ERDAS IMAGINE®
What's New in V9.0

ERDAS IMAGINE® V9.0

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Overview

ERDAS IMAGINE® is the raster-centric software GIS professionals use to extract information from satellite and aerial images. Because it is easy to use and easy to learn, ERDAS IMAGINE is perfect for beginners and experts alike. The vast array of tools allowing users to analyze data from almost any source and present it in formats ranging from printed maps to 3D models, makes ERDAS IMAGINE a comprehensive toolbox for geographic imaging and image processing needs.

Enterprise enabled

Now ERDAS IMAGINE V9.0 is enterprise-enabled! For organizations with extensive collections of geospatial data, processing that uses a centralized relational database to store geospatial information is of great benefit. Institutions maximize their investments by making data visible and accessible to end users. ERDAS IMAGINE provides client-side interaction with spatially aware databases such as ESRI ArcSDE and Oracle Spatial 10g, continuing the ERDAS IMAGINE tradition of helping users make the most of their imagery.

Key New Features Summary

- Enterprise enabled
- OrbView3 orthorectification
- CARTOSAT-1 orthorectification
- High-Pass Filter Resolution Merge (pan sharpening)
- Metric Accuracy Assessment tool
- Visual improvements for Pyramid layers
- Improved process automation tools

Enterprise Enabling

Three Key Areas   The Enterprise-enabling of ERDAS IMAGINE 9.0 occurs in three key areas:

- IMAGINE Essentials
  - o Read-only access to the database

- IMAGINE Enterprise Loader
  - o Bulk-load raster and vector data to the database

- IMAGINE Enterprise Editor
  - o Oracle Spatial editing solution for the connected or disconnected user

IMAGINE Essentials 9.0 Enterprise Capabilities

ESRI ArcObjects 9.1   • Updated capabilities based on ESRI ArcObjects V9.1

  - o Geodatabase Support
  - o ArcSDE Raster Exporter
  - o ArcSDE Raster and Vector dll

Oracle Spatial 10g   • New capabilities based on Oracle Spatial 10g

  - o Read-only access for
    - GeoRaster
    - Vector Feature geometries (points, lines, polygons)
  - o Spatial selector tool for GeoRaster

Spatial Selector Tool   Spatial selector tool for GeoRaster enables fast selection of appropriate raster datasets by supporting

- User-customizable backdrop maps
- MBR footprint display
- Thumbnail image display
- Image selection
  - o Attribute criteria-based
  - o Spatial (view extent or AOI)
  - o Point and click selection

The screen shot below shows the selection tool showing the graphical depiction of a background map, footprints of imagery stored in the database, thumbnails of selected images and a tabular view of attribute fields, all of which can be used in combination to select the imagery to work with from the database.
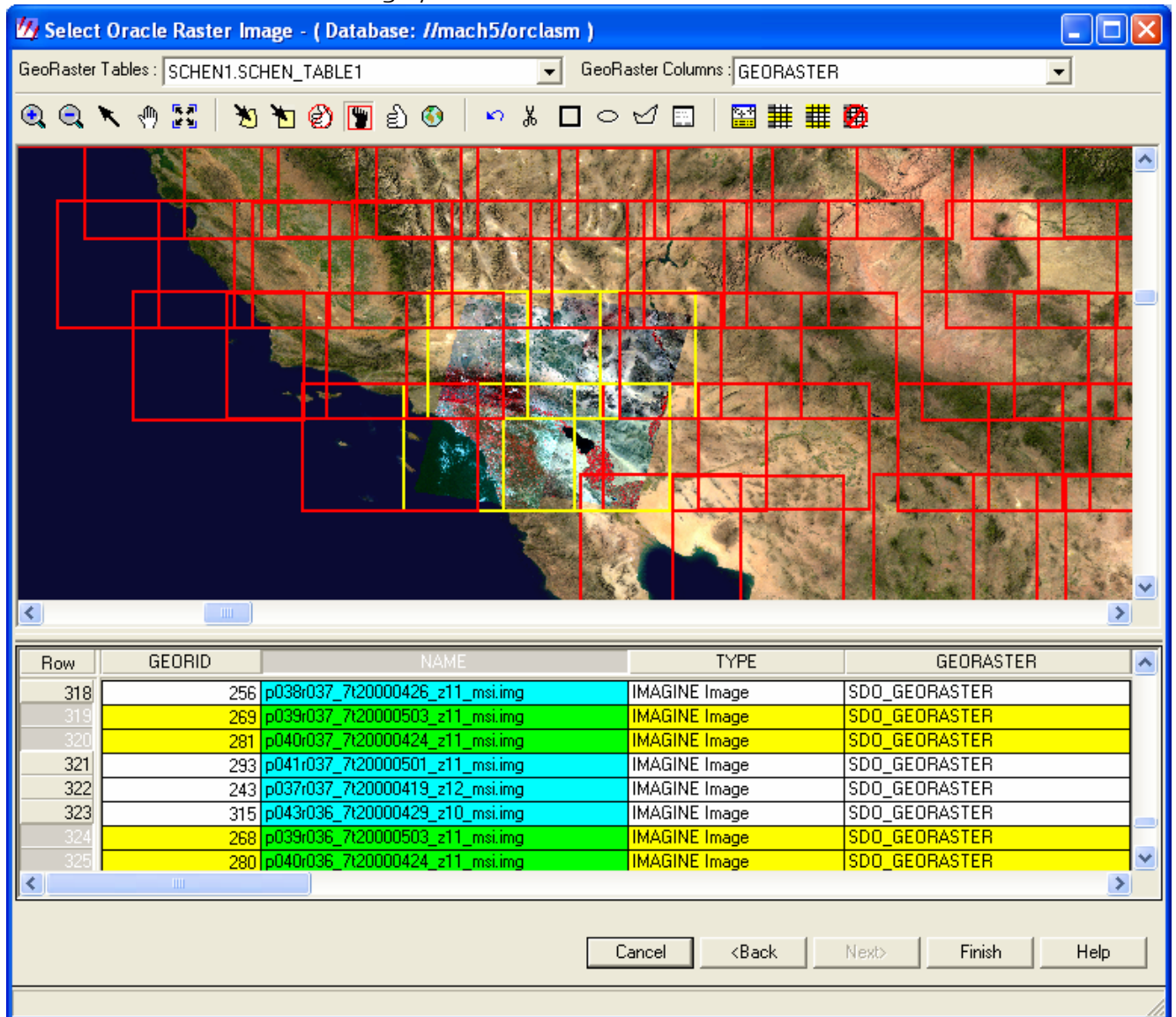
IMAGINE Enterprise Loader

IMAGINE Enterprise Loader allows users to load vector and raster data into a database system such as Oracle Spatial 10g, enabling the largest number of end users to have visibility and access to data.

Images can be loaded as individual GeoRasters, or the IMAGINE Enterprise Loader can be used in conjunction with other capabilities offered by ERDAS IMAGINE® to automatically combine multiple images into a single GeoRaster.

This is available as an add-on module to ERDAS IMAGINE V9.0 or Leica Photogrammetry Suite (LPS) V9.0.

Once data is loaded into the database, all ERDAS IMAGINE and LPS users (as well as other client applications supporting Oracle Spatial 10g) can access, view and analyze the information.

Key Features

- Populate the open GeoRaster structure and metadata
- Extends the GeoRaster structure with proprietary information usable by the ERDAS IMAGINE client
    - o Geometric models, such as RPCs
    - o NITF metadata for advanced exploitation
    - o Thumbnails to aid in geospatial selection
- Load ESRI Shapefiles into Oracle Spatial Geometry features
    - o Append to existing tables or create new
- Oracle Table Tool helps administrators design tables to hold GeoRasters

The screen shot above shows the dialog used to queue up multiple images for loading as GeoRaster into Oracle Spatial. Control is provided over several parameters and mapping can be set up between input image header tags and database attribute fields for automatic conversion during the process
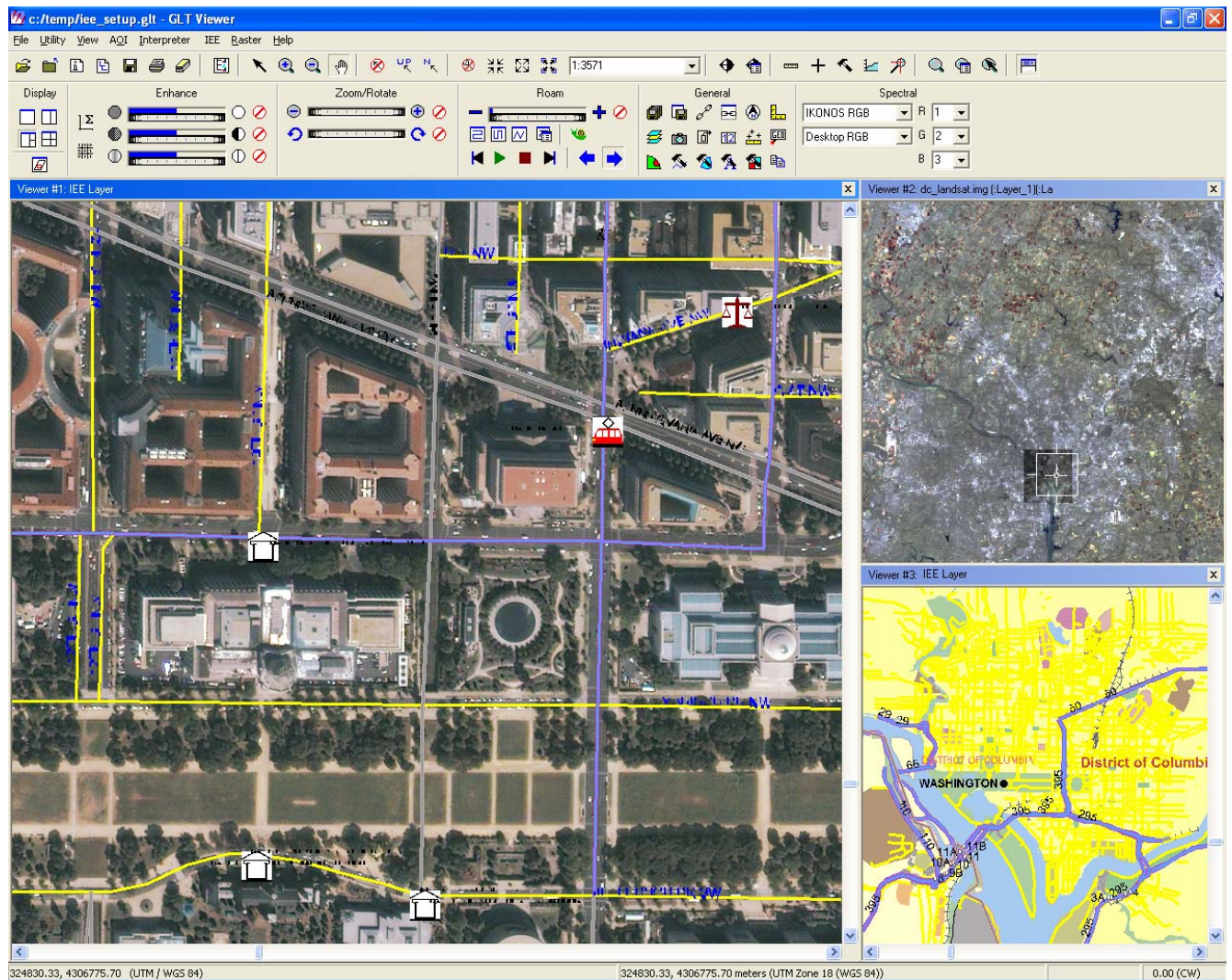
IMAGINE Enterprise Editor

IMAGINE Enterprise Editor add-on module provides the first integrated image processing and spatial feature editor which can be used to manage data both via the web and connected directly to Oracle Spatial 10g. This enables editing of Oracle Spatial geometries, topology and attribute data in an intranet or web environment.

Completely integrated with Oracle, IMAGINE Enterprise Editor natively supports all the Oracle server-side spatial data analysis functions and transaction management capabilities, promoting scalability, performance and manageability.

MAGINE Enterprise Editor leverages the complete Oracle technology stack to provide a fully scaleable, robust and standards-based Oracle Spatial editing solution for web-based or directly connected users.

Key Features

- Supports connected editing of Oracle Spatial 10g topology, geometries and attribute data
- Native support of Oracle GeoRaster for enterprise-wide imagery access and maintenance
- Offers connected editing of Oracle 10g topology data which enables quick and efficient determination of topological relationships for immediate validation in field based data collection operations
- Supports rendering of all symbology defined and stored in the database using the Oracle Map Definition Tool
- Comprehensive tolerance and snapping capability that substantially improves productivity and reduces the risks of operator error
- Controls the automatic segmentation (splitting) of crossing features and creates all relevant objects and relationships
- Associates topology primitives to pseudo primitives and features thereby offering full control of the topology management and enforcing third party business logic where necessary
- Powerful set of polygon editing tools that support topological maintenance of polygon geometries
- Supports spatial contiguity maintenance
- Comprehensive set of attribute editing capabilities including automated data validation
- Utilizes both optimistic and pessimistic locking principles for transaction management

Screen shot showing the display of an IMAGINE Enterprise Editor layer in the viewer in preparation for editing
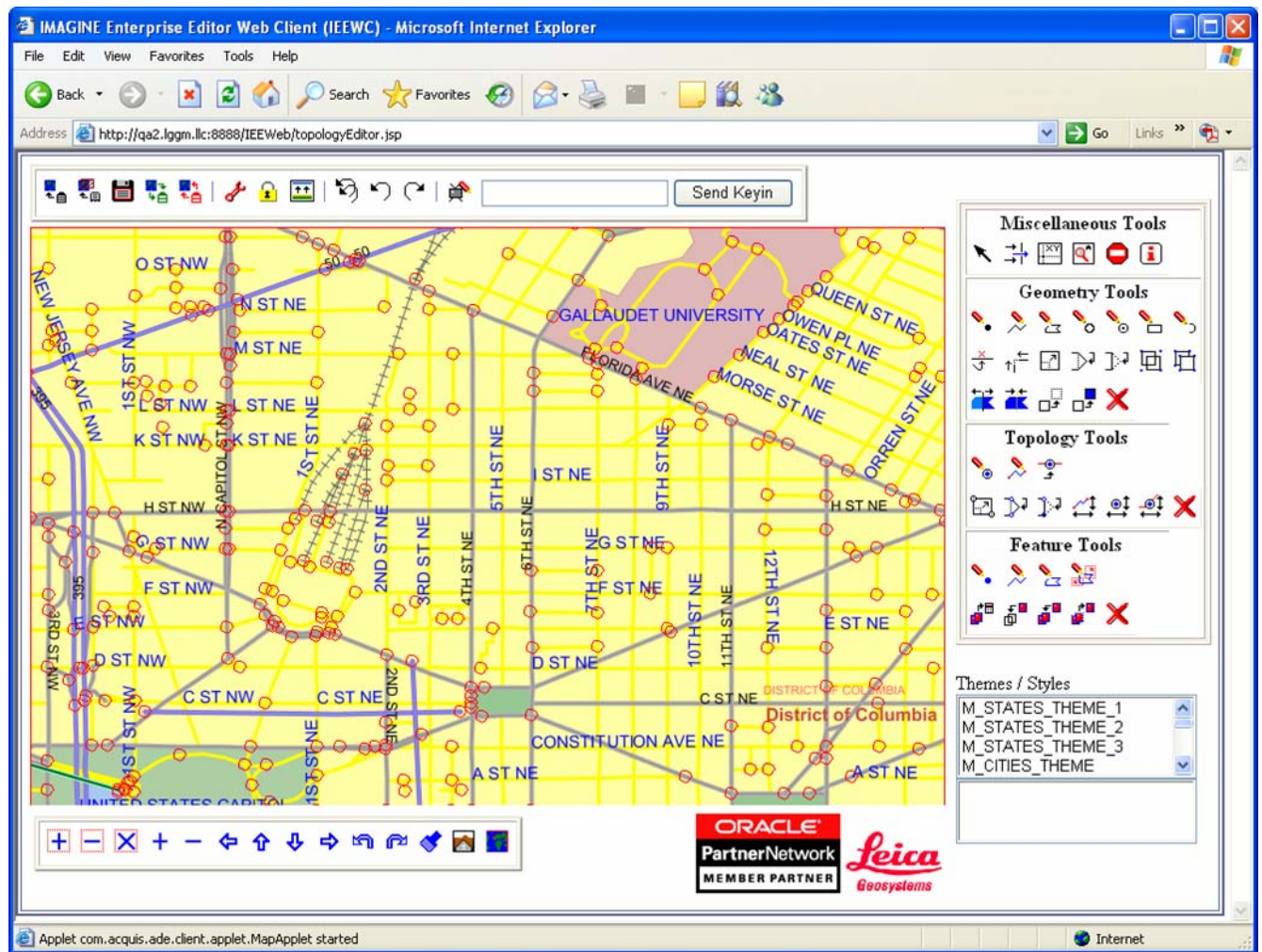
Screen shot showing IMAGINE Enterprise Editor deployed as a Java-based wed client for editing of Oracle Spatial topological features via the internet. The web client is user-customizable and can be tailored to applications from simple map display and query to full topological editing.

New in IMAGINE Essentials®

Pyramid Layer Improvements

Pyramid Layer Edges

When calculating pyramid layers a new option enables a NoData value to be set for the imagery representing background or "null" data values in the image. These values are then ignored in calculations such as pyramid generation where a region of pixels is generally taken into account. This has the effect of maintaining sharp edges where the image data transition to surrounding background values even in the pyramids where previously the background values might have been averaged in creating a dark edging around the image when displayed with background transparency turned on

To take advantage of this capability pyramids would need to be recalculated on any existing imagery after having set a NoData value for each image

Visually appealing pyramids for 1-bit data

Scanned black and white maps are often stored as 1-bit image data (0s and 1s) to minimize the file size. Unfortunately 1-bit data leaves no room for anti-aliasing of pixel values when calculating pyramid layers which has the effect of dropping out the black linework due to nearest neighbor resampling and making the pyramids illegible.

Instead ERDAS IMAGINE 9.0 takes advantage of a technique whereby the pyramid data (only) is first expanded to an 8-bit data range thereby allowing anti-aliasing to occur (i.e. there can be values between 0 and 1 to provide "greys"). When the pyramids are utilized for image display purposes the data then retains its legibility. See the side-by-side comparison screen shots below.
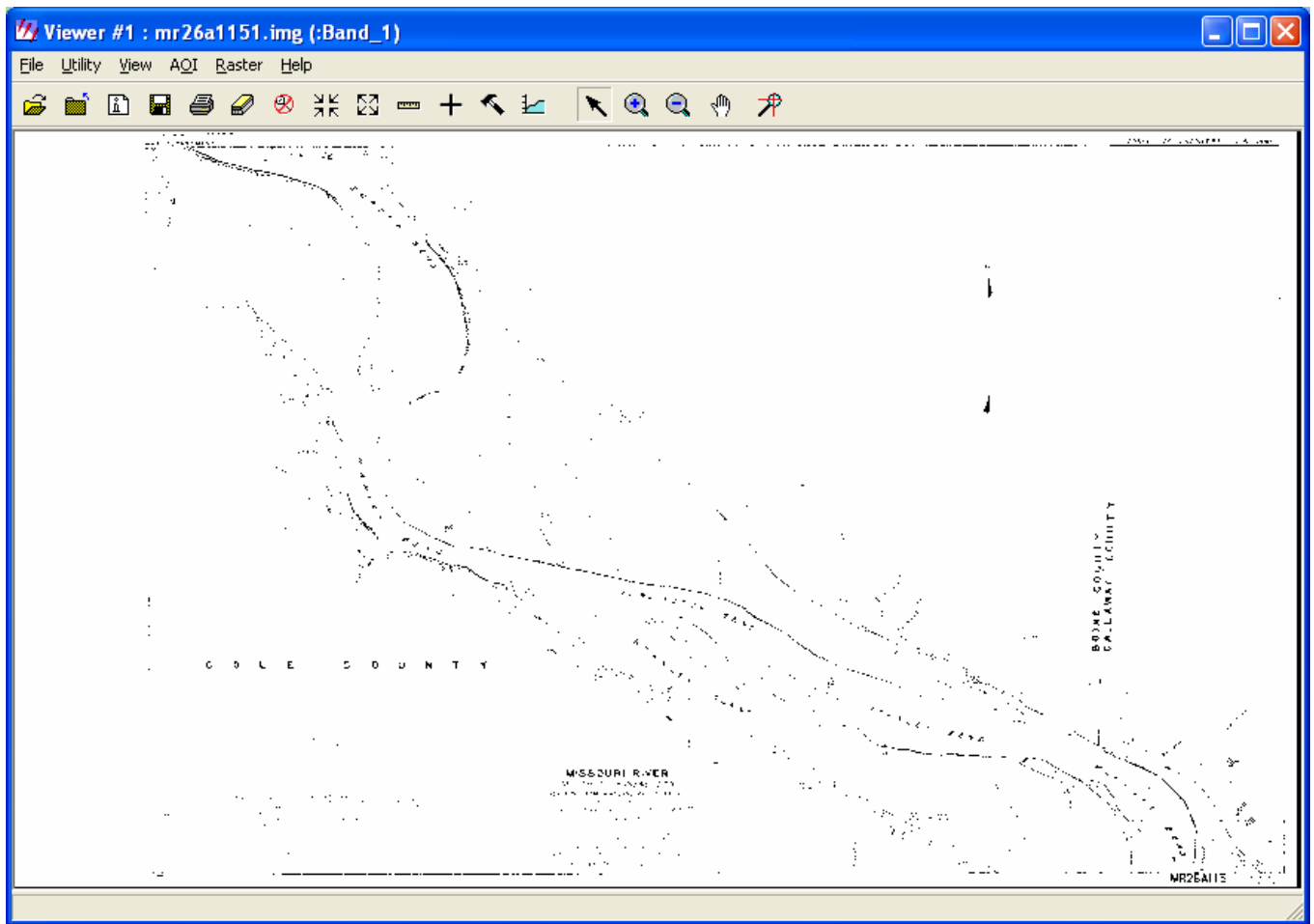
The screen shot above shows a 1-bit scanned black and white map scaled to fit the window (i.e. utilizing pyramid layers) in ERDAS IMAGINE 8.7. Note how difficult it is to discern features in the map due to the black pixels being suppressed by the simple nearest neighbor pyramid resampling.
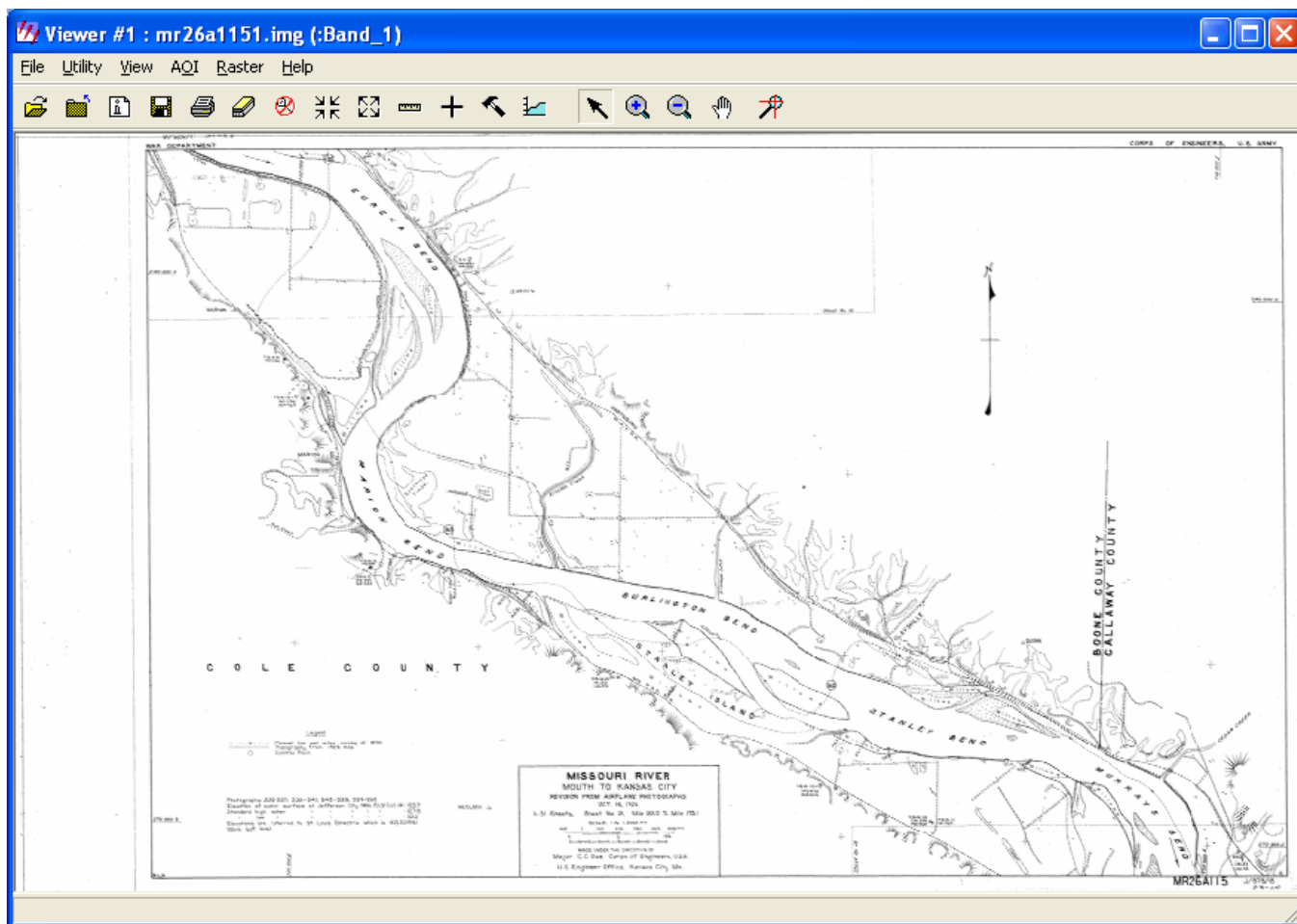
In comparison, the screen shot above shows the same 1-bit scanned black and white map scaled to fit the window (i.e. utilizing pyramid layers) but in ERDAS IMAGINE 9.0. Note how features can now be easily recognized due to the anti-aliasing effects of expanding the pyramids to an 8-bit range thereby allowing intermediary values to be calculated.

> While this technique does provide much improved visual appearance it should be noted that it does come at the price of slightly increased disk space usage to expand the pyramid data to an 8-bit range. However if Runlength Encoding is also turned on as a Preference even this increase in file size can be minimized.

Viewer Improvements

User-specified projection

The IMAGINE viewer now provides an option to enable the user to set a specific projected coordinate system for all the data in that viewer to be projected to. For example, the user might load two data sets, one in State Plane and the second in Geographic Lat/Lon, but then selects the viewer to use the UTM coordinate system – both datasets would then be projected on the fly to UTM.

Brightness / Contrast for 16-bit data

In previous versions it had often been difficult to utilize the standard Brightness and Contrast thumbwheels or sliders with 16-bit (or higher) imagery (such as IKONOS, QuickBird, OrbView3, etc). It was often difficult to bring out contrast in saturated areas.

With ERDAS IMAGINE 9.0 these tools now work in a more predictable fashion enabling quick and easy manipulation of 16-bit imagery.

16-bit AOI Brightness / Contrast editing

ERDAS IMAGINE 9.0 no longer disables AOI-based editing of brightness / contrast in imagery with 16-bit data depth (or higher)

Viewer-based Preferences

Several new Preferences have been added which affect the performance of the Viewer.

The Orient Image to Map System preference enables the user to select whether or not a geometrically calibrated image is automatically projected to its geospatial coordinate coordinate system by default.

The Viewer Resampling Method preference enables the File Chooser to default to something other than Nearest Neighbor when opening athematic (continuous) imagery. For example, if you generally always use Bilinear Interpolation, this can be set as the default so that it does not need to be selected every time.

Miscellaneous Improvements

File Size in Image Info

A capability has been added to the Image Info dialog to report the file size occupied by an image.

Since images can be constituted of several individual files this capability can summarize the total size, or can be broken out by specific file components.

Set Preferences from File Chooser

For user convenience Preferences which affect options in the File Chooser dialog can now be set directly from the File Chooser without needing to bring up the Preference Editor

Preferences which can be set in this manner include
- Default output directory
- Default input directory
- Files of Type filter
- Resampling method

DEM options in Image Command Tool	The Image Command tool is a useful utility for setting up batch processes to modify aspects of multiple existing images, such as the creation of pyramid layers or addition of projection information. ERDAS IMAGINE 9.0 extends this tool to include operations affecting DEM images, such as adding the vertical datum definition or recalculating heights based on a vertical datum translation

Vector Handling

Enable Editing	The user interface now disallows all user interaction with editing tools until the Vector | Enable Editing option has been selected.
"All Vector Formats" Filtering	The File Chooser now has a vector options analogous to the "All Raster Formats" filter. Selecting the "All File-based Vector Formats" filter in the File Chooser will show all recognized vector files in the file selection area.
Circle Tool	A tool is provided to quickly create circles and ellipses in vector layers. The user clicks the center and drags out the cursor to define the polygon. Holding down the Shift key while dragging will lock semi-minor and semi-major axis so that a circle is created rather than ellipse
.EVS support improvements	The .evs vector symbology file used to symbolize vector layers in ERDAS IMAGINE will now be automatically picked up if it has the same root name as the vector layer and is either at the same directory level as the coverage or within the coverage directory itself. Additionally the Copy Vector Layer utility in the IMAIGNE Vector module will now automatically copy the .evs file too.

New in IMAGINE Advantage®

OrbView3 Rigorous Sensor Model

Ortho-rectification capability is provided for GeoEye's OrbView3 imagery through the Rigorous Orbital Pushbroom model.

CARTOSAT-1 ortho-rectification

Ortho-rectification capability is provided for CARTOSAT-1 imagery through the RPC model.

Mosaic Tool ignores empty output tiles

The geometry of data added to the Mosaic Tool may mean that there are areas included in the minimum bounding rectangle of the mosaic which contain extensive areas where no imagery will actually be written. When outputting the mosaic as tiled data there is therefore the potential for regularly spaced tiles to be constituted of nothing but zeros. ERDAS IMAGINE 9.0 now provides an option to automatically identify such tiles and not produce them.

High-Pass Filter Resolution Merge

One of the key new capabilities provided by ERDAS IMAGINE 9.0 is the addition of another resolution merge (pan sharpening) technique in Image Interpreter.

This new High-Pass Filter Resolution Merge technique is an expansion of the High-Pass Add-Back method designed to allow user-selectable trade-off between retention of color or retention of spatial detail. Even when adding high levels of spatial detail the spectral quality of the original multispectral data is retained at a high enough fidelity to allow standard image exploitation techniques to be applied such as image classification.

This implementation also provides for a two-pass filtering option where the ratio between pan and multispectral image pixel size is high.
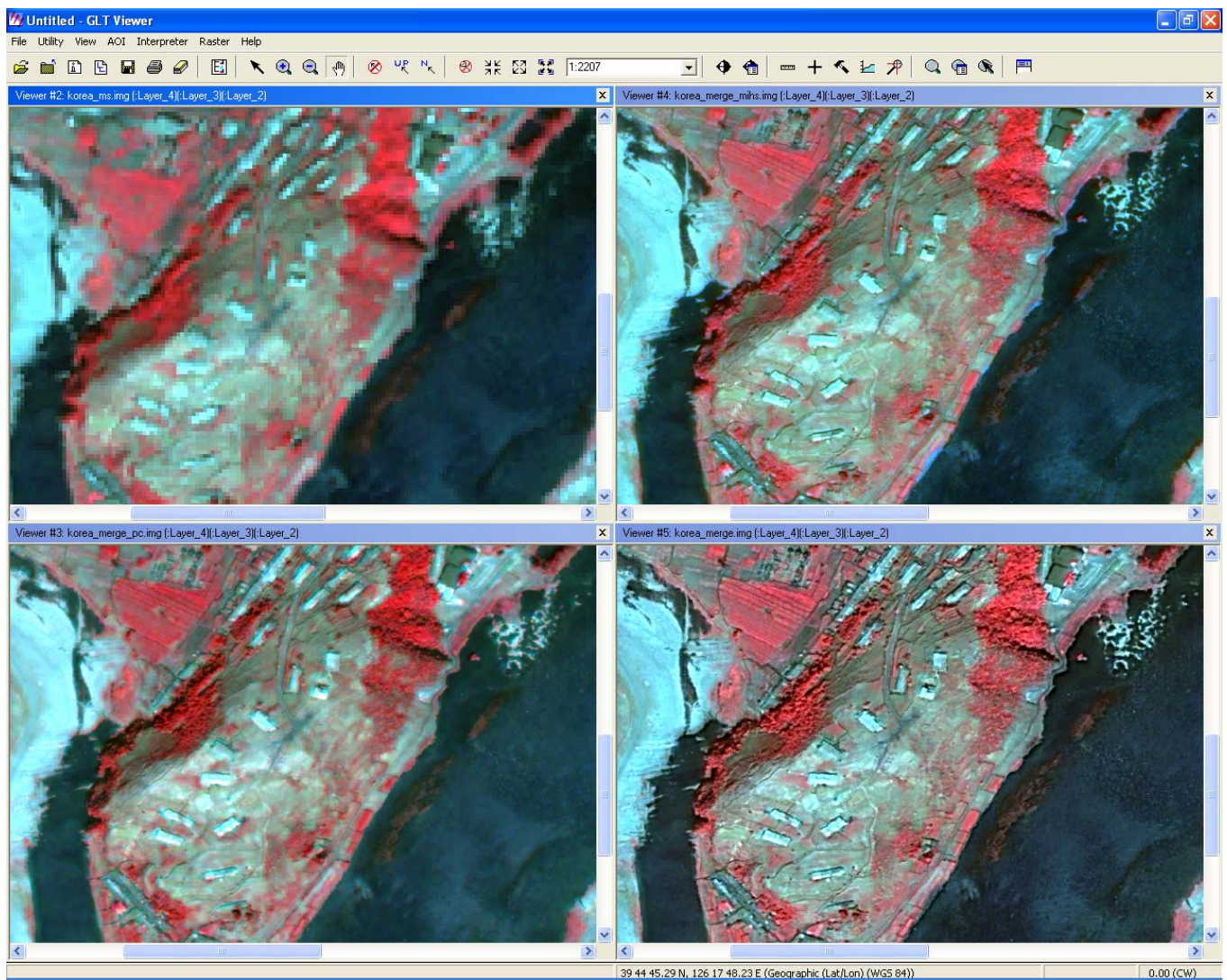
Comparison of merge techniques using a QuickBird MS / Pan image pair.

- Upper left shows the original Multispectral image
- Bottom left shows a traditional Principal Component merge with good color retention but loss of some spatial fidelity
- Top right shows a Modified IHS merge (introduced with ERDAS IMAGINE 8.7 Service Pack 2) with improved spatial detail, good general color retention but some color artifacts along the river bank
- Bottom right shows the new HPF merge technique with both excellent color retention and high spatial detail

Metric Accuracy Assessment (MAA) tool

When delivering products derived from imagery you should always be able to state the spatial accuracy of those products. The MAA tool provides the means of calculating the accuracy of mono or stereo pair imagery which has a 3D geometry model using photo-identifiable ground control points. Differences between the real-world coordinate of a feature and the same feature measured in the image (based upon a RPC-based or other sensor model) enable calculation of the relative accuracy of the images geometric information.

Functionality includes:
- Control (or Test & Evaluation – T&E) points can be manually entered or read from file
- Calculation of error statistics
- Individual point error and statistics report
- Error computations are based on MIL-STD-600001, with bias taken into account
- CE is computed using horizontal error as input to the LE formula with bias
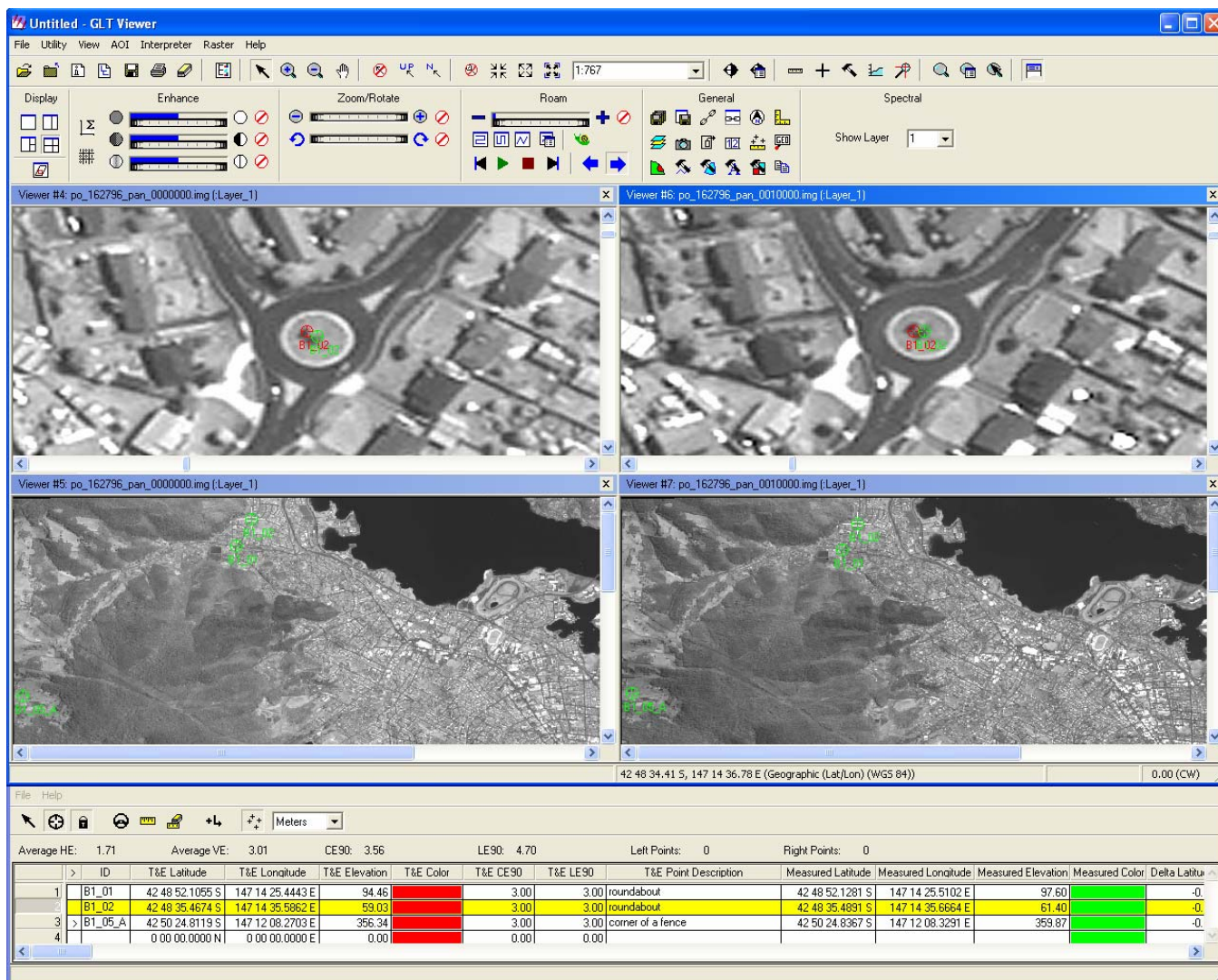
The screenshot above shows the Metric Accuracy Assessment tool being used with a stereo pair of IKONOS imagery (specially prepared to provide a test-bed for such measurements). In the upper view panes the green coordinate indicates the image-derived location of a surveyed feature (in this case a roundabout) while the red coordinate represents where the surveyed coordinate for the roundabout lies according to the image header-derived geometric model. Displacement between the two coordinates enables calculation of errors.

New in IMAGINE Vector®

Reproject Shapefiles   A new utility enables the reprojection of Shapefiles including both 2D and 3D variants and recalculation of attributes such as area and perimeter based on the new coordinate system

New in IMAGINE MrSID Encoder Modules

The IMAGINE MrSID Encoder modules now support production of both MrSID Generation 2 and Generation 3 images. Advantages provided by adding support for MrSID Generation 3 include:

- Create MrSID files larger than 2GB
- Lossless compression option
- Control of sub-block sizes

New in IMAGINE Radar Mapping Suite Modules

IMAGINE OrthoRadar

- Significantly higher geocoding performance
- Higher orthorectification performance for large scenes
- Significantly less memory use during orthorectification
- Height models in Geographic (lat/lon) can now be used for orthocorrection
- Improved orbit modeling

IMAGINE Radar Interpreter

- Radiometric terrain correction
- Improved Generic SAR Node interface
- Use of Alaska SAR Facility (ASF) radar data "Radar conversions" function

IMAGINE Developers' Toolkit

To expedite continued improvements to the documentation and interaction between developers the IMAGINE Developers Toolkit is now offered only as a web-downloadable package with online interactive support via the Leica Toolkit Developers' Network (http://developer.lggi.com). This packaging offers
- Interactive online forum owned by a dedicated LGGI employee
- Ensures up to date documentation is always available
- Toolkit Library contains all supported Toolkit packages, Data Types, and Functions
    - All entries are categorized for easy searching and
    - Every item is guaranteed to be complete
- Each item in the Toolkit Library Database is dynamically linked to every example

Licensing

With ERDAS IMAGINE 9.0 onwards all Leica Geosystems Geospatial Imaging software products will be using a new licensing approach which should simplify the end-user experience with issuing and installing license files going forward.

To this end the "Upgrade" approach to licensing we have been using since the introduction of FLEXlm with ERDAS IMAGINE 8.5 has been dropped. The old approach required issuing license files with every new release of ERDAS IMAGINE shipped to Software Maintenance (SWM) customers (e.g. ERDAS IMAGINE 8.6 to 8.7) – these licenses were "upgrade" types which required the original, earlier version, license file to still be present to be "upgraded" to the newer version. In many cases however the old files were accidentally removed during un-installation of old versions of software or other problems were experienced such as the amount of time taken to request and issue licenses for the correct System ID and module types.

Instead two major changes have been made to the licensing approach:

- Only "Increment" style licenses will be issued (i.e. ones that do not require any existing license). Upgrade license files will no longer be issued.

- Existing SWM customers will only be required to request new license files for major version changes (such as going from ERDAS IMAGINE 8.7 to ERDAS IMAGINE 9.0). Minor version changes (e.g. from ERDAS IMAGINE 9.0 to ERDAS IMAGINE 9.1) will not, in general, require a new license – the newer version will be unlocked by a license file within the major version number range (e.g. a SWM customer installing ERDAS IMAGINE 9.2 will be able to unlock this new version using their existing 9.0 license file, but not with their 8.7 license file)

To the end user the advantages of this new approach are that you do not need to worry about retaining old license files when new ones are being issued and you will now only rarely be required to request license files to perform a SWM upgrade

Please note that these changes to the physical enforcement of licensing via license files does not release the user from being bound by the License Agreement. You may be breaching the license agreement if you do not have a SWM contract and install a newer version of software and run it using an old license file.

Platform Support

ERDAS IMAGINE 9.0 is currently only available for the Windows platforms, including

- Windows 2000 (Service Pack 4 or higher)
- Windows XP Professional (Service Pack 2 or higher)
- Windows Server 2003 (Service Pack 1 or higher) – only supported for running the License Manager

A Sun Solaris version of ERDAS IMAGINE 9.0 should be available in the Summer of 2006

CD-ROM Distribution

ERDAS IMAGINE 8.7 is distributed as a five disk set consisting of the following volumes:

- ERDAS IMAGINE 9.0 for Windows
- IMAGINE Geodatabase Support Installer
- Leica Photogrammetry Suite (LPS) 9.0
- Example Data DVD 1
- Example Data DVD 2

SWM shipments may include other separate disks for demonstration purposes, such as VLS Feature Analyst

Supported Modules

The initial ERDAS IMAGINE 9.0 release provides upgraded installation for the following modules:
- IMAGINE Essentials
- IMAGINE Advantage
- IMAGINE Professional
- IMAGINE Vector
- IMAGINE VirtualGIS
- IMAGINE Radar Interpreter
- IMAGINE StereoSAR DEM™
- IMAGINE OrthoRadar
- IMAGINE IFSAR DEM™
- IMAGINE MrSID Desktop Encoder
- IMAGINE MrSID Workstation Encoder
- IMAGINE NITF 2.1™
- IMAGINE AutoSync
- IMAGIZER® Data Prep
- IMAGIZER Viewer
- ERDAS Stereo Analyst
- Leica MosaicPro

Additional modules are scheduled for future releases.

Data for the screen capture on pages 9 and 10 was provided by: IKONOS imagery courtesy of GeoEye, www.geoeye.com; Oracle feature data courtesy NAVTEQ North America, LLC, www.navteq.com

Data for the screen capture on page 17 is courtesy DigitalGlobe, www.digitalglobe.com

Data for the screen capture on page 19 is provided by: IKONOS imagery copyright of GeoEye. Ground Control Point data courtesy of Clive Fraser and Dept. of Geomatics, University of Melbourne

About Leica Geosystems Geospatial Imaging Division

When building image-based maps, you need reliable measurements and solutions for your entire workflow. So when it has to be right, more geospatial professionals trust Leica Geosystems Geospatial Imaging, LLC to help them collect, analyze, and present spatial information. Leica Geosystems is powering geospatial imaging by putting precise imaging to work. Its broad array of photogrammetry and remote sensing software solutions capture data efficiently, reference imagery accurately, measure and analyze easily and present spatial information, even in 3D. Those who use Leica Geosystems Geospatial Imaging products every day trust them for their precision, their seamless integration, and their superior customer support. Delivering geospatial imaging solutions with precision, integration, and service from Leica Geosystems.

When it has to be right.

Leica Geosystems Geospatial Imaging, LLC
5051 Peachtree Corners Circle, Suite 100
Norcross, GA 30092-2500 USA
Phone +1 770 776 3400

gi.leica-geosystems.com

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Geosystems