Jupyter Notebooks in NAF

Short overview for NUC

(A lot of material shamelessly stolen from Todd Tannenbaum & Johannes Reppin !)

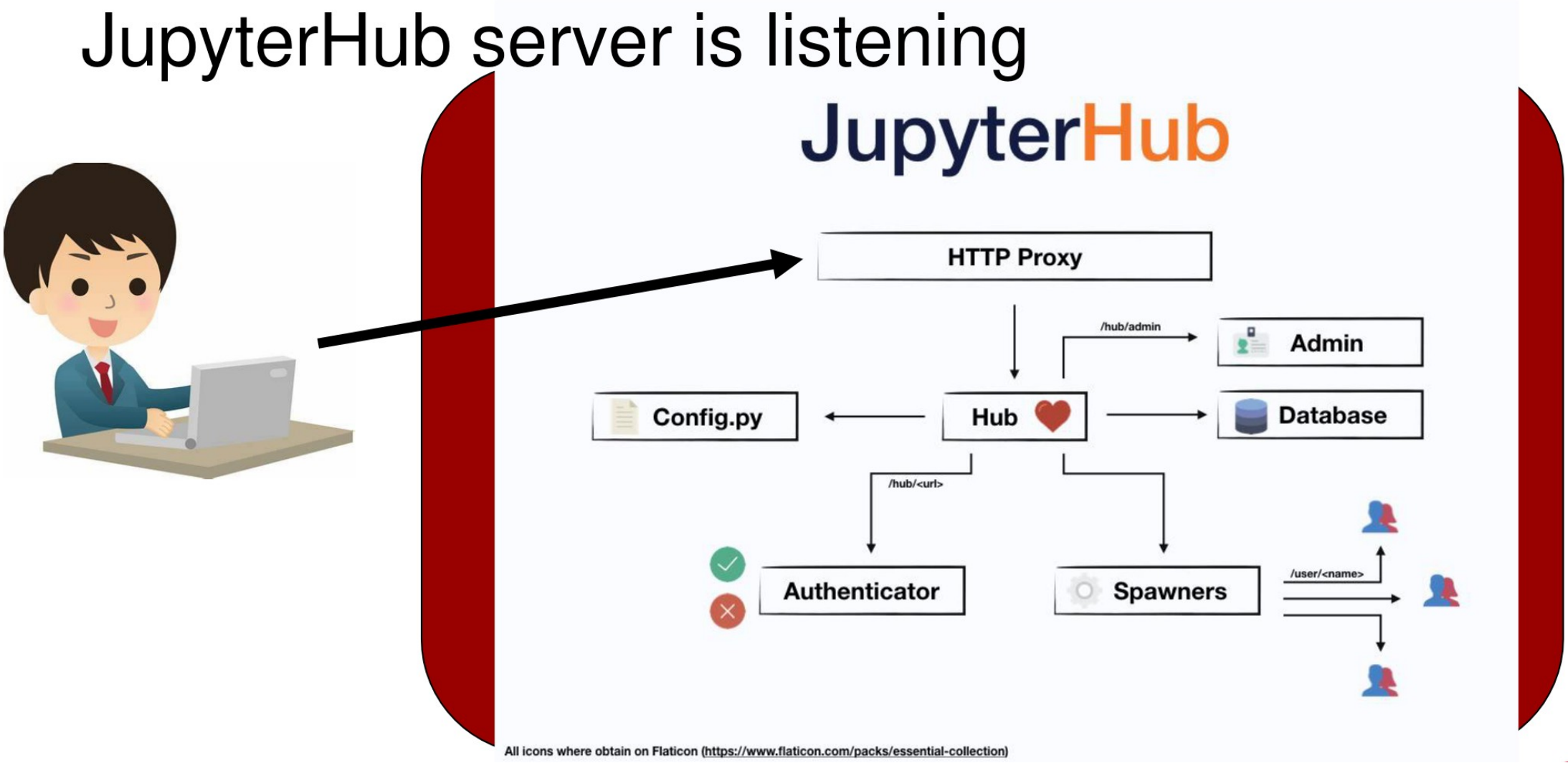
Beyer, Christoph
HH, 18-01-2021

Daily business

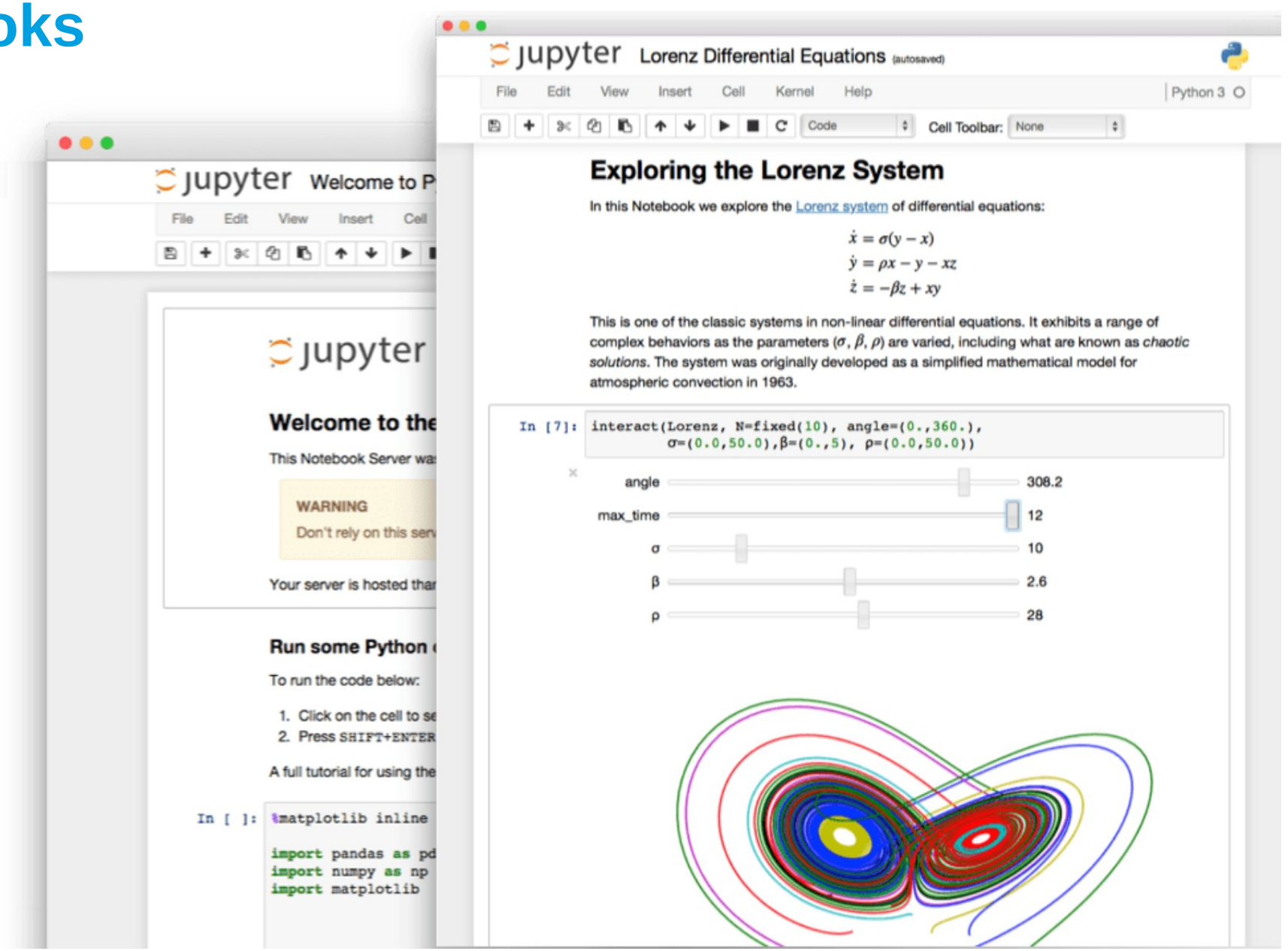
- SL6 decomissioning well under way, only very few remnants.
- Migration of old WGS hardware to VMs progressing slowly. Please report, if current setup not working ... and please report in a timely manner, so that we can investigate.
- Commissioning of end-of-2020-purchases: Delay due to working restrictions in the computing center. Currently making a plan, and prioritization. Will inform you about progress.
- Roughly 40 WN s for GRID and 20 WN s for NAF in the queue
- Parts of DUST will go out of warranty in Mai. Planning purchase. (same technology, different vendor)

Jupyter Notebooks – an interactive scientific environment

- Point your browser at a URL where a JupyterHub server is listening



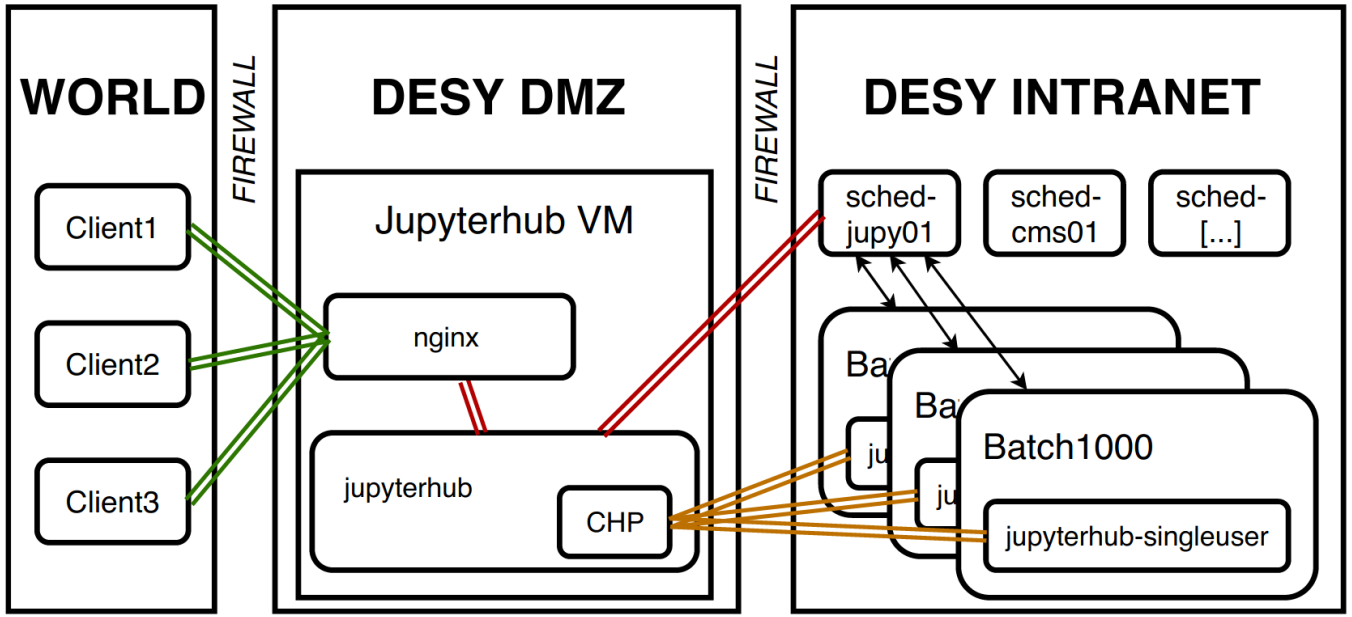
Jupyter Notebooks



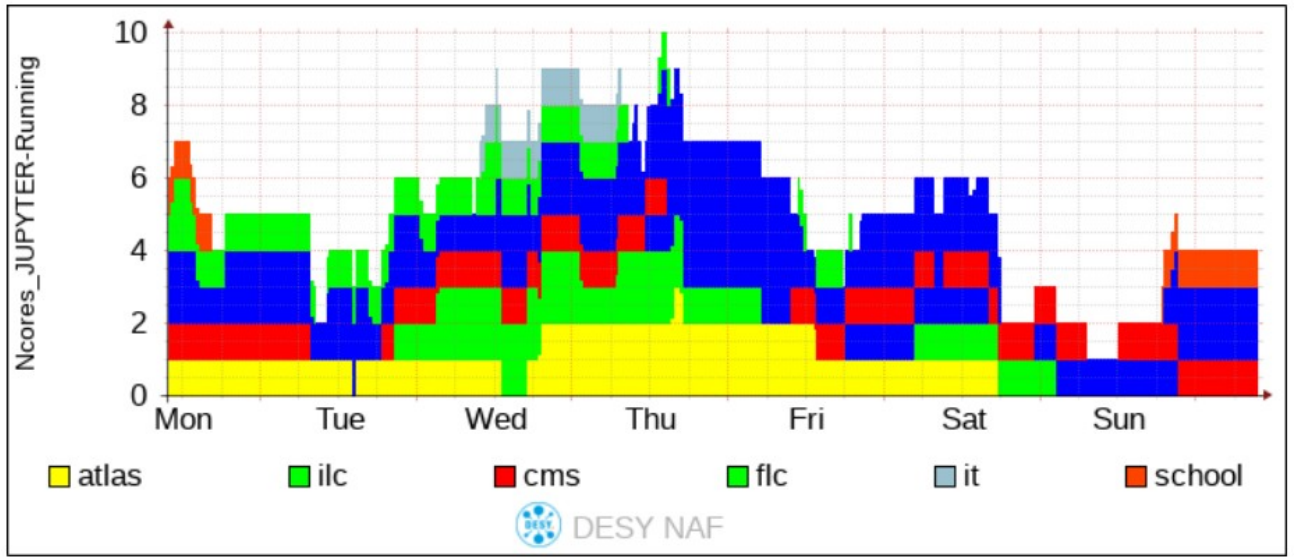
Current setup for the NAF

HTC computing with a notebook

- Access through webinterface worldwide (jupyterhub)
- Currently one slot reserved per host (= 300 slots)
- Cpus & memory used by other jobs when unclaimed
- Current slot setup: 1 core 1GB memory (3 GB memory usable)



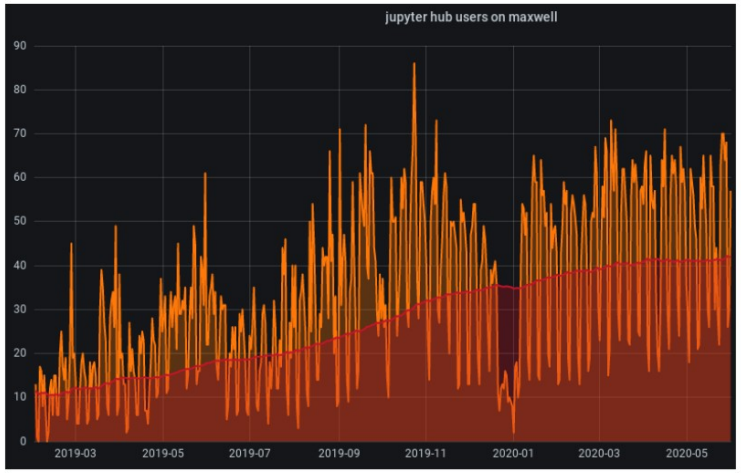
Python notebooks current usage



- Around 10 to 20 notebooks at a time
- Peak usage during CERN beamline for schools etc.
- Around 300 different users
- 1.500 accounts with NAF access

Notebook starts since summer last year by VO

```
belle   |################################ (2820)
atlas   |###### (594)
cms     |################ (1439)
flc     |###### (562)
pier    |# (181)
school  |#### (475)
uni     |## (227)
```



Using Python map (builtin function)

```
# Describe work
def double(x):
    return 2 * x

# Do work
doubled = map(double,range(10))

# Use results!
print(list(doubled))
# [0, 2, 4, 6, 8, 10, 12, 14, 16, 18]
```

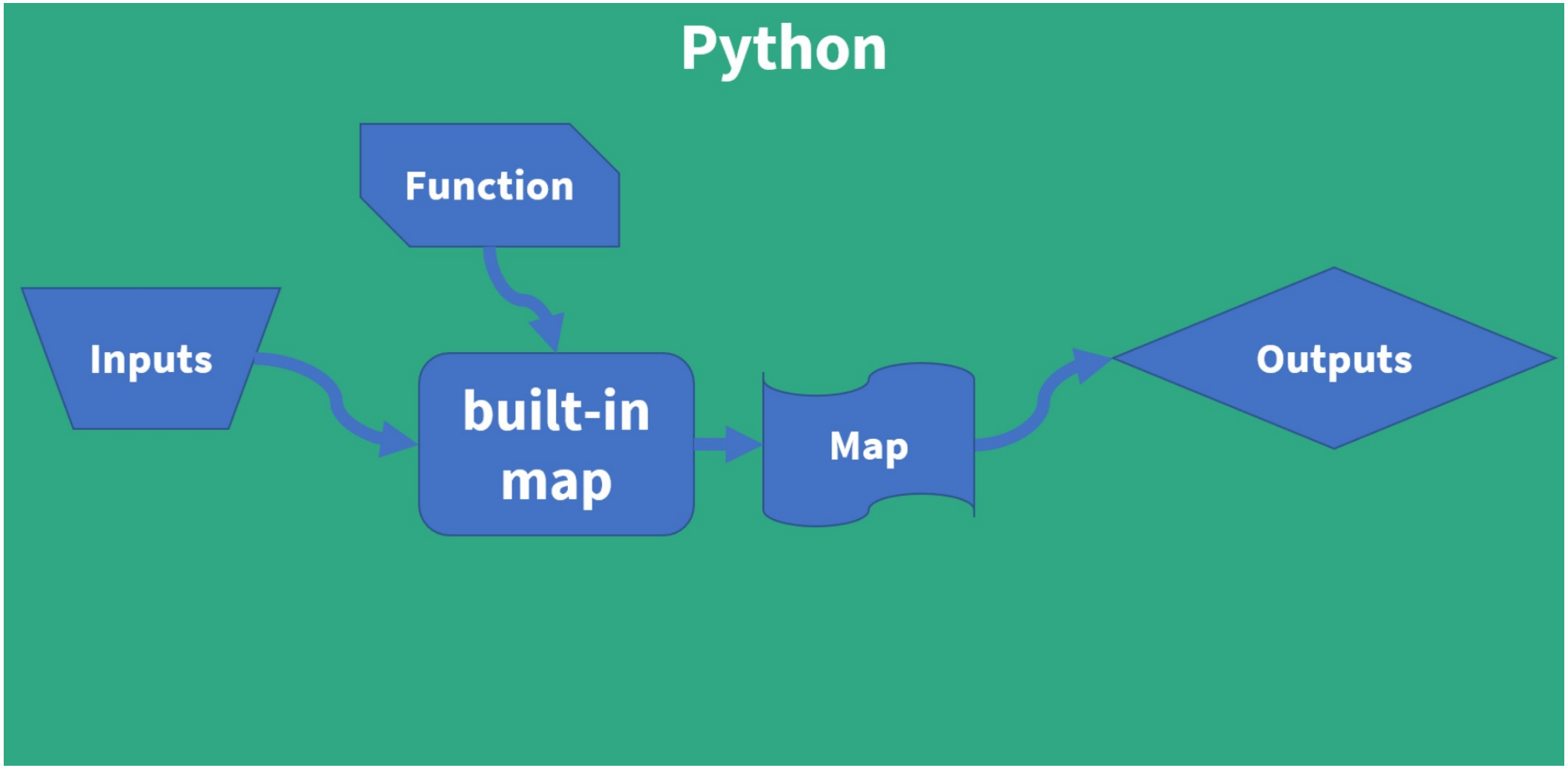
Limits/drawbacks

- What if this function takes minutes/hours ?
- What if you had hundreds or thousands of inputs ?
- Interactive behaviour = sitting in the waiting room

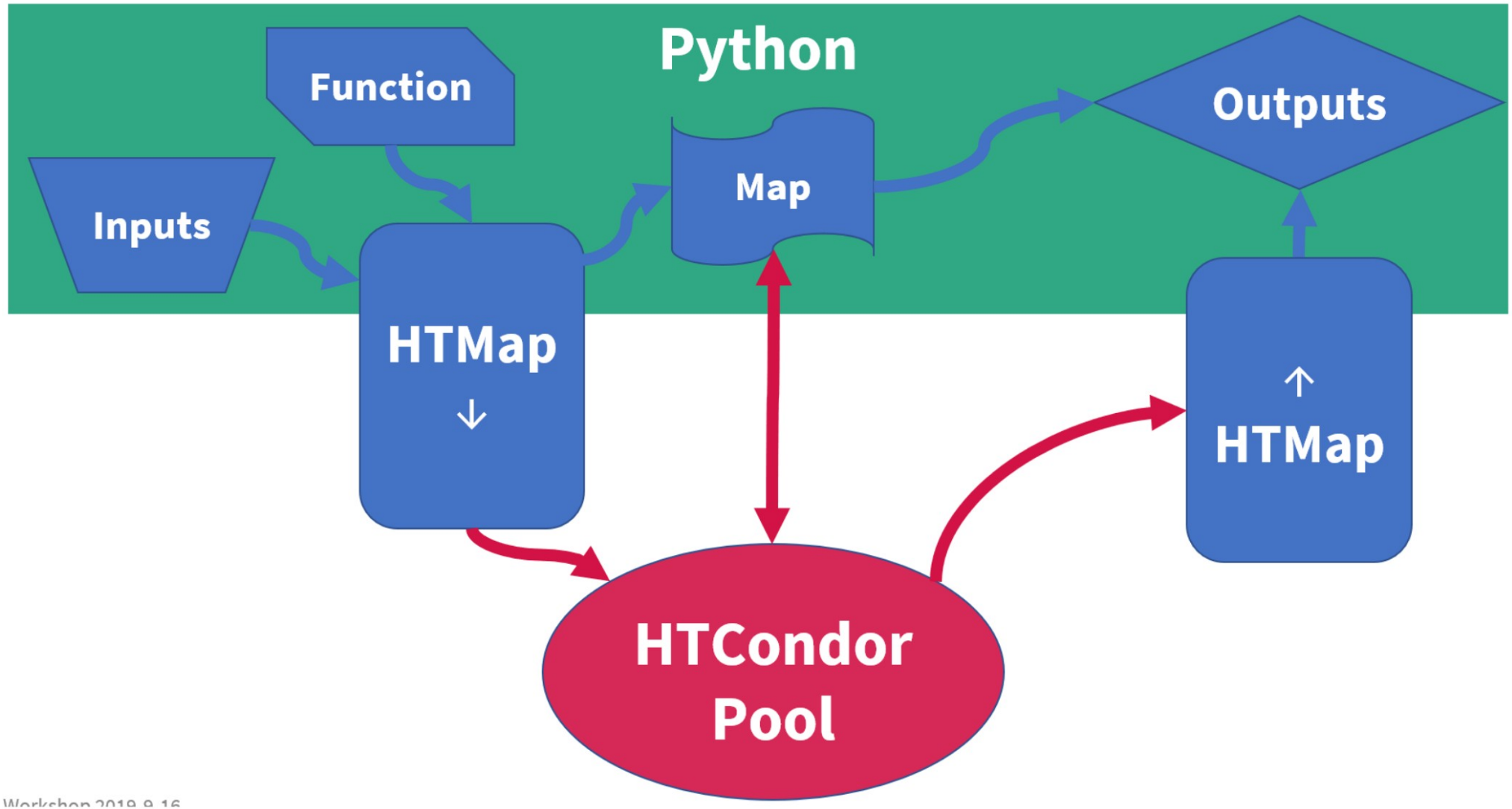
Using HTMap

```
import htmap
# Describe work
def double(x):
    return 2 * x

# Do work
doubled = htmap.map(double,range(10))

# Use results!
print(list(doubled)) # [0, 2, 4, 6, 8,
10, 12, 14, 16, 18]
```

Python Map



HTMap


Python
Function
Inputs
Map
Outputs
HTMap
↓
↑
HTMap
HTCondor
Pool

Conclusion

Notebooks with HTMAP

- Bring python based scientific computing to where the big boys play
- Notebook can be seen as a python based WGS
- Local resources shallow but access to compute farm **when needed and as long as needed**
- Minimum harm for others, as ressources dynamically used
- This even more important as Jupyter Notebook user literally are not even aware that you can ‘turn off’ a notebook !!!
- Following the spirit of HTC computing by implementation
- Of course: the ‘high speed train’ looks boring to some if you offer a ‘ferrari’ as an alternative at the same time ;)
- HTMap and Python Bindings will get to work without additional effort once the pool runs a higher version of Condor

Python bindings & outlook

Used by HTMap internally → Python Bindings

- Collector, sched and negotiator as Python objects
- Import htcondor; import classadd
- Can be used to submit jobs into the pool from the notebook

Outlook

- Both HTMap & Python Bindings working in the test cluster with KRB support
- No backporting and some things still to sort out due to different other changed behaviors
- Update strategy a bit clumsy at the moment
- Will be available before summer
- Users do see the need to break out of the notebook but nobody explicitly asked for HTMap so far
- Some tried to use python bindings and failed