

# Orchestrating a proprietary endurance qualification system for HV batteries with KNIME

KNIME Spring Summit 2017 – Berlin

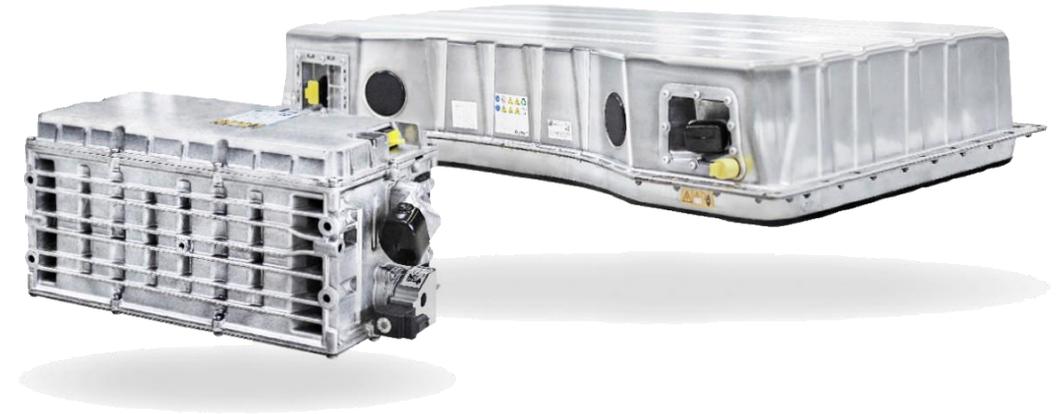
Maximilian Mücke (ACCUmotive) and Jürgen Walter (DATATRONIQ)

# Agenda

1. Speakers
2. Challenge
3. Initial Solution
4. Current Solution
5. Future Plans

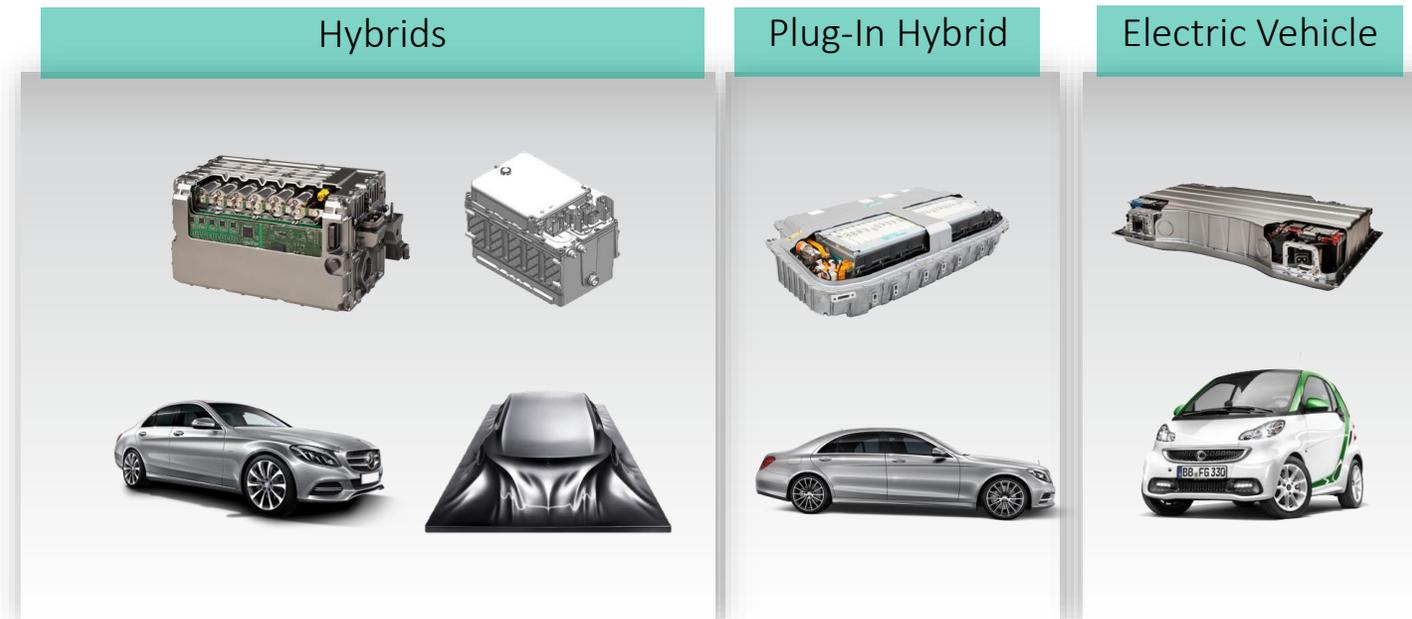
# Maximilian Mücke – ACCUmotive

- Data Analyst at ACCUmotive
- Make testing data more accessible to his team
- Responsible for developing the teams software environment
- Currently pursuing Master's degree in Business Analytics at Ulm University



## Deutsche ACCUMOTIVE GmbH & Co. KG

- A Daimler Company
- Advanced Lithium-Ion Batteries
- Research & development based in Kirchheim unter Teck/Nabern
- Production based in Kamenz



## Jürgen Walter – Datatroniq

- Industrial IoT
- Predictive Maintenance
- Better OEE
  - Quality, Availability, Performance
- Cloud & Hardware
- KNIME Partner
  - Custom Projects
- Co-Founder, HW & SW, Cloud



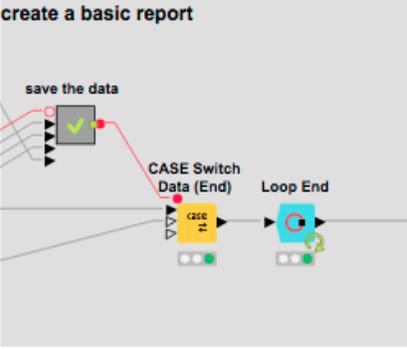
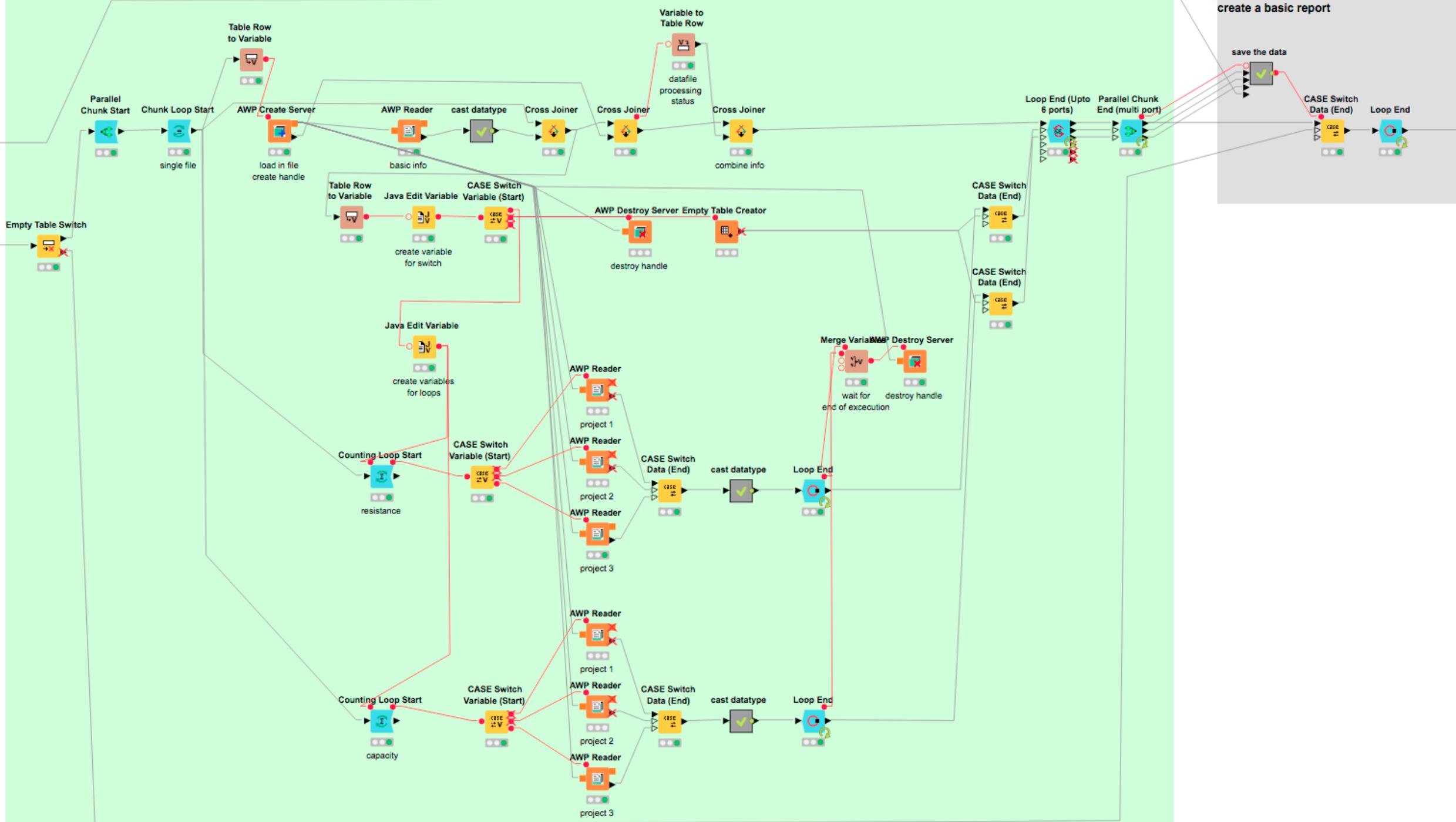
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# Challenge

- Analysis of endurance and performance tests of HV Batteries
    - Endurance qualification under real world conditions
    - Testbed to simulate accelerated aging of equipment
    - Both, for HV and LV batteries, compare latest SMART car battery
  - Lots of data, multiple GB per hour
  - Custom, in-house developed analysis methodology
    - Proprietary algorithms & intellectual property
    - Implemented on C/C++, user interface = programming API
- How to make those tools and algorithms more easily available to engineering team w/ no/little coding/programming experience

# Use KNIME to orchestrate analytics workflow

- Encoding of domain knowledge
  - what you see is what you get
  - KNIME Workflow = process documentation
- Democratize access to library of proprietary algorithms
  - familiar KNIME node instead of API-only C++ access
- KNIME Server
  - Proven, reliable workflow manager
  - Web Portal for “customer” self-service; mostly reporting
- Intuitive, visual interface
  - Quickly explore ideas w/ additional metrics from raw data
  - Easily communicate core concepts of particular workflow/analysis
  - Help manage complexity



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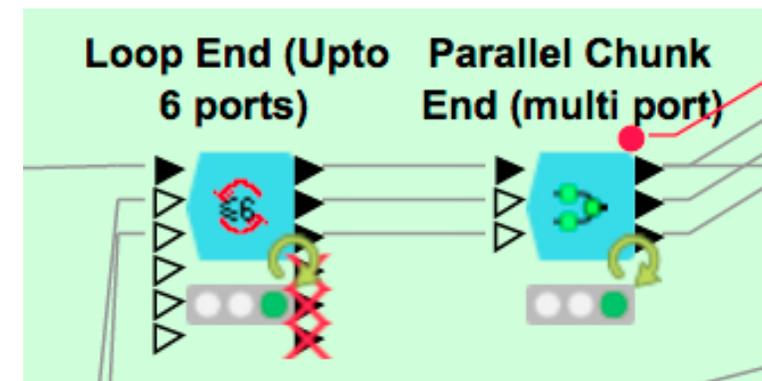
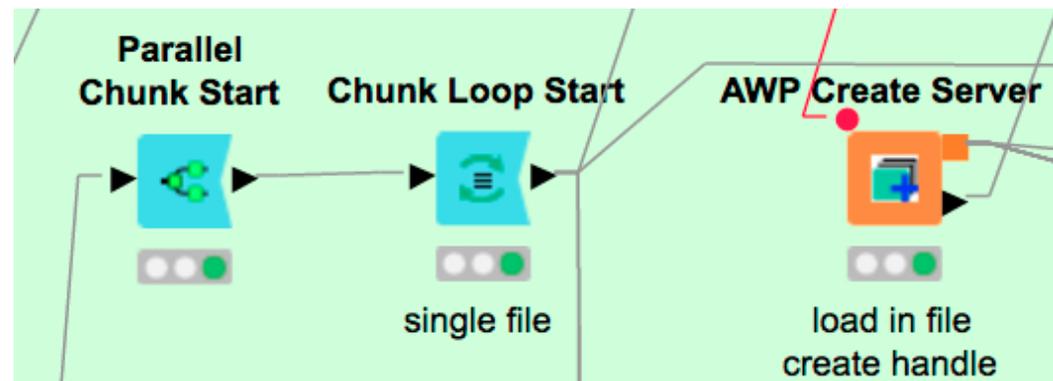
# Initial Solution – KNIME node development

- Student project, proof-of-concept
- Inconsistent reliability
- (Very) limited parallelism
- Based on Java Native Interface
  - Tight, deep integration, needs C++-Header files, compilation steps
- Shared memory between C/C++ library and Java VM
  - Good for performance/large data
  - Requires lots of effort to get stable and robust

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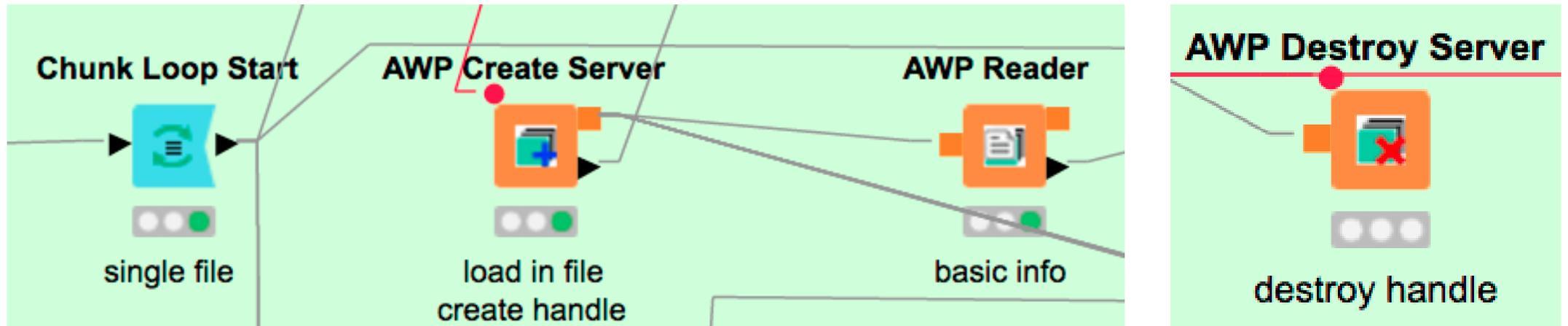
## Align with “Loop” concept in KNIME

- Simple, yet effective workload manager
- Parallelize work; expose (meta-)data for flow control
- Expose status and progress data
  - Facilitate loop control: retry, skip
  - Reporting for long running workflows - some scenarios run up to 24hrs



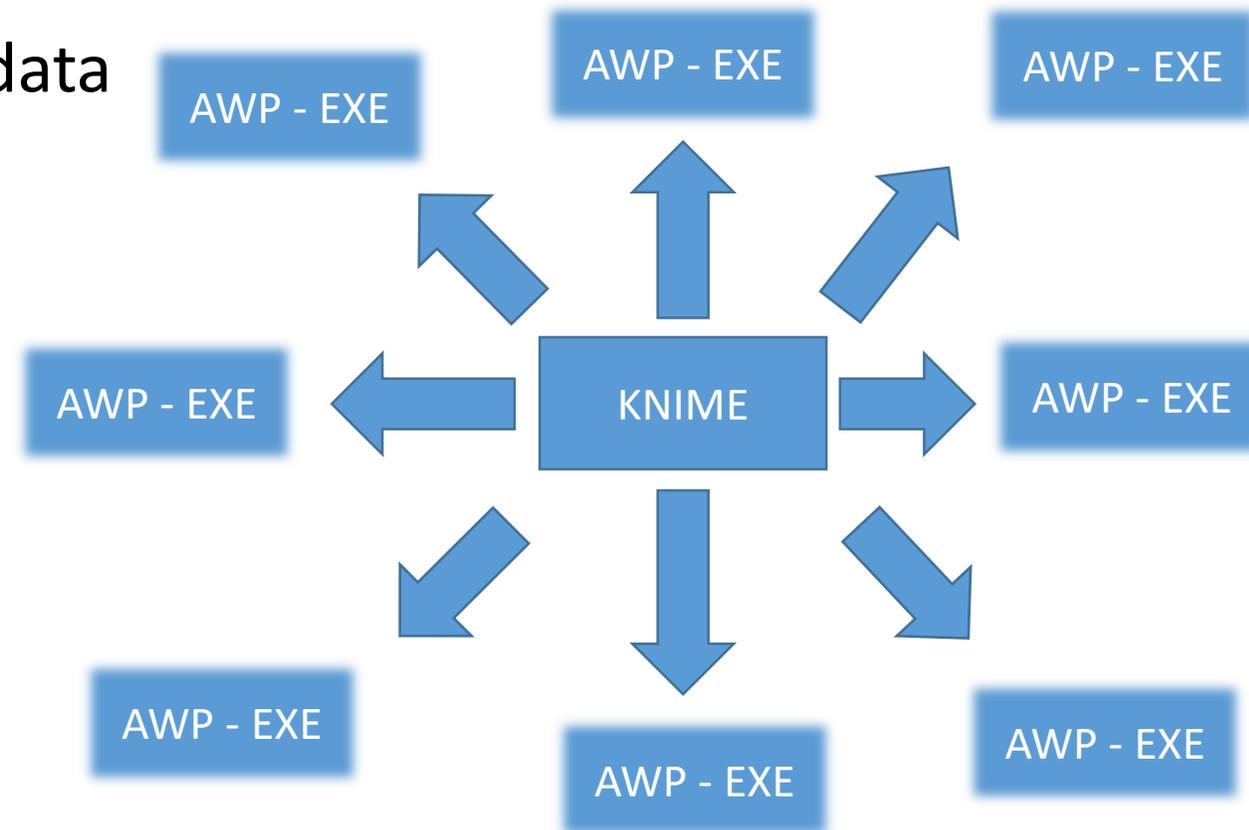
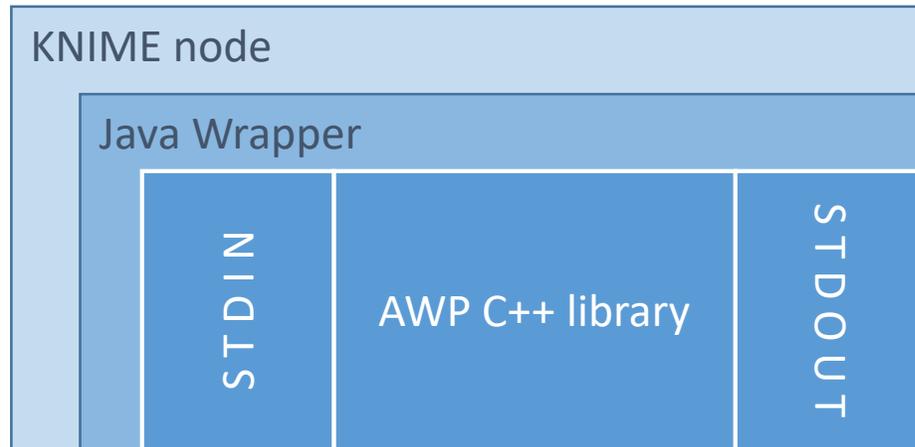
## Group of Nodes for AWP (“Auswertepattform”)

- Create AWP Server – AWP Reader – Destroy AWP Server
- Inspired by KNIME Big Data: Create/Use/Destroy Spark



# STDIO binary protocol instead of Java Native Interface (JNI) w/

- More robust, versatile
- Well suited for small chunks of data



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## Future Plans

- Replace custom binary protocol between AWP C++ library and Java wrapper with Google Protobuffers
- Improve current measurement data management
  - Currently flat files organized by naming convention
  - Based on semantics, flexible database management system
- Improve handling of analysis results / insights
  - Currently KNIME table writer
  - Future: export to centralized SQL database

## Contact

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