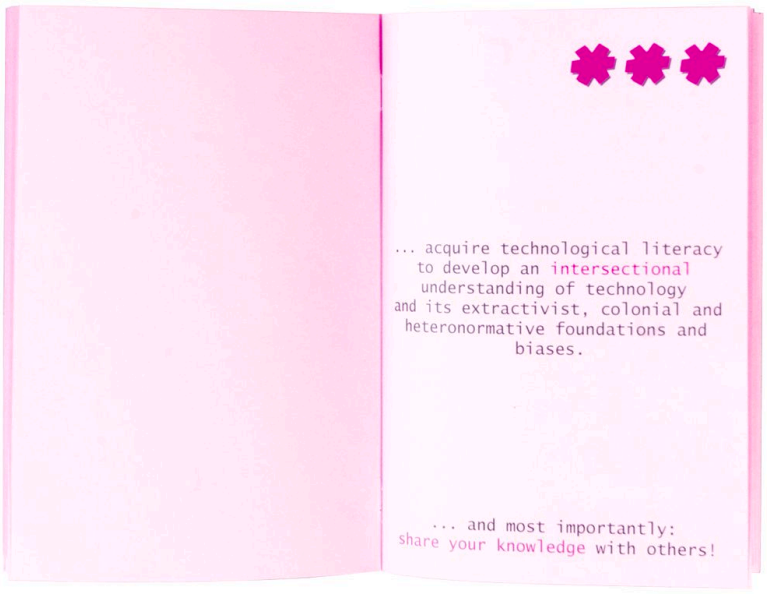
ETH Zurich Department of Architecture
ARCHITECTURE OF TERRITORY
Chair of Architecture
and Territorial Planning
Professor Milica Topalović

The Production of Cloud
Fall 2025

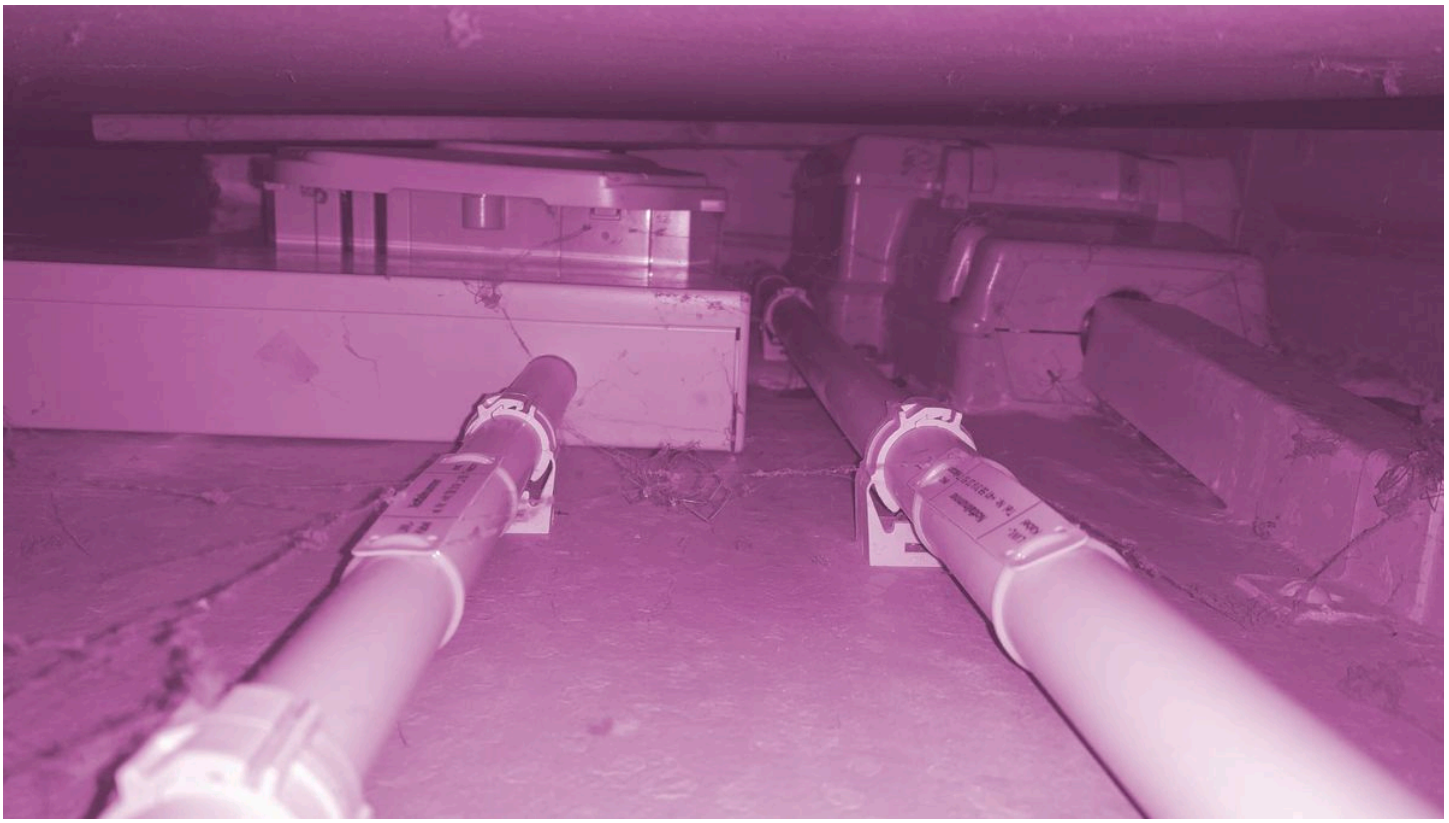
A Counter-Narrative— Abolishing the Data Centre

Gabriele Clarelli, Ellen Stettler, Laurin Fravi, and Giovanni Paolo Valota



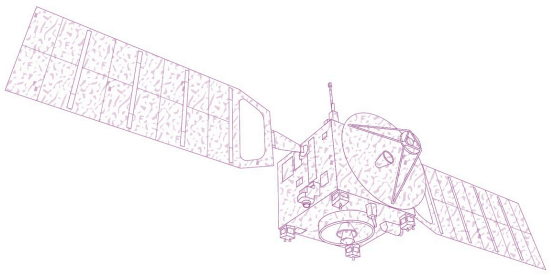
Data is often viewed as immaterial and opaque, supported by vocabulary such as “the cloud.” While narratives of infinite growth echo from Silicon Valley, this project investigates the material physical infrastructure that sustains the flow of data: the fibre optic backbone network and its infrastructural pieces, from microchip to submarine cable. The research follows the imperial and colonial paths of the digital infrastructure. It further focuses on ETH Zurich’s Swiss National Supercomputing Centre (CSCS), and how it positions itself within the geographies of AI that are built around supercomputers and superclusters. In the final part, the project tries to sketch a response to these contemporary geographies by presenting a different approach to technology.

Inconspicuous Infrastructures

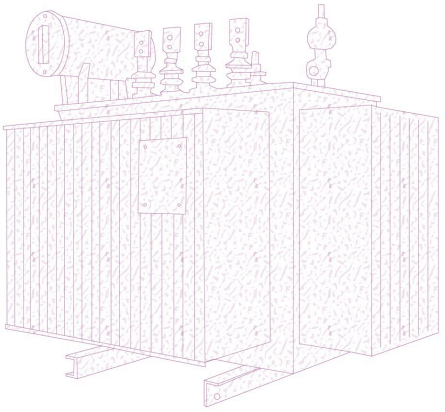


The cloud is not weightless. Beneath seamless data flows lies a dense assemblage of material-technological objects, territorial negotiations, and human labour. By examining the Swiss fibre optic network, we question the concept of digital immateriality.

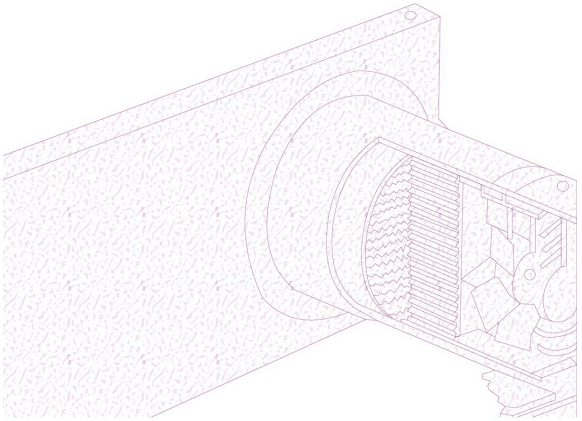
The method of cataloguing requires a mapping that is, according to Presner et al. (2014), an “on-going process of picturing, symbolising, contesting, re-narrating, re-symbolising, erasing and re-inscribing a set of relations.” This process renders visible objects on multiple scales that, as a system, create the grounds for other objects to operate on.



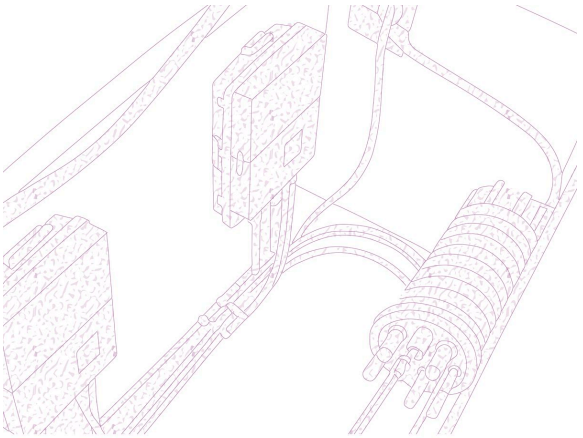
SATELLITE



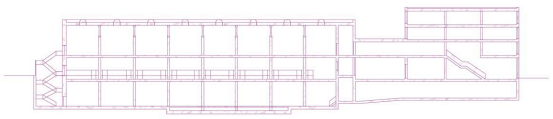
HIGH VOLTAGE TRANSFORMER



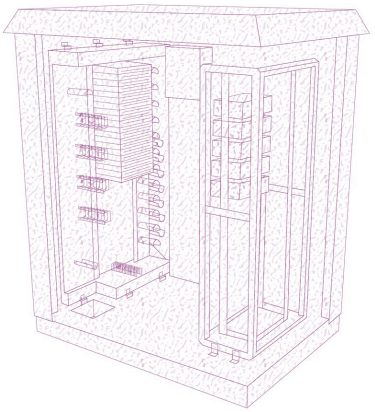
VENTILATION SYSTEM



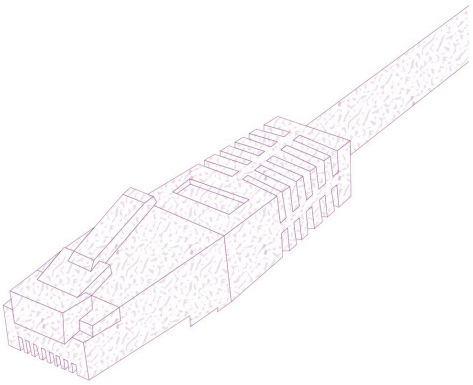
CONNETCTING COLLAR



CSCS - SUPERCOMPUTER

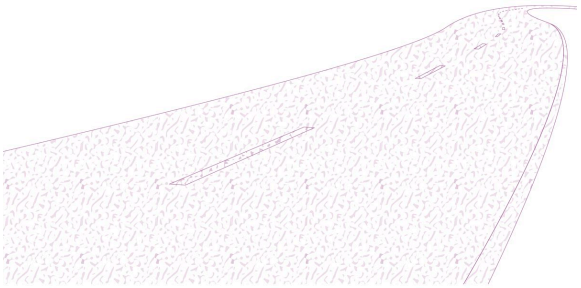


POP - POINT OF PRESENCE



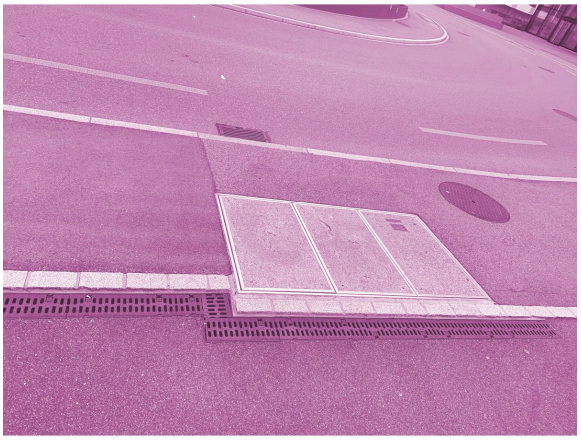
ETHERNET

WEATHER STATION



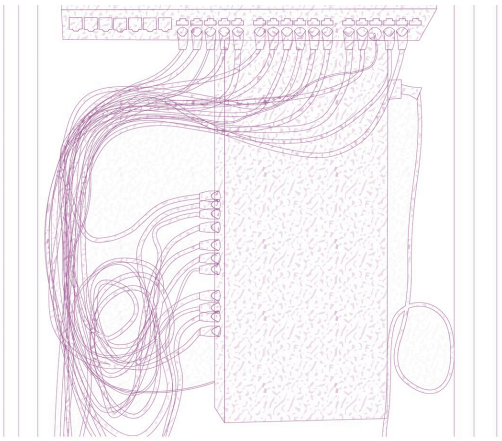
ROAD NETWORK

ETH ZURICH



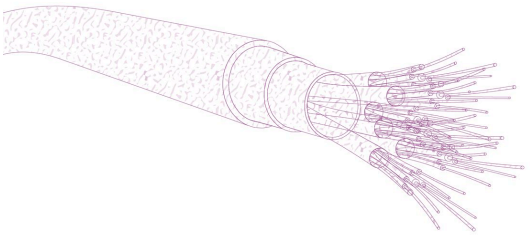
OPTIC FIBRE DUCT

OPTIC FIBRE CABLE

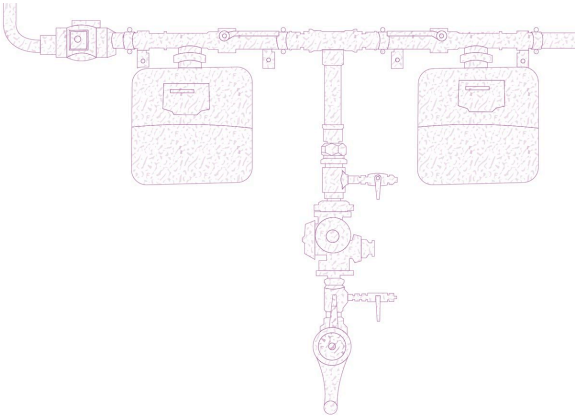


OPTIC FIBRE SERVICE ENTRANCE

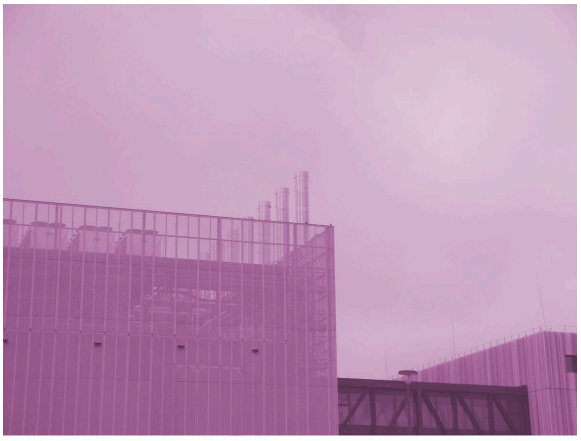
WEATHER STATION



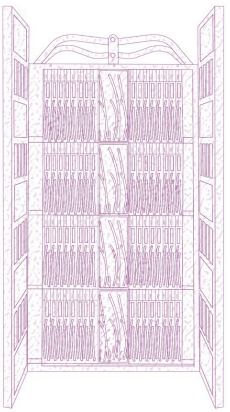
OPTIC FIBRE



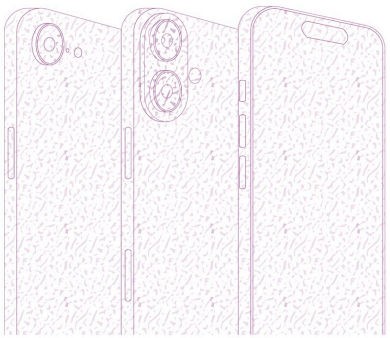
GAS PIPE



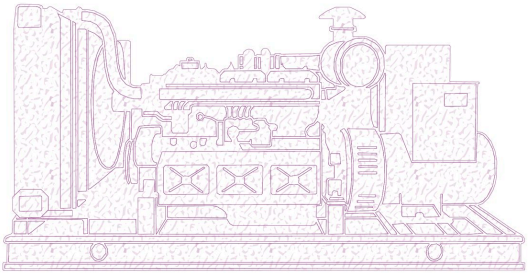
DIGITAL REALTY



SERVER

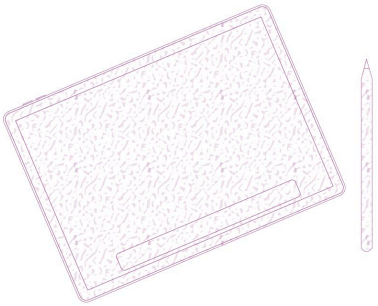


SMARTPHONE

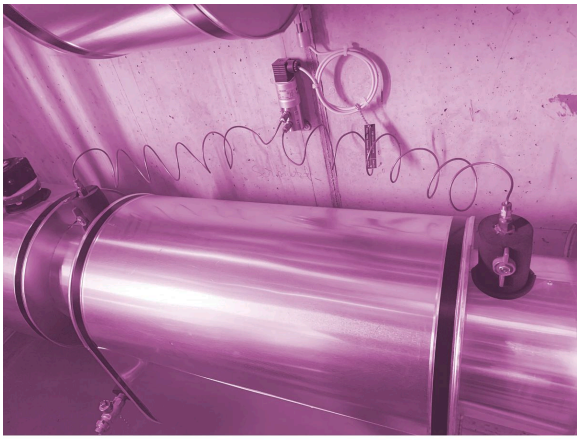


DIESEL GENERATOR

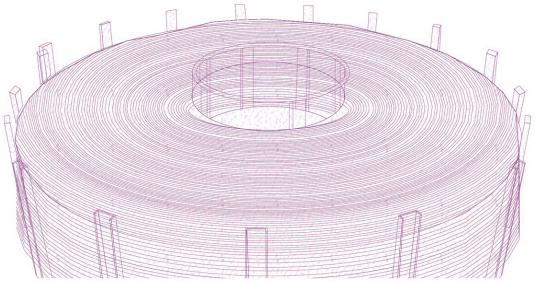
OPTIC FIBRE DUCT



TABLET

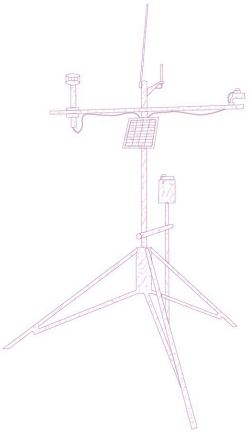


COOLING SYSTEM



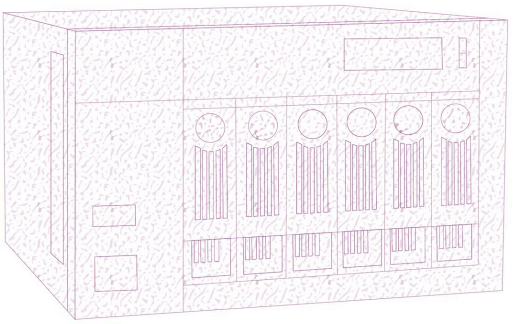
UNDERSEA CABLE

POP - POINT OF PRESENCE

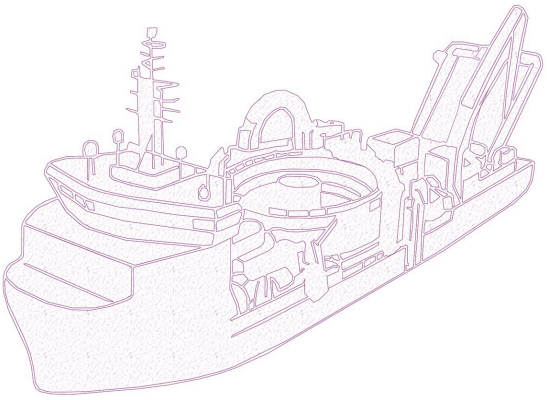


WEATHER STATION

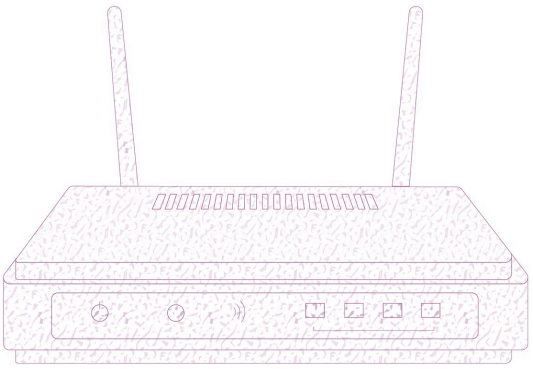
UNIVERSITY OF ZURICH



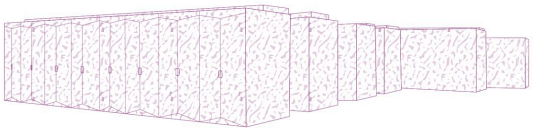
NAS - NETWORK ATTACHED STORAGE



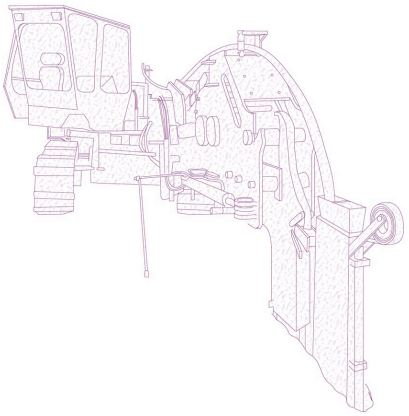
UNDERSEA CABLE LAYING VESSEL



MODEM



PROCESSOR

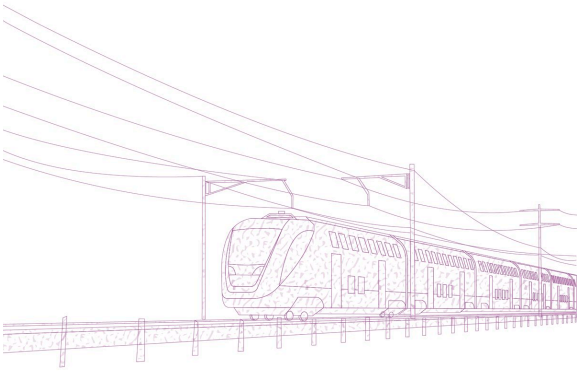


OPTIC FIBRE CABLE PLOW

OPTIC FIBRE SERVICE ENTRANCE

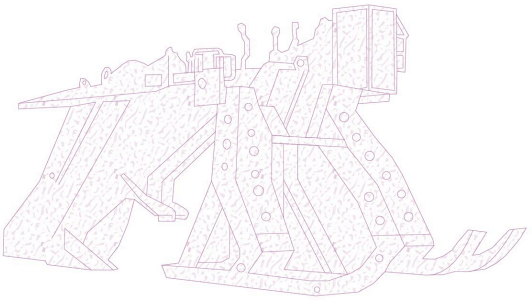
LAPTOP

CSCS

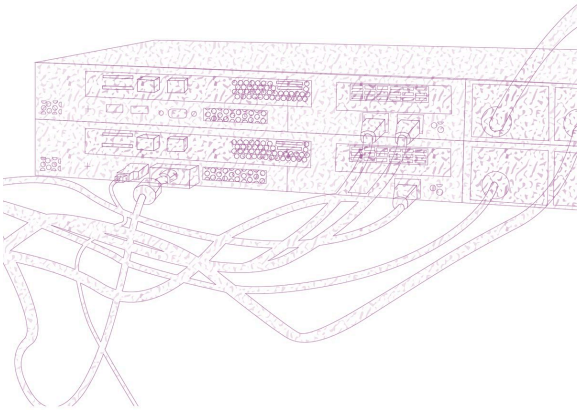


TRAIN NETWORK

POP - POINT OF PRESENCE

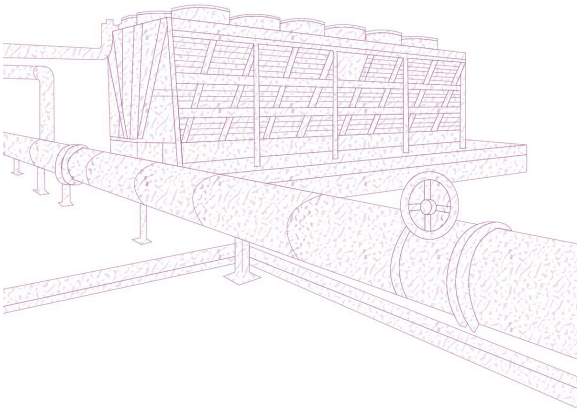


UNDERSEA CABLE PLOW



ROUTER

LAYING OF GAS PIPE



COOLING SYSTEM

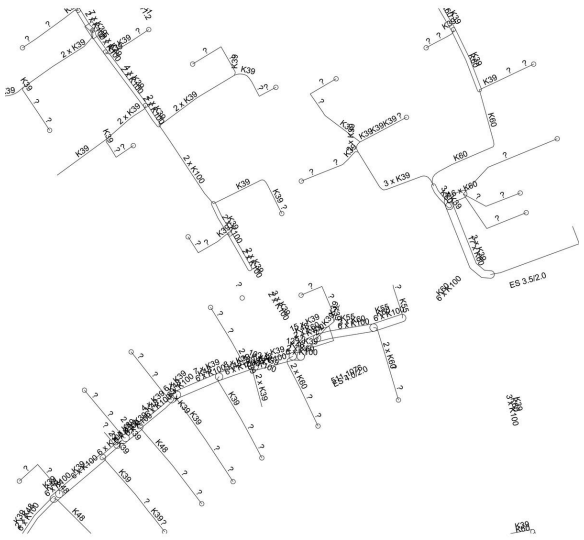
OPTIC FIBRE SERVICE ENTRANCE

POWER SUPPLY LINE

POP - POINT OF PRESENCE

WEATHER STATION

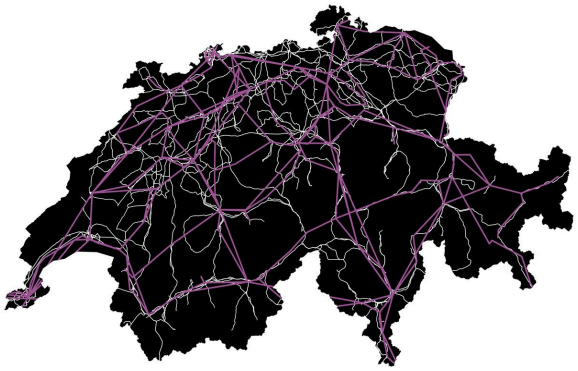
In order to understand how data flows function, an analysis of the material infrastructures that cross our territories is necessary. The things we see and interact with, our computers and smartphones, rely on an assemblage of material-technological objects and human labour along a multilayered supply chain. The way these items are put in relation to each other is what is described here as inconspicuous infrastructures. Placing the material-technological objects at the centre of our analysis is an effort to de-hierarchise the understanding of digital spaces and architectures as immaterial and complex and therefore out of reach of societal discourse. This often intentionally constructed over-complication has been theorised as a tactic of states and more recently tech-imperialists. The system of core interest here is the Swiss fibre optic network, its relation with and dependency on other infrastructures, its global connectivity, and the power that lies in the infrastructure.



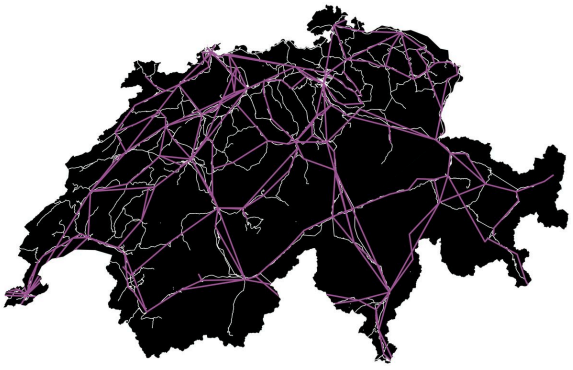
Fiber-to-the-Home (FTTH) connections in Zurich's Niederdörfli. Source: Swisscom Netzauskunft, 2025.

Fibre optic cables in Zurich's district 1. Source: Swisscom Netzauskunft, 2025.

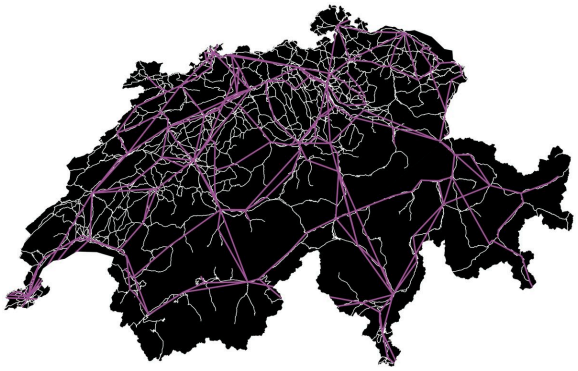
The Fiber-to-the-Home (FTTH) connection marks the threshold between the public and the private domain. Fibre optic cables run through the streets and enter a building where abstract light pulses are spliced into domestic data flows. At street level, the apparent seamlessness of digital communication is revealed to be a complex assemblage of infrastructure and labour. Streets are excavated, fibres are laid, trenches are filled, exposing the material and social effort underlying the digital network. While data travels at the speed of light, infrastructure progresses at the speed of human labour and bureocratic negotiations. This discrepancy further underlines how the digital is fundamentally grounded.



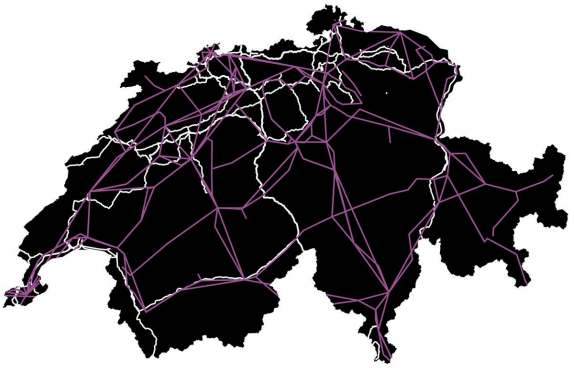
Fibre optic (purple) and electricity network (white). Source: ITU, geo.admin.ch, 2025.



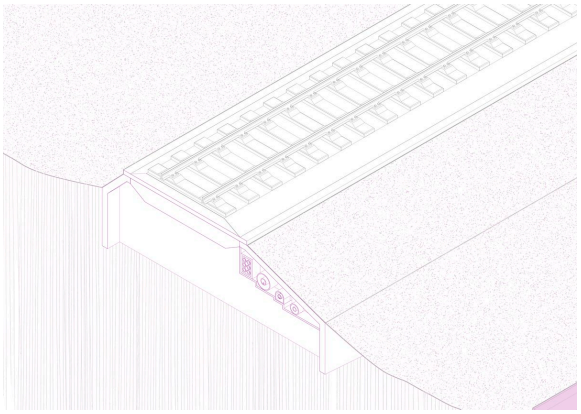
Fibre optic (purple) and railway network (white). Source: ITU, geo.admin.ch, 2025.



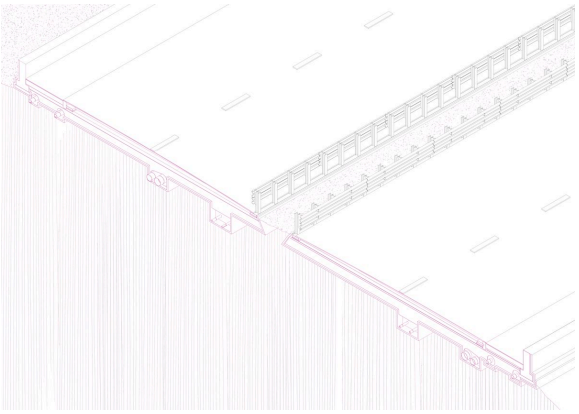
Fibre optic (purple) and trunk and secondary roads (white). Source: ITU, geo.admin.ch, 2025.



Fibre optic (purple) and gas network (white). Source: ITU, geo.admin.ch, 2025.

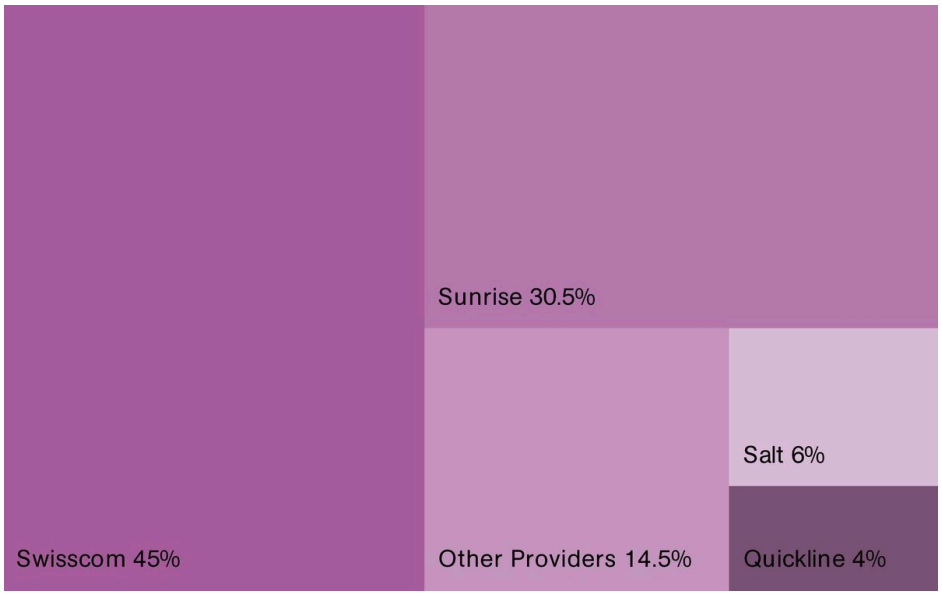


Railway, axonometric section. Drawing: the authors.



Road, axonometric section. Drawing: the authors.

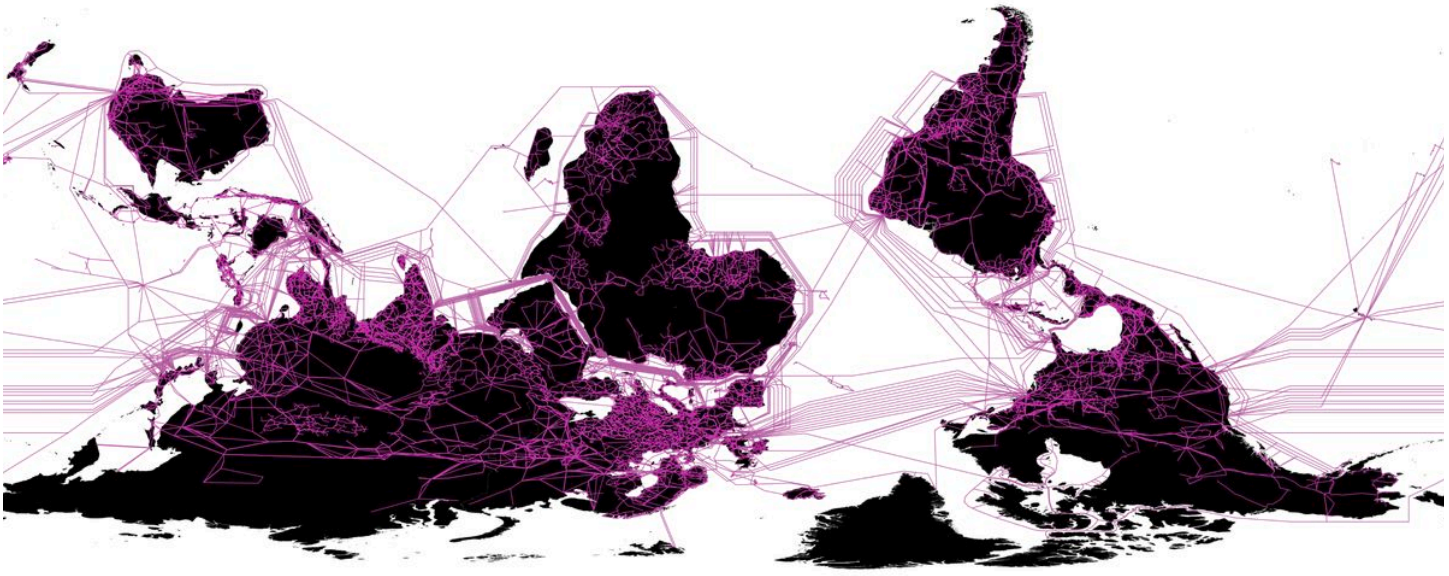
In Switzerland, the fibre optic's territorial dependency on other infrastructures is clearly visible. Comparing the fibre optic network with public infrastructures, such as the electricity network, gas pipelines, highways, or railway lines, reveals shared spatial logics. Guidelines determine how utilities are positioned in the streets and below the ground.



Market shares of broadband providers in Switzerland. Source: connect.de, 2025.

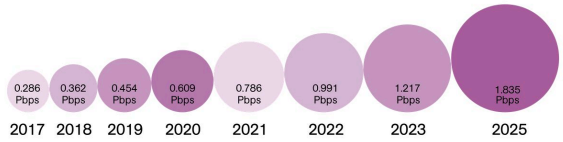
Swisscom dominates the fibre optic network as a semi-public entity, followed by private providers like Sunrise and Salt. They rely on public infrastructures and space, yet the specifics regarding the network's exact position and influence on surroundings remain undisclosed to the public.

Imperial Continuums

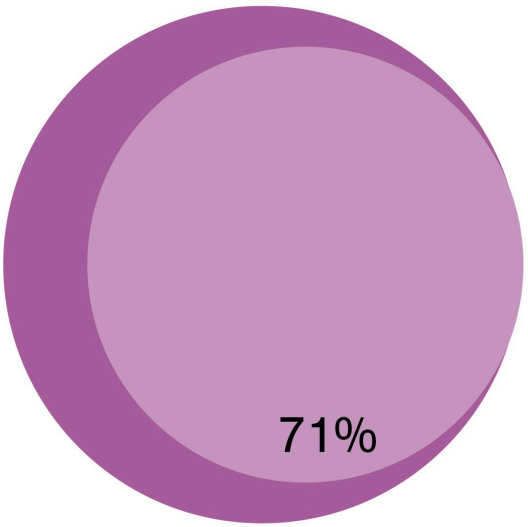


The cloud is a planetary infrastructure, shaped by geopolitical dependencies. Submarine cables reveal how connectivity relies on a handful of tech giants, continuing imperial logics of extraction, control, and growth.

The Swiss fibre optic network extends beyond national borders, connecting to transcontinental nodes such as Marseille. Here, the terrestrial fibres merge with a dense congregate of submarine cables linking Europe to Africa, the Middle East and the Americas. At this scale, the apparent autonomy of national networks dissolves into shared responsibilities. Within these geopolitical dependencies, a few global players maintain significant power and continue to expand their influence through an imperial-colonial logic. Submarine cables form the true backbone of the global internet, enabling the overwhelming majority of global data traffic. Their construction and maintenance, carried out by specialised cable-laying vessels crossing oceans, show the immense material and logistic effort behind seemingly immaterial digital communication.

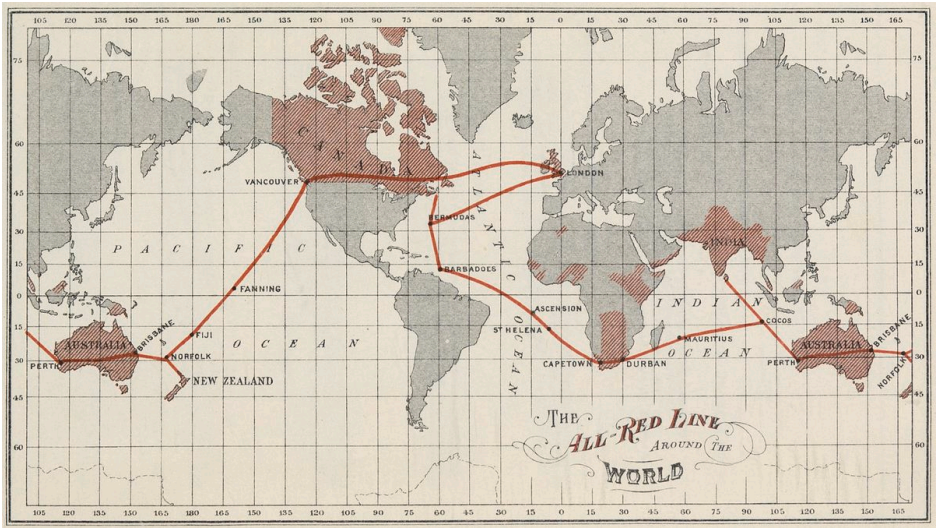


Development of global international internet bandwith (in petabytes per second). Source: Telegeography, 2025.



Share of "hyperscalers" in global internet traffic. Source: Teleography, 2025.

Once controlled by national telecom providers, the sector has increasingly been taken over by large corporations. Today, hyperscalers such as Google, Meta, Microsoft and Amazon not only invest heavily in new cables but also generate the majority of global demand for international bandwidth, accounting for roughly 70 % of utilised capacity in 2022. Control over submarine cables translates into control over global data flows. By deciding where cables land and which regions they connect, their presence is extended across borders, exercising power through infrastructure.

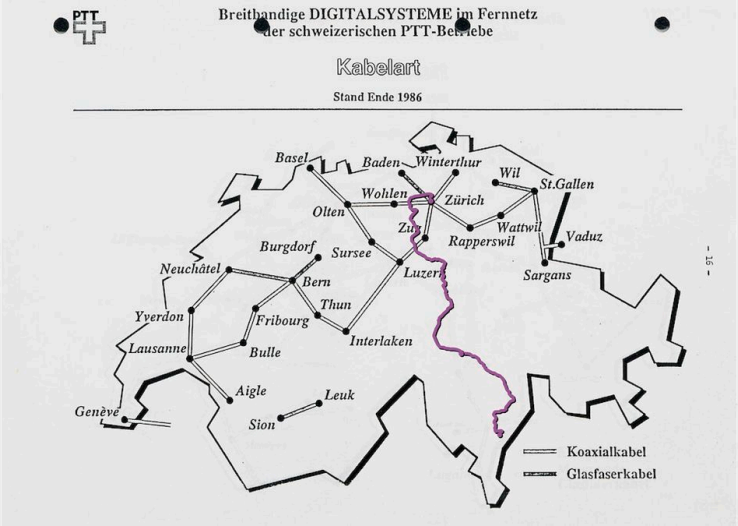


The "All Red Line" connecting the British Empire. Source: George Johnson, *The All Red Line: The Annals and Aims of the Pacific Cable*, 1903.

This rapid concentration of infrastructure in the hands of a few US-based companies is reshaping global power relations and producing new transnational power monopolies. Control over cables gives not only infrastructural dominance but also economic, resource-based and epistemic power, echoing imperial systems. Earlier precedents, such as the British Empire's "All Red Line," a telegraph cable of early 20th century, which connected the Empire's dominions and colonies around the world, illustrate how backbone infrastructures have long functioned as tools of geopolitical control. Contemporary fibre optic networks continue this legacy of using connectivity for political and imperial endeavours.

Positioning the Supercomputer

When situating the Swiss National Supercomputing Centre (CSCS) in the global scale, the material interface between the AI capital and a national infrastructure becomes apparent. The CSCS is an exemplar of the considerable expense of digital development, built on exceptional territorial, energetic, and infrastructural arrangements. The CSCS functions as a physical extension of the global AI machine, powered by NVIDIA superchips.



1986 Swiss broadband long distance network superimposed with added connection from ETH Zurich to CSCS in Lugano. Source: PTT Archive, 1986; edited by the authors.

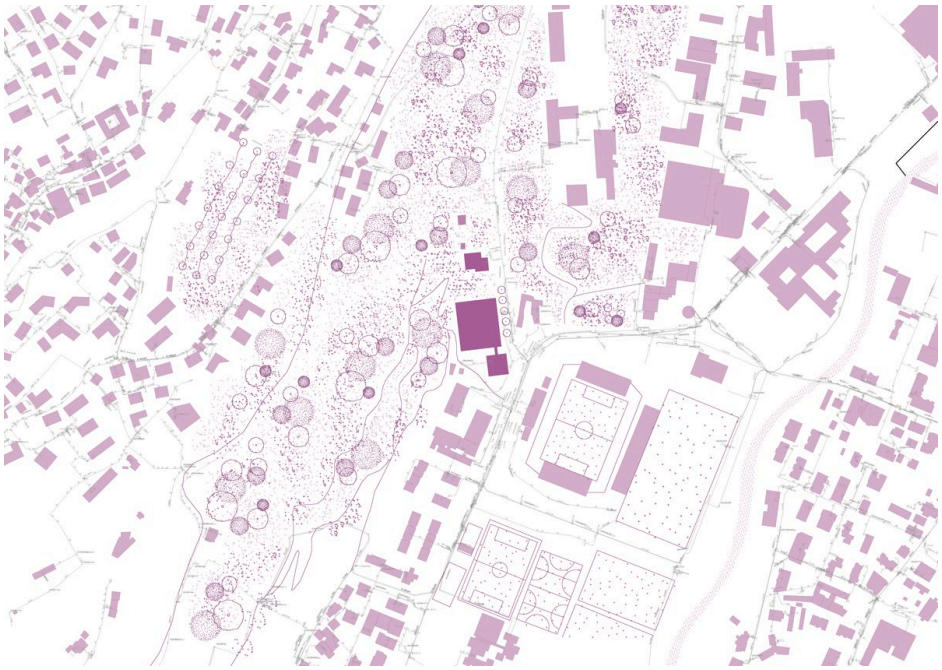
The introduction of fibre optics in the late 1970s marked the beginning of a new technological era. In December 1978, the Swiss Post, Telephone and Telegraph Enterprises (PTT) inaugurated the first Swiss fibre optic telephone cable beneath the streets of Bern and called it a “new epoch of communication.” Technological infrastructure was integrated into the national narrative of progress, and Switzerland was proclaimed to be at the forefront of technological advancement.

Eight years later, in 1986, the map shows the Swiss PTT web of coaxial and glass fibre cables connecting the country’s main cities. A void is still visible on the southern side of the Gotthard Tunnel. This changed in 1991, when, as an act of federalism, the Swiss State decided to build a supercomputing centre in Manno, near Lugano. It was to be owned and operated by ETH Zurich. In the 2000s, facing fast developments in computing research, the Federal Council and ETH Zurich started planning a new centre only a few kilometres away in the city of Lugano.

CSCS construction site.
Source: hpc-ch YouTube, 2011.

Laying of cooling pipes.
Source: hpc-ch YouTube, 2011.

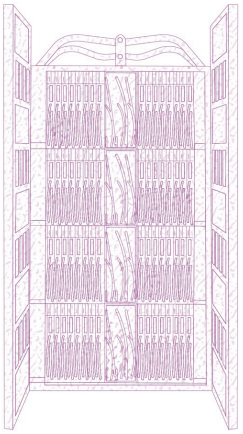
The city of Lugano granted ETH Zurich 4000 m^2 of land in Cornaredo free of charge for a period of 40 years to build a new Supercomputing Centre. Completed in 2013, the Swiss National Supercomputing Centre (CSCS) consists of a concrete box, computing infrastructure, next to a glass box, an office building. One of the world's largest cranes had to be mobilised during construction to carry the 35-metre-long concrete beams, which highlights the building's material scale. To ensure the continuous electricity supply, a special agreement with the local energy provider AIL (Aziende Industriali di Lugano) was made. The cooling is ensured by a 3-kilometre-long pipe running from Lake Lugano to Cornaredo.



CSCS site plan. Drawing: the authors.

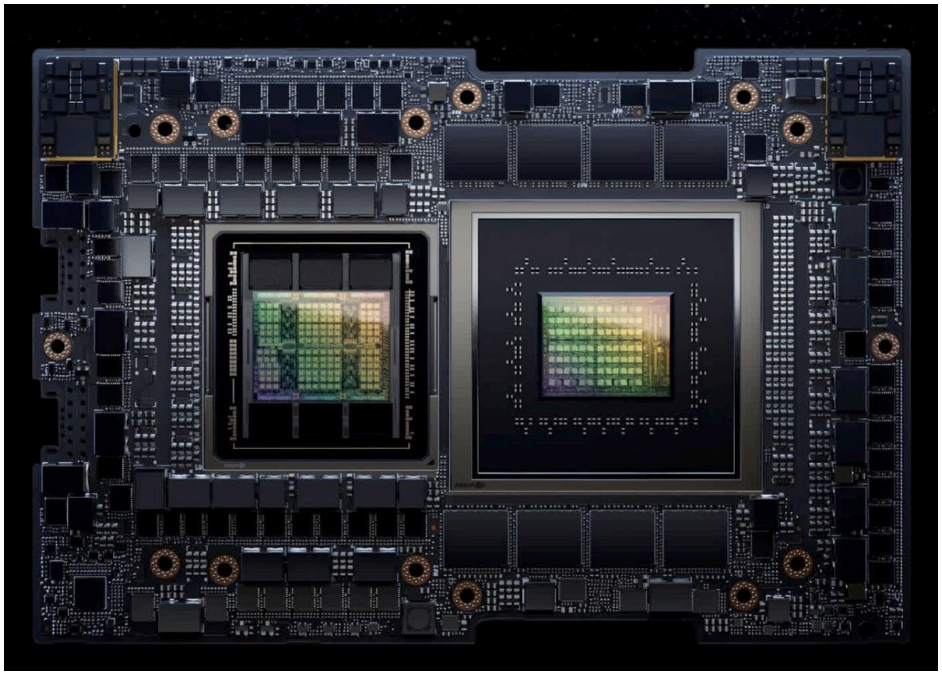
As a research institution, the CSCS, together with its parent institution ETH Zurich, positions itself at the forefront of technological innovation. With a power demand of 25 megawatts, the centre operates the ALPS computer alongside other extensive computing and storage infrastructure for partner institutions.

ALPS supercomputer. Source: CSCS, 2024.



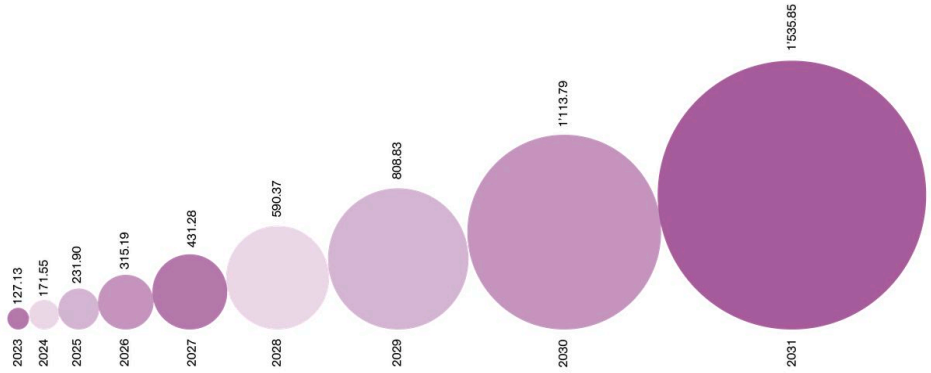
Server rack. Drawing: the authors.

The ALPS supercomputer, inaugurated in September 2024, is designed to meet the extreme computational demands of contemporary science. It is conceived as a "general-purpose compute and data research infrastructure" and is open to a broad community of researchers in Switzerland.



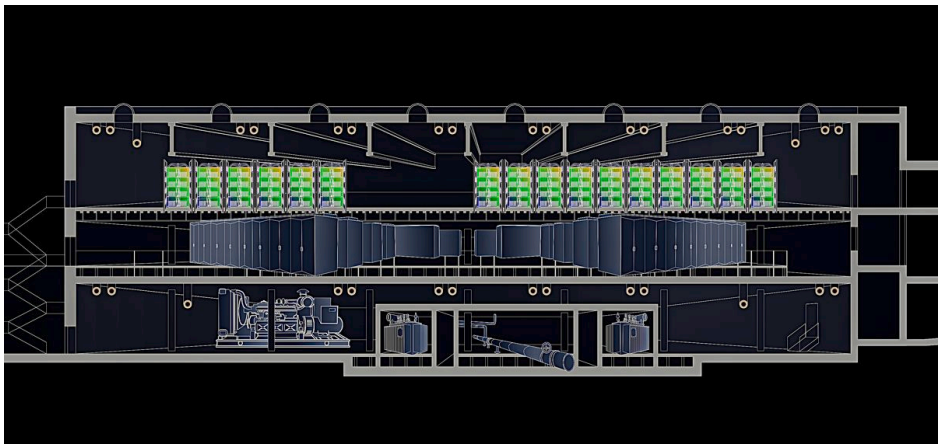
Nvidia Grace Hopper superchip. Source: Nvidia.

To sustain this capacity, ALPS was the first supercomputer to be equipped with Nvidia Grace Hopper Superchips. These chips, which combine CPUs and GPUs, have become indispensable on the global AI market and are basic requirements in the global technology landscape.



Current and projected global investments in AI (billions). Source: Statista, 2025.

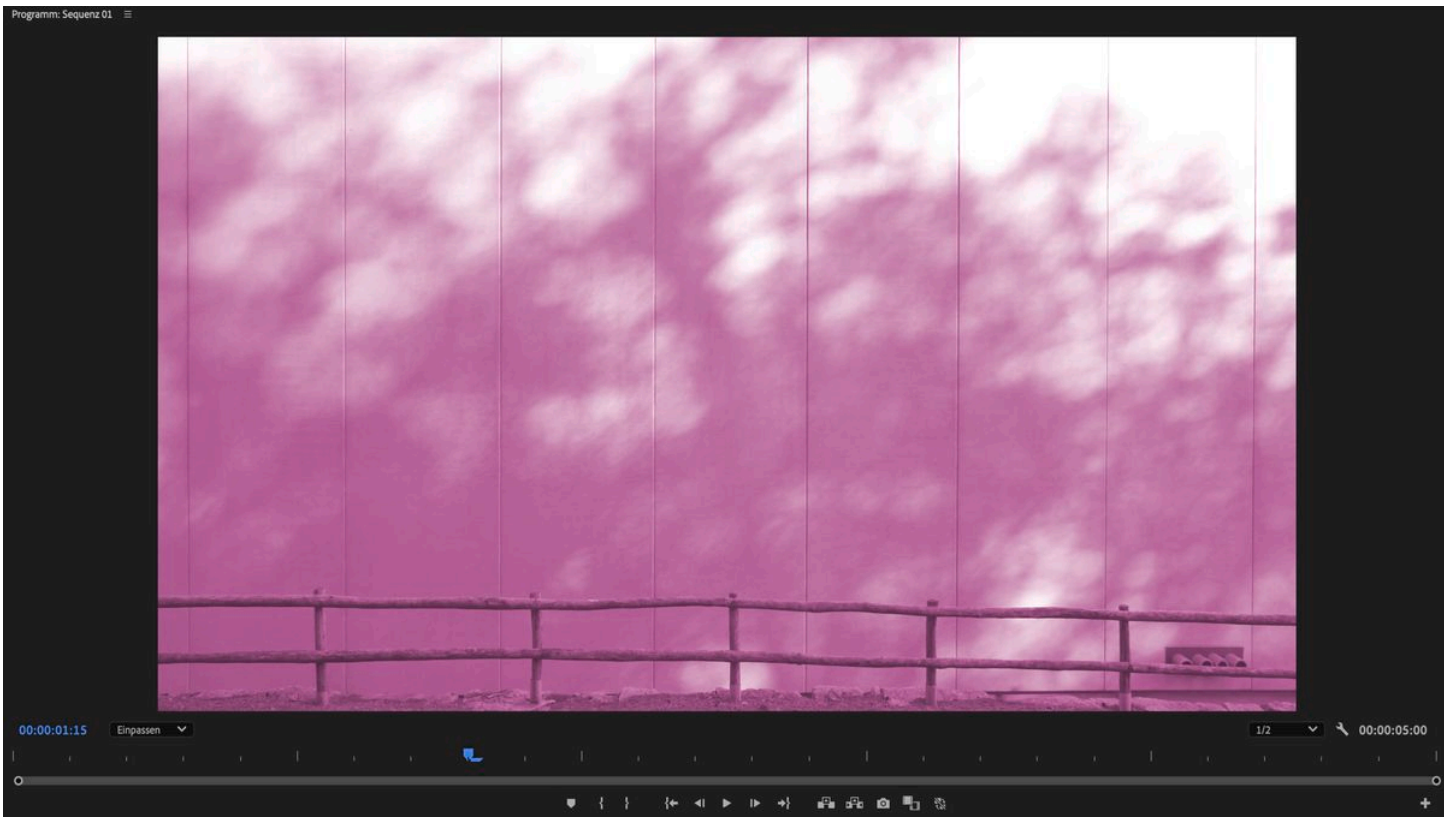
Staying competitive in the context of an accelerating AI race means using Nvidia. Supplying roughly 80 % of the global AI market, Jensen Huang's company operates a near-monopoly within the computation bubble. The lack of alternatives no longer matters, as the pressure to remain competitive is stronger than concerns about dependency. With Nvidia surpassing a 4 trillion dollar market capitalisation in July 2025, it became the most valuable company in the world, showing that digital development continues at a breakneck pace. New data centres are appearing everywhere, and investments in machine learning show no sign of slowing down. This growing discrepancy between accelerated digital innovation and the relatively slow construction of its physical infrastructure becomes evident in the lifecycle of supercomputers themselves: after its inauguration, ALPS ranked first on the Top 500 list of fastest supercomputers, only to fall to the 8th place within a year.



Section of CSCS. Drawing: the authors.

In this capital-driven system, the CSCS is not merely a data centre hosting computing, but a scaled, materialised extension of the global AI market. It becomes a physical manifestation of the chip's logic, embedding Nvidia's economic and operational principles directly into a national research institution.

Geographies of AI



The global race for AI is accelerating at an unprecedented pace. A video essay explores the position of CSCS and ETH Zurich within these dynamics.

The frenzy around the current developments in AI is global, driven primarily by the United States and China. Their governments are actively pushing the industry forward with initiatives such as the American AI Action Plan, released by the White House in July 2025.

„(…) As our global competitors race to exploit these technologies, it is a national security imperative for the United States to achieve and maintain unquestioned and unchallenged global technological dominance. To secure our future, we must harness the full power of American innovation.“ (Winning the Race: America's AI Action Plan)

In the fast-paced development of the AI sector, state regulations such as the EU AI Act are neither equipped nor designed to control developments like these, where capital is the driving force.

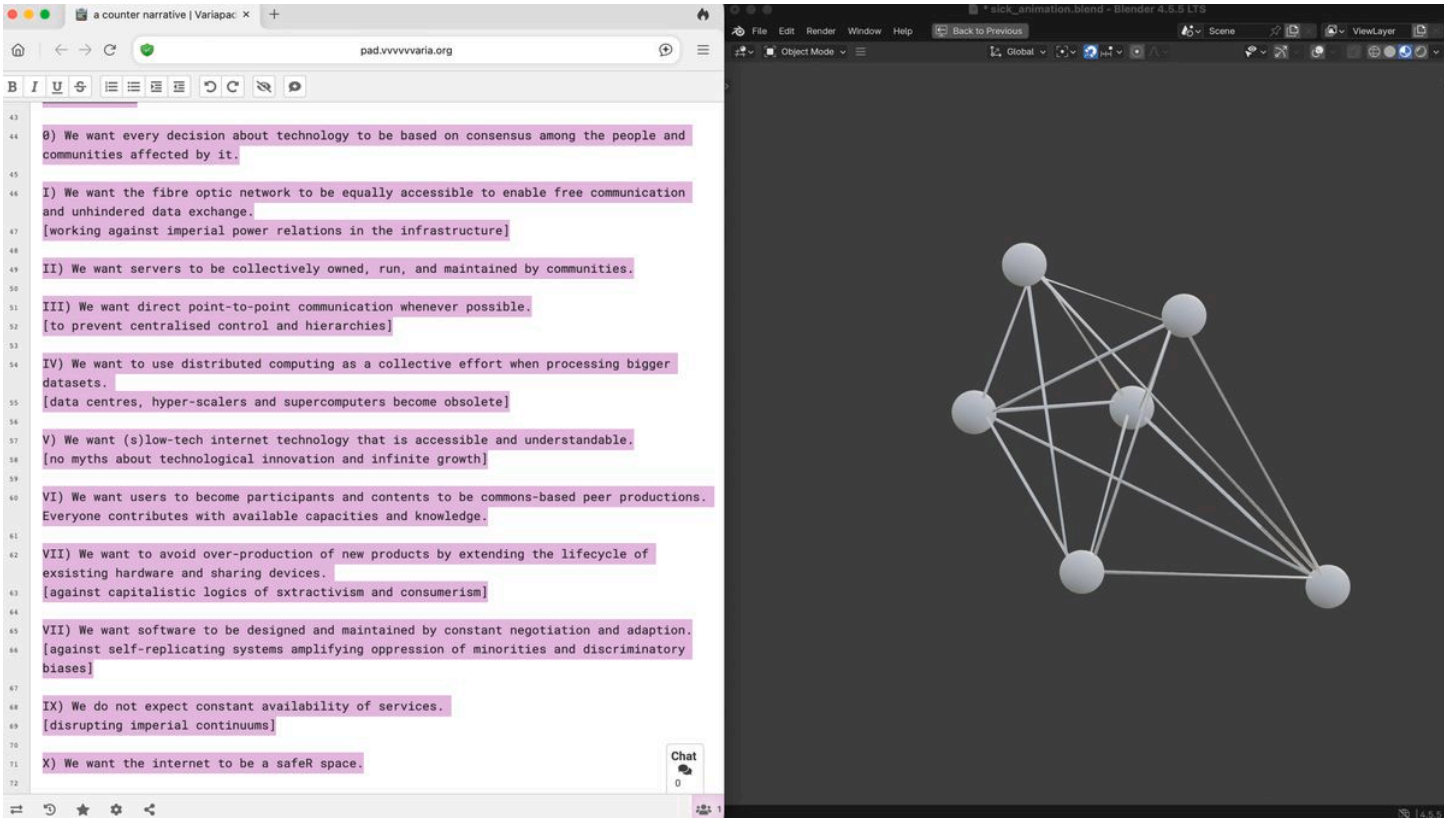
The Swiss AI Initiative is building its own sovereign AI model named “Apertus” to keep up with this accelerating AI race. Apertus is a foundational large language model (LLM) on which researchers and small and medium-sized enterprises (SMEs) can build their own specialised tools. Its first generation has been trained on the before mentioned ALPS supercomputer in summer 2025.

Using the recent launch of Apertus, the following video-essay is an investigation on how CSCS and ETH Zurich are positioned within technological developments, particularly in the context of the global race for AI, and techno-optimist and -inevitabilist ideologies.

Geographies of AI, video essay, 2025.
https://www.youtube.com/watch?v=qaCX7XV5gNA

It becomes apparent that the CSCS is part of the geographies of AI that are built around supercomputers and superclusters, centralising geographies of extraction, surveillance, and oppression.

A Counter-Narrative



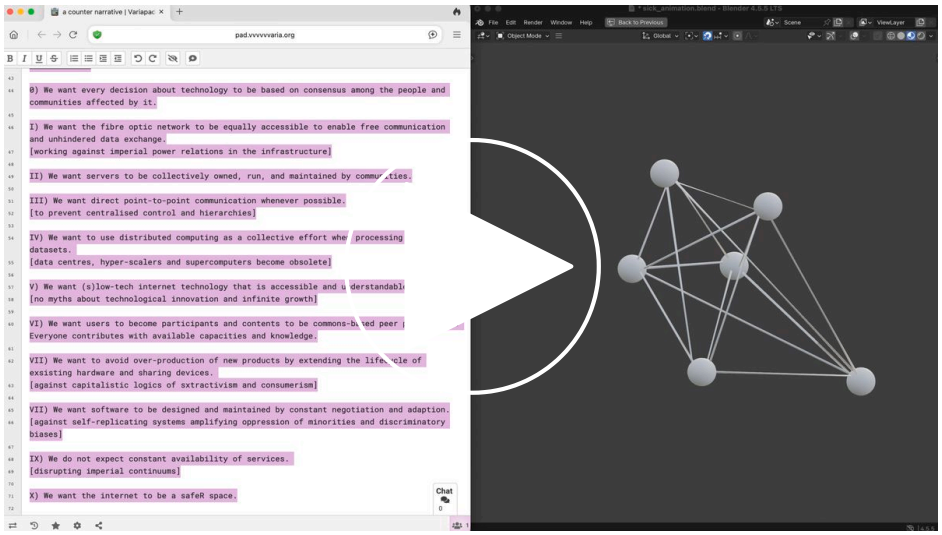
An audiovisual sketch of an alternative approach to technology.

We understand that data centres in their current state are buildings of the neoliberal empire.

We realised that within these geographies we cannot just change a few architectural features of a given data centre.

We cannot begin with the data centre. We have to start with the technology behind it, the connectivity, the internet, the user, the data. We have to build our own literacy in order to go forward. We have to figuratively abolish the data centre and think of ways of connectedness.

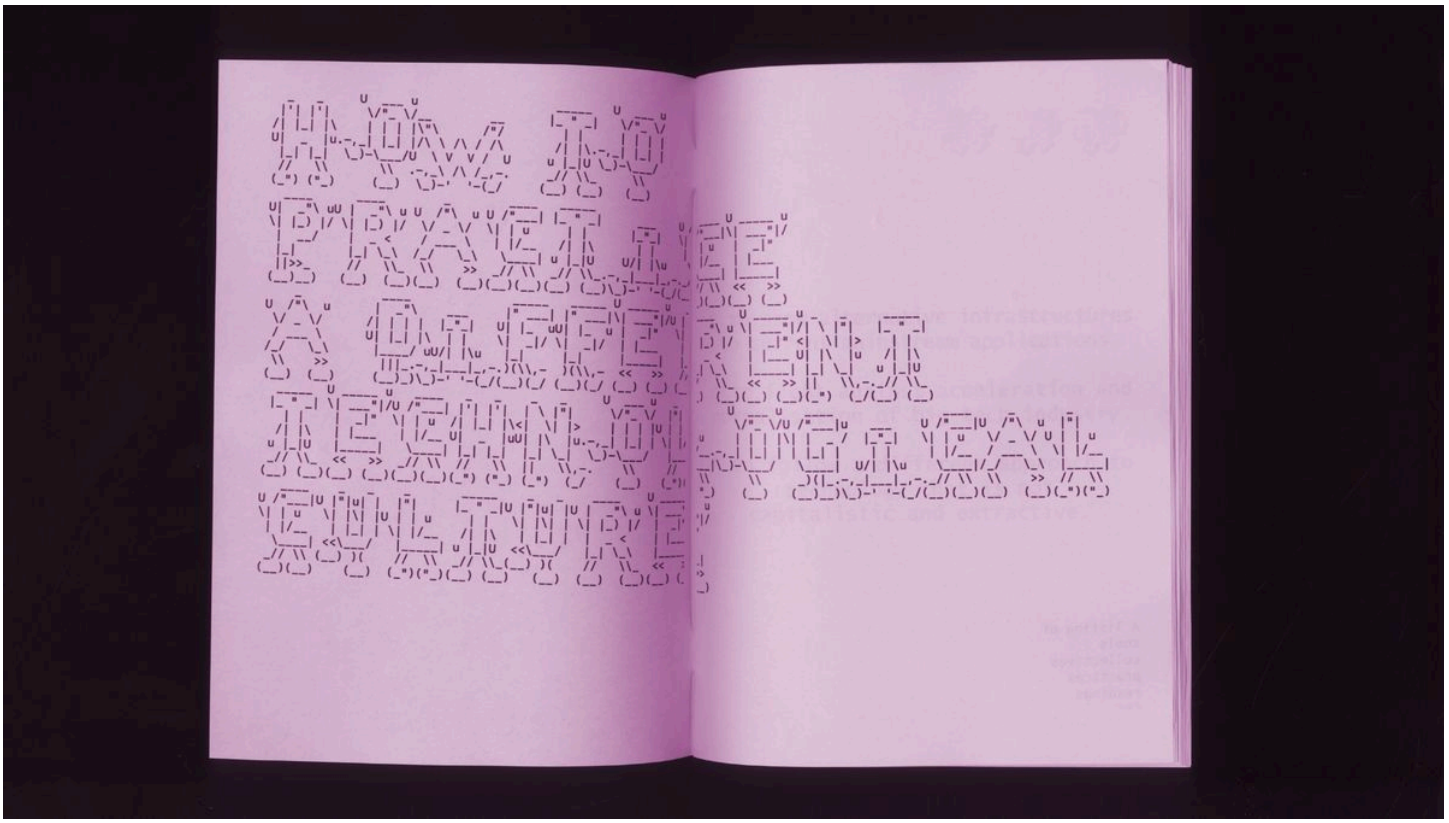
We have to counter “The Techno-Optimist Manifesto” and its techno-capital machine with our own narratives. We have to define our own way of approaching technology. For this we have to start now, while maintaining an imaginary of a future worth aspiring to.



A Counter-Narrative, video essay, 2025.
https://www.youtube.com/watch?v=i1h952rFhsg

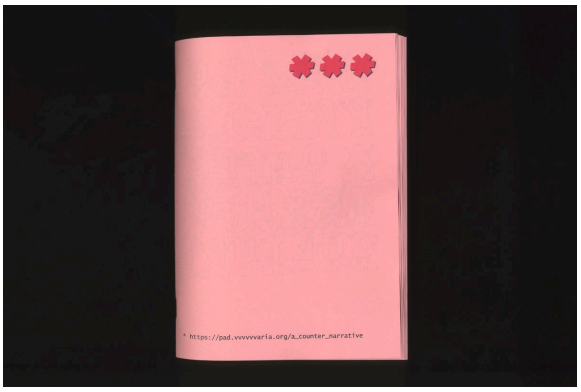
Follow this link [https://pad.vvvvvvaria.org/a_counter_narrative] to access the collaborative file with our approach to technology and the list of things we demand. The list is to be continued. Add your own approaches, wishes, and demands.

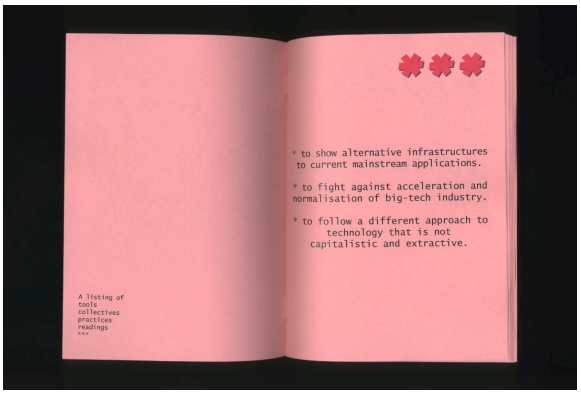
How to Practice a Different Technological Culture

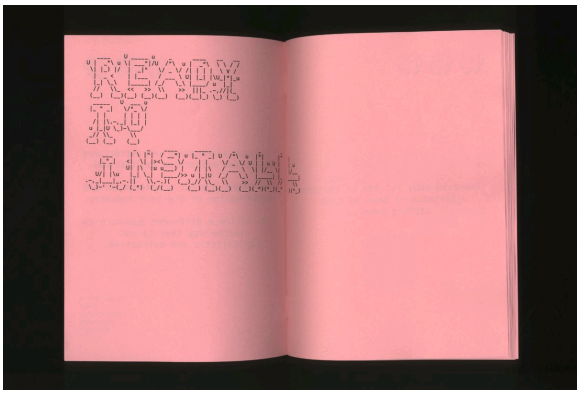


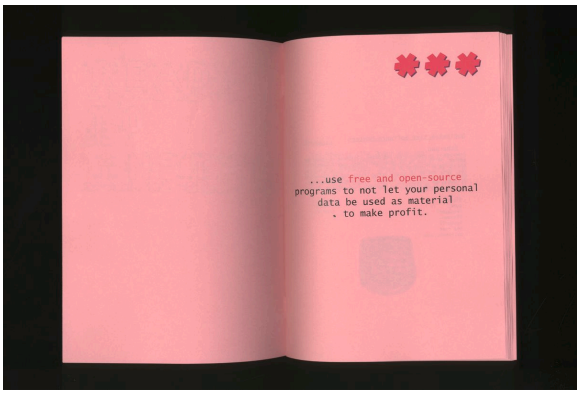
A list of tools, collectives, practices, and readings toward a counter-narrative.

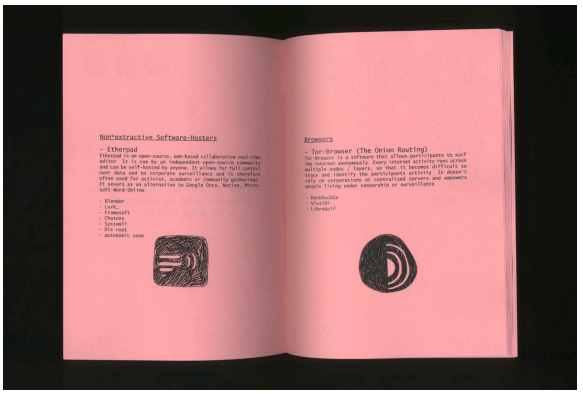
The situation outlined above raises a wide range of societal, political, and economic issues, which have been theorised and critically analysed by scholars early on. In this final part, we respond to this contemporary geographies by presenting a different approach to technology. The booklet begins with a listing of open-source software, applications and alternative modes of communication. Drawing on a wide range of text-based sources, we advocate for acquiring technological literacy. Finally, we conclude with a recontextualisation of early mesh-network initiatives as an invitation to practice a free and independent technological culture.

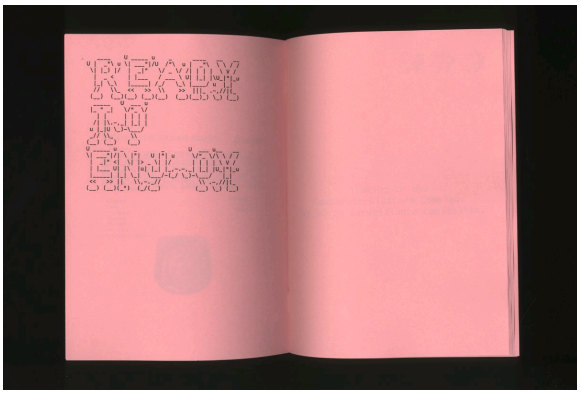


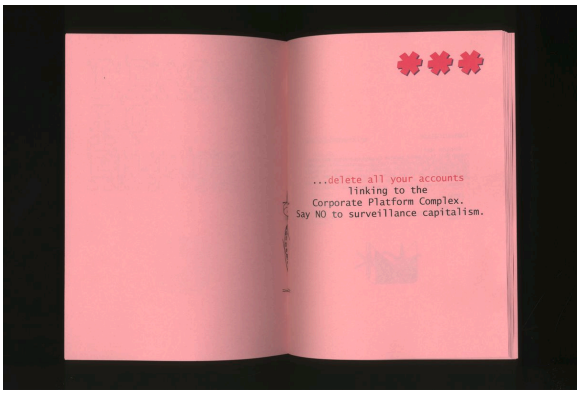


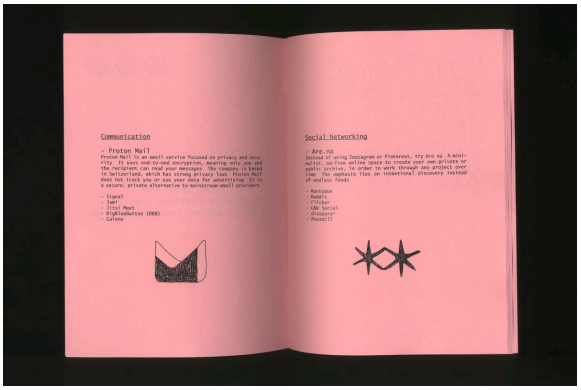


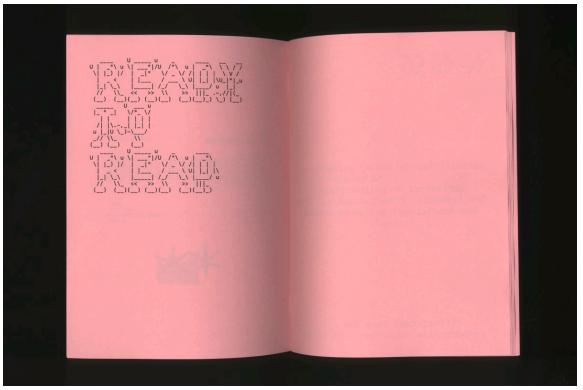


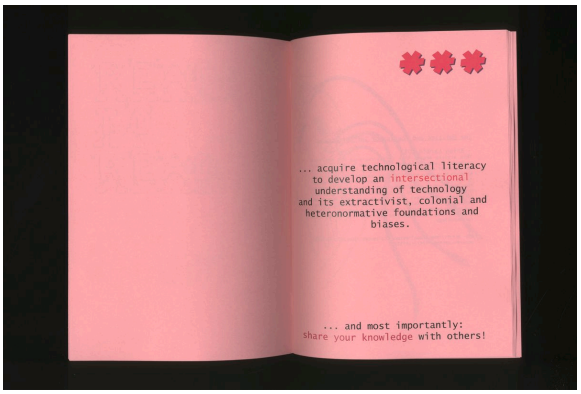


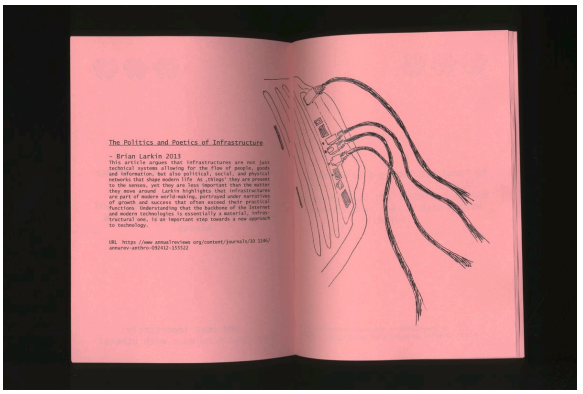


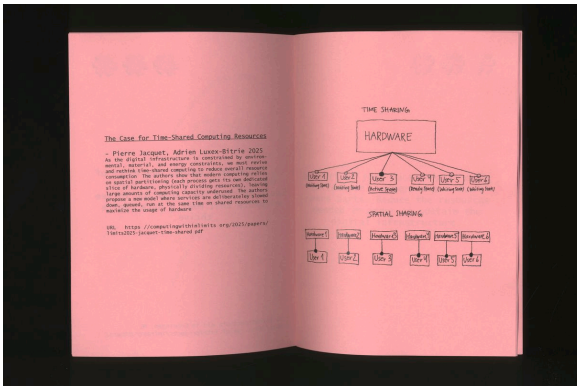

...delete all your accounts
linking to the
Corporate Platform Complex.
Say NO to surveillance capitalism.

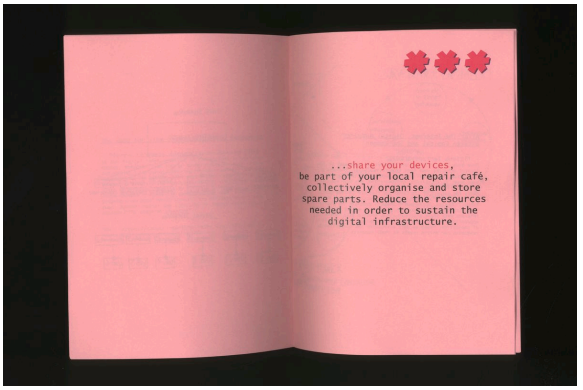

Communication
- Proton Mail
Social Networking
- Are.na

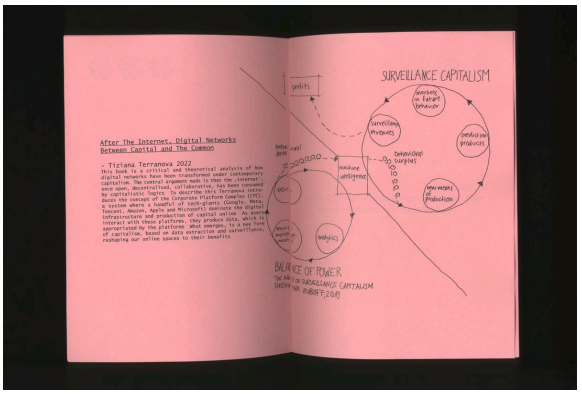


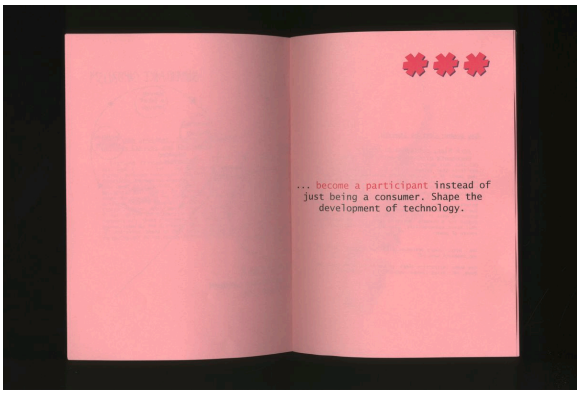

... acquire technological literacy
to develop an intersectional
understanding of technology
and its extractivist, colonial and
heteronormative foundations and
biases.
... and most importantly:
share your knowledge with others!


The Politics and Poetics of Infrastructure
- Brian Larkin 2013

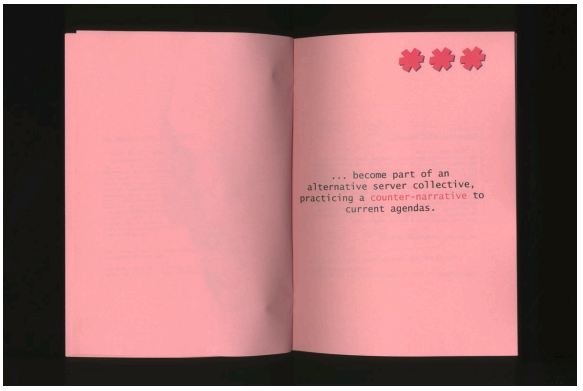

The Case for Time-Shared Computing Resources
- Pierre Jacquet, Adrien Luxey-Bitrie 2025
TIME SHARING
HARDWARE
SPATIAL SHARING

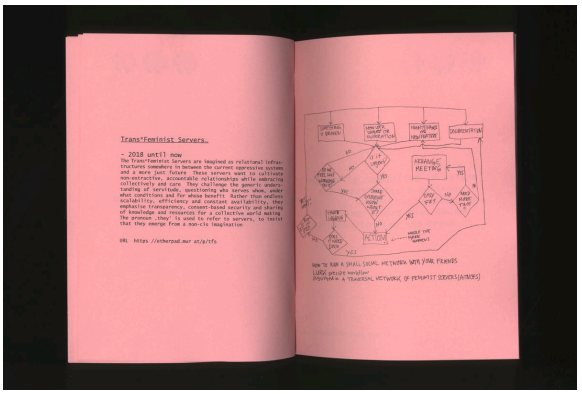

...share your devices,
be part of your local repair café,
collectively organise and store
spare parts. Reduce the resources
needed in order to sustain the
digital infrastructure.

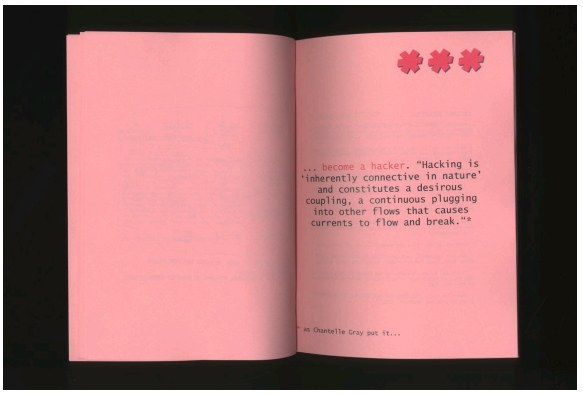

After The Internet, Digital Networks
Between Capital and The Common
- Tiziana Terranova 2022
SURVEILLANCE CAPITALISM
BALANCE OF POWER

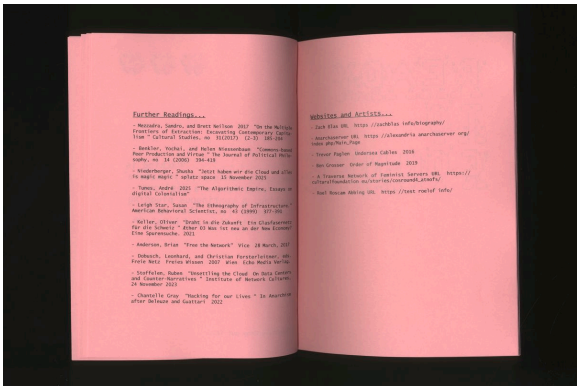

... become a participant instead of just being a consumer. Shape the development of technology.

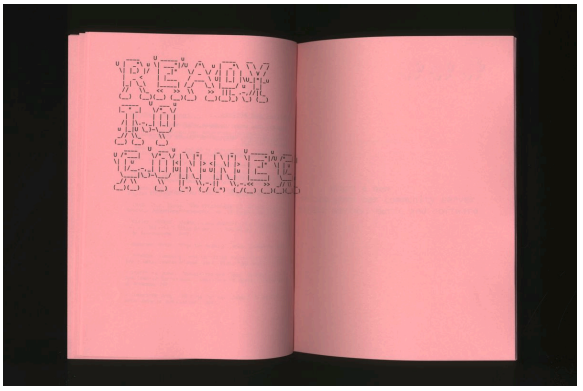
Gay Bombs: Getting Started
- Zach Blas, published in Queer:
Documents of contemporary Art 2016

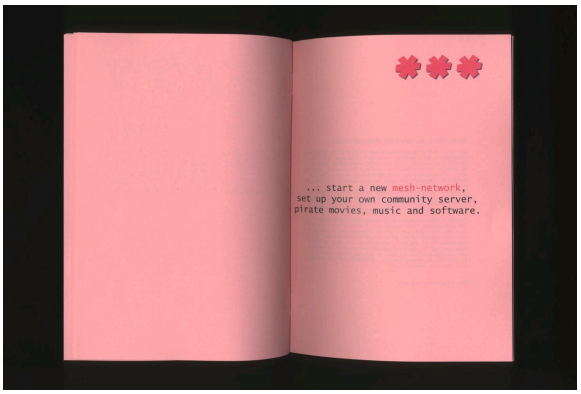

... become part of an alternative server collective, practicing a counter-narrative to current agendas.

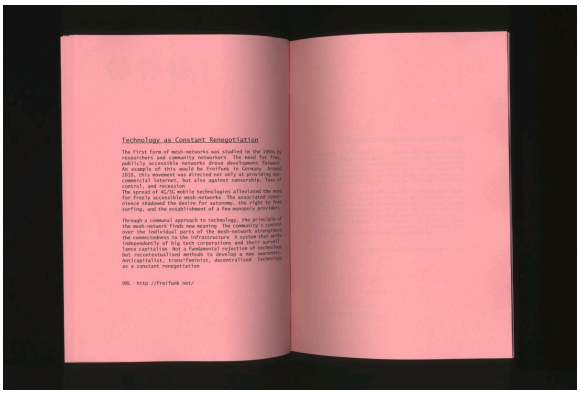

Trans*Feminist Servers.
- 2018 until now

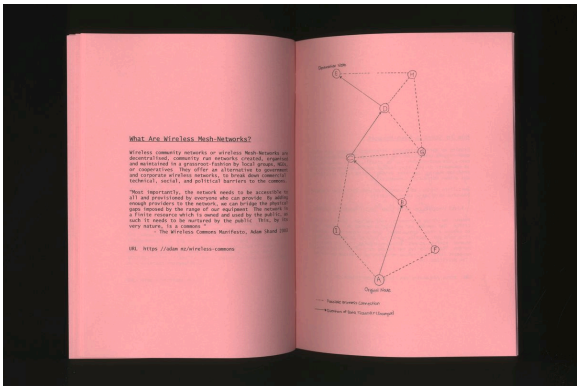

... become a hacker. "Hacking is 'inherently connective in nature' and constitutes a desirous coupling, a continuous plugging into other flows that causes currents to flow and break."

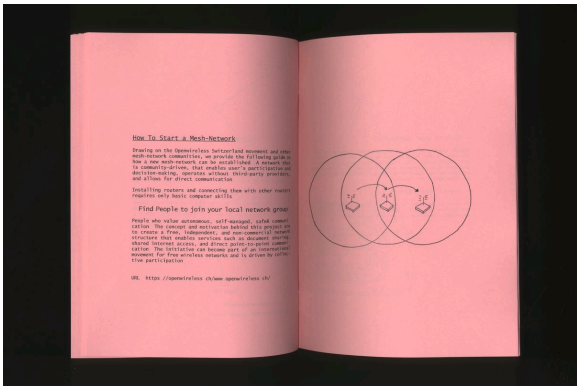

Further Readings...
Websites and Artists...

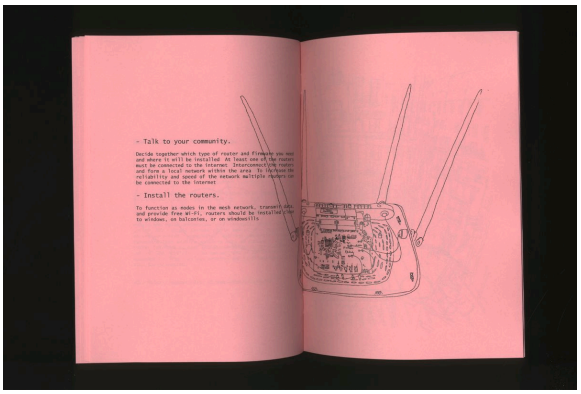


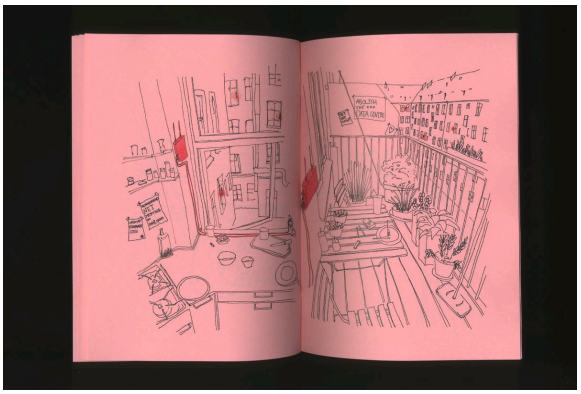

... start a new mesh-network,
set up your own community server,
pirate movies, music and software.

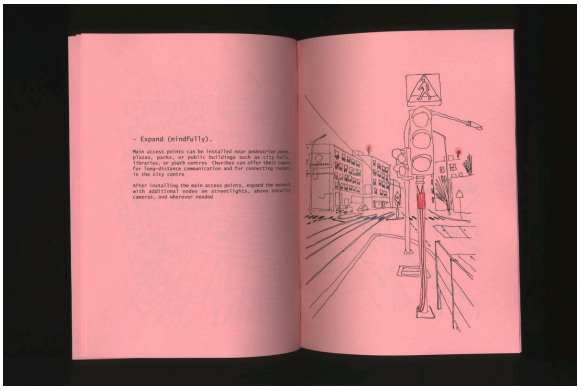

Technology as Constant Renegotiation

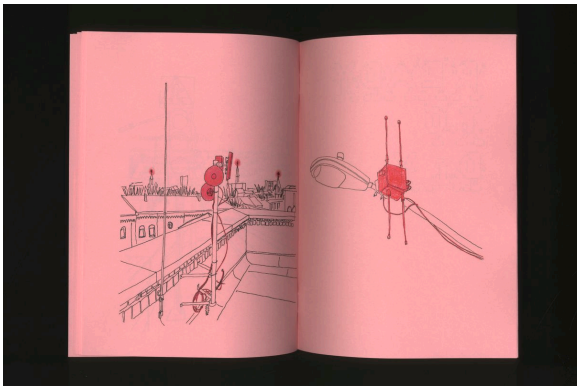

What Are Wireless Mesh-Networks?

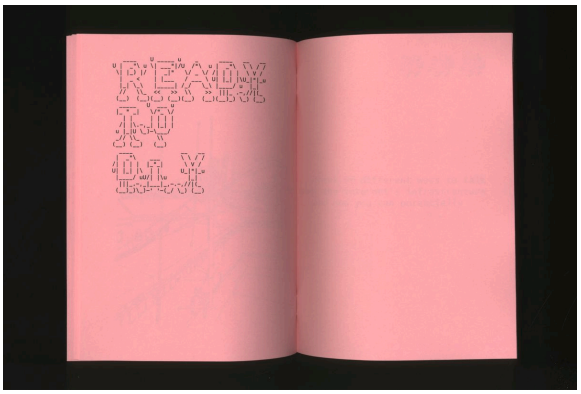

How To Start a Mesh-Network
Find People to join your local network group

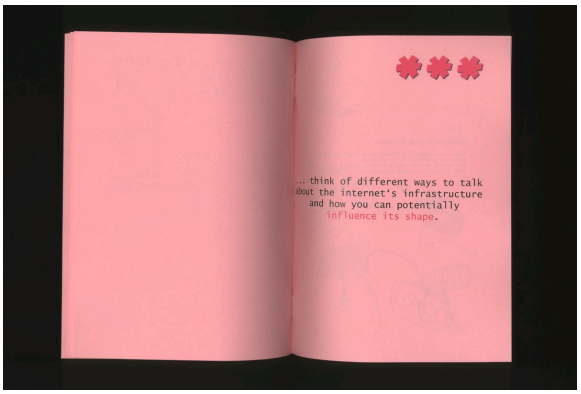

- Talk to your community.
- Install the routers.

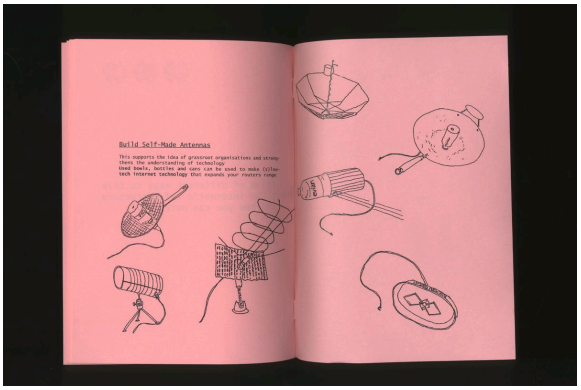



- Expand (mindfully).






... think of different ways to talk
about the internet's infrastructure
and how you can potentially
influence its shape.


Build Self-Made Antennas

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