

# **Technologies for E- Commerce**

**CAN302**

**Department of Communications and Networking  
Xi'an Jiaotong-Liverpool University (XJTLU)**

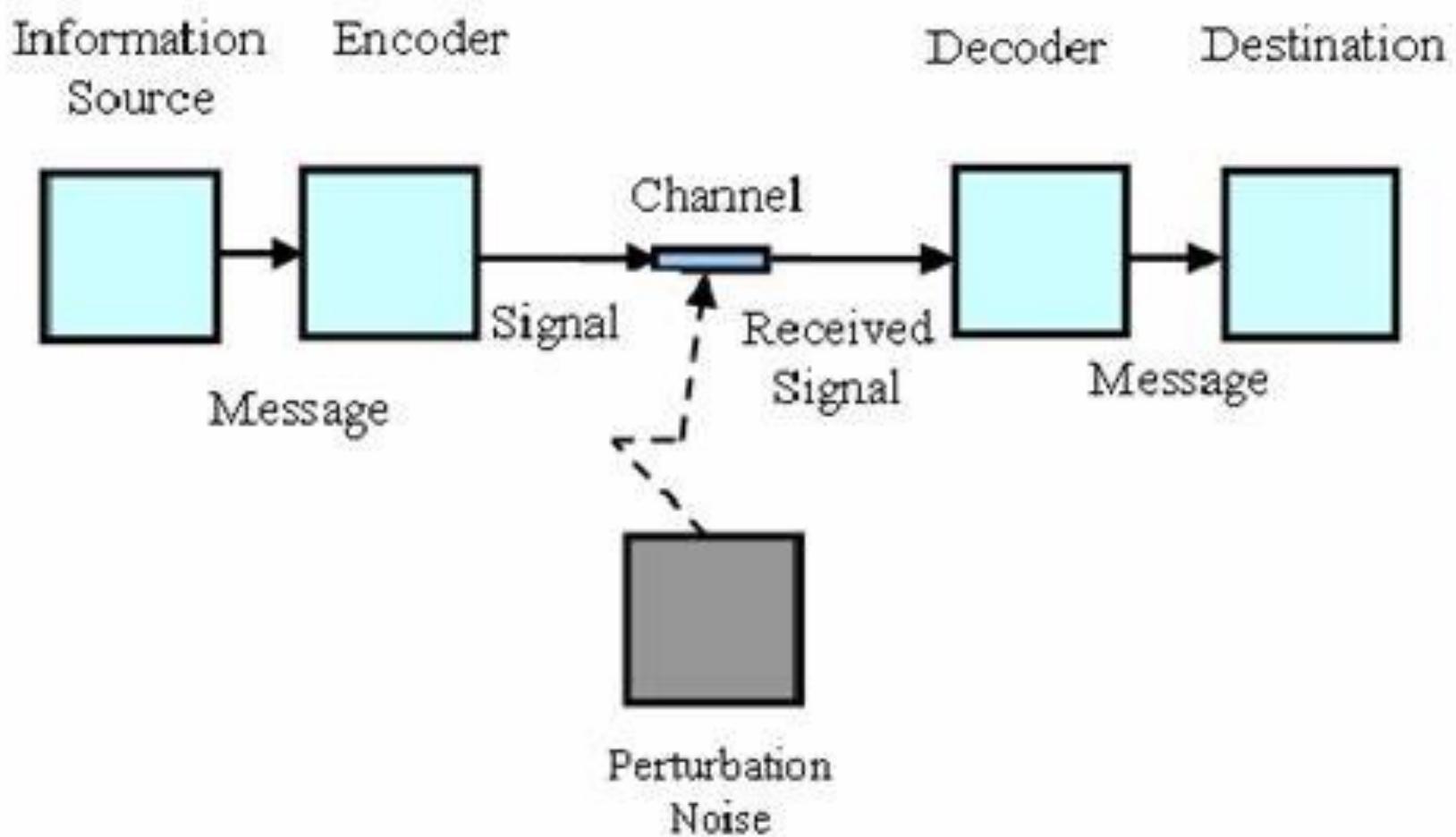
# Lec 2 – III networks to ONE



# **Outline of Lec2**

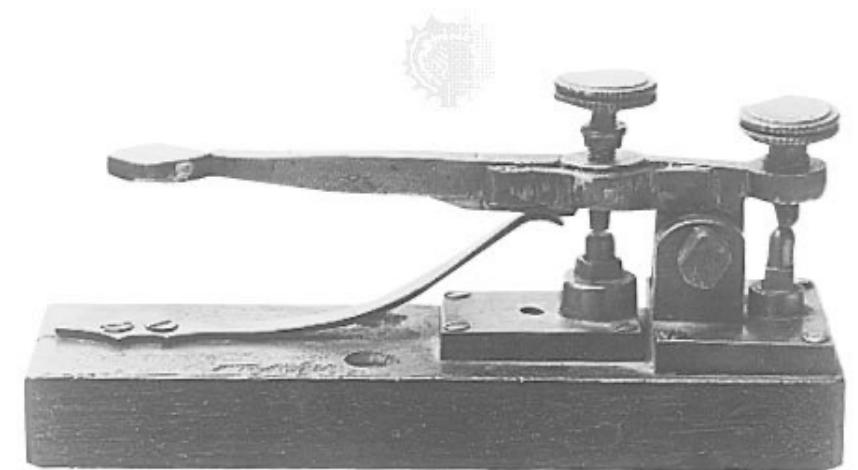
1. Telegraph age
2. Three different networks
3. Three to one
4. The future

# What's a communication system?



- Send a message to the right target audience!

# Train, Big Ben & Telegraph



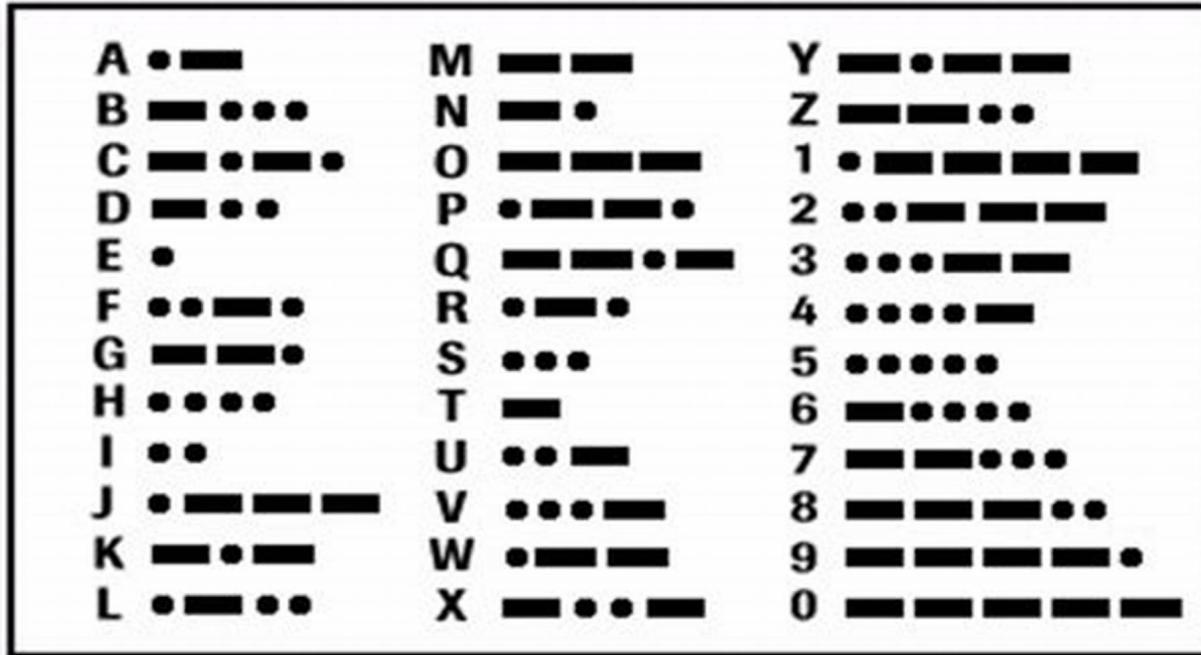
<https://baike.baidu.com/item/电报/110262>

<https://historyhome.co.uk/peel/railways/puborder.htm>

<https://www.britannica.com/technology/telegraph>

<https://wenku.baidu.com/view/1b21be23dbef5ef7ba0d4a7302768e9950e76ed2.html>

# Morse codes (1835-1839) & Tele transfer \$



**Discussion:** the relationship between telegraph signal and morse codes

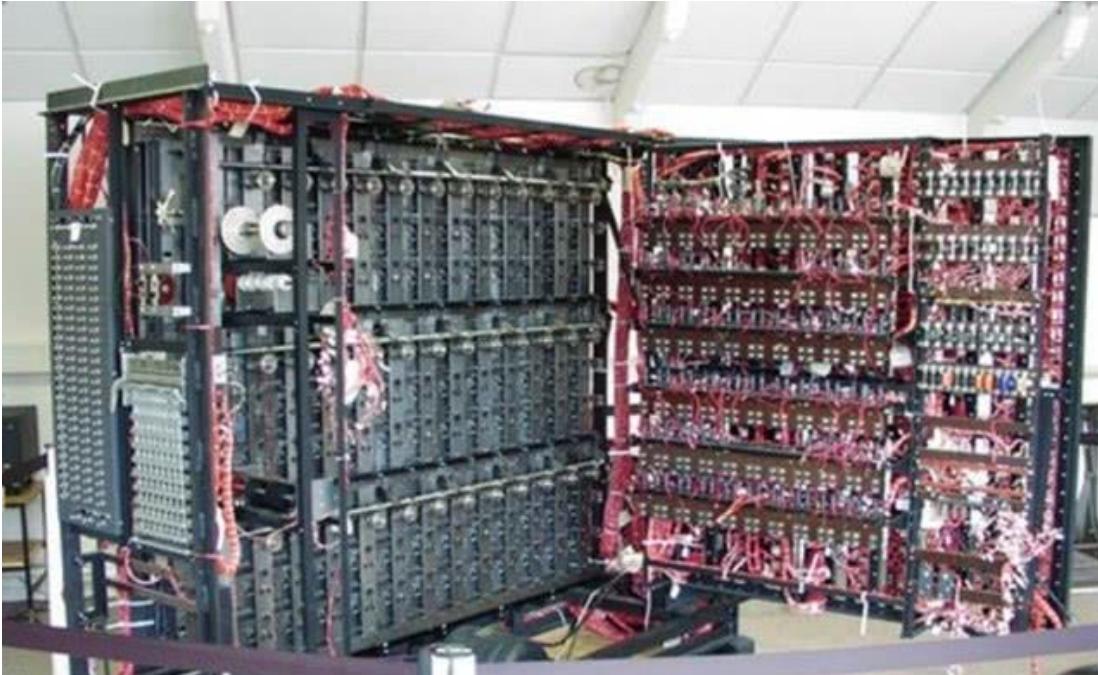
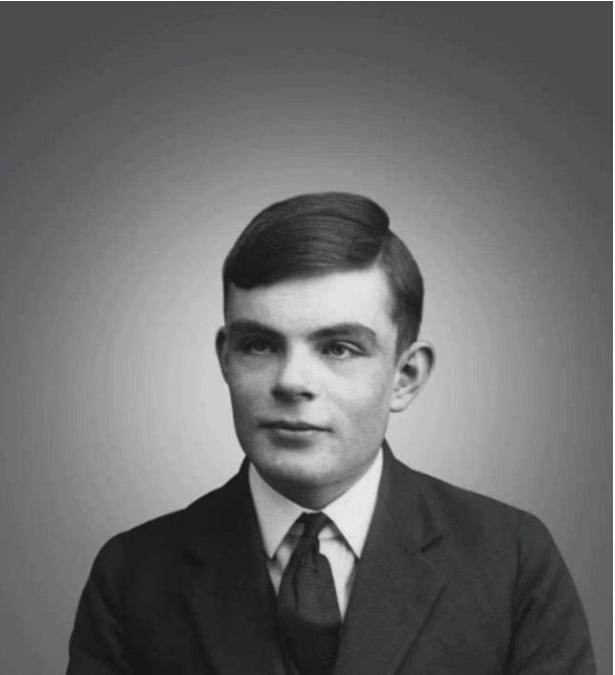
<https://baike.baidu.com/item/电报/110262>

<https://historyhome.co.uk/peel/railways/puborder.htm>

<https://www.britannica.com/technology/telegraph>

<https://wenku.baidu.com/view/1b21be23dbef5ef7ba0d4a7302768e9950e76ed2.html>

# Security is always: “The code”



Alan Mathison Turing, 1912 - 1954

Enigma machine

[https://www.sohu.com/a/443659675\\_120339167](https://www.sohu.com/a/443659675_120339167)

<https://www.163.com/dy/article/EHTEK00805372PI2.html>

<https://www.163.com/dy/article/GDC5UVCC0543U41J.html>

<https://item.jd.com/12307986.html>

# Three main modern network



- Narrow bandwidth (64kb/Chanel), **real-time**, point to point, dual-direction
- E1/T1, SDH··, <https://max.book118.com/html/2017/0112/82926960.shtml>

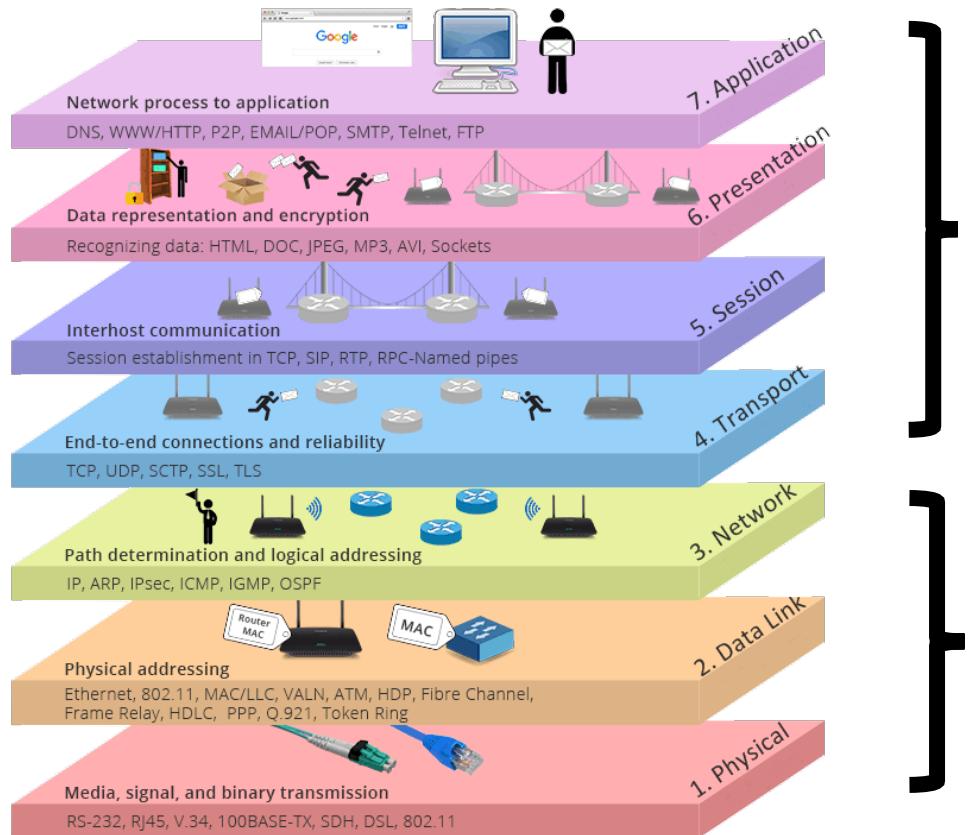


- Wide bandwidth (~ 8M/Chanel), **real-time**, point to many, mainly single-direction
- PAL, NTSC·· max 4.8Gb/cable
- [http://www.360doc.com/content/17/0221/15/36705993\\_630852940.shtml](http://www.360doc.com/content/17/0221/15/36705993_630852940.shtml)



- From narrow to wide (from 14.4kb to 1G)
- **Nonsynchronous**, point to point, dual – direction
- TCP/IP family

# OSI 7 layers network model

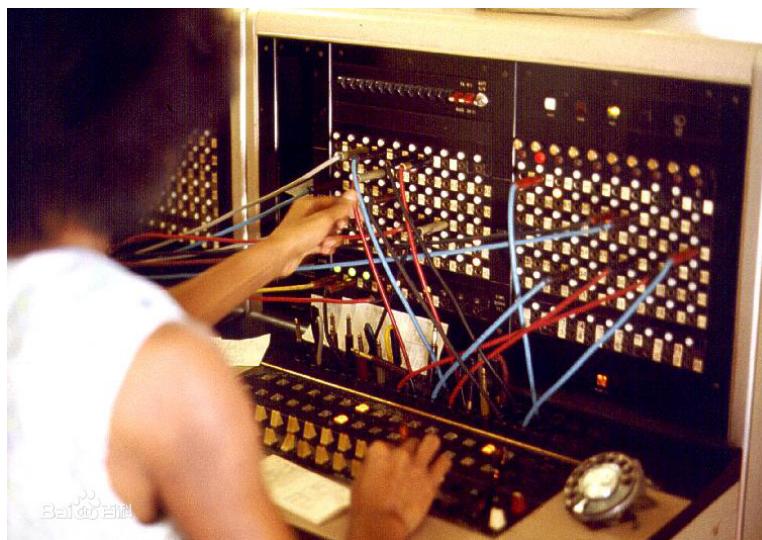
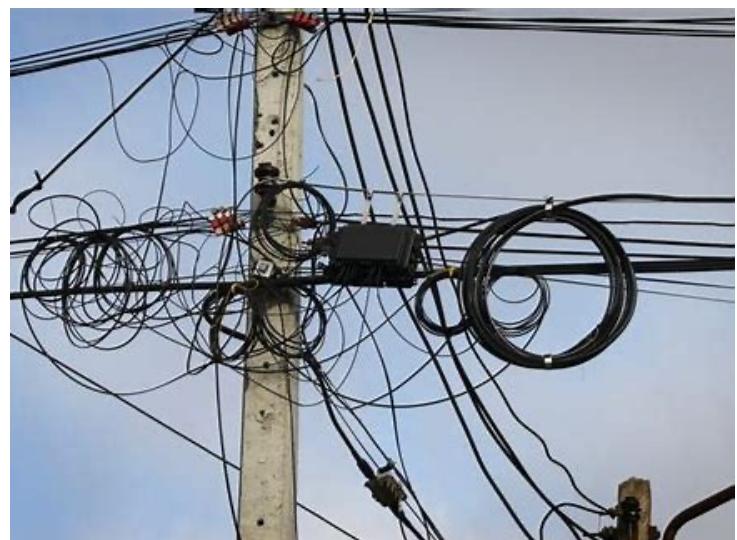


Host level, i.e. Servers, PCs,  
Handphones, IoTs  
B - Byte

Network level  
b - bit

- Industry standard is like the law to all vendors, thus all vendors products can properly work together.
- ISO defined OSI (Open System Interconnect) model in 1985.

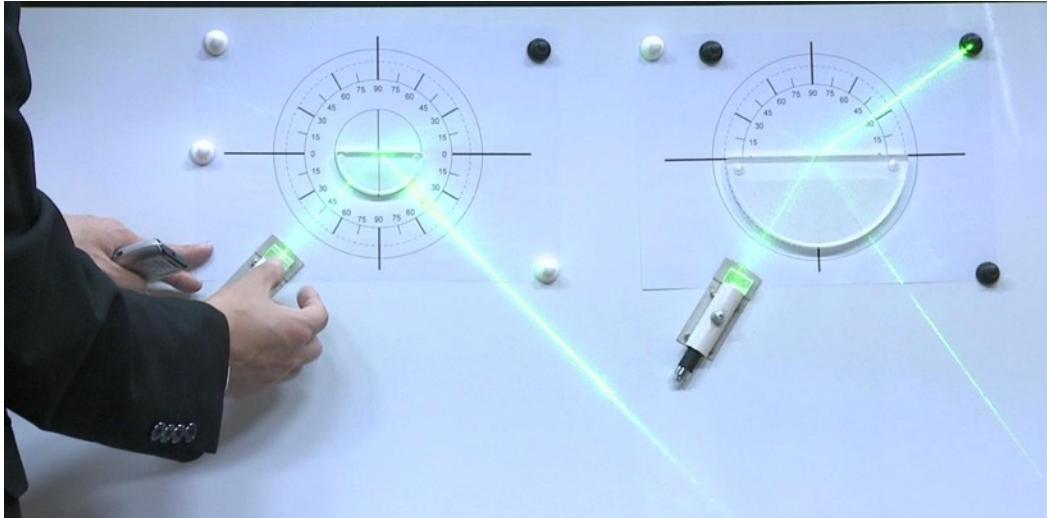
# Telephone: cooper wire age



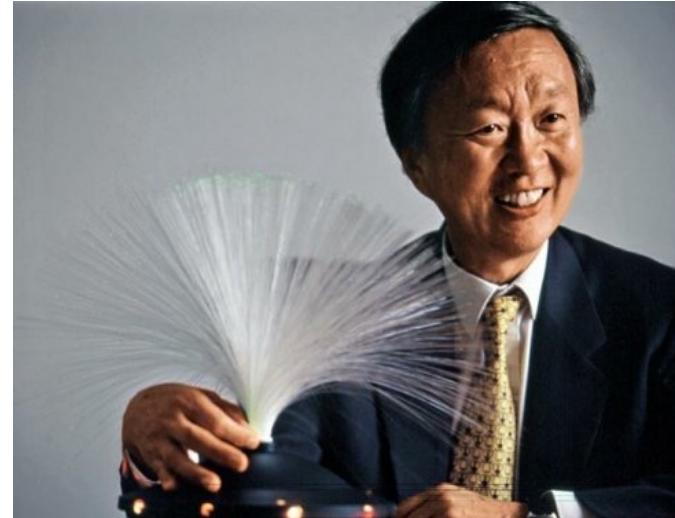
To: 牛保才 @ 上甘岭

Telephone: circuit switching/SS7

# Optical fiber is a key thing



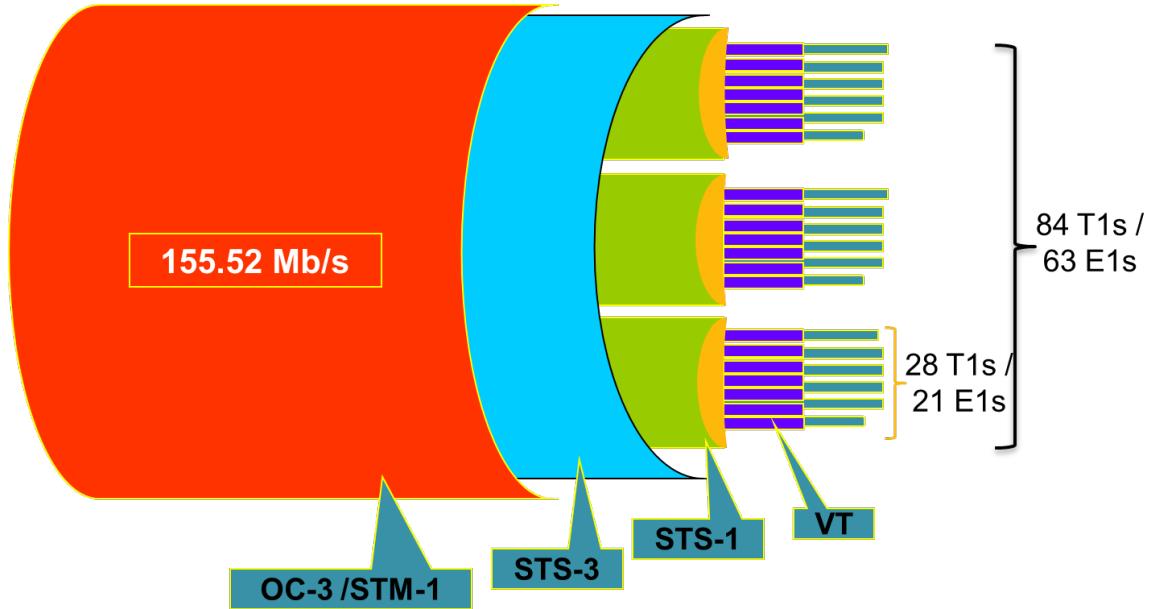
Total reflection



Dr. Kun Gao, the father of optical fiber

- Total reflection of light means the light can propagate very long distance with very low loss and results for the L of the B\*L.

# TDM age



## 一根光纤能让135亿人同时通话 中国刷新世界光纤纪录

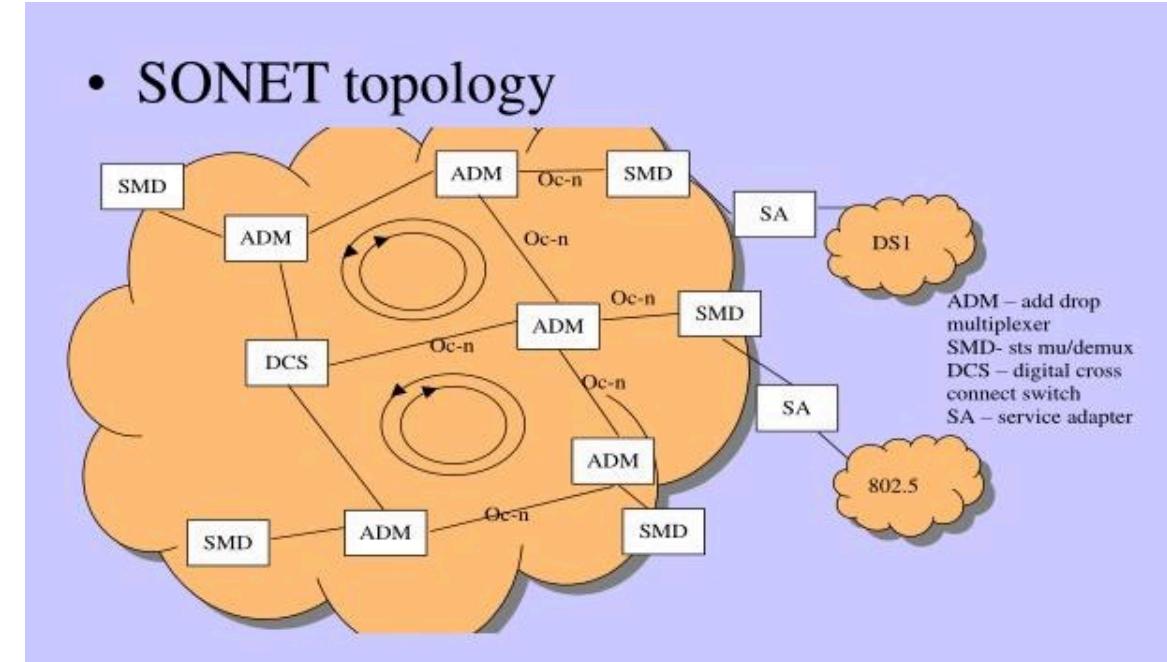
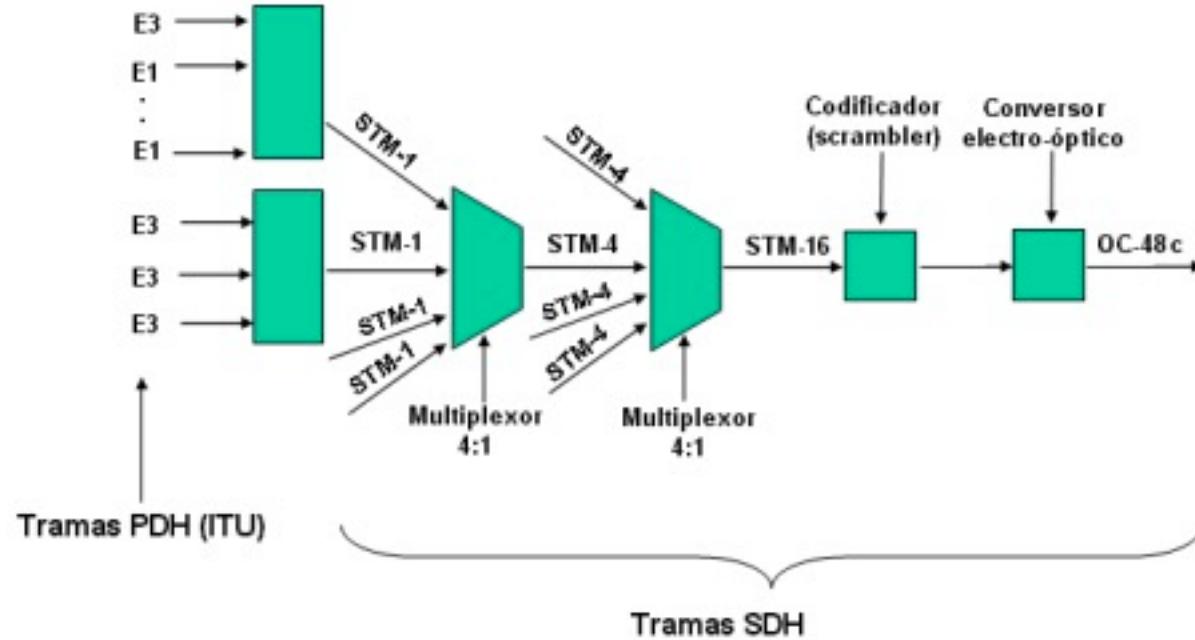
新华社消息，武汉邮电科学研究院近日宣布，在国内首次实现 560Tb/s 超大容量波分复用及空分复用的光传输系统实验，可以实现一根光纤上 67.5 亿对人（135亿人）同时通话。

据悉，为了实现非常好的效果，本次实验采用具有自主知识产权的单模七芯光纤为传输介质。和普通光纤不同的是，一根单模七芯光纤相当于七根普通光纤合而为一。武汉邮科院负责人表示：

如果将光纤信息传输类比作高速公路，普通光纤是单一车道，那么单模七芯光纤就相当于并行七车道，能够提供7倍于普通光纤的传输能力。通过工艺及技术上的突破，单模七芯光纤解决了多芯光纤间串扰难题，隔离度达到-70dB，把“车道”与“车道”之间的干扰和影响降到了最低。

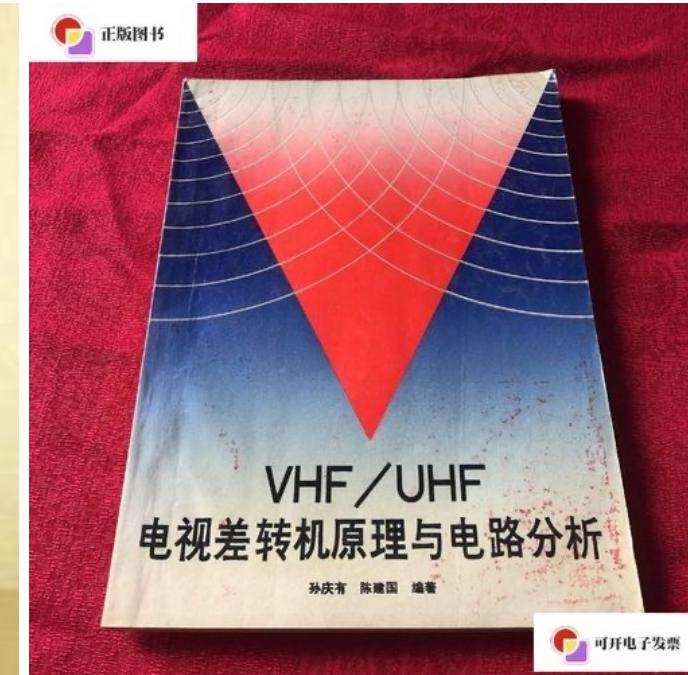
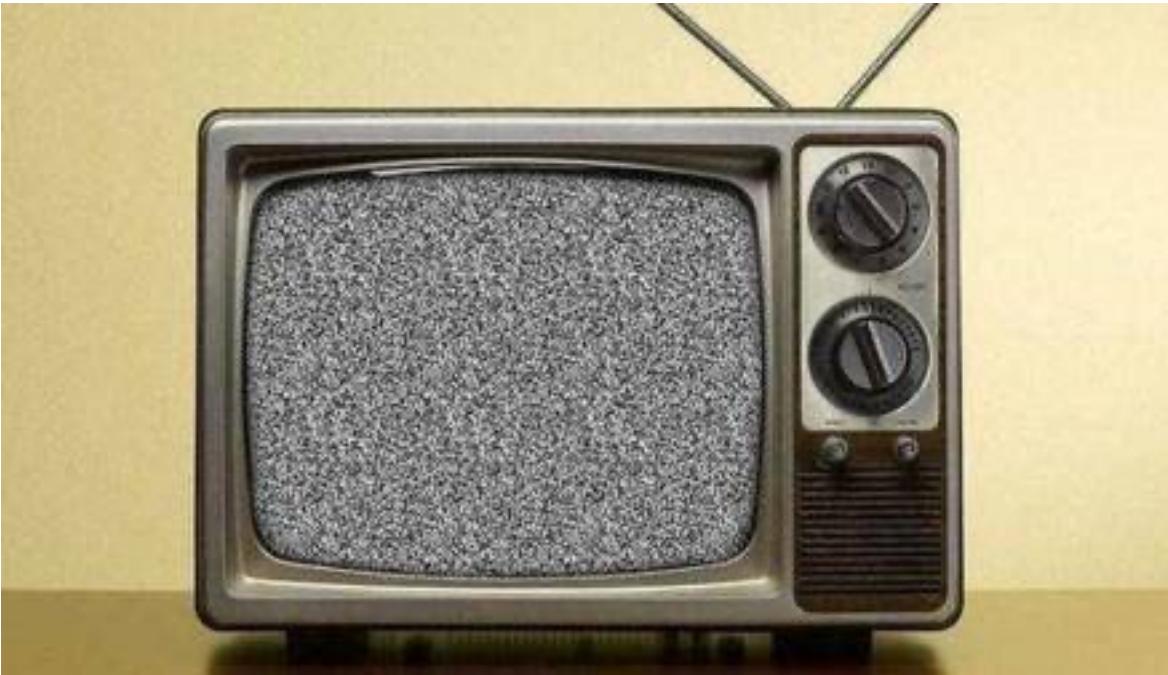
<http://www.elecfans.com/article/90/151/2017/0206480163.html>

# Telephone: SONET/SDH



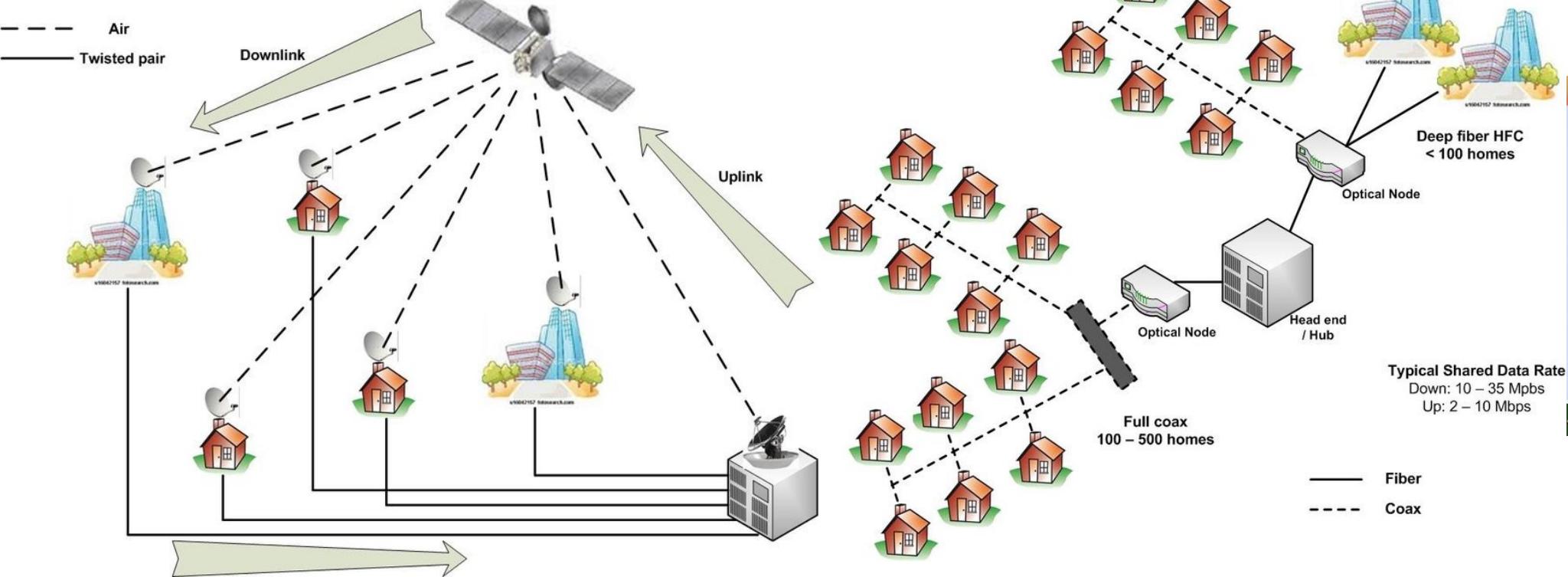
- SDH, or **Synchronous** Digital Hierarchy original from telephone application.
- STM-256 (OC-768) for 40G network.
- **TDM** technology
- <https://www.rfwireless-world.com/Terminology/OTN-Interfaces-OTU1-OTU2-OTU3-OTU4.html>

# Television: Wireless age

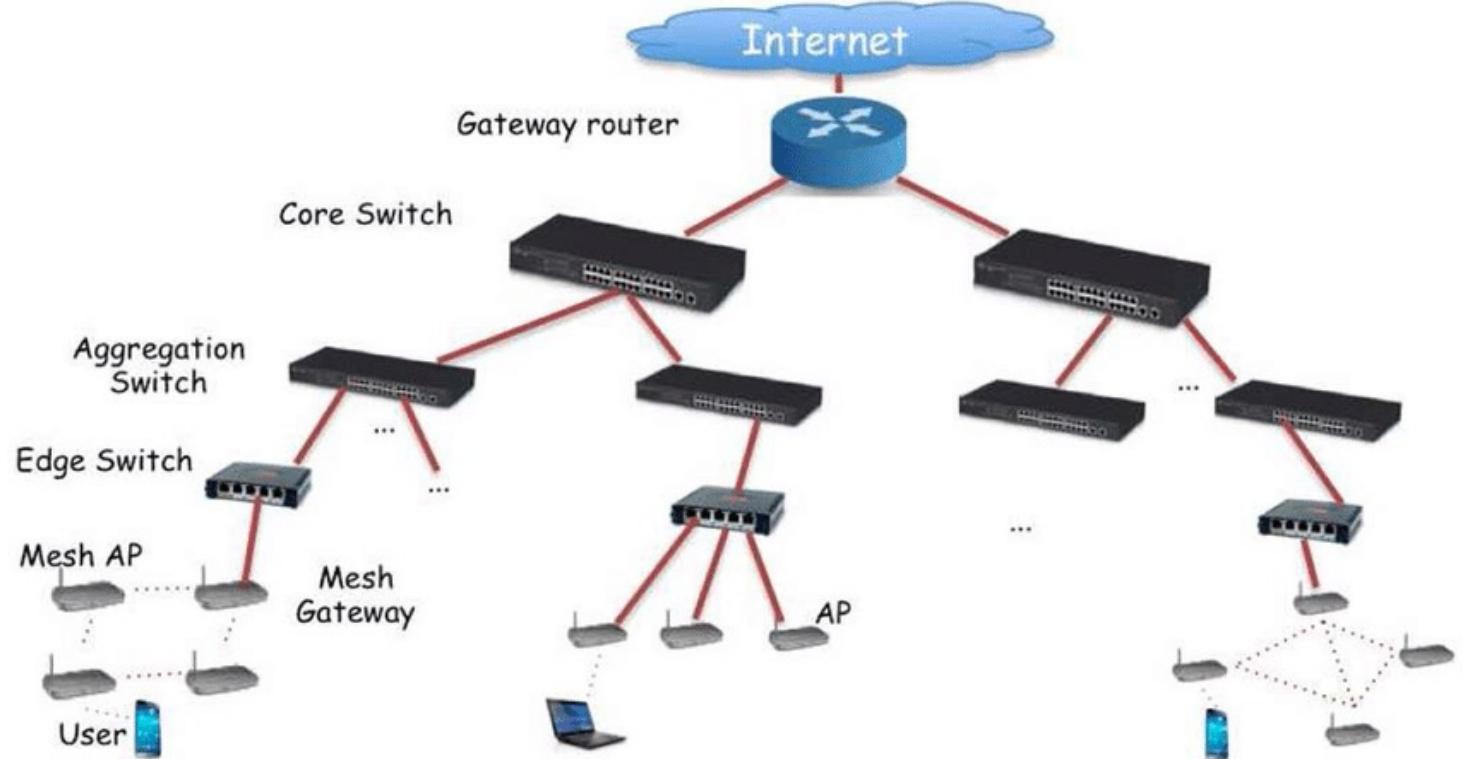
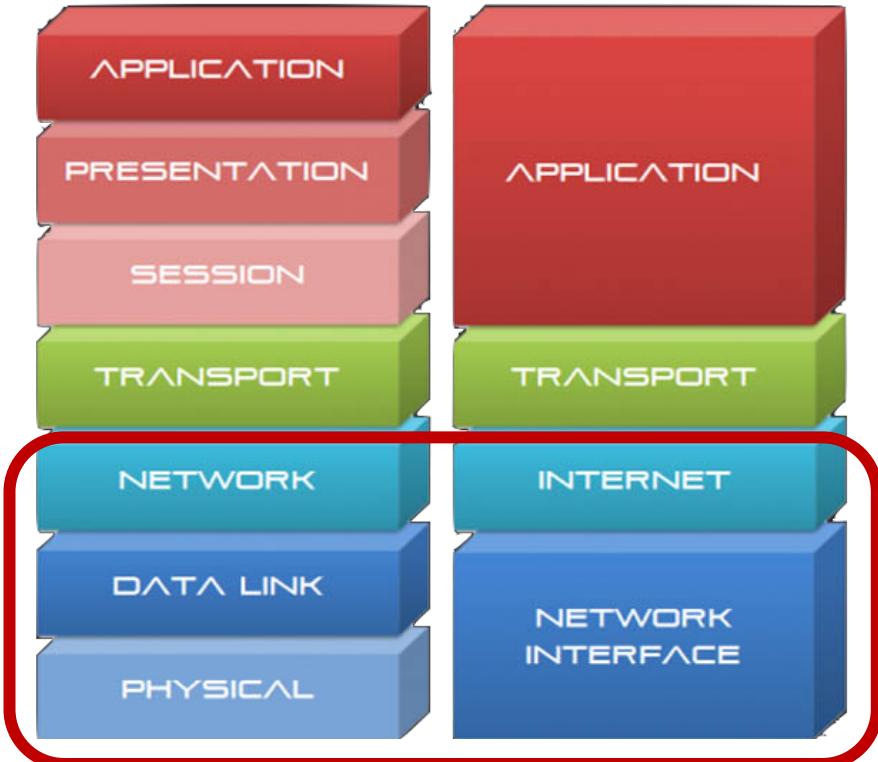


Analog age: (NTSC, PAL, SECAM)

# Television: Wireless → Cable

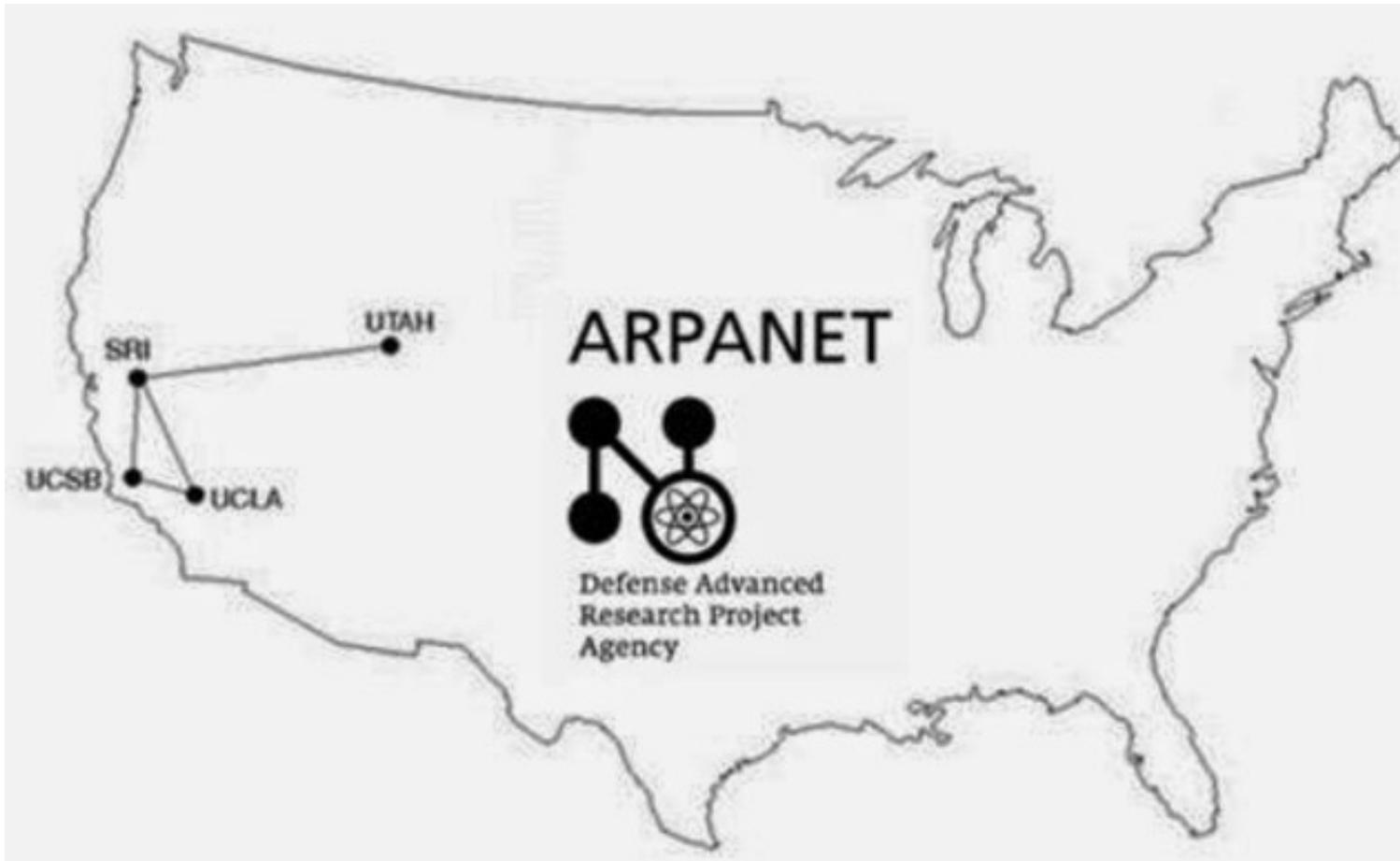


# TCP/IP model and internet



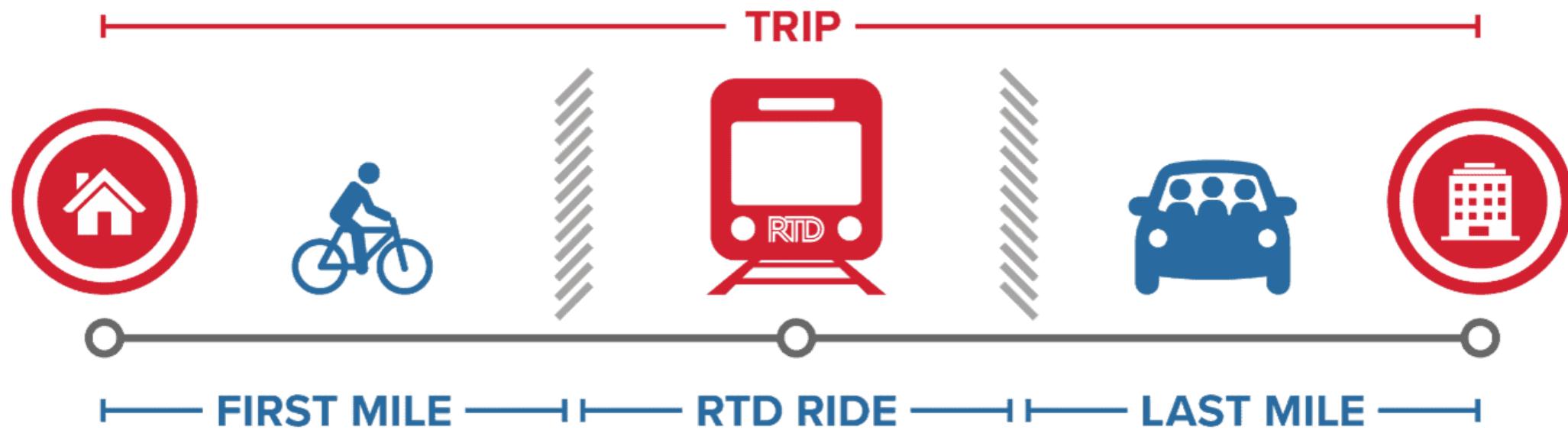
- TCP/IP package is asynchronous

# Original of internet: Dec, 1969

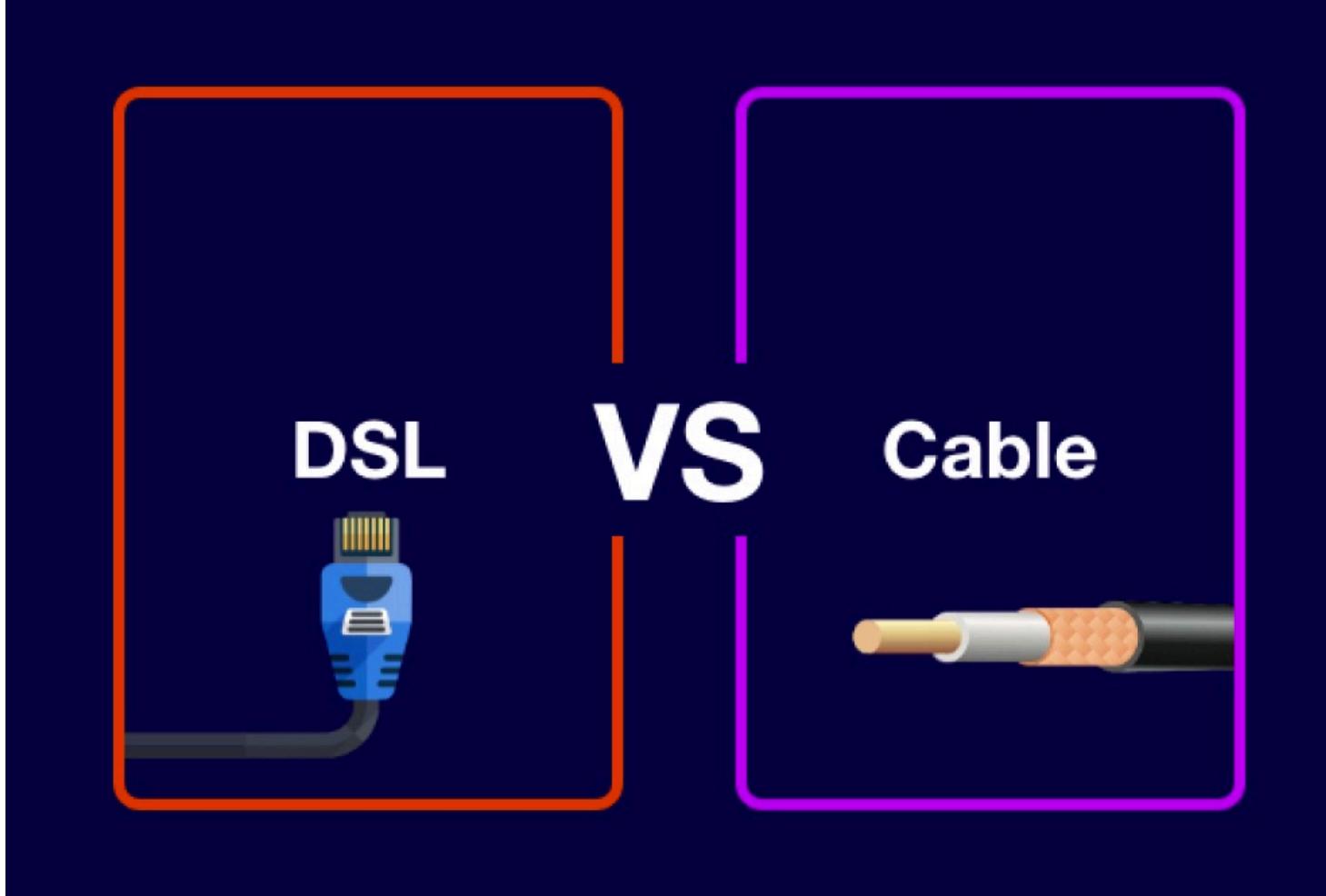


- Designed to link computers

# Last mile problem



# Which one would be the winner?



## Discussion I :

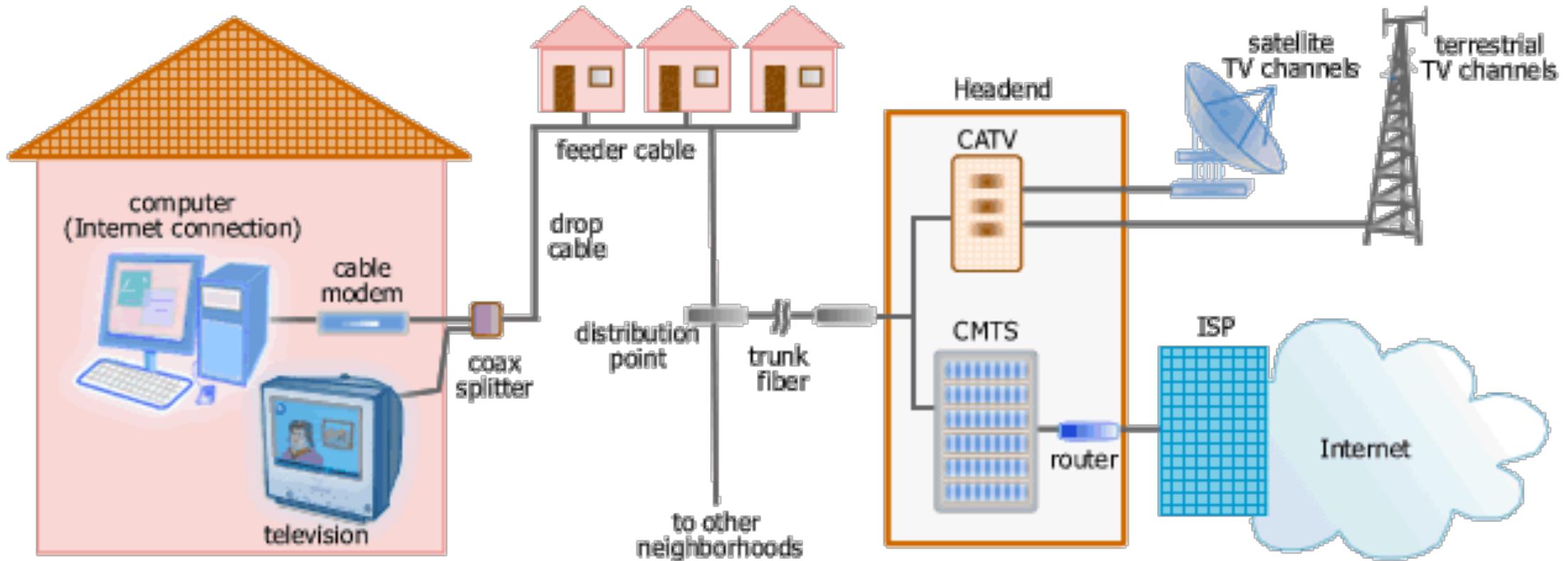
- Technical point
- The real world
  - Eco-system
  - Government policy

# Modem over phone Line



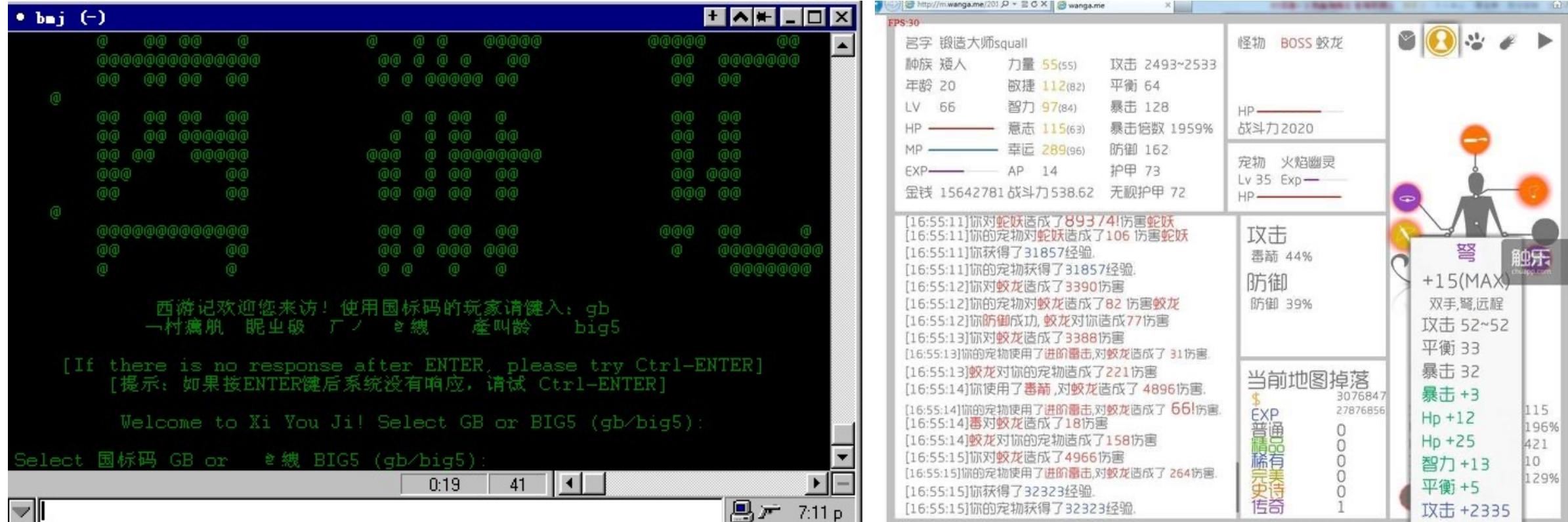
- Telephone system has been used for a very long time.
- High speed modem is at ???
- ISDN is an very expensive access -- 32 co-current telephone resources

# Cable modem



- Coax cable can reach 1Gb but shared by many people.
- Widely used in many countries but not popular in China.

# First generation internet game



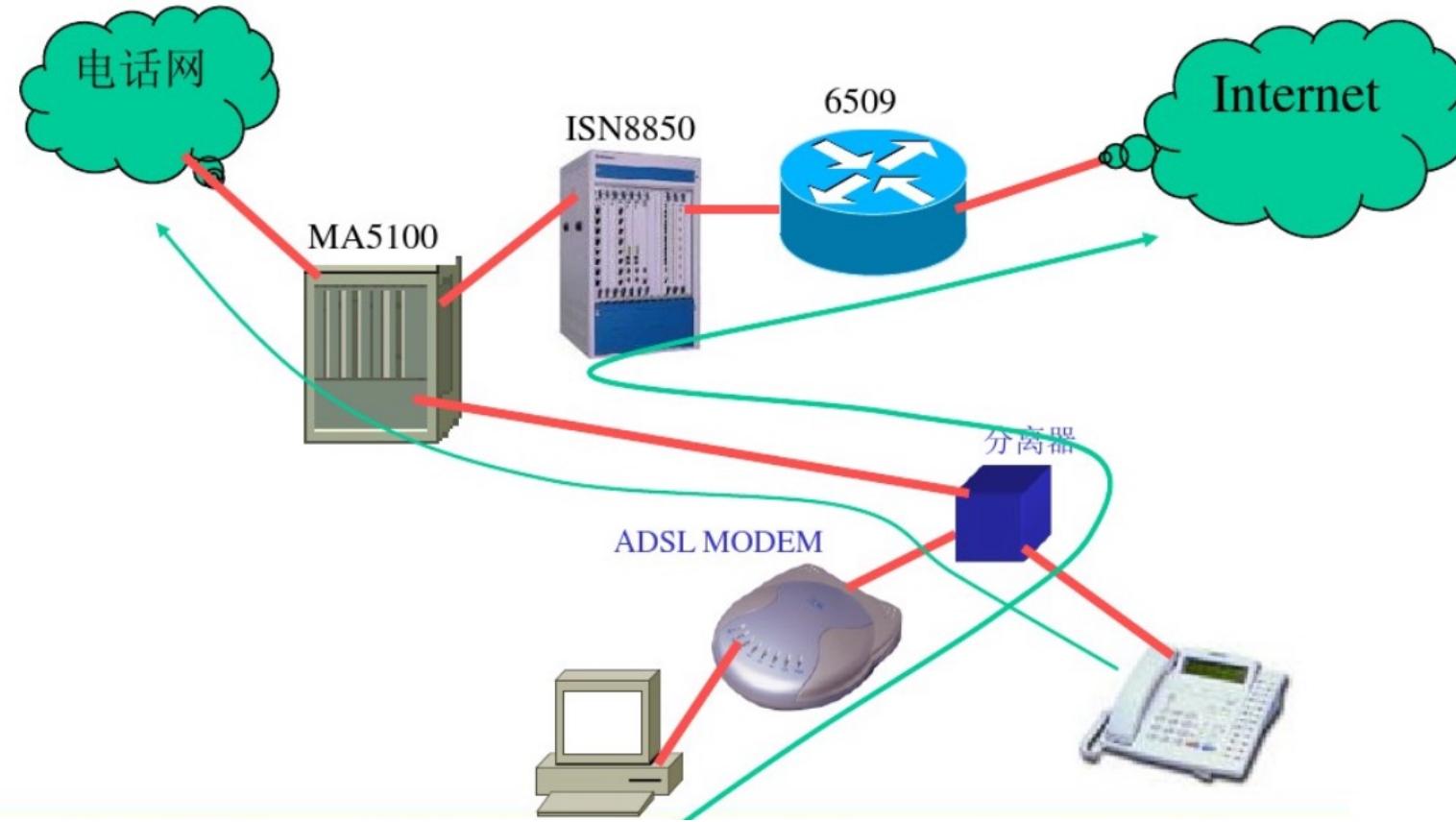
<https://games.qq.com/a/20160907/039835.htm>

# Intranet game @ the same time



- Bandwidth determine the game experience

# ADSL



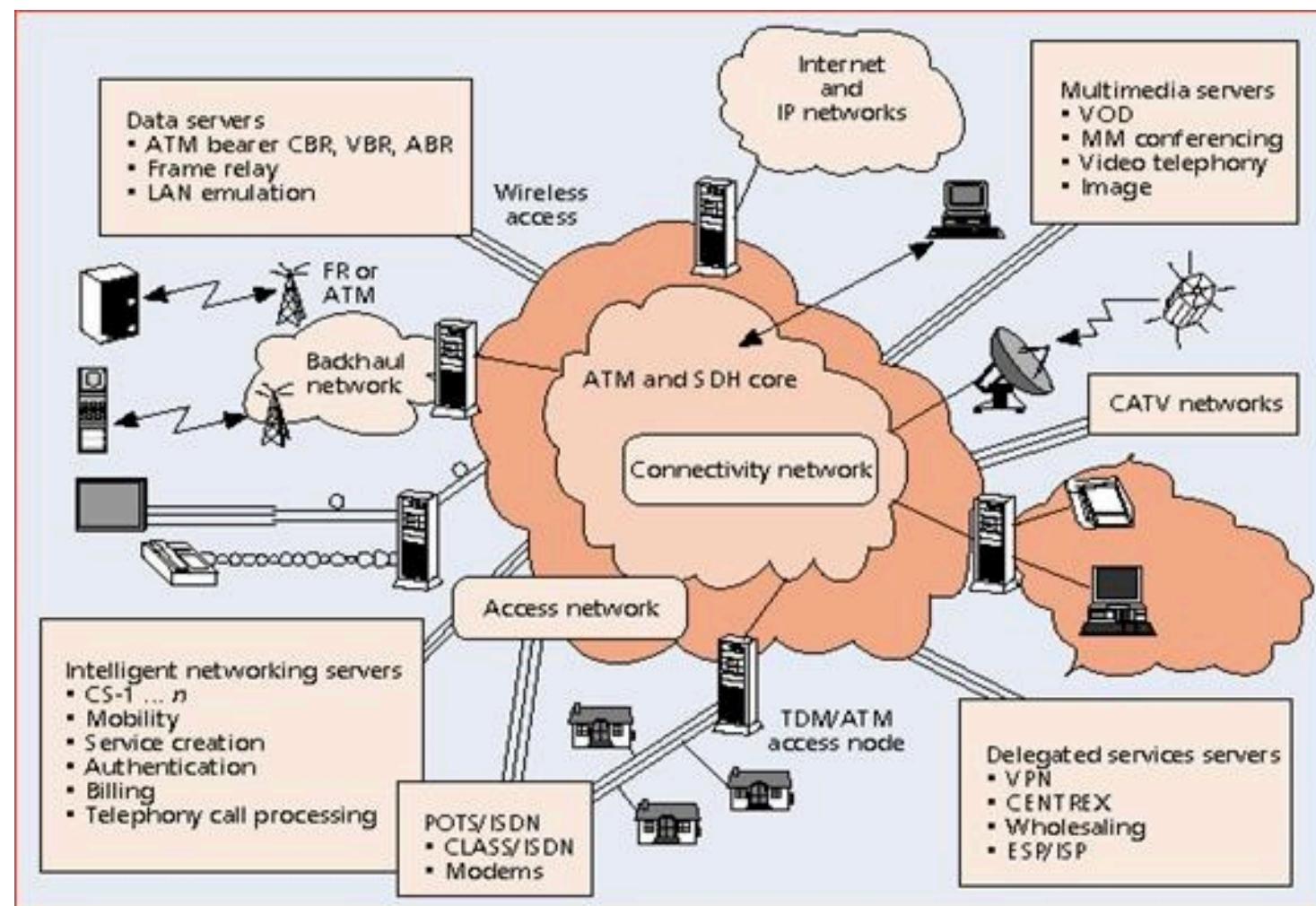
- ATM(Asynchronous Transfer Mode) has been developed.
- Broadband come to home for speed 8Mb

# The “picture” game over internet



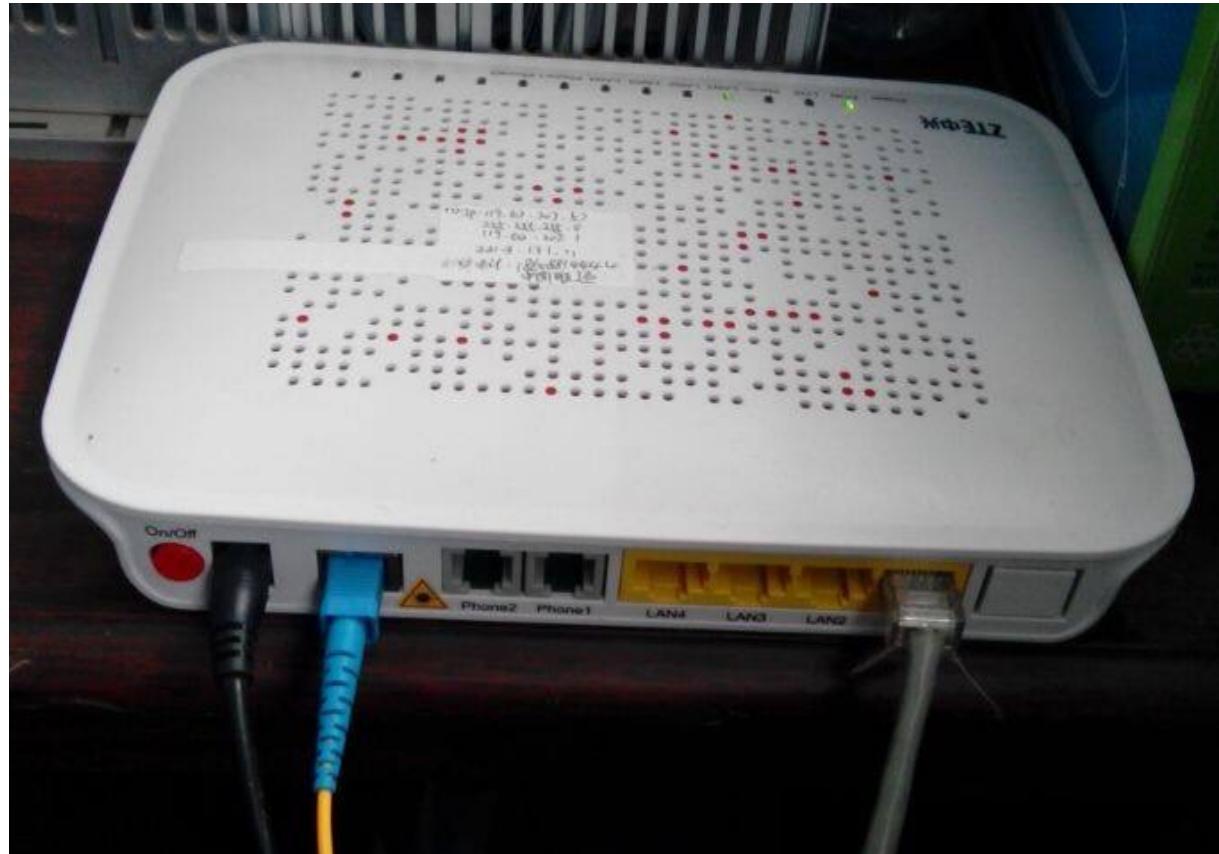
- Still PC age
- Relatively Low speed

# ATM over SDH



- Put the IP data to SDH network.

# FTTH: optical fiber to home win the game



- In China, every home/end-point can be 1Gb now and next gen will be 10Gb.

# ALL IP NOW!



3 in 1 and all IP!



Telephone  
From circuit switching/SS7  
to 5G

CATV  
From analog age  
(NTSC, PAL, SECAM)  
to OTT



Internet  
TCP/IP

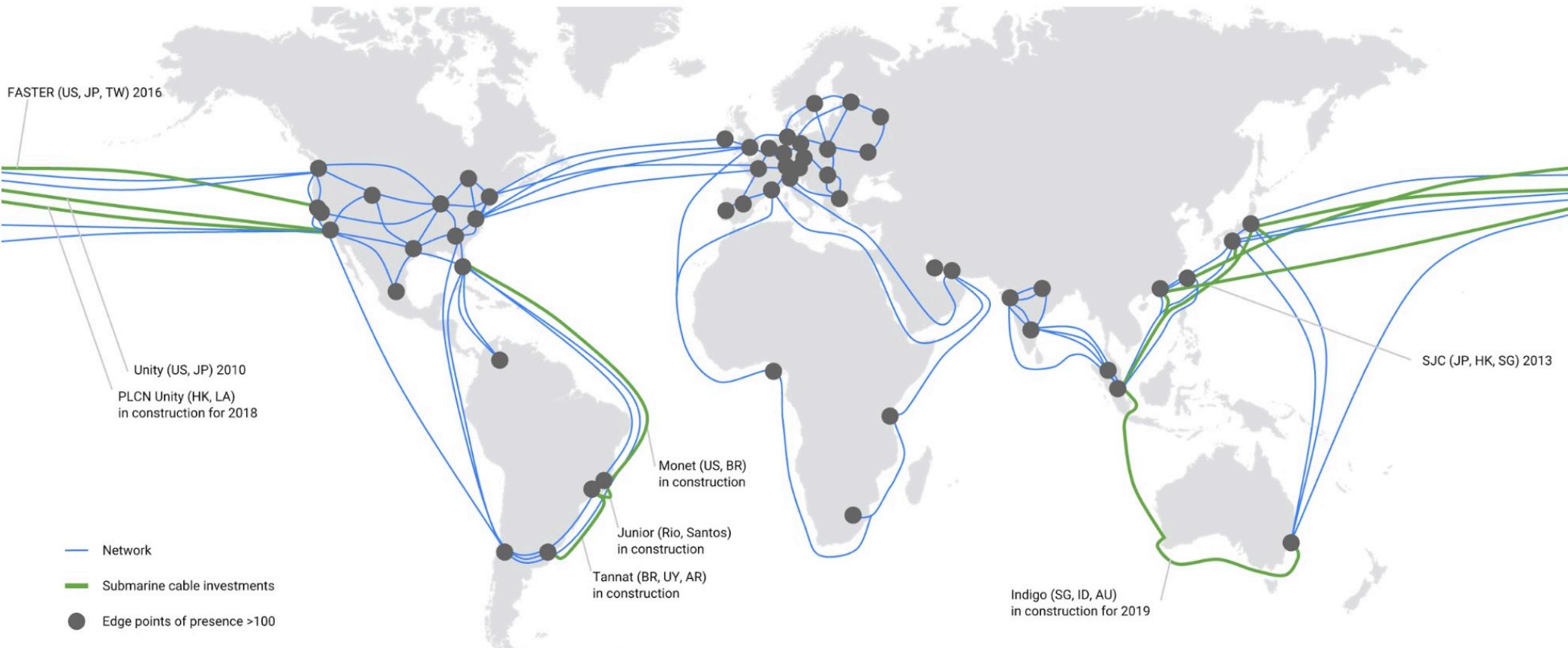
# Google broadband service



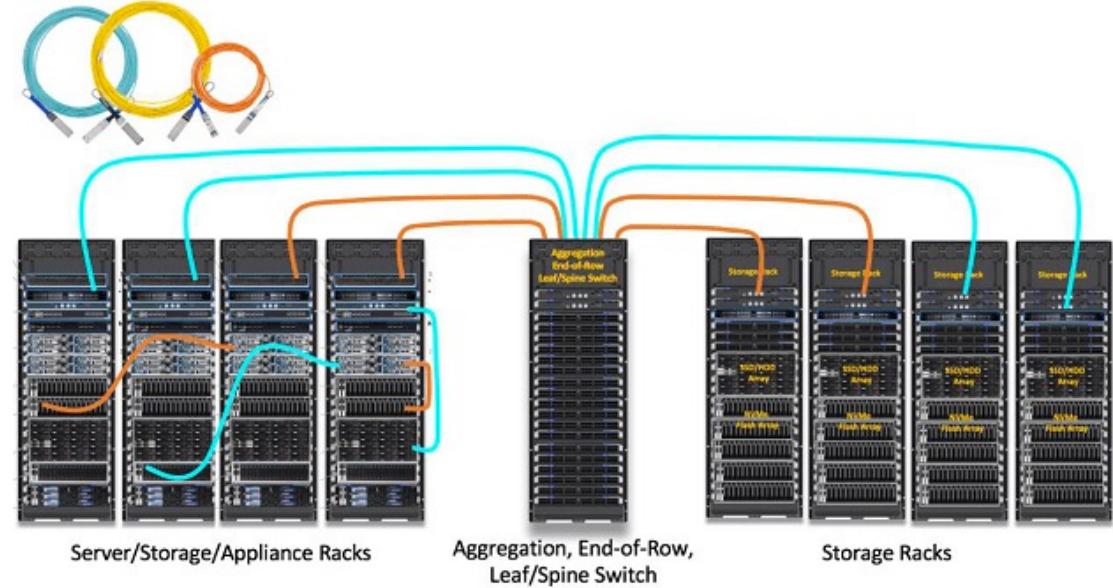
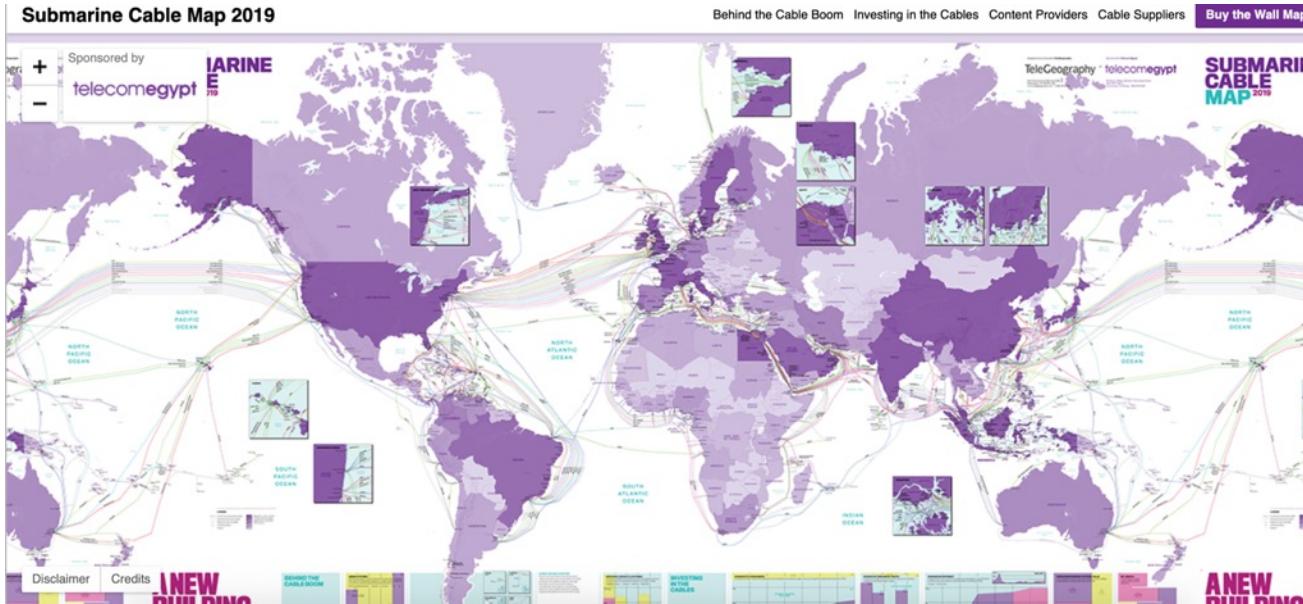
# Google fiber

## Google Cloud Submarine Cable Investments

Google Cloud's well-provisioned global network is comprised of hundreds of thousands of miles of fiber optic cable and seven submarine cable investments



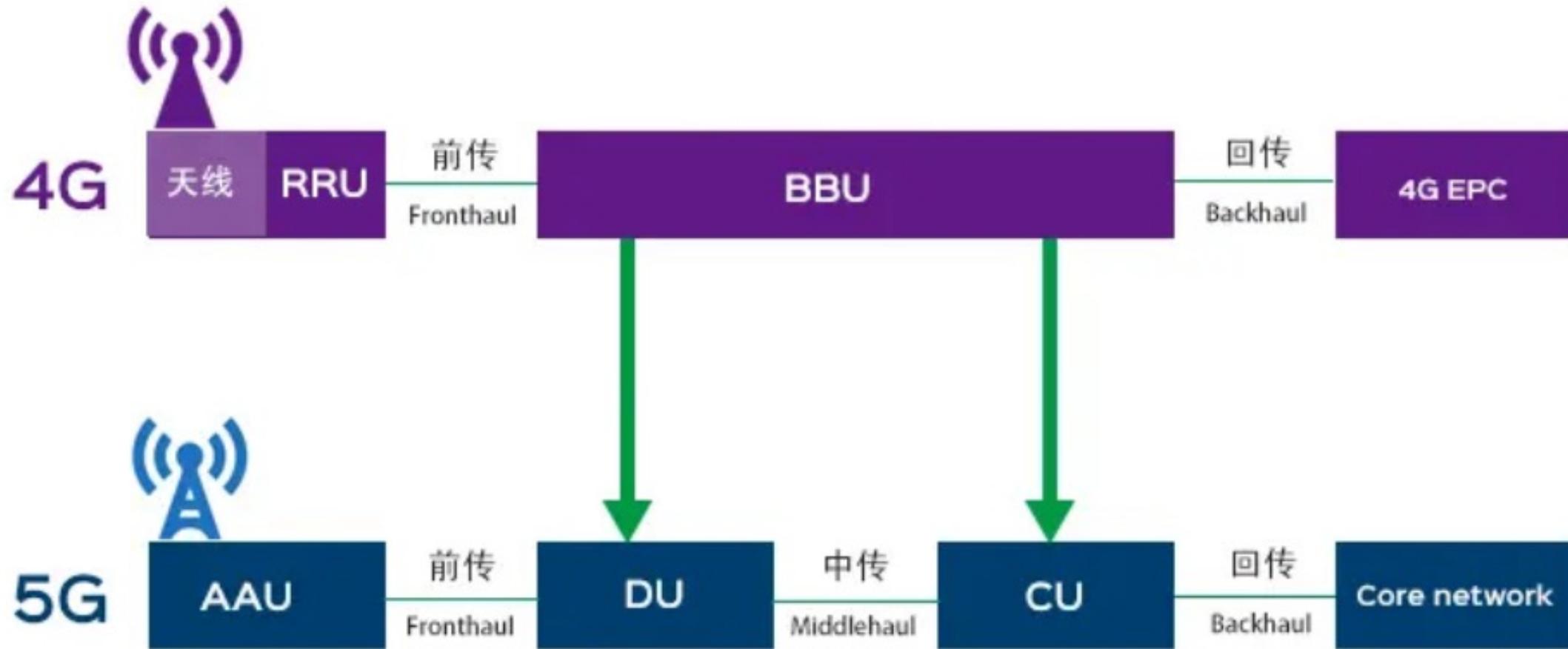
# Link the whole world!



Telecom  
Sea systems:  
> 400 systems  
> 1,200,000 km  
Land systems:  
China > 47,500,000 km

Data center  
The new driving force

# 4G/5G stations are also linked by optical fiber



# Game @ Mobile phone



## Discussion II:

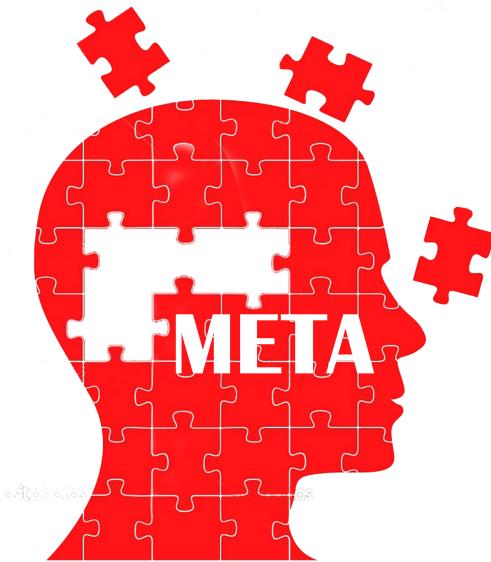
- What the main difference between mobile and PC?

# On-going: space internet



- Star-link

# Future: game or life?



- Meta

Decentraland



NFT

<https://weibo.com/ttarticle/p/show?id=2309404681397972631676>  
<https://www.ylfx.com>Show/index/cid/25/id/558112.html>