Customization of ArcGIS Pro: WSDOT’s GIS Workbench Data Access Add-In

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Abstract
Background

- The original Environmental GIS Workbench was developed in 1995-1997 using ArcView and designed to provide simplified access to GIS data and tools needed to perform Environmental Review and Permitting at the Washington State Department of Transportation.

- The user base of the Environmental GIS Workbench grew beyond the original environmental staff to include all business groups with a need to visualize the geographic location of the agencies data. As other business functions came to recognize the value of the workbench concept, it became apparent that a more flexible approach for the Workbench was needed to avoid duplication of effort.

- To meet this need a ArcMap based GIS Workbench extension was developed in 2003 that supported multiple business functions through the use of a supporting “definition” database containing business rules. This GIS Workbench extension allowed for the presentation of data menus and tool lists tailored by business function or area.

- Implementation of this concept ensured that the department’s enterprise GIS data was readily accessible for analysis and mapping while avoiding costly software development. The current GIS Workbench has been extended over the years and is now at its tenth major upgraded and is supported in ArcGIS Desktop 10.4.1.

- one GIS Workbench to meet the needs of many -
GIS Workbench Vision

Increase the use of geographical information systems at WSDOT by Enabling rapid data access, Making Metadata readily available, AND Providing commonly needed analytical tools in a single interface.
Success - Award Winning!

The value of the GIS Workbench concept has been recognized agency wide. Currently 8% of our employees ‘touch’ this extension monthly and it is used for Project Scoping and Cost Estimation of every construction project undertaken by the Washington State Department of Transportation and for daily facility management.
ESRI’s decision in 2016 to begin supporting a concurrent use licensing model for ArcGIS Pro has made Pro a viable replacement for ArcMap in enterprise environments. With the release of ArGIS Pro 1.4.1 we now have a stable platform that is suitable for enterprise use.

This presentation will discuss the three areas we researched while developing the next generation of the GIS Workbench in the ArcGIS Pro environment. This project had three major components:

- Identifying an enterprise deployment methodology for ArcGIS Pro & Add-ins
- Development of custom WSDOT Project Templates & Styles
- Development of a GIS Workbench Pro Add-In and WSDOT Ribbon

These three activities have been completed and the GIS Workbench Add-in was initially released for use in March 2017. In the fall of 2017 we will update our Introduction to GIS training class to include ArcGIS Pro. Our current timeline is to begin the transition to ArcGIS Pro in 2018 with the goal of making ArcMap ‘legacy’ software by 2019.
Deployment methodology for ArcGIS Pro & Add-ins
Deployment

Legacy Options (ArcGIS Desktop):
- Installed with a MSI Installation Package and registered extension with ArcMap
- Manual copy to machine and register with ESRIRegAsm.exe
- Add-in concept introduced with ArcGIS 10.0 but limited deployment support for enterprise solutions.

Future (ArcGIS Pro):
- Add-Ins, DIRECT registration into the registry NOT required
- Add-Ins compiled source code does not have to be installed on the end-users computer, rather code is cached locally.
- Auto update of Add-In when the Source Changes
- Appearance of the Add-In within the ArcGIS Pro interface is controlled using DAML (a human readable XML file definition)
WSDOT Project Templates & Styles
Customizing the User Experience

• The out of the box interface for ArcGIS Pro is suitable for skilled GIS practitioners or those working independently.
  - However, in organizations with fixed geographic boundaries or large number of users the time lost to ‘recreate or load’ the base map becomes an issue.
  - The benefit of providing a common base map is a common operational picture for your organization that all users recognized and understand.
  - This speeds the interpretation of maps produced by and shared within your organization and allows managers to focus on interpreting the key variables being mapped.

• At WSDOT we have provided two types of base maps for Pro, on and offline versions.
  - If the user is ‘Signed in’ to our ArcGIS Online organization they can utilize one of several base maps published there. The downside with this solution is that it requires every user in the organization to have an ArcGIS Online account in the organization. This is cost prohibitive and requires extensive administrative overhead managing all the end-user accounts.
  - To address this ‘offline’ versions of the WSDOT base map are installing as ‘default’ project templates that are visible within the ArcGIS Pro interface.

• These templates (and Styles and a Registry Setting) are installed by a WSDOT ArcGIS Pro Customizations MSI install package. This package is installed as part of our enterprise ArcGIS Pro installation.
WSDOT ArcGIS Customizations

- To make a custom Project Template available in the Pro Interface, install your APTX files to:
  
  **C:\Program Files\ArcGIS\Pro\Resources\ProjectTemplates**

- To make a custom Styles available in the Pro Interface, install your STYLX files to:
  
  **C:\Program Files\ArcGIS\Pro\Resources\Styles**

- To load custom Add-Ins to the Pro Interface, ADD a registry setting containing the PATH to your Shared Add-Ins. The Registry setting added at:
  
  **HKLM\Software\ESRI\ArcGISPro\Settings\Add-in Folders**
Customizations as Seen in ArcGIS Pro

ArcGIS Pro interface showing the Add-In Manager with options for customizations.
Updating the ArcGIS Pro Install Package for Enterprise Use

- Similar to ArcGIS Desktop there are options to modify the install package for ArcGIS Pro. This can be done (in some cases) using COMMAND LINE SWITCHES and by updating the install package itself.

- Prior to installing the package make the following edits to the ArcGISPro.msi. This can be done in one of several MSI editing tools. Recommended/Free one is the Orca Editor provided by Microsoft. Set the following six Properties as shown and save the MSI.

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<tr>
<td></td>
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- When installing ArcGIS Pro I recommend the use of the following Command Line Switch.

    msiexec /i ArcGISPro.msi ALLUSERS=1 /qb
GIS Workbench Pro Add-In and WSDOT Ribbon
Extending ArcGIS Pro with Add-Ins

- Add-Ins for ArcGIS Pro are developed based on the add-in and configurations extensibility pattern. This pattern leverages modern .NET features such as Task Asynchronous Programming (TAP).

- Add-In methodology fit well with our existing GIS Workbench design and is amendable to the Agile software development approach.

- It allowed us to refactor the GIS Workbench into smaller functional components that could be developed quickly, easily maintained, and incrementally released; thus, allowing for iterative software development.

- If you have access to Visual Studio 2013 or 2015 (Professional, Enterprise, or Community Edition) you can starting building your own Add-Ins NOW using Project and Item Templates available from the Pro SDK for Visual Studio or code snippets accessible on GitHub.

- This is **NOT** a class on building an Add-In, but let’s take a look at the Config.daml file created by Visual Studio when you author a new Add-In project.

- The Config.daml file uses a XML based file format and defines how your Add-In will be added to the Pro interface.

Your First Add-In: Key things to Know

• When you build your Add-In it will be assigned a Global Unique Identifier (GUID) and saved to the configuration file. Unless you manually change or regenerate it, it will stay the same throughout the life of your project. This can be thought of as a unique name for your Add-In. When Add-Ins are loaded they are read and added to the interface in sequenced based on their GUID. Thus an Add-In with a GUID of \{AA3e4567-e89b-12d3-a456-426655440000\} will be loaded before \{BB3f4567-e89b-12d3-a456-426655440000\}

• The Last Edited or Creation date contained in your configuration is important. ArcGIS Pro looks at this to determine if it needs to ‘try’ to update the locally stored version of the Add-In. By try, I mean it will look at any ‘Well Known Locations’ defined in the registry to see if the Source has been updated. If it has the update will be downloaded and replace the locally cached version of the Add-In.

• Both the GUID and Date are stored in the Config.daml file associated with your project. The Config.daml file also contains the definitions for your custom Tabs (a.k.a., Ribbons), Groups, and Controls (i.e., buttons and tools).

Autonomy of a Config.daml

<AddInInfo id="{6f55c658-9e44-463d-8f1e-72380bd8c773}" version="1.0' ...
  <Name>ProAppModule1</Name>
...
  <Date>4/26/2017 6:14:25 PM, 2017</Date>
</AddInInfo>

<modules>
  <insertModule id="ProAppModule1_Module" className="Module1" ...
    <tabs>
      <!-- add groups to Ribbon/Tab-->
    </tabs>
    <groups>
      <group> <!-- add controls to groups --> </group>
    </groups>
    <controls>
      <!-- add/DEFINE your controls here -->
    </controls>
  </insertModule>
</modules>
</ArcGIS>
Config.daml – GIS Workbench Pro as Displayed
Demonstration of the Basic Operation of the Add-In