DaaS – Geospatial Data in the Information Age

By now, you've all hopefully heard the term "SaaS" or Software as a Service. This concept has been around for a decade or so and refers to a distribution model in which a third-party provider hosts applications and makes them available to customers over the Internet for a subscription fee. Google seems to be one of the standard-bearers for this type of model, but many other software providers have moved to this type of model as well, including such well-known companies as Oracle, Microsoft, AutoDesk, Bentley and others. To be fair, some of these providers still offer perpetual licenses, but who among us enjoys paying annual maintenance costs to keep their software updated? One of the advantages of cloud-based software is that it will always be up-to-date.

What about "DaaS" – Data as a Service? When hearing this term, most people will think of spreadsheets or financials, but for Geospatial & SUE professionals, the term actually could encompass much more useful data for their everyday tasks. Over the past 10-15 years, advances in such fields as high-speed internet, server technology and software have democratized access to valuable geospatial data. A perfect example is digital orthophotos. This raster data can serve many purposes, from pre-planning projects and looking at them in the context of their surroundings, to layering field data over top of the imagery to provide an integrated deliverable for clients, to analyzing different vintages of images for the purposes of change detection. Often, imagery is the first base layer for such applications.

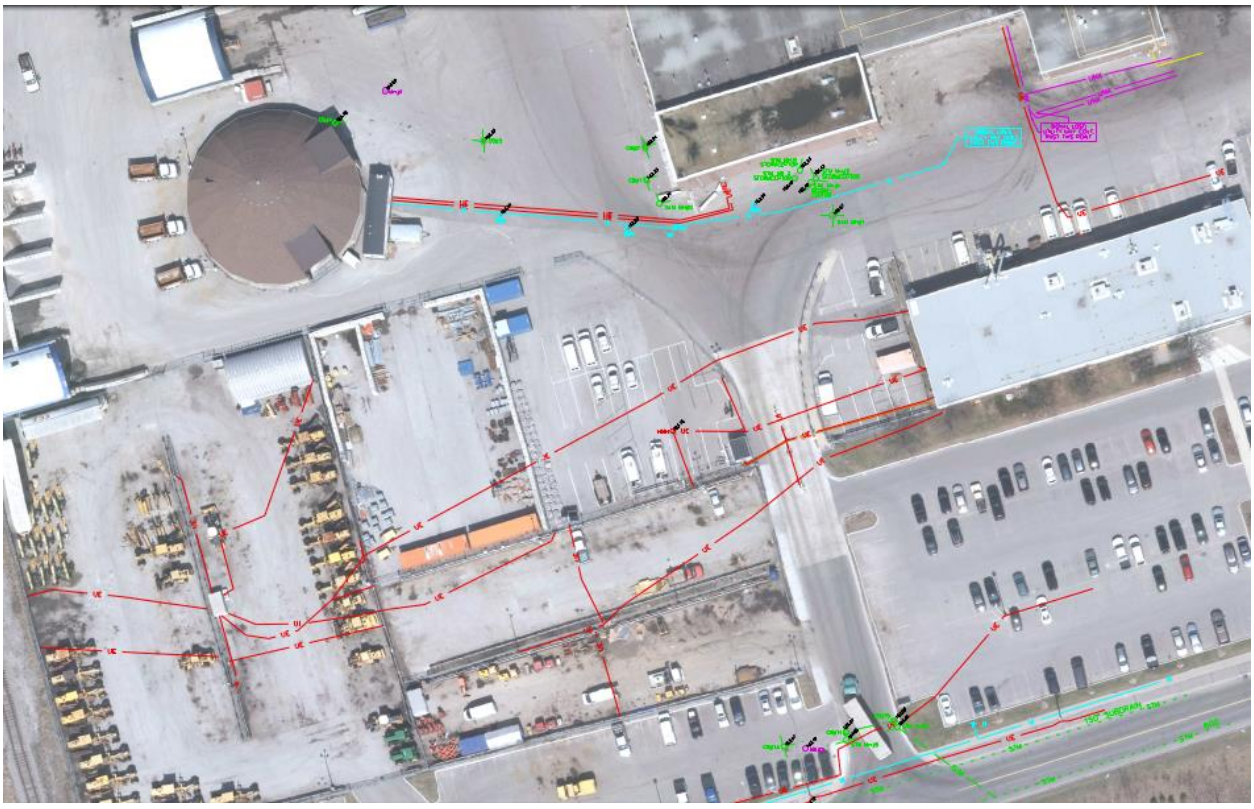

Fig. 1 – SUE project: Orthophoto base layer, with georeferenced Utility information shown.

There is in fact an abundance of geospatial data that is available to professionals - Orthophotos, Satellite Imagery, DEM's, Bare-Earth LiDAR, Parcel Fabric, Road Networks, Contours and other natural features such as soil types and hydrology, and more recently Utility infrastructure, 3D Buildings and other types of land classification. Coupled with a growing trend by municipalities and other levels of government to provide open data from their jurisdictions, it's easy to become overwhelmed trying to sift through what's relevant to your application.

There also exists a variety of platforms to access data. As pointed out above, many municipalities are making data available via their websites and related portals. Unfortunately, with limited budgets, most municipal governments don't have the resources to continuously update these data sets, so they tend to be static snapshots of conditions at the time they were published. If you're inclined to use this type of data, at the very least check the published date to understand how useful it might be to your application.

There are a growing number of sites that offer data visualisation. All datasets are similarly georeferenced to allow the users to layer the data, adjusting transparency of the layers, and even turning them on/off. Many will also allow you to browse other information related to the particular geographic location selected, such as, for example, zoning regulations, postal code data, or property ownership info. Most of these types of sites are either pay as you play, or require a subscription, and tend to cater to non-geospatial users. An example of such a service is shown below. In the example, we can see imagery, 1m contours and parcel fabric data. The function buttons on the left allow users to draw, measure, annotate, query, save and print views, as well as to import csv and zipped SHP files.

Fig. 2 An example of a data visualization website.

Some sites also offer spot purchases of tiles or map sheets in a variety of formats, depending on the type of data. Imagery and other types of raster data can be in JPG, MrSID or GeoTIFF, while vector data is most often found in DWG, DGN or SHP formats. The appropriate format will depend on whether the data is being imported into a CAD or GIS application. This can be a cost effective solution for occasional users who still need access to data but don't need large volumes of data that require a subscription. Tiles are typically reasonably priced and can cover areas from 0.25 km² to 4 or more km². For smaller areas of interest, it usually only requires a few tiles to obtain full coverage.

And then there are the data streaming services. These cater to clients that require higher volumes of data on a regular basis. Satellite and orthoimagery providers typically make their products accessible via a subscription-based model, supporting WMS (Web Map Services) and WMTS (Web Map Tile Services) protocols, amongst others. This allows clients to stream georeferenced imagery directly into CAD or GIS software. Most such sites will include instructions for inexperienced users on how to import the data into their application of choice.

Subscriptions are structured according to either the number of users, the estimated bandwidth to be used on a monthly basis, or both. Access is usually governed by UserID authentification. Streaming does not permit users to save the imagery to a local computer, but rather calls the imagery from a server connection to be displayed in the application of choice. However, when the application is closed, the imagery or other data is deleted and would need to be recalled for the same area in subsequent sessions.

When it comes to satellite imagery, most data providers offer a platform for accessing and viewing archived data and, in some cases, enable tasking of new imagery for particular areas of interest. Both Planet and Digital Globe (now rebranded to Maxar) offer such platforms as a subscription-based service. In the example shown below, the Houston, Texas area has been selected, and the various vintages of 1-month mosaics are shown on the left-hand side of the screen. As we can see, Planet's constellation allows for frequent capture such that monthly mosaics are available for every month going back to 2016. This type of data is very useful for applications such as change detection or monitoring project progress. Planet can even image the whole earth on a daily basis, at lower resolution (3-5m). This type of resolution is less applicable for applications such as Mapping or Planning, however users who are interested in monitoring ship traffic for example, into and out of the Port of Houston, would find this type of cadence to their benefit.

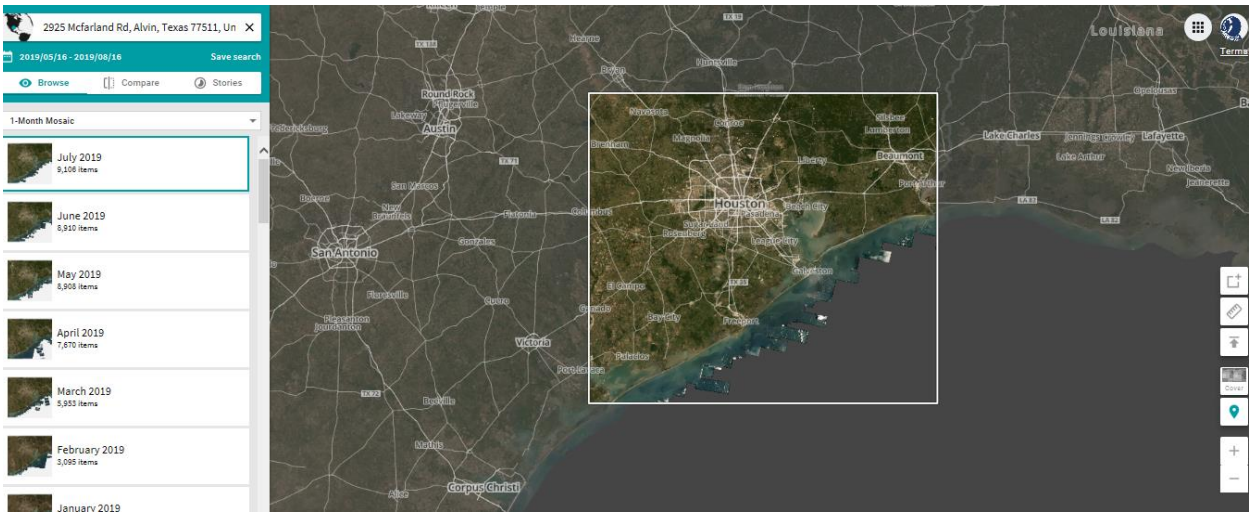

Fig. 3 Planet Explorer interface

As Artificial Intelligence (AI) and Machine Learning (ML) are increasingly deployed, imagery also serves as the basis for automating feature extraction. Until relatively recently, most feature extraction was performed manually from stereo images. With the rise of AI/ML, imagery is being "fed" into AI/ML

processes and used as the base data for feature extraction and land classification. Toronto-based Ecopia is one such company. Its algorithms are extracting building footprints and impervious surfaces with better than 95% accuracy (<5% false positives or false negatives), which in turn produces vector-based content that can be further accessed by interested users.

One aspect of utilizing such data that must be taken into consideration by the user, is licensing issues. Depending on the source of the data, licensing can vary, which in turn impacts how the data can be used. Some companies require specific, separate licenses where publication of the data is intended. These would be in addition to standard use licenses, and often involve additional costs. Other companies may merely require that their data is properly attributed when publicly displayed. And in some rare cases, no publication of data or imagery is permitted. In almost all cases, licenses allow use of the imagery by the customer, colleagues in their organization, and sub-contractors working directly for the client, provided the sub-contractor delete any such data at the termination of the contract. In the event you the reader are looking at utilizing imagery or other data, I strongly recommend familiarizing yourself with the licensing terms to avoid any unpleasant surprises.

So how do you decide what is the best option for you or your organization? Here's a couple of questions you might want to ask of yourself or your colleagues.

- Do you really need to purchase the data? Raster data can eat up memory pretty quickly – anyone who has an iCloud account can attest to this. Unless you're an imagery content provider, consider accessing it via subscription vs. buying it and having to host it internally on your computer or server.
- For imagery, do you need high resolution, or can you accomplish the same task with medium or low resolution imagery? The answer to this question will help you determine if you need orthophotos, or if satellite data can meet your needs. In some cases, such as for our far north, only satellite data is typically available, because it's not cost effective to fly these undeveloped areas for orthophotos, unless it's for specific use cases.
- Do you need to amalgamate a large number of datasets? Try to look for data providers that offer multiple types of data from one easy source. Often, these disparate datasets will be similarly georeferenced, making them easier to integrate and/or layer.

Beyond Utilities, there are many applications that would benefit from access to data, including Smart Cities and 3D City models, Real Estate, Engineering, Planning, Transportation, Infrastructure and Surveying to name a few. There are an increasing number of sites and options available for those looking to access Geospatial data-as-a-service. And with new satellite technology and new ground based imaging systems starting to proliferate, the amount of data and services directed at dissemination will only continue to grow.

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