CS 740, Fall 1997
Assignment 6:
Installing Cilk

Logistics

Any clarifications and revisions to the assignment will be posted on the class bboard and Web page.

Installing Cilk

One part of this assignment will involve writing a program in the multithreaded programming language Cilk - Release 5.1. In order to test your program, you will have to get Cilk up and running on some machine. You will find the files necessary for installing Cilk, as well as the manual for Cilk 5.1 at `http://theory.lcs.mit.edu/~cilk/release/cilk5.1.html`. For this assignment, it should be sufficient to install the smaller *Cilk Classic*, rather than the full-fledged *Cilk Pro*. Although you will write a program that exposes parallelism through multithreading, I expect that you will test your programs on a single-processor machine.

Instructions for installing Cilk can be found in Appendix A of the Cilk manual. I have installed Cilk on a SPARCstation4 running Solaris, and on a Linux machine. The Linux installation was much easier. If you have access to a Linux machine, please try to install Cilk yourself. If not, I will provide an account on my Solaris machine `bmm.pc.cs.cmu.edu` to any group that sends me an email request. My email address is `bmm@cs.cmu.edu`.

Linux installation notes

After `gunzip`ping and un`tar`ring the Cilk installation file `ftp://theory.lcs.mit.edu/pub/cilk/Cilk5.1.base.tar.gz`, you will find further instructions in a file named `README`. You will have to make two small changes before building Cilk. First, you should insert a # sign in file `Makefile.common` before each line related to Solaris, and remove the # sign preceeding the lines defining `ARCHFILE`, `ARCHLINK`, `ARCHLIBS`, and `ARCHOPTS` for Linux. In the end, your file should contain the following lines.

```
##############################
#  Solaris/processes/linker hack
##############################
# Note: CC should point to the GNU compiler.  The GNU compiler
# should call the GNU linker to do any linking.
#ARCHFILE = arch-solaris
#ARCHLINK = -Wl,-T$(LDSCRIPT_DIR)/elf32_sparc.x
#ARCHLIBS = -lthread

# this is ok for generic Solaris
#ARCHOPTS = -DCILK_SOLARIS=1 -mv8
#ARCHOPTS = -DCILK_SOLARIS=1
# This is for Solaris with sparc V9 (Cilk is faster if you use V9 instructions)
#ARCHOPTS = -DCILK_SOLARIS=1 -DSPARC_V9=1 -Wa,-xarch=v8plus -mv8
```

```
###############################
#  Solaris/threads
###############################
# ARCHFILE = arch-solaris-threads
# ARCHLINK =
# ARCHLIBS = -lthread

# this is ok for generic Solaris
# ARCHOPTS = -DCILK_SOLARIS_THREADS=1 -mv8
# This is for Solaris with sparc V9 (Cilk is faster if you use V9 instructions)
# ARCHOPTS = -DCILK_SOLARIS_THREADS=1 -DSPARC_V9=1 -Wa,-xarch=v8plus -mv8

###############################
#  Linux/processes/linker hack
###############################
# Note: CC should point to the GNU compiler.  The GNU compiler
# should call the GNU linker to do any linking.
ARCHFILE = arch-linux
ARCHLINK = -Wl,-T$(LDSCRIPT_DIR)/elf_i386.x
ARCHLIBS =
ARCHOPTS = -DCILK_LINUX=1
```

You should have to modify only one other file: `rts/cilk-conf.h`. This file should contain the following definitions.

```
#ifndef CILK_SOLARIS
#define CILK_SOLARIS 0
#endif

#ifndef CILK_SOLARIS_THREADS
#define CILK_SOLARIS_THREADS 0
#endif

#ifndef CILK_LINUX
#define CILK_LINUX 1
#endif
```

After making these changes, you can build Cilk and begin testing it by executing the commands

```
make depend; make
examples/testall
```

The tests may take a long time to complete. On my Linux machine, which has a 66MHz 486DX/2 processor with 32MBytes of RAM, the tests took over 6 hours before I finally gave up on it. I have been told that warning messages indicating that work-stealing is probably not working can safely be ignored.

Solaris Installation Notes (for the truly determined)

If you're determined to install Cilk on a Solaris machine, here are some hints.

1. Your processor may not be capable of executing V8 and V9 instructions – mine isn't. To get around this, you'll have to remove all references to `v8`, `V8`, `v9`, and `V9` in the Makefiles.

2. The Makefiles assume that you will be using the GNU compiler `gcc` and linker `ld`. Unfortunately, the GNU linker, `ld`, is not part of the standard software distribution provided by facilities for Solaris machines. On my machine, `gcc` invokes the vendor-provided linker, which is found at `/usr/ccs/bin/ld`. This version of `ld` expects different command line arguments than GNU `ld`. Getting around this was a real hassle. First, I had to compile GNU `ld`. Then, I couldn't figure out a clean way to get `gcc` to use the new version, short of recompiling `gcc`. So I just manually replaced `/usr/ccs/bin/ld` with GNU `ld`. If you want to install GNU `ld` on your machine, you can find pointers to the installation packages at the Cilk 5.1 page.

Installation on a SPARC SMP

I am planning to install Cilk on a multi-processor SPARC SMP running Solaris. Once your program is up and running on a single-processor machine, you will be able to test it on this SMP.