Building a Better Connected World in Digital Economy

“Open, Collaborative and Sharing”

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ICT Cloud Transformation
Foundation of Next Digital Revolution

Industry Players (Services)

Data Center Internet (Cloud)

Communications Internet (Network)

Industrial Internet (Device)

- SDN
- NFV
- 3-5G
- IoT GW
- Public
- Private
- Hybrid
Platform Revolution
In ICT Cloud Transformation

Open Developer Ecosystem: Open, Collaborative and Sharing

Platform Initiatives Product Portfolios

CT Category
IT Category
Consumer Category
Building Open Source Ecosystem

Huawei Leadership Position

- 9 Lead Roles, 3 WG Chairs
- Board Director, Top 5-8 Contributors
- Founding Member, Top 2 Contributor
- Platinum Member, Top 3 Contributor
- Top 1 Contributor
- Open-O Founding Member
- NFV Top 1 Contributor
- OpenStack Founding Member
- TOP 4 Contributor
- TOP 3 Contributor
- TOP 2 Contributor
- TOP 1 Contributor
- Gold Member, Top 6 Contributor
- 1 Long Term Maintainer
- 1 Committer
- 2 Committers
- 1 Committer
- Strategic Partner
- Kubernetes
- Docker
- Linux
Key Platform Ecosystem Play
Huawei Long Term Commitment

Open Ecosystem Foundation: Open, Collaborative and Sharing

**Huawei Developer Forum:**
- 10K+ Attendees
- Huawei Developer Congress
- Shenzhen Oct. 2015
- $1B 5 Year Investment In Huawei Developer Enablement Plan

**Open Lab Partner Program:**
- 10+ Open Labs
- 600+ Partners Today

**Business Solution Alliance:**
- Focus on ICT infrastructure to empower partner's value creation
- Inspire, engage and align all stakeholders with agile, lean and adaptive execution

Forming emerging solutions: SDN/NFV, ICT, cloud services, IoT, IoV, NB-IoT
“Platform + Product” Solutions

Huawei Early Business Success

Open Developer Ecosystem: Open, Collaborative and Sharing

- **FusionSphere / FusionStage**
  - 2500+ deployments, 1.4M VMs
  - 250+ cloud DCs in 100+ countries
  - Huawei Public Cloud in China
  - Open Telekom Cloud in Germany

- **Agile Network & CloudEdge / CloudCore**
  - 60+ joint innovation projects
  - Engage 20+ lead carriers
  - 9 commercial deployments

- **FusionInsight**
  - 200+ commercial customers
  - 500+ projects

- **IES**
  - Engage 5 lead carriers

- **Big Data**
  - SDN/NFV
  - Video
  - IES

- **Digital**
  - IoT Connect
  - PaaS/IaaS

- **Open Telekom Cloud in Germany**

- **60+ joint innovation projects**
  - Engage 20+ lead carriers
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- **9 commercial deployments**
  - 200+ commercial customers
  - 500+ projects

- **Engage 5 lead carriers**

- **Open Developer Ecosystem**
  - Open, Collaborative and Sharing
Overview of Huawei Four Platform Initiatives

- SDN/NFV Platform
- Big Data Analytic Platform
- Open Video Platform
- IoT Connectivity Platform
**SDN/NFV Platform:** Transforming Telco Network to Cloud

- Eventually penetrating to End CO
- Largely distributed into network infrastructure across Core-PoP, Metro-PoP & Hub to CO
- Highly concentrated at DCs

Cloud RAN → Cloud Field → Cloud DSL/OLT

- Cloud RAN
- Cloud Field
- Cloud DSL/OLT

**NFV In Data Domain**
- Eth Switch
- WDM

**SDN In Control Domain**
- Eth Switch
- Router
- WDM

**Converged Platform In Service Enabling Domain**
- DevOps In Operation Domain

- RRU
- ONT
- MxU
- Router
- Backbone
- Metro
Journey of Software Defined Network Evolution

2010: Software Abstracted Network

- Open Flow
  - ✓ Decouple control from data
  - × Focus on SB API
  - × Green data center only
  - × No migration path

2012: Software Controlled Network

- SDN Controller
  - ✓ Unify NB and SB APIs
  - ✓ ODL and ONOS Ecosystem
  - ✓ Support overlay, underlay & hybrid network devices
  - ✓ Control + Config domains with adapters to Legacy
  - × Limited data modeling
  - × Centralized State
  - × Weak distributed framework

2015 +: Software Operated Network

Next Challenges

- Hierarchical & Tiered SDN Architecture
- Distributed Network Telemetry framework
- Network-oriented big data analytics
- Declarative network data modeling
- Orchestration across layers
- Migration of distributed to centralized model
- Monolithic and Micro-services
- IoT connectivity in networks
- Leverage of distributed technology eco-system
Fundamental Challenge: **Network Engineering → Software Engineering**

How to Bridge SDN/NFV with rest of emerging Cloud World

- Configuration
- Telemetry
- Events
- Hierarchical & tiered SDN
- Distributed network telemetry
- Distributed system framework
- Network-oriented data modeling
- Access Control
- Message Broker
- Protocol Adapter
- Data Transformation
- Adapter
- Streaming Data Mux
- Pull / Push Dispatch
- Session Control
- Filter Matching
- Converged Service
- Management
- Ecosystem
- Cloud Operated Network
- Software Defined Network
- Strong Distributed Data Model
- Authoritative Network Model
- Open, Adaptable Data Distribution And Security
- PaaS / Container / Microservices
- Big data/streaming analytics
- NoSQL / Scalable SQL DB
- Orchestration and Automation

Cloud Operated Network

- Kubernetes
- Apache Kafka
- ONOS
- OpenDaylight
- akka
- OpenNESS
- Storm
- Cassandra
- Cloud Native Computing Foundation

Converged Service Management Ecosystem
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FusionInsight: Huawei Big Data Analytic Engine

**Manage Domain**
- System Management
- Data Governance
- Security Management

**Data Modeling, Algorithms & Tools**
- Solr
- HIVE
- STORM
- Arsto
- HBASE
- SPark
- hadoop
- Apache Kafka

**Smart**
- Enhanced algorithm set
- Domain driven models

**Agile**
- Life-cycle management
- Open API and enriched UX

**Trusted**
- Strengthened security
- Disaster recovery
Top 2 & 4 Contributors to Hadoop & Spark Ecosystem

Apache Huawei Contributions

Innovation
- HBase: Secondary index, 3X faster query

Efficiency
- Spark on HBase (Astro): Distributed SQL, Analytics on HBase

Performance
- Spark: Smart Query Rules, Optimized Cartesian join

Cost
- HDFS: Erasure Code, 50% cost saving

NEXT
- Spark: New format (Hadoop native), Optimized for OLAP

Carbon
- New format (Hadoop native), Optimized for OLAP
Shanghai Unicom Case: Deep Engagement
- Collaboration, Migration, Consolidation, Domain Knowledge & Co-innovation

30+ Use Cases
Across 4 Business Domains

31.3 Billion Records per Day
13.8 TB Data per day
1.9PB Storage, 60+M Subscribers

Consolidate 9 Systems from 3 Departments
Into 1 Big Data Platform

Promotion Success Rate
Improve 6X

Eliminate Invalid Promotion
25% saving

Subs Retention (Y2015)
200K Subs

Shared Data Asset
10+ Partners

Existing business Monetized Earning
$12M

New Business Monetized Earning
$3.2M
So far Big Data analytics have not been well applied to telecom network resource optimization.

- Missing a geo-distributed and tiered streaming analytic architecture and Network Telemetry framework
- Toward open analytics ecosystem across data center, network edge and IoT client devices
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- Video Platform
- IoT Connectivity Platform
Video Services become a core strategy of leading carriers

- Video Entertainment: 
  - EE: 41%
  - Vodafone: 51%
  - SK Telecom: 50%
  - China Telecom: 41%
  - NTT Docomo: 50%

- Video Communications: 
  - High Definition
  - Real Time
  - Convergent

- Vertical Applications: 
  - Everywhere
  - Identity
  - Social
  - eHealth
  - Online education
  - Smart city
Open Video Platform: Empowering business innovation and new value proposition in video service ecosystem

- Bold decision: Video as Basic service
- Devoted on network infrastructure for the best 4K experiences
- Rich content aggregation across IPTV, digital video, HD, 4K and 4G
- Creative business value proposition through service bundling
- Business success
  - Add 5.1M FTTH subs,
  - Add 6.9M IPTV/video subs
  - FBB ARPU up 14.3%
  - Monthly churn rate down by 4-20x,
  - Add 4.3M new mobile subs

China Telecom Sichuan case since 2014:
- Cloud architecture
- Big Data-driven
- Network-oriented
- EPG, CRM, BMS, CDN
- Content aggregation
- U-vMOS support
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IoT: Impact 2/3 Global Economy

Economic impact estimates for 2025 span from USD 3.9 trillion to USD 11.1 trillion *

Understanding the Market Dynamic is essential to make investment decisions at the right time.

* McKinsey Global Research 2015
Huawei IoT Strategy Focus: Infrastructure and Empowerment

1 Platform

2 Access Modes
- NB IoT
- Smart ONT
- Agile AR

1 IoT OS

Huawei LiteOS/Module
Smart Home Solution: Creating Telco’s New Value Proposition in Broadband Digital Transformation

IoT Connectivity Platform

Smart ONT

Home Health
Home Entertainment
Home Energy
Home Security
Home Automation
IoT Gateway: Unified industrial network edge device empowered with IoT edge intelligence

Industrial-grade design
- Shock-proof
- Water-proof
- Dust-proof
- Anti-EMI

Abundant interfaces
- Zigbee, RF, Blue-Tooth
- RS248, RS232, DI/DO

Complex protocol adaptation
- PLC, RFID, CAN, MODBUS, Wi-Fi

IoT Edge intelligence
- computing & storage
Smart Ammeter Solution: Low OpEx, high revenue and better UX for utility companies

- Reduced power loss
- Payment success rate
- Increased revenue

- Household users
- Commercial users
- Industrial users

Billing, Prepaid services, Power loss analysis

Agile AR

PLC
NB-IoT: Huawei pioneered technology and committed to standard with commercial global availability in 2016 Q3

- **Deeper coverage**: 20dB+ gain (penetrate one more wall than 2G)
- **Low power consumption**: 10-year battery life
- **10 billion connections**: 100K connections per cell (100x compared to 4G)
Cloud-based IoT Connectivity Platform: Accelerating digital transformation across consumer and industry space
Samples of early IoT Business Success

1,500 *ambulances* in Australia

18,000 *on-line buses* in China

100k+ *Gas Stations* in China

16,000 video surveillance points for *safe-city* in Hefei, China

120K+ *electric water heaters* in South Africa

30K *LED street lamps* in Czech
Summary: Embracing ICT Cloud Transformation

Open Developer Ecosystem: Open, Collaborative and Sharing

Platform Initiatives Product Portfolios

PaaS/IaaS
Big Data
SDN/NFV
Video
IoT Connect
Digital Operation

MBB FBB Core Network OSS VAS & BSS IoT GW UC&C Security Enterprise Network Server & Storage Smart Phone Wearable VR

CT Category
IT Category
Consumer Category
Performance Update

Revenue (USD in billion)

- 2010: 27.6
- 2011: 32.4
- 2012: 35.4
- 2013: 39.5
- 2014: 46.5
- 2015: 60.1*

* Internal estimate, not audited yet

- 2015 Revenue: 60.1 billion
- % Increase: 29%
- 2010 Revenue: 27.6 billion

- Carrier Network: 60%
- Consumer: 33%
- Enterprise: 7%

- China: 44%
- Oversea: 56%
- ~21% increase
- ~44% increase
- ~73% increase

Carrier networks
Enterprise
Consumer

China
Oversea
Long Term Commitment to R&D Investment

$7.7 billion (in 2015)

$38.7 billion (from 2005 to 2015)

79,000 employees dedicated in 16 R&D centers

Joined 300+ standard & open source organizations

280+ key positions in IEEE-SA, ETSI...

50,377 patents granted

The Most Innovative Companies

Top 100 Global Innovators

*: Internal estimate, not audited yet

**: As of Dec. 31, 2015

***: (Boston Consulting Group 2014)

****: (Thomson Reuters 2014)