

ADCL: Abstract Data and Communication Library
Installation and User Guide

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1 Installation

ADCL follows the regular UNIX/LINUX software configuration and installation model, requiring a sequence of

```
configure
make
make install
```

1.1 Prerequisites

ADCL requires a working installation of an MPI library, complying to the MPI-2 standard. ADCL has been tested with a large number of MPI libraries and on multiple platforms, including Open MPI, MPICH, MVAPICH, IBM MPI, and Cray MPI.

For the non-blocking operations supported by ADCL, a valid and working installation of the libNBC library has to be provided, compiled with the same MPI library as the one being used for ADCL.

The GNU scientific library is used for some clusternig algorithm, and can optionally be provided. The PAPI hardware performance counter library can be utilized by ADCL for high resolution timers.

1.2 Configure Options

ADCL can be customized with a number of options, which can be divided into three sections: enabling or disabling certain features, providing additional libraries (e.g. libNBC, GSL, PAPI) to enable certain features, and change the default behavior of ADCL. The following is a list of all configure options supported by ADCL.

Configuration:

```
-h, --help          display this help and exit
  --help=short      display options specific to this package
  --help=recursive  display the short help of all the included packages
-V, --version       display version information and exit
-q, --quiet, --silent do not print 'checking ...' messages
  --cache-file=FILE cache test results in FILE [disabled]
-C, --config-cache  alias for '--cache-file=config.cache'
-n, --no-create     do not create output files
  --srcdir=DIR      find the sources in DIR [configure dir or '..']
```

Installation directories:

```
1  --prefix=PREFIX          install architecture-independent files in PREFIX
2                          [/home/gabriel/ADCL]
3  --exec-prefix=EPREFIX    install architecture-dependent files in EPREFIX
4                          [PREFIX]
5
```

```
6  By default, 'make install' will install all the files in
7  '/home/gabriel/ADCL/bin', '/home/gabriel/ADCL/lib' etc. You can specify
8  an installation prefix other than '/home/gabriel/ADCL' using '--prefix',
9  for instance '--prefix=$HOME'.
```

```
10
11  For better control, use the options below.
```

```
12
13  Fine tuning of the installation directories:
```

```
14  --bindir=DIR             user executables [EPREFIX/bin]
15  --sbindir=DIR           system admin executables [EPREFIX/sbin]
16  --libexecdir=DIR        program executables [EPREFIX/libexec]
17  --sysconfdir=DIR        read-only single-machine data [PREFIX/etc]
18  --sharedstatedir=DIR    modifiable architecture-independent data [PREFIX/com]
19  --localstatedir=DIR     modifiable single-machine data [PREFIX/var]
20  --libdir=DIR            object code libraries [EPREFIX/lib]
21  --includedir=DIR        C header files [PREFIX/include]
22  --oldincludedir=DIR     C header files for non-gcc [/usr/include]
23  --datarootdir=DIR       read-only arch.-independent data root [PREFIX/share]
24  --datadir=DIR           read-only architecture-independent data [DATAROOTDIR]
25  --infodir=DIR           info documentation [DATAROOTDIR/info]
26  --localedir=DIR         locale-dependent data [DATAROOTDIR/locale]
27  --mandir=DIR            man documentation [DATAROOTDIR/man]
28  --docdir=DIR            documentation root [DATAROOTDIR/doc/PACKAGE]
29  --htmldir=DIR           html documentation [DOCDIR]
30  --dvidir=DIR            dvi documentation [DOCDIR]
31  --pdfdir=DIR            pdf documentation [DOCDIR]
32  --psdir=DIR             ps documentation [DOCDIR]
33
```

```
34  System types:
```

```
35  --build=BUILD           configure for building on BUILD [guessed]
36  --host=HOST             cross-compile to build programs to run on HOST [BUILD]
37  --target=TARGET        configure for building compilers for TARGET [HOST]
38
```

```
39  Optional Features:
```

```
40  --disable-option-checking ignore unrecognized --enable/--with options
41  --disable-FEATURE       do not include FEATURE (same as --enable-FEATURE=no)
42  --enable-FEATURE[=ARG] include FEATURE [ARG=yes]
43  --enable-gsl             enable the usage of gsl (default=no)
44  --enable-libnbc         enable the usage of libNBC (default=no)
45  --enable-onesided       enable the usage of one-sided communication (default=no)
```

```

1  --disable-printf-tofile      dump printf statements to a file (default=yes)
2  --enable-userlevel-timings  disable ADCL internal timing routines (default=no)
3  --enable-knowledge-tofile   dump the ADCL knowledge to an XML file (default=no)
4  --disable-saving-request-winner save the winner of a request (default=yes)
5  --enable-smooth-hist        smooth the history data (default=no)
6  --enable-dummy-mpi          enable the usage of dummy-mpi (default=no)
7  --enable-cluster-classify   enable the usage of clustering and
8                               classification with SVM for historic learning (default=no)
9  --disable-fortran           compile fortran wrappers (default=yes)
10
11 Optional Packages:
12  --with-PACKAGE[=ARG]        use PACKAGE [ARG=yes]
13  --without-PACKAGE           do not use PACKAGE (same as --with-PACKAGE=no)
14  --with-adcl-dir=dir         Main ADCL directory (default=$PWD)
15  --with-adcl-inc-dir=dir     ADCL include directory (default=ADCL_DIR/include)
16  --with-adcl-lib-dir=dir     ADCL lib directory (default=ADCL_DIR/lib)
17  --with-adcl-bin-dir=dir     ADCL bin directory (default=ADCL_DIR/bin)
18  --with-adcl-lib-name=name   Name of the ADCL library (default=libadcl.a)
19  --with-adcl-timer=timer     Timer options (default=TIMER_GETTIMEOFDAY)
20  --with-mpi-dir=dir          Installation directory of MPI
21  --with-mpi-inc-dir=dir      Include directory of MPI (default=MPI_DIR/include)
22  --with-mpi-lib-dir=dir      Library directory of MPI (default=MPI_DIR/lib)
23  --with-mpi-bin-dir=dir      Bin directory of MPI (default=MPI_DIR/bin)
24  --with-mpi-cc=mpicc         MPI C compiler wrapper (default=mpicc)
25  --with-mpi-cxx=mpicxx       MPI C++ compiler wrapper (default=mpiCC)
26  --with-mpi-f90=mpif90       MPI f90 compiler wrapper (default=mpif90)
27  --with-papi-dir=dir         Main PAPI directory (default=$PWD)
28  --with-papi-inc-dir=dir     PAPI include directory (default=PAPI_DIR/include)
29  --with-papi-lib-dir=dir     PAPI lib directory (default=PAPI_DIR/lib)
30  --with-papi-lib-name=name   Name of the PAPI library (default=papi)
31  --with-gsl-dir=dir          Main GSL directory (default=/usr/local)
32  --with-gsl-inc-dir=dir      GSL include directory (default=GSL_DIR/include/gsl)
33  --with-gsl-lib-dir=dir      GSL lib directory (default=GSL_DIR/lib)
34  --with-libnbc-dir=dir       Main libNBC directory (default=/usr/local)
35  --with-libnbc-inc-dir=dir   libNBC include directory (default=LIBNBC_DIR/include)
36  --with-libnbc-lib-dir=dir   libNBC lib directory (default=LIBNBC_DIR/lib)
37  --with-num-tests=NUMTESTS  Number of measurements per implementation (default=30)
38  --with-perf-win=PERF-WIN    Acceptable performance window (default=10)
39  --with-pred-algo=algorithm  Prediction algorithm options (default=ADCL_WMV)
40  --with-smooth-win=WIN-SIZE  Size of the smoothing window (default=3)
41
42 Some influential environment variables:
43  CC          C compiler command
44  CFLAGS      C compiler flags
45  LDFLAGS     linker flags, e.g. -L<lib dir> if you have libraries in a

```

```
1         nonstandard directory <lib dir>
2     LIBS      libraries to pass to the linker, e.g. -l<library>
3     CPPFLAGS  (Objective) C/C++ preprocessor flags, e.g. -I<include dir> if
4               you have headers in a nonstandard directory <include dir>
5     CXX       C++ compiler command
6     CXXFLAGS  C++ compiler flags
7     F77       Fortran 77 compiler command
8     FFLAGS    Fortran 77 compiler flags
9
10    Use these variables to override the choices made by 'configure' or to help
11    it to find libraries and programs with nonstandard names/locations.
12
13    Report bugs to the package provider.
```

1 **2 Runtime Configuration**

2 There are multiple ways on how to influence or enforce a particular behavior of
3 ADCL at runtime. ADCL reads a configuration file `config.adcl`, from the same
4 director as the executable is located (1st option) or from `$(HOME)/.adcl` (2nd
5 option).

6 The configuration file has the format:

7 **OPTION: value**

8 with the **OPTION** being a key word recognized by ADCL, and **value** being a
9 valid value for that key word. Currently recognized key words and there corre-
10 sponding valid values are as follows:

11 **Generic parameters influencing the behavior of ADCL**

- 12 ● **ADCL_MERGE_REQUESTS**: value indicating whether multiple requests that have
13 identical functionsets and vmap objects, but differ in the vector object (i.e.
14 the actual array used is different but everything else is identical) shall be co-
15 tuned or tuned separately. Valid values: 1 (enable co-tuning) or 0 (disable
16 co-tuning).
- 17 ● **ADCL_PRINTF_SILENCE**: whether ADCL should log the the tuning into into the
18 per process output files (`rank.out`) or not. Valid values: 0 (write logging), 1
19 (dont write logging).
- 20 ● **ADCL_EMETHOD_SEARCH_ALGO**: search algorithm to be used for tuning. Valid
21 values: 0 (brute force search), 1 (orthogonal attribute based search), 2 (2k
22 factorial design based search). Note, that only function sets with attributes
23 can use algorithms 1 and 2.
- 24 ● **ADCL_EMETHOD_NUMTESTS**: number of measurements to be performed per func-
25 tion. Valid values: anything between 1 and the value provided at configure
26 time (default: 30).
- 27 ● **ADCL_USE_BARRIER**: Valid values: 0 (don't use `MPI_Barrier` before every in-
28 vocation of a function), 1 (use a barrier before every invocation of a function).
- 29 ● **ADCL_TIMER_STEPS_BETWEEN_BARRIER**: t.b.d.
- 30 ● **ADCL_OUTLIER_FRACTION**: percentage of measurements that are allowed to be
31 classified as outliers. Valid values:
- 32 ● **ADCL_OUTLIER_FACTOR**: An outlier is defined as a data point that is `ADCL_OUTLIER_FACTOR`
33 times larger than the minimum value on a per process basis.

1 Parameters influencing a particular function set

- 2 ● `ADCL_EMETHOD_ALLGATHERV_SELECTION`: force the usage of a particular imple-
3 mentation for the `Allgatherv` function set. Setting this value disables runtime
4 tuning of this function set. Valid values: `Allgatherv_bruck`, `Allgatherv_linear`,
5 `Allgatherv_native`, `Allgatherv_neighbor_exchange`, `Allgatherv_recursive_doubling`,
6 `Allgatherv_ring`
- 7 ● `ADCL_EMETHOD_ALLREDUCE_SELECTION`: force the usage of a particular imple-
8 mentation for the `Allreduce` function set. Setting this value disables runtime
9 tuning of this function set. Valid values: `Allreduce_native`, `Allreduce_linear`,
10 `Allreduce_ring`, `Allreduce_recurusive_doubling`, `Allreduce_nonoverlapping`.
- 11 ● `ADCL_EMETHOD_REDUCE_SELECTION`: t.b.d.
- 12 ● `ADCL_EMETHOD_ALLTOALL_SELECTION`:force the usage of a particular imple-
13 mentation for the `Alltoall` function set. Setting this value disables runtime
14 tuning of this function set. Valid values: `Alltoall_native_SR`, `Alltoall_bruck_SR`,
15 `Alltoall_ladd_block2`, `Alltoall_ladd_block4`, `Alltoall_ladd_block8`, `Alltoall_linear_SR`,
16 `Alltoall_linear_sync_SR`, `Alltoall_pair_excl_SR`.
- 17 ● `ADCL_EMETHOD_ALLTOALLV_SELECTION`: t.b.d.
- 18 ● `ADCL_EMETHOD_SELECTION`:force the usage of a particular implementation for
19 the `Neighborhood` function set. Setting this value disables runtime tuning of
20 this function set. Valid values: `IsendIrecv_aao`, `IsendIrecv_aao_pack`, `IsendI-`
21 `recv_pair`, `IsendIrecv_pair_pack`, `SendIrecv_aao`, `SendIrecv_aao_pack`, `SendI-`
22 `recv_pair`, `SendIrecv_pair_pack`, `Sendrecv_pair`, `Sendrecv_pair_pack`, `SendRecv_pair`,
23 `SendRecv_pair_pack`.
24 If one sided communication has been enabled at configure time, the follow-
25 ing values can also be used for neighborhood commmunication: `PostStart-`
26 `Get_aao`, `PostStartGet_aao_pair`, `PostStartPut_aao`, `PostStartPut_pair`, `Win-`
27 `FenceGet_pair`, `WinFenceGet_aao`, `WinFencePut_pair`, `WinFencePut_aao`.
- 28 ● `ADCL_EMETHOD_IBCAST_SELECTION`: force the usage of a particular implemen-
29 tation for the `Ibcast` function set. Setting this value disables runtime tuning of
30 this function set. Valid values follow the pattern: `Ibcast_linear_segmentsize`,
31 where `segmentsize` represents the segment size in KB, it can be: 32, 64 or 128.
32 For instance, `ADCL_EMETHOD_IBCAST_SELECTION: Ibcast_linear_32` forces
33 the usage of the linear non-blocking broadcast algorithm with a segment size
34 of 32 KB. Other valid values are: `Ibcast_generic_fanout_segmentsize`, where
35 `segmentsize` represents the segment size in KB, it can be: 32, 64 or 128; and
36 `fanout` represents the number of child nodes (processes) per node within the
37 broadcast tree-based (generic) algorithm. `Fanout` can take a value from 1 to
38 5. For instance, `ADCL_EMETHOD_IBCAST_SELECTION: Ibcast_generic_3_64`
39 forces the usage of the generic non-blocking broadcast algorithm where each
40 node has at most three child nodes and a segment size of 64KB.

- 1 • `ADCL_EMETHOD_IALLTOALL_SELECTION`: force the usage of a particular imple-
2 mentation for the `Ibcast` function set. Setting this value disables runtime
3 tuning of this function set. Valid values: `Ialltoall_linear`, `Ialltoall_pairwise`,
4 `Ialltoall_diss`.

5 **Parameters influencing the ADCL GUI**

- 6 • `ADCL_DISPLAY_IP`: IP address of the host running the ADCL GUI.
- 7 • `ADCL_DISPLAY_PORT`: TCP port used by the ADCL GUI.
- 8 • `ADCL_DISPLAY_RANK`: comma separated list of MPI ranks that should connect
9 to the ADCL GUI.

10 **Parameters influencing Historic Learning**

- 11 • `ADCL_HIST_LEARNING`: controls the utilization of historic learning. Valid val-
12 ues: 0 (disable historic learning), 1 (enable historic learning).
- 13 • `ADCL_HIST_PREDICTOR`: prediction algorithm used if historic learning has been
14 enabled. Valid values: 0 (no clue), 1 (need to look it up).
- 15 • `ADCL_HIST_CLUSTER`:

¹ **3 Graphical Monitoring Interface**

² Instructions on how to compile and use the GUI will come here.