

# HPC Certification Forum

Towards building an HPC  
workforce in Africa

HPCCF  
May 2020

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ACE Lab



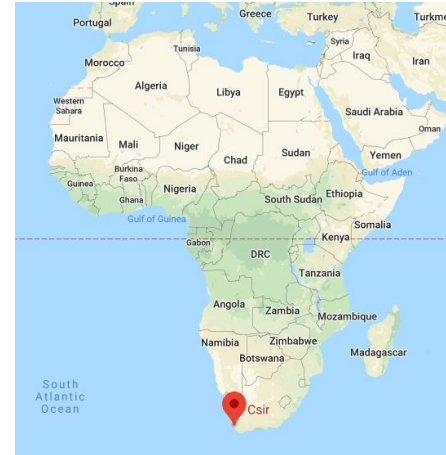
A national initiative of the Department of Science  
and Innovation and implemented by the CSIR

# # whoami



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and Innovation and implemented by the CSIR

HPCFF 202005



# CENTRE FOR HIGH PERFORMANCE COMPUTING

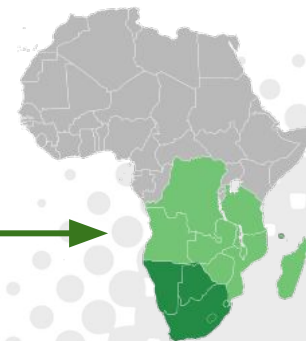
## NATIONAL SUPERCOMPUTING FACILITY

- 1PF system
- (just recently) formerly Top500
- Largest HPC System in Africa



## ... FOR RESEARCH COMMUNITY

- South African Academic Institutions & Research Facilities
- Southern Africa Community partners
- SKA partner countries



# ACTIVITIES: DEVELOPING AN HPC WORKFORCE IN AFRICA

**RESEARCH SUPPORT**

**SUMMER & WINTER  
SCHOOLS**

**STUDENT CLUSTER  
COMPETITION**

**HPC ECOSYSTEMS**

**(ACE Lab)**

# ACTIVITIES: DEVELOPING AN HPC WORKFORCE IN AFRICA

**RESEARCH SUPPORT**

**SUMMER & WINTER  
SCHOOLS**

facilitate  
advancements in  
research &  
optimisations

**(ACE Lab)**

# ACTIVITIES: DEVELOPING AN HPC WORKFORCE IN AFRICA

**RESEARCH SUPPORT**

**SUMMER & WINTER  
SCHOOLS**

Intro. to Scientific Computing  
Tools for HPC (~SWC)

Parallel Programming

Effective Cluster Usage

**(ACE Lab)**

# ACTIVITIES: DEVELOPING AN HPC WORKFORCE IN AFRICA

Outreach for U/G's

Compete  
Internationally

## STUDENT CLUSTER COMPETITION

CHPC Team Profile



Location: Cape Town, South Africa

Competition History: ISC 2013, ISC 2014, ISC 2015, ISC 2016, ISC 2017, ISC 2018, ISC 2019

Awards: ISC 2013 Gold, ISC 2014 Gold, ISC 2015 Silver, ISC 2016 Gold, ISC 2017 Silver, ISC 2018 Bronze, ISC 2019 Gold

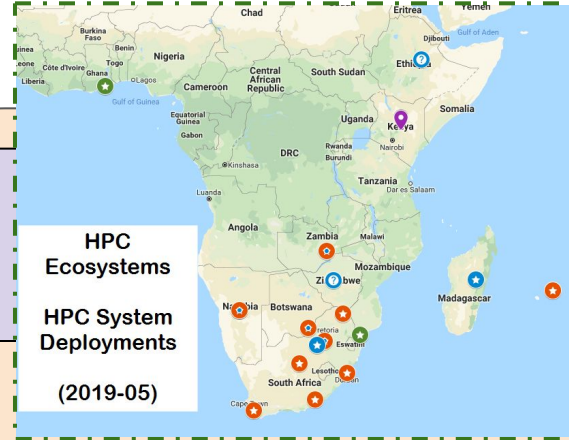
**(ACE Lab)**



# ACTIVITIES: DEVELOPING AN HPC WORKFORCE IN AFRICA

HPC System  
Deployments in Africa

HPC System  
Administrators



**HPC ECOSYSTEMS**

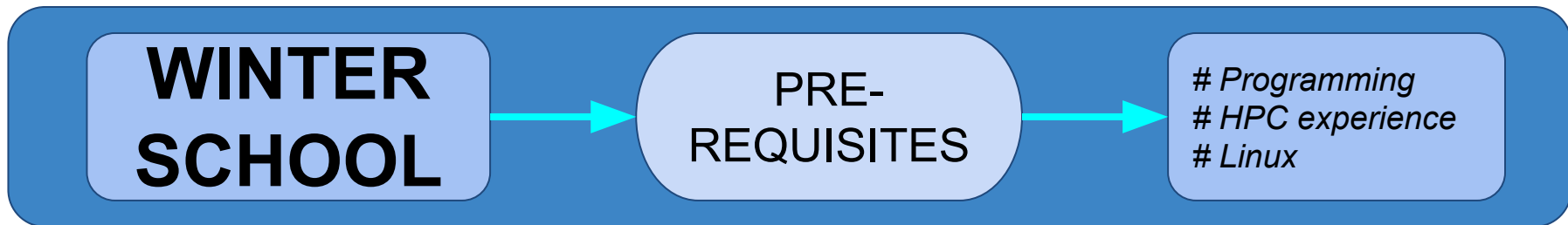
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# CHALLENGES & LESSONS LEARNED

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Gap in expectations

## Participants

Expect "everything"

- # basic Linux intro
- # basic programming
- # cluster usage 101

*Valuable time lost in  
class spent evaluating  
class ability & adjusting  
content delivery*

## Trainers

Expect "readthedocs"

- # core competencies

*(it's on the application form!)*

# CHALLENGES & LESSONS LEARNED

## WINTER SCHOOL

programming  
experience

Difficult to *“raise the bar”* when  
OpenMP and MPI classes include  
participants with no programming  
background (let alone experience  
on HPC system)

**Participants**  
Expect *“evening*

- # basic Linux intro
- # basic programming
- # cluster usage 101

**Trainers**  
Expect *“readthedocs”*

core competencies  
*(it's on the application form!)*

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# CHALLENGES & LESSONS LEARNED

**WINTER  
SCHOOL**

programming  
experience

**AN HPC CERTIFICATION  
PREREQUISITE CLARIFIES  
EXPECTATIONS &  
REQUIREMENTS  
BEFOREHAND**

**Participants**  
Expect “evening”

- # basic Linux intro
- # basic programming
- # cluster usage 101

**Trainers**  
Expect “readthedocs”

core competencies  
*(it's on the application form!)*

# CHALLENGES & LESSONS LEARNED



- **If it's free**, someone will take it.
- **A zero cost** can supersede rational & necessary time to prepare.
- Leadership's misunderstanding of what an HPC resource is confounds any useful allocation / adoption of scarce HPC resources.
- Site-assigned HPC SysAdmins vary widely in experience & background.
- Systems may arrive & sit idle for months while SysAdmins learn core skills.

***Valuable time  
lost.***

# CHALLENGES & LESSONS LEARNED

**HPC  
ECOSYSTEMS**

**AN HPC CERTIFICATION  
PREREQUISITE CLARIFIES  
EXPECTATIONS &  
REQUIREMENTS  
BEFOREHAND**

# SysAdmin XP  
# HPC knowledge  
# Linux (!!!)

- If it's free, some...
  - A zero cost can sur... necessary time to prepare...
  - Leadership's misundersta... resource is confounds any useful education... adoption of scarce HPC resource...
- ... HPC SysAdmins ... experience & ...  
... SysAdmins may arrive & sit idle for months while SysAdmins learn core skills.

***Valuable time  
lost.***

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# CHALLENGES & LESSONS LEARNED

## STUDENT CLUSTER COMPETITION

### UNEQUAL CONDITIONS

Some teams lack onsite expertise to mentor them & they rely on **one week school** for the bulk of their support for the entire competition.

### LIMITS ON OUTREACH

No capacity for ACE Lab to expand outreach beyond 20 teams with onsite ***Intro to HPC*** training.



# CHALLENGES & LESSONS LEARNED

STUDENT CENTER

**SCC CURRICULUM WELL-SUITED  
FOR OUTSOURCING INTRO TO  
HPC SYSADMIN CERTIFICATION TO  
ENABLE MORE TIME TO FOCUS ON  
HPC BENCHMARKING & REACH  
LARGER AUDIENCE**

UNEQUAL CO

OUTREACH

Some teams lack onsite support to mentor them & they rely on a **week school** for the bulk of the support for the entire competition

capacity for ACE Lab to expand outreach beyond 20 teams with onsite **Intro to HPC** training.

# WHY AN HPC CERTIFICATION

# WHY AN HPC CERTIFICATION

## WINTER SCHOOL

Focus on  
important HPC  
skills & improving  
scientific  
computing

## STUDENT CLUSTER COMPETITION

Reduce the bottleneck on  
introduction topics.

Reduce the workload for ACE  
Lab.

Expand the competition &  
outreach.

## HPC ECOSYSTEMS

Focus on enabling  
scientific computing  
resources and  
deploying working  
systems.

***GET TO THE SCIENCE***

# FINAL THOUGHTS

# FINAL THOUGHTS

- Know your audience (*what are we building from*)
  - What sort of experience & skills do they possess / require?
- Know your goals (*what are we building towards*)
  - What sort of skills should the audience gain at the end?

# CHPC\* HAS A DREAM

*\* Bryan, on behalf of CHPC, has a dream*

# HIGH-LEVEL SAMPLE HPC CERTIFICATIONS

<b>Introduction to HPC</b>	<ul style="list-style-type: none"><li>• What is HPC,</li><li>• why HPC,</li><li>• etc.</li></ul>	<ul style="list-style-type: none"><li>• Student Cluster Competition</li><li>• HPC Ecosystems Candidates</li><li>• HPC Users</li><li>• Datacentre Managers</li><li>• Institutional Leadership</li></ul>
<b>HPC System Administration</b>	<ul style="list-style-type: none"><li>• Software Stack</li><li>• Confirmed virtual cluster deployment</li></ul>	<ul style="list-style-type: none"><li>• HPC Ecosystems Candidates,</li><li>• Student Cluster Competition</li></ul>
<b>Scientific Computing</b>	<ul style="list-style-type: none"><li>• Job submissions</li><li>• Introduction to Parallel Computing</li></ul>	<ul style="list-style-type: none"><li>• HPC Users</li><li>• Student Cluster Competition</li></ul>
<b>Parallel Computing &amp; Programming</b>	<ul style="list-style-type: none"><li>• MPI code</li><li>• OpenMP code</li></ul>	<ul style="list-style-type: none"><li>• HPC Users</li></ul>

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# THANK YOU! (and stay safe)



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