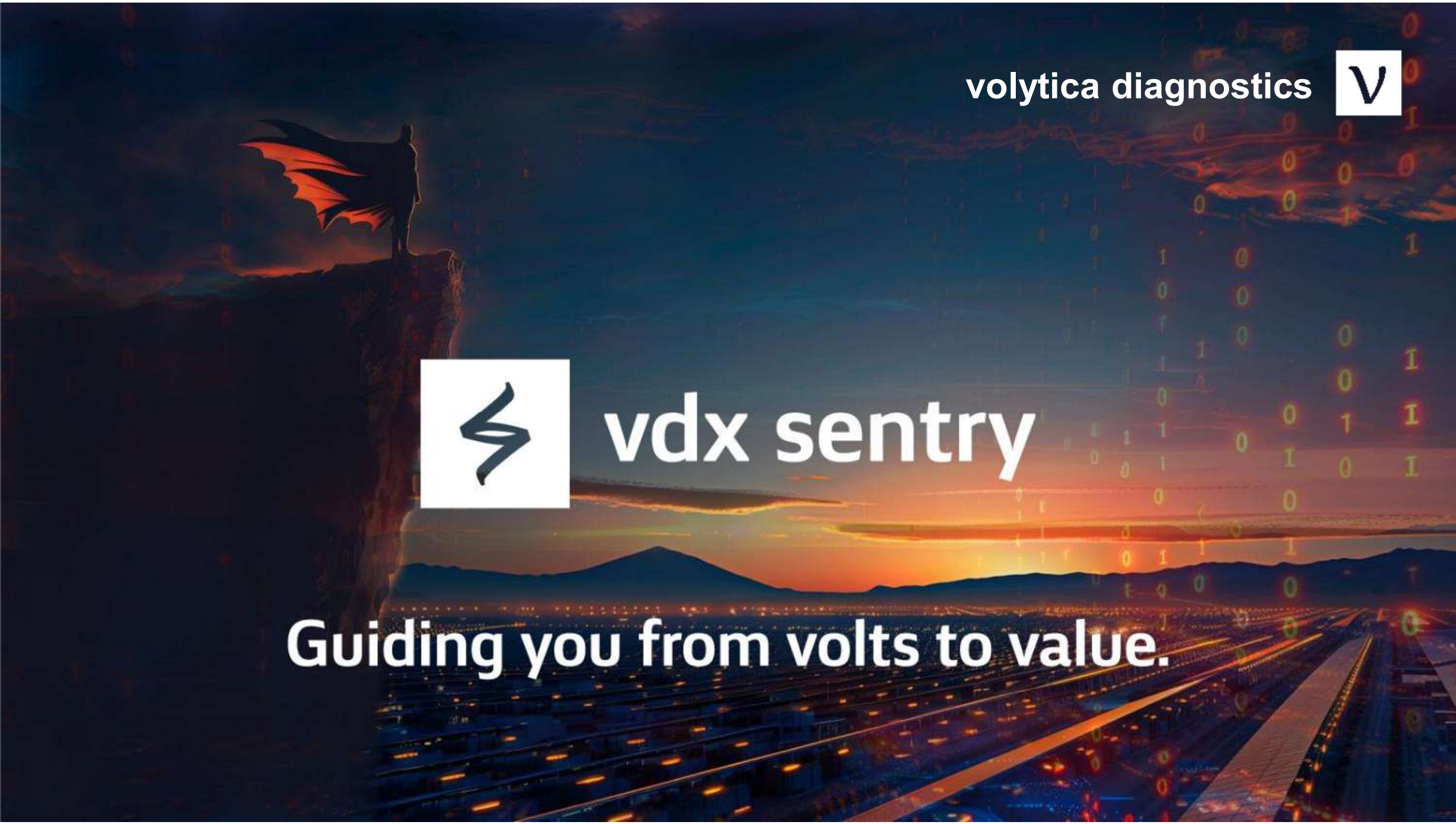

volytica diagnostics
vdx sentry
Guiding you from volts to value.

vdx sentry – E-Truck

Key Challenges of E-Truck Fleet Management

Rapid Industry Growth

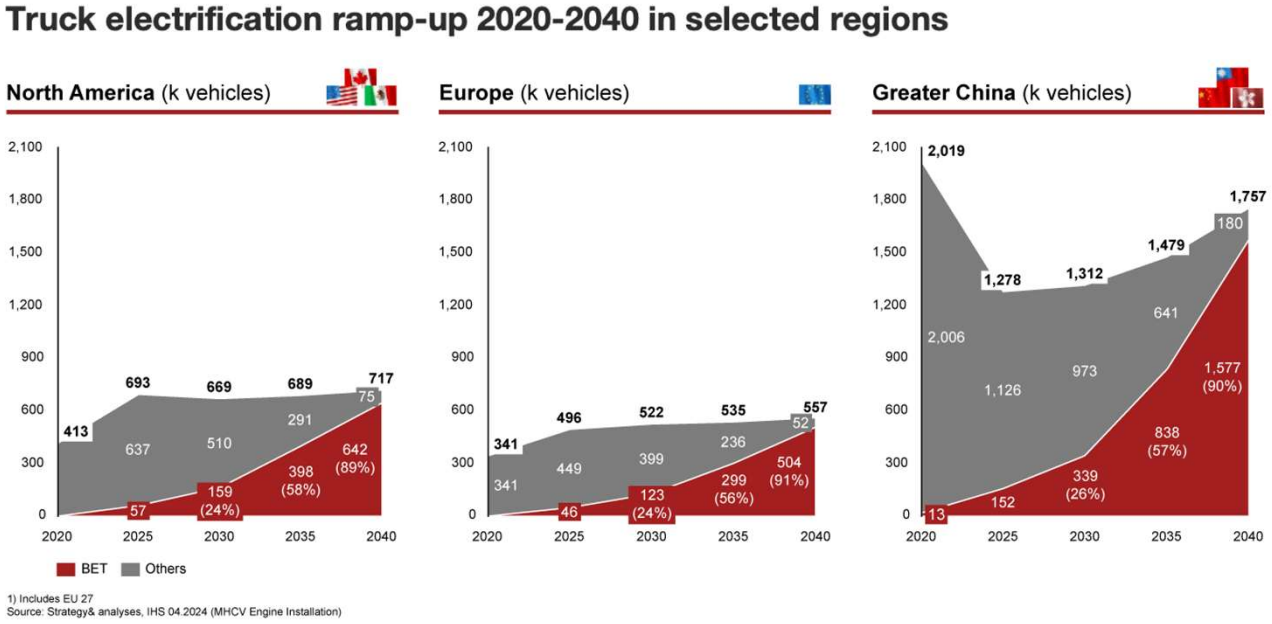
- Growing battery portfolios of large e-truck with diverse operational needs

Total Cost of Ownership (TCO) optimization

- higher upfront costs of e-trucks against long-term savings

Shortage of Experts

- **EU** Commission estimates 800,000 unfilled jobs along the battery value chain



Source: EV Markets Reports
September 2024

vdx sentry – E-Truck

Key Challenges of E-Truck Fleet Management

Safety Concerns

- Early failure detection & predictive maintenance with proactive monitoring.

Operational Complexity

- Need for keeping batteries safe and reliable in increasingly large and complex portfolios in terms of range, charging, and performance monitoring

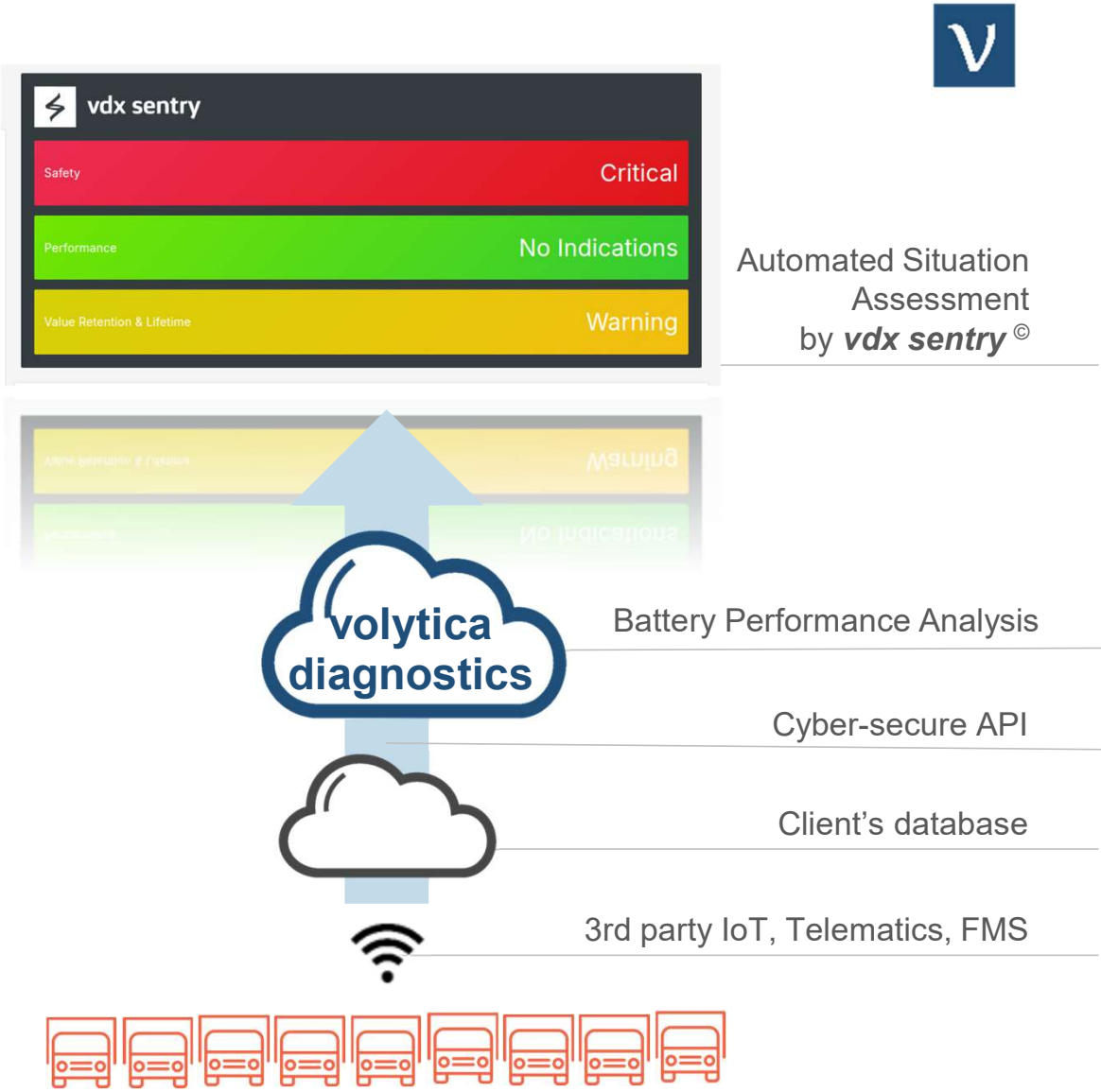
New software feature for battery monitoring

vdx sentry

vdx sentry – E-Truck

Our solution - the vdx sentry: Your Virtual Integrated Data Expert

- **Standard** sensor **data** (VDV238)
- **No additional sensors / hardware**
- **Key performance indicators -** generated trends and alerts by the **vdx engine** – pioneering technology, based on 10+ years of experience
- The **vdx sentry©** results: interpreted like human blood test results, incl. **Diagnosis, Criticality & Treatment**



vdx sentry – E-Truck

Battery Monitoring for the EV Fleet Industry: vdx sentry → Your Battery Data Analytics Expert

- List of Alerts
- KPIs and Indicators
- Asset History
- Cross-asset checks

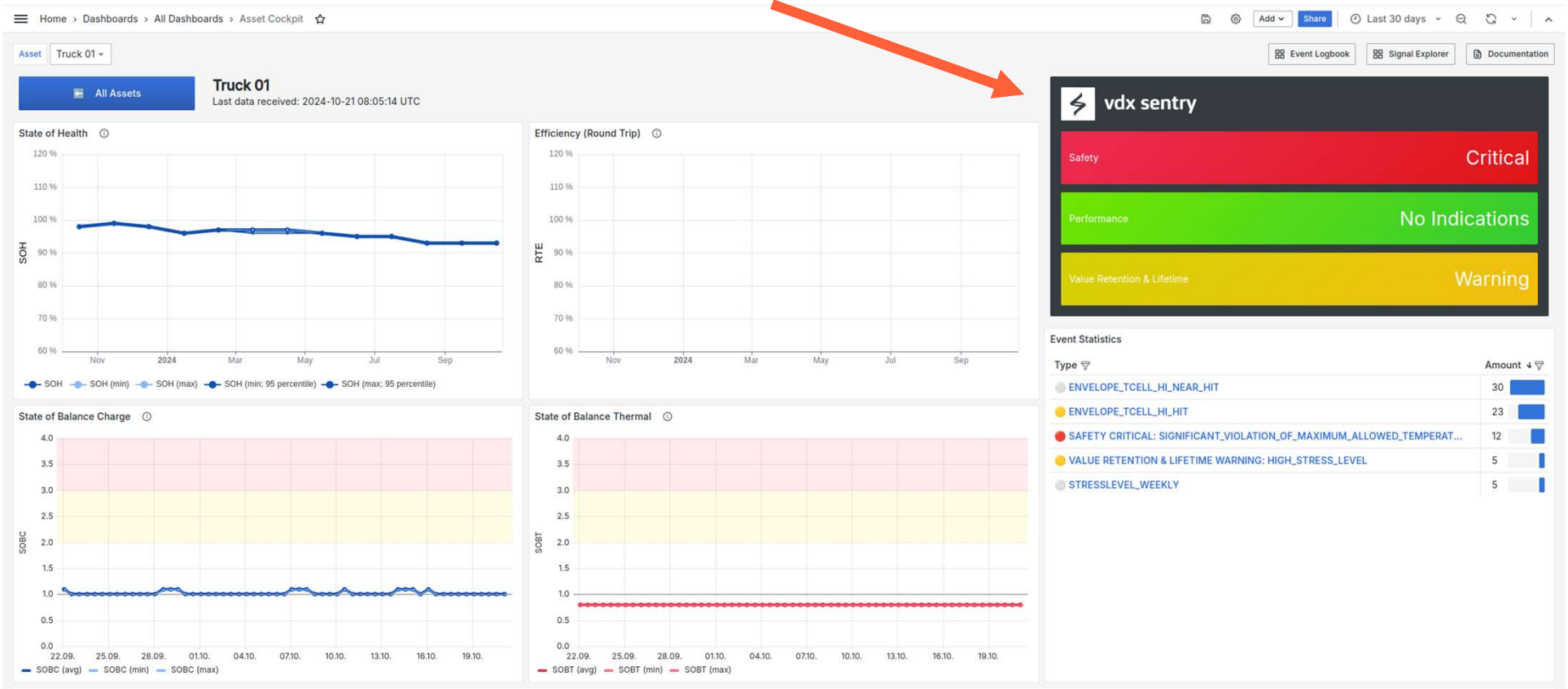
- Simple and Time Saving Diagnosis & Recommendations
- Risk of Performance Limitations
- Risk of Safety Risks
- Risk of Lifetime Issues

→ assigning the appropriate severity based on the circumstances to avoid:

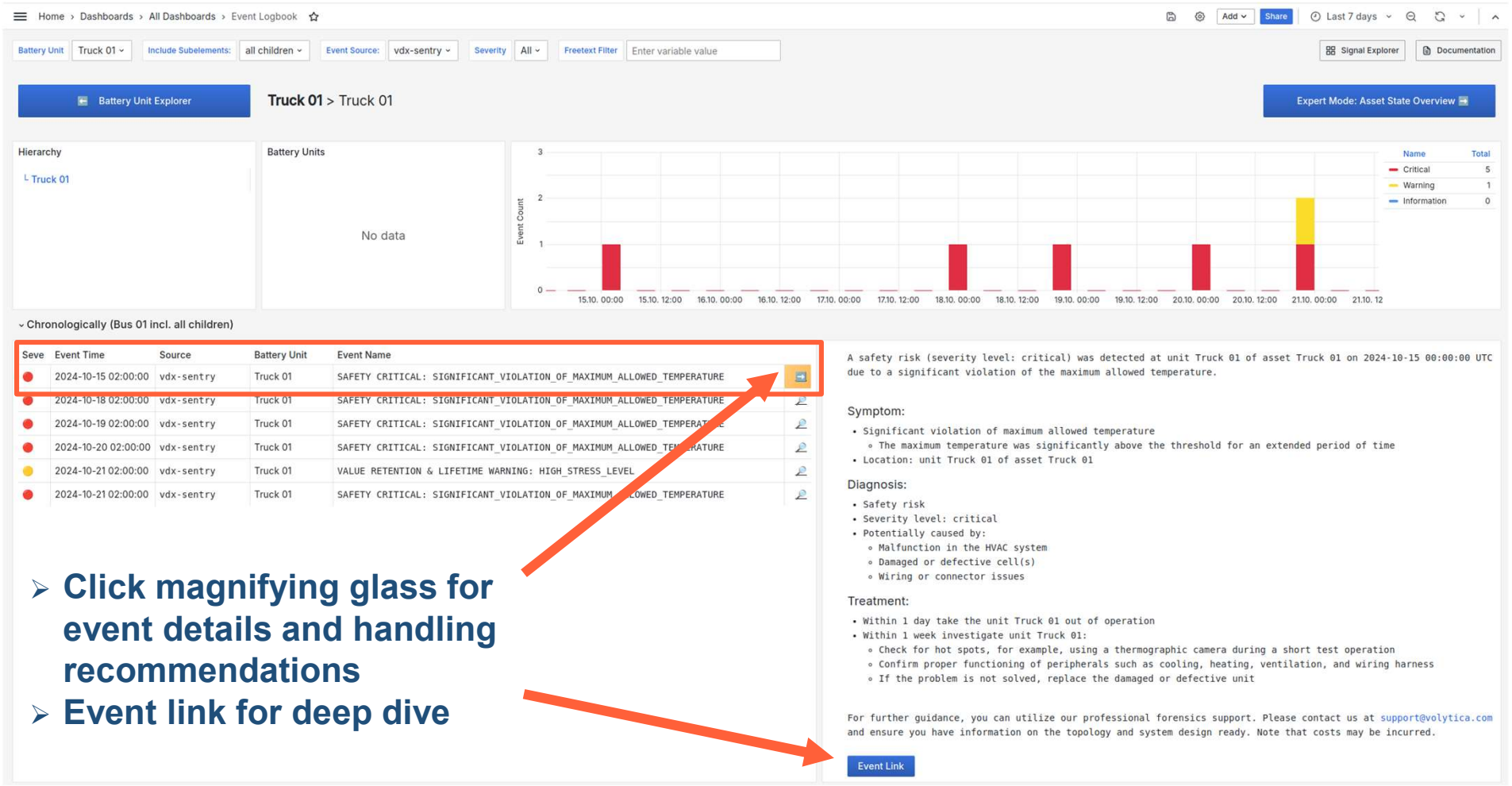
- ✓ Being flooded by alerts, and
- ✓ Missing out on issues

vdx Asset Cockpit: Screen View

➢ **vdx sentry messages are displayed prominently in the dashboard in the asset overview**



Battery Unit Explorer



- **Click magnifying glass for event details and handling recommendations**
- **Event link for deep dive**

Direct Handling Recommendations

➢ Zoom in for symptom, diagnosis & recommended treatment

A safety risk (severity level: critical) was detected at unit Truck 01 of asset Truck 01 on 2024-10-15 00:00:00 UTC due to a significant violation of the maximum allowed temperature.

Symptom:

- Significant violation of maximum allowed temperature
  - The maximum temperature was significantly above the threshold for an extended period of time
- Location: unit Truck 01 of asset Truck 01

Diagnosis:

- Safety risk
- Severity level: critical
- Potentially caused by:
  - Malfunction in the HVAC system
  - Damaged or defective cell(s)
  - Wiring or connector issues

Treatment:

- Within 1 day take the unit Truck 01 out of operation
- Within 1 week investigate unit Truck 01:
  - Check for hot spots, for example, using a thermographic camera during a short test operation
  - Confirm proper functioning of peripherals such as cooling, heating, ventilation, and wiring harness
  - If the problem is not solved, replace the damaged or defective unit

For further guidance, you can utilize our professional forensics support. Please contact us at support@volytica.com and ensure you have information on the topology and system design ready. Note that costs may be incurred.

Event Link

vdx sentry Report

- **Easy battery data access**
- **Battery analytics available via dashboard & reports**


volytica diagnostics

Battery Analytics
Battery Diagnostics
Continuous Battery Monitoring

vdx sentry
by volytica diagnostics

Guiding you from volts to value.

A critical performance risk was detected.

Risk type: PERFORMANCE
Severity: Critical
Asset:
Unit:
Detection time (range): 2024-07-23 00:00:00 UTC - 2024-07-23 00:10:00 UTC

Treatment

- Avoid operating at high or low SOC, as this increases t
- To resolve the issue:
  - Rule out sensor and data issues to avoid misinterp
    - Check and rectify potential malfunctions of th breakdown, connection loss, broken cable, ...)
  - Check and, if necessary, adjust the BMS settings
    - A reset the BMS might be required
  - Check and rectify potential malfunctions of the t
  - Initiate a balancing sequence
- Further overcharging despite these measures is a s
  - The affected cell(s) should be replaced to avoi

Investigate Now!

Sentry events within the last 4 w

- SAFETY CRITICAL: SEVERE_OVERCHARGING
- SAFETY CRITICAL: SEVERE_OVERCHARGING
- SAFETY CRITICAL: SEVERE_DEEP_DISCHARG

Symptoms

- Significant violation of the upper safety threshold for the cell voltage (overcharging) detected (Investigate in Signal Explorer)
- Disbalanced battery detected (Investigate in Battery Unit Explorer)
- SOC during overcharging was 76 % (Investigate in Signal Explorer)
- Note: Historical and other contextual evidence is also taken into account for battery diagnosis. As these are not directly linked to individual events, they are not listed here

Impact

- Short term: Risk that operation is unexpectedly interrupted and cannot be continued,
  - because the BMS detects that safety-critical thresholds are exceeded
  - because the available capacity is exhausted (SOC inconsistency)
- Long term: Cell damage caused by overcharging can lead to reduced performance in the long term (reduced capacity, reduced fast charging capability, lower efficiency)

Diagnosis

- Under normal circumstances, the BMS should provide the correct SOC, keep the battery within safe operating limits and ensure cell balancing
- Malfunction is potentially caused by:
  - Faulty voltage sensor
  - Erroneous balancing circuit (software or hardware)
  - Faulty BMS configuration
    - SOC estimation error
    - Incorrect voltage thresholds
  - Damaged or defective cell(s)
    - causing inconsistent SOC readings
    - preventing proper balancing
    - e.g. significant differences in capacity or resistance between the cells

Need Support?

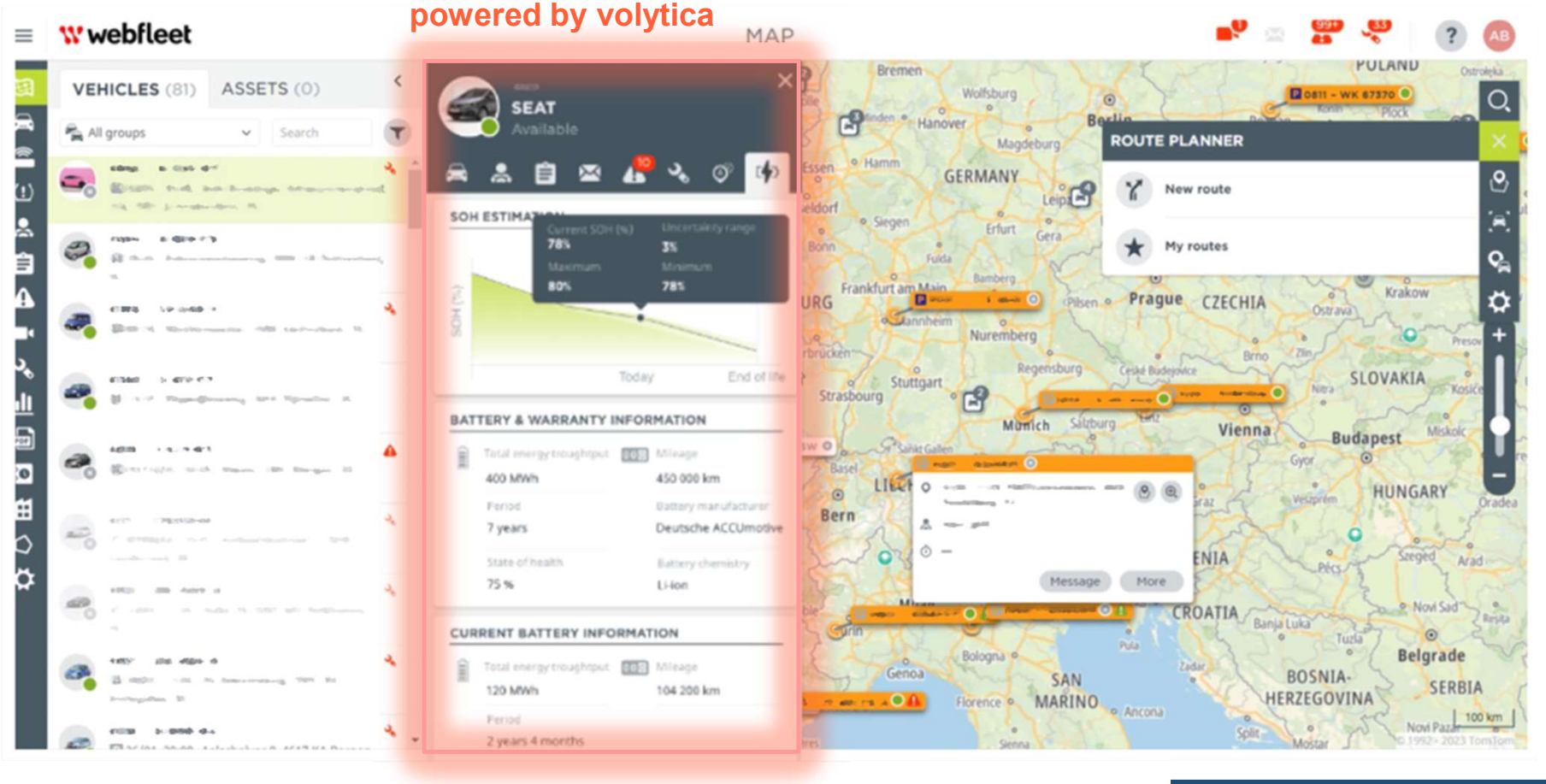
For further guidance, you can utiliz
Please contact us at support@volyt
topology and system design ready

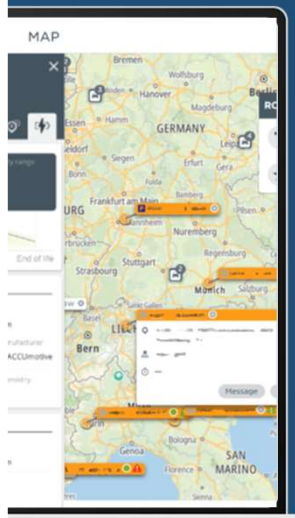
volytica diagnostics GmbH
Theresienstrasse 18, 01097 Dresden, Germ

volytica diagnostics GmbH www.volytica.com @volytica /volytica diagnostics

vdx sentry – E-Truck

Example of Software Integration in a Fleet Management System (here: car)





BRIDGESTONE

Fleet Management System

From Volts to Value

Increase Revenue

Optimal battery performance maximizes asset availability.

Maximize Safety

Early failure detection with proactive monitoring.

Ensure Value Retention

Extend battery lifetime for sustainable operations.

volytica diagnostics

Who are we?

Company Overview

volytica diagnostics

We have more than 10 years of practical experience with applied battery diagnostics across industries.

2012 — **First European E-Busses Monitored**
volytica's predecessor research group at Fraunhofer monitored some of the first e-busses in Europe (link, link)

Fraunhofer IVI

2017 — **Launch of First Battery Monitoring Platform**
IVImon, the first version of today's *vdx engine,* is launched into pre-commercial operation by Fraunhofer IVI

2019 — **Spinoff from the Fraunhofer Gesellschaft**
For further growth and industrialization, volytica is spun out of Fraunhofer Society as a independent company

2021 — **First Large-scale Stationary Battery System**
Successful onboarding of the first multi-megawatt power plant (BESS) in the U.S.

2024 — **>1 GWh of battery monitored globally**
With more than 30 experts in Dresden and all over Europe, we are one of Europe's leading battery diagnostics companies

volytica diagnostics

More than 30 battery experts at your disposal

Sebastian Stoll
CTO, Dipl.-Inf.

14 years of Experience in Scalable Cloud Platform & Data Pipeline Development

Claudius Jehle
CEO, Dipl.-Ing.

10 years of Experience in Battery Diagnostics, System Modelling, Founding & Management

Nicole Mattes
Head of Administration & Finance

13 years of Experience in Administration, Finance, HR, Controlling, Internal Sales

Lutz Morawietz
Head of Battery Diagnostics, Dipl.-Ing.

17 years of Experience in Battery Testing & Experiments, Algorithm Development and R&D

>30% Female
>9 Nationalities

+ more than 30 experts

with a Battery, Data Science, AI, Cloud Platform Development and Product Background

Trusted Partners and Clients across industries

EUROPEAN BATTERY ALLIANCE EBA250

SINO VOLTAICS

eit InnoEnergy Knowledge Innovation Community

enel

Fraunhofer

enel x

Battery Pass

EnBW New Ventures

cro forum

BVES Energie-Speicher-Systeme

Gantner

CarMedialab a init company

BRIDGESTONE

Newcastle University

TECHNISCHE UNIVERSITÄT DRESDEN

FRAMO

Paul Christensen LITHIUM ION SAFETY

UNIVERSITÄT DUISBURG ESSEN

HTW Hochschule für Technik und Wirtschaft Dresden University of Applied Sciences

Lancaster University

MAHLE

BVG

Forum für Verkehr und Logistik

TÜV NORD

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