

# Easy Trace Project. Creation and Adjustment.

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## Easy Trace project

Effectiveness of vectorizing depends much on simplicity of mutual transfer between GIS and vectorizer. Nobody needs «just vectorized data» - they should be attributed to different layers, comprise topological connections and correspond to data classification adopted in the target GIS.

These problems would be solved by themselves were the vectorizer an integrated tool of the GIS. But it's too big and complex to be reducible to one or even several tools. Besides, it would inherit «the load of faults» typical of any long-living advanced system and high effectiveness of specialized utilities would be unachievable.

Being an individual package, Easy Trace stores data in documents of a special format – so-called «projects». The project answers the following questions:

- What to vectorize?
- What should arise from vectorizing?
- What means can be applied?

The best way to create a new project is to import its settings from the target GIS. In that case, the vectorizer receives information «at first hand». This method is described in detail in the «Export and Import» chapter, but here we shall consider manual project creation and adjustment.

*Do not err about significance of task order! It is impossible to vectorize data anyhow and then «to stuff» them into GIS without waste of time and labor.*

*Development of data model should always forego vectorizing, and it is better to fulfill it in GIS environments. It means creation of a tiny but real trial project. Import of this project into Easy Trace unambiguously answers the question «What I want to get as a result?».*

*An additional bonus of this approach consists in possibility to make sure of correct data position and appearance IMMEDIATELY after vectorizing of first lines.*

## What is the project?

What do we call «project»? It is the main working document of Easy Trace. Besides vectorizing environment, it stores vector data and references to images.

Easy Trace projects are files with «JET» extension (this is abbreviation of «Easy Trace Project» reshuffled a little for the sake of harmony). Let us consider the essence of these documents.

Main components of the project related to vectorizing environment are:

- Coordinate system of the project characterized by:
  - orientation of coordinate axes;
  - unit of distance measurements;
  - map scale;
  - DPI of the project's raster field;
  - position and dimensions of the project's raster field.
- List of vector layers, which controls future structure of vector data.
- Attribute tables that contain semantic characteristics of vector objects. There may be 2 tables connected with every layer - for point objects and polylines separately.
- Attribute domains - a list of possible attribute values for specified fields of the attribute table. Attribute domain may also comprise a synonym (i.e. understandable name), an icon, and a way of screen output for every value of the attribute.
- Topological rules - the rules of object interaction subject to the layers these objects belong to.
- Strategies - named sets of parameters for different utilities. They may be used as they are or as initial approximation with further editing.
- Custom tools - accelerators of vectorizing tool selection together with a set of preliminary adjusted execution parameters.
- Blocks - named groups of objects to be taken for a single whole. They may be used independently or as conventional symbols for screen output of points in the «attribute-based» (thematic) view mode.
- Line types, polygon fillings, text styles.

Raster layers form another important component of the project. They were not mentioned above as rather belong to source data than to vectorizing environments. The raster layer is a reference to an image plus information about its georeferencing. Both raster layers and georeference files are considered in an individual section of this chapter.

Also, individual sections describe forming of vector layers, attribute tables, line types,

blocks, etc. But now we shall focus on creation of a project itself. Let us begin with the ideas of «coordinate system» and «project field».

One should remember that Easy Trace supports only Cartesian coordinates. In other words, ET project is always based on LINEAR COORDINATES (meters for example) but never degrees.

Easy Trace has no means for projection conversion. It means that only images georeferenced in the same coordinate system (for example, the same zone of UTM or Gauss-Krueger projection) may be united correctly. Besides, it is possible of course to create a project in coordinates of the drawing (millimeters \ centimeters) or in image coordinates (pixels).

Another significant fact is applying of fixed-point coordinate values in the current ET format. The program calculates exactness of coordinate representation at project creation reasoning from user-specified parameters - field dimensions, unit, DPI of the virtual image, and map scale.

A certain reserve envisaged at calculation enables about tenfold increase of project field in every direction if necessary, but it is impossible to overstep these limits (unless you import data into another project).

Similarly, change of scale, virtual image DPI and project unit is impossible for a ready project. These parameters control the factor of conversion between pixels of the virtual image and project coordinates. They do not influence the process of vectorizing by itself. You may specify meters instead of inches or input a wrong DPI value but vectorizing results will be the same, and even coordinates of exported data will be correct if the ratio of parameter values remains unchanged.

Nevertheless, it is reasonable to specify them accurately to ensure correct representation of conventional signs (point symbols and line types). Their size is measured in mm of the drawing in accordance with State Standard requirements. A wrong value of map scale may resulted in log-like or on the contrary very small lines and symbols.

What is the «virtual image» of the project mentioned above several times? It is a fictitious image coinciding with the project vector field. For projects based on real rasters, there is no difference between virtual and real images if project boundaries coincide with ones of the image.

What for is the idea introduced? It was done because of two reasons at least:

- it is convenient to specify many parameters of image preparing and vectorizing in pixels;
- there may be images scanned with different resolution on the project field and a «common denominator» is required to process them as a united material.

Resolution of real images linked to the project may differ from DPI of the virtual image but try to avoid this discrepancy if possible. It will be easier at least to adjust parameters of numerous tools and utilities provided for image processing and vectorizing.

At late stages (vector data merging, topological control, generation of derivative objects, attribute data input, etc.) DPI equality of the virtual and real images is unimportant. Actually, the program automatically breaks it at integration of vector data received by vectorizing of different-scale materials, without unwanted consequences.

## New project creation

Creation of a really NEW project is a relatively seldom task in practice. Most projects are just clones of others.

First, it is possible to inherit all settings of any existing project selected as a prototype. This approach in Easy Trace is called *prototype-based* project creation.

New-generated project differs from the prototype by its image set, position of the project field, and lack of vector data.

Second, coordinates of the project field may be calculated automatically. To do it, create a project based on an image with a georeference file.

Third, you may combine these approaches.

Fourth, project settings may be taken from the target GIS directly - it is enough to import the image and the vector frame of vectorizing area from it.

But we shall consider the most complex way - project creation «from zero» . The *File -> New Project* commands opens the *Creating Project Wizard* dialog box.

## New project creation with default settings

1. Specify a new project name and the folder, where the subfolder of project files will be generated in the *Project Creation Options* page of the Wizard.

*Dialog box of project creation parameters (Step 1)*

Creating Project - Step 1: Project Creation Options

Project name : example

Location : E:\Work

Prototype : Custom prototype

E:\Work\m2000\m2000\_proto.jet

New project will be created based on custom prototype. Any user project can be used as custom prototype. New project inherits all prototype settings: vector layers, attributes, blocks, line types, etc.

< Back Next > Cancel Help

**Project name** - enables name input for the new project. This name will be also used for the project folder generated in a user-specified directory. An existing folder may be

used if it does not contain another ET project (i.e. a JET-file), otherwise the program demands another folder name.

**Location** - meant for path selection to the project folder.

*ATTENTION! Only an existing folder may be specified.*

**Prototype** - meant for selection of a project-prototype to copy settings from. Select *No prototype* and click *Next*.

2. Switch off all options in the second page (*Image Using*) and click *Next*. We shall link an image later, after project creation.

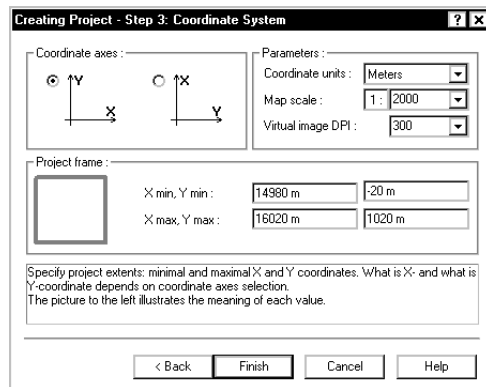
3. *Coordinate System* page controls coordinate parameters of the new project.

**Coordinate axes** - meant for selection of axis orientation in the project:

- right (standard) coordinate system (X axis is directed horizontally to the right, Y axis - vertically upwards);
- left coordinate system (X axis is directed vertically upwards, Y axis - horizontally to the right).

The right coordinate system is selected by default.

*Dialog box of project creation parameters - Coordinate System (Step 3)*



**Coordinate units** - enables selection of measurement unit for vector objects from the list: *pixels, kilometers, meters, centimeters, millimeters, miles, feet, inches*.

**Map scale** - enables input of the source (paper) map scale. You may select a standard value or specify another one.

**Virtual image DPI** - meant for selection or input of the virtual raster field resolution. Together with *map scale* and *coordinate units*, this parameter controls scaling factor at recalculation of project coordinates into inner Easy Trace units and inversely.

**Project frame** - controls minimal and maximal coordinates of the project fields.

If the right coordinate system is selected, *Xmin* field corresponds to the project left

boundary, and *Ymin* field - to the lower boundary. In projects with the left CS, *Xmin* is the lower project boundary, and *Ymin* - the left one.

When you click in one of the fields, the corresponding side of the frame placed to the right of it becomes highlighted, and vice versa - left click on a frame edge makes the corresponding field selected.

Unit change causes automatic recalculation of project boundaries' coordinates and their representation in new units.

4. Click *Ready* to complete project creation (image-to-project link is described in the next section of this chapter).

So, we have created a new project. It has only one vector layer called «0» without attribute tables, standard types of lines and fillings, and has no blocks.

## Prototype-based project creation

This version of the operation is primarily designed for vectorizing of bulky one-type materials, sheets of the same map for example. It is clear that all such projects must have identical sets of vector layers, data base structure, vectorizing and topology checkup strategies, etc.

On the other hand, even your first project may be based on a prototype taken from the Easy Trace kit.

The program completely copies the entire project-prototype with the exception of its images, vector data, and content of attribute tables. Many parameters may be altered of course, both at project creation and later.

1. Specify the new and folder for the new project in the *Project Creation Options* page of the Wizard as it was described above.

Select a desirable option in the *Prototype* field:

- *No prototype* option was considered in the previous scenario. When on, an empty project with one vector layer without attribute tables will be created.
- *Standard prototype* - enables prototype selection from the projects we have prepared and adjusted for some standard topographic map scales.

*We do not state of course that these projects are standard in a sense but they are adjusted in accordance with qualifiers that are in common use in the Russian Federation. We applied these prototypes in a series of big projects and thus have the right to recommend them as a basis.*

If your list of standard prototypes is empty, load them from our Web-site. By default, they are placed to the Easy Trace\Prototypes folder at installation. There are no limitations of set expansion - just save your own projects-prototypes to the same folder.

- *Custom prototype* - any JET-file accessible from your computer and located wherever you like.

Select a project-prototype and click *Next*.

2. Switch off all options in the second page (*Image Using*) and click *Next*.
3. All sett *Coordinate System* page are copied from the project-prototype, so you just click *Ready*.

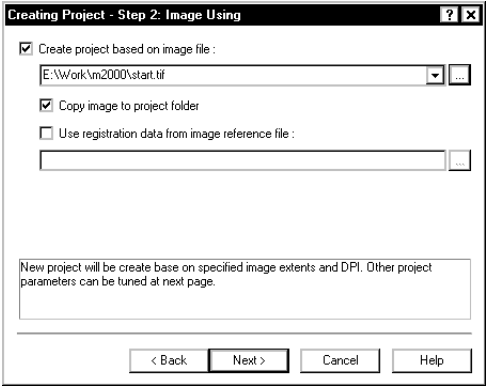
The new-created project has inherited all settings of the prototype - its set of vector layers, attribute structure, domains, blocks, line types, settings of thematic screen output, etc.

### Image-based project creation without a georeference file

1. Specify the new and folder for the new project in the *Project Creation Options* page of the Wizard as it was described above. Select *No prototype* option in the *Prototype* dialog box and click *Next*.
2. Select the *Create project based on image file* option in the *Image Using* page and specify the name of this image. Optionally, you may switch on the *Copy image to project folder* option.

Ignore the *Use registration data from image reference file* option for the time being.

Dialog box of project creation parameters  
- image link at project creation (Step 2)



3. Specify parameter values in the *Coordinate System* page as described in the first scenario (creation of an empty project).

The *Virtual image DPI* field contains a resolution value taken from the raster file header. But it is written incorrectly in some images, so check and correct this parameter. Use the *Ruler* tool (**see Easy Trace Tools**) to determine true image resolution.

Only coordinates of the lower left corner of the project field (*Xmin*, *Ymin*) are editable now. Other fields are inaccessible because the program calculates the field dimensions

automatically reasoning from dimensions of the image, selected unit, scale and DPI values. Recalculation of maximal coordinates at change of minimal ones is automatic.

4. Click *ready* to complete the process.

We have created a new project with defaults settings and only one vector layer called «0» as it was done in the first scenario but the specified image is already linked to it. Dimensions of the image were used at calculation of project field's coordinates. Conversion factor for vector and raster data depends on the specified scale, unit, and image DPI.

## Image-based project creation with use of a georeference file.

This version of the operation resembles previous one a lot but the program calculates project field coordinates applying data from a georeference file.

1. Specify project name and folder in the *Project Creating Options* page of the Wizard as it was described above. Select *No prototype* in the *Prototype* field and click *Next*.
2. Switch on the *Create project based on image file* and *Use registration data from image reference file* options in the *Image Using* page and specify names of corresponding files.

ET supports the following georeference file formats:

- World-file - ArcView/ArcGIS;
- Tab-file (for an image!) - MapInfo;
- Map-file - OziExplorer.

*ATTENTION! Easy Trace supports only Cartesian coordinates. That's why TAB-files with the «degrees» measurement unit are improper for the operation. Similarly, your MAP-file should contain at least 3 reference points with coordinates measured in meters.*

*As for the World-file, it is impossible to recognize applied coordinates in it unfortunately, as the file contains only numeric characters (affine transformation factors) but it also should correspond to projection coordinates rather than degrees.*

Click *Next*.

3. Adjust parameters in the *Coordinate System* page as it was described in the first scenario of new project creation.

Easy Trace calculates default values of these parameters on the base of the specified georeference file in the following way:

- Units are taken from the specified georeference file if it is in Tab format, otherwise «meters».
- Virtual image DPI is equal to DPI read in the raster file. See previous scenario about possible incorrect determination of this value.
- Map scale is calculated from selected units, DPI, and image dimensions taken from the specified georeference file.

Scale value will be far from real if DPI is incorrectly specified in the raster file header (it happens) or units different from «meters» are used at raster positioning in ArcView. That's why all fields in the page are editable. Specify parameters, which you know and the program will calculate the rest.

Coordinates of the project vector field depend on image dimensions and are not accessible for editing.

#### 4. Click *Ready*.

If a World-file was selected, project creation together with image link and georeferencing do not require additional operations.

In case of a Tab- or a Map-file, it may be necessary to align the image, as these files assign transformation of raster coordinates into vector ones on the base of reference points.

If the transformation calculated on the base of these points does not comprise rotation, image linking is over, otherwise the program suggests you to start image correction.

If you give your consent to correction, first steps of this operation (method of image linking and selection of reference data source) will be skipped and you will only have to click the *Correction* button.

Image correction and linking to project are considered in detail in the next section of this chapter.

### Prototype and image based project creation

This version is a combination of two options discussed above. The program copies all settings from the specified project-prototype but calculates coordinates of the project field on the base of image dimensions and position.

To choose this version, specify the prototype you want to use in the first page of the Wizard, and the image to be linked (and its georeference file maybe) - in the second page.