Grouping of clusters

Knowledge Graph Visual browser

Oskar Razyapov

Knowledge graph

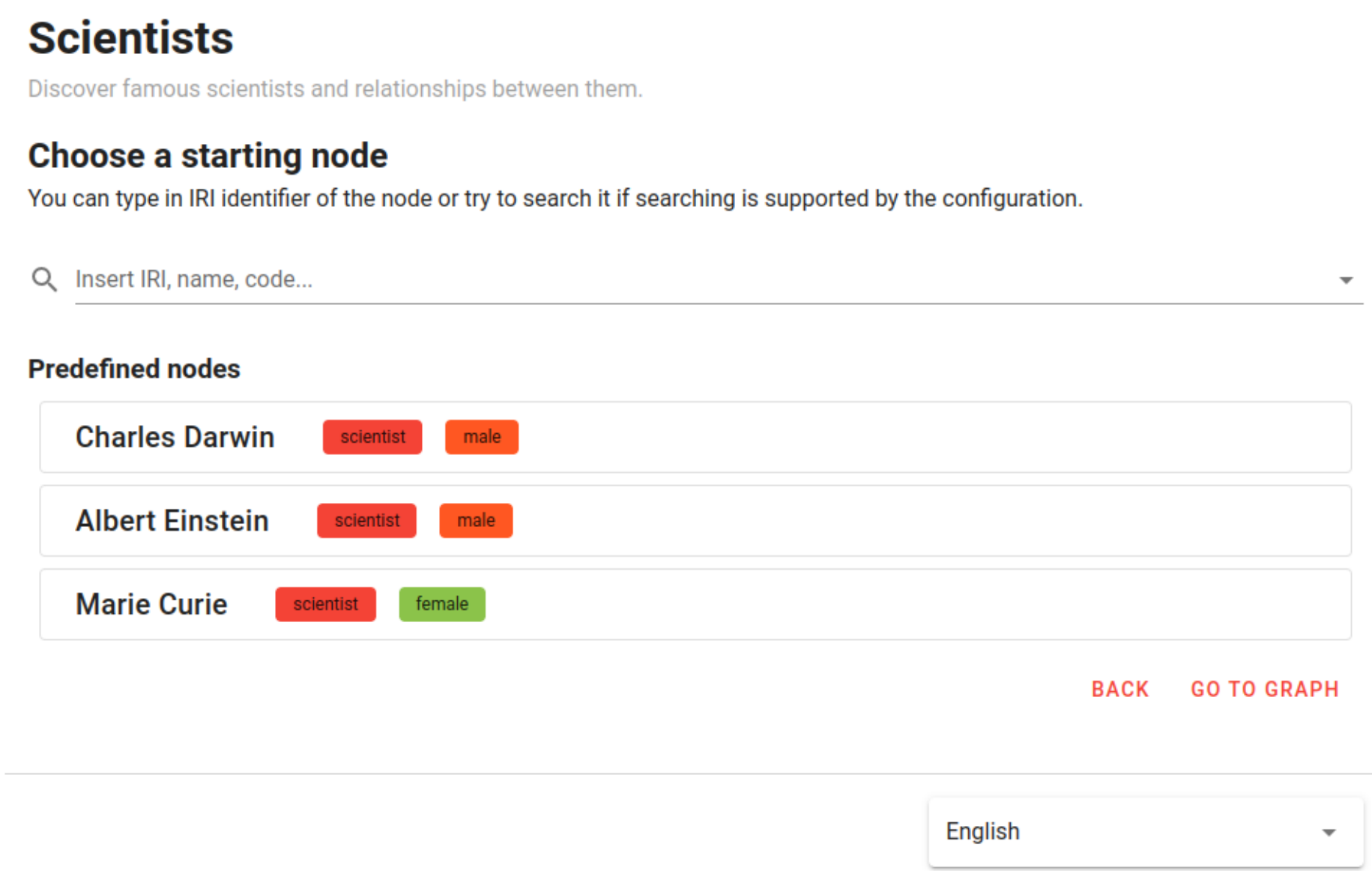
- Semantic network of real-world entities
  - Relationships between entities are then represented as edges
- Usually represented in the RDF format
- Available through SPARQL endpoint
- Examples:
  - DBpedia[1]
  - Wikidata[2]

[1] https://www.dbpedia.org
[2] https://www.wikidata.org

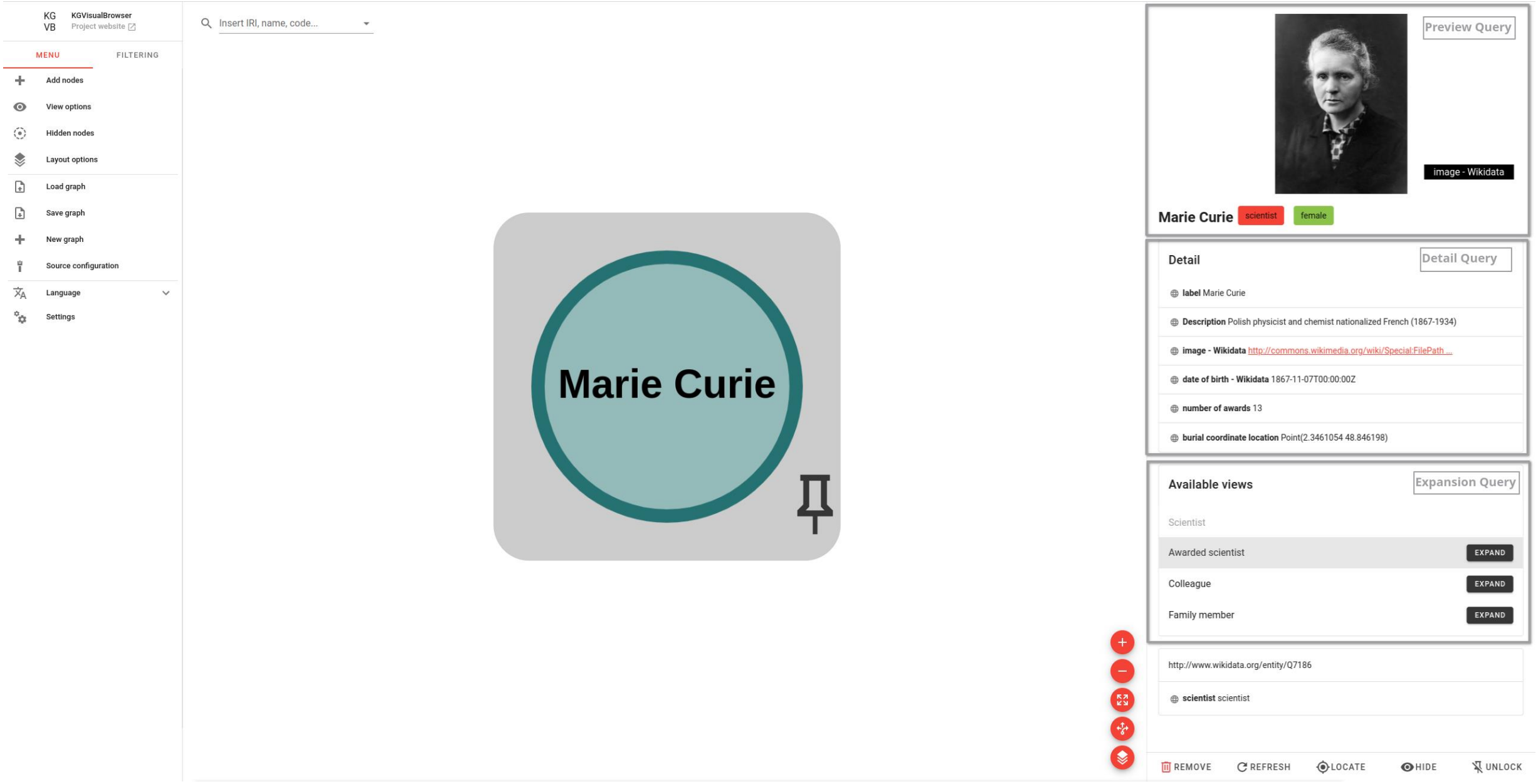
Knowledge Graph Visual browser

- Visual exploration of knowledge graphs for non-specialists
- Reusable visual configurations
  - Domain-specific operations
  - Starting nodes
  - Detail, preview, expansion queries

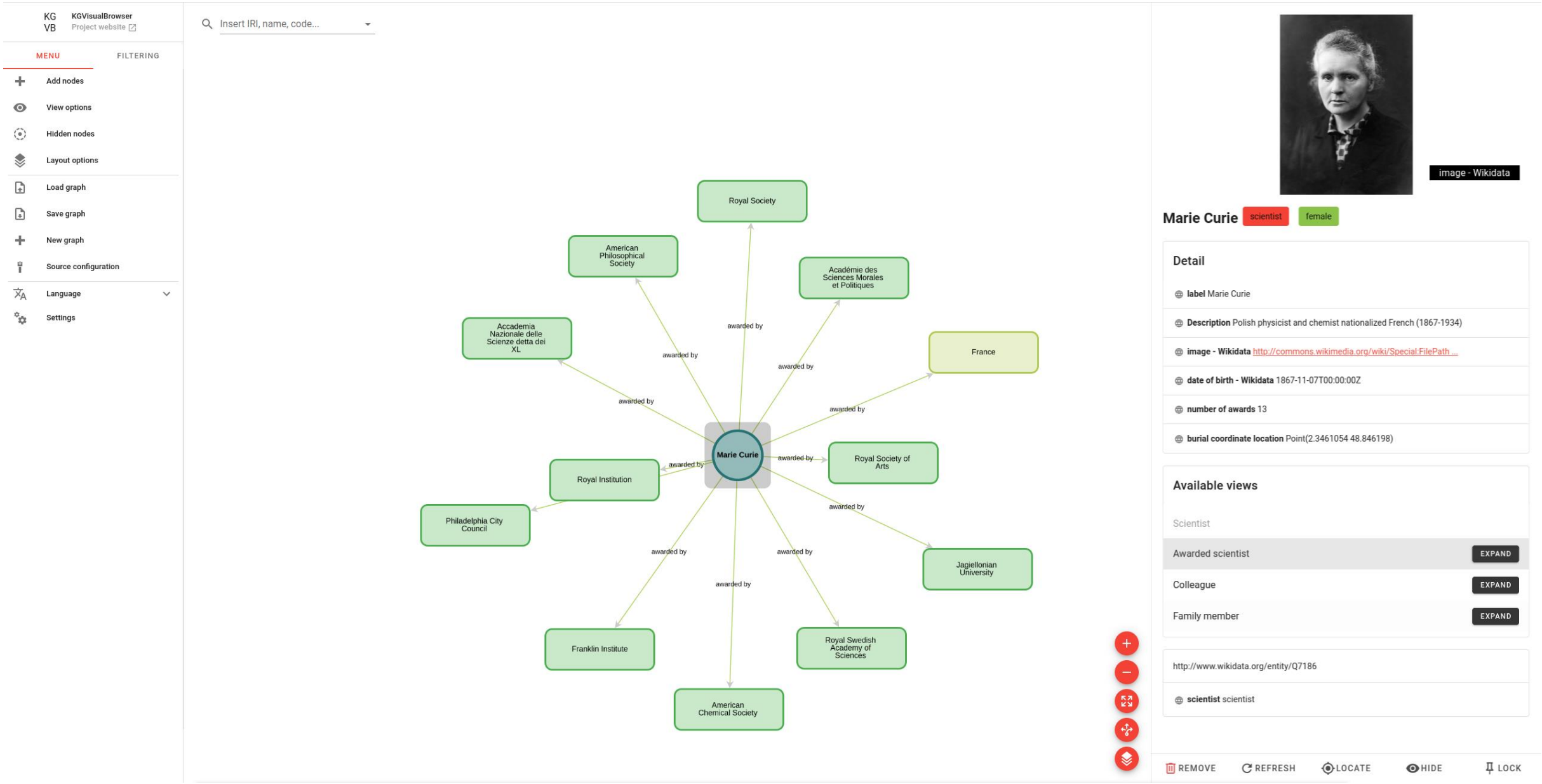
Starting nodes



Example of visual knowledge graph



Expansion example

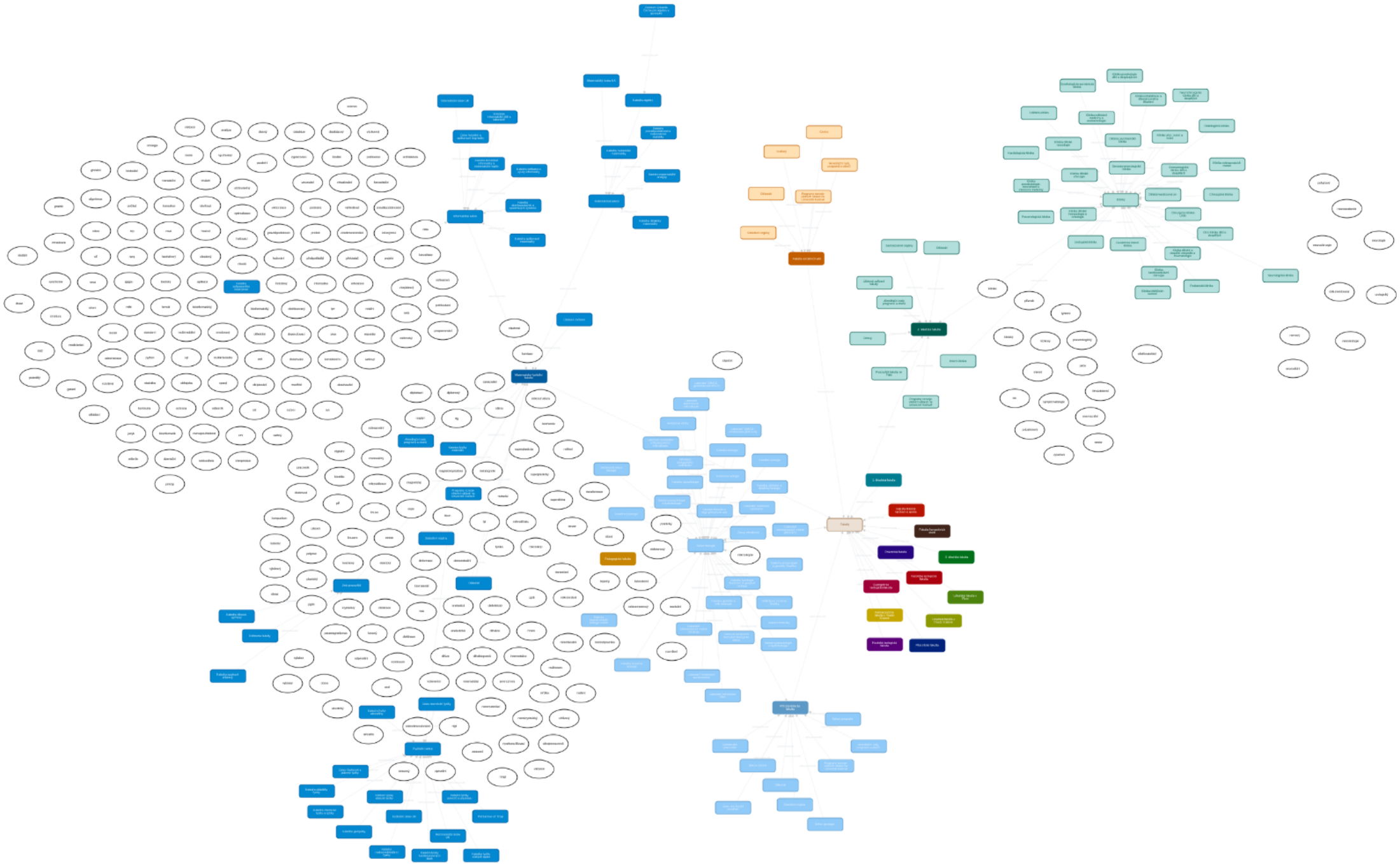


Team members

- Martin Nečaský
  - Supervisor
- Štěpán Stenchlák
  - Original KGVB
    - Github: https://github.com/linkedpipes/knowledge-graph-browser-frontend
    - Research paper: https://www.sciencedirect.com/science/article/pii/S1570826822000105
- Jiří Resler
  - Faceted filtering
    - Github: https://github.com/JiriResler/knowledge-graph-browser-frontend
- Oskar Razyapov
  - Grouping of clusters
    - Github: https://github.com/Razyapoo/knowledge-graph-browser-frontend-grouping-of-clusters

Motivation

- Large graphs:
  - Contain a lot of detail (often redundant)
  - Long time to render
  - Difficult to visualize
  - Not user-friendly



The output of the research project

The output of the project is:

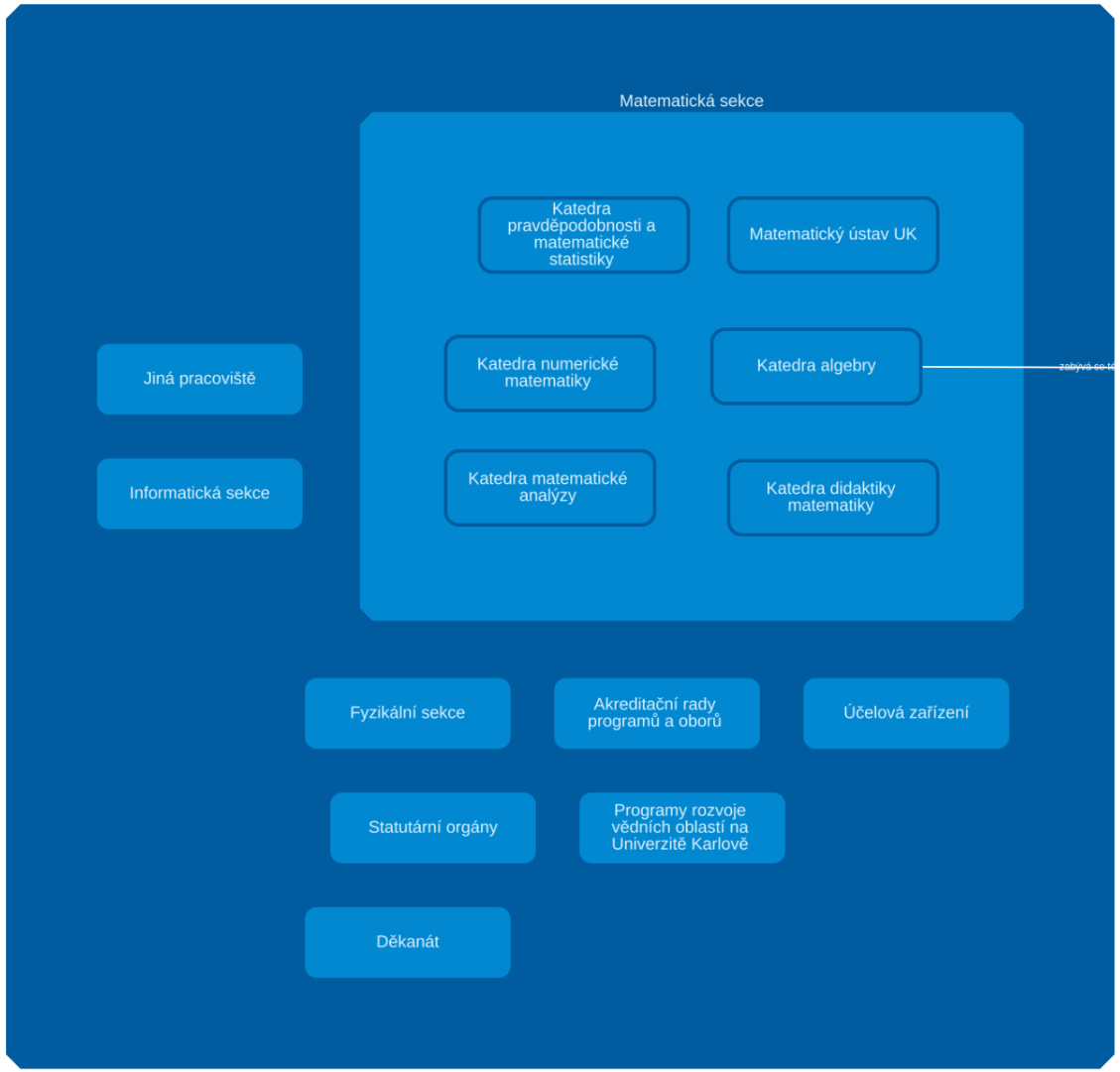
- the extension of the existing project to support visualization and exploration of large knowledge graphs
- text for publication, describing the techniques used and examples of their use (supplement to the existing publication)
    - Research paper: https://www.sciencedirect.com/science/article/pii/S1570826822000105

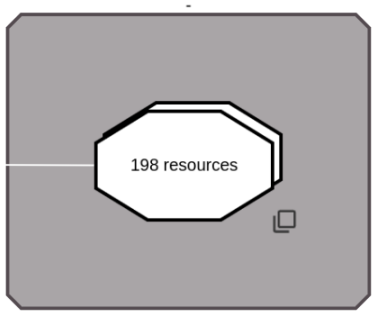
What is added?

- Extended visual configuration
  - Support for visual layout constraints
  - Reusable
- Extended Backend
  - Preparation of visual layout constraints
- Extended Frontend
  - Application of layout constraints
  - Clustering (based on position)
    - KMeans
    - KMedoids
  - Grouping
  - Zooming

New approaches

- Hierarchical relationships
- Non-hierarchical relationships

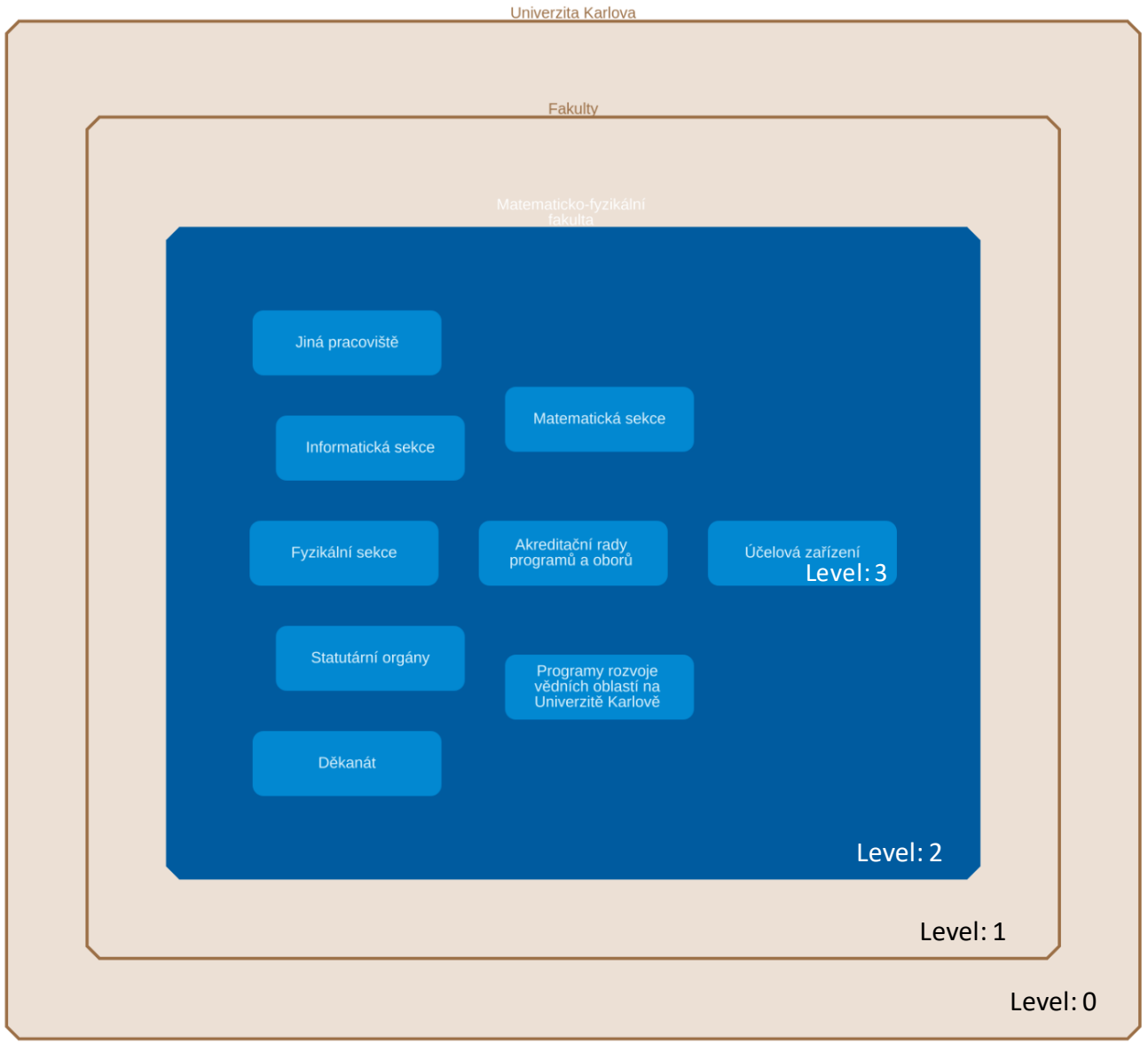




New approaches

- Hierarchical groups
  parent-child relationship

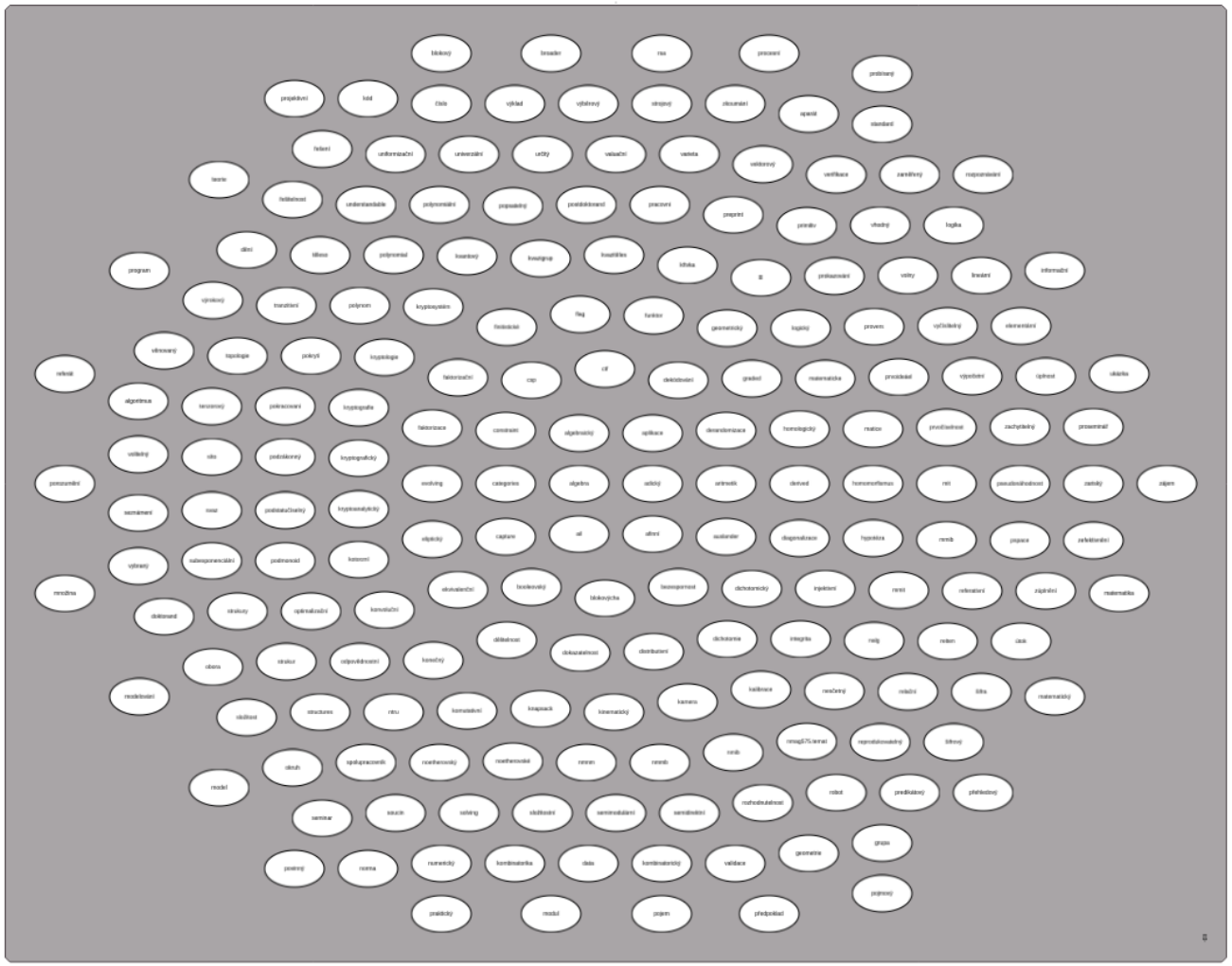
- Each node has:
  - Hierarchical class
  - Hierarchical level (0 .. 3 in the example)
  - Parent node
  - Child node list

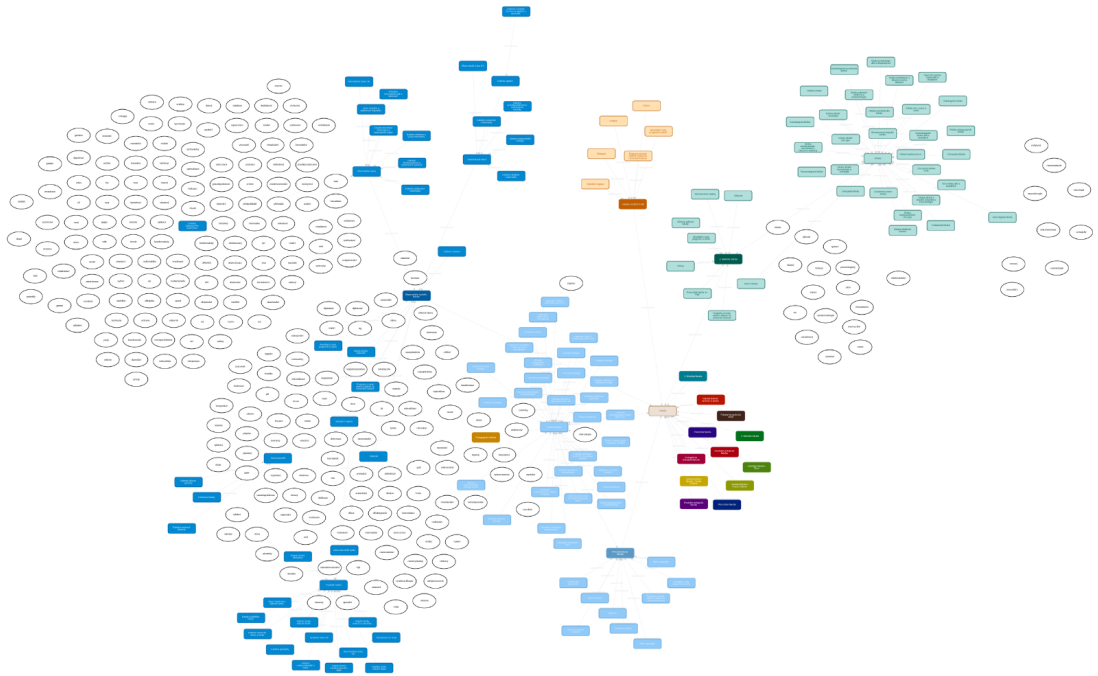


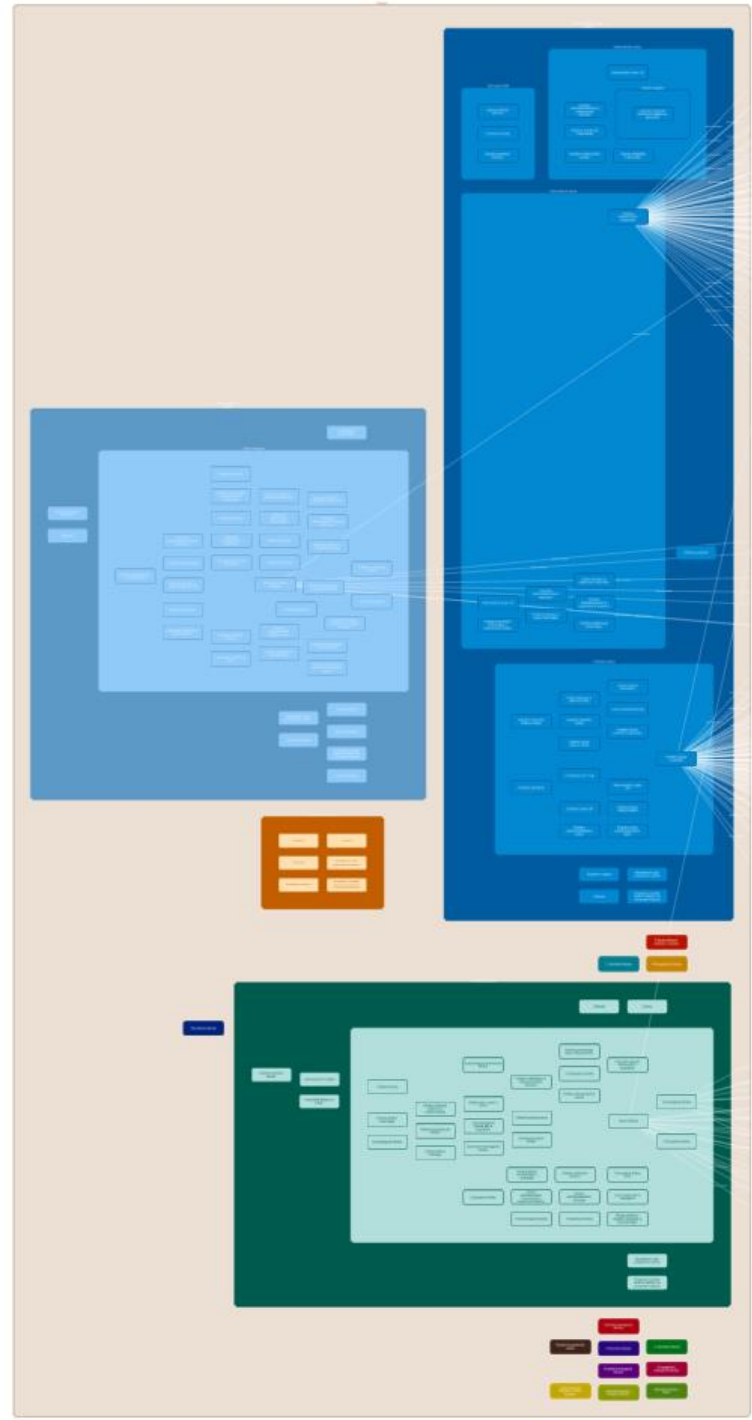
New approaches

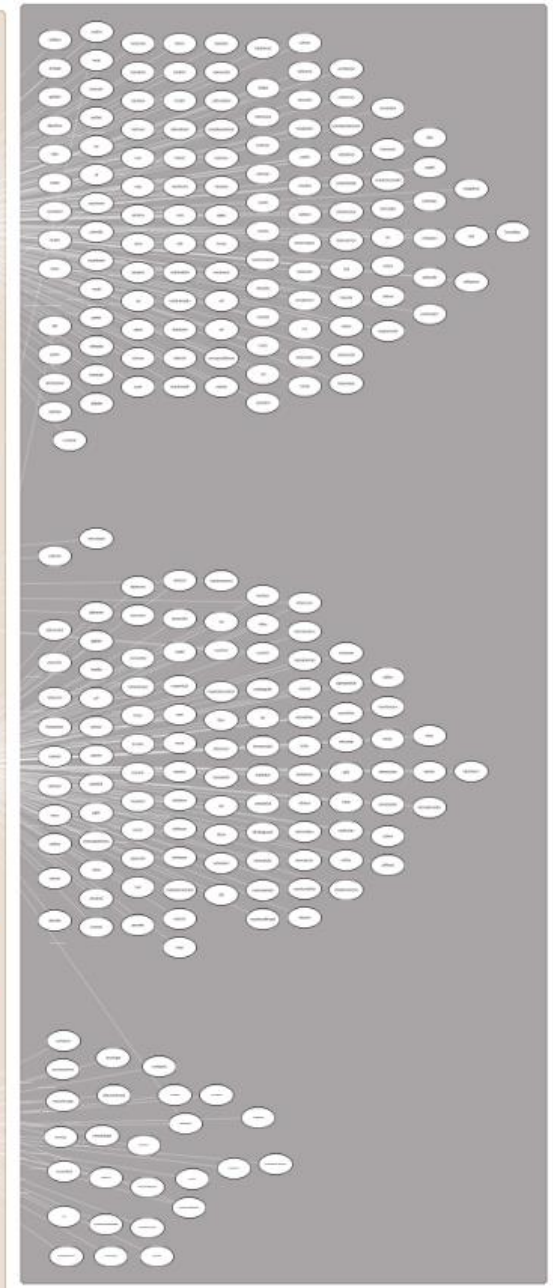
- Visual groups
  clusters of nodes

- Each node has:
  - Visual group class









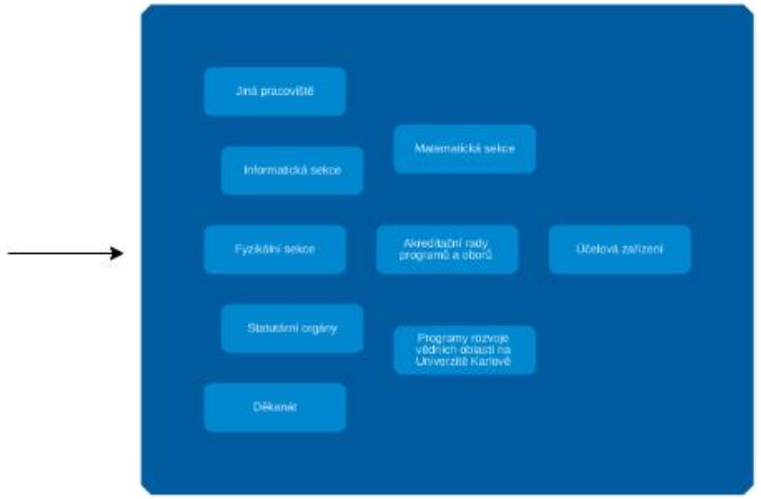
Map-style zooming

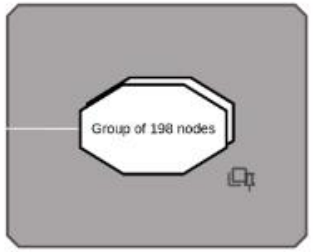
maps.google.com

Zoom in

Map-style zooming
inspiration

- First, to cluster, then to group
  - K-Means[1]
  - K-Medoids[2]
- Based on
  - Hierarchical class
  - Hierarchical level
    must be equal to current hierarchical level
  - Parent node
  - Same visual class
    Unless multiple classes specified

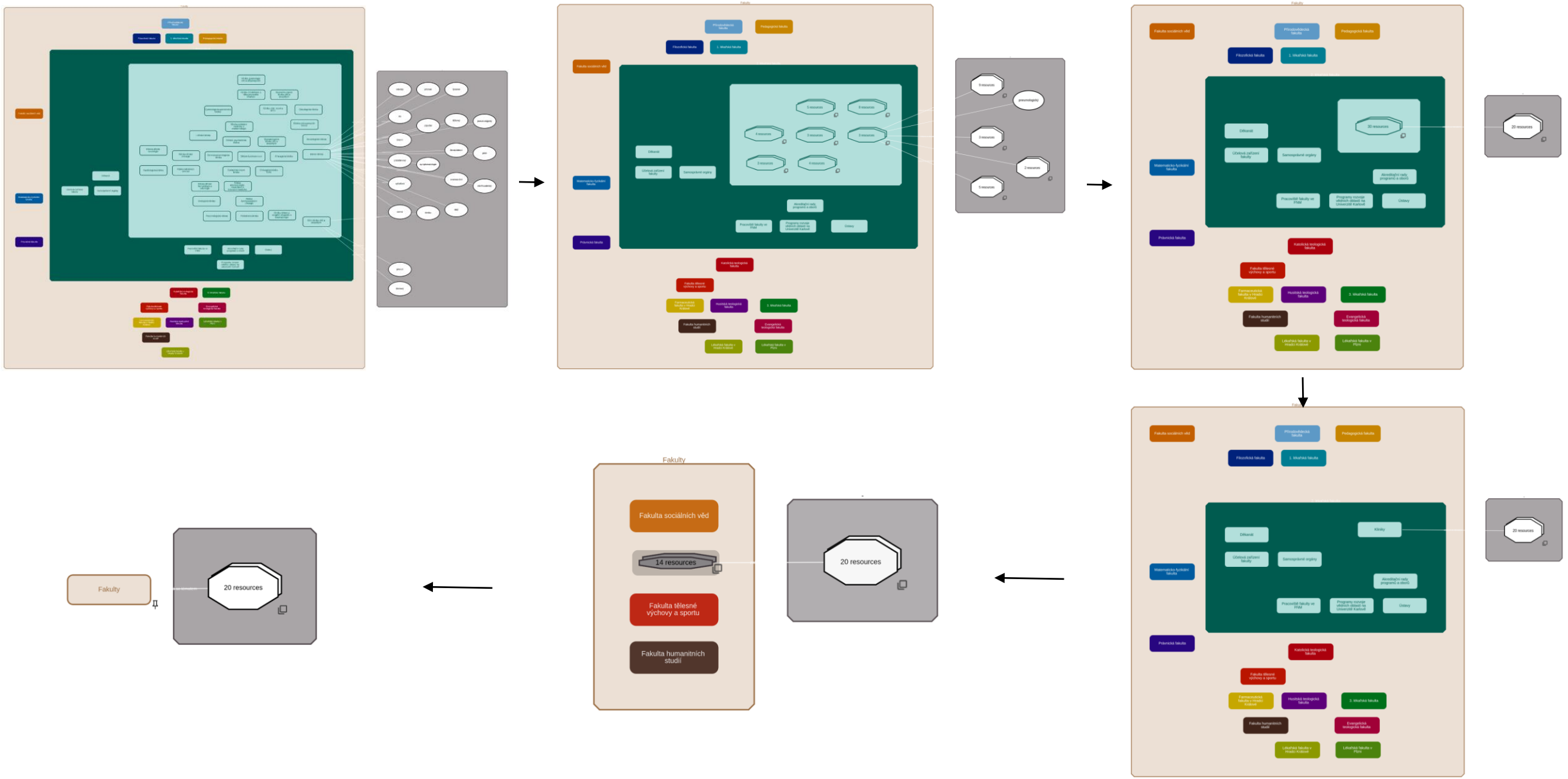




[1] https://en.wikipedia.org/wiki/K-means_clustering
[2] https://en.wikipedia.org/wiki/K-medoids

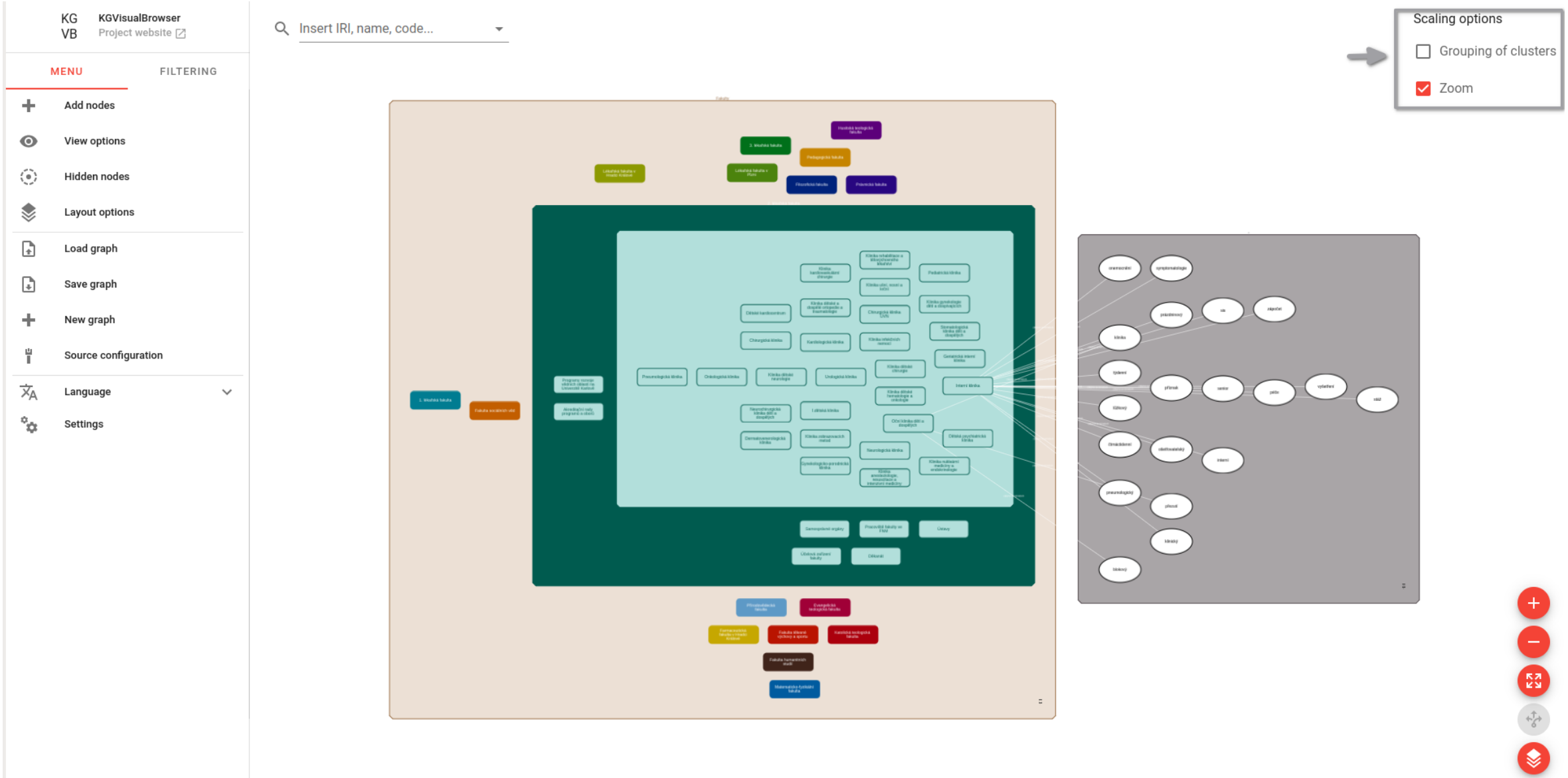
Map-style zooming

example



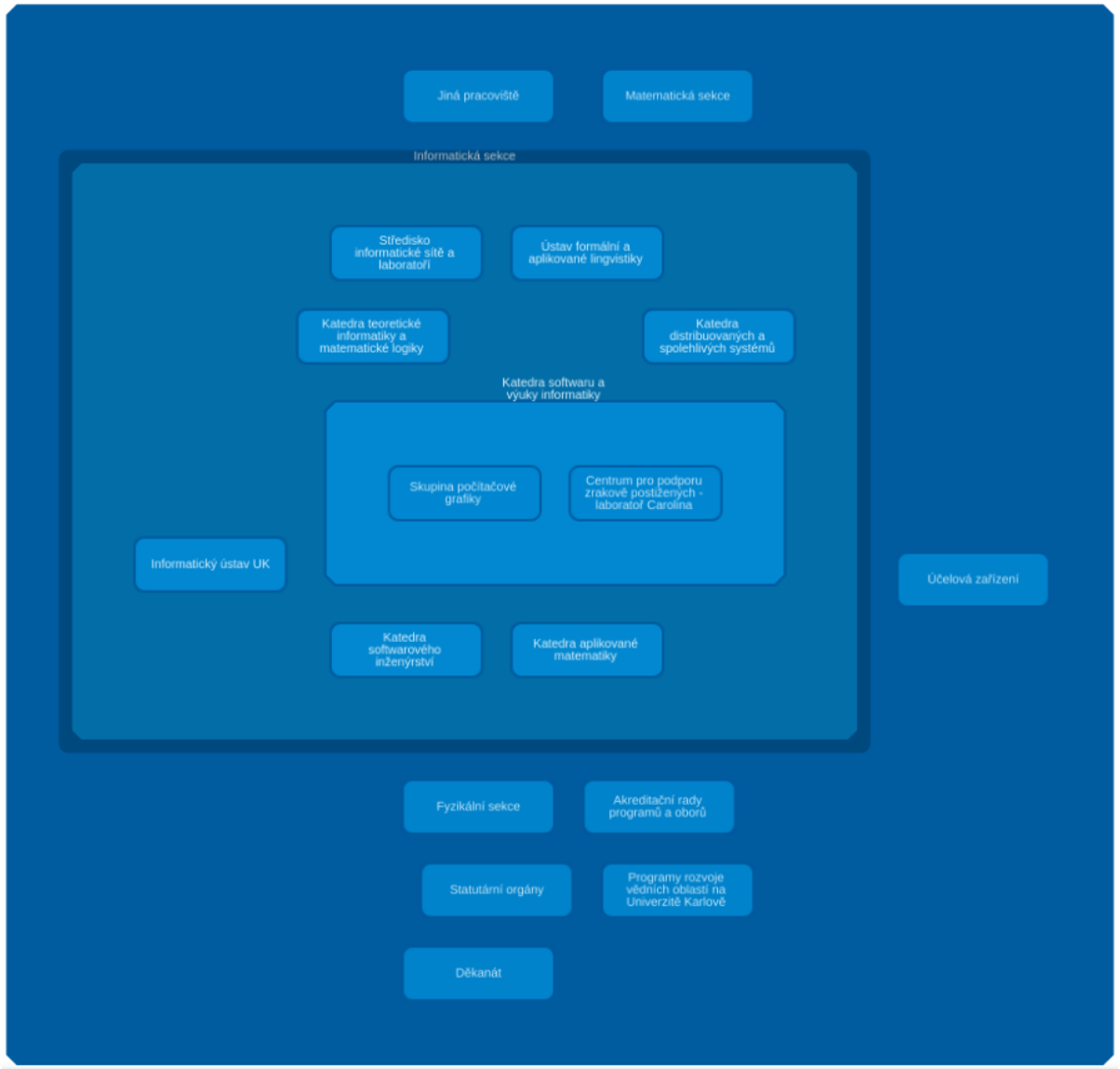
Map-style zooming

checkbox

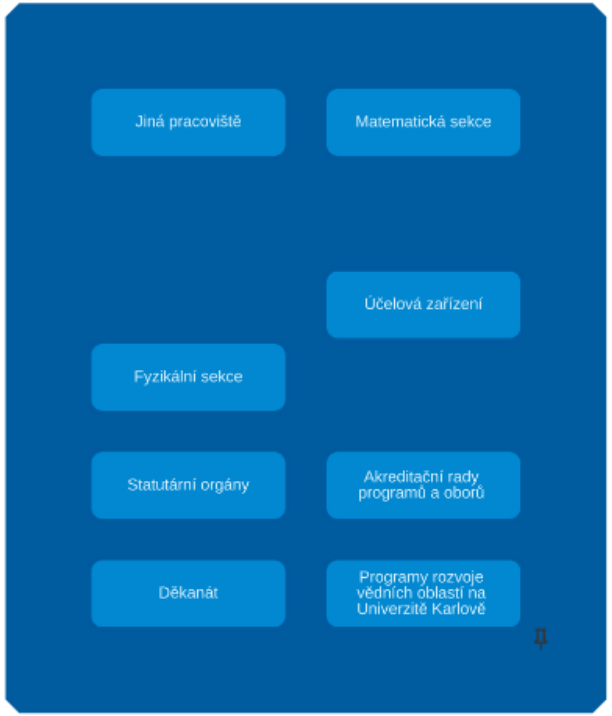


Node removal

Before:



After:



Restrictions

- It is not possible to:
  - group nodes placed in different hierarchical groups, hierarchical levels, visual classes (unless explicitly predefined in the configuration), or having different parent node
  - add pseudo-parent node to a group
  - explicitly delete a pseudo-parent node
    - It will be deleted with last child
- In case the user wants to ungroup an explicit group, he/she must first select that group and then press ungroup button, or double-click

What is next?

1. Add possibility for the user (in user interface) to:
    - Choose which hierarchical groups to cluster
    - Delete/add pseudo-parent for a visual group
    - Cluster nodes based on attributes other than their positions
2. Switching between hierarchical and normal views.

Publication

- Extension of an existing publication
  - https://www.sciencedirect.com/science/article/pii/S1570826822000105

Discussion