

ICON software requirements & experiences

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1 Introduction

The installation as well as running ICON will require a certain amount of training and support. As a prerequisite for the installation phase, this document provides information on the software requirements and experiences for ICON. This document is based on a survey. In this survey, ICON licensees are asked about their experiences with installing ICON and about compiler and library version they use. The document contains information on the following aspects:

- Lists of versions of different compilers and MPI libraries that are known to work or known to fail for the installation of the ICON release from the ICON Training Course 2018.
- A list of additional libraries that are necessary to install ICON including recommended versions.
- A list of recommended pre- and postprocessing software.

2 Compilers

The following table contains a list of compilers that are known to work with ICON. This list corresponds to the source code version used at the DWD ICON Training Course 2018. This list is not exhaustive and currently working versions might have problems with future ICON releases.

Fortran compiler	Recommended version	Alternatives ^a	Known problems
GNU	gcc v6.2.0	gcc v5.2.0	
Cray	ftn v8.4.1	ftn v8.5.5	other ftn v8.5.X ftn v8.6.X
Intel	ifort v16.0.0		ifort >v17.0.1 ^b
NAG	nagfor v6.0.1064		

^aThis list contains only regularly successfully tested versions

^bTo use these versions, you will need to use a compiler option like `-assume realloc-lhs`

3 MPI Libraries

The following table contains a list of MPI libraries that are known to work with ICON. This list corresponds to the source code version used at the DWD ICON Training Course 2018. This list is not exhaustive and currently working versions might have problems with future ICON releases.

MPI library	Recommended version	Alternatives ^a	Known problems
OpenMPI	openmpi-1.10	openmpi-2.0.2	
Cray MPICH	cray-mpich/7.5.0	cray-mpich/7.4.3	
MPICH	mpich-3.2	mpich-3.1	

^aThis list contains only regularly successfully tested versions

4 Additional Libraries

Additional libraries required by ICON are NetCDF and GRIB-API (or, more recently, ecCodes). The ICON Training Tutorial [2] contains detailed information on minimum required versions and useful hints on the installation of these libraries. For this reason, the reader is referred to that document.

5 Recommended Pre- and Postprocessing Software

5.1 DWD ICON Tools

The DWD ICON Tools[1] provide pre- and post-processing utilities. Here, only short descriptions of the most important features are given. For more details, the reader is referred to the DWD ICON Tools documentation[1]. As a version of the DWD ICON Tools is directly shipped together with the ICON code, it is recommended to use these corresponding versions together.

5.1.1 ICONREMAP

The horizontal remapping of initial and boundary data is performed with the ICONREMAP tool. Note, that this tool covers only the horizontal interpolation. Vertical interpolation is performed within ICON which allows for an adaption of the vertical layer structure without rerunning the pre-processing software.

5.1.2 ICONSUB

ICONSUB allows to cut a subregion out of an ICON dataset. ICONSUB can deal with the unstructured ICON grid in the GRIB2 and in the NetCDF format.

5.2 fieldextra

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The official COSMO post-processing software, a code named `fieldextra`, does also support the ICON unstructured grid. This support is currently limited to the import of fields, with the obligation to interpolate the imported fields on a regular grid as a first step. A full support of the ICON unstructured grid will be considered in the future.

Fieldextra is a generic tool to manipulate NWP model data and gridded observations; simple data processing and more complex data operations are supported. Fieldextra is designed as a toolbox; a set of primitive operations which can be arbitrarily combined are provided. Fieldextra is implemented in Fortran 2008; a control file, which is a collection of Fortran namelists, defines the set of operations to apply on the input data. A strong focus of this program is the production environment, with a lot of effort being put in the robustness of the code, in an extensive reporting of exceptions, and in memory and CPU optimization.

The minimal recommended version of fieldextra is 12.6.0. More documentation can be found here:

- <https://github.com/MeteoSwiss-APN/fieldextra> (you need an account and the authorization to access this private GitHub repository)
- <http://www.cosmo-model.org/content/support/software/default.htm> (including a software package)

References

- [1] F. Prill. *DWD ICON Tools Documentation*. Deutscher Wetterdienst (DWD), 2014. dwd.icon-tools/doc/icontools.doc.pdf.
- [2] D. Reinert, F. Prill, G. Zängl, D. Rieger, J. Schröter, J. Förstner, S. Werchner, M. Weimer, R. Ruhnke, and B. Vogel. Working with the ICON Model – Practical Exercises for NWP Mode and ICON-ART. Technical report, DWD, 2018.