

# AKKURATE<sup>+</sup>

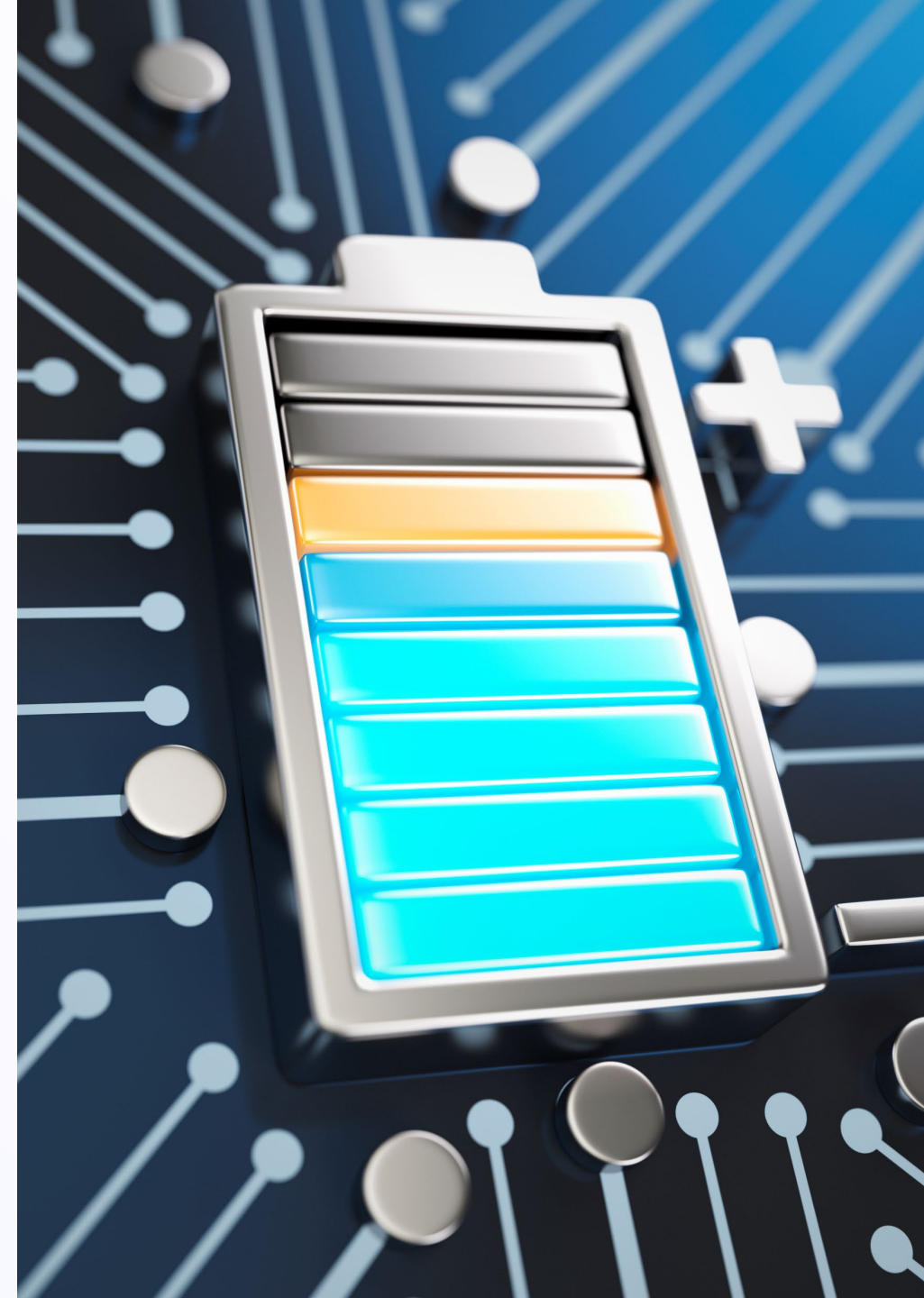
WHEN EVERY *ion* COUNTS

Webinar - Advancing smart use of batteries  
DIGITALIZATION OF BATTERY DIAGNOSTICS  
Mika Kanninen  
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# WHAT IS BATTERY DIAGNOSTICS?

RANGE OF METHODS AND PROCEDURES  
FOR DETERMINING  
BATTERY SAFETY AND PERFORMANCE





## TRADITIONAL WAY - LAB ENVIRONMENT

### PURPOSE

- ✦ Material research
- ✦ Product development
- ✦ Battery production Quality monitoring
- ✦ Root cause analysis

### METHOD

- ✦ Sample based
- ✦ Dedicated battery testers

### PROS

- ✦ High quality measurements & data
- ✦ Highly adjustable test parameters
- ✦ Controlled environment

### CONS

- ✦ Limited amount of samples
- ✦ Large investment
- ✦ Not scalable
- ✦ Limited understanding of field performance
- ✦ Transportation of samples



## BATTERY MANAGEMENT SYSTEM (BMS)

### BMS

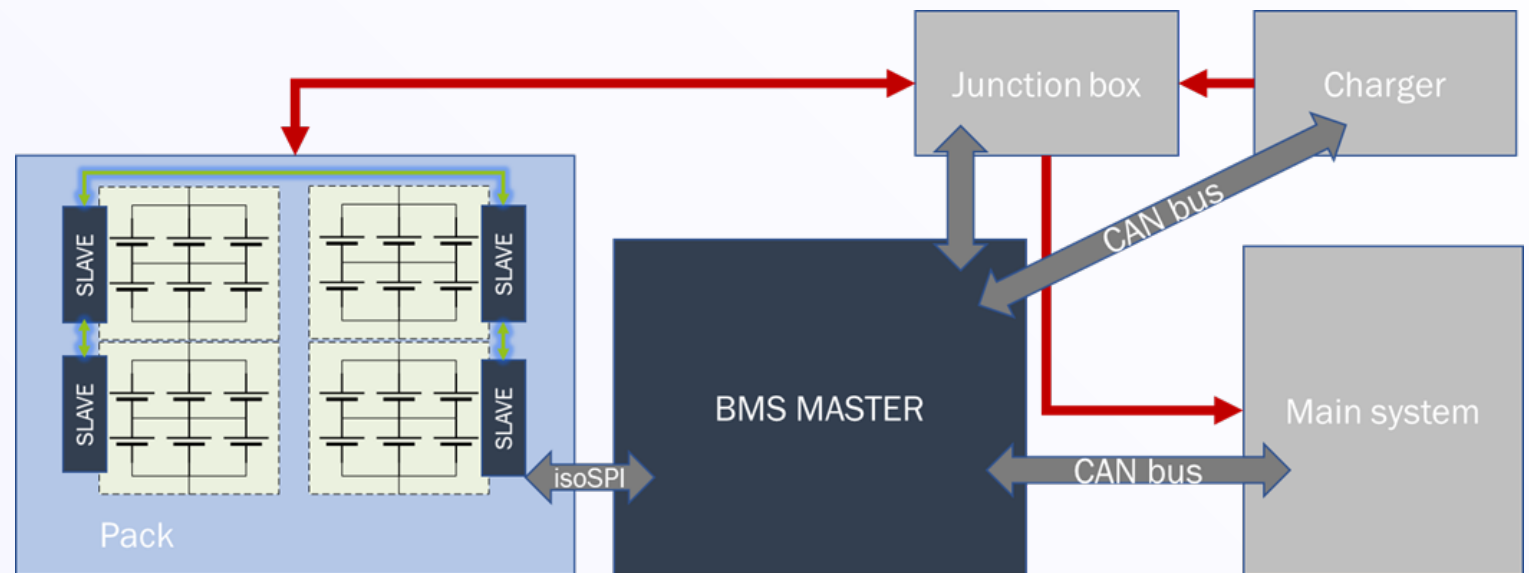
✦ Integrated in the battery

✦ Operates locally

Monitoring

Balancing

Protection against obvious faults



## BATTERY DIGITALIZATION

### CONNECTED BATTERIES

- ✦ Batteries in the field
- ✦ Connect batteries to the internet
- ✦ BMS data to the cloud

### DIGITAL BATTERY CONFIGURATION

- ✦ One-to-one with physical battery

### BATTERY MODELS

- ✦ Simulates battery behavior
- ✦ Various types
- ✦ Utilization of AI/ML



## BATTERY DIGITALIZATION

### DIAGNOSTICS

- ✦ Individual battery usage
- ✦ Individual battery performance
- ✦ Difference between individual batteries
- ✦ Anomalies
- ✦ Trends

### PROGNOSTICS

- ✦ Provides estimates
  - Remaining life of the battery
  - Residual value
  - Material flow

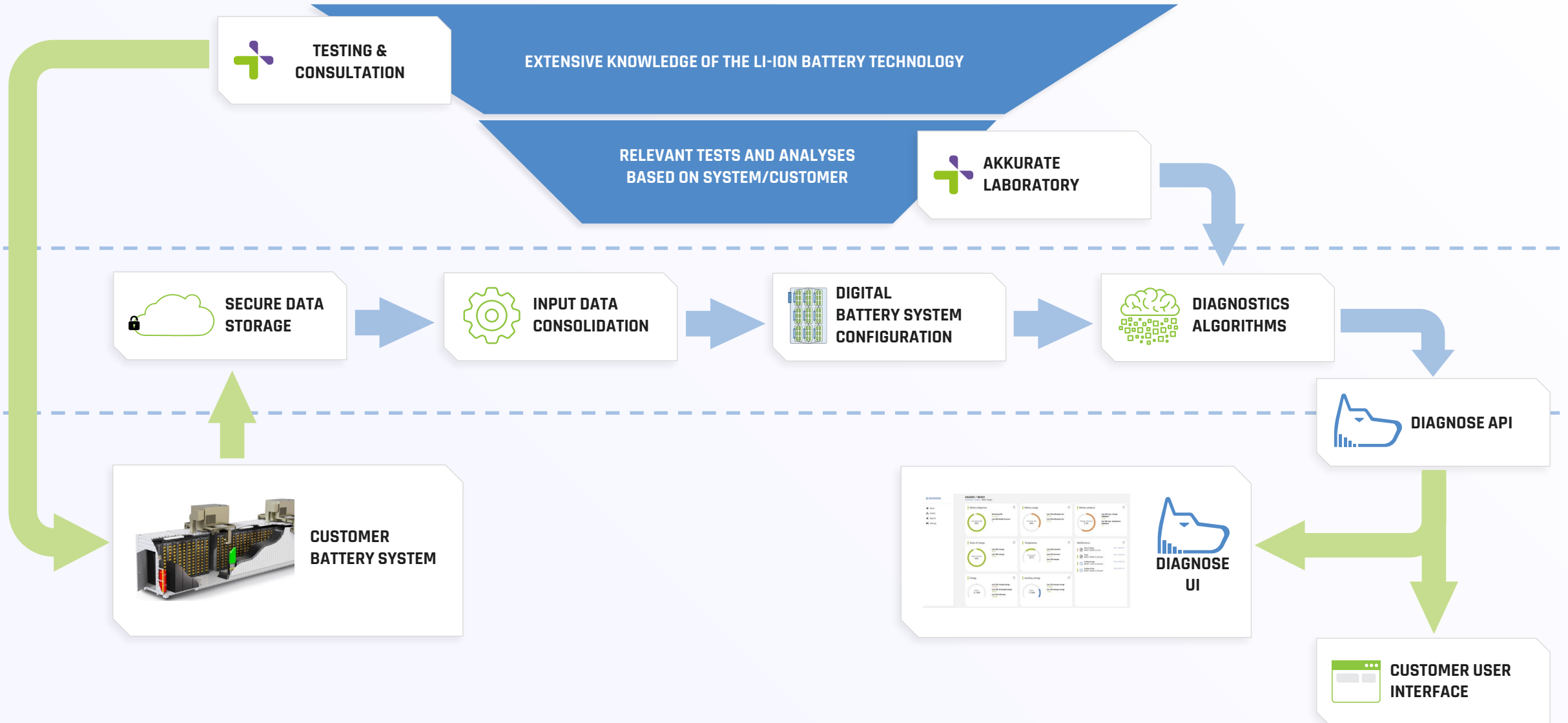
### PROS

- ✦ Possible to cover the whole battery population
- ✦ Enabling cost saving
- ✦ Enabling longer battery life
- ✦ Enabling valuable statistics
- ✦ Enabling new businesses
- ✦ Done remotely
- ✦ Scalable
- ✦ Supports circular economy
- ✦ Supports various players in value chain

### CONS

- ✦ Data quality
- ✦ Amount of data
- ✦ Availability of data

# AKKURATE DIAGNOSE & SUPPLEMENTARY SERVICES



THANK YOU !

AKKURATE<sup>+</sup>

WHEN EVERY *ion* COUNTS

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