

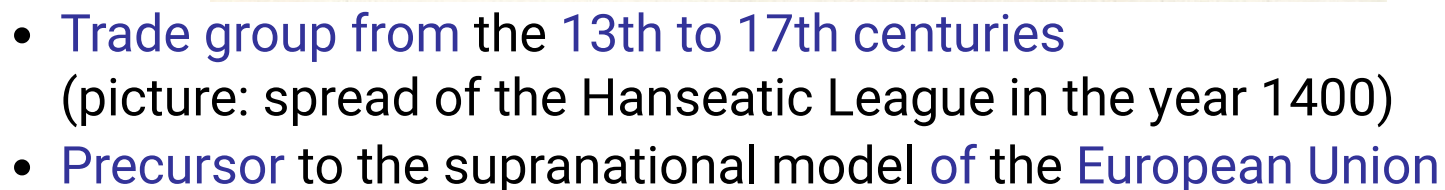
13th September 2022

Kickoff QualityOnt:

**High Quality Knowledge Graphs
from recent English, French and
German Emergent Trends with the
example of COVID-19**

Professor Dr. rer. nat. habil. Sven Groppe

<https://www.ifis.uni-luebeck.de/index.php?id=groppe>



University of Lübeck (UzL): Statistics

- **Employees**

- ≈ 150 professors, $\approx 1.8K$ research assistants, total: $\approx 3K$

- **> 5000 students (in 2021)**

- **Medicine and health:** 2.098

- Ergotherapie/Logopädie, Gesundheits- und Versorgungswissenschaften, Hebammenwissenschaft, Humanmedizin (CHE: 1,5), Pflege (CHE: B.Sc.: 2,5), Physiotherapie

- **Computer science and mathematics:** 1.077

- Entrepreneurship in digitalen Technologien, Informatik (CHE: B.Sc.: 2,0; Master: 1,8), IT-Sicherheit, Mathematik in Medizin und Lebenswissenschaften (CHE: B.Sc.: 2,1; Master: 1,7), Medieninformatik, Medizinische Informatik

- **Natural sciences and psychology:** 1.323

- Biophysik (CHE: B.Sc.: 2,2), Infection Biology (CHE: B.Sc.: 2,2), Medizinische Ernährungswissenschaft, Molecular Life Science, Psychologie

- **Technology:** 658

- Biomedical Engineering, Hörakustik und Audiologische Technik, Medical Microtechnology, Medizinische Ingenieurwissenschaft, Robotik und Autonome Systeme

Institute of Information Systems (IFIS)

- 5 Professors/PDs
- currently 15 PhD students, 5 External PhD students
- Labs
 - Information Systems and Quantum Computing (ISQC)
 - Prof. Dr. rer. nat. Sven Groppe
 - Cyber-Physical Medical Systems (CPMS)
 - Prof. Dr.-Ing. Jörg-Uwe Meyer
 - Foundations of AI (FAI)
 - Prof. Dr. rer. nat. Ralf Möller
 - Human-Aware AI (HAI)
 - Prof. Dr. N.N.
 - Intellectics
 - PD Dr. rer. nat. habil. Özgür Özçep

**UzL
Principal
Investigator:**



Prof. Dr. rer. nat. habil. Sven Groppe
Website [↗](#)

**UzL PhD
Student:**

- Hanieh Khorashadizadeh
 - Master Thesis: Improving Question Answering with Deep Learning Techniques
 - H. Khorashadizadeh, R. Monsefi, S. Foolad, Attention-based Convolutional Neural Network for Answer Selection using BERT, CFIS, 2020, **DOI:** [10.1109/CFIS49607.2020.9238669](https://doi.org/10.1109/CFIS49607.2020.9238669) [↗](#)
 - Since 22nd June 2022 working in QualityOnt

**External
Expert:**

- Sanju Tiwari
 - Knowledge Graph Expert
 - organizes many scientific events in the area of knowledge graphs
 - **Website** [↗](#)

Lectures by Sven Groppe

39 lectures in the areas of

- **New: Quantum Computing** **N** **T** (started in SomSem 2022)
- Semantic Web **N** **T** (2011 until today)
- Mobile and Distributed Databases **N** (2008 until today)
- Cloud and Web Technologies **N** **T** (*formerly Web based Information Systems*, 2015 until today)
- Algorithms and Datastructures (2014)
- Databases (2014)
- XML Databases **N** (2007)
- Compiler Design **N** **T** (2006/2007)
- Next Web Generation (2006, together with M. Zaremba)

N Newly designed **T** Online Tutorials

Supervision and Publication Record

- Dissertations
 - 2 dissertations (finished)
 - 5 current PhD students
 - 2 PhD students/postdocs to be employed
- $\approx$ 91 bachelor/master/diploma thesis/student projects
- $\approx$ 60 contributors to LUPOSDATE
- $\approx$ 15 contributors to LUPOSDATE3000
- $>$ 140 publications
 - 111 co-authors
 - 43 publications (30%) are co-authored by bachelor/master students (being students at time of writing)

Project Grants ($\approx$ 2M €)

1. **B** QC4DB: Accelerating Relational Database Management Systems via Quantum Computing (2022-2024)
2. **D** **I** High Quality Knowledge Graphs from recent English, French and German Emergent Trends with the example of COVID-19 (2022-2025)
3. **D** BigSloT: Big Data Management for the Semantic Internet of Things (2020-2023)
4. **D** Hybrid²-Indexstrukturen für Hauptspeicherdatenbanken (2019-2023)

5. **D** Hardwarebeschleunigung von Semantic Web Datenbanken durch dynamisch rekonfigurierbare FPGAs (2013-2015)
6. **W** Beschleunigung relationaler Datenbanken mittels laufzeitadaptiver FPGA-Cluster (2013-2015)
7. **D** Logisch und Physikalisch Optimierte Semantic Web Datenbank-Engine (2007-2009)

N New / Not Started **D** DFG projects **I** International Project **W** BMWi/ZIM **B** BMBF

Scientific Services

- Workshop Chairs
 - Semantic Big Data (SBD) @ SIGMOD (2016 - 2020)
 - Big Data in Emergent Distributed Environments (BiDEDE) @ SIGMOD (2021 - 2022)
 - Very Large Internet of Things (VLIoT) @ VLDB (2017 - 2022)
 - Web Data Processing and Reasoning (WDPAR) @ KI 2018
- General Chair
 - International Semantic Intelligence Conference (ISIC) 2021 - 2022
 - International Health Informatics Conference (IHIC) 2022 - 2022
- many other scientific services like
 - $\approx$ 103 PC memberships, reviewer of $\approx$ 33 journals, editor of 3 journals
 - Member of International Federation for Information Processing (IFIP) Working Group WG2.6 Database
- Detailed Information: <https://www.ifis.uni-luebeck.de/~groppe>

Own Contributions Relevant to QualityOnt

- Semantic Web (SW) Databases
 - LUPOSDATE
 - full-stack SW support
 - S. Groppe, [Data Management and Query Processing in Semantic Web Databases](#), Springer, 2011, [DOI: 10.1007/978-3-642-19357-6](#) 
 - ...
 - LUPOSDATE3000
 - multiplatform, i.e., running in server, browser, IoT, ...
 - B. Warnke, M. W. Rehan, S. Fischer, S. Groppe, [Flexible data partitioning schemes for parallel merge joins in semantic web queries](#), BTW, Dresden, Germany, 2022, this publication received the label 'Results Reproduced', [DOI: 10.18420/btw2021-12](#) 
 - S. Groppe, R. Klinckenberg, B. Warnke, [Sound of Databases: Sonification of a Semantic Web Database Engine](#), Proc. VLDB Endow. 14(12): 2695–2698, 2021, [DOI: 10.14778/3476311.3476322](#) 
 - ...

Semantic Web DBMS LUPOSDATE

Support of:

- SPARQL Queries
- RIF Rules
- RDF Schema
- OWL (via OWL2RL in RIF)

Indexing:

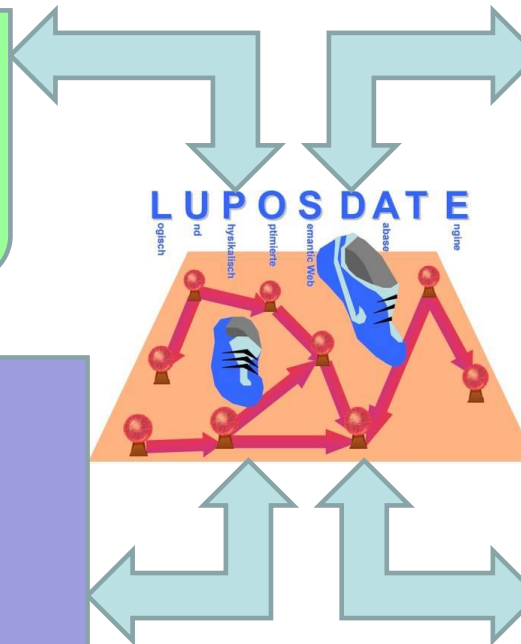
- Stream Processing
- Main memory for small datasets
- Disk-based for large datasets
- RDF3X
- Cloud: HBase
- P2P

Visualizations:

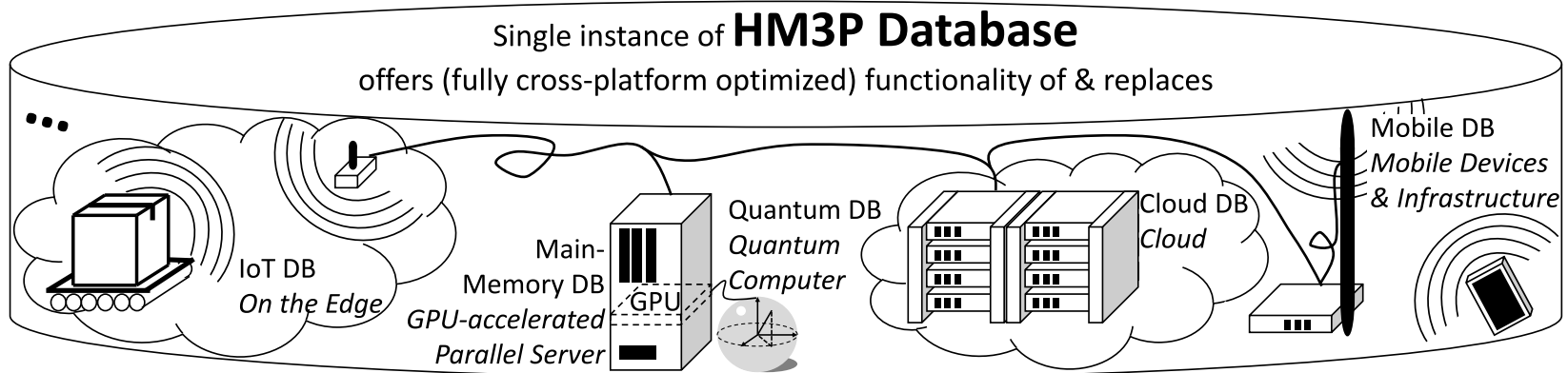
- Visual Editor
 - Queries (SPARQL)
 - Rules (RIF)
 - Data (RDF) in
 - 2D and
 - 3D
 - Logical Optimization Rules
- Summaries of RDF Data
- Operator graph
- Processing of Queries and Rules
- Optimization Steps

Extra:

- Parallel Processing
- Distributed Processing
- Cloud Computing
- Mobile Computing
- P2P for Internet of Things
- Compression of RDF Data
- Embedding of SW Languages in Programming Languages
- Speeding up by FPGAs

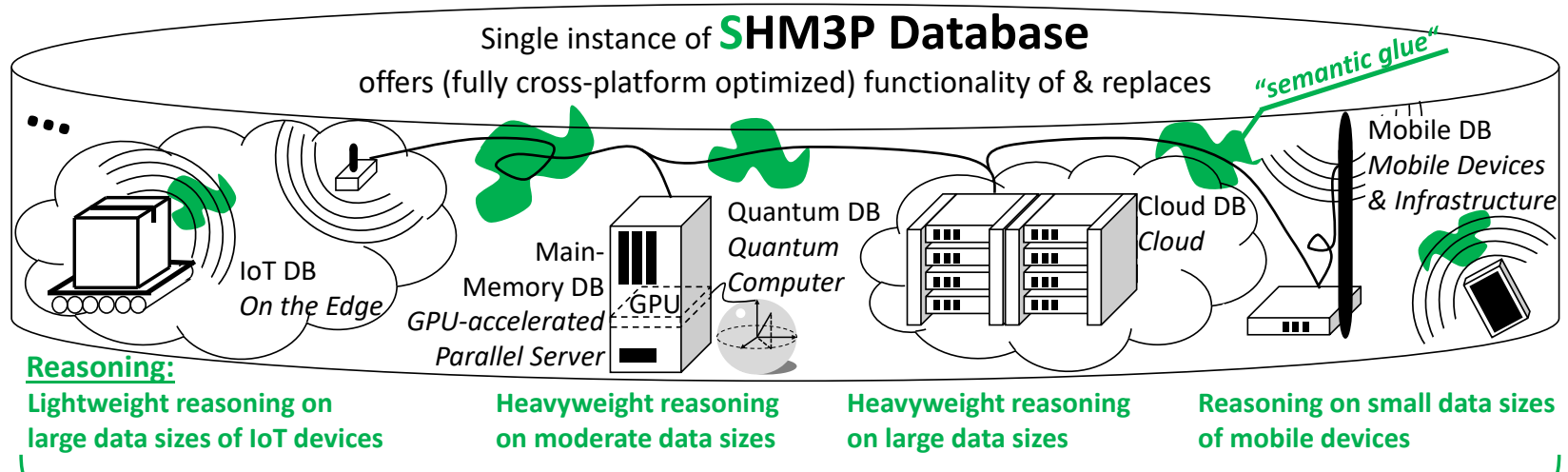


Hybrid Multi-Model Multi-Platform (HM3P) Database



- + full and uniform **data integration** at database level
- + **performance**: fully optimized across different data models
- + transparent **fault-tolerance**
- + **SQL standards**: relational ('87), XML ('03), temporal ('11), JSON ('16), Multi-dimensional Arrays ('19), schemaless ('19), streams ('20?), property graphs ('21?)
- + **features of different types of databases running on different platforms can be used**

Variant: Semantic HM3P (SHM3P) DB

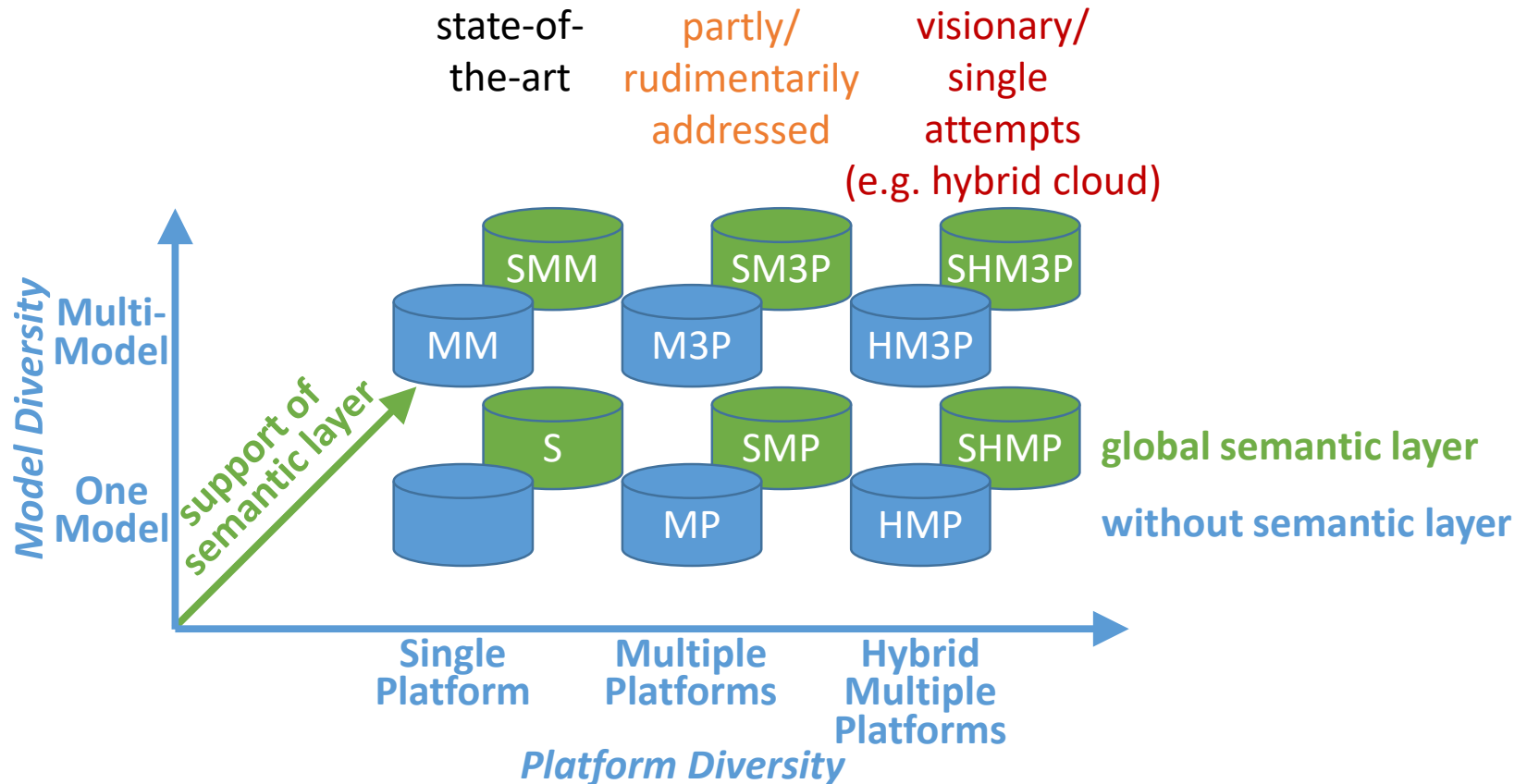


How to integrate the different reasoning capabilities and requirements into one transparent global reasoner?

- **Semantic Layer as glue** between other models and platforms
- **new challenges** like integrating different types of reasoners in a transparent global reasoner

- + **Features of HM3P databases**
- + **Easier data integration**
- **Performance issues** may occur due to semantic layer

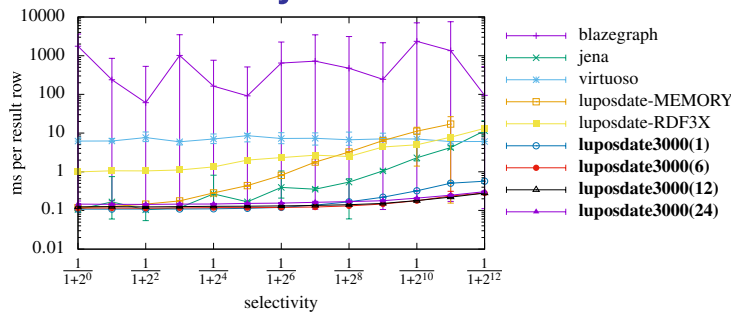
Types of DBMS



Legend: S: Semantic MP: Multi-Platform MM: Multi-Model M3P: MM MP H: Hybrid

The Power of Multi-Platform: LUPOSDATE3000

- ultra-fast in jvm...



B. Warnke, M.W. Rehan, S. Fischer, S. Groppe:
Flexible data partitioning schemes for parallel
merge joins in semantic web queries in: BTW'21 [\[1\]](#)

- ...but also enabling web demos running completely in the browser!



S. Groppe, R. Klinckenberg, B. Warnke. Sound of
Databases: Sonification of a Semantic Web
Database Engine. PVLDB, 14(12), 2021 [\[2\]](#)

QualityOnt Publications

- S. Groppe, S. Tiwari, H. Khorashadizadeh, J. Groppe, T. Groth, F. Benamara, S. Sahri, [Short Analysis of the Impact of COVID-19 Ontologies](#), International Semantic Intelligence Conference (ISIC), 2022

Activities related to QualityOnt

- **Tutorials** (Sven Groppe, Sanju Tiwari, Farah Benamara, Soror Sahri)
 - **Analysis of the Impact of COVID-19 Ontologies**, The Knowledge Graph Conference (KGC), 3.5.2022
- **Keynotes** (Sven Groppe)
 - **Leveraging Artificial Intelligence and Machine Learning in Pandemics using COVID-19 as a Case Study**, International Semantic Intelligence Conference (ISIC 2022), 19.5.2022
 - **Leveraging Artificial Intelligence and Machine Learning in Pandemics using COVID-19 as a Case Study**, Innovative Science and Technology after the Emergence of COVID-19: The 25th SANKEN International Symposium, 6.1.2022
- **Invited Talks** (Sanju Tiwari as part of her DAAD Post-Doc-Net AI Fellow) @ UzL
 - **From Ontologies to Knowledge Graphs: An Overview**, 17.6.2022
 - **Role of Semantic IoT in HealthCare**, 27.1.2022