ARCHITECTURE OF THE CARUSO ECOSYSTEM
BRINGING A MARKET PLACE FOR CAR-RELATED DATA AND SERVICES TO SPEED

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JENS KNODEL (CARUSO DATAPLACE)
Digitization

Technologie verändert Medien / Daten durch Digitale Produkte

Digitalization

Technologie verändert Märkte / Industrien durch Digitale Prozesse

Digital Transformation

Technologie verändert Wirtschaft / Gesellschaft durch Digitale Geschäftsmodelle

https://www.bitkom.org/Bitkom/Publikationen/Rollenideal-Digital-Design.html
DIGITIZATION | DIGITALIZATION | DIGITAL TRANSFORMATION

- New and innovative Services & Products
- Data-Driven Business Models
- Cross-Domain Business Models
- Digital Ecosystems / Platform Economy
- Offshore-Development & Operation
- Business Process Reengineering
- Digital Business Processes
- Efficiency Optimization & Cost Reduction
- New Value Creation

Radical Innovation

Incremental Innovation
EVERYTHING WE DO, WE DO TO ENABLE THE PLAYERS IN THE CONNECTED AUTOMOTIVE AFTERMARKET TO GROW THEIR SALES, PROFIT, AND BRAND VALUE.
# Development of Connected Vehicles in Europe

- Retrofit suppliers (short-term) & OEM (long-term) become potential data suppliers

## Number of European Cars and Light Commercial Vehicles in Millions

<table>
<thead>
<tr>
<th></th>
<th>2015</th>
<th>2020</th>
<th>2025</th>
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<tbody>
<tr>
<td>Total</td>
<td>314</td>
<td>325</td>
<td>344</td>
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<tr>
<td>Connected</td>
<td>16</td>
<td>21%</td>
<td>40%</td>
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<tr>
<td>Not Connected</td>
<td>285</td>
<td>91%</td>
<td>137</td>
</tr>
</tbody>
</table>

Source: IHS, LMD, Roland Berger
THE ENABLER FOR CONNECTED MOBILITY SERVICES

Acquire
Search
Sell

Use
Maintain
Collaborate

Vehicle Information
In-Vehicle Data
Process Data

Learn
Sell
Produce
MARKET EVOLUTION

01/2018

Innovators
2.5%

Early Adopters
13.5%

Early Majority
34%

Late Majority
34%

Laggards
16%

12/2018

Market share %

0

25

50

75

100
No stakeholders delivering concrete ecosystem requirements

Ecosystem needs to be (re-)invented, (re-)shaped, and refined

Very high degree of uncertainty and fuzziness

1. Innovators: 2.5%
2. Early Adopters: 13.5%
3. Early Majority: 34%
4. Late Majority: 34%
5. Laggards: 16%
ECOSYSTEM WITH B2B MARKETPLACE PLATFORM

Brokering Data & Services

DATA PROVIDER

DATA CONSUMER

Business
Technical
Legal

B2C
B2B
B2B2C
ECOSYSTEM WITH B2B MARKETPLACE PLATFORM

Example

Car

OEM

TANK STATION

Business
Technical
Legal

Driver
ECOSYSTEM WITH B2B MARKETPLACE PLATFORM

Brokering Data & Services

Communicate the ecosystem as simple as possible

Ecosystem architects: “the elevator in multiple buildings”

Internal stakeholders have to understand the ecosystem
Caruso is the B2B-Enabler

BROKERING DATA & SERVICES

GOLDEN RULES

1. You are the service & solution provider
2. You own your data & services
3. You have full control of your data & service and prices

Collect
Harmonize
Distribute
OUR INITIAL CONNECTED PARTNERS:

DATA PROVIDER
- ABAX
- BMW
- BOSCH (invented for life)
- Continental (The Future In Motion)
- OPENMATICs
- TecAlliance
- BOSCH Service

DATA CONSUMER
- WERBAS
- SCHAEFFLER
- JimDrive
- ABAX
Selection of initial partners is crucial

Ecosystem initially perceived as an attack on the domain

Business models need to be closely aligned

Partner onboarding is effort-intensive
PLATFORM LANDSCAPE

Telematics & Mobility Solutions

- Connectivity
- Market Segment Solution

Other Domains

- Data & Service Marketplace
  - B2B
  - B2C

Big Data & Cloud

IOT
PLATFORM LANDSCAPE

Telematics & Mobility Solutions

Connectivity

Market Segment Solution

Data & Service Marketplace

Other Domains

IOT

Big Data & Cloud

B2B

B2C
Ecosystem | Value Network

Open, Neutral

The Aftermarket Ecosystem connecting Business Model and Technology

Scalability, Security & Privacy by Design
HIGH-LEVEL PLATFORM ARCHITECTURE

CARUSO DATAPLACE

Marketplace

Data needed for brokering

"provider X offers mileage for car with VIN XYZ"

Brokering Engine

Data / Service

brokered via Caruso

"mileage of car with VIN XYZ is 10.382"

Partner System

Partner System
Ecosystem initiator sets many cornerstones.

The more effort invested, the more obvious the result.
CLASSIFICATION OF DATA ON CARUSO

Marketplace – Customer Interaction

- Marketplace Index
- Offer Specification
- Bundle Specification
- Subscription
- Contract
- Data Ownership
- User Account
- Data Access Rights / Visibility
- Company Details

Metadata | Master data | Configuration data | Reference data
Rather static, low volume

Brokered Data

- Provider Data Logging
- Technical Monitoring Data
- Billing Data
- Business Monitoring Data
- Consumer Data Logging
- SLA Monitoring Data

Transactional data | Streaming data | Monitoring/Logging data
Rather dynamic, high volume
SCALABILITY

BASED ON AWS

• Empower Caruso to grow along its envisioned scenarios
• Satisfy requirements for global availability
• Enable local deployments in any geographic region (e.g.: Frankfurt for the EU)
End-to-End Security

Connections & APIs:
• Authenticated access (Auth0, API Keys)
• Encrypted communication (TLS)
• Consulting

Approach:
• Security by Design
• Security with strong partners (Auth0, AWS, Fraunhofer, ...)
• Continuous security reviews
• Risk Management

Brokering & Marketplace:
• Adherence to privacy laws
• Clear data ownership
• Controlling usage of data
• Extensive logging and monitoring
• Manipulation-proof

Infrastructure:
• Built on Amazon Web Services
• Based on AWS cloud security (Firewalls, DDoS protection, high availability, ...)
• Hosted in Frankfurt for Germany

DATA PROVIDER

DATA CONSUMER
## VEHICLE DATA - CURRENT STATUS

<table>
<thead>
<tr>
<th>Category</th>
<th>Subcategories</th>
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</thead>
<tbody>
<tr>
<td><strong>Vehicle Position, Movement and Surroundings</strong></td>
<td>(65)</td>
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<tr>
<td>Movement and Distances</td>
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<tr>
<td>Time, Position and Orientation</td>
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<td>Vehicle Environment – Driving Assist</td>
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<td>Vehicle Environment – Surroundings</td>
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<td><strong>Vehicle Non-Powertrain Hardware</strong></td>
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<td>Brakes</td>
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<td>Seatbelts</td>
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<td>Airbags</td>
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<td>Lights</td>
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<td>Heater and AC</td>
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<td>Locks and Alarms</td>
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<td><strong>Vehicle Powertrain Resources</strong></td>
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<td>Fuel – Consumption</td>
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<td>Dongle</td>
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Vehicle Data
Digital Fuel for the Connected Car Economy
A Study on the Data Needs for Mobility Services
Get partners into the ecosystem, invest into the platform

Demonstrate with a mix of real and mocked partners

Become concrete quickly, a prototype system can help

Consider when to switch from prototype to product mode
THE BUSINESS MODEL

DATA PROVIDER

Definition of Prices, Terms & Conditions

B2B Contract

Acceptance of Prices, Terms & Conditions

Added Value for B2X Use Cases

Providing Data → Brokering Data → Consuming Data

DATA CONSUMER
Ecosystem architecture is more than the architecture of a software system:

**Overall partner landscape with roles of partners**

**Aligned business models**

**Relationships: flow of data, services, money, legal relationships**

**Platform as the central and connecting element**

**End-to-end interplay of all IT-systems to achieve quality**

**End-to-end processes across partners to achieve overall quality**
Industry 4.0
Smart Mobility
Smart Energy
Smart X
Smart Rural Areas
Smart Health
Smart Farming
Smart X
Ecosystems are available to learn from

Watch carefully what is transferrable
THANK YOU.