

# Hands-on: Building STREAM benchmark

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## 0. Legend

- `[src_dir]` : source directory
- `[rist_dir]`: this directory

## 1. Get source file

```
$ bash 00_dl.sh
$ ls
stream.v5 # The directory name is specified in 00_dl.sh.
```

## 2. Preparation

```
$ cd [src_dir]
$ cp [rist_dir]/rist/Makefile.fj .
$ cp [rist_dir]/rist/Makefile.fj_zfill
```

- We recommend that you modify the source code to properly show the results. See `[rist_dir]/rist/patch.rist`. We show a way of applying the patch file here.

```
$ patch -p 1 -d [src_dir] < [rist_dir]/rist/patch.rist
patching file stream.c
patching file stream.f
```

## 3. Set array size

- STREAM is a benchmark to measure memory bandwidth (memory access throughput, bytes/sec).
- Therefore, the memory size for the arrays needs to be larger than the size of the Last-level cache (LLC) in your machine.
- Set the array size in the following manner. Recall that the LLC of A64FX is L2 and its size is 4x8(=32)MiB.
  - As for FORTRAN (stream.f): Edit `PARAMETER n` in stream.f.
  - As for C (stream.c): Edit `STREAM_ARRAY_SIZE` in stream.c. Or, set `-DSTREAM_ARRAY_SIZE` in makefile.

## 4. Compile

- You can find the executable file in each of `Obj_***` directories.
- If you want to use own compiler, use `Makefile.fj_zill.own` and so on.
  - If you set a quite large array size, compiling would be failed. In this case, add `-mcmodel=large` to the compiler option.

- Compare the compiler options (CFLAGS and FFLAGS) of `Makefile.fj` to those of `Makefile.fj_zfill`.

```
$ cd [src_dir]
# We show the case when one choose Makefile.fj_zfill, for example:
$ make -f Makefile.fj_zfill &> make.fj_zfill.log
$ ls
Obj_c.fj_zfill  Obj_ctrad.fj_zfill  Obj_f.fj_zfill
```

## Note

- We summarize the main compiler options of each Makefile.

```
Makefile.fj          #Optimization level is fast. Auto-vectorization is allowed.
OpenMP thread is allowed.
Makefile.fj_zfill    #Optimization level is fast. Auto-vectorization is allowed.
OpenMP thread is allowed. ZFILL option is set.
```