GigaDevice Semiconductor Inc.

GD32F10x
Arm® Cortex®-M3 32-bit MCU

Application Note
AN019

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1. Introduction

Lua is a powerful, efficient, lightweight, embeddable scripting language. It supports procedural programming, object-oriented programming, functional programming, data-driven programming, and data description. Lua combines simple procedural syntax with powerful data description constructs based on associative arrays and extensible semantics. Lua is dynamically typed, runs by interpreting bytecode with a register-based virtual machine, and has automatic memory management with incremental garbage collection, making it ideal for configuration, scripting, and rapid prototyping. Lua is implemented as a library by cleanC (a subset common between standard C and C++). As an extended language, Lua does not have the concept of a "main" program, it can only work in a host program, which is called an embedded program or host for short. The host program can call functions to execute a small pieces of Lua code, can read and write Lua variables, and can register C functions for Lua code to call. Relying on C functions, Lua can share the same grammatical framework to customize the programming language, which can be applied to different fields. The official release of Lua contains a sample host program called Lua, which is a complete and independent Lua interpreter implemented using the Lua library, which can be used for interactive applications or batch processing.

Lua is an open source software language, and its use license determines its use without any guarantee.

This article describes how to port Lua to the GD32 project.

2. Lua interpreter migration

2.1. Lua download

The Lua interpreter transplantation platform introduced in this article is the GD32F103E-EVAL board. The IDE platform ported by Lua interpreter is KEIL4.

Lua source code can be downloaded from https://www.lua.org/. The currently tested Lua version is 5.4.2, as shown in the figure below.

Figure 2-1. Lua download interface

Figure 2-2. Lua historical version download interface

➢ Unzip the compressed package to get the file to be transplanted

Figure 2-3. Lua file after decompression

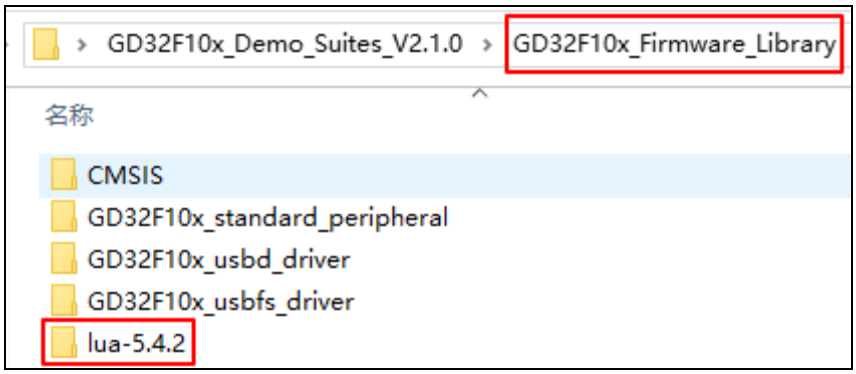
- Delete the lua.c and luac.c files under the decompressed lua-5.4.2\src file.

2.2. Add Lua source code file

The transplantation project introduced in this article is based on the 01_GPIO_Running_LED in GD32F10x Demo_Suite _V2.1.0

- Copy the files after deleting lua.c and luac.c to the GD32F10x_Firmware_Library file, as shown in Figure 2.4.

Figure 2-4. Lua file add path



- Open the project. Add all .c files in lua-5.4.2\src to the project.

Figure 2-5. Lua project configuartion

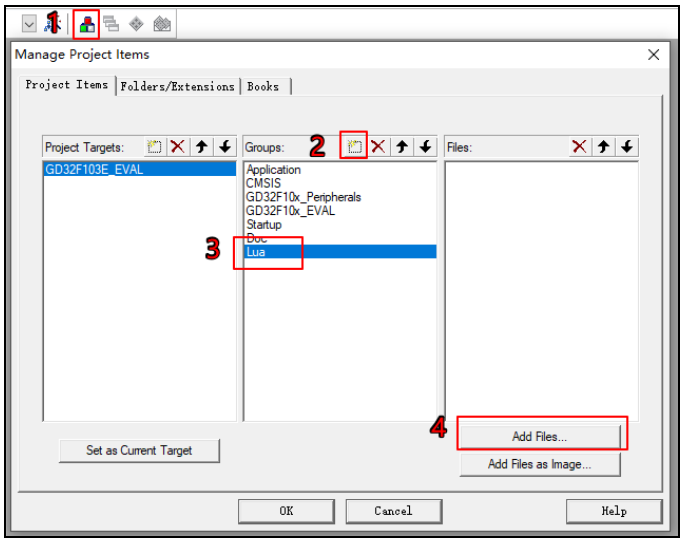
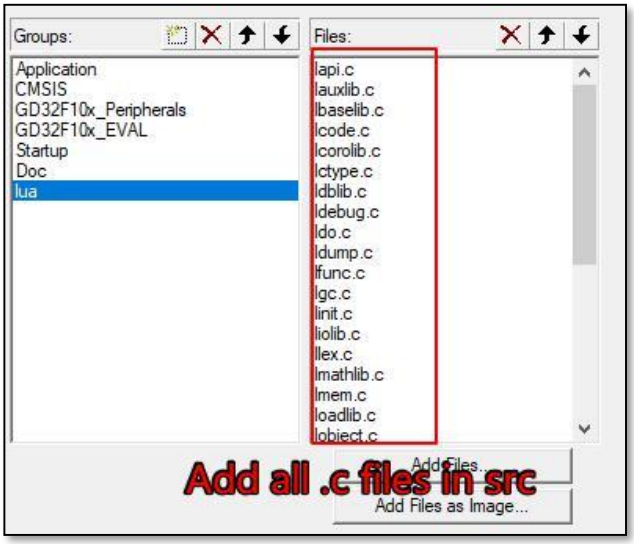
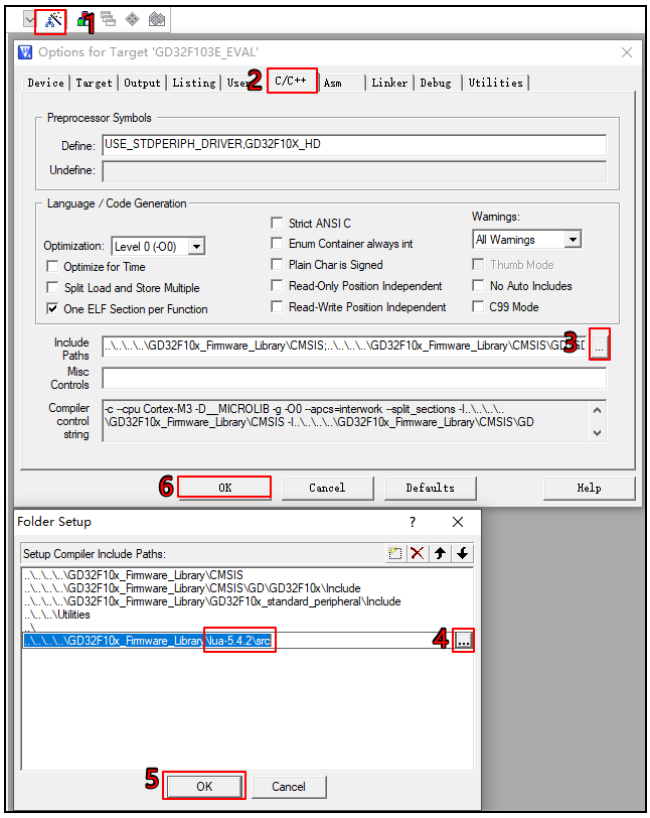


Figure 2-6. Add c file to Lua project configuration



➢ Configure Include Paths

Figure 2-7. .h file path configuration



➢ Change part of the content under the loslib.c file

1. Comment out if(L) exit(status) in the os_exit(lua_State * L) function, and add a status=status statement.

Figure 2-8. Change os_exit(lua_State * L)

```
394 static int os_exit (lua_State *L) {
395   int status;
396   if (lua_isboolean(L, 1))
397     status = (lua_toboolean(L, 1) ? EXIT_SUCCESS : EXIT_FAILURE);
398   else
399     status = (int)luaL_optinteger(L, 1, EXIT_SUCCESS);
400   if (lua_toboolean(L, 2))
401     lua_close(L);
402   //if (L) exit(status);  /* 'if' to avoid warnings for unreachab
403     status = status;
404   return 0;
405 }
```

2.Add time(time_t *time) and system(const char * string)

Figure 2-9. Added function

```
time_t time(time_t * time)
{
    return 0;
}

int system(const char * string)
{
    return 0;
}
```

The above changes are due to the use of Use MicroLIB mode

3. Lua usage test

3.1. Test

Lua usage tests are performed after the project configuration and related code changes are completed. This section uses the C language to interact with Lua to light up the led lights.

Table 3-1. main.c

```
#include "gd32f10x.h"
#include "gd32f103e_eval.h"
#include "systick.h"
#include "lua.h"
#include "lualib.h"
#include "lauxlib.h"

static int lua_led_on(lua_State *L)
{
    gd_eval_led_on(LED3);
    return 1;
}
static const struct luaL_Reg mylib[]=
{
  {"led_on",lua_led_on},
  {NULL,NULL}
};
const char LUA_SCRIPT_GLOBAL[] ="   \
while 1 do \
 led_on() \
end";
int main(void)
{
    gd_eval_led_init(LED3);
    while(1)
    {
        lua_State *L;
        L = luaL_newstate();
        luaopen_base(L);
        luaL_setfuncs(L, mylib, 0);
        luaL_dostring(L, LUA_SCRIPT_GLOBAL);
    }
}
```

After compiling the project and downloading it to the development board, LED3 will light up.

3.2. Other instruction

The ROM and RAM occupancy after compiling and running is shown in the figure below. When transplanting to other development boards, pay attention to the memory size of the development board, otherwise there will be a problem of unsuccessful migration.

Figure 3-1. ROM and RAM occupancy

```
Total RO Size (Code + RO Data)                89808 (  87.70kB)
Total RW Size (RW Data + ZI Data)             16544 (  16.16kB)
Total ROM Size (Code + RO Data + RW Data)      89964 (  87.86kB)
```

4. Revision history

Table 4-1. Revision history

Version number	Description	Date
1.0	Released the first draft	2021.3.18

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