MasTer Toolbox : Installation and update

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We will see/confirm here:

1. How to install MasTer Toolbox:
   - MasTer Engine
   - MSBAS
   - Scripts
   - Ancillary tools
2. How to update
3. How to check installation

MasTer Installation

Installation: see instructions in

- Specific installation manual (Install_MasTer_Linux_V*x.x*.docx or Install_MasTer_Mac_V*x.x*.docx)
- Script for automatic installation (***MasTer_Install.sh***)
- General operation manual (MasTer_Manual_*x.x*.docx)

Where *x.x* stands for the last version number.

Requirments:

- Mac (Preferably Monterey 12.6 or above)
- Linux (Preferably Ubuntu 22.04 or above)
- Hard disk(s) : beware, you will quickly need a lot !
- RAM: as much as possible. Not enough RAM may be a limitation for e.g.
  - Geocoding large/high resolution products
  - MSBAS inversion or large/high resolution data base

Remember:

- Keep exactly the same architecture… it will spare you a lot of problems
- Very simple when you get the structure in mind… Be patient
- Luckily, everything is in the manual
- Unfortunately, everything is in the manual

MasTer Installation

Whatever the method (maual or with script), one will have to :

- **Install several ancillary software, libraries, utilities**… (available from the web)
- **Install MasTer Engine**
  (binaries distributed by D. Derauw or available on GitHub)
- **Install/compile MSBAS**
  (sources tuned for MasTer Toolbox available on GitHub; original sources available from S. Samsonov)
- **Install The SCRIPTS**
  (available on GitHub)
- **Change some options in some configurations**
- **Update the .bashrc**
- **Reboot the computer**

MasTer Installation

MasTer Toolbox distribution is available on GitHub : https://github.com/ndoreye/MasTerToolbox_Distribution

If access is not allowed, send an email to ndo@ecgs.lu

It is highly recommanded to proceed with the installer script to ensure that nothing is forgotten and that the structure remains exactly the same.

Keeping the same structure will spare you a lot of trouble and greatly help you for the upcomming updates.

MasTer Installation

Conventions in the manual and in the presentations (hopefully) :

- Path are in green ("…/" at the beginning of a path means "whatever your path starts with")
- Parameters are in *italic green*
- External commands or files are in *italic blue*
- MasTerEngine commands and scripts are in ***bold italic***
- Some warnings or important remarks are in red
- Yellow highlight is coming soon (hopefully)
- Parameters with square brackets (i.e. [..]) show in command lines are optional

General conventions (hopefully) :

- MasTer Toolbox scripts usually start with a CAPITAL LETTER.
  Commands starting with a small letter are usually MasTer Engine commands (or external commands)

- Some files or directories names start by one or more "_" or "zz_".
  This is only to get them at the top or bottom of the list when searching a directory…

- Lines of text displayed at the terminal (or log files) starting with a double slash (i.e. " // ") are output by MasTer Toolbox scripts.
  Others are usually output by MasTer Engine or external commands.
  It can also be errors or warnings, though this must be obvious from the message itself.

MasTer Installation

Installation procedure:

1. Ensure that you have the administrator rights. You will have to create or modify your *.bashrc* and *.bash_profile*
2. On your computer, create a directory /SAR/MasTerToolbox_Distribution
3. Go to the GitHub repositroy
   https://github.com/ndoreye/MasTerToolbox_Distribution
4. Clone it in /SAR/MasTerToolbox_Distribution
   (see how to do here:
   https://docs.github.com/en/repositories/creating-and-managing-repositories/cloning-a-repository)
5. In the cloned repository on your disk, locate the directory Installer/
6. Open a Terminal and go (cd) in that directory
7. Launch the script ***MasTer_install.sh*** and follows the instructions.
   It will download the required libraries, apt or ports, gnu tools, ancillary softwares etc.
   It will also update your *.bashrc* and *.bash_profile* with the required (mandatory) state variable
   and update the $PATH state variable.

MasTer Installation

MasTer_install.sh will

1. Recommand to delete what you could have in your *.bashrc* that would result from an old version installed.
   ➔ You can ignore that since it is most probably your first installation. Type y to continue
2. Ask to confirm your $HOME directory.
   ➔ Type y to continue

It will then display the details about your Operating System (OS).
Watch the message displayed during the installation ; they may be important !

3. Ask if you want a [f]ull installation or an [u]pdate of only the main components (MasTer Engine, msbas or Toolbox scripts).
   ➔ select f
4. Offer to [i]nstall, [c]heck or [s]kip several mandatory elements
   (e.g. *apts or ports, libraries, gmt and gdal, clang14, gnu utilities, Java, Fiji (imageJ), snaphu, gnuplot, python3*…)
   ➔ As it is your first installation, select installing all of them. If it exists, it will simply let you know.

Follow the instructions if it ask you to download external software and copy them where it ask you (/SAR/EXEC/).

MasTer Installation

MasTer_install.sh will

5. Offer to [i]nstall, [c]heck or [s]kip some usefull tools:
   - ➔ *GitKraken* is an interface for Github: not mandatory
   - ➔ *QGIS* is not mandatory though **usefull** for manipulating geocoded data
   - ➔ *GIMP* is not mandatory though **usefull** to display SUN raster files (.ras) created by *cpxfiddle* (see below)
   - ➔ *gnu fortran* is not mandatory and you may not even need it (for development only)
   - ➔ *cpxfiddle* is not mandatory though very **usefull** to make quick look files in the form of SUN raster files (.ras) from InSAR results, which are binary matrix. It is widely used by the MasTer Toolbox.

Follow the instructions if it ask you to download external software and copy them where it ask you (/SAR/EXEC/).

MasTer Installation

MasTer_install.sh will

6. Offer to update your $PATH variable in your *.bashrc*. You need to have a line in your *.bashrc* as export PATH=$PATH
   ➔ If you already have something like export PATH=(*something_you_need*) in your *.bashrc* (e.g. from another installation on your computer), it will ask you if you are satisfied with that other line.
   If you say no, it will offer you to enter another variable. Enter export PATH=$PATH. The existing one can be deleted or kept after having entered your own new variable. Follow the questions and everything should be fine. At the worst, you can have several exports of export PATH=$PATH if you mess up. It is not harmful and you can always remove them manually after by editing your *.bashrc* after the installation.

7. Offer to add a state variable named EXTERNAL_DEMS_DIR.
   ➔ Answer "no". This state variable is only needed for using MasTer Engine without the Toolbox. MasTer Toolbox takes care of the external DEM for you through a configuration file you will need.

MasTer_install.sh will

8. Offer to assign state variable to some mandatory disks (or directories) where MasTer Toolbox expects to find and/or store several products, intermediate results or final results. You must have at least
   - $PATH_DataSAR
   - $PATH_1650
   - $PATH_3600
   - $PATH_3601
   - $PATH_3602

   (The names of these variables may look wierd. The are the heritage of servers at ECGS… Do not change them)
   The other disks ($SynoData or $HOMEDATA) are not mandatory and can be ignored.

   ➔ For each of these variable, enter a path to a disk or a directory.
   Note that if the disk (or directory) that you entered as state variable is not reachable (or does not exist yet), it will offer you to enter again the name (in case it results from a typo), or define it anyway and it will be your responsibility to mount the disk later. If it is a directory, it will offer you to create it for you.

   You can add more manually later in your *.bashrc* if needed.

   On Linux, mounting points of external disks are supposed to be in /mnt/ and on Mac, in /Volumes/.

MasTer Installation

MasTer_install.sh will

9. Offer to download the geoid data that are mandatory for building DEMs

10. Offer to download Sentinel 1 orbits.
    ➔ Providing that MasTer Engine is already installed, this can be done either from the first orbit (beware, it takes a lot of time !), or from a given date.

That should be it… If configurations were changed, it will also offer you to reboot the computer.

General notes about the installation:

- If your *.bashrc* and *.bash_profile* has been modified, a backup is created and named by appending the date and time of the modification.
- It is mandatory that the path to where some of the tools will be stored (/opt/local/bin) appears first in your *.bashrc*. If your MasTer Toolbox does not act as planned, ensure that the $PATH with /opt/local/bin is declared first.
- Python3 must be installed in (or available with an alias from) /opt/local/bin. The installation script takes care of that.
- For the sake of compatibility between Linux and Mac, several functions (sed, awk...) must be gnu version. These are stored or linked with their name and g-name version (e.g. gsed, gawk etc…) in a directory defined as $PATHGNU. The installation script takes care of doing that.

- For Linux installation, if you intend to operate MasTer Toolbox with cron jobs, note that installation script had warned you about :
  - some lines that MUST be commented in your *.bashrc*
  - the state variables that MUST be exported at the beginning of your crontab.

MasTer Installation

WARNINGS:

- Avoid naming directories with dash or blank characters. This is always a good practice anyway...
- Do not use hard drives formatted in FAT format because it does not support symbolic links, which are widely used by MasTer
- Although everything was made to keep the MasTer Toolbox as friendly as possible, some scripts contains some hard coded lines that must be revised by the user. See manual MasTer_Manual_x.x.docx in section RECOMMENDATIONS

MasTer Installation

Example of *.bashrc* for Linux :

```
[…]

# If not running interactively, don't do anything
#case $- in
#    *i*) ;;
#      *) return;;
#esac

[…]

PATH="/usr/local/bin/:/opt/local/bin:/usr/bin:/bin:/usr/sbin:/sbin"

# MasTer PATHS
##################
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/MasTerEngine/_Sources_ME
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/SCRIPTS_OK/MasTerOrganizer
PATH=$PATH:/usr/local/tigervnc/bin/
PATH=$PATH:/home/nicolas/SAR/EXEC
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/MSBAS
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/MasTerEngine
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/SCRIPTS_OK/zz_Utilities_CIS_Ndo
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/SCRIPTS_OK/zz_Utilities_CIS
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/SCRIPTS_OK/_cron_scripts
PATH=$PATH:/home/nicolas/SAR/MasTerToolbox/SCRIPTS_OK

# MasTer VARIABLES
##################
export OPENBLAS_NUM_THREADS=1
export JAVA_HOME="/usr/lib/jvm/java-11-openjdk-amd64"
export PATH_3602=/mnt/3602/
export PATH_3601=/mnt/3601/
export PATH_3600=/mnt/3600/
export PATH_1650=/mnt/1650/
export PATH_DataSAR=/mnt/syno_sar/

export EARTH_GRAVITATIONAL_MODELS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/EGM
export ENVISAT_PRECISES_ORBITS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/ORBITS/ENV_ORB
export S1_ORBITS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/ORBITS/S1_ORB

export PATH_SCRIPTS=/home/nicolas/SAR/MasTerToolbox
export PATHCONV=/usr/bin
export PATHFIJI=/home/nicolas/SAR/EXEC/Fiji.app/
export PATHGNU=/usr/bin
export PATHTOCPXFIDDLE=/home/nicolas/SAR/EXEC/
export PATH=$PATH
```

MasTer Installation

Example of *.bashrc* for Mac OSX :

```
[…]

PATH="$PATH:/opt/local/bin:/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin"

# MasTer PATHS
##################
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/SCRIPTS_OK/MasTerOrganizer
PATH=$PATH:/Users/doris/SAR/EXEC
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/MSBAS
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/MasTerEngine/_Sources_ME
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/MasTerEngine
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/SCRIPTS_OK/zz_Utilities_CIS_Ndo
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/SCRIPTS_OK/zz_Utilities_CIS
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/SCRIPTS_OK/_cron_scripts
PATH=$PATH:/Users/doris/SAR/MasTerToolbox/SCRIPTS_OK

# MasTer VARIABLES
##################
export PATH_HOMEDATA=/Users/doris/
export PATH_3602=/Volumes/hp-D3602-Data_RAID5/
export PATH_3601=/Volumes/hp-D3601-Data_RAID6/
export PATH_3600=/Volumes/hp-D3600-Data_Share1/
export PATH_1650=/Volumes/hp-1650-Data_Share1/
export PATH_DataSAR=/Volumes/DataSAR/

export EARTH_GRAVITATIONAL_MODELS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/EGM
export ENVISAT_PRECISES_ORBITS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/ORBITS/ENV_ORB
export S1_ORBITS_DIR=${PATH_DataSAR}/SAR_AUX_FILES/ORBITS/S1_ORB

export PATH_SCRIPTS=/Users/doris/SAR/MasTerToolbox
export PATHCONV=/opt/local/bin
export PATHFIJI=/Applications/Fiji.app/Contents/MacOS/
export PATHGNU=/opt/local/bin
export PATHTOCPXFIDDLE=/Users/doris/SAR/EXEC/
export PATH=$PATH
```

Updating MasTer

To update MasTer Toolbox:

You can run the installation script as often as you want. If you ask for full installation, it will check and update what you ask him.

Note that if you choose “update”, it will only offer you to udate MSBAS, MasTer Engine and the scripts. It will not attempt to update the libraries etc…

Checking the Installation

Checking the installation:

After completing the installation and having performed the reboot, you can check the installation by running the script ***Check_Installation.sh***

Watch the displayed messages. Note that, given the diversity of computer configurations, some displayed messages may be inaccurate (eg. complaining about wrong version and offering instead… the same version). Just ignore these warnings.

We will see/confirm here:

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   - MasTer Engine
   - MSBAS
   - Scripts
   - Ancillary tools
2. How to update
3. How to check installation

- DONE ! -