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Welcome to the documentation of Lizard.

Lizard is a data integration platform for data on the physical environment. Lizard opens up new possibilities to integrate spatially distributed timeseries and geodata, allowing you to transform data into informed decisions.

One can describe the physical environment with data. In essence you need three types of data: time series, rasters and vectors. Lizard’s databases are especially built for storing, accelerating and integrating these three types of data:

**Assets:** physical objects e.g. pump stations, groundwater stations, polders, measuring stations and parcels.

**Timeseries:** timeseries describing the physical environment, related to an Asset. E.g. water levels, growth stages, hydraulic head or temperature.

**Rasters:** (temporal) raster data; e.g.: digital elevation models, flood depths, model results, radar precipitation measurements, satellite imagery and landcover classification.

### 1.1 Where to start?

This document will help the novice as well as the experienced Lizard-user. For the novice it contains background information and key points for starting with Lizard, while for the experienced user it will serve as a reference work. The manual contains the following sections:

- *Portal*
- *User management*
- *Rasters*
- *API functional documentation*
- *API technical documentation*

Information about courses, examples, demonstrations and how to contact us can be found on: www.lizard.net
1.2 Getting started

You can access Lizard without login, but some data is only visible or retrievable when logged in. You can request an account via your organisation or by emailing servicedesk@nelen-schuurmans.nl

After this, you can go either to the portal, looking like this:

Or to the API, looking like this:
1.2. Getting started
The portal of Lizard is the graphical user interface (GUI), in which measuring locations, parameters, timeseries, rasters and other layers are visible in maps and graphs.

2.1 Basic elements

After logging in:

1. Log in or out and manage your account
2. Make and access favourites
3. Switch to graph view
4. Open export screen
5. Links to partner platforms and applications
6. Zoom in and out on map
7. Search for addresses, dates, names or codes/tags
8. Open and close data menu
9. Selection tools to query data on the map

2.2 Data menu and layers

The topmost entry in the data menu toggles between the following base layers:

- Neutral
- Topography
- Satellite

Click a data layer to activate it.

Note: Data layers need to be active to retrieve information from them in the map.

Tip: You can rescale the colour scale of the elevation layer (DEM) >> Double click the layer in the menu.

Adjust the opacity by clicking the green bar below the activated data layer.

Upon activating a raster layer a crosshair appears. By clicking it the application zooms to the full data extent, both in space and time.

Add more data
Want to see more or other data layers? Just add data that is available to your organisation.
Hit the button in the bottom of the data menu: Add data. Clicking the cross (x) in the layer bar removes it from the menu instantaneously.

Below is the ‘Add data interface’. Use the search bar (1) to navigate through the data layers that you or your organisation are authorized to see.

Close the Add data interface (2) and go back to the data menu.

One of the available data layer types is 3Di scenarios. A scenario is a combination of layers and products that belong to a 3Di model run. Click a scenario layer to expand it and activate data layers or download products.

2.3 Navigation in time

Search for the period you are interested in through the search bar or use the buttons next to the timeline. You can adjust the period by panning, zooming or dragging the timeline, or by specifying the start and end date.

Temporal rasters

Raster layers with a time component (temporal raster layers, e.g. Rain radar) can be animated. Start or pause the animation using the button on the left-hand side of the timeline.
When the rain layer is active, the bars in the timeline show the distribution of rainfall in time for the area on your screen.

The length of the selected period of time determines the aggregation level of the rainfall data. This can be 5 minutes, hourly or daily.

**Timeseries**

Once a time series has been selected, by clicking on a timeseries location or after you searched it in the search bar, you see something like the following:

The graph appears in in a new screen in the top left, which we call the *omnibox*. You also inspect the graph closer in the “Graph” mode (click it in the menu).

**Tip:** In the omnibox click the button ‘ZOOM TO EXTENT’ to zoom to the full extent of the series. There are also three buttons for standard periods. This means no more searching for a historical or short-term time series. Just click the buttons!
2.4 Navigation in space

Zoom in and out on the map by using the buttons next to the search bar. Use the search bar to navigate to specific locations like countries, cities or addresses.

Tip: Looking for a specific region? Drag a frame with your mouse while holding SHIFT. This feature enables you to navigate to the selected area.

2.5 Selection tools

There are 4 selection tools:

1. Point
2. Multipoint
3. Line
4. Region

Point selection Point selection retrieves asset information, time series and map values from the active data layers. Results are displayed on the left.

Multipoint selection

Use the multipoint tool to select multiple objects and/or locations. When multiple assets are selected, time series are not displayed in the omnibox. Go to the graph view to see them.
Tip: Add a set of locations to a favourite to always have them available instantaneously.

Line selection

Use the line selection tool to retrieve data along a profile, e.g. elevation from a DEM.

- 1st click: Start point
- 2nd click: End point
- 3rd click: Reset

Hovering along the profile on the map shows a corresponding indicator in the graph.

Region selection

The region selection tool aggregates data of the selected region.
Region analysis can be performed on raster of data type nominal (quantitative) or ordinal (classes). Click the star behind the layer name and the analysis is applied on-the-fly on the active region type for the zoom level. The regions are coloured based on the most abundant class.

Tip: Hover over the classes in the diagram to see more information.

Tip: Select a class in the legend and the regions are coloured based on the relative abundance of that class. This answers questions like: what is the general rice growth stage within my district or which municipality is most urbanized?

## 2.6 Graph view and data interpretation

There are multiple ways to interpret your data. For example, you can:

- Activate multiple layers in order to get a more integral scope on situations or to see interaction between locations.
- Export the data and analyse in another program (see next paragraph)
Graph view

Switch between map view and graph view with the Graph/Map button.

By scrolling or dragging within the graph the domain of the Y-axis can be changed. By scrolling or dragging the datetimebar, the X-axis can be changed.

Note: If multiple locations with time series are selected initially there are no time series displayed. Click time series in the menu to show/hide them.

Tip: Adjust the colour of a line by choosing from the scale that opens by clicking the coloured bar.

Tip: Drag multiple time series items into one graph to combine them.

Tip: Water level time series can be recalculated relative to the surface level. This is done by clicking the button ‘relative’. This enables analysis of drainage depth or freeboard. The option also applies to the export of these time series.

Next to the relative button you can zoom to the standard periods and full extent of the active timeseries.

Apps

In order to examine your data in further detail open one of our partner platforms through the Apps screen.

Note: Apps are not available by default in every Lizard portal.
2.7 Export and share

Lizard enables sharing asset, time series and raster data between organisations to provide (water) managers with a better overview of systems and processes.

Favourites

You can save a Lizard state with data of one or more assets, maps or time series as a favourite and share it with others.

Open the Favourites dropdown and enter a name/short description. You can save a specific period or one that is relative to ‘now’. In that case, the favourite is always up to date.

Click a favourite to load the Lizard state that was saved in it. A link to the favourite can be retrieved by clicking the blue symbol next to the delete button.

Export

You can use the export screen for both rasters and timeseries.
Click the Export button at the top of the screen and select period and the time series you are interested in. The export format is .XLSX with separate sheets for each time series. Further instructions are provided on screen.
Export Data

Timeseries Timeseries (raster) Rasters

You can select a (temporal) raster to download. Once selected, press the "Start Export" button and the exporter will fetch the raster data behind the scenes. The exported data will be in geotiff format.

Please select the raster:

AHN3

Please select the datetime:

15-01-2019 10:22

Please select the target projection: Please select the cellsize:

EPSG:3857 (Pseudo mercator) 1

Cellsize for EPSG:3857 is in meters

Start Export

For rasters you have to specify the target projection. Automatically, the extent of the export is the same as your current zoom extent.

Note: Please do not export a raster with both a large extent and a high resolution.

2.8 FAQ

Note: No results shown? Check your selection of space and time and whether you activated the right data layers.

Tip: By adding an annotation to an object or location you can make notes or share remarks with others.
Select an object or location on the map while the annotation layer is activated: 1. Write a message 2. Upload a file (max. 15 Mb) to support the message 3. Select the organisation to share the annotation with 4. Save the annotation (or delete one)
User management

Via the URL www.{yourorganisation}.lizard.net/management/users/ you can manage the user roles.

<table>
<thead>
<tr>
<th>Username</th>
<th>Read</th>
<th>Write</th>
<th>Supply</th>
<th>Manage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3gb_server_api</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td>zagl_hendriks</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td>alexander_hoff</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
<td>⊗</td>
</tr>
<tr>
<td>anne_brinkman</td>
<td>⊗</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>jojan_vendek</td>
<td>⊗</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>arnold_vanhelden</td>
<td>⊗</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>bern_douglas</td>
<td>⊗</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: You can only do this if you are a manager of the organisation. Usually, there is one member of the organisation a manager, or we (Nelen & Schuurmans) manage the roles by request.

3.1 Roles

We have 4 roles and 3 different types of privileges.

1. A user, who can only read data
2. A supplier, who can read data and change (‘write’) his or her own data
3. An administrator, who can read data and change (‘write’) all organisation’s data.
4. A manager, who can manage other roles in the organisation. A manager can not read or write data by default. This role should be appointed separately.
3.2 Existing users

On the user management page, you see the an overview of the users and their roles. These are sorted by organisation. You can change one user’s role by clicking his or her username.

3.3 New user

At the end of the page, you will find the form to add new users. Here, you need to fill in the username and emailaddress, a first and last name. Via a scroll-down menu you can assign the desired roles. After you click ‘Save’, an activation email will be send to the user.

Tip: In order to keep your users organised, we advise to choose a system of either picking the username based on the emailadress before the @, or the format {firstname.lastname}.

3.4 Frequently asked questions

“Someone with the role “read” can only see the data but not add or modify them, and with the role “write” you can add and modify them, right? Can you see data of the organisation if you only have the role of writing?”

- Yes, yes and yes. If you can write you can automatically see as well.

“Furthermore, as a reader, can you see data from other users in the organisation?”

- Yes, everything from the organisation, as well as public data from other organisations.
“And as a writer, can you add data to assets added by other users in the organisation? (for example, if another user adds a monitoring station, and I, as a writer, add groundwater level measurements to it). I guess it is like that, otherwise it would be the same as being a supplier, right? “

• Yes!

“Which role is the most powerful?”

• An administrator is the most powerful when it comes to data management, but a manager is actually the most powerful, as it can make itself an administrator and take other administrator’s rights.
CHAPTER 4

Rasters

4.1 Introduction

Rasters are data that represent continuous information across an area. Examples include digital elevation models, flood depths, radar precipitation measurements, satellite imagery and land cover classifications. Rasters are stored in a rasterstore.

4.2 Why Rasterstores

The rasterstore is a library designed for quick data retrieval. Rasters provide a simple structure for data analysis. Main functionalities:

- Retrieve values for a specific location or area
- Analyse data for a particular period or moment in time
- Map visualization in the lizard portal
- Exporting to a geotiff file
- Connecting with external applications via WMS
- Base block for on-the-fly map calculations and conversions
- API interactions: list, create, (partial) update, retrieve and delete

4.3 Raster data

A rasters is a grid of cells organized into rows and columns. Each cell contains a value that represents real-world phenomena, such as water depth. The values can be continuous (e.g. 28.5 degrees) or integer numbers. Integer numbers can represent classes (e.g. 1: Water, 2: Land).
Rasterstore data can be static or temporal. Examples of static data are a digital elevation model and a land cover map. Temporal rasterstores consist of multiple timesteps. The data can be stored in time using an origin (e.g. 2019-01-01) and an interval (e.g. every day). Examples are weather predictions and timeseries of 3Di model results.

### 4.4 Raster metadata

Characteristics of rasters are stored in the attributes of a rasterstore. The attributes are used to indicate the function, purpose and meaning of data. The main attributes are listed below.

- Organisation
- Name
- Description
- Aggregation type
- Observation type
- Colormap
- Supplier name
- Supplier code
- Temporal behaviour

### 4.5 Raster management

The data management interface for rasters can be used to upload, edit or remove rasters.

The Data Management interface is available at: “www.{your_organisation}.lizard.net/management/”.

**Note:** This functionality is available only to users with an admin, manager or supplier role.

After this screen, please click on ‘Data Management’, then ‘Rasters’ and, depending on if you want to manage a new or pre-existing raster, continue.
4.5. Raster management

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
<th>Supplier Code</th>
<th>Observation type</th>
<th>Upload</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARMONE (3D)</td>
<td>Precipitation for modelling purposes.</td>
<td>PROP_3DI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fysiek voorkomen 2018</td>
<td>Fysiek voorkomen van het landgebruik 2018</td>
<td>KLASSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fysiek voorkomen</td>
<td>Fysiek voorkomen van landgebruik in Nederland</td>
<td>KLASSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Landgebruik</td>
<td>Landgebruikskartaan - Functioneel</td>
<td>KLASSE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRR Smn 3Dk (m/s)</td>
<td>Precipitation store for modelling purposes.</td>
<td>PROP_3DI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NRR Smn 3Dk</td>
<td>Precipitation store for modelling purposes.</td>
<td>PRECIPITATION_MEASURED</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevation (surface)</td>
<td>DTM - digital surface model</td>
<td>Elevation(mMSL)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Interested in the possibilities for your organisation? Please contact Joeri Verheijden via info@lizard.net.
You can access the Lizard API via “www.{your_organisation}.lizard.net/api/”. 

![Django REST framework](image)
5.1 What is an API?

API stands for Application Programming Interface. The API, looking like the picture above, gives back timeseries, rasters, or other data or information. This is depending on the request you do to the API. This request comes from the URL you type in the browser. You can also access the API via another program, and make automatic requests.

5.2 Basic use API

Below we discuss a basic request to the API. More examples and possibilities will be discussed in the API technical documentation.

The basic url is www.{your_organisation}.lizard.net/api/v3, for example: www.demo.lizard.net/api/v3

If you type this in your browser, for example Google Chrome, you will get a list of parameters. These parameters are so called endpoints. If you paste this endpoint after your basic url, you will initiate a query. An example is locations. If you click on the url www.demo.lizard.net/api/v3/locations, you will send a query to Lizard to search all locations that you have access to. As a response, you will get indeed the locations back, as well as some metadata.

```
GET /api/v3/locations/

HTTP/1.1 200 OK
Allow: GET, POST, HEAD, OPTIONS
Content-Type: application/json

{
    "count": 2,
    "next": null,
    "previous": null,
    "results": [
        {
            "url": "https://demo.lizard.net/api/v3/locations/f6d4-496e-ac3a-8727a94823c/",
            "id": 1,
            "name": "Lizard",
            "description": "Created free data migration",
            "geo_ref": "",
            "layers": true,
            "id": "f6d4-496e-ac3a-8727a94823c",
            "type": "VECTORCATEGORY VARIOUSNESS PREDICTION",
            "code": "J2.B",
            "organisation": "https://demo.lizard.net/api/v3/locations/f6d4-496e-ac3a-8727a94823c/",
            "user": "tongueanarchy@biocrah.com",
            "users": ["tongueanarchy@biocrah.com"],
            "geo_ref": "",
            "bbox_valid": true,
            "bbox_valid": false,
            "bbox_valid": "",
            "bbox_valid": null
        },
        {
            "url": "https://demo.lizard.net/api/v3/locations/f6d4-496e-ac3a-8727a94823c/",
            "id": 2,
            "name": "Lizard",
            "description": "Created free data migration",
            "geo_ref": "",
            "layers": true,
            "id": "f6d4-496e-ac3a-8727a94823c",
            "type": "VECTORCATEGORY VARIOUSNESS PREDICTION",
            "code": "J2.B",
            "organisation": "https://demo.lizard.net/api/v3/locations/f6d4-496e-ac3a-8727a94823c/",
            "user": "tongueanarchy@biocrah.com",
            "users": ["tongueanarchy@biocrah.com"],
            "geo_ref": "",
            "bbox_valid": true,
            "bbox_valid": false,
            "bbox_valid": "",
            "bbox_valid": null
        }
    ]
}
```

Above each page, you will see some additional parameters, with which you can specify your query more. Most endpoints have examples of this.
If we are looking for a specific location, with a name that contains ‘gemaal’, we can use this query:

```
www.demo.lizard.net/api/v3/locations/?name__icontains=gemaal
```

**Tip:** `icontains` means that the name does not have to match exactly.

If you are an administrator or supplier of the data, you can also edit or delete the data via the API.

### 5.3 Versions

We have noticed that our users are increasingly making use of the API. To prevent failure of the applications of customers, scripts and Excel connections, we have decided to release new features according to the format below:

- **API v2:** deprecated
- **API v3:** stable
- **API v4:** experimental

From now on, the API v2 is deprecated. This means that this API will disappear when the development of API v5 starts, which will be around the end of this year. API v3 will be the stable version of API. We will no longer be updating this version. We are using the experimental version, v4, to develop new features.

We will be organising API masterclasses this year, where any user who wants to increase or maintain his or her knowledge can participate.
5.4 Contact

If you have additional questions about the use of the API, please look in *API technical documentation* or contact our servicedesk (servicedesk@nelen-schuurmans.nl)
This page goes into the technical documentation of our API.

The Lizard REST API is used to interact with Lizard data and objects. The API enables to collect, export and manage data. With the API, objects and data can be listed, created, (partially) updated and retrieved. Objects and data have different endpoints, to allow specific interactions.

The endpoints are browseable through the API root view:

- API V3 https://demo.lizard.net/api/v3/
- API V4 https://demo.lizard.net/api/v4/

Resources are addressable via an URL and can be interacted with via HTTP verbs. The most commonly used and supported verbs are:

- GET : retrieve data
- PUT : change data
- DELETE : delete data
- POST : add data

We also have HEAD and OPTIONS.

### 6.1 Authentication

When you login via your browser, you get a session-based authentication token that is valid for 24 hours. All subsequent requests to the API are authenticated with that token.

Authenticating to the REST API outside of a browser is done by sending `username` and `password` HTTP header fields with *every* request.

**Example request:**
For all endpoints, users have to be admin in the organisation that owns the data to create or update resources. See User management for more information about roles and permissions.

6.2 Supported data formats

The data formats supported depend on the endpoint, although JSON is generally available. See documentation on the individual endpoints for specifics.

The format of responses can be controlled by specifying an Accept header in requests, e.g. Accept: application/json. When posting data, the format of the payload must be specified via a Content-Type header, e.g. Content-Type: text/csv.

When interacting with the API via a browser, the format query parameter may also be used for controlling the format of the response, for example:

www.demo.lizard.net/api/v3/timeseries/?format=json

6.3 Common variables

In this section, query parameters and response fields applicable to all endpoints are described.

6.3.1 Query parameters

The API supports the following common query parameters on GET list requests:

```
GET /<endpoint>/?page=\(int: offset\) &page_size=\(int: size\)
```

**Query Parameters**

- **page** – offset number; default is 0.
- **page_size** – limit number of entries returned; default is 10.

6.3.2 Response fields

All list responses share the following fields.

- **count**: number of results for this page
- **next**: url to next page, null if last page
- **previous**: url previous page, null if first page
- **results**: array with actual results

These fields are not specifically mentioned in the response description of each endpoint.
6.4 Search

This section describes how the search endpoint can be used.

Example requests:

```plaintext
GET https://demo.lizard.net/api/v3/search/?q=water
GET https://demo.lizard.net/api/v3/search/?type=assetgroup,eventseries
GET https://demo.lizard.net/api/v3/search/?exclude=ef34gh3
GET https://demo.lizard.net/api/v3/search/?q=water&in_bbox=4.6,52.1,5.2,52.5&srid=4326
GET https://demo.lizard.net/api/v3/search/?q=water&point=POINT (5 53)&dist=10000
```

6.4.1 Query parameters

This API endpoint supports the following parameters on GET requests:

GET `/search/?query=input`

Query Parameters

- **q** – Full-text search filter limited to: bridges, culverts, groundwater stations, levees, levee cross sections, measuring stations, monitoring wells, pressure pipes, pump stations, sluices, waste water treatment plants, and weirs. A search query filter should at least contain two characters.
- **in_bbx** – comma-separated string of a bounding-box, of the form: “xmin,ymin,xmax,ymax”.
- **dist** – Distance in meters.
- **point** – Point geometry (either WKT or GeoJSON).
- **srid** – Spatial Reference System Identifier.
- **type** – Comma-separated list of entity types. Currently the only way to search for layer metadata is by explicitly requesting those entities: type=rasterstore,scenario,assetlayer. It may also be used to limit search results to specific types, i.e. type=levees.
- **exclude** – Comma-separated list of exclude terms. Results are excluded if the url of the resource contains a term. This is done in the viewset so the serializer still respects the requested page_size.

6.5 Timeseries

This section describes timeseries-related endpoints.

Example request:

GET https://demo.lizard.net/api/v3/timeseries/f1f20885-b09b-40fa-a717-1bfd4dffa60e/

Example response:
6.6 Locations

This section describes location-related endpoints.

Example request:

GET https://demo.lizard.net/api/v3/locations/6eb648bf-c5a4-4566-ac7a-1311ec69921c/

Example response:
De Nederlandse watersector staat voor de opgave om in een snel veranderende omgeving haar informatievoorziening te transformeren en klaar te maken voor de toekomst. De Digitale Delta is het open platform voor het aanbieden en vinden van relevante data voor het waterbeheer in Nederland. Lizard spreekt Digitale Delta en is een van de dataleveranciers binnen de Digitale Delta. De Digitale Delta API Root is te vinden op https://demo.lizard.net/dd/api/v1 De documentatie van de Digitale Delta API is te vinden op: https://github.com/DigitaleDeltaOrg/dd-api-spec/blob/master/README.md
HTTP Routing Table

/endpoint
GET /endpoint/?page=(int:offset)&page_size=(int:size), 30

/search
GET /search/?query=input, 31