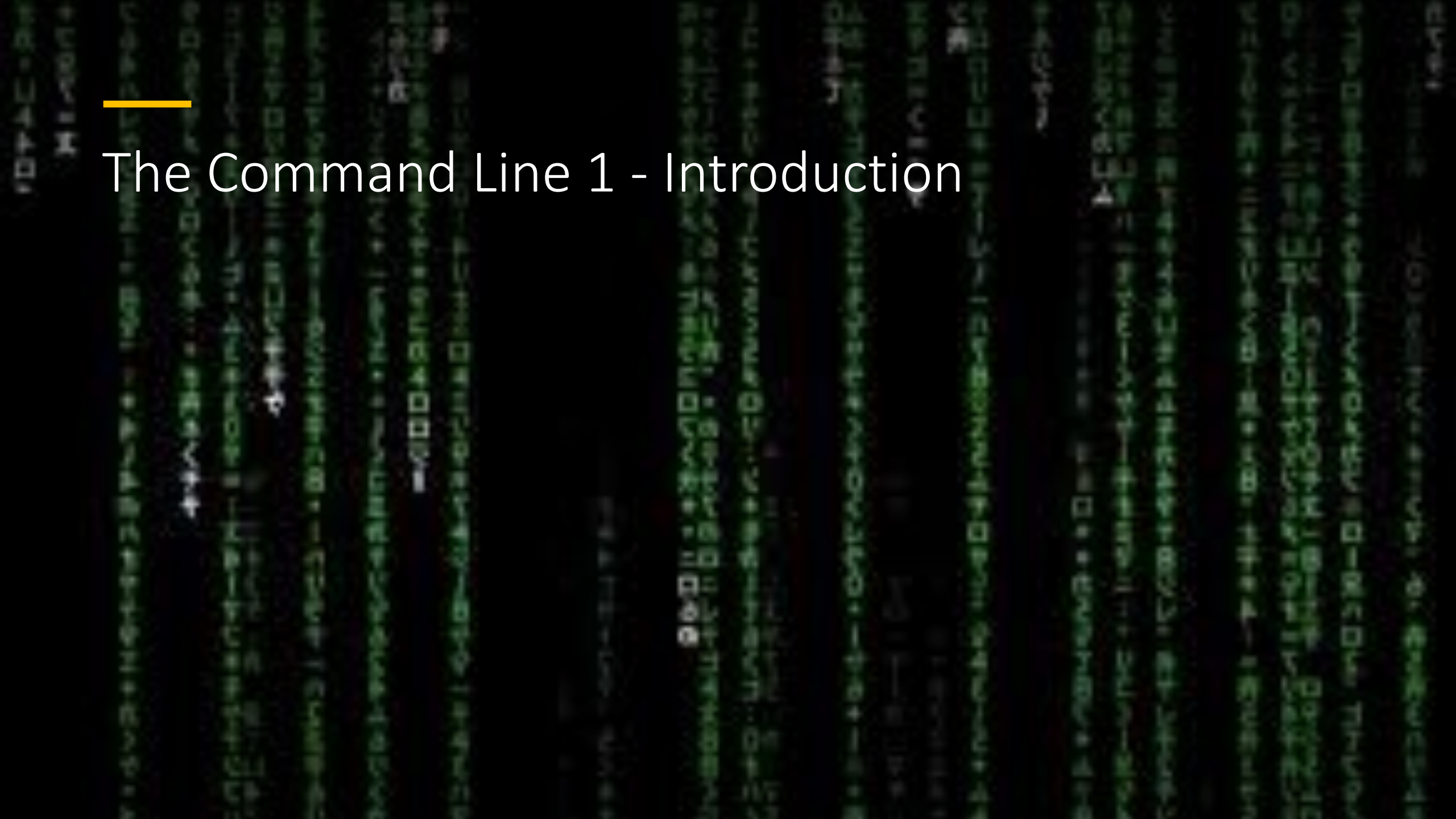
The Command Line 1 - Introduction



The command line 1

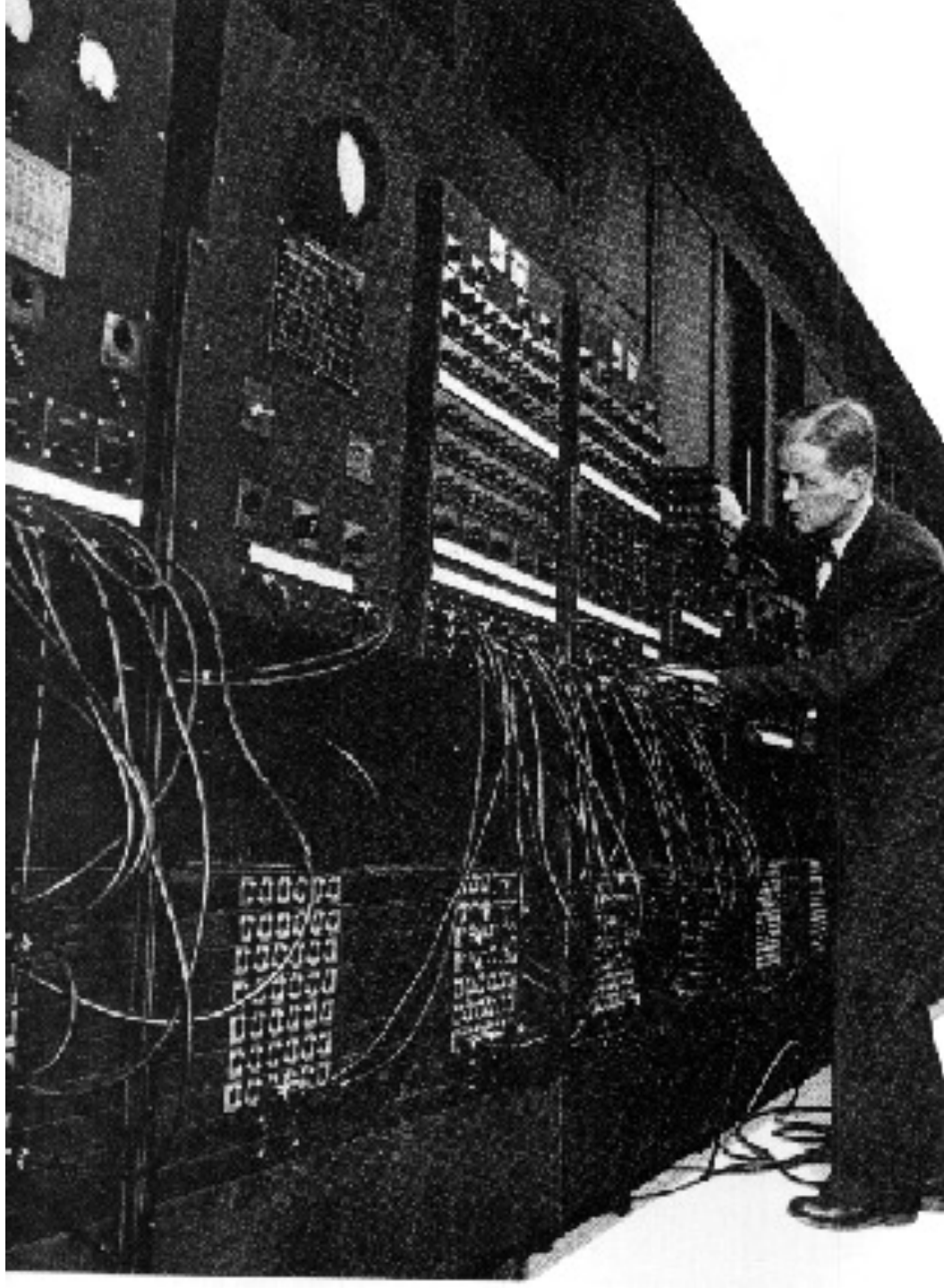
- The problem
- The teletype machine
- The cathode ray tube
- Graphical user interfaces

The problem

- When computers were first invented the only way to change what they did was to physically change the computer
- This was done by plugging and unplugging wires, turning knobs and flipping switches

The problem

- Here is someone working on an early computer
- Note all the wires

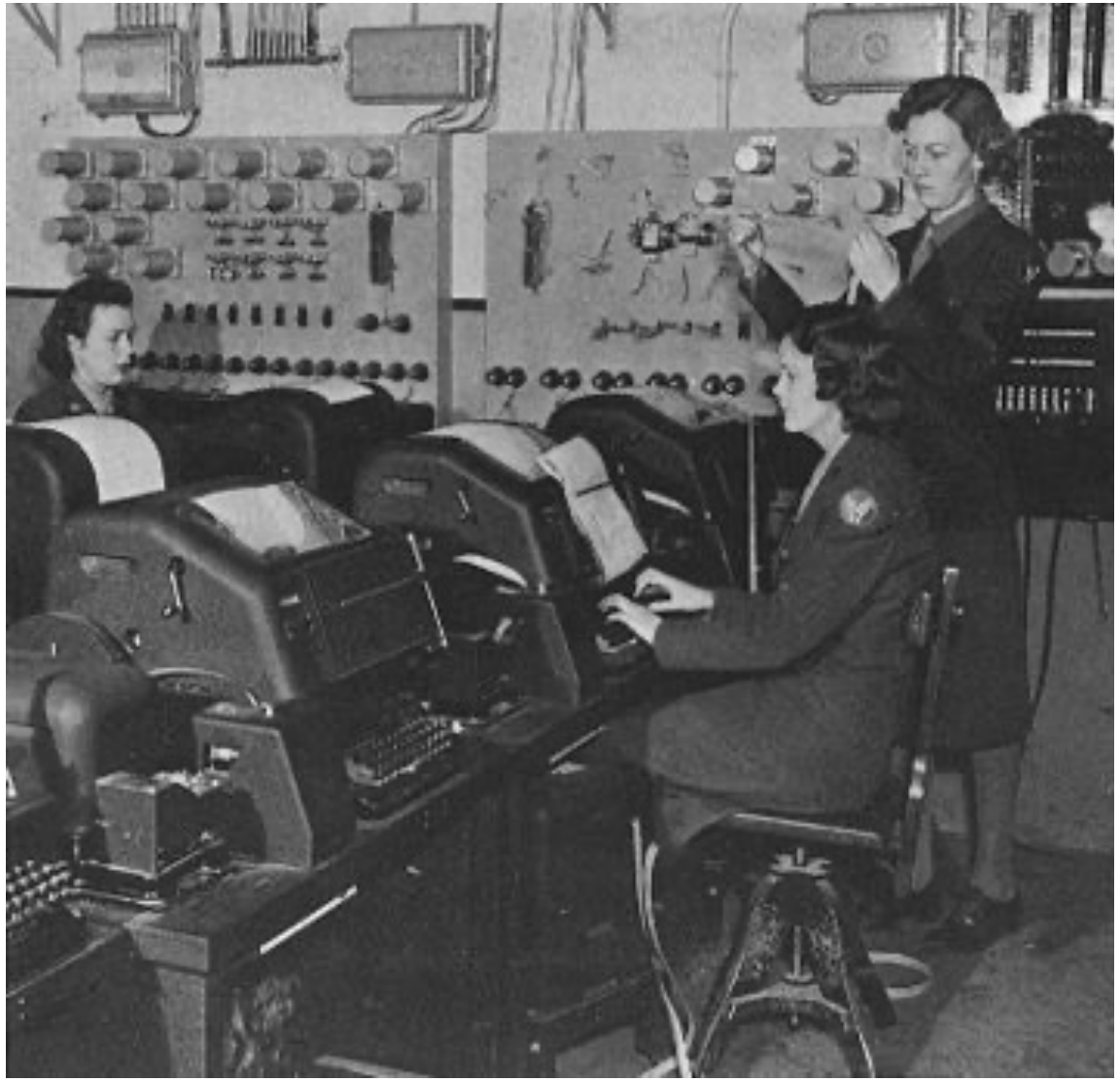


The teletype machine

- This got old pretty quick
  - It was slow and hard to do
- The initial solution was to borrow an idea from the telegraph: the teletype machine
- The telegraph operators had a problem
- Pressing the lever that sent the dots and dashes was tedious and slow
- It would be nice if there were a machine where you could press a button with the letter you wanted to send, and the machine would send the right dots and dashes over the wire
- On the receiving end another machine would receive the dots and dashes, figure out which letter they corresponded to, and print out the letter

The teletype machine

- Here are a few teletype machines in use in Britain during World War 2
- Thanks, Wikipedia



The teletype machine

- The teletype machine was a kind of cross between a typewriter and a printer
- Everything the operator typed would be printed out on the big roll of paper
- And everything the machine received would also be printed out
- One can imagine using it to chat with someone else far away
  - When you typed something it would be printed out on your printer, then sent to your friend where their printer would print it out
  - The same thing would happen in reverse when they wanted to talk
- The idea was adapted to computers
  - When you typed something it would be printed out on your printer, then sent to the computer
  - When the computer had output it would be sent to your teletype machine and printed out

The teletype machine

- The hardware changes required for the computer to work with the teletype machine instead of switches and wires were non-trivial
  - But outside of the scope of this class
- Interacting with the computer then followed a set of steps

1. Decide what you wanted the computer to do
2. Type the command that made the computer do that into the teletype machine and hit Enter
3. See the command show up on the teletype machine
4. Wait for the computer to do it
5. See the computer's response print out on the teletype machine

The teletype machine

- For example, if you wanted the computer to check its hard drive for faults, you could type in `chkdsk` and hit Enter
- The computer would then run some diagnostics on its hard drive to look for problems
- When it was done you would get a message back letting you know how it went
  - The message, of course, was printed out on the teletype
- If one wanted to run a program one had to type it all in, line by line
  - At the end one would type the command RUN, and the program would run
- This was somewhat inconvenient if you wanted to run the same program multiple times on different days
  - The entire program would have to be typed in again every time it needed to be run

The teletype machine

- As people gained experience with computers they noticed that they tended to do two different types of things with them

1. Run programs
   - Usually many lines of code, take a while to run, concerned with a problem to be solved
2. Make the computer itself do something
   - Usually a one line command which finished quickly, concerned with an issue about the computer itself

- As computers and their users became more sophisticated, the programs they wanted to run and the things they wanted the computer to do became more complex
- This lead to the creation of two types of languages

The teletype machine

- Programs were written in programming languages
  - FORTRAN, COBOL, Java, Python, etc.
  - A compiler or interpreter would handle this
- Commands to the machine were written in a language the machine understood
  - Bash, tcsh, etc.
  - The operating system would handle this
- At this point the job of dealing with the computer split into two:
  - Programmers
  - System administrators
- What they did and how they did it were different

The teletype machine

- Programmers
  - Wrote programs – big text files that would be run infrequently
  - Would often have to wait hours or days for any output
- System administrators
  - Took care of the system, mostly by issuing commands to the system itself (rather than writing a program)
  - Expected the commands to produce output in short order
- These are not mutually exclusive
  - Most system administrators can program, most programmers can deal with the system
  - It is more a matter of emphasis

The teletype machine

- As the complexity of programs and system commands grew, teletypes showed their limitations
  - They were slow and noisy
  - They used a lot of paper
  - Really a lot, like whole forests
- There were some workarounds
  - One could type a program in and save it on magnetic tape so it would not have to be typed in again
  - This worked for better for programmers than system administrators
- But something had to be done
- Before we leave this section, note: to tell the computer what to do, one typed in a command made up of characters on a single line

The cathode ray tube

- The cathode ray tube (CRT) came along in the 1950s to solve some of the problems
- In particular, you could type into one and not have what you typed printed out
  - In the same way, data you received was not printed out
- All the output that would have been printed out was instead displayed on the CRT's screen
  - This saved so much paper
  - And was much quiter
  - And they were cheap enough to have more than a few lying around
- Things were not perfect
  - They were small and heavy
  - And dangerous – they could electrocute you or send shrapnel all over if compromised

The cathode ray tube

- Other than that, using a CRT was a lot like using a teletype
- Most importantly, CRTs were still something you typed lines of text into, and which displayed lines of text as output
  - Early CRTs were not capable of displaying images

Graphical user interfaces

- The CRT had one hidden advantage: it could display images, with the right hardware
  - A graphics card
- Long story short, Apple introduced the first personal computer with a graphical user interface
- It had
  - Windows
  - Icons
  - A Mouse
  - A Pointer

Graphical user interfaces

- Here is the Apple Lisa
- It never really took off
  - Too expensive (about $10,000 in 1983)

Graphical user interfaces

- But the Apple Macintosh was a big hit
  - At only $2,500 in 1984)

Graphical user interfaces

- The introduction of the Macintosh started the graphical user interface vs command line interface wars
  - GUI vs CLUI (or CLI)