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Conference 2018

Challenges and Opportunities in the HPC Systems Administration and the User Support

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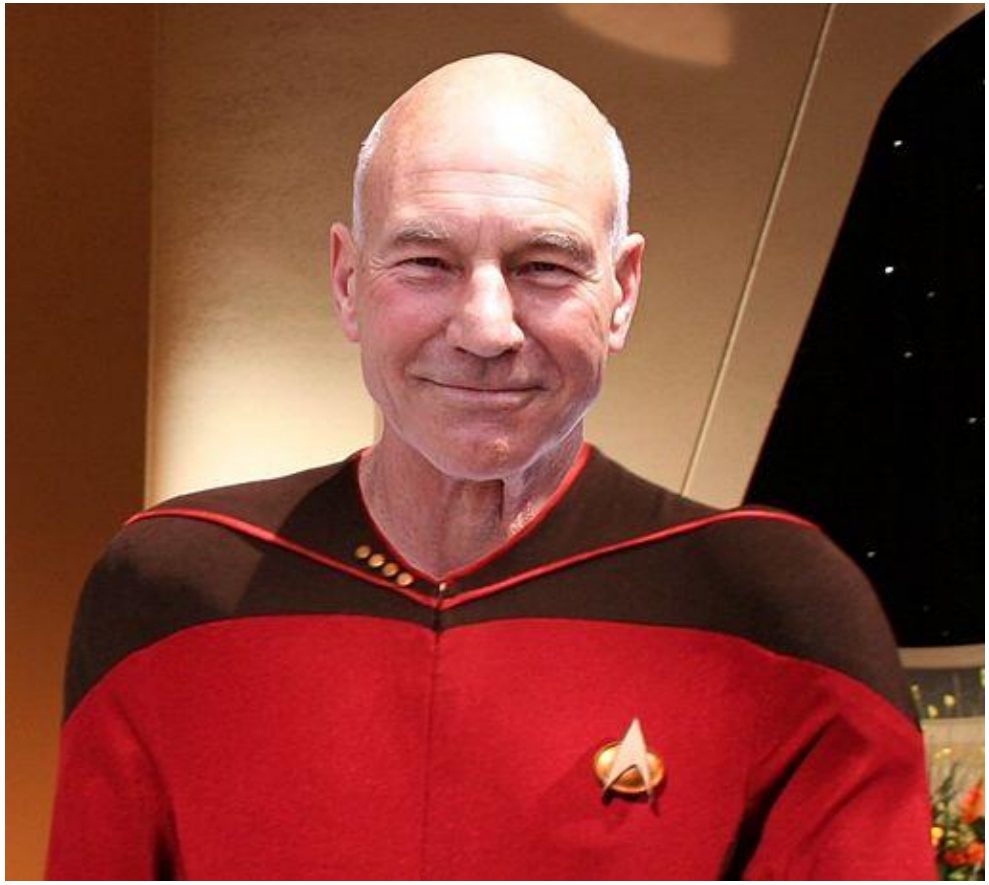
Introduction

- The HPC landscape has undergone tremendous change in the past 15 years.
- Architectural complexity and management challenges have increased significantly.

The Good Old Days



https://commons.wikimedia.org/wiki/File:Jean-Luc_Picard_2.jpg

Make it so!

- Shared memory systems and specialized clusters.
- Simple filesystem, software, and user environment.
- A limited number of skilled technical users.

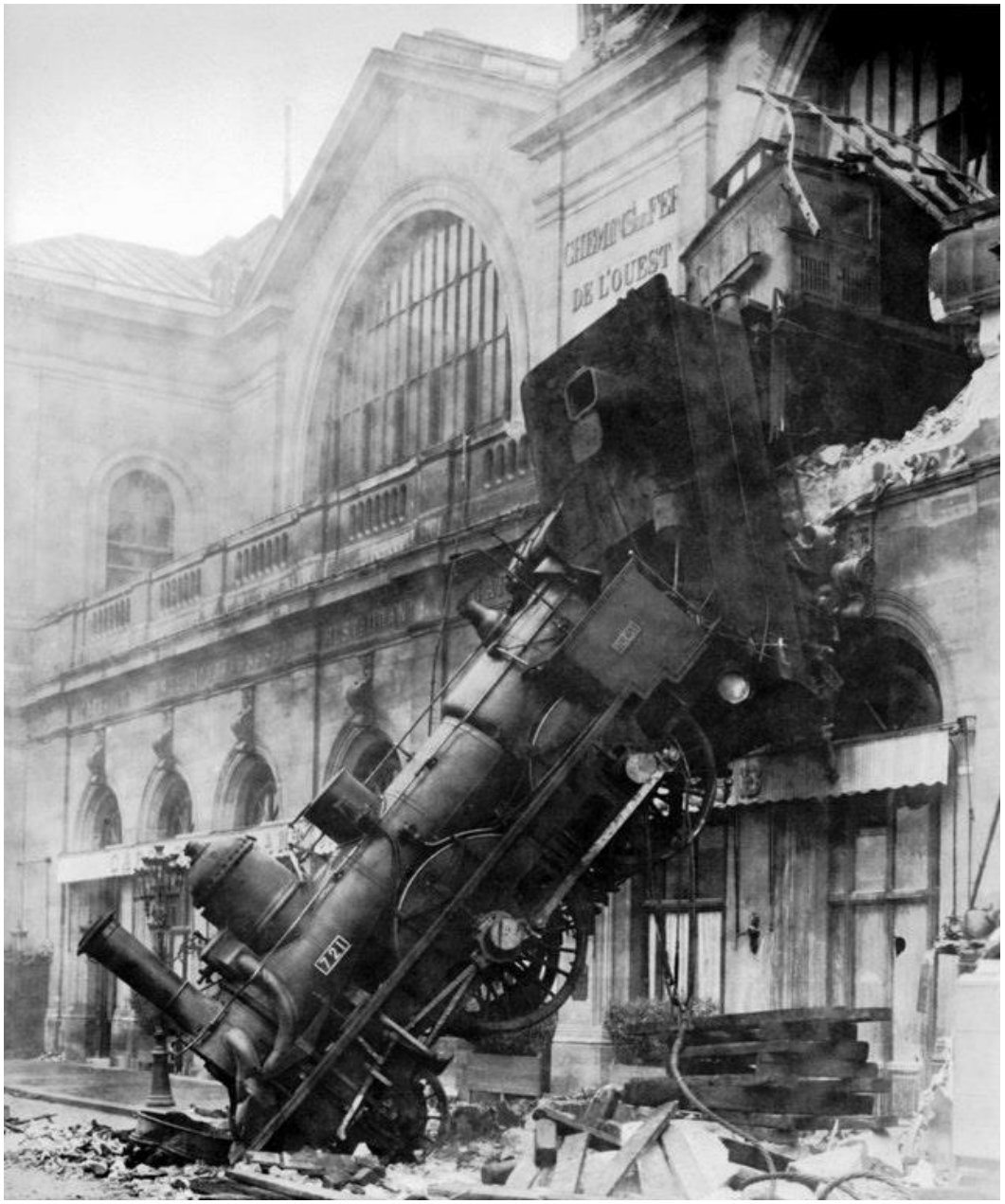
The Current Era

https://commons.wikimedia.org/wiki/File:Jean-Luc_Picard_as_Borg.jpg

A modern day
HPC Sysadmin

- Expected to deal with general purpose clusters and cloud computing.
- GPU computing.
- Specialized accelerators e.g. FPGAs.

- Complex filesystems (Lustre, Spectrum Scale, Hadoop, Ceph, etc.).
- Multi-layer networking (management network, MPI fabric, IO fabric, routing).
- Complex scheduling policies.
- And much more!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DE L'OUEST

- One man army approach does not work.
- Challenge: how to make larger teams collaborate effectively?

- Additionally, need to deal with many unpredictable scenarios.

- For example, vendor disappearance like IBRIX.

- Additionally, need to deal with many unpredictable scenarios.

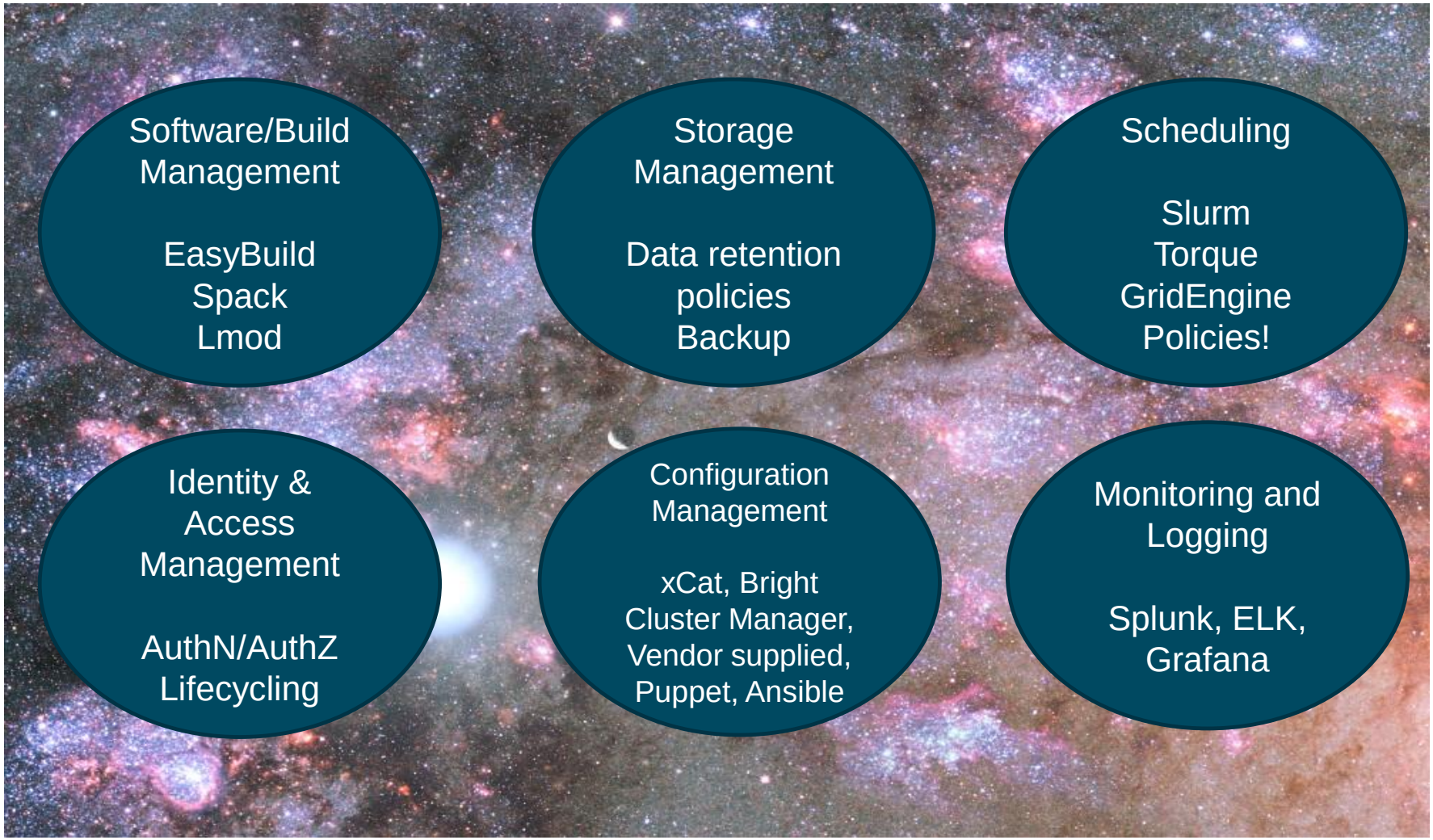
- For example, vendor disappearance like IBRIX. Or security concerns with Huawei.

What About Data Security and Privacy?

Health Data

Personal information in the cloud

It’s a Strange Universe Out There



- Not to mention the proliferation of security exploits and OS updates which can break or degrade performance of a system.

But…

- Modern HPC systems are more powerful and accessible than ever before.

- Lots of commercial codes to take advantage of HPC architectures.

User Support

https://xkcd.com/1084/

- Users nowadays come from varied backgrounds, some with almost no experience in HPC.
- Lack of familiarity with the command line.
- Issues with understanding problem scaling and parallel computing.

- Real life example 1 of a job submission script (my job does not start!):

…

```
mpicc file.exe
```

…

- But the onus is not always on the user. The complexity of the systems makes debugging challenging.

- Real life example 2: MPI job consuming all available memory on a node and crashing.
  - Debug code, memory allocation, OS limits configuration, etc.
- Issue turned out to be an Intel compiler bug with faulty memory allocation code generation.

But…

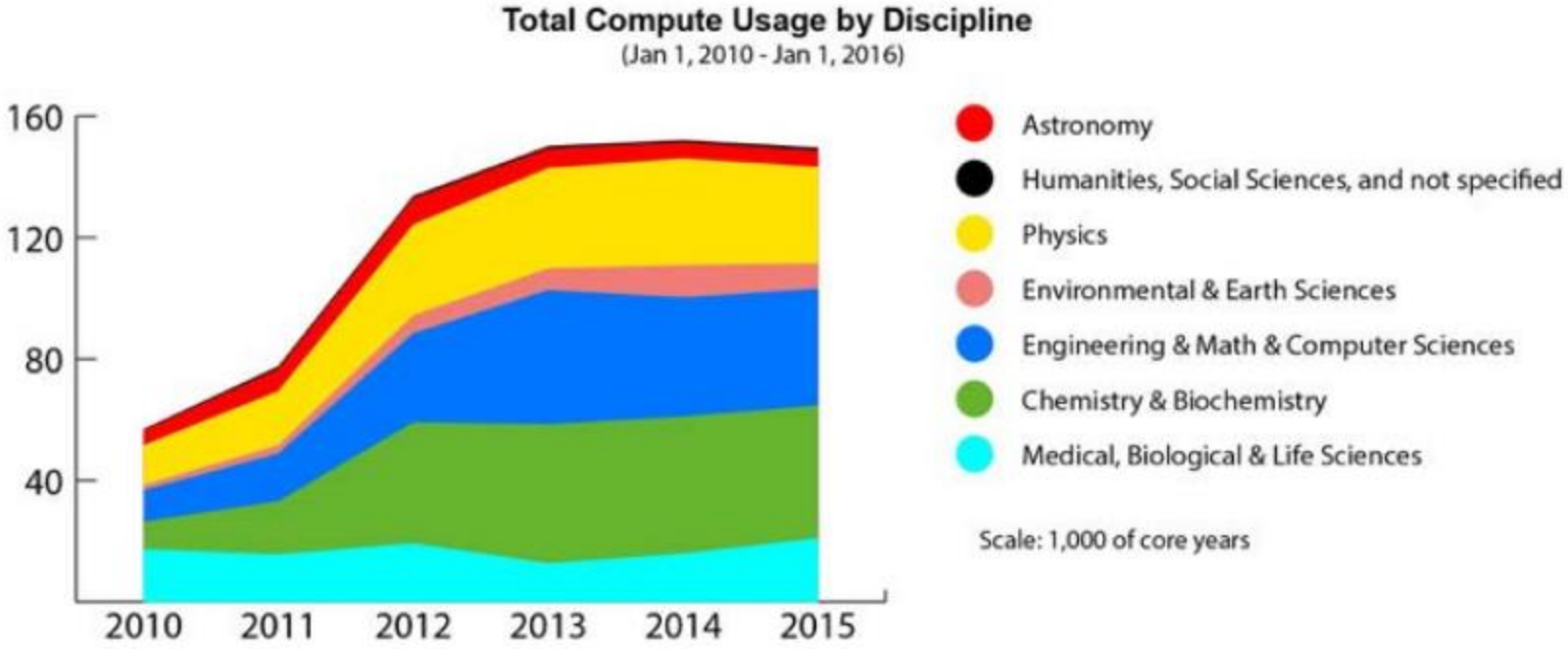
- Due to the proliferation of commercial codes, the bar of entry into HPC has been lowered.

- Many hundreds of users and thousands of jobs running at any given time on Compute Canada systems.

- Utilization and demand for HPC resources is at a new high and constantly growing.

- Opportunities for education and research are multiplying.

The Future is Bright



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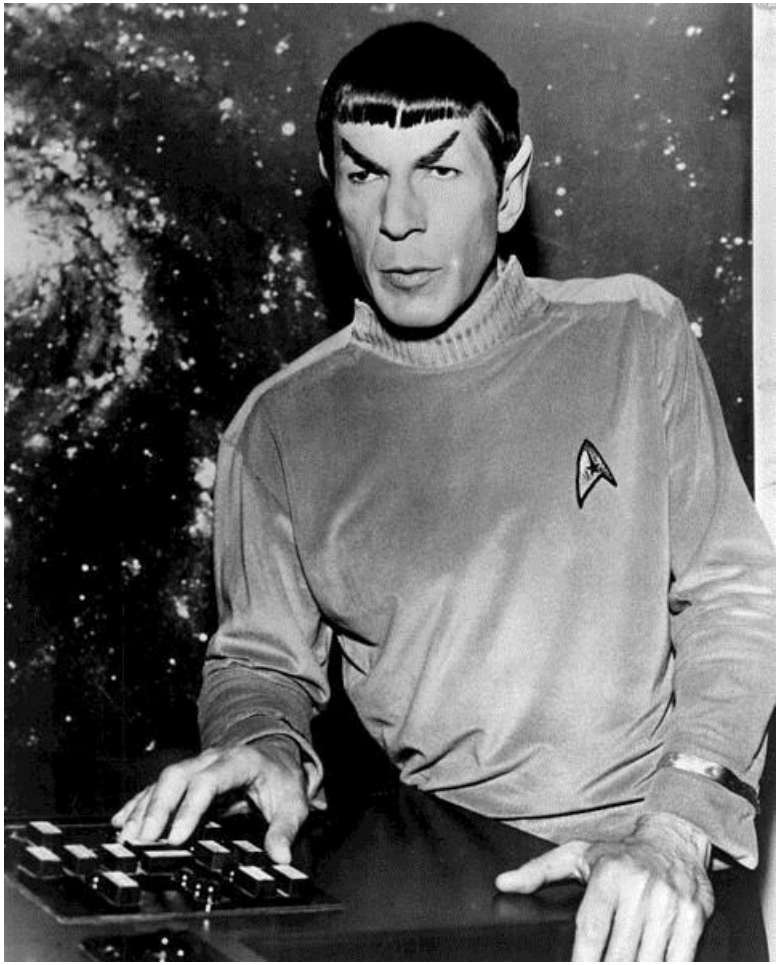

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"Computers make excellent and efficient servants, but I have no wish to serve under them." Mr. Spock, "The Ultimate Computer"