# Minimum Resource Requirements

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## Introduction

This note summarizes the resources that experiments require at sites running their data challenges, and future production and analysis work. Not having these resources in place means that experiments will not be able to make use of a site. The numbers are quite consistent between the four experiments.

## Resource Needs

| | ALICE | ATLAS | CMS | LHCb |
|---|---|---|---|---|
| ***SE GB/cpu*** | 30 | 20 | 50 | ? |
| ***WN Disk GB/job*** | 2.5 | 2 | 1 | 4 |
| ***WN memory MB/job*** | 600 | 300 (1GB for pileup at selected sites) | 500 | 500 |
| ***Longest job (@ ~2 GHz)*** | 8h | 24h | 1 week | 24h |
| ***SW installation space (GB)*** | 0.5 GB in shared area | 15GB | 0.7 GB (prod) 20GB (analysis) in shared area | 0.5 GB |

**Comments:**

- SE GB/cpu: Space needed on the local storage element in GB per cpu in the cluster. All experiments need similar amounts. A comfortable limit would be between 1.5 and 2.5 TB per 50 cpu per experiment supported.
- WN disk GB/job: Space needed on each worker node in GB for each simultaneous job. This is scratch space that should be available to each job. With recent systems with large disks this should really be no issue.
- WN memory MB/job: RAM needed for each job. To avoid swapping cluster nodes must have this amount of RAM available for each simultaneous job running on a machine, and sufficient swap space to go with it. If the RAM is not available then the number of jobs that can be run on a machine should be limited appropriately.
- Longest job: Length of the longest jobs measured in hours on a 2 GHz cpu. Batch queues need to support jobs of this length *scaled by the site's slowest cpu*. Thus, queues need to be able to support week-long jobs.
- SW installation space: How much space in GB each experiment needs for its software installation. This includes the installation of multiple software versions.

It is important that each site participating in the data challenges urgently make these resources available. We have seen many problems particularly with insufficient SE space available which really make sites unusable for the experiments, and problems with cpu normalization and queue lengths. LHCb have seen problems with queues being too short, since many nodes are much slower that the 2GHz assumed in the numbers above. This will become a real problem for CMS jobs.

Together with these needs, there are some changes needed in the information providers so that appropriate description of these resources is advertised through the information system. Some of these changes will require local modification to deal with appropriate scaling of cpu power and queue lengths. Information on what is needed will be communicated to the site managers.