

# Paving the Path to a Geoscience Gateway

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## INTRODUCTION

Geoscience is one of the most prominent research areas today, involved in modelling and analysing the evolution of Earth systems for the betterment of mankind. Geoscientists engaged in geoscience research and experiments often use sophisticated software tools such as Geographic Information Systems (GIS). Nevertheless, as computational geoscience is an emerging field, effective management and utilization of available geoscience data remains a major challenge.

Open Geospatial Consortium (OGC) Web Processing Service (WPS) standard provides extensive support and contribution towards the field of computational geoscience. WPS standard offers an interface for distributed geo-processing and as a result it enables integration of various geo-processing libraries and processes into WPS implementations. Furthermore, it facilitates sharing common geo-processing services among different communities and eliminates the need of redeveloping. OGC WPS is a widely adopted standard among geoscientists.

Due to the nature of geoscience experiments, substantial expertise in high performance computing resources and complex geoscience tools is required to effectively utilize the existing technology. Therefore authoring of WPS processes is still in the hands of the software developer rather than the geoscientist. Reflecting on the current situation, it is vital to have a common and convenient platform for geoscientists, which facilitates the ordinary users as well.

## ARCHITECTURAL PERSPECTIVES

Based on the above analysis we propose a geoscience gateway, which is a collection of geoscience related tools and applications that are integrated via a portal, as the solution. Two architectural perspectives are considered for the proposed geoscience gateway based on Apache Airavata. Apache Airavata's capability to support execution of complex scientific applications deployed in grid environments and supercomputing resources facilitates complex geoscience experiments. Among similar frameworks, Apache Airavata is preferred due to its ability to support building web based science gateways and the large open source community contribution for it.

52<sup>o</sup> North WPS is a major open source WPS standard implementation. WPS implementations provide ability for users to expose their own geo processes according to WPS standard. One perspective we consider is WPS orchestration

by providing the flexibility to chain a set of WPS processes. Services exposed as WPS can be loaded into Apache Airavata which is then used for WPS chaining by creating scientific workflows. Above architectural perspective promotes reuse of existing WPS processes in a geoscience experiment. Furthermore orchestration process is simplified by the use of workflows.

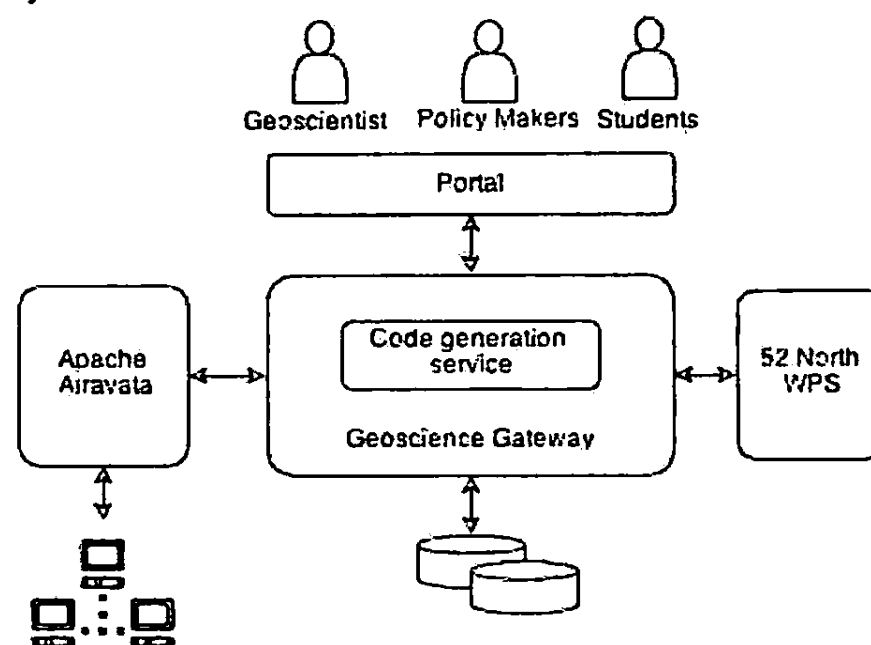


Figure 1: Solution Architecture

The second architectural perspective enables geoscientists to create workflows using Apache Airavata and to expose them according to WPS standard. It is beneficial for a workflow created in a particular geoscience experiment to be exposed as WPS so that it can be reused in another geoscience experiment.

## BENEFITS AND IMPACT

The proposed solution allows designing and testing workflows in a traditional desktop application (i.e. Apache Airavata), and exposing them via standardized WPS interface. This approach also offers a convenient way to access workflows and many other data services. It demonstrates the influence of WPS orchestration and workflow technologies on geoscience experiments. This minimizes the effort of geoscientists in conducting complex experiments. The capabilities provided through the solution makes a significant impact in geoscience experiments related to disaster prediction. Effective predictions enable policy makers to handle the situations by minimizing damage. Furthermore, the user-friendly and convenient environment can be utilized as a learning tool for the students with an interest in geoscience to work with simple geoscience experiments.