

# Animation in ArcScene

By Nathan Shephard, ESRI Technical Marketing Analyst

**Editor's note:** Three-dimensional GIS animations make presentations more compelling and can help visualize data in a new way. With the release of ArcGIS 8.2, ArcScene—the three-dimensional viewing application that is central to the ArcGIS 3D Analyst extension—lets users create animations.

Through a simple iterative process of modifying the desired scene, capturing it, modifying the scene again, and capturing the modified scene, ArcScene generates a series of keyframes that represent the significant states of the view that will be shown in the animation. ArcScene interpolates the frames between keyframes to complete the animation. All the tools needed for creating, modifying,

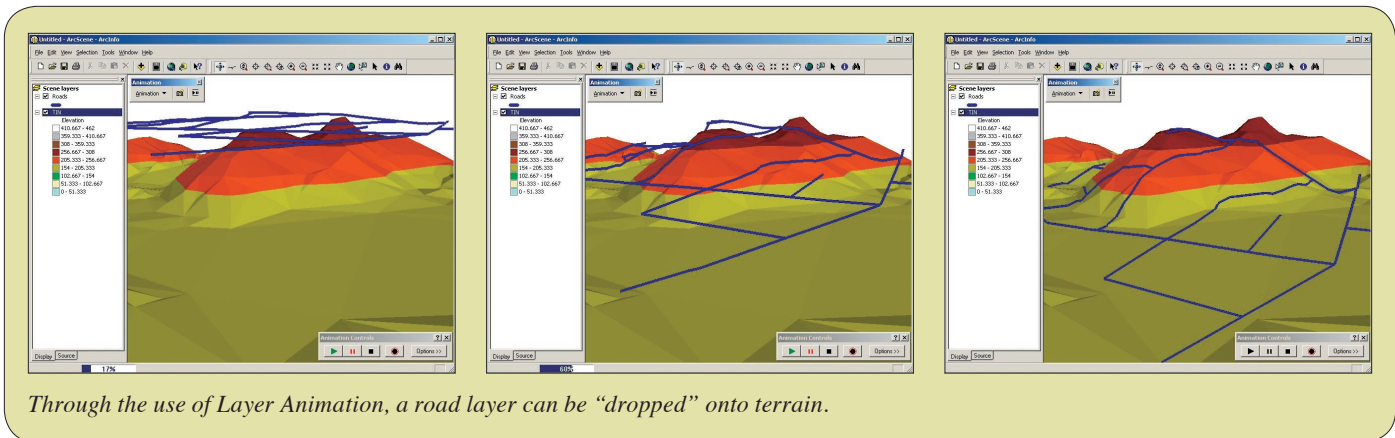
ArcGIS 3D Analyst extension, allows navigation through three-dimensional data. By simply adding data—shapefiles, TINs, rasters, geodatabase layers—with a *z* component (typically denoting height), this data can be viewed in three dimensions in ArcScene.

Although the look and feel of ArcScene is very similar to ArcMap, it has slightly different navigation tools. It is worth noting that the *z* component in ArcScene doesn't have to be terrain height—it can be an attribute value such as population, emission level, or the average price of eggs for the region. As with ArcMap, data loaded into ArcScene will be displayed using default symbology that can (and usually should) be modified. Once the symbology for the ArcScene view is set, the animation can be defined.

## Keyframes

One way to think of animations is as a series of pictures calculated between two states. For example, through the use of Layer Animation, a road layer can be “dropped” onto terrain. Specifying a start position of 300 feet above the terrain, an end position level with the terrain, and an animation time of 30 seconds will produce an animation showing the road layer dropping at the rate of 10 feet per second.

The start position and end position of the road layer—the keyframes—are locked positions within the animation. If the animation time is reduced to 15 seconds, the road layer drops at a rate of 20 feet per second, but the start and end keyframes and path between the two remain the same. Only significant animation positions need be specified because ArcScene will interpolate the intermediate



Through the use of Layer Animation, a road layer can be “dropped” onto terrain.

playing, and saving an animation track are available from the Animation toolbar in the ArcScene interface.

If you've ever been to an ESRI presentation, you've probably seen an example of a fly-through of a three-dimensional landscape or perhaps other types of animations that feature roads dropping from the sky onto an elevation model or trees sprouting from the earth. With the ArcGIS 3D Analyst extension you, too, can quickly and easily create presentation-quality three-dimensional animations.

## What Is ArcScene?

ArcScene, the ArcGIS three-dimensional viewing application that comes with the

## Animation Types

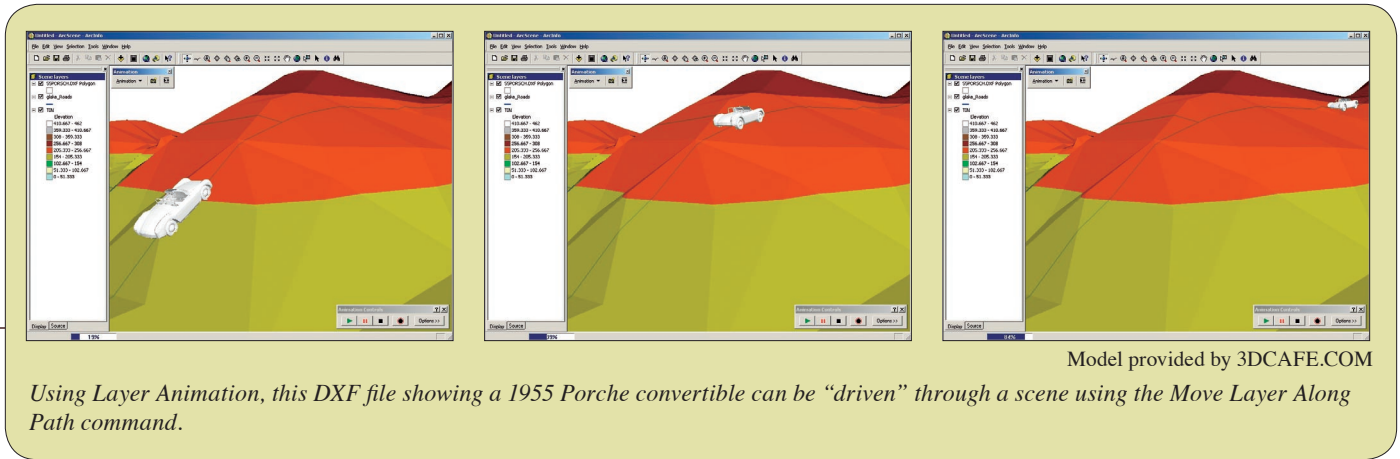
Three animation types are available in ArcScene—Camera Animation, Layer Animation, and Scene Animation. To create a flyby, use Camera Animation. To have roads drop from the sky, use Layer Animation. To simulate the passage of time by moving the sun's location, use Scene Animation. In addition to the effects achieved using individual animation types, different animation types can be combined. A viewer can fly through a canyon while roads are dropping from the sky and shadows are moving across the canyon floor. And if this isn't enough, custom animation types can be created using ArcObjects.

positions based on the animation's running time.

In the same manner, keyframes are set for Camera Animations that show flight from point to point and Scene Animations that depict changes in lighting as the sun moves from east to west. Any number of keyframes can be specified per animation track to get the desired effect.

## More on Camera Animations

Camera Animations are the easiest animation tracks to create. They can require as little as two mouse clicks to generate! Simply set up the initial viewing position, click the camera button on the Animation toolbar, navigate to the



second viewing position, and click the camera button again. That’s it. Running the animation track now will “fly” the viewer from the first location to the second. Add as many keyframes as desired and ArcScene will interpolate the flight path between each position on the fly.

Another way to generate a Camera Animation is to follow a linear feature, such as a transmission pipeline, using the Camera Flyby from Path command. Either edit a feature specifically for the flight path or select an existing feature. Many configuration options—banking and downward view angles—are available with this method. Experimentation is the key.

Because there is only one camera per

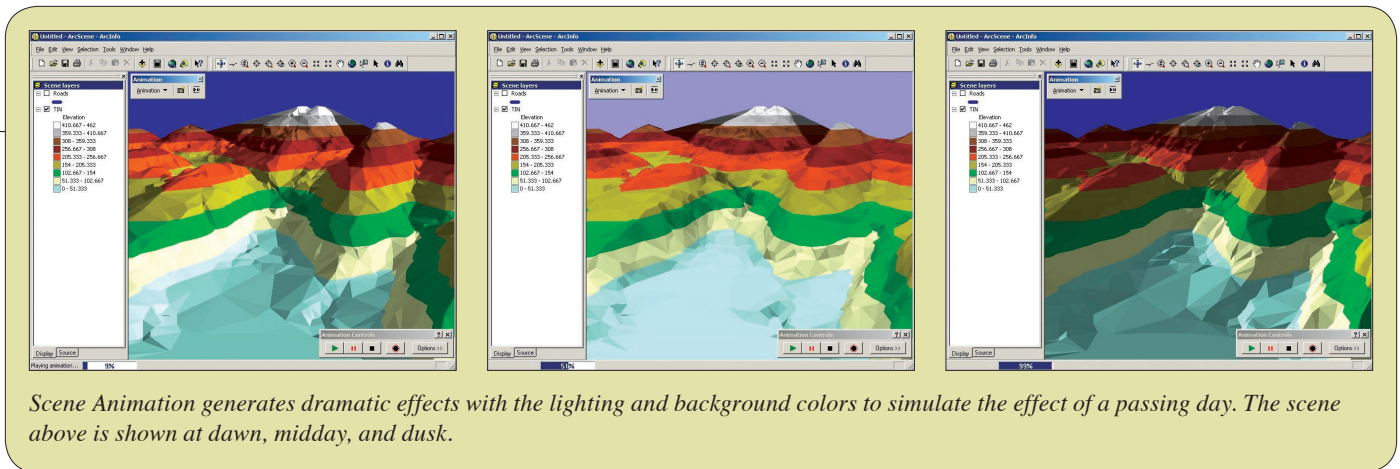
position), its visibility (to fade it away), and its rotation (to spin it around). Clever combinations of these settings can make for extraordinary cinematography.

One particularly neat trick is to use the Move Layer along Path command, which causes the layer to follow an existing feature or path. The tool generates all the keyframes required to move and rotate the entire layer along the path so that a three-dimensional CAD file, such as the DXF file depicting a three-dimensional model of a Porche shown in the accompanying illustrations, can be “driven” along a road network feature. Because ArcScene allows many Layer Animation tracks to be defined,

style for temporal data because it focuses viewers’ attention on changes in data layers over time.

### Day to Night Effects With Scene Animations

Scene Animation generates dramatic effects with lighting and background colors. Changing the light source’s azimuth, inclination, and contrast can create the effect of a passing day. Changing the background color from an indigo blue into a bright cyan and back again enhances this dawn-to-dusk effect. Adjusting the overall vertical exaggeration of the view in a Scene Animation can make it appear



window, multiple camera animations cannot be run in the same window at the same time. However, several Camera Animations can be strung together, one after another, which is useful for following several routes and linking them together in a single flight path. The bold user (with a robust machine) may also experiment with simultaneously running animations in multiple windows!

### Possibilities Galore With Layer Animations

Layer Animations offer great flexibility in effects—animate the layer’s position (to move it into position), its scale (to stretch it into

an entire fleet of Porches can be tearing up the streets of a view in ArcScene.

### Layer Group Animations

The Layer Group Animation, a specific subtype of Layer Animation, provides a shortcut for changing the visibility of several layers at the same time. Use all the layers in the Data Frame, or define a new Group Layer and click the Create Group Animation button. The Group Animation created will show and then hide each layer using the transition settings defined. Having the layers blend into each other as the animation progresses definitely adds punch to a presentation. This is an effective animation

as if great mountains are rising from a flat plain. Like a Camera Animation, only one Scene Animation can be active at a time and any active Scene Animation properties will overwrite all subsequent Scene Animations.

### Getting the Timing Right

When creating multiple animation tracks that will run simultaneously, getting the timing between the tracks synchronized may become important. For example, coordinating the progress of a Camera Animation so that it will provide a specific viewpoint at the same time as the Scene Animation is depicting a midday

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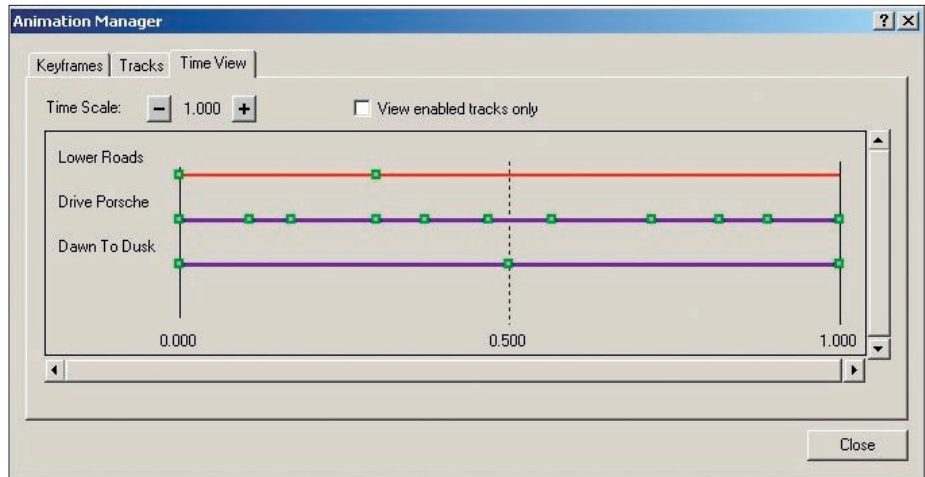
sun can be accomplished two ways—by setting exact times as part of the keyframe properties or clicking on the Time View tab in the Animation Manager dialog and moving the keyframes for each animation track interactively. Manually moving the keyframes will modify when each animation track starts and stops as well as the relative position of keyframes within a track.

## Saving or Exporting an Animation

After the animation has been refined, saving the ArcScene document (.sxd file extension) retains the animation settings. Animation settings can also be exported to a stand-alone ArcScene Animation file (.asa file extension) and loaded into any ArcScene document so that several animations for a single three-dimensional scene can be easily managed.

To create a transportable copy of an animation, click the Export to Video command from the Animation toolbar and choose AVI as the file type. The size of the final AVI file will depend on the extent of the ArcScene window, the frame rate, and the video quality specified. Experiment with export options such as frame rate and video quality to keep the file sizes down. With animations, it is easy to generate files in excess of 100 MB.

By exporting animations as stand-alone



*Use the Time View tab in the Animation Manager dialog to move keyframes for each animation track interactively. In addition to controlling when each animation track starts and stops, the relative position of keyframes within a track can be adjusted.*

AVI files, the results of an analysis performed using the ArcGIS 3D Analyst extension can be shared with non-GIS users. The animation options available in ArcScene are flexible and powerful, yet simple to use. More detailed information on animations is available in *Using 3D Analyst*, the manual that comes with the ArcGIS 3D Analyst extension. Jump in there, start experimenting, and have fun!

## About the Author

Nathan Shephard has a bachelor's degree in computer science (GIS) from Curtin University in Western Australia. He worked for three years with ESRI Australia and has been in technical marketing with ESRI on the Redlands campus since October 1999.