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Predictive Assimilation Framework: Cloud based System for Site Monitoring

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Over the past several years Subsurface Insights (under SBIR funding) has developed PAF (Predictive Assimilation Framework), a cloud based multi tenant web application for site monitoring and understanding. From its inception PAF has been designed as a vertically integrated system which should translate subsurface data into actionable information in an auditable, automated and low friction manner.

To achieve this PAF is implemented as a cloud based software application with five components: (1) data acquisition, (2) data management, (3) data assimilation and processing, (4) visualization and result delivery and (5) workflow orchestration. PAF is provided as software as a service (SAAS) with modular functionality. This functionality can be activated based on available data or project needs. The main organizational unit in PAF is a project. Projects have users (with different levels of privileges). Users can be members of multiple projects and can easily switch between projects through both the mobile and browser interface. All projects share the same database models and information architecture, but for security, efficiency and portability reasons each project has its own database.

PAF is implemented serverside using ZF2 (Zend Framework 2), a modular PHP web application framework and python. Rich front end functionality is provided by Javascript and CSS and back end processing is implemented in python workflows.

Projects are implemented in software through dynamic routing. PAF also supports the use of domain aliases (e.g. https://weatherstations.rmbl.org is a PAF site, even though it looks to be hosted at rmbl.org). All PAF capabilities are exposed through APIs. PAF is integrated with a variety of numerical models including PFLOTRAN, Landlab and E4D. PAF can ingest a broad range of data including timelapse geophysical data from electrical resistivity and DTS systems, time series sensor data from a broad number of physical sensor data, geochemical data and remote sensed data. PAFs modular design, API centric software architecture, hierarchical user model and customizability has proven to be very well suited to meet a number of different demands. Users interact with PAF through either a standard web browser or the mobile app “Site Info” (available for IOS and Android). PAF is currently used in about 20 projects and is seeing increased acceptance in the private sector, including for agricultural and water resource applications.

We will discuss the overall PAF architecture, design choices, API interface and several use cases and recent enhancements and lay out our plans for future enhancements of PAF.