

Executable Infrastructure for Regional Collaboration

Bruce Becker | bbecker@csir.co.za
Meraka Institute, CSIR



Outline

- Mission of the Africa-Arabia Regional Operations Centre
- Members and Peer Infrastructures
- The complexity of the ROC
- AAROC is DevOps.
- Tools of the trade
- What does this mean for the ROC ?



Mission

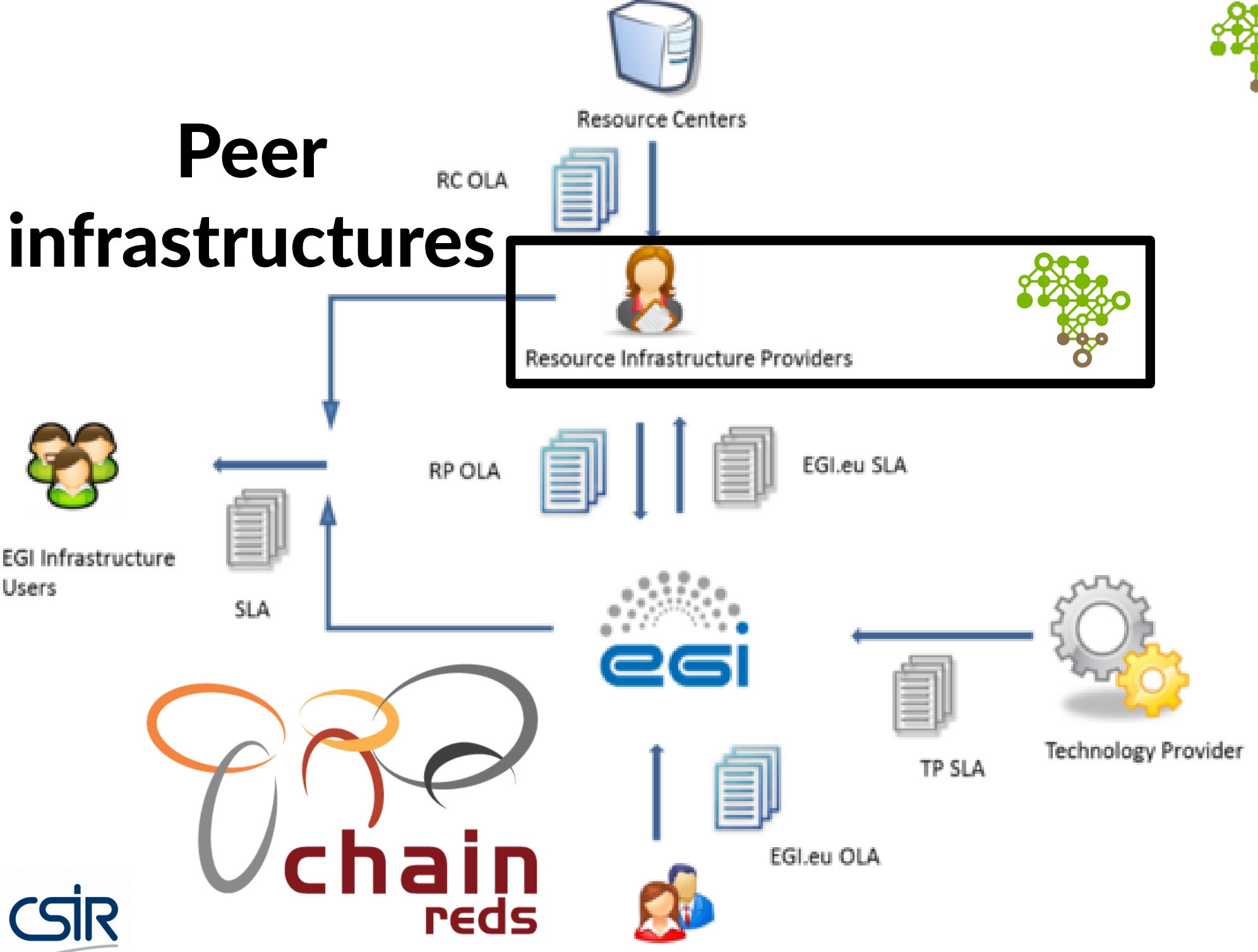
<http://www.africa-grid.org/AAROC/>

To promote and support ***collective, coherent and sustainable interoperability*** of e-Infrastructures within the region, to peer infrastructures in the rest of the world;

To act as a ***point of coordination and support*** to computational resource providers in the region, in order to promote and develop regional scientific and technical collaboration.”



Peer infrastructures



Africa-Arabia Regional Operations Centre



<http://www.africa-grid.org/sites>



ZA-UCT-ICTS



ZA-CHPC



ZA-UFS



ZA-UJ



ZA-WITS-CORE



ZA-MERAKA



MA-01-CNRST



EG-ZC-T3






DZ-ARN-01





Infrastructure Services

-  Information services
-  Accounting services
-  Compute services:
 - workload management and execution
-  Data services:
 - Data storage, movement and metadata
-  Identity services:
 - Roles, authentication, attributes
-  Monitoring and alerting services
-  Application Integration and delivery



How do we develop and maintain these services in Africa ?



Old issues in maintaining computing infrastructures

Service Configuration

- Drift – it was working yesterday !
- Reproducibility - Something happened
- Semantics – I did the thing, and then the thing happened
- Maintenance – Not my problem
- Portability – Now make it work over here



Old issues in maintaining computing infrastructures

- **Monitoring**

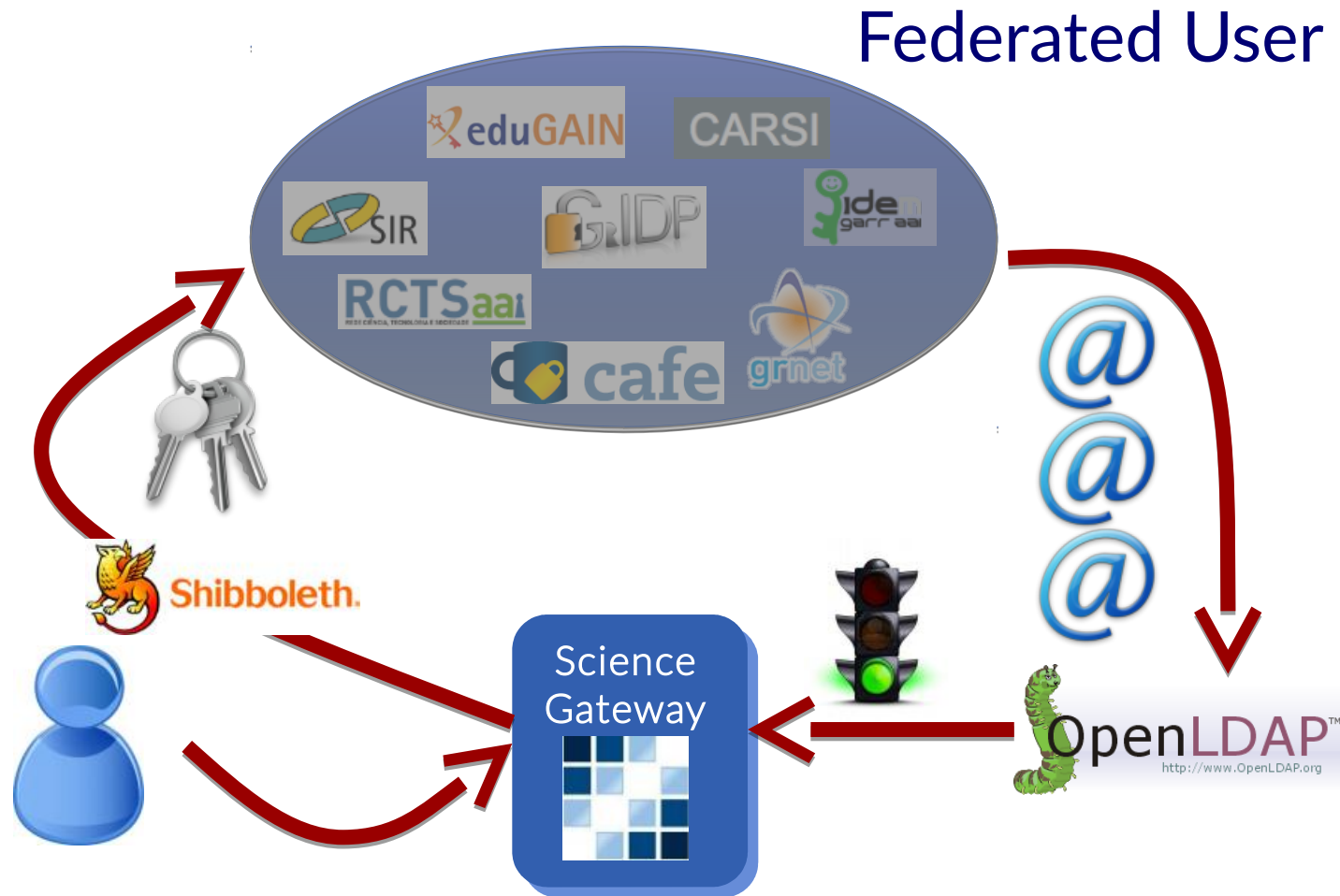
- Service X went down - get it back to it's previous state
 - Ok, what was that previous state ?! (See: Drift)
 - What tasks need to be executed ?

- **Disaster Recovery**

- Everything broke, fix it.
 - What's everything ?
 - How do we move from broken hardware to fixed hardware ?



An example - the science gateway



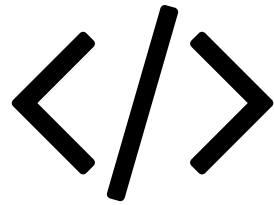


The issues in newer computing infrastructure

- Abstraction
 - What are we even running on ?
 - Does it even matter ?
- What is an "application" ?
 - The Science Gateway is an "application" of the cloud or grid infrastructure.



Everything = Code



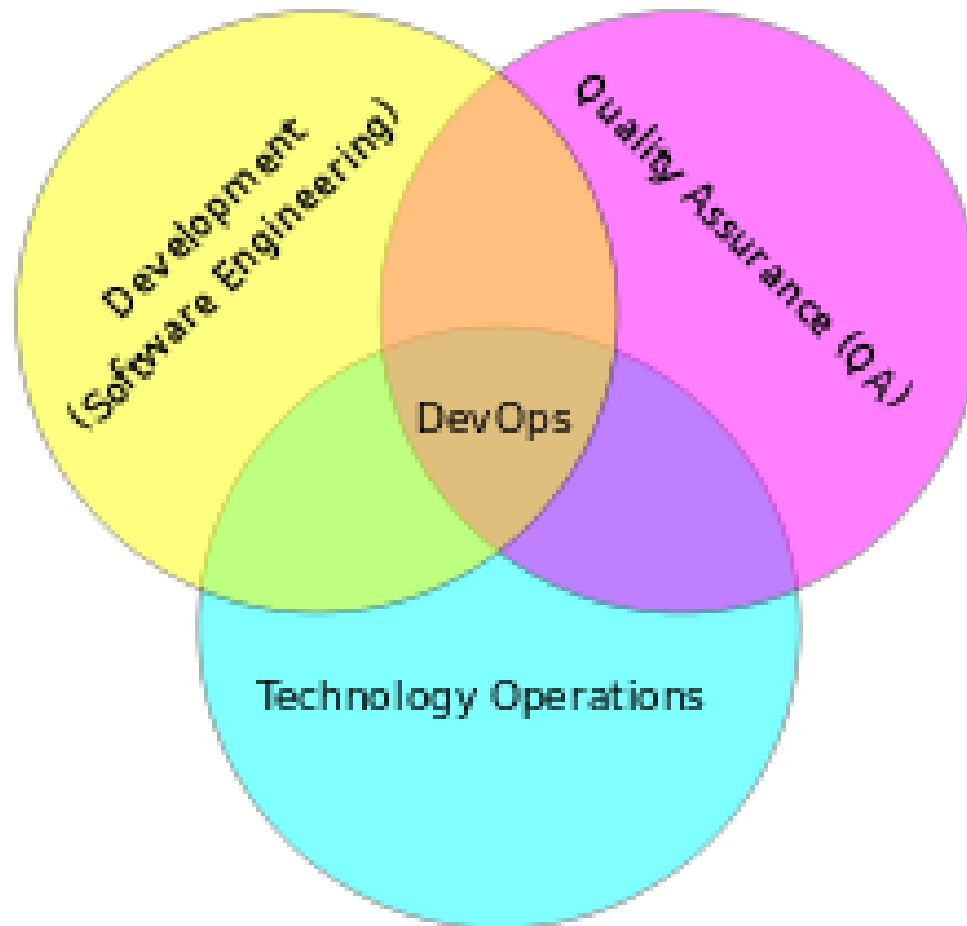


Here's the thing :

- Everything is code - Treat it like code !
 - Change control
 - Unit tests
 - Continuous Integration
- Code is *developed* and *tested*
- Services and configurations are put into operation
- → Enter DevOps



What is DevOps



<https://en.wikipedia.org/wiki/DevOps>



Collaborating with code

- **Distributed infrastructure ! Every site ...**
 - has a set of services which they offer
 - has different skill levels and human resources
 - needs to be configured in context
- **Problems:**
 - How do we maintain robust code and still maintain freedom at sites ?
 - How do we support new sites and quickly deploy new services ?



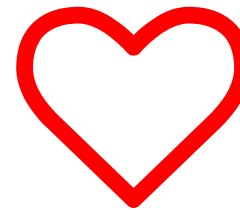
How do we do this ?

- **Executable Infrastructure:**

- Services are expressed as Ansible playbooks
- Site configurations are combinations of site variables and specific playbooks

- **Benefits :**

- Human-readable
- Forkable
- Executable





Example – Science Gateway

- **name**: Configure Liferay database (MySQL)
hosts: db-servers
roles:
 - **liferay-mysql**





- **name**: Prepare the Application and Web Server (Glassfish)
hosts: science-gateways
vars_files:
 - "roles/glassfish/vars/{{ ansible_os_family }}.yaml"**roles**:
 - **certificates**
 - **glassfish**

- **name**: Deploy and Configure Liferay Application
hosts: science-gateways
vars_files:
 - "roles/glassfish/vars/{{ ansible_os_family }}.yaml"
 - roles/liferay-mysql/vars/main.yaml**roles**:
 - **liferay-csgf**



AAROC

<https://github.com/AAROC/DevOps>

-  **Remote deployment:**
 - Sites can be remotely configured over the network
-  **Fork my infrastructure:**
 - *entire infrastructures* can be forked and deployed with minimal effort
-  **Service Remediation:**
 - Configuration drift and service recovery can be checked remotely
-  **Reproducible and Idempotent**
 - Code is tested before being put into production at every commit



AAROC

- Slack : a modern messaging platform.
- No more Ops meetings, no more emails
- All services and people in one place – <https://africa-arabia-roc.slack.com>
- Channels keep information contextual
- Integrated with the services we like – everyone knows what's going on.



github BOT 16:51

[CODE-RADE] New tag [v0.0.1](#) was pushed by [brucellino](#)



Bruce Becker 16:52

RELEASE THE somewhat incomplete Foundation Release 1 !!!



Travis CI BOT 16:55

Build [#37 \(41b7d64\)](#) of AAROC/CODE-RADE@v0.0.1 by Bruce Becker passed in 3 min 43 sec



github BOT 17:02

[AAROC/CODE-RADE] Issue closed: [#37 Request: NetCDF](#) by [brucellino](#)

[AAROC/CODE-RADE] New comment on issue [#13: NETCDF won't build](#) (assigned to [brucellino](#))

Comment by [brucellino](#)

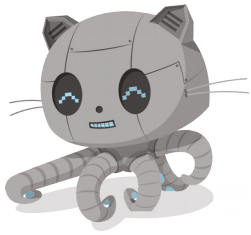
All done :

```
ls /cvmfs/devrepo.sagrid.ac.za/generic/u1404/x86_64/netcdf/4.3.2-gcc-4.9.2/*
/cvmfs/devrepo.sagrid.ac.za/generic/u1404/x86_64/netcdf/4.3.2-gcc-4.9.2/bin:
```

[how more...](#)



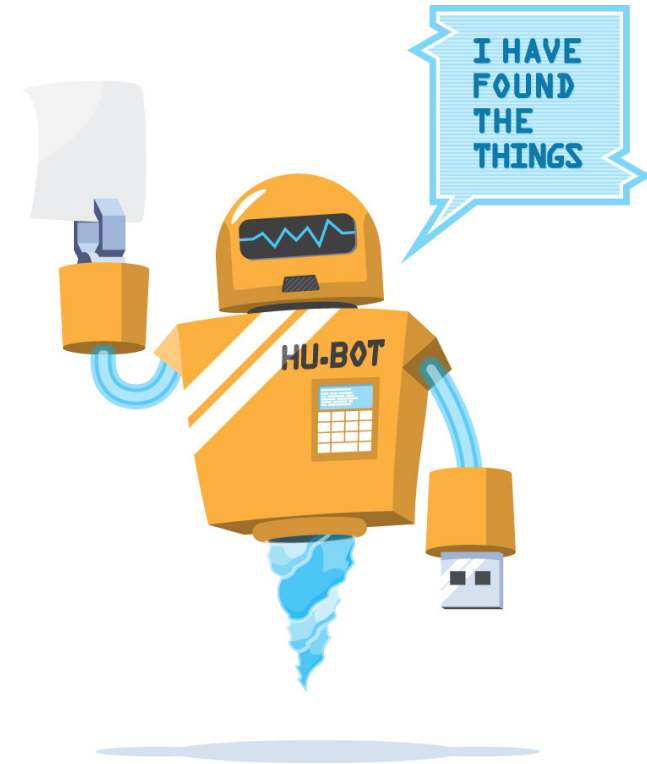
[AAROC/CODE-RADE] Issue closed: [#13 NETCDF won't build](#) by [brucellino](#)



Automation









Slackbot
keeps the team
happy and organised





Hubots connect humans
to services



-  **Ansible on vm04.ct.infn.it** BOT 17:29
Starting bootstrap on [vm04.ct.infn.it](#) at identity-dev
-  **Ansible on ui-dev.c4.csir.co.za** BOT 17:29 ★
bootstrap on [ui-dev.c4.csir.co.za](#) has run at ZA-MERAKA-DEV
-  **Ansible on ce-dev.c4.csir.co.za** BOT 17:29 ★
bootstrap on [ce-dev.c4.csir.co.za](#) has run at ZA-MERAKA-DEV
-  **Ansible on site-bdii-dev.c4.csir.co.za** BOT 17:29 ★
bootstrap on [site-bdii-dev.c4.csir.co.za](#) has run at ZA-MERAKA-DEV
-  **Ansible on wms-dev.c4.csir.co.za** BOT 17:32 ★
Starting bootstrap on [wms-dev.c4.csir.co.za](#) at ZA-MERAKA-DEV
bootstrap on [wms-dev.c4.csir.co.za](#) has run at ZA-MERAKA-DEV
-  **Ansible on localhost** BOT 17:38
Starting bootstrap on localhost at Travis
Starting bootstrap on localhost at Travis
Starting bootstrap on localhost at Travis
Starting bootstrap on localhost at Travis

 **TARS** BOT 19:26
joined #devops-bootstrap by invitation from @brucellino

 **Bruce Becker** 19:26
hi @tars
shellcmd ansibleping
tars shellcmd ansibleping

 **TARS** BOT 19:26
27.0.0.1 | SUCCESS => { "changed": false,
"ping": "pong"





Robots are our most productive teammates



Bruce Becker 16:32

I'm going to start a transaction and get WRF passing.



CVMFS BOT 16:34

Hello HOOMAN. Are CVMFS transaction before hook speaking. devrepo.sagrid.ac.za is going into transaction. Will be unavailable until publication of new version



jenkins BOT 16:46 ☆

jasper-deploy - #5 Started by changes from Bruce Becker (3 file(s) changed) ([Open](#))



jenkins BOT 17:05

netcdf-deploy - #24 Success after 13 min ([Open](#))

No Tests found.

Ok team - netcdf-deploy has just completed on master

netcdf-deploy - #24 Changes:

- minor fixes to the modulefile [Bruce Becker]



CVMFS BOT 17:07

Hello HOOMAN. Are CVMFS publish after hook speaking. devrepo.sagrid.ac.za has finished transaction and is once again published. LET THE SCIENCE BEGIN !



Bruce Becker 17:08

ok, v7 has everything that you need to build WRF





What does this mean for the ROC ?

- By developing robust and reliable code for service configuration, we can support more sites
- By applying software-engineering principles to infrastructure, we are able to maintain more services
- By working collectively, we can specialise and collaborate better
- Automation takes the load off humans who can focus on their jobs



What does this mean for you ?

- By joining the ROC, everyone wins :
 - Make better use of your local equipment
 - Connect to a dedicated and experienced DevOps team
 - Take advantage of agreements with EGI
 - Bring better services to your local research groups



What are you waiting for ?

 <http://www.africa-grid.org>

 <http://discourse.sci-gaia.eu>

 <http://github.com/AAROC>

 [@thesagrid](#)

 bbecker@csir.co.za

