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## Total Cost of Ownership and Evaluation of Google Cloud Resources for the ATLAS Experiment at the LHC

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The ATLAS Google Project was established as part of an ongoing evaluation of the use of commercial clouds by the ATLAS Collaboration, in anticipation of the potential future adoption of such resources by WLCG grid sites to fulfil or complement their computing pledges. Seamless integration of Google cloud resources into the worldwide ATLAS distributed computing infrastructure was achieved at large scale and for an extended period of time, and hence cloud resources are shown to be an effective mechanism to provide additional, flexible computing capacity to ATLAS. For the first time a Total Cost of Ownership analysis has been performed, to identify the dominant cost drivers and explore effective mechanisms for cost control. Network usage significantly impacts the costs of certain ATLAS workflows, underscoring the importance of implementing such mechanisms. Resource bursting has been successfully demonstrated, whilst exposing the true cost of this type of activity. A follow-up to the project is underway to investigate methods for improving the integration of cloud resources in data-intensive distributed computing environments and reducing costs related to network connectivity, which represents the primary expense when extensively utilising cloud resources.

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