

MAKING YOUR DIGITAL STRATEGY WORK FOR YOU

BOSCH SOFTWARE INNOVATIONS
APRIL 3, 2017



SAS Global Forum 2017

Bosch Software Innovations



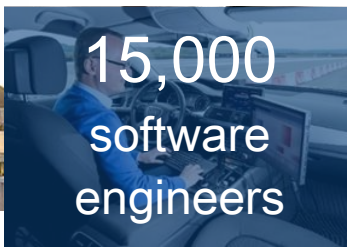
Matthew Jennings
Regional President
Bosch Software Innovations



Corey Plender
CTO
Bosch Software Innovations

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Overview



Overview



Energy & Building Technology

Leading manufacturer of security, safety, and communications solutions as well as thermotechnology



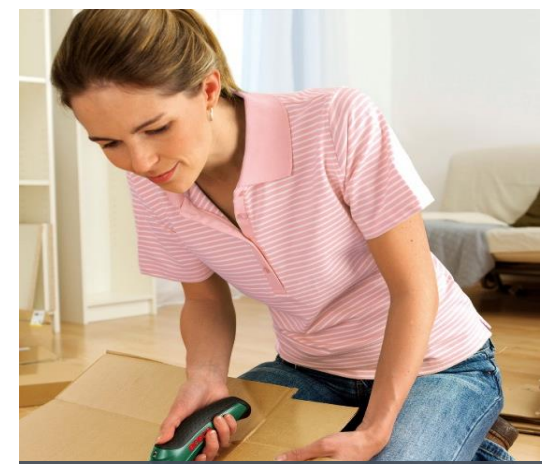
Mobility Solutions

One of the world's largest suppliers of cutting-edge automotive technology



Industrial Technology

Leading in drive and control technology, packaging, and process technology



Consumer Goods

World's largest power tool manufacturer and leading manufacturer in household appliances

Bosch Software Innovations

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Overview



1,000,000

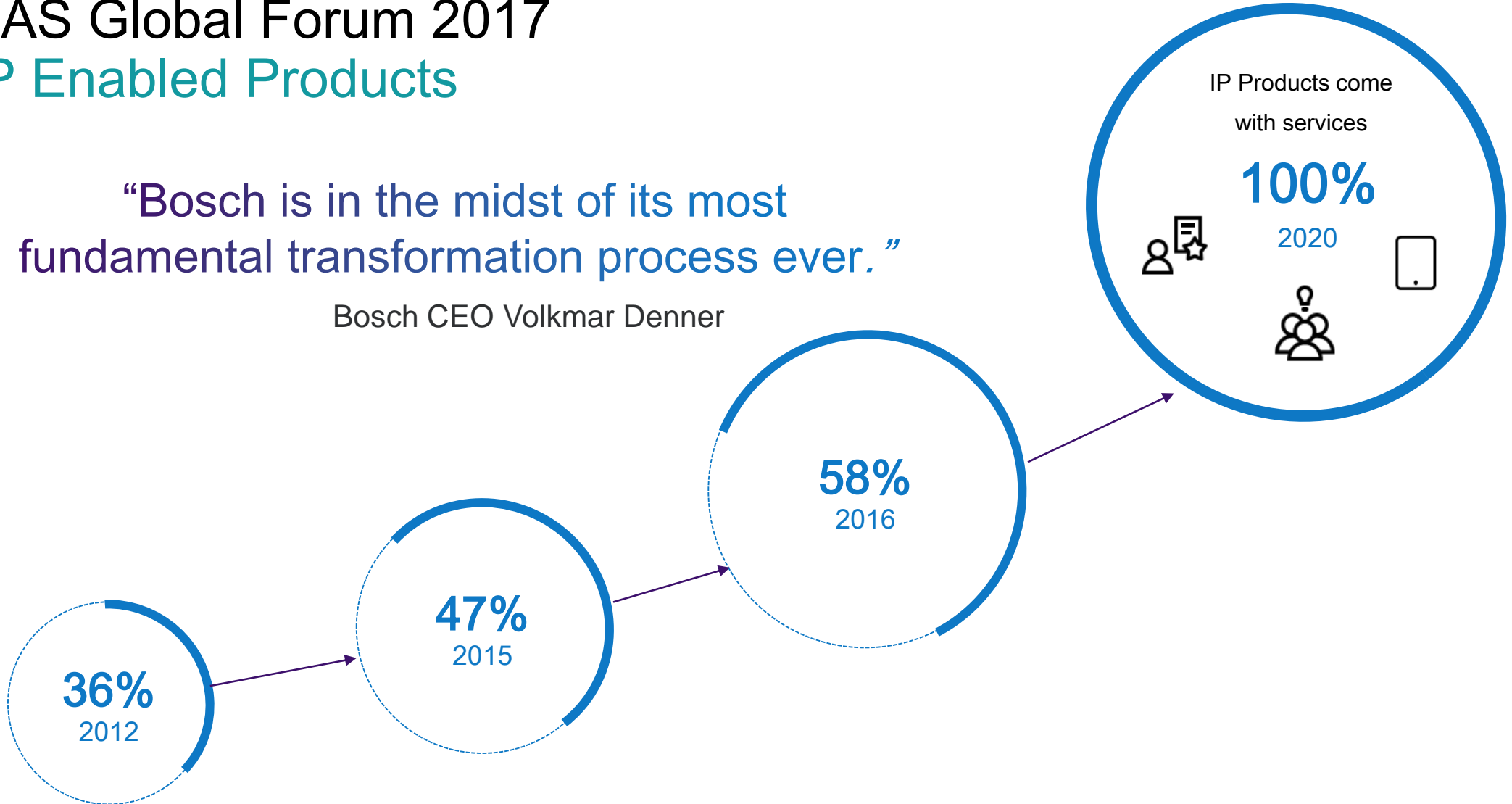
number of things produced
by Bosch (per day)

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IP Enabled Products

“Bosch is in the midst of its most fundamental transformation process ever.”

Bosch CEO Volkmar Denner



*“Eventually everything connects –
people, ideas, objects.”*

Charles Eames, Designer & Architect

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Global Focus on IoT

Chicago

Product Development
Sales & Marketing
Support Services
SaaS Delivery

Berlin

Corporate
Sales & Marketing
Product Development
Professional Services

Waiblingen

Sales
System Technology
Systems Projects
Professional Services
Product Development

Shanghai

Sales
Services

Immenstaad

Corporate
Sales & Marketing
Professional Services
Product Development

Singapore

Sales & Marketing
Professional Services
Product Development
Systems Projects

Melbourne

Sales
Services

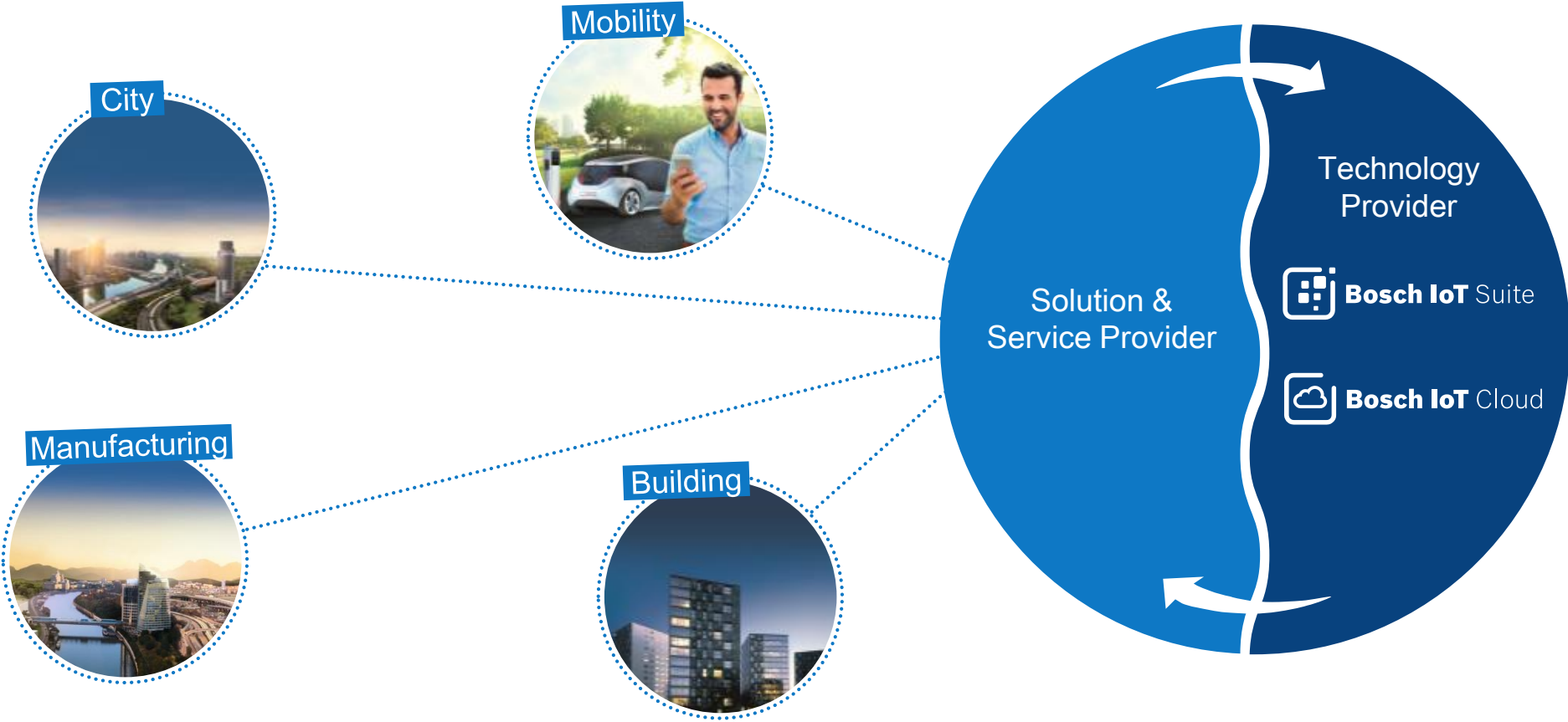
Overview

- Software platform, products and services for the Internet-of-Things
- Experience ranges from embedded electronics to complex systems
- Bosch Group Expertise



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Leading IoT competence, technology, solutions, and services



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Leading companies into a connected world

Market presence

5.1m

connected devices using
Bosch IoT Suite and ProSyst

Know-how

700+

IoT experts around the world

Projects in many business areas

150+

IoT international projects in the areas of manufacturing,
mobility, energy, home & building, city, agriculture ...

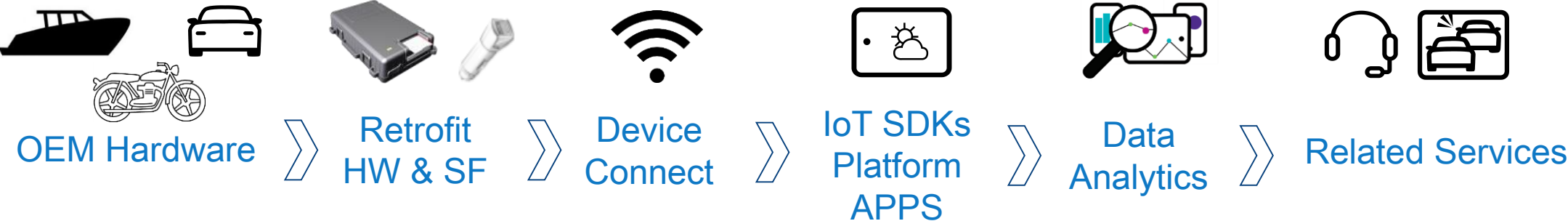
Bosch early IoT visionary

2008

Bosch Software Innovations emerged out of the two
earliest acquisitions in the IoT space

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IoT End-to-End Solutions

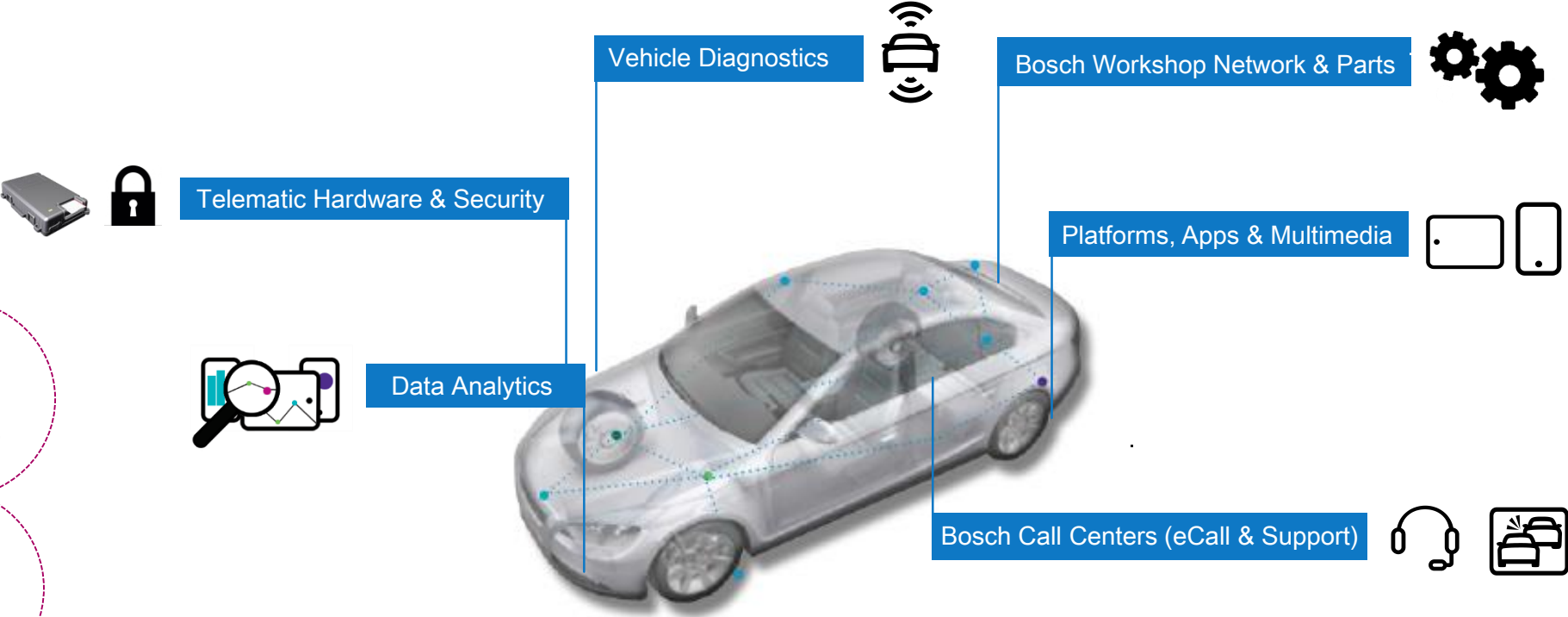
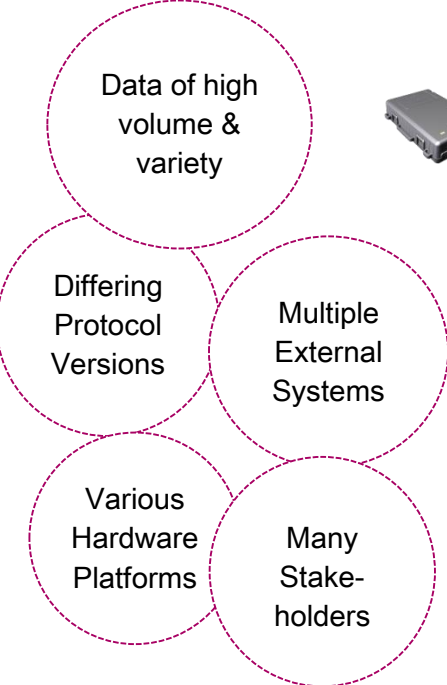


 **Bosch IoT Suite**

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Connected Mobility Example

Complexities

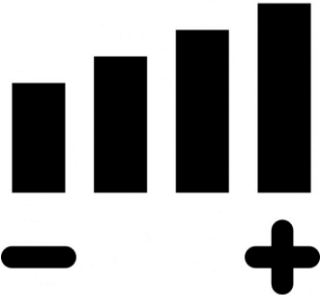


“The Big Data Problem....when the size of the data itself becomes part of the problem.”

Mike Loukides. O'Reilly Radar

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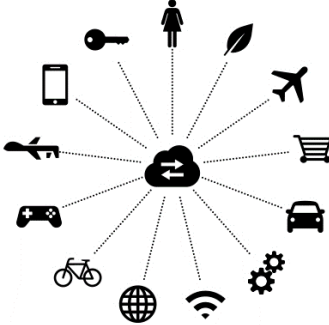
Four V's of Data Complexity



Volume



Velocity



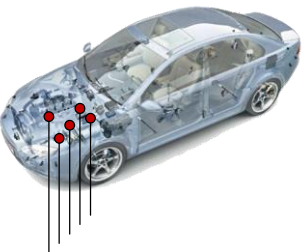
Variety



Veracity

sFDE Concept Overview

Overcome challenges in (automotive) data complexity



Data Collection



Data Ingestion
Processing & Storage



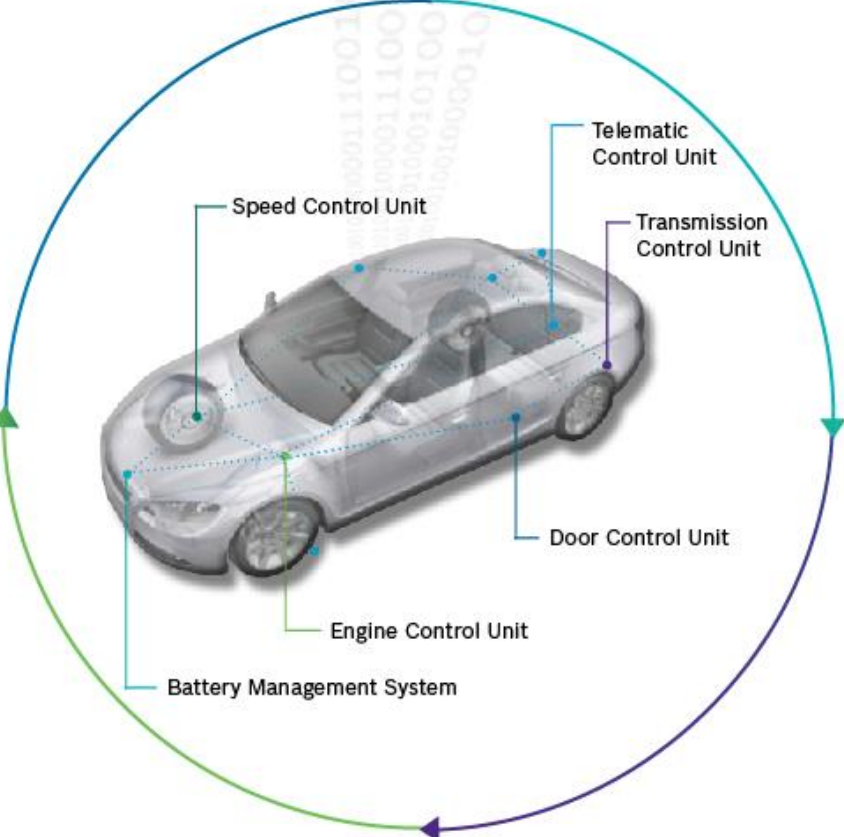
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011101010110010
011001010010011
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001001010100
1110001000100
0110000101011
000010000010011
111011101001011
    
```

Analysis & Analytics



Analytics
Enablement &
Execution
Data Insight



Data Collection
Read raw ECU data

Normalization
& Enrichment
Data Cleansing and
Preparation

Exploration
& Visualization
Data Clustering

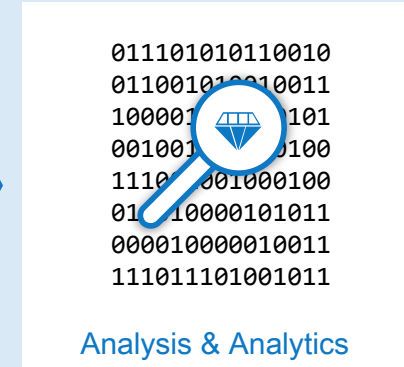
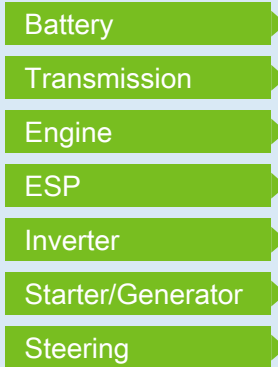
sFDE – Structured Field Data Exploration

Overview: Automotive Example

sFDE in one Picture

Bosch Cloud

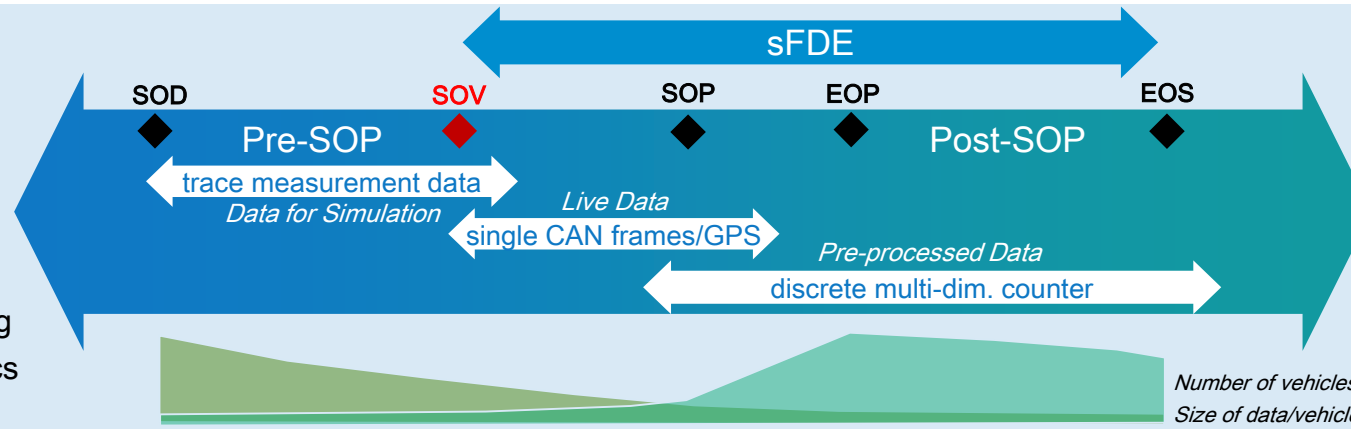
- ▶ Data Ingestion for ALL ECUs
- ▶ Data Provider for Projects / Products



sFDE in the Vehicle Product Lifecycle

Use Case

- ▶ Wide Field of Data Processing
- ▶ Remote Monitoring & Analytics

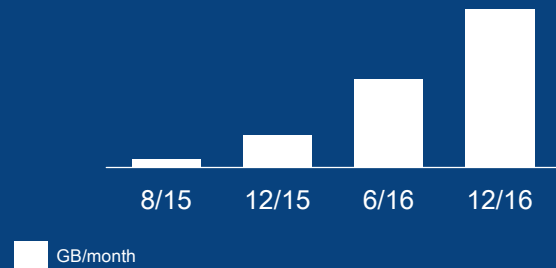


SOD Start of Development
SOV Start of Validation (pre-production cars)
SOP Start of Production
EOP End of Production
EOS End of Support

Bosch – sFDE

The Challenges

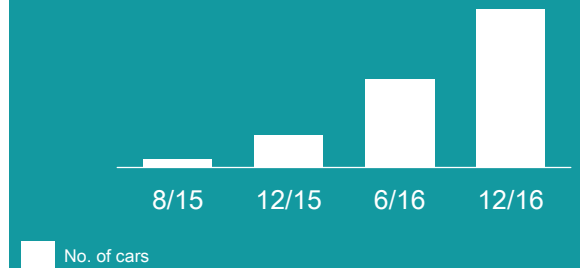
DATA GROWTH



SERVER LOCATION



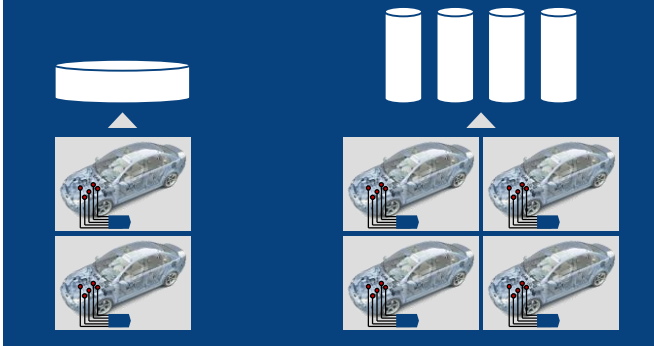
CONNECTED CARS



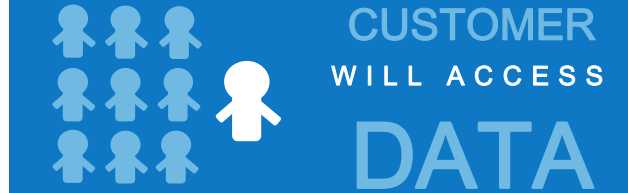
CONNECTIVITY



Pre / Post Start of Production



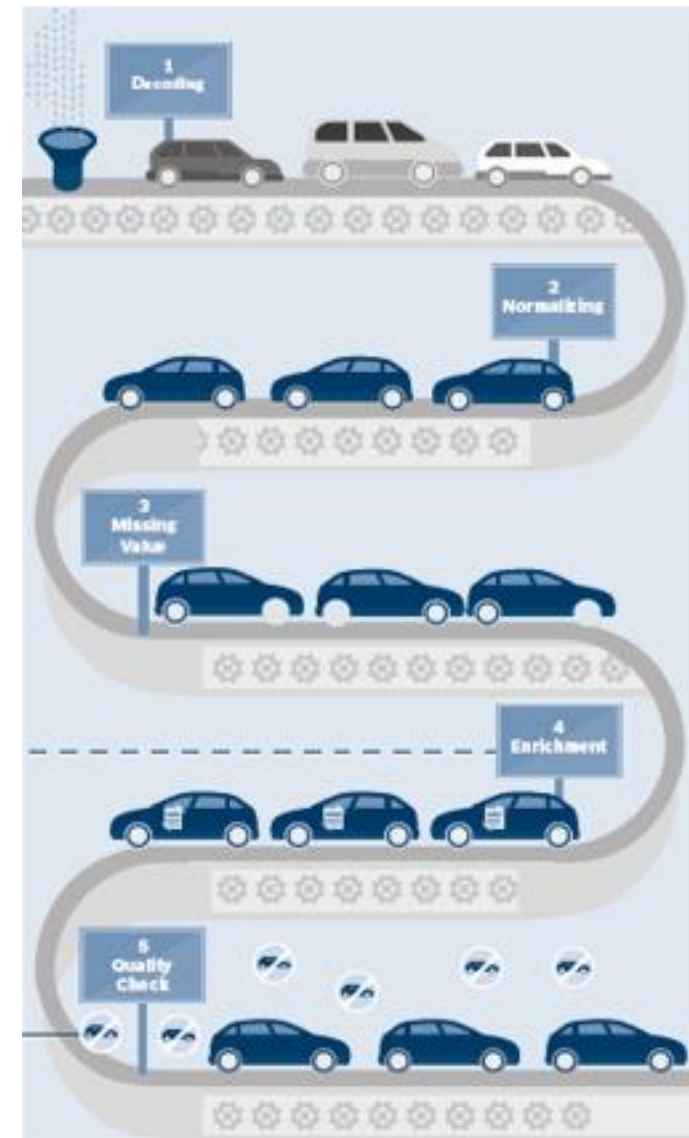
DATA ACCESS



sFDE

Value Creation

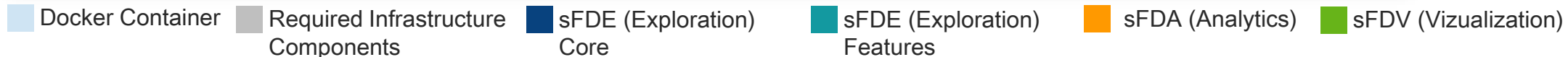
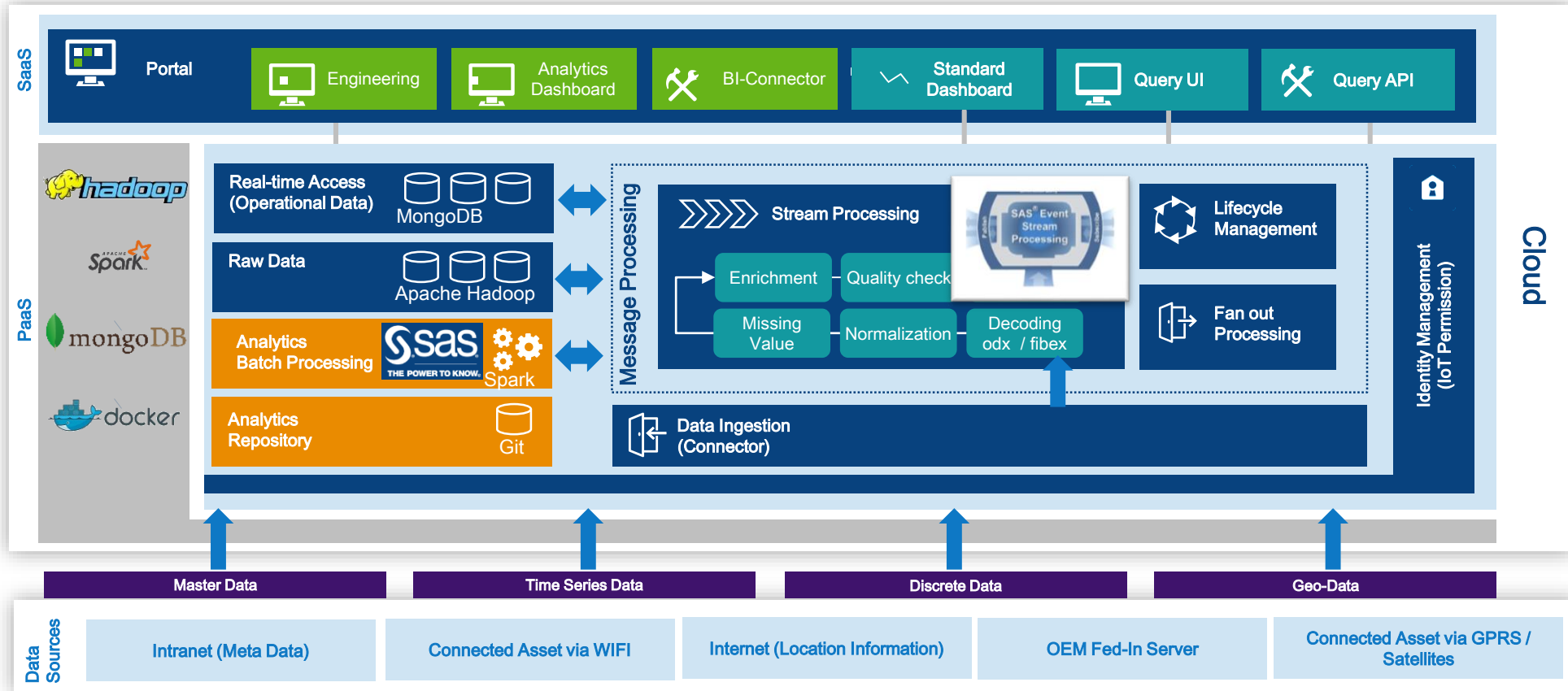
- ▶ Decode protocols from industry specific binary formats into processable formats. E.g. ODX and FIBEX
- ▶ Normalize data into a common representation. E.g. Miles vs. km
- ▶ Manage missing values and gaps that can occur in data streams
- ▶ Enrich the data by combining additional and external complex data sets. E.g. weather or traffic information
- ▶ Validate data quality to assure that the data stored is correct. E.g. duplicate detection and missing data



sFDE Data Ingestion

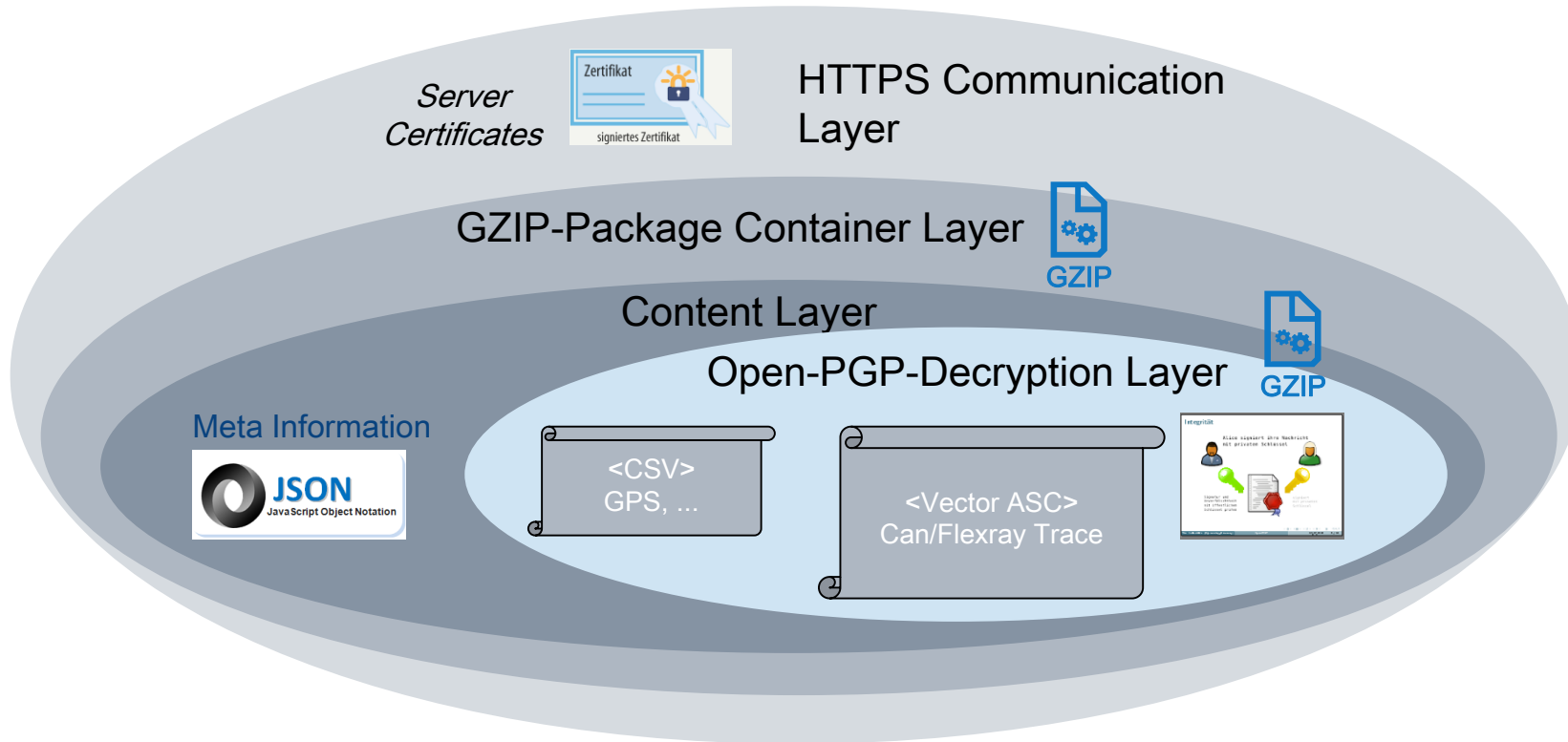
sFDE

Building Blocks - Offer Overview – Data Ingestion



sFDE

Secure Communication Layers with external ECU's

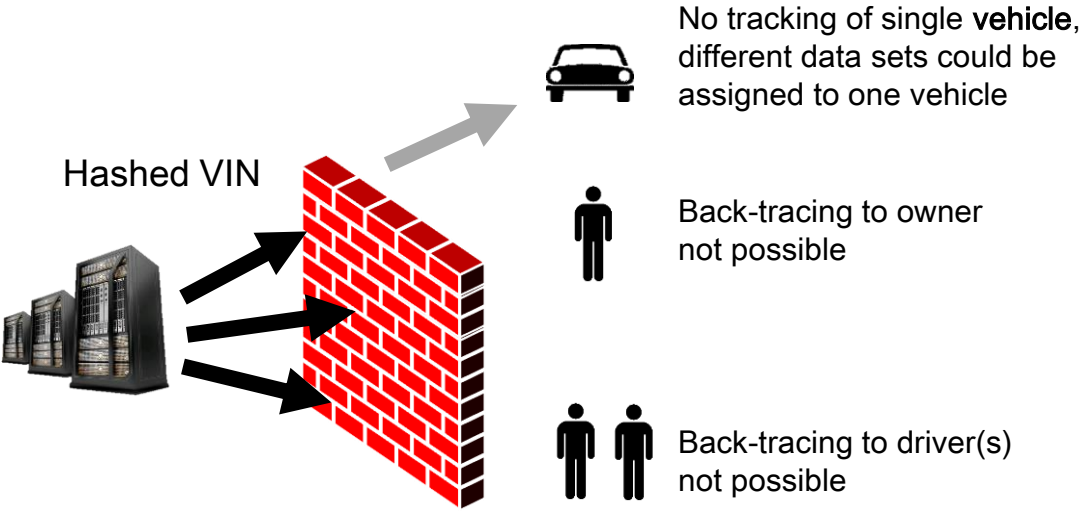
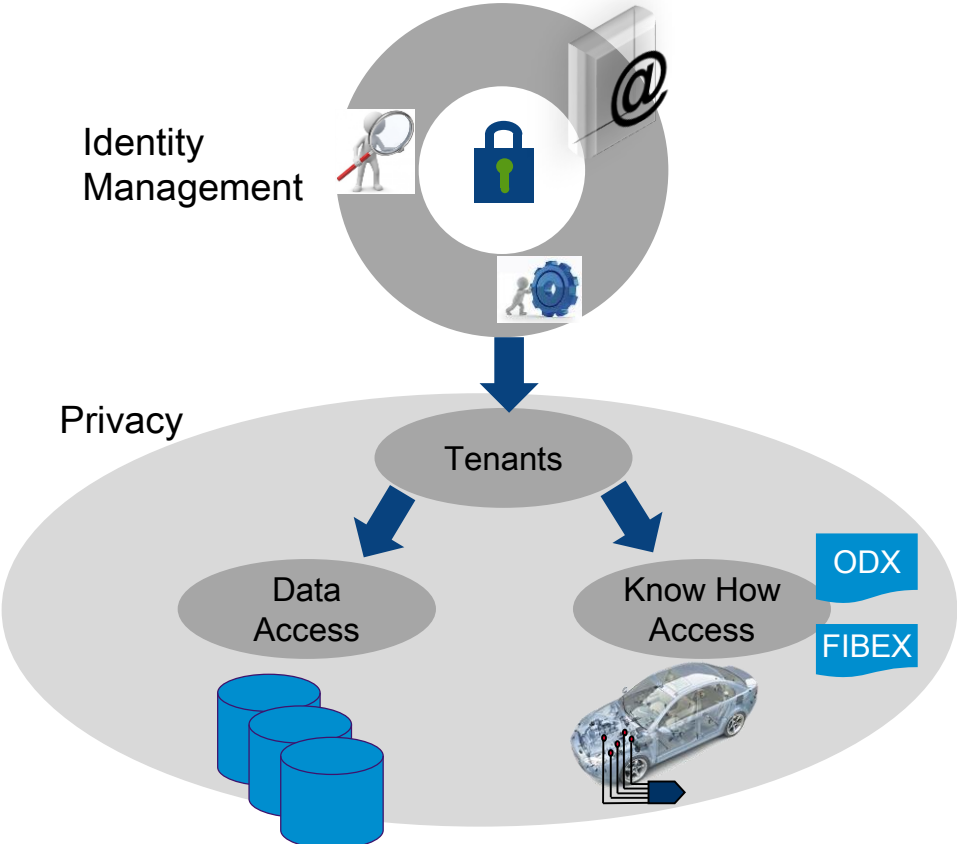


- ▶ Security Summary
 - Secured by HTTPS
 - Authentication by Server Certificate and Token (e.g. JWT or basic auth)
 - Additional content decryption by PGP

- ▶ Content Summary
 - Meta
 - GPS
 - Fibex-Based
 - CAN-Trace
 - Flexray-Trace
 - ODX-Based
 - CAN-Histogram

sFDE

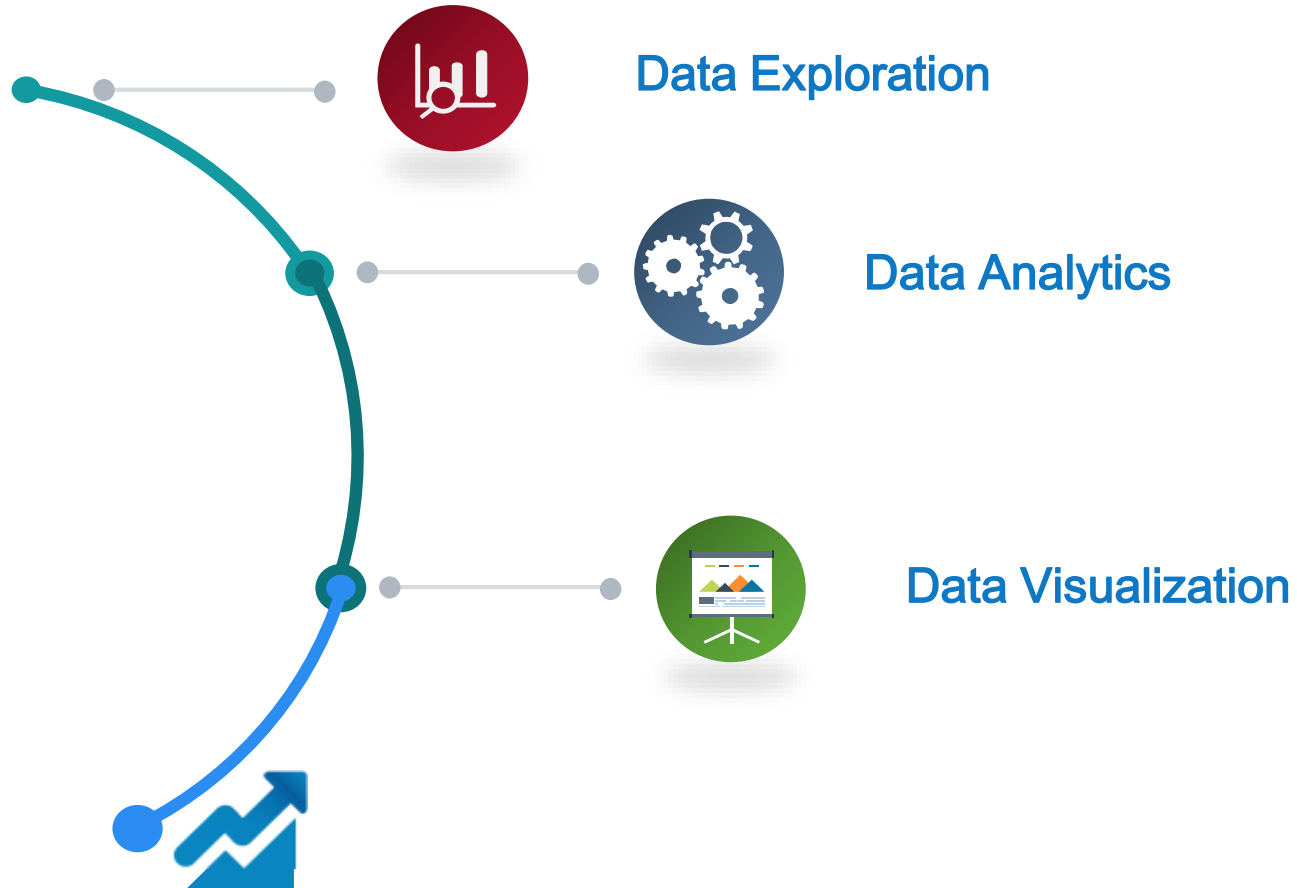
Security & Privacy



sFDE Data Analytics

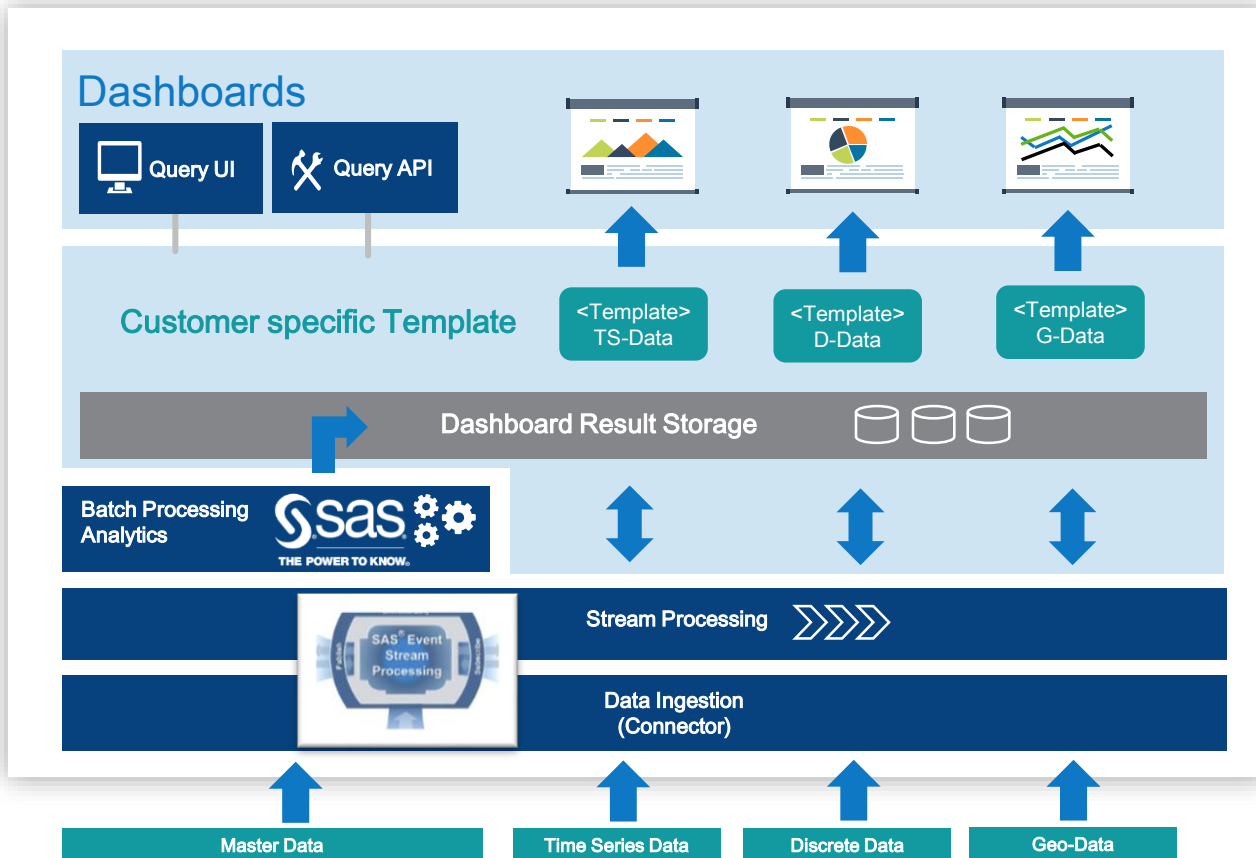
sFDE

Three Steps to bring value into the data



sFDE

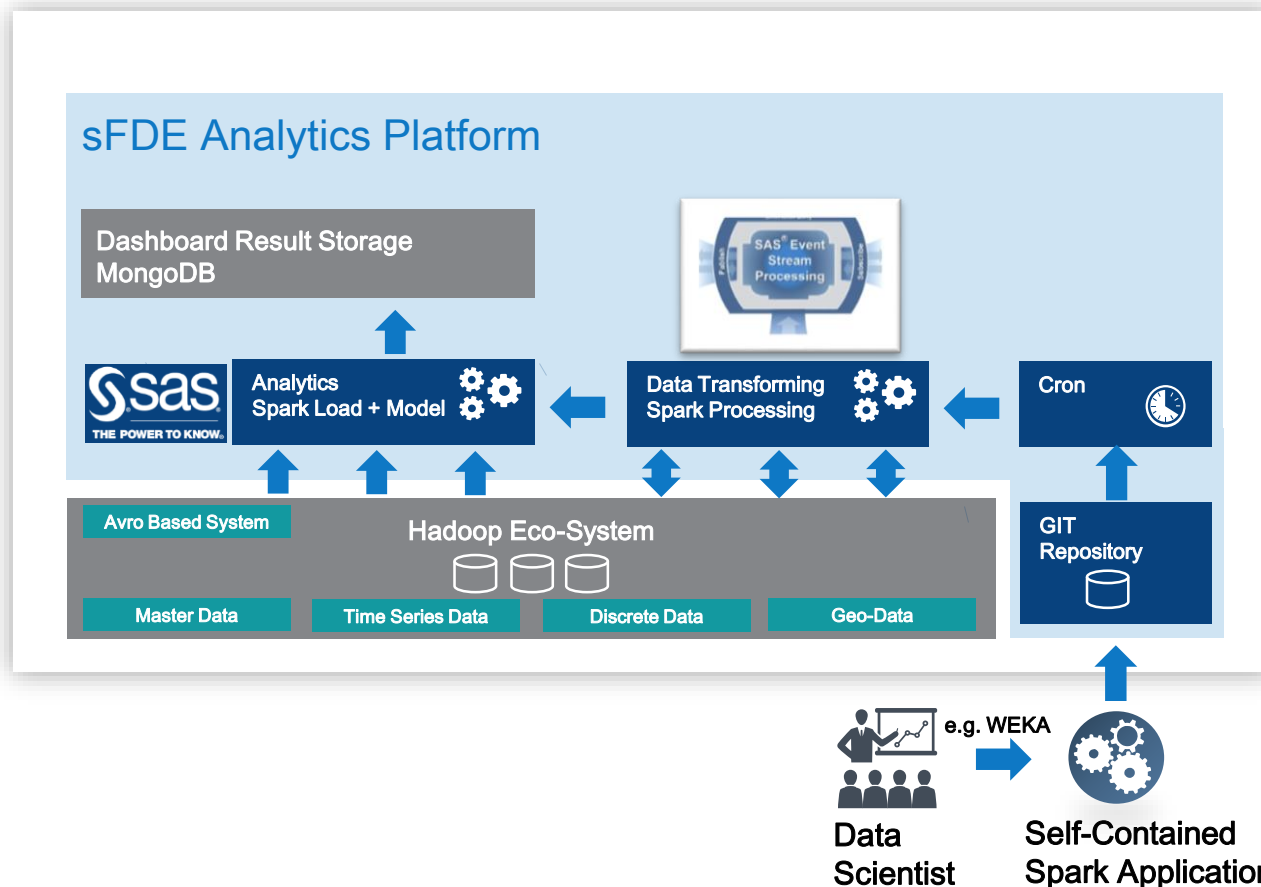
Data Exploration Building Blocks



- ▶ Get a fast overview of the data
 - Using static templates
 - Data categories
 - Online Dashboards
 - Query UI for experts
 - BI Connector for 3rd Tools
- ▶ Templates (customer specific)
 - Correlation Heat Map
 - Undetermined Significance
 - Geo Map
 - Datasets per Day
 - ...

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Data Analytics Building Blocks



► Data Scientist

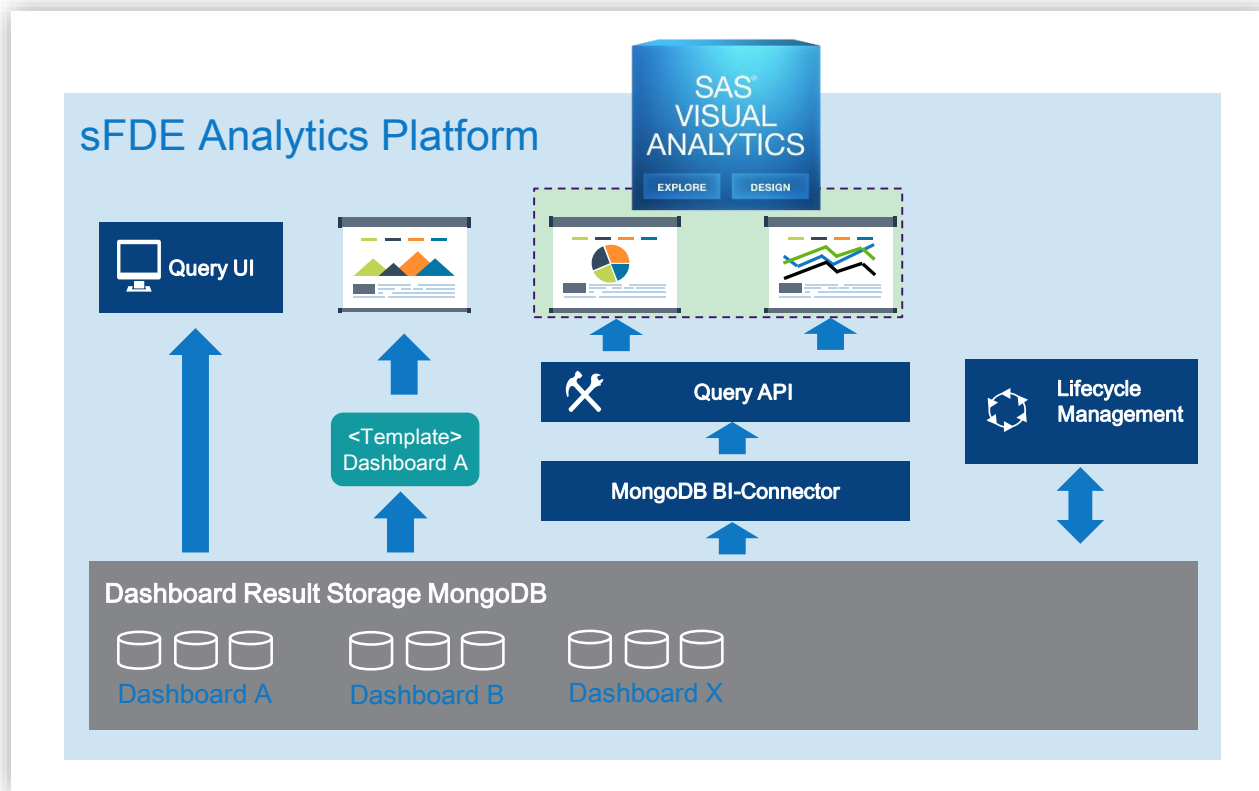
- Developing Spark Algorithm
- Optional using 3rd party tool with data samples
- Deploy a Self-Contained Spark Application

► sFDE Analytics Platform

- Connected to Hadoop Eco-System Hadoop 1.6 / Spark 2.0
- Automatic Processing
- Result stored in a Dashboard Result Database

sFDE

Data View Building Blocks



 e.g. Tableau  Customer Specific (optional)

► Analytic Result Data

- Stored in the sFDE Dashboard Result Storage (MongoDB)

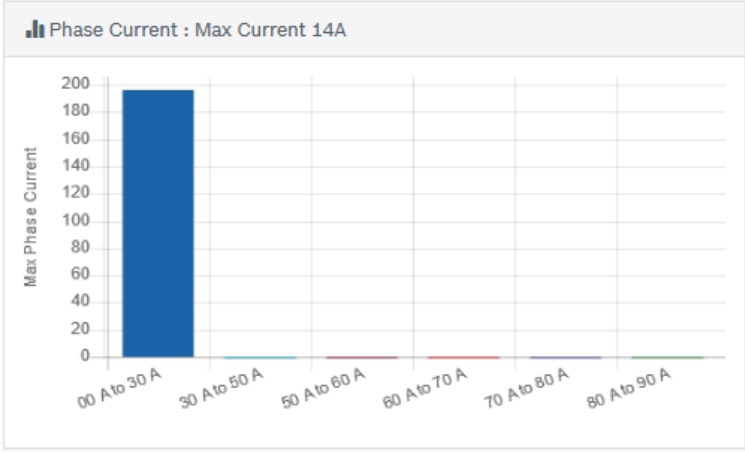
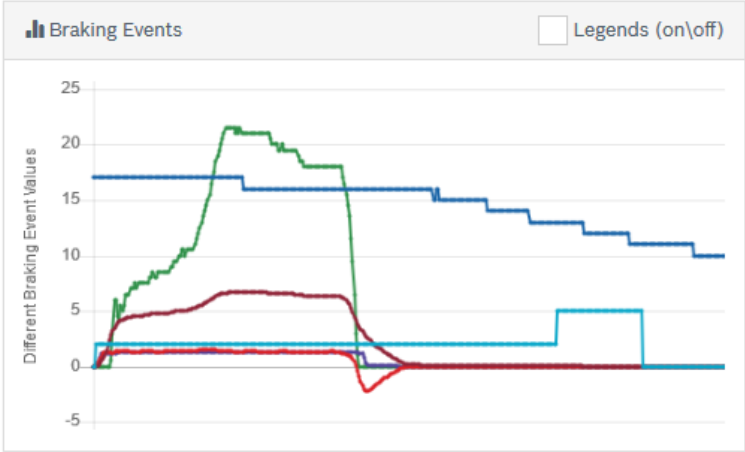
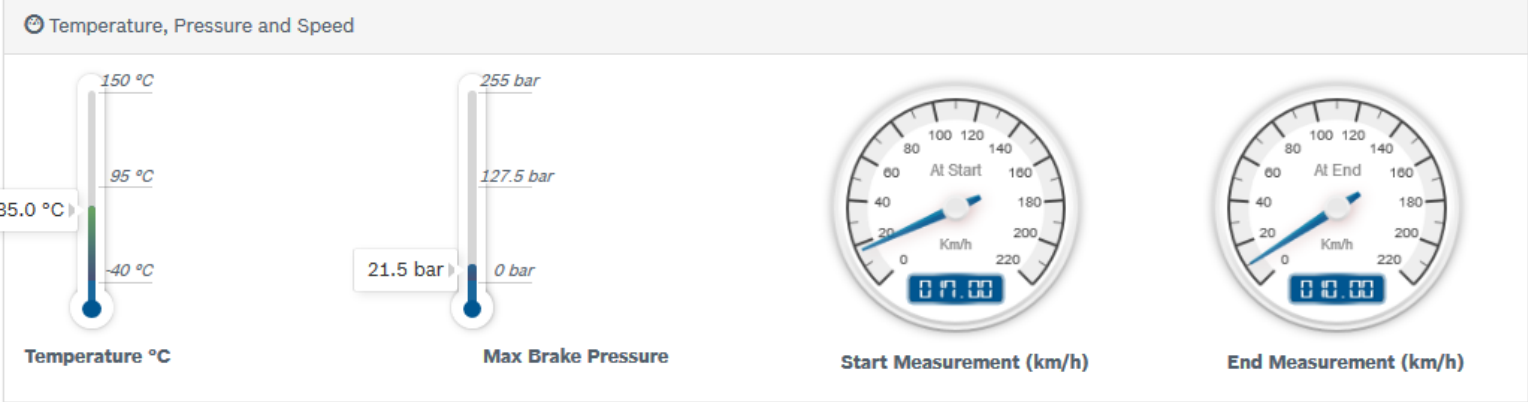
► Analytic Result Data Access

- Three Options
- sFDE Query UI (for Experts)
- Customer specific Dashboard Useful for static Analytic Views
- 3rd Party Tools e.g. Tableau Can be integrated into the sFDE Portal

sFDE Examples

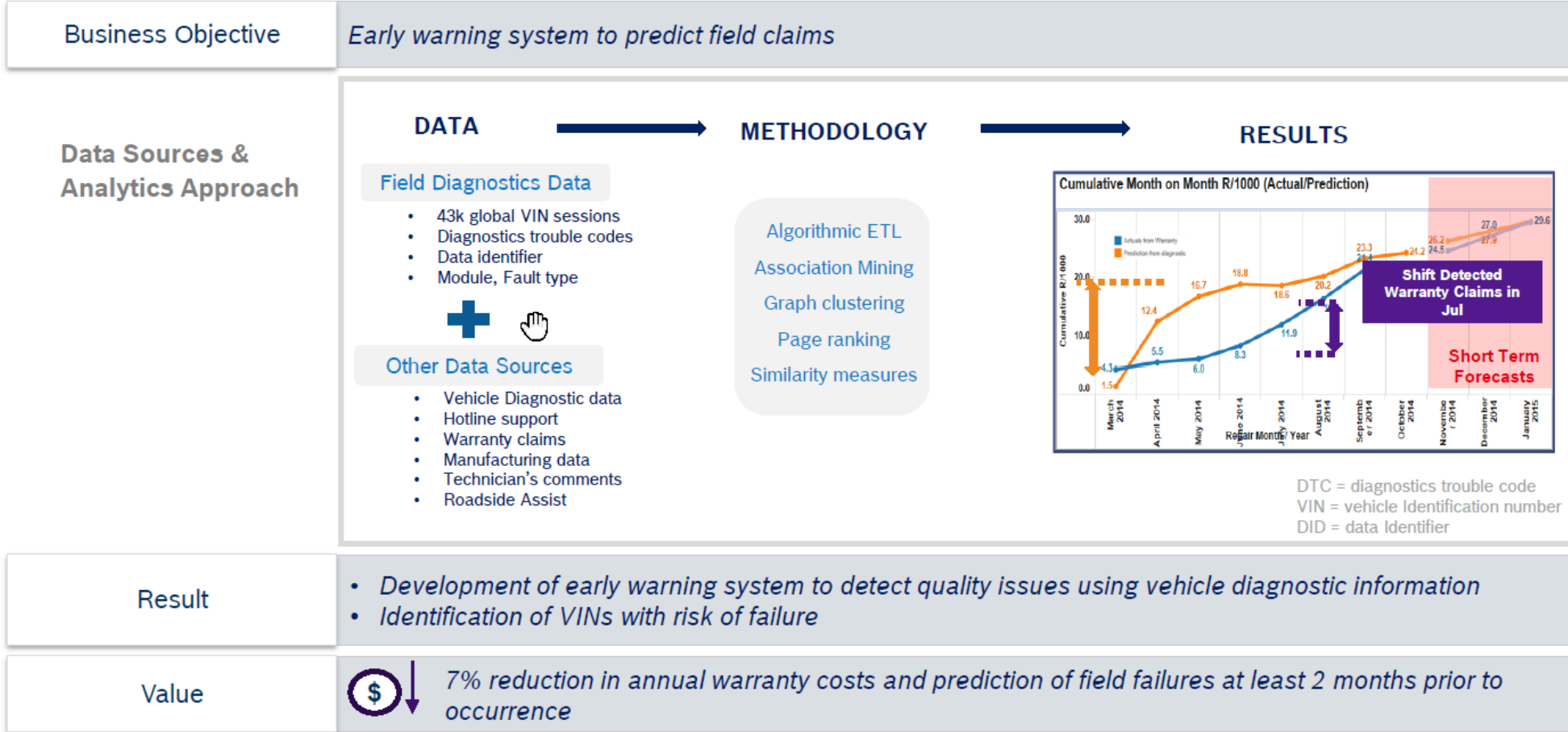
sFDE Example

Use Case: Systems/Component Validation



sFDE Example

Use Case: Warranty Diagnostics



sFDE Example

sFDE Dashboard for Geo-Data

Home / Visualization / Data Overview

Connected Cars: 2
Datasets Total: 43
Datasets Today: 17

Incoming Datasets

Date	Amount of Datasets
Jul 14, 2016	16
Jul 15, 2016	6
Jul 18, 2016	2
Jul 20, 2016	2
Jul 21, 2016	17

■ Last 7 Days

Latest Signals

Map showing signal locations in the Stuttgart region.

Home / Visualization / Tour Dashboard

Q Filter

Serial ID: 71878103413
Measurement Date: 03-07-2016 to 21-07-2016
Submit

Tours

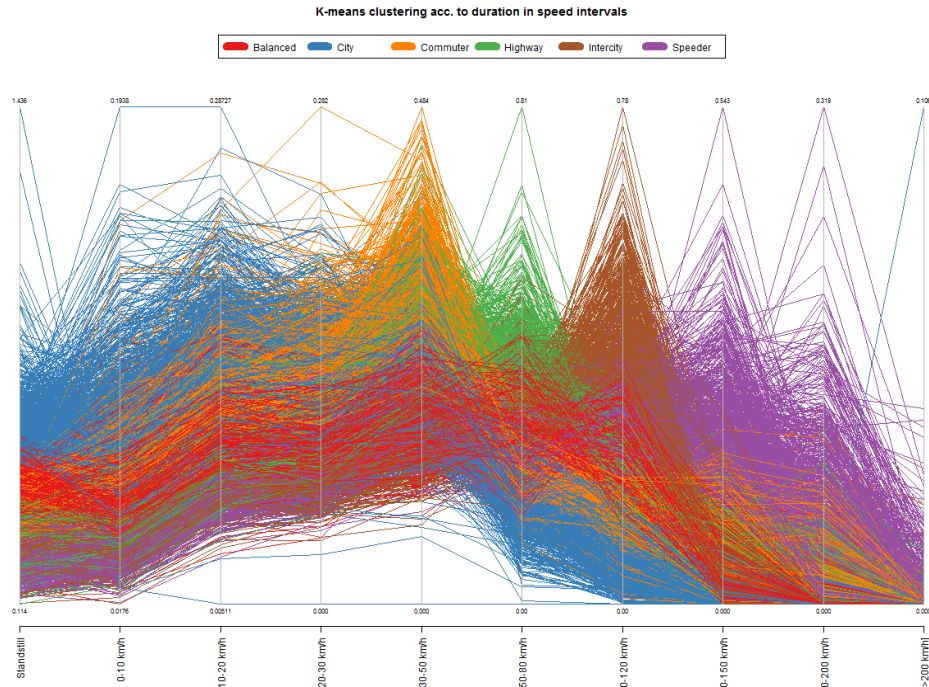
- Jul 15, 2016 5:26:39 PM
- Jul 15, 2016 5:26:39 PM
- Jul 15, 2016 5:24:20 PM
- Jul 15, 2016 5:24:20 PM
- Jul 15, 2016 5:21:01 PM
- Jul 15, 2016 5:21:00 PM
- Jul 15, 2016 3:44:08 PM
- Jul 15, 2016 3:44:08 PM
- Jul 15, 2016 3:27:16 PM
- Jul 15, 2016 3:27:15 PM

Previous 1 2 3 4 5 Next

Map showing a tour route in Leonberg.

sFDE Example

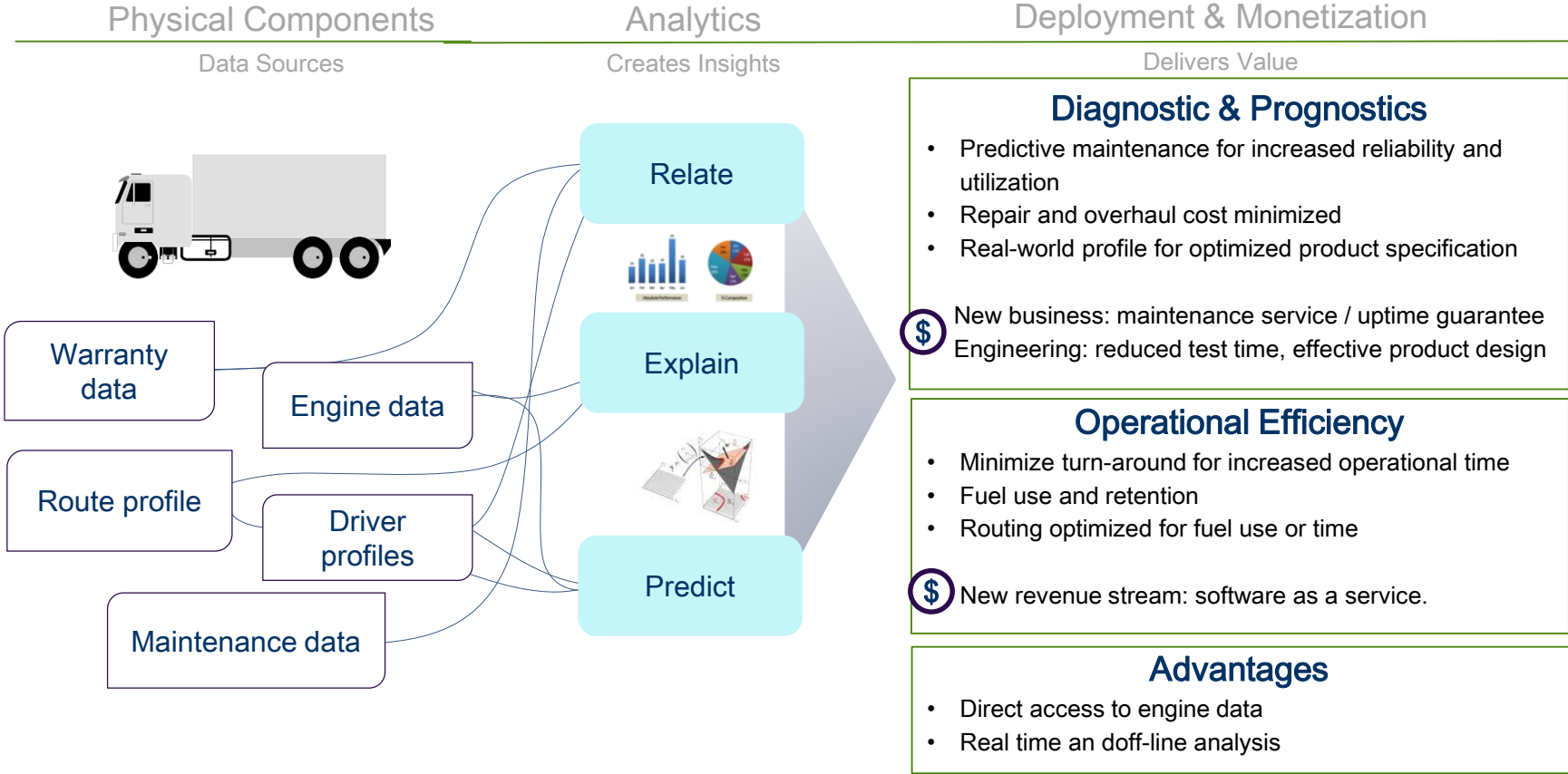
Individual Analysis



- Each line represents one inspection and its differently scaled values (y-axes) in the 10 speed classes (x-axes)
- Each line is colored according to its corresponding cluster
- The separation of the different clusters is clearly visible.
- The clusters lie far apart as the distance between clusters is far greater than the distance within clusters

sFDE Example

Fleet Analysis



Driving Efficiency with Analytics

Questions?

Contact us at info-us@bosch-si.com

