"Open Search for Science - Science for Open Search”

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#ossym2022, CERN, Geneva Switzerland

Science is about the discovery of new things, knowledge, concepts, contexts, systematics, relations etc.

- **The more data and information** we render and collect in the digital sphere and consume (also as the basis for science**), the more important it is to ensure open, unbiased and public access to it.**
- **Science profits significantly** from the ease of exchange of data and information and thus also has a **responsibility in keeping it open,** accessible, findable and curated.

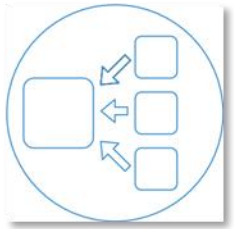
Science ⇔ Web

Large scientific organizations handle large quantities of information and data from external sources and internally in their research environments.

- **Large science organisation generate, store, manage and maintain large amounts of information** in their intranet, research systems, data repositories and information corpora as well as they generate large volumes of scientific artefacts which they put out to the public domain.

- The German Aerospace Centre, about 10.000 scientific, technical and administrative staff has a **vital interest in ensuring that access to digital information is unbiased, objective and as efficient as possible.** Internally, within the organisation, as well as externally, in the web.

Project tasks and activities



1. OpenSearch Network within DLR

- 1.1. Research on DLR internal OpenSearch potential
- 1.2. WIKI OpenSearch@DLR

2. Events and Cooperation

- 2.1. Internal Meetings
- 2.2. WAW-OpenSearch
- 2.3. Contributions to Conferences and Symposia
- 2.4. Project Cooperation and Partnerships

12-14 October 2020 FULLY WEB-BASED
2nd International Symposium on Open Search Technology

SIGIR

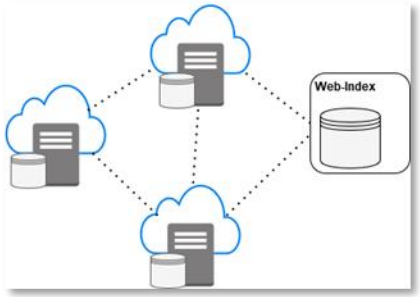
CIKM 2021 1-5 NOVEMBER

CERN

osf open search foundation

HELMHOLTZ

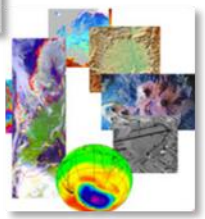
3. Pilot Applications and Project



- 3.1. DLR OpenSearch Testbed
- 3.2. Database connectivity
- 3.3. Pilot applications
- 3.4. Specialized data base connectivity

elib Publikationen des DLR

DLR.Wiki



GitLab

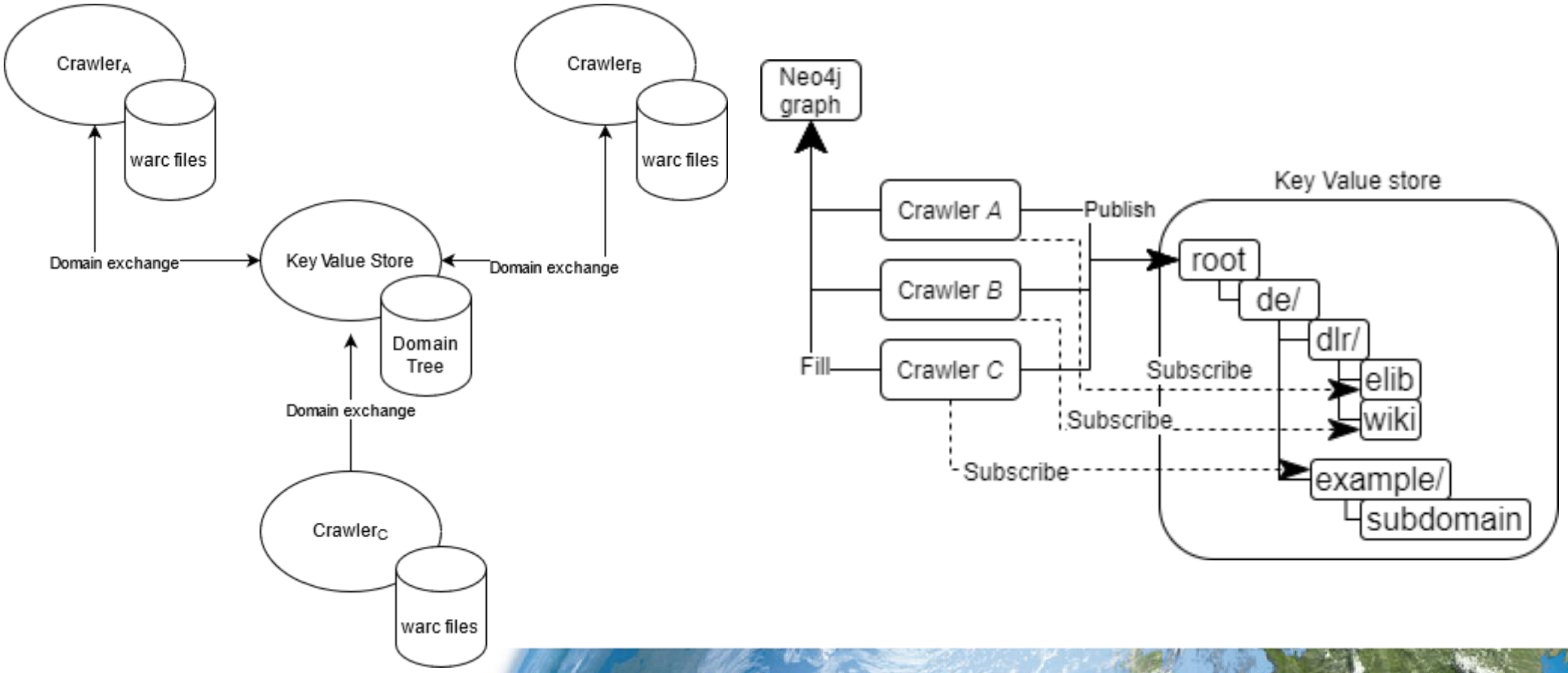
4. Open Search Concept paper for DLR

- 4.1. Concept paper

DLR

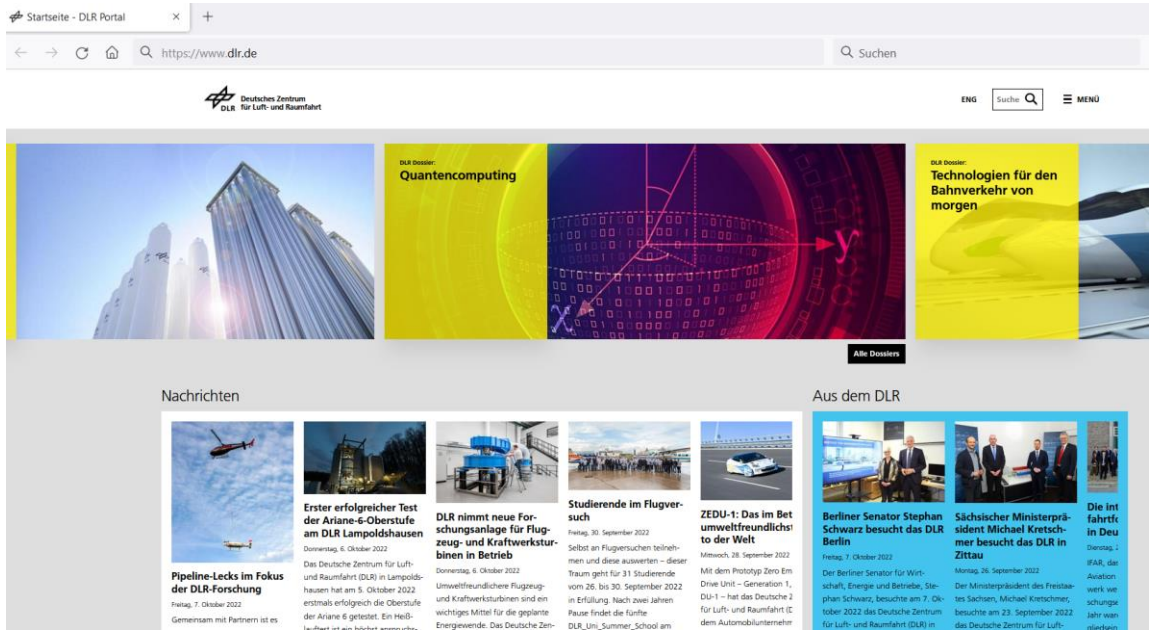
Distributed Crawler Architecture

- Details: https://gitlab.com/opensearch-dlr/opensearch-prototype/-/wikis/home

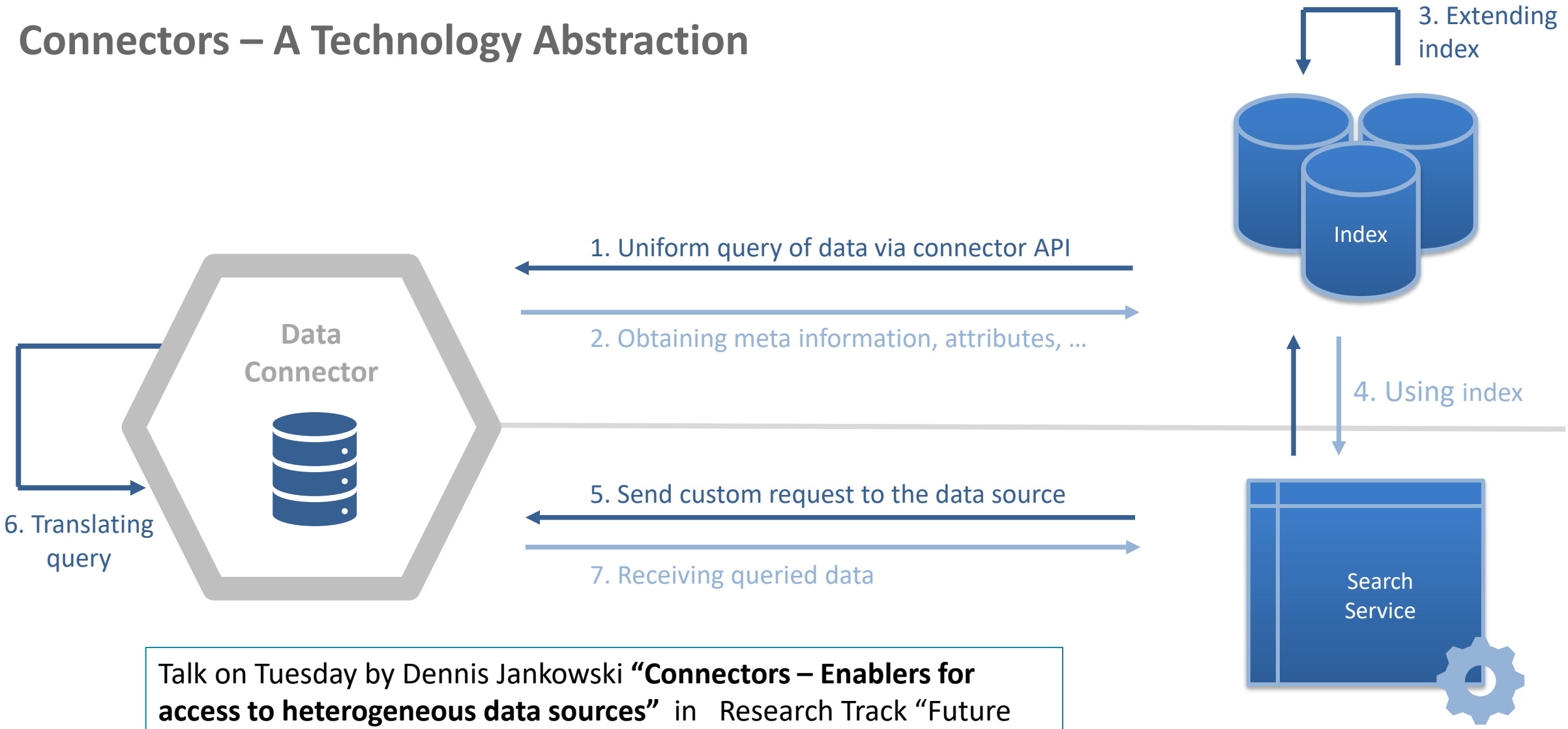


Crawl Results for Subdomain *.dlr.de*

- First crawl: 2021-10-04 08:19:49+00:00
- Latest crawl: 2022-08-26 10:39:07+00:00
- Overall crawled sites: 1.349.830 (4127 sites/day on average)
- Unique crawled sites: 340.501
- Every crawled site is re-visited every 24h, except other policies given in robots.txt.
- Coordination via Elastic Index
  - Every crawler stores which pages were retrieved and when. Other crawlers check for tasks.



Connectors – A Technology Abstraction

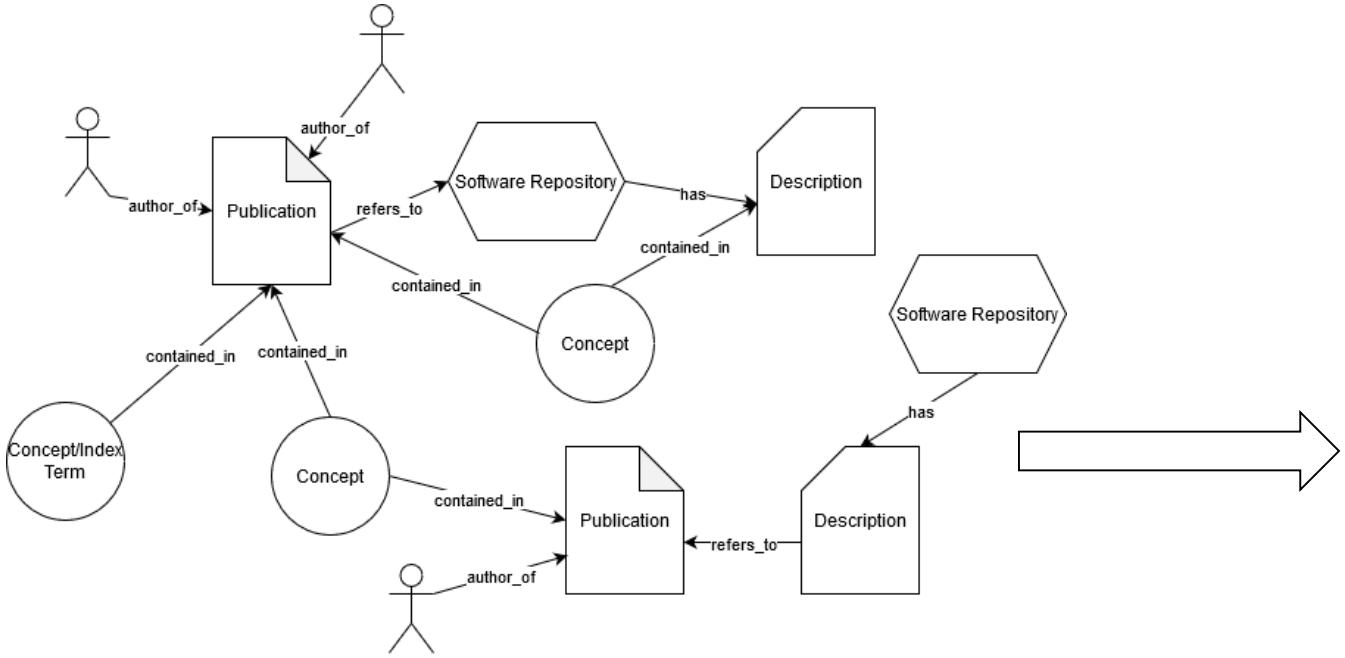


Talk on Tuesday by Dennis Jankowski **“Connectors – Enablers for access to heterogeneous data sources”** in Research Track “Future open search paradigms and concepts” from 15:45

DLR

DLR Open Science Search Prototype

http://app.opensearch.sc.dlr.de/ (DLR internal)



Opensearch @ DLR

sipMask

Publications | Git Repositories | Expert Search | Co-Author Recommendation

Related DLR-Sites

Publication entry

SipMask: Spatial Information Preservation for Fast Image and Video Instance Segmentation
2020

Authors:

Name	Email
Jiale Cao Suggest Co-Authors	-
Rao Muhammad Suggest Co-Authors	-
Hisham Cholakkal Suggest Co-Authors	-
Fahad Shahbaz Suggest Co-Authors	-
Yanwei Pang Suggest Co-Authors	-
Ling Shao Suggest Co-Authors	-

Expert search and collaboration recommendation

Associated Git-projects:

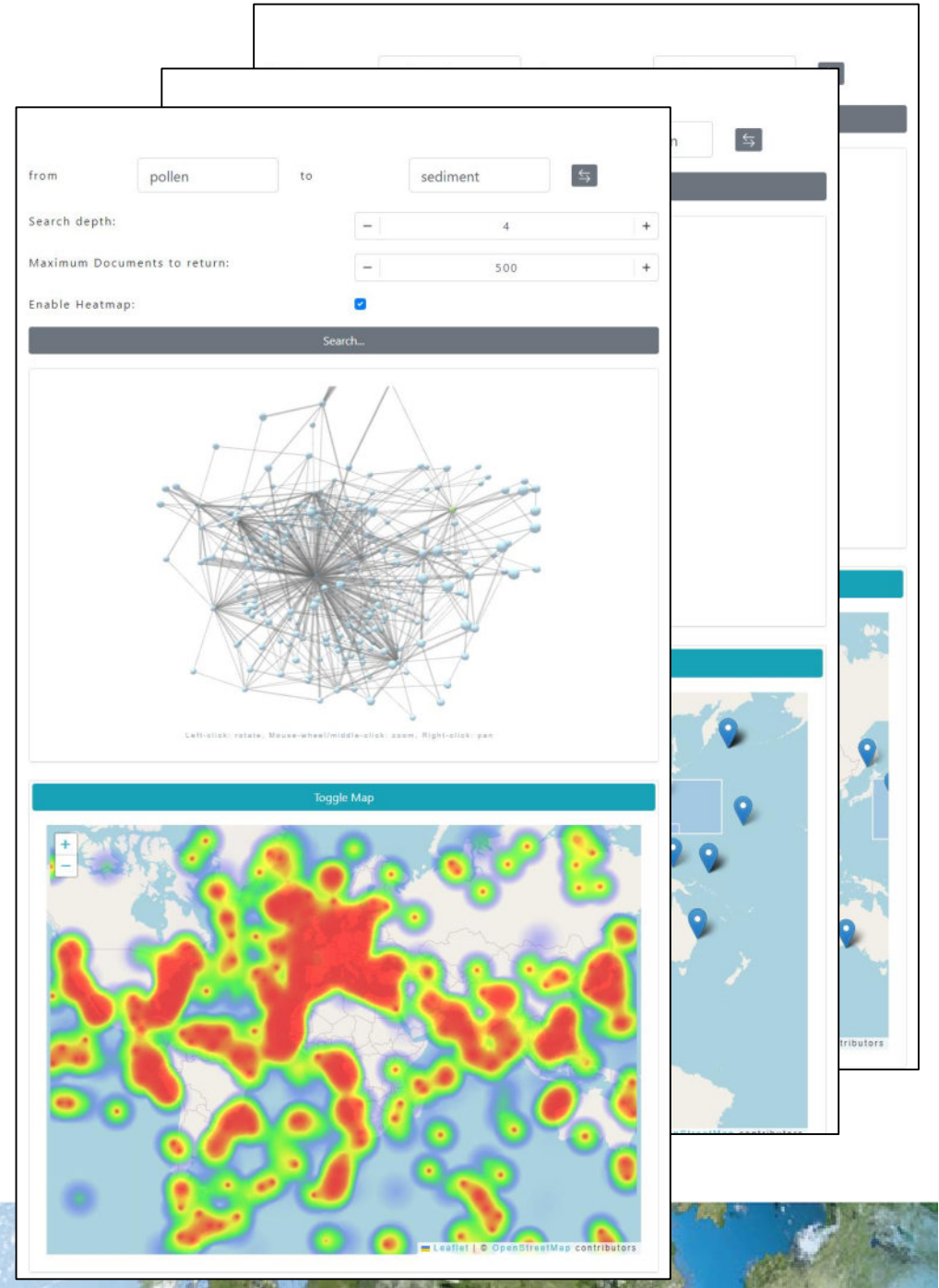
SipMask

Links to related software and datasets

DLR Open Science Search Prototype

http://app.opensearch.sc.dlr.de/ (DLR internal)

- **Dataset search and discovery**
  - Pangaea environmental science dataset and study search
  - Discovery of possible indirect connections between scientific concepts (Literature-based discovery)
  - Location of relevant environmental studies along with references to open datasets



OpenSearch@DLR Workshops, Colloquia, Sprints, Networking…

Past colloquia in 2021 - overview

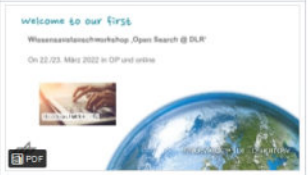
Date/Time	Topic/Speaker
13.04.2021 / 14:00-14:45	"OpenSearch@DLR – Hintergrund und Ziele des Projekts" - Dr. Stefan Voigt, DLR
08.06.2021 / 14:00-14:45	"Practical Experiences and New Challenges in Web Crawling" Christopher Schröder and Martin Potthast - Universität Leipzig / Webis Group
14.09.2021 / 14:00-14:45	"DLR OpenSearch Testbed and first Experiments" - OpenSearch@DLR Team
09.11.2021 / 15:00-15:45	"Semantic representation and analytics for geospatial data" - Prof. Dr. Elena Demidova - Computer Science Institute - University of Bonn

Dates in 2022

Date/Time	Topic/Speaker
15.02.2022 / 14:00-14:45	"Information Extraction and Entity Linking for Semantic Web Search" - Dr. Faegheh Hasibi - Institute of Computing and Information Sciences - Radboud University, NL
05.04.2022 / 14:00-14:45	"The Europe Media Monitor: web news as unconventional data sources" Eng. Marco Verile - Team Leader of the Europe Media Monitor (EMM) at the European Commission – Joint Research Centre (JRC)
24.05.2022 / 14:00-14:45	"A Super Computing Centre Perspective on Open Search" Prof. Dr. Dieter Kranzlmüller, Leibniz Supercomputing Centre (LRZ)
19.07.2022 / 14:00-14:45	"Open Search Pilot Applications at DLR" Dr. Tobias Hecking and Dennis Jankowski (DLR)
27.09.2022 / 14:00-14:45	"Science Search / Open Search @ CERN" Dr. Andreas Wagner, CERN
08.11.2022 / 14:00-14:45	**"Economic Dimension of Open Search" Dr. Oliver Blanchard (Open Search Foundation) and Klaus Fuest (Roland Berger)**
06.12.2022 / 14:00-14:45	"Two years of OpenSearch@DLR – looking backward and ahead" Dr. Stefan Voigt (DLR)

WAW Open Search @ DLR

Day 1: 22 Mar. 2022 (Tuesday)

Time	Agenda item	Description	Presenter	Online / OP	Slides
12:45	Checkin - Tech-Setup		all		
13:00 - 13:45	Opening Session	Welcome, organisational matters and introduction to the Open Search Initiative and Project	Voigt, Stefan	Online/OP	
13:45 - 14:00	DLR Opening Statement	DLR perspective on Open Search	DLR Vorstand Prof. Karsten Lemmer	Online	
14:00-14:45	Invited Keynote Speech	The European Dimension of Open Search	Prof. Michael Granitzer, University Passau	Online	
14:45 - 16:45	Market Place / Poster Session	Getting to know each other and networking	Haupt, Carina	Online (Gather.Town)	
16:45 - 17:45	Scientific Programme - *Geospatial search and web data analysis*	**Registered talks** Scientific talks (10-15 min.) / Lightning talks (~5 min.). See Call for Talks	Hecking, Tobias	Online/OP	

Research-Proposals

Open WebSearch .eu

Research
Information Retrieval, AI, HCI, Geo-spatial Data Processing

UNIVERSITÄT PASSAU
Webis.de
Bauhaus-Universität Weimar
Radboud Universiteit
DLR
TU Graz

Infrastrcuture Organisations
Data Storage, HPC, Services and Scientific Computing

lrz
CERN
VSB TECHNICAL UNIVERSITY OF OSTRAVA | IT4INNOVATIONS NATIONAL SUPERCOMPUTING CENTER
CSC ICT Solutions for Brilliant Minds

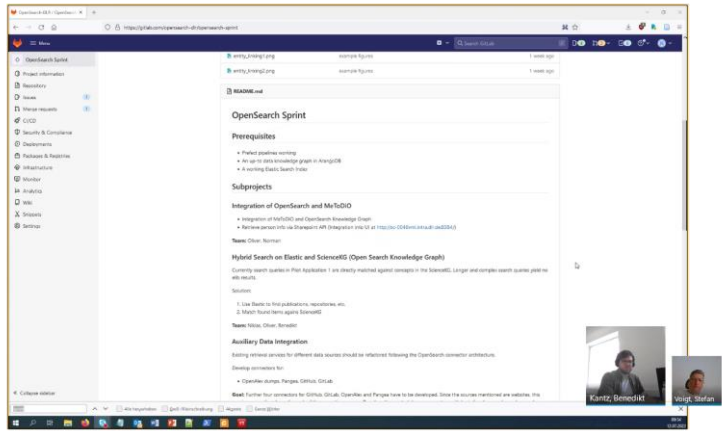
Associations
for a future Web /Internet

open search foundation
nlnet FOUNDATION

Companies
for a future Web /Internet

A1 metaGer

OpenSearch@DLR Coding Sprint



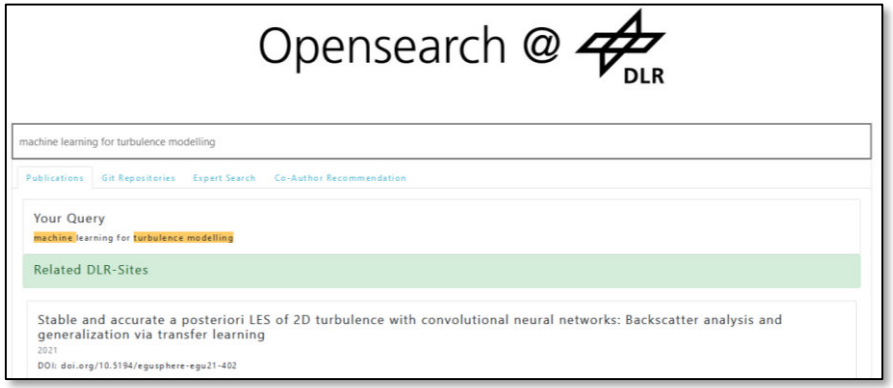
During the OpenSearch@DLR project we found the following (1/2):

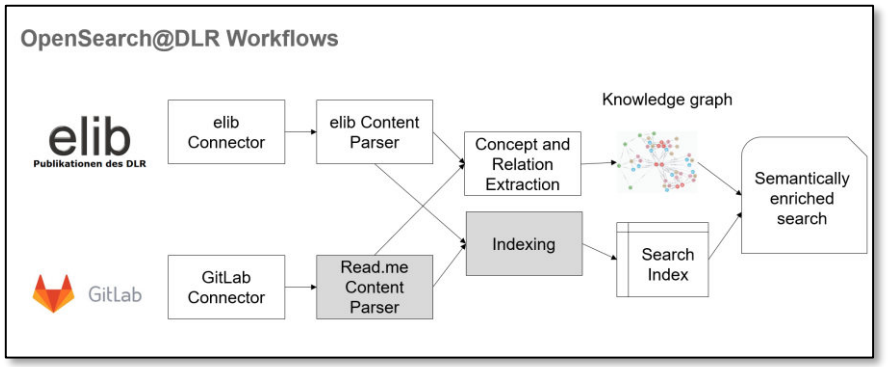
- Efficient **searching and finding of information within the different repositories** within the organization is as important as searching for external information and data on the web.

- In particular for scientists**,** **finding and retrieval of research data** is very important and needs better technical tools and support. This **requires thematically pre-structured and pre-processed information** on existing data and information to better search in internal repositories and corpora.

- Often enough**,** **information needs to be found in heterogeneous artefacts** (such as papers, software tools, manuscripts, etc.) which are often distributed over various different subsystems.

- **Techniques for automatic content analysis** have to be advanced to identify **relationships between scattered pieces** of information and data, which enable integrated **search and discovery of scientific knowledge simultaneously** and synergistically across different repositories and corpora: e.g. to search for authors, scientific concepts, tools or techniques.





DLR

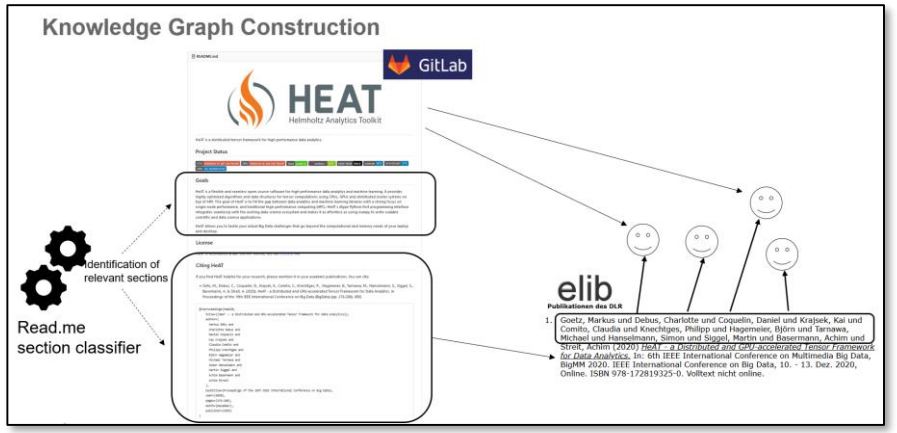
During the OpenSearch@DLR project we found the following (2/2):

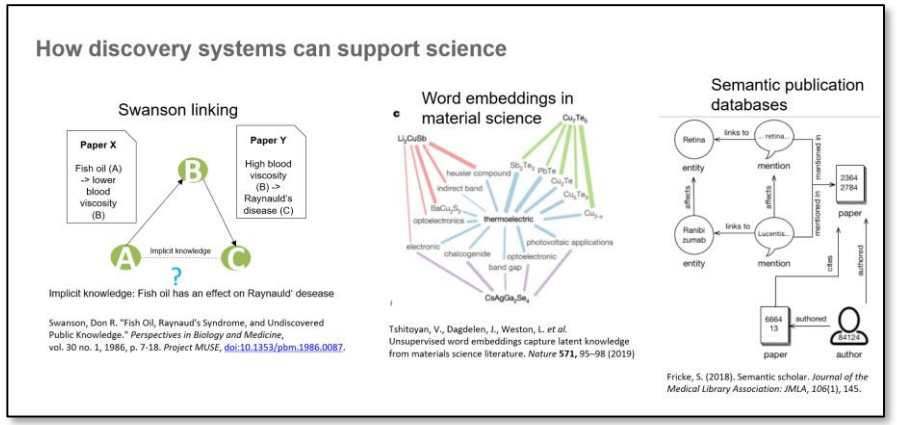
- Sophisticated search involves **efficient visualization and analysis tools**, allowing deeper insight in to search results and going far beyond of what is offered in today's standard search tools.

- This includes for example that the availability and analysis capabilities of **geospatial search features need to be significantly improved** for all kinds of search and analysis tasks in the web. Along with this, time-stamps and versioning of web artefacts are equally important factors.

- Versions of knowledge artefacts have to be tracked in order to avoid inconsistencies and ensure that data of **known provenance and up-to-date-ness are used for scientific analysis.**

- It is **desirable to identify emerging topics and to anticipate future trends of scientific and technological or even societal developments.** Representing extracted information and resources as well as **semantic relations** between them in **graph-databases** seems to be a promising approach for this.





In conclusion:

- All in all, it can be established that **good internal search features**, good internal **knowledge management** and thus, **sophisticated intranet search** is a critical infrastructure for science centers, which need better care and which by far should not be considered a by-product.

- In conclusion we argue that improving the **intranet search features and linking them with sound public and distributed open web search** infrastructures will substantially improve the scientific work and organizational efficiency of many large-scale science organizations.

- Thus, any major **science and research organization** needs to actively engage in the building and maintaining of **openly searchable information repositories internally**, as well as where possible, **also externally**, in cooperation with others and for searching the web as a whole.

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