



GIS 101 Geocoding...



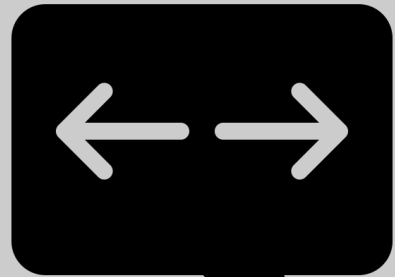
National States Geographic Information Council

Presented by Greg Bunce
GIS Data Coordinator
Utah Geospatial Resource Center

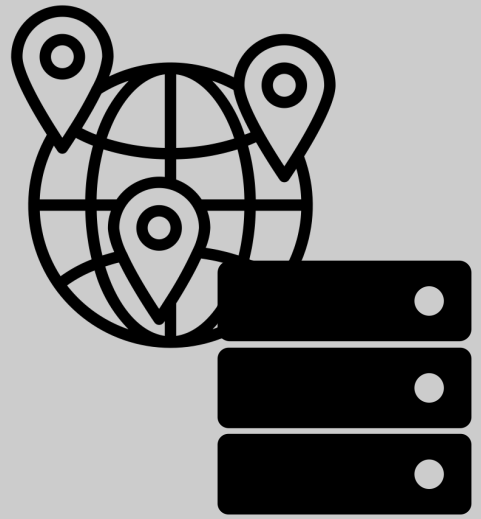


What is geocoding?

Humans



Machines



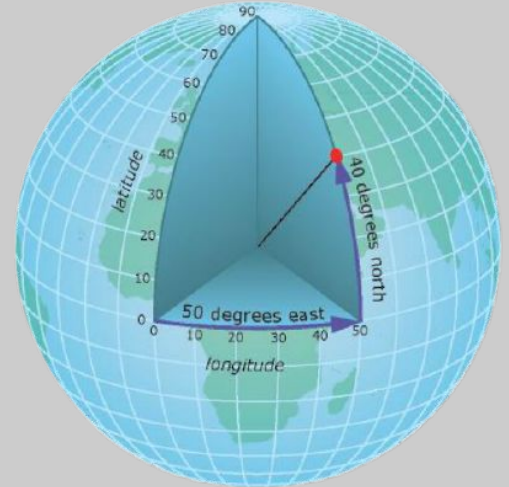
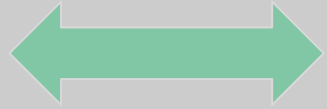


What is geocoding?

... street address



**506 Columbia Street
Hood River, Oregon
97031**



**45.7103734052504,
-121.51601801862141**



What is geocoding?

... open location codes



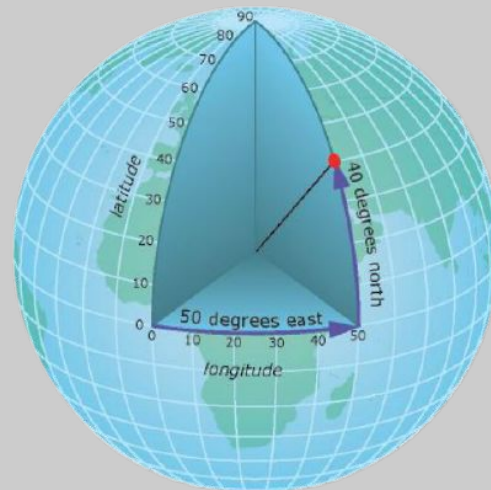
Plus Codes

PF6M+5H Hood River, Oregon

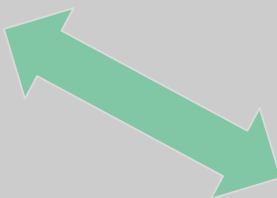


what3words

broaden.radical.finest



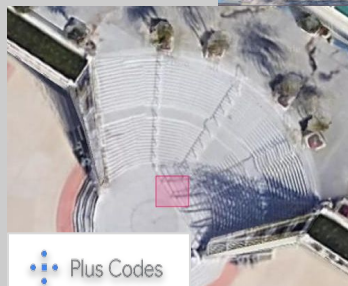
**45.7103734052504,
-121.51601801862141**





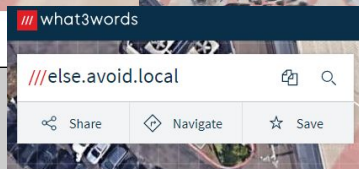
What is geocoding?

📍 San Diego Convention Center
111 W Harbor Drive
San Diego, CA 92101



Plus Codes

PR4P+JM
San Diego, CA, USA



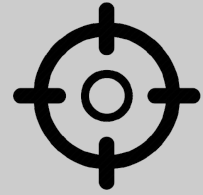
32.70651837532672, -117.16337066603002



Who geocodes?



**navigation and
directions**



**location
services**



we all geocode!

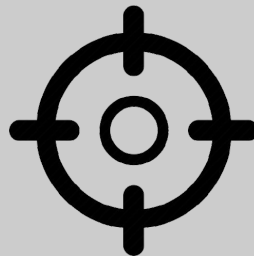


Reverse geocoding

going from coordinates to standardized address



I need transportation services from my current location



you are here



I'm not sure where I'm located but I need assistance



An abundance of geocoders

this list is by no means inclusive

Census Geocoder

<https://geocoding.geo.census.gov/geocoder>

ESRI ArcGIS World Geocoding Service

<https://developers.arcgis.com/features/geocoding>

GeoPy

<https://geopy.readthedocs.io>

Google Maps Geocoder

<https://developers.google.com/maps/documentation/geocoding/overview>

HERE Maps

<https://developer.here.com/c/geocoding>

Mapbox

<https://docs.mapbox.com/search-playground/>

Nominatim (OpenStreetMap) Geocoder

<https://nominatim.org>

OpenCage

<https://opencagedata.com/>

TomTom

<https://developer.tomtom.com/products/places-api>



Benefits of maintaining your own

Full control to correct, improve, and update the data

To enhance existing IT systems

Promotes collaboration

Wider use of users (not everyone wants points and lines)

Adds accountability to the data

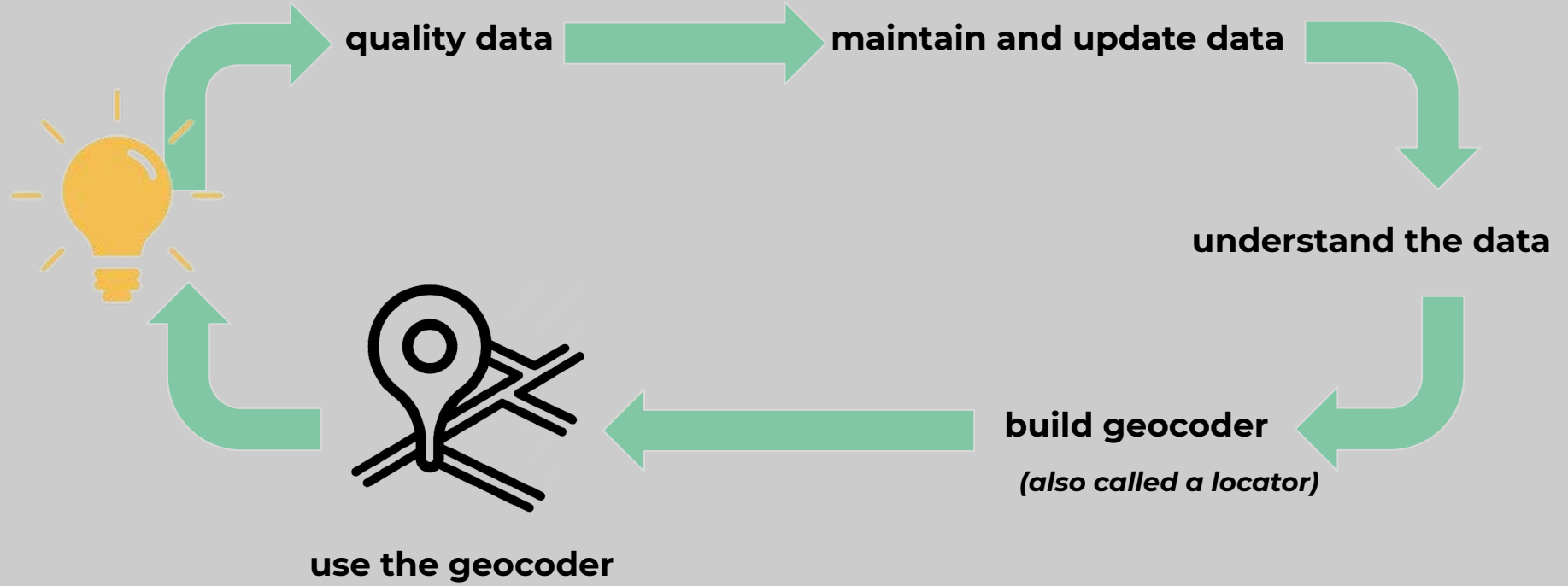
Adds value to your data

It opens the door on the value of GIS (data visualization)

Potential to generate revenue

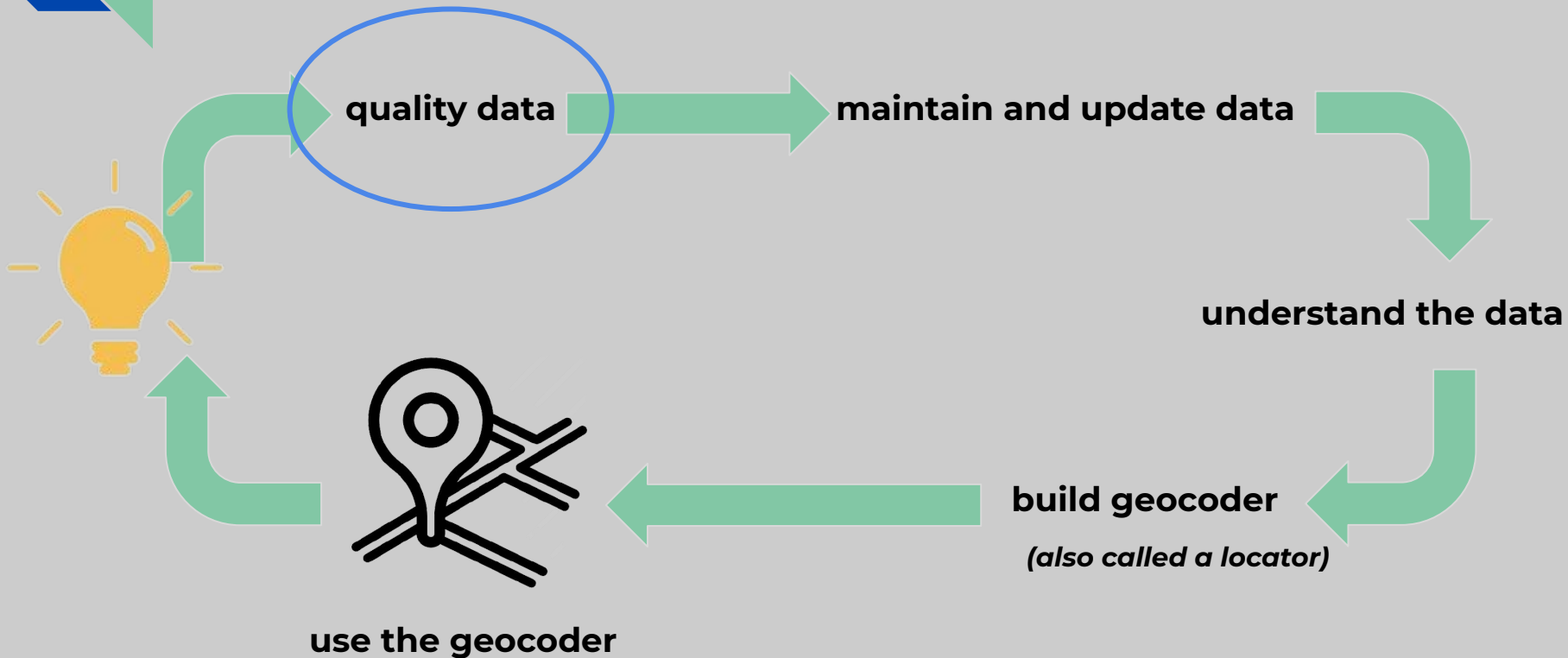


The evolution of a geocoder





The evolution of a geocoder





Quality data (authoritative)

The reference data

Address Points →

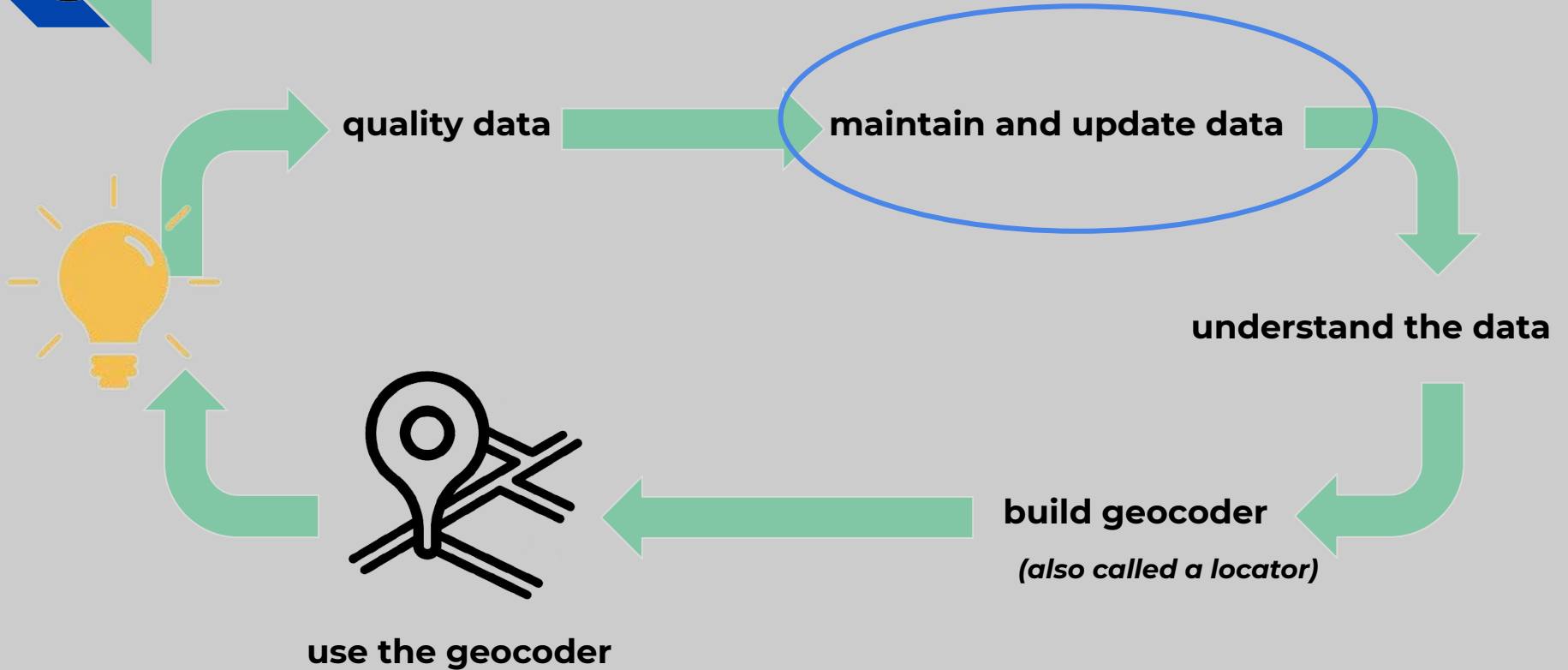
Road Centerlines →

Assessor Parcels →



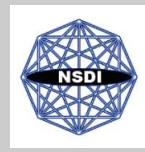


The evolution of a geocoder





Maintain and update the data



↑
States

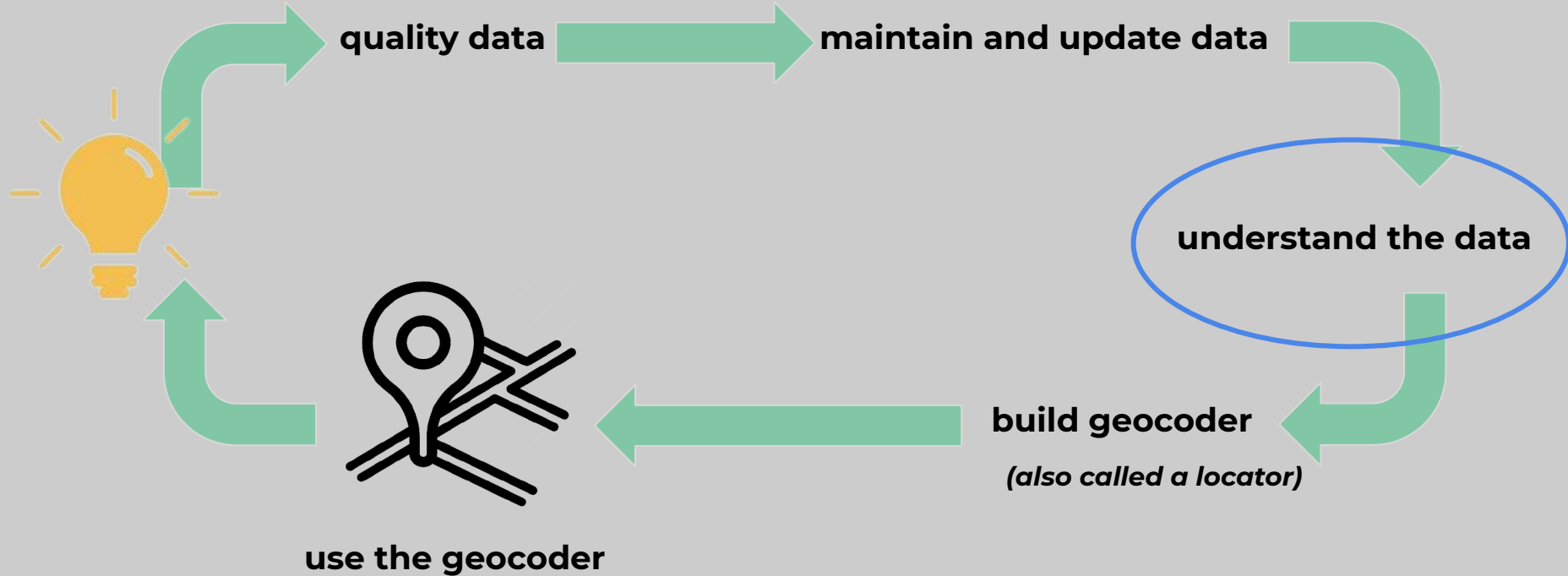
↑
Counties

↑
Local Municipalities and agencies (PSAPs, etc.)

↑
Tribal lands



The evolution of a geocoder





Understand the data

Road Centerlines

- Direction of line (geometry)
- Right-Left attributes
 - Parity (odd/even/both)
- Alias names

Address Points

- Place names
- Sub addresses (units, suites)



address grids

ADDR_SYS	L_F_ADD	L_T_ADD	R_F_ADD	R_T_ADD	PREDIR	STREETNAME	STREETTYPE	ALIAS1	ALIAS1TYPE	ALIAS2	ACSALIAS
SALT LAKE CITY	101	159	100	160	South	MARIO CAPECCHI	Drive	MEDICAL	Drive	HIGHWAY 282	1900 E

alias names



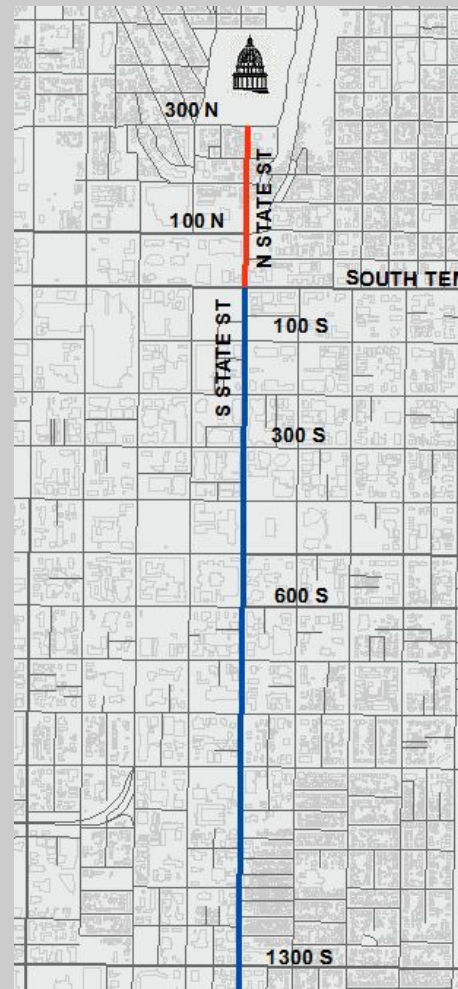
Understand the data

Domains

- St George, St. George, or Saint George?

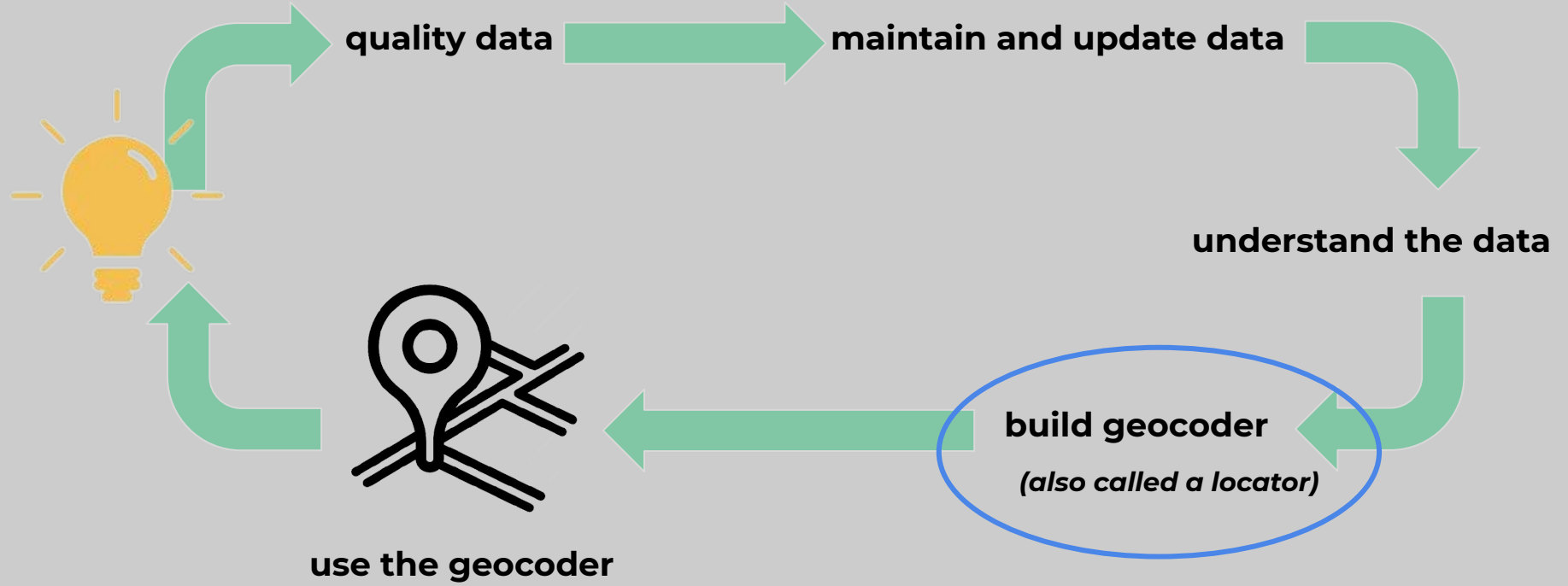
Understand the local vernacular

- Optimize the data via a derived dataset
 - '4500 South' is also known as '45th'
 - '900 E 900 S' is also known as 'nine and nine'
 - Omit predirection for better match scores
 - 'Wasatch Drive' vs 'E Wasatch Drive'
 - Omit road segments with no address ranges
- Enhance the input
 - Switched coordinates on numeric streets
 - '1300 E 1840 S' has to be '1840 S 1300 E'
 - Numeric streets have two directionals
 - 1706 E 1300 S
 - Common misspellings
 - Tooele, Uinta





The evolution of a geocoder





Building a geocoder

Road Centerlines

- geocode offset
 - know the road right of ways and the polygon data

Extent of the data

- native coordinate system

Composite geocoders

- Address points
- Road Centerlines

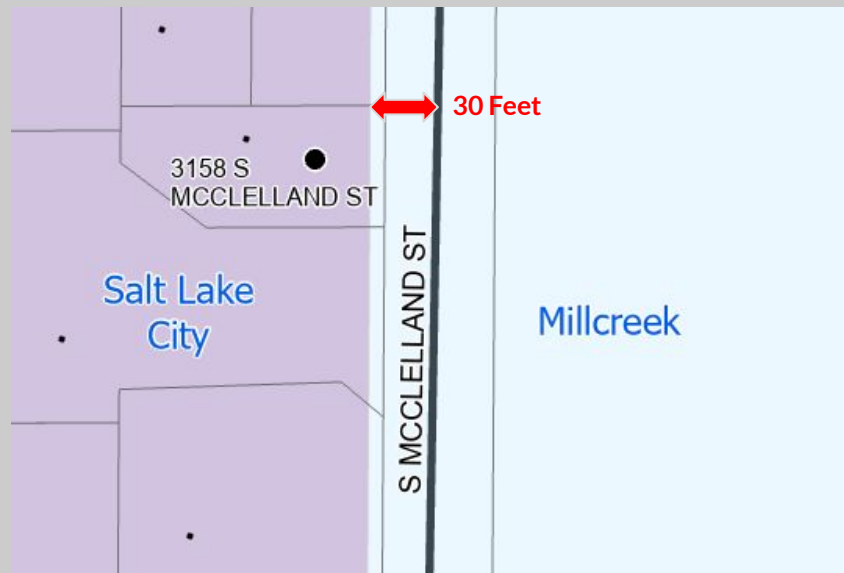
What's the appropriate match score?

Hardware/servers

- In cloud vs on premise

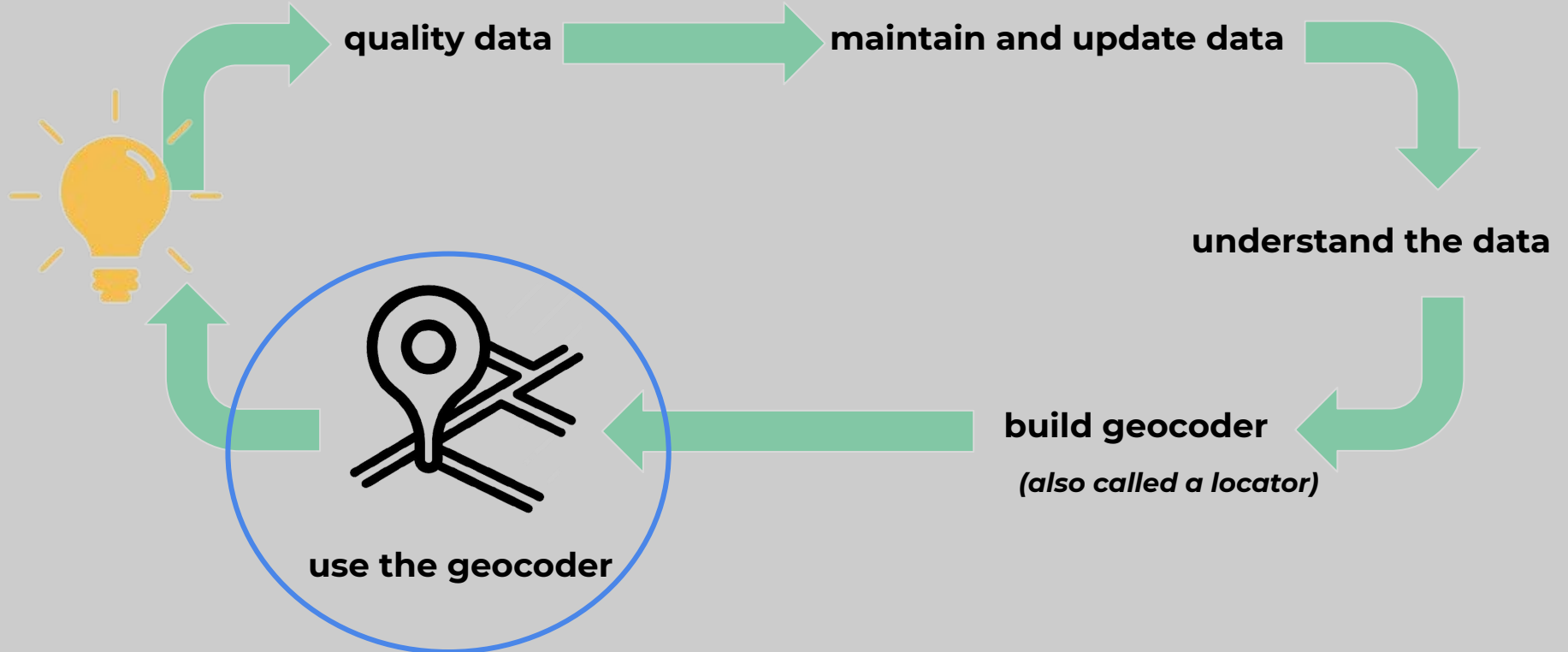
Make it useful

- API, desktop version, plug-ins, spreadsheet, etc.





The evolution of a geocoder





Using the geocoder... use cases

enhancing larger IT systems



NSGIC

GEO-ENABLED ELECTIONS



Using the geocoder

road centerlines vs address points



NSGIC
GEO-ENABLED ELECTIONS

know the
geocoder

know the data

Municipal
Boundary

Voting Precinct





Using the geocoder

road centerlines vs address points



NSGIC
GEO-ENABLED ELECTIONS

know the
geocoder

know the data

1:911

Pop-up

AGRC_RoadsLocator (1)

903 E GREGSON AVE, Salt Lake City, 84106

903 E GREGSON AVE, Salt Lake City, 84106

Street	903 E GREGSON AVE
City	Salt Lake City
ZIP	84106
x:	426,897.632203



Using the geocoder

road centerlines vs address points

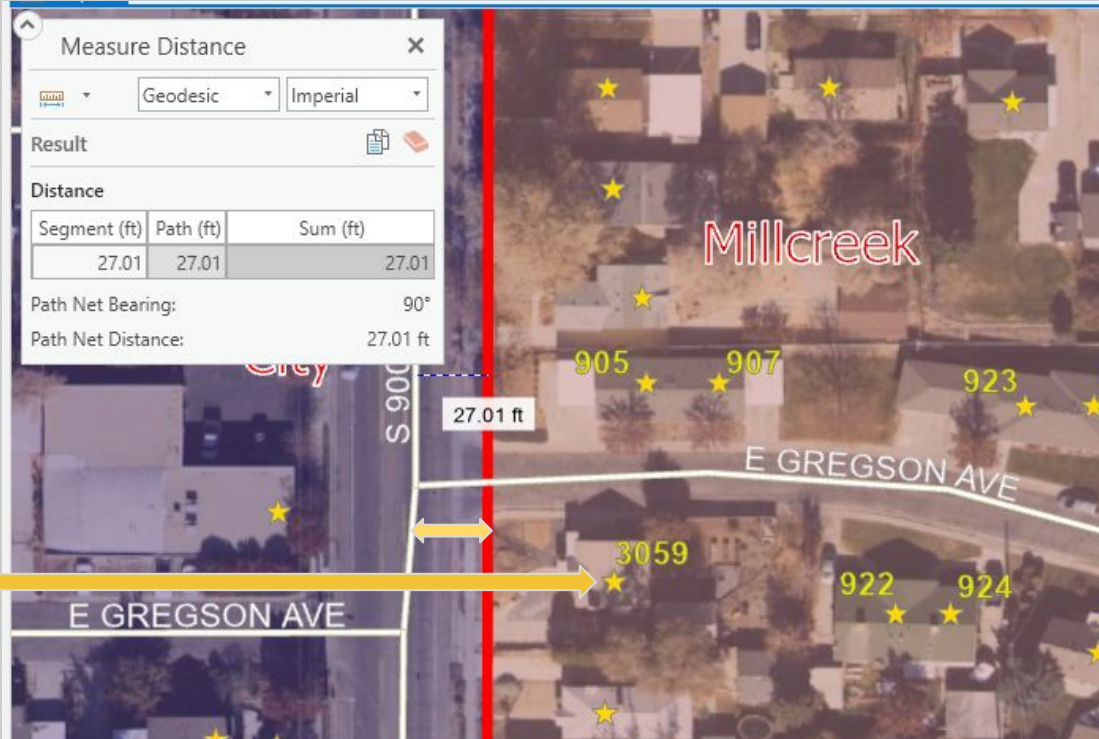


NSGIC
GEO-ENABLED ELECTIONS

know the
geocoder

know the data

potential for
wrong ballot



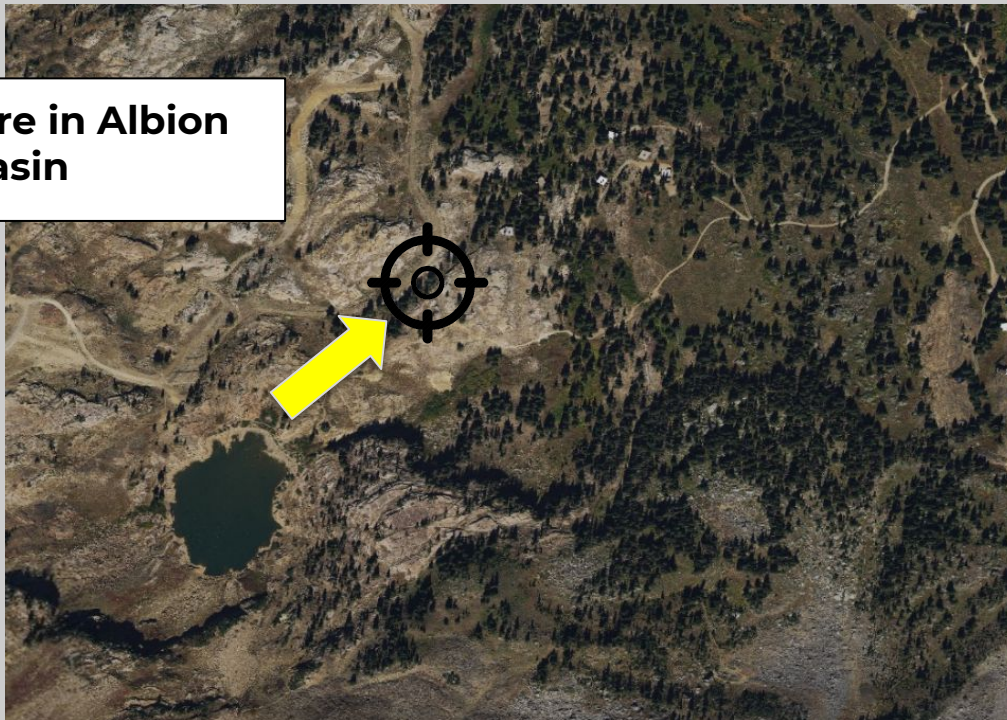


Using the geocoder

reverse geocoding

somewhere in Albion
Basin

from
coordinates
to
standardized
address



NEXT
GENERATION
9-1-1

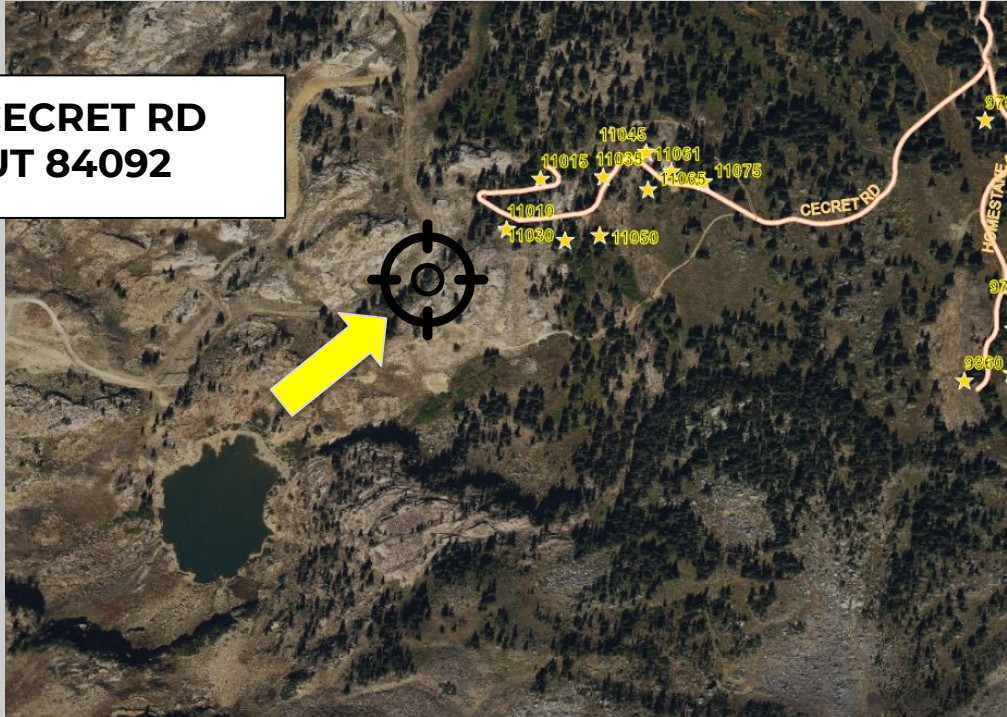


Using the geocoder

reverse geocoding

**11030 E CECRET RD
ALTA, UT 84092**

from
coordinates
to
standardized
address



**NEXT
GENERATION
9-1-1**



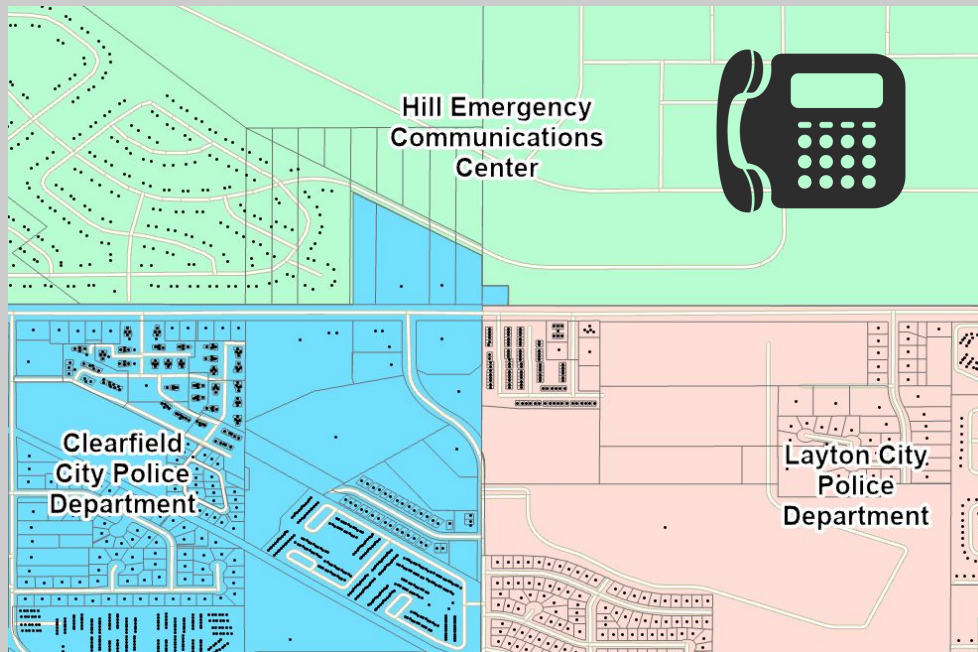
Using the geocoder

routing calls to the correct dispatch center (PSAP)

NEXT
GENERATION
9-1-1

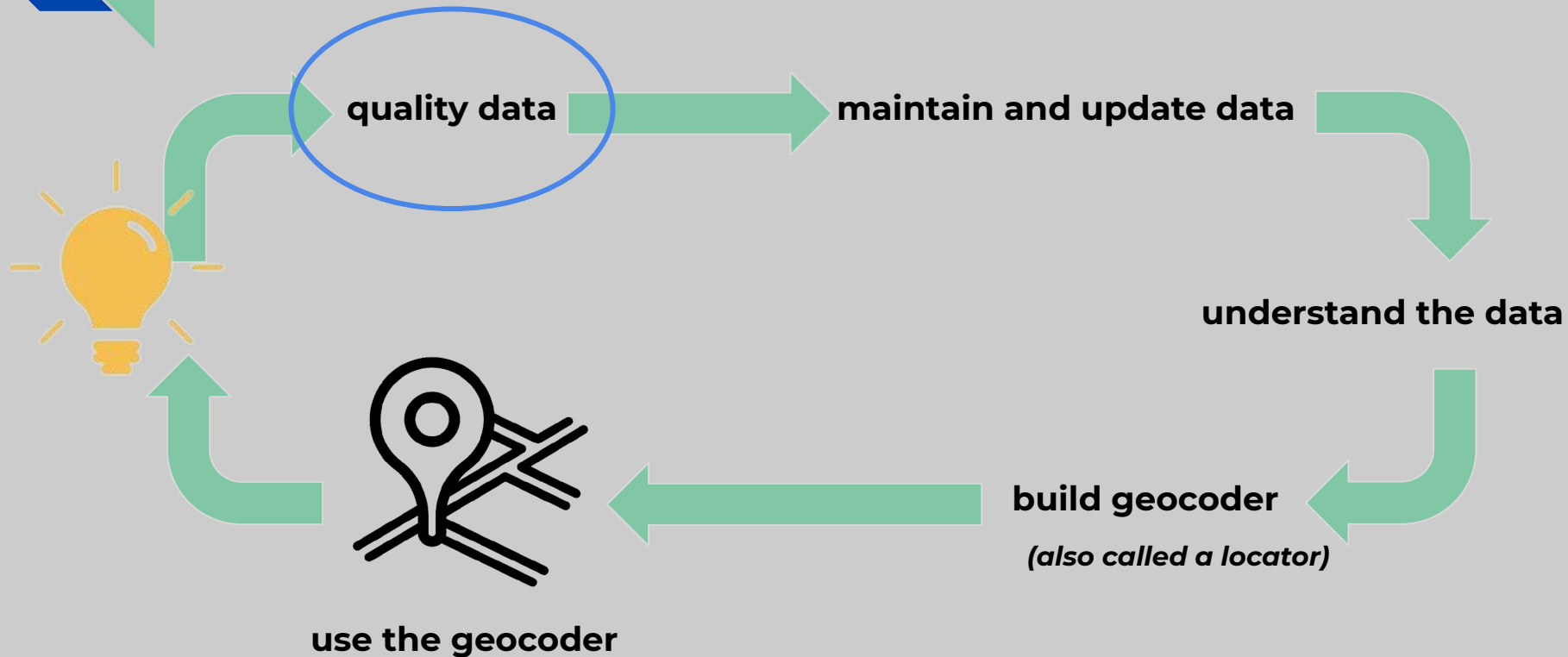
GIS is the backbone of NG911 call routing

location, location, location.





The evolution of a geocoder





Quality data

Geocoding helps improve the data

Geocoding enables quality checks

- **Batch geocodes**
- **Match scores**
- **Fishbone analysis**



Image: Michael Baker Datamark and 1Spatial

Encourages greater communication with the data stewards

- **Everyone has vested interest in a reliable geocoder**



Geocoding... a universal function

- **We all speak the language of geocoding**
 - **Humans and IT system alike**
- **Accurate, authoritative data is invaluable**
- **It's the gateway to GIS**
- **Location services power our world**



GIS 101
Geocoding



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