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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

**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
Yintan 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

**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

**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

**One meter’s journey...**

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

- **Dual-chip solution**
  - MCU
  - Boudica 120

- **Single-chip solution**
  - Boudica 150
  - (Powered by Huawei LiteOS)
  - Large-scale shipments of Boudica 150 by 2018 Q2

- **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

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%.

- **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.
  - ....

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**Application Interconnection Test**

- Water Application
- NB-IoT BS

**Complex Stimulation Environment of Water Meter Installation**

- Antennas
- Combiner
- VAM8864

- Path Loss (100-164 dB)
- 78 dB (Fixed)
- (22-86 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

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.

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

**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 Technology**
- **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 Management**
- **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

**Industry Alliances**
- NB-IoT
- Industry
- Connected Vehicle
- Smart Home

**20+ Industry Standards and Specifications**

- **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**
Huawei IoT Ecosystem Program for European Partners

**Learning Experience**
- Design Reference
- Terminal Development Guides
- Application Development Guides
- Develop Tools
- Offline Trainings

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

**Business Success**
- Third-parties’ product and solution showcase
- Co-marketing

**Developer Community**

**OpenLab**

**Hosting Service**
Comprehensive Support for Easy Invocation and Fast Development


Developer Community

Getting Started
- Product Introduction
- Solution Introduction
- White Paper

Read & Learn
- Beginners
- Trial user

Good Perception
- DevCenter
- Forum
- Remote Lab
- API Explorer
- Code Lab
- API Reference
- SDK
- Code Lab

Offline Trainings
- May
  - Germany Dusseldorf
- August
  - Britain
- November
  - France Paris
- June
  - Germany Hannover
- October
  - Spain/Portugal
- December
  - Holland
OpenLab for Joint Innovation, Integration Testing and Certification

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

3 Huawei OpenLabs
- Düsseldorf
- Munich
- Paris

3 Operator-Huawei OpenLabs
- Vodafone
- Telefonica
- Telecom Italia
IoT Hosting Service Accelerates Large-scale Commercial Deployment

OceanConnect IoT PaaS

- IoT Hub
  - Device cloud services
- Security kits
  - Enablement suites
  - Big data analysis and EI

IaaS

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.