

HISTORY OF TELECOMMUNICATIONS

تكنولوجيا الاتصالات - نظرة للوراء

Presented By

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PREFACE

- **The history of telecommunications began with the use of smoke signals and drums in Africa, Asia, and the Americas.**
- **In the 1790's, the first fixed semaphore (visual signaling) systems emerged in Europe.**
- **In the 1830s, the electrical telecommunications systems started to appear.**

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9. **Other Major Telecommunications Systems (not covered in this presentation)**

THE ANCIENT SYSTEMS



Talking Drums



Semaphore



Smoke Signal



Human Messenger



Homing Pigeon



Fire Beacons

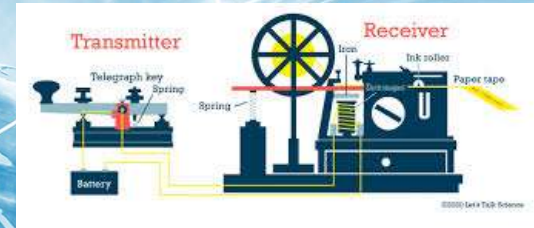
THE ANCIENT SYSTEMS

LONG DISTANCE COMMUNICATIONS METHODS

Method	First Recorded Use		Last Recorded Use	
Pigeons	Egypt	2900 BC	California	AD 1981
Runner/Couriers	Egypt	1928 BC	Pony Express	AD 1860
Beacons/Torches	Troy	1184 BC	England	AD 1588
Calling Posts	Persia	400 BC	Germany	AD 1796
Heliographs	Greece	400 BC	Pakistan	AD 1975
Flags	Greece	400 BC	Maritime Use	today

ELECTRICAL TELEGRAPHY

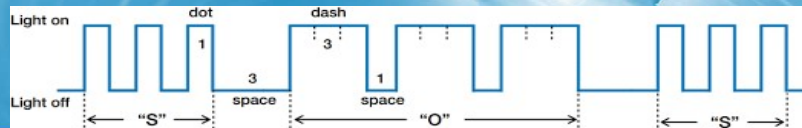
- A point-to-point text messaging system that was invented by the inventor and painter Samuel Morse.
- Morse developed the so-called Morse Code, a systems of dots and dashes to represent letters and numbers.
- The Code was transformed into electrical pulses.



International Morse Code

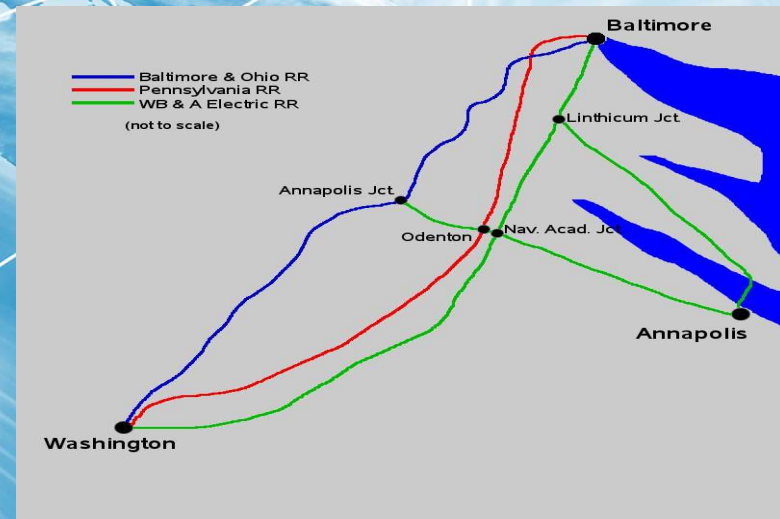
1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

A	· —	U	· · · ·
B	· · · —	V	· · — ·
C	· — · —	W	· — · ·
D	· — · ·	X	· — · —
E	·	Y	· — · · ·
F	· · · ·	Z	· — — ·
G	· — —		
H	· · · ·	1	· — · — · —
I	· ·	2	· — · — · — · —
J	· — · · ·	3	· — · — · — · — · —
K	· — · — ·	4	· — · — · — · — · — · —
L	· — · · ·	5	· — · — · — · — · — · — · —
M	— —	6	· — · — · — · — · — · — · — · —
N	· — —	7	· — · — · — · — · — · — · — · — · —
O	— · —	8	· — · — · — · — · — · — · — · — · — · —
P	· — · — · —	9	· — · — · — · — · — · — · — · — · — · — · —
Q	· — — ·	0	· — · — · — · — · — · — · — · — · — · — · — · —
R	· — · — ·		
S	· · · ·		
T	— ·		



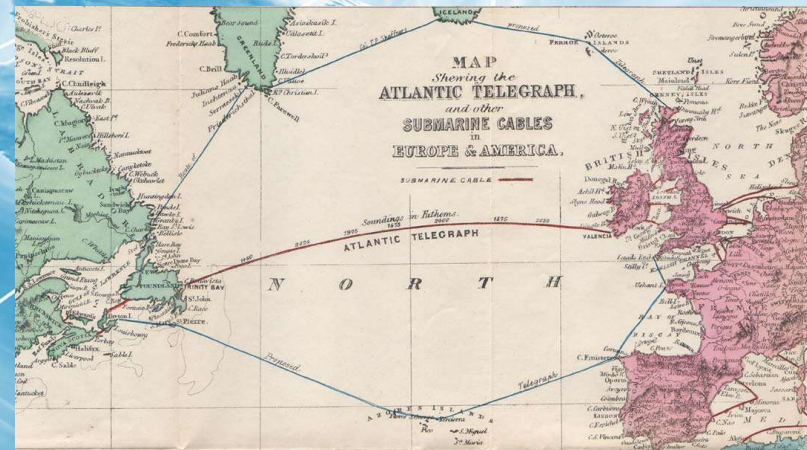
ELECTRICAL TELEGRAPHY

- Morse (alongside Alfred Vail) built the first system from Washington DC to Baltimore, MD (62 Km) in May 24, 1844.
- The telegraph era began since then and lasted more than 100 years.



ELECTRICAL TELEGRAPHY

- The first cable was laid in the 1850s across the Atlantic from western Ireland to Newfoundland. Other cables were laid to improve the link which was put in service in 1866.
- Telegraphy stands as a turning point in world history though has now been replaced by telephone, fax machine and Internet.



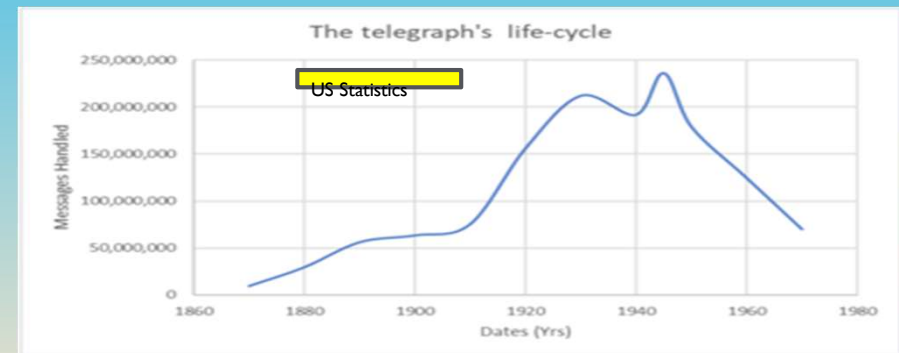
ELECTRICAL TELEGRAPHY

Who contributed most to the invention of telegraphy

- Frenchman Claude Chappe, 1791 to 1799, visual network “If you succeed, you will bask in glory”.
- Samuel Morse, in 1838, Electric telegraph and morse code, “What hath God wrought?” (What has God done?).

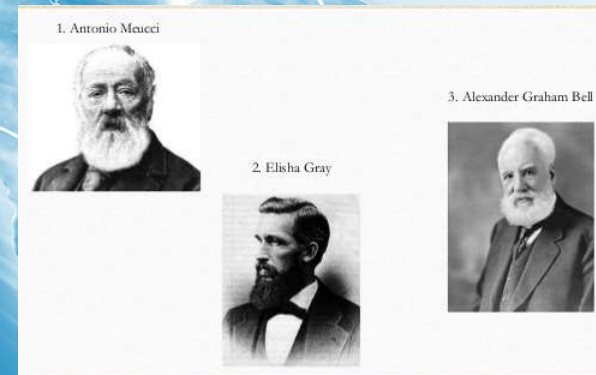
ELECTRICAL TELEGRAPHY

- Telegraphy began to permanently decline around 1930's. The decline began with the growth of the telephone use.
- 27 January 2006: Western Union discontinues telegram services. Indian company BSNL discontinues telegraphic service in 2013.



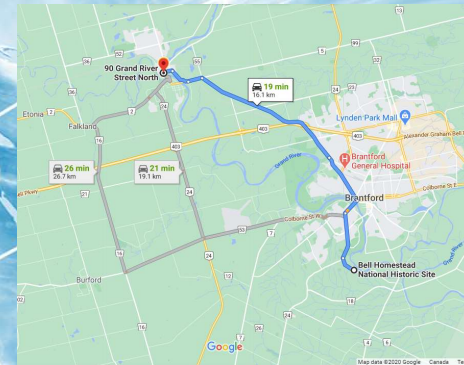
THE TELEPHONE

- Mechanical acoustic devices existed for a long time for transmitting speech.
- Antonio Meucci, Alexander Graham Bell, and Elisha Gray were all credited with the telephone's invention. Bell was the first to patent the invention in 1876.
- Early Telephone



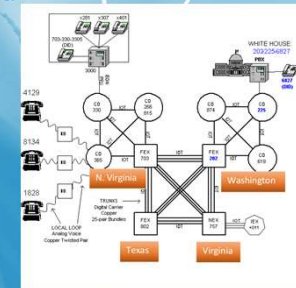
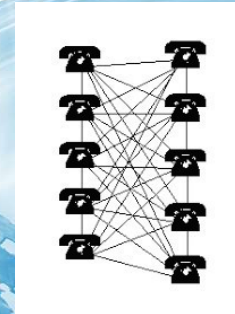
THE TELEPHONE

- 10 August 1876: Using the telegraph line between Brantford (became known as the Telephone City) and Paris, Ontario, eight miles distant, Bell made a telephone call, said by some to be the "world's first long-distance call".
- The Bell Homestead National Historic Site, located in Brantford, Ontario, was the first North American home of Professor Alexander Melville Bell and his family, including his last surviving son, scientist Alexander Graham Bell.



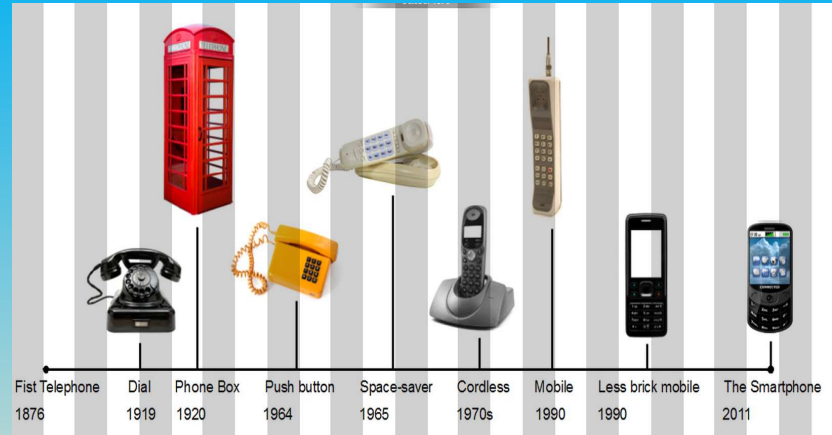
THE TELEPHONE

- The wiring of the telephone system presented a big challenge (each telephone needed to be directly wired to all other telephones).
- The Telephone exchange was needed to enable the system to operate more cost effectively:
 - ❑ **1G:** Telephone Switchboard was invented 1878.
 - ❑ **2G:** Electromechanically Automated Exchange was invented in 1891 by Almon B. Strowger (1839–1902).
 - ❑ **3G:** Stored Program Control (The present day Digital Switch with all modern features) was introduced in the 1960's.
- The first commercial telephone exchange was opened at New Haven, Connecticut, with 21 subscribers on 28 January 1878.



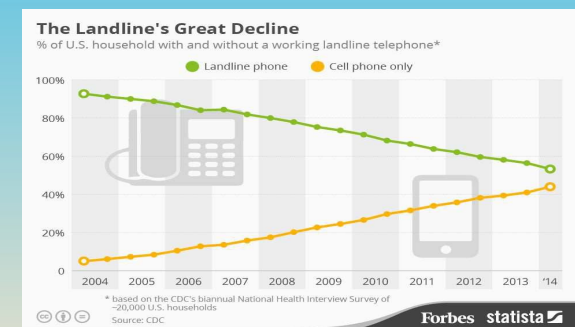
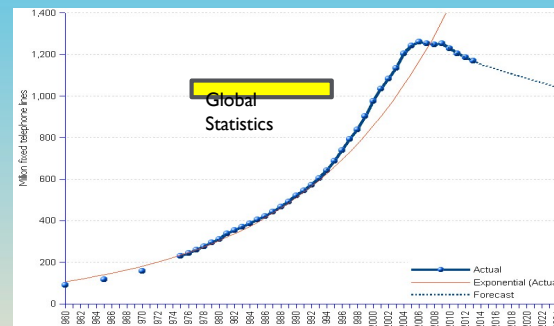
THE TELEPHONE

EVOLUTION OF THE PHONE



THE TELEPHONE

- Landlines began their rapid decline after cellphones gained popularity.
- A decade ago, 9 out of every 10 American households had a landline phone. Fast forward to today and it's just every second household.



THE TELEPHONE

Quotes:

- “Utility is when you have one telephone, luxury is when you have two, opulence is when you have three - and paradise is when you have none.”

Doug Larson

THE CELLULAR PHONE

- First historic mobile call was made on April 3, 1973 by a communications innovator and inventor Martin Cooper.
- The phone used was invented by Cooper himself while working for Motorola. It was very bulky and dubbed "the brick" and became available for consumers only 10 years later for the steep price of \$4000 which is equivalent of \$10,000 in today's money.

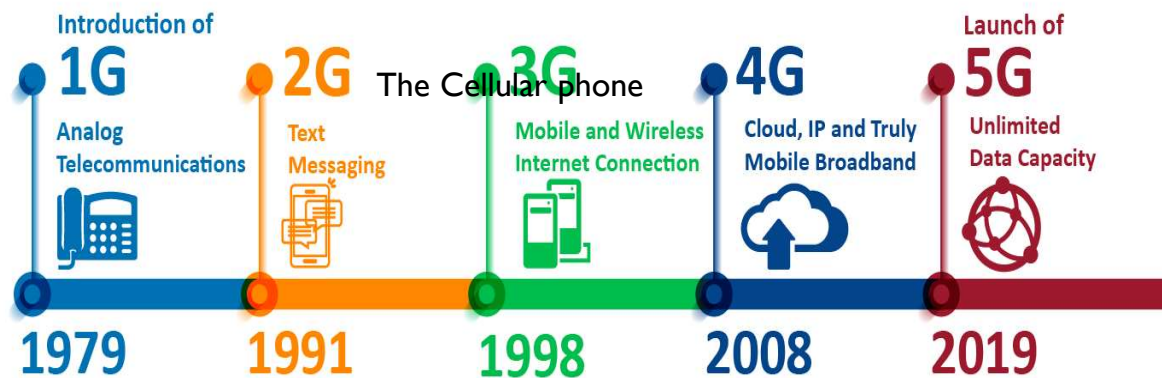


THE CELLULAR PHONE

- First Commercial system was launched in 1984.
- The cellular service evolved into 5 generations of standards, 1G since late 70's through 5G at the present time (6G is in the pipeline and gathering momentum and planned for 2030).
- As of June 2020, there are 35 countries that have deployed 5G already, among which are Canada and all the GCC countries.
- Also by 2019, there were over 8.3 billion cellphone subscriptions—slightly more than the number of people on the planet.

THE CELLULAR PHONE

The Evolution of 5G



THE CELLULAR PHONE

Quotes by anonymous :

- “Cell phones bring you closer to the persons far from you, but it takes you away from the ones sitting next to you!”
- “I finally realized that people are prisoners of their phones... that's why it's called a "cell" phone.”
- “Girls are like phones. They love to be held and talked to, but if you press the wrong button you'll be disconnected!”
- “Our phones fall, we panic. Our friends fall, we laugh.”

RADIO COMMUNICATIONS

- Scientific developments in the field of radio communications spanned some 80 years starting from 1780. Here are the most famous pioneers:
- **1. Michael Faraday (England, 1791 -1867)**
Electromagnetic Field Theory, making electricity from magnetism and vice versa.
- **2. James Clerk Maxwell (Scotland, 1831 -1879)**
Translated Faraday's ideas on electric and magnetic phenomena into mathematical notation.

RADIO COMMUNICATIONS

➤ 3. **Henreich Hertz (Germany, 1857 – 1894)**

First demonstrated the production of radio waves.

➤ 4. **Guglielmo Marconi (Italy, 1874 – 1937)**

- Focused on wireless telegraphy, not voice.
- Made the first radio communications system in 1894.
- Transmitted a message across the English Channel in 1899.
- Transmitted a message across the Atlantic Ocean in 1901 between Cornwall, England to Cape Breton, Nova Scotia.
- Marconi wireless was used by the Titanic before it sank on 15 April 1912.



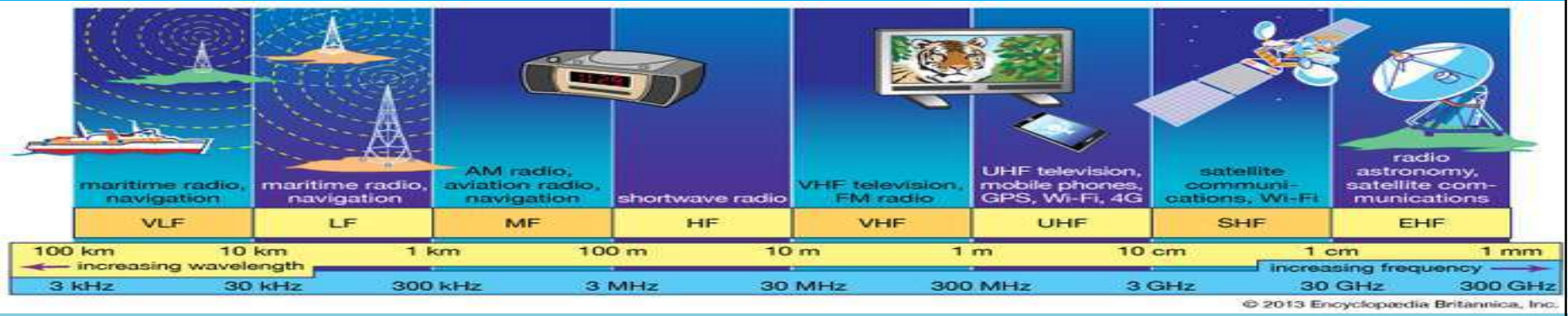
RADIO COMMUNICATIONS

➤ 5. Reginald Aubrey Fessenden (Canada, 1866 -1932)

Canadian radio pioneer who on Christmas Eve in 1906 broadcast the first program of music and voice ever transmitted over long distances.

RADIO COMMUNICATIONS

Radio Spectrum



RADIO COMMUNICATIONS

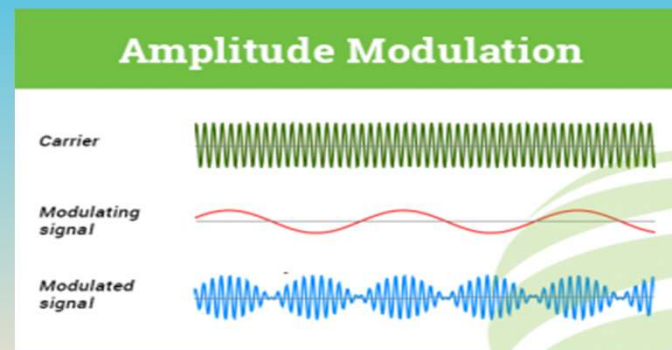
Examples of day to day frequencies

- 0 Hz – DC voltage/current
- 20 Hz – Lower limit of human hearing
- 50/60 Hz – Electricity frequency
- 440 Hz – Musical note A (La)
- 1 KHz – Audio test frequency
- 20 KHz – Upper limit of human hearing
- 1 MHz – AM Radio
- 100 MHz – FM Radio
- 2.4 GHz – Microwave oven
- 2.4 GHz and 5.0 GHz - Wi-Fi
- 2.45 GHz - Bluetooth

RADIO COMMUNICATIONS

Modulation

- It is the process of merging the information to be transmitted (data, voice, text, image, video) with a carrier signal. A carrier signal is one with a steady waveform - constant height, or amplitude, and frequency.
- Examples of modulations: AM, FM, FSK, PSK, QAM, SSB ...etc



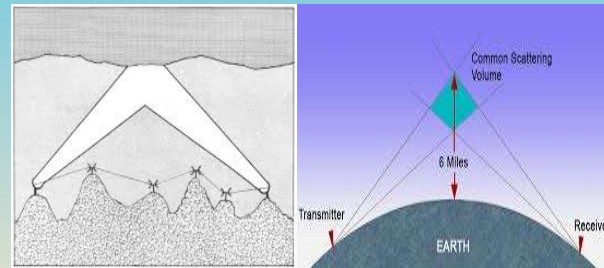
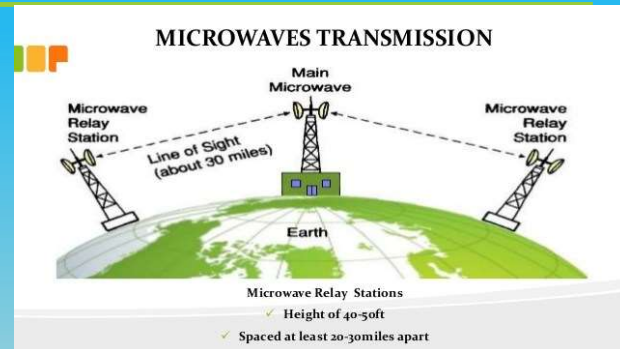
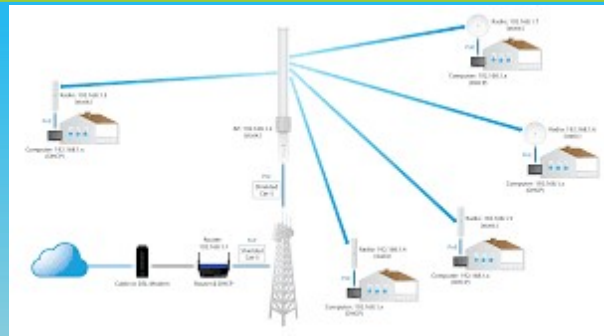
RADIO COMMUNICATIONS

Types of Radio Links

- Terrestrial System (40 – 60 km)
 - ❑ Point to Point (Microwave)
 - ❑ Point to Multipoint (Rural, Cellular, Police, Broadcast)
- Troposcatter System (300 km)
- Satellite System (one GPS Satellite covers 38% of earth surface)

RADIO COMMUNICATIONS

Types of Radio Links



SATELLITES COMMUNICATIONS

- The concept of satellite was born in 1945.
- A technique was developed by the US Navy in the 1950's to utilize the moon as a natural reflector of radio signal in what is called Earth-Moon-Earth (EME) communications.
- Sputnik I, as the first human-made object to orbit Earth, was put into orbit by the Soviet Union in 1957.
- Explorer I, the first American satellite in space, was launched in 1957.
- Pioneer I, the First spacecraft launched by NASA was launched in 1958.

SATELLITES COMMUNICATIONS

- Telstar 1, the 1st satellite to provide communications to multiple nations, was launched by NASA on July 10, 1962.
- Relay 1, the first satellite to broadcast television from the United States to Japan, was launched by NASA on December 13, 1962.
- Syncom 3, the world's first geostationary satellite was launched by NASA in 1961.

SATELLITES COMMUNICATIONS

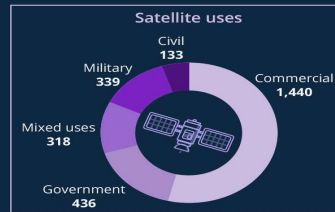
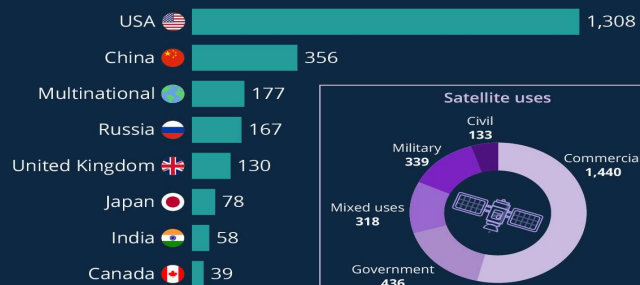
Types of Satellites

- GEO - Geostationary Orbit, 35,785 km above Earth's surface
- MEO - Medium Earth orbit , 2,000 to 36,000 km above Earth's surface
- LEO - low Earth orbit , 160 to 2,000 km above Earth's surface

SATELLITES COMMUNICATIONS

The Countries With the Most Satellites in Space

Satellites currently orbiting Earth by country* (as of April 2020)



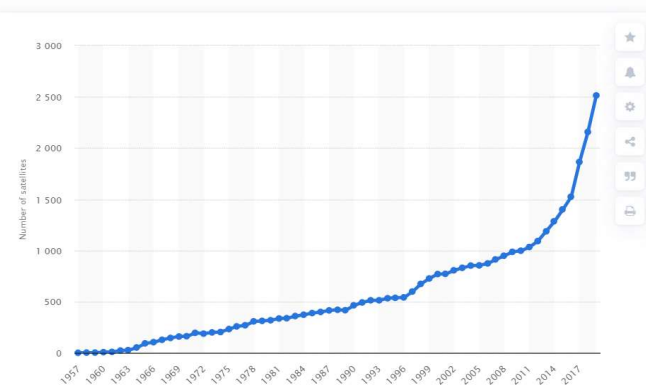
* Country of operator/owner
Source: Union of Concerned Scientist Satellite Database



statista

Transportation & Logistics > Aviation

Number of active satellites from 1957 to 2019



Additional information

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SATELLITES COMMUNICATIONS

Quotes:

➤ A picture is worth a thousand words. A satellite image is worth a million dollars.

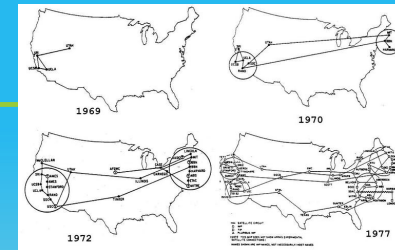
Sarah Parcak

➤ I predict that there are hundreds of thousands, if not millions, of undiscovered ancient sites across the globe. The only way to map them and locate them quickly is from satellites.

Sarah Parcak

THE INTERNET

- The term is derived from “Inter-networking”.
- Worldwide system of interconnected networks and computers
- The concept of packet, the cornerstone of the Internet, was developed by Donald Davies of the National Physical Laboratory (NPL) of the UK in 1965.
- ARPANET developed, in 1969, the world’s first operational small scale internet (4 sites).
- NPL launched its own internal packet switched local area network (LAN) in 1971.
- US Government allowed commercial use of internet 1989.
- World Wide Web was brought together by Tim Berners Lee in 1990 and thus saved the Internet due to the invention of enhanced Graphical User Interface, mouse and hyperlink.



THE INTERNET

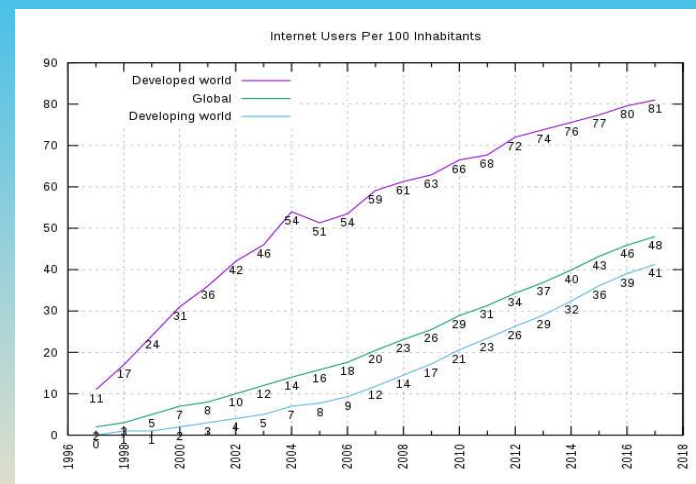
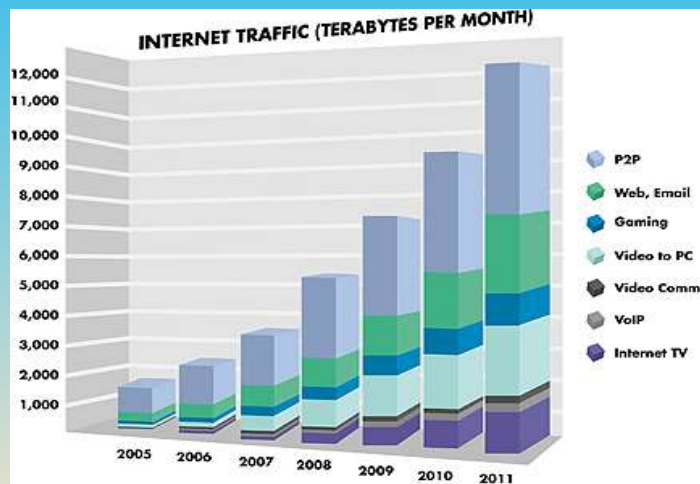
World Wide Web War

Most popular browsers:

- Mosaic 1993
- Netscape 1994
- Internet Explorer 1995
- Opera 2003
- Firefox 2004
- Apple Safari 2007
- Google Chrome 2008

THE INTERNET

The internet has been one of our most transformative and fast-growing technologies. Globally the number of internet users increased from only 413 million in 2000 to over 3.4 billion in 2016.



THE INTERNET

Most Popular Internet Applications

- **E-mail** : First email sent in 1971, about 3,9 B active users in 2019
- **Facebook** : Launched in 2004, about 2.74 B monthly active users 2020
- **YouTube** : Launched in 2005, about 2 B users worldwide at present
- **Twitter** : Launched in 2007, about 330 M monthly active users at present
- **Instagram** : Launched in 2010, more than 2 B monthly active users at present

THE INTERNET

Quotes:

- “The Internet emphasizes what you would do anyway. If you want to be a loner, you can be more alone. If you want to connect, it makes it easier to connect.”

Esther Dyson

- The Internet gave us access to everything; but it also gave everything access to us.

James Veitch

MOST SIGNIFICANT CANADIAN ACHIEVEMENTS

- 1874 – **Concept of telephone** disclosed by Alexander Graham Bell
- 1881 – **World's first international submarine** built between Windsor and Detroit
- 1900 - **Common battery service** introduced in telephone exchanges
- 1908 - **Automatic telephone equipment** introduced
- 1927 - **Commercial transatlantic telephone service** introduced
- 1947 - **First commercial mobile telephone service** launched
- 1962 - **Commercial facsimile service** offered

MOST SIGNIFICANT CANADIAN ACHIEVEMENTS

- 1969 - **"911" system** introduced
- 1972 - **World's first national geostationary satellite** launched
- 1977 - Technical field trial of **fiber optic technology** conducted
- 1981 – The **Canadarm** launched (retired in 2011 after 30 years of service)
- 1985 - **Cellular mobile telephone service** offered
- 1995 - Consumer **Internet service** launched
- 1996 - World's most powerful **geostationary mobile communications satellite** launched



OTHER MAJOR TELECOMMUNICATIONS SYSTEMS (NOT COVERED IN THIS PRESENTATION)

- Fibre Optic and Coaxial Cable Communications
- Radio and Television Broadcast
- Radar
- Telephone Exchange
- External Cable Plant
- Voice Over IP and IPTV

