Rules

Written final examination (graded)

Admission requirement for participation in the final examination is the successful completion of at least one worksheet each from:

- "Theory" (devise method/algorithm)
- "Implementation" (programming method)
- "Application" (applying the algorithm)

A total of at least 3 worksheets must be successfully completed and presented.

Questions

- **https://moodle.thi.de**
- **Office hours:**

  Time: by arrangement (Munir.Georges@THI.de)

  Location: A130

Please observe the copyright!

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They are intended exclusively for your personal use in the context of this lecture.

In particular, the materials may not be redistributed.

Own video or audio recordings of the lecture are unfortunately not permitted.

Practical course

- Moodle course page: **Practical Course: Spoken and Natural Language Understanding**
- 3 Assignments each 100 points
- Need to score minimum 260 points to eligible for exam
- Two groups:
  - **Monday:** 16:35 – 18:05 (G111)
  - **Wednesday:** 08:15 – 09:45 (G308)

Our learning objectives

- History of the Command Line - Chronological and Content Classification of the invention
- Command line and Linux - content classification and example of a command
- Outlook: From text to image - content classification

Agenda:

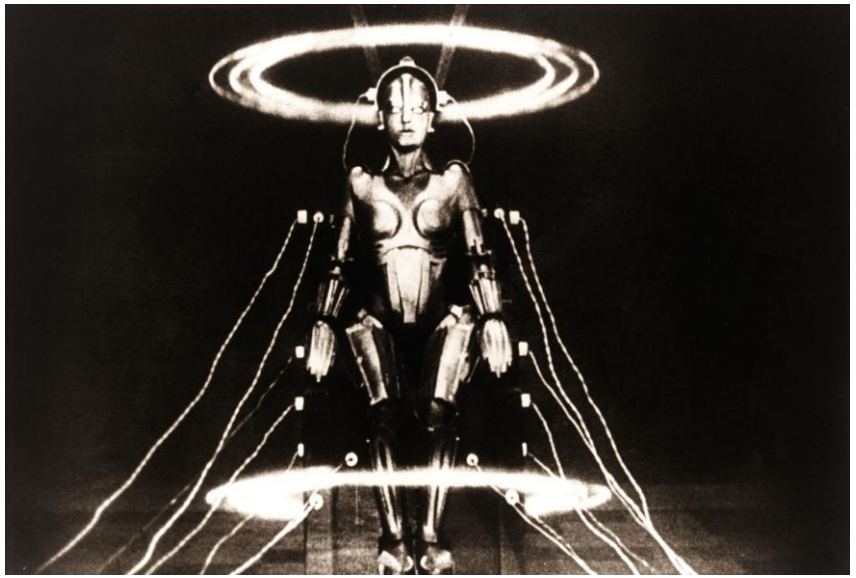
- **History of the command line**
- **Command line and Linux**
- **Outlook: From text to image**

History of the command line: When was the first programmable computer built?

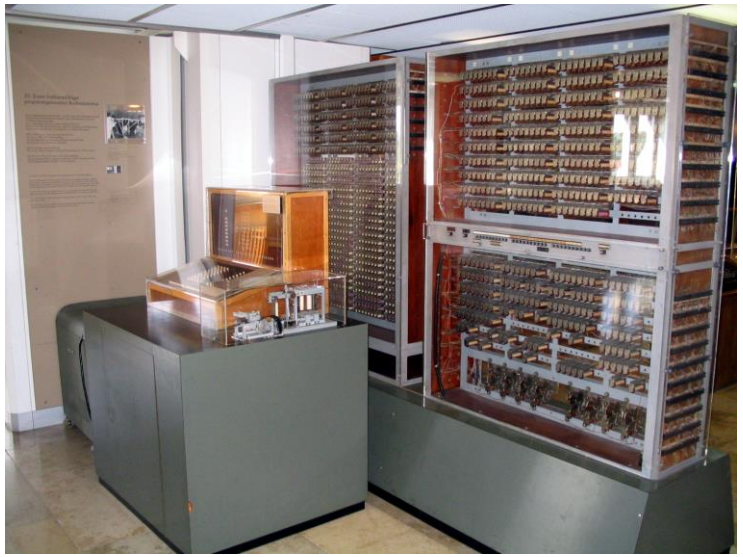
„Metropolis“
1927

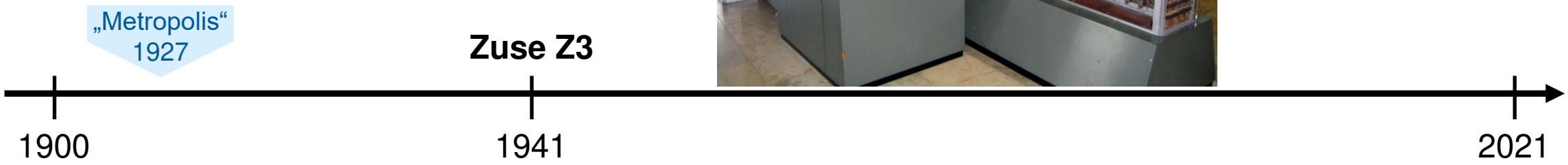
1900

2021



History of the command line: The Z1 (mechanical), Z2 (relay) and Z3 (programmable) were built by Konrad Zuse.



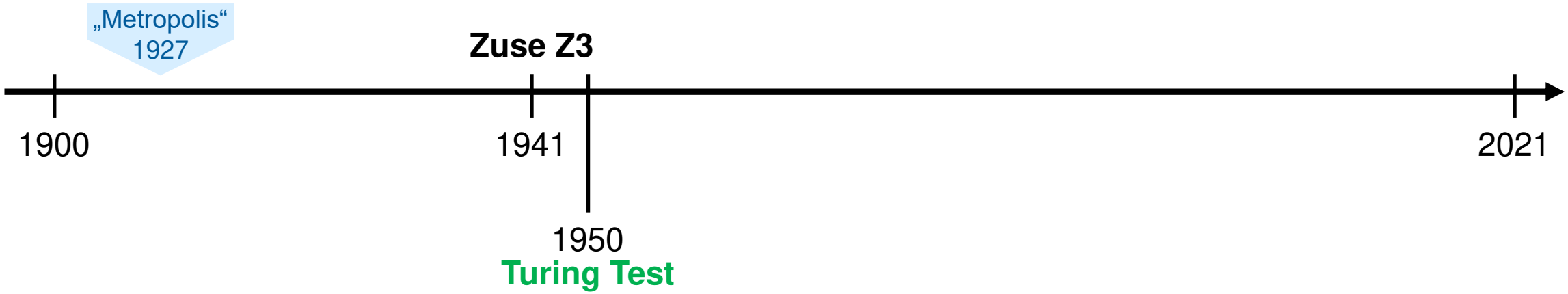


General information:
https://www.vdi-nachrichten.com/technik/technikgeschichte/12-mai-1941-als-konrad-zuse-mit-der-z3-den-computer-erfand/

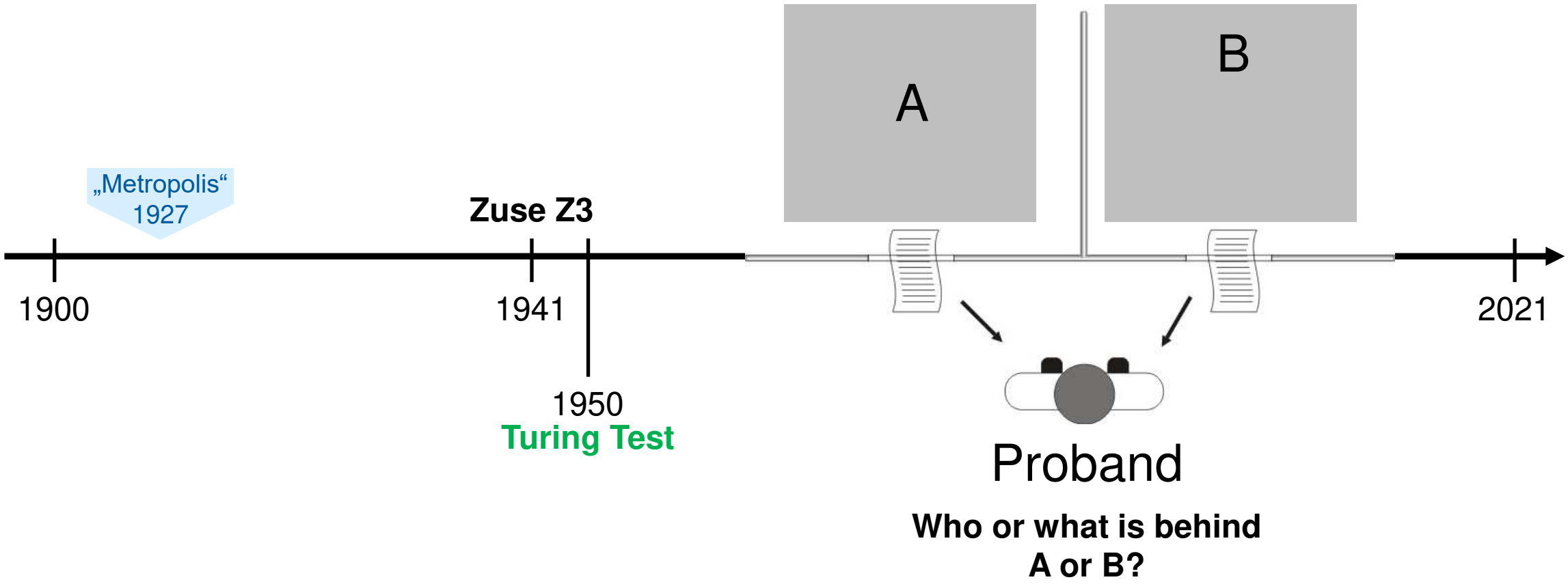
Technical description:
http://page.mi.fu-berlin.de/rojas/1996/Konrad_Zuses_Legacy.pdf

Modern User Interfaces – Linux Command Line

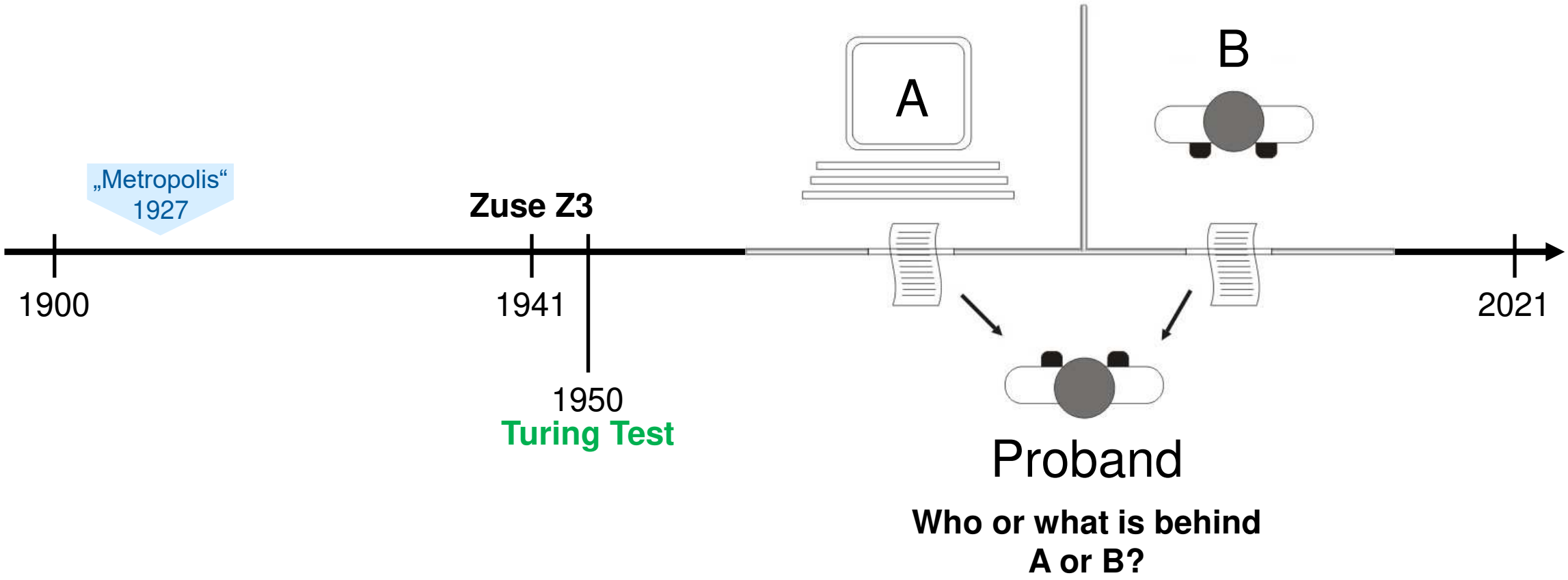
The history of the command line: The fascination of being able to talk to computers. What is the Turing Test?



The history of the command line: The fascination of being able to talk to computers. The Turing Test: A or B?

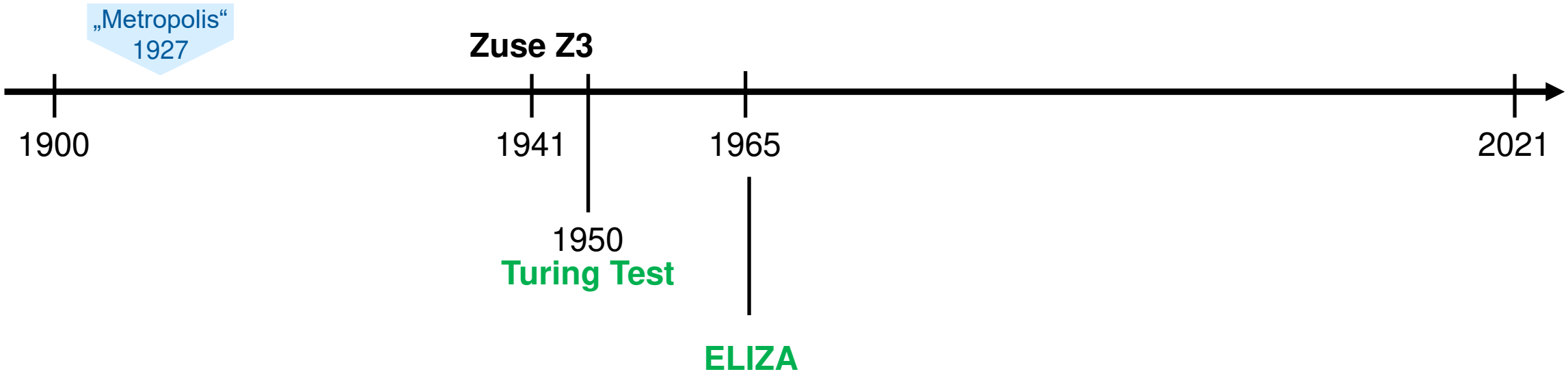


The history of the command line: The fascination of being able to talk to computers. The Turing Test: Human or Computer?



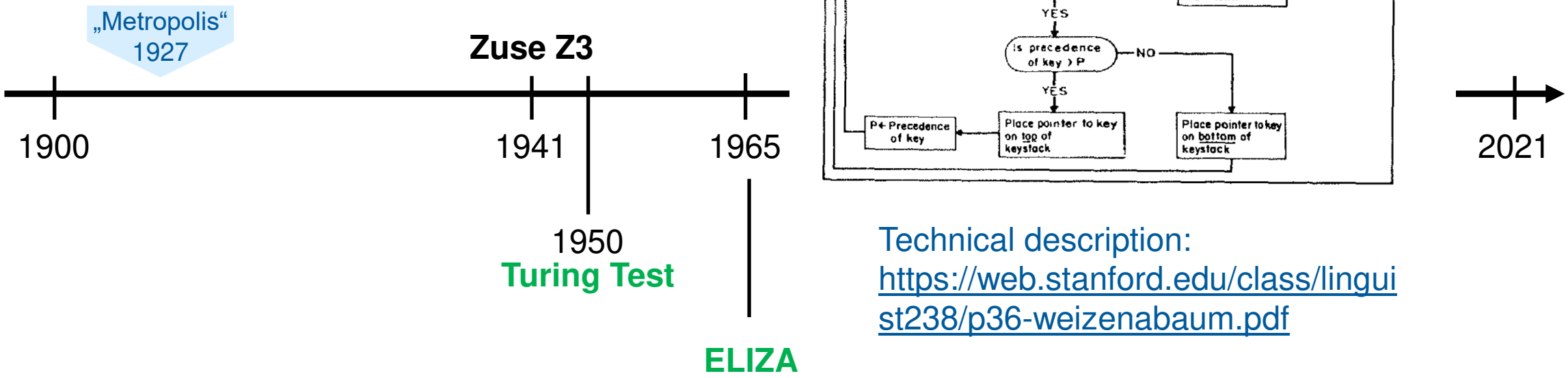
https://en.wikipedia.org/wiki/Turing_test

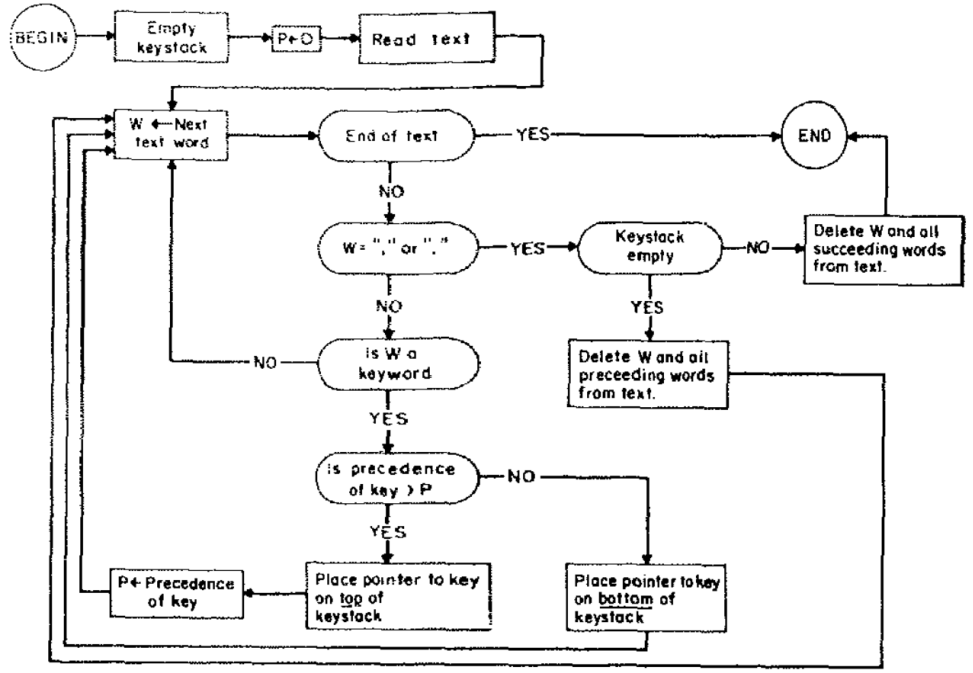
History of the command line: Applications for "Talking Computers



To play:
http://psych.fullerton.edu/mbirnbaum/psych101/eliza.htm

The history of the command line: How did the "talking computer" work? - A rule-based system.





Technical description:
https://web.stanford.edu/class/linguist238/p36-weizenabaum.pdf

To play:
http://psych.fullerton.edu/mbirnbaum/psych101/eliza.htm

Modern User Interfaces – Linux Command Line

History of the command line: The foundation for the modern computer was laid at the same time.

„Metropolis“
1927

„Star Trek“
1966

Multics

Zuse Z3

1900

1941

1950
Turing Test

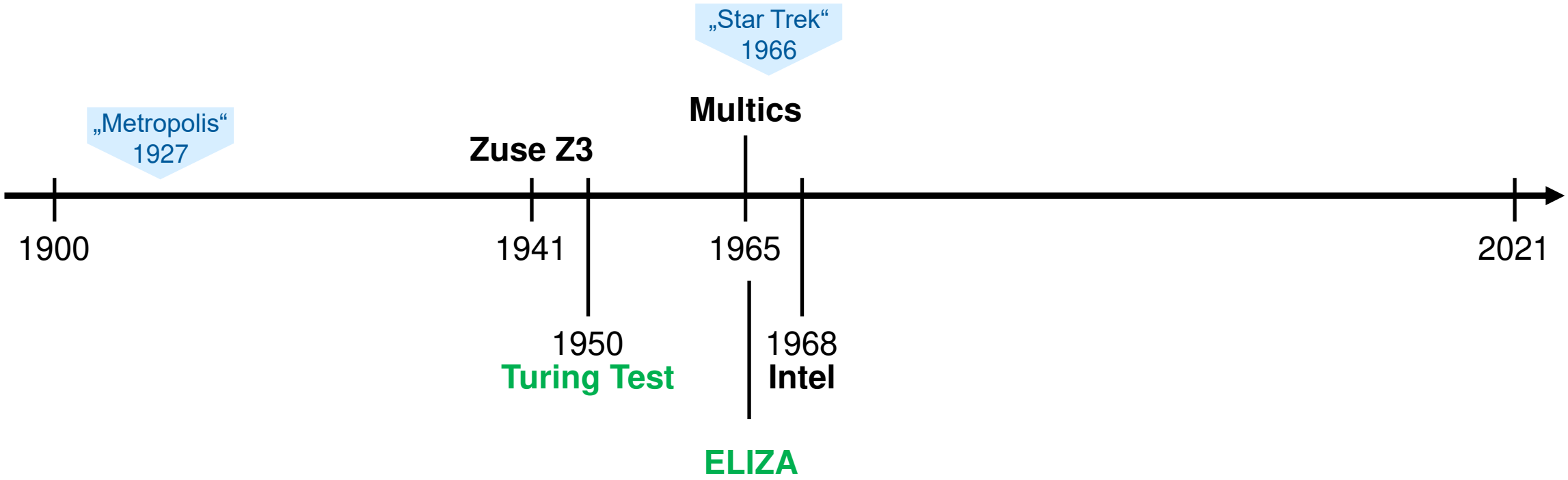
1965

ELIZA

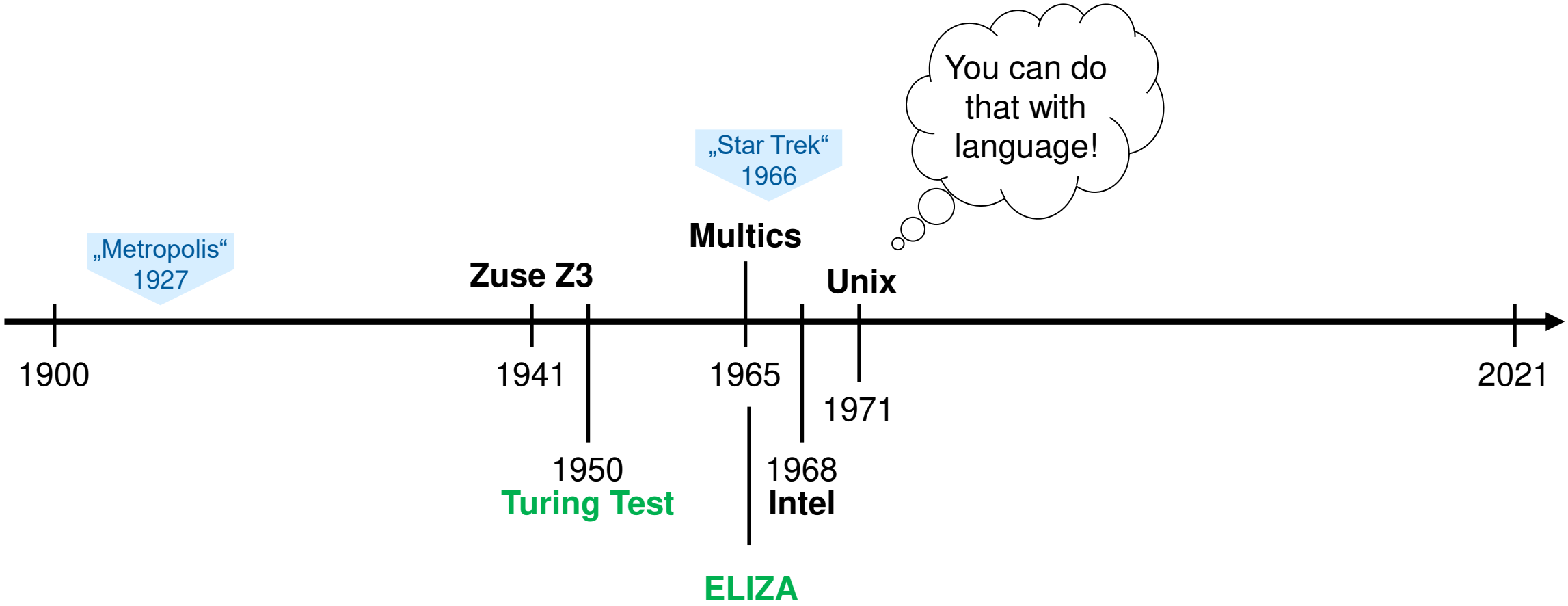
1968
Intel

2021

History of the command line: But how do you control a computer?

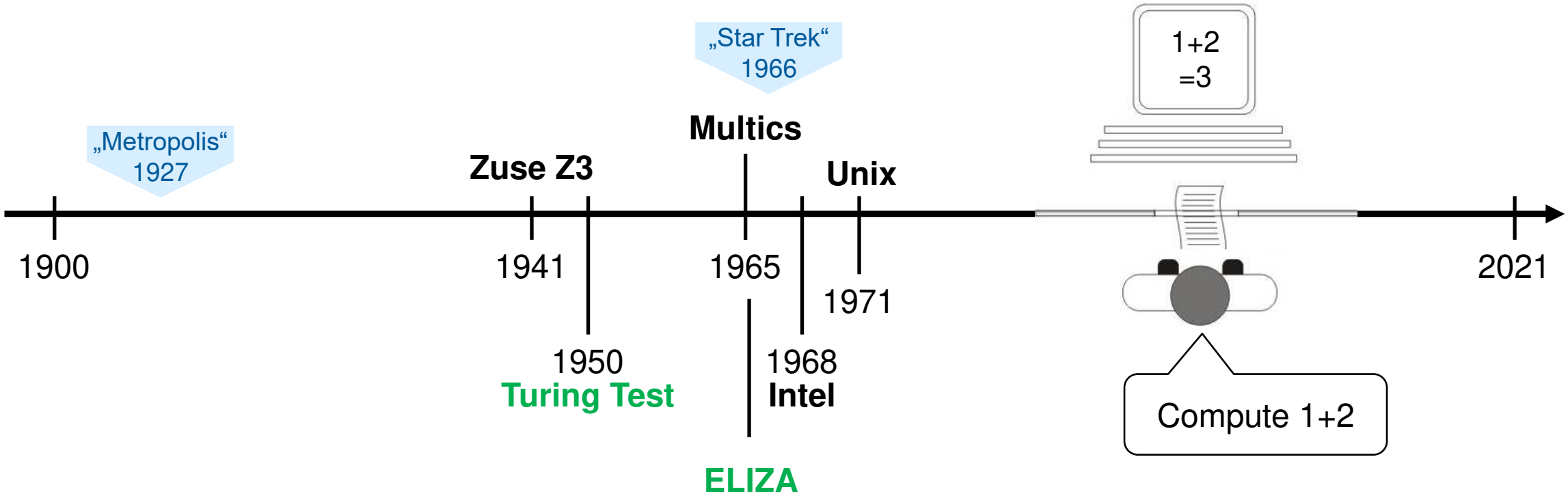


History of the command line: But how do you control a computer? - Command & Execution.

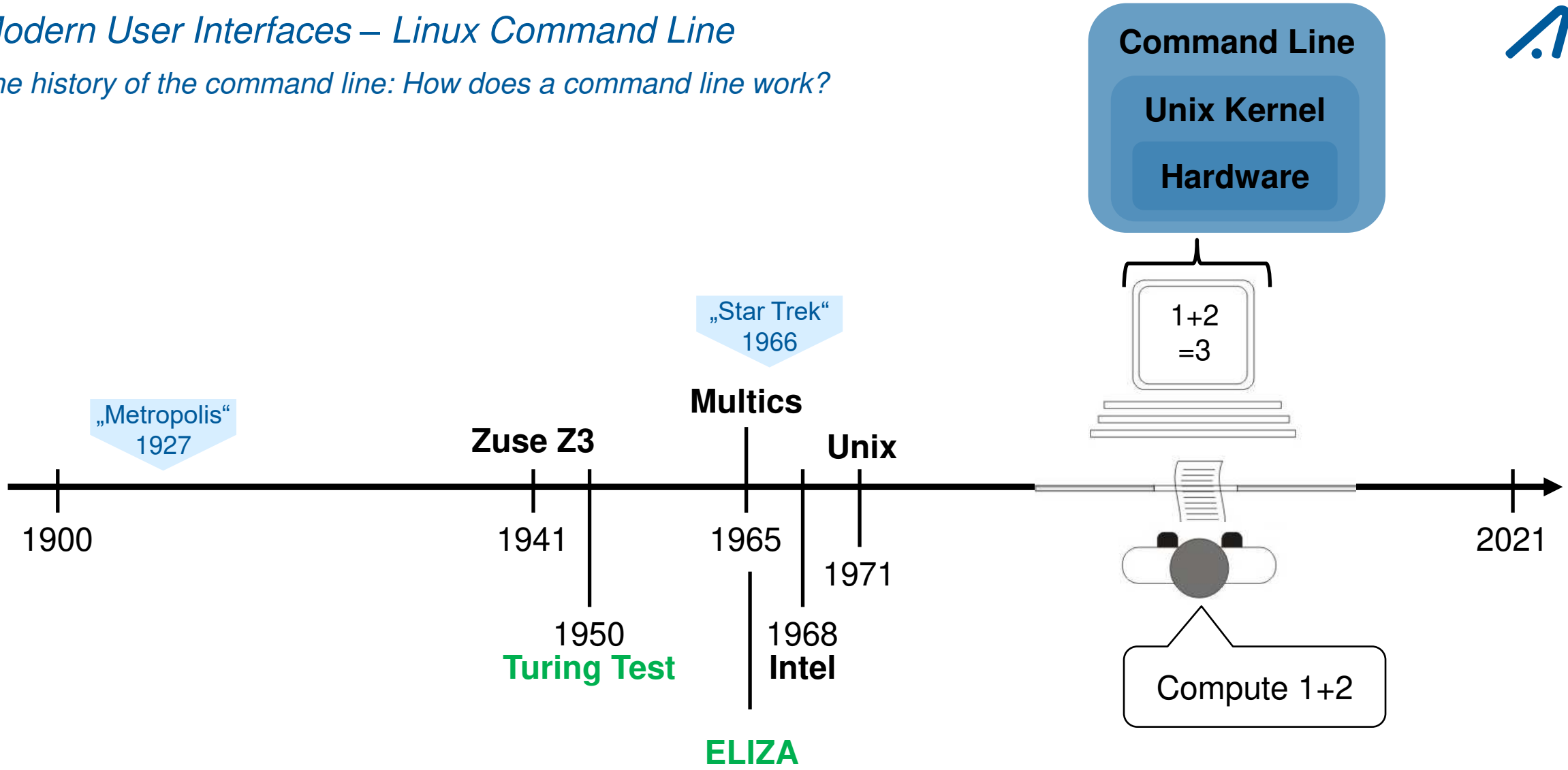


Modern User Interfaces – Linux Command Line

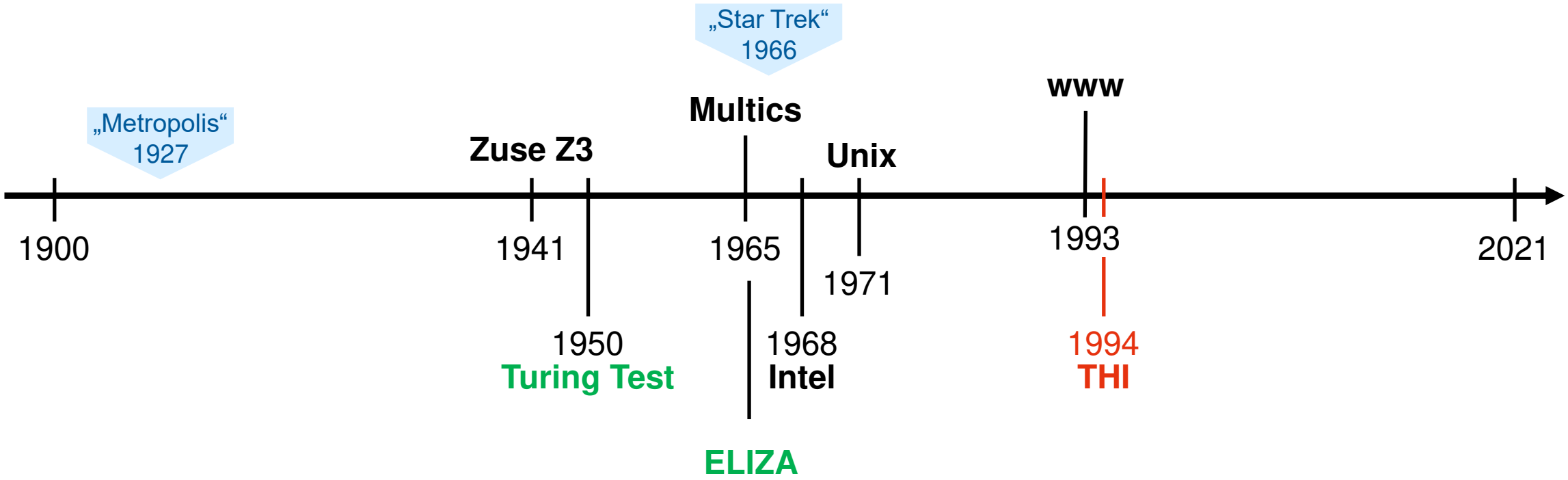
The history of the command line: But how do you control a computer? - The idea: the command line.



The history of the command line: How does a command line work?

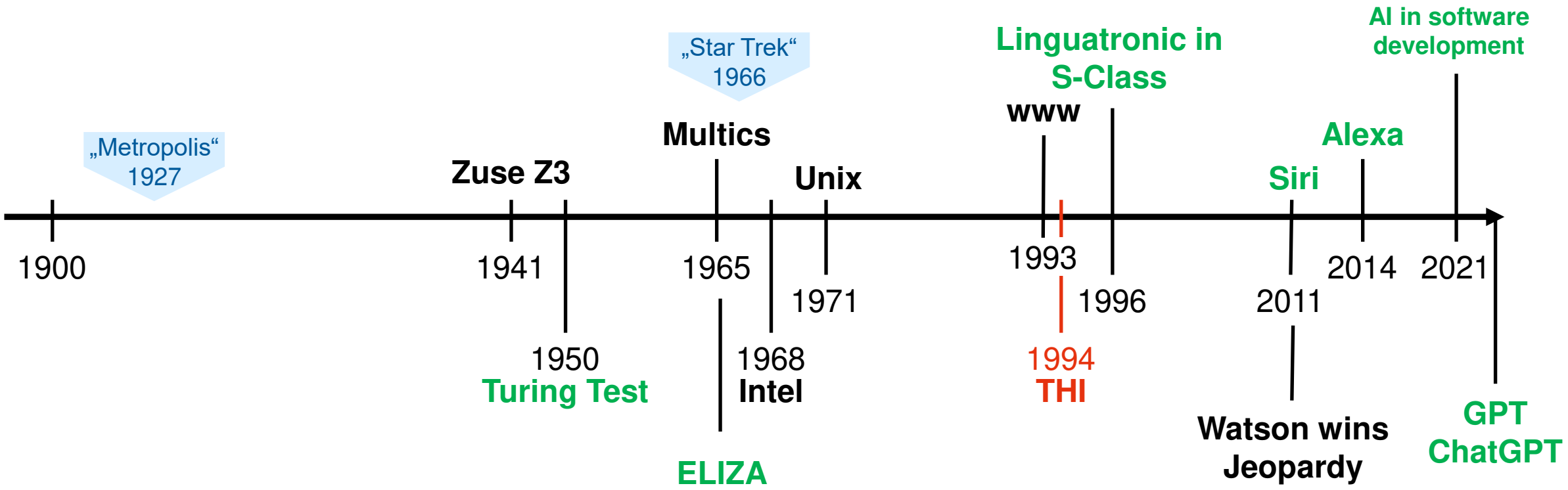


History of the command line: What happened next with talking computers?



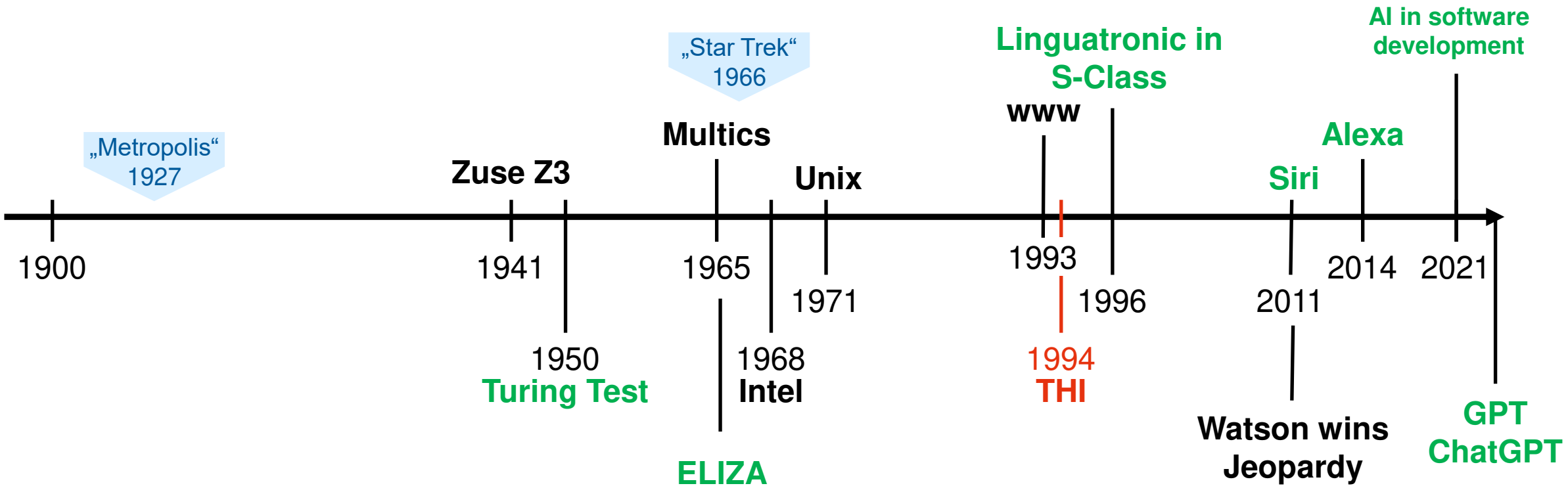
Modern User Interfaces – Linux Command Line

Geschichte der Kommandozeile: Textverstehen => Internet, Sprachverstehen => Auto, Business, Consumer



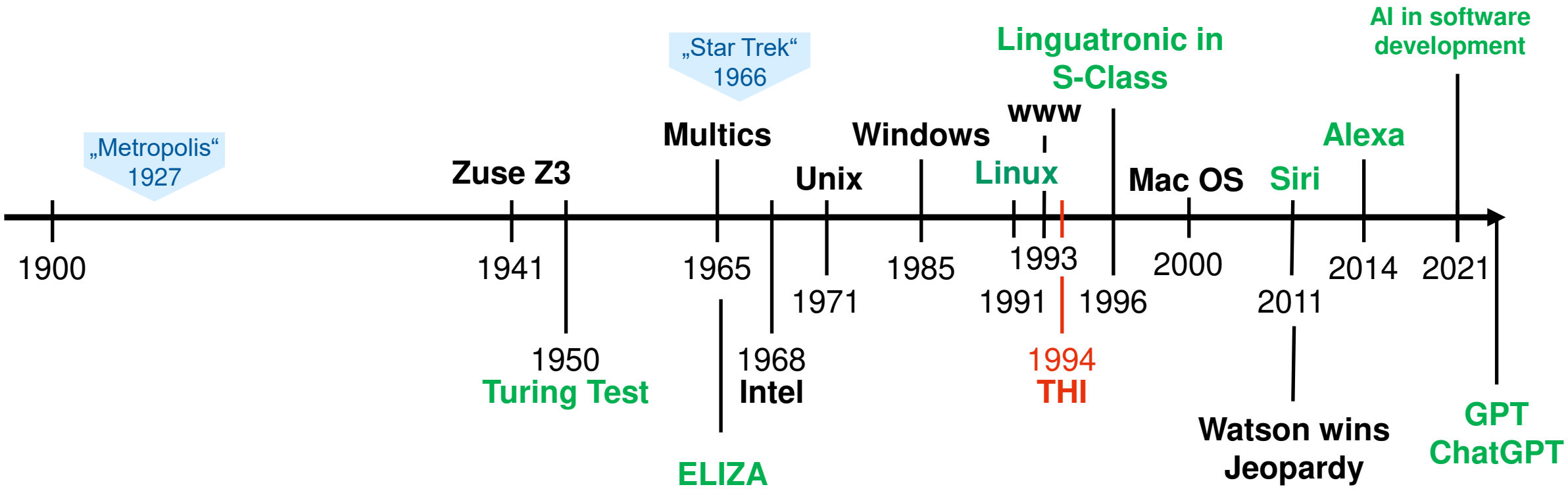
Modern User Interfaces – Linux Command Line

Geschichte der Kommandozeile: Wann kam Windows und co. auf den Markt?



Modern User Interfaces – Linux Command Line

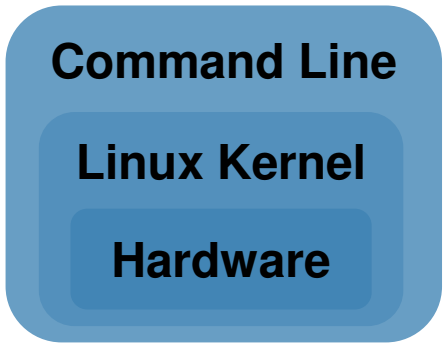
Geschichte der Kommandozeile: Au Unix ging Linux und Mac OS hervor, 2008 dann Android.



Agenda:

- History of the command line
- **Command line and Linux**
- Outlook: From text to image

Command line and Linux: How does it work?

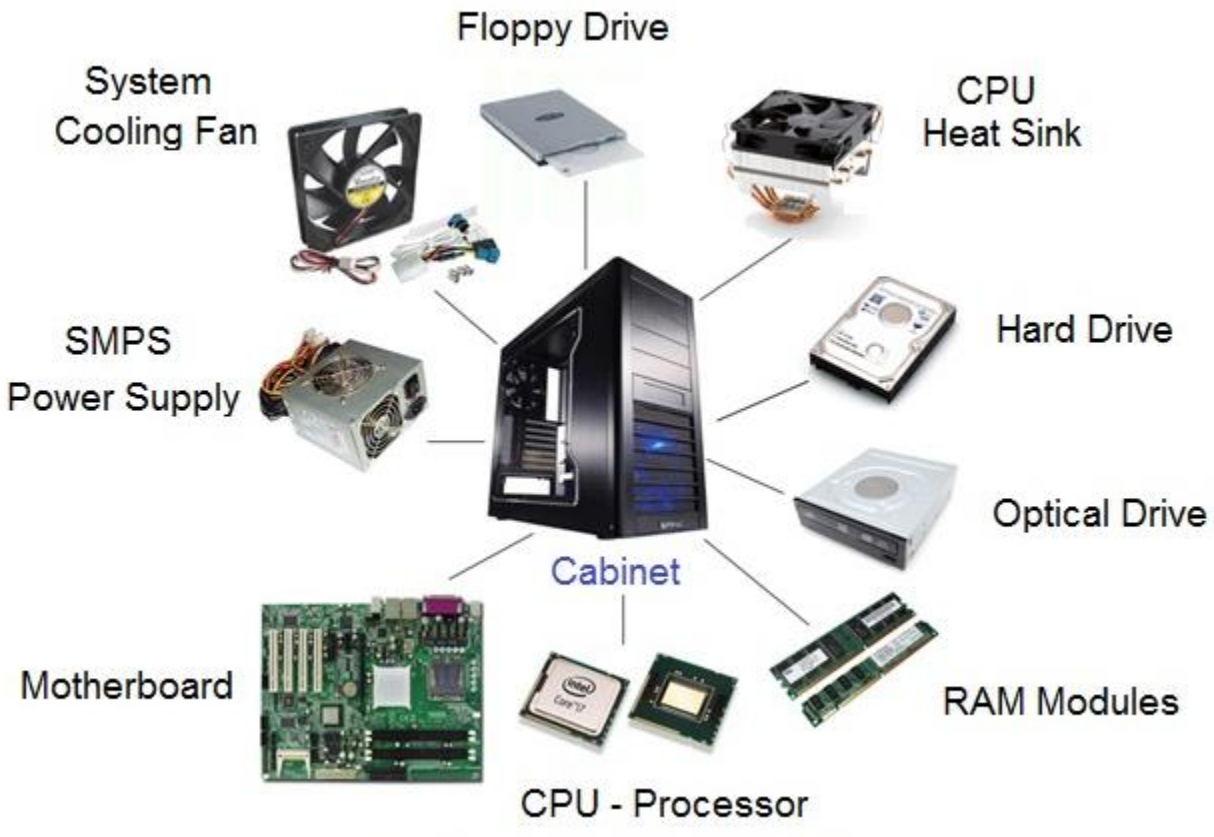


Command line and Linux: What is "hardware"?

Command Line

Linux Kernel

Hardware **Example:**



https://www.learncomputerscienceonline.com/wp-content/uploads/2020/04/Computer-System-Hardware-Components.jpg

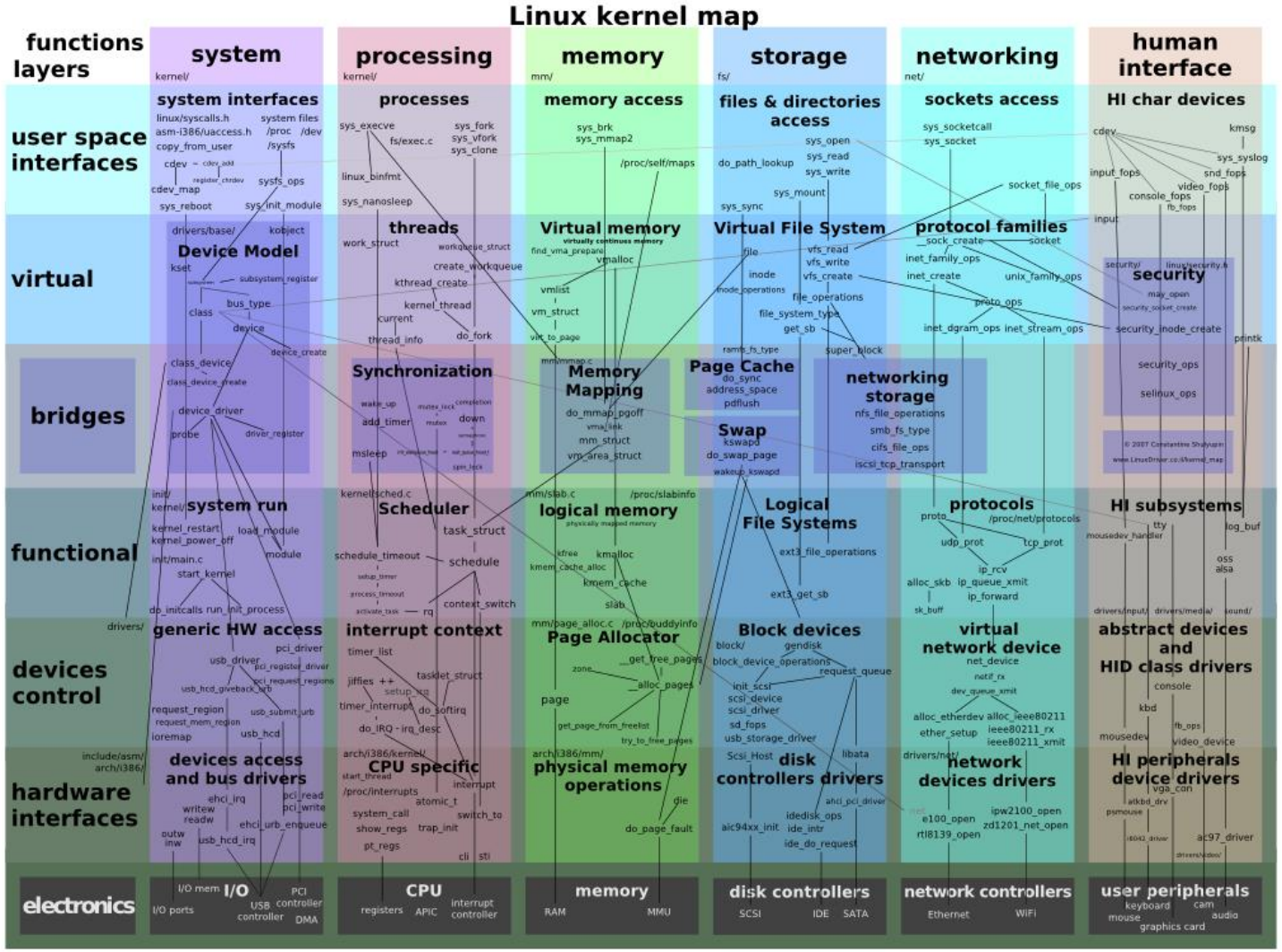
Command line and Linux: What does a "Linux kernel" do?

Command Line

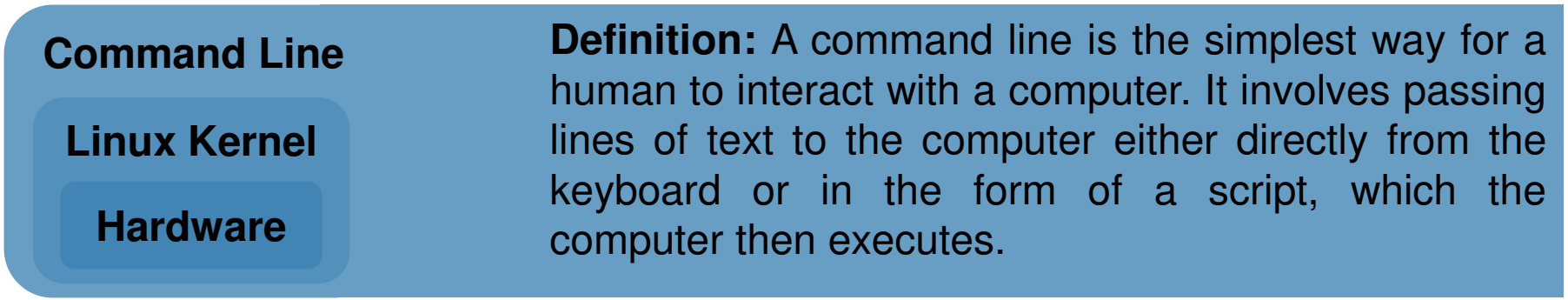
Linux Kernel

Hardware

Example:



https://upload.wikimedia.org/wikipedia/commons/5/5b/Linux_kernel_map.png



Definition: A command line is the simplest way for a human to interact with a computer. It involves passing lines of text to the computer either directly from the keyboard or in the form of a script, which the computer then executes.

https://de.wikipedia.org/wiki/Kommandozeile

Command line and Linux: Example of interaction with the command line

Commands and notations:

- echo
- “
- >

https://de.wikipedia.org/wiki/Kommandozeile

Befehlszeile und Linux: Beispiel Interaktion mit der Befehlszeile

Commands and notations:

- echo, cat
- “
- >

https://www.tutorialspoint.com/execute_bash_online.php

https://de.wikipedia.org/wiki/Kommandozeile

Commands and notations:

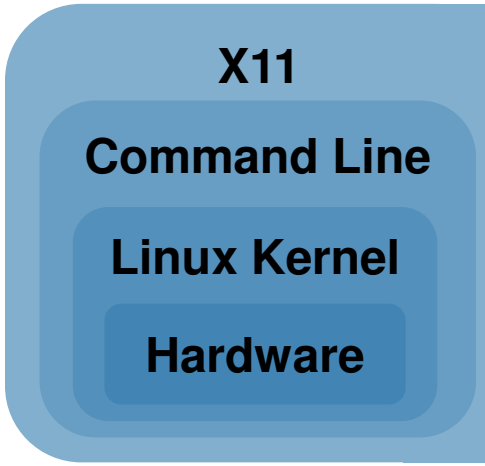
- **Exercise in exercise**
- **https://wiki.ubuntuusers.de/Shell/Befehls%C3%BCbersicht/**

https://de.wikipedia.org/wiki/Kommandozeile

Agenda:

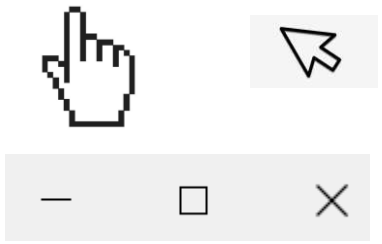
- History of the command line
- Command line and Linux
- **Outlook: From text to image**

Command line and Linux: images as an "intuitive" abstraction of voice/text commands



Definition: It provides a standard construction kit and protocol for building a graphical user interface. This includes drawing and moving windows on the screen and editing user input with mouse and keyboard.

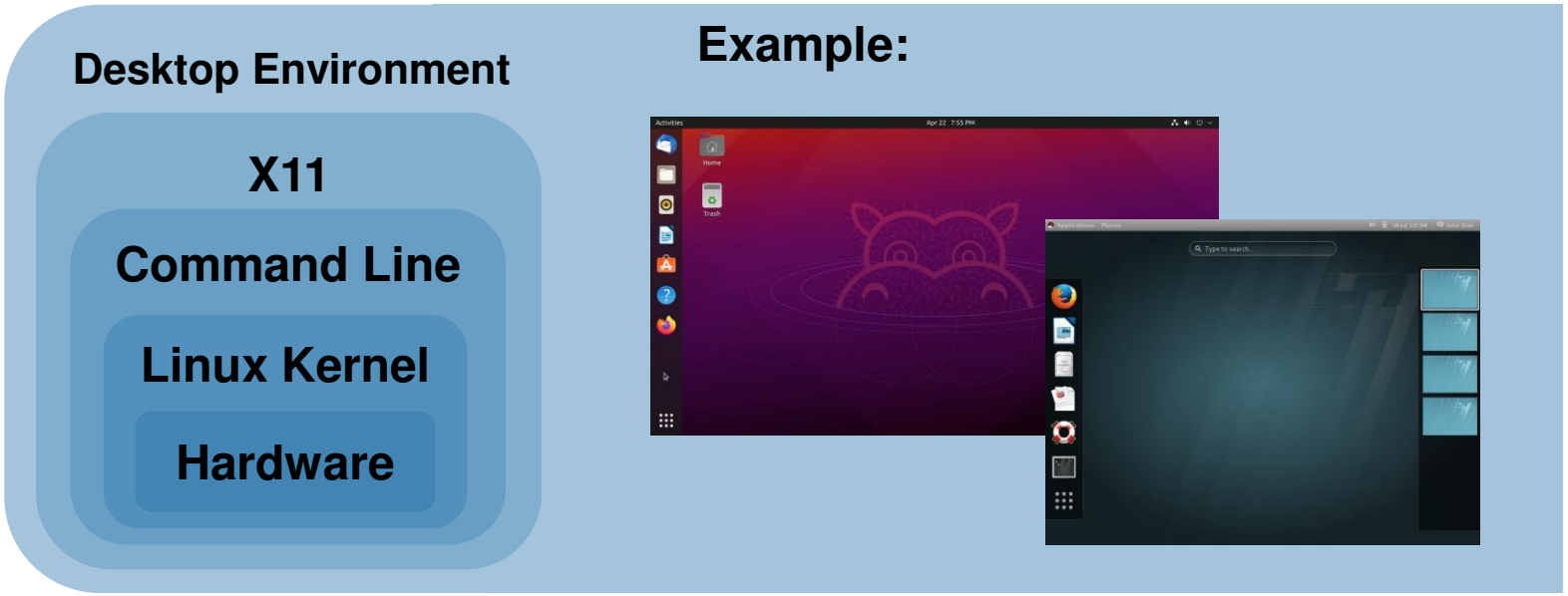
Operate with images:



https://de.wikipedia.org/wiki/X_Window_System

Modern User Interfaces – Linux Command Line

Command line and Linux: A picture is (sometimes) worth a thousand words

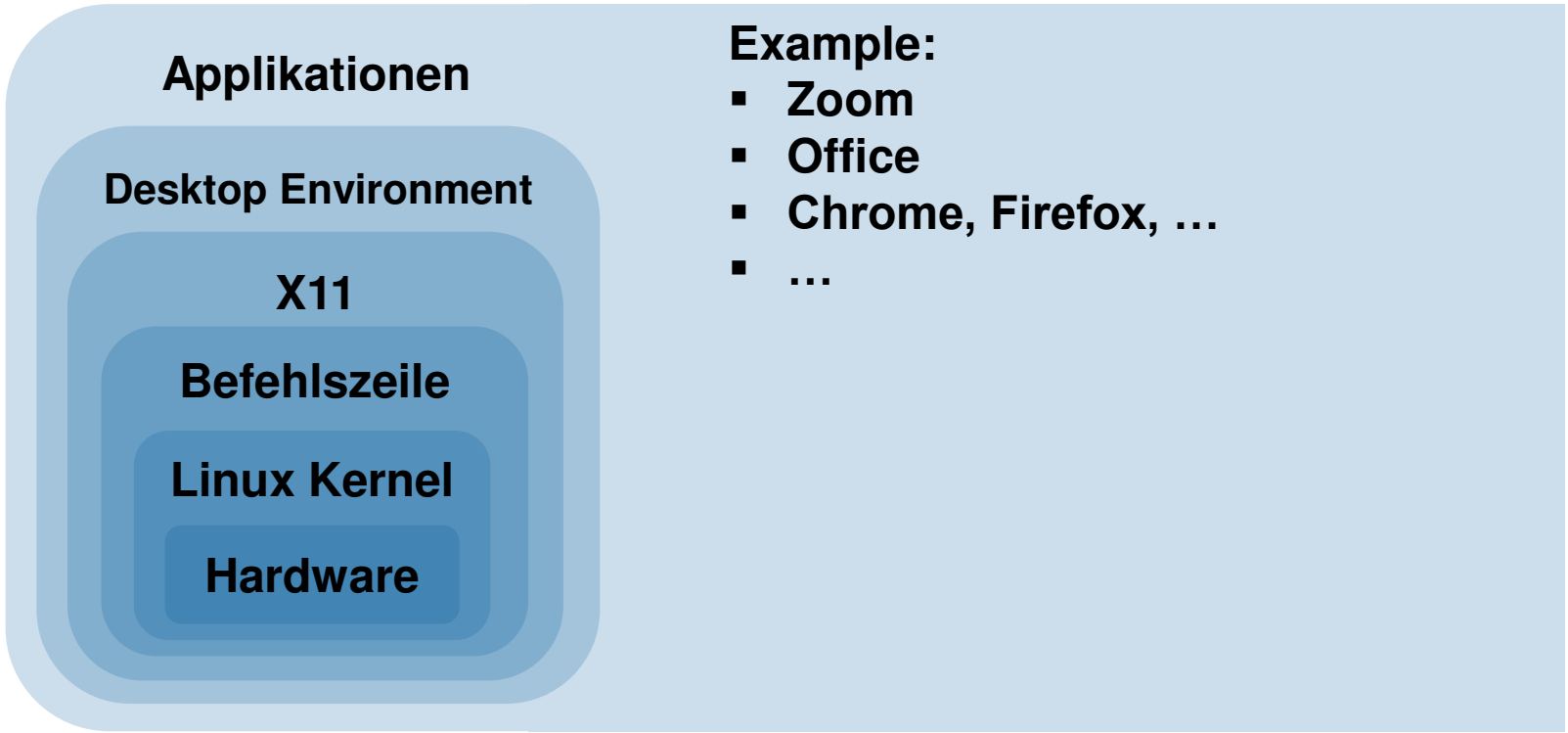


Distributionen:

- MX Linux
- Manjaro
- Linux Mint
- elementary
- Ubuntu
- Debian
- Solus
- Fedora
- openSUSE
- Deepin
- ... (>500)

https://de.wikipedia.org/wiki/Ein_Bild_sagt_mehr_als_tausend_Worte

Command line and Linux: The world we live in (today).



Example:

- **Zoom**
- **Office**
- **Chrome, Firefox, …**
- **…**

What have we learned?

- **History of the command line:**

  Speech/text control is already in the computer's cradle and is gradually evolving.

- **Command Line and Linux**

  With (speech/text) commands, actions can be carried out, e.g. writing a text file. In our vision, the commands can of course also be formulated linguistically.

- **Outlook: From text to images**

  On this basis, a "visual language" emerged that today is perceived as natural and intuitive and with which computers can be controlled.

What have we learned?

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- Outlook: From text to images

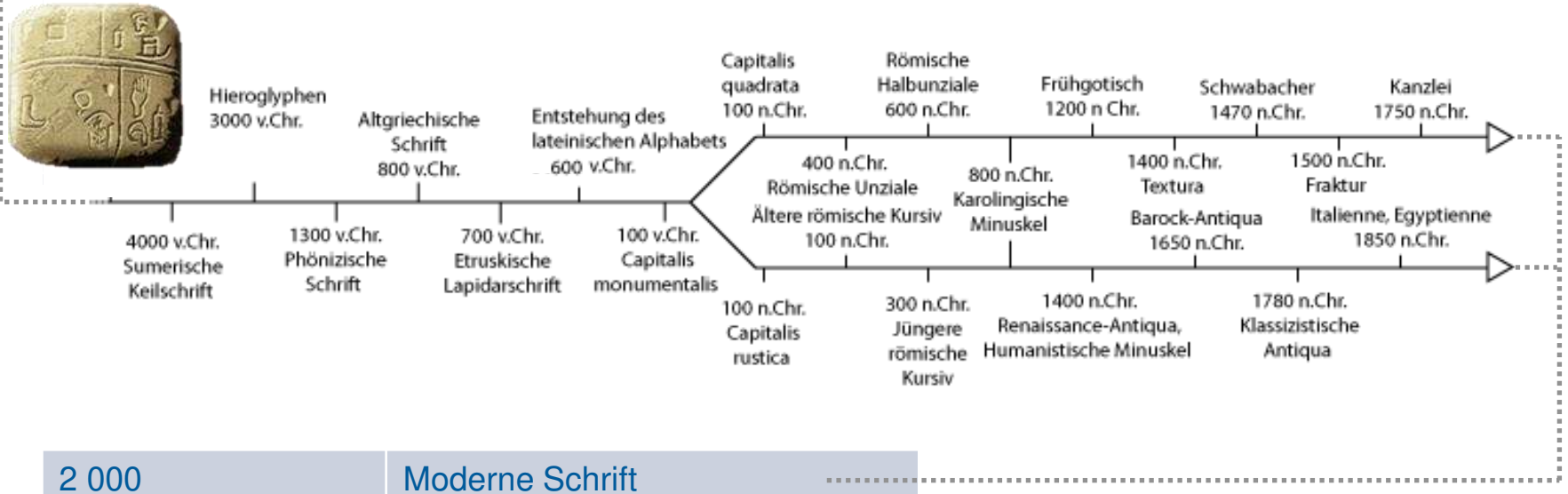
  On this basis, a "visual language" emerged that today is perceived as natural and intuitive and with which computers can be controlled.

From the idea of natural interaction:

How will the use of computers change in the coming decades?

Language development

(years ago)	Language
300 000 bis 100 000	Morphologization the phonological changes of grammatical constructions
50 000	Language also fully developed in syntactic terms
5 500	Cuneiform writing in Mesopotamia



2 000	Moderne Schrift
500	Buchdruck
70 (1950)	Turing Test

http://manok.de/typo/index.php?pid=5

Linguistic development

Until (months)	Speaking	Understanding
6	Lallen: „da-da“, „ba-ba“	unknown
6-12	Multisyllabic phonetic strings: „ba“, „mama“, „ba-da-ba“, „nane“, „tu“	Eye contacts, reacting to names, gestures
12-18	Single words: "mom", "ball".	Understanding of questions, prohibitions, assignment of words and objects
18-24	250 words, first verbs and two-word phrases: "Mommy sleep", "don't eat".	Understand prompts like "Get the ball."
24-30	Mehrwortsätze, einfache Melodien: „nicht in Bett“	First prepositions
30-36	450 words, consonant compounds, verb position: "I play ball".	Understand the linking of nouns and verbs
From 36	"I was at grandma's today"	Longer conversation possible, several orders: "Please get your jacket and put it on".
Adult	Active vocabulary: >>10 000	Passive vocabulary: >>20 000
Machine	At high quality, <100,000 words* can be read aloud, but to what extent can the machine formulate itself?	With high accuracy, speech of <250,000 words* can be transcribed, but then how much of it does the machine understand?

*Numbers refer to the German language

Linguistic development

Until (months)	Speaking	Understanding
6	Lallen: „da-da“, „ba-ba“	unknown
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12-18	Single words: "mom", "ball".	Understanding of questions, prohibitions, assignment of words and objects
18-24	250 words, first verbs and two-word phrases: "Mommy sleep", "don't eat".	Understand prompts like "Get the ball."
24-30	Multi-word sentences, simple melodies: "not in bed".	First prepositions
30-36	450 Wörter, Konsonantenverbindungen, Verbstellung: „ich spiele Ball“	Verstehet das verknüpfen von Nomen und Verben

Current status from Alexa, Cortana, OK Google, etc.

- (Almost any) commands are recognized and implemented
- Large number of objects are detected: "light", "ceiling light", "radio", ...
- Simplest prepositions: "Turn on the light above the door".

*Zahlen beziehen sich auf die Deutsche Sprache