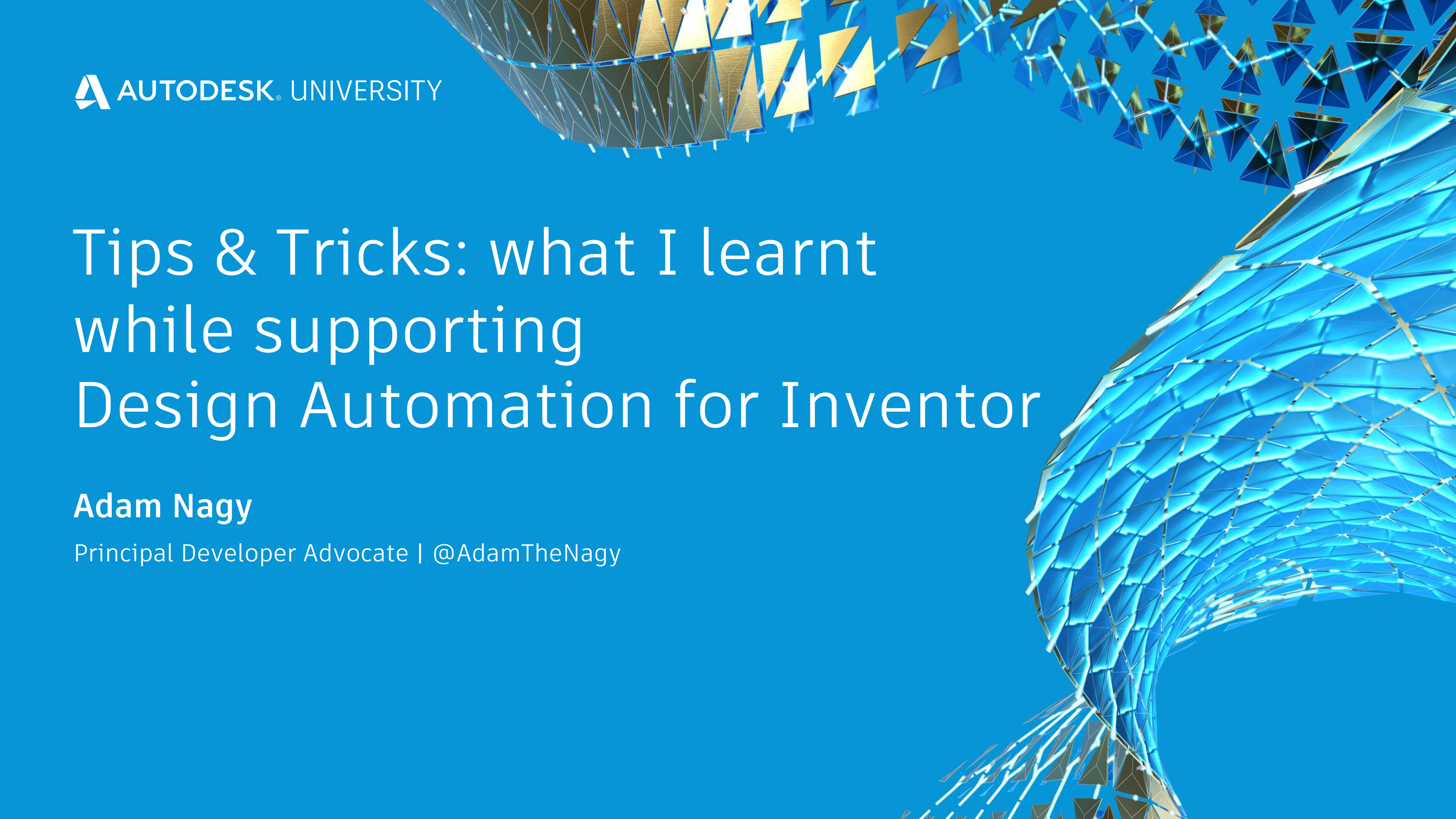
AUTODESK. UNIVERSITY

Tips & Tricks: what I learnt while supporting Design Automation for Inventor

Adam Nagy

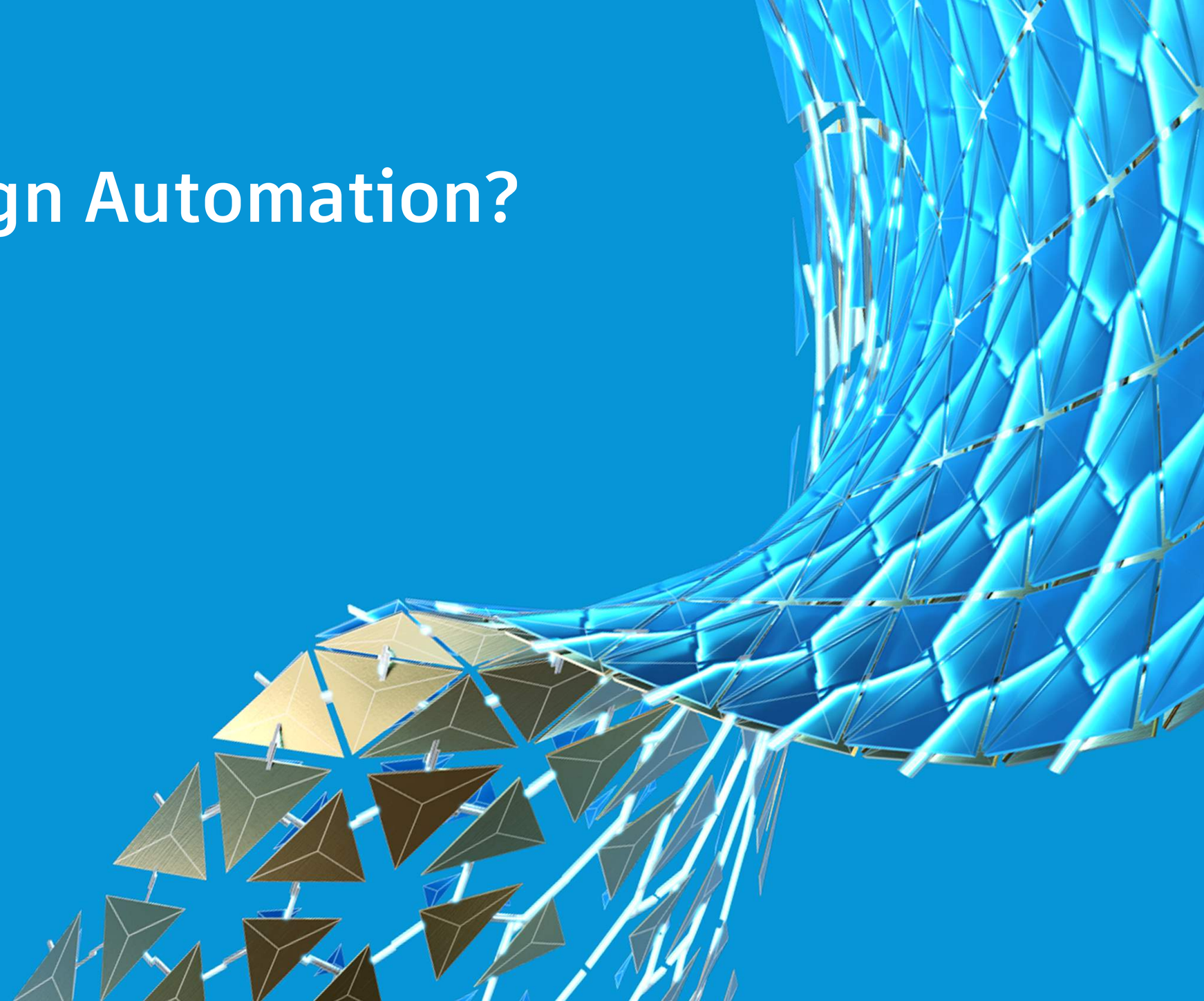
Principal Developer Advocate | @AdamTheNagy



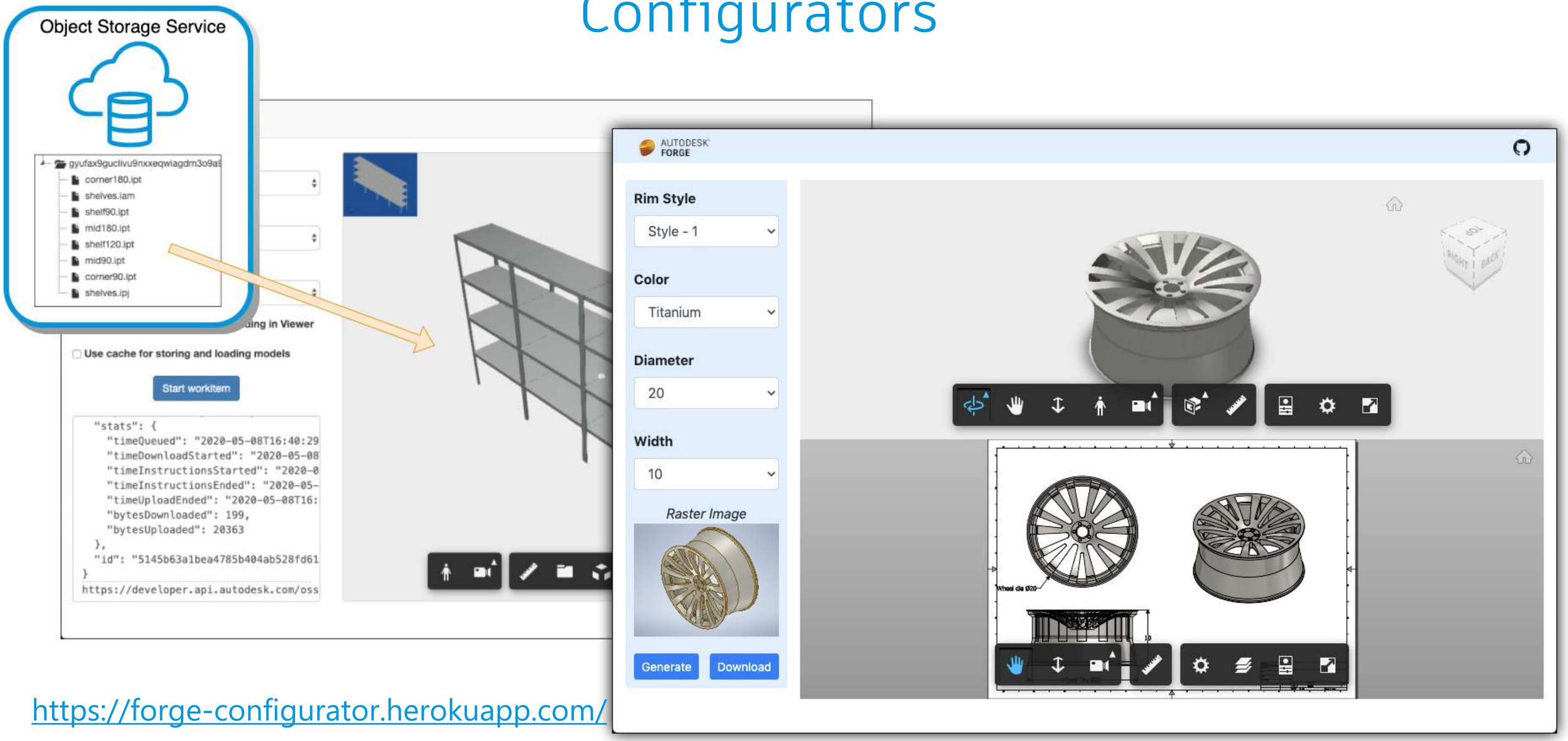
About the speaker

Adam Nagy joined Autodesk back in 2005, and he has been providing programming support, consulting, training, and evangelism to external developers. He started his career in Budapest working for a civil engineering CAD software company. He then worked for Autodesk in Prague for 3 years, and now lives in South England, United Kingdom. Adam focuses on supporting Forge and the API's of our manufacturing products, Inventor and Fusion 360.

What is Design Automation?



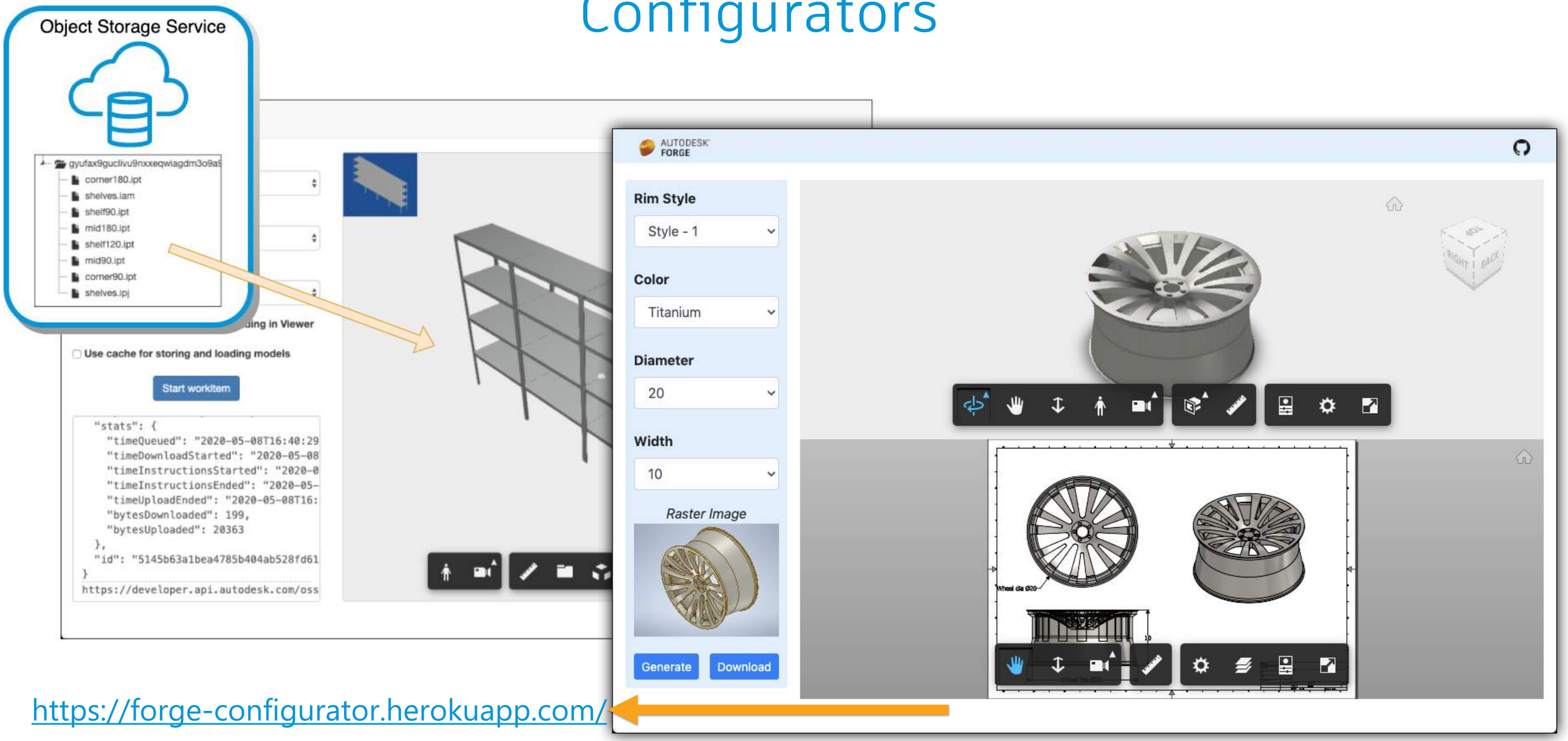
Configurators



https://forge-configurator.herokuapp.com/

https://forge-rimconfigurator-inventor.herokuapp.com/

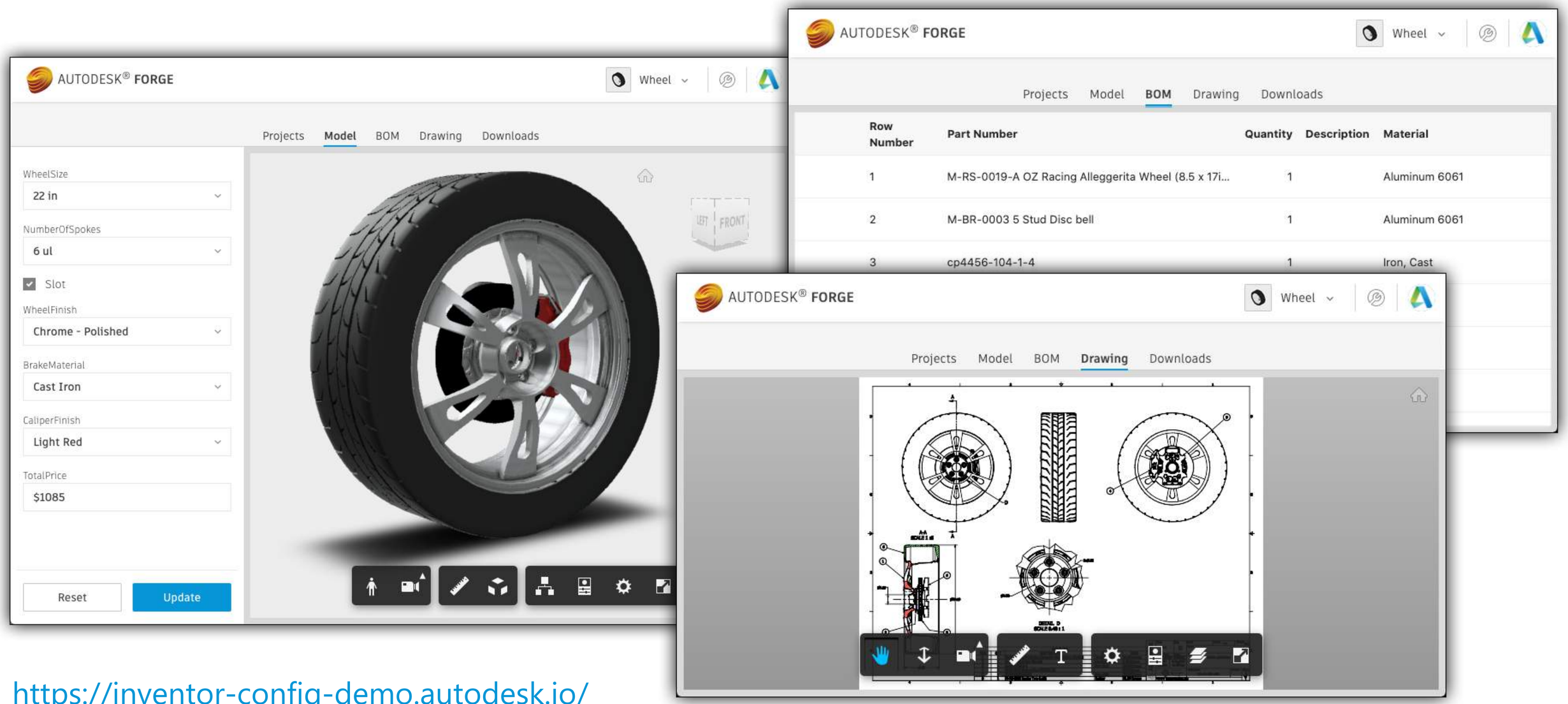
Configurators



https://forge-configurator.herokuapp.com/

https://forge-rimconfigurator-inventor.herokuapp.com/

Configurators



https://inventor-config-demo.autodesk.io/
https://github.com/Autodesk-Forge/forge-configurator-inventor

Configurators

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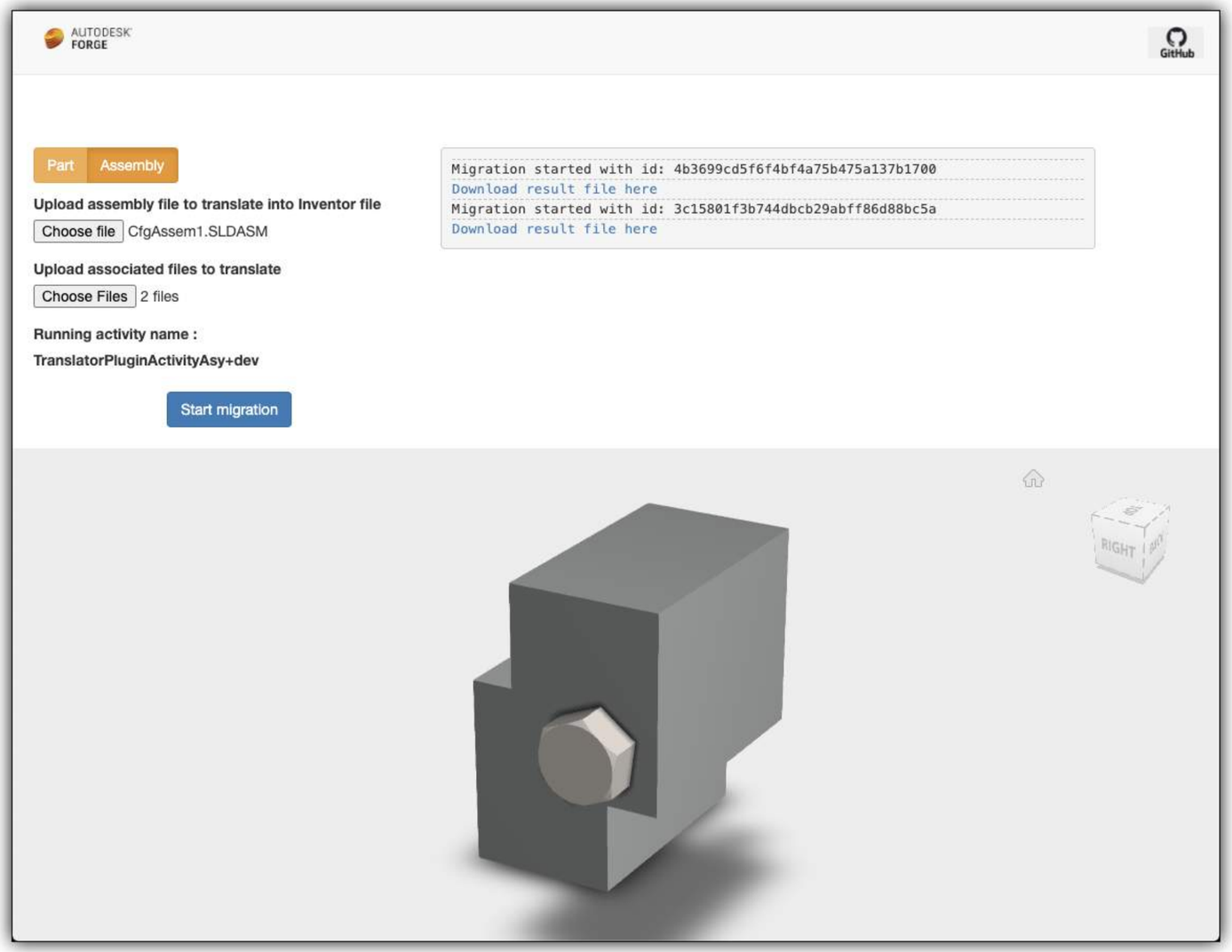
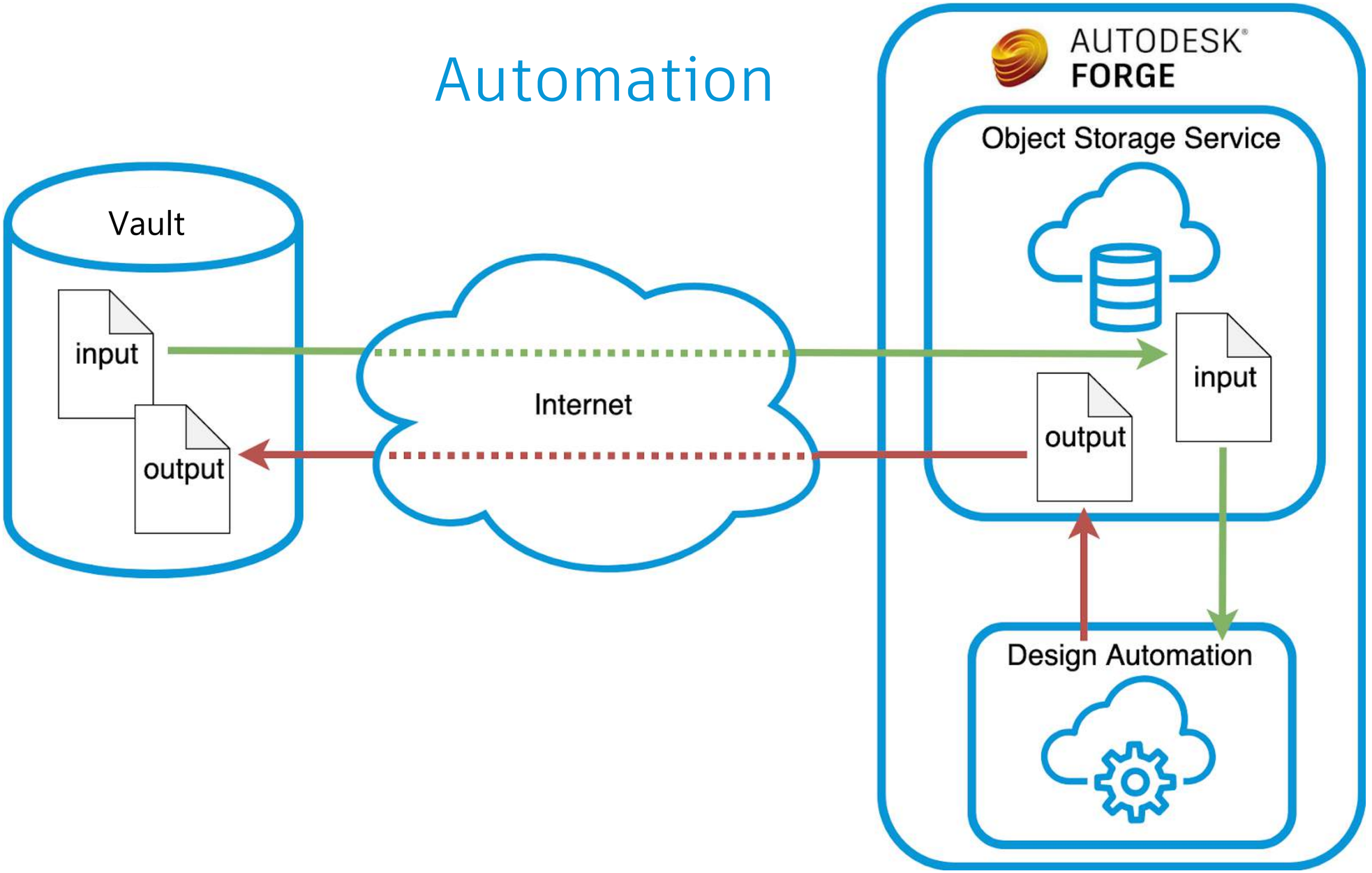
Automation



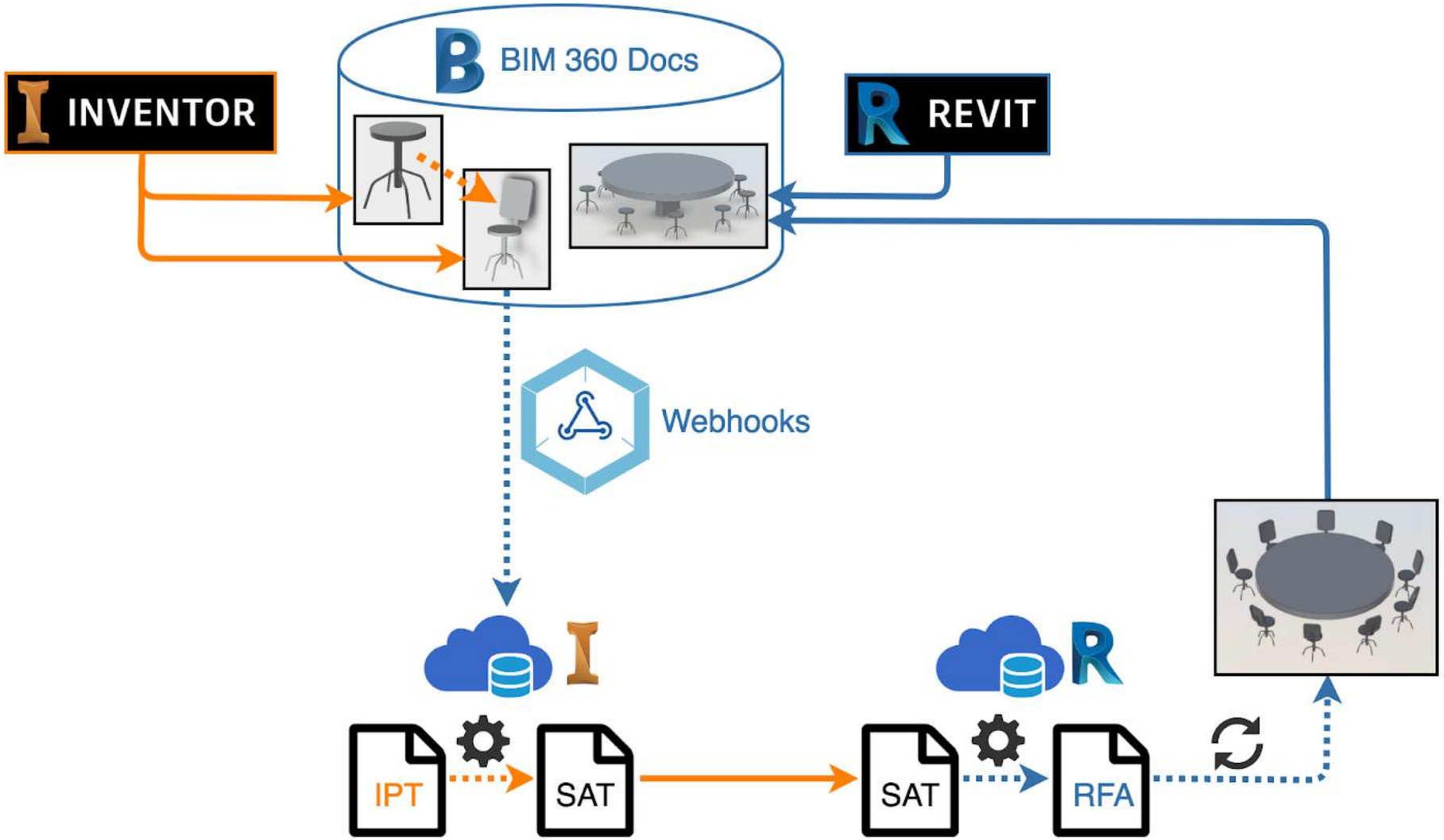
https://design-migration.azurewebsites.net/

Automation



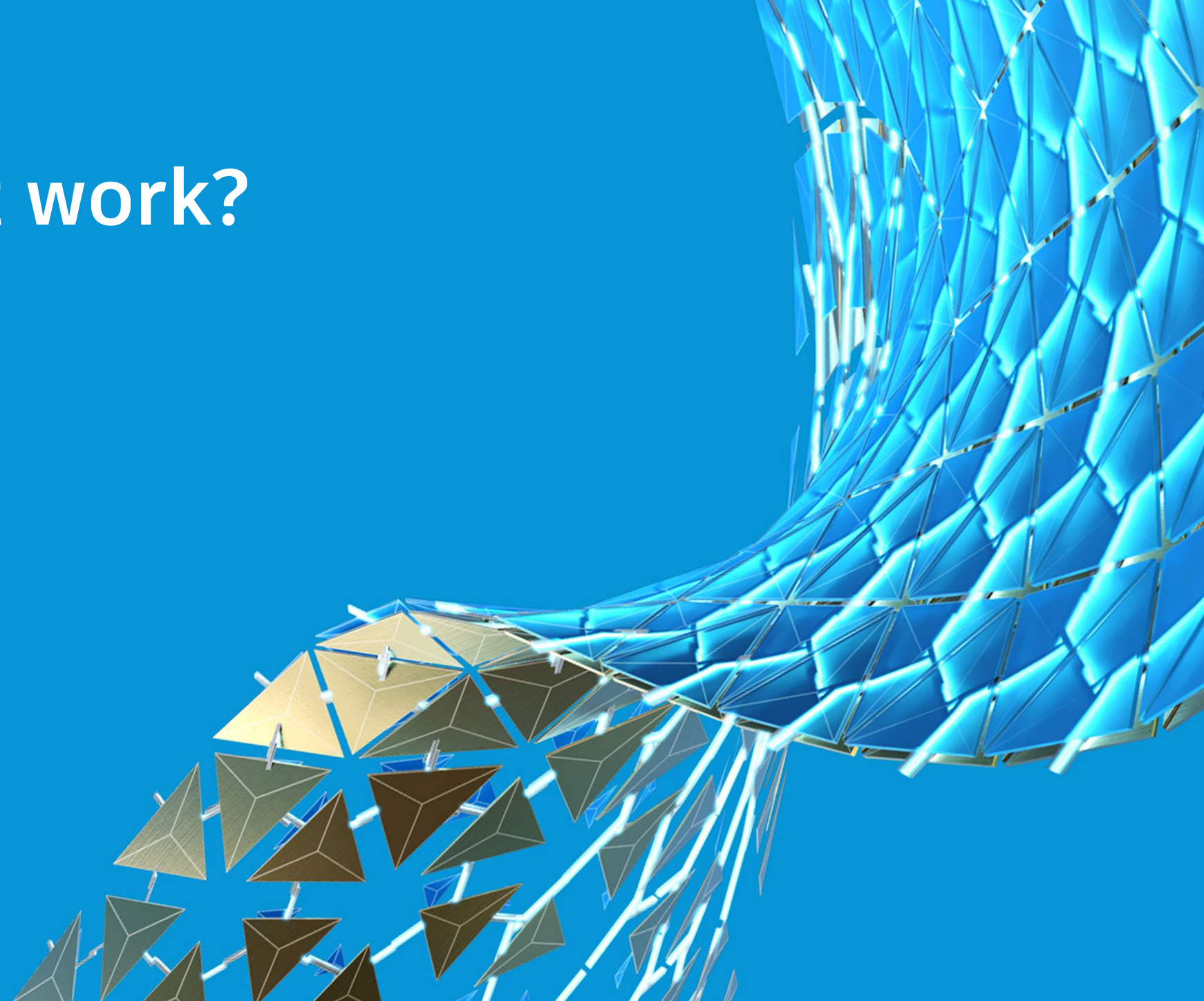
https://github.com/sajith-subramanian/Inventor_Design_Automation_with_Vault

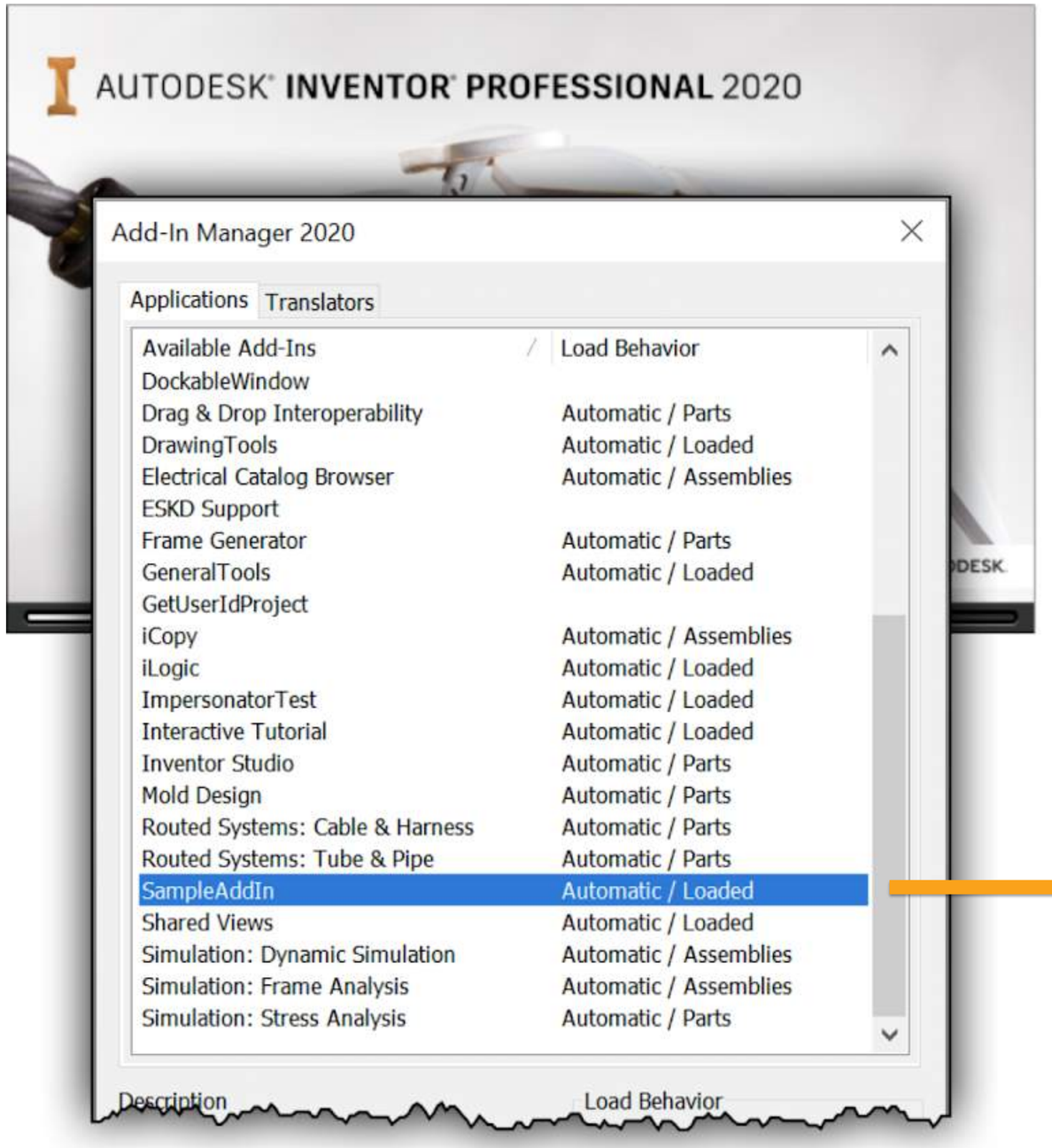
Automation

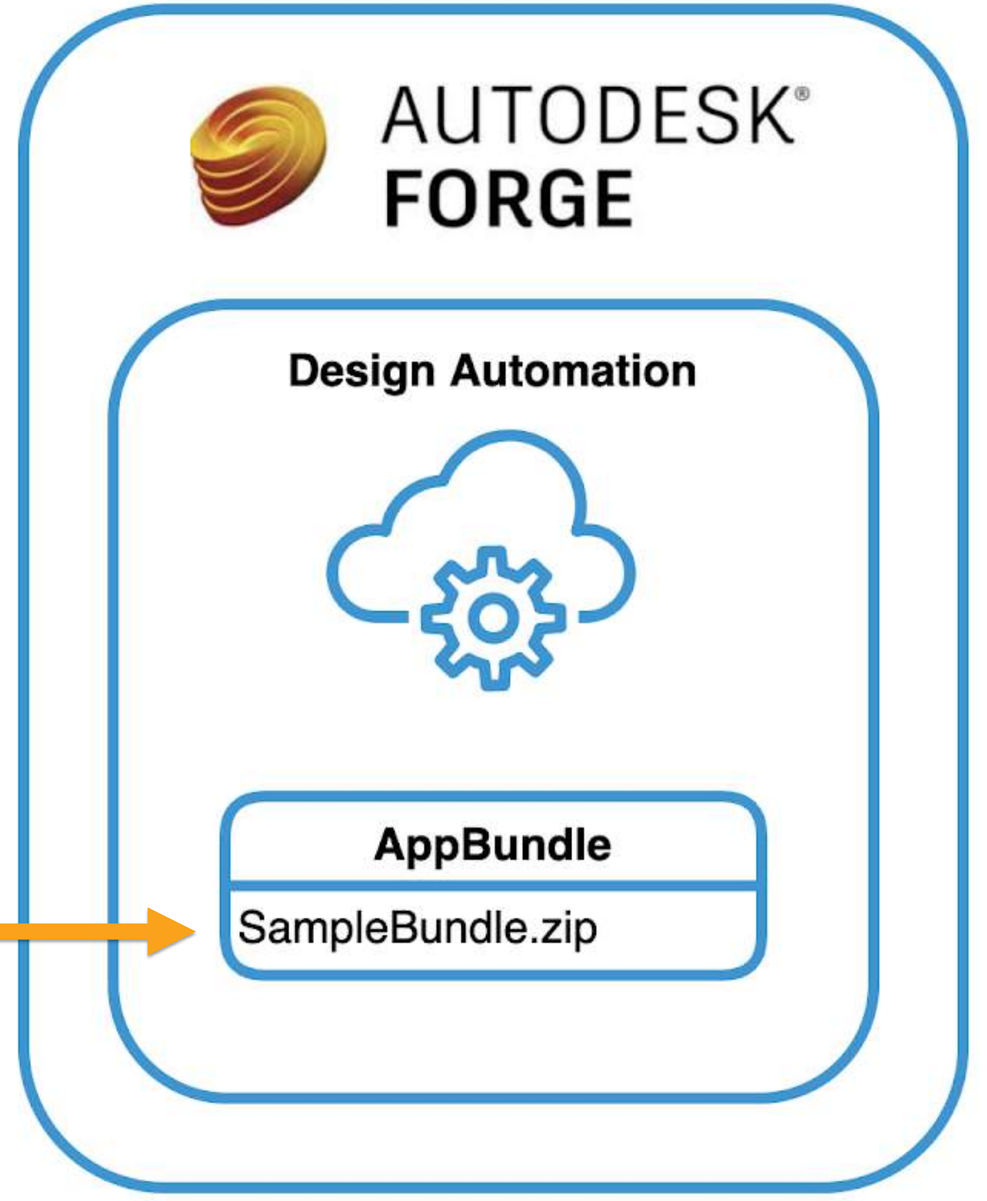


https://github.com/Autodesk-Forge/forge-update-revitfamily-from-inventorpart

How does it work?







https://forge.autodesk.com/blog/migrate-inventor-add-design-automation

Main API endpoints

V3 HTTP Endpoint	Programming concept	Product concept
/workitems	Function call	Product execution, session
/activities	Function definition	Script file command line parameters
/appbundles	Shared library	Plugin
/engines	Instruction set	Product (Revit, AutoCAD, Inventor, etc) to use

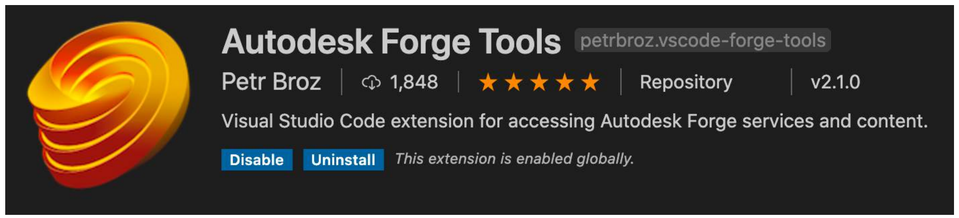
https://forge.autodesk.com/en/docs/design-automation/v3/reference/http/

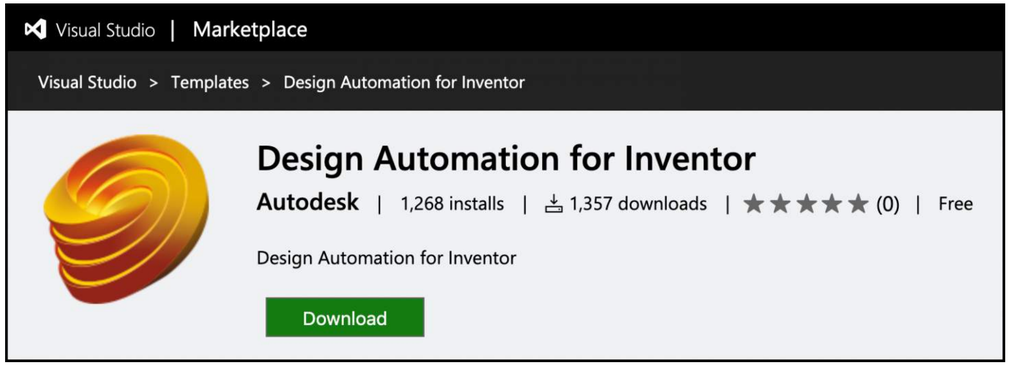
Main API endpoints

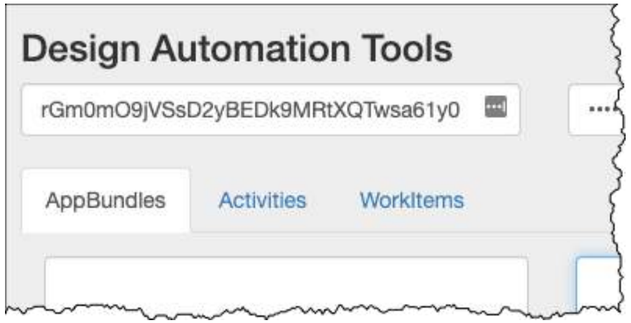
V3 HTTP Endpoint
/workitems
/activities
/appbundles
/engines

execution – needs to be called from your web app

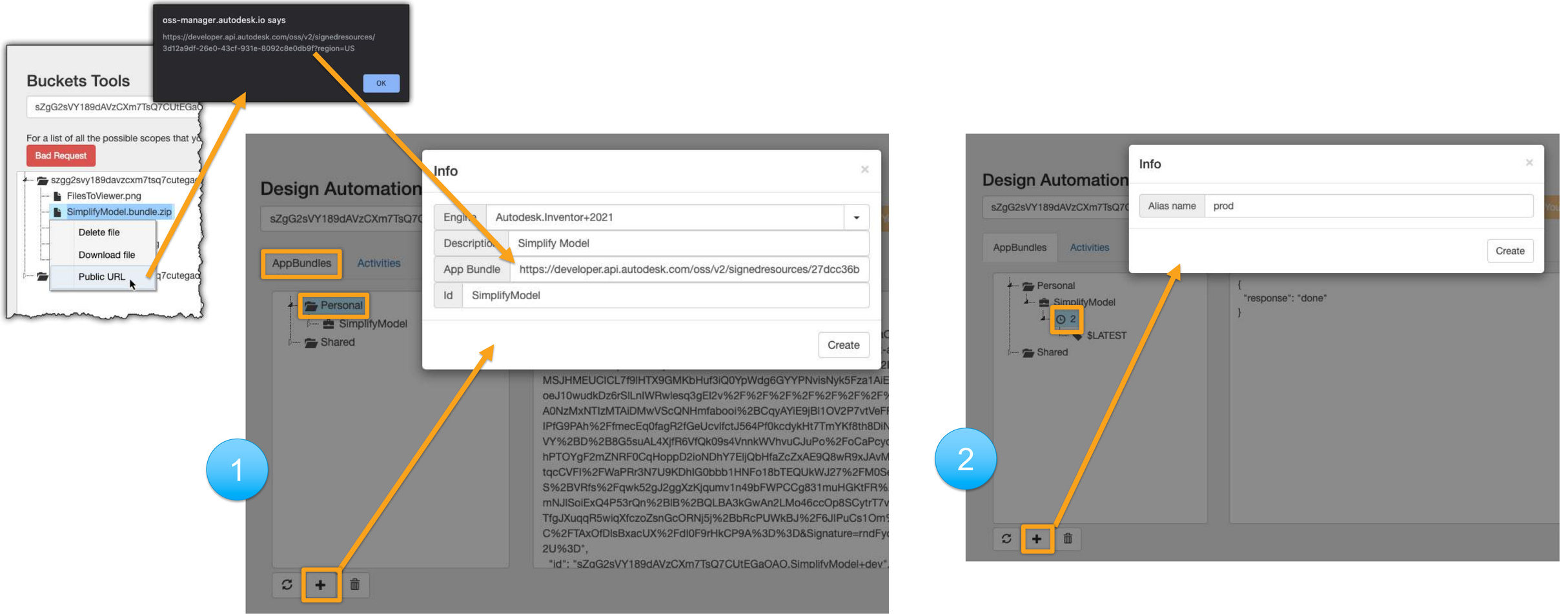
setup – you can rely on tools to do this



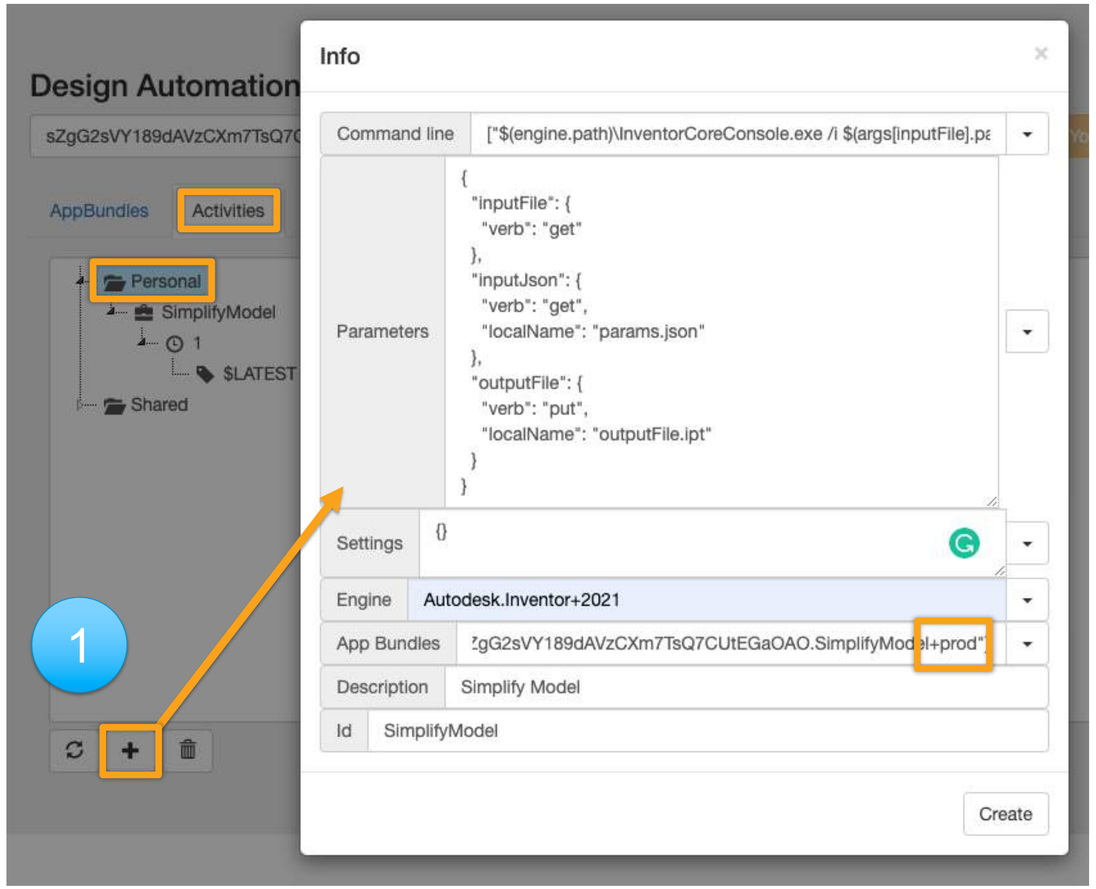


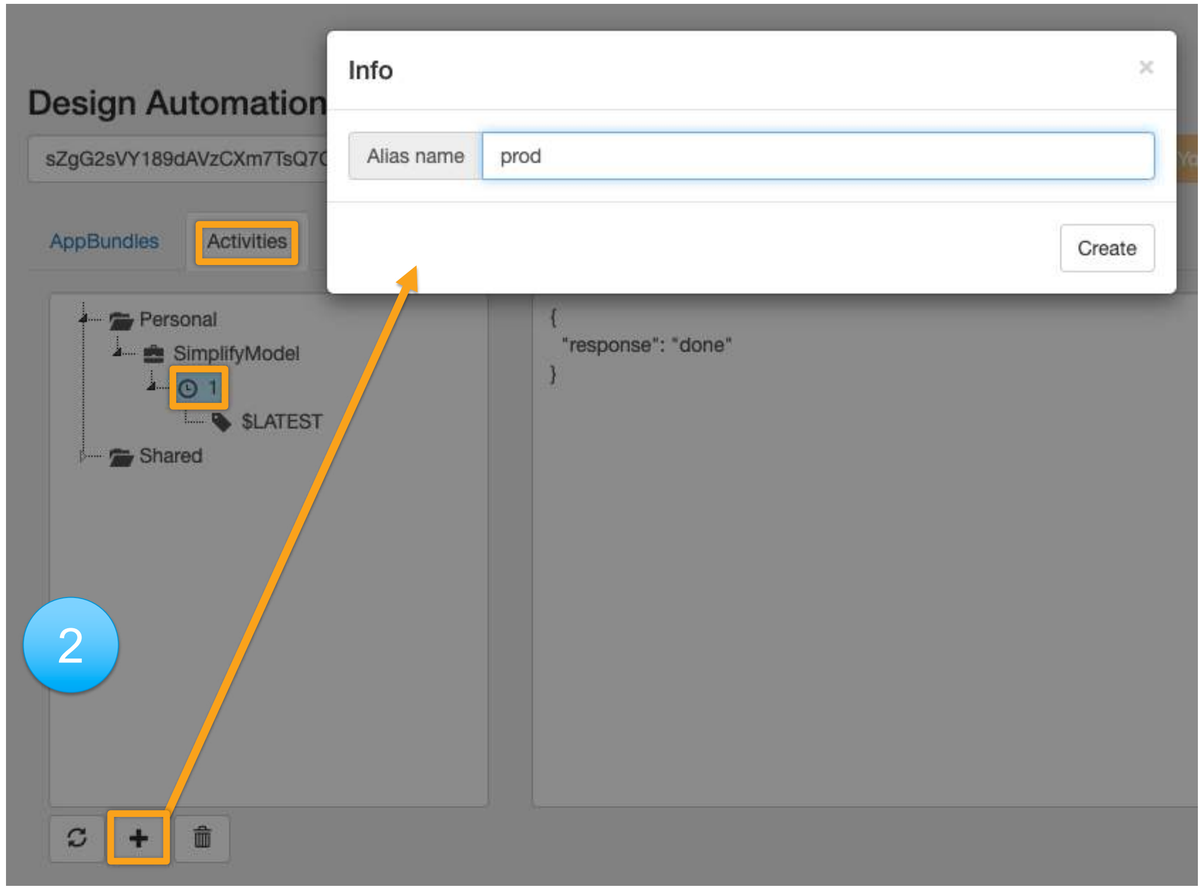


Create AppBundle & Alias

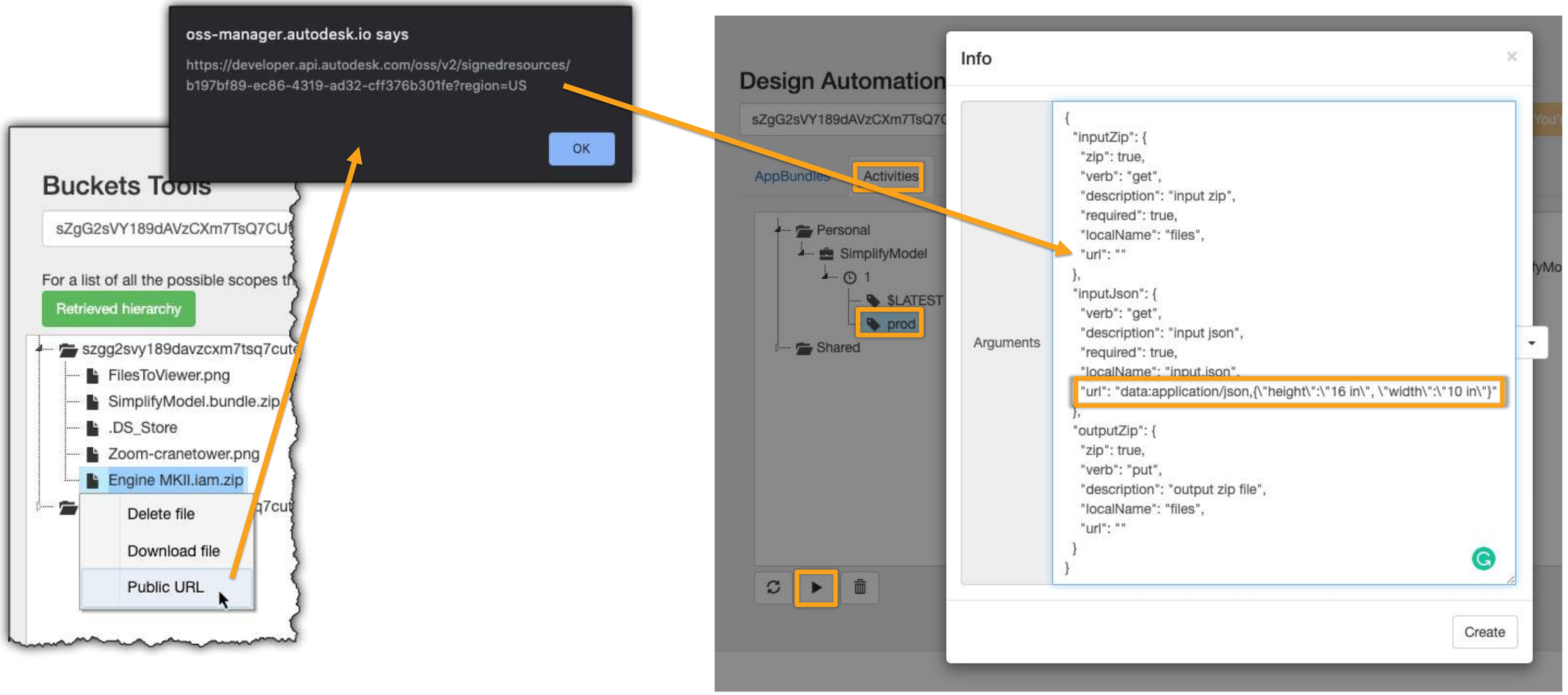


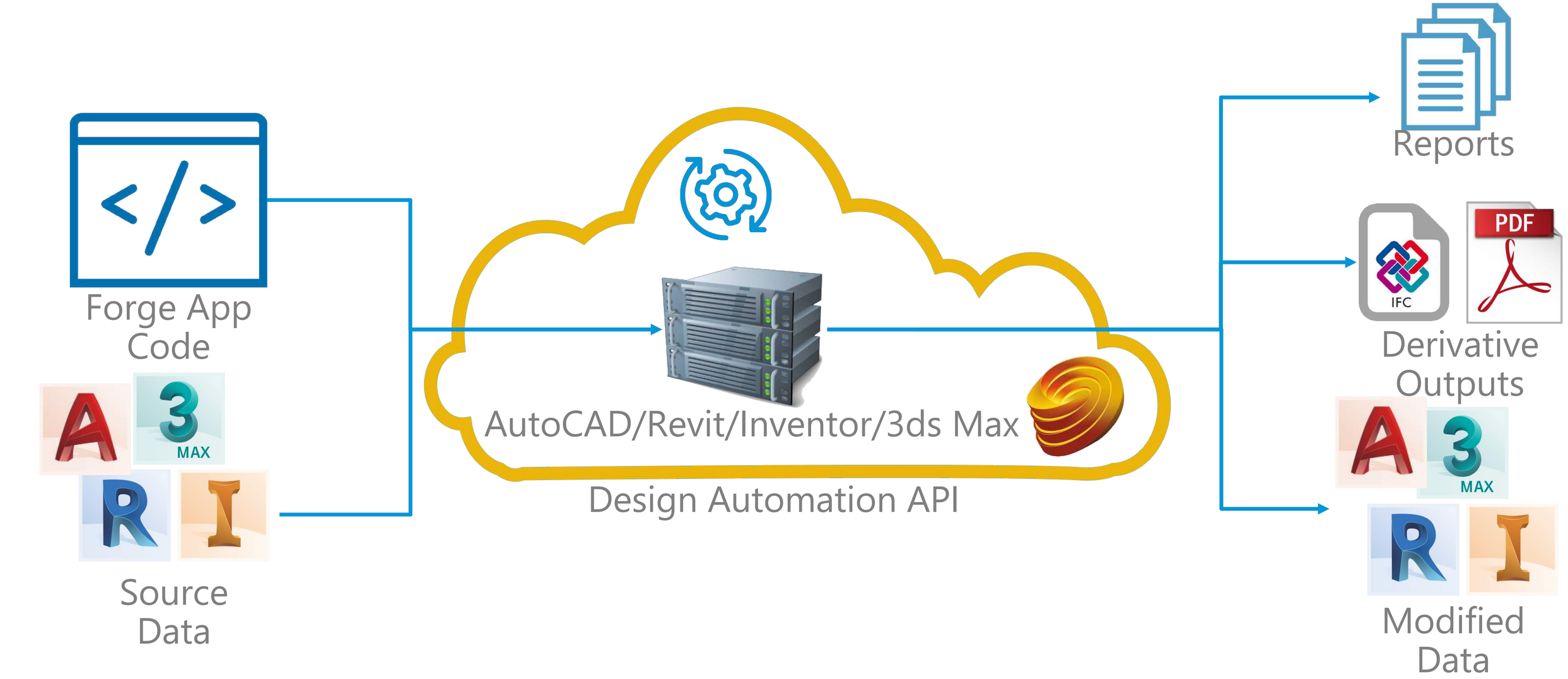
Create Activity & Alias

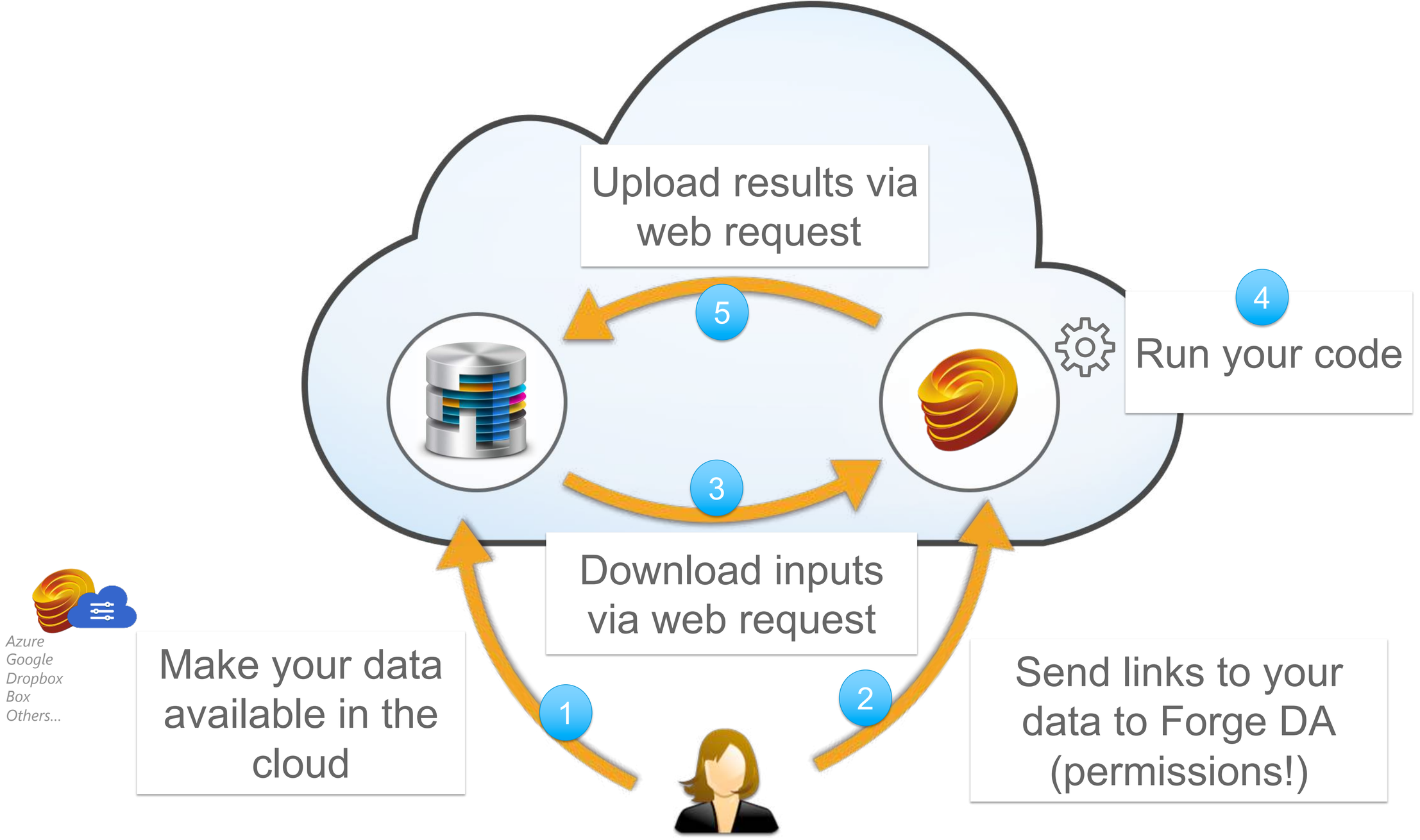




Create WorkItem

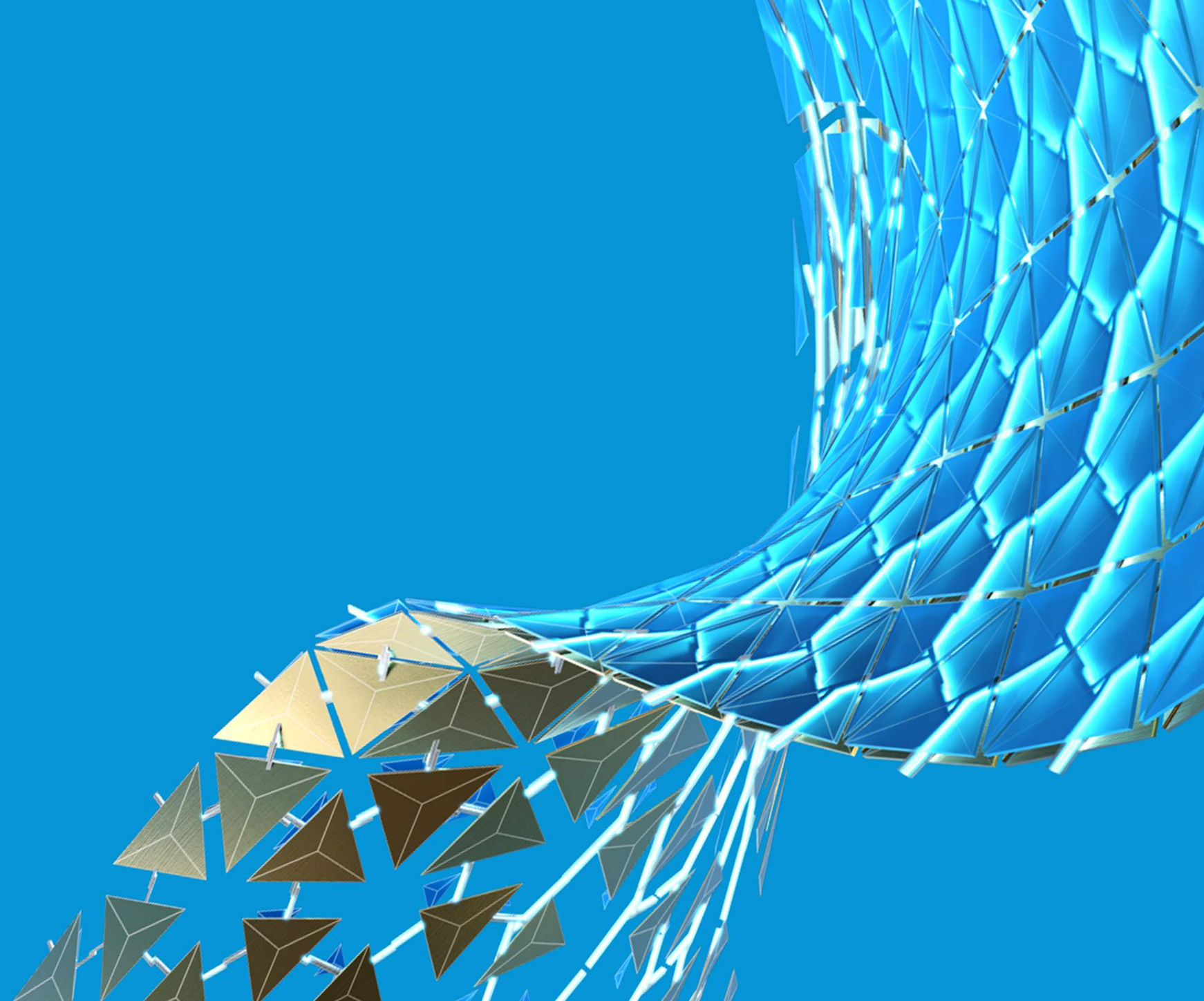



Forge App Code
Source Data
AutoCAD/Revit/Inventor/3ds Max
Design Automation API
Reports
IFC
PDF
Derivative Outputs
Modified Data

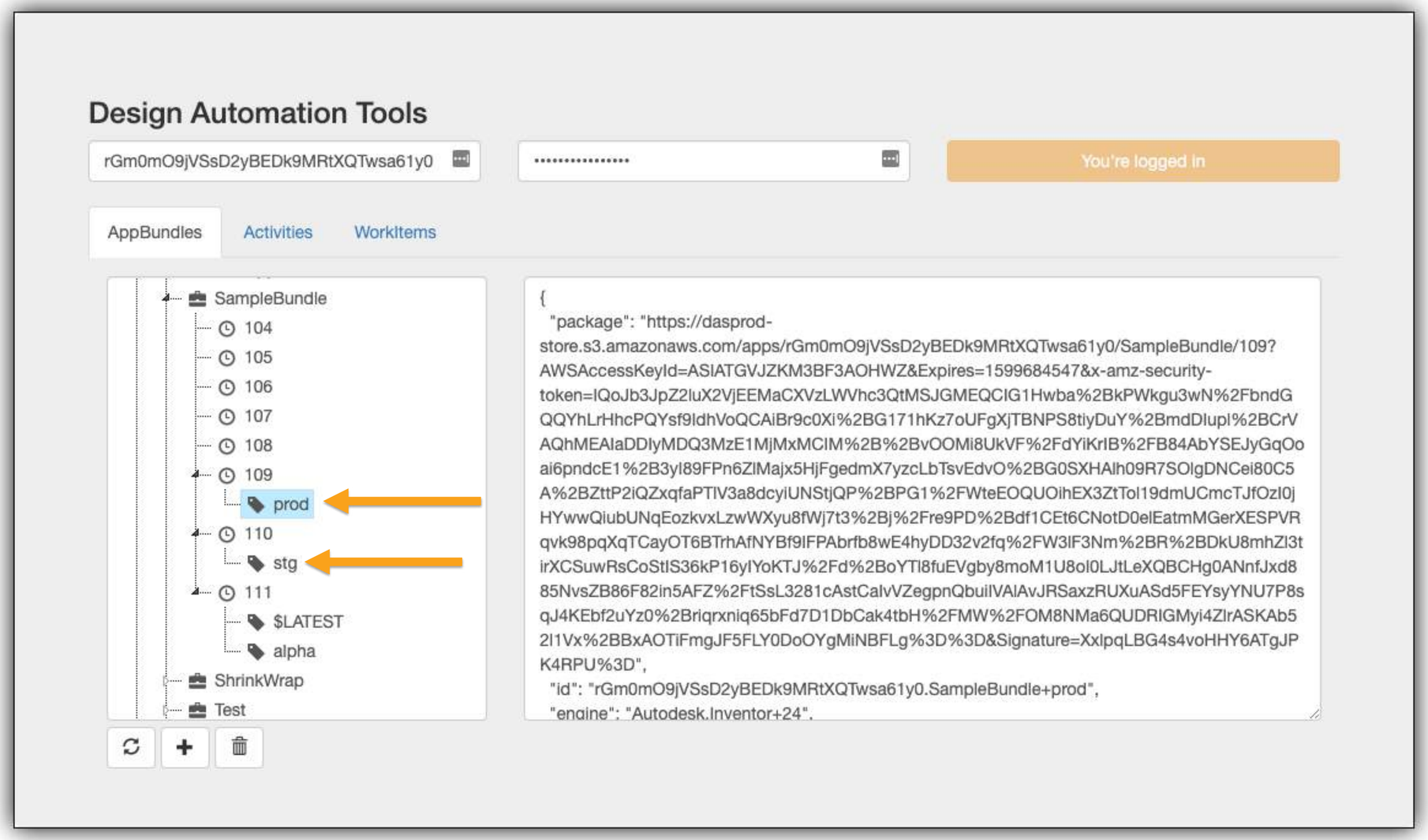


ⓘ Input/outputs are **NOT** stored, they are downloaded/processed and **DISCARDED**

Aliases



Aliases


Design Automation Tools
rGm0mO9jVSsD2yBEDk9MRtXQTwsa61y0
You're logged in
AppBundles
Activities
WorkItems
SampleBundle
104
105
106
107
108
109
prod
110
stg
111
$LATEST
alpha
ShrinkWrap
Test
{
"package": "https://dasprod-store.s3.amazonaws.com/apps/rGm0mO9jVSsD2yBEDk9MRtXQTwsa61y0/SampleBundle/109?AWSAccessKeyId=ASIATGVJZKM3BF3AOHWZ&Expires=1599684547&x-amz-security-token=IQoJb3JpZ2luX2VjEEMaCXVzLWVhc3QtMSJGMEQCIG1Hwba%2BkPWkgu3wN%2FbndGQQYhLrHhcPQYsf9IdhVoQCAiBr9c0Xi%2BG171hKz7oUFgXjTBNPS8tiyDuY%2BmdDlupI%2BCrVAQhMEAIaDDIyMDQ3MzE1MjMxMCIM%2B%2BvOOMi8UkVF%2FdYiKrIB%2FB84AbYSEJyGqOoai6pndcE1%2B3yI89FPn6ZlMajx5HjFgedmX7yzcLbTsvEdvO%2BG0SXHAlh09R7SOlgDNCei80C5A%2BZttP2iQZxqfaPTlV3a8dcyiUNStjQP%2BPG1%2FWteEOQUOihEX3ZtTol19dmUCmcTJfOzI0jHYwwQiubUNqEozkvxLzwWXyu8fWj7t3%2Bj%2Fre9PD%2Bdf1CEt6CNotD0elEatmMGerXESPVRqvk98pqXqTCayOT6BTrhAfNYBf9IFPAbrfb8wE4hyDD32v2fq%2FW3lF3Nm%2BR%2BDkU8mhZl3tirXCSuwRsCoStlS36kP16yIYoKTJ%2Fd%2BoYTl8fuEVgby8moM1U8ol0LJtLeXQBCHg0ANnfJxd885NvsZB86F82in5AFZ%2FtSsL3281cAstCaIvVZegpnQbuiIVAlAvJRSaxzRUXuASd5FEYsyYNU7P8sqJ4KEbf2uYz0%2Briqrxniq65bFd7D1DbCak4tbH%2FMW%2FOM8NMa6QUDRIGMyi4ZlrASKAb52l1Vx%2BBxAOTiFmgJF5FLY0DoOYgMiNBFLg%3D%3D&Signature=XxlpqLBG4s4voHHY6ATgJPK4RPU%3D",
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"engine": "Autodesk.Inventor+24",

Aliases


rGm0mO9jVSsD2yBEDk9MRtXQTwsa61y0.SampleBundle+$LATEST
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rGm0mO9jVSsD2yBEDk9MRtXQTwsa61y0.SampleBundle+alpha
stg
111
$LATEST
alpha
ShrinkWrap
Test
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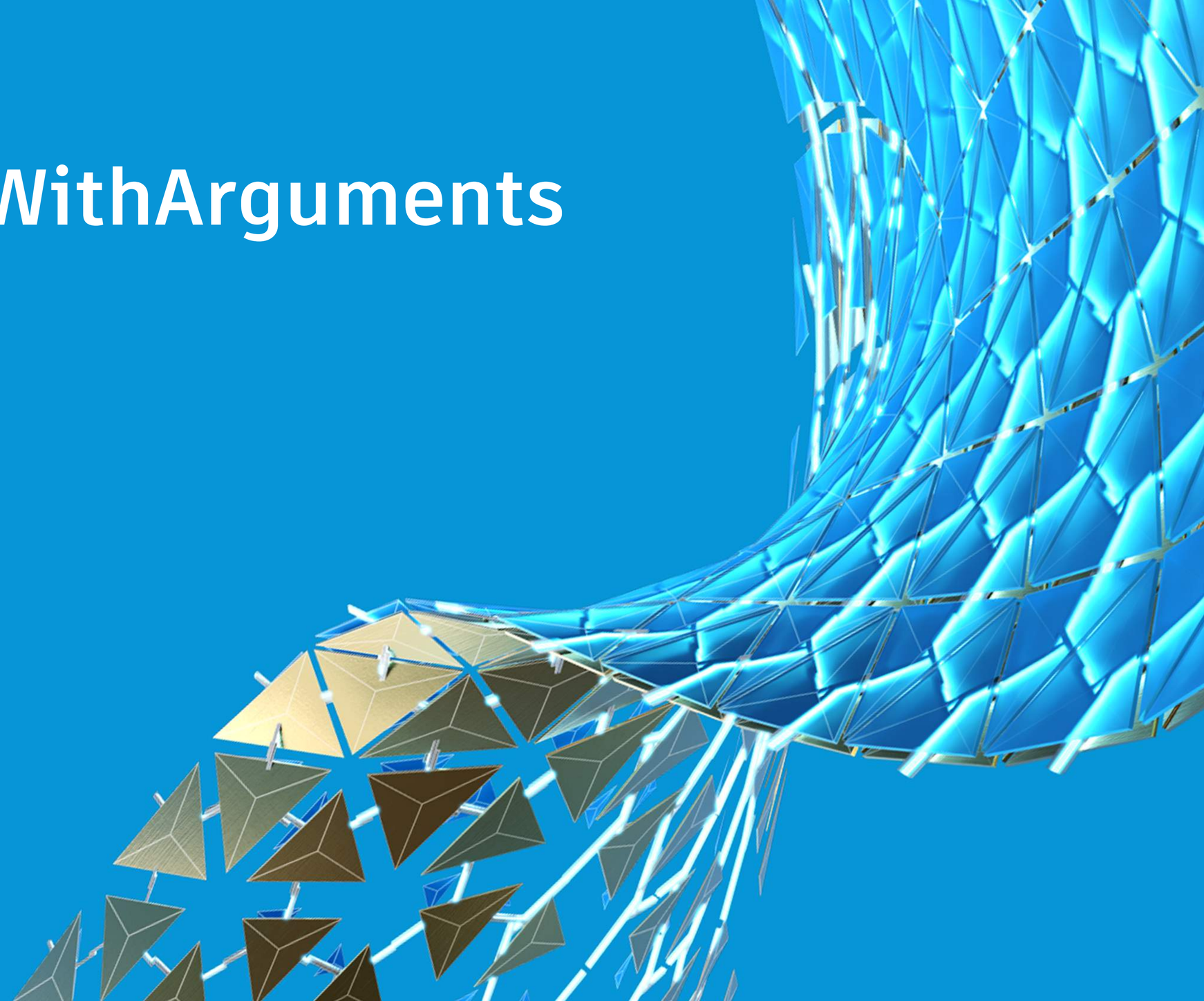
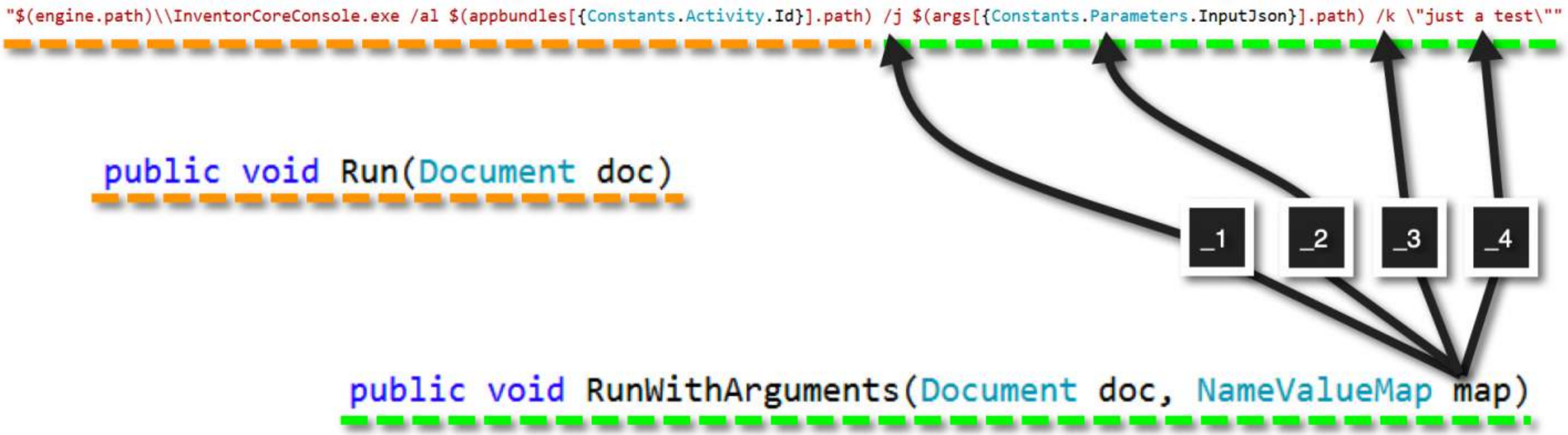
Run vs RunWithArguments

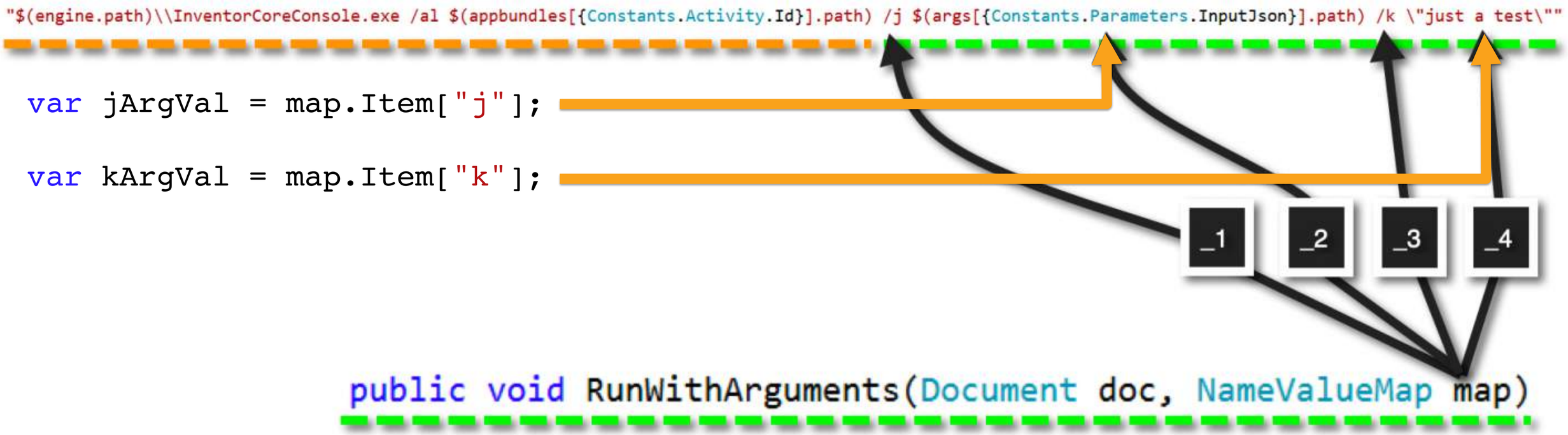


Run vs RunWithArguments



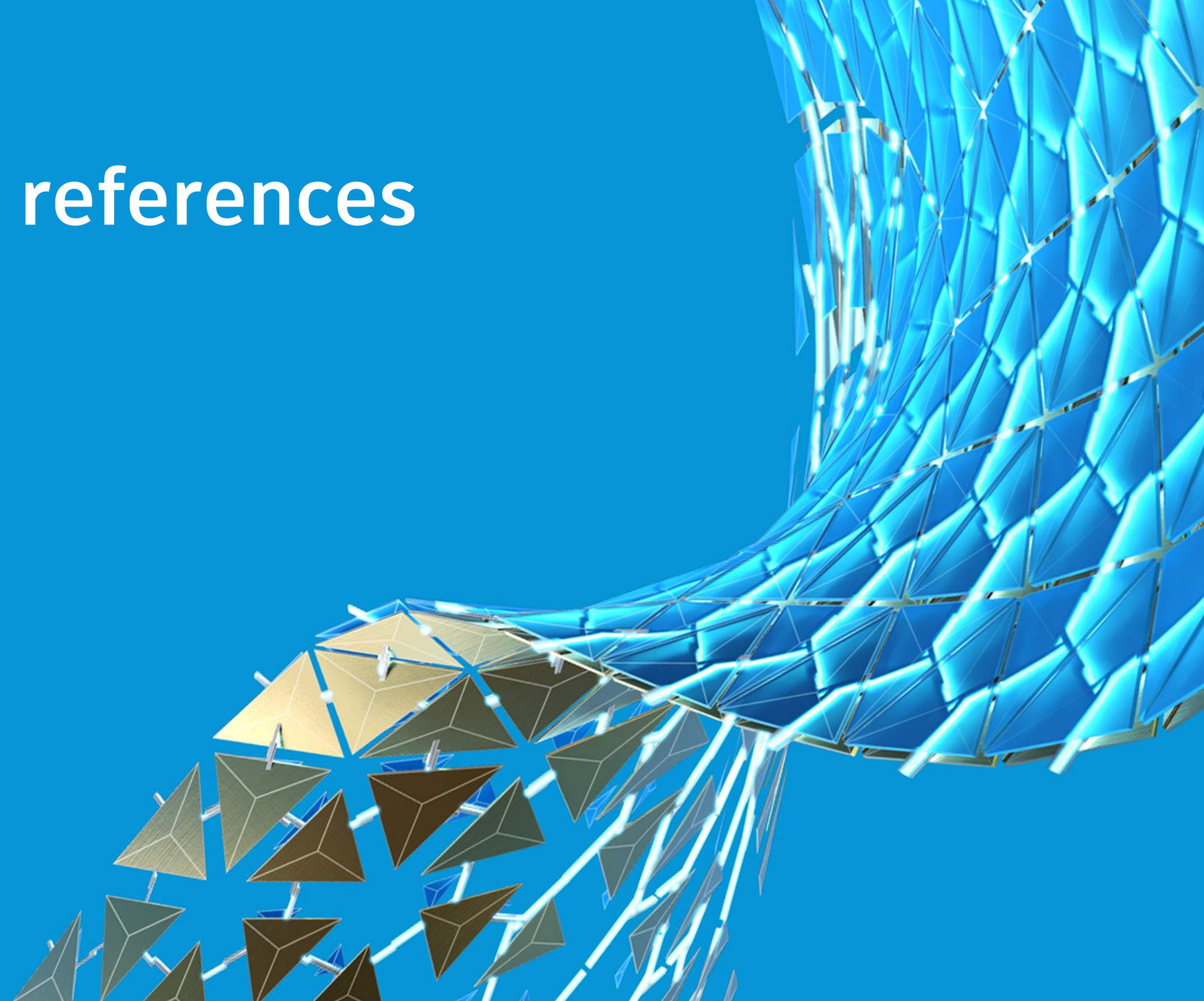
https://forge.autodesk.com/blog/run-vs-runwitharguments

Run vs RunWithArguments

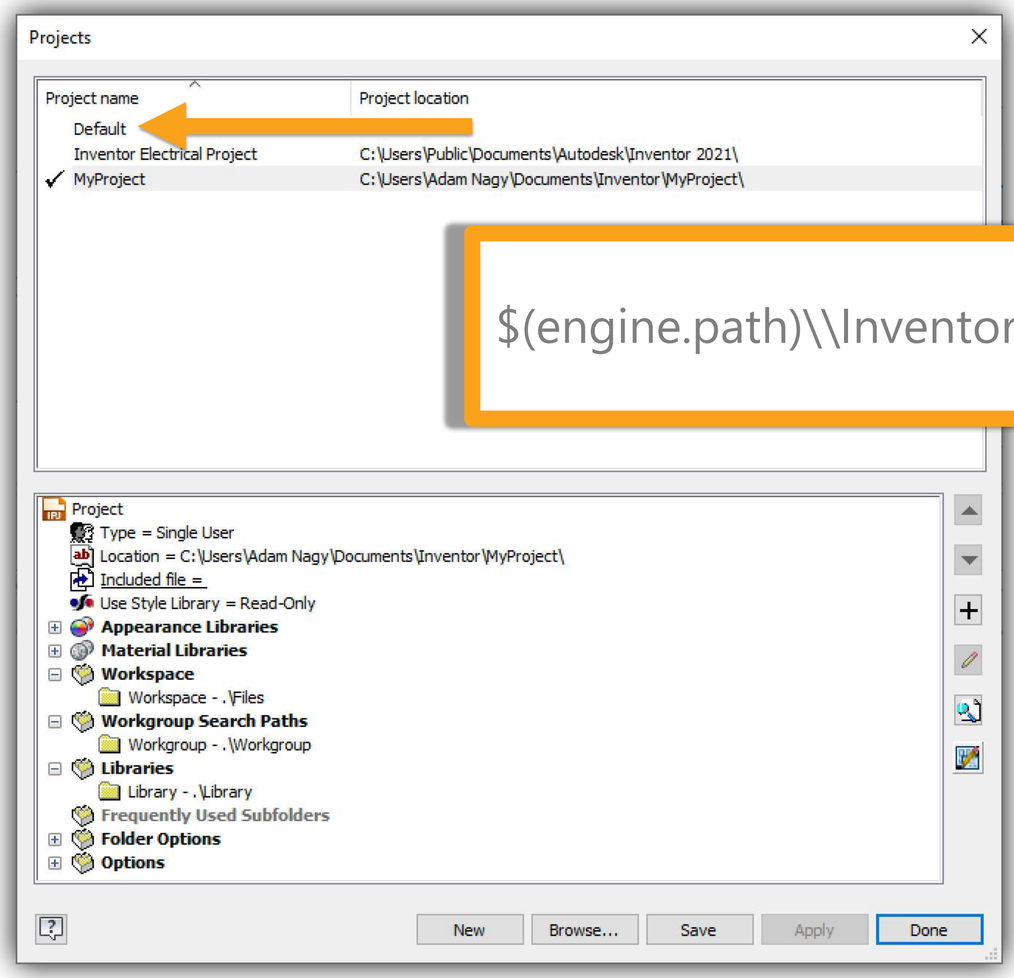


https://forge.autodesk.com/en/docs/design-automation/v3/reference/cmdLine/cmdLine-inventor/

Resolve file references



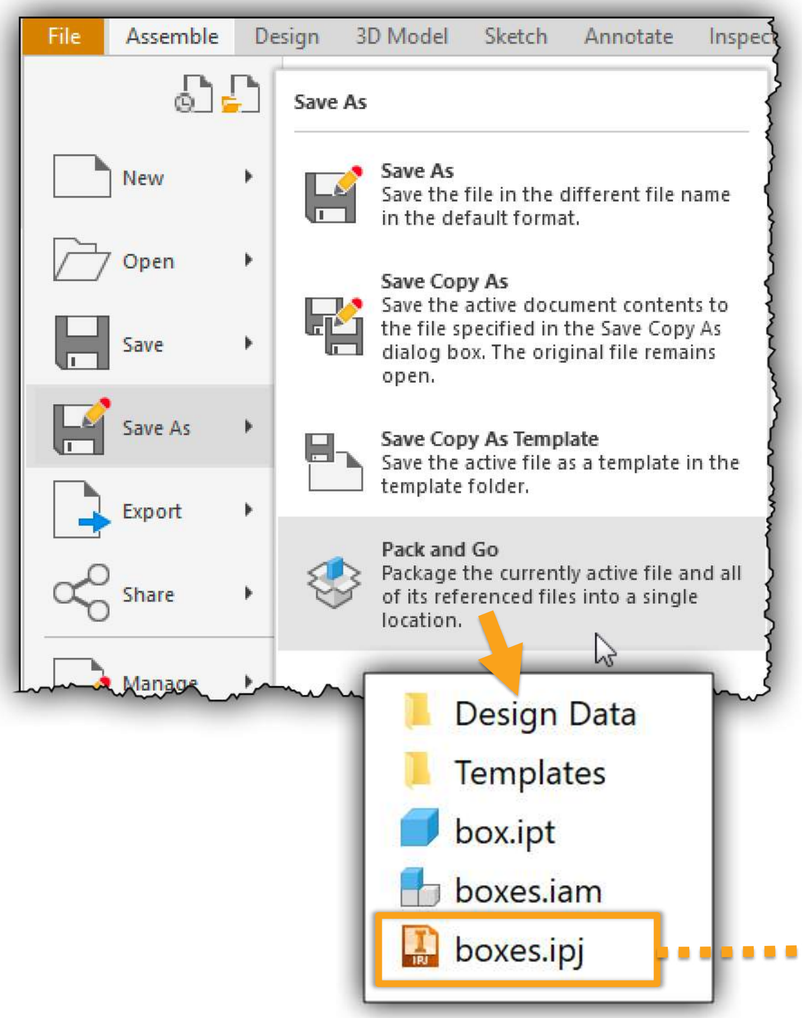
Resolve file references




```
$(engine.path)\\InventorCoreConsole.exe /al \"$(appbundles[SampleBundle].path)\" /p
```

https://forge.autodesk.com/blog/resolving-referenced-inventor-files

Resolve file references




```
public void Run(Document doc)
{
  // Set Active Project
  // Note: localName of input assembly zip is set to "assembly"
  string curDir = System.IO.Directory.GetCurrentDirectory();
  string asmDir = System.IO.Path.Combine(curDir, "assembly");
  string projFile = System.IO.Path.Combine(asmDir, "boxes.ipj");
  DesignProject proj = inventorApplication.DesignProjectManager.
    DesignProjects.AddExisting(projFile);
  proj.Activate();

  // Open the assembly
  string asmFile = System.IO.Path.Combine(asmDir, "boxes.iam");
  doc = inventorApplication.Documents.Open(asmFile, false);

  // etc.
}
```

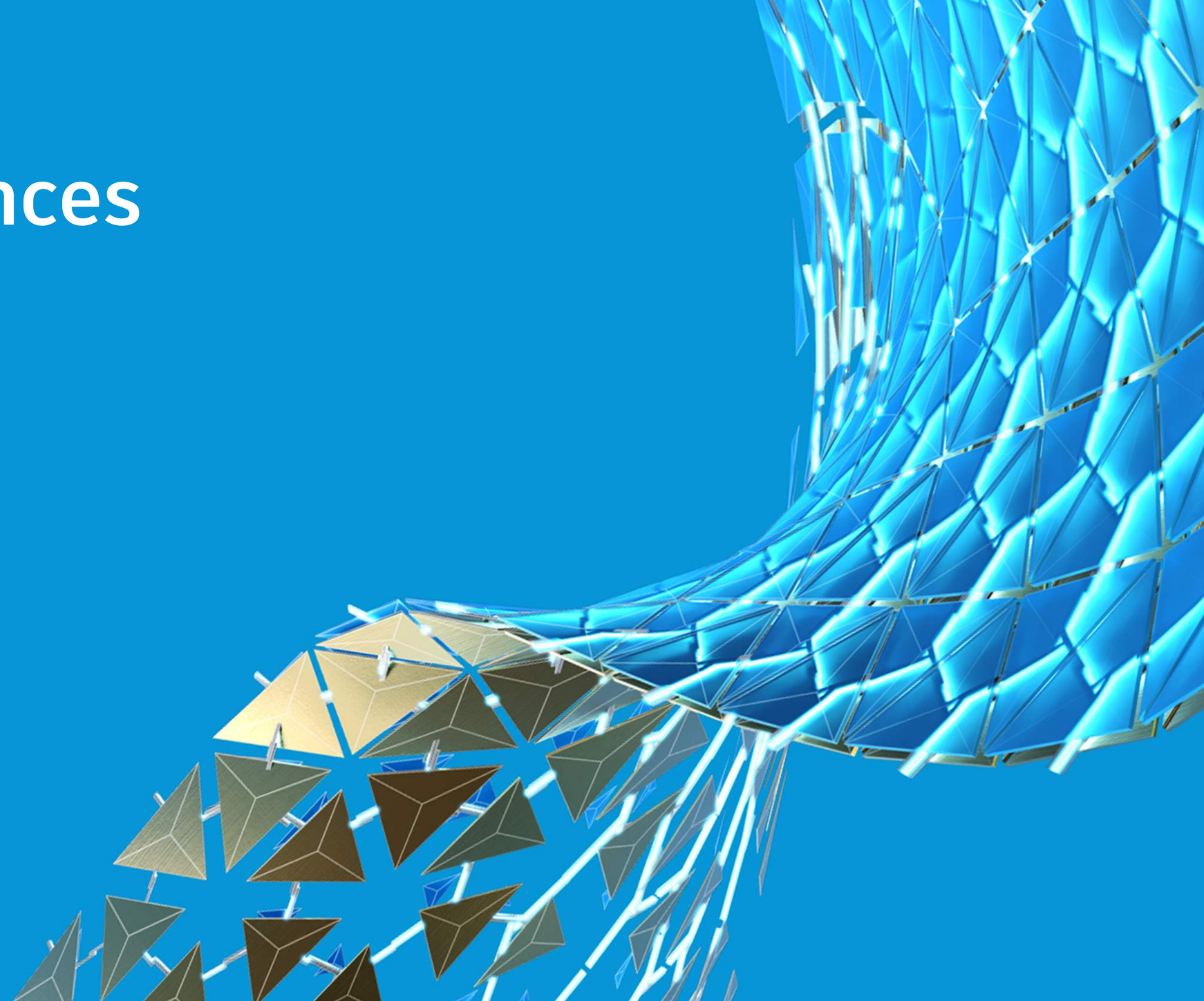
https://forge.autodesk.com/blog/resolving-referenced-inventor-files

Resolve file references

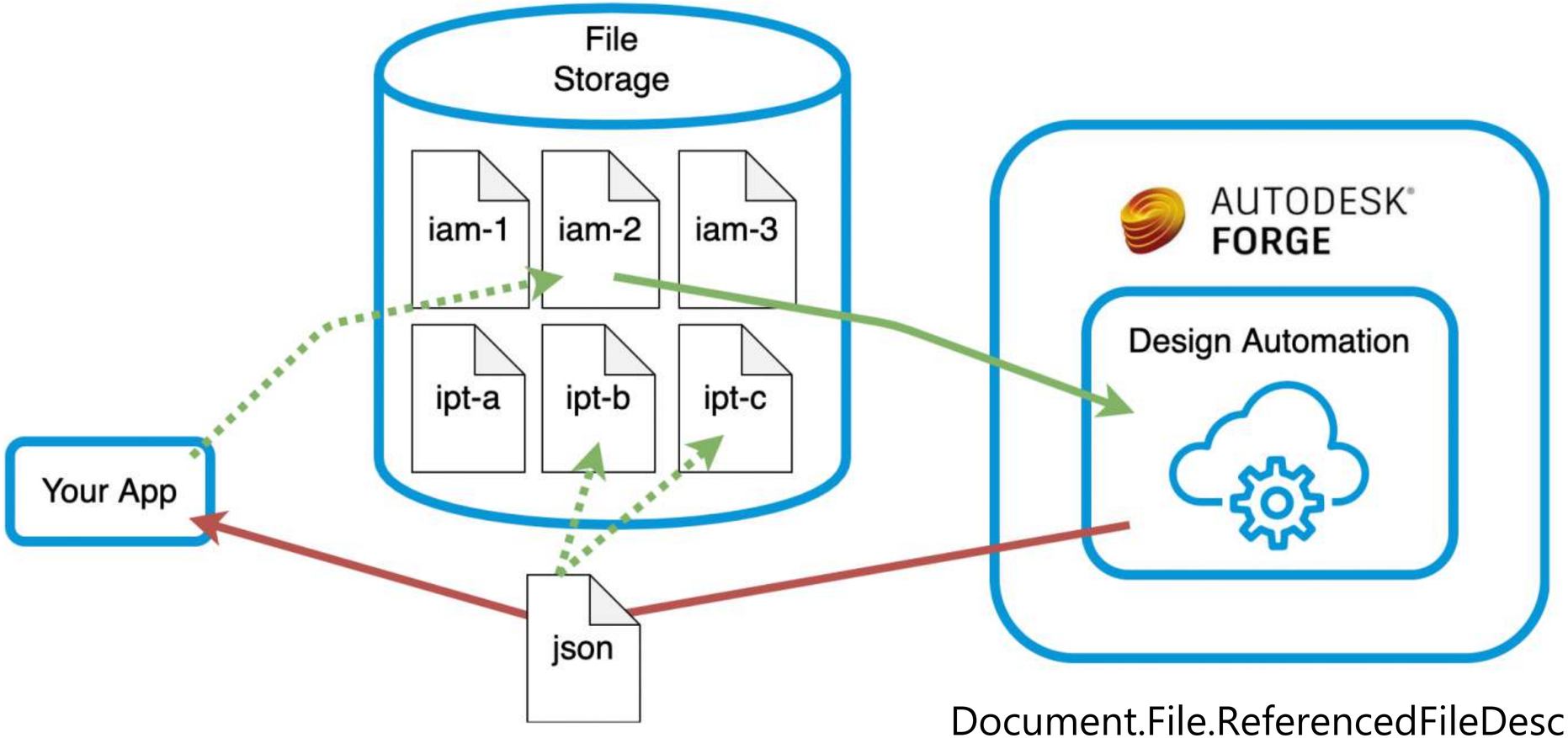
```
// Make sure you keep a reference to events objects otherwise the events won't fire
FileAccessEvents fae = inventorApplication.FileAccessEvents;
fae.OnFileResolution += Fae_OnFileResolution;

// etc

private void Fae_OnFileResolution(
  string RelativeFileName,
  string LibraryName,
  ref byte[] CustomLogicalName,
  EventTimingEnum BeforeOrAfter,
  NameValueMap Context,
  out string FullFileName,
  out HandlingCodeEnum HandlingCode)
{
  // It's best practice to first say we didn't handle the event
  // and then change it later on if needed
  HandlingCode = HandlingCodeEnum.kEventNotHandled;

  // Let's say all my parts will be in this specific folder
  string partsFolder = System.IO.Path.Combine(g_bundlePath, "SampleBundlePlugin.bundl

  // Get the file name without the path
  string fileName = System.IO.Path.GetFileName(RelativeFileName);

  // Combine it with our folder
  FullFileName = System.IO.Path.Combine(partsFolder, fileName);

  if (System.IO.File.Exists(FullFileName))
  {
    HandlingCode = HandlingCodeEnum.kEventHandled;
  }
}
```

https://forge.autodesk.com/blog/resolving-referenced-inventor-files

Find references



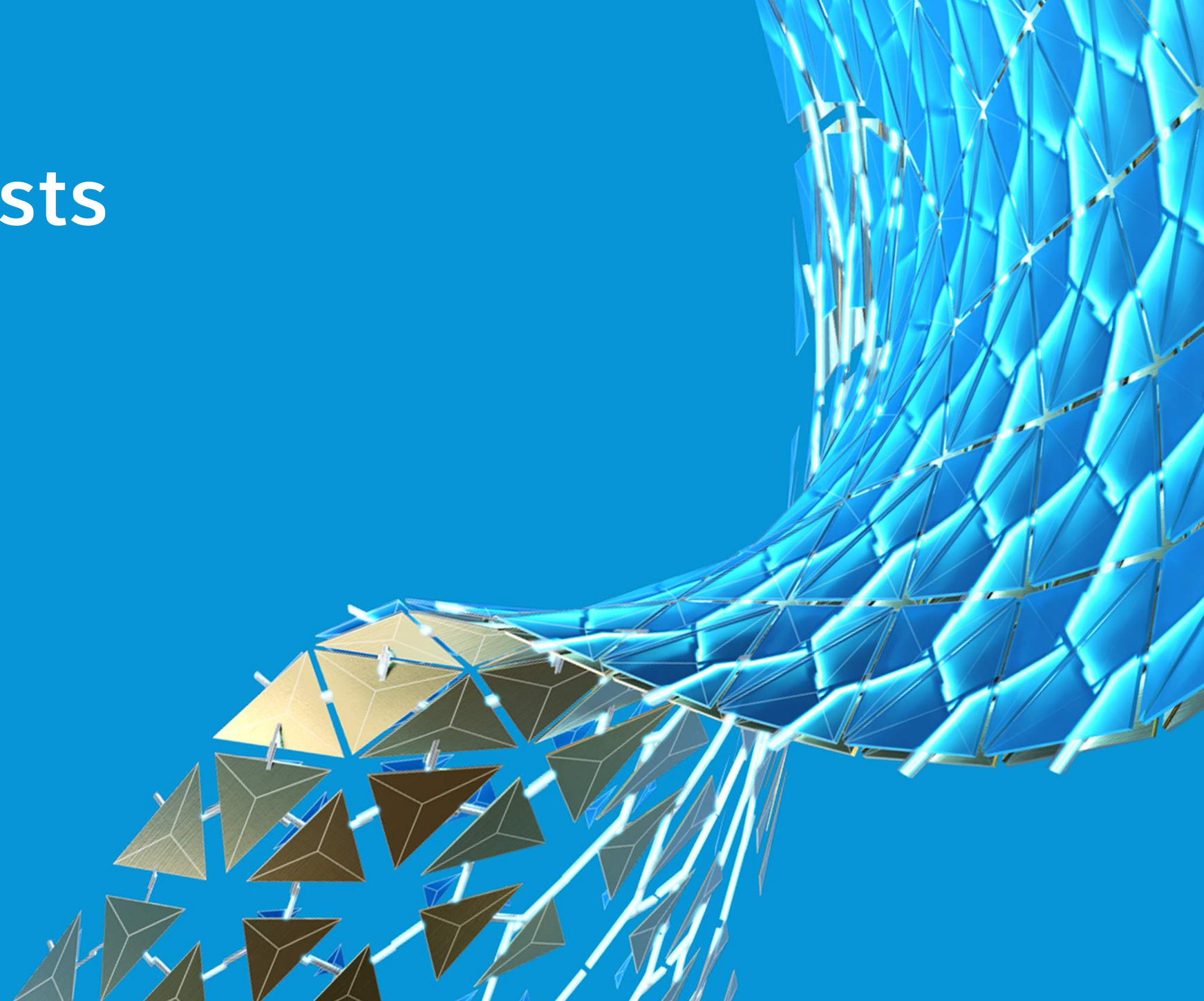
Find references



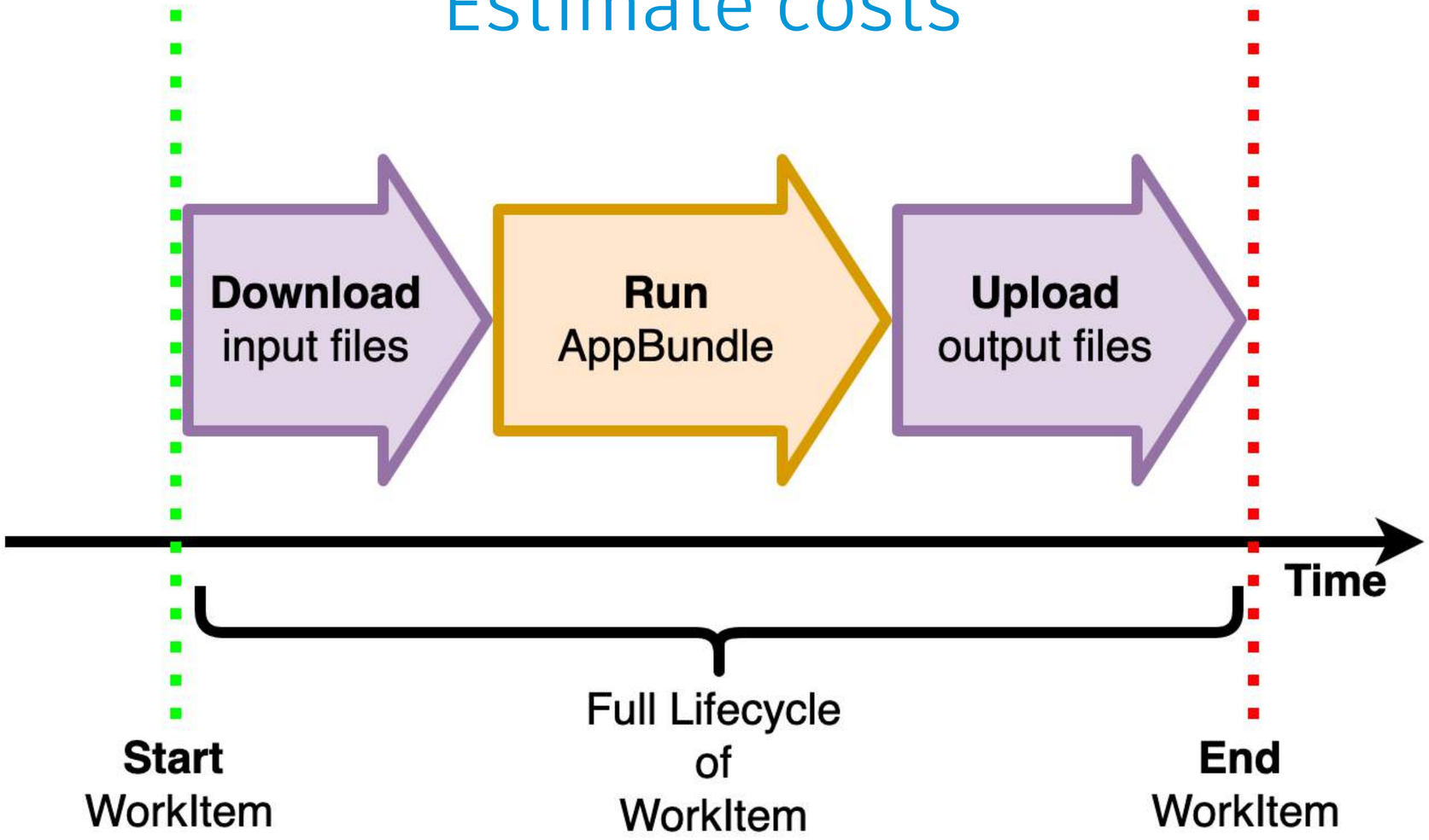
Document.File.ReferencedFileDescriptors

https://forge.autodesk.com/blog/get-list-referenced-files

Estimate costs

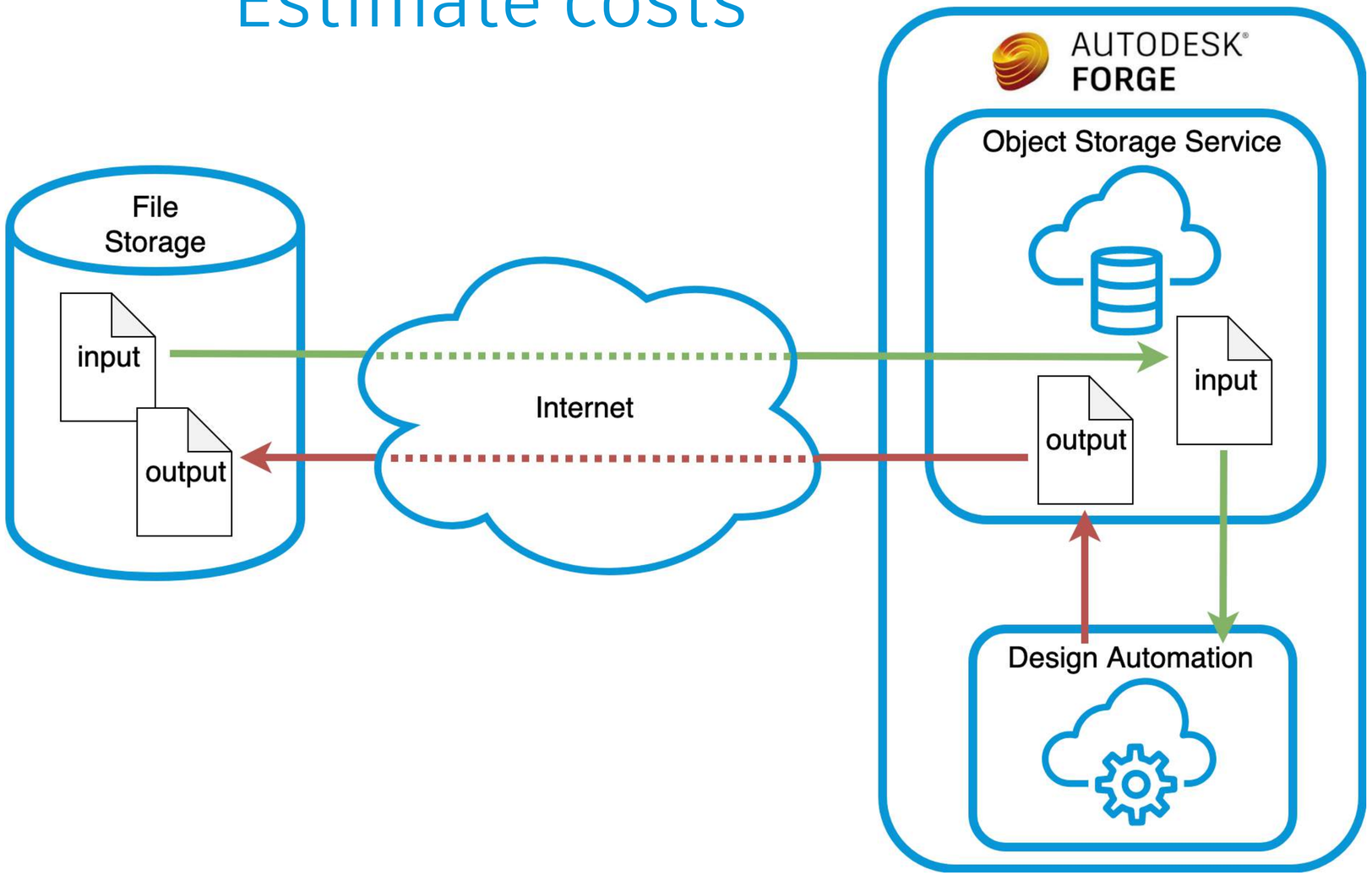


Estimate costs



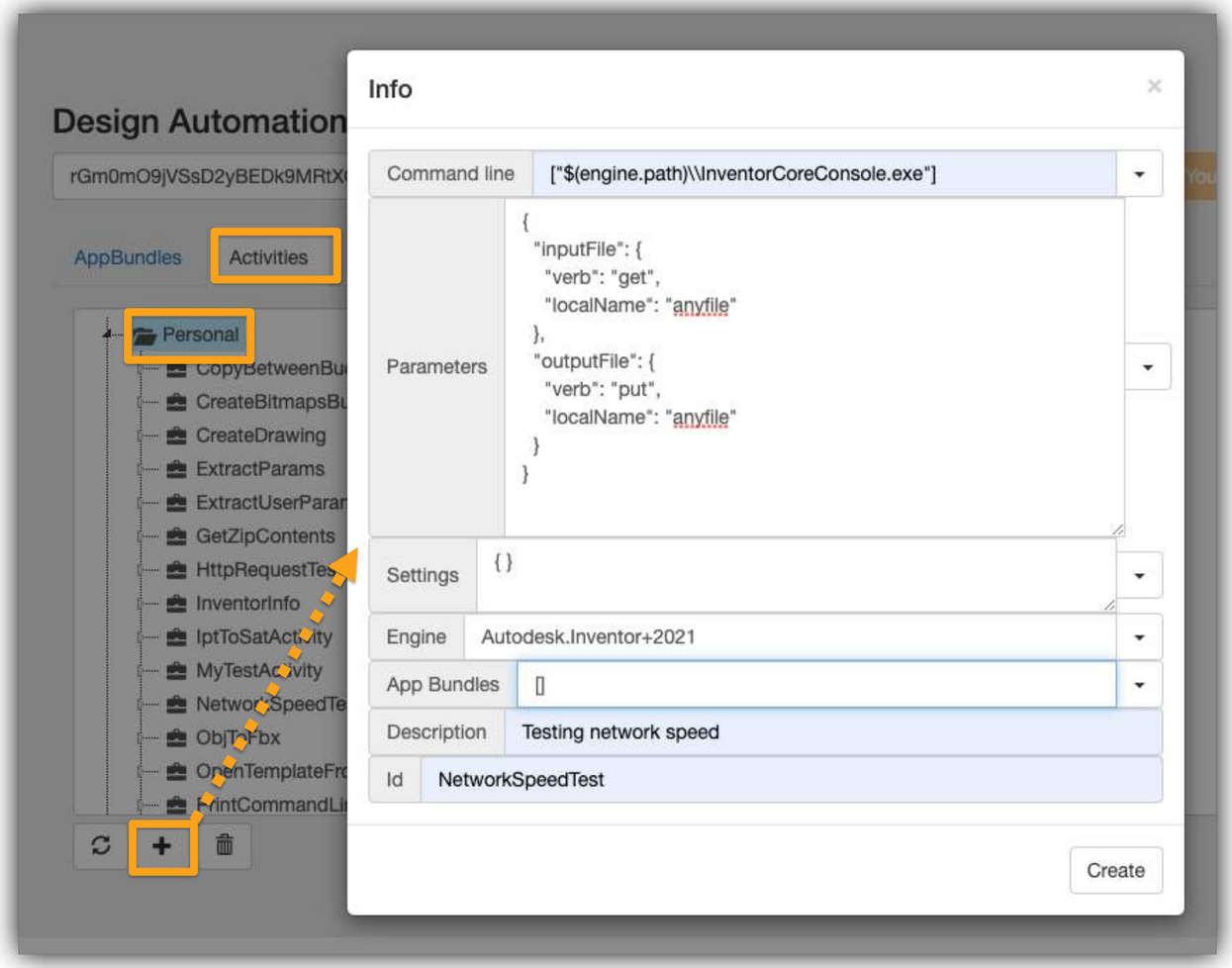
https://forge.autodesk.com/blog/estimate-design-automation-costs
https://forge.autodesk.com/blog/optimize-design-automation-process

Estimate costs



https://forge.autodesk.com/blog/estimate-design-automation-costs
https://forge.autodesk.com/blog/optimize-design-automation-process

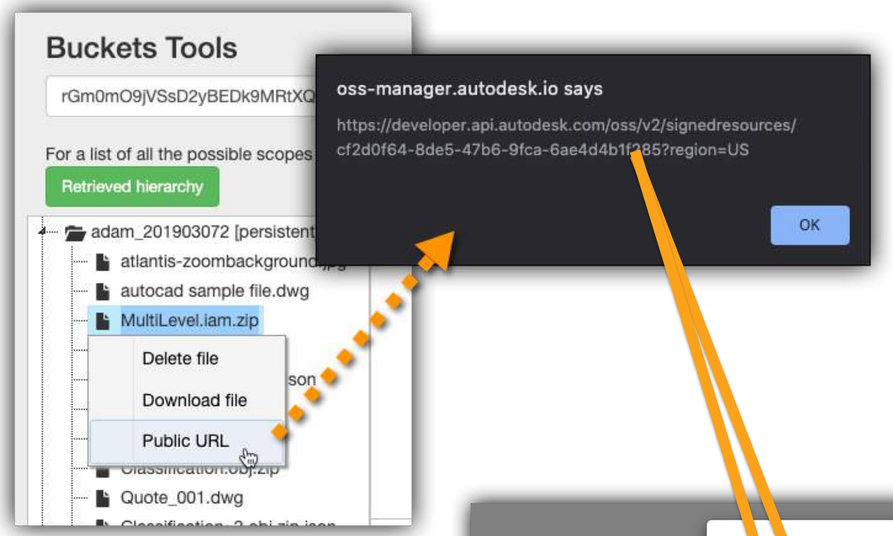
Estimate costs

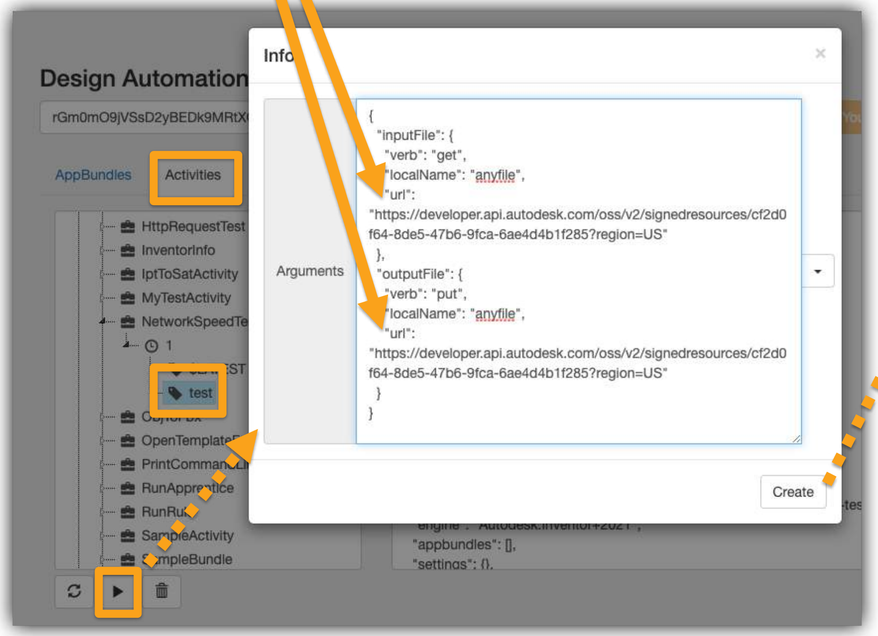


https://da-manager.autodesk.io/

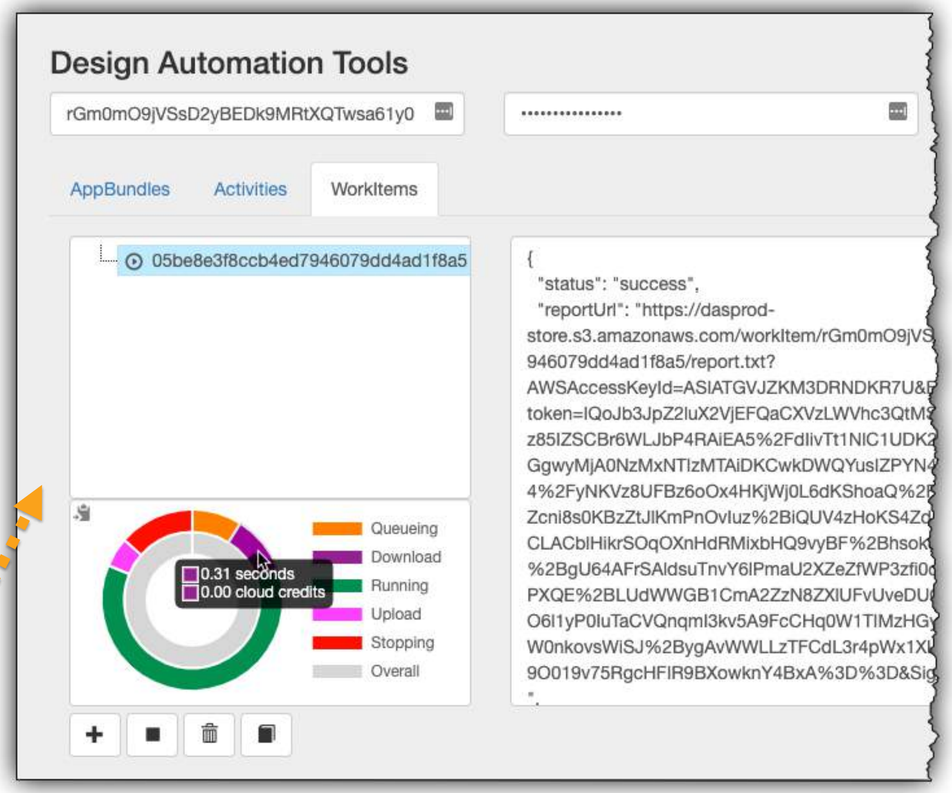
https://oss-manager.autodesk.io/

Estimate costs



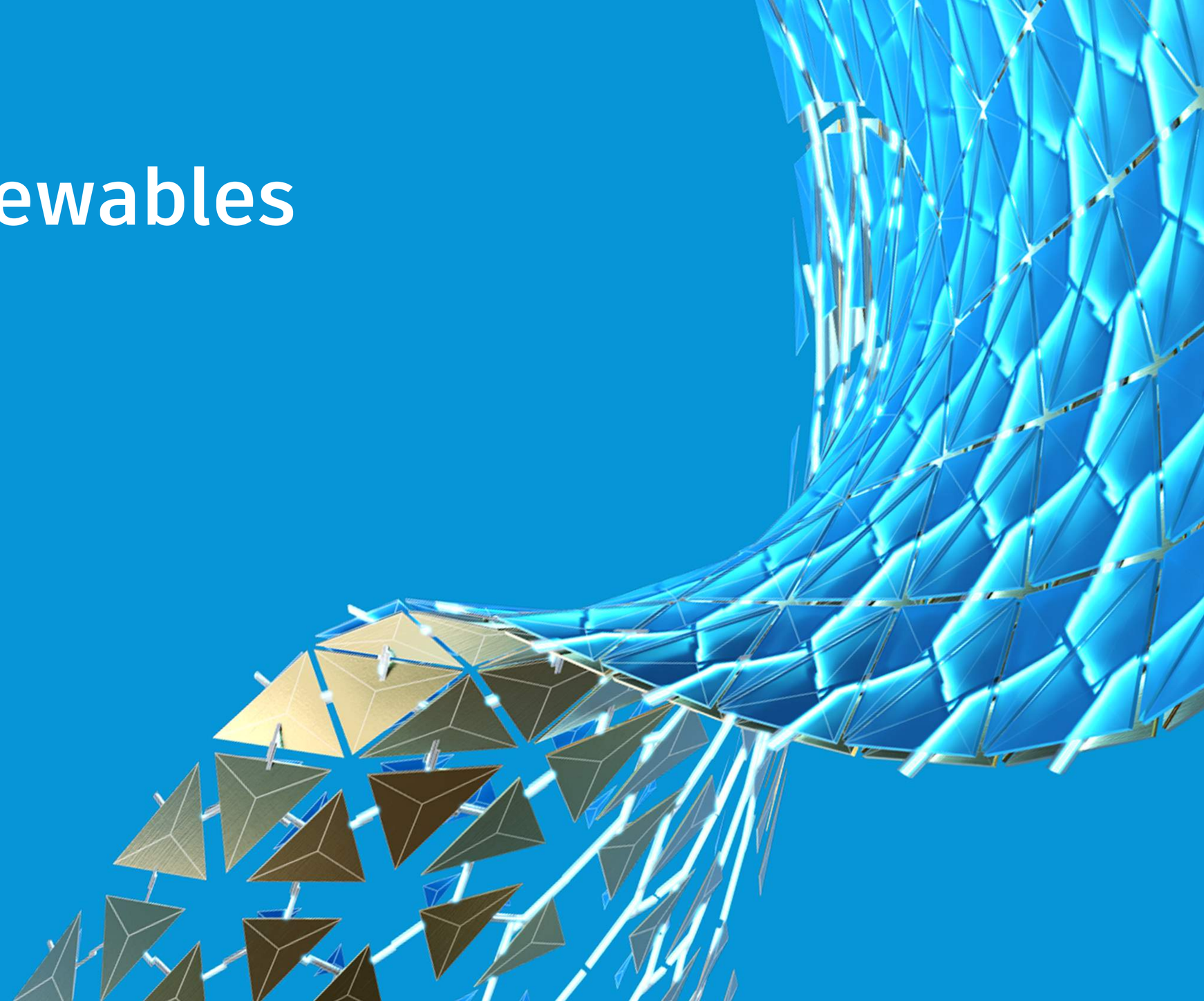


https://da-manager.autodesk.io/

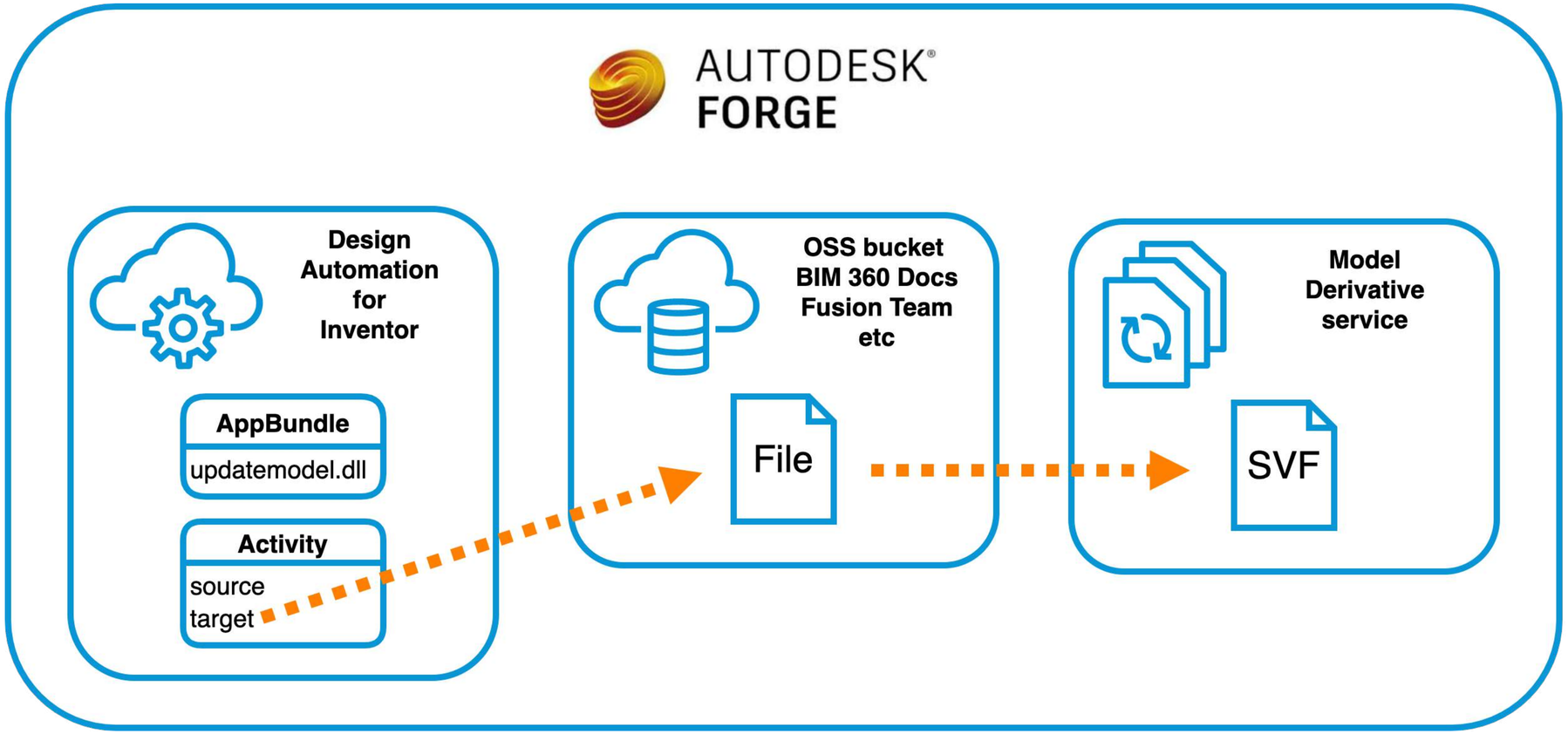


350KB -> 0.31 second -> 8Mbps
310MB -> 13 seconds -> 190Mbps

Generate viewables

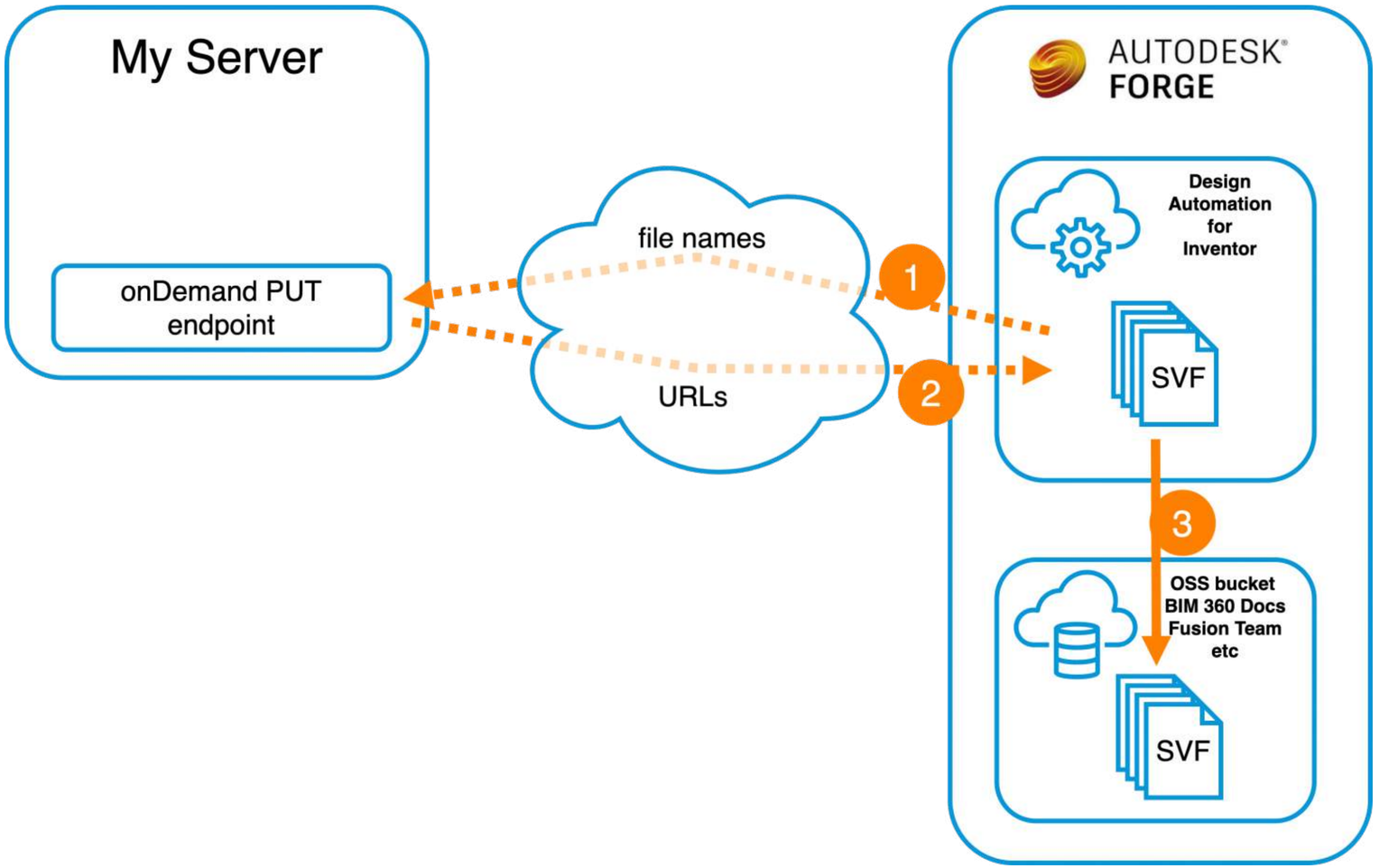


Generate viewables



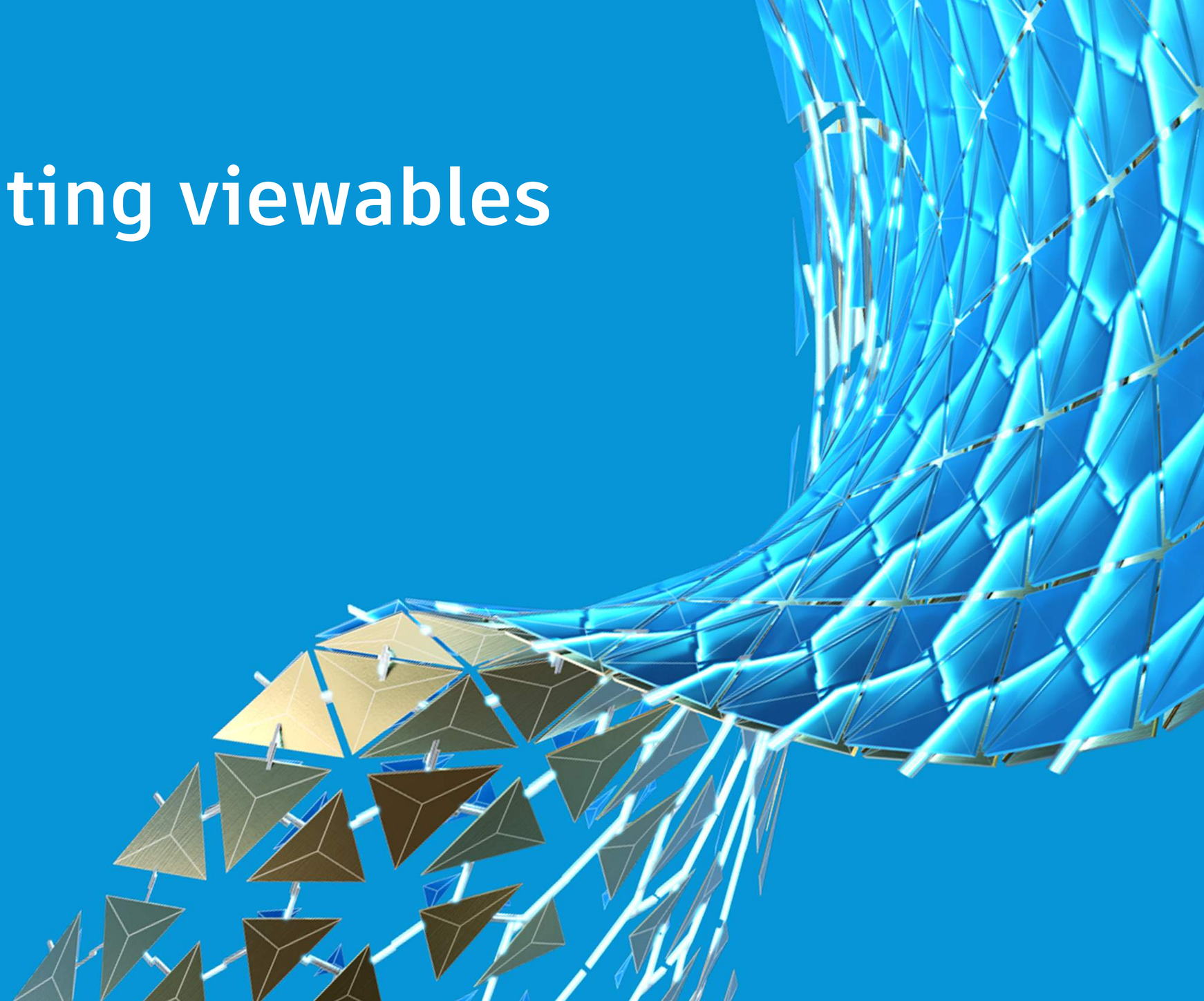
https://forge.autodesk.com/blog/speed-viewable-generation-when-using-design-automation-inventor

Generate viewables

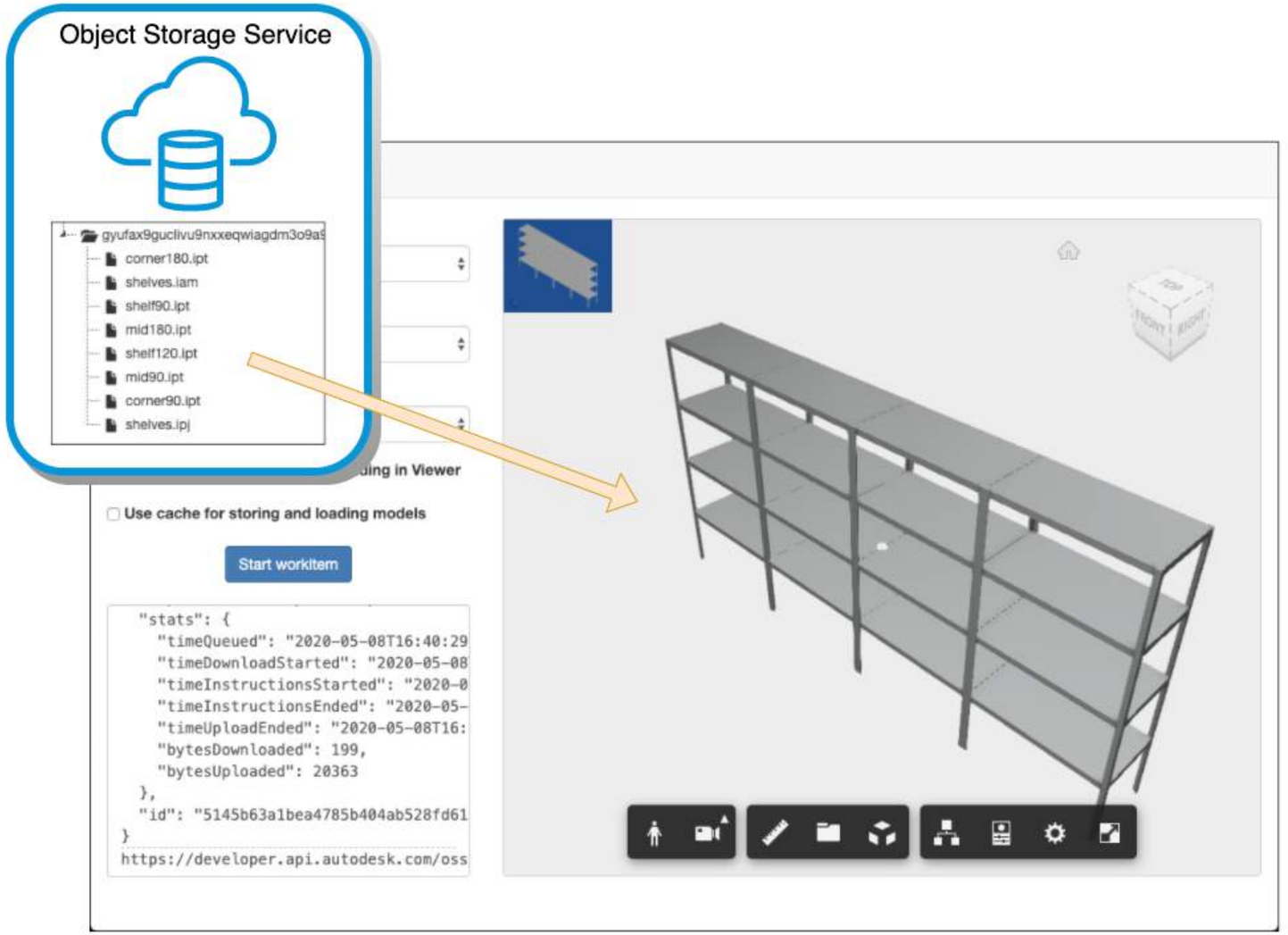


https://forge.autodesk.com/blog/speed-viewable-generation-when-using-design-automation-inventor

Skip generating viewables



Skip generating viewables

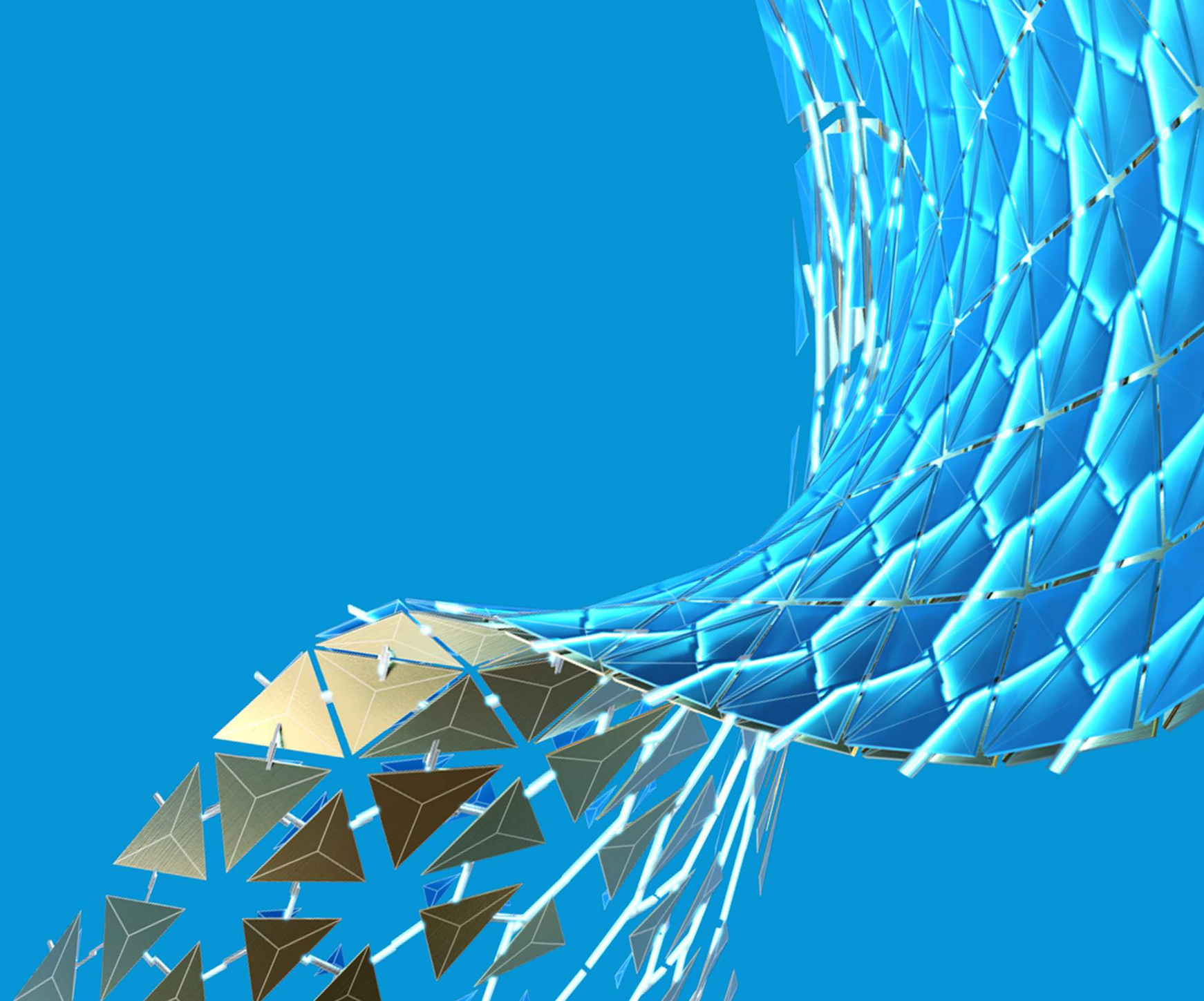


https://forge.autodesk.com/blog/faster-configuration-results

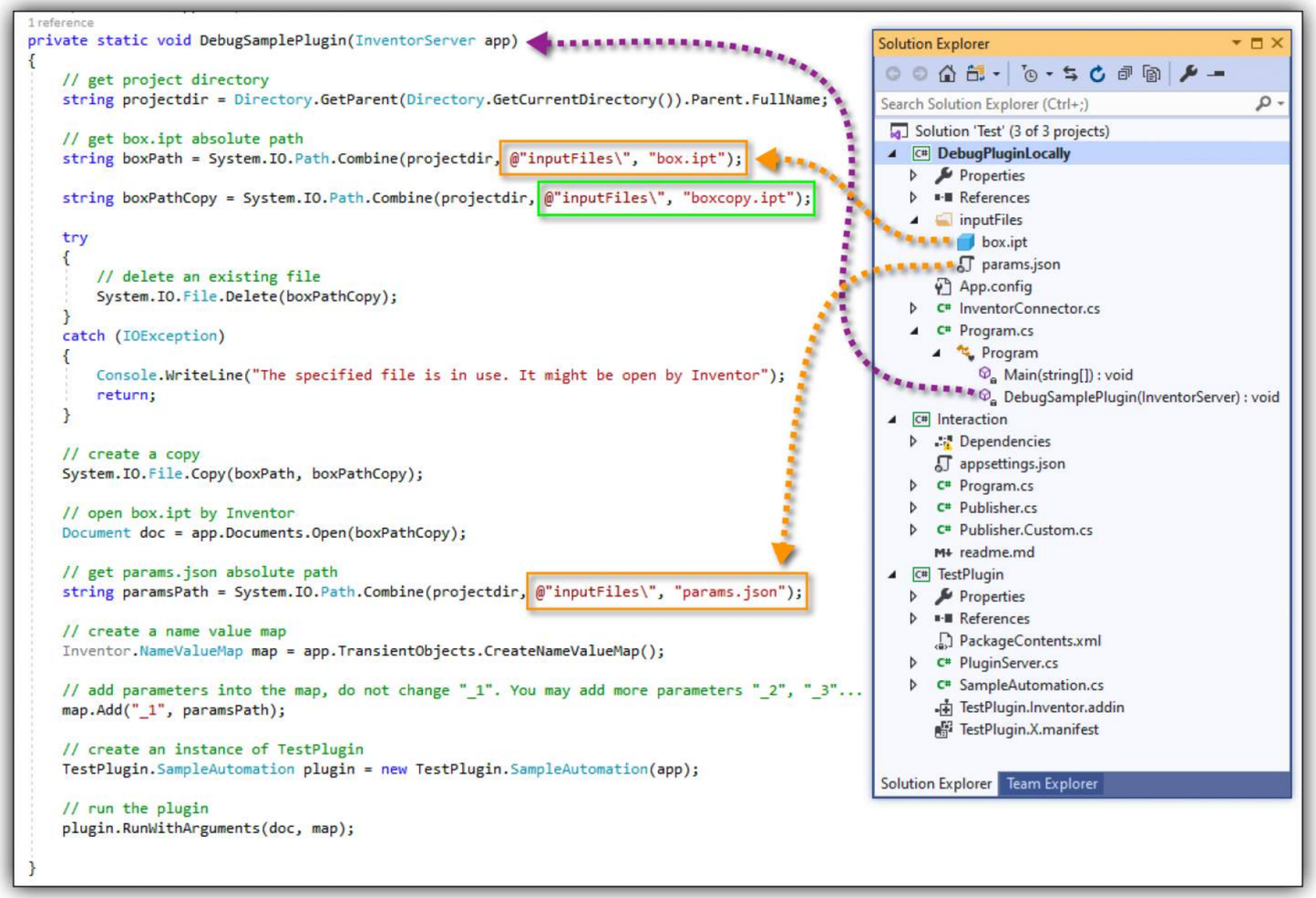
Skip generating viewables

https://forge-configurator.herokuapp.com/

Debugging

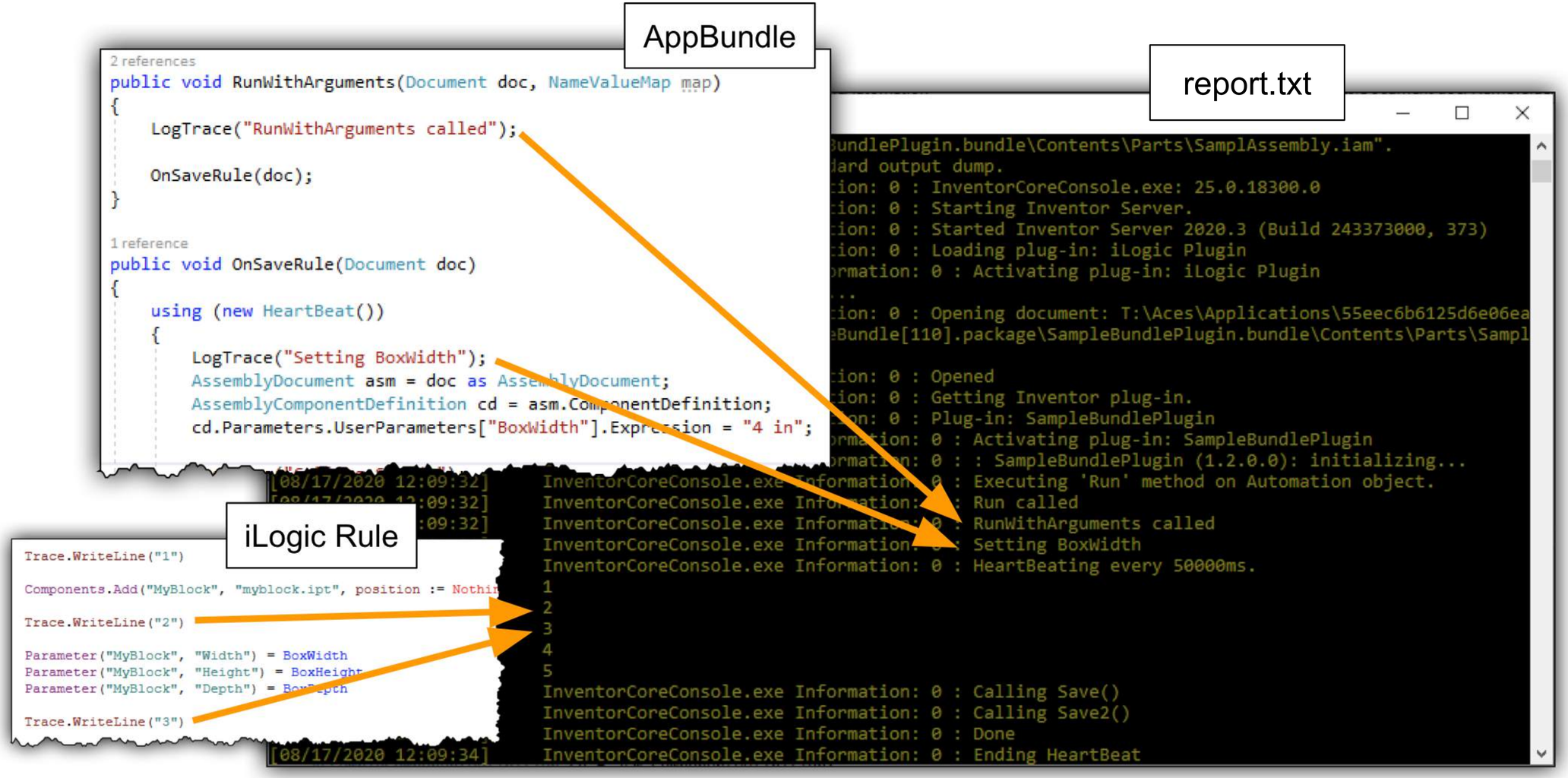


Debugging - local



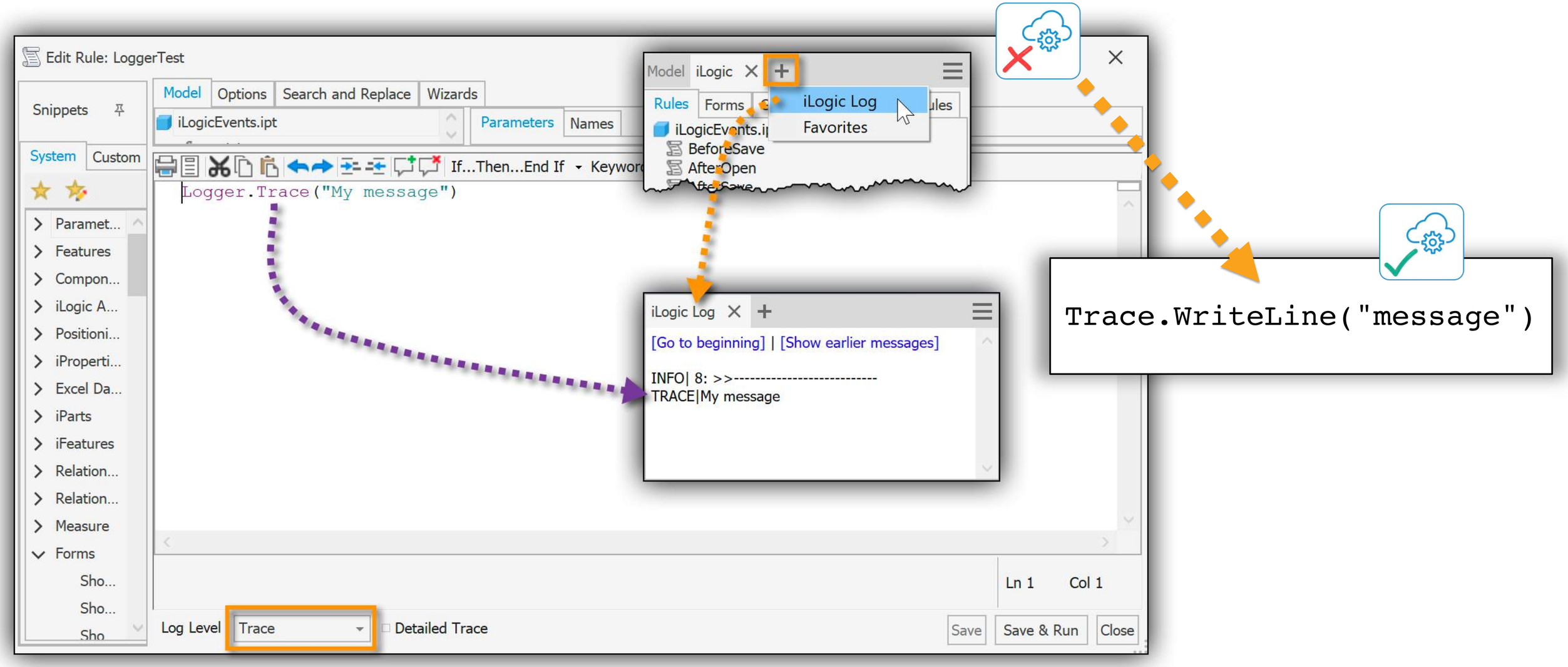
https://forge.autodesk.com/blog/design-automation-inventor-vs-template-local-debug

Debugging - server



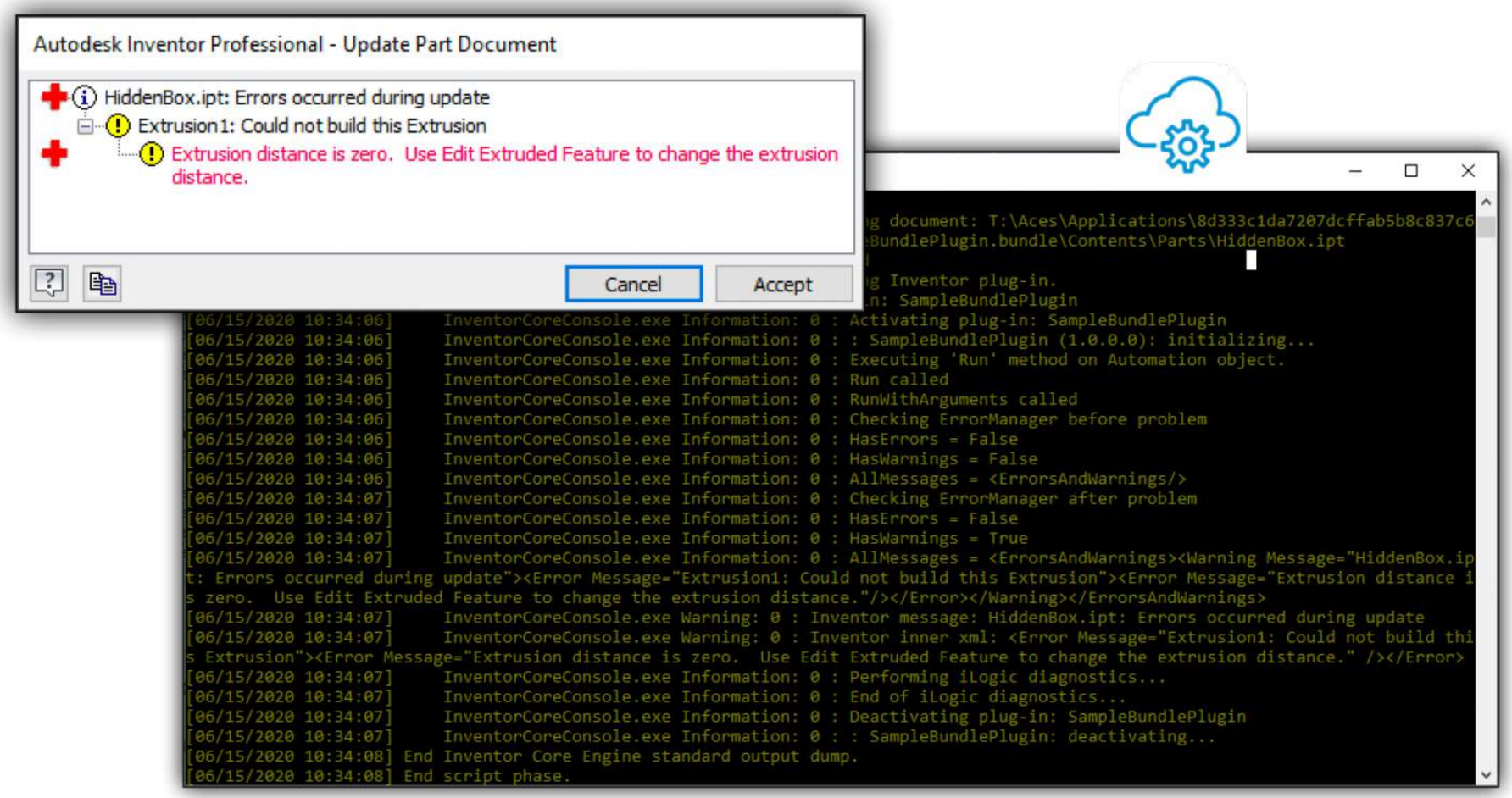
https://forge.autodesk.com/blog/design-automation-inventor-vs-template-run-workitem

Debugging - server



https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

Debugging - ErrorManager



https://forge.autodesk.com/blog/get-modeling-error-details-inventor

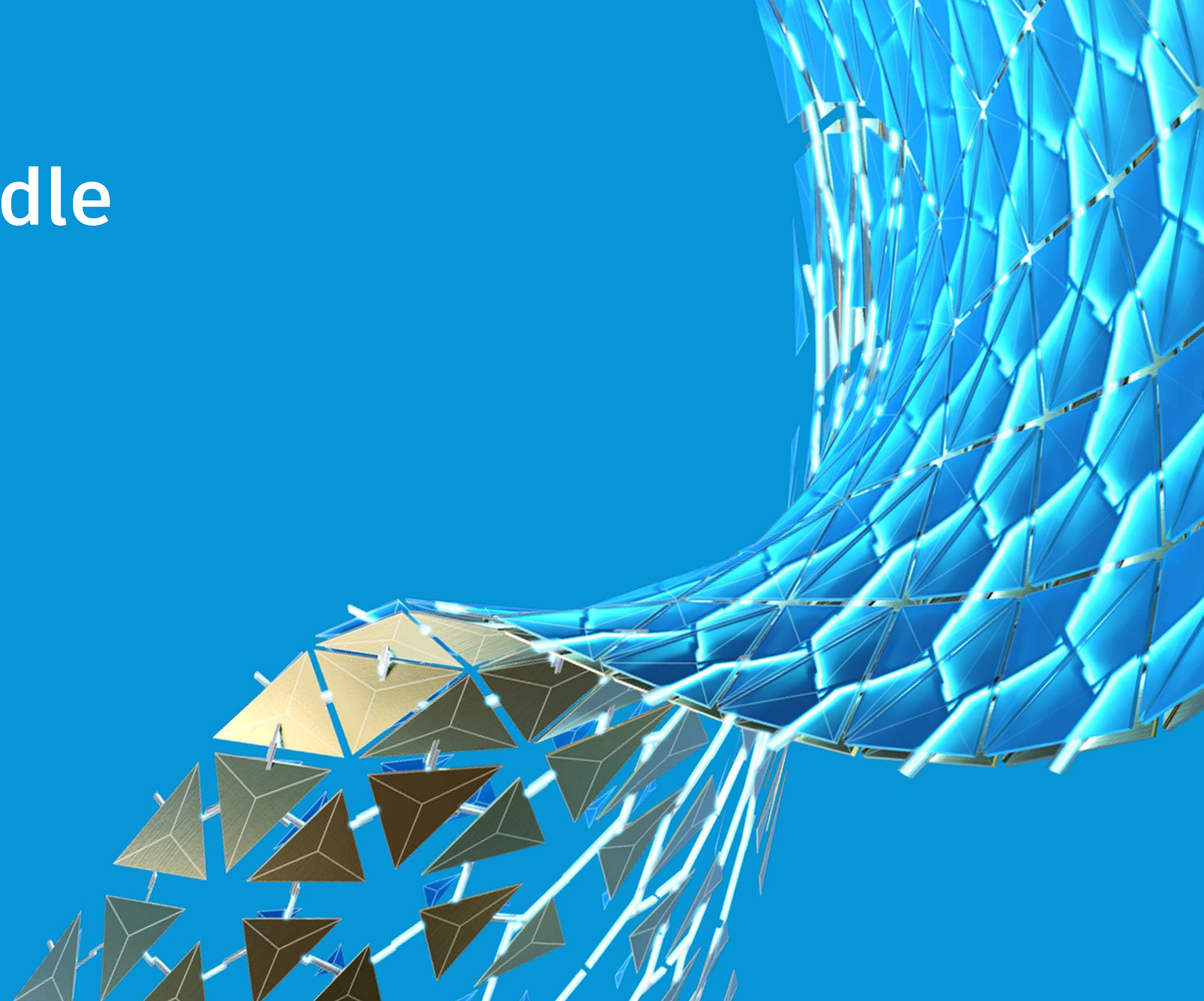
Debugging - ErrorManager

```
public void RunWithArguments(Document doc, NameValueMap map)
{
    var em = inventorApplication.ErrorManager;
    LogTrace($"Checking ErrorManager before problem");
    LogTrace($"HasErrors = {em.HasErrors}");
    LogTrace($"HasWarnings = {em.HasWarnings}");
    LogTrace($"AllMessages = {em.AllMessages}");

    PartDocument pd = doc as PartDocument;
    pd.ComponentDefinition.Parameters["height"].Expression = "0";
    pd.Update2();

    LogTrace($"Checking ErrorManager after problem");
    LogTrace($"HasErrors = {em.HasErrors}");
    LogTrace($"HasWarnings = {em.HasWarnings}");
    LogTrace($"AllMessages = {em.AllMessages}");
}
```

[06/15/2020 10:34:07] InventorCoreConsole.exe Information: 0 : Checking ErrorManager after problem [06/15/2020 10:34:07] InventorCoreConsole.exe Information: 0 : HasErrors = False [06/15/2020 10:34:07] InventorCoreConsole.exe Information: 0 : HasWarnings = True [06/15/2020 10:34:07] InventorCoreConsole.exe Information: 0 : AllMessages = <ErrorsAndWarnings><Warning Message="HiddenBox.ipt: Errors occurred during update"><Error Message="Extrusion1: Could not build this Extrusion"><Error Message="Extrusion distance is zero. Use Edit Extruded Feature to change the extrusion distance."/></Error></Warning></ErrorsAndWarnings> [06/15/2020 10:34:07] InventorCoreConsole.exe Warning: 0 : Inventor message: HiddenBox.ipt: Errors occurred during update [06/15/2020 10:34:07] InventorCoreConsole.exe Warning: 0 : Inventor inner xml: <Error Message="Extrusion1: Could not build this Extrusion"><Error Message="Extrusion distance is zero. Use Edit Extruded Feature to change the extrusion distance." /></Error>

https://forge.autodesk.com/blog/get-modeling-error-details-inventor

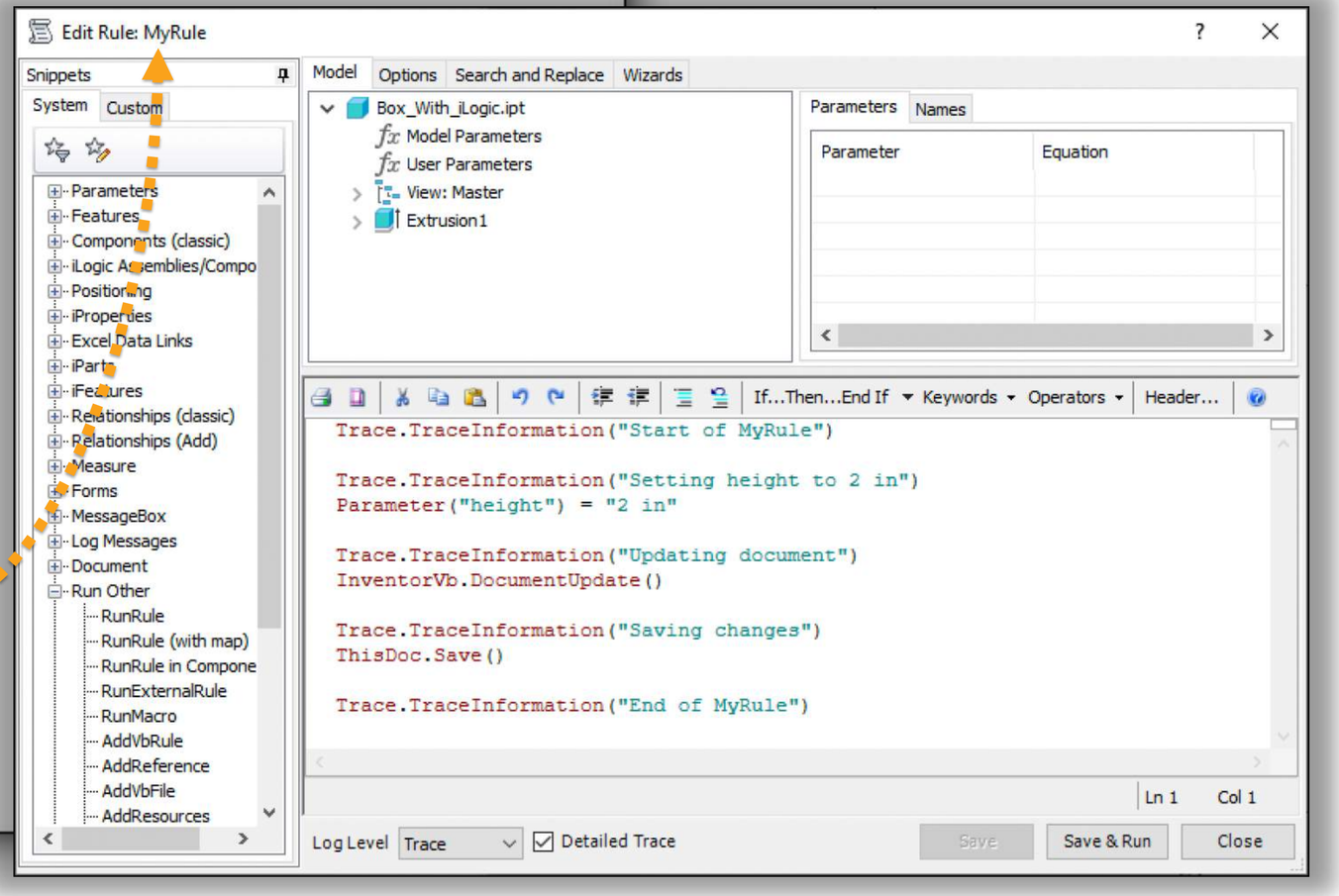
No App Bundle



No App Bundle

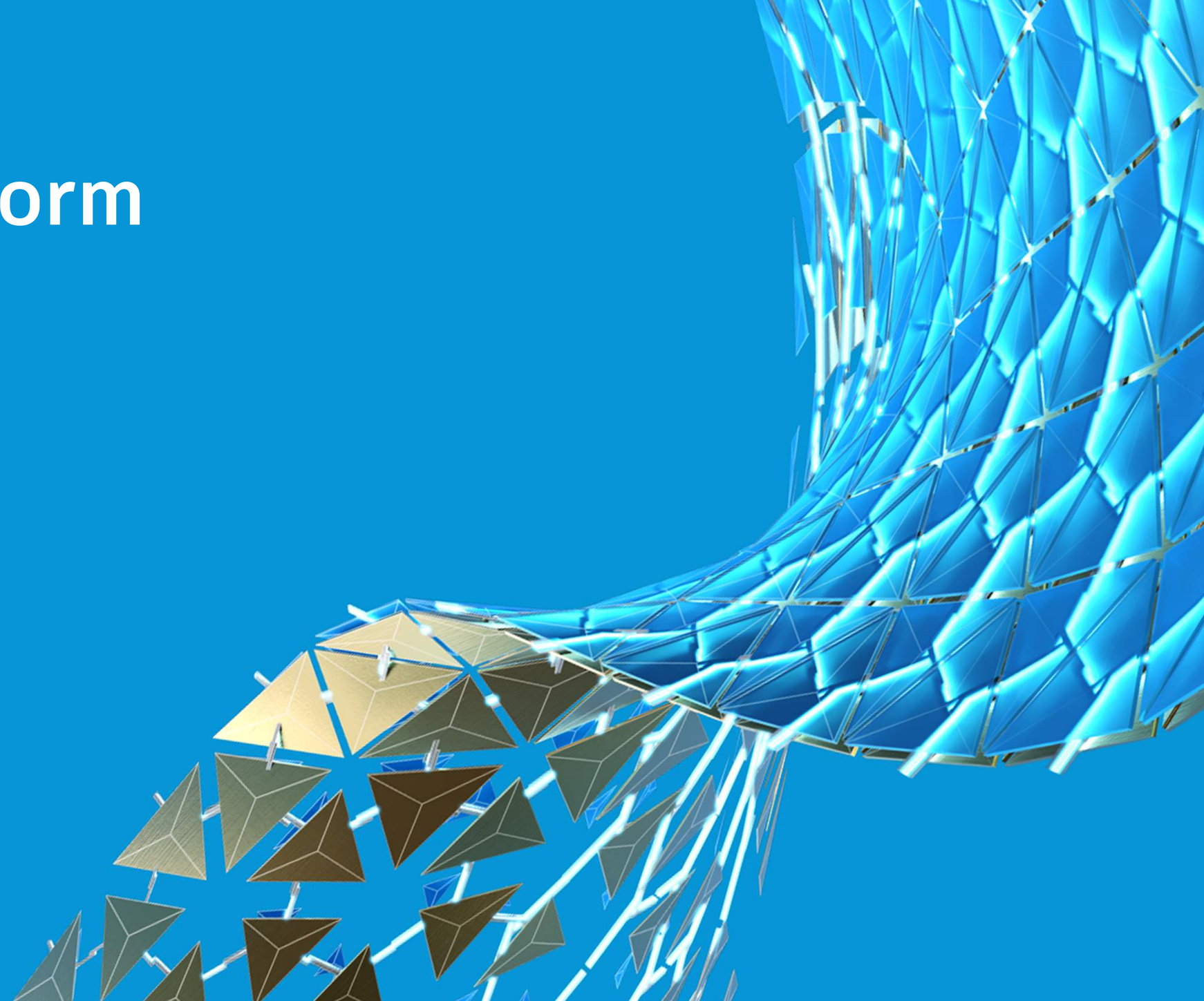
Activity

```
{
  "commandLine": [
    "$(engine.path)\\InventorCoreConsole.exe /i $(args[inputFile].path) /s $(settings[script].path)"
  ],
  "parameters": {
    "inputFile": {
      "verb": "get",
      "localName": "inputFile.ipt"
    },
    "outputFile": {
      "verb": "put",
      "localName": "inputFile.ipt"
    }
  },
  "id": "rGm0mO9jVSsD2yBEDk9MRtXQTwsa61y0.RunRule+prod",
  "engine": "Autodesk.Inventor+24",
  "appbundles": [],
  "settings": {
    "script": {
      "value": "iLogicVb.RunRule(\"MyRule\")"
    }
  },
  "description": "Running iLogic Rule",
  "version": 1
}
```

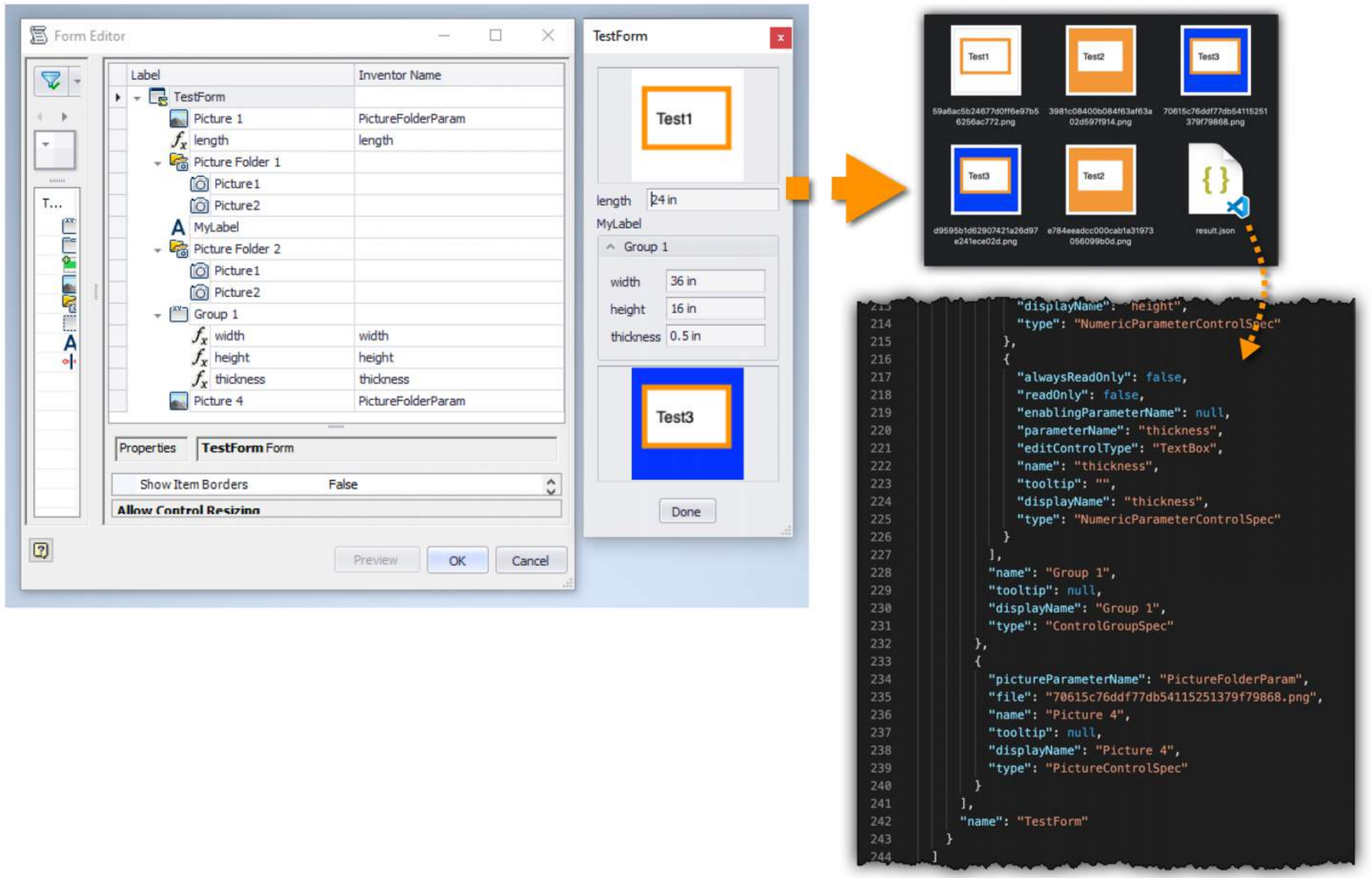


https://forge.autodesk.com/blog/run-ilogic-rule-without-appbundle

Get iLogic Form

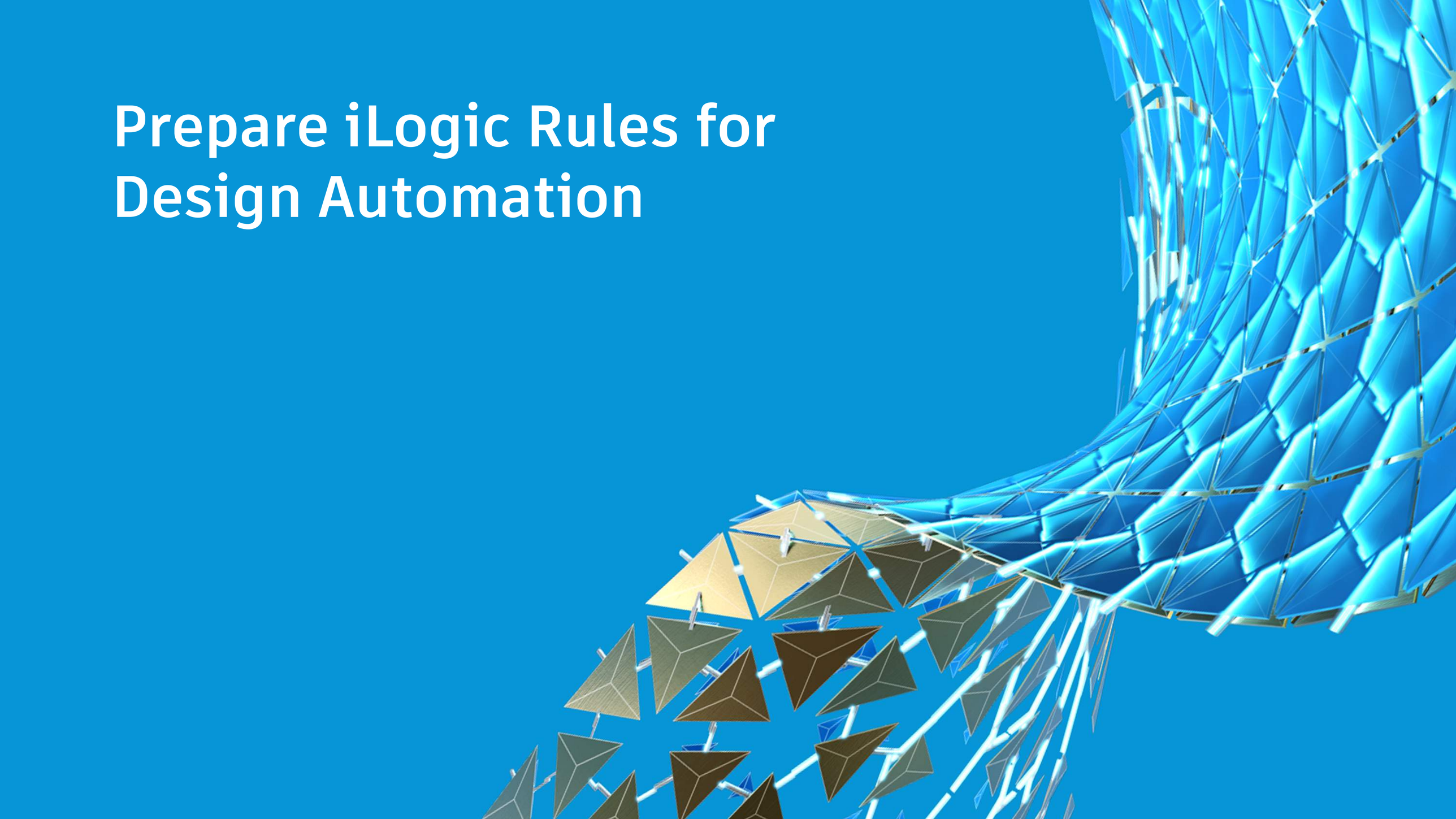


Get iLogic Form

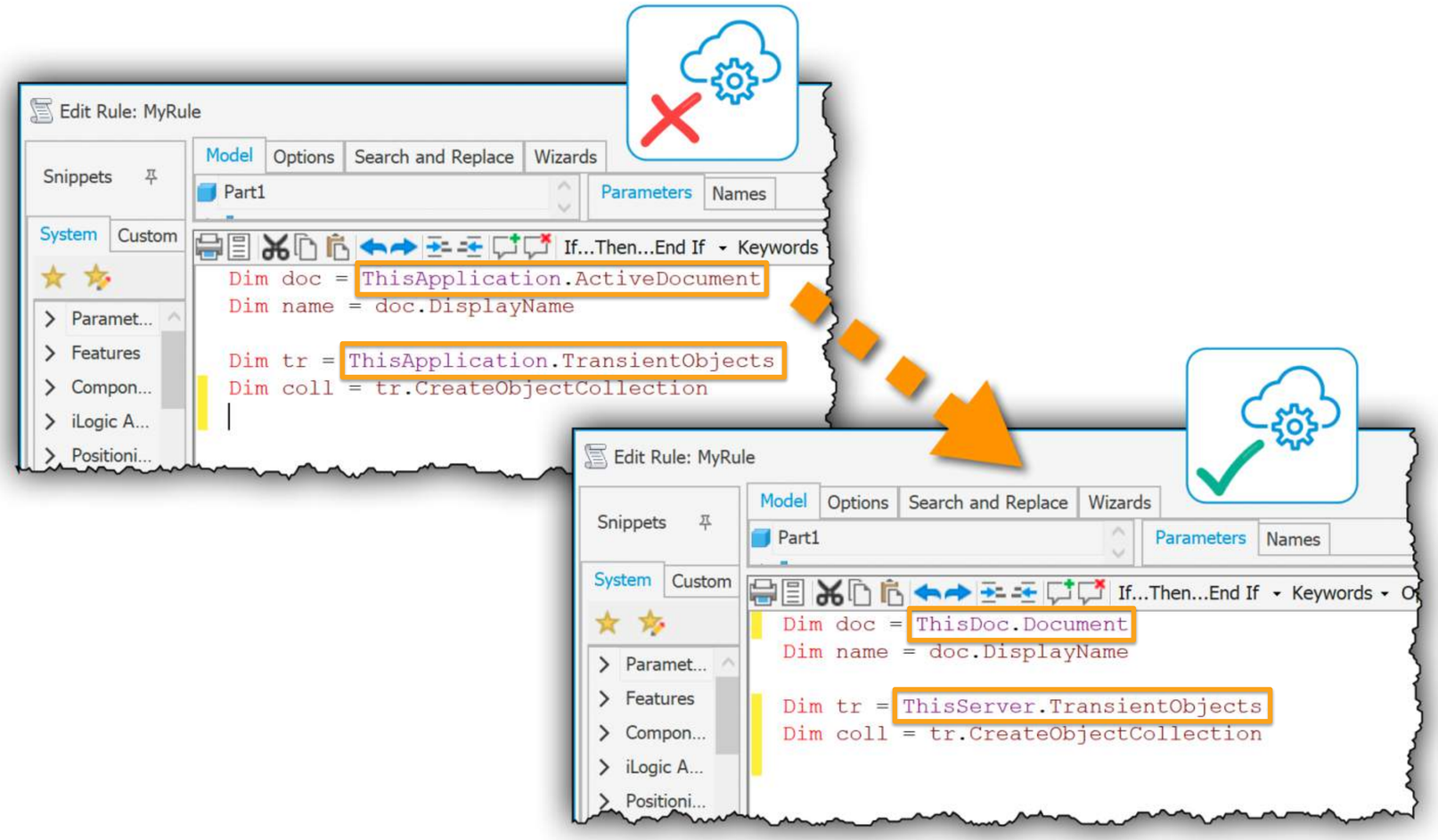


https://forge.autodesk.com/blog/get-ilogic-form-information-inventor-documents

Prepare iLogic Rules for Design Automation

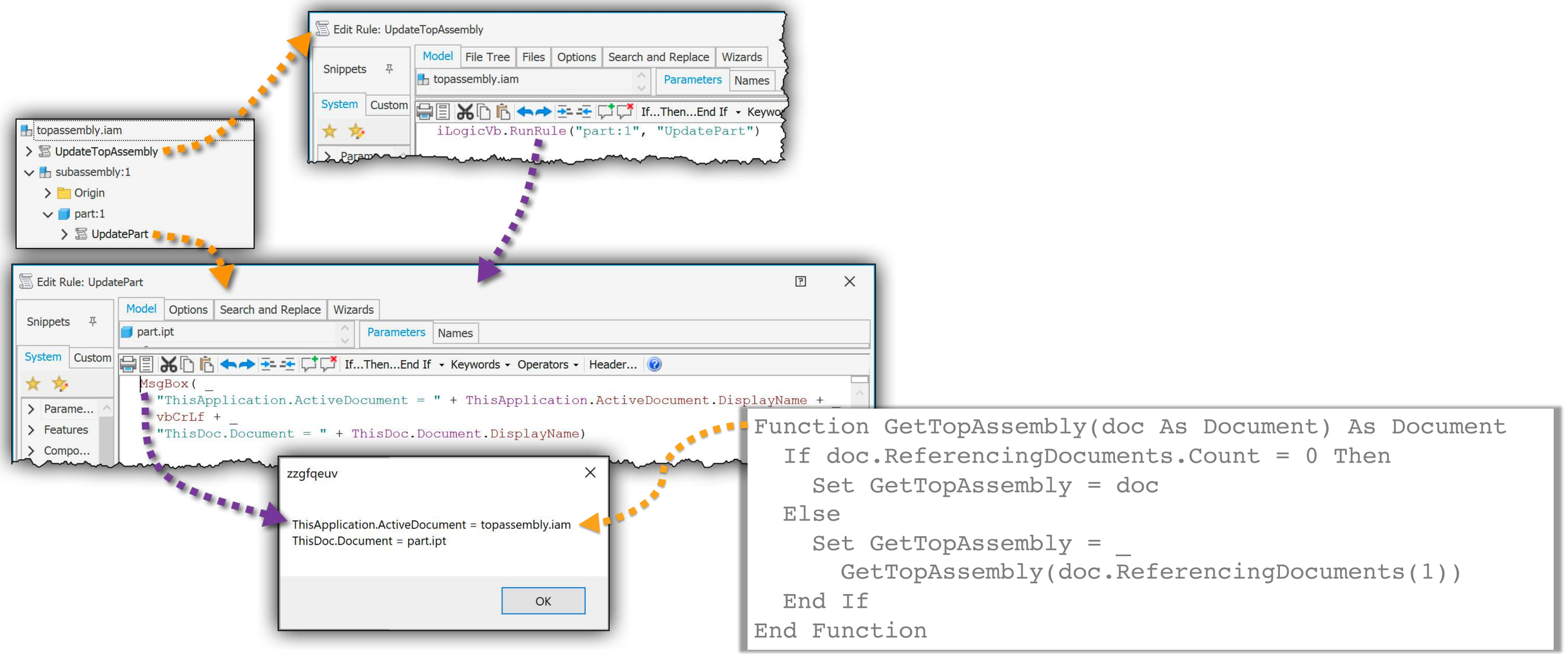


Prepare iLogic Rules for Design Automation



https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

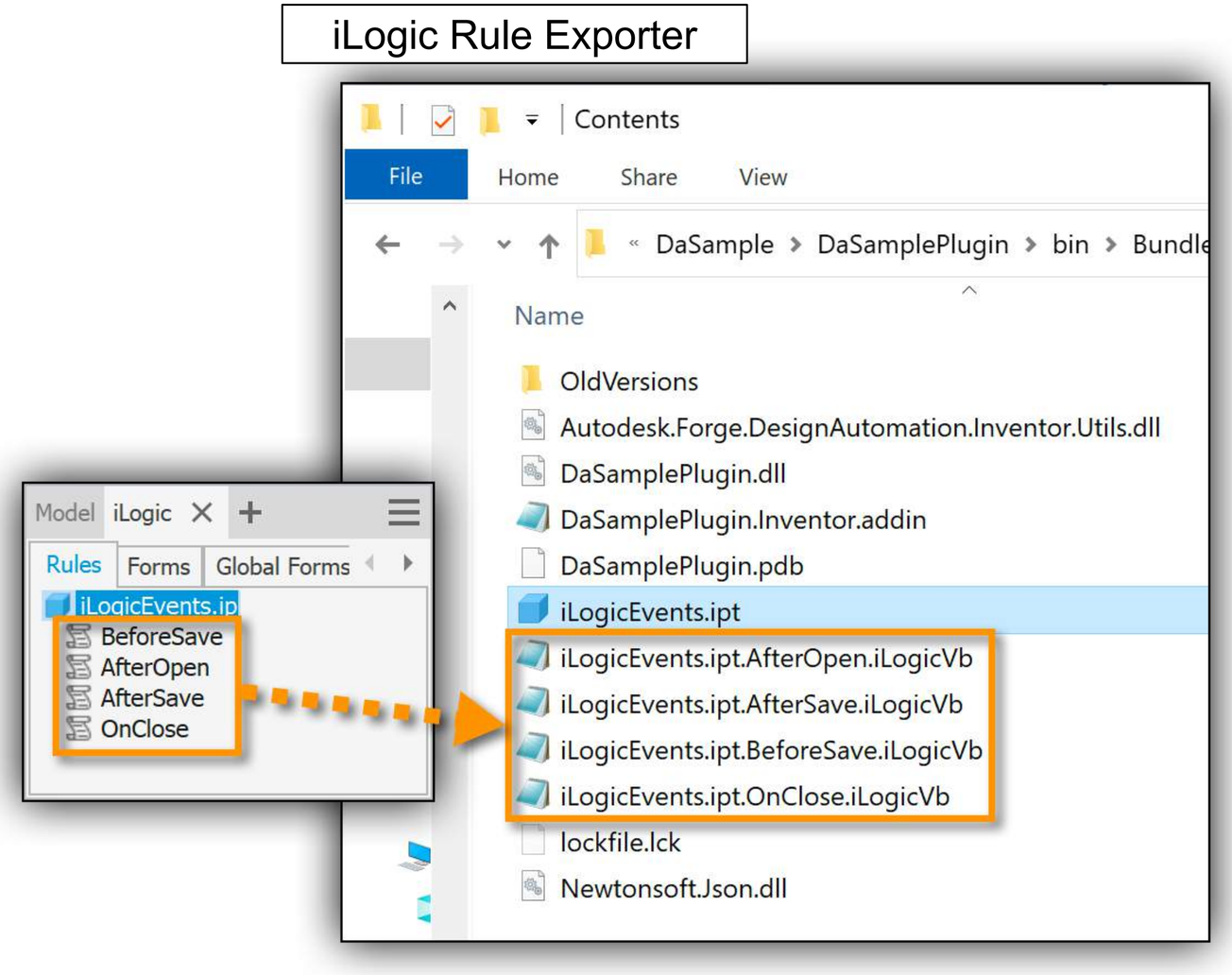
Prepare iLogic Rules for Design Automation



https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

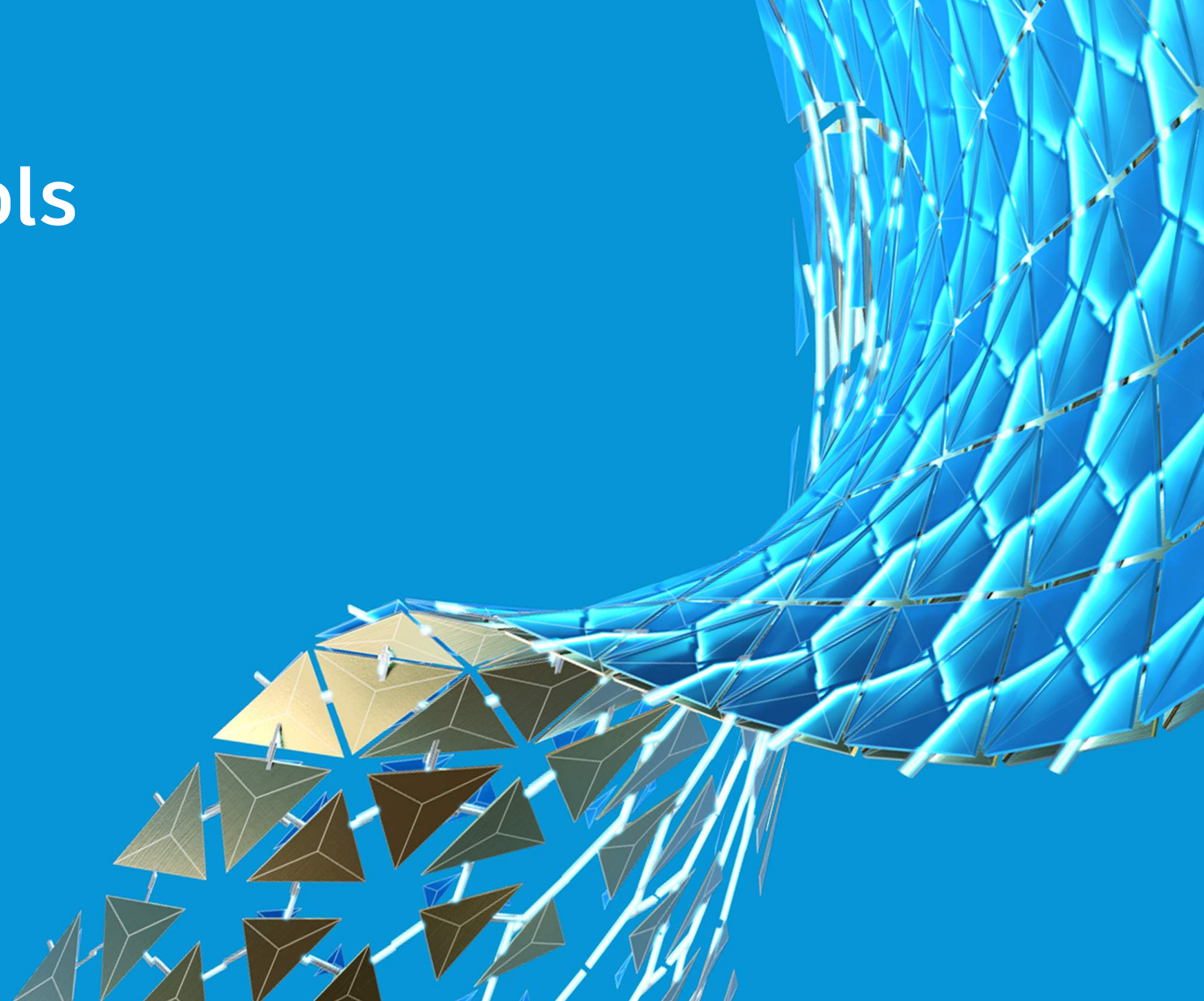
Prepare iLogic Rules for Design Automation

```
MessageBox.Show()
MsgBox()
iLogicForm.Show()
InputBox()
Etc
```



https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

Buckets Tools



Buckets Tools

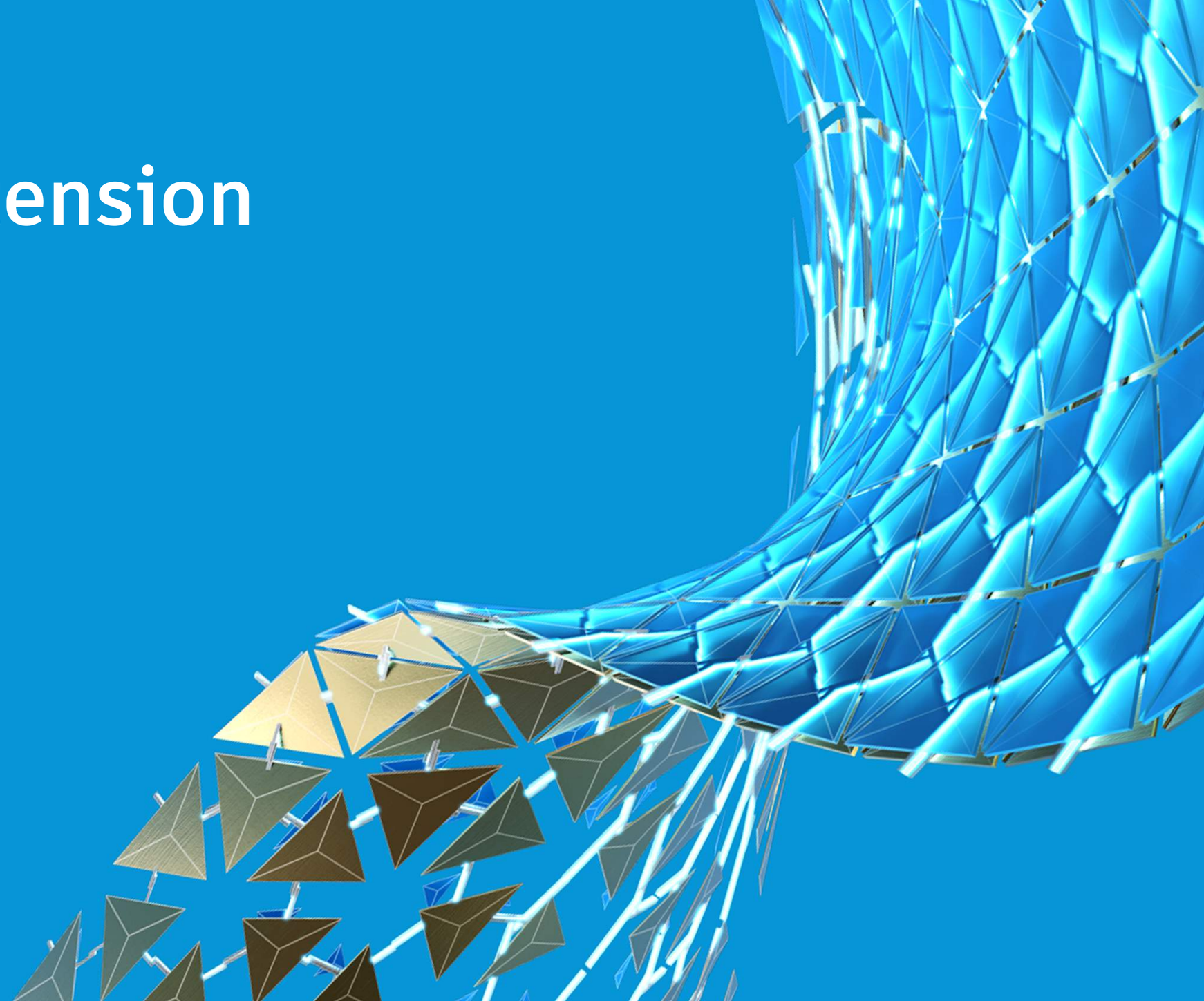
https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

Design Automation Tools

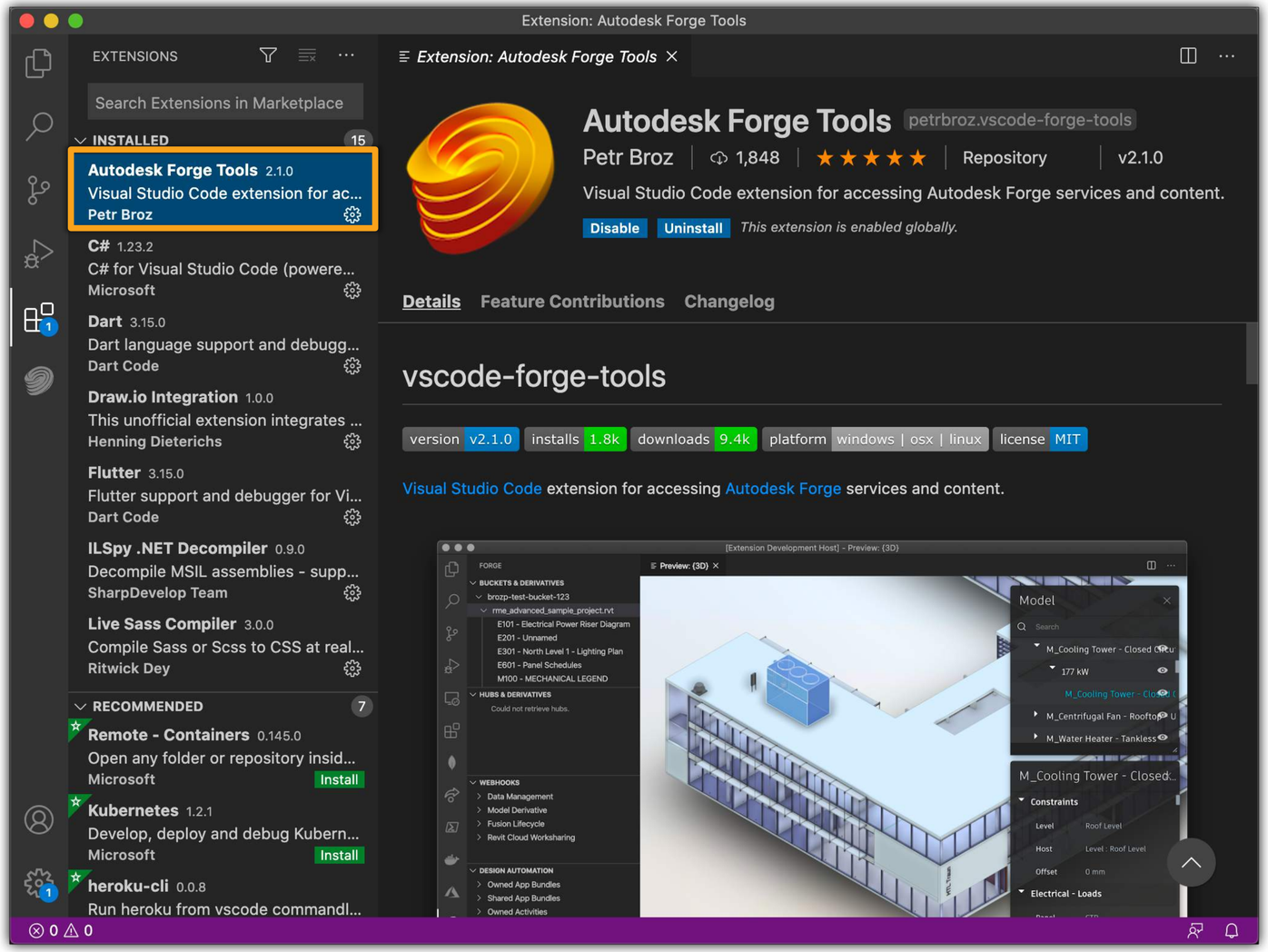
Design Automation Tools

https://forge.autodesk.com/blog/prepare-ilogic-rules-design-automation

VS Code Extension

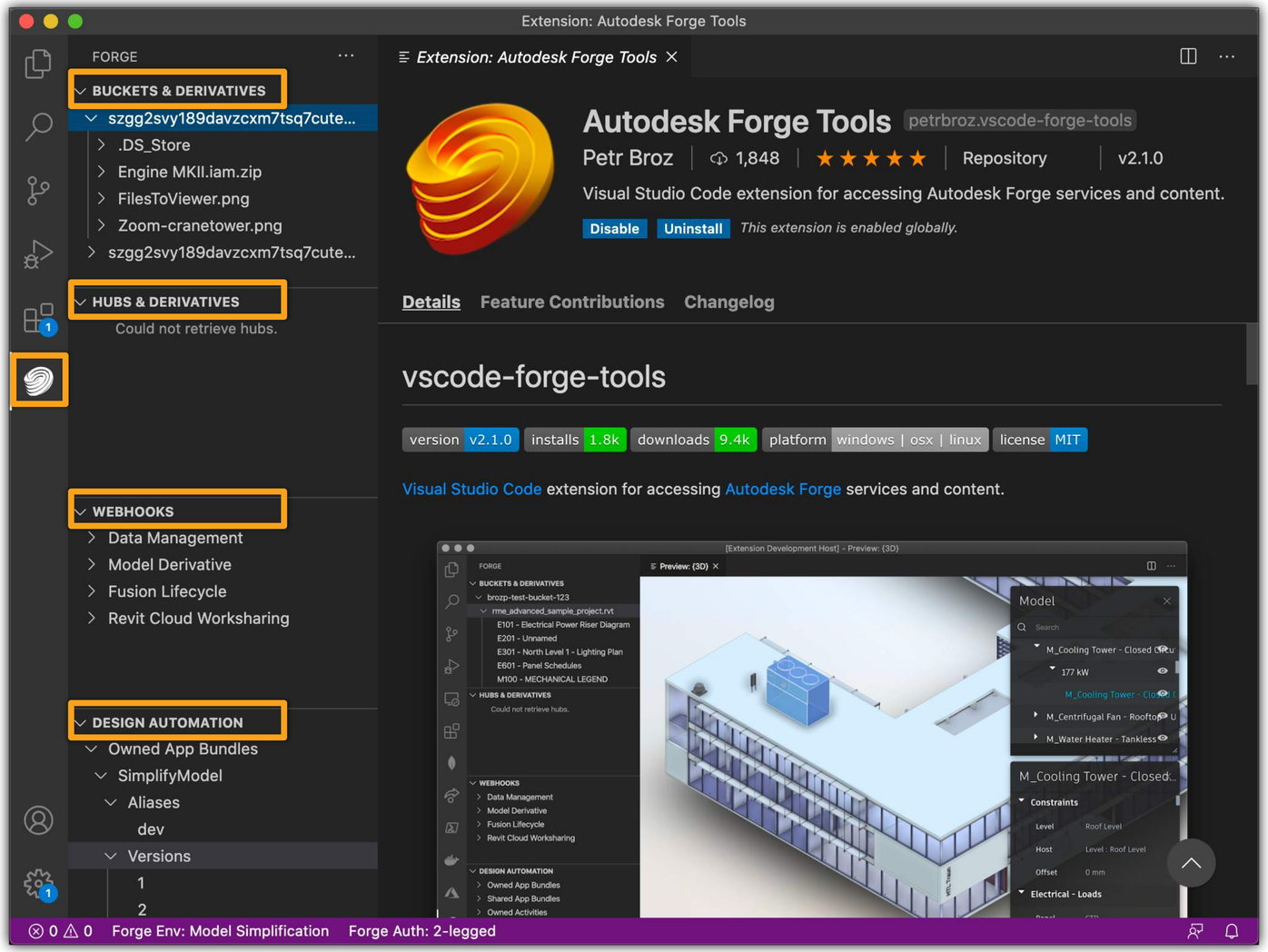


VS Code Extension



https://forge.autodesk.com/blog/forge-visual-studio-code

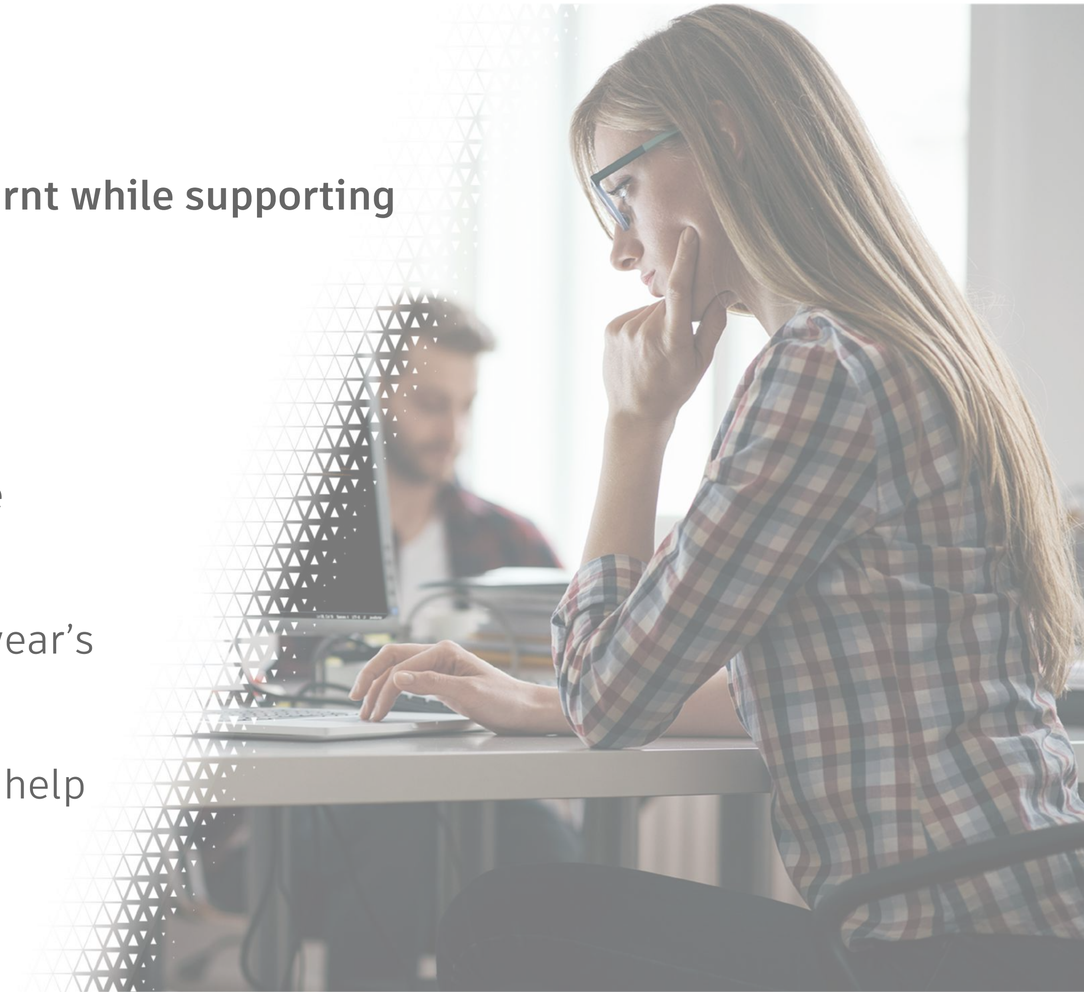
VS Code Extension



https://forge.autodesk.com/blog/forge-visual-studio-code

Questions?

- **During AU**
  - There will be a scheduled Q&A for this class
    - Check the class page for details
    - Class is identified as **SD473689 - Tips & Tricks: what I learnt while supporting Design Automation for Inventor**
  - Comments / Questions section on the Class page
  - Forge Answer Bar
    - Search for the Answer Bar from AU site, and then find the Forge specific one
    - Time slots will be available around the clock during this year's Virtual AU event!
    - Also languages and experts will be advertised, so we can help you as much as possible in a "live" setting



Questions?

- **Anytime**
  - Look for related topics in the Forge blog, documentation and code samples:
    - https://forge.autodesk.com/en/docs/design-automation/v3/developers_guide/overview/
  - Forge Help: https://forge.autodesk.com/en/support/get-help
  - Have an idea for an awesome Forge App, but need help getting started?
    - Join an accelerator: https://forge.autodesk.com/accelerator-program