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Analyze that! How can I run advanced engineering on my design?

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UT5238-P You have created design using utility design solutions, but now you wonder if you can exchange the model data with advanced engineering tools to ensure regulatory and integrity checks. This lecture will attempt to show and tell how to integrate utility model for distribution, transmission and substation to advanced engineering tools like OCalc, Spida, Autodesk Robot and Advanced Steel. It will also discuss the capabilities of APIs to exchange data between design and analytical tools so that you can plan your integration and extend your utility's workflow without copy/paste data.

Learning Objectives

At the end of this class, you will be able to:

- Identify opportunities and challenges for exchanging design model with engineering tools
- Explore and Learn how to send model information to external tools
- Identify the workflows which will benefit utilities by this integration
- Use of Autodesk Utility Solution APIs for integrated workflow

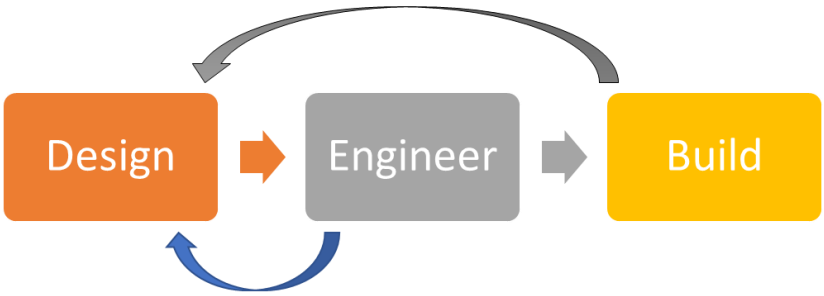
About the Speaker

Ram is a solutions architect for 20+ years with extensive consulting experience in Design, Geographic information systems (GIS) and related technologies; He has delivered successful projects in the utility industry and has the experience of the whole project life cycle. He is experienced in delivering projects for the telecom, utility, banking and airline industries. He has a strong database and enterprise GIS integration technology background, and has extensive background in integrating enterprise systems using open standards and middleware technology. He is currently responsible for providing solutions to integrate Autodesk® products into the utility customer's workflow.

Identify opportunities and challenges for exchanging design model with engineering tools

Every utility designer would wish if the design can be validated for following factors seamlessly,

- Meets Standards?
- Is it Cost Effective?
- Is it Compliant with Code?
- Can it be built based on current field conditions?



Unfortunately, the solution is not in one tool in the marketplace as the requirements are vast and varied.

Then what if I can send the relevant design data to advanced engineering tool and be able to get the resultant model back which is compliant.

In order to send exchange information between Autodesk design tools and engineering analysis tools let's consider some use cases existing in specific business areas in Utilities,

In distribution design scenario, typically designer would like to perform overhead pole analysis in third party tools like O-Calc Pro and SpidaCalc for compliance checks with regulatory standards like GO-95, NERC or CSA.

In Substation design scenario, foundation and steel structure analysis can be done using Autodesk Robot Structural and Advance Steel packages.

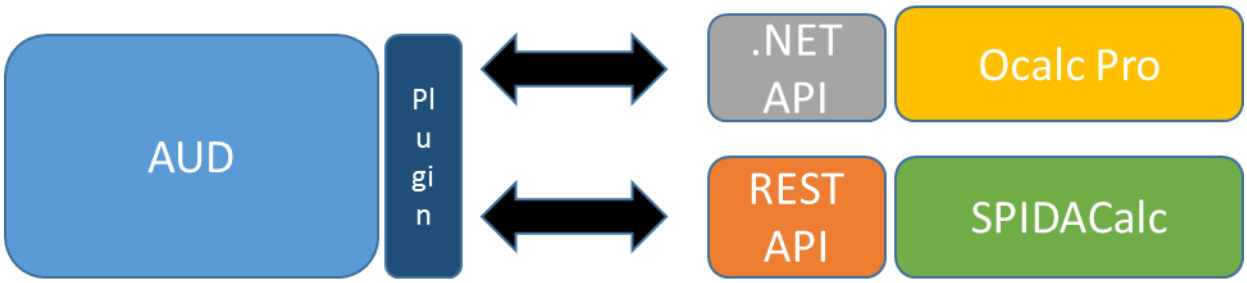
Explore and Learn how to send model information to external tools

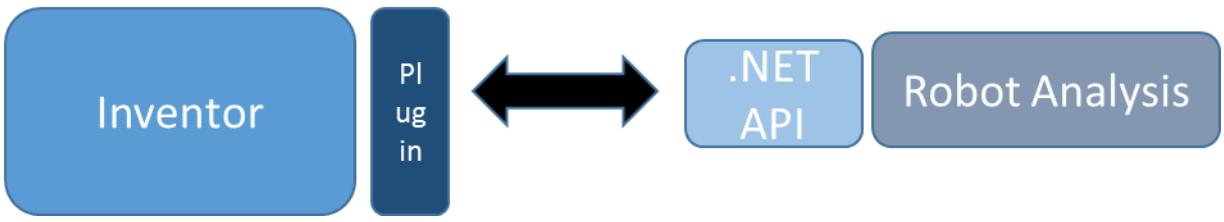
What do you need to do in order successfully exchange data between these systems?

- Ensure the configuration of structures and standards are same
  - Model Name and CUs defined in AUD have corresponding mapping or is same in O-Calc/Spida
  - Physical properties and Engineering values are matching between both packages.
  - If you need to round-trip then ensure the pole model and its attributes are extended to store relevant engineering resultant data with the design.
- Decide if you must recreate the pole in O-Calc/Spida ground up or can live with sending just enough information for it to build the pole. (Both packages allow you to create a Pole from scratch, but then the translation for every component needs to be mapped on AUD interface and can get complicated)
- Ensure the load cases are configured on O-Calc/Spida.
- Decide where and how you want to store the results of the analysis.

What are the options available in order to integrate?

- Both OCalc Pro and Spida has extensive api infrastructure (.NET / REST) to exchange model information.
- Robot Structural has .NET/VBA api which allows for access to Robot Object Model.





Identify the workflows which will benefit utilities by this integration

The basic workflow is to allow the engineer to review/certify the design of structures created by the designers without re-entering it in the spreadsheets or non-integrated applications.

Leverage the complex load cases and material options in advanced engineering tools for specialized field cases (e.g. Steep grading, Highway crossing, Foundation analysis etc).

AUD and Inventor offers many options for standard use cases, but in order to perform comprehensive structural analysis, designer needs to typically send the design scenario to Engineering for review and recalc.

If the remodeled Pole can be transferred back into design then it would eliminate re-design.

The designers can check their designs for standard cases via direct interface without sending it to engineering, hence reducing the number of designs to be reviewed by engineers. Currently, all these decisions are based on designer's experience and not actual calc. results.

Use of Autodesk Utility Solution APIs for integrated workflow

As mentioned in previous sections, the external analytical tools have different integration techniques. The common theme is to create a plugin framework on AUD or Inventor and leverage managed .NET API's of Autodesk tools to interact with 3rd party software.

For OCalc, the developer needs to add references to .NET Managed API Dlls in Visual Studio in order to interact with OCalc Object Model.

For SpidaCalc, the developer can directly create connection using HTTP/Rest services in C# without any references or application dependencies.

For Robot, it's same as OCalc with managed API references.

The need for license and API key is to be considered before you attempt to build a plugin.

The screen capture below shows the integration samples between AUD and OCalc/Spida.

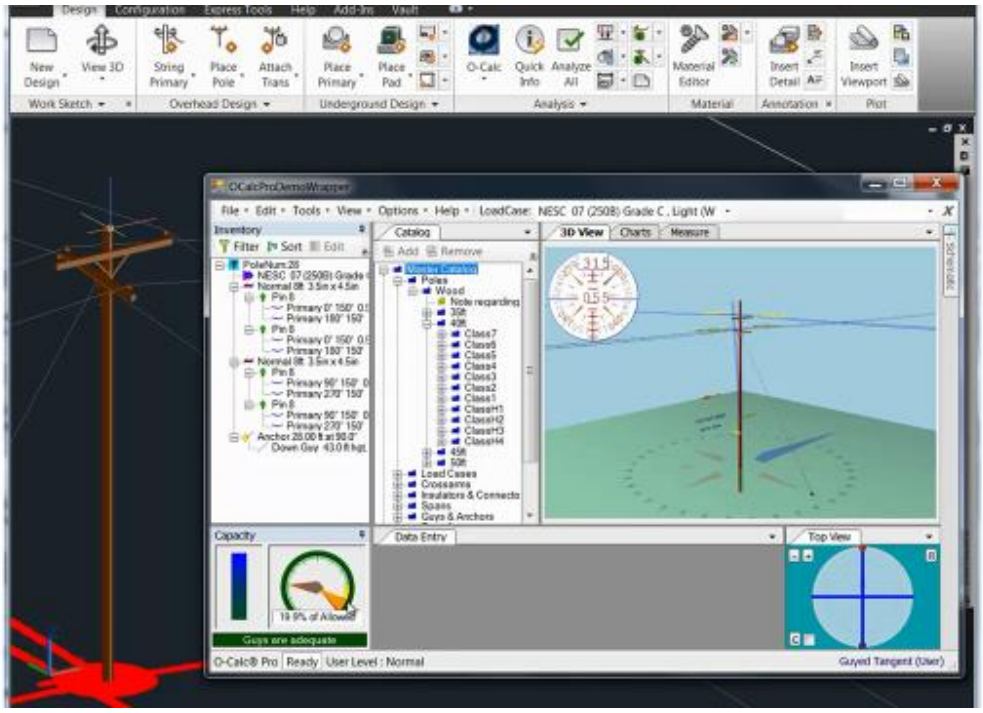


Figure 1 Invocation of OCalc from within AUD

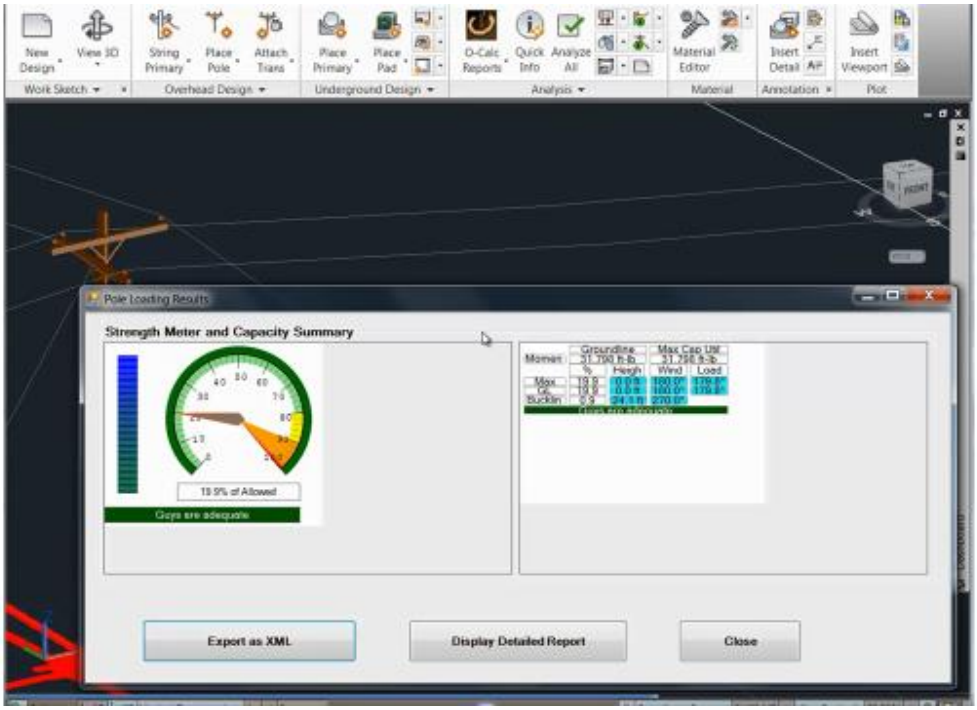


Figure 2 Quick Calc for Standard Use Cases

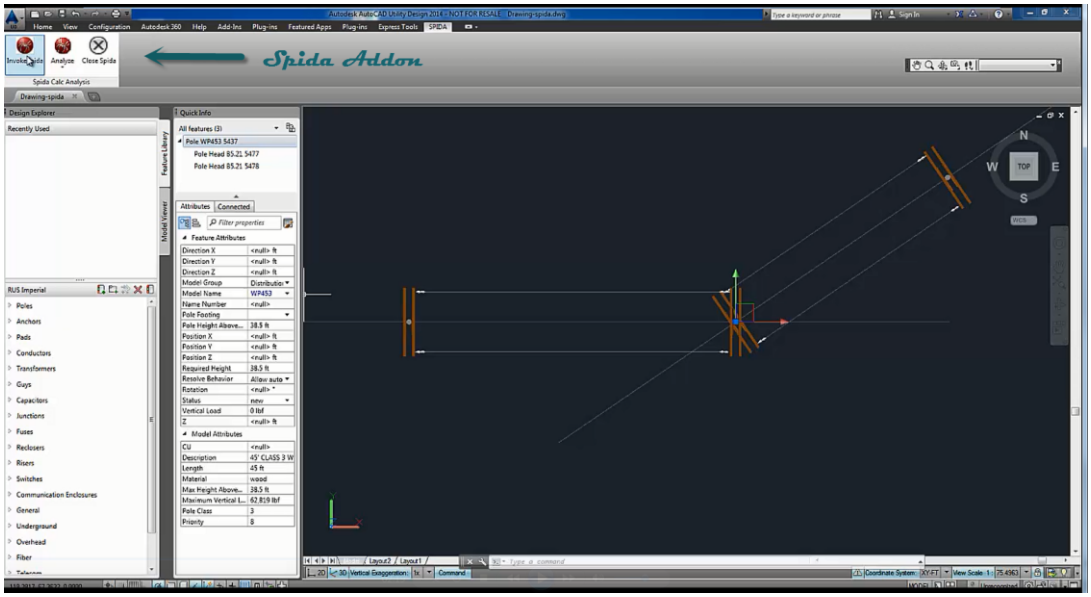


Figure 3 AUD integration with SpidaCalc

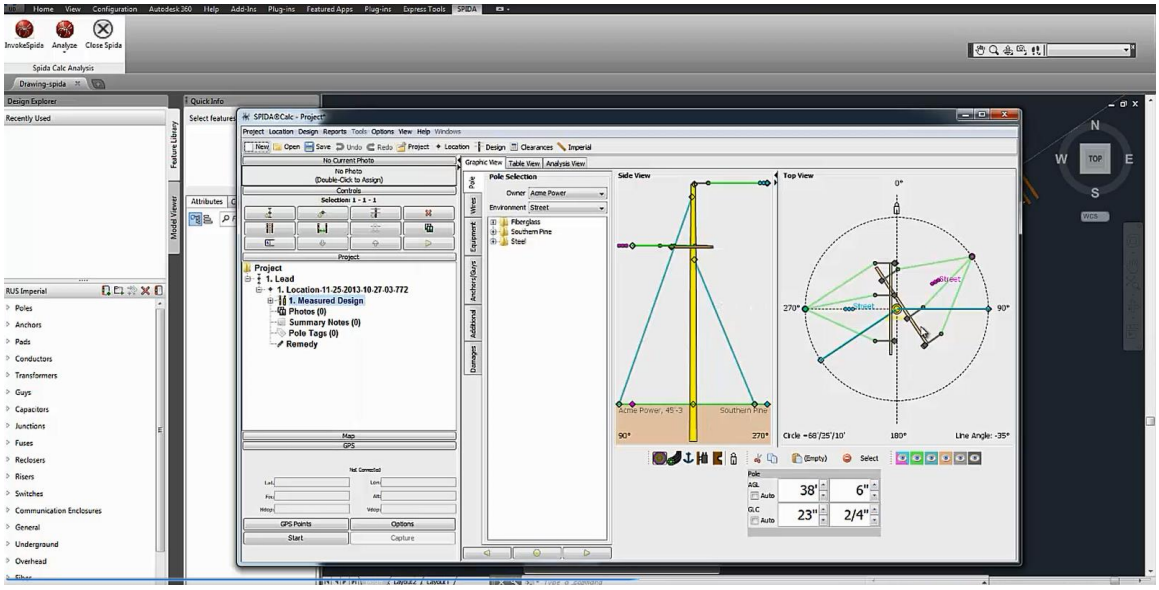


Figure 4 Invoke SpidaCalc from within AUD Design

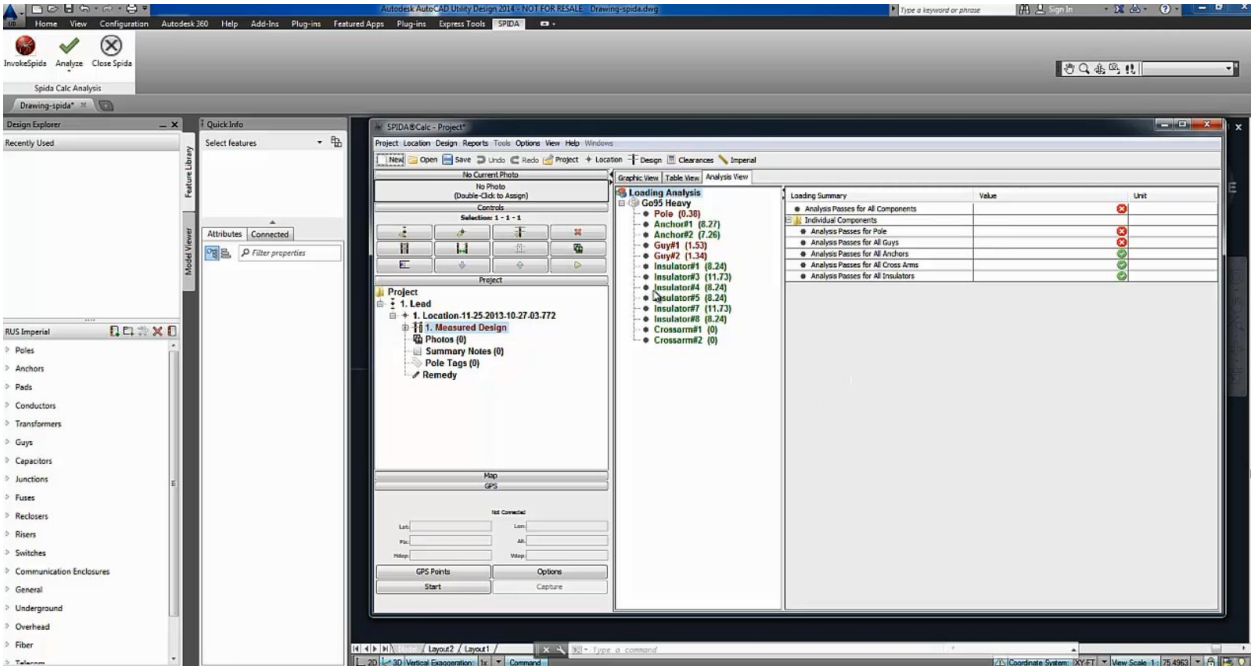


Figure 5 Run Load cases within Spida