



AUTODESK UNIVERSITY 2015

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Lasers, Analysis, and Chapels: Modelling and Collaboration

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Learning Objectives

- Discover best practices for using point clouds within Revit
- Learn how to manage reference and model data efficiently
- Discover how to capitalize on legacy 2D data in a Revit project
- See an example of sharing a project via Revit Server and Box

Description

The United States Air Force Academy (USAF) Cadet Chapel, in Colorado Springs, Colorado, is a modernist architectural icon and one of Colorado's most-photographed landmarks.

Unfortunately, five decades of exposure have taken their toll. In advance of a major renovation, Autodesk, Inc., worked with the USAF to capture as-built conditions and simulate the existing performance of this building. These efforts comprise a proof of concept for the application of scan-model-analyze workflows to renovation projects. This session will take an in-depth look at the modelling workflow, including use of alternate data sources to resolve as-built conditions, the challenges of constructing a Revit software model to serve many competing needs, and the mechanics of using Revit Server software and third-party file storage solutions to collaborate. We will also discuss lessons learned, insights gained, and best practices.

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Your AU Experts

Lieutenant Colonel Patrick Suermann is a graduate of the U.S. Air Force Academy with a B.S. in Civil Engineering. After serving as a combat and stateside engineer, he earned his M.S. in Construction Management from Texas A&M University and subsequently taught computer courses for engineers in the Department of Civil and Environmental Engineering at the U.S. Air Force Academy. After successfully defending his dissertation and receiving his Ph.D. in Design, Construction, and Planning at the University of Florida in 2009 as the first ever Rinker Scholar, Suermann deployed to Afghanistan to oversee nearly \$1B in Air Force contingency construction. Later, he served as the BIM SME, MILCON PM/Transformation Action Officer at AFCEE (now AFCEC) in San Antonio, TX. After serving as a Commander in Thule, Greenland he returned to the Academy where he was promoted to Associate Professor in January, 2015. He is currently the Construction Division Chair for the four-division Department.

Aaron Vorwerk is a Registered Architect, Civil/Structural Engineer-in-Training, LEED AP BD+C, and an AEC industry technology evangelist. Holding graduate degrees in architecture and engineering (M.Arch, MSCE, BSCE), Aaron has acquired widespread industry experience in architecture, engineering, and construction over the past 20 years. Aaron initiated Revit transition efforts in two design firms prior to joining an Autodesk partner, where he spent five years offering consulting, training, and support to AEC customers. A senior technical sales specialist with Autodesk, Aaron presently serves on Autodesk's Frontline team, informing and influencing AEC customers in their BIM workflow strategies and adoption.

Simon Whitbread is a Revit and BIM specialist for Enterprise customers at Autodesk, he has over 30 years' drafting, design and CAD Management experience in the Building Services and Architectural industries. Since the early 1990s he has been involved in developing and managing CAD and IT Systems for a variety of companies around the world. Simon is a passionate author and teacher and lives in the UK.



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The CONTEXT

The Cadet Chapel at the US Air Force Academy is a visually stunning building; it comprises one of the United States most significant publicly-owned religious structures from architectural, academic, and historical perspectives.

The US Air Force Academy and the Cadet Chapel

The Cadet Chapel at the United States Air Force Academy in Colorado Springs, Colorado, is a stunning building featuring 17 identical spires soaring 150 feet into the air. Dedicated in 1963, it is a Modernist architectural gem and one of Colorado's most photographed landmarks. Unfortunately, half a century of exposure to the elements will take its toll on any building. The chapel's concrete foundation, for example, has been damaged by annual freeze-thaw cycles, and the building is experiencing water infiltration. And what other repairs might be needed...and how best to communicate the need for renovation work to key stakeholders?



View of USAF campus

The Academy decided it was time to assess the existing state of the chapel by documenting the structure in an entirely new way.



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Teams from the USAF and Autodesk were given a first-ever opportunity to perform hundreds of laser scans, take thousands of photographs, and shoot 4K video footage of the interior and exterior of the chapel. The teams leveraged Autodesk ReCap software to produce a virtual as-built model of the chapel, which in turn served as a starting point for a group of modellers from Autodesk. The modelling team referenced the point cloud data and original drawings to construct a detailed Revit model of the facility.

Their use of Revit as a platform for an intelligent model opened up many possibilities, e.g. whole-building energy analysis, daylighting and electric lighting analysis and simulation, exterior wind studies, computational fluid dynamics (CFD) studies, structural analysis, and (of course) visualization.



USAF Cadet Chapel, courtesy SOM <http://www.som.com/>

As this project remains an ongoing case study within Autodesk, techniques are being reviewed as technology continues to evolve. We will discuss the rationale used for our early efforts, share what we have learned, and touch on some of the work that is forthcoming.



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The MOTIVATION

When the US Air Force Academy decided that it was time to assess the existing state of the chapel and document the structure in an entirely new way, Autodesk jumped at the opportunity to get involved. The thought was that we could showcase our technologies around reality capture, modelling, and simulation to look at the chapel through the lens of high performance building design. Meanwhile, the Air Force saw this as an opportunity to reset expectations around the deliverables that they receive from their consultants.

US Air Force Academy

From the perspective of the Air Force, this project is an opportunity to better understand the Chapel's existing condition in order to plan appropriately for forthcoming renovations. Goals for this project included:

- Generating of a high-quality model of the existing facility via reality capture;
- Exploring the possibilities of current technologies to maximize value;
- Resetting expectations for project deliverables from consultants; and
- Leveraging this experience as a training tool within the US Air Force.

Autodesk

It was a primary objective for Autodesk to utilize this project as a proof-of-concept (and world-class case study) of a Revit-based High Performance Building Design (HPBD) Workflow, including:

- Reality Capture
- Detailed Building Model Creation
- Site Contextual Model Creation
- Lighting Analysis
- Energy Analysis
- CFD Analysis
- Structural Analysis

A secondary objective was the dissemination of this information, i.e. sharing insights from this project both internally and externally:

- Leveraging lessons learned as a teaching tool for internal development and support teams;
- Fostering similar partnerships with additional customers to accelerate the adoption of BIM and HPBD;
- Learning to better support our customers in best practices and workarounds involving Autodesk products.



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REALITY CAPTURE

Autodesk performed 129 scans of the interior and exterior of the cadet Chapel using a FARO Focus 3D x330 laser scanner while an unmanned aerial vehicle (UAV) toting a GoPro camera captured 1,232 photos of the exterior. The UAV also recorded high-definition video footage of both the interior and exterior. A second crew from the US Air Force Academy and Peterson AFB also performed laser scans of the interior and exterior of the building. The laser scans were then processed in Autodesk [ReCap](#), producing a three-dimensional “virtual chapel.” This process involves importing raw scan files, or point cloud data, into ReCap. ReCap converts the scan files to a Reality Capture Scan format (RCS) that can be read by other Autodesk programs.

The Team

Pete Kelsey, Mike Kotanian, and Kirk Fisher of Autodesk were onsite to perform scans and drone flights, as detailed above.

A companion team from the US Air Force Academy was also present to perform laser scanning. The USAF team, led by Roger Clark of Peterson Airforce Base, used Leica equipment to scan the Cadet Chapel and immediate surroundings.



Autodesk's Pete Kelsey preparing to fly the exterior of the chapel

Photo and Video

Aerial and ground-based high-resolution photography of the Cadet Chapel was captured while onsite. An attempt was made to use the [ReCap 360](#) Photo to 3D service to construct a 3D model of the Chapel for comparison with laser scan data. However, the results were found to be poor. It is thought that the extreme regularity (i.e. 17 identical tetrahedral shapes) of the Chapel façade was problematic for the algorithm. This effort was not pursued further, as laser scanning results were much more promising.

Additionally, (4K) high-resolution video was shot from the UAV, both on the exterior and interior of the Cadet Chapel. This was notable, as this may have been the first and only time that a civilian UAV was



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approved to fly over the military institution. Lt. Col. Suermann went to extraordinary lengths to win approval, even filing a flight plan for the exterior flight! While this video wasn't directly used for modelling purposes, it served as a high-altitude inspection tool, and it adds significant value to the overall documentation of existing conditions.

Laser Scans

As mentioned above, two teams (from Autodesk and the USAF) performed laser scans on the exterior and interior of the Cadet Chapel. With different crews and different equipment, this inevitably led to a technology comparison...and it proved to be an educational experience for our Autodesk team.

At the outset, the Autodesk team chose to showcase the targetless registration capabilities of ReCap 360 Ultimate in capturing the chapel. Two key benefits to this process are the ability to combine laser scans automatically, and the speed at which scanning may be performed (as one scan may be registered while the next one is being performed). As a result, the Autodesk team found that they were significantly more productive than the USAF team, completing a circuit around the Chapel much more quickly.

Their excitement at this result was to be short-lived. The same conditions that had confounded the ReCap photogrammetry algorithm (i.e. the extreme repetition and regularity of the Chapel façade) were found to be problematic for the targetless registration feature. The scan results produced by the Autodesk team were simply unable to be resolved with an acceptable level of accuracy.

Meanwhile, the USAF team (using traditional targets) was able to successfully scan both the exterior and interior of the structure. While their work took significantly more time to complete, the resulting point cloud is very impressive.



Point cloud generated by laser scans performed by USAF, as displayed in Revit



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This lesson was not lost on our Autodesk team; they have gone on to scan several more projects of national significance, and they are learning to balance the speed and flexibility of targetless registration with the security and accuracy of traditional scanning targets.

MODEL CREATION

After the point cloud data was processed in ReCap, it was inserted into [Revit](#), Autodesk's popular Building Information Modelling (BIM) authoring platform. Using the point cloud information as a reference, an intelligent three-dimensional model was created in Revit 2015. In addition to the point cloud data, the photographs, video, and reference drawings proved immensely informative for creating an accurate Revit model.

The Team

An ad-hoc team from Autodesk volunteered to work on this project, primarily in their collective spare time. This was truly a collaborative company-wide effort, with representation from consulting, enterprise priority support, product and sales teams. We had a common goal; everyone understood the benefits to the Air Force and Autodesk, and we all shared a certain appreciation or reverence for this iconic structure. It was, of course, a unique opportunity to walk in the shoes of our customers and understand some of the challenges faced in working on a complex and very real project.



Autodesk project participants: primary Revit modellers included Carlos Orona, Aaron Vorwerk, Elizabeth Grant, and Simon Whitbread



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The Revit modelling effort was divided amongst 4 primary team members, each working on separate sections of the Chapel:

- Roof structure
- Lower levels of the chapel and stairs
- Interior spaces, structure, and railings
- Mechanical services and Jewish chapel

Approach

To begin the process of turning the point cloud into an accurate Revit model, the modelling team first opted to create a massing model, and then developed a more detailed model, starting with the roof geometry and building structure. As the exterior modelling neared completion, modelling of interior spaces began. Throughout the entire process, a range of reference materials were used to compare actual construction to the Revit model.

Preparing the Revit Environment

Given that the modelling and analysis team spanned over several countries and time zones, early coordination on how the model would be shared and updated would be critical for success. The team opted to use [Revit Server](#) to share the central working model. This approach, along with a separate project file to host historical DWGs, was determined to be the most efficient way to handle the project data.

Best Practices for Revit Server Worksharing

- Create a new local file on a daily / weekly basis
- Save changes at regular intervals (i.e. 30 minutes)
- Manage the times when a selective Purge and audit is done on the Central file
- Don't work inside the Revit Server central file; always work inside a local file on your workstation
- Always work on an assigned workset, and relinquish elements when saving back to the central file
- Ensure worksets are relinquished and everything synchronized with central at the end of each session

Starting from CAD, but...

Many DWG files were provided to our team; these files had been created for previous renovation work. Wherever possible, these files were used to expedite the creation of the Revit model.

To avoid any 'pollution' of the Revit model with CAD data, two Revit projects were created. The primary project would host the complete Revit model of the Chapel, while a second 'sacrificial' Revit project was created to host the DWG's. In this way, the CAD data could easily be referenced when needed and discarded when desired. This also reduced the file size of the primary project.

During the initial modelling efforts, it was determined that some errors did, in fact, exist within the CAD drawings, as there were conflicts between scans of the original paper drawings, the CAD drawings, and



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the reality capture data. This was an important reminder about the value of cross-referencing multiple data sources to determine what is 'real'.

Verification Using Reality Capture Data

At the outset of this project, there was some excitement within Autodesk at receiving the outstanding reality capture dataset of the Cadet Chapel. Finding the most efficient use of this dataset, however, was a bit more challenging. Autodesk does not offer an 'easy button' for automated conversion of a point cloud to a Revit model. Instead, our team began modelling using the aforementioned DWG files as references, and the point cloud data was used to double-check all work for discrepancies and fill in missing details.

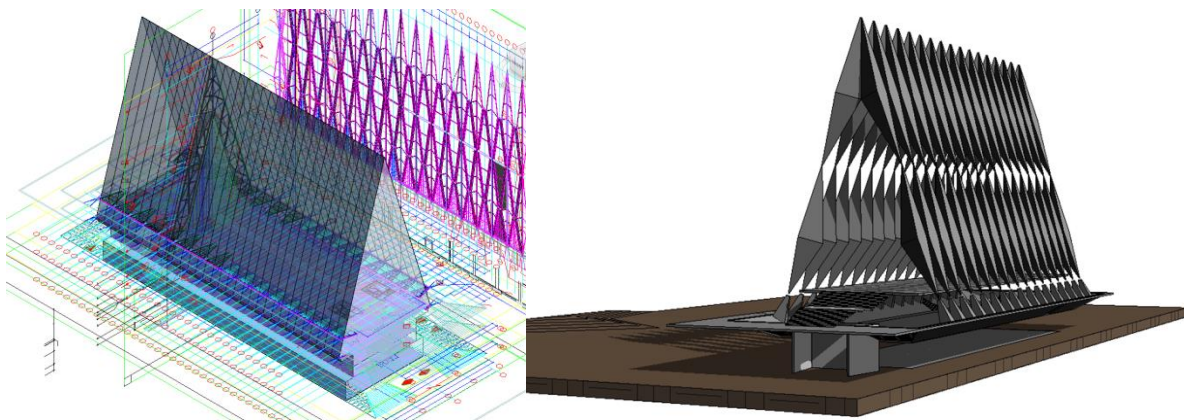
After the point cloud was processed in ReCap, the data file itself was not intended to change, so each team member saved it locally as per [best practice suggestions](#) and referenced in the central Revit file.

Modelling Philosophy

The building was essentially divided into three main subcomponents for modelling purposes—Roof, Base, and Interior:

The Roof

- The roof and walls of the Cadet Chapel, particularly for the upper level (the Protestant Chapel) are one and the same.
- Despite starting with a point cloud, the roof was initially modelled quite conceptually. This would form the basis of a conceptual analysis model.
- From there, using a combination of the point cloud and DWGs as references for geometry creation, the tetrahedrons began to take form as roof panels.
- Originally modeled as structural framing, the roof objects were later changed to roof elements so that the panels would be room-bounding. However, as we'll discuss later, this required revision yet again for structural and energy analysis.



Left: roof mass with DWG references; Right: detailed roof elements



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The Base

- The base and lower levels of the chapel were modeled with reference to the DWGs, then compared to the point cloud.
- Starting with a generic layout, with minimal detail, it was easy to spot discrepancies between the two sources and validate the correct geometry with the point cloud.



Revit model showing lower level with point cloud overlay

The Interior

- A challenge in modelling the interior spaces and key features was the noise of the point cloud. It contained much more information than was necessary, so often times trying to decipher what exactly was in the space was difficult.
- Conversely, the point cloud proved invaluable for modelling many of the interior elements that were otherwise undocumented. Most of the furnishings, for example, were not specified in the original contract. In fact, the entire sacristy area did not appear in any documentation.
- The end result was accurate modelling down to the alter rail, pulpit, and pews in the Protestant Chapel.
- Further preparation on the model interior was done with the intent of performing downstream analysis. For example, air terminals were added in the lower level to facilitate a CFD study.



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Revit model showing elements in sacristy derived entirely from the point cloud

ANALYSIS

The resulting Revit model created from the point cloud was intricately detailed. However, some of these details—particularly the roof structure—caused a fair amount of trouble when preparing the model for the various analyses. The main volume of the building does not have discrete walls and a roof; they are one and the same. Due to the complexity of this roof surface, methodologies that might have worked for typical buildings presented challenges on this project.

The key to solving this problem was understanding how curtain systems are applied in Revit. It was found that curtain panels that have been created, customized, and applied will function for documentation and structural analysis purposes, but not for energy analysis. Even the original curtain wall mass families proved to be problematic for the creation of an energy analytical model.

Much testing was done on smaller pared-down models to understand which elements were working and which were not. After originally modelling the roof elements as structural framing families, and then as roof elements, the team finally reached success and was able to obtain valid analysis models by changing the elements once more and setting them as floor elements.

Whole-Building Energy Analysis

[Energy Analysis for Revit](#) was used to determine the ease with which an Energy Analytical Model (EAM) could be created and the efficacy of the resulting model in representing the existing conditions of the Chapel. It took some time to ensure the EAM could be accurately created given the complex geometry (more details below), but an accurate analytical model was eventually created and used for analysis.



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The continuation of this project would devote resources to better understanding the existing thermal conditions in the Chapel to ensure energy analysis settings are appropriately assigned to the unique space.

Early in the Revit modelling process, following creation of the massing model, a conceptual energy analysis was run using some simple baseline settings. A glazing percentage was estimated and skylights were included as well. To underscore the value of this study, an early conceptual energy analysis suggested that upgrading the existing (minimal) wall insulation to a higher insulation value could potentially lead to an energy savings of approximately \$1 million over a typical building lifecycle.

For energy analysis to be performed, the building envelope needed to be reasonably enclosed. When Revit creates the Energy Analytical Model, it can tolerate some small gaps, but attention needs to be paid to close large gaps (typically larger than 2 feet). The Revit model had some larger gaps, but by viewing the Energy Analytical model in Revit 2016, these gaps were quickly identified and addressed. Note that this upgrade to Revit 2016 required saving a separate version from the original Revit 2015 central file.

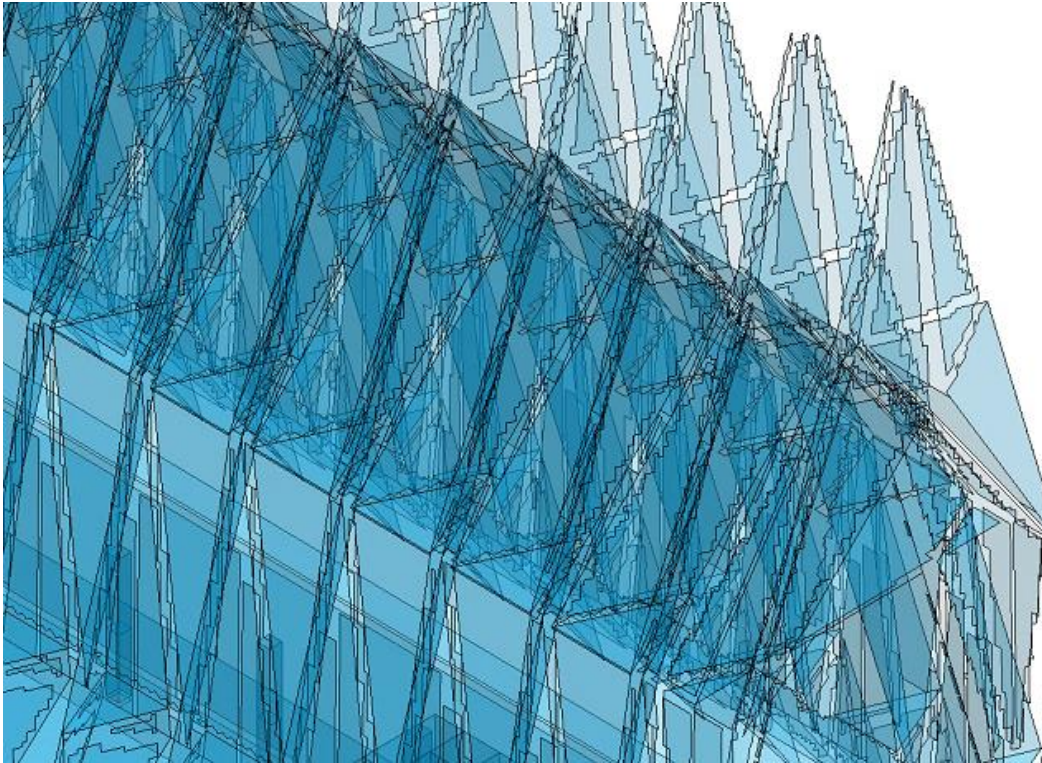
Given the complex geometry and level of detail to which it was modeled, the Revit model that resulted was really more complex in form than the energy analysis tool was designed for. Initially, the tetrahedron spaces of the roof structure were not translating correctly in the analytical model. However, after reconstructing the roof surfaces as floor elements, the tetrahedrons were interpreted correctly. A significant side benefit of using floor elements was the ability to perform structural analysis on these components; we will address that later in this report.

Limitations of this energy model stem from a lack of information concerning the Cadet Chapel's actual thermal behavior. The majority of this model is a large open space; however, studying it as one space will not lead to an accurate analysis. Additionally, the air spaces in the upper portions of the spires behave very differently than the air spaces at the occupant level. To help with this, the large central space was divided into levels to help represent stratification effects. Still, more information on the real-world thermal stratification values will be required to continue with accurate energy analysis assumptions.

In the end, this model represented the upper echelon of analysis needs and will continue to be part of development testing for future energy analysis workflows. The team feels confident that the Revit geometry is creating an accurate energy analytical model, but more information on existing thermal conditions is required to pursue with any deeper analyses.



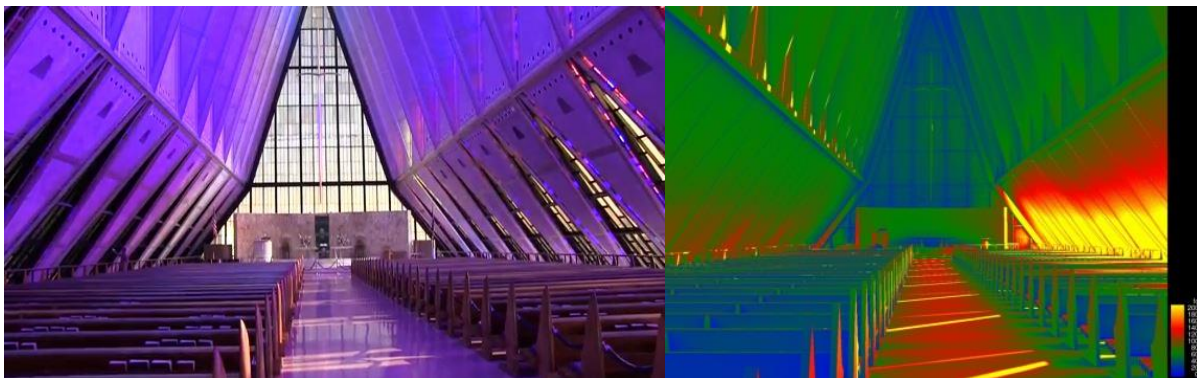
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Energy analytical model derived from Revit geometry

Lighting Analysis

[Lighting Analysis for Revit](#) was used to study light levels in the Chapel. To ensure a realistic illuminance-based rendering, additional research was done to understand the glazing material properties; specifically, understanding the Visible Transmittance (VT or Tvis) was crucial. This helped to ensure that illuminance renderings were as representative of the actual conditions as possible. Additionally, special care was taken to replicate the time of day and year and other relevant settings.



Side-by-side comparison of a photograph and an illuminance rendering

Automated daylighting for LEED was used to generate illuminance maps at the work plane, and the advanced electric and solar illuminance workflow was used to create illuminance renderings for 3D



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perspective views. This latter workflow allowed the team to compare actual photographs from the Chapel side-by-side with illuminance renderings. Future work would allow onsite light level measurements to compare with the simulated results.

Much of the glazing featured in the Chapel was custom-made, which meant collecting information on it was challenging. The information required for an accurate analysis included the Visible Transmittance, type of framing, and number of panes used.

Computational Fluid Dynamics Study

[CFD](#) was used to visualize and understand interior airflow of the Chapel. It was by far the most challenging analytical work for the team to complete. As previously mentioned, the Revit geometry was more complex and detailed than necessary for analysis. This was very true in the case of CFD, which required the most simplified geometry for analysis after many attempts at using more complex geometries. The CFD analysis also required the most additional information. In order to accurately set up and define the analysis, onsite measurements were required (in addition to the point cloud data, original DWGs, videos, etc.) to identify the location and capacity of items such as the air terminals.

Not surprisingly, meshing proved to be a challenge for the original highly-detailed geometry. In the future, the team would like to test a scan-to-mesh prototype tool, predicted to save a great deal of time. As will be discussed further below, leveraging Autodesk CFD's capability for cloud-based computation may also permit runs with highly-detailed geometry.

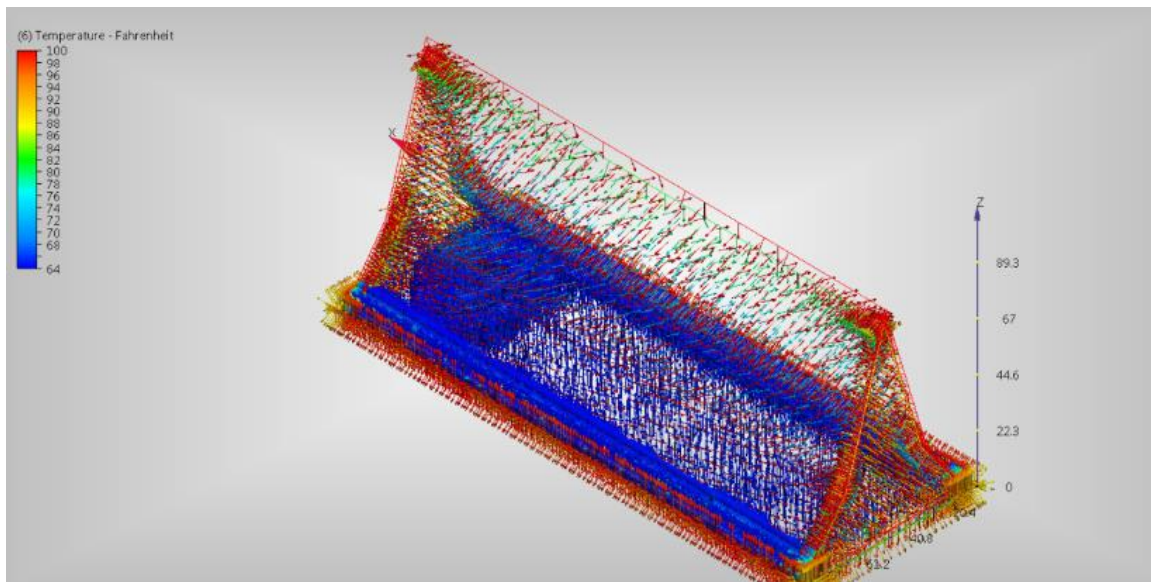
After much simplification, a suitable model for CFD analysis was created for the main Protestant level. A new model was created, as the original curtain wall roof could not create an analytical mesh or be assigned a surface when it was imported from Revit. Additionally, when the original geometry was brought into CFD, there were failures to mesh because the model was not completely solid.

While the interior furniture layout was initially deemed important for studying indoor airflow, the pews in the Protestant level were eventually removed, as each pew had close to 3 million faces; this would lead to unrealistic computing times. Even at this simplified level, the simulation took a large amount of time due to the size of the space and the intricacies defined within. It should be noted that this analysis was performed on a laptop computer; it would be reasonable to expect dramatic performance gains if future analyses are performed using cloud-based solving features of [CFD](#).

Once a simplified model geometry was found to be successful, the boundary conditions were set. The most recent as-built DWGs the team could source were from 1966, which proved to be out-of-date for gathering air terminal information. As a result, the team relied heavily on photographs and the videos captured of the Chapel. A simple summer and winter interior airflow study was conducted to understand interior airflow and temperature distributions.



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CFD study of the Protestant Level of the Cadet Chapel



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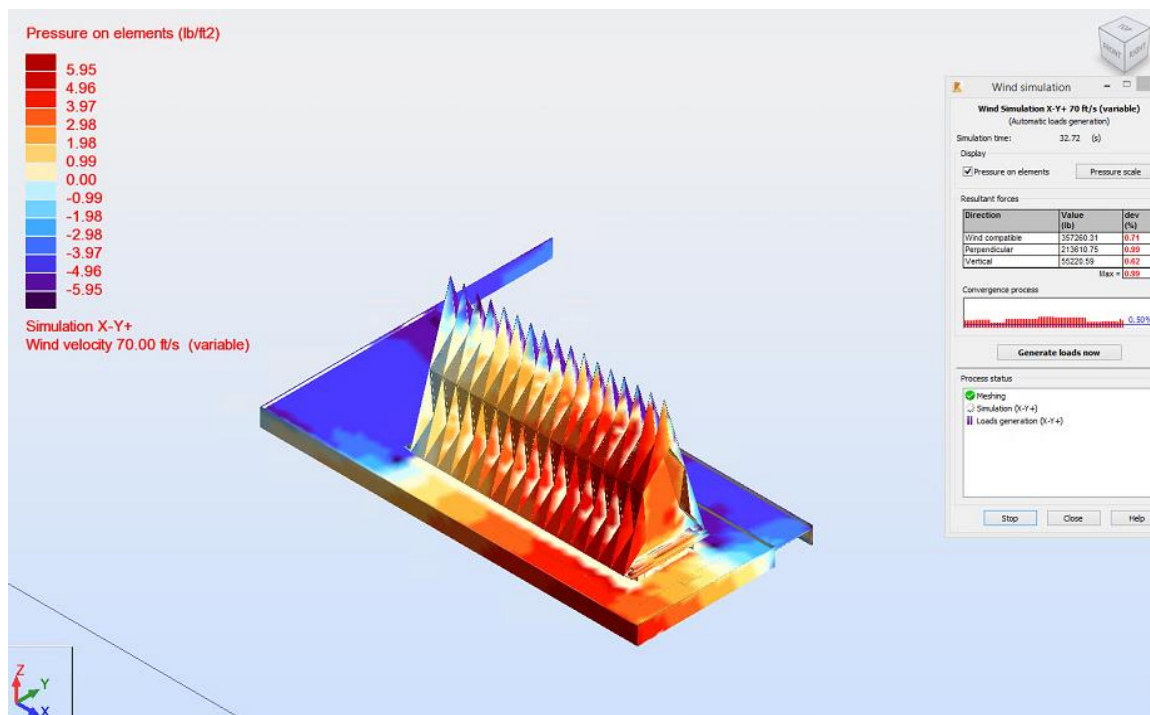
Wind Loads Simulation

[Robot Structural Analysis Professional](#) (RSA) was used to provide insight into wind loading analysis. Given the unconventional structure, the team knew the workflow for the wind loading analysis was going to be a bit unusual. The level of detail required for structural analysis is different than the level of detail required for documentation. For structural analysis, the focus was on where the joints came together and how the attachments are made.

Unfortunately, as was the case for other analyses, the team was not able to conduct structural analysis on the original (detailed) Revit model. A discrepancy between the elements what would create a valid energy analytical model and a valid structural analytical model meant that a separate structural model would be required. This is common practice in the AEC industry, of course...but then again, this building has a unique relationship between its architectural skin and structural skeleton. In retrospect, the team might have explored the creation of separate linked Revit files for the architectural and structural disciplines to optimize the models for the needs of each discipline.

The simplified structural model ended up using floor elements as the sloped surfaces to represent the curtain wall, as sloped walls and curtain walls would not create a structural analytical model. This resulted in a structural model that was perhaps not as 'clean', but which served its purpose for analysis. Ironically, this modelling solution (i.e. modelling the wall/roof elements as floors) ended up serving as a valid energy analytical model as well.

As this Revit model was created for simple structural analysis, such as wind loading, and did not have the full structure modeled for analytical purposes, deflections were unable to be calculated. That said, as will be shown in the presentation accompanying this handout, the RSA product team was given access to our datasets and created a detailed structural analytical model from the original plans of the chapel.



Wind load simulation performed in Robot Structural Analysis Professional (RSA)



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The PROBLEM of teamwork

With a geographically diverse team needed to work on the project, the main question was: How? How do we get this team to work together collaboratively?



As with any project, each user has a specific role to play; their needs for the data vary, but the nature of Revit means they can have access to that same data. In addition, the team members are highly mobile, either working from an office, home, or in transit. Therefore, an adequate workflow was needed to allow the team the most efficient workflow possible.

Disclaimer

Although this written is by an Autodesk employee, the workflow described herein is not 'officially' tested or supported – you use it at your risk!



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The Solution

This may seem fairly straightforward:

- Install Revit Server
- Use it

But life is rarely this simple and for this project we had the following considerations:

- Diverse team
- Irregular access to a LAN
- Large datasets
- Different file formats

It is possible that the one significant difference between a typical company and our team dynamic is the irregular access to a LAN; regardless, we decided on Revit Server, and we chose to install the Revit Server Accelerator as a service on the very machine being used to create the model.

This should not be possible (see disclaimer), but this workaround was essential to the initial success of the project. [A360 Collaboration for Revit \(C4R\)](#) was in early-stage development at the time, but it was not yet accessible to our team. It should be noted that the model was eventually shared via C4R, both in 2015 and later in 2016 formats, but this occurred after the initial round of work on the chapel was completed.

First steps

Before we even get to the install process there are prerequisites needed for this service to work.



Programs and Features

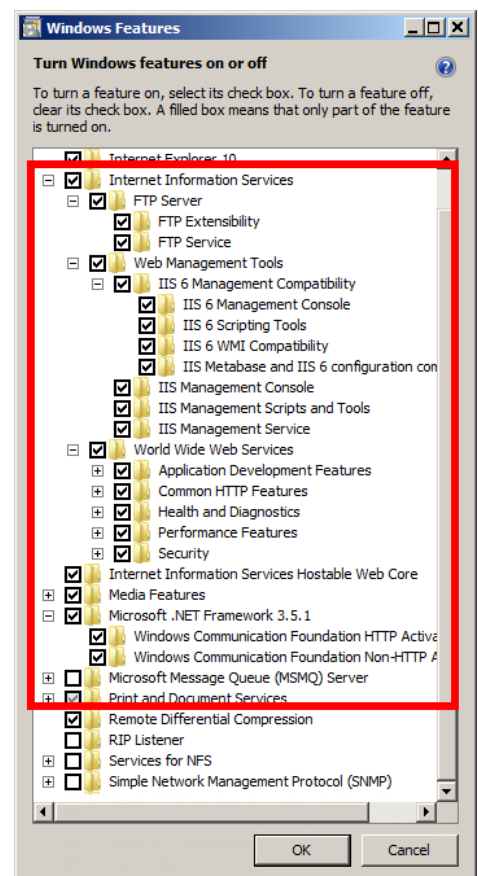
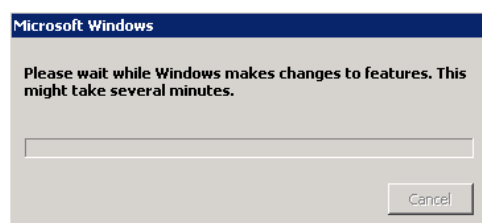
Uninstall a program | Turn Windows features on or off | View installed updates | Install a program

Go to Control Panel > Programs > Turn Windows Features on or off.

Here we need to install all the Internet Information Services and Microsoft .NET Framework 3.5.1.

It is important to expand the tree and check each of the items. Without these, Revit Server will not operate.

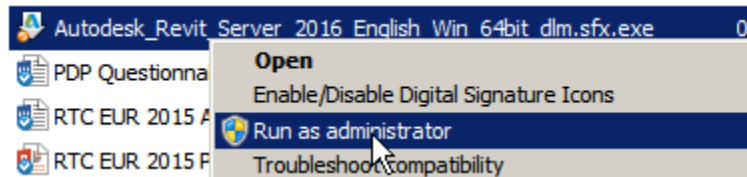
When you click on OK, Windows will inform you of the progress...



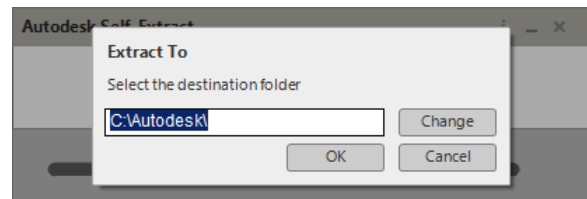
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Revit Server Install

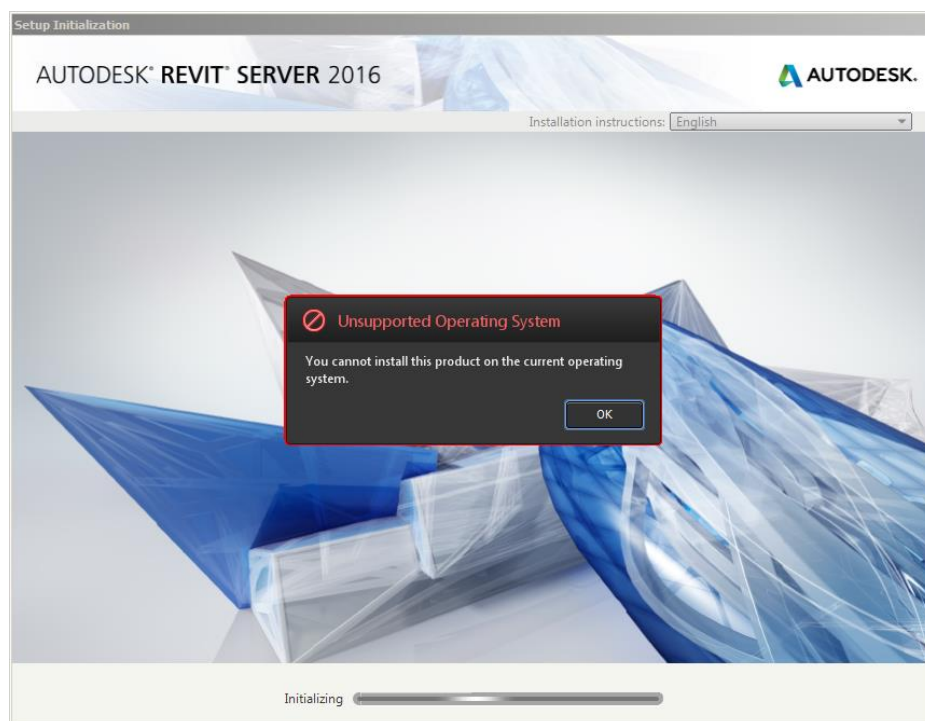
With the prerequisites taken care of, let's turn our attention to the Revit Server install. Using Windows Explorer, browse to the install file and, just to be on the safe side, right-click and select 'Run as Administrator':



This will then ask you to extract the files, select the default location.



Once the package is installed, setup starts, but returns an error message stating the Operating System is unsupported:



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Browse to the install default location:

C:\Autodesk\Autodesk_Revit_Server_2016_English_Win_64bit_dlm

Amongst the files you will find the file "Setup.ini"; edit this in Notepad:

```
CLIENT_LOGGING=YES
EXTRA_FILES=REVITSERVER;*.exe:Setup:eula:3rdParty:setupres:%lang%

#===== Install Info

INSTALL_PATH=%ProgramFiles%\Autodesk
CREATE_DESKTOP_SHORTCUT=YES

#===== Custom Callback
;CB_FUNC=CustomCallbackRevitServerOsVerCheck
;CB_SOURCE=Setup\RevitSetup.dll
;CB_PARAM=7.0.5730;7.0
;CB_DESCRIPTION=Detecting RevitServer Supported Platforms

#===== REVIT Server

[REVITSERVER]
PLATFORM=x64
PRODUCT_NAME=Revit Server 2016
PRODUCT_MESSAGE=RevitSetupRes.dll;503
;PREREQUISITE=RevitServerOsVerCheck;VCREDIST2012X86;VCREDIST2012X64;DOTNET45;DOTNET45LANG
PREREQUISITE=VCREDIST2012X86;VCREDIST2012X64;DOTNET45;DOTNET45LANG
PRODUCT_GROUP=
EULA_PATH=eula
LOG=%tmp%\Autodesk Revit Server 2016 Install.log
EXE_PATH=x64\RS2016\RevitServer.msi
UI_SEQUENCE=RevitServerRolesPanel;RevitServerUsersPanel
INSTALL_TYPE=1
IGNORE_FAILURE=NO
ACTION=INSTALL
ALLOW_ADD_REMOVE=YES
USE_EXTERNAL_UI=YES

[RevitServerOsVerCheck]
;VC_FUNC=RevitServerOsVerCheck
;VC_SOURCE=Setup\RevitSetup.dll
;VC_PARAM=7.0.5730;7.0
;VC_DESCRIPTION=Detecting windows server 2008 R2

#===== Modified Main Pages: Install Mode
```

Find the highlighted sections and place a semi colon (";") at the start of the line to turn the line into a comment. Notice there are two similar lines for prerequisites:

```
;PREREQUISITE=RevitServerOsVerCheck;VCREDIST2012X86;VCREDIST2012X64;DOTNET45;DOTNET45LANG
PREREQUISITE=VCREDIST2012X86;VCREDIST2012X64;DOTNET45;DOTNET45LANG
```

The first line is the original, comment this out and then copy the line to below, removing

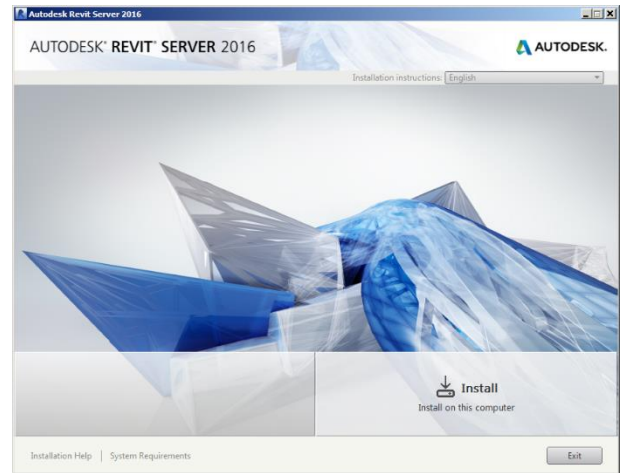
"RevitServerOsVerCheck;"

Save the .ini file and exit.



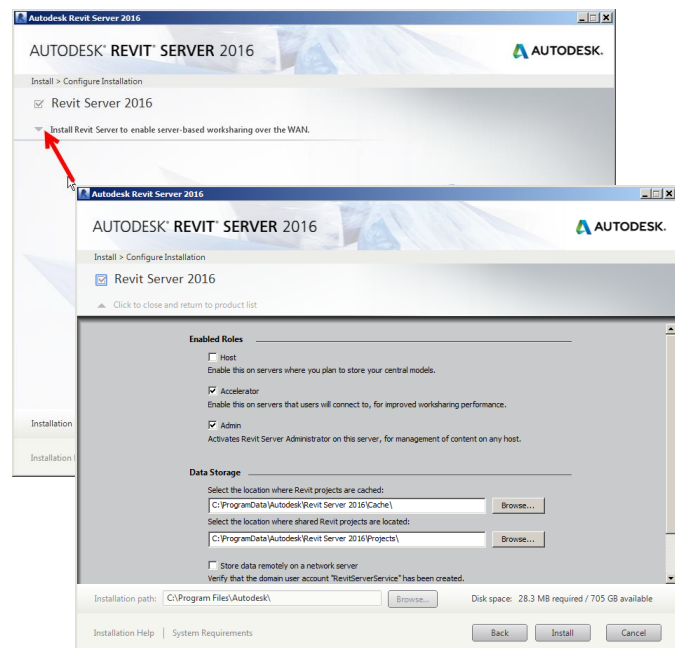
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Re-run the setup.exe and you should now have the Revit Server Install Screen:

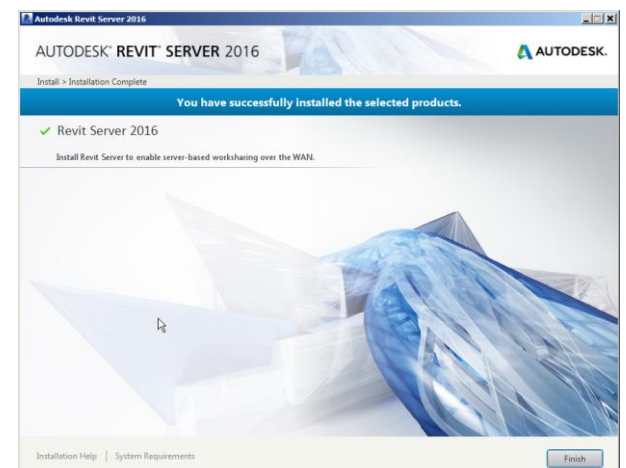


Click on Install and accept the licensing agreement to proceed.

Expand the installation choices and check Accelerator and Admin as roles for your Revit Server.



And once installed, you should be faced with:



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Sharing non-Revit data in a Revit Server environment

It doesn't work...or does it? I'm a 'bit' on the fanatical side when it comes to Revit project files and maintaining them.

For example, I really don't like DWGs messing up my nice Revit database. To avoid this issue, I'll create a completely new Revit project file to host the DWGs in.

This DWG 'Host' project is saved to the Revit Server and gets treated as any other linked file. This 'Host' file is linked to Central, with the result that it doesn't matter too much if, as a user, you cannot get access to the location where the DWGs reside, as a copy sits within the Revit Project. Everyone wins!

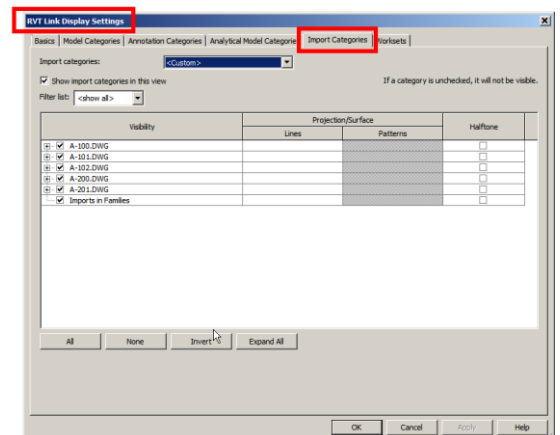
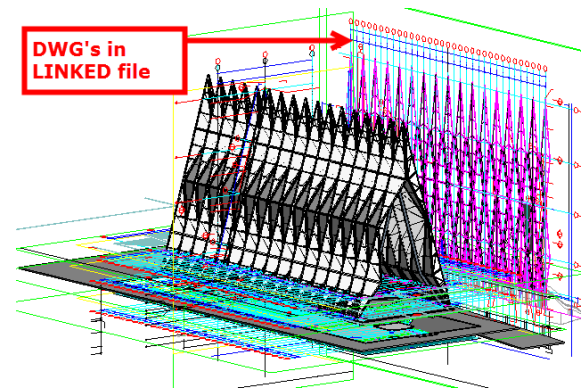
All the user has to do is customize the visibility of the linked files Import Categories.

Again, the best part of this workflow is that if you lose the network link, or are travelling, as long as you have the local copy of the Revit DWG host, the DWGs are cached within that file.

You can read all about this particular workflow in any of the RTC / AU presentations I've made in the past:

RTCNA 2011: Massing for Revit MEP and AU2012: MP1483: Massing and using Architecture Models for Revit MEP 2013 Analysis

Both these papers can be downloaded here:
<http://bit.ly/1MNuBG5>



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Point Clouds

There's no doubt that point clouds are large and there are many ways of managing them, largely depending on your purposes for them.

You can, of course, select default settings under Options, but I wanted to incorporate a small bit of automation so that everyone on the project could retain the same path to the point cloud and have it update when necessary.

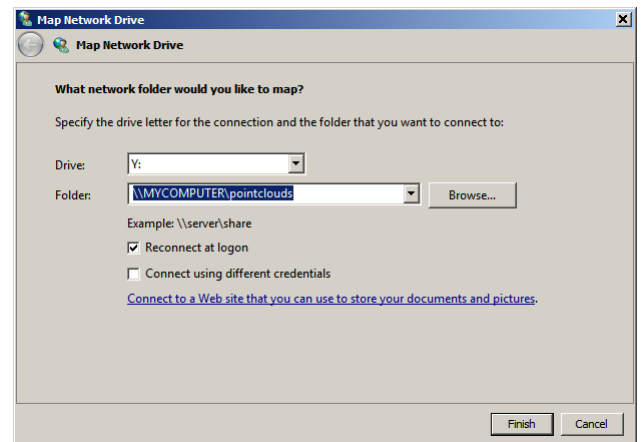
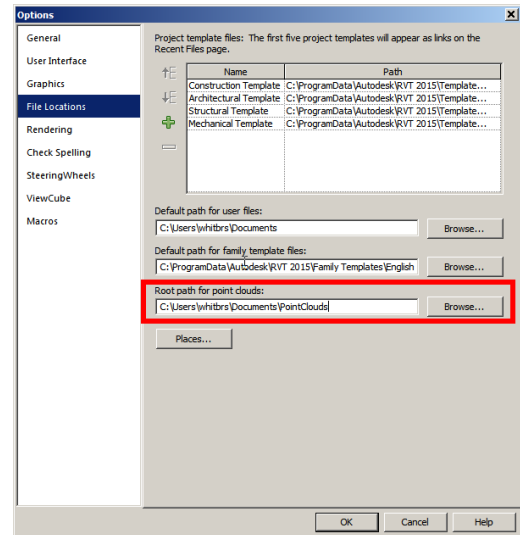
To this end, we used our corporate Box account. You can achieve similar results with virtually any cloud storage service—just be aware of any storage issues that may involve secure projects.

With the Box account, we copied the point cloud into a folder which is then shared and synced across the team. The actual location of the local users Box folder isn't that important, as we shared that synced folder with...ourselves, and then mapped that location as a network drive, so the full path could be:

C:\users\joe.soap\boxsync\pointclouds or

C:\users\b.head\boxsync\pointclouds

But when the share is made, every user now has a 'network' drive that is connected to the syncing folder with the same effective drive and path.



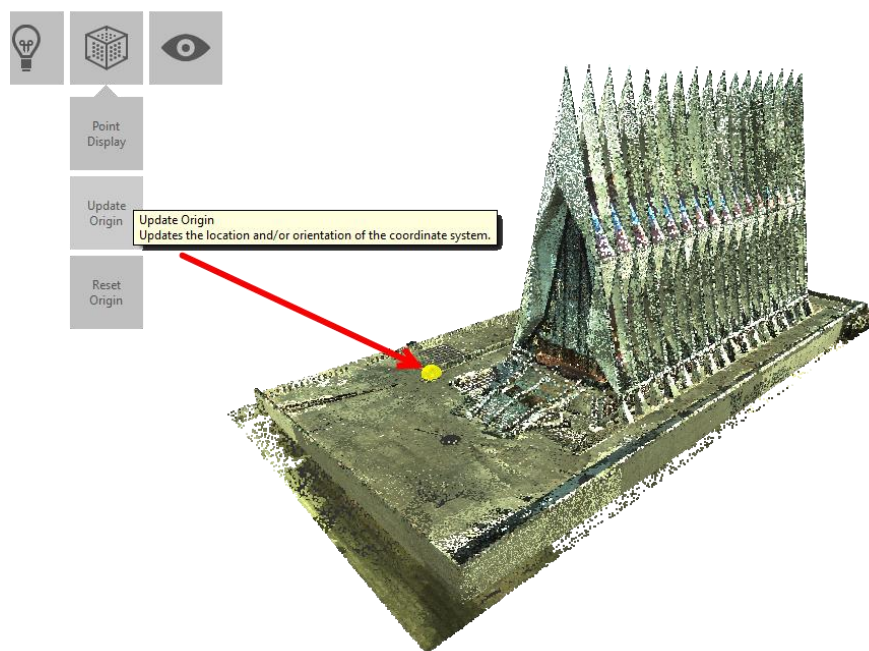
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Point cloud efficiencies

From an efficiency standpoint, there is a lot to gain from editing your original point clouds in ReCap.

For example, point clouds are great at storing very specific coordinate systems—we could, after all, be working on very large datasets that cover many hundreds of square miles.

Sometimes, these very precise coordinates may produce inaccuracies in Revit for the same reason. Revit will happily work with objects within a 20-mile radius; beyond that, graphical representation can get distorted. In these instances, you can update the project origin in ReCap to a more localized one. This does not affect the original scan data, as you will save a ReCap .rcp project file with the .rcs linked.



Again, in ReCap, consider cropping the site, if you only require the building.

Lastly, if you want a 'portable' point cloud, you can export a cropped version, deleting unnecessary points and then exporting a 'low resolution' .rcs...as long as the result delivers the accuracy you require for that particular portion of the project.

