



How Blockchain* May Disrupt the Automotive Industry – An Insider's View

- Data usage
- Market mechanics
- Cooperation models

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Product Owner DLT Mobility

 @pbusch42



*Rather „Distributed Ledger Technology“ (DLT)

The Bosch Group – Four Business Sectors

Key figures 2018



Bosch Group

- ▶ 78 billion EUR in sales*
- ▶ 409.881 associates*
- ▶ 280 plants in 60 countries

Mobility Solutions

- ▶ One of the world's largest suppliers of mobility solutions



Industrial Technology

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



Energy and Building Technology

- ▶ One of the leading manufacturers of energy-efficient heating products and hot-water solutions and leading in security and communication technology



Consumer Goods

- ▶ Leading supplier of power tools and accessories
- ▶ Leading supplier of household appliances



60% share of sales

40% share of sales



BOSCH: SUSTAINABLE MOBILITY



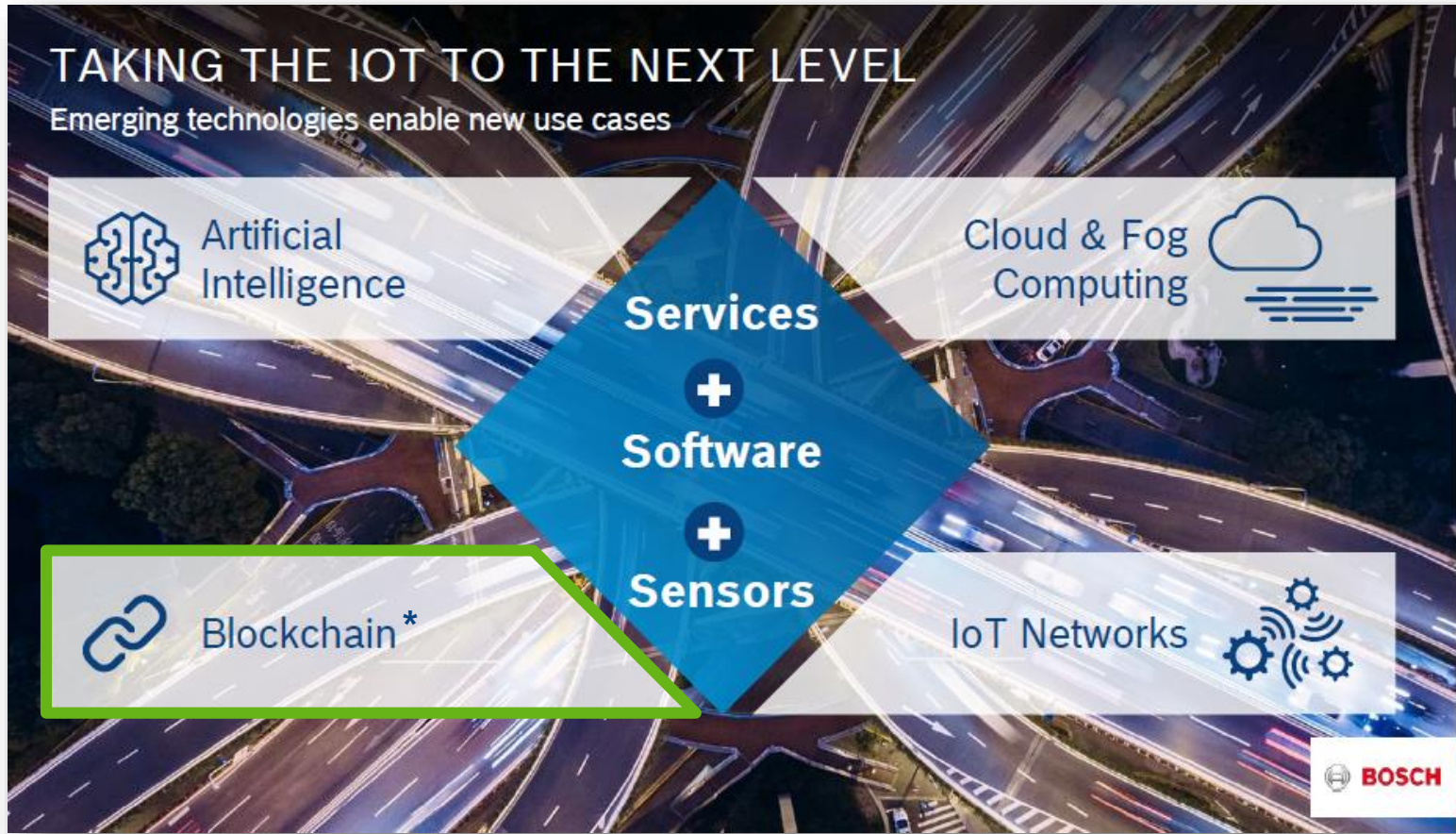
costs hybrid electric motor
roaming power electronics
e-bike **electrified** range
driving enjoyment charging infrastructure
market ramp-up battery
e-scooter smart charging **plug-in**

legislation assistance systems
emergency braking assistant
automated auto pilot
highway pilot sensors
redundancy electric steering
valet parking digital environment

augmented reality electronic horizon
internet of things smartphone integration
connected
vehicle to vehicle cloud
vehicle to infrastructure
services fleet management
entertainment eCall

Introduction

Enabling technologies for the Economy of Things



BCW 2017
Opening Keynote
Dr. Volkmar Denner

*Rather „Mutual Distibuted Ledgers“ (MDL) or „Distributed Ledger Technology“ (DLT)

OMNIPRESENT – THE INTERNET OF THINGS

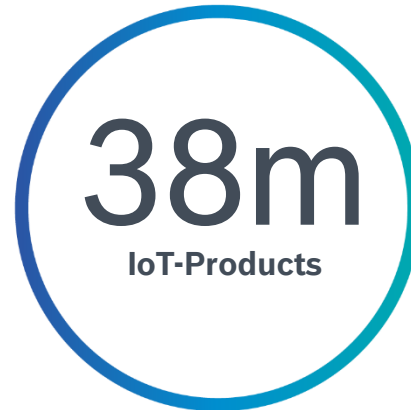


CONNECTED PRODUCTS



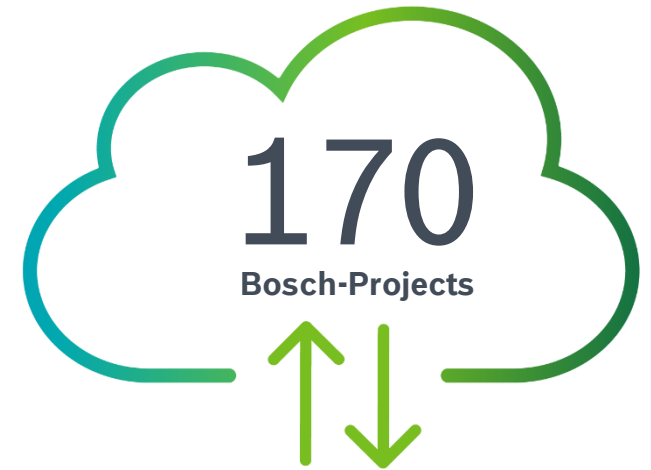
All electronic Bosch-product categories are IP-enabled

MARKET PRESENCE



Sold by Bosch in 2017

INNOVATIVE PLATFORM



Currently realized on Bosch-IoT-Cloud

DLT* enable the Next Generation of the IoT

IOT: CONNECTED DEVICES



- > Internet of Things generates DATA
- > DATA enables new products



ECONOMY OF THINGS

- > CONNECTED devices become ECONOMIC devices
- > Devices do seamless Business
- > Towards AUTONOMOUS, LEGAL entities

DLT AND SMART CONTRACTS



- > Foundation of crypto-currencies
- > Decentralization and Trust
- > Machine2Machine Value Exchange

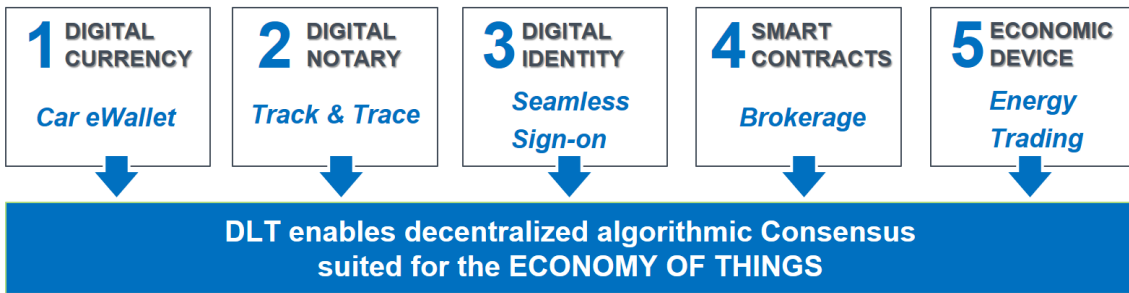
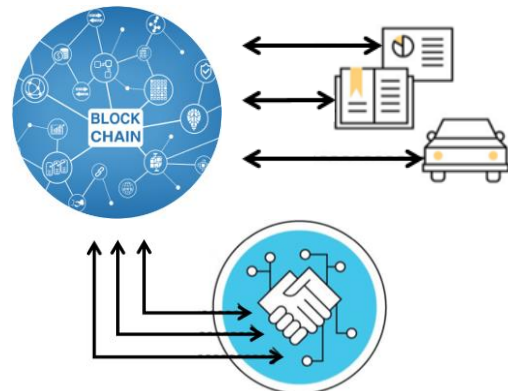
DLT: „Distributed Ledger Technologies“

DLT-based business backbone as alternative to proprietary platforms

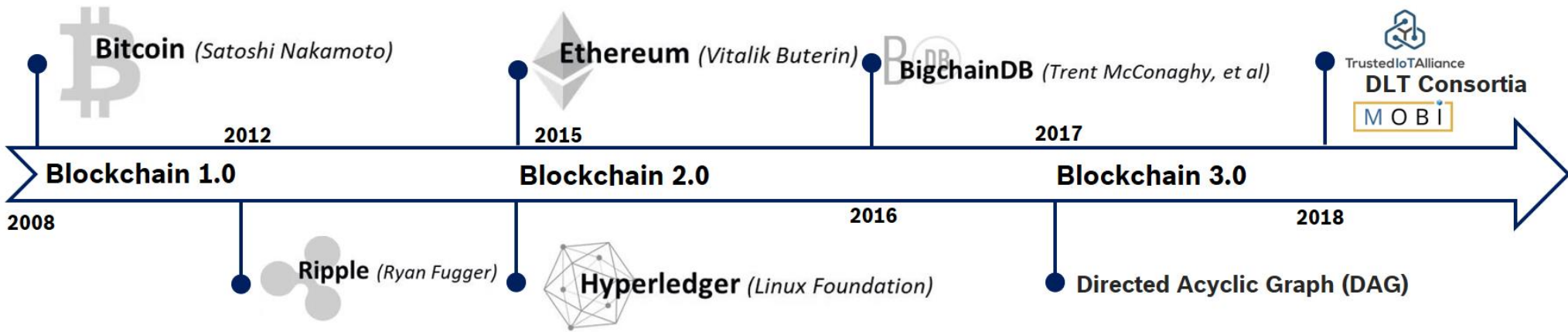
Bosch Corp. DLT-Project “Economy of Things”

An Alternative Approach to GAFA* Platform Monopolies

- Decentralization**
Organizational and technical
- Immutability**
Tamper proof recording of events and their evidence
- Trustless exchange**
Fair market place without platform monopolies



5-Steps Strategy of the Bosch DLT-Project



* GAFA: GoogleAmazonFacebookApple



DISRUPTION I:

DATA USAGE

IoT Building Block XDK and Eclipse Mita

Make Machine2Machine Economy REAL

Bosch XDK Cross Development Kit



Accelerometer



Gyroscope



Magnetometer



Humidity sensor



Pressure sensor



Temperature sensor



Acoustic sensor



Digital light sensor



Li-Ion rechargeable battery



32-bit Microcontroller ARM



Wireless LAN



Bluetooth LE



Eclipse Mita

A complete example to build
a shock detector connected
using MQTT over WLAN

Easy programming of IoT devices

Transpiles to C

Declarative setup of sensors

Declarative setup of connectivity

Direct access to sensor readings

```
// Mita has packages which are the main unit of isolation
package main;

// Every Mita program must import a platform, here we use the XDK
import platforms.xdk110;

// System resources are configured using the setup keyword.
// Here, we configure the WLAN connectivity of the XDK.
setup devnet : WLAN {
    ssid = "MyWifiName";
    psk = "supersecretkey";
}

// Software resources are resources nonetheless and thus are set up
// using the setup keyword. Notice how we refer to the devnet WLAN setup
// as means of transport, and instantiate a signal to the /events topic.
setup backend : MQTT {
    transport = devnet;
    url = "mqtt://iot.eclipse.org:1883";
    clientId = "shockDetector42";

    var events = topic(name="/events");
}

// Functions use the fn or function keyword. If the return type were omitted
// the Mita compiler would infer it automatically. Also, notice the type
// parameter of the array.
fn mean(x : array<uint32>) : uint32 {
    ...
}

// Variables can be immutable (let) or mutable (var).
// For arrayPosition we do not have to explicitly give a type as our
// type inference infers it from the initialization.
let acceleration = new array<uint32>(size=10);
var arrayPosition = 0;

// The every keyword handles events. Here we use time as an event source and
// run at a regular interval.
every 10 milliseconds {
    // Sensor data (and other modalities) are available due to the platform import above
    // One can use some resources even if they were not configured beforehand.
    acceleration[arrayPosition] = accelerometer.magnitude.read();
    arrayPosition = (arrayPosition + 1) % acceleration.length();

    // The mean() function can be called using the familiar OO-style notation.
    // The expression on the left side of the dot becomes the first argument
    // of the function call.
    if(acceleration.mean() > 5000) {
        // Writing to the signal instance we've created in the signal block
        // above sends out the MQTT message (backend is an MQTT resource
        // after all). Using backticks we can use string interpolation.
        // Here we construct a JSON string inline to the function call.
        backend.events.write(`{ "type": "shock", "mag": ${acceleration.mean()} }`);
    }
}

// Events are described and offered by the platforms.
// This pressed event exists because the xdk110 platform imported
// above declares it.
every button_one.pressed {
    for(var i = 0; i < acceleration.length(); i++) {
        acceleration[i] = 0;
    }
    arrayPosition = 0;
}
```


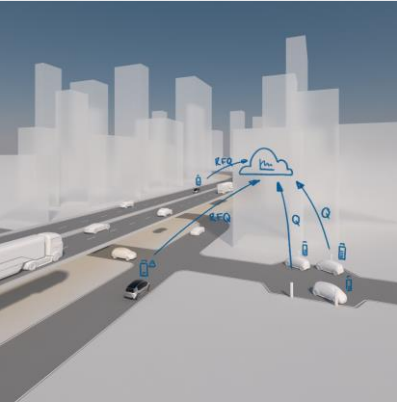
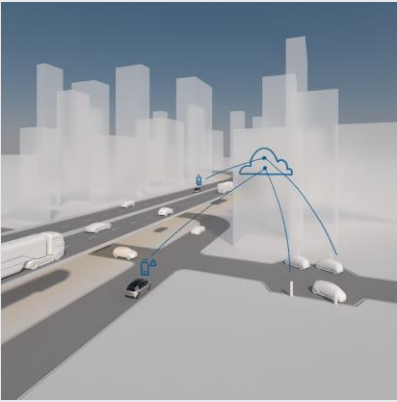
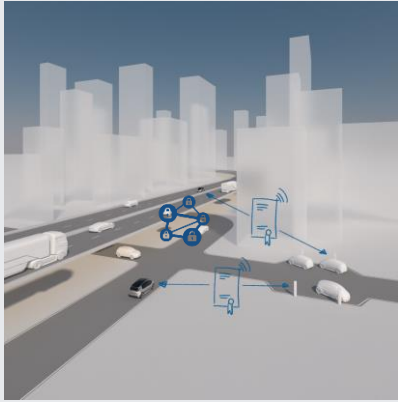


DISRUPTION II:

MARKET MECHANICS

Disrupting Market Mechanisms

Example: Smart Cities / EV Charging

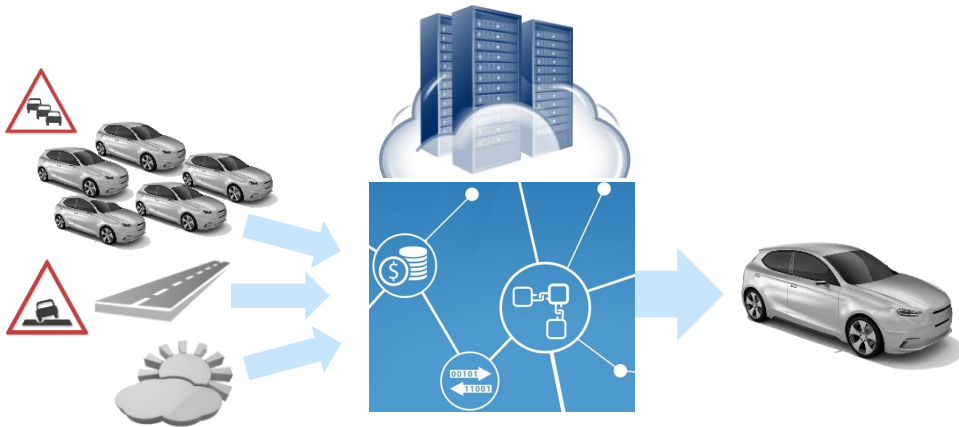
Market Mechanics		Characteristics
Bundling	 <p>All mechanisms for a functioning charging economy are bundled in the hand of one business entity</p> <ul style="list-style-type: none"> • Search and Find • Contracting • Payment • General Terms and Conditions 	<ul style="list-style-type: none"> • Platform Business entity as the “monarch” • Danger of Market-Stall: Fierce fights of incumbents over platform dominance • Very difficult to establish, but Winner-takes-it-all
Unbundling	<div>Discovery</div>  <div>Contracting</div>  <div>Execution</div> 	<ul style="list-style-type: none"> • Division of power into at least three parties: Discovery, Contract, Execution • Potentially easy to establish • More price signals • Federated market structure • Enabled by Smart Contracts • Secured by Blockchain

Example: Hazard Spot Warning



*Afraid of **unforeseeable black-ice** or **upcoming hydroplaning** (or any other valuable data)?*

Let all drivers collect data and let all the others know!



What difference does DLT bring propose?

Incentive for cars to collect valuable info to sell the data to the cloud (to buy other services)!

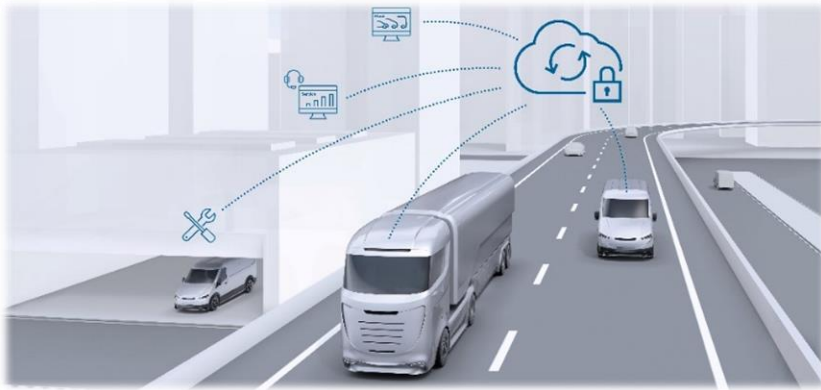
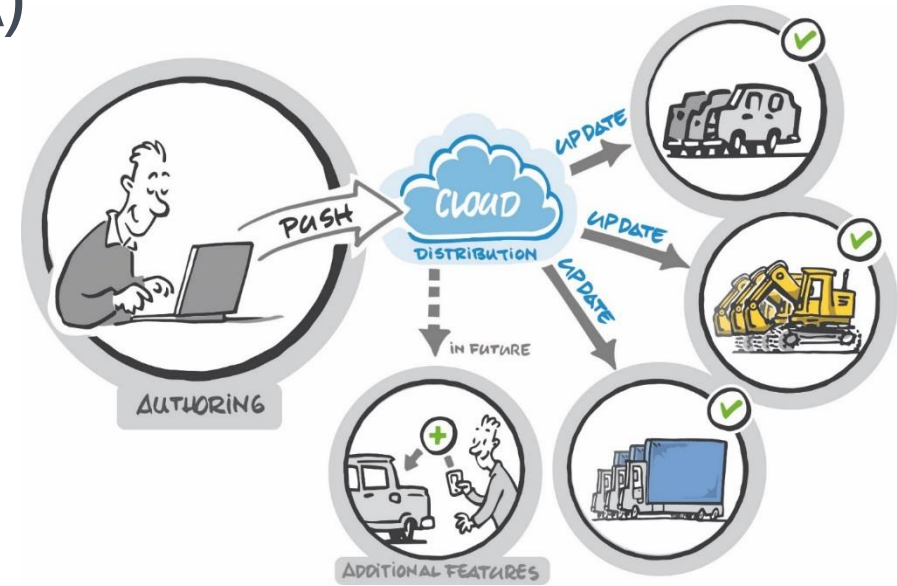
Depending on the value of the data, the market prices would be brokered by Smart Contracts

Example: Firmware-Over-The-Air (FOTA)

Warranty claims significantly reduce the profit margin.

*BOSCH FOTA allows for a **remote update of the vehicle's Soft- and Firmware***

*FOTA **saves approx. 50 Euros** per vehicle compared to a field action.*



What difference does DLT bring propose?

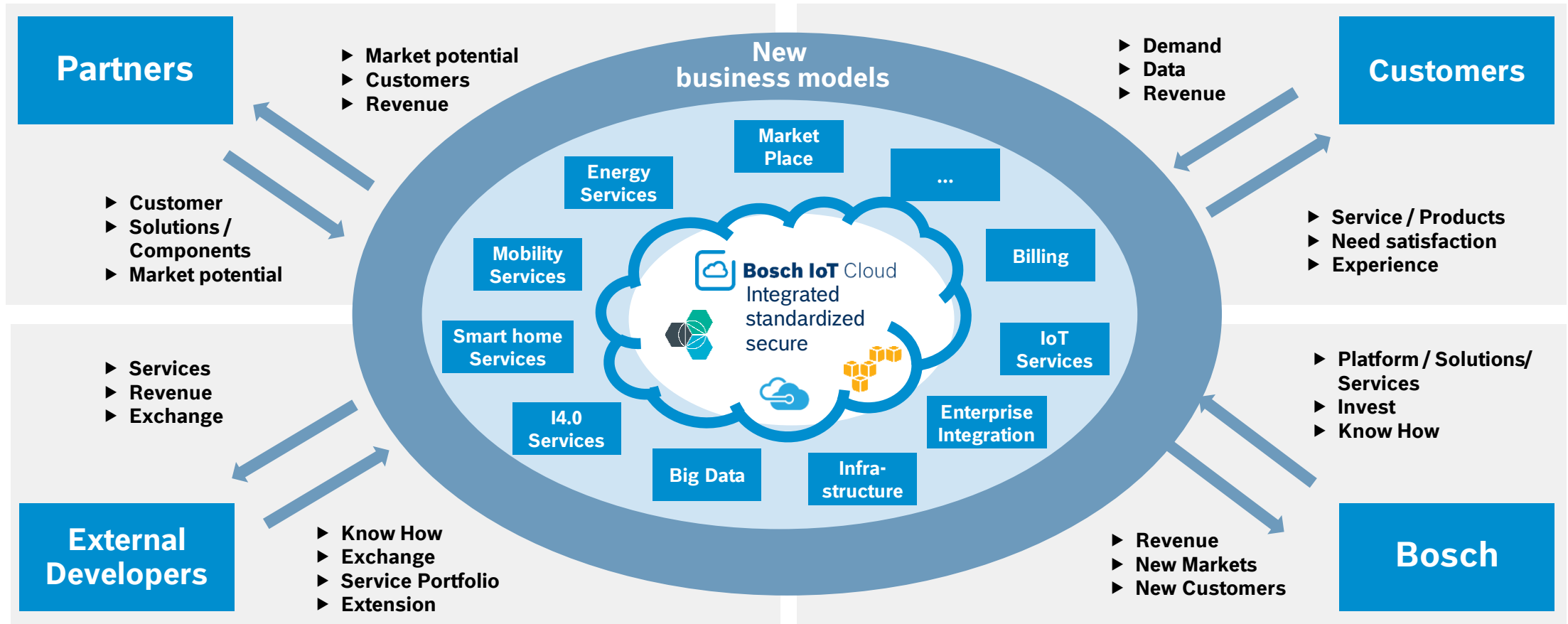
Tamper-proof documentation of the vehicles components and software in distributed Ledgers

Additional features and services bought from the market place via Smart Contracts

DISRUPTION III: COOPERATION MODELS

What's next: From an Automotive to an IoT Ecosystem

The give-and-take in an Ecosystem



Consortial Collaboration: Trusted IoT Alliance

Founders Meeting – May 18th 2017 @ CISCO in Santa Clara

Open Source Software Foundations to support the creation of a SECURE, SCALABLE, interoperable, and TRUSTED IoT and Blockchain Ecosystem

FOUNDING MEMBERS



TrustedIoTAlliance



BNY MELLON



BOSCH



FOXCONN

gemalto



CHRONICLED



FILAMENT



CONSENSYS



Ledger

Consortial Collaboration: Trusted IoT Alliance

Open Source Foundation with Focus on IoT



Enterprise Companies



Blockchain Technology Companies



IoT Technology Companies



MOBI: Mobility Open Blockchain Initiative

Blockchain Consortium dedicated to Automotive



Use Cases

- [Digital History: Tracking Vehicle Data](#)
- [Auto Component Supply Chain Tracking](#)
- [Autonomous Machine Payments](#)
- [Mobility Commerce Platform](#)
- [Data Markets for AV Driving Data & Research](#)
- [Car & Ride Sharing](#)
- [Usage-based Insurance](#)

“Everybody wants to own the platform
plus

Nobody wants to be locked in on other platforms
results in

Small platforms without benefits of scaling networks

A new concept to break this deadlock is

The Economy of Things”

Michael Bolle
CTO Bosch

Conclusion from an Automotive Insider

Blockchain Will Disrupt the Automotive Industry!

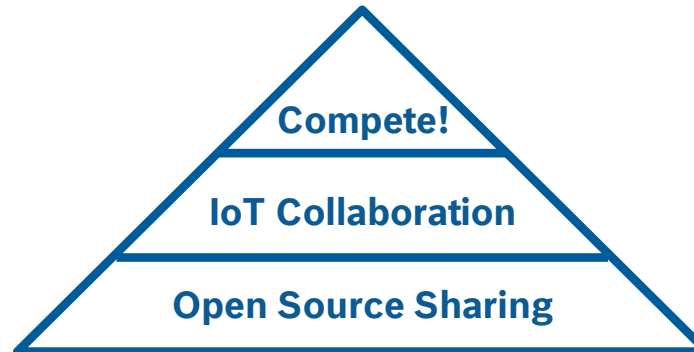
- **Data usage**



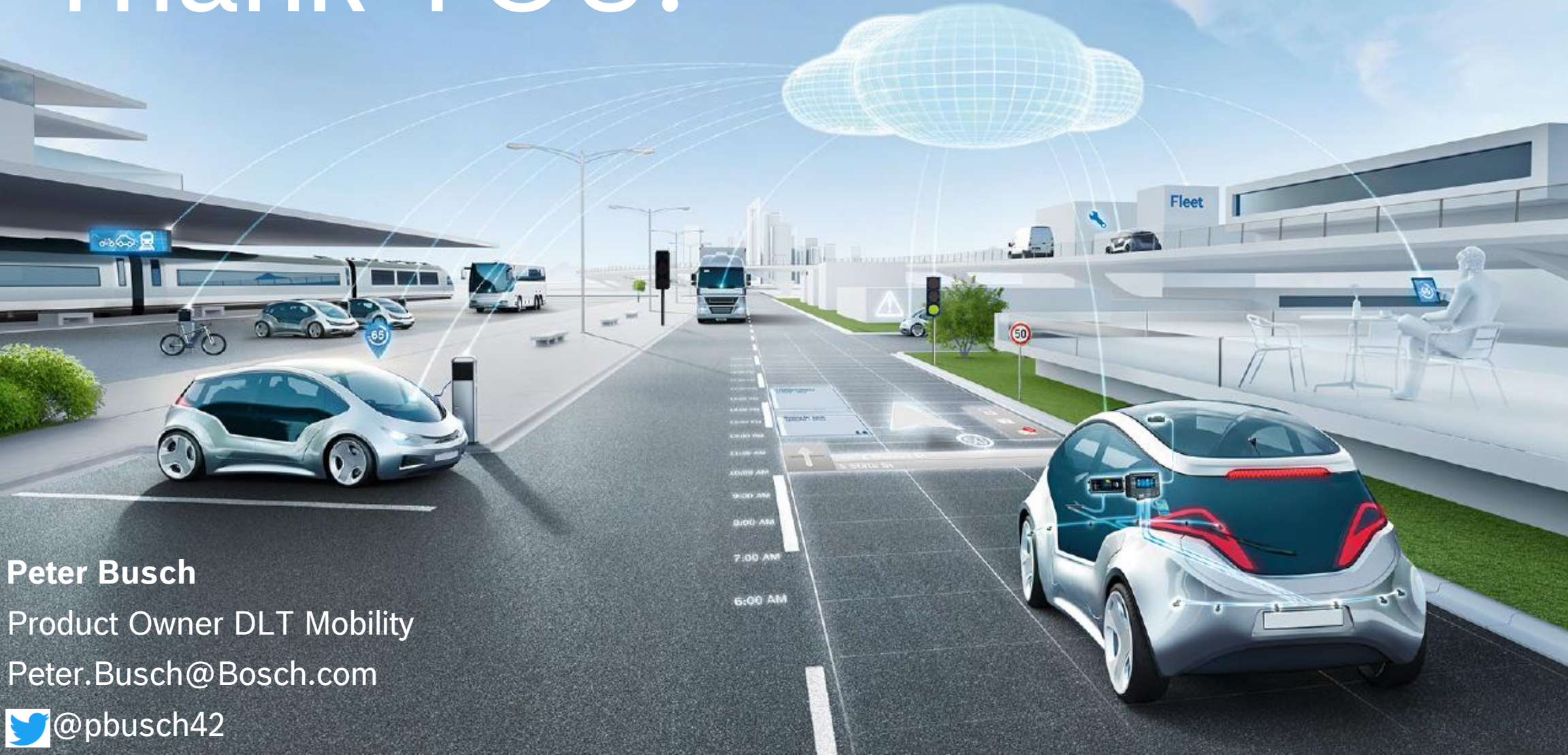
- **Market mechanics**



- **Cooperation models**



Thank YOU!



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