Advanced Editing with Focus on Edit Operations, Transaction Types, and Events

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Session Overview

- Edit Operations
  - Review of Basic workflow
  - Chaining Operations
  - Callback
- Edit Operation Type
  - Dataset compatibility – short and long transaction types
    - Toward consistent Undo/Redo, Save/Discard, Cancel behavior
- Events
  - Row level events
  - EditCompletedEvent

Edit Operations

- EditOperation is the primary pattern for Editing in the Pro API
  - Coarse-grained API for creating and manipulating records
    - Individual methods for:
      - Create, Modify, Delete, Cut, Clip, Merge, Reshape, Rotate, Split, Scale, Move,…
  - Executes edits against the underlying datastores
  - Adds undo/redo on the Operation Manager*
  - Invalidates affected layer caches

- *Non-versioned edits cannot be undone

Edit Operations

Example combining many coarse-grained methods (on different datasets):

```
var editOp = new EditOperation();
editOp.Name = "Simple edit operation";
//Add three points - 1 point to each layer
editOp.Create(pointsLayer1, start_pt);
editOp.Create(pointsLayer2, GeometryEngine.Instance.Move(start_pt, distance, 0.0));
editOp.Create(pointsLayer3, GeometryEngine.Instance.Move(start_pt, distance * 2, 0.0));

//Modify two polygons - 1 polygon in two layers
editOp.Modify(polyLayer2, 1, GeometryEngine.Instance.Buffer(boundary, distance));
editOp.Modify(polyLayer3, 1, GeometryEngine.Instance.Buffer(boundary, distance * 2));

//Execute the operations
editOp.ExecuteAsync();
```

Edit Operations – Execute() and ExecuteAsync()

- On Execute:
  - Edits are executed in a predefined order regardless of how they are declared in your code
    - Internally grouped together by method - Creates first, Updates, Deletes, then reshape, clip, etc.
    - A session is started per datastore (i.e. “workspace” - if not already started)
  - Individual edits <u>must be independent</u> of one another
    - Dependent edits require *chaining*
  - On success an undo operation is placed on the undo stack (if undo-able)
  - On failure (of any edit), all preceding edits for *that* edit operation are rolled back

- On Save or Cancel all sessions are ended

```
if (Project.Current.HasEdits)
   await Project.Current.SaveEditsAsync();
```

  - Save: Edits saved across all datastores (workspaces)
  - Cancel: Edits rolled back across all datastores (workspaces)
  - Undo/redo is cleared

Edit Operations - Chaining

- A chained operation is an edit operation that links to a previous EditOperation
  - Both operations become part of the <u>same undo/redo item</u>
    - Normally, each edit operation has its own undo/redo item
- Use a chained operation when the edit you require is dependent on the results of a previous EditOperation being commited AND you want the combined group of edits to be treated as one item on the undo/redo stack.
  - The classic scenario is adding a feature attachment as part of feature creation.
    - To add the attachment, the OID of the feature must already exist (i.e. the feature must have <u>*been*</u> ~created~ and not be <u>*being*</u> created…)
- Call `editOp.CreateChainedOperation()` to create a chained operation
  - (Instead of "`new EditOperation`")

Edit Operations - Chaining

- Flow
  - Create the “initiating” edit operation (this is the one that shows up in the undo/redo stack)
  - Execute it
  - If it succeeds, call editOp.CreateChainedOperation() to create the dependent /”chained” operation

```
var editOp = new EditOperation();
editOp.Name = "Create new facility record"; //←this is what shows up as the undo/redo

var attribs = new Dictionary<string, object>();
attribs["SHAPE"] = ...;

long new_oid = -1;
editOp.Create(facilities, attribs, oid => new_oid = oid); //capture oid
if (editOp.Execute()) {//do the create. Note: Execute() needs a QueuedTask
   //create succeeded so chain a new operation to add the attachment
   var chained_op = editOp.CreateChainedOperation();
   chained_op.AddAttachment(facilities, new_oid, @"E:\Attachments\Hydrant_1.jpg");
   chained_op.Execute();
 }
```

Edit Operations

- Demo
  - Basic Edit Operation
  - Chained edit operation

Edit Operations - Callback

- Certain *specialized* scenarios require “custom” handling beyond what the coarse-grained API provides. They are:
  - An edit that must span both GIS and Non-GIS data (non-registered tables)
  - An edit that (needs to) edit data that is not in the project
  - An edit for which there is no coarse-grained API method
  - An edit for Annotation text symbol properties (at 2.1)

- For these scenarios, use a Callback
  - The callback is executed when the editOp.Execute() is called.
  - Pass in, as parameters, at least one dataset per datastore that will be edited

Edit Operations - Callback

- Considerations:
  - All edits must be done “by hand”
    - Cannot mix in edit operation calls within the callback *itself*
  - Use non-recycling cursors to update rows
  - You are responsible for calling Store, CreateRow, etc
  - You are responsible for feature or feature dataset invalidation
    - Use the provided context that is passed in to you in your callback

Edit Operations - Callback

```
var editOp = new EditOperation();
editOp.Name = “Do callback";
var featLayer1 = ...

editOp.Callback((context) => {
  //Do all your edits here – use non-recycling cursors
  var qf = ...;
  using (var rc = featLayer1.GetTable().Search(qf, false)) {
    while (rc.MoveNext()) {
        context.Invalidate(rc.Current);//Invalidate the row before
        //Do edits...
        rc.Current.Store(); //call store
        context.Invalidate(rc.Current);//Invalidate the row after
    }
  }
  //Edit the non_versioned_table here, etc.

  //Note: can also invalidate any datasets (instead of rows)
 //context.Invalidate(featLayer1.GetTable()); - simpler but less efficient
}, featLayer1.GetTable(), non_versioned_table,...); //Pass as parameters the datasets
                                                    //and tables you will be editing
editOp.Execute();
```

Edit Operations

Demo – Callback edit operation

Edit Operations – Dataset Compatibility and EditOperationType

Visual Basic (Declaration) C#

```
public enum EditOperationType : System.Enum, System.IComparable,
```

Members

Member	Description
Long	A long transaction. Edits can be placed on the undo stack.
Short	A short transaction. Edits are committed immediately.

- **By default, `EditOperationType` property returns null or "mixed mode"**
  - **long <u>and</u> short in the same operation is ok**

Edit Operations –EditOperationType

- In mixed mode (`editOp.EditOperationType == null`)
  - Dataset Compatibility is not checked (ok to mix)
  - Long transactions go on the undo/redo stack
    - Edit sessions established on underlying datastores
  - Short transactions are committed immediately
    - No edit session

Edit Operations – EditOperationType

- To enforce dataset compatibility explicitly set `EditOperationType` = to Long or Short
  - Setting `EditOperationType` = `Long` disallows datasets with “short” semantics
  - And vice versa for Setting `EditOperationType` = `Short`
  - Generally speaking, setting EditOperationType provides for a consistent Undo/Redo experience (by extension, Save and Discard):

- Execute will fail if your operation mixes datasets with “short” and “long” semantics.
  - `editOp.Execute()` will return `false`

Edit Operations – Determining Edit Operation Type

- Check underlying `GeodatabaseType` and `RegistrationType` of the feature class:

```
((Geodatabase)featLayer.GetFeatureClass().GetDatastore()).GetGeodatabaseType();
 featLayer.GetFeatureClass()?.GetRegistrationType();
```

GeodatabaseType	RegistrationType	Version	EditOperationType	Example
FileSystem	N/A	N/A	LONG	Shape file
LocalDatabase	N/A	N/A	LONG	File GDB
RemoteDatabase	Versioned	N/A	LONG	Enterprise
RemoteDatabase	NonVersioned	N/A	SHORT	Enterprise (Direct)
Service	NonVersioned	N/A	SHORT	Hosted or "Standard"
Service	Versioned	Default	SHORT	Branch Versioned
Service	Versioned	Named	LONG	Branch Versioned

Edit Operations – Edit Operation Types

- Summary of characteristics by Long and Short type

GeodatabaseType	RegistrationType	CancelEdit	Undo/Redo	Save/Discard
FileSystem	N/A	YES	YES	YES
LocalDatabase	N/A	YES	YES	YES
RemoteDatabase	Versioned	YES	YES	YES
RemoteDatabase	NonVersioned	YES	NO	NO
Service	NonVersioned	PARTIAL*	NO	NO
Service	Versioned (Default)	YES	NO	NO
Service	Versioned (Named)	YES	YES	YES

LONG SHORT

*2.2 and earlier - Create cannot be canceled

Edit Operations - Undo and Redo

- For datasets with LONG semantics…
  - Call Undo/Redo on the edit operation
    - `editOp.UndoAsync()` + overloads, `RedoAsync()` + overloads
- For Save or Discard:
  - Call `SaveEditsAsync()` or `DiscardEditsAsync()` on the current project
    - Use `HasEdits` to check if there are pending edits

```
if (Project.Current.HasEdits)
   await Project.Current.SaveEditsAsync();
   //await Project.Current.DiscardEditsAsync();
```

Edit Operations

- Demo – Dataset compatibility

Editing Events – Row Events

- Use to
  - Make changes to *the* row being edited (passed in the event argument)
    - Changes to the row become part of the on-going transaction
  - Validate row attributes that have been changed
  - Cancel row transactions (e.g. those that fail validation)
  - Log edits
    - Changes to other tables must use Core.Data API within row events

Editing Events – Row Events

- Use the RowChangedEventArgs parameter to:
  - Access the Row being edited
  - EditType (Create, Change, Delete)
  - Call `CancelEdit` on the `RowChangedEventsArgs` to abort the transaction

```
public sealed class RowChangedEventArgs  {
  public Row Row { get; }
  public EditType EditType { get; }
  public Guid Guid { get; }

  //CancelEdit + overloads...
  public void CancelEdit(string errorMessage, bool canOverride = false);
}
```

Editing Events – Row Events

```
  RowChangedEvent.Subscribe((rc) => {
    //Validate any change to “police district”
    if (rc.Row.HasValueChanged(rc.Row.FindField(“POLICE_DISTRICT"))) {
       if (!ValidateDistrict(rc.Row[“POLICE_DISTRICT"])) //Cancel edits with invalid “police
district” values
          rc.CancelEdit($"Police district {rc.Row[“POLICE_DISTRICT"]} is invalid");
    }
   }, crimes_fc);
```

Editing Events – Row Events

- Note:
  - If you wish to edit a separate table in the event callback (eg for audit trial) you <u>cannot</u> use an edit operation.
    - Use the ArcGIS.Core.Data API.

```
var rowBuffer = history_table.CreateRowBuffer();
rowBuffer[“DESCRIPTION”] = “Edit description here”;
history_table.CreateRow(rowBuffer)
```

  - Other:
    - RowEvent callbacks are called on the QueuedTask thread.
    - You do NOT need to wrap code in a QueuedTask within your row event callback
      - It is redundant

Editing events

- Demo – Row events

Editing Events – EditCompletedEvent

- Fired *after* the transaction completes
- Global event – once you subscribe, you receive it for all transactions on all datasets in the Pro session:
  - EditOperations, Save edits, Cancel edits, Undo, Redo
- Check the passed-in EditCompletedEventArgs and its…:
  - public IReadOnlyDictionary<MapMember, IReadOnlyCollection<long>> Creates,
  - public IReadOnlyDictionary<MapMember, IReadOnlyCollection<long>> Modifies and
  - public IReadOnlyDictionary<MapMember, IReadOnlyCollection<long>> Deletes
  - …to determine the editing activity for the given operation, save, undo, etc. that triggered the event.

Editing Events – EditCompletedEvent

```
EditCompletedEvent.Subscribe(HandleEdits);

private Task HandleEdits(EditCompletedEventArgs e) {
    var selSet = new SelectionSet(MapView.Active.Map);
    foreach (var pair in e.Creates) {// handle adds. In your code check e.Creates != null
      MapMember member = pair.Key;
      var oids = pair.Value;
      selSet.Add(member, oids);
    }

    foreach (var pair in e.Modifies) {// handle modifies
      MapMember member = pair.Key;
      var oids = pair.Value;
      selSet.Add(member, oids);
    }
    // assign it to the map
    return selSet.Set();
  }
```

Summary

- EditOperations are the preferred editing API for Pro
  - Coarse-grained methods that can be combined into a single transaction
  - Use ChainedOperations when one operation is dependent on another
  - Use Callback in special scenarios only
- Dataset compatibility and EditOperationType implications
  - Explicitly set for consistent undo/redo, save/discard behavior
- Row events for validation, cancel edit, logging, etc.

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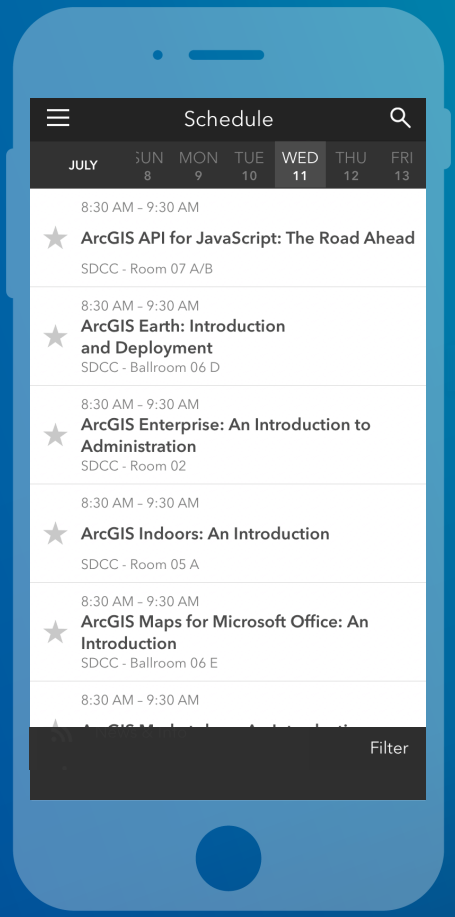

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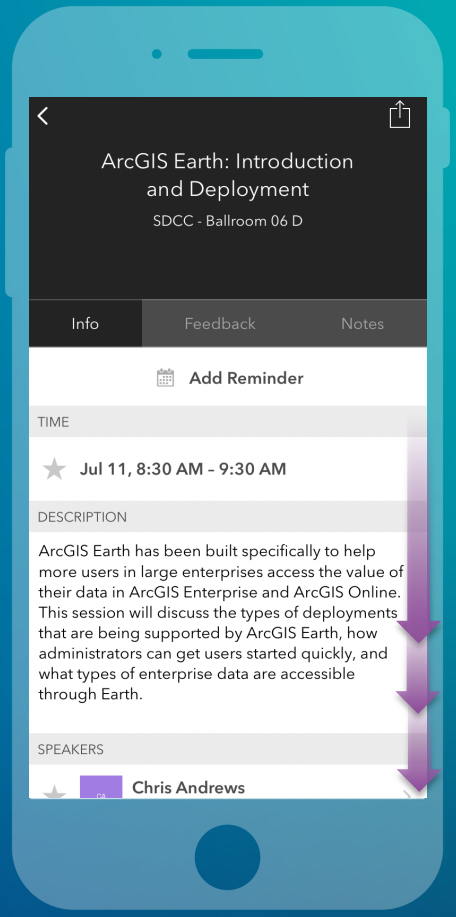

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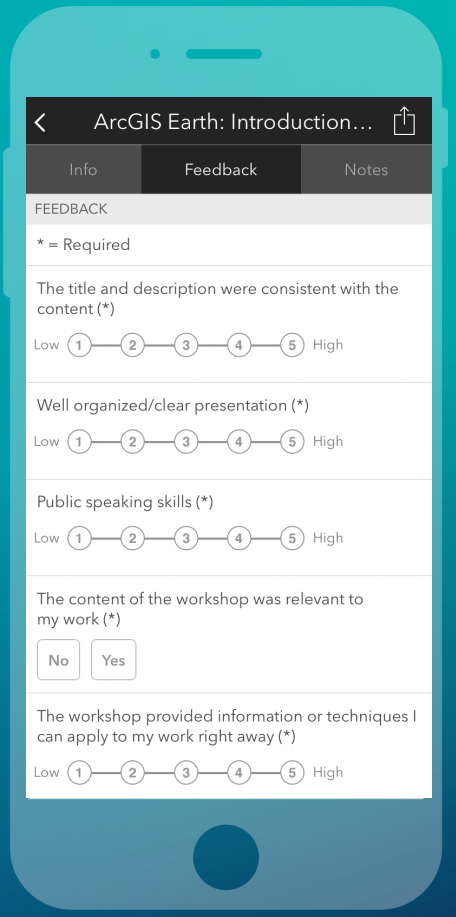

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