

# How to setup Free Pascal for Nintendo DS

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This tutorial describes an easy way to install and configurate FPC4NDS (Free Pascal Compiler for Nintendo DS) on Linux and Windows.

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## I - Introduction

After my discovery of FPC4NDS, which is a development environment used to build applications for the Nintendo DS (NDS) platform, I wanted to share an easy way to set it up. At the end of all setup instructions, we will create a small example program.

Before deploying them on a real Nintendo DS, you will need an NDS emulator in order to test your programs. Here are some emulators that you can download :

- **DeSmuME**
- **No\$gba**
- **NeonDS**

To program with FPC4NDS, it is required to have strong experience with the Pascal language.

 *The successive steps of installation and configuration of Free Pascal for NintendoDS have been successfully tested on the following platforms : Linux Ubuntu 9.10, Mandriva 2008.0, Windows 2000, Windows XP and Windows Vista.*

## II - Installation and configuration

To setup the Free Pascal for Nintendo DS environment you'll need :

- **fpc 4 nds** arm-nds-fpc (Nintendo DS platform)
- **devkitARM** (choose devkitARM in the list)
- **libnds** (same link as devkitARM)
- **default\_arm7** (also same link as devkitARM)

### II-A - On Linux

#### II-A-1 - Creating the installation directories

You must choose now in which directories the different components will be installed. In our case, we have chosen the /opt directory, where we created two subdirectories : devkitPro and fpc4nds.

Name	Ext	Size	Changed	Rights	Owner
..			08/01/2010 03:...	rwxr-xr-x	root
devkitPro			17/01/2010 19:...	rwxrwxrwx	krachik
fpc4nds			17/01/2010 19:...	rwxrwxrwx	krachik

#### II-A-2 - Installing devkitARM

1. Go to the devkitPro directory;
2. Create a new subdirectory named devkitARM;
3. Download the **devkitARM** package for your Linux distribution :

devkitARM		435.7 MB	2009-12-02	119,064	
devkitARM_r27-i686-linux.tar.bz2		28.6 MB	2009-12-02	641	
devkitARM_r27-x86_64-linux.tar.bz2		32.5 MB	2009-12-02	293	
devkitARM_r27-osx.tar.bz2		46.1 MB	2009-12-02	565	
devkitARM_r27-win32.exe		10.4 MB	2009-12-01	11,674	
previous		318.1 MB	2009-05-01	105,891	

4. Extract the package into the devkitARM directory.

#### II-A-3 - Installing libnds

Create the libnds directory in devkitPro. Download the **libnds-1.4.0.tar.bz2** package and extract it into the libnds directory.

▼ libnds	4.2 MB	2009-12-01	99,171	📡 🗑️
libnds-src-1.4.0.tar.bz2	122.9 KB	2009-12-01	443	
libnds-1.4.0.tar.bz2	320.3 KB	2009-12-01	9,497	
▶ previous	3.7 MB	2009-07-30	89,231	📡 🗑️

## II-A-4 - Installing default\_arm7

Download the **default\_arm7-0.5.8.tar.bz2** package and extract the files **default.arm7** and **default.elf** into libnds.

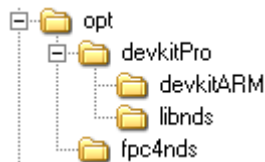
▼ default arm7	98.7 KB	2009-12-01	36,667	📡 🗑️
default_arm7-src-0.5.8.tar.bz2	2.3 KB	2009-12-01	164	
default_arm7-0.5.8.tar.bz2	62.6 KB	2009-12-01	9,014	
▶ previous	33.7 KB	2009-07-11	27,489	📡 🗑️

## II-A-5 - Installing fpc4nds

The next step is the content of the fpc4nds directory. Choose the latest package, i.e. **arm-nds-fpc-2.4.0.i386-linux.tar**. Extract it in the fpc4nds directory :

▼ NDS	81.8 MB	2009-12-30	32,221	📡 🗑️
▼ 2.4.0	69.7 MB	2009-12-30	72	📡 🗑️
arm-nds-fpc-2.4.0.i386-win32.zip	12.9 MB	2009-12-30	46	
arm-nds-fpc-2.4.0.i386-linux.tar	56.8 MB	2009-12-30	26	
▶ 2.2.4a	12.1 MB	2009-05-26	32,149	📡 🗑️

Here is the complete treeview of /opt now :



## II-A-6 - Modifying .bashrc

Add the following lines to the **.bashrc** file :

```
export PATH=/opt/fpc4nds/bin/arm-nds:$PATH
```

```
export DEVKITPRO=/opt/devkitPro
export DEVKITARM=$DEVKITPRO/devkitARM
```

## II-A-7 - Creating .fpc.cfg

Now let's create the configuration file necessary to run the execution environment. Create the **.fpc.cfg** in your home directory (/home/[user]/) and paste the following content into it :

```
-Tnds
-XParm-eabi-
-Fu/opt/fpc4nds/units/arm-nds
-FD/opt/fpc4nds
-FD/opt/fpc4nds/lib
-Fu/opt/fpc4nds/units/arm-nds/libndsfpc
-FD/opt/fpc4nds/bin/arm-nds
-Fl/opt/devkitPro/libnds/lib
-Fl/opt/devkitPro/devkitARM/lib/gcc/arm-eabi/4.4.2/thumb
-Fl/opt/devkitPro/devkitARM/arm-eabi/lib/thumb
-Fl/opt/devkitPro/devkitARM/lib/gcc/arm-eabi/4.4.2
-Fl/opt/devkitPro/devkitARM/arm-eabi/lib
```





## II-B - On Windows

### II-B-1 - Creating the installation directories

As explained previously in the Linux chapter, choose the directory in which all the components will be installed. Let's choose the root C:\ and create two subdirectories named devkitPro and fpc4nds.

### II-B-2 - Installing devkitARM


1. Go to the devkitPro directory;
2. Create a new subdirectory named devkitARM; 3. Download the **devkitARM** package for Windows;

▼ devkitARM	435.7 MB	2009-12-02	119,064	 
 devkitARM_r27-i686-linux.tar.bz2	28.6 MB	2009-12-02	641	
 devkitARM_r27-x86_64-linux.tar.bz2	32.5 MB	2009-12-02	293	
 devkitARM_r27-osx.tar.bz2	46.1 MB	2009-12-02	565	
 devkitARM_r27-win32.exe	10.4 MB	2009-12-01	11,674	
▶ previous	318.1 MB	2009-05-01	105,891	 

4. Extract the package into the devkitARM directory.





### II-B-3 - Installing libnds

Create the libnds directory in devkitPro. Download the **libnds-1.4.0.tar.bz2** package and extract it into the libnds directory.

▼ libnds	4.2 MB	2009-12-01	99,171	 
libnds-src-1.4.0.tar.bz2	122.9 KB	2009-12-01	443	
libnds-1.4.0.tar.bz2	320.3 KB	2009-12-01	9,497	
▶ previous	3.7 MB	2009-07-30	89,231	 







## II-B-4 - Installing default\_arm7

Download the **default\_arm7-0.5.8.tar.bz2** package and extract the files **default.arm7** and **default.elf** into libnds.

▼ default arm7	98.7 KB	2009-12-01	36,667	 
default_arm7-src-0.5.8.tar.bz2	2.3 KB	2009-12-01	164	
default_arm7-0.5.8.tar.bz2	62.6 KB	2009-12-01	9,014	
▶ previous	33.7 KB	2009-07-11	27,489	 

## II-B-5 - Installing fpc4nds

The next step is the content of the fpc4nds directory. Choose the newest package, i.e. **arm-nds-fpc-2.4.0.i386-win32.zip**. Extract it into the fpc4nds directory :

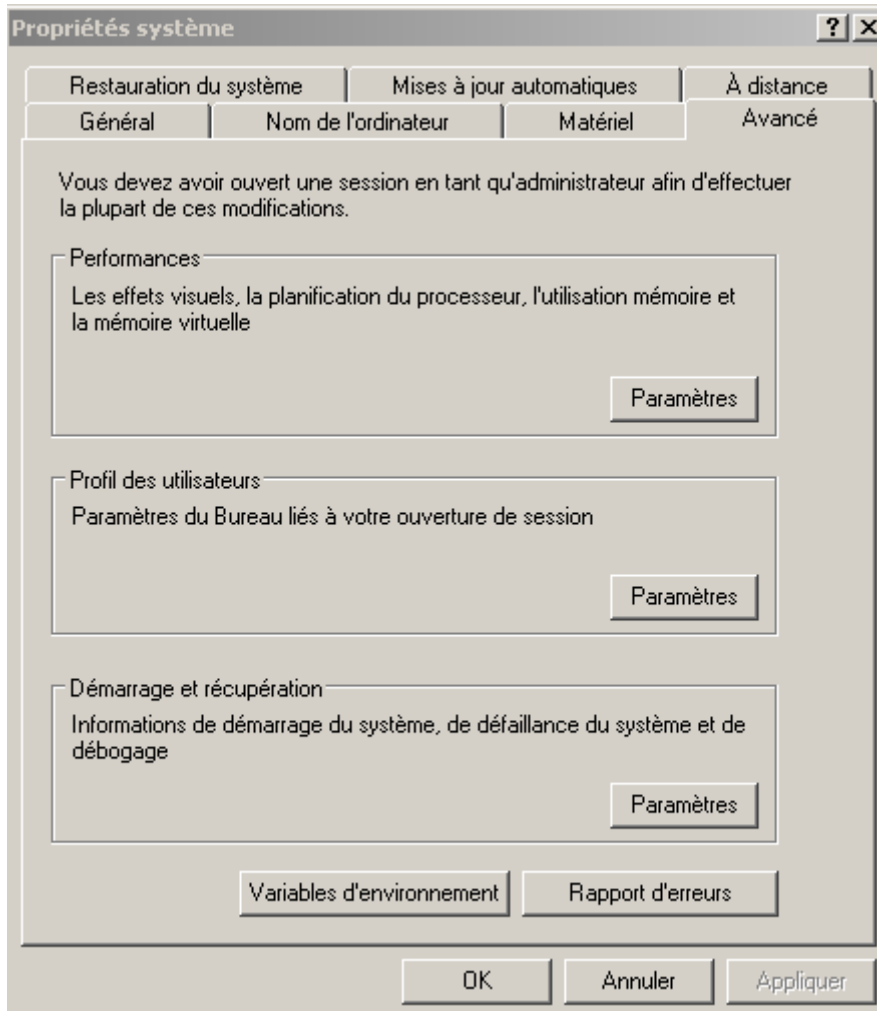
▼ NDS	81.8 MB	2009-12-30	32,221	 
▼ 2.4.0	69.7 MB	2009-12-30	72	 
arm-nds-fpc-2.4.0.i386-win32.zip	12.9 MB	2009-12-30	46	
arm-nds-fpc-2.4.0.i386-linux.tar	56.8 MB	2009-12-30	26	
▶ 2.2.4a	12.1 MB	2009-05-26	32,149	 

Here is the complete treeview of C:\ now :

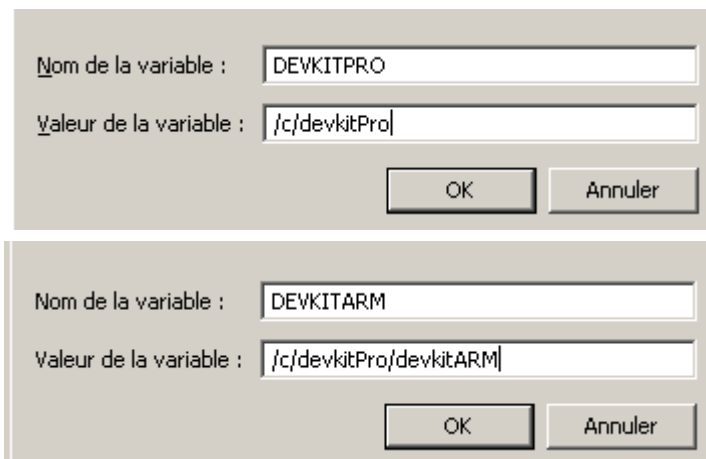
```
+C\ (root)
|____+devkitPro
|   |____+devkitARM
|   |____+libnds
|   |____... other files and directories ...
|   |____default.elf
|   |____default.arm7
|____+fpc4nds
|   |____+units
|   |____+bin
|   |____+msg
|   |____+[examples]
```

## II-B-6 - Adding environment variables

Now let's create two environment variables : **DEVKITPRO** and **DEVKITARM**. On your desktop, right-click on My Computer, choose Properties and go to sheet Advanced :



Click on New to create two system environment variables named **DEVKITPRO** and **DEVKITARM** :





## II-B-7 - Creating fpc.cfg

The configuration file used for running the sources for the Nintendo DS platform must be similar to this :

```
-Tnds
-XParm-eabi
-FuC:\fpc4nds\units\arm-nds
-FuC:\fpc4nds\units\arm-nds\libndsfp
-FDC:\fpc4nds
-FDC:\fpc4nds\bin\arm-nds
-FlC:\devkitPro\libnds\lib
-FlC:\devkitPro\devkitARM\lib\gcc\arm-eabi\4.4.2
-FlC:\devkitPro\devkitARM\lib\gcc\arm-eabi\4.4.2\thumb
-FlC:\devkitPro\devkitARM\arm-eabi\lib
-FlC:\devkitPro\devkitARM\arm-eabi\lib\thumb
```

Create the **fpc.cfg** file in the C:\fpc4nds\bin\arm-nds directory and paste in this file these previous lines.

### III - Compiling and running

The environment is now completely set up and you can write your first NDS program. In order to help you in that task, there are some examples in the `fpc4nds` directory.

Let's compile and run our "*Hello world*". In the `fpc4nds/examples` directory, create a new subdirectory named `my_first_program`. In that directory, create the file `helloworld.pp` with the following code :

```
program helloworld;
{$mode objfpc}


uses nds9;
begin
  consoleDemoInit();

  printf('Hello World !!!');
end.
```

#### III-A - Compiling and running on Linux

To compile the source file, go to the `my_first_program` directory and enter the following command to invoke the right compiler :

```
krachik@kraserver:/opt/fpc4nds/examples/my_first_program$ /opt/fpc4nds/bin/arm-nds/ppcarm helloworld.pp
Nintendo DS rom tool 1.46 - Dec 2 2009
by Rafael Vuijk, Dave Murphy, Alexei Karpenko
```

 *If the compiling process fails, make sure you have execution rights on the **helloworld.pp** file.*

#### III-B - Compiling and running on Windows

To compile the source file, go to the `my_first_program` directory and enter the following command :

```
C:\fpc4nds\examples\my_first_program>C:\fpc4nds\bin\arm-nds\ppcarm.exe helloworld.pp
Nintendo DS rom tool 1.46 - Nov 30 2009
by Rafael Vuijk, Dave Murphy, Alexei Karpenko
```

#### III-C - Brief explanation

The `consoleDemoInit()` function initializes the Nintendo DS console screen for display. To use this function, you need to declare the `nds9` unit in the `uses` section. To display a text you can use `printf` or `iprintf`.

The Nintendo DS runs applications compiled for the **ARM7** or **ARM9** platforms. If the whole process succeeds, **\*.nef.bin**, **\*.nds** and **\*.nef** files are created. If no target platform is mentioned, the default environment setting is `{$apptype arm9}`.

#### III-D - Using an emulator

You need an NDS emulator to test the program you've just compiled. See *the emulator list above*.

Let's choose for example the **No\$gba** emulator : you only need to run **NO\$GBA.EXE** and to load the **helloworld.nds** file.

Here is the result :



## IV - Conclusion

In this tutorial you learned how to install and configure your environment to create and run applications for the Nintendo DS. Depending on the applications you are planning to create, you will need libraries that can be downloaded with the same URL as **devkitPro** (*dswifi*, *libfat*, a.s.o).

Notice that you can also run the NDS emulators on Linux with **wine**.

## Useful links

**FPC4NDS - Francesco Lombardi's site**

**Free Pascal wiki - Nintendo DS**

## Acknowledgements

I wish to thank **Alcatiz** and **Mathieu Dalbin** for the tests, advices, corrections and translation.