



**South African National Grid :
A blueprint for e-Infrastructure
in Sub-Saharan Africa ?**

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Coordinator, South African National Grid
South African National Research Network

Overview



- ... in my own words ...
- The goal : e-Science in (South) Africa
- Starting with trust
- Existing e-Infrastructure in South Africa
- SAGrid organisational model and activities
- Interoperability / cooperation
- The future : A blueprint for Africa





A scenario : this scientist walks into a bar...

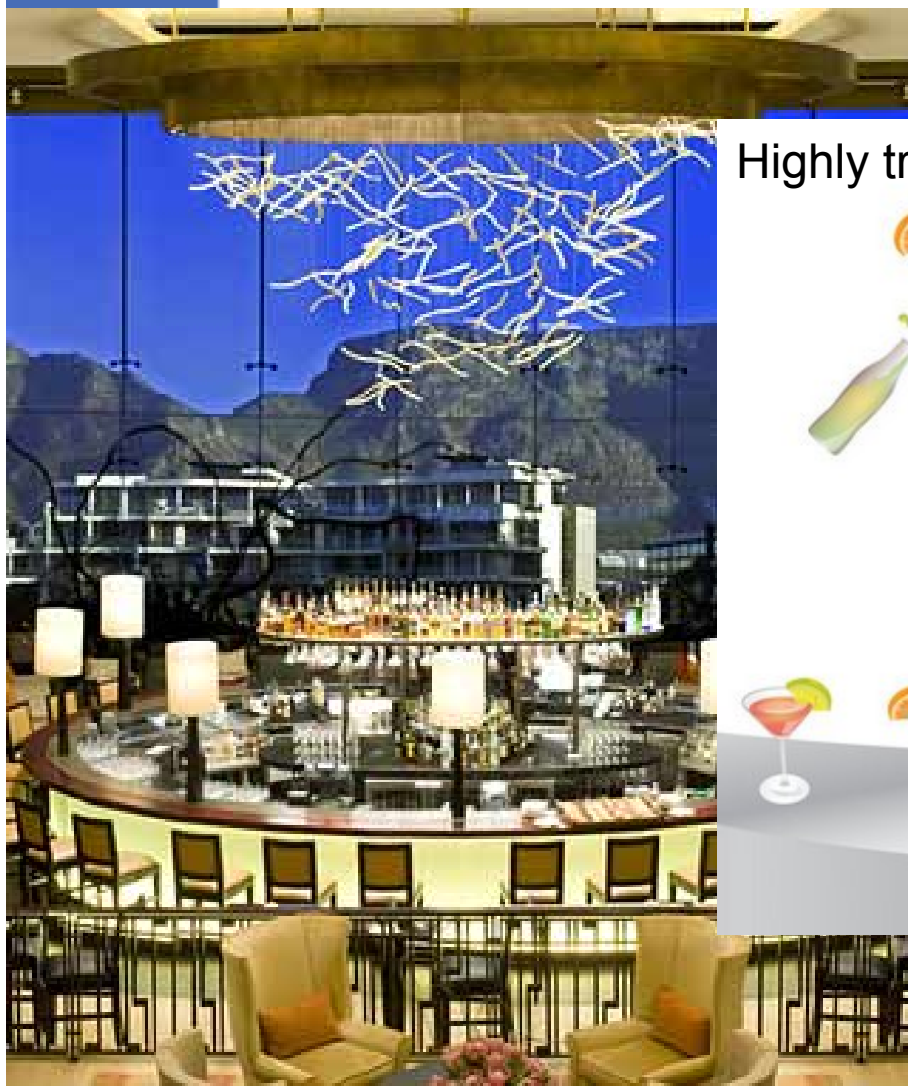


What users want – best of all worlds for no extra effort

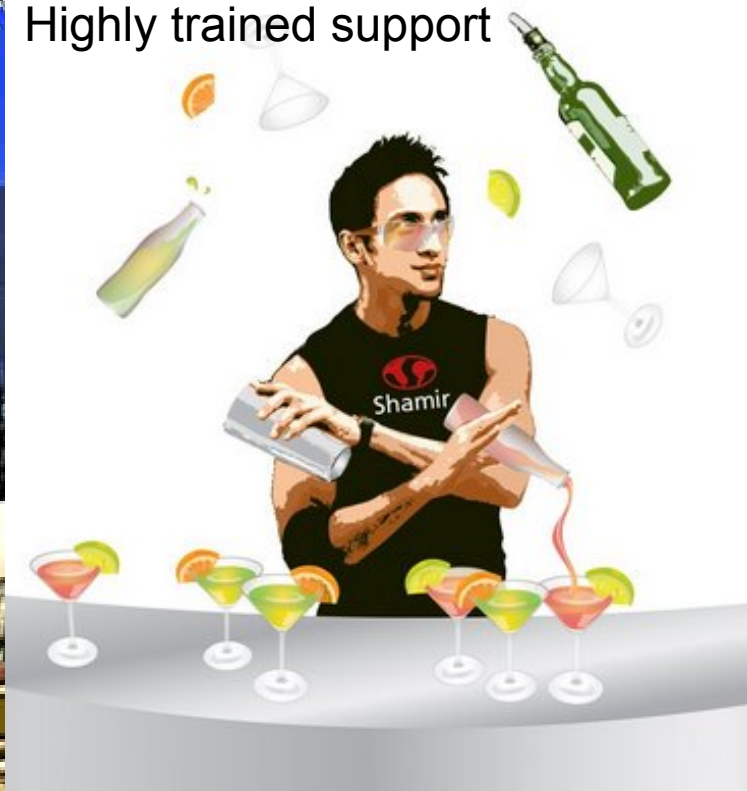


Some users want highly
varied, modular
application selection

Amazing infrastructure



Highly trained support



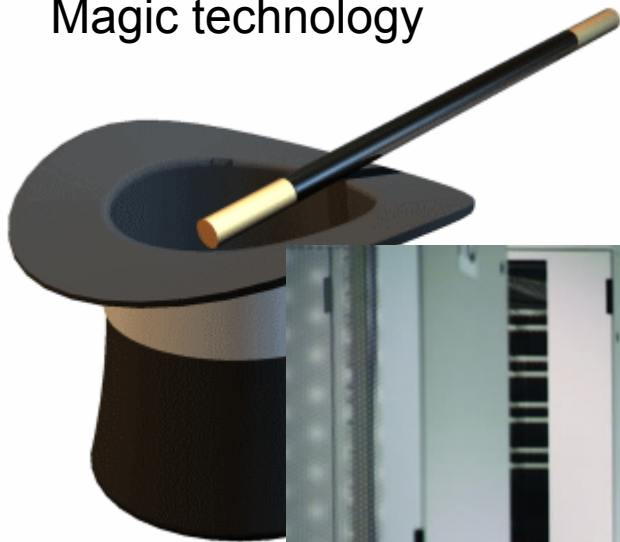
Vertically integrated
Highly specialised
applications





What Site Directors want

Magic technology



PROFIT !!!

?
?
?

Generic HPC data centre with shared resources

5

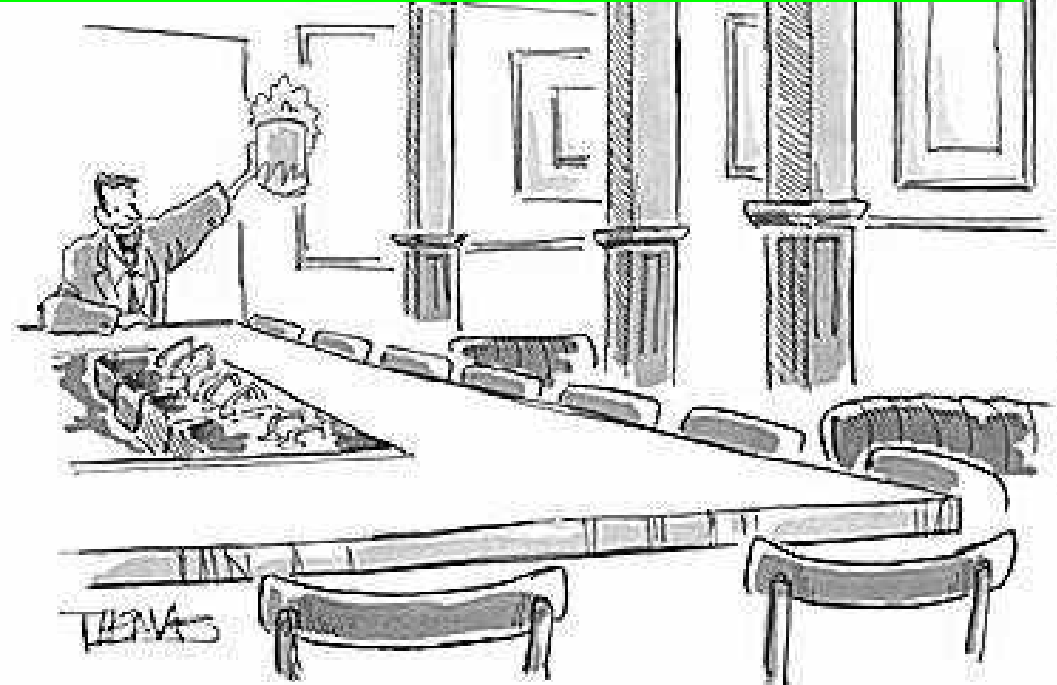


Best laid plans...
potential alternate realities we want to
avoid...



Strange experiments on users

Build a great bar, but
Nobody comes to the party



Search ID: tbrn93

"Drinks are on me!"



Over-ambition ending in disaster



We have to standardise on something...
not just anything : good, functional, palatable, interoperable
not necessarily perfect...

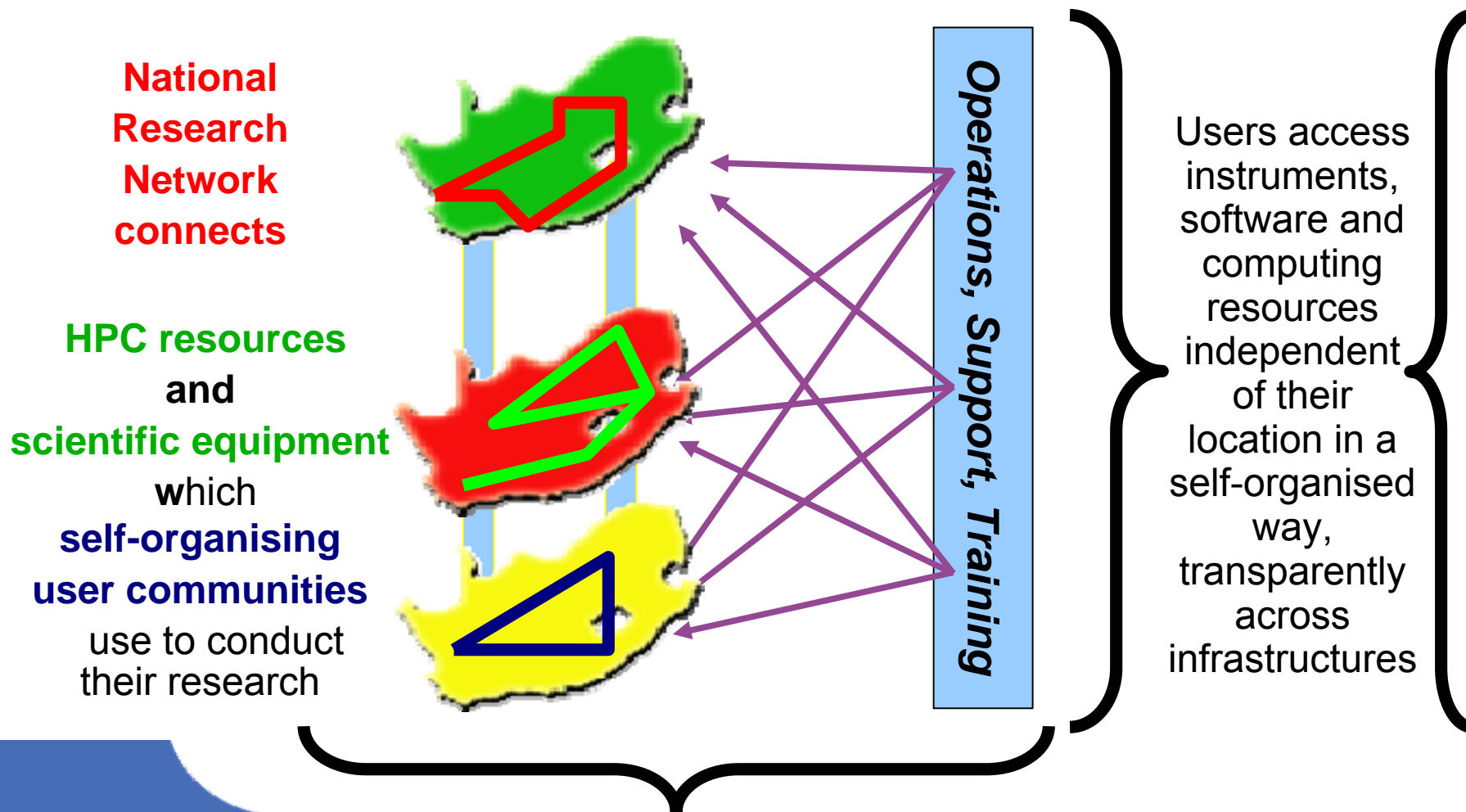
To talk about infrastructure, we have to standardise on something...

- Technologies
- **Methodologies**





An integrated federal infrastructure to the end-user's benefit -
 Requires interoperability and collaboration at all levels :



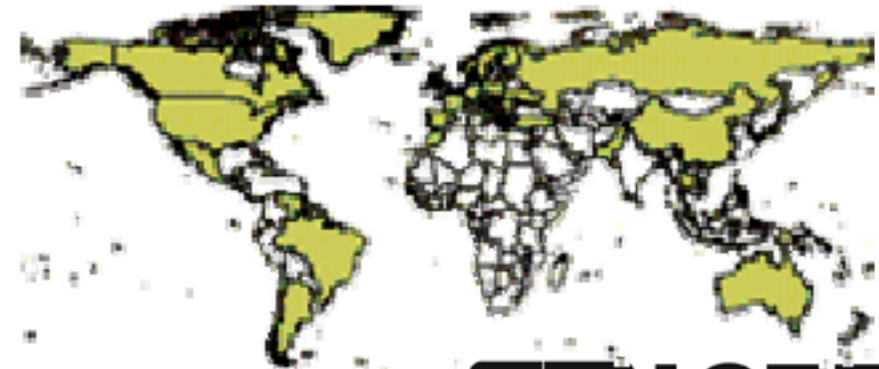
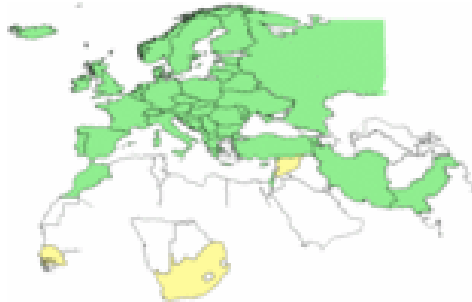


Let's start from the very beginning : The SAGrid Certificate Authority



Enabling International Collaboration Through Trust : SAGrid Policy Management Authority

- Security and identity infrastructure is crucial to the entire undertaking, yet no PMA exists for Africa
- SAGrid started with trust anchor in INFN CA (similar process to participants in EUMedGrid)
 - <http://security.infn.it/CA/en/RA>
- SAGrid CA under development – first presentation to EUGridPMA October 2009 (Berlin)
- Can act as trust centre for the region, evolve into AfricaGridPMA





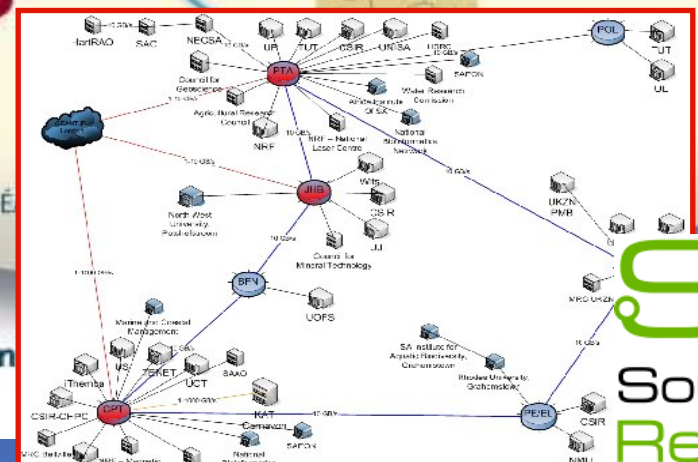
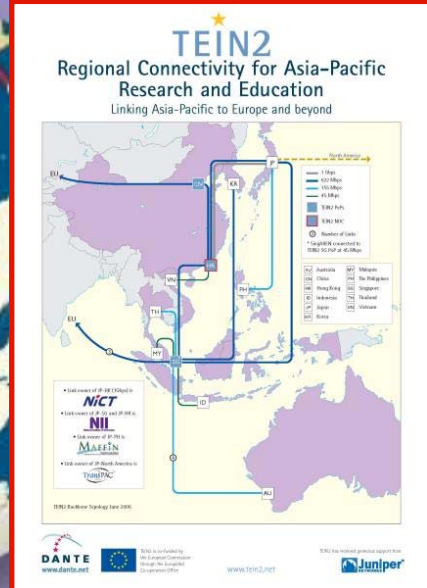
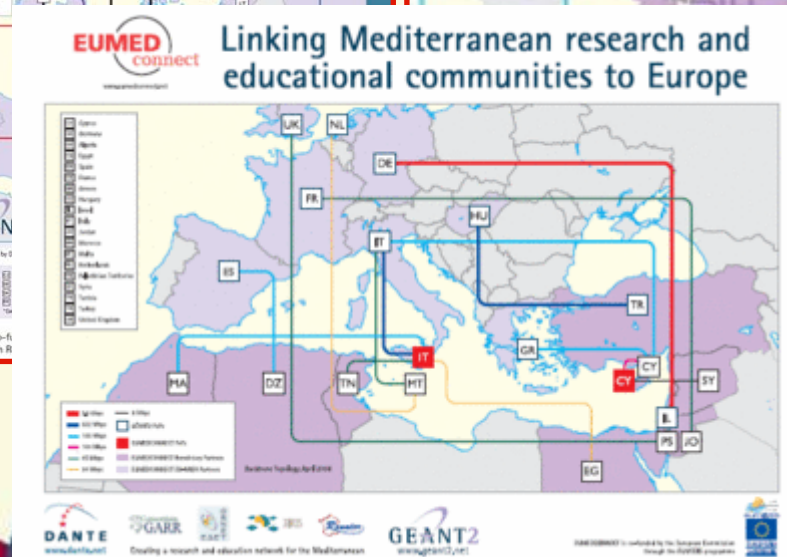
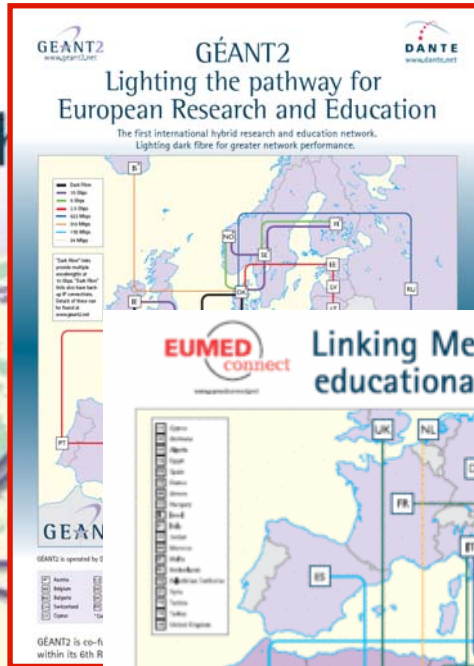
The “global” network coverage means high-speed access... to computing resources, data, instruments – and other researchers !

See <http://www.feast-project.org/> ; soon AfricaConnect project (Dante)

GEANT2 At the

Networking

- GEANT2 Coverage
- ALICE-RedCLARA Network
- EUMEDCONNECT Network
- TEIN2 Network
- SEEREN2 Network



SANREN
South African National Research Network



South Africa's investment in e-Infrastructure



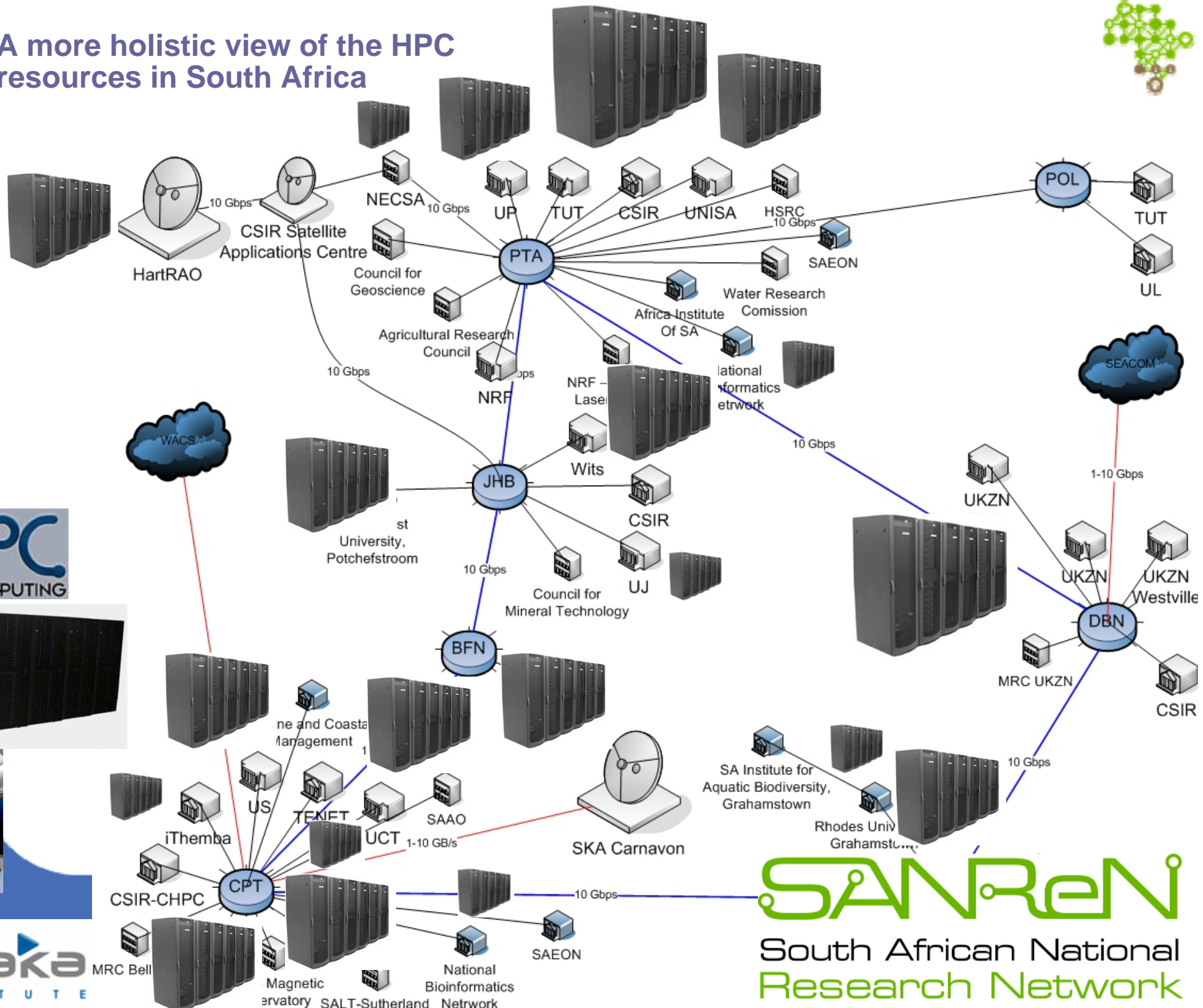
- The Centre for High-Performance Computing :
 - Premier HPC site in the country, provides more resources than any given site
 - Situated in Cape Town, managed by Meraka
 - Designed and managed to tackle exceedingly large problems, perhaps requiring specialised hardware
 - Used on a project basis, through major “flagship” projects and collaborative “consortium” projects



Figures from www.chpc.ac.za

Not shown : CHPC phase 1₃

A more holistic view of the HPC resources in South Africa



7 functional sites
O(1000) cores
O(100 TB) permanent storage

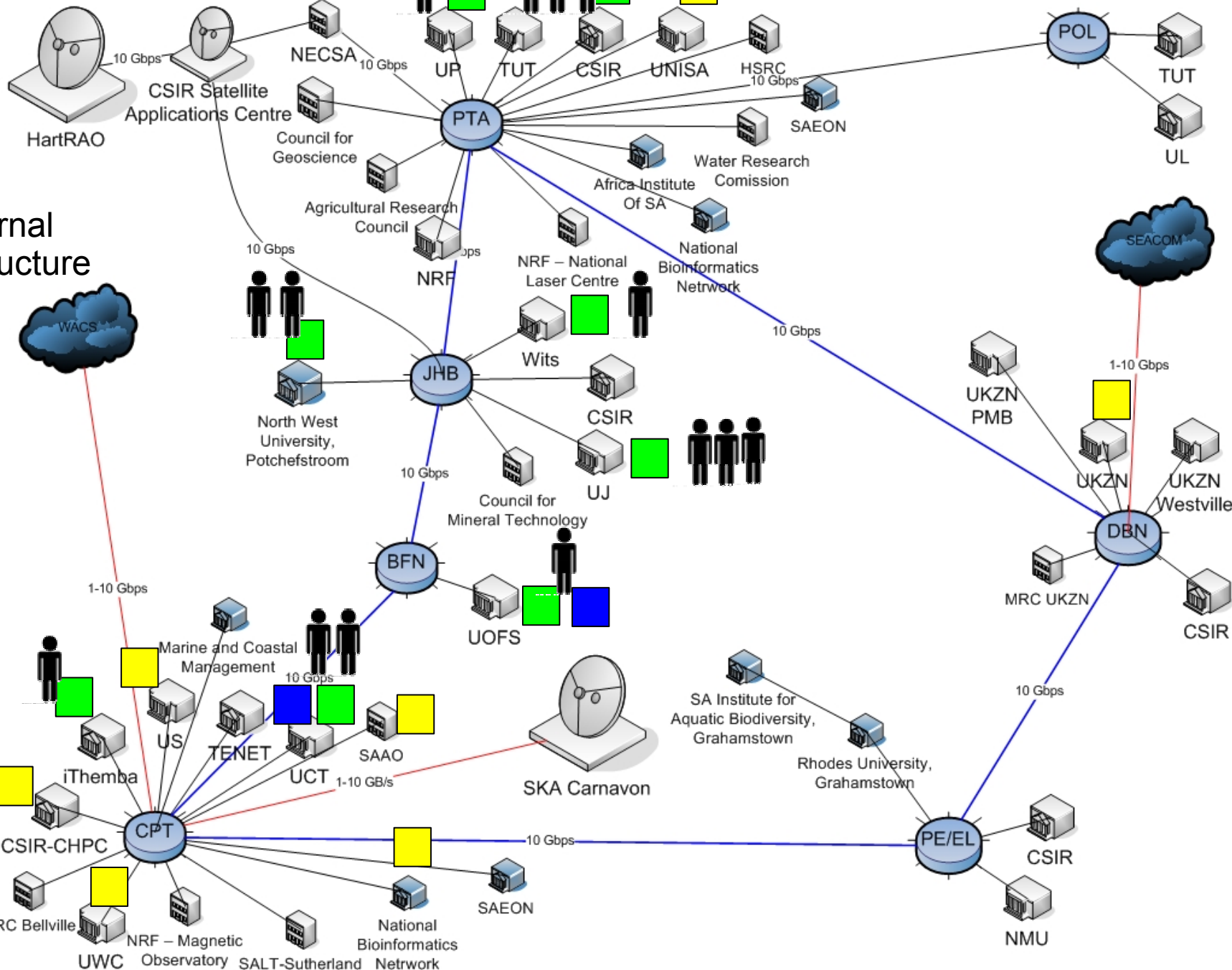
Phase 1 sites (JRU)

“interested/under discussion”

Core services



External infrastructure





SAGrid : An example of an integrated infrastructure initiative

- A coordinated effort to address all aspects of e-Infrastructure deployment, management and usage, modelled on experiences of similar projects worldwide
- Services provided by SAGrid to **users and scientific collaborations** :
 - Identity and security infrastructure
 - User Training
 - Application and User Support
- Services undertaken by **SAGrid resource providers**
 - Compute resource deployment
 - Operations
- **Overall coordination and coordination** with other infrastructures
 - Interoperability (EGI and other international infrastructure)
 - Network coordination (TENET, SANReN)
 - VO-level collaboration and new collaborations on the grid



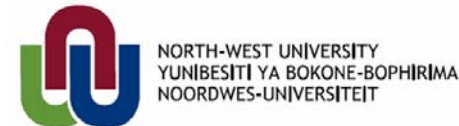
Frameworks

Management
Support
Training
Application Deployment



SAGrid Joint Research Unit

- SAGrid is a federation :
 - A technical collaboration to enable scientific collaboration, members of a Joint Research Unit
 - Adhere to principles and themes which they find self-evident
 - Agree to pool, share and jointly manage resources
 - Provides a framework for participation to collaborative projects aimed at deploying, maintaining and improving e-Infrastructure
 - Designates a “flagbearing institute” to represent the federation (currently Meraka)
 - An open document, inspired by very successful Italian Grid Initiative (IGI)
 - Precursor to a more formal National Grid Initiative (NGI) – along the lines of EGI model.



Support : South African National Grid Operations Portal



SOUTH
AFRICAN
NATIONAL
GRID



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Request Support

Documentation

SAGrid portal and links

Timeline

Roadmap

View Tickets

[Last Change](#) | [Watch This](#)

There are 65 currently Open tickets (all milestones)

#23, #24, #25, #26, #82, #97, #99, #100, #106,
#108, #109, #122, #128, #129, #132, #135,
#140, #141, #147, #155, #157, #159, #163,
#164, #165, #166, #168, #169, #172, #186,
#199, #203, #205, #206, #208, #211, #212,
#214, #215, #216, #217, #218, #220, #221,
#225, #226, #229, #230, #231, #232,
#235, #236, #238, #239, #247,
#253, #254, #255, #257, #258

Your current work

#23, #24, #25, #26, #82, #97, #99, #100, #106,
#108, #109, #122, #128, #129, #132, #135,
#140, #141, #147, #155, #157, #159, #163,
#164, #165, #166, #168, #169, #172, #186,
#199, #203, #205, #206, #208, #211, #212,
#214, #215, #216, #217, #218, #220, #221,
#225, #226, #229, #230, #231, #232,
#235, #236, #238, #239, #247,
#253, #254, #255, #257, #258

[New User Support and Operations Portal](#)

[New User Support on EVO](#)

[Monitoring at GSTAT](#)

[Milestones](#)

[Tickets Overview](#)

[Starting Points](#)

Welcome to the SAGrid Operations Portal

This is the operational portal for the South African National Grid - SAGrid. The computing infrastructure is based on the [gLite](#) middleware stack from [EGEE](#). SAGrid part of the [GILDA](#) (Global Grid Infrastructure Dissemination Activities) and the [Italian Grid Infrastructure \(IGI\)](#) for training and upstream technical support for the user and site support, as well as an interface to other support systems, from

- [GILDA](#)
- [Enabling Virtual Computing \(EVC\)](#)
- [Global Grid User Support \(GGUS\)](#)
- [IGI Operations](#)
- [Centre for High-Performance Computing Helpdesk](#)

and others. Once you [log in](#) ([register here](#) if you don't have an account yet), you will see more context-driven menus.

- **If you are an SAGrid operator:** Start with the [SAGrid Site Operations Handbook](#), where you can find more information on the todo list, minutes from meetings and other technical documentation for day-to-day management of SAGrid sites. While you're about it, why not pick up one of the currently open tickets ? For more information on the responsible persons at each site, please see [SaGridSiteOperationsContacts](#).
- **If you are a user:** you can submit a support request using the ["New User Support Request"](#) above. To contact the SAGrid user community, you can also write to sagrid@lists.sagrid.ac.za.

Discussions under way for integration of ops.sagrid into GGUS and GOCDDB → new : AfricaRoc recently created !



Training

- User communities need to be provided with relevant and easy-to-use services
- Coherent deployment and operations requires that various communities are trained in parallel :
 - Technical specialists, site administrators
 - Users and application developers
- An entire infrastructure is required in order to allow this training : a ***t-Infrastructure*** !
- T-Infrastructure serves as :
 - Immediate access point for user communities in areas with no grid infrastructure
 - Model for creation of new SAGrid VO's
 - Incubation and testing ground for prototype deployment





The EPIKH Project : www.epikh.eu

“Exchange Programme to advance e-Infrastructure Know-How” (EPIKH)

EU FP7- Marie Curie Actions – People - International Research Staff Exchange Scheme (IRSES)

Consortium “numbers”:

23 partners;

18 countries;

4 continents (**Africa**, Latin America, Asia, Europe);

115 persons involved;

>650 researcher-months;

>500 secondments;

Duration: March, 1, 2009 – February, 28, 2013 (48 months)

EC contribution: 1,188,000 €





The EPIKH Partners

(coordinator : Roberto Barbera. INFN (CT) and Consorzio COMETA)

- | | | | | | | | | | | | |
|--------|---|---------------|--------|---|-------------|--------|---|--------------|--------|---|---------------|
| No. 1 |  | COMETA | No. 2 |  | MTASZTAKI | No. 3 |  | CIEMAT | No. 4 |  | UTFMS |
| No. 5 |  | ERI | No. 6 |  | CSIR | No. 7 |  | IHEP | No. 8 |  | CESNET |
| No. 9 |  | CEFET-RJ | No. 10 |  | ISI | No. 11 |  | JUNET | No. 12 |  | CERIST |
| No. 13 |  | UTIC | No. 14 |  | PKU | No. 15 |  | SCS-TAU | No. 16 |  | CNRST |
| No. 17 |  | BUAA | No. 18 |  | CNRS | No. 19 |  | UFRJ | No. 20 |  | UNAM |
| No. 21 |  | INFN | No. 22 |  | GRNET | No. 23 |  | UCT | | | |



Interoperability



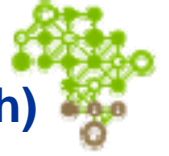
- Service-level infrastructure interoperability crucial to collaboration
- SAGrid provides a near clone of Italian Grid Infrastructure middleware release for all services
- Sites 100 % self-supported, maintained in concert with IG middleware releases
- Training material and events provided in joint events with GILDA




Lightweight Middleware for Grid Computing



Interoperability means : EGEE VO's are more easily accessible to (South) Africans – research activities open up.




EGEE Applications Registry

Home
User
Download
Admin

Logged In as: User










You are in: [Region: EGEE](#) >> [User](#) >> [Registry](#) Click [here](#) for regional contacts.

Records shown 1 - 10 of 247

Custom Filter All Fields Whole words only

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		Id	Logo	Acronym	Application Name	Discipline	Sub-Discipline	Description	Scientific Contact	Web Site	Region	VO
View		48		LAWEF-GRID	Limited Area Weather and Environmental Forecasting on a Grid Platform	Earth Sciences	Meteorology	This application is targeting to produce early warnings related with hazardous weather events. Such real time operations are approached using the MPI based Skiron/Eta weather forecasting system for short time periods (18 hours forecasting horizon). Using the concept of "nowcasting", the system is daily integrated on a very high resolution domain (~5 km) covering the wider area of Eastern Mediterranean. The normal operation of the computational model runs in a deterministic fashion under Grid ... more	View ...		SEE	gridcc
View		50		AMIAS	A Model Independent Analysis Scheme (AMIAS) for Extracting Multipole Amplitudes.	Life Sciences	Other	A novel method for extracting multipole amplitudes in the nucleon resonance region from electroproduction data is applied. The method is based on statistical concepts and it relies heavily on Monte Carlo and simulation techniques; it produces precise identification and determination of the contributing multipole amplitudes in the resonance region and for the first time a rigorous determination of the associated experimental uncertainty. The results are demonstrated to be independent of any model ... more	View ...		SEE	SEE
View		51		AA-GISSmodelE	Academy of Athens-NASA-Goddard Institute for Space Studies modelE	Earth Sciences	Metrology	To better understand and describe Earth's Climate and address past and future climate change, natural as well as anthropogenic, at the Centre for Atmospheric Physics and Climatology in the Academy of Athens, we employ a hierarchy of numerical models of different resolutions, geographical extent, and parameterization complexity. 1) A state-of-the-art coupled Atmosphere-Ocean-Land-Ice numerical model that was developed at NASA-Goddard Institute for Space Studies in New York City. The model has b ... more	View ...		SEE	SEE
View		53		CAMx-UOA	Numerical simulations of meteorology and atmospheric pollution	Earth Sciences	Meteorology	The first application that will be attempted through SEE uses the atmospheric pollution model CAMx. Current simulations involve atmospheric aerosol over Greece and Attica. Special focus is given on sea-salt aerosol production and chemical interaction with other pollutants.	View ...		SEE	SEE
View		49		STFCAPP	Simulation of three-dimensional folding by prediction of critical amino acid positions in proteins	Life Sciences	Biophysics	This application lies in the field of Bioinformatics and more precisely, in the domain of ab initio prediction of protein folding. From the point of view of Biology and Biophysics, it simulates the initial stages of the folding process of a polypeptide chain into a unique, globular, stable and biologically functional protein. By using only amino acid sequence data, it provides a set of amino acid residues, called MIRs, which play a critical role in the folding process. The knowledge of these re ... more	View ...		SEE	SEE
View		54		In Silico	Development and customization of an in silico (computational) oncology	Life Sciences	Other	The in silico oncology application concerns four-dimensional simulation models of tumour growth and tumour and -to a lesser extent- normal tissue response to radiotherapeutic or chemotherapeutic schemes. The goals are a better understanding of cancer disease and a	View ...		SEE	SEE

Virtual Organisations supported on South African infrastructure



Catch-all SAGrid VO for SA applications and individual users



GILDA VO for new users and development of new applications

<https://voms.virt.sagrid.ac.za/voms/sagrid>



**CERN/LHC :
HEP,
experimental
nuclear
physics**

Enable access to all EGI-supported VO's for African researchers, by participating directly as NGI



**Bio-chemistry,
materials**



**Bioinformatics/
Drug discovery**

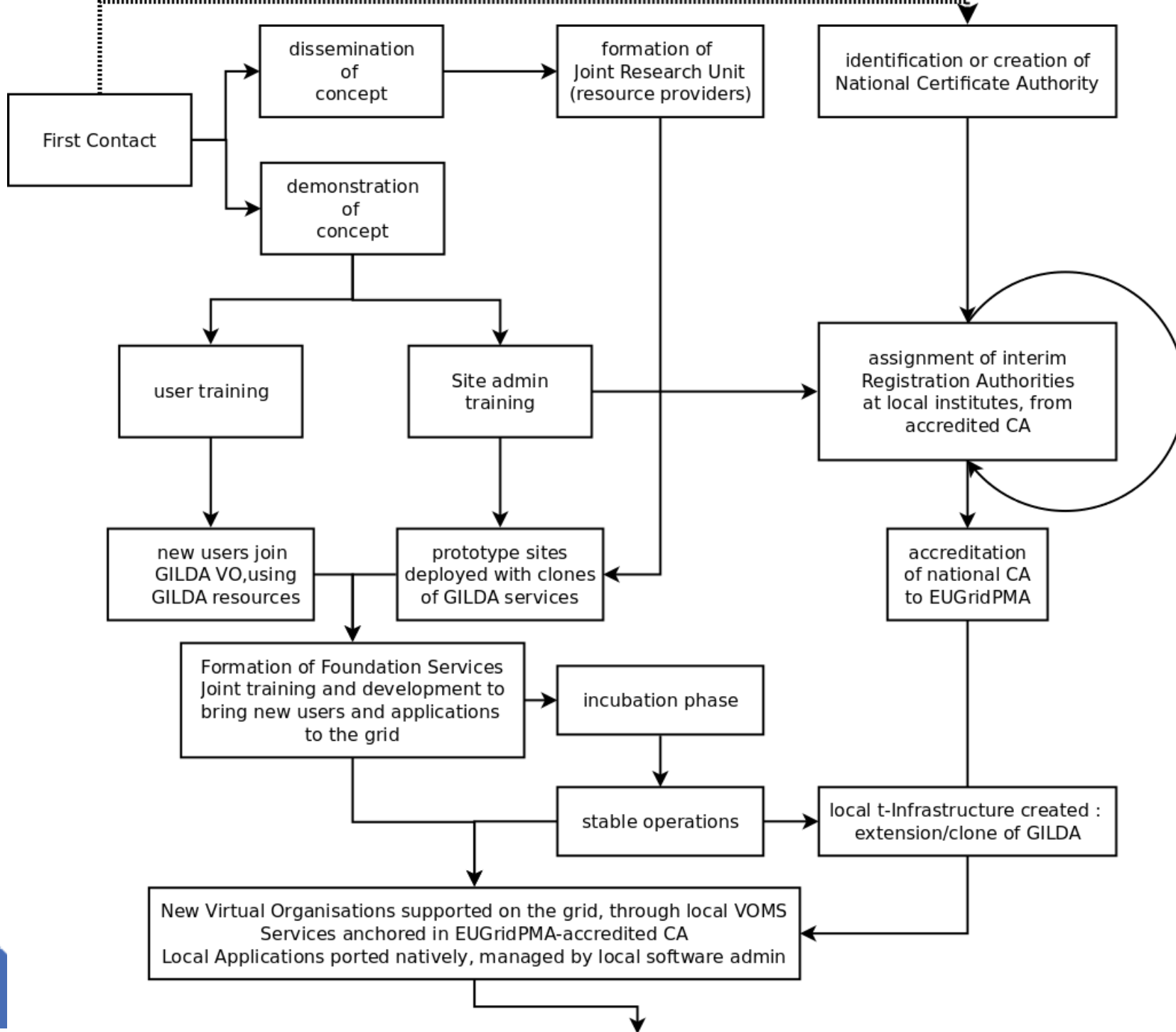


SAGrid : ported applications and development projects

- EGEE/EGI VO's and **applications** enabled per-site “on demand”
- Permanent call for applications – treated prior to porting workshops
- Several new applications ported during porting workshop :
 - Selected 8 from ~ 36 submissions ; Others will be addressed at other porting schools.
 - Ported :
 - Molecular Dynamics (NAMD, AutoDock)
 - Gene sequencing (WCD)
 - Genetic Programming (Comp Sci)
 - HTK (Human Languages Technologies)
 - Detector design, simulation (GEANT4)
 - Earth Observation and Disaster Modelling (GIS/GRASS)
- Developing the “client” model for cooperative projects which do not provide resources
 - Eye towards sustainability and wider use of infrastructure
 - Strong collaboration with Foreign Affairs Ministries of France and Italy
- Investigating Data Management system for SALT, SKA.



A blueprint for the future : exporting what we have learned



African Collaborations “on the grid”

- Brain Gain Initiative managed by UNESCO
 - 20 institutes in Africa, Middle east,
 - Several scientific domains, Operational and technical support from SAGrid
- Other projects :
 - ERINA4Africa
 - “Lighthouse” projects
- Regional scientific research projects (SKA, ASP2010, EGY)



United Nations
Educational, Scientific and
Cultural Organization



CHAIN : Ensuring relevance and connection with worldwide activities

Coordinator : Federico Ruggieri, INFN and Universita' Roma-III





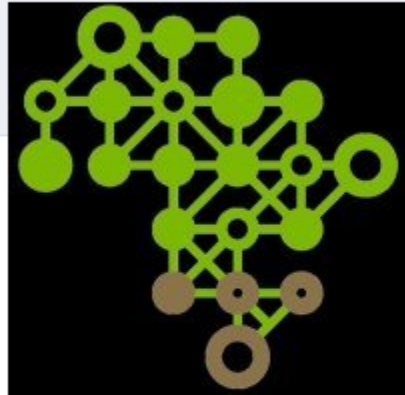
Summary

- SAGrid is coordinating distributed computing, focal point for e-Science and collaboration in South Africa and the region
- Good participation to FP7 programme, expected to continue
- Fully interoperable with EGEE/EGI “by design”, strong effort to ensure that Sub-Saharan region will be able to follow
- Infrastructure level is in place, applications and VO-level work in 2010 to ensure wide use and relevance of services.

Where to find more information

- SAGrid websites :
 - <http://www.sagrid.ac.za> (main website)
 - <http://ops.sagrid.ac.za> (user and site operations portal)
 - <http://docs.sagrid.ac.za> (digital repository)
 - <http://gstat.sagrid.ac.za> (monitoring)
 - <http://www.facebook.com/pages/South-African-National-Grid/162132040926>

Become a fan and follow "South African National Grid" on Facebook



Mangle Flag

Tell ye landlubbers with some hawkin'

Tell yer mateys

The South African National Grid is a federation of Universities, national laboratories and the National Cyberinfrastructure programme. This page is maintained by the SAGrid coordinator and operations team.

Spyins

Peer into the depths

18.5 **★★★★★**
Excellence of the scribblin's

6 Blabbers
For everrrry 7 sunrises o' sailin'

These har truths can only be looked upon by Davey Jones hisself

35 shipmates be appreciatin' this

South African National Grid The "grid and cloud" day at HPC Cetraro... where people claim they've been doing cloud computing since before it was called grid computing :) on Wens'dy Swab

Plank Cap'n's Log Portraits Jabberin' Rantin's Treasure Chests >> +

What be troublin' ye?

Attach some loot



Blabber t' yer mates

Cap'n South African National Grid an' other mates

Cap'n South African National Grid Scrawlin's from yer mateys

Adjust ye rigin's



South African National Grid The "grid and cloud" day at HPC Cetraro... where people claim they've been doing cloud computing since before it was called grid computing :)

One sunrise ago at 9:24 in the mornin' · Weigh in · Arr! · Promote



South African National Grid First NAMD jobs just ran on SAGrid: **Keelhaul**
<http://www.ks.uiuc.edu/Research/namd/2.7b2/notes.html>

NAMD 2.7b2 Release Notes

www.ks.uiuc.edu
// National Institutes of Health // National Science Foundation // Physics, Computer Science, and Biophysics at UIUC Contact Us // Material on this page is copyrighted; contact Webmaster for more information. // Document last modified on 12 Nov 2009 // 3458 accesses since 12 Nov 2009 .

Day o' the Moon roundabouts 6:39 in the evenin' · Weigh in · No longer agreein' · Blabber t' yer mates · Promote

Ye an' Gordon Wells an' Valeria Ardizzone an' Johan Eksteen fancy this.

Scrawl a message...



South African National Grid while work continues on application porting, we've been invited to present at at the International Workshop on HPC and Grids, in Cetraro,