Introduction to

TNTserver™ and Clients

with

TNTmips®
TNTserver™ and Clients

Before Getting Started

TNTserver™ provides the means to distribute atlases prepared in TNTmips® over the Internet or your intranet. All the tools you need to create a TNTatlas are provided as part of the basic TNTmips software package. Once constructed, a TNTatlas can be used without change for viewing on CD-ROM with the free TNTatlas software, in TNTmips, and with TNTserver accessed by any of the three Client products.

Prerequisite Skills This booklet assumes you have completed the exercises in *Displaying Geospatial Data* and *Navigating* tutorial booklets. The exercises in those booklets introduce essential skills and basic techniques, which are not covered again here. There are also three other companion booklets to this one: *Constructing a HyperIndex*®, *Introduction to Designing Electronic Atlases*, and *A Case Study: MERLIN: Enterprise-wide Geospatial Analysis*.

Sample Data This booklet does not use exercises with specific, downloadable sample data to develop the topics presented. You are, however, referred to MicroImages' test atlas web site (http://atlas.microimages.com) to explore how these concepts have been implemented.

More Documentation This booklet is intended only as an introduction to the operation of TNTserver and its client products. For additional information on installation and administration of TNTserver, refer to http://www.microimages. com/atlasserver/serveradmin.htm. For additional information on operation of the client, click on the Help icon while using TNTclient or refer to http://www. microimages.com/atlasserver/help.htm.

TNTmips and TNTlite® TNTmips comes in two versions: the professional version and the free TNTlite version. This booklet refers to both versions as "TNTmips." If you did not purchase the professional version (which requires a software license key), TNTmips operates in TNTlite mode, which limits the size of your project materials and does not allow preparation of atlases for use with TNTserver.

Merri P. Skrdla, Ph.D., 2 February 2002
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Introducing TNTserver and Clients

TNTserver is a geoserver designed to allow rapid access, viewing, and interpretation of massive collections of geodata, which includes raster, vector, CAD, TIN, and relational database materials. The TNTserver software runs on a Windows NT or 2000 computer and is enabled by a software license key that attaches to one of the computer's parallel ports.

The geodata served by TNTserver is viewed using one of the three clients developed and provided by MicroImages: Java TNTclient, TNTbrowser, and HTML TNTclient. Java TNTclient is a web-based Java applet that is downloaded from a TNTserver site and cached on your machine for repetitive use by most browsers. TNTbrowser is a free Windows application that you download and install, then run like any other Windows program. HTML TNT-client has an HTML-designed interface that works in a separate window with your web browser.

The client provides the interface for extracting geodata from the TNTserver and atlases it hosts. The composite request of the client to show layers, zoom, move down a level, and so on is communicated to TNTserver by the Internet or intranet. The TNT-server then locates, extracts, and combines the layers for the area, scale, and so on into a composite image that is sent together with auxiliary data (metadata, geo-coordinates...) to create the client's view.

Currently, the largest geodata collections prepared for use with TNTserver are the MERLIN (Maryland's Environmental Resource and Land Information Network) system and the Nebraska statewide atlas, which each hover around 240 gigabytes of geodata before compression. TNTserver is totally scalable without changes in performance to accommodate even larger data sets (up to terabytes if you have the geodata) and, of course, small data sets that fit on a single CD work as well. You can easily change the total amount of geodata incorporated in an atlas without altering the geodata already there.

TNTserver Manager

TNTclient
TNTbrowser

Vocabulary: A **server** is a computer or device on a network that manages network resources. A **geoserver** is a server that manages geospatial data. A **client** is an application that runs on a personal computer or workstation and relies on a server for resources. An **applet** is a program designed to be executed from within another application. Unlike an application, an applet cannot be executed directly from the operating system.

Pages 4–10 describe installation and management of TNTserver. Pages 11–20 describe the features common to most versions of the three clients, while pages 21–23 emphasize the differences between clients.

TNTserver Requirements and Options

MicroImages hosts a variety of atlases on a machine configuration similar to that shown below. This setup includes four 400 MHz Pentiums with 64 Mb of RAM, one 450 MHz Pentium with 96 Mb of RAM, and one 330 MHz Pentium with 64 Mb of RAM configured as a RAID with six 20 GB drives. Each of these machines has a 100 Mbit ethernet card and all are connected by a 100 Mbit ethernet switching hub.

TNTserver will run with any level of Windows NT 4.0 or Windows 2000. The requirements beyond that depend on how much traffic you anticipate and how much data is associated with your atlases. TNTserver will run on a 233 MHz Pentium with 64 Mb of RAM. Although the bottom of the line NT and 2000 will run TNTserver, a higher level is needed to support a RAID (Redundant Array of Independent, or Inexpensive, Disks) configuration. MERLIN uses a 500 MHz Pentium with quad Xeon processors, 1 GB of RAM, and an ethernet card to connect it with multiple machines configured as RAIDs that contain all the data served.

As for the professional version of all TNT products, the operation of TNTserver is enabled by a software license key. The type of license key is determined by the platform: a parallel key is available for use with Windows NT 4.0 while parallel and USB keys are available for Windows 2000 (NT does not support USB). Two TNT product keys cannot be daisy-chained together on a single port. If you are running TNTserver on the same machine as another professional TNT product, the TNTserver license can be added to your existing key.

Each of the machines in the MicroImages server farm, except the RAID, runs its own copy of TNTserver. Two of the TNTservers run on Windows 2000, and the other three run on Windows NT 4.0 with service pack 4.

TNTserver is multi-threaded, which means it can handle multiple requests at the same time. There are three basic types of threads: receive (input), compute, and send (output) threads. The number of client connections is controlled by your operating system license level. The number of compute threads is controlled by the number of processors and your TNTserver license. Multi-threading is discussed in more detail on the following page.

Number of Simultaneous Threads

The number of compute threads is the number of requests that can actually be processed, or computed, at the same time. The number of receive threads is the number of client requests that can be queued up for a turn at a compute thread. The number of send threads is the number of computed results being returned to clients whose requests have been processed.

Microsoft and Intel recommend for best performance with NT 4.0 that the number of compute threads be set to no more than one greater than the number of processors, or two for a single processor machine. Two compute threads are supported by the basic TNTserver. Depending on the volume of TNTserver usage and other demands on the machine, the basic product can be set to use one or two compute threads. If your machine has more than one processor, you can purchase support for additional compute threads for your TNTserver. For example, the basic product can be expanded from two to five compute threads for a single quad processor-based NT server.

Your TNTserver license limits the number of compute threads, but it does not limit the number of receive and/or send threads. However, your Windows NT operating system license may limit the number of simultaneous network connections you may have. Each client (from receive to compute to send) counts as one network connection. A Windows NT Workstation 4.0 license (entry level) limits you to 10 simultaneous network connections, which means a maximum of 10 receive threads. The high-end Windows NT Server-Enterprise Edition products allow thousands of users and provide load balancing across 32 NT-based systems.

Note: TNTserver is not a network Project File server that serves up RVC objects to the client. TNTserver serves up a composite image with embedded vectors, CAD, and other layers along with auxiliary descriptive data and metadata.

receive threads

basic 2 compute threads
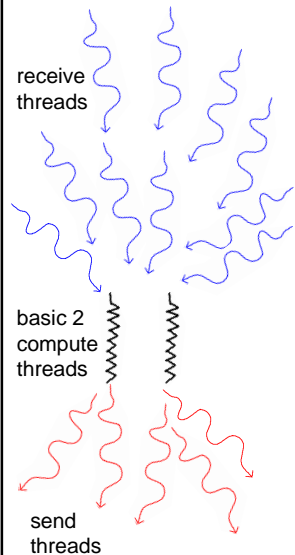
send threads

The number of send threads is theoretically not limited, but reflects the number of receive threads and speed of processing.

TNTserver Installation

TNTserver should be installed in its own directory separate from other TNT products to avoid possible update conflicts with common software components.

Installing TNTserver

☑ run the downloaded executable from a temporary directory (latestserver.exe is a self-extracting Zip file containing the installation program and TNTserver)

☑ run SETUP.EXE*

☑ open a command prompt, cd to the installation directory, type *rvcatlas -i* to install TNTserver as an NT service

☑ open the Control panel, then the Services control applet

☑ highlight the MicroImages TNTserver entry, press the Startup button, and change the account the service operates in

☑ press Start button on the Services control applet

*If the Windows NT drivers for the MicroImages Software License Key are not already installed, you also have to install these drivers at this point (and reboot the machine) as part of your TNTserver installation.

The current versions of TNTserver and TNTclient software are available for download from http://www.microimages.com/atlasserver/source/tntserver if you have purchased TNTserver. Access to this web page requires a special username and password.

This site provides a number of different versions of TNTserver and clients. The files named latestserver.exe and latest client.zip provide the versions of TNTserver and TNTclient you encounter if you run an atlas from MicroImages' web site using the regular atlasserver (not the Atlas Test Clients). Various dated beta versions can also be found in this directory. Unless you are specifically working with MicroImages on new feature development, use of the standard files is recommended The files for TNTbrowser with and without the Java virtual machine are also in this directory (jtntbrow.exe and tntbrow.exe respectively).

When you unzip latestclient.zip, you must specify the -d option (restore directories). Also, Windows hides files with certain extensions by default. If you unzip the client to one location and then copy it to a final location, you may miss files if some file types are hidden. Be sure your system is set to show all file types (choose View / Options / View and select Show All Files from the file display window that contains your unzipped files).

Always run TNTserver in the context of a specific user, not the LocalSystem (root) user. Running as a specific user provides access to network resources, which are generally not available to the LocalSystem, and better security if you give TNTserver's user account access only to the files and directories it needs to function properly. It is important to set up TNTserver's user account so the password does not expire. If the password does expire, the server's account will automatically shut down on the expiration date and take your atlases offline.

Configuration and Testing

Your Windows NT/2000 system must be configured as an Internet server and given appropriate directory access to use the full capabilities of TNTserver. MicroImages uses the Internet server called IIS, which is included with Windows NT. The users who visit your atlas web site can use the TNTserver / TNTclient browser combination only if the machine running TNTserver is a web server that will serve up the TNTclient software. If your NT/2000 system is not configured as a web server, your copy of TNTserver will work only with non-browser applications, such as TNTbrowser (Micro-Images' stand-alone Java client).

The web page documents that present the initial welcome and information screens for your online atlases should be on the same NT/2000 machine as your TNTserver. The TNTmips Project Files that contain the geodata for your online atlases can be on the same machine or on any other device on the network that the TNTserver account can access.

Be sure that the communication port on the NT/2000 machine with TNTserver is open. Do not let firewalls or routers do any filtering on the port. If this port is filtered for protocols, it will interfere with server-client communication.

After installing TNTserver, be sure to test it first by running the client on the same machine, then by running the client on another local machine and connecting to the TNTserver across a simple network connection. Verify that TNTserver is working correctly with these simple configurations before connecting to the Internet or other remote intranet that you already have up and running.
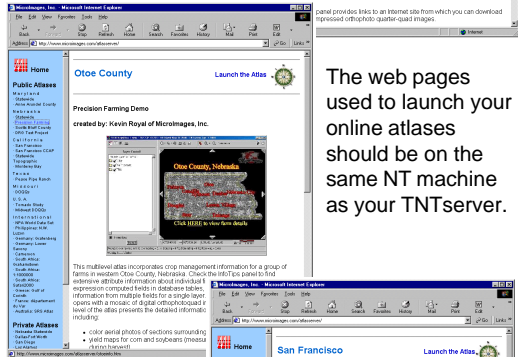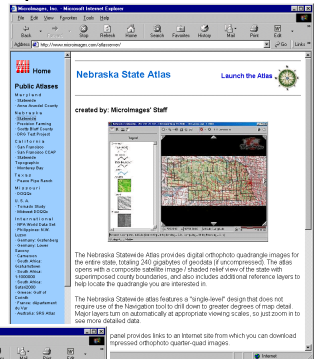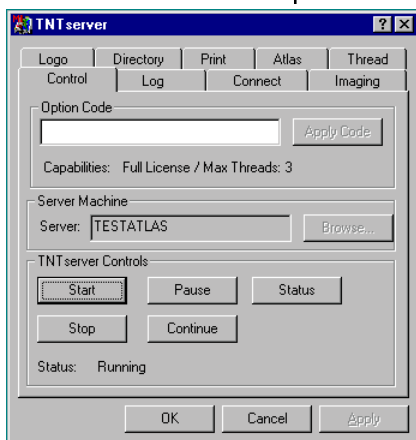
The web pages used to launch your online atlases should be on the same NT machine as your TNTserver.
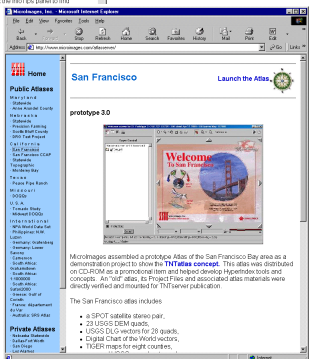
TNTserver Manager: **Control, Log, Directory**

Once you have installed TNTserver, you can modify its configuration settings with TNTserver Manager. You will find TNTserver Manager with your other control panels. TNTserver Manager's functions are grouped onto nine panels: Control, Log, Connect, Imaging, Logo, Directory, Print, Atlas, and Thread. The Control tabbed panel provides the means for you to upgrade TNTserver using an option enable code, lets you start/stop or pause/continue server function, and reports the server status.

Many configuration changes require you to stop the server and restart it when changes are complete. The pause button lets you update atlas files without actually stopping the server. If your TNTserver supplies access to more than one atlas, you may want to keep atlases you are not changing available for use. Rather than pausing the server, you can choose to lock directories from client access for the atlas you are changing. After updating files when you have paused the server, click Continue. After updating files in a "locked" directory, remember to remove the directory from the lock list (Directory panel) so it can be accessed again.

When the server is stopped, clients attempting to communicate with the server get a socket exception. When the server is paused, clients get a message that the server is down for system maintenance.

The server status is determined when the TNTserver Manager is launched. The status is only updated when you click on the Status button.

The Log panel lets you specify the name of system log file, which contains status and error messages, and the stats log file, which contains the level of information you select (connection time, thread time, or request type). You also specify how often you want a new log file created and can choose to have old log files automatically deleted after a specified number have accumulated.

TNTserver Manager: **Connect, Imaging, Logo**

The Connect panel specifies the port number for communication with TNTserver, which by default is 4750. As stated previously, this port must be open and not filtered by a firewall or router. Filtering interferes with server/client communication. You also specify the send and receive timeout length in seconds. These timeouts keep queues from filling up with aborted or interrupted client requests. The send timeout is typically longer than the receive timeout because the server sends significantly more data than it receives.

The imaging panel lets you designate compression settings, layout cache size, and the maximum height and width of the image sent. All of these settings have to do with performance speed. The compression settings refer to the image sent to the client. When an image is compressed, it is transmitted more quickly. When a new layout is requested by the client, it can be sent much more quickly if it is already in the cache particularly if the layout has many layers. You should decide how much RAM you are willing to devote to your layout cache then adjust the cache size until NT's Performance Monitor indicates you are using close to that amount (be sure to initiate enough client requests for a variety of layouts to reach the number set). You do not want to exceed the available RAM because performance will decrease if virtual memory is used.

The Logo panel lets you choose a logo to superimpose on all client images. This logo must be a 24-bit RGB raster in rvc format. A separate coregistered mask raster is utilized to provide transparency values for each cell location (0=transparent, 255=solid). You also specify which of eight positions along the edge you want the logo to occupy. Null values will be transparent if no mask raster is selected.
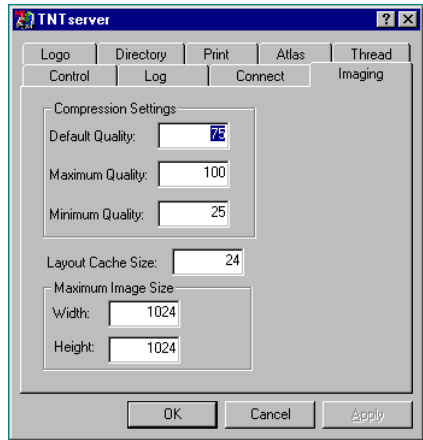
The logo you encounter on all atlases when visiting MicroImages' web site has a mask raster with a cell value of 108 for the partially transparent cells. The area surrounding the logo has a value of zero.

solid logo

68% transparent logo over atlas background

TNTserver Manager: **Print, Atlas, Thread**

The Print panel lets you set up the information required to use the HTML Layout printing option from TNTclient. You need to specify a directory to contain the temporary image for printing both as a Windows path and a URL so it can be located by both TNTserver and the client. You also need to select the HTML file that provides the layout template. TNTserver automatically deletes old print images at the time interval you specify. See the next page for additional information on setting up HTML Layout printing.
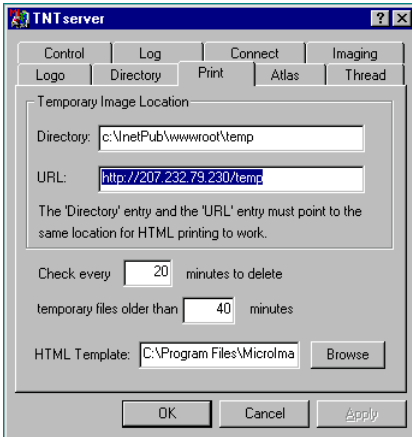
The atlas panel lets you choose and name the atlases that will be available to someone visiting your site using TNT-browser. Atlases are not accessible to those using TNTbrowser unless they are on this list even though TNTclient can find them using the web links you have set up. There is no reason not to list all your atlases unless some have proprietary information you don't want viewed by the general public (if it is on the list, it can be viewed by TNTbrowser even if it requires a password for TNTclient viewing).

The thread panel points out that the illustration on page 5 is over simplified. There is actually a queue before each set of threads where requests and results wait for the next available thread in the receive / compute / send sequence. Any client connection, whether in a queue or using a thread, counts toward the total number of connections allowed by your operating system. So, if you have an entry level NT license, setting the receive, compute, and send queue sizes to 10 should keep you within your license limits. You can use NT's Performance Monitor to see how your machine responds against requests by a number of different clients.
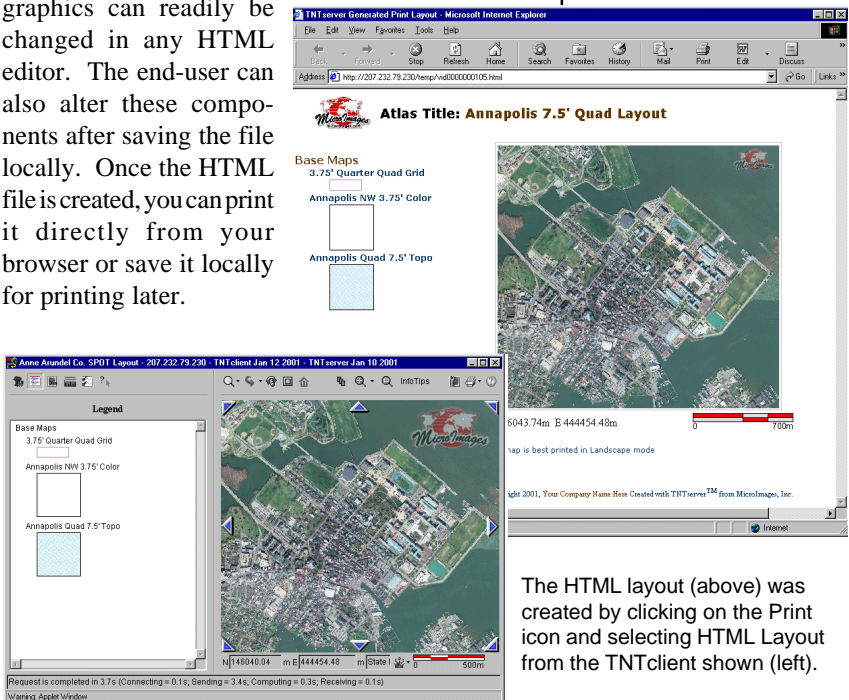
Printing from TNTclient

The client offers two printing choices: HTML Layout or Image Only. Image Only printing, which lets you print what is currently shown in the atlas viewing area, relies upon your browser's printing capabilities. This image only printing can be enabled for Java applets run from Microsoft Internet Explorer, but not from Netscape Navigator (see the Toolbar Icons section of TNTatlas Client Help at http://www.microimages.com/atlasserver/help. htm).

HTML Layout printing creates an HTML page that it opens in your browser. This page layout includes the current image, what you see in the Legend panel of TNTclient, a scale bar, and the coordinates at the center of the image. The layout object name is inserted for the atlas title. The other components of the layout are determined by the person who maintains your TNTserver. The additional text and graphics can readily be changed in any HTML editor. The end-user can also alter these components after saving the file locally. Once the HTML file is created, you can print it directly from your browser or save it locally for printing later.

Note: HTML Layout printing may currently be available only with the Atlas Test Client.

Remember that this HTML file is deleted after an interval specified by TNTserver Manager. If you wait longer than this interval to print, you may discover you have placeholders rather than graphics in your print.

The HTML layout (above) was created by clicking on the Print icon and selecting HTML Layout from the TNTclient shown (left).

Changing TNTserver's HTML Layouts

As mentioned on the previous page, the HTML layout generated by TNTserver for printing can be changed by the person who maintains the TNTserver or by anyone choosing to print an HTML layout. Only the person who maintains the TNTserver can change the form of the standard layout generated when someone chooses Print / HTML Layout. An end-user can change the standard layout generated by TNTserver if desired by choosing Save As from the browser's File menu and creating a local copy of the HTML document.

One obvious change that all TNTserver administrators should make in the file that generates the layout is to substitute your company name for the text that reads "Company Name" at the bottom of the layout.

In either case, the method of change is the same—use an HTML editor (if you really know what you're doing, a text editor is sufficient). The person maintaining the TNTserver needs to be more careful about making changes than the end-user. The HTML file (printtemplate.htm) that generates the print template contains specific instructions to TNTserver to generate the layout, such as "place legend here" and "place image here." If specific instructions to the TNTserver are altered, you may end up without important layout components. There is also a style sheet companion file (printtemplate.css) that determines text size, color, and font for the layout.

Compare this layout to the one on the bottom right of the preceding page (changes are also noted here).

Once the layout has been generated and saved to a user's machine, it can be changed as the user desires. Although the user can view the original HTML source in their browser, any attempt to edit it will not be saved. The end-user must open a locally saved version in an editor to be able to make changes. In the example at the left, a newly captured illustration was substituted for one of the legend components.

Caching Layouts for TNTserver

Recall that on the Imaging panel of the TNTserver Manager you can set the number of layouts to keep in the cache on your TNTserver machine. TNTserver will then accumulate layouts in the cache until that number is reached. In the absence of any additional setup, the next layout opened after this number is reached will displace the least recently used layout from the cache.
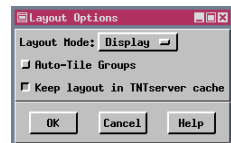
The complexity of a layout determines the amount of benefit you get from having the layout in the cache before you go to view it. All cached layouts will display faster, but half a second is probably not significant to the user. Very complex layouts, such as the Nebraska Statewide Atlas, which contains TIGER data and DOQQs for the entire state in a single layout, may see tremendous benefit. When not cached, this layout may take longer than four minutes to load while it takes just a few seconds when cached. Most atlas viewers would decide something had gone wrong before waiting this amount of time. So a means is necessary to provide some layouts priority other than last use to stay in the cache.

This means is provided in Spatial Data Display within TNTmips where TNTatlases are assembled. There is a check button in the Layout Options window to keep the layout in the TNTserver cache. You must, of course, save the layout after turning on this option. A layout with this option set is retained in the cache regardless of last use as long as there are layouts to discard that do not have this option turned on. If every layout in the cache has this option set, the least recently used layout marked to remain in the cache will be discarded once the layout limit is reached.
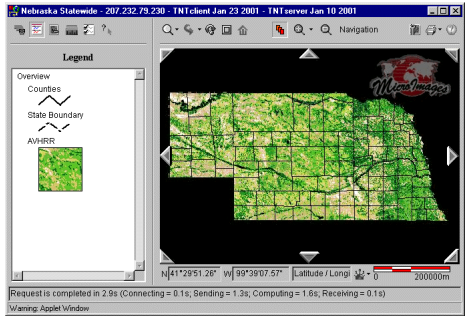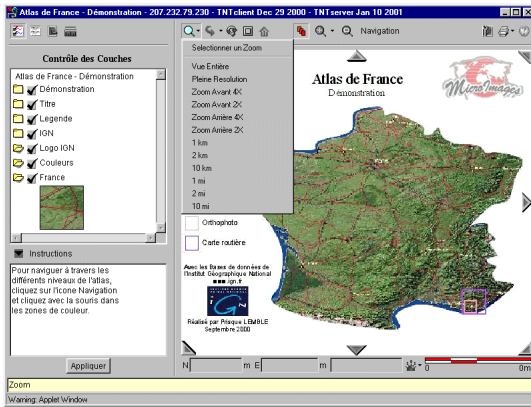
You can set a priority for keeping a layout in TNTserver's cache in the window shown below, which opens when you choose Options from the Layout menu in the Layout Controls window.

Localized TNTclient Interface

The interface of TNTclient can be translated for the intended audience just like all other TNT products. In order for the TNTclient interface components to automatically come up in a language other than English, the language preference of your computer must be set to that language and the TNTserver providing the TNTclient must have a version of the locale file in that language. The HTML page that launches the TNTclient for a particular language can also specify the locale for the atlas so that atlases can come up in different languages from the same server. When the locale for an atlas is specified in the HTML page that launches it, your computer need not have that language preference set for the TNTclient interface to appear in the specified language.

An atlas of the Var region in southeast France (above) is available from MicroImages' web site and on CD-ROM. The atlas was developed by Prisque Lemblé, a second year student at l'Ecole Nationale des Sciences Géographiques. M. Lemblé was a summer 2000 intern at MicroImages, Inc. He spent about a month to make the atlas, set up the client in French, and write a ToolScript to locate streets.

No extra preparation is necessary for the names of the layers and groups to come up in your own language, provided they were named in that language when the atlas was prepared. Layer and group names, as well as layout text and labels, will remain as they were saved even when TNTclient uses a different locale.

The atlas shown at the right was prepared by a cooperative effort of several government agencies in Germany. The text and layer names are in German, but the TNTclient interface is in English.
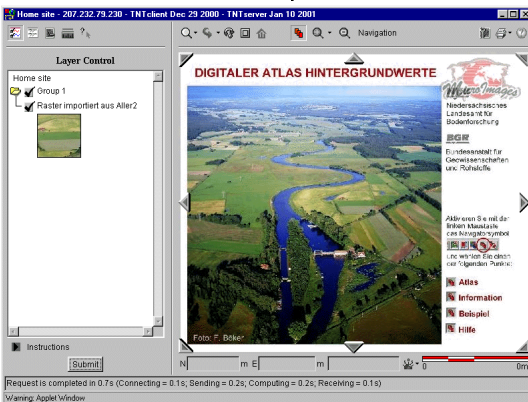
Clients: Navigating and Zooming

There are two methods for structuring a TNTatlas: as a hierarchical stack put together with the Hyper-Index Linker tool in TNTmips or as a single layout atlas with map scale controlled layer visibility. Features of both atlas types can be combined. For example, on one level of an atlas you might have vector overlays that only appear after zooming in and rasters layers that change from scanned maps to high resolution imagery and still have HyperIndex links that take you to a different theme or level of detail. Another means of handling layers that are far too detailed for meaningful display at full view is to initially have these layers hidden and let the user turn them on when desired.

There are two modes of zooming: around the center of the current view or as determined by the mouse (either with a click or an elastic box). If you are zooming around the center of the current view, the Navigation tool can remain active when you zoom.
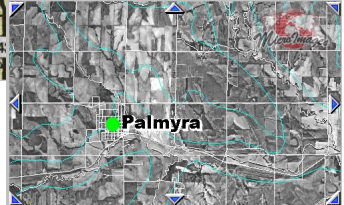
In addition to common zooming choices, such as in/out 2X/4X, full view, and full resolution, zooming options for specified ground distances are provided, for example 1 km/mi, 2 km/mi. The distance you choose (plus 10%) is the distance shown in the smallest dimension of the atlas viewing area of the client. Arrows are provided for scrolling within a layout. If the atlas is hierarchical, the arrows will scroll you to the next layout in that direction if you have reached the edge of the current layout.

takes you to the next level in a hierarchical atlas

zooms around center

zooms where click

zooms to outlined area

Navigation

This single layout atlas uses map scale controlled layer visibility, which means the visible layers change at predetermined map scales as you zoom in and out.

The hierarchical atlas shown below provides different base layers as you navigate through the stack. Many of the same vector overlays are available at either level.
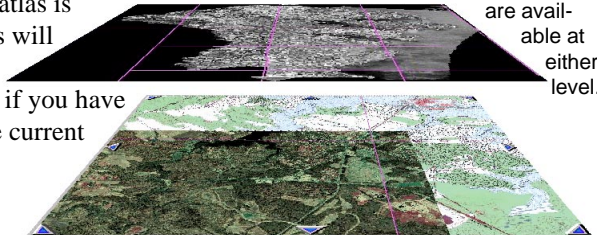
Clients: Predefined Queries

Some atlas users are interested in locating specific places or viewing specific information rather than just browsing through the imagery and vector/CAD/ TIN overlays. Two types of query operations are available with TNTserver and clients: predefined and user designed queries. There are two examples of atlases with predefined queries on MicroImages' web site: Anne Arundel County (Maryland) and Nebraska Statewide.

The address entered is centered on the screen even though the vector layer with the address information is not displayed.
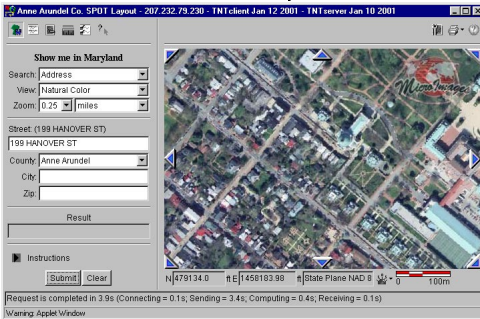
First you select the search mode (address, city name, township/ range, or Latitude/Longitude in the Nebraska atlas; address only for Anne Arundel), then select the base map you want to view (photographs, soils, streets, or topography for Nebraska; satellite image, color-infrared orthophoto, topographic map, or natural color orthophoto for Anne Arundel), and the smallest dimension of the view (0.1 to 5.0 miles or kilometers). The fields in the next panel are determined by the search mode you have chosen. If searching by address, you can enter any or all of the street address, county (chosen from a list), city, and zip code. If searching by city, there is only a field in which to enter the city name.

Some queries may turn up multiple matches with varying degrees of certainty (below). You can pan between the choices provided without having to resubmit the query to TNTserver.

Such predefined queries are atlas specific. For example, the View options provided must correspond to layers available in the atlas and the county selection list needs to correspond to the appropriate state. Depending on the choices you make, you may end up on a different level of the atlas than where you started.
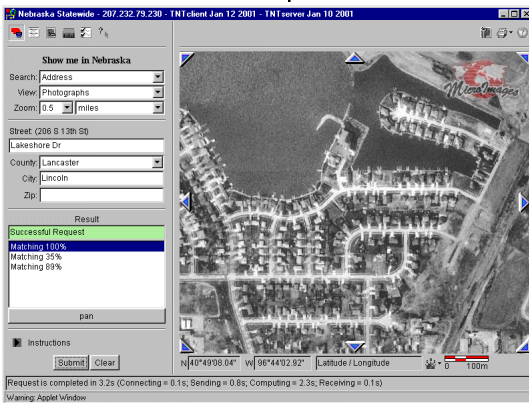
Clients: User Designed Queries

Designing your own query requires some familiarity with the database information associated with the atlas. The first step in the query process is to identify the individual layer and the element type you want to query by choosing the group, layer, and type from the corresponding lists on the query panel. Once you have made these three selections, click on the Get Info button, which acquires the table and field names from the database for the element type you have selected. You can then select table and field names to insert in the query. Hopefully the atlas designer has insured that the table and field names are straightforward so you can determine which table and field will provide the information you want.

The query language and syntax is the same as used with other TNT products. The query illustrated below highlights the most profitable areas in a field by taking into account both yield (pounds per second through the yield monitor greater than 25) and dryness (corn with moisture of 15.5% or less does not require additional drying before storage). After your query is entered, click on the Highlight button.

Direct highlighting draws selected elements in red without changing the display properties of unselected elements. **Color-locked highlight**ing draws selected elements in red and unselected elements in green. If red is a common color in the display scheme, color-locked highlight makes the results of the query much easier to interpret.
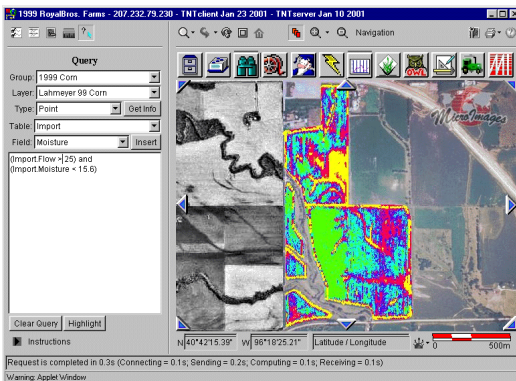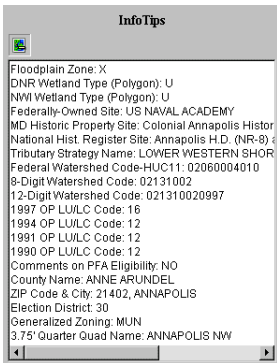

Points collected during harvest are theme mapped according to yield monitor readings in the Precision Farming atlas (shown before selection query was applied). There are two highlighting options: direct and color-locked.

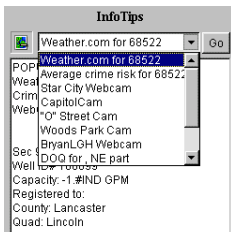direct highlight (red) of theme mapped points
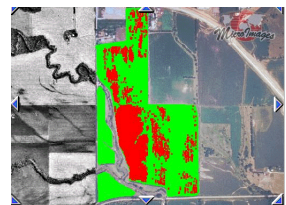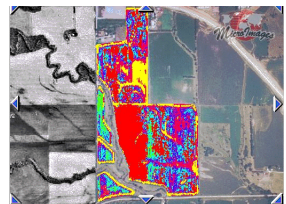
color-locked highlight

Clients: InfoTips

Vocabulary: A *DataTip* is the information from a designated database field revealed when the mouse is paused in TNTmips. An *InfoTip* contains the same information but requires a mouse click to display the information.

The InfoTips panel can provide useful information about every layer in the current atlas layout if correctly set up by the atlas designer. The information that shows in the InfoTips panel is the same information set up for DataTips in TNTmips. The atlas designer's choice of a prefix or suffix for the Data-Tip is quite important for interpreting the information supplied. The InfoTips panel provides Data-Tips for all layers and elements within selection range of your mouse click, whether or not the layer is selected for display. For example, look at the InfoTips panel at the upper left, which was generated by clicking in the view shown on page 11. The DataTip "30" without the prefix "Election District" (third from bottom) would be meaningless, as would many of the other entries. Only a few of the pieces of information provided would be understandable without the prefix.

The InfoTips panel may additionally provide links to other web sites based on the position of your mouse click. If any layer where you click has a DataTip in a special form (see *Introduction to: Designing Electronic Atlases*), you get a list of web sites designated by those layers. The list provides descriptions entered by the atlas designer rather than the web addresses. The links provided can be to any file as long as it has a web address. For example, the link could be to a pdf file or mpeg movie. The list is accompanied by a Go button such that you make your selection from the list then click on the Go button to open another browser window or application (file types other than web pages require the user to have appropriate software to view the file, such as Acrobat Reader for pdf or an mpeg viewer for a movie). The Nebraska Statewide atlas provides many external links.

Clients: Measuring

The clients provide five different tools that enable you to make all kinds of measurements: straight line (ruler), curved line, rectangle, circle, and polygon.

You can make either single or cumulative measurements. The ability to add a number of separate measurements is useful for two types of applications. One is for measuring a number of discrete features that you want to group together, such as the ground area occupied by all buildings within a park. The other is to continue measurements from one view to the next, such as the length of a road or stream that do not fit wholly in the view at the resolution you want for measuring. Be sure to add the current measurement to the total before scrolling when using this method.

The ruler, circle, and rectangle present a default tool when selected—you reposition and resize the default tool to fit the feature you want to measure. The diagonals in the rectangle tool let you rotate the box to measure features that run at an angle, such as the soccer field and buildings in the illustrations on this page. The curved line and polygon tools do not present a default tool, you simply click where you want to start your measurements and then at each vertex of the feature you want to measure. Once you have drawn three points with the polygon tool, the end and start are automatically connected to show you the closed shape used for the currently reported measurements. The curved line and polygon tools need to be cleared before you can start measuring another feature.

The rectangle tool has been resized and rotated to fit the dimensions of the soccer field (below).
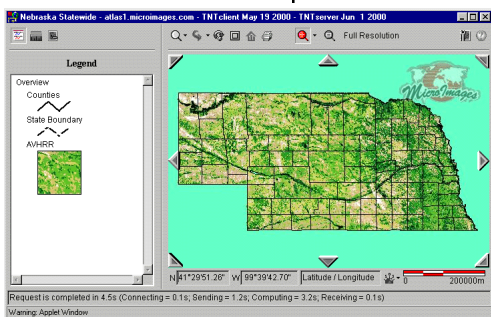

diagonals let you rotate the box
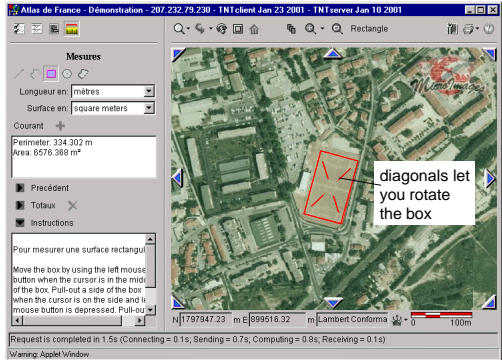
For cumulative measurements, a record of each measurement is maintained in a scrolling list and a running total is kept. In the illustration below, the ground area occupied by three of the buildings has been measured.
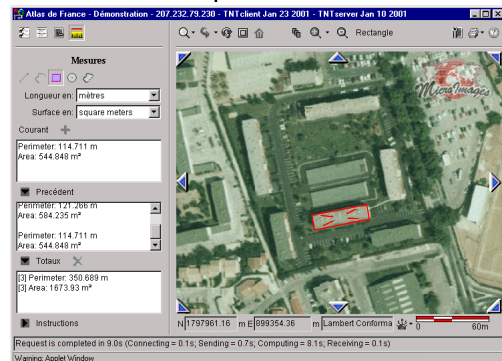
Obtaining measurements does not require a trip to the server; all the information necessary to determine length and area using the current image have already been received by the client.

Clients: Customizing

The appearance of TNTclient is determined by the HTML file that launches the selected atlas. You can experiment with customization for any of the atlases on MicroImages' web site by clicking on Customization Features on the TNTserver Atlas Hosting page. The Applet Customization Form lets you specify the background color with red, green, and blue values from 0–255, choose whether the Navigation tool is present or absent, and indicate the order of the work area panels if you choose to show

them at all. You can view the HTML used to bring about your customization selections, which makes it trivial to customize your own atlas (see *Introduction to: Designing Electronic Atlases*).

If an atlas is a single layout atlas, it is a good idea to remove the Navigation tool because it has no function and is the tool active by default when it is present. A tool that produces no results (other than the message "No Child") tends to be confusing, particularly for a novice user. If there are no hidden layers in your atlas or if layer display is controlled entirely by map scale, you may want to eliminate the layer controls panel. If your atlas does not contain georeferenced or scale calibrated images, you should consider removing the measurements panel because the results will be misleading (in the absence of calibration, the system assumes 1pixel = 1 meter).

The TNTclient shown above has no navigation tool, the background color has been changed, the layer controls panel has been removed, and the remaining panels have had their order changed (compare to the illustration on page 13). The query panels are also missing because this feature was available only with the testing version of TNTclient when the illustration was captured (customization calls the standard version of TNTatlas).

TNTbrowser cannot be customized. Because the same TNTbrowser is used for all atlases you view, all the tools and work area panels are needed. The features of TNTbrowser are constant across time and atlases (until you download and install a newer version). HTML TNTclient is written entirely in HTML so you can customize it with any HTML editor.

Java TNTclient

Java TNTclient is a web-based Java applet that is downloaded from a TNTserver site when you request an atlas and is cached locally for reuse as long as your browser is operating. Downloading this Java applet requires about two minutes with a 56 kbs modem. Atlases subsequently requested from the same TNTserver machine will also use this cached client. Atlas requests to a different TNTserver will initiate another TNTclient download.

TNTclient was the first product developed for viewing the geodata served by TNTserver. It is also currently the version of the client in which development of new features occurs. If you choose Atlas Test client from the TNTserver

Atlas Hosting page, you will get the latest version of the client with the atlas you choose. Some of the features described in this booklet, such as queries and HTML printing, were only available from the test client at the time.

Local caching of Java clients has only recently been supported for the Macintosh. It requires a newer Apple Java Engine for Internet Explorer 5 called MRJ version 2.2.3 (or newer). The latest versions of Internet Explorer or Netscape Navigator can be used interchangeably on Windows platforms, but Netscape Navigator is not recommended for the Macintosh.
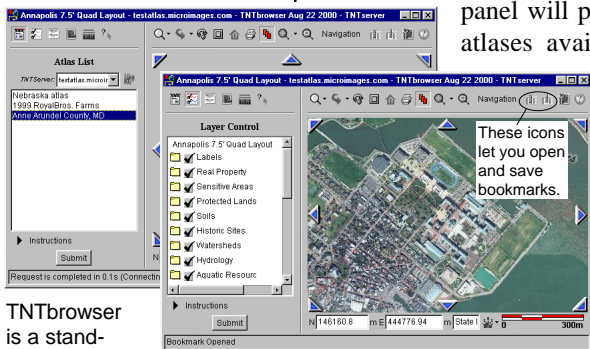
Once the applet is downloaded, communication with the server for the first layout of the atlas is established. It is at this point that layout caching becomes important (see page 13). Because layout caching is a function of the server from which you have requested the atlas, the effect is the same regardless of which client you are using.
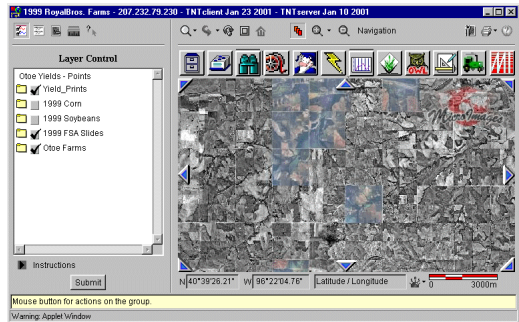
This atlas makes use of the banner feature to create the "buttons" across the top that link to various web sites and external files. Using the banner feature lets you have these links available regardless of where in the atlas you are. For more information on banners see *Introduction to: Designing Electronic Atlases*. Because banners are a function of the HTML instructions that launch the atlas and not a part of the atlas itself, they appear in TNTclient but not in TNTbrowser.

TNTbrowser

There are four main differences between TNTclient and TNTbrowser: TNTbrowser is a stand-alone Windows program, it has an atlas list panel, it has the ability to save and open bookmarks, and it prints using your Windows printers. There are two choices for TNTbrowser download: with or without the Java virtual machine. If you already have the latest version of the Java virtual machine, choose to download TNTbrowser only. You then run the install process, and TNTbrowser is ready to access atlases on any TNTserver that has atlases listed on the atlas panel of TNTserver Manager (see page 10). Once you have connected with a TNTserver, your atlas list panel will provide the names of the atlases available from that server. From that point on, all tools for navigation and zooming are exactly as in TNTclient.

Choose the TNTserver name from the list or type in the server address, and click the Connect to Selected TNTserver icon next to the server name field. Then select the desired atlas from the list, and click Submit.

Bookmarks enable you to return to a particular level in the atlas hierarchy at a specified zoom and position with designated layers exposed. If you have already saved bookmarks, you can skip the server connection and atlas selection steps by simply choosing Open Bookmark after launching TNTbrowser. The bookmark takes care of connecting to the server and selecting the correct atlas. You can also switch from one atlas to another using bookmarks.

TNTbrowser is a stand-alone program for Windows only (95/98/NT/2000/ME). It does not run on the Macintosh or Linux. The primary advantage of the stand-alone program is you do not have to spend the time to download the client for each viewing session.

When you click on the Print Image icon in TNTbrowser, you get your familiar Windows Print dialog, just as you would if printing from Microsoft Word. There are no issues about which browser you are running or how your Java permissions are set. This print is similar to snapshot printing in TNTmips where the image area is enlarged until it fills the page in one dimension and is centered in the other.

HTML TNTclient

The HTML version of TNTclient is the newest of the client products. It is still undergoing development to reach the functionality of the Java version of TNT-client and TNTbrowser. For example, there are no measurement tools in the current HTML version and printing is not implemented.

The general appearance of the HTML version of the client is significantly different thanthat of the Java version or TNTbrowser. For example, the pan buttons surround a globe above the atlas image area rather than being placed at the image edges and corners. The legend and controls panels replace each other with the name of the one not currently shown appearing on the button above the panel. The zoom choices that operate centered on the current view are on buttons rather than on a menu. Scale is reported as the ground dimensions of an individual screen pixel.

The HTML version has one feature not present in the Java version—a locator panel, which is not yet operational but is intended to function like the locator window in TNTmips' Spatial Data Display.

The HTML version of TNTclient can only be reached through the TNTserver Development Version page at this point (which you get to by choosing Atlas Test Clients from the main Online Atlases page).

Although the HTML client is still in an experimental stage, it holds promise because it eliminates the time required for Java client download. It does, however, require additional configuration of the atlas server because the HTML client communicates with the TNTservelet, which runs under TomCat and talks to TNTserver through the web server (IIS).

You may want to experiment with the features in the HTML version of TNTclient, but should wait until it appears on the main atlas server page before planning any routine work with it.

Advanced Software for Geospatial Analysis

MicroImages, Inc. publishes a complete line of professional software for advanced geospatial data visualization, analysis, and publishing. Contact us or visit our web site for detailed product information.

TNTmips TNTmips is a professional system for fully integrated GIS, image analysis, CAD, TIN, desktop cartography, and geospatial database management.

TNTedit TNTedit provides interactive tools to create, georeference, and edit vector, image, CAD, TIN, and relational database project materials in a wide variety of formats.

TNTview TNTview has the same powerful display features as TNTmips and is perfect for those who do not need the technical processing and preparation features of TNTmips.

TNTatlas TNTatlas lets you publish and distribute your spatial project materials on CD-ROM at low cost. TNTatlas CDs can be used on any popular computing platform.

TNTserver TNTserver lets you publish TNTatlases on the Internet or on your intranet. Navigate through geodata atlases with your web browser and the TNTclient Java applet.

TNTlite TNTlite is a free version of TNTmips for students and professionals with small projects. You can download TNTlite from MicroImagesí web site, or you can order TNTlite on CD-ROM.

Index

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