DIGITAL WATER:
ANALOGES SAMMELN IM DIGITALEN GESTRÜPP

INTERNATIONAL CLOUD ATLAS

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WORLD METEOROLOGICAL ORGANIZATION

CHRISTINA GRUBER

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ERLÄUTERUNG ZUR DIPLOMARBEIT

"DIGITAL WATER: ANALOGES SAMMELN IM DIGITALEN GESTRÜPP"

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NOTE

THE PHOTO ON THE FRONTPAGE SHOWS THE KRONSTORF CLOUD, THE FIRST DIGITAL CLOUD IN THE INTERNATIONAL CLOUD ATLAS.

PHOTOGRAPH TAKEN BY CHRISTINA GRUBER, NOVEMBER 2015.

I WRITE, COLLECT AND SORT
TO UNDERSTAND WHAT I HAVE FORGOTTEN.

Content

Introduction
No Water. No Cloud.

The topic of my thesis is the manifestation of the digital "Cloud" in form of water. I will use the term Cloud for the software and hardware platforms supporting data centers, physical transmission links, browser-based applications, and so forth.[1] The first mention and visualization of the Cloud was by Sharon Gillett and Mitchell Kapor in 1996 in a research paper (see Fig. 1).[2] The paper showed a Cloud of networks situated between routers linked by Internet Protocol (IP).

The hypothesis is: **No Water. No Cloud.** This phrase was coined in 2013 by *NullifyNSA*, a libertarian-conservative right activist group, stating that the only way to stop the ongoing surveillance of our online activities is by cutting the water supply of the NSA's data center in Utah.[3] Reading these words it became clear to me that the Cloud is ultimately **dependent on water** in form of **electricity and cooling systems**. I started thinking about the abstract, immaterial system of the Cloud and how it becomes part of our environment. For instance by using water to cool the servers, by using hydropower to generate power and by obtaining land to build data centers. All of a sudden, my cloudy imaginations of this mystical data ship floating weightless in cyberspace turned into a body relying, as my own, on water. The data centers, in their Walmart-like aesthetics (see Fig. 3), dominated by concrete and the lack of windows, are the "factories of the Internet".[4] These manifestations of the Cloud, the copper wires, fiber-optic cables, specialized routers and switches form the material basis of the *formless cyberspace.*[5] In this paper I will use the term *digital water* refering to the water used to cool the servers.

Apart from these findings I had never really associated anything with the Cloud beside my Dropbox, iCloud, Soundcloud, Instagram and Evernote account. Everything I need became available and storable in the Cloud, from my favorite TV series to the photos from my last holidays. The weight of my backpack got less and less and I can access my data from pretty much any place with internet access. However, I like collecting things so I still keep a hard drive to store my data and I also carry books with me, since I like the smell of the paper a lot.

I have never really cared much about the Cloud as I have not been able to fully grasp it. Now it feels like we are all part of the Cloud, based on water and being part of this Earth.

[1] Benjamin Bratton. The Black Stack. e-flux jornal #53. March 2014. p.12.

[2] Sharon Gillett and Mitchell Kapor. The Self-governing Internet: Coordination by Design. Harvard University. Boston. MA. September 8-10, 1996. See http://ccs.mit.edu/papers/CCSWP197/ccswp197.html.

[3] See Michael Boldin/NullifyNSA. In: Metahaven. Captives of the Cloud Part III: All Tomorrows Clouds. e-flux journal #50. December 2013. p.4.

[4] James Glanz. The Cloud Factories: Power, Pollution and the Internet. New York Times. September 22, 2012. See http://www.nytimes.com/2012/09/23/technology/data-centers-waste-vast-amounts-of-energy-belying-industry-image.html

[5] Jack Goldsmith and Tim Wu. Who Controls the Internet?: Illusions of a Borderless World. Oxford. Oxford University Press, 2006. p. 73.

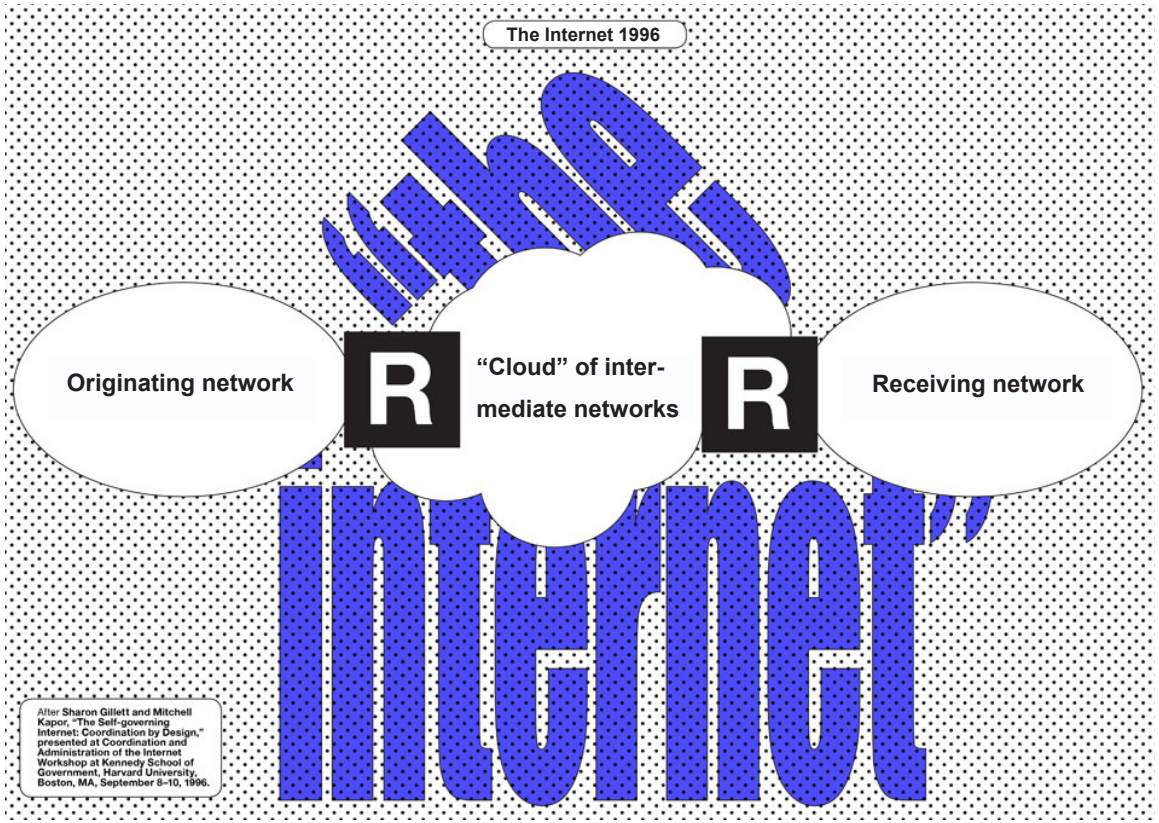


Fig. 1: The Internet 1996. First mention of the Cloud after Sharon Gillett and Mitchell Kapor. "The Self-governing Internet: Coordination by Design", presented at Coordination and Administration of the Internet Workshop at Kennedy School of Government. Harvard University, Boston, MA. September 8-10, 1996. Source: Metahaven. 2012.

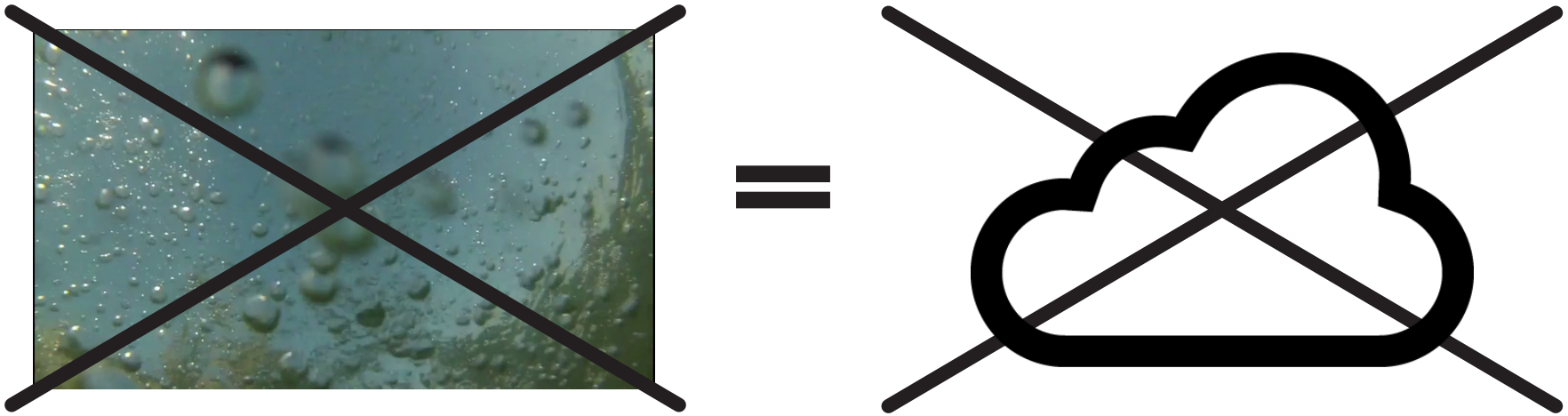


Fig. 2: No Water. No Cloud. Source: Cloud Icon from http://simpleicon.com/cloud-10.html. Retrieved November 12, 2015.

Fig. 3: Walmart-like aesthetics of data centers. The left picture shows a Walmart store in Gladstone, Missouri. Source: Walmart Corporate. The right one depicts the Terramark data center in Santa Clara, California. Source: CLUI.

Aim
Login in Real Life
(L.I.R.L.)

The aim of my work is to collect pieces of the Cloud and its manifestations to indicate the material world of the immaterial Cloud. As the Cloud becomes part of our environment, it gets a body. Huge amounts of data are shared all over the world and gather in the data centers (Fig. 6). The geographical positions of these "endpoints" of the Internet are strategically located and are usually equipped with direct water supply, ideally situated by rivers or oceans. As data centers use high amounts of power, they require cheap energy. In times of "green computing"[6], which means environmentally and sustainable computing, ever more important is the change to a sustainable energy production and cooling methods.[7] Therefore, the direct access to water can guarantee a greener Internet with water-cooled servers and energy from hydropower plants. In 2015 the data centers were responsible for 2% of the global greenhouse gas emissions, which is about the same as air travel.[8] It can be said that viral cat videos - YouTube videos starring cats that go viral, having more than a million views - are warming the planet. In other words, the data center servers generate a lot of heat and require huge amounts of energy to keep them cool. Using Google's services (Gmail, YouTube, Google search, etc.) for one month causes as much CO_2 as driving a car for 1 mile (about 200g) (Fig. 5).[9] The single services consume different amounts of energy. For instance, using Gmail for one year produced about 1.2 kg per user.[10] Thus, it cannot be denied the energy consumption of the digital world (incl. user and data centers) adds up to a fair amount and influences the environment.

On June 28, 2006 former United States Senator Ted Stevens coined the phrase "the Internet is a series of tubes".[11] The metaphor was highly criticized displaying the limited knowledge of the Senator about the Internet. However, this analogy perfectly describes the inside view of todays' water-cooled data centers (Fig. 7). Google's data centers use color-coded pipes to indicate for what they are used for: blue pipes carry cold water for cooling and red ones return warm water back to the cooling facility.[12]

The collection of the "real" pieces of the immaterial Cloud enables to pinpoint the abstract virtual world to precise locations and objects (Fig. 8).

[6] Gary Cook. Clicking Clean: A Guide to Building the Green Internet. Greenpeace. May 2015.

[7] Ibid.

[8] Adam Vaugahn. How viral cat videos are warming the planet. The Guardian. September 25, 2015.
See http://www.theguardian.com/environment/2015/sep/25/server-data-centre-emissions-air-travel-web-google-facebook-greenhouse-gas.

[9] Google Green. Big Picture. 2015. See https://www.google.com/green/bigpicture/.

[10] GeSI SMARTer2020. The Role of ICT in Driving a Sustainable Future. 2015. See gesi.org/portfolio/portfolio/report/72.

[11] Matthew Moore. Google easter eggs: 15 best hidden jokes. September 17, 2009. The Daily Telegraph.

[12] Stephen Shankland. Google tries wowing the world with a look at its data centers. Cnet. December 17, 2012.

"... what I am really concerned with is giving you some insight into the relationship of a book collector to his possessions, into collecting rather than a collection." [13]

This quote is taken from Walter Benjamin's text *Unpacking my library* from 1931. The emphasis lies on the importance of the process of collecting at any given time in any given space (analog to the availability of the Cloud and the data stored in it). A collection is tightly woven around its collector and her passion in the hunt for new pieces. Furthermore, it is a process of gathering and deconstructing conglomerations into its single components to better understand them.

"...I must ask you to join me in the disorder of crates that have been wrenched open, the air saturated with the dust of wood, the floor covered with torn paper, to join me among piles of volumes that are seeing daylight again after two years of darkness, so that you may be ready to share with me a bit of the mood—it is certainly not an elegiac mood but, rather, one of anticipation which these books arouse in a genuine collector."[14]

The collection is not only about the objects, but the minute particles in it, which store memories, pictures and thoughts of places and encounters. Analog to the definition of clouds, they do not permanently consist of the exact same particles.[15] The digital Cloud itself is also a hybrid of software and hardware stacks which are not tied to a single place but still have to be stored in data centers, which do require real land (infrastructure, energy, etc.) and access to resources like water.

Hence data centers can be located in the most unusual places to support more efficent ways of supplying information around the clock. One example is the floating data center of HavenCo on the micronation of "Sealand".[16] The Principality of Sealand was an unrecognized mini-state founded by a British family on a former war platform in the North Sea in international waters. in the early 2000s it hosted the servers to HavenCo, a startup providing off-shore data hosting. It acted as a data haven free from any national jurisdiction. It was able to host content considered illegal by other hosting companies because of its location. In November 2008 operations of HavenCo ceased without explanation.

[13] Walter Benjamin. Ich packe meine Bibliothek aus. Eine Rede über das Sammeln. In: Tillman Rexroth. Gesammelte Schriften IV. Frankfurt am Main. 1972. (First release in *Die literarische Welt*. 1931). p. 388-396.

[14] Ibid.

[15] See World Meteorological Organization. International Cloud Atlas. Vol. I. World Meteorological Organization. Geneva. 1975. p. 9.

[16] See James Grimmelmann. Sealand, Havenco, And The Rule Of Law. Illinois Law Review. 405. 2012. p. 460. http://illinoislawreview.org /wp-content/ilr content/articles/2012/2/Grimmelmann.pdf

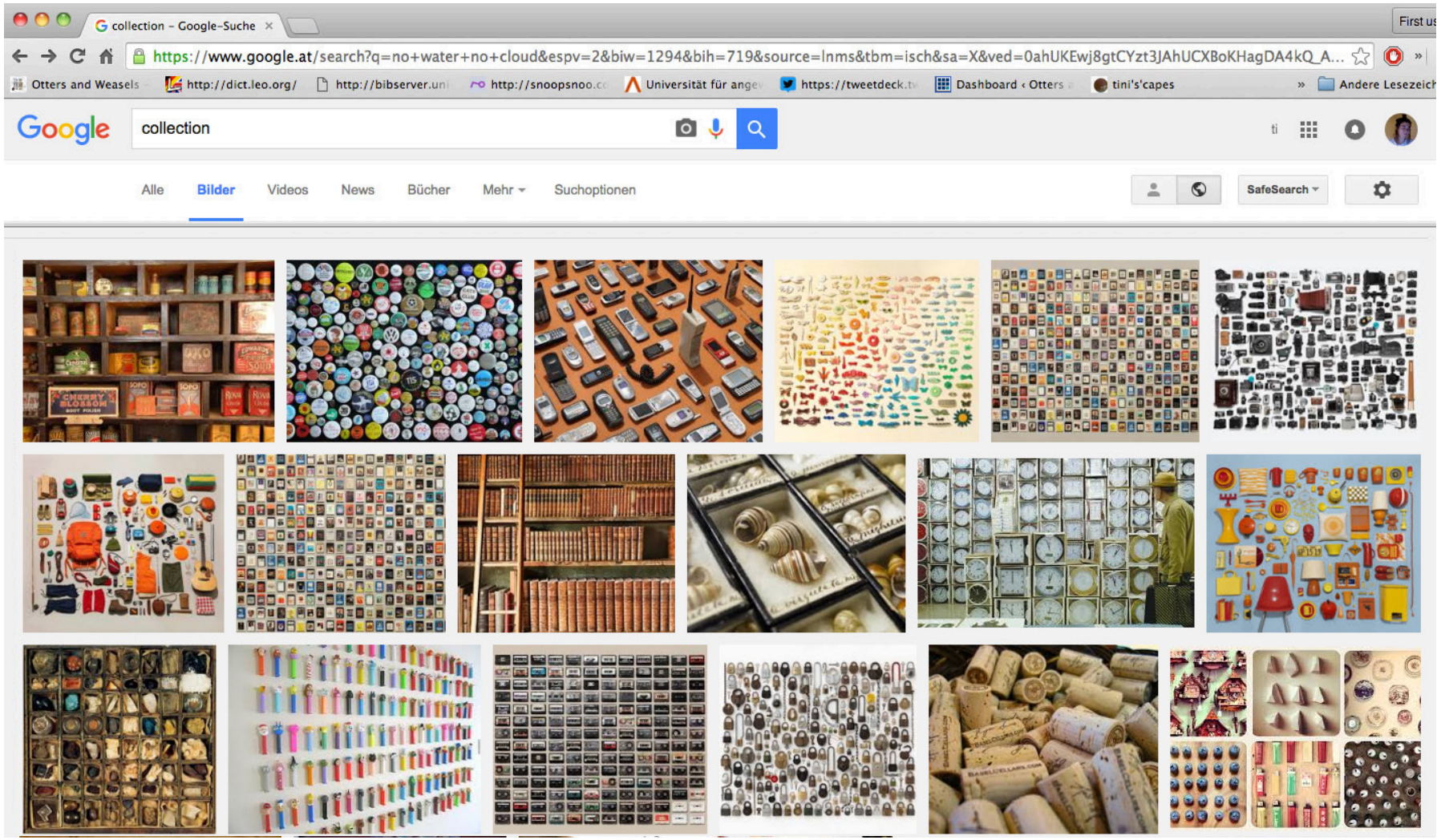


Fig. 4: Screenshot of the Google search result for the word “collection”. Source: Google Image. Retrieved on October 25, 2015.

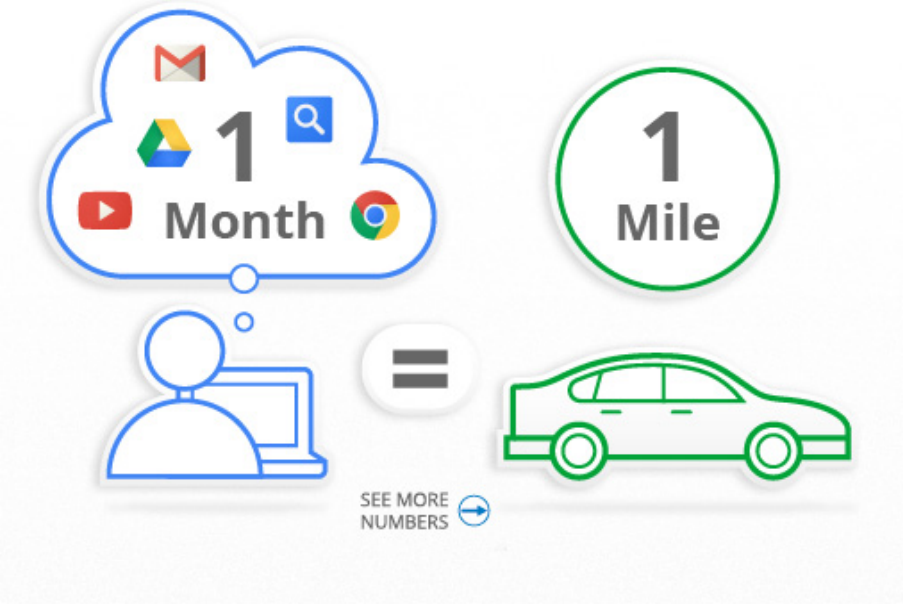


Fig. 5: Energy consumption of the average Google user per month. Source: Google. 2015.

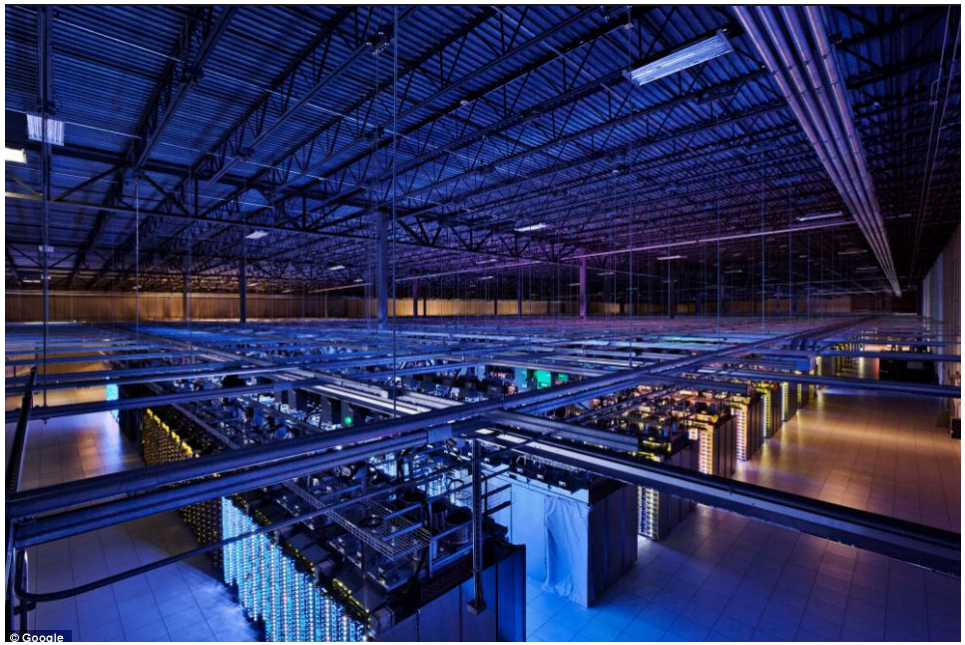


Fig. 6: The server floor in Council Bluffs, Iowa. Source: Connie Zhou for Google. 2012.

Fig. 7: The tubes of the Internet. The water cooling system in the Google data center in The Dalles, Oregon. Source: Connie Zhou for Google. 2012.

Fig. 8: Google's Street View tour of a North Carolina data center includes this humorous view of a stormtrooper and R2-D2 droid from Star Wars. Source: Google. Retrieved December 29, 2015.

Material & Methods
Harvesting The Cloud

Living in a time in which almost every corner of the world is known, the digital world becomes the object of observation and desire. The collecting of pieces of the Cloud can be compared to the treasure hunt for new stones as part of the mineral collection of the Emperors cabinet of wonders. Parts of the cloud in form of infrastructure, depending on water, are collected. In other words, this infrastructure established a network of finite things among finite things. The network, often seen as something immaterial and invisible, would land on the actual ground and leave traces which can be understood and changed.[17]

The big difference in this quest is not to search for precious stones, as the rare earth minerals (see Fig. 9)[18] which are processed in our technical devices, but for an abundant one, **water**: the one forming the main element on our planet.

All things considered the most important tool in this search for manifestations of the Cloud was my computer. I started to browse, actually "google", the Internet to find pieces of the cloud. As I was searching for the manifestations outside the digital world), I focused on data centers and their locations around the world (Fig. 10).

In detail, I looked into the data centers of the American company Google, as they describe themselves as a sustainable enterprise using newest technology to minimize environmental impact (Fig. 11). To achieve these goals Google invests in innovative data centers around the globe: for instance in a water-cooled data center located in an old paper mill at the Northern Sea.

As I wanted to visit them in real life, I also googled for locations of data centers in Austria. Most data centers were located in Vienna and provided cloud space. But I also found articles about Google purchasing land to build a data center in the rural area of Upper Austria.

In order to collect further details I added interviews and phone calls to my search about how Google found the small town of Kronstorf, Upper Austria. I also started to visit the site regularly and walked along the invisible borders and future cooling towers. I left the pure Google sphere to "Login In Real Life".

The common method to characterize clouds[19], is to take pictures of them according to the "International Cloud Atlas" from the World Meteorological

[17] Pier Vittorio Aureli. In Pier Vittorio Aureli, Boris Groys, Metahaven, and Marina Vishmidt. Form. In Uncorporate Identity. Baden. Lars Müller, 2010. p. 262.

[18] Boris Ondreička and Nadim Samman. Rare Earth Exhibition at Thyssen-Bornemisza Art Contemporary. Vienna. 2015.

[19] According to the World Meteorological Organization (International Cloud Atlas, 1975) clouds are so called hydrometeors. A meteor is a phenomenon observed in the atmosphere or on the surface of the earth, which consists of a suspension, a precipitation, or a deposit of liquid or solid particles, or a phenomenon of the nature of an optical or electrical manifestation. Clouds consist of minute particles of liquid water or ice, or of both, suspended in the atmosphere and usually not touching the ground. However, a specific cloud does not permanently consist of the exact same particles. Technically speaking, a cloud is not even an object, but an area in the atmosphere reaching oversaturation.

Organisation. I did the same for the manifestation of the Cloud.
Furthermore it was important for me to collect pictures of the Cloud, produced by the Cloud itself and combine them with images of real clouds (hydrometeors)(Fig. 12). These comparisons showed the relationship of the clouds to each other and the possibility to rearrange them as desired and to emphasize that they all consist of water and are all part of the Earth.

Additionaly I requested information from freshwater ecologists and their opinion about the use of the river water to cool a data center and the effect it has on the ecosystem. The ecological footprint of water-cooled data centers is smaller, but the alterations of the used water are unknown due to temperature change and additives against corrosion.

With the cloudiest of Clouds - the “Kronstorf Cloud”- it was possible to let all the results come together in one project. The possibilities of the Cloud appeared to be all the differrent particles as they continuously change their composition.

Fig. 9: Collection of rare earths. Precious metals and rare earth minerals are mined from destroyed hard drives and reformed back into mineral form. Revital Cohen and Tuur Van Balen. b/NdAlTaAu. 2015. Source: Jens Ziehe for Thyssen-Bornemisza Art Contemporary. Vienna. 2015.

Fig. 10: Data Center Map. The map shows Cloud servers around the world. Adapted from Google Maps and datacentermap.com. 2015.

Fig. 11: Collecting particles. Google data centers (from left to right): Berkeley County, South Carolina; Douglas County, Georgia; Saint Ghislain, Belgium; Pryor, Oklahoma; Hamina, Finland; The Dalles, Oregon. Source: Google. 2015.

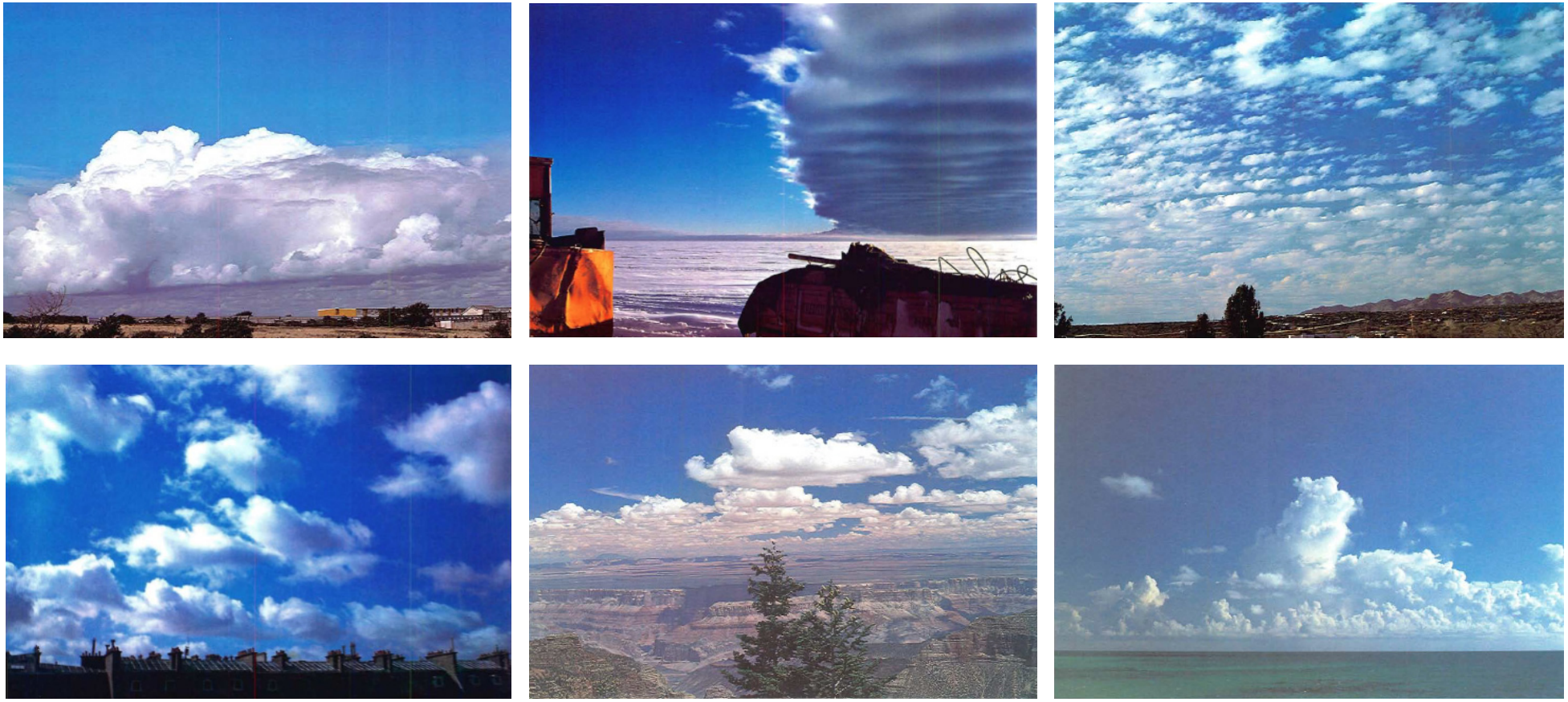


Fig. 12: Collection of different cloud forms from the International Cloud Atlas. Source: WMO, 1987.

Kronstorf
The "Cloudy Cloud"

One example of Cloud manifestation is Kronstorf, a small town in Upper Austria in the center of Europe that has become one of the future hotspots of the digital world.
In 2008 the Google company purchased land to install a data center there. The American technology company paid 40 million Euros for the 75 ha property (about the size of over 100 football fields) to several farmers who owned it (Fig. 14). Kronstorf has all the prerequisites needed for a data center: direct water supply by the river Enns with an efficient hydropower plant (Fig. 16), fiber-optic cables (three international data highways cross the area, see Fig. 15), access to a strong power grid and the proximity to big settlements. The intention of Google was to secure the data traffic towards Eastern Europe with the available infrastructure.
So far, 13000 trees have been planted as a compensation area, a Canadian kindergarten teacher has been hired and five new housing projects have been realised. Articles about the possible landing of the Cloud in Kronstorf are regularly published in national and local newspapers, but no clear statement about the start of the constructions is available. The mayor of Kronstorf, Dr. Christian Kolarik, states that the interest of Google in his small town opened up so many new opportunities and made people fantasize about the place and "initiated an upheaval."[20]

I first entered the Google property via Google Earth[21] on my computer and tried to find its location which lies between the federal road and the river Enns. Immediately I discovered the newly geometrically planted forest. Moreover I tried to localize the Cloud by drawing a polygon shape in the programme to estimate its size. The land appeared familiar to me as I used to play in fields like these when I was a child. I usually got intentionally lost in the cornfields to discover them for myself which always felt like an adventurous expedition. On the property of the future data center in Kronstorf, which are fields at the moment, a similar feeling of adventure is noticeable as there is so much information and there are so many secrets inscribed into the land. For more detailed investigations of the area I took a series of photos, films and used a drone to survey the property from above (Fig. 13). I also walked along the entire perimeter of the area to get a better feeling for its extensions.
Since 2008 the Cloud has been growing continuously. The municipality of Kronstorf is still waiting for Google like Samuel Beckett's vagabonds Estragon and Wladimir are waiting for Godot.[22]
Although the Cloud can form anywhere it is about to form here, due to the prerequisites of the place. It became clear to me that the digital and analog cloud merge in Kronstorf and form one layer on the Earth's surface.

[20] "Es entsteht so viel Phantasie für den Ort das gibt uns einen Ruck nach vorne." Dr. Christian Kolarik.

[21] Google Earth is a virtual globe, map and geographical information program.

[22] Samuel Beckett. Warten auf Godot. Frankfurt am Main. Suhrkamp. 1968.

Fig. 13: Aerial view of the Kronstorf Cloud. On the left side of the picture the newly planted forest of 13000 trees; on the right the future Google data center. Source: Florian Bogdan.

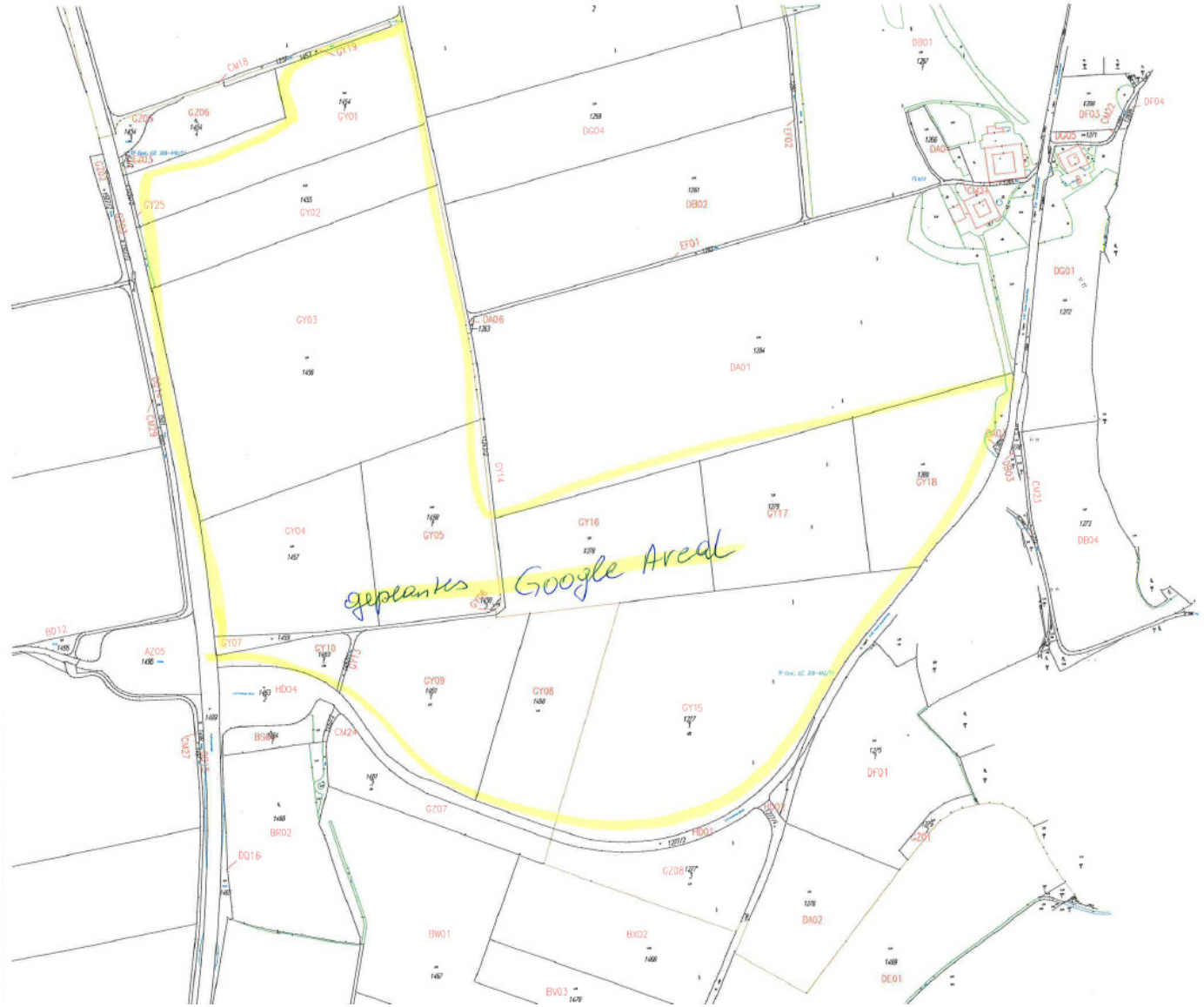


Fig. 14: Map of the Google area for the data center in Kronstorf. Source: Johann Mitter. 2015.

Fig. 15: Shaft of the fiber optic cable line and Dr. Christian Kolarik.
Source: Moritz Metz. 2015.

Fig. 16: Left: Hydropower plant Mühlrading. Right: Operation panel for the turbines and watergates. Source: Verbund. 2015.

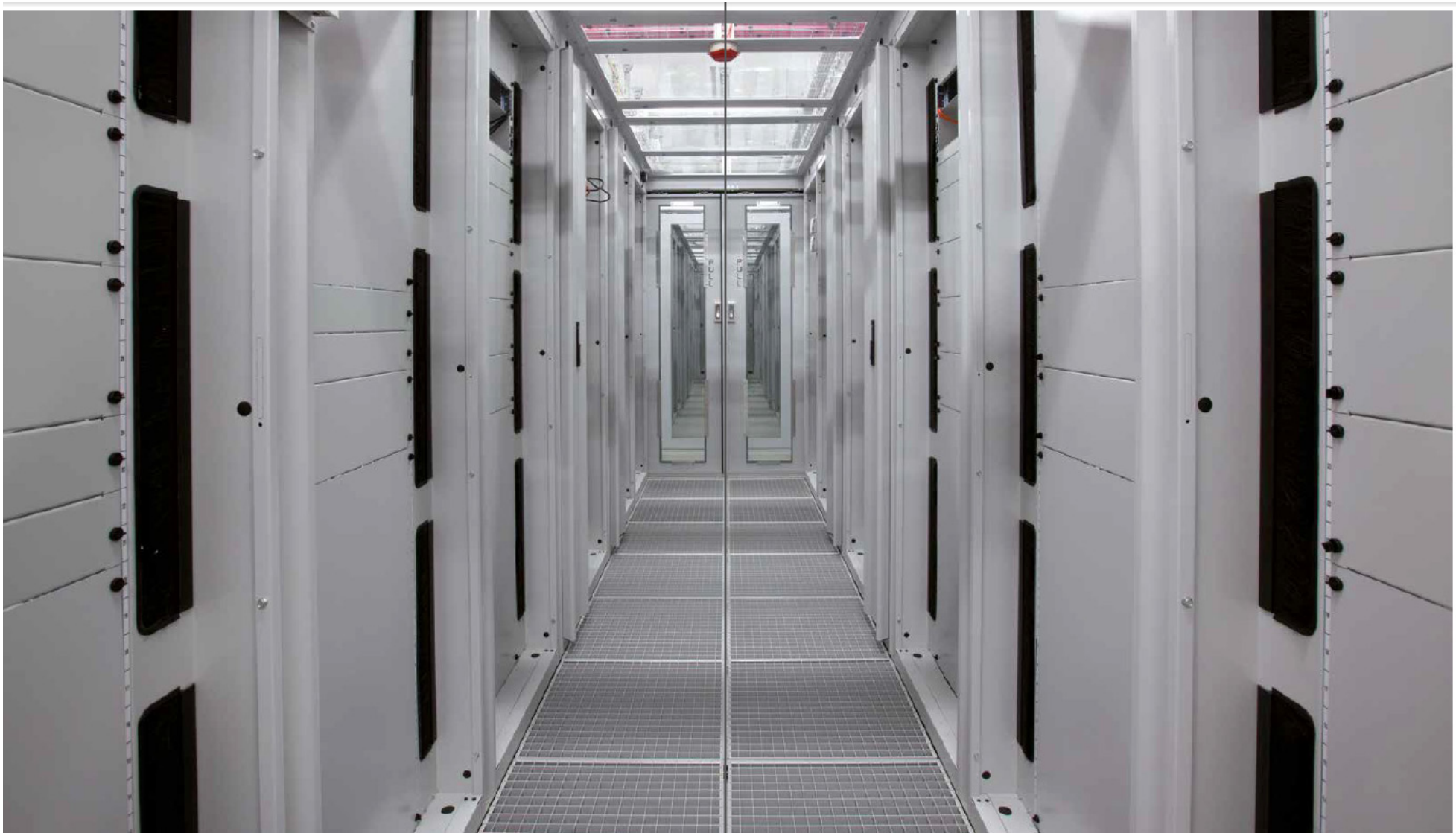


Fig.17: Possible view of the future Google data center in Kronstorf. Source: e-shelter. 2015.

About Me - The Collector

I am fascinated with water, its interaction with humans, and its power to shape the landscape and its inhabitants. My fascination started with the observation of changes of the river in my hometown and the transformation of a vivid stream into a "polluted soup".[23] These factors also influenced the choice to study art and hydrobiology. I wanted to improve the conditions of waterscapes and prevent further deterioration. For some time I dealt with the anthropogenic changes of water bodies - the human impact.[24] Working as a scientific researcher I focused on the historical changes of rivers and their impacts on the fish community. I participated in interdisciplinary projects investigating fundamental changes of waterscapes during the last 300 years analyzing the influence of dynamic urban development for the aquatic environment. This type of research required field work on a boat, mapping, extensive archive work and the Internet.
For engaging with the land and waterscapes in a more complex approach I decided to study landscape art to dive deeper into the relation between humans and water and to find solutions that only art can offer. In my artistic practice I focus on socio-economic changes and the ecological impacts humans have on the landscape, especially on waterscapes, and vice versa.

For me clouds are only a temporary state of water. In "Digital Water - Analoges Sammeln im digitalen Gestrüpp" water in its gaseous state acts as a connector between the analog and the digital world. New ways of how to think about the virtual reality are created.
I believe that water has the ability to disentangle complex political and social structures and constructions of identity that are interwoven in the digital world.

I chose English for my written part of the diploma thesis as English is the universal language of the Interne. Although it does not have this official status, and never will.[25] The reason for choosing English was the fact that the Internet and the Cloud first appeared in the United States of America and therefore used the English language.

When I came up with the idea of the dependency of the Cloud on water I asked myself how much water I have already used so far to investigate the manifestations of the digital Cloud on Earth. However, during my research it has not been possible for me to make "precise" estimations.

[23] Several paper mills are located along the river Ybbs and until the middle of the 1990ies they heavily polluted the river. Nowadays stricter restrictions prevent further deterioration and improved the water quality drastically.

[24] David L. Hawksworth and Allan T. Bull. Biodiversity and Conservation in Europe. Springer. 2008. p. 3390.

[25] Jukka Karpela. English - the universal language on the Internet? In: Human languages. IT and communication. 2013.

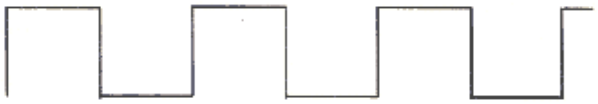
Glossary[26]

digital
[ˈdɪʤɪtəl], adjective

ORIGIN late 15th century: from Latin from *digitus* 'finger, toe.'

1 relating to or using signals or information represented by discrete values (digits) of a physical quantity, such as voltage or magnetic polarization, to represent arithmetic numbers or approximations to numbers from a continuum or logical expressions and variables: digital TV. Often contrasted with analog. Digital describes electronic technology that generates, stores, and processes data in terms of two states: positive and non-positive. Positive is expressed or represented by the number 1 and non-positive by the number 0.
• (of a clock or watch) showing the time by means of displayed digits rather than hands or a pointer.

2 of or relating to a finger or fingers.



Digital Signal

water
[ˈwɔːtəʳ], noun

ORIGIN Old English *wæter* (noun) of Germanic origin; related to Dutch *water*, German *Wasser*, from an Indo-European root shared by Russian *voda* (compare with vodka).

a colorless, transparent, odorless, tasteless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms. Water is a compound of oxygen and hydrogen (chem. formula: H_2O) with highly distinctive physical and chemical properties: it is able to dissolve many other substances; its solid form (ice) is less dense than the liquid form; its boiling point, viscosity, and surface tension are unusually high for its molecular weight, and it is partially dissociated into hydrogen and hydroxyl ions. Water is a liquid at standard ambient temperature and pressure, but it often co-exists on Earth with its solid state, ice; and gaseous state, steam (water vapor). It also exists as snow, fog, dew and cloud.

[26] The Glossary is based on the New Oxford Dictionary. 2nd Edition. Oxford University Press, Inc. 2005.

analog
[ˈænəlɒg], noun

ORIGIN early 19th century: from French, from Greek *analogon*, neuter of analogos ‘proportionate’.

a person or thing seen as comparable to another; similar, comparable, simultaneous, equivalent, continuous (IT).

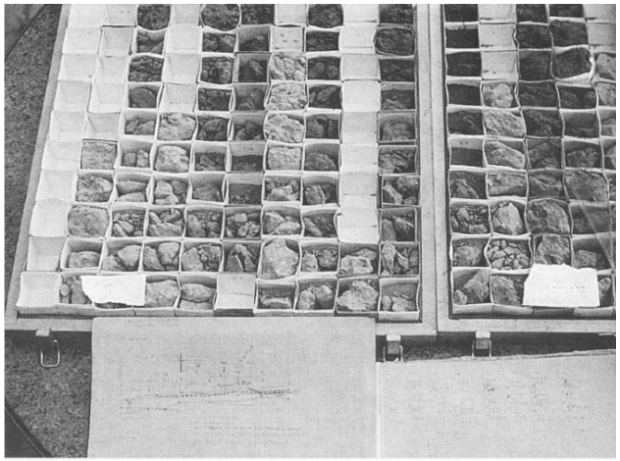
An analog signal is any continuous signal for which the time varying feature (variable) of the signal is a representation of some other time varying quantity, i.e. analogous to another time varying signal. It differs from a digital signal in terms of small fluctuations in the signal which are meaningful.

collect (sammeln)
[kəˈlekt], verb

ORIGIN Middle English: from Old French *collecte*, from Latin *collecta* ‘gathering,’ feminine past participle of *colligere* ‘gather together’.

bring or gather together (a number of things), come together and form a group, systematically seek and acquire (items of a particular kind), accumulate over a period of time, something that is collected, a group of objects or an amount of material accumulated in one location, especially for some purpose or as a result of some process.

Collecting identifies the systematic quest, acquisition and storage of objects or information.



Pedocomparator to collect different stones. Source: Bruno Latour. In Pandora’s Hope. Circulating Reference. 2002.

undergrowth (Gestrüpp)
[ˈʌndəʳ grəʊθ], noun

a dense growth of shrubs and other plants, especially under trees in woodland.

brushwood. Source: aydualk, sonyuserforum.

hydroelectric
[ˈhaɪdroʊ ɪˈlektrɪk], adjective

relating to or denoting the generation of electricity using flowing water (typically from a reservoir held behind a dam or other barrier) to drive a turbine that powers a generator.

cyberspace
[ˈsaɪbə speɪs], noun

the notional environment in which communication over computer networks occurs.

surf
[sɜːf], verb

ORIGIN late 17th century: apparently from obsolete suff, of unknown origin, perhaps influenced by the spelling of surge.

- ride on the crest of a wave, typically toward the shore while riding on a surfboard.
- move from site to site on (the Internet).

source
[sɔːs], noun

ORIGIN late Middle English: from Old French *sours(e)*, past participle of *sourdre* ‘to rise,’ from Latin *surgere*.

a place, person, or thing from which something comes or can be obtained.
- a spring or fountainhead from which a river or stream issues.
- a person who provides information.
- a book or document used to provide evidence in research.

source code
[sɔːs kəʊd], noun

a text listing of commands to be compiled or assembled into an executable computer program.

google
[ˈguːgl] **(also Google),** verb

ORIGIN from Google, the proprietary name of a popular Internet search engine.

- use an Internet search engine, particularly Google.com.
- search for the name of (someone) on the Internet to find out information about them.

googol
[guːgɒl], cardinal number

ORIGIN 1940s: said to have been coined by the nine-year-old nephew of E. Kasner (1878–1955), American mathematician, at Kasner's request.

equivalent to ten raised to the power of a hundred (10 100).

surveillance
[sɜːˈveɪləns], noun

ORIGIN early 19th cent.: from French, from *sur-* 'over' + *veiller* 'watch' (from Latin *vigilare* 'keep watch').

close observation, esp. of a suspected spy or criminal : he found himself put under surveillance by military intelligence.

agriculture
[ˈægrɪˈkʌltʃəˈ], noun

ORIGIN late Middle English : from Latin *agricultura*, from *ager*, agr- 'field' + *cultura* 'growing, cultivation.'

the science or practice of farming, including cultivation of the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.

cultural
[ˈkʌltʃərəl], adjective

ORIGIN mid 19th century: from Latin *cultura* 'tillage' + -al .

of or relating to the ideas, customs, and social behavior of a society.
- of or relating to the arts and to intellectual achievements.

anthropology
[ˌæn(t)θrəˈpɒlədʒi], noun

the study of humankind, in particular.
- (also cultural or social anthropology) the comparative study of human societies and cultures and their development.
- (also physical anthropology) the science of human zoology, evolution, and ecology.

stream
[stri:m], noun

ORIGIN Old English *strēam* (noun), of Germanic origin; related to Dutch *stroom*, German *Strom*, from an Indo-European root shared by Greek rhein 'to flow.'

1 a small, narrow river.
2 a continuous flow of liquid, air, or gas.
• Computing a continuous flow of data or instructions, typically one having a constant or predictable rate.
• a current within a larger body of water or in the ocean.
• (a stream/streams of) a mass of people or things moving continuously in the same direction.

verb

1 Computing: transmit (audio or video data) continuously, so that the parts arriving first can be viewed or listened to while the remainder is downloading.
2 (of liquid) run or flow in a continuous current in a specified direction.
• (of a mass of people or things) move in a continuous flow in a specified direction.
3 (of a person or part of the body) produce a continuous flow of liquid; run with liquid.

flow
[fləʊ], noun

ORIGIN Old English *flōwan*, of Germanic origin; related to Dutch *vloeien*, also to flood.

the action or fact of moving along in a steady, continuous stream.
• the rate or speed at which such a stream moves.
• the rise of a tide or a river.
• a steady, continuous stream of something.
• menstrual discharge.
• the gradual permanent deformation of a solid under stress, without melting.

verb

(esp. of a fluid) move along or out steadily and continuously in a current or stream.
• (of the sea or a tidal river) move toward the land.
• circulate continuously within a particular system.
• be available in copious quantities.
• (of a solid) undergo a permanent change of shape under stress, without melting.

data
[ˈdeɪtə], noun

ORIGIN mid 17th century (as a term in philosophy): from Latin, plural of *datum*

facts and statistics collected together for reference or analysis.
• Computing the quantities, characters, or symbols on which operations are performed by a computer, being stored and transmitted in the form of electrical signals and recorded on magnetic, optical, or mechanical recording media
• Philosophy things known or assumed as facts, making the basis of reasoning or calculation

Data was originally the plural of the Latin word: datum, 'something (e.g. a piece of information) given'. Data is now used as a singular where it means 'information'. It is used as a plural in technical contexts and when the collection of bits of information is stressed.

date
[deɪt], noun

ORIGIN Middle English: via Old French from medieval Latin *data*, feminine past participle of *dare* 'give'; from the Latin formula used in dating letters, *data* (epistola) '(letter) given or delivered,' to record a particular time or place

1 the day of the month or year as specified by a number.
2 informal a social or romantic appointment or engagement.
• a person with whom one has such an engagement.
• an appointment.
• a musical or theatrical engagement or performance, esp. as part of a tour.
3 informal go out with (someone in whom one is romantically or sexually interested).

landscape
[lænd ˈskeɪp], noun

ORIGIN late 16th century (denoting a picture of natural scenery): from Middle Dutch *lantscap*, from land 'land' + scap (equivalent of -ship).

all the visible features of an area of countryside or land, often considered in terms of their aesthetic appeal.
- a picture representing an area of countryside.
- the genre of landscape painting.
- figurative the distinctive features of a particular situation or intellectual activity.

verb

improve the aesthetic appearance of (a piece of land) by changing its contours, adding ornamental features, or planting trees and shrubs.

power
[ˈpaʊəʳ], noun

1 the ability to do something or act in a particular way, esp. as a faculty or quality.

2 the capacity or ability to direct or influence the behavior of others or the course of events.
- political or social authority or control, esp. that exercised by a government.
- a right or authority that is given or delegated to a person or body.
- the military strength of a state.
- a state or country, esp. one viewed in terms of its international influence and military strength.
- a person or organization that is strong or influential within a particular context.
- a supernatural being, deity, or force.
- (powers) (in traditional Christian angelology) the sixth highest order of the ninefold celestial hierarchy.

3 physical strength and force exerted by something or someone.
- capacity or performance of an engine or other device.
- the capacity of something to affect the emotions or intellect strongly.
- [as adj.] denoting a sports player, team, or style of play that makes use of power rather than finesse.
- the magnifying capacity of a lens.

4 energy that is produced by mechanical, electrical, or other means and used to operate a device.

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