Developing MIOS Applications with Code::Blocks

Note Updated 18/01/07 Please check to be sure you are doing this right, c::b changed a lot since the first version of this doc - *stryd_one*

The technical jargon: This is a walkthrough on the process of developing MIOS Applications primarily in C but also in ASM utilising the MIOS C Wrapper. The platform used will be Code::Blocks IDE onMicrosoft Windows XP, and the applications will be built for both AC-Sim (AudioCommander's C Simulator) compiled with GCC for MinGW, and for the MIDIBox Hardware Platform (MBHP) compiled for PIC18F with SDCC, assembled with GPUtils, using ActiveState ActivePerl to generate, and parse files for, the DOS-Console-based make batch file scripts, and MIOS Studio will be used for debugging on MBHP.

Please don't be put off by all that mumbo jumbo. If you're totally newbie then this document is also for you :) I've included everything you need to do, step-by-step, for everything except for actually coding the app. I hope this will not only make it easier for newbies to get started, but for ASM coders like myself to transfer their skills into C development (which seems to be the future of MIOS) or as a reference point for the experienced. In order to do this, I've included as much information as possible, but I have created links to jump through the document for those who don't need all that detail.

I hope you find this document helpful and that you will feel free to make suggestions or criticism or corrections or any kind of modifications as you see fit :)

Install and Configure Applications

Sun Java J2SE

Chances are you already have this... I don't recommend upgrading the existing version if you do.

- Download J2SE
- Install with defaults or whatever meets your requirements. I recommend disabling automatic updates.

7zip

This tool is needed to extract compressed files. If you already have winzip or winrar then you won't need this. I recommend the latest version MSI installer for ease of use.

- Download 7zip
- Install the complete application using the defaults

GNU PIC Utilities (GPUtils)

- Download gputils-win32
- Install the complete application using the 'Complete' option.
- When the installer asks you, click 'Yes' to add the installation directory to the PATH environment variable.

ActiveState ActivePerl

- http://www.activestate.com/store/download.aspx?prdGUID=81fbce82-6bd5-49bc-a915-08d58c2648ca
- Install using defaults
- If you are prompted to restart your computer, then do so (yes, now... I know it's annoying!).

Small Device C Compiler (SDCC)

- Download SDCC. 2.50 is officially supported or you can get the latest snapshot if you're more experienced. Some PIC compiler routines have been improved in 2.6.0+ so this may be beneficial.
- Install using defaults (Note that this installs the PDF doc as well which can be very useful)

MinGW

MinGW contains GCC which is used to compile the simulator

- Download the installer. Version 5.1.3 has tested OK.
- Install, taking the 'Download and Install' option, and select the 'Candidate' package (use 'Current' if you have problems) and the 'Minimal' install type. It may be best to accept the default install path as MinGW doesn't like paths with spaces.
- If the installer crashes while downloading just keep repeating the above until it completes.

GDB (GNU DeBugger)

GDB is used to debug apps and is a must-have for MIOS development.

- Download the installer
- Install, taking the same default install path as MinGW (above).

Environment Variables

Normally, the necessary directories are added to you PATH environment variable during the above installations. Sometimes, they aren't. Here's how to check it:

- Minimise any open windows so that you can see the desktop.
- Right-click on 'My Computer', select 'Properties'.
- Click on the 'Advanced' tab, then click 'Environment Variables'
- Under either User or System variables, select the variable 'PATH' and click 'Edit'
- Add these entries if they don't exist (Entries should be separated by semicolons):
  - ;C:\Program Files\ActiveState\PERL\bin\
  - ;C:\Program Files\SDCC\bin
  - ;C:\Program Files\gputils\bin
  - ;C:\MinGW\bin

Code::Blocks IDE

Install

Full Installer package is *no longer recommended* unless you're an expert. We now need to manually install and configure GDB (GNU DeBugger) and MinGW, which contains GCC - the GNU C Compiler. GDB is used to debug your application in the simulator, which is compiled with GCC. Once those are installed we can get C::B ready. Here's how:

<trivia> GCC actually stands for GNU Compiler Collection, not GNU C Compiler. In addition to C, it supports heaps of other stuff so the name changed.</trivia>

Code::Blocks

For our purposes, CodeBlocks latest nightly build version should be installed.

- If there is an existing version then delete the share\ dir, for example C:\Program Files\CodeBlocks\share*.* before upgrading
- Get link for Nightly Build from the CB Forum
- Unzip downloaded file to Program Directory, for example C:\Program Files\CodeBlocks\, and overwrite where prompted.
- Download a patched wxwidgets dll and extract to the CodeBlocks Program Directory, for example C:\Program Files\CodeBlocks\
- Start Code:Blocks. If it generates an error about mingwm10.dll missing, ensure the above path variabless are set.
- Code:Blocks will detect and configure installed compilers. It should find 'GNU GCC Compiler' and 'SDCC Compiler'. Accept defaults.

Configure

In order to use the GDB (GNU DeBugger) debugging features of Code::Blocks with AC-Sim (AudioCommander's C Simulator) you need to configure GCC to produce debugging symbols when compiling as follows:

- Select the menu 'Settings... Compiler and Debugger...'
- Select 'Global Compiler Settings' in the pane on the left
- In the box labelled 'Selected compiler', select 'GNU GCC Compiler'
- Select the tab labelled 'Compiler' and then the tab labelled 'Compiler Flags'
- From the dropdown box labelled 'Categories:', select <All categories>
- Tick the box labelled 'Produce debugging symbols [-g]' (Sometimes there's no box, just click in the space to the left of the text and you'll see the tick.

This should be all that is needed to have all the applications ready to go.

Project Setup

Full instructions are below, but you may jump to the required section based on your requirements:

Project Setup - New Application



The template needs updating

If you are creating a new application, you can simply download the MIOS SDCC Skeleton Application Template, extract it to your template directory, and start with that, and none of the below steps are necessary. This zip file does not change any of the functionality of the normal SDCC Skeleton App, so you can use it as normal, as well as with C::B. Here is a walkthrough:

- Download the MIOS SDCC Skeleton Application Template
- Extract the contents of the zip to your user template directory. It will be C:\Documents and Settings\<your username>\Application Data\codeblocks\UserTemplates
- In Code::Blocks, Select 'File... New Project'
- Select the tab labelled 'User Templates', and double-click the project named 'MB-ACSim'
- Writing your code is up to you but once you're done, jump to the section on Compiling and Debugging for either AC-SIM or MBHP

Project Setup - Existing Application or Skeleton Creation

I plan to write a small application which will automatically convert a MIOS application (as downloaded from UcApps) into a Code::Blocks Project complete with AC-Sim sources for pre-MBHP debugging. In the meantime, the C::B Project can be setup from either an existing MIOS C Application or the SDCC_Skeleton App as follows. You should have your application/skeleton in a dedicated folder.

Create Empty Project

- Copy all files from either the C Skeleton or your app to a directory where you would like to store the project.
- Start Code::Blocks
- Open a new project ('File... New Project')
- Click 'Console Application' from the list.
- In the box labelled 'Project Path and Name', browse to the directory containing your MIOS Application or Skeleton, and add the name of your Project
- Ensure GCC Compiler is selected
- If you are prompted to select a language to use, select 'C'

Add Application files to project

- The automatically created main.c needs to be deleted
- Select 'Project... Add Files', Select All of the source code files in your Project directory, Click 'Add'
- If you are prompted to select which build target should be used, click 'Select All'

Configure Build Targets

AC-SIM Build Target

Skip this section if you do not need to use the simulator

- Ensure AC-SIM files are added to the project. Follow the instructions at the AC-Sim WIKI page Setup Guide
- Select 'Project... Properties', Select the 'Targets' tab, you should see two targets preconfigured ('Debug' and 'Build')
- Select the target 'Debug'
- In the box labelled 'Selected build target options', select 'Console Application' from the drop-down list labelled 'Type'
- In the box labelled 'Selected build target files', Tick ONLY 'ACSim_console.c', 'ACSim_mios.c' and 'ACSim_toolbox.c'

MBHP Build Target

Perform the following sections to build the application for MBHP

- Returning to 'Project... Properties', 'Targets' tab, select the build target 'Release'
- In the box labelled 'Selected build target options', select 'Commands Only' from the drop-down list labelled 'Type'
- In the box labelled 'Selected build target files', Tick ONLY 'main.c'
- Click 'OK' to close project properties

- Select 'Project... Properties', Select the 'Targets' tab (Yes, again. It is necessary to apply the previous settings first)

- Select target 'Release', click 'Build Options'
- In the box labelled 'Selected Compiler' Select 'SDCC Compiler' from the dropdown list (until this point both targets will be using C::B's default of GCC), Click 'OK' and return to the 'Targets' tab
- In the box labelled 'Selected build target files' (bottom right), select file 'main.c' and then click 'Selected File Properties'
- Select the 'Advanced' tab, in the box labelled 'Custom Build', Select 'SDCC Compiler' from the dropdown list labelled 'For this compiler'
- Tick 'Use Custom Command to build this file'
- Type into the textbox “make.bat”
- Click OK
- Click OK

MIOS-Specific SDCC Libraries

TK says: If multiplications, divisions, pointer operations, etc. are used in the .c code, the linker may fail due to missing functions, which are part of the “libsdcc.lib” library. The error message will be:

```
Linking project
lib/libsdcc.lib: No such file or directory
ERROR!
```

The common library for pic16 derivatives is not compatible to MIOS, therefore I've created a special one. Click here for more information

- Download the MIOS-Specific SDCC Libraries
- Create a 'lib' directory within the root directory of your project
- Copy the 'libsdcc.lib' file from the above zip file into this directory
- Open the “project.lkr” file of your project and add following line below the “LIBPATH” entry:

```
FILES lib/libsdcc.lib
```

At this point, I highly recommend selecting 'File... Save Project as user template', then you can use it as a quick starting point for all your awesome projects :)

AC-Sim Simulator

Setup

Follow the instructions at the AC-Sim WIKI page

Compile

Select the 'Debug' target, Click 'Build', and you're done!

Debug

Follow the instructions at the AC-Sim WIKI page

MBHP

Compile

Select the 'Release' target, Click 'Build', and you're done!

Debug

done! Make music!

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