

Structure of the Workshop

M.Inggs and B.Mellado



**High-performance Signal and Data Processing
Workshop, HUB, Wits, Johannesburg**

27/01/14-31/01/14

Scope

- ❑ **Bring together the “Big Sciences” in SA around the problem of the “Big Data”**
 - ❑ **Signal and data processing are problems common to modern sciences in general**
 - ❑ **Developing architectures in house, critical for the sustainability and further expansion of research and high-tech industry**
 - **Launch common SKA/CERN projects**
- ❑ **Training of students in advanced technologies**
 - ❑ **Hands on sessions led by specialists in fast electronics**
- ❑ **Forum for research presentations by students and young researchers**
- ❑ **Aiming at monograph with workshop proceedings**

SKA

CERN

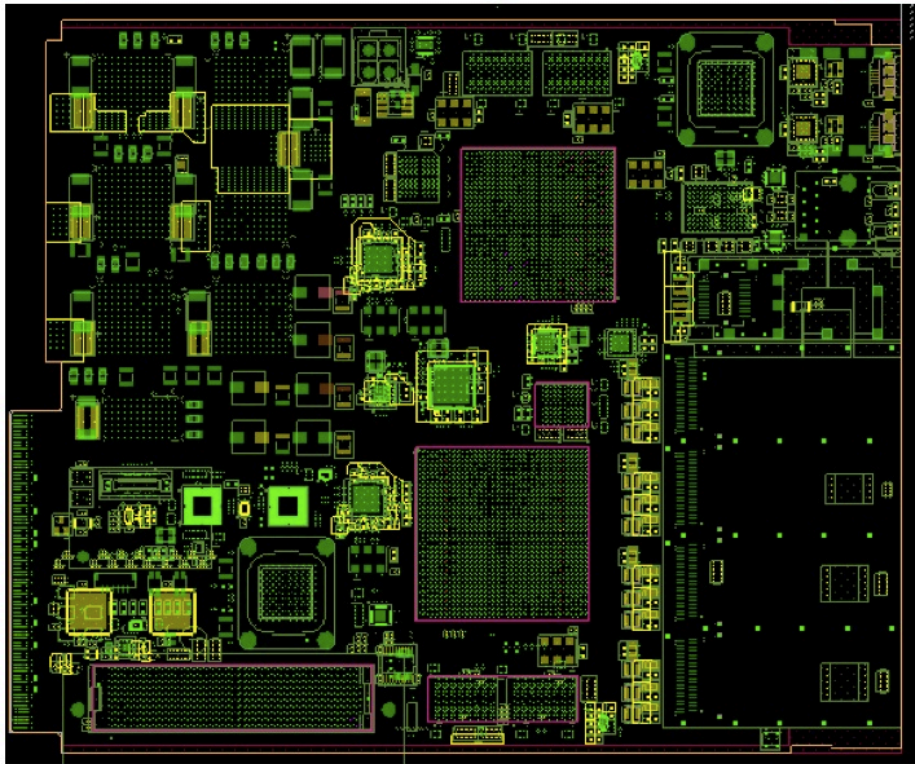


Where the internet was invented leading to GRID and cloud computing.
Pb/s data processing leading to Exabyte of data storage and processing

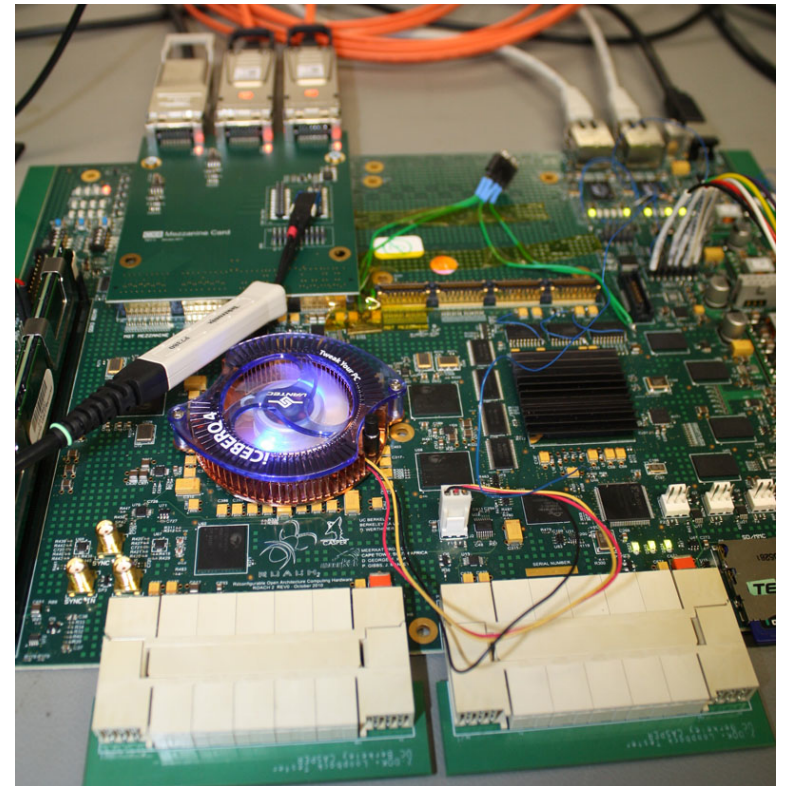
The SKA takes these challenges to the next level

Synergy between Sciences

Super Read-out Driver for the Tile Calorimeter of the ATLAS experiment



Roach 2 to be upgraded for the MeerKat



CERN and MeerKat/SKA are designing new generation of FPGA based digital back-end electronics based on same core technology: **Can we develop a generic platform for SA?**

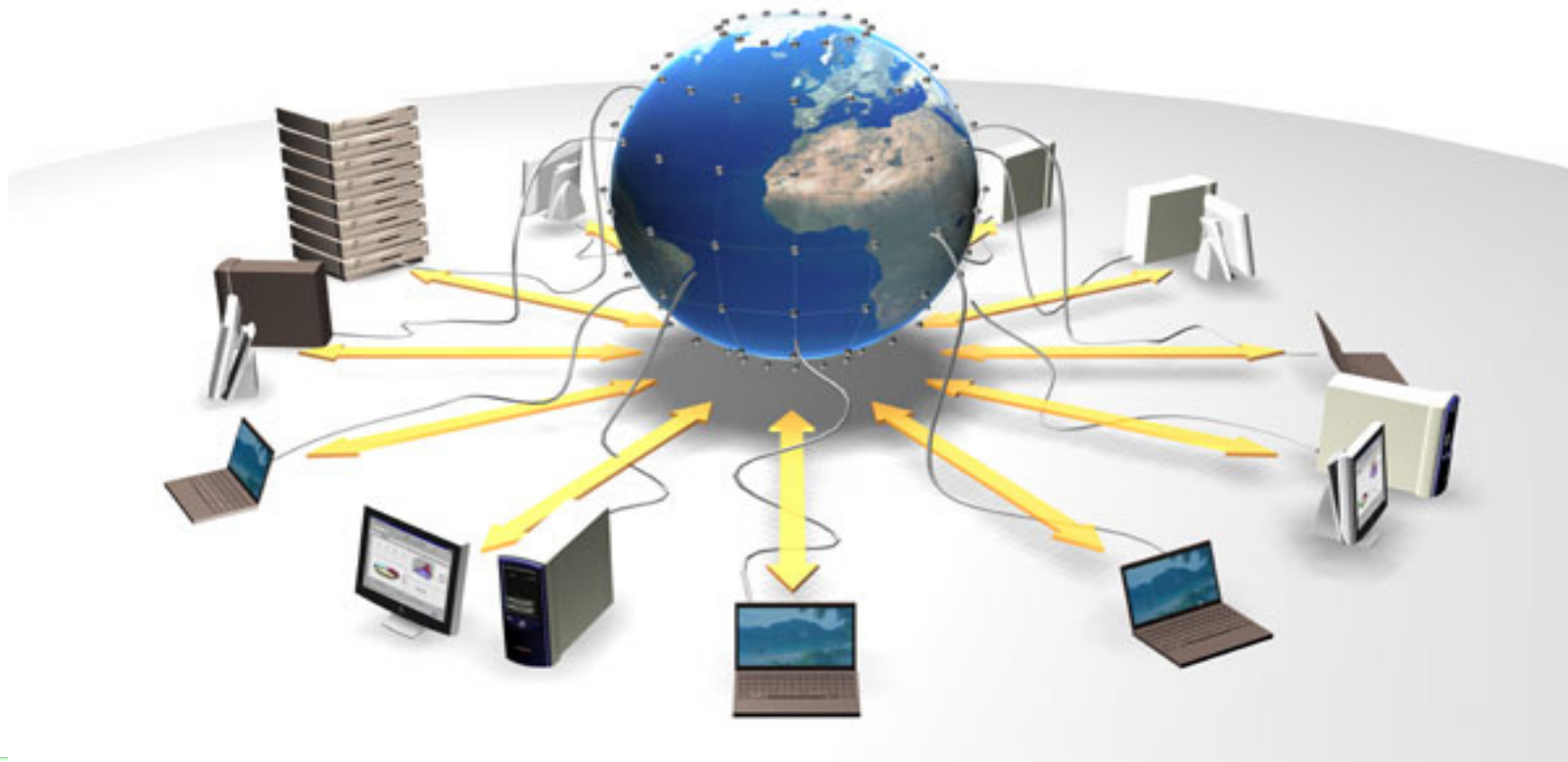
Synergy between Sciences

A workshop was organized at the SKA offices in CT on Jan 25th to discuss possible synergies in the area of timing and data transport. **We need more of these initiatives!**

	WORKSHOP ON TIMING AND DATA TRANSPORT IN RADIO ASTRONOMY AND PARTICLE PHYSICS			
Venue	SKA South Africa, Third Floor, The Park, Park Road (off Alexandra Road) Pinelands, 7405, Latitude: -33.94329 (South); Longitude: 18.48945 (East).			
Time	TOPIC	Speaker	Comments	
0830	Gather		MeerKAT Auditorium	
0900	Introductions	M. Inggs / F. Kapp		
0915	The MeerKAT front end	Jason Manley		
1000	The ATLAS Calorimeters read-out architecture	Alberto Valero Biot		
1045	Tea			
1115	Discussion on synergies	Jason Manley		
1215	Lunch			
1330	MeerKAT Timing solution	Sias Malan		
1415	GPS Discipline Oscillator	S. Sandenbergh		
1500	Tea			
1530	White Rabbit Concepts	Grzegorz Daniluk		
1615	Workshop on Timing Distribution	Sias Malan		
1700	Wrap up	M Inggs / F. Kapp		
	Bookings	https://docs.google.com/forms/d/1bW0dTGYPHsdpYfIDia_GK0mHSVw		
	The ATLAS Calorimeters read-out architecture	White Rabbit Project		



The GRID Furthest reaching computer in the world...

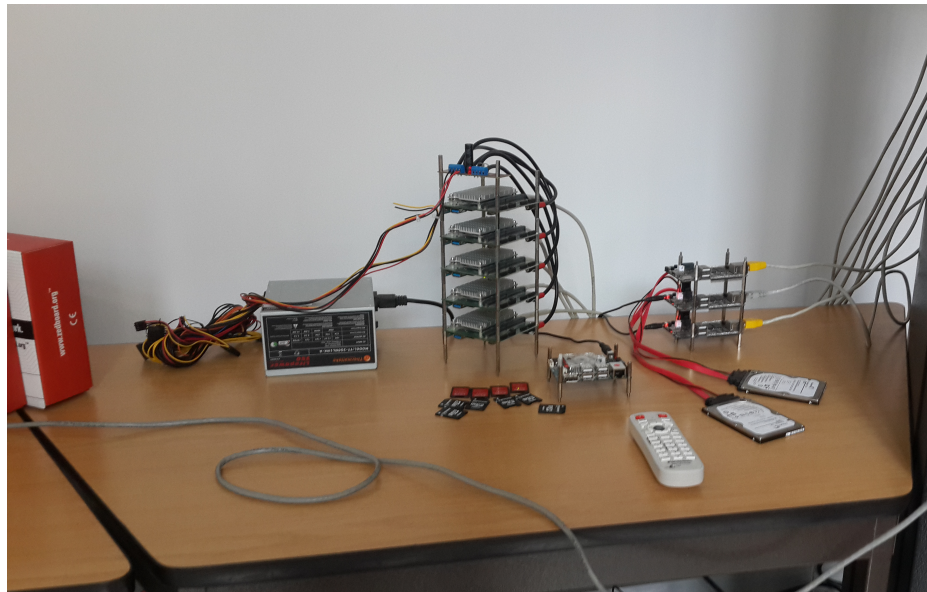
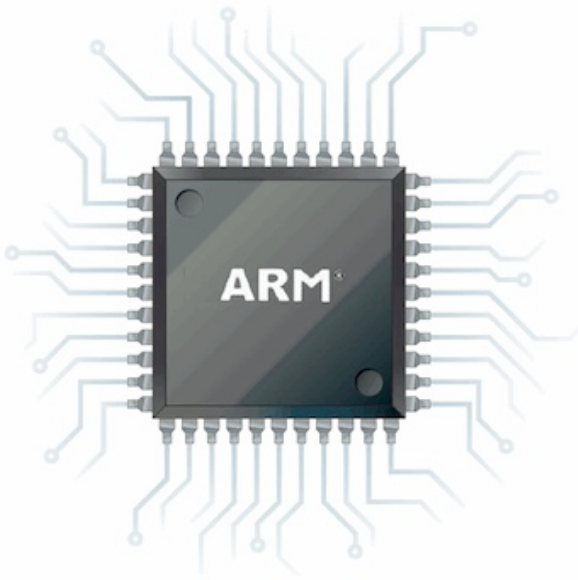


Hundreds of thousands of computers, **including in South Africa**, based all over the world are used to analyse data from CERN. The Meraka Institute and the CHPC are involved in the South African GRID. The computing needs of the SKA will be impressive. **Can we connect the National Cyber-infrastructure with these developments to serve the needs of the SKA and other sciences in South Africa?**

Towards a High-throughput Super-computer Based on ARM Processors

ARM processors
power smart-
phones and tablet

10 abstracts submitted on the subject



Exercise is intended to provide a digital back-end for the upgrade of the ATLAS detector. **Can this be used by the SKA?**

Training: Hands on Sessions

**Setup with
RHINO
boards**

Training: Hands on Sessions

**PC setup for
firmware
programming**

**RHINO
boards**



Outstanding Speakers



Broad Participation

Over 130 registered participants out of which 60 are students

CHPC, DST, iThemba Labs (Cape Town and Gauteng), Meraka Institute, NECSA, SANSA, SA-CERN, SKA

Radio astronomy, astro-physics, particle physics, geosciences, applied math, paleontology, electrical and information engineering...

Broad Participation

**Cape Peninsula UT, Cape Town, Edinburg,
Ghana Space Science and Technology
Institute, Harvard, Johannesburg,
Liverpool, Malaya, Pretoria, Stellenbosch,
UKZN, UNISA, Valencia, Wits**

**Several High-tech companies are also
present at the event**

Monday 27 January 2014

09:00 - 13:00

Plenary Overview Session I

Convener: John Carter (University of the Witwatersrand)

Location: HUB (G17)

09:00 **Welcome** 30'

Speakers: Zebulon Vilakazi (University of the Witwatersrand) , John Carter (University of the Witwatersrand)

09:30 **Welcome from the DST** 20'

Speakers: Thomas Auf der Heyde (DST)

09:50 **Workshop Overview** 20'

Speakers: Michael Inggs (University of Cape Town) , Bruce Mellado (University of the Witwatersrand)

10:10 **Coffee Break** 20'

10:30 **Cyber-infrastructure in South Africa** 50'

Speakers: Daniel Adams (DST)

11:20 **The SKA & MeerKAT** 1h00'

Speakers: Justin Jonas (SKA)

12:20 **Group Photo** 10'

14:00 - 17:00

Plenary Overview Session II

Convener: Michael Inggs (University of Cape Town)

Location: HUB (G17)

14:00 **The MeerKat Correlator & Beamformer** 45'

Speakers: Francois Kapp (SKA)

14:45 **The Long Journey to the Higgs Boson and Beyond at the LHC** 55'

Speakers: Peter Jenni (CERN)

15:40 **Coffee Break** 30'

16:10 **The national SA-CERN programme** 50'

Speakers: Jean Cleymans (University of Cape Town)

Tuesday 28 January 2014

09:00 - 12:30

Plenary Session I

Convener: Simon Winberg (University of Cape Town)

Location: HUB (G17)

09:00 **Observing to the Very Edge of a Black Hole Using Wideband Signal Processing** 45'

Speakers: Jonathan Weintraub (Harvard-Smithsonian Center for Astrophysics)

09:45 **Imaging the Radio Sky** 45'

Speakers: Andreas Faltenbacher (University of the Witwatersrand)

10:30 **Coffee Break** 30'

11:00 **The Wits Astronomy Data Center: A hands-on data analysis center for multi-frequency astronomy** 1h00'

Speakers: Sergio Colafrancesco (University of the Witwatersrand) , Nukri Komin (University of the Witwatersrand)

12:00 **User Perspective of Data Analysis of Data Analysis Flow with the ATLAS Detector** 30'

Speakers: German Carrillo-Montolla (University of the Witwatersrand)

14:00 - 17:30

Plenary session II

Convener: Elias Sideras-Haddad (University of the Witwatersrand)

Location: HUB (G17)

14:00 **The Computing Model of ATLAS** 45'

Speakers: Sahal Yacoob (University of KwaZulu-Natal)

14:45 **An Overview of SANSA Earth Observation Data Processing and Storage: Challenges and Opportunities** 45'

Speakers: Paida Mangara (SANSA)

15:30 **Coffee Break** 30'

16:00 **Readout Electronics of the Alice Detector** 45'

Speakers: Tom Dietel (University of Cape Town)

16:45 **The Data Pipeline of the AGILE Space Telescope** 45'

Speakers: Andrew Chen (University of the Witwatersrand)

Wednesday 29 January 2014

09:00 - 13:15

Plenary Session III

Convener: Siegfried Fortsch (iThemba LABS)

Location: HUB (G17)

09:00 **The upgrade of the ATLAS readout system 45'**

Speakers: Alberto Valero (Instituto de Física Corpuscular (Universidad de Valencia-CSIC))

09:45 **Upgrade of the ATLAS TileCal Electronics 45'**

Speakers: Carlos Solans (CERN)

10:30 **Coffee Break 30'**

11:00 **The RHINO Digital Processing Skills Development Initiative: An integrated review of the platform, resources and training structures 45'**

Speakers: Simon Winberg (University of Cape Town)

11:45 **MeerKAT RFI Issues and signal processing challenges 45'**

Speakers: Jason Manley (SKA)

14:30 - 17:30

Hands-on Session I

RHINO/ROACH

Location: 3rd Year Lab, School of Physics

Thursday 30 January 2014

09:00 - 13:00

Plenary Session IV

Convener: Andrew Van der Byl (University of Cape Town)

Location: HUB (G17)

09:00 **Opti-NUM Solutions (Matlab): Distributed Computing** 1h30'

10:30 **Coffee Break** 30'

11:00 **White Rabbit** 45'

Speakers: Grzegorz Daniluk (CERN)

11:45 **New Tool Flows** 30'

Speakers: Wesley New (SKA)

14:00 - 17:30

Hands-on Session II

GRID Tutorial

Location: Computing Lab, School of Physics

14:00 - 17:30

Hands-on Session III

RHINO/ROACH

Location: 3rd Year Lab, School of Physics

Friday 31 January 2014

09:00	Parallel Session II - High-throughput supercomputing & performance testing (1)	Parallel Session I - Digital Backend Processing Hardware & Tools
10:00	115, HUB 09:00 - 10:30	111, HUB 09:00 - 10:30
	Coffee break HUB 211, University of the Witwatersrand 10:31 - 10:59	
11:00	Parallel Session IV - High-speed Signal Processing Platforms and Software	Parallel Session III - High-throughput supercomputing & performance testing (2)
12:00	111, HUB 11:00 - 12:30	115, HUB 11:00 - 12:40
13:00		

14:00 - 17:00

Hands-on Session IV

RHINO/ROACH

Location: 3rd Year Lab, School of Physics

Logistics

- ❑ **Monday January 27th through Friday January 31st**
 - ❑ **Breakfast at 8:30 am**
 - ❑ **Lunch at 1:00 pm**
 - ❑ **Diner at 6:00 pm**
- ❑ **For those who stay at the hotel:**
 - ❑ **Bus departures to HUB at 8:00 am (sharp)**
 - ❑ **Bus departures to hotel at 7:00 pm**
- ❑ **If speakers have difficulty uploading slides to the indico system send me an E-mail**
 - ❑ **Bruce.Mellado@wits.ac.za**

Many Thanks to our Sponsors!

