

## Building with preCICE

In this part, I describe how to build SU<sup>2</sup> linked with preCICE. Therefore, the adapter files *precice.hpp* and *precice.cpp* developed in this thesis and explained in Chapter 5 are included in the SU<sup>2</sup> source code. It is assumed that preCICE has been installed successfully beforehand. Concerning installation instructions for preCICE, I refer to:

<https://github.com/precice/precice/wiki/Building>

It is assumed that code changes as stated in Appendix A have already been applied to SU<sup>2</sup>.

First of all, copy the adapter files to the following locations:

```
/path/to/SU2SourceCode/SU2_CFD/include/precice.hpp
```

and

```
/path/to/SU2SourceCode/SU2_CFD/src/precice.cpp
```

Now, navigate to the source code of the SU2\_CFD module. It is located here:

```
/path/to/SU2SourceCode/SU2_CFD/src/SU2_CFD.cpp
```

The header file of the adapter, (*precice.hpp*), needs to be included in order for the coupling to be established. Therefore, simply add the following line to the inclusions already given in *SU2\_CFD.cpp*:

```
#include "../include/precice.hpp"
```

Now we can start linking SU<sup>2</sup> and preCICE via the static library *libprecice.a*, which is generated upon successfully building preCICE. To do so, some environment variables have to be adapted so that SU<sup>2</sup> knows what library to look after and in which directory:

```
$ export LDFLAGS=-L/path/to/preCICESourceCode/build/last
$ export LIBS=-lprecice
```

Here it is assumed that the last successful build of preCICE is used for linking. Of course, this can be customized in order to link specific builds.

Before using *autoconf* and *automake*, the makefiles of SU<sup>2</sup> have to be edited such that the adapter files (*precice.hpp* and *precice.cpp*) are compiled with SU<sup>2</sup>. Navigate to the following directory:

```
$ cd /path/to/SU2SourceCode/SU2_CFD/obj/
```

Now edit the file *Makefile.am*, in which all the files to be compiled with SU2\_CFD are given.

```
$ vi Makefile.am
```

Search for the following line in that file:

```
su2_cfd_sources = \
```

If you copied *precice.hpp* and *precice.cpp* to the suggested locations, add the following lines below that expression:

```
../include/precice.hpp \
../src/precice.cpp \
```

If you copied them somewhere else, you need to adapt these paths. Make sure to use spacings and backslashes analogously to the other lines there. Now the changes in *Makefile.am* have to be transferred to *Makefile.in*, which finally leads to a new *Makefile* in the configuration process. This *Makefile* is then used to build SU<sup>2</sup> coupled with preCICE, again using the *make* command. Navigate back to the main directory of SU<sup>2</sup> by simply typing:

```
cd ../../
```

Now run:

```
$ automake
```

to update *Makefile.in*. If this fails, it might be necessary to run

```
$ autoreconf
```

as described in the first part of this manual.

Once more, follow the configuration procedure:

```
$ ./configure --prefix=/installation/location/for/SU2/  
--enable-mpi --with-cc=/location/of/mpicc  
--with-cxx=/location/of/mpicxx
```

Depending on whether you changed the position/names of your SU<sup>2</sup> source code or not you may or may not have to add the command lines adapting the SU<sup>2</sup> environment variables to your *.bashrc*, which are given as console output at the end of a successful configuration process. Analogous to the build without preCICE, now run make (with optional parallelization):

```
$ make -j 8
```

and

```
$ make install
```

The new executable of SU2\_CFD, now coupled with preCICE, can be found in  
`/path/to/SU2SourceCode/SU2_CFD/bin`

if the installation finished successfully.