SKA simulations: AIPS++ in a parallel environment on the Swinburne cluster

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Simulations Flow-chart

Begin

Dataset simulations

Imaging

AIPS++ or external program

AIPS++ and glish scripts

Image analysis

AIPS++ (image.statistics)

End
Begin

Search for maximum

Update the model

Reset the model

Residual dirty image

Last iteration?

No

Yes

End

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Dynamic range simulations

![Graph showing dynamic range simulations for different cleaning methods. The x-axis represents shift in arcsec, and the y-axis represents log of dynamic range. The graph compares CS-cleaning with and without w-term, and AIPS++ Clark clean.]
AIPS++ on the cluster

- AIPS++ has its own mechanism supporting a parallel environment
  - A special client, named glish daemon, is responsible for start up of the software on an external host
  - The glish daemon can either be started with the root permissions or use rsh
  - For the rsh-based method a proper configuration of .rhosts files is required
- According to the manual, it should be easy to start any glish client (UNIX shell script, glish script or C++ client) on other host
AIPS++ on the cluster: problems

- A glish client is started on other host in a root directory with an uninitialized environment variables

- In principle, there are special events acceptable by glish daemon to change current directory, environment and library path. But there is no predefined variable of the daemon’s client available for glish scripts to send such an event.

- Solution: UNIX shell wrapper starting glish script after proper configuration
UNIX shell wrapper

```
#!/bin/sh

. /nfs/cluster/src/aips++/stable/aipsinit.sh

cd /nfs/data/'hostname'/mvoronkov/
ln -sf /home/cluster/mvoronkov/fileprefix.g ./

glish $@ > /nfs/data/'hostname'/mvoronkov/glishoutput.log
```

Required client object can be created using

```
nodeclients[i]:=client("glishwrapper pwrapper.g",host=hosts[i]);
```
Parallel computations

Tera 1  ->  Tera 2  ->  Tera 16
Tera 17  ->  Tera 20  ->  Tera 18
Tera 23  ->  Tera 25  ->  Tera 22
Tera 24  ->  Tera 28  ->  Tera 24
The Swinburne cluster in use
Precision: floats and doubles

AIPS++ currently supports single precision FITS files only.
Large image problems: precision?

For considerably large image the dynamic range becomes very low at certain offset. May be this is also an influence of precision.
Conclusions

- AIPS++ is capable with parallel computations.
- Floating point precision is a very important issue, when one would like to get dynamic ranges of about $10^6 - 10^7$. At least $u, v$ and $w$ should be stored as doubles.
- A desirable cluster upgrade for the SKA simulations is more free disk space for private area at each host.