The Microsoft TerraServer™

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Abstract

The Microsoft TerraServer stores aerial and satellite images of the earth in a SQL Server Database served to the public via the Internet. It is the world's largest atlas, combining five terabytes of image data from the United States Geodetic Survey, Sovinformsputnik, and Encarta Virtual Globe™. Internet browsers provide intuitive spatial and gazetteer interfaces to the data. The TerraServer demonstrates the scalability of Microsoft's Windows NT Server and SQL Server running on Compaq AlphaServer 8400 and StorageWorks™ hardware. The TerraServer is also an E-Commerce application. Users can buy the right to use the imagery using Microsoft Site Servers managed by the USGS and Aerial Images. This paper describes the TerraServer's design and implementation.

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The Microsoft TerraServer™

The TerraServer has five terabytes of satellite and aerial images of urban areas compressed to one terabyte of database data. It serves these images onto the Internet with a graphical and intuitive user interface. The application demonstrates several things:

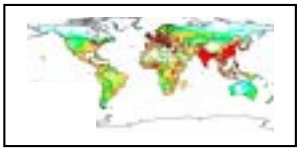
- **Information at your fingertips:** This is the most comprehensive world atlas anywhere — and it is available to anyone with access to the Internet.
- **Windows NT Server and SQL Server can scale up to huge nodes**: The TerraServer fills eight large cabinets: one for the Compaq Alpha 8400 processors, and seven cabinets for the 324 disks -- almost three terabytes of raw disk storage and 2.3 TB of RAID5 storage.
- **Windows NT and SQL Server are excellent for serving multi-media and spatial data onto the Internet**.
- **Microsoft Site Server can help sell images over the Internet.**

The TerraServer hardware

TerraServer is a multi-media database that stores both classical text and numeric data, as well as multi-media image data. In the future, most huge databases will be comprised primarily of document and image data. The relational meta-data is a relatively small part of the total database size. TerraServer is a good example of this new breed of multi-media databases.

The Application

An Interesting Internet Server: TerraServer is designed to be compelling Internet application. It tries to be interesting to almost everyone everywhere, be offensive to no one, and be relatively inexpensive to build and operate. It is hard to find data like that — especially a terabyte of such data. A terabyte is nearly a billion pages of text — 4 million books. A terabyte holds 250 full-length movies. It is a lot of data.



World population density

Satellite Images of the Urban World: Pictures are big and have a universal appeal, so it was natural to pick a graphical application. Aerial images of the urban world seemed to be a good application. The earth's surface is about 500 square tera-meters. 75% is water, 20% of the rest is above 70° latitude. This leaves about 100 square tera-meters. Most of that is desert, mountains, or farmland. Less than 4% of the land is urban. The TerraServer primarily stores images of urban areas. Right now, it has nearly five square tera-meters -- and it grows as more data becomes available.

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