Publishing Hosted 3D Feature Layers

An Esri® White Paper
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The 10.3.1 release of ArcGIS® includes the capability to publish 3D scene services on-premises using ArcGIS Pro 1.1 with Portal for ArcGIS. Since the release of ArcGIS 10.3 and the launch of the built-in 3D scene viewer in ArcGIS℠ Online and Portal for ArcGIS, users can publish hosted feature layers and add them to the scene viewer to represent them in a 3D environment. With the release of ArcGIS 10.3.1, it is now possible to publish 3D scene layers and mash them up with existing feature layers. This paper will look at the system and configuration requirements for the publication of these layers and the integration and curation of these and other services that make up rich 3D web scenes.

System Requirements

Portal for ArcGIS: Portal for ArcGIS requires a 64-bit operating system on a Windows or Linux platform.

■ Windows 7, 8, and 8.1 are supported for basic testing and application development but are not recommended for deployment in a production environment. Windows Server 2008, 2012 Standard, Enterprise, or Datacenter is recommended for production environments.

■ Linux x86_64 on systems that adhere to the x86_64 architecture (64 bit) with supported Linux releases. Modified OS binaries are not supported.

ArcGIS for Server: ArcGIS for Server requires a 64-bit operating system on Windows or Linux platforms. It also requires Python 2.7 (64 bit) along with OpenGL version 1.5 or higher to be installed with ArcGIS for Server.

■ Windows 7, 8, and 8.1 are supported for basic testing and application development but are not recommended for deployment in a production environment. Windows Server 2008, 2012 Standard, Enterprise, or Datacenter is recommended for production environments.

■ Linux x86_64 on systems that adhere to the x86_64 architecture (64 bit) with supported Linux releases. Modified OS binaries are not supported.

ArcGIS Data Store: ArcGIS Data Store requires a 64-bit operating system on Windows or Linux platform.

■ Windows 7, 8, and 8.1 are supported for basic testing and application development but are not recommended for deployment in a production environment. Windows Server 2008, 2012 Standard, Enterprise, or Datacenter is recommended for production environments.

■ Linux x86_64 on systems that adhere to the x86_64 architecture (64 bit) with supported Linux releases. Modified OS binaries are not supported.

Licensing

To be able to publish a 3D scene layer, Portal for ArcGIS and ArcGIS Data Store are required, which are available under the Standard and Advanced versions of the ArcGIS for Server license.

Installation

The typical installation for ArcGIS for Server, Portal for ArcGIS, and ArcGIS Data Store goes as follows:

■ Install ArcGIS for Server.

■ Access the ArcGIS for Server admin page and enable http and https under Security.

■ Install ArcGIS Data Store, create a Data Store, and register it with your ArcGIS for Server instance.

■ Install Web Adaptor for ArcGIS for Server (use "arcgis" as the instance name—you can use any name).

■ Install Portal for ArcGIS.

■ Install Web Adaptor a second time for Portal for ArcGIS (use "portal" as the instance name—you can use any name).

■ Access the Portal for ArcGIS admin, register ArcGIS for Server, and make it a hosted server, and you are ready to go.

Detailed installation directions can be found at the following links:

■ ArcGIS for Server installation:
server.arcgis.com/en/server/latest/install/windows/welcome-to-the-arcgis-for-server-install-guide.htm

■ Enabling SSL on ArcGIS for Server:
server.arcgis.com/en/server/latest/administer/windows/enable-ssl-on-arcgis-server.htm

■ ArcGIS Data Store installation:
server.arcgis.com/en/portal/latest/administer/windows/install-data-store.htm

■ ArcGIS Data Store management:
server.arcgis.com/en/portal/latest/administer/windows/data-store-backups.htm

■ Web Adaptor for ArcGIS for Server installation and configuration:
server.arcgis.com/en/server/latest/administer/windows/configure-arcgis-web-adaptor-after-installation.htm

- Portal for ArcGIS installation:
  server.arcgis.com/en/portal/latest/install/windows/installing-portal-for-arcgis.htm

- Portal for ArcGIS configuration:
  server.arcgis.com/en/portal/latest/administer/windows/configure-hosting-server-for-portal.htm

ArcGIS Data Store Backup

By default, backup for ArcGIS Data Store is turned on and configured to back up the Data Store every 7 days and retain the backup files for 31 days. This means the backups of feature layer data are stored automatically in C:\arcgisdatastore\backups on the same machine as the Data Store. When caching large scene services, this quickly fills up the hard drive hosting the Data Store and can lead to issues with both the caching of new services and the delivery of already cached services from the server. It is good practice to configure the backup on another drive and adjust the backup frequency to best match cache updates. See server.arcgis.com/en/portal/latest/administer/windows/data-store-backups.htm.

Caching Data Size Issues

Once the scene definition file is created and the feature service is uploaded, the caching process kicks off on the server. A large number of files are created in the processing of the cache, and these can be quite large depending on the complexity of the source data. Be sure to have adequate free storage on your caching hard drive to allow for this. Once completed, cache size is quite manageable.

Memory Requirements

Depending on the number of caches being created and number of services running, the system can run out of memory. A minimum of 16 GB to 32 GB of memory should ensure seamless caching.

Features That Can Be Published in a Web Scene

	When symbolized with	Can publish?	Publish labels?
Points			
	Picture markers (Billboard images that scale to screen height)	Yes	Yes
	Shape markers (2D Vector Shapes)	No	No
	Simple 3D model markers (Simple 3D geometries such as spheres, cubes)	Yes	No
	3D model markers (Complex, user-defined 3D shapes)	No	No
	Icon Points Preset layer	Yes	Yes
	Thematic Shapes Preset layer	Yes	No
	Trees Preset layers	Yes	No
	Flattened textures on the surface	No	No
Polylines			
	Flattened as textures on the surface	No	No
	Simple polylines in 3D scaled to screen size	Yes	Yes
	Simple polylines extruded as tubes that scale to screen size or real-world height	Yes	Yes
Polygons			
	Floating 3D polygons	Yes	Yes
	Flattened as textures on the surface	Yes	No
	Extruded in 3D	No	No
Multipatch Geometry		On-premises Portal for ArcGIS 10.3.1 only	No
Annotation		No	N/A

Publishing a Web Scene

With ArcGIS Pro 1.0, publication and sharing of web scenes was possible with hosting on ArcGIS Online. This was limited to the authoring of smaller feature datasets (less than 2,000 features) with simple 3D shapes and 3D labels. See pro.arcgis.com/en/pro-app/help/mapping/map-authoring/author-a-web-scene.htm.

Localized detailed elevation can also be published to ArcGIS for Server as cached image services. This publication is currently only possible through ArcGIS 10.3.1 for Desktop and is covered later in this document.

With the release of ArcGIS Pro 1.1 and ArcGIS 10.3.1, it is now possible to publish 3D objects to Portal for ArcGIS. While this authoring process is primarily for on-premises Portal for ArcGIS and ArcGIS for Server with ArcGIS Data Store instances, it is possible to share with a wider audience through ArcGIS Online once publishing is complete on ArcGIS for Server.

Once the on-premises instances of Portal for ArcGIS and ArcGIS for Server with ArcGIS Data Store are installed and configured, it is possible to author and cache 3D scene services from ArcGIS Pro 1.1.

First, ensure ArcGIS Pro is signed into the Portal for ArcGIS instance to be published to and that it is the active portal for ArcGIS Pro.
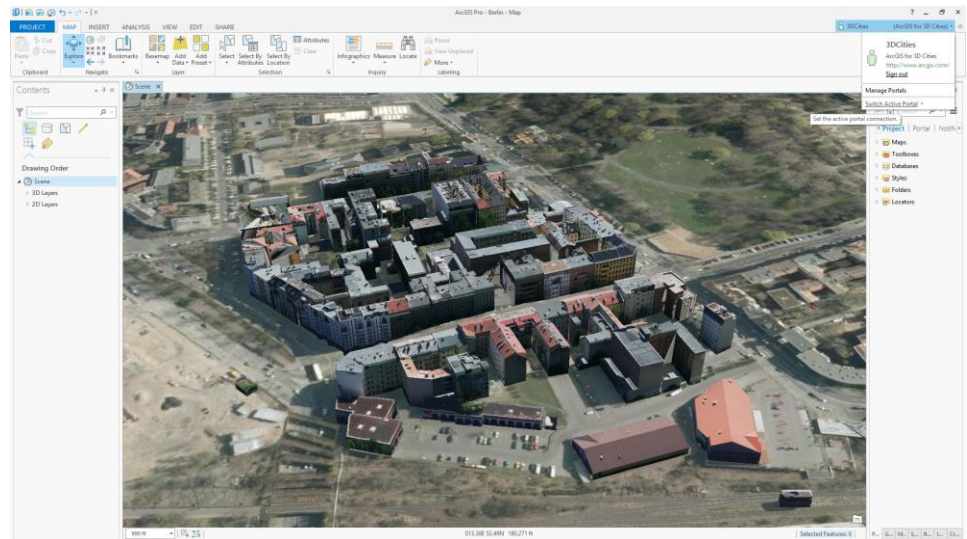
Once Pro is signed in and active on Portal for ArcGIS, one can create the scene to be published. This can include the definition of the online basemap, 3D layers, and 2D feature layers (less than 2,000 features).

Once the arrangement and symbolization of the scene are set, select the Share ribbon and the Share as Web Scene feature.
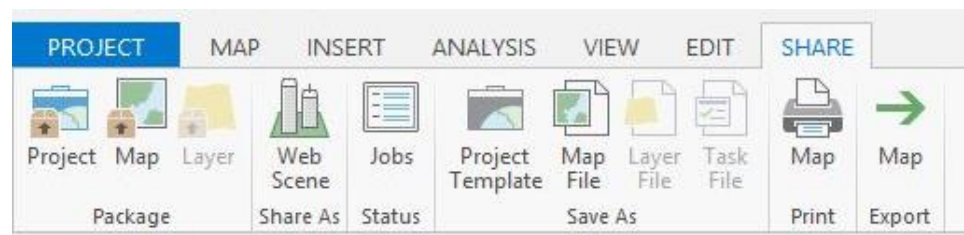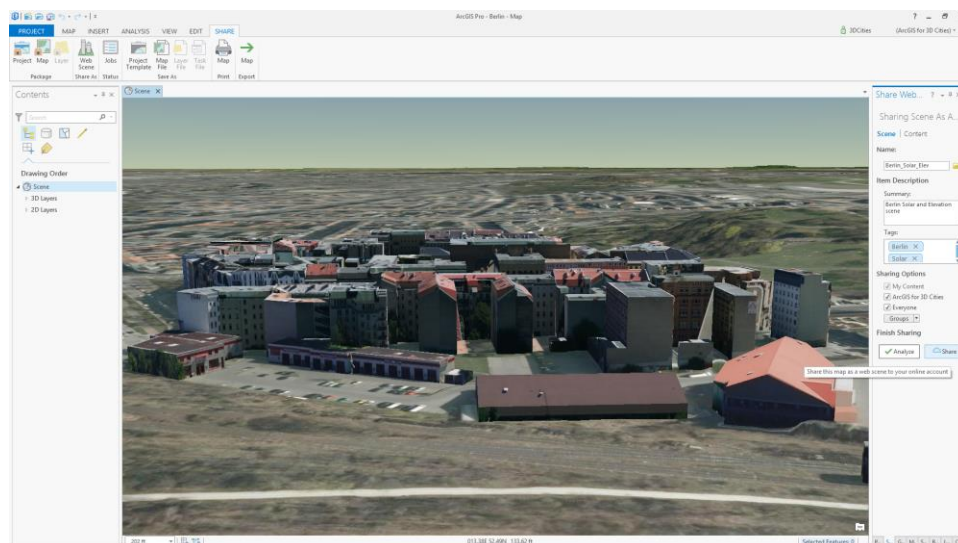

This will launch the Share Web Scene tab. Fill out the highlighted boxes:

Name: Apply unique naming for each web scene, using underscores between words.
**Summary:** Item Description of the scene.
Tags: Descriptive tags enable searching for the web scene.
**Share options:** Select with whom the scene will be shared.

Once the all the necessary information is added, the Share button will be activated. It is important to analyze the scene before publication to ensure that all layers and configuration parameters meet the publication requirements.

Once any analysis issues have been addressed, the scene is ready to share with Portal for ArcGIS.
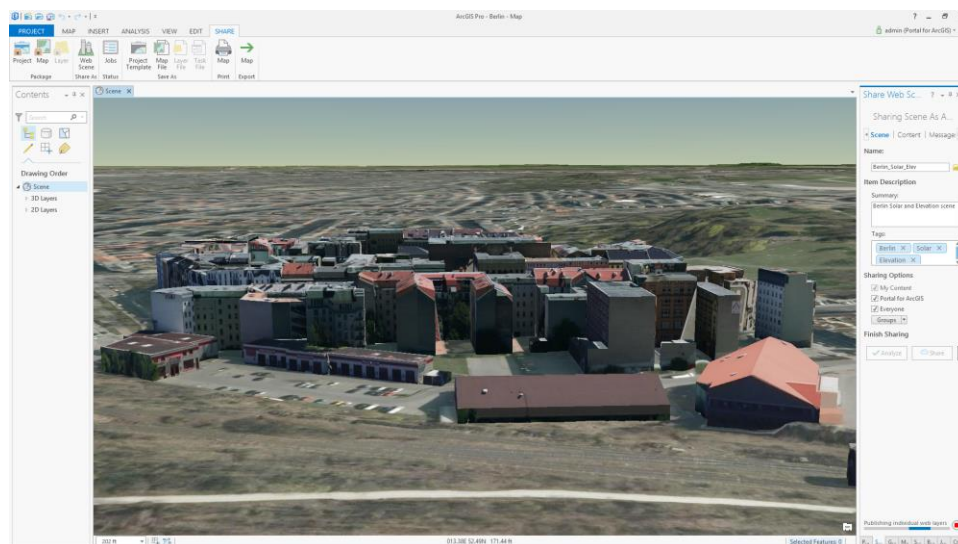

The Web Scene definition and each web scene layer are published to the portal, and when completed, a notification that the web scene is shared successfully will appear on the Share Web Scene tab.

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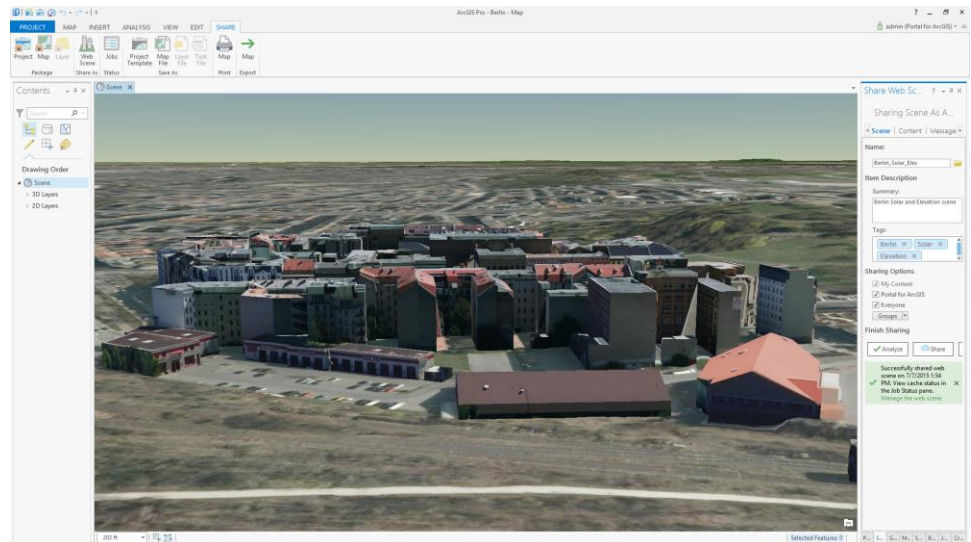
This is an indication that the scene definition and feature definition successfully published to the server. The caching of the scene is now in progress on the server and can be monitored through the Job Status tab.
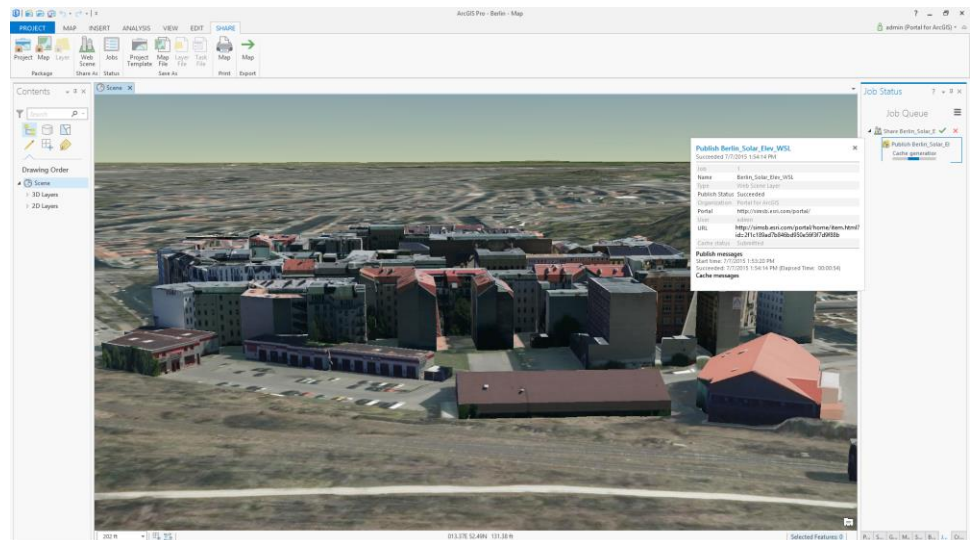
When caching is completed successfully, publishing and caching information is available for review. Click the URL to launch the Item Description page for the completed scene and review this information.
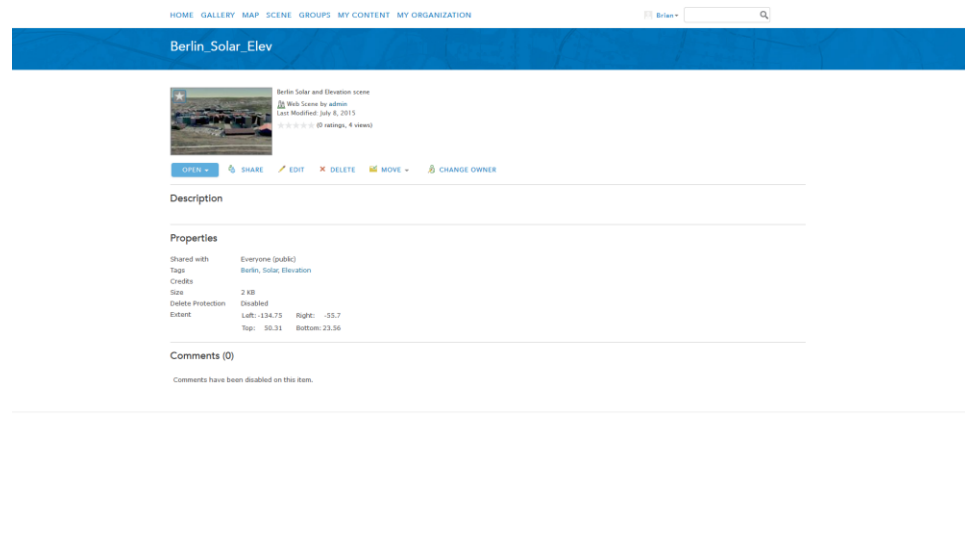
This can be edited to give a full description of what the scene consists of and how to interact with it. The scene can also be shared and otherwise managed from this page. Clicking the Open drop-down menu will launch the 3D Web Scene Viewer and add the scene to the table of contents.

The scene can be adjusted and edited, have extra layers added, and be saved back as an updated scene or a whole new scene. See doc.arcgis.com/en/arcgis-online/create-maps/save-scene.htm.

Publishing ArcGIS for Server Cached Image Elevation Services

ArcGIS Pro and the Web Scene Viewer (WSV) consume World Elevation Services (WES) from the web in Limited Error Raster Compression (LERC) format. LERC is an efficient compression format for single band or, in this case, elevation data. WES provided an underlying elevation service for WSV with resolutions from 30 to 3 meters depending on the area of the globe being navigated to. An elevation coverage map with the extents and resolution of coverage can be found at arcgis.com/home/item.html?id=3af669838f594b378f90c10f98e46a7f.

This elevation service provides a suitable terrain for most web scenes at global and landscape scales. If working at the city scale, it may be necessary to either match the LoD1 building to the terrain or incorporate a detailed local elevation model, which may be available at higher resolutions to provide the terrain for LoD2 buildings.

To enable the incorporation of higher-detailed Digital Terrain Models (DTM), it is possible to author and publish raster elevation services as compressed LERC services that can be hosted on an image server.

To publish a LERC elevation service, first acquire and assemble your source elevation data, whether it be from lidar, photogrammetry, spot, or contour sources. Save the derived raster DTM in a geodatabase as a raster dataset or as a stand-alone TIFF and transform from the local coordinate system to Web Mercator Auxiliary Sphere

EPSG: 3857 with vertical units set to meters. Once set, the DTM dataset can be processed and published as a LERC service using the steps below:

■ Open ArcCatalog and ensure that there is a publishing connection to a server with image services running.

■ Navigate to the DTM raster that is to be published.

■ Right-click on the raster and select Share as Image Service.

■ As the Share as Service dialog box opens, select the Publish a Service button and click Next.

■ Choose the server you wish to publish to in the connection drop-down menu and give the service a suitable name. Click Next.

■ Choose the server folder to which to publish the service and click Continue.

■ A service editor will open, and the following configuration values will need to be entered:

- Parameters: Allowed compression methods **"LERC"**
- Capabilities: "Imaging"

■ Caching

- Draw this image service: Using tiles for a Cache

- Tiling scheme: ArcGIS Online

- Level of Detail: World to Building Level 0–19 (for smaller areas, Town to Building 14–19)

- Build cache automatically when the service is published

■ Advanced setting

- Minimum cache scale: 1:591,667,527
- Maximum cached scale: 1:1,128
- Cache directory: Select suitable location on server
- Area of interest to cache: Full extent of dataset
- Tile Format: LERC
- Compression: "0.5" ("0.1" for more precise data)

Aside from these configuration values, the defaults can be selected.
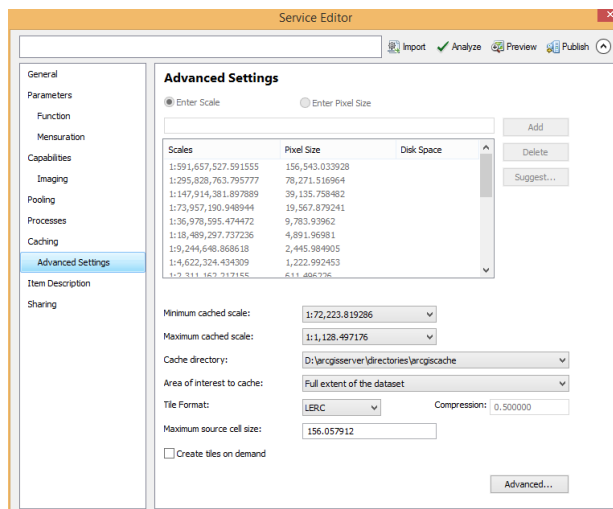

Be sure to fill out the Item Description and Sharing rights before analyzing, previewing, and publishing the image elevation service.

Once published, the service may be added to ArcGIS Online scene services or as an elevation layer in ArcGIS Pro through the Portal tab.
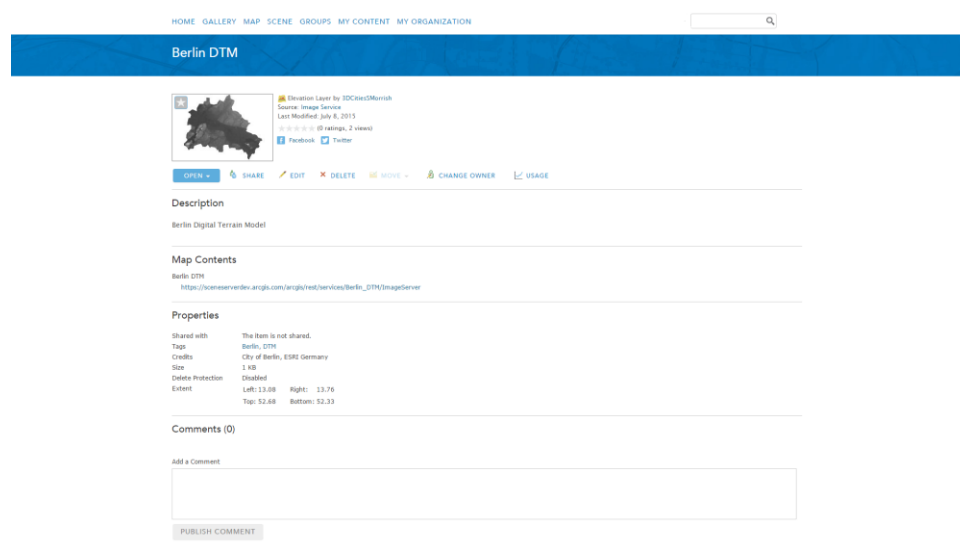
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To add the service to an ArcGIS Online scene service, open the Add Layer tab in the Web Scene Viewer. There are two options. The first is to search for the published elevation layer in the contents menu:
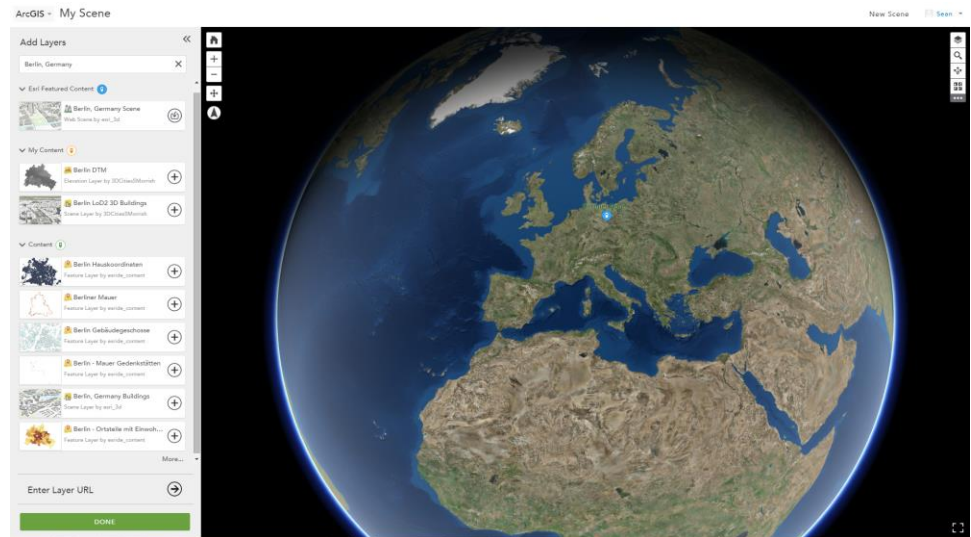
Alternatively, add the REST endpoint that was generated by the caching service on the server through the Enter Layer URL dialog box:
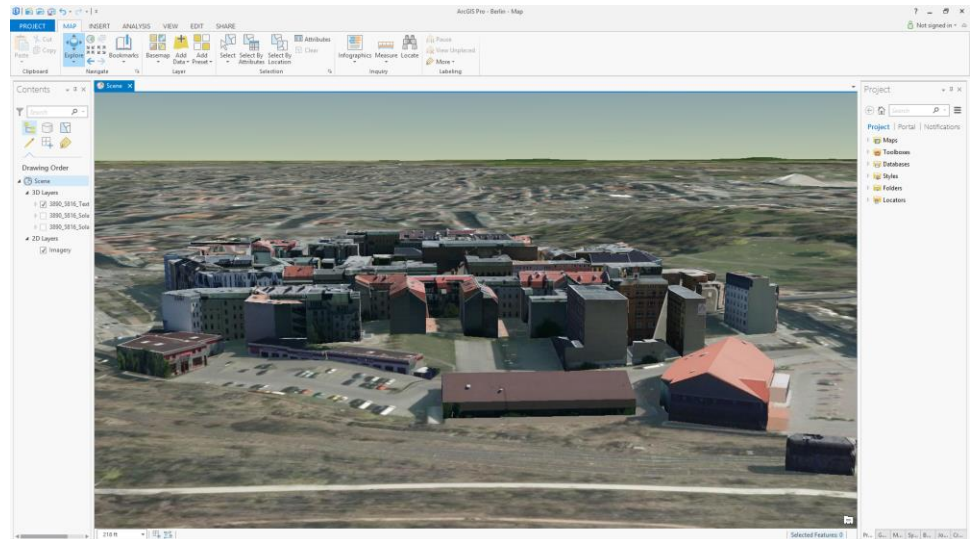
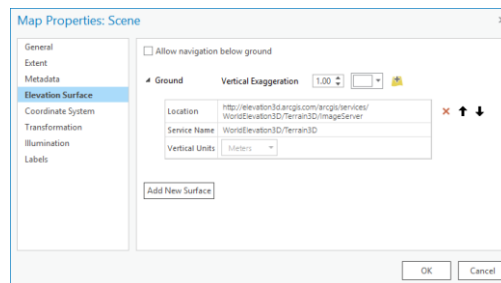The addition of the local elevation service can be seen in these before and after images:

In the ArcGIS Pro scene view, the default elevation is the WES:

If a suitable local database with higher-resolution elevation data is available, it may be added to the scene properties Elevation Surface to sharpen up the terrain in the area of interest.

If no local elevation dataset is available but an elevation service is accessible through Portal for ArcGIS, it may be added to the current scene by entering the services description in the Project Portal search dialog box.
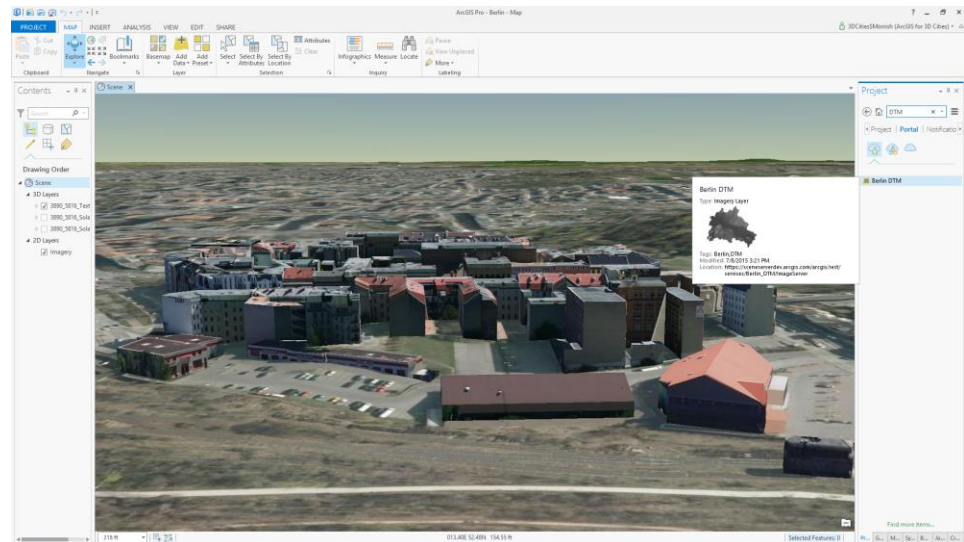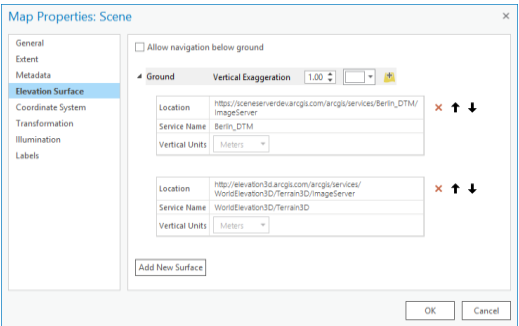
Once added to the scene, the local elevation can be used to sharpen up the elevation in the scene properties dialog box.
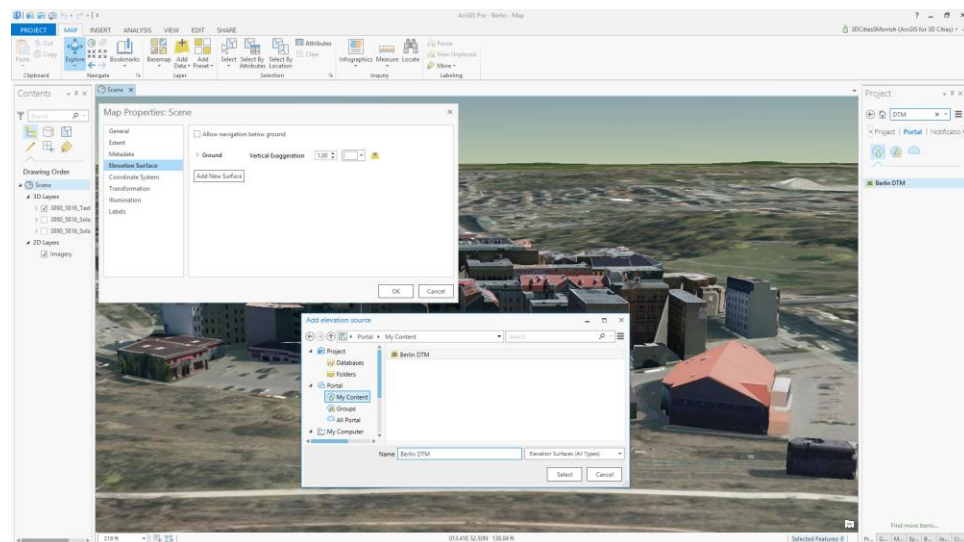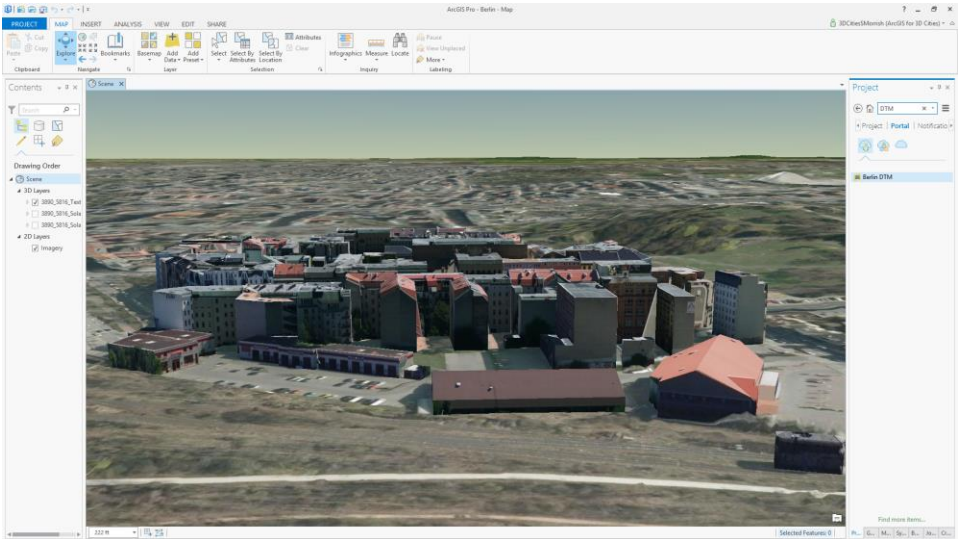

Once added, it will replace the WES in the area covered by the local elevation service.

This will sharpen up the elevation and eliminate buried or floating 3D building models.

It is possible to combine the 3D models and the local elevation service to publish a web scene incorporating the rich detail of the scene.

Esri inspires and enables people to positively impact their future through a deeper, geographic understanding of the changing world around them.

Governments, industry leaders, academics, and nongovernmental organizations trust us to connect them with the analytic knowledge they need to make the critical decisions that shape the planet. For more than 40 years, Esri has cultivated collaborative relationships with partners who share our commitment to solving earth's most pressing challenges with geographic expertise and rational resolve. Today, we believe that geography is at the heart of a more resilient and sustainable future. Creating responsible products and solutions drives our passion for improving quality of life everywhere.

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