Create Business Value for Industry with the Internet of Things

Ulrich Graf
ulrich.graf@huawei.com

Western European Branch of Huawei Solutions Management

November 29th 2016, Zuerich/Switzerland
Huawei at a Glance

- 228 Ranking in the Fortune Global 500
- 170+ Countries
- 176,000 Employees
- 79,000 R&D employees
- 16 R&D centers
- 36 Joint innovation centers
Huawei Business Divisions

**Consumer Business**
- Devices Business
  - Smart phones
  - MBB/ Home devices
- Device Chipsets
  - M2M

**Carrier & Software Business**
- Fixed Network
- Wireless Network
- Communication Software
- IoT Platform

**Enterprise Business**
- Enterprise Networking
- UC&C
- IT Infrastructure
- Fusion Cloud
- IoT Gateways & Router

- 5 of Top 10 Banks
- 160+ Power Companies
- 140+ Public Sectors
- 12 of Top 20 Oil & Gas Companies
- 145,000+ km Highway & Railway

Hundreds of millions of people and devices

45 of Top 50 Operators

Thousands of companies

enterprise.huawei.com • Huawei Confidential • 3
From M2M to IoT

Vertical Point-to-Point
Closed Systems
Individual Integration Projects

Horizontal Interworking logik
Open System
Cloud based / as a Service
ICT enables the Digital Transformation
Multiple different Sensors and protocols via one unified interface

Real-time Mobile Broad & Narrowband, agile Wide Area Access technologies

Open APIs and SDKs

Multi-application collaboration on distributed platforms

One horizontal integration logic and service exposure + Big Data processing

Real-time Mobile Broad & Narrowband, agile Wide Area Access technologies

Specialized industrial IoT Gateway portfolio for rapid service deployment

Multiple different Sensors and protocols via one unified interface
Enterprise Business Value drives Industrial IoT

Process Optimization
- Remote Monitoring
- Predictive Maintenance
- Livecycle Management

Examples:

New Business Model
- Monitoring as a Service
- Production on Demand
- Solution as a Service

New Revenue Opportunity
- Cross Industry Services
- Individualized Products
- Industrial eCommerce
Solutions & Projects across Vertical Industries

Smart Energy
- Smart Grid
- Smart Metering
- Meter Data Management /AMI
- Energy Management

Smart Living
- Smart Home
- Smart Building
- Assisted Living
- eHealth
- Home Security

Smart City
- Safe City
- Smart Parking
- Traffic Management
- Waste Management
- Smart Health Care
- Smart Street Lighting
- Smart Education
- eGovernment

Smart Industry
- Industry 4.0
- Predictive Maintenance
- Remote Monitoring
- Smart Elevator
- Smart Port
- Smart Logistic
- Smart Agriculture
- Smart Retail

Smart Mobility
- Connected Car
- Telematics
- Fleet Management
- Track & Trace
- Autonomous Driving
- Usage Based Insurance
- Remote Maintenance

Smart Industry
- Industry 4.0
- Predictive Maintenance
- Remote Monitoring
- Smart Elevator
- Smart Port
- Smart Logistic
- Smart Agriculture
- Smart Retail
IoT Case Study
HOLMER exxact
Predictive Maintenance
Open, Secure, Scalable
Insert Video: HOLMER

https://vimeo.com/arendsoog/review/190077349/44c1780cab
Maintenance Technology Overview

Corrective Maintenance
- Maintain after fault
  - Unplanned fault cause economic loss
  - Major fault may cause dangerous situation (e.g. fire, gas leaking)

Preventive Maintenance
- Scheduled maintenance
  - Still exists the possibility of sudden failure
  - Over maintenance cause extra cost

Predictive Maintenance
- Maintenance on demand
  - Real time equipment status monitoring
  - Maintenance decision made by predictive maintenance system
Holmer PdM PoC Project Setup

Beet Harvest Vehicle Predictive Maintenance (PdM) Proof-of-Concept

Target: Reduce maintenance costs, improve efficiency, transform to service business

Defined Workspliit

- Data collection
- Data transmission
- Data security
- Connection Management (IoT platform)
- Cloud infrastructure

- Additional sensors type identification
- Sensors integration
- Requirement clarification

- Big data analysis platform
- Prediction model
- Real time data analysis result
- App coding
- ERP interconnect
- Hosting

- Overall coordination
- Use case research

Industry Application Provider

Fraunhofer ESK

enterprise.huawei.com • Huawei Confidential • 14
Predictive Maintenance Solution for Agriculture Machine

- CANBUS
  - Telematics/Sensor Data
  - Process/Task Control
  - GIS system

- Maintenance alert
- Spare part inventory mgmt. (ERP system)
- Schedule optimization suggestion

- Operational record
- Resource consumption
- Geography information
- Farm status visualization
- Quality and quantity
- Machinery status

Cloud Anti-attack solution
Encrypted data transmission
Secure device SDK/OS/Chipset

Data Security

Sensitive Data flow

Correlative Company

Mobile Network

Wireless IoT Gateway

SSL/VPN
PoC Infrastructure Choice & Scenario List

<table>
<thead>
<tr>
<th>Scenario List</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>End to End Security</strong></td>
</tr>
<tr>
<td>Data collection and push to PdM</td>
</tr>
<tr>
<td>In case Bad internet connection</td>
</tr>
<tr>
<td>Send command to CAN-bus</td>
</tr>
<tr>
<td>Location information query</td>
</tr>
<tr>
<td>Connection Quality Query</td>
</tr>
<tr>
<td>Storage on AR rough evaluation</td>
</tr>
<tr>
<td>AR Key Resource Supervise</td>
</tr>
<tr>
<td><strong>Holmer</strong></td>
</tr>
<tr>
<td>AR Hardware installation</td>
</tr>
<tr>
<td>App related scenarios</td>
</tr>
</tbody>
</table>

Holmer Admin

- Holmer PdM
- IoT platform
- Agile Controller
- Open Telekom Cloud
- IoT Agent
- AR
- CAN bus
- ECU

REST API over HTTPS

Infrastructure Choice & Scenario List

PoC Infrastructure Choice & Scenario List

Holmer Admin

- Holmer PdM
- IoT platform
- Agile Controller
- Open Telekom Cloud
- IoT Agent
- AR
- CAN bus
- ECU

REST API over HTTPS
## Huawei IoT Gateway AR503

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet Interface</td>
<td>1 x GE</td>
<td>Power supply</td>
<td>DC: 12 V / 24 V, Range(9V~36V)</td>
</tr>
<tr>
<td>USB3.0</td>
<td>1 x USB HOST</td>
<td>Dimensions (W x D x H)</td>
<td>220 x 150 x 66 mm</td>
</tr>
<tr>
<td>USB2.0</td>
<td>1 x USB HOST</td>
<td>Operating temperature</td>
<td>-40°C to 70°C</td>
</tr>
<tr>
<td>3G/LTE</td>
<td>TDD/FDD LTE</td>
<td>Operating humidity</td>
<td>RH 10% to 90%</td>
</tr>
<tr>
<td>Wi-Fi</td>
<td>MIMO3x3, 802.11a/b/g/n/ac</td>
<td>Storage temperature</td>
<td>-40°C to 105°C</td>
</tr>
<tr>
<td>GPS</td>
<td>Supported</td>
<td>IP level</td>
<td>IP54</td>
</tr>
<tr>
<td>Mirco USB</td>
<td>1 x Mirco USB</td>
<td>CPU</td>
<td>1GHz, 4*core</td>
</tr>
<tr>
<td>CAN 2.0</td>
<td>1 x</td>
<td>Memory</td>
<td>1 GB</td>
</tr>
<tr>
<td>Sim Card</td>
<td>2 x</td>
<td>Storage</td>
<td>128 GB mSATA</td>
</tr>
</tbody>
</table>
Project Plan

1. Concept
   - Week 1: Kick-off
     - Target, SoW, Budget, Solution
   - Workshop:
     - Requirement alignment
     - Process, business model
   - Data Prep.:
     - Modeling
   - Holmer PdM solution design

2. Development
   - Week 1:
     - Review Point
     - Front-end development
     - Algorithm / Backend
   - Week 2:
     - PdM solution test
   - Week 3:
     - PdM solution test with Holmer
   - Week 4:
     - Integration test

3. Validation
   - Week 1:
     - Decision Point
     - Review Point
   - Week 2:
   - Week 3:
   - Week 4:
Outlook
What’s ahead?
Agile IoT Gateways empowering the Industrial IoT

**Devices**
- Zigbee
- Ethernet
- PLC
- RS 485
- ... (other devices)

**Network**
- 3G/LTE
- E1/xDSL
- Ethernet
- WAN

**Mgmt. & App.**
- Open APIs
- SDK
- Agile Controller

**Industrial-grade design**
- Shock-proof
- Water proof
- Dust proof

**Multiple Protocols & Interfaces**
- 3G, 4G, Ethernet (FE/GE)
- GPS, Zigbee, Bluetooth, Wi-Fi, RFID, 6LOWPAN, RS485, RS232, DI/DO...

**Enable Complex protocol adaptation**
- I.e. CAN, MQTT, OPC-UA, Video, MODBUS,....

**IoT Edge Intelligence**
- Edge Computing
- IoT Agent
- Agile Control
5G Network Slicing enables New Services

- Real Time
- On Demand
- Secure

Machine: Automation < 1-10ms
IPTV: Video Surveillance > 20Mbps
e-Guard: Security High Data Security
Asset: Track & Trace > 100K Connections
Narrow Band-IoT to connect huge amount of Things

**Features:**

- **100k connections per cell**
  - 100x compared to 4G

- **Deeper coverage**
  - 20dB+ gain (penetrate one more wall than 2G)

- **Low power consumption**
  - 10-year battery life

- **Secure Connectivity**
  - 3GPP standard based

**Introduction 2016**

- NB-IoT (CAT-NB1)

**Comparison:**

- **4G**
  - [People]
  - [Things]
- **5G**
  - [People] & [Things]
NB-IoT e2e Solution

Sensor/Meter Data
- Application
  - CoAP
  - UDP/IP

Chipset AP
- NAS
- Uu

Chipset CP
- NAS

NB-IoT Device
- NB-IoT Uu protocol
- Simplified NAS
- Data over NAS
- CoAP/UDP/IP

NB-IoT eNB
- NB-IoT Uu Protocol
- Support S1 Optimized Interface (S1-lite)

IoT Controller
- MME/SGW/PGW
- Simplified NAS protocol & Data over NAS
- Paging based on coverage level
- UE authentication

IoT Platform
- Connection Management (SIM card, Service signing, Device Management, Data collection, Transmission, etc)
- Service Enabler (Data analysis, Capability openness, app lifecycle management)
- Portal/BSS/OSS

Third Party IoT APP Server
- Application
  - AMQP
  - TCP/IP

HTTP

AMQP
Traditional Parking Scenario

Traditional Parking solutions

- Gateway (wireless or wire)
- Sensor
- App Server

Challenges

- How to power the street sensors?
- How to efficiently connect the street sensors?
- Limited Customer base / Usability
- Multiple networks, Owners & Application
Smart Public Parking

**IoT Smart Parking solution**

- **P1 App**
- **Street App**
- **IoT Platform**
- **Sensor**
- **Mobile APP**

**IoT Opportunity**

- One Service for the whole city or beyond
- Service interworking between the systems
- Utilizing existing Cellular WAN infrastructure
- Simple Implementation, no GW, no dependencies
- Deep indoor coverage for remote controlled parking

**NB-IoT Parking Sensor**

Indoor (private)  Street line (public)
Open Cooperation to Build IoT Ecosystems

Industry Standard

- ETSI
- IEEE
- ZigBee Alliance
- Bluetooth
- OMA
- oneMM
- WiSe
- ETSI
- dt

Industry Partner

- SAP
- NXP
- Honeywell
- accenture
- CISDI
- Fraunhofer

Industry Associations

- AIOTI
- INDUSTRIE 4.0
- BITKOM
- Logistics Alliance Germany
- Platform Digital Energiewende

Chipset and Module

Access and Network

Service Platform

Application
## Innovate new IoT Solutions with Partners

### OpenLab Munich

<table>
<thead>
<tr>
<th>Verification Center</th>
<th>Technical Support Center</th>
<th>Joint Innovation Center</th>
<th>Experience Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Comprehensive range of ICT infrastructure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Secure remote lab</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Open API for application development</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Online development support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Joint development of industry solutions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Joint solutions pilot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Experiencing innovative achievements</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Sharing success stories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Solutions showcases</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Vielen Dank

Ulrich Graf
ulrich.graf@huawei.com

Western European Branch of Huawei Solutions Management

November 29th 2016, Zuerich/Switzerland