The RainCloud project: Harnessing Cloud Computing for a meteorological application at the Tyrolean Avalanche Service

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Precipitation in mountainous regions is an essential process in meteorological research for its strong impact on the hydrological cycle and its effects on avalanche danger. Our meteorological aim is to investigate and simulate precipitation in mountainous regions with a simple numerical model. This model, due to its mathematical nature, is called the "'linear model of orographic precipitation"' (short: LM). As it is a very simple and basic model, it can be easily run in a large number of iterations for parameter studies, i.e. newline the same setup with variations in certain input parameters.

We are using the LM in 3 different "'flavours"' within the same ASKALON workflow: an operational type, and two research types with varying idealization of the meteorological setup.semi-idealized and an ideal type. The operational type comprises the repeated and regular run of a certain version of the workflow providing the Tyrolean Avalanche Service ("'Lawinenwarndienst Tirol"') with a spatially detailed (500 m resolution) probabilistic precipitation forecast to help them forecast avalanche danger.

Using Cloud Computing allows us to be more flexible and cheaper than dedicated hardware. Our workflow invocations can differ substantially in requirements to the computational infrastructure, both in computing power and data size.

We present the design of a meteorological application for the Tyrolean Avalanche Service using the ASKALON environment comprising graphical workflow modelling and execution in a Cloud computing environment. We demonstrate with the Amazon EC2 Cloud that within the limits of Amdahl's law our workflow can gain important speedup when executed in a visualized Cloud environment with important operational cost reductions.

Results from the research type workflow implementations show the usefulness of our model for determining precipitation distribution in the case of two field campaigns over Norway.