New Mexico Environment Department

APIs and API Management Platforms
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April 28th, 2020

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Introductions

- Zack Stauber, GIS Coordinator, the consumer of APIs for web maps, report figures, dashboards, or to pass on to the WDA
- Todd Hochman, Application Development Lead, the producer of APIs; these could be from data stored in any database engine, cloud store, spreadsheet,text file, etc. but much of ours in currently in Oracle
- Keith Weber, developer, contractor, master of API Management Platforms

What are APIs?

- A **GUI**, or Graphical User Interface, is meant for human eyes, mouse clicks, scrolling, e.g. most web pages
- An **API**, or Application Programming Interface, is also served up via a type of web server, and while usually in text form, is specifically formatted (e.g. XML, JSON, GeoJSON) to be immediately parsed and used by software, such as shown on a web map, or turned into a table

What are APIs?

- ☐ A **RESTful service, or REST API**, is the most common type of web API which defines some constraints that make it easy to serve data snapshots, even while it may be changing in the background, and even guess at an endpoint, e.g.:
  - ☐ If https://x-23.env.nm.gov/arcgis/rest/services/swqb/npdes_permits/FeatureServer/0 is the endpoint of active NPDES permits
  - ☐ You can take off the /0 and reasonably assume that
  - ☐ https://x-23.env.nm.gov/arcgis/rest/services/swqb/npdes_permits/FeatureServer/ is *all* NPDES permits, and
  - ☐ https://x-23.env.nm.gov/arcgis/rest/services/swqb/ might yield a directory of other services from our Surface Water Quality Bureau. And right on all counts.
- ☐ In sum APIs mean, *no more downloading and parsing specific formats*, such as PDFs, Excel files, or shapefiles, just ingesting services into various software.

Why APIs for GIS?

GIS, on a typical day

GIS, with APIs and an API Management Platform

APIs and API Management Platforms make it much easier to pull together data from disparate sources and manipulate it into web maps or any other use.

Why GIS?

- Most GIS analysts are already using APIs, all the time, whether they know it or not.
  - ArcGIS Server serves map layers as REST services
  - KML feeds shown by Google Earth are REST services
  - USGS has an extensive API for serving stream gage data https://waterservices.usgs.gov/
  - USGS built this API service first (API First paradigm!), then built https://waterdata.usgs.gov/ on top of it
  - Active Wildfire Perimeters is a REST service consumed by Inciweb, NMWatch, and our own Source Water Protection Atlas.
  - You get the idea...

Why GIS?

- ☐ Maps are an easy starting point for non-GIS savvy users to access much more data
  - ☐ REST services aren't just about tabular (or map) data!
  - ☐ They can link you to documents (PDFs, Excel tables, site photos), other data which may make enhance research or web maps
- ☐ Handled directly by software. E.g., Is it easier to download an Excel file with lat/longs and turn it into a shapefile once a day, or just bring an Esri map service directly into your ArcMap?
- ☐ https://e-enterprise-prod.apigee.net/ambient-air/?format=xml (Excel demo)
- ☐ https://e-enterprise-prod.apigee.net/ambient-air/?format=geojson
- ☐ https://gis.web-q.env.nm.gov/apigee/GeoJSONLayer.html (web map demo)
- ☐ Tableau directly consumes web APIs

What is an API Management Platform?

An API Management Platform typically consists of 4 broadly-defined functional elements:

- ☐ A way to publish APIs
- ☐ A way to consume APIs
- ☐ A way to transform APIs
- ☐ A way to secure & analyze the use of APIs

What is an API Management Platform?

Produce APIs

- ☐ Role-Based Access Control over who can upload, publish
- ☐ Define / import API specifications
- ☐ Configure & test API Proxies
- ☐ Publish APIs
- ☐ Orchestrate APIs
- ☐ Bundle results from multiple sources into one output API

What is an API Management Platform?

Consume APIs

- ☐ API Portal
- ☐ Displays services in a searchable, navigable,consistent GUI for API discovery
- ☐ Provides documentation & test harness for APIs
- ☐ Can have multiple portals, depending on solution
- ☐ Portals can include other content, depending on solution

What is an API Management Platform?

Transform APIs

- ☐ Consistent URLs for all services
- ☐ Security controls - JWT security, others
- ☐ Can proxy 3rd-party APIs
- ☐ Caching for large or complex (slow) queries
- ☐ Can manipulate output (including from 3rd parties) on the fly, e.g. metric->imperial units

What is an API Management Platform?

Transform APIs

- ☐ Can reformat output for specific uses, e.g. XML->JSON, JSON->GeoJSON, WaterML->GeoJSON
- ☐ Can add/subtract/reorder columns, do subsets of data, filter queries, &c.

What is an API Management Platform?

Secure & Analyse the use of APIs

- ☐ Can restrict access to content:
  - ☐ APIs/Products free to use w/o registration
  - ☐ APIs that require registration
- ☐ Requiring a security key guarantees accurate usage stats
- ☐ Usage statistics & analytics -- robustness of analytics tools depends on solution
- ☐ Impose security and proxy standards

The Water Data Act:

The Act will develop common water data standards for data collection and integrate a water data information platform.

- ☐ Became law in 2019
- ☐ Requires five state agencies to standardize data on water levels, quality and use

How can this benefit the Water Data Act?

How to most quickly & easily get data & make it interoperable?

APIs are quicker & easier to build than almost any other software - only has to do 4 simple things:

1. Access the database
2. Query the data
3. Format the data
4. Return the data

How can this benefit the Water Data Act?

API Management Platforms help us handle all the hard parts:

- ☐ Establishing a centralized secure location;
- ☐ API Standards & Documentation;
- ☐ API Security;
- ☐ API Data format translation & transformation;
- ☐ API Discoverability;
- ☐ API Usage Analytics;

Conclusions

- ☐ We need GIS people, and hydrologists, to start getting excited about APIs:
  - ☐ https://community.esri.com/ideas/7155-support-swagger-for-arcgis-server-rest-endpoints

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