



ArcGIS Runtime: Routing and Navigation Tips and Tricks

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DEVELOPER SUMMIT

Overview

- **Network Analyst API**
- **Navigation API**
- **Related areas**

Network Analyst API



Network Analyst API

- Route, Closest Facilities, Service Area tasks
 - Similar programming pattern
 - Task → Parameters → *inputs and solve* → Result
 - RouteTask → RouteParameters → Stops → RouteResult

Network Analyst API

- **Local**
 - mmpk\mobile geodatabase with transportation network
 - runtime solve done on device
- **Network Analyst Services**
 - NAServer (vs. GP)
 - creates service request and server does the solve

Inputs from a feature table

- Stops\Barriers can be set using a feature table
 - `SetStops(ArcGISFeatureTable featureTable, QueryParameters queryParameters)`
- Service table – connected/accessible service
- Local – a mobile geodatabase
- Properties will be populated from the table attribute values

Stops - Stop1	
ObjectID	1
Name	Stop1
RouteName	Route1
Sequence	1
TimeWindowStart	2/9/2021 8:00:00 AM
TimeWindowEnd	<Null>

Settable stop properties

- **RouteName** - to create multiple routes with single solve
- **Name** - add context to messages or exception messages
- **SetAddedCost** - to add to TotalTime (vs. Travel Time)
- **CurrentBearing\CurrentBearingTolerance** – influences locating
 - determine *which* network edge and *which* side of the street

Locating

- **Searches up to 20 km for network edge**
 - restriction not allowing locating
 - very sparse network
 - outside network extent
- **Local solve all stops need to locate, otherwise errors**
- **Service unlocated stops are reported in messages**

Catching exceptions

- Try\Catch
 - ArcGISException → ErrorCode
 - ArcGISWebException → Details
- <https://developers.arcgis.com/net/reference/platform-error-codes/>

Result Messages

- Information on the solve

- Warning

- Network elements with avoid-restrictions are traversed in the output (restriction attribute names: "Avoid Unpaved Roads, Avoid Gates, Avoid Private Roads, Through Traffic Prohibited").

- Error (services)

- Location "Stop_4" in "Stops" is unlocated.
 - Need at least 2 valid stops for route "Route B"

Routed\Solved stop properties

- **DistanceToNetworkLocation**
 - Difference in stop location vs. snapped to network location
- **LocationStatus**
 - Local – OnClosestNotRestricted or OnClosest
 - Service – above plus NotLocated or NotReached

Network Location

- **NetworkLocation & SourceObjectPosition**
 - Populated on solve
 - Set for fine grain control of locating
 - Need to have knowledge of network dataset
- **Process**
 - Validate value against network and used if ok (not the x,y)
 - if NOT ok falls back to regular locating (using x,y)
 - *BUT can validate OK but on different network*

Direction Maneuvers

- **Geometry**
 - **Points (snapped to network)**
 - **Lines**
- **Other info**
 - **Maneuver type**
 - **ETA**
 - **Duration**

DirectionManeuver	
Geometry	Geometry {read-only}
ManeuverType	DirectionManeuverType {read-only}
Duration	Double {read-only}
Length	Double {read-only}
EstimatedArrivalTime	Date[0..1] {read-only}
EstimatedArrivalTimeShift	Double {read-only}
DirectionText	String {read-only}
ManeuverMessages	DirectionMessage[*] {read-only}
DirectionEvents	DirectionEvent[*] {read-only}
FromLevel	Integer {read-only}
ToLevel	Integer {read-only}



Demo


Navigation API



Navigation API

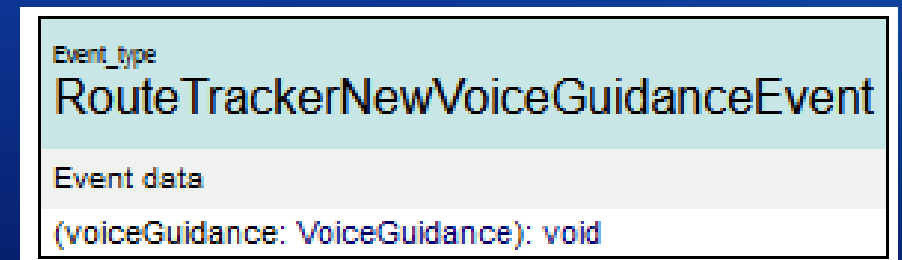
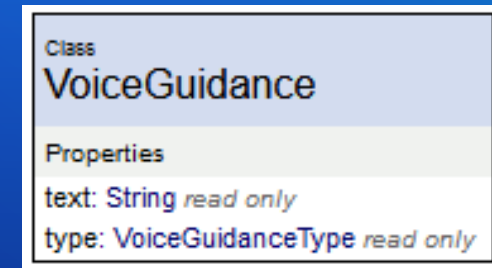
- Helps with tracking you present location along a route
- Takes in a location and raise events
 - Providing voice guidance a key locations
 - Updates the internal state with each new location
- Requires a route result containing a route with directions
 - Directions are need b/c the voice guidance is generated from these

Rerouting

- Off route is determined by using a tolerance of 16 m and 32 m plus the bearing
 - Rerouting strategy - ToNextWaypoint, ToNextStop, ResequenceStops
 - Server property “Licensed for automatic rerouting”
- 

Voice Guidance

- Based on text length, speed, and next maneuver
 - Long, Middle, or Short Notification
- Abbreviations expanded
 - “St.” → Street
- “Round” distance
- Event at key locations
- RouteTracker.GenerateVoiceGuidance



Tracking Status

- Current Maneuver Index - can get back to directions
- Tracking Progress - maneuver, destination, route
- Display Location – differs from GPS

Class
TrackingStatus
Implements: InstanceId
Properties
currentManeuverIndex: int32 <i>read only</i>
destinationProgress: TrackingProgress <i>read only</i>
destinationStatus: DestinationStatus <i>read only</i>
displayLocation: Location <i>read only</i>
isOnRoute: bool <i>read only</i>
isRouteCalculating: bool <i>read only</i>
locationOnRoute: Location <i>read only</i>
maneuverProgress: TrackingProgress <i>read only</i>
remainingDestinationCount: int32 <i>read only</i>
routeProgress: TrackingProgress <i>read only</i>
routeResult: RouteResult <i>read only</i>



Demo



Related

Route Layers

- Storing and sharing a solved route, and analysis settings
- Created via
 - Pro, Online tools (e.g. Plan routes), Directions Widget
- Stored in Portal
 - a feature collection – json

Share As Route Layers ? x

Input Network Analysis Layer or Route Data
Route

Summary

Tags

Route Name Prefix
Route

Portal Folder Name
DS2021

Share with
Not shared

Apply OK

<input type="checkbox"/>	Title	
<input type="checkbox"/>	 SD - Route 1	Route Layer

Using a route layer

- **Create Route Result object**
 - Visualize and get route information
 - Navigate
 - `RouteResult routeResult = await RouteTask.CreateRouteResultAsync(portalItem);`
- **Create Route Parameters object**
 - resolving
 - Network dataset should “match”
 - `RouteParameters routeParameters = await routeTask.CreateParametersAsync(portalItem);`

Location Data Sources

- **Simulated Location Data Source**
 - Uses a polyline or array of locations
 - Can change iteration rate or position in array
 - - IterationRate; CurrentLocationIndex
- **Route Tracker Location Data Source**
 - Uses passed in location data source and tracking status's *display location*




Demo



Summary

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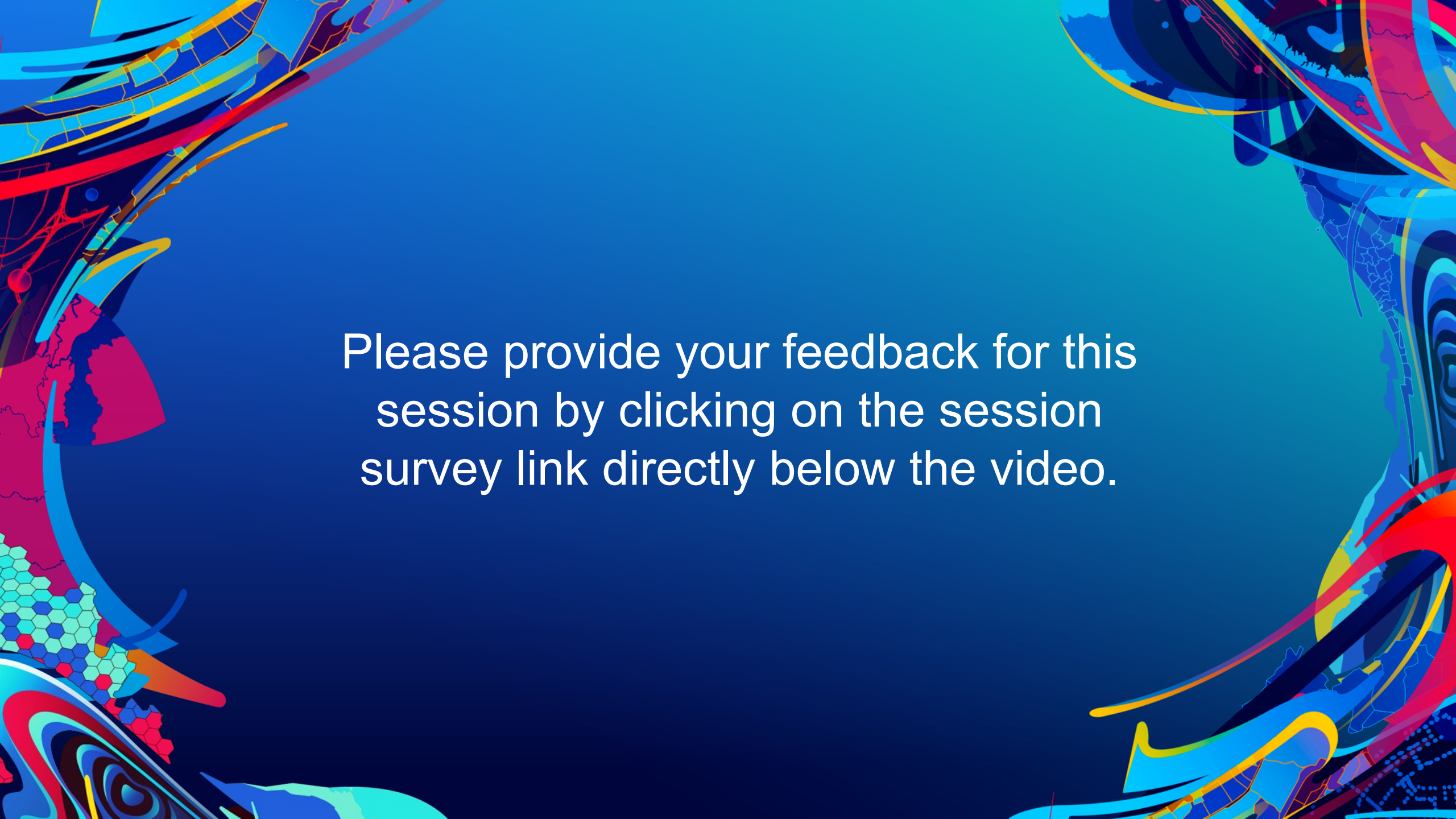
Summary

- Feature tables
 - Stop properties
 - Locating
 - Exceptions
 - Result Messages
 - Routed stop properties
 - Network Location
 - Direction maneuvers
 - Rerouting
 - Voice guidance
 - Tracking status properties
 - Route Layers
 - Location Data Sources
- 



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