



Non-imaging Processing

- other projects
- comparing technologies
- where to next?

Ben Stappers, for a cast of many contributors

Some other projects



- Number of projects going on around the world that aren't necessarily directly feeding in to the SKA, but certainly could be important/relevant
- Getting a full overview of these is important

GPU based search/transient machines

- Swinburne (Bailes et al) – Processing HTRU data, >4000DMs real time, similar to ARTEMIS, main issue is getting dedispersed time series back out again. I/O working on adding in searching.

CPU based transient machines

- V-FASTR (JPL/NRAO/ICRAR) – works on VLBA data, individual dishes, DIFX channelised output, real time.

Some other projects



GPU based acceleration

- Ransom/NRAO – working on this but no details
- Stappers/Kramer/Bailes – only in the planning stage, probable GPU cluster

Pulsar timing Backends

- Many reached “end” of development cycle, reached max BW (from telescope), and can achieve real-time.

ICRAR dedispersion concept

- Extension/modification of tree algorithm and implementation
- see document pack for more details, could be applied to other platforms.

Candidate Identification.



- An all sky survey, with acceleration searching and SKA₁/SKA sensitivity will produce billions of candidate pulsars/transients
- We have already developed some algorithms for automating using NNets
- BUT
 - Need improved “scores” for MSPs
 - Not yet incorporated acceleration space
 - Only initial development on “bursts”
- Once trained, not particularly computationally intensive.
- BUT must happen in real time, as need to “fold” candidates before data is “lost”

How to compare?



- Many systems under consideration for the SKA
- Often with quite disparate architectures
- We plan to develop a set of tests to be performed by the different systems and the metrics to compare them under headings such as:
 - How does it scale?
 - What does it cost?
 - How much power does it consume?
 - Is it reconfigurable?
 - Is there a path from SKA₁ to SKA?
- Not possible to compare all algorithms on all platforms, so a first step is to make a sensible choice of algorithms.

Way forward



- The non-imaging processing, especially for large area surveys, are strongly affected by changes in layout and A/T.
- Determining the design choices requires that we limit the changes made as the scaling of downstream requirements is not trivial.
- Timescales are also important, how rapidly do surveys want/need to happen, affects strongly online/offline processing choice.

Way forward



- Clearly developing a way to compare the platforms/approaches/architectures is key.
- Also apparent that there are a a number of parallel projects around the world that are quite similar e.g.
 - ARTEMIS, SwinburneGPU
- Need to improve knowledge transfer between these projects and with the SKA so we can converge more rapidly.
- In some cases these are currently only half the solution, i.e. can dedisperse but can't fold.
- Need to address how to make the jump from a few beams to few thousand beams

Way forward



- We now have an almost complete description of the available architectures and projects
- There is a better link between the requirements and how they affect the specs.
- These requirements still need to be honed though.
- Need to converge on a couple of candidate solutions soon, but “real” tests on pathfinders are still a while away.
- However can build “simulated signal distribution systems”

Summary



- There isn't anything fundamentally difficult about the processing that is required.
- It is a combination of the 1000-10000 fold increase in the amount of data and...
- The possible requirement of real time.
- When combined with the power/cooling restrictions this is where work is required.