

topoXpress

USER MANUAL



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1.	Introduction	5
2.	Installation	7
2.1	Windows	8
2.2	Android	8
2.3	MacOS	10
2.4	iOS	11
3.	User interface	13
4.	Tutorials	15
4.1	Create New Project	16
4.2	Open Existing Project	16
4.3	Create New Layer	16
4.4	Start Survey	17
5.	Menus	18
5.1	Projects	19
5.1.1	New project	19
5.1.2	Open project	20
5.1.3	Import project	20
5.1.4	Current project	21
5.2	Layers	22
5.3	Cloud	24
5.3.1	Cloud Access	24
5.3.2	Cloud Storage	25
5.3.3	File Sync	25
5.3.4	Send Files	26
5.3.5	Receive Files	26
5.4	Settings	26
5.4.1	Map Settings	26
5.4.2	Attribute Settings	27
5.4.3	Projection	28
5.4.4	GNSS	28
5.4.4.1	GNSS General	29
5.4.4.2	GNSS COM Port	30
5.4.4.3	GNSS TCP Port	30
5.4.4.4	GNSS NTRIP	30
5.4.5	Peripherals	31
5.4.6	System Settings	31
5.5	Software	32
5.6	Help	33

6.	Layer Types	34
6.1	Vector layer	35
6.1.1	General	36
6.1.2	Style	37
6.1.3	Classes	38
6.1.4	Label	39
6.1.5	Attributes	39
6.1.6	Data	40
6.2	Raster layer	40
6.2.1	General	40
6.2.2	Display	41
6.2.3	Georeference	42
7.	Tools	43
7.1	View	44
7.2	Info	46
7.3	Survey	47
7.4	Draw	48
7.5	Stakeout	49
7.6	CoGo	50
7.7	GIS	51
8.	Panels	52
8.1	Table	53
8.2	Records	54
8.3	Attributes	55
8.4	Coordinates	56
8.5	Field Property	56
8.6	Survey	58
8.7	Divide	60
8.8	Sampling	61
8.9	Skyplot	62
9.	Appendix	65
9.1	Values	66
9.2	Expressions	67
9.3	Code dictionary	69
9.4	Language file	70

Index

72



Introduction

1 Introduction

topoXpress is an efficient, lightweight but powerful GIS (Geographic Information System) data collection, visualization and processing software with the following characteristics:

1. Multiplatform support: the same software with the same rich functionality for Windows®, Android®, MacOS® and iOS®. You can prepare your work in the office, collect data in the field, and process your collected data in the office.
2. Includes both GIS and Surveyor tools and commands
3. Handles and displays large spatial datasets (raster and vector) due to the C++ native engine.
4. Responsive and intuitive user interface: easy to learn and use, automatic adjustment to different screen size, orientation and resolution of mobile (tablets, smart phones and desktop devices), multiple colour templates, skins and fonts
5. Online and offline operation: online data sources (Google® Drive, Dropbox®, OneDrive®, TMS, WMS, KML), offline raster datasets (jpeg, ecw, ers, tiff, geotiff, bigtiff, png, lan, bil, envi), offline vector datasets (map, shp, bna, mif, dxf, txt, crd, csv, dat, dbf, tab, mid).
6. Powerful GIS visualization tools: thematic mapping, transparency, labelling, layer groups, vector symbols, line types, fill types, event mapping.
7. Productive field data collection: templates, several surveying modes, point and line stakeout, CoGo (Coordinate Geometry), forms, lists, default and calculated values, expressions, data validation, topological GIS editing functions, sampling, generalization and more.
8. Extensive support of GNSS receivers (built-in, Bluetooth, USB, UART, TCP), range finders, projection systems, shift grids, geoids.

The app can be used in various sectors:

- Field data collection and inspection
- Land Surveying
- Topographic mapping
- Forestry
- Farm mapping
- Utility mapping and inspection
- Archeology

*** NOTE: topoXpress offers all specified GIS and Surveying functions free of charge. However, saving and exporting your job can be done through our Cloud service. Please contact us at the website topoXpress.com for further details.



Installation

2 Installation

topoXpress can be installed to multiple platforms.

The following section contains detailed information about the installation process for [Windows](#)^[8], [Android](#)^[8], [MacOS](#)^[10] and [iOS](#)^[11] platforms.

2.1 Windows

Installation of topoXpress on Windows® operating systems.

Please, check the software requirements before installation:

- Windows 7, 8, 10 Operating System
- 32 or 64 bit architecture
- Minimum 1 GB RAM
- Minimum 1024x768 display resolution
- 32 MB Storage space
- Mouse and keyboard

1. Installation

Download the latest installer from topoxpress.com or topolynx.com website.

The installer contains executables for Windows 7 and Windows 8 (and above), for 32 bit and 64 bit systems too.

Start the installer, follow its instructions!

The program displays a message if a newer version is available. You may download the new version and install it over the already installed one. It is not necessary to uninstall the previous version.

2.2 Android

Installation and usage of topoXpress on Android® operating system

Please, check the software requirements before installation:

- Android 5.0 or above
- Minimum 1 GB RAM
- Minimum 800x480 display resolution
- 32 MB Storage space

1. Installation

There are two choices to install the program for Android devices:

a) Installation from Google Play:

Start Google Play Store application and search topoXpress in the store, select Install and grant permissions! We suggest this kind of installation because the update is easier and can be automated.

b) Installation from APK file:

Download the latest topoXpress APK file from topoxpress.com or topolynx.com website!

We don't suggest other web sources to download the APK file.

Copy the APK file to your SD card or internal storage!

Start the File browser application, find the topoXpress.apk and select it to install!

Make sure to enable the option in the Android System Settings to install from unknown sources.

The program displays a message if a newer version is available. Use the Google Play Store application, own applications, select topoXpress to update it. It is not necessary to remove the previous version.

2. Permissions

While using the program, at some points Android may ask permissions to continue, for example taking a picture, connecting to the GNSS. Please, grant this required permissions to continue the work with topoXpress.

The software may need the following permissions:

- Read external storage
- Write external storage
- Manage documents
- access USB storage filesystem
- Internet access
- Access fine location
- Access location extra commands
- Access mock location
- Access coarse location
- Access network state
- Access WiFi state
- Bluetooth
- Access Camera
- Record Audio
- Write settings
- Mount/unmount files systems

2.3 MacOS

Installation and usage of topoXpress on MacOS® operating system

Please, check the software requirements before installation:

- MacOS 10.8 (Mountain Lion) or above
- 32 or 64 bit architecture
- Minimum 1 GB RAM
- Minimum 1024x768 display resolution
- 32 MB Storage space
- Mouse and keyboard

1. Installation

- Download the most recent macOS® installer (topoXpressSetup.dmg) from: topoXpress.com.
- Open the downloaded DMG file with the Finder application.
- In the window drag the topoXpress icon into the Applications folder.
- If you are updating topoXpress to a newer version, click Replace in the popup window.
- The topoXpress app can be launched from the Launchpad application.
- During the first launch, the app will ask for permissions. Please, grant these to make all app function work properly.

2. Permissions

The topoXpress app requires permissions from you to access your Documents and Downloads folders, media capture devices and location services to function properly.

- Open the System preferences on your Mac® computer.
- Open the Security & Privacy setting in the System preferences.
- In the Security & Privacy switch to the Privacy tab.
- You can edit the permissions for topoXpress under: Location Services, Camera, Microphone, Files and Folders
- To make changes don't forget to click the Lock icon at the bottom.

There is a recommended option, to grant Full Disk Access to topoXpress. If this permission is enabled, you can map your entire hard drive to add or save files in the app. To enable this go to the Full Disk Access option:

- Unlock the Lock icon at the bottom
- Click on the + icon.
- Select topoXpress from the Applications list.
- Click in the check box next to topoXpress in the list.

3. Gestures

The support for Multi-Touch gestures were integrated into the macOS® edition of topoXpress. The Multi-Touch gestures provided higher user experience can make your work even more efficient on Mac® computers.

- Tap with one finger: Use a single tap to draw, edit or get info instead of a click in the map view.
- Scroll with two fingers: Use two finger to zoom the map or scroll the lists.
- Three finger drag: Use three of you fingers on the Touch-Pad to navigate in the map view

4. Drag & Drop

If you are looking for a more dynamic way to add layers to a topoXpress project than using the built in file manager, use the drag and drop gesture.

With drag and drop layer files can be added directly from Finder to the currently active layer group of topoXpress.

The file drop feature of topoXpress is only active when the layer manager is open!

2.4 iOS

Installation for iOS® operating system

Please, check the software requirements before installation:

- iOS 12.4 or above
- 32 or 64 bit architecture
- Minimum 1 GB RAM
- Minimum 1024x768 display resolution
- 32 MB Storage space
- Mouse and keyboard

1. Installation

Find the topoXpress application in the App Store and install it.

The program displays a message if a newer version is available. Use the App Store, select my applications, select topoXpress and update it.

2. Permissions

While using the program, at some points iOS may ask permissions to continue, for example taking a picture, connecting to the GNSS.

Please, grant this required permissions to continue the work with topoXpress.

The software may need the following permissions:

- Location
- Bluetooth
- Local network
- Camera
- Siri & search
- Mobile data



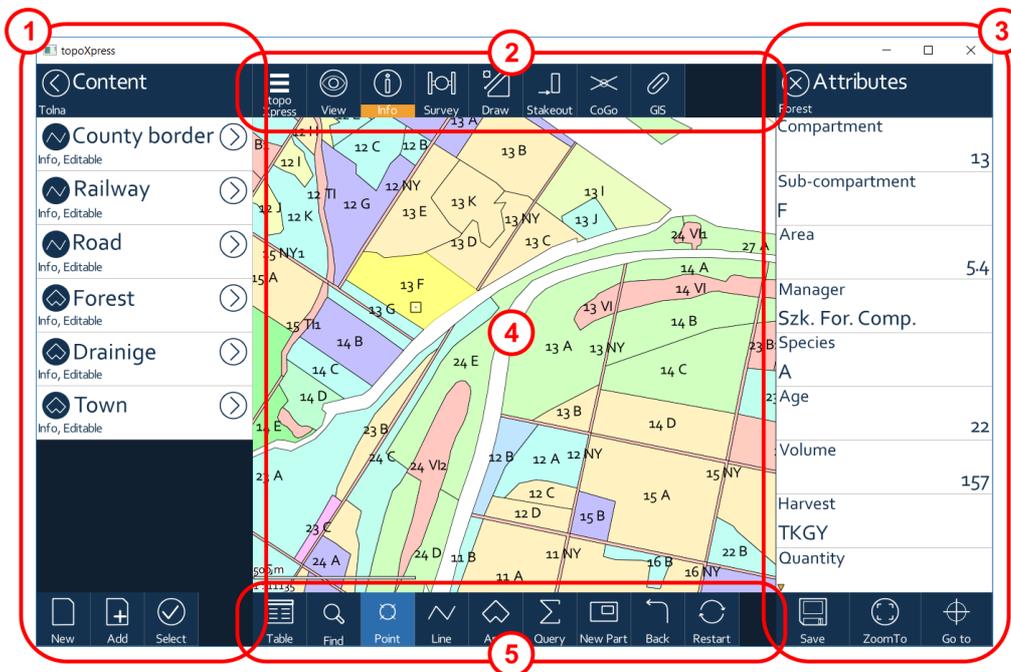
User interface

3 User interface

topoXpress user interface is a responsive, resizable, intuitive, easy to use graphical interface to communicate with the program. The interface consists of 5 main elements:

1. Left side panel: usually contains [menu](#) items and settings
2. Top [toolbar](#): switch between bottom toolbars
3. Right side [panel](#): contains properties and attributes
4. Center view: displays the map
5. Bottom [toolbar](#): contains the tools and commands of the selected toolbar

The left and right panels can be resized by dragging the header section of the panels.





Tutorials

4 Tutorials

This section contains some tutorials which cover the basic functionality of the program.

We strongly suggest looking through these tutorials in order to quickly learn and efficiently use the software.

4.1 Create New Project

This tutorial describes the steps to create a new template based Project.

1. Start the program
2. Open menu with the [topoXpress](#)^[44] button
3. Select [Projects](#)^[19] menu item from the left side menu
4. Select the [New](#)^[19] tab
5. Select one of the predefined template: Empty project, Point/Line/Area Survey
6. Enter the name of the Project, this will be the folder name of the job too
7. Select the desired file format to collect geospatial data (Map, Shp, Dxf)
8. Modify the Projection if necessary (select a projection or enter country name, projection name keywords, for example: WGS 84 UTM 33)
9. Press the top-right OK button of this panel to create the Project and start data collection
10. Done

4.2 Open Existing Project

This tutorial shows how to open and switch between existing Projects.

1. Start the program
2. Open menu with the [topoXpress](#)^[44] button
3. Select [Projects](#)^[19] menu item from the left side menu
4. Select [Open](#)^[20] Tab, if not selected
5. You can browse the existing Projects on the local storage
6. Select any project from the list to open it
7. You can select sub-folders or any location of the file system
8. The program opens and displays the content of the selected project
9. Select another project from the list to switch to it
10. Done

4.3 Create New Layer

This tutorial explains how to create a new layer for data collection.

1. Start the program

2. [Create](#)^[16] or [open](#)^[16] an existing Project
3. Open menu with the [topoXpress](#)^[44] button
4. Select the [Layers](#)^[22] menu
5. Press the New button at the bottom
6. Enter the Name of the new layer, the default name is based on the current date and time: yymmdd-hhmm
7. Select the Type of the geometry (Point, Line, Area) to draw/collect in this layer or the type of the layer (Table, Group, WMS)
8. Select Vector Layers and the desired file format (Map, Shp, Dxf, Mif)
9. Check the 3D Coordinates option, if you want to collect 3D geometry
10. Alter the Code page of the new layer, if it is necessary
11. Press the top-right OK button of the panel to create
12. The program creates the layer and add it to the top of the layer list
13. Done

4.4 Start Survey

This tutorial explains how you can create a new layer and start spatial data collection.

1. Start the program
2. [Create](#)^[16] or [Open](#)^[16] an existing project (the previous two tutorials)
3. Select the [Survey](#)^[47] from the top toolbar
4. Select a vector layer with the left command at the bottom toolbar
5. If the layer list is empty, then [Create](#)^[16] a new layer for data collection or enable the [Editing](#)^[36] for an existing layer
6. Turn on the GNSS receiver outside of the program
7. Press Start button to start collecting spatial data
8. Press Create button to finish the collection
9. Fill the [Attribute](#)^[55] data of the entity on the right panel
10. Press Create at the bottom to save the data
11. Done



Menus

5 Menus

The Left side panel contains the main menu elements of the program. The user can create new job, open existing jobs here, manage the layers, and setting up the program.



topoXpress command button can show and hide the left side menu

The width of the menu can be adjusted by dragging the title section of the panel.

The menu contains the following elements:

- [Projects](#)^[19]: create, open, import and export Jobs
- [Layers](#)^[22]: create, open layers, manage layer structure, modify layer appearance
- [Cloud](#)^[24]: cloud access properties
- [Settings](#)^[26]: modify the various parts of the program
- [Software](#)^[32]: shows different information about the software
- [Help](#)^[33]: displays the online help
- Exit: exit the program

5.1 Projects

This panel provides tools to create a new project, open existing ones, import projects or manipulate the current project.

The top section of the panel contains 4 Tabs:

1. Create [New](#)^[19] Project, it can be empty or based on templates
2. [Open](#)^[20] existing Project, list sorted by name
3. [Import](#)^[20] Project from files or from Cloud
4. [Current](#)^[21] Project settings

5.1.1 New project

This Tab lists project templates to create a new Project.

The following predefined templates are available:

- Empty project
- Point survey
- Line survey
- Area survey

The list continues and includes the user defined templates too.

Conclude the next steps to create a new project:

1. Select the appropriate template
2. Enter the name of the Project, this will be the name of the folder which stores all Job related files
3. Select the preferred file format (Map, Shp, Dxf) to save spatial data
4. Define the Projection system: select or enter country name, projection name keywords, for example: WGS 84 UTM 33
5. Press Create button at the bottom of the list
6. The new Job will be created and opened

5.1.2 Open project

The Open Project Tab contains the list of the existing Projects in the default Project folder.

Any existing Project can be opened by selecting it from the list. After selection the content of the folder appears on the map panel.

The default topoXpress project folder varies by platform:

- on Windows®: Current user / Document / topoXpress
- on Android®: inner Storage / topoXpress
- on MacOS®: Document
- on iOS®: sandbox, File App can open this folder

The working folder can be changed in the [System Settings](#)^[31].

The project list title displays the name of the current folder and the path of this folder. Selecting the title navigates to the parent folder.

If the folder contains sub-folders, then these folders will be at the top of the list. You can open any sub-folder and list its content.

The three-rectangle menu is a selector menu, where you can change drives, mounted memory cards, or go back to the default folder.

5.1.3 Import project

Import tab allows the import file base projects or import projects from Cloud database.

1. File based project import show the content of the project folder

The Tab contains an Import button at the bottom to import Maps, Projects from other formats. Currently the following formats are supported:

- KML: Google® Key Markup Language
- DMP: TopoLynx® / DigiTerra® Map Pack
- DAT: Hungarian Digital Base (Cadaster) Map
- EXP: topoXplore / DigiTerra® Explorer project file

The project list title displays the name of the current folder and the path of this folder. Selecting the title navigates to the parent folder.

If the folder contains sub-folders, then these folders will be at the top of the list. You can open any sub-folder and list its content.

The three-rectangle menu is a selector menu, where you can change drives, mounted memory cards, or go back to the default folder.

2. The Cloud based import list the projects in the Cloud database you have access. Each item of the Cloud project list shows the name, the creation date and the owner of the project.

Selecting any cloud project replicates it, downloads the project to the client device and establish a live connection between the Cloud project and client one. If the user has the right and makes changes on the project, the changes will be uploaded to the Cloud if the client device has Internet access, and vice versa, the Cloud project changes will be downloaded automatically to the client.

5.1.4 Current project

Current Tab contains information about the opened Job.

Name: editable name of the project

GUID: Globally Unique Identifier of the project, it is important for Cloud usage and for teamwork.

Source: relative path to the project file.

Last modification: last modification date and time of the project

Geometry decimals: number of decimal digits of the geometry in the project, it controls the accuracy of the geospatial data representation

Projection: The projection system definition used for this project. The system can be altered by selecting it.

Code dictionary file: the absolute path of the code dictionary file, which contain code and description pairs for specific data fields (enumeration fields). The code dictionary file can be selected, altered or removed with this item.

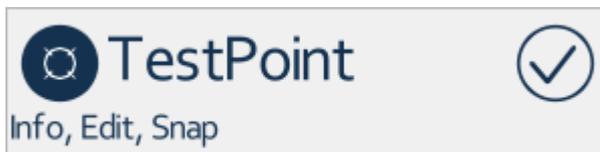
The bottom toolbar contains commands related to the current Project:

- **Template:** saves the current Project as a new template. The template can be used to create [New](#)^[19] Projects.
- **Save as:** save the current Project file with a new name.
- **Share / Stop sharing:** upload the project to the Cloud to share with others, or stop sharing an already uploaded project.
- **Export the Current Project to KML format**

5.2 Layers

The Layers panel displays the list of the layers of the current Project. Layers can be any of the following types: group layer, vector layer (point, polylines, polygons), data table, raster layer and online sources (TMS, WMS).

Each item of the list shows the type of the layer as icon on the left, the layer name (large text) and state of the layer (small text), and a selector icon on the right. The layer type icon controls the visibility of the layer. Clicking on it turns on and off the visibility of the layer. The right selector icon can be used for operations work on several layers. Layers can be selected using sweep gesture, dragging from one layer to another, these two layers and all intermediate layers will be selected.



Clicking on the layer name opens the layer properties for data layers. [Vector](#)^[35] layers and [Raster](#)^[40] layers (including the online raster sources) have different properties. Clicking on the name of a group layer opens its content. Group layer has an additional control, three rectangles, which opens its property panel.

If no layer selected, the next commands are available in the bottom toolbar:



Create a new layer: enter the name of the layer, select the geometry type for vector layers. Select the type of the layer: Group layer, Vector layers (Map, Shp, Dxf, Mif, Bna), Table layers (Tab, Dbf, Txt, Csv, Crd), or WMS layer.

Selecting WMS layer option opens the WMS layer property panel, where URL, login name, password can be entered, and after login the available layers from the online source can be selected.



Add existing file based layer(s) to the project. The list show all supported layer type in the project folder. Multiple layers can be selected to add to the project. You can enter sub-folders or move the parent folder if it is possible. The three rectangle sub-menu contains the next command:

- Select data source: root folder of the device drives, mounted drives, working folder or the Cloud drives (Google Drive, Dropbox, OneDrive) can be selected.
- Change filter: specific vector, raster, table file formats can be selected to show only this kind of files in the list
- Select all: select all supported files to add to the project.



Online

Add online sources. This command lists predefined TMS sources and already defines WMS sources.

WMS sources can be created with the New Layer command (see above).



Hide all

Hide all layers in the project or in the current layer group.

If all layers are hidden, this command changes to Show all, which makes all layers visible.



Select all

Select all: selects all layers of the project or in the current layer group.



Sort

Sort the layers by geometry type, points first, then polylines and polygons last.

If one or more layers are selected, the following command are available in the bottom toolbar:



Remove

Remove the selected layers from the Project or from the current layer group.



Move Up

Move the selected layers upward.



Move D...

Move the selected layers downward.



Group

Create a new layer group and put the selected layers into this new group.



Export the selected vector layers to vector or data table format. The output will be exported into the Job folder.



Compress the selected layers. During editing the program marks the deleted and modified records in the layer. This Compress command re-saves the layers and eliminates all the marked records from the it and reduces its size.



Upload the selected layers to Google Drive. You need a Google credential to access your Google Drive. If you do not have or you do not know, you can get one by clicking the Get One button on the sub-panel.



Upload the selected layers to DropBox. You need a DropBox credential to access your DropBox folder. If you do not have or you do not know, you can get one by clicking the Get One button on the sub-panel.



Upload the selected layers to OneDrive. You need a OneDrive credential to access your OneDrive. If you do not have or you do not know, you can get one by clicking the Get One button on the sub-panel.

5.3 Cloud

The Cloud menu consists of several Cloud related attributes and commands divided into various Tabs:

1. [Cloud Access](#)^[24] tab provides input elements for Cloud login, module selection and functionality access type.
2. [Cloud Storage](#)^[25] panel lists the Cloud based projects you own or you have access, and you can manage your own projects.
3. [File Sync](#)^[25] panel contains tools to download large datasets from a configured file server.
4. [Send](#)^[26] panel lists the users from your organization to send files to them.
5. [Receive](#)^[26] panel lists the users from your organization to receive files from them.

5.3.1 Cloud Access

This Tab contains the input elements for Cloud login, Cloud module selection and Cloud functionality access type.

User: Cloud login name

Password: Cloud login password

Modules: if more than one modules are available for your organization, then you can select here the appropriate module combination you wish to use

Access type: various Cloud access type can be selected here

- None: no access for Cloud functionality,
- Online: Cloud functionality can be used for 5 minutes, after this period the program automatically renews it,
- Offline for 1 hour: you can use the Cloud functionality of the program for 1 hour, even if you are offline,
- Offline for 4 hours: you can use the Cloud functionality of the program for 4 hours, even if you are offline,
- Offline for 8 hours: you can use the Cloud functionality of the program for 8 hours, even if you are offline,
- Offline for 1 day: you can use the Cloud functionality of the program for 8 hours, even if you are offline,
- Offline for 4 days: you can use the Cloud functionality of the program for 8 hours, even if you are offline,
- Offline for 7 days: you can use the Cloud functionality of the program for 8 hours, even if you are offline,
- Offline for 14 days: you can use the Cloud functionality of the program for 8 hours, even if you are offline,
- Auto renewal Offline 14 days: same as the previous, but the program try to renews it automatically, if you have Internet access.

Expiration: displays the expiration date and time of the offline Cloud functionality

5.3.2 Cloud Storage

This Tab lists the user's own Cloud based projects or those Cloud based project the user has access rights.

Selecting one project from the list displays additional buttons:

Rights: assigning or revoking access rights to the specific users within the user's organization.

Compress: compress the project in the Cloud database by eliminating the outdated records.

Delete: delete the project from the Cloud database.

5.3.3 File Sync

If your organization has a dedicated file server, here you can see the list of all of the large data files that are out-of-date and needs to be updated.

These large data files can be raster dataset and vector layers including the main files and all auxiliary files.

If the list contains file entries, you can start the downloads at the bottom and you can monitor the process here. The downloading process is a background process so you can continue your work during downloads.

5.3.4 Send Files

You can send files to a dedicated user on this tab.

At first you may enter a message and select a receiver.

After selecting a receiver a file browser appears listing the content of the topoXpress folder where can select project folders, sub-folders and select files to send.

The top-right OK button inform the receiver about the transfer and if the receiver accept the files the transfer of the files begin.

5.3.5 Receive Files

You can receive files from a dedicated user on this tab.

At first you may select a sender to receive files from him or her, after that you may select a folder to save the received files.

If there is a pending file transfer form the selected sender, the file transfer starts immediately.

5.4 Settings

This panel contains the user and device specific settings.

The program supports many languages. The first important element of the Settings is the Language selection.

The settings menu consists of several sub-menus:

- [Map Settings](#)^[26]: various map related settings
- [Attribute Settings](#)^[27]: unit, date format, media settings
- [Projection](#)^[28]: projection system customization
- [GNSS](#)^[28]: GNSS receiver and NTRIP related settings
- [Peripherals](#)^[31]: settings for paired or attached peripherals
- [System Settings](#)^[31]: system related settings

5.4.1 Map Settings

This panel contains Map related settings.

Default layer format: this is the preferred format for a new layer (MAP, SHP, DXF).

Vertex snapping: this check box globally controls the snapping function to existing vertices.

Smart GNSS Zoom (sec): the program automatically pan the map to the current GNSS location after the entered seconds elapses without user input.

Show GNSS log: controls the display of the GNSS receiver track log.

Explode DXF blocks: controls the exploding of the complex DXF blocks during DXF opening

Google Maps API key: you may enter a Google Maps API key here to legally use Google Tile Map Services.

SHP full save: controls the full re-save of the SHP and DBF files after deletion or modification. If it is disabled, then the program only mark the modified and deleted records as null geometry records, but the records remain in the SHP and DBF files. Not all GIS program supports this partially edited format.

Rotate map: controls the rotation of the map based on the GNSS course.

Dark style: controls the Map render to work in dark or traditional mode.

5.4.2 Attribute Settings

This panel contains attribute related settings.

Units of measurement related settings:

Unit type: quickly switch between metric or imperial units.

Length: selecting the unit for the length related calculations and displays.

Area: selecting the unit for the area related calculations and displays.

Speed: selecting the unit for the speed related calculations and displays.

Data format related settings:

Date format: choosing between the three possible date format.

Default codepage: this is the default codepage for a newly created or newly added layers.

Media file (images, voice messages) related settings:

Media folder: controls the folder where the media files are saved:

- Project: media files are saved into the project folder
- Project/Media: media files are saved into the Media sub-folder under the Project folder
- Project/Media/LayerName: media files are saved into the Media/Layer sub-folder under the project Folder

Media file name: controls the name creation of the media files:

- Increasing number: the name of the media file is "Media" + an increasing number
- Timestamp: the name of the media file is based on the current date and time (yymmdd_hhmmssdc)
- Username_number: the name of the media file is the name of the logged in user + an an increasing number

5.4.3 Projection

This panel provides four tabs and several controls to select a projection system, review and modify its attributes.

The panel has four Tabs. The Projection System can be selected on the first Select Tab. Due to the large number (4 thousands) of projection systems keywords can be entered to find the required system quickly. Enter the country name, projection or datum name to reduce the number of hits, for example: WGS 84 UTM 33. The system can be selected in a hierarchical form, selecting the continent, sub-continent, then selecting the country and finally selecting the system. After selection the properties of the system will appear in the remaining three Tabs.

The second Tab shows the identifier, region, country, datum and grid name of the selected projection system. The third Tab contains the Datum properties, the attributes of the spheroid (ellipsoid of revolution) and relative position to WGS84 spheroid. The fourth Tab contains the Grid properties, the name and type of the projection, reference values, offsets and scales. Existing projection systems can be altered quickly and the program has all the tools to define a new system. Metric, feet based and mixed systems (metric distances, feet heights) are supported.

5.4.4 GNSS

This panel contains several Tabs for GNSS receiver, hardware and NTRIP related settings:

1. GNSS [General](#) ^[29] Settings
2. GNSS [Com Port](#) ^[30] Settings
3. GNSS [TPC Port](#) ^[30] Settings
4. GNSS [NTRIP](#) ^[30] Settings

5.4.4.1 GNSS General

The first GNSS Tab includes the several GNSS device and positioning related settings.

3D Fix position: ensures that 3D fix positioning is required for surveying.

DGNSS solution: type of differential GNSS solution is required for surveying:

- Autonomous or better
- DGNSS or better
- Fixed or Float RTK
- Fixed RTK only

Maximum PDOP: maximum allowed PDOP value for surveying. Above this value the program does not survey and does not collect spatial data.

Accuracy limit: maximum allowed RTK accuracy for surveying. Above this value the program does not survey and does not collect spatial data.

Antenna: this control opens a sub-panel to select an antenna by vendor, select the appropriate band, modify the offsets and antenna height.

Antenna height: direct input of the antenna height.

Geoid file: this control can select a geoid file. The geoid file contains the geoid undulation (the difference between the local geoid and the spheroid) for a given area. The usage of a geoid undulation file will alter the measured and projected GNSS height. The following formats are supported: BIN, GEO, DAT, GGF, GSF, GSB, HDR.

WGS84 based geoid: this control determines whether the selected Geoid file is in the WGS84 reference system.

Location source: on different platform various location sources can be selected:

- Windows: None, COM port, Geolocation,
- Android: None, Built in GNSS, Bluetooth Device, PPM10x, CHC LT700H, Trimble Catalyst, Trimble Catalyst-Ntrip, UART Device,
- Mac: built in GNSS, Bluetooth
- iOS: built in GNSS, Bluetooth, TCP

Bluetooth device: optional settings, Bluetooth device selection for Bluetooth location source

UART Baudrate: optional settings, baudrate for UART location source

Connect after startup: if this control is enabled, then the program tries to connect to the selected location source at start up.

NMEA log: the program creates NMEA log file for each session.

Spectra POPN: optional settings, Spectra Prove of Purchase Number

Raw data collection: optional settings, enables raw GNSS data collection for Spectra devices

5.4.4.2 GNSS COM Port

This settings are only available on Windows platforms and controls the communication port settings between the external GNSS and the computer.

COM Port: communication port between 1 and 256 through which the GNSS connect to the computer.

Baudrate: the data transfer rate of the port between 1200 and 115200 bits per second.

Parity: parity bits setting

Databits: number of data bits 7 or 8.

Stopbits: number of stop bits between 1 and 2

5.4.4.3 GNSS TCP Port

This settings are available on iOS platform to receive NMEA sentences via TCP stream.

TCP Address: four part address of the TCP server in the following format:
123.123.123.123

TCP Port: port number of the TCP server.

5.4.4.4 GNSS NTRIP

This Tab contains NTRIP related settings. NTRIP (Networked Transport of RTCM via Internet Protocol) enables the mobile RTK GNSS receiver (rover)

to access real-time correction data from the RTK base station over the internet.

Domain: domain name of the NTRIP caster.

Port: port number to access the domain.

User name: login name to the caster.

Password: password to the caster.

Mount point: after successful login various caster supported mount points can be selected here.

Validity interval: validity interval of correction data between 1 to 250 seconds.

Board type: various board can be selected here from Trimble, CHC, Novatel OEM7.

Board command: command can be entered here to initialize the board.

5.4.5 Peripherals

Various external device related settings.

Range finder settings

Range finder device: select a Bluetooth device from the list with distance measuring capabilities.

Device height: enter the vertical height in meters of the range finder

Signal height: enter the vertical height of the signal (same height as the device of the range finder can measure horizontal distances).

5.4.6 System Settings

The panel contains system specific settings.

Working folder: the folder where the program creates new jobs and browse for existing ones.

FPS indicator: shows the map rendering speed, the number of rendered frames per second.

Interface scale: scaling factor to magnify or shrink the interface elements.

Pop up next input field: control the appearance of the next input field during the attribute editing of a new record.

Vertex gripper: enables the usage of a eccentric gripper during vertex editing

Frame style: selection from various frame styles which determines drawing of the control elements

Color style: selection from various color styles which controls the user interface color appearance

Font style: selection from various fonts to use it on the interface an the map

5.5 Software

This menu contains information about the software.

Application: current version and date, time based build number.

Serial number: unique identifier of the system. It can be saved to a text file by clicking on this control.

Current UTC time: UTC time of the system. It is useful to figure out cloud access problems.

Messages: it contains the program messages (error, warning, information) since last start.

Available features: shows which features of the software are available.

Author: TopoLynx company name.

EULA: shows the End User Licence Agreement

Author: shows information about the program's author

Credits: list of the program developers.

Unit tests: contains various tests to check the functionality of the program.

5.6 Help

The menu displays the built-in help about the important parts of the program.



Layer Types

6 Layer Types

Layers can be group layers, vector layers (point, polylines, polygons, data tables) and raster layers (offline and online sources: TMS, WMS).

Different properties are available for [Vector](#)^[35] layers (tables with and without geometry) and [Raster](#)^[40] layers (offline and online sources).

6.1 Vector layer

Vector layers may contain points, polylines, polygons defined by vertices (2D or 3D vectors), and each features has fixed number of attributes. Vector layers are stored in one or several data files, usually one file for the geometry and another one for the attributes. The following vector and table files are supported: Map, Shp, Mif, Dxf, Bna, Txt, Csv, Crd, Dat, Dbf, Tab, Mid.

The features of a vector layer can be displayed on the map using symbology (colors, symbols, size), and can be labelled by attribute values.



[General](#)^[36] Tab: contains basic controls and information about the layer



[Style](#)^[37] Tab: provides controls to classify the features



[Classes](#)^[38] Tab: list the thematic classes of the vector layer created by the selected Classification method



[Label](#)^[39]: controls the labelling of the features on the map



[Attributes](#)^[39] Tab: contains the attribute fields of the vector layer



[Data](#)^[40] Tab: has controls to define an event layer.

6.1.1 General

This Tab includes the basic properties of a vector layer.

Visibility: controls the layer appearance on the map.

Layer Name: modifiable layer name.

GUID: globally unique identifier of the layer, it is important for Cloud usage.

Information: enables layer information query. The various [queries](#)^[46] examine layers where this control is enabled.

Editable: enables layer editing. Only editable layers will appear in the layer selection list of [Survey](#)^[47], [Draw](#)^[48], [CoGo](#)^[50] and [GIS](#)^[51].

Snapping: controls the vertex snapping to this layer.

Scale Minimum 1: define the minimum scale number (largest scale) to display a layer on the map

Scale Maximum 1: define the maximum scale number (smallest scale) to display a layer on the map

Layer source: show the data source of the layer, it can be altered to another source.

Cloud layer: shows the layer is in the Cloud database and its content is replicated.

Remote folder link: name of the folder where the new version of this layer can be downloaded from.

Geometry decimals: defines the precision of the stored geometry, the number of decimal digits. Value of 2 means [cm] accuracy, value of 3 means [mm] accuracy. Lower values require less memory to store the geometry but the spatial accuracy is decreasing too.

Codepage: defines the codepage of the data source. Modification of this value reloads the attribute data of the layer.

GNSS survey section contains three elements to customize the GNSS data collection of the layer:

Measure mode: Changing between Single, Average, Continuous measurement modes. Single mode means only one vertex is measured. In Average mode the program averaging given number of vertices and stores the average position. In Continuous mode the program collects vertices by a given Distance threshold.

Average: Controls the number of averaged position in Averaging measurement mode.

Distance: Defines the minimum allowed distance threshold between vertices in Continuous measurement mode.

6.1.2 Style

This Tab provides controls to classify and display vector features.

Style: selection between various thematic classification methods. The program uses this method to classify the values of the selected classification field (or data column) into categories. The following methods are available:

- **Single:** displays every entity in the same way, it creates one single class
- **Unique:** every unique values of the data field constructs a thematic class
- **Equal:** the range between the minimum and maximum values of the data field is divide into Classes number of equal parts
- **Interval:** the range between the minimum and maximum values is divided into interval size parts
- **Deviation:** the range are defined by the average - 3 times standard deviation and average + 3 times standard deviation, the range is divided into Classes number of equal parts
- **Quantile:** the class boundaries will be created that each class contains (approximately) equal number of entities
- **Modulo:** the classes are created by the remainder division of the data values (from zero to classes-1)

Classify: selection of the classification field (data column) to generate the thematic classes

Classes: number of thematic classes. In case of Interval method it defines the range of one class.

Palette: classifier selects colors from this color palette.

Transparency: defines the opacity of the vector elements. 0% means the elements are fully filled, 100% means the elements are fully transparent.

Filter geometry type: the program displays all or only the selected type of geometry on the map. It is useful to filter Dxf or Mif data sources.

Vertex display scale: defines the maximum scale number (smallest scale) to display the vertices of a geometry.

Outline display scale: defines the maximum scale number (smallest scale) to display the contour lines of a polygon.

6.1.3 Classes

This Tab lists the thematic classes created by the selected classification method and classification field.

Each class can be selected from the list to modify its properties. After selecting a class, the following properties are displayed and altered:

Visibility: controls the visibility of the thematic class.

Value: defines the value or range of this thematic class. Range minimum and maximum values should be separated by hyphen, for example: 10 - 20

Label: this is the name of the thematic class. Usually it is the same as the values, but it can be altered.

Display scale: defines the maximum scale number (smallest scale) to display the elements of the class.

Label display scale: defines the maximum scale number (smallest scale) to label the elements of the class.

Symbol type: selection of a vector symbol to display in the center of the geometry.

Symbol size: defines the size of the symbol in Points (10 points are 3.528 mm).

Symbol color: defines the primary (fill) color of the symbol.

Line type: select the line type of the polylines and polygons.

Line size: defines the thickness (width) of the line in Point unit.

Line color: defines the color of the line elements.

Fill: select the fill type of the polygons.

Fill size: defines the size of the fill shape.

Fill color: defines the color of the polygon fill.

6.1.4 Label

This tab controls the labelling of the layer features based on their attributes.

Label #1: defines the first attribute (data column or field) to display on the map.

Label #2: defines the second attribute (data column or field) to display on the map. If the length of the concatenated label is longer than 10 characters it will be displayed in two rows.

Label size: defines the size of the label in points (10 points are 3.528 mm). This is the screen/printer resolution independent definition of the label size.

Label color: the color of the labels can be selected here.

Label effect: provides various labeling effects:

- none: simple labeling
- frame: labels will appear on a filled rectangle
- halo: labels has a thin contour
- bold: labels use bold face
- bold+frame: combination of frame and bold, bold labels appear on filled rectangles

Label background color: defines the color of the rectangle or contour for labeling.

Minimum label display scale: controls the minimum scale number (largest scale) to display the labels.

Maximum label display scale: controls the maximum scale number (smallest scale) to display the labels.

6.1.5 Attributes

This Tab lists the attributes fields (data columns) of the vector layer, it also provides commands to add a new data field, modify or delete the existing ones.

Clicking the left part of a data field entry opens its [Field property](#) ^[56] panel, where the properties of an existing data field can be modified.

Checking the selection circle at the right enables additional functions at the bottom toolbar: Delete selected data fields, Move selected data fields upward or downward in the field list.

Pressing the New field button at the bottom creates a new data field and opens its [Field Property](#) ^[56] panel.

6.1.6 Data

This Tab provides control elements to define event data stored in the attribute table.

X position field: selection of a data field which defines the easting coordinate of the geometry.

Y position field: selection of a data field which defines the northing coordinate of the geometry.

Z position field: selection of a data field which defines the elevation coordinate of the geometry.

6.2 Raster layer

Raster layers are grid data structures, rows and columns of pixels, and each pixel can store one or more (multiband) numeric values. Raster layers are stored in data files. Currently the software supports the following file formats: Jpeg, Ers, Tiff, Png, Lan, Bil. It can open georeference world files next to the raster such as jgw, tfw, pgw.



[General](#) ^[36] Tab: contains basic controls and information about the layer



[Display](#) ^[37] Tab: controls the appearance of the raster



[Georef](#) ^[38] Tab: the raster georeference can be viewed and edited here

6.2.1 General

This Tab includes the basic controls and information of a raster layer.

Visibility: controls the layer visibility.

Layer Name: unique but modifiable layer name.

Information: enables layer information query. The various [queries](#)^[46] examine layers where this control is enabled.

Scale Minimum 1: define the minimum scale number (largest scale) to display a layer on the map.

Scale Maximum 1: define the maximum scale number (smallest scale) to display a layer on the map.

No data value: a numeric value which indicates empty pixels

Metadata: displays detailed information about the raster layer

Layer source: show the data source of the layer, it can be altered to another source.

6.2.2 Display

This Tab controls the appearance of the raster layer.

Color mode: defines the color mixing of the raster layer, it can be one of the following:

- Pseudo: single channel display with pseudocolor palette, only one color band can be selected
- RGB: three color bands can be selected for red, green, blue channels
- RGBA: four color bands can be selected for red, green, blue, alpha channels
- Band difference: the difference of two color bands can be displayed with a pseudopalette
- Band ratio: the ratio of two color bands can be displayed with a pseudopalette
- NDSI: the normalized difference of two color bands can be displayed with a pseudopalette

Blue/Pseudo channel: selection of the Blue or Pseudo color channel

Green channel: selection of the Green color channel

Red channel: selection of the Red color channel

Source channel 1: selection of the first color band for Difference, Ratio and NDSI mode

Source channel 2: selection of the second color band for Difference, Ratio and NDSI mode

Min and Max: the minimum and maximum values of the above color channels can be adjusted. The raster values between minimum and maximum are stretched to 0..255 range.

Transparency: defines the opacity of the raster pixels. 0% means the pixels are fully filled, 100% means the pixels are fully transparent.

Transparent color: define the color of the transparent pixels (null value pixels)

Pseudo palette: selection of the color palette for Pseudo, Difference, Ratio and NDSI modes.

Stretch: command button which automatically setup the minimum and maximum values for each channels to enhance the visual appearance of the raster.

6.2.3 Georeference

This Tab provides controls for the raster georeference and projection system.

Upper left pixel East coord: easting coordinate of the upper left corner of the raster

Upper left pixel North coord: northing coordinate of the upper left corner of the raster

East scale (pixel width): easting component of the pixel width

North scale (pixel height): northing component of the pixel height

East skew (rotation): northing component of the pixel width

North skew (rotation): easting component of the pixel height

Projection: if the projection of the raster differs from the projection of the current project, then it can be specified here. The program automatically re-project the raster (on-the-fly projection).



Tools

7 Tools

topoXpress can be managed by several toolbars. The top single toolbar above the map is the selector of the bottom toolbars. Each top tool activates a different bottom toolbar below the map. These bottom toolbars contains commands and tools to interact with the map, active layer and geographic features. These toolbars can be scrolled horizontally.

topoXpress top toolbar contains the following tools:



This is the topoXpress tool which opens and closes the left side [Menu](#)^[19] panel.



Activates the [View](#)^[44] toolbar which contains map display tools and commands.



Activates the [Info](#)^[46] toolbar which includes graphical and textual information query, selection and search tools and commands.



Activates the [Survey](#)^[47] toolbar which contains GNSS information and survey commands.



Activates the [Draw](#)^[48] toolbar which contains drawing tools and commands.



Activates the [Stakeout](#)^[49] toolbar which contains stakeout and navigation tools.



Activates the [CoGo](#)^[50] toolbar which consists of coordinate geometry tools and commands.



Activates the [GIS](#)^[51] toolbar which contains Geographic Information System tools and commands.

7.1 View

This toolbar contains tools and commands to manipulate the map view.



Zoom all: Zoom to the entire extent of the map. The extent is calculated by the boundary box of the visible layers.



Zoom in: Zoom the map twice. The map can also be zoomed by pinch (two fingers) or mouse wheel.



Zoom out: Shrink the map twice. The map can also be zoomed by pinch (two fingers) or mouse wheel.



Window: Draw a rectangle (usually from top-left to bottom-right) to zoom to its content.



Pan: Pan the map by dragging it up, down, left or right. This is the default tool. The map can be dragged by finger or mouse.



Rotate: Rotates the map by dragging it left or right.



Set Scale: Set the display scale number manually. Enter the scale number only without "1:".



Print: prints the current view of map. After the printer is selected the user may enter the title, subtitle of the map, select a logo, enter the map scale, resolution, and choose the legend type. The program shows the layout on top of the map, and the user can position the layout before printing.



PDF: export the current view of map in PDF format. The user may enter the title, subtitle of the map, select a logo, enter the map scale, resolution, and choose the legend type, paper size and orientation. The program shows the layout on top of the map, and the user can position the layout before export.



TMS offset: This tool moves the active (top visible) TMS layer horizontally. It may georeference an inaccurate TMS layer. A simple click with this tool reset the offset.



Refresh: refresh the map content, synchronize the cloud layers with the Cloud database.

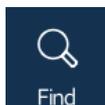
7.2 Info

This toolbar includes commands and tools to identify, find and query entities.



Info

Information: get information about the nearest features on the map. This tool queries the visible layers where the Information property is enabled. If more than one features are queried, then the [Record](#)^[54] panel shows these records on the right. If only one feature is queried, then the [Attributes](#)^[55] panel show its properties.



Find

Find: this command select features by entered keywords. Separate the keywords by spaces! The program queries a feature if all keywords occur within the attributes. The [Record](#)^[54] panel on the right side shows the selected records.



Measure

Measure: this tool can measure coordinates (1 point), length (2 or more points), perimeter and area (3 or more points). You may drag the points. Pressing this tool again restarts the measurement.



Select info layer

Select info layer: this command displays the list of layers to select one for additional queries.



Table

Table: this command displays the attribute [Table](#)^[53] of the selected info layer.



Point

Point: this tool select features around the designated point. The [Records](#)^[54] panel on the right side shows the selected record(s).



Line

Line: this tool draws a polyline to select features from the info layer. During the polyline drawing the length of each segment is displayed on the map. The existing vertices can be dragged. Pressing the Select button selects the features that overlap with the polyline. The [Record](#)^[54] panel on the right side shows the selected records.



Area

Area: this tool draws a polygon to select features from the info layer. During the polygon drawing the length of each segment and the area of the polygon are displayed on the map. The existing vertices can be dragged. Pressing the Select button selects the features that overlap with the polygon. The [Record](#)^[54] panel on the right side shows the selected records.



Expressi...

Expression: this command displays an expression editor to select features by expression. If the expression is true, then the feature

will be selected and highlighted on the map. The selected features will be listed in the [Record](#)^[54] panel on the right side.



Select

Select: this command select features based on the input geometry (point, polyline or polygon). The [Records](#)^[54] panel shows the selected features on the right.



Deselect

Deselect: clears the selection. If one or more features are selected on the info layer, then this tool can deselect them.



New Part

New part: this command adds a new part to the input geometry. It can construct a multipart geometry (multi polyline, islands or holes in a polygon).



Back

Back: this command deletes the last vertex of the input geometry.



Restart

Restart: this command erases all vertices of the input geometry.

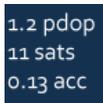
7.3 Survey

This toolbar contains GNSS information and survey commands.



Select survey layer

Select layer: this command lists the editable layers in order to select one for surveying. The editable property of a layer can be adjusted in the [Layers](#)^[22] panel.

1.2 pdop
11 sats
0.13 acc

Connect / GNSS state: this command displays the current GNSS state (PDOP, number of satellites, accuracy). It connects to the GNSS or opens the [Skyplot](#)^[62] panel to display the GNSS satellites and the positioning information.



Start

Start / Pause / Continue: start the GNSS position collection. Depending on the [Measurement](#)^[36] mode it can be a single survey, averaged survey or continuous survey.



Mode

Mode: this command displays the [General](#)^[36] settings of the selected layer to modify the surveying mode.



Create: creates a new feature from the collected geometry. Opens the [Attributes](#) ^[55] panel where the attributes of the new features can be entered.



Main/Sub part: this command switches between main and sub part measurement modes. Sub part measurement mode adds a new part to the surveyed geometry and start the vertex collection into the sub-part. Main part measurement mode switches back to the main geometry and continue the data collection into the main (first) part of the geometry.



Back: this command deletes the last vertex of the surveyed geometry.

7.4 Draw

This toolbar contains drawing tools and commands.



Select draw layer: this command lists the editable layers. The Draw tools will use this layer as output to save the elements.



Point / Line / Area: draw points, polylines and polygons. The geometry type depends on the type of the layer (point, line, area). Only one geometry type is allowed to store in a layer. Each vertex will be snapped to the nearest existing vertices, endpoints, perpendicular points, or nearest segments. Snapping can be turned off in the [Map](#) ^[26] Settings. It is possible to reshape the input geometry by dragging the already inserted vertices and snapping it to existing features.



Create: this command creates a new feature from the input geometry. It opens the [Attributes](#) ^[55] panel to enter the new record attributes.



New part: this command adds a new part to the input geometry constructing a multipart geometry (multi polyline, islands or holes in a polygon).



Back: this command deletes the last vertex of the input geometry.



Restart: this command deletes all vertices of the input geometry.



Delete: this tool selects the nearest feature from the drawing layer at first; the second selection of the same feature will delete it.



Input: appends a new vertex to the input geometry by entering its [Coordinates](#)^[56]. This panel can be used to transform coordinates between WGS84 and selected projection systems.



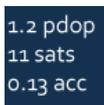
Refresh: refresh the map content, synchronize the cloud layers with the Cloud database.



Crosshair: enables a special input mode, when the user taps, clicks the map, then a new vertex is added at the marked centre position.

7.5 Stakeout

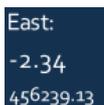
This toolbar contains stakeout and navigation tools and information.



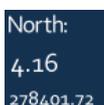
Connect / GNSS state: this command displays the current GNSS state (PDOP, number of satellites, accuracy). It connects to the GNSS or opens the [Skyplot](#)^[62] panel to display the GNSS satellites and the positioning information.



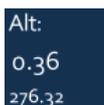
Target: this tool designates the target for stakeout or for navigation. The same target position must be designated twice (two click on the same position) in order to set the target.



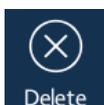
East: it shows the easting offset, the easting difference between the target position and the current GNSS position.



North: it shows the northing offset, the northing difference between the target position and the current GNSS position.



Alt: it shows the altitude offset, the altitude difference between the target position and the current GNSS position.



Delete: deletes the target position.



Input

Input: this command open the [Coordinates](#)^[56] panel to enter the coordinates of the target position. This panel can be used to transform coordinates between WGS84 and selected projection systems



Line

Line: enables the line stakeout mode. Any polygon or polyline can be selected to mark as stakeout target. The program finds the nearest vertex or calculates the perpendicular point of the selected feature to the current GNSS position.

7.6 CoGo

This toolbar consists of coordinate geometry tools and commands.

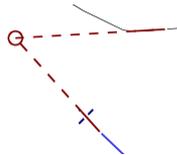
TestPoint
Select CoGo layer

Select CoGo layer: this command lists the editable Point layers to select one of them. The selected Point layer will be the output of the CoGo (Coordinate Geometry) operations.



Intersect

Intersect: this tool can determine the intersection point of two line segments, any segments of a polyline or polygon. Click on the first line segment to select it, the selected segment will be highlighted as dark red line with white halo. Click on the second line segment. If the two line segments are not parallel, then the program displays their intersection point and draws dashed lines from the segments to the intersection point. Clicking on the intersection point will create a new point feature in the CoGo layer. Consecutive click on another line segment relocates the nearest segment and recalculates the intersection point.



Baseline

Baseline: this tool designates the two endpoints (A-B) of the baseline. Baseline is used for [Survey](#)^[58] operations. The endpoints are snapped to existing features. Consecutive click relocates the nearest endpoint. Endpoints can also be dragged.



Survey

Survey: this command opens the [Survey](#)^[58] panel to conduct various CoGo operations. Before opening this panel the baseline must be designated first.



Divide

Divide: this tool can select a polyline and then opens the [Divide](#)^[60] panel and survey points alongside the polyline with various methods.



Average: the user can draw a polygon with this tool. All vertices of the visible and information enabled layer within this polygon

7.7 GIS

This toolbar contains Geographic Information System tools and commands.



Select GIS layer: this command lists the editable layers to select one of them. The selected layer will be the output of the GIS operations.



Sampling: this tool can select a polygon from any visible layer and opens the [Sampling](#) panel to generate features inside the polygon. The output layer can be point, polyline or polygon. The type of the output layer determines the sampling options.



Generalize: this tool can select a polyline and opens the Generalize panel. The panel includes a Distance input item which control the generalization. This value is the maximum allowed distance between the vertices of the selected polyline (red) and the newly generalized polyline (blue). The top-right OK button of the panel saves the generalized polyline replacing the selected one.



Vertex: this tool can select a feature to edit its vertices. After a successful selection the program displays the vertices of the selected geometry. This tool can drag existing vertices, insert new ones by dragging the middle point of the segments, and delete existing one by dragging them to an adjacent vertex. The map shows the edited version and the original version of the selected feature. Press the Save button at the bottom toolbar to save the changes, or the Cancel button to revert the modifications.



Vertices: opens a panel on the right side to display and edit the vertex coordinates of the selected feature.



Split: draws a polyline to split polygons. The polyline only split those polygons where the polyline passes through the polygon. Press the Save button at the bottom toolbar to save the changes, or the Cancel button to quit from the operation.



Merge: draws several point on polylines to merge them. Adjacent polygons common edges will be removed, non-adjacent polygons will form a multipart polygon. Press the Save button at the bottom toolbar to save the changes, or the Cancel button to quit from the operation.



Panels

8 Panels

This section describes the right side panels in details.

The following panels can appear on the right side of the interface:

- [Table](#)⁵³: this panel displays the entire data table of a vector layer.
- [Record](#)⁵⁴: this panel shows the records of the selected/queried features.
- [Attributes](#)⁵⁵: this panel shows the attributes, data fields of one feature.
- [Coordinates](#)⁵⁶: this panel helps to enter a position.
- [Field property](#)⁵⁶: this panel lists the properties of a data field
- [Survey](#)⁵⁸: this panel can solve CoGo problems.
- [Divide](#)⁶⁰: this panel can measure points alongside a polyline.
- [Sampling](#)⁶¹: this panel can generate features inside a polygon.
- [Skyplot](#)⁶²: this panel shows information about the GNSS receiving.

8.1 Table

This panel displays the entire data table of a vector layer.

The title of panel can close the panel. The second line displays the name of the currently selected data table. Clicking on this line displays the list of the available vector layers and tables to choose one of them. The remaining large table area displays the data records (rows) and data fields (columns). The table area can be scrolled into any direction. The most left part of this area is the quick scrolling area. Every record can be selected for editing. Selected records appear with yellow, the currently edited record with orange background in the table.

Table

Show records

Forest

Select table

ID	ComID	Munic	Comp	SubCon	Area	CentX	CentY
361	314100305	Sopron	3	E	2.86	464116.2	270138
362	315002101	Nagyecenk	21	A	1.54	472391.7	255145
363	314100505	Sopron	5	C	13.43	464711.1	270235.7
364	313900705	Ágfalva	7	E	0.81	459020.7	261830.1
365	314111011	Sopron	110	K	0.66	460901.7	259612.6
366	314120205	Sopron	202	C	1.54	455308.3	262760.2
367	314120205	Sopron	202	E	4.4	455284.3	262463.5
368	314120206	Sopron	202	F	5.25	455412.1	262550.7
369	314120405	Sopron	204	E	1.63	455226.7	262871.5
370	314120506	Sopron	205	F	4.9	455039.7	263334.6
371	314120502	Sopron	205	B	2.44	454671.2	262894.5
372	314401605	Fertőboz	16	A	2.77	474176.1	257063.9

8.2 Records

This panel shows the records selected by the [Info](#) ^[46] tools or query commands.

The panel shows records from those layers only where the [Information](#) ^[36] option is enabled. The list can contain [Raster](#) ^[40] layers too. The first line usually shows the properties of the selection geometry (position, length or area). The other lines contain records as the hits of the used query tool. Selecting one record will open the [Attributes](#) ^[55] panel of that record. The list contains the first 20 hits.

Records

More results

Geometry:

East: 646366.70 North: 5235226.94

Buildings	>
305706213 1500 building residential	
Buildings	>
305706221 1500 building residential	
Landuse	>
228382906 7203 residential	
Landsat8.tif	>
R: 30 G: 132 B: 105	

8.3 Attributes

This panel shows the attributes, data fields of one entity of a vector layer.

Every line contains one attribute in the same order as in the data table. Each attribute can be edited. Depending on the type of the data different input panel appears, numerical or alphanumerical keyboards, lists, file, symbol or color selectors.

Attributes can be grouped into several Tab pages. It can be set in the [Field property](#) panel.

After modification the top-right OK button saves the changes. The top-left Cancel button revert the changes.

The bottom line contains additional commands:

Zoom to: zoom the map to the extent of the selected feature.

Navigate: sets the navigation/stakeout target to the selected feature or the center point of the selected feature.

Export: export the selected features to a file (vector or table files).

Report: create a PDF report about the selected features. There are several settings on the file name, report panel: title, subtitle, page size, page orientation, include map window, map resolution, coordinate list, attribute list.



Make sure to press the top-right OK button to save the modifications!

8.4 Coordinates

This panel provides controls to enter a position of a vertex or navigation target by its coordinates.

The position can be entered in the selected projection system or by latitude, longitude, height of the WGS84 ellipsoid. This panel can also be used to transform coordinates between these two reference systems.

Target	
Specify stakeout target	
East	646330.74384
North	5235181.35684
Altitude	254.32
Geographic	
Longitude	16.9339617853
Latitude	47.2537892303
Height	254.32

8.5 Field Property

This panel provides controls to customize a data field, listing all of its properties.

The properties can be viewed or edited. Please, press the top-right OK button after modification in order to save the changes.

The following properties define a data field:

Name: this is the primary name of the data field. Use short name (maximum 11 characters) and ASCII letters and numbers for SHP+DBF format.

Alias: this is the detailed alias name of the data field. It is independent from the file format, any character can be used here without length limitation.

Default: this property defines the default value of the data field. It is triggered only once after inserting a new record. The [Values](#)^[66] section lists the possible values. [Expressions](#)^[67] can be used for default value. Default values can be used to store values when the record is created, such as creation time, user who created the record, PDOP value at the exact time of creation, area and other geometric values of the created geometry.

Calculate: this property defines the calculation of the data field. It can be triggered many times after every modification, modification of any attribute or the geometry. The [Values](#)^[66] section lists the possible values. [Expressions](#)^[67] can also be used for calculation. These calculations automatically update those fields which may change after modification, such as modification time, user who made changes, modified area and other geometry related values. The various calculated fields can reference to each other. The program avoids the circular referencing. Calculated fields can reference to each other, in this case the modification of one field can trigger the recalculation of the other field, and vice versa. An example for this: [Diameter] is calculated as [Perimeter]/Pi(), and [Perimeter] is calculated as [Diameter]*Pi()

Type: type of the data field (bool, int, real, string, date, time, document). Various default and calculated values require specific types, so the selection one of these values adjusts the type automatically.

Width: number of characters the data field can store. For an integer value 5 character is enough, for real value at least 10 character is required, for storing names 30 character is suggested, for remarks minimum 100 characters.

Decimal: number of decimal characters after decimal point.

Predefined values: predefined values of the data field. The elements are separated by semicolons (eg: oak; beech; poplar). The optional numeric codes can be defined before the values (eg: 10=oak; 20=beech; 50=poplar). The values can be grouped using [group] labels (eg: [Trees] oak; beech; poplar). The program can use external [Code dictionary](#)^[69] files (CDT). We suggest to use these CDT files, if you have several code-name pairs (several tens or hundreds).

Multi selection: If it is enabled, then more than one predefined values can be selected. It is recommended to modify the field type to String and the width to 100 characters or more depending on the length of the concatenated values.

Read only: the content of this field cannot be modified.

Required: the field cannot be null. The user must enter a non null value.

Searchable: the Find by keywords command searches in this field if it is enabled.

Hidden: if it is enabled, then this field is not visible in the table view and the attributes panel.

Verify: verification expression to validate the entered value. If the verification expression is false, then a red exclamation mark appears on the data field control. The user cannot save the changes until fixing the wrong input fields. Here are some examples : explanations for verification expressions:

- $[field] < 100$: if the $[field]$ is less than 100, then the input is ok, otherwise wrong, an displays (!)
- $[field] > 10$ and $[field] < 100$: if the $[field]$ is greater than 10 and less than 100, then the input is ok, otherwise wrong and displays (!)
- $if([field] < 100, 1, "#Warning")$: if the $[field]$ is less than 100, then the input is ok, otherwise wrong, and displays the Warning message
- $if([field] < 100, 1, "Error")$: if the $[field]$ is less than 100, then the input is ok, otherwise wrong, and displays the Error message.

Field icon: displayed icon before the field name (or alias) in the record

Group: name of the data field group. Data fields can be grouped. Entered group name will start a new group and the program creates a Tab for each group.

Group icon: icon of the data field group. It will be displayed on field Tab.

8.6 Survey

This panel provides methods and controls to solve Coordinate Geometry problems.

Method: one of the six methods can be selected here. See the methods below.

Distance / Angle A: depending on the method the primary arguments of the method can be entered here. Several angles and distances can be entered with space separator. Angles are in decimal degrees. If a laser range-finder is attached and a distance based method is selected, then this control can be selected to capture distances from the range-finder.

Distance / Angle B: this input receives the secondary arguments for the selected method. Several angles and distances can be entered with space separator. If a laser range-finder is attached and a distance based method is selected, then this control can be selected to capture distances from the range-finder.

Side: every method has two solutions depending on the clockwise/counter clockwise order of the angles. This option can switch between the solutions.

Set A point: set the A point to the current GNSS position.

Set B point: set the B point to the current GNSS position.

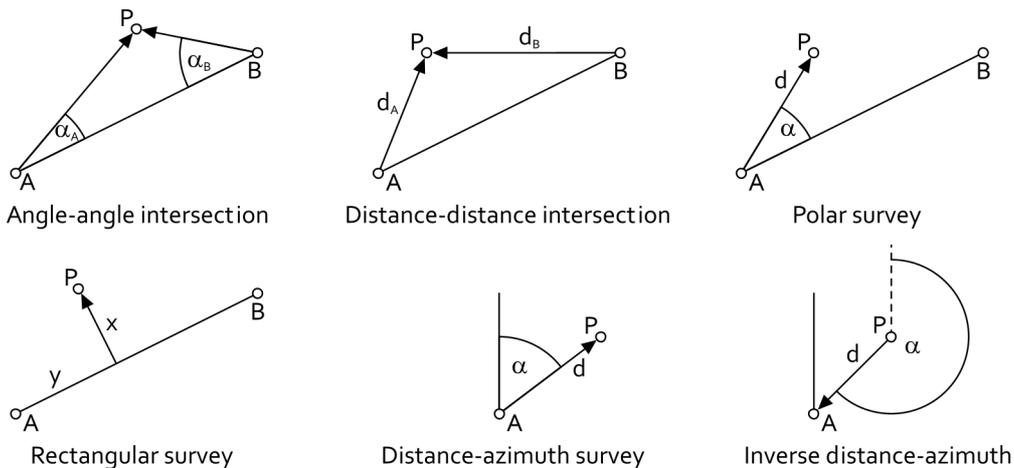
Add: If there is a feasible solution, then the program calculates and displays the points on the map. Pressing the Add button at the bottom of the panel creates the point records in the CoGo layer.

The image shows a mobile application interface for a surveying tool. The panel is titled "Survey" and has a close button (X) in the top left. Below the title, it says "Faegyed.map". The "Method" is set to "Angle intersection". Under "Angle A", the values "15 25 35" are entered. Under "Angle B", the values "30 20 10" are entered. The "Side" is set to "Left". At the bottom, there is an "Add" button with a circular icon and the text "Add new points" below it.

Currently six methods are available on this panel:

1. Angle-angle intersection: P point is defined by two angles, one between segments A-B and A-P, and another between B-A and B-P.
2. Distance-distance intersection: P point is defined by two distances, one from A to P, and another one from B to P.
3. Polar survey: P point is defined by the distance between A and P, and the angle between segment A-B and A-P.
4. Rectangular survey: P point is defined by two distances, one from A to the perpendicular point, and another between the P and the A-B segment.
5. Distance-azimuth: P point is defined by the distance from A, and the angle between geographic north and P point where the origin is A.
6. Inverse distance-azimuth: P point is defined by the distance from A, and the angle between geographic north and P point where the origin is P.

The following figure explains the methods graphically:



8.7 Divide

This panel can measure points alongside a polyline.

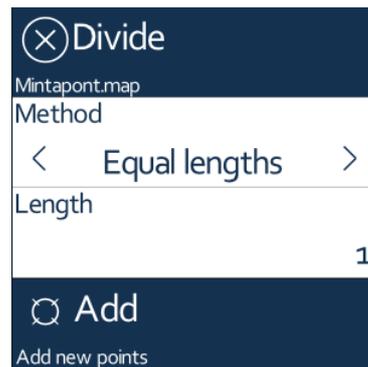
The [Divide](#) tool can select a polyline and display this panel on the right. A point layer must be selected first as CoGo output layer. The panel contains three interface elements. If the method and the parameter selection are appropriate, then the output of the method, the points appear on the polyline. The points will divide the polyline in equally, distance based or ratio based way.

Method: the type of the division can be selected here:

- Given number of section: the parameter is an integer number which divides the polyline into equal number of sections.
- Equal lengths: the parameter is real distance; this distance will be measured alongside the polyline from its start vertex several times until the last distance section can be measured.
- Given distances: the parameter is a list of distances; the distances will be measured alongside the polyline from the start vertex.
- Given ratios: the parameter is a list of ratios; the ratios of the polyline length will be measured alongside the polyline from the start vertex.

Number / Length / Distance / Ratio: depending on the selected method the numerical parameter of the method can be entered here. Use space character to separate distances and ratios.

Add: it creates the points in the CoGo layer according to the above settings.



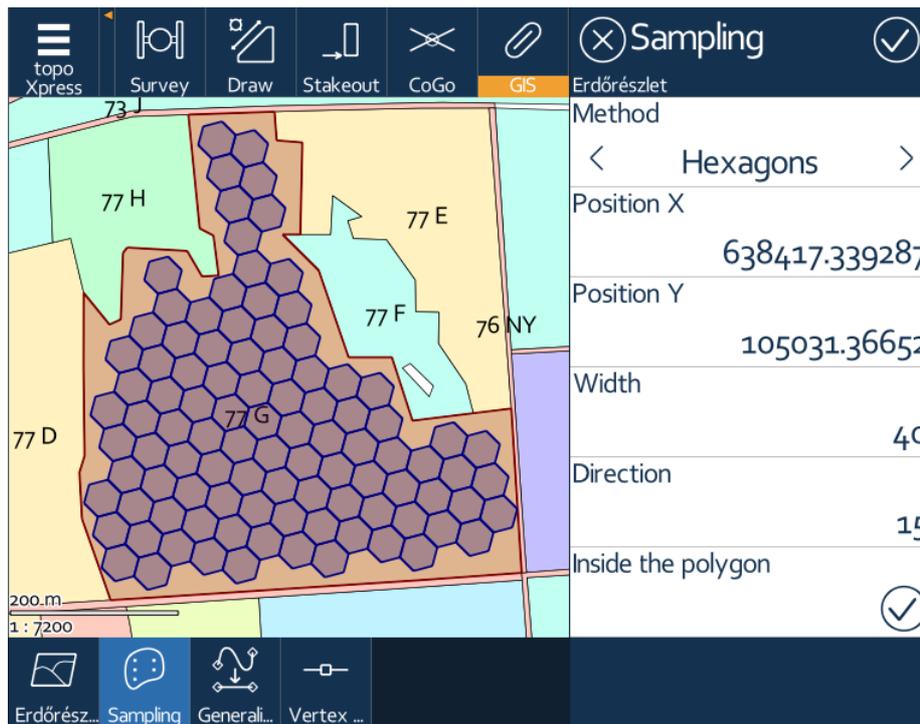
8.8 Sampling

This panel can generate point, line, rectangle, triangle or hexagon features inside a polygon.

In order to use this panel, you need to [Select](#) an output GIS layer and select a polygon on the map where the new elements will be created in.

Method: Depending on the geometry type of the output layer 7 methods area available:

1. Point type output layer
 - a. Points in Rectangular net
 - b. Points in Triangle net
 - c. Points in Hexagon net
2. Line type output layer
 - a. Line segments in Rectangular net
3. Area type output layer
 - a. Rectangles
 - b. Triangles
 - c. Hexagons
 - d. Strips



Position X: easting coordinate of the starting point (southwest corner) of the feature generation.

Position Y: northing coordinate of the starting point (southwest corner) of the feature generation.

Width: horizontal (easting) size of the generated feature or the horizontal distance between points.

Height: vertical (northing) size of the generated feature or the vertical distance between points.

Direction: rotates the generated features around the starting position in degrees.

Inside the polygon: a switch to generate feature only within the selected polygon.

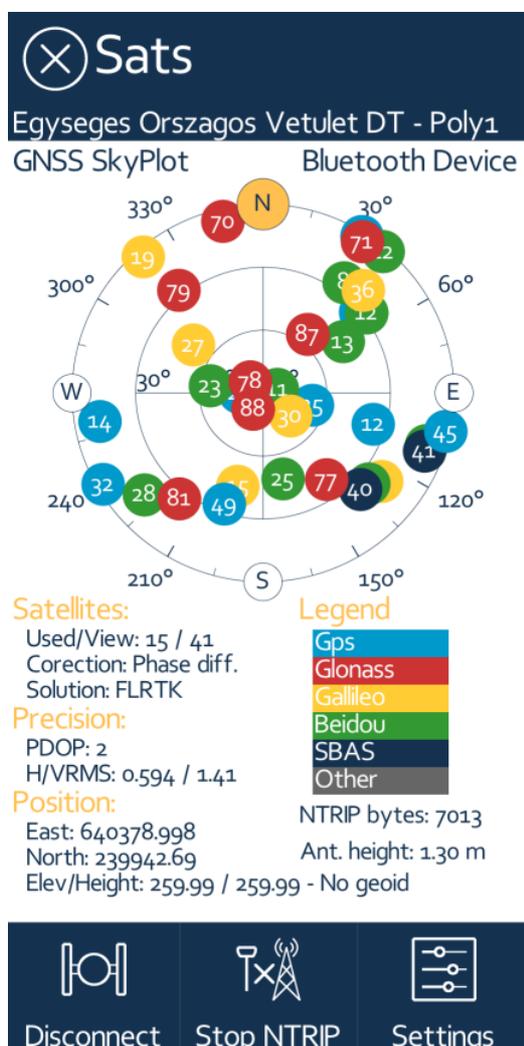
OK: pressing the top-left OK button of the panel saves the generated features into the selected GIS output layer; otherwise it will be displayed on the map, but only temporary.

8.9 Skyplot

This panel displays the actual GNSS receiving status.

The following information appears on the panel:

- Currently used projection system in the header section
- Currently user GNSS source or Location service
- Graphical representation of the satellites above the horizon colored by type
- Number of visible satellites, and satellites used for positioning
- Correction type
- Solution (autonomous, differential, float or fixed RTK)
- Position dilution of precision (PDOP)
- Predicted precision (HRMS, VRMS)
- Easting, northing coordinates in the selected [Projection](#) ^[28] system
- Elevation/Height and geoid usage
- NTRIP bytes received
- Antenna height



The bottom of the panel contains additional command:

Connect/Disconnect: connect to and disconnect from the selected GNSS source.

Start/Stop NTRIP: starts and stops the downloading of the NTRIP correction

Settings: brings to the [GNSS General](#)  settings panel



Appendix

9 Appendix

These appendices describes, specifies the various components, data files of the program.

Appendix #1: [Values](#)^[66]

Appendix #2: [Expressions](#)^[67]

Appendix #3: [Code dictionary](#)^[69]

Appendix #4: [Language file](#)^[70]

9.1 Values

This Appendix enumerates the various values, variables, properties that can be used for attributes as default values or calculated values.

General values

- Null: empty value, no value
- Zero: numeric zero value
- TrueFalse: true or false
- Copy: copy the previous value from the same data field of the previous record
- Inc: increment the previous value from the same data field of the previous record
- Now: the current date and time
- [Expression](#)^[67]: the value is based on an expression

Geometry related values

- East: easting coordinate of the geometry center point
- North: northing coordinate of geometry center point
- Elevation: elevation coordinate of the geometry center point
- Area: area of the geometry in the selected area unit
- Length: area of the geometry in the selected distance unit
- Perimeter: area of the geometry in the selected distance unit
- SlopeDegree: slope angle of the 3D polyline or polygon
- SlopePercent: slope percent of the 3D polyline or polygon
- Azimuth: azimuth angle of the line between the first and last vertex

GNSS related values

- Lon: longitude coordinate of the geometry center
- Lat: latitude coordinate of the geometry center
- Height: height above the ellipsoid of the geometry center

- Heading: current movement heading based on the GNSS positions
- Speed: current movement speed based on the GNSS positions
- PDOP: current PDOP (Position Dilution of Precision) value of the GNSS receiver
- Sats: number of visible satellites by the GNSS receiver
- HRMS: estimated Horizontal RMS (root mean square) of the the position
- VRMS: estimated Vertical RMS of the the position
- GNSStime: current date and time of the GNSS receiver
- AutonomousRatio: ratio of the collected autonomous positions
- DifferentialRatio: ratio of the collected differential positions
- RTKfloatRatio: ratio of the collected float RTK positions
- RTKfixedRatio: ratio of the collected fixed RTK positions

Identifiers

GUID: globally unique identifier

Serial: unique identifier of the hardware

Username: name of the logged in user

9.2 Expressions

This Appendix describes the syntax of the expressions used in the program.

An expression may contain several operands and operators between these operands.

Operands can be:

- numeric constant: -1.2345E15
- text constant between quotation marks: "text"
- data field between rectangular brackets: [fieldname]
- sub-expression between parentheses: (sub-expression)
- function with parameters: func(param1, param2)

Operators can be:

*	multiplication	/	division
+	addition	-	subtraction
>	greater	>=	greater or equal
<	less	<=	less or equal
=	equal	/=	not equal
and	logical and	or	logical or
^	power operator		

The program expression evaluator supports many functions, which are grouped as follows:

Constant value functions:

- `null()`: null (empty) value
- `pi()`: value of Pi (3.1415926..)

Power and logarithmic functions:

- `sqrt(val)`: square root of *val*
- `ln(val)`: natural logarithm of *val*
- `lg(val)`: ten based logarithm of *val*
- `exp(val)`: *val*/power of e (2.71828..)

Trigonometric functions:

- `sin(val)`: sine of *val*
- `cos(val)`: cosine of *val*
- `tan(val)`: tangent of *val*
- `asin(val)`: inverse sine of *val*
- `acos(val)`: inverse cosine of *val*
- `atan(val)`: inverse tangent of *val*
- `atan2(x, y)`: inverse tangent of *x/y*

Other mathematical functions:

- `hypot(x, y)`: longest side of a right-angled triangle: $\sqrt{x^2+y^2}$
- `deg(val)`: convert radian *val* to degree
- `rad(val)`: convert degree *val* to radian
- `abs(val)`: absolute value of *val*
- `floor(val)`: largest integer which is smaller or equal to *val*
- `round(val, rnd)`: round *val* to the multiplication of *rnd*
- `rand(max)`: random value between 0..*max*

Date and time functions:

- `days(str)`: convert date and time *str* string to seconds
- `date(val)`: convert *val*/seconds to date and time string

String conversion functions:

- `chr(code)`: convert ASCII *code* to string
- `asc(str)`: convert the first character of *str* to ASCII code
- `len(str)`: length of *str* (number of characters)
- `upper(str)`: convert *str* to uppercase
- `lower(str)`: convert *str* to lowercase
- `val(str)`: convert *str* to numeric value
- `str(val)`: convert *val* to string
- `fix(val, dec)`: convert *val* to string width *dec* number of decimal digits
- `gen(val, digit)`: convert *val* to string width *digit* number of digits

String manipulation functions:

- left(str, num): first *num* character of *str*
- right(str, num): last *num* character of *str*
- mid(str, pos, num): *num* character of *str* starting from *pos*
- find(str, pat): find *pat* in *str*, return the starting position or zero
- replace(str, pat, rep): replace *pat* with *rep* in *str*

Conditional functions:

- if(cond, true, false): return the value of *true* if *condition* is true, otherwise return the value of *false*, example: if([area]>10, "large", "small")
- lookup(fieldname, value, findByName): return the enumeration description of *fieldname* by *value* name if *findByName* is true, otherwise return the enumeration name of *fieldname* by *value* description

Geometric functions:

- area(part): return the area of *part* sub-polygon, or the full area if *part* is zero
- perim(part): return the perimeter of *part* sub-polygon, or the full perimeter if *part* is zero
- length(part): return the length of *part* sub-polyline, or the full length if *part* is zero
- posx(idx): return the x coordinate of *idx*-th vertex
- posy(idx): return the y coordinate of *idx*-th vertex
- posz(idx): return the z coordinate of *idx*-th vertex

9.3 Code dictionary

This Appendix describes the Code dictionary file format.

This file may contain several code, name, description pairs for various fields and for an entire project.

Every # line in the file marks a new code set. The name after the # is the data field where the codes are used.

Multiple fields can be entered after # separated with , commas. Do not use spaces here. All of these fields use the same code set.

Field names with spaces or commas in the name are not supported.

After the # line the various code - name pairs, and optional description, group items follow until end of file or the next # character. Each row contains exactly one code - name pairs.

Optional [Group] marks the beginning of a new group. The code-name pairs from this line until the next [group] are merged and can be expanded, collapsed in the enumeration lists.

Use tabulators to separate the code - name - description - group elements in each line, because the name and the description may contain spaces!

The following section is a sample code dictionary file with two data fields (Species and Damage).

The Species field codes contain 7 code-name pairs and two groups.

The Damage field codes contain 4 code-name-description triplets.

Code Dictionary - topoXpress

```
#    Species
1    Common oak [Oak]
2    Turkey oak
3    Sessile oak
4    European beech    [Other]
5    Scotch pine
6    European larch
7    Norway spruce

#    Damage
1    None    No damage
2    Small    Small damage
3    Medium    Medium damage
4    Large    Large damage
```

9.4 Language file

This Appendix describes the topoXpress language file format.

topoXpress language files are UTF8 encoded text files containing two-row English and localized pairs.

First row is always the English version, and the second row is the localized one.

Please, do not modify the English version, because this is what the program looks for and substitutes it with the localized version.

Due to the UTF8 encoding the file can support accented, Cyrillic, Hebrew or any national characters even Asian ones.

There are some special characters in the file, such as \n which means a new line character, or %s %d which are place holders.

Please, preserve these special characters in the local version.

Here is an example, the first part of the German.lang file:

```
Select layer!
Layer wählen!
```

Please select layer!
Bitte Layer wählen!

Please select layer to store survey data!
Bitte Layer wählen um Vermessungsdaten zu speichern!

Layers
Layer

About
Über

...

- A -

accuracy 29
alias 56
Android 8
antenna 29
area 27
attribute 55
attributes 39
Author 32
average 50
azimuth 58

- B -

baseline 50
Bluetooth 29

- C -

calculated value 56
class 38
classify 37
Cloud 20,24,25
cloud access 24
code dictionary 21
codepage 27,36
CoGo 50
color mode 41
color style 31
COM Baudrate 30
coordinates 56
correction 62
create layer 16
crosshair 48

- D -

dark map 26
DAT 20
date format 27
default layer 26
default value 56
delete 48
deselect 46
device height 31
DGNS 29
divide 50,60
DMP 20
draw 48

Dropbox 22
DXF block 26

- E -

editable 36
EULA 32
event 40
EXP 20
expiration 24
export 21
expression 46

- F -

field property 56
file sync 25
fill 38
find 46
font style 31
FPS 31
frame style 31

- G -

generalize 51
geoid 29,62
georeference 42
GIS 51
GNSS 28,47,49,62
GNSS log 26
Google Drive 22
Google Maps API Key 26

- H -

help 33
hidden 56
HRMS 62

- I -

imperial 27
import project 20
info 46
information 36
input 48
installation 8
interface 14
interface scale 31
intersect 50

intersection 58
Introduction 6
iOS 11
iPad 11
iPhone 11

- K -

KML 20

- L -

label 39
layer 22,35
layer group 22
length 27
line 38
line stakeout 49

- M -

MacOS 10
main part 47
map settings 26
map view 14
measure 46
measure mode 36
media 27
menu 14,19
merge 51
messages 32
metric 27
multi selection 56

- N -

navigate 49
new project 16,19
NMEA 29
NTRIP 30,62

- O -

offline work 24
OneDrive 22
online work 24
on-the-fly projection 42
open project 16,20

- P -

palette 37
pan 44
panel 14,53
password 24
PDF 44
PDOP 29,62
peripheral 31
permissions 8,10,11
point stakeout 49
polar survey 58
predefined values 56
print 44
project 19,21
projection 21,28

- R -

range finder 31,58
raster 22,40
read only 56
receive files 26
record 54
rectangular survey 58
required 56
rotate 44
rotate map 26
RTK 29,62

- S -

sampling 51,61
satellite 62
save as 21
scale 36,40
select 46
send files 26
serial number 32
settings 26
signal height 31
skyplot 62
smart zoom 26
snapping 26,36
software 32
solution 62
source 36,40
speed 27
split 51
stakeout 49
start survey 17

storage 25
stretch 41
style 37
sub part 47
survey 47,50
survey mode 47
symbol 38
system 31

- T -

table 46,53
TCP 30
template 16,19,21
TMS offset 44
toolbar 14,44
tranparency 41
transparency 37
tutorial 16

- U -

UART 29
units 27
username 24
UTC 32

- V -

vector 22,35
version 32
vertex edit 51
vertex gripper 31
view 44
visibility 36,40
VRMS 62

- W -

WGS84 56
window 44
Windows 8
working folder 20,31

- Z -

zoom 44