

TerraShareTM – Distributed Image Data Management

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ABSTRACT

There are a lot of ongoing changes in today's Geo-data market. Traditional areas but especially new industries like telecommunication, car navigation as well as new technologies like location based services (LBS) are leading to a high demand of digital data. Data production shops have to be prepared for a huge amount of data throughput. Managing this data is a critical problem facing today's private and governmental imagery producers and users. Being the worlds leader for industry solutions in earth imaging Z/I Imaging expanded it's product line by introducing TerraShare – a comprehensive data management and distribution solution for geo-image data and projects. The paper describes the benefits of Terrashare and explains details about architecture, modules and functionality of this product family addressing customers needs towards high productivity and seamless workflow.

1. INTRODUCTION

The huge amount of Geo-related digital information is increasing permanently. Data production shops, data brokers and end-users are handling TeraBytes of mostly raster-based data like aerial or satellite images as well as Ortho images, DTM's etc. or scanned maps. With respect to different requirements as well as additional projects usually new hardware (servers, disk space) is added to the IT infrastructure. Actually this affects the productivity of operators, departments and finally the whole organisation. Some questions are :

- Where are my data ?
- How do I access quickly and easily ?
- What is the status of my project or my data ?
- How can I distribute the data most efficiently ?

Therefore a high effective data management solution will have a big impact to the entire production process. This will help saving costs and reducing time for production milestones, data delivery and availability.

2. DATA-CENTRIC PARADIGM

Workflows will no longer be purely serial to reach out a maximum of production benefits. Dramatically increasing volumes of data will lead to a new "data-centric" paradigm. Some key aspects in the production process are:

- The project and his data will remain the focus rather than the software tools
- Access is multi-user
- All user have a total view of the project
- Any action can be taken on any part of a project from any workstation

3. WHAT'S BEHIND TERRASHARE ?

Addressing this new challenges Z/I Imaging presents TerraShare as an enterprise-wide solution for image and workflow management as well as data distribution. TerraShare is a modular, client-server product family designed to address the needs of geo-imaging producers and distributors. TerraShare provides a system that manages terabytes of geo-imaging data from acquisition to exploitation to storage to distribution. TerraShare helps users organize their data by presenting the data in a logical hierarchical view or a geo-referenced view, both from within Microsoft Windows Explorer. TerraShare utilizes a scalable database and software that is tightly integrated with the Windows NT or Windows 2000 operating system.

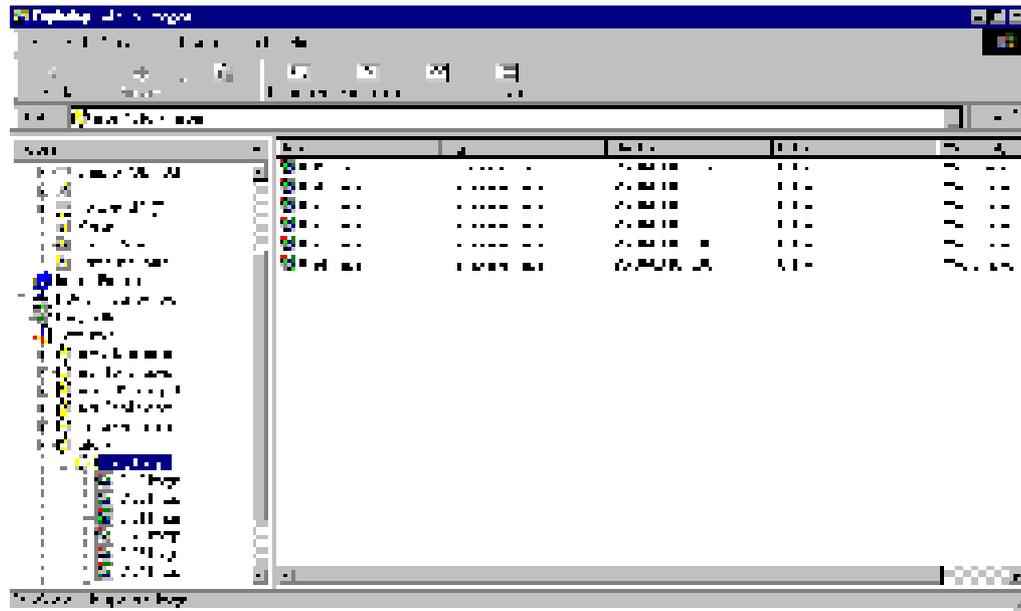


Figure 1: TerraShare Windows Explorer look & feel

With Terrashare operators and users never have to know the physical location of their data. Data can also be made available for distribution or sale over the Internet. TerraShare also stores metadata describing image and project statistics due to users requirements. TerraShare is a single, but open and modular environment. A software development kit allows customization on different levels.

4. SEAMLESS WORKFLOW FROM DATA PRODUCERS TO END USERS

The exploding volumes of Geo-imaging data such as aerial and satellite images does affect all organisations involved, although the producers are mostly faced with data management issues. Along this workflow Terrashare is designed to address the following:

- Manage large production photogrammetry data sets by presenting a logical view of the data, including offline data.
- View photogrammetric data from any TerraShare client in the connected enterprise.
- Display images in mono view or models in stereo view directly in a Windows Explorer view/window.
- Access TerraShare from all photogrammetric products.
- Use disk shadowing to intelligently download only what is needed to the local machine.

- Make more efficient use of production time because you do not need to know where the physical files reside on the system.
- Use TerraShare as a quick and effective tool for quality check. With TerraShare, you can quickly page through photographs and models to look for defective data.
- Enable Web-deployed image/DTM distribution for e-commerce.
- Enable Intranet/Extranet deployed data distribution or viewing across different locations or between cooperation partners or to customers.



Figure 2: Terrashare data management and distribution across the network

5. CORE OF TERRASHARE

The Terrashare product family is a modular system based on a common core product. It covers a range of customer needs from production/control data management to archiving and e-commerce, sharing the same data located in the enterprise. TerraShare add-on modules allow users to easily manage, process, transfer, and distribute various types of data. TerraShare natively handles images, elevation models and Digital Raster Graphics (DRG) as well as complete photogrammetric projects. Data can be published to the web and sold or distributed through an e-commerce ready set of controls. TerraShare can also be extended to process users data as Generic Files or Extended data types with user-defined metadata.

Tightly integrated within the Windows environment, TerraShare is a multi-tier, client-server application running under Microsoft™ Transaction Server (MTS). Operating within MTS TerraShare contains the heavy-duty design features expected in an enterprise solution such as support for distributed servers, support for multi-processors, and transaction processing.

TerraShare consists of the following parts:

- The server component that contains the database manager and provides responses to requests submitted by the clients.
- TerraShare data structures that reside within the underlying Oracle™, SQL Server or MSDE database, that TerraShare uses through ODBC to keep track of the relationships among the logical and physical files, as well as all image and project related metadata

- TerraShare Explorer Plug-In that you use to create and organize TerraShare folders and TerraShare files. TerraShare folders and files are logical, rather than physical – meaning that TerraShare knows where the files are located and can track the data without actually hosting the physical files.

TerraShare typically resides on a multi-workstation, distributed computing environment. In simpler terms, this means a server and one or more clients. The server software is installed on the server, and the client software is installed on each client that is to be included in the TerraShare system.

6. LOGICAL VIEW TO PROJECTS AND DATA

Traditional methods of managing data can involve a manual process such as storing images for a project on a designated drive, workstation or server. This process can cause several problems such as:

- Fragmenting projects when disk partition space is exceeded.
- Keeping the associated metadata with the image data.
- Copying data onto workstations during data collection – or leaving data on the server.
- Tracking active data and providing it to other departments or consumers.
- Wasting precious disk space by keeping multiple copies of the same data.

TerraShare addresses these needs in an organized, easy to administer approach. The system provides the tools to automatically track your project data across your enterprise. TerraShare separates the logical management of data from its physical location. Even though the data may be located in various physical locations, once it is entered into the TerraShare system, it is automatically tracked and then displayed within one static view. Everybody involved has always a logical view to the entire project and it's data wherever the information physically located across the network. This automated system eliminates the time consuming task of tracking your imagery and metadata as it flows through your network.

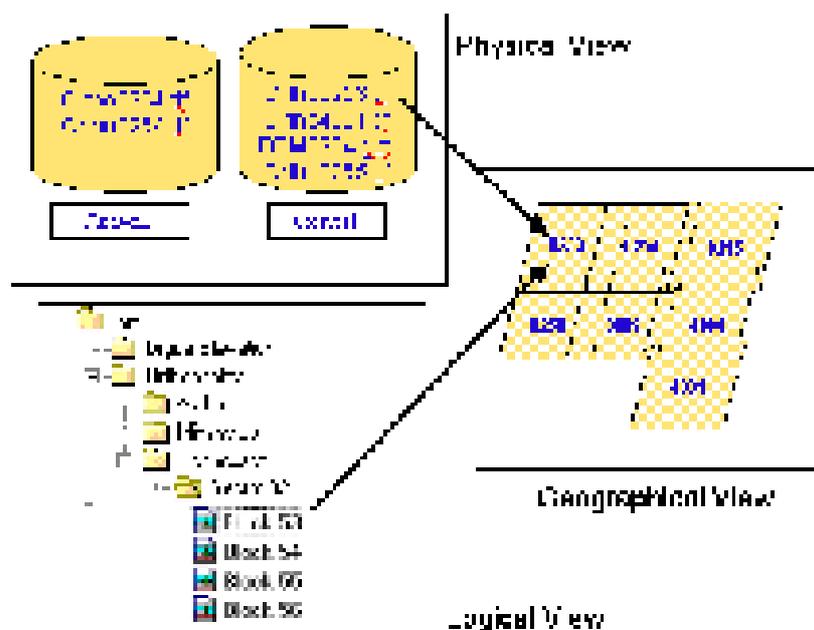


Figure 3: Logical View through Terrashare

7. MODULAR PRODUCTS IN A SINGLE ENVIRONMENT

The modular, integrated design of TerraShare allows you to address your image management and distribution needs within a single environment regardless if your organization has one workflow or several different operational flows. Inside this single environment TerraShare handles all tasks through different software modules depending on your production processes:

- **TerraShare Core** is the central module of our server-based raster data management system. It includes server and client software. This system provides full tracking and management functions for geo-imaging data and serves as the core for TerraShare add-in modules.
- **TerraShare Photogrammetric Manager (PM)** provides an integrated interface to our ImageStation and GIS Imaging product families and brings together all data into a seamless environment.
- **TerraShare e-geo** makes it easy to turn your geo-imaging projects into a thriving Internet e-commerce or distribution site.
- **TerraShare Software Development Kit (SDK)** allows you to tailor the TerraShare environment to create systems that meet your specific geo-imaging requirements.

The TerraShare core module draws all of the image data into a seamless, distributed environment. This builds the platform for all production, management and distribution tasks sharing the same data located in the enterprise.

8. TERRASHARE PHOTOGRAMMETRIC MANAGER

TerraShare Photogrammetric Manager (PM), installed on the TerraShare server, provides an interface to our ImageStation and GIS Imaging products, through the TerraShare Explorer Plug-In, to all TerraShare clients in the connected enterprise. Designed for high performance in a distributed environment, TerraShare PM includes features such as:

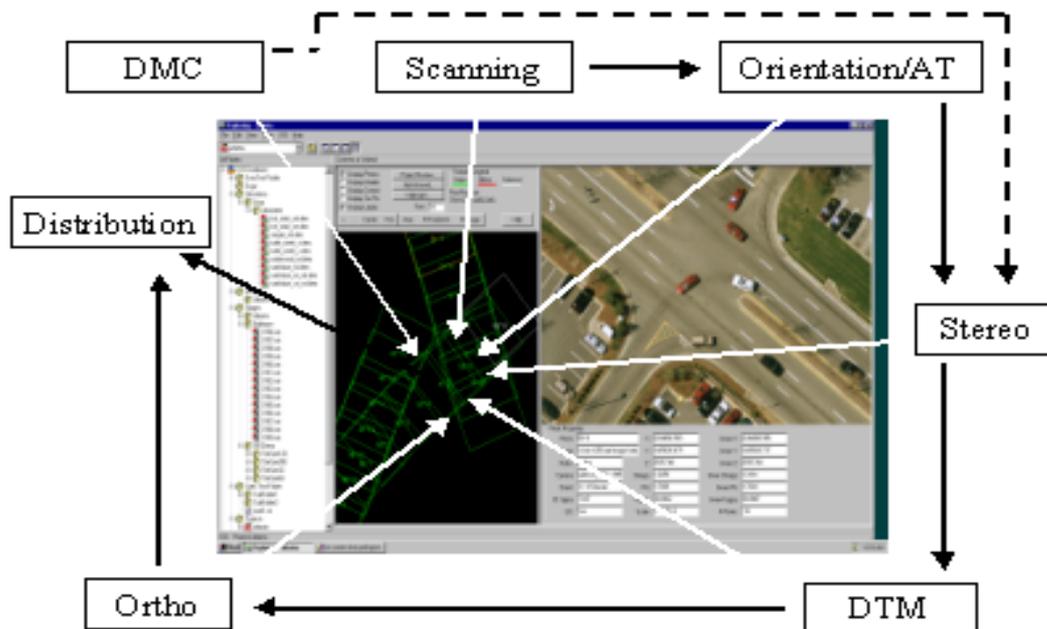


Figure 4: TerraShare PM display and distributed processing

- Manage photogrammetric projects within TerraShare PM using a common Windows Explorer interface.
- Browse projects and images based on name without knowing the machine, disk, and directory that the target is located.
- View a graphical display of the block layout, project status, and project metadata.
- Use our unique "just-in-time" tile delivery system that caches imagery tiles to the local disk as soon as they are transmitted. Since the data is locally available, the next time you view the same image area, the system will access the locally stored image as opposed to pulling the data over the net again.
- Isolate users from project disturbances caused by moving data from scanners to workstations or servers. Users have a static view of the project regardless of data or location.
- Request data using a common method such as project, strip, photo, or model and TerraShare PM provides the data to you regardless of physical location.
- Review photogrammetry projects from a TerraShare client within the connected enterprise.
- Launch ImageStation photogrammetry products directly from the Windows Explorer view of a project.

9. TERRASHARE E-GEO

TerraShare e-geo makes it easy to distribute project information and data to distributed users and to establish an e-commerce site by projecting your TerraShare geo-imaging data to the web. You can publish data for e-commerce activities. The e-geo module offers the following features:

- View data in a geo-spatial environment and see the associated project metadata.
- Browse an image archive via the Internet.
- Use the e-commerce component to sell data via the Internet

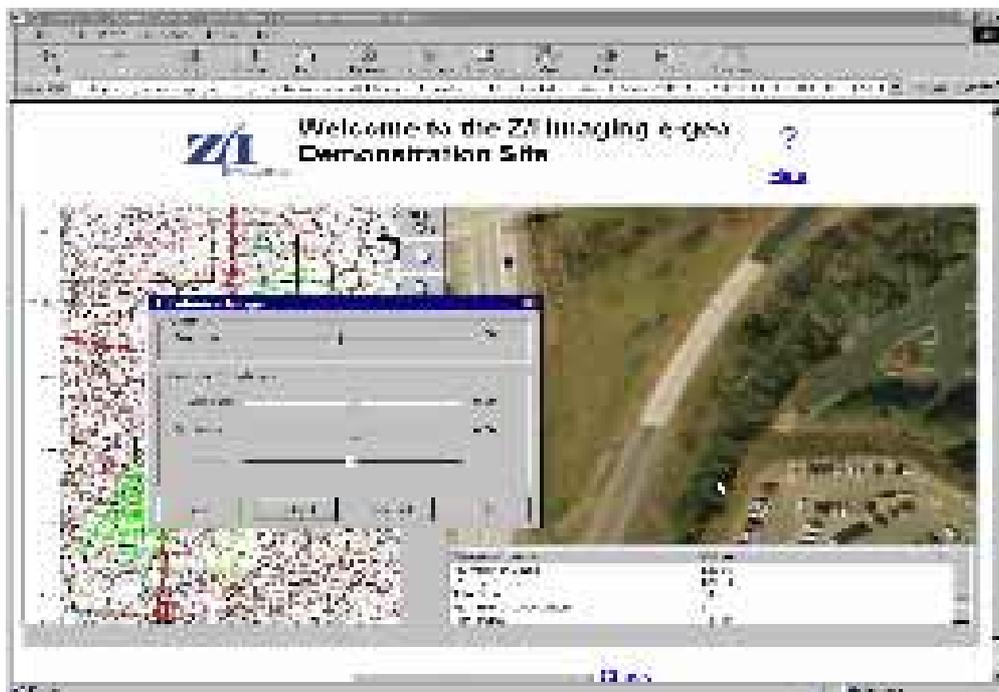


Figure 5: TerraShare e-geo site and display control functions

In the production workflow TS e-geo is an excellent tool to increase collaborative and concurrent project performance. Today companies run photogrammetric production as an internationally globalised business. They want to benefit from a business network, but not loose productivity along the way of data exchange or quality check between project partners and/or different locations. For example, a scanner contractor could scan directly to the TerraShare environment and immediately publish the project to the web. The project image footprints would appear for the entire project and include notations on which images have been processed. The contracting company could then view the images via the web and request changes.

10. TERRASHARE SOFTWARE DEVELOPMENT KIT (SDK)

TerraShare SDK enables you to use TerraShare as the nucleus for your own custom development. TS SDK provides the tools needed to customize the TerraShare system.

- Access the TerraShare core data, services, and sample programs through the Application Programmer's Interface (API).
- Access functions for data tracking, disk space management, and user-definable server-based processing routines.
- Plug in custom ActiveX controls that seamlessly interface with TerraShare.
- Manage geo-imaging data in your own customized networked production environment.

11. TERRASHARE AWARE APPLICATIONS

In addition to the TerraShare Explorer Plug-In, other client-based applications can use the TerraShare client to access TerraShare files and data. Applications are "TerraShare Aware" when they are able to read or write TerraShare files. Applications can achieve two levels of TerraShare awareness: basic and complete.

Today all Z/I Imaging photogrammetry and GIS Imaging products are completely TerraShare Aware. Operators can launch Z/I's ImageStation software directly from the Windows Explorer view of a project. They can fully benefit from the entire Terrashare system capabilities.

With basic TerraShare awareness, you use the Microsoft Open dialog box to open TerraShare files. This level of TerraShare awareness is freely supplied by Windows, but only lets you open files because TerraShare files cannot be saved or created using the Microsoft Save As dialog box. Basic TerraShare Aware applications do not have access to any extra physical files or extended metadata associated with the TerraShare file. However, this approach is often sufficient in simple applications.

You can attain complete TerraShare awareness by using the Z/I Common Dialog controls provided in TerraShare Software Development Kit (SDK). These controls replace the Microsoft common Open and Save As dialog boxes and let you browse, create, and save standard Windows physical files as well as TerraShare files and folders. First 3rd party products are already Terrashare aware to fully benefit from the TerraShare data management environment, e.g. *DEFiNiENS* object oriented image analysis software *eCognition*TM. Specific plug-in's for the most popular GIS and CAD products are under development.

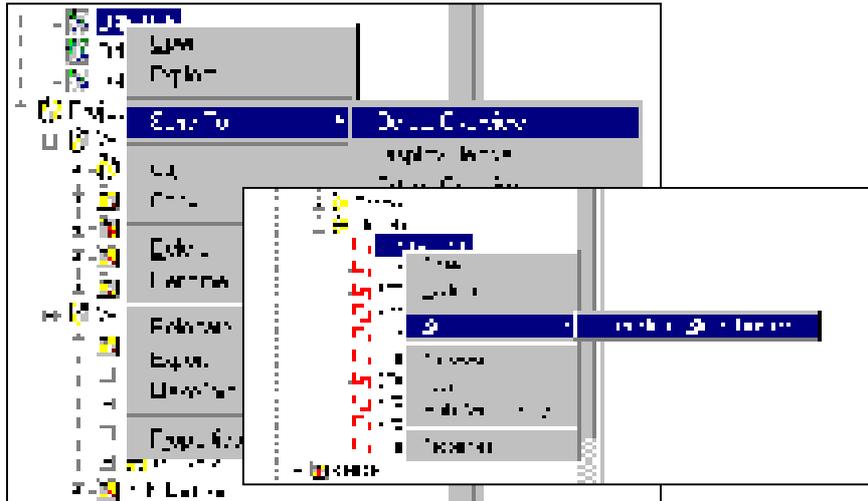


Figure 6: Launch of “TerraShare Aware” applications and functions

12. EASY TO USE

When your workstation is a client of a TerraShare data management system, your photogrammetric application software interacts seamlessly with image, project, and other application data controlled by a TerraShare server. TerraShare’s key-roles to the TerraShare family comprise the setup, maintenance, and management of the TerraShare database, and the display of TerraShare logical folders and files in Windows Explorer. The database is populated with data containing information associated with each file or files imported into TerraShare, such as physical file location, coordinate system, geographic location, online/offline information, standard metadata, and user-defined metadata. TerraShare is also responsible for responding to queries or data requests made by any user of the Intranet or Internet.

The TerraShare Explorer Plug-In is the interface through Windows Explorer that allows users to access the TerraShare core module. This means that within your Windows Explorer view you can see the TerraShare data management system – like any other file within your networked environment. The plug-in provides the ability to import/export, copy, rename, and delete TerraShare files.

TerraShare files represent physical files that are distributed across the network within the well-known environment of Windows Explorer. In this environment, which is natural to all Windows users, TerraShare can be treated like a file management system that separates the physical location of files from their logical view. There is also a footprint view in the right pane of Explorer that allows users to see the geo-referenced locations of images in a TerraShare folder or multiple folders. Simple operations, traditionally performed only on files, can now be performed on TerraShare entities, such as logical files, logical folders, and footprints.

13. SUMMARY

TerraShare is a modular, client-server system designed to address the image management and distribution needs of geo-imaging producers and distributors. TerraShare is an enterprise-wide

solution designed to grow with customers data management needs. The software family has a positive impact on your production environment and will significantly reduce your project costs. TerraShare immediately reduces the time your staff devotes to tracking data throughout the production environment. This automated system also increases the efficiency of every person involved in managing geo-imaging projects. The result is a short-term return on investment for your TerraShare installation.

14. REFERENCES

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