GigaDevice Semiconductor Inc.

Arm® Cortex®-M3 32-bit MCU

应用笔记

AN019

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1. 简介

Lua 是一种强大、高效、轻量级、可嵌入的脚本语言。它支持过程编程、面向对象编程、函数式编程、数据驱动编程和数据描述。Lua 将简单的过程语法与基于关联数组和可扩展语义的强大数据描述结构相结合。Lua 是动态类型的，通过使用基于寄存器的虚拟机解释字节码来运行，并具有带增量垃圾收集的自动内存管理，使其成为配置、脚本和快速原型设计的理想选择。Lua 由 cleanC（标准 C 和 C++间共通的子集）实现成一个库。作为一门扩展式语言，Lua 没有"main"程序的概念，它只能嵌入一个宿主程序中工作，该宿主程序被称为被嵌入程序或者简称宿主。宿主程序可以调用函数执行一小段 Lua 代码，可以读写 Lua 变量，可以注册 C 函数让 Lua 代码调用。依靠 C 函数，Lua 可以共享相同的语法框架来定制编程语言，从而适用不同的领域。Lua 的官方发布版包含一个叫做 Lua 的宿主程序示例，它是一个利用 Lua 库实现的完整独立的 Lua 解释器，可用于交互式应用或批处理。

Lua 是一个开源软件语言，其使用许可证决定了它的使用过程无需任何担保。

本文介绍了如何将 Lua 移植到 GD32 工程下的方法。

2. Lua 解释器移植

2.1. Lua 下载

本文介绍的 Lua 解释器移植平台为 GD32F103E-EVAL 开发板。Lua 解释器移植的 IDE 平台为 KEIL4。

Lua 解释器源码可由 https://www.lua.org/下载。目前测试的 Lua 解释器版本为 5.4.2，具体如下图所示。

图 2-1. Lua 下载界面

图 2-2. Lua 的历史版本下载界面

➢ 将下载后的压缩包解压得到要移植的文件

图 2-3. 解压后 Lua 文件

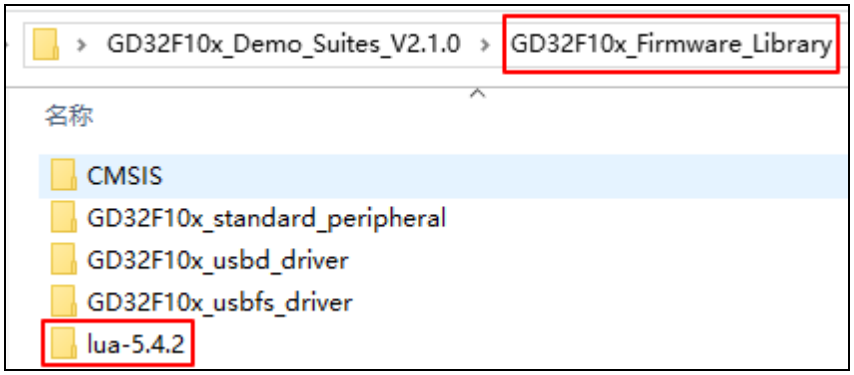
➢ 将解压后的 lua-5.4.2\src 文件下的 lua.c 和 luac.c 文件删除。

2.2. 添加 Lua 源码文件

本文介绍的移植工程是基于 GD32F10x_Demo_Suites_V2.1.0 里的 01_GPIO_Running_LED

➢ 首先将删除 lua.c 和 luac.c 后的文件拷贝至 GD32F10x_Firmware_Library 文件下，如图 2.4 所示。

图 2-4. Lua 文件添加路径



➢ 打开工程，在工程中添加 lua-5.4.2\src 中所有.c 文件

图 2-5. Lua 工程配置

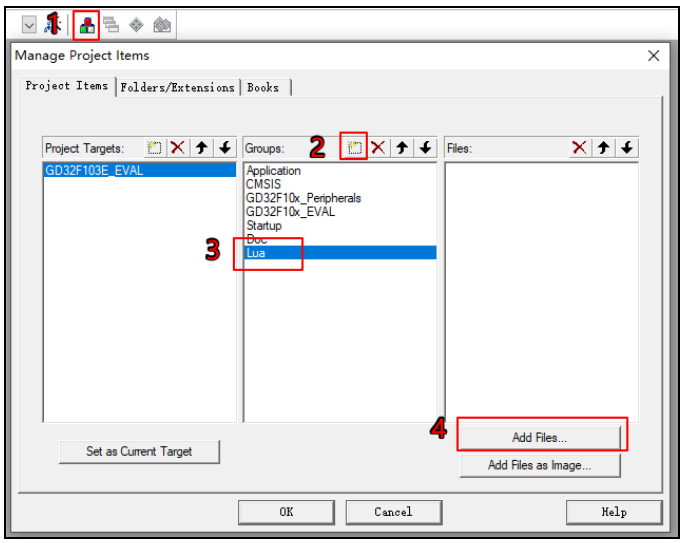
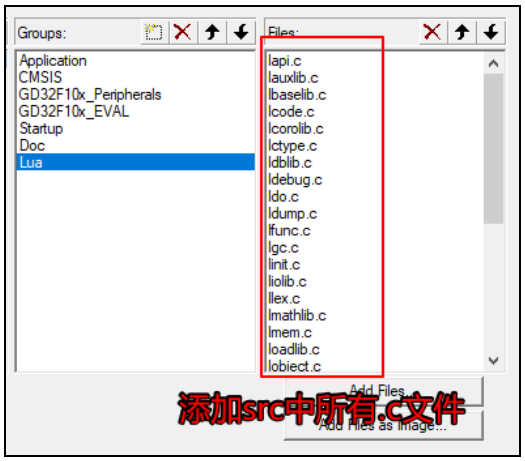
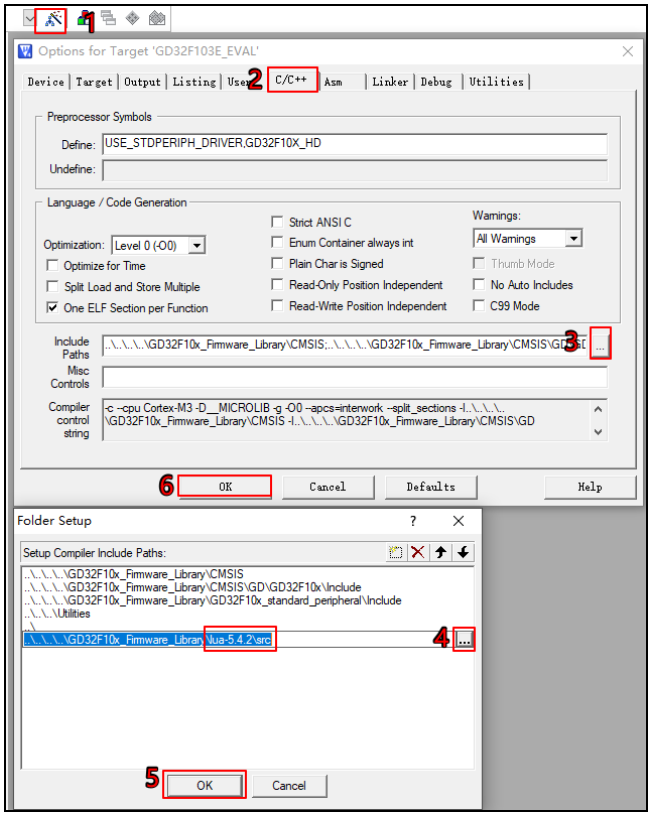


图 2-6. Lua 工程配置中加入 c 文件



➢ 配置 Include Paths

图 2-7. Lua 工程配置.h 路径配置



➢ 更改 loslib.c 文件下部分内容

1.将 os_exit(lua_State * L)函数中 if(L) exit(status)注释，并添加 status=status 语句。

图 2-8. 更改 os_exit(lua_State * L)函数

```
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.添加 time(time_t *time)和 system(const char * string)

图 2-9. 添加的函数

```
432 time_t time(time_t * time)
433 {
434     return 0;
435 }
436
437 int system(const char * string)
438 {
439     return 0;
440 }
441
```

更改以上内容是因为使用了 Use MicroLIB 模式。

3. Lua 使用测试

3.1. 测试

在工程配置以及相关代码更改完成后进行 Lua 使用测试，本节使用 C 语言与 Lua 交互的方式点亮 led 灯。

表 3-1. main.c 代码

```
#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);
    }
}
```

编译工程后，下载进开发板后，LED3 将点亮。

3.2. 其他说明

编译运行后的 ROM 及 RAM 占用情况如下图所示，在移植到其他开发板中时，需注意开发板的内存大小，否则将存在移植不成功的问题。

图 3-10. ROM 及 RAM 占用情况

```
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. 版本历史

表 4-1. 版本历史

版本号.	说明	日期
1.0	首次发布	2021 年 3 月 18 日

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