

Using CAD Data in ArcGIS

Phil Sanchez and Jeff Reinhart discuss how your organization can leverage CAD data using Esri's data integration tools.

<http://video.esri.com/watch/666/using-cad-data-in-arcgis>

Video Transcription

00:01 My name is Phil Sanchez and I'm joined by my colleague Jeff Reinhart.

00:03 We're both members of Esri software development team based in Redlands and we work on the CAD GIS integration team.

00:08 So today we're here to talk about CAD GIS integration. So, first just start off, go over our agenda for today.

00:16 I'm going to talk about the overview of ArcGIS CAD support. Talk about how you can use CAD datasets in ArcMap.

00:23 And then we're going to shift over to loading CAD features into the geodatabase. So Jeff's going to do a...

00:27 ...demonstration showing how to do that using some geoprocessing tools.

00:32 We'll talk about how to export GIS features to drawings.

00:35 And then the last section we'll talk about actually using GIS data in CAD.

00:41 Quick show of hands. How many of you are familiar with the ArcGIS for AutoCAD product?

00:45 A few of you. Okay, so we're going to cover that as well, along with ArcGIS Desktop.

00:50 Alright, just a quick overview of the remaining sessions for this week for those of you that are interested in CAD GIS...

00:56 ...workflows. We're doing a new format, 20-minute technical sessions tomorrow in room 24A.

01:03 So for those of you that...If any of these topics seem like good information for you to check out, please join us tomorrow.

01:12 First thing we start in the morning with a demo theater and then pretty much the whole day we're going to be in room 24A.

01:17 So this is a new format. They're really focused on a particular workflow. We're going to do demonstrations.

01:22 Probably get in a little bit more detail than what we show here on a particular item, so again, feel free to join us tomorrow.

01:30 Alright, so reason why we're here. We're here to talk about CAD drawings and CAD data.

01:35 So most of you already know what CAD drawings are. For those of you that are new to CAD drawings, essentially...

01:40 ...they're file-based methods for storing spatial information that contains geometry, text, and symbology.

01:51 So a CAD drawing, a lot of information is represented as symbology and so another aspect of CAD...

01:58 ...drawings, they're organized into drawing layers and levels.

02:00 So a well organized drawing's going to have a lot of different levels.

02:04 Maybe some of you have some drawings that everything's on layer zero. Well, if that's the case, we can maybe still...

02:09 ...try to help you out today, but you really do want those CAD drawings to be on well-organized layers.

02:16 Another thing too along with just CAD properties are inherent with the drawings, you CAD users can attach...

02:22 ...additional information. So that makes the CAD drawing more effective use in ArcGIS.

02:29 So how do we use it in ArcGIS? In the geospatial context, CAD drawings are a large source of GIS data.

02:37 Maybe the largest source of GIS data. In fact a lot of demos that you see with geodatabase feature layers...

02:43 ...chances are the data probably came from CAD drawings. So what you professionals are out there doing...

02:49 ...or your colleagues and all these various industries - surveying, cadastre, infrastructure with civil engineering and...

02:56 ...the design professions provide a lot of content that's used in ArcGIS and GIS in general.

03:04 So, as a company, Esri has long provided support for CAD data. This goes back previous to ArcGIS with ArcView...

03:11 ...with ArcInfo Workstation. So for over the last two decades, we've supported CAD data at various levels.

03:19 So a couple of items here that I want to make sure to get the point across here is that this is out-of-the-box support, so you...

03:26 ...don't need to have an extension to work with CAD datasets in ArcGIS Desktop.

03:31 Another important thing is that conversion is not required, so you're able to just quickly start working with CAD data...

03:38 ...just by adding it to a map.

03:40 In terms of file format support, we currently support AutoCAD DWG format up to 2012 which is using the...

03:48 ...AutoCAD 2010 format and for MicroStation DGN files up to version V8.

03:53 So that's where we're currently at. Of course when AutoCAD and MicroStation come out with new formats, we'll...

03:57 ...update our code base and get those updates out there for you to work with these latest formats either through...

04:04 ...a major release or a service pack. So that's...it's a constant process for us and we're aware of those release cycles.

04:11 Also, too, one important note regarding geoprocessing tools, all the CAD-related geoprocessing tools...

04:17 ...are available at all license levels, so whether you have ArcView, ArcEditor, or ArcInfo licenses, you have access...

04:22 ...to all these tools that we're going to show today. Of course we're going to show different tools, geoprocessing...

04:26 ...tools that may require higher licenses, but in terms of CAD, that's what you get.

04:31 You get all access to all those tools.

04:34 Alright, so what we've seen over the years in terms of patterns of ArcGIS users that integrate CAD data...

04:42 ...we see that a lot of people just need to add CAD datasets to their map...

04:46 ...as a complement to their existing map layers or to use them as a reference.

04:51 So that's a very easy thing to do and I'm going to show you in a few moments here.

04:55 The next level is actually taking those CAD datasets and loading them into a geodatabase.

05:01 So that's a case where you may need to just take some as-built information, some updates that you get out in the field...

05:06 ...add them to the geodatabase to increase the information that's stored in there.

05:11 And the last part, it's a smaller percentage, but we recognize that it's still a key part here, is to deliver GIS data in...

05:16 ...a CAD format. So that's exporting geodatabase features to CAD.

05:21 On the flip side, a lot of CAD users may need to view GIS data in CAD, so we have some ways to do that...

05:28 ...to provide CAD users with some spatial information coming from ArcGIS as well as edit GIS

data in CAD.

05:34 And then lastly, provide drawings, so CAD users providing you guys drawings to use in ArcGIS.

05:40 So those are the scenarios that we've seen since we've been working with these tools.

05:45 And so today we want to talk about all these different types of workflows and hopefully that will help out, you know...

05:50 ...explain how our tools work in that context.

05:54 Alright, so let's go down a level. Let's talk about CAD datasets.

05:57 Some of you this may be review for you if you already work with CAD data in ArcGIS, but for every CAD drawing...

06:03 ...file that you have, it's going to be represented as a CAD dataset in ArcGIS. And that CAD dataset's going to have feature...

06:10 ...classes and they're going to be organized similar to how you would organize, or see organization of geodatabase...

06:15 ...features or shapefiles into feature classes based on geometry type.

06:21 In addition, all CAD drawings have properties, so you know they're always on a certain layer, they have a certain line...

06:26 ...style, et cetera, so that's information that you get in the feature class as well.

06:31 In addition, you can also access user-defined data, so that can also help with querying CAD features in ArcMap.

06:38 The bottom two pertain to location. Of course you know, we know that all CAD drawings are drawn in a real-world...

06:47 ...location and you never have to transform them, ever.

06:50 Okay, maybe not, so...but that's okay. You know, a lot of times local coordinate systems are used by AutoCAD...

06:57 ...users or MicroStation users to design objects, buildings, structures and what we do in ArcGIS is provide tools that...

07:05 ...allow you to reposition those datasets so they can align up with your map layers.

07:10 And that's important for, you know, spatial overlays, just for mapping.

07:14 Essentially you want your CAD data to be in the right location, things that you work with.

07:18 So you can define a coordinate system to your drawing, as well as you can define a world file.

07:24 A world file is going to control that georeferencing, that transformation.

07:29 One important note is that not all CAD drawings require that, so that's something to keep in mind.

07:35 Alright, this is a kind of zoomed-in view if you're looking at a CAD dataset in Catalog what you're going to see is several...

07:41 ...feature classes representing different types of geometry.

07:45 So all the different types of geometry that are in the drawings are going to be organized based on these feature classes.

07:51 So I'm sure a lot of you are familiar with this structure. Of course you could have a PRJ file that's a companion file...

07:57 ...that helps define that coordinate system, but let me go ahead instead of talking about this, I'm going to go ahead...

08:02 ...and switch to a demonstration and show you how easy it is to work with CAD data.

08:06 So let me go ahead and switch to ArcMap.

08:09 Alright, so this is ArcMap 10 Service Pack 2, so most of you probably are at this version here.

08:17 And if you're at 9.3.1, the same workflow applies, just with a few minor things we'll make a note of.

08:22 So this is the—actually the E-s-r-i campus, the Esri campus. These are some building footprints with the topographic...

08:29 ...basemap behind it. What you see here are some buildings with some interior spaces.

08:35 And what I want to do here is add an additional dataset. I just got some updated floor plan information...

08:41 ...I'm going to add to my map. So first thing I want to do here is search for my CAD data.

08:51 So I can go ahead and click on, or enter CAD and for those of you that haven't used search yet, let me go...

08:55 ...ahead and show you how to create an index.

08:58 So basically you open up at 10.0, this is a 10.0 functionality tool here that you can add folders to search.

09:06 So what I've done here, I have a few CAD drawings and there it's already indexed.

09:10 So just by simply typing CAD I can just find some data. As you can see here, I have Esri Building Features...

09:17 ...I have some different feature classes, but I want to be more specific.

09:21 I want to type DWG, that's a file extension that I want to work with, it's an AutoCAD file, so I get a few different...

09:27 ...types of content compared to that last search.

09:30 What I want to do here is drag Esri Building Features, I'm going to add it to my TOC.

09:37 Alright, well, it's supposed to be right here. Now of course, some of you may have experienced this at one time...

09:42 ...so let's take a look. Let's go ahead and let's zoom to the drawing.

09:47 So I'm...go ahead and expand that, zoom the layer, and of course, this is in a different location that's not...

09:53 ...in my particular building footprint. That's okay. What I'll do now is I'm going to go back to that building W area...

09:58 ...and the first thing I'm going to do is I'm going to add the Georeferencing toolbar. It's already added to this map.

10:04 This toolbar...at 9.2 we introduced the ability to georeference CAD datasets.

10:09 This was existing prior to 9.2 and it was designed for raster layers.

10:14 So at 9.2 we've added the ability to georeference CAD data with it.

10:19 For those of you that are familiar with the Spatial Adjustment tool in the Editor, it's really similar.

10:22 All the workflows are very close. So as you see here, my target layer is set to Esri Building Features.

10:31 You'll see every feature class. Now this georeference applies to the entire dataset, not just one feature class.

10:37 If you had multiple drawings, you'd want to make sure that you're choosing the right one.

10:41 That's always an important thing, especially when you're demoing this. So let me go ahead and first bring this...

10:46 ...drawing closer to my focus area so we have a nice command called Fit To Display.

10:51 I'm going to go ahead and click on that, and now I've actually moved that drawing from the Pacific Ocean...

10:56 ...into Redlands, California. So that's the first step here.

10:58 So I'm going to go ahead and scale this thing down, actually something that I can work with a little bit better.

11:03 So in terms of a best practice, what we're showing here is what we recommend as the best practice.

11:09 If your CAD dataset is pretty far away, let's say in you know, near zero-zero, the origin, but right here we're in...

11:16 ...state plane coordinates. The best thing to do is fit to display, scale it down and then lastly, to create an...

11:21 ...accurate transformation I would click on this Add Control Points tool.

11:27 I'll go ahead and snap to the corner and create my first control point and then do one more.

11:36 Okay, so now I have two points that define this transformation. That's all that you need to create for CAD transformations.

11:42 They're two-point similarity transformations, meaning that you can never skew it, rubbersheet it.

11:47 The aspect ratio is always going to be maintained.

11:49 So if we take a quick look at the link table, you'll notice I have some deltas here.

11:54 This is my from coordinates, my to coordinates. I could edit these values right here in the link table.

11:59 I'm satisfied with this transformation, so the next step to do is click on Update Georeferencing.

12:05 So I'll click on that and you'll notice that I get a Save As dialog box.

12:09 What we're doing here is that we're enabling the ability to create a world file after your transformation has been committed.

12:16 So right here you'll notice, this is called, the file name is Esri Building Features.wld.

12:23 You'll notice that it matches the drawing name and it's in the CAD workspace.

12:27 That's the folder where the drawing resides.

12:31 So world files are only going to be recognized by ArcGIS when they have the same prefix name and they reside...

12:36 ...in the CAD workspace. So something important to remember there.

12:39 I'm going to go ahead and click on Save here. What that's going to do it's going to commit my transformation...

12:43 ...and now I'm set.

12:45 So next thing I want to do here, let me go ahead and go back to the slides.

12:57 So I talked about search and add. Did my demo a little bit out of order there, but that's okay.

13:01 Let's just take a look at a few other things that's part of the workflow.

13:04 So now that I've georeferenced the data, what I can do now is filter my CAD features.

13:08 So this means that I want to isolate the data I want to work with because there are times when you may not need to...

13:13 ...work with the entire drawing. There could be a lot of content in that drawing.

13:17 You really only need to work with maybe a subset of it.

13:19 So the easiest way to filter your data is just to work with a particular feature class.

13:24 So you can just choose a feature class that you want to work with and you don't have to add all the additional five feature classes.

13:32 You can use drawing layer visibility to control the display and definition query.

13:37 So, many of you are probably familiar with some of these topics here.

13:41 In terms of display control we have a layer properties interface that allows you to control layers just like you would in...

13:48 ...AutoCAD or MicroStation. What ArcGIS does is recognizes the settings that are saved in the drawing.

13:54 So if you have layers that are turned on in CAD, they're going to be turned on in ArcGIS.

13:59 If they're turned off, you know, they're going to be turned off. But you can control that.

14:02 You can disable all of them and just pick a few. You can actually restore the original appearance.

14:07 So let's say you've made a lot of changes to your dataset in terms of the layer display, you can restore back.

14:12 And then you can also apply it to the dataset, so you don't have to do it per feature class.

14:15 You can make a change here and click on that Apply To Dataset button and then all the drawing layer visibility changes...

14:21 ...are applied to the entire dataset. Really helpful. Probably saves you like about 10 to 15 clicks.

14:27 Okay, so the next thing to do is to query features and this is what we're talking about in terms of definition queries.

14:33 The Query Builder tool is really useful for CAD data because you can leverage the properties that are in the drawing.

14:39 So in this case here, I'm showing that, an example of selecting features that are going to be on layer building with color five...

14:46 ...and line type continuous. So a lot of you are familiar with those types of properties and you can leverage that...

14:51 ...in ArcMap to create a query.

14:53 This query can be saved in the map document.

14:56 You can save it to a layer file, an LYR file, you can even save it to an expression file.

15:00 So if you have a lot of CAD drawings that follow the same standard, these can be applied to multiple CAD datasets.

15:06 So that's kind of a nice thing assuming that you have CAD drawings that have all the same CAD standard.

15:14 Alright, so the next thing here is just to talk about, or cover the properties that you get just by default.

15:19 Again, so you're going to hear me say, you know, color, level, line type.

15:23 Again, those are feature attributes that are represented in the feature classes.

15:29 You can even access the tags and attributes of those features, and again, they support display...

15:35 ...in addition to geoprocessing input and conversion.

15:39 Alright, so this is diving a little bit more deeper into features, feature attributes.

15:44 We support DGN tags and DWG block attributes.

15:47 So for those of you that have datasets, CAD datasets, that contain tags or contain block attributes, that's a nice...

15:55 ...thing to have because you can query on those just like you would with any other feature attribute.

15:59 So for every tag, or every block attribute, you're going to see a field in the table, and then their attribute...

16:06 ...values will be field values.

16:08 Again, really useful if you have them. Definitely leverage them where possible.

16:14 And, of course, CAD feature rendering is a process of symbolizing the CAD data when you add it to ArcMap.

16:21 What we do here, is we take those properties, again same properties we're talking about earlier, color and line type...

16:27 ...and line weight, and we have a CAD style that we map those to.

16:30 So when you add those CAD drawings to ArcMap, you get a very close representation of what you see in CAD.

16:37 It's not 100 percent, but it's pretty close. And of course, you always have the ability to change that symbology.

16:42 In terms of text styles, they're mapped to TrueType fonts.

16:45 So for those of you that have the same TrueType fonts in the system, you're going to see them just like you...

16:51 ...would in AutoCAD or MicroStation. Any other CAD-specific text style is going to be represented as Arial.

16:58 You can go ahead and change that to suit your mapping needs.

17:05 Alright, let's go back to the demo. There we go. So back in ArcMap here. So I've georeferenced my CAD dataset.

17:13 It's in the right location. So now what I really want to work with are the interior spaces. So let's just zoom in a little bit.

17:19 You can see here we have some office spaces. We have some columns, some doors, some blocks.

17:23 So first thing I can just turn off, you know, point features, so I remove those from the drawing.

17:29 I can turn off my polygon feature class; my multipatch feature class, so now we just have polylines.

17:35 I can open that up here, right-click, go to Properties, as I talked about earlier. I can disable all the drawing layers really easily.

17:42 In this case I want to work with walls. So I'll pick a wall and a wall move and then I'll go ahead and apply that.

17:50 And what I could do also is change the symbology.

17:53 So I can go to the layer properties Category section here and you see there's a CAD unique entity values.

18:00 These are all the rendering that's happening.

18:03 Basically anything that's going to have a unique rendering between the line type, the color and the line weight...

18:08 ...you're going to see as an additional item.

18:10 Of course, you can use your own unique values based on another field in the CAD feature class, or just do a single symbol.

18:16 I can just simply go pick a different line type, maybe center, you know, change that color, line weight.

18:22 So most of you are familiar with these particular processes.

18:25 So, of course that's not really how you want to see floor plans, but just give you an example of, you know...

18:30 ...you don't really want dashes in your wall, but that's okay.

18:33 Phil, can you turn off the labeling if you want to?

18:35 Yeah, the annotation? I actually kept that annotation on, but sure, you can turn off the annotation.

18:40 You can label features too.

18:42 So I can go back...Let's just say if I went back, I wasn't happy with that, just to show you what, in terms of restoring...

18:47 ...original here, I mean restore original, and you'll see we're back to the original appearance.

18:51 So you can change that all you want.

18:53 Again, you go back to the Layer Properties Symbology tab and change, you know, revert back to the original.

19:00 And the question was, "Can you turn off labeling?"

19:02 And those pieces of text that you saw were actually annotation features, but we can label CAD features as well...

19:09 ...just the way we would label a geodatabase feature layer.

19:13 In fact, that's how you can leverage information maybe coming from block attributes, or tags. So that's pretty useful.

19:19 Okay, I think I've showed my part. I think it's going to you. So let me just go back and summarize a little bit.

19:28 So again, the message here is how you can, you know, you search for your CAD data, again at 10.0 we have the search...

19:34 ...capabilities, pretty useful. You add the data. You simply add it to the map. You don't convert it.

19:39 You may need to convert it later, but you don't have to convert it just to start working with it.

19:43 Georeferencing may or may not be required. When your drawing ends up in the Pacific Ocean, you need to georeference it.

19:50 And then you can filter that to really isolate what you want to work with.

19:53 Last part is rendering.

19:55 And then the final step, which I'm not going to talk about, because Jeff's much better at talking about loading CAD...

20:00 ...data to the geodatabase, but that may be a requirement that's part of your workflow.

20:04 So let me go ahead and...

20:07 Switch it.

20:08 ...cover a few additional slides.

20:12 Ooh. A start and a stop.

20:15 Alright, so loading CAD data into the geodatabase. You can see here we talked about how you

would have, let's say some...

20:21 ...updates coming in from the field. Someone goes out, you know, surveys a site, gets some updated as-built information...

20:27 ...needs to add that to the geodatabase, that's when you want to load CAD data into your feature classes.

20:32 You may need to edit the data. So if it's a one-way street, meaning that someone delivered some CAD data to you...

20:37 ...maybe it's really old CAD data that there's no way you can ever send it back to anyone to edit it, editing's all up to you...

20:44 ...that's when you want to convert it. If you want to use advanced geodatabase behavior such as geometric networks or...

20:50 ...topology, again, you can't do this with CAD data. CAD data's read-only in ArcGIS, so you're going to have to convert it.

20:58 And there's a few tools to convert it.

21:00 You have, in ArcMap, you can export data; you can copy and paste in an edit session, but for more control...

21:06 ...that's when you want to use a toolbox.

21:08 We have a variety of tools.

21:09 There's always a few ways to do something in ArcGIS.

21:12 So we have Feature Class To Feature Class; you have a Copy Features and Import CAD Annotation for dealing with text.

21:19 And of course, at 10 we introduced a new tool called CAD To Geodatabase.

21:23 That's basically a tool that allows you to batch load a lot of CAD drawings into a geodatabase.

21:30 What you get, let's say if you had 100 CAD files and you use CAD To Geodatabase, in the end you would get a...

21:35 ...geodatabase with just five feature classes.

21:38 Basically it's going to merge the datasets...or the feature classes during the conversion and also deal with annotation.

21:45 Previous to this tool you had to deal with annotation separately. So that's a nice way to do a batch load.

21:50 We're dealing with a dataset at that point, so you're going to get the entire drawing, so you may want to add that...

21:55 ...to a model. Use some tools to query that down and just get what you want to work with.

22:01 And then here's some scenarios. So we're going to show this in a little bit, but you always want to leverage the information...

22:07 ...into drawings. So if you have text inside polygons, that's the classic, you know, ID in the lot.

22:11 You always want to try to leverage that from the drawing, or proximities. You know, text in your lines.

22:16 That's always useful to get like, let's say a diameter value next to a utility line.

22:23 And then also to construct geometries. So taking lines. Sometimes in AutoCAD or MicroStation the data wasn't really...

22:29 ...snapped completely. So we have tools that allow you to construct polygons.

22:34 And we can add some tolerances and in the end you get some feature geometry that's going to be more useful for you.

22:39 Of course, traditionally you can just create new geodatabases from CAD. You can append to CAD and then merge.

22:45 Now it's time for Jeff, so...

22:47 Alright.

22:48 Thanks, Jeff.

22:50 Alright, thank you, Phil.

22:52 Okay, what I want to talk about today is...He's talked about rendering your CAD in ArcGIS, but what I want to...

22:58 ...talk about is converting your CAD data into your GIS feature class, ArcGIS feature classes.

23:04 You know, just to...I've talked to more than a couple of people so far at the islands that they get CAD data...

23:10 ...they reference it in, and then they retrace, or redigitize. I don't know if anybody's doing that.

23:16 That's fine, but there's...If you just convert your CAD data using the geoprocessing tools...

23:20 ...it saves you all kind of tracing time.

23:22 But I'll show you that in a moment. But the first thing I want to do here is go to that campus drawing...

23:25 ...that Phil has already showed here and he's...went into it a little bit, but basically what we're trying to do here is...

23:34 ...we've got these offices that we're interested in and what we'd like to do is to take these offices and turn them...

23:39 ...into polygons and load them into my feature class so I can load them into my data model for my existing offices at Esri.

23:47 And if we look at these a little closer, we'll see that we've got the wall layers, which is good.

23:52 So there's some CAD standards going on. Hopefully where things are in unique layers.

23:58 We've got the CAD text which we mentioned. It's in Mtext and it looks like it's on a unique layer, so that's good news.

24:05 We've got these columns, the beams I guess, and in this case I'm probably going to ignore them.

24:11 I just want to build the polygons from that. The other thing here if we look at this, we'll look a little closer...

24:17 ...if you've ever been to Esri, or seen pictures of it, all of our offices have sliding glass doors, patio doors...

24:23 ...and in the CAD world, looking at this drawing, this is exactly how it looks. This is just spot on.

24:28 It's great, but as a GIS analyst I'm looking at this and I'm getting a little fearful because how am I going to generate...

24:33 ...polygons out of this, right? So that's one of the things where the data model difference.

24:39 It's a big thing. In CAD that's exactly accurate; that's right, but in GIS I need to build polygons, so it's a little bit of a problem.

24:46 And to look a little closer, I have this complex shape that...this casing that where the patio door slides into, so that's...

24:54 ...another issue too that we've got all these tiny polygons that we want to filter out as well.

24:58 But I wouldn't show you if I didn't have a solution though, right?

25:03 Hopefully it works. Okay, so what I want to do here is, I'll go back to the MXD that Phil's already showed you and...

25:11 ...same thing. If we look down here, here's the rest of our building interior spaces if I turn that on and off.

25:20 That's where the offices exist in the rest of the campus, the different buildings, but what we were given is we were...

25:27 ...giving that CAD drawing, and if I bring it in here now you'll see that it lines up nice.

25:31 It's not in the Pacific Ocean anymore, so thanks to Phil it's in the right spot relatively.

25:36 So what we want to do is instead of going and tracing that again, you know I wouldn't want to be the person...

25:40 ...to go ahead and trace so I could build polygons out of that.

25:44 What I think we want to do is we want to filter out information out of that CAD file and put it into a feature class.

25:51 So what we want to do here is we could go to the geoprocessing framework, or geoprocessing in general...

25:57 ...we could go to the search menu which Phil already talked about, and we can look up tools.

26:02 Feature Class To Feature Class is what I'm interested in to show you guys.

26:07 And if we open up that tool. Let that come up. This is the example I've talked...like I said, more than a couple people...

26:17 ...where they've traced their CAD file. They already have their lines but I need to get it in my geodatabase and I trace it...

26:21 ...here's a great tool for doing that quickly. I pull in my polyline feature class on my CAD file and there we go.

26:30 I put it to a location, but the big thing here is I want to query it out. I hit my SQL expression and the CAD...

26:37 ...properties that Phil's already talked about are things like layer and color. So in this case, layer equals...

26:42 ...I get my unique values and then I can pull up my walls.

26:45 So what I've done is I've quickly converted that to a feature class, but it's a great way of dissecting the CAD file...

26:51 ...and pulling out what you're interested in, so.

26:54 Now to further along in that, that's all fine and good, but what I really want is I want to take those polygons that I...

27:00 ...want to generate, I want to create attributes in these polygons they give from the office numbers.

27:05 So I have that attribute in my polygon and I want to put it into my existing data model.

27:10 So in that case, if we go here, I've actually built some tools that...to do that.

27:15 So if I had this model that I built, create interior spaces, I've chained together a bunch of tools and what I've done...

27:21 ...is I'm taking my input feature class, I've done my SQL query, expression, again in this case I know because...

27:27 ...there's some CAD standards that I'm aware of, or I've done some research on that...

27:33 ...that the two wall layers in those doors, we got to pull those doors out because we got to somehow close those off.

27:39 And then we put that out to a feature class, and then I use my CAD annotation, and that's what it's going to be, an attribute...

27:44 ...of the polygon. Well, that's fine and good and that runs, but let's look under the hood a little

bit.

27:50 Let's look into what I did.

27:52 Now I don't want...From the last session too is don't try and write down what I'm doing here.

27:57 Just try and understand it. At the end of this session, I'll give you my card. I'll e-mail you this model if you're interested.

28:02 It's yours to have, but you'll have to see it first. Maybe you don't like it, so.

28:07 So the first thing is the Feature Class To Feature Class tool, I already talked to you guys about that.

28:11 That's just doing exactly what we did before.

28:13 Taking an input polyline feature class from the CAD file using that expression, that query expression...

28:17 ...and I'm going to put it to a dataset and I'm going to do that feature class.

28:21 The next tool is a Split Line At Vertices.

28:24 If we think about it, the problem is, is those sliding glass doors, they were a complex shape if you noticed in AutoCAD.

28:30 What I want to do is I want to break up all those shapes so they're just lines.

28:35 Because what I want to do is just shoot those through and extend them to close off things.

28:39 So it's an important tool here to break that complex shape so that you can use those to extend through.

28:45 So that's what I've used that tool for.

28:48 And what I want to get across here too is I'm really...Who cares if this used to be CAD files, or CAD data?

28:55 This is just feature classes in ArcGIS. I'm just using geoprocessing to do this.

29:02 So the next thing I want to do is my Make Feature Layer. Remember when I break apart the sliding glass doors, for example...

29:09 ...there is those little pockets on the end where the sliding glass doors go into. Those are really small.

29:15 If I generate polygons, I'm going to have 400 little tiny polygons that I'm not interested in.

29:20 So a way to do that is I filter it out with Make Feature Layer, just another geoprocessing tool, like you would with any...

29:25 ...feature class, anything less than .5 feet I think it is, get rid of those.

29:31 I just want everything but that.

29:38 And then the Extend Line. Here's a nice tool at ArcGIS 10, so there's a difference between 9.3.1, but at ArcGIS 10 they...

29:45 ...introduced the Extend Line and Trim Line tools. They're at an ArcEditor level license, but what they're intended for is...

29:52 ...they're not intended to replace—to do any topology or anything like that, but what they are is they're quick cleanup tools...

29:58 ...that we can use especially for our world, right, because we get these CAD files with breaks in them.

30:03 We've got a line with a break in it and there's a piece of text and then it continues on.

30:07 Like contours, for example. In CAD that's just fine, but in GIS that's killer for us. We hate that.

30:13 So what I've done here is I've taken this input feature and I want to extend it out to a length of, in this case, 20 feet.

30:21 The other thing I want to show you here is there's this optional parameter of this tool extender extension and...

30:28 ...I've checked it because what I want to do is extend a virtual extensions, so if you consider I've got two lines that...

30:33 ...come like this, if I extend one 20 feet it doesn't touch anything so it's not going to close off that area, but if they both...

30:41 ...extend out, there's a virtual connection, so what that does is it closes off that area.

30:45 It closes that shape for you. So that's an important part too. It's all important.

30:51 And then the next one is Feature To Polygon. And the people that don't have an ArcInfo level license, you can't do that...

30:58 ...because it's ArcInfo level license tool, unfortunately. But what it does is it generates polygons from closed lines.

31:06 And along with that, it'll take my annotation feature class which is, in this case, a CAD file, so I can take that text...

31:13 ...and I'll make it an attribute of my polygon that way.

31:16 So it's kind of a nice option as well. So I could go ahead and run this tool, but we'd be here a little while, so...

31:22 ...Madame Benoit, slightly ahead of her time. If I close that I actually have the results already.

31:28 And I go in here and it is...So if we go to the campus polygons and turn off the CAD file, you can see that...

31:47 ...there we go. So we'll just zoom in to that. We're just really interested in this.

31:51 You could see that now I've generated all these polygons. If I identified them...there we go. I

go here, I've got a polygon...

32:01 ...closed shape now. I've got my label and my office number is in there as well.

32:06 So there's my office number, refname. So that's great, but the problem is, this is not what I'm interested in yet.

32:13 This is just all the polygons. There's stairs that were not quite following the CAD center that I expected, but...

32:19 ...there's all these tiny little polygons that frankly, I don't care about. All I care about is the office ones.

32:26 And in my investigation I noticed that this is Phil's new office and it's not really an office, so, bad news buddy, sorry.

32:35 Thanks.

32:36 It looks like you're in the hallway.

32:38 I think I always am.

32:40 Anyways, so the next thing is, is that now I've built these polygons, that's great, but there's a lot of junk in there...

32:46 ...I don't care about still.

32:48 So what I can do now is the next model I created to do this work is actually a pretty simple one really.

32:56 I do another Make Feature Layer, just a standard geoprocessing tool, and what I want to do is take that input feature...

33:01 ...class that I just created and I want to pull out from that refname field if you remember, that's where the offices numbers were.

33:09 Some of them didn't have...The ones that don't have an office number, they're not offices.

33:13 So anyways, so I'm just making a query to say, hey just give me the ones that are full of an office number...

33:19 ...the other ones I want to ignore. So that's easy and then I want to append.

33:24 The interesting thing about append is that that's fine that I'm going to take that feature class and I'm going to append...

33:30 ...it to my existing feature class here in my data model, but also there's a field mapping component.

33:36 Because this is coming from CAD data, it has its own field values and I told you it was refname was a field that...

33:41 ...contained that office number? Well, in my feature class, it's actually space ID is where it is.

33:48 So what you can do, in this case, if you add for input field, you can map. You can pick a field out of the CAD file and make...

33:55 ...it map to that as long as it's the same data type, it'll punch it in there.

33:58 So if you can imagine, if you built this model without that it would be add field, calculate field, delete all these fields...

34:06 ...so you'd be doing a bunch of field manipulation. This is a nice way of not having to do that.

34:11 So why don't we just go ahead and run it. It takes a few moments. Done.

34:25 And we go to our building interior spaces now and you can see that now I've actually generated just polygons that are offices.

34:35 And we excluded Phil's office, so that's not there anymore.

34:40 But now obviously, let's be honest here, what I've done is I've done a demo of pretty perfect data.

34:45 Everything closes right. Well, it's not 100 percent perfect.

34:50 For example, I've got this hallway became an office number because a piece of text is sitting out there that wasn't...

34:56 ...closed off so it said, hey, you're part of this polygon, you must be an office. So this hallway.

35:01 So that's an easy fix, right? I can go in here. We're going to go...I can go like this. Start my edit session.

35:14 Anyways, well I can go in here, start a...I won't do this, but start an edit session, delete it, pull it out and do it there...

35:20 ...and my data's perfect again. Well, in reality that's not always true.

35:23 So oftentimes you have things like this happen where this is actually one office, but because of the length I...

35:30 ...extended my line, and the piece of text was over here on the right-hand side, it made a polygon and not a polygon.

35:36 So these are things that you're going to have to, frankly, edit manually. That's what editing is for.

35:41 But what I intended with this model, or these workflows is to try and get you 80 percent of the way, 85, 90 percent...

35:49 ...of the way. Maybe even higher.

35:50 Where you've done a bulk of the work to do this; you might have to do some editing after to clean it up, but it does...

35:56 ...kind of save you some time. So that's the idea of this. So I guess that's straight talk, right, Phil?

36:02 That's straight talk.

36:03 Straight talk, okay. Anyways, I guess I'll hand it back to Phil now and you want to talk about some export to CAD?

36:09 Sure, and let me just switch back. In that workflow what you saw here is it applies to other types of data.

36:17 Parcels, you know, same concept. You have parcel lots, you have ID numbers in there, so that's another example...

36:22 ...but I think in conceptually just showing how we can automate that process a little bit better. Okay.

36:28 Alright, so now we're going to talk about going the other direction and that's exporting geodatabase features to CAD.

36:37 Now again this is...I know probably not a lot of you need to do this, but some of you do and it can be important.

36:43 It can be important to share your data with your CAD users. You know, if you were collaborating on a project...

36:52 ...or you just have some contract obligations that you have to deliver, you know, your geodatabase content in a DGN or...

36:58 ...DWG format, so we have a tool that can do that. It's called the Export To CAD tool. It can be pretty simple.

37:05 You can simply drag and drop some layers in there and export.

37:08 Pick your format, click OK and you actually get CAD data pretty quickly.

37:13 But you can do more with it. You can leverage your geodatabase information to drive that export, so you can definitely get...

37:19 ...more out of the geodatabase into the drawing by using filled attributes, by using seed and template files.

37:26 So in the end, the goal or the objective is to deliver CAD data that's going to adhere to a CAD standard for any...

37:34 ...organization that you have to work with in that context.

37:38 So here's some scenarios. So there may be times when you want to take one feature class and export to one drawing.

37:44 You can do it with multiple feature classes to one drawing, but more interesting, you can take one feature class and...

37:50 ...export it to multiple drawings.

37:52 What we call a fan out that you can just drive it with some attributes to get multiple CAD drawings.

37:58 And of course, you go multiple to multiple.

38:00 So there's different variations of how you can export geodatabase feature classes to CAD.

38:06 Here's a screen shot of the dialog box, Export to CAD. Again, it's similar to our reading capability, so we write to...

38:13 ...DGN V8 formats as well as DWG release 14. Probably not a hot format these days, but all the way up to 2012.

38:22 So it's similar to our reading capabilities.

38:25 One of the nice features about this tool, it allows you to not just create new data, but you can append to an existing drawing.

38:32 So if you have, let's say a master drawing that data keeps getting added to over time, it's a production copy, then...

38:39 ...you can use that option, Append, to write...to add to it.

38:44 Maybe on the GIS side there's been some updates maybe from some different updates out in the field, add it to the...

38:53 ... geodatabase, you can just use it to append there.

38:55 And again, like we mentioned earlier, available at all license levels, so that's a nice feature.

39:01 Attribute-driven support, so again, that's using fields. That's what we call a well-organized CAD drawing in the end.

39:08 Some key areas you can define and control CAD entity type. So we have a CAD type field that you can specify...

39:15 ...a particular geometry type in CAD, like polyline or lightweight polyline, arc, circle, et cetera.

39:21 So that's an important way to control the data, how it's created.

39:24 Elevation—you can generate elevation, you know, contour lines that are going to be specified with a particular value.

39:31 Blocks and cells and their attributes can be generated with this tool too. So that can be important to then populate data...

39:37 ...in the CAD drawing so that CAD users can access that from the geodatabase.

39:42 Of course, text styles, or text is going to be supported too, as well.

39:45 So you can control positioning, justification, and then document names and paths.

39:49 That's how you can actually drive out, you know, you can just by using a document name, a different unique...

39:55 ...file for the drawing. That's where you can fan that out to multiple drawings.

40:01 So lastly, the last part of it is the use of seed files, or template files depending on if you're a MicroStation user...

40:06 ...they're seed files; AutoCAD, template. These are what are going to be used by CAD operators or designers to define CAD...

40:13 ...drawings with the standard. And so what the Export To CAD tool allows you to do is point to a seed file and then that's going to...

40:21 ...have the default symbology, all the layer schema, line styles, block definitions and for MicroStation it's required...

40:28 ...to have one, but we install those by default with Desktop so you can certainly change to use your...

40:33 ...own seed file for MicroStation.

40:36 Okay, back to Jeff. Jeff has the fun part. He gets to demo.

40:42 It's only fun if it works.

40:43 That's true.

40:45 Okay, the next thing I want to do is talk about export CAD, of course.

40:50 Did you ask the question about exporting to CAD earlier?

40:54 Just a quick question, who does that? Who takes the GIS data, pushes it out to CAD? Okay.

40:59 Oh, wow.

41:00 More than usual. Okay, good. Awesome.

41:02 Okay, so the next thing I want to do is, I've got some data here from the City of Riverside.

41:06 And here's some as-built. The white polygons are the as-built coming from my CAD file, directly read.

41:13 And with the pieces of text that are in there identifying what the parcel APN and parcel ID is, but what I want...

41:21 ...to do is I've gotten some feature classes and my boss wants me to export this out to the CAD file.

41:27 And like we were talking about before, let's be good to our CAD people so they're good to us, right?

41:32 So what I want to do is not just dump out a CAD file to them, but let's dump them out a CAD file how they would expect it.

41:38 So what I could do, is I could run export to CAD right now. Go in here, Tools, look for my...search.

41:53 I could open my Export To CAD and I could start inputting these feature layers.

41:56 And what's built into Export To CAD is anytime a feature layer, and a feature layer is because it lives inside of ArcMap...

42:03 ...feature class, it points at a feature class, but when it's in ArcMap it's a feature layer.

42:07 If I added these as input to my Export To CAD - trees, streets, what's going to happen is I would export these feature classes...

42:16 ...to a DWG and it's going to create all...everything from the trees layer on a trees layer in AutoCAD.

42:23 So that's just built in by default. If you work from ArcMap, it just gives that that functionality.

42:29 So that's the easy way of doing it. But also, if we go look at the actual AutoCAD drawing itself, and we do something...

42:38 ...like, well, what layers that this...from the existing and what do we have in here, well, we got the as-built centroid and the...

42:45 ...as-built polygon, or parcel ID in there, so that's great.

42:50 The other thing, too, if I look at it a little closer, it's not actually a piece of text here. What this is, is a block reference...

42:56 ...with tag values. If you look a little closer at this thing here we can see that this is a block.

43:06 It's telling me here that it's a block, but also it has APN and parcel ID as tags off that block.

43:14 So it's a quick way of filling things in. So what it would be nice if I could create a CAD file, and give them in the same...

43:23 ...context of what they have it. So they have block definitions in this AutoCAD file.

43:26 So I'd like to take advantage of that. So we'll close it. Go back to our MXD. So how do I go about doing that?

43:35 Well, what I want to do is I want to export these two feature classes. So if I look at the field values, because Phil's...

43:41 ...already talked about key name fields for...that export CAD understands, and layer is one of them.

43:48 Now if I just ran this from ArcMap, or we would get this, but in this case, I've used the layer feature class so I could run...

43:54 ...it from ArcCatalog and get the same behavior along with layer color, layer line weight, these are things that mean...

44:00 ...something when you run Export To CAD because it's going to push those into AutoCAD drawing with the...

44:05 ...color and the weight of the line that you want to go across.

44:08 Along with, which Phil's going to talk about a little bit later on, but these other attributes,

there's a specification in CAD...

44:14 ...where we support attribution inside of AutoCAD that both of us can read and Phil will talk more about that, but that's coming.

44:22 So that's fine. What about the centroid? The same thing happens. We've got the same things.

44:27 Well in...So entity type is a really cool field because what it does it allows you to define the entity that you're going...

44:32 ...to go into. In this case, if you think back to the AutoCAD drawing, there's a block definition in there.

44:37 So if I export a point that has a type of insert which is what a block is called inside of AutoCAD, it's going to know...

44:44 ...that that's a block. I have the definition in my AutoCAD file. I push it across and already know it's all, I'm a block.

44:50 I'm going to go into there. It's going to go into the layer of here.

44:54 The rename, this is the name of the block that I want to use, I could have multiple blocks if I had...along with the...

44:59 ...tag values, the APN and the parcel ID.

45:02 So if I want to do that, I would go back to my search and take my polygon and my centroid. So what I could do here...

45:25 ...is I could go to a brand-new file or I could use a seed file that Phil talked about that has my block definitions.

45:31 But in this case I'd like to go append to that existing drawing that I already have. So I'm going to save it to that.

45:37 I have an override option telling me here that hey, it already exists, but that's fine because I want to append to it.

45:43 So we're okay with that. So if I run this tool now, it's going to go to the background because we have background...

45:49 ...processing at 10 as you probably know, so you'll see it come up here.

45:54 I should be doing something else right now to, you know, say that background processing is great because I...

45:59 ...can go ahead and zoom now, so. But I didn't.

46:01 It worked too quick.

46:02 It worked too quick. So if we go back here now, if we go back into AutoCAD, and load that same drawing...

46:10 ...let's do it. So then if we do the same thing, type in our layer, we've added two new layers, a

proposed parcel...

46:24 ...and the centroid layer, and also - ta-da - we're able to add just like our AutoCAD users are expecting in their drawing.

46:36 So it's a nice little technique to be able use that, but what I'm trying to get at, point here is you can use Export To CAD...

46:41 ...simply for just dumping geometry across, or putting in unique layers using queries on...in geoprocessing, or inside of...

46:49 ...ArcMap to pull out just what you need, but you can also do some interesting things with Export To CAD too, to...

46:54 ...create great CAD data that, you know, make your CAD users a little happier.

46:59 That's never bad, is it, Phil?

47:00 Not bad.

47:01 Okay. Alright. Next.

47:04 Next. Alright, so now we're going to shift gears quite a bit. We're going to talk about using GIS data in CAD.

47:13 So even though this title is Using CAD Data in ArcGIS, we're actually going to talk about how to access some GIS data in...

47:19 ...CAD, in particular map services. So a lot of you are probably already using ArcGIS Server to publish your maps and...

47:26 ...share them within your organization as web services or to the entire Internet.

47:31 And so that's a great way to get content out that's going to have information about your particular projects and your maps.

47:41 The good news is that CAD can be an additional client to Server just like ArcMap's a client to Server...

47:46 ...web applications, Flex viewer, et cetera. So we have techniques and some tools that allow you to access that.

47:56 In terms of MicroStation, that's done through WMS. That's built in. And with AutoCAD it's a little more tightly integrated.

48:03 We have an ArcGIS for AutoCAD product that we talked about earlier that allows you access to Server map services.

48:11 So in MicroStation, again, it's built in beginning at V8 XM and higher. You have the ability to connect to WMS.

48:18 In terms of how to do that from an author and publishing perspective in Server, it's simply checking that WMS box.

48:26 So if whoever's publishing map services does that, that's going to enable MicroStation users, your MicroStation users...

48:33 ...potentially to access that content.

48:38 In terms of AutoCAD, we have a product, a lightweight product called ArcGIS for AutoCAD.

48:43 It's a plug-in application. It's free. It's always a nice thing that it's free.

48:47 It currently supports AutoCAD 2010 to 2012, so the current versions.

48:52 We have an older version that supports 2007, -8, and -9.

48:55 What it does, it allows connection to ArcGIS Server map services. So it doesn't require that WMS capability, but if...

49:02 ...the service does have WMS you can still use it.

49:06 In addition to your own map services that you can have AutoCAD users access...

49:10 ...it also can access ArcGIS Online content. As you saw on Monday's plenary there's a lot of effort getting content out on...

49:17 ...ArcGIS Online for everyone to access.

49:21 So again, AutoCAD and MicroStation are part of that.

49:24 An additional part of ArcGIS for AutoCAD is the ability to organize CAD drawings into feature classes and attribute them.

49:31 So that's another...like there's two parts of ArcGIS for AutoCAD. I'll show that a little bit later.

49:35 But again, the goal here is to make AutoCAD a better client, a better application that works with ArcGIS Desktop and Server.

49:45 So here's a few slides, just kind of showing you conceptually what's happening.

49:48 You can add basemaps, map services, and of course, CAD drawings. Still a very viable file-based solution for exchanging data.

49:56 In terms of accessing map services, you would...we have some...a ribbon interface that allows you connection to...

50:03 ...the basemaps on ArcGIS Online as well as traditional URL connections to services.

50:09 We use AutoCAD's palette user interface to manage these map services, to get information about the coordinate systems...

50:16 ...and the URL, et cetera, and control visibility.

50:19 And you can identify map features as long as the map services are enabled with query. Most of them are.

50:26 Alright. Back to Jeff. Now Jeff's going to show WMS in MicroStation and I'm going to follow it

up with...

50:31 ...showing ArcGIS for AutoCAD, how it works with Server.

50:37 Alright. Back again.

50:40 There we go. Back again. Sorry. Alright, so in this case as he's talked about ArcGIS for AutoCAD, we've shown...

50:47 ...that product in the past and a lot of people have questions. MicroStation people, how can they participate and be...

50:53 ...able to get a map service as a part of that functionality?

50:56 And this is a way with MicroStation...in this case I have MicroStation V8i SS2 which I think is the latest release...

51:04 ...of MicroStation. What I'm going to show you is available in MicroStation XM .09, point something, you can...

51:13 .03?

51:14 Yeah. .09...

51:15 08.09.03?

51:16 Yeah, is that what it is? Alright. And then also V8i is the same thing, but what happens in the later versions is they've...

51:21 ...wrapped it into the Raster Manager, so it's a little bit nicer to work with. With V8i and beyond.

51:28 So in this case we already had a map service published for us. An image service, actually.

51:33 And what I have here is I've got some data from Charlotte. It's the airport in Charlotte.

51:38 And what I want to do is I want to bring in a map service behind here for a little design that I'd like to do.

51:46 So I use my Raster Manager and in this case, I could go a new WMS. So that's a nice little thing here.

51:53 So by default it comes with a lot of WMS services that you can hit, but in our case I have one buried in here.

52:02 This one right here. And this is the WMS of an image service that I have sitting on a server back in Charlotte right now.

52:09 And what I could do here, is I could add that to map.

52:13 And then there's configurable variables over here as well. God, I can't say that word. Configurable variables off to...

52:21 ...the side here and there's different projection information that in this case is coming into

NAD83 US survey feet.

52:27 I'm happy with that. I could go to WGS84 from where it was published. I can change my image type as well...

52:34 ...whether it be PNG or JPEG and also the transparency. I want to turn that on and off.

52:43 But I won't bother doing it here because I want to show you something else on this.

52:46 The other way to get at this is to attach an existing WMS file, or attach an existing connection file.

52:55 So I can go here and select this thing and I'm going to accept all the defaults and give it a second.

53:08 There we go. A little slower today, but not bad.

53:12 So what's going on now is I've got that image in the background now, so it's a nice way of being able to grab the image...

53:18 ...and maybe do some design with a little awareness of what's going on around me with the imagery.

53:23 What's doing the job here is that actually this XWMS file and it's a, pretty much an XML file that's formatted so it can be...

53:31 ...understood from MicroStation to ArcGIS Server.

53:35 If you want to get in more detail of it, in my other session that we talked about, I'll go into a bit more detail of that.

53:40 But that's in essence what it does.

53:44 So, Phil.

53:46 Okay. Alright, thanks, Jeff. So now I'm going to show AutoCAD 2011 with ArcGIS for AutoCAD installed.

53:56 And let me...first thing I want to do here is I'm going to net load the application.

53:59 So again, you can download ArcGIS for AutoCAD from our resource center or from esri.com if you just do a search...

54:04 ...ArcGIS for AutoCAD, it'll send you to our product page.

54:08 You can download two different setups. There's a 32-bit setup that supports AutoCAD 2010, -11, -12 and...

54:14 ...a 64-bit setup as well. So depending upon which version of AutoCAD you have, we have setups for you.

54:21 So, let me go ahead and type net load. This is the AutoCAD command to net load an application.

[54:27](#) It takes me to my ArcGIS for AutoCAD folder. It's a pretty small, lightweight application.

[54:32](#) It's a small footprint, about 25 megs. We do install the coordinate systems.

[54:37](#) The same folder that you get in Desktop installed under the Desktop 10 folder. And what I want to do here is just select my...

[54:45](#) ...ArcGIS for AutoCAD DLL to load it.

[54:47](#) So what you'll see here is the ArcGIS for AutoCAD splash screen. This is build 250.

[54:52](#) Again, we've had a few different versions over the years. This is our current version.

[54:56](#) We have a new version coming out this fall called 300 that's going to add additional capabilities such as...

[55:02](#) ...support for feature services and image services. So that's going to be...really extend our functionality.

[55:08](#) For now we're going to show map services because that's what we support at this release, but please check back...

[55:14](#) ...to esri.com coming this fall for our latest release.

[55:18](#) Alright, first thing I'm going to do here, you'll notice when I loaded it, our ribbon changed.

[55:21](#) We have an additional ribbon tab here with several different panels here.

[55:27](#) Going from left to right we have the area that we would use to add content.

[55:33](#) We can manage our map services from here.

[55:35](#) Of course feature classes I'll talk about in a few moments.

[55:39](#) And we have some tools to refresh your maps, to select features, identify features, and of course, to access...

[55:45](#) ...our resource center and help system from here.

[55:47](#) So first thing I want to do here is I have a drawing. This is actually from our Esri Water Distribution sample that's...

[55:53](#) ...available on ArcGIS.com in the local government section.

[55:56](#) So you can actually download this drawing. You can see all the feature classes and information and the geodatabase...

[56:02](#) ...that's part of this, so feel free to check that out when you get a chance.

[56:05](#) First thing I'm going to do. The easiest way to add a map service to AutoCAD here is just by clicking on this Esri Maps...

[56:11](#) ...button. It's going to open up a browser.

56:13 This is a smaller, I guess, selection of basemaps as compared to what you see in ArcMap or Explorer.

56:18 So we're going to add to that in the future as well, but in this case here, what I want to do is add some more...

56:22 ...get some context about this particular area.

56:25 So I'll click on World Street Map and I'll add it to my drawing.

56:28 One thing I mentioned, I talked about coordinate systems, how we install those, you have the ability to define a...

56:34 ...coordinate system in the drawing using ArcGIS for AutoCAD.

56:38 So as soon as this gets added to the map what we'll do is I'll do a list of the coordinate systems so you...

56:42 ...can see where we're at.

56:43 Now this drawing already had the coordinate system defined, so if I list it, we can open the AutoCAD text window...

56:48 ...we notice that we're in State Plane Florida East, Zone 0, 901 feet.

56:54 If I didn't have a coordinate system in that drawing and I added this map service, the drawing's going to assume...

56:59 ...the coordinate system of the map service.

57:00 In this case it'll probably be WGS84 auxiliary sphere because that's what most of the basemaps are.

57:06 But whatever map service it has, that will be basically, it will assign it to it.

57:12 That coordinate system now is defined in the drawing, so if you take that back to Desktop you will actually have that...

57:17 ...information in there so you don't have to assign a coordinate system.

57:21 Talked about that georeferencing workflow earlier where you would transform your data, you would assign your...

57:25 ...coordinate system. This with having ArcGIS for AutoCAD, it automatically does that for you if you do it in AutoCAD.

57:29 We embed that in the drawing. You don't have to have a companion file.

57:33 Okay, let me go ahead and zoom in. So I'm going to zoom in to our focus area.

57:39 So as you can see here, this is a water distribution network.

57:42 We have some main lines, some laterals, some valves, and so forth, but this is a good basemap.

57:49 But what I want to do is access data that gives more description about this site.

57:54 So what I'm going to do here is open up our map service palette.

57:57 You notice that this is that palette I showed earlier. You get information about the service.

58:02 I can turn off visibility. I can change the dynamic display which is useful if you're going to pan around.

58:07 Every time you pan with dynamic it's going to make a request to the server, so best practice is turn off your...

58:12 ...dynamic, zoom around and then once you get to the location you want to work with, for instance I'll just uncheck that...

58:18 ...I'll zoom in closer, you'll notice that I don't get a refresh on the map, but I can go ahead and click on Refresh Maps.

58:23 It's on demand refreshing right there.

58:25 So you'll notice if you get coordinate system information, again this is web Mercator auxiliary sphere, but the drawing is...

58:33 ...State Plane Florida 901, so that's going to take precedence and then of course, you have layers.

58:37 This is a basemap so you only get a few layers there, but what I'm going to do here is I'm going to delete this one because...

58:42 ...I want to get...I want to use a better map service for my particular needs here.

58:46 So a more traditional way, I can add a map. Open up the Add Map Service dialog box here.

58:51 I'm going to enter my, well my URL's already saved. I have ArcGIS Server installed on this laptop, so I'm serving out...

58:57 ...a few different map services, so I'll just click on Connect and it's going to connect my server and then fetch the list...

59:03 ...of services that are available.

59:05 So I only have a couple here, so I'll pick on this local government basemap service, click on Add and just like the...

59:12 ...other map service, it will get added and it's reprojected.

59:14 Now this one, all the coordinate systems are the same. This is from the same dataset.

59:18 Now you notice I get more information; you can see I have some information about some lots and parcels here.

59:25 You know, every time I zoom, you notice, or pan around, I get a refresh, so I could identify some map features.

59:30 For instance I could just make a selection. Drag a box around. You get all this information here.

59:35 Let's say for parcels I could get information...This is coming from the map service which is coming from a geodatabase...

59:40 ...so you have all access to all that data, and let's say a CAD operator wants to use this information as a reference.

59:47 If you're editing, you're creating some new data. So let me do a regen here.

59:51 What I could do is just make sure I have the proper layers selected here, so I'll create a new lateral line.

59:59 Let me go down to the proper layer. There it is.

1:00:01 And of course, you just use standard AutoCAD editing tools.

1:00:03 All we're doing, we're adding data to a drawing here.

1:00:05 So I can snap to, or let's say I add the line right here, snap it.

1:00:12 Actually, that's the wrong one. Let me try that one more time. Click on Polyline. Just start it from here.

1:00:17 So it's just, the idea here is that with map services, or basemaps, you can have CAD operators access GIS data...

1:00:24 ...without any conversion necessary.

1:00:26 Conversion is still a very valid exchange process and in some cases it's required, but in this case with a lot of map...

1:00:32 ...services that are being posted on ArcGIS Server, ArcGIS Online, you have the ability to use those with this product.

1:00:41 So that's one example of how you can use services. So let me just quickly go through a few more slides here.

1:00:47 I'm going to talk about feature classes, what we call CAD-defined feature classes in ArcGIS for AutoCAD.

1:00:53 So this is just a graphic example of what we mean when we talk about these feature classes.

1:01:02 Of course a CAD entity is going to have its inherent properties, but with ArcGIS for AutoCAD you can define...

1:01:07 ...feature classes to assign schema.

1:01:11 So not only is it on a layer, mains, but it can have material information, diameter information.

1:01:16 In this case we're talking about like a water line.

1:01:18 So that's a way that you can attribute data in AutoCAD.

1:01:29 We really want to leverage what's existing in the CAD drawing as much as possible and really not disrupt a...

1:01:35 ...workflow of a CAD editor.

1:01:37 So one thing you'll see, is once you have these feature classes, you bring them back to Desktop, you're going to see...

1:01:42 ...additional feature classes beyond the standard ones.

1:01:45 You can define feature classes in ArcGIS for AutoCAD.

1:01:48 You can edit attributes using the Properties palette, so these are tools or interfaces that CAD users are familiar with so...

1:01:55 ...it's just really an extension of what they do on a daily basis.

1:02:00 And lastly, the goal here is also to provide interoperability with Desktop, or improved interoperability with ArcGIS Desktop.

1:02:06 ArcGIS 9.3 or higher will read these feature classes in the drawing and so that definitely helps the story in terms of...

1:02:13 ...making CAD integration more effective here.

1:02:15 So let me go back to AutoCAD. I'm going to go to a different drawing.

1:02:18 Now this one is some county data in Tennessee. Now this one I have with some imagery in the back.

1:02:24 What we, just from talking to a lot of users over the years, it seems like imagery is a really useful thing to have in...

1:02:30 ...terms of CAD designers and engineers. To understand what's around the project site.

1:02:36 So this is just a basemap. You can probably get some higher res imagery other than what's available for free online.

1:02:43 But what I'll do here is I'm going to just zoom in to an area, this particular commercial lot, and then go back to...

1:02:51 ...see if we can bring that basemap back. And let's try it again. This happened on yesterday too.

1:03:00 I can't see the basemap. But that's okay. What we can do here is click on this Feature Classes palette...

1:03:10 Alright, there we go. So we got the Feature Classes palette. So this drawing has some feature classes defined.

1:03:15 For instance, if we click on this drop-down, you're going to notice that we have a few different feature classes in there.

1:03:21 And for each feature class, such as Parcels for instance, you see there's a filter.

1:03:25 This is a pretty basic filter. Just the layer property pointing to the parcels layer.

1:03:31 But you notice that down here we have some fields and some schema here that you can use to...that basically is defining...

1:03:37 ...that feature class.

1:03:39 So if I click on, let's say, let's pick a parcel here. You'll notice that when I open up the properties, this is the AutoCAD...

1:03:49 ...Properties palette, not only do I get information about the standard CAD properties, if we scroll down, you'll notice...

1:03:55 ...that we have some more information.

1:03:57 This section called Parcels is in addition to the properties and that's coming from these feature classes that we embed in...

1:04:05 ...the drawing. So for instance, as an AutoCAD...inside the AutoCAD environment, I can use some selection tools.

1:04:12 I can have my feature class set to Parcels. Just like in ArcMap when you perform a query, select by attributes...

1:04:20 ...you know I can go back and just add a query here and apply it and what happens is just with that information in the drawing...

1:04:28 ...you know, I get zoomed right to this particular feature.

1:04:32 So again, that's selected. We can find out, you know, what...more information about that particular parcel.

1:04:37 So it's showing you that you're not just using AutoCAD properties to locate some data in there; we're actually using some...

1:04:44 ...information that's coming from the geodatabase.

1:04:47 So let me show you how you can create a new feature class. I'm going to zoom back to that area.

1:04:57 And just by...Let me go back and add the palette here.

1:05:02 So I can create a New Feature Class. I can select New Feature Class; I'm going to call this Footprints.

1:05:07 So I'm going to create a feature class to store the building footprints. I can click on Polygon. Click on Add.

1:05:16 And now down here I can create a query. So it's a little...I don't have a lot of real estate here on my screen here but...

1:05:22 ...I'll have to zoom out. I can choose Layer and I click on Add. It brings up a basically a

picker.

1:05:30 I can choose this drawing layer called Parcels. Click on Add, and then down below here I can...Oops, actually...

1:05:38 ...that was the wrong layer. Let me go ahead and pick Footprints. There we go.

1:05:46 Alright. So now I picked the drawing layer called Footprints and then I can give it, let's say, a field called ID and...

1:05:53 ...just give it a...let's say call it a short integer and add it.

1:05:58 If I wanted to, let's say, add name and say text, I can add that too.

1:06:03 And I can give it a default value. So if we knew that it was going to be called let's say, you know, Building 1 that...

1:06:10 ...means by default any feature that's participating in that feature class now has that attribute called Building 1.

1:06:16 What I'll do now is I'll go through and zoom in on these building footprints.

1:06:24 I'll select one. Now when I do properties you notice that not...You know this just a new feature class I created.

1:06:30 You have that footprints feature class as part of the Properties palette.

1:06:35 You'll notice that it has an ID value, it has an ID field, number one, so I can give it a 25 for instance.

1:06:42 And then name was Building 1. Of course, you want some unique valid names here, but just showing you that...

1:06:46 ...you can set a default value for all those features that are going to be just by default, all the features in the...

1:06:51 ...feature class get that information in there.

1:06:53 So that is showing how you can leverage ArcGIS for AutoCAD to organize your data, your AutoCAD drawings into...

1:07:00 ...feature classes and then either set attributes by default values or as a CAD operator is creating new data you can have...

1:07:07 ...them simply, you know, request that they add attributes as they're creating data.

1:07:13 So it's not, you know, it's a similar workflow to how they're going to edit data.

1:07:17 They're just using the Properties palette.

1:07:19 As a CAD manager, for instance, we have this tool called Import GIS Schema.

1:07:23 So you could take a master drawing and then import the schema.

1:07:28 So with all these feature classes that we've defined in a drawing, you can import those schemas to multiple drawings.

1:07:34 So if you follow the same CAD standard, other drawings have a layer named Footprints, they will automatically inherit that.

1:07:41 So that's a really useful way to distribute a GIS schema within an AutoCAD drawing.

1:07:48 And in the end, the goal is to really leverage that information in ArcGIS Desktop.

1:07:52 So if I switch back to ArcMap, now I'm going to go ahead and start a new map document.

1:07:58 Now you remember when I showed that graphic of what the feature classes...just by default, all the standard...

1:08:03 ...feature classes that you get?

1:08:05 Now when I go over to that data...Let me just browse to it really quick.

1:08:17 I'm going to drag this into ArcMap. Now watch what you see. You'll see what's different about this drawing.

1:08:24 Now I have all these feature classes, additional feature classes.

1:08:27 So if I open up, let's say Footprints. I didn't save the drawing yet, but anyway, you'll see that we have a Parcels feature class.

1:08:35 So if I open up the attribute table you get those CAD properties that are inherent with the CAD features, but you'll...

1:08:42 ...notice now we have information such as, you know, appraisal, object ID, PIN number, property address, et cetera.

1:08:50 So of course, what Jeff showed here with export to CAD, you can generate a CAD drawing that has blocks with attributes.

1:08:56 That's going to be useful information, but the other way if you consider ArcGIS for AutoCAD what it...

1:09:03 ...can do with feature classes allows CAD users to populate that information, those features with information...

1:09:09 ...that a desktop user...let's say you receive that data back, now you have way more information than you would...

1:09:13 ...potentially without ArcGIS for AutoCAD.

1:09:15 So this is our technique for improving interoperability between AutoCAD and ArcGIS. So...

1:09:23 Alright. Let's go back and finish up with a few more slides. I think we're doing pretty good on time. Just about.

1:09:32 Okay. Alright, so just a...this is a slide, of course not all of you have control of how CAD data is created.

[1:09:41](#) Some of it's legacy. Some of it could be 20 years old, but if you do, if you can, you know, give tips to your CAD...

[1:09:49](#) ...operators, yes. You always want it to be drawn in a real-world coordinate location.

[1:09:53](#) Makes life a lot easier, but it's okay. We have tools that address...that resolve those issues if your CAD data is not perfect.

[1:10:02](#) Of course, you know, having logical, well-organized layers is always nice. You know, everything on layer zero.

[1:10:10](#) You know, that could be a little painful, but let's hope we all get good CAD standard, or good CAD drawings...

[1:10:16](#) ...that follow good CAD standard.

[1:10:19](#) Alright, so we're wrapping up here. Just a few resources. Please check out our resource center.

[1:10:24](#) We have a CAD Integration Resource Center at resources.arcgis.com.

[1:10:29](#) We're working on improving. Adding more content to it. Getting some solutions out there.

[1:10:34](#) We've talked to some of you at the island this week and we know that, you know, we've heard about some of the...

[1:10:38](#) ...workflows that you've been going through, so we're very appreciative of that info and we'll try to get more...

[1:10:44](#) ...solutions and more documents out there to support you guys.

[1:10:47](#) There's a Working with CAD Data course. If you're interested, it's a one-day course that goes through some of the...

[1:10:53](#) ...things you saw here today, but in more detail and you go through some exercises with an instructor.

[1:10:58](#) We also have a live training seminar. It's a little bit old now, but a lot of it still applies conceptually.

[1:11:04](#) And just to talk about the road ahead here. We do have that new version of ArcGIS for AutoCAD 300 coming out...

[1:11:11](#) ...this fall. Again that's going to provide support for feature services and image services, so if you like what you saw today...

[1:11:18](#) ...you think that could be helpful for you, please download the application, keep an eye out for our new version coming out.

[1:11:24](#) It's definitely going to extend its functionality based on what you saw today.

[1:11:29](#) Alright, this is going back to just another reminder for those of you that want to focus on a particular, you know, CAD...

1:11:36 ...integration workflow, or just really want to hang out tomorrow, room 24A all day long, so we'd love to have you there.

1:11:44 We'll be answering questions.

1:11:47 Of course we're at the Geodatabase Island all week long, so if there's anything that we didn't cover here that you...

1:11:52 ...have some questions, and also too, we really like to know what you guys are doing, what your workflows are...

1:11:57 ...you know, what challenges are you facing. Please let us know. It helps us build better software.

1:12:01 It helps us build better help and get samples out there for you. So feel free to come by.

1:12:07 We have new online evaluations, so please go to, think it's esri.com/evalsessions...

1:12:12 [Unintelligible]

1:12:13 Eval sessions. Anyway, please fill those out. Again, thank you for attending. Have a great conference.

1:12:18 Have a great rest of the week. Thank you very much.

1:12:21 Thank you.