



**TerraGate®**

**Version 6.0**

# **Data Sheet**

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## Overview

The TerraGate suite of tools supports the client-server data delivery requirements of Skyline's 3D technology. This powerful network feature and terrain server technology efficiently streams massive amounts of 3D geographic and feature data to thousands of concurrent users, giving each user uninterrupted viewing.

TerraGate suite is compliant with OpenGIS Implementation Specifications for:

- ◆ OpenGIS® Web Feature Service (WFS) Implementation Specification
- ◆ OpenGIS® Web Map Service (WMS) Implementation Specification
- ◆ OpenGIS® Catalog Service: Web (CSW) Implementation Specification

TerraGate includes the following components:

- ◆ **TerraGate Terrain Streaming Server Component** - A powerful network data server technology that provides the following services, via the TerraGate server:
  - **TerraGate Terrain Service** - Streams 3D geographic data from terrain cache databases (MPT) or directly from the original sources through the DirectConnect extension.
  - **TerraGate Internet License Service** - Enables the use of extended TerraExplorer Pro API capabilities from authorized domains.
  - **TerraGate Collaboration Service** - Hosts TerraExplorer Collaboration sessions to which multiple users can connect and work together in the 3D environment.
- ◆ **TerraGate Spatial Framework Services (SFS) Component** - A powerful network feature server technology that provides the following services, via the SFS server:
  - **Web Feature Service (WFS)** - Streams feature layers (points, lines and polygons) via the WFS server from Shape files, the Oracle database, SQL server database, PostGIS and ArcSDE servers, and from pre-cached layers created using the Cache Creator.

- **Web Map Service (WMS)** - Streams maps via the WMS server of spatially referenced data from terrain cache databases.
- **Catalog Service: Web (CSW)** - Provides TerraCatalog search interface for remote users.

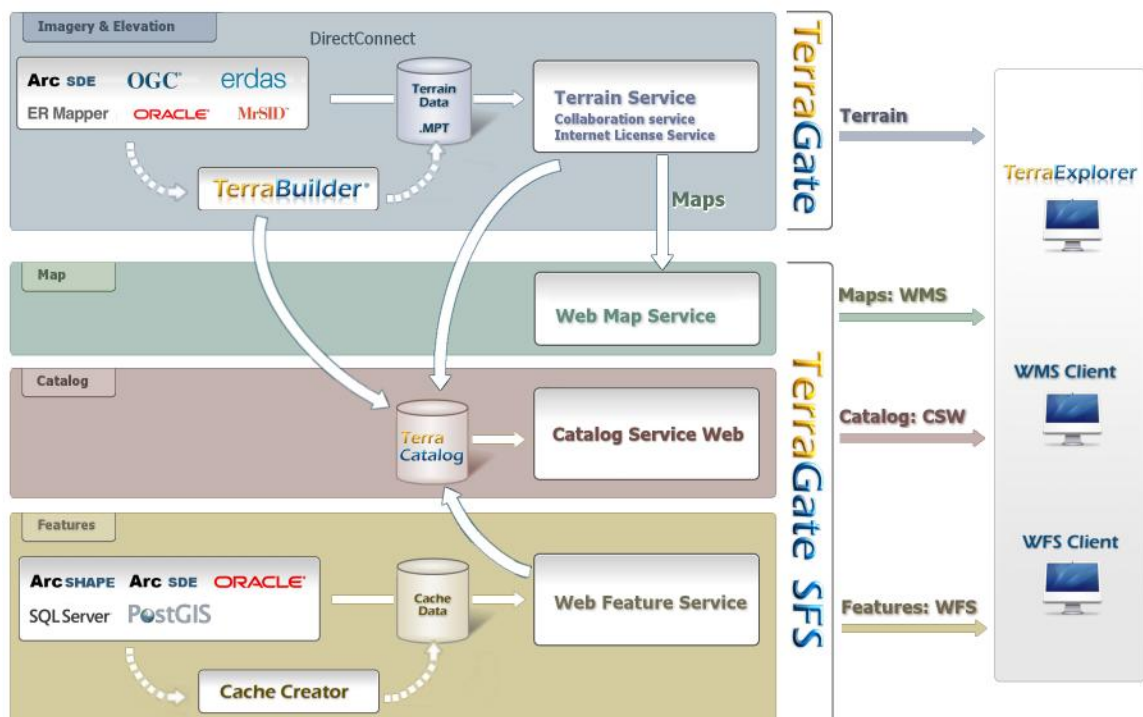


Figure 1: TerraGate Architecture

## Product Main Features

### Terrain Service

- ◆ 3D data streaming over private networks or the Internet.
- ◆ Serves Skyline terrain cache databases (MPT files) created by TerraBuilder.
- ◆ Serves on-demand 3D processing of raw imagery and elevation data (raster) using the DirectConnect extension.
- ◆ Optimized for low-bandwidth conditions.
- ◆ Designed for easy scalability.
- ◆ Uses TCP/IP protocols. Enable SSL (Secure Socket Layer) protocol.

- ◆ Works with firewalls and proxy servers.
- ◆ Takes full advantage of multi-processor server hardware.
- ◆ Efficient handling of massive data sets.
- ◆ Terrain data size limited only by disk media.
- ◆ Fully controlled through the TerraGate Manager tool.
- ◆ Distributed TerraGate Network enables users to fly on a single project managed by dispersed TerraGate servers.

### **Internet License Service**

- ◆ An authorization server allowing activation of TerraExplorer extended API from authorized domains.

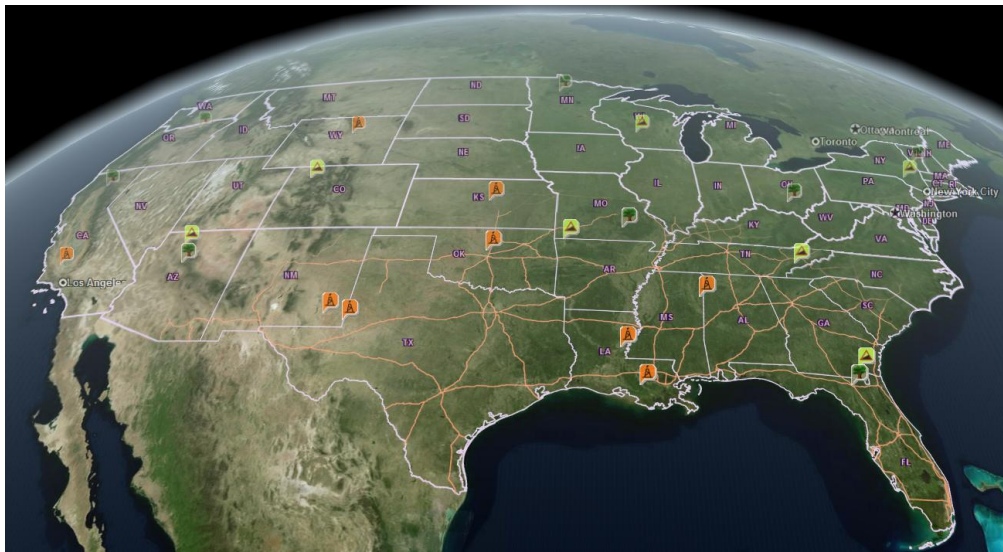
### **Collaboration Service**

- ◆ Hosts TerraExplorer Collaboration sessions to which multiple users can connect and work together in the 3D environment.

### **Web Feature Service**

- ◆ Manages and streams layers of features, including polylines, polygons and points.
- ◆ Streams from Shape files, the Oracle database, SQL server database, PostGIS and ArcSDE servers.
- ◆ Provides OGC Web Feature Service (WFS) interface to other applications.
- ◆ Ability to pre-cache data or directly connect to a source. Using a cache helps the SFS reduce loads from slower data sources such as ArcSDE or Oracle.
- ◆ Creates a cache on the server for high-performance streamed data.
- ◆ Data cache can be configured in advance for an entire layer or created on-the-fly per request.
- ◆ Dynamic cache – Cache is created gradually in response to user requests for sections of data.
- ◆ Scalable to serve out data to a large number of users (SFS Cluster).
- ◆ Auto-refresh mechanism can be set to active when a layer is updated.
- ◆ Ability to mark each cache tile data with an expiration time.

- ◆ Stores each layer's cache in three different detail levels for better optimization.
- ◆ Optimized to handle a high number of requests per server.
- ◆ Web-based management system to define the data sources, layers, and cache settings. Efficient handling of massive databases. No size limitation.
- ◆ Supports advanced queries from TerraExplorer and other WFS clients
- ◆ Divides query results into several replies to enable queries on large data sets
- ◆ Read-write access allows editing of data source (WFS-T).



**Figure 2: WFS streaming to TerraExplorer**

## Web Map Service

- ◆ Provides OGC Web Map Service (**WMS**) interface to TerraGate terrain databases.
- ◆ Outputs Imagery and Elevation layers.
- ◆ Outputs raster data in JPEG and PNG formats.
- ◆ Scalable to serve out data to a large number of users (SFS Cluster).
- ◆ Optimized to handle a high number of requests per server.
- ◆ Web-based management system to define the data sources and layers. Efficient handling of massive databases. No size limitation.

## Web Catalog Service

- ◆ Uses OGC Catalog Service: Web (CSW) protocol.
- ◆ Delivers published TerraCatalog layers to remote applications.
- ◆ Remote users can query the Catalog Service by text or geographic properties.
- ◆ "Publish" property determines which layers are exposed to the client.
- ◆ Customizable filter limits the catalog items exposed to the client.
- ◆ Service managed using the Skyline TerraCatalog database.

## Terrain Service

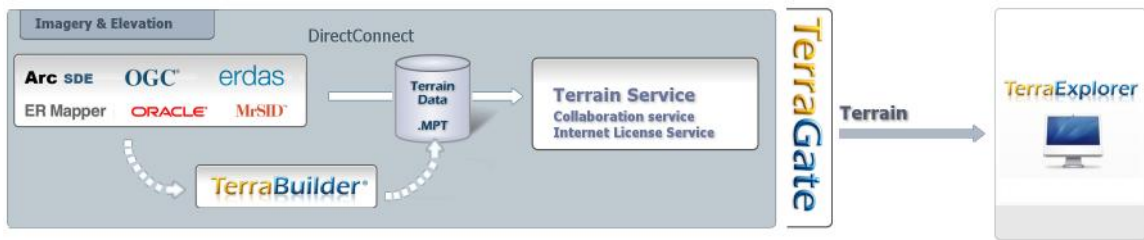
The TerraGate Terrain Service is a powerful network data server technology designed to stream 3D geographic data in real-time. The Terrain Service client-server model is optimized to handle thousands of concurrent users accessing virtually unlimited sized databases in low-bandwidth situations, giving each user uninterrupted viewing. TerraGate achieves this by allowing the client to quickly receive low-resolution scenes around the current location, and then requesting high-resolution information based on the user's current speed and direction, while allowing for real-time changes in navigation.

The Terrain Service provides the platform for launching applications created with Terra development and editing tools. In conjunction with TerraBuilder, TerraDeveloper, and TerraExplorer Pro, the Terrain Service makes the digital Earth accessible, and makes a geo-referenced backdrop available for clients' web-based applications.

The Terrain Service differs significantly from video streaming technology in that it works seamlessly across variable bandwidths on the Internet and is not affected by latency or breaks in connectivity. Once users have received the initial scene in low-resolution, they can begin accessing the 3D environment without waiting for entire frames of data to display. This breakthrough technology displays seamless 3D graphics for a smoother and more enjoyable user experience.

The Terrain Service can stream from two sources:

- ◆ From terrain data stored in Skyline optimized terrain databases (MPT)
- ◆ From the original sources directly through the DirectConnect project



**Figure 3: TerraGate Terrain Service Architecture**

### Terrain Database (MPT)

The terrain database (MPT) is a compressed, multi-resolution, stream-optimized file. The MPT database includes all source information and applied manipulations in the TerraBuilder project. The terrain database is used locally or published by TerraGate to Internet or Intranet users.

### DirectConnect Extension

TerraBuilder DirectConnect, together with TerraGate, allows you to fly directly over a TerraBuilder Project (TBP), saving the time and resources needed to create a 3D terrain database (MPT). You can add your raster files to a TerraBuilder project, perform all the required manipulations, and make the project immediately accessible through TerraGate to clients over the network. Later, existing files can be updated or removed to show variations of the original information.

DirectConnect can stream any TerraBuilder supported raster source that either has an internal resolution pyramid (e.g., MrSid, ECW) or for which a resolution pyramid (MPT or MPU) was created by TerraBuilder. If a source does not have a resolution pyramid, DirectConnect can still stream it, if its maximum visible UPP is set to its UPP in the project.

TerraBuilder DirectConnect can manipulate and combine multiple source files, of various formats and projections as well as unlimited size and resolution. TerraBuilder DirectConnect uses TerraBuilder fusers to exploit the combined computing power of any available server-side computers. This provides scalability for the resources needed to handle the performance-demanding workload of on-the-fly 3D terrain database creation.

## **Fusers**

A TerraBuilder Fuser (or “Fuser”) is an application that allows TerraBuilder DirectConnect to utilize the resources of the computer, on which it is running, for the on-demand generation of a virtual 3D terrain database. Local or remote fusers operate as copies of TerraBuilder on the client machines, adding their resources to the streaming of data to TerraGate via the DirectConnect component. TerraBuilder fusers can also be used to share the workload of MPT creation simultaneously between several computers and multi-CPU platforms.

## **Distributed TerraGate Network**

TerraGate can be installed as a distributed network, enabling users to fly on a single project managed by dispersed TerraGate servers. Each of the servers provides data for different sections of the terrain database and manages a cache database for sections handled by other servers. This allows enterprise level management and scalability, while also providing high-level availability, and bandwidth optimization.

## **Internet License Service**

The Internet License Service allows the generation of specific and targeted flying experiences in real-time, by providing TerraExplorer Pro API functionality to TerraExplorer Viewer applications over the Internet. Each Internet License includes a list of domain names and addresses that can be authorized by it. The list is written in your TerraGate license file, and can be changed by Skyline only.

When a web page that is delivered from one of the authorized domains attempts to use advanced TerraExplorer Pro API from TerraExplorer Viewer, an authorization request is sent to the Internet License service. If the domain from which the page originated is included in the authorized list, TerraExplorer Viewer receives permission to execute the advanced API.

The Internet License requires Terrain Service to be installed. It uses the server settings, as defined by the TerraGate component, for communicating with clients.

## Collaboration Service

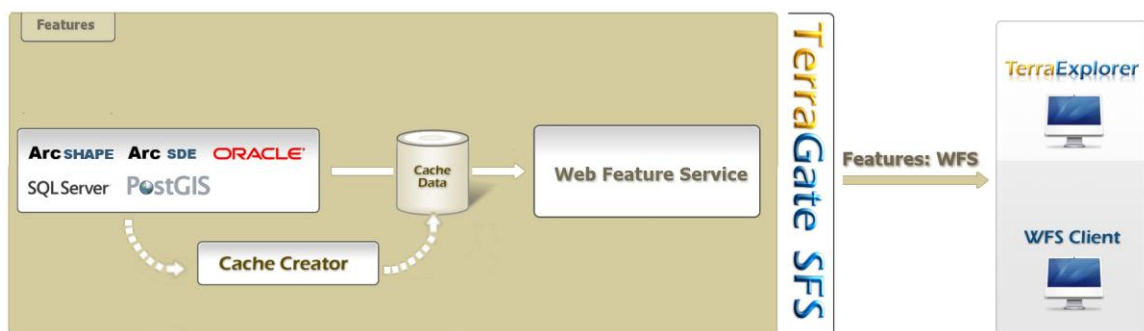
The Collaboration Service provides hosting services for collaboration sessions between TerraExplorer users. Using the collaboration tool in TerraExplorer, users can create collaboration sessions and invite remote participants to share the 3D experience.

## Web Feature Service (WFS)

TerraGate Web Feature Service provides an interface that allows requests and spatial and attribute queries for layers of features from any application that reads the standard OGC WFS protocol. WFS retrieves layers of features from Oracle Spatial/SQL 2008/ArcSDE/Postgre SQL with PostGIS and Shape files. The layer data is returned to the WFS Service, converted to a standard WFS format, and sent to the client application. WFS has several sub-systems that are individually responsible for handling streaming requests from several different sources.

TerraGate supports WFS-T, providing remote clients with read-write access, to edit (create, delete, and update) the feature layer and save changes to the data source.

WFS uses a cache mechanism allowing high-speed performance as well as offering high-level scalability.



**Figure 4: Web Feature Service Architecture**

### Input formats:

- ◆ Oracle Spatial

- ◆ ESRI ArcSDE server
- ◆ SQL server 2008
- ◆ PostgreSQL/PostGIS
- ◆ ESRI Shape file (\*.shp)

**Output formats:**

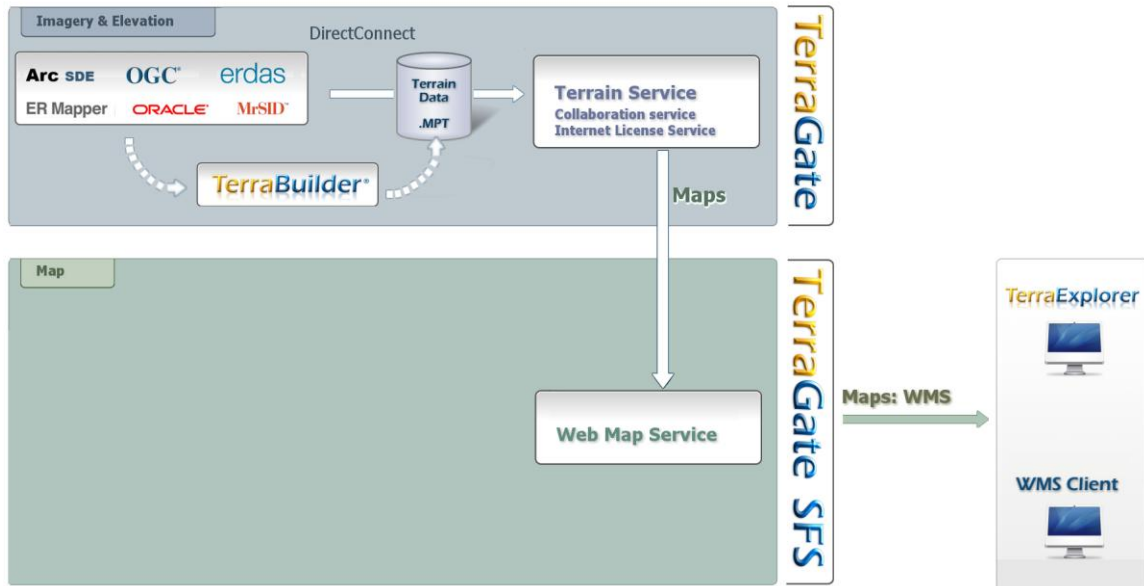
- ◆ Standard WFS data block
- ◆ Scrambled and compressed data block

**SFS CacheCreator**

One of the components of the WFS is the SFS CacheCreator. The SFS CacheCreator takes a single layer as its input and creates a cache that the WFS can directly use. This “pre-prepared cache” option is the most efficient and fastest way to serve incoming data requests. The cache can also be moved or shared between multiple servers.

## Web Map Service (WMS)

TerraGate Web Map Service provides an interface for requesting geo-registered map images from geospatial databases as well as for publishing map data as WMS services. WMS delivers Skyline map image data to any application that reads the standard OGC WMS protocol. Each request for map data is transferred from WMS to the TerraGate Terrain Service. The Terrain Service fetches the data from terrain databases (MPT files) or builds the blocks of data using the DirectConnect component. The data is then returned to the WMS Service, converted to a standard WMS result and sent to the client application. Supported imagery and elevation formats include JPEG (signed 8 bit) and PNG (unsigned 16 bit).



**Figure 5: Web Map Service Architecture**

## Web Catalog Service

TerraGate's support for the OGC Catalog Service for the Web (CSW) enables it to deliver published TerraCatalog layers to remote TerraExplorer Pro or TerraBuilder users, without the layers being pre-published by TerraGate. Remote users can query the TerraGate Web Service, using geographical coordinates or by any data in any of the metadata elements.

The service is managed using the Skyline TerraCatalog, which is a catalog database that helps you access, manage and organize your raster, feature, projects and other geographic assets located in storage files or on remote servers. TerraCatalog maintains detailed information about your geographic data including type, dimension, dates, tags, and metadata of each layer.

## Management Tools

### TerraGate Manager

TerraGate Manager is a management and configuration tool that enables the user to control and monitor the services included in the TerraGate Terrain Streaming

Server component: Terrain Service, Internet License Service and Collaboration Service. From TerraGate Manager, you can do all the following:

- ◆ Start and stop the Terrain Service and Collaboration Service.
- ◆ Monitor server performance and statistics.
- ◆ Change configurations (IP address, port).
- ◆ Add and remove terrain database directories.
- ◆ Control the IP addresses that can perform remote administration.
- ◆ Connect TerraGate to TerraCatalog, a catalog database.
- ◆ Add, remove, and search for TerraBuilder fusers.
- ◆ Set cache settings.
- ◆ Set TerraGate security parameters that determine how TerraGate handles connection requests from remote clients.
- ◆ Assign terrain database aliases.

### **TerraGate SFS Manager**

The TerraGate SFS Manager is a management and configuration tool allowing the user to control and monitor the Web Feature Service and Web Map Service. From the SFS Manager, using a browser web interface, you can do all the following:

- ◆ Monitor server status and performance.
- ◆ Configure SFS server settings (e.g., public URL, server name and title, cache directory, authorization mode).
- ◆ Modify and add user names, passwords, and permissions.
- ◆ Connect SFS to data sources it will be using (e.g., Oracle Spatial, ArcSDE, Shape files).
- ◆ Modify local server settings.
- ◆ Define streaming layers from the data sources.

**TerraGate® - SFS Manager** Skyline Globe

Main User: admin Logout ?

» Data Sources  
» Layers  
» Namespaces  
» Users  
» Settings  
» Messages  
» Local Server

**SFS Information**

Status	Started (Stop)
Name	SFS
Version	6.0.0.287 (64 bit) ( <a href="#">Download latest version of SFS CacheCreator</a> )
Client Access URL	http://AT-PC/SFS/streamer.ashx
Latest Message ( <a href="#">View all messages</a> )	Error: Unexpected error occurred at 7/11/2011 12:19:45 PM
Catalog Status	Disconnected ( <a href="#">Connect</a> )

**Monitor for: AT-PC**

Name	Last minute	Last hour	24 hours	Total	Average block size (kb)
Total Requests (from data source, from cache)	0 [0,0]	0 [0,0]	0 [0,0]	695 [182,513]	
Data Transfer (mb)	0.00	0.00	0.00	18.06	
BaseGlobe_Secured.Lmpt_1	0 [0,0]	0 [0,0]	0 [0,0]	0 [0,0]	0.00
BaseGlobe_Secured.Lmpt_2	0 [0,0]	0 [0,0]	0 [0,0]	0 [0,0]	0.00
border_2	0 [0,0]	0 [0,0]	0 [0,0]	0 [0,0]	0.00
border_3	0 [0,0]	0 [0,0]	0 [0,0]	0 [0,0]	0.00

Figure 6: TerraGate SFS Manager

## System Requirements

### TerraGate System Requirements

- ◆ **Operating System** - Windows Windows® Server 2003 SP2 / 2003 R2 SP2 / 2008 SP 2 / 2008 R2.
- ◆ **Processor** - Pentium IV or equivalent. TerraGate works best in a multi-core environment and can utilize multiple CPU's and hyper-threaded processors.
- ◆ **System Memory** - 2 GB of RAM plus additional 2 MB per concurrent user. Running TerraBuilder Fusers requires additional resources.
- ◆ **User Privileges** - Administrator privileges required for installation and configuration.

## **TerraGate SFS System Requirements**

- ◆ **Operating System** – Windows® Server 2003 SP2 / 2003 R2 SP2 / 2008 SP2 / 2008 R2.
- ◆ **Browser** - Microsoft Internet Explorer (7 and higher), Firefox (3 and higher), or Google Chrome (All versions). Required only for accessing SFS Web Administration.
- ◆ **Processor** - Pentium IV or equivalent. TerraGate SFS works best in a multi-core environment and can utilize multiple CPU's and hyper-threaded processors.
- ◆ **Memory (RAM)** - 1 GB of RAM (2 GB or more recommended)
- ◆ **User Privileges** - Administrator privileges required for installation and configuration.
- ◆ **Additional Software** –
  - Microsoft Internet Information Services IIS6 or IIS7.
  - Microsoft .Net Framework 2.0 or later.
  - Optional: Oracle Client 11.1.0.6.20 and ODP.NET 2.111.6.20.

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