HARDWARE CONFIGURATION FOR SKYLINEGLOBE SERVERS

This article provides information for SkylineGlobe Server (SGS) configuration. It discusses various considerations to take into account when setting up and configuring the different server components.

Server Hardware and Software Requirements

Requirement	Description
Operating System	Windows® Server 2008 R2 / 2012 R2 / 2016 / 2019 – 64-bit.
System Memory	4 GB of RAM (8 GB or more recommended).
Processor	Dual-Core (4 or 8 cores recommended).
Browser	Microsoft Internet Explorer 11, Edge Legacy, Chromium Edge, Mozilla Firefox, and Google Chrome.
User Privileges	Administrator privileges required for installation and configuration.
Additional Software	Microsoft Internet Information Services IIS7.5, IIS8.5, IIS10 with .Net 4.8 and ASP.Net.
Redundancy	In **mission critical systems,** it is advisable to allocate at least one additional failover server, e.g., for a 2000 concurrent user system, it is recommended to allocate a server for each 500 users and then an additional fifth server. Since a single SGS server can in fact support **more** than 500 concurrent users, it is also an option to forego the failover servers and rely on the rest of the SGS servers in case one of the systems fails. This option is recommended only in cases where the streaming requirement can be compromised for a limited time.
Load Balancing	You can set up several servers behind a load balancer. Usually these servers share a central storage for the configuration database, upload folders, and other data. Any hardware or software load balancer solution is supported.

Processing

The processor and system memory recommended above are capable of handling nearly all SGS processing requirements, such as conversion of feature layers to WFS, raster to WMS, and mesh layers to 3D Tiles. Even in DirectConnect projects, fuser processing requirements are kept to a minimum through data optimization and caching. During TerraBuilder's publishing process, optimized MPT resolution pyramids are created for each of the native sources. This eliminates the need for fuser processing except in terrain areas with overlapping MPT sources. Since over 97% of block requests are from non-overlapping sources, minimal fuser processing is required.

Caching further reduces the necessity for fuser processing. When a block is requested for the first time, it is processed by a fuser and then cached. Future requests for this block are delivered from the cache (MPT) and require no fuser processing. Thus within just a few days, almost all required fuser processing will be completed. Currently the only way to determine the ratio between fuser requests and cache requests is by performing a small scale test of the project.

Bandwidth Allocation

The configuration described below is based on a SkylineGlobe application with an **average of 8 minutes per user session**. Applications with longer sessions (e.g. city control applications) will reduce the average user data consumption per second from the terrain and feature services. In general, during short sessions the user zooms into high quality areas and navigates around. In longer sessions, after the initial browsing, the user focuses on an area of interest and therefore pulls less data from the SkylineGlobe servers. The nature of the application determines the user browsing behavior and thus the average bandwidth and storage requirements.

Note: It is important to verify that the **Load Balancer** can handle the traffic load.

Map and Terrain Services

For a smooth navigation experience for **Internet** applications, it is recommended to allocate **300 Kbits (37.5 KB) per second** for each concurrent user. This will satisfy the average bandwidth requirements of an average viewing session that includes periods of panning (requiring higher bandwidth) and periods in which the camera is zoomed in on a specific area (requiring lower bandwidth).

300 Kbits represents an average of 2 data blocks per second, with each block approximately 15 KB. The block size will vary during a viewing session depending on whether the camera is in motion. When the user is panning and zooming around in the 3D View, TerraExplorer usually requests **small blocks** (128x128 pixels of around **8 KB per block**). When the camera is static, zoomed in on a particular area, with only one block required per second, TerraExplorer usually sends requests for **large blocks** (256x256 pixels of around **40 KB per block**).

In fast **Intranet** environments, it is possible to allocate higher bandwidth per user for an even smoother, more seamless viewing experience.

Feature Service

To calculate the recommended bandwidth allocation for the Feature Service, the number of feature layers the application displays and the complexity of each layer must be taken into account.

In a fairly complex environment (SkylineGlobe.com), the Feature Service's bandwidth requirement generally parallels that of the Terrain Service. The average bandwidth requirement for an entire flight session of **3 feature data blocks per second** per user is **300 Kbits (37.5 KB, with each block approximately 10 KB)**.

Mesh Service

For a reasonable and smooth 3DML streaming experience for TerraExplorer application, it is recommended to allocate **6 Mbit** per second for each concurrent user during average consumption, and **24 Mbit** per second during peak consumption. The bandwidth is the average of a complete flight session. This bandwidth takes into account the periods when the user navigates around and consumes higher bandwidth and the periods the user is looking at a specific place and stops requesting 3DML blocks. The **24 Mbit** represent an average of **18 blocks** per second (about **170Kbyte per block**).

Storage Requirements

One of the most critical parameters when defining the server architecture is the data storage capability. It is important to verify that the storage can handle the number of requests per second.

Terrain/Map Service

On average, a **single user requests 2 blocks of 15 KB each per second**. To serve the requested blocks the Terrain/Map Service reads the required data from the disk storage.

Feature Service

On average, a **single user requests 3 blocks (files) of 10 KB each per second**.

Layers from Remote or Slow Data Sources:

If the Feature Service reads the data from an external database or server (e.g. ArcSDE, Oracle) you should make sure the database/server can handle the number of transactions.

Note: Only the first request for a specific block queried from the external database/server is processed. The resulting block is cached so any future requests for this block are delivered from the cache and require no processing. Thus within just a few days, many requests will no longer need to be queried from the external server and processed. Currently the only way to determine the ratio between external requests and cache requests is by performing a small-scale test of the project.

Case Study

This diagram describes an optional architecture for **1000 concurrent users** of a SkylineGlobe Internet server:

Bandwidth (peak time)

(Terrain Service + Feature Service + TE download) * 1000 users = (300 Kbit + 300 Kbit + 40 Kbit) * 1000 = **640 Mbit per second**.

Terrain Storage

2 blocks per user * 1000 users = **2000 data requests per second** (average of 15 KB per request)

Feature Storage

3 blocks per user * 1000 users = **3000 data requests per second** (average of 10 KB per request)

Terrain DirectConnect

In this project, the sources are already compressed to MPT. No need to allocate dedicated servers for the fusers.

Oracle/SQL Database

Up to 5 GB for the application and Gazetteer database.

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