

# High Performance Computing

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What is it used for and why?

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# Overview

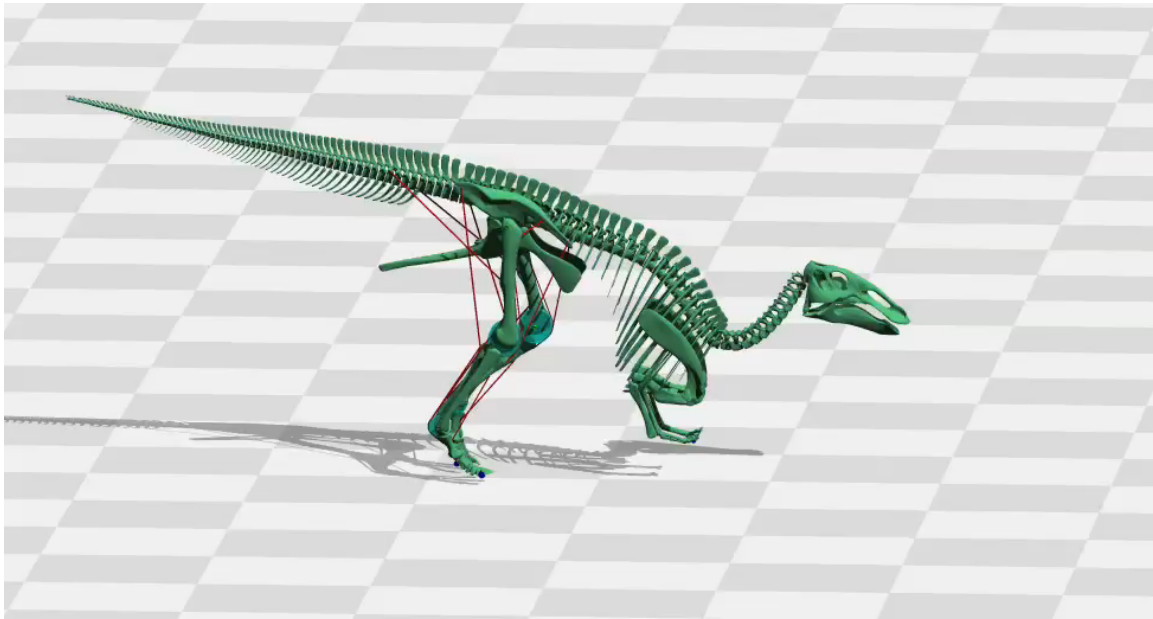
- What is it used for?
  - Drivers for HPC
  - Examples of usage
- Why do you need to learn the basics?
  - Hardware layout and structure matters
  - Serial computing is required for parallel computing
  - Appreciation of fundamentals will help you get more from HPC and scientific computing

# What is HPC used for?

Drivers and examples

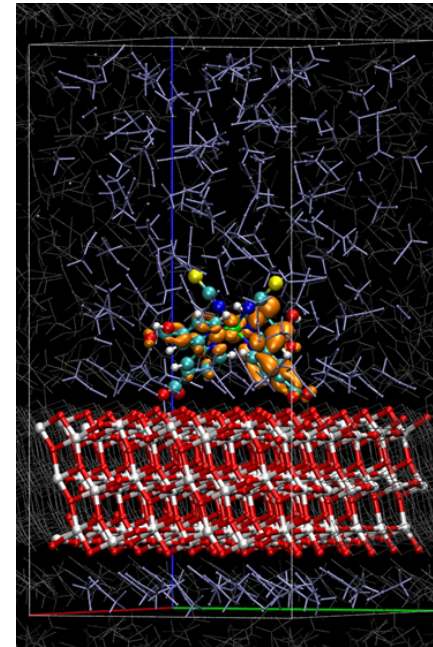
# Why HPC?

- Scientific simulation and modelling drive the need for greater computing power.
- Single systems could not be made that had enough resource for the simulations needed.
  - Making faster single chip is difficult due to both physical limitations and cost.
  - Adding more memory to single chip is expensive and leads to complexity.
- Solution: parallel computing – divide up the work among numerous linked systems.

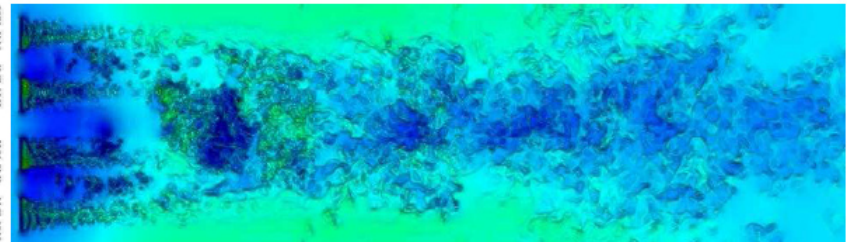
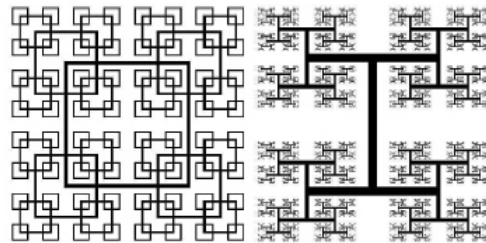


Modelling dinosaur gaits  
Dr Bill Sellers, University of Manchester

Dye-sensitised solar cells  
F. Schiffmann and J. VandeVondele  
University of Zurich



Fractal-based models of turbulent flows  
Christos Vassilicos & Sylvain Laizet,  
Imperial College



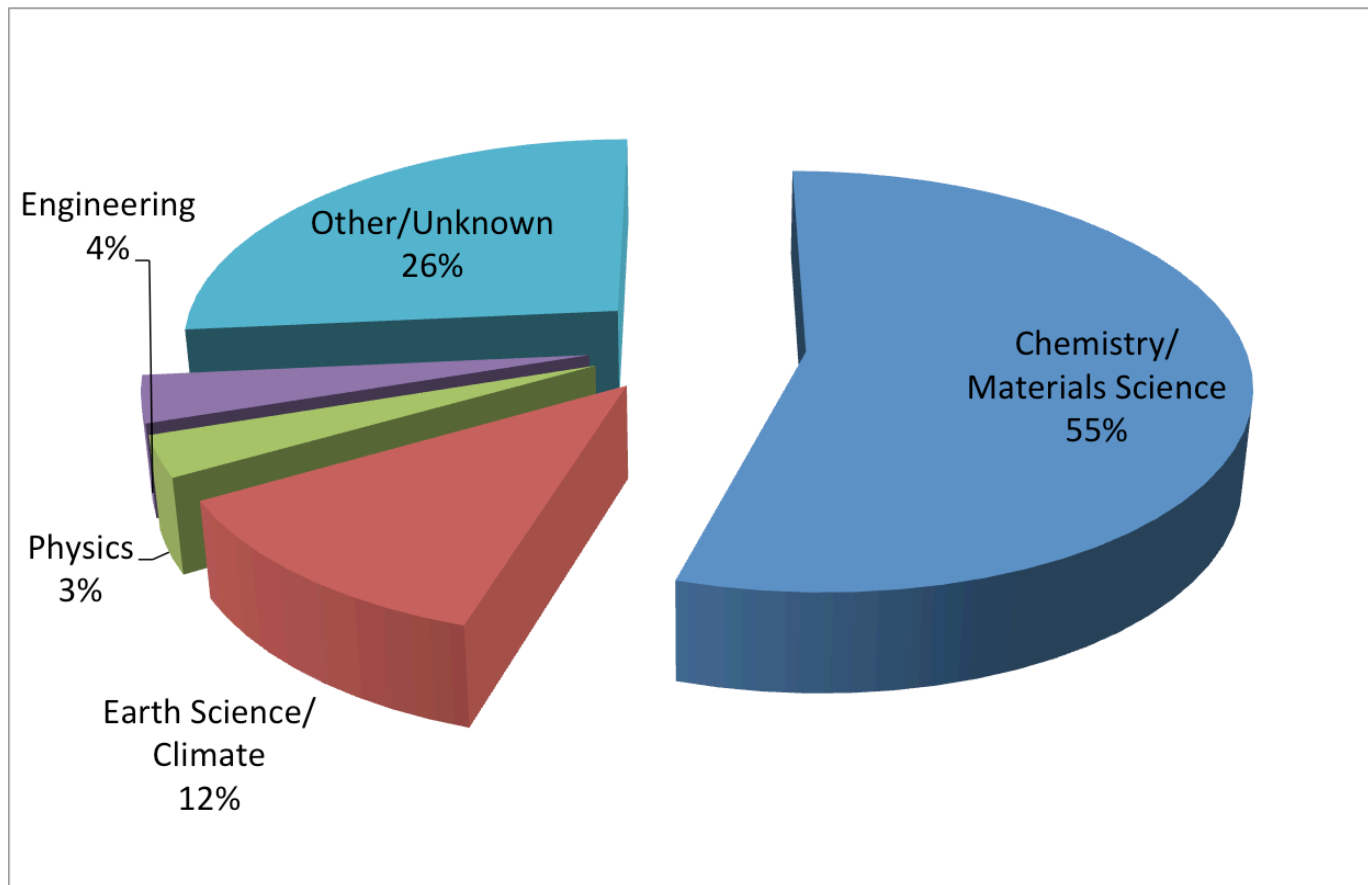
# HECToR



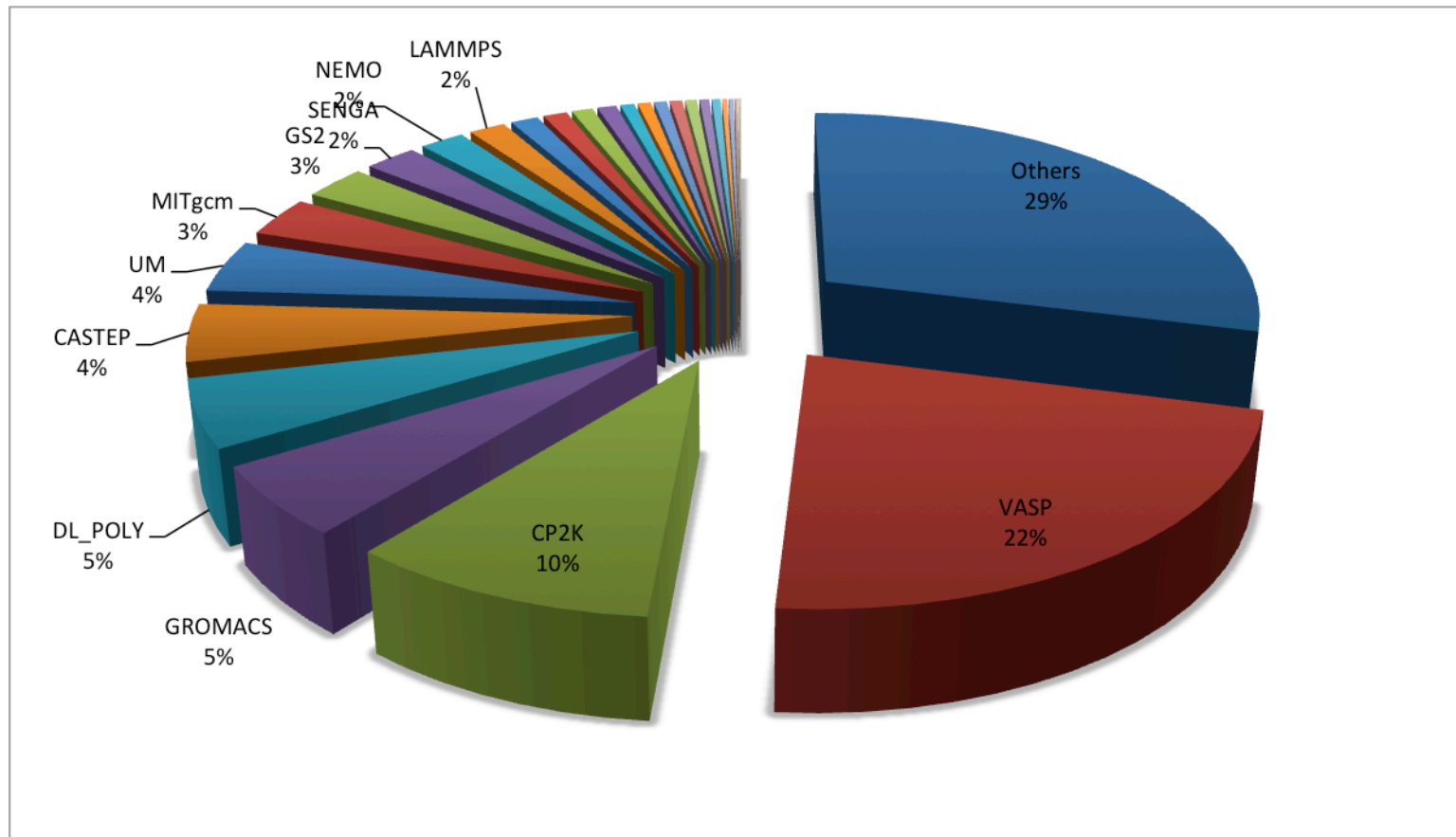
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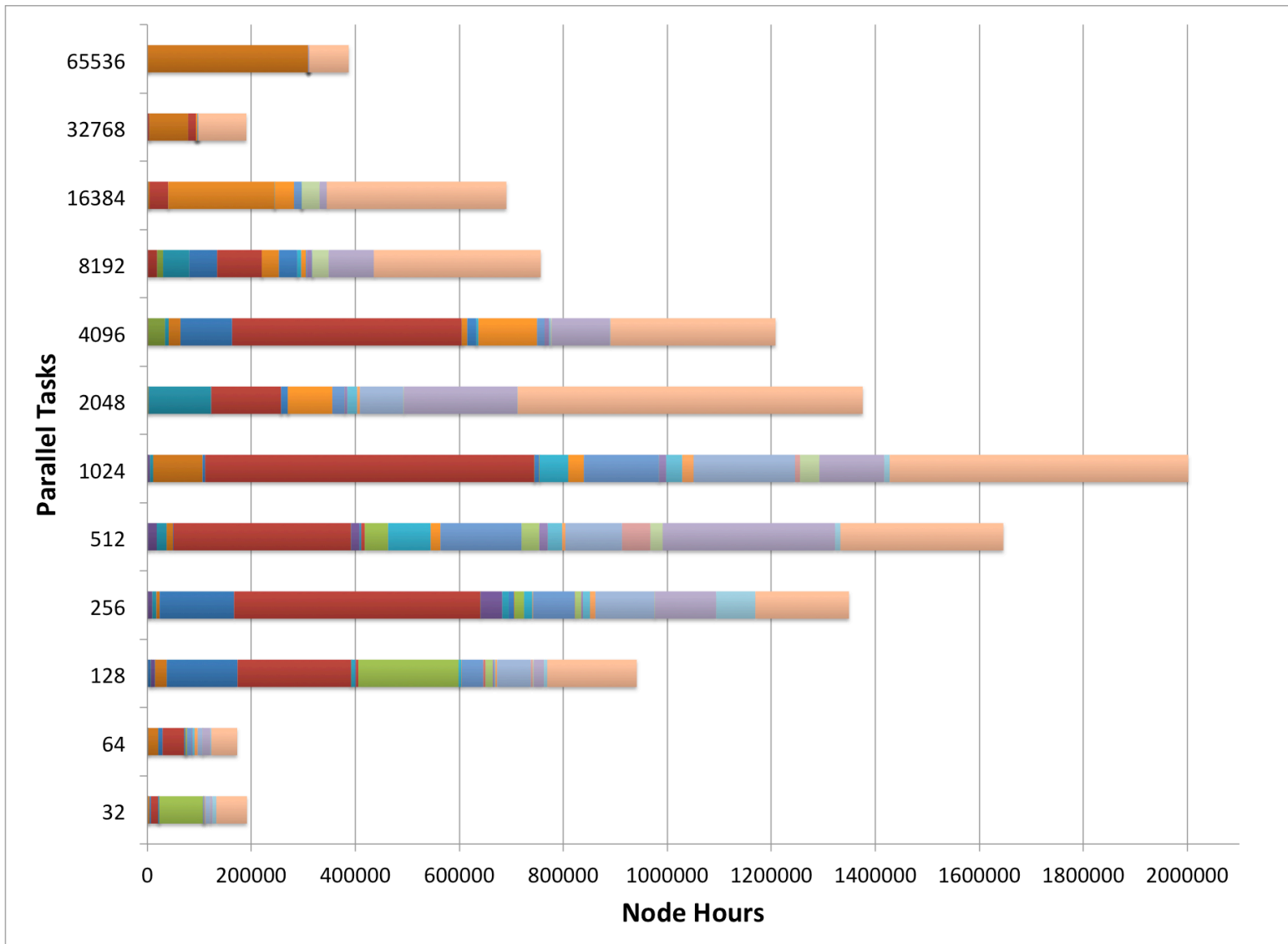
# What is it used for?



# Simulation software







# The Fundamentals

Why do I need to know this?

# Hardware Layout

- Understanding the different types of HPC hardware allows you to understand why some things work better on one resource than another
- Allows you to choose the appropriate resource for your application
- Gives you an appreciation of the parts that are important for performance

# Serial Computing

- Without an understanding of how serial computing operates it is difficult to understand parallel computing
  - What are the factors that matter for serial computation
  - How does the compiler produce executable code?
  - Which bits are automatic and which parts do I have to worry about

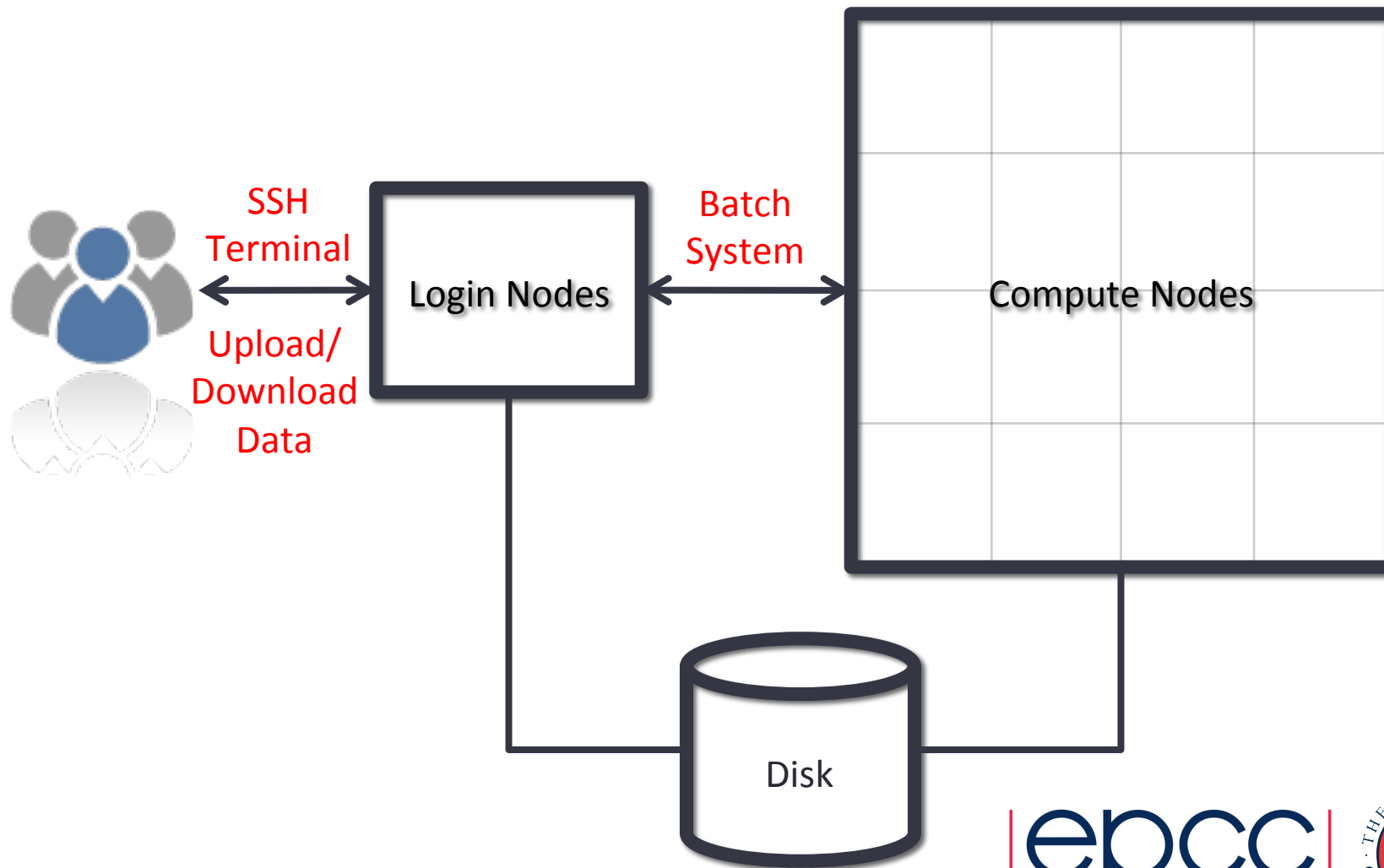
# Parallel Computing

- Parallel computing and HPC are intimately related
- Understanding the different parallel programming models allows you to understand how to use HPC resources effectively

# HPC Layout and Use

Starting concepts

# Typical HPC system layout



# Typical Software Usage Flow

