Certification Strategy and Contributions

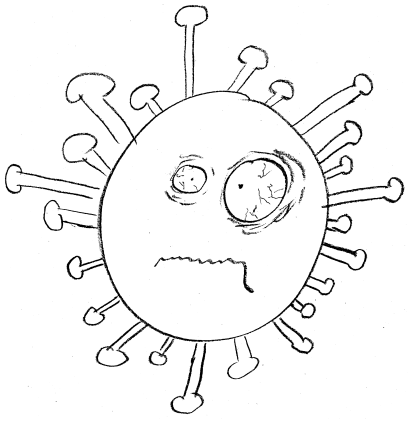
HPCCF Virtual Workshop

Christian Meesters (+ HPC Certification Forum)

HPC Group – Johannes Gutenberg-University of Mainz

2020-05-18

About Me

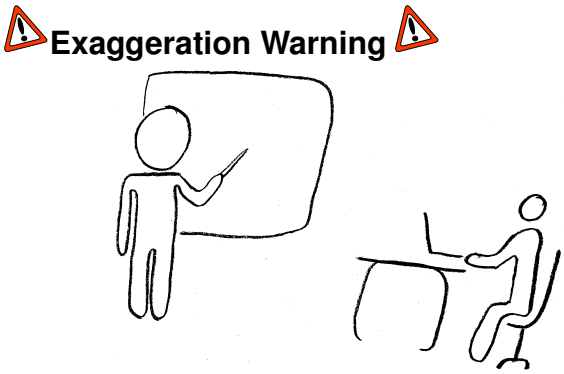


- I hope everyone is doing well.
- I hope we all be teaching *in personam*, soon-ish, again.

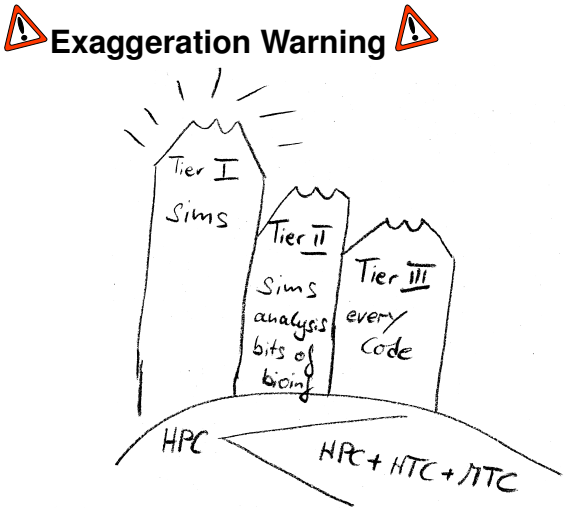
- PhD in Biophysics
- PostDoc in Genetic Epidemiology (Programming)
- detour in industry
- since 2014 Computational Scientist
- working with/at Tier II/III clusters . . .
- . . . as life science contact and lecturer

Outline

Two Types of Users

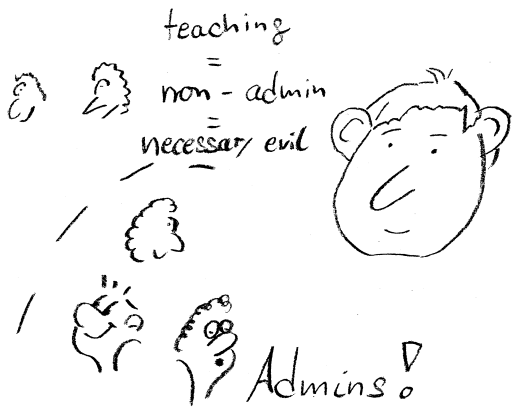


Range


Exaggeration Warning
Tier I
Sims
Tier II
Sims
analysis
bits of
bioinf
Tier III
every
Code
HPC
HPC + HTC + MTC

How the Site Manager looks on HPC Education

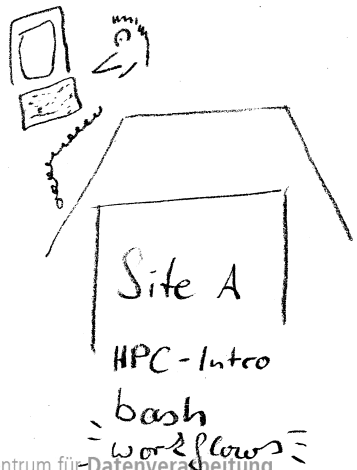
Exaggeration Warning



- ressources are always limited
- teaching ressources even more
- integration into HPCCF might offer more (still needed) courses

How Joe User looks on HPC

Exaggeration Warning



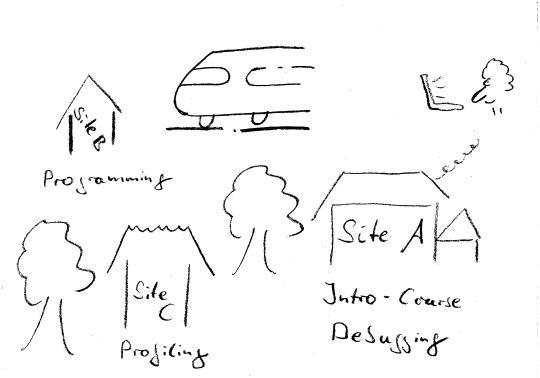
Most users

- . . . use 3rd party applications . . .
- . . . will need (yet not always visit) an intro course . . .
- . . . perhaps a scripting course . . .
- . . . only *really* interested in workflows taylored for their need.

And will never leave their site for other HPC courses!

How Bruce Coder looks on HPC

Exaggeration Warning



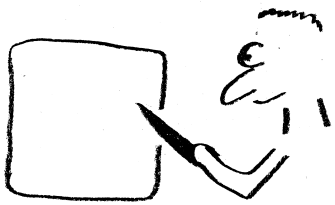
Only power users

- . . . will select *their* topics . . .
- . . . will care to travel for computing topics . . .
- . . . will rarely need intro courses . . .

HPCCF for Teachers – Anyway

Teachers, basically, get two benefits:

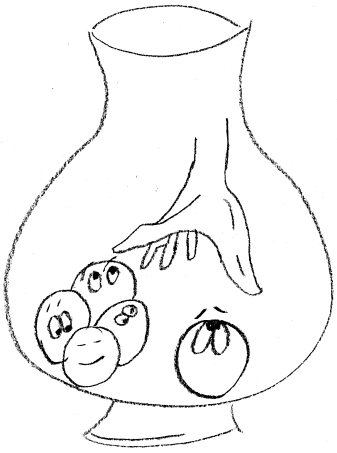
1. simpler / better content and course objective transparency
2. feedback from HPCCF with regard to course quality ("Did my students pass? How good?")
3. Plus: We have learned, that users appreciate when a course content apparently is not conceived in isolation.



Strategy

When conceiving a Certification Strategy the different views are in our mind.

Selecting Questions



Questions are randomly choosen from a pool:

- the pool may itself be a bundle of sub-branches of the skill tree
- each question will have a number of right and wrong answers in case of multiple choice questions

$\curvearrowright$ All examininations will be based on different sets of questions.

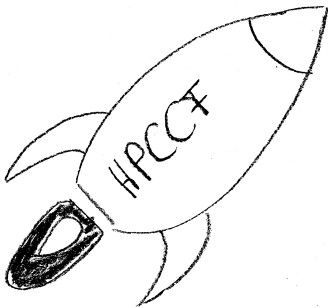
On Cheating

1. By confronting with random questions no perfect preperation can be accomplished.
2. There is a time-limit per question.
3. A registration prior to a test session is required.

No online system without ID checks and other measures is safe against cheating! Yet, our measures will raise awareness.

Boosting Acceptance

Want to hire a scientist?
We intend to provide a (sub)set of question for prospective employers. This way they will have an idea of the background, if a solicitant waves a HPCCF-certificate.



Disclaimer

Some examples are inspired by Greg Wilsons book

Teaching Tech Together (CRC Press, 2020)

Some ideas are based on own experience, some on other sources.

Purposes . . .

Before diving into Question Design, note:

- a question can be asked with a certain aim
- different courses ask for different knowledge / skills
- ↷ questions need to be designed and choosen with care

Multiple Choice – When?

Multiple Choice Questions (MCQs) are popular when designing e-learning tests . . .

Question

When are they most suitable?

Suppose you are teaching children and you give them this MCQ:

Excercise – Type: Testing Conceptions

What is 37 + 15?

a) 52 correct
b) 42 child did not understand “carrying”
c) 412 child treated every column seperately
d) 43 knows she has to carry 1, but to wrong column

Multiple Choice – When? (continued)

The Young-Child question rephrased for newbies to the SLURM batch system:

Excercise – Type: Testing Conceptions about SLURM

Think of a cluster with 20 core nodes. If a job is submitted with the following parameterisation, how many nodes are reserved?

```
#SBATCH -n 20
#SBATCH -c 2
```

a) 2 correct

b) 4 user did correctly multiply, but is not aware of the 20 cores

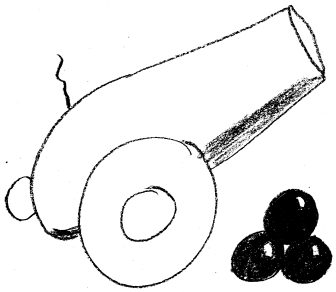
c) 1 user did not multiply by `-c 2`

d) unkown without `N`-flag user did not understand the concept

What is in the Arsenal?

MCQs aren't everything:

1. Freetext (if short and explicit)
2. Filling in blanks (for code; to be implemented)
3. Parson Problem (can by done as MCQ; shown in a minute)
4. Tracing (can by done as MCQ; in a minute)



Fill in Blanks

Filling Blanks is a (technical) variation on Freetext. It is more specific and the *blank screen of horror* issue is avoided, whilst the test might be testing “vocabulary”. An example:

Excercise – Type: Bash Operators

Which operator has to be filled in the place of ’_’ to print the statement in line 3?

```
1: number=4
2: if [ $((number _ 2 )) -eq 0 ]; then
3:     echo "$number is even"
4: fi
```

Hint

The answer is a single character.

Parsons Problems

Parsons Problems, too, avoid the *blank screen of horror* problem and also the vocabulary testing. Instead they allow the examinee to concentrate on the control flow.

Excercise – Type: Bash Loop & Math

Rearrange these lines to sum the values.

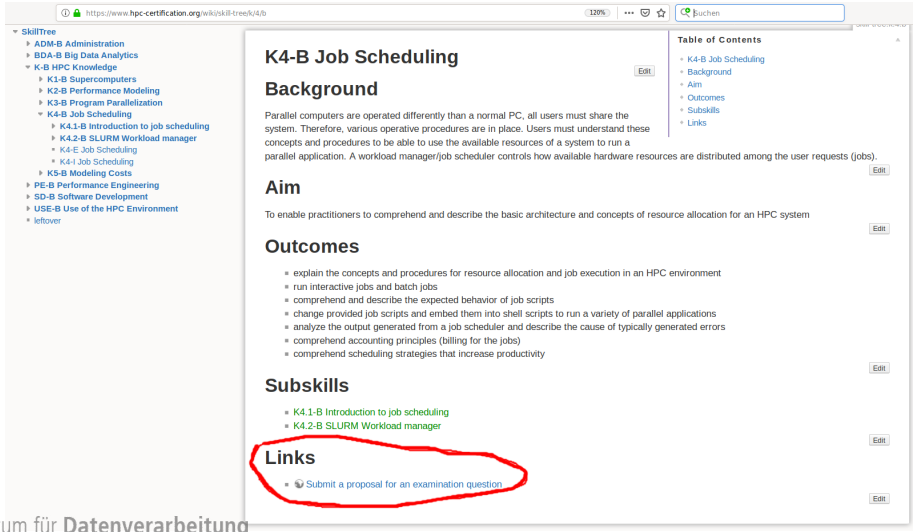
1: `done`
2: `values=(1 2 3 4)`
3: `for v in $values[@]; do`
4: `total=$((total + v))`

Real tasks can be longer and intricated - allowing test of control flow understanding.

Note

The answer can be a free text, e. g.: “2 3 4 1”, which is easy to parse and check.

Contributions via the HPCCF-Wiki



Contributions via the HPCCF-Wiki II

Each HPCCF wiki page contains a link. It leads to a little form asking for:

- contact mail
- to select a learning objective from a pre-formatted list
- to supply the question you thought of
- and (in case of a multiple choice question) the possible answers.

Evaluation Process

Now, HPCCF-member evaluate the submitted question. If approved, it will be formatted and merged into the pool of questions for the choosen topic / skillset.

Certification: Assessment Prototype

1. User takes multiple-choice test online (any time!)
   - A combination of JavaScript and a web service
   - System selects number of questions randomly from a pool
     - By submitting questions the related usage-allowance is granted to HPCCF
   - In case of sufficient numbers the system draws from a pool of different possible answers (MCQ-case).
2. Choices are submitted to the web server
3. *Manual approval* of the result
4. Automatic creation of certificate and returned by email
   - Permanent computer-verifiable proof is created about certification of skills
     - Return a text version with GPG signature
     - Return a link that can be verified on hpc-certification.org
5. Privacy: minimize information stored on servers, keep some for statistics

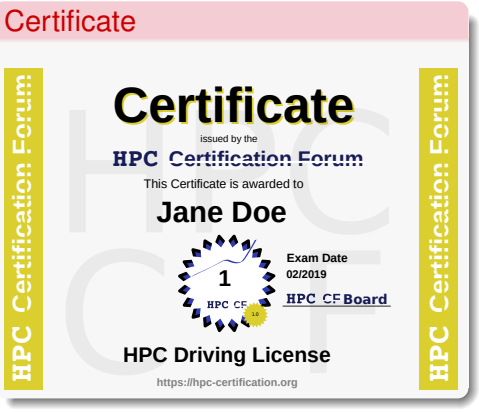
Includes some measure to prevent cheating and brute forcing (e.g., delay)

Certification: Certificate

Text representation

```
-----BEGIN PGP SIGNED MESSAGE-----
Hash: SHA512
HPC Certification Forum Certificate
This text confirms that "Jane Doe" has
successfully obtained the certificate
"HPC driving license" (id: 1) at 02/2019.
Verification URL: https://hpc-certification.org/[...]
-----BEGIN PGP SIGNATURE-----
[...]
-----END PGP SIGNATURE-----
```

Certificate



Thank You for Your Attention!