ENVIROFI

ENVIROFI

"ENVIROfying" the Future Internet

BRINGING BIODIVERSITY TO THE FUTURE INTERNET

BIODIVERSITY APPLICATION OVERVIEW

Katharina Schleidt - Umweltbundesamt GmbH Austria

Denis Havlik and Maria Egly - AIT Austrian Institute of Technology GmbH.

FUTURE INTERNET PPP

SEVENTH FRAMEWORK PROGRAMME

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ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

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Introduction

1. Biodiversity – the variety of Life on Earth – makes our planet habitable and beautiful.
2. Human well-being is dependent upon “Ecosystem Services" provided by nature for free such as
   - Water provision
   - Air purification
   - Fisheries
   - Timber production
   - Nutrient cycling
3. Anthropogenic pressures are causing biodiversity to decline
4. Dependable data on the state of biodiversity is essential to establish the most efficient measures for biodiversity protection

Introduction

1. ENVIROFI-BIO app explores the opportunities provided through new technologies to support biodiversity survey
2. The goal was to identify the required Enablers for such applications, so the necessary basic building blocks to simplify future development of such apps
3. ENVIROFI-BIO app currently tailored to trees, but the same mechanisms work for most other areas of biodiversity

Biodiversity Scenario Requirements

1. Enable users to provide observations on biodiversity using mobile devices (often in remote areas and under unfavorable weather conditions)
2. Integrate additional (possible contradictory) observations from third-party databases
3. Assess the quality of the observation through combination of context aware quality assurance methods and crowdsourcing
4. Utilize ontologies for unique identification of species as well as quality assurance (plausibility checks)
5. Provide observation data based on international standards

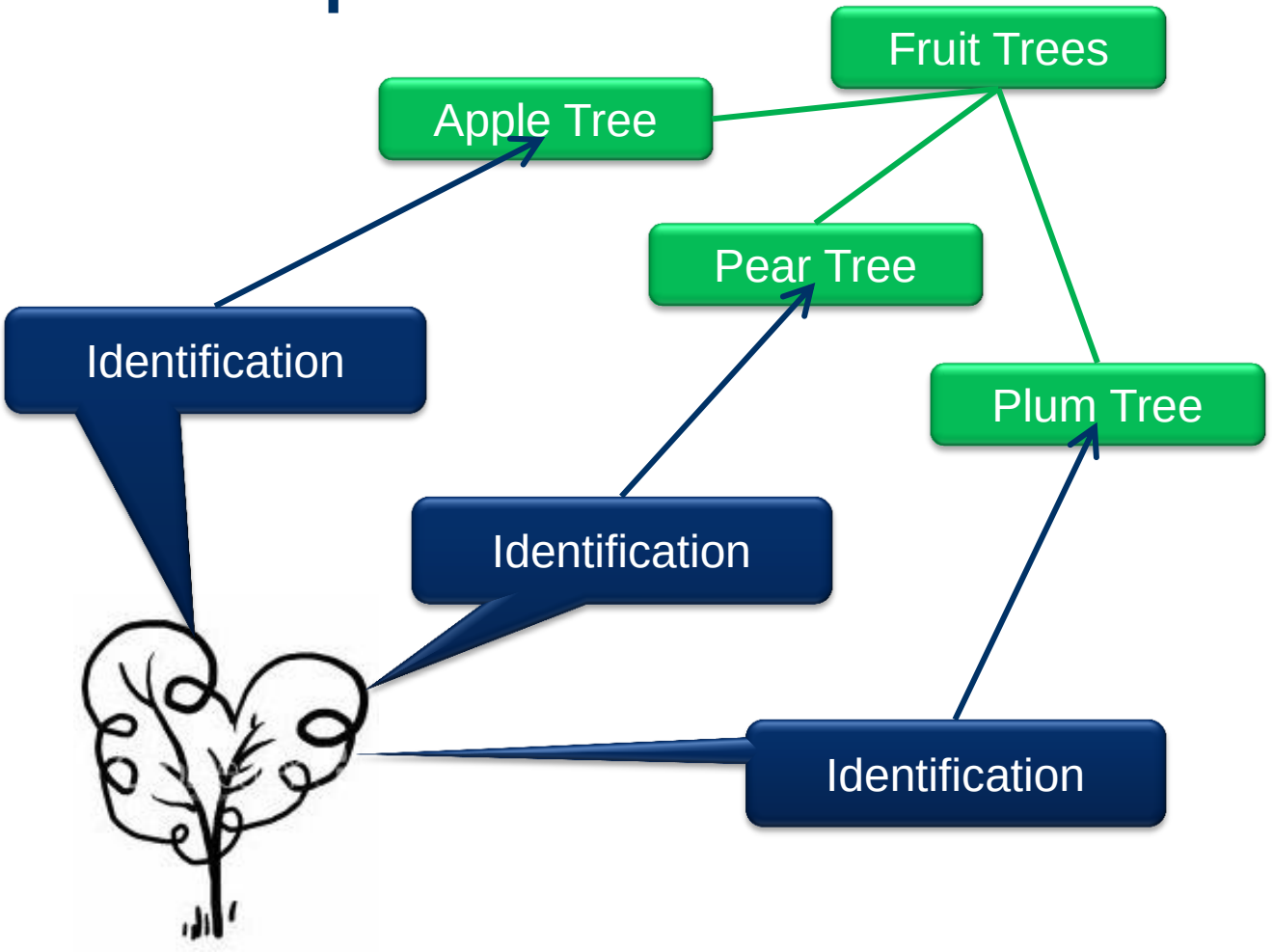
Basic Concepts

1. Ontology
   - Unique entry for each species
   - Identifications reference species entries
2. Area of Interest (AoI)
   - Define location where app will be used
   - Download and cache relevant data for use in the field
3. Object of Interest (OoI)
   - The object we are interested in
   - Contains only basic geographic information, rest is provided by observations
4. Observations
   - Covers all additional information on the OoI
   - Structured in accordance with O&M (ISO 19156)

Basic Concepts: OoI versus Observations

1. First approach: label Object as „apple tree“
2. Problem: what if somebody says it‘s a plum tree?
3. Continues: somebody else says it‘s a pear tree

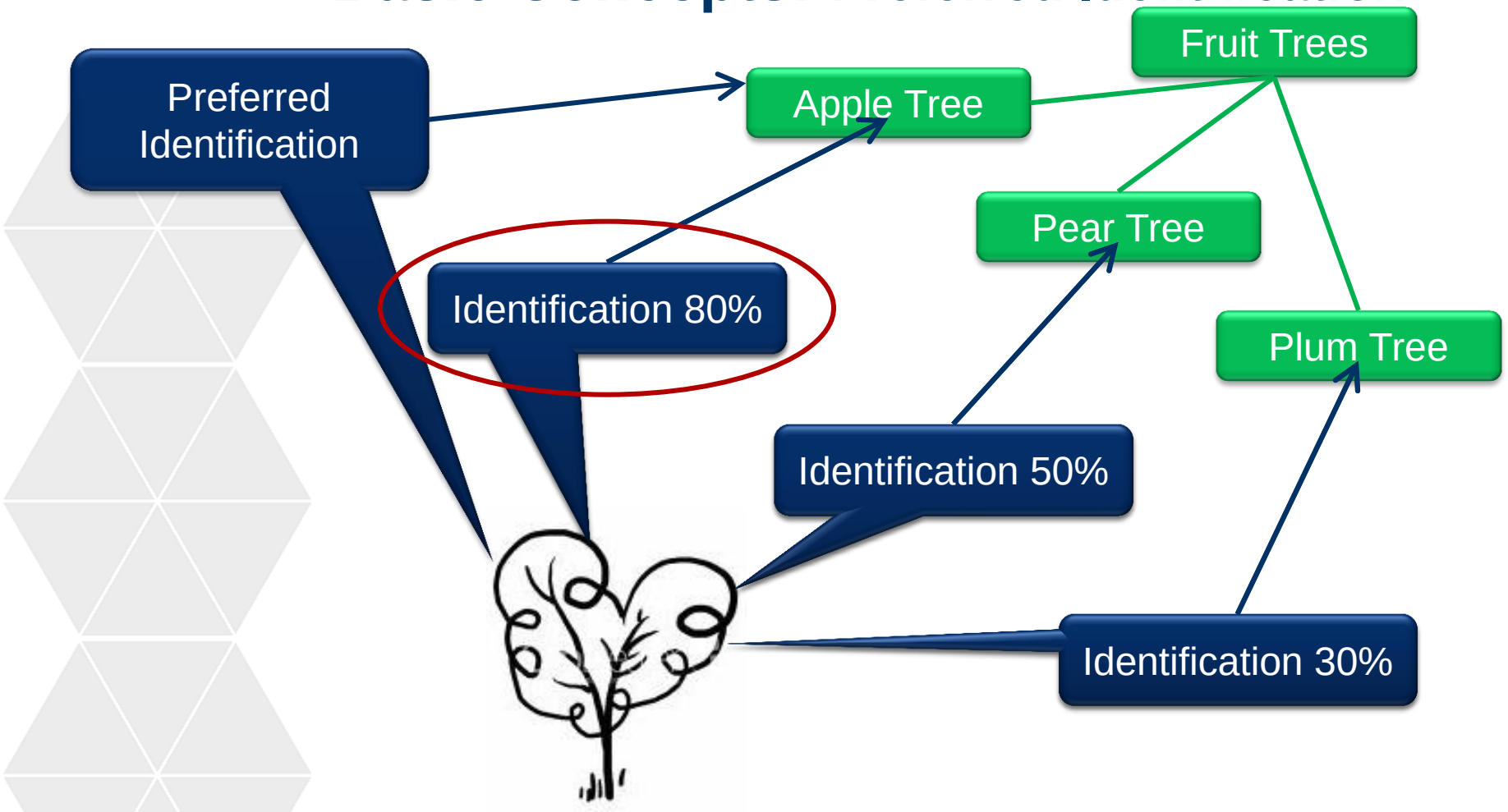
Basic Concepts: OoI versus Observations



Basic Concepts

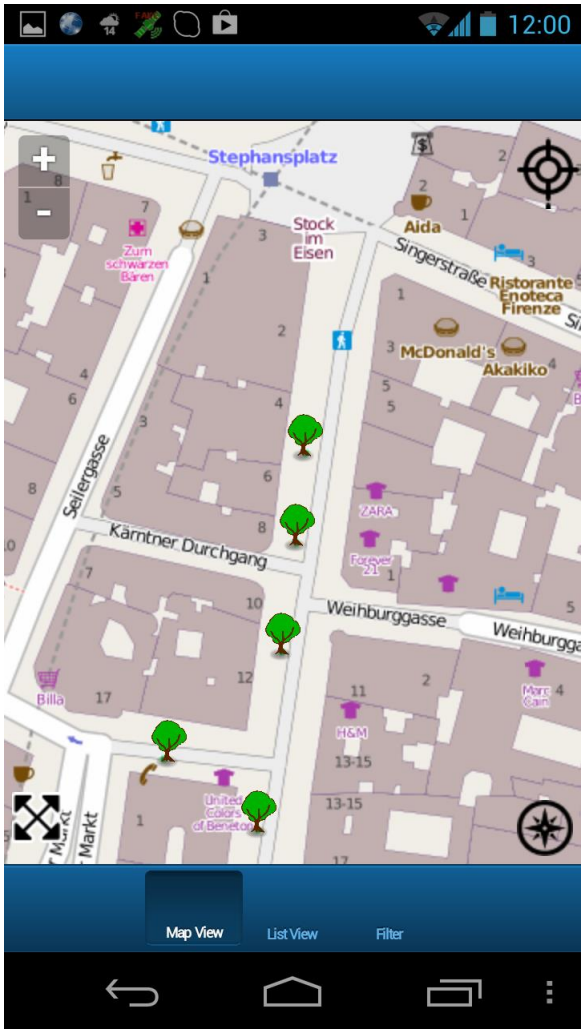
5. Crowd Sourcing
   - Existing data from various sources available
   - Additional OoI can be provided by users
   - New observations on existing OoIs can be provided by users
   - Users are assigned a Trust Level based on
     - Credentials provided at registration
     - Their track record within the system
   - Plausibility level for new observations determined by:
     - Users Trust Level
     - Trust the user gives their own observation
     - Automated quality assurance mechanisms
   - Observation with the highest trust level is displayed, others available for expert users

Basic Concepts: Preferred Identification



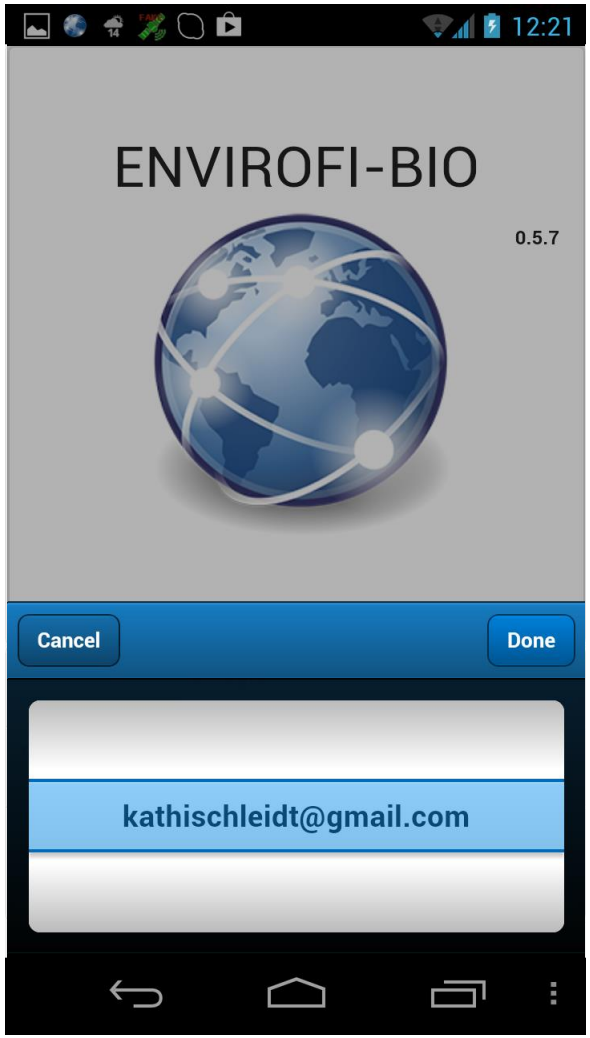
Getting Started

1. Login
2. Set Area of Interest



Getting Started: Login

Login User



Getting Started: Main Menu

List Observations

Browse through Objects of Interest (trees), report new objects and observations, define new areas of interest.

Settings

User options

Areas of Interest

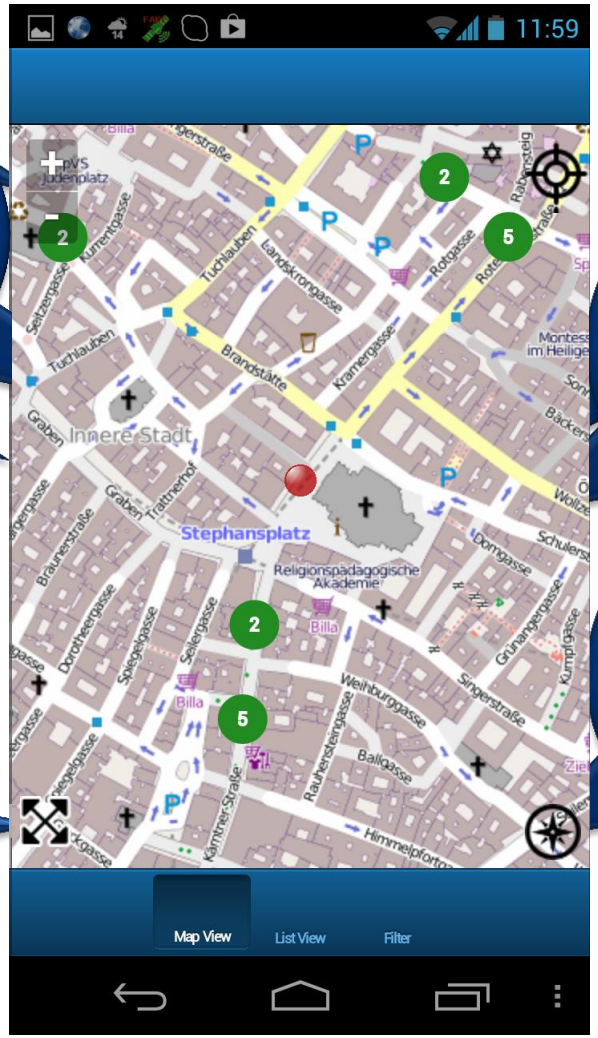
Shortcut to previously defined Areas of Interest

ENVIR… …g Started: Area of Interest

Select relevant area of th…

C… for…

Download Progress is Shown



Enter Name for Area of Interest

Save Area of Interest

Set Area of Interest

Map View

Basic functions:

- ***Double-tap to zoom-in,***
- ***Stretch to zoom-out,***
- ***Drag map to pan***

Zoom buttons

Single OoI (tree)
Tap to show and add details

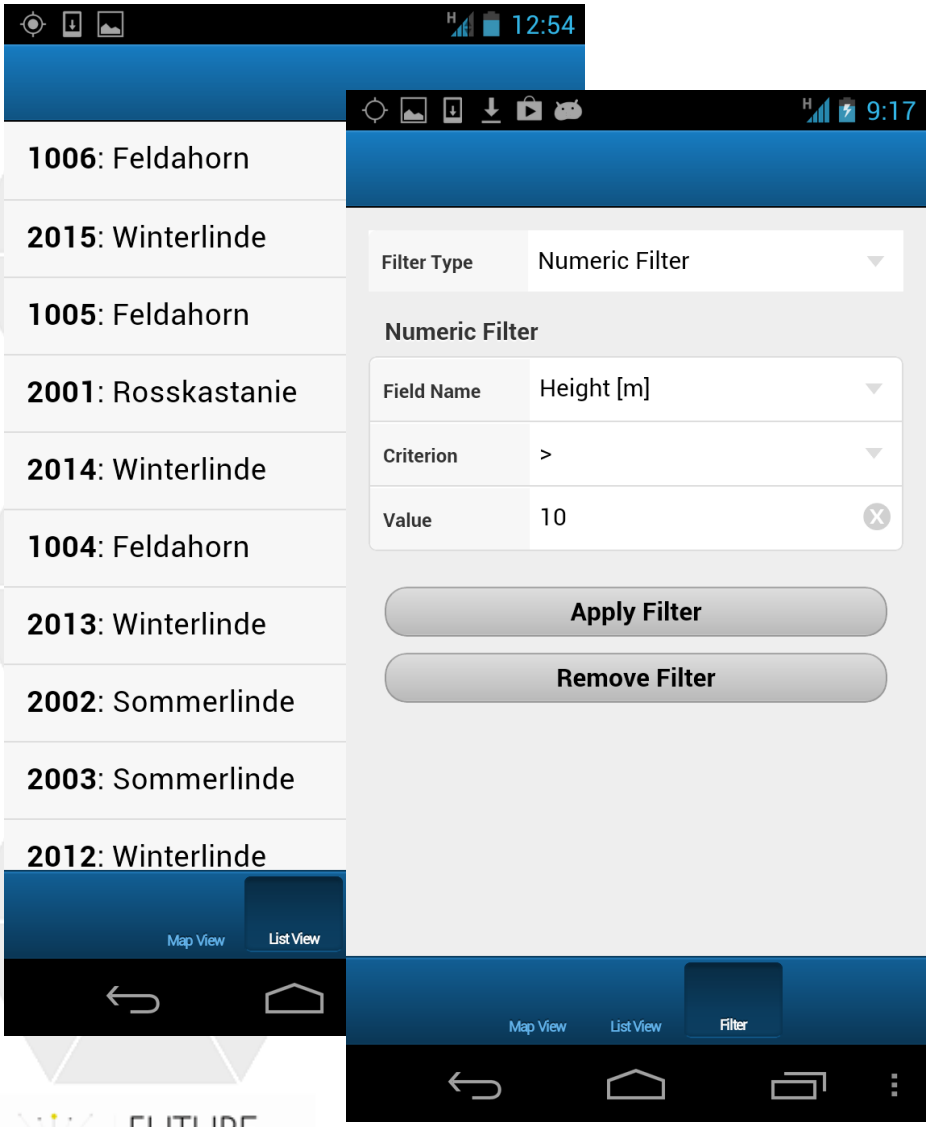
New AoI button
Tap to add new Area of Interest

Add OOI button
Tap to add new object

OoI group (11 trees)
Tap to zoom in

„My position“ button
Tap to re-center the map on GPS position

List View and Filters



List View

List view is synchronized with the Map View and presents an alternative view of the trees within currently active map area.

Hint: *press on a tree name to show tree details*

Filters

Filters can be used to reduce the number of individuals displayed by selecting only those corresponding to filter criteria. The filter is honoured by map and list view

Tree Details View

Observations on OoI

A table providing the initial observations on the individual are shown. Each entry is the result of one observation

Additional observations provided at a later point in time are displayed in seperate blocks together with user information and a time stamp

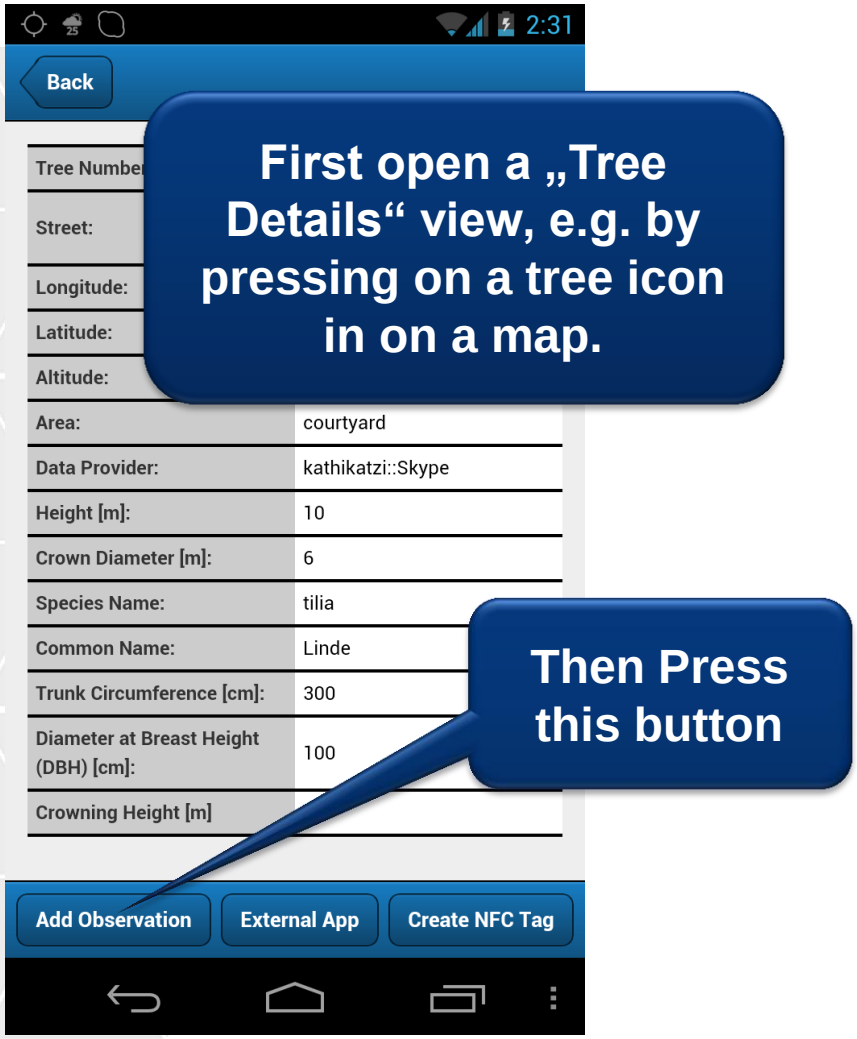
Adding Objects of Interest (OoI)

Why OoI?

OoI closely aligned with OGC's "Feature of Interest" and the concept of "Thing" in Internet of Things.

OoI is one of the core data elements of the Environmental Georeferenced Observation Service SE, and used to represent species occurrences in this app.

Adding Observations



Concept of observation originates from the Observations and Measurements Standard (O&M) from OGC Sensor Web Enablement.

Each piece of data added to an OoI is an Observation.

One OoI will often have many Observations attached; multiple Observations of the same property may be attached to an OoI

Note: *While for internal storage other data structures are used due t performance considerations, mapping to the standard O&M schema is simple.*

Adding Observations - Properties

1. Each Observation is assigned a Property that describes what is being observed
2. The available Properties were collated from existing data sources
3. In cooperation with the Austrian Long Term Ecological Research Network (LTER) we assured that all requirements for scientific use are met
4. The Observation Properties are thematically grouped for easy navigation and access.

Adding Observations - Properties

The following types of Observed Properties have been defined:

1. Inventory Number
2. Identification
3. Location
4. Length Properties
5. Planting Year
6. Comment
7. Image
8. Classification of the Social Position
9. Status (with additional timestamp)

- Height
- Coordinates
- Crowning Height
- Relative positioning (Azimut & Distance from a Reference Point)
- Deadwood Height
- Crown Diameter
- Address Information (Street & Number)
- Trunk Circumference
- Beetle Infestation
- Breast Height Diameter
- Leaf Connection to Branch
- Tree Damage
- Other

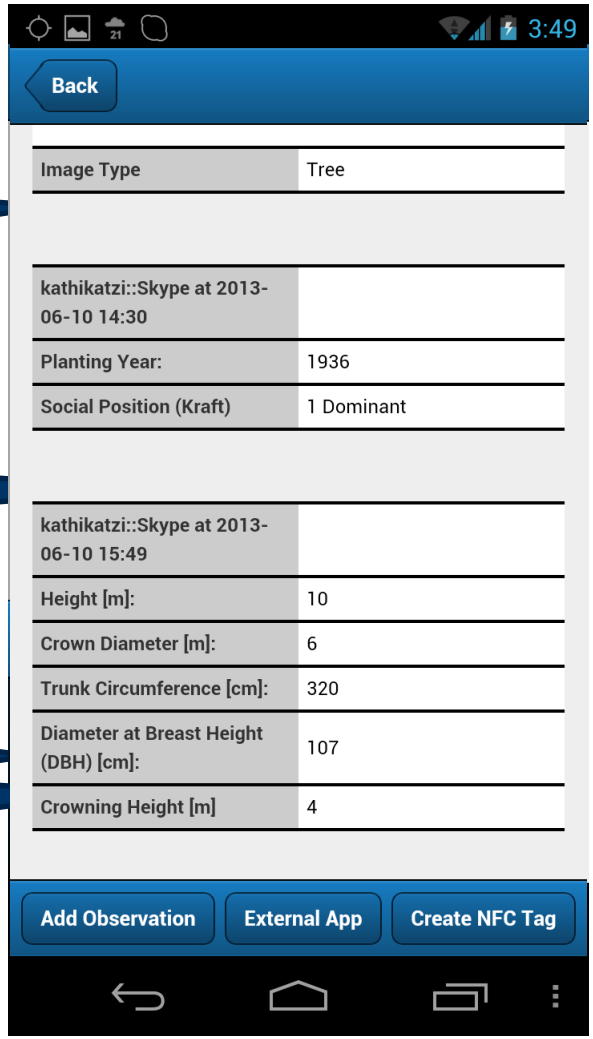
Adding Observations

Select Property

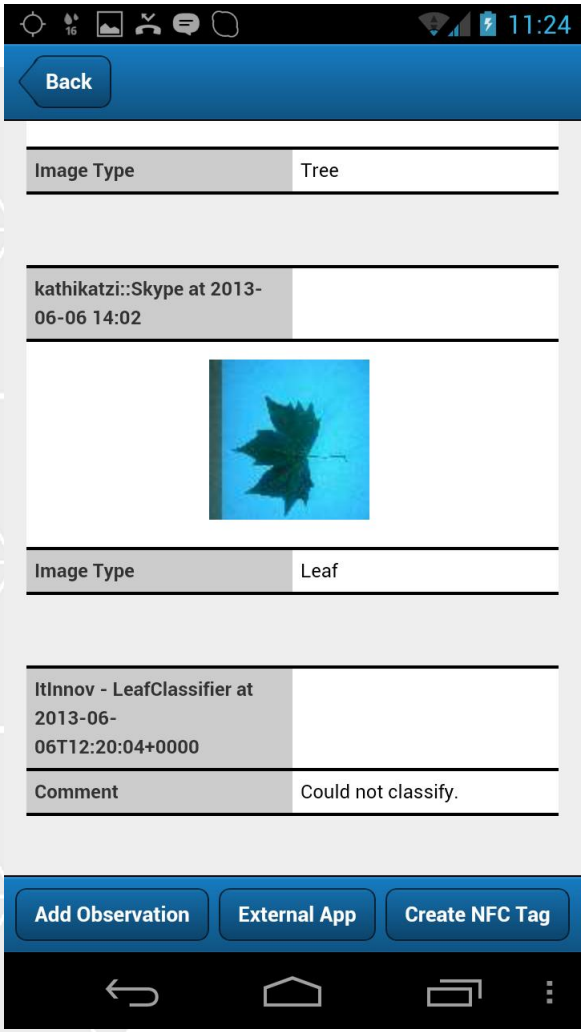
Select Property from list

The various fields

Save Observation

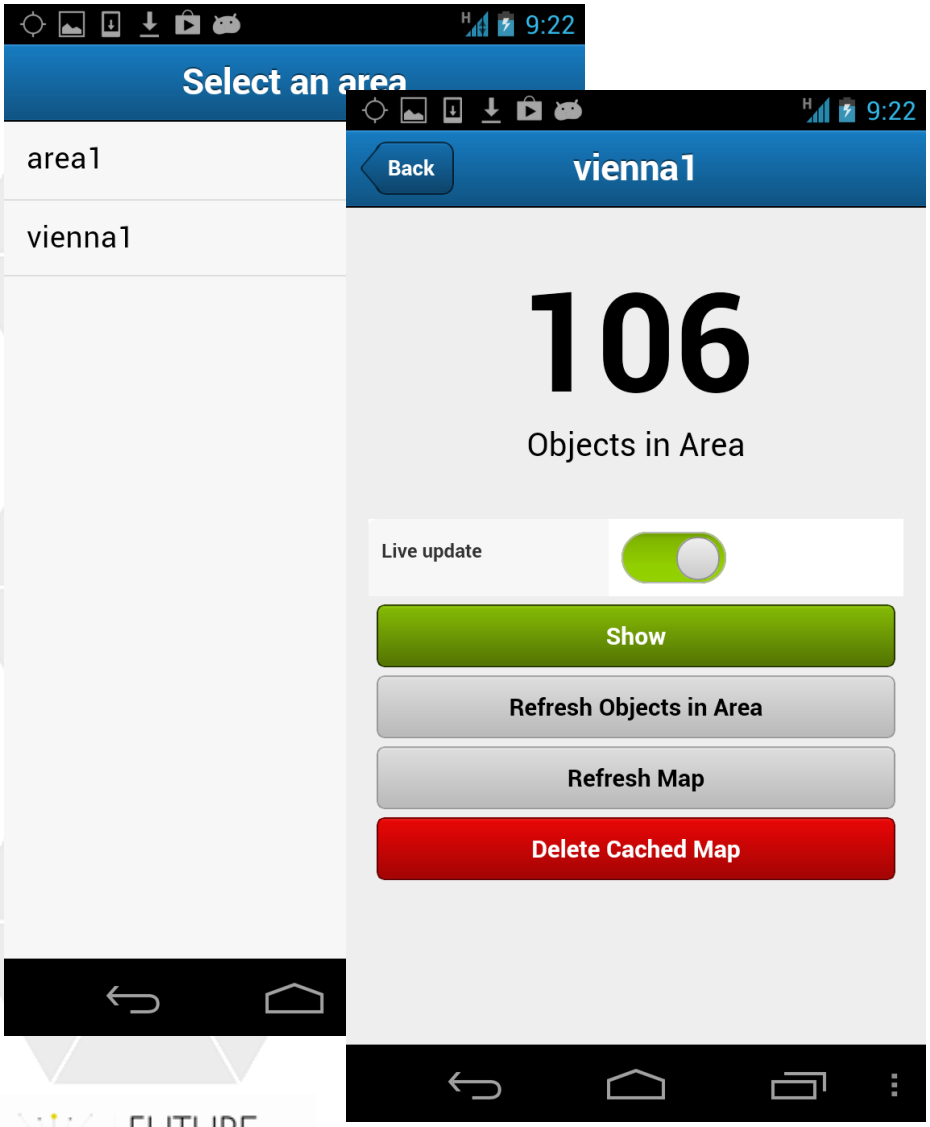


Automated Data Quality Assurance



1. Image recognition based on tree leaves
2. Plausibility based on eHabitat Plausibility Service

Administrating AoIs



Your data and AoIs

Stored AoIs can be selected by the user

Known objects of interests (e.g. previously reported trees) within the new Area of Interest provided.

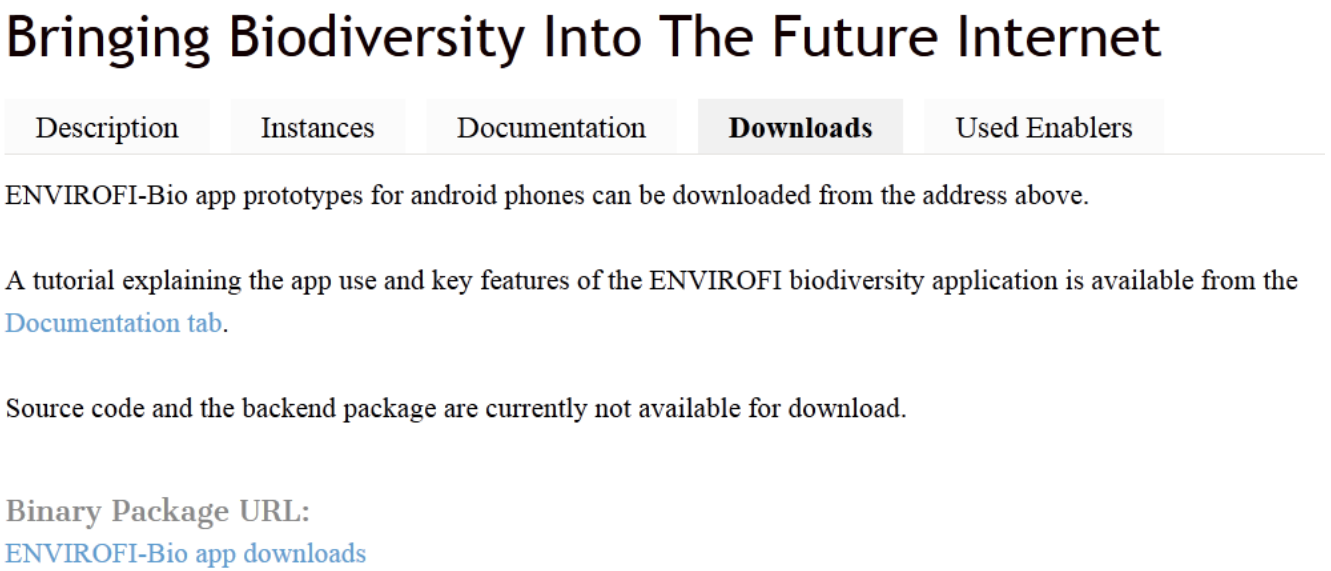
Note: *Application can be used offline. OoIs and observations within your AoI will be synchronised whenever a network connection is available*

Possible Future Applications

- **Biodiversity**: plants and animal sightings, seasonal changes, invasive species, educational
- **Forestry & agriculture**: invasive species, spread of pests & infections
- **Administration**: state of inventory, need for actions (e.g. user input that „this tree is about to fall“)
- **Tourism:** support for nature guides, information on biodiversity in area
- ???

App Download & Installation

Download and documentation on:
http://catalogue.envirofi.eu/applications



Bringing Biodiversity Into The Future Internet

Description | Instances | Documentation | **Downloads** | Used Enablers

ENVIROFI-Bio app prototypes for android phones can be downloaded from the address above.

A tutorial explaining the app use and key features of the ENVIROFI biodiversity application is available from the Documentation tab.

Source code and the backend package are currently not available for download.

Binary Package URL:
ENVIROFI-Bio app downloads

Note:

- Developed and tested on Android 4.1, 4.2; not compatible with 4.0
- Expected to work (but not tested) on Android 2.3.3 and higher

Thank you for your attention

Katharina Schleidt
Katharina.Schleidt@umweltbundesamt.at

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