

# The movement towards HPC inclusivity: Achieving on-demand accessibility of High Performance Computing (HPC) through ephemeral projects utilising the Alces Gridware Project



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## Overview

The Alces team, through our work with the open-source Alces Gridware project, created Alces Flight Compute: a fully-featured, scalable HPC environment for research and scientific computing. A free version was created for cloud and hybrid use to understand how researchers would approach and consume on-demand HPC resource regardless of platform.

Our initial results show:

- Acquisition of public cloud HPC averages a time of a day and a half, including training.
- Any barriers to entry for cloud were primarily due to economic or knowledge reasons, not technical.
- Ephemeral (temporary) embarrassingly parallel workloads are highly suited to auto-scaling cloud HPC clusters.
- Clients focussed on hybrid solutions primarily utilise resources which might be cost prohibitive in an on-premise design.
- Creation of a consistent environment across platforms optimises for research outcome.

## Acquiring and Capacity Planning for HPC Resource: On-premises vs. Public Cloud

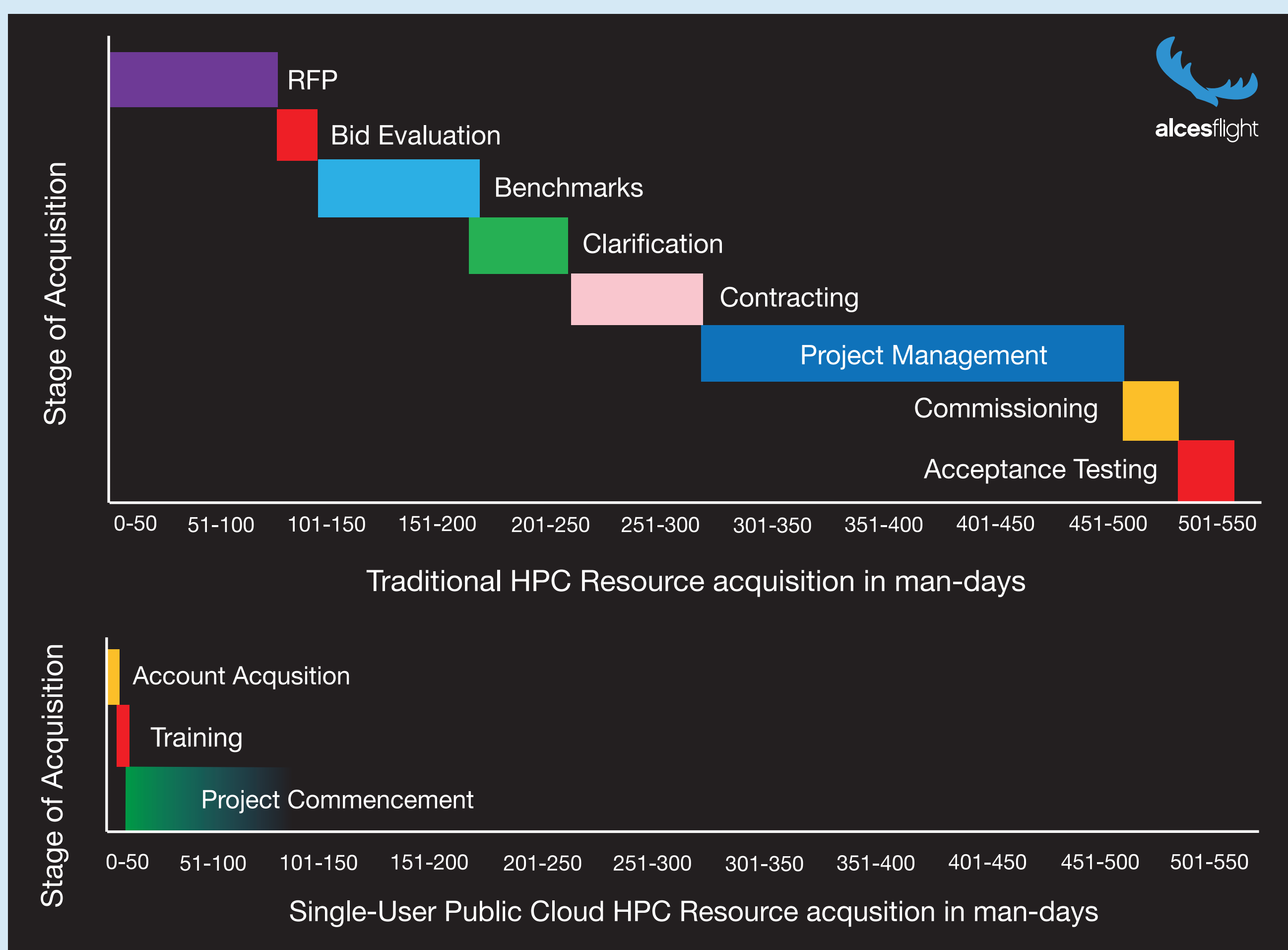


Figure 1: Average time of HPC resource acquisition - Traditional HPC vs. Cloud. (2016) [1]

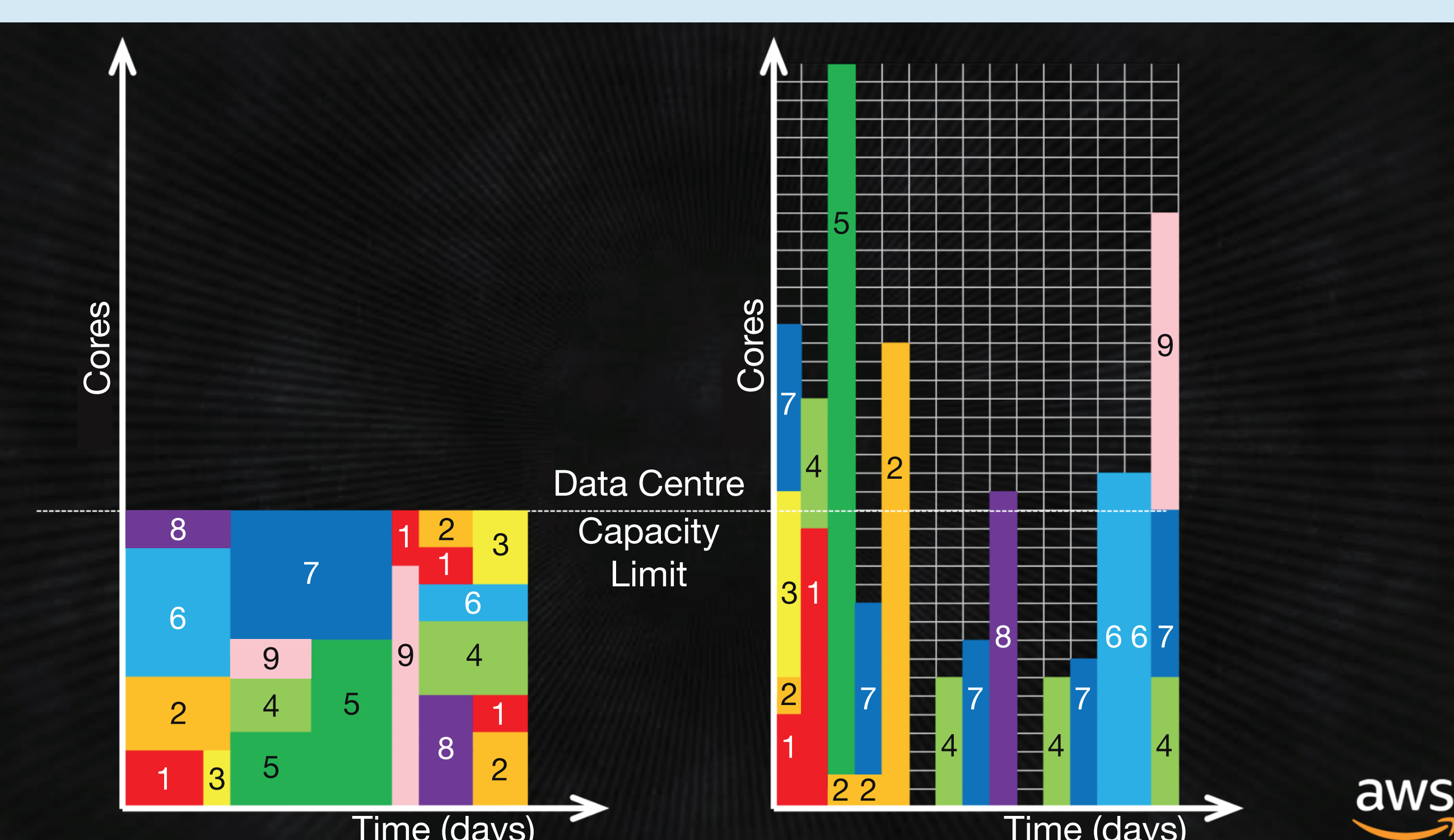


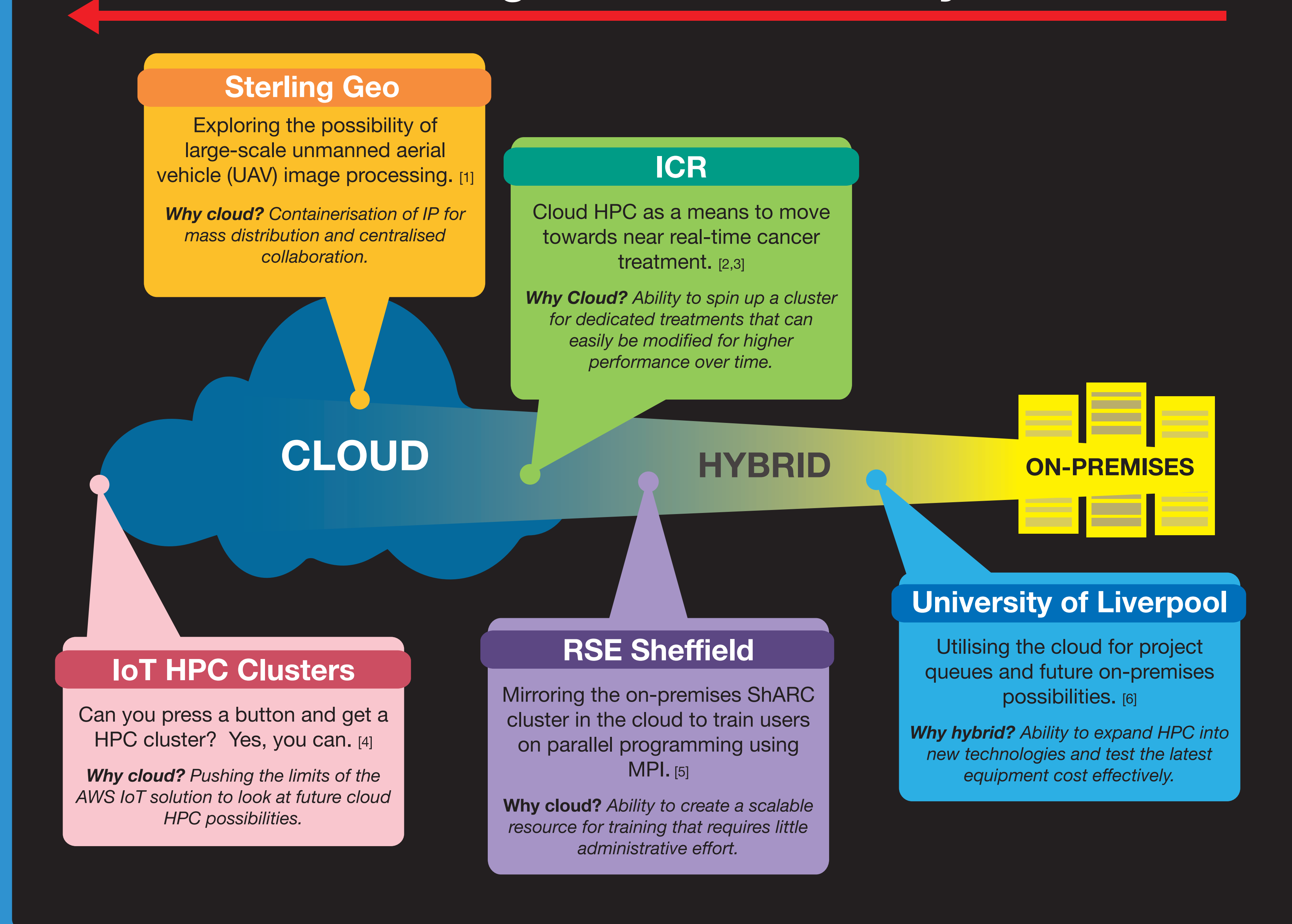
Figure 2: Capacity Planning, On-premises vs. AWS [2]

## Criteria for projects using Alces Flight

In each project the following criteria were set:

- The Community Edition of Alces Flight Compute was used.
- In the case of cloud, only public cloud-compute time was charged.
- In the case of Alces Flight on hardware costs were included as part of integration.
- Focus was on ephemeral, or temporary projects.
- In most cases, anonymized data was set-up within a single user environment.
- Additional time measurements were made for application optimization, scalability, and performance.
- Public cloud testing used Amazon Web Services (AWS), focusing on the Ireland and UK regions.

## Trending towards Inclusivity



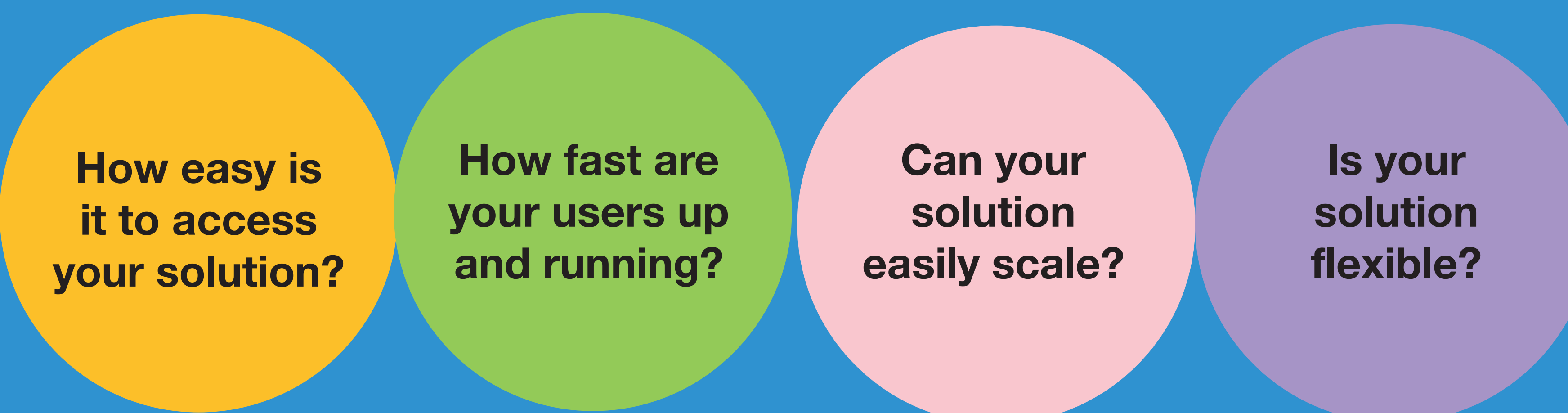
## Conclusions

The following trends were observed in how researchers were consuming cloud HPC resource:

- Projects towards the right (on-premises) side tend towards future planning and mirroring of an on-premises design.
- Those within the hybrid spectrum play closely to the strengths of cloud. Embarrassingly parallel workloads utilising autoscaling heavily favoured.
- On the left (cloud) side ease-of-use was placed as the primary design objective as the intent of these projects is to engage and enable as many users as possible.

## How Inclusive is your HPC solution?

**Inclusive:** adjective (/ɪnˈkluː.sɪv/) - Including everything (and possibly everyone). Is your solution inclusive? Are you working to invite even more users and technologies into HPC? Here's four questions you need to answer to find out.



## References

### IMAGES

- [1] Mayers, Wil. *Comparison of Traditional HPC Resource Acquisition vs. Single-User Public Cloud HPC Resource Acquisition*. (2016) Image used with permission of Alces Flight R&D.
- [2] Bouffler, Brendan. *Capacity Planning - On-premises vs. the AWS Cloud Platform*. (2017) Image used with permission from Amazon Web Services

### PAPERS

- [1] **Breaking Boundaries, Saving Lives - Sterling Geo reimagines UAV imaging in public cloud.** Phil Cooper, Cristin Merritt, Wil Mayers. *Sterling Geo and Alces Flight Limited*
- [2] **Towards real-time Photon Monte Carlo Dose Calculation in the Cloud.** Peter Ziegenhein, Igor N. Kozin, Cornelis Ph. Kamerling and Uwe Oelfke *Joint Department of Physics at The Institute of Cancer Research and the Royal Marsden NHS Foundation Trust, London, UK SM2 5NG*
- [3] **Near Real-Time: How Cloud is Shaping Cancer Treatment**, Wil Mayers, *Alces Flight Limited*
- [4] **Real-World High Performance and High Throughput Computing on AWS**, Matthew Berryman and Adrian White *University of Wollongong and Amazon Web Services*
- [5] **Bespoke High Performance Computing Clusters in the Cloud with Alces Flight**, Mike Croucher, *University of Sheffield*
- [6] **The Liverpool Barkla Cluster: Exploring HPC Hybridisation**, Cliff Addison, *University of Liverpool Advanced Compute Facilities*