

The Road to Runtime

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A Brief History of Field Apps at UniSource

ArcExplorer

- Free
- Users can customize map symbology
- No GPS
- No Editing
- No custom functionality
- No longer supported (replaced by ArcGIS Explorer)

ArcReader

- Free
- Users cannot customize symbology
- No out-of-box GPS
- No out-of-box editing
- Can add custom functionality
- Limited [and shrinking] use of ArcObjects

ArcGIS Runtime

- Free or moderate cost
- GPS
- Offline editing and synchronization
- Software Development Kit

Roads to Runtime

- Esri ready-to-use apps: Collector, Workforce, Survey123
- RTReader*
- AppStudio [Runtime SDK for Qt]
- Build it yourself: Android, iOS, Java, .NET, OS X, Qt, Xamarin

*Available at ArcGIS Online

Quartz Release

- Improved, standardized core functionality across all platforms
- Complex vector symbol support
- Mobile Map Package
- Raster datasets
- Utility network
- Currently in Beta

Demo

ArcGIS Runtime SDK for .NET [10.2.7]:

What can you do *right now*?

Basic Licensing [Free!]

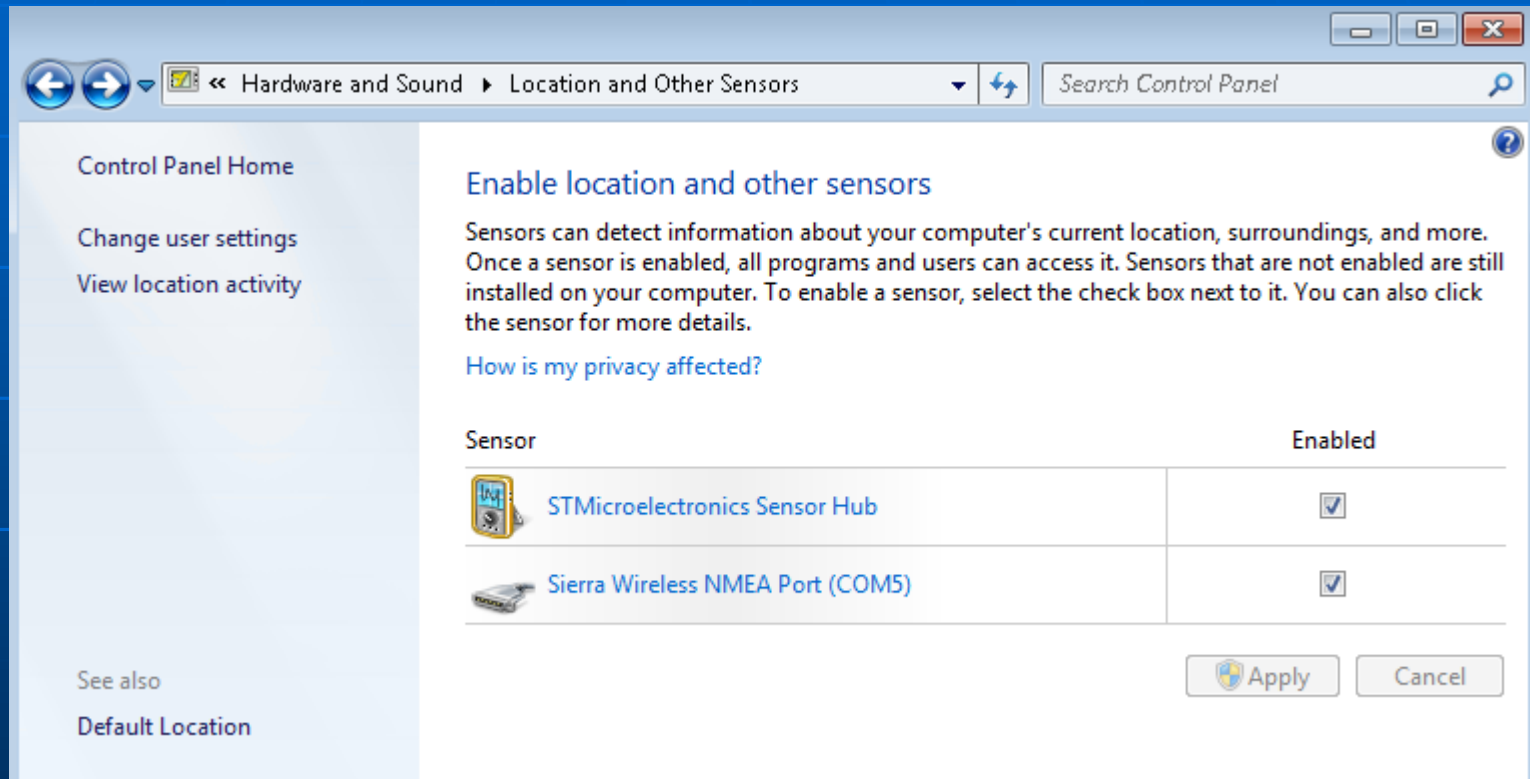
- Access web services
- Access local data:
 - Runtime geodatabases
 - Tile caches and packages
 - Shapefiles
- GPS location display & capture
- Editing via feature services

Runtime Geodatabases

- Open very quickly
- Simple features, geolocators, routing networks (no utility network yet)
- Attachments and related tables
- Symbol limitations:
 - Multilayer marker symbols are rasterized
 - Line marker symbols not supported
- Cannot symbolize on multiple fields

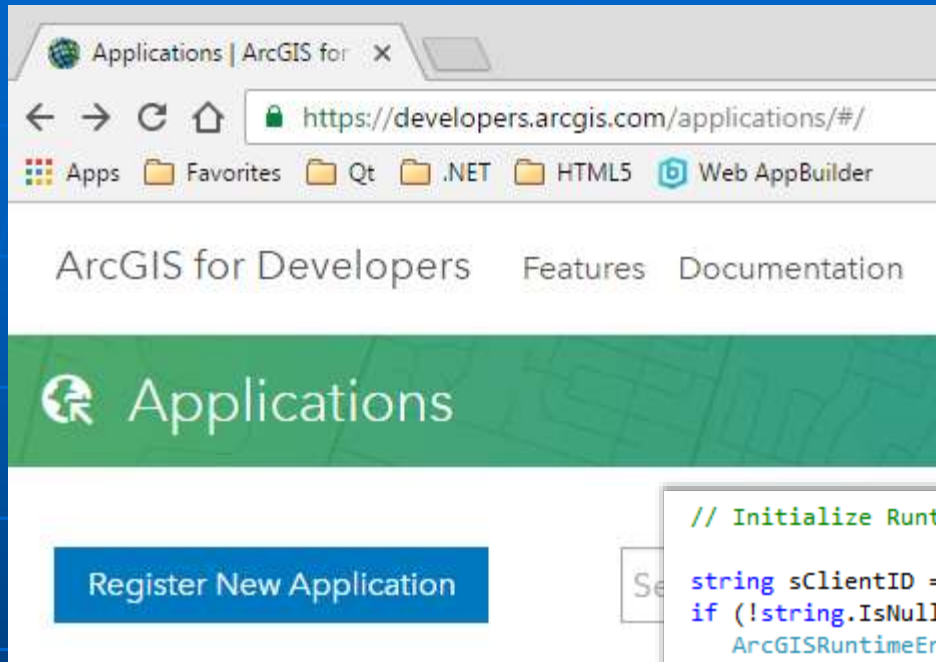
Out-of-box GPS Support

Requires an installed location provider:



[Custom code required for other types of devices]

Registering a Basic License



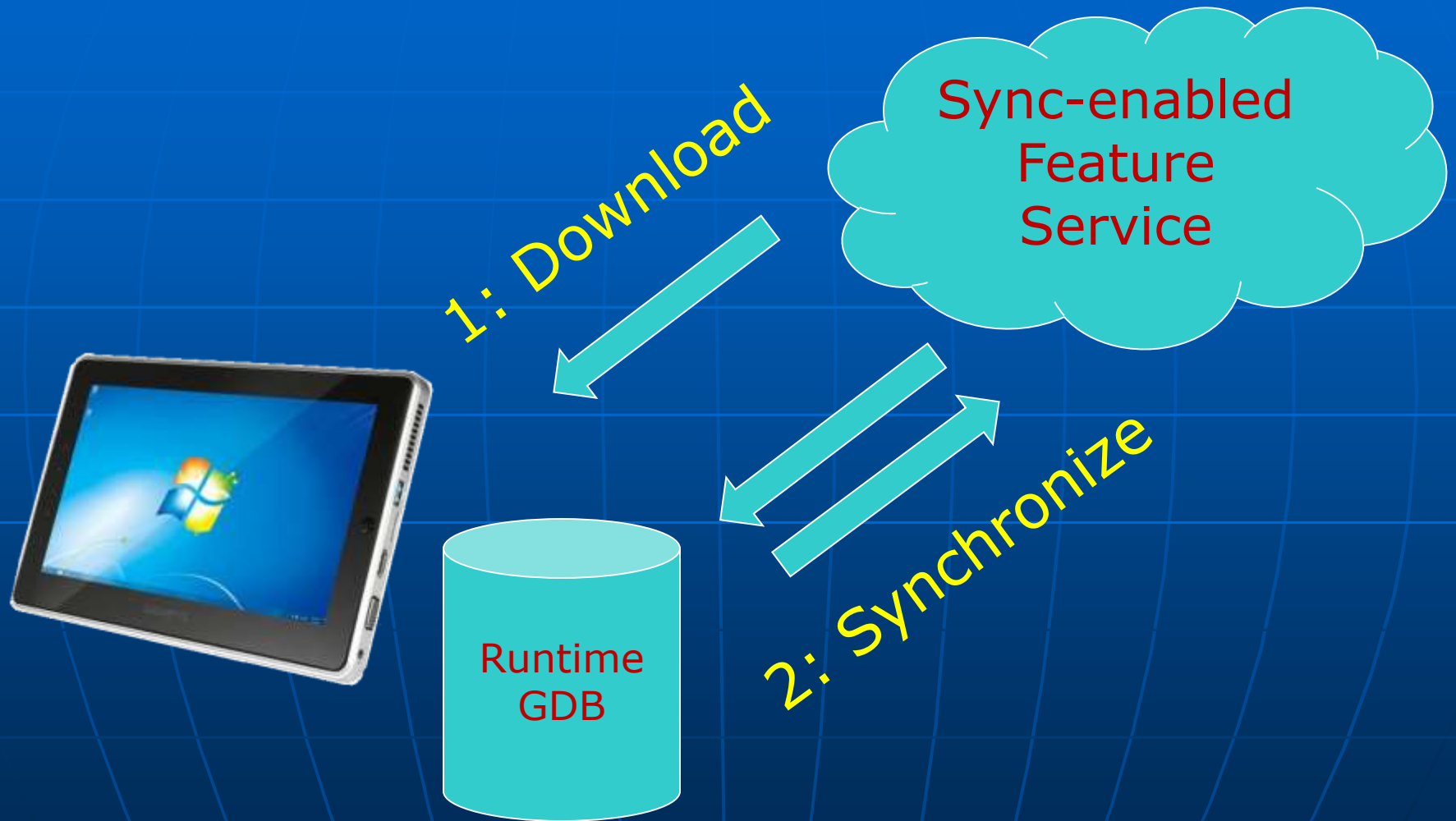
```
// Initialize Runtime

string sClientID = MyClientID;
if (!string.IsNullOrEmpty(sClientID))
    ArcGISRuntimeEnvironment.ClientId = sClientID;
try
{
    ArcGISRuntimeEnvironment.Initialize();
}
catch (Exception ex)
{
    MessageBox.Show("Could not initialize Runtime:\n" + ex.Message);
    return;
}
```

Standard Licensing

- Sync framework: offline editing and synchronization
- Local server: map packages and geoprocessing
- Offline routing, geocoding
- Cheaper than ArcGIS Engine

Sync Framework



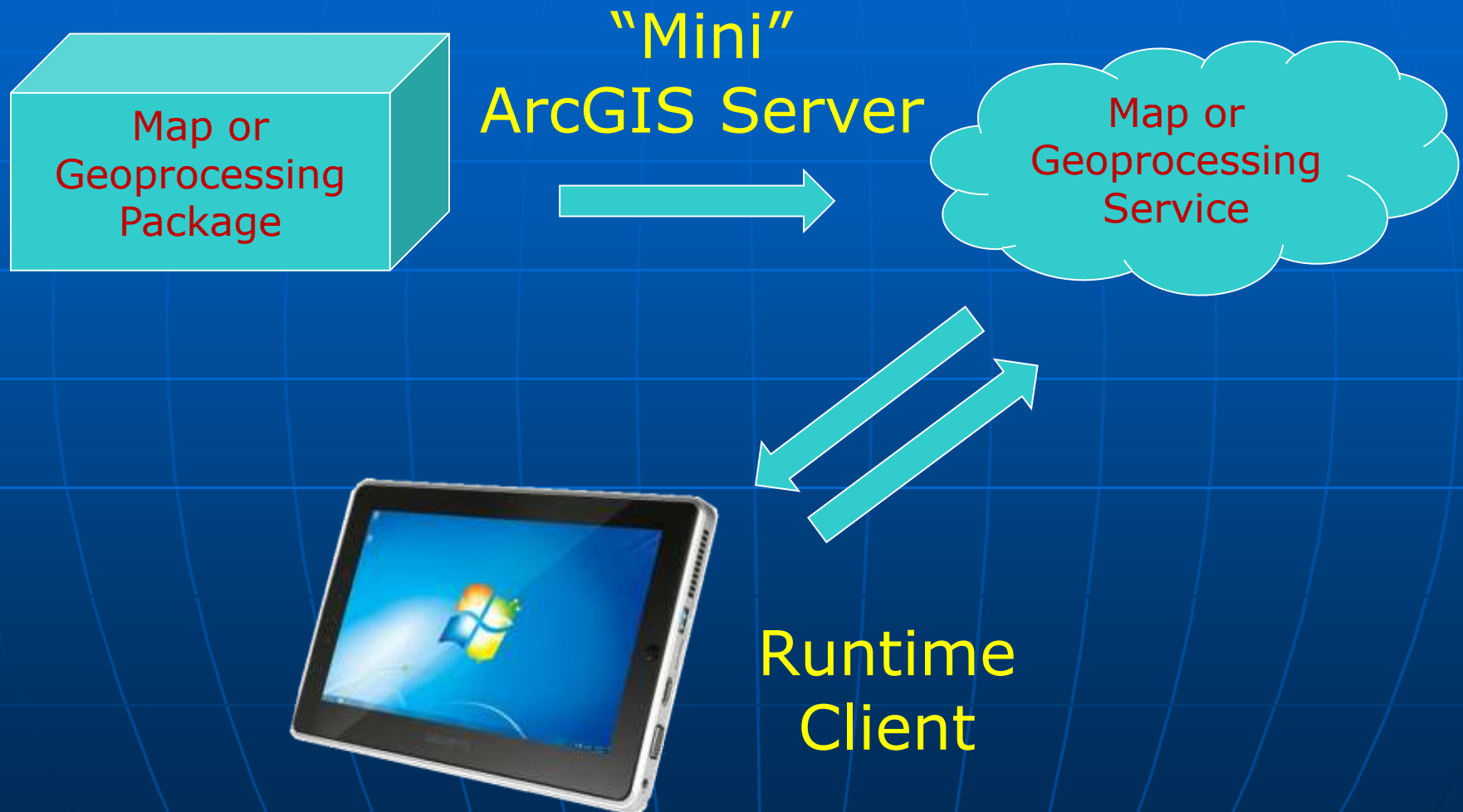
Why use the Sync Framework?

- Robust, full-featured solution
- Fully supported by Esri

Custom Solutions

- XML, JSON, shapefiles
- Search for examples, libraries
- Use at your own risk

Local Server



Why use Local Server?

- File geodatabases
- Complex vector symbols
- Annotation
- Network tracing [Geoprocessing tool]
- BUT: services take time to fire up

How to Get Standard Licensing: 1

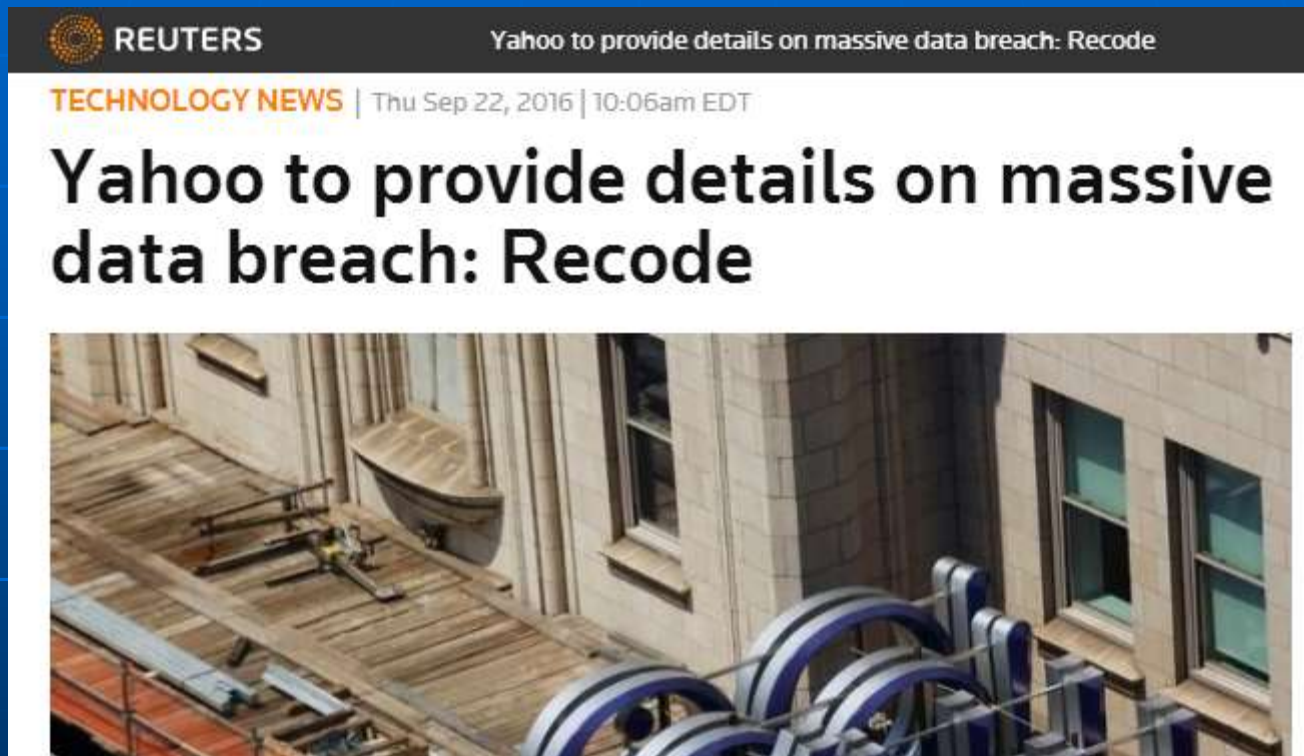
- **Use ArcGIS Online or Portal for ArcGIS** to license your app if your app will be connected to ArcGIS Online or your portal at least every 30 days.

SaaS is the new COM

- Everyone is scrambling to implement it
- Twenty years from now*, everyone will realize what an incredibly bad idea it was

*probably a lot sooner

Cloud / Named User Model: Risks



How to Get Standard Licensing: 2

- Obtain a license code by contacting the Esri office that serves you. You can also obtain a client ID from this Esri office if you don't have access to an ArcGIS for Developers account.

How to Do it Yourself

- Download Runtime for WPF (10.2.5)
<https://developers.arcgis.com/downloads/>
- Run SoftwareAuthorizationRT.exe
- Supply your authorization code for purchased licenses: RUD-----
(my.esri.com)
- Use LicenseViewer.exe to grab the license string

Tips, Tricks, and Caveats

ArcGIS Desktop: Creating Runtime Content

	ArcGIS 10.2.1	ArcGIS 10.3.1	ArcGIS 10.4.1
Runtime GDBs	Fails	Yes, but with blank GlobalIDs	Yes, but with blank GlobalIDs
Tile Packages (TPKs)	Fails (CustomTPK works)	😊	😊
Map Packages (MPKs)	😊	Requires hotfix for referenced data*	**CRASH!**
Geoprocessing Packages (GPKs)	😊	😊	GPKs don't work

Runtime Content

 MyContent

 basemap

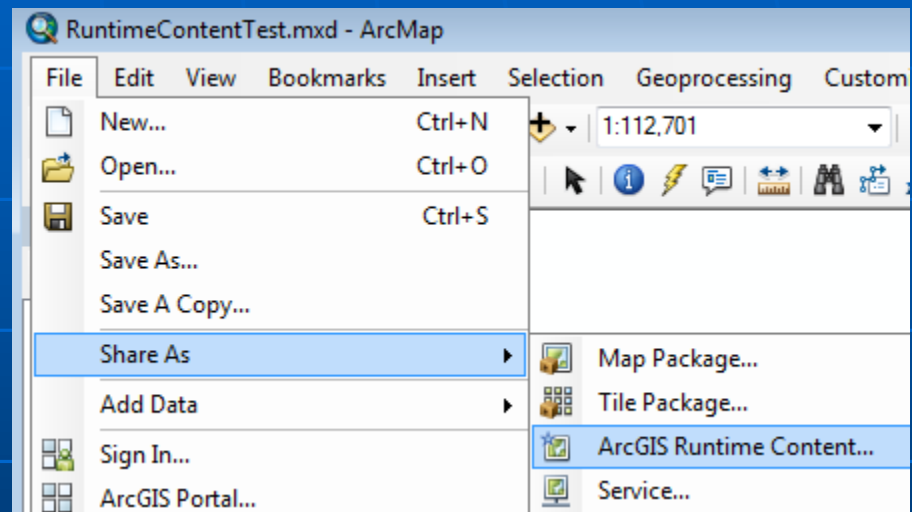
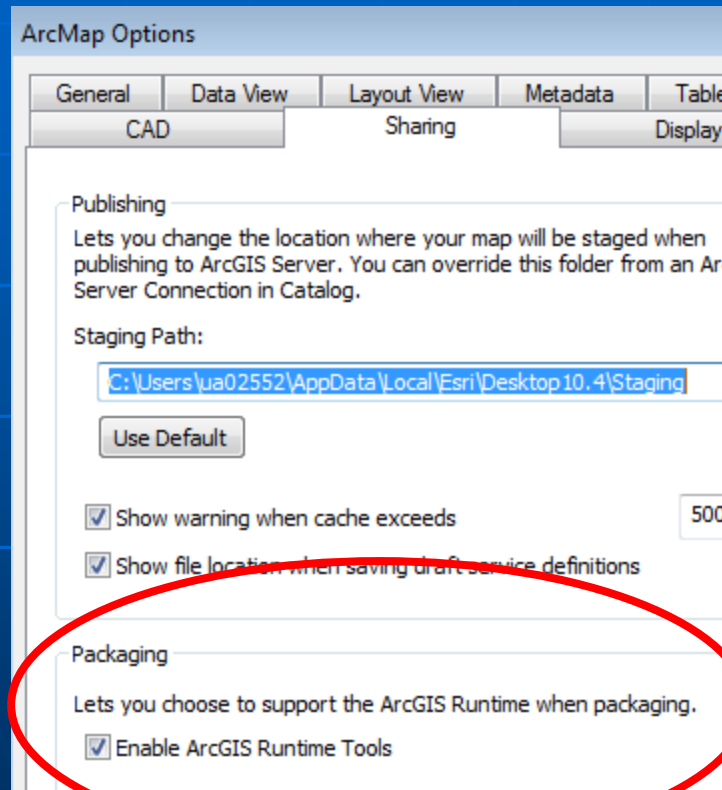
BaseMap [Tile Cache or TPK]

 Data

mycontent.geodatabase
[Runtime GDB]

Tile cache and Runtime GDB must be same projection

Creating Runtime Content [ArcMap]



[Or use Create Runtime Content
geoprocessing tool]

Problems with Out-of-Box Runtime Content

- Esri basemaps are not supported
- GlobalIDs are blank
- 10.4.1: Display fields are not honored
- QueryRelatedAsync does not support ObjectID relationships
[RTReader uses a workaround]

Creating an ESRI Basemap: ExportTileCacheTask

- Extracts a tile package (TPK) from a map service
- Same projection and tiling scheme as the service uses [Web Mercator, ArcGIS Online]
- Create a Runtime app to execute this task, or use Python to call REST API

Sample code: Python script

Creating an ESRI Basemap: Custom TPK Creator

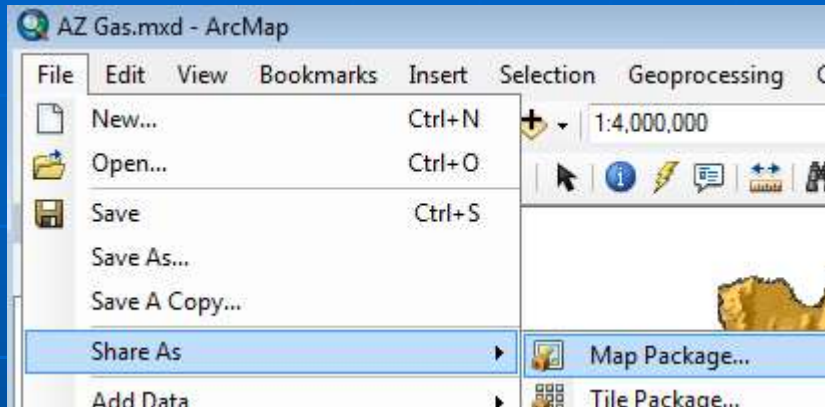
- Python tool compatible with ArcGIS Desktop and Pro [Desktop is recommended*]
- AOI feature class determines spatial reference and extent(s)
- By default, visible at > 1:10,000
- Available at ArcGIS Online

Creating a Runtime GDB: GeodatabaseSyncTask

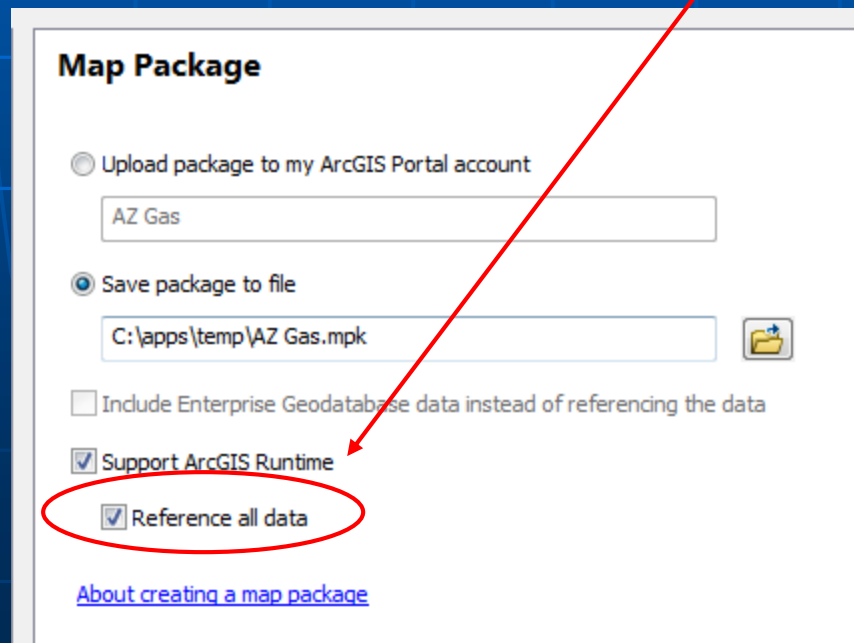
- Create a feature service with extract capabilities [data must be compatible with sync framework]
- SyncModel = null
- GenerateGeodatabaseAsync
- Create a Runtime app to execute this task, or use Python to call REST API

Sample Code: Python script

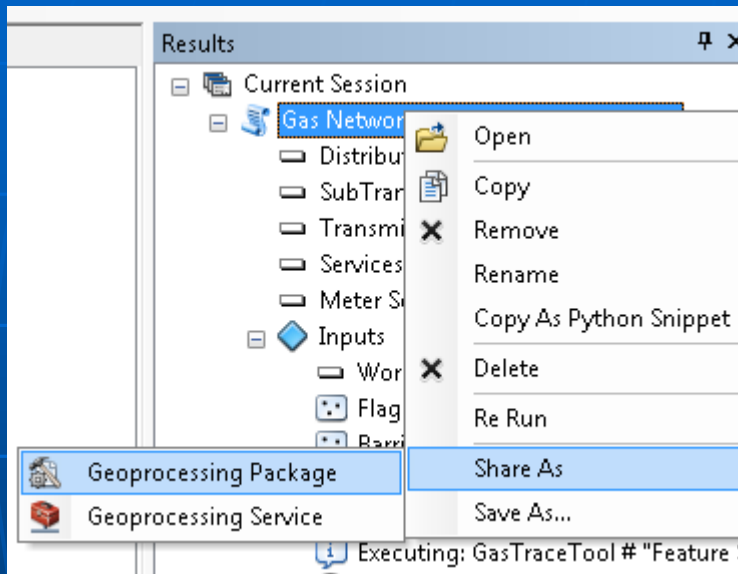
Creating a Map Package



Allows data to be updated separately from package



Creating a Geoprocessing Package



- Can use Python tool or model
- Do not explicitly reference data, except for schema
- Include a nullable parameter to generate empty results
- For fastest performance, return object IDs instead of features
- Arcpy.mapping not supported

Not all geoprocessing functionality is supported. For a complete list, see <https://developers.arcgis.com/net/desktop/guide/local-server-geoprocessing-tools-support.htm>

Runtime vs. ArcObjects

- No out-of-box components: TOC, Identify, Find, Legend, Layout, etc.
- Toolkit and examples available at [Esri @ GitHub](#)
- RTReader replicates much of ArcReader's functionality

Runtime vs. ArcObjects: Network Tracing

- Can be accomplished in Runtime using the Trace Geometric Network geoprocessing tool
- However, barriers disable an entire complex edge feature instead of just the sub-edge: **BUG-000098301**

Sample code

Runtime vs. ArcObjects: Symbology

- Feature Layers [Web or Runtime GDB]: get or set Renderer

SimpleRenderer, UniqueValueRenderer, ClassBreaksRenderer, TemporalRenderer, DictionaryRenderer

- Map Packages: Dynamic Layers [difficult to work with]

Annotation

- Only supported in Map Packages
- Workaround: convert to lines and use labeling

Sample code

Extending Runtime

- Extensibility Framework: allows creation of configurable, extendable, MVVM apps
- View assemblies contain views
- Extensions contain models, behaviors, and other code
- XML configuration ties everything together
- RTReader uses it

Runtime Resources

- ArcGIS for Developers:
developers.arcgis.com
- Esri @ GitHub [github.com/Esri]
[arcgis-toolkit-dotnet](https://github.com/Esri/arcgis-toolkit-dotnet)
[arcgis-runtime-samples-dotnet](https://github.com/Esri/arcgis-runtime-samples-dotnet)
[arcgis-runtime-demos-dotnet](https://github.com/Esri/arcgis-runtime-demos-dotnet)

Sample Code

- **Python:** TPK download
- **Python:** Runtime GDB download
- **Python/.NET:** Network tracing
- **Python/.NET:** Annotation to labels
- See website for other examples, including latest code for RTReader and Extensibility Framework

Questions?

- Mark Cederholm
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- This presentation and sample code may be downloaded at:

<http://www.pierssen.com/arccgis/runtime.htm>