Homework1 初识模拟器

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Problem

请在keil，或segger模拟器调试运行一个C（C++）程序：

- 列出编译调试过程的问题与解决措施
- 提交程序源码

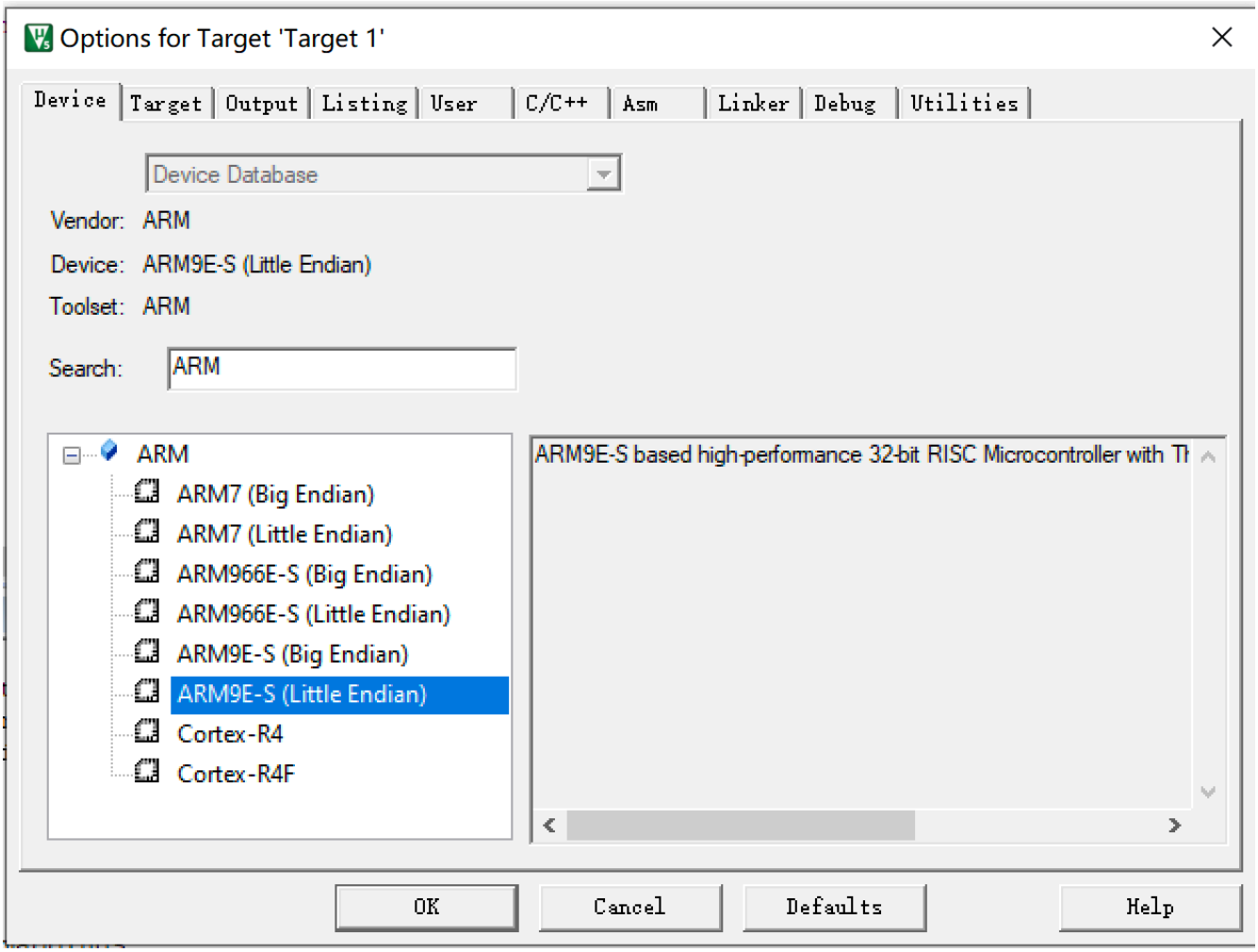
Answer

Keil

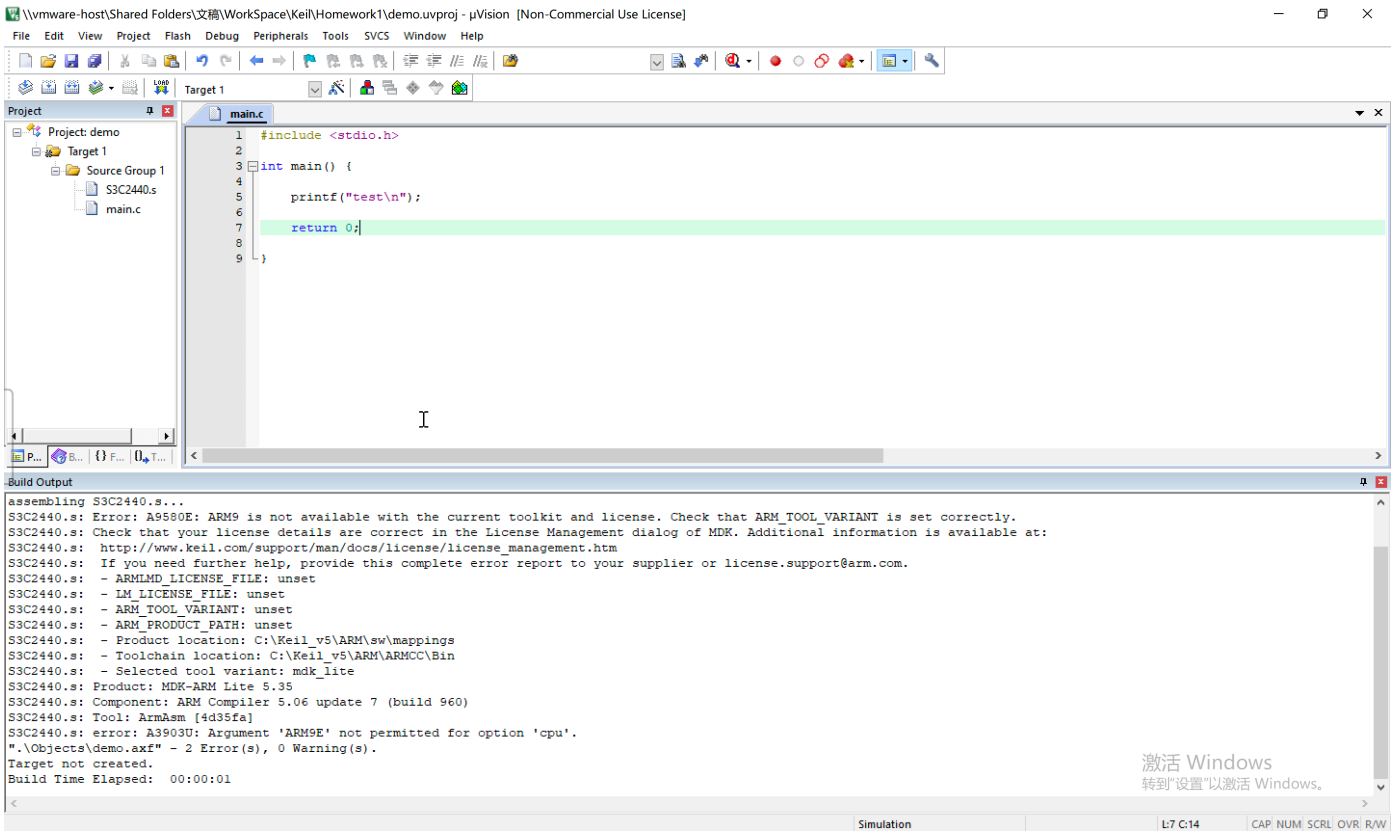
针对该问题，首先下载了keil进行测试，从keil官网（https://www.keil.com/）上下载安装MDK-ARM版的Keil。

为了支持ARM9，于是查阅网上资料找到这篇博客，根据该内容安装了ARM9的Device。

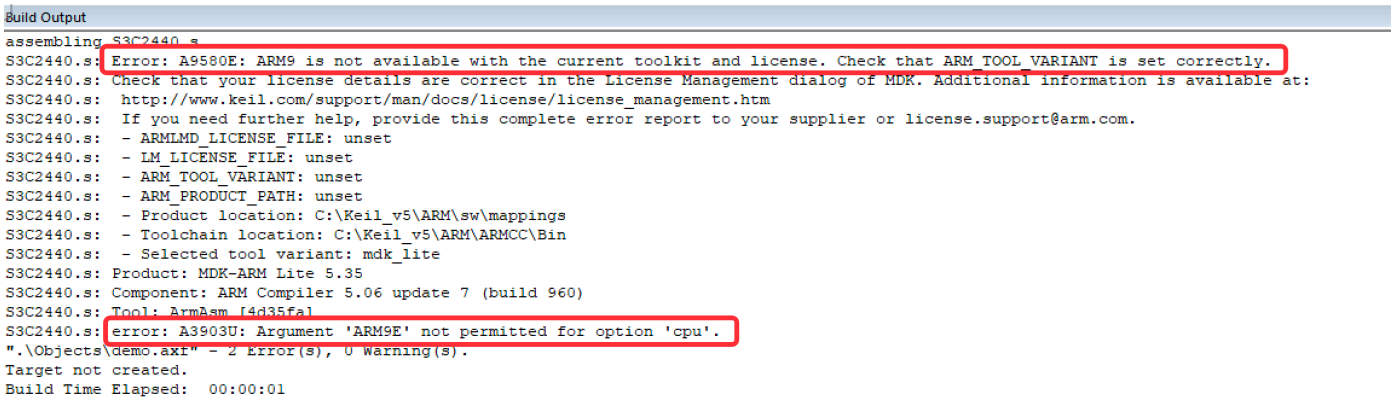
于是新建项目选择Arm9的Device进行最基础的代码测试：



运行一个最基础的printf函数：



发现报错信息，并且尝试根据报错信息去搜索资料，并没有查到资料解决此问题，Keil软件的不熟悉让我难以下手，遇到该问题暂时无法解决：



Segger

于是，选择试一试老师提供的另一个工具Segger Embedded Studio，在官网下载安装，同时观察到官网提供了软件的文档Document

根据文档中的Getting Start部分进行简单学习：

Getting Started

You will need to install a CPU support package:

Choose **Tools > Package Manager**
Choose the CPU support packages you wish to install and complete the dialog.

You will need to create a project:

Choose **File > New Project**
Select the appropriate Executable project type
Specify a location for the project
Complete the dialog selecting the appropriate **Target Processor** value

You will need to build the project:

Choose **Build | Build 'Project'**

To debug on the simulator

Choose **Project | Options...** to show the project options dialog
In the **Search Options** type in **Simulator**
Choose **Simulator** for the **Target Connection** option

To debug on hardware

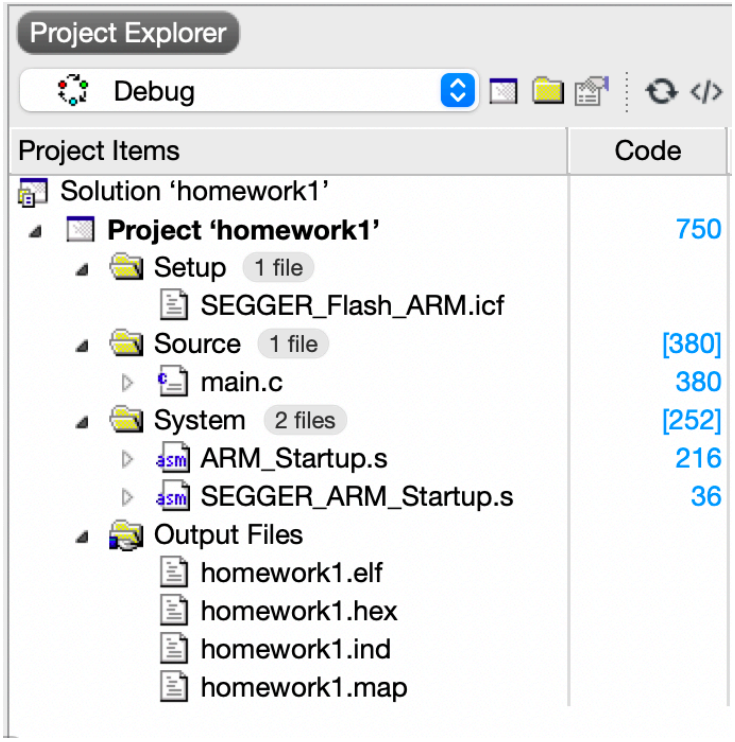
Choose **Project | Options...** to show the project options dialog
In the **Search Options** type in **J-Link**
Choose **J-Link** for the **Target Connection** option

To start debugging

Choose **Debug | Go**

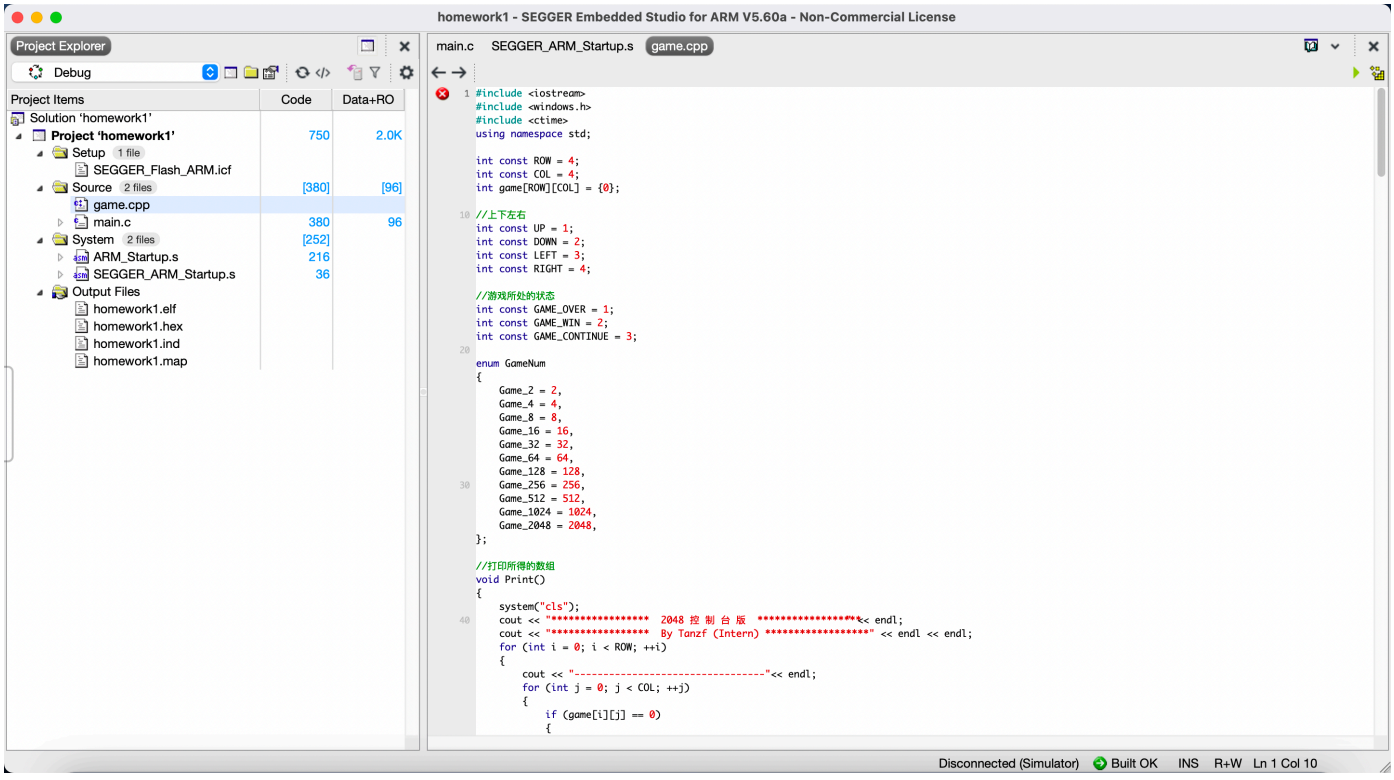
The debugger will stop the program at the main, you can now debug the application.

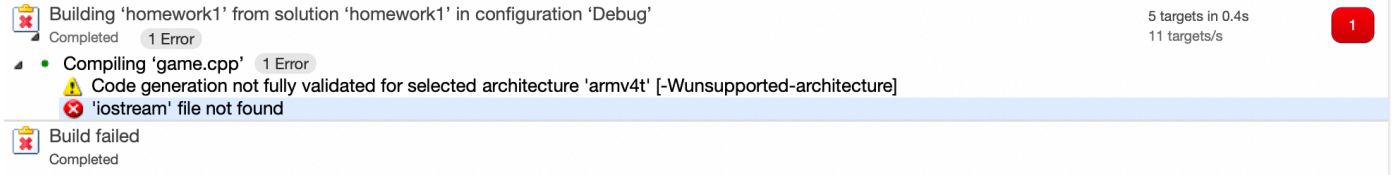
创建**Solution：Homework1**和**Project：Homework1**：



在main.c中 **build and debug** 默认给的hello world循环100次的程序，发现可以完美运行，总算是实现了第一步。

于是，找了大学C++程序设计课程的小游戏代码，直接报错如下：





可以看出，找不到这个库，于是在官网文档 中找到**C++ Library User Guide**

C++ Library User Guide

SEGGER Embedded Studio for ARM provides a limited C++ library suitable for use in an embedded application.

Standard library

The following C++ standard header files are provided in `$(StudioDir)/include`:

File	Description
<cassert>	C++ wrapper on assert.h.
<cctype>	C++ wrapper on ctype.h.
<cerrno>	C++ wrapper on errno.h.
<cfloat>	C++ wrapper on float.h.
<ciso646>	C++ wrapper on iso646.h.
<climits>	C++ wrapper on limits.h.
<clocale>	C++ wrapper on locale.h.
<cmath>	C++ wrapper on math.h.
<csetjmp>	C++ wrapper on setjmp.h.
<cstdarg>	C++ wrapper on stdarg.h.
<cstddef>	C++ wrapper on stddef.h.
<cstdint>	C++ wrapper on stdint.h.
<cstdio>	C++ wrapper on stdio.h.
<cstdlib>	C++ wrapper on stdlib.h.

发现并没有像在Windows上运行的C++命令窗口那样的程序，分析了一下应该是嵌入式的程序是烧录到板子里的，不支持windows.h等库

并且iostream标准输入输出需要使用cstdlib去代替。

就此问题，于是还是现场写一段C的简单代码来试一试吧。（该软件的换行缩进很不好用，体验很差。。。）

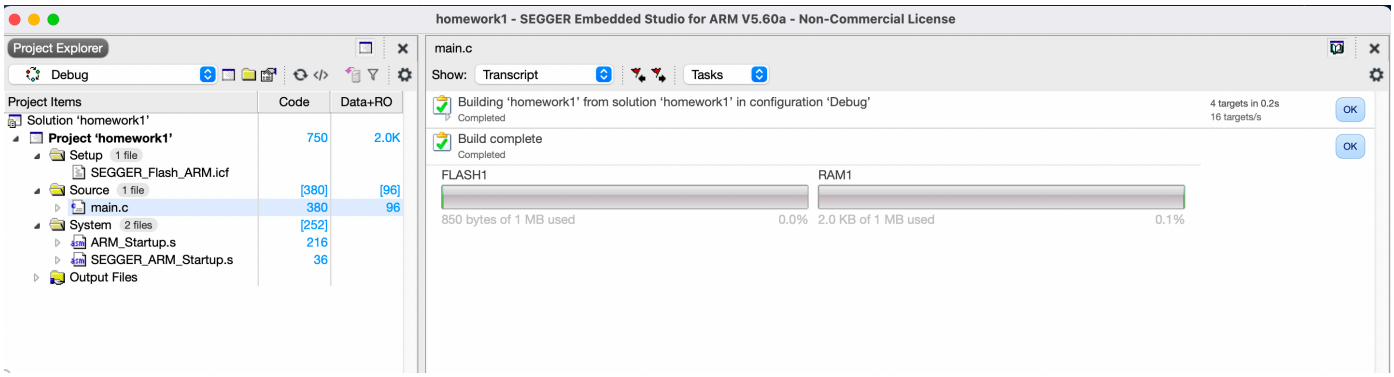
于是，写了个简单的递归求解阶乘和二分插入排序算法来感受一下模拟器如何调试程序，具体代码如下：

```
#include <stdio.h>
#include <stdlib.h>

/**
  calc_n()

  input: n
  output: n!

*/
int calc_n(int n){
  if(n==1){
    return 1;
  }
```

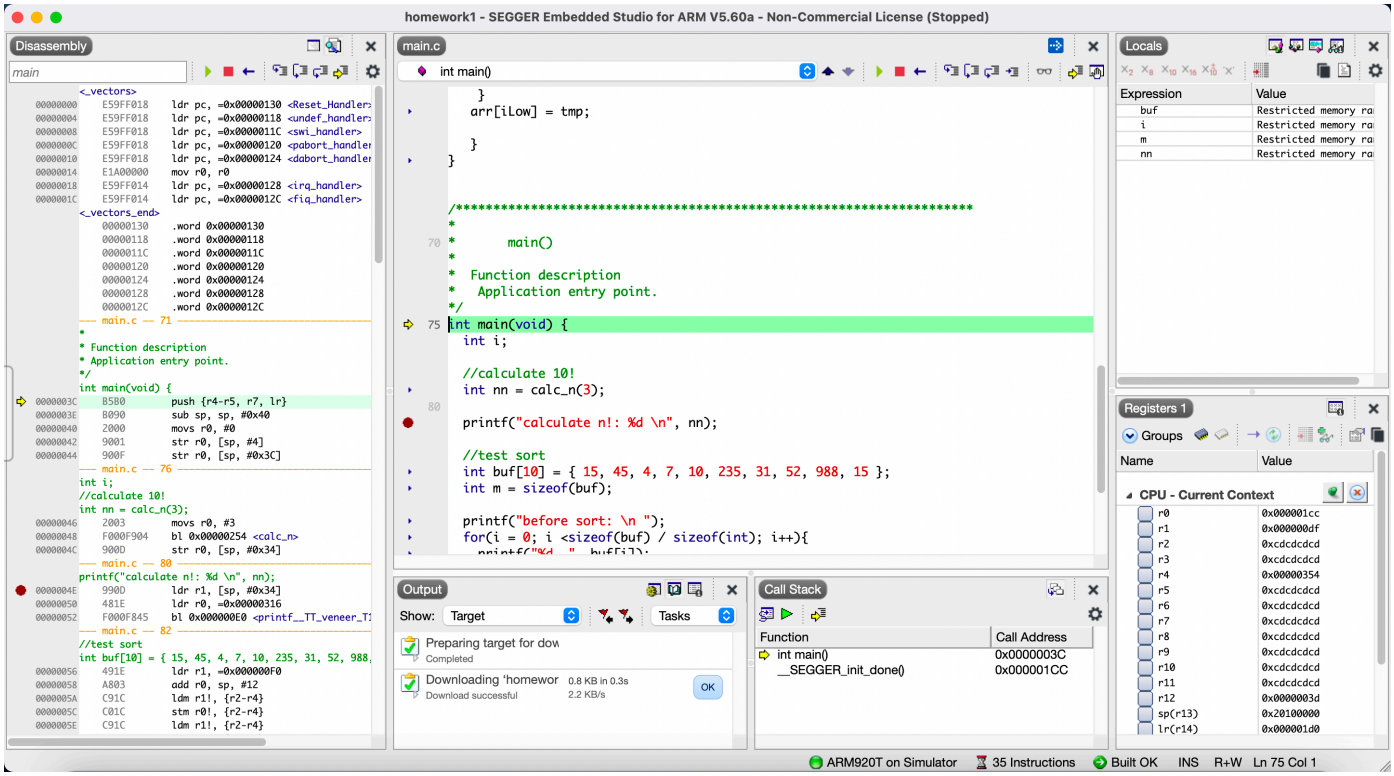
```
  else{
    return calc_n(n-1)*n;
  }
}


/**
  sort
*/
//exchange the 2 items a and b
void swap(int a, int b){
   int tmp = a;
   a = b;
   b = tmp;
}

void BinaryInsertSort(int *arr, int len){
   for (int i = 1; i < len; ++i){
     int tmp = arr[i];
     int iHigh = i - 1;
     int iLow  = 0;
     int iMid = 0;
     while (iLow <= iHigh){
      iMid = (iLow + iHigh) / 2;
      if (tmp > arr[iMid] ){
        iLow = iMid + 1;
      }
      else{
        iHigh = iMid - 1;
      }
     }

    for (int j = i; j > iMid; --j){
      arr[j] = arr[j - 1];
    }
   arr[iLow] = tmp;

   }
}


/*****************************************************************
*
*       main()
*
*  Function description
*   Application entry point.
*/
int main(void) {
```

```
    int i;

    //calculate 10!
    int nn = calc_n(3);

    printf("calculate n!: %d \n", nn);

    //test sort
    int buf[10] = { 15, 45, 4, 7, 10, 235, 31, 52, 988, 15 };
    int m = sizeof(buf);

    printf("before sort: \n ");
    for(i = 0; i <sizeof(buf) / sizeof(int); i++){
      printf("%d  ", buf[i]);
    }

    BinaryInsertSort(buf, sizeof(buf) / sizeof(int));
    printf("\nafter sort: \n ");
    for(i = 0; i <sizeof(buf) / sizeof(int); i++){
      printf("%d  ", buf[i]);
    }

}
```

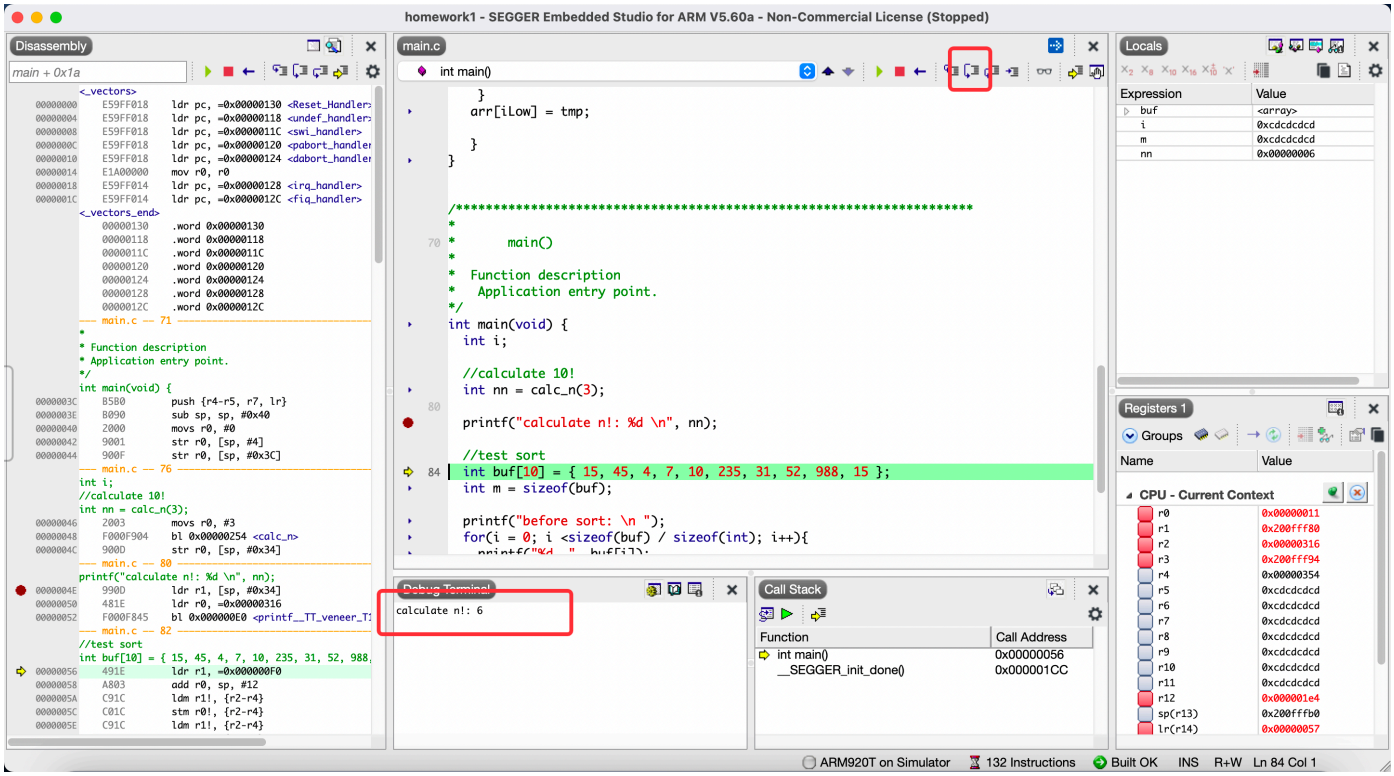
点击build，成功build：



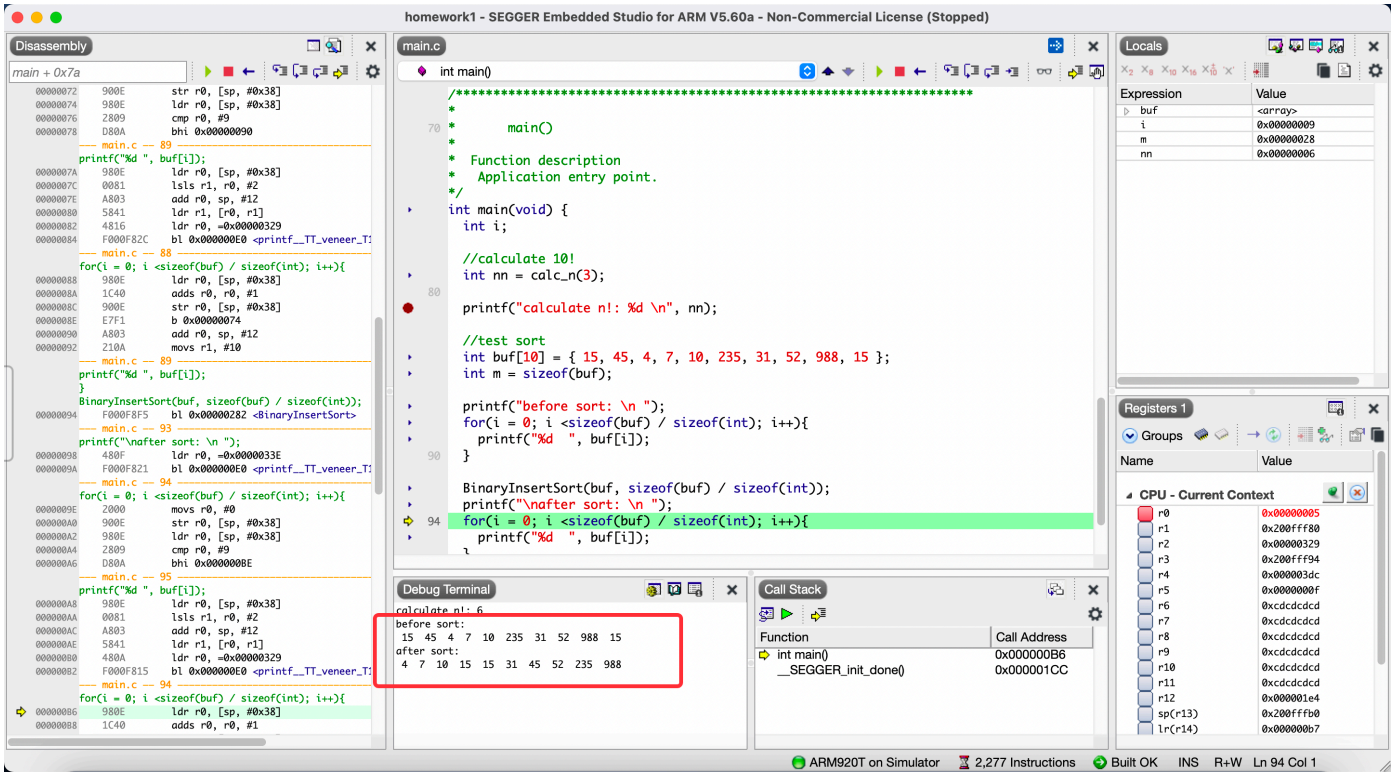
其次，进行debug，进入debug页面：



点击Step Over（F10）按钮进行debug，测试3的阶乘，结果如下：



继续debug，测试排序如下：



程序成功运行，和预期效果一致。

心得

在测试过程中发现debug过程软件提供了编译的汇编代码窗口，寄存器窗口，能够实时看到Debug过程的细节，还是很不错的，在这个过程中可以体会到程序对CPU寄存器的实际操作流程与运行原理。