Department of Engineering

EE 4710 Lab 1

Title: Getting started with a real-time operating system

Objective: The student should become acquainted with real-time operating systems, install one for cross-development, and build a simple multi-threaded application.

Parts: 1-C8051FX20-TB Evaluation Board
1-USB Debug Adapter
1-Silicon Labs Optional Third Party Tools CD

Software: Silicon Laboratories IDE version 3.50.00 or greater

Background: Salvo is a bare-bones real-time operating system that is marketed by Pumpkin Inc. A limited freeware copy is available on the Silicon Labs 3rd party tools CD and at www.pumpkininc.com (select Salvo Demo Version).

Preparation: For this lab, an entry in your lab book is not required. However if you would like to make notes so that you can avoid pitfalls when installing the OS in the future, the lab book is the best place for this.

Using your own PC, install Salvo RTOS (and Silicon Labs IDE if not already installed). Salvo RTOS typically creates a folder C:\salvo that includes libraries, tutorials and include files.

Procedure: Create a C8051F020 project on your computer using the Silicon Labs IDE. Create a file called main.c and add it to your project. Main.c should that contain the following code:

```
//
// Put your file header here
//
#pragma small // compile using the small memory model to match
salvo libraries

#include <C8051F020.h>
#include <salvo.h>

_OSLabel(TaskA1)
_OSLabel(TaskB1)

//
// First OS Task
//
void TaskA( void )
{
   for (;;)
```

```
      OS_Yield(TaskA1);

}

//
// Second OS Task
//
void TaskB( void )
{
   for (;;)
      OS_Yield(TaskB1);
}

int main( void )
{
   OSInit(); // call this before any other OS call
   OSCreateTask(TaskA, OSTCBP(1), 10); // Create first task
   OSCreateTask(TaskB, OSTCBP(2), 10); // Create second task
   for (;;)
      OSSched(); // schedule tasks forever
}
```

Note that main.c includes another file called salvo.h. In order for the compiler to find salvo.h, you must modify the include path for the compiler. Select Tool Chain Integration, make sure to start with the Keil tool definition preset, and add c:\salvo\inc to the include path under the Compiler tab.

Now, salvo.h includes another file that you have to write called salvocfg.h. This file tells the compiler how to configure the operating system. For now, create salvocfg.h with the following text:

```
//
//  Salvo Lite build
//
#define OSUSE_LIBRARY       TRUE
#define OSLIBRARY_TYPE      OSF // use the free library
#define OSLIBRARY_GLOBALS   OSD // globals in the data segment
#define OSLIBRARY_CONFIG    OSM // multi-tasking only
#define OSLIBRARY_VARIANT   OSB // OS calls from background only
#define OSEVENTS            0   // 0 events (multitasking only)
#define OSEVENT_FLAGS       0   // 0 flags
#define OSMESSAGE_QUEUES    0   // 0 message queues
#define OSTASKS             2   // 2 tasks
```

You will next have to copy mem.c from c:\salvo\src to your project folder (do not simply add c:\salvo\src\mem.c to your project). Add the copied file (which should be in the same folder as salvocfg.h) to your project and to the build.

In order for your code to work, it has to be linked with one of the precompiled salvo libraries, in this case sfc51sdmb.lib. The naming convention for these libraries is given in Figure 1. Note how the last three letters of sfc51sdmb.lib match the OSD, OSM and OSB in salvoconfig.h.

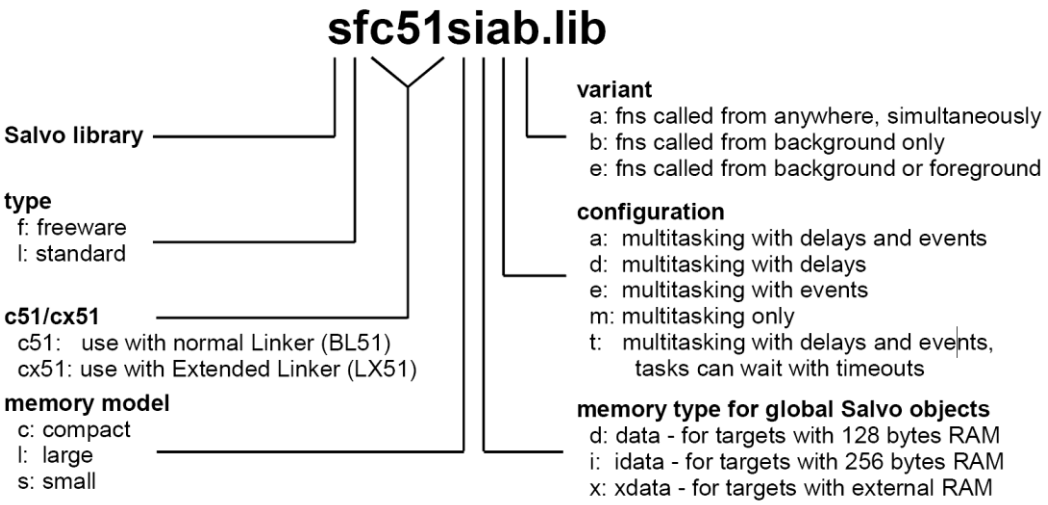

Figure 1 – Salvo Library Name Nomenclature

To tell the IDE that you want to link with this library, select target build configuration, then under “Download File Generation” click “Customize.” Next, under the “Files to Link tab,” click Add External OBJ and enter “C:\salvo\lib\kc51\sfc51sdmb.lib”.

Compile your code and confirm that there are no errors. Download your code to your C8051F020 evaluation board (used previously in EE 3710).

Add breakpoints on the lines containing OSYield. And run your program. Verify that the two breakpoints alternate. Demonstrate this to your lab instructor to receive credit. This lab is worth 10 points and they are given on an all-or-nothing basis.