1st Slide Set Cloud Computing

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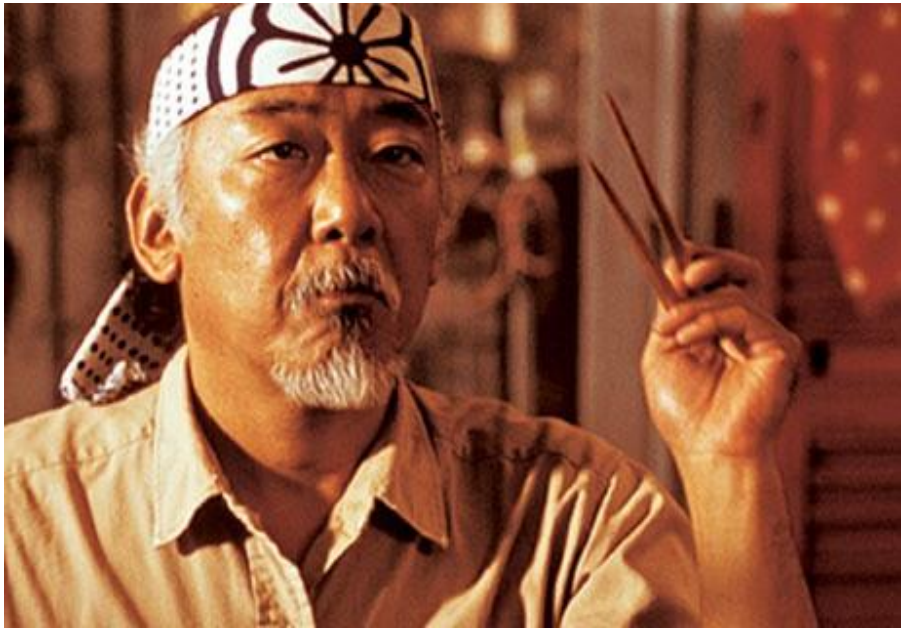
Agenda for Today

- Organisational Information
- Literature
- Generations of computer systems
- Brave new world?
- Client-Server

Today we discuss basic knowledge and give some food for thought

The Way a good Course works...

Image source: Google Image Search



- Mr. Miyagi says:
  „*Not only the student learns from his master, also the master learns from his student.*“

- **Active participation please!**

Generations of Computer Systems

Generation	Timeframe	Technological progress
0	until 1940	(Electro-)mechanical calculating machines
1	1940 – 1955	Elelectron tubes, relays, jack panels
2	1955 – 1965	Transistors, batch processing
3	1965 – 1980	Integrated circuits, time sharing
4	1980 – 2000	Very large-scale integration, Microprocessors, PCs/Workstations
5	2000 until ?	Distributed systems, *the network is the computer*, Virtualization

Quote from the magazine *Popular Mechanics* (1949)

„In the future, computers may weigh no more than 1.5 tonnes.“

5.Generation (2000 – ????)

- Some key words from the 5th generation:
  - *The network is the computer*
  - Distributed systems $\Longrightarrow$ Cluster-, Cloud-, Grid-, P2P-Computing
  - Multicore processors and parallel applications
  - Virtualization $\Longrightarrow$ VMware, XEN, KVM,...
  - OpenSource $\Longrightarrow$ Linux, BSD,...
  - Communication everywhere $\Longrightarrow$ mobile systems
  - New ways of working $\Longrightarrow$ e-Science, e-Learning, e-Business,...
  - Services $\Longrightarrow$ Service-oriented architectures (SOA)
  - Resources are requested and rent when needed $\Longrightarrow$ on demand
- Keywords for later generations:
  - Quantum computers (probably 7th or 8th generation)

Topics of this Course

- **Cloud computing**, as well as the other technologies, discussed in this course, like **cluster**, **peer-to-peer** and **grid computing**, belong to the group of distributed systems
- In this course, we cannot discuss **all**, but only **some** distributed systems
- Topics of this course:
  - Discussion of some of the fundamentals of distributed systems
  - Discussion of the backgrounds of the development of some distributed systems
  - Developing an understanding of how distributed systems work today
  - Acquisition of basic skills in handling the discussed distributed systems

Brave new world?

- Brings the concept *the network is the computer* only benefits?
- Who decides, which applications we are allowed to use in the future?
- Who decides, which books we ware allowed to read in the future?
- How much freedom and self-determination do we give up?

- Some examples...

Apple iPhone

Image source: Google Image Search

- No free software allowed
- Apple regulates which applications are allowed to run on the iPhone
- All media files contain DRM technologies (digital rights management)
- DRM-free formats like Ogg Vorbis or MP3 cannot be used
- Reasons for the exclusion of applications is somtimes difficult to understand and always without warning
- Apple can erase applications, which are installed on the devices

Google Chrome OS

Releasing the Chromium OS open source project

11/19/2009 10:31:00 AM

In July we announced that we were working on Google Chrome OS, an open source operating system for people who spend most of their time on the web.

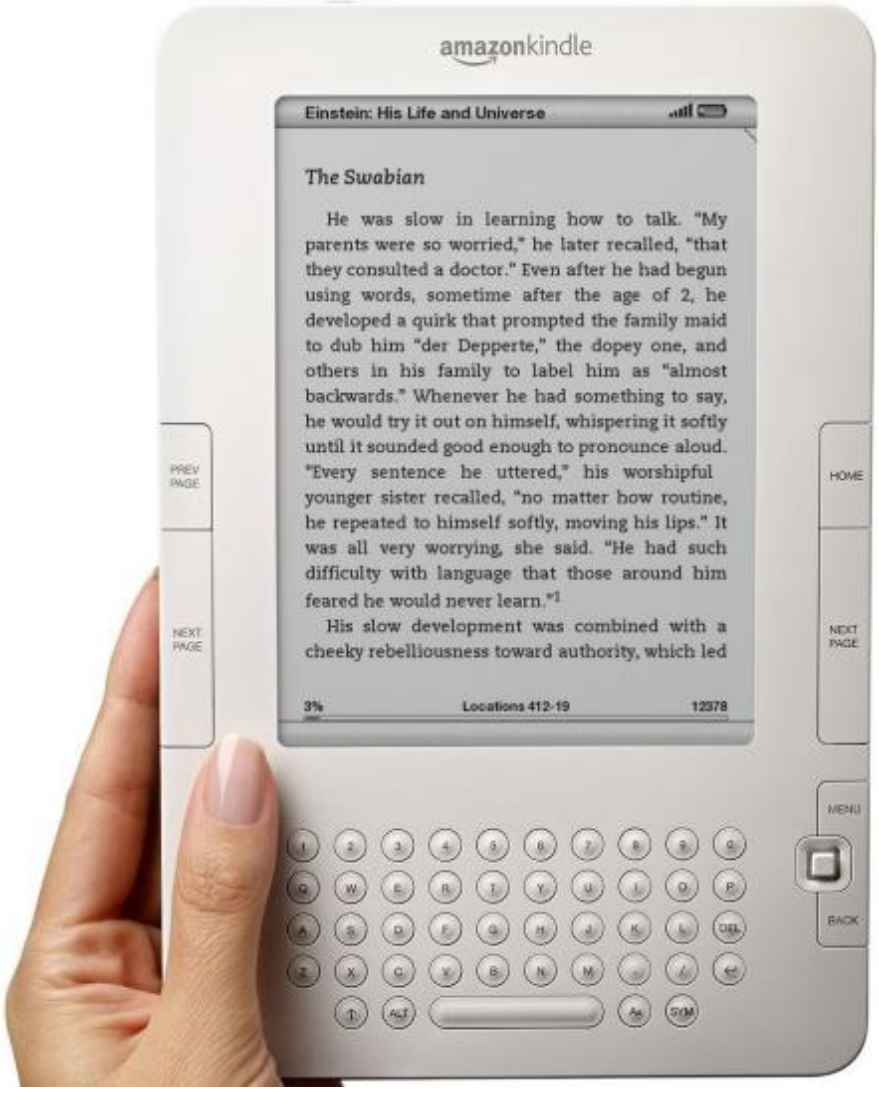
Today we are open-sourcing the project as Chromium OS. We are doing this early, a year before Google Chrome OS will be ready for users, because we are eager to engage with partners, the open source community and developers. As with the Google Chrome browser, development will be done in the open from this point on. This means the code is free, accessible to anyone and open for contributions. The Chromium OS project includes our current code base, user interface experiments and some initial designs for ongoing development. This is the initial sketch and we will color it in over the course of the next year.

We want to take this opportunity to explain why we're excited about the project and how it is a fundamentally different model of computing.

First, it's all about the web. All apps are web apps. The entire experience takes place within the browser and there are no conventional desktop applications. This means users do not have to deal with installing, managing and updating programs.

Amazon Kindle

Image source: Google Image Search



- Books can only be read with devices which are registered to a common Amazon account
- Sharing books is impossible
- Amazon can deny access to already purchased books

- Who decides in the future about censorship and freedom?
  - Politics?
  - Industry?
  - Population (customers/citizens)?

Interesting Article about this Topic: Parental Computing

The Cloud's My-Mom-Cleaned-My-Room Problem

SEP 26 2011, 12:50 PM ET | 39

+1 70 Recommend 432

Welcome to the era of parental computing, or how the cloud makes children of us all

When your mom cleans your room, it's a mixed bag.The clothes are in the drawers and the papers are straight, but you can't find anything and there is the distinct possibility that she found out whatever illegal (or at least immoral) material you had stashed away under the mattress.

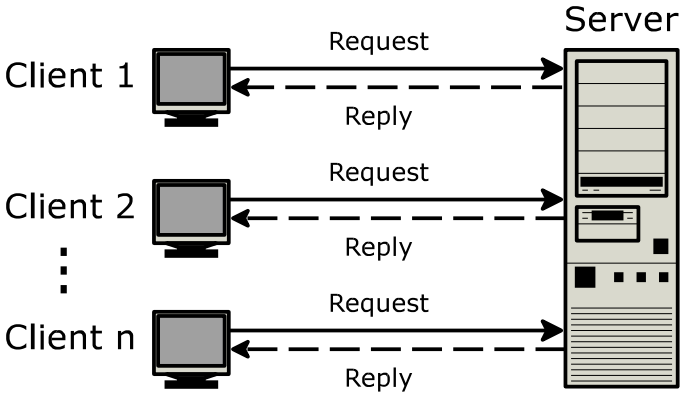
This is not a short reflection on my childhood (neither of my parents was the room-cleaning type) but a metaphor for the set of web services we call the cloud. We all know the feeling of logging into Facebook/Tumblr/Twitter/Netflix/Pandora/Gmail and realizing that the interface has changed. Maybe the company's internal testing says the new interface is better organized, but dang -- we'd gotten used to the last one and we liked it. "New Twitter? But I liked Old Twitter!" we cry.

We've always been dependent on software providers to create the digital spaces we inhabit, but when your email and documents and music are in the cloud, you're giving up the lock on the door and allowing changes to be made on the schedule of the parent. He or she may clean up or buy you a new desk. He or she may take away the car or decide you can't do something you think you should be able to.

http://www.theatlantic.com/technology/archive/2011/09/the-clouds-my-mom-cleaned-my-room-problem/245648/

Client-Server

- A client-server system includes:
  - one or more **clients** which use the services of the server and accesses data, stored at the server (⇒ consumers)
  - a **server**, which provides services and/or data (⇒ producer)
- The connection establishment is initiated by the clients
- Communication works according to a procedure protocol



- A client sends a request to the server responds with a reply
- The client-server architecture consists of 2 layers and is called two-tier model (tier = layer)

Tasks in the Client-Server Model

- For a distributed application, that is based on the client-server architecture, 5 tasks can be separated from each other:
  - Display (graphical) user interface
  - Calculation of the (graphical) user interface
  - Data processing
  - Data management
  - Data storage
- The distribution of the tasks to clients and server determines the client types
- According to their areas of responsibility, 4 types of clients exist:
  1. **Text-/X-Terminals**
  2. **Thin Clients**
  3. **Applet Clients**
  4. **Fat Clients**

Four Types of Clients in the Client-Server Model

- **X-Terminal** or **Text-Terminal**
  - Only displays the (graphical) user interface and transfers the user interaction to the server
  - Calculation of the (graphical) user interface, data processing and data storage, data management are tasks of the server
- **Thin Clients**
  - Calculate and display the graphical user interface
- **Applet Clients**
  - Also called **Network Computers**
  - Calculate and display the graphical user interface and do a part of the data processing
  - The clients process the applications (applets) themselves
- **Fat Clients**
  - Only data management and data storage are located on the (file or database) server

(Text-)Terminal: WYSE WY-50 (early 1990s)

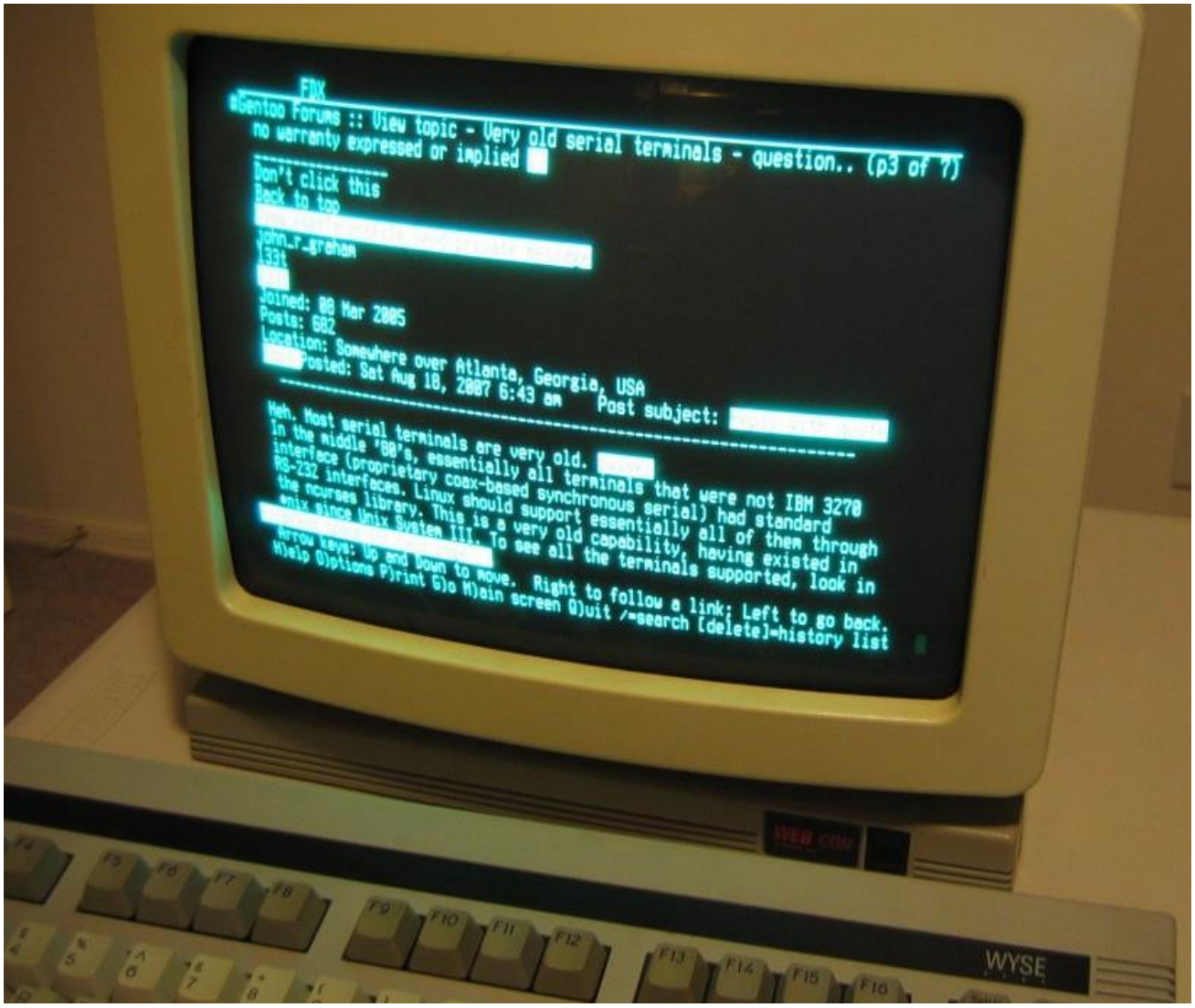


Image source: Google image search

(X-)Terminal: NCD 88K (mid-1990s)

Image source: Google image search

Network Computer: SUN JavaStation (1996 – 2000)

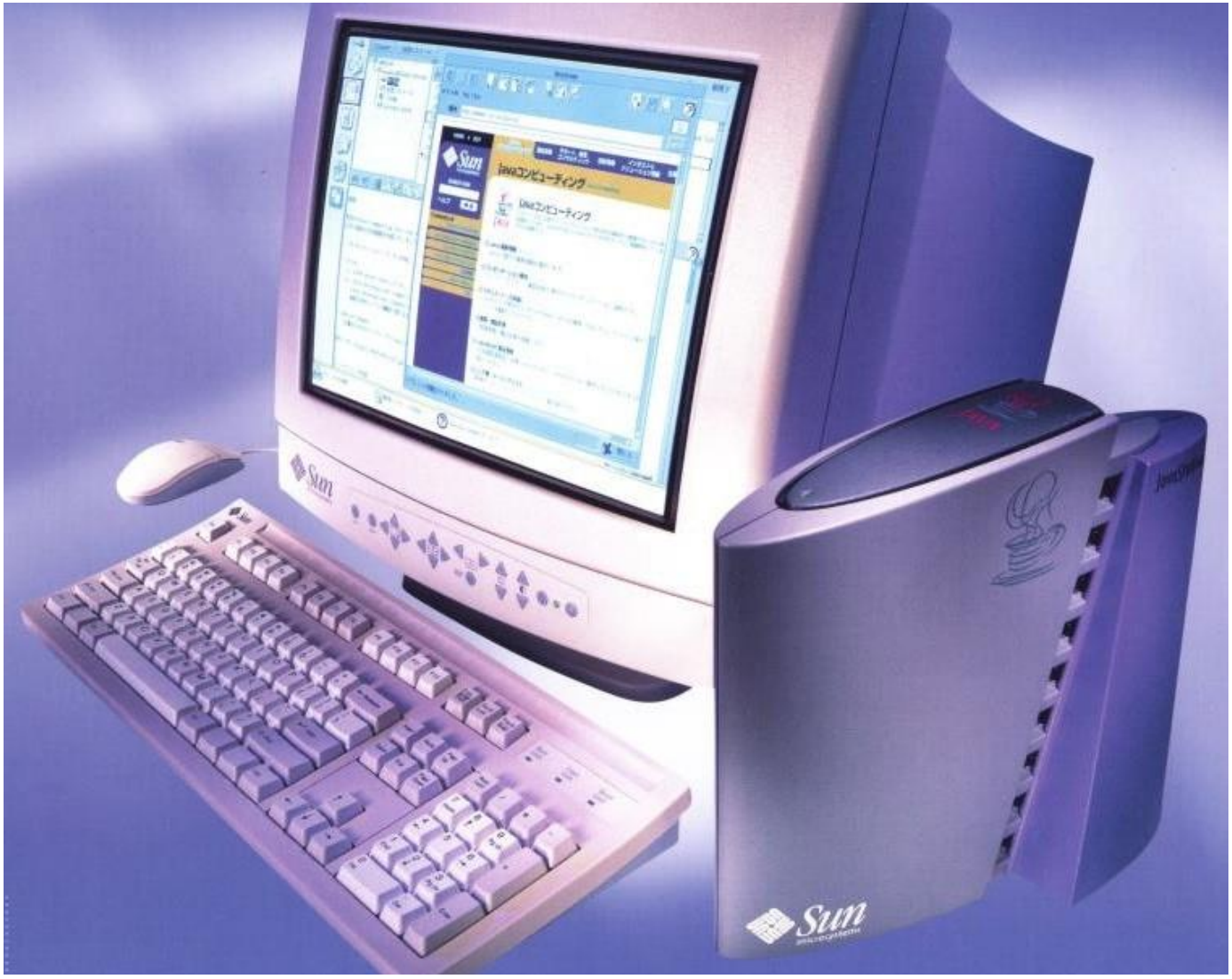


Image source: Google image search

Thin Clients

Image source: HP

Advantages and Drawbacks of Thin Clients over Desktops

- Advantages of Thin Clients
  - Low acquisition costs (approx e 500)
  - Reduced power consumption (a few watts) $\Longrightarrow$ reduced operating costs
  - Reduced footprint (little space consumption)
  - Reduced noise, because no hard drive and sometimes fanless
  - Central storage of data is more efficient and more secure
  - Reduced resource consumption because of virtualization on the server
  - Reduced effort (cost) for administration
- Drawbacks of Thin Clients
  - No 3D graphics performance
  - Limited extensibility
  - Users fear storing their data outside of their PC (outside of their own sphere of influence)
  - Server is a single point of failure and eventually a bottleneck

Linux and Windows CE with 3 Watt (flush-mounted)

Image source: Google image search

Summary about the Clients

- The era of X-Terminals and Text-Terminals is over
- Applet Clients have never established
  - Applet Clients may establish in the future $\Longrightarrow$ Google Chrome OS
- Fat Clients are standard today
- Thin Clients are rarely used today
  - Things change slowly in the industry
  - Thin Clients are a hot topic again because of rising energy costs
  - Keyword: Green IT