SPOC Modernization Project – White Paper

About SPOC

Survey Plan Online Checker (SPOC) is a web-based plan checking system that is designed to provide Alberta Land Surveyors and their staff the ability to verify that the digital CAD file meets Alberta Land Titles specifications. This system assists the Land Titles staff in the quality assurance of digital CAD file submissions and improves the quality of survey plans to be registered.

SPOC provides three essential quality assurance functions:

1. A Structure check provides the user with an acknowledgment that the submitted CAD file meets the required layer and element structure;
2. A Georeference check ensures the CAD file is georeferenced accurately and is consistent with the legal land description, projection, and datum described on the survey plan; and
3. A Dimension check compares line lengths with their observed survey distances.

Once these checks are complete, and if the file has met the quality requirements, it is uploaded to a map viewer for the user to verify their plan relative to the Alberta cadastral fabric to ensure the survey plan's surrounding information had been considered. Once this has been verified, an email is sent to the user containing a link to access the required encrypted plan package containing files for submission to Land Titles for plan registration.

History of Survey Plan Online Checker

As a truly progressive province, the Land Titles system in Alberta has been automated since 1988 when the Alberta Land Titles Automation (ALTA) system was first implemented. In 1999, the Plan registration system was also converted to a totally electronic system, including electronic submission, examination, registration, storage, and dissemination of over 250,000 survey plans in the province.

Despite a forward approach to plan registration, many steps within the plan review process were manually executed. When a Surveyor would submit a digital CAD file as part of the plan registration package, technologists within the Alberta Land Titles Office would review the CAD file and verify the completeness of information contained within the CAD layers.

In January 2010, the Government of Alberta introduced a new requirement for the submission of digital CAD files mandating that they be geo-referenced to ensure positional accuracy. This additional requirement, together with reduced resources at the Land Titles office, drove the development of a web-based plan checking system that was the first of its kind in Canada. Survey Plan Online Checker (SPOC) effectively reduced human intervention and provided an automated process for ensuring the quality and accuracy of survey plan CAD files. It also effectively moved the quality assurance process for digital CAD files closer to the source – the Surveyors. This in turn saved time at the Land Titles Office and improved the quality of registration documents.

Business Challenge

The original SPOC application was launched in 2010 and hosted on Adobe Flash technology. The Adobe Flash plugin would no longer be supported as of December 31, 2020, which prompted the need to modernize the application before this deadline.

At the same time, there were other components of the application which had come to require modernization since the site's initial deployment. The quality assurance checks for instance were originally built on Esri ArcGIS technology from 2010 and could no longer process many of the newer CAD files that users were creating.

In addition, the web map used to validate plan locations contained a background layer of cadastral data for the province which needed to be manually updated once a month. This update not only required time and resources each month to complete, but also meant that the cadastral background was out-of-date with the latest cadastral changes for the province. The background also did not include current cadastral fabrics for the Cities of Calgary or Edmonton.

Finally, the SPOC Help Desk support system was limited in its functionality and scalability. For instance, when users needed to contact the Help Desk, they would either call or send an email and incoming support requests were tracked in a Microsoft Excel spreadsheet.

Solution

Alberta Data Partnerships (ADP) contracted Martin Newby Consulting Ltd. (MNC) to begin work on the SPOC Modernization Project in July 2020, and the site was deployed less than 6 months later in mid-December 2020. In that time, both the SPOC Application and SPOC Help Center were modernized.

Modernized SPOC Application

The Modernized SPOC application was built on several key pieces of technology, including:

- The Survey Plan Checker (SPC) API;
- JavaScript;
- Safe Software's FME; and
- Amazon Web Services (AWS).

The Survey Plan Checker (SPC) API

The SPOC application programming interface (API) houses the business and validation rules that are unique to SPOC. The API was also built with the flexibility to be reconfigured if additional rules are required for SPOC in the future.

JavaScript

The actual SPOC web application built in front of the API was built using a JavaScript library called Angular. Angular provides a framework for the application that allows code to be reused so applications can be deployed on multiple targets such as web, mobile web and native desktop. Angular is widely-used and achieves the maximum speed possible on web platforms today.

The web map used to validate plan locations was built to run from Leaflet; an open-source JavaScript library used for mobile-friendly interactive maps. The cadastral background for Alberta was also changed from a static dataset updated once a month, to a streaming web service with cadastral data provided for the whole province by Altalis and by the Cities of Calgary and Edmonton.

Safe Software's FME

The three essential quality assurance checks for SPOC were translated from their original ArcGIS platform to run instead from Safe Software's Feature Manipulation Engine (FME). FME was chosen for several reasons; notably because it can handle current and future CAD file versions, it offers flexible options to run workspaces from the cloud, scripts are easily reconfigured and deployed as necessary, and it is the #1 platform for integrating spatial data.

SPOC's validation checks are prompted to run from the SPOC web application after users have uploaded their files and entered the survey details (metadata). The validation checks are performed in FME workspaces which are run from FME Server sequentially starting with the Structure Check, then the Georeference Check, and finally the Dimension Check.

The scripts produce text document outputs in JSON format. These are then read in by the web application which parses the JSON output and presents the content onto the validation user interface (UI). For example, once the Dimension Check runs, it presents the output to users in SPOC in the form of a table that displays the various dimensions of the uploaded survey plan.

Amazon Web Services (AWS)

SPOC was built on various Amazon Web Services (AWS), which are cloud-based products that can be used for storage, analytics, front-end web, etc. AWS was chosen because it is a comprehensive and broadly adopted cloud platform offering many services with dependable functionality, security and performance. The SPOC web application is hosted by a combination of two services called Cloud Front and S3. The application is also run in a docker contained in AWS Fargate. API Gateway and Lamda are two additional services that run various checks on CAD files uploaded to SPOC, and these services are configured in another AWS called Dynamo DB.

FME Server is hosted in EC2; a cloud-based service that acts like an operating system (in this case Linux). Survey plans are uploaded temporarily to S3 folders ("buckets") as input data for the FME scripts. These survey plans are also used as input to create encrypted zip packages. Java classes are used to create and zip file and add an encryption password to it, then the zip files are stored temporarily in another S3 bucket.

Modernized SPOC Help Center

The modernized SPOC support system is hosted in Freshdesk; a customer support software by Freshworks. The new online ticketing system allows for easier management and scalability of incoming support tickets. For instance, multiple internal support desk agents can now easily respond to and check the status of tickets. SPOC documentation was also translated from a single PDF into a series of articles that users can access from the SPOC Help Center. Users can easily search for SPOC documentation from the user-friendly application, and support agents can easily add, remove, or edit articles in real-time. A SPOC Demo Video will also be created to give users an overview of how to use the SPOC application.

Project Success Factors

The SPOC Modernization project successfully met all project success factors indicated at the start of the project:

- Business Success Factors
  - ✓ The project was completed and all users on-boarded by December 31, 2020
  - ✓ The project was completed within the planned budget
  - ✓ Modernized SPOC can perform plan checks, workflows and create plan packages that mirror current SPOC functionality
  - ✓ Cost reduction through the use of free/open software/data such as Linux, Freshdesk, and open map streaming services
- Technical Success Factors
  - ✓ Built on a framework that can be expanded to address future business requirements
  - ✓ Solution platform and software aligns with modern technology
  - ✓ Solution API configuration and AWS integration support plan checking
  - ✓ Cadastral web map integration supports improved currency
  - ✓ Modernized SPOC supports a better user experience and limits the need for user training

The SPOC Modernization project successfully transitioned Alberta's digital survey plan checker into a modernized platform utilizing industry-leading technologies. Together these technologies will help ensure SPOC's flexible, scalable and reliable performance into the future.