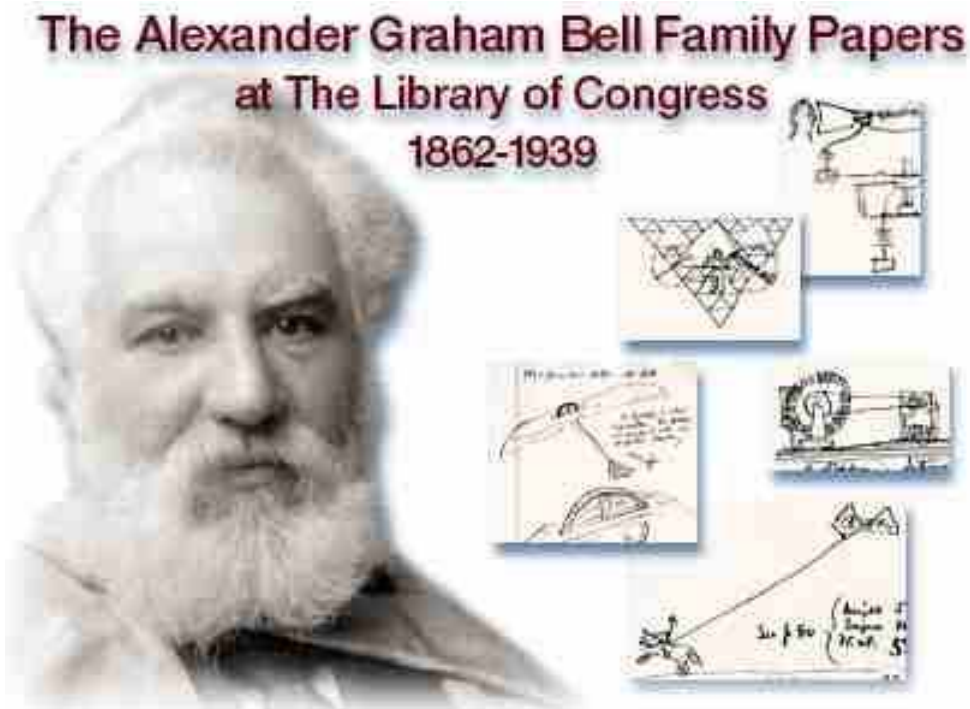
Telecom Service/Policy
Chae Y. Lee

International History of Telecommunication



Contents

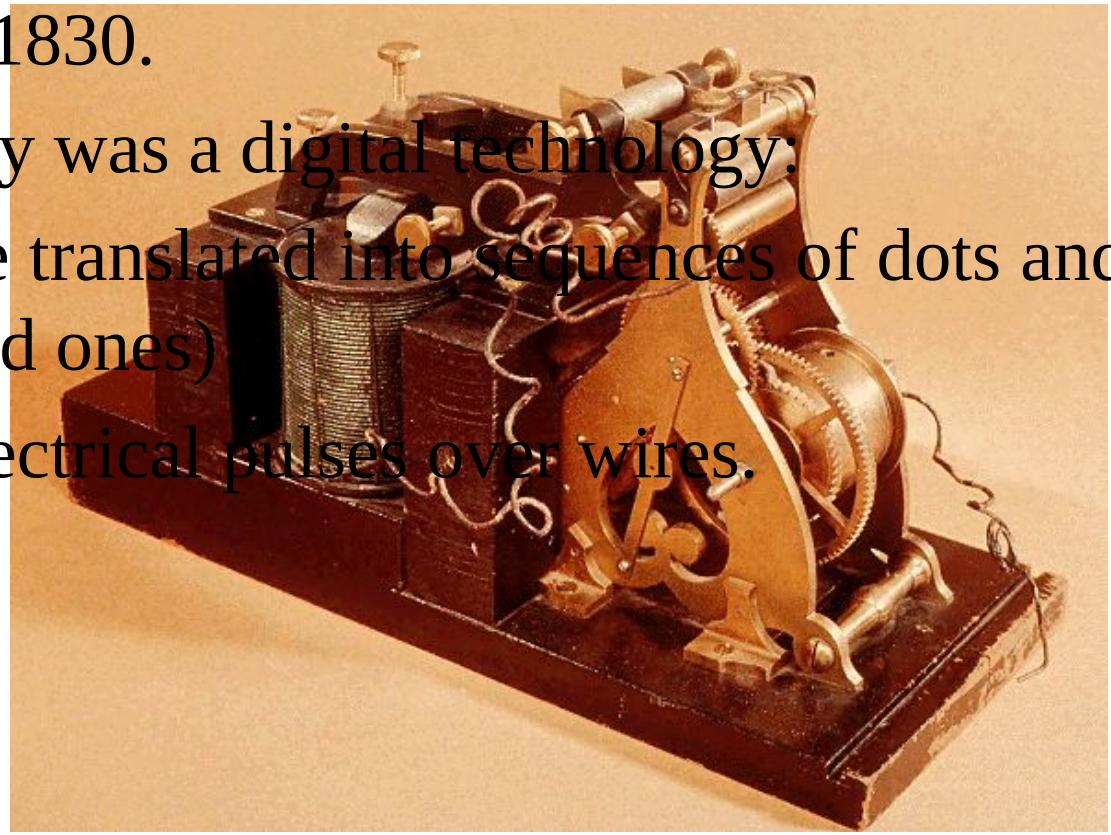
Telegraphy

Electric telegraphy was invented and tested in the U.S. and the U.K. in 1830.

Electric telegraphy was a digital technology:

data (letters) were translated into sequences of dots and dashes (zeros and ones)

Transmitted as electrical pulses over wires.



Telegraphy

The first international telegraph agreement was signed on October 3rd, 1849, by Prussia and Austria

Submarine cables were laid in international waters shortly thereafter.

In 1851 the U.K. laid cables between Ireland and England, and England and France.

A transatlantic cable was laid in 1866, and by the 1870s places as far flung as Australia had direct cable links to the UK.

Telegraphy

The **railway** was the engine of growth in the mid 19th century

cf telecommunications today.

In Europe railways were highly **regulated**, and almost without exception government-owned.

In Europe telegraphy was almost universally controlled by government **monopolies** (subsequently called PTTs for post, telegraph, and telephone).

For example, the U.K. granted its postal service monopoly rights to domestic telegraphy, and it was no coincidence that the bulk of the cable laid by the U.K. serviced its colonies.

Telegraphy

It was quickly realized that the commercial value of telegraph was high, and that commercial fees could be used as a means of **subsidizing the railway** and diplomatic functions of the telegraph.

In fact, **monopoly prices** were set and since the state or its agent typically had the sole rights to telegraphy transmission, these were high indeed.

As a result, use by the general public was extremely limited.

Complexity of international telegraphy

Bilateral arrangements

Language/coding/standardization

Security

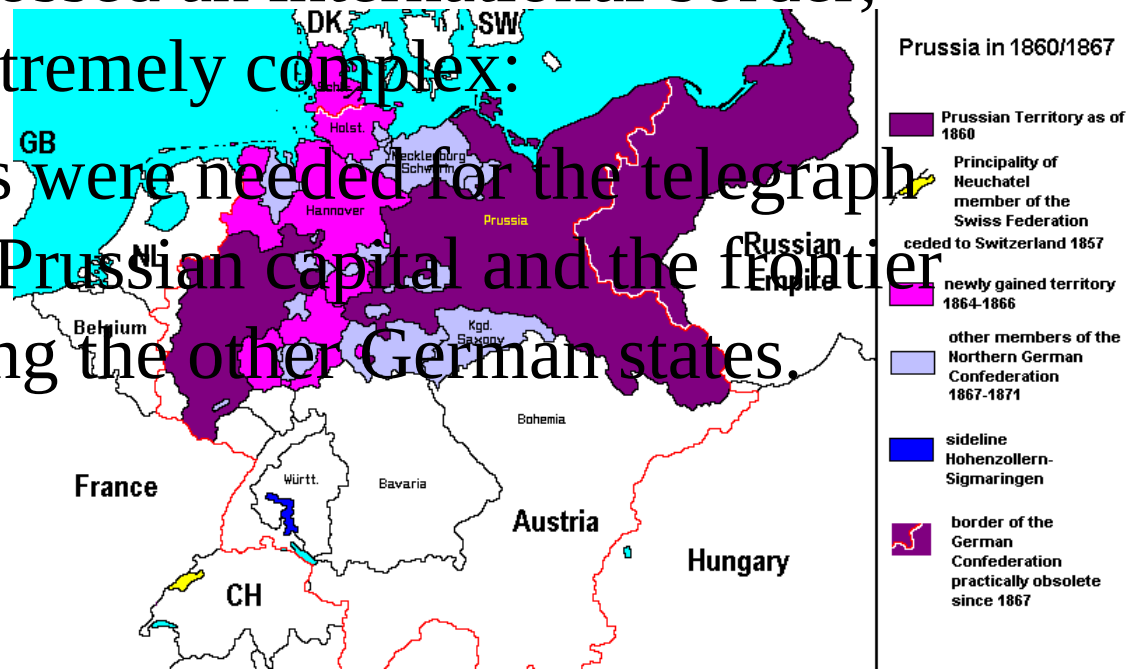
Costs and cost sharing/pricing

Complexity of international telegraphy

Bilateral arrangements

An international agreement was required whenever telegraph lines crossed an international border, which became extremely complex:

E.g. 15 agreements were needed for the telegraph link between the Prussian capital and the frontier localities bordering the other German states.

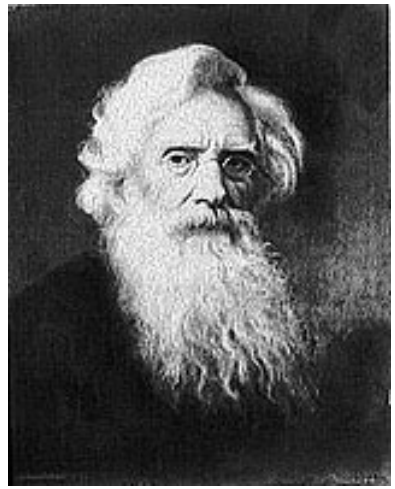


Complexity of international telegraphy

Language/standardization

These issues were not helped by language difficulties,

and the need for standardized coding (e.g. the use of the Morse code) on telegraph transmissions, and standardized procedures.



Painting: Self Portrait by Samuel Morse

Complexity of international telegraphy

Security

Telegraphy was a point-to-point technology.

As a result a telegraph message often had to be written out and retransmitted several times to reach its final destination.

This problem was aggravated at national borders where it was common for the message to be taken down and physically passed across the border to be then resent.

At any of these points the message could be intercepted, or not retransmitted.

Complexity of international telegraphy

Costs and cost sharing/Pricing

Costs were extremely difficult to identify,

mirroring similar problems telecommunications networks face today,

making *tariffing* difficult,

especially when consistency was called for on international routes.

A telegraph message could transit through several different national systems.

Under these circumstances it was very difficult to tell who should pay who what.

Formation of international organizations

The problems of cross-border transmissions led to the formation of two telegraph unions

The **Austro-German Telegraph Union**, and

the **West European Telegraph Union** under the auspices of France.

Britain was excluded because its telegraphs were privately owned,

and in 1858 English was barred as an official language of the Unions.

Formation of international organizations

The convention and its development created an **inter-European network**

guaranteeing international telegraph traffic,

protecting its confidentiality,

overseeing technical change and developments,

bringing some uniformity in tariffing and regulations,

and chose a standardized Morse code.

Formation of international organizations

On the 17 May 1865, under the auspices of Napolean III,

The International Telegraph Convention of Paris was signed

merging the two unions and forming the **International Telegraphy Union**

perhaps the first truly international coordinating body of modern times.

Formation of international organizations

- International law was not clear whether a country, on agreeing to an international protocol, could impose these commitments on private corporations operating in its territories.
- This was a particularly difficult problem for the U.S. and Canada whose communication providers were private organizations.
- In fact, the U.S. refused to join the International Telegraphy Union both because it believed it could not enforce any commitments it made, and because it was unwilling to do so.

Telephony

In 1874 the telephone was invented by A. G. Bell.

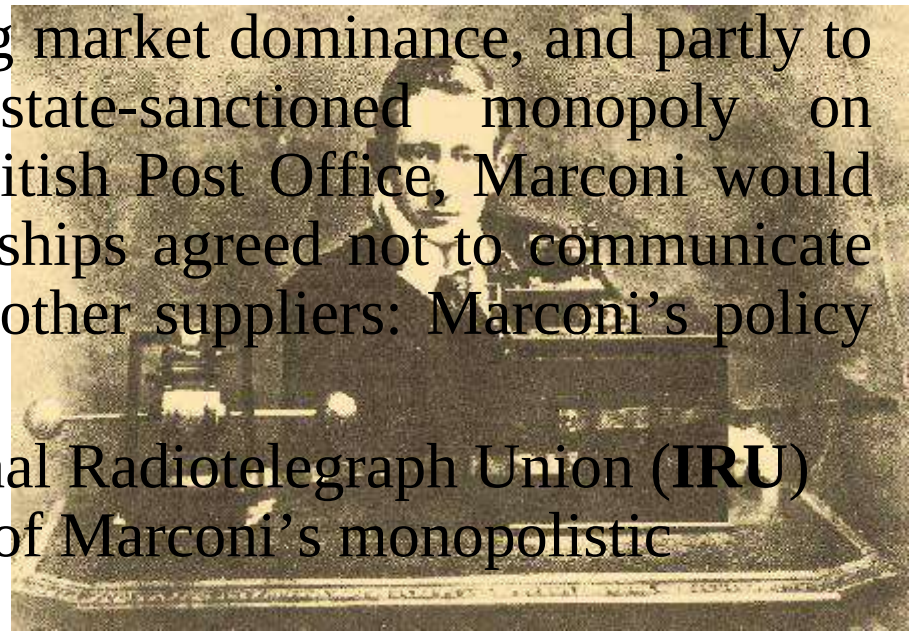
The International Telegraphy Union became the International Telegraph and Telephone Union (**ITTU**) at a meeting in St. Petersburg, Russia.

Wireless communication

In 1889 wireless communication was invented by Marconi, the value of which was quickly understood in shipping.

By 1901 Marconi Co. had a contract with Lloyd's to cover its ships, and its operations continued to expand rapidly.

Partly as a means of gaining market dominance, and partly to avoid infringing the state-sanctioned monopoly on telegraphy held by the British Post Office, Marconi would only install equipment if ships agreed not to communicate with ships who had used other suppliers: Marconi's policy of **non-interconnection**.



Formation of the International Radiotelegraph Union (**IRU**) in 1906, but not to an end of Marconi's monopolistic practices.

Wireless communication

The sinking of the *Titanic* had a major impact on the London meetings of the IRU in 1912.

Marconi's policy had always allowed communications in emergencies.

Marconi Co. finally agreed to allow interconnection in all cases.

Wireless in the U.S.

The U.S. government was essentially uninvolved in wireless until 1912, when as a signatory to the IRU conventions.

With the passage of the Radio Act private wireless in the U.S. became regulated in 1913.

Wireless in the U.S.

Wireless communication developed rapidly, with substantial international wireless facilities being erected through WWI.

In 1915 AT&T and France establish a wireless voice link between Arlington, VA and France.

By 1918 there were links which stretched from London to Australia, and by 1927 these were direct.

Moving towards the ITU

In 1924 representatives from a number of PTTs met in Paris to form the International Consultative Committee on **Long Distance Telephone** (**CCIF**).

At ITTU meetings in Paris in 1925 the **International Telegraph** Consultative Committee (**CCIT**), was formed, and the CCIF brought under the ITTU.

The IRU Formed in 1912

An informal conference of 10 countries in London in 1925 created the Union Internationale de Radiophonie.

In 1927, at Washington DC, the International Radiotelegraph Convention and Regulations were adopted by the world's major nations, the first frequency allocation table established, and the International Radio Consultative Committee (**CCIR**).

The IRU Formed in 1912

The CCIR allocated frequencies, orbital slots and set standards in radio telegraphy until 1989.

Standard setting is now done by the telecommunications standardization sector of the ITU; **ITU-T**

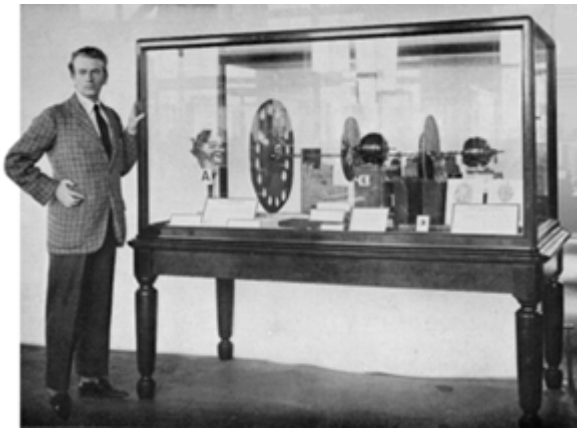
while allocation of frequencies and orbital slots is done by the radiocommunication sector; **ITU-R**.

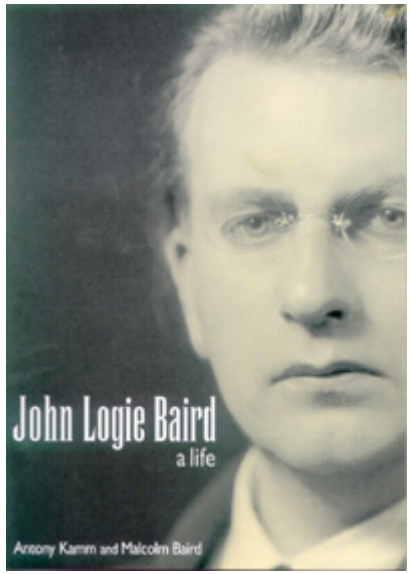
The ITU

At a joint meeting between the ITTU and the IRU in Madrid,
the 1865 International Telegraph Convention and the 1906 International Radiograph Convention were combined in the International Telephone Convention, out of which a new union was formed to bear, from 1 January 1934, the name International Telecommunication Union (ITU).

The emergence of television

In 1926 Baird demonstrated electronic transmission of moving pictures in England,
and by 1931 Shoenberg had developed a fully electronic method of scanning (picture reproduction).
HD TV broadcast in London in 1936 and in U.S. in 1939





Reconstruction after WWII

War damage to the world's communications systems was extensive.

In France alone

200 buildings were seriously damaged,

90,000 km of overhead wire downed,

60 relay stations destroyed,

30 cities had their cable networks cut,

and 38 of 42 broadcasting stations were left unusable.

Reconstruction after WWII

The situation in the rest of Europe was similar, and in Germany it was worse.

The ITU post-war

At Atlantic City in 1947 the ITU became a government agency of the United Nations;

its headquarters were to be moved from Bern to Geneva in 1948.

The ITU post-war

The International Frequency Registration board (IFRB) was set up to manage the spectrum allocation in a situation where the airwaves were becoming increasingly crowded;

Extensive changes were made to the Frequency Allocation Table (earliest form 1912 London), which set aside frequencies for particular services, and these became mandatory.

The post-war ITU

The most important change, however, was that membership became open only to sovereign nations.

Existing territorial members, however, did not lose their membership rights.

This substantially increased the influence of small or developing countries in a manner quite unrelated to telecommunication usage.

Frequency fights

From 1948 to 1952 the ITU engaged in strenuous efforts to develop an International Frequency List (ILF).

The effort failed largely due to vast oversubscription to available spectra,

and also because of outright objections from the Soviet bloc which saw the ILF as violating national sovereignty.

Frequency fights

In 1956 the CCIT and CCIF were amalgamated forming the International Telephone and Telegraph Consultative Committee (CCITT).

The CCITT covered virtually all aspects of wireline service including standard setting until 1989.

These functions are now carried out by the ITU-T.

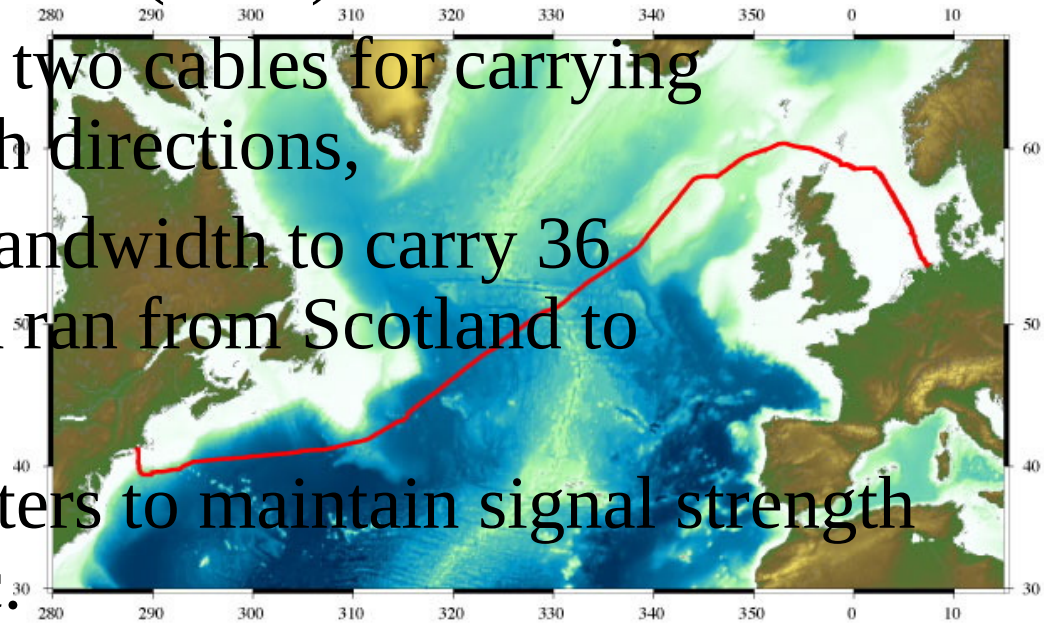
Submarine cables

In 1956 AT&T, the Canadian Overseas Telecommunications Corporation, and the British Post Office completed the first submarine transatlantic telephone (TAT) cable.

TAT-1 consisted of two cables for carrying information in both directions,

each with enough bandwidth to carry 36 conversations, and ran from Scotland to Newfoundland.

It required 51 repeaters to maintain signal strength across the Atlantic.



Submarine cables

By 1961 a direct telephone link was established between London and Vancouver,

and on December 2, 1963, a Pacific Communications Cable (COMPAC) linked Vancouver to Hawaii, Suva, New Zealand, and ultimately Australia.

Geo-stationary Satellite

In 1945 Arthur C. Clarke suggested using a satellite in a geo-stationary orbit;

an orbit in which the satellite remains stationary wrt a location on earth.

Syncom II, launched on July 26th, 1963, was the first satellite to occupy a geo-stationary orbit,

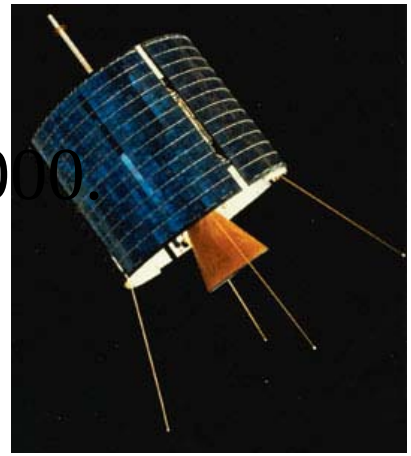
and in 1964 it carried the first continuous live TV broadcast; the opening of the Tokyo Olympics.

Intelsat

In 1964 Intelsat was formed on an interim basis by eleven nations to establish a global commercial communications satellite system.

Intelsat I (Early Bird), launched in 1965 into a geo-stationary orbit, was the first commercial communication satellite, a modified version of Syncom.

A voice channel on Early Bird costs $32,000.



Intelsat

Satellite capability increased quickly:

Year	Satellite	Telephone circuits	TV circuits
1965	Intelsat I	240	or 1
1968	Intelsat III	1,200	and 1
1971	Intelsat IV	5,000	
1992	Intelsat VII	100,000+	and 2
1997	Intelsat 8/8A		

…..