How to Build Various Common Applications and Libraries on Beagle2

While many applications and libraries are already provided by the Beagle support staff, you may find you need to compile these yourself with local modifications or requirements. Below we provide how we compiled the various applications we provide. This document assumes you are already familiar with how to compile code on Beagle. If you are not, please make sure you understand the Beagle programming environment before moving on.

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BAMTOOLS

Currently only compiles with GNU compiler.

```
git clone git://github.com/pezmaster31/bamtools.git
module switch PrgEnv-cray PrgEnv-gnu
module load cmake
mkdir build
cd build
XTPE_LINK_TYPE=dynamic
CC="cc -dynamic" CXX="CC -dynamic" BamTools_SOURCE_DIR="/lustre/beagle/<bamtools_src>" cmake ..
make
```

Edit makefile to add "-dynamic" to the the last step, building the binaries:

```
make install DESTDIR=<you_dest_dir>
```
Move following libraries into the path, as the installation doesn't seem to work properly:

```
#move files to the library path of bamtools (for some reason they did not get copied)
cp /lustre/beagle2/denovo/src/bamtools/lib/libbamtools-utils.so.2.1.0 <your_dest_dir>/lib
cp /lustre/beagle2/denovo/src/bamtools/lib/libjsoncpp.so.1.0.0 <your_dest_dir>/lib/
```

**BLAT**

Currently only compiles with GNU compiler.

Setup your environment:

```
module switch PrgEnv-cray PrgEnv-gnu
```

Apply the patch file and compile:

```
export BLAT_INSTALL=/soft/blat/gnu/3.4/bin
mkdir -p ${BLAT_INSTALL}
export MACHTYPE=x86_64
make BINDIR=${BLAT_INSTALL} CC=cc CFLAGS=-O3
```

**Charm++**

Charm++ currently only compiles with the PGI and GNU compilers and there is no difference in how you compile with either. Below is an example using the PGI compiler.

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

Setup your environment:

```
module load rca petsc
```

Configure and compile:

```
env MPICXX=CC MPICC=cc ./build \
  charm++ \ 
  mpi-crayxt \ 
  --no-build-shared \ 
  --with-production \ 
  -j4 \ 
  -optimize \ 
  -DCMK_OPTIMIZE=1
env MPICXX=CC MPICC=cc ./build \
  AMPI \ 
  mpi-crayxt \ 
  --no-build-shared \ 
  --with-production \ 
  -j4 \ 
  -optimize \ 
  -DCMK_OPTIMIZE=1
env MPICXX=CC MPICC=cc ./build \
  FEM \ 
  mpi-crayxt \ 
  --no-build-shared \ 
  --with-production \ 
  -j4 \ 
  -optimize \ 
  -DCMK_OPTIMIZE=1
cd tests
make
```

# Verify there are no errors when compiling the tests
CGA tools

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

vers=1.5.0.31
vers=1.7.1
subvers=${vers}.5
wget http://sourceforge.net/projects/cgatools/files/${vers}/cgatools-${subvers}-source.tar.gz/download
tar -xvf cgatools-${subvers}-source.tar.gz

module load cmake
module swap PrgEnv-cray PrgEnv-gnu
module load boost
cd cgatools-${subvers}-source

# WARNING: check the current version and make sure that the
# version of gcc used is compatible with cgatools and with the libraries
# it is using (e.g., boost)
module swap PrgEnv-gnu/4.1.40 PrgEnv-gnu/3.1.49A
module swap gcc/4.7.2 gcc/gcc/4.6.1
module swap xt-mpt xt-mpich2
module swap xt-mpich2/5.6.1 xt-mpich2/5.3.2

cmake -DBOOST_ROOT=/soft/boost

make -j8
test -- -j8
make install
cd /soft/modulefiles/applications/cgatools
ln -s ../../templates/cgatools $vers

Cufflinks

http://cufflinks.cbcb.umd.edu/downloads/cufflinks-1.3.0.tar.gz
tar -xvf cufflinks-1.3.0.tar.gz

module load python
module load boost
module load samtools

(Needed to create include file on samtools, create a subdir bam there and copy there all the .h files)

CXX=CC cc=cc PYTHON=`which python` ./configure --prefix=/soft/cufflinks-gnu/1.3.0 --with-boost=$BOOST_ROOT --with-bam=$SAM_HOME

for x in *.cpp *.h; do sed 's/foreach/for_each/' $x > x; mv x $x; done

Replace line 24 of common.h

//#include <boost/foreach.hpp>
#include <boost/foreach.hpp>

# After because boost was made with 4.6.1
module swap gcc/4.6.1 gcc/4.5.2

make
make install

Gromacs
Gromacs can be built 4 different ways: single precision no MPI, single precision with MPI, double precision no MPI, double precision with MPI. There is no difference in how you compile Gromacs with the different compilers. Below are examples using the PGI compiler. You can find more details here: http://www.gromacs.org/Documentation/Installation_Instructions#Details_for_building_the_FFTW_prerequisite

Before building Gromacs, you need to setup your environment:

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

module unload dmapp
module load fftw gsl

Single precision, No MPI

./configure \
CC=cc \nCXX=CC \nF77=ftn \nCFLAGS="$(FFTW_INCLUDE_OPTS) $(GSL_INCLUDE_OPTS)" \n--prefix=/soft/gromacs/pgi/4.5.3 \n--disable-shared \n--enable-fortran \n--with-fft=fftw3 \n--with-gsl \n--disable-threads \n--enable-all-static \n--enable-static \n--disable-mpi \n--with-external-blas \n--with-external-lapack \n--without-xml
make
make install

Single precision, With MPI

./configure \
CC=cc \nCXX=CC \nF77=ftn \nCFLAGS="$(FFTW_INCLUDE_OPTS) $(GSL_INCLUDE_OPTS)" \n--prefix=/soft/gromacs/pgi/4.5.3 \n--disable-shared \n--enable-fortran \n--with-fft=fftw3 \n--with-gsl \n--disable-threads \n--enable-all-static \n--enable-static \n--enable-mpi \n--program-suffix="_mpi" \n--with-external-blas \n--with-external-lapack \n--without-xml
make
make install

Double precision, No MPI
Double precision, With MPI

Gromacs 4.5.5 single precision with MPI: custom installation

Before you start installation make sure to have following in your module list:
Currently Loaded Modulefiles:
1) modules/3.2.6.7
2) nodestat/2.2-1.0502.53712.3.109.gem
3) sdb/1.0-1.0502.55976.5.27.gem
4) alps/5.2.1-2.0502.9072.13.1.gem
5) lustre-cray_gem_s/2.5_3.0.101_0.31.1_1.0502.8394.10.1-1.0502.17198.8.50
6) udreg/2.3-2-1.0502.9275.1.25.gem
7) ugni/5.0-1.0502.9685.4.24.gem
8) gni-headers/3.0-1.0502.9684.5.2.gem
9) dmapp/7.0.1-1.0502.9501.5.211.gem
10) xpmem/0.1-2.0502.55507.3.2.gem
11) hss-1lm/7.2.0
12) Base-opts/1.0.2-2-1.0502.53325.1.2.gem
13) craype-network-gemini
14) craype/2.2.1
15) craype-abudhabi
16) ci
17) moab/6.1.1
18) torque/2.5.7
19) cmake/2.8.4
20) gcc/4.9.1
21) totalview-support/1.2.0.3
22) totalview/8.14.1
23) cray-libsci/13.0.1
24) pml/5.0.6-1.0000.10439.140.3.gem
25) atp/1.7.5
26) PrgEnv-gnu/5.2.40
27) cray-mpich/7.0.5
28) fftw/3.3.0.4
29) gsl/1.15

export CPPFLAGS="-I/opt/fftw/3.3.0.4/abudhabi/include"
export CRAY_LIBSCI_PREFIX_DIR=/opt/cray/libsci/13.0.1/CRAY/83/xe6464/gem/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/lib64:/opt/cray/libsci/13.0.1/CRAY/83/xe6464/gem/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/gem/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/gem/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/gem/lib64:/opt/cray/libsci/13.0.1/CRAY/83/x6464/lib64:
export LDFLAGS="**
export CFLAGS="$(GSL_INCLUDE_OPTS) -static-libgcc -static-libstdc++ -static-libgfortran"
export LDFLAGS=" $(GSL_INCLUDE_OPTS) -static-libgcc -static-libstdc++ -static-libgfortran"

.runconf

To run Gromacs 4.5.5 on Beagle2, put this in your PBS script:

#!/bin/bash
#PBS -N <job_name>
#PBS -l walltime=48:00:00
#PBS -l mppwidth=64 # this number can be any multiple of 32, since there is 32 cores/node, and this number must
match aprun -n 32 (in this case)
source /opt/modules/default/init/bash
cd $PBS_O_WORKDIR
module load fftw/3.3.0.4
module load gromacs/4.5.5-single
aprun -n 1 -N 1 /soft/gromacs-gnu/4.5.5-single/bin/grompp -f tip3pBox60_equil.mdp -c tip3pBox60_preequil.gro -n
   tip3pBox60.ndx -p tip3pBox60.top -o tip3pBox60_equil.tpr
aprun -n 64 /soft/gromacs-gnu/4.5.5-single/bin/mdrun -s tip3pBox60_equil.tpr -o tip3pBox60_equil.trr -x
tip3pBox60_equil.xtc -e tip3pBox60_equil.edr -g tip3pBox60_equil.log
To learn more about Gromacs installation please visit this page: http://www.gromacs.org/Documentation/Installation_Instructions_4.5

To learn more how to run Gromacs please visit this page: http://www.gromacs.org/@api/deki/files/213/=gromacs_parallelization_acceleration.pdf

Hoard lib
This is an alternate version of java other than the IBM java that is installed by default on Beagle.
http://www.cs.umass.edu/~emery/hoard/hoard-3.8/source/hoard-38.tar.gz

module swap PrgEnv-cr ay PrgEnv-gnu
replace all g++ with CC in makefile
create lib and move .so there
create include and move .h there.

Sun java
This is an alternate version of java other than the IBM java that is installed by default on Beagle.
Setup your environment:

module load sun-java

Swift
The Swift parallel scripting framework.
Setup your environment:

module load swift

GSL (GNU Scientific Library)
There is one slight difference in how you compile GSL with the PGI and Cray from GNU compilers. With the PGI and Cray compilers, you need to do the following immediately after running configure:

```
export GSL_VERSION=1.14
./configure \
CC=cc \n--prefix=/soft/gsl/pgi/${GSL_VERSION} \n--disable-shared
```

sed 's;#define HAVE_INLINE 1;#undef HAVE_INLINE;g' -i config.h

With GNU this is not required.

Below is an example using the PGI compiler.

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

```
extport GSL_VERSION=1.14
./configure \
CC=cc \n--prefix=/soft/gsl/pgi/${GSL_VERSION} \n--disable-shared
sed 's;#define HAVE_INLINE 1;#undef HAVE_INLINE;g' -i config.h
make
make install
```
LAGAN
LAGAN compiles with bot PGI and GNU compilers.
NOTE: for the time being we do not have PGI compiler, it might become available in the future.

GNU Compiler
Setup your environment:

module switch PrgEnv-cray PrgEnv-gnu
Unzip the source and move the resulting directory to the installation destination:

mkdir -p /soft/lagan/gnu
cd /soft/lagan/gnu
tar zxvf lagan20.tar.gz
mv lagan20 2.0
Apply the src/Makefile patch and src/local/Makefile patch and compile:

rm -f prolagan
make

PGI Compiler
Setup your environment:
NOTE: for the time being we do not have PGI compiler, it might become available in the future.
module switch PrgEnv-cray PrgEnv-gnu
Unzip the source and move the resulting directory to the installation destination:

mkdir -p /soft/lagan/pgi
cd /soft/lagan/pgi
tar zxvf lagan20.tar.gz
mv lagan20 2.0
Apply the src/Makefile patch and src/local/Makefile patch and compile:

rm -f prolagan
make

LAMMPS
LAMMPS, currently, only compiles with the GNU compiler.

GNU Compiler
Setup you environment:

module switch PrgEnv-cray PrgEnv-gnu
module load fftw/2.1.5.2
• Install atc Makefile in lib/atc
• Install `meam` Makefile in `lib/meam`
• Install `poems` Makefile in `lib/poems`
• Install `reax` Makefile in `lib/reax`
• Install `Beagle` Makefile in `src/MAKE`

Compile LAMMPS:

```bash
cd src
make yes-all
make no-gpu
cd ../lib/atc
make -f Makefile-atc.beagle
cd ../meam
make -f Makefile-meam.beagle
cd ../poems
make -f Makefile-poems.beagle
cd ../reax
make -f Makefile-reax.beagle
cd ../../src
sed -i -e 's/fftw.h/dfftw.h/g' fft3d.h
make beagle
```

**METIS**

Download either the [PGI Makefile](http://example.com/pgi-makefile) or [GNU Makefile](http://example.com/gnu-makefile). The following example assumes PGI:

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

```bash
rm -f Makefile.in; ln -sf Makefile-pgi.in Makefile.in
make
mkdir -p /soft/metis/pgi/4.0.1/bin
mkdir -p /soft/metis/pgi/4.0.1/lib
cp graphchk mesh2dual oemetis partdmesh pmetis kmetis mesh2nodal onmetis partnmesh /soft/metis/pgi/4.0.1/bin/
cp libmetis.a /soft/metis/pgi/4.0.1/lib/
```

**NAMD**

**GNU Compiler**

Setup your environment:

```bash
module switch PrgEnv-cray PrgEnv-gnu
module load rca petsc charm++ tcl fftw/2.1.5.2
```

`Edit Make.charm` and make sure `CHARMBASE` points to the install of Charm++:

```
CHARMBASE = $(CHARM_DIR)
```

`Edit arch/CRAY-XT.fftw` so it looks like:

```bash
FFTDIR=\$(FFTW_DIR)
FFTINCL=\$(FFTW_INCLUDE_OPTS)
FFTLIB=\$(FFTW_POST_LINK_OPTS) -ldfftw -lfftw
FFTPLAGS=\$(FFTW_FLAGS)
FFT=\$(FFTINCL) \$(FFTPLAGS)
```

`Edit arch/CRAY-XT.tcl` so it looks like:
TCLDIR=$(TCL_DIR)
TCLINCL=$(TCL_INCLUDE_OPTS)
TCLLIB=$(TCL_POST_LINK_OPTS) -ldl
TCLFLAGS=-DNAMD_TCL
TCL=$(TCLINCL) $(TCLFLAGS)

Edit arch/CRAY-XT-g++.arch so it looks like:

NAMD_ARCH = CRAY-XT
CHARMARCH = mpi-crayxt

#
# The GNU compilers produce significantly faster NAMD binaries than PGI.
#
# You must run the following to switch CC/cc to the GNU compiler
# environment before building either Charm++ or NAMD:
#
#   module swap PrgEnv-cray PrgEnv-gnu
#
# Users of psfgen might also need to do 'module remove acml' in order for
# the the psfgen compilation to succeed.
#
CXX = CC -DNO_SOCKET -DDUMMY_VMDSOCK -DNO_HOSTNAME -DNAMD_NO_STDOUT_FLUSH -DNAMD_NO_O_EXCL
CXXOPTS = -O3 -ffast-math -fexpensive-optimizations -fomit-frame-pointer
CC = cc
COPTS = -O3 -ffast-math -fexpensive-optimizations -fomit-frame-pointer

Compile NAMD:

./config CRAY-XT-g++.arch
cd CRAY-XT-g++
make -j4

PGI Compiler

Setup your environment:

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

module load rca petsc charm++ tcl fftw/2.1.5.2

Edit Make.charm and make sure CHARMBASE points to the install of Charm++:

CHARMBASE = $(CHARM_DIR)

Edit arch/CRAY-XT.fftw so it looks like:

FFTDIR=$(FFTW_DIR)
FFTNCL=$(FFTW_INCLUDE_OPTS)
FTFLIB=$(FFTW_POST_LINK_OPTS) -ldfftw -ldfftw
FFTFLAGS=-DNAMD_FFTW
FFT=$(FFTNCL) $(FFTFLAGS)

Edit arch/CRAY-XT.tcl so it looks like:

TCLDIR=$(TCL_DIR)
TCLINCL=$(TCL_INCLUDE_OPTS)
TCLLIB=$(TCL_POST_LINK_OPTS) -ldl
TCLFLAGS=-DNAMD_TCL
TCL=$(TCLINCL) $(TCLFLAGS)

Edit arch/CRAY-XT-pgcc.arch so it looks like:
NAMD_ARCH = CRAY-XT
CHARMARCH = mpi-crayxt

# The GNU compilers produce significantly faster NAMD binaries than PGI.
#
CXX = CC
CXXOPTS = -O
CXXNOALIASOPTS = -fast -Mnodepchk -Msafeptr=arg,global,local,static -Minfo=all -Mneginfo=loop
CC = cc
COPTS = -fast

Compile NAMD:

./config CRAY-XT-pgcc.arch  
cd CRAY-XT-pgcc  
make -j4

NCBI Blast+

We currently only have instructions for compiling Blast+ with the GNU compiler

GNU Compiler

Setup you environment:

module switch PrgEnv-cray PrgEnv-gnu

Configure and compile Blast+:

./configure \  
CC=cc \  
CXX=CC \  
--prefix=/soft/ncbi-blast+/gnu/2.2.24 \  
--without-dll \  
--with-static \  
--with-static-exe \  
--with-lfs \  
--with-mt \  
--with-64 \  
--without-debug
make
make install

Netlib CBLAS

You can only compile CBLAS using the PGI or GNU compilers. There is no difference in how you compile Netlib CBLAS, only which Makefile you link Makefile.in to. We provide the PGI Makefile and the GNU Makefile. The examples below use the PGI compiler.

NOTE: for the time being we do not have PGI compiler, it might become available in the future.

Setup you environment:

module load acml

Compile and install CBLAS:

rm -f Makefile.in  
ln -sf cblas-Makefile.pgi Makefile.in
make all
mkdir -p /soft/cblas/pgi/3.0/lib
cp lib/libcblas.a /soft/cblas/pgi/3.0/lib
PCRE

GNU compiler

We compile PCRE for both shared library support (for SWIG) and for static library support (for Octave). Because compiles default to static libraries, we compile that last.

Setup your environment:

module switch PrgEnv-cray PrgEnv-gnu

export XTPE_LINK_TYPE=dynamic

Configure, build and install the shared library version:

export XTPE_LINK_TYPE=native

./configure \ 
CC="cc -dynamic" \ 
CXX="CC -dynamic" \ 
--prefix=/soft/pcre-gnu/8.12 \ 
--enable-shared \ 
--disable-static
make
make install

Configure, build and install the static library version:

./configure \ 
CC=cc \ 
CXX=CC \ 
--prefix=/soft/pcre-gnu/8.12 \ 
--disable-shared \ 
--enable-static
make
make install

Python

It only makes sense to compile Python dynamically since in almost all cases you will want to load Python modules dynamically. Because of this, you have to use Python in DSL mode. We also only compile Python with the GNU compiler.

Setup you environment:

module switch PrgEnv-cray PrgEnv-gnu
module unload xt-mpt pmi

Configure and compile:

./configure \ 
CC="cc -dynamic" \ 
CXX="CC -dynamic" \ 
F77="ftn -dynamic" \ 
XTPE_LINK_TYPE=dynamic \ 
--prefix=/soft/python/2.7.1 \ 
--enable-shared
make
make install

Biopython

Setup your environment:

module load python

export XTPE_LINK_TYPE=dynamic

export BIOPYTHON_ROOT=/soft/python/modules/biopython/1.56
Build Biopython:

```
mkdir -p ${BIOPYTHON_ROOT}/lib/python2.7/site-packages
env LDFLAGS="-L/soft/python/2.7/2.7.1/lib" python setup.py build
PYTHONPATH=${PYTHONPATH}:${BIOPYTHON_ROOT}/lib/python2.7/site-packages python setup.py install --prefix ${BIOPYTHON_ROOT}
```

**NumPy**

```
module swap PrgEnv-cray PrgEnv-gnu

module load python/2.7.3-vanilla
module load acml
module load metis
module load SuiteSparse
module load swig
export XTPE_LINK_TYPE=dynamic
export NUMPY_ROOT=/soft/python/2.7/2.7.3-vanilla/modules/numpy/1.7.0
export BLAS=""
export LAPACK=""
export ATLAS=""
export LDFLAGS="-L/soft/python/2.7/2.7.3-vanilla/python/lib/"
python setup.py build --compiler=unix --fcompiler=gnu95

PYTHONPATH=${PYTHONPATH}:${NUMPY_ROOT}/lib/python2.7/site-packages python setup.py install --prefix ${NUMPY_ROOT}
```

**PIL**

Setup your environment:

```
module load python
export XTPE_LINK_TYPE=dynamic
export IMAGING_ROOT=/soft/python/modules/imaging/1.1.7

Apply the patch file and compile:

```
mkdir -p ${IMAGING_ROOT}/lib/python2.7/site-packages
env LDFLAGS="-L/soft/python/2.7/2.7.1/lib" python setup.py build
PYTHONPATH=${PYTHONPATH}:${IMAGING_ROOT}/lib/python2.7/site-packages python setup.py install --prefix ${IMAGING_ROOT}
```

**SciPy**

```
module load pil
export XTPE_LINK_TYPE=dynamic
export SCIPY_ROOT=/soft/python/2.7/2.7.3-vanilla/modules/scipy/0.12.0
mkdir -p ${SCIPY_ROOT}/lib/python2.7/site-packages
export BLAS="/opt/cray/libsci/12.0.00/GNU/47/mc12/lib/libsci_gnu.a"
export LAPACK="/opt/cray/libsci/12.0.00/GNU/47/mc12/lib/libsci_gnu.a"
export ATLAS="/opt/cray/libsci/12.0.00/GNU/47/mc12/lib/libsci_gnu.a"
python setup.py build --compiler=unix --fcompiler=gnu95

repeat at eternum adding -shared to build shared libraries when the idiotic linker is called incorrectly. NEED TO FIND A WAY TO TELL THE INSTALLER HOW TO USE GCC TO LINK THE FORTRAN LIBRARIES.

export PYTHONPATH=${PYTHONPATH}:${SCIPY_ROOT}/lib/python2.7/site-packages python setup.py install --prefix ${SCIPY_ROOT}
```

**R**

It only makes sense to compile R dynamically since in almost all cases you will want to load R modules dynamically. Because of this, you have to use R in DSL or CCM mode.
GNU Compiler

This has been successfully tested with R up to version 2.13.1 (not all intermediate releases have been tested)

Setup you environment:

If using PrgEnv-gnu/3.1.49A or earlier:

module switch PrgEnv-cray PrgEnv-gnu/3.1.49A

This might be necessary because some of the later versions have issues with shared libraries. Otherwise

module switch PrgEnv-cray PrgEnv-gnu

is sufficient because cray-mpich is the current default (unless you changed it)

Configure and compile:

```bash
./configure \   
  CC="cc -dynamic" \   
  CXX="CC -dynamic" \   
  FC="ftn -dynamic" \   
  F77="/ftn -dynamic" \   
  XTPRE_LINK_TYPE=dynamic \   
  CPICFLAGS="--pic" \   
  CXXCPICFLAGS="--pic" \   
  FPICFLAGS="--pic" \   
  FCPICTYPE="--pic" \   
  SHLIB_LDFLAGS="--dynamic" \   
  SHLIB_CXX_LDFLAGS="--dynamic" \   
  --prefix=/soft/R/gnu/2.12.1 \   
  --enable-R-shlib \   
  --enable-R-static-lib \   
  --enable-BLAS-shlib \   
  --enable-shared \   
  --with-blas="-lsci -lsci_mc12" \   
  --with-lapack="-lsci -lsci_mc12" \   
  --without-x
make
make install
```

Note that `--prefix=/soft/R/gnu/2.12.1` should point to a local directory (probably under `/lustre/beagle/`whoami`/soft/R`) if you are building it for yourself.

SuiteSparse

SuiteSparse currently only builds with GNU compilers. Download the `UFconfig.mk` configuration file and install it as `UFconfig/UFconfig.mk`.

Setup your environment:

```bash
module switch PrgEnv-cray PrgEnv-gnu
module load metis
```

Copy the configured and built source tree of METIS to the source root of SuiteSparse as `metis-4.0` so that your SpareSuite root looks like:

```
[jurbanski@sandbox:/soft/build/SuiteSparse]$ ls
AMD/        CSparse_to_CXSparse*      MATLAB_Tools/       SuiteSparse_install.m
BTF/        CXSparse/                 MATLAB/           SuiteSparseinstall.m
CCOLAMD/    CXSparse_newfiles/        MATLAB/           SuiteSparse_install.m
CAMD/       CXSparse_newfiles.tar.gz  RBio/              SuiteSparse_install.m
CHOLMOD/    KLU/                      README.txt         UFconfig/
COLAMD/     LDL/                      UFconfig/         UFconfig.mk
Contents.m   LINFACTOR/                UFcollection/     UFconfig/make
CSparse/     Makefile                  UFcollection/     UFcollection.mk
            SuiteSparse_demo.m
```

Build and install SuiteSparse:

```bash
make
make install
```
SGA -- String Graph Assembler

GNU Compiler

`git clone git://github.com/jts/sga.git`

```
module load sparsehash
download and install sparsehash
module load bamtools
download and install bamtools
module load hoard
```

```
./autogen.sh
CXX=CC cc=cc ./configure --with-sparsehash=${SPARSEHASH_DIR} --with-bamtools=${BAMTOOLS_HOME} --with-hoard=${HOARD_DIR}
make install DESTDIR=<your_destadir>
```

SKAT

```
module load R/2.15.1-vanilla
vers=0.82
wget http://cran.r-project.org/src/contrib/SKAT_${vers}.tar.gz
gunzip SKAT_${vers}.tar.gz
```

```
# We try with CC, which is the wrapper for MPI and general system builds
# it is possible that for the package to work properly under Vanilla we
# will need to use CC=g++ cc=gcc
R CMD INSTALL --configure-args="--prefix=$R_HOME --build=X86_64  CC=CC cc=cc"  SKAT_${vers}.tar
```

SWIG

GNU Compiler

Because SWIG is used with languages such as Python that are dynamically linked, we build SWIG dynamically.

Setup your environment:

```
module switch PrgEnv-cray PrgEnv-gnu
module load pcre
module load python
export XTPE_LINK_TYPE=dynamic
```

Configure, build and install SWIG:

```
./configure \ 
CC="cc -dynamic" \ 
CXX="CC -dynamic" \ 
--prefix=/soft/swig/gnu/2.0.2 
make
make install
```

Valgrind

GNU Compiler

Valgrind is an instrumentation framework for building dynamic analysis tools. The version that ships from Cray will not work on the compute nodes since it requires `/tmp` to be writable. We will build a patched version that will honor a user's `$TMPDIR` environment variable.

Setup your environment:

```
module switch PrgEnv-cray PrgEnv-gnu
```
Apply the patch to the Valgrind 3.6.1 source tree:

```bash
tar jcvf valgrind-3.6.1.tar.bz2
cd valgrind-3.6.1
cp /path/to/patch/file/tmpdir.patch .
patch -p1 < tmpdir.patch
```

Configure, build and install Valgrind, allowing it to find the default gcc:

```bash
./configure \
   --prefix=/soft/valgrind/gnu/3.6.1
make
make install
```

To use Valgrind on the compute nodes you will need to set `TMPDIR` to something other than `/tmp`.

**VARIANT TOOLS**

```bash
wget http://sourceforge.net/projects/varianttools/files/1.0.4/variant_tools-1.0.4a.tar.gz/download
tar -xvf variant_tools-1.0.4a.tar.gz
module load python/2.7.3-vanilla
python setup.py install --install-platlib=/soft/variant_tools/gnu/1.0.4/python_lib --install-scripts=/soft
   /variant_tools/gnu/1.0.4/bin
```