



# Applications and impacts of the BrAPI project on plant breeding

What is the **Breeding API (BrAPI)**?

# What is the BrAPI?

BrAPI is a ...

Standardized

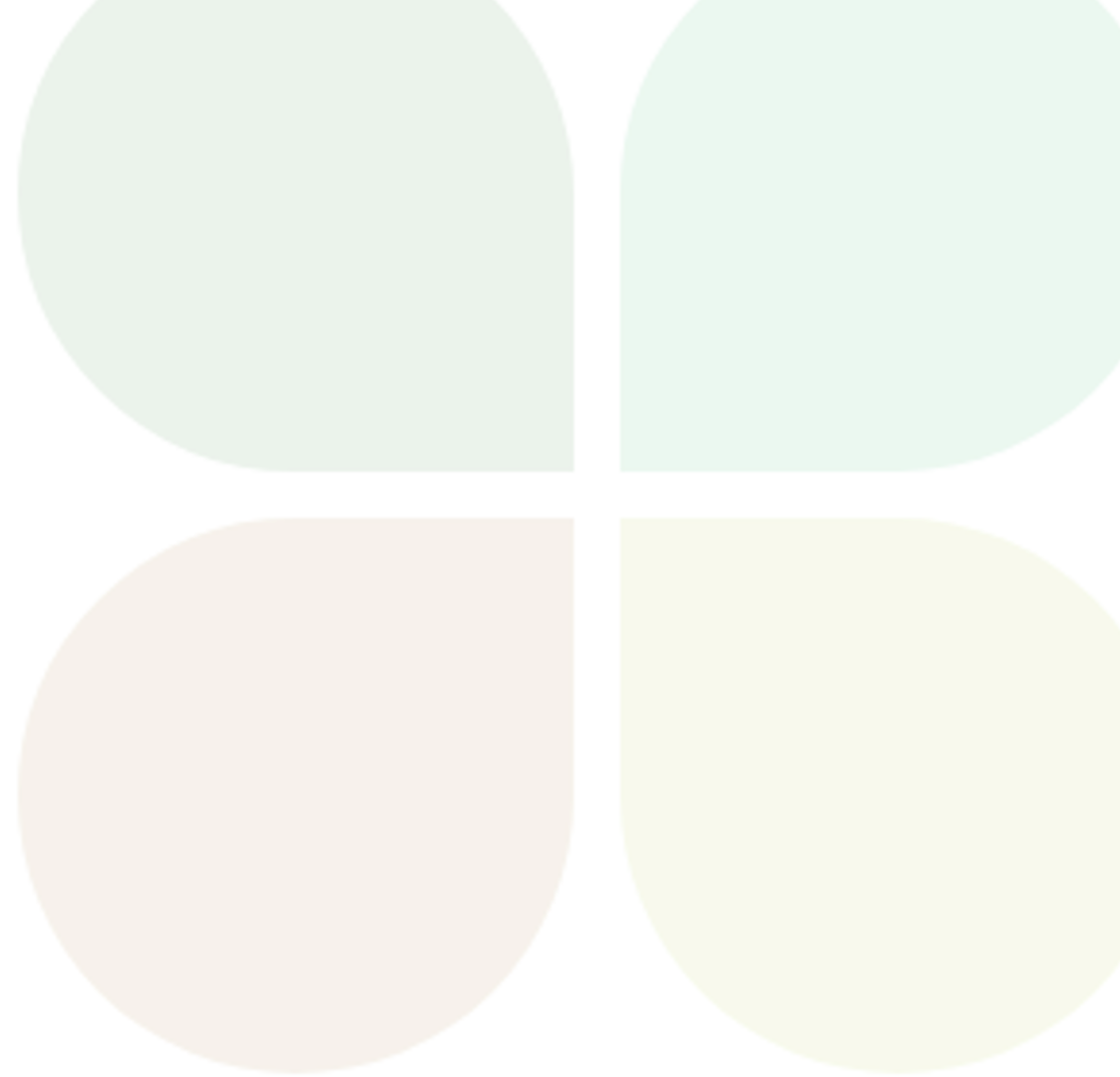
RESTful

Web Service

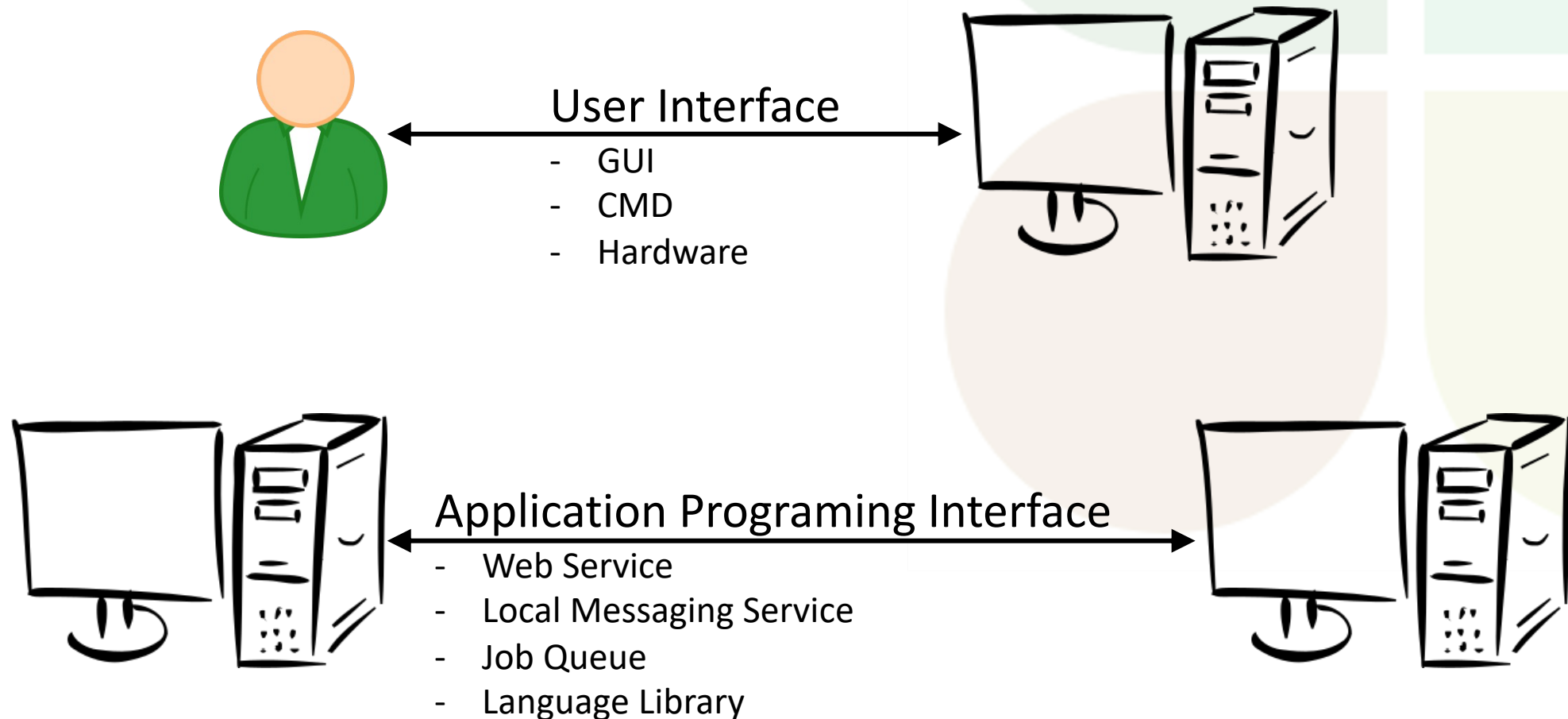
API

Specification

...for communicating plant breeding data

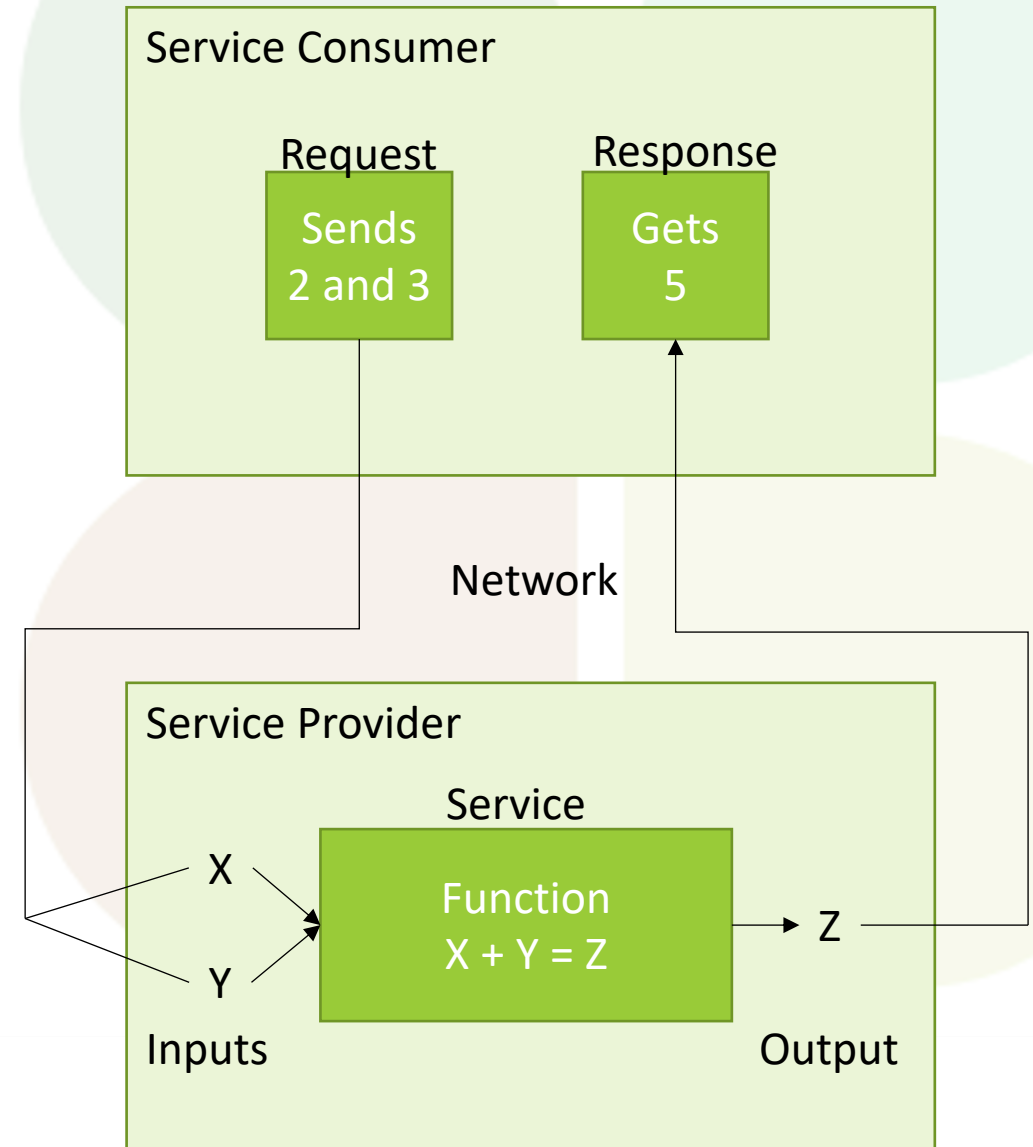


# API – Application Programming Interface

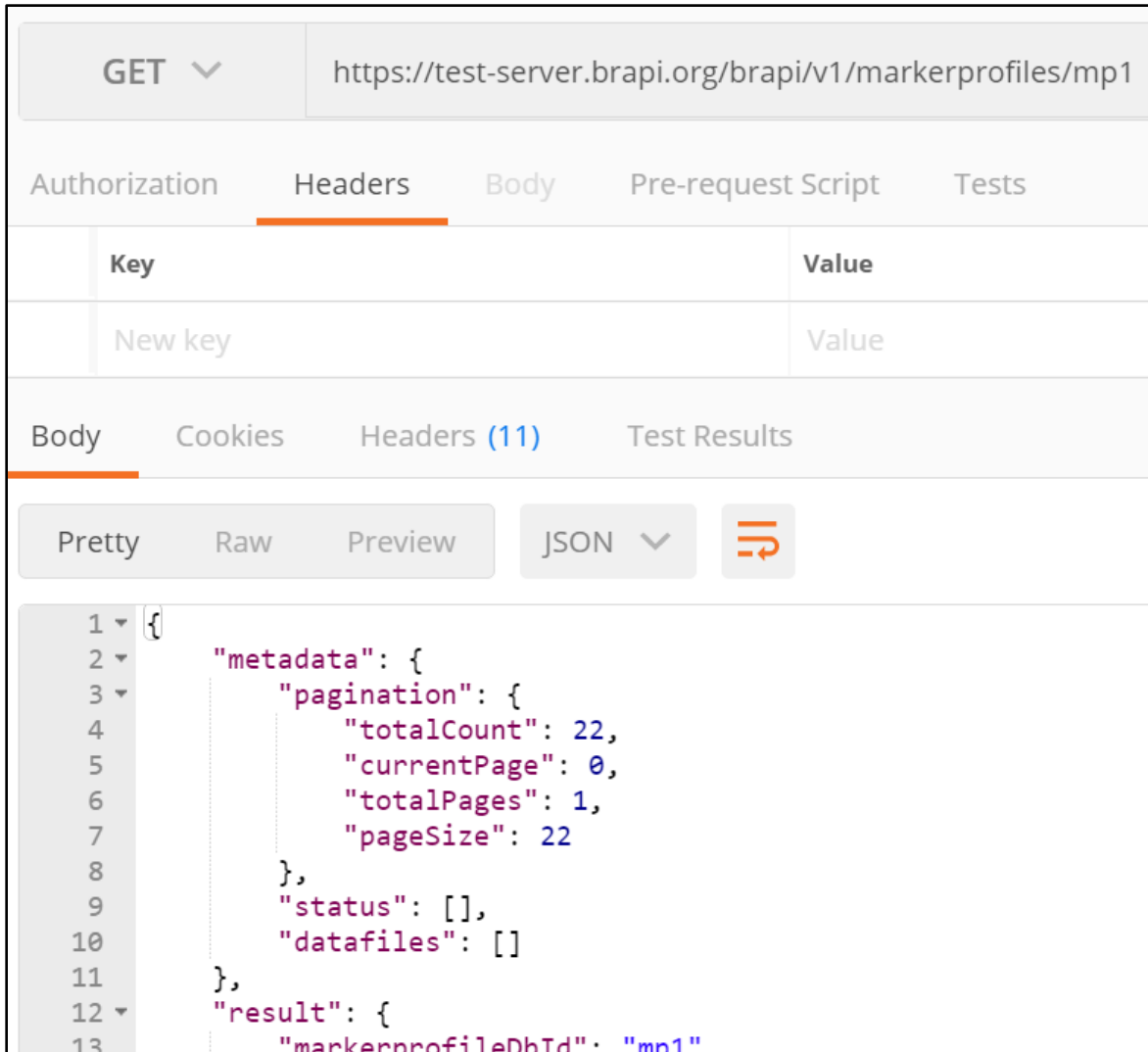


# Web Service

- A Service Provider contains some Service with well defined Inputs and Outputs
- A Service Consumer sends a request to the Service Provider with the Input data, and waits for a response
- The Service performs some Function on the Input data
- The Service Provider sends the Output data as a Response back to the Service Consumer



# REST - Representational State Transfer



The screenshot shows a REST client interface with the following details:

- Method: GET
- URL: <https://test-server.brapi.org/brapi/v1/markerprofiles/mp1>
- Response Body (JSON):

```
1 {
2   "metadata": {
3     "pagination": {
4       "totalCount": 22,
5       "currentPage": 0,
6       "totalPages": 1,
7       "pageSize": 22
8     },
9     "status": [],
10    "datafiles": []
11  },
12  "result": {
13    "markerprofileDbId": "mp1"
```

- REST is an architecture design for creating Web Services using the well known HTTP standard
- Requests are made with URLs
- Data is represented with JSON

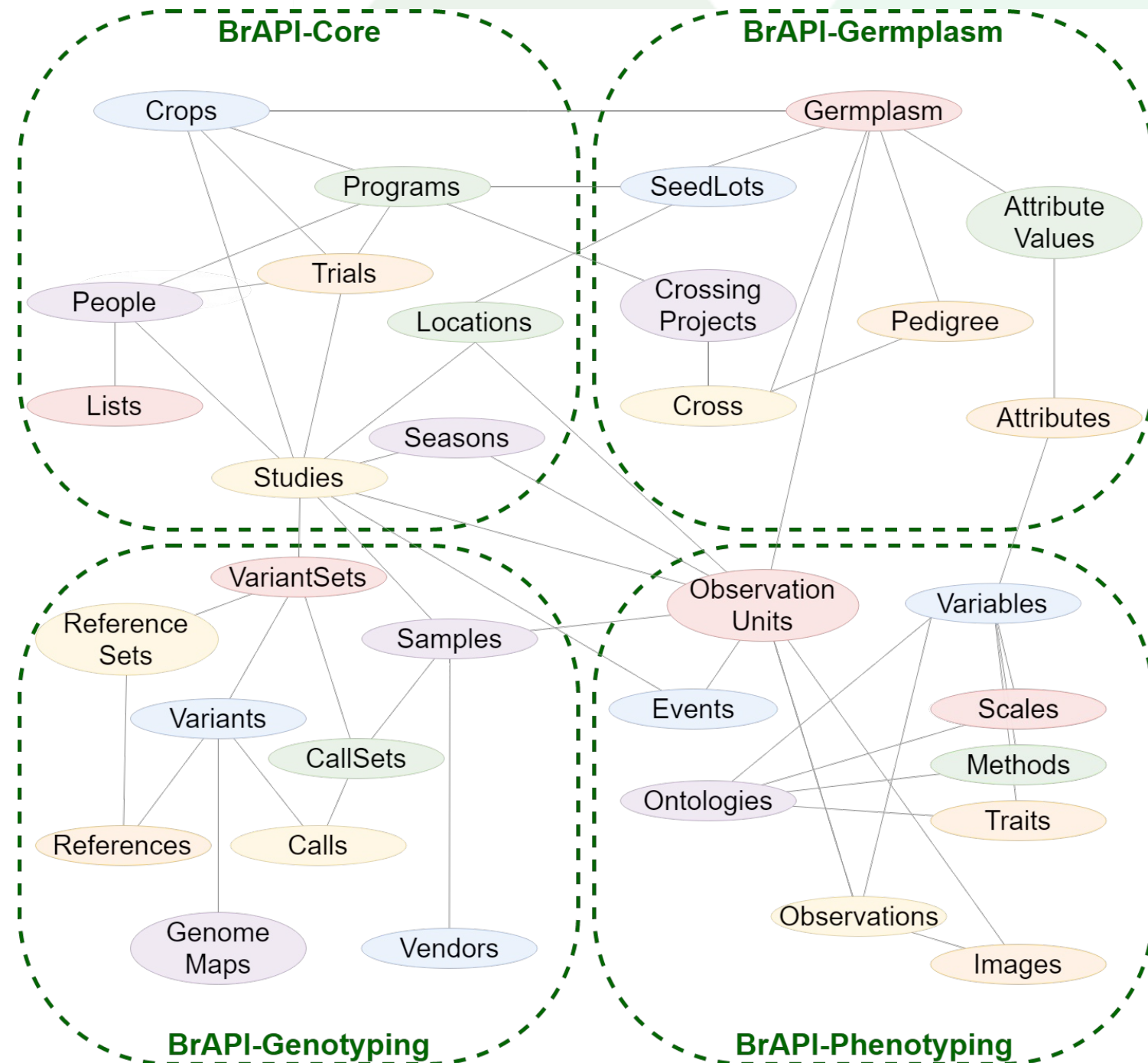
# Standardized **Specification**

BrAPI has defined a Standardized set of data model structures to communicate the basic information of plant breeding

BrAPI is a technical **Specification** which software developers can easily turn into code which communicates using the Standard.

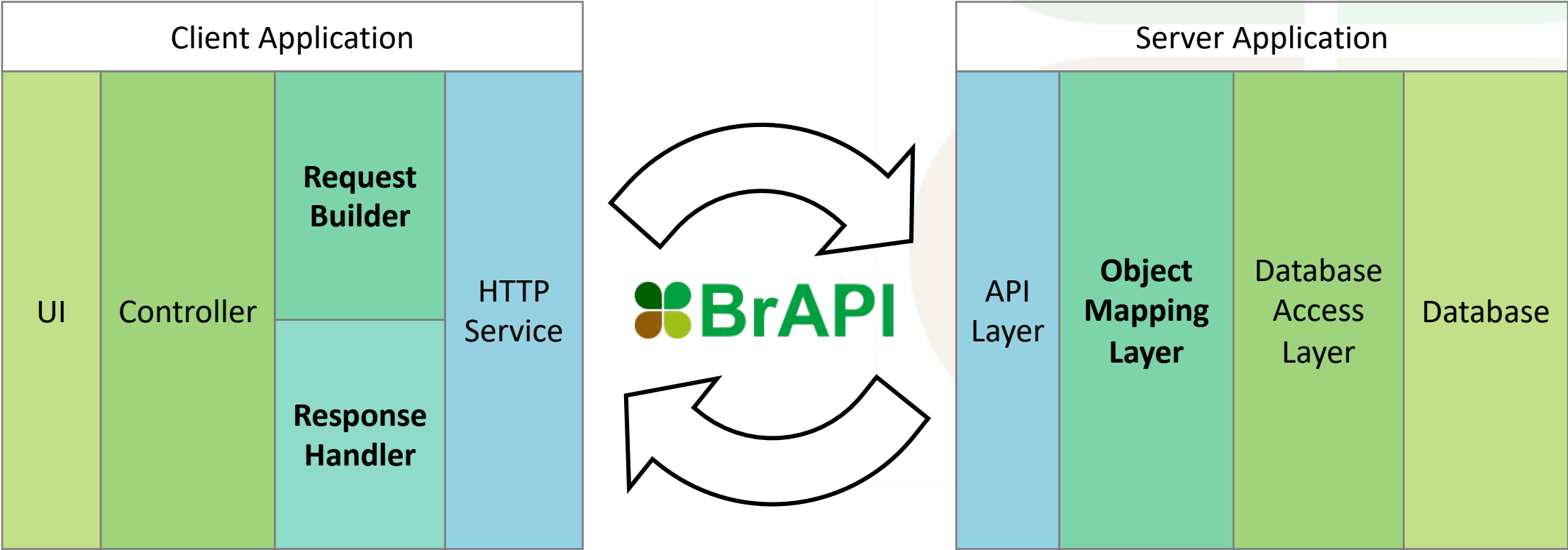
# BrAPI Domains

The BrAPI Data Model defines the data and metadata required for any generic breeding trials. The data models are designed to be easily interpreted by a computer in any programming language.



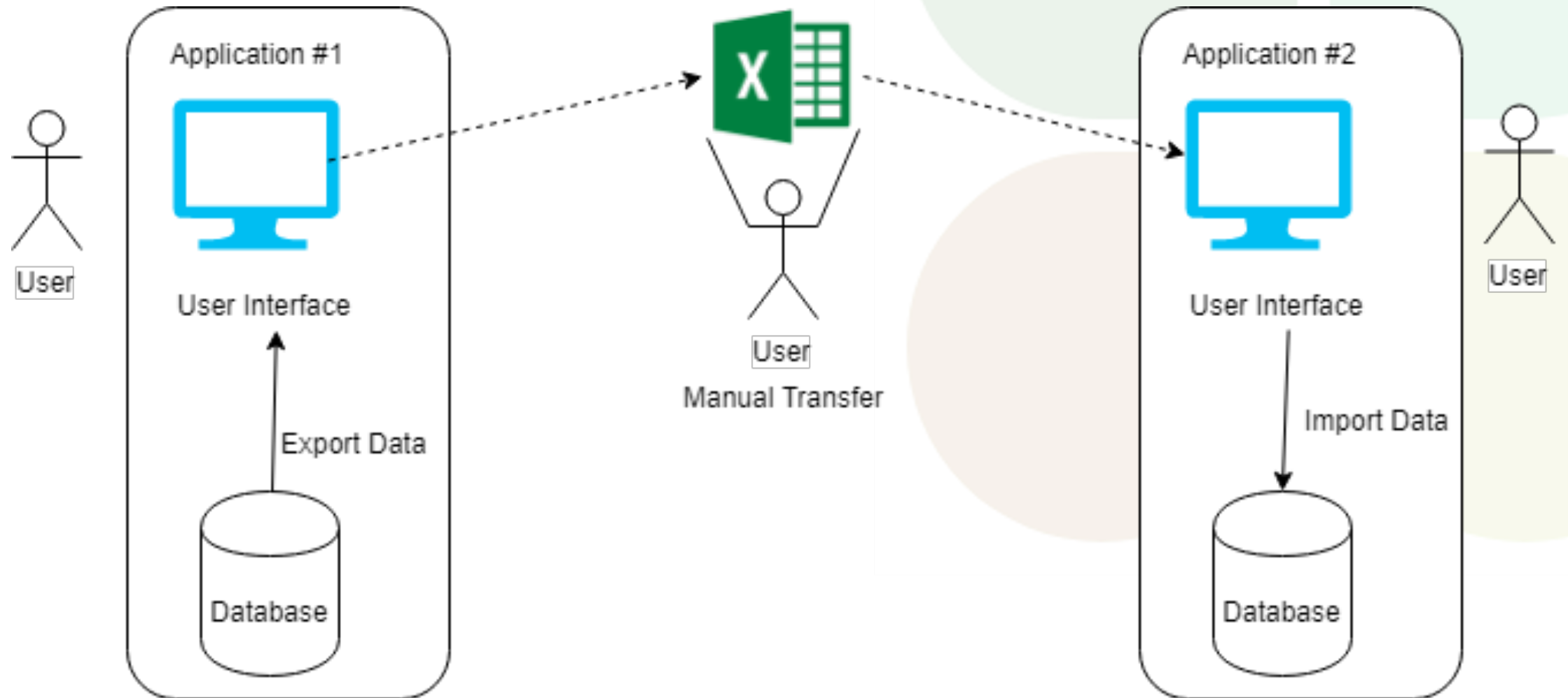


# Typical Request/Response Loop

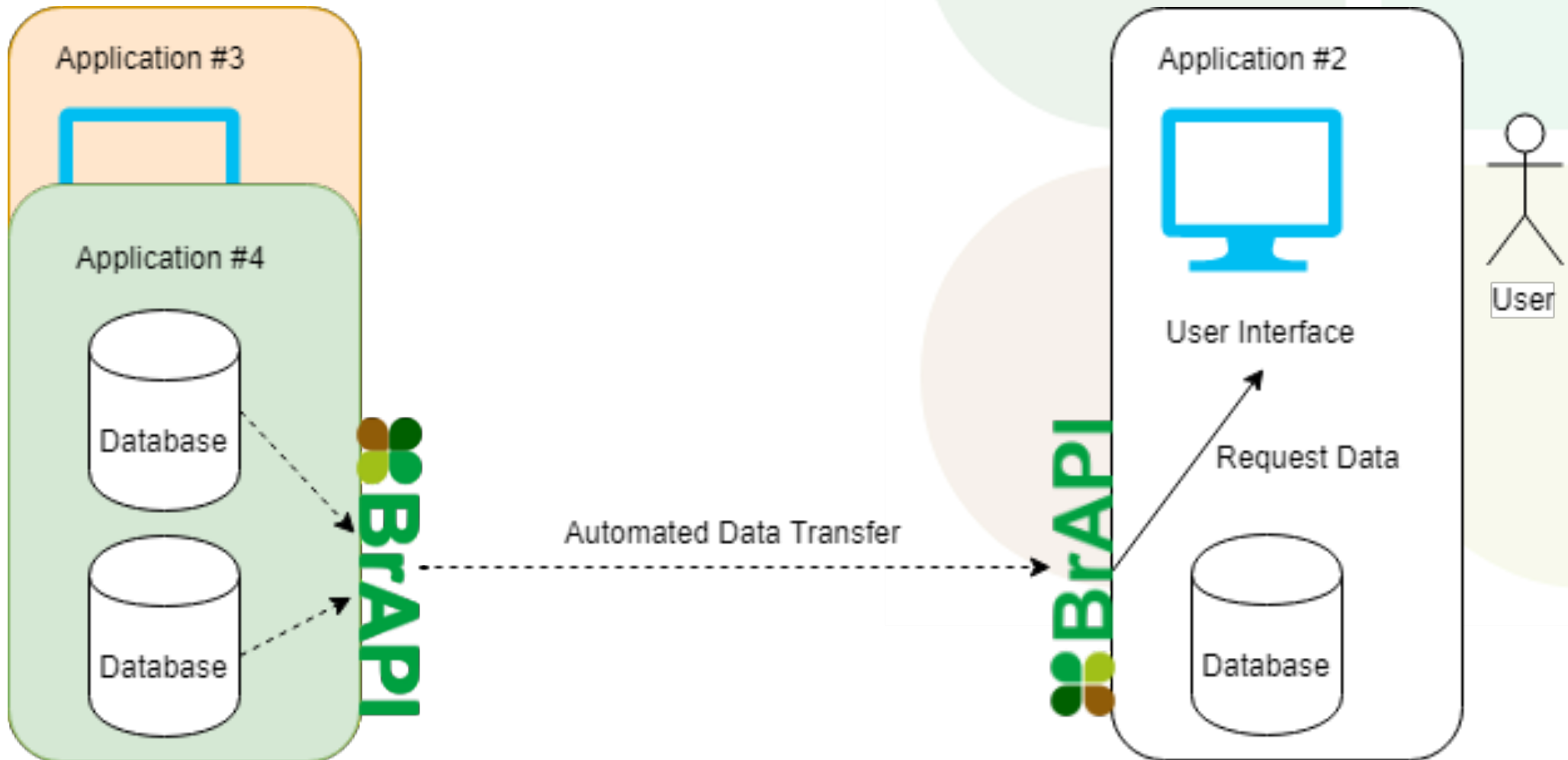


Why do we need BrAPI?

# Manual Interoperability



# Automated and Standardized Interoperability



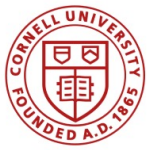
Who is in the BrAPI Community?

# Who is in the BrAPI Community?

37+ registered partner organizations

250+ plant breeders, software developers, data managers, and other expert scientists

6 Elected members of the Advisory Board, managing the long term goals of the project



Patranca E.I.R.L.



NEXTGEN CASSAVA



AfricaYam



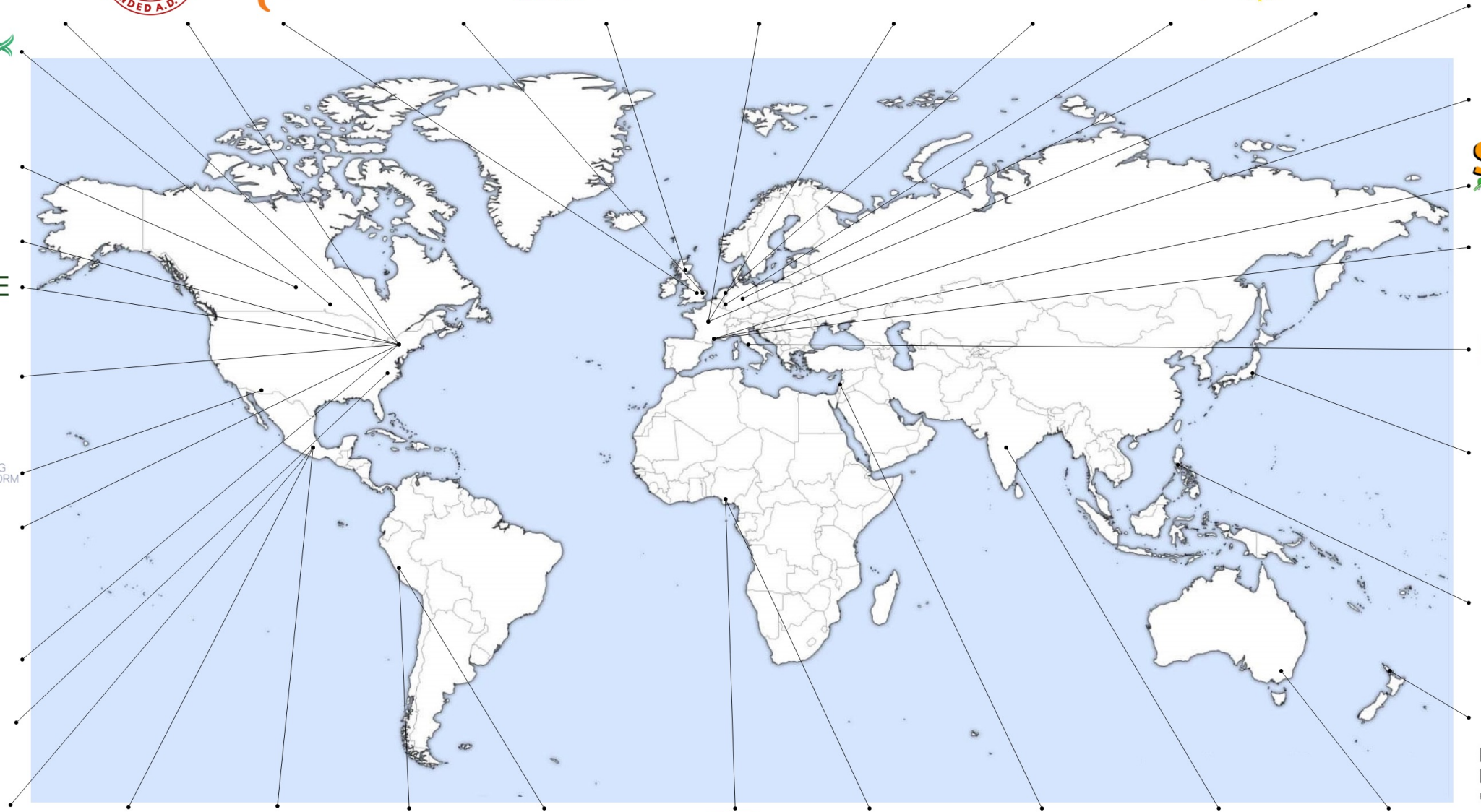
ICARDA Science for resilient livelihoods in dry areas



ICRISAT



Diversity Arrays Technology





**Greenville, SC, USA - 2023**



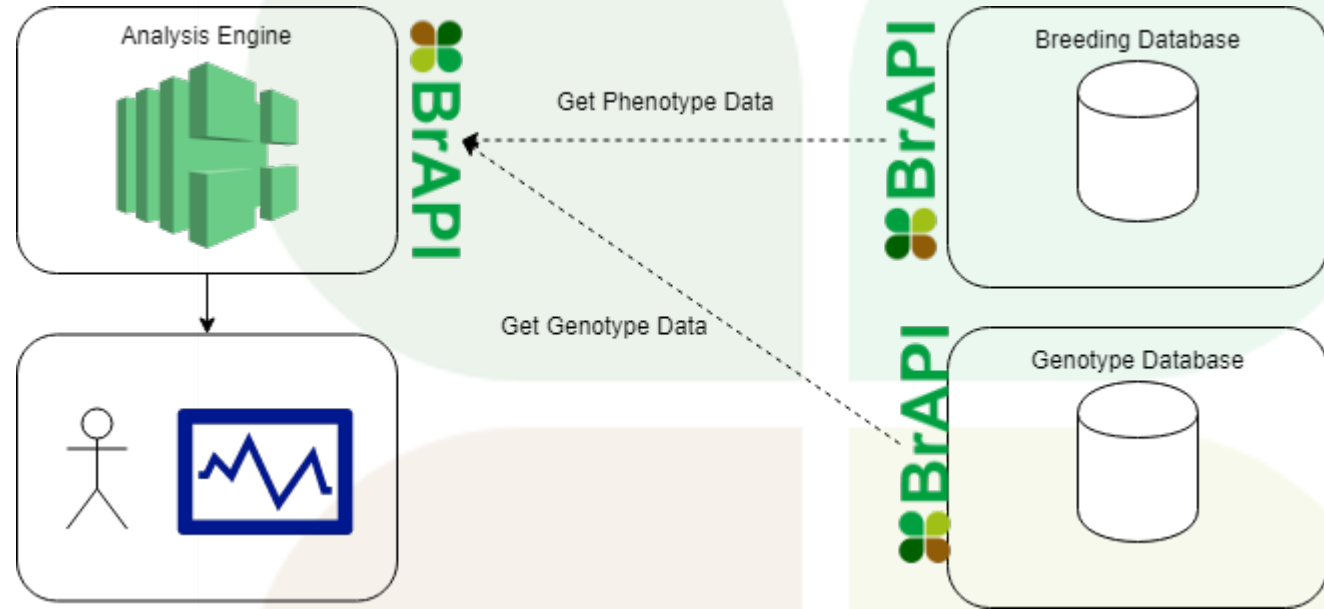
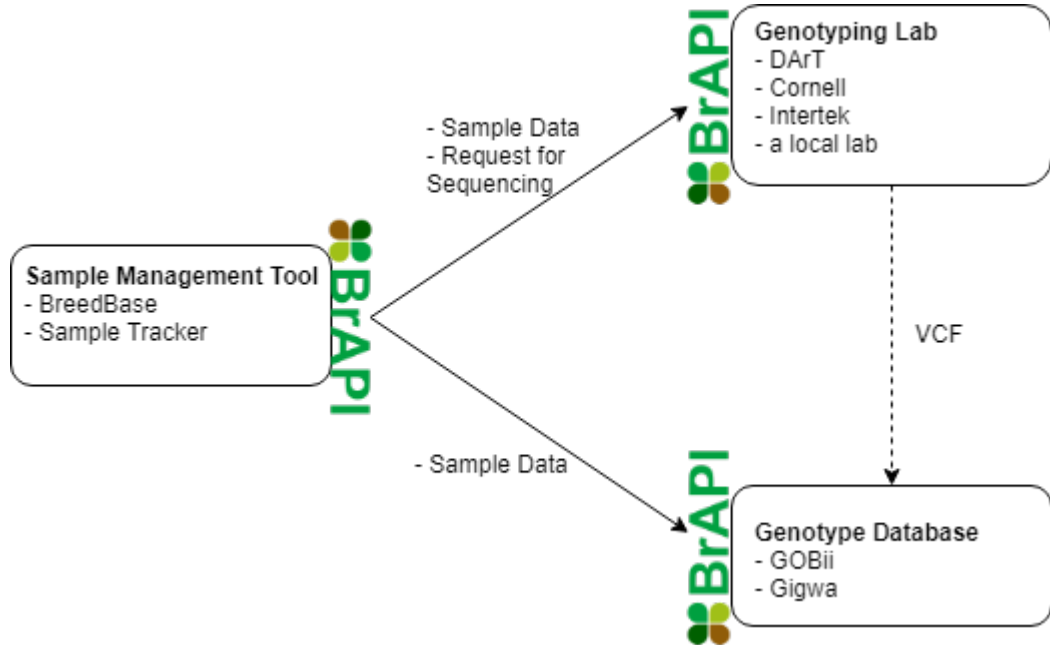
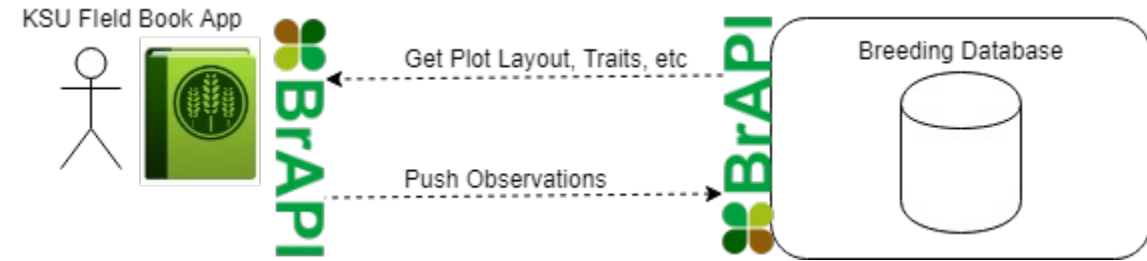
# Applications & Impacts

# BrAPI Compatible Software

The image displays a grid of 24 panels, each representing a different software tool or service compatible with the BrAPI standard. The panels include:

- Panel 1:** A network diagram showing interconnected nodes, likely representing a breeding scheme or genetic relationships.
- Panel 2:** The logo for **GRIN Global**, featuring a stylized green plant.
- Panel 3:** A screenshot of a software interface with a grid of colored dots, possibly representing a data matrix or experimental design.
- Panel 4:** A screenshot of a web interface with a search bar and a message: "1,321,245 DOTS recorded so far".
- Panel 5:** A screenshot of a software interface showing a complex data visualization with multiple colored bars and lines.
- Panel 6:** A screenshot of a software interface titled "Breedingview" showing a flowchart and various data plots.
- Panel 7:** A screenshot of a software interface showing a complex network diagram with many nodes and edges.
- Panel 8:** A screenshot of a software interface titled "Beegmac" showing a data table with columns for "Name", "Parent", "Sex", and "Date".
- Panel 9:** An aerial photograph of a large agricultural field with distinct rectangular plots.
- Panel 10:** The logo for the **BREEDING INFORMATION MANAGEMENT SYSTEM**, featuring a stylized leaf and the acronym "BIMS".
- Panel 11:** The logo for **FAIDARE**, featuring a magnifying glass over a leaf and the word "FAIDARE" in large letters.
- Panel 12:** A screenshot of a software interface showing four histograms representing different data distributions.
- Panel 13:** A screenshot of a software interface showing a grid of colored data points, similar to a heatmap.
- Panel 14:** The logo for **DARt diversity arrays technology**, featuring a stylized green plant and the acronym "DARt".
- Panel 15:** A screenshot of a software interface showing a grid of data points and a bar chart.
- Panel 16:** A screenshot of a software interface showing a grid of data points and a bar chart, similar to panel 15.
- Panel 17:** A screenshot of a software interface showing a grid of data points and a bar chart, similar to panel 15.
- Panel 18:** A screenshot of a software interface showing a grid of data points and a bar chart, similar to panel 15.
- Panel 19:** The logo for **QBMS**, featuring a stylized DNA helix and the acronym "QBMS".
- Panel 20:** A screenshot of a software interface showing a circular diagram with a blue path, possibly representing a genetic map or breeding cycle.
- Panel 21:** A screenshot of a software interface showing a list of "Traits, methods and scales" with various options and checkboxes.
- Panel 22:** The logo for **PHIS**, featuring a stylized green leaf and the acronym "PHIS".
- Panel 23:** A screenshot of a software interface showing a grid of data points and a bar chart, similar to panel 15.
- Panel 24:** A screenshot of a software interface titled "BREEDBASE" with a search bar and a list of projects.

# Solved Use Cases



BRAPPS

# Resources

## BrAPI Specification

<https://brapi.org/specification>

## GitHub

<https://github.com/plantbreeding/API>

## ReadTheDocs

<https://plant-breeding-api.readthedocs.io/>

## Compatible Software List

<https://brapi.org/compatibleSoftware>

## Publication

<https://doi.org/10.1093/bioinformatics/btz190>

## Contact

<https://brapi.org/contact>



# Questions?

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