

# Working with Cartographic Representations

David Watkins and Jamie Conley teach you how to build and edit symbols, apply geometric effects, and perform geometry and symbol overrides to improve the quality of your cartography.

<http://video.esri.com/watch/643/working-with-cartographic-representations>

---

## Video Transcription

**00:01** My name is David Watkins. I'm the cartography product manager at Esri, and I'm here with Jamie Conley...

**00:04** ...using marker placement styles.

**00:05** ...and she's a product engineer on the holistic testing team, and we're going to go through a lot of...

**00:11** ...information here today and hopefully get you guys going with representations.

**00:16** How many of you guys have used representations already?

**00:19** Alright. That's more than half of you.

**00:22** Why are you guys here? No. Alright. Okay. More is good. Alright.

**00:28** Hopefully we'll be able to answer any questions you guys have. Let's just get going.

**00:34** What we're going to cover today, we're going to talk about what are representations?

**00:38** We're going to go into working with representation rules and talk about geometric effects, marker placement...

**00:45** ...styles, and then we're going to talk about overrides.

**00:51** So I have to turn this this way so I can see it.

**00:54** First question, What are representations?

**00:57** So, representations are a way to symbolize your features to solve common cartographic challenges.

**01:05** So they're what we usually refer to as advanced symbology.

**01:08** You can do more with them than you can with the standard symbology that you've got with ArcMap.

**01:13** They're also a storage methodology for storing your symbology along with your data.

**01:19** And we'll go over more about how it does that as part of the workshop.

**01:23** And they're also part of a feature class because you're storing the representations with the

feature class.

**01:30** But, keep in mind they're managed through the layer properties.

**01:34** So, it's a kind of important distinction to make, and just keep that in mind as we start going through all of these examples.

**01:42** So, speaking of examples, I think a good way to kind of explain what representations are...

**01:48** ...is to talk about some of the... kind of things you can do with representations.

**01:52** So, you can create custom symbology and you can create some very, very advanced, complicated symbology with them.

**02:00** There's a whole editing tool in here for editing your symbols and building very complicated symbols.

**02:08** You can control the placement of markers with representations.

**02:11** And this gives us some powerful ways to build symbols where you can control if you want to place markers...

**02:18** ...for example, completely inside the polygon boundaries or align them with line features...

**02:24** ...and do different things with them like that.

**02:27** You can add drawing behaviors.

**02:29** So a good way to kind of think about representations is, you've got a symbol and you can add a behavior to it.

**02:36** So a behavior being like something like, in this case, I've got these offset lines where I'm creating this effect for the...

**02:43** ...boundary features by offsetting multicolored lines inside the polygons.

**02:49** It's just one of the many kind of behaviors you can add with representations.

**02:54** You can also do masking with representations.

**02:57** So any of you guys use the standard kind of masking options in ArcMap? Quite a few of you.

**03:02** There are more than one way to mask features; there are actually quite a few ways, and it can get kind of complicated, but...

**03:10** ...you can also mask them using representations.

**03:14** Another thing, and this what a lot of people think of with representations, is they give you a way to move the...

**03:21** ...symbology without changing the underlying geometry of the features.

**03:27** So, it gives you a way to make cartographic edits to your database without changing the underlying, true centerline data.

**03:39** [unintelligible audience question]

**03:40** Oh, I'm sorry. Okay, I'm going to try to move this a little closer. Is that better? No?

**03:49** I should have started with, can everybody hear me?

**03:52** But... Is that better? Can you hear me in the back?

**03:57** Yes, okay. Alright. Thank you. Sorry about that.

**04:03** Before I get into this, I think it's important to know, and this question comes up at almost every session...

**04:09** ...what are the licensing requirements for representations?

**04:13** Because there are different things you can do with different license levels and we often have a bunch of people...

**04:20** ...who just use ArcView and some of them get up and leave at this point in the presentation when they realize...

**04:26** ...with ArcView you can view representations, but it doesn't allow you to create new representations.

**04:33** So, you need an ArcEditor license to be able to create and use some of the geoprocessing tools with representations.

**04:40** And then there are some more advanced geoprocessing tools you can use at the ArcInfo license level.

**04:46** But, the most common things usually require an ArcEditor license for representations.

**04:51** So, does anybody want to get up and leave now or...no? Okay.

**04:56** [unintelligible audience question]

**05:00** Are those capabilities mutually exclusive?

**05:04** [unintelligible audience question]

**05:12** Yes, yes, so they, the ArcEditor license I'm talking about is Desktop.

**05:17** It doesn't have anything to do with Workstation.

**05:19** So, yeah, and for the, for this presentation, so just ignore Workstation.

**05:27** It doesn't deal with Workstation at all, so.

**05:32** Alright. So let's get in...let's get started.

**05:35** How do I create representations?

**05:38** How do I convert my symbology to representations?

**05:40** Well, the easiest way and the way most people do it is, they'll go in and they'll symbolize all

their features ...

**05:45** ...with kind of the standard symbology, and then if you right-click on your layer, you get this option...

**05:51** ...to convert to symbology to representations.

**05:54** And when you hit that, you're going to get this pop-up dialog, this menu, and it gives you some options in here.

**06:00** And the first one is, what do you want to call your representation?

**06:03** Layer. It's going to create a new layer for you.

**06:06** And, you're going to give it two field names - a rule ID and an override field, and it's going to default to, you know...

**06:14** ...rule 1 and a rule ID and override, but you can call them whatever you want, really.

**06:20** And then you're going to get an option for, how do I want to store my changes, so my overrides.

**06:25** And you get a couple of different options.

**06:28** You can either store your changes into the feature geometry itself, so...

**06:34** ...in that case, if you're editing a feature, it's going to change the geometry of the feature, so it's not going to have that effect...

**06:42** ...I talked about where you're modifying just the symbol.

**06:46** The other option is to change the geometry of the - actually, I just did those in reverse, but, you're going to save the...

**06:55** ...geometry changes as a representation override.

**06:59** So in that case, it's going to write the representation into a new field, this override field, and you'll be able to keep...

**07:04** ...multiple shapes for the same feature.

**07:08** Does that make sense?

**07:11** No. Alright.

**07:15** So, basically the simple way to say this is, you have the choice to either, if you go in and edit a line...

**07:22** ...you can either write the change to the line, to the Shape field, or you can write it to the Override field.

**07:29** And that's what this does; this is just telling us which field it's going to write to.

**07:33** And, I'll get into next how it's actually storing these.

**07:37** So, what it does when you run through that convert symbology to representation...

**07:42** ...is, it adds two fields to your feature class.

**07:45** It adds that rule ID and it adds that override field.

**07:51** So, these are just attributes in your geodatabase.

**07:55** They're also properties of the feature class but you manage all of the contents of this through a layer.

**08:00** ...another set of symbology for my city employees, I can have two sets of symbology, and all I'm doing...

**08:01** I kind of mentioned that before.

**08:03** So, when you make changes, you're not going to go into the table and calculate things.

**08:07** You're going to go in through the GUI and through the tools that we've got, and...

**08:12** ...you're going to make changes to your feature.

**08:13** So when you make those changes, those changes are going to get written to that Override field, and...

**08:19** ...we'll get into that in a lot of detail as we go along here.

**08:23** But that's just, it's important to know that it's actually storing these on the feature class itself.

**08:30** So, multiple representations.

**08:33** So, you can add more than one representation to the same feature class.

**08:38** You can just keep adding additional views of your data.

**08:42** So, they can be used to symbolize features differently.

**08:46** So, for example, in this case, if I want to have one set of symbology for a tourist map, and...

**08:59** ...is setting those as two separate representations.

**09:03** You can also have different representations for different overrides you want to make to the data.

**09:09** So, let's say you want to symbolize a road and move it differently in one representation...

**09:15** ...and then you want to move it a different way for another representation.

**09:18** You can do things like that, as well.

**09:20** So, it gives you really complete control over how you want to symbolize and work with your data.

**09:26** So, we're going to talk a little bit about representation rules now.

**09:32** So, what are representation rules?

**09:33** Well, again, they are symbols with behaviors.

**09:38** And the symbols are created as layers as the symbols, the same you would make any regular symbol.

**09:43** You can add multiple layers to a symbol.

**09:46** And, the behavior comes in the context of geometric effects and marker placement styles.

**09:54** And these are rules that you can apply that have some sort of behavior; they do something to the symbol...

**10:00** ...on the fly as it's drawn.

**10:03** So, just an example of how a rule is built.

**10:06** So it's a unique symbol, so I'm going to refer to these as rules a lot, and you just have to kind of think, rule equals symbol.

**10:15** That's how we address these.

**10:19** And it consists of different layers to your symbol, and then you can also add these geometric effects...

**10:24** ...in marker replacement style.

**10:26** So, in this example, I've got a dark blue outline, which is one layer in my symbol.

**10:31** I've got the blue polygon fill, which is another layer.

**10:34** I've got the little kayaker in the middle, who is a marker symbol, and I'm adding all those together.

**10:39** And then I'm actually applying a smooth geometric effect to the outline of this polygon.

**10:47** Now what that means is, it's actually, on the fly, doing a little generalization and smoothing that line.

**10:53** And that's just kind of one of the geometric effects you've got access to.

**10:58** The other thing it's doing is it's placing the kayaker right in the center of my polygon, and that's another...it's a...

**11:04** ...that's a marker placement style, so I'm telling it where I want to place that marker.

**11:10** So, let's get into some demonstrations, and Jamie's going to start.

**11:16** Okay. Do you mind getting a switch?

**11:18** Oh, I've hit a switch.

**11:20** Thank you. Can everybody hear me okay?

**11:24** Can you hear me in the back? Okay.

**11:26** So here I have a map of Austin, Texas, and I'm going to show you some of the ways that I can improve...

**11:31** ...the symbology using representations.

**11:34** So to start with, I'm going to show you how to create a feature representation by converting...

**11:38** ...already symbolized layer.

**11:41** And I'm also going to demonstrate what David just showed on his slide on how you can build a rule...

**11:45** ...using different symbol layers.

**11:48** So to start with, I'm going to create a representation for my roads.

**11:53** And here, you can see I have several different classes of roads, and if we go into the renderer...

**11:59** ...we can see it's symbolized using a standard renderer using unique values in many fields.

**12:05** And I have a few case roads as well as a dash road that has a casing on it, as well.

**12:12** So I'm going to convert that by right-clicking on the layer and choosing the Convert Symbology to Representation.

**12:19** And then we get the GUI data that David showed on his slide.

**12:22** And as he mentioned, I can change the name of my representation or any of the attribute fields...

**12:26** ...that are going to be added to the table, but I'm going to keep the defaults for those.

**12:30** And I'm also going to keep the default to store the changes to the geometry as the representation override.

**12:36** And that's how all my representations in this map are set because I don't want any changes that I make to the geometry...

**12:41** ...of the representation to actually change the location of my data.

**12:45** So I'm going to leave that, but I am going to uncheck the option to add a new layer to the map.

**12:50** By unchecking this, I'm letting ArcMap know I just wanted to rerender the layer that I already have in my map...

**12:56** ...instead of adding a new layer to my map.

**12:59** So I'll go ahead and convert that, and you'll see very little changed on my map. It handled the conversion very closely.

**13:07** But if we, over here in the TOC, we can see that we now have a representation, and if we go

back into the Symbology tab...

**13:13** ...I now have a representation renderer listed as my options, and it's pointing to the representation that I just created.

**13:22** Now all those different classes of roads that I had symbolized have become individual rules...

**13:27** ...and if we click on those rules, you can see they're made up of the different symbol layers.

**13:31** So in this case, I have a black casing with this pinkish fill.

**13:35** And if we look at my class 2 roads, I have the casing to show, as well as my third symbol layer, which has my...

**13:41** ...geometric effect that's creating the dashes.

**13:44** So it converted that and created the geometric effect for me.

**13:48** And we'll get into more geometric effects later but for now, I simply want to change the color of my...

**13:54** ...class 2 roads to match my class 1 roads.

**13:56** So that's pretty simple; you guys all know how to change colors on a symbol.

**14:00** So once you understand that, you can just choose not to see that warning again either in this session or ever again.

**14:01** But the thing you need to keep in mind is that, while I'm making a simple visual change to this representation...

**14:06** ...the rule that I'm making the change to is a part of the feature class representation, and that...

**14:14** ...representation is a property of the feature class.

**14:17** So, the change that I'm making is actually being made in the geodatabase itself.

**14:22** So when I click Apply, I'm going to get a warning that reminds me of this.

**14:27** And basically, what it's letting me know is that the changes that I'm making of the representation will be...

**14:31** ...maintained in that feature class, which means that any map that I have that references this representation...

**14:37** ...will also see that update that I've made.

**14:48** And when we click that, we can see that my roads have been updated.

**14:52** And again, if I had another map that was maybe displaying this with the same representation for at a different type of map...

**15:00** ...or a different type of scale, those, the color on that map would also be changed.

**15:05** And the other thing I want to show you is an example of how you can create a rule by adding the different symbol layers.

**15:13** ...similar to the example David had of the kayaker.

**15:16** So here I have a golf course and right now it's just, the rule contains a polygon fill and a line.

**15:24** But I'd also like to add a marker to it to represent the golf course.

**15:28** So to do that, I simply choose to add a new marker layer.

**15:32** And you can see I now have a marker layer added to my symbol layers.

**15:35** And this is where I can control the appearance of the marker as well as the placement of it.

**15:41** So if you click on the default symbol, which is this black square, and then go into the properties...

**15:45** ...this takes you into the marker editor.

**15:47** And David's going to talk about that in a minute.

**15:50** But this is where you can create an edit on your markers to create any type of symbol that you'd like.

**15:56** So I'm going to delete the default symbol and I'm going to add a new symbol by creating a glyph from a font.

**16:03** So this is, I have access to all the fonts on my machine, and I'm just going to choose this golf course here.

**16:10** Give it a little more appropriate color.

**16:13** Now this is a little more detail than I would like to see on my map.

**16:16** I don't need a golf course with a sand trap as well.

**16:20** So I can edit this by simply exploding it to multipart geometry.

**16:24** I can select just my sand trap and delete that portion of it.

**16:31** And if we apply that - oops, let me go a little bit larger.

**16:45** So now I have my marker, but obviously because my annotation's centered in my polygon, it's in conflict with it.

**16:51** Since I know most of my annotation is going to be centered in my polygons, I can apply a simple offset to my point.

**17:01** And then when I [click] OK, you'll see that I'll no longer be in conflict.

**17:05** So, it's a simple way for me to just offset my markers just slightly, and that way I should limit or hopefully resolve...

**17:13** ...all my conflicts with my annotation.

**17:15** So that's just a quick example of how you can create the representation and also some of the ways...

**17:19** ...you can build the rules just using symbol layers.

**17:24** Thanks, Jamie. Alright.

**17:28** So we're going to move on, we're going to start talking about geometric effects and marker...

**17:35** I've got to get good at this KVM switch thing. I don't usually use one of those.

**17:39** Alright, so, we're going to talk about geometric effects and marker placement styles.

**17:46** Again, geometric effects dynamically modify the symbology at draw time.

**17:53** And you can set a geometric effect for all the layers in your symbol or just one of the layers...

**17:59** ...in your symbol, or some or not all of them.

**18:01** But you can apply a geometric effect globally to every layer in a symbol if you want.

**18:07** And they're applied sequentially, so you notice there was an order to the layering of the symbols?

**18:14** You can also put an order to the geometric effects.

**18:17** And you can actually get different results if that order changes because, you know, as a - with a behavior...

**18:23** ...you might modify one property and then go modify another one that affected the first one.

**18:28** We'll give you some examples of that.

**18:31** But some of the things you can do with that is, you can do things like control the dashing patterns...

**18:35** ...and you can control the ends of the dashing.

**18:38** So in this case, we're actually controlling where the dash pattern starts and stops so that we can ensure...

**18:46** ...that every place there's a connection, we have a dash.

**18:50** We're also controlling where the corners are, and these are just two different geometric effects on a line that you can apply.

**18:57** For the polygons in this example, we're applying an offset to our buildings and creating a drop shadow for all...

**19:06** ...of our buildings, and all that does is, that's a global effect on all our buildings.

**19:08** It just offsets and creates a drop shadow.

**19:13** And on the, in the last polygon example, we're actually rotating the orchard symbol, so these little tree symbols inside...

**19:22** ...our polygon, we're rotating them to the angle of the polygon itself.

**19:28** And so you can control the way those points are placed within the polygon.

**19:36** Now, marker placement styles are very similar, but they only apply to where you're placing markers...

**19:42** ...and you can create some very complex line and polygon fills using markers for them.

**19:49** So in this case, the first one, we're placing markers along the line to create a little railroad tic...

**19:54** ...and you can tell it how frequently you want to place that little tic, which is a marker, along the railroad line.

**20:00** In the second example, we're placing the little tree symbols randomly inside of our polygon.

**20:06** And we're also giving it an option to be able to place those markers slightly outside of the polygon...

**20:11** ...so that they kind of overlap; it looks a little more natural.

**20:15** And again, we're using a point marker symbol placement option to offset these point buildings...

**20:21** ...to make another drop shadow effect.

**20:24** So, as Jamie showed you in the demo, there's a whole tool for editing your markers and creating symbols.

**20:33** So have any of you guys created custom symbols without representations before, where you're...you go in...

**20:38** ...and create a true type font and modified it using, like, FontLab?

**20:43** Okay, so you don't need to use that with representations.

**20:46** It's one of the really nice things is you have a whole editing tool for building marker symbols.

**20:52** And, the tool has all the standard drawing, kind of editing, tools that you would get in any sort of graphics package...

**21:00** ...so you know, you can manipulate all the vertices of the lines, the colors, you can apply gradient shadows...

**21:06** ...and do all sorts of things with them.

**21:09** And, this is in the Marker Editing tool that Jamie just showed.

**21:16** So, back to Jamie for the next demonstration and I will...

[21:21](#) Thank you.

[21:24](#) As David just explained, you can use geometric effect in marker placement styles to create...

[21:28](#) ...fairly complex symbols and just to improve and control the symbology in your map.

[21:33](#) So I'm going to show a couple examples, some of which David just showed on the slides.

[21:38](#) So here I have a hiking trail that's symbolized with a dash line.

[21:43](#) But because of the way the dashes are falling along the line, it's a little unclear which way the trail continues.

[21:48](#) So down here I have this intersection that's unclear, and then also up here at this sharp corner.

[21:54](#) So to fix that, the first thing I'm going to do is change the way that the dashes are constrained...

[22:02](#) ...at the beginnings and endings of lines.

[22:05](#) So I'm just going to go into my trail rule, and on the dash geometric effect here, I'm going to change the endings...

[22:11](#) ...to end with a half pattern.

[22:13](#) And if you watch this intersection down here when I click Apply, you can see that makes it much clearer...

[22:19](#) ...to which way the path continues.

[22:21](#) Unfortunately that didn't clear up my sharp corner up here at the top, so to fix that, I'm going to add...

[22:26](#) ...a second geometric effect on top of the dashed geometric effect just by clicking on my plus sign here.

[22:32](#) You see, I have several options of different geometric effects that I can apply, but I'm going to choose the...

[22:37](#) ...Add Control Points, and what this does is it tells the line to flag any vertex with an angle of...

[22:45](#) ...120 degrees or sharper as a representation control point.

[22:49](#) And these representation control points can act as constraints that will force the dash to be centered on that line.

[22:56](#) So you can see when I apply this that now my dash is centered on the vertex and it's very clear...

[23:02](#) ...that this trail is turning the corner.

[23:06](#) Now another common effect to add is drop shadows to buildings.

**23:09** And this is a very easy effect to add with representations, so I'm going to go into the properties for my buildings...

**23:16** ...and I see here that I already have a representation on this feature class.

**23:20** So to start with, I'm going to choose that, and then I'm going to add a second polygon layer and add it to...

**23:26** ...the bottom of my list because I want it to be the shadow that I add to the bottom of my symbol...

**23:32** ...and then I'm going to add the Move Geometric effect.

**23:36** And so, and then, not quite so dark a color there.

**23:41** And I want this to be a subtle effect, so I'm going to go ahead and bump these down a little bit from the default...

**23:49** ...and when I apply those, you can now see, I have the shadow on all my polygon buildings, which creates the kind of 3D effect for my buildings.

**24:00** And the final example I want to show you is how you can create a more complex symbol...

**24:07** So here hopefully, okay, good, it looks bright up there.

**24:10** My forested areas are symbolized with just a simple fill, but I want to create a more representative symbol...

**24:18** ...by adding some trees to this.

**24:20** So I'm going to see my forest rule and add a marker to it.

**24:25** And just like I did with the golf courses, I'm going to go into the properties here and change this.

**24:34** And this time, I'm going to choose a pine tree.

**24:40** Keep it a nice green tree 'cause we don't want it to be dead.

**24:45** And I'll change this.

**24:46** And the default for the marker placement options is to center one marker in the center of your polygon.

**24:53** Obviously, that wouldn't be a very representative forest, so I'm going to change that to be randomly inside the polygon.

**25:01** Go ahead and apply that, and you can see...

**25:04** ...I start having to randomly displaced trees, but these are spaced a little too far apart for what I'd like to see.

**25:10** So I can easily check, change that by changing the, my steps and clicking Apply.

**25:17** I can do it, simply see my edits that quickly, I can do all of my symbology work in one screen, or one window...

**25:24** ...and see the results by clicking Apply.

**25:26** I don't have to close multiple windows to get back to my results on the map.

**25:31** So, this is a nice symbol, but I'd like a little bit more detail to it, so I'm going to go ahead and add another tree.

**25:43** I'll choose that same tree again.

**25:45** We'll make this one a little bit lighter.

**25:48** And so that I have some variety in my trees, I'm just going to quickly resize that, create a skinny tree.

**25:56** And again, place them randomly inside the polygon.

**26:04** And when I apply that, you can see they're randomly inside the polygon, but because of the way my trees...

**26:08** ...are being distributed, they're drawing in conflict with each other.

**26:12** This I can fix by changing the seed of one of the trees, and what the seed value is, is it's the starting...

**26:17** ...value for the random generation.

**26:19** So, by changing that, I'm having that second tree start its pattern in a different location.

**26:26** So, I'm almost to the symbol that I want and the last thing I'm going to do is change the way that the...

**26:30** ...markers are drawing on the boundary of the polygons.

**26:33** So the default's to clip the marker at the boundaries and obviously that creates some strange-looking trees on the edge.

**26:40** So I'm going to go ahead and change those to be whole marker boundaries, and with that I've created a fairly...

**26:47** ...complex symbol in a few steps, just using the marker placement options that are available.

**26:56** [audience question] What was the last way to have your markers over the edge of the polygon?

**27:02** The last option in the list is to have them...

**27:08** ...it's to have them not touch the boundaries. So that will place them...

**27:16** ...mic back on so everybody can hear me.

**27:18** This last option is to not touch the boundaries, and basically that won't, will keep the trees completely...

**27:25** ...within the polygon instead of allowing the marker to cross the edge of the polygon.

**27:28** [audience question]What was the one that allows you to, to overlap the boundary?

**27:31** That's the whole markers can cross boundary.

**27:34** Oh, okay.

**27:41** Alright, thanks. Alright.

**27:44** So, we're going to now start talking about overrides.

**27:47** So, everything we've done so far, we've been applying symbols to a layer and we've been doing that...

**27:53** ...as part of the layer properties.

**27:55** So anything you can do now that we just did for the whole set of symbols, you can now do on individual features.

**28:04** So, we call those overrides.

**28:07** So overrides are exceptions to the rule.

**28:10** So we can go in and we can customize individual layers. In them are [unintelligible] individual features in our map.

**28:17** And we've got a number of different ways to do that, and because we're making those changes as we're...

**28:23** ...in features that are stored in the database and the overrides are stored in the database, you have to be...

**28:28** ...editing to be able to do that.

**28:30** So, you need to start editing and, and make those changes that way.

**28:35** There's two kinds of overrides - there are property overrides and geometry overrides.

**28:39** So, property overrides are those overrides that affect any part of the rule that we've been setting up...

**28:45** ...so, changing the color, changing the geometric effect that you're using, changing the marker placement.

**28:52** Those kinds of things are property overrides.

**28:54** Then we can also apply geometry overrides, so that's actually editing the shape of the features...

**29:00** ...and over, you know, storing those in that override field.

**29:03** So, that's how you can, you know, pick up points and move them but keep the true location of the points in your database.

**29:11** So, for example, the property override in this case, we've taken the Paris airport and we've made it...

**29:18** ...red and bigger, bolder, for some reason.

**29:21** We want to highlight Paris.

**29:23** I just came from there last week, so...so that's exciting.

**29:29** And a geometry override, just as an example, is you can go in and reshape the line, so in the top example...

**29:35** ...we're reshaping the line so you've got the true location of the line with the dots on it, and then we've...

**29:41** ...reshaped it to make it a little smoother line, and it's storing that in the override field.

**29:46** So, you can store it in both geometries.

**29:49** And again in the bottom we're actually picking up the bike shop.

**29:52** So, in the Before example on the left, we've got two bike shops that overlap and we want to move those apart...

**30:00** ...but we don't want to actually move the data, so we're just moving the representations.

**30:07** So, creating overrides. There's actually a number of different ways you can create overrides.

**30:12** Interactively, with the representation toolbar, and we'll go into that.

**30:16** That's what most people will, will end up using.

**30:20** You can actually go in and change a rule property explicitly, so you can go into the properties of the rule and change it.

**30:27** You can also have overrides fed to your rules from a field in your database, and this is actually really powerful...

**30:38** ...because you can do things like store an angle field and use that to apply an override...

**30:43** ...and you don't have to go in and rotate each symbol, for example.

**30:48** And then there's a whole series of geoprocessing tools called, in the Cartographic Refinement GP...

**30:54** ...toolset that apply different, different overrides to your map, and they'll do those in batch, and...

**31:02** ...that's actually pretty cool.

**31:04** Yeah, just a quick question up front.

**31:06** [audience question] I was just curious, up to now, so far...

**31:07** ...what would be the difference between just converting the...

**31:11** ...the marker to, to a graphic and moving in your map and storing it in the geodatabase, as opposed to...

**31:15** ...to this, because if you do that, it seems like it would, that also stays with it. It doesn't change the...

**31:28** ...the underlying geometry with the of the point.

**31:30** So, so what would be the difference between just converting your feature to a graphic, and then...

**31:36** ...so that the question and, the question I have is, and then storing that in the database.

**31:42** I don't know the way to store that graphic in the database.

**31:45** I can store it in the map, but I don't have a way to store it in the database itself.

**31:51** [audience question] I thought they had that...I know you can store your annotations in an independent geodatabase.

**31:55** Sure.

**31:56** [audience question] You can't store the graphic changes, you've left it in the database?

**32:00** Yeah, so you can store annotation as if it were kind of like graphics in the database, but if you convert...

**32:07** ...something to a graphic, it's stored in the map; it's not stored in the database.

**32:11** So, that's the difference. Good question, though.

**32:16** So, let's get into the Representation toolbar.

**32:18** So, this is how we actually, if you go in and select a bunch of features and you want to apply an override...

**32:23** ...you're going to use this toolbar to go in and make those modifications.

**32:28** And, in conjunction with this toolbar, you're also going to get a Properties menu that's going to pop up.

**32:35** And this Properties menu has a Tools and a Drawing tab on it.

**32:41** And, what happens is, if you're doing a graphic editing, if you're editing one of the geometry overrides...

**32:46** ...you get access to the tool properties.

**32:49** So, this is my Resize tool that I just highlighted here in orange.

**32:54** So the Resize tool will give me access to this Tool Properties menu and I can then pick and choose the different...

**33:02** ...properties I want to resize.

**33:05** And, you're going to do a demo of this, right?

**33:08** It comes across better in a demo, but basically what you could do is pick, say, one of the properties.

**33:15** Let's just say you want to change your x offset.

**33:19** You can use this tool to drag and have it just change that one offset, if you just check on that one.

**33:26** Or if you wanted to change the size of the whole feature but not your x,y offset, you can just check size and not x and y offset.

**33:34** So you've got a whole bunch of different ways of applying these geometry overrides.

**33:41** Now you also have access to the property overrides.

**33:45** If you click on the button on the far end that's got the little paintbrush over the property page.

**33:48** And this gives you access to all those properties that you set up in the layer, so everything Jamie did...

**33:54** ...to set up a symbol, you can then go in and modify for individual or selected features.

**34:00** So that lets you apply these property overrides to any selected set of features.

**34:09** Now the next thing I mentioned was field mapping overrides.

**34:12** So, this allows you to add a field, or if you add a field to your database...

**34:17** ...you can store any values in that field and actually have your overrides read from that field.

**34:23** Now, this is actually, it can be very powerful and it's actually a really recommended way to store overrides...

**34:32** ...if you're applying overrides to every feature in your database.

**34:36** So, for example, and this example with the little blue squares following the river.

**34:43** I guess those are buildings. I don't know.

**34:46** The buildings along the river - we're going to call them buildings - are rotated to follow that river.

**34:52** So, each one has a different angle.

**34:54** Now, I could go in and apply those and store those in the override field.

**34:58** In that case, it's going to write a separate - it stores these as BLOBs - it's going to store a different BLOB for every single building.

**35:05** It's a lot cleaner to actually store the individual values for the angle, and then you can go in

and modify...

**35:13** ...those just in the field, if you want.

**35:16** So, there are a lot of properties where it makes sense to actually store them as an override in the field...

**35:22** ...and what you'll get is this little database can that shows up on the menu.

**35:28** And you click on that and it will allow you to point a field and you just map all of your, your fields to your overrides.

**35:36** [unintelligible audience question]

**35:41** Very good question. So how would I get the angle populated?

**35:44** There is a geoprocessing tool that - I don't think we're going to show that tool but - we're going to show for polygons.

**35:53** We've got one for lines, one's for polygons, but it's calculate the angle of, and it'll actually do that for you...

**36:00** ...which is kind of nice. Yeah, question?

**36:02** [unintelligible audience question]

**36:05** Is there a reason why that the database can't only next to the angle?

**36:09** Yes, so that's the only field, or only property, that's being read from a field.

**36:14** So you could have next to size, you could have one next to your offsets.

**36:19** In this example we're just using angle, but you could feed all of your overrides in specific fields if you wanted.

**36:30** So, oh, here it is. Okay.

**36:33** So, well, actually this doesn't have it.

**36:36** So, there again, there's a geoprocessing toolset called the Cartographic Refinement GP toolset.

**36:43** And in it we have a whole series of tools for calculating things like the polygon main angle...

**36:49** ...or aligning a marker to your stroke or fill.

**36:52** Well, that's the one that does it to lines, yeah.

**36:55** So, you can align those and it'll calculate angles for you.

**36:59** We also have a series of tools for creating overpasses and underpasses for those kind of geometric effects.

**37:06** And, there's a whole bunch of tools in here, but this is just some of the more common ones.

**37:13** So, Jaime's going to do another demonstration for you.

**37:18** Thank you.

**37:20** Okay, as David just explained, you can have overrides for both properties and geometries, so I'm going to show you...

**37:27** ...a couple of examples of both of those and how you can apply them.

**37:30** So, here I have my orchards and as you can see, the way my markers are placed, they are aligned in a way...

**37:37** ...to mimic rows you would expect to see in a grove.

**37:40** They can improve the way this looks by also having it follow the angle of the polygon.

**37:45** So I'm going to set an attribute field, map to an attribute field, to grab that angle...

**37:51** ...and then have that dictate the way that my rows are aligned for each individual polygon.

**37:58** So, to do that, I'm going to add an attribute field to my woody area, layer here, my feature class.

**38:12** I'll just give it a name here. I'm going to make this a double.

**38:17** And also to point out here, you can see this is, as David mentioned, it's an attribute that gets added to your table.

**38:24** And this is one of the fields that gets added, so we can see that all the rule IDs points to whichever rule...

**38:31** ...is dictated for that feature.

**38:33** And if I wanted to go in and have this orchard actually be a forested area, I can simply just change this rule value here.

**38:42** So to calculate this angle for the tool, I'm going to use one of the tools that David just mentioned.

**38:48** And these are all, live in the Cartographic Refinement toolset, and there's several of them listed here.

**38:53** And that one I'm going to use is the Calculate Polygon Main Angle.

**38:57** And what this tool does is it finds the dominant trending angle of a polygon, and populates...

**39:04** ...that in whichever field that I specify.

**39:09** So I'm going to choose my wooded area layer, and then the angle that I just, the field I just added.

**39:18** And it will process really quickly.

**39:20** And you can see here that all my angles have been added to my table.

**39:25** So now that I have that, I can use that to drive the symbology of my markers.

**39:30** So I want to get into the rule of the orchard and choose my marker.

**39:36** And then I'm going to click on the database down here at the bottom, which is going to take me to...

**39:39** ...the Display Fields Override view.

**39:43** And this view here is where you can see all the properties that you can set to an attribute in the feature class itself.

**39:51** So, as the question was asked before, why was it showing up on only the angle?

**39:56** And it was because only the angle was set here.

**39:58** But the one that I'm going to choose is actually the grid angle, 'cause I want to control the way...

**40:03** ...the grid itself is placed within the polygon.

**40:07** So I'm going to change that to my symbol angle field.

**40:11** And you can see that I have the database can now, and I also have that, my default view.

**40:17** And this is letting me know that it is grabbing the values for that from the feature class.

**40:23** It's coming from the database and that's what's driving that.

**40:28** So I apply that. You can see now that my rows are following the general trend of the polygons themselves.

**40:35** And it's on override because each polygon is using an angle that's assigned to it in the attribute field.

**40:43** So along with setting it to, map to a specific field, I can create individual overrides for a specific feature.

**40:51** So in this case, I'm not a big fan of this single tree up here at the top.

**40:56** So I'm going to change the way these roads are placed in just this orchard.

**41:01** To do that, I do need to start editing.

**41:07** I'm going to go ahead and minimize my Create Feature window.

**41:12** And then I'm going to open my representation toolbar.

**41:16** So this is the toolbar that David was just showing that has the tools that you can use for editing...

**41:20** ...as well as the Representation Property window.

**41:26** And select my orchard here.

**41:29** And what this window shows you is the properties for the specific feature that you have selected.

**41:35** So again, we can see that I have my grid angle coming from the database and we can see exactly what that angle is...

**41:42** ...and I can also change any of these properties here if I want to create an override.

**41:47** So I'm going to change my x offset to improve my rows so that I don't have the random trees at the ends.

**41:55** And you can see, a paintbrush gets added.

**41:58** And basically what this paintbrush is telling you is that the default value for that property is being overwritten.

**42:04** Now, if you decide that's not what you want, you can easily remove that by just clicking on the paintbrush.

**42:09** So it's very easy to apply and remove.

**42:12** Now, of course, I know a value to put in there because I've been playing around with this demo.

**42:16** But if you don't know what you want to put in there, then you can interactively adjust your symbology...

**42:23** ...and that's where this Tool tab comes in.

**42:26** And as David mentioned, this is for any of the representation editing tools.

**42:30** And what those tools are, are resize, move, rotate, offset, and orient.

**42:38** So the one that I'm going to choose is the Move tool, and then as soon as I choose it, it gives me the options...

**42:44** ...of what properties I can change.

**42:47** I'm going to uncheck the y offset so that I'm only changing the x offset.

**42:51** And then I can just interactively move my symbols around till I get them placed the way that I want.

**42:58** And then if we go back to the Drawing tab, you can see again that I'm seeing the override, and the value's been put in there.

**43:07** So everything I was just showing with the orchards are examples of property overrides...

**43:12** ...but you can also do geometry overrides, and then this will hopefully explain some of what we were...

**43:18** ...talking about earlier, about where you store the shape overrides in a representation.

**43:25** So, as I mentioned earlier, in my map, all of my representations are storing the geometry any

geometry changes to the...

**43:30** ...Shape Override field.

**43:34** So what this means is that any change that I make to the shape of my representations won't affect...

**43:38** ...the actual geometry, the true geometry of the feature.

**43:45** So here I have a conflict between my railroads and my roads.

**43:49** So to fix that, I want to move the railroad away from the roads without changing the actual location of the railroad...

**43:55** ...because I might need that later for analysis or for some other reason, I don't need to change the location.

**44:02** So I'm going to use my Direct Select Lasso tool and select the vertices that I want to move.

**44:08** You can see the ones that are going to be affected are highlighted in blue.

**44:13** And then using the Warp tool for my representation toolbar, I'm just going to move those vertices...

**44:17** ...away from my road till I create the look that I want.

**44:23** Okay. So now you can see, I've fixed my conflict, my symbol's now moved away from the road, but if I copy...

**44:30** ...any of these railroads and symbolize them with the simple renderer...

**44:41** ...oops, make it red so you can see it. You can see that the actual geometry of my feature remains intact and accessible.

**44:49** So, if I need it for analysis, it's there, easily accessible, and the changes I've made are only understood by...

**44:55** ...the representation that I edited.

**44:57** So if I have additional representations, they're not going to know what geometry changes I made...

**45:02** ...and it's only understood and displayed by that representation.

**45:06** Hopefully that makes that a little bit clearer for you.

**45:10** And that's just one example of a geometry effect that you can, or geometry override that you can add.

**45:22** Alright. Thanks, Jaime.

**45:26** Okay, we have some odds and ends. Yeah, okay, yes, before we go on.

**45:29** [inaudible audience question]

**45:40** Yes, yes, so, yeah. So an override is just, you're changing some properties of, of one of the rules, or, yeah, any of the properties.

**45:50** [inaudible audience question]

**45:51** No, it's not an either/or. You can pick and choose what sort of properties you want to change...

**45:57** ...yeah, that's good, that means you're getting it.

**45:59** Okay. So I hope everyone else is too. Mark?

**46:02** Would it be possible to use this to make a stream feature of varying width so it looks more irregular and natural?

**46:10** Would it be possible to use this to make a stream feature of varying width?

**46:14** Yes, yes. We actually have a taper geometry effect that does just that for that exact use case.

**46:20** [inaudible audience question]

**46:30** Sure, yeah, so symbol width can be fed with any of those properties and you can feed it with width.

**46:37** So, for example, if you have a stream order, you could use that to make, you know, your streams that are downstream...

**46:47** ...where everything's converting thicker than the streams that are upstream.

**46:51** That make...? Yeah, okay.

**46:54** Yes, real quick.

**46:56** [audience question]Do you use that to essentially erase the line in between two polygons?

**47:00** Could you use that to erase a line in between two polygons?

**47:02** Absolutely. Yes, there is a little Erase tool that you can actually go in and erase parts of features...

**47:09** ...parts of polygons, just about anything.

**47:13** Yeah, good question.

**47:15** [inaudible audience question]

**47:52** Every power line, or every power pole along the line?

**47:55** Yeah, so could you use it to offset, for example, every power pole along a line or separate them further.

**48:02** Yeah, absolutely; that's just an adjustment to the marker replacement on that line, and...

**48:07** ...it's a good example of something you could do. Yes?

**48:09** [inaudible audience question]

**48:22** If you have an exception to the rule you want to apply to just one feature, you just select the feature.

**48:27** So, the same way that Jaime did with that one orchard...

**48:31** [audience question]So she selected it first?

**48:32** You select it first and then apply it...

**48:34** ...and then that override only pertains to that one selected feature, yeah.

**48:39** Mark?

**48:41** [unintelligible]

**48:53** So could you use this to apply contour turnbacks, is the question.

**48:58** We don't have a nice geometric effect that would do that.

**49:03** We've been asked for it before, but there are kind of other ways to make that happen, usually...

**49:12** ...involving the DEM at the beginning before you generate the contours, but...anyway.

**49:18** It's not something we really have a geometric effect for, so. Good question, though.

**49:25** [inaudible audience question]

**49:39** So, when we made the change to the one line, or if you make a change for one feature, what does it do to the attribute table?

**49:46** What we have is we have two fields in the attribute table.

**49:49** We have a rule field and an override field.

**49:51** All the changes you make to that one feature get written to that one feature's record's override field.

**49:58** So, all of those are combined together in a BLOB.

**50:02** [inaudible audience question]

**50:05** Yes, and when you create representations, it automatically adds the Override field, so that's there.

**50:11** So, why don't we hold on the questions, I've got like three more slides is all, and let's just get through them...

**50:18** ...so if other people want to take off or whatever, they can. Actually, we're good on time.

**50:23** So, yeah, if you don't mind.

**50:25** So, the next thing I wanted to just mention and talk about is something called free

representations.

**50:33** So, let's say that all those rule properties and all those geometric effects weren't quite enough for...

**50:40** ...exactly what you were trying to produce.

**50:42** You want to go in and modify every little aspect of your symbol.

**50:46** You can actually do that with representations.

**50:49** Now we really don't recommend doing this a lot, because it literally writes every bit of that representation...

**50:56** ...to that BLOB field in the overwrite, and you can start bloating your database and making it big and slow...

**51:05** ...and so if you apply to free rep to every feature, it's going to make a much more hard...

**51:10** ...it's going to make a database that's a lot harder to deal with.

**51:12** So, use these sparingly, but if you have an, for example, the situation at the bottom, where I've got...

**51:20** ...my representation rule, I've got my trees in it, and they're overlaying this river that's running through them.

**51:25** ...reassign the rule to that feature to get rid of it.

**51:27** I want to actually pick up individual trees and move them around to make a little corridor for the river.

**51:33** I can do that. There is a way to do that.

**51:36** Now, what you do is you right-click on the representation and you say, Convert to free representation...

**51:41** ...and then it brings it up in an editor window that you can actually modify every little vertice...

**51:45** ...every little aspect of the symbol.

**51:48** It's actually really powerful, really cool, but again, I wouldn't recommend doing it a lot.

**51:56** It copies the entire rule into the override field.

**52:00** You can do things like change the whole structure of the rule; you can make it a different rule.

**52:04** Even though it started as a polygon, you know, points and stuff, you can make it a line or something else.

**52:12** You can completely change it.

**52:16** Now to undo that, what you have to do is just reassign the rule.

**52:29** Anyway, free representations are pretty cool.

**52:32** The next thing I just wanted to mention is, there's another tool in production mapping.

**52:39** So, have you guys heard of production mapping? It's a, it used to be PLTS. Anyway.

**52:45** They have a specific tool to help you manage your representations, and it's worth mentioning in this workshop.

**52:52** What it does is, it will allow you to set up all your representations in advance and create a...

**52:57** ...specification for your map series, for example.

**53:01** And what you do is you go through and you set up a table that's got rules and, so rules being symbols...

**53:09** ...and then all the attribute values that used to drive that rule.

**53:12** And you can then apply that to your database and it will apply all of your representation rules at once...

**53:18** ...in batch to all your layers.

**53:20** So where we went through that one layer and converted the representation, you might have to do that 30 times...

**53:26** ...if you're converting all your layers.

**53:28** Well, this tool will do all that for you.

**53:31** And, if you're making more than one map, you're making a, you know, hundred maps, all with the same symbols...

**53:37** ...you can use this tool to apply that across all of them.

**53:40** So, just something to be aware; again, it comes as a, it comes as part of a separate extension, but it is something...

**53:47** ...that you might want to use at some point in the future.

**53:53** So, just one slide on what we're doing at 10.1 with representations.

**53:59** So, one of the things we've done is we added Search at 10.0, at 10, for all of your regular symbology.

**54:09** Well, at 10.1 we've made the representation rules searchable as well, so you can search for representation rules.

**54:16** We've also added a check box on all the marker placement options for rotation, so at 10.0, they only rotate counterclockwise.

**54:27** No, clockwise. Yeah. Counterclockwise. Okay, yeah. Sorry, I have to look at the slide.

**54:34** They only rotate counterclockwise, so you have an option to actually have them rotate

clockwise.

**54:40** We have a lot of people who have their own angle information and they calculated the angle using...

**54:45** ...a clockwise direction instead of counterclockwise, so this allows them to use that marker placement option...

**54:51** ...with the counterclockwise option.

**54:54** And then we have some new geometric effects that are coming out.

**54:56** One is called Extension, and what that allows you to do is extend the ends of lines and give them a direction.

**55:03** So, it allows you to create like the little wing tics off the ends of these bridges, for example...

**55:08** ...so it gives you an extension off the end of your lines.

**55:12** We also have an offset tangent option, which offsets your lines in separate directions, either direction you want.

**55:19** And so this is another kind of good example of where you can use that.

**55:23** So you can offset one bridge symbol one direction, and one bridge the other direction...

**55:27** ...where the roads come in together at this kind of - it's not really acute, is it? Well, it's kind of an acute angle.

**55:38** And the last, oops, let's see, sorry, the last one is a suppress option.

**55:45** So, between control points, you can then turn off your symbol.

**55:50** So, for in this example I've got a swimming area and I'm symbolizing that with a dotted line...

**55:55** ...and I want to suppress the shoreline underneath that.

**55:59** So, I've just got two control points on my shoreline and it just turns off the symbol right at that point.