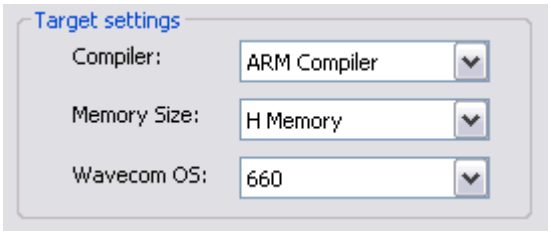


Figure 6: Target Settings

These options may be used in order to set-up the Target related settings (current running OS on the target, target memory size, target compiler to use).

3.2.8.1 Compiler

This option list allows to select the used compiler (ARM or GCC) when a compilation process is launched for the target application within a development environment.

IMPORTANT WARNING : The provided GCC compiler runs only on Windows NT/2000/XP versions (it is not supported on Windows 95/98/ME systems).

3.2.8.2 Memory Type

This option list allows to select the used memory type when a compilation process is launched for the target application within a development environment.

Available memory types list is dynamically updated each time the Open AT® libraries path setting is modified.

Please refer to the ADL User Guide (See Ref.IV) for more information about available memory types on the current SDK version.

3.2.8.3 Wavecom OS

This option list allows to select the current running Wavecom OS on the target. The list provided choices include all the installed Wavecom OS packages in the Wavecom OS root directory.

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Available Wavecom OS packages list is dynamically updated each time the Wavecom OS Root path setting is modified.

Each time the Open AT® libraries path setting is modified, the Wavecom OS required to work properly with the new Open AT® version is automatically selected.

The Wavecom OS package is used in RTE mode (each Wavecom OS has its owns RTE executable kernel), and in target mode (each Wavecom OS provides debug files, usable to decode backtraces frames – please refer to the Target Monitoring Tool chapter, and to the Open AT® ADL User Guide (See Ref.IV) for more information about security, errors handling and back traces decoding).

3.3 Applying changes

When changes have been made in the Open AT® settings, once the Apply or OK button is pressed, all Development Environments and Cygwin shells have to be closed and restarted, to be updated with these changes.

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4 Open AT® Project Wizard

4.1 Tool description

The Open AT® SDK setup installs an " Open AT® Project Wizard" application on the system. The application may be started from the Start menu shortcut (Wavecom\Open AT\Open AT Project Wizard).

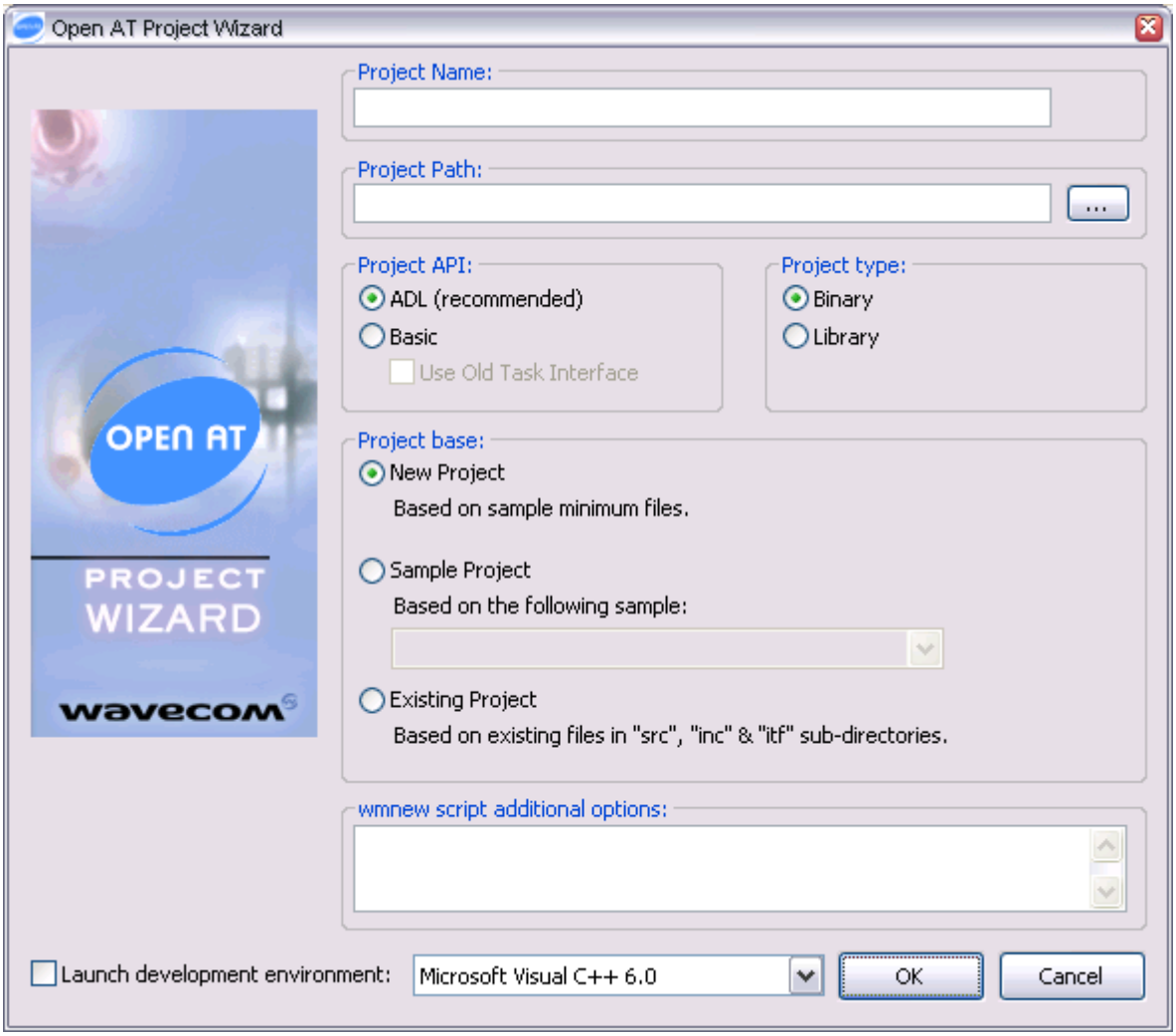


Figure 7: Open AT® Project Wizard

This application has to be used to create, or edit an Open AT® project software common settings (saved in the corresponding <Project>.scs file), and also the selected synchronized Workspaces in the Open AT® Settings application (cf. § 3.2.6).

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4.2 Basic settings

4.2.1 Project Name



Figure 8: Project Name

This setting will be the name of the Open AT® project (software common settings will be saved in the <ProjectName>.scs file).

When using the Sample base mode, the name will be set to the selected sample name.

When browsing for an existing project directory, if a .scs file is found in the selected directory, this file name will be used as the project name.

4.2.2 Project Path



Figure 9: Project Path

This setting is the path were the Open AT® project is located.

The browse button may be used to find the required project Path. If the path selected by the browse button contains a .scs file, the Wizard goes to the Existing Project mode, and reads the project name and the project options from this selected directory.

4.2.3 Used API

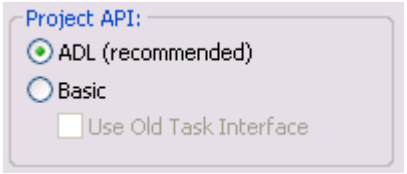


Figure 10: Project API

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This setting is the API used by the current Open AT® project. ADL API is strongly recommended (Basic API should be used by advanced users only).

The "Use Old Task Interface" option applies only to Basic interface binaries : when using this option, the Open AT® application has only to implement the old `wm_apmAppliInit & wm_apmAppliParser` *functions instead of a task table (cf. Open AT® Basic Development Guide for more details).*

4.2.4 Project Type

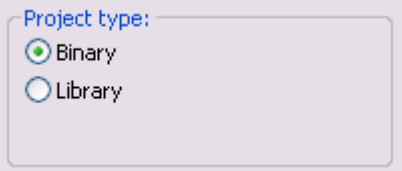


Figure 11 Project type

This setting is the current project type (binary or library) which will be generated within the Development Environment.

4.2.5 Wmnew script additional options



Figure 12: `wmnew` additional options

This text field may contains additional options for the `wmnew` script ; please refer the Command Line Scripts chapter for more details. Only described options starting from § 8.1.5 chapter (Project global options) may be used ; the other ones are all handled by the Open AT® Project Wizard.

This option is available only in New Project & Existing Project modes.

4.2.6 Development Environment launch

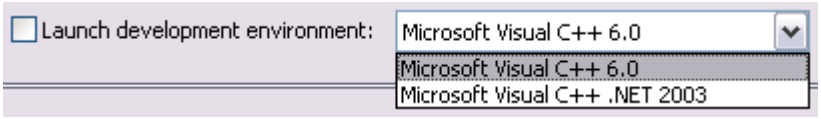


Figure 13: Available Development Environments

If the "Launch development environment" option is checked, the currently selected environment will be launched with the current project. The drop-down list contains only the installed environments on the system.

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4.3 Wizard modes

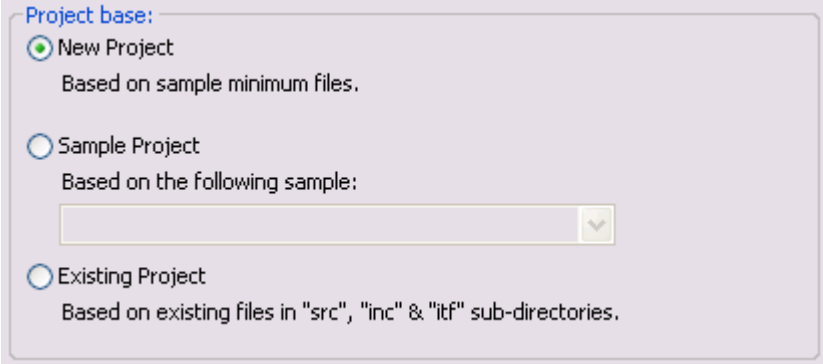


Figure 14: Wizard modes

The wizard behavior is determined by the selected mode in this option field.

4.3.1 New Project

In this mode, minimum code sample files will be copied in the current directory, before building the project settings.

The wmnew additional option field is available in this mode, to set-up other project settings options.

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4.3.2 Sample Project

This mode creates a new project, based on the selected sample in the drop-down list. This list content depends on the selected API and project type.

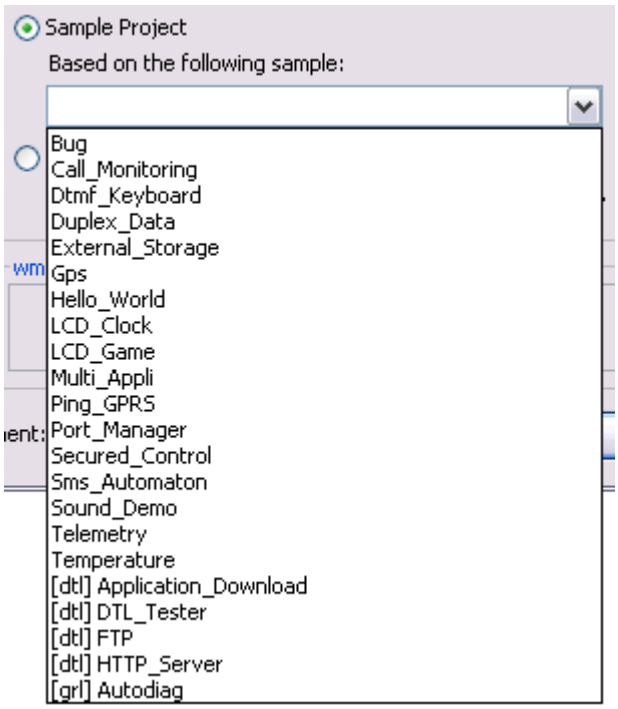


Figure 15: Samples list

When a new sample is selected in the list, the project name is updated to be renamed with the sample one.

As the wmnew script, if the selected sample depends on one or several sample libraries, this/these library/libraries project(s) will also be copied in the Libraries subdirectory.

4.3.3 Existing Project

In this mode, the Project Wizard is used to update an existing project settings. To edit an existing project, the path browse button has to be used to find the project path. Then, the project name and the wmnew option field will be updated with the values read from this directory.

The wmnew additional option field is available in this mode, to set-up other project settings options.

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4.4 Updating existing projects

Important Warning : It is strongly recommended always to use the Project Wizard to update existing projects (for adding source files, include paths or others...), rather than hand-editing make files, or modifying projects in development environments.

An existing project may be opened with the wizard by the following ways :

- Browse for the existing project path with the Project Wizard application ;
- Open directly the project from the Windows Explorer (".scs" files are automatically associated with Open AT® Project Wizard).

4.5 Error messages

The Open AT® Project Wizard may display the following error messages.

"Please enter a name to create the new project..."

The project name text field is empty.

"Not authorized characters (space, ".", "$") found in the project name..."

The project name field can contain all characters, except spaces (" "), dollars ("$") and dots (".").

"Not authorized characters (space, "$") found in the project path..."

The project path field can contain all characters, except spaces (" ") and dollars ("$").

"Please select a sample to create the new project..."

The Project Wizard is in Sample mode, but no sample was selected in the drop-down list.

"Please select a path to create the new project..."

The project path text field is empty.

"Bad format for provided path string..."

The project path text field does not contains an absolute path (in Windows format).

"Unable to create the folder."

A new directory was required to be created, but the creation failed.

"Wmnew script error 3 (bad environment settings)"

The Open AT® environment is not correctly configured in Cygwin. Please refer to the `wmcheck` script documentation for more details.

"Wmnew script error 6 ([wmsync] xsltproc package is not installed on the system)"

The `xsltproc` package, needed by the Open AT® Project Wizard, is not installed within Cygwin. Please check the Cygwin installation, or re-install it to solve the problem.

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"Unable to run the wmnew script ; Open AT® or Cygwin may not be correctly installed."

Cygwin environment should be uninstalled, and re-installed again. If the issue is then not solved, please refer to the wmcheck script documentation for more information.

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5 Building Open AT® applications

5.1 Open AT® application directories architecture

The typical directory tree structure of an application is shown below.

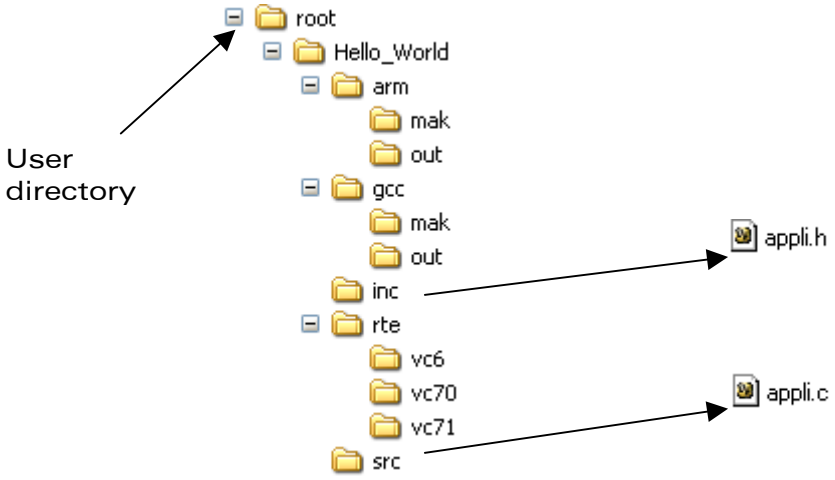


Figure 16: Open AT® Project Directory Architecture

The **AppliName** directory is specific to each new application ; it contains the project software common settings (.scs) file, and also the different supported development environments project files. It also contains the following sub-directories :

- **rte** : contains the Remote Application binaries, generated with one of the supported development environments,
- **arm/out** : contains the Embedded OS ready to be downloaded to the Target, generated with the ARM compiler,
- **gcc/out** : contains the Embedded OS ready to be downloaded to the Target, generated with the GCC compiler,
- **src**: contains the User Open AT® sources,
- **inc**: contains the User Open AT® header files.

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5.2 Generated applications for target mode

Open AT® projects (applications or libraries) may be generated using a development environment (cf. following chapters), or using the wmmake script from a Cygwin bash shell command line (for advanced users, cf. §8.2).

5.2.1 Generated binary files

The generated binary files are :

- for a library :

  [compiler]/out/[project].lib

  where:

  [compiler] is the current used compiler (arm or gcc),

  [project] is the project name.

- for an application :

[compiler]/out/[compiler]_[project]_[memory].dwl &

[compiler]/out/[compiler]_[project]_[memory].wpb.dwl

where:

[compiler] is the current used compiler (arm or gcc),

[project] is the project name,

[memory] is the current used memory type (please refer to ADL User Guide (See Ref.IV) for more information about memory types).

The ".wpb.dwl" is a compressed version of the ".dwl" one (wpb is the acronym for Wavecom Packed Binary).

Both files may be downloaded on the product ; as the ".wpb.dwl" file is smaller than the simple ".dwl" one, downloading this file will be faster.

5.2.2 Open AT® application download

Please refer to the Tutorial documentation (see Ref. III) to know how to download Open AT® application binaries on wireless CPU.

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5.3 Microsoft Visual C++ 6.0 development environment

5.3.1 Creating an Open AT® application workspace for Visual C++ 6.0

Open AT® application projects are created with the Open AT® Project Wizard (see corresponding chapter). This wizard may be launched from the Start Menu, or from the Visual C++ "New Project" menu.

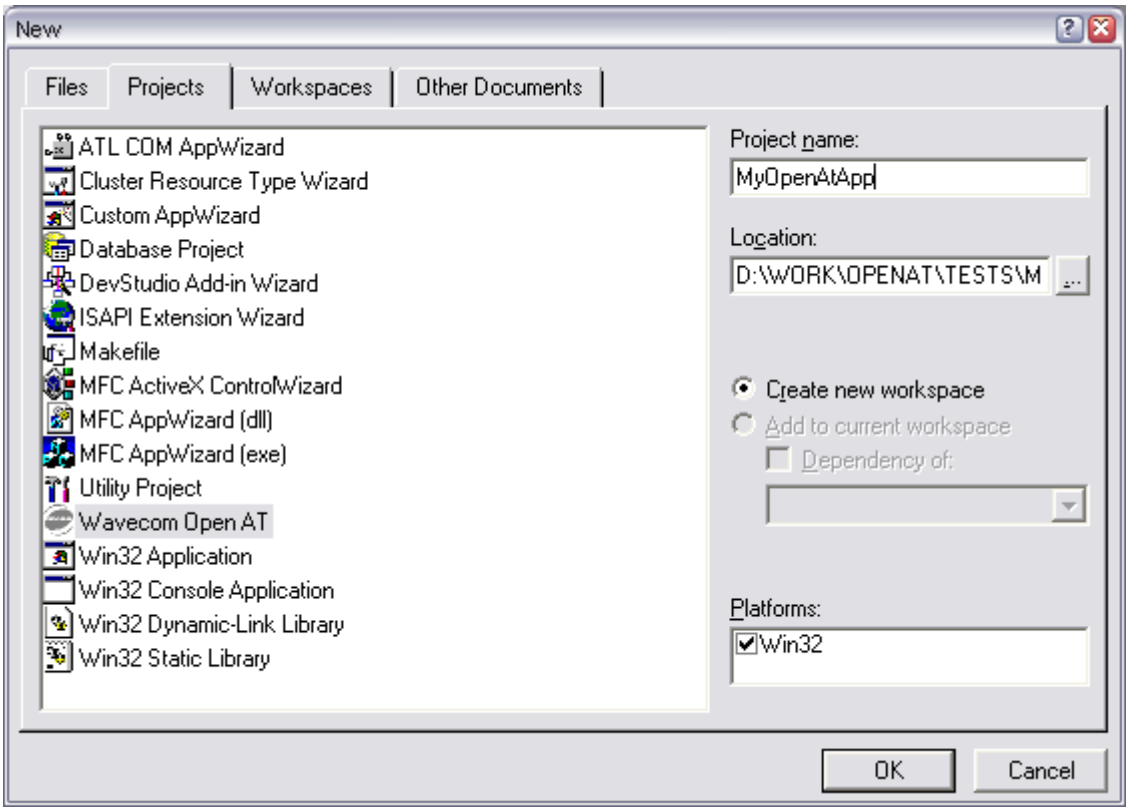


Figure 17: New Open AT® project from Visual C++ 6.0

After have hit the OK button, the following box is displayed.

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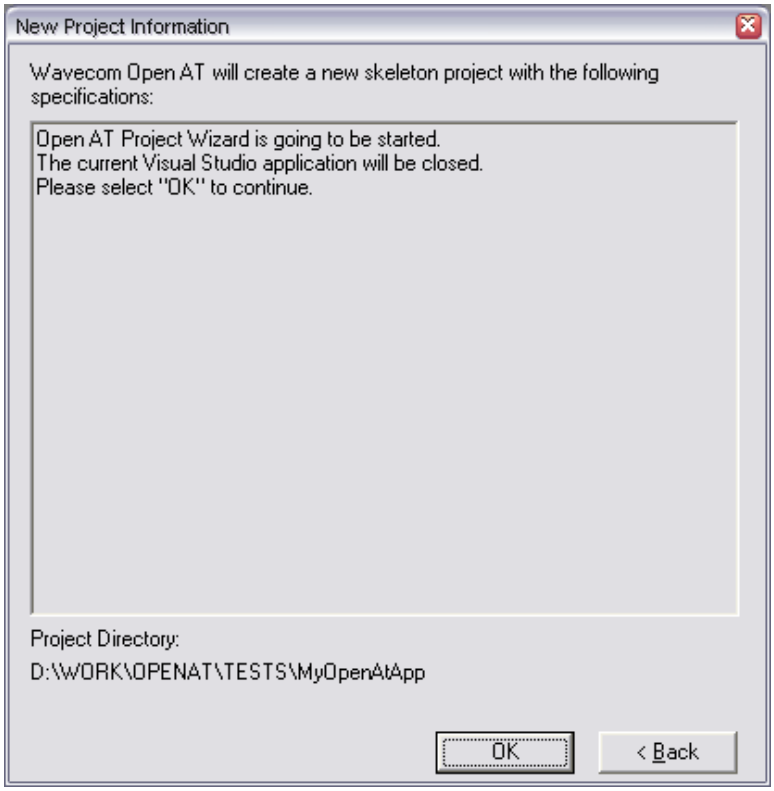


Figure 18: Open AT® Project Wizard is going to be started

The Open AT® Project Wizard is going to be started. When the OK button will be clicked, the current running Visual C++ session will be closed, and the Wizard will be launched (See the Open AT® Project Wizard description for more information).

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5.3.2 Visual C++ 6.0 Projects

A Visual C++ 6.0 Open AT® workspace contains two projects, for target mode (named <project>) and remote mode (named <project>_rte).

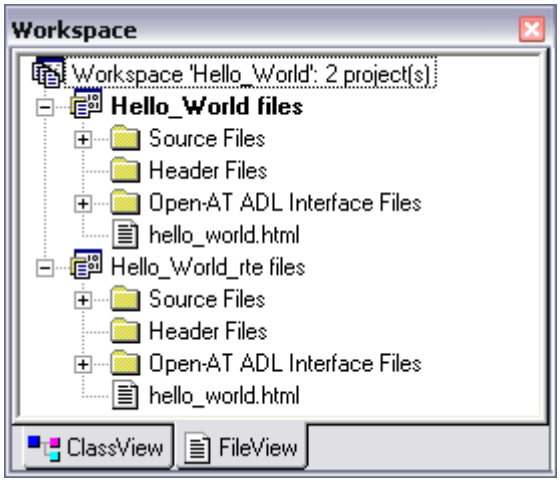


Figure 19: Open AT® projects in Visual C++ 6.0

Each project contains the same files (application sources & headers, the Open AT® interface files, and the HTML help file, if the project was created from a provided sample), which may be edited from any of these two projects.

If an Open AT® project implements libraries, all the corresponding projects (target and remote) will also be added to the main application workspace.

As written in the § 4.4, it is strongly recommended always to use the Project Wizard to update existing projects (for adding source files, include paths or others...), rather than modifying projects in the Visual C++ environment.

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5.3.3 Displaying HTML help file

When an Open AT® project is created from one of the provided samples, the projects include an HTML help file, describing the sample interfaces and processing.

In order to display this file from Visual C++, it has to be opened in the editor, and launched in the HTML browser by selecting the "Preview Page" option in the mouse right-click menu.

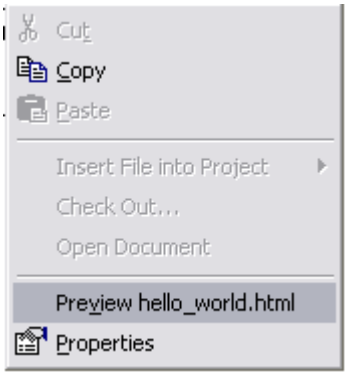


Figure 20: Preview the HTML help file from editor screen

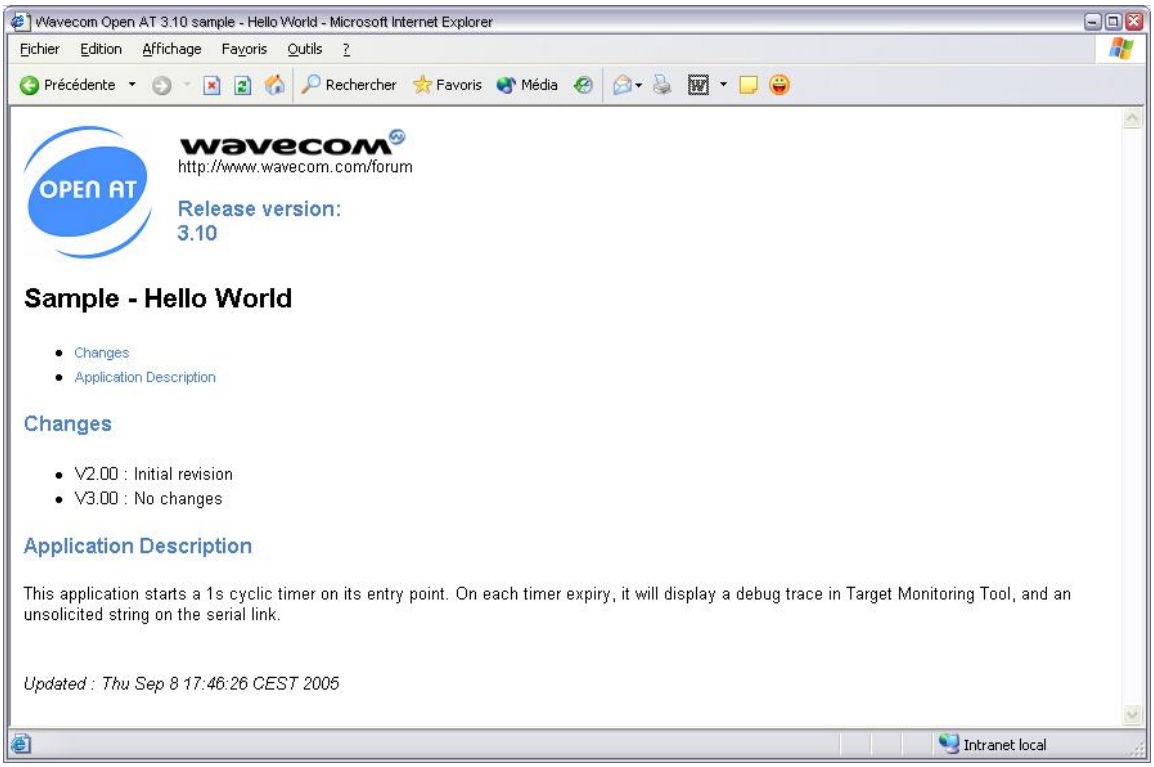


Figure 21: Application sample HTML help file display

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5.3.4 Building application for Target Mode

To build the application for target mode, the target project has to be selected as the active project, from the Project menu :

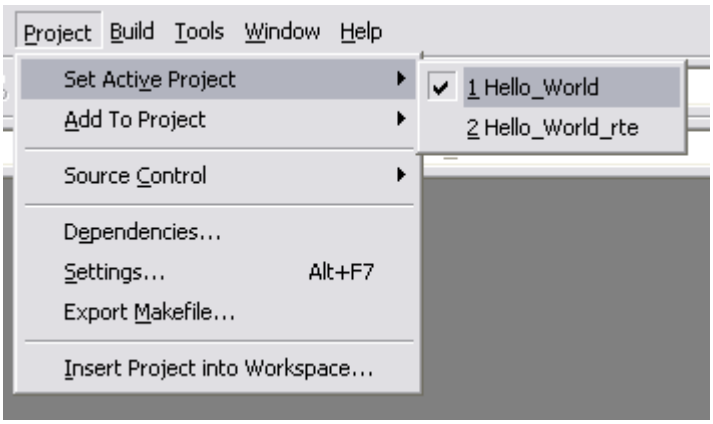


Figure 22: Select the active project – way 1

Or from the right mouse button click contextual menu :

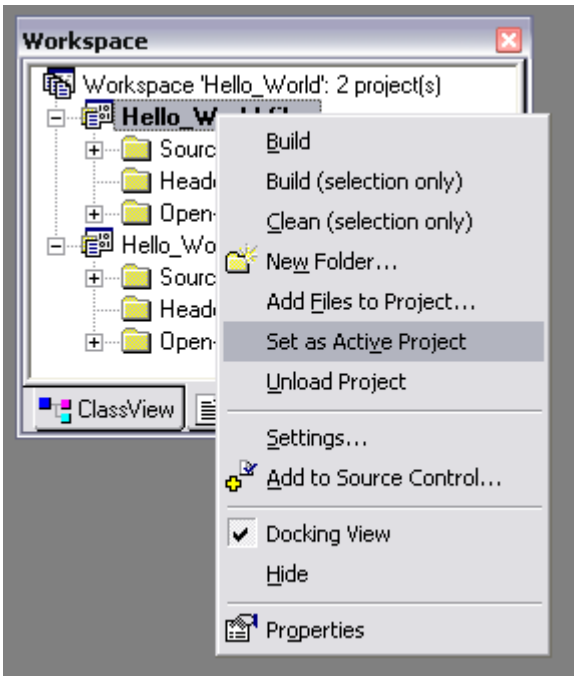


Figure 23: Select the active project – way 2

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Or from the Build toolbar :



Figure 24: Select the active project – way 3

Then, the project may be built by launching the Build command, from the Build Menu, the contextual menu, or with the F7 key. The compilation results will be displayed in the output window.

Warning: detected error and warning messages should not be relevant, since the Visual Environment displays these messages when it detects "error" or "warning" strings in the compilation text output (i.e. for example the "no error" string will be detected as an error by Visual Environment).

Error messages which may be displayed by the Software Generation Toolkit are listed in the `wmmake` script description.

5.3.5 Building application for remote mode

To build the application for remote mode, the remote project has to be selected as the active project, by the Project menu, the contextual menu or the Build toolbar (as shown above in the previous paragraph).

Then the configuration has to be set. Both Release and Debug mode are available, but the Debug mode should be chosen in order to perform step-by-step debugging in the program. The configuration may be selected from the Build->Set Active Configuration... menu :

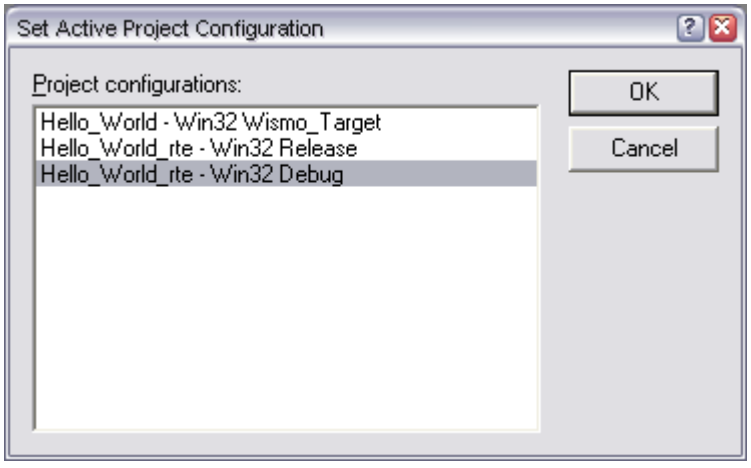


Figure 25: Select the configuration – way 1

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Or from the Build toolbar :



Figure 26: Select the configuration – way 2

Then, the project may be built by launching the Build command, from the Build Menu, the contextual menu, or with the F7 key. The compilation results will be displayed in the output window.

5.3.6 Setting breakpoints

Due to the Remote Task Environment architecture, breakpoints should be set once the RTE graphical interface is launched, just before pressing the Start button (see the Remote Task Environment chapter).

If breakpoints are set before running the application, the Environment will inform the user that the breakpoints cannot be set (see Figure 24). The execution will then stop at the beginning of the program : just press Go to continue running the application.

Once the application is started, the user has to return to Visual environment, and to edit the breakpoints window (from the Edit menu, or with the Ctrl-B key). In this window, all breakpoints are displayed, and may be enabled / disabled as required (see Figure 28).

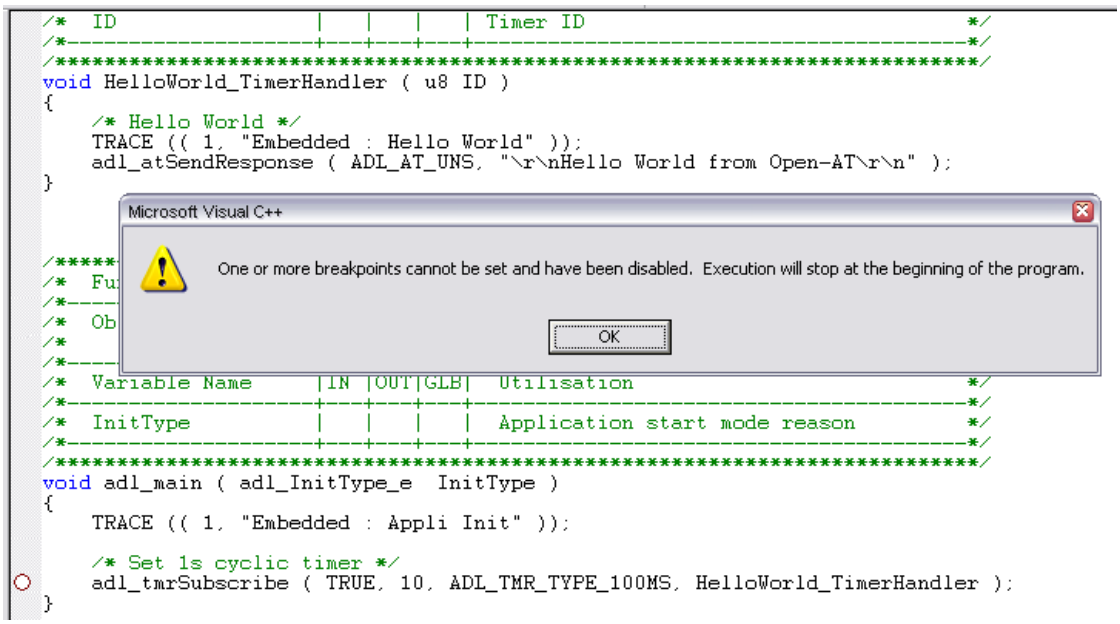


Figure 27: Unable to set breakpoints

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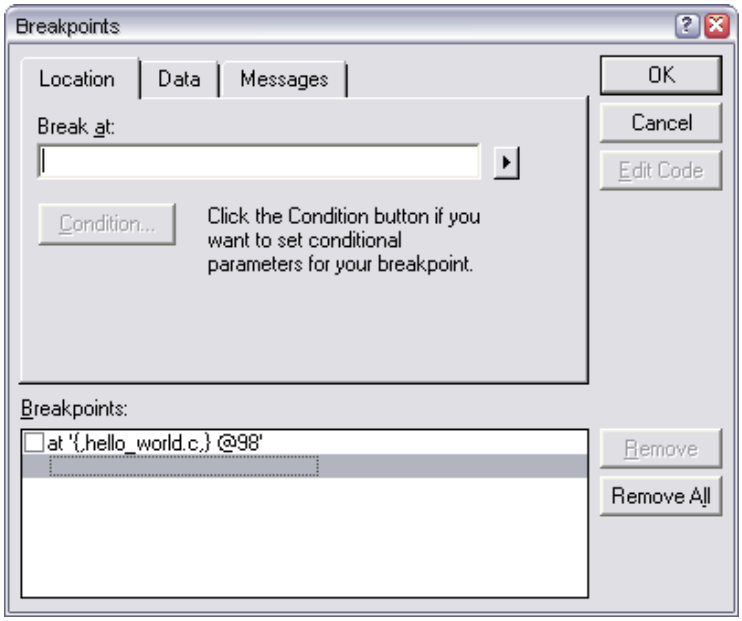


Figure 28: Breakpoints window

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5.4 Microsoft Visual C++ .NET development environment (2002 & 2003 versions)

5.4.1 Creating an Open AT® application workspace for Visual C++ .NET

Open AT® application projects are created with the Open AT® Project Wizard (see corresponding chapter). This wizard may be launched from the Start Menu, or from the Visual C++ "New Project" menu.

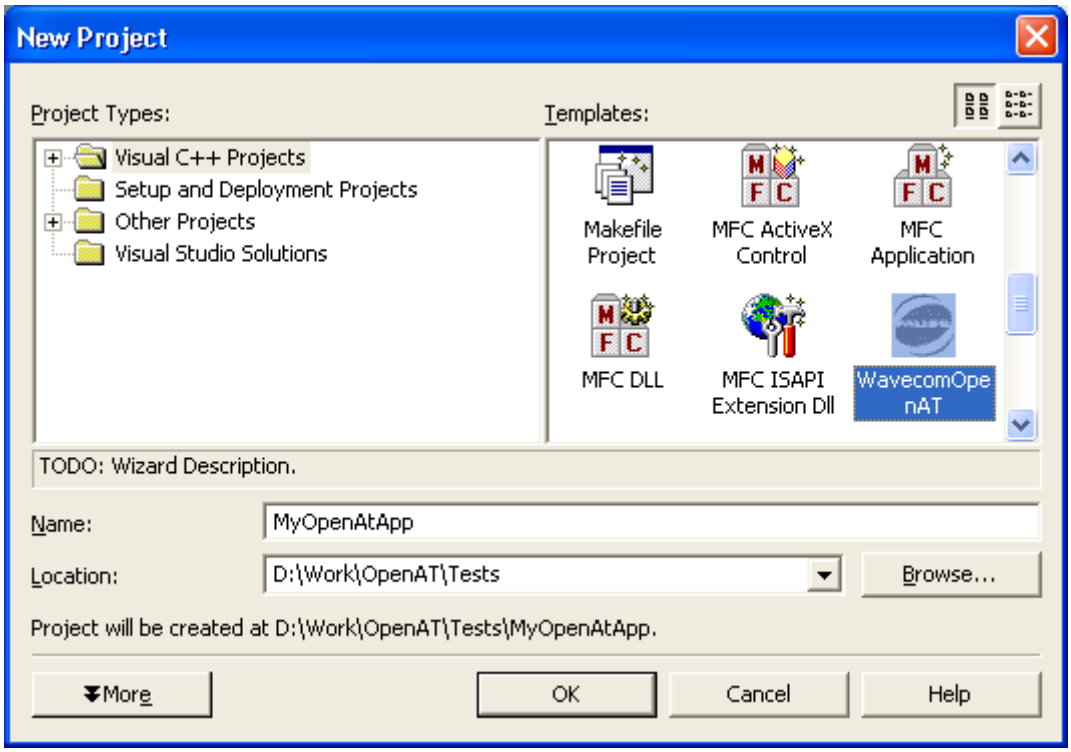


Figure 29: New Open AT® project from Visual C++ .NET

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After have hit the OK button, the following box is displayed.

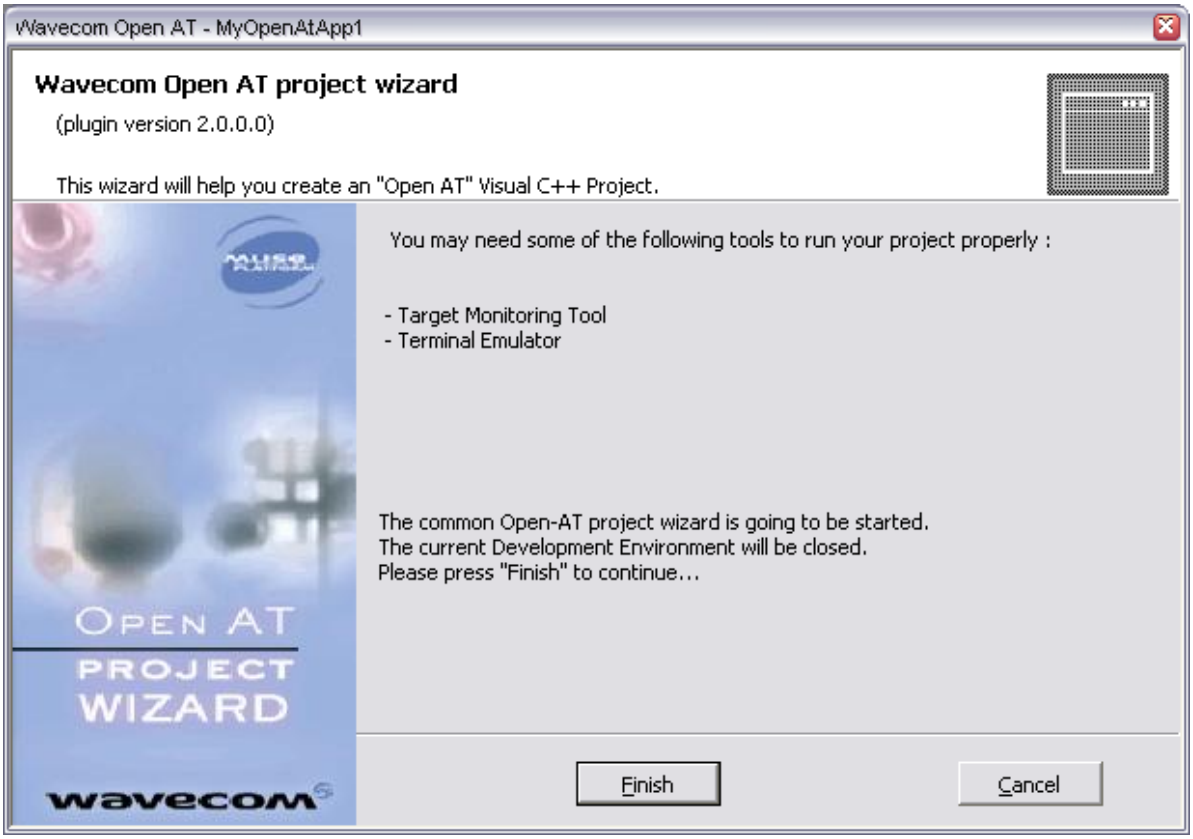


Figure 30: Open AT® Project Wizard is going to be started

The Open AT® Project Wizard is going to be started. When the Finish button will be clicked, the current running Visual C++ session will be closed, and the Wizard will be launched (See the Open AT® Project Wizard description for more information).

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5.4.2 Visual C++ .NET Projects

A Visual C++ .NET Open AT® workspace contains two projects, for target mode (named <project>) and remote mode (named <project>_rte).



Figure 31: Open AT® projects in Visual C++ .NET

Each project contains the same files (application sources & headers, the Open AT® interface files, and the HTML help file, if the project was created from a provided sample), which may be edited from any of these two projects.

If an Open AT® project implements libraries, all the corresponding projects (target and remote) will also be added to the main application workspace.

As written in the § 4.4, it is strongly recommended always to use the Project Wizard to update existing projects (for adding source files, include paths or others...), rather than modifying projects in the Visual C++ environment.

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5.4.3 Displaying HTML help file

When an Open AT® project is created from one of the provided samples, the projects include an HTML help file, describing the sample interfaces and processing.

In order to display this file in Visual C++ Web Browser, it has to be launched by selecting the "Display in Browser" option in the mouse right-click menu.

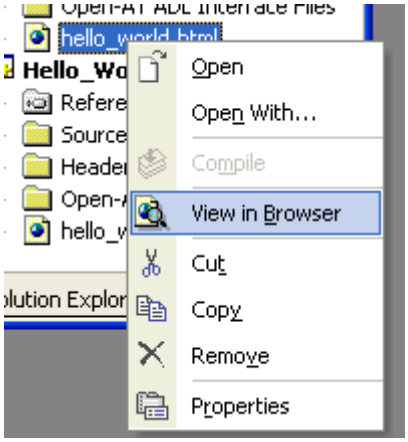


Figure 32: Preview the HTML help file from solution explorer

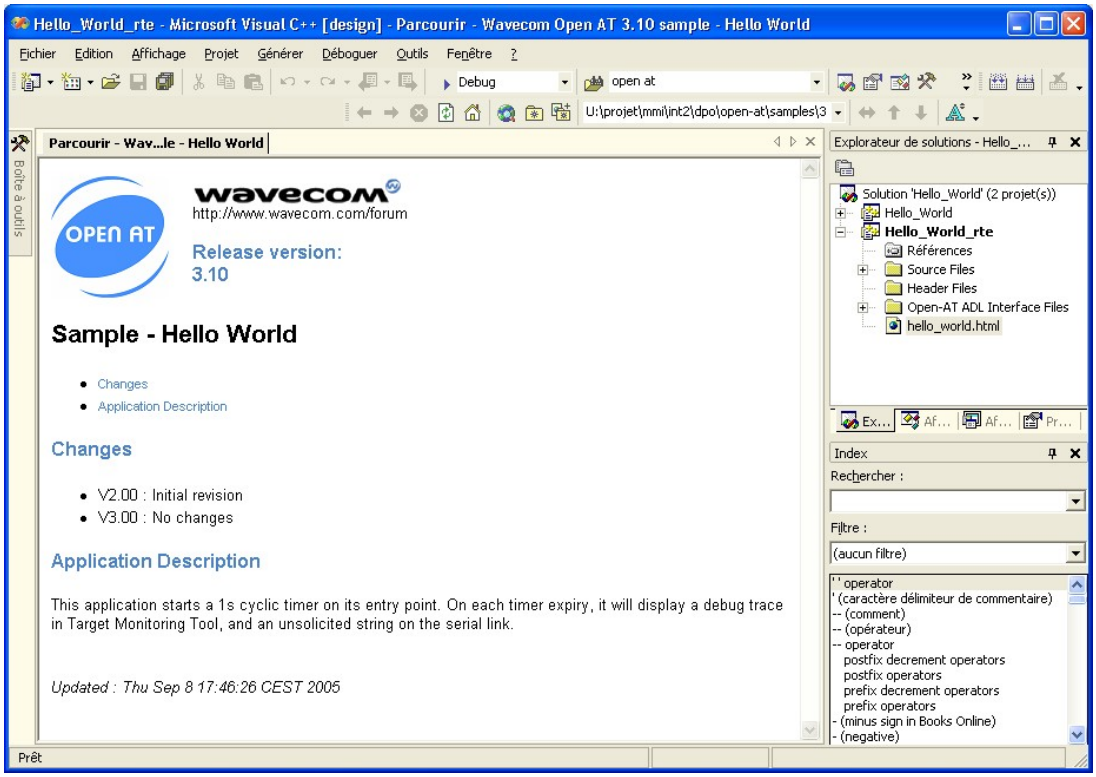


Figure 33: Application sample HTML help file display

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5.4.4 Building application for Target Mode

To build the application for target mode, the target WISMO Target configuration has to be selected as the active one, from the Build toolbar :



Figure 34: Select the WISMO Target configuration

Then, the project may be built by launching the Build Solution command, from the Build Menu, the contextual menu, or with the Ctrl+Shift+B key combination. The compilation results will be displayed in the output window.

Error messages which may be displayed by the Software Generation Toolkit are listed in the wmmake script description.

5.4.5 Building application for remote mode

To build the application for remote mode, the configuration has to be set. Both Release and Debug mode are available, but the Debug mode should be chosen in order to perform step-by-step debugging in the program. The configuration may be selected from the Build->Configuration Manager... menu :

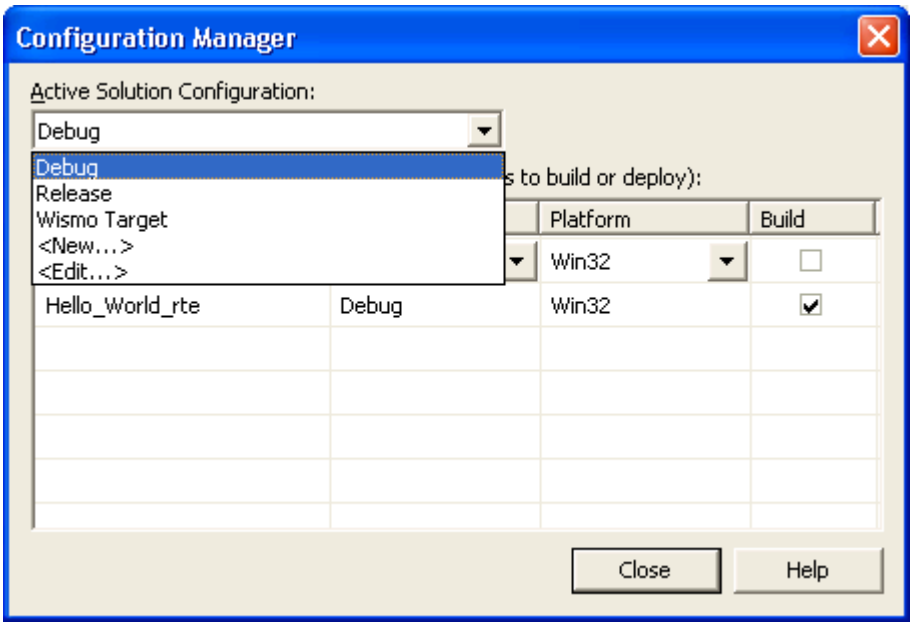


Figure 35: Select the configuration – way 1

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Or from the Build toolbar :



Figure 36: Select the configuration – way 2

Then, the project may be built by launching the Build Solution command, from the Build Menu, the contextual menu, or with the Ctrl+Shift+B key combination. The compilation results will be displayed in the output window.

5.4.6 Starting the Remote Task Environment

The first time the RTE project is executed (by the Start command / F5 key), the environment will prompt for the debug executable file.

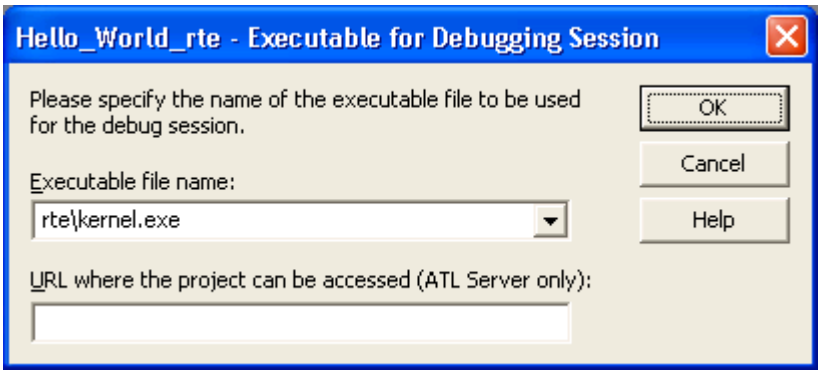


Figure 37: Provide RTE kernel file name

The file to provide in order to start debug the application is "**rte\kernel.exe**". Further debug sessions (for this project) will not prompt again for this executable name. If a new project is created, or if the current project is updated with the Open AT® Project Wizard, the kernel executable name will be prompted again.

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6 Development ToolKit

6.1.1 Overview

The Development ToolKit is a set of 4 tools running under Windows, designed and supplied by Wavecom.

The Development ToolKit environment is presented in Figure 3.

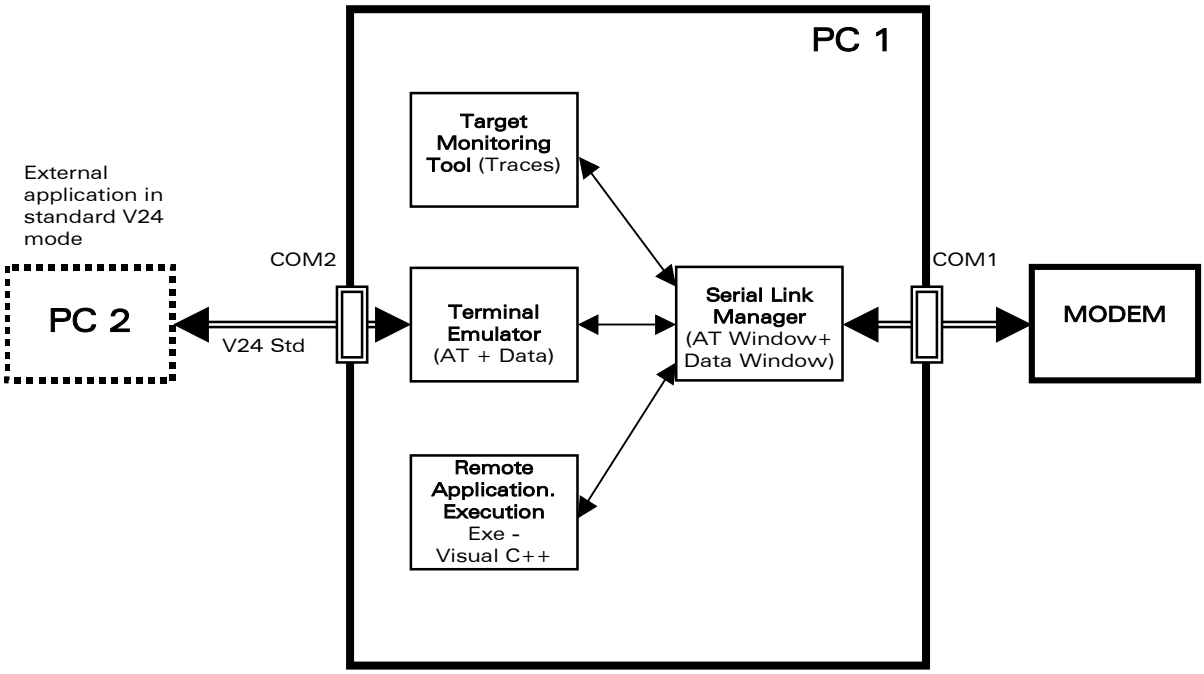


Figure 38: The Development ToolKit Environment

These tools are described here-below.

6.1.2 Serial Link Manager

6.1.2.1 Description

The Serial Link Manager uses the PC serial link (COM1) to communicate with Wavecom products. It behaves like a server between the different applications.

The Serial Link Manager dispatches data received from the serial link to the Wavecom PC applications (Target Monitoring Tool, Terminal Emulator and Remote Task Environment). It also multiplexes the frames sent by these applications and forwards them to the product.

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The other serial port (COM2) can be used to connect another PC, using the serial link in nominal mode (cf. Terminal emulator description).

6.1.2.2 Getting Started

The Serial Link Manager is automatically launched as soon as the **Target Monitoring Tool**, the **Terminal Emulator** or the **Remote Application** starts : the serial port is opened and the Serial Link Manager icon ( ) is displayed on the task bar. Double-clicking on this icon will launch the Serial Link Manager dialog box.

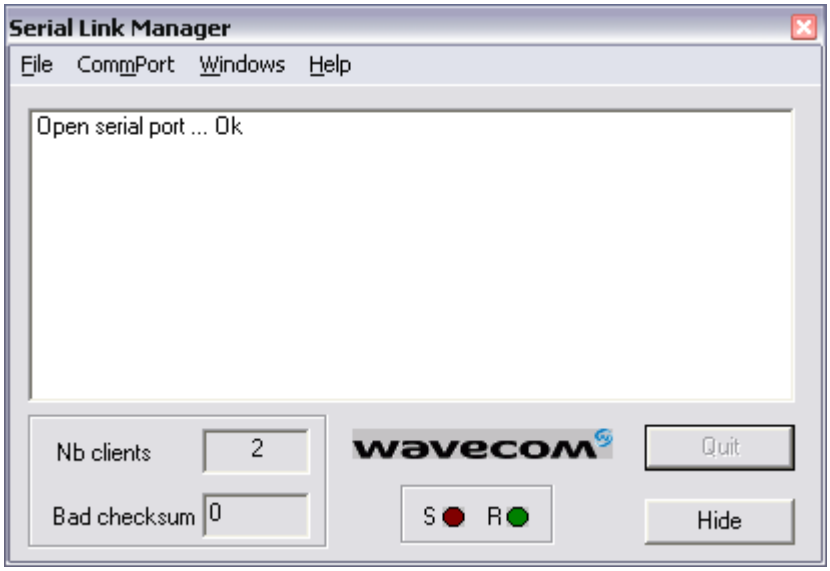


Figure 39: Serial Link Manager window

With this Dialog Box, the user can manage the Serial Port (with the help of the **"CommPort"** menu : open/close the port, set the port configuration). It can be closed with the **"Window" -> "Hide Tray"** command. Refer to the Target Monitoring Tool help for more information on the Serial Link Manager.

Note: the Serial Port configuration used in the Serial Link Manager will be also used in the other programs of the Development ToolKit.

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6.1.2.3 Playing back backtrace buffer files

If an application has used the ADL Error Service in order to retrieve the stored backtraces in the product, the obtained binary files may be plaid back in the Serial Link Manager following the steps below:

- In the Target Monitoring Tool, select the current application workspace (cf the Target Monitoring Tool description) ;
- Close the serial port (CommPort -> Close command) ;
- Open the re-play frames window (File -> Play Log File command) ;

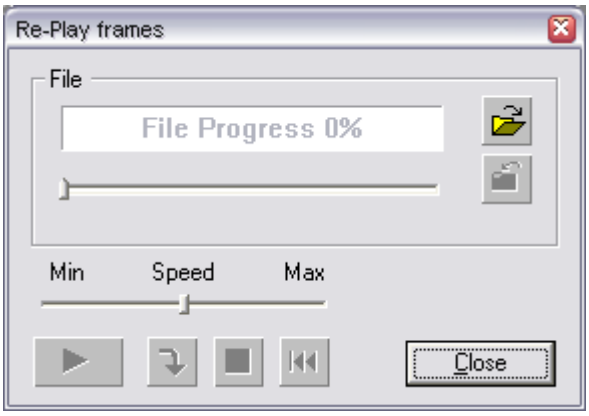


Figure 40: Re-play frames window

- Use the Open ( ) button to select the binary file to play ;
- Hit the Play ( ) button to start the backtrace buffer play-back process.
- Backtraces should now appear in the Target Monitoring Tool.

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6.1.3 Target Monitoring Tool

6.1.3.1 Description

The **Target Monitoring Tool** is used to display the Embedded application trace messages (from the Target or the Remote Application).

6.1.3.2 Getting Started

In order to use the **Target Monitoring Tool**, please follow these steps:

1) Download an Embedded OS to the target, using one of the provided samples,
2) Make sure the COM1 port is not used by another application,
3) Start the **Target Monitoring Tool** application from the Windows Start menu,
4) Check the PC serial link settings:

   Click **"Settings"** in the **"Preferences"** menu,

   Select the **"Com"** tab,

   Check default mode parameters :

   Baud rate : 115200

   Data bits : 8

   Parity : none

   Stop bits : 1

   Notes:

   The serial port settings can be changed using either the Target Monitoring Tool or the Windows Serial Link Manager.

   The serial port speed can be detected by the **Commands->Auto Detect** command of the Target Monitoring Tool.

5) Check the communication with the Target :

   Click the **"Terminal Emulator"** button in the Target Monitoring Tool toolbar, and select the **"AT1"** window.

   Type `AT` and press `<Enter>`:

   A blue Ok response must appear. Otherwise, select **"Init Target"** from the **"Commands"** menu of the **Target Monitoring Tool** and type AT again,

6) Close the **Terminal Emulator** window.

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6.1.3.3 Get Traces Sent by the Wavecom Target

1) Select **"Open"** from the **"Traces"** menu,
2) Select **"Get Information about Target"** from the **"Commands"** menu,
3) Select **"Set and Request to the Target..."** from the **"Commands"** menu,
   Select **CUS** from the **Parameter** list,

   Click on all levels from 0 to 31 in **Bitmap**,

   Click on the **"Send Level"** button,

   Click on the **"Close"** button,
4) The Trace window then displays the traces sent by the Wavecom product.

   Notes:

   - The traces are strings sent by the embedded application to the Target Monitoring Tool thanks to the `TRACE() & DUMP()` functions. This function takes the display level, and the string to display as parameters. See the Basic Development Guide for more information (See Ref. I).
   - If the serial link speed is set to 9600 bps, some traces may not appear (lost). The user should, to avoid this, use the speed of 115200 bps on the serial link (see the **"AT+IPR"** command in the AT Commands Interface Guide for OS 6.60, Ref.).
   - In the case of an embedded application using the FCM API, the traces flow from the Target Monitoring Tool may conflict with the Terminal Emulator data block flow : some of the data or of the traces may be not displayed. When sending many data on an IO flow, the user should limit the number of traces requested to the Target Monitoring Tool.

6.1.3.4 Select the Current Embedded Application Workspace

When an embedded application binary file is generated, a workspace file MyProject.wks is also produced.

1. Use the **File->Open Workspace...** menu.
2. Select the .wks file the **out/tmt** directory of the current downloaded embedded application (in **arm** or **gcc** directory, according to the used compiler).
3. The Target Monitoring Tool does not need to be restarted.

The Target Monitoring Tool can use this file to display the function's names when the software crashes and leads to a BackTrace. (for more information on software security, see Basic Development Guide for more information, Ref. I)

The "BackTraces" log can be retrieved by using the Commands->Get Debug Info->Request EEPROM logged errors menu.

The workspace defines also a diagnose tip file, usable to display tooltip windows according to the current downloaded application, during the selection of trace levels. This file is named DiagnoseTips.ini and is copied in the **out/tmt/config** directory. The user should update this file with its own tip labels to use them with the target monitoring tool.

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6.1.4 Terminal Emulator

6.1.4.1 Description

The **Terminal Emulator** is an AT command terminal. It is used by the User to send and receive string commands to or from a customer task (on the Target or in Remote mode). It can use either the serial link Nominal mode (the AT window is then open) or the Wavecom Debug mode.

The **Terminal Emulator** connects an External application in standard V24 mode. It transforms a data flow from standard mode to debug mode. An External application can also get information in nominal mode.

6.1.4.2 Getting Started

If the **Target Monitoring Tool** is running, start the **Terminal Emulator** using the corresponding button in the toolbar (check **"Toolbar"** in **"View"** menu), or **"AT cmd terminal"** from the **"Tools"** menu.

You can also launch the **Terminal Emulator** using the shortcut from the Windows Start menu.

The Terminal Emulator provides two windows : one for AT commands and one for the V24 Data flow. Refer to the Terminal Emulator **"help"** menu for more information.

> Note: in case of an embedded application using the FCM API (cf. the Development Guide), the target should be initialized in Debug Mode (**"Commands" -> "Init Target"**) before any FCM operation; otherwise the Terminal Emulator and the Target Monitoring Tool will not run properly. Moreover, if the external serial port (COM2) is used, the **"External Com" -> "Open..."** command must be used before any FCM operation.
>
> Note: if there is a data call, or if the serial link is switched into DATA mode with the FCM API, the **"+++"** sequence does not work in the Terminal Emulator.

6.1.5 Remote Application Execution

This tool is a set of libraries with which the User application can be executed on a PC by means of Visual C++ ® while communicating with the target through a serial link.
This tool is detailed in the next paragraph.

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7 Remote Task Environment

7.1 Basic Concepts

An Embedded application can be executed from a PC, while communicating with the rest of the Target software through a serial link.

An Embedded application is implemented in a specific task (customer task). This task can be executed on a PC, using the Windows version of RTK. In this case, the customer task is deactivated on the target.
This concept is described in Figure 4.

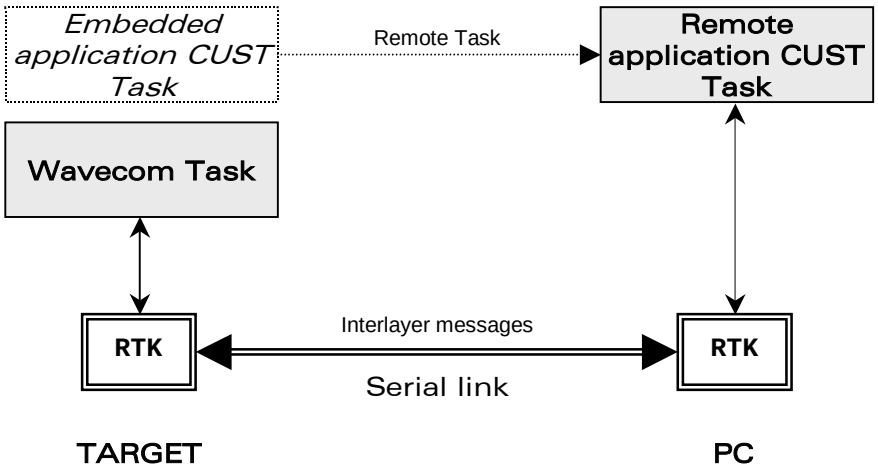


Figure 41: Project Architecture

Without changing the code, an Embedded Application becomes a Remote Application after recompilation.
The Remote process (development, compilation, link, execution) operates in one of the supported development environments.

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7.2 Project Creation

Please refer to the "Building Open AT® applications" chapter for more details on how to create and build projects in remote mode.

7.3 Remote Application Execution

7.3.1 Serial Port Configuration

Using the **Serial Link Manager**, the user has to check that the serial port speed is set to the same value as the Target port speed.

The **Auto Detect** command from the **Target Monitoring Tool** can be used to retrieve this speed. In order to get better results, the speed should be kept at **115200 bauds** (default value).

When connecting the target to the computer through the serial link, the connection may not work, because the Target and the computer serial interfaces may use different baud rates.

Selecting **Auto Detect** will then make the **Target Monitoring Tool** send frames with different successive baud rates. If the target sends them back, it means the target speed and the computer speed match. The **Target Monitoring Tool** then stops scanning.

An **Auto Detect** sequence typically lasts five to ten seconds. The **Target Monitoring Tool** may seem slower during this time.

The Terminal Emulator has to be launched before starting the remote application, to check whether the communication with the target is correct or not.

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7.3.2 Remote Application Launch

To launch the user interface, from the Development Environment menu, select the following command :

build -> Start Debug -> Go (F5) *Visual C++ 6*
or
Debug -> Start (F5) *Visual C++ .NET*

The Development environment then starts in Debug mode, and launches the **Remote Application Execution Tool**.

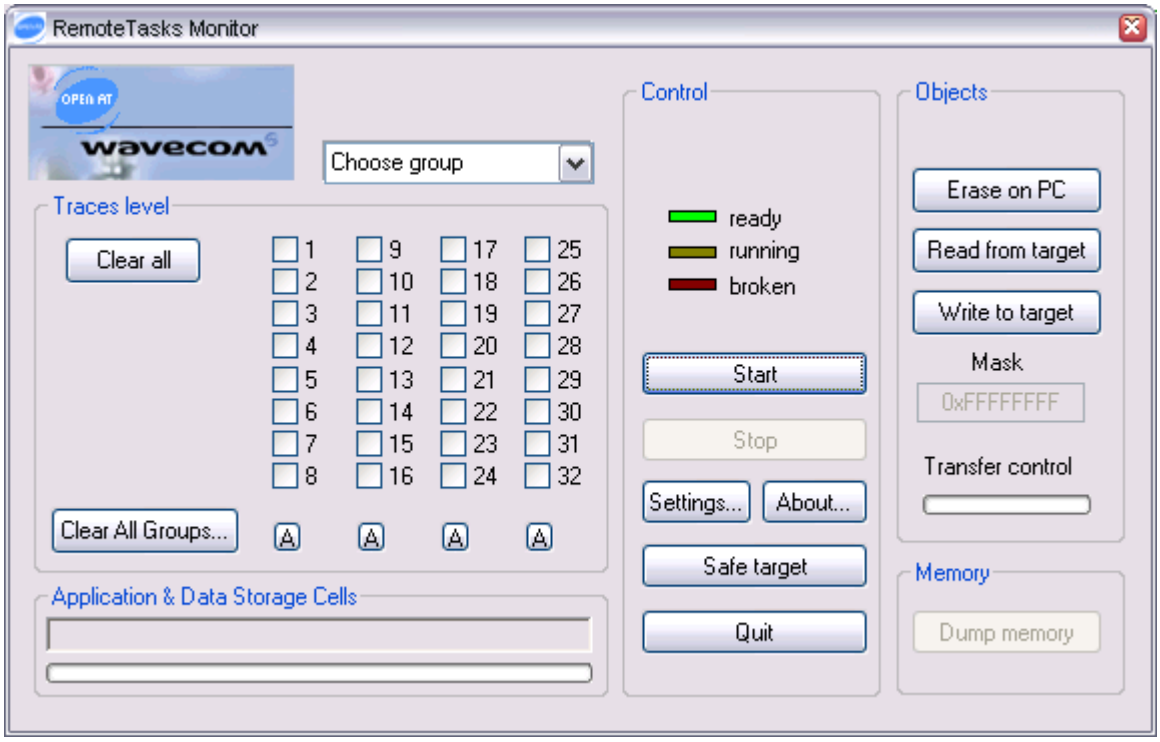


Figure 42: Remote Application Controller

The remote process is started as soon as the **Start** button is clicked from the Remote Application Controller (see Figure 42 – step 1, then step 2).

The Initialization sequence is described below :

1. Initialization of the serial link (in Serial Link Manager mode),
2. Target configuration,
3. Target RTK Re-initialization,
4. Remote Application Execution creation and activation.
5. The **Target Monitoring Tool** should then display the selected trace levels, showing that the application is running correctly (in Figure 42, the step 3 is reached)

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Note

During step-by-step execution, trace messages are not displayed at once by means of the **Target Monitoring Tool**. They are only displayed after an RTK scheduling.



Figure 43: RTE Monitor control steps (1 to 4)

To stop the remote application execution, the Stop button has to be clicked (Figure 42, step 4). Then, a Flash Object synchronization may be done (if wished), and the RTE monitor may be closed by the Quit button.

If the RTE application does not end by this way (Stop button, and then Quit button), due to an exception during the process, or by using the "Stop Debug" option of the Development Environment, any target Open AT® application will still be disabled.

In order to restore the target application normal running mode, the RTE monitor has to be launched again, and the Safe Target button has to be clicked.

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7.3.3 Traces Configuration

Embedded application trace messages are displayed using the **Target Monitoring Tool**, by the way of a trace window opened from the **Traces** menu.

The Target application traces then appear **in black** and the Remote Application traces appear **in blue**.

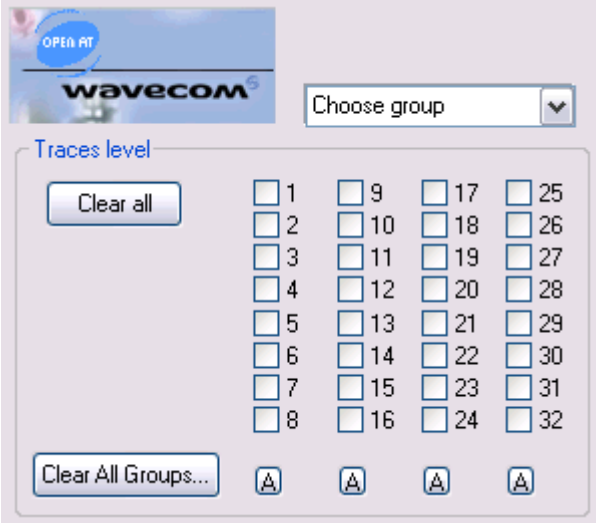


Figure 44: Trace Level Selection

Each trace instruction corresponds to a trace level. The user has to select this level using the Remote Application Controller before using the **Target Monitoring Tool** to display the traces.

Firstly, the Open AT® task has to be selected (ADL applications use always CUS4 task).

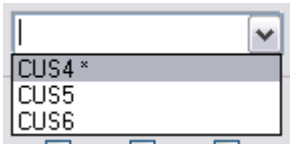
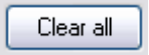


Figure 45: Select Open AT® task

Then each trace level may be selected separately, or a whole column by pressing a  button. Trace levels may be also cleared separately, or together, for the selected task ( button), or for all tasks ( button).

Enabled trace levels may be changed at any time, during or out of the application execution. Changes will immediately be applied in the **Target Monitoring Tool.**

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7.3.4 Data Flash Objects synchronization

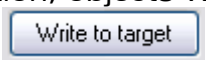
Data Flash Objects are entities in which the User application can save data such as addresses, phone numbers, etc. An object is referred to by a 16-bit hexadecimal identifier (this is NOT a physical address).

In remote application, these Data Flash Objects are emulated through physical files, located in the **[project path]\rte\objects** directory.

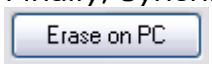
In order to have the same Data Flash Objects configuration as on the Target, the user has to launch a read synchronization (

button) before starting the Remote Application.

Note :
Because both size and number of Data Flash Objects present on the Target, read synchronization may take up to one or two minutes.

After a remote application execution, objects written on PC side may be synchronized to target using the 

button.

Finally, synchronized objects on PC side may be erased using the 

button.

7.3.5 Application & Data Storage Cells synchronization

Application & Data storage cells are fully available within RTE mode. Writing to cells process is completely transparent. On “GetInfo” (reading) process, cells are synchronized and shadowed on PC each time the data are updated. The synchronization process is monitored by the corresponding progress bar in the RTE monitor interface.

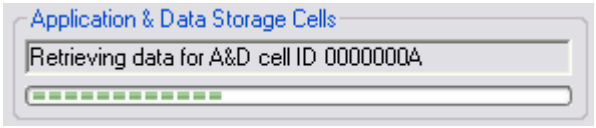


Figure 46: A&D cell synchronization

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8 Commnd-line scripts

Open AT® Project Wizard and development environment are graphical interfaces which use the following command-line scripts to respectively create and build Open AT® application projects.

8.1 Create Open AT® projects : wmnew script

The wmnew script may be used from a Cygwin bash shell command line in order to create/update Open AT® application projects. This script has to be called from the project root directory. The available options are described below.

8.1.1 Script control

Option	Use
-h	Displays help on wmnew script and exits.
-v	Verbose mode (displays information on each project generation step).
-c	Cleans previously generated workspaces files before process.
-i	Ignores the current directory wmnew.opt file if any (by default, this file content is added to the command line options).
-ns	Does not save the currently required options in the wmnew.opt file (by default, command line options are saved in a wmnew.opt file in the current directory).
-s	Synchronizes the enabled workspaces in the Open AT® Settings application (by default, the only generated/updated file is the .scs one)

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8.1.2 Script modes

Option	Use
[default]	Updates the existing project in the current directory with existing options.
-n	Creates a new project (similar as –sample adl/New_Project option)
-sample SAMPLE	Creates a copy of the required SAMPLE in the local directory ; if the sample depends on some sample libraries, these ones are also copied in a Libraries directory (located in the same directory as the project one). SAMPLE syntax is "[api]/SampleName" (where SampleName is the sub-directory name of chose sample in the $WMATHOME/Samples/[api] root one ; for example –sample adl/Hello_World)

8.1.3 Project interface options

Option	Use
-adl	Uses the ADL interface (default).
-basic	Uses the Basic interface.

8.1.4 Project type options

Option	Use
-app	Defines an application project (default).
-lib	Defines a library project.

8.1.5 Project global options

Option	Use
-name NAME	Defines the project name (for new projects only ; existing and sample projects names are automatically defined).
-flag FLAG	Adds the FLAG compilation flag to the project flags list.
-gssf FACTOR	Sets the GCC stack size factor to the FACTOR value (default 2). This value is the factor with which the source code stack size has to be multiplied for the GCC compiler (since GCC needs more room in the call stack on run time than the ARM compiler).
-product PRODUCT	Defines the used OS on the target as the PRODUCT one. The required value is the corresponding sub-directory of the "$WMATHOME/Wavecom OS" one, which contents the needed OS files.

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Option	Use
-optionfile FILE	Add SGT options FILE content to compilation flags list. A SGT options file is a text makefile containing a PP_OPT_COMMON variable (all compilation flags set in this PP_OPT_COMMON variable will be added to the compilation flags list).

8.1.6 Project source paths options

Option	Use
-src SRCPATH	Adds SRCPATH to the source paths list (always contains by default the ./src current sub-directory). All .c files in these directories will be considered as a source file for the project.
-inc INCPATH	Adds INCPATH to the include paths list (always contains by default the ./inc & ./itf current sub-directories). All .h files in these directories will be considered as an header file for the project.
-path FULLPATH	Similar to : -src FULLPATH/src -inc FULLPATH/inc -inc FULLPATH/itf

8.1.7 Project object paths & names options

Option	Use
-extobj OBJPATH	Adds the OBJPATH path to the absolute objects paths list. Object files will be browsed exactly in the provided directory.
-rootobj OBJPATH	Adds the OBJPATH path to the root objects paths list. Object files will be browsed in the sub-directory which matches with the currently used compiler (for example arm/out for ARM compiler, gcc/out for GCC compiler, etc...)
-objname OBJNAME	Adds the OBJNAME template to the real object names filter list. Object files will be browsed with trying to match exactly the provided template (including the extension), whatever is the currently used compiler. (for example, the –objname “m*.o” option will browse for all object file names beginning with the “m” letter).
-objpref OBJNAME	Adds the OBJNAME template to the prefixed object names filter list. Object files will be browsed with trying to match the provided template, according to the currently used compiler. (for example, the –objpref “myobject” option will browse for object file names which match the “arm_myobject.o”, “gcc_myobject.o” or “rte_myobject.obj”, according to the currently used compiler).

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8.1.8 Project library paths & names options

Option	Use
-extlib LIBPATH	Adds the LIBPATH path to the absolute libraries paths list. Library files will be browsed exactly in the provided directory.
-rootlib LIBPATH	Adds the LIBPATH path to the root libraries paths list. Library files will be browsed in the sub-directory which matches with the currently used compiler (for example arm/out for ARM compiler, gcc/out for GCC compiler, etc...)
-libname OBJNAME	Adds the LIBNAME template to the real library names filter list. Library files will be browsed with trying to match exactly the provided template (including the extension), whatever is the currently used compiler. (for example, the –libname “mylibraries*.lib” option will browse for all library file names beginning with the “mylibraries” template).
-libpref LIBNAME	Adds the LIBNAME template to the prefixed library names filter list. Library files will be browsed with trying to match the provided template, according to the currently used compiler. (for example, the –libpref “mylibrary” option will browse for library file names which match the “arm_mylibrary.lib”, “gcc_mylibrary.lib” or “rte_mylibrary.lib”, according to the currently used compiler).

8.1.9 Provided libraries options

Option	Use
-samplelib SMPLIB	Adds dependencies to the SMPLIB sample library in the current project. (copy the SMPLIB sample library files in the ../Libraries/SMPLIB directory, and then similar to : -inc ../Libraries/SMPLIB/itf -rootlib ../Libraries/SMPLIB -libpref SMPLIB)
-otherlib OLIB	Adds dependencies to OLIB in the Add-on libraries list. OLIB syntax is [add-on]; Where [add-on] is the required add-on directory (located in the $WMLIBHOME location); a [add-on]/[version] syntax should also be used if the required [add-on] version is installed in a [version] sub-directory.

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8.2 Building Open AT® projects : wmmake script

The wmmake script may be used from a Cygwin bash shell command line, in order to build an Open AT® project. This script has to be called from the project root directory. The script syntax & options are defined below :

```
wmmake [<Project>] [options…]
```

where <Project> is the project name, without any extension or with the `.scs` or `.mak` one.

If the `<Project>` name is not provided, `wmmake` will automatically use the current directory project file.

8.2.1 Script control

Option	Use
-h	Displays help on wmmake script and exits.
-n	Do not browse for libraries projects dependencies. By default, for all libraries with a prefixed name (-libpref option in wmnew script) and a root path (-rootlib option in wmnew script), the wmmake script (re-)builds also the corresponding library project.
-v	Do not check the SDK version versus the current project one. By default, if SDK & current project versions do not match, a warning message is displayed, and the user is prompted in order to continue the build process or not.

8.2.2 Clean options

Option	Use
all_clean	Cleans the output directory generated files and exits.
-c	Performs a “all_clean” process, and re-launches the build process.

8.2.3 Compiler options

Option	Use
[default]	Builds the project using the compiler defined by the Open AT® settings application.
-arm	Builds the project using the ARM compiler
-gcc	Builds the project using the GCC compiler

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8.2.4 Memory options

Option	Use
[default]	Builds the project using the memory type defined by the Open AT® settings application.
-X	Builds the project for X type memory products; please refer to the ADL User Guide (See Ref.IV) for more information about the available memory types.

8.2.5 Debug Options

Please see the ADL Trace Service description for more information about the debug flags.

Option	Use
-debug	Defines the __DEBUG_APP__ flag at compilation time (default value).
-fulldebug	Defines both the __DEBUG_APP__ & __DEBUG_FULL__ flags at compilation time.
-release	Does not define any debug flag.

8.2.6 Error messages

The following error messages may be displayed by the `wmmake` script.

"Unable to find xxx.scs project file."

The provided project file name is invalid.

"Makefile synchronization error"

Please refer to the wmcheck script description to find what is not correctly configured in the Open AT® environment.

The Cygwin environment may also not be correctly installed.

"The Open AT® environment is not correctly installed."

Please refer to the wmcheck script description to find what is not correctly configured in the Open AT® environment.

"The ARMDLL environment variable is not set."

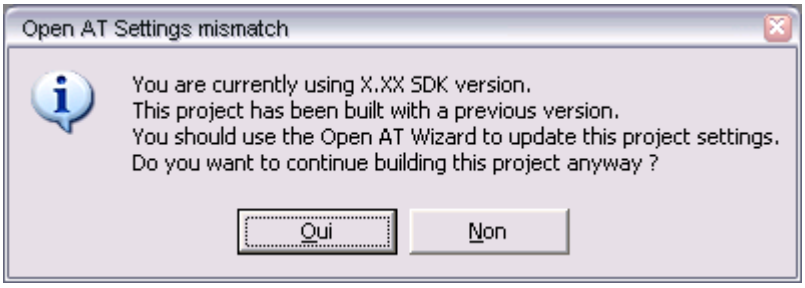
The ARM compiler is selected in the Open AT® Settings application, but either it is not correctly configured in the ARMDLL environment variable, or it is not installed.

"The WMGCCHOME environment variable is not set."

The GCC compiler is selected in the Open AT® Settings application, but either the compiler path is not set, or the GCC compiler is not installed.

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If SDK & current project versions do not match, the message box below will be displayed:



If the "yes" option is selected, the build will continue (with no success guarantee, since the project should be updated with the Open AT® Project Wizard).

If the "no" option is selected, the build will stop, and the project should be updated with the Open AT® Project Wizard.

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8.3 Check current Open AT® environment settings : wmcheck script

The wmcheck script may be used from a Cygwin bash shell command line, in order to display the current environment configuration, and detect what is going wrong if other tools (as the Open AT® project wizard, or the wmmake script) do not run properly. The script syntax & options are defined below :

```
wmcheck [-n | <output file>]
```

8.3.1 Script control

Option	Use
-n	Do not display the configuration. If a configuration error is detected, an error message will be displayed, and the script return value will be 1 instead of 0.
<output file>	Name of the text file where to copy the configuration dump. This text file should be used to report any configuration problem.

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8.3.2 Configuration dump sample

When running the wmcheck script, a configuration dump similar to the one below may be displayed.

```
Current target compiler: arm [OK]
Current target memory size: X [OK]
Current target OS: 6XX [OK]
Current IDE workspaces synchro list:  .dsp  .vcproj [OK]
Current SGT directory: /cygdrive/C/OpenAT/Tools/SGT/vX.X.X [OK]
Current SGT version: vX.X.X [OK]
Current SGT scripts directory: /cygdrive/C/OpenAT/Tools/SGT/vX.X.X/script_sgt [OK]
Check make_lib script: /cygdrive/C/OpenAT/Tools/SGT/vX.X.X/script_sgt/make_lib [OK]
Current Open AT directory: /cygdrive/C/OpenAT/VXXX [OK]
Current Open AT directory (for Windows): "C:\OpenAT\VXXX" [OK]
Current GCC compiler directory: /cygdrive/C/OpenAT/Tools/GCC/X.X.X.X [OK]
Current ARM compiler directory: C:\Program Files\ARM\ADSv1_2\BIN [OK]
Current Add-on libraries directory: C:/OpenAT/VXXX/TgtGen/Add-ons [OK]
Current Tools base directory: /cygdrive/C/OpenAT/Tools [OK]
Current OS root directory: /cygdrive/C/OpenAT/Tools/CoreSW [OK]
Check OS root directory consistency: /cygdrive/C/OpenAT/Tools/6XX [OK]
Check wmnew script: /cygdrive/c/OpenAT/VXXX/TgtGen/WmGen/wmnew [OK]
Check wmmake script: /cygdrive/c/OpenAT/VXXX/TgtGen/WmGen/wmmake [OK]
Check wmsync script: /cygdrive/c/OpenAT/VXXX/TgtGen/WmGen/wmsync [OK]
Check wmsetup script: /cygdrive/c/OpenAT/VXXX/TgtGen/WmGen/wmsetup [OK]
```

If at least one line of the configuration dump displays an [ERROR] tag, it means that there is a problem in the environment configuration.

In order to solve configuration problems :

- Check the configuration in the Open AT® Settings application.
- Try to run the "$WMATHOME/TgtGen/WmGen/wmsetup" script from a Cygwin bash shell, and restart Cygwin.
- If the problem is not solved, try to install again Cygwin (ie. delete completely the cygwin directory, and re-install it from the Open AT® CDROM), and run the "$WMATHOME/TgtGen/WmGen/wmsetup" script from a Cygwin bash shell.
- If the problem is still not solved, try to re-install completely the Open AT® environment.

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9 TCPIP debug tool

A script tool is provided on Open AT® SDK, in order to trace IP packets when using the TCPIP Add-on library.

Note: IP packets can be only monitored on the GPRS flow, not on the GSM Data flow.

9.1 Enable the traces

In order to display the IP packet in the Target Monitoring Tool, the +ADLDBG command may be used. This command syntax is defined below:

AT+ADLDBG=<FlowId>

Where <FlowId> is the ADL FCM flow ID (in hexadecimal base) to monitor, in order to display IP packets: please refer to the ADL User Guide (See Ref.IV) to get the full flow ID list.

In order to monitor the IP packets sent and received on the GPRS flow, the AT+ADLDBG=50 command has to be used.

FCM data packets traces are displayed on the level 25 of the CUS4 task, so in order to retrieve the IP packets traces, the CUS4 task's 25th level has to enabled in the "Set and request to the target" dialog box of the Target Monitoring Tool.

9.2 Write traces to disk

In order to save retrieved IP packets traces into a file, the user may:

- Either enable the "Saving" checkbox in the Target Monitoring Tool ; the file name is defined by the "New File" options of the right-click menu in the Traces window.
- Or copy all the traces lines of the Traces window, and paste them into a new text file, within a text editor.

9.3 TCPDUMP format conversion

From the Cygwin command line, the `wm_trc2tcpdump.awk` script may now be used to convert the traces text file to the TCPDUMP format. The syntax is:

```
Usage: wm_trc2tcpdump.awk <TraceFile> <TcpDumpFile>
```

Where <TraceFile> is the text traces file saved from the Target Monitoring Tool, and <TcpDumpFile> is the TCPDUMP format destination file. This file will be overwritten without any warning.

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If the text traces file does content any IP packets, a warning will be displayed, and the output file will not be written.

9.4 IP packets analysis

Now the TCPDUMP format file may be opened by any software able to read this format. The most known one is Ethereal, which may be downloaded for free from the http://www.ethereal.com URL.

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10 Annex: environment & compilation issues

This section describes problems commonly encountered when using the Open AT® environment, along with their solutions. Problems can be due to either bad environment settings, Cygwin installation errors, or Open AT® project setting errors.

10.1 Bad environment settings

Environment variables are used in order to supply configuration elements to the different software programs used in the Open AT® SDK. These variables are set at SDK installation and should be modified through the Open AT® Settings application. It is strongly recommended not to modify them in the Windows settings.

Please remember that environment variables value can be checked through the **`wmcheck`** script, called from a Cygwin bash shell.

10.1.1 Environment modification issues

Environment variables are processed differently according to the version of Windows used.

- In Windows 98 & ME, the computer has to be restarted each time the environment is modified.
- In Windows NT, 2000 & XP, the computer does not need to be restarted, but some applications should be closed and re-opened in order to apply changes.
  - Explorer windows are automatically updated to reflect environment changes.
  - Other applications (Visual C++ IDE, Cygwin bash shell, Open AT® Wizard, Windows command line shell) are not updated to reflect these changes and have to be closed & re-opened when an environment variable is modified.

10.1.2 Environment redefinition in Cygwin .bashrc files

Environment variables should be redefined in the Cygwin .bashrc file, using the **`export`** statement. This configuration is not recommended, since tools such as Visual C++ use both Windows & Cygwin environments to run and would not work properly if environment variables are modified in this way.

10.1.3 Environment settings rights

In Windows NT, 2000 & XP, environment variable may only be modified by certain users for security reasons. This depends on the security policy of the Operating system being used. For example, Windows NT distinguishes users

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on the basis of their privileges. Users having administrators rights will be provided with complete access to install or uninstall software, hardware and change the environment variables etc. However, some users (such as Guests, Operators etc) will not be granted privileges to change settings with a major impact on the system (such as a change of registry or environment variable settings). If Open AT® is installed by a user having restricted privileges (i.e. not having Administrative privileges), then the environment variables may not be set properly. So for correct installation in Operating Systems such as Windows XP, Windows NT or Windows 2000, Open AT® installation must be performed from a user account with the correct privileges to set environment variables and change system settings (preferably an Administrative account). This will solve the problems related to the unavailability of environment variables.

10.2 Cygwin & other installation issues

The Open AT® generation environment is based on script & makefiles, running through the Cygwin utility. According to the configuration of each computer (especially the network configuration), Cygwin may not install properly, and the configuration files should be modified to make it run.

Please remember that Cygwin installation can be checked through the **`wmcheck`** script, called from a Cygwin bash shell.

10.2.1 Missing Cygwin packages

When installing the Cygwin distribution supplied on the Open AT® SDK, please remember that all packages have to be installed (cf. the Getting Started document for more information about Cygwin installation).

A commonly encountered error, when generating an Open AT® project thanks to the Wizard, is the "**`Wmnew script error 5 ([wmsync] xsltproc package is not installed on the system`**" message display. Such an error can be easily solved by re-installing Cygwin with all the supplied packages.

10.2.2 Missing SGT or GCC packages

If the SGT or GCC tools were not selected when installing the SDK, Open AT® projects will be neither be created nor compiled properly. Such a problem can be diagnosed by using:

- either the Open AT® Settings application (if the SGT or GCC paths are not set, or if it is not possible to configure correctly these settings);
- or the **`wmcheck`** script from a Cygwin bash shell.

10.2.3 Problems on Cygwin home directory

If, when using the Open AT® Wizard, a "bad environment settings" message is displayed, there are problems with the current user's Cygwin home directory.

When starting a Cygwin bash shell (from the start menu or the desktop icon, if any; if not, the **`cygwin.bat`** file can be found in the Cygwin root directory), the

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following messages are usually displayed. If not, the user's home directory is not configured correctly.

```
----------------------------
 Software Generation Toolkit
----------------------------

 SGT_VER  = v1.2.11
 SGT_DIR  = /cygdrive/C/OpenAT/Tools/SGT/v1.2.11
 Scripts path for SGT :
  /cygdrive/C/OpenAT/Tools/SGT/v1.2.11/script_sgt

 Type help_sgt for a list of SGT commands

----------------------------
```

Cygwin uses the **$HOME** environment variable to reference the user root directory. To process this directory, Cygwin applies the following rules (extract from /etc/profile Cygwin file):

```
# Here is how HOME is set, in order of priority, when starting
from Windows
#  1) From existing HOME in the Windows environment, translated
to a Posix path
#  2) from /etc/passwd, if there is an entry with a non empty
directory field
#  3) from HOMEDRIVE/HOMEPATH
#  4) / (root)
```

The current home directory can be identified using the **pwd** command under a Cygwin bash shell. Please remember that the Cygwin "/" directory matches the installation directory (C:\cygwin by default).

The **/etc/passwd** file content is described in the next chapter.

When using a Windows **HOME** environment variable, the process depends on the existence of the directory:

- Either the directory does not exist: Cygwin will create it (if the **HOME** environment variable is consistent), and copy skeleton files (from the **/etc/skel** directory) to it.
- Or it already exists: Cygwin will not perform any update on this directory. If skeleton files (normally copied from the **/etc/skel** directory) do not exist, the user should copy them manually to this existing directory.

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Once the skeleton files exist in the home directory, the user should use the **wmsetup** script in order to set up the Open AT® environment under Cygwin. Finally, after closing and restarting Cygwin, the Software Generation Toolkit welcome message should be displayed, and the **wmcheck** script diagnostic should be correct.

10.2.4 Corrupted Cygwin files

Depending on the user's computer network specific configuration, Cygwin computes the users files at installation time (**/etc/passwd** & **/etc/group**). Sometimes, these files are not correctly computed: Cygwin then displays information on how to re-generate them via the following commands:

- **mkpasswd -l > /etc/passwd**
- **mkgroup -l > /etc/group**

After closing and restarting Cygwin, if the problem still occurs, the **/etc/password** file should be edited to add the current user:

- copy & paste any other user line (or the administrator line) at the end of the file;
- in this line, replace all occurrences of the copied login with the user login (can be read from the **$USER** variable);
- finally, close and re-start Cygwin.

Once this corrupted files problem has been solved, please also check the Cygwin home directory problems, described in the previous section.

10.3 Compilation & link issues

When the environment is correctly configured, the sample projects supplied are all correctly compiled and linked. Further compilation and link issues may be due to bad project settings, or mistakes in the application code.

10.3.1 Add-on libraries: missing header file or library

Sometimes, the compilation fails on the dependencies checking phase, when an add-on library header can not be found.

The recommended way to use an add-on library (i.e. include the header files location and link against the supplied library) is to add the **-otherlib LIBNAME** statement in the **wmnew** script options location of the Open AT® Wizard. **LIBNAME** is the required add-on library name: it is one of the sub-directory names located in the **$WMATHOME/TgtGen/Add-ons** path (e.g. to use the Open AT® GTi add-on, use the **-otherlib GTi** statement in the Open AT® Wizard).

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10.3.2 Header files inclusion issues

When there are mistakes in the application header files inclusion statements, the compilation process has to be completely re-started in order to refresh the dependencies.

- with Visual C++, use the "Rebuild All" command, instead of the simple "Build" one.
- With **wmmake** script, use the **-c** option to re-run the whole build process.

10.3.3 Compilation issues in Target mode

When there are mistakes in the application source code, these are displayed differently according to the compiler used:

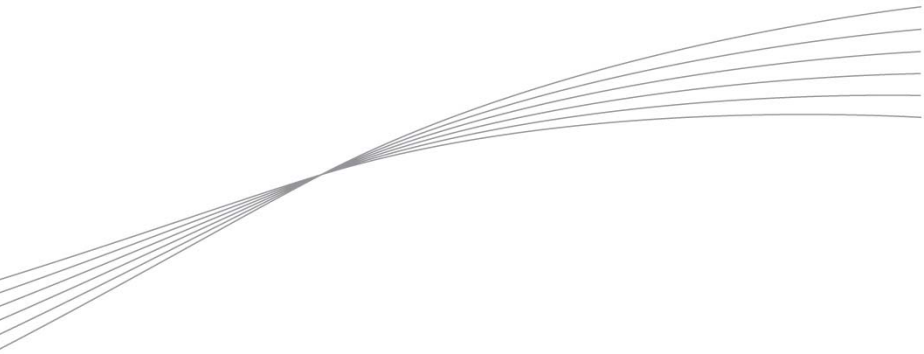
- with the GCC compiler, compilation issues are displayed just after the "**… Compiling myfile.c**" statement in the console window
- with the ARM compiler, compilation issues are logged in the **arm/out/status_log.tmp** file, and are displayed at the compilation process end.

10.3.4 Link issues in Target mode

When symbols (functions, constants or global variables) are missing at the link step, issues are displayed differently according to the compiler used:

- with the GCC compiler, there are link issues when the "**arm-elf-nm: 'Mybinary.elf': No such file**" message is displayed. Issues are logged in the **gcc/out/Mybinary_err_lnk.tmp** file; this file has to be opened in order to view the issues.
  Undefined reference issues can be found by searching for the "**undefined**" statement.
  Missing library or object issues can be found by searching the "**error**" statement.
- with the ARM compiler, link issues are logged in the **arm/out/Mybinary_err_lnk.tmp** file, and are displayed at the end of the compilation process.

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