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 ("Auswerteplattform")

- 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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