PALM - Installation

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Before we start: Some Definitions About Runs (I)

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  - Run command (`mrun`) is called in terminal and program (PALM) immediately starts to run.

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- Batch run on remote machine
  - Like a batch run, but the batch job is send (via `scp`) to a queue on a remote computer.

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  - Every queuing system has CPU time limits. If a run needs more time than these limits allow, it has to be split into several parts.
  - The first part is called **initial run**.
  - The other parts are called **restart runs**.
  - All runs together form a so-called **job-chain**.

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- Participants of this seminar can install and use PALM in different ways:
- Installation on a personal notebook.
- Installation on a CUHK desktop PC.
- The installation instructions can also be found in the PALM online-documentation under

  `http://palm.muk.uni-hannover.de/trac/wiki/doc/install`

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3. A FORTRAN90/95 compiler.
4. The Message Passing Interface (MPI), if the parallel version of PALM shall be used.
5. The revision control system subversion (see subversion.tigris.org). This is already included in many Linux distributions (e.g. SuSe). Subversion requires port 3690 to be open for tcp/udp. If there are firewall restrictions concerning this port, the PALM code cannot be accessed. The user needs a permit to access the PALM repository. For getting a permit please contact the PALM group (raasch@muk.uni-hannover.de) and define a username and a password under which you like to access the repository. This username and password also gives you access to advanced features of the online documentation. (trac-server)

PALM - Installation / General Requirements (II)

6. All participants of this seminar are already permitted to access the repository. Use "seminar_cuhk" as username and "palm2013" as password.

Accounts and Passwords for PALM 2013 Seminar

- On all the CUHK PCs you can log into the account “student” with the corresponding password “fed19pa!m”.

Installing PALM on the local Computer
Package Download on Linux Notebooks and CUHK PCs

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2. Create a working copy of the newest PALM version (currently 3.9) from the subversion repository:

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cd ~/palm/current_version
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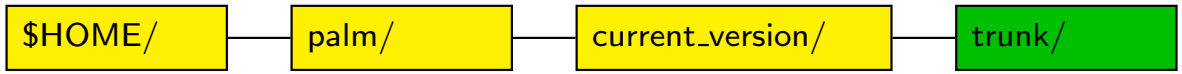

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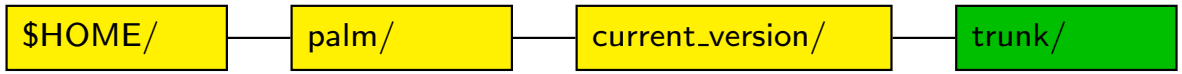

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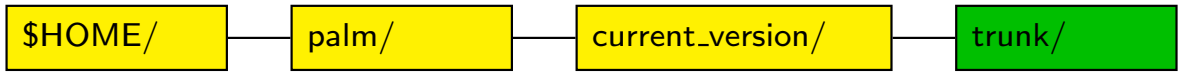

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```
cd ~/palm/current_version
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Generally, this version may contain bugs and new features may not be documented!
Anyhow, using the most recent version is recommended for this seminar!

Installing PALM on the local Computer
Package Configuration on Linux Notebooks

- Set environment variables in the respective profile of the user's default shell (e.g. in `.profile`, when ksh is used, or in `.bashrc`, when bash is used):

```
export PALM_BIN=$HOME/palm/current_version/trunk/SCRIPTS
export PATH=$PALM_BIN:$PATH
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mrun
mbuild
...

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- Create your personal configuration file, needed by `mbuild` and `mrun`:

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cd  /palm/current_version
cp trunk/SCRIPTS/.mrun.config.default .mrun.config
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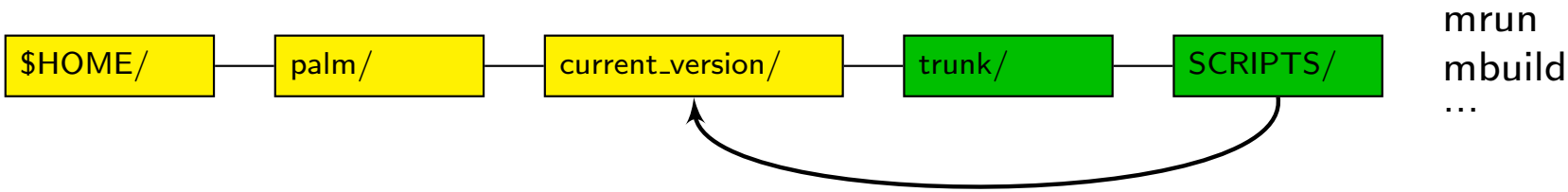

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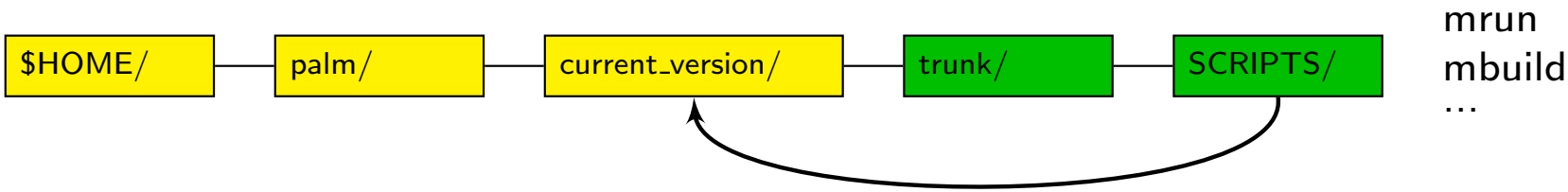

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The next two slides explain parts of the format of the configuration file.

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The Configuration File (I)

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```
#column 1                 column 2                                        column 3
#name of variable         value of variable (must not be used)            scope
#-------------------------------------------------------------------------------
%mainprog                 palm.f90
%base_directory           $HOME/palm/current_version/
```

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- The configuration file allows settings for different computers (e.g. local / remote host). These are done in different blocks of lines, and these blocks are marked with the so-called host-identifier of the respective computer. This identifier is given in column 3. No entry in column 3 means that the respective setting is valid for all computers (hosts).

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%mainprog                 palm.f90
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```

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%compiler_name          mpif90                          lcsgih
%compiler_name_ser      ifort                           lcsgih
%compiler_name          mpif90                          lcother
%compiler_name_ser      f95                             lcother
%compiler_name          ftn                             lcxt4
%compiler_name_ser      ftn                             lcxt4
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%compiler_name          mpif90                          lcother
%compiler_name_ser      f95                             lcother
%compiler_name          ftn                             lcxt4
%compiler_name_ser      ftn                             lcxt4
```

- If value-strings contain blanks, they have to be replaced by colon (":"):
  (`fopts`: compiler options to be used)

```
%fopts      -g:-w:-xT:-O3:-cpp:-r8:-nbs          lcother parallel
```

Installing PALM on the local Computer
Configuring `.mrun.config` on Linux Notebooks

- Now edit the configuration file and adjust it for your local computer.

  For this, you will need informations about all paths where the netCDF- and MPI-libraries reside, as well as the hostname of your local computer. You can find out the hostname by simply typing the unix-command:

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  hostname
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- Please give all respective paths and replace <hi>by your host identifier.

```
# The next line is just an example. Add your own line below or replace this line.
%host_identifier myhostname lcmy
#
# The next block contains all informations for compiling the PALM code
#
%tmp_use_catalog     /tmp                                                    <hi> parallel
%compiler_name       mpif90                                                  <hi> parallel
%compiler_name_ser   ifort                                                   <hi> parallel
%cpp_options         -D__mpi2:-DMPI_REAL=MPI_DOUBLE_PRECISION:               <hi> parallel
                     :-DMPI_2REAL=MPI_2DOUBLE_PRECISION:-D__netcdf
%netcdf_inc          -I:<replace by netcdf include path>                     <hi> parallel
%netcdf_lib          -L<replace by netcdf include path>:-lnetcdf             <hi> parallel
%fopts               -xS:-cpp:-openmp:-r8:-nbs:-convert:little_endian:       <hi> parallel
                     -I:<replace by mpi include path>
%lopts               -xS:-cpp:-openmp:-r8:-nbs:-Vaxlib:                      <hi> parallel
                     -L<replace by mpi library path>
# if you want to use your own hostfile, uncomment next line
#%hostfile           $base_directory/.hostfile                               <hi> parallel
# if you want this host to be used as a remote host, uncomment next line
#%remote_username    <replace by your username om this host>                 <hi> parallel
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%host_identifier scirocco lcsci
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Package Configuration on the CUHK PCs

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2. Restart the shell. Otherwise settings are not active.

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   ```

Installing PALM on the local Computer
Package Configuration on the CUHK PCs

1. Set environment variables in the respective profile of the user's default shell, (which is .bashrc, on the CUHK PCs):

   Note: .profile / .bashrc have to be located in $HOME; recommended text editors are e.g. kate / vi

   ```
   export PALM_BIN=$HOME/palm/current_version/trunk/SCRIPTS
   export PATH=$PALM_BIN:$PATH
   ```

2. Restart the shell. Otherwise settings are not active.

3. Create your personal configuration file, needed by `mbuild` and `mrun`:

   ```
   cd  /palm/current_version
   cp trunk/SCRIPTS/.mrun.config.cuhk .mrun.config
   ```

mrun
mbuild
...

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   ```
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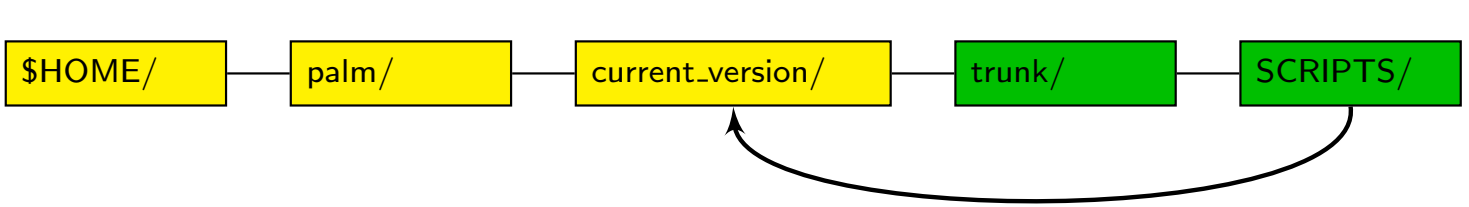

mrun
mbuild
...

Installing PALM on the local Computer
Configuring `.mrun.config` on CUHK PCs

- The only parameter that has to be changed is the hostname.
- You can find out the hostname by running the program "hostname" in your terminal.

```
# The next line is just an example. Add your own line below or replace this line.
%host_identifier <replace with your hostname> lccuhk
#
# The next block contains all informations for compiling the PALM code
#
%tmp_use_catalog    /home/student/tmp                                    lccuhk parallel
%compiler_name      mpif90                                               lccuhk parallel
%compiler_name_ser  ifort                                                lccuhk parallel
%cpp_options        -D__mpi2:-DMPI_REAL=MPI_DOUBLE_PRECISION:            lccuhk parallel
                    :-DMPI_2REAL=MPI_2DOUBLE_PRECISION:-D__netcdf
%netcdf_inc         -I:/opt/netcdf-3.6.3/include                         lccuhk parallel
%netcdf_lib         -L/opt/netcdf-3.6.3/lib:-lnetcdf                     lccuhk parallel
%fopts              -xS:-cpp:-openmp:-r8:-nbs:-convert:little_endian:    lccuhk parallel
                    -I:/opt/mpich2/include
%lopts              -xS:-cpp:-openmp:-r8:-nbs:-Vaxlib:                   lccuhk parallel
                    -L/opt/mpich2/lib
%remote_username    student                                              lccuhk parallel
```

Installing PALM on the local Computer
Creating the Utility Programs

- The shellscript `mrun` which is used to run PALM needs a few more utility programs (written in FORTRAN) and the respective executables have to be created on the local host:

```
cd  /palm/current_version
mbuild -u -h <hi>
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After:

mrun
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interpret_config_parallel.x
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After:

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mbuild
interpret_config_parallel.x
combine_plot_fields_parallel.x
...

Installing PALM on the local Computer
Pre-Compiling the PALM Code

Reason: Compilation is time consuming (especially when regarding short test runs). Using pre-compiled files prevents the code from being repeatedly compiled for each model run.

Pre-compiled files are generated by using the command `mbuild`.
`mbuild` performs the following steps:

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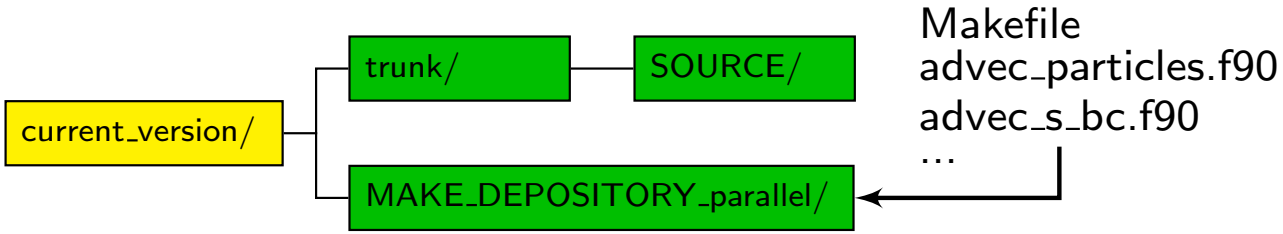

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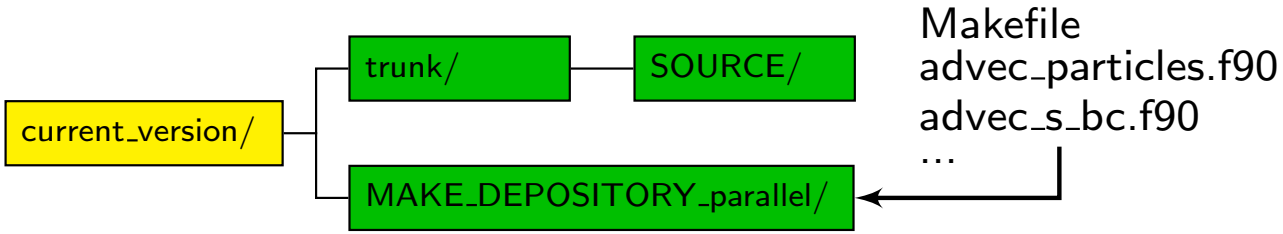

- It calls the compiler using the `unix` make mechanism. Compilation informations (i.e. files to be translated, dependencies, etc.) are given in file `trunk/SOURCE/Makefile`. `mbuild` transfers compiler options given in `.mrun.config` to Makefile.

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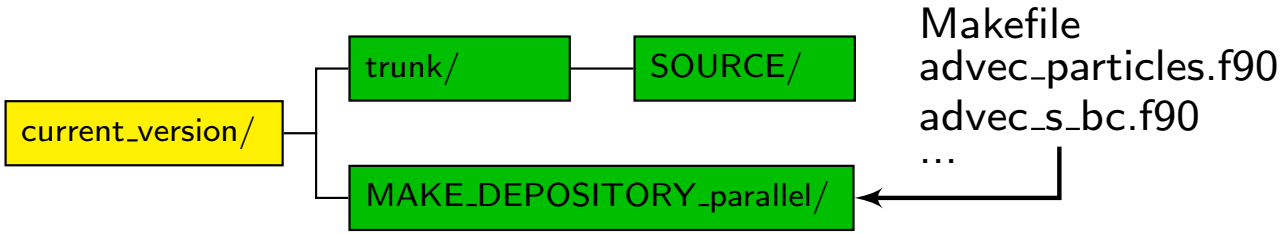

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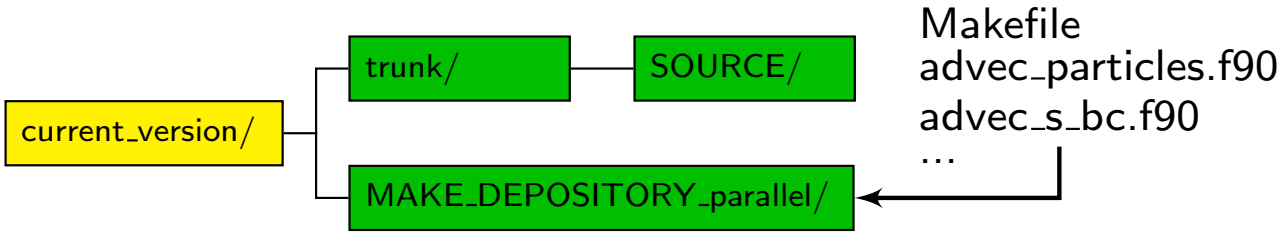

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- The compiled files (object files with suffix .o) are stored in the make depository. This directory should **never** be directly modified by the user.
- If more than one block of settings for the local host (host identifier) is given in `.mrun.config`, `mbuild` creates further depositories, one for each block (`MAKE_DEPOSITORY_block1, MAKE_DEPOSITORY_block2`, etc.).

Installing PALM on the local Computer
Pre-Compiling the PALM Code, Running `mbuild`

The pre-compiled PALM code is generated with the command

```
mbuild -h <host identifier>
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- Informations will appear on the terminal.

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- Compilation on Intel machines may take several minutes. On multicore systems less time is needed, because parallel compilation is switched on by default (see setting of environment variable `mopts` in the configuration file).
- No errors should (hopefully) occur, as long as the previous installation steps have been carried out without errors, and as long as the PALM source code has not yet been modified by yourself.

Checking the PALM Installation (I)
on the local Computer

The installation can be checked by running a short PALM test job ("example run") and comparing the output of this job with values from a reference file.

The test job will be started by using the mrun-tool.
Details about mrun and its options will be explained later.

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1. Provide the configuration file `.mrun.config` (already done)

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Pre-requisites on the local host:

1. Provide the configuration file `.mrun.config` (already done)
2. Provide the parameter file for running the test job (needed for steering PALM):

```
mkdir -p JOBS/example_cbl/INPUT
cp trunk/INSTALL/example_cbl_p3d JOBS/example_cbl/INPUT/
```

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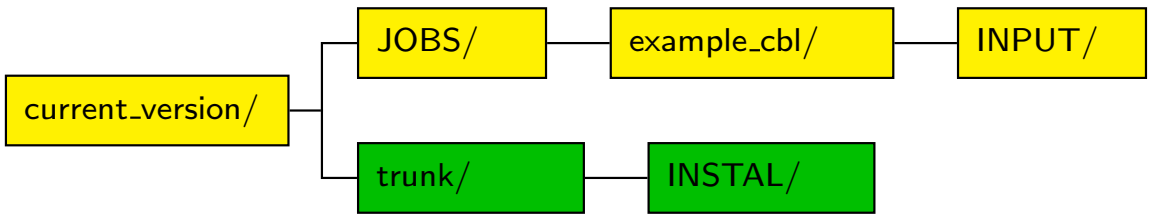

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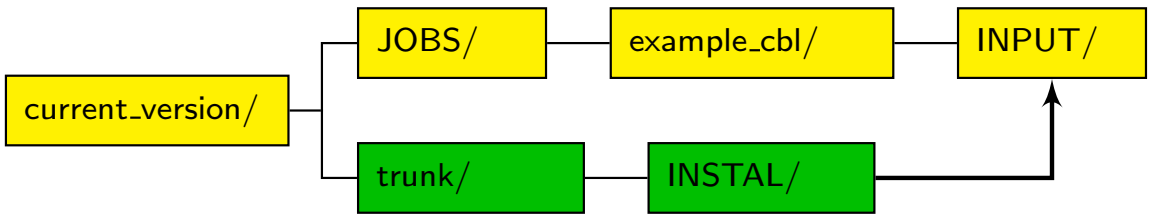

Checking the PALM Installation (II) on the local Computer

Now the job can be run and results can be compared with the reference file

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- Create and start the (interactive) test run using `mrun`:

  ```
  mrun -d example_cbl -K parallel -X2 -T2 -r "d3# ts#"
  ```

  Confirm the terminal query with "y". Messages about the progress of execution will be displayed on the terminal and should end (after about 30 s) with

  ```
  -->  all actions finished
  Bye, bye <username> !!
  ```

Checking the PALM Installation (III) on the local Computer

1. Check output files:

   After the above message has appeared, there should be three files in directory: `JOBS/example_cbl/MONITORING` with names `example_cbl_cpu`, `example_cbl_header` and `example_cbl_rc`

Checking the PALM Installation (III) on the local Computer

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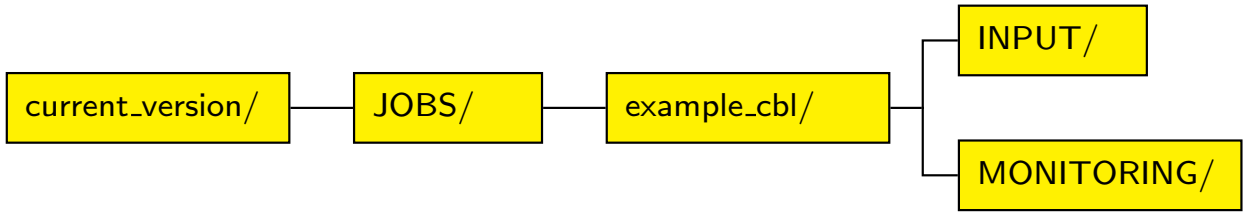

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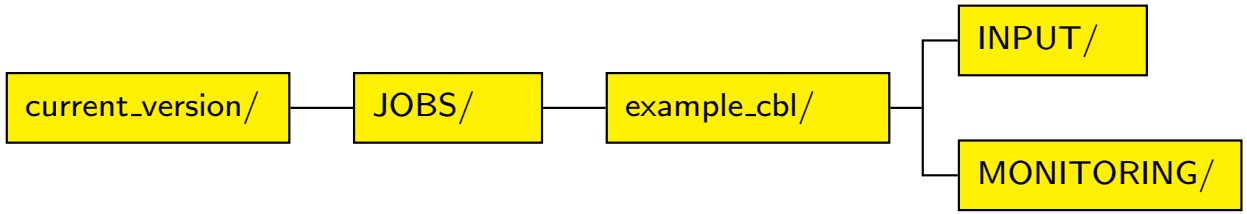

2. Compare the contents of `example_cbl_rc` with the contents of a reference file by using the unix command `diff` or, even better, `kdiff3` (if available):

```
cd JOBS/example_cbl/MONITORING
diff example_cbl_rc ../../../trunk/INSTALL/example_cbl_rc
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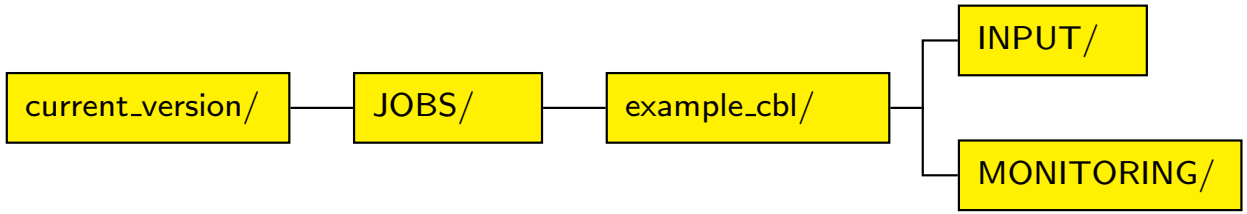

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```
cd JOBS/example_cbl/MONITORING
diff example_cbl_rc ../../../trunk/INSTALL/example_cbl_rc
```

Except run date, time, and small differences in the version/processor numbers, you should not find any difference between these files!

Installing PALM on CUHK PCs
Step by Step Instructions (I)

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1. Log into the CUHK PC using the “student” account
   and the password “fed19pa!m” FORTRAN-compiler, MPI- and netCDF-libraries
   and all other required software are already installed.

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Step by Step Instructions (I)

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   and all other required software are already installed.
2. Download the PALM package by using subversion:

```
mkdir -p ~/palm/current_version
cd ~/palm/current_version
svn checkout --username seminar_cuhk    \
    svn://130.75.105.7/palm/trunk trunk
```

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```

3. Set environment variables:

```
export PALM_BIN=$HOME/palm/current_version/trunk/SCRIPTS
export PATH=$PALM_BIN:$PATH
```

   Set these variables also in file `.bashrc`.

Installing PALM on CUHK PCs
Step by Step Instructions (II)

4. A pre-configured configuration file for the IMUK/HLRN system is available:

```
cp trunk/SCRIPTS/.mrun.config.cuhk .mrun.config
```

Installing PALM on CUHK PCs
Step by Step Instructions (II)

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5. Create the utility programs:

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6. Pre-compile the PALM code:

   ```
   mbuild -h lccuhk
   ```

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6. Pre-compile the PALM code:

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```

7. Provide the parameter file:

```
mkdir -p JOBS/example_cbl/INPUT
cp trunk/INSTALL/example_cbl_p3d JOBS/example_cbl/INPUT
```

Installing PALM on CUHK PCs
Step by Step Instructions (III)

8. Carry out the test run:

```
mrun -d example_cbl -K parallel -X2 -T2 -r "d3#"
```

Installing PALM on CUHK PCs
Step by Step Instructions (III)

8. Carry out the test run:

```
mrun -d example_cbl -K parallel -X2 -T2 -r "d3#"
```

9. Check results (after job has finished):

```
cd JOBS/example_cbl/MONITORING
kdiff3 example_cbl_rc ../../../trunk/INSTALL/example_cbl_rc
```