SARAO computing

Cloud computing workshop at CERN Sept 2019
PRESENTER: Martin Slabber
MeerKAT is a 64-dish radio telescope built by SARAO in the semi-desert regions of South Africa.

MeerKAT is a pathfinder telescope for SKA, SARAO is part institute of SKAO.

MeerKAT is a functional telescope, but plans are already in motion to enlarge* the telescope. MeerKAT+ with 84 (64 + 20 new SKA type dishes) dishes entered planning stage and is scheduled for late 2020.

* In general $O(N^2)$ compute growth but SDP is $O(N^3)$ for $N=$number of dishes
SARAO has several sites around South Africa but applicable for this talk is:

- Karoo - Telescope site, own data centre (Karoo)
- Cape Town - offices at Black River Park (BRP)
- Cape Town - Centre for High Performance Computing (CHPC)*

* In the same building as the Lengua Supercomputer but completely separate
Sites linked at 10Gb/s: Karoo ↔ CHPC ↔ BRP ↔ Internet

Karoo & CHPC all systems on 25GbE or 40GbE very simple setup good performance.

At BRP network is complex:
• changes all the time
• very little production, several “ICT labs”
• multiple rooms/floors/owners/vendors
• 1GbE to 100GbE

Karoo ↔ CHPC being upgraded to 100Gb/s, Civil Eng. started
Mainly three types of compute (excluding storage systems)

1. Telescope soft real-time processing and archiving [Karoo only]

2. Commissioning + Research [CHPC & BRP]

3. Miscellaneous [Everywhere]

We have been focusing on No 1. and now that MeerKAT is “done” we feel the pressure with No. 2 and No. 3
Telescope soft real-time processing and archiving [Karoo only]

- Processing of data from telescope correlator
- Store artifacts to archive (Ceph)
- 80% of all SDP resources
- Mesos + custom framework, Docker runtime
- GPU and IO heavy, distributed, req. shared storage
- Very granular resource management, custom GPU resource definition for fractional allocation
- Require: x8 growth in next 2 years
- Stable and happy with this setup 😊
Commissioning + Research [CHPC & BRP]
- Current: Bare metal - arm wrestle scheduler
- Astronomy software does not scale well
- Big-ish memory (~128GB) needs per job
- Need to “bill” teams
- Variety of needs and projects:
  - 2 to 10 TB cubes
  - Newer applications can lazy load (katdal)
  - Machine learning
  - GPU/CPU/Memory/IO heavy
- Security: external users from all over the world
- Require: ∞

Ideal would be a “research-cloud”
Miscellaneous

Miscellaneous [Everywhere]
- The unimportant stuff that keeps important stuff running
- Currently: Bare metal, Proxmox, Docker, Nomad
- Batch processing (Nomad)
- many-many Jupyter notebooks (no scheduler)
- Multiple other teams - SDP just helping out
- GPU workloads - ML, Astronomy, Engineering
- Research & production
- How to encourage users to shutdown VM’s?

Ideal would be a “cloud” solution with a self service portal for users
Virtualisation

Proxmox
- Easy to install
- Self-contained OS
- Installs Ceph
- Open Source
- Clustering
- Used by IT, CAM, and SDP
- LXC + KVM
- We run Docker in LXC
- Famous for home-lab use
- Our biggest cluster was only 10 nodes
- Used to it, so we like it
Deploy & Provision

MAAS
- Deploy OS - Ubuntu
- Setup deploy user
- Default software install
- DHCP & DNS
- API

Ansible
- Install and configure software
- Ansible everything

Where MAAS & Ansible overlap we Ansible
I have an OpenStack for dummies book!

It is thin so… hey… I am halfway there.

Test HW arrive in 1 month
Contact information

Martin Slabber
Senior Software Engineer - DevOps
Email: martin@ska.ac.za