Inject Intelligence to Digital Economy and Work Together to Build a Better Future

Preliminary Thoughts and Practices

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China Telecommunications Group Co., Ltd.
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Traditional businesses are facing challenges, where is the future of the telecom industry?
Mobile business: an era of “all” having mobile phones

1.5 billion users

1.4 billion population

User scale:
one phone for a person –
market saturation
Mobile business: an era of “all” having mobile phones

User growth:
a bowl of soup, poured from one bowl to another, and the industrial value decreases with every pour
Mobile business: an era of “all” having mobile phones

Dual-card users:
a meal for one person,
served in two bowls

300 million
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Data traffic business: **unlimited volume + sharing** may lead to big increase in volume but few in revenue.

Data traffic growth and DOU growth lead to CAPEX/OPEX growth.

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<thead>
<tr>
<th>Company</th>
<th>Mobile data traffic growth</th>
<th>DOU growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company A</td>
<td>350%</td>
<td>290%</td>
</tr>
<tr>
<td>Company B</td>
<td>280%</td>
<td>240%</td>
</tr>
<tr>
<td>Company C</td>
<td>140%</td>
<td>130%</td>
</tr>
</tbody>
</table>
Broadband business: bundled with mobile phones, TV and data traffic services – some happy and some sad

Where is the marginal benefit? Where is the synergistic effect?

$$\text{PMPI} = \text{MCI}$$

BB market share 2015

BB market net growth share 2017
Private lines for governments and enterprises: replaced by the function of cloud-network integration

Customer’s traditional IT architecture

Buy operator’s resources

Operator revenue: long-distance circuits, local circuits, and IDC (disaster backup)

Customer’s cloud IT architecture

Buy cloud service provider’s functions

Operator revenue: local circuits
Prosperous digital economy brings broad prospects to the telecom industry!
Status Quo of Digital Economy

China is making greater contributions to the recovery growth of world economy and digital economy plays an increasingly prominent role.

- Contribution by China to world economy:
  - 2008: 15.2%
  - 2009: 20.3%
  - 2010: 26.1%
  - 2011: 27.5%
  - 2012: 30%
  - 2013: 30.3%
  - 2014: 32.9%
  - 2015: 34%

- Proportion of digital economy in China’s GDP:
  - 2008: 0%
  - 2009: 20%
  - 2010: 30%
  - 2011: 34%

- China’s GDP growth rate:
  - 2008: 15.2%
  - 2009: 20.3%
  - 2010: 26.1%
  - 2011: 27.5%
  - 2012: 30%
  - 2013: 30.3%
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- World GDP growth rate:
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  - 2014: 32.9%
  - 2015: 34%
  - 2016: 34%
  - 2017: 34%
Digital Economy Brings Bright Prospects to ICT Industry

• Without informatization, there will be no modernization. Informatization brings a golden opportunity to the Chinese nation.

• Promote further integration of the internet, big data, and artificial intelligence with the real economy.

• Accelerate the development of informatization to generally drive and improve the development of new industrialization, urbanization, and agricultural modernization.

• Make China a country of innovations and provide powerful support for building China’s strength in cyberspace, and for building a digital China and a smart society.

• Develop new driving forces through informatization, to promote new development and therefore make new achievements.
Expedite digital transformation and develop into a comprehensive intelligent information service operator
Operator’s Path Choice?

Dumb pipe
- Have pure basic network facilities
- Provide access service to users

Inheritor of traditional businesses
- Focus on network, marketing and other core capabilities
- Provide connection service in a relatively closed market environment

Intelligent pipe
- Cooperate with internet companies to improve the quality of user services
- Make use of regulation policies to protect the core connection business

Integrated service provider
- Besides providing intelligent pipes, enable the cooperation partners and jointly expand digital application services

Pipe + platform + content
- Besides providing connection service to end users and enabling cooperation, develop a series of new digital content products to obtain more added value for application services
# Operator’s Transformation Journey

<table>
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<th>Traditional practices of telecom industry</th>
<th>Digital transformation road</th>
<th>China Telecom’s practices</th>
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<td><strong>Business provision</strong></td>
<td><strong>Operation model</strong></td>
<td><strong>Network system</strong></td>
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<tr>
<td>• Closed management system</td>
<td>• Open API platform architecture</td>
<td>• Eco-based businesses</td>
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<tr>
<td>• Limited portfolios of traditional services</td>
<td>• Diversified portfolios of digital services</td>
<td>Intelligent connection, smart home</td>
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<tr>
<td>• Limited and relatively closed suppliers</td>
<td>• Open-source ecosystem</td>
<td>Internet finance, IoT, DICT</td>
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<tr>
<td>• Traditional process, limited data development</td>
<td>• Agile iteration, big data operation</td>
<td><strong>Smart operation</strong></td>
</tr>
<tr>
<td>• Traditional marketing channels, simple retaining</td>
<td>• Integrated channel system, 360° customer experience</td>
<td>Smart middle ground</td>
</tr>
<tr>
<td>• Solidified organization, closed culture</td>
<td>• Flexible organization, open culture</td>
<td>Application of “precise marketing, fine service, lean network operation, and accurate management”</td>
</tr>
<tr>
<td>• Discrete professional networks (wireless, bearer, transmission, core, IP, etc.)</td>
<td>• Integrated cloud-network architecture (virtualization, software-based, cloud-based)</td>
<td><strong>Intelligent networks</strong></td>
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<tr>
<td></td>
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<td>Cloud-network integration</td>
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<td>SDN/NFV…</td>
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## Business provision
- Closed management system
- Limited portfolios of traditional services
- Limited and relatively closed suppliers

## Operation model
- Traditional process, limited data development
- Traditional marketing channels, simple retaining
- Solidified organization, closed culture

## Network system
- Discrete professional networks (wireless, bearer, transmission, core, IP, etc.)
China Telecom’s Practices — Smart City/Governance

Hangzhou government services: “go to the office hall at most once”

1 window handling for housing, local taxation and land resources departments, completion in 1 hour

Immediate online handling of 25 matters for Common Reserve Fund Center

One ID card identification for 296 government service matters

Full data sharing, saving more than 10,000 paper materials per day

Connecting 59 departments, exchanging 36 billion pieces of data, and realizing “go to the office hall at most once” for 5953 matters
China Telecom’s Practices — Smart City/City Management

### Smart apps
- public order
- fire fighting
- safety supervision
- city management
- Emergency response
- comprehensive management
- water resources management
- Traffic
- Healthcare
- Tourism
- Education
- ……

### Smart City Integrated Management Platform
- Tianyi 4G
- Fibre broadband
- Private lines for governments & enterprises
- NB-IoT

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**Fuzhou of Fujian**
- Monitor the water level changes in the areas liable to waterlogging in real time with NB-IoT
- Connect the emergency response platform and make responses and scheduling in 5 minutes
- Get through the scattered city drainage system for linked drainage and scheduling to realize real-time control of drainage

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**Guanghe of Gansu**
- Integrate trans-department real-time data resources, including public order, traffic, fire fighting and city management, to realize unified commanding and scheduling
- Use technologies such as face identification, trace tracking, and abnormal behavior analysis to handle events that disturb the public order, traffic accidents, illegal stalls, etc.
China Telecom’s Practices – Smart City/Public Services

Shenzhen Smart Water System

Smart pipe network

- Automatic meter reading (AMR)
- Tiered pricing
- Data analysis
- Energy-saving management
- Zone metering
- Online monitoring

IoT Open Platform

- API management & opening
- Data management
- Connection management
- Device management

NB-IoT

- Reporting success rate
  - 99%
  - 86%

Savings

- Labor cost saved
  - 270 million
  - 135 million
  - (10 years)

- Annual bad debt loss reduced
  - RMB 3 million/year

Leak rate

- 20%
- 10%
China Telecom’s Practices—Smart City/Smart Industries

Building Yilian Industrial Internet Platform and Contributing to “China Manufacturing 2025”

Smart application
- Lean production
- Digital station
- Predictive maintenance
- Intelligent storage & logistics
- Personalized customization
- Product life cycle management

E.g. a high-end parts manufacturer
- Order on-time delivery rate: 74.2%
- Problem shut-off rate: 91.6%
- Material scrap rate: 4.7%

Smart platform

Intelligent networks
- Industrial PON
- Industrial wireless private network
- NB-IoT
- 4G/5G

Smart sensing
Smart devices
Smart products
SMEs may use information services like using water and electricity

Based on SDN, NFV and other technologies; aggregate third-party information applications; unified service portal; implemented in Shanghai and other 20 parks

- **One-stop shopping**
- **Fully equipped**
- **Intelligent on-demand services**
- **Self-service**

**Unified service portal**
- online order & purchase
- self-service
- …

**App products**
- company mailbox
- OA
- company site building
- HR
- financial management
- call center
- big data
- …

**Cloud-network products**
- cloud host
- cloud storage
- on-demand private line
- on-demand internet surfing
- cloud desktop
- company cloud disk
- cloud WiFi
- …

**New cloud-network technologies**
- SDN
- NFV
- Collaborative arrangement

**New eco model**
- basic software
- corporate apps
- professional service
- solutions

**Corporate IT costs**
- 46%

**Host Rovisioning time**
- 1 month
- 3 days

**Local operation & maintenance staff**
- 3 people
- 1 person
China Telecom’s Practices—Smart Home

From connection to applications, bringing users more comfortable, convenient and smarter home life through all-round ecosystem cooperation and operation.

3 interactive entrances
- Tianyi gateway
- Smart set-top box
- Xiaoyi Housekeeper APP

4 core apps
- Smart Home
- iPTV
- E-cloud Disk
- Intelligent networking

3 industrial ecosystems
- Home eco
- Content eco
- Connection eco

Highlighting core values
- Convenient cross-brand connected smart devices
- Unified operation
- Connected devices
- Linked scenes

- Aggregate & present mass entertainment contents
- 4K VR
- Live broadcast, video on demand

- High-speed & stable home network
- Wired + WiFi
- 1,000M full coverage

160 million intelligent optical bandwidth
200,000 offline channels
130,000 customer engineers
200+ Alliance members
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Smart set-top box
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Smart Home HD Platform
connection management, network management, business management, application management, terminal management, data management

Connection eco
Content eco
Home eco

Tianyi gateway
Set-top box
Xiaoyi Housekeeper APP

Smart home networking
IPTV
E-cloud Disk

Convenience
Interactive
Eco-systems

Organizations

200,000
160 million
130,000
200+

Off-line Channels
Intelligent Optical Bandwidth
Customer Engineers
Alliances

Interactive entrances
Core apps
Platform systems
Industrial ecosystems

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China Telecom’s Network Evolution – Preliminary Results Achieved

CTNet2025 Network Re-configuration
Launched in 2016

- **NFV**
  - Software-hardware decoupling, intensive operation
  - E.g.: six nodes of vIMS in 3 regions; centralized VoLTE network and businesses in 31 provinces

- **SDN**
  - Central control, intelligent opening
  - E.g.: SDN in cloud resources, on-demand private lines for governments & enterprises
  - Configuration and opening period shortened from weeks to minutes

- **Cloud-network integration**
  - Network changes with the cloud, unified arrangement
  - E.g.: unified arrangement of DCI/CN2 capability and cloud resources opening of cloud-network one-spot handling and adjustment as needed
China Telecom’s Network Evolution – Challenges & Opportunities Co-existing

Future network will bring subversive changes

- **Network architecture changes**
  - Simple, agile, open, intensive
  - Universally applied infrastructure, software-based network functions

- **Organizational process changes**
  - Development-operation integration (Devops) organization
  - IT-network integration, and open-source software becomes an essential element

- **Industrial chain changes**
  - Capability opening: network becomes a platform and service
  - Accelerated innovation: customer taking part in service defining, deeper network functions R&D by operators, wider suppliers

- **Culture, knowledge and skill changes**
  ... ... ...

The road ahead is long
Digital Economy Is Bound to Bring Bright Future to the Telecom Industry

The telecom industry has become a foundational, strategic and guiding industry; is becoming a catalyst, adhesive and propellant to digital economy; and in future will certainly become a multiplier to economic growth, convertor to development ways, and booster to industrial upgrade!
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