CLIENTS | PEOPLE | PERFORMANCE

Adventures in Cloud Computing

Commercial CFD Perspective

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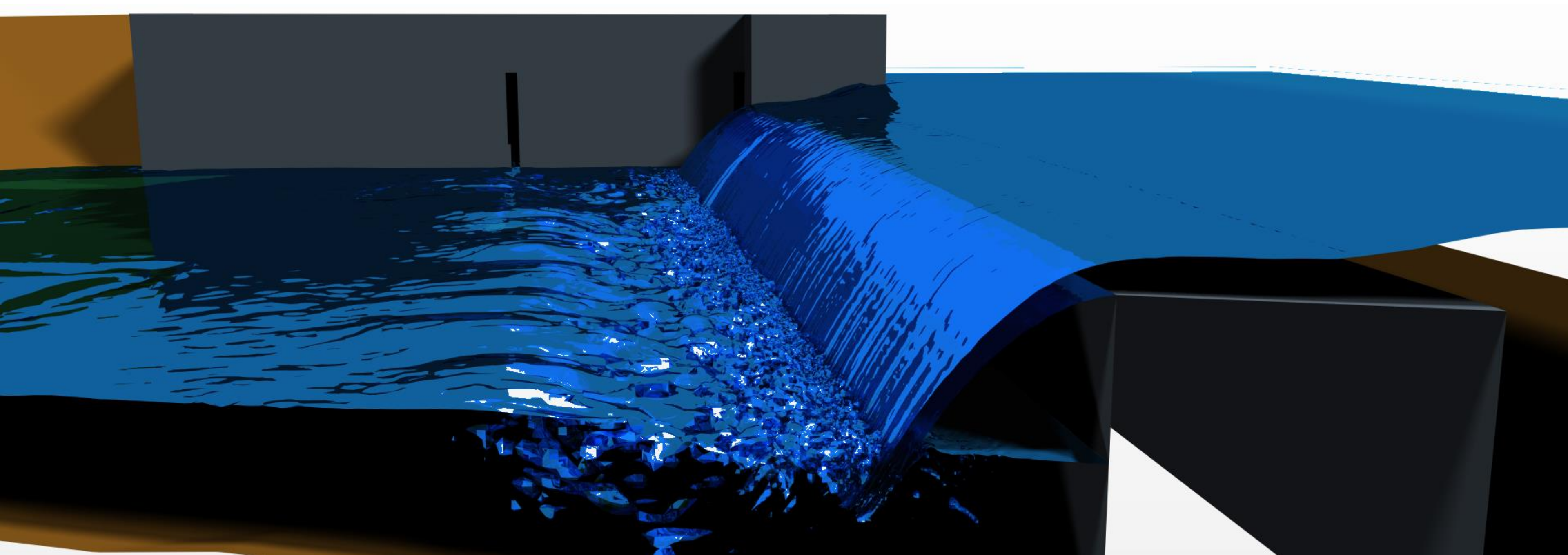
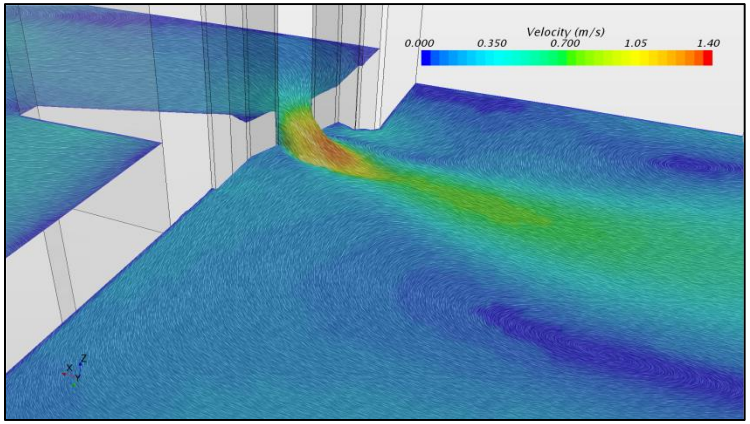


GHD Who are we?

Professional services company with >10,000 employees.
100% employee owned.

Melbourne office 350 staff.
CFD team consists of around 10 people.
Distributed across Australia and USA, 4 in Melbourne.
Growing team and workload.

CFD modelling work covers a range of industries, focused on water and dams.



Purpose of Presentation

Share the progress and experiences of our small group.

Motivations, ease of use, performance.

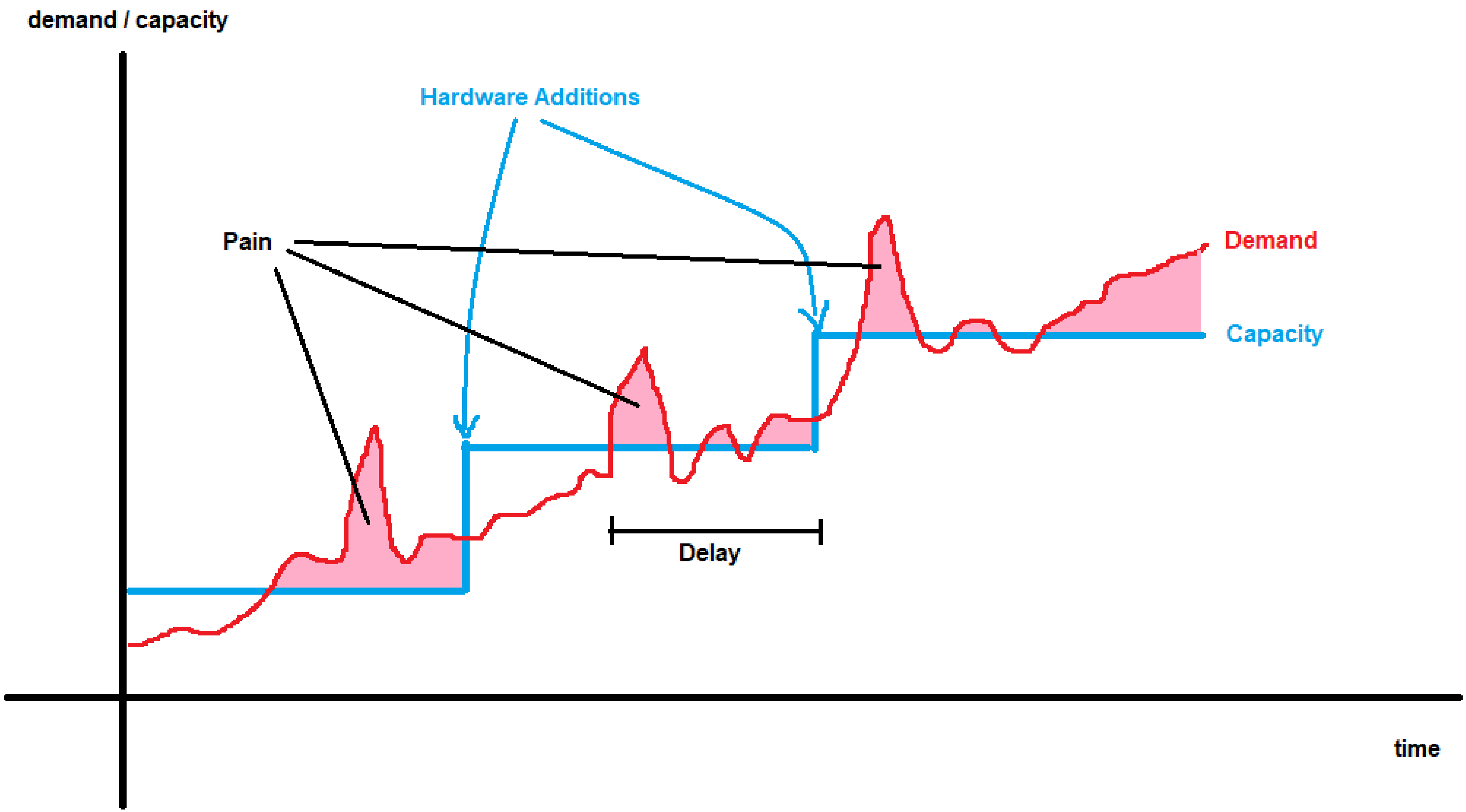
Cover positive and negative aspects.

Hopefully provide some useful information for those looking to get into cloud compute.

This will be a short presentation!

Why the interest in Cloud compute?

Part 1 – Reduce Growing Pains



Why the interest in Cloud compute?

Part 2 – Deliver Fast

Timelines are rarely reasonable.

Example project:

- Monday, identify issue.
- Tuesday, drone survey.
- Wednesday, model build and run existing conditions.
- Thursday, simulate options.
- Friday, advise client, provide design.
- Following Friday, construction complete, operating.

The Learning Curve:

Open an AWS account.

Robin Knowles (CFD Engine) Openfoam/AWS online training course, $79.

Play around with free-tier single instance simulations and Openfoam.

Try configuring conventional cluster, discover AWS ParallelCluster.

Start setting up multi-instance clusters, get approval for larger cluster sizes.

Benchmarking, customization, testing including StarCCM+.

Commence commercial usage (~3-4 months later, novice starting point).

ParallelCluster:

Open source project used to automate creation of cloud clusters.

Previously known as CfnCluster.

Takes care of almost all configuration on AWS side.

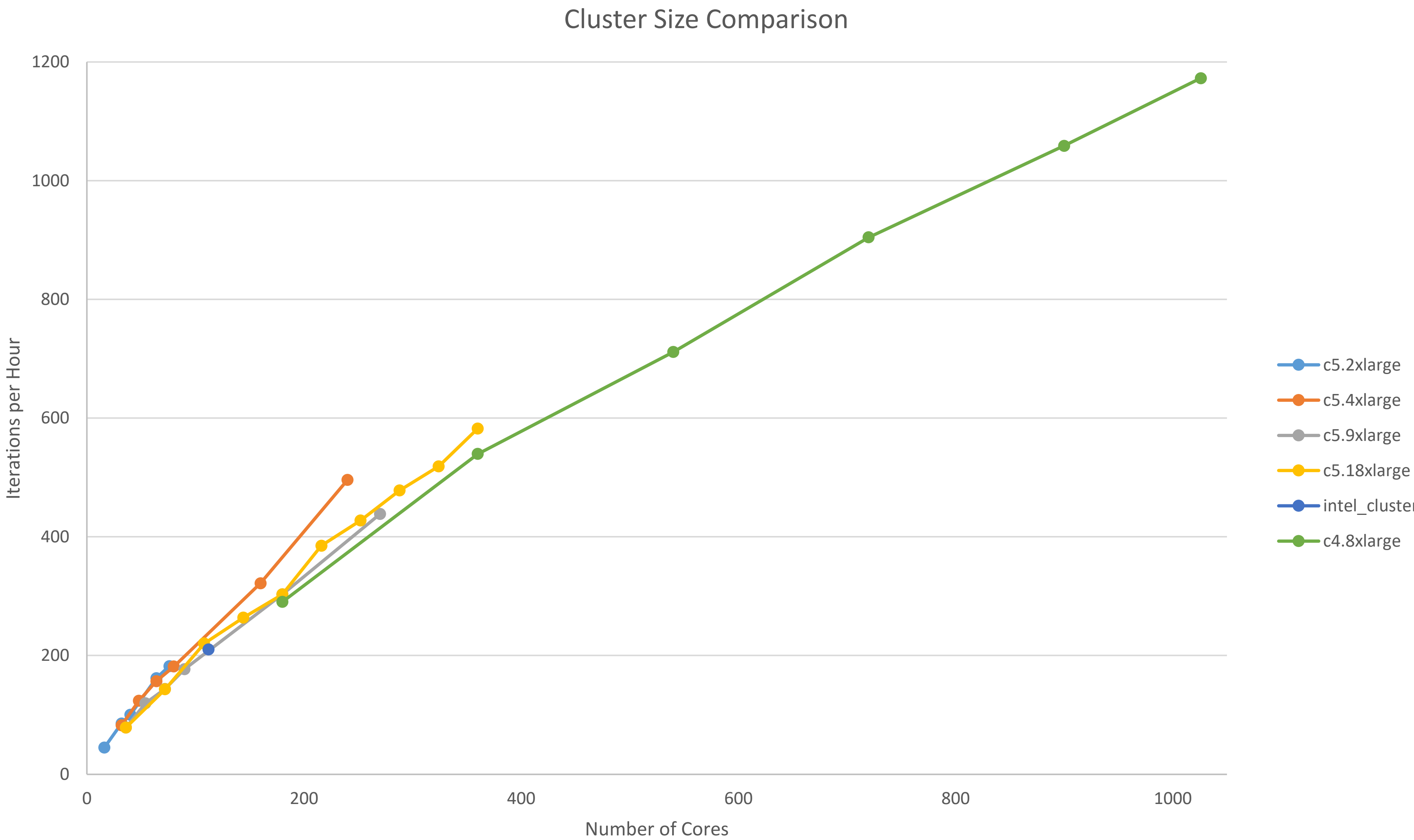
Requires some specific configuration for effective CFD usage.

Need to make custom linux images if using commercial CFD software.

Highly recommend a linux ‘jump box’ to create and manage clusters.

Includes queue management software.

Performance (Scaling)



StarCCM+, ~25m cells, multiphase transient

Performance (Economic)

Sydney AWS Servers, Early 2019

Typical setup:

Usually run on one or two 900 core clusters (cluster with 50 nodes).
License costs dominate economics, make larger clusters more desirable.
Use c4.8xlarge instances.

We learned:
Need to do your own testing (model type, vendor, mesh size, etc).
Be skeptical of 'cells per core' guidelines and other rules of thumb.
The best configuration will change (waiting for AMD Rome release with interest).

Conclusions:

Competitiveness of cloud computing for CFD improving with time.

Usability is expected to improve with time, fairly manual process at the moment.

Tools are available to make life easier.

Being used actively as part of a hybrid in-house and cloud compute strategy.

Will continue to monitor the performance and economics of cloud computing and will adjust our strategy accordingly.

Cloud computing requires a shift in modelling methodology (the compute resources aren’t free!).

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