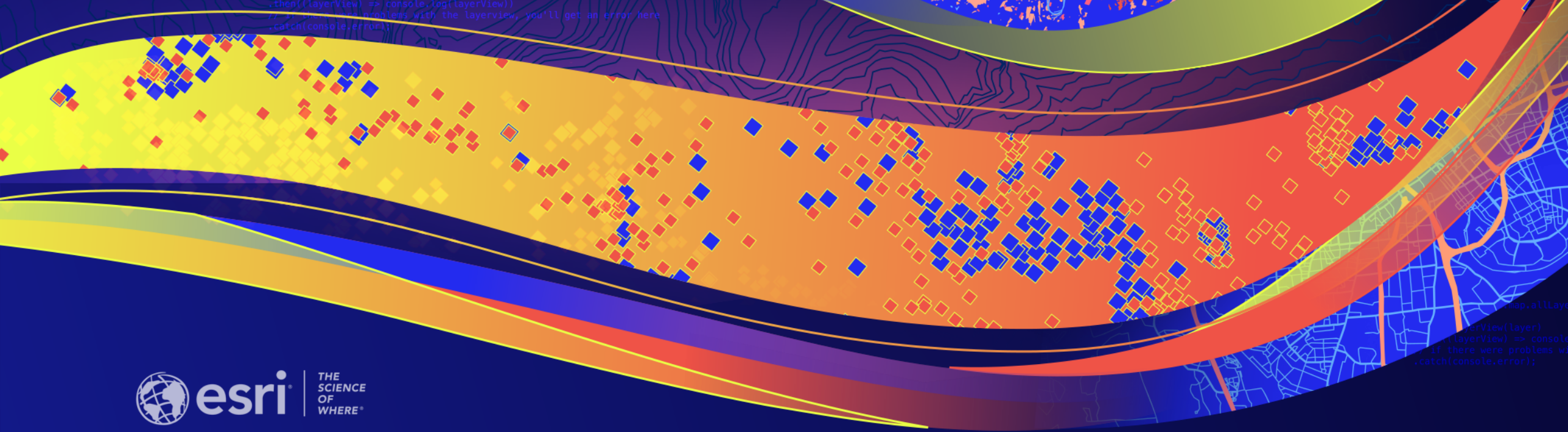

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ESRI DEVELOPER SUMMIT 2023

ArcGIS Enterprise: Publish Your Own Routing Services

Deelesh Mandloi

Max Zeng

Slides and code samples for this workshop on Publishing Your Own Routing Services

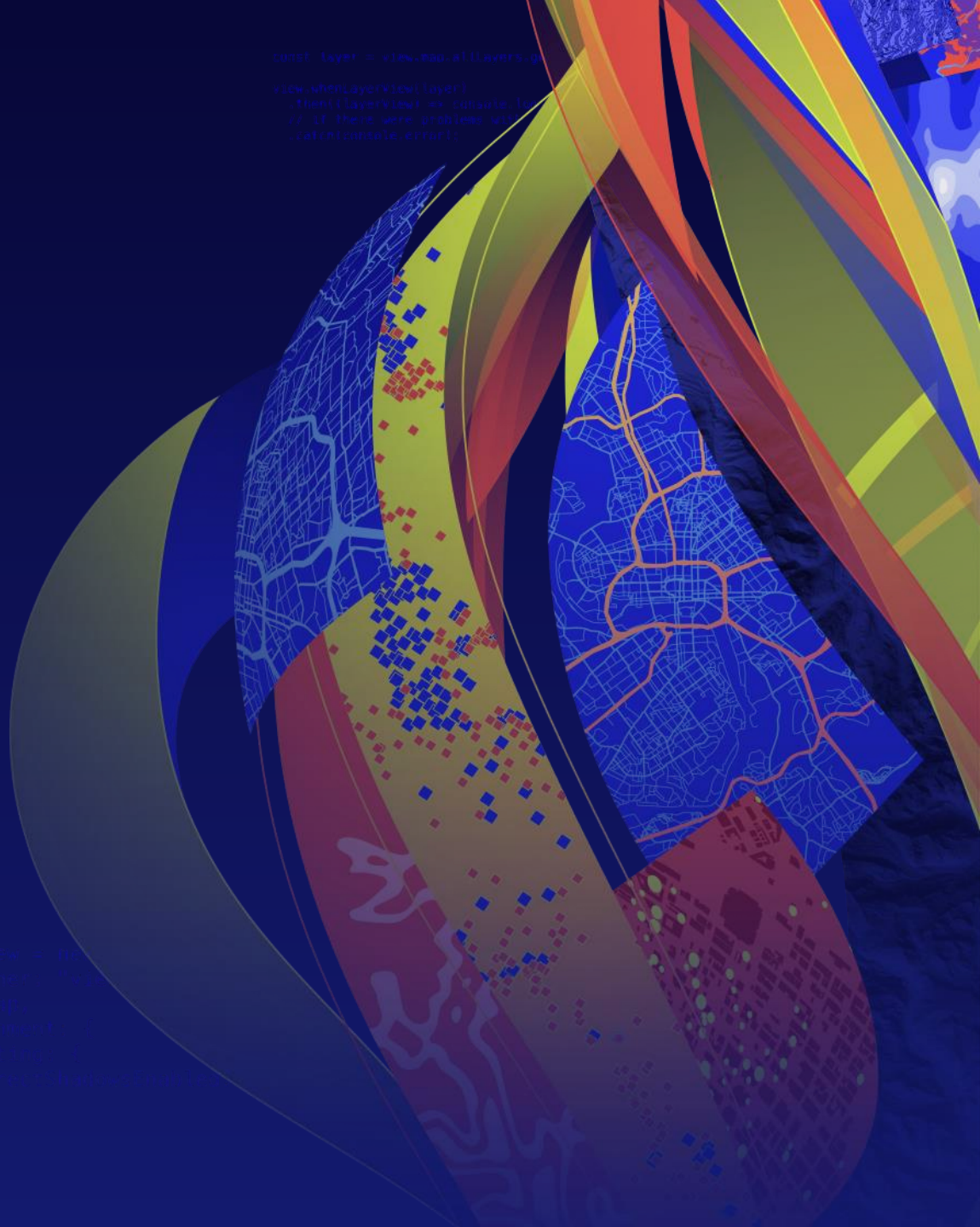
- http://esriurl.com/ds23rs

- https://github.com/EsriDevEvents/arcgis-enterprise-publish-your-own-routing-services-2023

Agenda

- Routing concepts
- ArcGIS Enterprise publishing workflow
- Standard routing services
- Custom routing services

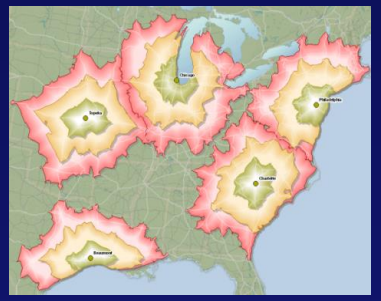
Routing Concepts



ArcGIS Network Analyst Extension

for transportation analysis

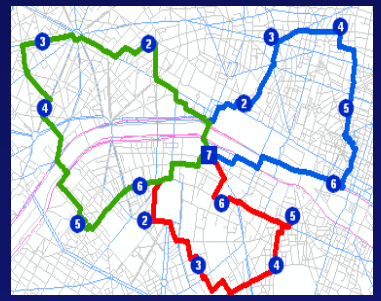
Coverage



Service Area

Optimization

Location-Allocation



Vehicle Routing Problem

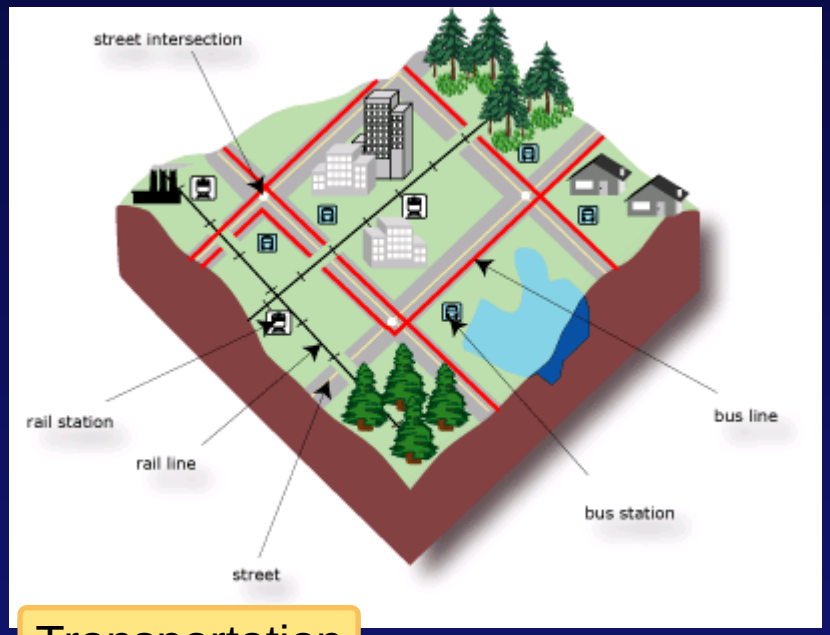
Point-to-point routing

Route

Closest Facility

Origin-Destination Cost Matrix

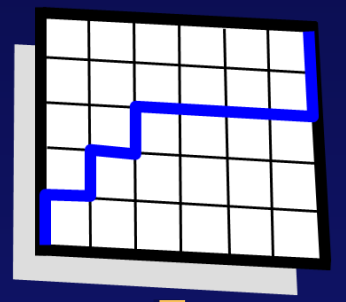
Analysis is performed on a network dataset



Transportation Network

Data Model

Network Dataset

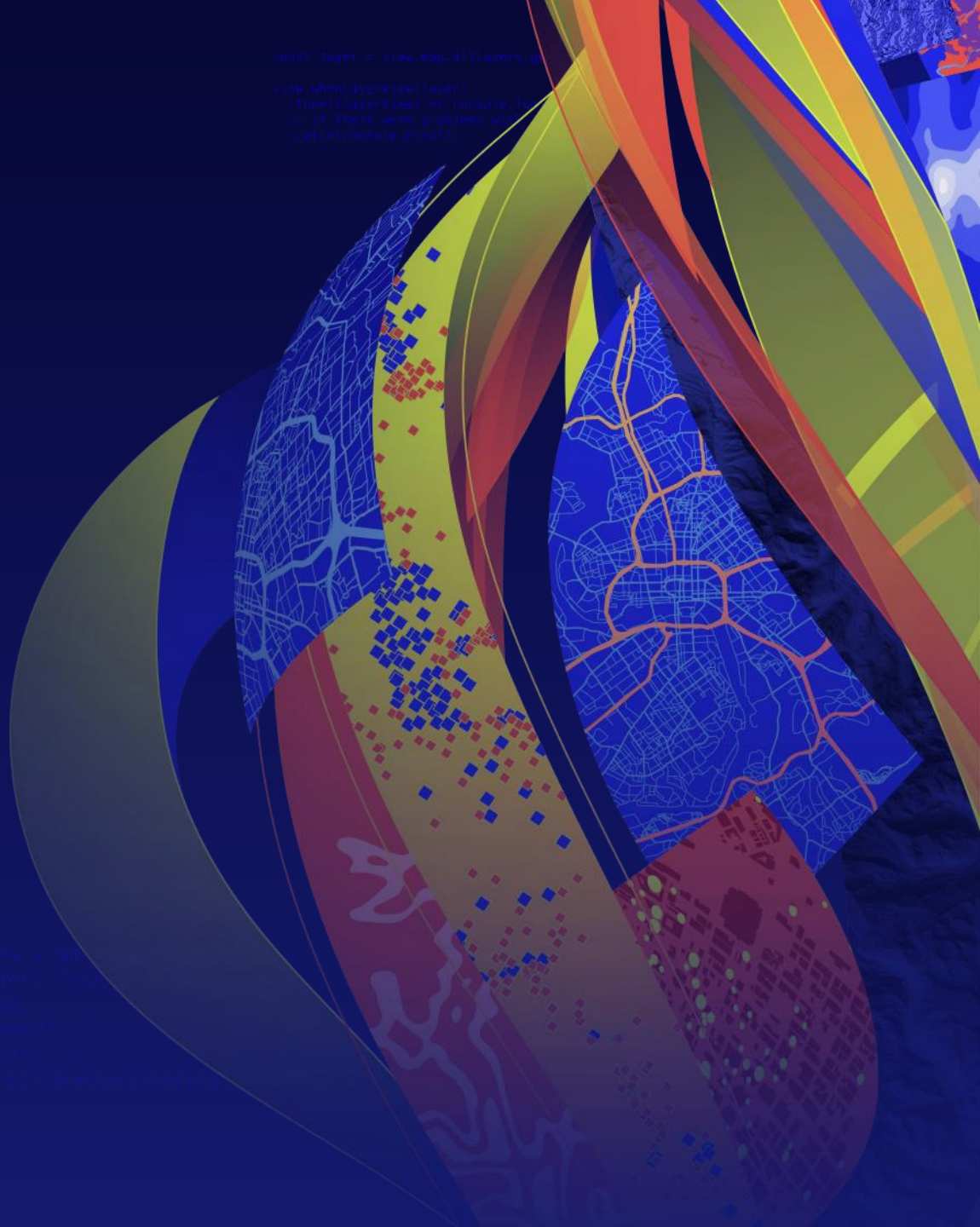


Geodatabase

Where do I get a network dataset?

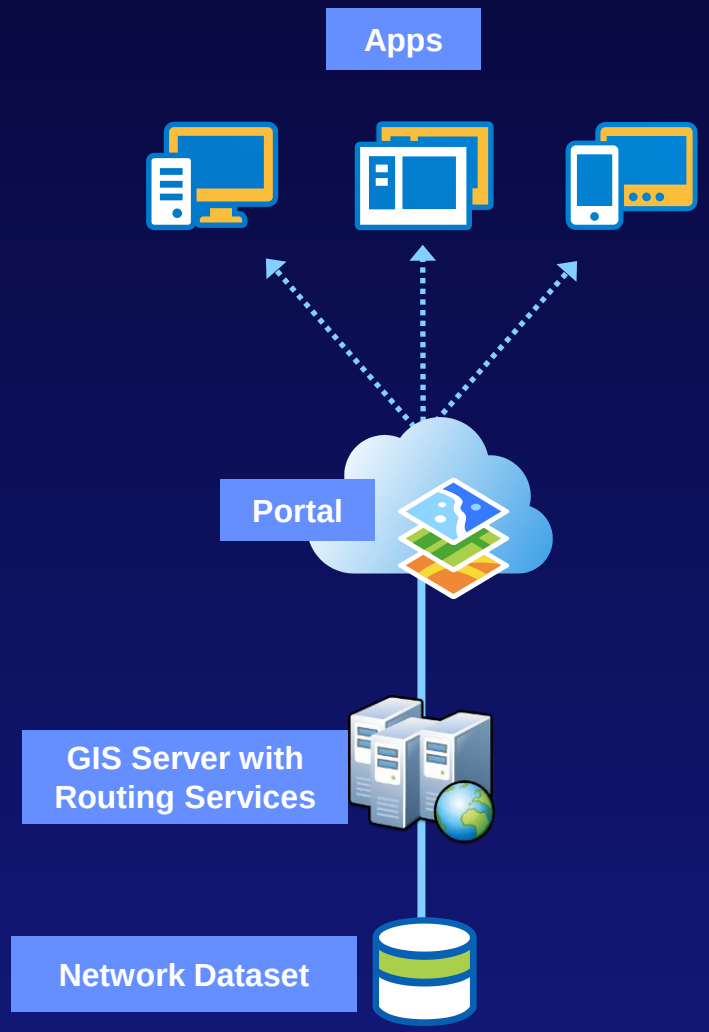
- Purchase StreetMap Premium for ArcGIS
  - High quality ready-to-use network dataset
  - Can add your own street data
- Build your own
  - Your organization's data
    - Try the ArcGIS Pro Tasks to Create a Local Government Network Dataset
  - TIGER
  - OpenStreetMap
- Use the ArcGIS Online routing services
  - You don't need a network. You just call the services.

ArcGIS Enterprise



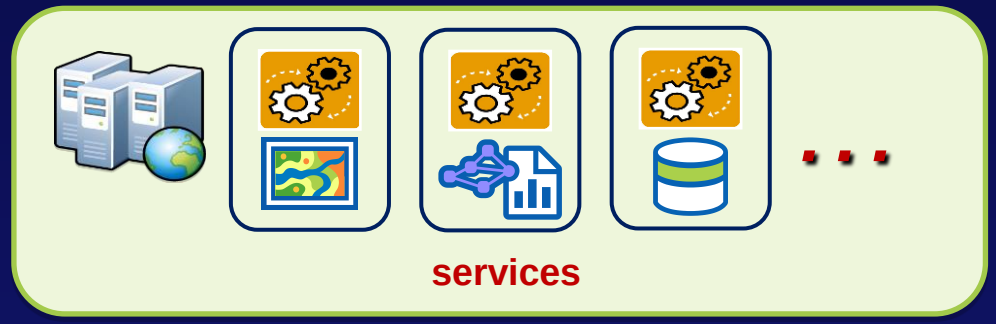
What is ArcGIS Enterprise?

- Enables “Web GIS” in your infrastructure
  - On-premises or in your own cloud
- Formerly known as ArcGIS for Server



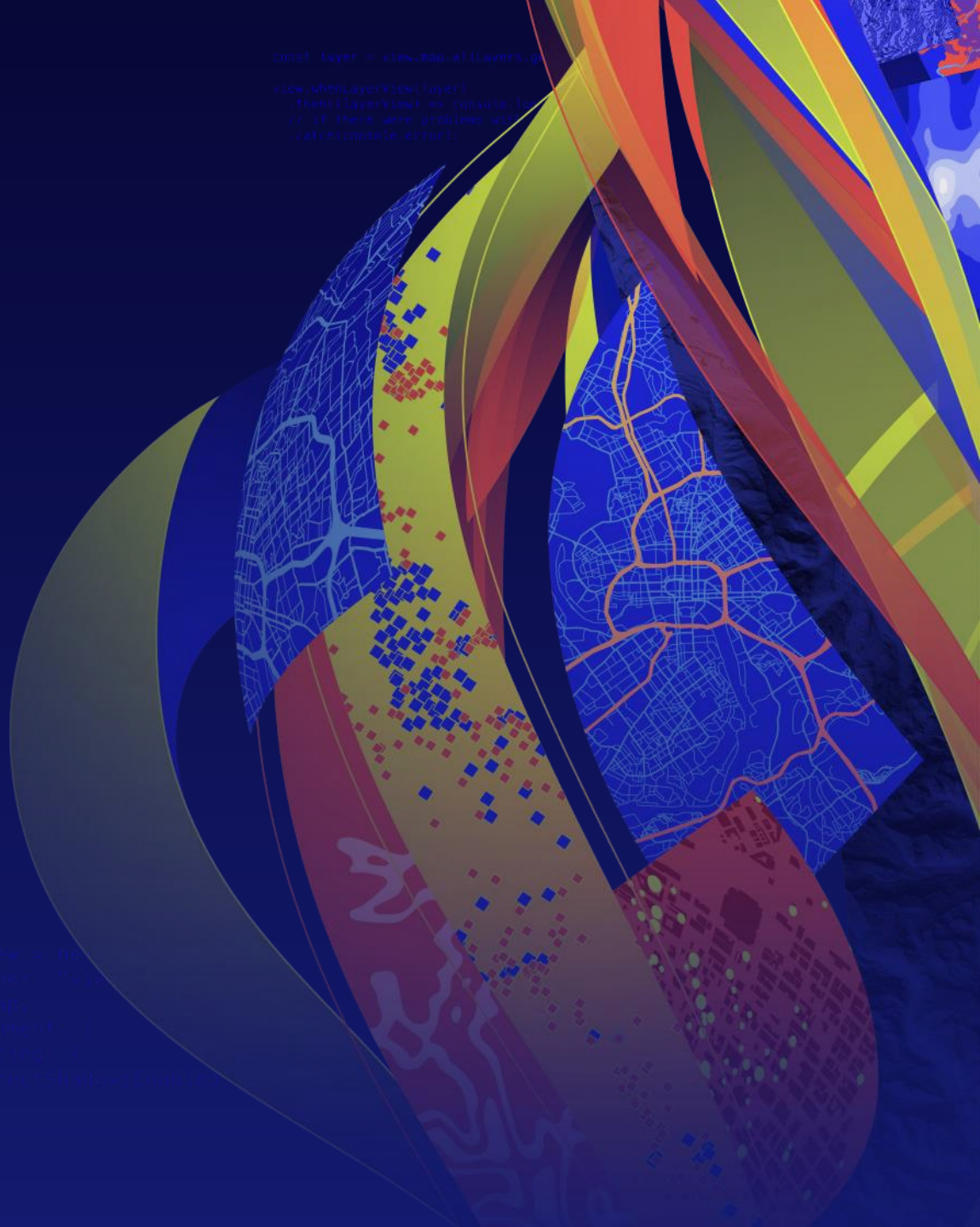
What are GIS services?

- GIS service → GIS resource running on a server
  - vs. GIS application on your local computer



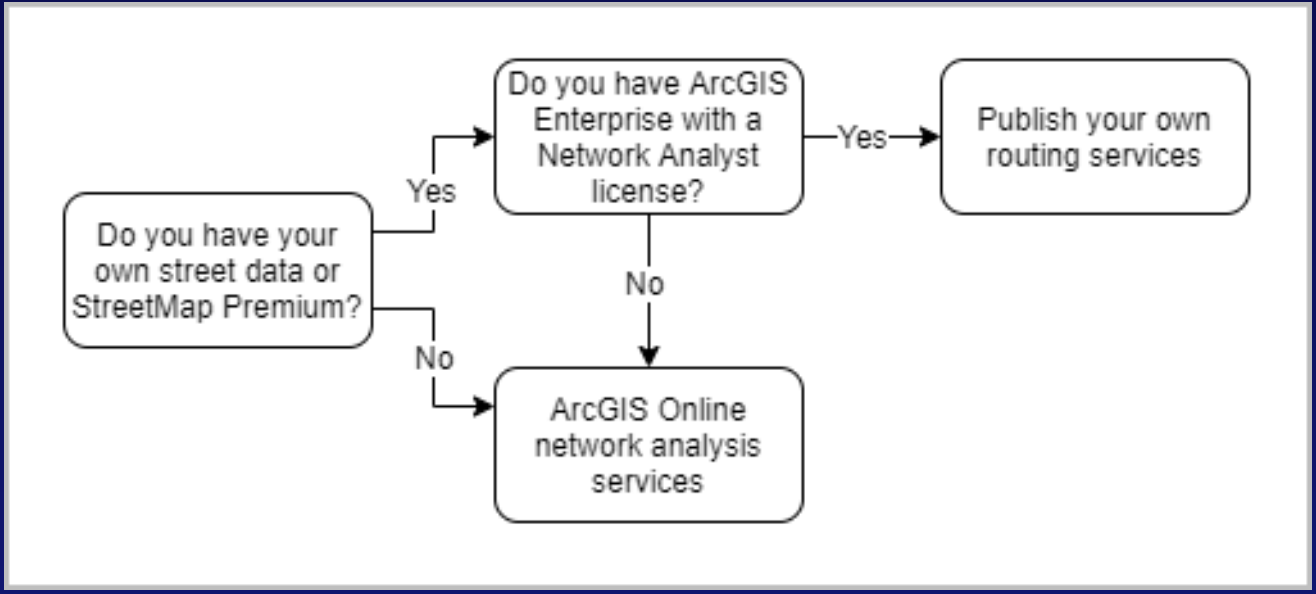
- Share GIS resources to the web as following service types

Routing Services



ArcGIS Online or ArcGIS Enterprise

- When should I use ArcGIS Online routing services or publish my own routing services ?

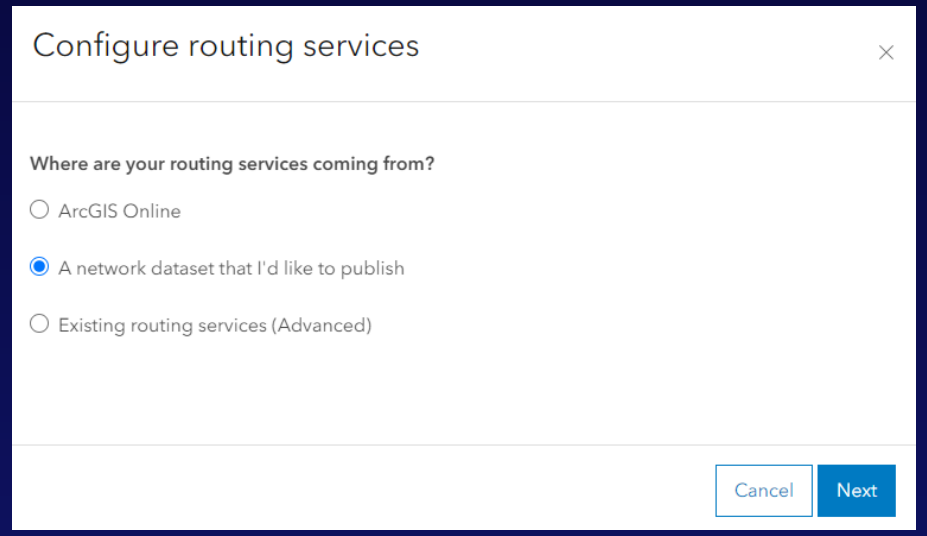


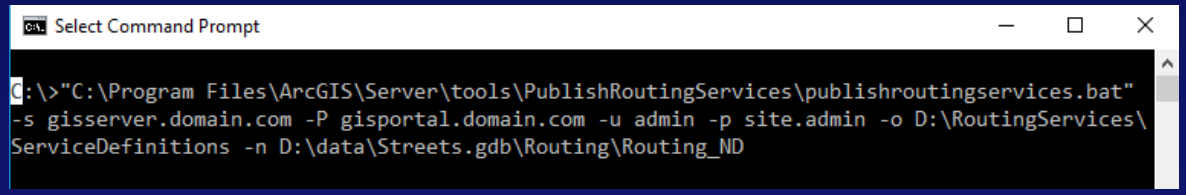
Standard and custom routing services

- Standard routing services are the map and geoprocessing services using out-of-the-box capabilities provided by Network Analyst.
  - Provides full integration with Esri provided client apps such as ArcGIS Pro and Map Viewer.
- Custom routing services are the geoprocessing services with custom capabilities that you develop using arcpy.nax Python module.

Publish standard routing services

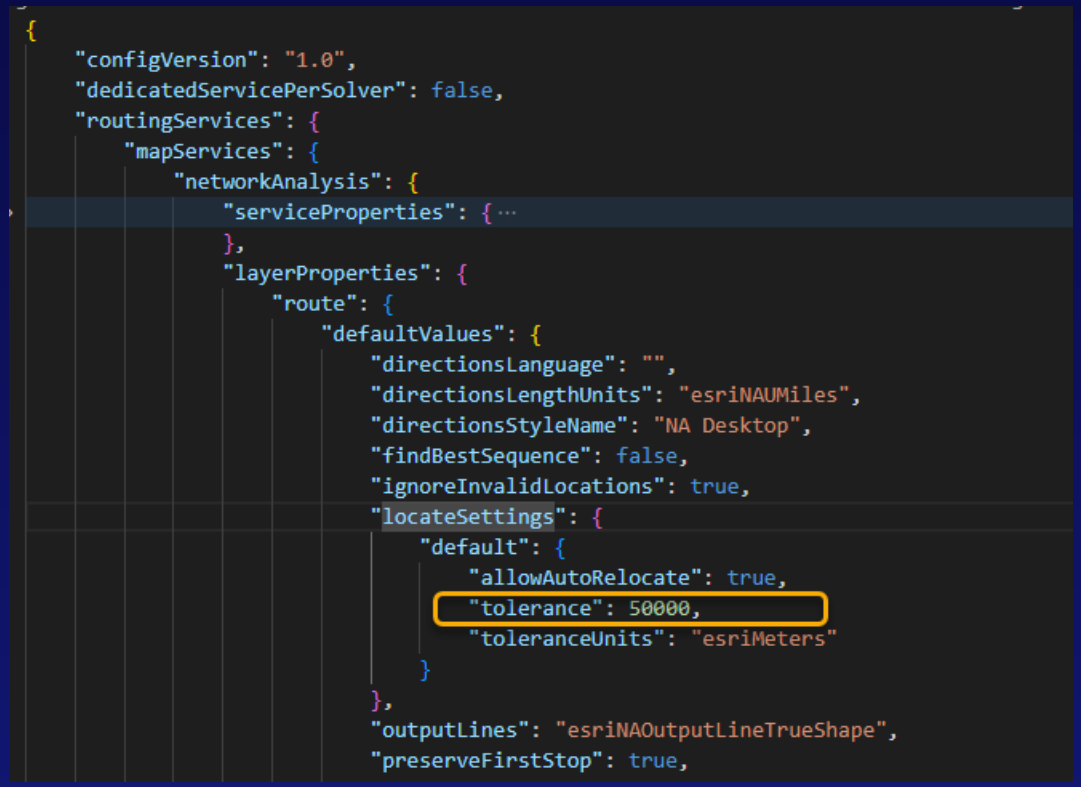
- Configure routing services from the ArcGIS Enterprise portal website
  - New at ArcGIS Enterprise 11.0
  - Not available with a standalone ArcGIS Server
- Publish routing services utility tool
  - Command line tool that works with standalone or federated ArcGIS Server





Publish standard routing services

- Specify additional properties for routing services using a configuration file.
- Configuration file can be specified when using the website or the CLI tool.

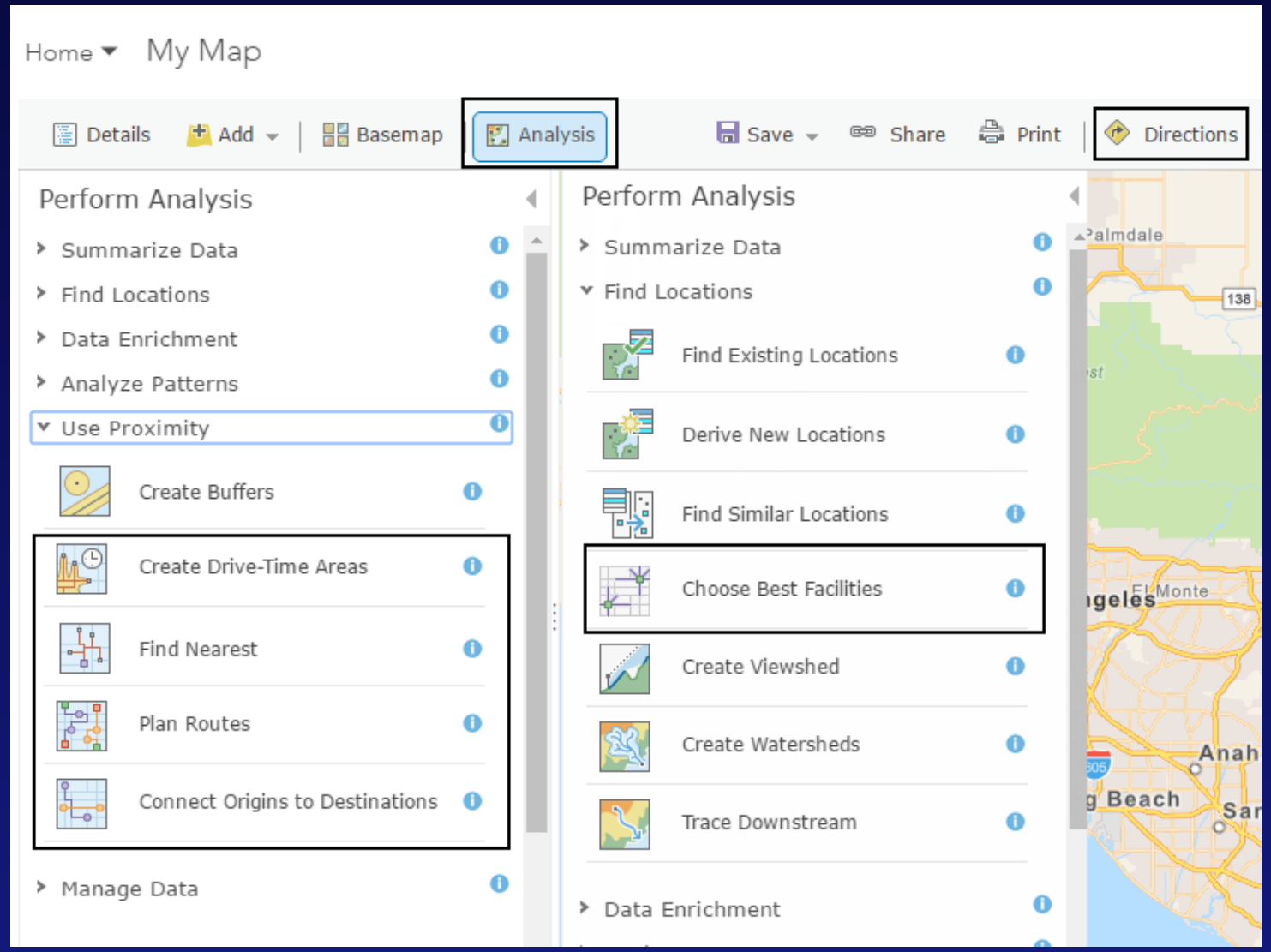


Updating standard routing services

- Manually delete existing standard routing services then recreate new ones
  - Upgrading to newer versions of ArcGIS Enterprise
  - Upgrading street data (for example, using newer version of StreetMap Premium

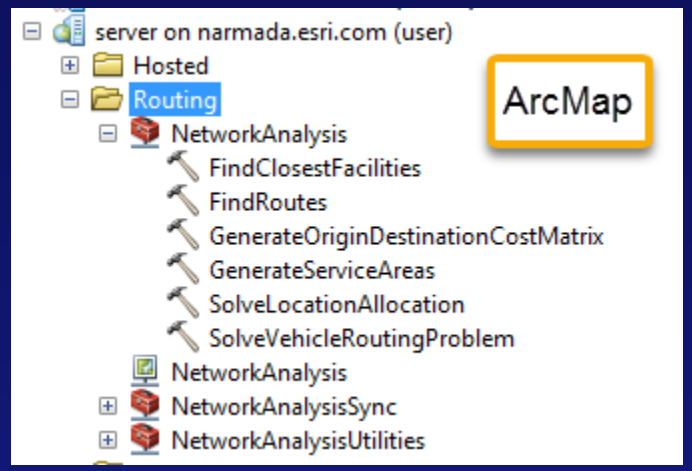
Using standard routing services in Map Viewer

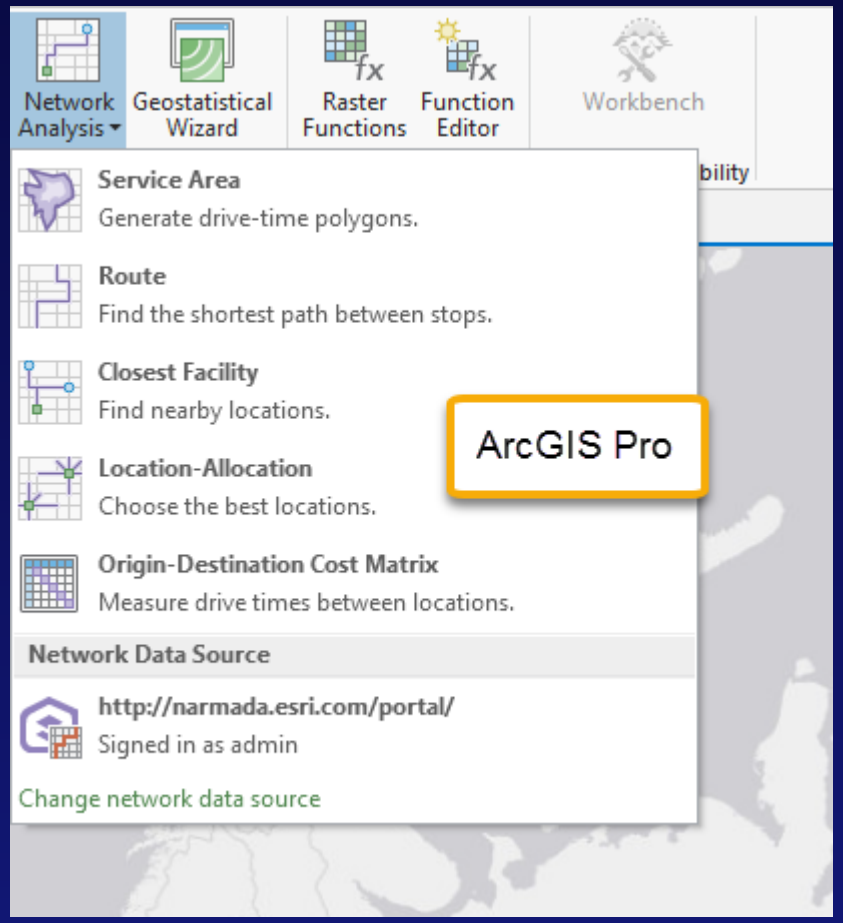
- Directions button
- Analysis tools
  - Most tools in the Use Proximity toolset
  - Choose Best Facilities tool in Find Locations toolset
  - Summarize Nearby tool in Summarize Data toolset

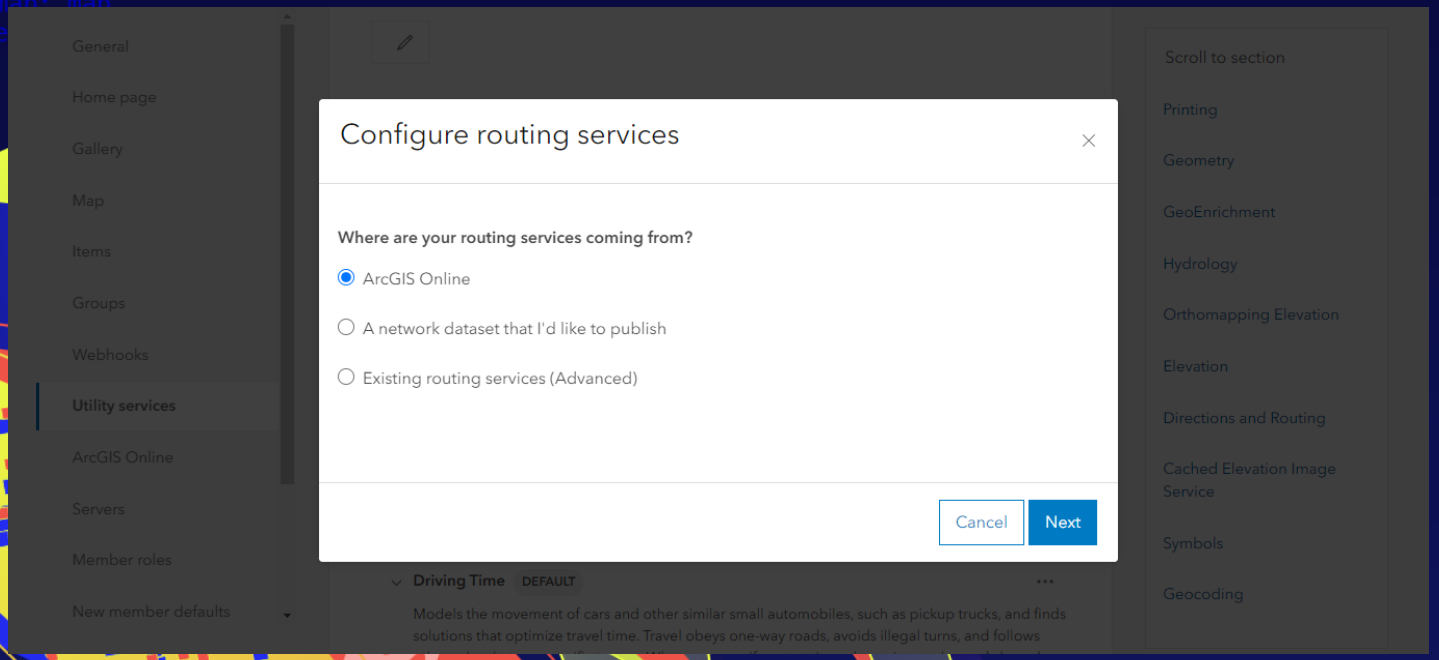


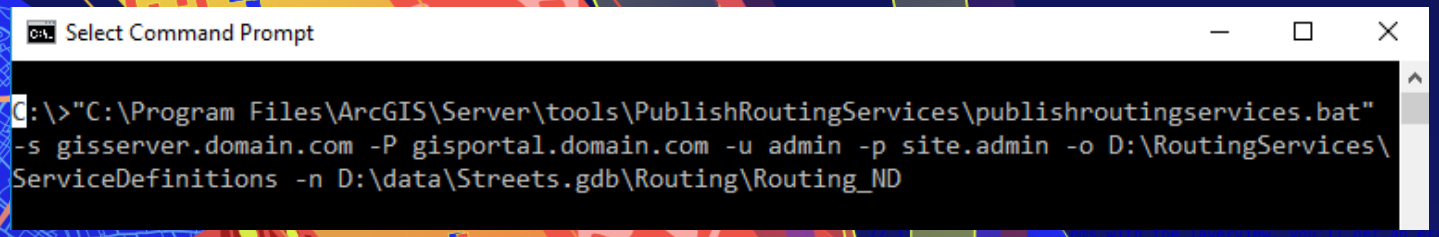
Using standard routing services in ArcGIS Desktop

- Use from Network Analysis gallery in the Analysis tab within ArcGIS Pro
- Use from an ArcGIS Server connection in ArcMap









Demo: Publish standard routing services

Max Zeng

Custom routing services

- Geoprocessing service (or web tool) with custom capabilities
- Publish a custom routing service
  - If you need the service to perform additional analysis along with network analysis. For example, find a route and calculate an elevation profile for the route
  - Combine multiple network analyses in a single service. For example, determine accessible open houses and then find the best route to visit them
- Author a geoprocessing script tool using arcpy and arcpy.nax Python modules

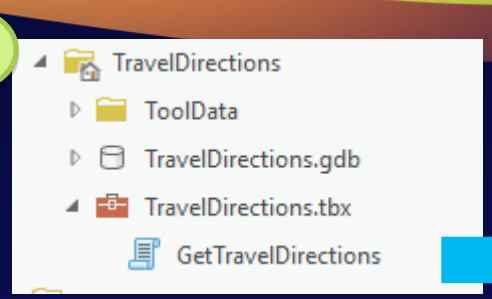
Publishing workflow for geoprocessing services

Geoprocessing service

1. Author using geoprocessing script tool based on arcpy and arcpy.nax Python modules

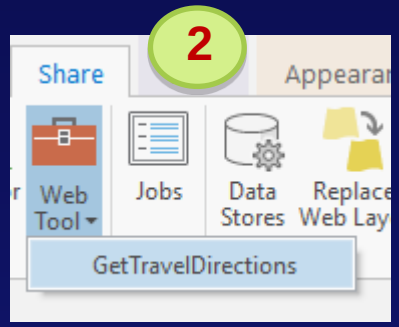
2. Run the tool and publish the result as a web tool

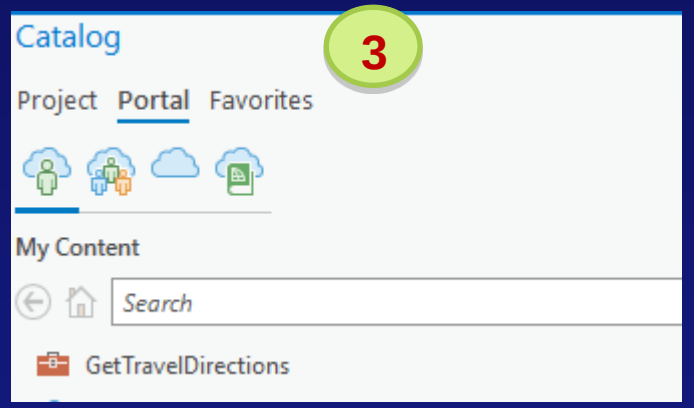
3. Use from Map Viewer, ArcGIS Pro, ArcMap, or programmatically using ArcGIS APIs or SDKs



Script tool

Python code





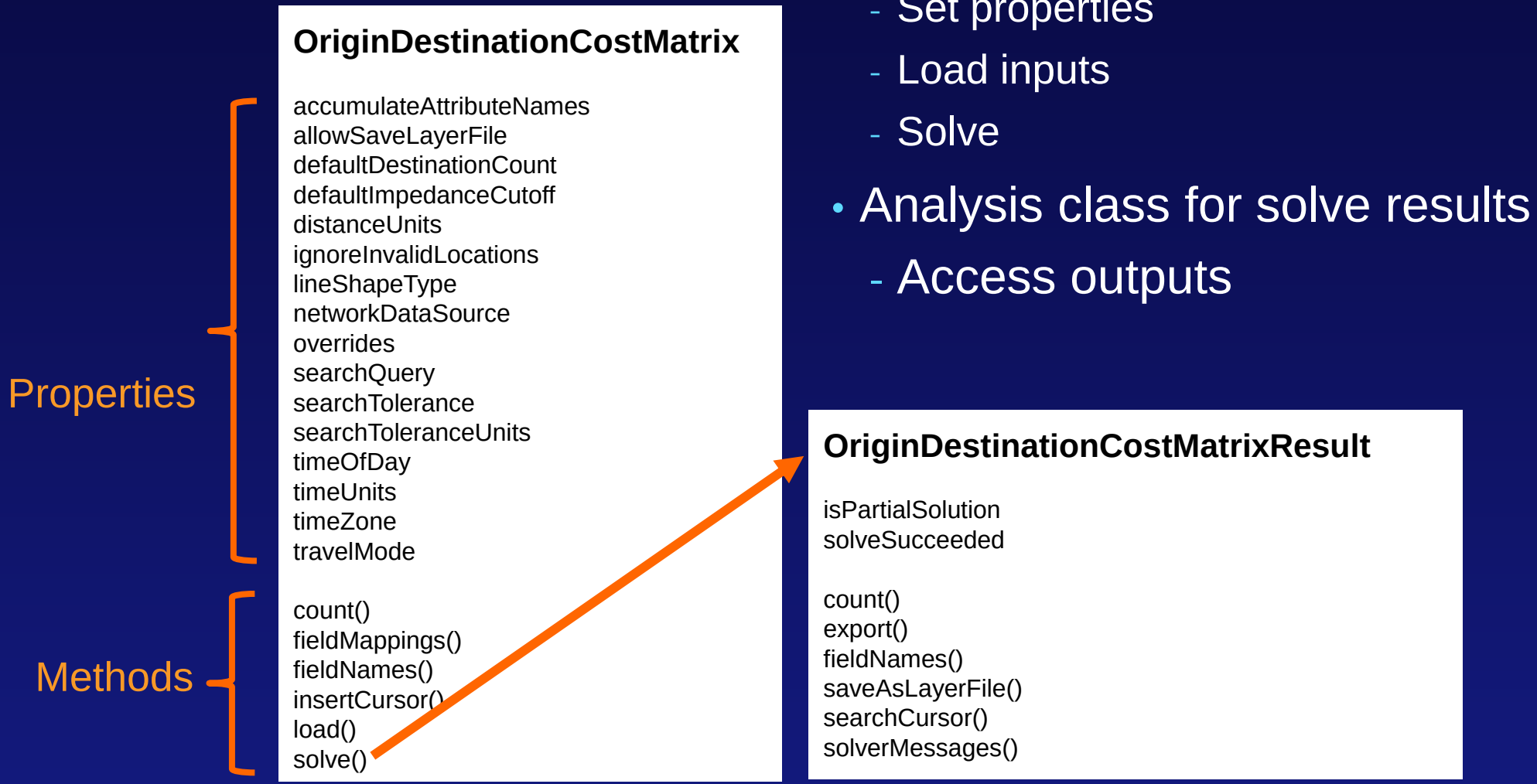
Network Analysis Workflow with arcpy.nax Python Module

1. Initialize the analysis object (based on a specific network data source)
2. Set the properties for the analysis
3. Load the inputs
4. Solve the analysis
5. Work with the results

Common to all the network analyses

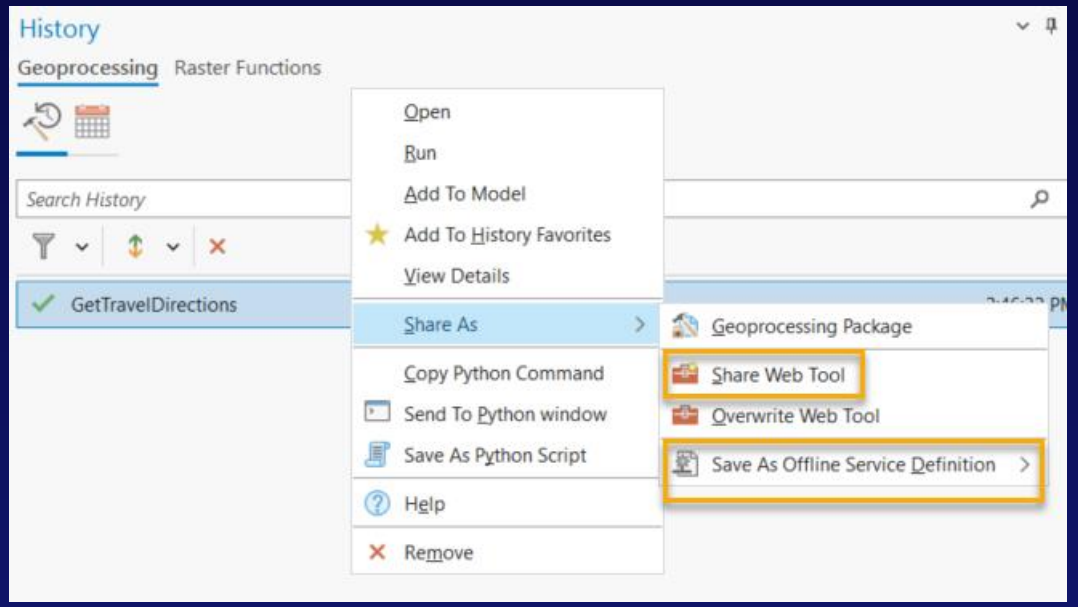
arcpy.nax Analysis (Solver) Classes

- Easy-to-use python objects for network analysis
- Analysis class for each solver
  - Set properties
  - Load inputs
  - Solve
- Analysis class for solve results
  - Access outputs



Publish geoprocessing script tool as geoprocessing service

- Share as Web tool from ArcGIS Pro
- Save as offline service definition
  - Useful when implementing dev, staging, and production workflow
- Using a Python script



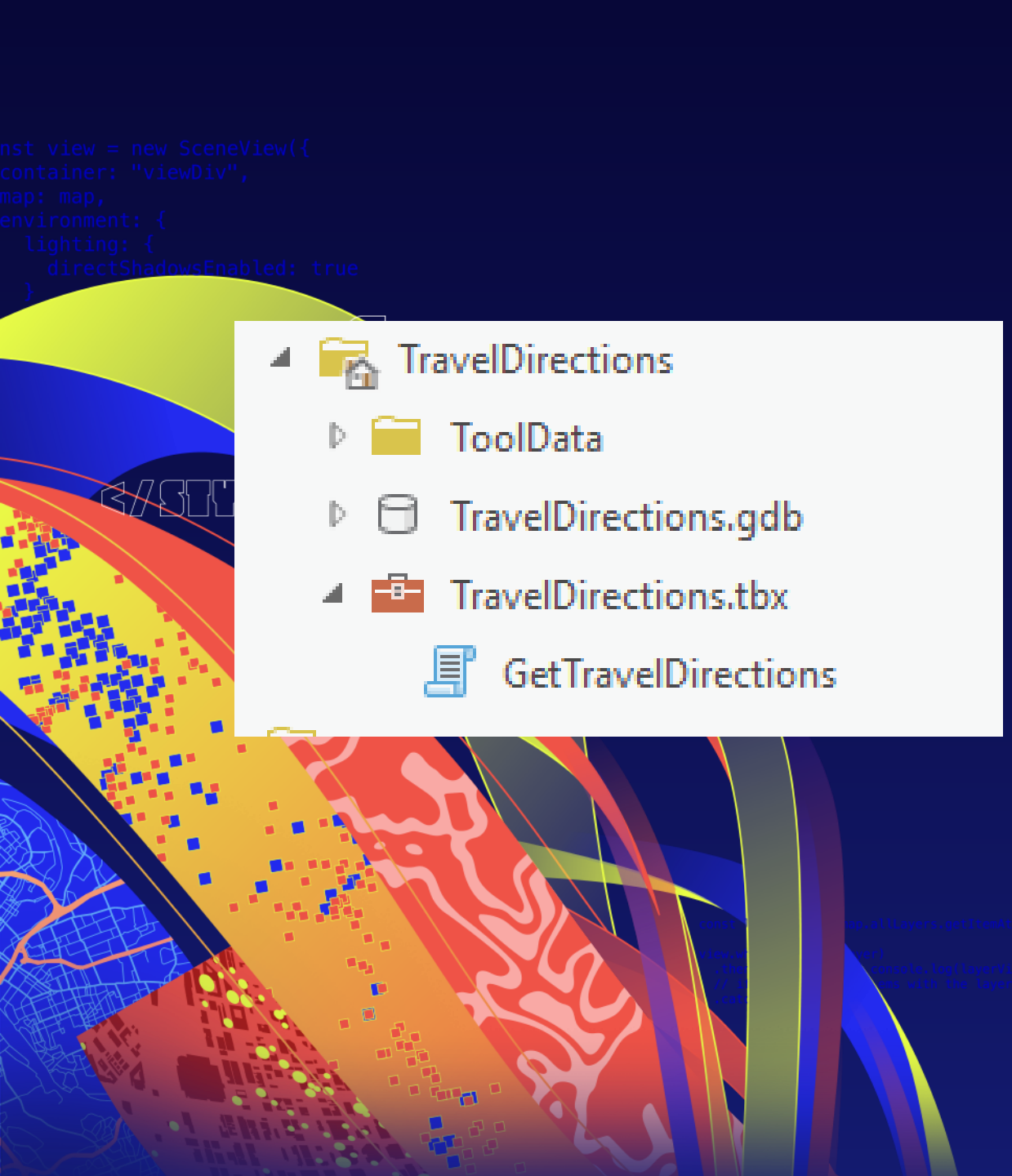

```
GeoprocessingSharingDraft >> StageService >> UploadServiceDefinition
```

Tips and tricks when authoring geoprocessing services

- Use a network dataset layer instead of a network dataset catalog path
  - Significant performance improvement as the connection to the network dataset is established once during the startup of the service
- Write a geoprocessing script tool using arcpy.nax Python module
  - Faster execution times as compared to services created from geoprocessing model tool
  - Use Feature Set data type for inputs
  - Write outputs to memory-based workspace instead of a file geodatabase
  - Avoid writing too many messages from your script tool
- Use network datasets in mobile geodatabases instead of file geodatabases

Tips and tricks when publishing geoprocessing services

- Set Input mode for network dataset as constant
  - Hides the network dataset from service consumers
- Register the folder containing the network dataset as a data store instead of copying data
  - You control the location of the data and allows for easier data updates
- Do not store the network dataset on a file share
  - If the ArcGIS Site has multiple machines, manually copy the network dataset to a local storage on all the machines
- Reusejobdir



Demo: Create a geoprocessing service

Max Zeng

Road ahead

- ArcGIS Enterprise 11.2 will provide new Python API as part of arcpy.nax module to
  - Extend network datasets using custom evaluators
  - Customize directions

- Publish custom routing services that use the new API to replace any existing server object extensions (SOE) for routing

In Summary

- Publish standard routing services
  - Configure routing services from ArcGIS Enterprise portal website
  - Publish routing services utility
- Custom routing services
  - Author geoprocessing script tools using arcpy and arcpy.nax module
  - Publish geoprocessing script tools as geoprocessing services

Help and Resources

- Network Analysis Concepts
- Network Analysis using routing services in ArcGIS Pro
- Routing services
- REST API doc

Slides and code samples for this workshop on Publishing Your Own Routing Services

http://esriurl.com/ds23rs

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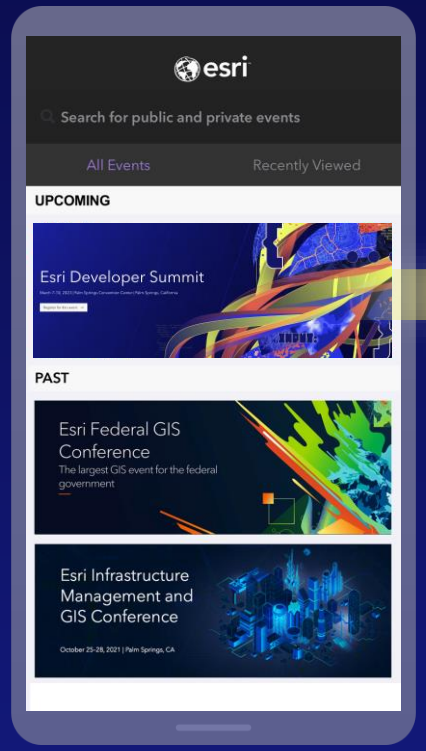

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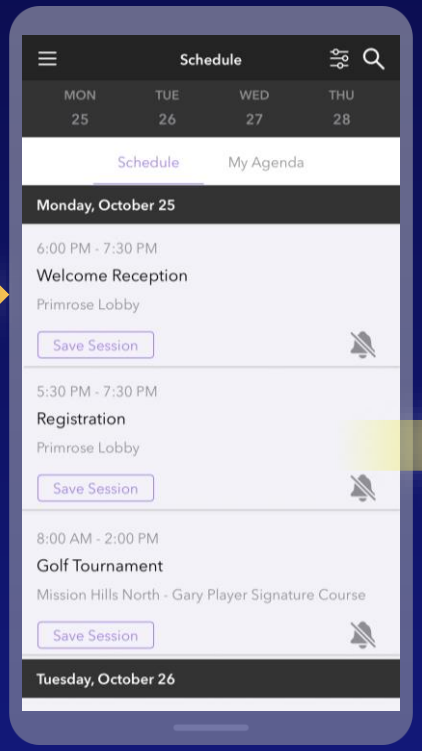
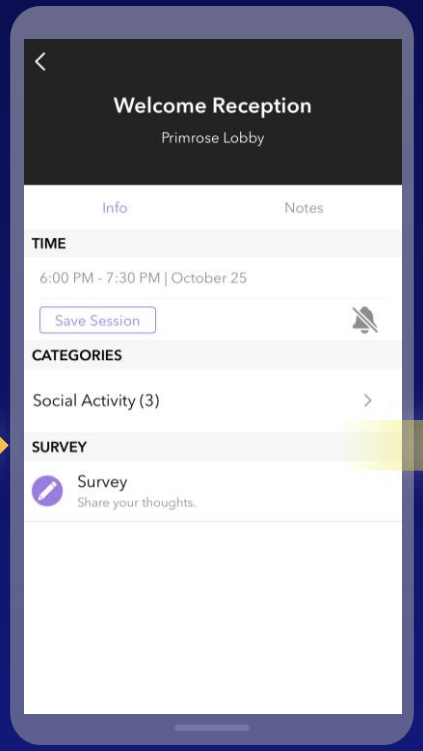
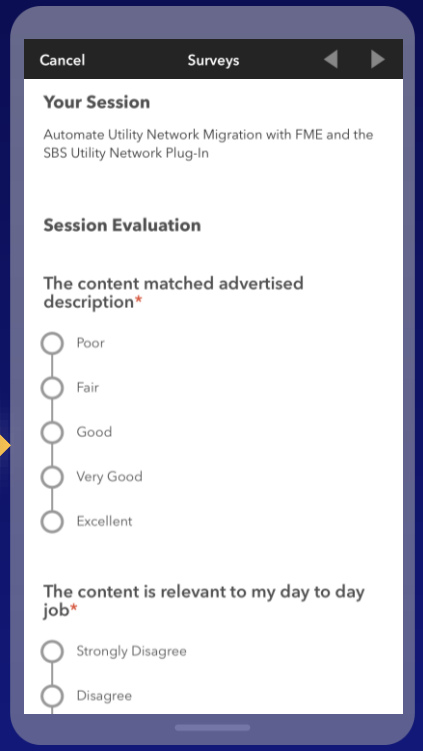


Scroll down to “Survey”



Log in to access the survey



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