



NextGIS Web documentation

Release 3.1

NextGIS team

25-10-2019

CONTENTS

INTRODUCTION

This document is a user manual for a **NextGIS Web** version 3.0 Web GIS. The manual covers general information about the software installation, configuration and usage, description of administrator interface, and an overview of basic user and administrator tasks.

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QUICKSTART TUTORIAL

2.1 Quickstart tutorial for advanced users

NextGIS Web - is a server *geographical information system* (GIS (geographical information system)), which allows to store and to edit geodata and to display maps in web browser. Also NextGIS Web can share *geodata* with other NextGIS software.

NextGIS Web has the following features:

- Display of maps in web browser (different maps with different layers and styles)
- Flexible access permissions management
- Geodata could be loaded from *PostGIS* or imported from files in GIS formats *ESRI Shape*, *GeoJSON* or *GeoTIFF*
- Vector data could be downloaded in the following formats: *GeoJSON*, *CSV*, *ESRI Shape*
- Map styles could be imported from *QGIS* project or could be set manually
- Could act as a server for *TMS*, *WMS*, *WFS*
- Could act as a client for *WMS*
- User can *add photos to records* (page ??), *change records attributes* (page ??), *with a support for a WFS-T protocol for editing* (page ??).
- Listed features are available through a REST API from external software

NextGIS Web - is an open source software (license GPL v2+, see *GNU General Public License, version 2* (page ??)).

System requirements listed in '[section \[http://docs.nextgis.com/docs_ngweb/source/genera hardware\]\(http://docs.nextgis.com/docs_ngweb/source/genera hardware\)](http://docs.nextgis.com/docs_ngweb/source/genera hardware)'.

2.2 Integration with other NextGIS software

To manage *geodata* in NextGIS Web you can use desktop application [NextGIS Manager](#)¹.

¹ http://docs.nextgis.ru/docs_ngmanager/source/intro.html

This software simplifies batch processing of data in NextGIS Web.

Mobile application [NextGIS Mobile²](#) allow to upload geodata collected in the field directly to Web GIS in online or offline mode.

Several mobile devices could see data changes in a single layer.

2.3 Map creation

To create a vector layer from *ESRI Shape* follow these steps:

1. Compress a shapefile to a zip-archive
2. Create a vector layer using a zip-archive through administrator interface
3. Add a style to newly created vector layer

To create a vector layer from *GeoJSON* follow these steps:

1. Create a vector layer from GeoJSON file through administrator interface
2. Add a style to newly created vector layer

To create a vector layer from *PostGIS* follow these steps:

1. Add a PostGIS connection (user login and password are required for access to database)
2. Add layers from created connection
3. Create styles for added layers

To create a raster layer follow these steps:

1. Prepare a raster file to meet the requirements
2. Create a raster layer from a file through administrator interface
3. Add a style to raster layer

After layers are loaded they should be added to a web map in web map properties page. Then a link to web map could be opened in a web browser.

If there are many layers to add this operation will be easier performed with NextGIS Manager.

² http://docs.nextgis.ru/docs_ngmobile/source/intro.html

GENERAL INFORMATION

NextGIS Web software is a web mapping application designed to support input, storage and regulated access to the results of the mapping and space activities, integrated into a single bank of data and metadata

NextGIS Web developed based on *open source* software. NextGIS Web software supports Open Geospatial Consortium (OGC³) open data exchange protocols and meets the modern requirements for application architecture implemented on the basis of free software (*Open Source*).

NextGIS Web allows:

1. Creation and display of maps.
2. Navigation on the map (zooming, shifting).
3. Control a filling of the map through web-interface.
4. Adding of vector (*ESRI Shape, PostGIS*) and raster data.
5. Using of standart protocols (*WMS, WFS-T*).
6. Detailed settings of access rights for layers, groups of layers, maps.
7. Interaction through API.

NextGIS Web has server and client sides.

Server side store and render geodata. It's written on Python with a use of Pyramid framework. Client side is a user interface for interactive *geodata* management and interaction with geodata on a map.

Client is written on JavaScript and based on a Dojo framework. All configuration is stored in a PostgreSQL database with a *PostGIS* extension. Page markup for user interface is written using HTML. Style for user interface is added using cascading style sheets - CSS. Queries to databases use SQL language.

NextGIS Web is a modular system with several core modules and extensions. Extensions could be enabled or disabled on the step of application configuration. NextGIS Web components communicate with each other using internal API methods.

NextGIS WEB is designed to operate in Linux operating system environment (Debian-based distributives are recommended, e.g. Ubuntu Server). Read more in section *Recommended software versions* (page ??). NextGIS Web works in all modern browsers. User interface with a published web map is on the Fig. ??.

³ <http://www.opengeospatial.org/>

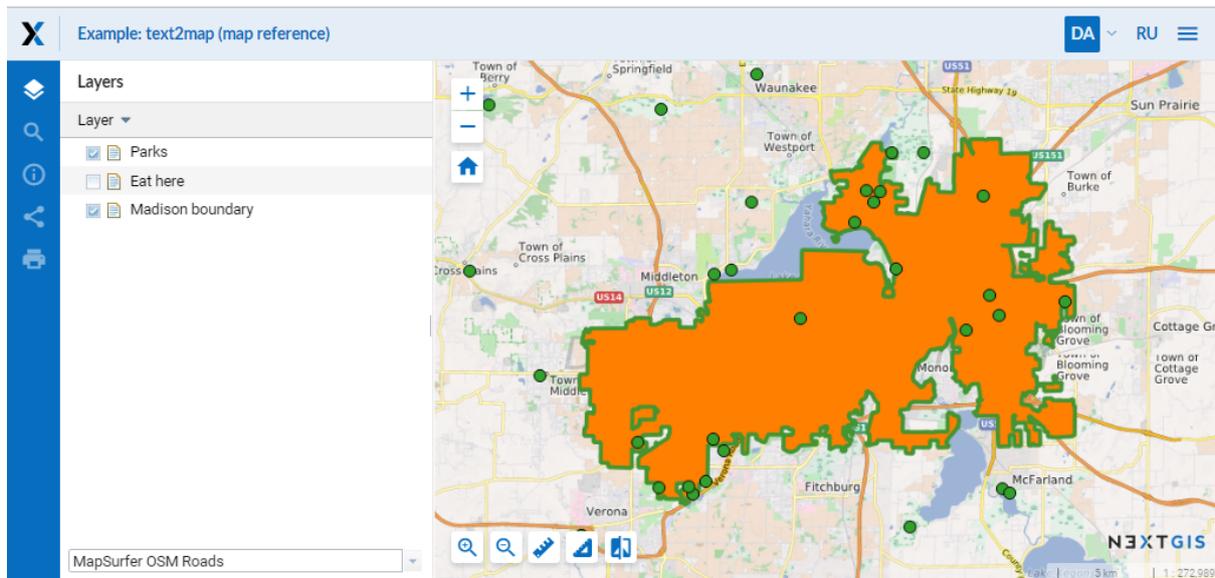


Fig. 3.1: User interface with a published web map.

3.1 Key features of NextGIS Web

NextGIS Web has the following key features:

3.1.1 Data layers

- Creation of raster and vector layers and data upload for them using web interface.
- Creation of *WMS* layers and connection to existing services.
- Creation of *PostGIS* layers and connection to layers in external databases.
- A set of standard basemaps: OpenStreetMap, Google, Bing and others from [QuickMapServices](https://quickmapservices.com/)⁴.
- WFS service.
- WMS service.
- Dictionary (with extension).
- File set.
- “Key-value” function, support for metadata.
- Export to *GeoJSON* and CSV.

3.1.2 Access management

- Detailed settings of access rights for each connected layer.
- Setting of access rights for resources and resource groups.

⁴ <https://qms.nextgis.com/>

3.1.3 Rendering and symbology

- Symbology import from QGIS with automated conversion “for renderer”.
- Pluggable renderers: *MapServer*, *Mapnik*, *QGIS* (import a project from desktop software NextGIS QGIS with the same layers, styles etc.).
- Several symbology options for the single data layer.

3.1.4 Web maps

- Unlimited number of web maps.
- Own set of layers and layer tree management for each map.
- Reuse of the same layer representation in different maps.

3.1.5 User interface

- Layer tree.
- Layer groups.
- Navigation tools panel.
- Search by attributes.
- Bookmarks for fast access to some regions of the map.
- Layer description view.
- Feature table view for layer with fast switch between a table and a map.

3.1.6 Editing

- Editing of feature attributes.
- Editing of layer description.
- Adding of photos and other attachments.
- Editing features with WFS-T.

3.2 Recommended hardware

Recommended hardware for effective work with NextGIS Web software includes a server with the following characteristics:

- one or two processor Intel Xeon E5 or AMD Opteron with frequency not less than 2 GHz (8 cores)
- not less than 16 Gb of DDR3 ECC Reg RAM
- appropriate motherboard for selected processors with integrated videocard and a network interface 10/100/1000BaseT

- two hard disk drives (HDD) with a capacity from 500 Gb in RAID1
- DVD-ROM
- server case
- mouse
- keyboard
- uninterruptible power supply with a capacity of not less than 1000 VA
- LCD monitor 17

Client device could be a desktop (with 11-27" monitor).

Also it is possible to use hosted servers with the same characteristics of processor and RAM. Hard disk drive capacity depends on the volume of geodata. Operation system with NextGIS Web software and a database requires not more than 20-30 Gb of hard disk drive space.

3.3 Recommended software versions

- Ubuntu Server 18.04 LTS
- PostgreSQL 9.5
- PostGIS 2.2
- Pyramid ≥ 1.5
- SQLAlchemy $\geq 0.8, < 0.9$
- GDAL 2.x

Recommended browsers are:

- Internet Explorer 11.0 or a newer version
- Mozilla Firefox 45 or a newer version
- Google Chrome 45 or a newer version

NextGIS Web would probably work with other versions, but this is not guaranteed.

3.4 Latest changes

3.4.1 2019-08-12 release

- Web map. Search for integer values in added to the embedded feature table.
- Web map. Improved zooming on a point from the embedded feature table.
- Web map. While editing the embedded feature table is correctly updated to show newly added features.

3.4.2 2019-00-00 release

ADMINISTRATOR INTERFACE

4.1 Home page

After login to administrative interface the user is taken to the home page shown on Fig. ??.

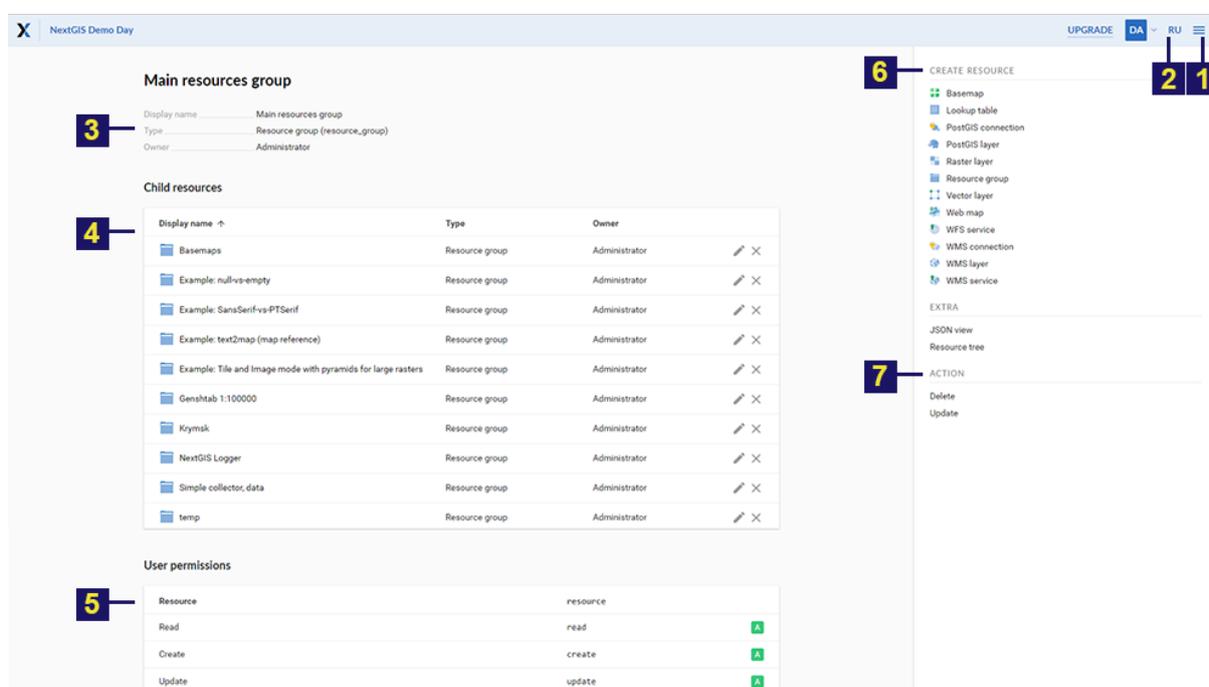


Fig. 4.1: Administrator interface home page.

The numbers indicate: 1 - main menu; 2 - “Change the language” button; 3 - main resource group description; 4 - child resources; 5 - user permissions for main resource group; 6 - types of items that could be added to the main resource group; 7 - actions that could be performed with main resource group.

Home page includes a main menu pane, (see item 1 in Fig. ??) which has the following links (see Fig. ??):

- Resources
- Control Panel
- Help
- Account

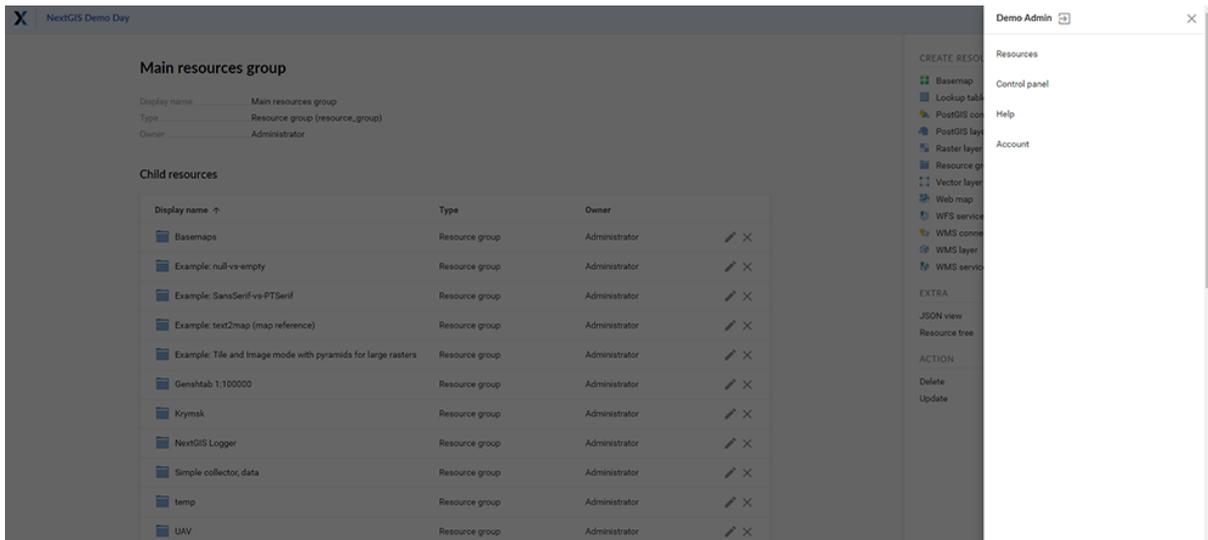


Fig. 4.2: Main menu.

Description pane (see item 3 in Fig. ??) displays root group description (if available).

Child resources pane (see item 4 in Fig. ??) contains a list of all resources placed in a root group. Pane displays information about display name, owner and contains an edit resource button.

User permissions pane (see item 5 in Fig. ??) displays list of permissions the current user granted for the root group. Green and red marks indicate that user has/don't have corresponding permission.

- A - allow
- D - deny
- M - mask (indirectly deny)
- E - empty (actually deny)

Possible permissions are the following:

- All
- Read
- View permissions
- Create
- Edit
- Manage permissions
- Delete

Actions pane (see items 6 and 7 in Fig. ??) contains tools for adding data and executing operations with root group.

In current version it is possible to add the following types of data (see item 6 in Fig. ??):

- Basemap
- Lookup table
- PostGIS connection
- PostGIS layer
- Raster layer
- Resource group
- Vector layer
- Web Map
- WMS connection
- WMS layer
- WMS service

Possible operations are (see item 7 in Fig. ??):

- Delete
- Update

4.2 Control panel

NextGIS Web Control panel is available through the main menu (see item 1 in Fig. ??), where you need to select “Control panel” (see Fig. ??). It is presented on Fig. ??.

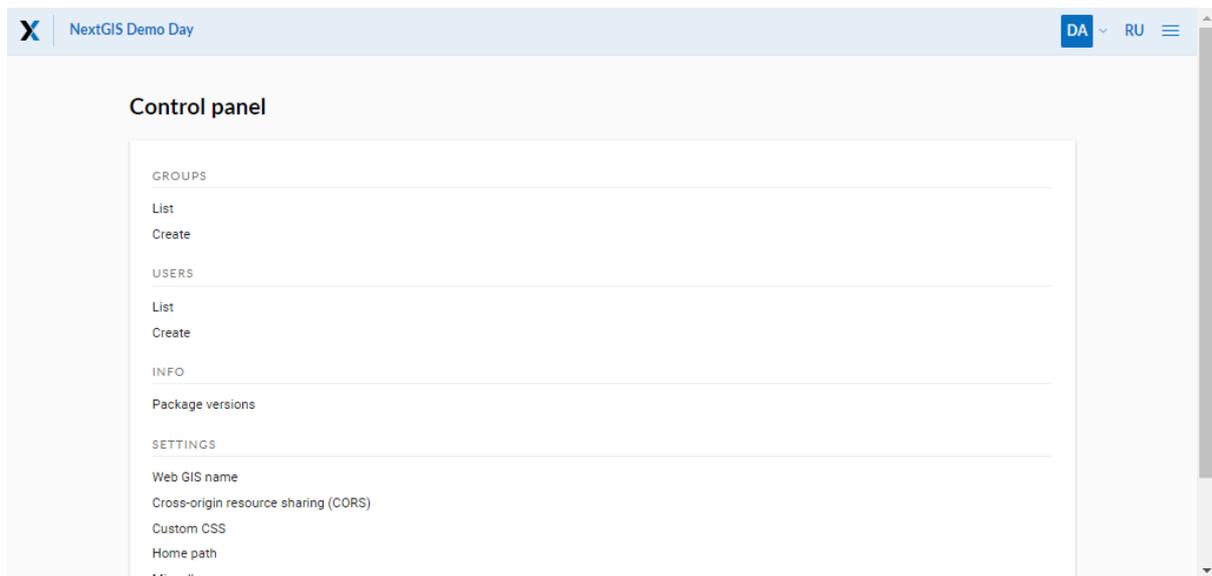


Fig. 4.3: Control panel.

Control panel allows to execute the following actions:

- View user groups and user list
- Create user groups and users

- Grant permissions to resource groups and web maps
- Set Web GIS name
- Input a list of possible sources for cross-origin resource sharing (CORS)

For more information about creation of user groups and users and granting permissions see topic *Administrative tasks* (page ??).

4.3 Resource view

After login to administrative interface the user is taken to home page shown on Fig. ??.

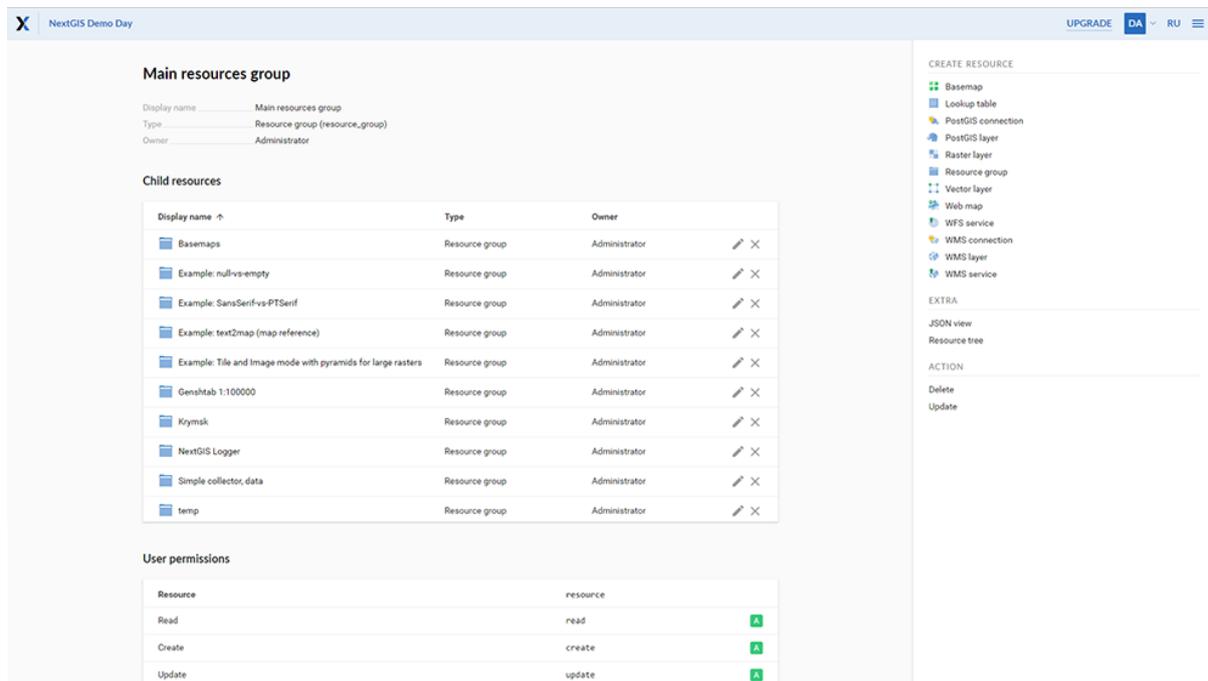


Fig. 4.4: Resource groups.

The content of resource group is displayed after a click on resource name in a child resources pane of main resource group (see item 4 in Fig. ??). On resource group page there is a pane with a list of resources in root group and user permissions pane. Layer properties are displayed after a click on a name of a layer in child resources pane. E.g. user can click on a resource of type vector layer.

After a click on layer in child resources pane user is taken to a vector layer properties and attributes page (see Fig. ??).

4.4 Feature table

To view feature table after login navigate to a child resource group (see item 4 in Fig. ??), where would be displayed resource types. Then select from child resources a resource with type vector layer and press the “Table” icon opposite the

Main resources group • Simple collector_data • tracks

tracks

Display name

Keyname

SRS identifier

Geometry type

Feature count

Type

Owner

Attributes

Keyname	Type	Display name	Table
COLLECTOR	STRING	COLLECTOR	Yes
STATUS	STRING	STATUS	Yes
ROUTE	STRING	ROUTE	Yes
LON	REAL	LON	Yes
TIMESTAMP	DATETIME	TIMESTAMP	Yes
LAT	REAL	LAT	Yes

User permissions

CREATE RESOURCE

- MapServer style
- QGIS style

EXTRA

- JSON view
- Resource tree

VECTOR LAYER

- Feature table
- Download as GeoJSON
- Download as CSV

ACTION

- Delete
- Update

Fig. 4.5: Vector layer parameters.

resource or select an action for a vector layer called “Feature table” in actions pane (see Fig. ??).

Feature table allows to perform the following operations with a selected record (see Fig. ??):

1. Open
2. Edit
3. Delete
4. Use Search Box

There is another way to open Feature table. In the administrative interface navigate to a child resource group where would be displayed resource types and select a resource with a type web map. In actions pane click a web map action called Display (see Fig. ??):

A web map will be opened with a layer tree (left) and a map (right). To view a feature table select required layer in layer tree and then select “Feature table” command in Layer drop down menu at the top of layer tree Fig. ??:

A table will be displayed in a new tab. Table allows to perform the following operations with a selected record Fig. ??:

1. Open
2. Edit

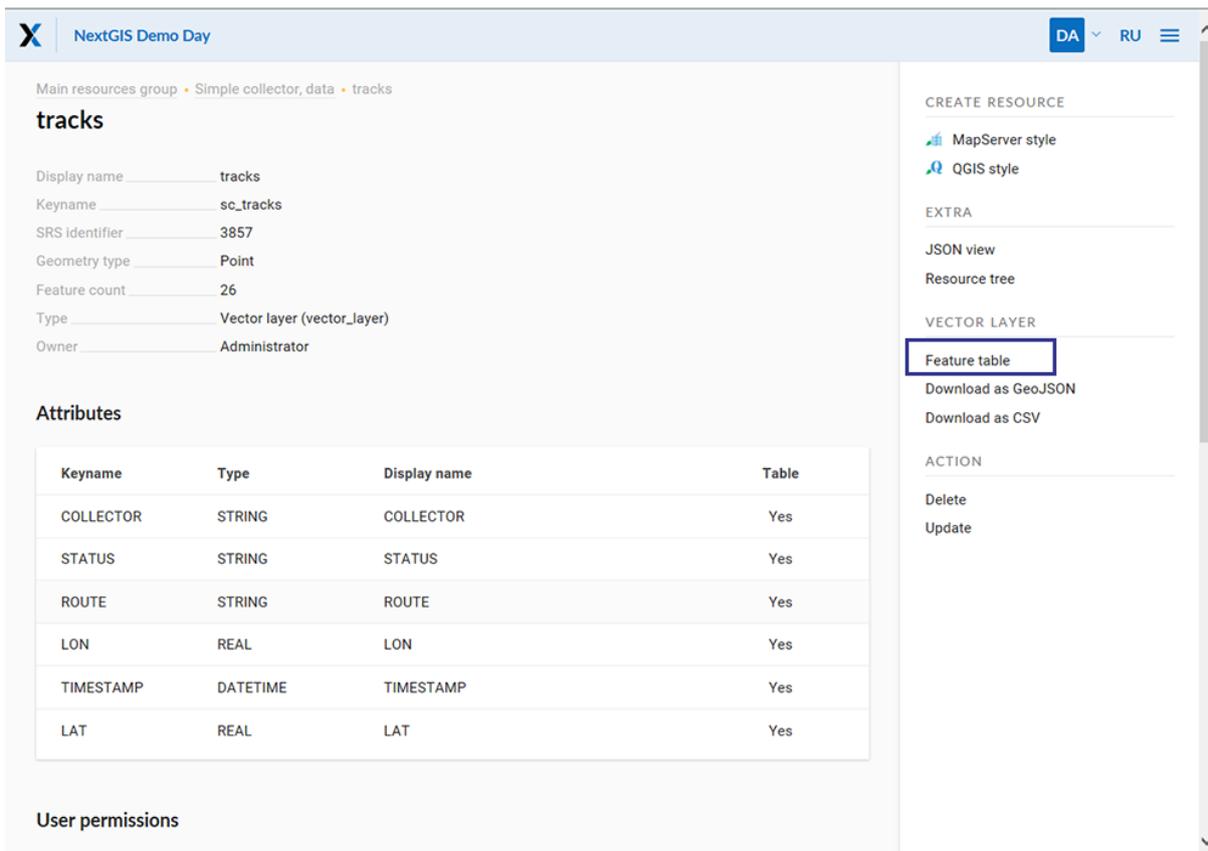


Fig. 4.6: Choice of feature table.

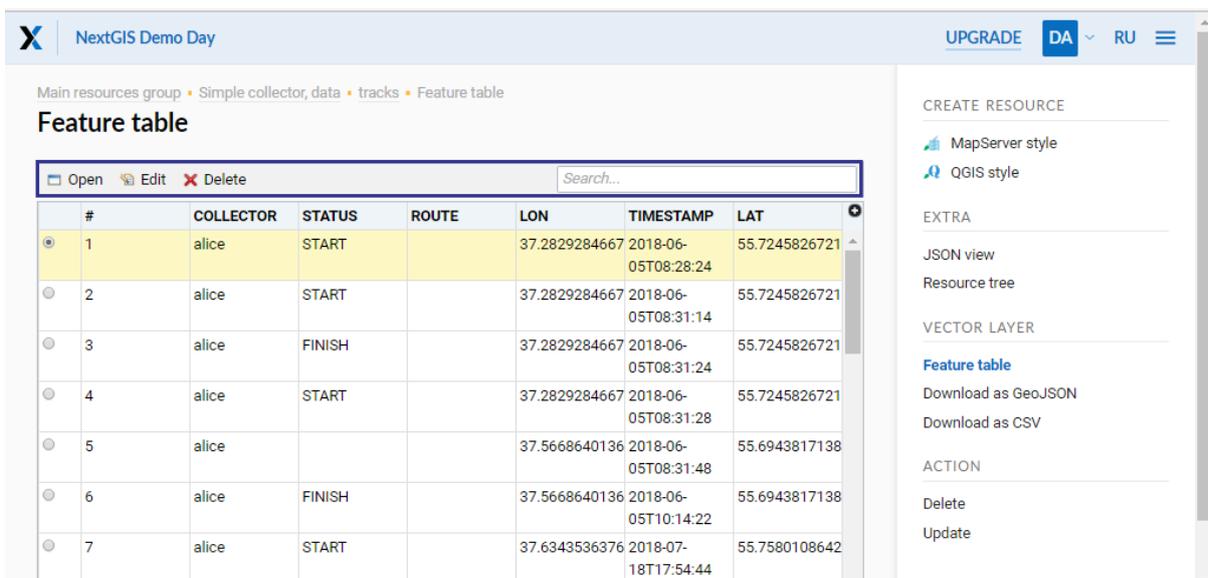


Fig. 4.7: Actions for the selected record in feature table.

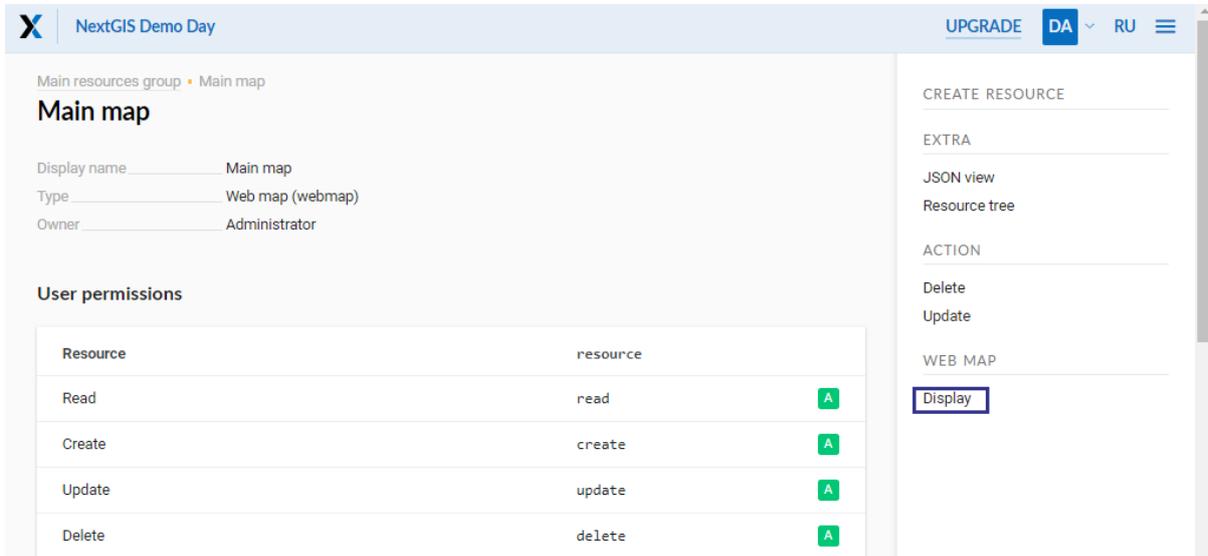


Fig. 4.8: “Display” web map action.

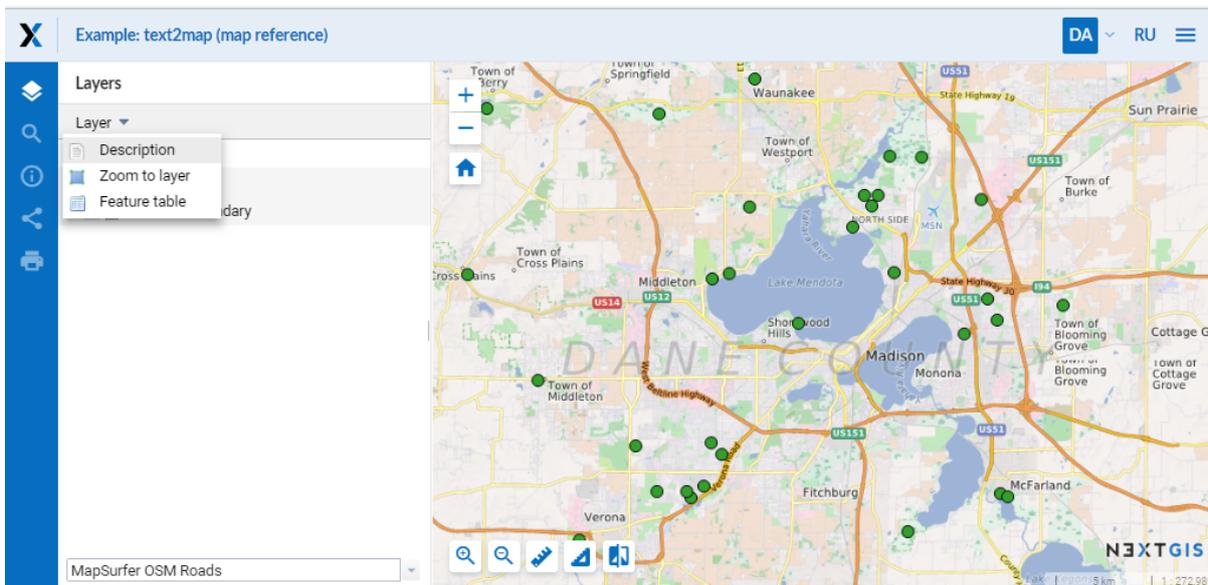


Fig. 4.9: Map and layer tree.

3. Delete
4. Go to (after a click the selected feature will be displayed on the map)
5. Use Search Box

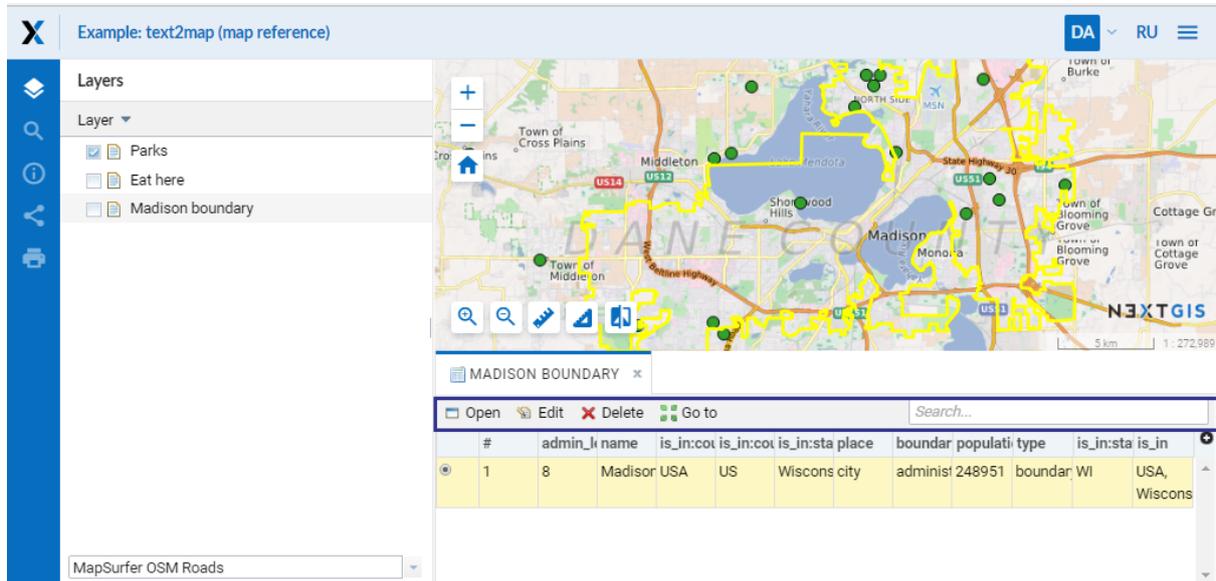


Fig. 4.10: Actions for the selected record in feature table.

4.5 Update resource

To edit a resource after login navigate to a child resource group (see item 4 in Fig. ??), where would be displayed resource types. Then select from child resources a resource with type vector layer and press the “Pencil” icon opposite the resource or select the layer and then select an action called “Update” in actions pane (see Fig. ??).

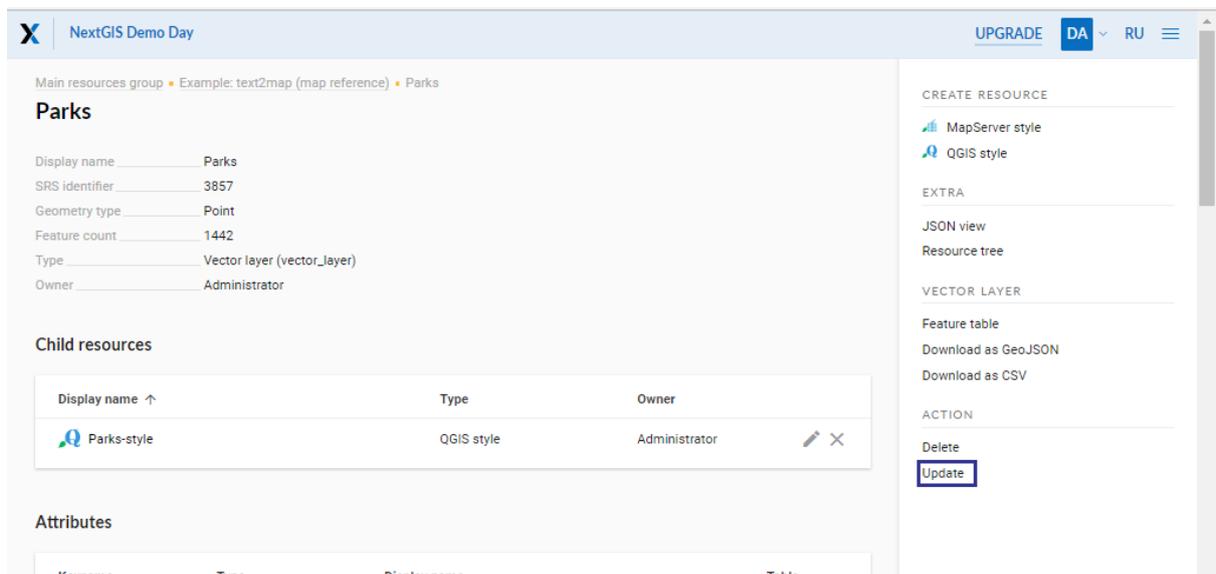


Fig. 4.11: Selection of “Update” action in action pane.

In opened window “Update resource” (see Fig. ??) you can edit parent of the selected resource, add description, metadata and attributes of the resource.

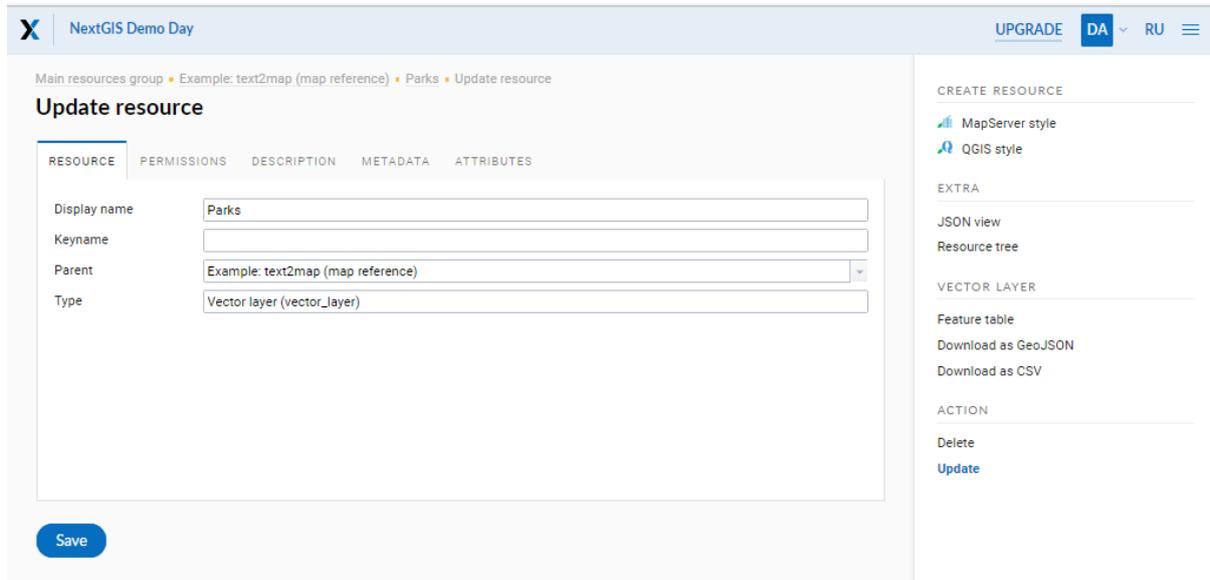


Fig. 4.12: “Update resource” window.

On the first tab “Resource” you can edit the next fields:

1. Display name (you can change the resource’s name)
2. Keyname
3. Parent (you can change the resource group through moving the resource)
4. Type

You can move resources from one resource group to another after their creation too. To do it press Parent drop down menu and select resource group to move the resource to in “Select resource” window (see Fig. ??). Then press OK and “Save” button.

If the resource is moved successfully, the information about it appears in a new resource group and is replaced from the previous one.

The third tab “Description” allows to edit or delete a text or to add a new text and to save it after pressing “Save” button:

The fourth tab “Metadata” allows to add and delete metadata, and to display them in a table using “Add” (Text, Integer, Float) and “Remove” operations:

The table contains three columns:

1. Key. It allows to describe metadata features (author, date, version etc.)
2. Type: Text, Integer, Float
3. Value. Value corresponds key type

The fifth tab “Attributes” contains a table with vector layer attributes (see Fig. ??).

- Tick in “FT” column means that the attribute is displayed in the identification window.

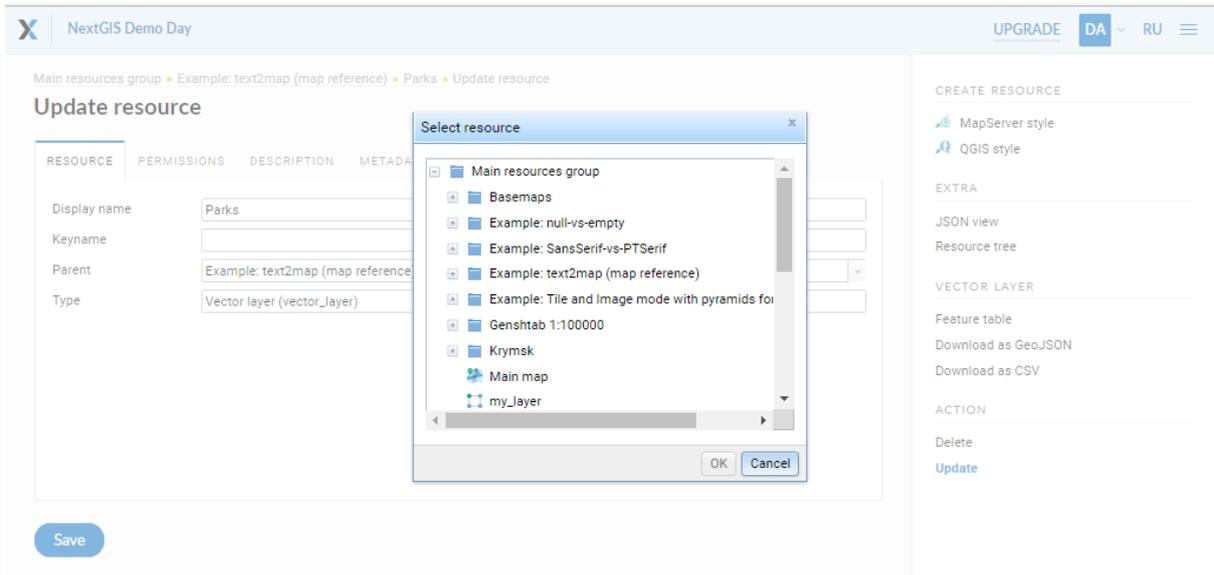


Fig. 4.13: "Select resource" window.

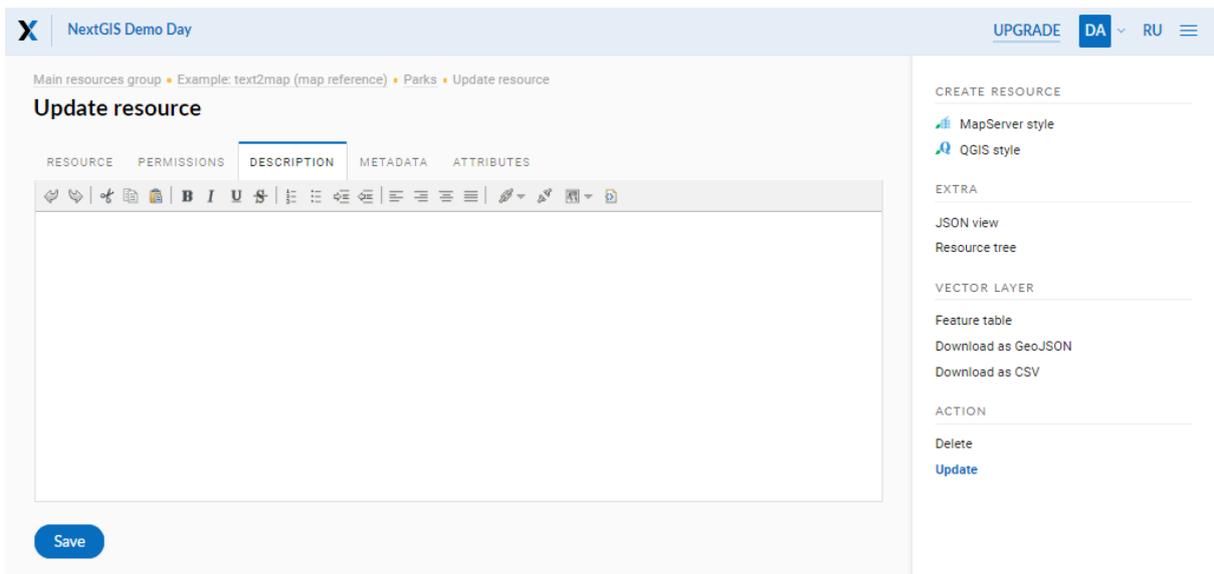


Fig. 4.14: "Description" tab.

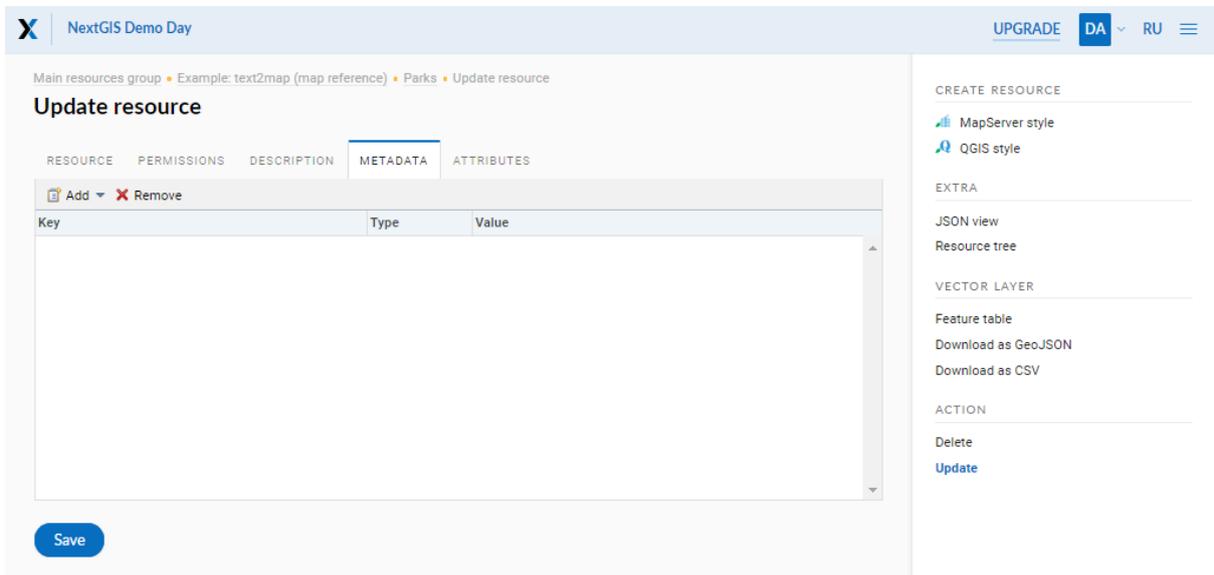


Fig. 4.15: “Metadata” tab.

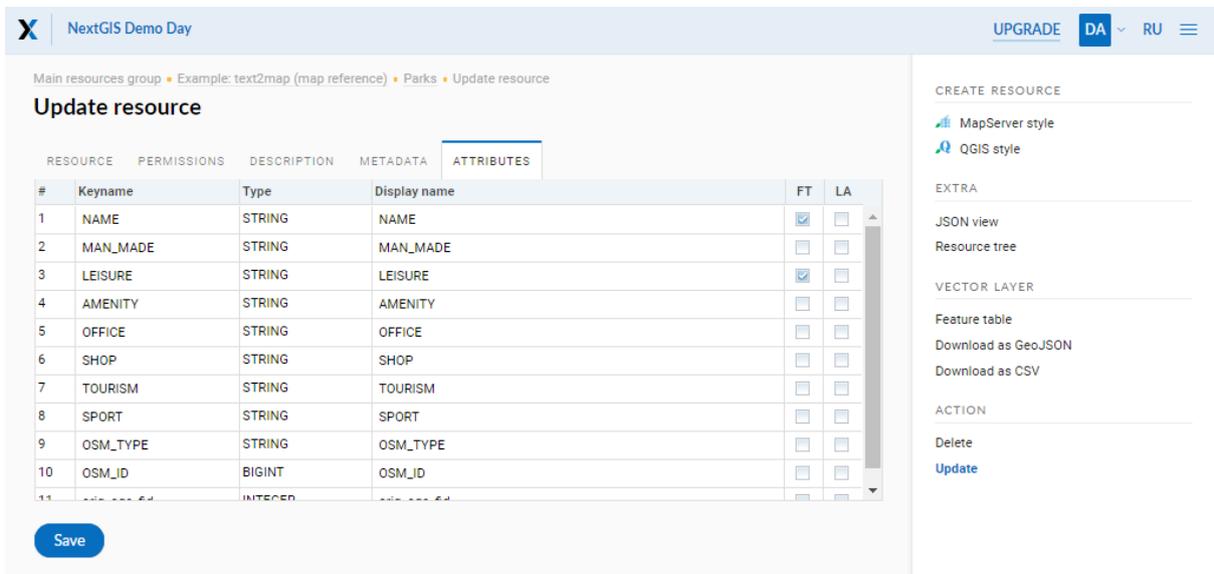


Fig. 4.16: “Attributes” tab.

- Tick in “LA” column means that the attribute gives its name during the identification and forming of the tabs list.

For each field name you can set the corresponding pseudonym to use it for display in the identification window instead of the name.

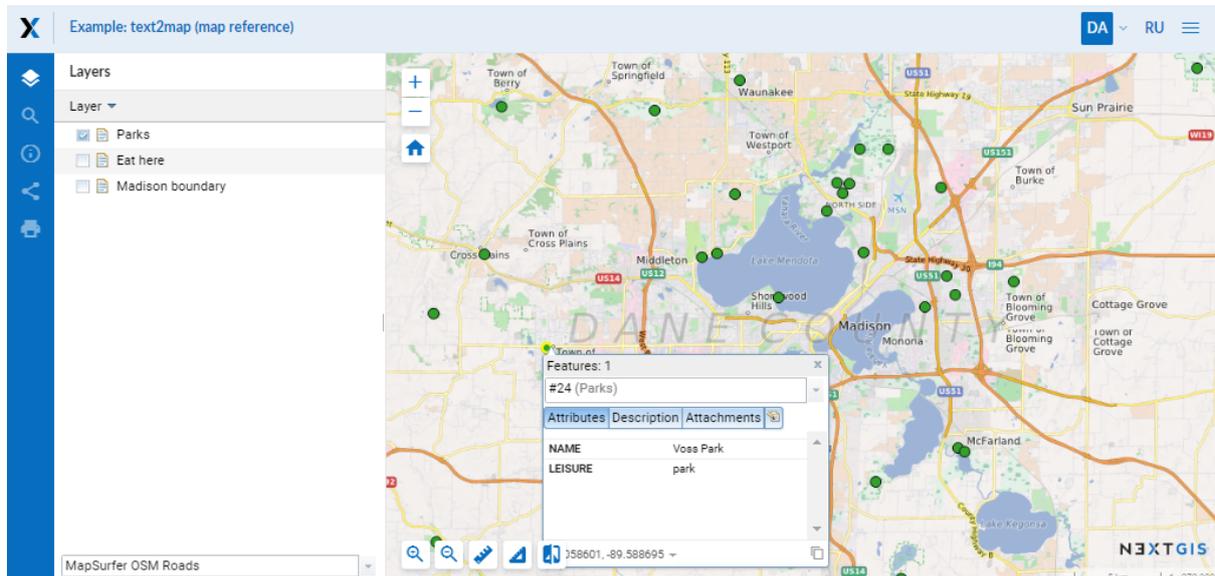


Fig. 4.17: The identification window.

4.6 Delete resource

Web GIS allows to delete uploaded data through deleting of the corresponding resources.

To delete the resource after login navigate to a child resource group (see item 4 in Fig. ??), where would be displayed resource types. Then select from child resources a resource with type vector layer and press the “Cross” icon opposite the resource or select the layer and then select an action called “Delete” in actions pane (see Fig. ??).

In the opened “Delete resource” window (see Fig. ??) you need to tick “Confirm deletion of the resource” and press “Delete” button.

If the resource was deleted successfully, the information about it disappear in the corresponding resource group.

4.7 Data export to CSV and GeoJSON formats

Web GIS allows to download/export data in CSV and GeoJSON formats.

To download data after login navigate to a child resource group (see item 4 in Fig. ??), where would be displayed resource types. Then select from child resources a resource with type vector layer or PostGIS layer you need to export and select an action called “Download as GeoJSON” or “Download as CSV” in actions pane “Vector layer” (see Fig. ??).

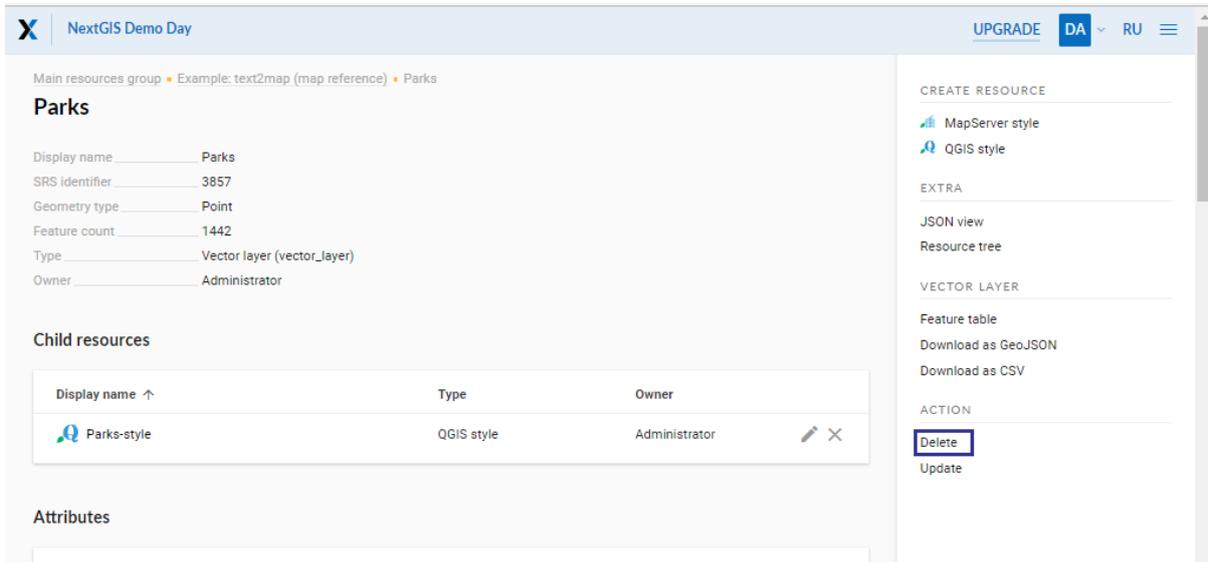


Fig. 4.18: Selection of “Delete” action in action pane

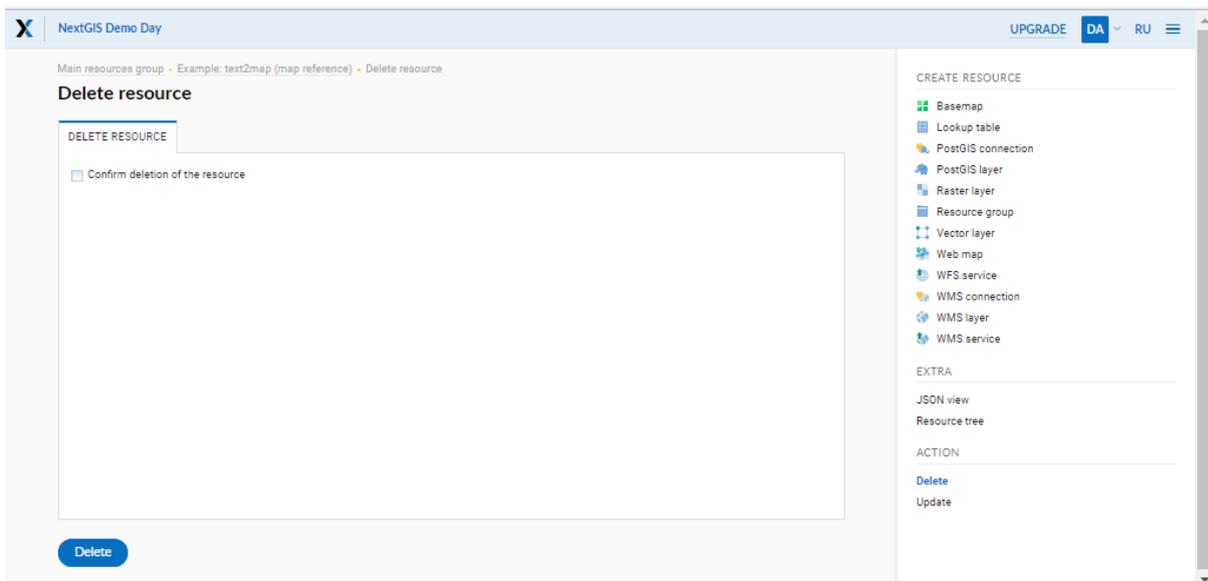


Fig. 4.19: Delete resource.

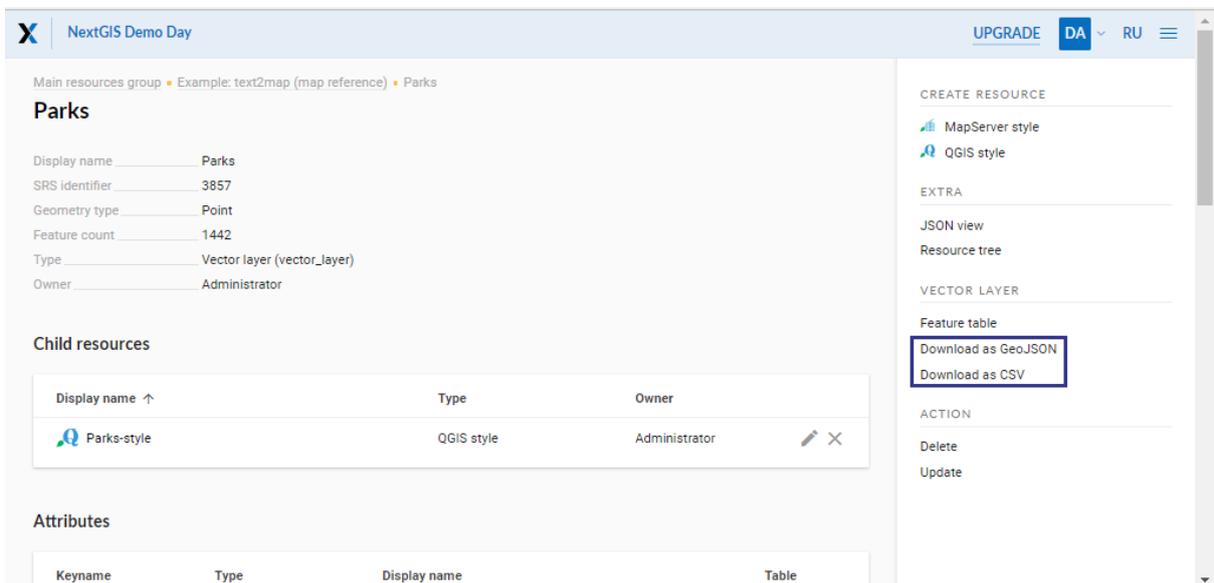


Fig. 4.20: Data export to CSV and GeoJSON formats.

ADDING RESOURCES

Layer is one of the main components of NextGIS Web software. Layer is a raster image or a vector file (table from database). To join layers on a map you need to set a style (or style set) to display a layer.

Styles may be set only for vector layers.

Interface for adding of PostGIS layers, vector and raster layers is practically the same. Firstly you provide layer parameters and then add a style.

5.1 Raster layer

To add a raster layer navigate to a group where you want to create it. In actions pane “Create resource” click “Raster layer” (see Fig. ??).

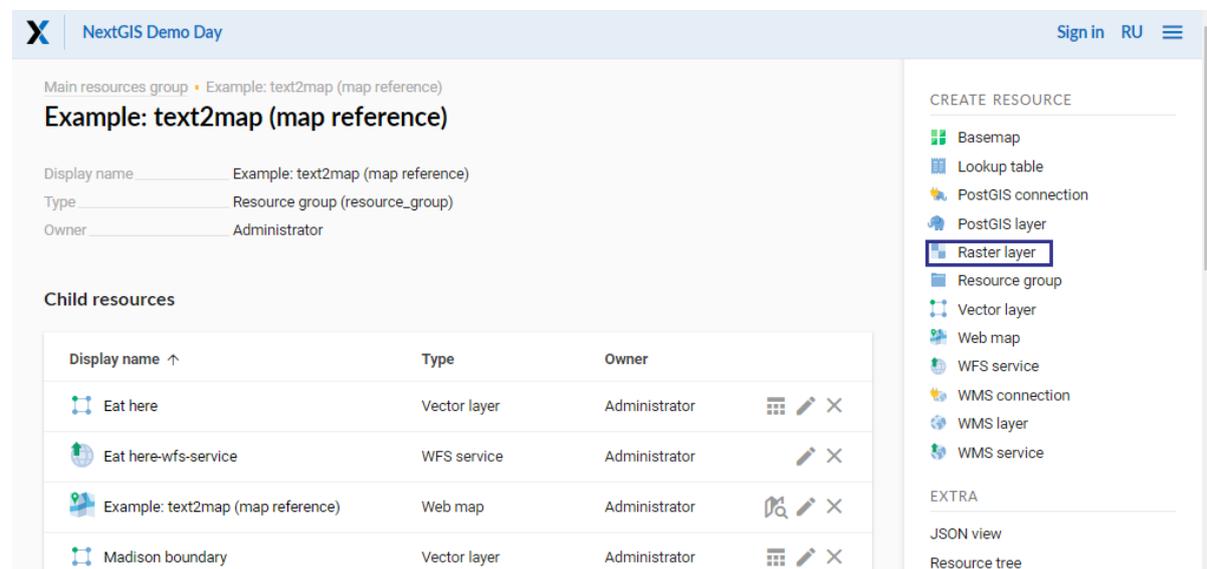


Fig. 5.1: Selection of “Raster layer” action.

Create resource dialog for raster layer will open and will look like Fig. ??.

Enter display name that will be visible in administrator interface and in map layer tree.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

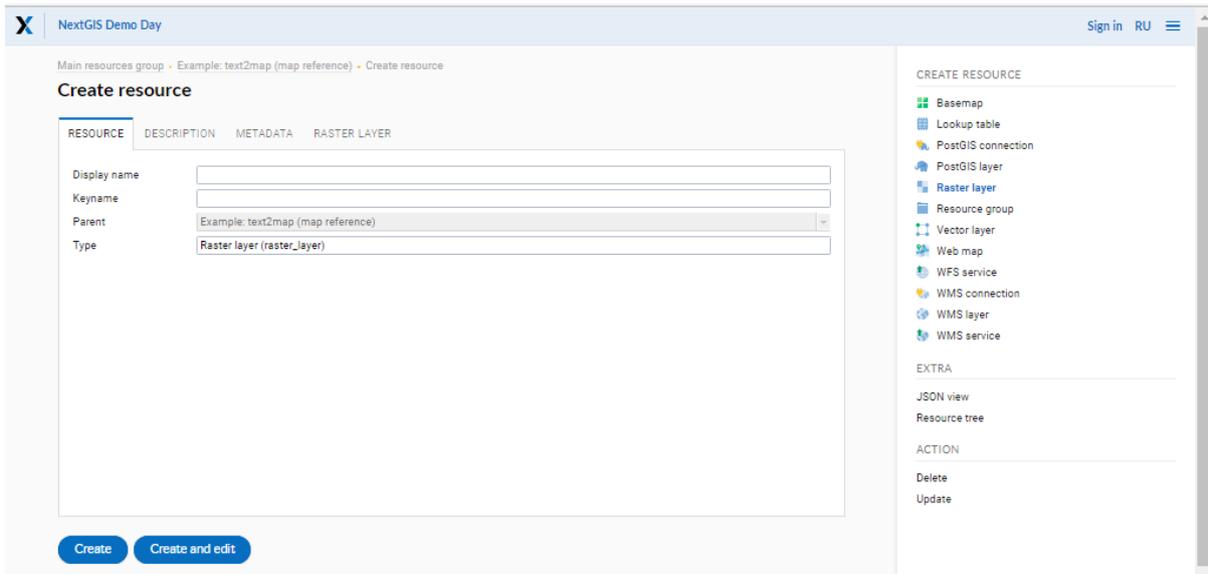


Fig. 5.2: Create resource dialog for raster layer.

Switch from “Resource” tab to “Raster layer” tab, which is presented on Fig. ??.

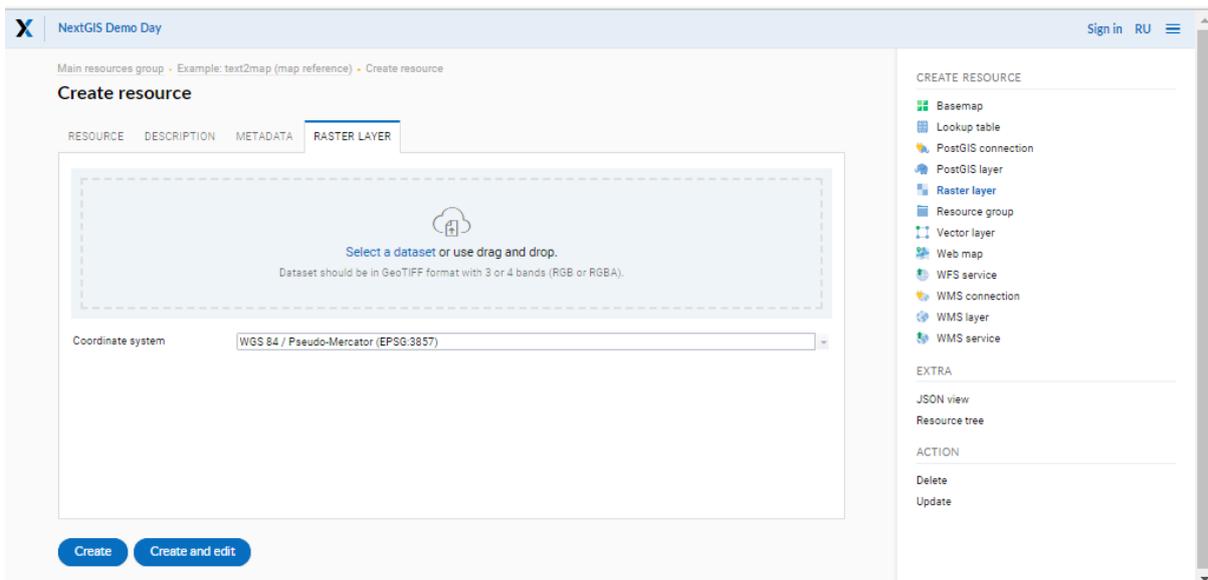


Fig. 5.3: Raster layer tab with button for upload of raster file.

Here specify a coordinate system the raster will be reprojected to (by default there is only WGS84 / Pseudo Mercator (EPSG:3857)) and select a file.

Note: The file should be in GeoTIFF format with 3 or 4 bands (RGB or RGBA).

After a file is successfully uploaded you need to create a style (if it was not create automatically). When creating a map (for more information see subsection *Creation of web map* (page ??)) you can add a raster to a map by selecting a raster and its style.

5.1.1 Raster layer with transparency (clip or alpha channel)

Most of utilities does not create alpha channel and only add a NoData value. To transform NoData value to alpha channel use a command line utility **gdalwarp**. Here is an example of this command.

```
gdalwarp -t_srs EPSG:3857 -multi -dstalpha -dstnodata none -wo \
"UNIFIED_SRC_NODATA=YES" -co COMPRESS=JPEG \
d:\temp\o\ast_20010730_010043_rgb.tif d:\temp\o\ast_20010730_010043_rgba.
↪tif
```

Tip: NextGIS Manager simplifies this process. Software has an option to upload a raster to NextGIS Web and cut using alpha channel.

5.2 Vector layer from file

To add a vector layer navigate to a group where you want to create it. In actions pane “Create resource” click “Vector layer” (see Fig. ??).

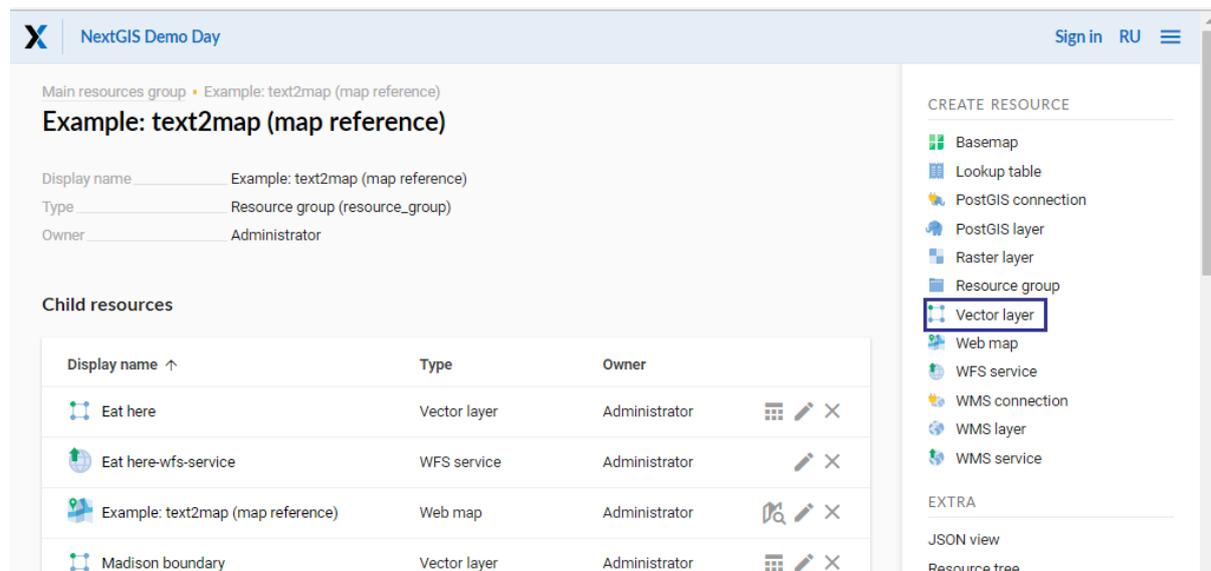


Fig. 5.4: Selection of “Vector layer” action.

Create resource dialog for vector layer will open and will look like Fig. ??.

Enter display name that will be visible in administrator interface and in map layer tree.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “Vector layer tab”, which is presented on Fig. ??.

Here specify a coordinate system the vector data will be reprojected to (by default there is only WGS84 / Pseudo Mercator (EPSG:3857)), encoding type (UTF-8 or

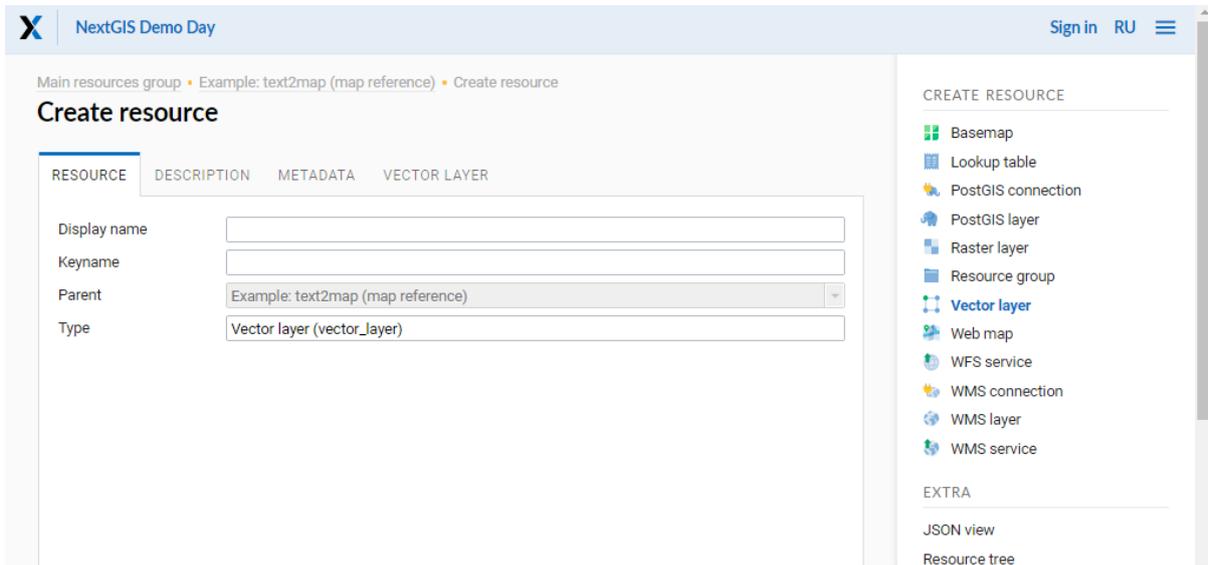


Fig. 5.5: Create resource dialog for vector layer.

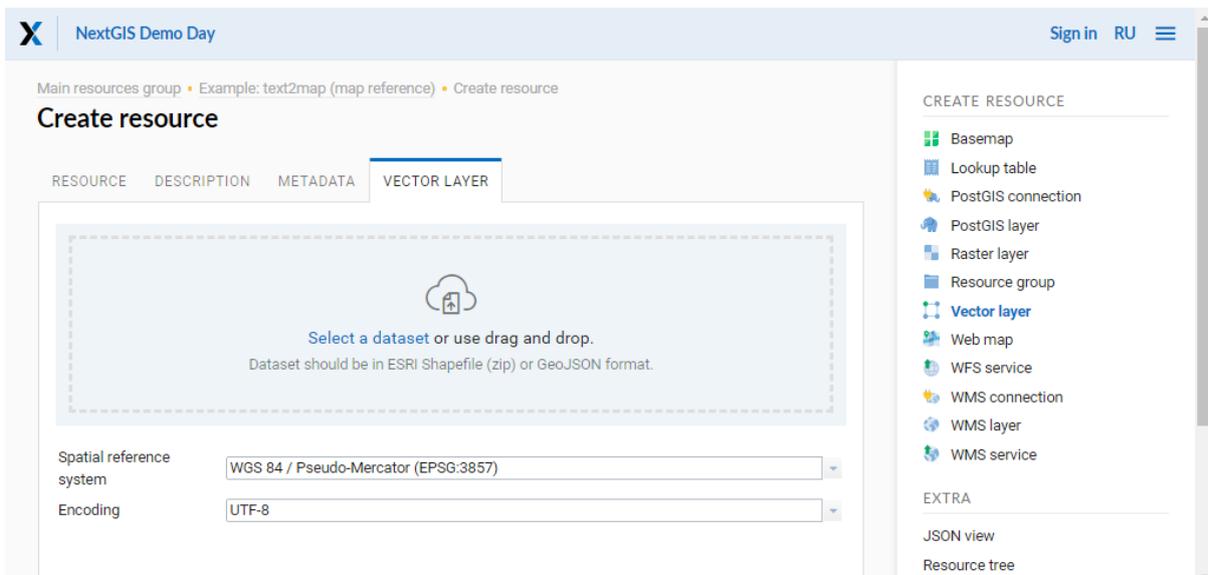


Fig. 5.6: Vector layer tab with button for upload of vector file.

Windows-1251; also you need to specify encoding that is used for attributes: if encoding is not set ESRI Shapefile should have a file with encoding description (.cpg extension), in case of GeoJSON encoding is always UTF-8) and select source file.

Source files could be in the following formats:

- ESRI Shapefile
- GeoJSON

Note: In case of ESRI Shapefile all components (dbf, shp, shx, prj and other files) should be compressed to a zip-archive. Shapefile should have UTF-8 or Windows-1251 encoding.

Warning: If you upload data through web-interface, do not use EPSG:3857. Use EPSG:4326 or other coordinate systems (EPSG:3857 mentioned on Vector layer tab is a storage CRS not related to data CRS).

Output file should not have invalid geometries (QGIS tool should output an empty list of invalid geometries), dates should not have NULL values, there should not be attribute names: *id (ID)*, *geom(GEOM)*.

Special restriction for WFS protocol: attribute names should begin only with letter or (), next allowed symbols in name is letters, digits, (-), (), (.).

In case there are multigeometries in the file, field type of the geometry should be multigeometry. In this case program-clients should convert field type before uploading. You can do it manually with ogr2ogr utility

```
ogr2ogr -nlt MULTIPOLYGON multipolygon_output.shp polygon_input.shp
```

Coordinate system should be recognized by GDAL (output of gdalinfo should contain coordinate system definition).

After a file is successfully uploaded you need to create a style. For more information about creation of styles see subsection *Vector layer styles* (page ??).

When creating a map (for more information see subsection. *Creation of web map* (page ??)) you can add a vector layer to a map by selecting its style.

Tip: NextGIS Manager simplifies this process. Software has an option to upload of vector files in different formats to NextGIS Web without separate archiving.

5.3 Vector layer from PostGIS

To add a vector layer from database PostgreSQL with PostGIS extension you need to create a resource PostGIS connection. It is enough to create one connection. In actions pane "Create resource" click "PostGIS connection" (see Fig. ??).

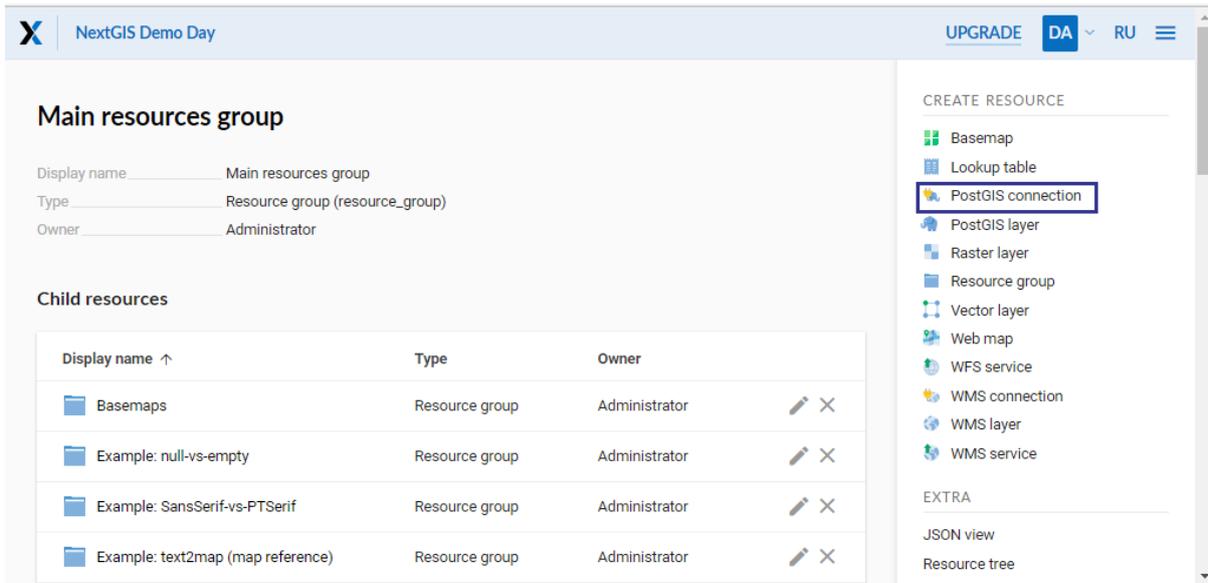


Fig. 5.7: Selection of “PostGIS connection” action.

Create PostGIS connection dialog is shown on Fig. ??

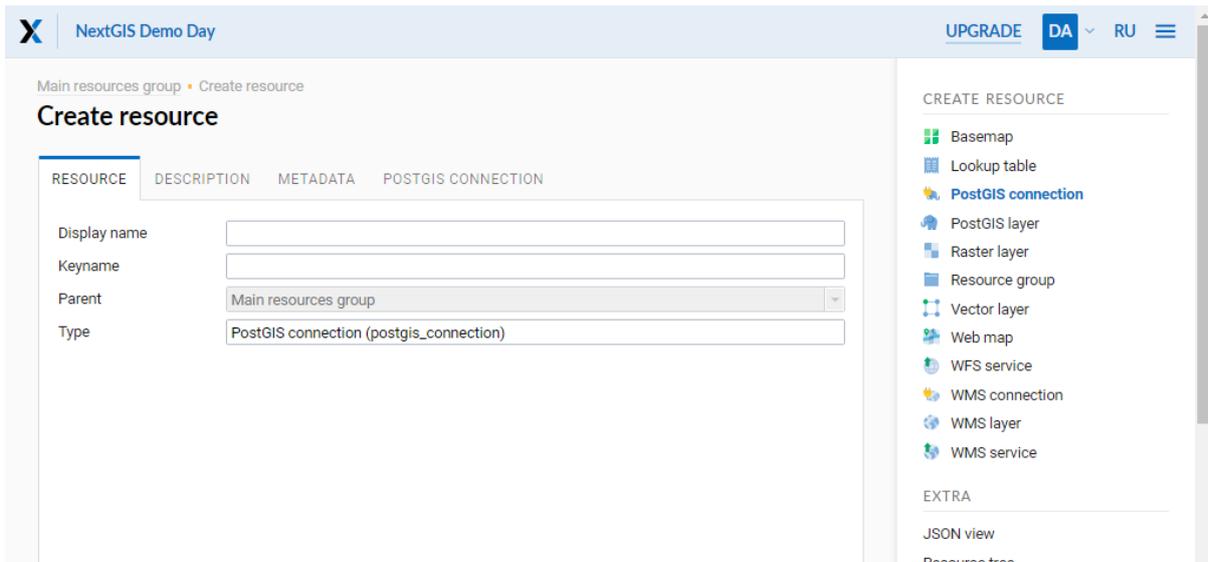


Fig. 5.8: Create resource dialog for PostGIS connection.

Enter display name that will be visible in administrator interface. Do not confuse this name with a name of layers in a database.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” to “PostGIS connection” tab, which is presented on Fig. ??.

Here enter PostGIS database connection parameters to connect data for display.

Then you can add single PostGIS layers. Navigate to a group where you want create layers and in actions pane “Create resource” select “PostGIS layer” (see

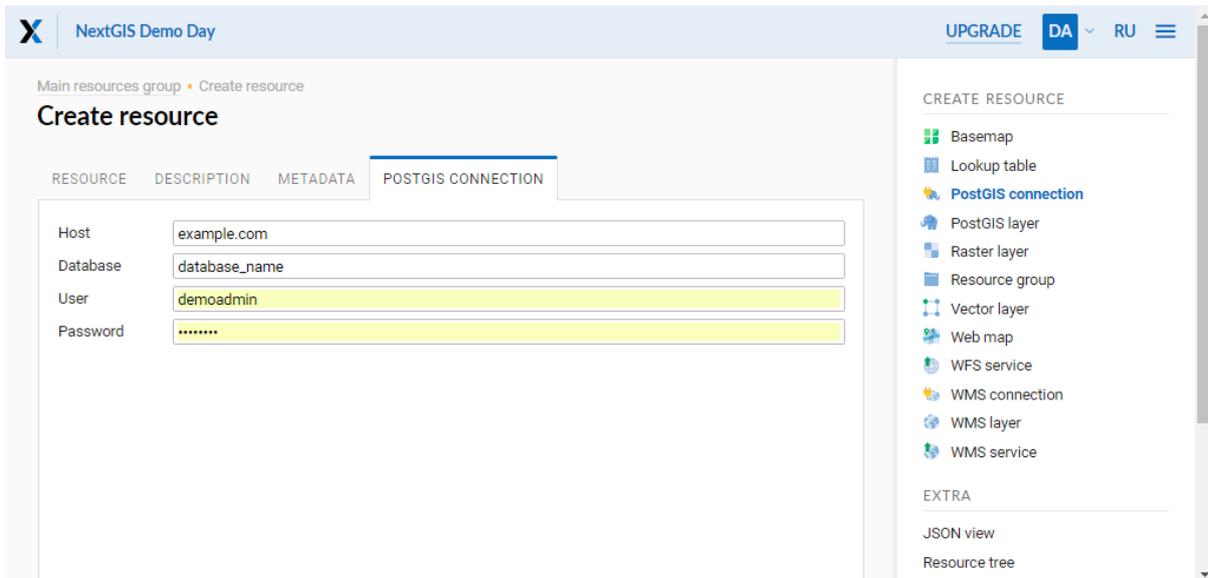


Fig. 5.9: PostGIS connection tab of Create resource dialog.

Fig. ??).

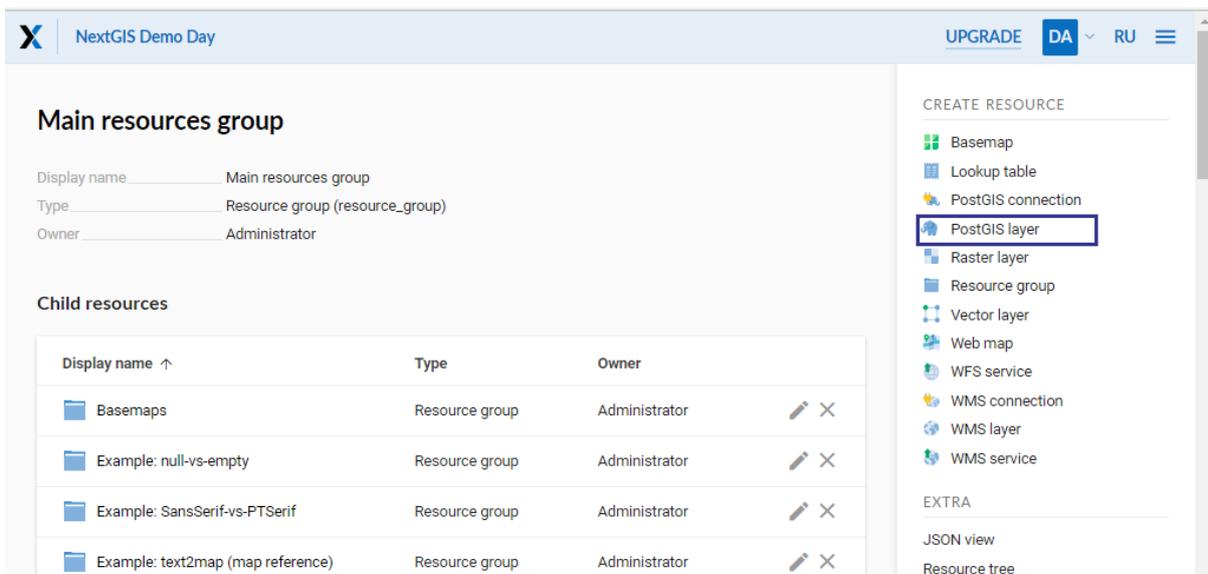


Fig. 5.10: Selection of “PostGIS layer” action.

Create resource dialog for PostGIS layer is presented on Fig. ??

Enter display name that will be visible in administrator interface and in map layer tree.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “PostGIS layer” tab, which is presented on Fig. ??.

Then perform the following steps:

1. From a dropdown list select a database connection (creation of a connection is described above).

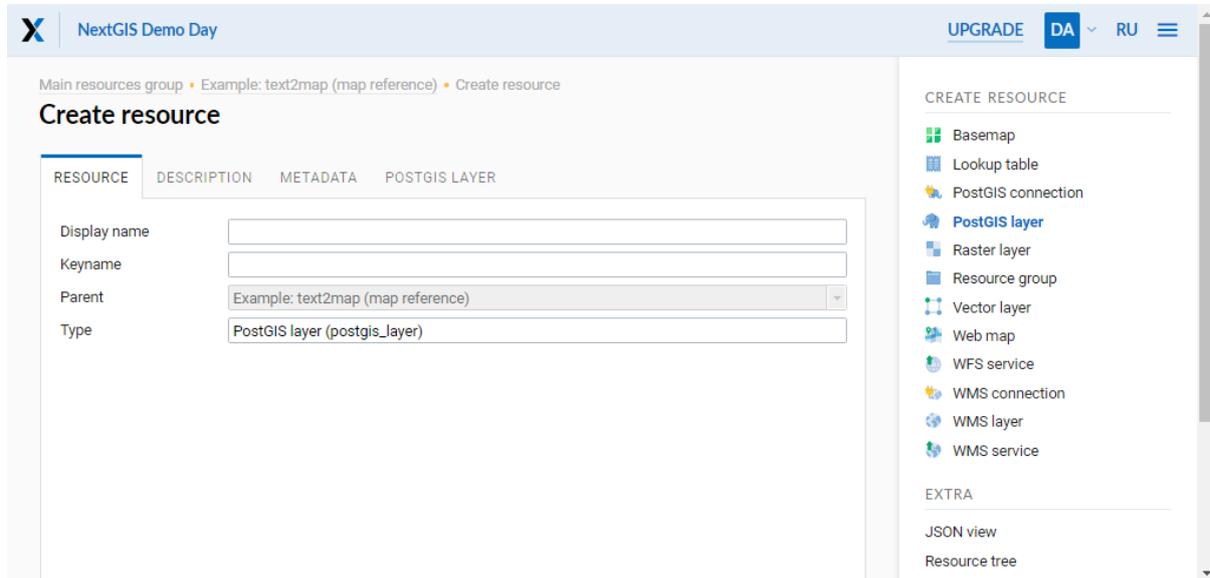


Fig. 5.11: Create resource dialog for PostGIS layer.

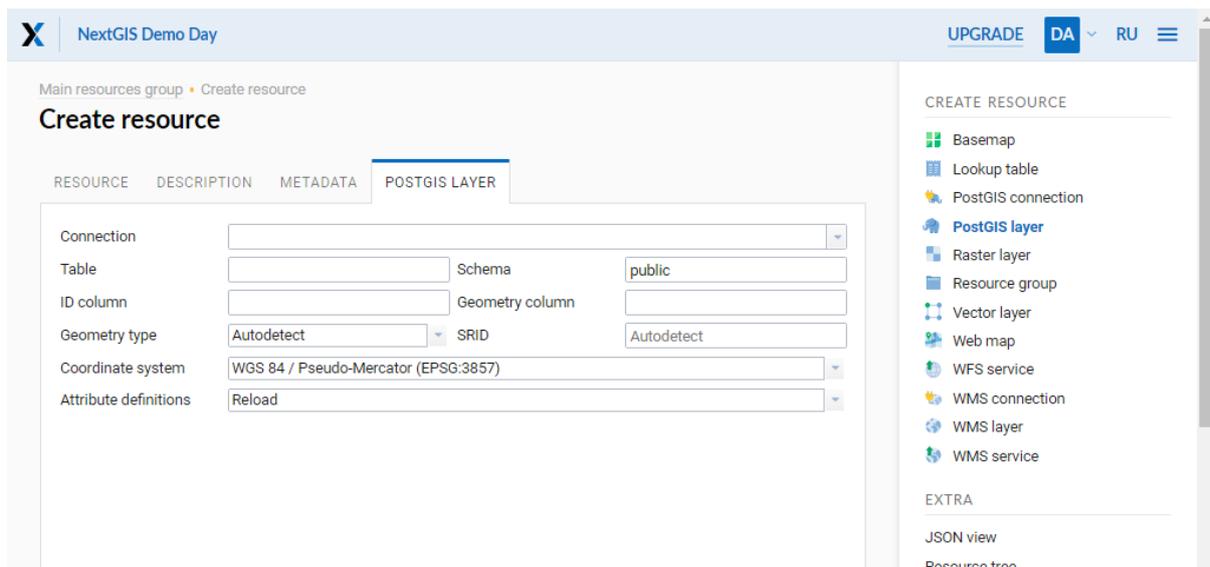


Fig. 5.12: PostGIS layer tab of create resource dialog.

2. Enter a schema of a database where layer data is stored. Single database can store multiple schemas. Each schema contains tables and views. If there is only one schema its called public. For more information see **PostgreSQL DBMS** manual.
3. Enter Table name (PostGIS layer). You need to know names of tables and columns in your database. Display of tables and views is not a feature of NextGIS Web. To view them you can use: *NextGIS QGIS* or **PgAdmin** software.
4. Enter "ID column". When data is loaded into PostGIS using :program: NextGIS QGIS software an ogc_fid column is created. If data was loaded in another way the name of column may be different. An ID column should follow rules for data type: the value type should be a number (**numeric**) and it should be a primary key.
5. Enter "Geometry column" name (if data was loaded to PostGIS using **NextGIS QGIS** software usually a geometry column called wkb_geometry is created. If data is loaded in another way the name of column may be different).
6. Parameters "Geometry type", "Coordinate system", "Attribute definitions" and "SRID" are not required so you can use default values.

NextGIS Web software supports adding of tables with point, line and polygon geometries stored in a single geometry column. This is required for some specific datasets: e.g. if one table stores coordinates for parks as polygons and trash cans as points in a single table. In this case in NextGIS Web you need to add three different layers for each type of geometry and select appropriate geometry type in "Geometry type" parameter.

After layer is created you need to set a label attribute to display labels. Navigate to layer edit dialog and set a checkbox for the required field in "Label attribute" column.

If structure of a database has changed (column names, column types, number of columns, table names etc.) you need to update attribute definitions in layer properties. To perform changes select in actions pane : "Update" and then on "PostGIS layer" tab change "Attribute definitions" to "Reload" and click "Save".

5.3.1 PostGIS layer troubleshooting

You created a connection and trying to create a PostGIS layer based on it and getting errors.

If you get:

1. Cannot connect to the database!

Check if the database is available, is it up, do you have right credentials? You can all these using pgAdmin or QGIS.

Note that databases go up and down and credentials change.

5.3.2 Create layers with conditions

In **NextGIS Web** you can not define queries using a WHERE SQL expression. This provides additional security (prevention of SQL Injection attack). To provide query capability you need to create views with appropriate queries.

To do this connect to PostgreSQL/PostGIS database using **pgAdminIII**, then navigate to data schema where you want to create a view, right click tree item "Views" and select "New view" (see item 1 in Fig. ??). Also you can right click on schema name and select "New object" and then "New view". Enter the following information to create new view dialog:

1. View name («Properties» tab).
2. Data schema where to create a view («Properties» tab).
3. SQL query («Definition» tab).

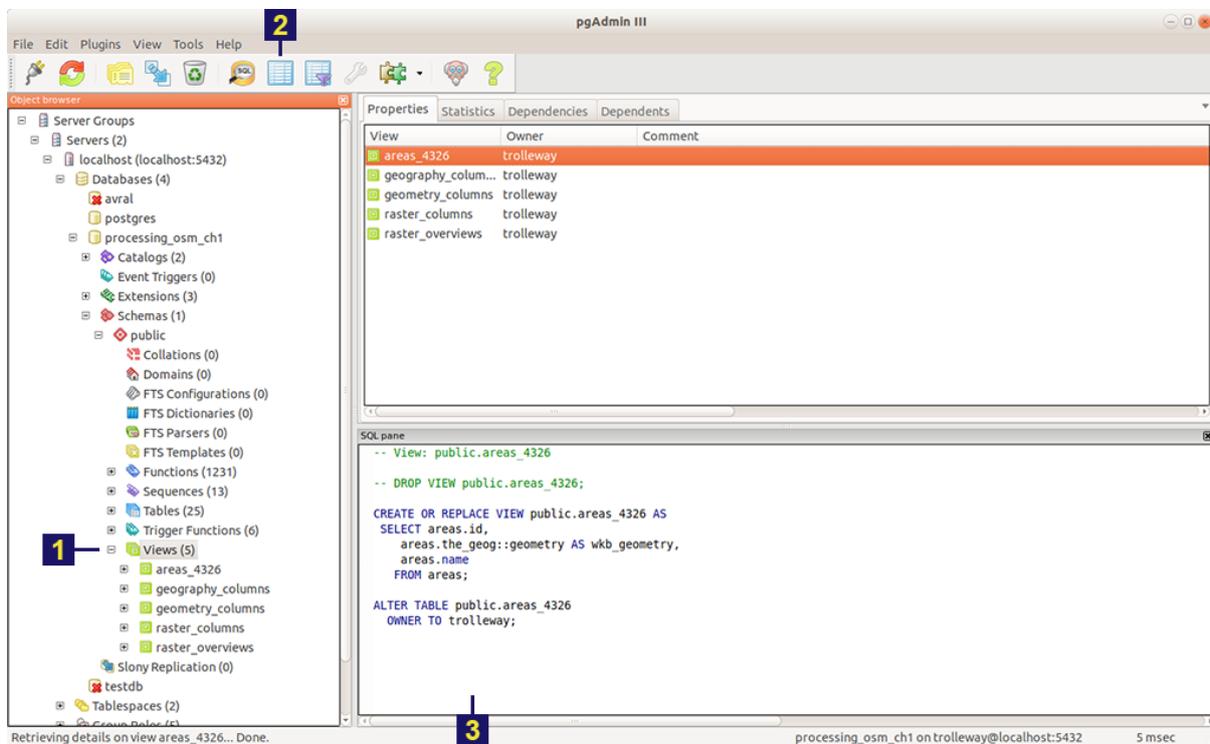


Fig. 5.13: Main dialog of **pgAdminIII** software.

The numbers indicate: 1. - Database items tree; 2 - a button for table open (is active if a table is selected in tree); 3 - SQL query for view.

After that you can display a view to check if query is correct without closing **pgAdminIII** (see item 2 in Fig. ??).

5.4 WMS layer

NextGIS Web is a WMS client. To connect a WMS layer you need to know its address. WMS server should be able to serve it using a coordinate system EPSG:3857. You can check for this coordinate system presence by making a GetCapabilities request to a server and examining the response. For example a

WMS layer provided by Geofabrik (GetCapabilities), responds in EPSG:4326 and EPSG:900913. While EPSG:900913 and EPSG:3857 are technically the same, NGW requests data in 3857 and server does not support for that coordinate system.

To add WMS layer you need to create a resource called WMS connection. You may create a single connection for many layers. In actions pane “Create resource” click “WMS connection” (see Fig. ??).

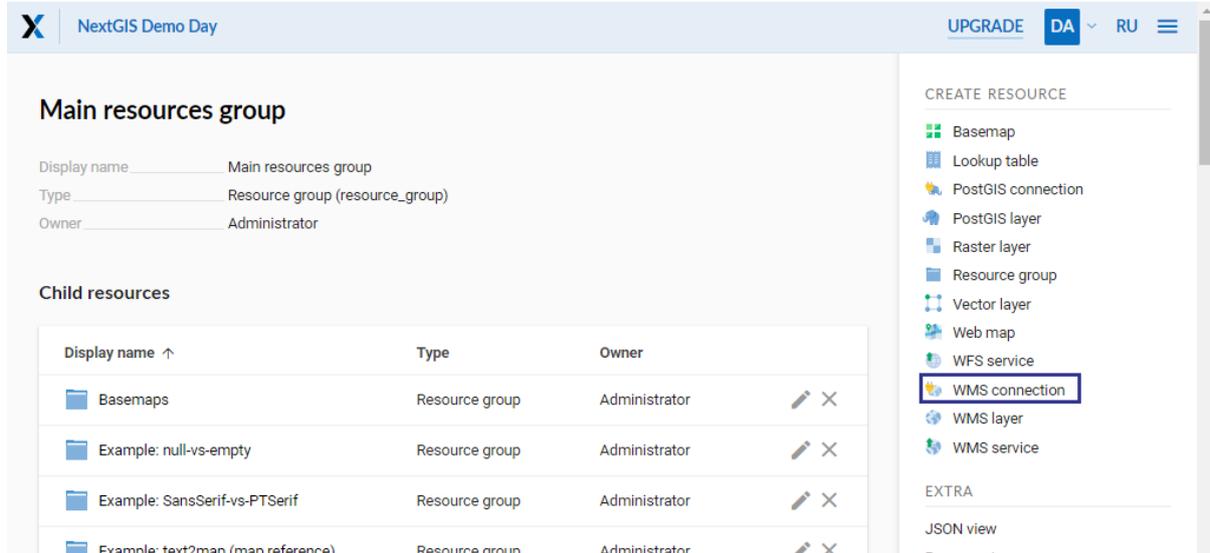


Fig. 5.14: Selection of “WMS connection” action.

Create resource dialog for WMS connection is presented on Fig. ??.

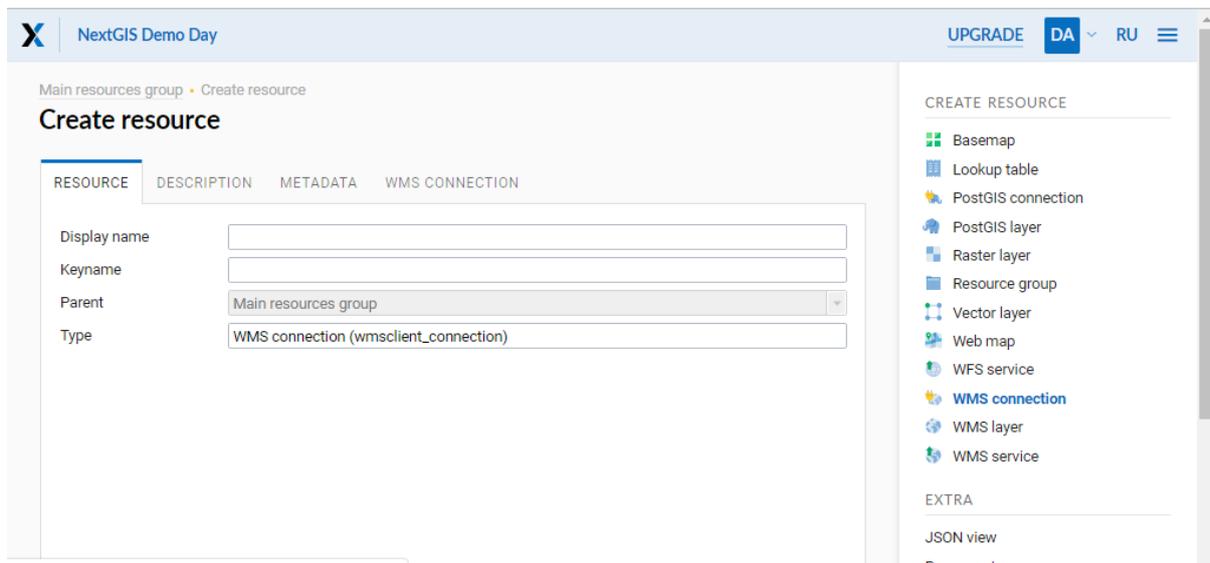


Fig. 5.15: Create resource dialog for WMS connection.

Enter display name that will be visible in administrator interface. Do not confuse this name with a name of layers in a database.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “WMS connection” tab, which is presented on Fig. ??.

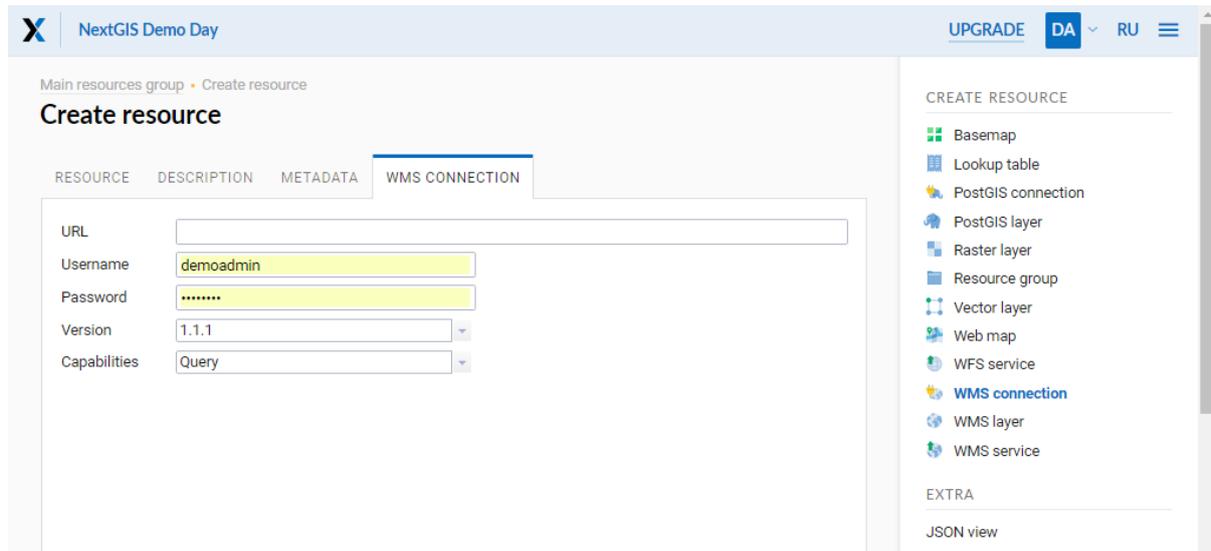


Fig. 5.16: WMS connection tab of Create resource dialog.

Here enter WMS server connection parameters from which you want to display data.

Then you can add single WMS layers. Navigate to a group where you want create WMS layers and in actions pane “Create resource” select “WMS layer” (see Fig. ??).

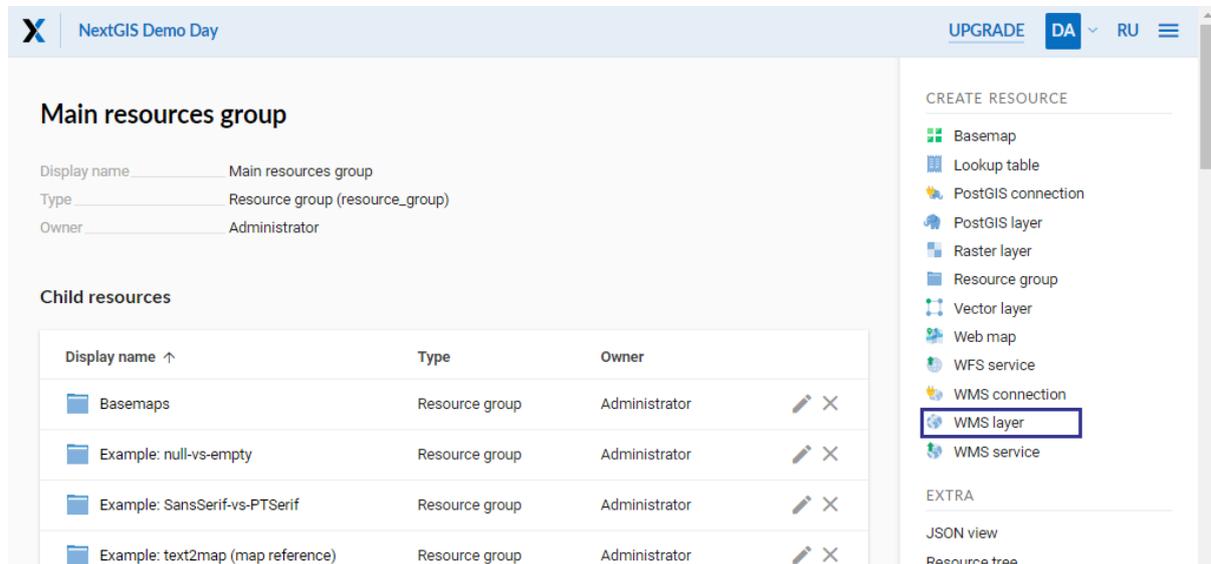


Fig. 5.17: Selection of “WMS layer” action.

Create resource dialog for WMS layer is presented Fig. ??.

Enter display name that will be visible in administrator interface and in map layer tree.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

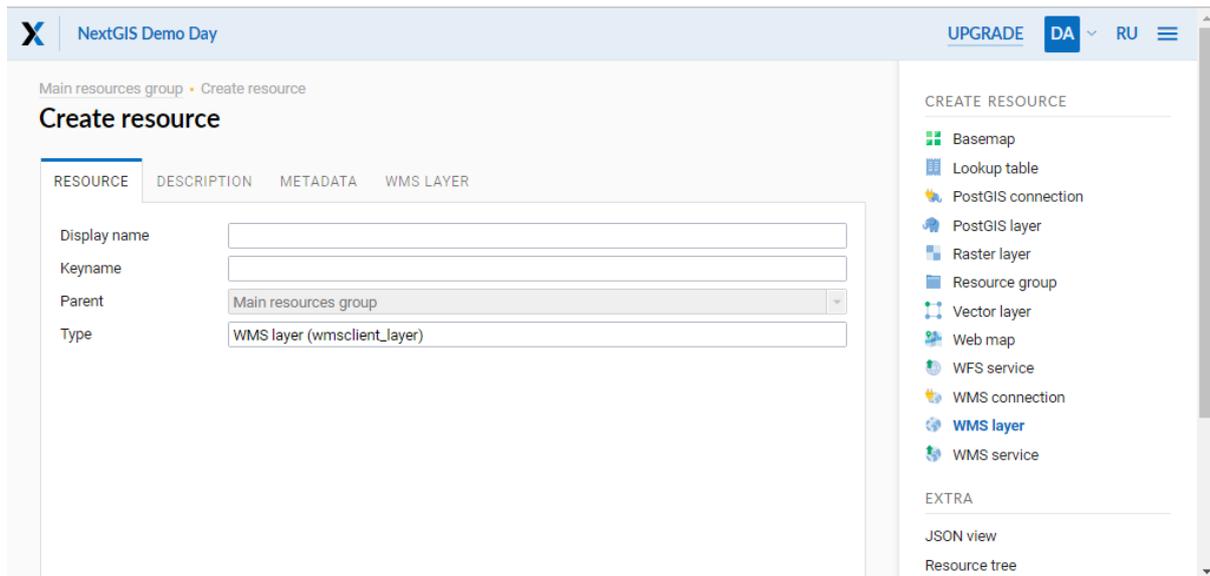


Fig. 5.18: Create resource dialog for WMS layer.

Switch from “Resource” tab to “WMS” tab, which is presented on Fig. ??.

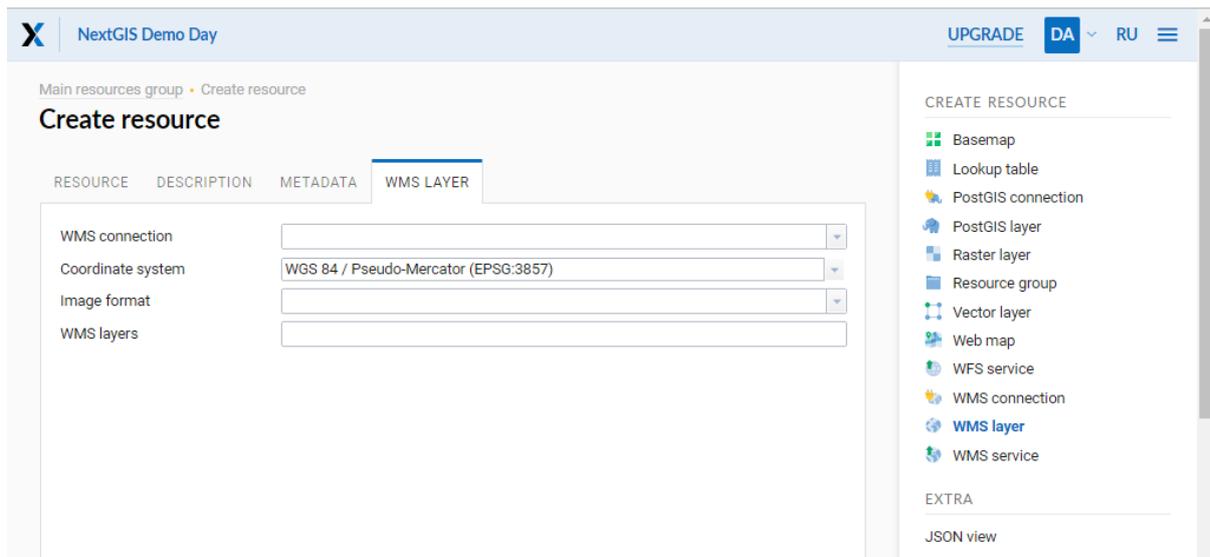


Fig. 5.19: WMS layer tab of Create resource dialog.

Then perform the following steps:

1. Select WMS connection that was created earlier.
2. Select coordinate system which to use for requests to WMS server (by default there are only WGS84 / Pseudo Mercator (EPSG:3857)).
3. If parameters are correct the parameter “Format” will display MIME-types list that are served by a server. Select an appropriate one.
4. If parameters are correct the parameter “WMS layers” will display a list of layers that are server by a server. Select required layers by clicking underlined names. You can select several layers.

Note: Parameters to add a WMS layer for Public cadastral map by Rosreestr:

URL <http://maps.rosreestr.ru/arcgis/services/Cadastre/CadastreWMS/MapServer/WmsServer?>

Supported versions of WMS protocol: 1.1.1, 1.3

Note: Identification requests to external WMS layers from Web maps are not supported yet.

5.5 WMS service

NextGIS Web software could perform as WMS server. This protocol is used to provide images for requested extent.

To deploy a WMS service you need to add a resource. To do it in actions pane “Create resource” click “WMS service” (see Fig. ??).

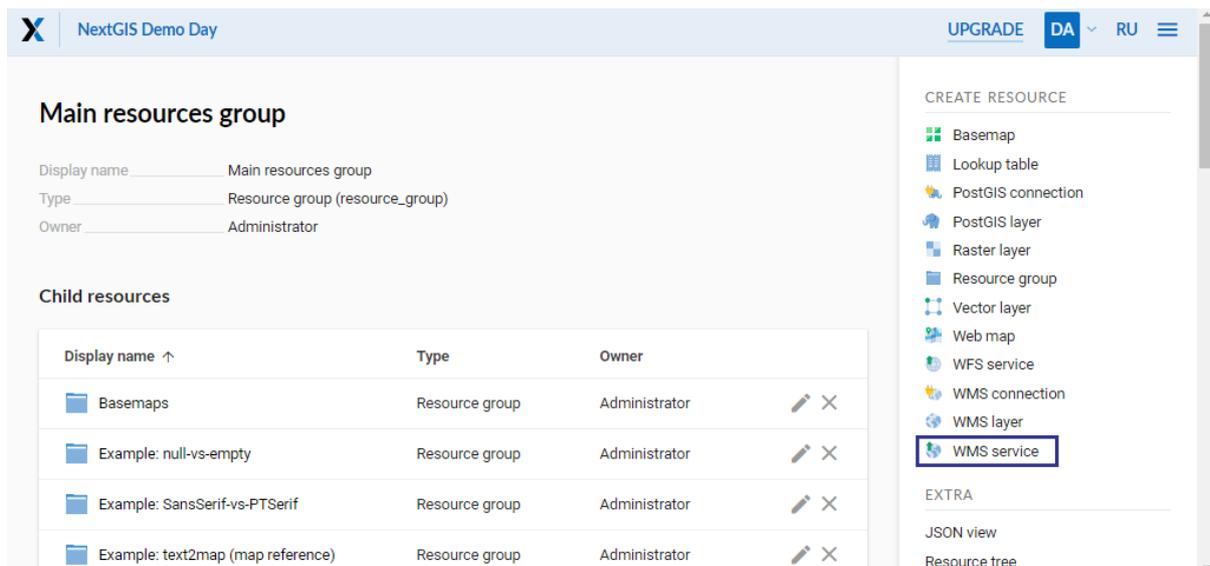


Fig. 5.20: Selection of “WMS service” action.

Create resource dialog for WMS service is presented on Fig. ??.

Enter display name that will be visible in administrator interface. Do not confuse this name with a name of layers in a database.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “WMS service” tab, which is presented on Fig. ??. Here add links to styles of required layers to a list (see (see Fig. ??) For each added style you should set a unique key. You can copy it from the name.

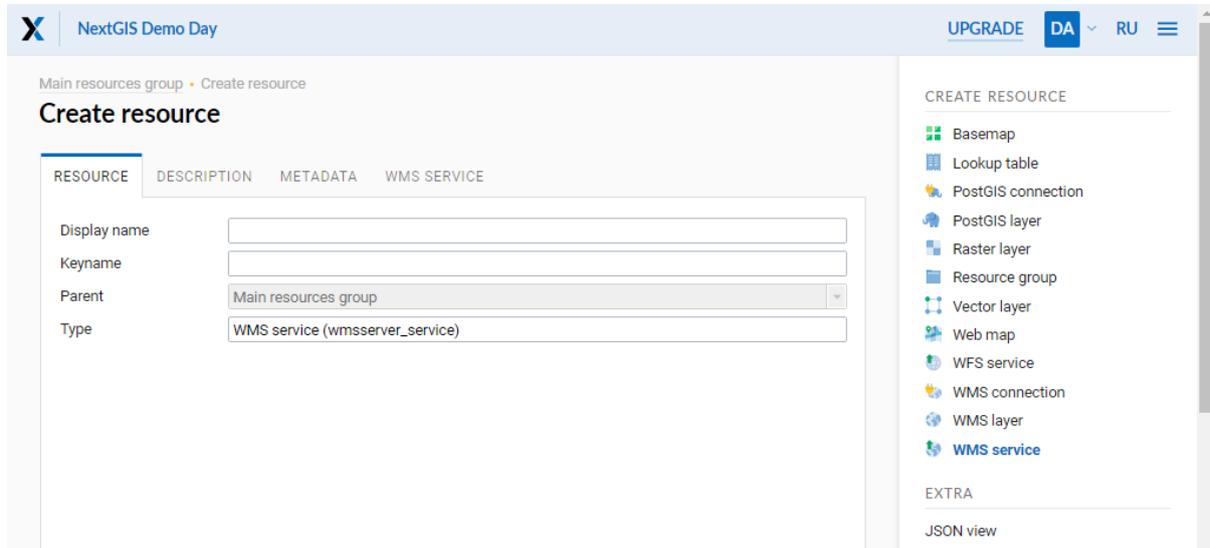


Fig. 5.21: Create resource dialog for WMS service.

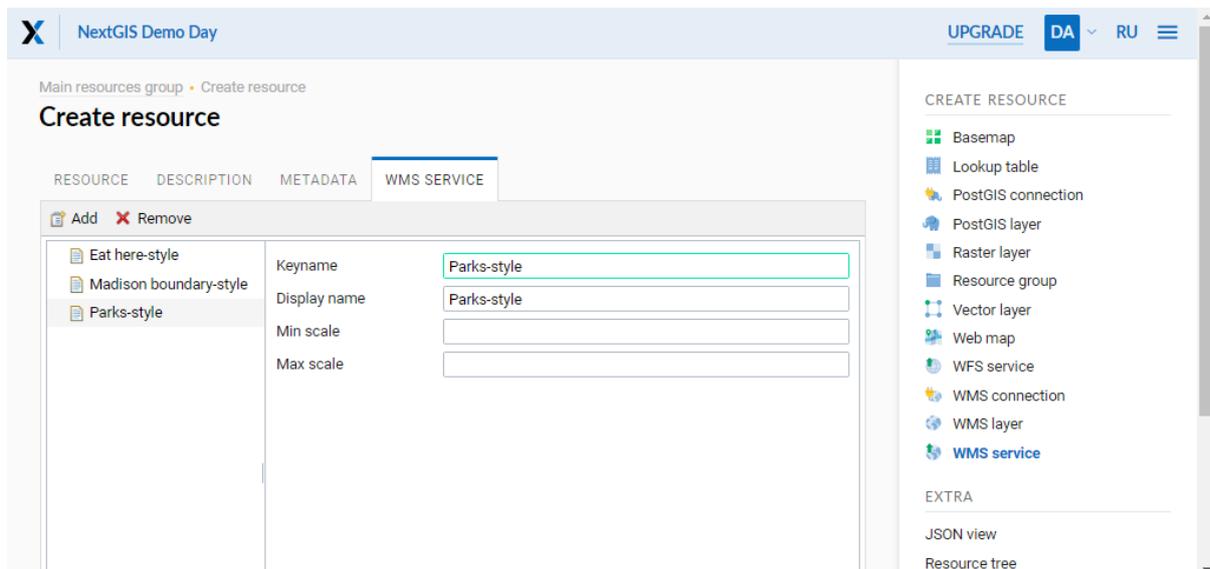


Fig. 5.22: WMS service tab of Create resource dialog.

After a resource is created you will see a message with WMS service URL which you can use in other software, e.g. **NextGIS QGIS** or **JOSM**. Then you need to set access permissions for WMS service (see section *Setting permissions* (page ??)).

NextGIS Web layer could be added to desktop, mobile and web gis in different ways.

5.5.1 WMS connection

NextGIS Web is a WMS server. Any WMS layers could be added to a software that supports WMS layers. You need to know WMS service URL. You can get in on WMS service properties page. Example:

```
http://demo.nextgis.ru/resource/60/wms?
```

5.5.2 Using WMS connection in GDAL

Single NextGIS Web layers could be added as WMS. To use them through GDAL utilities you need to create an XML file for required layer. You need to know an URL for WMS service to create that file. Enter these parameters to ServerUrl string in example below. The rest remains unchanged.

```
<GDAL_WMS>
  <Service name="WMS">
    <Version>1.1.1</Version>
    <ServerUrl>http://dev.nextgis.com/practice2/api/resource/85/wms?</
  <ServerUrl>
    <SRS>EPSG:3857</SRS>
    <ImageFormat>image/png</ImageFormat>
    <Layers>moscow_boundary_multipolygon</Layers>
    <Styles></Styles>
  </Service>
  <DataWindow>
    <UpperLeftX>-20037508.34</UpperLeftX>
    <UpperLeftY>20037508.34</UpperLeftY>
    <LowerRightX>20037508.34</LowerRightX>
    <LowerRightY>-20037508.34</LowerRightY>
    <SizeY>40075016</SizeY>
    <SizeX>40075016.857</SizeX>
  </DataWindow>
  <Projection>EPSG:3857</Projection>
  <BandsCount>3</BandsCount>
</GDAL_WMS>
```

If you need an image with transparency (alpha channel) set `<BandsCount>4</BandsCount>`

Gdal utility call example. The utility gets an image by WMS from NGW and saves it to a GeoTIFF format

```
$ gdal_translate -of "GTIFF" -outsize 1000 0 -projwin 4143247 7497160 \
4190083 7468902 ngw.xml test.tiff
```

5.5.3 Using TMS connection in GDAL

Single layers of NextGIS Web could be added as TMS. Create an XML file for required layer. To create this file you need the information about NGW address and a layer number (in the example: address - http://demo.nextgis.ru/ngw_kl, layer number - 5). Enter these parameters to ServerUrl string in example below. The rest remains unchanged.

```
<GDAL_WMS>
  <Service name="TMS">
    <ServerUrl>http://demo.nextgis.ru/api/component/render/tile?
      z=${z}&x=${x}&y=${y}&resource=5
    </ServerUrl>
  </Service>
  <DataWindow>
    <UpperLeftX>-20037508.34</UpperLeftX>
    <UpperLeftY>20037508.34</UpperLeftY>
    <LowerRightX>20037508.34</LowerRightX>
    <LowerRightY>-20037508.34</LowerRightY>
    <TileLevel>18</TileLevel>
    <TileCountX>1</TileCountX>
    <TileCountY>1</TileCountY>
    <YOrigin>top</YOrigin>
  </DataWindow>
  <Projection>EPSG:3857</Projection>
  <BlockSizeX>256</BlockSizeX>
  <BlockSizeY>256</BlockSizeY>
  <BandsCount>4</BandsCount>
  <Cache />
</GDAL_WMS>
```

5.6 WFS service

WFS layer setup is performed the same way as for WMS service but you add a layer instead of a style.

NextGIS Web can act as WFS server. Third party software could edit vector data on server using this protocol.

To deploy a WFS service you need to add a resource. To do it in actions pane "Create resource" click "WFS service" (see Fig. ??).

Create resource dialog for WFS service is presented on Fig. ??.

Enter display name that will be visible in administrator interface. Do not confuse this name with a name of layers in a database.

Field "Keyname" is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from "Resource" tab to "WFS service" tab, which is presented on Fig. ??. Here add links to styles of required layers to a list (see Fig. ??.) For each added style you should set a unique key. You can copy it from the name.

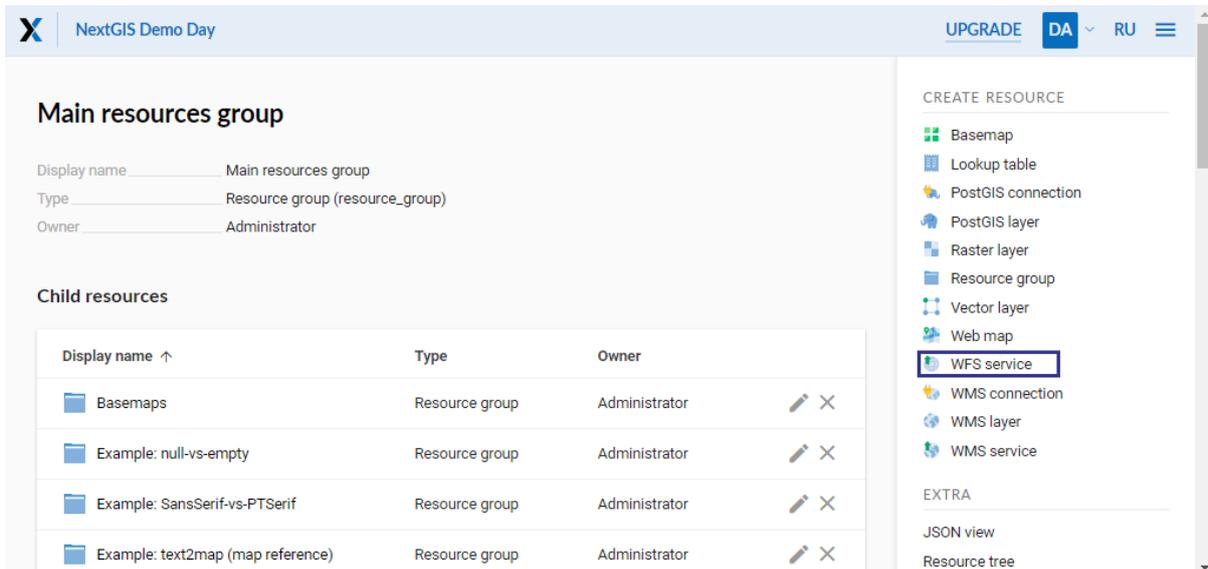


Fig. 5.23: Selection of “WFS service” action.

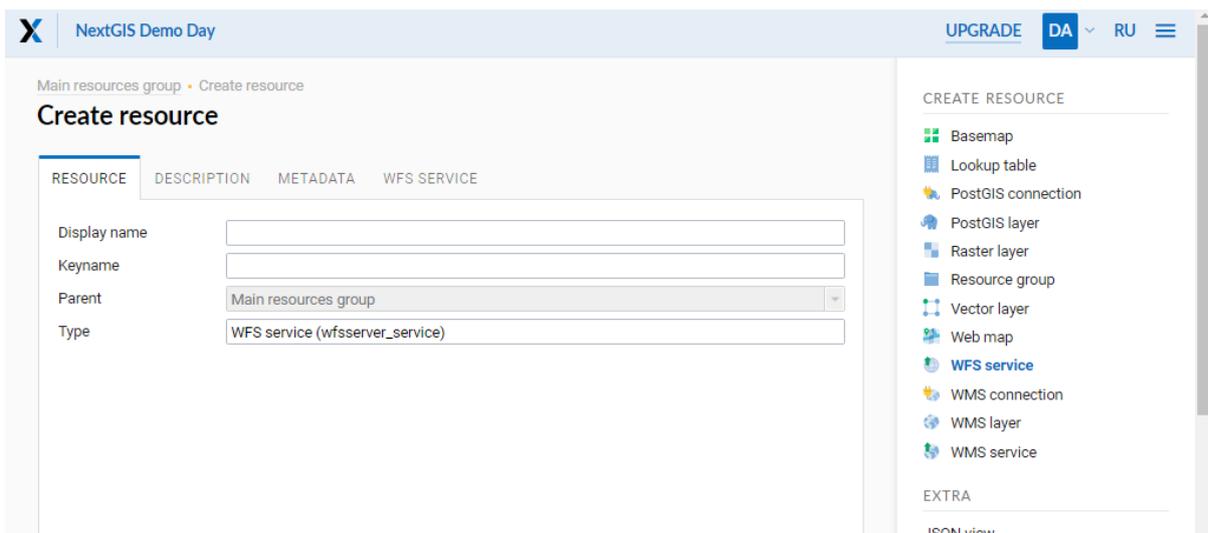


Fig. 5.24: Create resource dialog for WFS service.

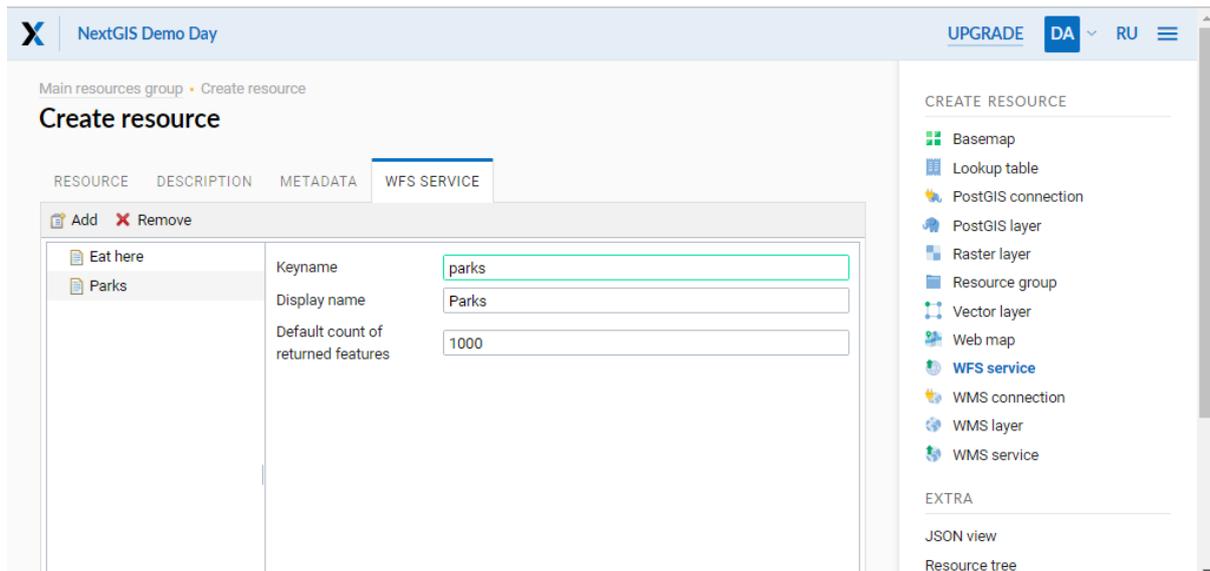


Fig. 5.25: WFS service tab of Create resource dialog.

For each layer you can set a limit for the number of features transferred at once. By default the value is 1000. If this parameter is empty the limit will be disabled and all features will be transferred to the client. But this could result in high load of a server and cause significant timeouts because of high volumes of transferred data.

After a resource is created you need to open it in administrator interface one more time. You will see a message with WFS service URL which you can use in other software, for example **NextGIS QGIS**.

Then you need to set access permissions for WFS service. See section *Setting permissions* (page ??).

5.7 Creation of a resource group

Resources could be joined to groups. For example you can join base layers to one group, satellite imagery to another group and thematic data to one more group etc.

Groups help organize layers in Control panel and help manage access permissions in a convenient way.

To create a resource group navigate to the group, where you want to create a new one (root group or another), and in actions pane "Create resource" click "Resource group" (see Fig. ??).

Create resource dialog for resource group is presented on Fig. ??.

In create resource dialog enter display name, that will be visible in administrator interface and in map layer tree, and then click "Create".

Field "Keyname" is optional.

You can also add resource description and metadata on the corresponding tabs.

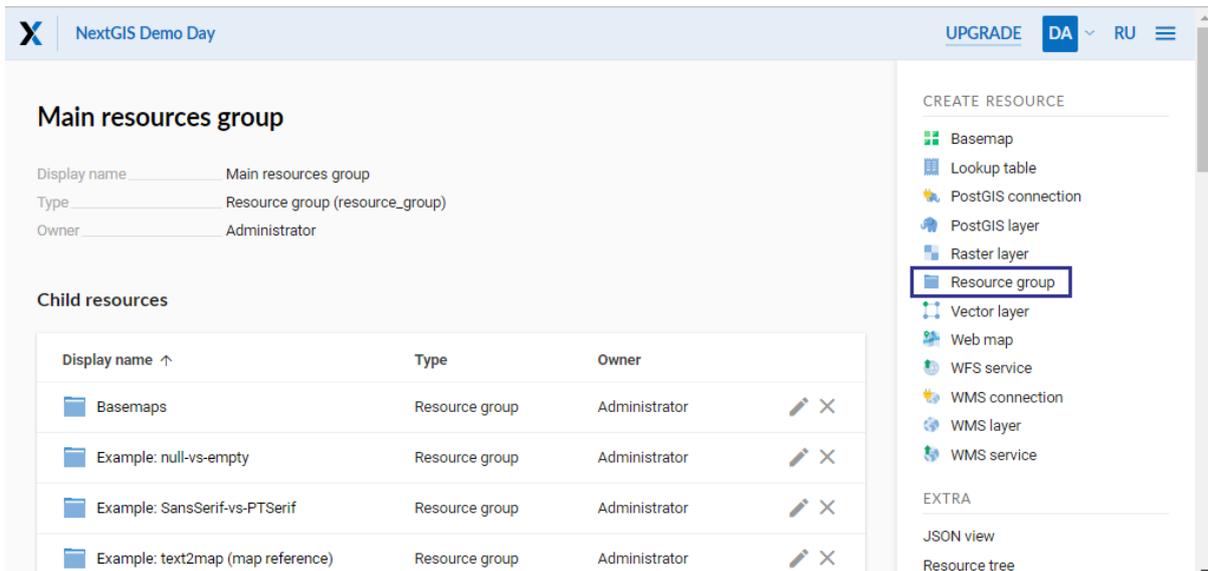


Fig. 5.26: Selection of “Resource group” action.

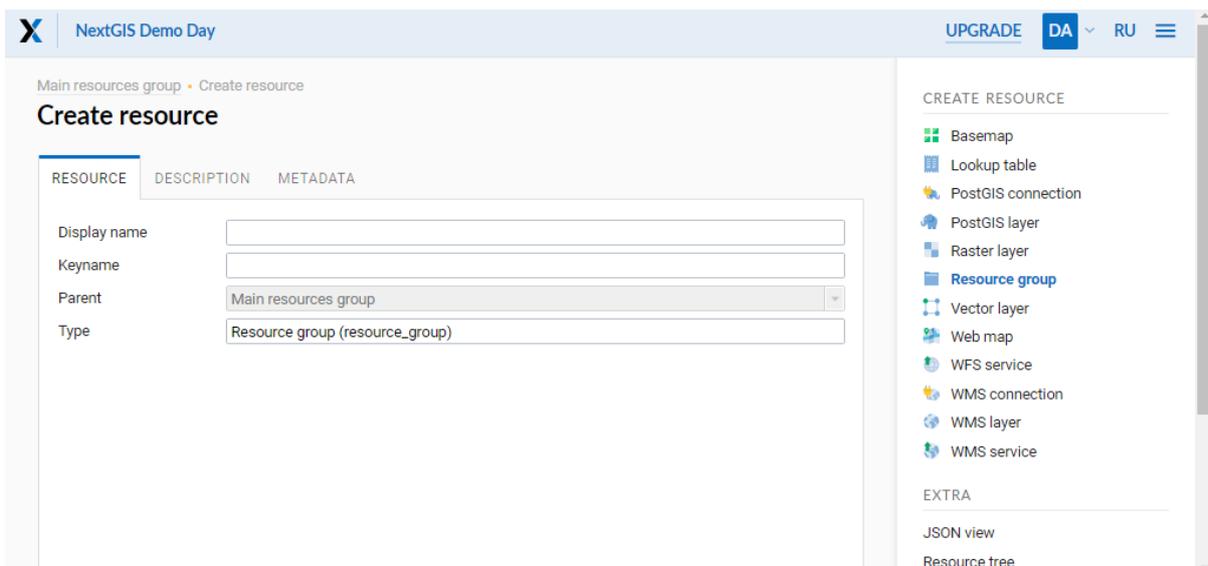


Fig. 5.27: Create resource dialog for resource group.

5.8 Lookup table

To create a lookup table navigate to the group, where you want to create it (root group or another), and in actions pane “Create resource” click “Lookup table” (see Fig. ??).

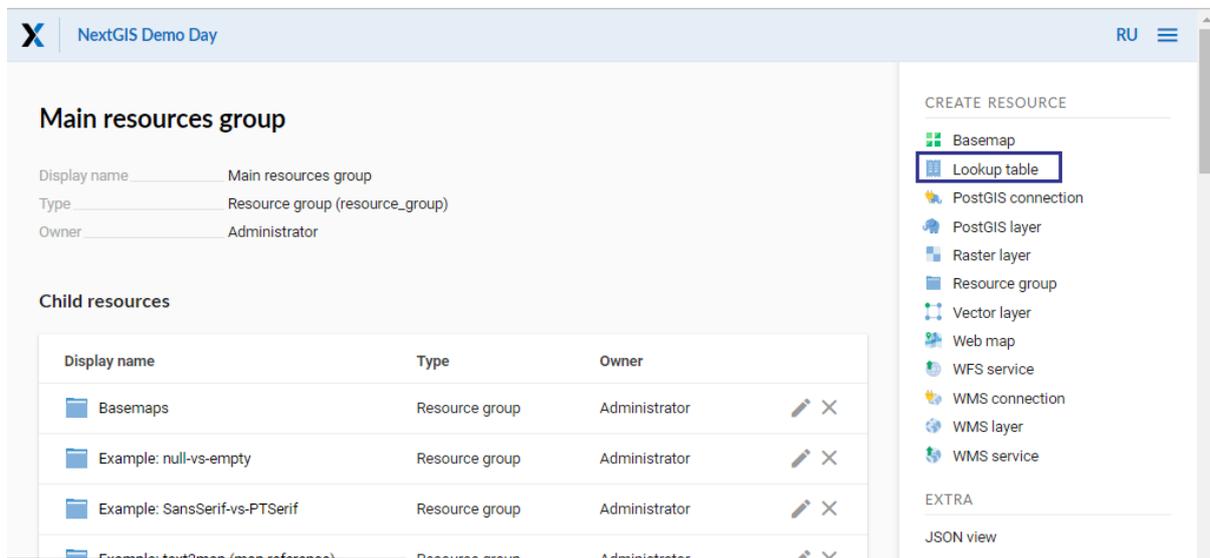


Fig. 5.28: Selection of “Lookup table” action.

Create resource dialog for resource group is presented on Fig. ??.

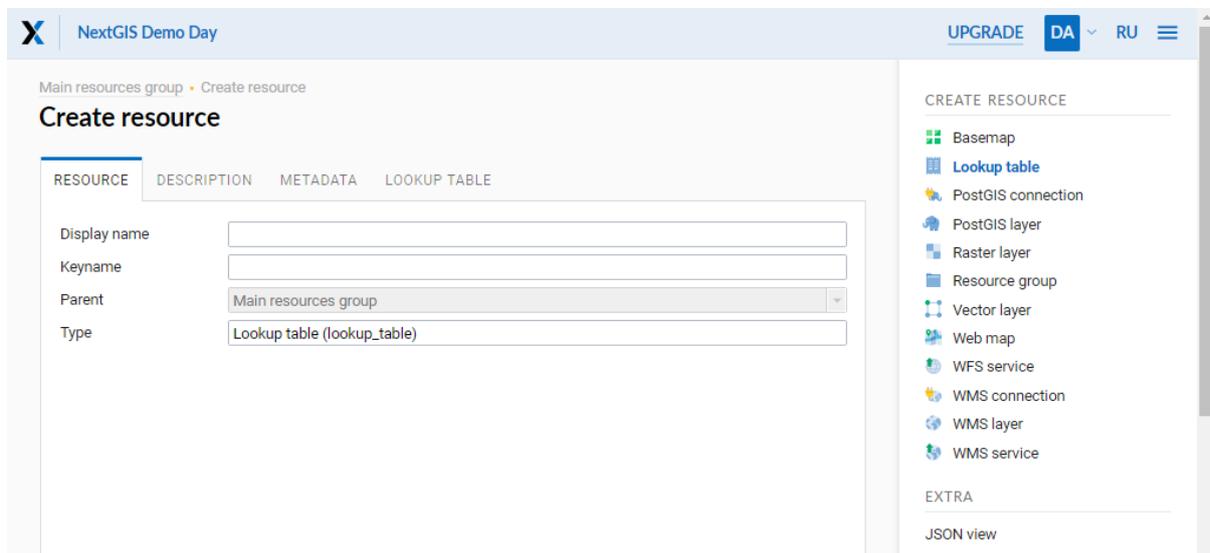


Fig. 5.29: Create resource dialog for lookup table.

In create resource dialog enter display name.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “Lookup table” tab, which is presented on Fig. ??.

In opened window there are options “Add” and “Delete”. “Text” tab in a dropdown

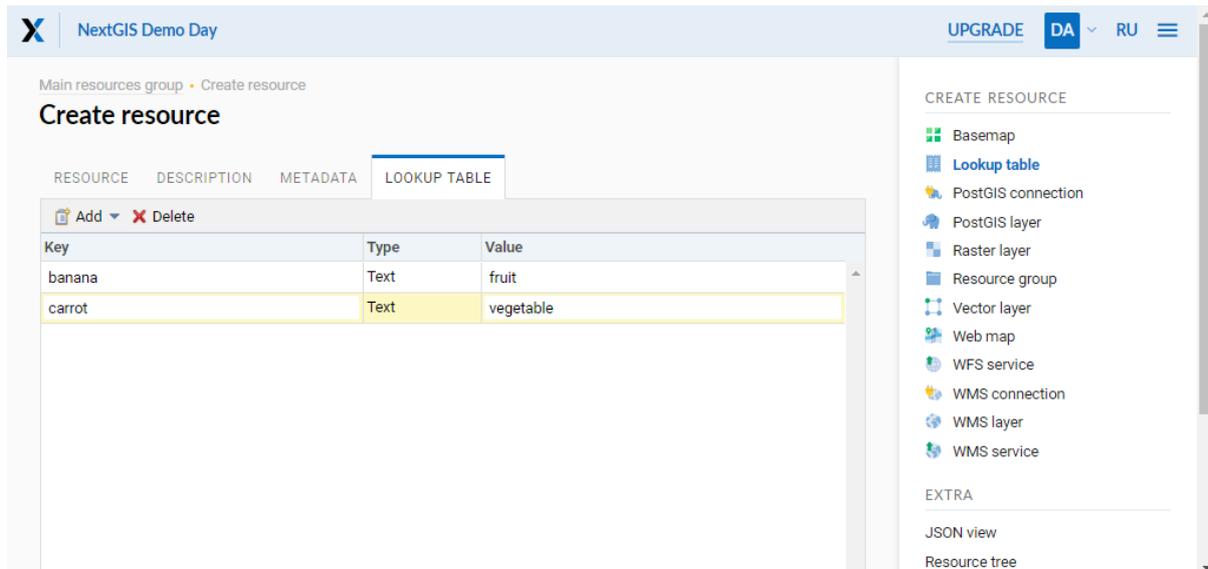


Fig. 5.30: Lookup table tab of Create resource dialog.

list of “Add” option allows to fill in lookup table data as “key” - “value” pairs. Then press “Save” button. The window will then look as on Fig. ??

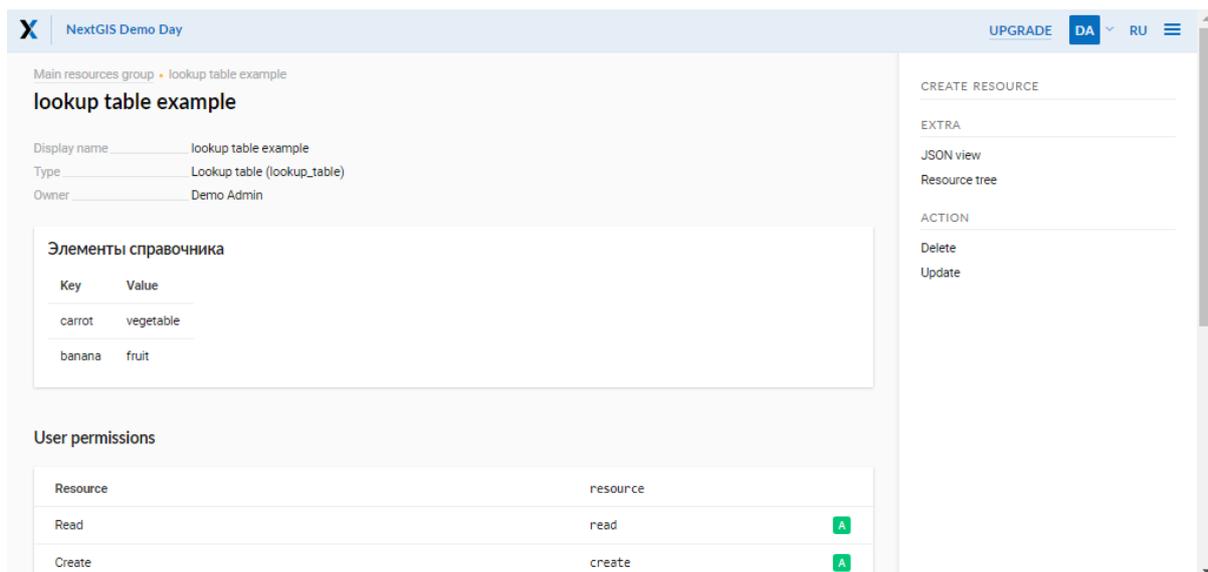


Fig. 5.31: Creation of new resource.

To change anything in lookup table in actions pane “Action” click “Update”. The window of resource update will open. Switch to “Lookup table” tab, where you can change lookup table’s contents:

- to add a new key - value pair
- to change current key - value pair
- to delete key - value pair

5.9 Typical structure

With NextGIS Web application experience we recommend the following typical structure for organizing resources.

Typical structure

```
Main resource group
  Web maps
    Master web map
    Test web map
  PostGIS connections
    PostGIS on server
  Data layers
    Base data
      Borders
      Infrastructure - linear features
      Accounting area
    Thematic data
      Results of measurements on accounting area
      Results of measurements on accounting routes
      Observation points for rare species
    Relief
      ASTER DEM
      DEM
      Isolines
    Topographic data
      Openstreetmap
      Roads
      Administrative borders
      Hydrology
      Railway stations
      Railway roads
      Landuse
      1 : 100000
      M-37-015
      M-37-016
      M-37-017
    Satellite imagery
      Landsat-8
      Ikonos
```

VECTOR LAYER STYLES

Styles describe a way of rendering for geodata and are one of the resources of NGW. Style is added to a map to display geodata.

6.1 Formats

By now NextGIS Web supports two rendering libraries: “Mapserver” “QGIS”. You can write Mapserver style yourself as a text or import from QGIS styles, it has few settings. QGIS style you can only download from QGIS styles, it has much more settings.

6.2 Creation of style

Style is related to a single layer so there is no item “Style” in the main resources list. To create a style you need to open layer properties of the layer you want create style for. In actions pane “Create resource” click “MapServer style” or “QGIS style” (see Fig. ??).

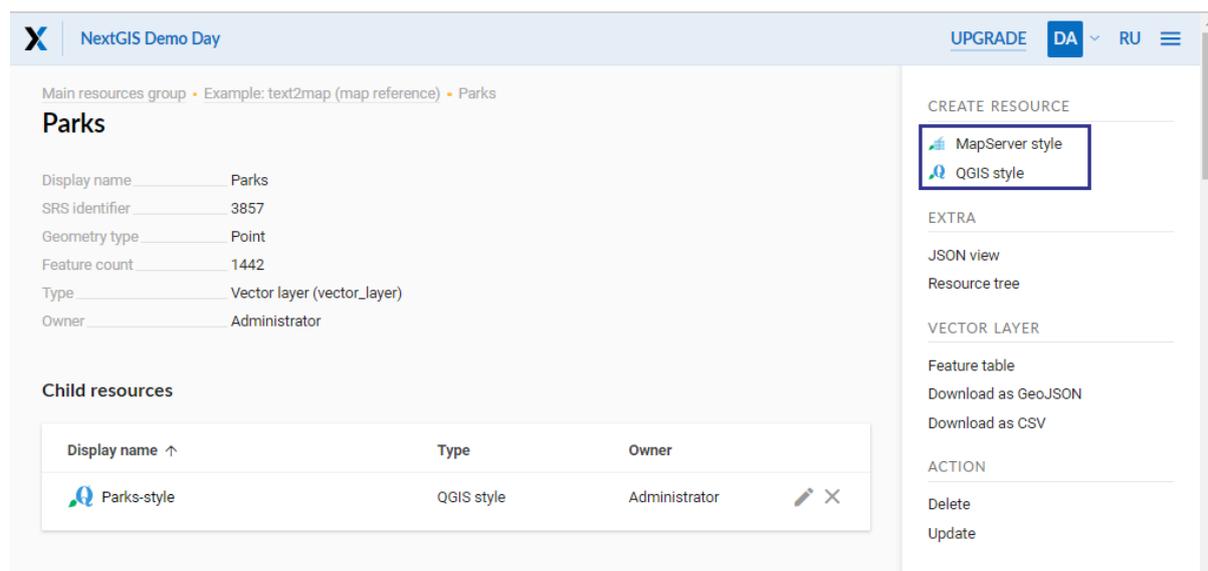


Fig. 6.1: Layer properties window.

In opened window you can import a QML style from QGIS or enter the style manually.

6.2.1 QGIS style

After the selection of “QGIS style” create resource dialog will open and will look like Fig. ??.

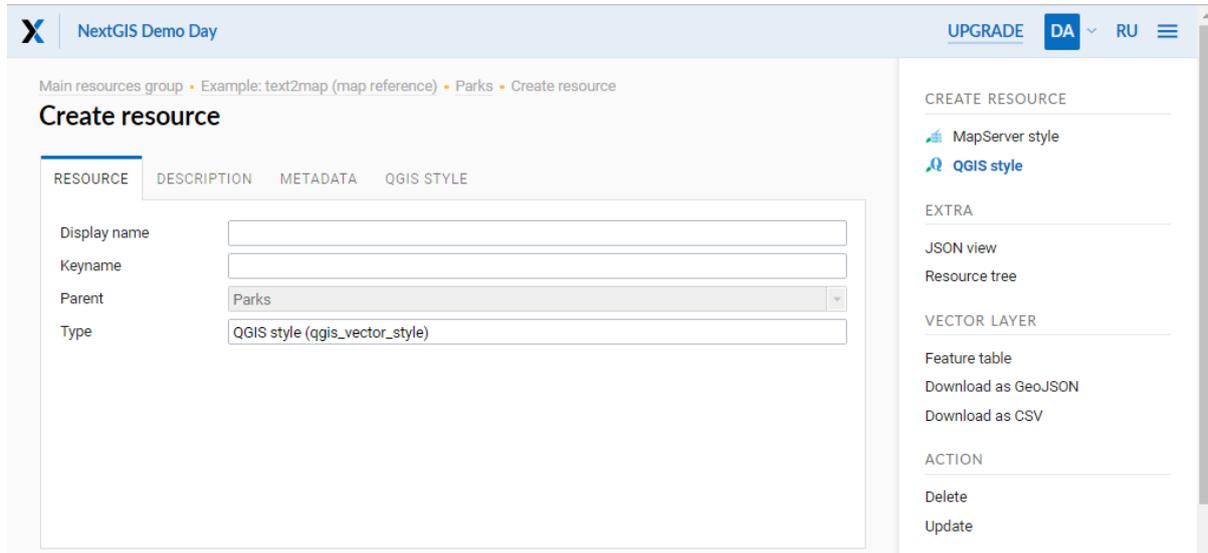


Fig. 6.2: Create resource dialog for QGIS style.

On the “Resource” tab enter the display name.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “QGIS style” tab and in the “QML file” field click “Select a file” button or drag a file to this field (see in Fig. ??).

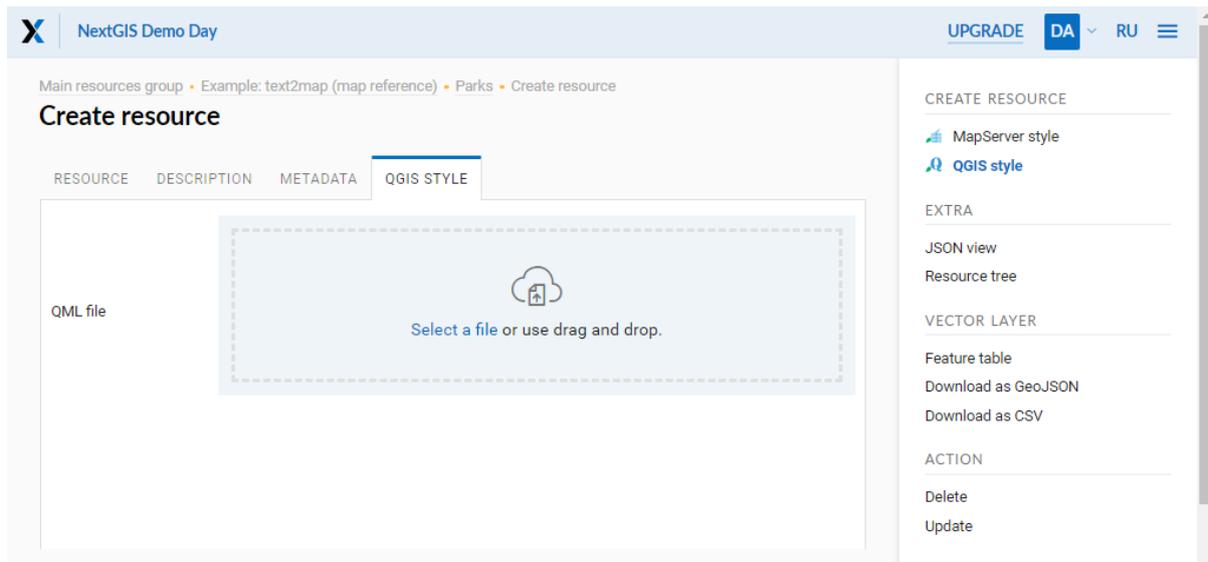


Fig. 6.3: QML file selection.

Warning: QML file to upload should be created in **NextGIS QGIS** and saved on the PC.

After QML file uploaded click “Create”. Then the window of QGIS style will open and will look like Fig. ??.

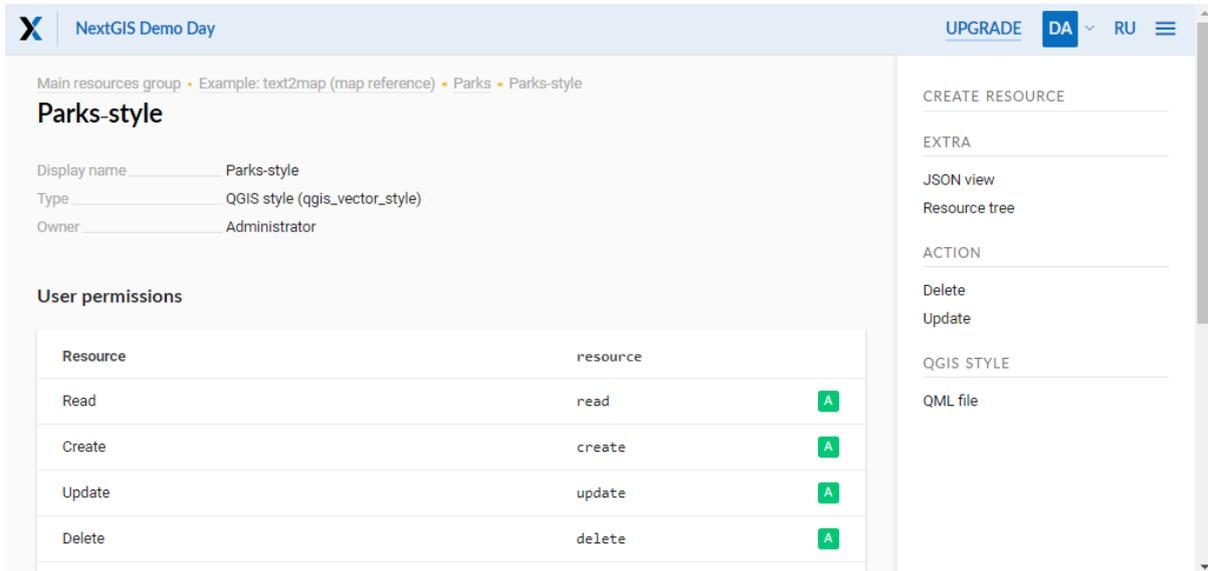


Fig. 6.4: QGIS style window.

To add a layer with QGIS style to a web-map navigate to home page (see in Fig. ??) and select the web-map in child resources. To edit a web-map click pencil icon near it or click the web-map and in actions pane “Action” select “Update”. In “Update resource” layer select “Layers” tab (see in Fig. ??).

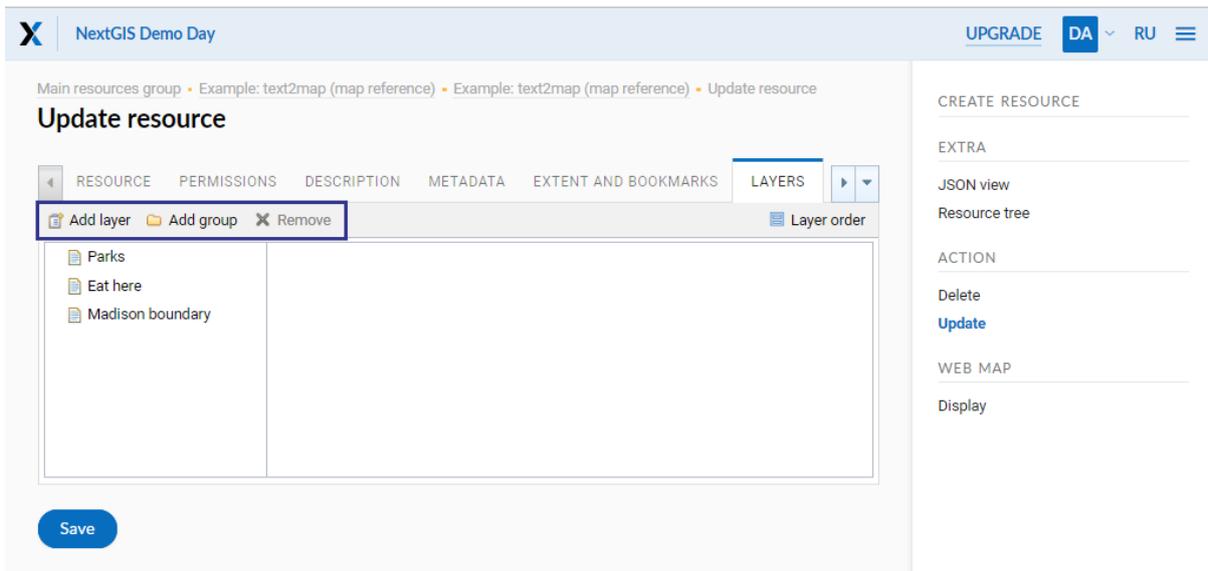


Fig. 6.5: “Layers” tab.

Here you can do the following actions:

1. Add layer

2. Add group
3. Remove

Click “Add layer” and in opened window select a layer with QGIS style, then click “OK”. After that click “Save” (see in Fig. ??).

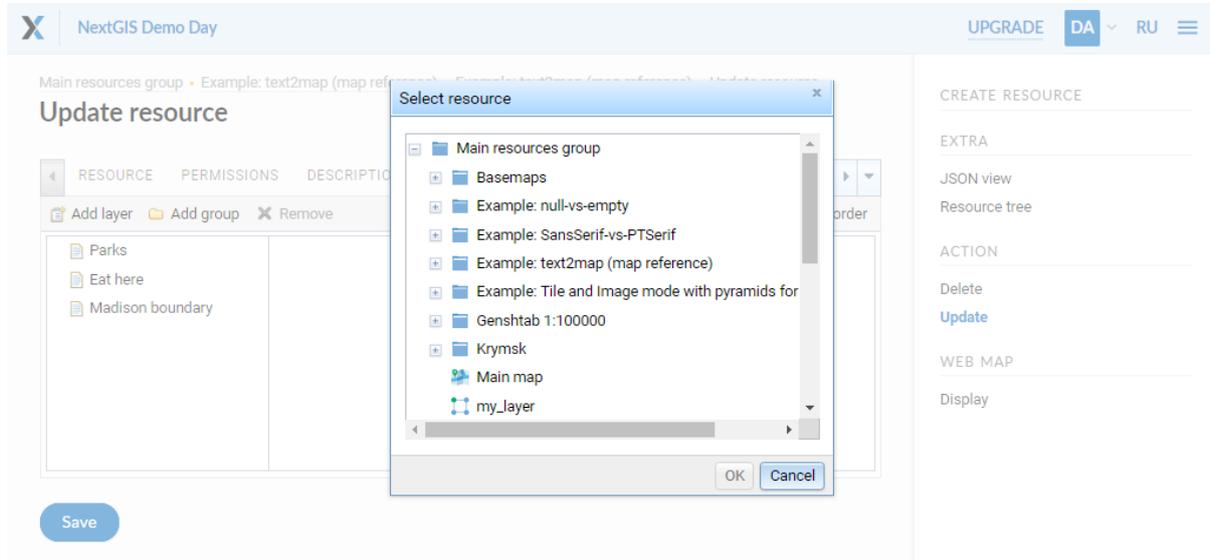


Fig. 6.6: Selection of a layer with QGIS style to add on a web-map.

In actions pane “Web map” of web-map properties window select “Display”. The map will open, layers tree will be on the left of it. To hide/display a layer place a tick near the layer (see in Fig. ??).

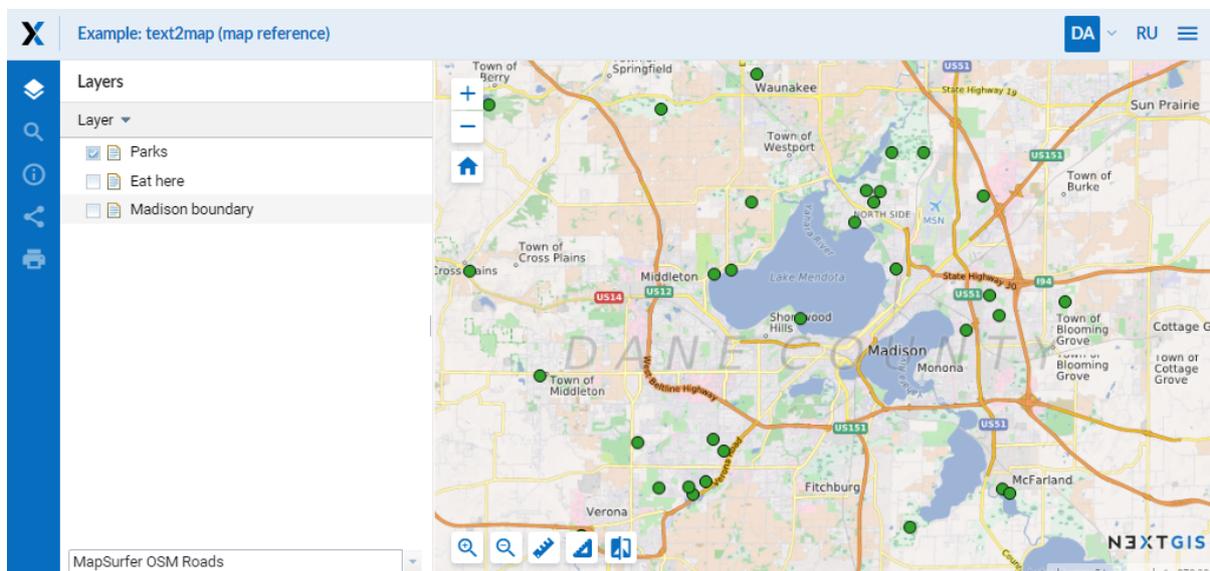


Fig. 6.7: Web-map with a layer with QGIS style and layers tree.

6.2.2 MapServer layer

To create MapServer style open layer properties of the layer you want create style for (see in Fig. ??). In actions pane “Create resource” click “MapServer style” (see

in Fig. ??).

Create resource dialog will open and will look like Fig. ??.

The screenshot shows the 'Create resource' dialog with the following details:

- Navigation:** Main resources group • Example: text2map (map reference) • Madison boundary • Create resource
- Header:** NextGIS Demo Day, UPGRADE, DA, RU
- Tabbed Interface:** RESOURCE (selected), DESCRIPTION, METADATA, MAPSERVER STYLE
- Form Fields:**
 - Display name:
 - Keyname:
 - Parent:
 - Type:
- Right Sidebar:**
 - CREATE RESOURCE: MapServer style, QGIS style
 - EXTRA: JSON view, Resource tree
 - VECTOR LAYER: Feature table, Download as GeoJSON, Download as CSV
 - ACTION: Delete, Update

Fig. 6.8: Create resource dialog for MapServer style.

On the “Resource” tab enter the display name.

Field “Keyname” is optional.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “MapServer style” tab and click “Import QGIS style” or write a style manually (see in Fig. ??).

The screenshot shows the 'Create resource' dialog with the 'MAPSERVER STYLE' tab active. The 'Import QGIS style' button is highlighted. The text area contains the following XML code:

```

1 <map>
2 <layer>
3 <class>
4 <style>
5 <color blue="211" green="177" red="128"/>
6 <outlinecolor blue="64" green="64" red="64"/>
7 </style>
8 </class>
9 </layer>
10 <legend>
11 <keysize y="15" x="15"/>
12 <label>
13 <size>12</size>
14 <type>truetype</type>
15 <font>regular</font>
16 </label>
17 </legend>

```

Fig. 6.9: “MapServer style” tab.

Click “Import QGIS style” button and in opened window select a file or drag a file in opened field:

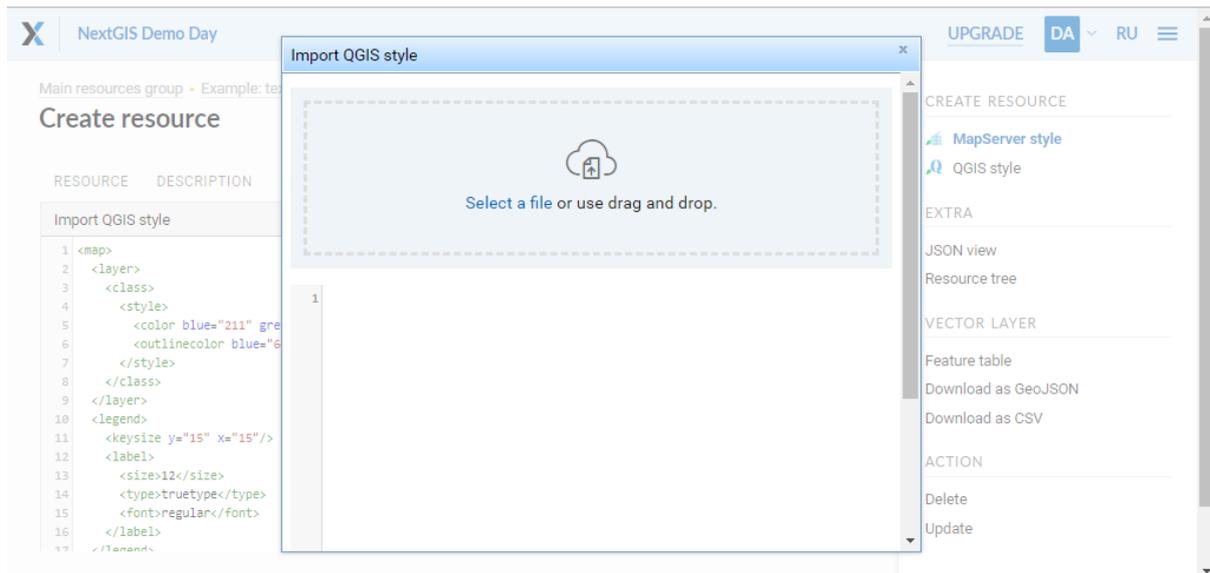


Fig. 6.10: Selection of a file with QGIS style.

Warning: File to upload should be created in **NextGIS QGIS** and saved on the PC.

After the import click “OK” and then, after “Import QGIS style” window will close, click “Create”. When the process of creation will finish, the window of the file with MapServer style will open.

To add a layer with MapServer style to a web-map navigate to home page (see in `admin_control_panel`) and select the web-map in child resources. To edit a web-map click pencil icon near it or click the web-map and in actions pane “Action” select “Update”. In “Update resource” layer select “Layers” tab (see in Fig. ??).

Here you can do the following actions:

1. Add layer
2. Add group
3. Remove

Click “Add layer” and in opened window select a layer with MapServer style, then click “OK”. After that click “Save” (see in Fig. ??).

In actions pane “Web map” of web-map properties window select “Display”. The map will open, layers tree will be on the left of it. To hide/display a layer place a tick near the layer (see in Fig. ??).

QML style will be converted to internal system format during import. Currently only basic geometry renderer settings are imported. If a style has a selection by query the empty option should be placed at the end (it is placed first after import from QGIS).

Warning: If you created a vector layer but MapServer style is absent in Create resource section check if you have installed nextgis_mapserver package. You can check this using “Package versions” (see in Fig. ??) in Control panel (see item 1 in Fig. ?? and Fig. ??).

You can create or edit a style of the layer using a manual input of a text or a code, or by editing an existing text/code (see details in ngw_mapstyles).

6.3 Map style tags

To change a style or to create a new one it is recommended you take a code of some existing style and then modify it, so there is no need to start creating a style from scratch.

6.3.1 Common tags

- `<color red="255" green="170" blue="127"/>` - the color of a fill or a line
- `<outlinecolor red="106" green="106" blue="106"/>` - outline color
- `<width>0.5</width>` - a width of a line or an outline of the polygon.
- `<outlinewidth>3</outlinewidth>` - outline width
- `<minscaledenom>1</minscaledenom>` - do not display a feature if the map scale is larger than value
- `<maxscaledenom>100000</maxscaledenom>` - do not display a feature if the map scale is less than value

6.3.2 Markers

- `<symbol>std:circle</symbol>` - marker type
- `std:rectangle` - rectangle
- `std:circle` - circle
- `std:diamond` - diamond
- `std:triangle` - triangle with peak at the top
- `std:triangle-equilateral` - triangle with peak at the bottom
- `std:star` - five-pointed star
- `std:pentagon` - pentagon
- `std:arrow` - arrow (by default is top oriented. Rotation could be set using a tag `<angle>45</angle>`)
- `std:cross` - +
- `std:xcross` - x

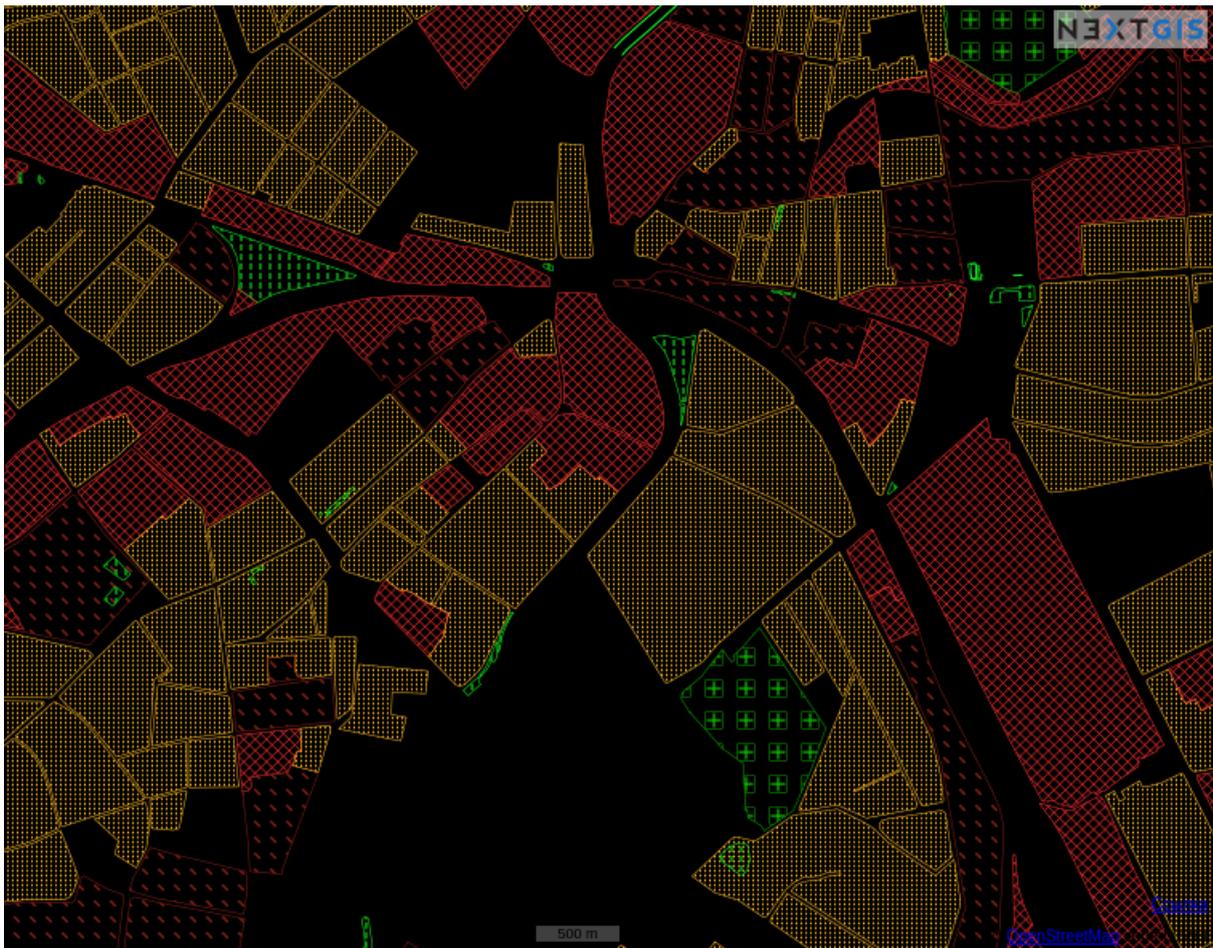


Fig. 6.11: A demo for different hatches.

- `std:line` - short line
- `std:hatch` - long line texture

These markers could be used to draw a line, to fill a polygon or to display points. Also they may be combined to a complex symbol:

```

<class>
  <expression>"industrial"</expression>
  <!-- Industrial areas -->
  <style> <!-- hatch with a right slope -->
    <color red="255" green="50" blue="50"/>
    <width>1.4</width>
    <symbol>std:hatch</symbol>
    <gap>10</gap>
    <size>5</size>
    <angle>45</angle>
  </style>
  <style> <!-- hatch with a left slope-->
    <color red="255" green="50" blue="50"/>
    <width>1.4</width>
    <symbol>std:hatch</symbol>
    <gap>10</gap>
    <size>5</size>
    <angle>-45</angle>
  </style>
  <style> <!-- Outline -->
    <outlinecolor red="255" green="50" blue="50"/>
    <width>0.5</width>
  </style>
</class>

```

- `<size>2</size>` - marker size in pixels

6.3.3 Line features

- `<gap>10</gap>` - a step size for dashed line (used with `<symbol>std:circle</symbol>`)
- `<width>8</width>` - width of line in pixels
- `<classitem>PLACE</classitem>` - filter by attribute PLACE. Also see example in [#Filtering](#). The following operators are supported:
 - attribute name
 - `!=`
 - `>=`
 - `<=`
 - `<`
 - `>`
 - `=*` - case insensitive string comparison.
 - `=`

- lt - less than
- gt - greater than
- ge - greater or equal
- le - less or equal
- eq - equal
- ne - not equal
- and - AND
- && - AND
- or - OR
- || - OR
- `<linejoin>round</linejoin>` - line draw at corners
- `<linecap>round</linecap>` - line draw at the beginning and at the end

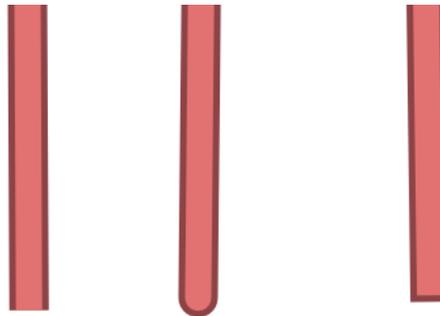


Fig. 6.12: `<linecap>butt</linecap>` / `<linecap>round</linecap>` / `<linecap>square</linecap>`

- `<pattern>2.5 4.5</pattern>` - dash template

Todo: check for numbers

- `<angle>` - marker rotation angle. Hatch could also be rotated.

6.3.4 Labels

- `<labelitem>a_hsnmbr</labelitem>` - attribute name for labelling.
- `<minscaledenom>100</minscaledenom>` - do not show a label if a scale is larger than 1:1000
- `<maxscaledenom>100000</maxscaledenom>` - do not show a label if a scale is smaller than 1:100000

- LABELCACHE [on|off] - specifies whether labels should be drawn as the features for this layer are drawn, or whether they should be cached and drawn after all layers have been drawn. Default is on. Label overlap removal, auto placement etc... are only available when the label cache is active.
- <position>ur</position> - label offset direction.
 - ur - ↗ up and right (recommended).
 - ul - ↖
 - uc - ↑
 - cl - ←
 - cc - centered
 - cr - →
 - ll - ↙
 - lc - ↓
 - lr - ↘
 - auto
- <Maxoverlapangle> - ?

6.3.5 Some other useful tags

- MAXGEOWIDTH - Maximum width, in the map's geographic units, at which this LAYER is drawn. If MAXSCALEDENOM is also specified then MAXSCALEDENOM will be used instead.
- MINGEOWIDTH - Minimum width, in the map's geographic units, at which this LAYER is drawn. If MINSCALEDENOM is also specified then MINSCALEDENOM will be used instead.
- OFFSITE - Sets the color index to treat as transparent for raster layers.
- OPACITY [integer|alpha] - opacity of the layer
- SIZEUNITS [feet|inches|kilometers|meters|miles|nauticalmiles|pixels] - Sets the unit of CLASS object SIZE values (default is pixels). Useful for simulating buffering.
- SYMBOLSCALEDENOM [double] - The scale at which symbols and/or text appear full size. This allows for dynamic scaling of objects based on the scale of the map. If not set then this layer will always appear at the same size. Scaling only takes place within the limits of MINSIZE and MAXSIZE as described above. Scale is given as the denominator of the actual scale fraction, for example for a map at a scale of 1:24,000 use 24000.
- TYPE [chart|circle|line|point|polygon|raster|query] - Specifies how the data should be drawn. Need not be the same as the feature geometry type. For example polygons or polylines may be drawn as a point layer.

6.4 Map styles examples (OSM-default)

6.4.1 Polygon layer with scale range and labels

```
<map>
  <layer>
    <labelitem>a_hsnmbr</labelitem>
    <class>
      <style>
        <color red="255" green="170" blue="127"/>
        <outlinecolor red="106" green="106" blue="106"/>
        <width>0.425196850394</width>
        <maxscaledenom>10000</maxscaledenom> <!-- Scale limit -->
      </style>
      <label>
        <type>truetype</type>
        <font>regular</font>
        <size>8.25</size>
        <color blue="0" green="0" red="0"/>
        <linewidth>3</linewidth>
        <outlinecolor blue="255" green="255" red="255"/>
        <position>ur</position>
        <maxscaledenom>10000</maxscaledenom>
      </label>
    </class>
  </layer>
</map>
```

6.4.2 White circle marker

```
<style>
  <color red="255" green="255" blue="255"/>
  <outlinecolor red="0" green="0" blue="0"/>
  <size>8.50393700787</size>
  <symbol>std:circle</symbol>
</style>
```

6.4.3 A line displayed with small black circles

```
<style>
  <angle>auto</angle>
  <gap>-10</gap>
  <color red="255" green="255" blue="255"/>
  <outlinecolor red="0" green="0" blue="0"/>
  <size>2</size>
  <symbol>std:circle</symbol>
</style>
```

6.4.4 Filtering

```

<map>
  <layer>
    <labelitem>NAME</labelitem>
    <classitem>PLACE</classitem>
    <class>
      <expression>"city"</expression>
      <style>
        <color red="255" green="170" blue="0"/>
        <outlinecolor red="0" green="0" blue="0"/>
        <size>11.3385826772</size>
        <symbol>std:circle</symbol>

      </style>
      <style>
        <color red="255" green="170" blue="0"/>
        <outlinecolor red="0" green="0" blue="0"/>
        <size>5.66929133858</size>
        <symbol>std:circle</symbol>

      </style>
      <label>
        <type>truetype</type>
        <font>regular</font>
        <size>18</size>
        <color blue="0" green="0" red="0"/>
        <linewidth>3</linewidth>
        <outlinecolor blue="255" green="255" red="255"/>
        <position>ur</position>
      </label>
    </class>
    <class>
      <expression>"town"</expression>
      <style>
        <color red="255" green="255" blue="255"/>
        <outlinecolor red="0" green="0" blue="0"/>
        <size>11.3385826772</size>
        <symbol>std:circle</symbol>

      </style>
      <style>
        <color red="0" green="0" blue="0"/>
        <outlinecolor red="0" green="0" blue="0"/>
        <size>5.66929133858</size>
        <symbol>std:circle</symbol>

      </style>
      <label>
        <type>truetype</type>
        <font>regular</font>
        <size>14</size>
        <color blue="0" green="0" red="0"/>
        <linewidth>3</linewidth>
        <outlinecolor blue="255" green="255" red="255"/>
        <position>ur</position>
      </label>
    </class>
  </layer>
</map>

```

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```

</class>
<class>
  <expression>"village"</expression>
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>6.8031496063</size>
    <symbol>std:circle</symbol>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
  </label>
</class>
<class>
  <expression>"hamlet"</expression>
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>4.25196850394</size>
    <symbol>std:circle</symbol>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
  </label>
</class>
<class>
  <expression>"locality"</expression>
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>2.83464566929</size>
    <symbol>std:circle</symbol>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>6.5</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>

```

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```

    </label>
  </class>
  <class>
    <expression>' '</expression>
    <style>
      <color red="255" green="255" blue="255"/>
      <outlinecolor red="0" green="0" blue="0"/>
      <size>2.83464566929</size>
      <symbol>std:circle</symbol>

    </style>
    <label>
      <type>truetype</type>
      <font>regular</font>
      <size>8.25</size>
      <color blue="0" green="0" red="0"/>
      <linewidth>3</linewidth>
      <outlinecolor blue="255" green="255" red="255"/>
      <position>ur</position>
    </label>
  </class>
</layer>
</map>

```

6.4.5 Polygon layer with a classification by field values and labels

```

<map>
<layer>
  <labelitem>NAME</labelitem>
  <class>
    <expression>(([num] gt 18) and ([num] le 26.1))</expression>
    <style>
      <color red="255" green="255" blue="212"/>
      <outlinecolor blue="64" green="64" red="64"/>

    </style>
    <label>
      <type>truetype</type>
      <font>regular</font>
      <size>8.25</size>
      <color blue="0" green="0" red="0"/>
      <linewidth>3</linewidth>
      <outlinecolor blue="255" green="255" red="255"/>
      <position>ur</position>
      <maxscaledenom>7000000</maxscaledenom>
    </label>
  </class>

  <class>
    <expression>(([num] gt 26.1) and ([num] le 28.1))</expression>
    <style>
      <color red="254" green="217" blue="142"/>
      <outlinecolor blue="64" green="64" red="64"/>

```

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```

</style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>7000000</maxscaledenom>
  </label>
</class>

<class>
  <expression>(([num] gt 28.1) and ([num] le 30))</expression>
  <style>
    <color red="254" green="153" blue="41"/>
    <outlinecolor blue="64" green="64" red="64"/>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>7000000</maxscaledenom>
  </label>
</class>

</layer>
</map>

```

6.4.6 OSM settlement-point

```

<!-- Style with different settings for different scales-->
<!-- Version 2015-07-24 -->
<map>
  <layer>
    <labelitem>NAME</labelitem>
    <classitem>PLACE</classitem>
    <class>
      <expression>"city"</expression> <!-- City -->
      <style>
        <color red="255" green="170" blue="0"/>
        <outlinecolor red="0" green="0" blue="0"/>
        <size>11.3385826772</size>
        <symbol>std:circle</symbol>

      </style>
    </class>
  </layer>
</map>

```

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```

<color red="255" green="170" blue="0"/>
<outlinecolor red="0" green="0" blue="0"/>
<size>5.66929133858</size>
<symbol>std:circle</symbol>

</style>
<label>
  <type>truetype</type>
  <font>regular</font>
  <size>18</size>
  <color blue="0" green="0" red="0"/>
  <linewidth>3</linewidth>
  <outlinecolor blue="255" green="255" red="255"/>
  <position>ur</position>
</label>
</class>
<class>
  <expression>"town"</expression> <!-- Small city or town -->
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>11.3385826772</size>
    <symbol>std:circle</symbol>
    <maxscaledenom>6000000</maxscaledenom>

  </style>
  <style>
    <color red="0" green="0" blue="0"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>5.66929133858</size>
    <symbol>std:circle</symbol>
    <maxscaledenom>6000000</maxscaledenom>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>14</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>6000000</maxscaledenom>
  </label>
</class>
<class>
  <expression>"village"</expression> <!-- Village -->
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>6.8031496063</size>
    <symbol>std:circle</symbol>
    <maxscaledenom>1000000</maxscaledenom>

  </style>
  <label>

```

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```

    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>1000000</maxscaledenom>
  </label>
</class>
<class>
  <expression>"hamlet"</expression> <!-- Hamlet -->
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>4.25196850394</size>
    <symbol>std:circle</symbol>
    <maxscaledenom>500000</maxscaledenom>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>8.25</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>500000</maxscaledenom>
  </label>
</class>
<class>
  <expression>"locality"</expression> <!-- Non inhabited place -->
  <style>
    <color red="255" green="255" blue="255"/>
    <outlinecolor red="0" green="0" blue="0"/>
    <size>2.83464566929</size>
    <symbol>std:circle</symbol>
    <maxscaledenom>500000</maxscaledenom>

  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>6.5</size>
    <color blue="0" green="0" red="0"/>
    <linewidth>3</linewidth>
    <outlinecolor blue="255" green="255" red="255"/>
    <position>ur</position>
    <maxscaledenom>500000</maxscaledenom>
  </label>
</class>
<class>
  <expression>' '</expression>
  <style>
    <color red="255" green="255" blue="255"/>

```

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```

<outlinecolor red="0" green="0" blue="0"/>
<size>2.83464566929</size>
<symbol>std:circle</symbol>

</style>
<label>
  <type>truetype</type>
  <font>regular</font>
  <size>8.25</size>
  <color blue="0" green="0" red="0"/>
  <linewidth>3</linewidth>
  <outlinecolor blue="255" green="255" red="255"/>
  <position>ur</position>
</label>
</class>
</layer>
</map>

```

6.4.7 OSM highway-lowzoom

Public roads (small roads are in a separate style). Colorscheme from openstreetmap.de



Fig. 6.13: Fragment of colorscheme for public roads.

```

<map>
<!-- Highways for low-zoom from openstreetmap (from motorway to
→residential)

```

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```

version 2015-11-06 -->
<layer>
  <classitem>Highway</classitem>
  <labelitem>Name</labelitem>
  <class>
    <expression>"motorway"</expression>
    <style>
      <color red="185" green="49" blue="49" />
      <linejoin>round</linejoin>
      <width>8</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="226" green="114" blue="114" />
      <linejoin>round</linejoin>
      <width>4</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="255" green="255" blue="255" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
    <label>
      <type>truetype</type>
      <font>regular</font>
      <size>7</size>
      <color blue="0" green="0" red="0" />
      <linewidth>1</linewidth>
      <outlinecolor blue="255" green="255" red="255" />
      <angle>follow</angle>
      <antialias>true</antialias>
      <repeatdistance>300</repeatdistance>
      <maxoverlapangle>20.0</maxoverlapangle>
    </label>
  </class>
  <class>
    <expression>"motorway_link"</expression>
    <style>
      <color red="185" green="49" blue="49" />
      <linejoin>round</linejoin>
      <width>8</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="226" green="114" blue="114" />
      <linejoin>round</linejoin>
      <width>4</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="255" green="255" blue="255" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
  </class>

```

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```

    </style>
  </class>
  <class>
    <expression>"trunk"</expression>
    <style>
      <color red="185" green="49" blue="49" />
      <linejoin>round</linejoin>
      <width>8</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="226" green="114" blue="114" />
      <linejoin>round</linejoin>
      <width>4</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="255" green="255" blue="255" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
    <label>
      <type>truetype</type>
      <font>regular</font>
      <size>7</size>
      <color blue="0" green="0" red="0" />
      <linewidth>1</linewidth>
      <outlinecolor blue="255" green="255" red="255" />
      <angle>follow</angle>
      <antialias>true</antialias>
      <repeatdistance>300</repeatdistance>
      <maxoverlapangle>20.0</maxoverlapangle>
    </label>
  </class>
  <class>
    <expression>"trunk_link"</expression>
    <style>
      <color red="185" green="49" blue="49" />
      <linejoin>round</linejoin>
      <width>8</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="226" green="114" blue="114" />
      <linejoin>round</linejoin>
      <width>4</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="255" green="255" blue="255" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
  </class>

```

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```

<class>
  <expression>"primary"</expression>
  <style>
    <color red="141" green="67" blue="70" />
    <linejoin>round</linejoin>
    <width>6.4062992126</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="226" green="114" blue="114" />
    <linejoin>round</linejoin>
    <width>3.57165354331</width>
    <linecap>round</linecap>
  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>7</size>
    <color blue="0" green="0" red="0" />
    <linewidth>1</linewidth>
    <outlinecolor blue="255" green="255" red="255" />
    <angle>follow</angle>
    <antialias>true</antialias>
    <repeatdistance>300</repeatdistance>
    <maxoverlapangle>20.0</maxoverlapangle>
  </label>
</class>
<class>
  <expression>"primary_link"</expression>
  <style>
    <color red="141" green="67" blue="70" />
    <linejoin>round</linejoin>
    <width>6.4062992126</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="226" green="114" blue="114" />
    <linejoin>round</linejoin>
    <width>3.57165354331</width>
    <linecap>round</linecap>
  </style>
</class>
<class>
  <expression>"secondary"</expression>
  <style>
    <color red="163" green="123" blue="72" />
    <linejoin>round</linejoin>
    <width>4</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="246" green="232" blue="86" />
    <linejoin>round</linejoin>
    <width>3</width>
    <linecap>round</linecap>
  </style>

```

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```

<label>
  <type>truetype</type>
  <font>regular</font>
  <size>7</size>
  <color blue="0" green="0" red="0" />
  <linewidth>1</linewidth>
  <outlinecolor blue="255" green="255" red="255" />
  <angle>follow</angle>
  <antialias>true</antialias>
  <repeatdistance>300</repeatdistance>
  <maxoverlapangle>20.0</maxoverlapangle>
</label>
</class>
<class>
  <expression>"secondary_link"</expression>
  <style>
    <color red="163" green="123" blue="72" />
    <linejoin>round</linejoin>
    <width>4</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="246" green="232" blue="86" />
    <linejoin>round</linejoin>
    <width>3</width>
    <linecap>round</linecap>
  </style>
</class>
<class>
  <expression>"tertiary"</expression>
  <style>
    <color red="187" green="187" blue="187" />
    <linejoin>round</linejoin>
    <width>4</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="255" green="255" blue="179" />
    <linejoin>round</linejoin>
    <width>3</width>
    <linecap>round</linecap>
  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>7</size>
    <color blue="0" green="0" red="0" />
    <linewidth>1</linewidth>
    <outlinecolor blue="255" green="255" red="255" />
    <angle>follow</angle>
    <antialias>true</antialias>
    <repeatdistance>300</repeatdistance>
    <maxoverlapangle>20.0</maxoverlapangle>
  </label>
</class>
<class>

```

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```

<expression>"tertiary_link"</expression>
<style>
  <color red="187" green="187" blue="187" />
  <linejoin>round</linejoin>
  <width>4</width>
  <linecap>round</linecap>
</style>
<style>
  <color red="255" green="255" blue="179" />
  <linejoin>round</linejoin>
  <width>3</width>
  <linecap>round</linecap>
</style>
</class>
<class>
  <expression>"unclassified"</expression>
  <style>
    <color red="187" green="187" blue="187" />
    <linejoin>round</linejoin>
    <width>4</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="255" green="255" blue="179" />
    <linejoin>round</linejoin>
    <width>3</width>
    <linecap>round</linecap>
  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>7</size>
    <color blue="0" green="0" red="0" />
    <linewidth>1</linewidth>
    <outlinecolor blue="255" green="255" red="255" />
    <angle>follow</angle>
    <antialias>true</antialias>
    <repeatdistance>300</repeatdistance>
    <maxoverlapangle>20.0</maxoverlapangle>
    <minscaledenom>1</minscaledenom>
    <maxscaledenom>40000</maxscaledenom>
  </label>
</class>
<class>
  <expression>"residential"</expression>
  <style>
    <color red="187" green="187" blue="187" />
    <linejoin>round</linejoin>
    <width>2</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="255" green="255" blue="179" />
    <linejoin>round</linejoin>
    <width>1</width>
    <linecap>round</linecap>
  </style>

```

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```

</style>
<label>
  <type>truetype</type>
  <font>regular</font>
  <size>7</size>
  <color blue="0" green="0" red="0" />
  <linewidth>1</linewidth>
  <outlinecolor blue="255" green="255" red="255" />
  <angle>follow</angle>
  <antialias>true</antialias>
  <repeatdistance>300</repeatdistance>
  <maxoverlapangle>20.0</maxoverlapangle>
  <minscaledenom>1</minscaledenom>
  <maxscaledenom>40000</maxscaledenom>
</label>
</class>
<class>
  <expression>"living_street"</expression>
  <style>
    <color red="187" green="187" blue="187" />
    <linejoin>round</linejoin>
    <width>2</width>
    <linecap>round</linecap>
  </style>
  <style>
    <color red="255" green="255" blue="179" />
    <linejoin>round</linejoin>
    <width>1</width>
    <linecap>round</linecap>
  </style>
  <label>
    <type>truetype</type>
    <font>regular</font>
    <size>7</size>
    <color blue="0" green="0" red="0" />
    <linewidth>1</linewidth>
    <outlinecolor blue="255" green="255" red="255" />
    <angle>follow</angle>
    <antialias>true</antialias>
    <repeatdistance>300</repeatdistance>
    <maxoverlapangle>20.0</maxoverlapangle>
    <minscaledenom>1</minscaledenom>
    <maxscaledenom>40000</maxscaledenom>
  </label>
</class>
</layer>
</map>

```

6.4.8 OSM highway-maxzoom

Access roads, service roads, dirt roads, pedestrian ways

```

<map>
  <!-- Highways for high-zoom from openstreetmap (from service to track)

```

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Fig. 6.14: Fragment of road map.

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```

version 2015-11-06 -->
<layer>
  <classitem>Highway</classitem>
  <labelitem>Name</labelitem>
  <class>
    <expression>"service"</expression>
    <style>
      <color red="187" green="187" blue="187" />
      <linejoin>round</linejoin>
      <width>2</width>
      <linecap>round</linecap>
    </style>
    <style>
      <color red="255" green="255" blue="255" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
  </class>
  <class>
    <expression>"footway"</expression>
    <style>
      <color red="255" green="0" blue="0" />
      <linejoin>round</linejoin>
      <width>1</width>
      <linecap>round</linecap>
    </style>
    <label>
      <type>truetype</type>
      <font>regular</font>
      <size>7</size>
    </label>
  </class>

```

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```

        <color blue="0" green="0" red="0" />
        <linewidth>1</linewidth>
        <outlinecolor blue="255" green="255" red="255" />
        <angle>follow</angle>
        <antialias>true</antialias>
        <repeatdistance>300</repeatdistance>
        <maxoverlapangle>20.0</maxoverlapangle>
    </label>
</class>
<class>
    <expression>"pedestrian"</expression>
    <style>
        <color red="255" green="0" blue="0" />
        <linejoin>round</linejoin>
        <width>2</width>
        <linecap>round</linecap>
    </style>
</class>
<class>
    <expression>"path"</expression>
    <style>
        <color red="255" green="0" blue="0" />
        <linejoin>round</linejoin>
        <width>1</width>
        <linecap>round</linecap>
        <pattern>5 5</pattern>
    </style>
</class>
<class>
    <expression>"track"</expression>
    <style>
        <color red="153" green="116" blue="43" />
        <linejoin>round</linejoin>
        <width>2</width>
        <pattern>16 8</pattern>
        <linecap>round</linecap>
    </style>
</class>
</layer>
</map>

```

6.4.9 OSM railway-line

```

<!-- railway-line style with different display for different scales
version 2015-07-24 -->
<map>
  <layer>
    <classitem>RAILWAY</classitem>
    <class>
      <expression>"abandoned"</expression>
      <style>
        <color red="255" green="255" blue="255"/>
        <linejoin>round</linejoin>
        <width>2.83464566929</width>

```

(continues on next page)

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```

    <linecap>round</linecap>
  </style>
  <style>
    <pattern>2.35275590551 4.70551181102</pattern>
    <color red="165" green="165" blue="165"/>
    <linejoin>round</linejoin>
    <width>2.35275590551</width>
    <linecap>round</linecap>
  </style>
</class>
  <class>
    <expression>"razed"</expression>
    <style>
      <color red="255" green="255" blue="255"/>
      <linejoin>round</linejoin>
      <width>2.83464566929</width>
      <linecap>round</linecap>
    </style>
    <style>
      <pattern>2.35275590551 4.70551181102</pattern>
      <color red="255" green="165" blue="210"/>
      <linejoin>round</linejoin>
      <width>2.35275590551</width>
      <linecap>round</linecap>
    </style>
  </class>
  <class>
    <expression>"construction"</expression>
    <style>
      <color red="255" green="255" blue="255"/>
      <linejoin>round</linejoin>
      <width>2.83464566929</width>
      <linecap>round</linecap>
    </style>
    <style>
      <pattern>2.35275590551 4.70551181102</pattern>
      <color red="255" green="0" blue="127"/>
      <linejoin>round</linejoin>
      <width>2.35275590551</width>
      <linecap>round</linecap>
    </style>
  </class>
  <class>
    <expression>"crossing"</expression>
    <style>
      <color red="37" green="37" blue="255"/>
      <linejoin>bevel</linejoin>
      <width>0.737007874016</width>
      <linecap>square</linecap>
    </style>
  </class>
  <class>
    <expression>"light_rail"</expression>
    <style>
      <color red="0" green="0" blue="0"/>
      <linejoin>bevel</linejoin>

```

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```

    <width>1.41732283465</width>
    <linecap>square</linecap>
  </style>
</class>
<class>
  <expression>"narrow_gauge"</expression>
  <style>
    <color red="150" green="150" blue="150"/>
    <linejoin>bevel</linejoin>
    <width>1.41732283465</width>
    <linecap>square</linecap>
  </style>
</class>
<class>
  <expression>"platform"</expression>
  <style>
    <color red="0" green="0" blue="0"/>
    <linejoin>bevel</linejoin>
    <width>4.25196850394</width>
    <linecap>square</linecap>
  </style>
</class>
<class>
  <expression>"rail"</expression>
  <style>
    <color red="0" green="0" blue="0"/>
    <linejoin>bevel</linejoin>
    <width>2.83464566929</width>
    <linecap>square</linecap>
    <maxscaledenom>25000</maxscaledenom> <!-- Black and white line at
↳large
    scale -->
  </style>
  <style>
    <pattern>9.41102362205 14.1165354331</pattern>
    <color red="255" green="255" blue="255"/>
    <linejoin>bevel</linejoin>
    <width>2.35275590551</width>
    <linecap>square</linecap>
    <maxscaledenom>25000</maxscaledenom> <!-- Black and white line at
↳large
    scale -->
  </style>
  <style>
    <color red="0" green="0" blue="0"/>
    <linejoin>bevel</linejoin>
    <width>2</width>
    <linecap>square</linecap>
    <minscaledenom>25000</minscaledenom> <!-- Black line at medium
↳scale -->
  </style>
</class>
<class>
  <expression>"siding"</expression>
  <style>

```

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```

    <color red="145" green="145" blue="145"/>
    <linejoin>bevel</linejoin>
    <width>1.41732283465</width>
    <linecap>square</linecap>
  </style>
</class>
<class>
  <expression>"subway"</expression>
  <style>
    <pattern>1.41732283465 2.83464566929</pattern>
    <color red="155" green="155" blue="155"/>
    <linejoin>round</linejoin>
    <width>1.41732283465</width>
    <linecap>round</linecap>
  </style>
</class>
<class>
  <expression>"tram"</expression>
  <style>
    <color red="0" green="0" blue="0"/>
    <linejoin>bevel</linejoin>
    <width>1.41732283465</width>
    <linecap>square</linecap>
  </style>
</class>
</layer>
</map>

```

6.4.10 OSM water-line

```

<!-- water-line style with different display for different scales-->
<!-- Version 2015-07-24 -->
<map>
  <layer>
    <classitem>Waterway</classitem>
    <labelitem>name</labelitem>
    <class>
      <expression>"river"</expression>
      <style>
        <color red="102" green="153" blue="204"/>
        <linejoin>round</linejoin>
        <width>3</width>
        <linecap>round</linecap>
        <!-- Unprocessed attributes: width_unit, offset_unit, customdash_
->unit -->
      </style>
      <label>
        <type>truetype</type> <!-- Label -->
        <font>bold</font>
        <size>7</size>
        <color blue="255" green="255" red="255"/>
        <linewidth>1</linewidth>
        <outlinecolor red="102" green="153" blue="204"/>
        <angle>auto</angle>

```

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```

    <repeatdistance>300</repeatdistance>
    <maxoverlapangle>90.0</maxoverlapangle>
    <maxscaledenom>500000</maxscaledenom>
  </label>
</class>

<class>
<expression>"canal"</expression>
<style><!-- vertical lines -->
  <angle>auto</angle>
  <gap>-8.50393700787</gap>
  <!-- unparsed attributes: interval_unit, placement,
  offset_unit, offset -->
  <color red="102" green="153" blue="204"/>
  <outlinecolor red="0" green="0" blue="0"/>
  <size>15.66929133858</size>
  <symbol>std:line</symbol>
  <!-- Unprocessed attributes: outline_width, offset_unit,
  outline_width_unit, size_unit -->
</style>
<style>
  <color red="102" green="153" blue="204"/>
  <linejoin>round</linejoin>
  <width>3</width>
  <linecap>round</linecap>
  <!-- Unprocessed attributes: width_unit, offset_unit,
  customdash_unit -->
</style>
<label>
  <type>truetype</type> <!-- Label -->
  <font>bold</font>
  <size>7</size>
  <color blue="255" green="255" red="255"/>
  <linewidth>1</linewidth>
  <outlinecolor red="102" green="153" blue="204"/>
  <angle>auto</angle>
  <repeatdistance>300</repeatdistance>
  <maxoverlapangle>90.0</maxoverlapangle>
  <maxscaledenom>500000</maxscaledenom>
</label>
</class>

<class>
<expression>"stream"</expression>
<style>
  <color red="102" green="153" blue="204"/>
  <linejoin>round</linejoin>
  <width>1.5</width>
  <linecap>round</linecap>
  <maxscaledenom>250000</maxscaledenom>
  <!-- Unprocessed attributes: width_unit, offset_unit,
  customdash_unit -->
</style>
</class>

<class>

```

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```

<expression>"drain"</expression>
<style>
  <color red="102" green="153" blue="204"/>
  <linejoin>round</linejoin>
  <width>1</width>
  <linecap>round</linecap>
  <maxscaledenom>250000</maxscaledenom>
  <!-- Unprocessed attributes: width_unit, offset_unit,
  customdash_unit -->
</style>
</class>
</layer>
</map>

```

6.4.11 OSM water-polygon

```

<!-- water-polygon style
version 2015-07-24
To add
-reservoirs
-swamp hatch
-->
<map>
  <layer>
    <labelitem>NAME</labelitem>
    <classitem>NATURAL</classitem>
    <class>
      <expression>"water"</expression> <!-- Water -->
      <style>
        <color red="102" green="153" blue="204"/>
        <outlinecolor red="102" green="153" blue="204"/>
      </style>
      <label>
        <type>truetype</type>
        <font>regular</font>
        <size>7</size>
        <color red="102" green="153" blue="204"/>
        <linewidth>2</linewidth>
        <outlinecolor red="255" green="255" blue="222"/>
        <!-- Label scale range-->
        <minscaledenom>1</minscaledenom>
        <maxscaledenom>100000</maxscaledenom>
      </label>
    </class>
    <class>
      <expression>"wetland"</expression> <!-- Wetland -->
      <style>
        <color red="102" green="153" blue="204"/>
        <outlinecolor red="102" green="153" blue="204"/>
      </style>
      <label>
        <type>truetype</type>
        <font>regular</font>
        <size>7</size>

```

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```

<color red="102" green="153" blue="204"/>
<linewidth>2</linewidth>
<outlinecolor red="255" green="255" blue="222"/>
<!-- Label scale range -->
<minscaledenom>1</minscaledenom>
<maxscaledenom>100000</maxscaledenom>
</label>
</class>
</layer>
</map>

```

6.5 OSM-black

6.5.1 OSM landuse-polygon

NextGIS Web styles support for different hatched (see Fig. ??).

```

<map> <!-- A demo of different hatched. Use with dark background.-->
<layer>
  <labelitem>OSM_ID</labelitem>
  <classitem>LANDUSE</classitem>
  <class>
    <expression>"residential"</expression>
    <!-- Residential -->
    <style>
      <!-- hatch with right slope -->
      <color red="255" green="185" blue="33"/>
      <width>1.4</width>
      <symbol>std:line</symbol>
      <gap>3</gap>
      <size>1</size>
      <angle>90</angle>
    </style>
    <style>
      <!-- Outline -->
      <outlinecolor red="255" green="185" blue="33"/>
      <width>0.5</width>
    </style>
  </class>
  <class>
    <expression>"grass"</expression>
    <!-- Grass zones -->
    <style>
      <!-- Lines -->
      <color red="20" green="255" blue="33"/>
      <width>1</width>
      <symbol>std:line</symbol>
      <gap>6</gap>
      <size>4</size>
      <angle>0</angle>
      <pattern>2.5 4.5</pattern>
    </style>
  </class>
</layer>
</map>

```

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```

        <!-- Outline -->
        <outlinecolor red="20" green="255" blue="33"/>
        <width>0.5</width>
    </style>
</class>
<class>
    <expression>"commercial"</expression>
    <!-- Residential -->
    <style>
        <!-- hatch with right slope -->
        <color red="133" green="33" blue="25"/>
        <width>1.4</width>
        <symbol>std:line</symbol>
        <gap>10</gap>
        <size>5</size>
        <angle>45</angle>
    </style>
    <style>
        <!-- Outline -->
        <outlinecolor red="133" green="33" blue="25"/>
        <width>0.5</width>
    </style>
</class>
<class>
    <expression>"industrial"</expression>
    <!-- Industrial zones -->
    <style>
        <!-- hatch with right slope -->
        <color red="255" green="50" blue="50"/>
        <width>0.4</width>
        <symbol>std:hatch</symbol>
        <gap>10</gap>
        <size>5</size>
        <angle>45</angle>
    </style>
    <style>
        <!-- hatch with left slope-->
        <color red="255" green="50" blue="50"/>
        <width>0.4</width>
        <symbol>std:hatch</symbol>
        <gap>10</gap>
        <size>5</size>
        <angle>-45</angle>
    </style>
    <style>
        <!-- Outline -->
        <outlinecolor red="255" green="50" blue="50"/>
        <width>0.5</width>
    </style>
</class>
<class>
    <expression>"cemetery"</expression>
    <!-- Cemeteries -->
    <style>
        <!-- fences -->
        <color red="14" green="166" blue="0"/>

```

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```
        <width>1.4</width>
        <symbol>std:rectangle</symbol>
        <gap>20</gap>
        <size>11</size>
        <angle>0</angle>
    </style>
    <style>
        <!-- fences -->
        <color red="0" green="0" blue="0"/>
        <width>1.2</width>
        <symbol>std:rectangle</symbol>
        <gap>20</gap>
        <size>10</size>
        <angle>0</angle>
    </style>
    <style>
        <!-- crosses -->
        <color red="14" green="166" blue="0"/>
        <width>1.4</width>
        <symbol>std:cross</symbol>
        <gap>20</gap>
        <size>9</size>
        <angle>0</angle>
    </style>
    <style>
        <!-- Outline -->
        <outlinecolor red="14" green="166" blue="0"/>
        <width>0.5</width>
    </style>
</class>
</layer>
</map>
```

LAYER SETTINGS

7.1 Introduction

Layers settings become available after a layer creation.

To edit a layer you need to navigate to a child resource group (see item 4 in Fig. ??), where would be displayed resource types. Then select from child resources a resource with type vector layer and press the “Pencil” icon opposite the resource or select the layer and then select an action called “Update” in actions pane (see Fig. ??). The window “Update resource” will open, where you can edit the layer.

7.2 Edit attribute values

NextGIS Web software allows to edit attributes for geographical features. Editing could be launched from administrator interface or from a map display.

- Editing of attributes from administrator interface:
 - Click the “Table” icon opposite the resource or select an action for a vector layer called “Feature table” in actions pane (see Fig. ??).
 - A feature table for the layer will open. Click a radio button at the left side of a row you want to edit. - Click “Edit” button (see Fig. ??).
- Editing of attributes from a map display:
 - Open a web-map.
 - Click on a map with identify tool active.
 - Click edit button in identify window (the last tab, see Fig. ??).

You can change attribute values in opened window. Description made on “Description” tab will be visible on a map display in indentify window.

In the editing of attributes window there are the next tabs:

- “Attributes” tab (see Fig. ??).
- “Description” tab (see Fig. ??).
- “Attachments” tab (see Fig. ??).

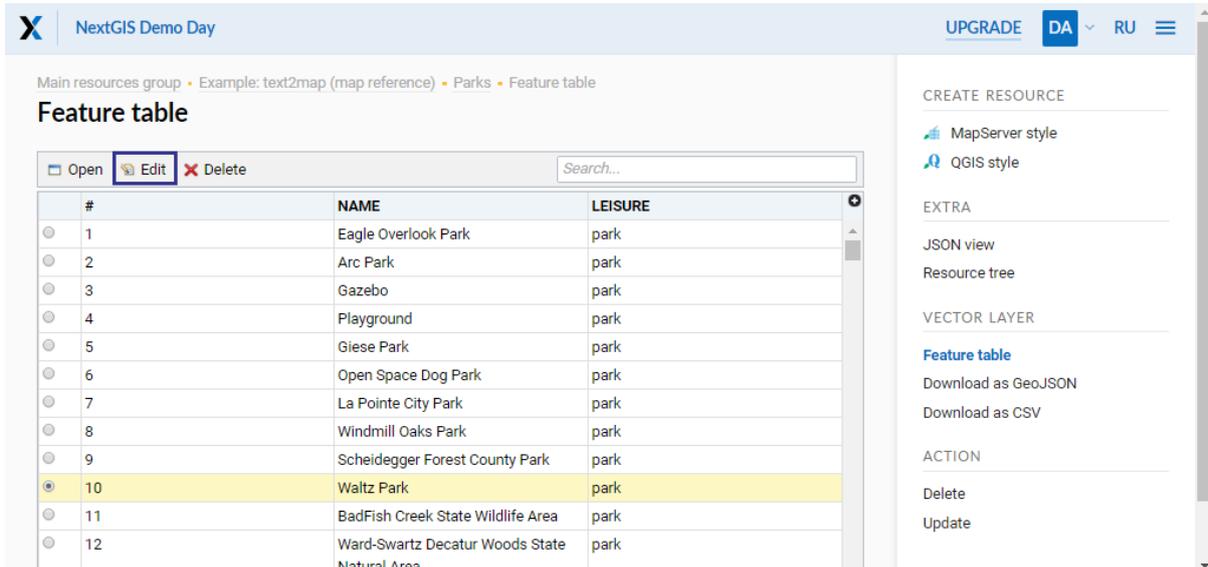


Fig. 7.1: Editing of attributes from administrator interface.

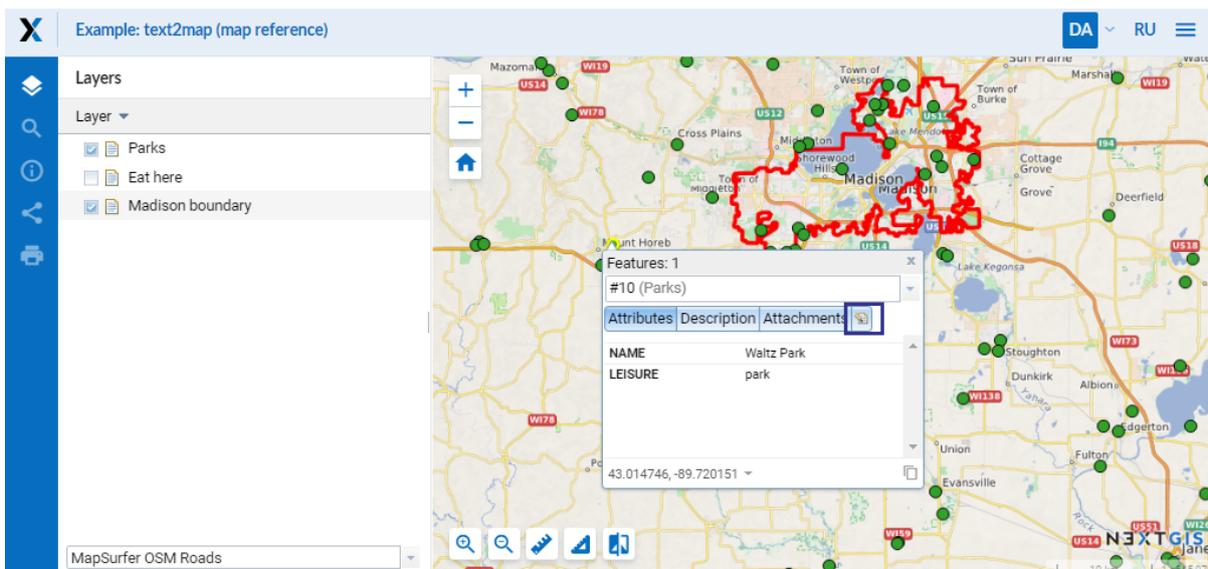


Fig. 7.2: Editing of attributes from a map display.

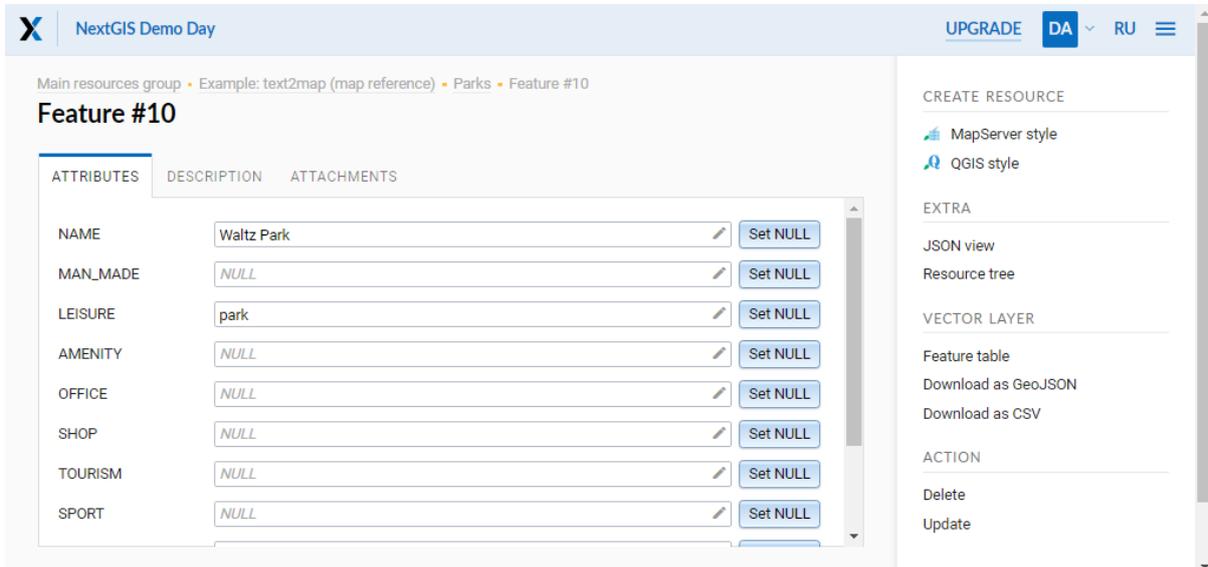


Fig. 7.3: "Attributes" tab.

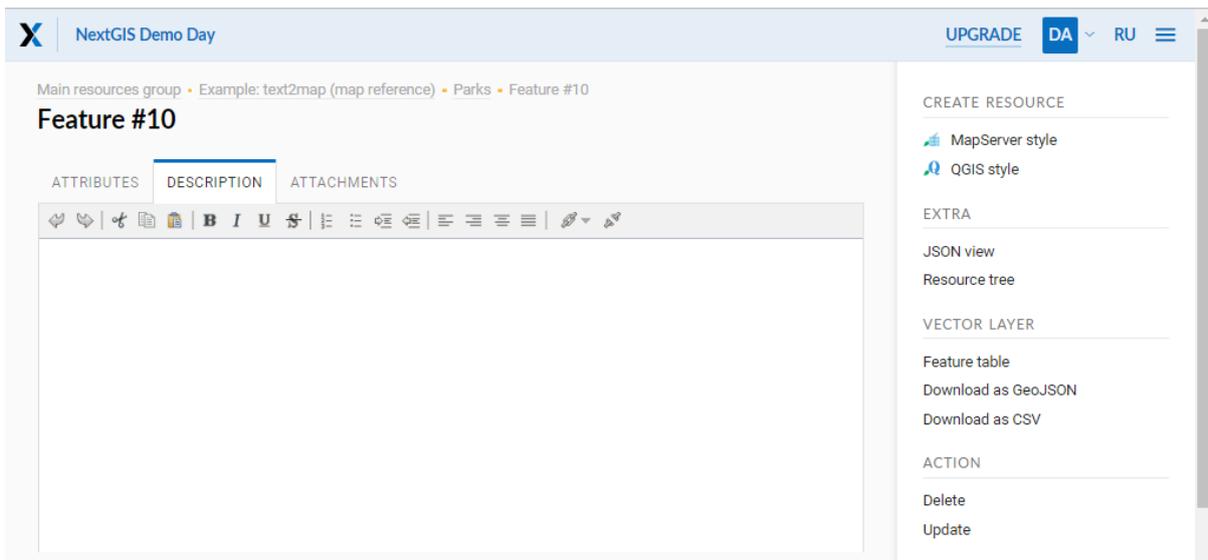


Fig. 7.4: "Description" tab.

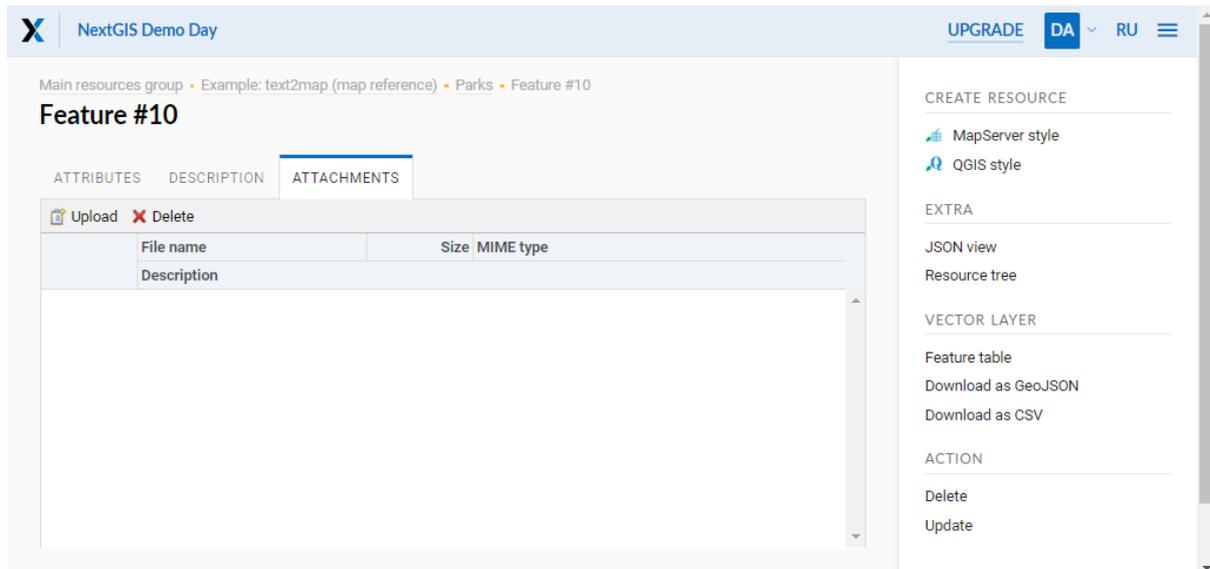


Fig. 7.5: “Attachments” tab.

When editing a PostGIS layer attribute changes are saved to PostGIS database and descriptions are saved to a local database. When editing a layer based on a Shapefile attribute changes are saved to a local database.

Geodata with changed attributes could be downloaded by link *Download as GeoJSON* or published as WFS service. Download of descriptions is currently unavailable.

7.3 Adding photos to geodata

NextGIS Web software support adding photos to feature records. If a feature has attached photos they will be shown with a description and attributes in identify window (see Fig. ??).

You can add photos in a map display. To do it:

1. Click on a feature on a map with active Identify tool.
2. Click edit button in Identify window (see Fig. ??).
3. In the edit tab navigate to “Attachments” tab (see Fig. ??).
4. Upload photos. JPEG and PNG formats are supported. GIF format is not supported (see. Fig. ??).
5. Enter Description and click “Save”.

After upload of photos you can see previews of photos on “Attachments” tab if identify window (see Fig. ??).

After a click on a photo preview a lightbox window is open (a javascript powered window in browser). Photo size is adjusted to fit the window. Photos have descriptions and user can navigate through photos using left and right arrow keys on a keyboard (see Fig. ??).

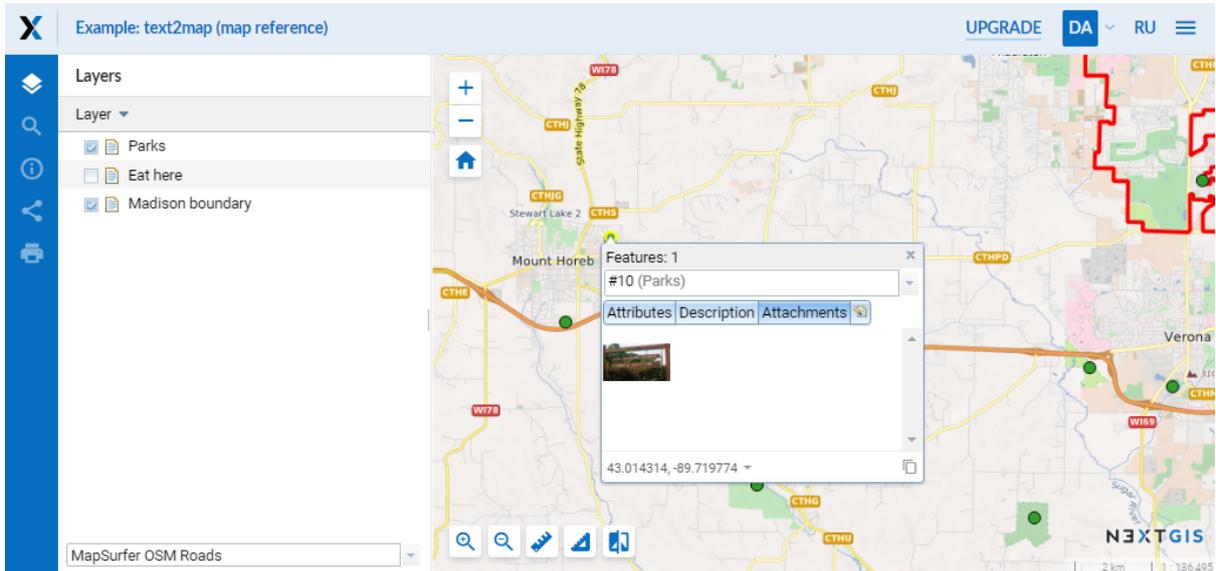


Fig. 7.6: Identify window with an identify result with attached photos.

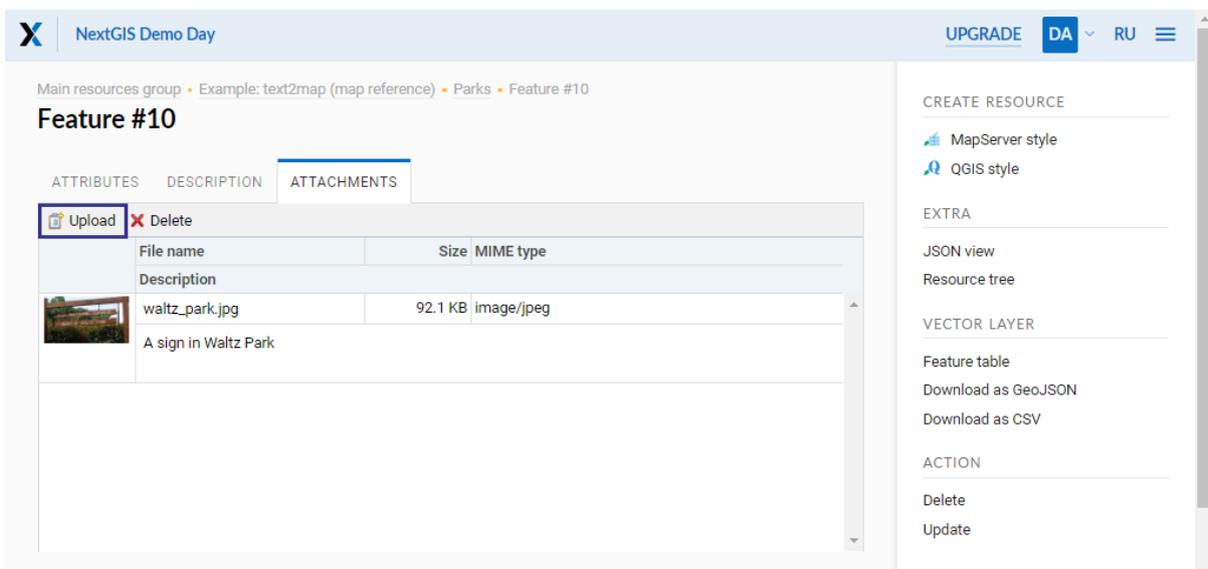


Fig. 7.7: Attachments tab of edit feature window for upload of photos.

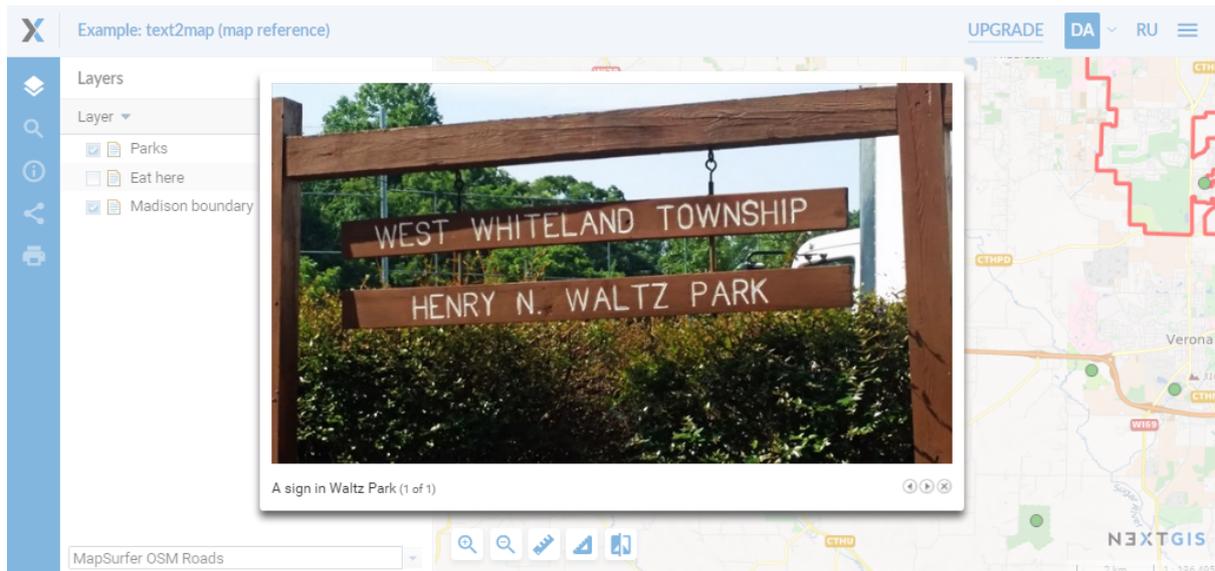


Fig. 7.8: A lightbox with uploaded photos for an identified feature.

Note: By default photos could be added by any user but there is an option to limit number of users who can upload photos (see *Setting permissions* (page ??)).

To delete a photo select it on “Attachments” tab of editing attributes window and click “Delete”, and then click “Save” button.

ADMINISTRATION OF WEB MAP

There could be several web maps in NextGIS Web. For example one map is for work, another is for public access and third is for testing of layer styles.

Web maps have their own URL addresses. You can manage display web map access permission for different users and groups.

Web map displays layers. User can turn web maps on and off. You can set the order for layers, define layers default visibility, create group layers. Groups on a map do not relate to groups of layers in control panel. There is no option to transfer layers between groups. Groups may be nested.

8.1 Creation of web map

To add a web map navigate to a resource group where you want to create a map and in actions pane “Create resource” select “Web map” (see Fig. ??).

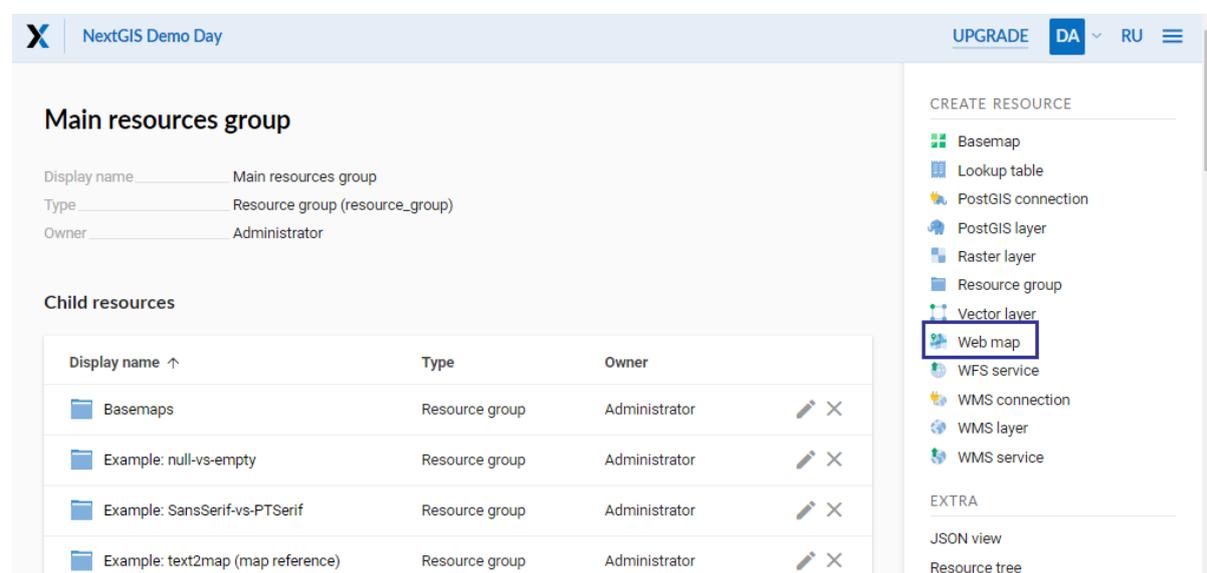


Fig. 8.1: Selection of “Web map” action.

Create resource dialog for a web map will open and will look like Fig. ??.

Enter web map display name that will be visible in administrator interface and in map layer tree.

Field “Keyname” is optional.

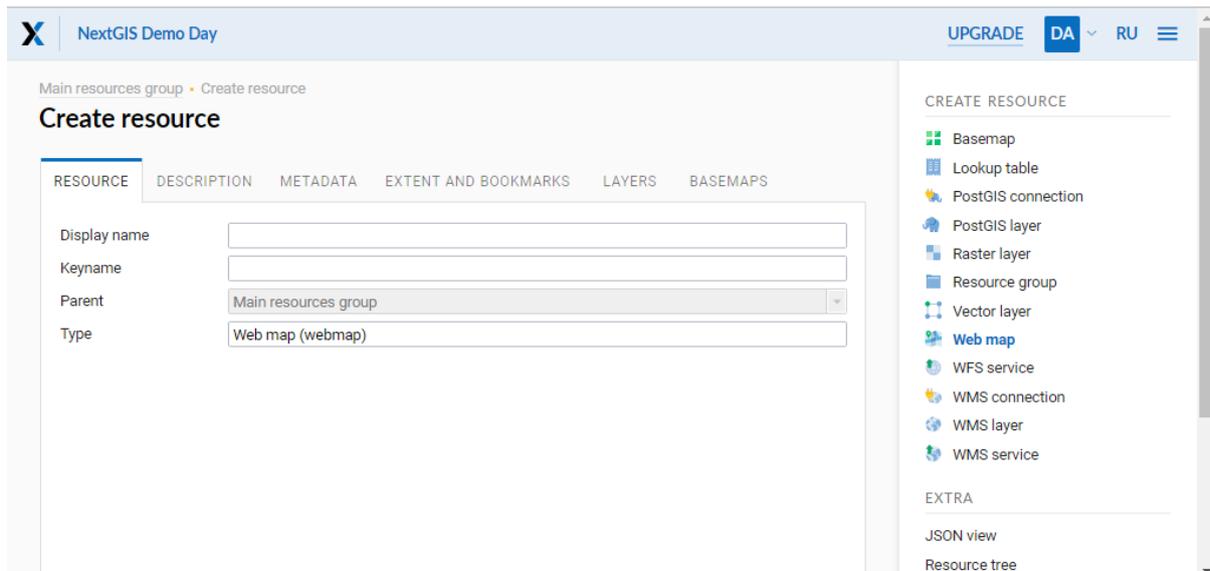


Fig. 8.2: Create resource dialog for web map.

You can also add resource description and metadata on the corresponding tabs.

Switch from “Resource” tab to “Extent and bookmarks” tab, which is presented on Fig. ??.

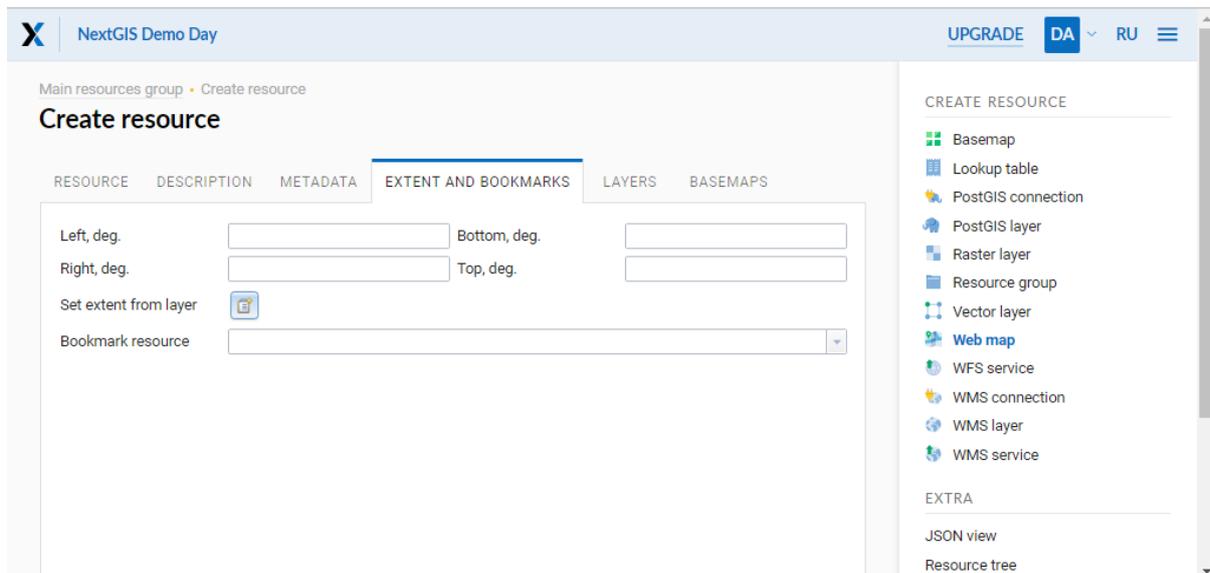


Fig. 8.3: “Extent and bookmarks” tab.

Set the extent in four fields by setting degrees.

The field “Extent from layer” allows to set web map extent on the layer extent. If you click the icon with plus on a folder near this field, the window “Select resource” will open, where you can select a layer to use for setting web map extent (four fields with extent coordinates will be filled up, see Fig. ??).

Tip: Coordinates for extent could be generated using third-party services <http://>

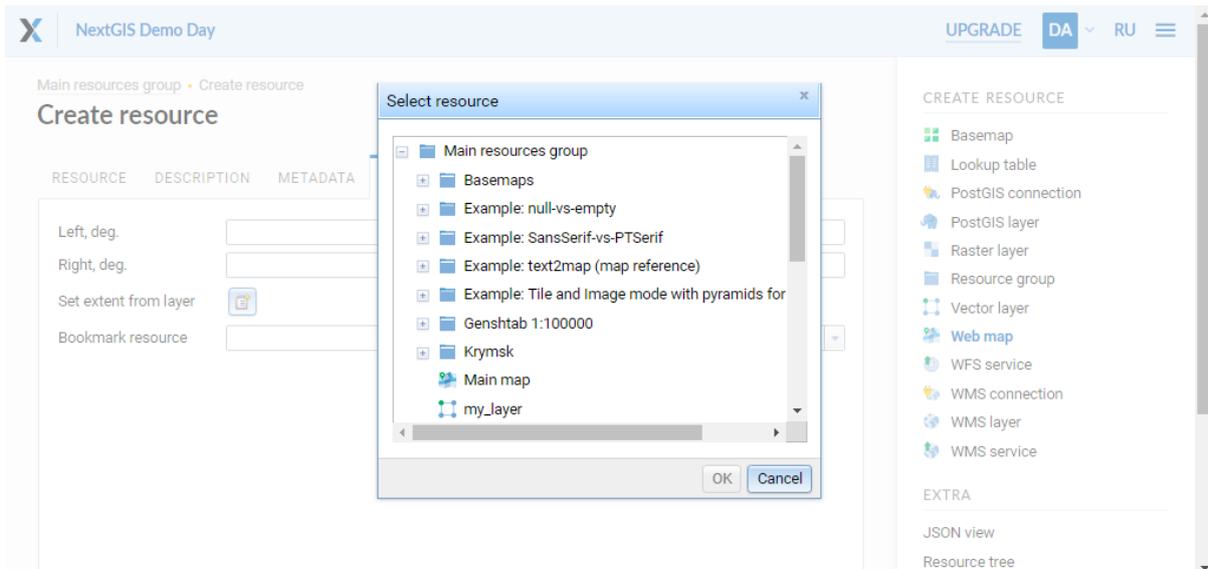


Fig. 8.4: “Select resource” window.

[//boundingbox.klokantech.com/](http://boundingbox.klokantech.com/) (select csv in a list), <http://lxbarth.com/bbox>.

You can select a vector layer for bookmarks in the field “Bookmark resource”. If layer is set the client will have a menu with bookmarks with names defined by “Label attribute”.

Navigate to “Layers” tab. This tab is used for adding layer, joining them to groups or removing them. These actions could be performed using corresponding buttons “Add layer”, “Add group” and “Remove” (see Fig. ??).

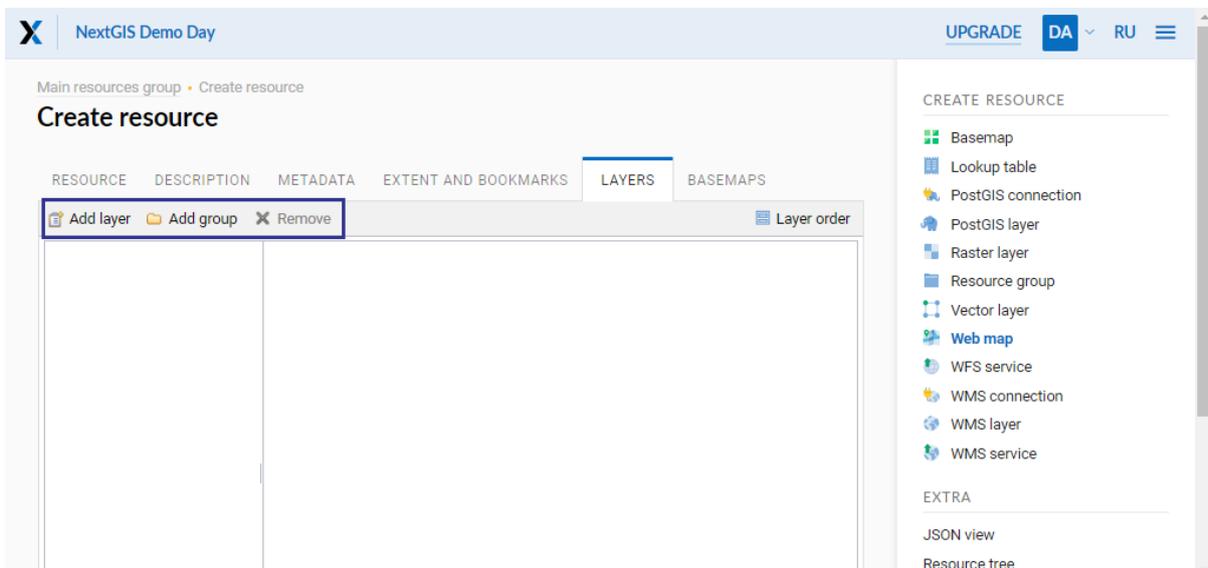


Fig. 8.5: “Layers” tab.

When a layer is added you set its style. The style is connected with the layer, so that “Style” is absent in main resource group. To create a style navigate to the layer resource and in actions pane select “MapServer style” or “QGIS style”. In opened window you can import a QML style from QGIS or enter the style manually

(see Fig. ??).

Settings for layers on web map are presented on Fig. ??.

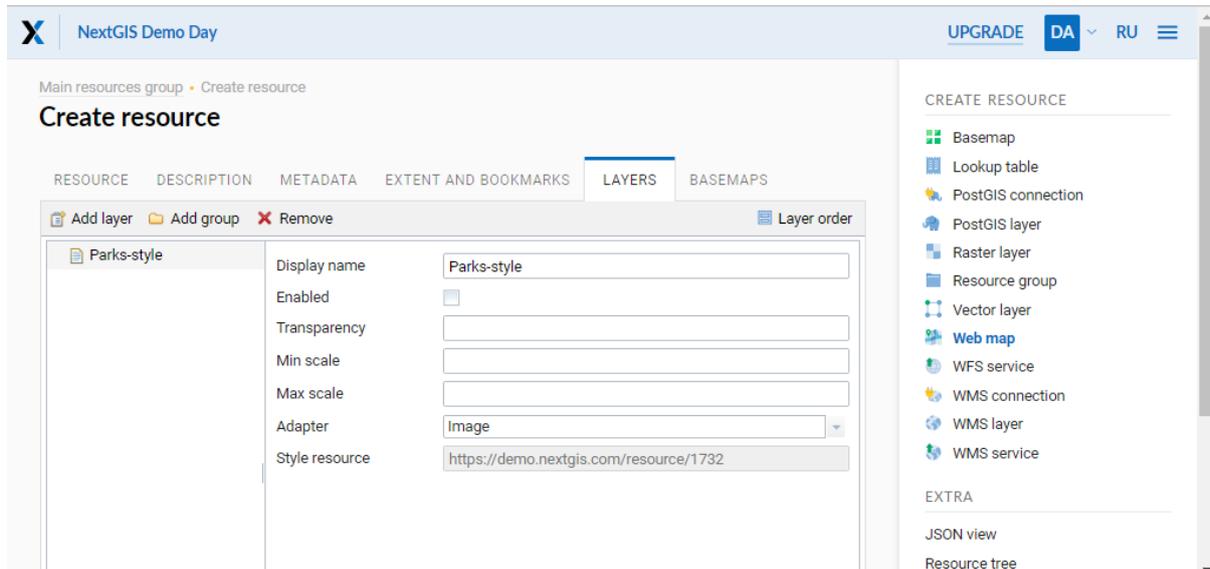


Fig. 8.6: Layers tab of create resource dialog.

A checkbox “Enabled” sets default visibility of a layer.

Field “Transparency” sets layer transparency on a map from 0% to 100%. A layer with 1% transparency is almost transparent, a layer with 100% transparency is opaque.

Field “Adapter” is recommended to be set to “Tiles” (256 x 256 pixels images) if there is no special requirements. You can also set it to “Image”, so there will be one image on a whole map.

For “Scale” parameters you may enter a scale range in the format like “1 : 10 000”. Scale range could be set in a layer style and in layer settings. If layer should be displayed in a range of scales it is better to set this in layer properties, instead of a style.

Note: If you set a scale range only in style empty tiles will be generated for distribution which is less efficient.

“Layer order” button opens a window where you can set layer order different from layer order in layers tree to show on a map.

“Basemaps” tab allows to add and remove basemaps using corresponding buttons “Add” and “Remove” (see Fig. ??).

A checkbox “Enabled” sets default visibility of a basemap.

Field “Transparency” sets basemap transparency on a map from 0% to 100%. A basemap with 1% transparency is almost transparent, a basemap with 100% transparency is opaque.

After a creation of map content and adjusting settings for all layers click a “Save” button. A saved map will be shown in a list of maps. Click an icon with a map in a

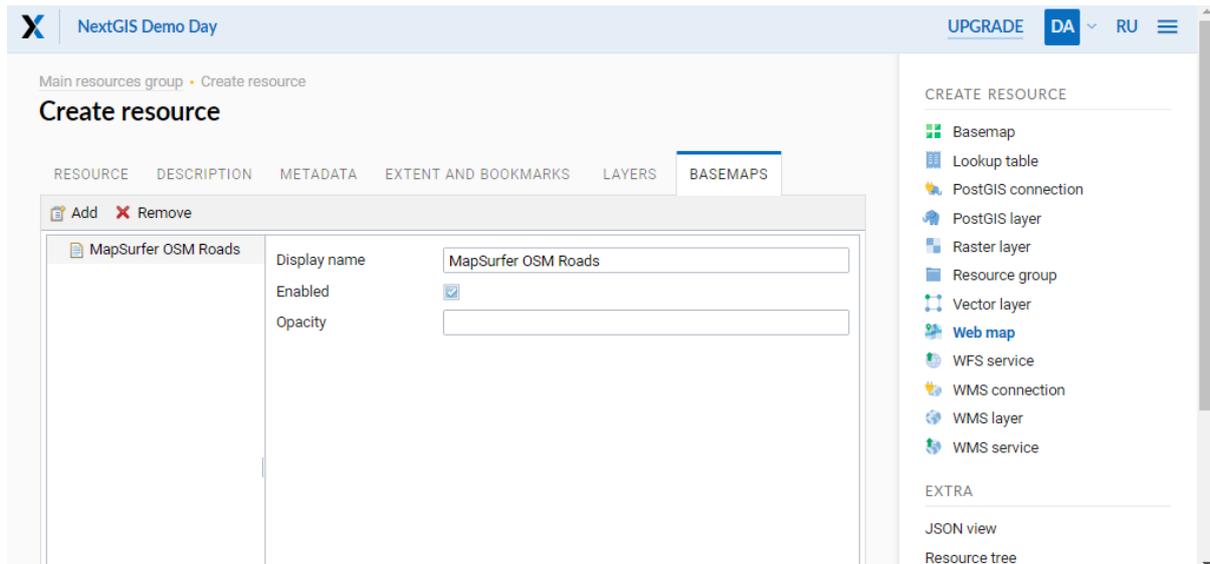


Fig. 8.7: “Basemaps” tab.

list of web maps or click a “Display” link in a window with web map properties to open a web map in a client application. Web map client application is described in section *A viewer for web maps* (page ??). Address which is used for web client may be transferred to other users because it is static.

Warning: Address will become unavailable if a web map is deleted.

A VIEWER FOR WEB MAPS

A special web application for viewing web maps is included with NextGIS Web (see Fig. ??).

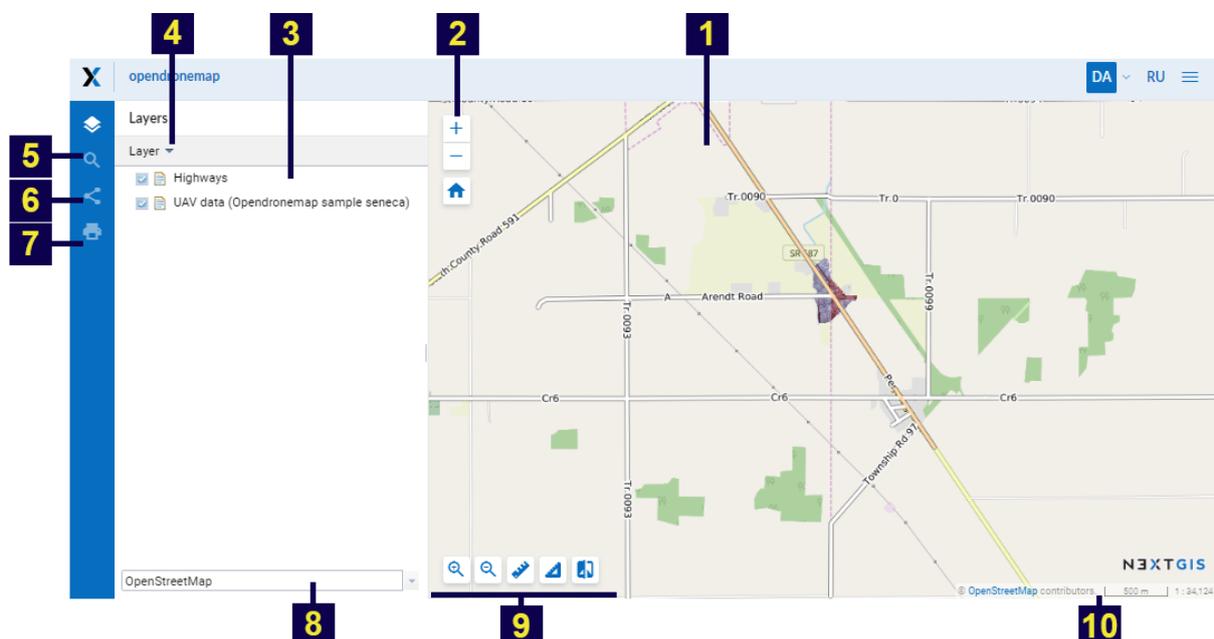


Fig. 9.1: The interface of viewer client application.

Numbers indicate: 1 - map; 2 - map zoom tools; 3 - layer tree; 4 - dropdown menu for selected layer; 5 - search bar; 6 - “Share”; 7 - “Print map”; 8 - dropdown list of basemaps; 9 - map tools; 10 - status bar.

Web client includes two main components: a map (see item 1 in Fig. ??) and layer tree (see item 3 in Fig. ??).

In a search bar (see item 5 in Fig. ??) during text input there will be performed a search using two sources: 1. In attributes of layers added to a map. 2. In address database of OpenStreetMap.

Results are shown as user inputs text with feature numbers for attribute search and full addresses. Found features that have a text in attributes are shown first and then addresses containing search text are shown. After a click on a search result map changes extent to show selected feature.

To share a link to a map use the function “Share” (see item 6 in Fig. ??), to print a map use the function “Print map” (see item 7 in Fig. ??).

Status bar (see item 10 in Fig. ??) displays current map scale. After a click on a map a window with click coordinates and features in this point (if there are any of them) appears.

When a layer is selected in a tree you can open a layer menu (see item 4 in Fig. ??) with the following actions:

- Description
- Zoom to layer
- Feature table

Using “Description” option you can get a description of selected layer, which was written during creation or editing of the layer. “Zoom to layer” option allows you to zoom a map to display selected layer on the whole visible map area.

After a click on “Feature table” option you will see feature table of the selected layer under a map. Select a row in feature table and navigate to the feature on a map, it will be highlighted (see Fig. ??). For the selected feature you can open a window with its properties, edit it or delete it. “Go to” button allows you to zoom a map to display the selected feature on the whole visible map area (see Fig. ??). In feature table tab you have an option to dynamically filter records. When user types a text the contents of the window is filtered leaving only records that match a search text.

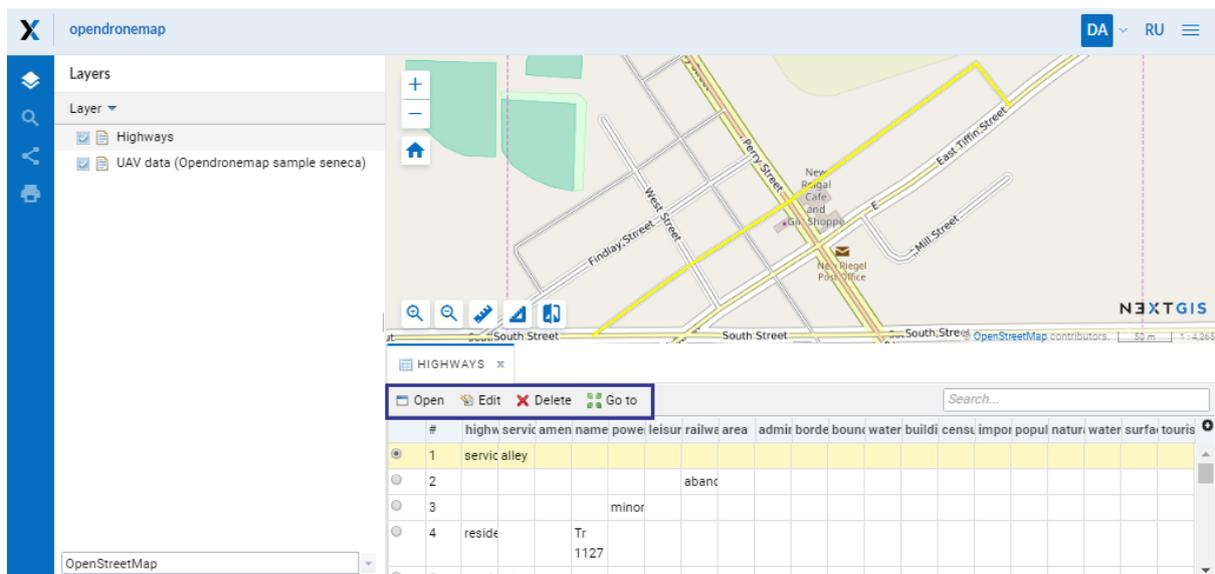


Fig. 9.2: Feature table of the selected layer on a web map.

To change a basemap use a dropdown list (see item 8 in Fig. ??). By default there are the following basemaps:

- None
- OpenStreetMap

Basemap - is a map image that is shared by thrid-party services in the Internet. User can not influence their content. User has an option to disable a basemap so a white background will be shown instead. If a user is supposed to have a poor Internet access or if web gis is deployed in local network without an access to

the Internet, it is possible to work without basemap adding base data as WebGIS layers.

Note: If it is supposed to work without an Internet access edit a file with [basemap settings](#) and delete records about Google basemaps.

Using map zoom tools (see item 2 in Fig. ??) you can change a map zoom or return it to a default zoom using “Initial extent” button with house icon.

There are some tools to work with map (see item 9 in Fig. ??) named from left to the right:

- Zoom in
- Zoom out
- Measure distance
- Measure area
- Vertical swipe

There are some options to work with map:

- if you click on `alt + shift` simultaneously and execute round cursor movements around a monitor, a map will turn for a certain degrees to the right or to the left,
- if you simultaneously click on `shift` and select of the necessary part of a map on a monitor by a cursor, you will highlight this part and zoom it in on a map.

ADMINISTRATIVE TASKS

10.1 Create new user group

A dialog for creation of a new user group presented on Fig. ???. To open this window select “Control panel” (see Fig. ??) in the main menu (see item 1 in Fig. ??). In control panel (see Fig. ??) select “Create” option in “Groups” block.

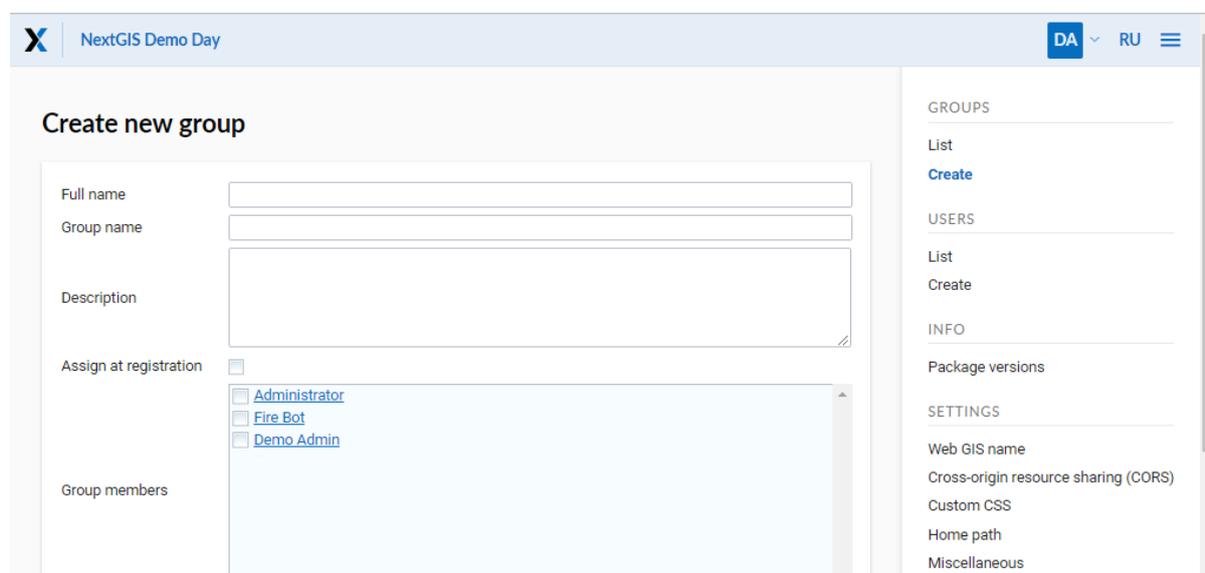


Fig. 10.1: “Create new group” dialog.

In “Create new group” dialog enter full name and group name (short name), if necessary enter a group description, set group members and click “Create” button.

Note: A name for a group should contain only letters and numbers.

10.2 Create new user

A dialog for creation of a new user is presented on Fig. ??. To open this window select “Control panel” (see Fig. ??) in the main menu (see item 1 in Fig. ??). In control panel (see Fig. ??) select “Create” option in “Users” block.

In “Create new user” dialog enter the following information:

Fig. 10.2: “Create new user” dialog.

- Full user name (e.g. John Smith)
- Login – user login (e.g. smith)
- Password
- Group(-s) user belongs to (the list of available groups is provided below user info. If the required group is absent you need to create a new one (see *Create new user group* (page ??))).

Then click “Create” button.

10.3 Setting permissions

NextGIS Web is resource based so each component (layer, group, service) is a resource. NextGIS Web provides extended settings for resource access permissions.

Permissions could be set during resource creation (see. *Adding resources* (page ??)), or using resource update (see. *Layer settings* (page ??)). To manage permissions use a “Permissions” tab in create/update resource dialog (see. Fig. ??).

You can grant, revoke and update permissions using this tab. You can grant different permissions to a single resource for different users and/or groups. A dialog with permission item settings is presented on fig. Fig. ??.

A dialog has the following elements:

- Action
- Principal
- Permission
- Resource
- Propagate

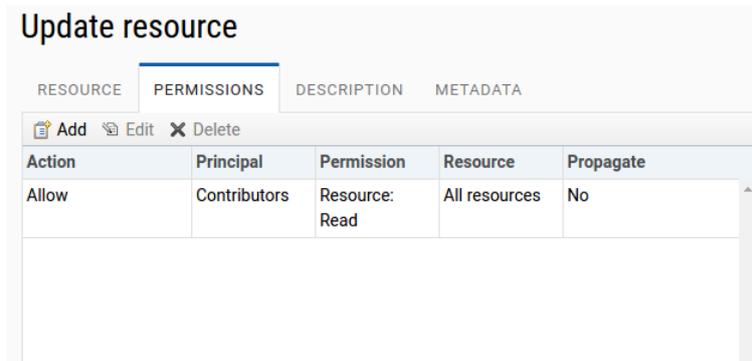


Fig. 10.3: Permissions tab for resource.

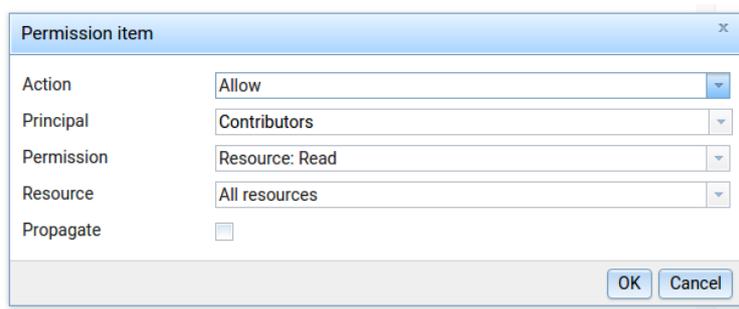


Fig. 10.4: Permission item settings dialog.

Action defines the kind of the rule - allow or deny.

Note: By default everything is denied.

Principal - a user or a user group who is subject to a rule.

Permission - defines allowed or denied actions with the resource. There are the following available types of permissions:

- All resources: All permissions
- Resource: All permissions
- Resource: Manage children
- Resource: Change permissions
- Resource: Read
- Resource: Create
- Resource: Update
- Resource: Delete
- Service: All permissions
- Service: Connect
- Service: Configure
- Data structure: All permissions

- Data structure: Write
- Data structure: Read
- Connection: All permissions
- Connection: Write
- Connection: Read
- Connection: Connect
- Web map: All permissions
- Web map: Display
- Data: All permissions
- Data: Write
- Data: Read
- Metadata: All permissions
- Metadata: Write
- Metadata: Read

Resource - type of resource the rule created for. This setting is important for resource groups where it is required to grant permissions only to some types of resources. If there is no need to grant different permissions to different types of resources, select “All resources” for this setting.

Propagate checkbox defines if permission rules need to be applied to resources in sub-groups or not. Note, that setting permissions for lower level resource and propagating doesn’t cancel the need to set them for upward resources. For example, if you gave read access to a resource group that is contained by other groups, but you didn’t give appropriate permissions for higher level resources (up to root) the user will not get access to current resource group.

Permissions could be assigned to resources indirectly. For example permission “Web map: Display” could be assigned for a resource group and if a “Propagate” checkbox is checked this rule will be applied to every web map inside this resource group and inside all the subgroups.

Here is a description for available permission types.

All resources: All permissions - allows or denies any actions with resources.

Resource: All permissions - allows or denies any actions with resources excluding resource groups.

Resource: Manage children - allows or denies update of child resources settings.

Resource: Change permissions - allows or denies access permissions management for a resource.

Resource: Read - allows or denies reading of resources.

Resource: Create - allows or denies creation of resources.

Resource: Update - allows or denies modification of resources.

Resource: Delete - allows or denies deletion of resources.

Service: All permissions - allows or denies any actions with a service.

Service: Connect - allows or denies connections to a service.

Service: Configure - allows or denies modification of service settings.

Data structure: All permissions - allows or denies any actions with data structure.

Data structure: Write - allows or denies modification of data structure.

Data structure: Read - allows or denies reading of the data structure.

Connection: All permissions - allows or denies any actions with connections.

Connection: Write - allows or denies modification of connections.

Connection: Read - allows or denies reading of connection parameters.

Connection: Connect - allows or denies usage of connection (defines if layers and data from the connection will be available for a user).

Web map: All permissions - allows or denies any actions with a web map.

Web map: Display - allows or denies display of a web map.

Data: All permissions - allows or denies any actions with data.

Data: Write - allows or denies data modification.

Data: Read - allows or denies reading of data.

Metadata: All permissions - allows or denies any actions with metadata.

Metadata: Write - allows or denies modification of metadata.

Metadata: Read - allows or denies reading of metadata.

When you assign rights to a particular resource take into account the rights of its constituent resources. For example to provide access to a WMS service you should grant the following permissions:

- **Service: Connect** - to a connection itself.
- **Resource: Read** - to all resources (vector and raster layers) published with WMS service.
- **Data structure: Read** - to all resources (vector and raster layers) published with WMS service.
- **Data: Read** - to all resources (vector and raster layers) published with WMS service.

If you have a complex system with several maps and different users who should work with these maps you can create user groups. You can assign different permissions to every group.

10.4 Example: Assigning permissions

10.4.1 Close a group for guests, open it for the user

Action	Principal	Permission	Resource	Propagate
Allow	Fire Bot	All resources: All permissions	All resources	Yes
Deny	Guest	All resources: All permissions	All resources	Yes

Fig. 10.5: Settings for resource group.

Action	Principal	Permission	Resource	Propagate
Allow	Fire Bot	Resource: Read	All resources	Yes

Fig. 10.6: Settings for root resource group.

You can also allow the user reading all higher resource groups as alternative.

10.4.2 Grant guest user resource display permission

Note: Guest users will be able to see administrative interface and view all folders excluding especially closed ones.

Add Edit Delete				
Action	Principal	Permission	Resource	Propagate
Allow	Guest	Resource: Read	All resources	Yes
Allow	Guest	Data: Read	All resources	Yes
Allow	Guest	Data structure: Read	All resources	Yes
Allow	Guest	Metadata: Read	All resources	Yes

Fig. 10.7: Settings for root resource group.

10.4.3 Grant guest user web map display permission

Note: Guest users will be able to see only a web map and layers in a folder, other resources will be closed.

Action	Principal	Permission	Resource	Propagate
Allow	Guest	Web map: Display	Web map	Yes
Allow	Guest	Resource: Read	All resources	Yes

Fig. 10.8: Settings for resource group with maps.

Action	Principal	Permission	Resource	Propagate
Allow	Guest	Data: Read	All resources	Yes
Allow	Guest	Resource: Read	All resources	Yes

Fig. 10.9: Settings for resource group with geodata.

Action	Principal	Permission	Resource	Propagate
Allow	Administrator	All resources: All permissions	All resources	Yes
Allow	Editors	Data: Write	All resources	Yes

Fig. 10.10: Settings for root resource group.

Action	Principal	Permission	Resource	Propagate
Allow	Guest	Data structure: Read	All resources	Yes
Allow	Guest	Data: Read	All resources	Yes

Fig. 10.11: Settings for resource group with maps.

Action	Principal	Permission	Resource	Propagate
Allow	Guest	Resource: Read	All resources	No
Allow	Guest	Web map: Display	All resources	Yes

Fig. 10.12: Settings for resource group with geodata.

Action	Principal	Permission	Resource	Propagate
Allow	Tracker	All resources: All permissions	All resources	Yes

Fig. 10.13: Settings for a resource group.

Action	Principal	Permission	Resource	Propagate
Allow	Administrators	All resources: All permissions	All resources	Yes
Deny	Everyone	Resource: Delete	All resources	No
Allow	Tracker	Resource: Read	Resource group	No

Fig. 10.14: Settings for root resource group.

10.4.4 Grant a single user permissions to a single resource group

10.4.5 Grant a permission to input data using a mobile application to a group of users

Create a separate group of users (“Contributors” in this example) and a separate resource group.

Action	Principal	Permission	Resource	Propagate
Allow	Contributors	Resource: Read	All resources	Yes
Allow	Contributors	Data structure: Read	All resources	Yes
Allow	Contributors	Web map: Display	All resources	Yes
Allow	Contributors	Data: All permissions	All resources	Yes
Allow	Contributors	Metadata: Read	All resources	Yes

Fig. 10.15: Settings for a resource group.

Action	Principal	Permission	Resource	Propagate
Allow	Contributors	Resource: Read	All resources	No

Fig. 10.16: Settings for root resource group.

10.4.6 Disallow view of webmap to all not authenticated users, grant view to authenticated users

Action	Principal	Permission	Resource	Propagate
Deny	Guest	Web map: Display	All resources	No
Allow	John Smith	Web map: Display	All resources	No

10.4.7 Disallow all access for guest users (without password)

10.5 Update user password

To update user password you can use administrative interface. To do it select “Control panel” (see Fig. ??) in the main menu (see item 1 in Fig. ??). In control panel (see Fig. ??) select “List” option in “Users” block and click pencil icon near the user you want to update password for (see Fig. ??). In opened window in “Password” field fill in a new password and click “Save” button.

Also there is an option to change user password using command line:

Warning: Setting a password using a command line is not safe.

```
env/bin/nextgisweb --config config.ini change_password user password
env/bin/nextgisweb --config config.ini change_password user password
```

Action	Principal	Permission	Resource	Propagate
Deny	Guest	All resources: All permissions	All resources	Yes

Fig. 10.17: User editing window.

10.6 Customization of NextGIS Web outlook

You can customize the look of NextGIS Web, including logos, backgrounds, header and buttons colors etc. To do it select “Control panel” (see Fig. ??) in the main menu (see item 1 in Fig. ??). In control panel (see Fig. ??) select “Custom CSS” in “Settings” block. In opened tab enter your own CSS rules. They will be used throughout your Web GIS on all its pages.

10.7 Custom CSS examples

10.7.1 Change header color

```
.header{background-color: #F44336; color: #fff;}
```

10.7.2 Remove NextGIS logo from Web map

```
.map-logo{display:none;}
```

10.7.3 Remove social networks sharing buttons

```
div.social-links {display:none;}
```

Remove hamburger button

```
span#rightMenuIcon {display:none;}
```

For return it back - open control panel by url <http://username.nextgis.com/control-panel>

10.7.4 Remove login button in upper right corner

```
ui.header-nav header__right {display:none;}
```

10.7.5 Remove identification window header

Identification window is a popup that is shown when you click on a feature on a Web map. This setting will hide it's header and layer selector:

```
div.ngwPopup__content div div.dijitAlignTop,
div.ngwPopup__features span.ngwWebmapToolIdentify-controller {
    display: none;
}
```

10.7.6 Advanced example

This example shows how to change the look of pretty much all changeable elements of NextGIS Web. You can try these examples as is or change it to your liking. You can also see them in action [here](#)⁵.

```
/* Base background */
body{
  background-color: #fff;
  background-image:url("https://nextgis.ru/img/hypnotize_transparent.png");
}

/* Header text and background color */
.header{
  background-color: #F44336;
  color: #fff;
}

/* Separator color between logo and title */
.header__title-logo{
  border-right: 1px solid rgba(255,255,255,.48) !important;
}

/* User info color in header */
.user-avatar__label{
  background-color: #fff !important;
}
```

(continues on next page)

⁵ <http://nastya.nextgis.com>

(continued from previous page)

```
    color: #F44336 !important;
}

.user-avatar .user-avatar__icon{
    color: rgba(255,255,255,.82) !important;
}

/* Primary button */

.dijitButton--primary{
    background-color: #fff !important;
    color:#f44336 !important;
    font-weight: bold !important;
    border: 2px solid #f44336 !important;
}

.dijitButton--primary:hover{
    background-color: #f44336 !important;
    color: #fff !important;
}

/* Default button */

.dijitButton--default{
    background-color: #fff !important;
    color:#999 !important;
    font-weight: bold !important;
    border: 2px solid #999 !important;
}

.dijitButton--default:hover{
    background-color: #999 !important;
    color: #fff !important;
}

/* Tabs color */

.dijitTabContainerTop-tabs .dijitTabChecked{
    border-top-color: #f44336 !important;
}

/* Left navigation panel on the map */

.navigation-menu{
    background-color: #fff !important;
    border-right: 1px solid rgba(0,0,0,.12) !important;
    color: #000 !important;
}
```

SYSTEM ADMINISTRATION

This section describes system administrator tasks. These tasks are actual during a process of deploy, backup, copying and migration.

11.1 Install in Ubuntu

This document is checked and subject to work with Ubuntu Server 14.04 LTS or higher. Python 2.7 is required to perform an installation.

Warning: To support file names with local names (e.g. ru_RU.UTF-8) it is required that appropriate locale is installed. To check if locale is installed use a command: `locale -a` To add a new locale use a command: `locale-gen ru_RU.utf8`

11.1.1 Preparation of the database

Install PostgreSQL:

```
$ sudo apt-get install postgresql-<version>
```

Create a user who would be used as database.user in config.ini (see further):

```
$ sudo -u postgres createuser ngw_admin -P -e
```

enter a password three times and then input 'n'.

Create a database where NGW will be deployed, the name of database should be the same as database.name in config.ini (see further):

```
$ sudo -u postgres createdb -O ngw_admin --encoding=UTF8 db_ngw  
$ sudo nano /etc/postgresql/9.3/main/pg_hba.conf
```

Edit a file so it contains the following strings (change authentication method to md5, if another is specified):

```
# IPv4 local connections:  
host    all             all             127.0.0.1/32      md5  
# IPv6 local connections:  
host    all             all             ::1/128          md5
```

Do not forget to restart database service:

```
$ sudo service postgresql restart
```

Install PostGIS:

```
$ sudo apt-cache search postgis
```

Find a package in the list that suits for your PostgreSQL version, its name should look like postgresql-{version}-postgis-{version}, and install it:

```
$ sudo apt-get install postgresql-9.3-postgis-2.1
$ sudo -u postgres psql -d db_ngw -c 'CREATE EXTENSION postgis;'
$ sudo -u postgres psql -d db_ngw -c 'ALTER TABLE geometry_columns OWNER \
TO ngw_admin;'
$ sudo -u postgres psql -d db_ngw -c 'ALTER TABLE spatial_ref_sys OWNER \
TO ngw_admin;'
$ sudo -u postgres psql -d db_ngw -c 'ALTER TABLE geography_columns OWNER \
TO ngw_admin;'
```

After these operations databases will be created in PostgreSQL with installed *PostGIS* and a user DB (database), will become an owner of databases, and also an owner of `geometry_columns`, `georgaphy_columns`, `spatial_ref_sys` tables.

Check if PostGIS functions appeared in a database:

```
$ psql -h localhost -d db_ngw -U ngw_admin -c "SELECT PostGIS_Full_
↳Version();"

```

If you deploy a system on a clean server and need to create one more PostGIS database to store data, you may enable a network access to it

```
$ sudo su - postgres
$ nano /etc/postgresql/9.3/main/pg_hba.conf
add a sting to the end of file: host all all 192.168.0.0/16 md5
mask 192.168.0.0/16 allows to access to DB from all IP starting with "192.
↳168"

$ nano /etc/postgresql/9.3/main/postgresql.conf
create a string listen_addresses='*' and uncomment it.
```

```
$ sudo service postgresql restart
```

11.1.2 Preparation of basic software

Install pip:

```
$ sudo apt-get install python-pip
```

Install virtualenv:

```
$ sudo pip install virtualenv
```

Install additional tools:

```
$ sudo apt-get install python-dev git libgdal-dev \
g++ libxml2-dev libxslt1-dev gdal-bin libgeos-dev zlib1g-dev libjpeg-
↳turbo8-dev
```

11.1.3 Prepare to NextGIS Web installation

Create required directories:

```
$ mkdir -p ~/ngw/{data,upload}
$ cd ~/ngw
```

Clone repository:

```
$ git clone https://github.com/nextgis/nextgisweb.git
```

Create a virtual environment in a folder ~/ngw/env (folder will be created after a command execution):

```
$ virtualenv --no-site-packages env
```

11.1.4 NextGIS Web installation

Install NextGIS Web package in development mode. All required packages will be installed:

```
$ env/bin/pip install -e ./nextgisweb
```

11.1.5 Install MapServer

This module needs a MapScript to function. Mapscript is not installed to a virtual environment in a standard way so you need to install it manually.

Install required package to a system:

```
$ sudo apt-get install python-mapscript
```

After that you need to copy required files to a virtual environment directory used for NextGIS Web. At this steps there are at least two options depending on what kind of python-mapscript package is installed to a system. This depends on distributive used.

If you use Ubuntu, to copy system MapScript to virtual environment (directory env) you can use the following commands:

```
$ mkdir env/lib/python2.7/site-packages/mapscript.egg
$ cp /usr/lib/python2.7/dist-packages/*mapscript* \
$ env/lib/python2.7/site-packages/mapscript.egg
$ echo "./mapscript.egg" > env/lib/python2.7/site-packages/mapscript.pth
```

If you use FreeBSD, the process will be slightly different:

```
$ cp -r python -c "import mapsript, os.path; print \
os.path.split(mapsript.__file__)[0]" env/lib/python2.7/site-packages/
↪mapsript.egg
$ echo "./mapsript.egg" > env/lib/python2.7/site-packages/mapsript.pth
```

If you use Fedora/CentOS, then:

```
$ mkdir env/lib/python2.7/site-packages/mapsript.egg
$ cp /usr/lib/python2.7/site-packages/*mapsript* \
env/lib/python2.7/site-packages/mapsript.egg
$ echo "./mapsript.egg" > env/lib/python2.7/site-packages/mapsript.pth
```

If you execute a command:

```
$ env/bin/pip freeze
```

you will get an error message:

```
"Missing 'Version:' header and/or PKG-INFO file", mapsript [unknown_
↪version]
```

To fix it you create a file PKG-INFO:

```
$ mkdir env/lib/python2.7/site-packages/mapsript.egg/EGG-INFO
$ touch env/lib/python2.7/site-packages/mapsript.egg/EGG-INFO/PKG-INFO
```

Set the version of MapScript to be used:

```
$ echo python -c "import mapsript; print 'Version: %s' % mapsript.MS_
↪VERSION" \
> env/lib/python2.7/site-packages/mapsript.egg/EGG-INFO/PKG-INFO
```

11.1.6 Install NextGIS Web MapServer

Clone repository:

```
$ git clone https://github.com/nextgis/nextgisweb_mapserver.git
```

Install a package in development mode:

```
$ env/bin/pip install -e ./nextgisweb_mapserver
```

Execute a command one more time:

```
$ env/bin/pip freeze
```

to check if there any errors.

Also you can install QGIS rendering module, and get rendered maps looking same as in desktop NextGIS QGIS. See install manual at *"Adding NextGIS Web QGIS extension (page ??)"*.

11.1.7 NextGIS Web configuration file

Configuration file with default parameters could be created using a command `nextgisweb-config`:

```
$ env/bin/nextgisweb-config > config.ini
```

A configuration file `config.ini` will be created. This text file should be edited to match the environment. Purpose of parameters is described in comments. User name and password and also a directory for data storage are taken from commands above. Check if the following parameters a set correctly:

Example of NextGIS Web configuration file

```
[file_upload]

# Temporary directory for uploaded storage of files (either core/dir or
# (file_storage/path and file_upload/path) is required)
# path =

[pyramid]

# Key used to encrypt cookies (required)
secret =
# HTML-help
help_page = /home/trolleway/ngw/help.htm
# System logo
# logo =
# Favicon
# favicon =
# Redirect link when open /
# home_url =

[core]

# System name
system.name = NextGIS Web
# Full system name
system.full_name = Demo web gis
# Database host name
database.host = localhost
# Database name
database.name = db_ngw
# Database user name
database.user = ngw_admin
# Database user password
database.password =
# Check the connection at startup
# database.check_at_startup =
# Do not load listed packages
# packages.ignore =
# Do not load listed components
# components.ignore =
# Data storage directory (either sdir or (core/file_storage/path and file_
# upload/path) is required)
```

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```

sdir = /home/trolleway/ngw/data
# Locale used by default
locale.default = ru

[file_storage]

# Directory for file storage (either sdir or (core/file_storage/path and
# file_upload/path) is required)
# path =

[feature_layer]

# Show attributes in identify
# identify.attributes =

[webmap]

# File with base layers definitions
# basemaps =
# Bing Maps API-key
# bing_apikey =
# Identification tolerance
# identify_radius =
# Width of pop-up window
# popup_width =
# Height of pop-up window
# popup_height =

[wmsclient]

[mapserver]

# List of fonts in a MAPFILE FONTSET format
# fontset =

```

To generate a key for configuration file `config.ini` use a command

```
$ openssl rand -base64 16
```

Warning: 1. In some cases absolute paths to folders should be entered because a python parameter `%(here)s` works not in all cases. 2. No spaces are allowed before the name of variable in configuration file .

Also commands `pserve` or `pshell` require a paster configuration file, e.g. `development.ini`.

```
$ nano development.ini
```

Contents:

```

[app:main]
use = egg:nextgisweb

```

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```
# a path to the main configuration file
config = %(here)s/config.ini

# a path to logging library configuration file
# logging = %(here)s/logging.ini

# parameters useful for debugging
# pyramid.reload_templates = true
# pyramid.includes = pyramid_debugtoolbar

[server:main]
use = egg:waitress#main
host = 0.0.0.0
port = 6543
```

If it is supposed that a server will be used in Intranet only then you need to delete records about Google basemaps from `/nextgisweb/nextgisweb/webmap/basemaps.json`.

11.1.8 Internationalization and Localization

As compiled files with translated interface are not stored inside a version control system you need to compile them for each package, or the administrator interface will be in English:

```
$ env/bin/nextgisweb-i18n --package nextgisweb compile
$ env/bin/nextgisweb-i18n --package nextgisweb_mapserver compile
```

To install localization by default for Russian language you need to add a string to a section **core** of configuration file (e.g. **config.ini**):

```
locale.default = ru
```

So the interface will be Russian during the first launch.

11.1.9 Database initialization

If you plan to use an interface language other than English by default make sure you have compiled translation files and that a `locale.default` setting of a **core** component in configuration file `config.ini` is set to required language before initialization of database, in other case some strings will remain English even after a forced change of language in administrator interface.

To initialize a database follow these steps:

```
$ env/bin/nextgisweb --config config.ini initialize_db
```

In some cases, e.g. during update, you may need to remove all database data and initialize a database one more time:

```
$ env/bin/nextgisweb --config config.ini initialize_db --drop
```

11.1.10 Migration and backup

Migration - is a process of data and NextGIS Web transfer between servers. During a migration a backup is created for:

- All the content of NextGIS Web database: information about layers, styles, user accounts, so everything that is set in administrator interface.
- Vector data uploaded through administrator interface.
- Raster data uploaded through administrator interface.

Config.ini file is not included to backup, it should be transferred separately.

To start a process of migration execute the following commands:

```
$ env/bin/nextgisweb --config config.ini backup file.ngwbackup
$ env/bin/nextgisweb --config config.ini restore file.ngwbackup
```

Backup is a ZIP-archive. To disable archiving of backup you need to use a key `--no-zip`. A catalog with defined name would be created.

```
$ env/bin/nextgisweb --config "config.ini" backup "backup/ngwbackup" --no-
→zip
```

In FreeBSD OS there is an error: sqlite support is not transferred in virtualenv. You need to manually copy the file:

```
$ cp /usr/local/lib/python2.7/site-packages/_sqlite3.so \
env/lib/python2.7/site-packages/
```

Migration should be performed using these steps:

1. Start a backup on source server.

```
$ env/bin/nextgisweb --config "config.ini" backup "backup/ngwbackup" --no-
→zip
```

2. If you need to transfer a PostGIS database with geodata then you need to make its backup using a pgAdminIII software in a tar format.
3. On target server install NextGIS Web using a manual (see section 2).
4. NextGIS Web database is created on target server and access rights are set using pgAdminIII.
5. On a target server in the config.ini file you need to set a connection to a database for NextGIS Web.

```
# Database host name
database.host = localhost
# Database name
database.name = zapoved_ngw
# Database user name
```

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```
database.user = user
# Database user password
database.password = password
```

6. On a target server execute a command:

```
$ env/bin/nextgisweb --config "config.ini" restore "backup/ngwbackup"
```

7. Launch NextGIS Web. Everything should work except PostGIS layers (if there were any).

8. If you need to transfer a PostGIS database with geodata you need to create a new database and then deploy a backup from source server.

9. You need to enter a new server address in PostGIS connection settings.

If there is an error “No module named pysqlite2” - it means that you forgot to transfer sqlite. Execute required command from the installation manual.

11.1.11 Software update

To update NextGIS Web software execute a command:

```
$ cd ~/ngw/nextgisweb
$ git pull
```

If some dependences were added to setup.py you need to execute:

```
$ env/bin/pip install -e ~/ngw/nextgisweb
```

If a database structure has changed you need to execute:

```
$ cd ../
$ env/bin/nextgisweb --config config.ini initialize_db
```

Also you need to update nextgisweb_mapserver package:

```
$ cd ./nextgisweb_mapserver
$ git pull
```

After executing of commands you need to restart NextGIS Web software with a restart of pserve, or with a restart of web server with uWSGI module.

11.1.12 Warnings and errors

During a work of software some diagnostic messages may be displayed in pserver console or written to the log:

```
aolt.py:471: SAWarning: Unicode type received non-unicode bind param value.
processors[key](compiled_params[key])
```

This message is not important.

If you plan to work with API from leaflet or OpenLayers you need to setup CORS technology.

11.2 Install in CentOS 7

This document is checked and subject to work in CentOS 7. Python 2.7 is required to perform an installation.

Warning: To support file names with local names (e.g. ru_RU.UTF-8) it is required that appropriate locale is installed. To check if locale is installed use a command: `locale -a` To add a new locale use a command: `locale-gen ru_RU.utf8`

11.2.1 Preparation of the database

PostGIS is absent in the official repository of CentOS 7 so you need to add third party repository. To do this go to [address⁶](#), select the required package for current release of PostgreSQL and install it. For PostgreSQL 9.5 it will look like:

```
$ sudo yum install https://download.postgresql.org/pub/repos/yum/9.5/
↳ redhat/rhel-7-x86_64/pgdg-centos95-9.5-2.noarch.rpm
```

To view a list of all packages available from this repository execute a command:

```
$ yum list | grep pgdg95
```

Install PostgreSQL:

```
$ sudo yum install postgresql95 postgresql95-server postgresql95-libs \
postgresql95-contrib postgresql95-devel
```

Initialize a database and enable autolaunch with the system start:

```
$ sudo /usr/pgsql-9.5/bin/postgresql95-setup initdb
$ sudo systemctl start postgresql-9.5.service
$ sudo systemctl enable postgresql-9.5.service
```

Create a user who would be used as database.user in config.ini (see further):

```
$ sudo -u postgres createuser ngw_admin -P -e
```

Create a database where NGW will be deployed, the name of database should be the same as database.name in config.ini (see further):

```
$ sudo -u postgres createdb -O ngw_admin --encoding=UTF8 db_ngw
```

Edit authentication parameters in corresponding file:

```
$ sudo nano /var/lib/pgsql/9.5/data/pg_hba.conf
```

⁶ <http://yum.postgresql.org/repopackages.php>

Edit a file so it contains the following strings (change authentication method to md5, if another is specified):

```
# IPv4 local connections:
host    all             all             127.0.0.1/32      md5
# IPv6 local connections:
host    all             all             ::1/128           md5
```

Do not forget to restart PostgreSQL:

```
$ sudo systemctl restart postgresql-9.5.service
```

Add a repository with PostGIS dependences:

```
$ sudo yum install epel-release
```

Install PostGIS:

```
$ sudo yum install postgis2_95
$ sudo -u postgres psql -d db_ngw -c 'CREATE EXTENSION postgis;'
$ sudo -u postgres psql -d db_ngw -c \
'ALTER TABLE geometry_columns OWNER TO ngw_admin;'
$ sudo -u postgres psql -d db_ngw -c \
'ALTER TABLE spatial_ref_sys OWNER TO ngw_admin;'
$ sudo -u postgres psql -d db_ngw -c \
'ALTER TABLE geography_columns OWNER TO ngw_admin;'
```

After these operations databases will be created in PostgreSQL with installed *PostGIS* and a user DB, will become an owner of databases, and also an owner of *geometry_columns*, *geography_columns*, *spatial_ref_sys* tables.

Check if PostGIS functions appeared in a database:

```
$ psql -h localhost -d db_ngw -U ngw_admin -c "SELECT PostGIS_Full_
↳Version();"

```

11.2.2 Preparation of basic software

Install pip:

```
$ sudo yum install python-pip
```

Install virtualenv:

```
$ sudo yum install python-virtualenv
```

Install additional tools:

```
$ sudo yum install git gdal gdal-devel libxml2-devel libxslt-devel gcc-c++
↳\
geos-devel proj-epsg zlib-devel libjpeg-turbo-devel dejavu-sans-fonts
```

11.2.3 Prepare to NextGIS Web installation

See *Prepare to NextGIS Web installation* (page ??).

11.2.4 NextGIS Web installation

Set environment variable PATH:

```
$ export PATH=/usr/pgsql-9.5/bin:$PATH
```

Install NextGIS Web in development mode. All required packages will be installed:

```
$ env/bin/pip install -e ./nextgisweb
```

During packages build process there could occur a lack of memory. (was spotted on a computer with 512 MB of RAM during installation of lxml package), in this case you can increase memory size using a swap file, [see more](#)⁷.

11.2.5 Install MapServer

MapServer is absent from repository of CentOS 7 so we built required packages: [mapserver](#)⁸ and [mapserver-python](#)⁹.

Download them and install:

```
$ sudo yum install fribidi cairo fcgi harfbuzz httpd librsvg2
$ sudo rpm -ivh mapserver-7.0.0-1.el7.centos.x86_64.rpm
$ sudo rpm -ivh mapserver-python-7.0.0-1.el7.centos.x86_64.rpm
```

After that you need to copy required files to a virtual environment directory used for NextGIS Web.

```
$ mkdir env/lib/python2.7/site-packages/mapscript.egg
$ cp /usr/lib64/python2.7/site-packages/*mapscript* \
env/lib/python2.7/site-packages/mapscript.egg
$ echo "./mapscript.egg" > env/lib/python2.7/site-packages/mapscript.pth
```

Create a file PKG-INFO:

```
$ mkdir env/lib/python2.7/site-packages/mapscript.egg/EGG-INFO
$ touch env/lib/python2.7/site-packages/mapscript.egg/EGG-INFO/PKG-INFO
```

Set the version of MapScript to be used:

```
$ echo python -c "import mapscript; print \
'Version: %s' % mapscript.MS_VERSION" \
> env/lib/python2.7/site-packages/mapscript.egg/EGG-INFO/PKG-INFO
```

For next steps see instructions if section *Install NextGIS Web MapServer* (page ??) and further.

⁷ <http://stackoverflow.com/a/18335151/813758>

⁸ http://nextgis.ru/programs/centos7/mapserver-7.0.0-1.el7.centos.x86_64.rpm

⁹ http://nextgis.ru/programs/centos7/mapserver-python-7.0.0-1.el7.centos.x86_64.rpm

11.3 Launch

11.3.1 Launch using Pserve

To launch NextGIS Web using Pserve run a command:

```
env/bin/pserve development.ini
```

To launch NextGIS Web automatically with a launch of operation system edit a user script for autolaunch:

```
sudo nano /etc/rc.local
```

and add the following string to the file:

```
/home/zadmin/ngw/env/bin/pserve --daemon /home/zadmin/ngw/production.ini
```

In production you should use *uWSGI* (page ??) instead of pserve.

To test if application is running go to the following address in the browser:

```
http://0.0.0.0:6543
```

An authentication page will be open.

Default login and password:

- Login: administrator
- Password: admin

11.3.2 Launch using uWSGI + nginx

At first you need to install uWSGI:

```
user@ubuntu:~/ngw$ source env/bin/activate  
(env)user@ubuntu:~/ngw$ pip install uwsgi
```

or using system service:

```
apt-get install uwsgi uwsgi-plugin-python uwsgi-emperor
```

Then you need to add an uwsgi section to existing .ini file:

```
[uwsgi]  
module = nextgisweb.uwsgiapp  
env = PASTE_CONFIG=%p
```

To launch uWSGI using unix socket the uwsgi section should look like:

```
[uwsgi]  
plugins = python  
lazy-apps = true
```

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```

master = true
workers = 4
no-orphans = true

pidfile = /run/uwsgi/%n.pid
socket = /run/uwsgi/%n.sock
chmod-socket = 666

logto = /var/log/uwsgi/%n.log
log-date = true

limit-post = 7516192768

harakiri = 6000
socket-timeout = 6000

env = PASTE_CONFIG=/opt/ngw/development.ini
env = LC_ALL=en_US.UTF-8

home = /opt/ngw/env
mount = /ngw=/opt/ngw/nextgisweb/nextgisweb/uwsgiapp.py
manage-script-name = true

```

Note: Corresponding folders should be already created. To use locale (LC_ALL=en_US.UTF-8) required files should be present in system (locale -a). If locale is absent you need to add it (locale-gen en_US.UTF-8). Using any other locale that uses a comma as a decimal separator can lead to unexpected [issues](#)¹⁰.

Nginx configuration file (edits should be done to a file in /etc/nginx/sites-available/):

```

server {
    listen            80;
    client_max_body_size 6G;
    large_client_header_buffers 8 32k;

    location /ngw {
        uwsgi_read_timeout 600s;
        uwsgi_send_timeout 600s;

        include uwsgi_params;
        uwsgi_pass unix:/run/uwsgi/ngw.sock;
    }
}

```

11.3.3 Gunicorn + nginx

/etc/systemd/system/nextgisweb.socket:

¹⁰ <https://github.com/mapserver/mapserver/issues/5431>

```
[Unit]
Description=NextGIS Web socket

[Socket]
ListenStream=127.0.0.1:6543

[Install]
WantedBy=sockets.target
```

/etc/systemd/system/nextgisweb.service:

```
[Unit]
Description=NextGIS Web
Requires=nextgisweb.socket
After=network.target

[Service]
RuntimeDirectory=nextgisweb
WorkingDirectory=/opt/ngw
ExecStart=/opt/ngw/env/bin/gunicorn --no-sendfile \
                                         --bind :6543 \
                                         --workers 2 \
                                         --timeout 300 \
                                         --error-logfile error.log \
                                         --paste /opt/ngw/development.ini

Restart=always
ExecReload=/bin/kill -s HUP $MAINPID
ExecStop=/bin/kill -s TERM $MAINPID
KillSignal=SIGQUIT

User=ngw
Group=ngw

[Install]
WantedBy=multi-user.target
```

/etc/nginx/sites-enabled/nextgisweb.conf:

```
server {
    listen 80;
    server_name 127.0.0.1;

    location / {
        include proxy_params;
        proxy_pass http://127.0.0.1:6543/;

        client_max_body_size 512M;
        gzip off;
    }
}
```

Enable socket unit:

```
sudo systemctl start nextgisweb.socket
sudo systemctl enable nextgisweb.socket
```

11.3.4 Other launch options

Important: these options are not officially supported.

When using FreeBSD you may need to disable WSGI file wrapper, as it sometimes does not work properly. To do this add the following string to that section:

```
env = WSGI_FILE_WRAPPER=no
```

The following steps will depend on what interface is required as an output of uwsgi. There is some confusion related to the fact that uwsgi is both protocol and program. Here we are talking about the protocol.

HTTP:

```
socket = host:port | :port
protocol = http
```

uWSGI:

```
socket = host:port | :port | /path/to/socket
protocol = uwsgi
```

FastCGI:

```
socket = host:port | :port | /path/to/socket
protocol = fastcgi
```

The sign | should not be present in the configuration file. For example you can write:

```
socket = :6543
```

When using socket you can set file system permissions using chmod parameter:

```
chmod = 777
```

The number of processes is set with workers parameters. The number of threads for a process is set with a thread parameter. The example below shows a launch of 2 processes with 4 threads per process:

```
workers = 2
threads = 4
```

An option with separate processes is more safe but it consumes more resources.

Launch of uwsgi is executed using a command `uwsgi file.ini`, and all variables could be redefined in command line. For example : `uwsgi --workers=8 file.ini`. You can launch uwsgi the same way using supervisor, for example:

```
[program:nextgisweb]
command = /path/to/uwsgi /path/to/file.ini
```

supervisor + uwsgi

To launch supervisor + uWSGI without web server configuration file should look like:

```
[uwsgi]
module = nextgisweb.uwsgiapp
lazy = yes
env = PASTE_CONFIG=%p
env = PATH=/home/ngw_admin/ngw/env/bin:/bin:/usr/sbin:/usr/bin
env = LC_ALL=en_US.UTF-8
virtualenv = /home/ngw_admin/ngw/env
protocol = http
socket = :8080
workers = 4 # the number of threads for processing of connections
limit-post = 4831838208 # maximum file size
```

Configuration file for supervisor should look like:

```
[program:ngw]
command = /home/ngw_admin/ngw/env/bin/uwsgi /home/ngw_admin/ngw/production.
ini
user = ngw_admin
environment=LC_ALL=en_US.UTF-8
stderr_logfile=/var/log/supervisor/%(program_name)s_stderr.log
stdout_logfile=/var/log/supervisor/%(program_name)s_stdout.log
```

apache + mod_uwsgi

If module `mod_uwsgi` is available you can enable uwsgi with the following configuration:

```
<Location /nextgisweb>
    SetHandler uwsgi-handler
    uWSGISocket /path/to/socket
</Location>
```

In this case a file system socket is used for communication between uwsgi and apache, so section `[uwsgi]` should have the following strings:

```
socket = /path/to/socket
protocol = uwsgi
```

Unfortunately when using this module not all functions are available, for example gzip compression at the apache side will be unavailable. Moreover this can cause unexpected consequences.

apache + mod_proxy_uwsgi

If module `mod_proxy_uwsgi` is available you can enable uwsgi with the following configuration:

```
<Location /nextgisweb>
  ProxyPass uwsgi://localhost:10001
</Location>
```

You need to use the port because `mod_proxy` in apache doesn't support file system sockets. So in this case the `[uwsgi]` section should contain something like:

```
socket = localhost:10001
protocol = uwsgi
```

nginx + uwsgi

To launch using nginx you need to add the following strings to Nginx configuration file.

In case uWSGI is launched on TCP-port:

```
location /path_to_ngw_instance/ {
  include uwsgi_params;
  uwsgi_pass 127.0.0.1:6543;
}
```

In case uWSGI is launched on unix-port:

```
location /path_to_ngw_instance/ {
  include uwsgi_params;
  uwsgi_pass unix:///home/ngw_admin/uwsgi/ngw;
}
```

To work with Ajax requests you should perform CORS settings:

```
#
# Wide-open CORS config for nginx
#
location / {
  if ($request_method = 'OPTIONS') {
    add_header 'Access-Control-Allow-Origin' '*';
    #
    # Om nom nom cookies
    #
    add_header 'Access-Control-Allow-Credentials' 'true';
    add_header 'Access-Control-Allow-Methods' 'GET, POST, OPTIONS';
    #
    # Custom headers and headers various browsers *should* be OK with,
    ↪but aren't
    #
    add_header 'Access-Control-Allow-Headers' 'DNT,X-CustomHeader,Keep-
    ↪Alive,User-Agent,X-Requested-With,If-Modified-Since,Cache-Control,
    ↪Content-Type';
    #
    # Tell client that this pre-flight info is valid for 20 days
    #
    add_header 'Access-Control-Max-Age' 1728000;
    add_header 'Content-Type' 'text/plain charset=UTF-8';
```

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```

    add_header 'Content-Length' 0;
    return 204;
}
if ($request_method = 'POST') {
    add_header 'Access-Control-Allow-Origin' '*';
    add_header 'Access-Control-Allow-Credentials' 'true';
    add_header 'Access-Control-Allow-Methods' 'GET, POST, OPTIONS';
    add_header 'Access-Control-Allow-Headers' 'DNT,X-CustomHeader,Keep-
↪Alive,User-Agent,X-Requested-With,If-Modified-Since,Cache-Control,
↪Content-Type';
}
if ($request_method = 'GET') {
    add_header 'Access-Control-Allow-Origin' '*';
    add_header 'Access-Control-Allow-Credentials' 'true';
    add_header 'Access-Control-Allow-Methods' 'GET, POST, OPTIONS';
    add_header 'Access-Control-Allow-Headers' 'DNT,X-CustomHeader,Keep-
↪Alive,User-Agent,X-Requested-With,If-Modified-Since,Cache-Control,
↪Content-Type';
}
}

```

nginx + uwsgi (option 2)

Create a file with configuration:

```
sudo touch /etc/nginx/sites-available/ngw.conf
```

contents:

```

server {
    listen          6555;
    client_max_body_size 6G; # for large files increase POST request_
↪size
    large_client_header_buffers 8 32k; # for large files increase buffer_
↪size

    location / {
        uwsgi_read_timeout 600s; #for large files set longer timeout
        uwsgi_send_timeout 600s;

        include          uwsgi_params;
        uwsgi_pass        unix:/tmp/ngw.socket;

        proxy_redirect    off;
        proxy_set_header  Host $host;
        proxy_set_header  X-Real-IP $remote_addr;
        proxy_set_header  X-Forwarded-For $proxy_add_x_forwarded_for;
        proxy_set_header  X-Forwarded-Host $server_name;

        proxy_buffer_size 64k; # for large files increase buffer size
        proxy_max_temp_file_size 0; # and a temporary file size is set to_
↪infinite
        proxy_buffers 8 32k;
    }
}

```

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```
}  
}
```

Setup uWSGI

```
[app:main]  
use = egg:nextgisweb  
  
# a path to the main configuration file  
config = /opt/ngw/config.ini  
  
# a path to logging library configuration file  
# logging = %(here)s/logging.ini  
  
# parameters useful for debugging  
# pyramid.reload_templates = true  
# pyramid.includes = pyramid_debugtoolbar  
  
[server:main]  
use = egg:waitress#main  
host = 0.0.0.0  
port = 6543  
  
[uwsgi]  
plugins = python  
home = /opt/ngw/env  
module = nextgisweb.uwsgiapp  
env = PASTE_CONFIG=%p  
socket = /tmp/ngw.socket  
protocol = uwsgi  
chmod-socket=777  
paste-logger = %p  
workers = 8  
limit-post = 7516192768 # POST request limit 7GB  
harakiri = 6000 # operation timeout 6000 seconds  
socket-timeout = 6000 # socket timeout 6000 seconds
```

nginx + uwsgi (option 3)

```
[app:main]  
use = egg:nextgisweb  
config = /opt/ngw/config.ini  
  
[server:main]  
use = egg:waitress#main  
host = 0.0.0.0  
port = 6543  
  
[uwsgi]  
plugins = python  
home = /opt/ngw/env  
module = nextgisweb.uwsgiapp  
env = PASTE_CONFIG=%p  
env = LC_ALL=en_US.UTF-8
```

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```
socket = :6543
protocol = uwsgi
chmod-socket=777
paste-logger = %p
workers = 2
threads = 4
limit-post = 7516192768
harakiri = 6000
socket-timeout = 6000
max-requests = 5000
buffer-size = 32768
```

Create symlink to development.ini in folders:

```
/etc/uwsgi/apps-available/ngw.ini /etc/uwsgi/apps-enabled/ngw.ini
```

```
service uwsgi restart
```

Lookup log for error messages:

```
cat /var/log/uwsgi/app/ngw.log
```

11.4 Using additional SVG symbols

You can use SVG symbols for your QGIS styles. NextGIS QGIS has a default set of icons, but you can also use your own.

Internal set is located here: C:/NextGIS/share/ngqgis/svg

Example: <http://trolleway.nextgis.com/resource/2061/display?panel=layers>

11.4.1 Using your own markers (no server solution)

If you need a marker which is not part of standard library, you can use a hyperlink for this marker while creating a style in QGIS. You can upload this style and the marker will also be functional. You'll need to host your marker somewhere to be available via hyperlink.

Example: <https://demo.nextgis.com/resource/4177/display?panel=layers>

11.4.2 SVG symbols search paths

If your QGIS style uses local SVG symbols and server renderer can't find them - they won't be rendered. To help renderer locate them you need to expand the search paths. To do that update configuration file `config.ini` and add a list of additional search paths to `qgis` section:

```
[qgis]
svgpaths = path1, path2, ..., pathn
```

If your symbols are located in subfolders and style file contains something like this:

```
<prop v="dir1/dir2/dir3/icon.svg" k="name"/>
```

your path in `svgpaths` should also include these subfolders, where `dir1` can be found.

EXTENSIONS

12.1 General Information

The following extensions are available to increase the functionality of the software:

1. **Basemaps** (nextgisweb_basemap) - support for default basemap selection and a list view of available basemaps, an option to select from pre-prepared list of services.
2. **Exporter** - support for additional vector layer exporters to different formats (ESRI shapefile, MapInfo tab etc.)
3. **File buckets** (nextgisweb_filebucket) - support for file sets, ability to upload any files, including non-geospatial files.
4. **Filtering** - support for filtering by attribute and spatial extent.
5. **Mapnik** - support for Mapnik map renderer.
6. **QGIS** - support for QGIS map renderer.
7. **MapServer** - support for MapServer map renderer.
8. **Logging** - support for writing of various messages to a log.
9. **Mobile debug** - support for receiving and categorizing debug information from NextGIS Mobile SDK.
10. **Vector tiles** - support for MVT and associated styles.

12.2 Adding an extension

Example: adding nextgisweb_filebucket extension. Here are steps to add an extension:

1. Execute command to download extension source code to server where NextGIS Web is installed:

```
git clone https://github.com/nextgis/nextgisweb_filebucket.git
```

2. Install extension in NextGIS Web:

```
env/bin/pip install -e ./nextgisweb_filebucket
```

3. Create necessary directories (optional):

```
mkdir file_bucket
```

4. Make changes to configuration file (optional):

```
nano config.ini
```

Example: changes to configuration file:

```
[file_bucket]
path = /home/username/ngw/file_bucket
```

5. Reinitialize NextGIS Web database:

```
env/bin/nextgisweb --config config.ini initialize_db
```

6. Restart NextGIS Web to apply changes.

12.3 Adding NextGIS Web QGIS extension

This extension adds support for rendering with QGIS. To operate it needs QGIS 2.8 or higher already installed on the system.

```
cd ~/ngw
git clone git@github.com:nextgis/nextgisweb_qgis.git
source env/bin/activate
pip install -e nextgisweb_qgis/
```

QGIS and PyQT4 dependencies are not listed in setup.py because it is hard to install it in virtualenv. So let's copy these libraries from system packages to virtualenv. On Ubuntu these libraries are located in python-sip, python-qt4 and python-qgis packages.

```
# DST should point to virtualenv site-packages directory.
# If it is point to another place you have to modify DST definition.
# For example: DST=python -c "import sys; print sys.path[-2]"
DST=python -c "import sys; print sys.path[-1]"
echo $DST
cp /usr/bin/python -c "import sip; print sip.__file__" $DST
cp -r /usr/bin/python -c "import PyQt4, os.path; print os.path.split(PyQt4.
↳ __file__)[0]" $DST
cp -r /usr/bin/python -c "import qgis, os.path; print os.path.split(qgis.
↳ __file__)[0]" $DST
```

For QGIS 2.16 and higher:

```
# Only for latest QGIS version (2.16 and higher)
export PYTHONPATH=$PYTHONPATH:/usr/share/qgis/python
cp -r /usr/bin/python -c "import PyQt, os.path; print os.path.split(PyQt.
↳ __file__)[0]" $DST
```

12.3.1 uWSGI Deployment Notes

You have to add *-lazy-apps* to the command line, in this way application will be loaded after master's fork, so each worker will get its thread.

```
[uwsgi]  
lazy-apps = True
```

Beware as there is an older options named *lazy* that is way more invasive and highly discouraged (it is still here only for backward compatibility).

If you get an error message *ERROR: Auth db directory path could not be created* then you have to specify directory where an existing *qgis-auth.db* is located or created if not present. This directory needs to be writeable by uwsgi process user. For example:

```
[uwsgi]  
env = QGIS_AUTH_DB_DIR_PATH=/var/www
```

If you don't see cyrillic labels add the following environment variable:

```
environment = LC_ALL="en_US.UTF-8"
```

GLOSSARY

coordinate system A way for description of point location relative to selected axes.

data Information represented in a way it can be processed with automatic tools with possible participation of an operator. [GOST 15971-90, article 1]

ESRI Shape

Shapefile Popular format for geodata files. Is developed and supported by Esri company for interoperability between products of Esri and other software.

geodata

geospatial data

spatial data Data about spatial features and sets of features.

geographical feature

spatial feature

geofeature Digital model for material or abstract feature of real or virtual world with assigned identifier, coordinates and attributes.

geographical information system Information system that operates with geographical data (geodata). [GOST R 52438-2005 "Geographical information systems. Terms and definitions"]

GeoJSON Open standard for representation of simple geographical features with their non-spatial attributes using a JavaScript Object notation.

GeoTIFF Open geodata format for raster data representation in a TIFF format with metadata about georeferencing. Uses TIFF 6.0 specification, and adds some types of geotags that defines a type of cartographic projection, geographical coordinate system, geoid, datum and all other information required for precise spatial orientation of satellite image.

GLONASS

Global navigation satellite system Soviet/Russian satellite navigation system initially developed for Ministry of defence of USSR. One of the two currently functioning systems for global satellite navigation (Chinese satellite navigation system BeiDou currently functions as regional).

GPS Global positioning system

information support for geographic information system A set of knowledge about information resources, information services, classifiers, rules for digital description, data formats and documentation, that is presented to the user or a developer of geographical information system for it's creation, maintenance and usage.

information system 1. System for storage, processing, search, distribution, transfer and representation of information. [GOST 7.0-99, article 3.1.30]
2. A set of information contained in databases and tools and technologies for information processing . [Federal law "About information, information technologies and information security" 27 July 2006 N 149-FL]

Mapnik Open source map renderer. Written on C++ and Python. Uses a AGG library and has a function of smoothing of features with high accuracy. It can read from ESRI formats, PostGIS, TIFF, .osm files, and also supports for any GDAL or OGR formats.

MapServer Server geographical information system with open source that is launched through CGI interface.

Open Source Software with open source code. Source code of such software is available for view, study and update. This allows a user to participate in a process of development of open source software, to use a code for creation of new software and debugging — through borrowing of source code if that is allowed by license compatibility, or to study of used algorithms, data structures, technologies, methods and interfaces (as source code could essentially complete documentation or be a kind of documentation if there is no one).

PostGIS Extension for relational DBMS PostgreSQL for storage of geodata in a database. PostGIS has a support for spatial indexes R-Tree/GiST and geodata processing functions.

QGIS A user-friendly geographical information system with open source code, distributed under GNU General Public License. QGIS is a project of Open Source Geospatial Foundation. It works on Linux, Unix, Mac OSX, Windows and Android, supports for various vector, raster formats, databases and has a variety of functions.

TMS

Tile map service [OSGeo](http://www.osgeo.org/)¹¹ standard that describes an access to representation of geodata through the Internet/Intranet without an access to geodata itself.

WFS

Web Feature Service A web service that represents data in a vector GML format. Client gets both attributes and geometry. There are standard extensions:

- Transactional (WFS-T) - allows clients to send to WFS server new and updated data;
- Gazetteer (WFS-G) - a draft of a standard that adds a search and a query of items by dictionary of geographical names. Initially developed by USGS;
- Temporal - a draft of a standard that adds a temporal measurement;

¹¹ <http://www.osgeo.org/>

- Versioning (WFS-V, WFSV) - allows to work with different versions of data (particular development of GeoServer project, not standardized by OGC).

WMS

Web Map Service A standard protocol for serving of georeferenced images through the Internet that are generated on server on a basis of data from a gis database. Standard was developed and initially published by international organization **OGC**¹² (Open Geospatial Consortium) in 1999.

¹² <http://www.opengeospatial.org/>

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