

SKA-Link kickoff

Combining knowledge to pioneer Big-Data solutions for SKA Data Centres

Instituto de Astrofísica de Andalucía (CSIC)

3rd and 4th April 2017



Cambridge team (SKA-LINK)



Paul Alexander
(SDPc LEAD)

Rosie Bolton (SDP
Project Scientist,
AENEAS WP3 joint
lead and SKAO
Regional Centre
Project Scientist)

Bojan Nikolic (SDP
Project Engineer)



MANCHESTER
1824

The University
of Manchester



SKA-link Meeting

University of Manchester/
Jodrell Bank Centre for Astrophysics

Chris Skipper
3rd April 2017



People



Anna Scaife

PIP.IMG consortium, based at Manchester

Interested in: radio imaging/interferometry,
magnetism, galaxy clusters



Chris Skipper

PIP.IMG consortium, based at Jodrell Bank

Interested in: Software, GPUs, algorithms, SQL,
gridding, w-projection



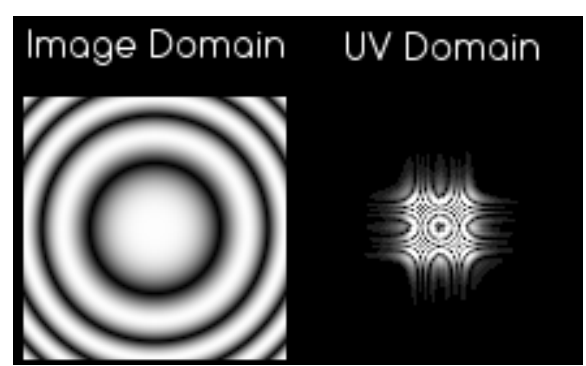
Jodrell Bank Observatory



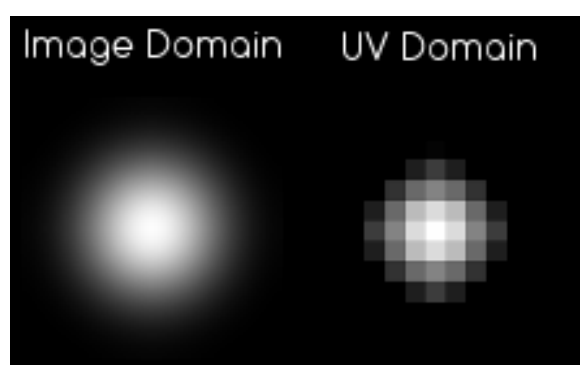
SDP Imaging Pipeline (PIPIMG)



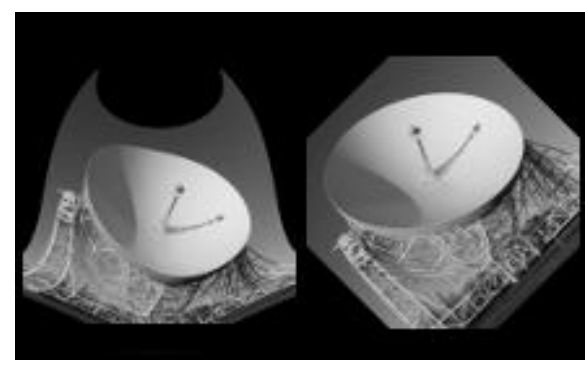
Prototyping: Gridding, W- & A-projection, fast imaging, GPU code (CUDA), anti-aliasing, cleaning



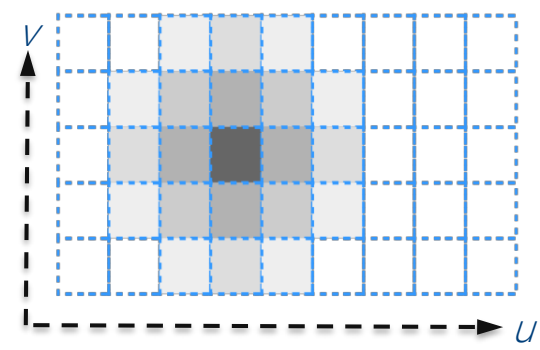
- w-Kernel Creation



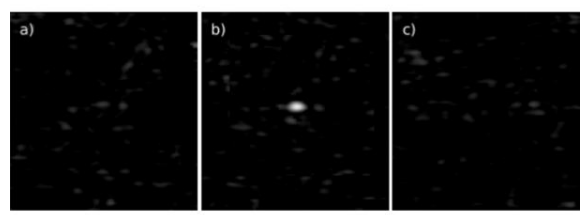
- AA-Kernel Creation



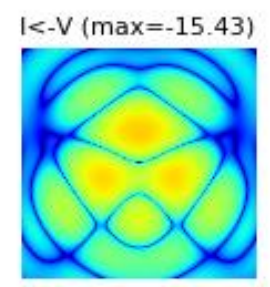
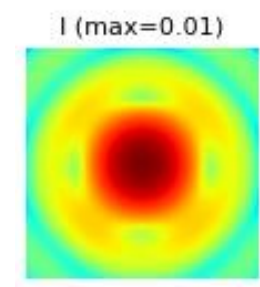
- Image-plane Reprojection



- Gridding



- Fast Imaging



- A-projection

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Thank You!



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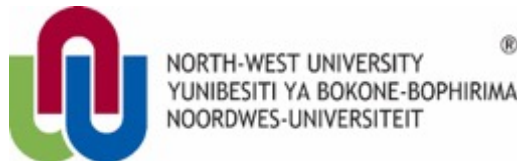
IDIA

Inter-University Institute
for Data Intensive Astronomy

from big data to big ideas

SKA Link / SDP DELIV:
University of Cape Town

Rob Simmonds
IDIA Associate Director
Professor, Dept. Computer Science, UCT.

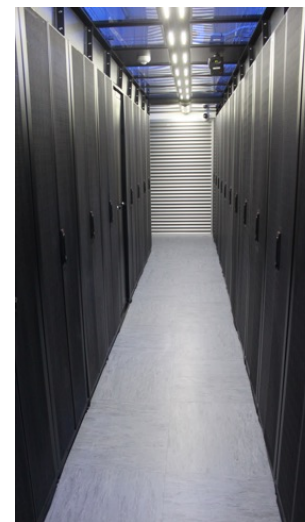


UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA



UCT people involved in data delivery activities

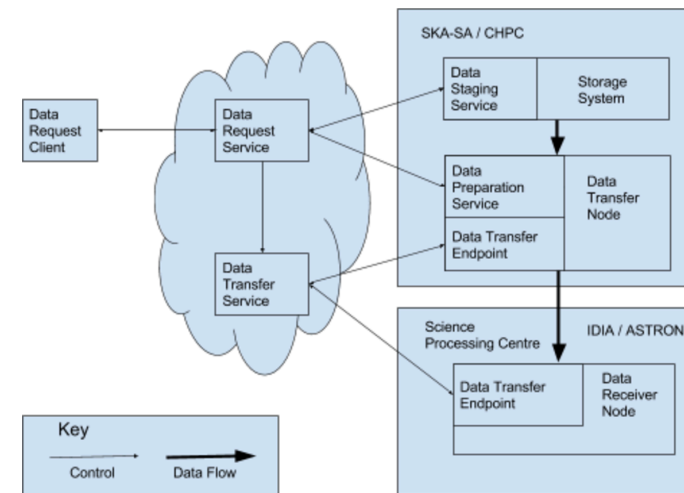
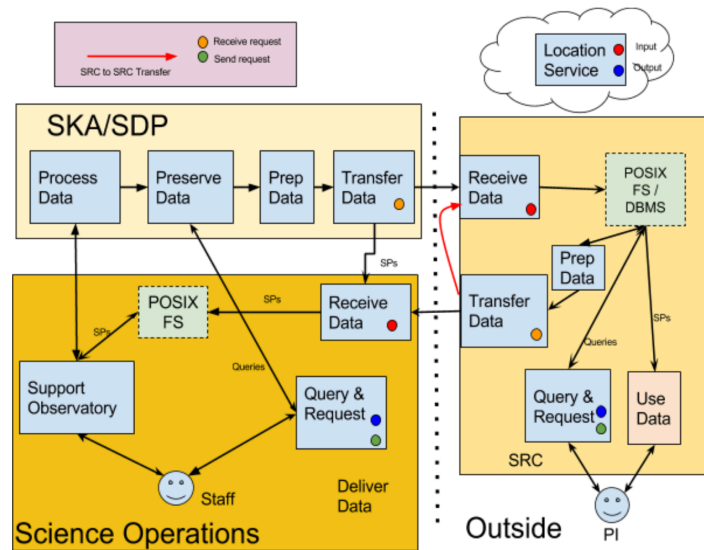
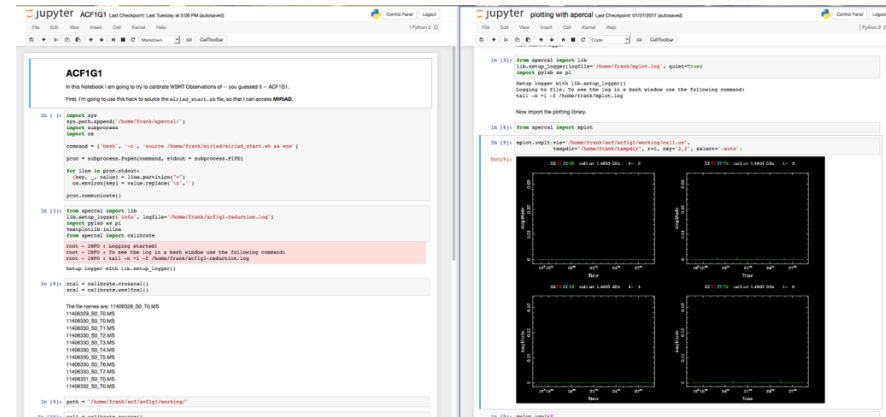
- Rob Simmonds (me)
 - Professor Computer Science UCT and Associate Director of IDIA
 - Lead of SDP DELIV (data delivery) work package
 - Previously CTO of WestGrid, Compute Canada
- David Aikema
 - IDIA Senior Data Scientist
- Adrianna Pinska
 - IDIA Visualization Specialist
- Stefan Coetzee
 - Cloud systems integrator / maintainer
- Joe Bochenek
 - IDIA Senior Data Scientist
- Russ Taylor – Director of IDIA
- Brad Frank – DOME collaboration Chief Scientist
- 4 more IDIA developer positions being advertised





SKA delivery activities

- SDP delivery architecture design with DELIV team
- Architecture prototyping includes:
 - MeerKAT data delivery from SKA-SA to IDIA and ASTRON (DOME collaboration)
 - MeerKAT query service in prototyping in collaboration with CADC





CyberSKA portal

- CyberSKA portal
 - Radio Astronomy Gateway with over 700 users
 - Federated architecture enables globally distributed portal instances to share namespace information, find data, access data and transfer data between instances
 - Remote visualisation of image cubes from any federated site



SKA-Link meeting objectives

- We offer:
 - SDP DELIV knowledge
 - MeerKAT focused collaboration
 - Existing radio astronomy portal and data delivery tools
- We would like:
 - Increased collaboration with European partners

ASTRON

Netherlands Institute for Radio Astronomy

SKA-Link Activities at ASTRON

Michael Wise

Head, ASTRON Astronomy Group

SKA-Link Kickoff Meeting

Instituto de Astrofísica de Andalucía

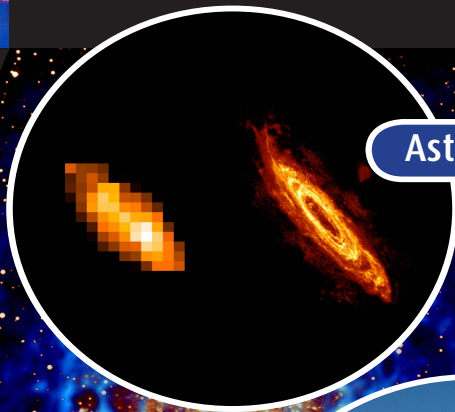
Granada, ES April 03, 2017

ASTRON is part of the Netherlands Organisation for Scientific Research (NWO)

ASTRON

Netherlands Institute for Radio Astronomy

MAKING DISCOVERIES IN RADIO ASTRONOMY HAPPEN!



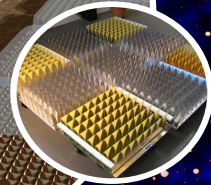
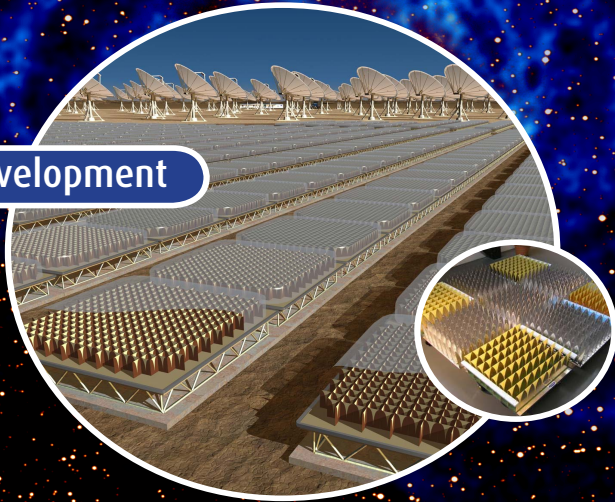
Astronomy Group



Research & Development



Radio Observatory



ASTRON
Netherlands Institute for Radio Astronomy

ASTRON
Netherlands Institute for Radio Astronomy

- **International LOFAR Telescope**
 - *Operations for data collection, processing, and distribution to science community*
 - *Design and development of advanced processing algorithms and pipelines*
 - *Design and operation of the LOFAR Long-Term Archive (LTA) currently housing 28 PBytes*
- **WSRT and APERTIF**
 - *Operations of the Westerbork Synthesis Radio Telescope*
 - *Design and construction of APERTIF phased-array feed to upgrade survey capabilities*
 - *Design and operation of the APERTIF Long-Term Archive (ALTA)*
- **SKA design consortia**
 - *Contributing to LFAA, MFAA, and SDP consortia*
 - *Design and prototyping activities*
- **ASTRON / IBM DOME collaboration**
 - *Collaboration between ASTRON and IBM (20 M€ investment)*
 - *Development of new technologies and algorithms to enable SKA science*

- **AENEAS**

- *H2020 project to produce a design study for a distributed, European SKA Regional Centre*
- *Work packages on data transport, computing, data access, and user analysis*

- **SKA (Science, SDP, and DELIV)**

- *ASTRON is contributing to both SDP and DELIV work packages consortium*
- *Significant participation by staff astronomers in SKA science teams*

- **ASTERICS**

- *H2020 project to address common challenges shared by the various Astronomy ESFRI facilities*
- *Facilities include SKA, CTA, KM3NeT, and the E-ELT*
- *Clear synergies with SKA computing, data management, and user access challenges*

- **DOME / SKA-SA / ASTRON data centre prototype**

- *Collaboration between ASTRON, IBM-DOME, SKA-SA, and IDIA*
- *Prototype distributed data management and processing*
- *Prototype porting user processing strategies (MeerKAT, Apertif, LOFAR)*
- *Support local science analysis with MeerKAT, Apertif, and LOFAR data*

- Exascale data distribution, management, and processing
- Federated distributed data collections and processing
- Distributed user support models
- Algorithms, pipelines, and virtualization
- Standardization, interoperability, and the VO
- User data access and customized analysis
- Advanced analytics, machine learning, and deep learning

- Michael Wise

- Head of ASTRON Astronomy Group
- PI AENEAS H2020 project on European SKA Regional Centre

- Rob van der Meer

- Program Officer European Collaboration at ASTRON
- Program Manager for AENEAS project

- Hanno Holties

- System engineer, ASTRON Radio Observatory
- Project lead for LOFAR LTA, Apertif LTA (ALTA)
- Member of AENEAS WP3 on Computing and Storage

- Yan Grange

- Developer in the ASTRON Data Science Group
- Background in astronomy, member of ASTRON computing group since 2012
- Member of SKA SDP consortium (DATA and DELIV work packages)
- Contributing to AENEAS WP5 on Data Access, Dome-SA-NL data centre prototyping project
- Experience with LOFAR LTA, storage optimisation, workload characterisation (SKA and LOFAR)

Amy Krause

Data Architect

The University of Edinburgh

Edinburgh Parallel Computing Centre (EPCC)



- Research software engineer and architect
- Data intensive architecture and design
- Cloud technologies
- User interfaces & mobile apps

- Many projects in the area of distributed data-intensive applications
- Collaboration with Informatics: Rosa Filgueira (now BGS), Malcolm Atkinson
 - Implemented dispel4py, a Python library for distributed stream-based workflows
- More recently focusing on cloud technologies
 - Commercial projects in large-scale data analytics: Genotype analysis, TV customer data analysis, letting agency data infrastructure
- Looking to support researchers by writing useful software and make their life easier

Malcolm Atkinson

University of Edinburgh
Prof of e-Science
School of Informatics
Leading Data-Intensive Research Group



70's **Data** ⇔ Applications ⇔ People ⇔ Databases

CAMBRIDGE
RANGOON
NORWICH
EDINBURGH

80's **Data** ⇔ Applications ⇔ Organisations ⇔ Software Engineering

EDINBURGH
PHILADELPHIA
GLASGOW
INRIA 02

90's **Data** ⇔ Applications ⇔ Organisations ⇔ Sun ⇔ Java

GLASGOW
MOUNTAIN VIEW
GLASGOW

00's **Data** ⇔ Applications ⇔ Nations ⇔ eScience ⇔ Distributed Systems

GLASGOW
E-SCIENCE
EDINBURGH

10's **Data** ⇔ Applications ⇔ eScience ⇔ Federations and Data Diplomacy

E-SCIENCE
EDINBURGH

Persistent goal: Enable easy, effective and ethical use of *your* data to meet *your* challenges

MALCOLM'S CONTRIBUTION TO SKA-LINK THINKING

- Systems architecture based on experiencing change
- Organisational strategies based on many campaigns
- Recognition that people are key
 - Harnessing multiple viewpoints with conceptual frameworks
 - Improving their productivity by sustaining the value of their work
 - Accelerating induction by removing hurdles
 - Respecting identity issues
- Frameworks that facilitate collaboration

I AM NOT ADEPT
AT THE TECHNICAL
DETAILS OF
SPECIFIC SYSTEMS
AND VIEW THEM
AS PART OF THE
EVOLVING
DIGITAL
ECOSYSTEM IN
WHICH DATA-DRIVEN
RESEARCH MUST BE
NIMBLE TO THRIVE

MALCOLM'S WANTS

TO TAKE HOME FROM SKA-LINK MEETING

- A better understanding of the socio-technical challenges
- Opportunities to try to collaborate to meet such challenges
- Plans to muster or bid for resources to do the necessary R&D
- Expectation that this will advance our capacity to exploit data riches in many fields

Malcolm Atkinson

Chat with me I'm interested in everything

E.G. Walking



Why are we so fortunate to live on a planet with such features?



MTA
SZTAKI

Hungarian Academy of Sciences
Institute for Computer Science and Control

Introduction to SZTAKI and LPDS projects

Prof. Peter Kacsuk

Head of
Laboratory of Parallel and Distributed Systems



- Established in 1964
- EU Centre of Excellence in IT, Computer Science and Control
- Basic and applied research
- Contract-based R&D&I activity mainly on complex systems, turnkey realizations
- Transferring up-to-date results to industry and universities

- Basic research
 - Computer science
 - Systems- and control theory
 - Engineering and business intelligence
 - Machine perception and human-computer interaction
- Applied research and innovation
 - Vehicles and transportation systems
 - Production informatics and logistics
 - Energy and sustainable development
 - Security and surveillance
 - Networking systems and services, cloud / distributed computing

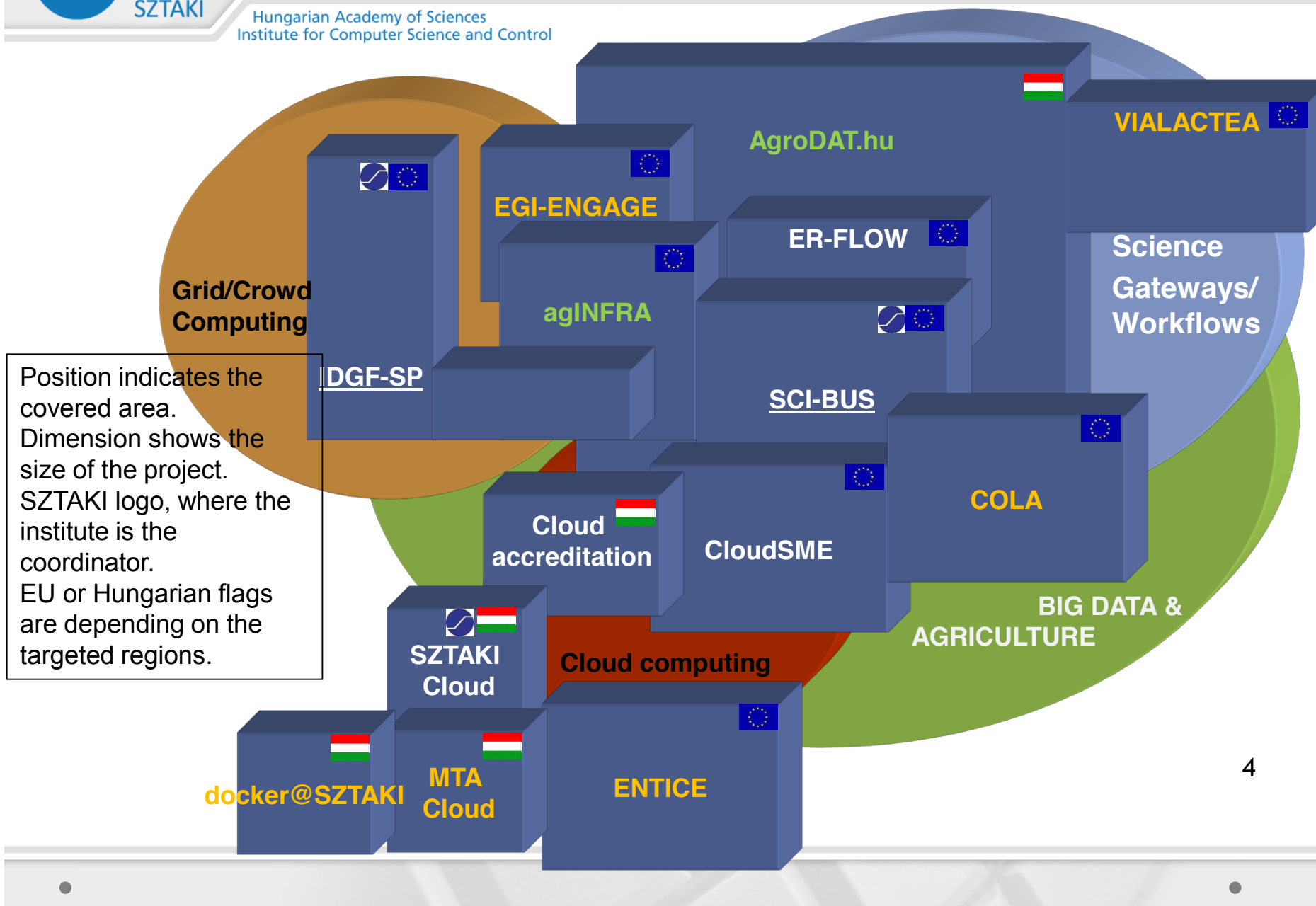
Key figures

- Budget
 - 12-13 MEUR/year
 - ~30% basic funding
- Staff
 - 280
 - 67% scientific
- Fraunhofer Project Center
- W3C member
- ERCIM member
- Contributor to the European Grid Infrastructure

About the research lab LPDS

- **Research division of MTA SZTAKI from 1998**
- **Head: Peter Kacsuk, Prof.**
 - editor in chief: Journal of Grid Computing (Springer)
 - coordinator of four e-Infrastructure projects in the EU 7th Framework Programme (FP7)
- **Deputy head: Robert Lovas, PhD**
 - coordinator of two projects in EU FP7
 - international liaison (European Grid Infrastructure)
 - secretary of International Desktop Grid Federation (Dutch foundation)
- **12 research fellows (full/part time)**
- **Foundation member**
 - Hungarian National Grid Initiative (NGI_HU)
 - International Desktop Grid Federation (IDGF)
 - OpenNebula (ONE) User Group, Hungary
- **Participant and/or coordinator in European and national Grid & Cloud research, e-infrastructure, and educational projects (from 2000)**
- **By far the most successful research lab in the region in the field ICT / e-Infrastructures in terms of the number of coordinated FP7 EU projects**



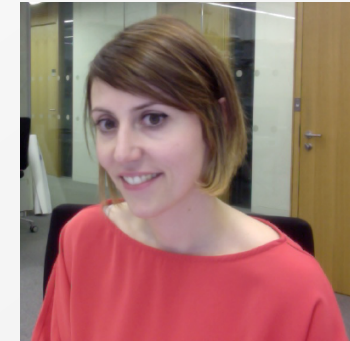


Our interest in SKA-Link

- Since the SCI-BUS project SZTAKI is engaged in supporting scientific user communities by gateway technology:
 - VIALACTEA science gateway
 - EGI-ENGAGE:
 - DARIAH science gateway
 - Long Tail of Science gateway
 - MTA Cloud project
- Extending the gateway technology to support the easy use of cloud and docker technology
- During this meeting I will present our gateway technology and its support for cloud and docker
- Colleagues who will participate:
 - Zoltan Farkas and Istvan Márton (Gateway), Jozsef Kovács and Enikő Nagy (Occopus/cloud), Attila Farkas (docker)

Rosa Filgueira

Senior Data Scientist
British Geological Survey (BGS)



Background:

- PhD Computer Science - HPC research – Madrid/Carlos III
- 5 years as a Postdoc - Data Intensive Research – University of Edinburgh/DIR group

Currently:

- Data sciences activities across Geoscience domains:
 - Data gathering, cleaning, filtering, analysis
 - Parallelization/optimization of applications
 - Promoting scientific workflows, data-frameworks, containers and reproducibility tools, etc.
- Writing research proposals
- Involved in many research projects – H2020, NERC, BGS
- Collaborations with EPCC, University of Edinburgh, etc.
- Research activities in BGS-Informatics

Contributions to Ska-Link thinking

Delivering easy-to-use frameworks to empower data-driven scientists

- Develop methods in their familiar environment
- Deploy methods in production systems without changing them
- Improve methods without introducing distractions by new technologies
- Enable sharing of methods and data

How ?

- New advanced abstract frameworks that adapt automatically
 - to different data scales and generation rates
 - to different computational platforms



need to be
easy to understood
platform-
independent

To take home from Ska-link meeting

- Opportunities to collaborate in the future
- Set us on a path to pioneer globally distributed use of data on an unprecedented scale.
- Plans for future grants and research proposals



SKA-link kick-off

Jens Krüger

High Performance and Cloud Computing Group
Zentrum für Datenverarbeitung
Eberhard Karls Universität Tübingen

03.04.17
Granada



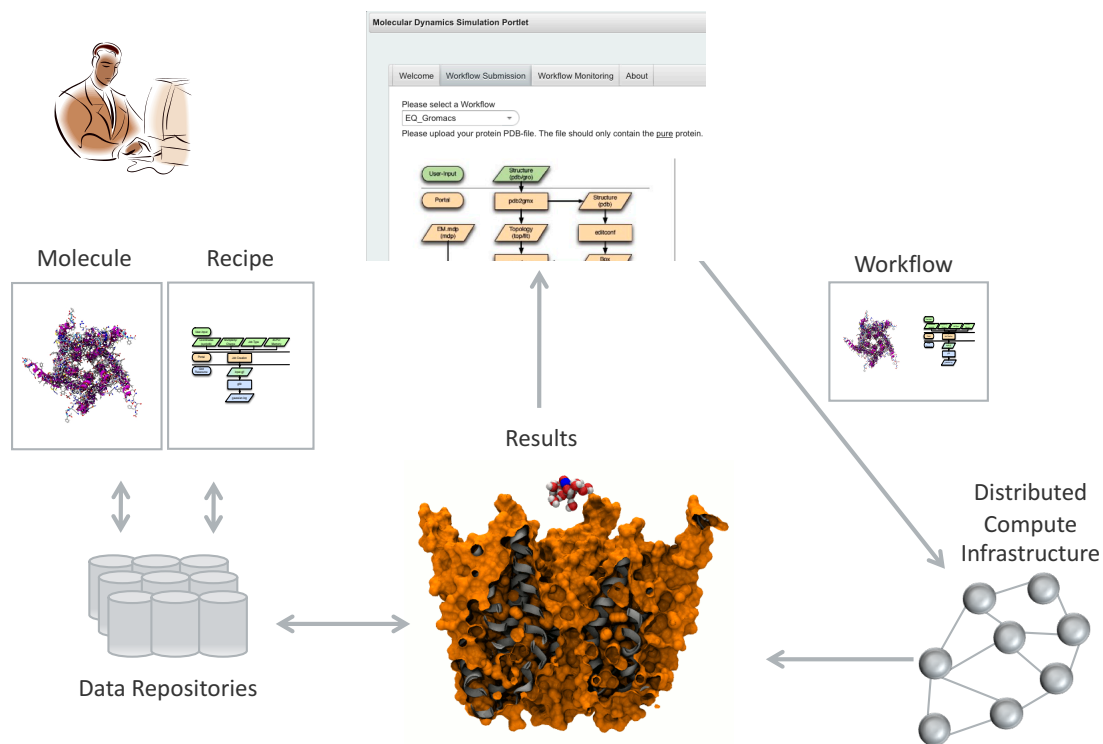
- Jens Krüger
 - Group Leader HPC and Cloud Computing
 - bwHPC competence center for bioinformatics and astronomy
 - Chemist, Bioinformatician, Simulant
- Felix Bartusch
 - PhD Student
 - CiTAR: Reproducible science, containerization, workflows
- Max Hanussek
 - PhD Student
 - de.NBI Cloud: Virtualization environment for bioinformatics
- Fabian Wannemacher
 - Master Student
 - Networking among OpenStack services
- Volker Lutz
 - Technician
 - HPC infrastructure, storage, software
- Werner Dilling
 - Head of the 'Zentrale Systeme' division





- Core developer and maintainer of MoSGrid
- Operating a science gateway for 6+ years on production level gives some insight with respect to:

- User management
- Authentication
- Community management
- Keeping software in sync
- Workflows
- Data staging
- Metadata annotation
- Distributed storage
- Middlewares
- ...





Networking

- Personal contact
- Discussion
- New trends
- ...

Sharing expertise

- Portal operation
- Community management
- Storage concept
- Identity Management
- ...

Outreach

- Conferences
- Workshops
- Dissemination
- ...

Technologies

- Science gateways
- Micro services
- Workflows
- Containerization
- ...

Reproducible science

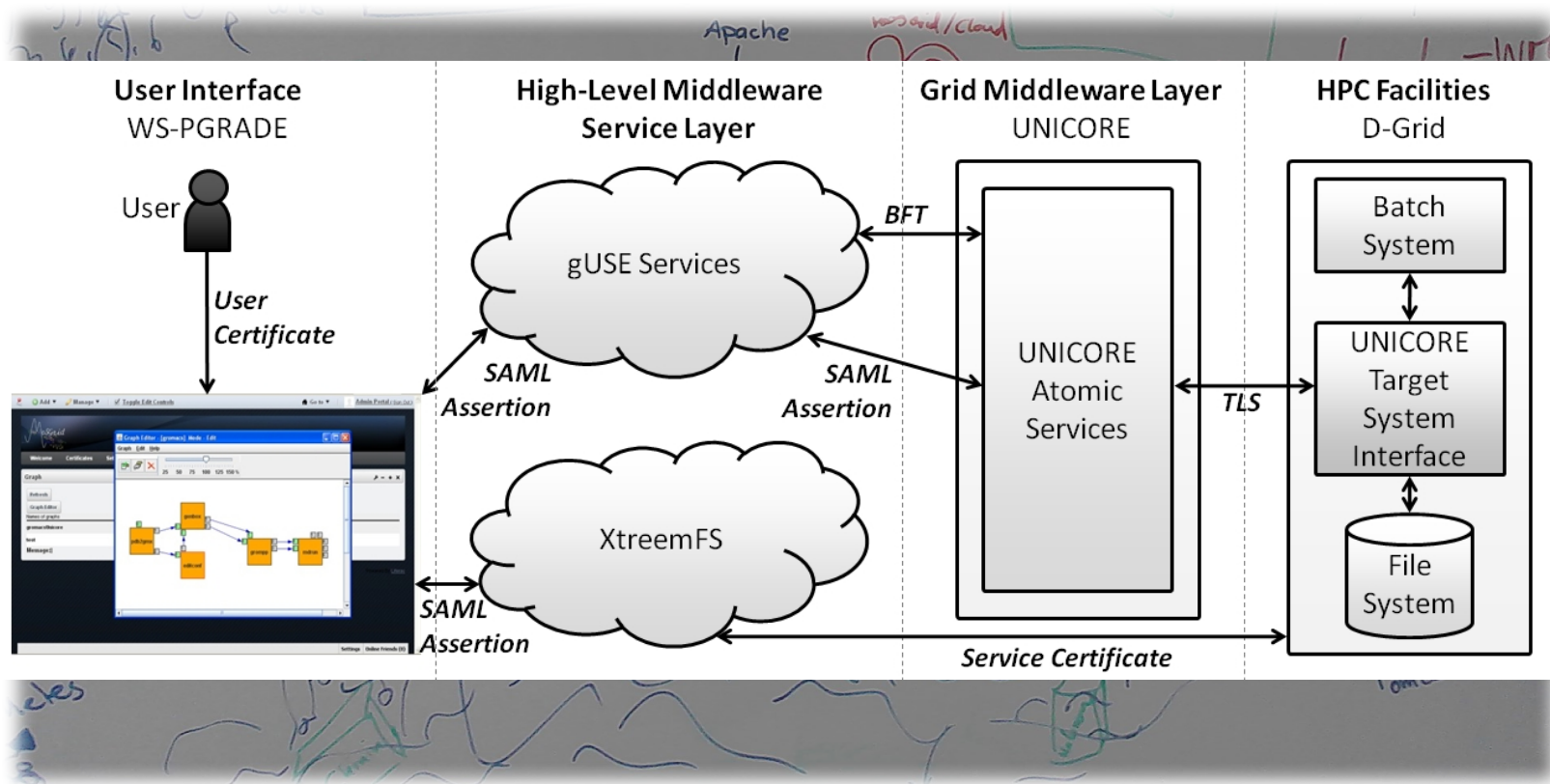
- Annotation
- Standards
- Semantic search
- ...

Future projects

- EU calls
- Research visits
- Exchange programs
- ...



- An architecture sketch



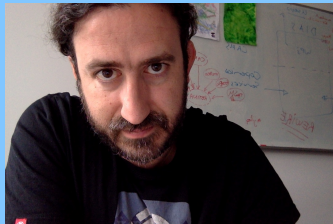
KNMI

Team @ RDWD

R&D Observation and Data Technologies

Prof. Albert Klein Tank

albert.klein.tank@knmi.nl



Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Milieu

Alessandro Spinuso - R&D Data-intensive VREs & Provenance

spinuso@knmi.nl

Wim Som de Cerff - R&D Climate Services, Agile Methods Expert

wim.som.de.cerff@knmi.nl

Andre Pagani - R&D Data Scientist - DataLab

andrea.pagani@knmi.nl

Maarten Plieger - GIS and OGC Engineer

maarten.plieger@knmi.nl

Andrej Mihajlovski - Metadata Engineer

andrej.mihajlovski@knmi.nl



Group Mission:

“Developing an optimal infrastructure for the collection, processing, accessing and visualisation of geophysical information”

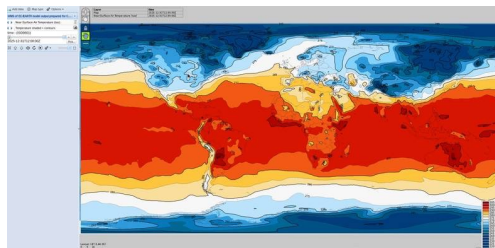


Relevant Projects and R&D

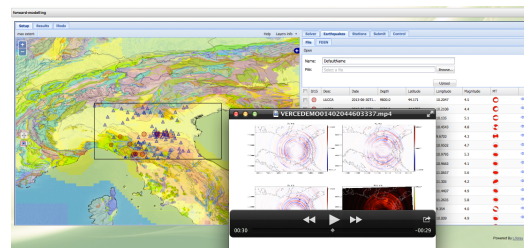
- **Climate4Impact** Climate data access, online processing and visualisation
<http://climate4impact.knmi.nl> (OGC standards, Metadata Vocabularies, Federated Archives, VREs)
- **EPOS-VERCE** Earthquake simulations and Misfit analysis workflows
<http://porta.verece.eu> (HPC & data-intensive workflows, provenance, VREs,)
- **R&D S-ProvFlow** Data-Intensive provenance. Capturing and exploitation
<https://github.com/KNMI/s-provenance> (Reproducibility as a Service)
- **R&D DataLab** KNMI “hub” for data-driven innovation
(Facilities Data Science Infrastructure and knowledge uptake)



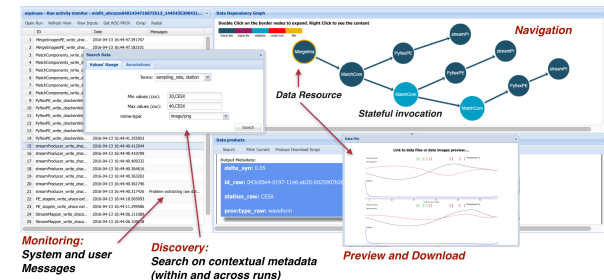
C4I



EPOS-VERCE



R&D S-ProvFlow

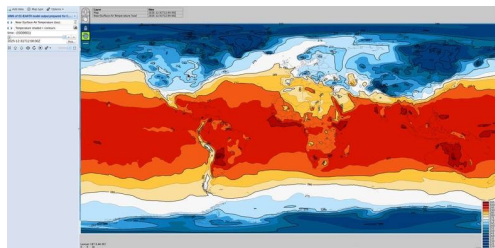




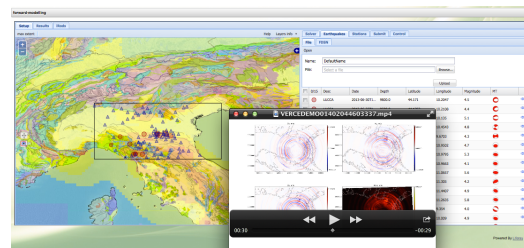
Role in The SKA-Link

- Share personal experience on the process for the realisation of a usable community-driven Virtual Research Environment (VERCE)
- Challenges of implementing HPC and data-intensive Applications as a Service
- Role and Integration of Reproducibility and Provenance Services in Modern Online Scientific Tools (RaaS).

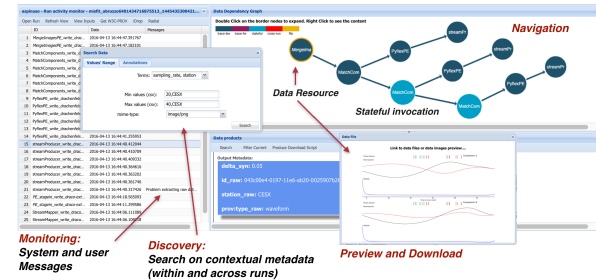
C4I



EPOS-VERCE



R&D S-ProvFlow

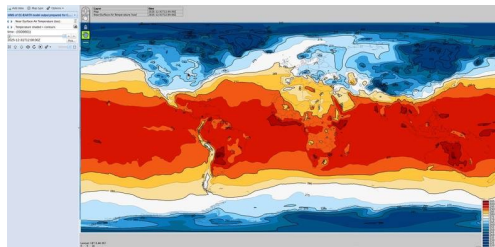




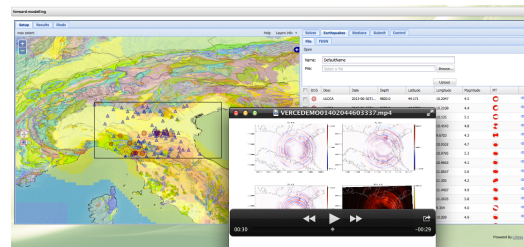
Take Home.. Knowledge and Network

- Inspiring group of experts from academy and public institutions (**creating bridges**)
- Discuss the role of users in the automation of methods, especially when scale surpass cognitive and technical possibilities. (**finding the right balance**)
- KNMI is starting evaluating a program for Space Weather Services (**new projects**)
bert.van.den.oord@knmi.nl
- People I want to work with. Great recent experience. Result oriented.
Extended network (**recipe for innovation**)

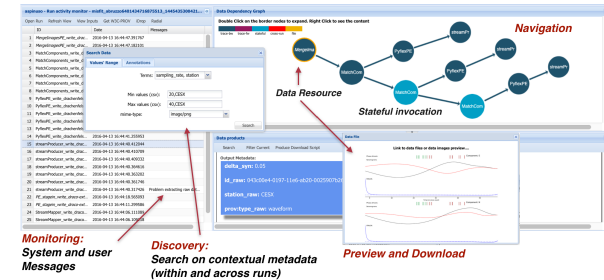
C4I



EPOS-VERCE

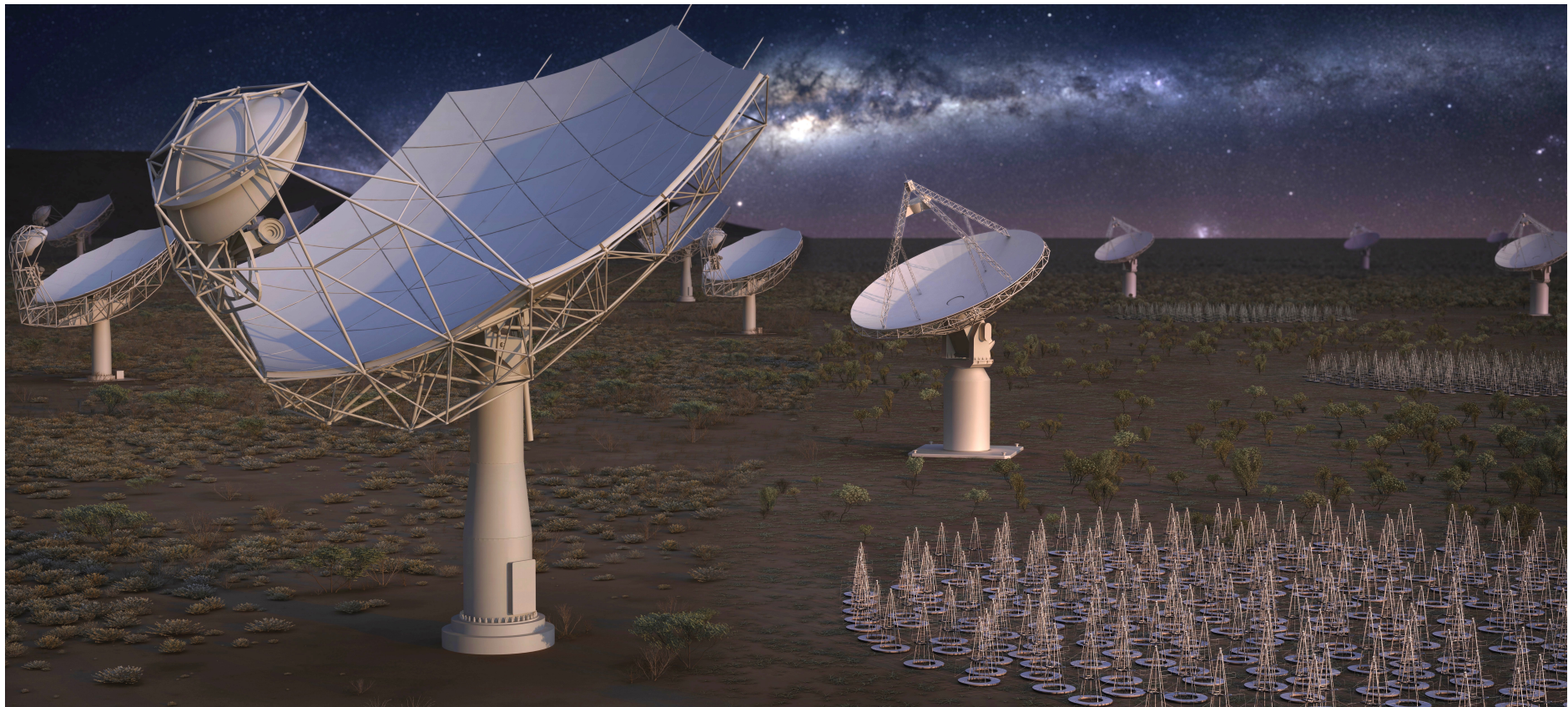


R&D S-ProvFlow



SKAO Introductions

Who are we - what do we do?



SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope

Dr Antonio Chrysostomou
Head of Science Operations Planning



www.skatelescope.org



a.chrysostomou@skatelescope.org



[@astroant](https://twitter.com/astroant)

Dr Antonio Chrysostomou

Head of Science Operations Planning at SKA

- planning for the operation of the SKA observatory across three sites

Chair of the SKA Regional Centres Coordination Group

- ensuring that the SKA has a viable platform for its users to be able to access and analyse their SKA data products

Travel and Hiking

- documenting those activities with my camera!





Dr Rosie Bolton

SKAO Regional Centre Project Scientist

Member of the SKA Regional Centre Coordination Group

Leading task to develop the high level requirements for SRCs and the Alliance of SRCs

- what must each SRC be able to pledge in order to be accredited and how will this be monitored?
- how will the alliance of SRCs function as a unified body, in spite of the diverse SRC landscape?
- to where do the responsibilities of the SKA Observatory extend?
- how will the picture evolve over the lifetime of the SKA?



Understanding the best practice from other existing and future large science projects

- CERN and the WLCG, LSST, etc

SQUARE KILOMETRE ARRAY

Exploring the Universe with the world's largest radio telescope



www.skatelescope.org



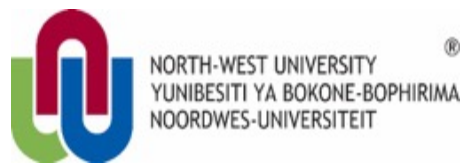
Russ Taylor

SKA Research Chair

University of Cape Town & University of the Western Cape

Director

Inter-University Institute for Data Intensive Astronomy



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA





Prof. Russ Taylor
Director



Prof. Rob Simmonds
Associate Director



Dr. Sarah Blyth
UCT



Assoc. Prof. Michelle Kuttel
UCT



Dr. Michelle Cluver
UWC



Prof. Roy Maartens
UWC



Prof. Claude Carignan
UCT



Prof. Romeel Davé
UWC



Dr. Bradley Frank
UCT



Prof. Renée Kraan-Korteweg
UCT



Prof. Mario Santos
UWC



Prof. Patrick Woudt
UCT





Developments relevant to SKA-link

- SKA Precursor Regional Science and Data Centre
- User-centric, scalable and extensible solutions for data-to-science for MeerKAT Large Survey Projects
- MeerKAT Tier 2 processing facility
- Multi-wavelength data fusion initiatives
- Cloud-based Visualization of remote big data sets
- Cyber-infrastructure platforms for distributed teams working on data intensive radio astronomy research
- African Data Intensive Research Cloud



Take-aways from SKA-link meeting

- Advance a joint vision of a distributed network of centres to enable science in the data-intensive paradigm with a user-facing philosophy
- Discussion of use cases and priorities
- Engagement of stakeholders
- Communication toward alignment of development plans and programs
- Identification of potential areas of collaboration

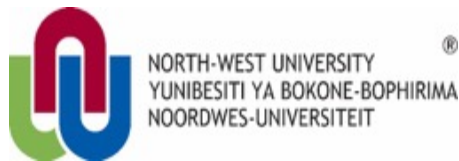


IDIA

Inter-University Institute
for Data Intensive Astronomy

from big data to big ideas

www.idia.ac.za





IAA Asteroseismology team

Prof. Rafael Garrido



Activities

Economic Resources from two research programs

Regional Funds (CoRot)

CoRot data exploitation.
Data Mining and Databases.
Support from the ground from Sierra Nevada Observatory (SVO).

National plan Funds (PLATO)

Is our technical responsibility
to develop the Main Electronic Unit (MEU).
Co-PI: Julio Rodriguez.

Is our scientific responsibility
to develop tools to transform the raw data into physical information.



**Rafael
Garrido**



**Javier
Pascual-Granado**



**Sebastiano
DeFrancis**



Mariel Lares



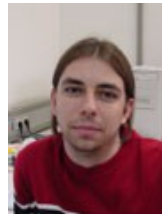
**José
Ramón
Rodón**



**Guillermo
Cortés**



**Juan Carlos
Suárez**



**Antonio García
Hernández**



Andrés Moya



**Maria Angeles
Mendoza**



Julio Rodriguez



Beatriz Aparicio



Rosario Sanz

Teams from IAA and University of Granada



Impact on the community

- Non standard time series analysis.
- Numerical stellar interior models including rotation.



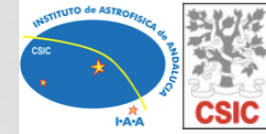
What can we do for SKA-link

What SKA-link can do for us

- Learning new e-Science techniques for a reliable and transparent work that can be applied to the study of stellar interiors through asteroseismology techniques.
- Knowing first hand what the SKA Regional Centres will be, and how this can be of interest beyond radioastronomers
 - Exploring whether we can, on our side, contribute or support an SRC at the IAA (see talk tomorrow)

AMIGA team in SKA-Link

Analysis of the interstellar Medium of Isolated GALaxies. <http://amiga.iaa.es>



Lourdes Verdes-Montenegro (lourdes@iaa.es)

- PI of the group
- Radio-astronomer, expert on HI studies of isolated galaxies and compact groups
- Coordinator of the Spanish participation in SKA
- Science Data Processor (SDP) consortium Board member
- SKA Regional Centre (SRC) coordination group member



Julian Garrido (jgs@iaa.es)

- Software engineer. Expertise on IVOA standards and astrophysical workflows development.
- Project manager of the Spanish participation in SKA
- SDP Member: DATA group, designing the platform for preserving SKA data



Susana Sánchez (sse@iaa)

- Software engineer. Expertise on e-Science tools, distributed computing and astrophysical workflows development.
- SDP Member: DELIV group, designing the platform for delivering SKA data



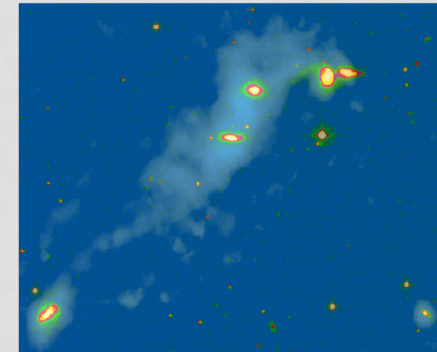
Marina Fernández (marina@iaa.es)

- Biochemist and communication specialist
- Coordination assistant, supporting the Spanish participation in SKA
- LOC of the SKA-Link kick-off meeting

AMIGA team background

Specialists in galaxy environment

- Multi-wavelength catalogue of ~1000 isolated galaxies
- Study of the Atomic gas (HI) as tracer of the galaxy formation and evolution (radio-astronomical techniques)



Hickson Compact Group 16
Verdes-Montenegro+. 2001

Contributors to IVOA standards

Multi-wavelength studies require access to heterogeneous archives

- Needs on data interoperability standards (IVOA), but:
IVOA standards for radio data missing

e-Science (tools) developers

Radio data volumes are increasing exponentially

- Tools for extracting scientific information from 3D data
- Migration to Grid and Cloud in preparation for huge data volumes
- Development of AstroTaverna, a plugin for integrating VO services in Taverna workflow management system.



RADAMS: First VO-compliant
Radio Astronomical Data
Model. It was used to
implement the 30m antenna
IRAM archive

AMIGA's **role** in SKA-Link and its interests

As **members of the SKA community**, we are

- Worried about the current crisis of reproducibility in science
- Interested on innovative ways of producing reproducible science
- Decided to trigger the idea that SKA could be the first scientific infrastructure taking the lead of trustable, reproducible science

As **members of the groups designing the**

- **Science Data Processor**

- Contributing to the design of the platforms for preserving and delivering SKA data and metadata

- **SKA Regional Centres**

- H2020 AENEAS project participants
- LVM external advisor of the SRC committee group

We are interested on technologies for supporting both data-intensive & reproducible science

AMIGA's expectations from SKA-Link

Together with SKA-Link participants, we would like to :

- Share ideas about what means *"good" science*:
 - There should be just Science, as the one following the Scientific Method
 - Reproducible / Trustable / Verifiable
- Suggest *innovative metrics* to assess the SKA success
 - Metrics that promote and support the Scientific Method
- Identify *innovative technologies* to support SKA users:
 - in exploiting huge data volumes
 - in producing Science
- Evaluate the *feasibility* of adopting these innovative metrics and technologies by SKA and the SRCs

SKA-Link kickoff

Combining knowledge to pioneer Big-Data solutions for SKA Data Centres

Instituto de Astrofísica de Andalucía (CSIC)

3rd and 4th April 2017

