Arcade: an Introduction

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Outline

- What is Arcade?
- Why use Arcade?
- Where to find it
- Ways to use it
- Considerations
- Resources
What is Arcade?

- Not a replacement for Python or geoprocessing
  - Arcade is lightweight and simple
- In-map calculator
- Alternative to calculating a new field – meaning you don’t have to own the layer
Your first expression

ArcGIS Arcade

```
var preface = 'Hi, my name is ';  
var name = 'Jim Barry';           
var intro = preface + name;       
return intro;                     
```

<table>
<thead>
<tr>
<th>Result</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
<td>Hi, my name is Jim Barry</td>
</tr>
<tr>
<td>Type</td>
<td>String</td>
</tr>
</tbody>
</table>
Why Use Arcade?

- Forgot to add a field? Used the wrong data type? Don’t own the data? No problem!
- On-the-fly calculations and data manipulation
- Easy to get started (excel-like functions and syntax)
- Expressions carry through to your downstream applications (portable)
- Secure
- Geospatial
The result of your Arcade expression essentially becomes a "virtual field".
Simple but Powerful

- Excel-like
- Simple
  - Write a basic calculation
  - Use a built-in function
  - Re-use existing expressions
- Examples:
  - Combine fields together
  - Format existing fields
  - Unit conversion
  - Rotate symbols
  - Improved text labeling
Test it!

Percent of Population Who is Male

Expression:

```
Round(((feature["B01001_002E"])/feature["B01001_001E"])*100)
```

Results:

<table>
<thead>
<tr>
<th>Result</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result</td>
<td>48.46</td>
</tr>
</tbody>
</table>

Global Fields:

- Field: Area of Land (square meters)
- Field: Area of Water (square meters)
- Field: Total Population
- Field: Total Population - Margin of Error
- Field: Male Population

Enough calculable fields are available to test this expression.
Where to find it in the Web Map

Symbology

1. Change Style
   HUD Insured Multifamily Properties
2. Choose an attribute to show
   - Show location only
   - USPS Address Type
   - USPS Standardized ZIP+4 Code
   - Was Ever Active 202/811 Grants/Loans for HUD
   - Watch List Date
   - ZIP Code
   - ZIP Return Code
   - New Expression

Rotation

- Rotate symbols (degrees)
- 1st Contract 1 Bedroom Units
- Rent to FMR Ratio 1
- Rent to FMR Ratio 2
- Total Assisted Unit Count
- Total Number of Children
- Total Number of People (in thousands)
- Total Unit Count
- Total Units Across All Active Contracts Associated

New Expression

Transparency

Set transparency based on attribute values

- Apply transparency to each feature based on the attribute values in a field or an expression.
  
  Field: None
  - Total Assisted Unit Count
  - Total Number of Children
  - Total Number of People (in thousands)
  - Total Unit Count
  - Total Units Across All Active Contracts Associated
  - Watch List Date
  - New Expression

Pop-up Configuration

Attribute Expressions

Adding expressions allows you to create new information from existing fields for use in pop-ups.

ADD

- Project Manager Name (expression/expr1)
- Property Name (expression/expr1)
- Address Line 1 (expression/expr2)
- City (expression/expr3)
- Annual Expenditure Amount for the Current Year
- Average Expenditure Amount for the Current Year
- Average Expenditure Amount for the Previous Fiscal Year

Labels

Label Features

HUD Insured Multifamily Properties

- Check box for feature
- Label Features
- Text: Property Name
- Percent of Household Members Age 65 or Older
- Percent of All Household Members Below Age 18
- Percent of Households with Income Below 80%
- Median of Total Annual Income for the Household
- LAST_UPDT_DTTM
- Annual Expenditure Amount for the Current Year
- Annual Expenditure Amount for the Previous Year

New Expression
You can store your Arcade expression with the map, or with the layer.
You can display results of the Arcade expression in the popup
Labeling
What’s a Feature Set?

- Feature sets are a way to access information from multiple features
  - From the same layer or any layer within your map ($map) or service ($datastore)
  - Work with data that is related either informally or formally
  - Can be very powerful when used responsibly
With Arcade, you have access to columns across all layers in your web map.
...so let's count the number of bike crashes in each neighborhood
Crashes per Neighborhood

```
1 var crashes = FeatureSetByName($map, 'crash points')
2 var countCrashes = Count(Intersects(crashes, $feature))
3 return countCrashes
```

"Test" button works on the first record in the layer.
// This Arcade script runs ONCE PER RECORD in the
// "Pilha Neighborhoods" layer
// ...

// From the map, get the "crash points" layer
// Store that as a "FeatureSet" in the variable "crashes"
var crashes = FeatureSetByName($map, 'crash points')

// For each neighborhood polygon:
// 1- Use the Intersects() function to find all the crashes within
// 2- Count the number of crash points returned by Intersect()
// 3- Store that count number in the "countCrashes" variable
var countCrashes = Count(Intersects(crashes, $feature))

// Return that number of crashes for that neighborhood polygon
return countCrashes
Popup shows how many crashes per neighborhood.
Troubleshoot your Expressions

- Plan things out in your head or on paper before you start
- The test feature and button are your friend
- Leverage log statements to debug code
- Factor out logic into functions in larger expressions
Arcade Expressions and You

Arcade expressions allow for customization of your maps within the ArcGIS Platform.

This collection of maps are available as examples of arcade expressions within the smart mapping interface. These maps can be opened and reviewed, along with the expressions used to create the cartography.
ArcGIS Pro

Field Calculator:

supported expression types:
Python, **Arcade**, SQL
ArcGIS API for JavaScript

```javascript
var renderer = {
    type: "class-breaks",
    valueExpression: "($feature.TOT_VOTES / $feature.REG_VOTERS) * 100",
    valueExpressionTitle: "Voter turnout",
    classBreakInfos: [...],
};

var labelClass = new LabelClass({
    labelExpressionInfo: {
        expression: "$feature.STATION_NAME"
    },
    labelPlacement: "below-right",
    minScale: 2500000
});
nameClass.symbol = new TextSymbol();
// set the label class to the feature layer
featureLayer.labelingInfo = [ labelClass ];

<script type="text/plain" id="myScript">
    Proper($feature.CityName)
</script>
var arcadescript = document.getElementById("myScript").text;
```
Resources for Arcade
http://esriurl.com/ArcadeResources

Documentation

GitHub – Arcade Examples

ArcGIS Online Group: Examples

Blogs about Arcade

Story Map Tutorial

How to Smart Map: Arcade
Dynamically transform your data using Arcade expressions
The Arcade expression language

A simple, portable scripting language for creating custom visualizations and labeling expressions.

Write your First Expression
Get started writing your own expressions in the Playground.

Understand the Language
Arcade can be used to write simple single line expressions, as well as complex scripts.

Arcade Profiles
See how Arcade can be used in the ArcGIS Platform.

Playground
Guide
Function Reference
ArcGIS Blog:
Arcade articles

https://www.esri.com/arcgis-blog/?s=#arcade
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