BIM 360 with AutoCAD Civil 3D, Autodesk Vault Collaboration AEC, and Autodesk Buzzsaw

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The modern design team does not end at the meeting room door, and by leveraging the full range of team collaboration tools from Autodesk, you can take your data full circle. In this class, we will look at delivering the promise of BIM 360 in the civil infrastructure profession by leveraging the interaction between AutoCAD Civil 3D, Vault Collaboration AEC, and Buzzsaw. We will start by exploring the internal team collaboration with Civil 3D and Vault, then submit drawings using Buzzsaw, and deliver feedback with the mobile AutoCAD WS platform

Learning Objectives

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

- Explain the concept of BIM 360 in the civil engineering framework
- Describe basic lifecycle concepts in the Vault Collaboration product
- Update and review data using Buzzsaw and WS platform technology

About the Speaker

James spent nearly a decade in the Dallas/Fort Worth land development industry before entering the Civil 3D® consulting field in 2006. A graduate of Texas Tech with a BSCE in 1997, he worked as a design engineer focused on private development, designing small commercial to multiphase single family and master-planned communities during his time in the industry. One of the earliest gunslingers for the AutoCAD® Civil 3D product, James has worked extensively with the Autodesk® product team to shape and guide the software's development. A highly-rated repeat presenter at Autodesk University and co-author of the best-selling Mastering AutoCAD Civil 3D text, James joined the Autodesk team in 2010.

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BIM 360

With every project, we consume data from a thousand sources and we share our creation with a thousand more. As a project moves from napkin sketch to paper to model to construction equipment, it will changes hands over and over, sometimes as a fax, sometimes as a courier package, sometimes through a digital markup. At every step of the way, every time there's a change in format, in owner, in process, in purpose, there's an opportunity for loss: loss of design intent, loss of detail, loss of clarity. All of these little losses lead to project breakdowns and inefficiencies.

BIM 360 refers to the idea that a complete, accurate, digital model of our projects, providing access anywhere to key information across the entire project lifecycle. This view of the world leads to better decision make, new insights and predictability in the project delivery, and improved operational reliability and efficiency. BIM 360 is an idea though, and you need tools to make that idea a reality.

Within the Architecture, Engineering, and Construction, (AEC) world and in the Autodesk view, the tools you need are bundled up in three segments: Design, Management, and Collaboration. Creating models is accomplished with tools like Revit, AutoCAD Civil 3D, and 3ds Max Design. Management is accomplished with the Vault Collaboration AEC data manament system. Collaboration (outside the company walls,) is accomplished using Buzzsaw, Design Review, and AutoCAD WS. It's an impressive tool collection, but with that many tools to understand and put together, the question quickly becomes, "How do I make this all work?"

The Setup

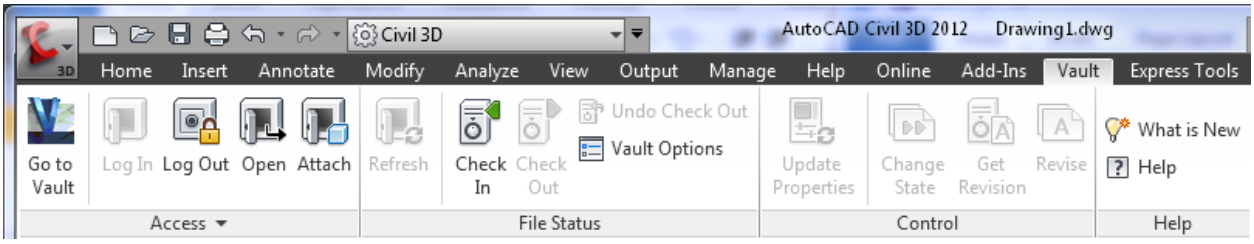
When you want to work with teams both internal and external, there are three major systems in play:

1. The Design Software. This can be Revit, AutoCAD, Civil 3D, or any number of other design pieces.
2. Internal Data Management. In this discussion, that's Vault Collaboration AEC.
3. External Data Management. In this case, Buzzsaw

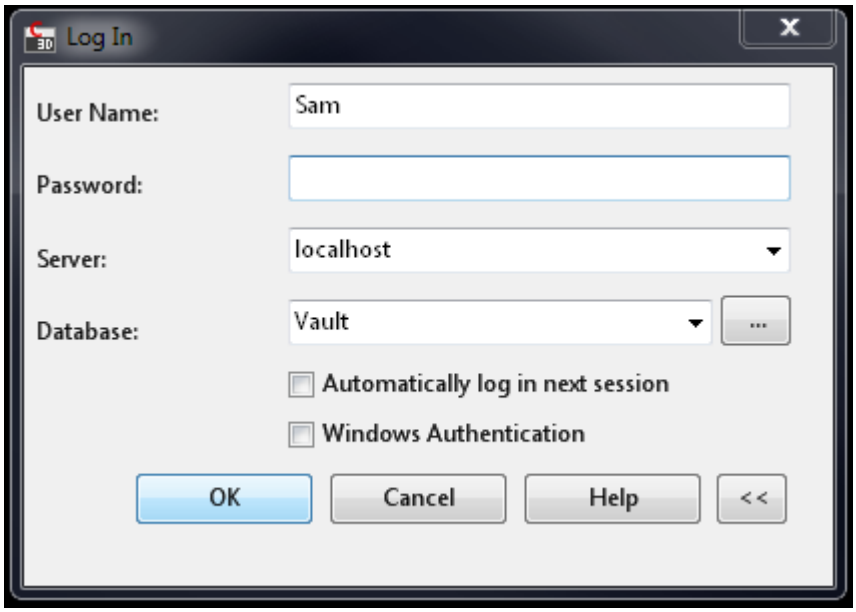
Pulling all these pieces together isnt' terribly complicated, but it does take some setup to really make it work! Let's take a look at the setup of each piece.

Design Software

In the case of most Autodesk software you simply have to install the Vault client. When you do, you'll see a new tab added to the ribbon as you see here:



The commands along this tab are activated when you login to the Vault. You can see in this case, the Log Out button is active, meaning the user is already logged in to Vault. If these commands are greyed out, you need to login to the Vault system. Click the Log In button and you'll see a dialog like this one. Note that you can use Windows Authentication if your Vault system is setup that way, and that you can toggle automatic login. This is a good suggestion if you don't share your computer with other users and you generally are working in a Vault environment.



Once you have your design software setup to work with Vault, it's important to do some work on the Vault system itself to make all the pieces work together smoothly.

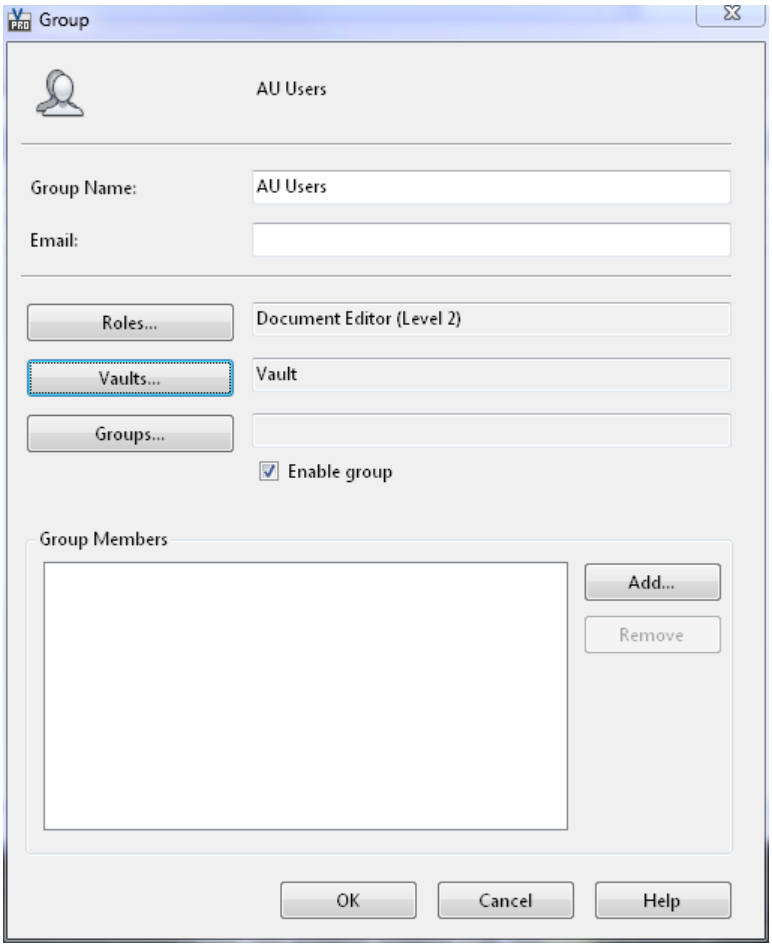
Setting up the Vault System

Before you can begin building and creating an effective Vault Collaboration system, you need to know who's who and think about what you want them to be able to do. In this discussion, we typically need to setup Users & Groups, Categories, and Lifecycles.

Users & Groups

To manage data security, you have to assign rights and privileges to some users while withholding them from others. In Vault, we typically do this with Security Groups. In this exercise, we'll create a basic security group.

1. Launch your Vault Collaboration application and login as a user with administrative privileges.
2. Select Tools→Administration→Global settings to display the Global Settings dialog.
3. Change to the Security tab if necessary, and click the Groups… button on the right to display the Group Management dialog.
4. Select New Group from the toolbar to display the group dialog shown here:'



5. Enter a group name and an e-mail if you have a distribution list setup for the group.
6. Click on the Roles button to display the Add Roles dialog.
7. Check the Document Editor (Level 2) option and OK to close the dialog.
8. Click the Vaults button to display the Add Vaults dialog.
9. Check the appropriate Vaults for access and click OK to close the dialog.

10. Click Add to the right of the Group Members to display the Add Members dialog. Select an appropriate user, click the Add button, then close the dialog by clicking OK.
11. Click OK to close the Group dialog, then the X in the upper right to close the Group Management dialog.
12. Click Close to exit the Global Settings dialog.

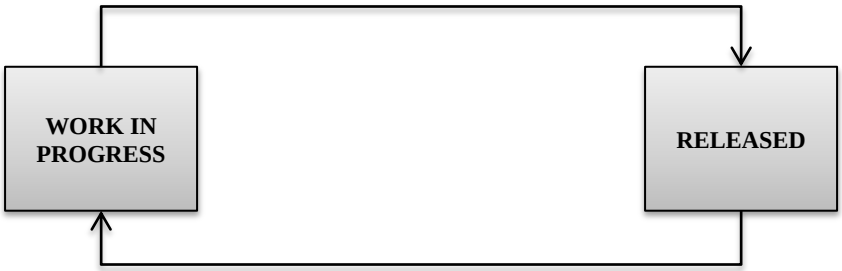
If you click OK without adding a person to your group, Vault will complain about not having members. For this reason, I've often found that creating a dummy account that no one actually logs into is a nice placeholder and will keep your hair pulling to a minimum. You'll want to actually assign users to groups as you're creating them, but I like having the containers in place first.

When you're planning your Vault configuration, think before you create group after group. As you'll see later, for every group you have, you're adding branches on the decision tree. Keeps your groups to the minimum you need and your life will be better. Now we have some of the players established, let's look at how they'll work with our Vault information.

Data Lifecycles in Vault Collaboration

Most firms have an ad hoc lifecycle management and security system. Almost every firm has a horror story of a user editing files they shouldn't have, usually leading to a costly change or a change in employment status. Some firms go through the hassle of setting up separate data shares, or even isolating files between groups, requiring survey to e-mail surface information to the engineering group. Regardless of the methodology, most current systems are onerous and cause at least as many problems as they solve.

With Life Cycles in Vault Collaboration, you can create both a security model and an approval process in a semi-transparent model. A simple lifecycle could be something as simple as this:

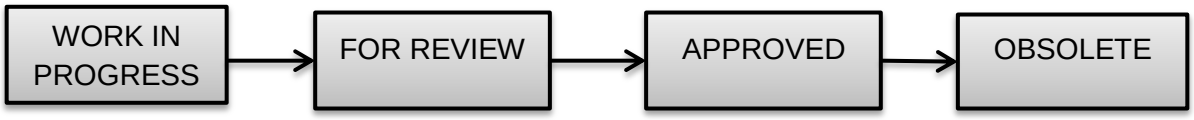


A bit of data is created, checked by the same group that created it and is then released for use by other groups. Even with something as simple as this, there are a lot of questions:

- Who can edit an object that's in a Work in Progress state? What about when it's Released?
- Who can view and object in a WiP state? Released?
- Who can move an object from WiP to Release? What about pushing it back?

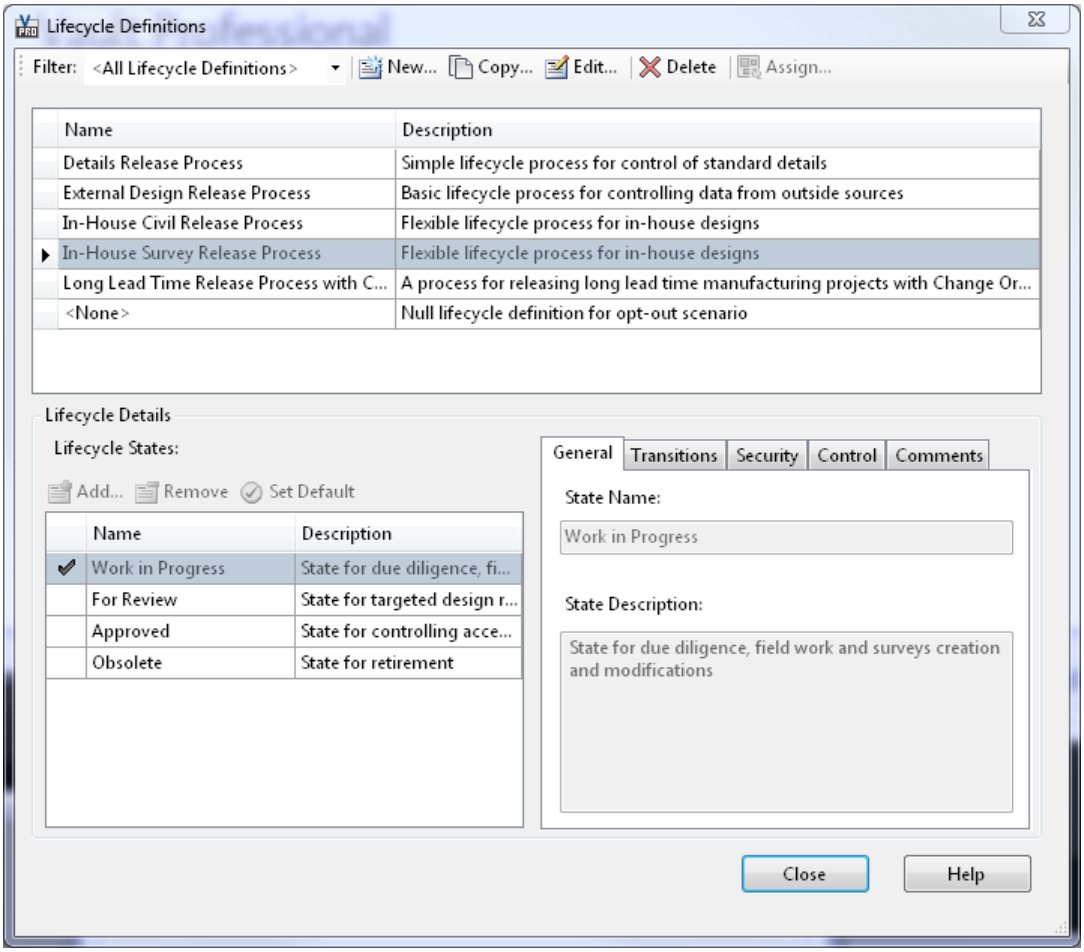
Even with the most basic lifecycle setup, you have to consider three major permissions: Edit Privileges, View Privileges, and Change State Privileges. Along the way, you can also make decisions about how a file should be modified with labels, updated with a new revision number, or published to a web server for external review.

Let's take a look at a more complex process, maybe something like a topographic survey might go through.

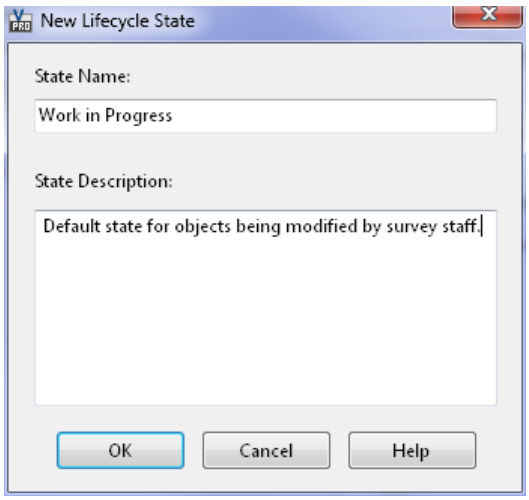


In this exercise, we'll setup this basic Lifecycle, establishing the states as shown.

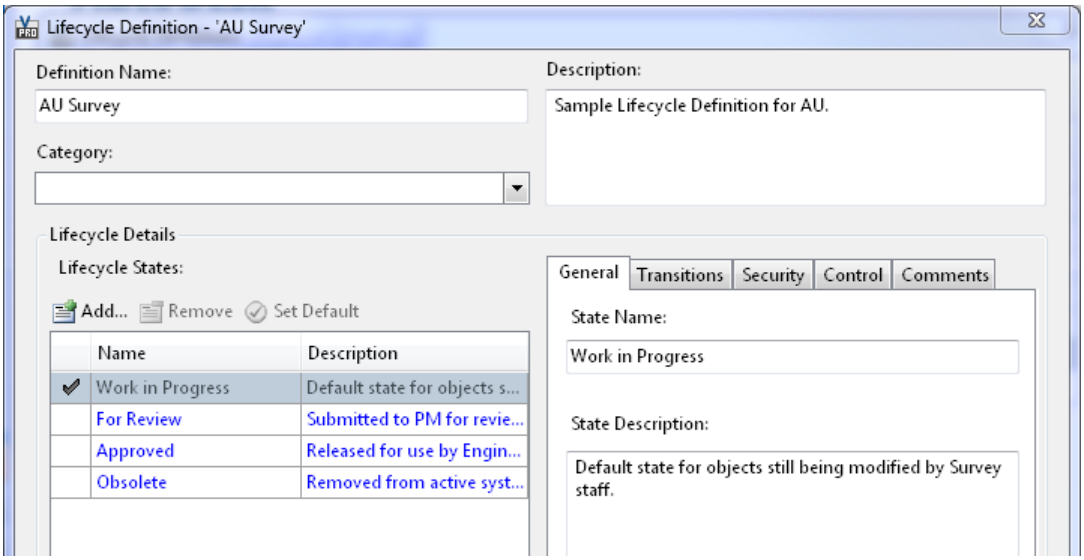
1. Select Tools→ Administration→Vault Settings to display the Vault Settings dialog.
2. Change to the Behaviors tab of the dialog and click the Lifecycles… button to display the Lifecycle Definitions dialog as shown here:



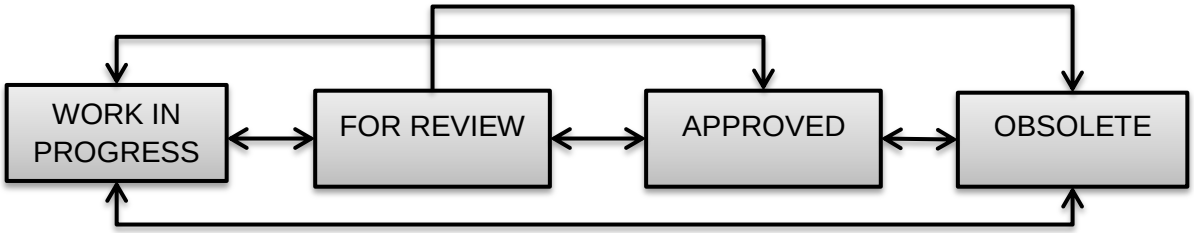
3. Click the New… button near the top to display the Lifecycle Definition dialog.
4. Enter a name for your new lifecycle as shown and click OK. (I'm using AU Survey to avoid conflict with an existing lifecycle I already have in place)



5. Create new states for For Review, Approved, and Obsolete. Your definition state will look something like this:



With the general states created, you can begin to ponder how a piece of data might move through this process. Obviously, the linear progress would be recommended, but what about other options? Can an object move from Approved to For Review? From Work in Progress to Obsolete?

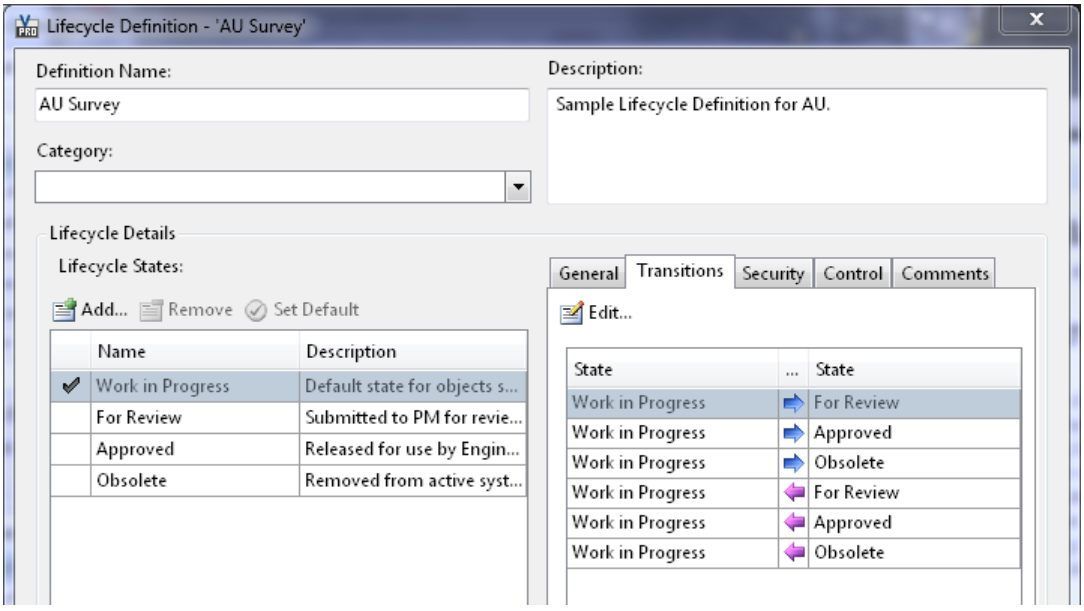


These options are controlled by the Transitions tab within the Lifecycle Details frame on the Lifecycle Definition dialog. Ideally, we want to make these changes:

- Surveyors can move data from Work in Progress to For Review
- Managers can more data from For Review to Approved, Work in Progress, or Obsolete
- Managers can move data from Approved to Work in Progress or Obsolete
- Managers can move data from Obsolete to Work in Progress
- Administrators can move data from Obsolete to Work in Progress

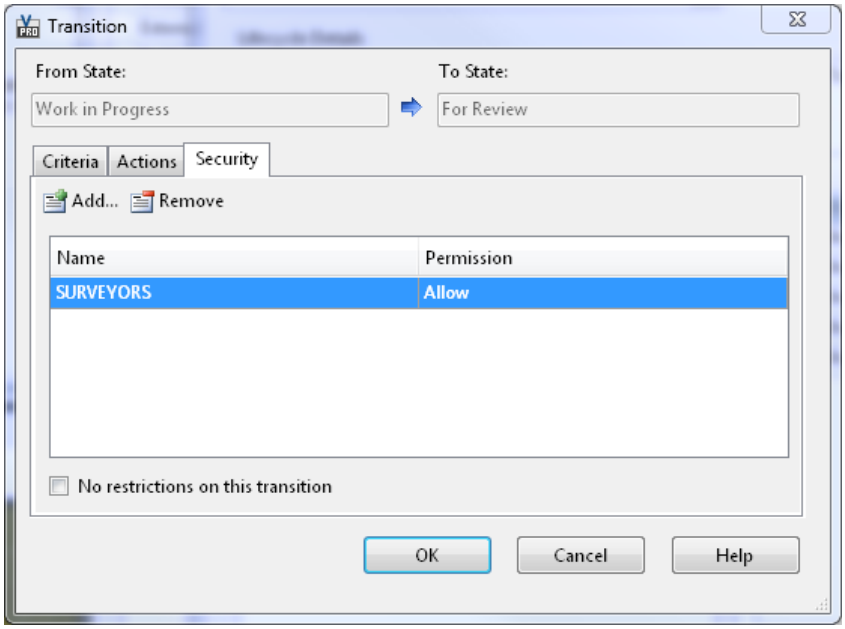
It's a good idea to create a list like this in order to review and work through how your ad-hoc workflow looks in a formalized world. In this exercise, we'll make take care of the first transition in our list.

6. Within the Lifecycle Definition dialog, select Work in Progress in the Lifecycle states list, then click the Transitions tab on the right. Your dialog should look like this:



7. Select the first line, and then click the Edit… button above to display the Transition dialog.
8. Change to the Security Tab, and uncheck the "No restrictions on this transition" option.

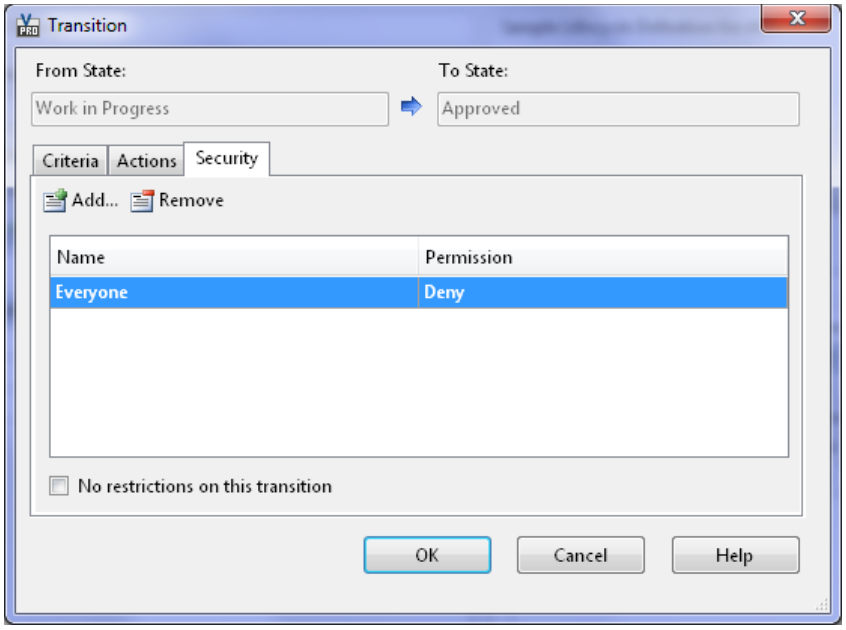
9. Click the Add… button to display the Add Members dialog, and change the dropdown list to Groups to help filter the options.
10. Select the AU Users group and then click the Add button. Click OK to close the dialog and your Transition dialog should look like this.



11. Click OK to return to the Lifecycle Definition window.
12. Select the Work in Progress →Approved row, and click Edit.
13. Change to the Security tab and uncheck the “No restrictions on this transition” option.
14. Click the Add button to display the Add Members dialog.
15. Select the Everyone Group and click Add. Click OK to close the dialog.
16. Change the Permission dropdown to Deny and click OK to close this dialog.

It’s generally a good idea to work from top to bottom in terms of Lifecycle States, and from top to *half-way* on the Transitions. If you work the Transitions as a matter of From…To… thought process, you’ll find it’s easier to keep track of. Repeat the process above, setting each transition’s permission appropriately.

Vault security generally works on the principal of if it’s not allowed, it’s denied. You only have to explicitly deny when you want an option to be available to no one, or when a subgroup might be part of a larger group that *does* have allowed permissions. For example, in our process, we don’t want to allow the transition from Work in Progress to Approved, so we can set that transition permission as shown here:



As you can see, adding groups and states to the lifecycle process raised the number of decision points exponentially. I can't emphasize enough how much you want to think out the process before you just start making groups and plugging things!

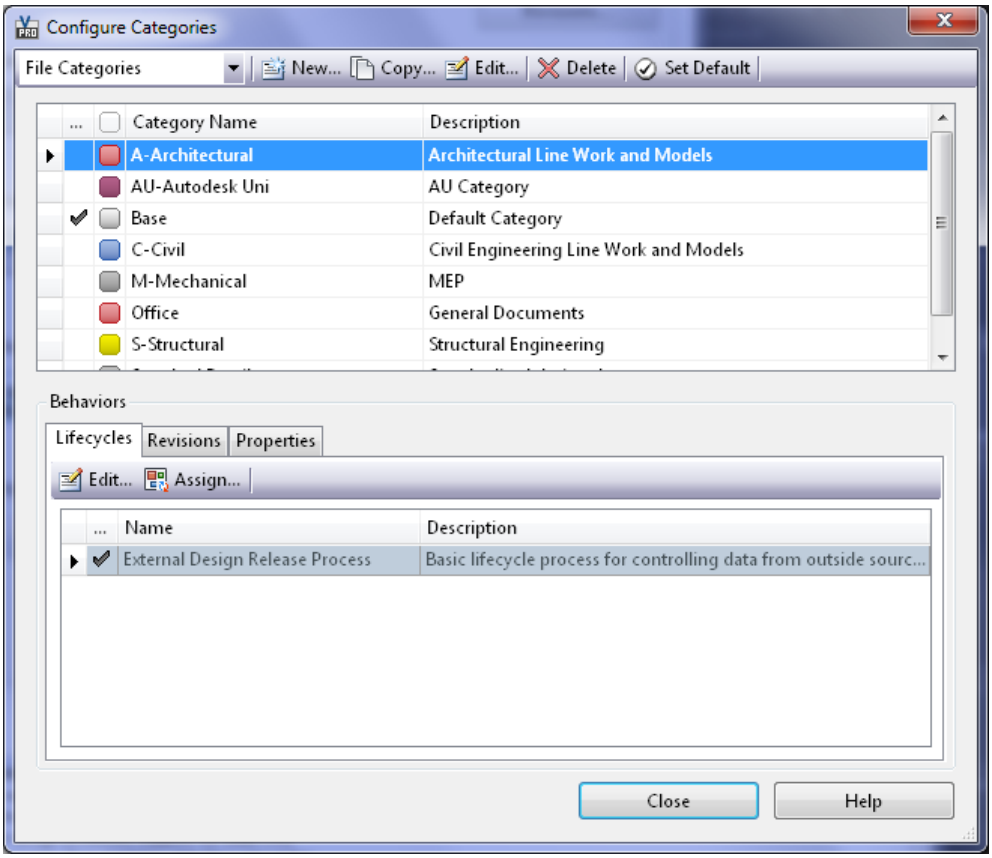
Categories in Vault Collaboration

One of the truisms about standards is that if you make it harder to follow the standard than to ignore it, you'll never achieve real standardization across the enterprise. You've built a number of lifecycles and setup the appropriate privileges for each group within the necessary states, but if you're depending on users to plug files into the correct lifecycle, you're toast. So what to do about it? Use Categories.

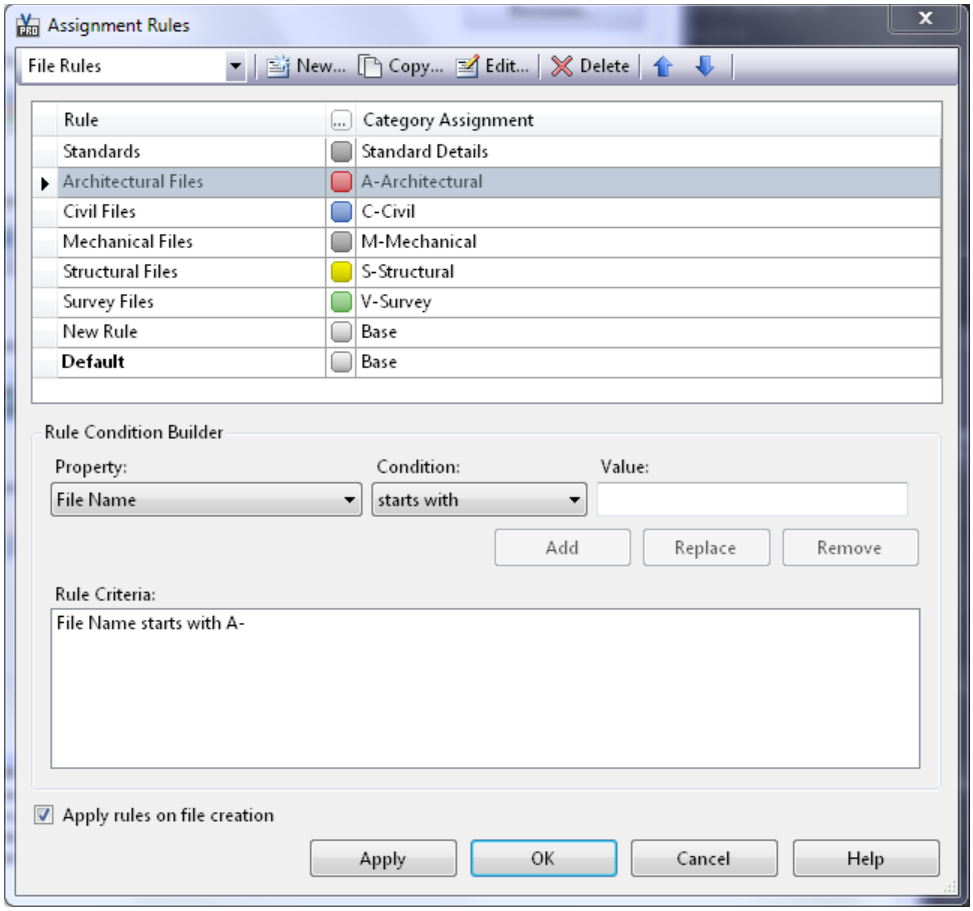
Vault Categories allow you to assign a lifecycle to a file based on some property of that file. Typically this is done at creation, but you could have other factors kick in such as age, size, or other custom properties that would be modified in midstream. For most Civil users, the simplest method of filing categories is using the file name convention to slot files appropriately. In this example, we'll set up an Architectural category, assign a lifecycle to that category, and establish rules to automatically categorize files based on a name of "A-"

1. Open the Vault Settings dialog, and on the Behaviors tab, click the Categories button to display the Configure Categories dialog.
2. Click the New button at the top to display the Category Edit dialog. Enter the name of A-Architecture, select a color, and enter a fitting description.
3. Click OK to close the dialog. Select the new category in the list, and then click Assign below on the Lifecycle tab to display the Assign Category dialog. Select the External Design Release Process (or whatever your lifecycle would be,) and click Add to assign the appropriate lifecycle to the category. Now when a file falls into the A-Architecture

category, it will automatically follow the release process you've assigned! Your Configure Categories dialog will look something like this when you're all done:



4. Click Close to return to the Vault Settings dialog.
5. Click the Rules button to display the Assignment Rules dialog.
6. Click the new button at the top to display the Edit Rule dialog. Enter "Architect" and then select the appropriate Category Assignment from the dropdown list. Click OK to close the dialog.
7. Select the new rule from the list and click the Property: dropdown to select "File Name" property, then the "Starts with" condition.
8. Type "A-" in the Value entry dialog and click the Add button to add the condition. Your rule will look something like this:



9. Click OK to close the Assignment Rules dialog and then the Close button to return to your Vault client application.

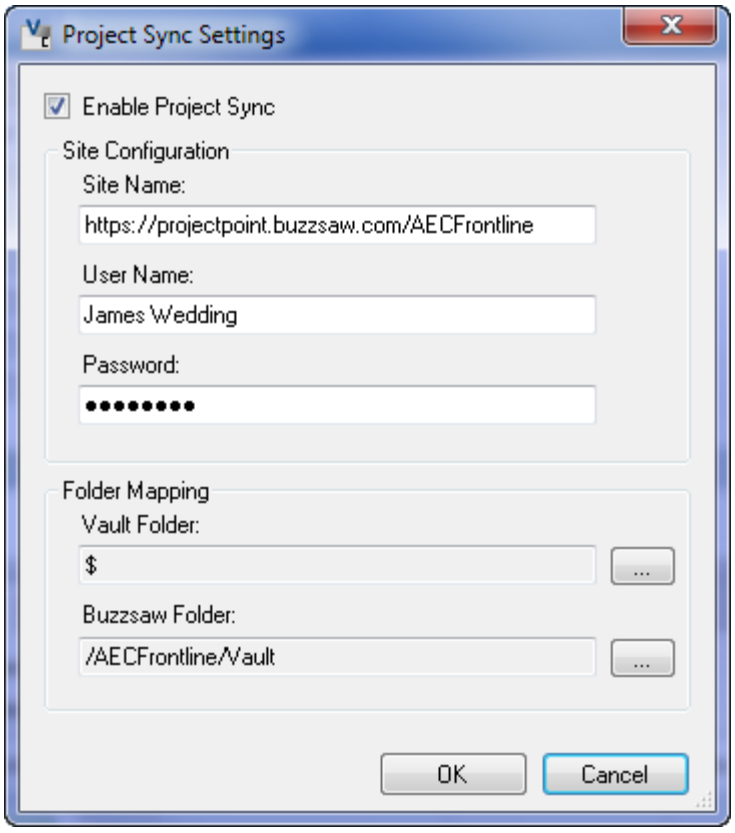
You can make categories and lifecycles in any order you like, but you'll need to use the Assign option on either end to make sure they're tied together. Obviously, you need to pull these pieces together to full create a system that will manage your files as you'd like.

With the Vault System setup for internal users, now let's look at how we share that data with the outside world.

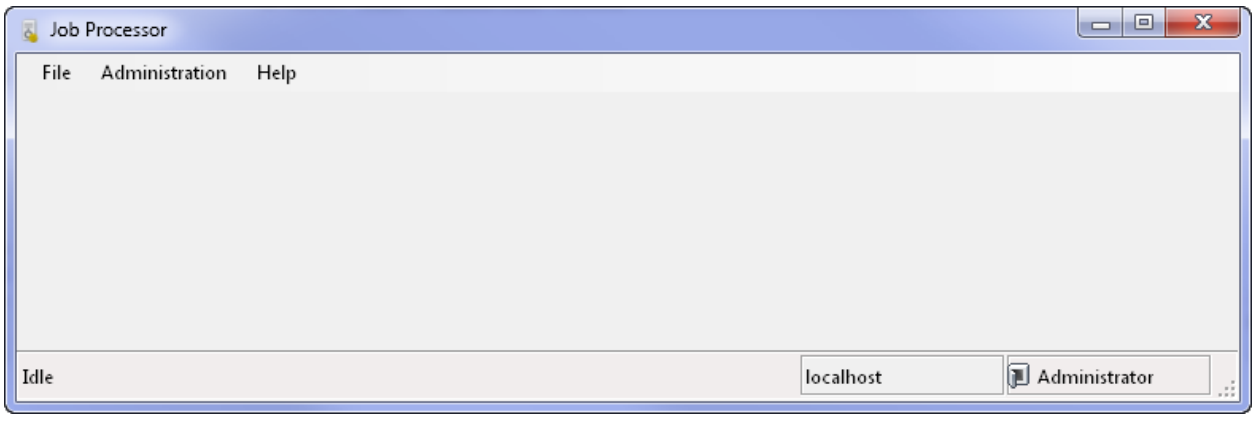
External Data Management with Autodesk Buzzsaw

While Vault Collaboration handles the access and sharing of interna files really well, it's not very simple to attach to a vault and work remotely. One option is to poke a hole in the firewall and allow remote users to connect directly to the Vault, but that presents a security risk and is typically a very inefficient system. With the 2012 release, Vault Collaboration AEC offers a new functionality that will allow you to automaticall publish data to an externally hosted Buzzsaw site, making it easier for outside team members to access the data they need when they need it. Let's look at the steps required to get this in place.

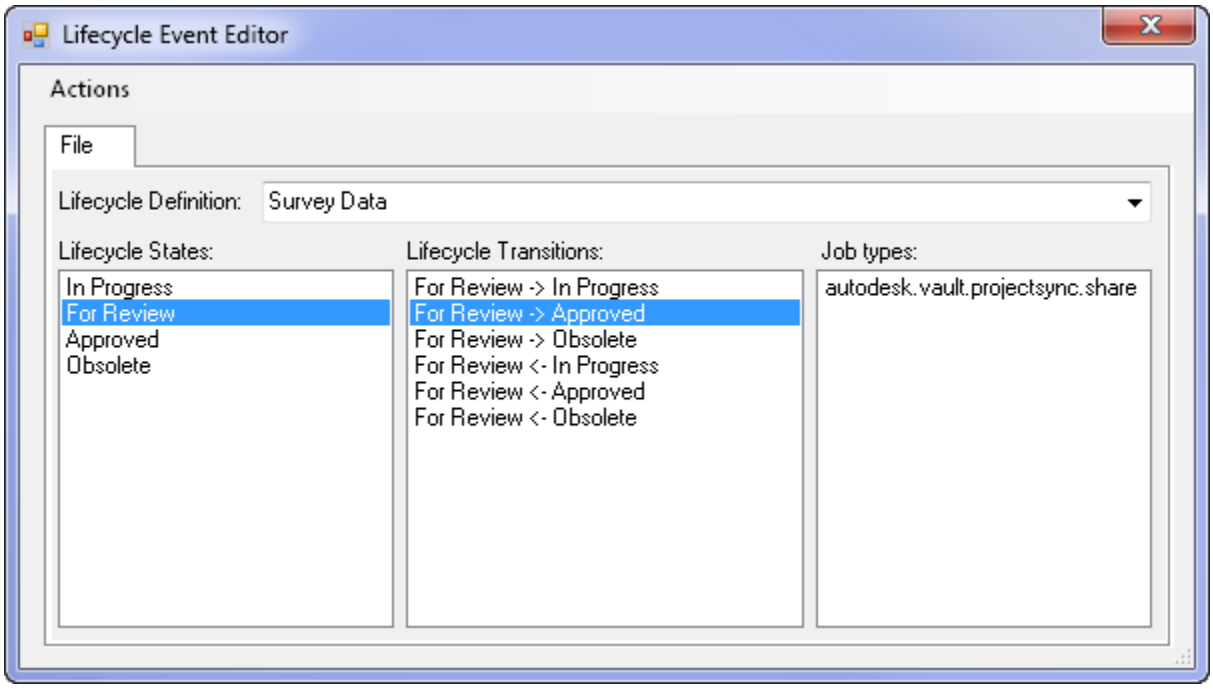
1. Download and install the Project Sync tool from the Autodesk Buzzsaw site: https://projectpoint.buzzsaw.com/!Autodes/download/ProjectSync.exe
   Once installed, you will have a new menu item in your Vault Collaboration Tools menu: Project Sync Settings.
2. Open the Project Sync Settings dialog shown here. Enter your Buzzsaw site name using the full https://projectpoint.buzzsaw.com/[YOUR SITE NAME HERE] format, along with a User Name, and Password. Setup the folder mapping also. Typically the root of your vault ($) will match up to some folder on the Buzzsaw site, but likely not the root.
3. Click OK. You'll also notice that you have a new toolbar in the Vault client with options for Share to Buzzsaw, Update from Buzzsaw, and Add from Buzzsaw.



4. You also need to verify that the Job Server is running on the Vault server machine. Go to the Tools→Adminstration→Global Settings and switch to the Integrations tab. Check the Enable Job Server option and close the dialog. If you want to verify the Job Server is running, go to Start→All Programs→Autodesk→Autodesk Data Management→Tools and select the Autodesk Job Processor for Vault Collaboration. This will show you the dialog here.



5. Install the ADMS Collaboration Software Development Kit (SDK) by going to C:\Program Files (x86)\Autodesk\ADMS Collaboration 2012\SDK\ directory and running the Setup.exe package there.
6. Now run the LifecycleEventEditor.exe found in C:\Program Files (x86)\Autodesk\Autodesk Vault 2012 SDK\util\LifecycleEventEditor. It looks like this after you login with an Administrators credentials:



7. Select the Lifecycle Definition you want to assign to a Buzzsaw push, then select the State, and Transition that you want to CAUSE this sync. In this case, we're setting up a Buzzsaw sync whenever a piece of Survey data moves from For Review to an Approved state.
8. One the Transition is selected, double-click in the Job Types dialog and you have to TYPE the job name you want to call. There are three options:
    a. autodesk.vault.projectsync.share This PUSHES data from Vault to the Buzzsaw site.
    b. autodesk.vault.projectsync.update This UPDATES a Vault file from the Buzzsaw data (useful for outside contractor files)
    c. autodesk.vault.projectsync.add This adds a file from the Buzzsaw site that may not exist on the local system.
9. Close the dialogs and close the Lifecycle Event Editor application.

Just as a side note, if you ever want to force the Job Server to run its queue of work, launch the Job Processor application, and simply Pause then Resume from the File menu.

With all the pieces in place, you're now ready to test, refine and flesh out your Vault Collaboration system. Let's take a look at a quick day in the life of a Survey drawing and how it might work its way through the system.

A Day in the Life of a Drawing

In this scenario, let's take a look at how a piece of data works its way into the system, gets approved, and is shared with the outside world.

- Sam the Surveyor starts the process by creating a new vaulted project from within Civil 3D.
- He opens and adds in a topographic map using proper file naming conventions. This assigns a project, a data category, and a basic lifecycle state.
- Sam works on the surface data, completes his work, and shares the surface information to his internal team using Vault data references. He also goes to his Vault client and submits the drawing for review, changing the lifecycle state, and essentially locking the rest of the Survey team out of the drawing until it's reviewed.
- Ed the Engineer starts his day by noting that a new project has been created and goes to look for some survey data. At this point in the Survey lifecycle, he cannot see or consume the Survey data, so he has to wait.
- Melinda the Manager reviews the topographic drawing and approves it, changing the lifecycle state to Approved. At this point, Ed can now see the data for internal design use, and the project with its relevant project folder structure is now pushed to Buzzsaw.
- Buzzsaw sends out notifications to team members when the data is uploaded, and they can open it via the Buzzsaw application, AutoCAD WS, or their own local design tools if they've used Buzzsaw sync.
- An external consultant makes their data available on Buzzsaw, and Melinda uses her Vault client to add this data back into the Vault system, assigning categories and lifecycles appropriately.
- Meanwhile, Ed has designed using the surface data and is now sharing his engineering data both internally and externally using Vault Collaboration AEC and Buzzsaw technology
- And the day comes to a close.

BIM 360

As you can see, the promise of BIM 360 is making sure that the right digital model is always available to the right people, right when they need it. Implementing Vault Collaboration AEC is a step to getting there, and the changes in your projects can really pay off in the short and long term.