AUTODESK UNIVERSITY

AS223963-L

Getting Started with Customizing Dynamo for the Non-Programmers Using C#

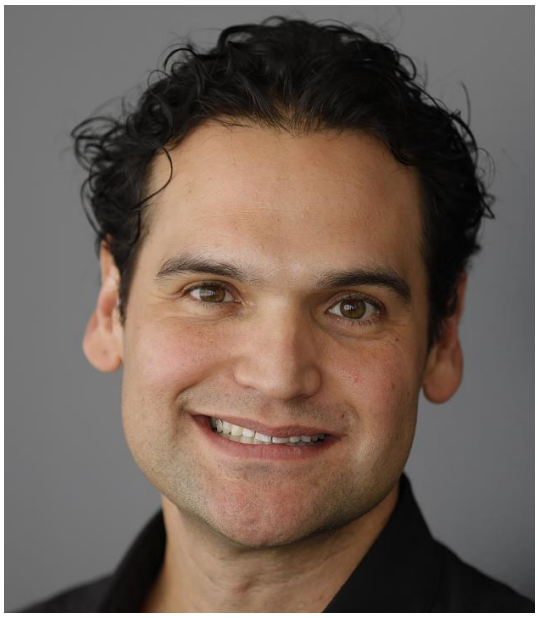
Marcello Sgambelluri SE
Director of Advanced Technology
John A. Martin Structural Engineers

Learning Objectives

- Learn how to create custom nodes using C# and Zero Touch
- Learn to use custom nodes to enhance your production on daily tasks
- Learn to have fun with Dynamo
- Learn how to use custom nodes from the package manager

Description

Are you using Dynamo? Need more from what is available with out-of-the-box nodes? Have you ever wanted to make a custom node in Dynamo but didn't have any programming skills to get started? If so, this class is for you! This lecture will explain how to use and create your own custom nodes using Zero Touch and C# programming language. This lecture will also give attendees very gradual doses of Dynamo and C# programming, so they leave with the skills to apply Dynamo at the workplace on practical projects. No C# programming experience is required; this class is meant for the nonprogrammer. Revit software experience is required.



Speaker

Marcello Sgambelluri currently serves as the BIM Director at John A. Martin & Associates Structural Engineers in Los Angeles. Marcello has worked on many BIM projects over the last 20 years as a project manager, design engineer, and BIM Director. Some of the BIM projects Marcello has worked on includes the Walt Disney Concert Hall in Los Angeles - CA, the Ray and Maria Stata Technology Center at MIT, Tom Bradley International Terminal Expansion at LAX. Marcello is internationally recognized at one of the top BIM leaders and contributors to the education and implementation of BIM technology in the building industry. Marcello continually speaks at Autodesk University and the Revit Technology Conference (BILT) where he has received the 1st place speaker award for a record 14 times between 2012 thru 2018 between both conferences. Marcello received his Bachelors and Master's degrees in Civil Engineering and he is also a licensed Civil and Structural Engineer.

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Pre Exercise Steps

CREATE A NEW C#
ZERO TOUCH LIBRARY IN DYNAMO PART 1

STEPS

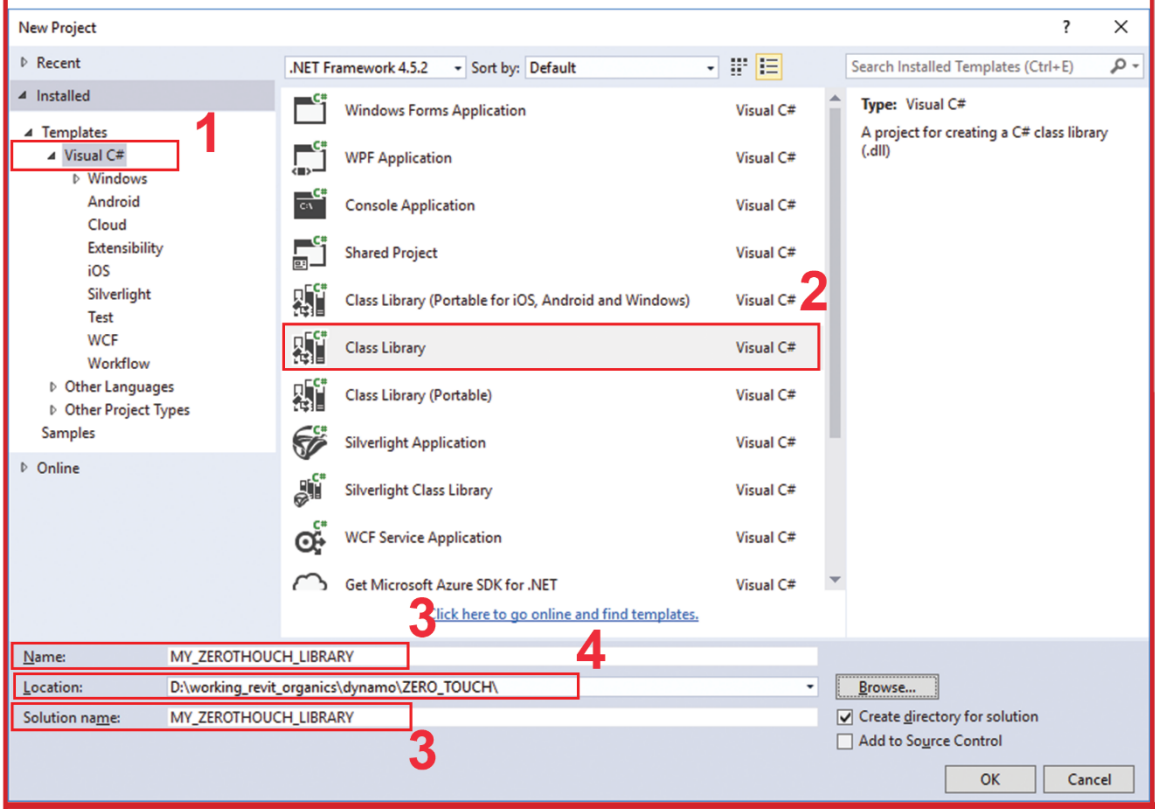
STEP 1:
OPEN VISUAL STUDIO AND START A NEW PROJECT SELECT C#

STEP 2:
SELECT THE CLASS LIBRARY. THE CLASS LIBRARY IS WHAT WILL "HOLD" THE DYNAMO NODES

STEP 3:
TYPE THE NAME OF THE PROJECT. THE PROJECT NAME WILL BE THE NAME OF THE .DLL. THIS IS ALSO KNOWN IN ZERO TOUCH AS YOUR "LIBRARY". THIS "DLL" WILL BE THE FILE THAT CONTAINS ALL THE NODES.

STEP 4:
SAVE THE PROJECT "DLL" TO A FOLDER. THIS FOLDER WILL BE THE LOCATION WHERE ALL THE SOLUTION FILES WILL BE STORED SO CHOOSE THIS CAREFULLY.

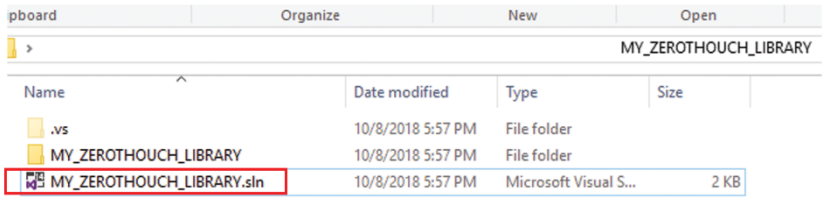
VISUAL STUDIO START SCREEN



NOTES

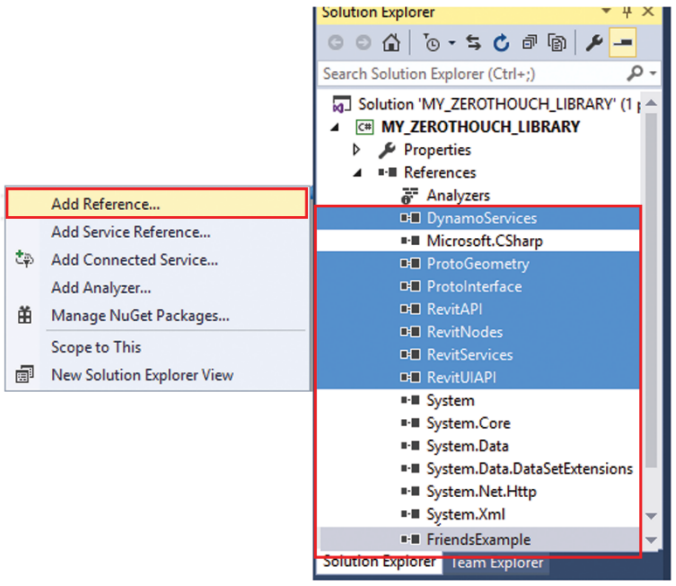
NOTES:
UNDERSTANDING THE STRUCTURE OF THE ZERO TOUCH PROJECT IS IMPORTANT AS IT WILL DETERMINE THE ORGANIZATION OF THE DYNAMO NODE LIBRARY. A LIBRARY IS A COLLECTION OF DYNAMO NODES.

CREATE A NEW C#
ZERO TOUCH LIBRARY IN DYNAMO PART 2 REFERENCES



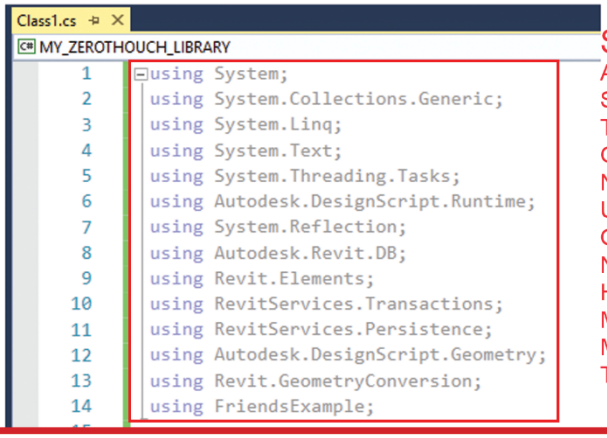
STEP 1:

NAVIGATE TO THE FOLDER THAT THE PROJECT IS STORED AND CLICK ON THE SOLUTION FILE ".SLN



STEP 2:

RIGHT CLICK OVER THE REFERENCES IN THE SOLUTION EXPLORER IN VISUAL STUDIO AND ADD THE PROPER REFERENCES THAT ARE ".DLL" FORMAT. REFERENCES ARE ANY PRESET LIBRARY THAT THE CURRENT PROGRAM NEEDS TO USE TO RUN PROPERLY. KNOWING WHICH REFERENCES TO ADD IS NOT ALWAYS EASY. IN THIS CASE SINCE, THE REVIT DATABASE WILL BE ACCESSED THEN REVIT REFERENCES ASS SHOWN NEED TO BE ADDED ALSO THE "FRIENDSEXAMPLE" REFERENCES MUST BE ADDED AS WELL.
(ALSO SEE NOTES BELOW)



STEP 3:

ADD USING STATEMENTS BY SIMPLY TYPING THEM IN AT THE TOP OF THE SCREEN. TYPE THE ONES SHOWN.
NOTE:
USING STATMENTS ARE NOT REQUIRED TO CREATE A DYNAMO NODE HOWEVER THEY ARE VERY HELPFUL BECAUSE USING STATEMENTS "SHORTEN" WHAT COMMANDS THAT NEEDED TO BE TYPE IN THE CODE.

VISUAL STUDIO START SCREEN STEPS

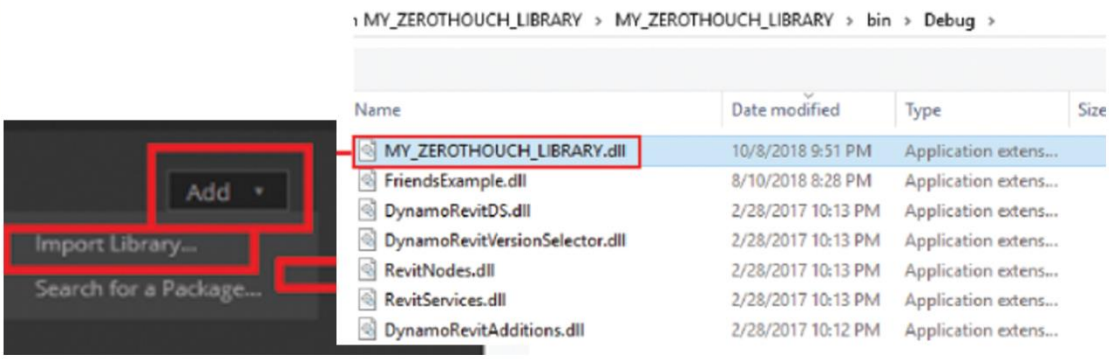
NOTES:
ADDING THE CORRECT REFERENCES AND FINDING THEM IS NOT ALWAYS VERY EASY. IT IS SOMETIMES EASIER TO GET THE REFERENCES AND USING STATEMENTS FROM A PREVIOUS PROJECT. OPEN THE "MY ZEROTOUCH LIBRARY' SAMPLE FILE TO START OR GET THESE REFERENCES.

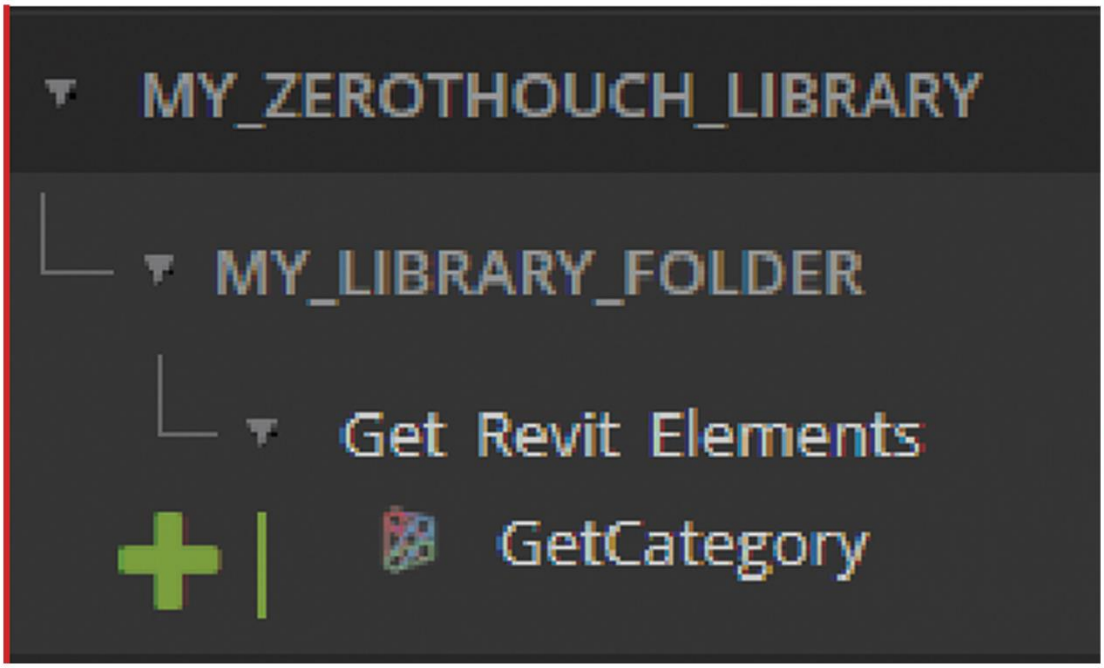
NOTES

LOADING LIBRARY OR "DLL" INTO DYNAMO

LOAD LIBRARY DLL

A. CLICK "ADD" + "IMPORT LIBRARY"
B. BROWSE TO FILE
"EXAMPLENAME\START\MY_ZEROTHOUCH_LIBRARY\bin\Debug\MY_ZEROTHOUCH_LIBRARY.DLL





LOADING DLL INTO DYNAMO

THIS IS ONLY ONE METHOD TO GET THE COMPILED "BUILD" DLL CREATED WITH ZERO TOUCH INTO DYNAMO. WITH THIS METHOD, AN NODE FROM THE LIBRARY "DLL" MUST BE PLACED ON THE CANVAS IN ORDER FOR THE DLL TO REMAIN. A "PACKAGE" COULD BE CREATED AND LOADED INTO DYNAMO WITH THE DLL AND THE "ADD" DOES NOT NEED TO BE USED

NOTES

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Lab Exercises
Main Examples

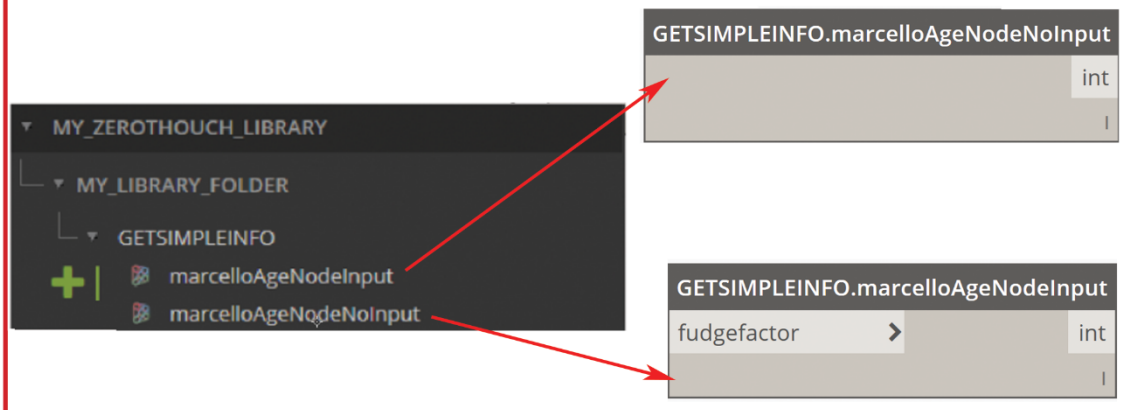
Final Nodes in Simplex Dynamo Package

GET MARCELLO'S AGE
ZERO TOUCH NODE W/ AND W/O INPUT

ZEROTOUCH CODE

```
using FriendsExample;

namespace MY_LIBRARY_FOLDER
{
    public class GETSIMPLEINFO
    {
        private GETSIMPLEINFO()
        {
        }

        public static int marcelloAgeNodeNoInput()
        {
            int marcelloAge = Friends.Marcello.Age;
            return marcelloAge;
        }

        public static int marcelloAgeNodeInput(int fudgefactor = 0)
        {
            int marcelloAge = Friends.Marcello.Age - fudgefactor;
            return marcelloAge;
        }
    }
}
```

DYNAMOLIBRARY + ZT NODES



STEPS

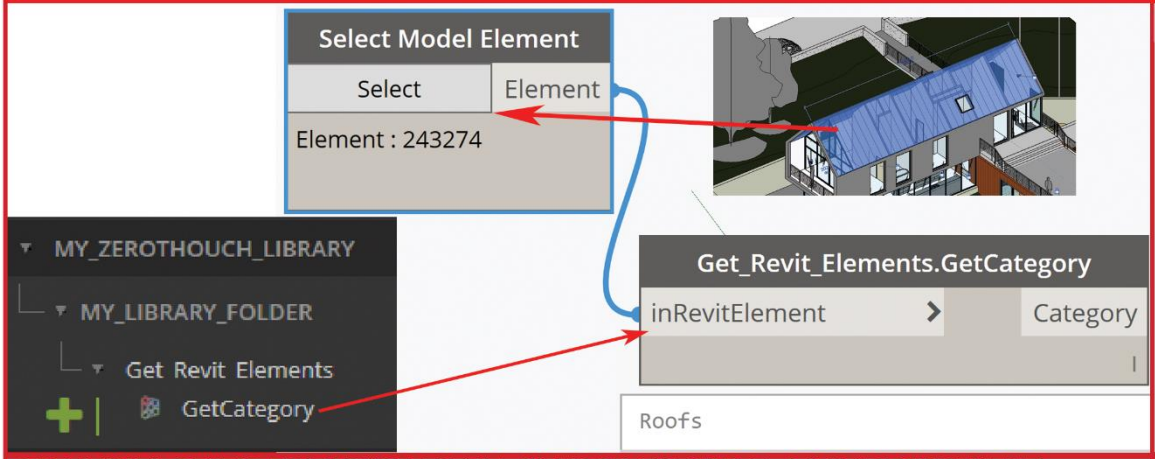
NOTES:
OPEN VISUAL STUDIO FOLDER "GET_MARCELLO_AGE_ZT_START" CLICK ON THE SLN FILE.
TYPE CODE AS SHOWN FOR BOTH WITH AND WITHOUT INPUT PORT CASE. BUILD THE SOLUTION.
OPEN DYNAMO VIA REVIT AND LOAD THE DLL FROM BIN DIR. OPEN "FINAL" FOLDER IF NEEDED.

GET REVIT CATEGORY FROM WRAPPED DYNAMO ELEMENT

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{

    public class Get_Revit_Elements
    {

        private Get_Revit_Elements()
        {
        }
        //Revit.Elements means wrapped Revit Element
        //Autodesk.Revit.DB means Unwrapped Revit Element

         public static Revit.Elements.Category
         GetCategory(Revit.Elements.Element inRevitElement)
        {
            Revit.Elements.Category CATFROMINPUT
            = inRevitElement.GetCategory;
            return CATFROMINPUT;
        }
    }
}
```

DYNAMO ZT NODES



STEPS

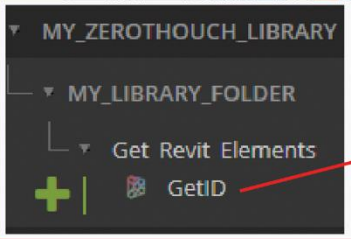
OPEN VISUAL STUDIO FOLDER "GET_REVIT_CATEGORY_WRAPPED_START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE "GET_REVIT_CATEGORY_WRAPPED_START.rvt"
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED.

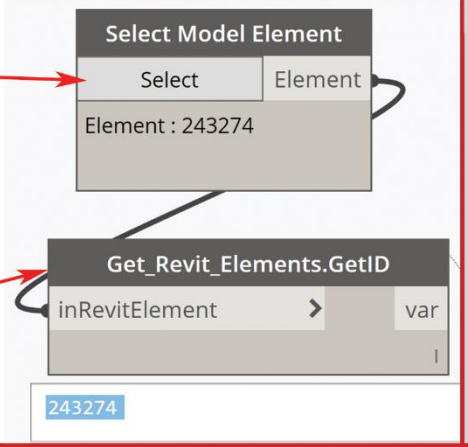
GET REVIT ELEMENT ID FROM UNWRAPPED DYNAMO ELEMENT

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{

    public class Get_Revit_Elements
    {

        private Get_Revit_Elements()
        {
        }
        public static Autodesk.Revit.DB.ElementId GetID
            (Revit.Elements.Element inRevitElement)
        {
            //unwrap
            //Revit.Elements means wrapped Revit Element
            //Autodesk.Revit.DB means Unwrapped Revit Element
            Autodesk.Revit.DB.Element UnwrappedElement
                = inRevitElement.InternalElement;
            Autodesk.Revit.DB.ElementId UnwrappedElementID
                = UnwrappedElement.Id;

            return UnwrappedElementID;
        }
    }
}
```

DYNAMO ZT NODES





STEPS

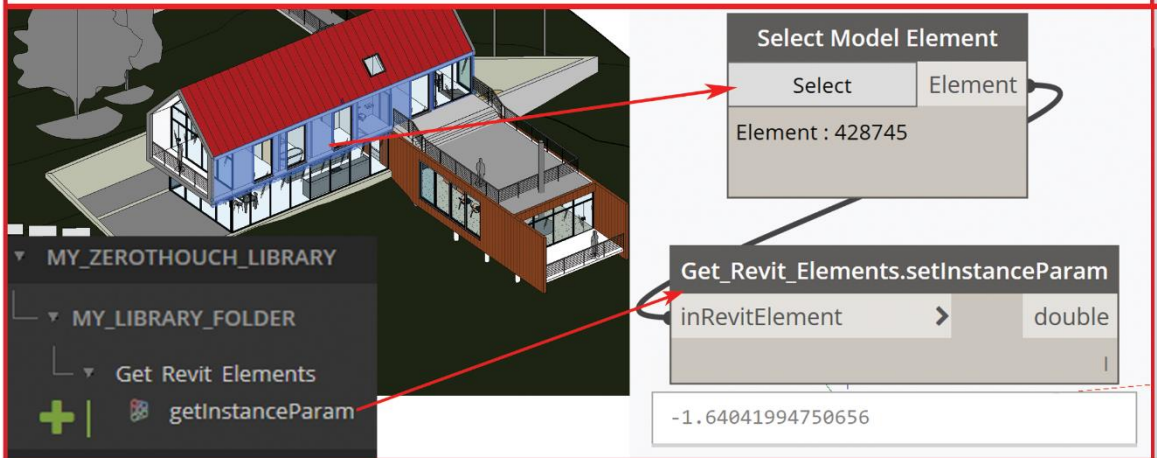
OPEN VISUAL STUDIO FOLDER "GET_REVIT_ID_UNWRAPPED_START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE "GET_REVIT_IS_UNWRAPPED_START.rvt"
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED.

GET REVIT WALL BASE OFFSET PARAMETER VIA UNWRAPPED DYNAMO ELEMENT

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{
    public class Get_Revit_Elements
    {
        private Get_Revit_Elements()
        {
        }
        public static Double getInstanceParam
          (Revit.Elements.Element inRevitElement)
        {
            //unwrap
            Autodesk.Revit.DB.Element UnwrappedElement
            = inRevitElement.InternalElement;
            Double UnwrappedElementParameterValue
            = UnwrappedElement.get_Parameter
            (BuiltInParameter.WALL_BASE_OFFSET).AsDouble();
            return UnwrappedElementParameterValue;
        }
    }
}
```

DYNAMO ZT NODES



STEPS

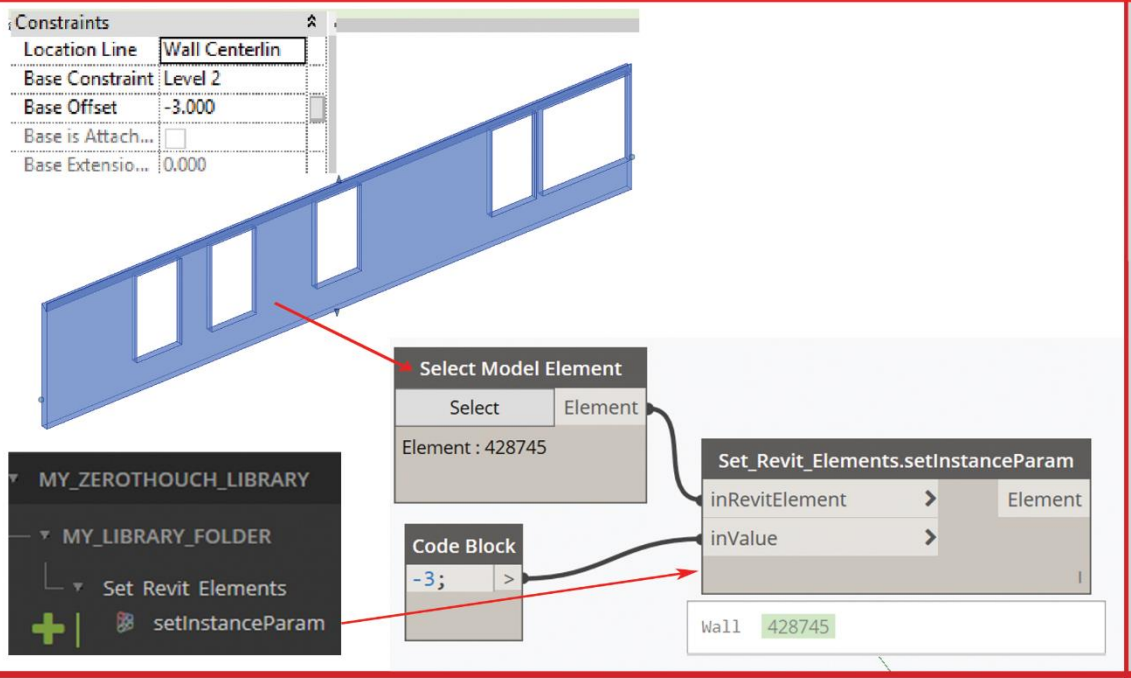
OPEN VISUAL STUDIO FOLDER "GET_REVIT_PARAMETER_START_START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE "GET_REVIT_PARAMETER_START_START.rvt"
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

SET REVIT WALL BASE OFFSET PARAMETER VIA UNWRAPPED DYNAMO ELEMENT

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{
    public class Set_Revit_Elements
    {
        private Set_Revit_Elements()
        {
        }

        public static Revit.Elements.Element setInstanceParam
            (Revit.Elements.Element inRevitElement, Double inValue)
        {
            //unwrap
            Autodesk.Revit.DB.Element UnwrappedElement = inRevitElement.InternalElement;
            //Start Transaction because changing the Revit DataBase
            //Get Current Document (standard stuff)
            Autodesk.Revit.DB.Document doc = DocumentManager.Instance.CurrentDBDocument;
            TransactionManager.Instance.EnsureInTransaction(doc);
            UnwrappedElement.get_Parameter(BuiltInParameter.WALL_BASE_OFFSET).Set(inValue);
            //End Transaction because changing the Revit DataBase
            TransactionManager.Instance.TransactionTaskDone();
            return inRevitElement;
        }
    }
}
```

DYNAMO ZT NODES



STEPS

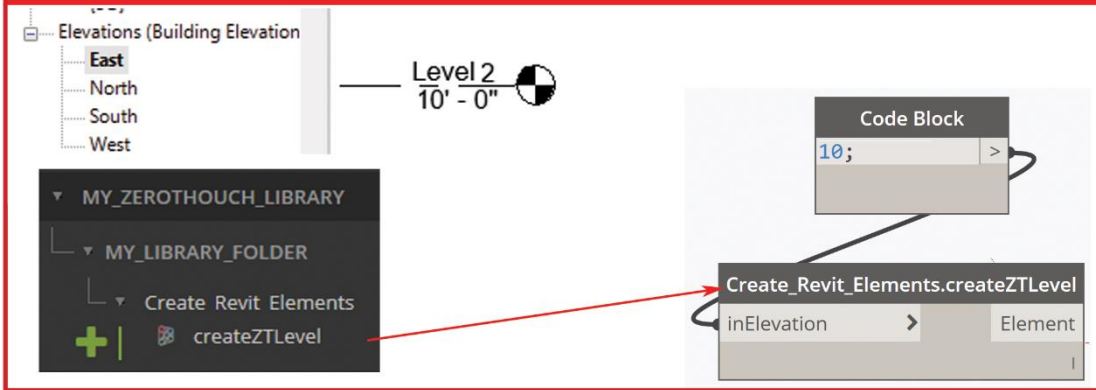
OPEN VISUAL STUDIO FOLDER "SET_REVIT_PARAMETER_START_START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE "SET_REVIT_PARAMETER_START_START.rvt"
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

CREATE REVIT LEVELS VIA ZT VIA TRANSACTIONS AND WRAPPING

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{
    public class Create_Revit_Elements
    {
        private Create_Revit_Elements()
        {
        }

        public static Revit.Elements.Element
            createZTSomething(double inElevation)
        {
            //Get Current Document (standard stuff) +
            //Start Transaction because changing the Revit DataBase
            Autodesk.Revit.DB.Document doc =
                DocumentManager.Instance.CurrentDBDocument;
            TransactionManager.Instance.EnsureInTransaction(doc);

            //End Transaction because changing the Revit DataBase
            Autodesk.Revit.DB.Level newLevel =
                Autodesk.Revit.DB.Level.Create(doc, inElevation);
            TransactionManager.Instance.TransactionTaskDone();

            //wrapit! since Revit element generated in Code and sent to Dynamo
            Revit.Elements.Element wrappedLevel = newLevel.ToDSType(false);

            return wrappedLevel;
        }
    }
}
```

DYNAMO ZT NODES



STEPS

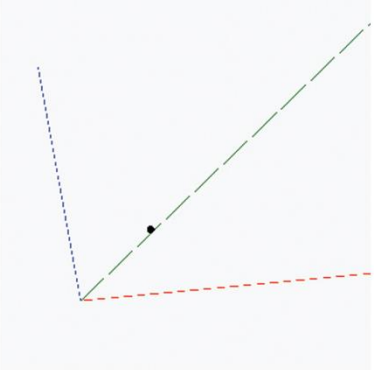
OPEN VISUAL STUDIO FOLDER "CREATE_REVIT_LEVEL...START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE "CREATE_REVIT_LEVEL...START.rvt"
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

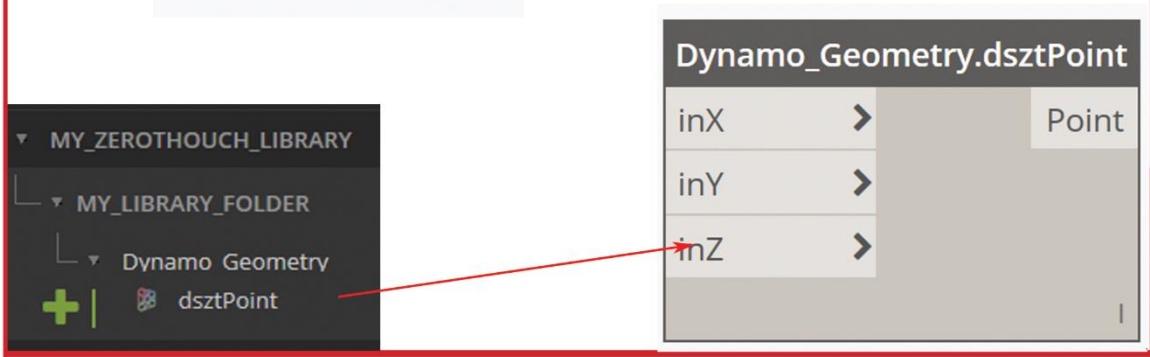
CREATE A DYNAMO POINT VIA DEFAULT X,Y,Z =1

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{
    public class Dynamo_Geometry
    {
        private Dynamo_Geometry()
        {
        }
        public static Autodesk.DesignScript.Geometry.Point dsztPoint
            (double inX = 1, double inY = 1, double inZ = 1)
        {
            //Autodesk.DesignScript.Geometry.Point  is a Dynamo point
            Autodesk.DesignScript.Geometry.Point dPt =
                Autodesk.DesignScript.Geometry.Point.ByCoordinates(inX, inY, inZ);
            return dPt;

        }
    }
}
```

DYNAMO ZT NODE





STEPS

OPEN VISUAL STUDIO FOLDER "CREATE_DYNAMO_POINT_START" OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.

OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN "FINAL" FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

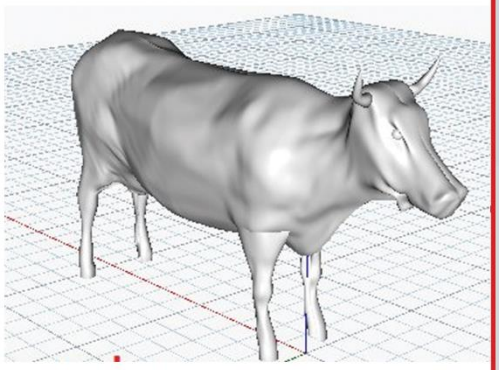
CREATE A COW IN DYNAMO WITH MULTIPLE OUTPUT PORTS

USE A MULTIRETURN TAG IF THERE IS MORE THAN 1 OUTPUT PORT

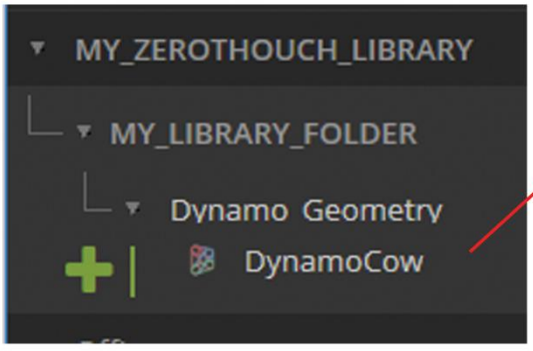
```
//SETTING UP MULTIPLE RETURNS TAG
[MultiReturn(new[] { "LeftBody", "LeftLeg", "RightBody", "RightLeg",
    "LeftEye", "RightEye", "LeftHorn", "RightHorn" })]
.....................................
 //RETURNING
 Dictionary<string, object> OutInfo =
      new Dictionary<string, object>
 {
     {"LeftBody",Surfacetorso},
     {"LeftLeg",Surfaceleg},
     {"RightBody",MirrorSurfacetorso},
     {"RightLeg",MirrorSurfaceleg},
     {"LeftEye",RotationEyeball},
     {"LeftHorn",RotationHorn},
     {"RightEye",MirrorRotationEyeball},
     {"RightHorn",MirrorRotateHorn},

 };

     return OutInfo;
```

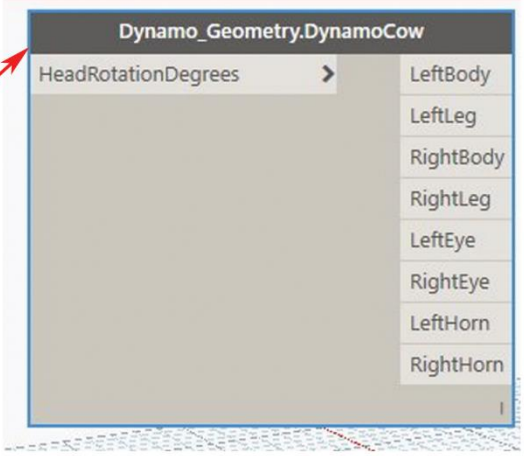
CREATE A DICTONARY TO STORE MULTIPLE OUTPUTS

RETURN THE DICTIONARY



DYNAMO GEOMETRY AND CODE NOTES





DYNAMO NODES

OPEN VISUAL STUDIO FOLDER “CREATE_DYNAMO_COW_FINAL” OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN “FINAL” FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

STEPS & NOTES

ADDITIONAL EXAMPLES

ANATOMY OF A SIMPLE ZERO TOUCH NODE NO INPUT

DESCRIPTIONS

1:
THE NAME OF THE ZERO TOUCH LIBRARY OR HIGHESET LEVEL FOLDER NAME (SHOWN IN THE DYNAMO BROSWER) IS THE NAME OF THE DLL

2:
THE NAME OF THE ZERO TOUCH LIBRARY SUB-FOLDER IS THE NAME OF THE NAMESPACE IN THE ZERO TOUCH CODE

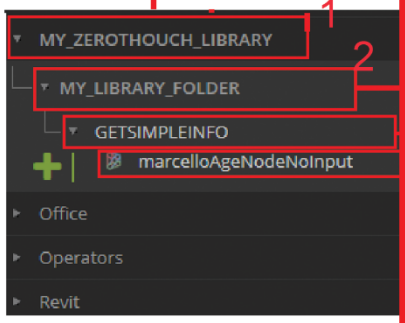
3:
THE NAME OF THE ZERO TOUCH LIBRARY SUB-SUB-FOLDER IS THE NAME OF THE CLASS IN THE ZERO TOUCH CODE

4:
THE NAME OF THE ZERO TOUCH NODE IS THE NAME OF THE METHOD IN THE ZERO TOUCH CODE

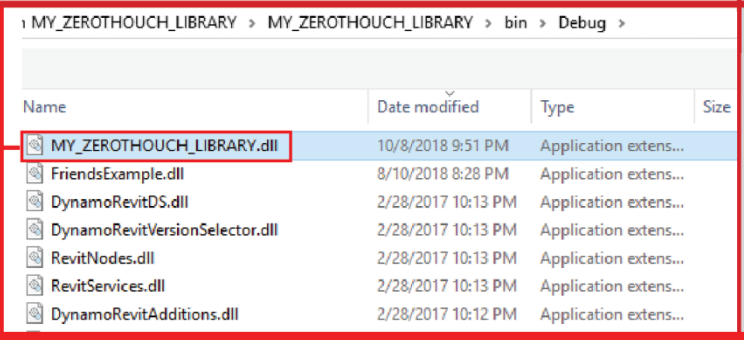
5:
THE NAME OF THE INPUT PORT IS THE NAME OF THE PARAMETER IN THE METHOD (BLANK IN THIS EXAMPLE)

6:
THE NAME OF THE OUTPUT PORT IS THE NAME OF THE METHOD TYPE RETURNED (INT IN THIS EXAMPLE)
ALSO SEE NOTES BELOW.

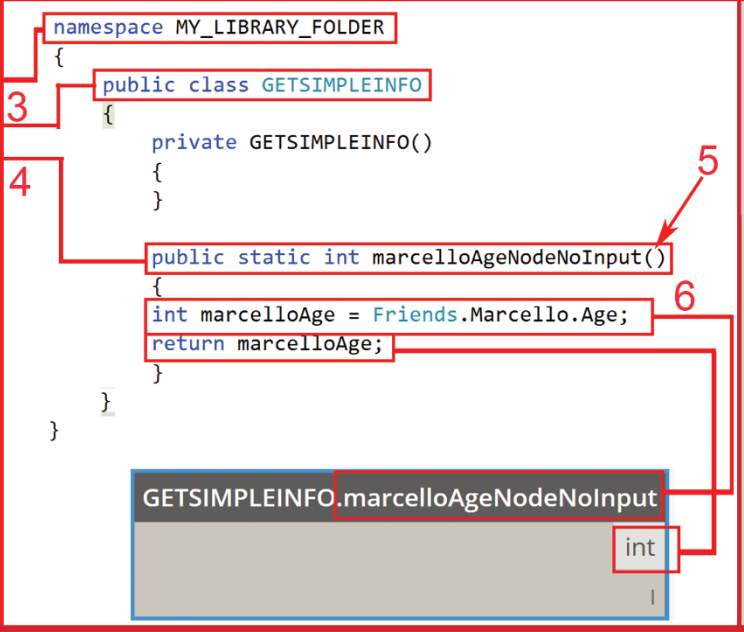
DYNAMO BROWSER



LIBRARY (DLL) LOC.



VISUAL STUDIO CODE



NOTES

NOTES:
UNDERSTANDING THE STRUCTURE OF THE ZERO TOUCH PROJECT IS IMPORTANT AS IT WILL DETERMINE THE ORGANIZATION OF THE DYNAMO NODE LIBRARY. ALSO IF MULTIPLE OUTPUT IS REQUIRED THEN THE METHOD WILL NEED TO OUTPUT A “DICTIONARY” OF MULTIPLE VALUES.

ANATOMY OF A SIMPLE ZERO TOUCH NODE W/ INPUT

DESCRIPTIONS

1: THE NAME OF THE ZERO TOUCH LIBRARY OR HIGHESET LEVEL FOLDER NAME (SHOWN IN THE DYNAMO BROSWER) IS THE NAME OF THE DLL

2: THE NAME OF THE ZERO TOUCH LIBRARY SUB-FOLDER IS THE NAME OF THE NAMESPACE IN THE ZERO TOUCH CODE

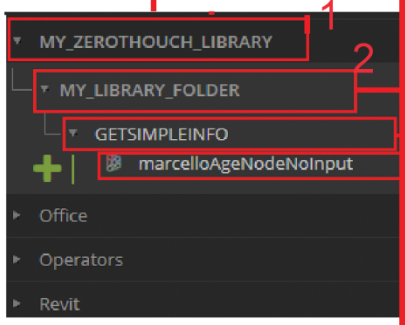
3: THE NAME OF THE ZERO TOUCH LIBRARY SUB-SUB-FOLDER IS THE NAME OF THE CLASS IN THE ZERO TOUCH CODE

4: THE NAME OF THE ZERO TOUCH NODE IS THE NAME OF THE METHOD IN THE ZERO TOUCH CODE

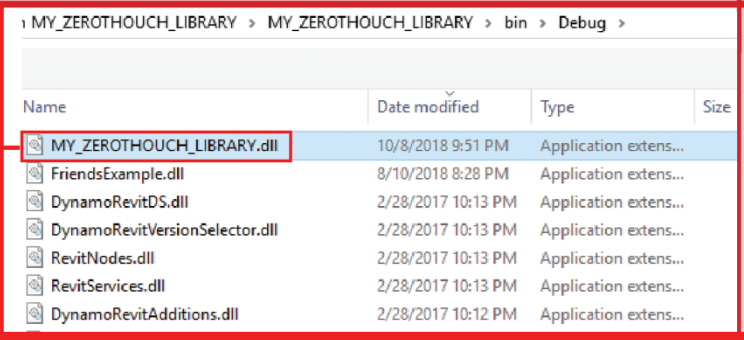
5: THE NAME OF THE INPUT PORT IS THE NAME OF THE PARAMETER. ALSO IF PARAMETER IN METHOD IS "=" TO A VALUE. THAT VALUE IS THE DEFAULT VALUE IN THE INPUT PORT.

6: THE NAME OF THE OUTPUT PORT IS THE NAME OF THE METHOD TYPE RETURNED (INT IN THIS EXAMPLE) ALSO SEE NOTES BELOW.

DYNAMO BROWSER



LIBRARY (DLL) LOC.



VISUAL STUDIO CODE

NOTES

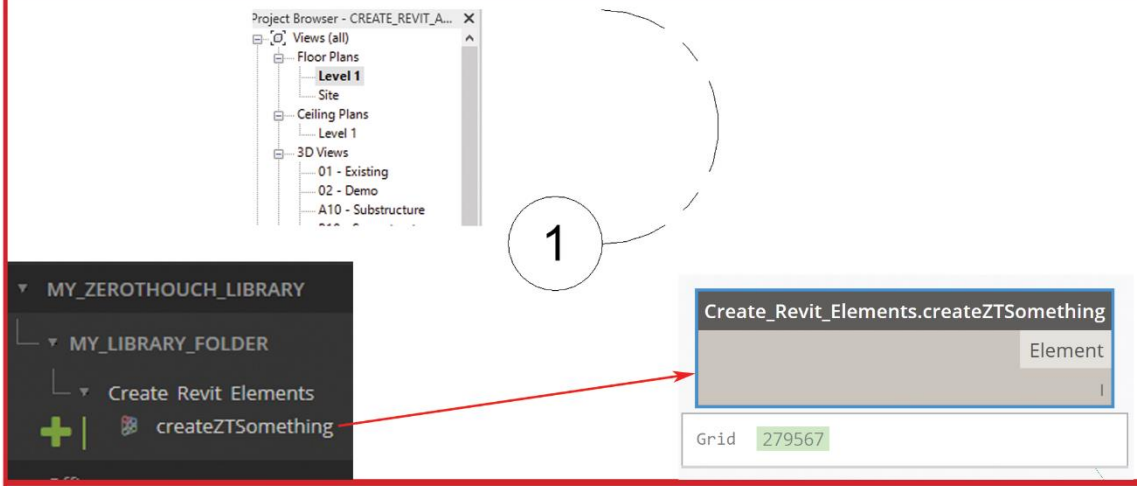
NOTES:
UNDERSTANDING THE STRUCTURE OF THE ZERO TOUCH PROJECT IS IMPORTANT AS IT WILL DETERMINE THE ORGANIZATION OF THE DYNAMO NODE LIBRARY. ALSO IF MULTIPLE OUTPUT IS REQUIRED THEN THE METHOD WILL NEED TO OUTPUT A "DICTIONARY" OF MULTIPLE VALUES.

CREATE REVIT ARC GRID VIA ZT VIA TRANSACTIONS AND WRAPPING

ZEROTOUCH CODE

```
namespace MY_LIBRARY_FOLDER
{
    public class Create_Revit_Elements
    {
        private Create_Revit_Elements()
        {
        }

        public static Revit.Elements.Element createZTSomething()
        {
            //Get Current Document (standard stuff) +
            //Start Transaction because changing the Revit DataBase
            Autodesk.Revit.DB.Document doc =
                DocumentManager.Instance.CurrentDBDocument;
            TransactionManager.Instance.EnsureInTransaction(doc);

            Autodesk.Revit.DB.XYZ p1 = new Autodesk.Revit.DB.XYZ();
            Autodesk.Revit.DB.XYZ p2 = new Autodesk.Revit.DB.XYZ(0, 10, 0);
            Autodesk.Revit.DB.XYZ p3 = new Autodesk.Revit.DB.XYZ(5, 5, 0);
            Autodesk.Revit.DB.Arc revitArc = Autodesk.Revit.DB.Arc.Create(p1, p2, p3);
            Autodesk.Revit.DB.Grid newGrid = Autodesk.Revit.DB.Grid.Create(doc, revitArc );
            //End Transaction because changing the Revit DataBase
                    TransactionManager.Instance.TransactionTaskDone();
            //wrapit
            Revit.Elements.Element wrappedGrid = newGrid.ToDSType(false);
            return wrappedGrid;
        }
    }
}
```

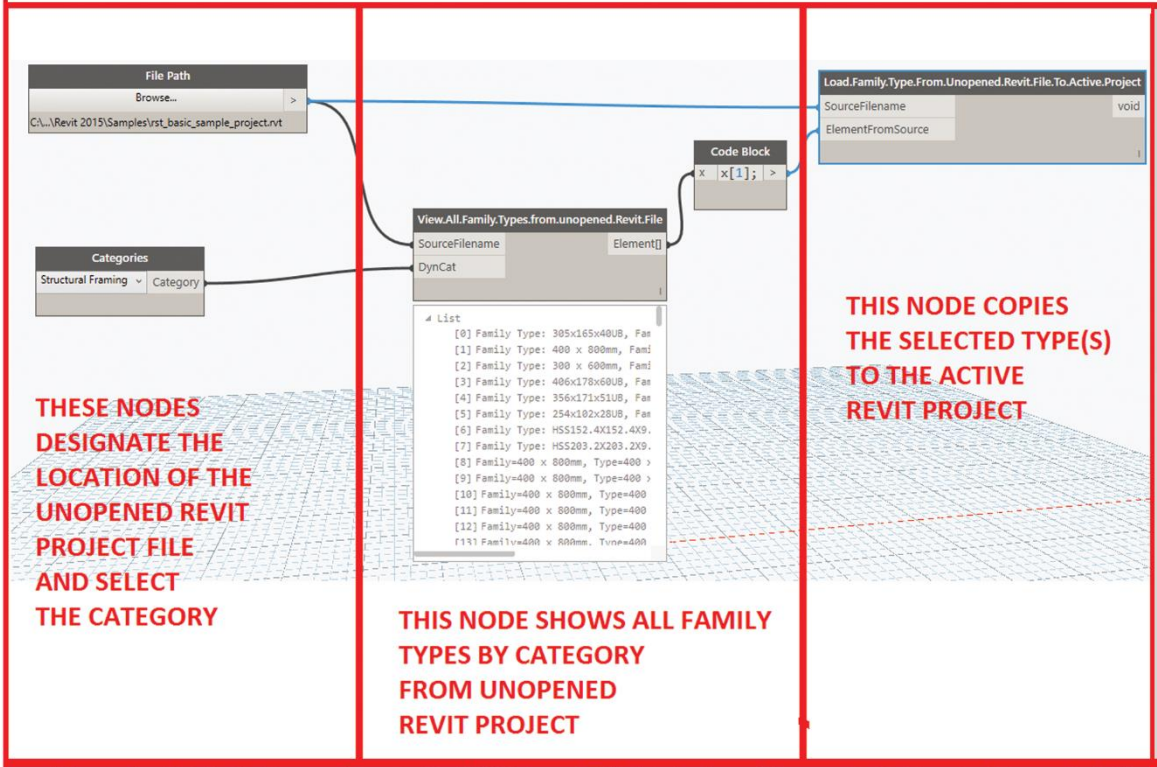
DYNAMO ZT NODES



STEPS

OPEN VISUAL STUDIO FOLDER “CREATE_REVIT_ARC_GRID..START” OPEN SLN FILE.
TYPE CODE AS SHOWN. BUILD THE SOLUTION.
OPEN REVIT FILE “CREATE_REVIT_ARC_GRID..START.rvt”
OPEN DYNAMO AND START A NEW FILE, LOAD THE DLL FROM BIN FOLDER
ADD NODES AS SHOWN. OPEN “FINAL” FILE FOLDER IF NEEDED. NOTE VALUE IS ALWAYS IN DECIMAL FEET

COPY TYPES FROM UNOPENED REVIT PROJECT TO ACTIVE REVIT PROJECT USING ZT DYNAMO NODES



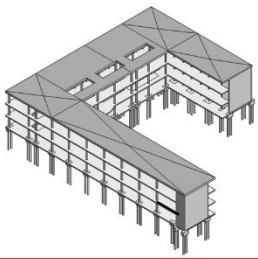
THESE NODES DESIGNATE THE LOCATION OF THE UNOPENED REVIT PROJECT FILE AND SELECT THE CATEGORY

THIS NODE SHOWS ALL FAMILY TYPES BY CATEGORY FROM UNOPENED REVIT PROJECT

THIS NODE COPIES THE SELECTED TYPE(S) TO THE ACTIVE REVIT PROJECT

DYNAMO NODES

```
public static List<Revit.Elements.Element> FindAllOfCategoryInFile(string SourceFilename, Revit.Elements.Category DynCat)
{
    Autodesk.Revit.DB.Document doc = DocumentManager.Instance.CurrentDBDocument;
    Autodesk.Revit.UI.UIApplication uiapp = DocumentManager.Instance.CurrentUIApplication;
    //TransactionManager.Instance.EnsureInTransaction(doc);

    Autodesk.Revit.DB.Document FamilyDoc = uiapp.Application.OpenDocumentFile(SourceFilename);

    Autodesk.Revit.DB.Category FoundCat = GetRevitCategory(DynCat);

    BuiltInCategory BIcat = (BuiltInCategory)DynCat.Id;

    var Elements = new FilteredElementCollector(FamilyDoc)
    .OfCategory(BIcat);

    List<Revit.Elements.Element> AllElements = new List<Revit.Elements.Element>();

    foreach (Autodesk.Revit.DB.Element TempEle in Elements)
    {
        Revit.Elements.Element WrappedEle = TempEle.ToDSType(false);
        AllElements.Add(WrappedEle);

    }

    return AllElements;
}
```



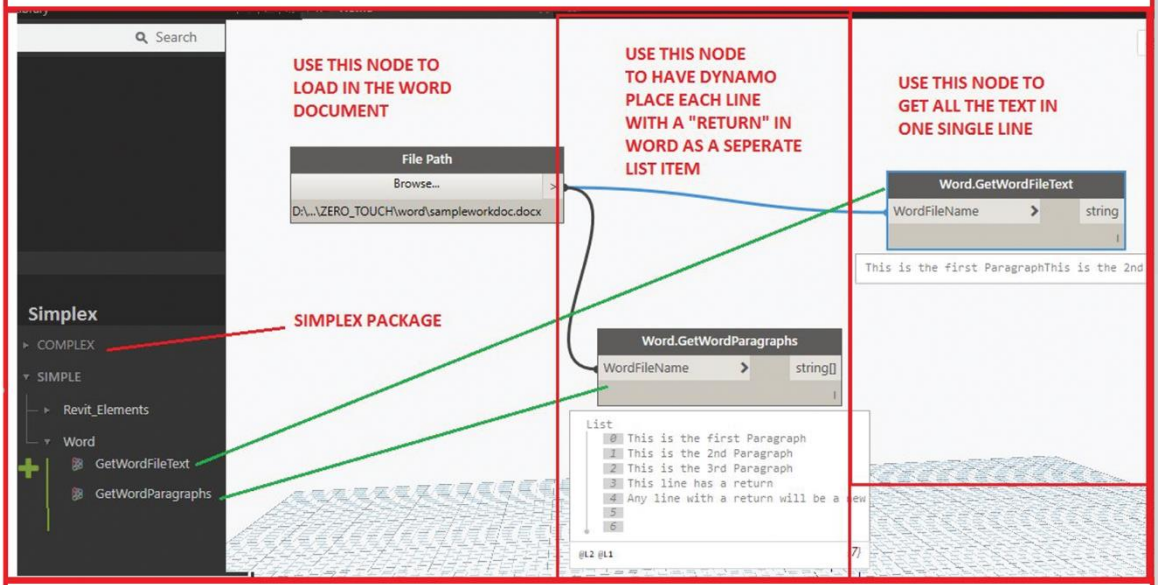
CODE AND REVIT GEOMETRY

STEP 1: OPEN THE REVIT SAMPLE FILE “rst_advanced_sample_project.rvt”
STEP 2: START AND NEW DYNAMO FILE AND ADD NODE SHOWN
STEP 3: SELECT THE SAMPLE FILE “ “rst_advanced_sample_project.rvt” FROM THE “PATH” NODE
NOTE: CUSTOM NODES COULD BE FOUND IN THE “SIMPLEX” DYNAMO PACKAGE

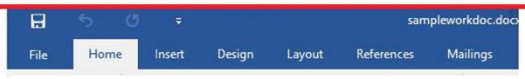
STEPS & NOTES

READ TEXT FROM MS WORD DOCUMENTS (.DOCX)

DYNAMO NODES



MS WORD



This is the first Paragraph¶
This is the 2nd Paragraph¶
This is the 3rd Paragraph¶
This line has a return¶
Any line with a return will be a new item in a list¶
¶
¶

Note: This workflow was intended for non-complex formated word documents

STEPS & NOTES

STEP 1: OPEN THE REVIT SAMPLE FILE “rst_advanced_sample_project.rvt”
STEP 2: START AND NEW DYNAMO FILE AND ADD NODE SHOWN
STEP 3: SELECT THE SAMPLE FILE “READ_TEXT_FROM_WORD.DOCX” FROM THE “PATH” NODE
NOTE: CUSTOM NODES COULD BE FOUND IN THE “SIMPLEX” DYNAMO PACKAGE

GET ALL FRAME NAMES IN ETABS USING DYNAMO USING ETABS API AND ZERO TOUCH C#

ZERO TOUCH C# API ETABS CODE

```
public static  ETABS2016.cSapModel        GetNameList()
{
                                SapModelObject; UseExistingInstance();
    ETABS2016.cOAPI myETABSObject = null;
    //attach to a running instance of ETABS

    myETABSObject =
    //create SapModel object
                  = myETABSObject.SapModel;
    int NumberNames = 0;
    string[] MyName = new string[0];
          SapModelObject.FrameObj.GetNameList(ref NumberNames, ref MyName);
    Dictionary<string, object> OutVars = new Dictionary<string, object>();


    return SapModelObject
}
```

CREATES A DICTIONARY FOR OUTPUT PORTS

STARTS THE METHOD
NOTE: NAME OF METHOD IS NAME OF NODE

(ZERO TOUCH IS A SPECIFIC FORMAT

(sets initial value place holder values)

METHOD GETS FRAME NAMES

OUTPUTS VALUES TO OUTPUT PORTS

RETURNS VARIABLES

ETABS API MANUAL

cFrameObj.GetNameList Method

Retrieves the names of all defined frame objects.

Namespace: ETABS2016
Assembly: ETABS2016 (in ETABS2016.dll) Version: 16.0.0.0 (16.0.0.0)

C#

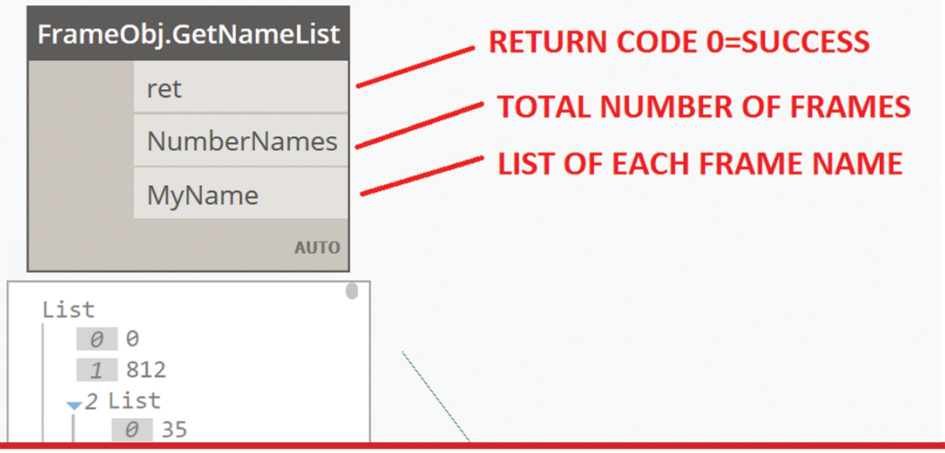
```
int GetNameList(
    ref int NumberNames,
    ref string[] MyName
)
```

INPUT IF THERE

STRING NAME,

OUTPUT

DYNAMO NODE



RETURN CODE 0=SUCCESS

TOTAL NUMBER OF FRAMES

LIST OF EACH FRAME NAME

STEPS & NOTES

STEP 1: OPEN ETABS AND OPEN DYNAMO FOR REVIT OPEN ETABS FILE “ETABS_SAMPLE_START”
STEP 2: COMPILE THE CODE AND ADD THE .DLL TO DYNAMO
NOTE: “REF” IN THE ETABS API MANUAL MEANS OUTPUT REST MEAN INPUT