

# Working with Temporal Data in ArcGIS

This session provides an overview of the functionality, techniques, and tips for visualization, query, and analysis of temporal data in ArcGIS. It includes an overview of considerations and best practices for the conversion, loading, and storage of spatiotemporal data. We will explain and demonstrate core support for time in ArcGIS 10, and cover visualizing real-time data with the Tracking Analyst extension. Examples of concepts and tools to solve some real-world problems will also be given.

<http://video.esri.com/watch/93/working-with-temporal-data-in-arcgis>

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## Video Transcription

**00:03** So the goals of this workshop are to kind of cover the overall concept of time and time in a GIS system.

**00:10** And this will be a few slides, real brief at the beginning, just a kind of a primer on time as it would relate to a map.

**00:18** And then we're going to talk about specific functionality for managing temporal information.

**00:22** And this will cover some of the mapping system and the controls and how you would work with it...

**00:28** ...from a...a usage standpoint of, say, using ArcMap or ArcGlobe or parts of the ArcGIS system.

**00:36** We're going to look into data visualization.

**00:39** And I apologize that data visualization is what I just described.

**00:42** The managing temporalation...managing temporal information is actually data management and not the mapping system.

**00:49** And then we're going to cover a little bit about sharing as well.

**00:54** So the first section here on time and GIS.

**00:59** These concepts are really to explain some of the different ways to measure and model time.

**01:05** And look at some of the common patterns or some of the common types of temporal GIS outputs.

**01:12** So the first thing that we would need to understand when we're dealing with time is the basis of time.

**01:18** And inside of any computerized system, that basis of time is something that's based on a Gregorian calendar.

**01:25** So if any of you have dealt with this, you're aware of some of these issues.

**01:30** And as a programmer or a developer, you can't just write a simple thing and say, Add 365

days to add a new year to a, to a date.

**01:39** 'Cause there's these complex rules.

**01:42** And so that actually matters.

**01:43** Our calendars are not based on a metric system, they're based on astrological definitions technically.

**01:49** So we can't add 31 days to compute a month.

**01:53** Weeks and months are not aligned evenly.

**01:55** I've got a little picture here where Friday is, or Saturday is the first day of the next month, and the month started on a Thursday.

**02:02** And it's complex; it's kind of a problem.

**02:05** So the reason I bring this out...

**02:06** Why does this matter, is that in working with time in a computing system...

**02:12** ...you really need to use that system's guidelines and that system's functionality to do that computation for you.

**02:20** And so we've tried to provide in ArcGIS the tools that will allow you to do these time offsets and calculations.

**02:28** We do it in behind the scenes when we work with different forms of data...

**02:32** ...so that you don't really need to know all of these rules and work with these complexities.

**02:36** There are other types of time systems that we work with as well from a GIS perspective that are really not calendar based.

**02:43** And some of these are things that we would call indexed time...

**02:47** ...where we may have an evenly gridded kind of sequence of events from a modeling perspective, scientific research perspective.

**02:58** And these oftentimes don't represent a time stamp, which is year, month, day, hour, minute, second...

**03:04** ...but maybe it's just a, a number on a number line.

**03:07** It's very interval...interval based.

**03:10** And equivalent to that is something that is what we'd call kind of an epic time or really an epic event.

**03:17** But it's similar to that one I just showed you of a number line, except the zero point is a place that we know of.

**03:24** So if any of you have done work on a UNIX system and you've seen a log file with a UNIX or

Linux type time stamp...

**03:33** ...they just have bas...they've been counting the number of seconds since January 1, 1970, at midnight.

**03:39** And they use an internal number that evolves like that.

**03:42** So this is an example of a, an integer-based or sequence-based numeric value.

**03:49** And we can actually work with that if you have features in a geodatabase or you have some features that you don't have time stamps...

**03:56** ...but you know the interval and the offset between them, we can actually work with that in ArcGIS.

**04:02** However, you know, we make some recommendations to avoid doing a lot of this calculations based on these big integers.

**04:10** The recommendation is to really store your temporal data as a date type.

**04:15** And that's kind of one of the things we'll talk about in that temporal data management...

**04:19** ...is converting and using the system tools to convert from all of these formats into an actual date object.

**04:25** That date object type is part of the geodatabase.

**04:29** There are date types in all of the underlying relational database systems, and even into the operating systems.

**04:35** Or if you're working between Java or .NET, they have that date object.

**04:40** And that date object is actually going to make it easier for migrating data across systems or to do certain operations.

**04:48** So it's always a recommendation if possible, to store that temporal data into that date type.

**04:56** Some additional properties of time that are obvious and...and things that would make sense when you think about it but just...

**05:03** The fact that time is always linear.

**05:05** We don't have this like, where there's holes in time like you might in...in a spatial context, with projections and so on.

**05:14** Time tends to be very unidirectional.

**05:18** And that's a no-brainer, but it...you have to think that way.

**05:22** As we move through time, as we're updating the display...

**05:25** ...things that are current are always replacing or adding to or overlapping things that, that came before.

**05:33** And there's also kind of a cyclical nature about time.

**05:35** And this kind of relates back to that concept of using those interval and regular sequenced time values...

**05:45** ...that you might have with some of your more scientific data.

**05:50** So again, a real obvious kind of case, any of you that saw the plenary session on Monday...

**05:57** ...saw some of the time functionality demoed very briefly.

**06:01** You might have seen this oil spill being mapped in conjunction with some other temporal sources.

**06:09** And...and this answers the question, why do we want to visualize data through time?

**06:13** Because it actually adds value, it actually lets us see something that we couldn't see by just say, printing these all out in a Layout tab.

**06:21** This actually lets us see the evolution or the dynamic change of some features.

**06:28** There're a couple of different types and the one that many of us are most familiar with is...

**06:34** ...what we would call a dynamic type of...of feature.

**06:38** So it's a dynamic pattern, and these are things that move.

**06:42** And so anything from a moving vehicle or...or a vessel or an aircraft to potential...

**06:50** ...you know, satellites in motion, animals that we might be tracking.

**06:54** Things like that.

**06:55** This is what we would call a dynamic GIS map.

**07:00** A similar one is something we would call a discrete, more of a discrete event.

**07:04** So a crime event, or an accident, something like that.

**07:09** And these are not necessarily going to evolve, or have multiple occurrences.

**07:15** It's more often just a single event versus the dynamic is really something that we're keeping track of as it moves...

**07:23** ...so there will be multiple observations of the dynamic where the event.

**07:27** They may all be uniquely represented in your feature class, or in your data.

**07:32** The stationary pattern is another one where we actually look at that as a model where something exists at a known location.

**07:41** So a weather sensor or a traffic sensor.

**07:44** And from that known location, we might get regular or periodic samples of only part of what you would see in that feature.

**07:52** And so there are times where this leads to, and we'll talk a little bit about a data model where we know the location...

**07:59** ...but the time value is with the observed attributes that go with that.

**08:05** And the last one is the, is kind of a change or growth pattern.

**08:10** And unlike the other three, this is usually never really an instant in time.

**08:14** It's usually more of a duration in time.

**08:17** So fire perimeters are a perfect example because fire perimeters are sampled maybe every 12 hours or something.

**08:24** And we see an evolving polygon that's growing as the fire is moving.

**08:29** Or the population or distribution or...or statistical heat map type of output.

**08:34** Those are all things that are a change or growth pattern and they represent a window in time or...or a time duration.

**08:44** In addition to these, these GIS patterns, the temporal visualization function brings different types of integration.

**08:53** So what are the, the different, I guess, resulting data models...

**08:57** ...or external systems that might be contributing information into this system.

**09:03** And so some of the patterns that we've seen quite a bit of are real-time sensor networks.

**09:09** And we've lumped together moving objects and stationary sensors in kind of the same thing.

**09:16** But this is like that dynamic GIS pattern in a way of...

**09:20** ...of events that are happening as vehicles are moving, or as sensors are updating.

**09:24** Another one is that simulation and modeling, which, it kind of calls back to that interval and gridded-based results...

**09:32** ...where we might be producing a complex result of years of research, in weather and meteorology-type research, for an example.

**09:41** And that is also in parallel with what we call multidimensional data, is one of the types of data.

**09:47** So there's a number of ways to bring together, geographically speaking...

**09:51** ...all of these different external sources of temporal information.

**09:56** So here's what, you know, everybody's been wanting to see, is this is now built into ArcGIS.

**10:00** We can handle all of this, it's part of ArcInfo, ArcView, ArcEditor.

**10:06** It's part of ArcGlobe, it's part of ArcMap, it's part of the server, the desktop product.

**10:10** It's there, but how do we use it?

**10:12** Well, we've built in this very simple temporal mapping system.

**10:15** And anybody here not know how to pan or zoom?

**10:18** Okay, I didn't think so.

**10:19** All right, you will not also know how to, you know, use the Time Slider.

**10:24** It's just like that. Moving the Time Slider is like panning through time.

**10:28** And it's going to take you from one range of time to another.

**10:32** So we've built this experience to be built into the product.

**10:35** There's...this kind of describes the whole thing, but in the lower right is, there's a Time tab on your Layer Properties.

**10:41** You open the Layer Properties and you enable time.

**10:43** We're going to see a demo of this in just maybe two minutes here.

**10:47** But once you've set up these properties, the Time Slider is functional and available.

**10:51** And that is something through, like I said, Desktop and Server.

**10:58** So the overall goal of this is to provide the temporal capabilities like you have with spatial...

**11:05** ...to provide that panning through time or to kind of change that scale on time if we want to make an analogy to the zoom.

**11:12** And to provide that like I just went through on the last, I just described.

**11:16** But it works the same in these products and is part of the whole experience.

**11:21** So we're going to actually come up here and Hardeep's going to do a demonstration for us.

**11:28** All right, thank you, David.

**11:31** In this demo, we are...I'm...I'm going to focus on the simple...

**11:35** ...up there, or not?

**11:37** Let's try this...

**11:41** My bad.

**11:42** Okay.

**11:43** So what we'll focus on in this demo is some simplified temporal mapping capabilities which we've exposed.

**11:49** David's already talked about those.

**11:52** What I have here is the Gulf of Mexico oil spill data, and this...

**11:57** ...these are actually the trajectories over time and how the oil...oil was projected to follow certain directions.

**12:05** So this is data which we logged from NOAA.

**12:08** And if I open up the attribute table for the oil trajectory data, you'll notice that for each polygon...

**12:16** ...or each oil trajectory polygon, I have a time stamp associated with it.

**12:21** And this is stored...this information, or the time information is stored in a date field.

**12:26** So if I open up its properties, you'll notice that this is the type-date field, right?

**12:33** So using this information, what I can simply do is I can set the, or configure the time properties on the layer itself.

**12:40** So in order to do that, I'll open up the Layer Properties, and new at ArcGIS 10 is the Time tab, right?

**12:48** Here, I can enable time on this layer.

**12:51** What this means is that now the layer will participate in the map time, which is controlled by the Time Slider.

**12:56** We'll take a look at the slider in a bit.

**12:58** And after that, I need to configure some of the time properties.

**13:02** So in this case, my layer time is stored so that each feature has a single time field, right.

**13:09** So all single time field, which had the time stamps associated with the polygons.

**13:14** So I choose that field.

**13:16** In this case, we autopopulate the...the date...the time field for you.

**13:21** Or you can also pick another time field, like if you have your time stamps in other field.

**13:27** Then you can specify the field format, which in this case, it's the daytime, so we automatically pick that up.

**13:32** If you have a string or numeric field format, we also support those.

**13:37** Then I can specify the time step interval.

**13:40** In this case, my data was collected on a daily basis, so I'll simply use one day.

**13:45** And let's hit OK here.

**13:49** And the moment I did that, we have the Time Slider window icon on the Tools toolbar.

**13:54** [Inaudible] We just drag and drop it right here.

**13:57** This is a new icon, or a new tool, in ArcGIS 10.

**14:01** So I click this, and it's going to bring up the Time Slider window.

**14:05** Let's move this guy back.

**14:07** And now, if you look closely, as soon as I enable time on the map, this is the leftmost button on the slider.

**14:14** You'll see my data is now reflective of the oil trajectory on second of May.

**14:21** Now if I move my slider back and forth, I can visualize my data over time.

**14:31** Now, a simple Time Slider option here is, now I can open up the Time Slider options to configure the Time Slider.

**14:39** So let's open up the Time Slider options dialog.

**14:42** And on the Playback tab, I can refresh the display when dragging the Time Slider interactively.

**14:47** So I'll choose that.

**14:49** And now if I move my slider back and forth, it's going to update automatically, or interactively.

**14:57** The key here is, why do we have it turned off by default is like if you have large amounts of data...

**15:02** ...and if you try to move the slider, it might choke on you.

**15:05** So it's kind of, for...for lighter datasets, it works perfectly fine.

**15:13** Okay? So once you've configured your time properties on the layer, I use the simple Time Slider to visualize my data.

**15:19** The other thing I can do here is I can actually serve this time-aware layer to a map service.

**15:25** The way I can do that is simply using the...the workflow for serving out data.

**15:31** So I have this document which I already created, and I can right-click Publish to ArcGIS Server.

**15:36** In this case, I'll name this to be Oil Spill and hit Finish.

**15:45** And once I have it served out...this is a time-aware service now...

**15:49** ...which means that besides the spatial extent, we're also providing the time information.

**15:54** So the time extent is also persisted with the map service.

**15:58** So once I publish it, I can then use it in a Web client.

**16:02** So I've already created a Web page, which...was...I'm using...

**16:08** I need to do something here, I guess.

**16:16** Let's try it again.

**16:19** Yes, so I'm picking it up.

**16:26** Let me show you another Web page that's again the Gulf of Mexico oil spill, and this is, in fact, on Esri's Web site.

**16:34** Ah, there it is. Finally.

**16:37** It took some time for some reason.

**16:41** So let's go back to my example here.

**16:43** Once I've published it, I can consume it on a Web client.

**16:45** This is JavaScript application I wrote.

**16:48** And the Time Slider here is also provided with the JavaScript API.

**16:53** Also you can use the Flex API or the Silverlight API to construct such a Web page.

**16:59** So the idea here is that once I've published or authored my layer...

**17:03** ...I can then share it with my colleagues or with the entire GIS community.

**17:08** So that's what I wanted to show in the first demo.

**17:14** So we're going to move on and...and spend a little time talking about managing temporal information.

**17:19** As you saw, we had this nice set of data which was these trajectories of...of the projected oil spill area.

**17:27** What happens if the data's not quite as perfect, or the field isn't in the format we want...

**17:32** ...or the fields are distributed in the wrong fashion?

**17:35** So we're actually...that's part of what we're wanting to emphasize for ArcGIS 10, is having the data in the right fashion.

**17:44** Similar to how you might adjust other properties of data spatially to make it fit your overall output.

**17:54** So we're thinking from a data modeling standpoint of different uses of temporal data.

**18:00** And I, I called back to this just a little bit ago.

**18:03** I mentioned time instant, or that, that duration or time extent.

**18:07** The instant is that one point in time.

**18:11** And we call that either a sample from a continuous flow of data...

**18:16** ...so when you read water levels from a stream, it's obviously a sample at that instant.

**18:23** An observation or an event, they're all kind of analogous, so even moving vehicles...

**18:28** ...you know the vehicle's constantly moving...

**18:29** ...but you get that update once a minute that is kind of an instant or an observation.

**18:34** The extent is a time span, and so we, we think of those as a duration or if it's an interval, at times, if it's an even interval...

**18:44** ...say every hour, you can make the assumption that between those intervals, there's a duration that's implied.

**18:51** If it's a very regular set of data.

**18:54** So that is the...the extent.

**18:57** There is also some less common, or maybe we should say very esoteric use cases, such as time in the attribute value.

**19:07** Where you may have features that have really no use of time in the mapping system, but have this validity time or time is valid.

**19:17** And that's kind of the same as transactional time except that's more from a database management standpoint.

**19:23** And it still is important because, from a query definition standpoint, or possibly from a symbolization standpoint...

**19:30** ...you might use those time windows to affect your map output...

**19:33** ...but those are not driven by the Time Slider and the temporal map.

**19:37** Those are things that you would define in your query or in your data adaptation layer, such as your SQL view.

**19:43** So these are the kind of overall uses of that temporal data.

**19:47** We're going to focus on the time instant and time extent entirely in, in these demos today.

**19:57** I mentioned a little bit ago about we recommend using the Date field when we were looking at the other integer and epic numeric types.

**20:08** One of the reasons to use that date type is, I guess, in comparison to string values, is that the date type is quite a bit faster.

**20:17** There are reasons why you might use a string, and actually...

**20:21** ...spell out in there M-A-R-C-H, comma, you know, 2, 1, whatever...I want March 21.

**20:27** There are reasons you might want to put a string value in there.

**20:31** But it's so much slower and it adds a number of difficulties, at least from the mapping and data handling system...

**20:38** ...because we are converting to that date type.

**20:40** So we're going to recommend as much as possible to convert into that date type.

**20:45** And plus, in the geodatabase, you can put an index on that date type...

**20:49** ...and your underlying data storage mechanism will be able to give you those time windows much quicker...

**20:54** ...especially when you're doing Web server-based queries...

**20:57** ...so that JavaScript API, when we click Next, and we get each day's oil trajectory...

**21:04** ...the server asks for that one-day time window, and because we have an index on the data, it can return that result very quickly.

**21:10** Well, for the oil trajectory, not so important, but if you're dealing with a few hundred thousand records, it becomes very important.

**21:20** Since I mentioned the...the format, such as numeric and string formats, I'm going to go into detail here on this.

**21:27** Numeric format is exactly what they look like, except as an integer...

**21:32** ...so if you have an integer in a database that...that is just four digits, you can actually use that as a year.

**21:39** Or you can actually string together year, month, day, hour, minute, seconds.

**21:44** The database thinks of it as a number.

**21:46** You could actually do math on those, it just wouldn't mean anything.

**21:50** So that is one way that we support...and the string formats are similar, except like I mentioned...

**21:55** ...these can have dashes and colons and spaces and commas and on your different format specifiers in the string.

**22:01** The very important point here is that we support these supported sortable formats.

**22:07** So I have a couple examples here, and I've put some green and orange letters.

**22:11** If any of you can't really see the colors in the back of the room, come up and I'll explain this later.

**22:16** But in this string, if I had 2009, 06, 30, greater than 2008, 08, 30, that's true because the year is the most dominant.

**22:25** The year is on the left side, so in that database sorting algorithm, that would be true.

**22:30** If I put month, day, year, with the same date values, it would look as if June is greater than August, which will fail.

**22:40** So we have to just stick with sortable formats for speed and performance...

**22:43** ...so if you're working with string and numeric types...

**22:46** ...you go on the Time tab, and you say I've got string, and you hit that drop-down...

**22:49** ...and then you panic, because you don't have month, day, year.

**22:52** We have tools that allow you to convert that when you import the data.

**22:56** But in the properties from the map system, and on the Layer Properties, it has to be in one of these formats.

**23:02** Additionally, named month strings are just a really bad idea.

**23:05** Which is first, the D or the F?

**23:08** You know, alphabetically speaking, April, August, December, February, et cetera, so stick with the types that are supported.

**23:16** And I'm going to actually jump out real quick just to show...

**23:21** ...as many of you might be having a lot of questions about this at this point.

**23:25** This is a quick jump over to the online help system for ArcGIS 10.

**23:31** Has anybody here looked at, on our Resource Center, for the ArcGIS 10 help?

**23:36** Anybody here surfed through any of this area?

**23:38** Okay, we've got like five or six people here...

**23:40** I'm going to show you where you would go here.

**23:44** In the Professional Library, under Mapping and Visualization, you will be very glad to see there's a whole section on time.

**23:53** And quite a bit of what we're showing today is represented in some of the topics here on time.

**23:59** The Temporal data management is a whole section.

**24:01** Visualizing temporal data, serving time-aware layers, it's all covered.

**24:05** We've got some good examples in here.

**24:09** And all of these string formats that we were talking about earlier are also listed in here as well.

**24:19** So if you ever have a question on any of this, this is all available online. It's all covered.

**24:33** So I just mentioned, you know, what if your time is not in one of those formats?

**24:36** Well, there's a geoprocessing tool that's called Convert Time Field.

**24:41** It does understand all of these other formats because it's actually running a batch processing, converting that...

**24:48** ...and bringing it into that geodatabase as the right format for the mapping system.

**24:52** So we can convert out of order month, day, year.

**24:55** We can do these custom string formats with the word March and the number 21, for example.

**25:01** So in the, in the screen shot, we have here the middle attribute is something called Input Time.

**25:06** And we've run it through this tool to create the date format object and the output time.

**25:12** It's very simple, and it does exactly what it says.

**25:16** So what types of layers in this system, what types of, of ArcGIS functionality is supported by this time system?

**25:25** And it's actually almost all of it.

**25:27** As you would expect, feature layers, data tables, the mosaic datasets, which supported the multidimensional data...

**25:35** ...such as netCDF, tracking layers, network layers, types of imagery, everything with some very limited exceptions.

**25:41** There're one or two, a handful of things, possibly like the old labeling...

**25:48** ...annotation things, and schematics and things like that.

**25:51** Yeah.

**25:52** But with, for, as a general rule, when we put time into ArcGIS at 10, it was in the basemap object.

**26:00** Anything that goes onto a map or into the table of contents, you will at least see the option to enable the Time tab...

**26:06** ...and unless that check box is grayed out, and then there's a few exceptions that don't support...

**26:12** ...but if you have time stamp data on features, more likely than not, or I should say 99.99% chance...

**26:19** ...you can enable the Time tab, choose a format, and this system will work.

**26:25** So this is an...and Hardeep showed this.

**26:28** I could almost skip right past this, but he showed this in his polygons, in the attribute table.

**26:34** But here's the example of, in this case, two different features, and three different time stamps each.

**26:40** So this introduces in your attribute table, duplicates of that feature ID.

**26:47** So you will see this, where you might have multiple features in an attribute table the same

ID...

**26:54** ...but combined with the time stamp is what makes them unique.

**26:58** And so our system handles all of that automatically.

**27:01** This type of data, this, I'd say unnormalized, or all fused together in one record set...

**27:10** ...is the real common one for that first use case of dynamic...

**27:13** ...where you're getting multiple observations of an object that you're following and tracking its progress.

**27:18** But I mentioned a little bit about that weather station...

**27:21** ...or that center network example where we know the location of something...

**27:25** ...but we're getting just attributes of some values and some observations.

**27:30** So if you have that situation where you have a one-to-many or one-to-one join combination...

**27:36** ...there is a geoprocessing tool called Make Query Table.

**27:39** It performs this in-memory join.

**27:42** And when you run that, you're left with that joined table for you to then turn on and enable the time properties...

**27:49** ...and it will work with the Time Slider just like a regular feature class would.

**27:54** So in this example, our station feature class, we have station 43, and you can see we're getting temperatures on a...

**28:05** ...this looks like a yearly basis where we're getting a temperature for the first day of each year.

**28:10** And so we can join that.

**28:11** In a real-world example, it's quite a large number of stations, and maybe millions of observations.

**28:16** But you could still do that join.

**28:17** You can still use that output.

**28:19** Enable time on the Time tab and it will work.

**28:25** When I mentioned the time duration, or the time extent model...

**28:30** ...one of the things that Hardeep showed as well in the user interface was the option of does each feature have one time field.

**28:38** Do we just represent the instant that it was observed, or do we have a starting and ending time field for each feature?

**28:44** If you have a time span of two fields, there are times where we want to populate that in time fields, so we've got a tool...

**28:52** This tool was actually here from 9.2 on as part of the Animation tools.

**28:57** We fixed it up and improved it a little bit.

**28:59** But what it does is it reads row number 2 start time and populates row number 1 and a time.

**29:04** So if you have irregular data, that has nonregular intervals, you might have a few records that were 10-minute samples...

**29:12** ...and then maybe a 12-hour window and then more 3-minute samples and so on.

**29:16** You could run this tool and create those different length, durational end times.

**29:21** And then you could, of course, manually adjust them.

**29:24** And by enabling on the layer, a start and end time per feature, enables you some more advanced type things...

**29:31** ...such as gaps between your feature's times...

**29:34** ...or possible overlaps where the next feature might start before the previous one ends.

**29:39** It's all supported. It's all part of that system.

**29:42** But this tool will create and populate that empty End time attribute...

**29:46** ...based on the next record start time to give you a duration from irregular observations.

**29:54** Another type of data that's supported is the mosaic dataset.

**29:58** Raster catalogs...actually I'm going to have Hardeep explain this one real quick.

**30:02** Okay, in terms of mosaic datasets and raster catalogs, what we, what we have is a similar support as feature layers...

**30:11** ...so there's an attribute table associated with a raster catalog and a mosaic dataset.

**30:17** Now all we need there is that each raster is valid at a certain time, so you can have a time instant associated with a raster.

**30:24** So it's...it's basically as simple as that.

**30:28** And the other thing, something very commonly used, or the use case for raster catalogs or mosaic datasets is that...

**30:35** ...you want to use an index field when you just want to go through the rasters in an order.

**30:41** So you can use that as well.

**30:43** So the ObjectID, for example, could be used there as an index field.

**30:48** Okay, so I'm going to look at the next case, which is What if time is stored in columns...

**30:55** ...and my graphic has gone missing here so....

**30:58** I'm going to do a lot of hand waving and explain this, or I'll try and fix the graphic later.

**31:04** There are types of data where you might have a feature.

**31:06** It's similar to the join situation where you have a stationary feature with successive samples.

**31:13** The Census data would be an example, or we have a feature which is a state, you know, a state of California boundary.

**31:20** And then there's columns for the 1990 population, the 2000 population, the 2010 population.

**31:26** What this tool will do is actually, I guess, denormalize that and create successive feature records...

**31:33** ...with one time attribute column and then populate the time stamp accordingly.

**31:40** So it essentially gives you a more properly formatted table...

**31:46** ...with each feature having an individual time stamp instead of those multiple columns.

**31:51** I guess the key here is that, you know, the ArcGIS framework would understand data which is stored in records rather than columns.

**31:59** Transpose Time Fields? As...

**32:01** Transpose Fields. Transpose Fields.

**32:05** Yeah.

**32:08** It was Transpose Time Fields from 9.2 on; it is now just Transpose Fields as of 10.

**32:14** And I can actually do this across more than just time fields, is one of the things that we did with it.

**32:20** We've talked a little bit about netCDF data and I need to just take a quick survey.

**32:24** Is anybody here working or has worked with netCDF data? Okay.

**32:28** For those that haven't, netCDF data is a storage format, operational storage format for scientific model-type data systems.

**32:38** It is similar to a Fortran array so it's, it's, it's very basic...

**32:45** I guess you would think of it as a Fortran array, but it's really an array of arrays and an array of that array of arrays.

**32:53** As many dimensions as you have.

**32:55** So when we talk about regular data, this is one of these formats that really implies regular data.

**33:00** Because you think of a cube, and if it's three times three times three...

**33:03** ...there's definitely nine values that are stored in that array...

**33:07** ...but as the dimensions grow, and the size of the, of these dimension grows, it becomes a very large numeric storage system.

**33:15** Well, what we have support for in ArcGIS is the ability to use these different dimensions...

**33:21** ...and just like was available from I believe 9.0 on...

**33:25** 9.2.

**33:26** 9.2 as well? Okay.

**33:28** The, the netCDF support allows you to choose one of those dimensions as your time dimension.

**33:35** When you do that, that layer is supported in the Time tab.

**33:40** You can set the intervals; you can use the Time Slider.

**33:42** The whole system works with it as a traditional time-enabled feature layer.

**33:51** So here's a screen shot of the toolbox.

**33:55** There are different tools based on that netCDF conversion of either to a feature layer or a raster layer or to a table view.

**34:05** And you simply choose which dimension is your time dimension.

**34:09** It's in the multidimensional tools if you're looking, if you do get the netCDF file, and you're looking for these.

**34:16** This is actually something that's got some specific use cases with it.

**34:21** If you're not familiar with it, and you have more questions...

**34:25** ...if there's any time yet today, to go to one of the Mapping and Visualization island areas, or inquire about it online.

**34:32** We don't actually have a sample of this today.

**34:35** So the last bit I'm going to talk about in Data Management is Time Zones.

**34:41** And I'm just going to show a couple screen shots and look at this a little bit, and then Hardeep's got a demo coming up.

**34:48** So ArcGIS does have support for time zones in our time handling.

**34:54** And our time zone support is very comprehensive.

**34:58** We support all of the time zones that you'll find in any operating system or development platform.

**35:05** So if you're looking at the time zone IDs in the Windows operating system, we can use those.

**35:11** If you're using Java in ArcGIS Engine, you can use the system time zone from that language or from .NET or whatever you're looking for.

**35:18** We have support for that.

**35:20** We recommend if possible to standardize on UTC, which is that Universal Coordinated Time.

**35:28** And let the...by standardize, I mean from the data standpoint.

**35:33** In, in your ingestion of data or working with sensor data, most sensor systems and...

**35:38** ...and most, say, vehicle tracking-type systems, give out UTC anyway.

**35:44** It's a best practice when you're crossing multiple time zones and dealing with multiple types of sensors.

**35:49** But if possible, don't convert that in your database or in your feature class to a time zone but leave it a UTC.

**35:55** And allow the Time Slider and the properties of the map to do that conversion for you.

**36:01** 'Cause your users might be in different time zones in their systems where their system is running...

**36:07** ...and then the client deals with that conversion for you.

**36:10** Especially important when you're publishing a temporal service through ArcGIS Server to avoid a double conversion.

**36:16** Again, it's not a bad conversion; it's just adding or subtracting a few hours.

**36:19** But why do it twice?

**36:21** And so keep it UTC; let the client do that conversion for you.

**36:25** We do have a GP tool called Convert Time Zone, which is doing...

**36:32** That's not exactly what it's called, is it?

**36:34** It is Convert Time Zone.

**36:35** Convert Time Zone, okay.

**36:36** And it is doing that temporal offset.

**36:39** If you do get some data that's in Pacific time, and you need to actually take off the eight hours offset and convert it to UTC.

**36:46** There's tools that...in the GP framework for that.

**36:51** So some of the added value of that is daylight savings time's kind of a quagmire as well.

**36:58** Daylight savings time is very subjective to political disagreements.

**37:04** There are daylight savings times that adjust less than a one-hour offset...

**37:08** ...so there are time zones of the world that go into daylight savings time by 30 minutes or 45 minutes.

**37:15** And there are evolving definitions; even three years ago, in the U.S. ...

**37:20** ...daylight savings time started almost a whole month earlier than it ever had before.

**37:25** In the last, I believe, 120 years, there have been 16 different definitions of the daylight savings time boundaries.

**37:32** Just in the U.S. and North America.

**37:35** So it's a complex problem because what do you do if you're dealing with centuries of data...

**37:40** ...and you really want that sample to be spot-on accurate to the proper month and it's you know, mid-March...

**37:46** ...and you're not sure when it's...which year is in or out.

**37:49** Our recommendation is to not actually honor that daylight savings time; deal with it as standard time.

**37:57** But then it becomes a transformation that you need to take into account...

**38:00** ...as you make your specific slices or as you cross these boundaries of these time zones.

**38:05** ArcGIS does not have a built-in map of every daylight savings time definition, of every country through time.

**38:13** And it probably won't. So deal with it in standard time.

**38:17** And I'm going to jump over here and show one quick thing...

**38:20** ...just as an illustrative example of, of the time zone problem.

**38:27** This is a good old Wikipedia document.

**38:31** And I show this and a lot of people then just kind of shake their head, and they were never aware of this...

**38:37** ...these types of issues...political issue with, with, with time zones...

**38:42** All of China is one time zone.

**38:43** Did anybody here know that?

**38:44** All of China is one time zone, and it's all Beijing time.

**38:49** So somebody on the western part of China gets up and goes to work and the sun comes up around noon.

**38:56** These kinds of things happen.

**38:58** If we go up and down here on one of these lines, we can look and say, like, right here...

**39:05** ...these are a plus-five offset, goes into a plus-six, crosses into plus-eight, back to plus-five into plus-five and a half...

**39:13** ...we haven't rotated around the globe at all.

**39:16** So these are the kinds of issues...

**39:18** There's no automatic way to kind of geocode a known point into its time zone.

**39:22** It's very political.

**39:24** There's not simple, like, 25 or 26 time zones.

**39:26** There's a lot of regional differences.

**39:30** And so...

**39:31** Plus, you can really see these half time zones; three and a half, four and a half.

**39:35** Australia has one that's a 45-minute during daylight savings time only.

**39:39** So it's kind of messy, and so I always just like to show that.

**39:43** So we're going to do a demo here.

**39:46** All right, so what we've seen so far in the demo is the...the oil trajectory data.

**39:51** Now and moving on with the same survey area, we have some other datasets such as the fishery closures...

**39:58** ...the oil sightings on the beaches...

**40:00** ...and I have some atmospheric data as well.

**40:02** So all of these have a temporal component.

**40:05** However, what I'm going to do here is I'm going to progress through these multiple temporal datasets and visualize these together.

**40:11** At the same time, and in the same way, I'm going to show you the data management tools we have.

**40:17** So how, how, how can you use those to your benefit now when you're dealing with temporal data visualization?

**40:23** So first of all, I have the fishery closures data, so if I open up a...just turn this on...

**40:31** ...and this in fact is the fishery closure polygons, which were put in effect at different times as, as the oil spill was happening.

**40:40** So it was changing.

**40:42** We open up the attribute table here, and you'll notice that it has a start date field which is...

**40:48** ...which actually stores the polygon time stamps.

**40:52** One interesting thing about this data is that it's irregular.

**40:55** So the first polygon was put in place on 18th of May, the second one on 28th, the third one changed on...on the 31st.

**41:05** So for irregular data, as David suggested, what we can do is, we can use the Calculate End Time tool.

**41:11** Before I do that, I'll have to create a field to which I will write my date values, or time values.

**41:17** So I'll just add the date field and call it End Date.

**41:23** You can also use the geoprocessing tool to create it in a, in a, in a model.

**41:28** The Add Field tool.

**41:30** So I'll...I'll use the Date Type here, and hit OK.

**41:34** And all...all of the temporal data management tools are available under Data Management toolbox.

**41:41** Under the Fields toolset, we have the Calculate End Time.

**41:45** We also have the Convert Time Field, which David mentioned.

**41:49** The Convert Time Zone tool is here, as well as the Transpose fields.

**41:53** The other way to find these tools is, go to the Search window...

**41:57** ...this is something new in ArcGIS 10...

**41:59** ...and I can simply type in "Calculate End Time" and search for it.

**42:05** And here I get my tool.

**42:08** Click on it, and, in this case, what I need to specify is the Input table.

**42:13** In this case, it's the fishery closures.

**42:15** The Start Time field in that data was the start date, and the end date is the one which we just added to that dataset.

**42:23** And I simply run the tool.

**42:27** And let me open up the Attribute table, here we have the end date.

**42:30** And essentially what it did was, it copied this particular date in the second col...second record to the first record.

**42:37** So now the fishery closures are in effect for the first polygon from 18th of May to the 28th of May.

**42:43** And likewise, the next polygon is from 28th to 31st.

**42:48** So how can I benefit from this is, essentially, if I enable time on this layer...

**42:53** ...in this case, each feature does not have a single time field, it has two time fields...

**42:58** ...which means that the polygons is valid for a certain duration and time, so I'll choose that.

**43:03** And I can specify the Start Time field and the End Time field.

**43:08** Also the field format is going to be the date format, so I don't need to do anything there.

**43:12** In this case, the time stamp...I'm going to choose one day...

**43:15** ...because the time stamp actually is going...is, is one day here, because...

**43:23** Come to think of it, the fishery closure polygons are changing every five days...

**43:27** ...or ten days, or two days, so that's why I chose one day here.

**43:31** Now I'll hit OK.

**43:33** And now if I move my slider all the way to the 18th, there's my first fishery closure put in place...

**43:41** ...and as I move in time, you'll notice that the polygon is going to change.

**43:46** And my underlying oil...oil trajectory's also changing at the same time.

**43:51** Also I can play this visualization by simply hitting the Play button.

**43:58** [Audience question] What would have happened if you didn't use the end time?

**44:01** In that case, you would have seen some flashing on the screen; like it would have appeared...

**44:04** [Inaudible audience question]

**44:05** Exactly.

**44:09** So, the, some other Time Slider options are, I can go into the Playback...

**44:14** ...and you can see that I can control the speed between each time stamp being displayed on the...on the screen.

**44:20** Also I can play in a specified duration.

**44:23** The other thing I can do here is I can specify the time zone information.

**44:28** We can talk about that in a little bit.

**44:30** The time stamp interval has to...

**44:32** If I...even if I have daily dataset, I can visualize it every five days if I want to, so it'll go to the fifth day instead.

**44:40** Also I have the display date format; in this case, I can choose my format, this date here, to be something different.

**44:47** So let's make it more legible and hit OK.

[44:51](#) So you'll notice that now the date is slightly better.

[45:00](#) Okay. The next dataset I have is the oil sightings on the beaches and the marshlands.

[45:07](#) So this is a point dataset. Let me just turn this on...

[45:10](#) And you can see these are the oil sightings; they have a time associated with it.

[45:14](#) So when our oil was sighted on a beach, they would record it and put it in a feature class.

[45:20](#) So if I open up the attribute table, you'll again notice that it has a start date right here.

[45:27](#) So these were also daily datasets, so at the end of the day, they would record that feature.

[45:32](#) This is the fishery closures, sorry.

[45:35](#) Open attribute table here...

[45:37](#) So here's the date field, actually.

[45:39](#) So it was again collected on a daily basis.

[45:42](#) The thing I wanted to show you here is something called Display the Data Cumulatively.

[45:46](#) So as the oil settings are happening, I want to display this data cumulatively to a certain point.

[45:51](#) The way you do that is you'll enable time on the layer and specify a time step of one day.

[46:00](#) But if...by the way, if I don't specify a time step interval, the system will automatically calculate it for me.

[46:06](#) So it will give us an indication, so let me do this actually.

[46:09](#) I'll do zero days here, and it's going to say like whether you want us to calculate it for you.

[46:14](#) So that's another good feature here.

[46:17](#) So I'll say Yes here, and this stuff I wanted to show you here is the Display Data Cumulatively option.

[46:23](#) Where I'll want to show a progression.

[46:25](#) So the oil was sighted on day one; there was oil sighted on day ten as well, but I want to see all this cumulatively.

[46:32](#) So if I choose this option, and hit OK...

[46:35](#) Let's go to day one.

[46:36](#) And you'll notice that we have some oil sightings on second of May...

[46:40](#) ...but as I progress in time, you'll notice that it's growing in...it's growing cumulatively.

[46:45](#) So all the points remain on the screen or in the display.

**46:50** So this is especially important like if you have something where you want to show progression...

**46:54** ...like a fire progression, or such a progression.

**46:58** Now furthermore, I have the Met Stations data; this is atmospheric data, which...

**47:05** ...for...for these particular Met Stations, so let me turn this on.

**47:08** This is a point feature class.

**47:10** And I'll turn...I'll open up the Attribute table, and here I'll show you we have the stations.

**47:17** So these are point locations of those stations along the Gulf Coast, or Gulf of Mexico coast I'll say.

**47:23** So here I have the station IDs, as well as the names of the stations.

**47:28** What's missing here is the temporal data.

**47:31** So the data was downloaded, you know, using an...an Excel format.

**47:36** So I have this data, which is stored in Excel, and this is the time series associated with each station.

**47:43** So for each station, I have a time associated, and it's an hourly dataset, so for, if you look closely...

**47:50** ...for the same station, I have multiple values for different times...

**47:53** ...for the wind speed, direction, air temperature, water temperature, and the pressure reading.

**47:59** So I'm going to make you a multidimensional visualization geek by the time we leave here.

**48:05** So how do I bring this data and utilize this with my, with my temporal map?

**48:12** The way to do it is I can convert my Excel worksheet data into a geodatabase table.

**48:18** So there's a tool called Table to Table; it's on the Conversion toolbox.

**48:23** If I go in here, it's right here actually.

**48:29** This is a Table to Table tool.

**48:31** So I'll use that tool, and furthermore, we'll, we'll bring in the data first, and let me open up a model I already built so...

**48:43** ...a lot is here to explain there.

**48:46** Ah. Doesn't look good. There you go.

**48:50** So we have the Table To Table tool; it brings in my Excel worksheet data into a geodatabase table.

**48:56** And I've already run the tool to this point.

**49:01** If I open up the geodatabase table, notice that we have our data, which was pulled from the Excel worksheet.

**49:11** So now I can use this data to perform a one-to-many join.

**49:14** I don't know if, if you noticed in the geodatabase view...

**49:17** ...there were 16 weather stations, and we have here about 13,000 observations.

**49:23** And so that's the type of pattern where you would see this join pattern be very useful.

**49:30** So the other thing I'd...if you notice here is that this date format is a string format.

**49:37** And it's kind of a little weird but it's eerier, eerier, so this is 2010, the month of June in this case.

**49:47** And the first of June, 2010, and then zero, zero, zero, it's the twelfth hour or the midnight hour.

**49:55** And then as I progress, it's one, two, three, all the way down.

**49:59** So it's an hourly dataset.

**50:01** Now what I want to do in this case is I want to convert this data, or this time field, into a date field.

**50:07** The way I would do that is again, let's go back to the model.

**50:12** So what I'm going to use here is the Convert Time Field tool.

**50:16** And again, this can be found under the Data Management tools.

**50:21** Right here...Fields and Convert Time Field.

**50:28** And back to my model; let's run this tool actually.

**50:34** So now, what it's doing is, it's going to go through each time stamp stored in the string format...

**50:38** ...read that format, and convert it into a date field.

**50:45** [Audience question] Are all these tools available with the ArcView bundle?

**50:48** Yes, they should be.

**50:50** So let me open up this tool actually; I forgot to do that.

**50:53** Let's see, Input Table is the format; the Input Time field.

**50:57** The other thing you can specify here is the Input Time format.

**51:01** And here are the different formats which we support.

**51:03** So you can have your data in different formats. This is a string format.

**51:07** Also, something interesting here is the Custom format.

**51:10** So David explained if you have your date written out as March 3, 2010...

**51:15** ...you'd take that custom format and convert it into a date field.

**51:18** So something very, the given, the given message here is that use the date field if you can, so that...that's very important.

**51:25** It's faster in terms of query and display of data.

**51:31** So let's take a look at my table now. So it's the same table. I'll open it up.

**51:36** Here's the date field. And it's all automatically calculated, you know, what...what time of the day it is.

**51:45** Now, now to use this data, what I can do is I can perform a one-to-many join with individual stations.

**51:53** So I can join the time series data for individual stations based on the fact that...

**51:59** ...if I open the attribute tables here, you notice that this has a station ID.

**52:04** And likewise, the meteorology data I have has a station ID too.

**52:08** So I can use the SQL expression there, and the Make Query Table tool, I'll show this in a second here.

**52:14** So let's open up the Make Query Table tool, which can be used for creating a one-to-many join.

**52:19** What it inputs is, is the, are the tables.

**52:23** So the one is the Met Stations feature class I have, the point feature class.

**52:27** And then the second one is the meteorology data I had in the table.

**52:31** So once I do that, I can specify which fields do I want to bring along into the, into the output layer.

**52:38** One tip here is that if you want your output layer, output table to be in the form of a layer, with the associated points...

**52:46** ...you should pick the shape field here for sure from the, from the input feature class.

**52:52** And likewise, I can bring all the other fields in the output table.

**52:57** The key here is that I need to use it, use an expression.

**53:01** I can go into the SQL, or the Query Builder and specify that the station ID in the feature class...

**53:06** ...is the same as the station ID in the meteorology data I have.

**53:11** And that's about it, actually. And I run the tool.

**53:20** And here's my query table layer, which got added, and it's an in-memory join...

**53:25** ...so here's the layer, which gets stored with the map document as well.

**53:28** So I have all this data now, and how do I visualize this?

**53:33** I have these variables, there...there's a lot of variables in here.

**53:37** If I open up the attribute table again, we have everything in terms of the wind speed, the direction...

**53:43** ...the gusts, the air temperature, water temperature, barometer.

**53:47** So it can, it can be important like when you're dealing with such a situation when the various barometers...

**53:54** ...the wind speed, for example, is an important one.

**53:58** The water temperature is an important one, too.

**54:00** So how do I visualize this?

**54:02** So what we can do is I can...I can...I'll show you how you can symbolize these points effectively.

**54:08** So let me open up the Symbology tab here for the Query layer.

**54:13** And under Categories, I can choose to symbolize my data with wind speed.

**54:19** So that's the color, the wind speed will be reflected by the color changes, all right?

**54:24** The other thing I'm going to do is I'm going to change the symbology and choose an arrow symbol here for the wind direction.

**54:31** So let me choose a character marker symbol.

**54:34** Use a dimensioning one, I like this one better.

**54:38** And I'll use this.

**54:40** And I'll choose a darker...oh, it's the same one...use this.

**54:48** The other thing, I've...I've completely forgot about, is I'm going to make these arrows slightly bigger...not that big, but...

**54:58** And so I have the wind speed all, all sorted out.

**55:02** I have the wind...the arrow, arrows, arrow symbols here.

**55:07** How do I use the wind direction now?

**55:09** So let's go to the Advanced tab here, and then you can apply rotation based on the attributes.

**55:15** So I'll use the wind direction here and hit OK.

**55:23** And what you're going to see here is a bunch of overlapping arrows, and these are the wind directions, so, right.

**55:32** The...now to visualize this over time, what I'm going to do is enable time on the layer, go to the Time tab, enable time.

**55:44** It's automatically going to pick the field.

**55:46** In this case, my time step is going to be hourly, so I'll hit OK here.

**55:50** The other thing I want to cover here is the time zone...

**55:53** ...so you can also set the time zone if your data was collected in a different time zone.

**55:57** Right.

**55:59** Hit OK here.

**56:03** And let's open up the Time Slider options.

**56:06** In this case, I'm going to choose a time step of my slider to be one hour.

**56:13** And again, if you've set some time zone on your layer...

**56:16** ...you can choose to visualize your data in a different time zone as well...

**56:19** ...so we have all the time zones listed on this machine.

**56:23** Right?

**56:26** I hit OK here, and let's go to the month of June.

**56:32** And now you can see like if I zoom in closer to this area, you can see those arrows.

**56:43** I'll turn off this point dataset, and as I move the Time Slider...

**56:47** ...these arrows are representative of the wind direction, as well as the wind speed.

**56:52** Furthermore, if I want to visualize the wind gusts, as well, the values there...

**56:58** ...I can choose to label these points with the, with the wind gusts, or an attribute field.

**57:04** In this case I'm going to use wind gust and specify the size.

**57:10** Hit OK, and here I have the wind gusts as well.

**57:14** So all of a sudden, what we've done is we've used this atmospheric data...

**57:18** ...and visualized it now using symbology and some of the Data Management tools.

**57:24** All right, this is what I wanted to show you is.

**57:30** Okay, well that was a whole lot of stuff, wasn't it?

**57:33** We're going to cover a few more things, and kind of...

**57:38** Let's see, ten after eleven here, so we're going to keep going and talk about some more advanced data visualization.

**57:45** And these advanced visualizations are things which are much less common or likely to be used.

**57:53** What you saw there was just time in ArcGIS mapping.

**57:56** And it's pretty easy to use, and I know every one of you is going to be using it.

**58:00** So what the advanced concepts cover are things such as time animations.

**58:07** What you saw there was, yeah, it was an animating display.

**58:09** When we play back, or we use the Time Slider...

**58:12** ...but as far as creating an animation, there's an animation framework in ArcGIS...

**58:17** ...which is basically just to animate the display and create like a video file...

**58:21** ...so if we want to export some, some specific things.

**58:25** Along with moving through time, the animation subsystem allows you to place a camera...

**58:31** ...and to move that camera through your animation, so you can do flyovers...

**58:35** ...and you can pan across areas and change your extent through time.

**58:40** And that's a more advanced, I guess, set of functionality.

**58:46** As well as, say, fading in and out of different layers, as well.

**58:50** If you have existing time layer animations, such as what you had in ArcGIS 9, those should also work the same in ArcGIS 10.

**58:59** And they're going to, when you use that Time Layer Animation, it's going to set the time properties on that later.

**59:05** So it's basically time enabled.

**59:08** If you're just looking to visualize data over time, you're not going to do this.

**59:12** You're going to use the Time Slider and all the time properties we've showed you.

**59:16** I'm going to give you an example here, of, in this case, moving a camera through time...

**59:21** ...so we have a camera in space, we're changing extents, and then we're going to pan and we're going to come in...

**59:26** ...as well as moving through, moving through space and time.

**59:30** And you can do these consecutively and concurrently in an, in an animation.

**59:35** So if you're looking to create something like this, even if it's not the big globe kind of scale...

**59:40** ...the animation framework is time enabled, and it does allow you to move the camera through time.

**59:46** Another type of visualization, which is not part of the mapping system per se, but is data through time.

**59:54** So creating a graph as part of the data that you're, you're looking at, you might create a graph.

**1:00:02** And this works just like it did from 9.2 on.

**1:00:07** Yeah, it's the same.

**1:00:09** Other than it's hooked into the Time Slider.

**1:00:12** So it's going to use the same time extent that you set the map display will control the graph.

**1:00:17** I'm going to show you an example on the next one.

**1:00:18** Okay. And one other type is, what we would use, a Tracking Analyst example.

**1:00:25** This is an extension; it's not designed to do any of the things that we've looked at here...

**1:00:33** ...but it's designed to basically monitor and observe real-time data.

**1:00:37** And so Tracking Analyst will create track lines from multiple-point observations.

**1:00:41** And it will try and do predictions on where a vehicle might be headed.

**1:00:45** And then there's advanced aging of information and per-feature analysis.

**1:00:51** And so the Tracking workflow is definitely...there's a whole booth on that; it's an extension product.

**1:00:55** It is also time enabled; tracking layers participate with the Time Slider just like the rest of ArcGIS.

**1:01:01** But it's a real-time and more advanced type of visualization.

**1:01:05** So we've got a demo coming up here.

**1:01:13** All right, I'm still not done with the multidimensional visualization, so I'm going to continue on that streak.

**1:01:22** I have the Met, the atmospheric data aggregated by the day...

**1:01:25** ...so what I did was I used the Summary Statistics tool, and aggregated by the day.

**1:01:30** So if I open up the aggregated data...I'm not going to show you that now; we're kind of running out of time there.

**1:01:36** What I did was I created the...the mean wind speed for the entire day, the max air temperature...

**1:01:43** ...max water temperature, and likewise for the other, other, other ones, right.

**1:01:48** Also, I have the time associated with that, so I'll enable time on this.

**1:01:58** And the other thing I'm going to do here is, I've...I've already created a graph...

**1:02:02** ...which represents the other parameters, which we didn't visualize.

**1:02:08** And in this case, it's a bubble graph, so this is something new in ArcGIS 10.

**1:02:12** The bubble graph, in fact, is, allows us to visualize multivariables.

**1:02:19** For example, in this case we have the wind speed and the atmospheric pressure...

**1:02:22** ...and the size of the bubbles is representing the air temperature.

**1:02:26** So all of a sudden, we have some more variables which we can look at over time.

**1:02:31** The other thing I'm going to do here is I'm going to set the Time Extent of the slider to be the same as the Met...the aggregated data.

**1:02:38** So the way to do this is go to the Time Slider options.

**1:02:41** Here on the Time Extent tab, I can choose to visualize only a certain, a certain time extent, which is of interest to me, so let's do that.

**1:02:51** And I'll essentially use a Met, data aggregator.

**1:02:54** Hit OK here.

**1:02:56** And now if I move my slider over time, you'll notice that the bubbles are moving as well.

**1:03:04** All my data below is moving, and at, on fifteenth of June, you know here's the air temperature...

**1:03:10** ...here's the atmospheric pressure, the wind speed, the wind gusts, oil trajectory, all of it is right there.

**1:03:17** All right.

**1:03:18** Now furthermore, David mentioned that we can also use Tracking Analyst layers.

**1:03:23** The main advantage as...as you look into, from the temporal visualization perspective...

**1:03:27** ...is that Tracking Analyst comes with advanced rendering capabilities, wherein you can render based on time.

**1:03:34** So let me add...I'm going to close this guy here.

**1:03:37** And I'll add a tracking layer.

**1:03:40** So there's the Tracking Analyst toolbar, which has some tools for advanced temporal visualization as well as analysis.

**1:03:50** So I'll add the temporal data here, and in this case, my data source is going to be Hurricane

Alex.

**1:03:55** Now it's called Tropical Storm Alex, I guess.

**1:03:59** And in this case, I'm going to go to the point feature class.

**1:04:04** This is one of the datasets I downloaded, and this is probably not reflective of where it eventually ended up being.

**1:04:12** But what I can do here in this dialog, I can specify the Date\_Time field, which contains the...the...the time stamps.

**1:04:20** Also I can choose something called a track ID.

**1:04:23** In this case, we're going to use the, a storm name.

**1:04:26** So this track ID can be used for, for a variety of purposes, and one of these is symbolizing over time.

**1:04:33** So let me add this dataset; let's go to a bookmark, and here I have the Hurricane Alex, or I'll just call it Alex, I guess.

**1:04:45** It's not a hurricane any longer, so.

**1:04:48** So once I have that in...in here, I can go to the Properties...

**1:04:53** ...and it's symbolized based on the advanced rendering capabilities there.

**1:04:58** So I can choose to have the most current event based on a different symbol.

**1:05:02** So I'll choose that, and I'll symbolize the most current event with a hurricane symbol.

**1:05:08** So I'll search for that symbol...probably this is new at ArcGIS 10 as well, the ability to search symbols.

**1:05:15** So I can do that, and I'll choose hurricane; hit OK.

**1:05:21** The other thing I'm going to do is I'm going to use the track IDs and create a track out of it.

**1:05:27** So as a point moves, there'll be a track as well.

**1:05:30** So I'll choose that and hit OK.

**1:05:35** So now in order to visualize this over time, we again go to the Time tab.

**1:05:39** This has slightly a different...a different look and feel, the Time tab here...

**1:05:44** ...because the date time and all those properties have already been configured on the Add Temporal Data Visit, which I showed earlier.

**1:05:51** In this case, I want to keep this layer synchronized with the map time.

**1:05:54** And also I want to display the data cumulatively.

**1:05:58** So I want to keep the track as it, as we progress in time.

**1:06:02** So let's go all the way to 20-6.

**1:06:08** Maybe a better way to do it is simply go to the Time Extent, and let's choose Hurricane Alex in this case and hit OK.

**1:06:16** And now if I progress over time, you'll notice that I have a track associated with my point feature class.

**1:06:26** Now this is a tracking layer; now that, that's the example there.

**1:06:30** And also I have my other datasets being animated at the same time.

**1:06:34** Right? That's about it.

**1:06:38** Okay, so lots of different types of data and lots of different things we can do with it, all related to the map time.

**1:06:46** Time Slider sets the time on the map, just like panning and zooming set the extent.

**1:06:51** All the time-enabled layers, they're enabled on that map, will respond to that map time.

**1:06:57** We're going to just kind of summarize some of these best practices.

**1:07:01** You saw these little yellow check marks throughout the presentation.

**1:07:04** Some of you were writing them down; that's good.

**1:07:07** Use a Date type field whenever possible.

**1:07:09** Index that Date type field; use UTC and avoid issues with time zone differences.

**1:07:16** Use standard time if possible.

**1:07:18** We have a good set of data conversion tools to convert into the supported field types and storage formats.

**1:07:27** And if you have questions about the data models and when to use the single or join table structures...

**1:07:33** ...that is also part of our documentation as well, which I didn't go through on the help system, but that is also covered.

**1:07:40** And future directions, I will mention there is a Special Interest Group discussion at 1:30 this afternoon...

**1:07:48** ...for people that are doing research into space-time modeling.

**1:07:52** So if that's a focus area and you've spent a lot of time working on multidimensional involving time...

**1:07:59** ...1:30 today, it's in room 31A, and it's going to be a packed room, because it's only about this big...

**1:08:06** ...and there's already a lot of people that are coming.

**1:08:08** But you'll be able to meet other people with similar interests...

**1:08:11** ...and provide feedback to some of the engineers and developers that are working on time at Esri.

**1:08:17** Other future directions are looking at things such as time as it relates to metadata...

**1:08:22** ...some advanced concepts in temporal data management.

**1:08:25** We've done a bit of work in 10; there's more work to go as far as automating some of that data processing...

**1:08:31** ...which we're maybe looking for feedback from you on.

**1:08:35** And you know, what do you need?

**1:08:37** We need to get information; you have a survey form out there.

**1:08:41** You can start filling that out; we do have, I think, five minutes or so for questions and answers, so question right here.

**1:08:47** [Inaudible audience question]

**1:08:53** Repeat the question.

**1:09:00** So the question was, when you create a graph, do we need to do something special there to make it time aware?

**1:09:06** [Inaudible audience question]

**1:09:07** In the graph creation process, I would suggest that there's something...

**1:09:13** ...when...when you are dealing with graphs, when you update the graphs, sometimes the axes need to be set to a certain time.

**1:09:21** So you can choose to have...right now what we do by default is that the axes are going to be set...

**1:09:29** ...the values on the axes will be set automatically, so you can choose to preset those values, the maximum value on the graph axes.

**1:09:36** So that makes it look better.

**1:09:38** The other ones are...it's there in the help as well.

**1:09:42** There's some tips and tricks in terms of how do you create graphs and visualize it over time.

**1:09:47** So you might want to refer to that, but if there's something specific, I can show that to you, like how I created this one.

**1:09:54** We can go there, right?

**1:09:56** Okay, in the back there?

**1:09:57** [Inaudible audience question] How do these tools work with a geodatabase [inaudible].

**1:10:03** So the tools don't...Okay, the question is, how do these tools or the temporal mapping system...

**1:10:08** ...work with geodatabases where there are archive tables?

**1:10:11** There's not an automatic acknowledgment of those history or archive tables in these tools.

**1:10:17** If we...Let's see if I have it here, quickly...I don't know how quickly I'd find it. Yeah.

**1:10:24** If you remember this slide here, where we were kind of talking about system-generated auditing in the database, et cetera.

**1:10:31** There are some patterns for time in the database that are not time as an attribute...

**1:10:37** ...where we can actually control that through our mapping system.

**1:10:40** And so that's part of future directions, is how do we honor archived and historical...

**1:10:45** ...or delta table-type information that has specific time windows on it.

**1:10:51** But not all of that archived data is meant to be used.

**1:10:54** It's like interval or animation-style time.

**1:10:57** So we need to get better understanding on that. But it's not something that's there at 10.

**1:11:03** Let's see, right here.

**1:11:04** [Audience question] Can you use other formats like Julian dating...

**1:11:07** ...and the other question I have is can your polygon's start and end time overlap?

**1:11:14** So I'll answer...There's two questions here, the first one, and I'll have you answer the first one about the Julian date.

**1:11:20** The Julian date, yeah, out of the box, we don't, but if you...

**1:11:23** ...if you want to do it programmatically, yes, there is, there are ways to do it on the time object, so.

**1:11:31** And you'll have to develop your own custom, custom slider for....

**1:11:36** So and then can you repeat the second part of that question?

**1:11:38** [Audience question] If you have a, your polygons where you have the start and end date so your, your fishing seasons overlap.

**1:11:45** Yes so, the question is, can a polygon where there's multiple time stamps on a polygon...

**1:11:49** ...that have start and end durations, can those durations overlap?

**1:11:54** And, excuse me.

**1:11:56** I think, what I'm understanding here is that one, let's say you have one polygon which is valid from T1...

**1:12:04** ...not T1, but say, it's valid from January first to January thirty-first...

**1:12:08** ...and the second one is valid from January first to January fifteenth.

**1:12:13** Is that reflective?

**1:12:14** [Audience comment] Or one from the fifteenth to February something.

**1:12:17** Yeah, it'll show both the polygons at the same time.

**1:12:20** So then when it's...

**1:12:21** Each, each polygon is essentially almost like its own feature, you might have the exact same area and boundary...

**1:12:27** ...and it might be this is a clone of that polygon with different times.

**1:12:31** And those separate features, as we play through time with the Time Slider...

**1:12:36** ...there might be gaps where they don't have continuous where it might kind of flash on and off.

**1:12:41** Or they may overlap, and if it's an overlap condition and it's the same boundary, you won't see it.

**1:12:46** If it has evolved, you might see both of them briefly until that overlap is gone.

**1:12:52** So...I'm going to take one back here.

**1:12:55** [Inaudible audience question]

**1:13:09** Yeah, can you switch real quick?

**1:13:12** So the question is, if...if time is continuing to evolve, and the underlying time repository is not static...

**1:13:19** ...and things are being added continually, can you keep this current?

**1:13:24** And I'll mention that, in, if you publish this, a layer against that time source, and you publish that through Server...

**1:13:31** ...that it's very easy in say, JavaScript or something, to refresh every minute and so on.

**1:13:36** In, this, in, in...

**1:13:38** Yeah, this option here, you, what we, for historical data, we suggest that you calculate the Layer Time Extent.

**1:13:45** So that's what the slider actually uses to calculate the full time extent.

**1:13:50** The other thing you can do here is you can choose this option...

**1:13:53** ...which saves data changes frequently, so calculate the time extent automatically.

**1:13:58** So using this option, the slider knows that there's a dynamic layer...

**1:14:02** ...and it'll show the dynamic layer in the, in the...in the table of contents.

**1:14:06** [Inaudible audience question]

**1:14:10** When you say that...

**1:14:11** [Audience comment] So the underlying data doesn't follow...

**1:14:13** The underlying data can be based on a view regardless.

**1:14:16** What happens here is this time extent gets saved into the layer with that setting, which right now is the ninth of July.

**1:14:24** And so the Time Slider would come to the far right and stop.

**1:14:26** And the server would not know that the data is changing as well, so the Web clients, et cetera...

**1:14:31** ...if you click that check box, then every time you bring up the Time Slider, or every time the map is loaded into the browser...

**1:14:37** ...it queries for the time extent, and it finds the range of time.

**1:14:40** [Audience comment] That's cool. I was just...the underlying data itself can be a view that's changing [inaudible].

**1:14:46** Yeah, I see. Yeah, yeah.

**1:14:48** Yeah, so have you looked...?

**1:14:49** There's something, you know if you are in your map document already, you, there's some tools here which I didn't cover.

**1:14:56** This is the Full Time Extent.

**1:14:57** So let's say your data's changed, you could, if you click this button, it's...it's automatically going to calculate the new time extent.

**1:15:04** The other thing is, have you looked at the query layers that are part of 10 now, where you can build a layer based on a SQL query?

**1:15:11** [Inaudible audience comment]

**1:15:12** That might be something, like if you just have a view against a...

**1:15:14** ...like say an Oracle table or something, you can build a query layer against that raw data.

**1:15:19** And if that data changes, when you bring up the Time Slider, it will find the newer date fields.

**1:15:24** Yep. So. Thanks.

**1:15:26** Let's see, over here.

**1:15:27** [Audience question] When you showed the Make Query, Query Table tool, and you said it would...

**1:15:32** ...does that actually, will it allow you to average [inaudible] values for a whole day?

**1:15:36** No.

**1:15:37** [Audience question] Or is that a separate tool?

**1:15:38** That's a separate tool; I used the Summary Statistics tool on that.

**1:15:41** [Audience question] So you used Make Query and then Summary Stats table?

**1:15:45** Yeah, that's what I used on that.

**1:15:47** So actually, you don't need...

**1:15:49** ...yeah, let me, let me...

**1:15:51** [Audience comment] Yeah, that would be awesome if you...

**1:15:52** Let me answer this again.

**1:15:53** So you have the time series data; you could actually run the Summary Statistics tool on that data itself.

**1:15:59** And then use a Make Query Table.

**1:16:01** So that'll be even better, because you don't have to join like a larger dataset that's already aggregated to a daily...

**1:16:08** [Audience comment] But when you do that Make Summaries Stats table...

**1:16:10** Yeah.

**1:16:11** [Audience question] Can I say, average it, average this station for this season?

**1:16:16** No. No, okay.

**1:16:17** Yeah, you could do, I can give you a trick here.

**1:16:20** What you can do is you can create a new field and say that you know, these...these features are valid for a certain season.

**1:16:28** See what I mean? Like these, these'll be grouped by a season then.

**1:16:31** And that's where you would use the Summary Statistics and say that this is the field, the season field...

**1:16:37** ...is which I want to base my summarization on or, you know, howsoever you want to summarize the data.

**1:16:44** Okay, I don't see that there's the next presenter here, but I'm going to keep taking questions.

**1:16:49** I just want to say before we might get flushed out that, thanks everybody for coming...

**1:16:53** ...but stick around and keep asking questions until the next person shows up, so.

**1:16:59** Yeah. Back there. Yeah, right there.

**1:17:01** [Audience question] In your Time tab on your layer [inaudible] in a checkbox.

**1:17:07** [Audience question] Does that just make the symbol persist? Or if I was doing rainfall, would my symbol actually [inaudible].

**1:17:20** [Audience question] I have...I've irradiated.

**1:17:21** Yeah.

**1:17:22** [Audience question] So my [inaudible] season, my data is in a format of inches per day.

**1:17:31** [Audience question] But my display is the range over time. Does that make sense?

**1:17:34** So it's going to be like, on the second day, you want it to be...

**1:17:38** [Audience question] Two inches.

**1:17:39** Can I ask a question here?

**1:17:40** I think our use of the word cumulative is that the map display is a cumulative display of features.

**1:17:46** Are you looking to say that that feature grows, the feature accumulates?

**1:17:49** [Audience comment] Correct. From here, when you say cumulative, you're really saying persists.

**1:17:53** We're saying, we're saying the older feature persists when the next one comes...

**1:17:57** [Audience comment] Correct.

**1:17:58** ...but the map display is cumulative in multiple features.

**1:18:02** We're saying the map is accumulating multiple features.

**1:18:04** [Audience comment] Correct, so you're not accumulating...

**1:18:07** The data. No. No. The data's not accumulating into a single feature.

**1:18:10** When we look into that...into that direction for sure, you know...

**1:18:13** ...that's why we want to hear like what you guys want in terms of data aggregation and all this stuff.

**1:18:19** Okay.

**1:18:20** [Audience question] I've been asked to, by...I've, I've...

**1:18:23** [Audience question] ...I've worked with [inaudible] with the city, and I've worked with parcels.

**1:18:26** [Audience question] And I've been asked by the planners to be able to click on a piece of land...

**1:18:30** ...[Audience question] and see how that's been zoned through time.

**1:18:33** Okay.

**1:18:34** [Audience question] Or how it's been subdivided through time is a separate problem.

**1:18:37** [Audience question] Can, can I show, will the symbology change when I, when I click through times?

**1:18:46** [Audience question] It was zoned industrial, and then it was, or it was zoned county and then it was annexed, [inaudible].

**1:18:52** Yeah, it should like...

**1:18:53** Yes. Yes. It should, yes.

**1:18:55** [Unintelligible speech]

**1:18:58** What you...I was going to say what you may have is, through some span of time...

**1:19:01** ...where there might be all kinds of other iterations on the features.

**1:19:04** You might have this parcel that just existed, and when it goes away, say, in January 28 of some year...

**1:19:10** ...now maybe there's two parcels that replace it, right?

**1:19:13** So it's up to you whether one of those new parcels keeps the same parcel ID of the old one or do you create new...two new IDs.

**1:19:20** That's part of your data management, right?

**1:19:22** But, but essentially a polygon would duration to some point, and it would no longer be valid...

**1:19:27** ...and two new polygons might be in the same space as what the previous one.

**1:19:31** And they're now persisting forward from that point on.

**1:19:33** As far as rendering, and...and showing the symbology of that, any of the attributes can affect the rendering...

**1:19:38** ...so you could have different color values, or outlines, or crosshatching, or anything based on those attributes that you have.

**1:19:45** [Inaudible audience question]

**1:19:49** So the question is, can you animate rasters through time?

**1:19:52** Yes, you can.

**1:19:53** So the key here is that you have to create a raster catalog or a mosaic dataset.

**1:19:57** And have an attribute field which has the time stamps.

**1:20:01** So that's...as soon as you have it, you enable time on the layer, and yeah, you [inaudible] business.

**1:20:07** [Audience question] So if I was to set up a layer like this, with, with [inaudible] problems, switching out the data source with Python?

**1:20:18** When you have such a dataset, and if you switch the data source...

**1:20:23** [Audience question] Yeah, if I had just any of these layers up here, if I went and switched the data source through Python...

**1:20:30** To do something different.

**1:20:31** So keeping the existing, let's say, layer properties, the symbology or whatever, but just changing to a different data source.

**1:20:38** I think that would be...

**1:20:39** Yes, it's...

**1:20:40** It's not a pattern that we've, we've really built up a new one from a data source and changed the properties in Python, but...

**1:20:45** The...one, one comment I'd like to make here is that...that there's a tool called Apply Symbology.

**1:20:50** I think there's a function in ArcPy now when you can just grab a symbology...

**1:20:55** ...or the layer properties from another dataset or another layer.

**1:21:01** At that point, we don't support it right now.

**1:21:04** There's a...there's a...yeah, we didn't develop that one there, but...

**1:21:09** ...so the key there is that you'll probably have to, have to change the time extent...

**1:21:16** ...if the data is totally changed in time extent, that might be a little problematic.

**1:21:21** But you, what you could do there is that you should author your layer with a dynamic option, which I showed on the layer.

**1:21:27** That's probably the way to go on that one.

**1:21:30** Right? Yes, please.

**1:21:32** [Audience comment] I've created animations in the past; I've had to create a fake point for

a...labels on my date and time.

**1:21:39** [Audience question] Do you guys have a simple way to put a date and time...

**1:21:42** Oh, I didn't see that, show that.

**1:21:46** I had my layer done, but...so on the Layout field, what you can do is insert dynamic text and data frame time, and...

**1:21:59** ...here, it's a dynamic element, so if I open this up, I can say Time...

**1:22:05** ...and it's going to get the slider's time, and the display format as well.

**1:22:12** And then I can change the symbol, and David had a...had a video as well, on his slides, so I'll make it 28.

**1:22:24** If I move the slider now, it should update...

**1:22:29** ...the time as well, so this is primarily useful when you're trying to create videos.

**1:22:34** Here's a video tool, Create Video tool, right off the slider.

**1:22:37** The other place where it's useful is when you are trying to use ArcPy scripting for generating temporal map books.

**1:22:43** We didn't cover that here, but now that is another capability that we have the data frame time...

**1:22:49** ...and I can just go through the different times and create maps as a...as a map book, so.

**1:22:55** [Inaudible audience question]

**1:22:57** Oh this one is Insert Dynamic Text and Data Frame Time.

**1:23:02** Because the current date and time are your current system date and time, not from the database.

**1:23:07** [Inaudible audience question]

**1:23:14** There's a question in the back.

**1:23:16** [Audience question] Is it possible to have two or more Time Sliders...

**1:23:20** ...and then change their [inaudible] time per layer, and then synchronize it.

**1:23:26** Okay, so the question is, if, if, is it possible to have two or more Time Sliders...

**1:23:31** ...and then as you change the current time that they keep synchronized.

**1:23:35** So there is one instance of Time Slider for the map; we're not, there's not like two different Time Sliders that come up.

**1:23:43** There is a lot of properties on this Time Slider that allow you to create time windows...

**1:23:48** ...and per layer, you can react to the Time Slider time.

**1:23:52** On layers, you can offset; you can do different time zones.

**1:23:55** You can do those things as a function of the Layer Properties, but not to say, have two sliders, like one per layer.

**1:24:01** Yeah. That, that, that's not...

**1:24:03** There's...the slider is per data frame, so you could possibly create two data frames as well.

**1:24:10** So...if you're looking at that offset kind of thing, maybe you have a layer that's 2009 for all of May...

**1:24:18** ...and you have 2010 for all of May.

**1:24:21** Well the Time Slider says 2010 right there, that's the...the control.

**1:24:25** You take the 2009 layer and you go to the tab and say Offset plus one year...

**1:24:29** ...and now both layers, you can do like an A, B kind of comparison...

**1:24:34** ...as one of them will be kind of artificially rendering in 2010 with that one-year offset.

**1:24:38** So that eliminates the need to have lots of sliders for different layers.

**1:24:42** So it's this property here, right at the bottom. Right.

**1:24:45** Okay, any, there was a question over here, right here.

**1:24:48** [Audience question] Just curious, what's the appropriate workflow for getting an animated graph onto a layout for export for videos?

**1:24:55** It's simple as this. Let me do... I'll try.

**1:25:02** Add to Layout, right-click on the graph, Add to Layout.

**1:25:06** [Audience question] So that'll work with the Time Slider?

**1:25:07** Yes, it should. Let me place it right here.

**1:25:12** Let's move the slider. It did...moved...the bubbles, so.

**1:25:15** Yeah it did. Yeah. It's doing the labeling at the bottom too, so it's good.

**1:25:19** Yeah. So it's all synced up, everything is synced up.

**1:25:23** [Audience question] When you calculate the End Time tool, you showed how it's offset.

**1:25:26** [Audience question] What happens for the very last record? Does it get to save End Time, Start Time?

**1:25:29** You know what, we actually had that in the notes and I didn't speak it; it does.

**1:25:36** So yeah, the last instance will keep the last instance Start Time, so these arrows point up, except the last one is the same.

**1:25:43** You can manually edit that and create the offset on the last one if you want to, yeah.

**1:25:48** I skipped through that accidentally, I was already past it and...

**1:25:51** And this is all available in the help, you know, these graphics...

**1:25:54** ...and so we've worked quite a bit on the help in this release as well, so...

**1:25:58** ...in general in ArcGIS 10, the help is much more clearer.

**1:26:02** [Inaudible audience question]

**1:26:05** Yeah, the, the User Conference proceedings we'll have this.

**1:26:08** We'll have...we haven't uploaded it yet, as far as the...the PDF.

**1:26:12** We're going to do that today, but the video will be available too, or the audio.

**1:26:17** Yeah.

**1:26:18** [Inaudible audience comment] Does it work with the ArcGlobe and ArcScene?

**1:26:25** Yes, it does.

**1:26:29** Yes?

**1:26:30** [Inaudible audience question]

**1:26:44** So when you...when you set the Layer Properties...

**1:26:46** ...and you publish a document, the services that are created in Server are time enabled...

**1:26:51** ...so the Time properties, such as, if you did set a time zone...

**1:26:54** ...or you set an interval, or what your time extent, and all of those fields...

**1:26:58** ...those go with the service; they're coming out of Server.

**1:27:01** So the REST API, the SOAP API, and including the different WMS, WFS...

**1:27:07** ...you're able to make a query request from that Web client to set a time window.

**1:27:13** [Audience comment] Okay, I've had a problem doing that, and I was very negative, something's wrong with my, [inaudible].

**1:27:29** So you have the netCDF data in the map document, and that's what you're trying to publish?

**1:27:34** Yes.

**1:27:35** Yeah, there might be some issues there; I'm not sure myself.

**1:27:41** Is there anybody that might help?

**1:27:43** Yeah, you could probably stop by on the Spatial Analyst island and look for Norman, as...as the lead...

