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# Jointly Build a Flourishing Ecosystem and Achieve Large-scale Commercialization of IoT

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# Huawei IoT Focuses on ICT to Enable Industry's Digital Transformation



Public utilities



Connected Vehicle



Industry 4.0



Smart Home

## OceanConnect IoT Platform

IoT Cloud Services | V2X Server



NB-IoT/eMTC/5G  
/eLTE/**C-V2X**



Smart Home Gateway  
EC-IoT

Huawei LiteOS

Chipset ( Boudica | **Balong** )

**T-Box**

3T+1M Security  
Architecture

## What we do:

- IoT platform, **V2X Server**, and **IoT cloud services**
- **Cellular wireless networks**, EC-IoT, Smart Home Gateway
- **IoT chips and OS**, **T-Box**
- Co-development of the IoT ecosystem with partners to meet IoT requirements

## What we don't do:

- Applications
- IoT Devices
- IoT Device reselling
- E2E integration





# Extensive Project Experiences Promote Large-scale IoT Commercialization



Yintan Smart Water



Shenzhen Smart Gas



Haier Intelligent Air Conditioner



Zhejiang Smart Fire Detector



Connected Cows



Yingtan Smart City



ofo Bicycle Sharing



Shanghai Smart Lighting



Schindler IoEE



Sinopec Jiujiang Smart Factory



PSA Connected Car

More...



# Extensive Experience to Build a More Convenient, Secure, and Efficient IoT



## Service development: sustainable growth

Challenges: security, industry standard, ecosystem, could Service ...



## O&M: high efficiency

Challenges: Difficult to locate faults; no support for remote upgrade; spare parts require customization



## Installation acceptance: simple installation and specified standards

Challenges: Unpredictable battery life; no acceptance standard; no process for network access license



## Integration verification: high performance and reliability

Challenges: No support for in-time command delivery; traffic models differ among industries; unexpected problems after devices connect to networks



## Device development: simple, fast, and cost-effective

Challenges: High workforce requirements for complex interworking between devices and module/platform; poor antenna performance; high device power consumption; no support for multiple frequency bands of different operators

One meter's journey...



# Device Development: Boudica 150 Reduce Development Cost and Shorten Development Cycle

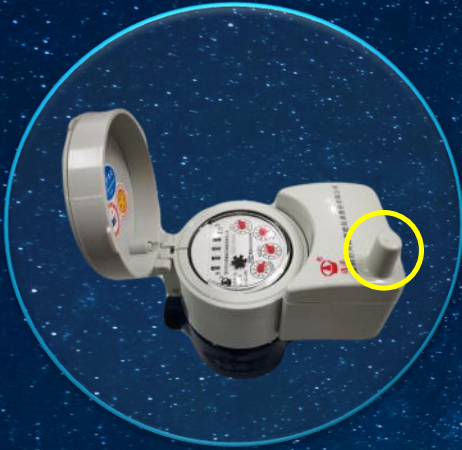


-  Cost ↓ **\$1-2**
-  Power consumption ↓ **50%**
-  Development cycle **months → weeks**

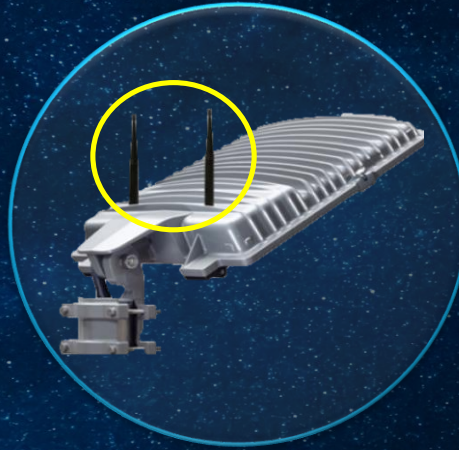
- **Boudica 120: Bring industry forward 6 months earlier**
- **Boudica 150: Reduce development cost and shorten development cycle**



# Device Development: Optimized RF Antenna Design Improves Network Performance



The following antennas can be selected: 1/4-wavelength monopole antennas designed based on metal-rod or metal-plate, monopole antennas with built-in PCB carrier, and spring antennas



Glue stick antennas are recommended for optimum radiation performance in scenarios where environmental requirements are low and internal antennas are not required.



Internal antennas are recommended for instruments that have been enhanced by adding IoT applications. PCB and FPC antennas are typical applications, where FPC antennas feature more flexible layouts.

**Cost, layout, and electrical performance are important to antenna design and selection schemes.**



# Integration Verification: E2E Pre-integration Verification Ensures the Large-scale Commercial Use of Services

## Meter measurement problems

- Meter do not report traffic.
- The reported data is inconsistent with that of the actual period.
- ....

## E2E function problems

- The reported cycle is inconsistent with the pre-set cycle.
- The data is not reported again upon reporting failure.
- ....

## System stability problems

- Alarms of low water pressure or battery voltage are reported occasionally only.
- Packet loss of modules occasionally occurs.
- ....

**In the OpenLab test result of Shenzhen Smart Water, 58 problems are discovered, among which 43 are caused by water meters, taking a percentage of 74%.**

## Application Interconnection Test



Water Application



NB-IoT BS

## Complex Stimulation Environment of Water Meter Installation

Antennas

Combiner

VAM8864



78 dB (Fixed)

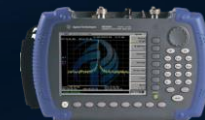
(22-86 dB)

Path Loss (100-164 dB)

## Test of the Spuriousness and Power Consumption of Signal Emission



>>



Spectrum Analyzer

>>



Oscilloscope



# Integration Verification: The Scenario-based Technical Proposals Are Released to Enhance Verification Efficiency



Technical proposals on parking, street lights, smart water, gas meter, white goods have been released.

## Optimized Network Suggestions

- Device working mode: The PSM is used by default, followed by eDRX and DRX.
- Downlink services (e.g. metering): The PSM is recommended when no requirement is performed on the executions delay of downlink commands or messages.
- Downlink services (e.g. appliances): For services initiated by the platform such as the remote control or parameter configuration and query services, the eDRX or DRX modes can be selected.

## Optimized Power Saving Suggestions

- Reduce the number and frequency of message exchange.
- Optimize the device PCB layout to improve the sending and receiving performance of devices.
- Install the devices in places with better signals.
- Use the PSM mode instead of power-off mode.
- Have the last message carry the RAI indicator when it is sent.



# Installation Acceptance: The Scenario-Based Acceptance Test Standard Is Made to Ensure Service Quality

The reporting success rate is poor (about 90%).



The success rate reaches 99.5% after the association of water meter vendors, Shenzhen Water Group, and China Telecom.

**10+ scenario-based acceptance test cases are used to enhance the service KPI on the live network.**



Water metering



Parking



Lighting



Gas metering



Sharing bicycle



Fire detector



Livestock farming



Manhole Cover



Fire Hydrant



Post box



Smart lock



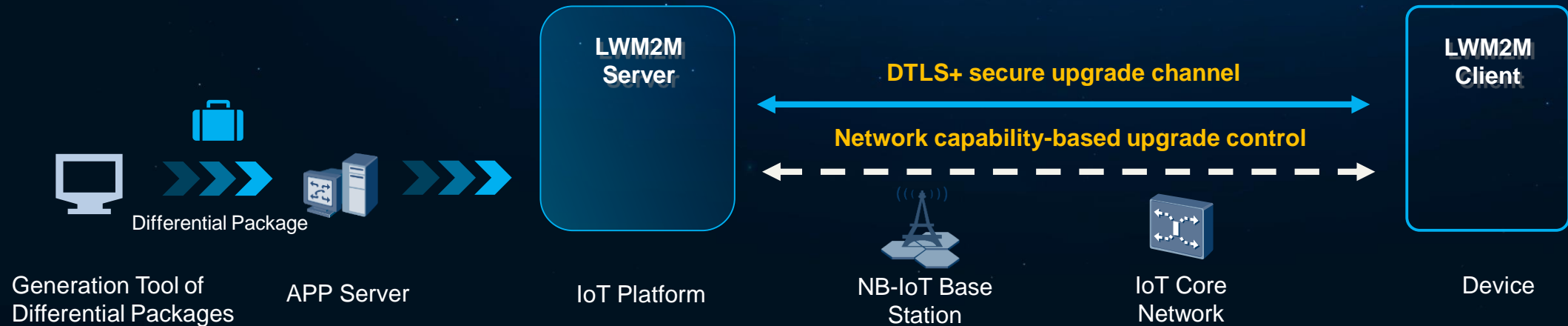
Air conditioner

## Basic test cases

- Device connection (registration/connection)
- Data reporting (signal strength/battery voltage)
- Maintainability (local/remote upgrade)
- Reliability (cell reselection/restoration)
- Network time synchronization
- Security (HTTPS and DTLS+)



# O&M: FOTA Enables the Remote Application Upgrade



## Differential upgrade

- The size of the upgrade package is greatly reduced using differentiation. In this way, the bandwidth requirement is decreased, which shortens the upgrade duration.

## Flexible upgrade policy

- The IoT platform performs concurrent control on the device upgrade tasks in the same NB-IoT cell, which ensures that the upgrade tasks do not block NB-IoT services.

## DTLS+ secure upgrade channel

- The security of the upgrade package during downloading is ensured using the DTLS secure upgrade channel.

# Service Development: Huawei “3T+1M” Security Framework Safeguards IoT Business

## 3T echnology



### Defend @ Device

- Configurable Defense
- Device & Cloud Collaboration



### Assurance @ Pipe

- Massive Reliable Access
- Anti-attack and Dispatch



### Analysis @ Cloud

- Malicious Detection & Isolation
- Platform and Data Protection

## 1M anagement



### 工具 & Procedure

- Security status awareness
- Security inspection tools
- Development guides
- Security test services ...



Device Security Design Guide



Device Security Test Acceptance Guide

- Huawei advocates security standards
- Huawei promotes security policy and regulation formulation



# Service Development: Continual Contributions to Standards and Industry Development

## Standards Organizations

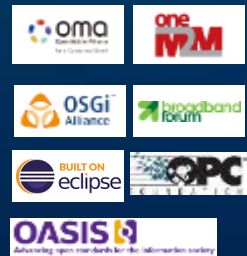
### Chipset



### Network



### Platform



### Application



- **Two “No.1” in NB-IoT Standard**

Proposals No.1, 1008 proposals to 3GPP

Acceptance No.1, 208 proposals were adopted to 3GPP standard

- **DTLS+, Ready for IETF standard**

- **OMA LwM2M technical specifications**

## Industry Alliances

### NB-IoT



### Industry



### Connected Vehicle



### Smart Home



### 20+ Industry Standards and Specifications

- NB-IoT **Smart Water** White Paper, NB-IoT **Smart Gas** White Paper, NB-IoT **Smart Lighting** Standard, **Industrial Internet Platform** White Paper, **IoT Security** White Paper, **Edge Computing** Reference Architecture ...

# Huawei IoT Ecosystem Program for European Partners

**Learning  
Experience**



**Technical  
Cooperation**



**Business  
Success**

## **Developer Community**

- Design Reference
- Terminal Development Guides
- Application Development Guides
- Develop Tools
- Offline Trainings

## **OpenLab**

- Munich , Paris , Düsseldorf
- Joint innovation, development, integration tests
- Partner certification

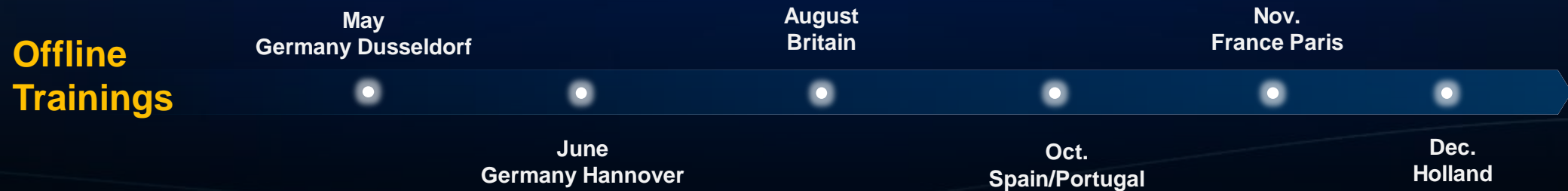
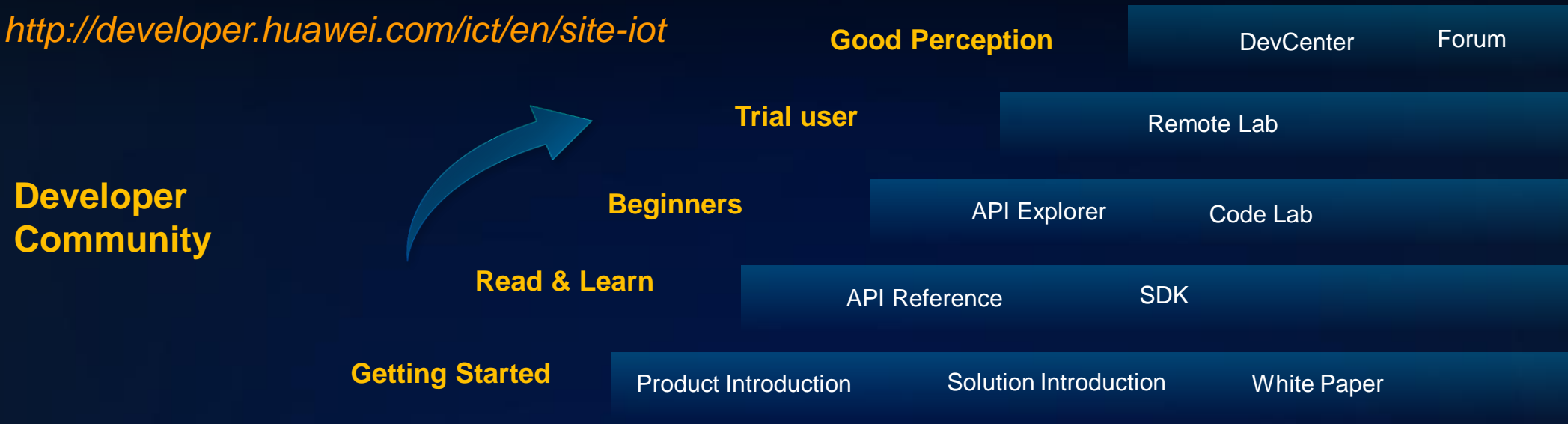
## **Hosting Service**

- Third-parties' product and solution showcase
- Co-marketing



# Comprehensive Support for Easy Invocation and Fast Development

<http://developer.huawei.com/ict/en/site-iot>



# OpenLab for Joint Innovation, Integration Testing and Certification



## 3 Huawei OpenLabs

📍 Düsseldorf   📍 Munich   📍 Paris

## 3 Operator-Huawei OpenLabs

📍 Vodafone   📍 Telefonica   📍 Telecom Italia

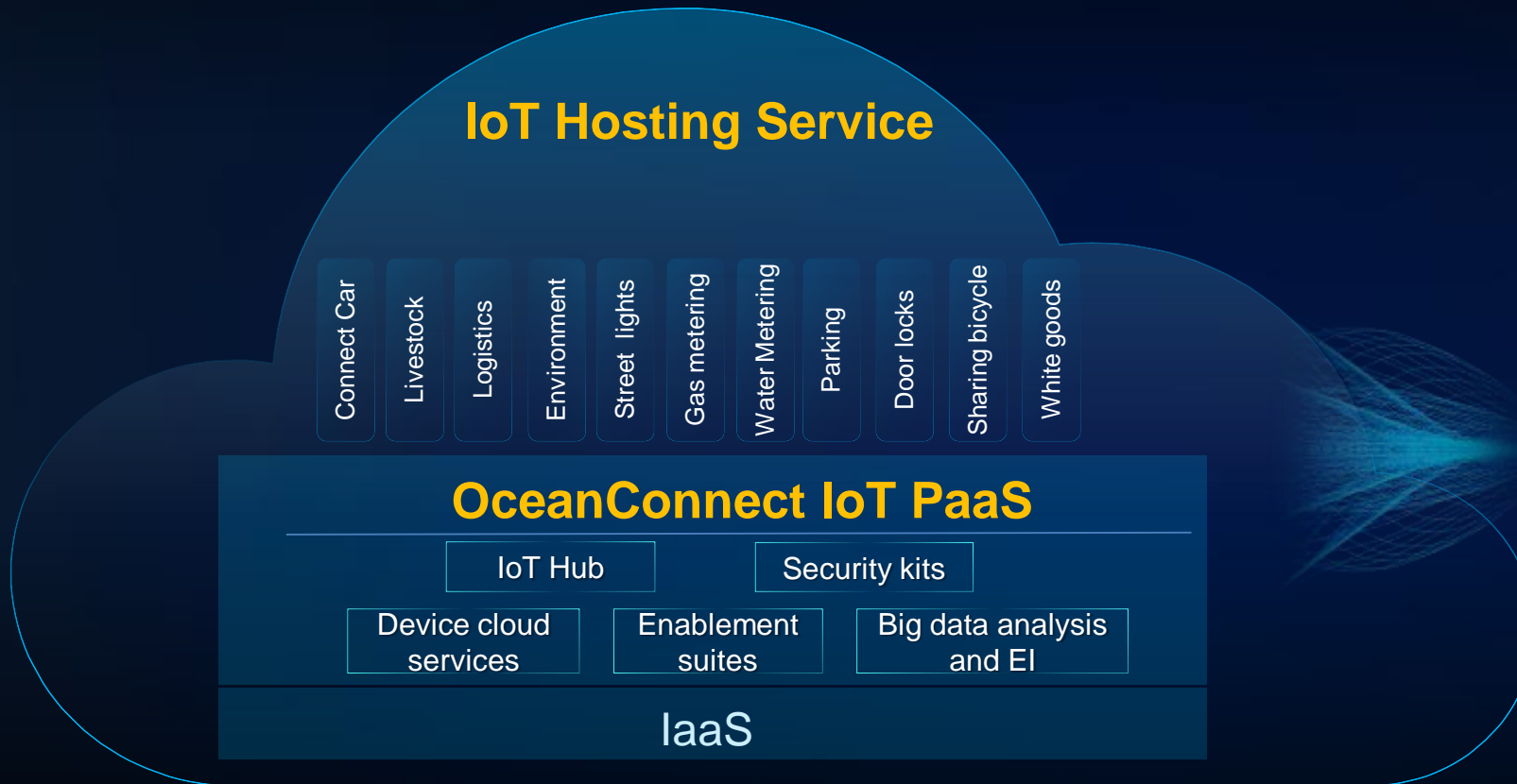
## Huawei Support

- **Design reference** for chipset
- **Test method** for chipset
- Scenario **technology proposal**
- E2E **development guidance**
- **Demonstration and Integration**
- **Technical Certification**





# IoT Hosting Service Accelerates Large-scale Commercial Deployment



## Partner

Rapidly building solutions to explore global markets



## Customer

Developing new services more efficiently and cost-effectively



**Huawei offers more convenient, secure, and efficient IoT solutions, and joins hands with partners to create and share value by commercializing large-scale IoT.**