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EXERCISES:
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1. Data Management basics:

- Repeat the basic Data Management commands demonstrated in Lecture L22 using your VM:

    - Set the LFC HOST environment variable to the correct value
    - List the file catalog, note that the toplevel directory for the course VO is /grid/tutor
    - Create one subdirectory under /grid/tutor with a name of your preference. Then check that the folder has been actually created. You will use this directory during the rest of the exercise.
    - Create a file locally on your VM, register it to the LFC and copy it to the following SE in one command: *srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/ <your_dir>/<your_file>*. Check if the copy was successful and that the file is registered.
    - Create two replicas of the file at the following SEs: srm://gb-se-ams.els.sara.nl:8446/dpm/els.sara.nl/home/tutor/<your_dir>/<your_file> and *srm://gb-se-amc.amc.nl:8446/dpm/amc.nl/home/tutor/<your_dir>/<your_file>*
    - Check the replicas of your file. Up to this point you must have 3 replicas.
    - Copy the file stored on Grid Storage back to your VM and check the contents.
    - Cleanup all the replicas and the directory you created.

2. Storage Resource Manager - srm:

- Repeat the 'Black box' example using your VM (the example code is attached in Lecture L25):
    - Create a new directory with a name of your preference to the following Grid SE: srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/
    - List the contents of this Grid directory to validate that your folder was actually created
    - Copy the bbox executable given here: bbox, to your new Grid directory
    - List the contents of your Grid directory to validate that the bbox executable was copied successfully
    - Modify the bbox.sh wrapper with your own Grid directory name
    - Submit the job to the Grid with the bbox.jdl
    - Check the status. When the job is done list the contents of your Grid directory to validate that the std.out WN result was successfully moved in here.
    - Copy the std.out file from the Grid SE to your VM
    - Get the job output to your VM and compare the result printed in your bbox.out file.

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SOLUTIONS:
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1. Data Management basics:

- If you don't have a valid proxy in your VM, create one before starting the exercise.
- Set the environment variable LFC_HOST:
  $ lcg-infosites --vo tutor lfc
  $ export LFC_HOST='lfc.grid.sara.nl'
  List tutor VO files:
  $ lfc-ls -l /grid/tutor
  //Optionally set the environment variable LFC_HOME to avoid typing /grid/tutor
  $ export LFC_HOME='/grid/tutor'
  $ lfc-ls -l
  Create a new directory
  $ lfc-mkdir /grid/tutor/mooc_test
  $ lfc-ls -l /grid/tutor
  Upload the file to the srm and register it to the lfc
  $ lcg-cr --vo tutor -d
  srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/mooc_test/filefromVM -l
  lfn:/grid/tutor/mooc_test/filefromVM "file://`pwd`/localfile"
  $ lfc-ls -l /grid/tutor
  See which are the replicas. It is only one for now:
  $ lcg-lr lfn:/grid/tutor/mooc_test/filefromVM
  //make two new replicas
  $ lcg-rep --vo tutor -d srm://gb-se-
  ams.els.sara.nl:8446/dpm/els.sara.nl/home/tutor/mooc_test/filefromVM
  lfn:/grid/tutor/mooc_test/filefromVM
  $ lcg-rep --vo tutor -d srm://gb-se-
  amc.amc.nl:8446/dpm/amc.nl/home/tutor/mooc_test/filefromVM
  lfn:/grid/tutor/mooc_test/filefromVM
  //see again which are the replicas
  $ lcg-lr lfn:/grid/tutor/mooc_test/filefromVM
  Download the file from the SE to your VM:
  $ lcg-cp --vo tutor lfn:/grid/tutor/mooc_test/filefromVM file://`pwd`/filefromGrid
  Delete the file you created from all replicas and test if it is removed
  $ lcg-del -a lfn:/grid/tutor/mooc_test/filefromVM
  $ lfc-rm -r /grid/tutor/mooc_test
  $ lfc-ls -l /grid/tutor

2. Storage Resource Manager - srm:

Create a new directory with a name of your preference:

$ srmmkdir srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/<mooc_dir>

List the contents of this Grid directory to validate that your folder was actually created:

$ srmls srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/

Copy the bbox executable given here: bbox, to your new Grid directory:

$ srmcp file:///`pwd`/bbox
srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/<mooc_dir>/bbox

List the contents of your Grid directory to validate that the bbox executable was copied successfully:

$ srmls srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/<mooc_dir>

Modify the bbox.sh wrapper with your own Grid directory name:

bbox.sh

Submit the job to the Grid with the bbox.jdl:

bbox.jdl

$ glite-wms-job-submit -d $USER -o jobIds bbox.jdl

Check the status. When the job is done list the contents of your Grid directory to validate that the std.out WN result was successfully moved in here:

$ glite-wms-job-status -i jobIds

$ srmls srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/<mooc_dir>

Copy the std.out file from the Grid SE to your VM:

$ srmcp -server_mode=passive
srm://srm.grid.sara.nl:8443/pnfs/grid.sara.nl/data/tutor/<mooc_dir>/std.out file:///`pwd`/std.out

Get the job output to your VM and compare the result printed in your bbox.out file:

$ glite-wms-job-output --dir . -i jobIds

$ cat bbox.out