



OpenMod  Africa



Plan4res installation workshop

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Plan4res

Power System Model



- Generation mix (capacities, costs, constraints) (incl. Storages....)
- Electricity demand (and system services rqrts)
- Interconnections
- Uncertainties
- Costs (OPEX and CAPEX)
- Investment potentials



- Generation schedules
- Emissions
- Marginal costs
- Costs and revenues
- Power not served

- Invested Generation capacities
- Invested Interconnection capacities
- Invested storage capacities



Plan4res software



plan4res is set-up as a container

Containers are executable units of software that package application code along with its libraries and dependencies. They allow code to run in any computing environment, whether it be desktop, traditional IT or cloud infrastructure.



Plan4res structure



plan4res is composed of the following pieces:

- ❑ The p4r-env container : <https://gitlab.com/cerl/plan4res/p4r-env>
- ❑ The SMS++ modelling and optimization library : <https://gitlab.com/smspp>
- ❑ The plan4res python linkage, pre/post processing, visualisation scripts : <https://github.com/openENTRANCE/plan4res-scripts>
- ❑ Launching scripts, documentation, example of datasets : <https://github.com/openENTRANCE/plan4res>

Installing plan4res requires installing each piece



Installing p4r-env



p4r-env is the main container

❑ It includes:

- A full linux installation (currently debian:bullseye)
- All dependences required by of SMS++ (in particular boost, eigen, netcdf-C++, see <https://gitlab.com/smspp/smspp#getting-started>)
- Python3 and all packages needed by the plan4res python scripts



Installing p4r-env in windows



Requirements:

- Windows 7 pro 64bit SP1 or higher
- powershell 3.0 or higher
- CPU must support hardware virtualization (which may require being enabled in the BIOS)

Procedure:

- Install Git for Windows (use default settings) <https://git-for-windows.github.io/>
- Install VirtualBox and Extension Pack <https://www.virtualbox.org/wiki/Downloads>
- Install Vagrant <https://www.vagrantup.com/downloads.html>
- (Optional) Install Vagrant Manager <http://vagrantmanager.com/downloads/>

Vagrant and VirtualBox allow to emulate a UNIX system on the windows computer

See <https://gitlab.com/cerl/plan4res/p4r-env#windows>



Installing p4r-env in windows



Commands for windows installation:

- Run Git Bash
- Within Git Bash:
 - `git clone --recursive https://gitlab.com/cerl/plan4res/p4r-env`
 - `cd p4r-env`
 - `git config submodule.recurse true`
 - `vagrant plugin install vagrant-proxyconf`
 - `vagrant up`
 - `vagrant halt`

Creates
structure
p4r-env

Starts the container
(first time
downloads image)

Stops the
container

You can set the RAM and CPU allocated to the VM by editing parameters `vb.cpus` and `vb.memory` in file `p4r-env\Vagrantfile`. We advise setting at least **4096 Mb of RAM!**

See <https://gitlab.com/cerl/plan4res/p4r-env#windows>



Installing p4r-env in linux



Commands for linux installation:

- Create a directory (install_dir)
 - `mkdir install_dir`
- Download p4r-env:
 - `git clone --recursive https://gitlab.com/cerl/plan4res/p4r-env`
 - `cd p4r-env`
 - *(if you are using OpenMPI, edit config/plan4res.conf => change MPICH to OpenMPI – see next slide)*
 - `bin/p4r`
 - `exit`

Creates
structure
p4r-env

Starts the container (first
time downloads image)

Stops the
container

See <https://gitlab.com/cerl/plan4res/p4r-env#linux>



Adaptations of p4r-env to local needs



If your system allows parallelisation

- Check mpi version :
 `mpiexec --version`
- 2 versions of the container are available depending on MPI installation: openMPI and MPICH

Default version of the container is for MPICH

To change to openMPI:

- **edit file** `p4r-env/config/plan4res.conf`
- **change value of** `P4R_MPI_IMP`:
 - Instead of `P4R_MPI_IMP=${P4R_MPI_IMP:-"MPICH"}`
 - Write: `P4R_MPI_IMP=${P4R_MPI_IMP:-"OpenMPI"}`



Adaptations of p4r-env to local needs



To prevent download of SIF image each time you run bin/p4r (or any Launch)

- edit file p4r-env/config/plan4res.conf
- change value of P4R_SINGULARITY_IMAGE_PRESERVE:

➤ Instead of

P4R_SINGULARITY_IMAGE_PRESERVE=\${P4R_SINGULARITY_IMAGE_PRESERVE:-0}

➤ Write

P4R_SINGULARITY_IMAGE_PRESERVE=1



Installing SMS++ in p4r-env



Requirements:

- You must have a linux installer of CPLEX (even if installing on a windows machine!!)
=> cplex_studioXXXX.bin (XXXX depends on the version of CPLEX)

Procedure (for academics to get free version of CPLEX):

- Go to IBM ILOG CPLEX Optimization Studio: <https://www.ibm.com/products/ilog-cplex-optimization-studio>
- click "Try it free" => You will be asked for create an account as an academic or use an already existing one, then you will be directed to the download page
- Download the **LINUX** version of the installer bin (cplex_studioXXX.bin)



Installing SMS++ in p4r-env



For Windows users, if necessary:

Edit `install_dir\p4r-env\scripts\add-ons\sms++`: replace 3 instances of `make -j$(getconf _NPROCESSORS_ONLN)` with `make -j1`.

Commands :

- Commands are launched from the directory `p4r-env`
- Install StOpt (stochastic optimization library)
 - `(bin/p4r add-on stopt uninstall)`
 - `bin/p4r add-on stopt`
- Install SMS++
 - `(bin/p4r add-on sms++ uninstall)`
 - `bin/p4r add-on sms++ CPLEX=<Your-CPLEX-Linux-Installer.bin>`

Always install
before SMS++

only if old install
already exists

Install sms++
executables in p4r-env

See <https://gitlab.com/cerl/plan4res/p4r-env#p4r-env>



Installing the python scripts in p4r-env



Commands (You are still located in the directory p4r-env)

- cd scripts
- mkdir python
- cd python
- git clone <https://github.com/openENTRANCE/openentrance.git>
- git clone <https://github.com/openENTRANCE/plan4res-scripts.git>

Install Open
ENTRANCE
nomenclature

Install linkage, pre/post-treatment and
visualisation scripts



Get documentation, config files and launch scripts



Commands (You are still located in the directory p4r-env)

- `cd ..`
- `git clone https://github.com/openENTRANCE/plan4res.git`

Go back to your
Install_dir

Creates plan4res dir in
Install_Dir, populated
with.... (see next slide)



The plan4res repo



Structure of plan4res repo (located in Install_Dir)

- doc — Plan4res documentation (install, run, data formats)
- LaunchScripts — Set of scripts for running plan4res components and plan4res workflows
- SMSconfig — SMS++ configuration files
- ExampleData — Example of dataset
- Mappings_genesys — Configuration files for creating IAMC data out of genesys-mod inputs/outputs



Move launch scripts and config files



Move launch scripts (You are located in your Install_Dir)

- `mv plan4res/LaunchScripts/run* to p4r-env/`
- `mv plan4res/LaunchScripts/include/ to p4r-env/scripts`

Copy SMS++ config files in case study repositories when running case studies

Copy Python settings files in case study repositories when running case studies

NB: in case you want to define a custom installation layout, we advise to set the absolute path for variables P4R_ENV, PYTHONSCRIPTS and DATA to the corresponding directories in your installation.



OpenMod Africa

 plan4res is now ready for running! Follow-up in Madrid 😊

Thanks for your attention!

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