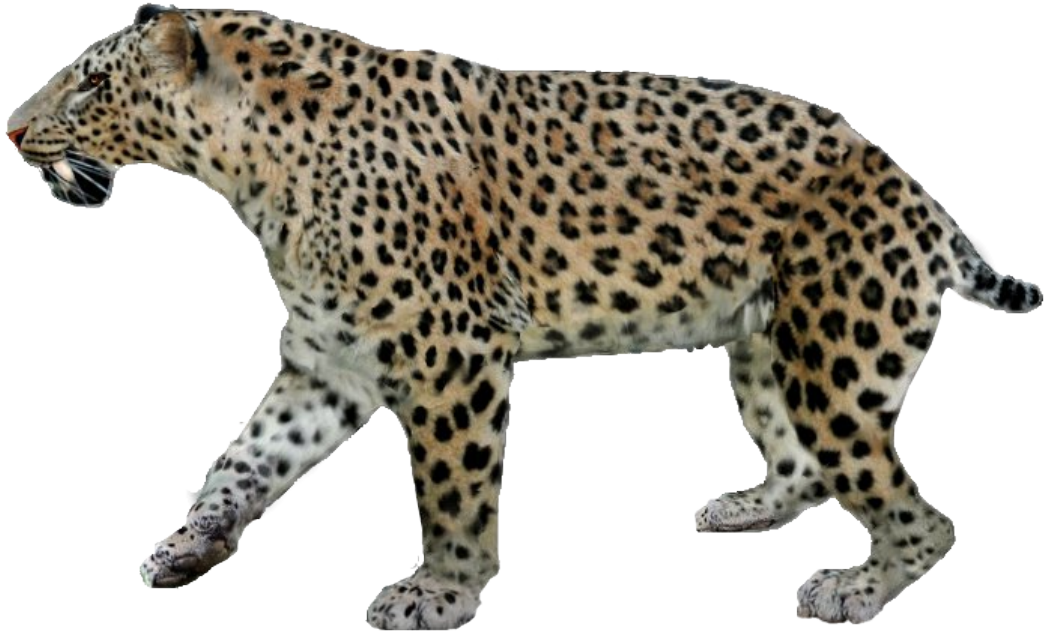

Xenosmilus - The Evolution of BIGCAT

Chris Phillips – BIGCAT Project Leader

BIGCAT Overview

- Replacement for CABB
- 8 GHz processed bandwidth
- RFSoC based digitizers
  - 128 MHz subbands, oversampled by 32/27
  - 100 Gbps Ethernet data transport
  - Multicast UDP – flexible routing of data
- GPU based processing
  - Software defined DSP – fast and easy reconfiguration

Current BIGCAT Plans

- 8 GHz processed bandwidth
- Flexible spectral line options
- Pulsar binning modes
- VLBI phased array

Eventually

- Near-field tracking (satellites, SSA)
- RFI mitigation
- Subarrays
  - Pointing centre and/or frequency

Fast dump visibilities

- Dump times of 54 usec theoretically possible
  - 1000 Gbps visibility output 8 GHz @ 1 MHz spectral resolution
    - 32 Gbps/100 GbE link (half raw data rate)!
  - 27 Gbps with 1millisec integrations & 2 MHz resolution
    - Ingest into dedicated GPU or cluster
  - Can trade total bandwidth for short integration times
    - LS 2 GHz total bandwidth
- FRBs or similar?

Ultra-high spectral resolution

- Sub-Hz spectral line resolution achievable
  - Minimal to no optimization if willing to sacrifice bandwidth

Ultra-high time resolution

- Re-process channelized data to 2 or 4 GHz continuous voltage spectrum
  - 0.50 nsec sampling @ 2 GHz
  - 0.25 nsec sampling @ 4 GHz
- Full 8 GHz @ 1 nsec (1 GHz “chunks”)
- LUNASKA style observations

https://www.narrabri.atnf.csiro.au/observing/bigcat-datarate-calculator/

Subarrays

- Flys-eye VLBI with Parkes CryoPAF
  - Similar fov
    - ASKAP single baseline follow up?
- Simultaneous obs
  different frequen

User Processing

- Correlator easily reconfigured
  - Provide “voltage to GPU” as service
  - User developed processing?
  - Commensal user processing?
  - Bespoke PhD or postdoc projects?

Guest Instruments

- Multicast UDP allows multiple destinations to same data
- Parallel guest instruments can run with no impact on normal processing
  - SETI
  - Commensal SSA
  - Commensal transients
  - Requires upgrade to switches

Caveats

- Available compute on GPU
  - Buy more servers ($ + power)
- Available disk storage locally and archive
  - Allocate more $ + $$
- Network ports on switches
  - Buy more switches ($)
- Flexibility of moving data between nodes

Ask For New Modes!

- BIGCAT backend is incredibly flexible
  - New and innovative modes will depend on user requests
  - These suggested modes will *not* happen by default
  - Clear science goals will need to be defined

Thank you

Space and Astronomy
Chris Phillips
BIGCAT Project Leader

+61 2 9372 4608
Chris.Phillips@csiro.au
www.csiro.au/atnf