

# topoXpress

## USER MANUAL



© 2018. 09. 06. TopoLynx Ltd.  
TopoLynx Ltd.

1.	Introduction	4
2.	Installation	6
2.1	Windows .....	7
2.2	Android .....	7
3.	User interface	9
4.	Tutorials	11
4.1	Create new job .....	12
4.2	Open existing job .....	12
4.3	Create layer .....	12
4.4	Start survey .....	13
5.	Menus	14
5.1	Jobs .....	15
5.1.1	New .....	15
5.1.2	Open .....	16
5.1.3	Current .....	16
5.2	Content .....	16
5.3	Settings .....	17
5.3.1	Map .....	18
5.3.2	Units .....	18
5.3.3	Projection .....	19
5.3.4	GNSS .....	19
5.3.5	Cloud .....	19
5.3.6	System .....	20
5.3.7	Interface .....	20
5.4	Software .....	20
5.5	Help .....	21
6.	Layers	22
6.1	Vector layer .....	23
6.1.1	General .....	23
6.1.2	Style .....	24
6.1.3	Classes .....	25
6.1.4	Attributes .....	26
6.1.5	Data .....	28
6.2	Raster layer .....	28
6.2.1	General .....	29
6.2.2	Display .....	29
6.2.3	Classes .....	30

<b>7. Tools</b>	<b>31</b>
7.1 View .....	32
7.2 Info .....	33
7.3 Survey .....	34
7.4 Draw .....	35
7.5 Stakeout .....	36
7.6 CoGo .....	37
7.7 GIS .....	38
<b>8. Panels</b>	<b>39</b>
8.1 Table .....	40
8.2 Records .....	41
8.3 Attributes .....	41
8.4 Coordinates .....	42
8.5 Survey .....	43
8.6 Divide .....	44
8.7 Sampling .....	45
8.8 Skyplot .....	46
<b>Index</b>	<b>48</b>



# 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 development: the same software with the same rich functionality for Android and Windows. You can prepare your work in the office, conclude the data collection in the field, and process your collected data in the office.
2. Includes both GIS and Surveyor functions
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.
5. Online and offline operation: online data sources (Google Drive, Dropbox, TMS, WMS, KML), offline raster datasets (jpeg, ers, tiff, png, lan, bil), offline vector datasets (map, shp, mif, dxf, txt, crd, dat, dbf, tab, mid).
6. Powerful GIS visualization functions: thematic mapping, transparency, labeling, layer groups, vector symbols, line types, fill types, event mapping.
7. Productive field data collection: templates, surveying, stakeout, CoGo (Coordinate Geometry), forms, lists, calculated fields, GIS editing functions, sampling tool and more.
8. Extensive support of GNSS receivers, range finders, projection systems, geoids, shift grids.

The app can be used in many different sectors:

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

\*\*\* NOTE: topoXpress offers all specified GIS 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](http://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](#)<sup>[7]</sup> and [Android](#)<sup>[7]</sup> operating systems.

### 2.1 Windows

---

Installation for 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

Download the latest installer from [topoxpress.com](http://topoxpress.com) or [topolynx.com](http://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!

### 2.2 Android

---

Installation for Android operating system

Please, check the software requirements before installation:

- Android 4.4 or above
- Minimum 1 GB RAM
- Minimum 800x480 display resolution
- 16 MB Storage space

The software requires the following permissions:

- Read external storage
- Write external storage
- Manage documents
- Internet access
- Access fine location
- Access coarse location
- Access network state
- Write settings
- Mount/unmount files systems

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

1. Installation from Google Play:

Start Google Play application and search topoXpress in the store, select Install and grant permissions!

2. Installation from APK file:

Download the latest topoXpress APK file from [topoxpress.com](http://topoxpress.com) or [topolynx.com](http://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.



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](#)<sup>[15]</sup> items
2. Top [toolset](#)<sup>[32]</sup>: switch between toolbars
3. Right side [panel](#)<sup>[40]</sup>: contains properties and attributes
4. Center view: displays the map
5. Bottom [toolbar](#)<sup>[32]</sup>: contains the tools and commands of the selected toolset

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 job

---

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

1. Start the program
2. Open menu with the [topoXpress](#)<sup>[32]</sup> button
3. Select [Jobs](#)<sup>[15]</sup> menu item from the left side menu
4. Select the [New](#)<sup>[15]</sup> tab
5. Select the desired template (Empty job, Point/Line/Area Survey)
6. Enter the name of the Job, this will be the folder name of the job too
7. Select the desired file format (Map, Shp, Dxf)
8. Modify the Projection if necessary (enter country name, projection name for searching, for example: WGS 84 UTM 33)
9. Press Create button to create the folder for the Job, and setup the Job for work
10. Done

### 4.2 Open existing job

---

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

1. Start the program
2. Open menu with the [topoXpress](#)<sup>[32]</sup> button
3. Select [Jobs](#)<sup>[15]</sup> menu item from the left side menu
4. Select [Open](#)<sup>[16]</sup> Tab, if not selected
5. You can browse the existing Jobs on the local storage
6. Click any Job to open it
7. The program opens and displays the content of the selected Job
8. Select another Job from the list to switch to it
9. Done

### 4.3 Create layer

---

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

1. Start the program
2. [Create](#)<sup>[12]</sup> or [open](#)<sup>[12]</sup> an existing job
3. Open menu with the [topoXpress](#)<sup>[32]</sup> button
4. Select [Content](#)<sup>[16]</sup> menu item from the menus
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
8. Select Vector Layers and the desired file format (Map, Shp, Dxf, Mif)
9. The program creates the layer and add it to the top of the layer list
10. 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](#)<sup>[12]</sup> or [Open](#)<sup>[12]</sup> an existing job (the previous two tutorials)
3. Select the [Survey](#)<sup>[34]</sup> toolset from the top toolbar
4. Select a vector layer with the left command in the lower toolbar
5. If the layer list is empty, then [Create](#)<sup>[12]</sup> a new layer for data collection or enable the [Editing](#)<sup>[23]</sup> 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](#)<sup>[41]</sup> 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:

- [Jobs](#)<sup>[15]</sup>: create, open, import and export Jobs
- [Content](#)<sup>[16]</sup>: create, open layers, manage layer structure, modify layer appearance
- [Settings](#)<sup>[17]</sup>: modify the various parts of the program
- [Software](#)<sup>[20]</sup>: shows different information about the software
- [Help](#)<sup>[21]</sup>: displays the online help
- Exit: exit the program

### 5.1 Jobs

---

This panel provides tools to create a new Job or open an existing one, modify the current job, import or export a Job.

The top section of the panel contains 4 Tabs:

1. Create [New](#)<sup>[15]</sup> Job, it can be empty or based on templates
2. [Open](#)<sup>[16]</sup> existing Job, list sorted by name
3. [Open](#)<sup>[16]</sup> existing Job, list sorted by last modification date
4. [Current](#)<sup>[16]</sup> Job

#### 5.1.1 New

This Tab lists templates to create a new Job.

The following predefined templates are available:

- Empty job
- Point survey
- Line survey
- Area survey

The list includes the user defined templates as well.

Conclude the next steps to create a new Job:

1. Select the appropriate template

2. Enter the name of the Job, 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: 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

The Open Tab contains the list of the existing Jobs. Depending on the selected Tab the list is sorted by name or last modification date. Any existing Job can be opened by selecting it from the list.

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: DigiTerra Map Pack
- DAT: Hungarian Digital Base (Cadaster) Map

### 5.1.3 Current

Current Tab contains information about the opened Job including the Name, Data Source, Last modification, Projection system. The name of the project can be altered.

The bottom toolbar contains commands related to the current Job:

- Save: saves the Job in its actual state (content, view)
- Save as template: save the Job in its actual state as template. This Job can be used as a template to create [New](#)<sup>[15]</sup> Jobs.
- Export the Current Job including its content to other file formats (KML, DMP).

## 5.2 Content

---

The Content panel displays the list of the layers of the opened Job. Layers can be group layers, vector layers (point, polylines, polygons), data tables, raster layers and online sources (TMS, WMS).

Each item of the layer lists displays the name of the layer, its state and the top-left icon shows the type of the layer. This icon controls the visibility of the layer. Clicking on this icon turns on and off the layer.

Clicking on the layer name or the right part of item opens the layer properties. [Vector](#)<sup>[23]</sup> layers and [Raster](#)<sup>[28]</sup> layers (including the online raster sources) have different properties.

Content panel provides tools to create new layer, add existing one, or select layers in the list.



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.



Add existing layer: vector layers, raster layers, data tables, TMS sources. At first select the layer type. Vector, raster layers and data tables can be opened from local storage, by default the Job folder or any other folder, but these layers can be opened from Google Drive or DropBox using the Drive icon.



Select layers: the program switches to layer selection mode. Each layer can be selected by the right icon.



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



Move the selected layers upward.



Move the selected layers downward.



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



Upload the selected layers to Google Drive. Authentication required.



Upload the selected layers to DropBox. Authentication required.

## 5.3 Settings

---

This panel contains the Job and device related settings. Job related setting can be changed by opening another Job.

One of the most important settings is the Language. The program supports many languages.

The settings menu consists of several sub-panels:

- [Map](#)<sup>[18]</sup>: preferred file format, geometry decimals, snapping
- [Unit](#)<sup>[18]</sup>: unit and date format
- [Projection](#)<sup>[19]</sup>: selection of a projection system and customization
- [GNSS](#)<sup>[19]</sup>: GNSS receiver related options
- [Cloud](#)<sup>[19]</sup>: cloud access properties
- [System](#)<sup>[20]</sup>: working folder
- [Interface](#)<sup>[20]</sup>: indicator and scale

### 5.3.1 Map

This panel contains Map specific settings.

New layer type: this is the preferred format for a new layer.

Geometry decimals: this is the default precision to store the geometry in a new layer. Lower value requires less memory to store the geometry but the spatial accuracy is decreasing too. Value of 2 means [cm] accuracy, value of 3 means [mm] accuracy.

Vertex snapping: globally turn on and off the snapping. If snapping is enabled, then the new vertices will be snapped to existing geometries (points, polylines, polygons) during drawing or vertex editing.

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

### 5.3.2 Units

This panel helps to setup units and date formats.

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.

Date format: choosing between the three possible date format.

Default codepage: this is the default codepage for a new or existing layer.

### 5.3.3 Projection

This panel provides tools to select a Projection System, review and modify the selected one.

The panel has four Tabs. The Projection System can be selected on the first Tab. Due to the large number (4 thousands) of projection systems keywords should be entered. Enter the country name, projection or datum name to reduce the number of hits, for example: WGS 84 UTM 33. Searching by keywords facilitates the selection of the proper 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 Projection System. The third Tab contains the Datum properties, and the fourth Tab the Grid properties. 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.

### 5.3.4 GNSS

This panel includes the GNSS receiver and survey related settings.

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

GNSS solution: type of GNSS solution is required for surveying.

Maximum PDOP: maximum allowed PDOP value for surveying.

Accuracy limit: maximum allowed RTK accuracy for surveying.

Antenna height: default height of the antenna.

Geoid file: select a geoid file, the following formats are supported: BIN, GEO, DAT, GGF, GSF, GSB, HDR. The geoid file contains the geoid undulation for a given area. The usage of a geoid undulation file will alter the measured and transformed GNSS height.

### 5.3.5 Cloud

topoXpress has a cloud server which can provide various online services such as uploading and downloading layers, jobs,

Username: name for cloud login

Password: password for cloud login

Online: online cloud access, this mode periodically checks the cloud server.

Logout: logout from cloud

Offline: offline work for a specified period, this mode acquires access from the server and the software can be used offline until the period expires.

Period: defines the offline work period: 1 hours, 4 hours, 1 day, 7 days.

Date of expiration: displays the expiration date of the offline work

### 5.3.6 System

The panel contains system specific settings.

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

### 5.3.7 Interface

This panel includes user interface related settings.

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

Pixel size factor: scaling factor to magnify or shrink the interface elements.

## 5.4 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.

Author: TopoLynx company name.

Web: product web page

Contact: TopoLynx contact information (phone number and e-mail)

Credits: list of the program developers.

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

Unit tests: contains various tests to check the different aspects and functions of the program.

## 5.5 Help

---

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



# Layers

## 6 Layers

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

Different properties are available for [Vector](#)<sup>[23]</sup> layers (geometry and data tables) and [Raster](#)<sup>[28]</sup> layers (offline and online sources).

### 6.1 Vector layer

---

Vector layers contain points, polylines, polygons defined by vertex coordinates, and each entity 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, txt, crd, dat, dbf, tab, mid.

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

Five Tab helps to setup the appearance of a vector layer:

1. [General](#)<sup>[23]</sup> Tab: contains basic controls and information about the layer
2. [Style](#)<sup>[24]</sup> Tab: provides controls to classify and label the entities
3. [Classes](#)<sup>[25]</sup> Tab: list the thematic classes of the vector layer created by the selected Classification method
4. [Attributes](#)<sup>[26]</sup> Tab: contains the attribute fields of the vector layer
5. [Data](#)<sup>[28]</sup> Tab: has controls to define an event layer.

#### 6.1.1 General

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

Visible: controls the layer visibility.

Layer Name: modifiable layer name.

Information: enables layer information query. The various [queries](#)<sup>[33]</sup> examine information enabled layers only.

Editable: enables layer editing. Only editable layers will appear in the layer selection list of [Survey](#)<sup>[34]</sup>, [Draw](#)<sup>[35]</sup>, [CoGo](#)<sup>[37]</sup> and [GIS](#)<sup>[38]</sup>.

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.

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

Code page: defines the code page of the data source. Modification of this value reloads the attribute data of the layer.

GNSS survey elements: 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, display and label vector entities.

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 chooses 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 the filter Dxf or Mif sources.

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

Label #2: defines the second data field (data column) to display on the map. If the length of the composite label is larger 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.

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.

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

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.

Every class can be selected from the list to modify its properties (value, name, symbol, color, size etc.).

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:** 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:** 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 Attributes

This Tab lists the attributes fields (data columns) of the vector layer, it also provides tools to append new data field and alter an existing one.

Pressing the New field button opens a panel where the properties of the new data field can be adjusted. The Add button at the bottom of this panel will create the new data field.

Selecting an existing data field shows the properties of that data field. This panel provides two buttons to Save the modification of the data field or to delete the selected data field.

The following properties define a data field:

**Name:** this is the primary name of the data field. Use short name (maximum 10 characters) and ASCII letters and numbers due to technical restrictions of various file formats.

**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 after inserting a new record. The following values are available:

- Null: zero value
- True, false: only true or false value can be stored here, default is false
- Copy: copy the value of the same field of the previous data record
- Increase: increase the value of the same field of the previous data record
- Now: date and time of the creation of the record
- East: easting coordinate of the center of the geometry
- North: northing coordinate of the center of the geometry
- Elevation: elevation coordinate of the center of the geometry
- Area: area of the geometry in the selected dimension
- Length: area of the geometry in the selected dimension
- Perimeter: area of the geometry in the selected dimension
- Longitude: longitude (WGS84) of the center of the geometry
- Latitude: longitude (WGS84) of the center of the geometry
- Height: height above WGS84 ellipsoid of the center of the geometry
- Heading: bearing of the movement at the moment of the geometry creation
- PDOP: current PDOP (Position Dilution of Precision) value of the GNSS receiver
- Satellites: 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
- GNSS time: Current date and time of the GNSS receiver
- GNSS solution: Solution type of the GNSS receiver
- GUID: globally unique identifier
- Serial: device serial number

**Calculate:** this property defines the calculation of the data field after every modification. The same values can be used like above.

**Type:** type of the data field (bool, int, real, string, date, time, document).

**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 files (Cdt) from the project folder.

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 50 or more.

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.

Verify: verification expression to validate the entered value.

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.

### 6.1.5 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 or cells, and each pixel can store one or more (multiband) numeric values. Raster layers are stored in data files. Currently the following file formats are supported by the software: Jpeg, Ers, Tiff, Png, Lan, Bil. The program can open georeference world files next to the raster such as jgw, tfw, pgw.

The 5 raster Tabs help to setup the appearance of the raster layer:

1. [General](#)<sup>[29]</sup> Tab: contains basic controls and information about the layer
2. [Display](#)<sup>[29]</sup> Tab: provides controls to adjust the rendering of the raster layer
3. Connection Tab: shows the WMS layer connection properties.

4. Layers Tab: lists the available WMS layers
5. [Classes](#)<sup>[30]</sup> Tab: list the thematic classes of the raster layer to categorize the pixel values

### 6.2.1 General

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

Visible: controls the layer visibility.

Layer Name: unique but modifiable layer name.

Information: enables layer information query. The various [queries](#)<sup>[33]</sup> examine information enabled layers only.

Editable: enables layer editing. The layer can be selected for editing.

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.

East offset: defines the easting offset to modify the georeference of a TMS/WMS layer.

North offset: defines the northing offset to modify the georeference of a TMS/WMS 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 rendering of the raster layer.

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

- 1 channel Pseudocolor, only one color band can be selected
- 3 channels RGB, three color bands can be selected for red, green, blue
- 4 channels RGBA, four color bands can be selected for red, green, blue, alpha

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

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)

### 6.2.3 Classes

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

Every class can be selected from the list to customize its range and name.

Visibility: controls the visibility of the thematic class.

Value: defines the value or range of this thematic class.

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



Tools

## 7 Tools

topoXpress can be managed by several toolsets. Toolsets are the top icons above the map view. Every toolset has a toolbar which are displayed below the map view. These toolbars contains commands and tools. Most of the cases these toolsets and toolbars can be scrolled horizontally.

topoXpress toolset contains the following elements:



This is the topoXpress tool which opens and closes the left side [Menu](#)<sup>[15]</sup> panel.



[View](#)<sup>[32]</sup> toolset contains map display tools and commands.



[Info](#)<sup>[33]</sup> toolset includes graphical and textual information query, selection and search tools and commands.



[Survey](#)<sup>[34]</sup> toolset contains GNSS information and survey commands.



[Draw](#)<sup>[35]</sup> toolset contains drawing tools and commands.



[Stakeout](#)<sup>[36]</sup> toolset contains stakeout and navigation tools and information.



[CoGo](#)<sup>[37]</sup> toolset consists of coordinate geometry tools and commands.



[GIS](#)<sup>[38]</sup> toolset contains geographic information system tools and commands.

### 7.1 View

---

This toolset 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.



Pan: Pan the map. This is the default tool. The map can be dragged by finger or mouse.



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



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



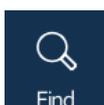
TMS offset: This tool moves the active (top visible) TMS layer horizontally. It can reduce the inaccuracy of a TMS layer. A simple click with this tool reset the offset.

## 7.2 Info

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



Table: this command displays the attribute [Table](#)<sup>[40]</sup> of a selected vector layer.



Find: this command select entities by entered keywords. Separate keywords by space! Each keyword must occur within the attributes to select it. The [Record](#)<sup>[41]</sup> panel on the right side shows the selected records.



Point: this tool select entities around the designated point. The [Records](#)<sup>[41]</sup> panel on the right side shows the selected records.



**Line:** this tool adds vertices to the input geometry. During vertex input the length of the polyline is displayed on the map, so this tool can be used for length measurements. Pressing the Query button selects entities under the polyline or in close proximity of the polyline. The [Record](#)<sup>[41]</sup> panel on the right side will show the selected records.



**Area:** this tool adds vertices to the input geometry. During vertex input the area of the polygon is displayed on the map, so this tool can be used for area measurements. Pressing the Query button selects entities under the polygon. The [Records](#)<sup>[41]</sup> panel on the right side will show the selected records.



**Query:** this command terminates the vertex collection of the previous two tools and graphically selects entities by the input geometry. The [Records](#)<sup>[41]</sup> panel on the right side will show the selected records.



**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 erases all vertices of the input geometry.

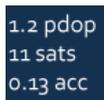
## 7.3 Survey

---

This toolset contains GNSS information and survey commands.



**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 [Content](#)<sup>[16]</sup> panel.



**GNSS state:** this command displays the GNSS state (PDOP, number of satellites, accuracy) and opens the [Skyplot](#)<sup>[46]</sup> panel.



**Start / Pause / Continue:** start the GNSS position collection. Depending on the [Measurement](#)<sup>[23]</sup> mode it can be a single survey, averaged survey or continuous survey.



Create: creates the collected geometry. Opens the [Attributes](#)<sup>[41]</sup> panel to fill the attribute data of the created record.



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



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



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



Mode: this command displays the [General](#)<sup>[23]</sup> settings of the selected layer to modify the surveying mode.

## 7.4 Draw

---

This toolset contains drawing tools and commands.



Select 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](#)<sup>[18]</sup> 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 entity from the drawing geometry. It opens the [Attributes](#)<sup>[41]</sup> panel to fill the attribute data of the new record.



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

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



Restart

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



Delete

Delete: this tool selects an entity at first; the second selection of the same entity will erase the entity.



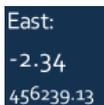
Input

Add: add a vertex to the input geometry by entering its [Coordinates](#)<sup>[42]</sup>.

## 7.5 Stakeout

---

This toolset contains stakeout and navigation tools and information.



East:

-2.34

456239.13

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

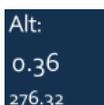


North:

4.16

278401.72

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

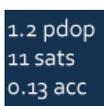


Alt:

0.36

276.32

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



1.2 pdop

11 sats

0.13 acc

GNSS state: this command displays the GNSS state (PDOP, number of satellites, accuracy) and opens the [Skyplot](#)<sup>[46]</sup> panel.



Target

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.



Input

Input: this command open the [Coordinates](#)<sup>[42]</sup> panel to enter the coordinates of the target position.



Zooming

Zooming: this command controls the automatic zoom to the target position and the GNSS position. If it is enabled both position will be visible during stakeout.

## 7.6 CoGo

This toolset consists of coordinate geometry tools and commands.



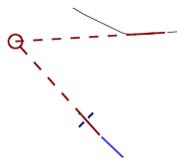
Sel. layer

Select 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. 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. Make sure to select line segments and not vertices. 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 entity 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](#)<sup>[43]</sup> operations. The endpoints are snapped to existing features. Consecutive click relocates the nearest endpoint. Endpoints can be dragged.



Survey

Survey: this command opens the [Survey](#)<sup>[43]</sup> panel to carry out 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](#)<sup>[44]</sup> panel and survey points alongside the polyline with various methods.

## 7.7 GIS

---

This toolset contains geographic information system tools and commands.



Sel. layer

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



Sampling

Sampling: this tool can select a polygon and opens the [Sampling](#) <sup>[45]</sup> panel to generate features inside the polygon.



Generalize

Generalize: this tool can select a polyline and opens the Generalize panel to simplify the polyline.



Vertex

Vertex: this tool can select a feature in order to edit its vertices. After a successful selection the program displays the vertices of the selected geometry. This tool can drag the vertices and click on a vertex to select it. Selecting another entity or clicking on an empty space will automatically save the previously modified entity and deselect it.



Insert

Insert: this command inserts a new vertex after the selected vertex.



Delete

Delete: this command deletes the selected vertex.



GNSS

GNSS: this command inserts the current GNSS position after the selected vertex.



Cancel

Cancel: this command drops the vertex editing modifications and cancels the selection.



# 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](#)<sup>[40]</sup>: this panel displays the entire data table of a vector layer.
- [Record](#)<sup>[41]</sup>: this panel shows the records of the selected/queried features.
- [Attributes](#)<sup>[41]</sup>: this panel shows the attributes, data fields of one feature.
- [Coordinates](#)<sup>[42]</sup>: this panel helps to enter a position.
- [Survey](#)<sup>[43]</sup>: this panel can solve CoGo problems.
- [Divide](#)<sup>[44]</sup>: this panel can measure points alongside a polyline.
- [Sampling](#)<sup>[45]</sup>: this panel can generate features inside a polygon.
- [Skyplot](#)<sup>[46]</sup>: this panel shows information about the GNSS receiving.

### 8.1 Table

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

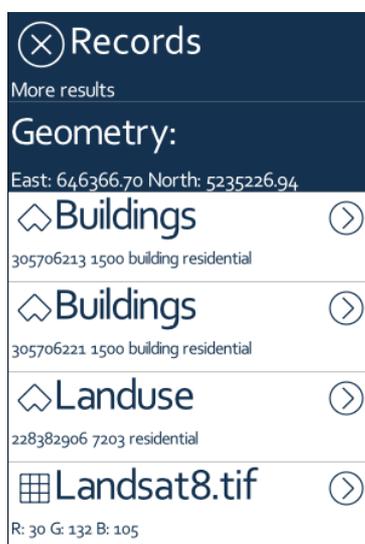
The title of panel can close the panel. The second line displays the name of the currently selected data table. Clicking on this line displays the list of the available vector layers and tables to choose one of them. The remaining large table area displays the data records (rows) and data fields (columns). 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.

topoXpress

## 8.2 Records

This panel shows the records selected by the [Info](#)<sup>[33]</sup> tools or commands.

The panel shows records from those layers only where the [Information](#)<sup>[23]</sup> option is enabled. The list can contain [Raster](#)<sup>[28]</sup> 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](#)<sup>[41]</sup> panel of that record. The list contains the first 20 hits.



## 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 [Attribute](#)<sup>[26]</sup> panel of the vector layer.

The bottom line contains three important buttons:

Save: save the modifications and close the panel.

Zoom to: zoom the map to the geographic boundary of the entity

Go to: set the center of the entity as navigation target

Attributes	
Buildings	
osm_id	305706213
code	1500
fclass	building
type	residential
<div style="display: flex; justify-content: space-around;"> <span>Save</span> <span>ZoomTo</span> <span>Go to</span> </div>	

Make sure to press the Save button in the bottom line to save the modifications!

## 8.4 Coordinates

This panel provides controls to enter a position 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(X)	458234.32
North(Y)	271813.84
Altitude(Z)	243.17
Geographic	
Lon	16.4890072679
Lat	47.7618304013
<div style="display: flex; justify-content: space-between; align-items: center;"> <span>Set</span> <span>Set as target</span> </div>	

## 8.5 Survey

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

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

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.

Distance / Angle B: this input receives the secondary arguments for the selected method. Several angles and distances can be entered with space separator.

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

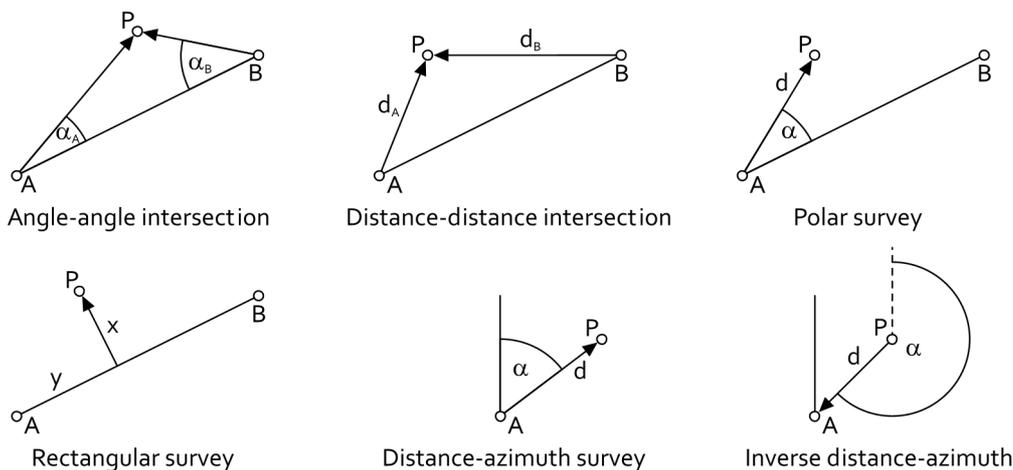
If there is a feasible solution, then the program calculates and displays the points on the map. Pressing the Add button at the bottom of the panel creates the point records in the CoGo layer.

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:



## 8.6 Divide

This panel can measure points alongside a polyline.

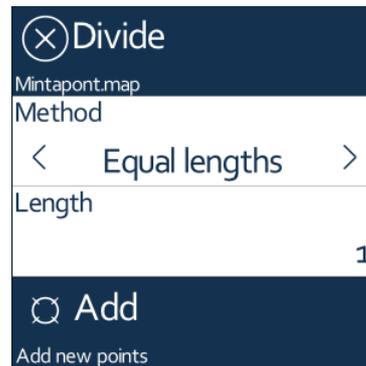
The [Divide](#) <sup>37</sup> tool can select a polyline and display this panel on the right. A point layer must be selected first as CoGo output layer. The panel contains three interface elements. If the method and the parameter selection are appropriate, then the output of the method, the points appear 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.



## 8.7 Sampling

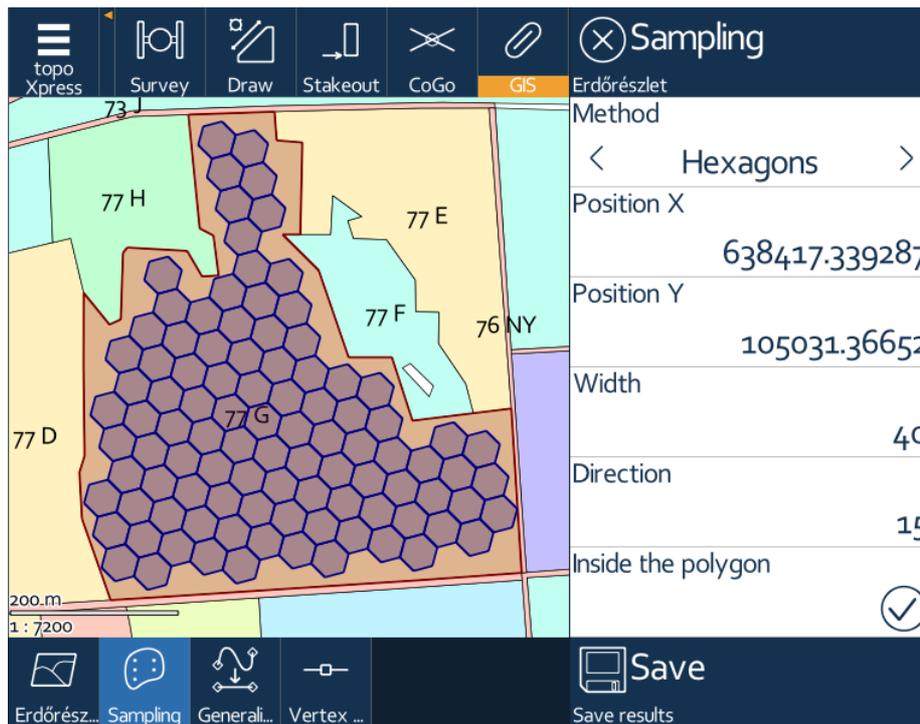
---

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

In order to use this panel, you need to [Select](#)<sup>38</sup> 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



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.

Save: this button saves the generated features into the selected GIS output layer; otherwise it will be displayed on the map, but only temporary.

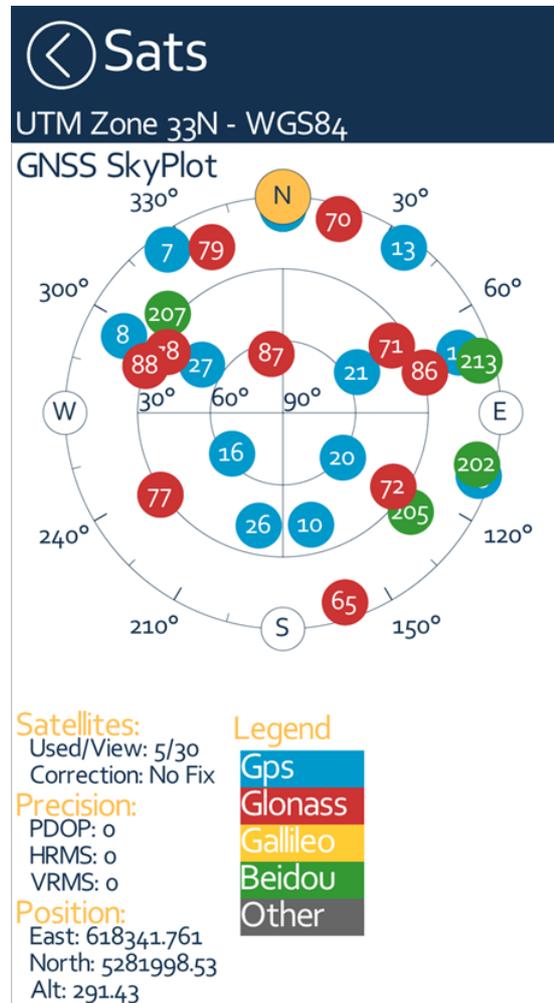
## 8.8 Skyplot

This panel displays the actual GNSS receiving status.

The following information appears on the panel:

- Graphical representation of the satellites over the horizon colored by type

- Number of visible satellites, and satellites used for positioning
- Correction type
- Position dilution of precision (PDOP)
- Predicted precision (HRMS, VRMS)
- Position coordinates in the selected [Projection](#) system



**- A -**

Android 7

**- C -**

Cloud 19  
CoGo 37  
content 16

**- D -**

draw 35

**- G -**

GIS 38  
GNSS 19, 34, 36

**- I -**

information 33  
install 7  
interface 10

**- J -**

Job 15

**- L -**

layer 23

**- M -**

menu 15

**- P -**

projection 19

**- R -**

raster 28

**- S -**

settings 17  
snapping 18  
software 20  
stakeout 36  
survey 34

**- T -**

toolbar 32  
tutorial 12

**- U -**

units 18

**- V -**

vector 23  
view 32

**- W -**

Windows 7