ArcGIS Pro: Vector Tile Package (Data Management)

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Document Release: Version 0.1

January 16, 2024

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Revision History

The table that follows summarizes the revision history of this document.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Release | Summary of Revisions | Date | Author(s) | Approver |
| Draft 0.1 | Draft content created | 01/16/2024 | Noe Diaz | N/A |
| Draft 0.2 | Technical edit and formatting |  |  | N/A |
| Draft 0.3 | Updated draft |  |  | N/A |
| Draft 0.4 | Technical edits from peer review |  |  | N/A |
| Draft 0.5 | Content edits |  |  | N/A |
| Draft 0.6 | Content corrections |  |  | N/A |
| Draft 0.7 | Quality assurance review |  |  | N/A |
| Final 1.0 | Accepted edits and baselined the document |  |  | N/A |

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# Introduction

## Purpose

This installation guide provides the information necessary for best practices in context to ArcGIS Enterprise Vector Tile Data Management.

## Scope

This document covers all required steps for best practices for Vector Tile Packaging.

## Document Conventions

Table 1‑1 describes the conventions used in this documentation.

Table 1‑1: Document Conventions

| Convention | Meaning |
| --- | --- |
| **🛈** | Indicates a note that supplements the information in the current section or about the procedure. |
| ! | Indicates an important note related to the current section or procedure. |
|  | Indicates that a section or procedure needs to be repeated. |
| Text > Text > Text | The arrow symbol (>) is used for navigation paths (e.g., **Start** > **Programs** > **Adlib** > **Express** > **Express Server**). All navigation paths in this document assume that Windows is set to display Classic View. |

# About This Guide and Outline

The content in this installation guide contains references to the software manufacturer’s online help documentation specific to ArcGIS Enterprise Vector Tile Data Management. These help topics that are noted, where applicable, and the links to the specific topics are in alphabetical order in Appendix A.

1. Define Project Goals and Requirements: Clearly articulate the goals and requirements of the vector tile service project, considering user needs, performance expectations, and technical specifications.

2. Prepare Data for Vector Tile Package: Collect and prepare geospatial data for the vector tile package using Esri ArcGIS Pro. Configure symbology, styles, and other settings to optimize data representation.

3. Create Vector Tile Package (VTPK): Generate a vector tile package (.vtpk) using ArcGIS Pro, specifying the tiling scheme, scales, and other package settings.

4. Validate Vector Tile Package: Validate the vector tile package to ensure data integrity, proper styling, and adherence to performance standards.

5. Publish Vector Tile Service: Open ArcGIS Enterprise or ArcGIS Online. Sign in, navigate to content, and add the vector tile package. Configure service properties, set permissions, and publish the vector tile service.

6. Optimize Performance: Configure caching settings, tiling schemes, and cache levels. Test caching performance and explore multi-tier caching options. Implement compression, network optimization, and load balancing for improved performance.

# About Vector Tile Data Management

The implementation of a Vector Tile Service in an Esri Enterprise GIS environment involves a systematic and multifaceted process. Beginning with the definition of project goals and data preparation, the process proceeds through the creation and validation of a Vector Tile Package (VTPK), culminating in the publication of the service. Optimization strategies, security considerations, and robust monitoring mechanisms ensure the service's performance and integrity. Extensive documentation and tailored training programs contribute to user proficiency and support. Community engagement initiatives, including forums and collaborative projects, foster a sense of shared learning and achievement. Continuous evaluation and improvement, coupled with a commitment to security and collaboration, underpin the successful implementation and maintenance of the Vector Tile Service. This comprehensive approach not only addresses technical aspects but also cultivates a dynamic and collaborative GIS community within the Esri Enterprise framework. By following these steps, organizations can ensure the successful deployment and ongoing optimization of a Vector Tile Service, fostering a collaborative and secure environment within the Esri Enterprise GIS framework. This process not only enhances user satisfaction but also promotes a culture of continuous learning and improvement in the GIS community.

# ArcGIS Pro

## ArcGIS Pro Setup

1. Open ArcGIS Pro and create a new project.
2. Add the layers you want to include in the vector tile package.
3. Set symbology, labeling, and other cartographic settings.
4. Create a New Vector Tile Package:
5. Navigate to the Share tab and choose "Vector Tile Package."
6. Select the feature layer or layers to include.
7. Customize Package Settings:
8. Define levels of detail (LODs) based on expected zoom levels.
9. Set tile extents to match your area of interest.
10. Choose an appropriate tiling scheme (e.g., XYZ).
11. Consider metadata inclusion for better search and discovery.
12. Generate the Package.
13. Review settings and initiate package creation.

## Project Creation

Open ArcGIS Pro and create a new project. Choose an appropriate template based on the nature of your project (e.g., map, scene, or chart).

## Data Connection

Add the datasets that will be part of the vector tile service to your project. Establish connections to geodatabases, shapefiles, or other data sources.

## Layer Organization

Organize layers in the Contents pane to reflect the desired order and hierarchy. Utilize group layers to organize related layers and improve project readability.

## Symbolization

Define symbology for each layer to ensure clear and visually appealing representation. Use appropriate symbols, colors, and labeling based on the cartographic requirements.

## Scale Dependency

Configure scale-dependent rendering for layers to control visibility at different map scales. Set scale ranges for layers to optimize the display based on zoom levels.

## Cartographic Elements

Add cartographic elements such as north arrows, scale bars, and legends. Adjust the layout for printing or sharing maps based on project needs.

## Map Extent

Set the map extent to match the desired geographic scope of the vector tile service. Ensure that the map extent aligns with the project requirements.

## Layer Properties

Access layer properties to fine-tune settings like transparency, visibility, and labeling. Configure pop-ups for layers to display relevant attribute information.

## Basemaps and Reference Layers

Add base maps or reference layers to provide context to your project. Utilize Esri's base maps or incorporate custom base maps if needed.

## 3D Settings (If Applicable)

If creating a 3D scene, configure elevation settings, lighting, and other 3D-specific properties. Adjust camera angles and tilt for optimal visualization.

## Bookmark Creation

Create bookmarks for specific areas of interest or predefined map views. This facilitates easier navigation and map exploration during the creation of the vector tile package.

## Data Validation

Validate data to ensure it aligns with the intended map visualization. Resolve any data-related issues before proceeding to the vector tile package creation.

## Map Exploration

Interactively explore the map to verify that the symbology, labeling, and other cartographic elements meet project requirements. Adjust settings based on feedback and visual inspection.

# Vector Tile Package Creation

Use the 'Share' tab in ArcGIS Pro to create a Vector Tile Package (VTPK).

Select the layers, scale levels, and other settings based on project requirements.

Optimize settings to balance detail and file size.

## Open ArcGIS Pro and Load Project

Open ArcGIS Pro and load the project you created during the ArcGIS Pro Setup phase.

## Set The Extent

Confirm that the map extent is set to cover the desired geographic area for the vector tile package.

## Navigate to the Share Tab

Go to the 'Share' tab on the ArcGIS Pro ribbon. This tab contains tools for creating and sharing various types of content.

## Select Vector tile

In the 'Share' tab, select the 'Vector Tile' option. This opens the Vector Tile tools and settings.

## Choose Layers

Choose the layers you want to include in the vector tile package. Ensure that the selected layers align with the project requirements and goals.

## Set Scale Levels

Specify the scale levels for which vector tiles will be generated. Consider the project requirements and the expected use cases for the vector tiles.

## Configure Style

Configure the style of the vector tiles. This includes defining the symbology, colors, and labeling for each layer. Ensure that the style enhances readability and meets project goals.

## Adjust Options

Explore and adjust additional options, such as compression settings, to optimize the vector tile package size without compromising quality.

## Preview Tiles

Use the preview option to inspect how the vector tiles will look at different scales. This allows you to make adjustments before creating the final package.

## Validate

Validate the vector tile package to identify any potential issues or errors. Address any validation errors before proceeding.

## Choose Output Location

Specify the output location where the vector tile package (.vtpk) will be saved. Consider organizing your files into a logical folder structure.

## Set Package Name

Provide a meaningful and descriptive name for the vector tile package. This aids in identification and organization.

## Create Vector Tile Package

Click the 'Create' or 'Share' button to initiate the process of creating the vector tile package. ArcGIS Pro will generate the tiles based on the configured settings.

## Monitor Progress

Monitor the progress of the vector tile package creation. The time required depends on the complexity of the data and the chosen settings.

# Publish Vector Tile Service

* Open the ArcGIS Enterprise portal or ArcGIS Online.
* Go to the 'Content' tab and add the Vector Tile Package.
* Share the Vector Tile Package as a Vector Tile Service.
* Configure service properties, such as caching and access permissions.
  + Set cache expiration policy for performance and data currency.
  + Define access permissions for security.
  + Enable usage tracking for monitoring and optimization.
* Vector Tile Service Publication (on ArcGIS Server):
* Share Package as a Service: Use ArcGIS Pro, ArcGIS Server Manager, or ArcPy to share.
* Advanced Configurations:
  + Clustering: Enable clustering to group similar features at higher zoom levels for improved performance.
  + Dynamic Styling: If included, enable dynamic styling to allow users to change symbology on the fly.
  + Offline Support: Generate mobile map packages (MMPKs) for users to download and utilize maps offline.
* Testing and Feedback: Test the service in different applications and web maps.
* Adjust settings based on performance and user experience.

## Open ArcGIS Enteprise or ArcGIS Online

Depending on your organization's infrastructure, open either ArcGIS Enterprise or ArcGIS Online.

## Navigate to the Content

In ArcGIS Online or ArcGIS Enterprise, go to the 'Content' section where you manage and organize your GIS content.

## Add Vector Tile Package

Upload the vector tile package (.vtpk) you created in ArcGIS Pro to the content area. Use the 'Add Item' option to upload the vector tile package.

## Configure Vector Tile Service

Once the vector tile package is uploaded, select it and choose the option to 'Share as a Web Layer' or 'Publish as a Vector Tile Service,' depending on your platform.

## Set Service Properties

Configure service properties, including a meaningful name, tags, summary, and any other metadata that helps describe the vector tile service.

## Choose a Folder (if Applicable)

Organize the vector tile service within a folder structure if your content management system supports it. This helps keep your content organized.

## Configure Caching (Optional)

Consider caching options based on your organization's needs. Configure the caching settings for optimal performance, balancing between cache storage and speed.

## Set Permissions

Define access permissions for the vector tile service. Specify who can view and edit the service based on your organization's security requirements.

## Advanced Settings

Explore advanced settings if additional configurations are needed, such as feature access settings, clustering options, or custom tile scales.

## Share and Publish

Click the 'Share' or 'Publish' button to make the vector tile service available on the platform. This action publishes the vector tile service based on the configuration and settings you specified.

## Access the Vector Tile Service

Once published, access the vector tile service through its unique URL. Test the service to ensure it loads correctly in web maps or other client applications.

# Summary

A GIS is only as good as the data that powers it. Geodatabase administration is crucial in keeping a well-maintained, performance geodatabase that users will be able to utilize efficiently. In this guide, we discussed how to create a geodatabase, connect to it, creates accounts for users to access it, load data into it, manage user privileges, manage user connections, and perform routine maintenance.

# FAQs

**Why would someone need best practices for vector tile package?**  Best practices for vector tile package (data management) are essential for several reasons, each contributing to the successful implementation, optimization, and maintenance of a vector tile service. Here are key reasons why someone would need to follow best practices for vector tile package data management:

1. Performance Optimization: Best practices guide users on preparing geospatial data in an efficient manner, including generalization, attribute reduction, and deduplication. This optimization ensures that the vector tile package is streamlined for performance.

2. User Experience: Best practices for choosing an appropriate spatial reference and maintaining data consistency facilitate seamless integration of vector tile services into existing datasets and base maps. This enhances the overall user experience.

3. Resource Utilization: Properly configuring the vector tile package, including setting levels of detail (LODs), tile extents, and tiling schemes, helps optimize resource utilization. This ensures that the package is tailored to the specific needs of the intended application.

4. Security and Access Control: Secure Data Handling: Following best practices for security considerations ensures that vector tile services are implemented with access controls, secure communication, and proper logging. This protects sensitive data and maintains the integrity of the GIS environment.

5. Ease of Use: Creating detailed documentation is a best practice that contributes to ease of use. Clear and comprehensive documentation assists users in understanding the vector tile package creation process, service publication, and consumption, leading to successful implementation.

6. Training and Knowledge Transfer: Best practices include the development of effective training programs, materials, and mentoring initiatives. This ensures that users, administrators, and developers have the necessary skills to work with vector tile packages and services.

7. Community Engagement: Establishing best practices for community engagement, such as user groups and forums, fosters collaboration. Recognizing and showcasing user contributions and success stories create a supportive GIS community.

8. Continuous Improvement: Best practices emphasize an iterative development approach, allowing for continuous improvement based on user feedback, changing requirements, and emerging technologies. This ensures that vector tile services evolve to meet evolving needs.

9. Data Efficiency: Best practices for data efficiency, including generalization, attribute reduction, and deduplication, contribute to optimized data handling. This is crucial for efficient storage, transmission, and rendering of vector tiles.

10. Quality Assurance: Following best practices for cleaning and validation ensures that the vector tile package contains high-quality, error-free data. This contributes to the overall reliability and accuracy of the GIS service.

11. Resource Management: Best practices for monitoring and maintenance include implementing tools for performance monitoring, regular reviews of logs, and applying updates and patches. This ensures the ongoing health and performance of the GIS resources.

Best practices for vector tile package data management are essential for achieving optimal performance, ensuring data integrity, fostering a collaborative GIS community, and facilitating a positive user experience. These practices contribute to the overall success and sustainability of vector tile services in an Esri Enterprise GIS environment.

**Does the vector tile package use the tile cache data store?** So, in short, yes, vector tile packages and the corresponding vector tile services in ArcGIS Enterprise use a tile cache data store. The tile cache data store is a mechanism that allows pre-generated map tiles to be stored and served efficiently. This caching approach significantly improves the performance of map and feature services by delivering tiles directly to clients, reducing the need for dynamic rendering on the server for each request.

Here's how the process typically works:

1. Vector Tile Package Creation: When you create a vector tile package (VTPK) in ArcGIS Pro, you are essentially packaging vector tiles at different levels of detail (LODs) based on zoom levels.

2. Publishing as a Vector Tile Service: When you publish the vector tile package as a vector tile service in ArcGIS Enterprise, the service leverages the tile cache data store to efficiently serve the pre-generated vector tiles.

3. Tile Caching: The vector tiles are cached and stored in the tile cache data store on the server. This pre-generated cache includes tiles for various zoom levels and extents, optimizing the delivery of map content to clients.

4. Client Requests: When a client application (such as a web map or custom application) requests map tiles for a specific area and zoom level, the ArcGIS Enterprise server can efficiently serve these pre-cached vector tiles.

5. Performance Benefits: The use of the tile cache data store significantly improves the performance of map rendering and response times. It reduces the need for dynamic rendering of map content on the server for each user request, as the pre-generated tiles are readily available.

6. Caching Settings: Administrators can configure caching settings for the vector tile service, specifying how tiles are generated, stored, and managed over time. This includes options for caching on demand, pre-generating caches, and defining cache expiration policies.

The tile cache data store in ArcGIS Enterprise plays a crucial role in efficiently serving vector tiles from vector tile services. It enhances performance, reduces server load, and provides a responsive mapping experience for end-users.

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