Management, Evaluation and Publication of Data from Mobile Laser Mapping in the Environment of Marushka Map Application Server

(Brief Overview)

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CONTENT

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1. Information Order System

The application is designed to run in a web browser to record trajectories of 3D laser scanning and integration with the order system. The application runs above common relational databases. In the order system graphical data publication is done via Marushka map server.

Certain level of authorization (access rights) is required for data editing and making changes in a database. Individual trajectories (rides) can be assigned to the orders. Associated graphic elements (map sheets and trajectories) can be displayed on the map card.

The application has a responsive design therefore it can be used comfortably on any mobile device such as tablet or mobile phone.

You must log in to gain access to the application. Number of features/functions depends on an authorisation level. Some users may have multiple roles. During the session they are able to switch between them freely which will affect the layout and tools available.

1.1 Main window – cards, tables

After starting, the main window is displayed. On the left hand side there can be selected trajectory or the order (job).
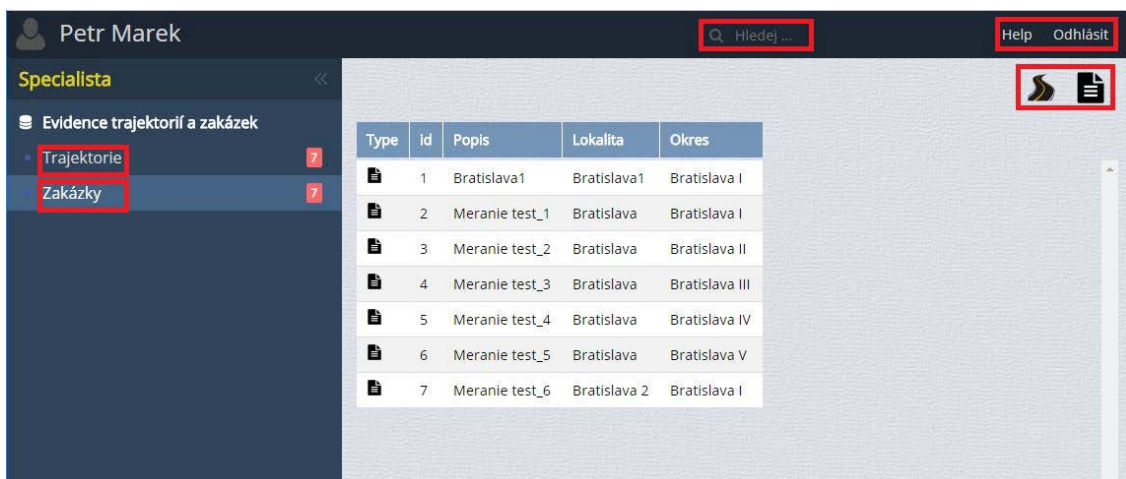
1.2 Tabs with record details

After selecting an order or a trajectory, the detail of the selected record will be displayed.

The main part of the order detail (trajectory) consists of up to three tabs. They appear dynamically only if they are available for a particular record.

The first tab with a Trajectory detail or Order items is always displayed. Another card shows the assigned orders (for the selected trajectory) or assigned trajectory (for the selected order). It only appears if the selected record has some orders or trajectories assigned. You can switch to a detail by a double click on this assigned entry. When displaying orders with assigned trajectories, the double-click on a trajectory switches to the detail of this trajectory and vice versa. Similarly, a third card with a map is displayed only if graphic elements, rides, and map sheets are assigned to the trajectory or the order.

1.3 Tab with a map

The card displays the territory with a map background and the graphic elements available for the selected record. When you have selected the Orders there will be displayed the maps sheets. In a Trajectory card there is displayed a route which car drove through.
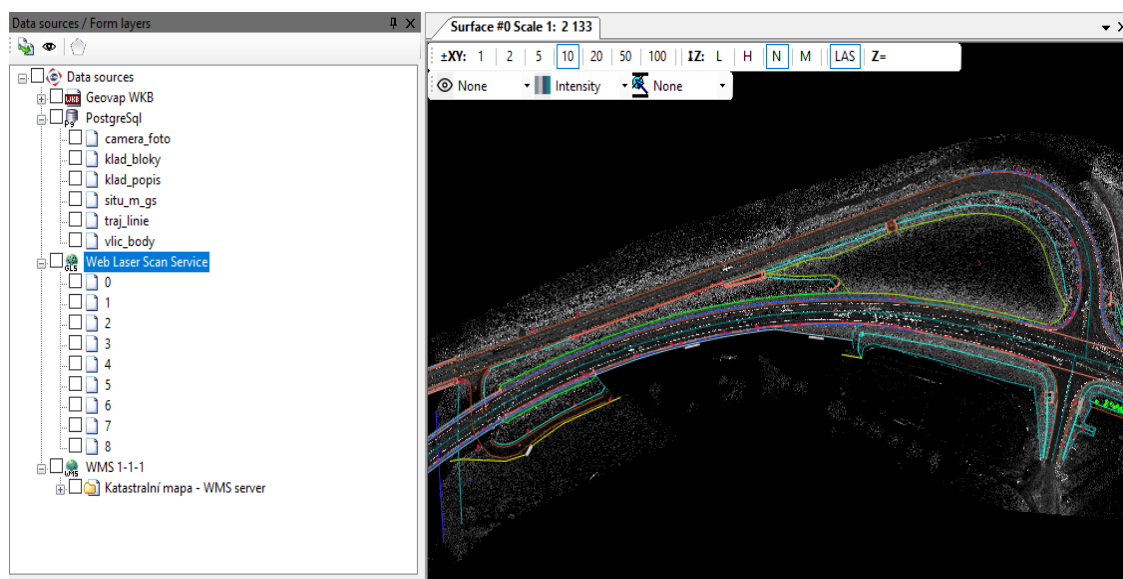

1.4 Card Dashboard

This card shows the appropriate charts according to the defined requirements. These statistics are accessible only if the user has rights as a Manager.

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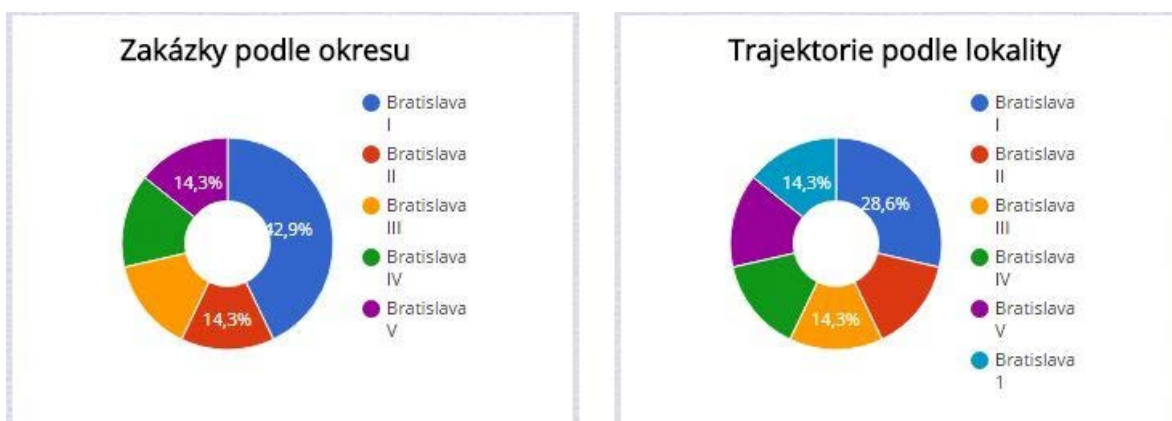
2. 3D Storage for Point Clouds and Vector Data

2.1 GLS Server

Point clouds can be accessed by a Web service via a Web Laser Scan Service (required within order records) or by a local source Laser scan GLS. Both ways are read from the GLS data storage as a seamless map.

2.2 LAS Manager

The module allows automatic storage of graphical data into a relational database according to pre-defined rules based on the assigned ID in the order system.

It also converts the Point Cloud (LAS format) into a binary file with its own structure (GLS format) to optimize the size of the data in the terms of its storage in the GLS server. The application allows using the transformation keys for converting heights.

LAS Manager also imports photos from a mobile mapping unit into a database.

LAS Manager is a module that runs in Marushka Design environment.

2.2.1 Graphical data import into a database
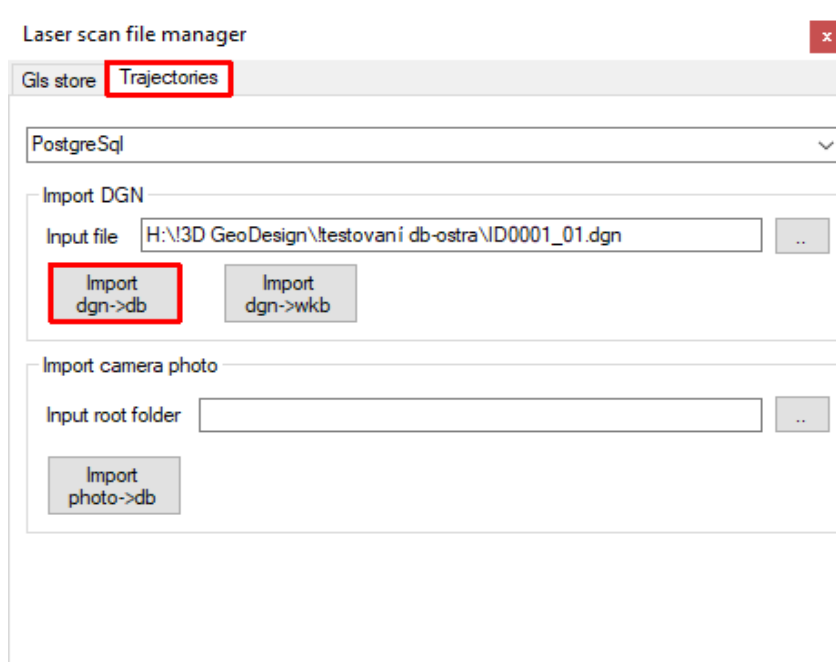
2.2.2 Height Conversion ETRS -> Bpv

2.2.3 Point Cloud Conversion (Las -> GLS) for GLS server
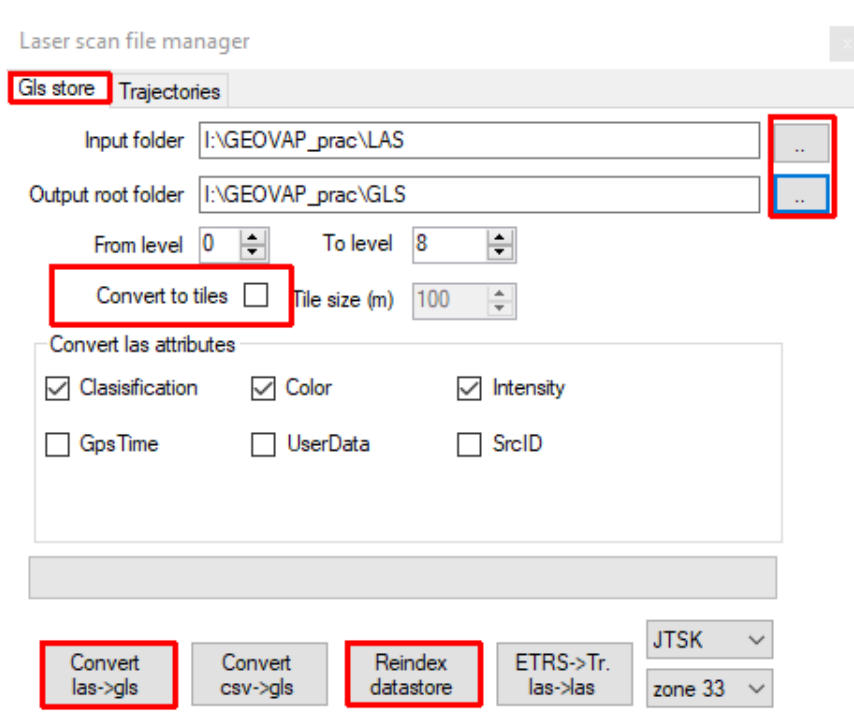
3. 3D GeoDesign

The module serves as a tool box for drawing in 3D from point clouds.
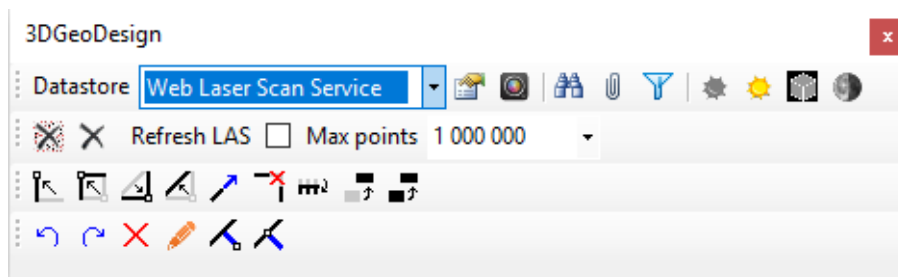
Module Application Options

Icon	Description
	- Point cloud display
	- Documents/Images
	- Find/Queries
	- Element Attributes
	- Set filter for GLS
	- Cloud lighting according to inclination
	- Cloud colouring according to inclination
	- Surface variation - edge detection
	- Colour Invert
	- Delete the LAS layers
	- Delete all except the new
	- Move the point
	- Move the node
	- Enter a point
	- Divide the line
	- Extend the line
	- Remove the vertex
	- Change line orientation
	- Move the element
	- Copy the element
	- Draw according to Etalon
	- Perpendicular to the point

3.1 Point Cloud Display

The symbology is set up in the LAS Cloud Setting window.

At the top left corner, you can choose how you want to colour the result in the map window. There are five options to choose from: None, Classification, Intensity, Z and UserData.

In the first column there are boundary values of intervals that can be edited. The second column shows the colour assigned to the interval, third column means visibility and fourth one gives an option to be able to snap on points from this interval.


3.2 Viewing photos from cameras including Ladybug camera

In order to be able to see pictures you have to click on a camera symbol in a map. If one of the icons is selected in a cluster of 4 photos, it will appear in the context photo of Document viewers and the camera icon will be displayed in the appropriate position. Using these buttons ▶ and ◀, you can move among the various route photos. To sync photos, you must activate this button:

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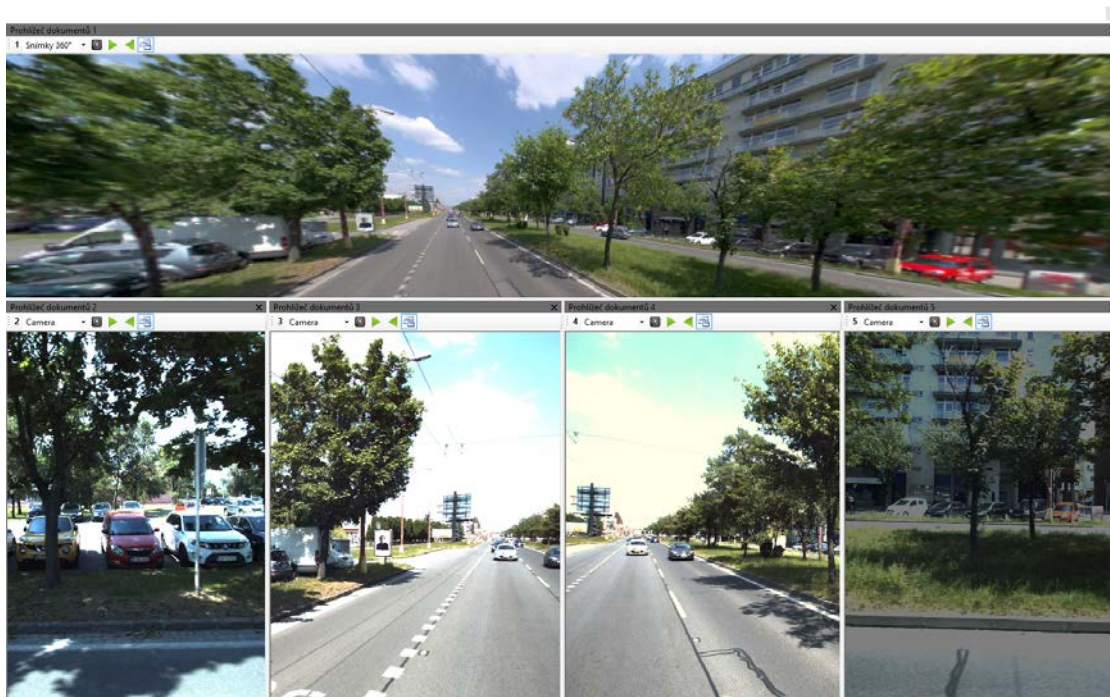
Main window showing all view angles

- The numbers of the individual cameras are displayed in window 0.
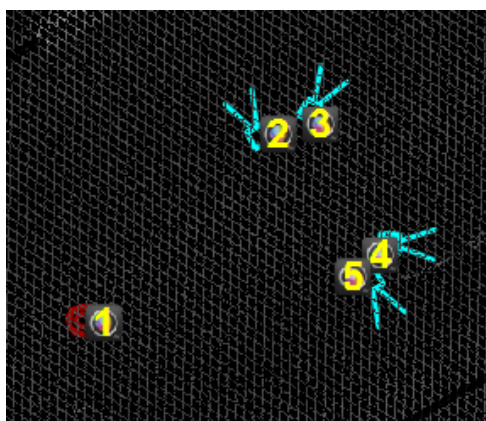
Picture showing window 0

Sample of a single picture from a camera

3.3 3D window

This window serves as the main map window to display point clouds in 3D window.
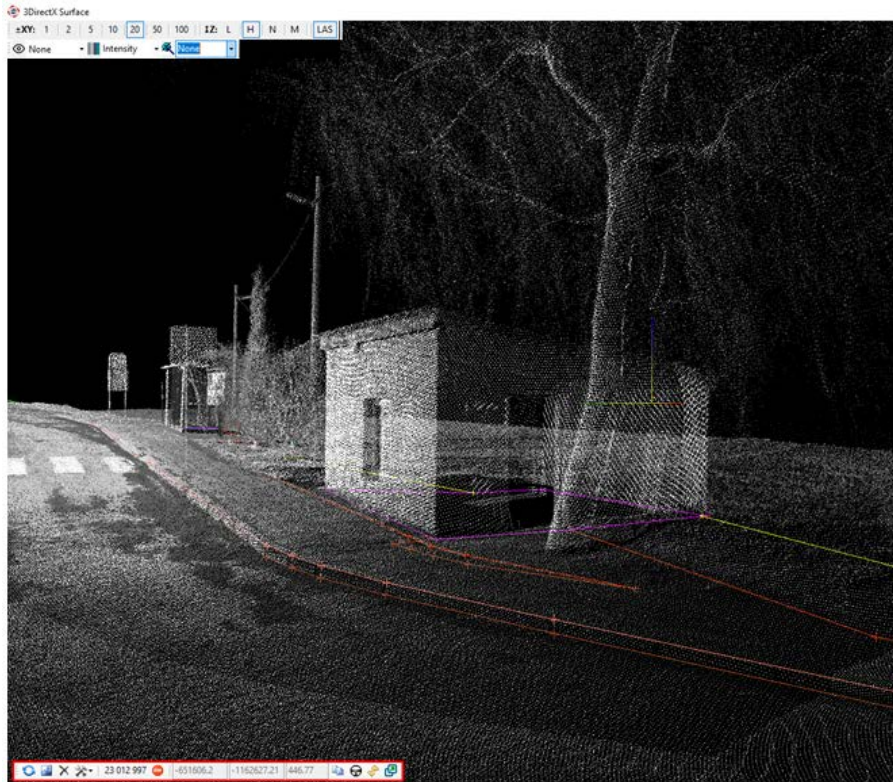
Window Application Tools

 　　　　　　- Refresh

 　　　　　　- Show all

 　　　　　　- Delete everything from 3D window

 　　　　　　- Settings (click button)

| 3 718 650 | 　- The number of currently displayed points in the map window
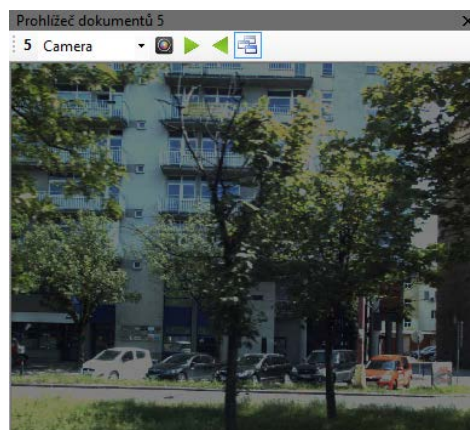
 　　　　　　- Copy the active point to the clipboard

 　　　　　　- Inspection along the line

 　　　　　　- Sync with window # 0

 　　　　　　- Move window to the position

 　　　　　　- It will appear only when the critical number of points is exceeded

| 210309.62 | 5338316.88 | 132.62 | 　- Coordinate values x, y, z

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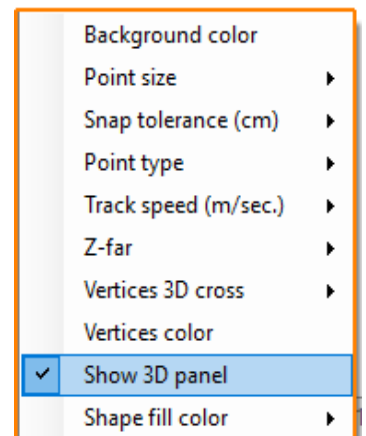
4. 3D Publishing server

4.1 Marushka Server®

Configuration project for Marushka Server® is created in Marushka Design.

The project is understood as a collection of different data storages, queries, symbols and their settings. Marushka Design offers a convenient and intuitive interface for configuring all of these project items as well as a full set of features for transforming, editing, or creating geographic data.

4.1.1 Project

It is a list of data sources (complete structure of map composition), definition of spatial data requirements (formal layers), project target projection settings, cell libraries, queries, user style libraries, and drawing guidelines from which the map compositions are generated for various scales. It is also possible to set parameters PassedParams within the project. The project is saved in the configuration XML file which is created by selecting "Save Project" in Marushka Design.

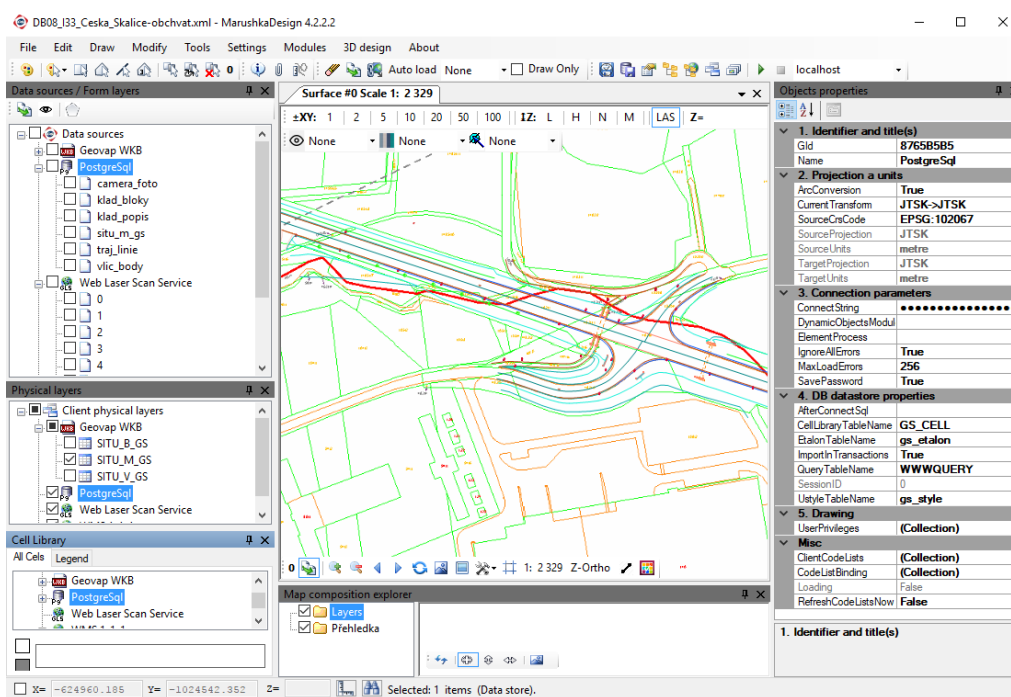The configuration file is universal for all GSFrameWork-based applications. For example, map compositions provided by a server Marushka® are identical with those which are drawn by the powerful Marushka Design client.

The XML project file can be edited outside of Marushka Design also manually in any XML editor or Notepad.

Marushka server is a web application streaming data for individual clients. It allows you to visualize 3D data in a 3D window and create dynamic slices in a point cloud.
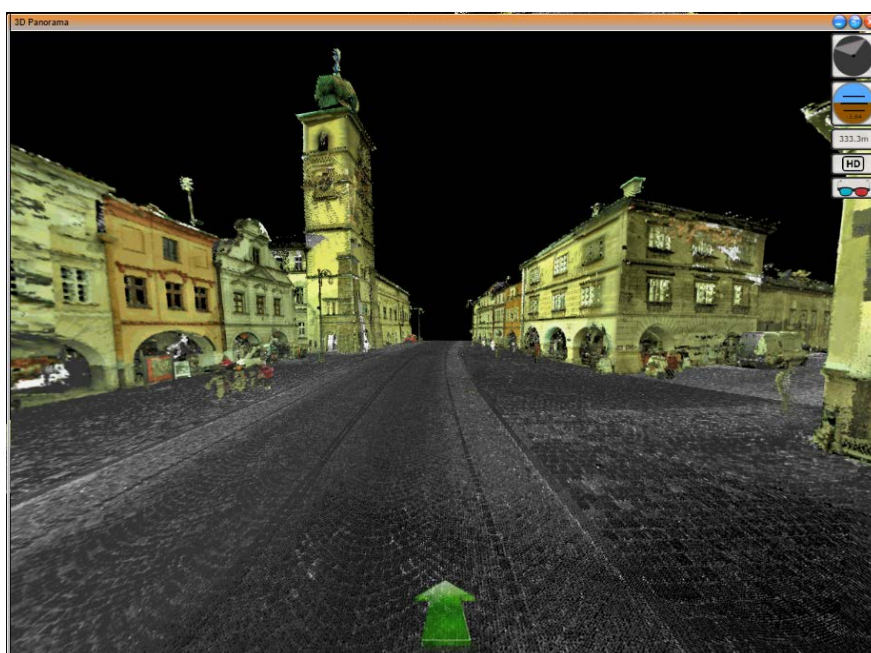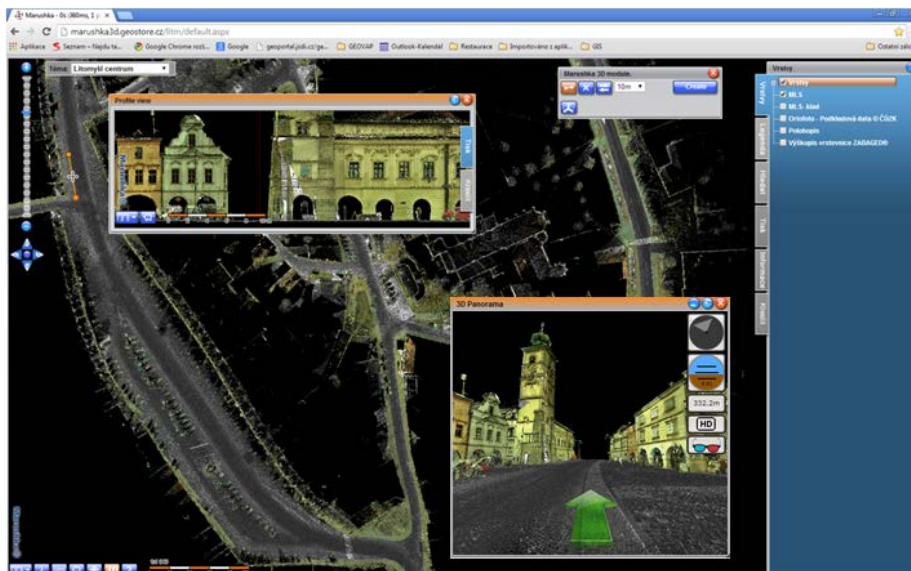
4.1.2 Web publication

Web publication means a list of formal layers for publishing purposes for both HTML client and other supported services (WMS, WFS, TILE). The end user has just these named lists - publishing layers. Each Publishing Layer may include for example a grouping of formal layers displayed at various scales. In the publishing layers, the waveguide notation is again used for tree view of individual layers.

a) HTML publication

b) Publishing web services

4.1.3 Project setup

In order to successfully create Profile and Panorama queries, the following requirements need to be met. The Profile type query then allows in a new window to view the cross section of terrain, the Panorama type query lets you display 3D view.

Topic 1

The project must contain the data storage with GLS (LAS) files that contain measured points from laser scanning. Additionally, the project must contain the SQLite InMemory data storage, which serves as an auxiliary data source and contains queries that are used to call Panorama and Profile queries. Other data sources are not required.

4.2 3D View

Panorama and Profile Control

Use the button ![3D] to launch the Marushka 3D dialog box. From this window, you can then run the Panorama or Profile windows.

In the first line with the Profile title, clicking on the button ![icon] makes it possible to draw a line to the map field where a profile cut is then created. After the cut is defined, the dialog box is opened by clicking on the button Create. You can use the buttons to adjust the width, rotate the profile view, or delete the line and start again. The control of the map window is completely standard and intuitive.

In the second line with the Panorama title is only one button ![icon] which activates the 3D Panorama dialog box. To retrieve the data into this window, it is necessary to click anywhere on the map. This dialog box is controlled using the mouse and arrows as well as using the buttons located in the right part of the dialog box. These buttons can set up bird's eye view: ![icon] default view north ![icon] zero horizon ![378m] vertical view ![HD] run view in HD and ![glasses] run view with 3D glasses.

5. Integration with third-party products (ESRI)

5.1 Vector Data Storage

The system supports common vector data storages, both file and database storage. Among the database belong mainly ORACLE SDO (Spatial Data Option), Microsoft SQL server, Posgresql and SqLite.

Additionally, the openness of the system allows the integration with third-party systems directly on the data level (e.g. with ArcSDE-based systems from Esri) and to extend their functionality for advanced acquisition/updating/3D data analysis with support of LAS point clouds. Integration with third-party systems at the data level does not require any export/import processes. This eliminates the potential risk of data loss/deformation as a result of their import / export conversion to another environment.

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