Huawei’s Internationalization: Past, Present, and Future

7TH COPENHAGEN CONFERENCE ON EMERGING MARKET MULTINATIONALS: OUTWARD INVESTMENT FROM EMERGING ECONOMIES

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15 – 10 – 2021

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Shenzhen in 1980

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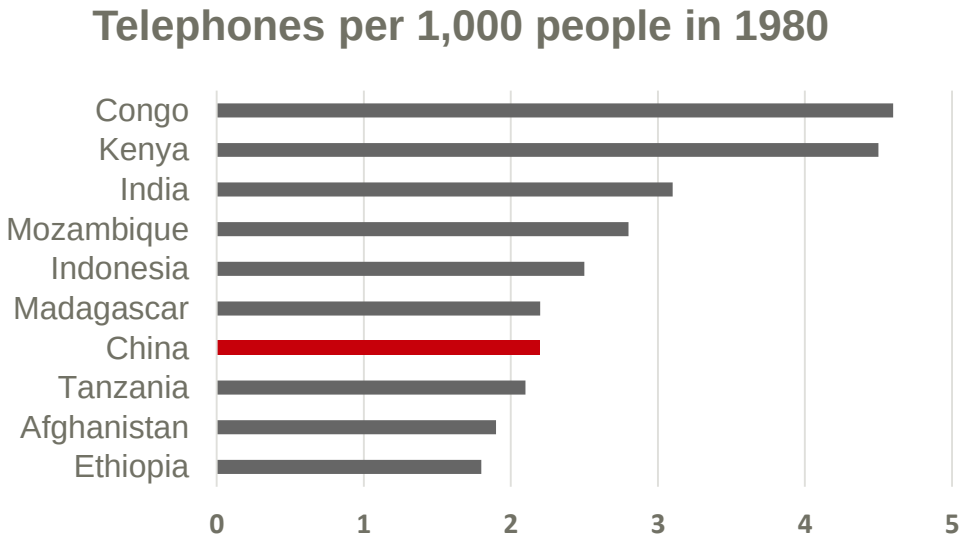
China in 1980

1980 marked the end of two decades of hardship and internal conflict in China. This period left China under-developed and greatly damaged what little infrastructure was in place at the time.

Shenzhen Town Center in 1980

Poverty Rate for China in 1980: 88%.

Number of registered vehicles: 365,000



China's telephone penetration rate was only 0.22%, one of the lowest rates in the world. This was the result of 20 years of telephone lines being restricted only to senior government officials.

Source: World Bank

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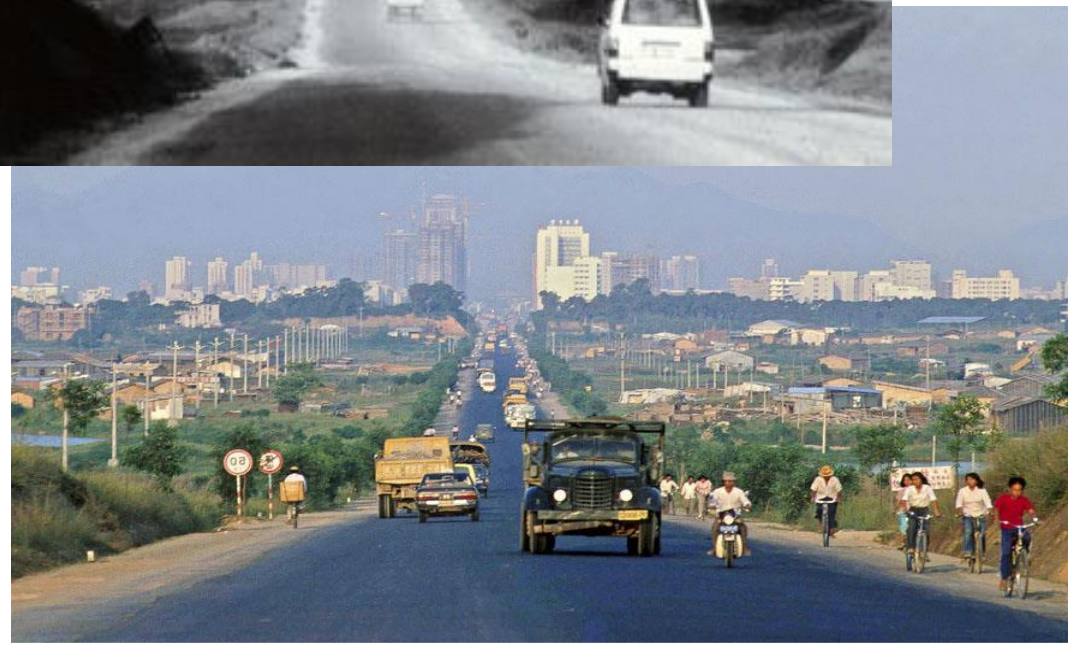
Shenzhen: China's first Special Economic Zone

Shennan Blvd in 1980 and 1985



- In May, 1980, Shenzhen was declared a Special Economic Zone (SEZ)
- The central government had no money to provide Shenzhen. They only gave them the freedom to make their own rules.
- The changes they made included
  - Removed restrictions on foreign investment
  - Simplified the rules for opening a business
  - Permitted leasing land
  - Allow people to be paid different rates based on what they produced
- Within a year, development in Shenzhen took off. Residents said it was like the entire city was a construction site.

Reforming China's Telecom Industry

In 1981, the central government recognized that China's under-developed telecommunications infrastructure was a serious bottleneck for national development. The estimated that telecommunications investment would be 15x more effective in driving economic development than other infrastructure development.

One Time Investment:

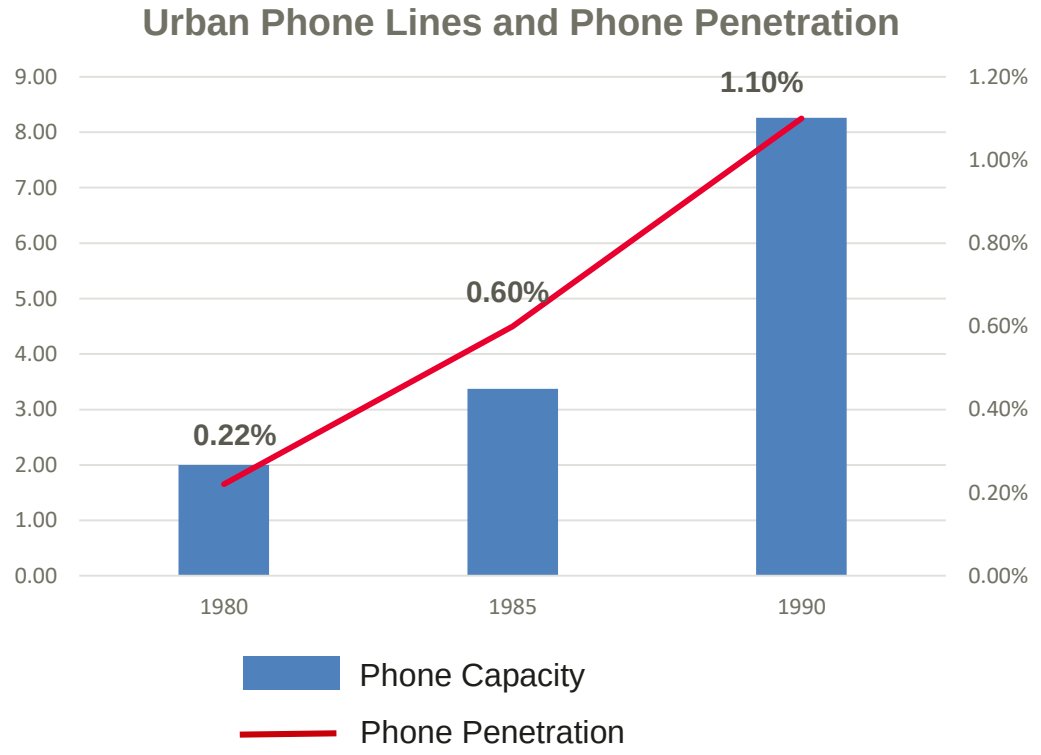
- The government allocated 4.2B RMB for telecommunication, a 20x increase and enough to install 1.37 million new phone lines.

Removed Bottlenecks

- Removed restrictions on importing telecommunication equipment
- Reduced then eliminated tariffs on communications equipment

Policies to Encourage Investment

- Decentralized the Ministry of Post and Telecommunications (MPT)
- Allowed the MPT to keep 90% of their profits,
- Allowed local MPT agencies to set the installation prices. This provided additional capital need to fund infrastructure growth.
- Made salaries a function of subscriber growth
- Adjusted accounting rules to encourage telecom investments



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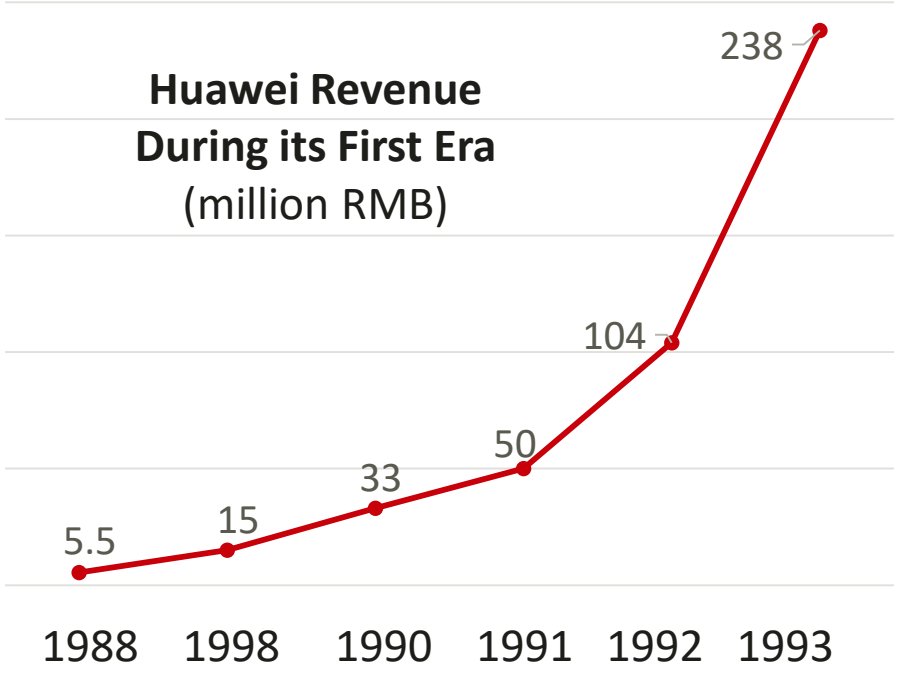
A Rocky Birth: 1987 - 1992

Born out of Necessity

- Mr. Ren recently laid off from Shenzhen South Sea Oil Company
- 43 years old, living in a 20m^2 apartment with parents and 2 kids.
- Started Huawei in 1987 with only 21,000 RMB ($3,500 US)
- Original business was reselling PBX equipment from HK

R&D was a Matter of Survival

- Competing with several hundred similar resellers
- Supply of equipment to resell was severely limited
- Delays and missed opportunities due to limited supply
- Mr. Ren decided that to survive we must control our own technology



First Product Bring First Crisis

- Initial products were analog phone switches for businesses
- BH01: 2x4-ports analog switch made from vendors board, assembled and supported by Huawei.
- Supply of parts for BH01 was suddenly cut off triggering a crisis
- The was not enough cash for refund pre-paid customer orders
- Resolved by quickly designing our own board with same functions and a new, better looking case. Called this BH03.
- When BH03 finally shipped, Huawei's cash was almost zero

Heavy Investment in R&D

- Profits from BH03 allowed Huawei to grow R&D team
- Hired Guo Ping, who recruited classmate Zheng Baoyong
- Expanded technical ability allowed us to build better products: supporting 100, then up to 500 lines.
- By the end of 1991, Huawei had 100 employees, and all profits went back into R&D

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Testing our early phone system

Taking the Thorny Road: Becoming a Telco Vendor

Change Strategy to Target Phone Operators

- At an all employee meeting, Ren shared his bold vision to build switches for the telephone bureaus (MPT).
- Puts Huawei in competition with well known giants: AT&T, Ericsson, Nokia, Alcatel, Fujitsu, and NEC. 8 foreign vendors operating in China, plus 4 domestic competitors.

First Carrier Product: JK1000 was a painful lesson

- Analog switch, released in June 1993, but everyone wanted digital
- 200 systems sold in rural areas, but problems emerged especially with lightening. Reputation for low quality started to develop.
- Support team was formed to address issues. They would travel to any area, work diligently, and resolve issues.
- JK1000 was a market failure that almost destroyed Huawei
- It also taught us many things, especially the important of support

We succeed next time, or I jump

- After the JK1000, Huawei again was facing bankruptcy
- Mr. Ren devoted all resources to building a new product, a digital, programmable telecom switch capable of supporting China scale.
- He would say "If our R&D fails, I will jump from the top of this building, and you can find your way out of the hole"

The Rocky Road to Success

Our Last Chance

- For the next year, the whole company focused on the C&C08
- Huawei again faced a shortage of cash:
  - Develop tools were rare. Learned to troubleshoot with a multimeter
  - Employees got 50% salary in cash and balance in stock
- Turnover was high. Everyone openly asking can Huawei survive?
- When an employee left, stock was bought back which help moral.

Poor Support Created an Opening

- Market saturated with western vendors and domestic Joint Ventures
- Shanghai Bell, a JV between Belgian Bell and the MPT was market leader
- Market demand greatly exceeded supply, creating delays of up to 2 years before products could be delivered.

Breakthrough in Yiwu

- Oct 1993, MPT in Yiwu couldn't want 2 year, and took a chance with Huawei.
- System was delivered before stable and fully tested
- Core R&D team worked onsite for more than 2 months to get system stable
- Customer was supportive and offered many suggestions to improve
- System finally delivered and accepted in Dec 1993.

Customers are Thrilled

- "Chinese Menu. Mouse Operations. Hotkey Help. The interface in clear and beautiful, easy to operate, easy to learn. It relieves the hardship of training and reduces the chance of errors. Very Happy"
- Enabled Yiwu MPT to install 58,000 new phone lines in 3 months
- They get paid more when they grow their subscriber base.

Never Stop Improving

- At the delivery celebration, Mr Ren declared: "For 8 years, we must continuously receive feedback from users and continuously improve our switch"
- He even said we would hire designer to make our racks more beautiful.
- Over the next few years, Huawei delivered many improvements to Yiwu and other customers.
- Yiwu was the first district in China to support Dial up Internet in 1996.

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Never Slow Down

Working Towards China Scale

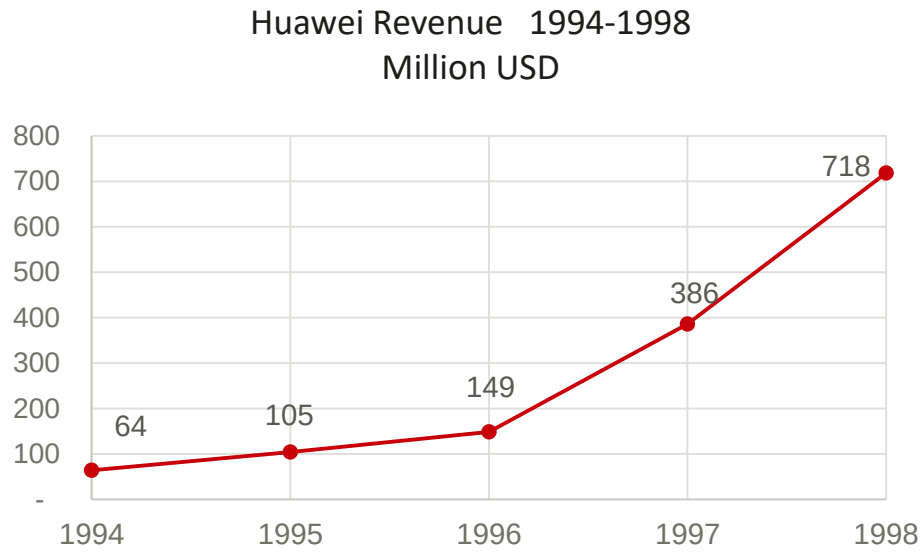
- After delivering the first C&C08, the team began working to support 1M lines
- Typically this was down by connecting smaller modules via a bus
- But for this scale, the most advanced busses wouldn't work.
- We use optical, which at the time only the biggest vendors (AT&T) supported
- Fortunately, our lead engineer graduated with a degree in optical electronics

Rural Quality

- We also continually adapted it to address issues in rural markets including:
  - Power: power could drop from 220v to 180v at times
  - Temperature: rural date centers often had poor cooling
  - Rodents: numerous trouble calls were triggered by rats or other pests
- Other vendors treated service as a profit center. We considered it a way to learn what our customers really needed and improved our products.
- After a few years of updates, the quality of C&C08 was ahead of the west

Steady Growth in Rural China

- 1995: C&C08 is certified by the Ministry of Post and Telecom (MPT)
- Enable Huawei to participate in the governments 50 Billion RMB "village-to-village" (rural coverage) program
- Awarded 1.3B RMB (179M USD) to provide C&C08 systems to rural cities
- 20% market in China by 1998, but only in the rural areas.



Advantages of the C&C08

- **Smaller**: Required 9 racks of gear to support 100k subscriber. Competitors required 28 racks
- **More Efficient:** Only required 8.2 kw of power. Competitors use 69 kw of power.
- **More Advanced**: Built from the latest technologies and not held back by legacy designs.
- **Simpler**: Used graphical user interfaces making it easer to operate and supported Chinese language.
- **More Scalable**: Leverages optical connections to support hundreds of thousands of lines.

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Russia was one of our first international targets

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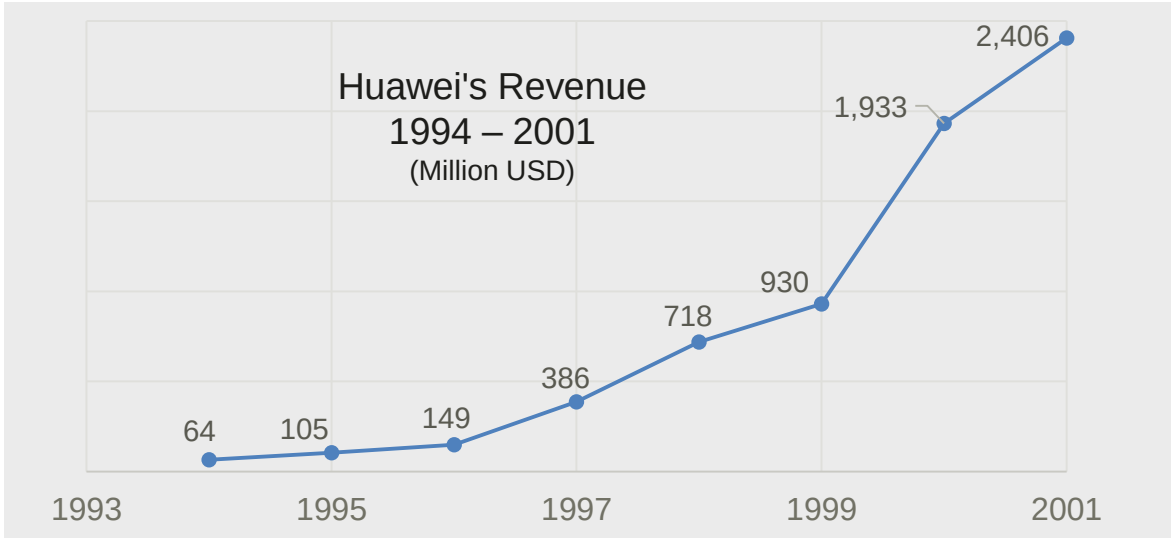
Huawei Expands into Optical and the World

1996: Huawei wins contract in Hong Kong

- First International contract with Hutchinson in Hong Kong for the C&C08 and optical networks. It too required months of onsite development and testing.

1997: Huawei goes International

- Expand overseas with C&C08, optical network solutions
- First contracts: Russia, Hong Kong, Thailand, S. Africa



C&C08 Global Deployments

Explosive Growth Across the Telecom Industry:

- By 2000, C&C08 is China's leading telephone switch with 20% market share, mostly in rural areas.
- Launched in 40 international markets
- Optical solutions captured 30% share of the SDH/DWDM market in China.

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Huawei Learns from the West

Struggling with Success

- 1997: Huawei was one of the top Chinese companies ($500 million revenue)
- Two product failures that year cause Mr. Ren to reflect on our challenges:
- Immature R&D processes: Success relies on heroic efforts of our employees
- Constantly evolving product lines: Nearly product 1,000 version to manage
- Low on-time delivery, about 50%
- Lack of Control: Mr. Ren looked to the West for guidance

Who ever resists change, must leave Huawei

- Met Lou Gerstner, CEO of IBM, in Dec 1997, and learned about IPD
- Mr. Ren returned convinced Huawei must change.
- Personally let the reform effort. Constantly advocating for transformation
- Initial Team: 50 IBM Consultants and 300 Huawei Leaders.
- In May, 2000, the IPD process was piloted with 3 product lines.
- This pilot reduced product development time by 50%
- By 2002, 50% of the products followed the IPD process, 100% in 2003.

Huawei's Transformation

5 years of effort: 1998 – 2003

Required massive investment: 4B RMB

7 Projects covering all aspects of the company:

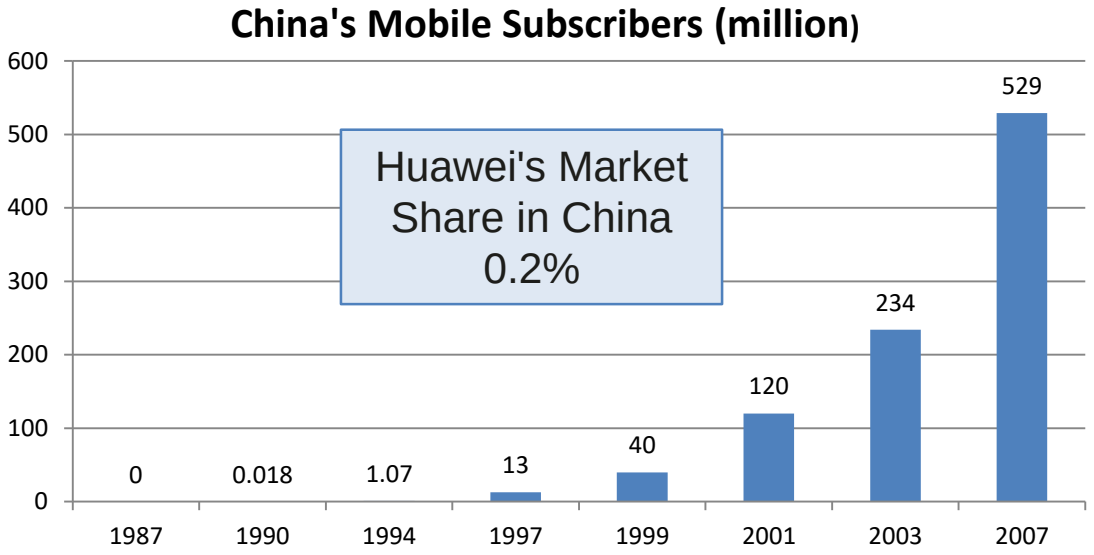
- Integrated Product Development (IPD) with IBM
- Integrated Supply Chain (ISC) with IBM
- Organizational Structure Design with Mercer
- Staff Shareholding Scheme with Towers Perrin
- Salary System and Job Grade Framework with Hay Group
- Financial System Optimization with KPMG
- Global Finance with PWC

Transformation was essential for our continued success

Huawei Misses Out in China

We entered the GSM (2G) market too late:

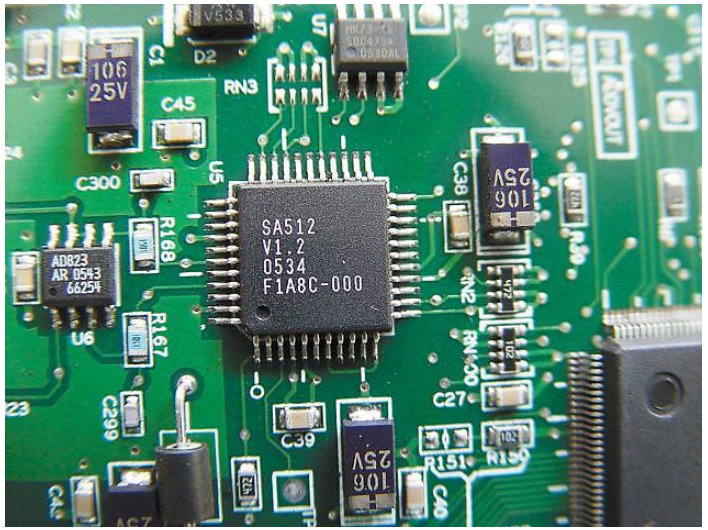
- GSM solution released in Oct 1997, but China market already captured by big western vendors.
- By 2000, there were over 100M mobile subscribers in China, but Huawei's share was only 200,000 subscribers.
- Our first major wireless win was in 2003 for a GPRS (2G data solution) sold to China Mobile for Fujian and Liaoning provinces.



3G Never Materialized in China

- We began developing UMTS (3G) in 1998 in parallel with our GSM solution. It was ready for release in 2001.
- That year, China announced it would delay issuing licenses for 3G services.
- After nearly 2 years of waiting for 3G licenses in China, Mr. Ren sent the team abroad to look for opportunities overseas.
- Our first 3G sales was at the end of 2003 to Etisalat in UAE and Sunday in Hong Kong (later acquired by PCCW).
- 3G licenses in China wouldn't be issued until 2009, and even then Huawei did not win any significant share of the market

Huawei's first WCDMA chipset



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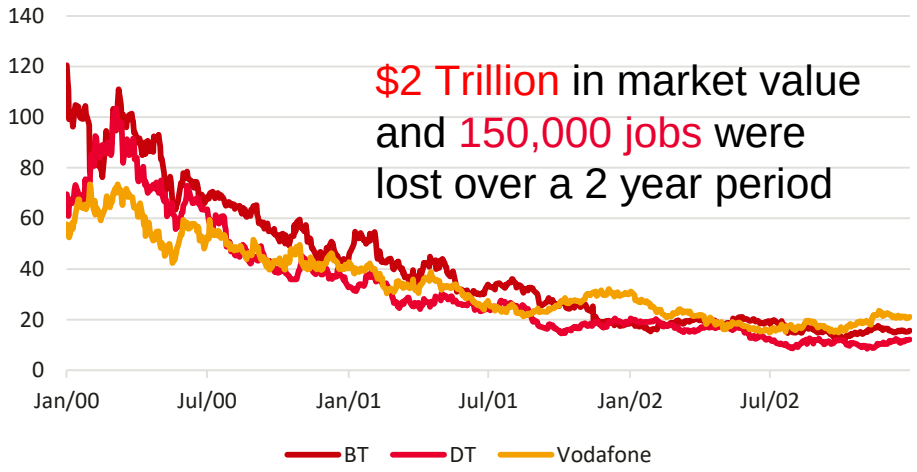
Winter Comes

Early 2001, Mr. Ren's article Huawei's Winter warned employees that even though things look good now, winter many be around the corner, and we must prepare for it. Three months later winter came.



Stock Price for Major Telecom Providers
2000 to 2002

Every vendor saw their revenues fall after the crash. Alcatel: by 41%, Ericsson by 42%, Nortel 65%, and Lucent 70%. Huawei's revenue dropped by 7.6% ($162 Million USD).

All vendors except Huawei responded with job cuts, cutting staff by 20 to 50%.

Huawei's Response to the Crisis

Huawei's Winter

Spring of the North Country

Focus on Survival

- Because our investors are our employees, survival and job preservation was our top priority. There were no large lay-offs
- Senior leaders accepted a pay cut, others voluntarily left to pursue other businesses.
- Avansys, our power division was sold to Emerson for $750 million USD providing much needed operating capital.

Look for Opportunities

- Chicken Rib Strategy: Focus on the low end of the market.
- 2002: bought OptiMight, a struggling silicon-valley based optical network company to strengthen DWM products.
- Expand our international presence by hiring talented people impacted by the down sizing.
- Huawei even considered selling it's self to Motorola in 2003, but the deal was rejected by the Motorola board.
- In 2003, our international revenue doubled

Huawei was the only vendor to emerge from the crisis stronger than before.

Europe Breakthrough Opens Doors

Winter Ends

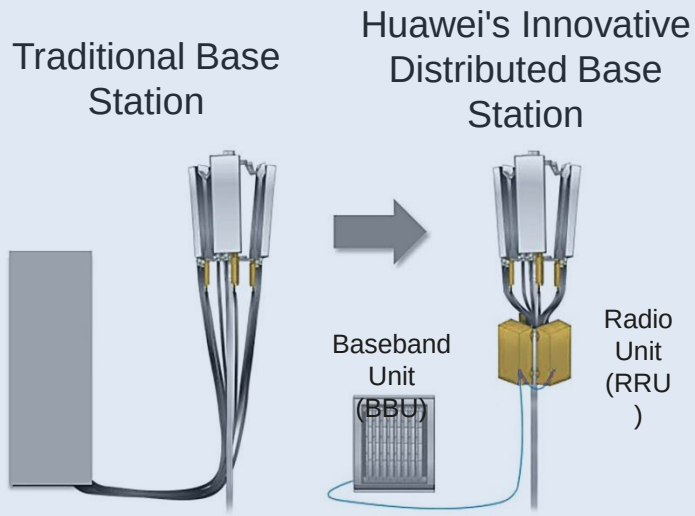
- Winter ended in mid-2003 with a contract for the France's National Optical backbone, and for 5.2M ADSL lines with China Telecom and China Netcom.
- 2003 also saw a few mobile wins including a 2G system for Megafon in Russia and Portugal and 3G for Malaysia and Hong Kong.

European Mobile Breakthrough

- In Dec 2004, Huawei won it’s first European contract with the Dutch carrier Telfort (now KPN) to deliver a nation-wide 3G network thanks to our innovative Distributed Base Station design.
- This win gave us new credibility in the more developed market, and was quickly followed up by more wins including strategic agreements with Telefonica, Vodafone and MTN.
- By 2006 we achieved a 32.9% market share for new 3G (UMTS/HSPA) mobile networks and a 22% market share for 2G (GSM) networks.

Breakthrough in Optical Networks

- In 2005, Huawei won a contract with BT to deliver its multi-service access network (MSAN) and the optical transmission components of it's 21 Century Network program. This was only after a long and thorough vendor vetting process from BT.



Traditionally, all the active gear in a base station was housed in an air conditioned equipment room at the base of the tower. This required ¾" coax cables to connect to the antenna and those cables created power loss, lowering the transmission power.

Huawei's Distributed Base Station changes the radio components to outdoor equipment that can be mounted on the tower, very close to the antenna. This had a number of benefits:

- More transmission power (lower loss)
- Lower OpEx cost due to less AC
- Less equipment room space required

Winning with Innovation and Service

Joint Innovation Produces Groundbreaking Results

- 2008: Huawei announces SingleRAN. Uses Software Defined Radio technologies to provide a mobile network capable of supporting both 2G and 3G.
- Prior to SingleRAN, operators had to deploy 2G and 3G as two independent networks. Operators frequently asked the vendor community for a single system to manage both technologies, but no other vendor was willing to make the necessary investment.
- Huawei's SingleRAN solution was developed in close partnership with Vodafone's Radio Mobile Innovation Centre based in Madrid, Spain. The is one example of what we call Joint Innovation.
- SinglleRAN was a huge market success. By the end of 2009, more than 30 operators had deployed Huawei's SingleRAN network. In 2012, 170 operators deployed SingleRAN.

Mount Everest

Winning with Customer Service

- Huawei learned in our early days, that even the smallest customers mattered. We continue to follow that principal today.
- Regardless of the challenge our customer faced, Huawei would be there to face them together with them.
- During this period, Huawei build base stations on Mount Everest, inside the Artic Circle, and in other areas other vendors would not go.

Pensiangan, Malaysia

Artic Circle

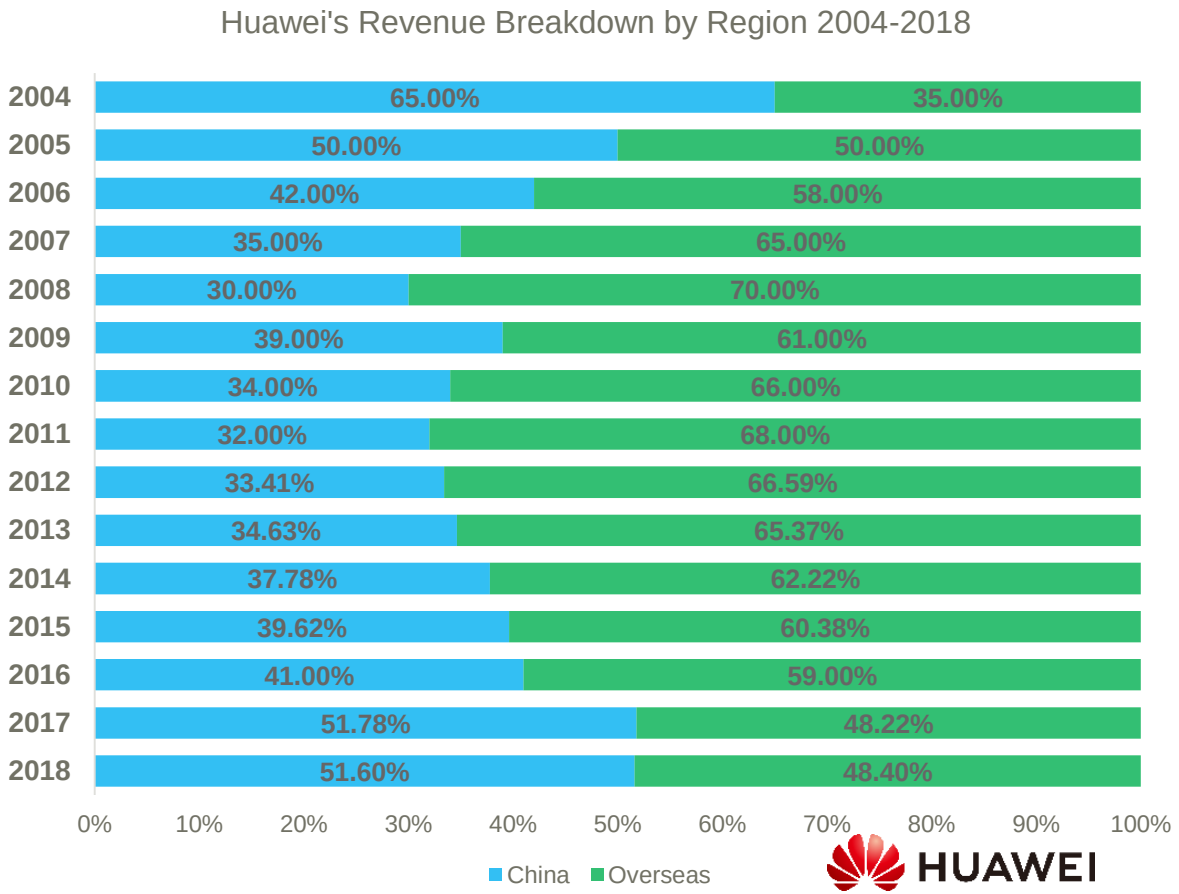
4G Moves Huawei into the Lead

4G Era Begins

- In December, 2009, Huawei launches the world's first 4G network with TeliaSonera, in Oslo, Norway. Two years later, in 2011, we deployed 4G across the country.
- Huawei's SingleRAN solution supported software upgrades to 4G. This allowed our 2G/3G customers to preserve their earlier investment, and rapidly deploy 4G. This helped us deploy 4G at an incredibly fast pace:
    - 2010: 28 LTE Networks
    - 2011: 49 LTE Networks
    - 2012: 139 LTE Networks
- By 2012, Huawei had deployed over 500 wireless networks including 139 LTE (4G) networks and 270 UTMS (3G) networks servicing 2+ billion people, roughly 1/3 of the world's population.

International Revenue Dominates

- In the 2G and 3G era, Huawei has virtually no market share in the mobile network. This limited our revenue opportunities in the domestic market.
- In 2005, sales of our Distributed Base Stations and SingleRAN solutions began to play a larger role in our revenue. During this period, international revenue was 60-70% of our overall revenue.
- International revenue continued to dominate, until 2011, when China finally release 4G spectrum in the domestic market.



Success Brings Scrutiny

Perceptions of China have always Plagued Huawei

- Huawei entered the international markets at about the same time that low-cost, low-quality Chinese products began to flood the markets
- Some of our competitors have been taking advantage to this to raise doubts rather than compete directly with us.

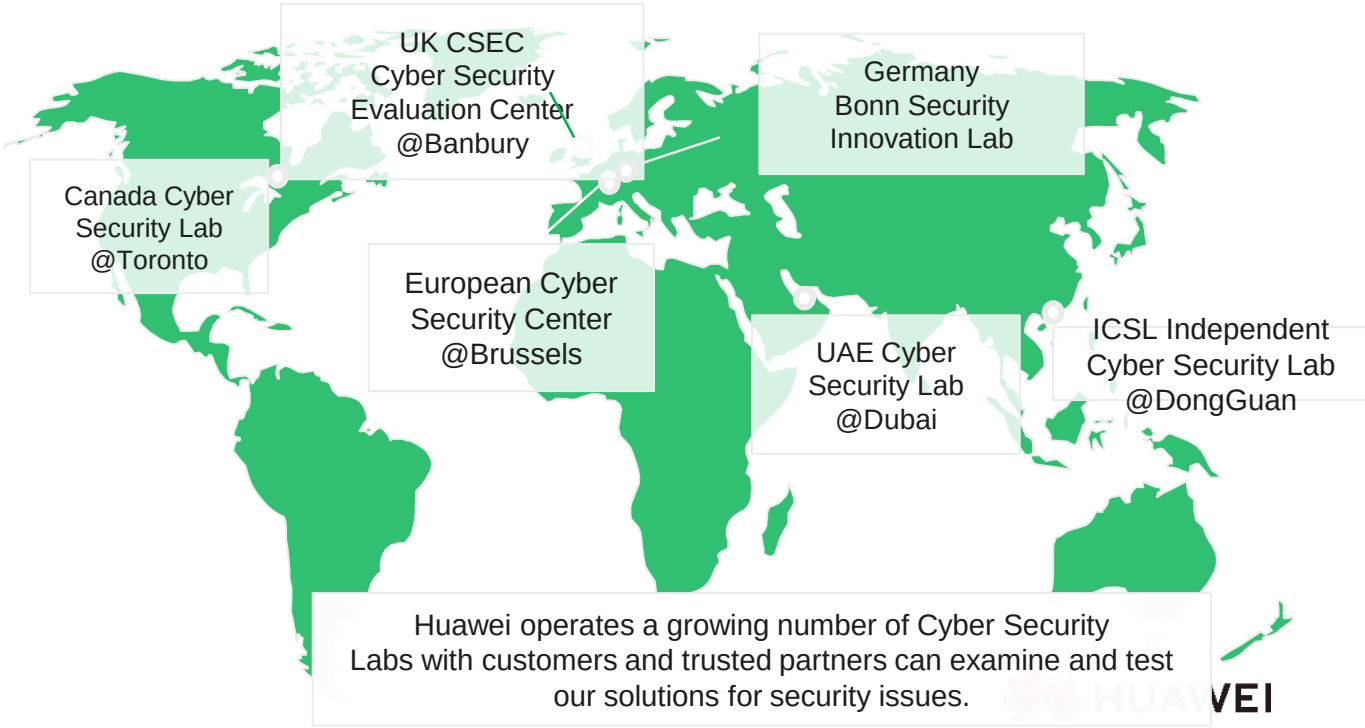
Whiter than White

- Because of the intense suspicion about Huawei and China we have always been held to a higher standard than others.
- In response, Huawei has implemented the strictest ethics and cyber security rules in the industry.
- All employees must take a course on business ethics and cyber security every 6 months and pass an exam
- Any violation of these rules are dealt with severely, and the results are published on our ethics website. No employee, even the most senior level, is able to hide from their actions
- Before an employee can be promoted an email goes out to people who have worked for/with them asking for input.
- If an employee violates the rules, the manager of that employee is also held accountable. In some cases, higher level managers are also held accountable.

False Accusations of IP Theft

- The US media often mentions that Huawei has faced numerous accusations of IP theft since 2003
- In every case, Huawei has responded transparently, including opening up our source code to independent evaluation.
- No evidence of IP theft has ever been found against Huawei.

Many Eyes, Many Hands Ensure Security



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Huawei Mobile Antennas

Early Challenges Made us Cautious about Devices

1998: **Huawei's First Phone**

- Fierce competition at the time drove prices down
- Manufacturing outsourced, and quality was very low
- Lightening hits the phone line, hundreds of phones die.
- Huawei pulled out off the phone business

Huawei **will not** make a mobile phone. It has already been determined. Anyone who **talks this nonsense**, is going to **get laid off**!

2000: **Missed Opportunities in PHS**

- China Telecom mobile license forces them to use PHS technology.
- Huawei considered entering this market but refused and focused on the global standard GSM
- By 2003, ZTE and UTStarcom earned hundreds of millions showing that the decision was a mistake
- 2004: Huawei entered the market as a defensive move. Do not seek high profits, don't lose money
- Market share quickly grew to 25% and the ban of making devices was formally lifted
- 2007: China Telecom shuts down the PHS, confirming our original assessment of the technology

2004: **Forced into GSM Device Business**

- No 3G test devices available. We had to build our own.
- OEM strategy: customized 3G phones sold to operators, not customers.
- Huawei sold many phone, but margins were very low: around 5%

2006: **Data Cards**

- Customer request opening our eyes to the opportunity in data cards
- Margins were much higher, and competition was low
- By 2009, we had sold 35M data cards for 3G, nearly double our closest competitor

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Huawei Chips Lower Cost and Drive Innovation

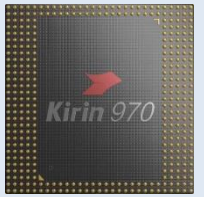
Long History Designing our own Chips

- Began in 1991, to support the C&C08 phone switch, and invested in chip design software while struggling with cash
- Our own chips gave Huawei a huge cost advantage: $100 to buy a chip became $15 to produce ourselves
- By 1998, had over 300 chip engineers covering switching, optical, and wireless product lines
- In 2004, established HiSilicon giving our chip business a degree of independence

Breaking the Qualcomm Monopoly

- In 2005, Qualcomm was the sole provider of 3G chipsets, both for devices and the network, due to CDMA patents
- When ZTE launched a 3G data card, Huawei's supply of 3G chips was limited because ZTE was prioritized
- Similar problems with the Baseband Processer which is central to a 3G base stations
- Huawei began investing in chip for mobile devices in 2006 and for base stations in 2008
- In 2009, the mobile chip business was transferred to the Device business because of the tight integration required
- After over 2 years of development, in 2010, Huawei released a baseband processor, Balong 700 for 4G base stations

Mobile Chip Evolution

2012	2013	2014	2015	2016	2017	2018
K3v2	Kirin 910	Kirin 920	Kirin 950	Kirin 960	Kirin 970	Kirin 980
						
Learning Initial chips used 40nm process, were prone to heating up, and performance lagged		**Trailing** Enhanced core plus GPU improved performance but still trailed the competition	**Matching** 16nm process and the latest ARM core allow us to match the competition in most areas		**Leading** 10nm process plus the addition of an AI core make Kirin the best performing SoC on the market	

Building our Own Brand

Entering the Smartphone Business

- In 2011, Richard Yu took over the terminal business
- Huawei exited the OEM business to focus on building our own branded smartphone
- The strategy was to leave the low-end business and target mid to high end devices
- Not all customers were happy with this decision, as low end devices were critical to their market

Learning to Build World Class Phones

- Use Huawei's chipsets in our phones
- Poor chip performance resulted in slower phones that ran hot
- Early phone models (P1, P2, D1, D2) were market failures
- First success was our 3rd generation phone, the Mate 6 released in June 2013

P9 2016 **P10** 2017 **P20** 2018 **P30** 2019

Huawei has invested heavily in Android, rewriting significant amounts of it's core code to ensure that it would run on our devices without pausing or freezing. With the Mate10, we introduced an AI core and a machine learning algorithm to prevent the phone from slowing down with age.

When the Ascend P1 failed to generate significant sales, Richard Yu went to work in a phone store to learn first hand what consumers wanted in their phones.

After identifying photos as a feature that customers cared about deeply, Huawei developed a partnership with Leica beginning with the P9 and improving each year after.

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Consumer Devices Drives Huawei's Growth

2018 Smartphone shipment

206,000,000

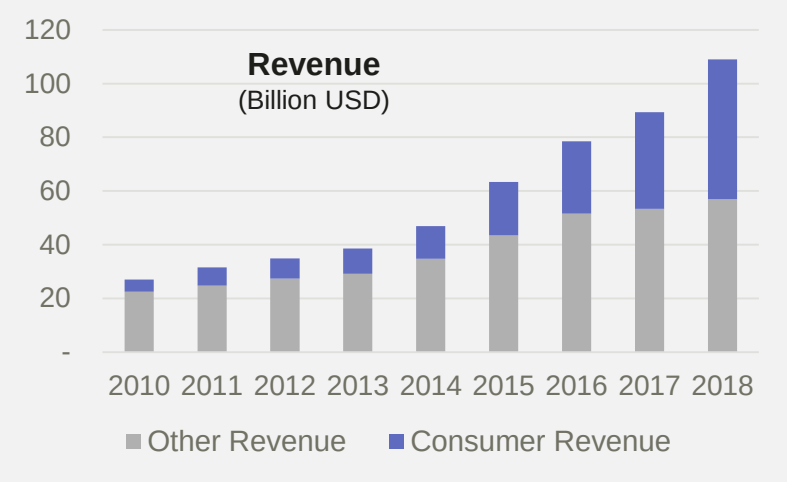
Units

2018 Non-Smartphone shipment

100,000,000

Units

Since 2015, Consumer is Driving Our Growth



Huawei is building an ecosystem of devices together with our partners

With a smart phone at the center like our upcoming Mate X

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Huawei's Headquarters in Shenzhen

HUAWEI

Huawei: Leading Global Provider of ICT Infrastructure and Smart Devices

Bring digital to every person, home and organization for a fully connected, intelligent world

194,000

Employees

94,000

R&D employees

170+

Economies

68 in

Interbrand's
Top 100
Best Global Brands

44 in

Fortune Global 500

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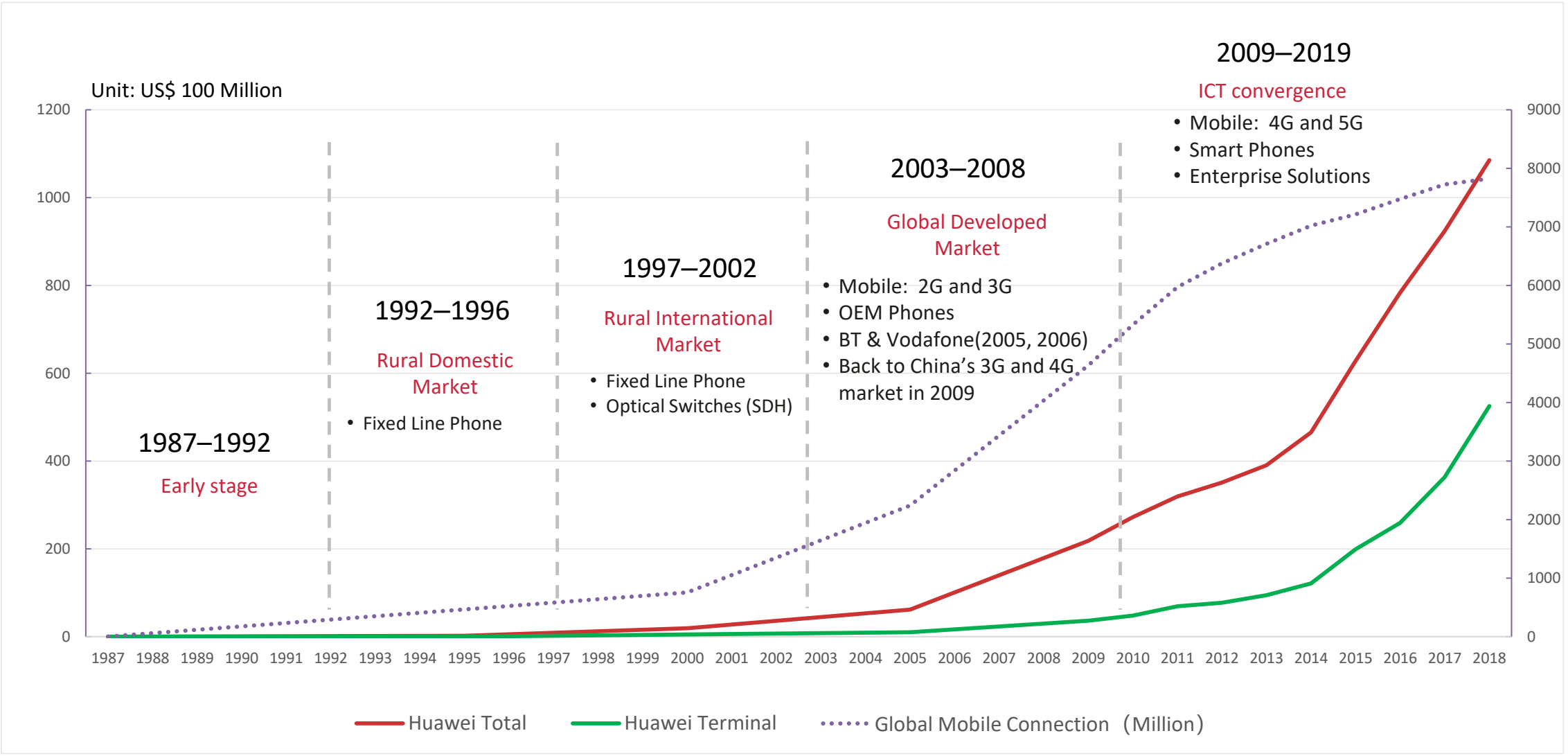
30 Years of Near Continuous Growth



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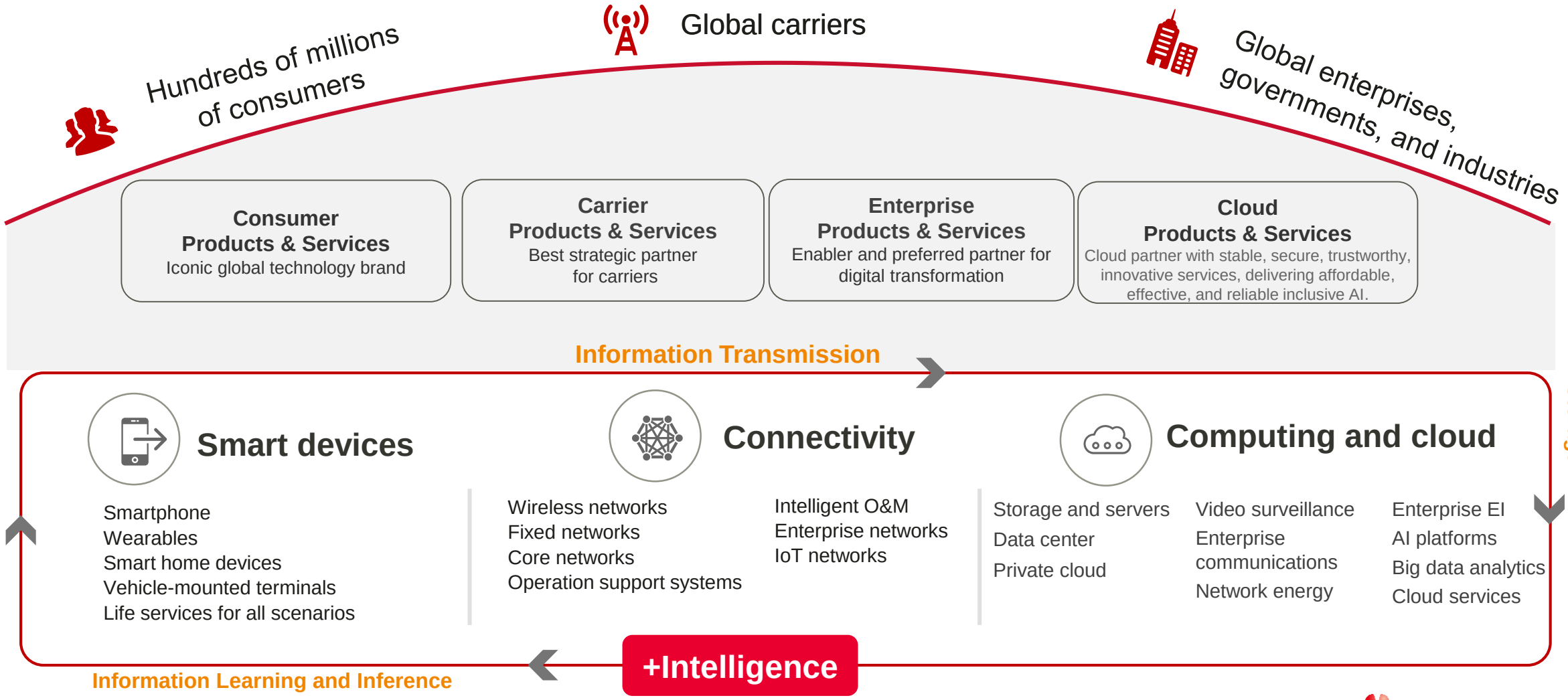
Focusing on Smart Devices, Connectivity, Computing, and Cloud; Providing Products and Solutions for Three Customer Groups



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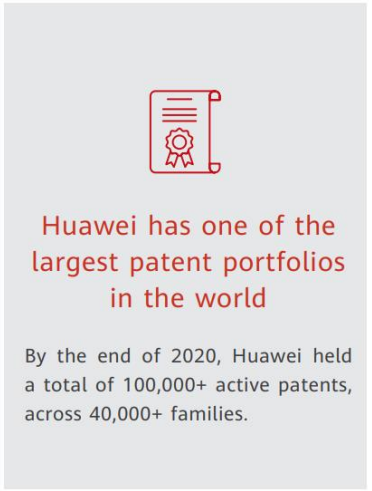
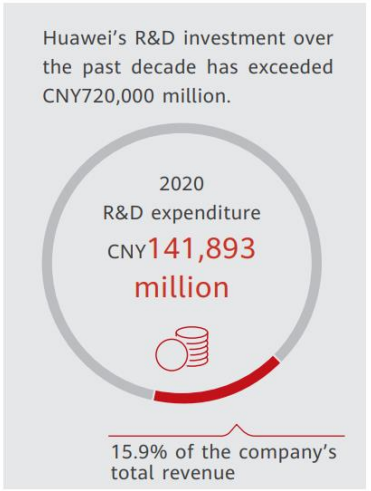
Sustained Investment in R&D Drives Technology Breakthroughs





Ranks 5th in 2018 EU Industrial R&D Investment Scoreboard

- Focusing on strategic opportunities: Huawei does not waste strategic resources on non-strategic opportunities.
- Huge investment (10+% of annual revenue) in R&D
- Realizing technological breakthroughs through perseverance, dedication, and self-reflection
- 100,000+ patents; more than 50% of the authorized outside of China.
- Member of 400+ standards organizations, industry alliances, and open source communities, with 400+ key positions; 5,000+ proposals submitted in the whole year and 60,000+ proposals submitted in total.

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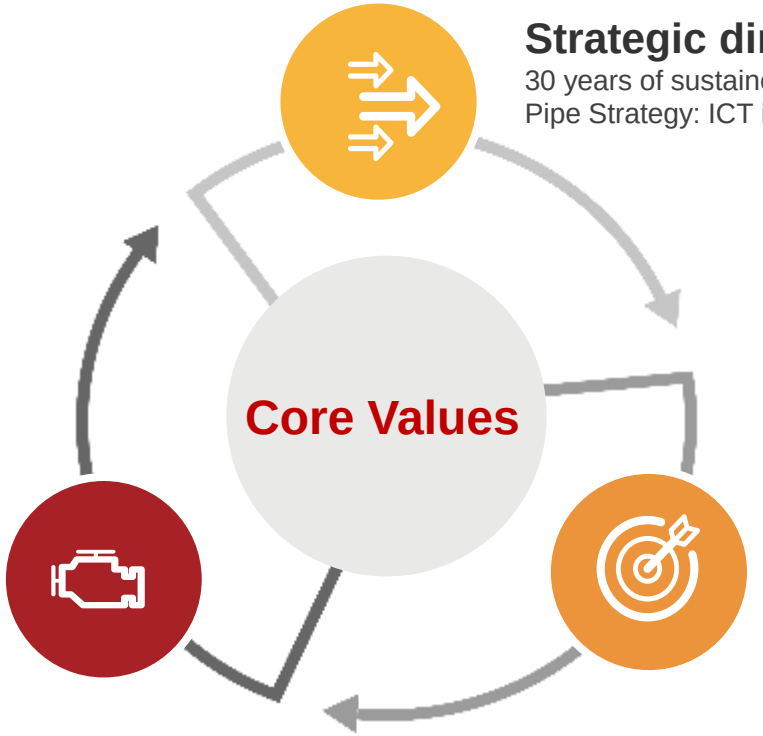
Drivers Behind Continuous Growth



Strategic direction

30 years of sustained focus on Pipe Strategy: ICT infrastructure

Sustained investment

in R&D to drive breakthroughs

Value-driven system

that shares value to maximize value creation

Huawei Core Values

Stay customer-centric

Creating value for customers is the only way for Huawei to guarantee its value. Our success depends on our customers' success.

Inspire dedication

A reasonable, effective value assessment and sharing system inspires employees to create greater value for the company.

Persevere

Customer expectations are rising, and our industry is evolving. Whether or not we can continue to survive depends on our ability to persevere with long-term focus.

Grow by reflection

Reflection leads to continuous improvement, prepares us for external challenges, and prevents inaction.

Join the Huawei Galileo Exhibition Hall!

Join us for a digitial tour of our 5G Exhibition Hall, as we explore the power of 5G technology and discover concrete examples of how 5G will transform tomorrow’s intelligent and connected society. 5G is on!

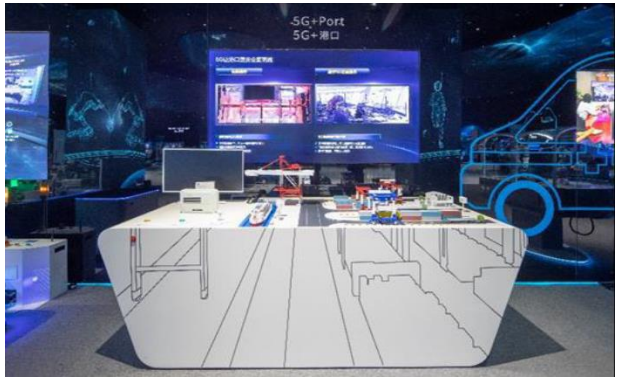
Huawei Galileo Exhibition Hall - What you can expect

- Discover how 5G will transform everything from logistics, to entertainment, healthcare and more
- Immerse yourself in the universe of the beautifully crafted, state-of-the-art 5G examples on display
- Explore the possibilities and functionalities of 5G technology alongside one of our talented exhibition hall presenters
- Dive into an interactive experience - ask exhibition hall presenters questions on-the-go

Our presenter guides you through the exhibition

Interested? Join us at the end of October!

5G Intelligent Manufacturing

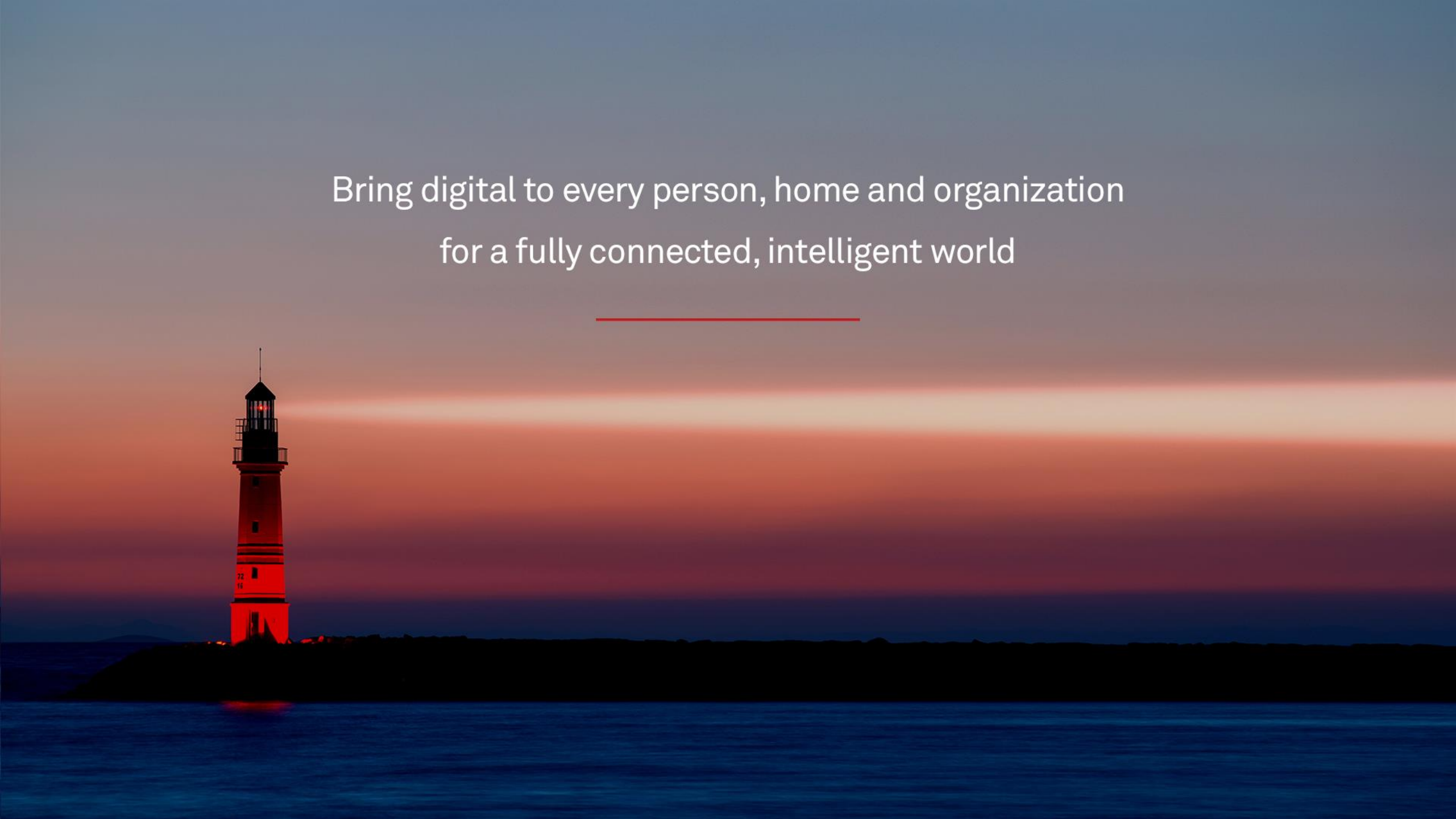


5G Port

5G Medical Care

AR Band

… And more!


Bring digital to every person, home and organization
for a fully connected, intelligent world

Thank you.

把数字世界带入每个人、每个家庭、
每个组织，构建万物互联的智能世界。

Bring digital to every person, home and organization for a fully connected, intelligent world.

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