ArcGIS Runtime:
Migrating from ArcGIS Engine

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https://community.esri.com/community/developers/native-app-developers
ArcGIS Runtime session tracks at DevSummit 2018

- ArcGIS Runtime SDKs share a common core, architecture and design
- Functional sessions promote common capabilities and workflows
  - An Introduction to the API and Architecture
  - Working with Your Portal
  - Building Great User Experiences
  - Working with Maps Online and Offline
  - Editing Your Data Online and Offline
  - Integrating Imagery
  - Analysis
  - Building 3D Applications
- Product sessions promote specific development experiences
- Demo theaters highlight examples of specific technical capabilities

Shared workflows, any platform, any device
Migrating from ArcGIS Engine to ArcGIS Runtime

- ArcGIS Runtime API: new and evolved workflows on all platforms

Windows  Linux  ArcGIS Engine

Windows  Linux  Android  iOS  macOS  ArcGIS Runtime

Shared workflows, any platform, any device
Migrating to ArcGIS Runtime

• ArcGIS Runtime API: new and evolved workflows on all platforms
• Local Server: additional support and extensibility on Windows and Linux

Shared workflows, any platform, any device
Migrating from ArcGIS Engine to ArcGIS Runtime

- ArcGIS Runtime API: new and evolved workflows on all platforms

Shared workflows, any platform, any device
Runtime functionality added in 2017

- **v100.1 - June 2017**
  - Raster on Android and iOS
  - Take a map offline
  - Related tables
  - Image Services
  - OpenStreetMap
  - Bing
  - WMTS
  - Camera controllers in 3D
  - Labeling
  - Service Area (online)
  - Closest Facility (online)
  - Coordinate Notation
  - Map Service DynamicLayer

- **v100.2 - December 2017**
  - Layers: ENC, WMS
  - Tables: Shapefile, Geopackage
  - Raster: Geopackage
  - Export Vector Tile Packages
  - Offline maps preplanned workflow
  - Dynamic feature layer rendering
  - Line of Sight
  - Viewshed
  - Service Area (local)
  - Closest Facility (local)
  - Statistics Queries
  - Transformations
  - Transactional editing
  - SketchEditor enhancements
  - Time

- **v100.2.1 - February 2018**
  - Bug fixes
  - Raster datasets and tile packages in mobile maps packages
  - SceneView WGS84 basemaps
  - WMS versions <1.3

**Patch – February 2018**

- ArcGIS Runtime Local Geoprocessing Service Startup Patch
  - Windows 7 SP1
  - Windows Server 2008 R2

- Patches:
  - WPF SDK v10.2.5
  - .NET SDK v10.2.7
  - Java SDK v10.2.4
  - Qt SDK 10.2.6
  - Local Server SDK v100.0 – v100.2
Migrating to ArcGIS Runtime

ArcGIS Runtime

- Maps & Data
- 3D
- Editing
- Analysis
- Routing & Geocoding
Migrating to ArcGIS Runtime

ArcGIS Runtime

Maps & Data

3D

Editing

Analysis

Routing & Geocoding
Maps: Migrating from ArcGIS Engine

- ArcGIS 8.x / 9.x / 10.x
- Documents
  - ArcMap document .mxd
  - Map Package .mpk
  - Layer file .lyr
  - Layer package .lpk
Maps: Migrating to ArcGIS Runtime

- ArcMap .mxd
- Map Package .mpk
- Online Maps
- Mobile Maps
Online Maps

- Maps from Portals
- Read/write in Online, Pro, and Runtime
- Webmap spec
- Online layers & embedded content
  - Feature Collection
  - Feature Layer
  - Map Image Layer
  - Tiled Layer
  - Vector Tiled Layer
- Include app configuration properties
  - Search, measure, routing, location, editable layers

https://developers.arcgis.com/rest/
Mobile Maps

- Maps from ArcGIS Online and Pro
- Mobile Map Package .mmpk
- Based on web map spec
- .mmpk Includes layers and data
  - Feature layers and tables
  - Raster datasets
  - Tile layer (as a .tpk)
  - Vector tile layer (as a .vtpk)
- From ArcGIS Pro can include locators and networks
  - Geocoding and routing offline

http://esriurl.com/CreateOfflineMap
Data: Migrating from ArcGIS Engine

- ArcGIS 8.x / 9.x / 10.x
- Data
  - Geodatabases (personal, file, and ArcSDE)
  - Shapefiles
  - Raster datasets
  - ArcGIS Server map services, image services
  - ArcIMS map services, feature services
  - OGC WMS, WCS
  - TIN
  - CAD
Data: Migrating from ArcGIS Engine

- Shapefile
- Personal Geodatabase
- File Geodatabase
- ArcSDE
- Raster
- Feature Service
- Map Service
- Image Service
- ArcIMS map service
- ArcIMS feature service
- WMS

- Shapefile
- Mobile Geodatabase
- Raster
- Feature Service
- Map Service
- Image Service
- WMS
- WMTS
- WFS (roadmap)
Data: Migrating to ArcGIS Runtime

• Mobile Geodatabase (.geodatabase)
• Based on SQLite
  - Cross-platform, portable, efficient
• Contains schema, data, and rendering information
• ArcGIS Online – on-demand / pre-planned workflow
  - Mobile map packages reference sync-enabled feature services
• Feature Service – .geodatabase file
  - Sync-enabled
• ArcGIS Pro – Mobile Map Package .mmpk
  - Read-only

http://esriurl.com/CreateOfflineMap
Data: Migrating to ArcGIS Runtime

- ArcGIS Runtime supports direct read of many raster formats
- Raster renderers applied by the API
  - Blend, Colormap, Hillshade, RGB, and Stretch
- Apply functions on the fly
  - Subset of Image Server raster functions
  - Mask, Clip, Pansharpen, Raster Calculator…
- Mosaic Datasets
  - Store, manage, view, and query collections of raster data as a catalog
  - Data model implemented in geodatabase
  - Visualize as a single mosaicked image
  - Create in ArcGIS Pro using GP tool
  - Create ArcGIS Runtime API via API
Data: Migrating to ArcGIS Runtime

- Feature Service
- ArcGIS Enterprise and ArcGIS Online
- Display, query, and edit data
- ArcGIS Runtime API accesses via calls to REST API
- Create mobile geodatabases
  - Synchronize features, records, attachments
- Simple feature access

Data: Migrating to ArcGIS Runtime

- Map and Image services
- Map services
  - Dynamically renders map images
  - Preconfigured layers, renderers
  - Override via DynamicLayer
- Image services
  - Dynamically access raster imagery
  - Apply rendering rules
Migrating to ArcGIS Runtime

- ArcGIS Runtime API: new and evolved workflows on all platforms
- Local Server: additional support and extensibility on Windows and Linux

Shared workflows, any platform, any device
Maps and Data: Migrating to ArcGIS Runtime

- Map Document .mxd
- Map Package .mpk
- Layer file .lyr
- Layer package .lpk
- File Geodatabase
  - Feature class
  - Raster dataset
  - Raster mosaic

- Local Geoprocessing Service
- Local Map Service
Maps: Migrating to ArcGIS Runtime

- .MXD, .MPK, .LYR, .LPK supported with Local Server
- Available on Windows and Linux desktops
  - With ArcGIS Runtime SDKs: .NET, Java, and Qt
- Read Map Packages with local map services
- Read and manipulate via local geoprocessing services
- Start from Geoprocessing Packages .gpk
- Create .gpks in ArcMap 10.5.1 with Model Builder or Python
- Python
Demo 1: Local Server

Model Builder

Python
Demo: Local Server

• Scenario
  - Map and data viewer
  - Browse for MPK file shared from ArcMap
  - Replace current map with Map Package
  - Browse for File Geodatabase
  - View list of contents
  - Choose item and add to map
Demo: Local Server – Part I

- Browse for map package (.mpk)
- Simple file browser
- Local Map Service is created for .mpk file
- New ArcGIS Map Image Layer added
- New Map is created and layer added
Demo: Local Server - Part II

- Browse for File Geodatabase
- View contents and datatype
- Choose item
- Add as new layer in Map
- Approach depends on content
- Feature classes, raster datasets, and mosaic datasets
  - Can be added to local map service as dynamic layer
- Raster catalog not supported by dynamic layer capability
  - Use custom Python script to create a new map package containing the raster catalog
Demo 2: Local Server

Model Builder

Python
Demo: Local Server

- Scenario
  - Browse for a File Geodatabase containing raster data
  - Choose a raster datset
  - Add raster dataset to view
  - Run viewshed on selected raster dataset
Demo: Local Server – Part I

• List Geodatabase contents
• Custom Python script
• Inputs:
  - Path to a File Geodatabase
• Outputs:
  - Table of contents (name and datatype)
• Built in ArcMap
• Shared as Geoprocessing package with runtime support
Demo: Local Server – Part II

- Local dynamic map service
- Empty map document (.mxd)
- Shared as an map package with runtime support .mpk
- Create LocalMapService from .mpk
- Create ArcGISMapImageLayer referencing LocalMapService
- Replace sub layers with new raster sub layer
- Add to map
Demo: Local Server - Part III

- Viewshed
- Custom Python script

Inputs:
- Path to a File Geodatabase
- Raster name
- Observer point feature
- Viewshed distance
- Observer height

Outputs:
- Raster dataset representing viewshed result

Built in ArcMap
Shared as Geoprocessing package with runtime support
Roadmap for maps & data in ArcGIS Runtime

- Create/save mobile maps
- Manage local mobile packages
- Create mobile geodatabase
- Utility networks
## Recommended DevSummit Sessions

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<thead>
<tr>
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<th>Room</th>
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<td>ArcGIS Runtime: An Introduction to the API and Architecture</td>
<td>Tues 1:00 pm - 2:00 pm</td>
<td>Primrose A</td>
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<td>Mesquite G-H</td>
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<td>Smoketree A-E</td>
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<td>Primrose B</td>
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<td>Thur 4:00 pm - 5:00 pm</td>
<td>Mojave Learning Center</td>
</tr>
<tr>
<td>ArcGIS Runtime: Building Cross-Platform Apps</td>
<td>Thur 4:00 pm - 5:00 pm</td>
<td>Primrose C-D</td>
</tr>
<tr>
<td>ArcGIS Runtime: Editing Your Data Online and Offline</td>
<td>Thur 5:30 pm - 6:30 pm</td>
<td>Catalina/Madera</td>
</tr>
<tr>
<td>ArcGIS Runtime: Migrating from ArcGIS Engine</td>
<td>Fri 10:00 am - 11:00 am</td>
<td>Mesquite G-H</td>
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<td>Fri 1:00 pm - 2:00 pm</td>
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Migrating to ArcGIS Runtime

ArcGIS Runtime

- Maps & Data
- 3D
- Editing
- Analysis
- Routing & Geocoding
Editing: Migrating from ArcGIS Engine

- ArcGIS Engine editing workflow mirrors ArcMap
- Editable data formats
  - Personal, File, ArcSDE geodatabases, and Shapefiles
- Editable content
  - Simple features / feature classes
    - Point, Polyline, Polygon, Multipoint
  - Complex features
    - Geometric networks, Topologies
  - Geodatabase schemas
- Workflow
  - Set target vector dataset (IFeatureLayer)
  - Edit features in an edit session via edit operations
  - Use geodatabase replication for offline editing
Editing: Migrating to ArcGIS Runtime

- Editable data formats
  - Personal geodatabase
  - File geodatabase
  - ArcSDE geodatabases
  - Shapefiles

- Editable content
  - Simple features / feature classes
  - Complex features
  - Geodatabase schemas

- Feature services
- Mobile Map Package
- Mobile geodatabase
- Feature Collection
- Shapefile
Editing: Migrating to ArcGIS Runtime

Editable data formats

• Feature service
  - ArcGIS Enterprise and Online feature services

• Mobile map package
  - Mobile map packages with sync-enabled mobile geodatabases
  - Created from feature service with the OfflineMapSyncTask

• Mobile Geodatabase
  - Sync-enabled mobile geodatabases
  - Created from feature service with the GeodatabaseSyncTask

• Static feature collection editing
  - Feature collections (map and item based)
Editing: Migrating to ArcGIS Runtime

Editable content

- Simple feature editing
  - Cannot edit topologies, utility networks, transportation networks
- Points, lines, polygons, multipoint
- Simple feature classes
- Features, attributes, attachments
Editing: Migrating to ArcGIS Runtime

Workflow

• Create or get a Feature from the Table
• Modify Feature geometry, attributes, attachments
• Apply Feature edits to Table via async Add, Update, Delete operations
• If editing an online service feature table
  - Call ApplyEdits to push edits up to service
• If editing a geodatabase table from an offline sync-enabled geodatabase
  - Use GeodatabaseSyncTask to sync with service
• If editing a static Feature Collection Table
  - Saved the map or portal item
Roadmap for editing in ArcGIS Runtime

• Edit contents of mobile map package and share with Pro
• KML read / write
• Apply service edits at root feature server level
  - Enables roll back of edits on all edited tables on failure
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Migrating to ArcGIS Runtime

ArcGIS Runtime

- Maps & Data
- Editing
- Analysis
- 3D
- Routing & Geocoding

Available on:
- .NET
- Qt
- Java
- Android
- iOS
- macOS
3D: Migrating from ArcGIS Engine

- ArcGIS 8.x / 9.x / 10.x
- ArcGlobe document .3dd
- ArcScene document .sxd
- Multipatch feature classes
- GlobeControl
  - Caching and cache management
- SceneControl
  - ‘Local’ scenes
3D: Migrating to ArcGIS Runtime

- Scene Service Layers
  - Published using ArcGIS Pro
  - ArcGIS Online
  - ArcGIS Enterprise

- Scene Layer Packages .slpk
  - Created using ArcGIS Pro
  - Use offline

- Elevation services and local raster datasets

- Exploratory analysis
  - Fast visual analysis
  - Viewshed, Line of Sight

- Key API types
  - SceneView, Scene, Surface, ArcGISSceneLayer, SceneSymbol, Camera
Roadmap for 3D in ArcGIS Runtime

- Web Scene read / write
- Location Display on SceneView
- Vector Tile Layer support
- More exploratory visual analysis tools
- SketchEditor on SceneView
- ‘Local’ Scenes
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- **ArcGIS Runtime**
  - Maps & Data
  - 3D
  - Editing
  - Analysis
  - Routing & Geocoding
Analysis: Migrating from ArcGIS Engine

- **ArcGIS 8.x / 9.x / 10.x**
- **Topological relationships**
  - Geometric objects: point, polyline, polygon…
  - Geometry objects implemented interfaces
    - IProximityOperator: nearest, distance…
    - IRelationalOperator: contains, crosses…
    - ITopologicalOperator: boundary, buffer…
- **Analysis of layers, processing of data**
  - Geoprocessing
- **Extensions**
  - NetworkAnalyst
  - SpatialAnalyst
  - 3DAnalyst
Analysis: Migrating to ArcGIS Runtime

• Geometry Engine
  - Operates on individual geometries
  - Not bound to data or services
  - Very efficient synchronous operations
  - The foundation for many workflows e.g. click > buffer > query > project > display

• Geoprocessing
  - Local geoprocessing service using LocalServer
    - Create geoprocessing package .gpk using ArcMap
  - ArcGIS Enterprise
    - Publish your own services
  - ArcGIS Online
    - Services hosted by esri

• Visualization
  - Exploratory Analysis (3D), Renderers
Roadmap for analysis in ArcGIS Runtime 100.x

- Local Server additional geoprocessing tools
- Local Server support for ArcGIS Pro packages
- More 3D exploratory visual analysis tools
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Migrating to ArcGIS Runtime

ArcGIS Runtime

- Maps & Data
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- Routing & Geocoding
Routing & Geocoding: Migrating from ArcGIS Engine

• ArcGIS 8.x / 9.x / 10.x

• Routing performed on ArcGIS Network Datasets
  - Requires Network Analyst extension
  - Execute via ArcObjects
  - Execute via geoprocessing tools
  - Use ArcGIS Server network analyst services
  - Solvers
    - Route, Closest Facility, Service Area, Origin-Destination
    - Cost Matrix, Vehicle Routing Problem (VRP) Solver,
    - Location-Allocation Solver

• Geocoding performed on ArcGIS Locators
  - Execute via ArcObjects
  - Execute via geoprocessing tools
Routing & Geocoding: Migrating to ArcGIS Runtime

• Routing
  - ArcGIS Network Datasets
  - Specific optimized Network Analysis service types and associated API ‘Task’ types
    - Route, Service Area, ClosestFacility
  - ArcGIS Runtime provides local equivalent
    - Route
    - Service Area
    - Closest
  - Packaged into Mobile Map Packages .mmpk with ArcGIS Pro
  - Other network analysis types available as Geoprocessing services

• Geocoding
  - ArcGIS Locators
  - Published as services (GeocodeServer endpoint)
  - Packaged into Mobile Map Packages .mmpk with ArcGIS Pro
Roadmap for routing & geocoding in ArcGIS Runtime

• Take locators and networks offline from a Webmap
• Additional network solvers
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Summary
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<tr>
<th>Version</th>
<th>Release Date</th>
<th>General Availability</th>
<th>Extended Support</th>
<th>Mature Support</th>
<th>Retired</th>
<th>Release Notes</th>
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<tr>
<td>10.6</td>
<td>January 17, 2018</td>
<td>Jan 2018 - Dec 2019</td>
<td>Jan 2020 - Dec 2021</td>
<td>Jan 2022 - Dec 2023</td>
<td>January 01, 2024</td>
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ArcGIS Engine product lifecycle
Get Started

1. Login to the ArcGIS for Developers web site https://developers.arcgis.com
2. Download ArcGIS Runtime SDKs
   - ArcGIS Runtime SDK for .NET, Java or Qt
   - ArcGIS Runtime Local Server SDK
3. Explore documentation
   - Guide doc for Local Server geoprocessing tools
     - 30% coverage with ArcGIS Desktop
     - Tell us what you need!
4. Discover DevLabs, samples, example apps
   Demonstrates Runtime capabilities, patterns and best practices
Please take our Survey

- Your feedback allows us to help maintain high standards and to help presenters

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Scroll down to the bottom of the session

Answer survey questions and submit