EXERCISE 3 - Calibrating Cygnus A with BBS

AIMS: Use BBS to calibrate the data and make an image within CASA.

DETAILS: The calibration and imaging of LOFAR data will be carried out using Black-Board Self-calibration (BBS), which allows direction dependent gains to be calculated and for the data to be processed over a multi-node cluster. In this exercise, the student will gain experience using BBS. Before starting this exercise, the student must have completed EXERCISE2 - Imaging Cygnus A with CASA.

LEARNING OBJECTIVES:

1. Create a BBS sky model file.
2. Use BBS to calibrate and produce a flux calibrated image of Cygnus A within CASA.
3. Be able to apply these methods to other LOFAR observations.

BBS ENVIRONMENT:

BBS is designed to operate over multiple nodes on the LOFAR processing cluster. Before being able to run BBS, you must first set-up a few files (See Chapter 1.3.2, 1.3.3 and 1.4 of the Cookbook). Ask for help if you have problems doing this.

See Chapter 6 of the LOFAR Cookbook, which describes the operation and input parameters for BBS. This chapter describes in detail the functionality of BBS and gives examples of the input run files that are used, and the parameters.

DATA: You will need the edited/flagged measurement set and the .model file that were produced during the data editing and calibration within CASA (EXERCISE2).

PROCEDURE:

A script is used to convert the clean components from the CASA model file to a BBS sky model file that is in the correct format.

```
> cp /home/heald/bin/casapy2bbs .
```

```
> ./casapy2bbs <your CASA model file>
```

This script will produce a file called <your CASA model file>.catalog. Inspect the file to see the syntax of a BBS sky model file. Also consult the LOFAR imaging Cookbook (Chapter 6.2) for further information about BBS sky model files.

Note that the Lofar software daily build failed today, so you must initialize the software build from another day

```
> use LofIm Thu
```

To run over multiple nodes, BBS must know what files are to be processed and where they are located. Note that in this example, the student will run BBS on a single sub-band over a single node.

> cp /home/diepen/cdesc/sub3.clusterdesc .

The file sub3.clusterdesc describes the cluster architecture to BBS. There is a file like this for each sub-cluster on the processing cluster. Since the student will only use sub3, this is the only file needed.

> makevds sub3.clusterdesc <directory>/SB105.MS.dppp

This command creates a file called SB105.MS.dppp.vds

> combinevds bbs.gds SB105.MS.dppp.vds

This command combines all of the vds files you have for all of the sub-bands in the dataset. Note that even though this exercise has only one sub-band, this command must still be executed.

This command creates a file called bbs.gds

The input parameters of BBS are controlled by a parset file, similar to NDPPP. An example parset file can be found in,

> cp /home/mckean/PARSETS/uv-plane-cal.parset .

Inspect this parset file to see the sytax and consult the Cookbook for further details.

To run BBS,

> calibrate -f --key test --cluster-desc sub3.clusterdesc --db ldb001 --db-user postgres bbs.gds uv-plane-cal.parset <your CASA model file>.catalog <working directory>

STEPS:

a. Calibrate the Cygnus A dataset using BBS (set to solve in parset file).
b. Flag poor solutions using PLOTMS (edit the CORRECTED and RESIDUAL data).
c. Make an image using CASA.
d. Subtract Cygnus A from the dataset using BBS (set to subtract in the parset file).
e. Make an image.