

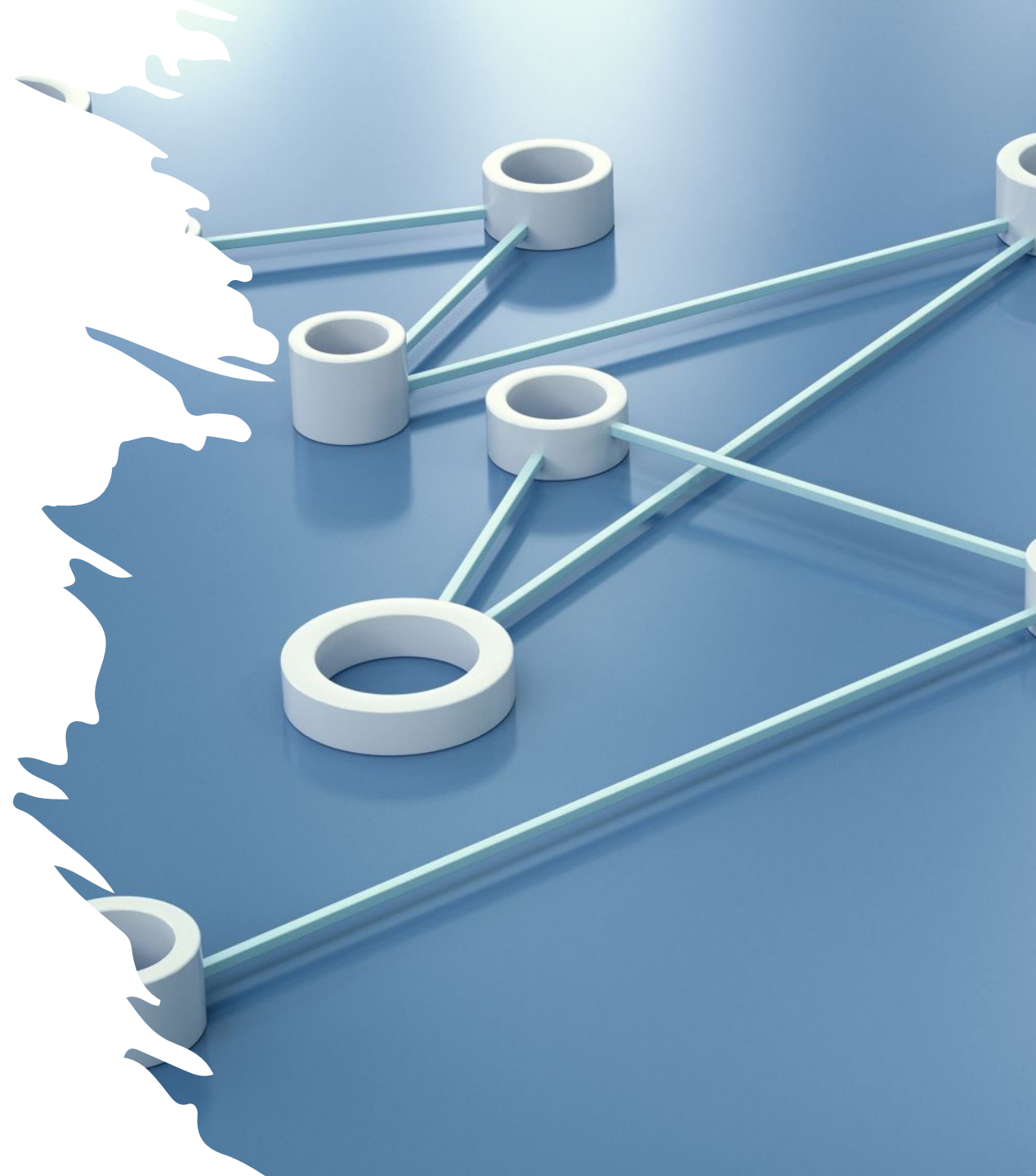
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# Practical Network Applications

The background of the slide features a complex network diagram. It consists of numerous small, glowing blue nodes connected by thin, light blue lines, creating a dense web of connections. The nodes are distributed across the frame, with some appearing more prominent than others. The overall aesthetic is futuristic and technical, typical of network-related presentations.

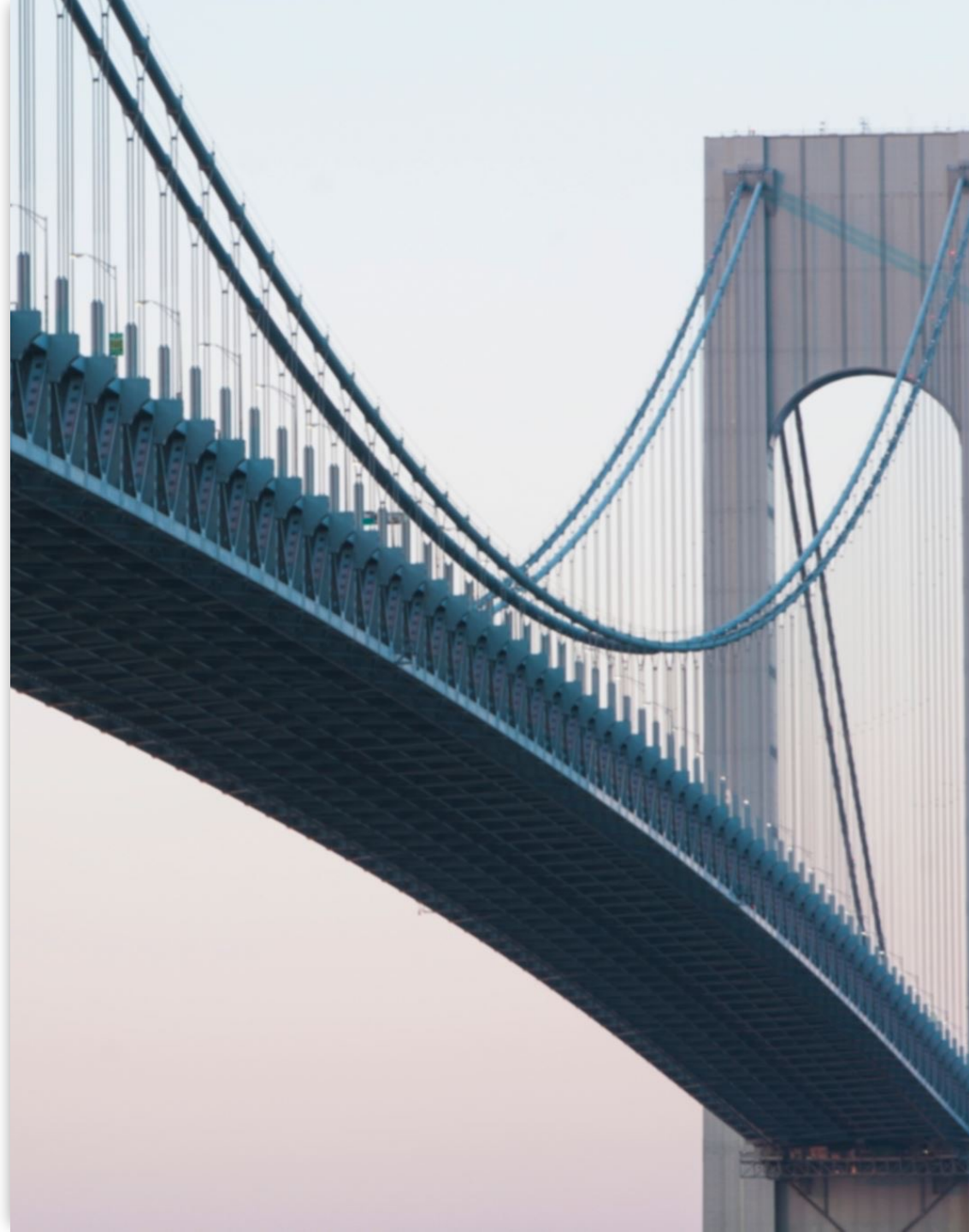
# Practical network applications

- Some history
- Background
- What happened?
- Lessons
- Summary



# Some history

- People have been moving from place to place as long as there have been people
- Regardless of why they move, they always want to maintain a connection to other people in different places
- This connection involves moving two types of things back and forth
  - Physical objects
  - Information
- An important part of technological change has been improvements in these connections





# Some history

- Improvements in moving physical things included carts, boats, trains, and planes
- For information: speech, writing, encoding, semaphores, telegraph, and telephone
- The goal of each technology was the same – more, faster
- It is never enough
  - People always want more even faster
- The latest advance in moving information is the computer network
- An overview of the nuts and bolts was just provided
- In this lecture we will take a brief look at how the business ends works
  - As it looks from a technical perspective

# Background

- My professional career started at a place called CompuServe in the late 90s
- CompuServe started as an online time-sharing service in 1969
- It was a subsidiary of Golden United Life Insurance (GULI)
- At the time computers were very expensive, and, although GULI needed one, it did not need it all the time
  - It primarily calculated actuarial tables and the like
- This mean that an expensive piece of equipment was sitting around idle
- The solution was to allow other companies, ones that could not afford their own computer, to rent time on the GULI computer

# Background

- Eventually (1975), CompuServe was spun off from GULI and did two things
  - Supplied compute power to GULI
  - Rented compute power to other businesses
- In general, businesses did two things on CompuServe
  - Ran their own software on CompuServe's hardware
  - Ran software they rented through CompuServe on CompuServe's hardware
- In 1979 CompuServe partnered with Radio Shack (an electronics store) to offer people access to CompuServe's computers during non-business hours
- At this point the number of users grew to the point that CompuServe needed to build and run its own network to keep up

# Background

- About this time H&R Block (Block), a tax preparation service, had a problem
- Block wanted to use computers to fill out tax returns
- It had over 8,600 offices across the United States and they needed to be linked together so they could share software, processing power and data
  - Also, like GULI, there were long periods of time when Block did not need the compute power or the network
- So Block bought CompuServe
- Within 2 years, the network side became big enough that it was spun off into its own business
  - Still wholly owned and operated by Block

# Background

- The seasonal nature of tax preparation meant CompuServe had an increased need to find some way to sell time on their service and network
- This led to a growth in four years (1984) from 1,000 to 110,000 users
- CompuServe also found that people wanted to use the service differently than businesses
- Businesses wanted to rent software and compute time to do business stuff
- People wanted to use software and the network to make their lives better
  - Communicate with other people
  - Buy things
  - Gather information
  - Play games



# Background

- As a result, CompuServe either originated or popularized software that did many things
- Email
  - At first CompuServe only, then to the internet
- Chat
  - Known at the time as CB (from the trucker radio send-receive unit)
- Online forums
  - Both special-interest and tech support for companies to interact with customers
- News
  - Stock prices, online access to newspapers, weather reports
- Business to consumer (B2C) electronic commerce
  - Amazon-style goods, airplane tickets, the shopping cart, and more
  - Online payment

# Background

- Business to business (B2B) electronic commerce
  - The Visa payment system ran on CompuServe's network
- Online games
  - Real-time, turn-based, and play-by-email
- Maps and travel directions
  - Early versions of on-demand location services
- File sharing
  - For software updates and electronic purchases
  - Including inventing the GIF file format for images
- There is a category on Wikipedia just for CompuServe

# Background

- Technological innovation was not enough to save CompuServe
- In the end, CompuServe was bought by America Online (AOL), a different online service provider, and more or less went out of business
  - The network part was bought by Verizon, which later sold it
- AOL was eventually bought by Yahoo!, and more or less went out of business
- It is not looking great for Yahoo!

# What happened?

- It is a long and interesting story
- In the end there were three major factors for the end of CompuServe
- First, AOL and CompuServe had different ideas of what users they wanted
  - CompuServe was good with fewer, better users
  - AOL wanted as many users as they could get
- Second, CompuServe tried to do everything itself
  - CompuServe saw the software it provided as part of its value proposition
  - When competitors offered new capabilities CompuServe simply could not keep up
  - For example, when better map apps came into being, rather than supporting them, CompuServe tried to write its own
  - In the end, it could not keep up with the rate of new apps being introduced



# What happened?

- Third, CompuServe did not/could not adapt to new technologies
  - Many important capabilities were pioneered by CompuServe
  - When new, better versions of those capabilities were invented, CompuServe was unable/unwilling to adapt its systems to use them
  - For example, CompuServe had a file transfer protocol called B+
  - When FTP came into wide use CompuServe's system were too dependent on B+ to change over, even though FTP was better

# Lessons

- What lessons can we take away from this?
  - How can we use this to look at current events?
- A networking business needs to grapple with the following issues well to succeed
  1. The network that carries the data and the services being provided are distinct
    - A company needs to know which one it is – do they provide a network, or online services
    - And if both, they need to separate these units
  2. Businesses and people want different things from a network
    - A business wants to move data and access resources
    - People want to communicate with each other, buy things, and access services

# Lessons

3. The more people are on a network, the more value users derive from that network
  - How useful would email be if only one person had an account?
  - This is known as the *network effect*
4. If people are not happy with your service they can leave quickly
  - There is a constant tension between this and the network effect
5. There is a lot of money to be made
  - But it can be hard to figure out how to make it
6. Your service needs to be flexible and open to innovation
  - Otherwise a competitor can seize an advantage from providing a better service based on new tech
  - You need to be open to change from both the inside of the organization and the outside
  - You can be smarter than a lot of people, but you are not smarter than everybody

# Lessons

- Consider Amazon, which is doing pretty well
  1. It is a service, not a network provider
  2. Amazon.com is for people, Amazon Web Services is for businesses
  3. It has a lot of users because there are a lot of vendors, and a lot of vendors because there are a lot of users
  4. Using amazon.com is not awful, so people stay
    - For example, the returns policy is good
    - People trust Amazon with their credit cards and money
  5. Amazon takes a cut out of purchases, rather than charging you for visiting
  6. Amazon spends a lot of money looking at/inventing new technology to keep potential competitors out
    - And adopts good ideas (like AWS) from others when it sees them



# Lessons

- Consider Twitter/X, which is having issues
  1. It is a service, not a network provider
  2. It is solely for people (which is fine)
  3. It has a lot of users because it has a lot of users
    - Pure network effect, choking off competitors like Truth Social and Mastodon
  4. Many people are finding it increasingly unpleasant to use
    - They would leave if they had somewhere to go, but the network effect is hindering this
  5. How does Twitter make money again?
    - Advertisers, who are leaving

# Lessons

6. Most changes to Twitter are to policy (or branding), not technology
  - Look at the way they killed off third-party apps (Reddit is in the same boat)
  - The next big advance in texting will not come from Twitter, and will probably end the company
  - Unless Musk has a secret plan
- Really, the only thing Twitter sells is the fact that everyone uses it
- Should this change they have (at present) no fallback business model

# Summary

- Businesses like networking because it allows them to access services that they do not want to run themselves
  - Cloud compute and storage, in particular
  - It can be a way to outsource IT
- People like networking for two reasons
- First, people like communicating with other people
  - Think texting/phones
- Second, people want access to things that are not nearby
  - Think TVs or ATM cards

# Summary

- If you want to start a networking business...
- The hardware end of things is pretty much settled
  - Big telecommunications companies run wires
  - Musk and Starlink run satellites
- There is a lot of room for new ideas on the services side