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Developments in TNT 2006:72

This is a progress report on developments underway in version **2006:72** of the **TNT** products (hereafter called **DV72**). It is only a partial list as during the testing of these major features other additional features will be added.

The first color plates for these **DV72** features are beginning to appear on MicroImages' web site and others will follow.

Anyone using TNT 2005:71 can also download and try DV72 (see last section for details).

Installing, trying, and reporting your suggestions and errors in these new **DV72** features will assist us in defining their final form and reliability.

Spatial Data Display.

New Display Setup Window.

Defining how objects, groups, and so on are added to 2D and 3D views is a task you do over and over in geospatial analysis. As the scope of your projects increases, you are also handling many more layers in each view. The ease of use and capabilities in these operations are key to your efficient visualization of complex geodata throughout the **TNT** analysis products.

Overview.

The interface you use for setting up your spatial data visualization has been extensively redesigned in **2006:72**. This was done both to simplify the interface and to improve its performance.

The Group Controls window and the associated Spatial Data Display icon toolbar are replaced with a single, completely new Spatial Data Display setup window. The older approach (**2005:71** and before) and this new **DV72** window are compared in the attached screen shots.

The design of the setup and control interface for your views is based on using Motif (and more recently, LessTif) graphic libraries to provide cross-platform operation of the **TNT** products. The earlier design of this interface was implemented a decade ago. At that time geodata was scarce, you only had a few objects available, and they were simpler in content. Today you have easy access to hundreds of geodata objects of different types and complex content. As features were added to the earlier setup and control interface design to accommodate these new opportunities, it became more and more complex and, thus, harder to learn and use.

The most obvious initial change is that the toolbar with the large icon buttons no longer appears when the process is started. The choices from this toolbar, along with the previously separate Group Controls and Layout Controls windows have been integrated into the menu of the new setup and control window. In addition, the 3D Animation (movie creation) process has been moved to a completely separate choice on the TNTmips menubar (Main / Publish / 3D Animation…).

Generic Object Selection.
The new Spatial Data Display window eliminates much of the redundancy in the old Group Controls window. For example, there are no longer icon buttons for adding layers for specific geospatial data types (which means CAD, vector, shape, or TIN objects). With the exception of multi-raster layers, all of these objects can be accessed from the single Add Layers button, and the appropriate layer types will be automatically created from the actual objects selected. In addition, more use of the "active" group and layer concept is made in order to eliminate the need for separate controls for each group and layer type. This change is especially dramatic when working with layouts having many groups.

Simplified Layer Management.
The interaction with the layouts, groups, layers, and layer details is now identical to what is already used in the LegendView. The + and – toggles are used to expand and collapse items, and the right mouse button provides quick access to many operations specific to individual items. Mac users should make special note of how to simulate the right mouse button for this purpose. Furthermore, newly released Mac desktop models are being delivered with Apple's Mighty Mouse to provide direct access to a right mouse button.

Legends can now be optionally viewed in the setup and control window. Most items will have 3 icons/buttons, which are expand/collapse (+/-), a toggle for item specific "state" (show/hide, enable/disable, and so on) and an indicator for the type of item (raster, vector, legend, etc), which can be clicked on to access the controls for that item if any.

Marking Elements (formerly called Selecting or Highlighting Elements).
Another significant change is that the controls for marking elements (previously referred to as selecting or highlighting) have been moved to the View window toolbar. This makes these much easier to access and eliminates much of the need to frequently switch between windows when performing this common operation.

Continuing Modifications.
These are only samples of the many changes in this new setup window, too many to describe in this introductory material. It will take time for existing clients to adjust to this new approach. If you want to have input into the design of the form of these new features and their reliability in **DV72**, please download and install this version now and try it and return your comments, suggestions, and errors.

New View Window Options.

Snapshot a View.
You can now directly create a copy of the contents of any view as a raster object using a Quick Snapshot icon. This snapshot file is a pixel by pixel replication of the contents of the view in the raster format of your choice. This file can be created in any location you designate in a dialog presented the first time you use it. It will be written in the format you choose the first time you use it.

You can set the default format for your snapshot files to these raster formats: TIFF, GeoTIFF, JPEG, JP2, PNG, or to create a new raster object in a new Project File. You can also set the default for its structure in that format (for example, the type of TIFF file, the lossy compression level for the JPEG2000 compression used in the JP2 file, and so on). Any subsequent snapshots will then default to this location and format and will be

automatically written when you click the icon without presenting any dialog. Your selection of the default location and format for these files can be changed at any time using Options / View Options / View / Quick Snapshot.

Toggle Auto-refresh On/Off.

In **2005:71** and earlier you set a preference for how you wanted all 2D, 3D, and layout views to refresh: 1) automatically after any change or 2) only on demand using the Redraw icon. **DV72** provides a Redraw After Any Change icon on the toolbar of each view. This icon will toggle your refresh selection for that view to the opposite choice for as long as that view is open and used. For example, you have your default preference for all views set to redraw automatically, this icon will change it to redraw on demand from the Redraw icon for that view.

Pan Sharpening.

Pan sharpening is the process of fusing a higher resolution panchromatic image with lower resolution multispectral images to produce a color image with more detail. New methods of pan sharpening QuickBird and Ikonos images to produce natural color and color infrared images have been tested in prototype form. While not yet available for your testing in **DV72**, they are producing very superior results to the Brovey and other approaches to this TNT operation, perhaps the best results of any approach in other commercial products. Watch for color plates illustrating these results and their addition to **DV72**.

Revised Menu Structure.

The **TNT** menu structure has been revised in **DV72**. The entries on the menubar for **TNTmips** 2005:71 are Display, Edit, Process, Support, Toolbars, and Help. For **DV72** the entries are Main, Raster, Geometric, Convert, Script, Tools, and Help. The Main menu provides access to the most frequently used processes: Display Spatial Data, Edit Spatial Data, Georeference, Import, and Export. It also has Publish and Print From cascades. The complete **DV72** menu structure can be found on the color plate posted at www.microimages.com/documentation/cplates/72menu72.pdf

Improved Operations.

Large Number of Point Elements in a Vector.

Vector objects are designed to handle 2 billion point elements (and lines and labels). However, in **2005:71** and earlier a design feature limited the number of elements that could be successfully imported or generated to approximately 2 million. The quadtree index was being generated in memory only and inefficient use of this memory caused an “Out of Memory” error for more than about 2 million. In **DV72** a new quadtree index object is generated in the Project File instead of in memory to avoid this out of memory condition. Recoding in this area, using improved quadtree indexing, now permits the efficient and practical use of much larger numbers of elements in a vector object.

Converting Computed Fields to Real Fields.

Conversion of computed fields to real in **2005:71** was extremely slow if more than about 1 million records were involved. This, along with other improved handling of large record count operations, is now much faster. In one example involving the preparation of the geodata for the 2nd edition of the Global Data Set, the process time decreased from 101.5 hours to two minutes for a table with 1.5 million records.

Watershed Physiography.

This process in **2005:71** could compute the watershed geomorphological properties up to about 30,000 by 30,000 cells before it ran out of virtual memory. The time to process also became much longer for these larger areas as the process began to use virtual memory. Some of you want to process DEMs of 200,000 by 200,000, perhaps derived from SRTM data for whole counties. Effort is underway to improve the maximum size of the DEM that can be processed and the time needed to complete the task. The results of this review of this process are unknown at this time.

Project File.

Long Names and Descriptions.

For objects and descriptions.
Project File names and descriptions in **2005:71** and before are limited to 15 characters for names and 63 characters for descriptions. In **2006:72** these restrictions are removed by allowing a one line unlimited length name and multiple line unlimited length description for any object.

For database fields and descriptions.
Database table field names in **2005:71** are limited to 15 characters and do not have descriptions. In **2006:72** field names can be one line of unlimited length and can now also have a multiple line description of unlimited length.

Access Control.

Project File objects now have the optional ability to support complex access controls. These permit the administrator of the Project File to limit the access other users have to the objects in the Project File. For example, a data administrator can set a vector object to be viewable by "Everyone" but only can be modified by "Steve." This setting not only restricts the user "Everyone" from modifying the vector object, but from modifying all objects under the vector object including databases. Given the above scenario, if the data administrator wants to let the user "Mary" to be able to modify a table even though she cannot modify the parent vector object, the administrator can set the permission on that table. There are also additional access control capabilities on individual fields of a database table. More information on this access control can be found in the color plate posted at www.microimages.com/documentation/cplates/72ACL.pdf.

Sample Data Sets.

Global Data Set – 2nd Edition.

A new, revised global data set is now nearing completion in a similar form to the 1st Edition TNT Global Data Set you have on DVD (shipped first with 2003:69) is based on 1/1,000,000 maps. Most of the 2nd Edition vector objects are based on these same maps but more detail is provided. For example, in the 1st Edition only the USA, Canada, and Brazil have state/province boundaries, which are provided for all countries in the 2nd Edition. A World Vector Shorelines vector based on 1/250,000 maps is also provided with the 2nd Edition Global Data Set. Manual editing and improvements in TNT processes are involved in this activity as the VPF form used for this new release is still very inefficient (100,000s of files) and has errors, for example, separate province polygons in the boundary layers that have small gaps or openings between them.

Enhanced.

NASA/JPL have released a new, enhanced, higher resolution "Blue Marble" image of the globe (10.4 GB uncompressed = 3 bands each of 86,400 by 43,200 pixels). It replaces the earlier 484 MB JPEG2000 lossless compressed version provided on your current TNT Global Data Set DVD. It downloads in tar format and is a bit messy to import. It will be provided on the 2nd Edition of the Global Data Set DVD noted above using JPEG2000 compression with a yet to be determined compression ratio.

TNTsim3D.

The main view in your simulation can provide a simple up/down, pan/tilt control panel to orient this view using your mouse. Using this control panel to orient this **TNTsim3D** view and, thus, its associated daughter views will be familiar as it duplicates the functionality and layout of the control panel in the bottom center of Google Earth view window. This panel can be docked to the bottom of the main view or undocked and repositioned separately wherever you like.

Spatial Relational Databases.

Links to and Import of Databases.

TNT linking to Oracle Spatial is direct and does not use ODBC. TNT links to other external relational database products in **2005:71** and earlier have been through ODBC. This has caused problems as the implementation of the ODBC interface, which is supposed to be a standard, is the responsibility of each database vendor. Alas, each database system has a slightly varied ODBC support. In general some aspects of the ODBC support are missing or different. Why, because each database is designed differently and thus some ODBC features could not be supported. ODBC support is also slow and cumbersome. **DV72** addresses these issues by also using the native communications for each database.

Microsoft Excel, Access, and SQL Server.

Microsoft's interface to these products and the use of Access as the underlying structure for Office products uses their intercommunications protocol called OLEDB (Object Linking and Embedding Database). **DV72** now supports connecting to Access using OLEDB and will soon add similar support for SQL Server and Excel. Connecting via ODBC will still be available. In initial tests, forming a link or importing a larger Access database using OLEDB is now about 5 times faster than using ODBC.

For your information, SQL Server 2005, which has just been released, now supports Binary Large OBject (BLOB) fields. This is how images, graphics, photos, … are stored in fields in Oracle Spatial, PostGIS, and ESRI's Geodatabase to enable an RDBMS to become a "spatial data storage system." Now we can anticipate some expanded geodatabase activities in SQL Server as Microsoft is not going to let Google, Oracle, and ESRI dominate this area.

For your information, there is also now a FREE version of SQL Server 2005 called the Express Edition for personal projects (download from www.microsoft.com/sql/ downloads/trial-software.mspx). It has no time limit and is restricted to a database size of 4 GB, 1 CPU, and 1 GB of RAM, but these would not be onerous restrictions when used with your personal **TNTmips**. Oracle also has a similar free offering forthcoming called Oracle Database 10g Express Edition.

PostgreSQL and PostGIS.

PostGIS, the spatial component of PostgreSQL, can be optionally installed with the latest version of this open source database software. **DV72** now links/imports PostgreSQL and a spatial layer in PostGIS in a similar fashion to Oracle Spatial. You can review how this works in general in the **TNT** products by reviewing how it connects to Oracle Spatial in the Release MEMO for 2003:68 on pages 70 to 79 and in associated color plates referenced in this document posted at www.microimages.com/relnotes/v68/rel68.pdf.

MySQL.

This open source RDBMS could now be easily supported for native linking and import, including its spatial layers. Alas, it has a complex license that may impact on the rights of **TNT**, as a commercial product, to deliver this capability. At this time we are trying to get some clarification of this matter from this product's management group.

Geodatabase.

ESRI-derived spatial databases in Personal Geodatabase form using Access tables can now be imported and linked. As of yet we have not deciphered the annotation or the style tables. Any information in this area would be appreciated. When you are ready to test this, the State of Utah has posted all its statewide geodata layers for downloading in ESRI Personal Geodatabase format at agrc.its.state.ut.us/agrc_sgid/sgidlib/gdbindex.htm.

Import/Export.

Several software engineers are working full-time on converting important import and export formats from the old, legacy method to the new separate Import and Export methods first released in **2005:71**. New formats are added in each weekly **DV72** patch. This is going slowly and consuming lots of time and energy since each format's code is being completely rewritten and new features previously requested for that format are being added.

Multi-file Raster Objects.

A new type of raster object is being developed. The design looks promising. It will automatically link up many smaller uniform raster tiles (SRTM, JPEG2000s, JPEGs, …) in a single directory structure into what looks and behaves like a single object – in effect a virtual mosaic. For example, all uniform-sized SRTM files in a directory will be automatically linked in this RVC link file simply by selecting the top level in the directory. Single pyramid layers will be automatically built, in other words mosaicked, in the link file and compressed.

If you have 100s or 1000s of files (now tiles to **TNT** in this approach) in a directory, building this link file will take time. However, after the link file is built, its repeated use for viewing will be fast, as only the link file needs to be opened until you zoom down to a detailed level requiring access to the original tiles/files and then only a few (1, 2, 4, 8) original files would be opened.

When available, this multi-file link can be used in other processes such as Extract. For example, extracting all or part of a multi-file object would then create a new internal raster object that is automatically mosaicked and compressed, the reverse of "chipping" a raster object into multiple, smaller raster objects.

Sample Geospatial Scripts.

Tracing Minerals / Contamination Upstream.

A new SampleBasin script processes point locations of stream sediment samples to identify the upstream areas that could potentially contribute sediment to each sample. This script has applications in mineral exploration, the identification and monitoring of sources of pollutants, and so on. The sample points and a digital elevation model are input to watershed functions to delineate the upstream basin and upstream flow paths for each point. Sample points are snapped to the nearest point on the nearest flowpath before basins are generated, and upstream channel length, basin area, and stream order attributes are added to the points.

Database records are also automatically transferred from the points to their associated basin polygons so that the polygons can be theme-mapped to indicate target areas that could be the source of the material of interest.

Theme Mapping Rasters.

A RasterIntervals script provides an example of a standalone script application that creates and uses several control dialogs and provides a preview of the script output in a View. The script categorizes a grayscale raster into a user-specified number of intervals based on cell value ranges. Ranges can be set up using either equal range or equal cell count per interval, and the resulting ranges can also be manually edited. The script output is a raster with a single value for each input interval with a color palette for display. The script could be used to subdivide an elevation raster into elevation ranges, a slope raster into ranges of different slope angle, and so on.

Object Finding in Pan Images.

A new OBJECT sample script in the Scripts by Jack series, written by Dr. Jack F. Paris, is designed to subdivide a grayscale image into polygonal areas of relatively uniform cell value that differ in value from their neighbors. Script parameters can be adjusted so these polygons correspond closely to different objects in the scene, such as areas with differing vegetative cover, agricultural fields, and buildings.

This script uses a novel edge-detection method (an enhanced version of the Sobel edge-detection filter) to determine for each cell the probability that the cell lies along an edge or boundary in the raster image. Watershed functions are then used to generate closed vector polygons bounded by these edges, and the script provides the option to thin and filter the resulting vector object in several ways to eliminate dangling lines and small polygons and to merge adjacent polygons of similar value.

The script produces an edge-probability raster and a vector object with Scene Object Polygons. Although the script operates on a single grayscale raster, that raster could be derived from multiple bands of a multispectral image using other scripts in the Scripts by Jack series (for example, a two-band vegetation index raster from GRUVI.SML or a multi-band tasseled cap Greenness raster from TASCAP.SML). The object script is accompanied by detailed explanations and instructions in FAQs by Jack Part H.

Platforms.

Windows X64 (for Intel and AMD).

MicroImages has now been able to assemble, but not yet evaluate, the missing 3rd party software components needed to try building a fixed license version of the **TNT** products for Windows x64. Specifically, these include a working HASP driver (previous versions of this driver had errors) and the official release of Visual Studio 2005.

Mac OS X (4 cores).

MicroImages and some clients have taken delivery of Power Mac G5 Quads with dual processors each with dual cores (4 cores total). There are no problems reported at this time associated specifically with using the **TNT** analysis products on this computer.

Mac OS X (Intel).

We will shortly take delivery of an Apple hardware and software kit to begin work on this version of the **TNT** products. The X server used by **TNT** on Apple's Intel based Mac OS X platforms may initially have to be Darwin and not X11 from Apple. At this time there are no HASP key drivers available and the company is not responsive about this Intel version or a native 64-bit driver for the G5.

Internet/Intranet.

TNTserver.

There are no significant new features to be reported as yet as perfecting the operation of the **2005:71** WMS of **TNTserver** is still being tuned and adjusted. Many of the setup problems of the previous edition of **TNTserver** have been alleviated in this **TNTserver**. Maryland Department of Natural Resources has reported after the fact that they were able to install and set up **TNTserver** 2005:71 and the stand alone **TNTmap** package for initial testing over their internal network without difficulties and without consulting us.

The initial public exposure of this Web Map Service and **TNTatlas** server and **TNTmap** client is accessible via the PublicAtlas TNTserver at microimages.com/tntmap. Gradually all the sample TNTatlases using the old server are being tested and transferred to this new server.

Those who want to try the latest modifications to this 2005:71 **TNTserver** and in the latest **TNTmap** can experiment using the TestAtlas *(beta)* **TNTserver** and an alpha Xatlas *(alpha)* TNTserver located at microimages.com/ogc. These two additional TNTservers operate on separate computers from the public site located at microimage.com/tntmap and are subject to being taken off-line or crashing at any time as they are used for testing and verification.

Important Note - anyone who has a **TNTserver** can now request a second HASP key to experiment off-line with the new **TNTserver** 2005:71 and later versions for $100 to cover the cost of the key and its express shipment. This 2nd USB key will operate any version of **TNTserver** so you can experiment off-line with the TNTserver weekly patches before replacing any public, working version using the 1st key. However, this 2nd key is for testing and management purposes only and every view it generates will be watermarked with a big word "TEST" in the middle of the view.

TNTmap.

Work continues on this public, open source client. The TNTmap Viewer appearance is now further streamlined for easier understanding by the general public. It is easier to move back and forth between the Viewer and the Builder so that layers can be found on some other WMS and added via the Builder to the current Viewer. The measurement tools are now reliable, easy to use, and provide new capabilities. Snapshot printing works. Layers defined as hidden in the atlas structure (for example for use only in DataTips) are now hidden in the Viewer but are still present and can be toggled on. HyperIndex links are now working. InfoTips now work and use the DataTip's text formatting.

Change in TNTmap is a day-to-day activity. The current versions are indicated by date and recent important changes are being recorded with the version's date on the /tntmap and /ogc pages.

Client Activities.

Geological Maps of Japan.

The Geological Survey of Japan has released a set of 7 CDs containing 124 digital geologic maps of Japan at 1:200,000 scale. The original paper maps were digitized by scanning, edited, updated, and styled in TNTmips and are provided on the CD as RVC vector objects. Rock unit polygons and lines representing faults are provided in separate objects for each map quadrangle. All these objects were also exported from TNTmips to shapefiles and USGS DLG files and are included on the same CDs. More details on this application and the availability of these maps can be found on the color plate posted at www.microimages.com/documentation/cplates/72GSJmaps.pdf.

Disaster Relief, Intel, and Other Maps.

British Aerospace Electronics (BAE, San Diego) and Lockheed (LMCO, Bethesda) have completed the testing of TNTmips 2005:71 for its release to the analysts at the National Geospatial-Intelligence Agency and other related sites around the world (NGA, formerly NIMA, formerly the Defense Mapping Agency and other components of the US Intel mapping and image analysis agencies). Lockheed's testing uses a 95-page reference document with over 1200 test steps, which must be passed. NGA has been using TNTmips 2002:67 and then 2003:69 to prepare complex image and other physical map layouts and for the publication of TNTatlases. In early 2006 Lockheed will train its training staff in the use of this new version, and they will begin to train the NGA operators involved in the production of these products.

For your information and use in marketing TNTmips to other government mapping agencies and organizations, preparing these specific NGA products is entirely completed in TNTmips and starts with importing DTED elevation and images and their 10:1 JPEG2000 compression; importing shapefiles and their considerable spatial content for correction and editing; reconciling coordinate reference systems as needed, database restructuring; styling; complex map layout, legends, and marginalia; and printing to large format ink jets for fast reaction use in small quantities or using an SML script to prepare TIFF files of each color layer for large volume press runs; reproduction of TNTatlas in EasyCD Creator; and so on.

Immediate Access to DV2006:72.

Everyone who is using version **2005:71** of a **TNT** product can now download the Development Version **2006:72** for that **TNT** product. This will permit you to use new features as they are added and to participate in the development and perfecting of this next release. You can obtain access to **DV72** now by simply downloading it from www.microimages.com. Installing it will automatically create a completely separate **TNT** DV product set on your hard drive and will not change your working version of **2005:71**. Your access to **DV72** will be temporary. When you download and install **DV72**, it will be installed as a timed license using your same USB key. **DV72** only will then automatically expire in 30 days, which will not affect your continued use of your **2005:71**. However, if you subsequently download the latest version of **DV72**, this timeout will be automatically reset again to 30 days.

On the day of the official release of **TNT** 2006:72, MicroImages will remove all access from microimages.com to **DV72**, and its patches. Thus, all temporary uses of **DV72** will expire for everyone in 30 days or less after it becomes the official release. Of course, if you have already purchased **2006:72**, you can simply download it on the day of its official release or later to permanently replace **DV72**.