



Esri International Developer Summit
Palm Springs, CA

Developing Web Applications with Geocoding and Routing Services Using ArcGIS Online

Deelesh Mandloi
Dmitry Kudinov
Brad Niemand

Metadata

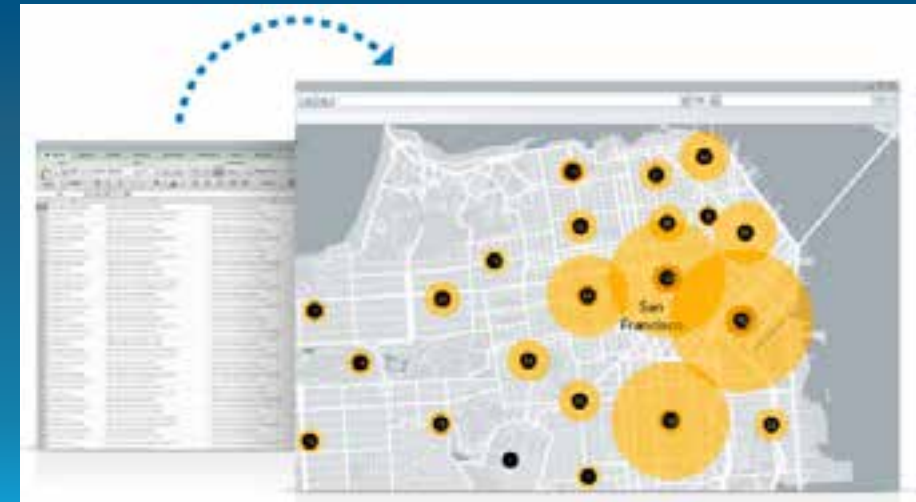
- Slides will be available at <http://proceedings.esri.com>
- Documentation at <http://developers.arcgis.com>
 - First read the REST API doc and then read the doc for your SDK
- Code samples at <http://nadev.arcgis.com/arcgis/samples>

Topics

- What geocoding and routing services are available with ArcGIS Online?
- What can I do with the services?
- How to access the services?
- How much will the services cost me?
 - To develop my application (**Free** fine print)
 - To deploy my application

Geocoding Service

- Turn addresses into coordinates
- Search for point-of-interest, business names
- Auto-complete inputs using suggestions
- Convert coordinates into addresses
- Convert a table of addresses into points



Geocoding Service Coverage

- Supports global coverage
- Hosted and managed by Esri
- Powered by authoritative content that is updated on a regular basis



[View larger map](#)

Geocoding Service Use Cases

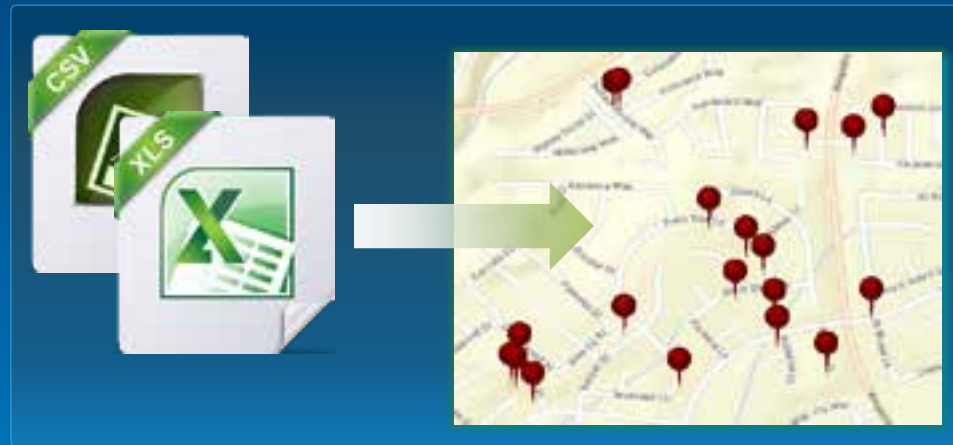
Geosearch with Suggestions

You can locate an address, or find a place, feature, or point-of-interest. The search **result is displayed** on the map



Batch Geocoding

you can convert an address to an x, y coordinate and **store the result** in a database.



Reverse Geocoding

You can also reverse geocode an x, y coordinate to get an address



Service Operations – Geosearch

- If your input is single text field – use **find** operation

- Example: Find Palm Springs, CA

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer/find?text=Palm Springs,CA&f=pjson
```

- Pass in **location** and **distance** to perform local search

- Example: Find 5 local Starbucks within 5 miles. Get the street address for each Starbucks

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer/find?text=Starbucks&maxLocations=5&location=-116.5453,33.8303&distance=8000&outFields=Place_addr&f=pjson
```

Service Operations -- Geosearch

- If your input is in multiple text fields – use **findAddressCandidates** operation

- Example: Find Address = 277 N Avenida Caballeros, City = Palm Springs, State = CA, Zip = 92262

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer  
/findAddressCandidates?Address=277 N Avenida Caballeros&City=Palm  
Springs&Region=CA&Postal=92262&f=pjson
```

- Pass in **location** and **distance** to perform local search

Service Operations – Geosearch with Suggestions

- Use **suggest** operation to get a list of candidates for input text
 - Example: Get local suggestions for palm springs co

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer/suggest?text=palm springs co&location=-116.5453,33.8303&distance=50000&f=pjson
```

- Use **text** and **magicKey** obtained from **suggest** operation with **find** or **findAddressCandidates** operations
 - Example: Use suggestion to perform geosearch

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer/find?text=Palm Springs Convention Center (Convention Center), 277 N Avenida Caballeros, Palm Springs, California&magicKey=JS91CYhQDS5vDPhvSMYgZby0YFbKQ5oEMskKCDNuYb9QDo4AYc5LDMhACbcn&location=-116.5453,33.8303&distance=50000&f=pjson
```

Service Operations – Reverse Geocoding

- To convert coordinates into an address – use **reverseGeocode** operation
 - Example: Find street address for Palm Spring Convention Center

```
https://geocode.arcgis.com/arcgis/rest/services/World/GeocodeServer/reverseGeocode?location=-116.537,33.8254&f=pjson
```

Demo

Local geosearch with auto-completion using the geocoder widget

find and suggest geocoding operations



Batch Geocoding

- Convert a table of addresses into points
- Synchronous operation that supports `SuggestedBatchSize` (currently set to 150) records per request
 - Requires chunking of inputs on client side
- Workflows to perform batch geocoding
 - Geocode Addresses geoprocessing tool
 - Use `addItem`, `analyze`, `generate` and `publish` operations from ArcGIS Online
 - `geocodeAddresses` operation from the geocoding service

Geocode Addresses geoprocessing tool

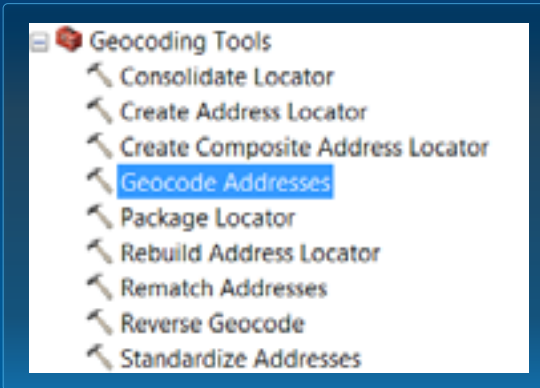
- Available with ArcGIS for Desktop, ArcGIS Engine and ArcGIS for Server
- Requires an ArcGIS Server connection file (.ags file)
- Automatically chunks your input table
- Handles timeouts and failure from any intermediate requests

Geocode Addresses geoprocessing tool

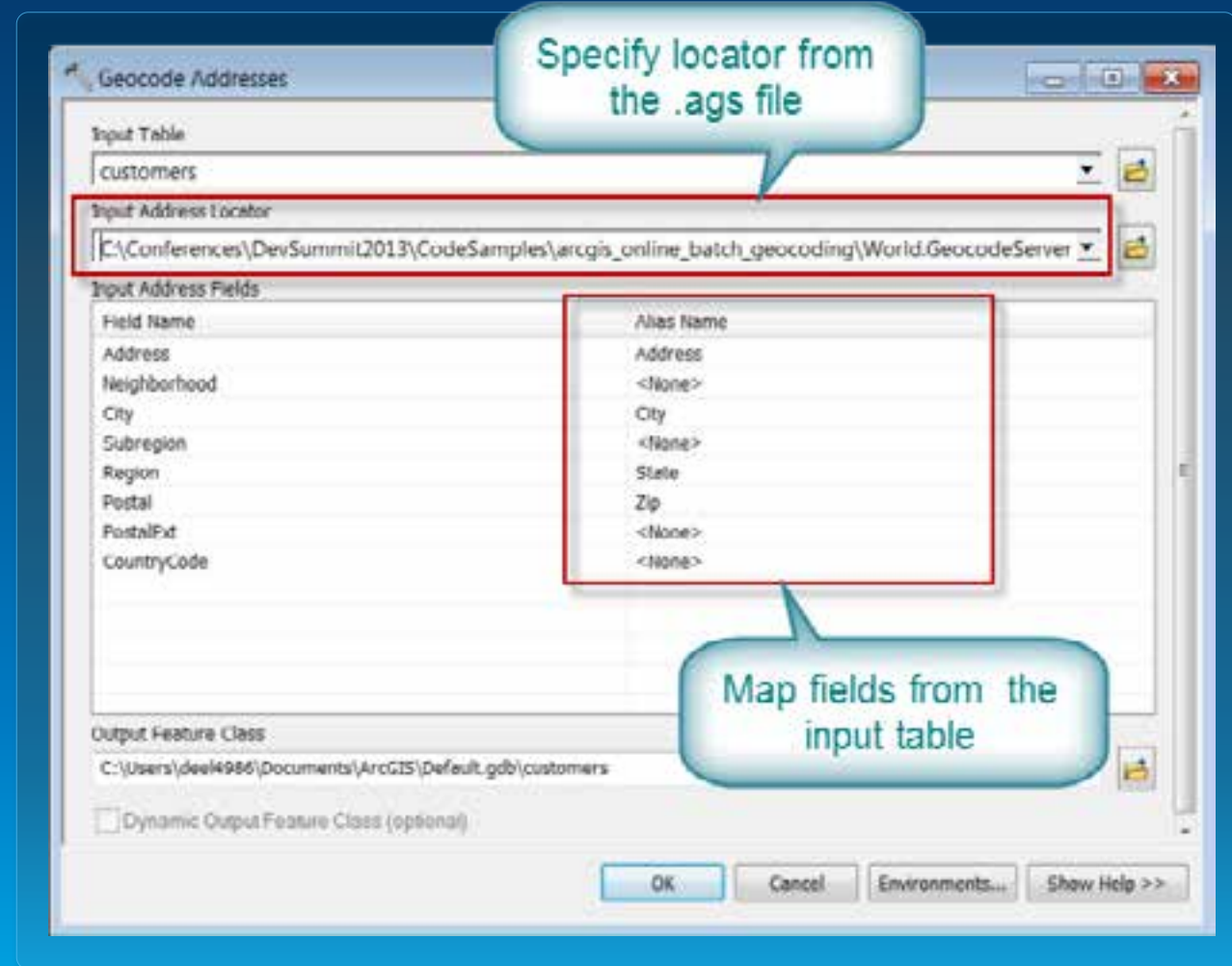
- Create ArcGIS Server connection file using ArcGIS for Desktop



Geocode Addresses geoprocessing tool



The tool can also be accessed in Python scripts



Batch Geocoding using **analyze, generate, publish**

- Operations available with arcgis.com
- Make use of the geocoding service behind the scenes
- Useful when working with web maps and apps
- Simplifies client-side logic
 - Automatically chunks input table
 - Handles timeouts and failure from any intermediate requests

Batch Geocoding using **analyze** and **generate**

- **Example use case: Drag and drop a CSV file to perform batch geocoding and save results in a web map**
- **Use analyze to get **publishParameters****

```
https://www.arcgis.com/sharing/rest/content/features/analyze?file=<file name>&type=csv&f=json
```

- **Use generate to geocode the CSV file and create JSON feature collection that can be persisted in a web map**

```
https://www.arcgis.com/sharing/rest/content/features/generate?token=<your token>&file=<file name>&type=csv&publishParameters=<publish parameters>&f=json
```

Batch Geocoding using `addItem`, `analyze` and `publish`

- **Example use case: Upload a CSV file to `arcgis.com` and publish the file as a feature service**
- **Use `addItem` to upload the file to `arcgis.com` and get the item id**

```
https://www.arcgis.com/sharing/rest/content/users/<username>/addItem?token=<your token>&file=<file name>&type=csv&itemInfoParameters=<item info parameters>&f=json
```

- **Use the item id with `analyze` to get `publishParameters`**

```
https://www.arcgis.com/sharing/rest/content/features/analyze?itemID=<item ID>&type=csv&f=json
```

- **Use `publish` to geocode the uploaded CSV file and save the results as a feature service**

```
https://www.arcgis.com/sharing/rest/content/users/<username>/publish?token=<your token>&itemID=<item ID>&filetype=csv&publishParameters=<publish parameters>&f=json
```

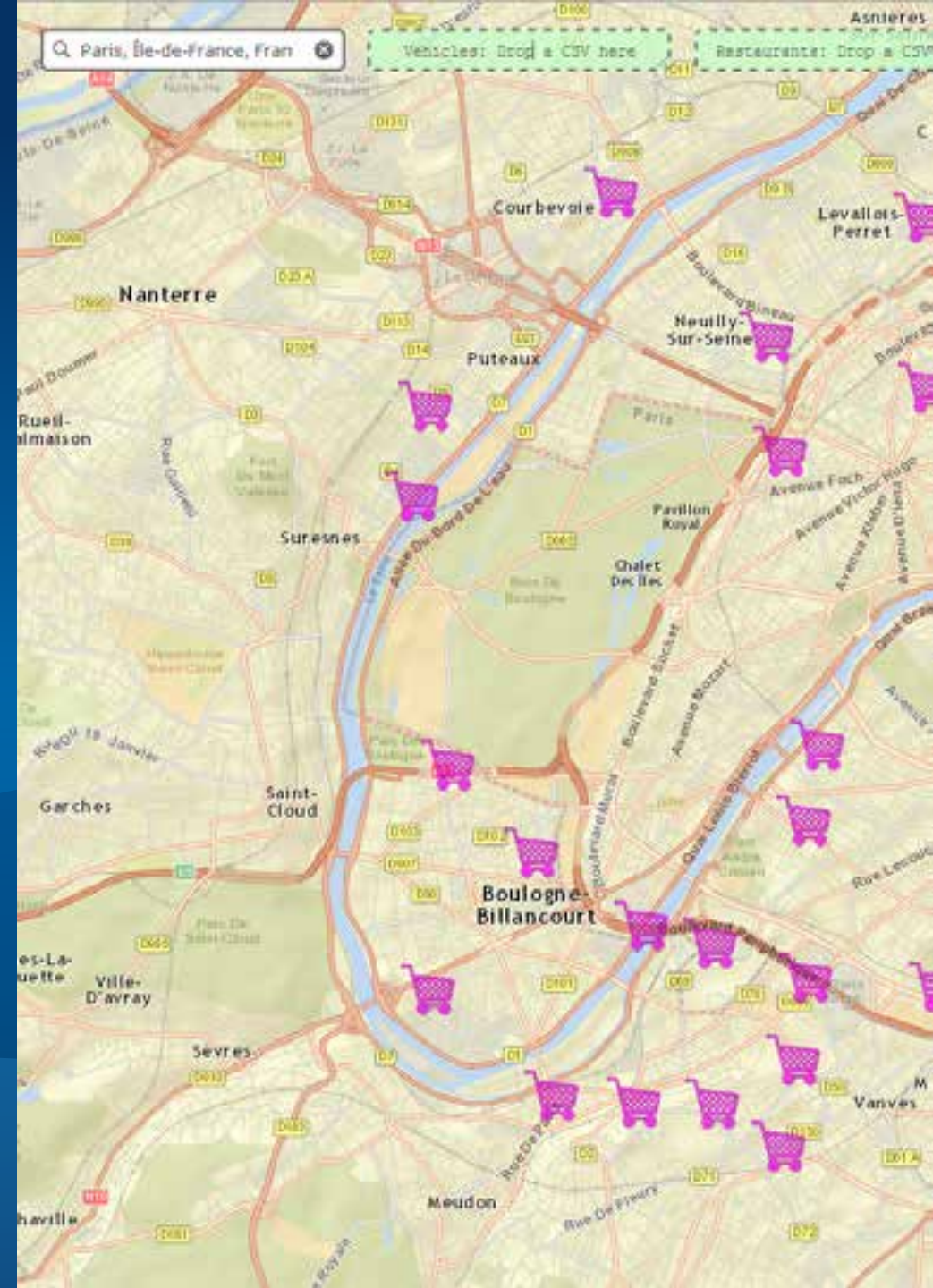
Batch Geocoding using `geocodeAddresses` operation

- Need to provide the client side logic to
 - Chunk input table into batches of size `SuggestedBatchSize` (currently set to 150)
 - Handle timeouts and failure from any intermediate requests
 - Persist the results from each successful intermediate requests
- Useful if batch geocoding is part of a back end enterprise process

Demo

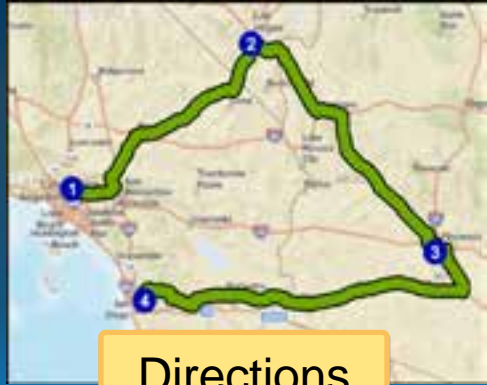
Batch geocode a CSV file containing restaurant addresses

- **analyze** and **generate** operations
- [View live sample](#)
Works best with Google Chrome browser

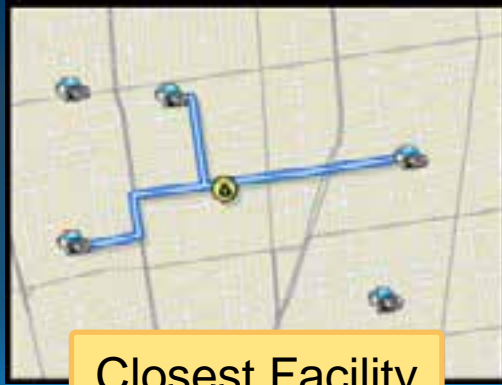


Routing Services

- Services that allow you to perform analyses on street networks



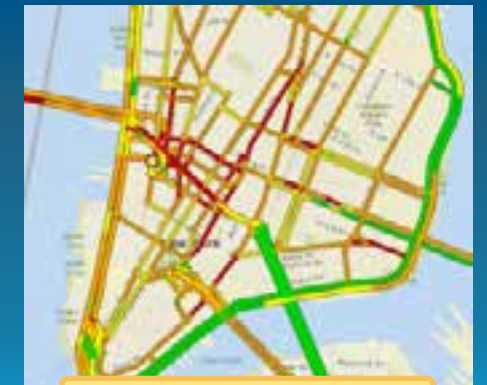
Directions



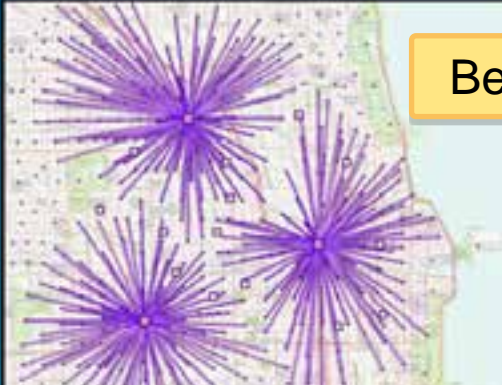
Closest Facility



Service Areas



Traffic



Location-Allocation

Beta



Vehicle Routing Problem

Common to all Services

- **Work globally**
 - Currently 147 countries.
 - New countries are added periodically
- **Use high quality underlying street data**
 - Real time traffic where available
 - Support for vehicle weight, width and height restrictions
 - Can use preferred truck routes or avoid toll roads



[View larger map](#)

Directions

- Point-to-point routing – Simple Route
- Find the best route for visiting a series of stops that minimizes travel time or travel distance – Optimized route
- Use live traffic conditions
- Driving directions in many languages
- Synchronous and Asynchronous execution



Directions

Request URL (Synchronous Execution)

```
https://route.arcgis.com/arcgis/rest/services/World/Route/NAserver/Route_World/solve?<parameters>
```

Example Request (Synchronous Execution)

```
https://route.arcgis.com/arcgis/rest/services/World/Route/NAserver/Route_World/solve?token=<yourToken>&stops=-122.4079,37.78356;-122.404,37.782&f=pjson
```


Closest Facility

- Find the closest facilities from each incident
- Generate routes and driving directions
- You can also...
 - Use live traffic conditions
 - Limit the search distance
 - Limit the number of facilities to find
 - Travel from the facility to the incident
- Synchronous and Asynchronous execution



Closest Facility

Request URL (Synchronous Execution)

```
https://route.arcgis.com/arcgis/rest/services/World/ClosestFacility/NA Server/ClosestFacility_World/solveClosestFacility?<parameters>
```

Example Request (Synchronous Execution)

```
https://route.arcgis.com/arcgis/rest/services/World/ClosestFacility/NA Server/ClosestFacility_World/solveClosestFacility?token=<yourToken>&incidents=-122.4496,37.7467&facilities=-122.4267,37.7486;-122.4561,37.7513&f=pjson
```

Service Areas

- Find the area you can reach from a location in a given time period
- You can also...
 - Solve for many locations
 - Use multiple drive time values
 - Analyze for different times of the day
 - Specify the direction of travel
- Synchronous and Asynchronous execution



Service Areas

Request URL (Synchronous Execution)

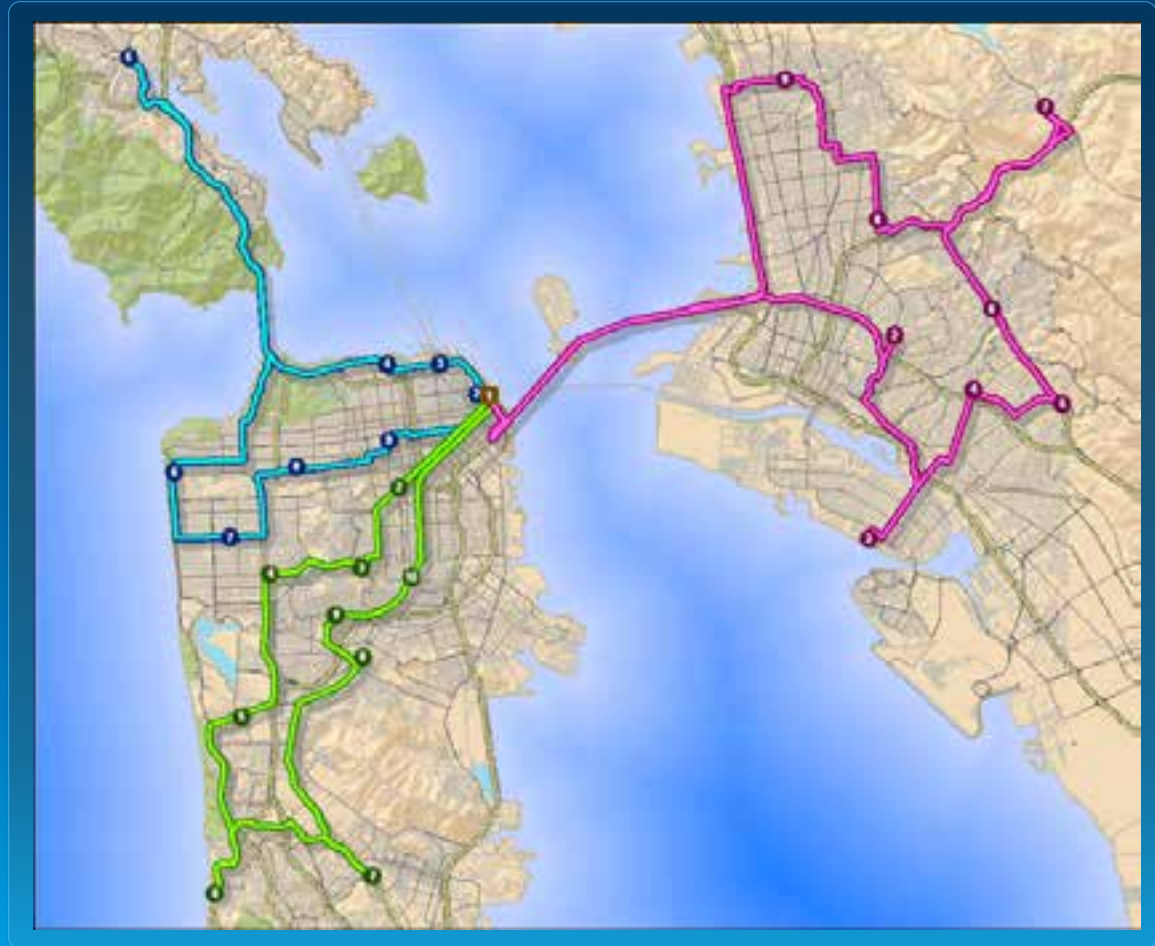
```
https://route.arcgis.com/arcgis/rest/services/World/ServiceAreas/NAserver/ServiceArea_World/solveServiceArea?<parameters>
```

Example Request (Synchronous Execution)

```
https://route.arcgis.com/arcgis/rest/services/World/ServiceAreas/NAserver/ServiceArea_World/solveServiceArea?token=<yourToken>&facilities=-122.4496,37.7467&f=pjson
```

Vehicle Routing Problem

- Route a fleet of vehicles to service a set of orders
- You can also specify...
 - Vehicle capacities
 - Driver specialties
 - Work breaks
 - Time windows on orders
- Synchronous and Asynchronous execution



Vehicle Routing Problem

Request URLs (Asynchronous Execution)

Submit Job

`https://logistics.arcgis.com/arcgis/rest/services/World/VehicleRoutingProblem/GPServer/SolveVehicleRoutingProblem/submitJob?<parameters>`

Get Job Status

`https://logistics.arcgis.com/arcgis/rest/services/World/VehicleRoutingProblem/GPServer/SolveVehicleRoutingProblem/jobs/<yourJobID>?token=<yourToken>&f=json`

Get Outputs

`https://logistics.arcgis.com/arcgis/rest/services/World/VehicleRoutingProblem/GPServer/SolveVehicleRoutingProblem/jobs/<yourJobID>/results/<output_parameter_name>?token=<yourToken>&f=json`

Location-Allocation (Beta)

- Choose best facilities based on their potential interaction with demand points
- You can also...
 - Choose from many different analysis types
 - Limit the capacity of facilities
 - Analyze for different times of the day
- Asynchronous execution only



Location-Allocation

Request URLs (Asynchronous Execution)

Submit Job

`https://logistics.arcgis.com/arcgis/rest/services/World/LocationAllocation/GPServer/SolveLocationAllocation/submitJob?<parameters>`

Get Job Status

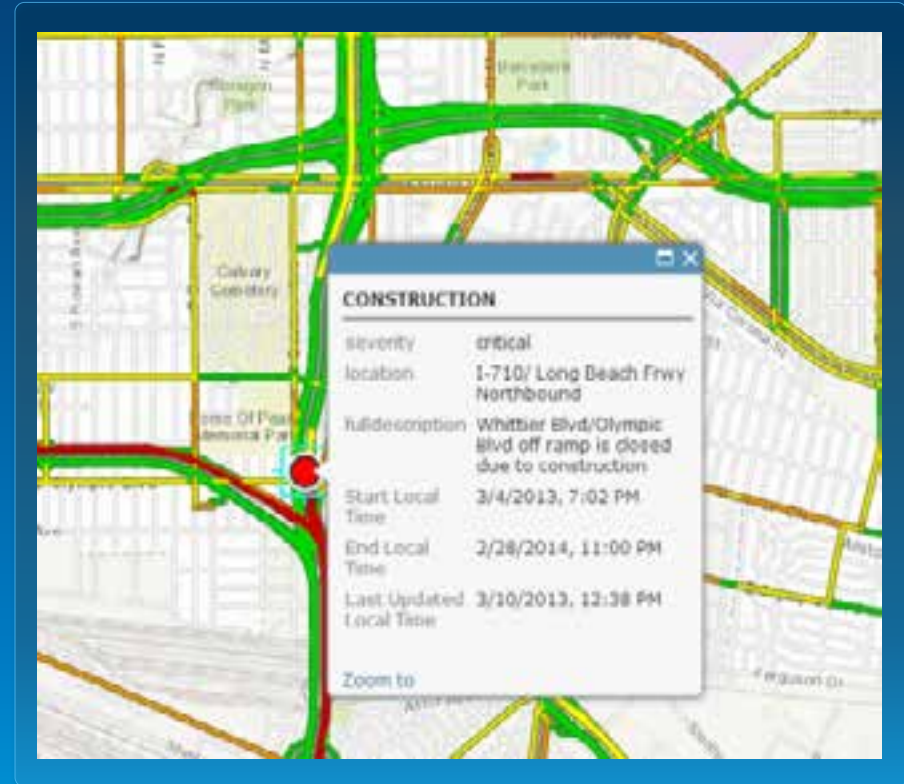
`https://logistics.arcgis.com/arcgis/rest/services/World/LocationAllocation/GPServer/SolveLocationAllocation/jobs/<yourJobID>?token=<yourToken>&f=json`

Get Outputs

`https://logistics.arcgis.com/arcgis/rest/services/World/LocationAllocation/GPServer/SolveLocationAllocation/jobs/<yourJobID>/results/<output_parameter_name>?token=<yourToken>&f=json`

Traffic

- Visualize traffic speeds
 - Support for live, historical and predictive traffic conditions
- Traffic Incidents
- Background layer to display results from routing services
- Data updated every five minutes
- Synchronous execution only



Traffic

Request URL

```
https://traffic.arcgis.com/arcgis/rest/services/World/Traffic/MapServer/export?<parameters>
```

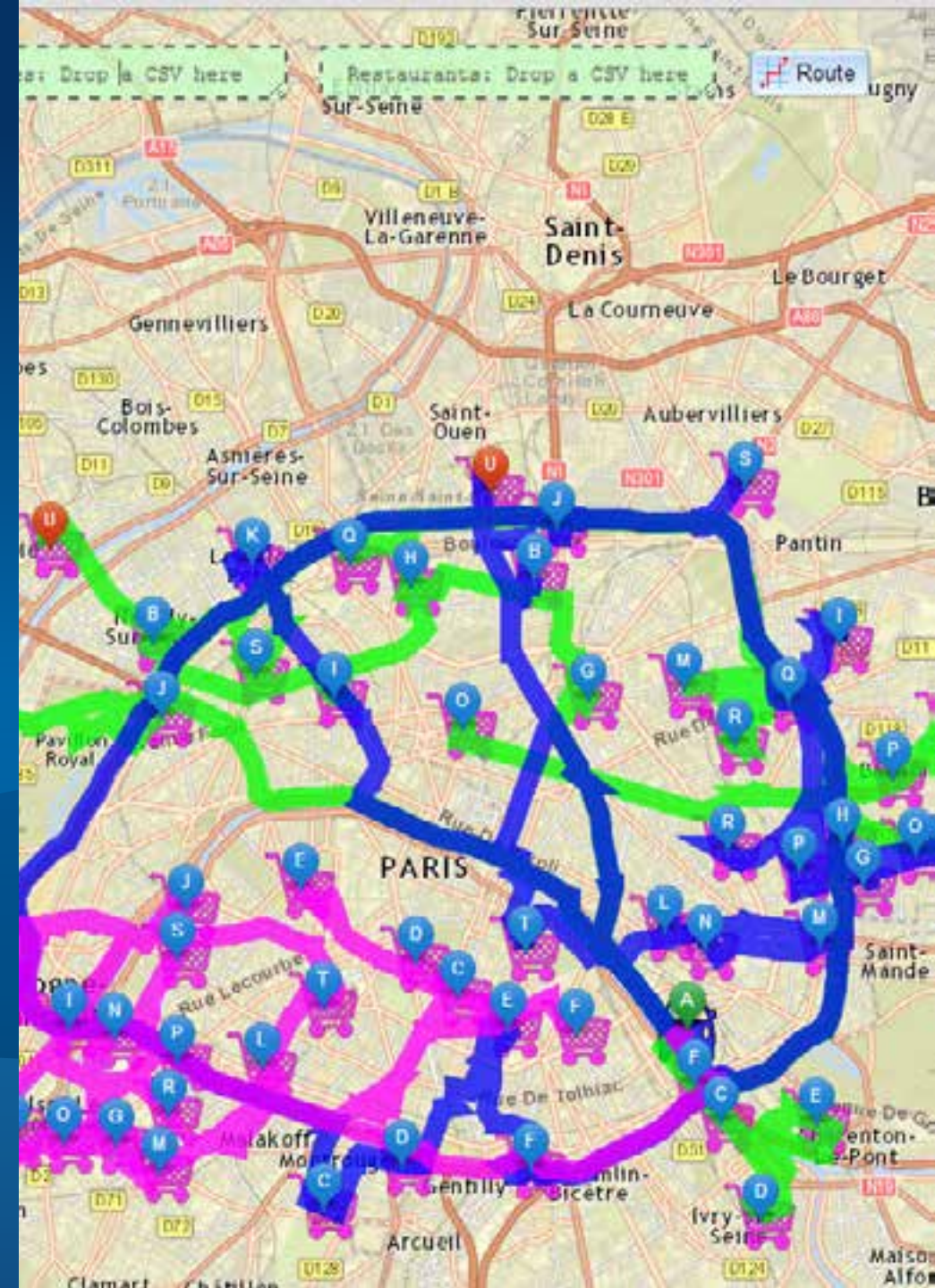
Example Request

```
http://traffic.arcgis.com/arcgis/rest/services/World/Traffic/MapServer/export?token=<yourToken>&bbox=-13168112.16706758,4029125.2769380505,-13152117.71889893,4037275.375078947&f=image
```

Demo

Find best routes for the three trucks to make deliveries to the restaurants

- Use the vehicle routing problem service
- [View live sample](#)
Works best with Google Chrome browser



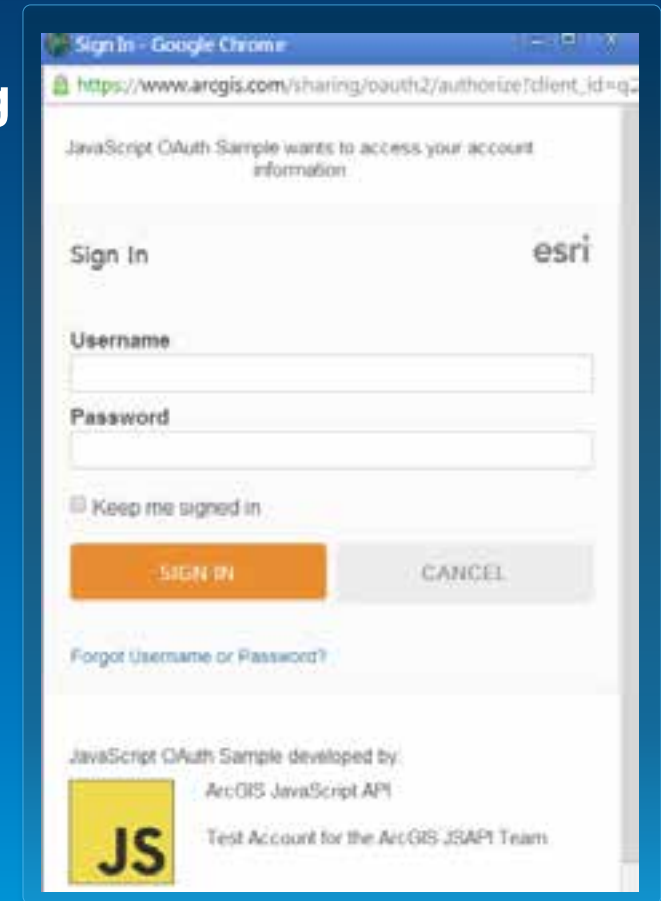
Accessing Geocoding and Routing Services

- Every request to a secured service requires a valid token
- Geosearch operations can be made anonymously if you are not storing the results
 - If storing results, you need to pass a token and `forStorage=true`
- Batch geocoding is a secured operation
- All routing services are secured
- Secured services require an ArcGIS Online Organization Subscription
 - Sign up for a 30 day free trial at www.arcgis.com
 - Sign up for a free [introductory developer account](#)



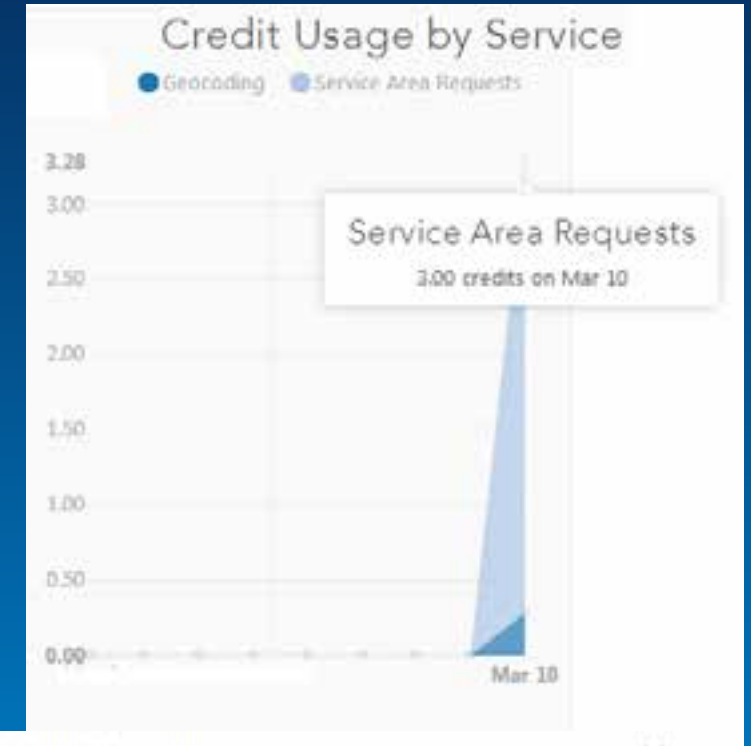
Authentication

- OAuth2 and non- Oauth
 - Use OAuth2 for better tracking of how your app is using the services
- Your app asks the end users to login (User logins)
 - Use the identity manager provided by your SDK
- Your app logs in behind the scenes (App logins)
 - Register your app and get an AppID and AppSecret
 - Manage your AppID and AppSecret using a server side proxy
 - Proxy examples in .NET, Java and PHP on Esri's github site
- Authentication documentation



Understanding Your Bill – Service Credits

- Every successful request to secured services deducts credits from your organization
 - Use of traffic service does not deduct credits
 - Use of location-allocation service does not deduct credits while in beta
- Track credits used by your app
- Credits Explained
- Credit Estimator



Application Usage [Close]

Listed below are the billable platform services consumed directly by this application or by named users within this organization via the application.

Show statistics for: Last 24 hours [Dropdown]

Time	Units	Credits
Service Areas	6 routes	3.00
Geocoding	10 locations	0.40
Total		3.40

Data Privacy Concerns

- **When performing batch geocoding, do I have to send in my sensitive data along with the addresses to Esri's cloud?**

No. You can just send in your addresses and a value from a key field that can be used to join back geocoded points to your data.

- **Does Esri store my routes?**

No. For synchronous requests the routes are returned instantly to the client and never stored.

For asynchronous requests the routes are stored for 24 hours and automatically deleted. No relationship between input request and output routes is stored.

Session Evaluation

- <http://www.esri.com/events/devsummit/session-rater>





Understanding our world.