ArcGIS Runtime SDKs
Building Offline Applications

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GIS INSPIRING WHAT'S NEXT

Design for connectivity

Make connectivity as part of the application strategy

Connected

Disconnected

Occasionally connected

- Temporary interruptions due connection problems
- Plan work as if in disconnected environment

ArcGIS Runtime capabilities

You can leverage variety of capabilities with ArcGIS Runtime

- View and interact with maps
- Query data
- Synchronize features
- Edit features
- Find places and locations
- Solve routes and get directions
- Analysis (geoprocessing)

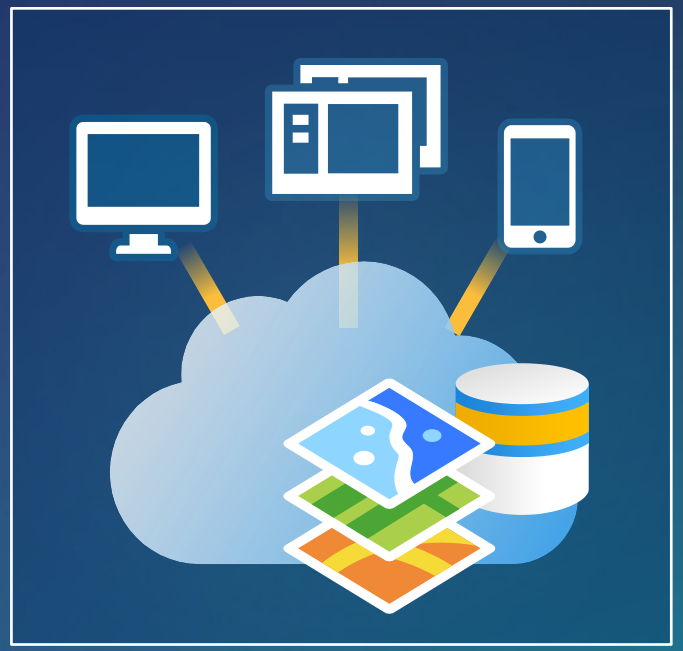
What we are covering and what not

- We are focusing on maps and the new workflows
  - Previously working with layers and tables directly
  - Focus moved to map instead
- Support for offline data formats hasn’t gone anywhere
  - Tile packages, Vector tile packages, Rasters, Geodatabases
- Even more data types are now supported with extra functionality
  - OGC GeoPackages, Shapefiles, Electronic Navigational Chart (ENC)
  - Vector tiles export

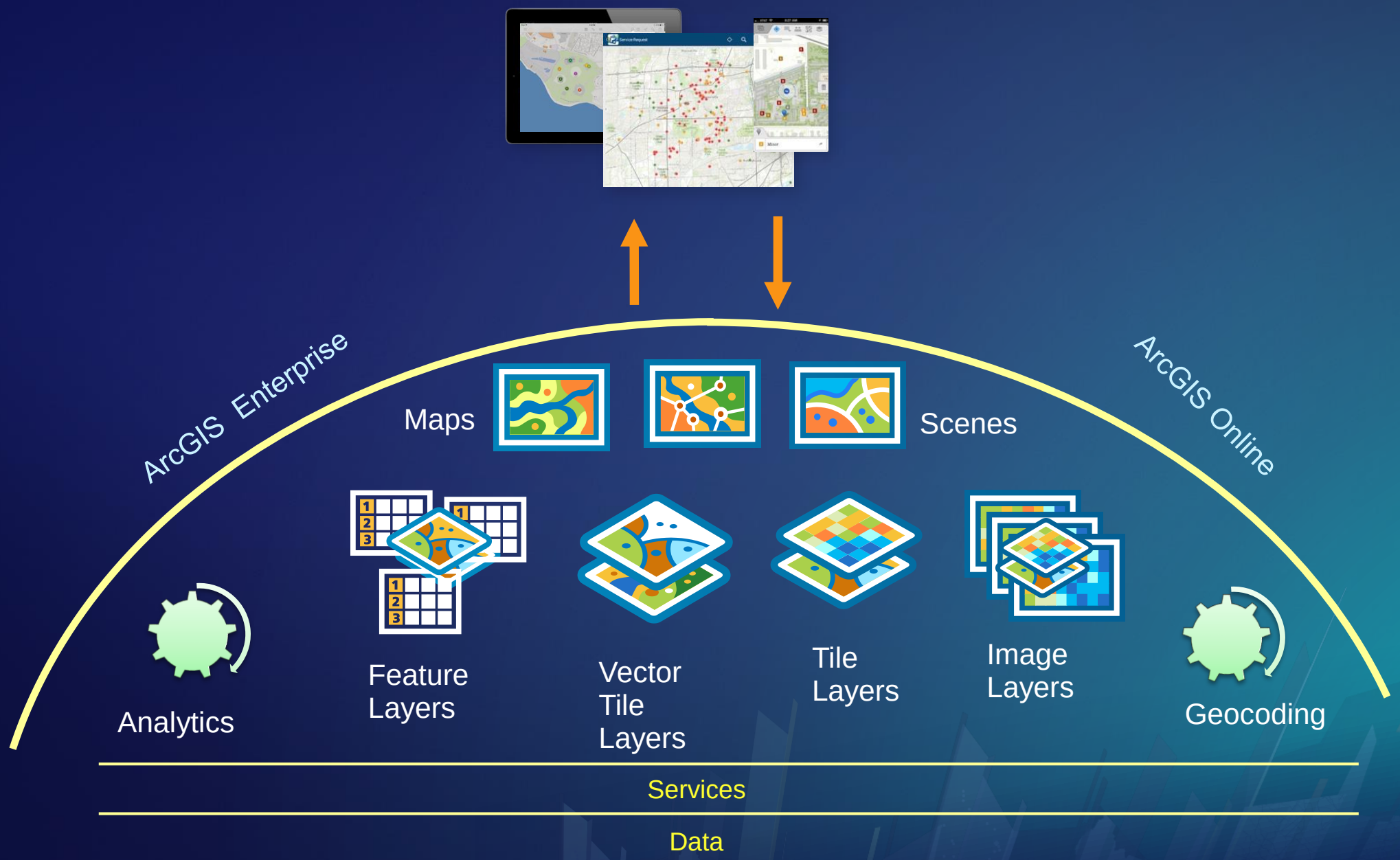
Check previous session recording from videos.esri.com
search term : ArcGIS Runtime: Working with Maps Online and Offline

What is a map?

- Central concept in ArcGIS
- Can be shared between multiple applications
- Contains
  - Basemaps
  - Operational Layers
    - Symbology
    - Popups
  - Metadata
- Authoring is done usually outside of Runtime
  - Can be updated outside of client application update cycle

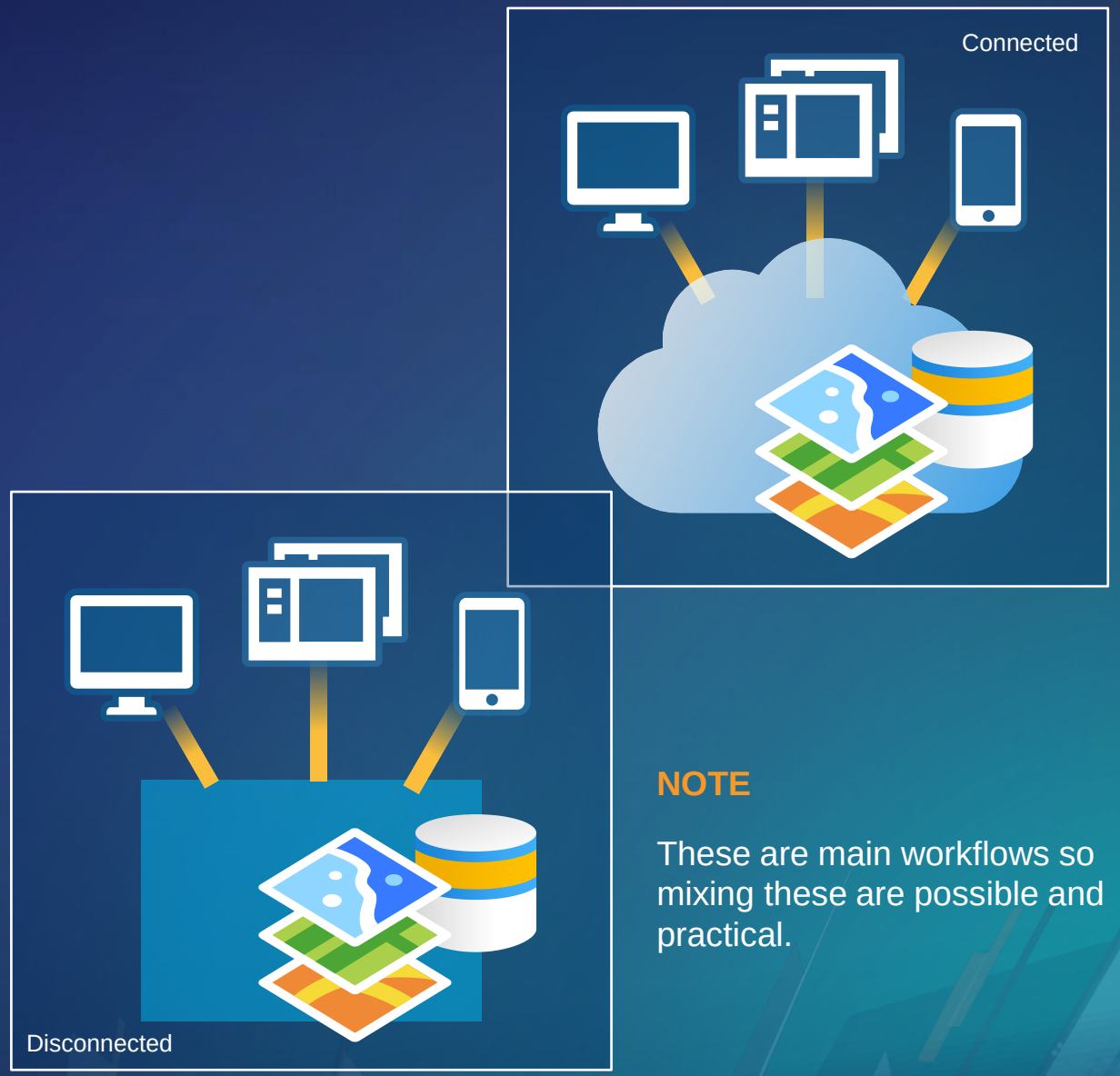


The ArcGIS Platform Information Model



Maps workflows

- **Connected maps**
  - Distributed through Portals
- **Preplanned map areas**
  - Prepackaged using ArcGIS API for Python or Geoprocessing tools
  - Downloaded using ArcGIS Runtime
- **On-demand map areas**
  - Generated and downloaded on request basis
- **Fully disconnected maps**
  - Authored using ArcGIS Pro
  - Side loaded to the devices



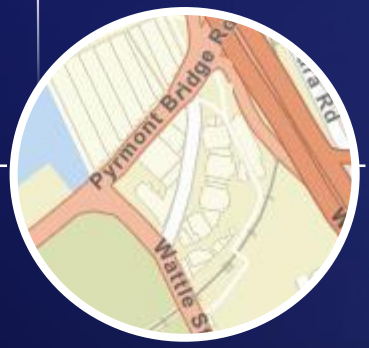
NOTE

These are main workflows so mixing these are possible and practical.

Working with offline maps

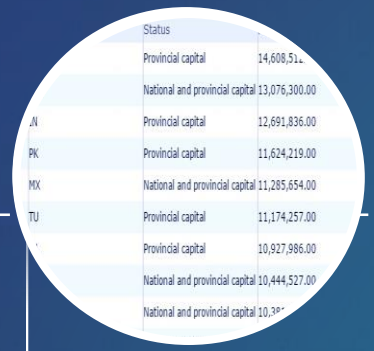
Supported data types

Vector tiles



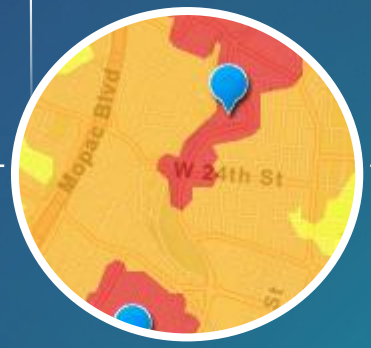
Raster tiles

Features



Tables

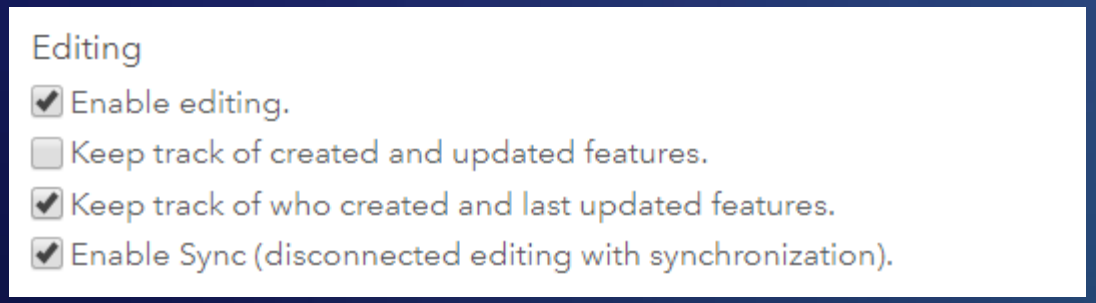
Feature collections



Enable for offline

- Service authors has to enable support for offline use
  - Raster and Vector Tile Services

  - Feature services



- Locators and Network datasets have to be side loaded to the device

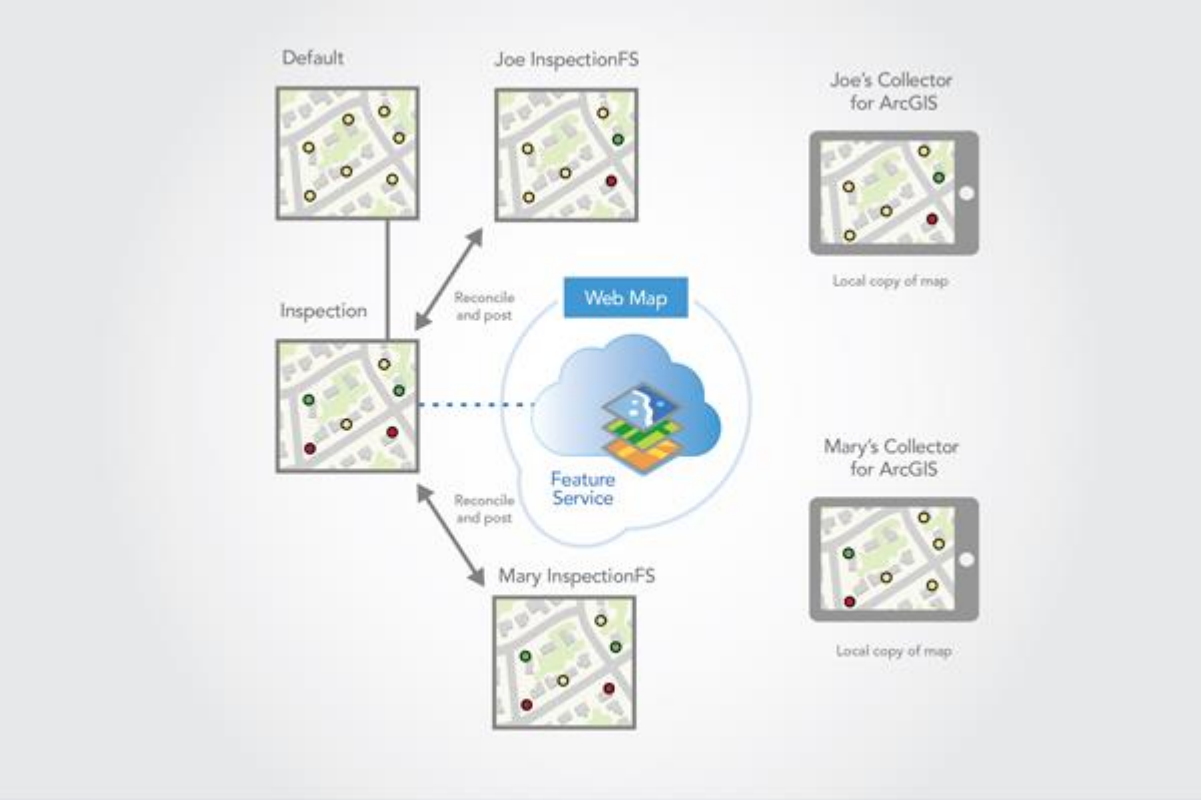
NOTE

You can enable offline mode on publishing time or from the service management tools.

Working with versions on ArcGIS Enterprise

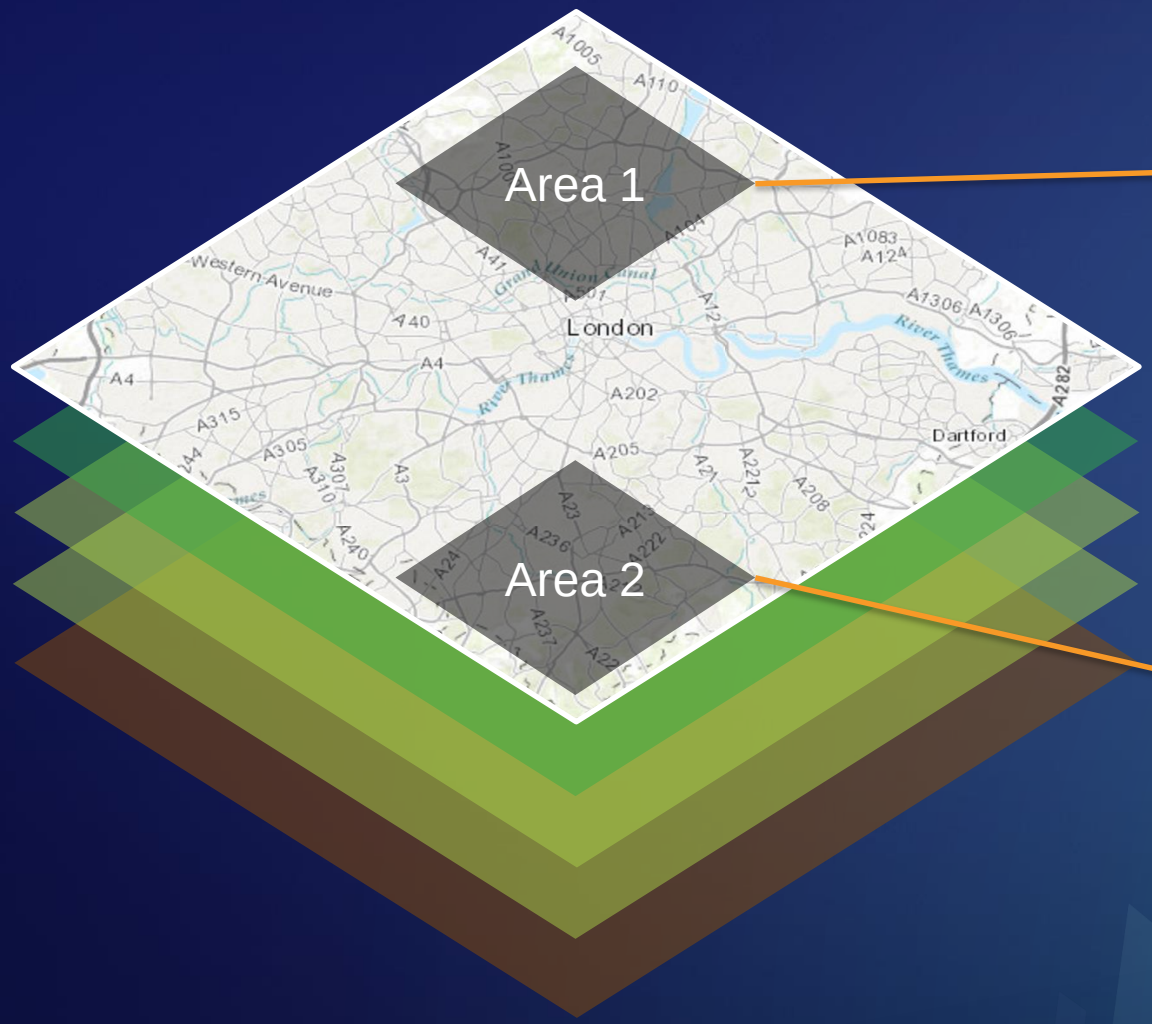
- Create a version for each offline map
- Create a version for each user

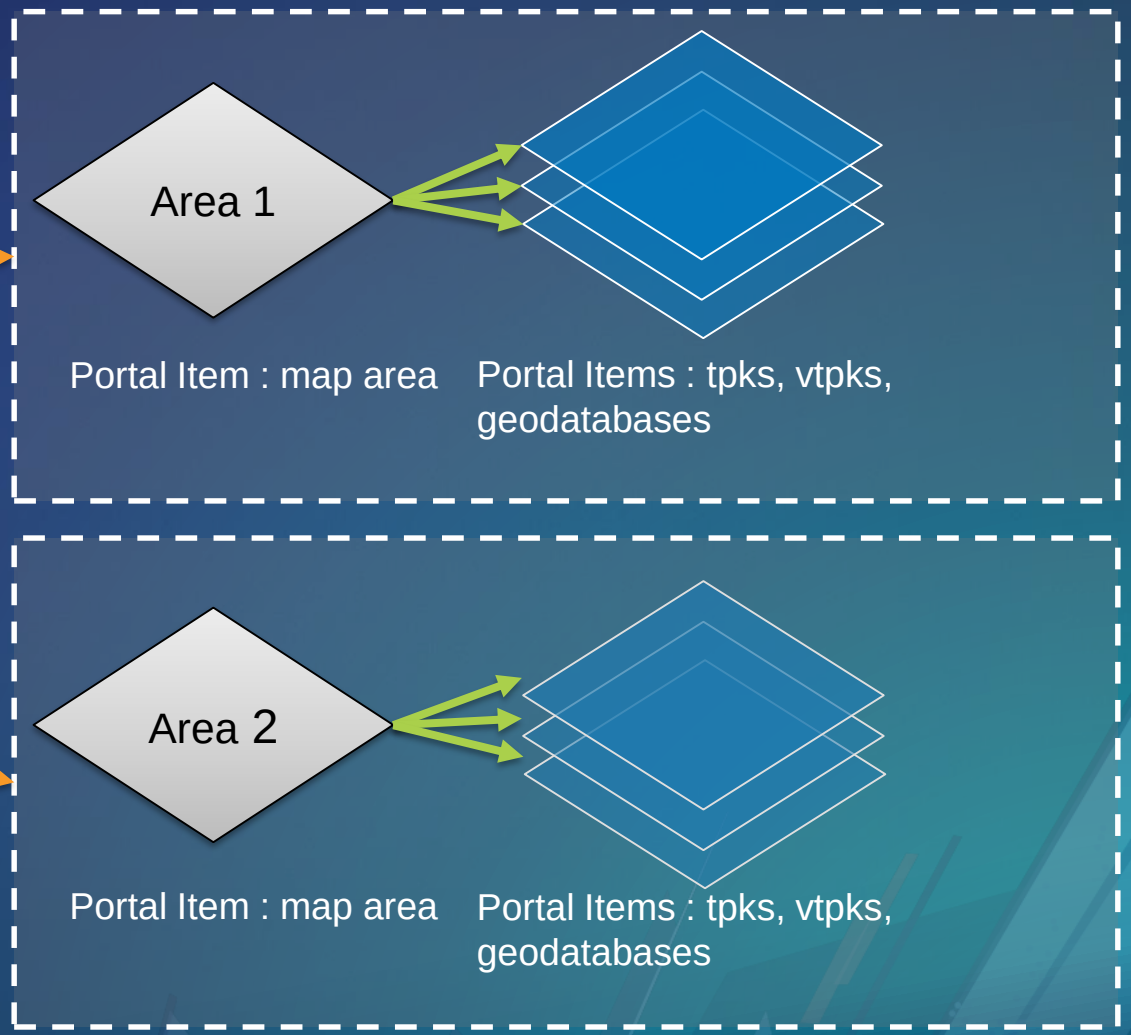
- Back-end reconcile and post procedure required



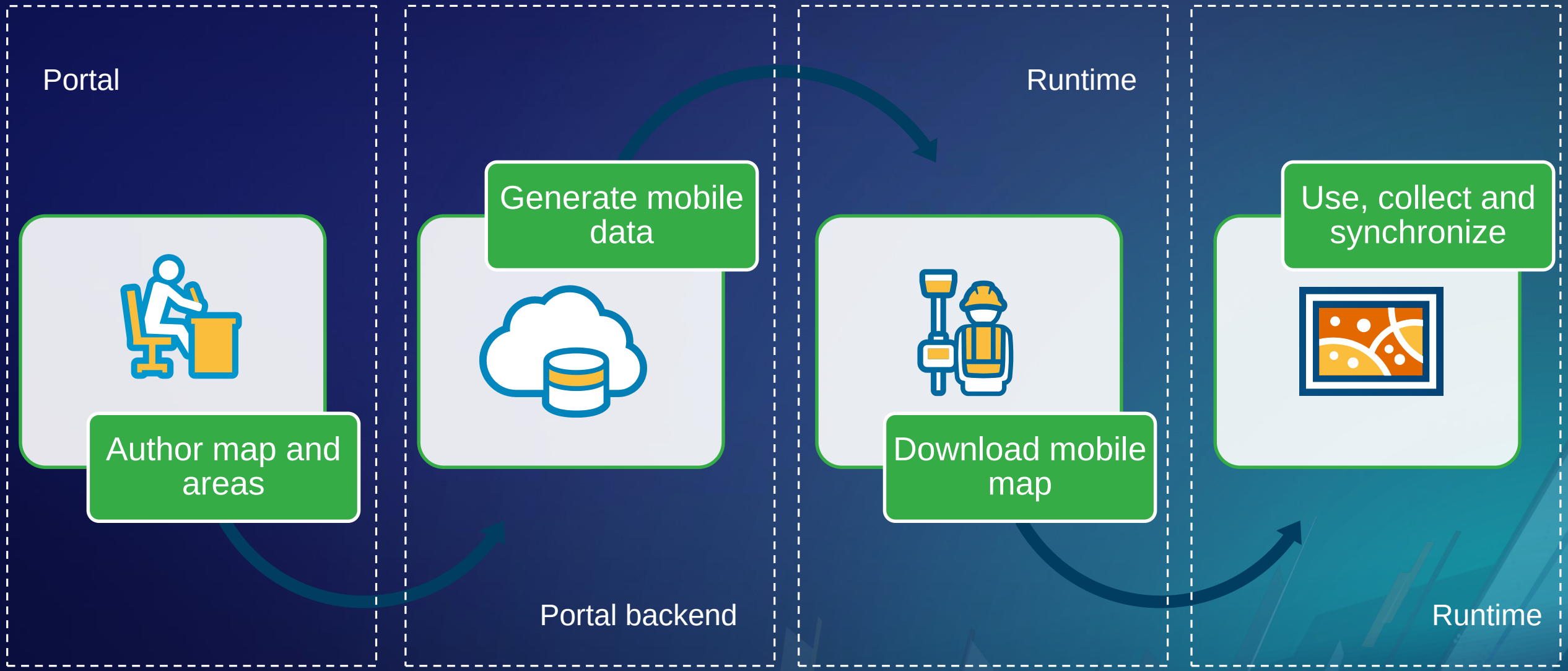
Preplanned workflow

Preplanned map areas





Preplanned workflow



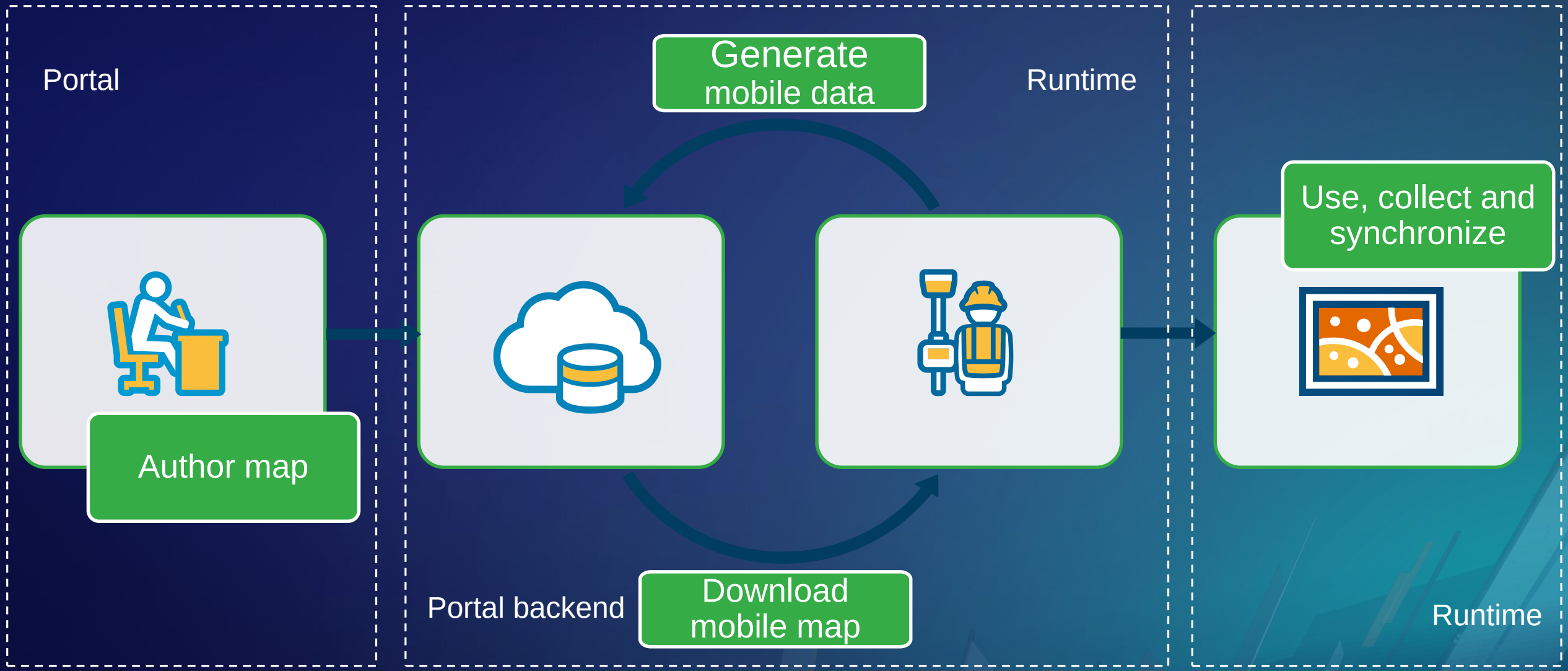
Authoring and using preplanned map areas

ArcGIS Runtime for .NET 100.2.1

```
// Create task that is used to access the area information and download functionality
var task = await OfflineMapTask.CreateAsync(Map);
// Get areas that are created for the map
var areas = await task.GetPreplannedMapAreasAsync();
// Create job that handles the download operation. Remember to took progress indication
// if that is needed and log messages for debugging
var job = task.DownloadPreplannedOfflineMap(areas.First(), offlineDataFolder);
// Start download and wait until the area is downloaded
var results = await job.GetResultAsync();
// Use results. Remember to check possible errors as well.
Map = results.OfflineMap;
```

Ondemand workflow

On-demand workflow



Take map offline on-demand

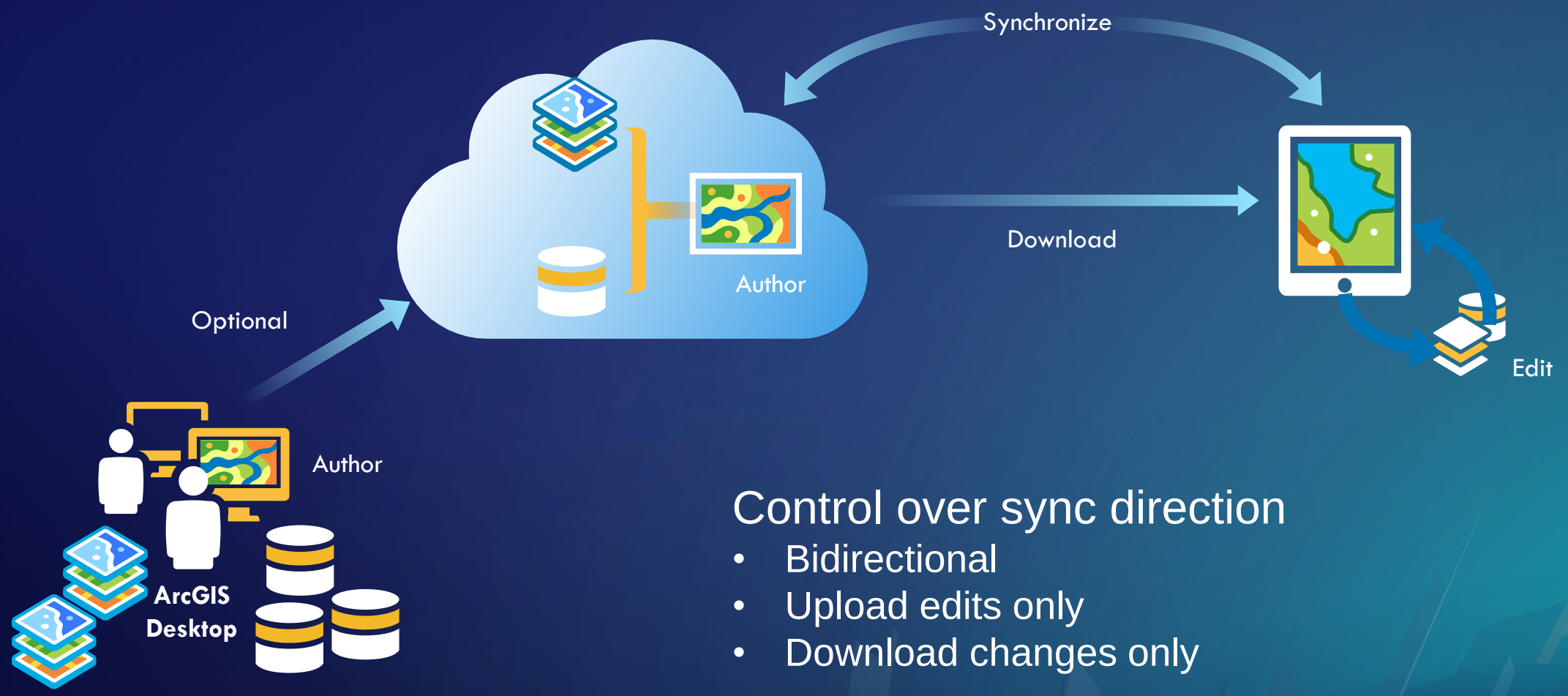
ArcGIS Runtime for .NET 100.2.1

```
// Create task that is used to generate offline area
var task = await OfflineMapTask.CreateAsync(Map);
// Create parameters. By default all levels of details are included.
var parameters = await task.CreateDefaultGenerateOfflineMapParametersAsync(
    areaOfInterest);
// Create job that handles the generation and download operations.
// Remember hook progress if that is needed and log messages for debugging
_job = task.GenerateOfflineMap(parameters, offlineDataFolder);
_job.ProgressChanged += ProgressChanged;
// Start generation and wait until area is downlaoded
var results = await _job.GetResultAsync();
// Use results. Remember to check possible errors as well.
Map = results.OfflineMap;
```

Offline based editing

Working with sync and geodatabases

ArcGIS Online – Editing Offline

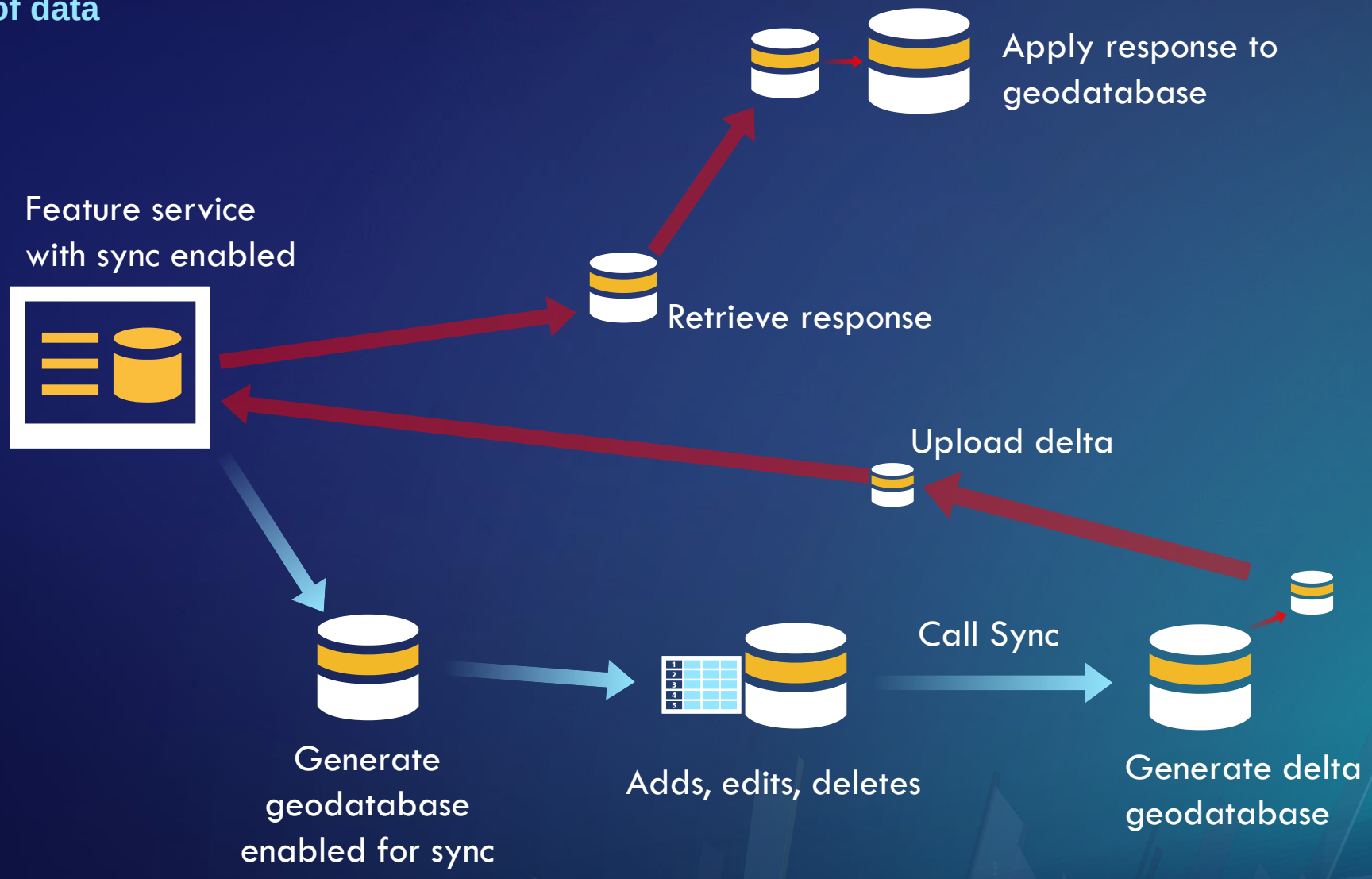


Control over sync direction

- Bidirectional
- Upload edits only
- Download changes only

How Does Sync Work?

The flow of data



Synchronizing layers

GeodatabaseSyncTask

- Targets a single feature service
- Choose which layers are targeted
- Control over layers/tables options

- Related tables are not returned by default

Synchronizing map

OfflineMapSyncTask

- Targets every feature layer in the map
- Simplifies usage
- Restricts options
- Designed to work with **OfflineMapTask**

```
// Create task that is used to synchronize the offline map
var task = await OfflineMapSyncTask.CreateAsync(Map);
// Set sync direction
var parameters = new OfflineMapSyncParameters()
{
    SyncDirection = SyncDirection.Bidirectional,
};

// Create job that does the work asyncronously
var job = task.SyncOfflineMap(parameters);
job.ProgressChanged += OnProgressChanged;

// Run sync and continue when it is finished
var results = await job.GetResultAsync();
// Handle errors
if (results.HasErrors)
{
    // handle nicely
}
```

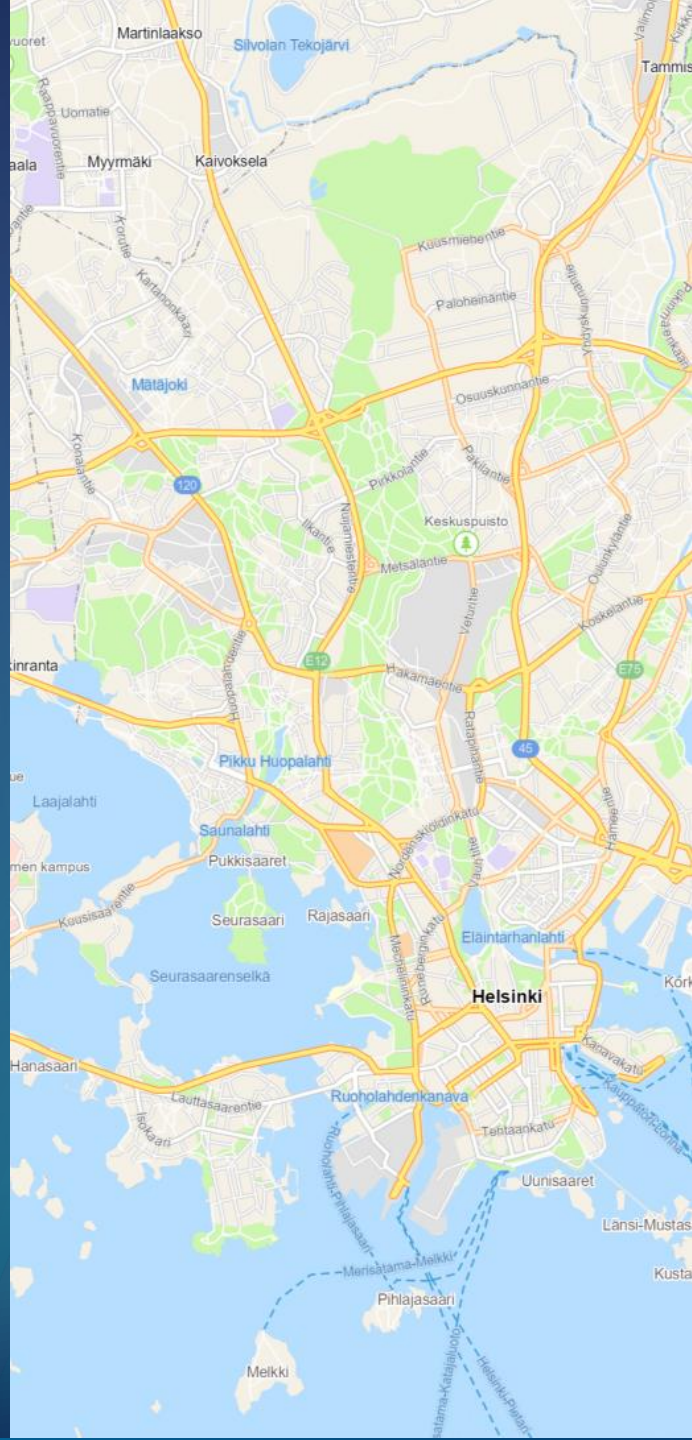
Synchronizing map

ArcGIS Runtime for .NET 100.2.1

Working with disconnected maps

Desktop pattern

- **Read-only** workflow
- **Mobile Map Packages** authored with ArcGIS Pro
- Locators and network dataset needs to be created with this pattern
- Has to be **side loaded** to the clients
- **Street Map Premium for ArcGIS** offers very good dataset for disconnected scenarios
  - Contains basemap
  - Locator
  - Network dataset



Authoring and using a mobile map package

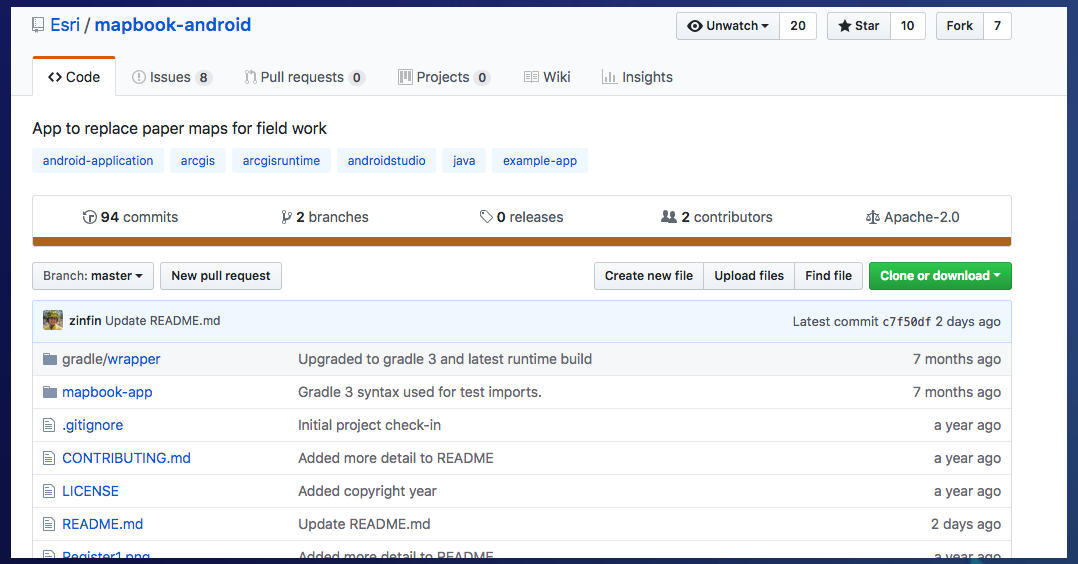
ArcGIS Runtime for Android

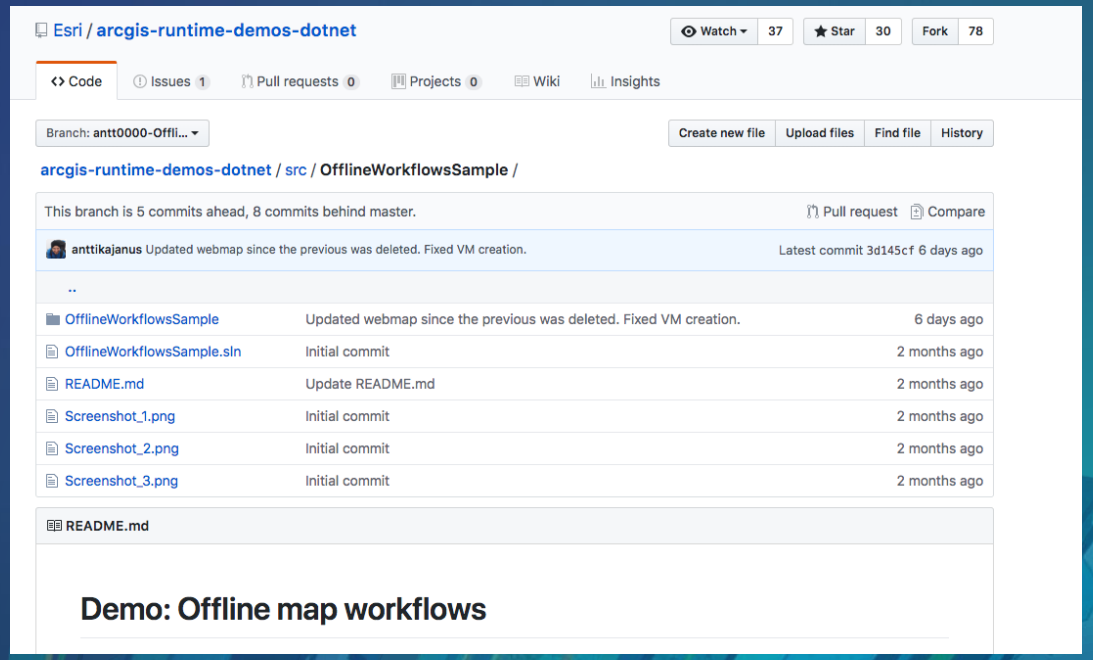
Summary

- Preplanned workflow is complementing the offline story – not replacing it
  - Use Preplanned workflow if you can plan the work and/or the work is done in the same areas
  - Use On-demand workflow if you need to provide support for ad-hoc offline work
- Try to adapt the WebGIS pattern since it is the most versatile way to provide maps that works well both in online and offline modes
- Take the connectivity design as a core requirement for your system and applications
- Hybrid approaches work well – choose the approach based on YOUR requirements

Get the code now

- https://github.com/Esri/arcgis-runtime-demos-dotnet/tree/antt0000-OfflineWorkflowSample
- https://github.com/Esri/mapbook-android





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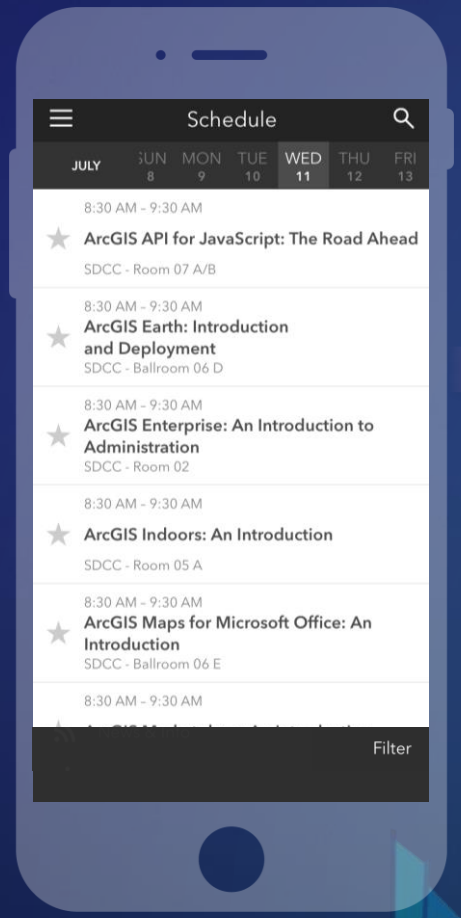
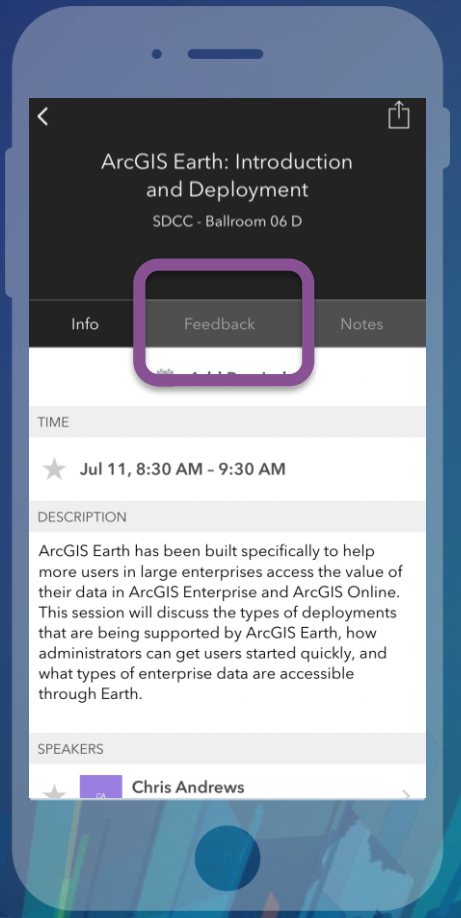
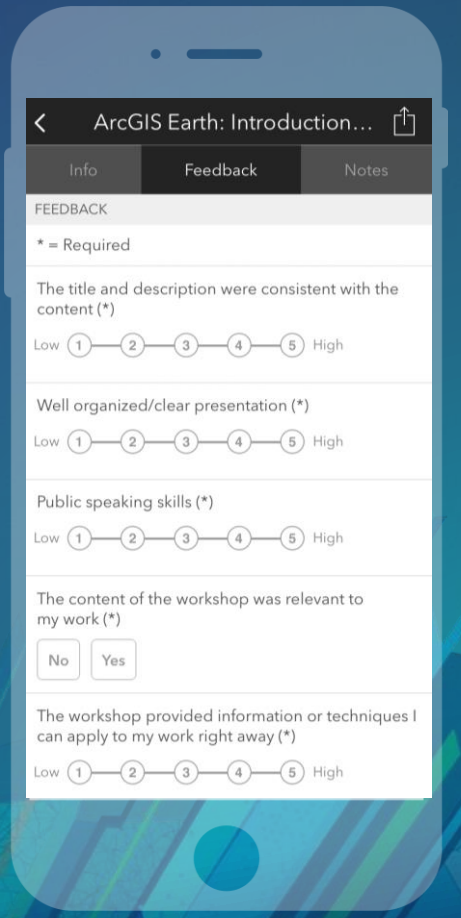


Scroll down to find the feedback section



Complete answers and select “Submit”



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