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Using open source technologies to improve spatial data analysis and access for geologists.

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Summary

There are a large number of very useful commercial tools available to geologists to fill a wide range of needs including mapping, data storage, basin analysis etc. The trouble is that many of these tools operate in isolation rather than as an integrated workflow. This is typically necessary because commercial software developers are focused on a specific task and cannot possibly account for the wide range of workflows that are experienced across the industry or even within a specific company. SAGD operations and well planning require a very different set of procedures than Montney gas operations for example.

As we move to a more mobile world with large integrated teams spread out over multiple properties or even countries, it is becoming imperative that we look for ways to improve our workflows and allow for improved collaboration between teams. Web frameworks that allow for rapid development of custom tools are maturing and becoming available and can be run on local networks or web-facing servers to allow for custom tools to be built rapidly to address a wide range of needs that are trivial to integrate with advance data analysis modules.

Open source technologies and programming languages such as Python are easy to integrate with spatial data and allow for the creation of custom reporting and analysis tools that can be customized to each user and business unit. SSEC Ltd. has been working with a number of our clients to implement a custom web portal to share data between wellsite geologists, geosteering teams and directional drilling companies while providing custom outputs that allow office technologists to directly import data into their own applications and reporting tools without needing to convert multiple file types and data formats. Not only is the data immediately usable for the end user but it is stored and searchable for rapid access and analysis at a later date.

Theory / Method / Workflow

A need to make data more available to field consultants while also allowing office staff access to the data in a timely manner was identified. Currently, field staff rely primarily on static files shared prior to drilling operations by office geologists through email which can be difficult to manage if files are not added as intended or if field staff changes multiple times through the course of a project. By having a single point of contact for all involved parties that can be managed by the principal interest (in this case an oil company) it is possible to track what information is available to all members of the team and to remove access in the event a contract is terminated or a service company no longer needs direct access.

As our consultancy is a small operation, the need to keep ongoing costs low necessitated the use of open source/license free tools that would allow for great flexibility in creating the necessary tools and interfaces while also maximizing compatibility with client systems. A web based system was chosen as it is platform agnostic allows for central management of data. Python was chosen as the primary back-end language due to the excellent support for data analysis tools and the ability to integrate with spatial databases.

After the framework was chosen, it was necessary to define the required outputs so that a system could be designed to meet those needs. Drawing on decades of experience in wellsite geological operations and consultation with primary clients a database schema was defined to store all relevant data while leaving open the possibility to extend with further data types in the future. The flexibility of the open-source approach means that as long as the data is stored in a properly normalized database new tools can be added at any time to extract meaningful information from existing datasets without having to create a whole new platform at a later date.

One the database was implemented, a web application was written initially to allow wellsite geologists access to well reporting tools before adding the ability for other contractors on site to have access to shared files and notes on well progression.

Results, Observations, Conclusions

Preliminary testing with two clients has been positive with several deficiencies in the original design identified and rectified. This included added additional tables to the database to handle unforeseen reporting requirements for the Saskatchewan government and reworking of the interface for handling files from the field.

Compared to manual reporting methods, there has been a net reduction in time required to generate reports at the end of a well and a significant improvement in uniformity of reporting across multiple rigs working for the same client. It is now possible for wellsite consultants to compare and collaborate with those on other rigs working in the same area for the same client to ensure well reports and analyses are directly comparable. The addition of time-stamped notes and file uploads has also allowed for both the clients and the consultants in the field to keep track of what information was shared with all interested parties and when that sharing occurred.

Novel/Additive Information

The primary contribution of this project to industry is the creation of a unified reporting platform that our clients can use to effectively share information between multiple service providers. It also demonstrates the possibility of rapidly developing custom geospatial and reporting tools that can be used internally or externally by an organization to improve data management and increase efficiencies. While this project had a specific goal in mind for our clients, it has further reaching implications that can be scaled to a wide range of project goals.

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References

All work presented is original and not derivative of any publication to the best of this author.