A Crash Course in Handling Large BIM Projects

Harlan Brumm – Autodesk, Inc.

AB1656   Are you intimidated by what it might take to handle your project in Autodesk® Revit®-based software? Are you on the verge of starting a large project? In this class, you learn a systematic approach for handling your most complex Revit projects, while maintaining your sanity. This advanced class discusses how to get your team prepared for the project, build a project plan, and implement and maintain the project along the way. We talk about the functionality of Revit for large projects including hardware and network requirements, deploying Revit, building templates, using Revit Worksharing efficiently, working with Revit Server, and finally, best practices and tips and tricks for supporting end users working on large projects.

Learning Objectives

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

- Describe the process and best practices for managing a large BIM project

- Maintain healthy Revit files throughout the course of the project

- Use the functionality of Revit to manage and support a large BIM project

- Describe how to solve common large BIM project problems

About the Speaker

Harlan is a Service Design Manager with Autodesk. Based in Manchester, NH, he manages the service readiness of the customer service and support organization. He has spent 7 years in technical support helping customers with large BIM projects and resolving the most complex Revit issues, and training many users in most effective troubleshooting techniques. Before joining Autodesk, he worked for AEC firms in the Midwestern USA on a wide variety of project types. Harlan has spoken at the Revit Technology Conference USA, and at Autodesk University for several years, having been rated one of the top speakers.

Find me on Twitter @HarlanBrumm

Contents

Managing a Large BIM project

Dealing with a large design project of any type can be a daunting challenge. Adding BIM to the mix can add even more concerns for a project team.

Defining a Large BIM Project

Starting with defining what a large project is seems like a good place to begin. However, it isn't a very simple task. A large project is very relative to the team working on it. Large projects can have a sheer size component (amount of square footage) but it also can have an emotional component (the most important thing we have ever done). There are things that large projects have in common though:

1. The perception of the team involved
2. The unpredictable nature of the project
3. A need for collaboration with multiple teams and stakeholders.

Large Projects Problems

Large projects in general can be a drain on resources; huge amounts of time and money and invested. Because of the things large projects have in common (listed above) large projects inherently have a lessened likelihood to be successful. There is a tendency for large projects to present forced stressful tipping points during the lifecycle of the project.

What you Control

Understanding and accepting (acceptance is the first step) what you and your teams control within the project is critical to helping you manage a large project. There are really three things that you control.

1. The capability of your teams – you control the people

2. The methods for completely work – you control the process

3. The solutions you use – you control the technology and how it's implemented/used.

The focus of this class will be on these three areas: People, Process, and Technology in the context of large BIM projects. Rather than separate things though, they are intertwined within a project, each one being impacts by the others.
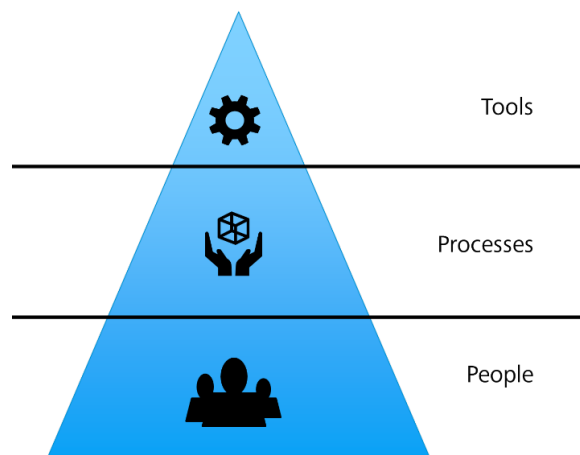
People

People are really the key to a large project. It might not be the most enjoyable piece for many (but it might be), but nothing will work on a large BIM project without having good people doing good work. Fundamentally people are more important and have a bigger impact than any tool/technology, or any BIM process.

Culture

The culture of the team working on a project has everything to do with the success of a large project. But what defines a good culture? There are plenty of books and references available on the subject. When it comes to a BIM project, a culture that supports open and frequent communication is required.

Due to the collaborative nature and amount of teams typically involved, communication between teams, between team members, and with leadership is important to maintain information and ensure all the team members are on the same page. Some technology can help, but it's no substitute for a team that has communicating clearly built into its everyday culture.

Organization

When a team understands and has a clearly defined organization it performs at its best. Each member of the team needs to understand their responsibilities and how what they do relates to the whole of the project. A term I like is "Glass Silos" – everyone can see in and see out, but knows their boundaries. On a large project with large teams, having these delineations clear allows the team members to focus and plan their work.

BIM Roles

On a large BIM project, managing the data within the model can require that team members absorb "BIM" roles simply related to the Building information Model. On large projects, this can mean separating out a traditional "BIM Coordinator" by discipline in order to make sure that there are resources taking care of specific elements of the project.

Some typical roles on large projects.

- Design Manager

- Revit Administrator

- Revit Champion

- Content Creation Specialists – by discipline

- BIM Coordinator – by Discipline

- Data Coordinators

Training/ Skills development

Training and development is aspect of dealing with people that often gets minimal focus or only focus at certain times in a team member's time. There are really four types of training (related to specifically to large BIM projects).

1. Applications – the software/technology itself.

2. Standards – the "normal" methods of the project/company.

3. Processes – what needs to happen, when, and how we do it.

4. Maintenance – when things change, gaining understanding quickly

It's often assumed that teams need new version training, new hire training, how we "BIM" training, etc. We hand our teams the standards, the templates, the books we've written and say, "go to it".

But we often miss a key point in skills development– things change quickly and projects often have very different requirements at different times. Often formal training is too slow to allow team members to act on it in their current work – their current Large Project. This means that training needs to become a full time activity. Training needs to be part of your culture, your expectation, and it needs to be ongoing, never done. Learning is the word we should be using, always learning.

Keeping it simple

Training doesn't have to be complex or hard, but it does have to be intentional. Building a framework for your projects about how you will share information, train your teams on changes to the project, workflows, processes, can go a long way to making training part of your culture for your people and ensure you always have a fully engaged and highly performing team.

Processes

Ensuring you are the optimal culture and training is important. Having the right tools and technology to ensure success will ensure BIM can be done, however, being able to use those tools and ensure productive people raises things the next level. Process is the means in which we deploy our tools and workflows and ensures alignment and execution.

There are a few things to consider in the context of large projects and processes that are undertaken.

BIM Execution Planning

Having a documented project execution plan not only helps the team plan the project, but also serves as a reference for the team to settle problems that arise in the course of the project. It defines key variables in the course of the project to ensure they delivered in a predictable way. A BIM execution plan should cover many things:

1. The Design Authoring environment and workflow

2. Cost Estimation

3. Design Coordination

4. Project information

5. Uses of the Building Information Model

6. Requirements for model maintenance and keeping healthy project files

7. How information is exchanged between teams

8. Requirements for the model data

9. Procedures for collaboration

10. Structure of the building information model and team responsibilities.

Documenting your BIM execution plan can be a huge asset during the entire lifecycle of a project. It is your opportunity to provide process control over the project and from the beginning set the stage for a successful project. There is nothing that cannot go into an execution plan and there are plenty of resources available to help you get started as many organization have samples and guides available (including Autodesk). Here are a few out there:

- AGC – Consensus Docs / BIM Addendum / Execution Plan

- AIA – IPD Guide / E202

- CIC – BIM Project Execution Planning Guide

- NIST – General Buildings Handover Guide

- FIATECH – Fully integrated and automated project processes

- CURT – Collaboration, Integrated Information and the Project Lifecycle

- GSA – BIM Standard

- NIBS – National BIM Standard

- 3xPT Strategy Group – CURT, AGC and AIA collaboration

- AIST – CIMsteel Integration Standard

- Autodesk BIM Deployment Plan

Collaborative Workflows

Documenting and being clear about how you will collaborate and what tools will be used along the way is an important consideration for large projects. In most cases, large projects are going to have many different file formats and inputs at play within the course of the project. Being able to answer the quest "how are we going to work together" will help things progress more smoothly.

An example that you will need to consider is that through the different phases of the project, it is very possible that different tools will be used. Is Revit the only tool – not likely. The workflow of designers, engineering, and in the field will need to be considered.

Beyond the tools however, there likely will be multiple models involved (even within the same tool) and those models will need to be documented. Splitting models due to the constraints of a large project bring with it additional challenges. Understanding the execution plan and how all the moving pieces will fit together will save your team's time, energy, and effort later in the project's lifecycle when you cannot afford to not know the answer.

Standards

Project standards an interesting problem – everyone tends to have their own, so their only standards to those that use them. For Large projects with diverse teams and multiple companies working together, understanding the standards for the project will be one thing, actually getting everyone to use them is another. Documenting and using standards is a challenge even on simple projects.

Large Project Process

Processes on large projects often actually become a project in their own right. This is where problems happen later on. Ensuring that the projects processes are transparent to the team that they are being monitored and everyone is using the same standards and workflows will go a long way to preventing issues down the road. With large projects, it' better to plan than to have to fix later.

Tools and Technology

In this last section of the handout we will talk about the tools and technology related to managing large projects. This is the fun part.

Hardware

The first consideration for technology and tools needs to be focused on the hardware being used for the project and project team. Large Project in particular are dependent on hardware. This is because large project stretch resources and technology often to the limits. There are two types of hardware that we want to talk about, Workstations, and Networks. Both types of hardware play a role in the course of a large BIM project and require thought and planning.

Hardware is all about making sure you get off to the right foot and don't start with problems from the beginning (without even getting into Process and people).

Workstations

The first area we will focus on is the end users workstations. There are a few questions to consider while planning and thinking about hardware for your end users workstations.

1. What hardware do we need to execute the project?

    a. The "specs" of the hardware will need to be quantified based on a number of factors. First, at a minimum, the system requirements need to be followed. This is to ensure minimum viability of the project. Next however, is based on how big do you think the project will end up at the end? Experience is a great way to plan for this. Without experience, you can start to gage things by the physical size of the project, the number of models that will likely need to be built, the number of teams working on the project etc. This initial determine related to your hardware can also help you understand constraints on how you will be modeling etc. A poor choice is plan your project around your hardware however – this sets yourself up for limitations in the beginning and can negatively influence your ability to adapt when things change.

2. Does everyone need the same performance?

    a. A difficult question, but in all likelihood, you should think about this by how much a person will be actually working on the project and what a impact poor performance will have on their ability to execute on their tasks and what impact that will have. Often, we think the more senior someone, the better performance they require, however, it is actually more often than not the opposite. The ones really in the model every day, doing the execution to complete the design, require the best performance because they inability to complete tasks impacts the rest of the chain.

    b. BIM Managers and other project roles (that we spoke about above) are also a serious consideration. These are the people who will likely be working and doing more than one thing within the project – they will be accessing more of the project likely than others. This means they will be straining their machines beyond a typical user.

    c. It's tempting to say that everyone requires great performance, but like most things, it's a balance to ensure project success and sometimes hard choices need to be made.

3. How to we make the case for procurement?

    a. This should really be the easiest question to answer. The hard fact is the people cost more than workstations. Throwing more people at a large project is something that isn't in the cards for many projects (and for BIM projects isn't always the right answer).

    b. The other main consideration is the amount of time that will be wasted on the project by the slowness that occurs with poor performance. Finding ways to improve performance (things like file open and save times for example) can have a real impact on the project and how efficient your people are at working on the project. Nobody likes a 30 minute file open time, and that is time simply wasted (cause there isn't much else you can do while a file opens). Hardware can in fact get you time back.

Let's dive deeper into workstations in particular and look at the different components that need to be considered. It's important to understand the components of a workstation and what affect they have on performance, what are their benefits and draw backs and how to make an informed decision. Part of this is simply dispelling myths about hardware in general.

Processors

The processor is really all about the speed at which things are completed. Multi-threaded (multi-core) processors allow for tasks to be run at the same time in parallel. It's important to know that in many cases it's impossible for a task to be multi-threaded – no matter the software, something's just have to happen linearly for them to be completed.

Revit does take advanced of multi-threading, but it won't always be obviously this is happening. The reason for this is that Revit's multi-threaded abilities are in specific areas of the program and aren't occurring all the time or going to automatically be balanced equally at all times. Here are the areas where Revit is multi-threaded and will use multiple cores:

- Vector printing

- 2D Vector Export such as DWG and DWF

- Rendering (4 Core Limitation lifted in Revit 2011)

- Wall Joins representation in plans and sections

- Element Loading. Loading elements into memory is multi-threaded, reducing view open times when elements are displayed for the first time in the session.

- Parallel computation of silhouette edges (outlines of a curved surfaces) in perspective 3D views. Engaged when opening views, changing view properties, and navigating the view and will be more noticeable as the number and complexity of curved surfaces increases.

- Translation of high level graphical representation of model elements and annotations into display lists optimized for given video card. Engaged when opening views, changing view properties and will be more noticeable as the number and complexity of model elements increases.

- File Loading

- Point Cloud Data Overlay

Hard drives

Hard drives are all about data storage and access. This is also about speed, but pretty specific to file load/open and save times. It's obvious at this point that Solid State Drives (SSD) are faster and perform optimally today. SSD drives will not only impact your large BIM project, but in general computer boot, wake, and shutdown speeds as well. Like anything there are grades of quality when it comes to SSD drives and often you get what you pay for not just in terms of storage size, but also quality. There is nothing worse when your hard drive fails so like anything, play carefully.

Memory

Memory (Random Access Memory – RAM) is all about amount that can be done. RAM helps you multi-task and run multiple programs at the same time. It also lets you complete very large tasks that cannot be run on the processor in one or more operations. RAM really comes in to play during render, printing, exporting, etc. Creating any kind of output can be very dependent on the amount of RAM you have.

At this point, 64 bit (processor) is really a requirement for any large project. This is critical because it allows the workstation itself to access more memory, without it that extra RAM is useless. Today most computers all come 64 bit so this isn't much of an issue unless you are trying to use old hardware.

RAM really lets you do more, not really do it any faster (that is your processor). When it comes specifically for Revit, a general rule of thumb is that Revit needs about twenty times the size of file you are opening in RAM in order to expand the file in Memory and work on it. This number can fluctuate, it's a general rule of thumb, not law, but it works well as a gage for your memory requirements.

The size of file is typically calculated to include everything directly opened in the file. Linked files and references are handled differently and their size can typically be added closer to 1 to 1 to the size of the 20x calculation of the file being opened. The calculation can be shown like this

Revit file being opened X20 + Size of all linked files in the above file (1x) + Size of any other reference files, dwgs, etc. (1x) = Amount of RAM needed.

The other consideration for memory and Revit is that the increase in RAM means that you are less reliant on paging to your hard drive (using hard drive space as RAM when you run out) – this greatly can slow down your machine and cause instability issues like crashing. Having more memory can have a direct impact on how stable your workstations can be:
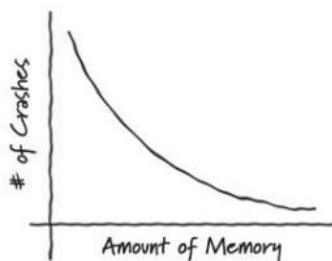
The Revit Memory Curve (Unofficial)

Graphics Card

Your graphics card is a critical component for your large BIM project. After all you are modeling a 3D representation of your building and displaying it. There is one rule here, follow the supported and certified

hardware list here.   If you feel like having to go off list – ensure you get a card that has a DirectX 10 capable GPU with at least Shader Model 3.

Networks

The other component besides your workstations is the rest of your technology infrastructure – specifically we are talking about servers and your network itself.

Servers

Servers make up the backbone of your network and the access points for file storage and licensing. Ensuring that they are doing what they need to do and optimized for your environment is a key component for your large projects.

For file servers, it's important that they are windows based systems and not based on another OS. This is due to how Revit files utilize Microsoft file access and saving protocols. Other operating systems use different languages to communicate file operations and this is sort of like going through google translate – what you put it doesn't quite look the same once it's been translated to other language and then back again. Staying with the same "language" (Windows OS) reduces that risk of things like file corruption or Worksharing sync errors due to mismatches or lost data.

Since file storage is all about storage, it makes sense that your server hard drive storage is also important. Like a workstation, using Solid State Drives is optimal for this purpose due to their speed of operation.

One important thing to avoid – using DFS (Distributed File system), a Microsoft technology, isn't optimal for Revit project files. DFS can work well for content being accessed on the network to duplicate it to other locations, but using this technology on work shared projects with multiple individuals working together can cause sync problems during saving projects (do to how Revit sees the location of the files changing).

When it comes to license servers, on large projects teams will often be using network licensing, its important to follow the support configurations and operating systems. Licensing servers can also be bandwidth dependent due to checking in and out licenses. To ensure users have a good experience launching a session of Revit, making sure the bandwidth is good quality between the workstations and the license server is important. A personal note about license servers – don't use a redundant license server configuration. It is often simple a waste and doesn't offer many valuable benefits over other models (like distributed). It's temping from a naming perspective, but its setup and complexity in maintaining makes it less than ideal.

Network Infrastructure and Bandwidth

Networks can be the weak link within the best large project. Its' not an easy thing to manage or correct either. How can you improve your network bandwidth? Well, you can increase your bandwidth, installing faster network cards and better cables, routers, providers, etc. On large BIM projects there is also the opportunity to manage your bandwidth by controlling the process of saving and syncing files and work across teams. You can optimize the work the teams are doing to limit conflicts and chances that you will utilize all of your available bandwidth.

Another way to adjust your network is to change the flow of data. Virtualization is an option to change the way users access a project. In a typical workflow the idea is to bring the data (the project) to the users by

pulling data to their workstation and using it there. Virtualization allows you to reverse this workflow and bring your users to the data. This impacts your network in that instead of moving the data, you are moving the user. This might be right for your organization as you look at how best to manage your large project or your users and their data. There are good things and draw backs to either method.

When it comes to bandwidth for large projects, better is better for Revit and BIM. As a general rule your network latency should not exceed 100ms as you work on a project. This is a general rule again and can vary, but it's a safe thing to gage your network against.

What can do wrong?

So what if you have older hardware or aging network infrastructure? What's going to happen? Besides all of the above about saving yourself time, money, energy, and effort, how about preventing stress? Poor or inadequate hardware leads to poor performance, slow response times, and even the inability to complete your work. Ultimately this can lead unneeded stress and in the worst case, even the loss of the project. Nothing's worse that having to give up after months of effort simply because the tasks can no longer be completed by something that could have been avoided by pre-planning.

Revit

After hardware, the next area where we need to focus is on Revit itself. There are two areas of focus for Revit itself. The first is on the End users of Revit and the practices they need to implement to be successful with a large project, the second is what management (BIM Management to be specific) needs to ensure they are focused on. The majority of the time will be spend with BIM Management.

End users and Revit

End users of Revit are the ones in the day to day work within your large project. Often their role in the maintenance and care of the project is about using best practices and ensuring all processes are followed as they work. The best practices for the end users are important to be in place and enforced by management because they often have the greatest impact in the day to day operation of the project. There are a number of best practices that end users should follow in their day to day work.

1. New Local file Daily

   a. This is the "apple a day keeps the doctor away" rule. Creating a new local file every day (instead of just continuing with yesterday's file) does a number of things for the project and the benefit of everyone involved. Mainly this practice ensures that the user is starting with a clean and most up to date version of the project and that they will not lose work due to an outdated dataset. This practice also builds in automatic backups in case of failures and creates redundancy. This practice also helps to "clear out" errors that could have possibly occurred and resets in affect the communication between the local file and the central file.

2. Communicating coordinated Syncs to Central with Peers

   a. Building a practice of having coordinated syncs with others on the project and even just going as far as telling everyone when you are syncing can be a huge benefit to the larger team and the project itself. On large projects it's recommended that this practice be coordinated to ensure that not everyone is trying to save at once and that the projects files are being accessed all at once. Resolving these issues can take time if done all at once and can end up denying access to someone that needs it at the worse time. Keeping the sync schedule is a great way to foster communication across the teams as well.

3. Following Workset creation and usage guidelines

   a. Worksets can become unwieldy if left along and unmanaged (like AutoCAD Layers can without monitoring) so its' important that understanding the workset guidelines is clear and being followed by your end users. Without doing so, the project can quickly become a mess to understand, navigate, and troubleshoot in the case of problems. Whatever standard is used, end users need to make sure that they play along.

4. Use "Specify Open"

   a. When opening a file, end users should take care to only open the worksets they need to use to work. This goes along with point 3. By using this command, users can limit what

is loaded into memory and improve the performance of their file open times and their ability to focus on the aspects they need to without overloading themselves.

5. Using Working views

    a. Views are cheap in Revit. This means that views unlike model geometry do not have a noticeable impact on project and system performance (as long as too many are not open at the same time). Creating working views for working on the model that allow documentation views to remain in place keeps things organized and allows others to know what is being worked on better by others.

6. Being "you" and being consistent with file navigation

    a. It's important for End users to keep an eye and be conscience of their Revit user name. The user name in Revit is changeable, but end users should take care with changing it without working with their BIM Manager. It can have consequences for others on the project and changing it should be done with intent and not on a whim just to "fix" something. It can have downstream affects.

    b. How an end user navigates to a file and paths to directories of a project is very important. Pathing issues can result when files are accessed or created differently than others working on the project. The team should have a consistent way to do this (the BIM Manager should ensure) and the end users need to be accountable for making this be the same for all team members.

7. Memory Management

    a. Closing other applications - Users should take care to free up available memory before performing a memory intensive task on a project. Things like printing, exporting, and rendering should be planned and considered before they are started.

    b. Restarting Revit – end users should regularly restart Revit before intensive tasks or during breaks in action (like at lunch). This action of restarting allows the system to free additional memory and start from a fresh state.

    c. Close Hidden Windows – as mentioned above, closing hidden windows regularly to ensure that only the views needed are opened will save memory and improve working performance as a user works on the project. Views themselves in the project do not impact performance, but having many views open at the same time in a session can cause some performance delays.

BIM Managers and Revit

With Large Projects, BIM Managers play a critical role in the health of the project and in preventing issues before they occur. Often their decisions will make or break the project work that occurs. Its important to understand that a BIM Manager role is not just about the technology, but needs to focus on all aspects, the people, processes, and the technology.

BIM Managers need to implement and monitor many processes that have a direct result on the project lifecycle. They have many Revit related roles. Here are the ones we will discuss in this section:

- Basic Troubleshooting

- Installation and Deployment Prep

- Template creation and management

- Worksharing management

- Shared Coordinate management

- General project health

- Administrating Revit Server

Basic Troubleshooting

BIM Managers are often tasked with basic and even advanced project troubleshooting when something breaks in the course of the day to day work on the project. There are some basic things BIM Managers need to be able to understand about the problem before diving directly into troubleshooting and using all the stored up Revit knowledge.

1. Did the issue appear recently?

2. Is everyone on the project seeing the behavior?

3. Did the machine get the latest updates?

4. Does the same thing happen with hardware acceleration turned on or off?

5. Is the machines drivers up to date?

Beyond these, a common theme with Revit projects is display and visibility problems. Understanding some quick tricks to resolving these issues can save time and support calls.

- Create a new view

- Cut and Paste geometry to same place

- Cut and Paste geometry to new project

- Apply a view template (new workflow for 2013)

- Check for large coordinates outside 20 mile "box"

- Save a project copy with worksets disabled

- Check View Properties:

  - View Range

  - Discipline

- Detail Level

- Scale

- Visibility / Graphic Overrides

Install and Deployment Prep

Part of a BIM Managers role is often half architecture/Engineering and half IT. The IT often comes into play with installing and deploying Revit and other products across the project team or the entire enterprise. This isn't a task to take lightly, no matter how often you have done it. There are a lot of questions you need to answer before ever getting started. These are worth looking at any time you are starting a new project.

- Do you need to create deployments for different groups of **users** based on discipline, software features, and settings?

- What Revit out of the box **content** do you need?

- How can / do you want to manage content?

- How will you manage **add-ins**?

- Where will user projects and files reside?

- Which user settings do you want to specify?

- Revit Server?

- Do you need to create 32 bit and/or 64 bit deployments?

- For network licensing, what is your **license server type**?

- How do you want to distribute/access your licenses across your enterprise?

Then there are the basics you need to be familiar with for any deployment:

Read the Autodesk Network Admin Guide.   Read the Revit Install Supplement

- Use **short** paths

- Plan Revit Server

- Do **not** use Modify Deployment tool

- Turn Off Any Security Software

- Close All Programs

- Turn Off **UAC** (User Account Control)

These items will help you plan your deployment and ensure that you don't encounter an easy to avoid problem. Some of them are not easy things to do (like turning off Security/Anti-virus software due to IT policy) and others require real thought and planning to understand their impact to the deployment process.

Revit.ini workflow

A common need is to ensure consistent settings and control over the initial setup of users machines. Every office is difficult but in large enterprises with large projects it's good for everyone to have equal footing. It makes the people and process part a little easier to manage. The Revit.ini file is a setting configuration file that allows you to use a set of consistent settings across users. There are easy ways, and hard ways to make this work. There is a recommended workflow however that will improve the results.

1. Install **first** standalone on test machine

2. Launch Revit

3. Configure

4. Locate and **Save** Revit.ini

5. Use option to include Revit.ini in deployment

Troubleshooting Installs

Solving installation problems is really a matter of being able to understand where something happened. Log files with installation can be key to figuring out what happened during the process and what needs to change. In the %temp% folder of the installed user you will find the various log related to the Autodesk Software you have installed.

A file containing setup in the file name is related whole install sequence as defined in the setup.ini file. This doesn't contain any detail regarding the individual component installation.

In order to understand actual install process you will need to look for log files which contains word "install" in the file name. Also the install log would be much bigger in size than a setup log.

During the SCCM/GPO installation a log might not be created by default in the System's temp folder i.e.:\Windows\temp. If that is the case, please enable Verbose MSI log using a GPO or manual registry tweak.

There are good tools to help you analysis these logs, the Windows install log analyzer (Wilogutl.exe) is a good example.

Template Creation and Maintenance

Templates allow the BIM Manager to set the starting point for projects or content and can be the tool to get the project on the right foot. Taking the time to build out your templates will never be time wasted. There are so many things that can be done with templates there is really only the limit to how much you want to start with. The key is knowing how much of your template is actually going to be used during the course of the project and if you are helping or simply adding information that won't be used. There are some basics that likely you will want to cover however:

1. Project Browser organization

2. Object Styles, Line Styles, Line Weights

3. Shared Parameter usage

4. Families

5. Materials

6. Annotative Objects

Worksharing Management

Managing a Worksharing project is not an easy task. The BIM Manager needs to be able to ensure at the root consistency. Its consistency and predictability that leads to large projects running smoothly. Many of these repeat what the end user needs to be doing on a daily bases, the BIM Manager needs to ensure that it happens for the same reasons.

1. New Local File daily

2. Consistent network locations \ mapped drives

3. Consistent workset naming

4. Each user has unique username

5. Set synchronization intervals for project teams – must manage the people!

Shared Coordinate Management

Coordinates systems cause more problems than they should on large projects and its worth adding here. It's important for a BIM Manager to pre-define the organization and methodology clearly within the team and setup rules for the coordinate systems. The first key is having a understanding of the system and the uses of the projects internal coordinates and the shared coordinate systems. Added functionality in recent releases of Revit makes this more confusing (in my opinion) and can cause additional problems due to how the systems and can managed.

The key is to pick one, make sure it works for you the way you want and expect, and then stick to it. I prefer the approach of not using acquire coordinates on files, but instead using "Specific coordinates at a point" to set the project based on agreed coordinate information. This tends to eliminate a lot of confusion and variables and take away some of the "what is this point or that point" confusion – because you don't need them. Then again, I really prefer simple.

I highly recommend having a process for this and making sure it is clear in your BIM execution plan. Having a process, and sticking to it, is the best way to prevent accidents and have a solution in place when they do happen. Planning is your best friend.

General Project Health

Providing general maintenance on a project of large scale and importance can take on additional significances. There are a few questions to try to answer.

1. How often do we need to perform maintenance?

    a. It depends on the project and when in the project lifecycle you are. Early in the project less maintenance is going to be required then towards wrapping it up. This is due to the amount of data contained within the project at any time and the depth of that data. The schedule can vary greatly as well based on the complexity of the project and of course, how healthy the project seems. All of these factors can lead to varying schedules so unfortunately, there isn't a single correct answer here. I would say though that as things get more intense so should the frequency of the maintenance.

2. What should I do?

    a. Again it greatly depends on what is happening in the project at the time of the maintenance and what has happened since the last review. Basically we are talking about reviewing the models and ensuring they are working and performing some general steps to repair and optimize the model sense the last review. With scheduled and repeat maintenance you should be able to know the health of a project at any time and what has been done since the last review. Here are a few items to build into your regular maintenance:

        - Purge Unused

        - Audit

        - Save As (with new name) – New Locals for All – wipe the old away.

        - Monitor Project Size and Family Sizes

            1. Exporting all families and checking for families with larger than usage file sized.

            2. Reduce Family Complexity

            3. Clean up imported content

Revit Server

Revit server is often employed on large projects to allow all the teams to work collaboratively on the models. Revit Server allows you to build a system for your project while solving the issue of physical distance between teams. Revit Server doesn't add real tangible benefits for teams within the same LAN

network, but when teams are displaced, it can help bring the data to the teams in a managed and ideal way. It's important however that BIM Managers have the skills and time to manage the process.

The Revit Server workflow is complex with many variables and pieces that need to be monitored and maintained to be successful. There are LAN (local area network) components, components of the WAN (wide area network) and components on the Revit Server hosts themselves.

Here is an overview of all the components and pieces of a Revit Server environment:
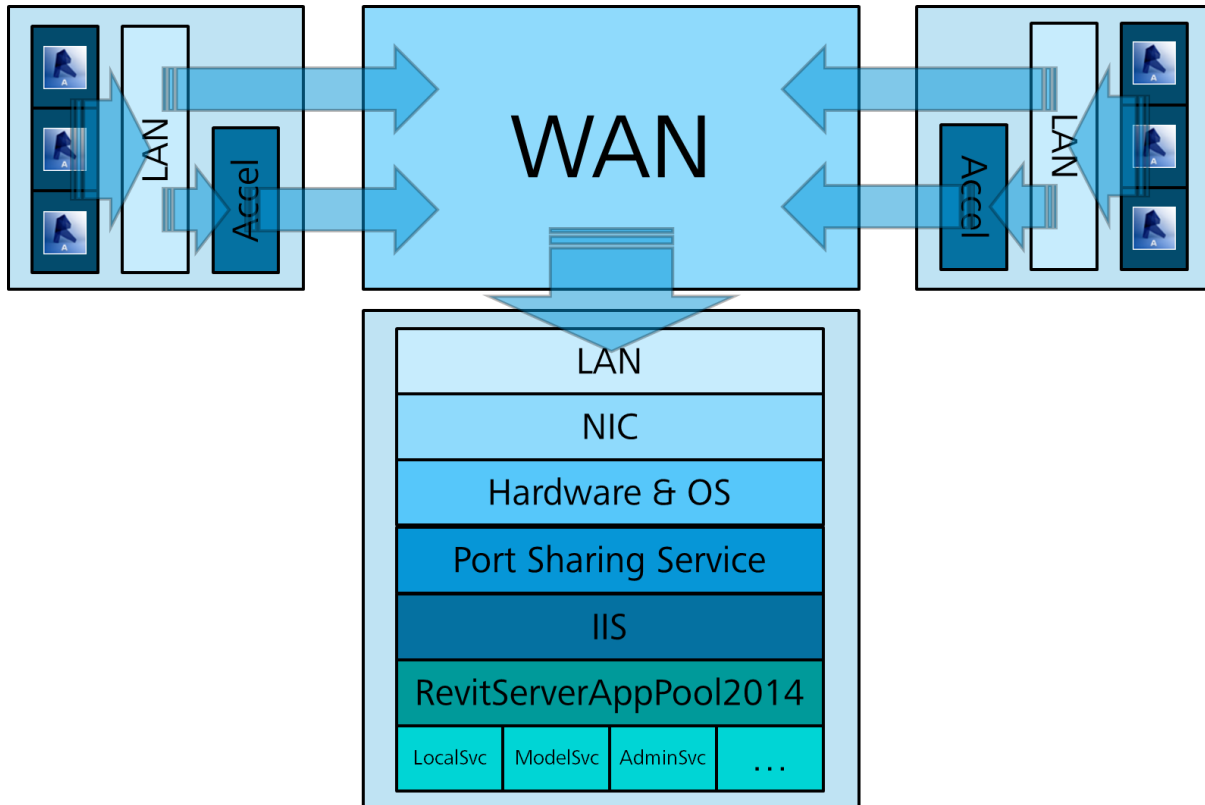
There are so many areas where things can go wrong due to the number of connections between components that it is not really possible to dive into each one here. At the end of the PowerPoint deck for this class are a number of slides in the appendix that outlines the symptoms and possible points for troubleshooting along this chain.

Closing

All large BIM projects present challenges and opportunities for the teams involved. With careful planning and continued execution, your next large BIM project can be your most successful one yet.

To follow up about me with questions directly about this handout or presentation, reach out me via twitter @HarlanBrumm