Executable Infrastructure for Regional Collaboration

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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

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<th>ZA-UCT-ICTS</th>
<th>ZA-CHPC</th>
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<td>ZA-UJ</td>
<td>ZA-WITS-CORE</td>
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<td>MA-01-CNRST</td>
<td>EG-ZC-T3</td>
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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
- $\rightarrow$ Enter DevOps
What is 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 }}.yml"
  - **roles**: 
    - *certificates*
    - *glassfish*

- **name**: Deploy and Configure Liferay Application
  - **hosts**: science-gateways
  - **vars_files**: 
    - "roles/glassfish/vars/{{ ansible_os_family }}.yml"
    - roles/liferay-mysql/vars/main.yml
  - **roles**: 
    - *liferay-csgf*
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](https://africa-arabia-roc.slack.com)
- Channels keep information contextual
- Integrated with the services we like – everyone knows what's going on.
[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/ul404/x86_64/netcdf/4.3.2-gcc-4.9.2/*
/cvmfs/devrepo.sagrid.ac.za/generic/ul404/x86_64/netcdf/4.3.2-gcc-4.9.2/bin:
```

how more...
Automation

Slackbot keeps the team happy and organised

Hubots connect humans to services
Starting bootstrap on vm04.ct.infn.it at identity-dev

bootstrap on ui-dev.c4.csir.co.za has run at ZA-MERAKA-DEV

bootstrap on ce-dev.c4.csir.co.za has run at ZA-MERAKA-DEV

bootstrap on site-bdii-dev.c4.csir.co.za has run at ZA-MERAKA-DEV

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

Starting bootstrap on localhost at Travis

Starting bootstrap on localhost at Travis

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Starting bootstrap on localhost at Travis

joined #devops-bootstrap by invitation from @brucellino

hi @tars

shellcmd ansibleping
tars shellcmd ansibleping

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