



DiversityNaviKey

A Progressive Web Application for interactive diagnosis and
identification

Dagmar Triebel, **Ariane Grunz**, Stefan Seifert, Anton Link & Gerhard Rambold

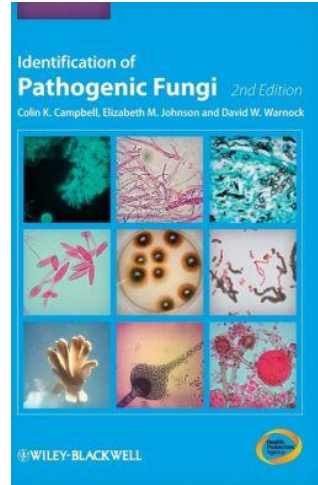
INFORMATIK2021 | CS4BioDiversity

27/09/2021 | München/Berlin

Identification and diagnosis



Plant identification



Pathogenic fungi

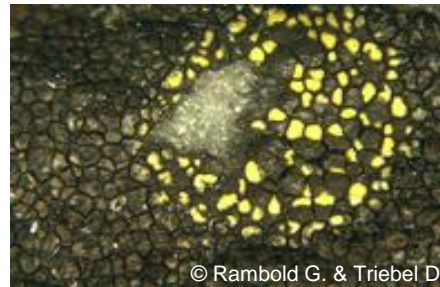


Rock identification



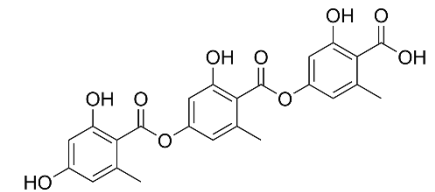
© Agerer R

Boletus edulis Bull.: Fr. + *Picea*
Ectomycorrhizae



© Rambold G. & Triebel D.

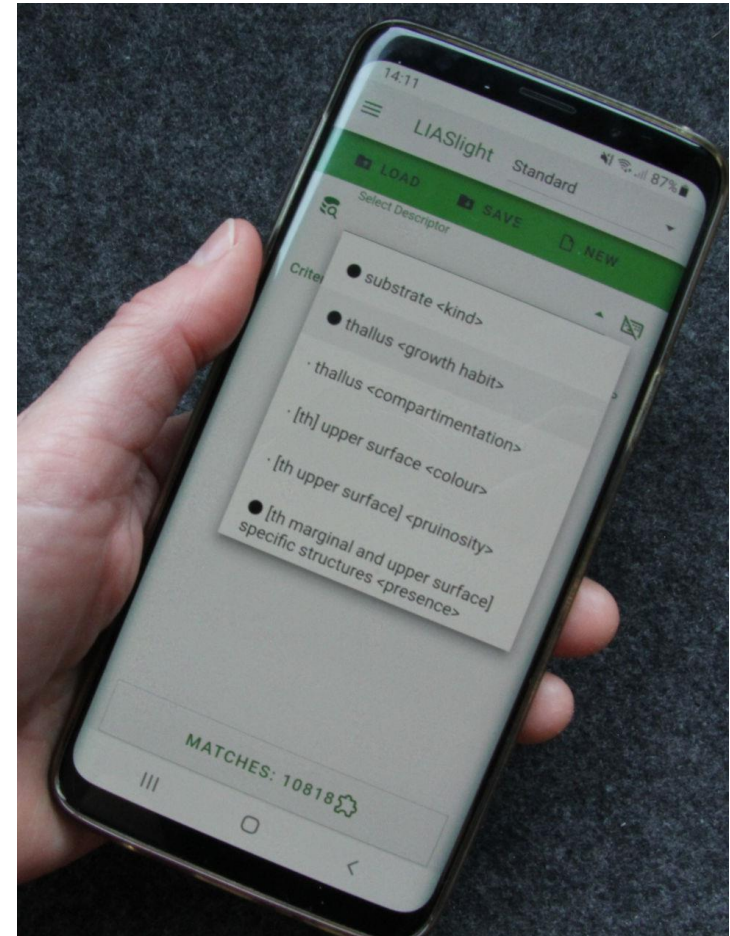
Rhizocarpon pussillum Runemark
Lichen



Gyrophoric acid
Lichen substance

DiversityNaviKey (DNK)

- **Interactive identification tool** in the field of biology and related sciences
- **Generic tool to identify** organisms as well as other diagnostically relevant entities
- **Identification keys** based on datasets with predefined properties



Structured datasets – Example

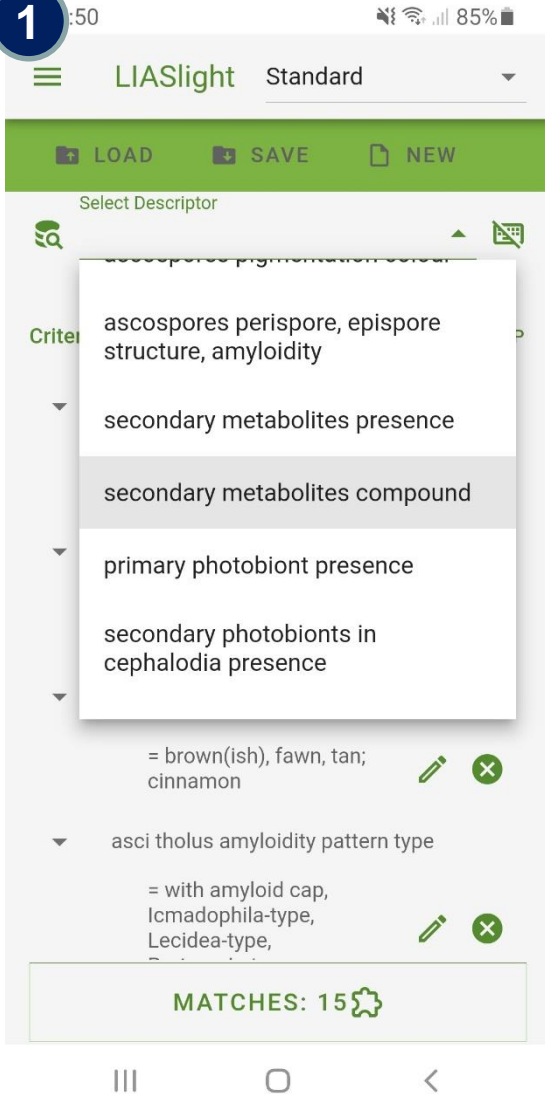
Items (Objects/Entities) are defined by descriptors and their states/values

- **Descriptors** (= characters, attributes, properties), e.g. substrate kind, leaf colour, fungus fruitbodies growth habit, cell length,..
- **Descriptor states** or **values** are the manifestations, e.g.
 - Lichen substrate kind: rock, leaves, bark,..
 - Plant leaf colour: green, yellow, brown black,..
 - Fungus fruitbodies growth habit: corticioid, stereoid, epigeous, cup-shaped,..
 - Cell length in μm



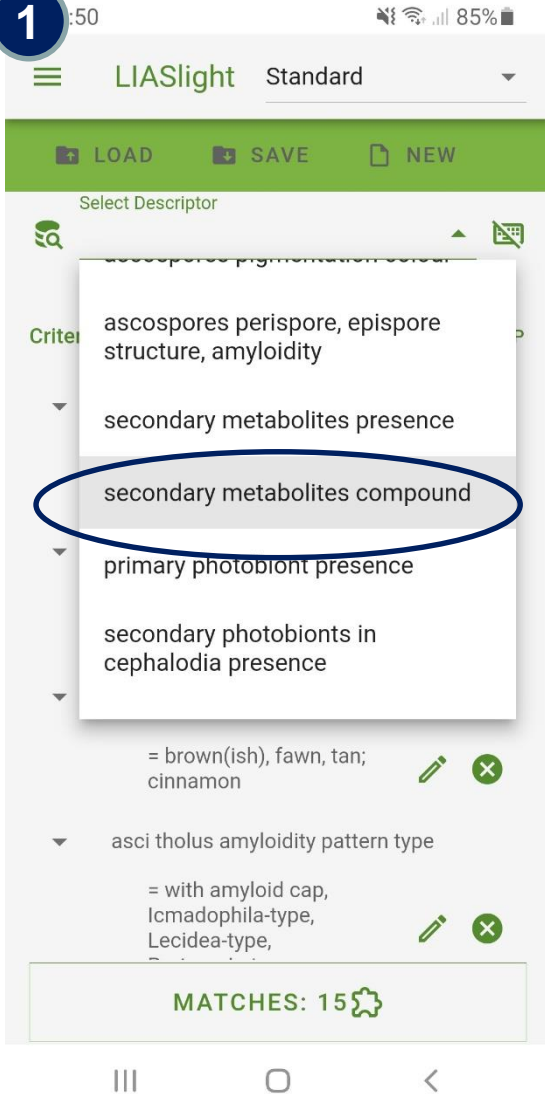
DNK allows interactive queries on descriptive datasets

DiversityNaviKey – Interactive query



Successive selection of descriptor-state-values

DiversityNaviKey – Interactive query



Successive selection of descriptor-state-values

1. Select a descriptor

DiversityNaviKey – Interactive query

1 :50 85%

LIASlight Standard

LOAD SAVE NEW

Select Descriptor

ascospores perispore, epispore structure, amyloidity

secondary metabolites presence

secondary metabolites compound

primary photobiont presence

secondary photobionts in cephalodia presence

= brown(ish), fawn, tan; cinnamon

asci tholus amyloidity pattern type

= with amyloid cap, lcomadophila-type, Lecidea-type,

MATCHES: 15

2 :53 86%

LIASlight Standard

barbatic acid

gyrophoric acid

norstictic acid

rhizocarpic acid

salazinic acid

stictic acid

gyrophoric acid, stictic acid

CANCEL OK

asci tholus amyloidity pattern type

= with amyloid cap, lcomadophila-type, Lecidea-type,

MATCHES: 15

1. Select a descriptor
2. Select state/s

DiversityNaviKey – Interactive query

2 53 86%

LIASlight Standard

- barbatic acid
- gyrophoric acid
- norstictic acid
- rhizocarpic acid
- salazinic acid
- stictic acid

gyrophoric acid, stictic acid

CANCEL OK

asci tholus amyloidity pattern type

= with amyloid cap, lcmadophila-type, Lecidea-type,

MATCHES: 15

3 4 86%

LIASlight Standard

- ascospores septa kind
 - = muriformly septate, muriform, submuriform
- substrate kind
 - = rock, siliceous, siliciferous, acidic
- thallus upper surface colour
 - = brown(ish), fawn, tan; cinnamon
- asci tholus amyloidity pattern type
 - = with amyloid cap, lcmadophila-type, Lecidea-type, Pertusaria-type
- secondary metabolites compound
 - = gyrophoric acid
 - = stictic acid

MATCHES: 7

1. Select a descriptor
2. Select state/s
3. All selected descriptor-states grouped by AND/OR

DiversityNaviKey – Interactive query

Result list

The screenshot shows a mobile application interface with a status bar at the top displaying the time as 10:54, signal strength, Wi-Fi, and 86% battery. The app header includes a hamburger menu icon, the text 'LIASlight', and a 'Standard' dropdown menu. Below the header is a green navigation bar with left and right arrow icons and a central '1' in a white box. A 'per page' dropdown menu is set to '50'. The main content area displays a list of seven *Rhizocarpon* species, each with a share icon to its right. At the bottom of the list is a 'QUERY' button with a magnifying glass icon. The Android navigation bar is visible at the very bottom.

4

10:54

LIASlight Standard

< 1 >

per page 50

- Rhizocarpon arctogenum Gelting
- Rhizocarpon distinctum Th. Fr.
- Rhizocarpon geminatum Körb.
- Rhizocarpon grande (Flörke) Arnold
- Rhizocarpon obscuratum (Ach.) A. Massal.
- Rhizocarpon polycarpum (Hepp) Th. Fr.
- Rhizocarpon reductum Th. Fr.

QUERY

DiversityNaviKey – Interactive query

Result list

4 :54 86%

LIASlight Standard

< 1 >

per page 50

- Rhizocarpon arctogenum Gelting
- Rhizocarpon distinctum Th. Fr.
- Rhizocarpon geminatum Körb.
- Rhizocarpon grande (Flörke) Arnold
- Rhizocarpon obscuratum (Ach.) A. Massal.
- Rhizocarpon polycarpum (Hepp) Th. Fr.
- Rhizocarpon reductum Th. Fr.

QUERY

III O <

Details view

5 :54 86%

Rhizocarpon arctogenum Gelting

Description

- genus taxon
Rhizocarpon
- family taxon
Rhizocarpaceae Hafellner (1984)
- order taxon
Lecanorales
- global occurrence continent
Americas, North America incl. Mexico
Arctic
- substrate kind
rock, siliceous, siliciferous, acidic
rock, stones, pebbles, unspecified
- thallus growth habit
crustose, crustaceous, episubstratal,
unspecified
- thallus compartmentation
compartmentized, areolate, squamulate

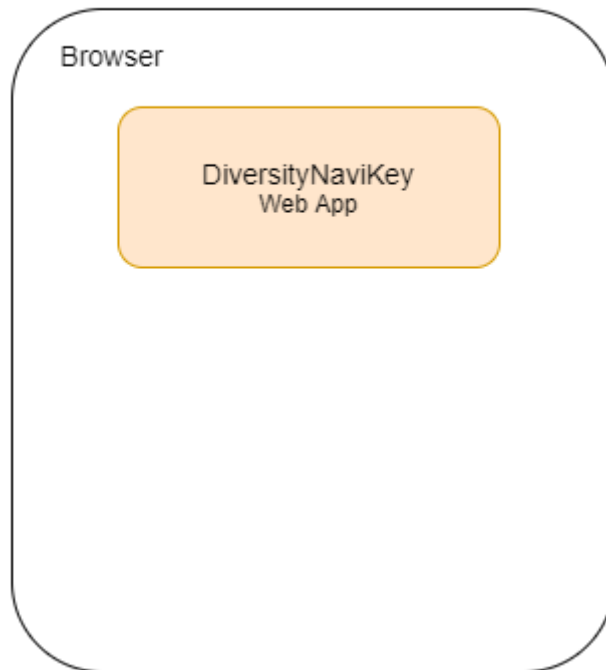
III O <




DiversityNaviKey – Architecture

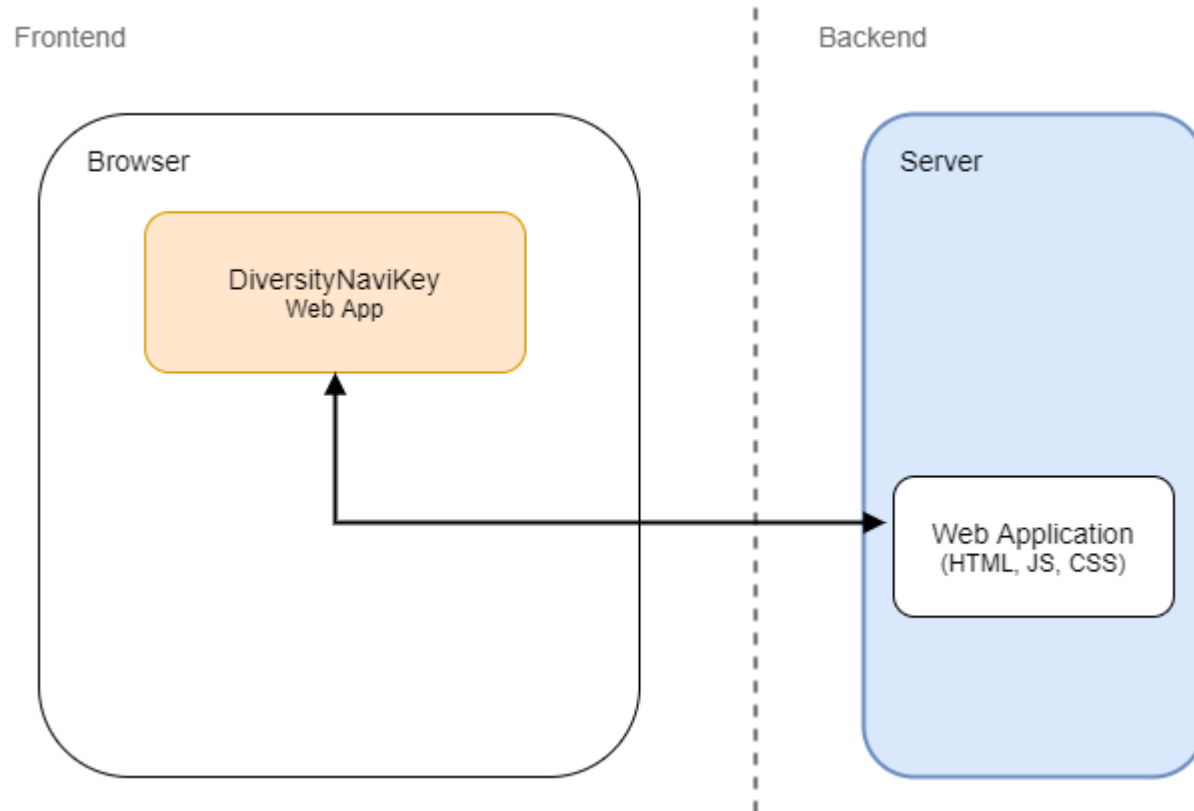
DNK – Architecture – Frontend

Frontend



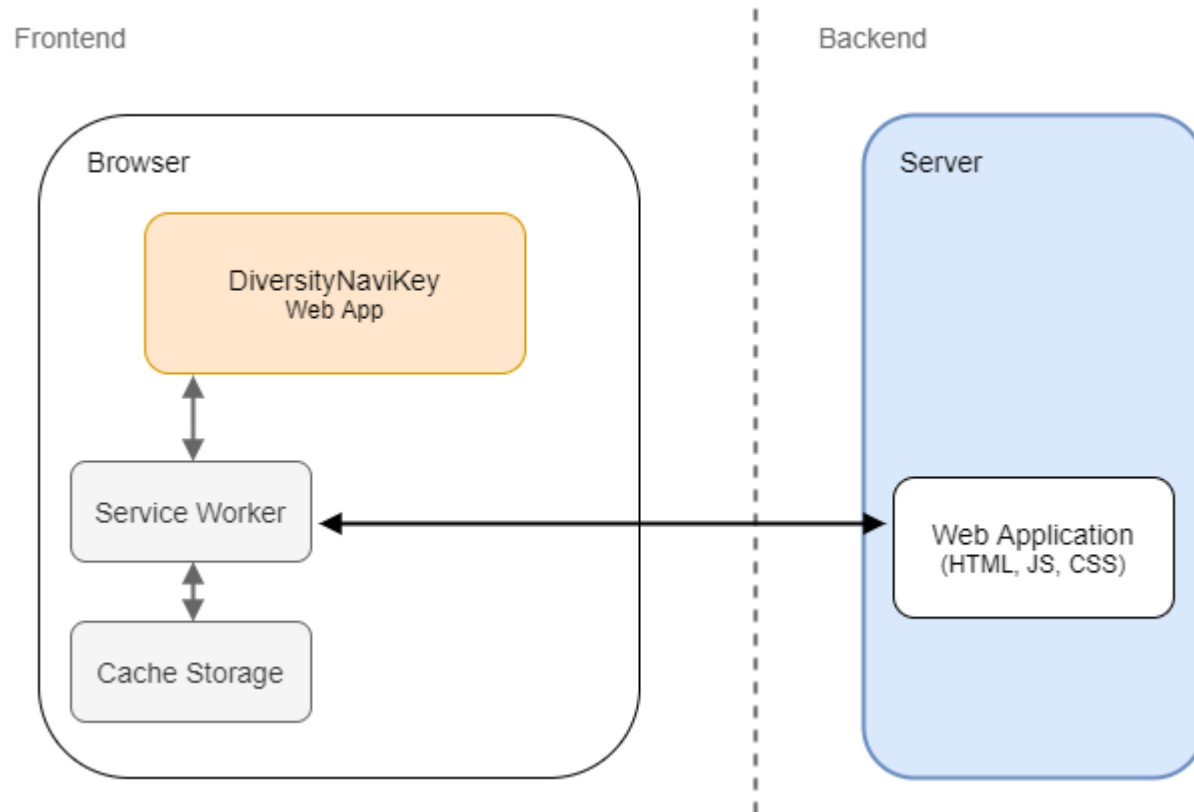
- **Progressive Web Application (PWA)**
- **Vue.js Framework** 
 - Vue Router
 - Vuetify
 - Vuex

DNK – Architecture



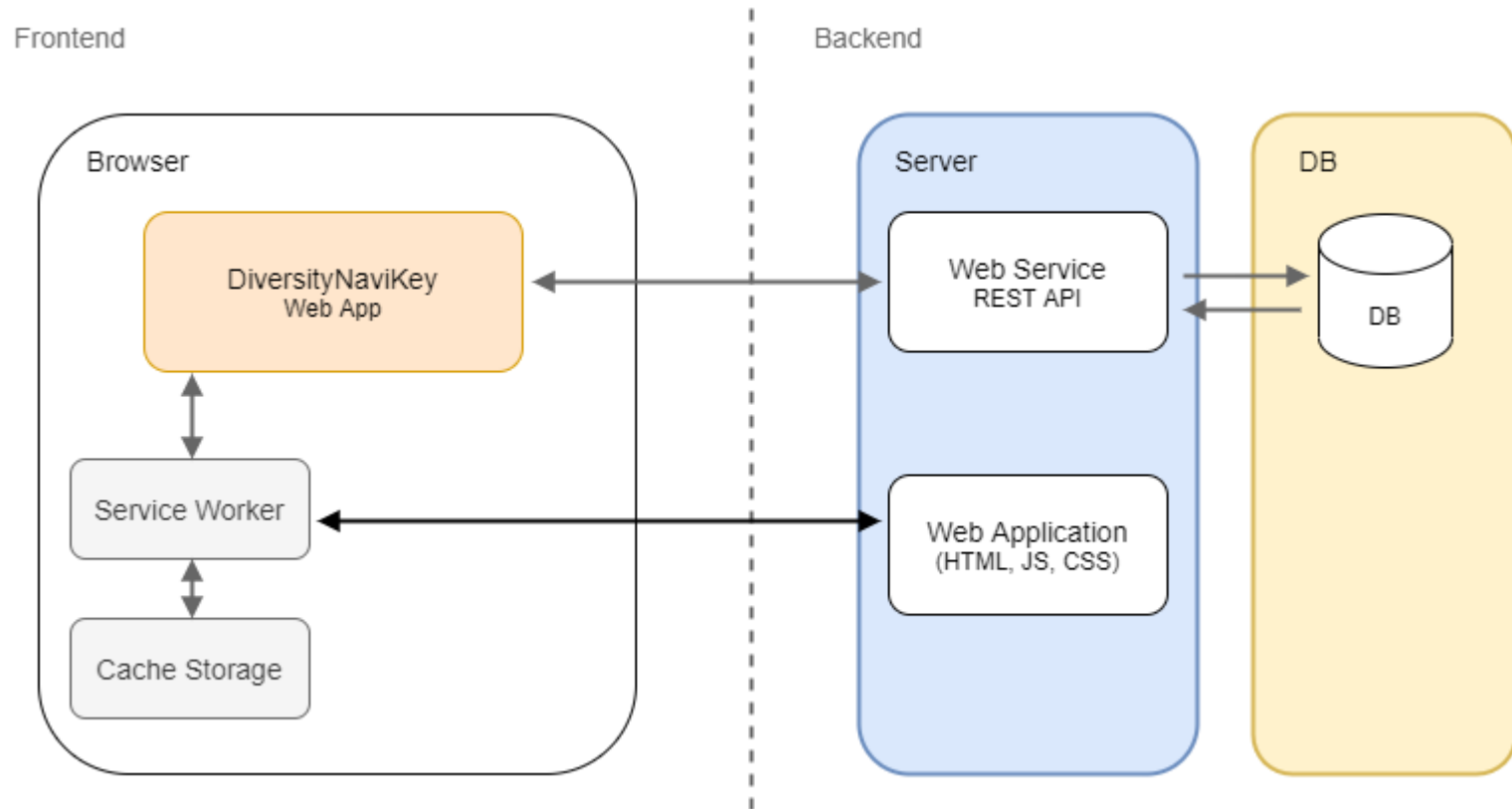
Initial call

DNK – Architecture



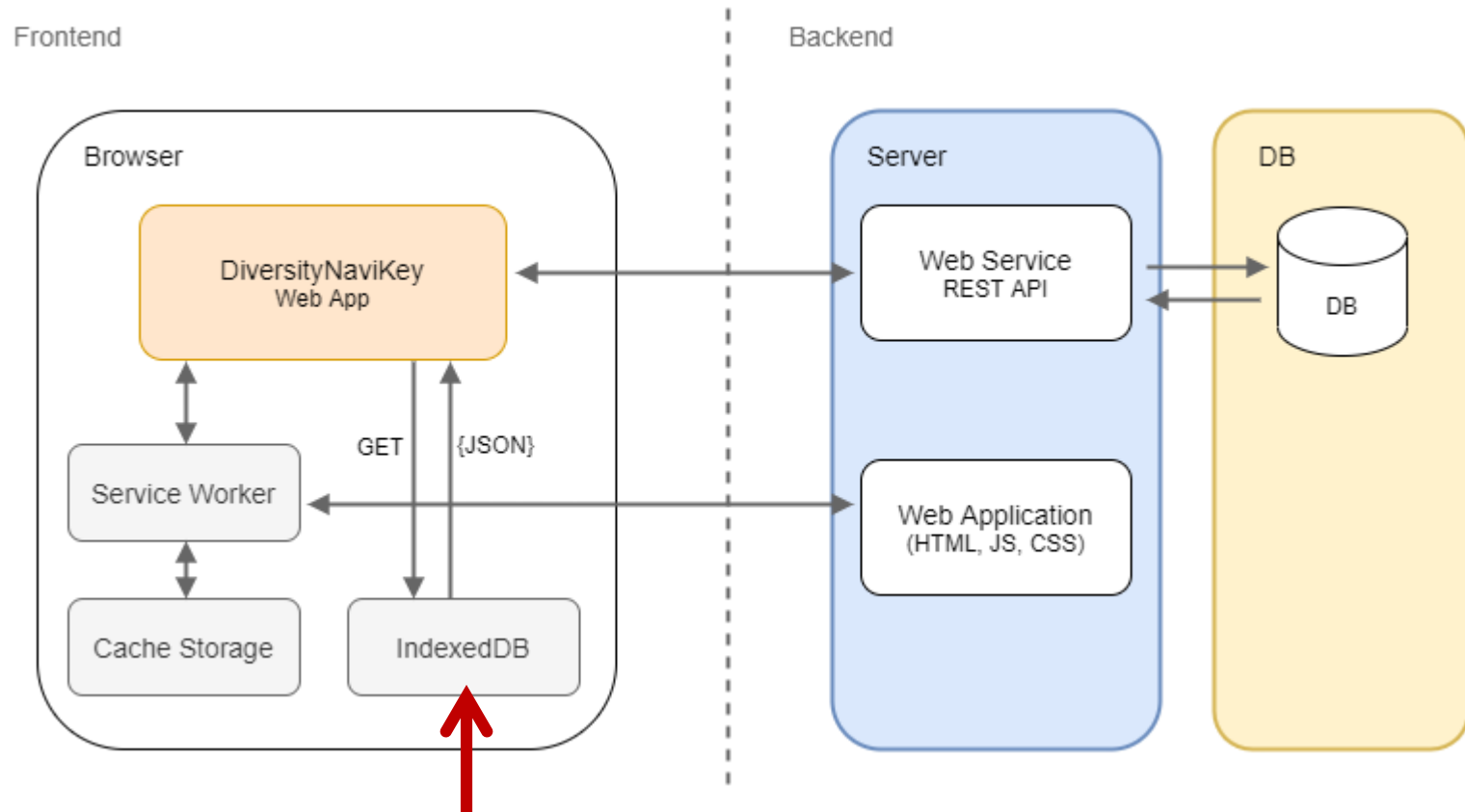
Installation of the service worker on the first call

DNK – Architecture



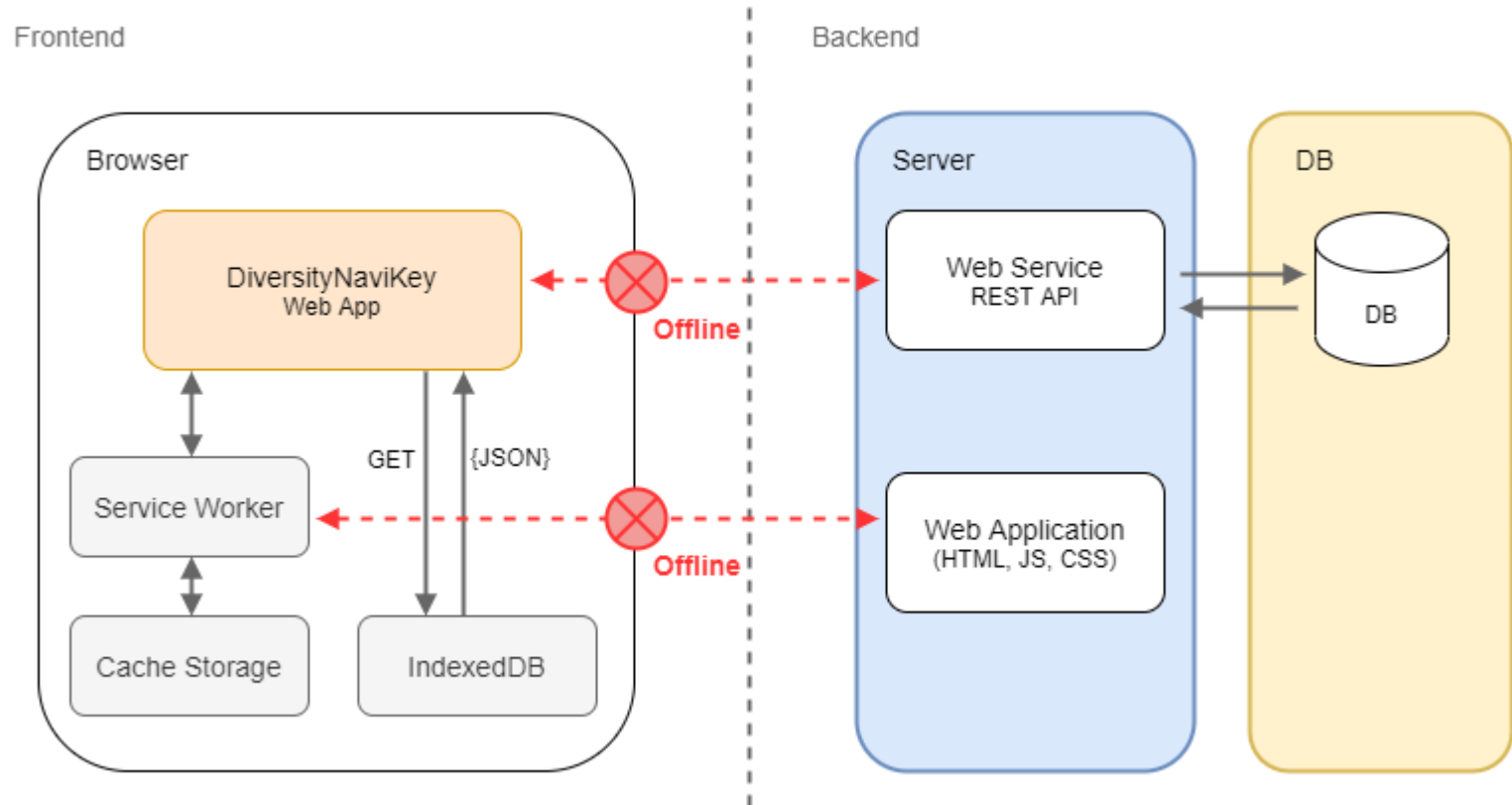
Content data is retrieved via a REST Web Service

DNK – Architecture



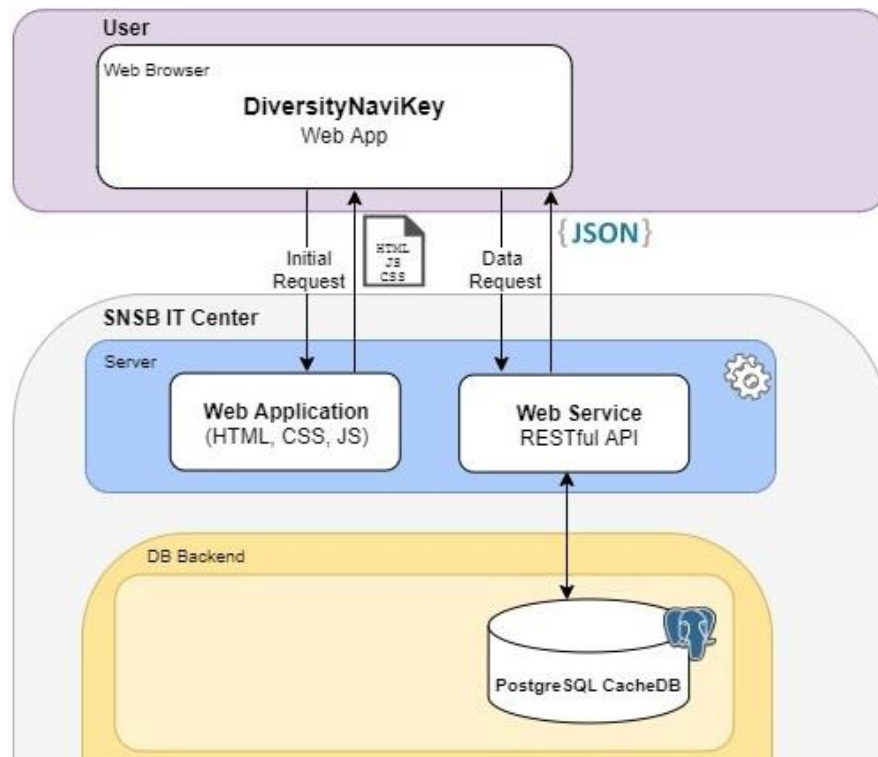
Content data is cached in the browsers IndexedDB

DNK – Architecture

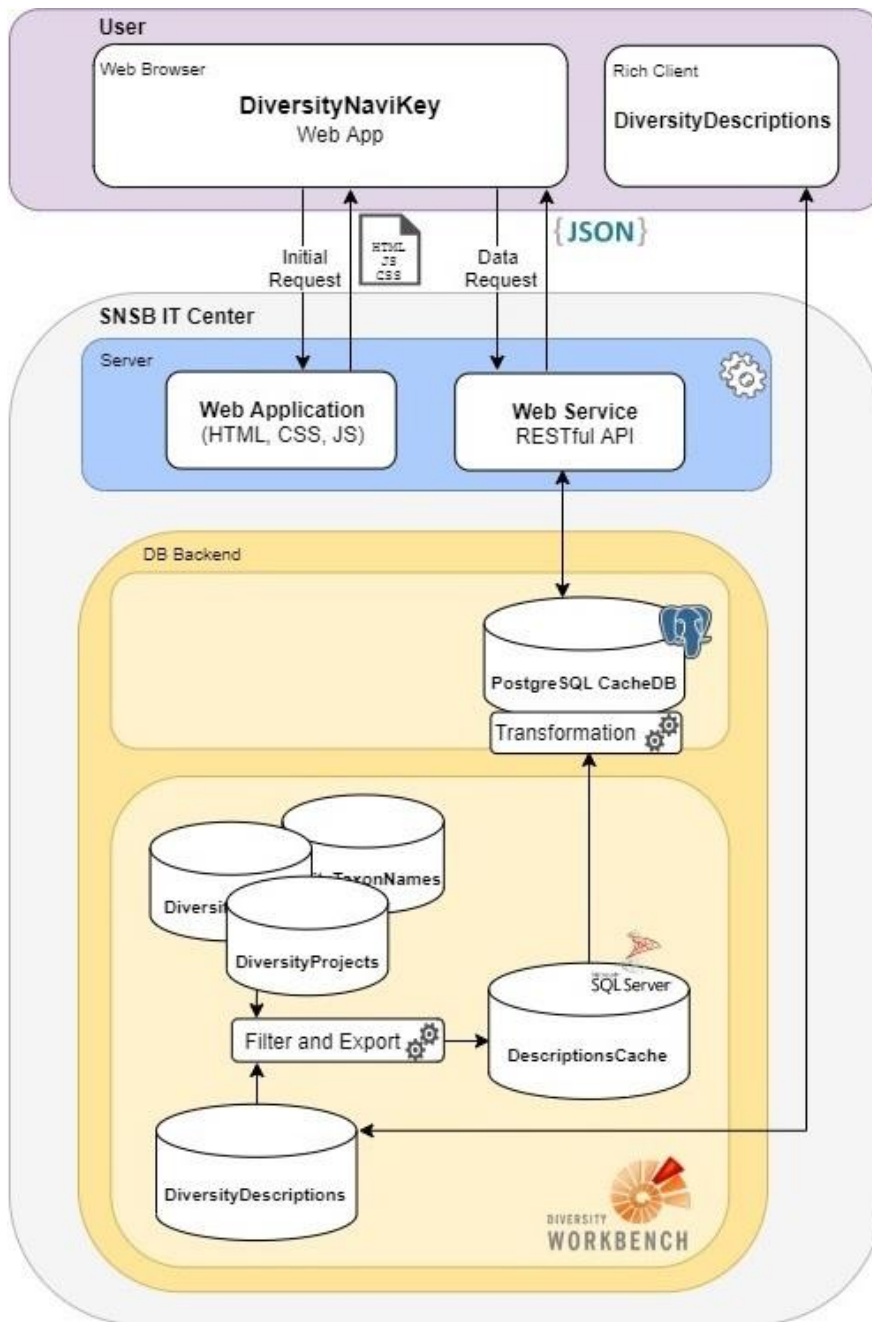


Offline dataflow

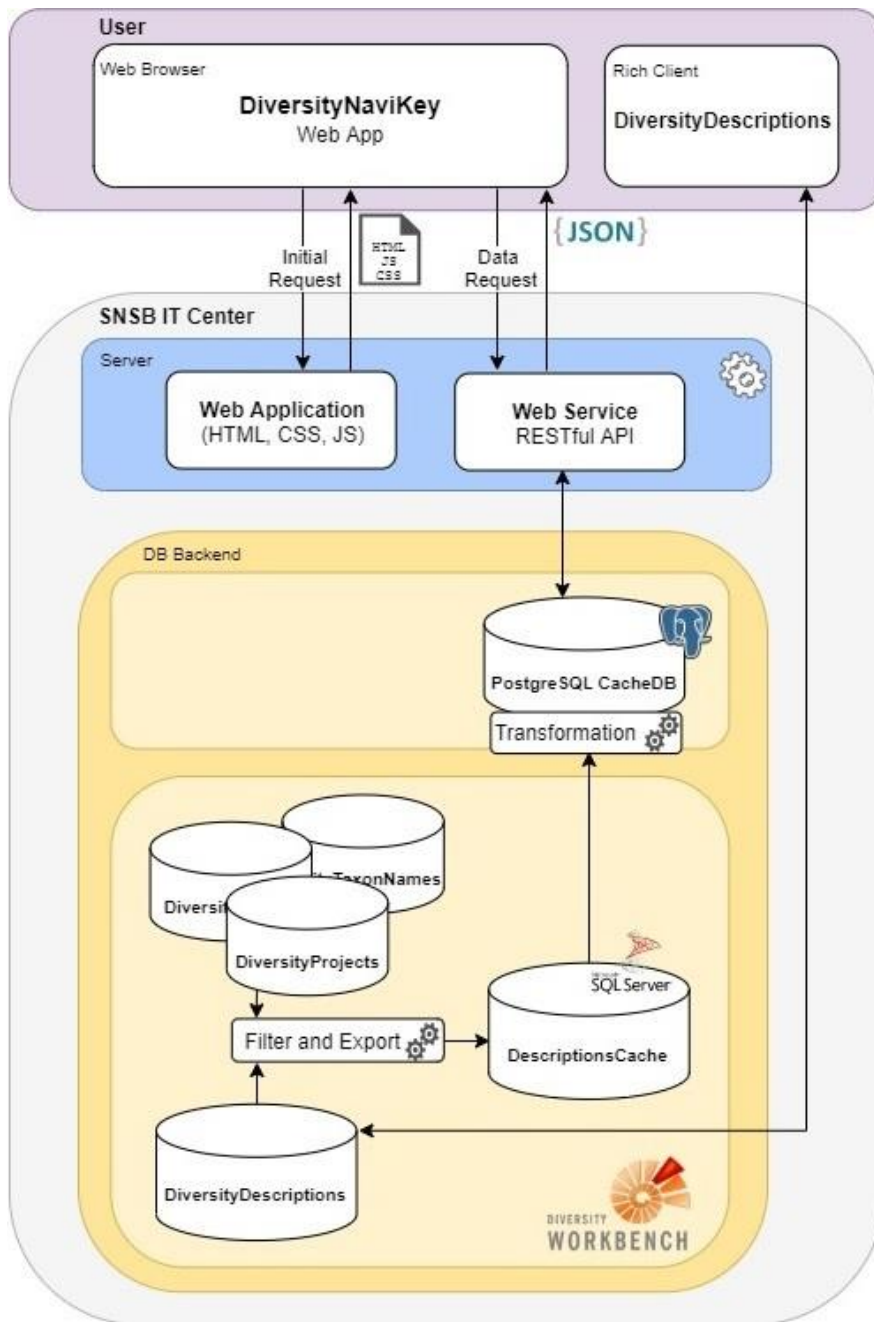
DNK – Sample installation at the SNSB IT Center



- PostgreSQL database with a simple 'flattened' data structure
- No data management



- Data sources are managed by the DiversityDescriptions (DD) application
- DD pre-processes and transfers the data to the CacheDB
- All data sources defined in the web service are automatically read out by the DNK



Six exemplary data sources



LIASLight



DEEMY



LIASmetabolites



BFLheilpflanzen (quiz
official plants)



DSMZbacdivedesc

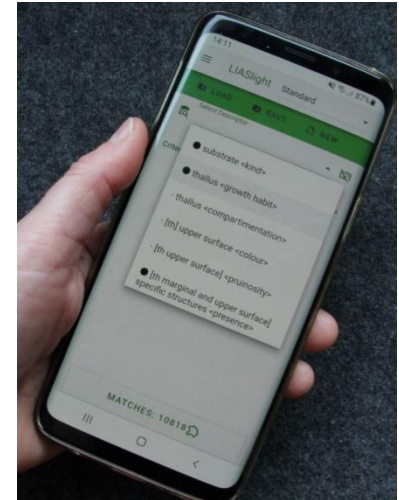


BELMONTsurveyd
esc

Summary

DiversityNaviKey is a progressive web app realised to identify organisms or other objects by means of predefined descriptors

- Interactive queries on descriptive data (trait data)
- Support of different datasets accessed via a web service
- Support of unsettled or dynamically growing datasets by using the SNSB and DD installation
- Platform independent, offline capable, installable, extendable



Summary – Outlook

- Future plans
 - Support of multiple web services
 - A cloud-based DNK PostgreSQL cache database with DNK web service
 - Service to transform Delta/SDD-XML files to suit the DNK data scheme

Sample installation at SNSB: <https://divnavikey.snsb.info/>

For further info see: <https://diversityworkbench.net/Portal/DiversityNaviKey>