

Wireless!

The forces and strategies that shaped a revolution



Lecture 7- Cellular Politics: Monopoly or Competition?

Lecture 7- Classwork

1. Please summarize in 3-4 sentences the Pre-Lecture reading for **Lecture 7** including some important takeaways from your reading.
2. What were the advantages and disadvantages of a cellular monopoly?
3. Why was cellular delayed for so many years by the FCC?
4. Would you have broken up the Bell System Monopoly? Explain.
5. Why do you think AT&T did so badly after the Bell System was broken up?

Topics

- ❑ The advantages of big Common Carrier systems
- ❑ The arguments for and against Monopoly
- ❑ A century of conflict and its impact on AT&T
- ❑ The long political fight over cellular
- ❑ The breakup of the AT&T monopoly and its sad aftermath

Common Carriers (broadly speaking)

- Big systems that “carry” things for anyone
 - Mail
 - Telephone calls
 - Electricity
 - Cable
 - Internet
 - Water
 - Sewage
 - Natural Gas
 - Even our system of Highways



Large Groups are Statistically Less Variable

The Power of Aggregation

□ Law of Large Numbers

A fundamental theorem in probability and statistics that states that as the number of trials or observations increases, the actual observed average result will approach the expected (theoretical) value

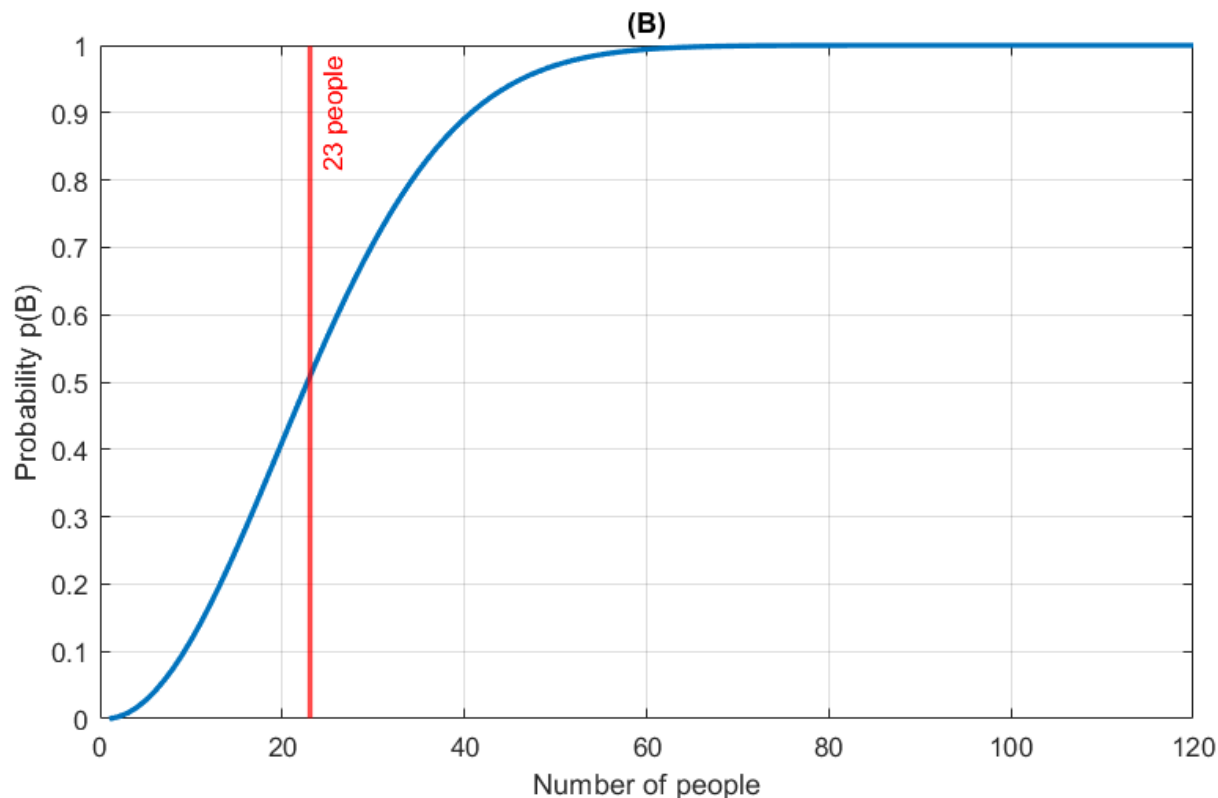
□ Central Limit Theorem

Sufficiently large random samples from any population (regardless of its original distribution—skewed, uniform, etc.), the distribution of the sample means will tend toward a Gaussian distribution (a bell curve) as the sample size gets larger

Large Groups are Statistically Less Variable

Unlikely events become very likely: “Law of Truly Large Numbers”

- What is the probability $p(B)$ of 2 people in this classroom sharing the same birthday?
- $p(B) = 99.9\%$



Cars; kilowatts; calls; gallons; packets

The Power of Aggregation: “Law of Large Numbers”

- ❑ Combining traffic is the key to low cost
 - Large routes can afford the best technology
 - Most large systems are cheaper per person
- ❑ Network control allows central planning
 - New technology; “End-to-end” quality
- ❑ Large groups are statistically less variable and thus more predictable
 - They can provide less total capacity, with a small probability of overload
 - Some overloads are very serious, so overload planning becomes critical
- ❑ If big systems are cheaper, why not one (monopoly)?

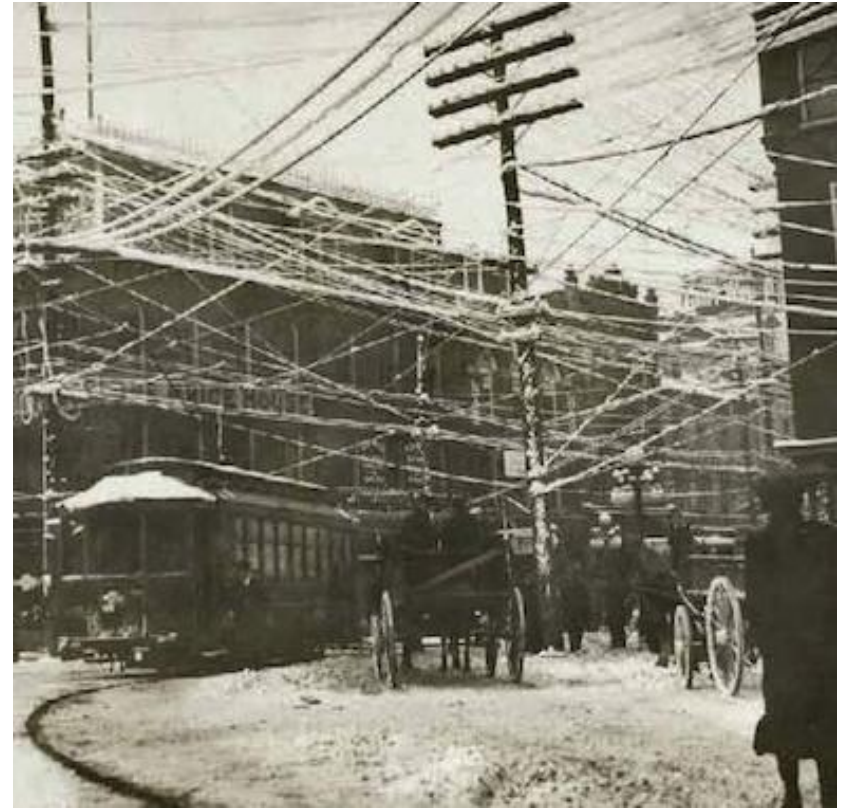
Many common carriers have extensive infrastructure that's messy to build

- Messy infrastructure
 - Roads, wires and pipes



How would the economics of these monopolies be like cellular economics?
What other similarities do you see between these examples and Cellular?

Urban telephone wires circa 1900



Recall: Western Union's strategic blunder

Turning down the telephone patent (1876)

"Messrs Hubbard and Bell want to install one of their 'telephone devices' in every city. The idea is idiotic on the face of it. Furthermore, why would any person want to use this ungainly and impractical device when he can send a messenger to the telegraph office and have a clear written message sent to any large city in the United States?"

In view of these facts, we feel that Mr. G.G. Hubbard's request for \$100,000 for the sale of this patent is utterly unreasonable, since this device is inherently of no use to us. We do not recommend its purchase."

(Bell bought Western Electric six years later, in 1882)

The AT&T monopoly

A wonder of technology and universal service

- ❑ Bell created the AT&T monopoly (also called the “Bell System”)
 - Buying up competitors
 - Eliminating the mess of competing wires
 - Going on to create the “Bell System”
 - ❑ Local, long distance, international, R&D, manufacturing
- ❑ A focus on technology and service
 - Lower cost
 - Better service
 - Universal, end-to-end service
 - “Any color phone, as long as it’s black”
- ❑ Result: the world’s best telephone service
 - But not everyone was happy

Some less friendly views of the Bell System

- ❑ Unfair to other manufacturers
 - Always buys from Western Electric (its own manufacturer)
- ❑ Anti-competitive and unnecessary
 - A target for the “trust busters” at the Department of Justice
- ❑ Result: A long-term erosion of the AT&T monopoly
 - Connection of independent telephone companies (1913)
 - “Consent Decree” - Restricted to regulated businesses (1956)
 - “Carterfone” and “Radio Common Carriers” (1960s)
 - MCI and Long Distance competition (1970s)
- ❑ This political tension had a big effect on cellular
 - Was a cellular monopoly in the public interest?
 - The argument caused controversy and delay
 - AT&T seemed to win the cellular war in 1981
 - Breakup of AT&T monopoly in 1982 ended its “cellular” dreams₁₂

Cellular politics:

The many “stakeholders”

- ❑ FCC- Wanted to get “land mobile” requests for channels off their backs
- ❑ DOJ- Wanted to prevent a Bell System monopoly
- ❑ Broadcasters- Wanted to keep their TV channels
- ❑ AT&T- Wanted to offer an expanded mobile telephone service
 - Concerns about the long-term threat of cellular
 - A chance for a new business
 - A good use of AT&T’s technology and wealth

Cellular politics:

The many “stakeholders” (continued)

- ❑ RCCs- Wanted to stay in business
 - Did they have the resources to compete?
- ❑ Motorola- Wanted to keep AT&T out of wireless
 - They dominated the profitable “private” business
 - Cellular would threaten that business
- ❑ Other manufacturers (primarily the Japanese)
 - Saw cellular as a new market opportunity
- ❑ John Q. Public- Didn't know much about cellular, or care much, and was not represented in the fight

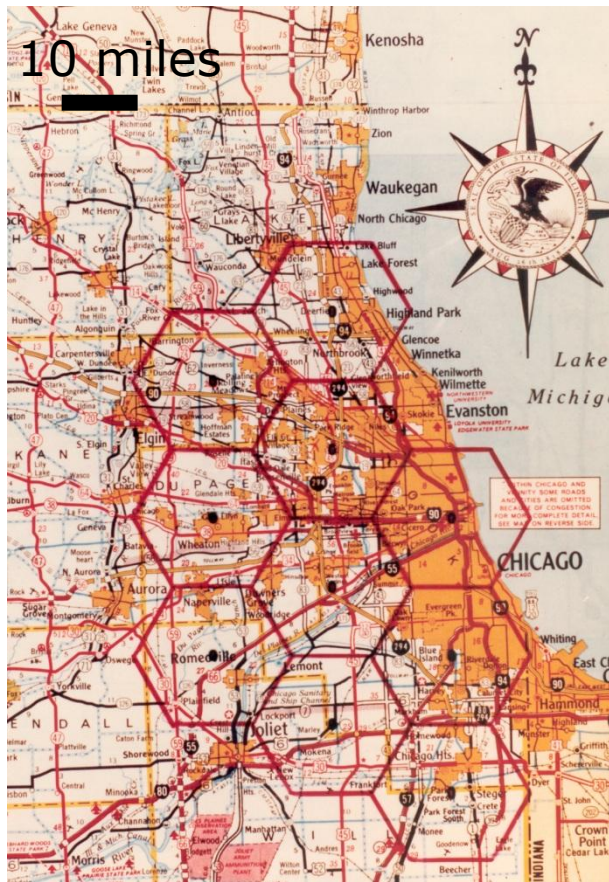
Q3

The FCC inquiry process:

An endless debate

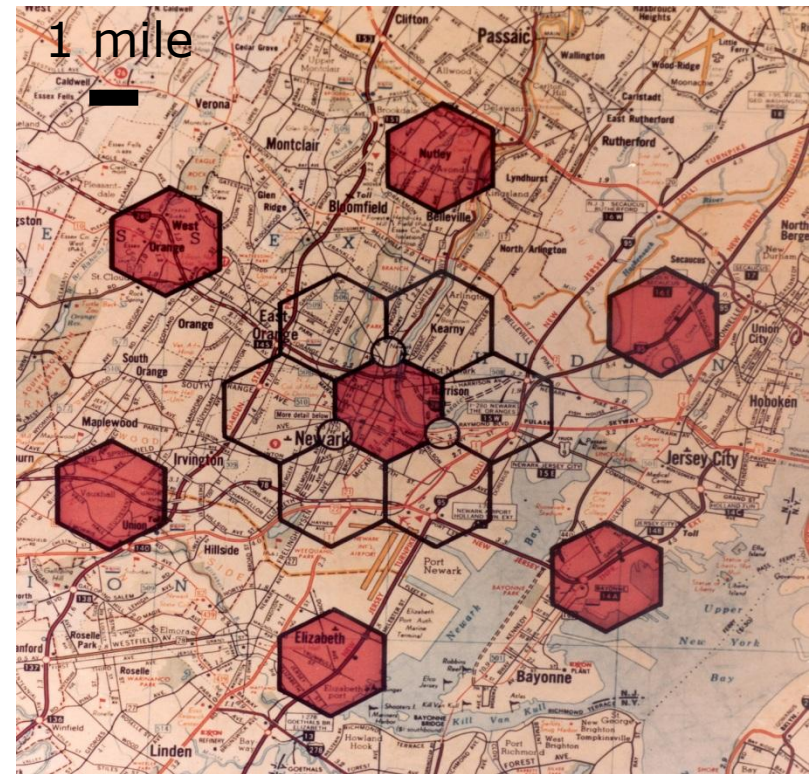
- ❑ Notice of Inquiry- 1968
- ❑ AT&T commits to a proposal in 18 months
- ❑ Comments on the proposals
- ❑ Rebuttals on the comments
- ❑ Oral testimony
- ❑ Petitions to courts
- ❑ New proposals
- ❑ New comments
- ❑ Arguments over technology, cost, spectrum, services, trials, standards (e.g. channel size)
- ❑ The Chicago trial was delayed for a year by Motorola objections
- ❑ On, and on, and on.... for 15 years!

AT&T Cellular Trials



Chicago Service trial

Large Coverage Area (3000 square miles, 1000+ users, 3 phone suppliers including Motorola)



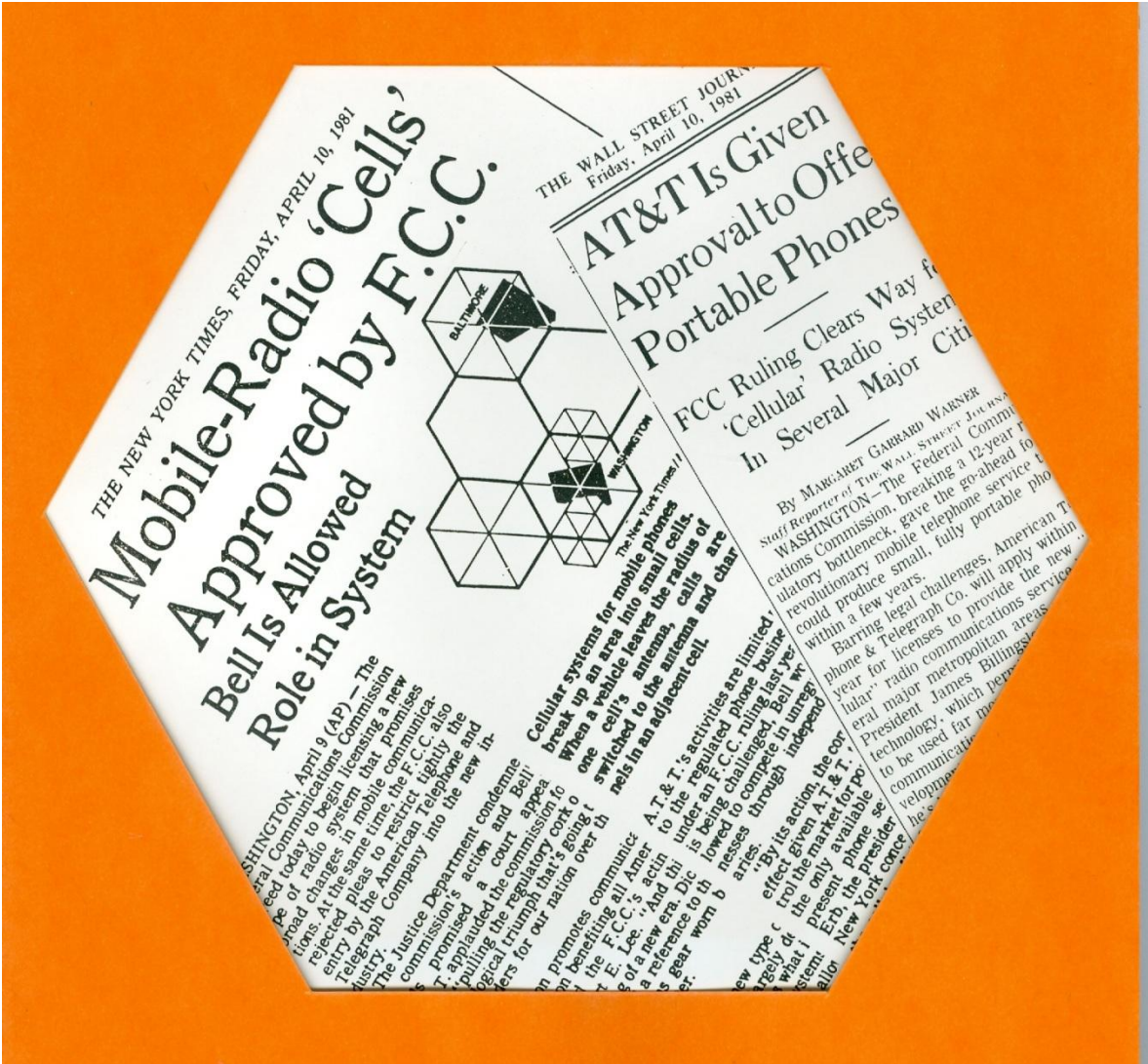
Newark small-cell testbed

Small Coverage Area (7-cell reuse)

The long and bitter experience led to some new and interesting strategies

- ❑ The “90-day reports” that Bell labs was forced to submit to the FCC “90-day reports” on its service and technical trials
 - Some suggest they were less informative than they could have been
- ❑ Bell Labs and others participated in the “standards committee” for creating nationwide cellular compatibility

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SATURDAY, JANUARY 9, 1982

"All the News
That's Fit to Print"

The New York Times

LATE CITY EDITION

Weather: Windy and cold, chance of
bursts today; clear, cold tonight.
Temperature range: today 8-23; yes-
terday 22-31. Details are on page 22.

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25 CENTS

U.S. SETTLES PHONE SUIT, DROPS I.B.M. CASE; A.T.&T. TO SPLIT UP, TRANSFORMING INDUSTRY

NEW LAYOFFS PUSH U.S. JOBLESS RATE TO 8.9% FROM 8.4%

Impact in Heavy Industry Puts
Level for Adult Males at a
Post-World War II High

By SETH S. KING

Special to The New York Times

WASHINGTON, Jan. 8 — Layoffs of 460,000 workers in December pushed the nation's unemployment rate from 8.4 percent of the labor force to 8.9 percent, the second highest monthly level since the beginning of World War II. The number of unemployed Americans climbed to a nearly 9.5 million.

At the same time, the total number employed last month fell to 97,180,000, a decline of 840,000 from November, when the total fell 190,000 from the preceding month.

The Bureau of Labor Statistics reported today that the unemployment total, seasonally adjusted, was 9,462,000, an increase of half a percentage point above the November rate. The 8.9 percent rate for December was within a tenth of a percentage point of the postwar monthly high of 9 percent reached in May 1975 in the deepest recession of the postwar years.

Rate in Region Increased

The job market in New York and New Jersey showed some weakness last month, as the unemployment rate rose in both states. New York City's rate, which dropped sharply in November, moved upward again in December. [Page 13.]

U.S. Drops Rule On Tax Penalty For Racial Bias

By STUART TAYLOR Jr.

Special to The New York Times

WASHINGTON, Jan. 8 — The Reagan Administration, reversing an 11-year-old Federal policy, announced today that it would no longer deny tax-exempt status to private schools, colleges and certain other nonprofit institutions that practice racial discrimination.

The decision on the interpretation of the tax laws will apparently entitle more than 100 schools and other organizations whose tax exemptions were revoked in the last decade to receive favorable tax treatment as charitable organizations. It is also expected to open the door to tax exemptions for many other private segregated schools that have never had them.

Justice and Treasury Department officials said that the reason for the policy change was that policies against racial discrimination should be enforced by Congress, not the tax authorities.

Reversal Since September

Allowing tax exemptions to racially discriminatory institutions is the opposite of the legal position the Justice Department took in the Supreme Court last September in a case involving a university and a school that had been denied tax exemptions for racially discriminatory admissions policies.

The department argued then that the Federal tax laws required the Government to deny tax exemptions to racially discriminatory organizations.

Today the Justice Department notified the Supreme Court that the Treasury Department had moved to reinstate the tax-exempt status of one of the two institutions in the case, Bob Jones Uni-



William F. Baxter, Assistant Attorney General, above left, and Charles L. Brown, chairman of the American Telephone and Telegraph Company, at a Washington news conference on the settlement.

IBM

Thomas Barr, right, chief attorney for the International Business Machines Corporation, outside Federal court in New York after the Government dropped its antitrust suit.



COURT HEARING SET

\$80 Billion Divestiture Is
Required — Rises in
Local Rates Seen

By ERNEST HOLSENDOLOPH

Special to The New York Times

WASHINGTON, Jan. 8 — The American Telephone and Telegraph Company settled the Justice Department's antitrust lawsuit today by agreeing to give up the 22 Bell System companies that provide most of the nation's local telephone service.

On a landmark antitrust day, the Justice Department also dropped its marathon case against the International Business Machines Corporation, a suit

Excerpts from decree, page 36.

that had sought to break up the company that has dominated the computer industry. The Justice Department said the suit was "without merit and should be dismissed."

The A.T. & T. agreement, if finally approved by a Federal court, would be the largest and most significant antitrust settlement in decades. It is likely to be compared with the 1911 settlement that divided the Rockefeller family's Standard Oil Company into 33 subsidiaries, some of them huge oil companies in their own right.

Two-Thirds of Total Assets

The heart of the agreement requires A.T. & T. to give up all its wholly owned local telephone subsidiaries, which are worth \$80 billion, or two-thirds of the company's total assets. That would radically alter a company that has ac-

RISE IN LOCAL RATES
MAY COME RAPIDLY

End of Action on I.B.M. Follows
Erosion of Its Dominant Position

The New York Times / George Tuzson. United Press International

An unexpected end to the long battle

- ❑ The Bell System agrees to break its monopoly apart
 - 7 regional bell telephone “operating” companies (Baby Bells)
 - Cellular went to the Baby Bells (like Verizon)
 - AT&T got long distance+rental phones+Bell Labs+Western Electric
- ❑ The 7 RBOCs would soon buy each other until only Verizon and SBC were left.
 - Local service remained a “de facto” monopoly **(why? what ended that?)**
 - In 2005, SBC bought its old parent, the almost bankrupt AT&T, and adopted the historic AT&T name for the resulting company
- ❑ With some added spectrum sold at auction in 1994, the cellular business became 4 companies
 - The larger Verizon and AT&T and the smaller T-Mobile and Sprint
 - T-Mobile and Sprint have now merged **Why?**

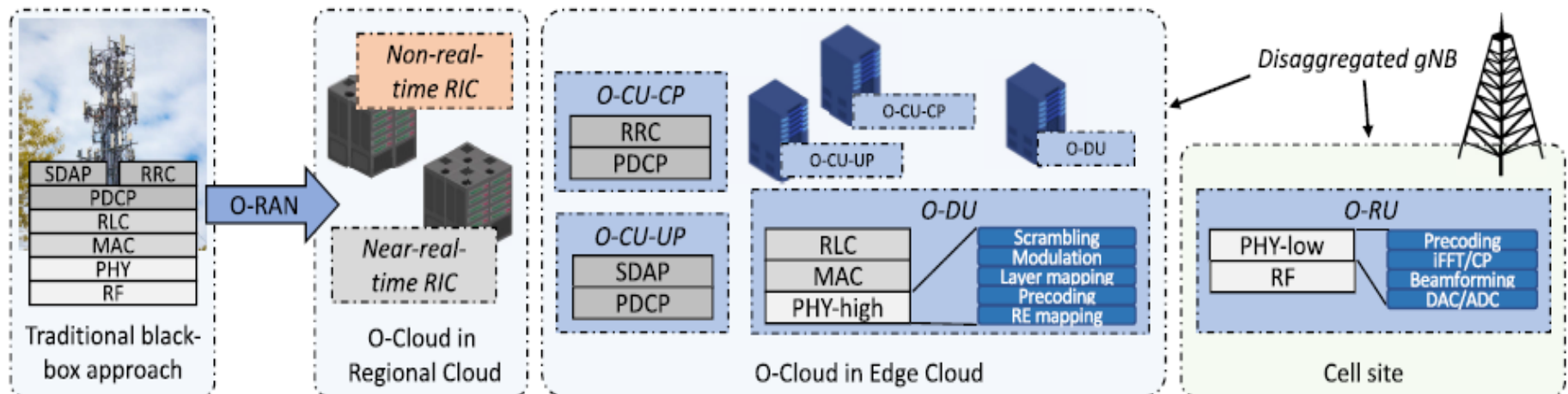
How the loss of Bell Labs affected AT&T (and Verizon)

- ❑ The Baby bells bought a lot of cellular equipment from Lucent (formed from a second split of AT&T in 1995) for the early systems, but gradually diversified (more like other service providers)
- ❑ Almost all the engineers in the old AT&T were in Bell Labs, including the systems engineers who best understood the system and its economics
 - That expertise was never replaced, which left the new AT&T (and Verizon) weaker strategically when it came to planning new technological opportunities like 2G, 3G, 4G, 5G and now 6G

Far from Monopoly: Next G- O-RAN

❑ O-RAN: Open Radio Access Networks

- From Traditional Base Station Architecture to Virtualized Cloud-based Architecture
- Virtualized RANs where disaggregated components are connected via open interfaces and optimized by intelligent controllers
- Multiple Vendors

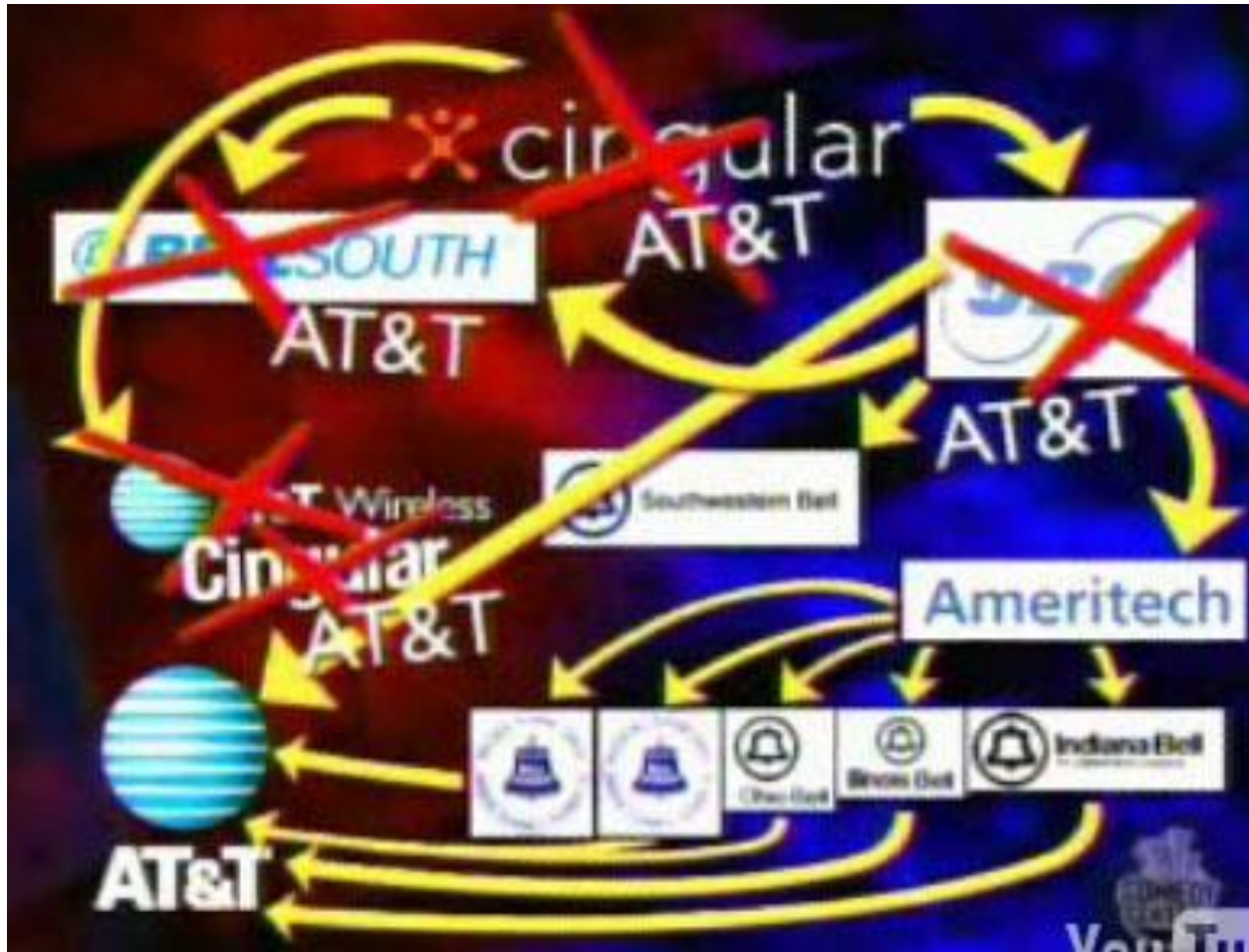


AT&T's long trip to nowhere

- ❑ **A combination of many businesses in 1980s**
 - Long distance, telecom equipment, chips
- ❑ **Addition of more businesses in 1990s**
 - Cellular (McCaw); NCR; Universal Card; TCI Cable
 - Dissolution begins in late 1990s
 - Spins off “product” businesses (Lucent and NCR) to focus on “convergence” (Lucent then spins off consumer products; chips; PBXs to focus on cellular, switching and fiber– loses 99% of value in dot-com bust)
 - AT&T spins off cellular and cable, giving up on “convergence”
 - AT&T abandons residential long distance to focus on VOIP
- ❑ **Tiny remaining AT&T acquired by SBC (one of the three remaining RBOCs) for its network and VOIP capability (and its name)**
 - SBC also buys Cingular wireless, which had bought the wireless business that AT&T spun off
 - The AT&T name lives on
 - You can't tell the players without a program

The journey from AT&T to AT&T

As summarized by Stephen Colbert



Q4

Q5

Strategic lessons

- ❑ Regulation causes delay
 - When anyone wants it to
 - Delay hurts the economy
 - ❑ Billions lost
 - Embarrassment over other countries being “first” finally forced FCC action (President Reagan was upset)
- ❑ AT&T also contributed to the delays
 - Arguments about standards
 - Insistence on a monopoly with all the channels for many years

Upcoming lectures

- ❑ Lectures 8 and 9 will introduce the 35 years of cellular service, when competition replaced politics as a dominant force
 - Lecture 8 will focus on spectrum and how methods for providing it changed over the years. In particular, the selling of spectrum by auction had important effects on competition and profits.
 - Lecture 9 will focus on the evolution of cellular service from “analog” voice service for automobiles to pocket phones, digital voice, and smart phones with access to the internet
- ❑ Lecture 10 will be a movie 😊 and discussion
- ❑ Lecture 11 will be Midterm 1