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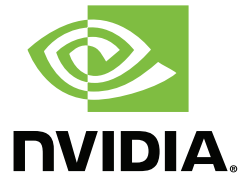
August 2014

How to Collaborate Effectively

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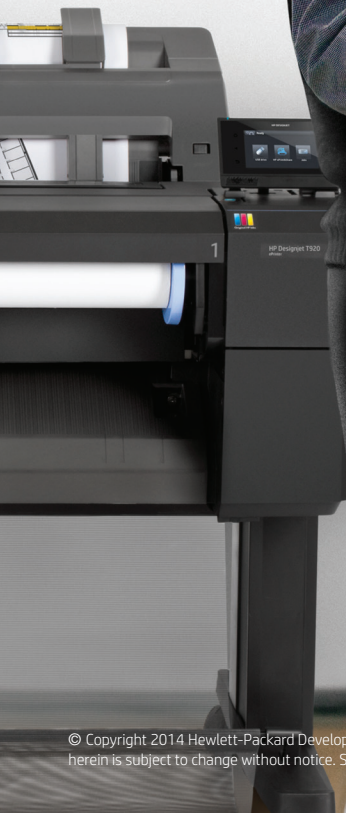
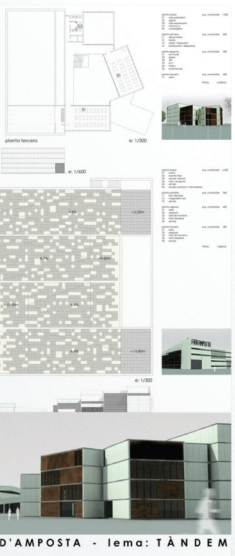
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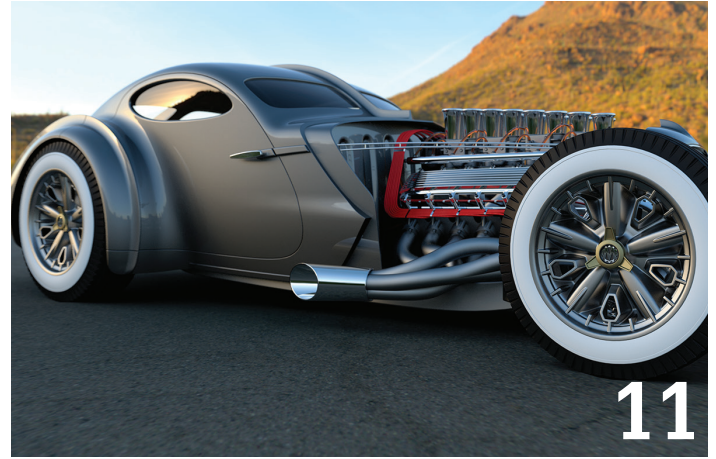


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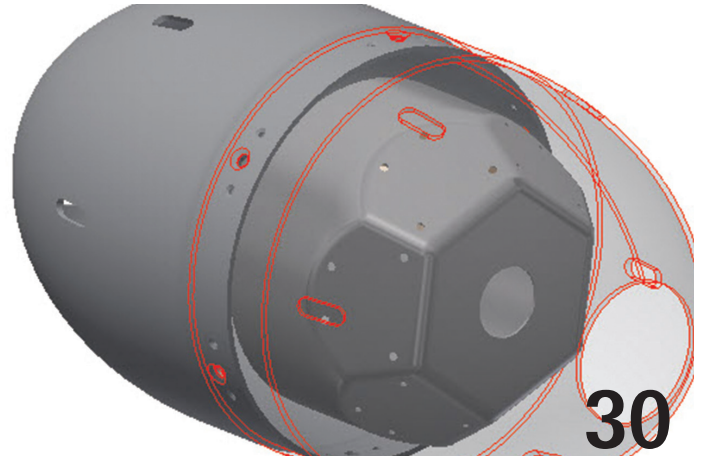


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Letter from the President



AUGI



THE CONFERENCE LIFE

I recently returned from the Revit Technology Conference held in the Chicago area. The event was wildly successful and AUGI is proud to have been a sponsor. One of the most interesting moments for me came during the opening session when the audience was asked, by a show of hands, how many were AUGI members. Nearly every hand was raised. That was simply incredible. It was obvious to me that AUGI members continue to appreciate the value of networking with each other and learning from each other.

Another RTC event will be held later this year in Dublin, Ireland. Those of you who want to know more about Revit and/or network with folks at the forefront regarding Revit should consider attending that event. For those of you who cannot afford to travel that far, the North American event for next year will be held in the Washington, DC area. *Disclaimer: I serve on the committee for RTC North America, but I would be enthusiastic about the event even if I were not on the committee.*

RTC is not the only event for which AUGI is a sponsor. Yes, it is time to start making your plans to attend this year's Autodesk University. AUGI is already making its plans for the event and working closely with Autodesk to provide a noteworthy presence there. AU promises to be filled with exciting events, great classes, and ample opportunities to network with your peers.

AUGI holds its Annual Meeting at AU every year. This year the Board wants to make this a fun event. We are planning on a new format and offering great prizes to those who attend the session. Notice that I called it a "session." We are obligated by the bylaws to provide this meeting, but there is nothing that forces us to make it a boring event. So expect to enjoy the session. Make plans to attend AU and to attend AUGI's events.

I suppose that this letter will bring to mind, for some members, the AUGI CAD Camps. The Board is occasionally asked why AUGI no longer offers these events. To be frank, they are very difficult to bring off successfully. While one-day local events sound like a great idea and simple to implement, the reality is that it is tough to bring in enough quality speakers and provide enough depth of classes to bring in audiences large enough to make the events self-sustaining.

For this reason AUGI continues to promote the importance of local area user groups (LUGs). These groups provide valuable networking at the local level and there is no reason why a LUG cannot offer quality material or roundtable discussions. So locate and revitalize your LUGs! If there isn't one in your area, AUGI can help you form one.

So with that, I will bring this letter to a close. Join AUGI at the upcoming conferences and continue to support your LUGs.

R. Robert Bell
AUGI President

AUGIWorld

www.augiworld.com

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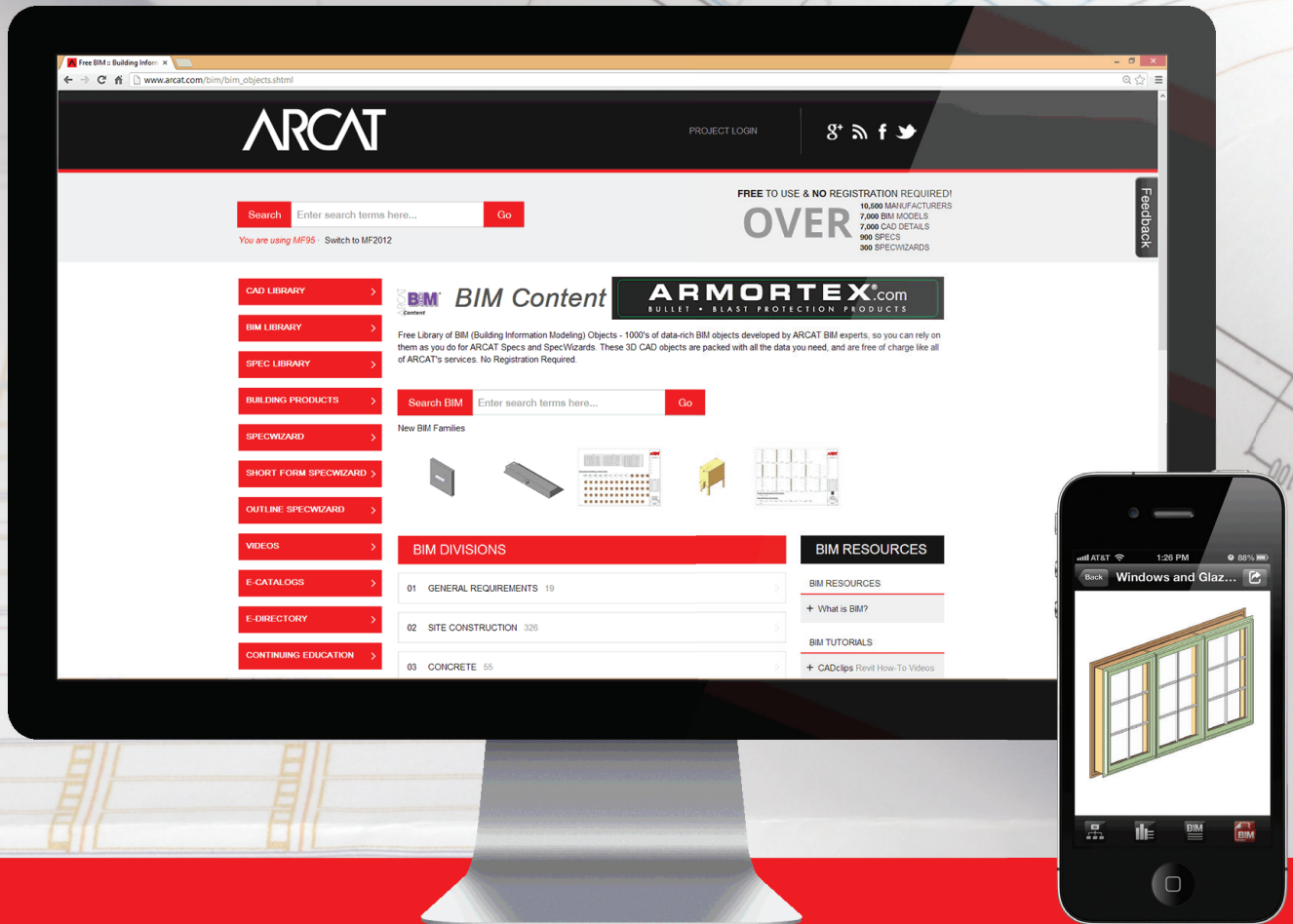
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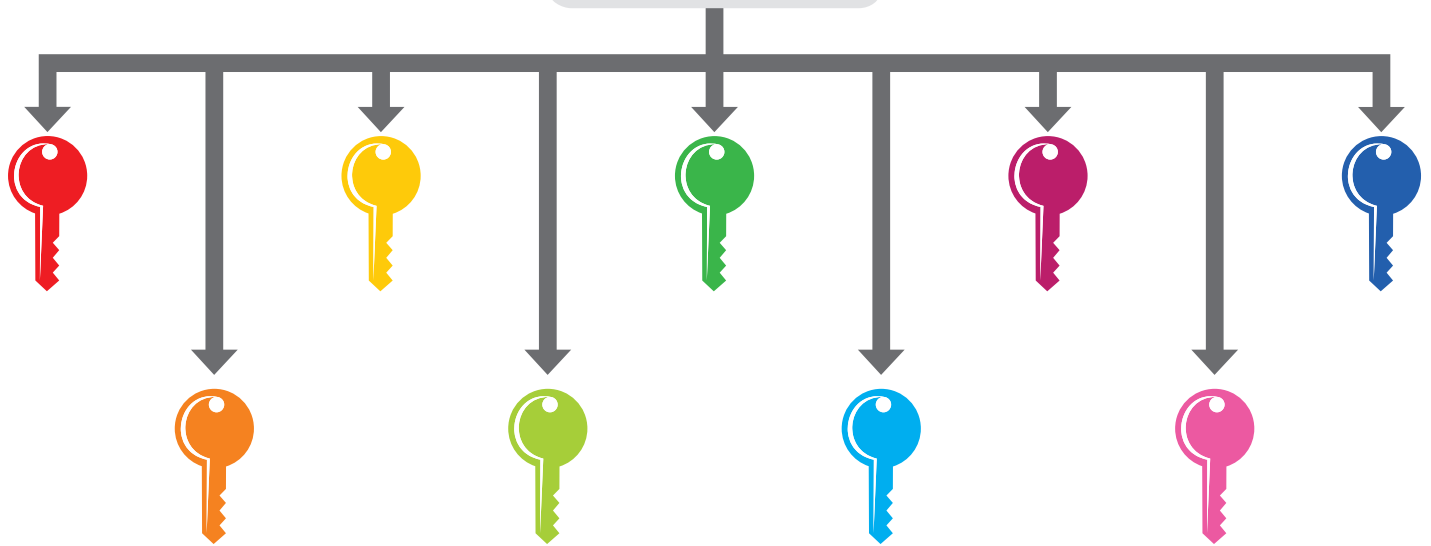
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Keys to Collaboration, Part One



Definitions of collaboration span a wide range of ideas. Many of them are overly simple and others very complex. I would not be splitting hairs to separate collaboration from teamwork, contribution, or cooperation. Teamwork is task-oriented and combines individuals working separately on efforts that are then combined to make the output successful. Contributing is when you provide something that others need, but has little effect on your personal outcome. Cooperation is when individuals work on complementary or combined efforts at the same time to achieve similar goals.

Collaboration is more interdependent and interwoven into the fabric of a group's effort. Most of us think that we are collaborating, when actually we are just contributing or assisting

in an effort. It might actually be a collection of all the above that makes it all work together, but collaboration is the elusive process that many never achieve.

Here is my working definition for collaboration:

A process that combines individuals into a group with a single, interdependent focus on a united beneficial outcome.

The entire perspective as to which process is being used—teamwork, contribution, cooperation, or collaboration—might hinge on the leadership of that process.

Here are some keys principles and perspectives that will assist in having everyone understand and participate as collaborators.

COLLABORATION:

A process that combines individuals into a group with a single, interdependent focus on a united beneficial outcome.

KEY ONE: IT IS NOT ABOUT THE SOFTWARE

Software can aid in collaboration, but it does not make it happen. This magazine issue outlines many fantastic tools that help you collaborate, but I assure you that all of these features can be ignored, avoided, and broken apart by one or two individuals who either don't get it or don't want to bother. Countless hours are often spent trying to get the model back into shape, the files reorganized, and the project back on track because someone did not understand the process. While all the tools being used today reinforce and assist in collaboration, they cannot make up for the unified approach to using those tools by the team members.

KEY TWO: UNIFIED PURPOSE BY ALL TEAM MEMBERS

All participants must have a shared purpose. This goes beyond just the concept of getting the job done. It has to be an understanding of all the components of collaboration and how each step is connected to the whole. Interdependence must be accepted by all and discouraged by none. When the action of one affects the whole, everyone needs to be devoted to a shared outcome. If one member does not win, all members lose. If one team member loses, the entire group is impacted.

KEY THREE: SHARED MOTIVATION

The team must drive toward a consensus in the way problems are addressed and remediated. When troubles come, and they will, the team cannot split apart to define the best way to address them. They must work together to gain the best progress for all. If one team chooses to protect only its interests, collaboration starts to break down.

KEY FOUR: COORDINATED SELF-SCHEDULING

The entire team works toward coordinated schedules. Even when parts of the team may work apart from others, they schedule based on the entire team's needs. If they miss a deadline, the entire team is impacted. If they deliver too early, it may cause an imbalance as they run ahead. There is no individual schedule change without informing the entire group and adjusting as needed. It is just-in-time and coordinated scheduling of all events and deliverables across the spectrum of the project. I have seen this in action at BIM coordination meetings—all stakeholders talking about all areas at the same time. Everyone in the same room. Working it out together.

KEY FIVE: CONSTANT PARTICIPATION

Those who join in collaboration must understand that they have to be constantly vigilant about participating in all areas of the project. No longer can it be thought of as "not our problem" or "not my concern." Everything is a concern to all members. Not only should they monitor their own team members, but also the participation of other firms teams. When someone misses a meeting or two, it needs to be addressed by all.

KEY SIX: COMPROMISE

Team members and firms are joined together in the success of the project at such a high level that balancing individual firm goals has to bow to collective goals for success, outcome, and profit. It is similar to a joint venture project without the binding agreements. I have seen some projects actually define the collaboration process via agreement with all firms involved. When this kind of relationship is established, all parties must agree on the methods of mediation when disagreements come up. All are devoted to talking it out. Striving together for a win-win outcome.

Next month I will continue to outline the key ingredients for true collaboration. Until then, read this entire issue to gather more tips on working together in teams.



Mark Kiker has more than 25 years of hands-on experience with technology. He is fully versed in every area of management from deployment planning, installation, and configuration to training and strategic planning. As an internationally known speaker and writer, he is a returning speaker at Autodesk University since 1996. Mark is currently serving as Director of IT for SIATech, a non-profit public charter high school focused on dropout recovery. He maintains two blog sites, www.caddmanager.com and www.bimmanager.com.

All Together Now



The acronym IPD (Integrated Project Delivery) was once a lot more common than it is now in the AECO industry. Likely, this has to do with the fact that a lot of studies over the past three years show some inefficiencies in the workflow of a typical IPD-driven model, combined with recently logged lessons-learned for this very hopeful and idealistic delivery method.

More importantly, I think that the growing prevalence of the use of BIM on our projects has all but eradicated the IPD hoop dream. Now, the two acronyms (for those who were on the IPD bandwagon, at least) are used almost synonymously. The reason that we associate utilizing BIM on a project with “project

collaboration” and IPD’s famed mantra, “shared efforts, shared gains”, is because when utilizing BIM on a project, all project stakeholders need to work very closely with one another in order to make it work. This is because it benefits their individual success as a company on a project when they do.

What *actually* occurs from this—on a larger scale—is far less selfish in nature, intended or not, with all stakeholders working together in a holistic manner that benefits the entire project’s budget, goals, deadlines, dates, and milestones. This mimics that of what IPD initially stood for—“collaboration.” This is not to say that we don’t play nice for the good of the project *without* BIM—there is just not as much incentive to do so (depending on the project’s contract type, among other things).

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Attendee Comments

"As always, I've come away from the conference buzzing about what's happening in the industry."

"Awesome work this year, a lot of great talks, and people to learn from both in and outside talks."

"Fantastic. The value is obvious for me. Now I just have to implement what I've learned and continue to try to teach management the direction the industry is heading in."

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AutoCAD MEP 2015

You may think that was a pretty bold statement and that it is simply my opinion based on my personal, subjective experience. But in reality, it is a fact taken from a recent international poll administered by the AIA. Hundreds of professionals in developed nations from around the world were asked whether they notice a marked decline in project collaboration, teamwork, and project-driven decisions (versus internal, company-based decisions) as it relates to information sharing on a project that utilized *true* BIM, versus one that did not. The vast majority (89 percent) answered the expected result: Utilizing BIM on a project nudges all stakeholders into doing the right thing for the good of the project, not for the good of the bottom line.

This puts emphasis on all designers, architects, CMs, GC reps, BIM designers, and CAD drafters to focus on the overall, cooperative success of the project by interactively communicating with all of their MEPF+A counterparts. If the Owner, GC, or CM didn't necessarily see a need for labor-intensive BIM/VDC on one of their projects for one reason or another, yet wanted everyone to participate as a group with shared interests in order to get the project done on-time, under budget, and include a stuffed animal at commission, they might want to look at none other than BIM. At the very least, they get the "all-in" mentality that IPD promises, with a side of great marketing material and decreased office and construction hours, if only using even a very small attribute of BIM.

When working on any BIM project, small or large, all stakeholders from MEPF+ subcontractors ("+" denotes the specialty contractors such as controls, drywall, framing, curtain-wall, acoustics, etc., who have been participating more and more lately), the architect, who is starting to become more involved with the BIM collaboration process, General Contractors or CMs, Training Vendors, Overflow 'Virtual Bench' Staffing services offered by the CM or technology companies such as BIMAnywhere, laser scanning vendors such as F3, Inc., site surveillance companies and the like all need to work very closely together in order for the project's BIM execution plan and overall "fast-track" project planning to fare well. With every project completed, we get greedier with the schedule.

A few years ago, I first heard of a BIM project that was an aggressive, "fast track" project. It was not so much a rarity, per se, but at least there was an alternative: A "normal" project (based on the previous years' estimating and design/construction schedule testaments) that had more realistically achievable dates for milestones and goals. These days, "fast track" is the norm. You don't even need to say the phrase anymore, especially when it pertains to BIM projects, in which they utilize BIM full-force for their "fast track" jobs, because it gets them there even quicker.

Obviously we all know that it isn't that cut and dried, but that is now how owners think. A few projects go pretty smoothly, given their aggressive schedules, and the construction industry thinks, "Why do it in three years when we can do it in one?" They think that "BIM" saved the day, when in reality it was five parts intense BIM-driven collaboration, which eliminated time-consuming RFIs (and other bothers that can kill a deadline very quickly),



two parts BIM optimization and strategy, and three parts added manpower and equipment/resources.

The articles in ENR that speak to this say that "BIM software" is to thank for this—along with the industry tech leaders coming up with more efficient workflows, which I will agree with to a certain point. But plain and simple, it isn't "BIM software" that drove these fast-track projects into attaining almost unachievable deadlines. It was the way in which BIM forces us to hold hands and sing 'Kumbaya' by the campfire.

In a BIG Room environment, you have no choice but to get out of your chair and walk to the architect three cubicles down to ask a question about ceiling heights, and how you can't fit your run of bus duct into a recently changed height for aesthetic purposes driven by owner request. The architect calls and shares some PDFs with the owner's rep, and gets the lowered ceiling approved within 30 minutes.

Outside of the BIM Process or a BIG Room environment, this would have been an RFI that would have taken two weeks of pain and torture from the electrical subcontractor to the architect. It is for reasons such as this that make the process side of BIM so appealing to all. Obviously, not to discredit the model-based intelligence and software, etc., we all know that I am a staunch BIM advocate. But in this case, it isn't the BIM that we all know and love that saves the day. It is the collaboration between trades, working together in symphony, with the GC acting as the conductor. Sometimes it is music to my ears. Other times, it is Justin Bieber. It is all relative.



Bill Campbell lives in the San Francisco Bay Area with his wife and two boys, and works as Director of Preconstruction Technologies & BIM at Balfour Beatty Construction, Northern California. In his free time, he enjoys playing tennis, surfing in Santa Cruz, and developing and beta-testing new technology.

Detroit BOXX City



*When presenting VRED automotive design software,
Autodesk's James Cronin rides with renderPRO*

When I speak to James Cronin, his latest news is that he is back in Detroit, a city you won't find on many "preferred destinations" lists. In fact, most of today's press reports regarding the Motor City read like autopsies, centering on a once great metropolis now fallen on hard times. There's always talk of a resurgence, but it is slow getting underway. Despite all of this, for an industrial designer, car guy, and family man like Cronin, Motown sounds like home. He lived here for over a decade when he studied at the College for Creative Studies, followed by a job (right out of school) at General Motors as an Autodesk Alias modeler. From there, he went to work for Alias Wavefront, traveling to car design studios as a consultant and Alias training provider. His last stop was in San Diego, working

for a major Japanese automaker, beginning as a concept modeler and departing as the visualization lead. The father of two children, Cronin likes the idea that he and his family are back in Michigan where his wife grew up and her family still resides. "The summers are great," he adds.

If it sounds like James Cronin is, in effect, getting back to his roots, it's true. It's even more apparent when he describes how good it is to be working again for Autodesk—especially since their acquisition of PI-VR, the German software company and makers of VRED, a series of software applications that streamline the car manufacturing process through sophisticated, real-time, visualization techniques. Autodesk is integrating VRED technology within its own existing lineup including Showcase, Alias, Maya, and 3ds Max. "For the past nine months, I've been using the world's best visualization tools," says Cronin, "and that's pretty exciting."

VRED Products

VRED (for product designers) allows users to visualize 3D models on the fly.

VRED Design (for automotive) enables users to review and evaluate design ideas in real time.

VRED Professional (for automotive) provides high-end visualization and virtual prototyping to analyze 3D models.

THE VRED ADVANTAGE

Although VRED users have expanded to include virtual photographers and other industries (in particular kitchen equipment and machinery for factories and manufacturing plants) it is still an automotive-focused visualization tool featuring real-

time ray tracing courtesy of a CPU-based ray tracer. And because VRED is CPU-based, it can accommodate large data sets, as opposed to other visualization software which is GPU-based. “In terms of automotive design, that’s one of its major strengths,” says Cronin. “We can pull in data sets right out of team center as a JT file (the 3D data format used for product visualization, collaboration, and CAD data exchange) and we don’t even have to clean it up. We don’t have to do any backside culling. You just bring it right in, the whole part, and save all that prep time.” This is critical to Cronin since he admits when working in visualization, most of his time is spent preparing data. He sees time savings as the true advantage of VRED.

“I would spend days preparing it so that I could spend one hour painting it up and hitting go for a turntable,” he says. “The benefit of VRED is that you don’t have to spend all that time preparing data. You can bring everything in to render and the ray tracer doesn’t care. You have all that RAM. With the graphics card, you have limited RAM.” But that doesn’t mean VRED, which has its own unique rendering engine, is strictly CPU-based. It can also rely on the GPU for OpenGL rendering. “I met one customer using VRED in an immersive mode,” says Cronin. “It had to be run on a graphics card at that point because they didn’t have a large CPU cluster. It’s performing very well for them—forty million polygon data sets running on a single graphics card in 3D. When it’s in ray trace mode, it’s actually very fast. Comparing it to Showcase running on my laptop, there’s a huge speed increase. When I installed VRED for the first time and got it running, I was shocked at how much faster it was. I don’t know the actual numbers, but to me, it seemed four times faster than Showcase.” One of the reasons Autodesk made the decision to acquire PI-VR (and VRED) is because VRED is very much a cross-functional tool with a very broad range of uses, as well as a strong appeal to a certain type of user. “Most would probably fall under the category of a designer that needs to make a marketing level quality rendering and do it quickly,” says Cronin. The reason, he explains, is that throughout the world, the bar has been significantly raised when discussing the turnaround time and quality of rendered images. High fidelity visualization, or experiencing reality as close as possible before a product actually becomes real, is becoming more commonplace thanks to CPU-based rendering capabilities like those found in VRED. As a result, expectations are higher and Cronin admits that senior managers and executives have become more difficult to impress. “Perhaps ten years ago, if an image included reflections, they were blown away by it,” he says. “But now everything has it. Now it’s about how good it looks and how fast you can get there.”

Our discussion also revolves around achieving photorealism earlier in the design process in order to make decisions. Design managers prefer renders be as realistic as possible, alleviating confusion in regard as to what has been designed. “The old days of thumbnail sketches with a lot of chalk are really cool,” says Cronin, “but back then, an executive could indicate one aspect of the design and ask, ‘What is going on back here and you might say ‘I haven’t figured that out yet. Renderings are able to do that too, of course, but now, just as soon as possible, it’s important to get a photorealistic rendering of what the design is going to be because design times have shortened. The sooner you can demonstrate that your design

is feasible, the more likely it is to be chosen or you’ll get the go ahead sooner.”

In other words, decision makers don’t have to rely so much on their imagination to fill in the blanks. They can easily see that design A is going to be the next Dodge Ram, Chevy Camaro, or Ford Mustang and say, “Let’s do that one.” Cronin explains that in the past, there would likely be eight design proposals with six of those selected to move on to the clay model phase. Three of these would then become full-size models, and of those three, one would be selected as the full-size car model. Nowadays, six proposals become two quarter scale models, followed by one full-size model. “One of the reasons the design schedule has been reduced is because they’re making the early ones so much more accurate,” says Cronin. “They have everything, like the ability to scan and mill right on the plate. In the old days, it was dragging templates and mirroring the car by hand in the clay. So it’s not just the digital process, the physical processes have sped up too. They’ve figured out a way to make everything faster and more streamlined.”

In addition to rendering, VRED Design and Professional are also instrumental for processes like validation and verification. For example, engineers may want to know what a particular headlight is going to look like in bright noonday sun. They may also want to see how that same light will look in a lit condition or how much light the LEDs are emitting. “These engineers don’t care about making a picture or rendering it,” says Cronin. “They just want to look at it for validation or to see what these interior parts look like when they are all together. In other words, how do they line up?”

VRED Professional also includes engineering tools like surface analysis and gap measurement, enabling carmakers to take a look at a virtual prototype of the auto body and determine if the surfaces were built correctly. This means they don’t have to build an actual, physical prototype of the car body and send it to surface analysis. Within VRED, they can accomplish some steps of the surface analysis process, saving both time and money.

For Cronin, one of the most unique VRED Professional features is its ability to ray trace the NURBS data so there is no tessellation—extremely critical in regard to lighting and reflection. “For a lighting simulation person, a half of a degree makes a huge difference on how a reflection or light actually bounces,” he explains. “The level of tessellation can affect the results, so if you’re using purely NURBS data and not tessellation at all, you don’t see the tessellation when you zoom in. It’s perfectly smooth.” Another benefit of VRED is that users of other Autodesk applications can easily bring those 3D formats into VRED and go to work.

ON THE GO WITH RENDERPRO

Though officially designated as a member of the Autodesk sales team, Cronin is actually the subject matter expert for automotive design, focusing on Alias and visualization. Most often, he splits his time between the Big Three automakers, accompanying sales personnel. “I go in and demo Alias, demo VRED, and answer questions,” he explains. “I do a lot of support as well since I’m on site so much. I get asked the instant question instead of customers putting a call into support.”



Vehicle designed and built by Marc Mainville

It was at Cronin's last job (the aforementioned Japanese automaker) where he first became acquainted with BOXX Technologies by way of the four GPU 3DBOXX 8550 XTREME that sat on his desk. But now, in his new role as a demo expert, he travels with a 17" laptop manufactured by a tier one company. However, when Cronin needs to demonstrate detailed lighting, or any of the other features found in VRED, he brings along a BOXX renderPRO, the compact, dedicated rendering module featuring dual Intel® Xeon® processors and solid state drives. "It gives me workstation power without having to lug my workstation around," he explains.

When Autodesk first acquired PI-VR and Cronin started working with VRED, he quickly learned that his laptop was woefully insufficient for demonstrating the software's potential. Because of his previous experience with BOXX, Cronin went in search of a demo solution and discovered renderPRO. "I was able to convince my boss to get me one, along with a nice little Pelican rolling case," says Cronin. "Before, whenever I had to take my workstation, I'd also have to bring a monitor, a carry cart, and all that. It was a cumbersome process. But renderPRO is compact and easy to transport—and it's even faster than my workstation!"

The speed of renderPRO is also critical since demonstrations require providing a wealth of information in a short amount of time. "When you're presenting, you don't have a lot of time," says Cronin. "No one wants to sit and watch a full global illumination with photon map gather to one hundred percent. They want you to go on to the next thing. You have limited time to show off, so that's where other guys have to lug the workstation in and say this is what you will get with your nice workstation. I just bring my laptop and renderPRO."

VRED Design and Professional cluster very easily (they feature an offline and online cluster module) so for real-time ray tracing, while Cronin is interacting with the software, he can render frames for still images. When presenting, the real-time window on his laptop uses the renderPRO to power the ray trace, so he's able to get very high-performance on the laptop without actually relying on it. "It's great since I don't know of any laptops out there with 32 cores or dual Xeons," he laughs.

Was Cronin surprised the first time he used the renderPRO?

"Yes, it was so nice to see the status bar inside of VRED," he recalls. Where it used to read eight cores, it now said forty. It added 32 cores! Usually, when you're demonstrating high end, full global illumination, you rotate the vehicle and then wait for all the ray tracing to gather. With renderPRO, it's nice to see it gather at an exponentially faster rate. It's all about time to image. How fast can I get the best looking image without making mistakes? You need fast results and renderPRO allows you to make the right choice sooner."

Cronin explains that one of VRED Professional's strongest attributes is its ability to create simulation quality lighting imagery. "It's like simulation level," he says. "It's not a simulation tool like some of the other ones that actually are, but it's very accurate and I know the VRED team has conducted tests with actual production lighting and its 95-98%."

However, in order to reach that level of realistic lighting, the calculations on the simulation (full global illumination, photon mapping, etc.) require a good bit of time. "You need it to proceed quickly," says Cronin. "You don't want everyone sitting there waiting and thinking 'Is this going to happen soon? You just want

3ds Max 2015

to rotate around and hear everyone say ‘Oooh. You can’t have awkward pauses. That’s why renderPRO is such an important demonstration tool. The companies I conduct presentations for have high end workstations, so you want to demo with hardware that is similar to what they have on their desks.’”

As much as Cronin appreciates the power and performance of renderPRO, he loves to talk about its mobility as well. “Sometimes I go to trade shows,” he explains, “and standing on the show floor I want to be able to show off this high end software, but we just have our laptops. It’s great to be able to throw the renderPRO in the little cabinet under the table and then I’m networked right into it. It works really well and, once again, I’m not forced to cart all that equipment to and from the show. If I’m traveling to California for a trade show and I call Autodesk and ask “will you have high end workstations for me to work off of with all the software loaded, usually the answer is no. You have to bring your laptop and that’s another reason why renderPRO is so perfect. I can bring it with me and stow it in the overhead compartment on the flight.”

According to Cronin, renderPRO’s mobility also makes it ideal for working from home. “When I’m at home, I’m able to cluster my workstation with the render pro,” he says. “Now I have the power of two workstations without actually having to own two workstations. It’s also a smaller footprint on my desk and I’m not spending extra money on a graphics card and everything else that goes into a second workstation. At my old job, I had two workstations on my desk and when you start getting to the point where you need more rendering power you ask yourself if maybe you need a third workstation. You start to wonder what you’re going to do, where is your monitor going to go? renderPRO sits right on top of my workstation and easily ties right into it—small footprint and quiet too.”

Cronin also likes the fact that if you’re working for a large company, renderPRO is an easier sales pitch to management and IT departments. “I don’t have the restriction of going through IT personnel to install this,” he says. “At my former job, hardware decisions came down to the corporate standard equipment. They were buying for people that were doing Powerpoint or Microsoft Word, assuming that that one particular workstation would work across the whole spectrum of 10,000 employees. But when you’re doing high-end design of any kind, you know you need professional workstation performance, including the right graphics cards. Unfortunately, when you start talking about that, you’re doubling the price. If you get a high-end workstation with dual CPUs and an NVIDIA Quadro K5000, you could end up with a machine on your desktop that costs \$15,000. With renderPRO, it’s a lot easier to say that all I need is this one small cluster unit for a fraction of the price and I’ll be doubling my speed. It’s also easier to justify by saying that you have to render this many frames by next week and that you’ll be sitting here watching your computer do nothing but render for the next ten days or you can knock it out in four days. Speed and performance return your time back to you and that is the most expensive time for a company. You don’t want your users just watching a status bar.”

I remind Cronin that at BOXX, we often hear that our systems are expensive or that a particular company, though impressed with BOXX performance, is already entrenched with a mass-produced computer manufacturer. Cronin’s response is simple: “If you’re kicking off a giant animation on Friday, when you walk in Monday, you want to know that it finished on Saturday afternoon. My argument is always this: ‘What’s more expensive—someone sitting on their hands doing nothing or faster frame rates that equal greater productivity?’”

His logic makes perfect sense: save time, save money, increase productivity, increase profits. And since there are no substitutes for creativity, hard work, and common sense, if Detroit can hasten the return of more individuals like James Cronin, while retaining the like-minded souls who already reside there, perhaps the Motor City resurgence will get underway after all.



With over 14 years’ experience in the automotive design industry, James Cronin has been an Alias Subject Matter Expert with Autodesk since July, 2012. His duties include helping customers by understanding their business issues and finding solutions that resolve their challenges. James graduated with honors from the College for Creative Studies with a BA in Industrial Design.



John Vondrak is an artist, writer, award-winning filmmaker, and musician who resides with his wife and five sons in Austin, Texas. He holds a BA from St. Edward’s University and an MA from the University of Texas. John is currently a senior copywriter and video producer at BOXX Technologies.



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Play Nice in the Sandbox



You don't know me, but I bet you know someone just like me: A design professional, someone who likes working in BIM (you are reading this magazine, after all), who was maybe even an early adopter of the technology.

I'm guessing that you, our reader, are either a regular BIM user or hope to become one. I'm also guessing you are not the principal of the firm, but wish that those principals listened more to your input, especially when it comes to collaborating and working with others.

A quick search of Google will bring up a never-ending stream of software, articles, and advice on collaborating better with BIM. They talk about the "cloud," they talk about "sharing," and they even occasionally mention humans. They sometimes bring up the subject of attorneys (gasp!), but if they don't, make no mistake that the thought hangs over the conversation like a dark shadow. Finally, all of this guidance is devoid of one thing, which is what does it actually mean if you are just trying to get the job out the door so you can get into the next one. We know the goal is to make more \$\$ somehow, and hopefully that means more raises and happy hours, but aside from that, why do we actually need to do it?



Let's talk about why, in spite of having some of the best collaboration tools ever (Revit®, Navisworks®, etc.), true collaboration still has little to do with technology, and everything to do with your childhood? At the end of the day it is about sandboxes.

THE BOX

The sandbox on the playground is a potential kill zone. There are pecking orders, turf wars, and arguments over who owns which toys. Alliances form and dissolve in minutes, and at the end of the day someone is trying to win control, possibly to the detriment of other kids. Our projects are nothing more than grown up sandboxes. There are egos, fights for leverage and control, and high stakes—both personal and professional. The same things that rule the sandbox rule the project. Protect your friends, stifle your enemies, and above all, never give up control of the box.

This has worked for decades in our industry, and shows little sign of changing quickly. Design teams build elaborate plans and strategies to control the builder and make sure “he does what he is

supposed to do.” They learn from previous failures of strategy, and are always looking to add another layer of protection (spec writers out there, unite!).

So principals, managers, and corporate attorneys ask, “Why change?” and ponder why collaborating will make their lives better or more profitable. “Why should we buy all this new software, just so I can give the builder more information? What has he done for me, and won't he just use it against me anyway?”

Builders would love more collaboration, but as historical whipping boys of the industry, they don't always have the trust connections with the designers that collaboration demands.

Does Revit, with its nifty integration of all the parts we use to build a project, solve this problem? Maybe not entirely, but it certainly has provided us with numerous additional tools to make working together easier.

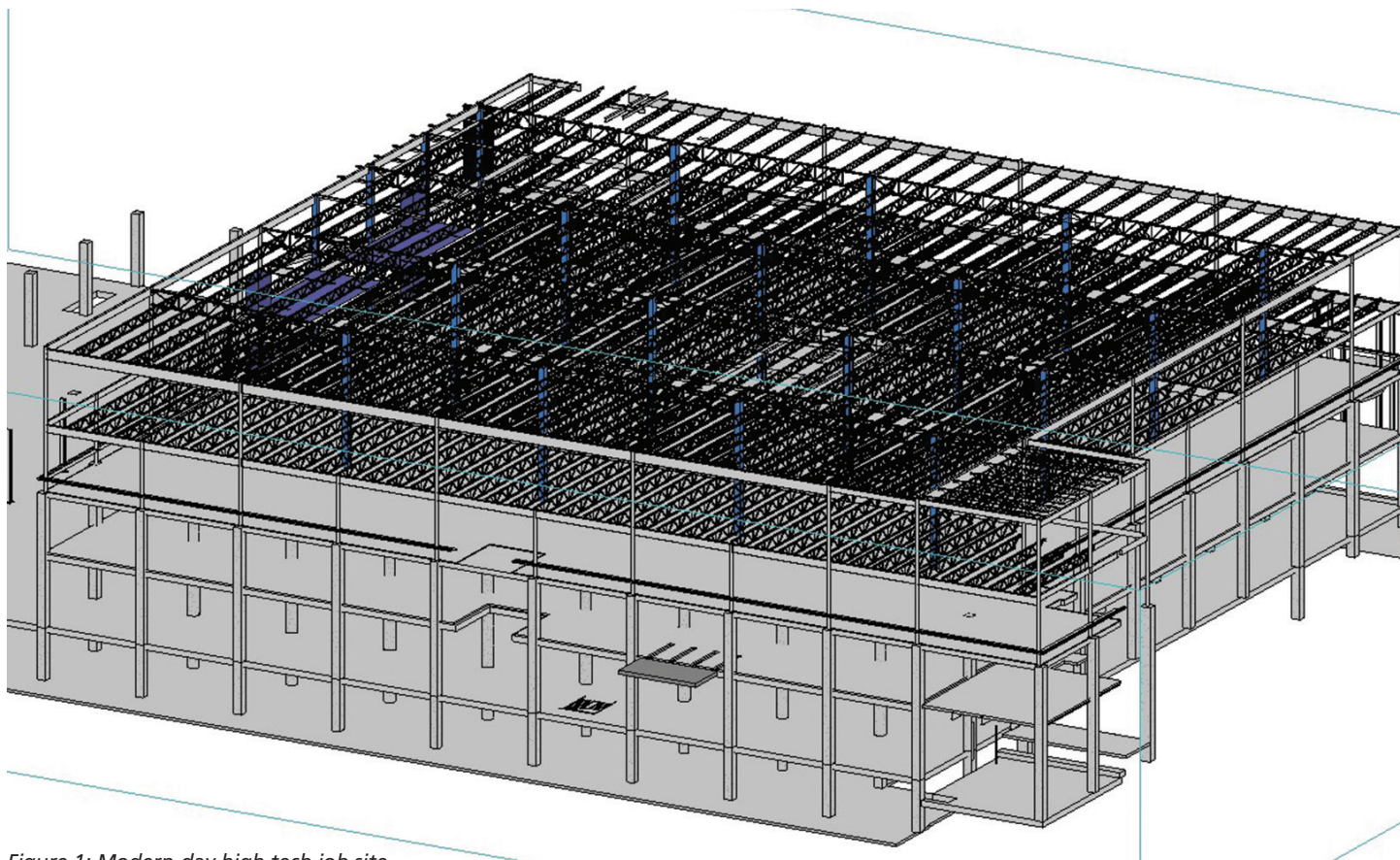


Figure 1: Modern-day high tech job site

From BIM meetings on Navisworks, to model sharing during design with our CM and GC, we have come a long way to helping us all visualize the project together. The tools to achieve true collaboration are here and available to us, and the rules by which to use them were learned in the sandbox.

MAKE FRIENDS

As simple as it sounds, this is the critical first step. Friends watch out for each other and trust each other to cover for them. The project team needs, before anything else, to achieve this “friendship.” It doesn’t mean you have to go out for a beer with each other (although....), but it does mean that there must be trust. Trust is how friendships start and how they end. It is also how project teams succeed and how they fail.

In the project world, the trust is sometimes written down (“the agreement”), but is mostly about understanding that everyone has needs, and the best way to make sure everyone succeeds is to be nice to one another. Listen more, talk less. Walk in each other’s shoes, and try to protect the interest of others as well as our own. Assume that everyone wants to make a profit and that we should encourage everyone to do so. Fights do not lead to more work—success does.

Production staff is generally much better at collaborating than managers or principals, so the lesson here is let them do their jobs, and don’t create reasons not to talk. We encourage open discussion amongst all members of the team, and while we document conversations, we do so after the details are talked through. Using

Revit Structure, we regularly output models to those who are comfortable using them, and output 3D PDF files to those who are not. Our data is the framework around which the entire building is constructed, so the quicker we can share this information, the faster and more efficient the team can be.



SHARE TOYS

We don't have good toys in the AEC world, but we do have tons of information. We have rich worlds of data, and they get better and cooler every year. The answer for collaboration is to share! I don't mean give out snippets, or dumbed-down versions. I mean to share data openly and freely; be the Tesla of the design world and let everyone see your "secrets"!

"But how can we let our proprietary info go?" you ask. Guess what—no one cares about your standards, and no one's model is special. We have released hundreds of Revit models over the years, and have had only good come from that. I suspect your experience will be the same.

Sharing your model will win you more friends (see previous paragraphs). You will find that a builder is better able to understand your vision, and if it means you have dirty underwear (those who cheat the model), well maybe it's time to think about washing those undies and stop cheating. Revit has come a long way, and there is no good reason not to model correctly anymore. Builders want you to be happy with their work because they want the next job. Work with them, and share like a good kid.

Models are cool toys!

MAKE THE BAD KIDS LEAVE

In many projects, there is one player that screws things up. One bully or sneak who tries to get everything for himself. It's that antisocial kid in the sandbox who plays people against each other, or who always has to have his own way. Get rid of this person. If not on this project, then on the next one.

Architects, stop hiring the subconsultant everyone hates. The one who takes pride in sticking it to the contractor. The one who just will not switch to Revit because it "doesn't make sense for him." (By the way, architects, don't be the bad kid; you are supposed to be the cool kids with fun ideas.) Builders, don't tolerate subs who don't do their jobs, and be willing to hold them accountable. Remember that the one who stands up to the nasty kid is a hero in everyone's eyes, especially the teacher (owner). If we as an industry were better at self-policing, we would need fewer barriers, and we would collaborate and cooperate better.

THE MORE HELPERS, THE BIGGER THE CASTLE

Not to restate the obvious, but a team that collaborates better is more likely to deliver a better job, which leads to happy owners, which leads to more jobs. Working together is ALWAYS the best solution, even if there is an argument. We have a rule on our project teams that all fights are worked out within the team (including the construction team!) prior to going to the owner, and the owner is presented with *solutions* to issues, not just issues.

This has gotten much easier. Sometimes we are sitting in a room looking at a Navisworks model, sometimes it is an email exchange of snapshots out of Revit. This has been successful over hundreds



of jobs, and in fifteen years of working together with our best client, we have yet to have a serious dispute with another team member that did not find a balanced resolution.

While BIM software has helped us to share more efficiently and has given us numerous tools to collaborate, it has done squat to teach us how. We learned that skill back in grade school, and would do well to keep that in mind. No matter what happens in our industry with the technology and tools, we all started out as kids, and kids have played by the same rules for thousands of years.



Josh Carney is a practicing structural engineer and president of Carney Engineering Group, Inc. in York, PA and Baltimore, MD. He was a very early Revit Structure convert, and believer in BIM as a game-changing technology. He has a wife and two children who teach him about how to play nice.

Organize with the Project Navigator



The Project Navigator in AutoCAD® Architecture is the main point where you work with a project. The Drawing Management environment within the AutoCAD Architecture Project Navigator helps you organize, create, and access all your project drawings in one unified interface. Creating sheets for plotting is easier with the streamlined coordination that is built into the Project Navigator. The Project Navigator has four tabs that you can use to enter project data. These tabs correspond to the main phases of project creation: general project information, creating building data (constructs), and creating building documentation (views and sheets). We will look at an overview of each of these and then will look at them more in depth.

PROJECT CATEGORIES OVERVIEW

Each of the basic categories is represented by a folder in the Drawing Explorer within the project structure that helps you to organize your project files. For every building project in AutoCAD Architecture, the following basic category structure is displayed on the Project tab of the Project Navigator palette:

- **<ProjectName>**: This is the top node in the project and is represented by a folder with the project name.
- **Constructs**: This is the default category for constructs within the project. When you create a construct, it is saved into the Constructs category.
- **Views**: This is the default category for view drawings in the project. When you create a view drawing, it is saved into the Views category. It is important to note that if you create model space views within a view drawing, they will be placed under the view drawing in the same category as the view drawing itself.
- **Sheets**: Sheets in the project can be viewed in two ways: the Sheet Set View and the Explorer View. Each of these views will be discussed in more detail later in the article.

The main category structure listed above is fixed, but you can create subcategories and subcategory trees within this structure. Subcategories typically represent aspects of your workflow. These subcategories can be set up in different ways. For example, you might set up subcategories by discipline, by view type (presentation, section, and rendering), or by sheet type (floor plan, ceiling plan,

and elevation). It is important to note that you cannot mix basic category types. For example, you cannot create a Construct subcategory within the Views category.

Categories offer excellent organization for a project. Even small building projects contain a large number of individual drawings that can be difficult to track. By putting them into descriptive categories, you can quickly find the correct files you need for your project.

THE PROJECT TAB

The Project tab on the Project Navigator tool palette is where you enter information that pertains to the entire project. The Project tab allows you to do the following:

- Change project properties
- Launch the Project Browser
- Launch the Content Browser to access the project library
- Add, modify, and delete levels
- Add, modify, and delete divisions
- Synchronize the project with project standard styles and display setting
- Enable and configure project standards
- Refresh the project
- Close the current project

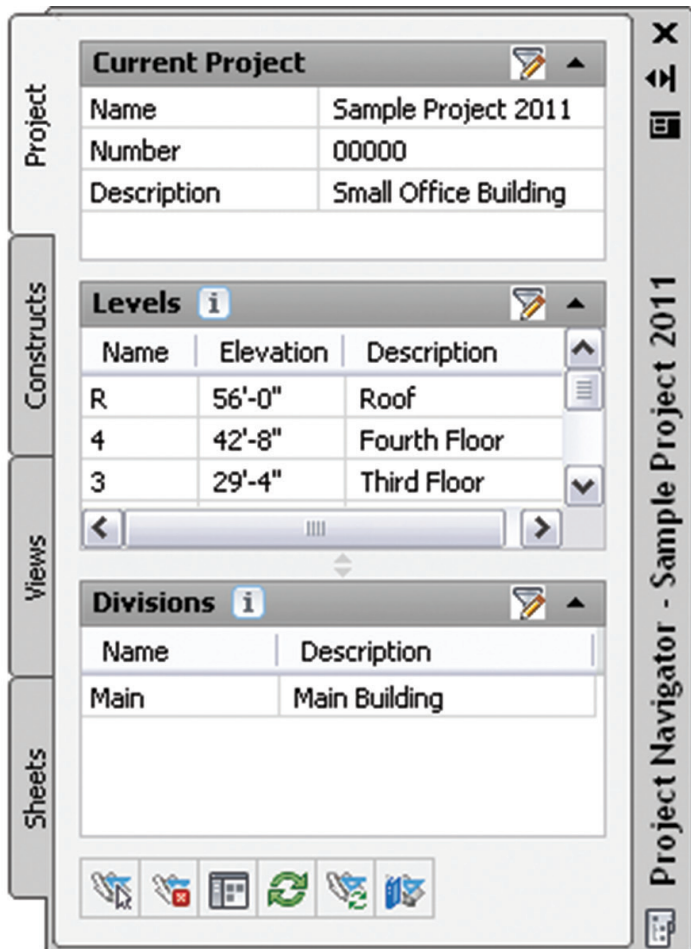


Figure 1: Project tab

THE CONSTRUCTS TAB

The Constructs tab of the Project Navigator tool palette is where you add the basic building objects for your project. Constructs are basically the main building blocks of the building model. A construct represents one unique portion of a building such as a building core or an entire floor. You will need to assign a construct to a level (floor) and a division (area of the floor) within the project. For example, you could assign an architectural construct named Interior Partitions—Second Floor/West Wing to the second level and the west wing division of the building. Constructs can span more than one level, which is useful for objects such as curtain walls.

The Constructs tab allows you to do the following:

- Open and close existing construct drawings
- Add, modify, and delete constructs within the project
- Create categories for constructs
- Launch the Content Browser to access the project library

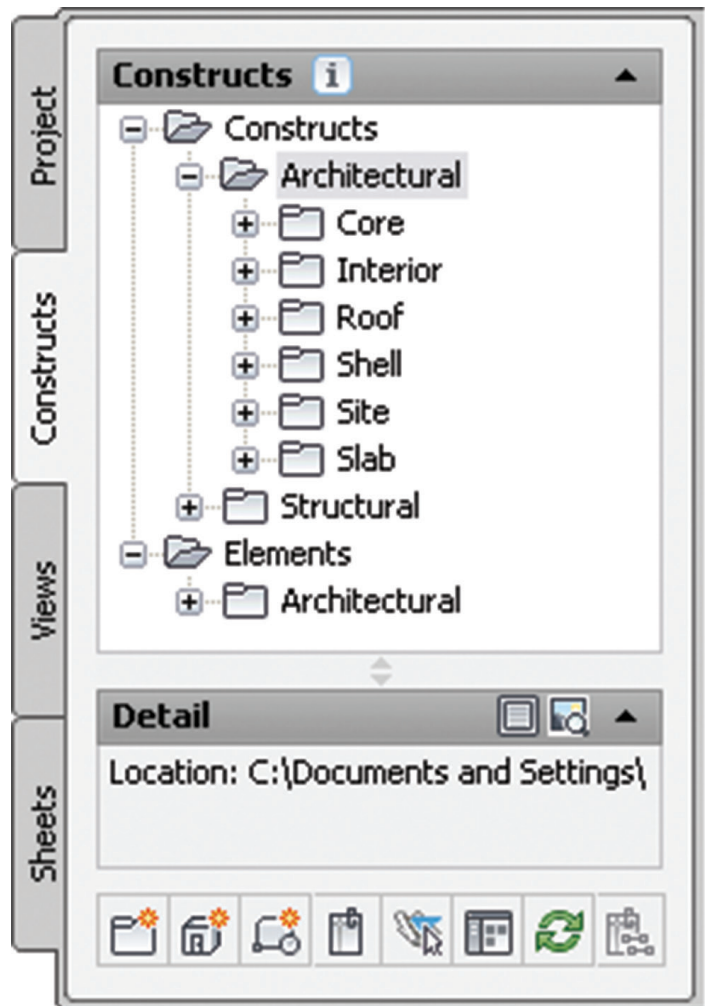


Figure 2: Constructs tab

THE VIEWS TAB

The Views tab of the Project Navigator tool palette is where you can create individual views of your building data. Views contain constructs and are the primary location for you to add annotation such as notes, tags, and dimensions within the project. After you have created a view drawing, you can then create model space views within it.

AutoCAD Architecture 2014

After the structure of the building project has been defined and constructs have been assigned to both levels (floors) and divisions (area of the floor), you can then start to create view drawings within the project. A view drawing references any number of constructs to present a specific view of the building project. In order to create a view drawing, you must first decide which portion of the building you wish to look at and which type of view you wish to generate. View drawings will automatically reference the appropriate constructs in accordance to their level/division assignments within the building. For example, to create a floor plan of the west wing of the second floor, you would create a view that references all constructs that are assigned to the second floor and the west wing.

The Views tab allows you to do the following:

- Open and close view drawings
- Add, modify, and delete model space views
- Add, modify, and delete general views, detail views, and section/elevation views
- Change the contents of view drawings
- Create categories for view drawings
- Launch the Content Browser to access the project library

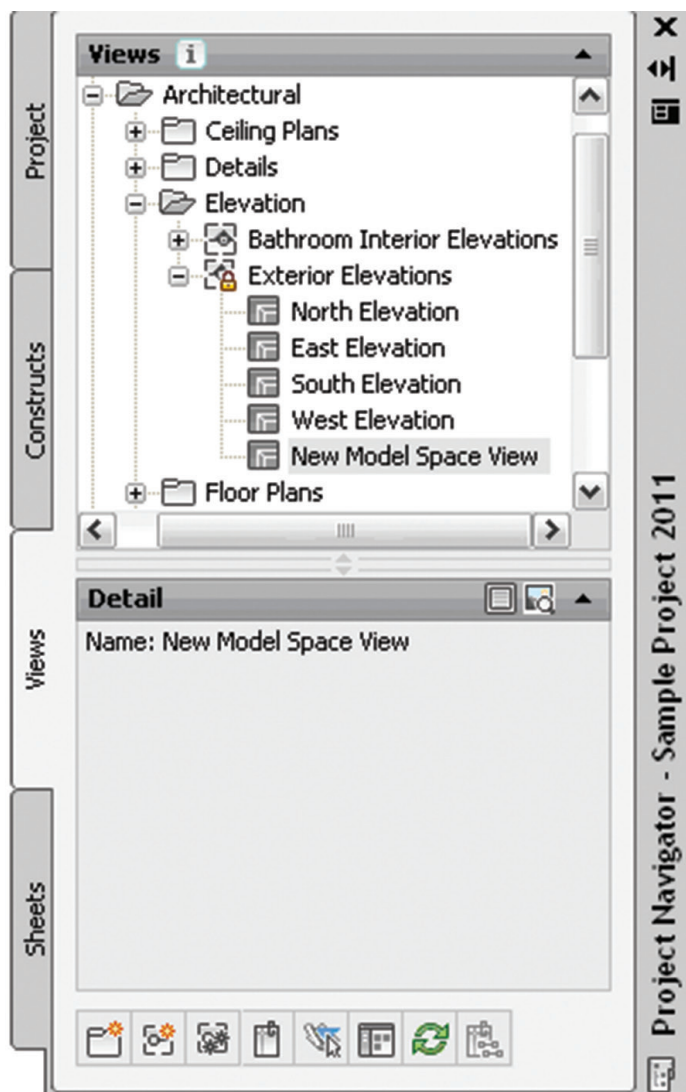
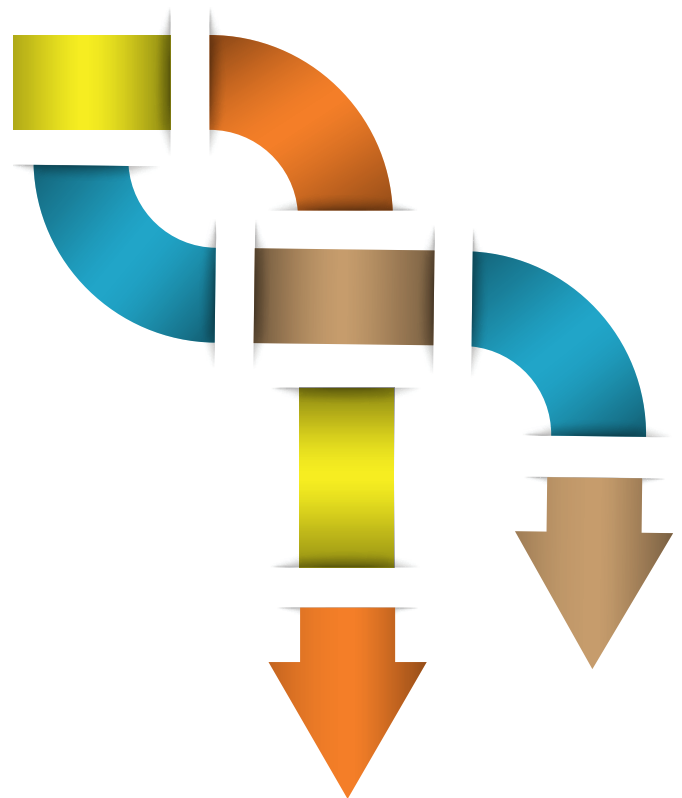


Figure 3: Views tab



THE SHEETS TAB

The Sheets tab of the Project Navigator tool palette is where you create and organize sheets for your project. Sheets reference views and are used for plotting drawings. The Sheets tab is also where you manage the project sheet set. This is where you will perform tasks such as creating a table of contents, managing page setups, or publishing to a plotter, a PDF, or a DWF file. The buttons at the top of the Sheets tab let you view sheet information in two ways: the Sheet Set view or the Explorer view.

The Sheet Set view is a tree view of the project sheet set in which you have access to all publishing capabilities. The Sheet Set view allows you to do the following:

- Add, modify, and delete sheets in the project
- Open and close sheet views
- Assign numbers to sheet views
- Insert a table of contents
- Electronically transmit the sheet set
- Archive the sheet set
- Create sheet selections for specific tasks
- Manage page and publishing options
- Launch the Content Browser to access the project library
- Publish the sheet set to a plotter, a PDF, a DWF file, or to an alternate page setup

The Explorer view is a view of the folder structure and sheet drawings in the project. The Explorer view allows you to do the following:

- Open, close, and delete sheet drawings
- Create categories for sheet drawings
- Launch the Content Browser to access the project library

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Sheets are organized into sheet subsets in the Sheet Set view. Sheet subsets are a logical structure. The sheet folder category does not need to be identical to the sheet subset in which the sheet is placed. To avoid confusion, however, it is recommended that you have parallel structures in the sheet set and the sheet categories. You can rearrange sheets into different subsets within the Sheet Set view, but that will not change their physical location in the category or folder. Also, when you remove a sheet from a sheet subset in the Sheet Set view, only the reference of the sheet to the subset is removed. The layout itself and its containing sheet drawing are not deleted from the Sheets folder or subfolder.

In the Explorer view, sheet drawings are placed in folder categories. When you create sheets or sheet views within a sheet drawing, they are placed in the sheet drawing.

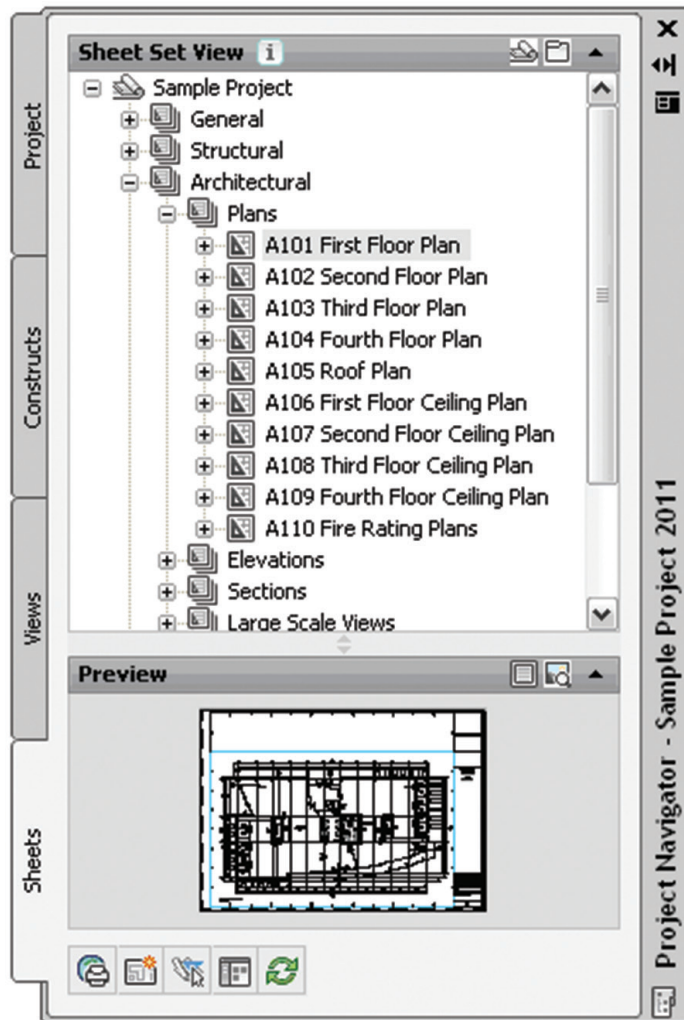


Figure 4: Sheet Set view

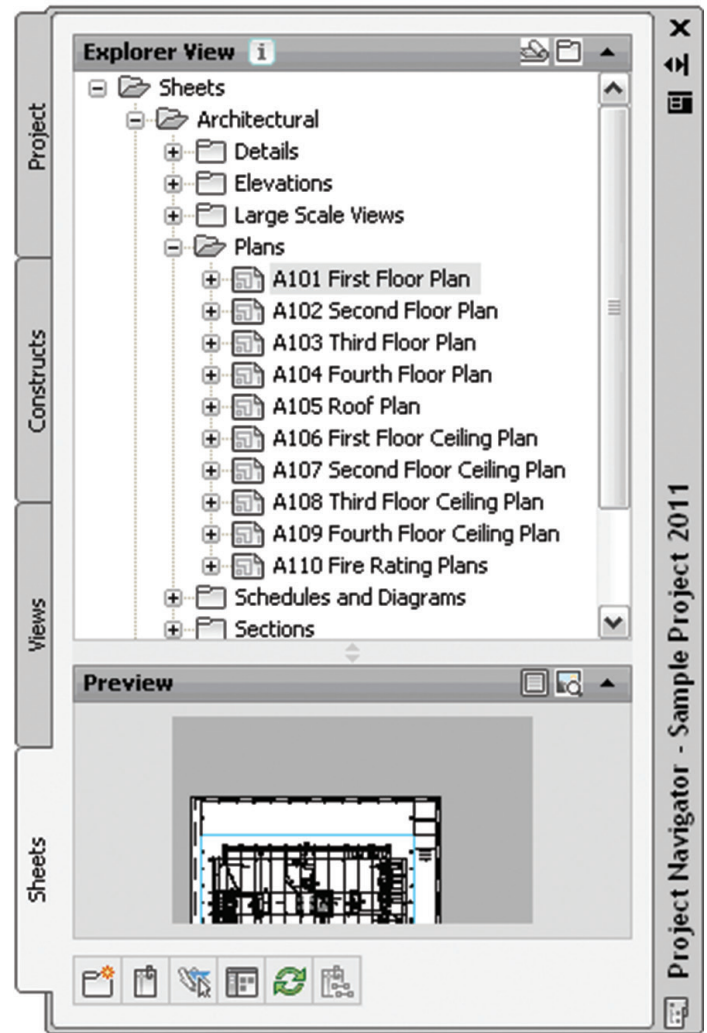


Figure 5: Explorer view

THE DRAWING EXPLORER

The Drawing Explorer is a tree view that is common to the Constructs, View, and Sheets tabs of the Project Navigator. This is where the drawing files are organized. With the exception of the Project tab, each tab of the Project Navigator has a Drawing Explorer tree where the associated project drawing files are displayed.

Drawing files belonging to a project are displayed on their respective tabs in the Drawing Explorer tree view. This tree view lists the drawings within their category. You can drag and drop, or copy and paste drawing files in the Drawing Explorer.

EXTERNAL REFERENCES

The Drawing Management feature uses external references (xrefs) as a means to create a project and maintain it. Elements are referenced into constructs; constructs are referenced into views; views are referenced into sheets. The mechanism of referencing is identical to the regular AutoCAD External References Management feature; however, the background methods employed have additional features.



Xrefs that are created in drawing management can automatically make use of project data, while those created manually through the xref palette or command line cannot. If you are working in a project environment, the best practice for referencing project drawings into other project drawings is to use the Project Navigator rather than the standard AutoCAD Xref Manager. The AutoCAD Xref Manager cannot differentiate between project drawings and non-project drawings. If you reference a non-project file into a project file by mistake, you cannot use the full Drawing Management functionality on that file.

It is important to keep the following considerations in mind when working with a project:

- Do not delete any XML files generated by the Drawing Management feature as they are vital for the project.
- Use the Project Navigator to create, modify, and reference project files within the project. If you want to use existing non-project files in a project, convert them to project files first.
- Drawing Management supports the use of relative paths for external references. In the project setup, you can decide whether to use full paths or relative paths. Working with relative xref paths makes moving the project and transmitting it easier and reduces the need to repath the project.

REFRESHING THE PROJECT NAVIGATOR

When multiple people are working on the same project simultaneously, one person's Drawing Explorer view on the Project Navigator palette can become out of sync with the changes of another. To prevent this situation, refresh the Project Navigator by clicking Refresh Project so all items are updated to reflect the current project status. This should be done frequently during a project session if there are multiple people working on the same project.

On the Quick Access toolbar, select Project Navigator. Next, select the tab where you want to refresh the file tree. Finally, select Refresh Project.

REPATH THE PROJECT

A repath is necessary after you make any of the following changes within the project:

- Rename a project file
- Move the project to a different location
- Move a project file to a different category
- Move a subcategory from one category to another

In addition to updating the project files, repathing will also update the paths of support files, images, and schedules that are referenced in the project drawings.

When you zip a project and then send it to another user who unpacks the project to a different location on another computer, the project will be updated in its new location when it is set current for the first time on the new computer. However, this will update only if all project paths were correct and current when you zipped them. If you moved the project to another location on your computer and did not repath it before zipping, the repathing on the new user's machine will not work correctly. Before you zip and send a project, you must make sure that all external reference paths in the project are valid.

You have the choice of repathing a single project file, all files in a category, or all files in the project. On the Quick Access toolbar, select the Project Navigator. Next, change the name or the location of a project file or project folder in the Drawing Explorer. The Project Navigator - Repath Project dialog box will display (see Figure 5). Specify when you want the repathing to be done (Repath Now or Repath Later).

It is important to note that when you repath a project that was saved in a version of AutoCAD Architecture prior to 2010, the drawings are saved in the new file format. You will no longer be able to open these drawings in a version of AutoCAD Architecture prior to 2010. Synchronizing a project with the project standards will also save the project drawings in the new file format.

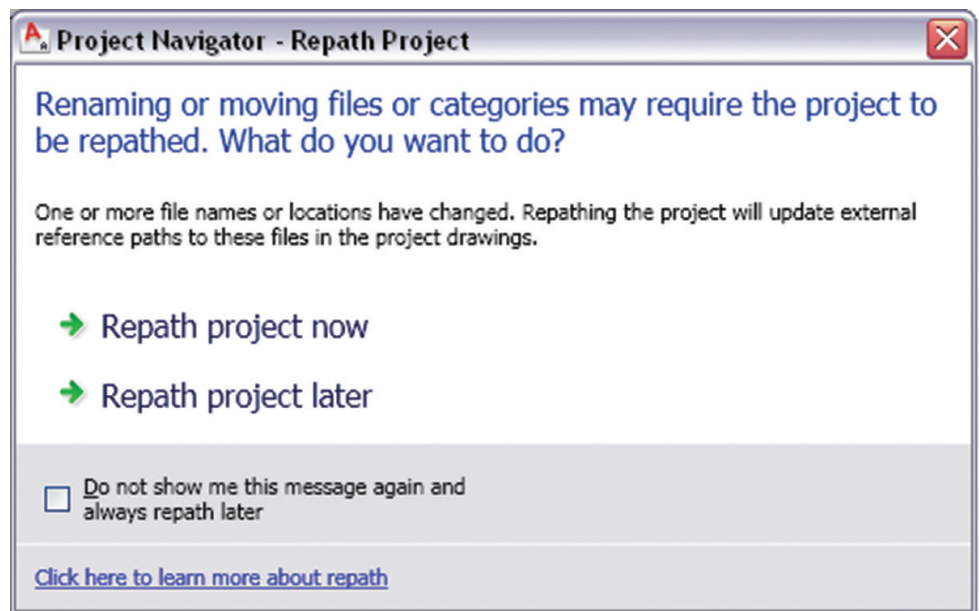


Figure 6: Repath project dialog box



Melinda Heavrin is a CAD Coordinator & Facility Planner for Norton Healthcare in Louisville, Kentucky. She has been using AutoCAD Architecture since release 2000. Melinda can be reached for comments and questions at melinda.heavrin@nortonhealthcare.org.

Project Collaboration



In 2012 I wrote an article in *AUGIWorld* on AutoCAD® Civil 3D® collaboration. My article focused on the process of exporting, converting, or otherwise manipulating Civil 3D model files for the purpose of sharing with clients, subcontractors, or stakeholders. While I still stand by all methods referenced in that article, my perspective has shifted in recent years with regard to what collaboration truly means.

Collaboration goes far beyond file conversion and compatibility. To truly collaborate on a project utilizing Civil 3D for design and modeling, a new level of communication and coordination must be embraced. While the level of openness and sharing may make some individuals and companies wary, it is a necessity in minimizing confusion and production issues. This article won't solve all your collaboration hurdles, but the goal is to convince you that openness to sharing is the right way to collaborate and to get

you asking the right questions in preparation for collaborating on Civil 3D projects.

SHARING IS CARING

Everyone and every company using Civil 3D understand not only the importance of a template, but also the time, energy, and expense involved developing a robust and manageable template. I don't take that investment lightly, nor should anyone else, as to do so would undermine its importance when implementing Civil 3D.

However, what this often leads to is a white-knuckled grip on the "intellectual property" held within the template. Companies explode, export, and otherwise disguise the styles and settings they worked so hard to develop when sharing files. I don't blame anyone for wanting to keep this out of competitors' hands, but this behavior is also counterintuitive for effective collaboration.

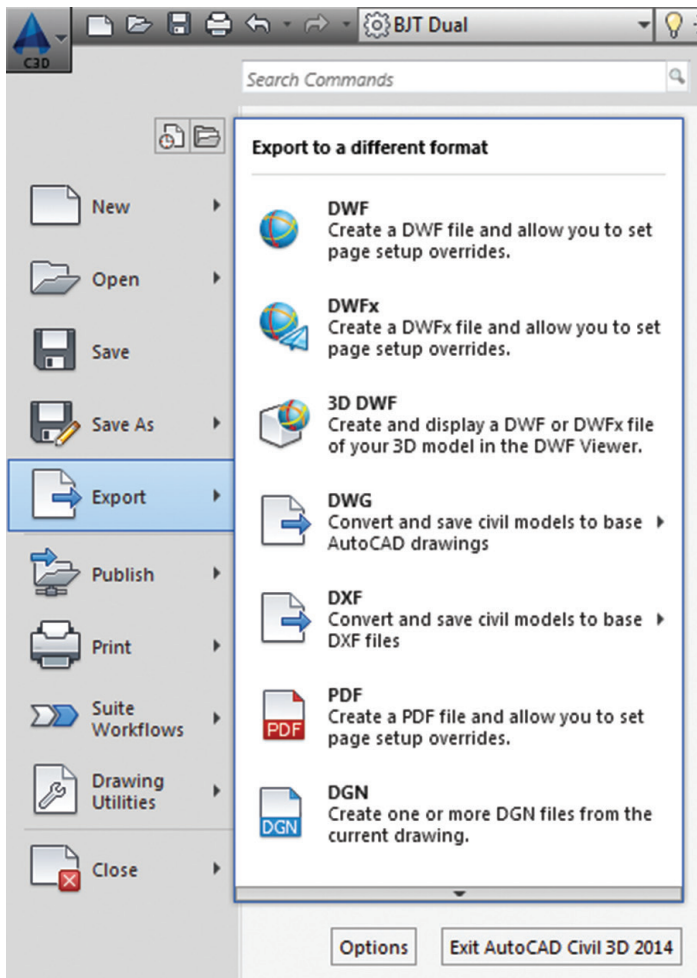


Figure 1

When working on a project team that includes one or multiple competitors as subs, there will be some friction, criticism, and second-guessing regarding sharing a template. Get over it. The team member or sub with the best and most complete template for the purposes of the project and client should be willing to share that work with the entire project team. This *should* be the team designated as project lead, but that's not always the case. The team contributing the template should also utilize a non-disclosure/electronic-use agreement restraining use of the template and all contents for purposes specific to the project, and should also be compensated to some extent for this contribution.

The sharing must extend beyond the template, though. Plot style tables, north arrow blocks, title blocks, logos, special fonts, and any custom linetypes referenced within the template also need to be distributed to the entire project team. Do this for your own benefit for a smooth project, consistent construction documents, and minimizing coordination headaches at submission time.

ESTABLISH STANDARDS

We have all (hopefully) defined file naming and folder structures for project drawings. This practice needs to extend to the project team and subs. Though not everyone will be accustomed to working the same way, establishing consistency before the project ever starts

will keep all on point. This also plays a major part in maintaining and tracking file versions. Whether an FTP site, Autodesk 360, Dropbox, or some other file sharing service is utilized in maintaining project files, the last thing any team member wants to do is search for a figurative needle in a haystack because a file was named incorrectly or saved in the wrong folder.

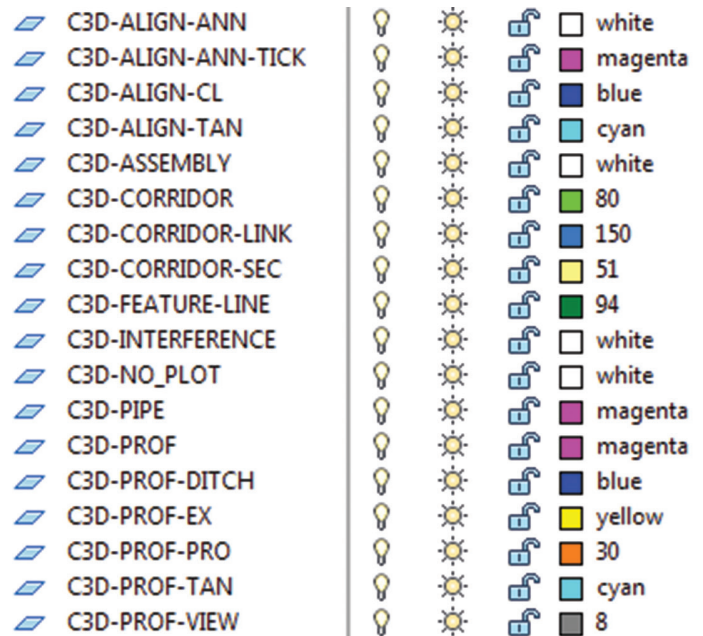


Figure 2

Layers also play a major role in our communication of Civil 3D files. Although a template is shared, there are inevitably object types and representations that don't conform to or make sense to place on those template layers. Thus, new layers need to be made, applied, and then interpreted by all those looking at the file throughout the project. Existing layers need to look a certain way, proposed another, and layer names must be quickly and easily understood.

Create a one- to two-page document at or before the project kickoff meeting outlining these standards, as well as template and block files made available for all to understand and check against. When files are submitted, each team member or sub should be upheld to those standards and asked to correct any irregularities for the benefit of everyone on the team.

COMMUNICATE...REGULARLY

Whether via email, telephone, weekly meetings, chat apps, or some other means, make sure every team member is aware of file changes, available resources, deadlines, and template changes. You may have started the project from a single template supplied by one of the project team members, but I can almost guarantee that some standard, method, reference, or preference will change through the project timeframe and those changes need to be communicated and distributed.

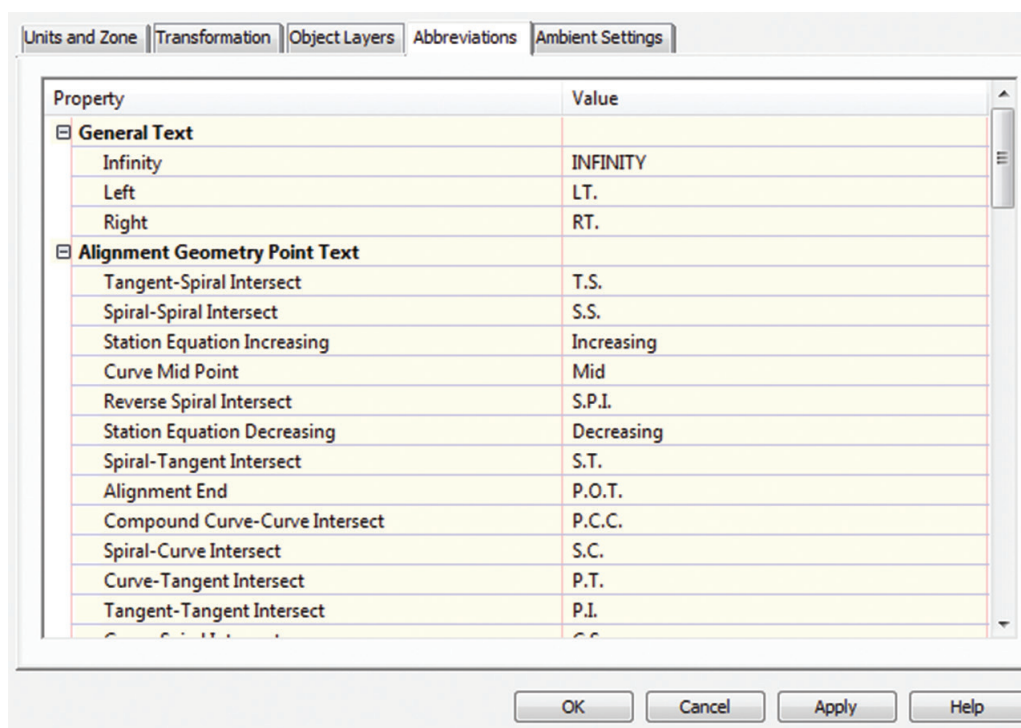


Figure 3

Did you remember to make a layout template for cross section views? How about that obscure expression for alignment labels you use and team members who ask why your delta symbol looks different than theirs? Did you import the styles and settings from the project template? Then perhaps you didn't initially realize that importing doesn't overwrite or correct drawing settings such as object layers, abbreviations, or ambient settings. These are just a few examples of the template issues that may arise.

Project communication needs to extend further than template styles and settings, though. What about the coordinate system being used? Did the client or state update pay item numbers or how quantities are calculated? Someone created a Pipe Network structure from a custom Part Catalog and you are having trouble swapping parts. What do you do now? These questions, and more, will arise between planned project meetings and need to be addressed immediately to avoid hampering production.

After working through a couple projects involving multiple teams, develop a checklist for these types of questions and get them out of the way at project kickoff. Until you've developed the perfect

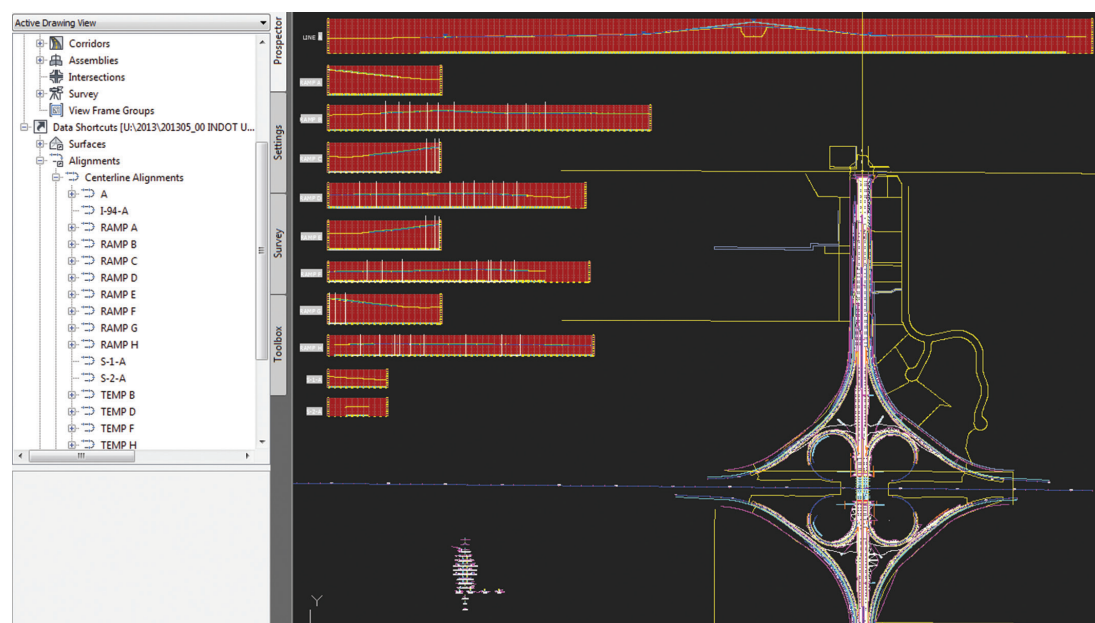


Figure 4: Complex projects require especially detailed coordination

and data references, will make it feel like every team member is working out of the same office.

Yes, there are certain data sharing and file coordination applications that can synchronize files across offices and teams, but I haven't

template and standardization documents, be prepared to ask and answer questions such as these.

STANDARDIZE MORE

More to standardize? Yes. We haven't even started discussing Civil 3D object names. Yet this may have one of the most profound effects on Civil 3D productivity.

Take, for instance, data shortcuts and data references. One Civil 3D file, using the same drawing name from start to finish on a project, containing an alignment named the same from start to finish on a project will allow everyone to upload, download, and reference this alignment without synchronization issues. The same goes for surfaces, profiles, pipe networks, and view frame groups. Maintaining drawing and object names, in files all based on the same template and utilizing data shortcuts

seen any company that won't immediately copy those files to their internal server for production. The future may change that, but for now it is the modus operandi.

Let's not stop there. There are hundreds of ways in which to configure Civil 3D project files. Will alignments, profiles, corridors,

and cross section views be in the same drawing or will each reside in its own respective drawings and be referenced in? Will the team be generating proposed linework from the corridor model utilizing a predefined code set style, or will there be an external reference for proposed linework that can be used for targeting within the corridor? Without buy-in from all team members and subs on a standard methodology for these, time and money will be spent in later project phases.

SHARING IS CARING...THE ENCORE

When developing collaborative projects in Civil 3D, certain design elements are dependent on others being completed. Profiles can't be cut until alignments are defined, assemblies can be quickly generated if typical sections are already created, and it is much easier to apply pipe networks to a proposed corridor surface than adjusting them later. With that in mind, sharing these objects early and often helps move project work along smoothly—with one caveat: The shared files and objects need to be standardized and without misinformation.

Error	6/26/2014	10:57:04 AM	Roadway
Error	6/26/2014	10:57:04 AM	Roadway
Warning	6/26/2014	10:57:04 AM	Roadway
Error	6/26/2014	10:57:04 AM	Roadway
Error	6/26/2014	10:57:04 AM	Roadway
Error	6/26/2014	10:57:04 AM	Roadway
Warning	6/26/2014	10:57:05 AM	Roadway
Warning	6/26/2014	10:57:05 AM	Roadway
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Error	6/26/2014	10:57:07 AM	Roadway
Error	6/26/2014	10:57:07 AM	Roadway
Error	6/26/2014	10:57:08 AM	Roadway
Error	6/26/2014	10:57:08 AM	Roadway
Error	6/26/2014	10:57:09 AM	Roadway
Informa...	6/26/2014	10:57:12 AM	Surface: l
Informa...	6/26/2014	10:57:12 AM	Surface: l
Informa...	6/26/2014	10:57:12 AM	Surface: l
Informa...	6/26/2014	10:57:12 AM	Surface: l
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Figure 5

Uploading unstandardized files and objects creates more work for every team member involved, while misinformation creates confusion and coordination issues. Unstandardized files and objects must be discovered, communicated, and corrected. Misinformation is much more difficult to uncover, as it typically materializes as mundane mistakes (i.e., a profile end station 0.01' shorter than the associated alignment and corridor model, creating a "waterfall" effect on the model, and often crashing Civil 3D when cross section views are generated).

The project lead should be clear in defining checkpoints and upload dates for specific files. Additionally, team members and subs must ensure the uploaded files are accurate, even if uploaded late. The saying "done is better than perfect" creeps its way into projects more often than we would like to admit; use common sense and avoid project "Easter Eggs," which tend to cause greater problems later in a project cycle.

CONCLUSION

As civil engineers, designers, surveyors, and technicians, we're accustomed to sharing our finished work—many times with it modified and submitted in such a way that no method could be used to detect how the work was originally created. It is no small task to toss that practice and the mentality surrounding it. The payoff when you do, though, is a well-oiled machine of productivity, which should be noticeable in your bottom line.

Another benefit of your willingness to share your Civil 3D template, supporting files, and practices is the tendency to let you drive the ship. If you and your company have been slated as the project team lead, then that should already be the case. However, a contribution such as this if you are a sub or scheduled for a smaller team role should garner respect and hopefully a larger or more prominent role in future team proposals. Better yet, your contribution and efforts could and should be noticed by the client, and potentially lead to future projects.



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Reduce the Complexity in Controlled Surface Design

I have been working on a project that is enclosed within an organized, organic shape. I learned numerous things about surfaces during the process. While I cannot show the project details directly, I can discuss the workflows and key factors that made surfaces successful in this application.

WHERE ARE SURFACES USEFUL?

- Managing Data
- Basic Surface Tools
- Working in Symmetrical Sections
- Using Derived Surfaces to Create Components

Anytime you need to control the limits of a complex shape, surfaces can play an important role. Furthermore, when that shape is also the control of other component features, especially in situations where concentricity and parallelism play a role, surfaces may be your only realistic option.

I had an outer shape that was important to my client, which subsequently limited most of the design. The outer shell and inner shield needed to be held at a consistent offset; surfaces became the control for most of the design.

Another area where surfaces become very important is in sheet metal. There are some shapes that Autodesk® Inventor® Sheet Metal cannot create, and there is simply no alternative but to employ surfaces to create those components.

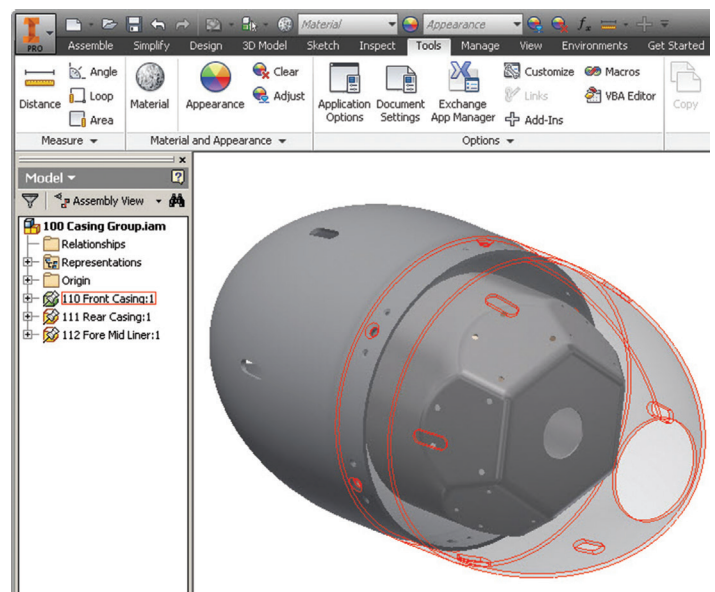


Figure 1: A tube-contained robotic concept—surfaces, work planes, and parameters drive the entire build.

MANAGING DATA

I am always looking to parameters to provide an easy method of managing the overall design and making the recall of feature-specific data easier.

I typically load a master skeleton part file with all the overall design parameters, typical tooling sizes, and sheet thicknesses. I then use these as a tool to develop the outer shape limits that the client desired. Work planes are used to transfer organized division throughout the design. Once completed, the skeleton usually contains two or three stitched surfaces, numerous work features and user-created parameters. Solids are rarely employed in my master skeleton files.

- Parameters pass numeric control to the surfaces (and work features).
- Surfaces pass geometric control to the component features.

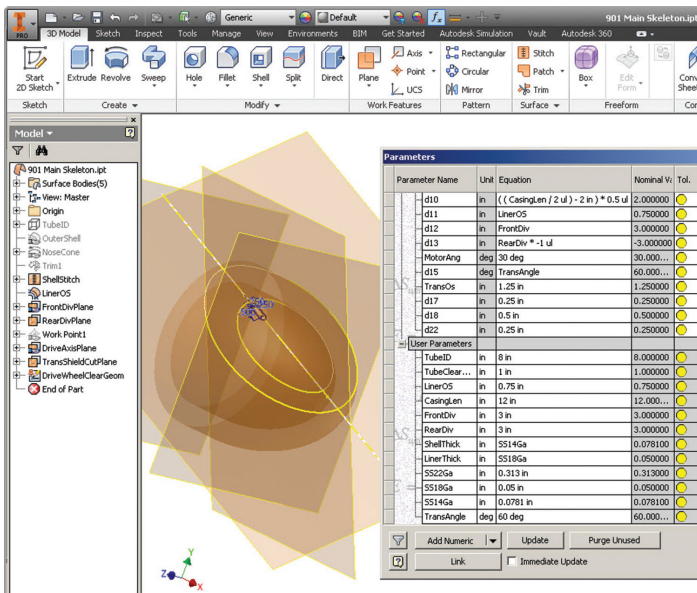


Figure 2: The Master skeleton. Note the parameters, surfaces, and work features. The work planes make it seem busy, but the Model Browser shows that there are really only a few key features to control the main shape of the machine. The outer shape is automatically controlled by equations that rely on the length to OD ratio.

Once the skeleton is developed, it is passed onto the entire design in one manner or another. When the outer shape is changed, or a liner thickness needs to be altered, changes in the master skeleton are perpetuated throughout the design.

Sub-assembly and Construction Skeletons

In order to reduce complexity in the design, I will usually employ sub-assembly skeletons. This tactic allows the following:

- Keeps the master skeleton much less complex.
- Reduces the number of duplicated operations such as the same surface offset in adjoining components.
- Allows convenient creation of multi-body parts and feature-specific parametric controls.

In each sub-assembly skeleton, I would derive only the surfaces, work features, and parameters necessary to drive the individual components in the sub-assembly.

Note: These skeletons do not necessarily have to represent the actual sub-assembly to which the features will ultimately be assigned. In some cases you could call these construction skeletons.

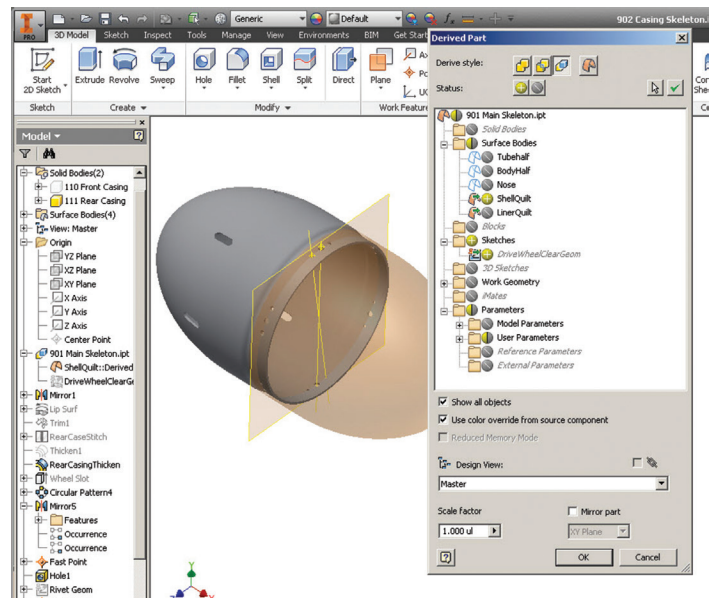


Figure 3: The derived outer casing skeleton. Note that only a few features were required to be derived from the main skeleton part file.

The outer shell and inner liner represented components that were similar and concentric in nature. One option would be to develop the entire outer shell pair and possibly the inner liner in a single multi-body part file—all offset from a single derived surface.

Derive the Simplest Forms Possible

Too many parameters, sketches, and surfaces can convolute a skeleton or basic part file. A clean set of instructions is preferred. Go a step further and derive only the simplest surfaces required (see Figure 4). This can reduce needless downstream complexity.

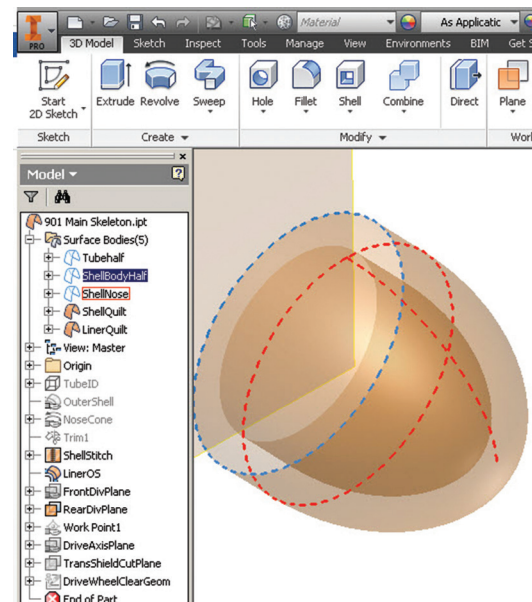


Figure 4: Individual surface parts remain after stitching. It is possible to derive these instead of the entire surface. This option can be a valuable resource when editing derived components, so name these appropriately.

Work Directly on Surfaces

Not only can you benefit from the simpler partial surfaces in the

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master file (or conversely, trimming down the derived surfaces), but also there is value in applying as much work directly to the origin planes, derived work features, and surfaces.

You have likely been encouraged to stick close to your origin planes and work features, but what about when the solid bodies have been thickened? The tendency is to work off of the solid features.

Tip: If you have the opportunity, turn off the solid body and apply your construction geometry and references to the base surface. Then turn on the solid, and get back to work.

Why?

Because solids can get fouled up after a bad feature application/edit. The surfaces will often remain unharmed even when a solid disintegrates. If the surface survives, so do all your downstream construction features.

BASIC SURFACE TOOLS

After the derived feature process is complete, I use the sketched geometry and the following surface tools to develop the components.

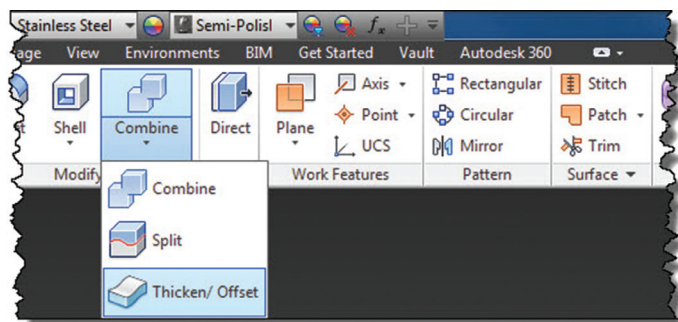


Figure 5: The main surface tools.

Surface Patch – creates a surface based on the shape of bounding features and sketch geometry.

Surface Trim – allows seamless, precise fitting of surface pieces, trimmed by surfaces, planes, and sketch geometry.

Surface Stitch – is much like stitching a quilt together out of pre-trimmed surface parts.

Almighty **Thicken/Offset** – allows surfaces to be either offset from another surface in a concentric manner, or a solid to be built by adding a thickness to a surface.

Specific surface features can be applied to the sections using sketch geometry and the Extrude, Revolve, and Sweep tools. In these cases, employing *Project Cut Geometry* in the sketch is a design necessity in order to reference the section surfaces.

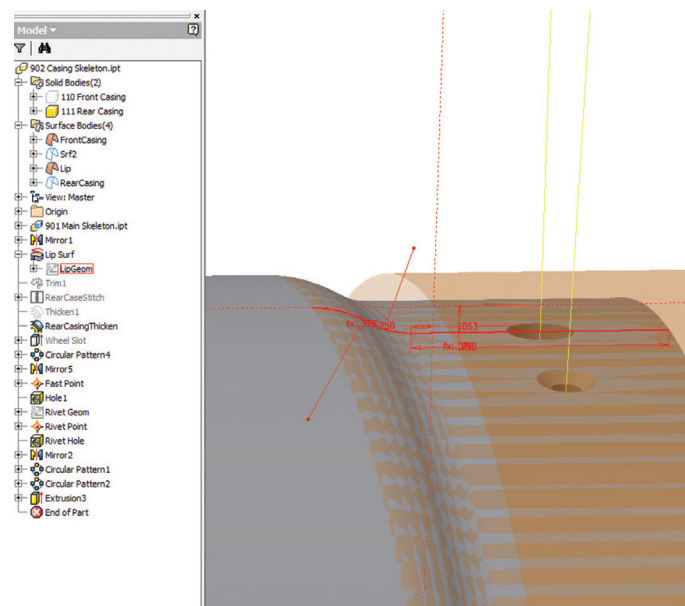


Figure 6: Using derived parameters and surfaces as well as the *Project Cut Edges* tool to guide the lip's sketched revolve geometry.

WORKING IN SYMMETRICAL SECTIONS

Once the basic surfaces for your part are derived and offset, etc., if your part is symmetrical it is wise to apply any and all features that appear in that symmetry. The strategy is to:

- Minimize the complexity of the reference surface
- Reduce the number of features applied to the surfaces

We can do this by trimming down the overall surface into the appropriate single section of the symmetry/pattern and developing all basic features at the surface level. When parametric changes are passed down from the main skeleton files, only a fraction of the design is actually being adjusted. The rest of the design is simply a copy.

My Design Example

My project design was orthogonally developed about a centerline axis, so many components were easily built in a single quarter, and then mirrored about the origin planes of the hemisphere. In order to do this, the main-derived surface was cut into a hemisphere by a named work plane, and then quartered by the part origin planes using the Surface Trim tool.

Note: A clean work plane trim is required for the final parts to be mirrored back into place properly.

To Fillet or Not to Fillet

Specific radii can be applied directly to the surfaces, such as roll formed and stamped sheet bends, using the Fillet tool. This allows consistent thickness offsets on the sheet when the solid is created by the Thicken tool, and only one fillet operation is needed.

Tip: If you are working in sections, you may want to hold your feature fillet operations until the entire surface (mirrored, patterned, etc.) has been stitched together as a complete unit. Quite often, additional fillet operations may still remain when the entire surface is stitched.

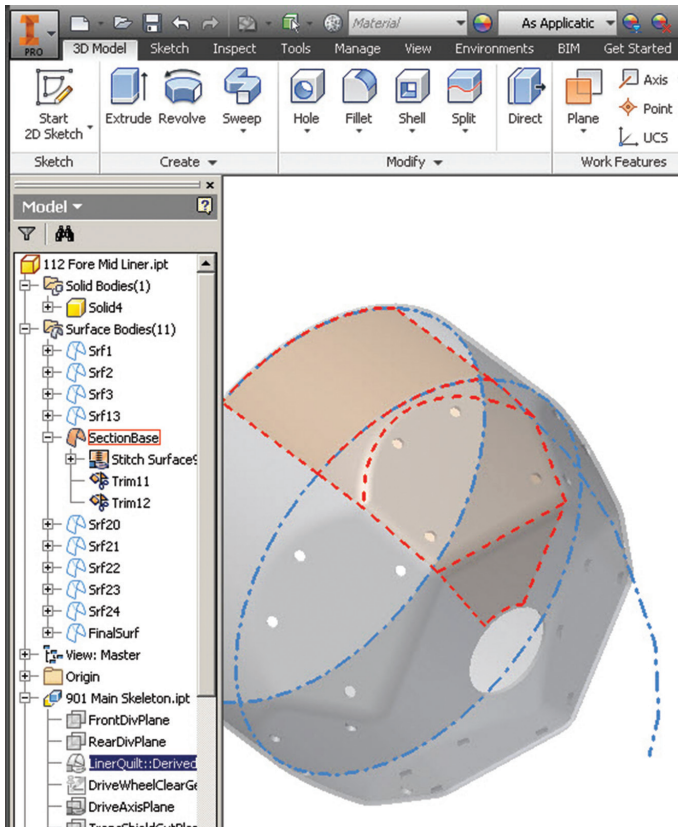


Figure 7: The thickened liner example. Note the outline of the derived outer surface (blue), and the resulting surface build (red). The preliminary surface was derived from the overall, trimmed into a 1/6 section, and trimmed again by two controlled “division” work planes. A surface patch was applied to close up the angled face, and all were subsequently stitched together. The result was then duplicated six times in a circular pattern, and then stitched together again.

A single fillet was applied to the liner’s final surface shown in Figure 7. I used the “Feature” option, and picked the final surface object. Inventor then added the radii to all edges in one operation. Note: In my project design, I was able to perform most of my fillet operations in the section prior to patterning. A somewhat rare opportunity, but this made the design quite simple.

In some cases it can be quite convenient to thicken the surface section and join patterned solids onto the final shape. Beware of your seams—convex thicknesses often leave gaps.

Other Areas of Concern

Another area that presented a specific problem was where a component was to be molded, and an odd rib had to be formed along a centerline seam for support. This had to be added as a sketched feature, and Swept into place after the solid was built.

USING DERIVED SURFACES TO CREATE COMPONENTS

Observe how surface features behave when thickened. The question that should be asked is, “Should the feature be applied to the sheet before or after it is formed?”

Holes applied to the surface and then offset will be stretched differently on the upper and lower sheet edges. If the hole needs

to be consistently the same parallel diameter throughout, then the hole needs to be applied to the solid after the surface is thickened as if it will be drilled and reamed after the sheet part is formed. Sometimes however, this stretch is advantageous.

Using Sheet Metal Tools

Whenever possible, I used Inventor Sheet Metal to take care of the component design. The derived surfaces and work features were used to develop the base sketch geometry, and then the remaining faces and flanges were handled with sheet metal workflows.

CLOSING THOUGHTS

It will take significant practice to determine which application of these ideals will fit your needs. I tried to stress the benefit of reducing the complexity by:

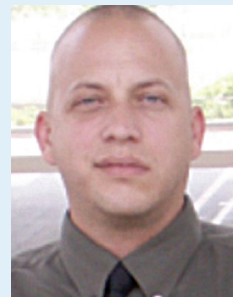
- Referencing surfaces
- Deriving the simplest information (including partial surfaces) necessary
- Leveraging as much symmetry as possible
- Understanding when to move ahead with features and solids

These will quickly enhance your update resilience.

Remember, if you are employing intersecting surface trims, etc., any sketches that reference drastically changing projected cut edges will go rogue. Another reason to derive the simplest surface necessary, and not the entire master shape.

If your surface trims become insane and cumbersome, you will lose the robustness of the design. Often, a little reflection and a return to the master skeleton file can help approach your automation from a different direction, and bring your seamless updates back to life.

It may sound as if I am trying to discourage you from using surfaces. Quite the contrary—I hope these tips and notes will help you make this powerful control option a success.



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Set Up Your Team for Successful Collaboration



➔ If I were a consultant brought into your firm, I would gather your CAD and design staff together and I ask one question to begin: “Tell me three things that went bad with your last project.” Just three.

Naturally the answers would vary with each office. In fact, the answers vary from person to person. What I can guarantee you is that no one in that office would list “successfully collaborated” on their tally of things that went wrong. The reason is simple: Collaboration is not something that hinders projects; it accelerates them! But you already know that. Don’t you?

If you have practices and policies in place that support and encourage collaboration among your CAD and design staff, then you already know the benefits this can offer. You are already on the road to “win” and you know it.

If you are in a place where collaboration is not a priority, then you cannot possibly understand the full scope of benefits you could reap. Still, you probably have a pretty good sense that things could, and should, be going better than they currently are. Just because you are not aware of the answer does not prevent you from realizing that a pretty important question is staring you in the face. Whatever the case may be for you, there is always more you can do. There is always the first small step you can take to get your staff collaborating or there is another way you can work to expand current collaboration.

All you need to do is realize that there is a better way to work. Together.

COLLABORATION: WHAT'S IN A WORD?

“Collaboration.” It’s one of those buzzwords that we all hear in staff meetings, press reports, and board of director statements. And why not? Collaboration is one of the greatest of all human accomplishments, producing such feats as the pyramids, modern medicine, and space travel. Too abstract for you? Fair enough, but did you know that from mid-2011 to late 2013 nearly 1,000 people came together to collaborate on one product? Together they produced the blockbuster video game title “Assassin’s Creed 4: Black Flag,” which sold more than 8.5 million copies!

That is a whole lot of collaboration—not only in terms of the accomplishment in creating such a popular title, but in the sheer task of coordinating so many people. With a rumored budget of nearly \$100 million and a creative team approaching 1,000 people, the challenges of accomplishing anything must have been unimaginable. It sort of puts your own challenges of workplace collaboration into perspective, doesn’t it? Sometimes it seems that collaboration is a concept so far outside the reach of the average person that it seems practically fictional.

COLLABORATING (AND WHY YOU AREN'T DOING IT)

Perhaps you feel as if “collaboration” is like “synergy” or “thinking outside of the box” or some other made-up, corporate jargon. And why shouldn’t you? “Working together,” “taking one for the team,” and “collaboration” are just a few of those nonsensical things that are crammed down our throats as a lofty mantra that no one is actually expected to take to heart. Fortunately, “collaboration” is a real thing and it is pretty great. Perhaps, instead of pining

away for collaboration, you should examine the roadblocks that obscure your path.

The list is not exactly short. There are plenty of things standing between you and the bounties that are provided by collaboration. Perhaps you have new, or not so new, employees who are wasting time and preventing collaboration because they cannot efficiently locate the files they need for a project. Perhaps your staff has no problem finding files, but they always seem to be tied up, being used by others, and preventing access for editing. Or maybe your staff doesn't have any file-related issues. Maybe they have issues related to knowing what to do once they have the files. Or maybe your staff is just having plain old-fashioned communication issues that are causing needless rework. It can all be very daunting, but obstacles are meant to be overcome.

Luckily for you, overcoming any of these obstacles does not have to be impossible or even all that difficult! It just takes decisive direction and action. For each obstacle preventing your staff from collaborating to bring a project to delivery, there is a straightforward solution.

FILE STRUCTURES FOR COLLABORATORS

Collaborative difficulties in a project schedule are hard to accept, but difficulties due to employees being unable to locate the necessary files is especially heinous. The reason is that file structures are at the very basis of any organization with project teams working together. The file structure should make sense to anyone even remotely familiar with the firm's workings and it must be consistent from project to project. Once each staff member is confident that he has access to all the files necessary for any given project, the foundation of project collaboration will be laid.

Overhauling your file structure could seem insurmountable, but it does not have to be that way. It only takes three things.

Make today the day that you make a clean break with the way things have "always been done." Accept that every job, every project directory before today is just beyond saving and leave them all for dead. Of course, they won't actually be "dead"—they will just be cordoned off and only used to finish current projects and to archive old jobs. But, in the sense that they are no longer used for new work, they are dead as a doornail. And that is quite dead.

Begin your new life of collaboration with a simple but effective file structure. Begin with a place on your server that is specifically designated for project files. Subordinate to that you should have a separate directory for specific projects. Below that could be any number of directories categorizing digital files into such areas as contracts, correspondence, and incoming documents. Most important for us will be the directory holding CAD files. Your new file structure might look something like this:

- Projects
 - a. Job Number
 - i. Contracts
 - ii. Drawings
 - iii. Incoming
 - iv. Miscellaneous

Of course, you can be as elaborate or simple as you like. What is important is that you have the drive to A) be consistent with the setup of your template in every project going forward; and B) be driven enough to not slip into old, bad habits.

COLLABORATION AND THE ROLE OF XREFS

Working "together" to produce large plan sets means working "at the same time" to get the job done. In this day of modern CAD practices, it is almost universally accepted that the use of external references (xrefs) are a tremendous help in accelerating the efficiency of a group of CAD professionals. Xrefs reduce rework and propagate changes to base files throughout the project, replacing the need for the edits repeated in each and every file.

So how can something so great be a roadblock to collaboration?

While xrefs are, in fact, pretty great, using them improperly can cause big problems. Groups of workers can find themselves in situations with circular reference errors and files that are tied-up with drawing locks when others need to work on them. In general, improper and willy-nilly use of xrefs is a hindrance to collaboration rather than a facilitator.

The solution to these pesky issues is as simple as it is devious. Attach external references in "overlay" mode, rather than "attachment" mode. On the surface there may not seem to be any difference. The benefit emerges when drawings with external references are, themselves, referenced into other drawings. This is the beginning of a situation known as "nested xrefs" which are at the root of such issues as circular references and increased possibilities for drawing corruption and reduced performance. And, as we all know, smooth collaboration requires drawings be corruption-free and performing well.

COLLABORATION DOCUMENTATION

Perhaps you've been working with AutoCAD® for years and did not know there was more than one way to set up an external reference. At this point one should consider how you could have gone so long without knowing this or other important information. It isn't as if anyone sets out to keep useful information from their coworkers. It just ... happens.

The reason that good information doesn't get around to everyone is because we are too busy being busy. We're too busy with phone calls and emails to write down good ideas. We're too busy with meetings to share discoveries. Most importantly, we're too busy racing against deadlines to properly document the best practices of the firms we work for. If we could just stop being so busy, we could make the preparations to be able to do even more work!

Best practice documentation does more than waste hours of people tapping away at keyboards, writing page after page to fill big shelves of binders. Best practice documentation is a key ingredient of smooth collaboration for your CAD staff!

AutoCAD 2015

Documenting your firm's best practices accomplishes several vital goals. First, and probably most obvious, it documents the best practices that your firm has developed over the years. These are the practices that have, over time, proven to be the most efficient and approved methods by which you and your staff should be producing your work. Second, and just as important, documenting these best practices ensures that everyone is on the same page, doing the same thing, at the same time. This coordination is a prime ingredient of effective collaboration.

COLLABORATION COORDINATION

As we've seen, there are plenty of building blocks that can come together for there to be effective collaboration in your drafting room. We've already discussed standardizing file structures, external references, and best practice documentation. One obvious ingredient needed for collaboration is clear communication. And if there is one area of communication that could use improvement in just about any office it is centered on design markups.

How many times have we seen markups cross our desks that are more like riddles than design commentary? Is there even a way to add up the hours that have been lost trying to find black markup lines on a print? Or how many miles you've walked up and down the hall to ask your engineer "what does that say?" Or even something as simple as misinterpreting a note that says "remove" to mean "delete this" when the architect wanted a text note that says "remove"?

What is needed is a uniform system for communicating markups. A system that is easy to remember and recognize will clear the lines of communication and accelerate collaboration between your CAD and design staff. The perfect solution for easy markup collaboration is the Four Color Markup scheme, which provides a separate color for each type of markup that can be made on a design sheet.

- Red: Linework or text that should be added to the drawing
- Green: Linework or text that should be removed from the drawing
- Blue: Questions or comments to the drafter
- Yellow: Markups that have been checked or completed

To further customize the scheme and integrate accountability for edits performed, add a fifth color that is different for each drafter in a work group. This simple change makes it possible to easily identify who made the changes listed on the marked up sheet.

This system of multiple colors clarifies the intent of every mark placed on a reviewed sheet. All of this may seem excessive, but the advantages that are possible far outweigh any inconveniences during the initial implementation. Seriously, this is collaboration gold!

CROSS-POLLINATION COLLABORATION

Collaboration is a pretty fantastic thing, all on its own. What is even more fantastic is that in addition to the benefits of efficiency that you get from collaborating with coworkers, there is the added benefit of naturally occurring cross-training.

It should be plainly obvious to just about anyone considering the matter that each individual member of your team increases his skill set. Creating an environment that fosters collaboration is creating an environment where your staff will have greater exposure to new challenges. Working together and sharing the challenges of large projects provides the opportunities for your staff to pick up new skills and learn entirely new toolsets.

If you find that your collaboration efforts are yielding appreciable levels of cross-training on their own, there is always the option to jump start the effect. All it takes is a small effort to either pair employees with certain disparate skill sets together or intentionally assign employees with nascent skills to tasks that will deliberately stretch their current abilities. Before you know it, your CAD staff will have multiplied their effectiveness by several orders of magnitude.

CONCLUSION

There you have it. Just a handful of ideas you can pick and choose from to goose the collaboration efforts in your firm. Perhaps your CAD staff is already working together in a pretty fair manner. If so, take these as suggestions and ideas, any one of which could accelerate your current efforts. Perhaps your CAD staff is at an impasse, desperately in need of help to get the collaboration wheel turning at all. If so, then take as many of these ideas as you can grapple in the beginning and add others as you progress.

By no means are the ideas listed above the be all and end all of collaborative effort sustainers. The ways in which you and your CAD staff can come together to collaborate are as endless as the things you can accomplish once you begin collaborating. Along those lines, collaboration is not a black and white issue. There are many shades of grey in the world of collaboration and some shades may be better suited to your particular office than others.

What is paramount is that you give your CAD staff the tools and create an environment that will encourage and support collaboration. In doing so you are not only helping your firm get the most out of the CAD staff, you are helping your CAD staff get the most out of their careers.



Based in Houston, Texas, Curt is a CAD Coordinator for a civil engineering firm and the owner and editor of the Kung Fu Drafter blog. He began using AutoCAD with Release 10 and has spent the past 20+ years working with various Autodesk products including AutoCAD, Civil 3D, Map 3D, and SketchBook Designer. Curt is also a freelance content creator, featured Autodesk University speaker, and training content developer. In his spare time Curt writes, games, and spends time with his dog and horses.

And Here's How to... Hyperlink Anything!

The Hyperlink feature is one of the most underutilized, but certainly one of the most powerful. (introduced in AutoCAD 2000i!) Wouldn't it be cool to launch one drawing from within another one? Or how about linking a part to a website containing product specs?

SETUP

Let's take four possible link options: Link to a URL on the Internet, link to an .XLS (or .CSV), link to another .DWG, or maybe link to an MS Word .DOC.

You could create a simple library of 'bullets' to represent each type of link (shown in the illustration). Whenever you need to hyperlink an area or an object to that file type or location, add that bullet to your drawing, then use the Hyperlink command and make the link!

Memo: The shapes shown in the illustration were created with the (antiquated) Solid command. The illustration indicates the results based on the sequence used to place the points.

In this exercise, I'm attaching a hyperlink that will go to the AUGI Forums site, but you can link to some other site if you want.

How to Assign a Hyperlink to an Object

1. Copy your URL of choice, such as <http://www.augi.com/forum/>.
2. On the Insert tab > Data panel, click Hyperlink.
3. Select the object(s) to receive the hyperlink, then press [Enter] to open the Insert Hyperlink dialog box shown here.

Memo: If you don't see the information shown in this figure,

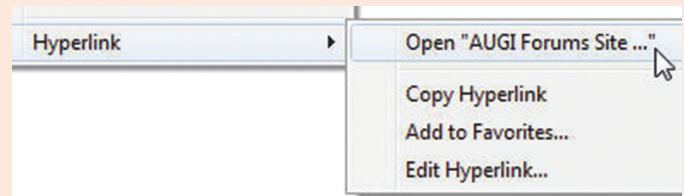
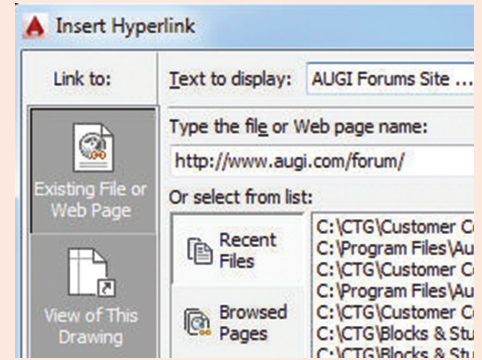
click the button for Existing File or Web Page.

4. Now Paste the copied into the box for 'Type the File or Web Page'.

5. Change the 'Text to display' to something more concise.

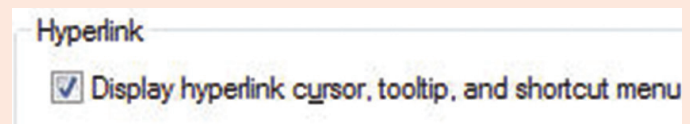
6. Click OK, then hover over the object to see the hyperlink tooltip.

7. You have two options when you want to open the hyperlink:

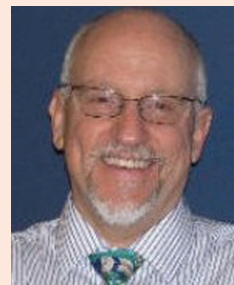


A. Per the tooltip, CTRL + click to follow the link.

B. Select the hyperlinked object, then right-click, then click Hyperlink > Open (shown here).



Memo: If you don't see the tooltip, go to Options on the User Preferences tab and confirm the box is checked for 'Display Hyperlink.'



Michael E. Beall (B. Arch.) won the AU 2013 Speaker Award for Hands-on Labs and will be presenting the updated version of that Lab at AU2014! An Autodesk Authorized Author, he is the owner of CAD Trainer Guy, LLC in Shelbyville, KY and has been presenting onsite CAD training around the planet since 1982. Contact him anytime at michael.beall@cadtrainerguy.com, on LinkedIn at <http://www.linkedin.com/in/cadtrainerguy/> or give him a call at 502.500.2267.

Myth Buster: Revit & IFC, Part 4 A New Hope

After the first three IFC articles were published in *AUGIWorld* in 2012 and 2013, I decided it was time to move on. Not so much with IFC, but I had the feeling everything that could be said at that point had been said. Now, almost a year later, a lot of my reservations with the IFC implementation in Autodesk® Revit® have been dealt with, or are definitely going in the right direction.

There is A New Hope.

RESERVATIONS? WHAT RESERVATIONS?

Wasn't I the one going on and on about how awesome IFC is? I taught about it at RTC Europe, North America, and Autodesk University. Ranting online, tweeting, blogging... What reservations are we talking about?

Well, the people at Autodesk sure know what I'm talking about. I've given them hell about the limited implementation in Revit,

on Export but mostly on Import. My main point: If I want a 100 percent right, absolutely perfect geometric export, I'll use .SAT, .DWG, or whatever perfectly developed 3D geometry format there is. But IMHO the main reason for being anything worth the trouble one has to go through to use IFC is that IFC can transfer information—non-geometric information that is. This is something no other file format can do. That's why I use IFC. So who cares that it cannot do free-form designs really well? I'll export the model twice: one full-blown geometric detailed shape through 3D DWG for geometric clash detection and once in simplified geometric shape to transfer the Information.

However, sadly enough, the Autodesk developing team told me that geometry was their primary focus for the time being. And since I did not have the time or resources to take on the challenge of coding my own IFC exporter/importer, I put the whole IFC thing on a side-track for a while. Of course, I kept on moaning and nagging about it, but I really did not think the status quo was going to change for at least a few years.

SO WHAT CHANGED?

I don't really know what changed, but suddenly there's a huge turnaround in the direction Autodesk development is taking IFC. Of course, geometry is still important. But lately the most important steps have been taken towards information exchange.

Naturally, I am assuming that they finally started to listen to me, since this kind of boosts my ego. But I don't know really. However, I won't be complaining about it either.

NO SERIOUSLY: WHAT CHANGED?

In order of "this is a huge freaking deal." Here's my top 5:

1. Custom Property Sets
2. Open Source Importer
3. Support of IFC Types on import
4. Export Linked Files
5. IFC Links

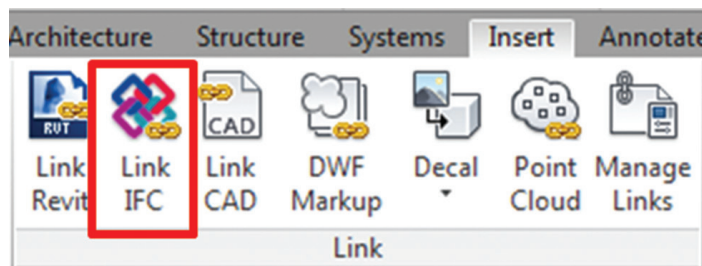
And then there's a whole bunch of other improvements that I won't be talking about here due to lack of time, space, or just because I'm still working on getting my head wrapped around them myself.

So maybe there will be a part 5 and 6 due before the next "Star Wars" movie comes out. Just for the fun of it, we're going through this like a pop chart, starting with the least impressive one.

#5: IFC LINKING

From Revit 2015 onward, it is possible to choose between linking and importing an IFC. What's the difference? Well, in the "old" days, opening an IFC in Revit meant importing it. And that meant clicking R > IFC > Import and then go on holiday, take an online origami course (I learned to do all Autodesk logos in the time it took to import a single IFC), or switch to your second worksystem and go do something useful.

And then the week after, when you received a new file, you had to start over again. I know people who literally spent 30 percent of their weekly time importing IFCs.



With Linking, you don't have to go through that anymore. Just as you can link in DWGs or other Revit files, you can also link in IFCs, with the same benefits:

- It's about 80 percent faster
- It saves a lot of time navigating through the model
- They even made it so that all properties of the IFC components are at least there as text parameters

Just to be clear: That is impressive! A HUGE deal!

So why is it in 5th place then? Well, basically it's only there for its potential. A sort of incentive award. The components are not Room Bounding, which of course renders it pretty much useless at this point.

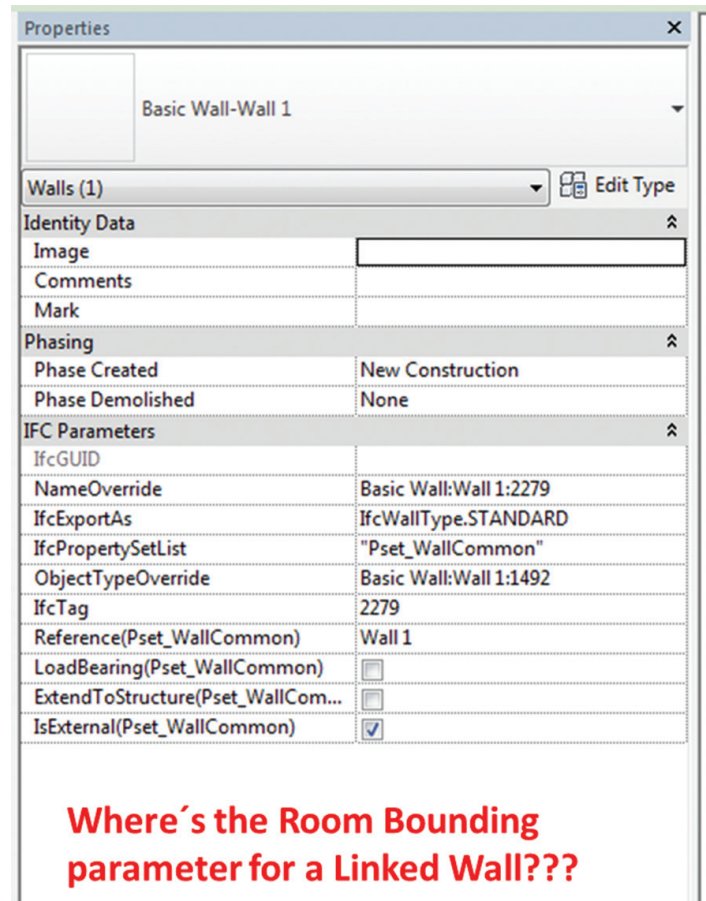


Figure 1: ARGGGHHHH!

I have been told that this limitation is due to lack of time and will be fixed, but seriously Autodesk, stop publishing software that is not done yet.

On the bright side: at least we're getting some parameter information from the IFC Link, even though it's all text.

COMMERCIAL BREAK, BROUGHT TO YOU BY THE AUTODESK OS EXPORTER TEAM

From this point forward these are all features brought to you by the Open Source IFC Exporter. If you don't have it, and you're still dabbling with the ootb (out of the box) exporter, shame on you! Google "IFC Revit Sourceforge," go to the website, then download and install the OS Exporter. Your life will be so much better. If for nothing else, I am writing this article on the weekend and they still respond to my questions within a matter of hours. Try that with your regular Autodesk support!

Revit Architecture 2015

4: EXPORTING LINKED FILES

Anyone working with IFC in projects containing linked files knows this: they won't export. You need to open each and every linked file and export them manually. This isn't that big of a deal when working with two linked files. However, with 20 of them, it becomes annoying. Having 20 of the same linked files copied around the project, you're in some serious trouble because the linked file, when opened and exported separately, will revert back to its original location.

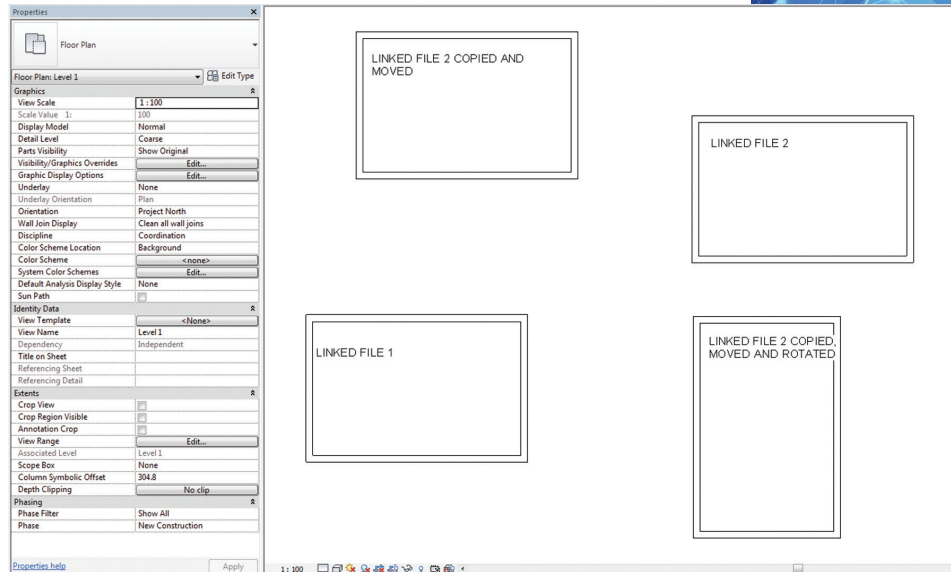


Figure 3: Sample project with linked files

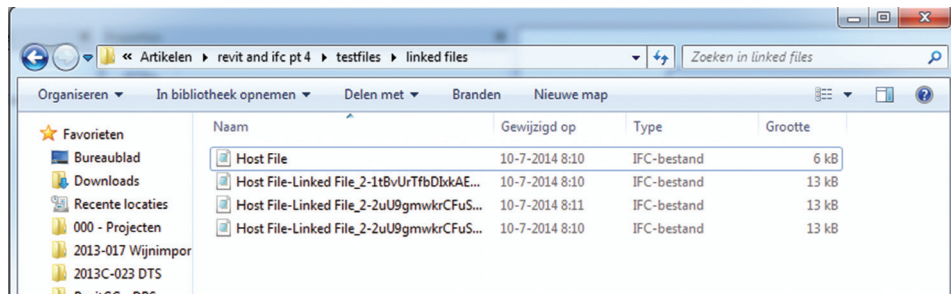


Figure 4: That merge together on their Host (!) location

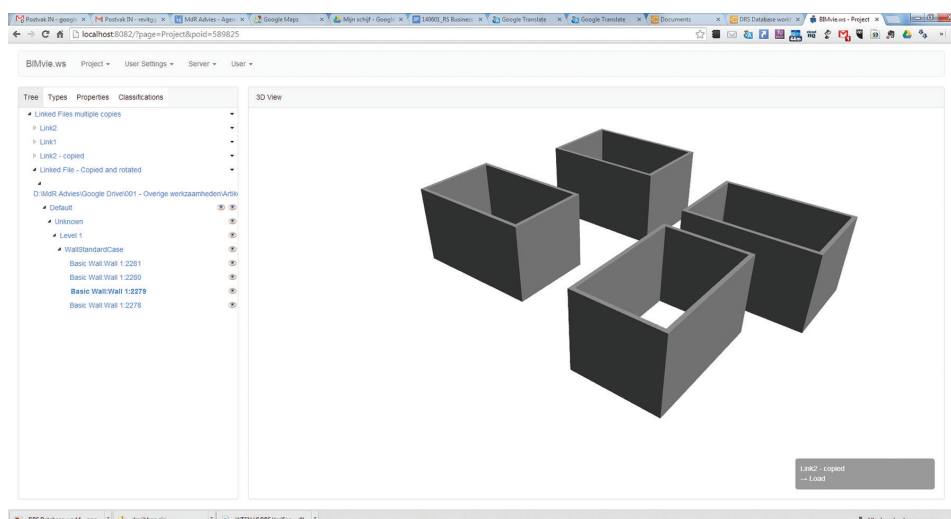


Figure 5: Returns an separate IFC for the Linked Files

As of now, the OS Exporter supports exporting links to separate IFCs that you can merge together later. Not only that, it will export the links based on their placement in the Host file.

COMMERCIAL BREAK, BROUGHT TO YOU BY OPEN SOURCE BIM SERVER BY TNO

Pop quiz:

Is anyone able to name a single software product that can merge multiple IFCs into a single aggregate IFC model?

And no, the answer is NOT ArchiCAD BIM Server, nor any other commercially available tool.

3: IFC TYPES ON IMPORT

Improving (but not completely solving) one of the more annoying issues with importing IFC files—the ability to map Types. Two examples that stand out:

From the beginning of time, the ooth import mapping for IfcColumns (both architectural and structural) was Columns (Architectural) in Revit. This is, in my humble opinion, flat-out wrong. The importer can now distinguish between LoadBearing and non-LoadBearing types and send them to subsequently structural and architectural columns.

Another great improvement is the ability to export different IfcCoveringTypes for ceiling, flooring, and walls into different Revit categories instead of having to put them all in the same category.

Default Template for IFC Import: Browse...

Import IFC Class Mapping:

IFC Class Name	Category	Subcategory
IfcActuatorType	Generic Models	
IfcAirTerminalBoxType	Generic Models	
IfcAirTerminalType	Generic Models	
IfcAirToAirHeatRecoveryType	Generic Models	
IfcAlarmType	Generic Models	
IfcAnnotation	Generic Annotations	
IfcBeam	Horizontal Bracing	
IfcBoilerType	Generic Models	
IfcBuildingElementPart	Generic Models	
IfcBuildingElementProxy	Generic Models	
IfcCableCarrierFittingType	Generic Models	
IfcCableCarrierSegmentType	Generic Models	
IfcCableSegmentType	Generic Models	
IfcChillerType	Generic Models	
IfcCoilType	Generic Models	
IfcColumn	Columns	
IfcCompressorType	Generic Models	
IfcCondenserType	Generic Models	
IfcControllerType	Generic Models	
IfcCooledBeamType	Generic Models	
IfcCoolingTowerType	Generic Models	

Eeehm, NO!

Figure 6: R2014 import mapping table

Default Template for IFC Import:

Import IFC Class Mapping: C:\ProgramData\Autodesk\RVT 2015\importIFCClassMapping.txt

IFC Class Name	IFC Type	Revit Category	Revit Sub-Category
IfcAirTerminal		Air Terminals	
IfcAirTerminalType		Air Terminals	
IfcAnnotation		Generic Annotations	
IfcBeam		Structural Framing	
IfcBeamType		Structural Framing	
IfcBoiler		Mechanical Equipment	
IfcBoilerType		Mechanical Equipment	
IfcBuildingElementPart		Parts	
IfcBuildingElementPartType		Parts	
IfcBuildingElementProxy		Generic Models	
IfcBuildingElementProxyType		Generic Models	
IfcCableCarrierFitting		Cable Tray Fittings	
IfcCableCarrierFittingType		Cable Tray Fittings	
IfcCableCarrierSegment		Cable Trays	
IfcCableCarrierSegmentType		Cable Trays	
IfcColumn		Columns	
IfcColumn	[LoadBearing]	Structural Columns	
IfcColumn	COLUMN	Columns	
IfcColumn	NOTDEFINED	Columns	
IfcColumn	USERDEFINED	Columns	
IfcColumnType		Columns	

That's better!

Figure 7: R2015—new and improved

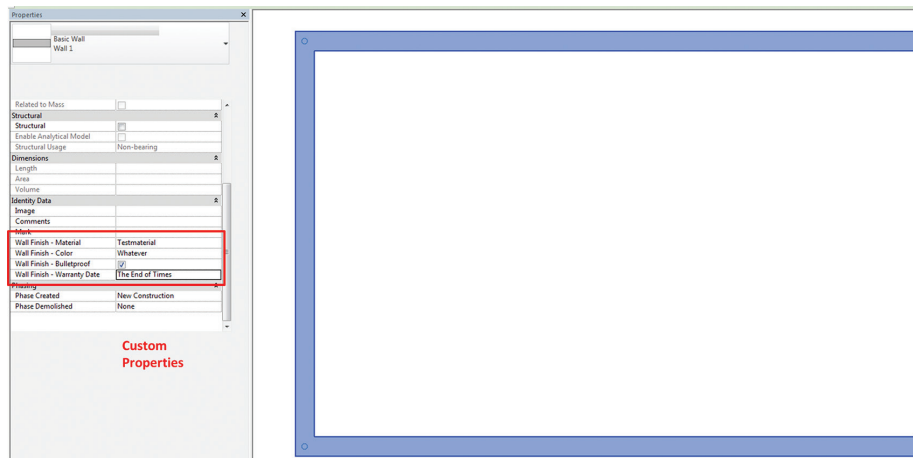


Figure 8: Random set of custom properties

2: OPEN SOURCE IMPORTER

Autodesk, a marketing machine? Well, definitely not the part responsible for marketing their IFC-based ventures. The biggest thing since the Open Source Exporter, the Open Source Importer, was released a few months ago and nobody noticed. It is now possible to actually do something about that import tool yourself. And Autodesk forgot to mention it.

For those of you who feel that Autodesk should support this out of the box, look at your Ribbon. Is there any extra tab there? And does the add-in tab have any of those extra thingies you can click on and do stuff?

If these questions are answered with a firm and solid “No,” well then, you’re missing out. A vast supply of add-ons is available to make your Revit-life a lot easier.

If you answered “Yes” to one of the questions, then stop whining about developing an improved IFC handling tool. You did the same (or at least someone did and you’re using it), and find that perfectly acceptable.

So go out and find someone to add your desired functionality to the OS Ex-/Importer. The beauty is you can then send it to Autodesk, and they will integrate, update, support, and expand on it.

1: CUSTOM PROPERTY SETS

This article would become too short if I put this in places 1, 2, and 3. But it should be there. The Open Source Exporter has finally matured. You can now create your own custom property sets and have complete and utter control over which data you want to export.

Let’s look at our sample family again. Figure 8 shows that I added four custom parameters to the walls in the project. I want to export them all into IFC, except the one stating that these walls are bullet-proof. (That, I don’t want the interior decorator to know about).

Previously, that could not be done. You’d either export everything (export Internal Revit PropertySets) or close to nothing (export IFC PropertySets).

Revit Architecture 2015

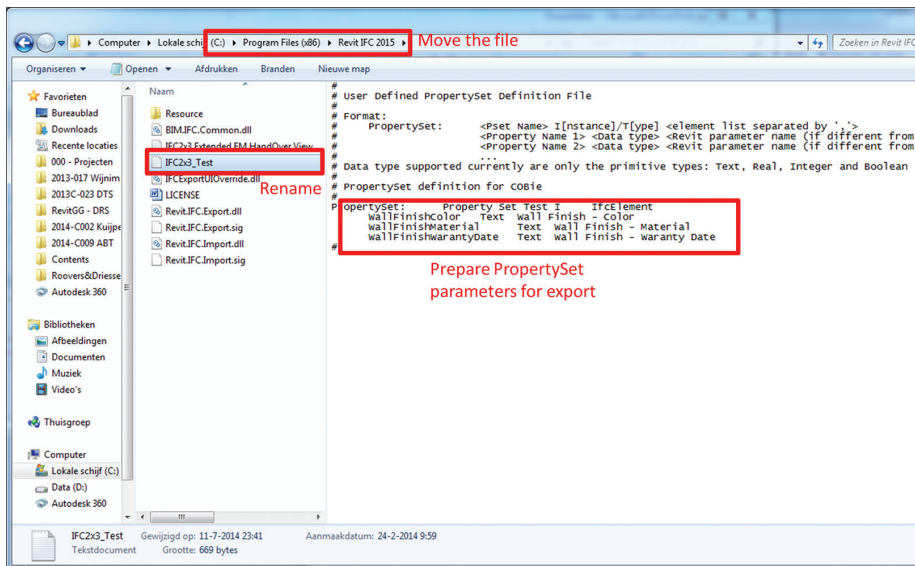


Figure 9: Setup custom Property Sets pt 1

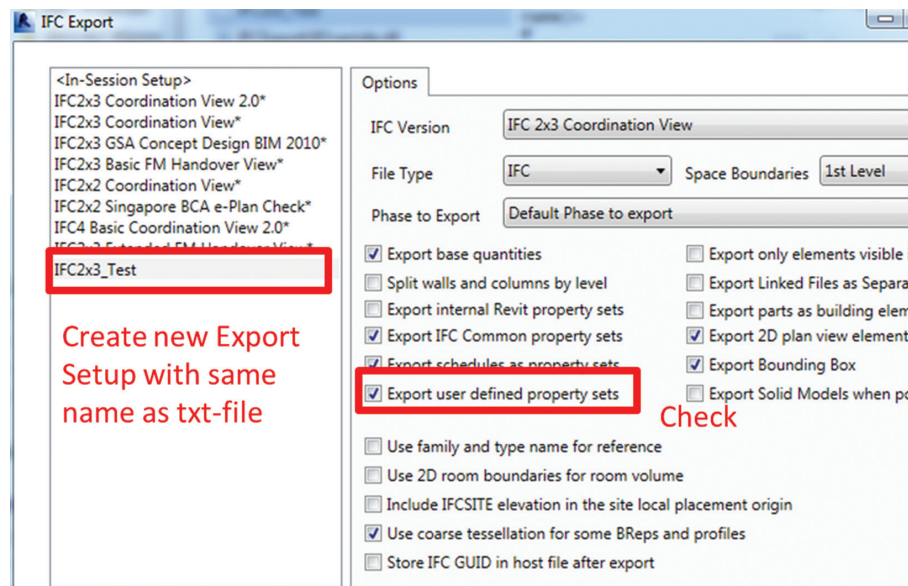


Figure 10: Create new Exporter Setup

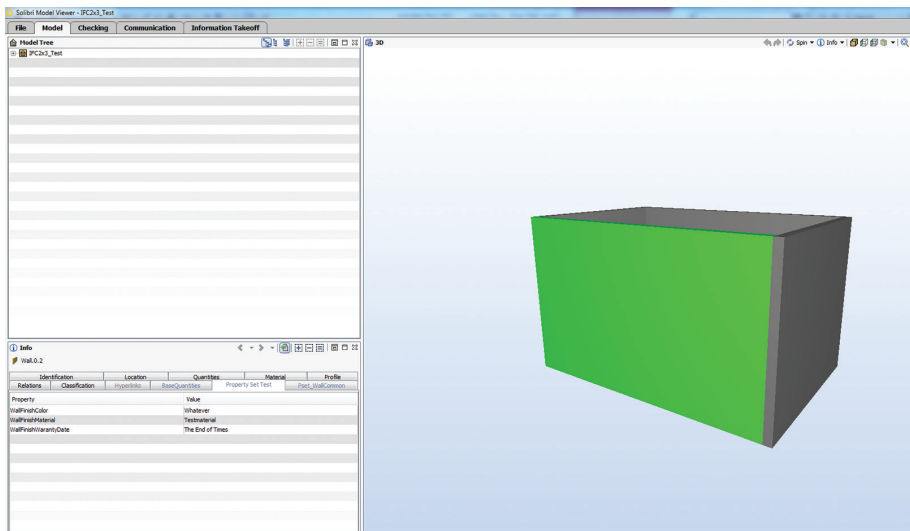


Figure 11: Custom Property Set in IFC with specified parameters

If you installed the latest OS Exporter, you should also download these files: AdditionalExtendedFMHandover-ViewFiles.zip. You can find them here: <http://goo.gl/ZqjJsV>

Once exported, extract and move the file "IFC2x3 Extended FM HandOver View.txt" to your IFC Exporter program directory. For Revit 2015 the path is C:\Program Files (x86)\Revit IFC 2015.

Rename the file to whatever suits you.

Now go back to Revit. Hit R > Export and go to the Modify Setup screen. In here, create a new export setup.

After setting this up, export the IFC with your custom PropertySet attached to it.

CONCLUSION

Like I said, a lot has changed—and and for the better. We have gotten more control over our models and the IFC exports we create from them. I, for one, am looking forward to the new features in upcoming releases.



Martijn de Riet is a self-employed BIM Consultant from the Netherlands, working with Revit since version 5.1. Martijn has a bachelor degree in Building Science. After his

studies, he started his own engineering firm working for contractors, architects and private clients. Starting in 2007 his company transformed into a full-time BIM consultancy service. At the moment Martijn's clients vary from mid-sized architectural firms to the largest dutch General Contractor and MEP Engineering firms, with a focus on specific corporate solutions, design and implementations of Revit and BIM workflows. Martijn is a member of the Dutch Revit User Group and currently working on creating a Master Template and Component Library. He provides lectures for companies, technical universities, seminars, etc. on a regular basis.

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- * MegaCAD
- * MicroStation
- * PowerCAD
- * Revit
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- * Spirit
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- * VersaCAD
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Dynamo

<http://dynamobim.org/>

Dynamo is a free download offering open source graphical programming for designing with Autodesk® Revit®.

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If you have some news to share with us for future issues, please let us know. Likewise, if you are a user of a featured product or news item and would like to write a review, we want to know. Brian.andresen@augi.com

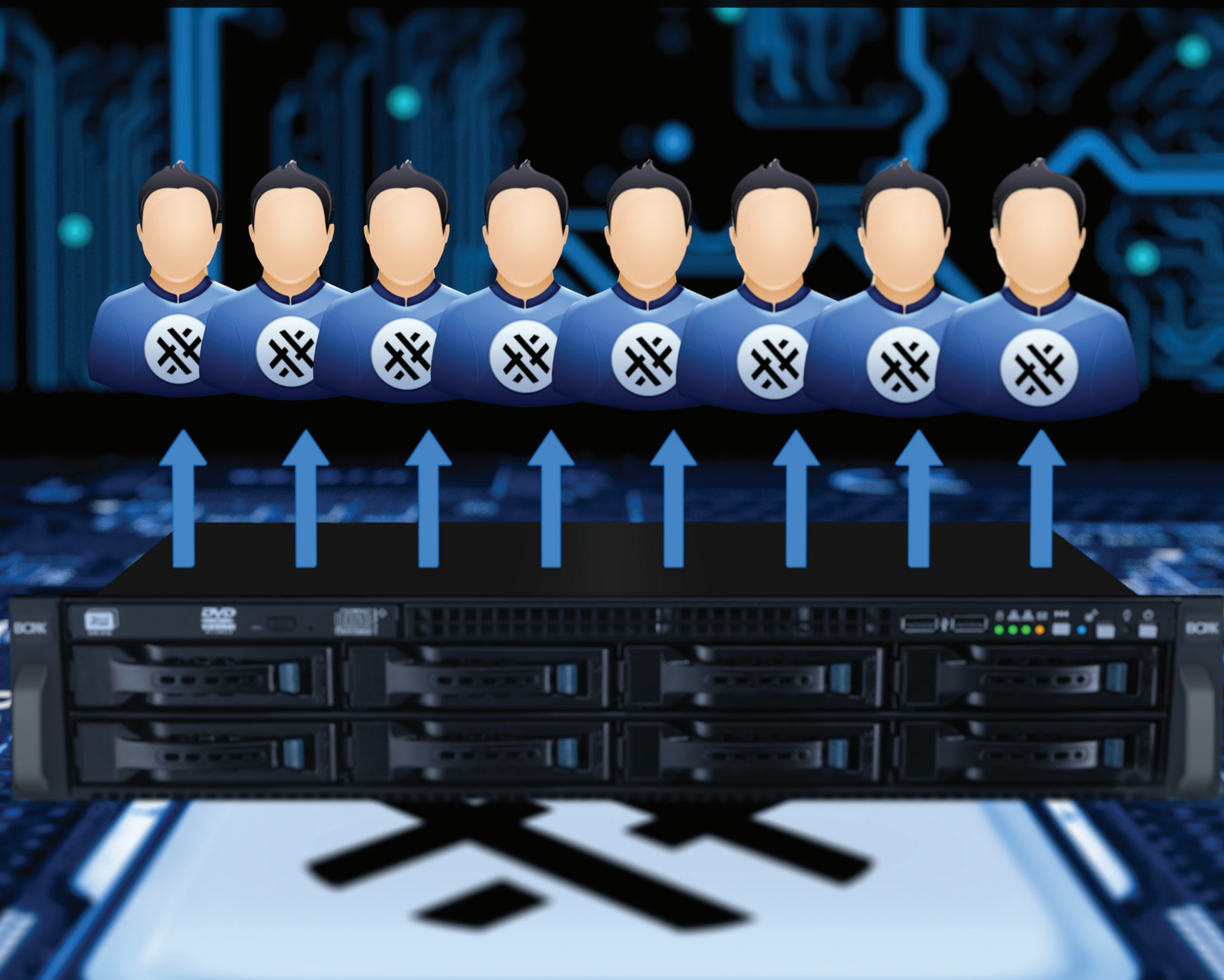
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