Lexicographic Perspective on Wordnet Interoperability in CLARIN

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CLARIN

CLARIN-PL
Common Language Resources and Technology Infrastructure

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Plan

- CLARIN in a snapshot
- Diversified lexical resources in CLARIN
- Applications vs interoperability
- Idea of federated search across lexical resources,
- Lexical Platform – a light way solution for users
- Perspectives on deeper, technological integration

CLARIN ERIC - *Common Language Resources and Technology Infrastructure*

- CLARIN is ERIC type consortium of 20 members and 2 observers: countries and international organisations
- Focus area: supporting research in Humanities and Social Sciences
- CLARIN Mission
  - to collect language resources and tools for languages used in Europe in one shared, distributed infrastructure with uniform access
  - to significantly lower the barriers for the use of Language Technology in Humanities & Social Sciences (H&SS)
  - to facilitate or enable research methods based on automated analysis of text and speech resources

CLARIN ERIC (European Research Infrastructure Consortium)

- 20 members:
  - Austria
  - Bulgaria
  - Croatia
  - Czech Republic
  - Denmark
  - *Dutch Language Union*
  - Estonia
  - Finland
  - Germany
  - Greece
  - Hungary
  - Italy
  - Latvia
  - Lithuania
  - The Netherlands
  - Norway
  - **Poland**
  - Portugal
  - Slovenia
  - Sweden
- Observers:
  - France, Great Britain

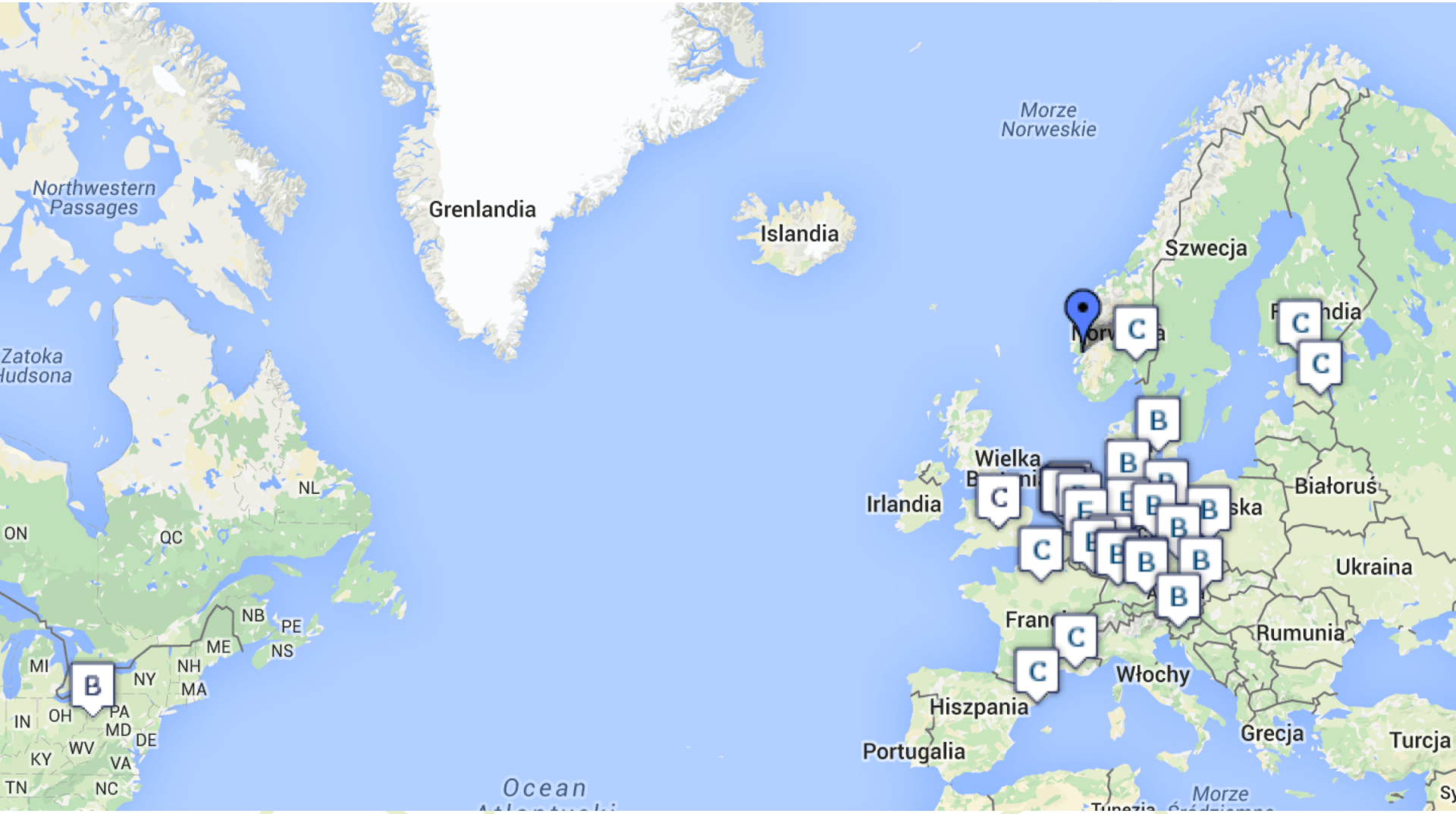
Language Technology for H&SS

- Language Technology (LT)
  - language resources and tools
  - **robust** in terms of quality and coverage,
  - **multipurpose**
  - **component based**
- Language Technology Infrastructure
  - a software framework (architecture or platform)
  - for combining language tools with language resources into **processing chains** (or pipelines)
  - the defined processing chains are next applied to language data sources
  - **interoperability**, also with the external systems

Language Technology for H&SS

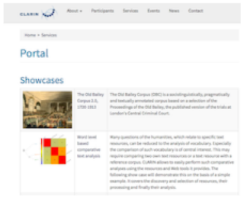
- Limited usage of LT in **Humanities and Social Sciences**
  - hard to find: dispersed in the Web, poorly described in a technical language
  - varieties of technological solutions, insufficient users' computers
  - required programming skills or knowledge from the area of natural language engineering
- **LT Infrastructure for H&SS**
  - common standards, combined platforms, open approaches
  - joint catalogues and search facilities
  - focused on H&SS users and support for them
  - Web Services and Web Applications: no need for installing, processing focused on H&SS research tasks

Distributed Infrastructure
CLARIN is a persistent, distributed system



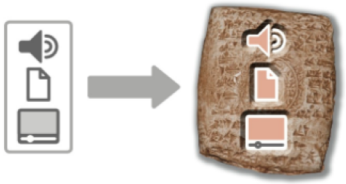
CLARIN: Central Services

https://www.clarin.eu/



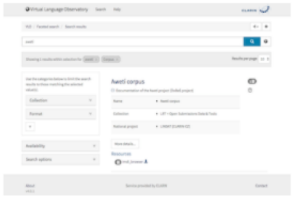
CLARIN portal

Get an example-based impression of what's currently available



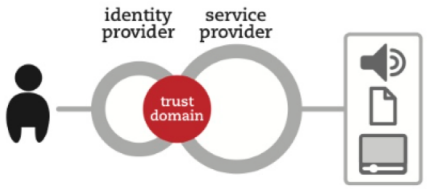
Depositing services

Store language resources in a sustainable repository at a CLARIN centre



Virtual Language Observatory

Discover language resources using a faceted browser or a map

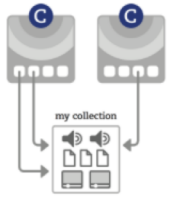


Easy access to protected resources

Get easy access to protected resources, with your institutional username and password.

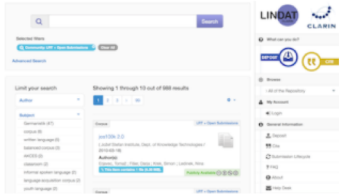
Web services and applications

Explore and analyze language data with a wide variety of tools



Virtual Collections

Create your own digital bookmarks, ideal for citing data sets.



Language Resource Inventory

Submit and access information about language resources relevant to your

Content Search (prototype)

Search different corpora with a single search engine

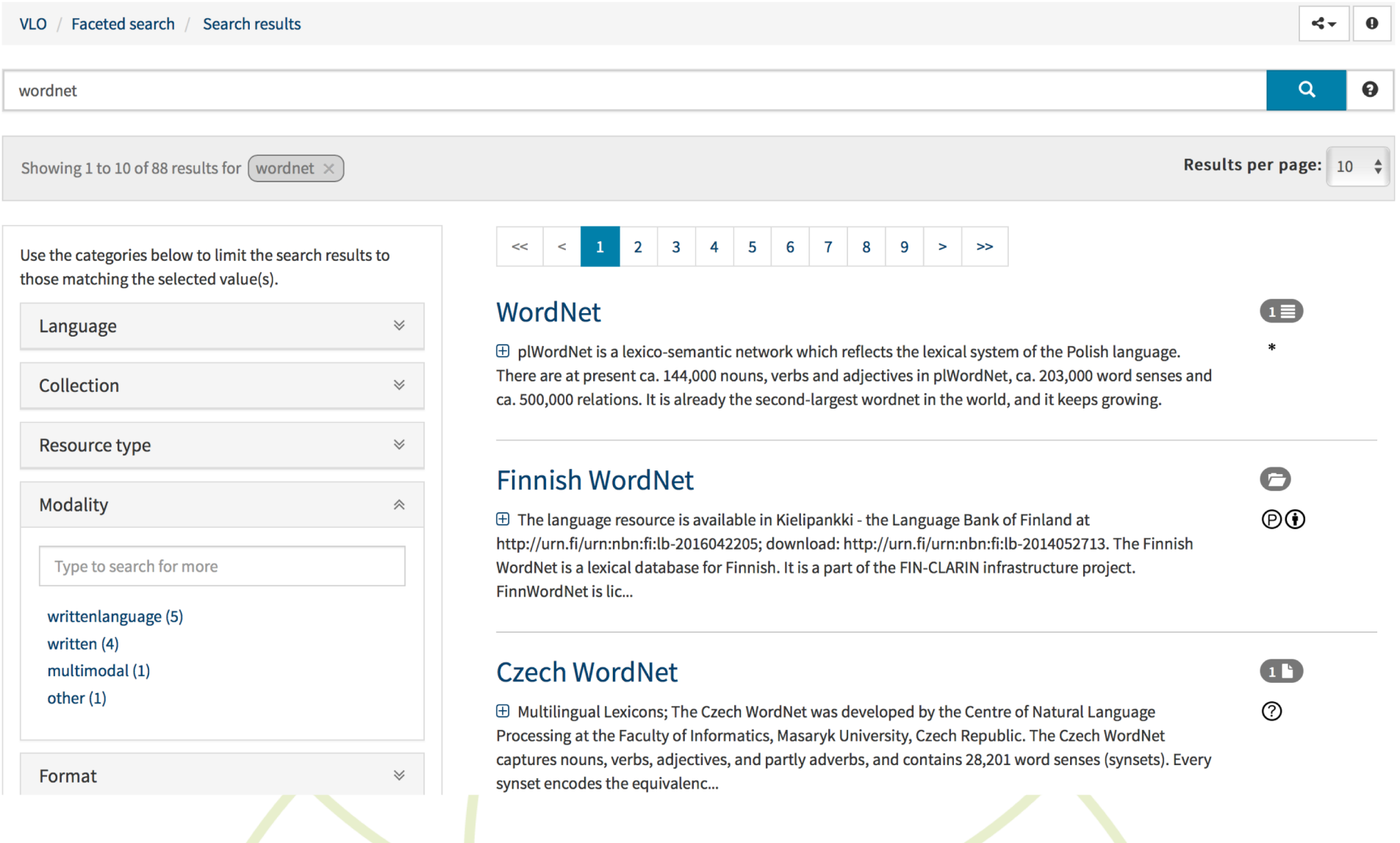
Questions

Searching for a specific data set or application? Wondering how CLARIN can

CLARIN Basic functions

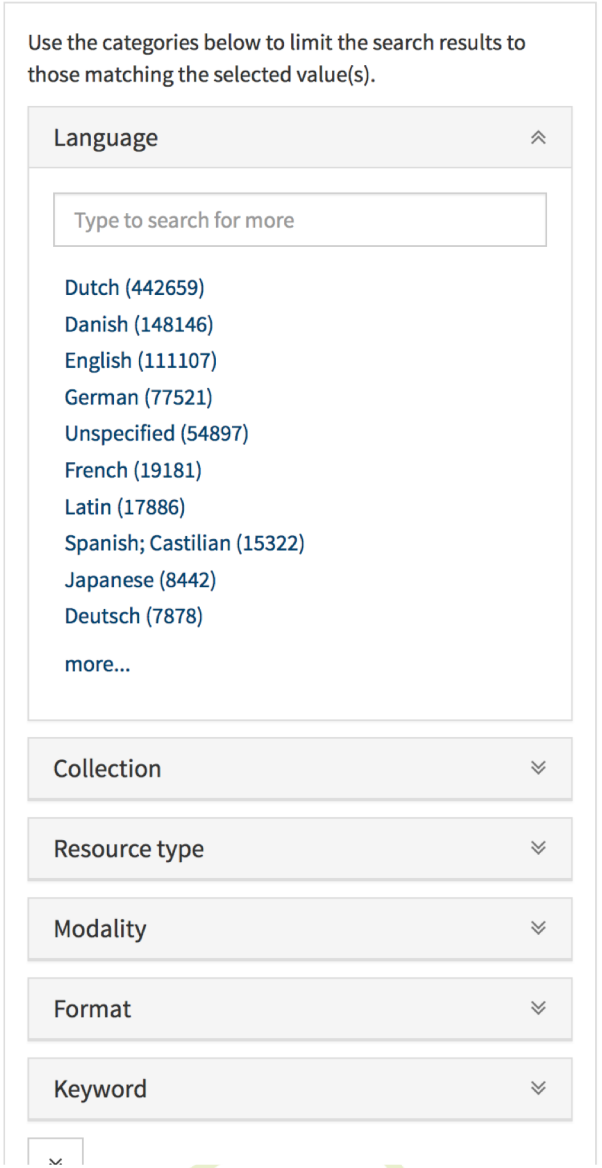
- Facilitating access to language resources
  - federation of repositories - Virtual Language Observatory
  - federated search across corpora - Federated Content Search
- Support for automated analysis of text and speech
  - a range of ready to use language tools
    - Web Services and (web) applications
    - Access through repositories
- Research applications
  - built for concrete needs, often in cooperation with users (researchers)
  - Based on LT, but not `imposing' it on users

Virtual Language Observatory



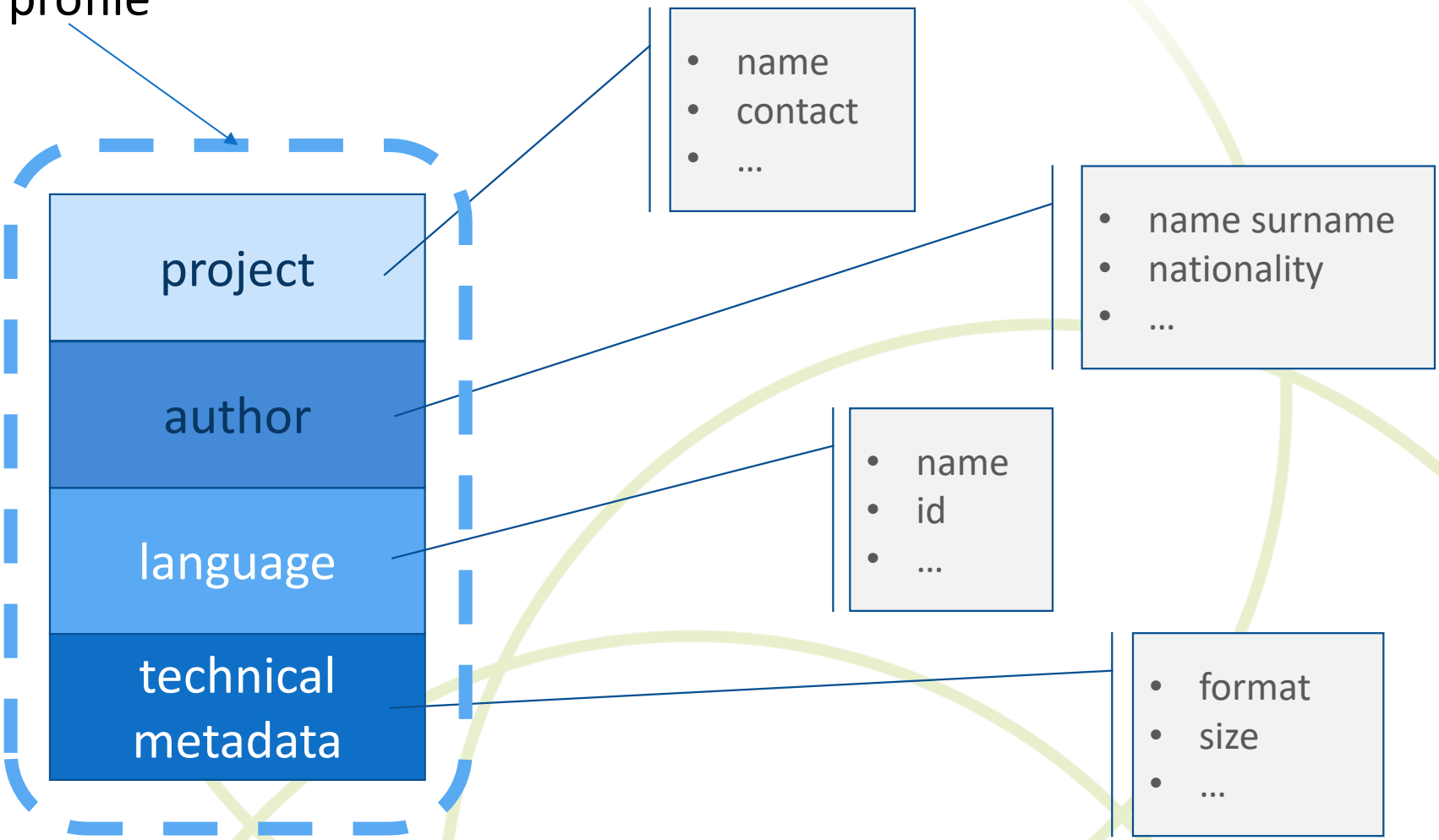
VLO – Facet-based Search and Browsing

- Common meta-data standard:
  - CMDI
  - = Component Metadata Infrastructure
- Facet-based search browsing
  - Fields and values acquired from CMDI records
  - Semantically grouped



CMDI Components

- profile



Diversified lexical resources in CLARIN

- Types:
  - word lists and frequency lists
  - gazetteers (lists of Proper Names)
  - morphological dictionaries
  - bilingual word-to-word dictionaries
  - dictionaries with textual descriptions
  - grammatical lexicons:
    - valency frames, some with semantic restrictions
- Wordnets:
  - based on Princeton WordNet – transfer method
  - manually constructed from scratch
  - wordnet-like semantic lexicons

Wordnets in CLARIN ERIC infrastructure

- Wordnets, e.g.:
  - based on Princeton WordNet by transfer
    - Princeton WordNet, Ancient Greek WordNet, Estonian WordNet, Finnish WordNet, ItalWordNet (Italian), MultiWordNet (Portuguese, Italian), sloWNet (Slovene), …
  - manually constructed from scratch
    - DanNet (Danish), GermaNet (German), plWordNet (Polish), enWordNet (English)
  - wordnet-like semantic lexicon
    - Saldo (Swedish), Swesaurus (Swedish)

Applications of wordnets

- H&SS users' manual work
  - dictionary consulting: single entry, examples, comparing and contrasting resources,
  - thematic lists of entries
  - classification of words and meanings
  - language comparison
- Language processing
  - Word Sense Disambiguation
  - expanded text representation
  - semantic frequency text representation
  - thematic text classification and grouping

Interoperability - problems

- Models – understanding of basic notions
  - synsets, lexical units,
  - relation types and subtypes,
  - glosses, usage examples, comments,
  - frames, attributes, restrictions,
  - stylistic registers, domains (representation & definition), contexts,
  - emotive description (e.g. emotions, sentiment polarity) etc.
- Models - correspondence:
  - between basic building blocks: anchor points
  - direct and indirect mapping between wordnets
  - linking with other resources, e.g. LOD

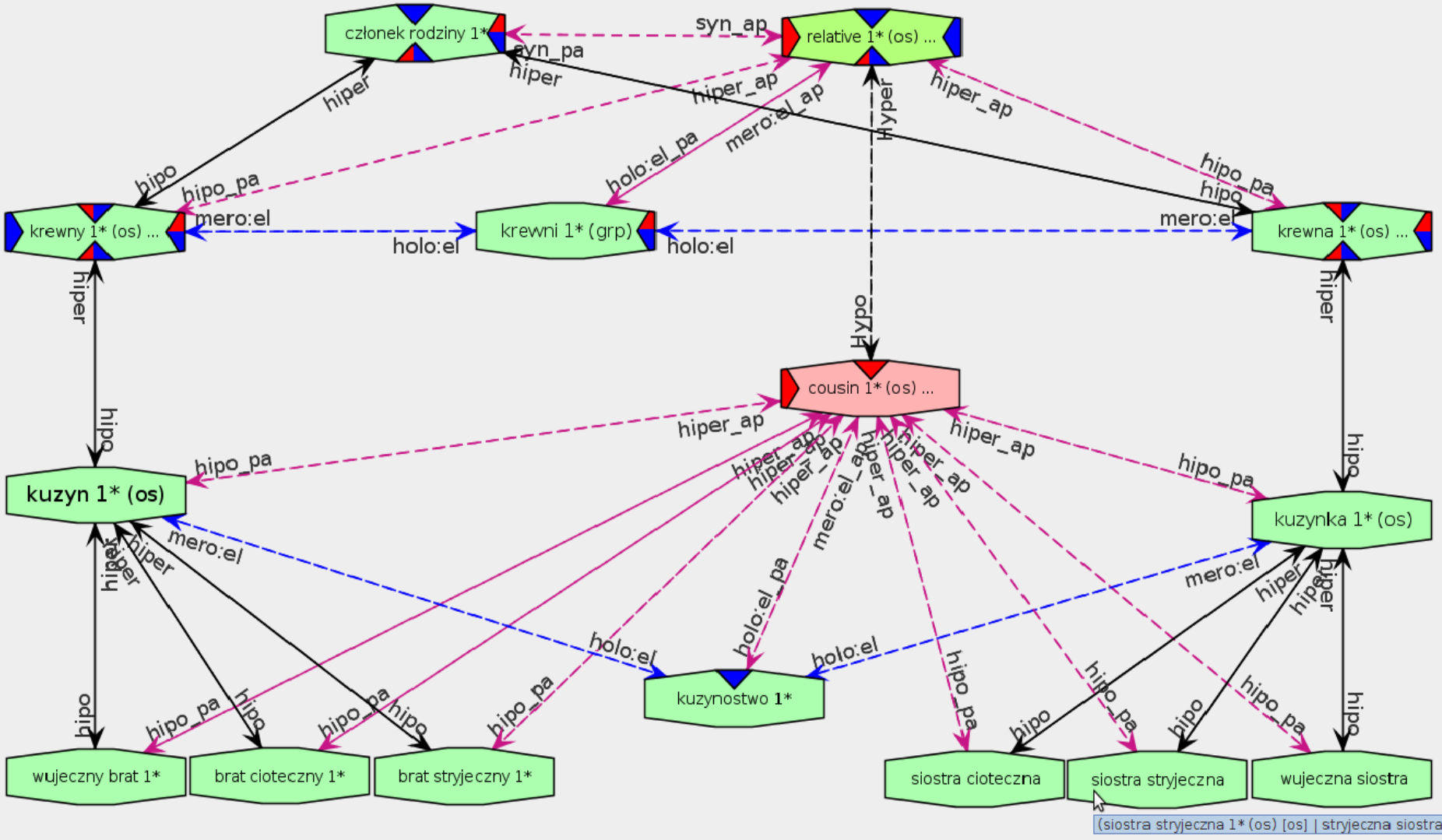
Interoperability - problems

- Wordnets and knowledge sources (knowledge databases)
  - especially Linked Open Data and terminological databases
  - strategies for mapping, anchor points
  - division of material
- Multilingual mapping
  - types, models, languages
    - synsets vs lexical units (senses)
  - cross-lingual anchor points

plWordNet on WordNet mapping procedure

- Recognise the sense of a source synset by:
  - its position in the network structure,
  - existing relations, commentaries (glosses),
  - comparison to other synsets containing the given lemma
- Search for candidates for a target synset:
  - intuitions, automatic prompting and dictionaries
- Verify candidates:
  - by comparing hypernymy and hyponymy structures
  - by exploring existing inter-lingual relations;
  - by comparing definitions, commentaries; dictionaries
- Link the source synset with the target synset

plWordNet mapping in WordnetLoom system



plWordNet mapping: problems

- **Lexico-grammatical differences**

1. Markedness
   - young being (prosiak 'piglet' -hypo→ młodzik 'young creature')
   - diminutive (prosiaczek 'piggy' ← prosiak + -ek)
   - augmentative
2. Lexicalised gender
   - e.g. cousin ~ kuzyn (masc.) & kuzynka (fem.)
3. Lexical gaps
   - E.g. names of different types of relatives
   - {kaowiec 1}, a Polish term denoting an institution's employee responsible for the organization of cultural and recreational events in the Communist times

plWordNet mapping: problems

- **Differences in synonymy and the structure of synset:**

4. Mixed Princeton WordNet synsets:
   a) neutral and marked forms in the same synset
   b) gender, e.g. {bondswoman 1, bondsman 1}
   c) countability - mass/count distinction, |
      e.g. {furniture 1, piece of furniture 1}
   d) hypernym and hyponyms in one synset
      e.g. {monte 1, three card monte 1}
   e) multiple hypernymy *and* vs. *and/or*

- **Other differences:**

5. Glosses contrary to relations
6. Different relations to code the same conceptual dependencies: meronymy vs. hyponymy
7. More detailed sense distinctions (&) Dictionary content mismatches...

plWordNet mapping: inter-lingual relations

- In total: >274,000 links from plWordNet to WordNet 3.1
- Cascade of noun relations – the first which fits is chosen

1.	Inter-lingual synonymy	38,674
2.	Inter-lingual inter-register synonymy	1,848
3.	Inter-lingual partial synonymy	5,747
4.	Inter-lingual instance	616
5.	Inter-lingual partial hyponymy	82,033
6.	Inter-lingual hypernymy	29,336
7.	Inter-lingual meronymy	10,756
8.	Inter-lingual holonymy	7,816
9.	Inter-lingual type	7,505

plWordNet mapping: inter-lingual relations

- Cascade of adjective and adverb relations – the first which fits is chosen

1.	Inter-lingual synonymy	4,491	998
2.	Inter-lingual inter-register synonymy	97	48
3.	Inter-lingual partial synonymy	1,600	311
4.	Inter-lingual cross-categorial synonymy	24,715	98
5.	Inter-lingual partial hyponymy	44,206	9,842
6.	Inter-lingual hypernymy	311	112

Interoperability - problems

- Accessibility and compatibility of licenses
  - different licences
    - open – restricted academic – commercial
  - problems in combining resources
- Aggregators and credits for the authors
  - aggregated resources: different languages, different types
    - e.g. BabelNet, Open Multilingual WordNet
  - limited recognition of the aggregated individual wordnets by users
  - citations directed to aggregates instead to the creators of the resources

Interoperability - formats

- Common format for lexico-semantic resources – almost a mission impossible
  - native XML formats, LMF, TEI, RDF, …
- Wordnet formats
  - native XML-based, e.g. DEBVisDic
  - RDF-based, e.g. WordNet RDF in DanNet
  - LMF, e.g. KyotoLMF, GermaNet LMF, UBY LMF but also **CILI LMF**
  - Lemon (with conversion to CILI LMF)
- Versions, granularity and Persistent Identifiers

Interoperability - attempts

- Multilingual Central Repository and WordTies
  - common format, common database, loss of information
- *BabelNet*
  - common format, common database, loss of information
  - aggregator with very limited visibility of components, very restricted licence
- *Open Multilingual WordNet* and CILI
  - common format focused only on wordnets
  - aggregator, limited to open resources

Idea of federated search across lexical resources

- Idea
  - a virtual place for aggregating different types of LRs as separate individual components
  - in a way that they form an interconnected system, a complex LR, from the user point of view
- Fundamental assumptions
  - descriptions provided for LRs must be minimal
  - no common format required for the full usability of the platform by non-technological users
  - solution open for all types of LRs
    - with a special focus for wordnets
  - **all LRs must preserve their identity**

Federated search across LRs: basic assumptions

- Independence of LRs
  - different LRs are grouped as independent components, implemented as software modules
  - minimal requirements are imposed on developers
  - individual identity of all LRs must be visible and preserved
  - distribution
    - a component may be located in any freely selected network location
    - no need to copy LR data to the platform – IPR protection
- Format agnostic
  - a limited set of common formats promoted
  - any specific data format not imposed on the platform on its components

Federated search across LRs: basic assumptions

- Data encapsulation
  - a component will be only accessible via a set of Programming Interfaces (PIs), e.g. Web Services
    - no means for a direct access to LR data
  - one PI can be implemented as a one separate WS, or several PIs can be provided by a single WS
  - only a minimal set of PIs is required to be implemented by every component
  - all components can provide any number of additional PIs
- Read-only access
  - Lexical Platform is a tool for accessing a complex system of linked resources
  - no editing, updating will not be supported

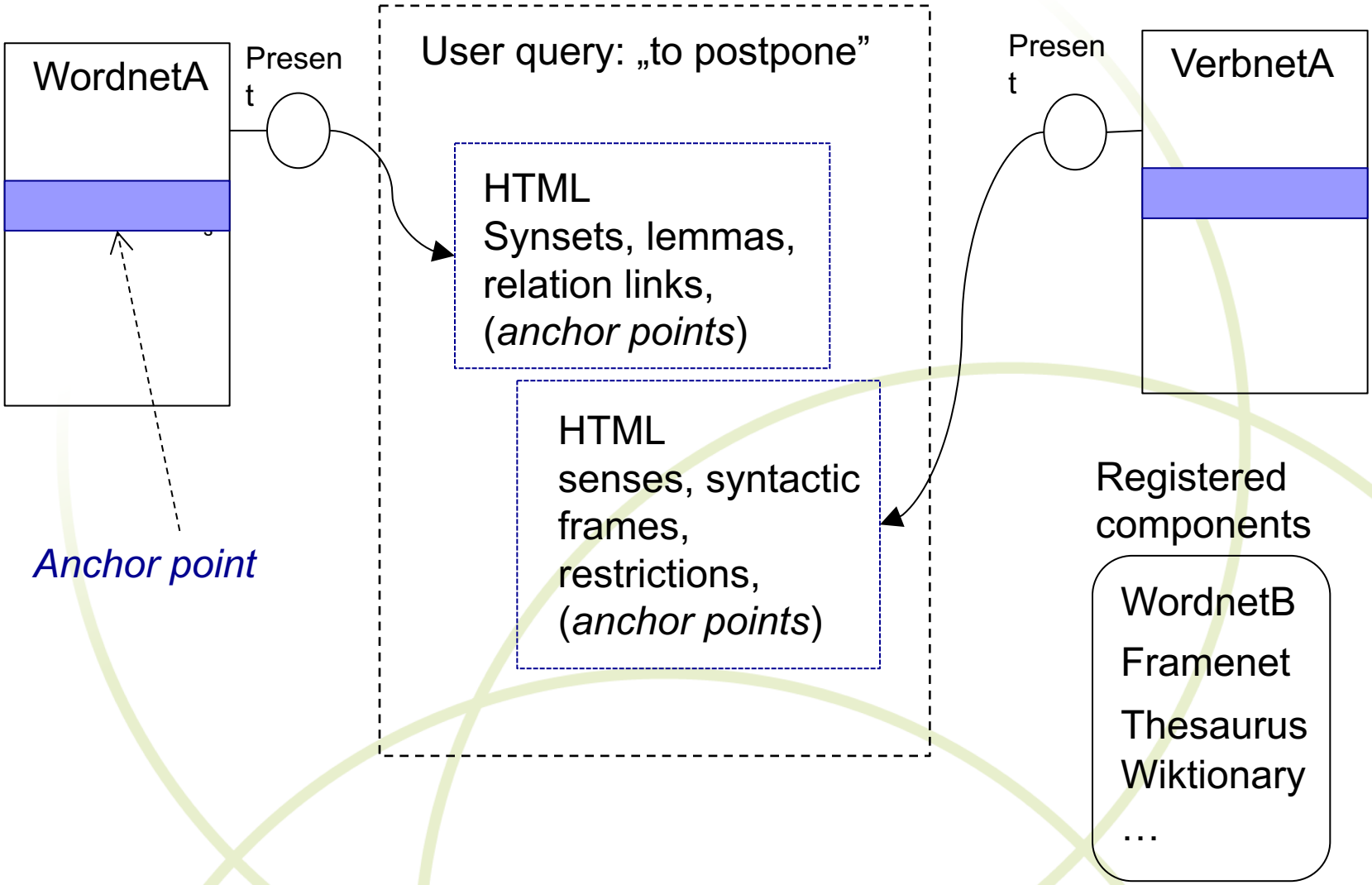
Federated search across LRs: basic assumptions

- Inter-linking
  - based exclusively on the content of LRs
  - each component recognises references to elements of the limited set of types:
    - selected points by which the data from different components are **anchored** to the whole platform and **inter-linked** between them
  - anchor elements should naturally originate from the construction of a LR
    - characteristic elements for browsing
    - native (or natural, typical) mapping to other LR
  - expected types for inter-linking
    - *word form* (including multi-word expressions), *lemma* (literals, entry form,…), *lexical unit* (word sense), *synset* (id), *frame* (syntactic and/or semantic), *domain* (context), and *concept*

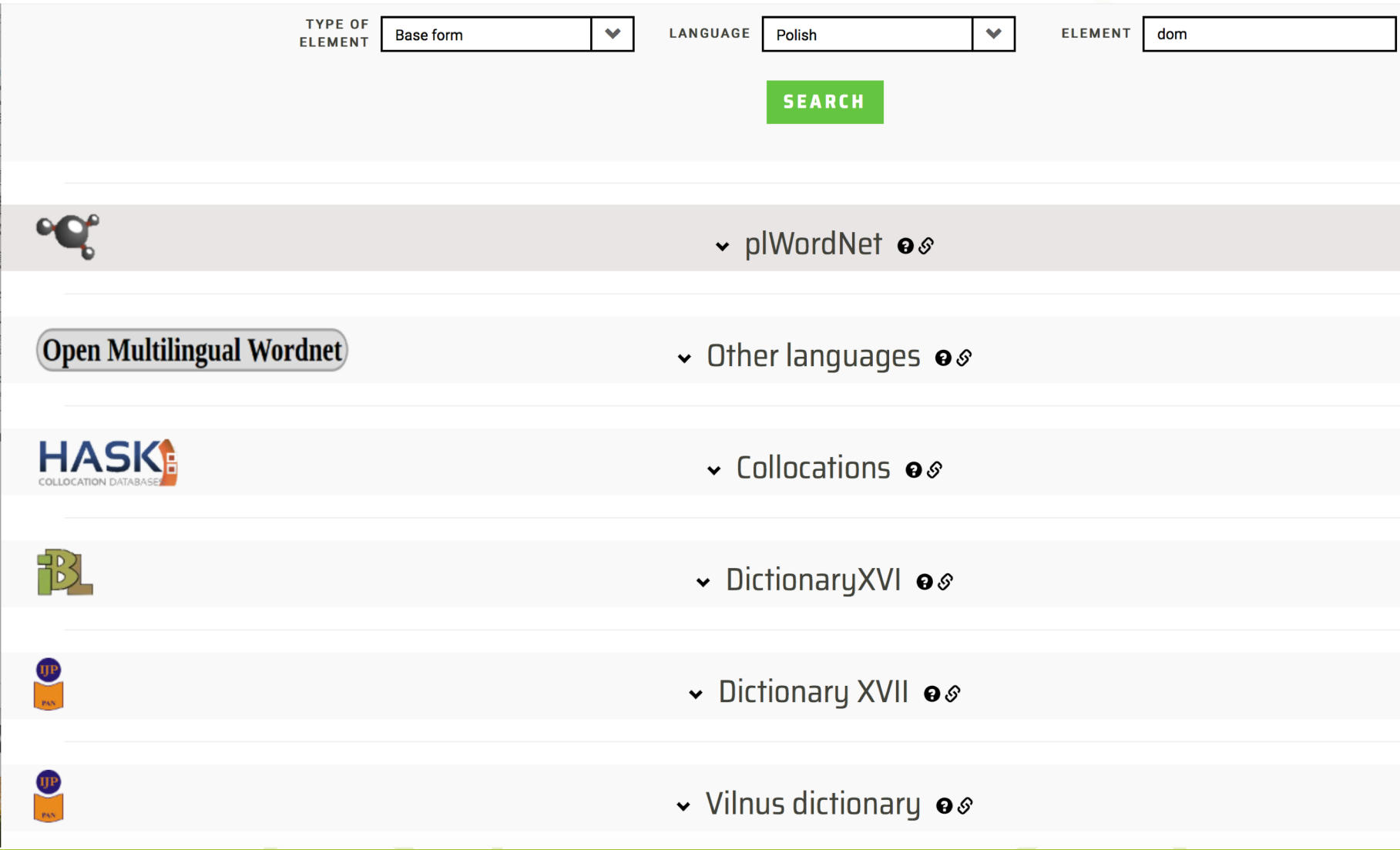
Federated search across LRs: functions

- Learning about the component LRs and the range of information provided by them, e.g. by a query;
- Searching across combined LRs on the basis of **anchor elements** supported by different components
- Browsing LRs by lists of anchor elements retrieved from the components
- Navigating across linked LRs on the basis of anchor elements;
- Finding out how to access and download original resources and obtain information on how to browse different LRs in their native browsers

Lexical Platform a light way solution for users



Lexical Platform a light way solution for users
http://lexp.clarin-pl.eu



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Open Multilingual Wordnet

Other languages

Meaning	List of words
a dwelling that serves as living quarters for one or more families	en : house es : casa
aristocratic family line	en : house es : casa
where you live at a particular time	en : home, place es : casa

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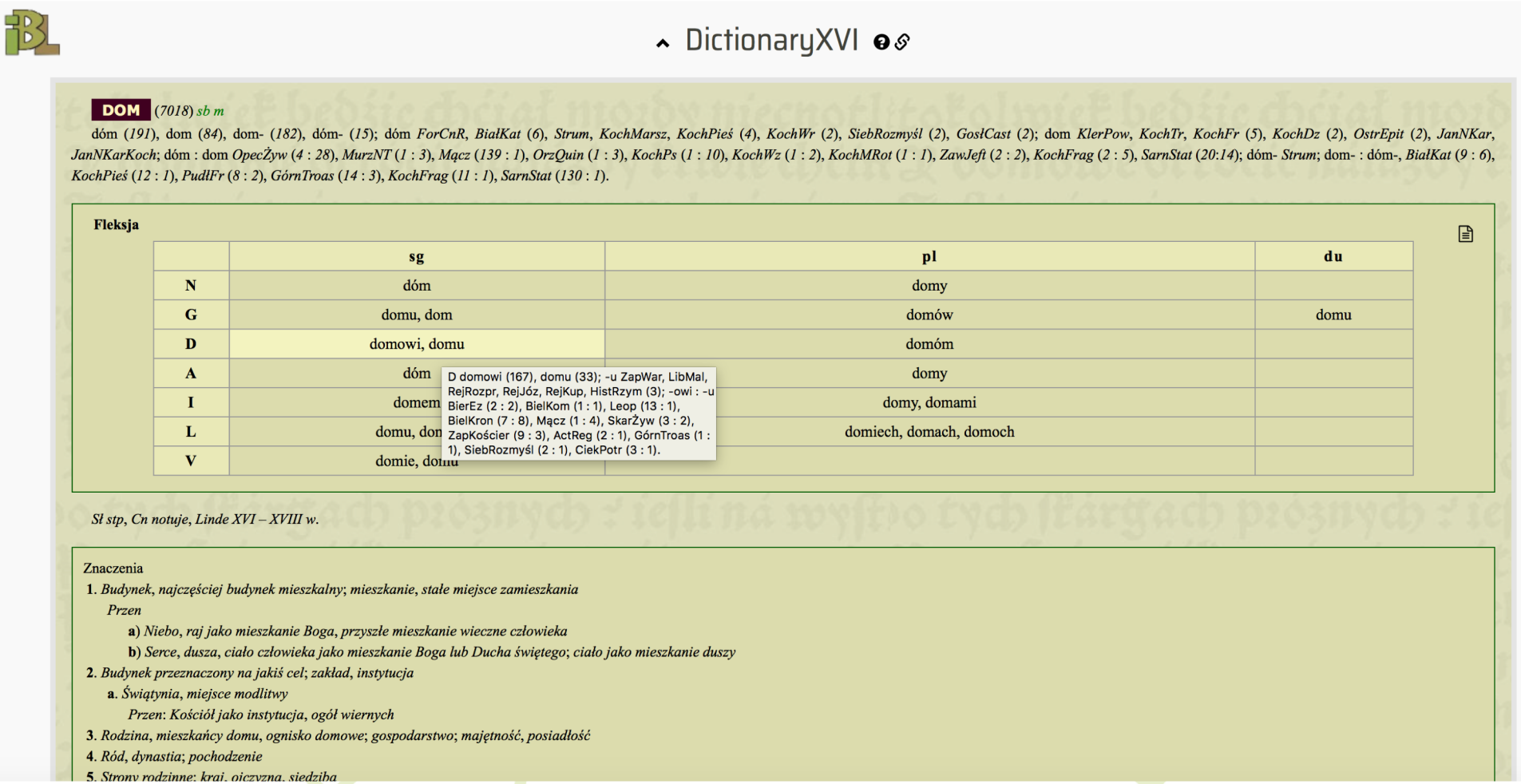

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Znaczenia

1. *Budynek, najczęściej budynek mieszkalny; mieszkanie, stałe miejsce zamieszkania*

Przen

a) *Niebo, raj jako mieszkanie Boga, przyszłe mieszkanie wieczne człowieka*

b) *Serce, dusza, ciało człowieka jako mieszkanie Boga lub Ducha świętego; ciało jako mieszkanie duszy*

2. *Budynek przeznaczony na jakiś cel; zakład, instytucja*

a. *Świątynia, miejsce modlitwy*

Przen: Kościół jako instytucja, ogół wiernych

3. *Rodzina, mieszkańcy domu, ognisko domowe; gospodarstwo; majętność, posiadłość*

4. *Ród, dynastia; pochodzenie*

5. *Strony rodzinne; kraj, ojczyzna, siedziba*

6. *Klasztor, dom zakonny*

7. *W dawnej astrologii pewna część nieba w stosunku do odpowiedniej części Ziemi*

8. *n-loc*

*** *Bez wystarczającego kontekstu*

Synonimy: **1**. *bud, buda, budowanie, chromina, gmach, kamienica, komora, mieszkanie*; **2**. »celna komora«, *prasownia, ratusz, warsztat, zbrojnica, zest.* »dom barwierski«: *postrzyg zamknienie*, »dom gościnny«: *gospoda, gościniec, karczma*, »dom kurewski«: *zantus*, »dom nauki«: *szkoła*, »dom nierządny«: *zantus*, »dom pastuszy«: *pastyrznia*, »dom pielgrzymny«: *szp* »dom robotny«: *warsztat*, »dom sądny«: *dwor, ratusz, urząd*, »dom sirotny«: »szpital dziecinny«, »dom trędowatych«: *szpital*, »dom wojtowski«: *ratusz*, »zbojcy morskich dom«: *kar kościoł, krolestwo, mieszkanie, pałac, przybytek, zebranie*; **3**. *familija, gniazdo, gospodarstwo, ojczyzna, pokolenie, potomstwo, rodzaj, rodzina, zebranie*; **4**. *familija, herb, imię, narod, poko* **5**. *ojczyzna*.

Cf **DOMA, [DOMOGOSPODARNY], DOMORODAK, DOMORODNY, DOMOSTWO**

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Lexical Platform a light way solution for users
http://lexp.clarin-pl.eu

Conclusions

- Wordnets together with semantic lexical resources form within CLARIN rich lexicographic knowledge base
- This richness is not yet enough well visible and explorable by the users
- Light way models the integration of resources can pave a road towards an interconnected network of lexical resources

Thank you very much for your attention!