

**a2/kmeans/Makefile**

```
1  .KEEP_STATE:
2
3  CC = gcc
4
5  CFLAGS    = -Wall -Wextra -Wno-unused -O3 -std=gnu11
6  # Compile OpenMP sources with -fopenmp (+CFLAGS)
7  OMPFLAGS = $(CFLAGS) -fopenmp
8
9  # Link step includes -fopenmp so binaries link libgomp if any object used OpenMP
10 LDFLAGS = -fopenmp
11
12 H_FILES = kmeans.h
13 COMM_SRC = file_io.c util.c
14
15 # Build all variants
16 all: seq_kmeans omp_naive_kmeans omp_reduction_kmeans
17 seq_kmeans: main.o file_io.o util.o seq_kmeans.o
18     $(CC) $(CFLAGS) $^ -o $@ $(LDFLAGS)
19
20 omp_naive_kmeans: main.o file_io.o util.o omp_naive_kmeans.o
21     $(CC) $(CFLAGS) $^ -o $@ $(LDFLAGS)
22
23 omp_reduction_kmeans: main.o file_io.o util.o omp_reduction_kmeans.o
24     $(CC) $(CFLAGS) $^ -o $@ $(LDFLAGS)
25
26 main.o: main.c $(H_FILES)
27     $(CC) $(CFLAGS) -c $< -o $@
28
29 seq_kmeans.o: seq_kmeans.c $(COMM_SRC) $(H_FILES)
30     $(CC) $(CFLAGS) -c $< -o $@
31
32 # OpenMP objects use OMPFLAGS so pragmas are honored
33 omp_naive_kmeans.o: omp_naive_kmeans.c $(COMM_SRC) $(H_FILES)
34     $(CC) $(OMPFLAGS) -c $< -o $@
35
36 omp_reduction_kmeans.o: omp_reduction_kmeans.c $(COMM_SRC) $(H_FILES)
37     $(CC) $(OMPFLAGS) -c $< -o $@
38
39 file_io.o: file_io.c
40     $(CC) $(CFLAGS) -c $< -o $@
41
42 util.o: util.c
43     $(CC) $(CFLAGS) -c $< -o $@
44
45 clean:
46     rm -rf *.o seq_kmeans omp_naive_kmeans omp_reduction_kmeans
47
48
```