Building web apps with advanced routing capabilities

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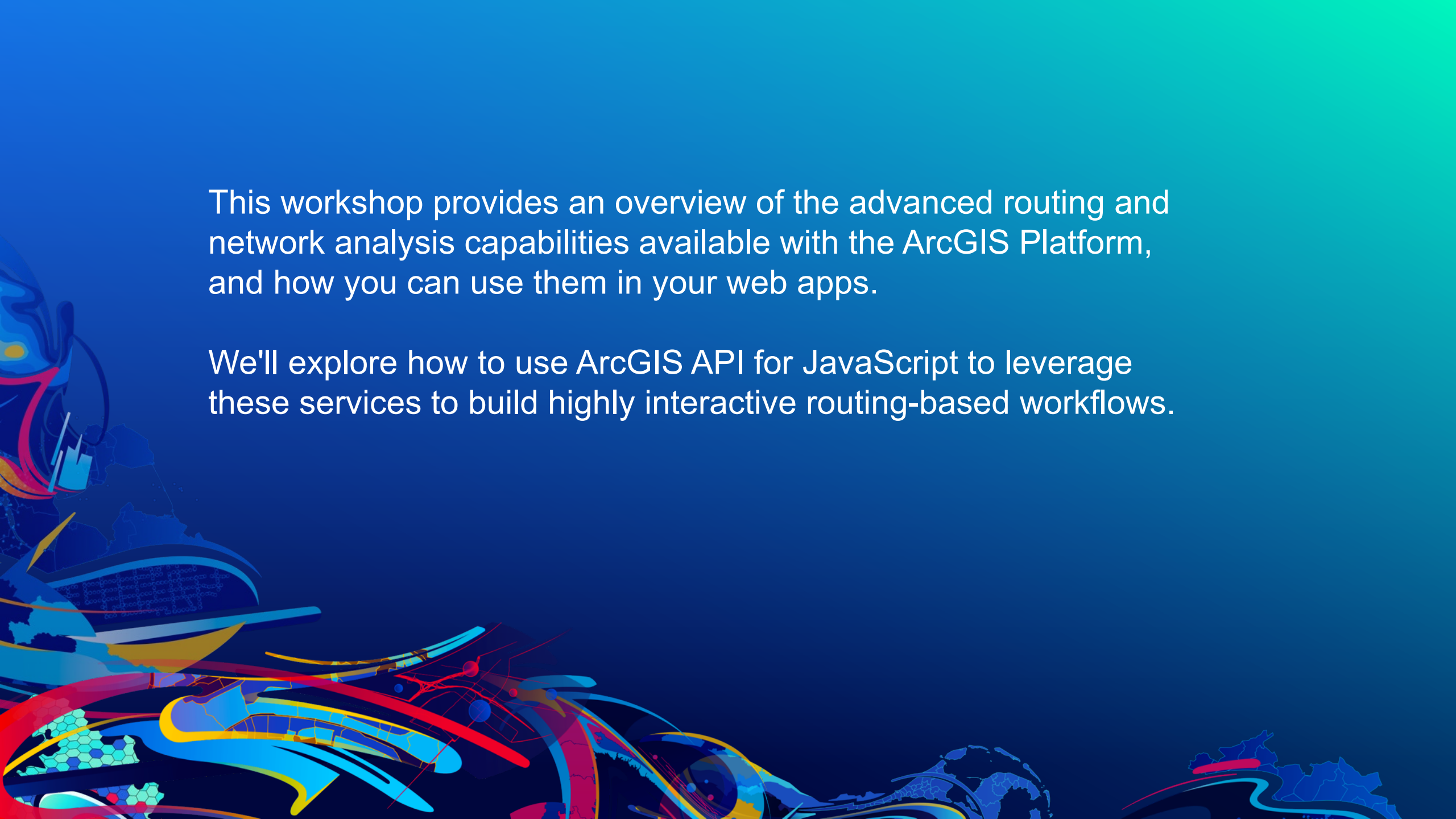
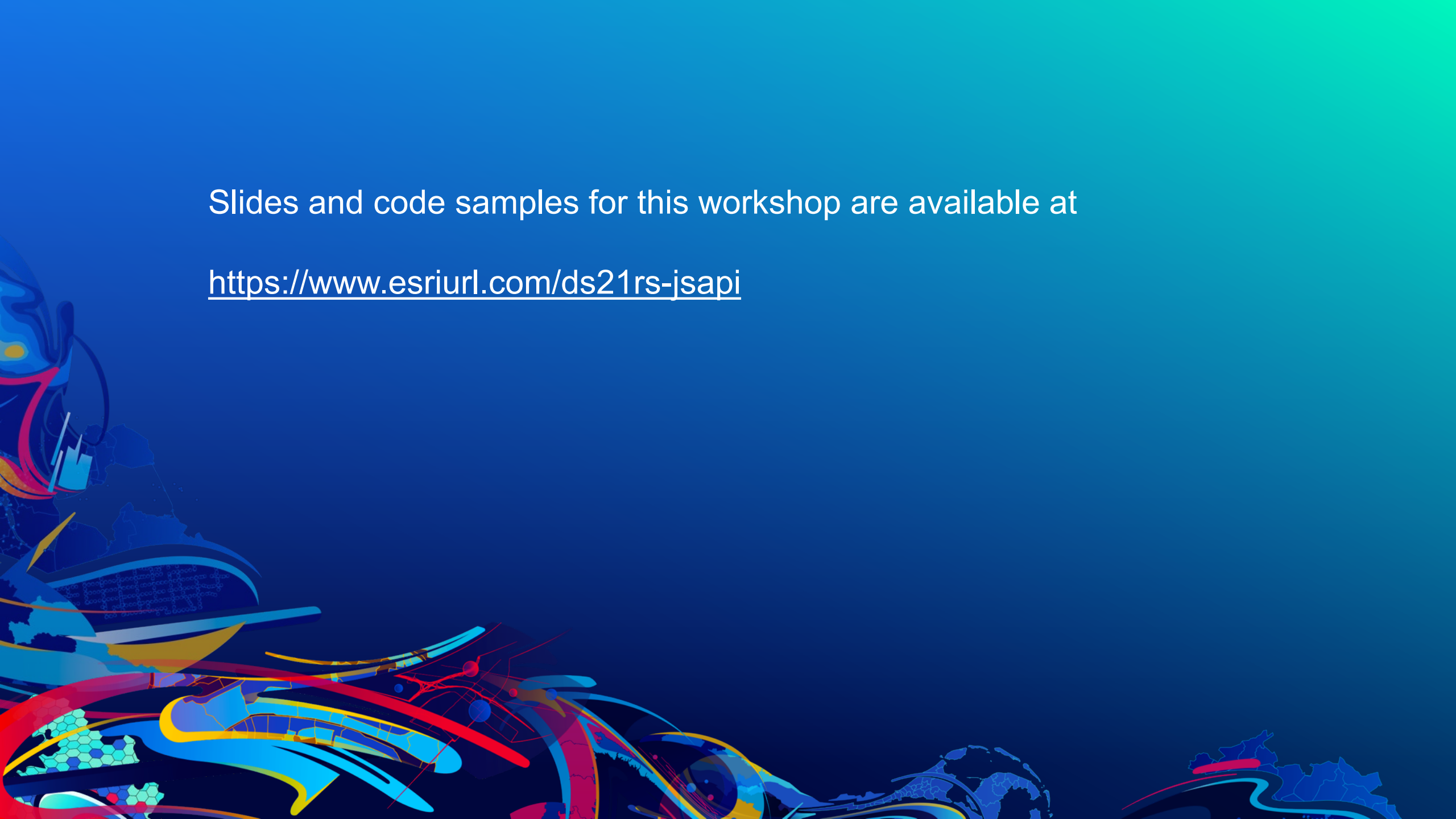
This workshop provides an overview of the advanced routing and network analysis capabilities available with the ArcGIS Platform, and how you can use them in your web apps.

We'll explore how to use ArcGIS API for JavaScript to leverage these services to build highly interactive routing-based workflows.



Slides and code samples for this workshop are available at

https://www.esriurl.com/ds21rs-jsapi



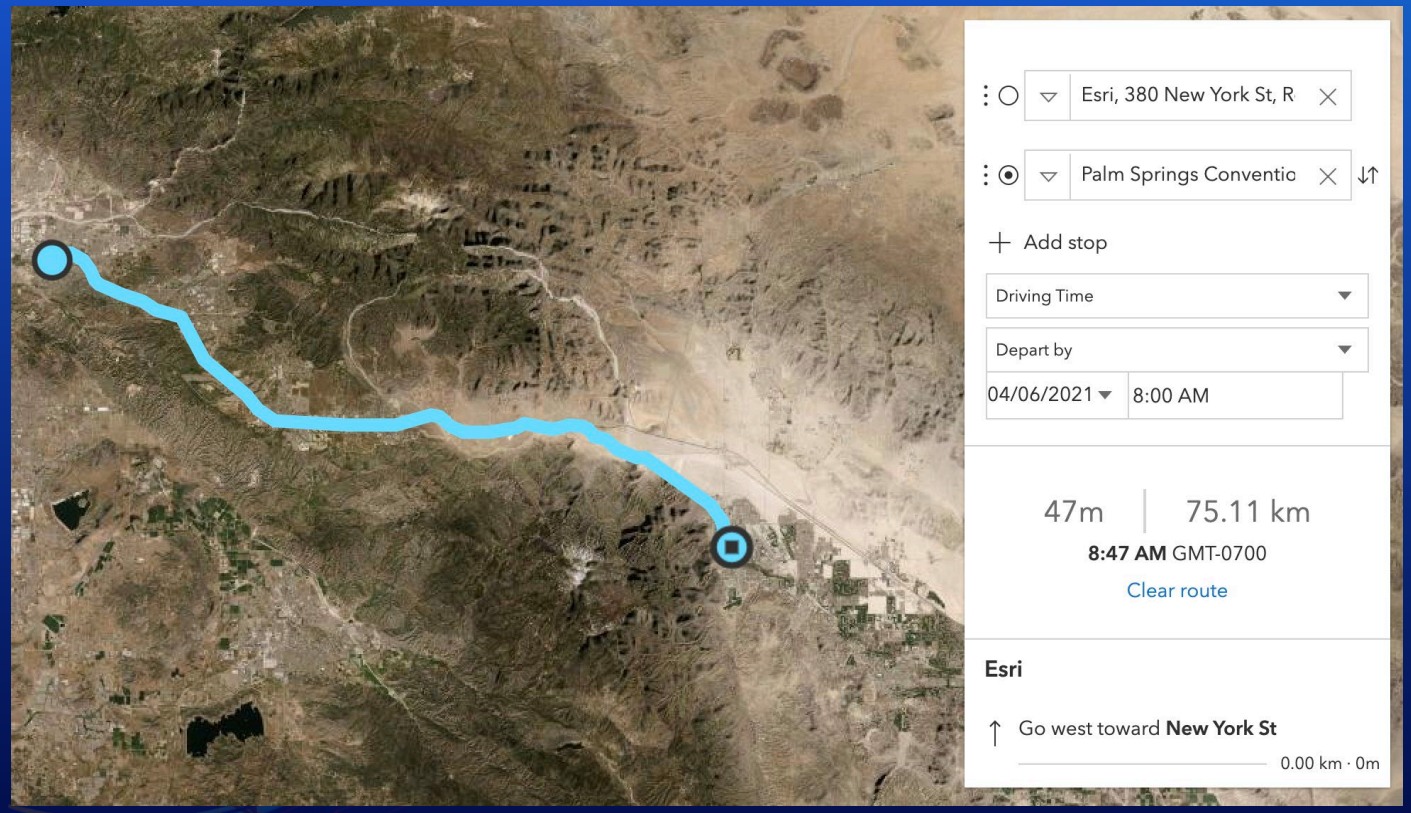
AGENDA

- Introduction to routing services
- Demo: Directions widget with the ArcGIS API for JavaScript
- Routing services and capabilities
- Goods delivery demo using fleet routing service
- Demo: Vehicle routing problem (VRP) with the ArcGIS API for JavaScript

Introduction to Routing Services

DEMO

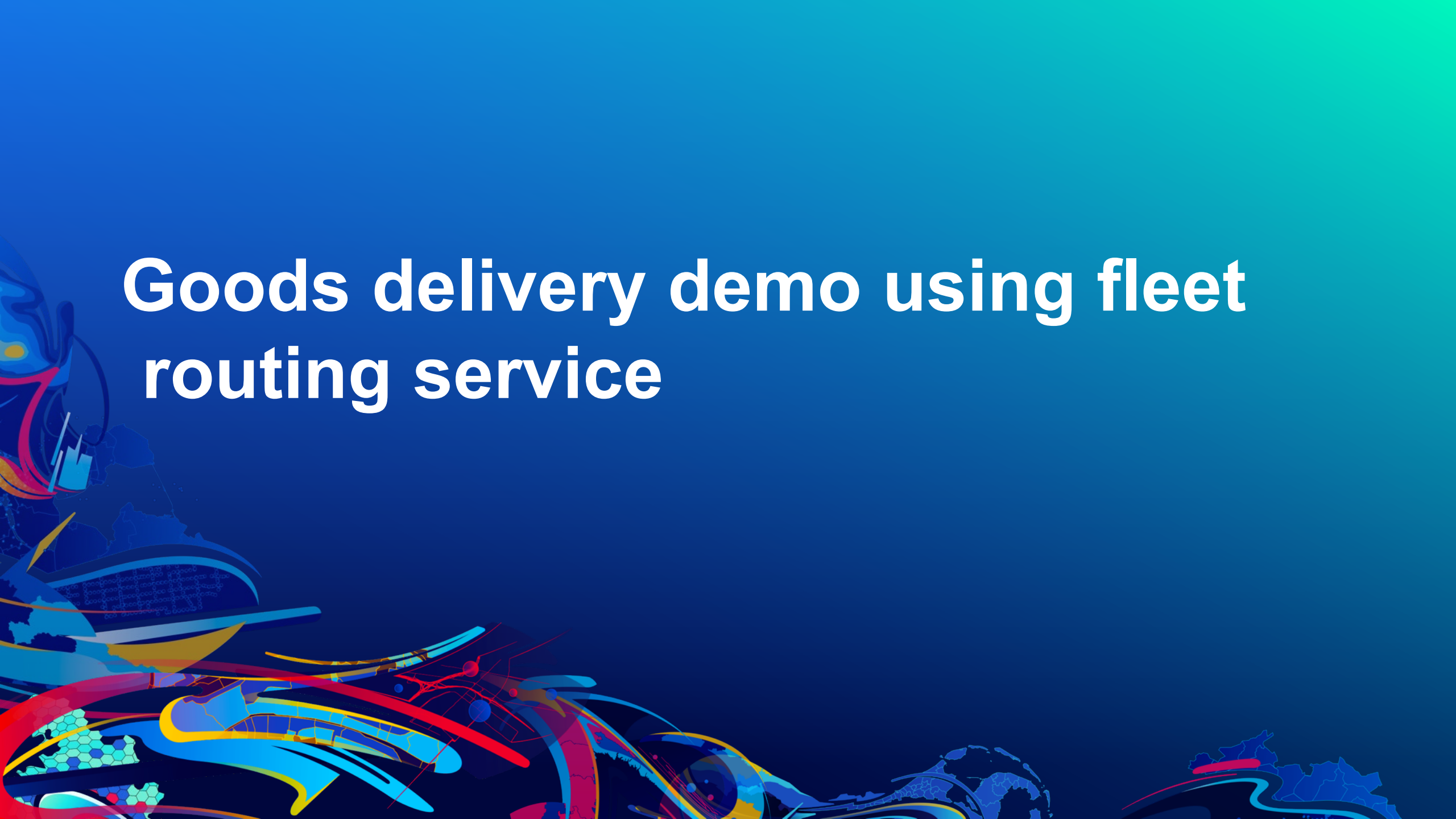
Directions widget with the ArcGIS API for JavaScript



https://noashx.github.io/presentations/DS_2021/Directions_widget_with_the_ArcGIS_API_for_JavaScript.html

Other routing services and capabilities

Goods delivery demo using fleet routing service



Goods delivery Demo

- Problem statement:
  - 3 vehicles deliver to 9 stores
- Objective:
  - Minimize overall cost and balance workload between three drivers
  - Cost includes cost per minutes (driver salary) and cost per mile (gas, mileage, maintenance, etc.)
- Constraints:
  - Each store has delivery time window
  - Each driver has max shift work hours
  - Trucks cannot make U-turns
  - Trucks have capacity limit

Model your business constraints using Fleet Routing Service

- Orders
  - Name
  - ServiceTime
  - DeliveryQuantities
  - TimeWindowStart1
  - TimeWindowEnd1
  - MaxViolationTime1
- Depots
  - Name
  - TimeWindowStart1
  - TimeWindowEnd1
- Routes
  - Name
  - StartDepotName
  - EndDepotName
  - StartDepotServiceTime
  - EarliestStartTime
  - LatestStartTime
  - Capacities
  - CostPerUnitTime
  - CostPerUnitDistance
  - MaxOrderCount
  - MaxTotalTime
  - MaxTravelTime
  - MaxTravelDistance

- Business Constraints
  - Time to unload goods at each store
  - Total weight of goods to be delivered at each store
  - Each store has time window it can accept delivery
  - Time window cannot be violated
  - Depot has time window it can accept pickup
  - Each truck starts and ends at a particular depot
  - Time to load truck at depot
  - Earliest and latest time driver could start working
  - Maximum carrying capacity (weight/ volume) of each truck
  - Cost to operate the truck
  - Maximum number of stores can be serviced by a truck (to balance workload)
  - Maximum work shift hours
  - Maximum driving hours and distance (for safety)

Model your business constraints using Fleet Routing Service

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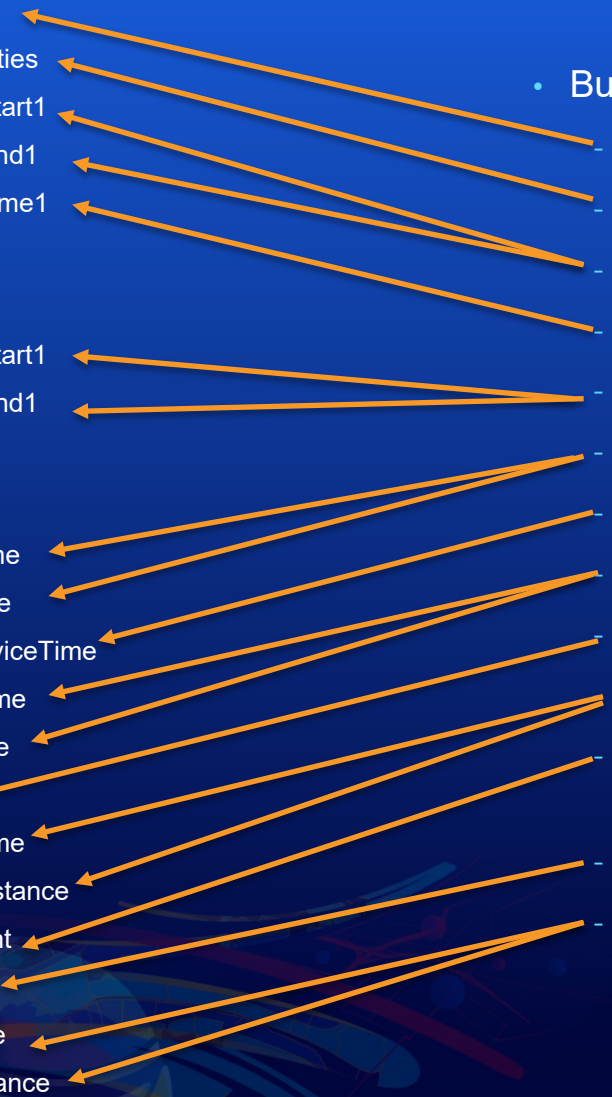

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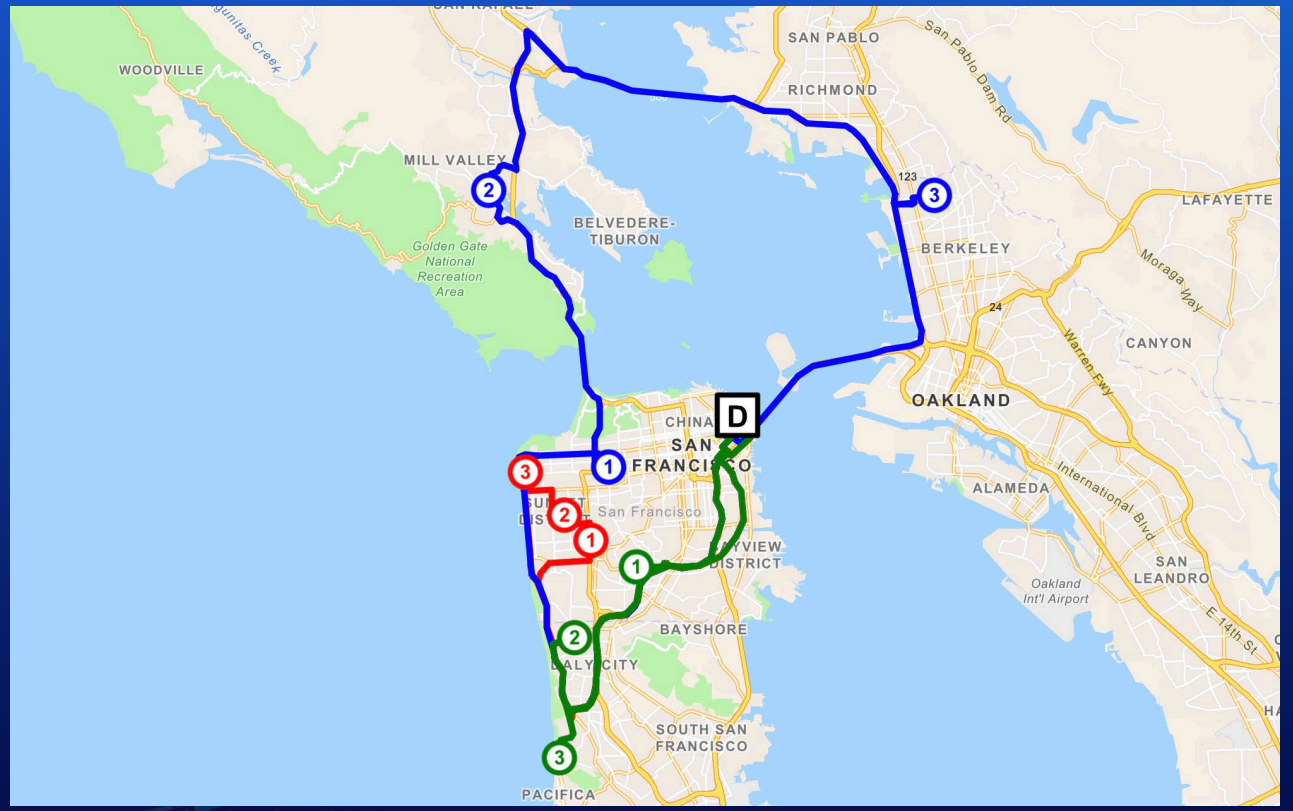
Model vehicle routing problem using Pro

DEMO

Vehicle routing problem (VRP) with the ArcGIS API for JavaScript



https://noashx.github.io/presentations/DS_2021/Vehicle_routing_problem_with_the_ArcGIS_API_for_JavaScript.html

Takeaways

- Esri routing services and capabilities
  - Routing
  - Closest facility routing
  - Travel cost matrix
  - Service areas
  - Location-allocation
  - Fleet routing

- How to model a complex fleet routing problem
  - Model in ArcGIS Pro and inspect parameters passed from ArcGIS Pro to Fleet routing service

Takeaways

- ArcGIS API for JavaScript
  - Directions widget
    - https://developers.arcgis.com/javascript/latest/api-reference/esri-widgets-Directions.html
  - Geoprocessor class
    - https://developers.arcgis.com/javascript/latest/api-reference/esri-tasks-Geoprocessor.html
  - API Keys
    - https://developers.arcgis.com/documentation/mapping-apis-and-location-services/get-started/

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