Cells, Modules, Series –
the rationale of space processing in the age of containers

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Abstract

When technology reaches its ultimate perfection it turns into architecture (Mies van der Rohe). Seen from this point of view, it is more than a metaphor when the spatial designs of computer hardware and software and that of the virtual realities in communication and information platforms are called „architecture“: information architecture, data architecture, computer architecture. The worlds of information and architecture seem to be intertwined in many ways, on their material levels as well as on their conceptual and imaginary levels. Certain elements and/or core ideas operate as constitutive factors in all of them, thus connecting the different spheres from within. The container is one of these elements.

Having emerged parallel in architecture and in logistics/transportation industry as a „digital“ object, the container combines the ideas of computing time and space: workflows and storage capacities. As an outcome of the development of rational space division – namely: the grid – and the implementation of zero as center of a system of digits which allows to calculate the virtual – the basis of bookkeeping and data processing –, today’s standardized shipping container and its kinship formats function as „universal packing machines“: processable space modules, or threedimensional wildcard characters, the generic repository, absolutely indifferent towards its contents. Space processing as equivalent to data processing.

[title]

0. INTRO

Hello, glad to be here. My name is ... Thank you, etc.

What I am going to present here today is (the newest) part of my phd-project on containers and containerization. The project itself is entitled „20 Foot Equivalent Unit. Containerization takes command“.

[logo_containerwelt]

Archeology of globalization

What my research project is trying to achieve, I call an „archeology of globalization“: Meaning, on the one hand, research into the material culture of what we refer to as „globalization“; and taking one of the key „material“ elements – if not *the* key material element – of this process into focus, that is, the container. Meaning, on the other hand, an archeology in the Foucauldian sense, a research into the episteme of the different bodies of knowledge which made possible the process of globalization and codify it. Here, I take the container as a structural, or conceptual element, when hunting for a constellation I would like to introduce as the *episteme of logistics*.

The first of the two connotations of archeology, I have given, is heading for the consequences of the container system. I would call it a historical interest. The emergence of the container system in the second half of the 20th century not only affects seafaring and transportation. It also has to be described as a major part in the changes of the urban condition: It seems as if the container operates as an agent of *periphery diffusion*: the generalization of a new urban principle, the „generic city“ (Koolhaas), logistical spaces between, within, and instead of older formations of the urban.

My second interest which I would call media theoretical or philosophical refers to the container as an epistemic or epistemological object that, in the course of the 20th century, appears in different knowledge formations, and begins to structure them. The goal is, through an analyses of the item container, and its operating capabilities on several physical and conceptual levels, to achieve a description of the fundamental importance of logistics.

Infrastructures

Paul Edwards makes clear that in the modern condition infrastructures are conceived of as nature. Or, to put it the other way around, that the naturalization of overall technological systems, their becoming invisible, is vital for their functionality as infrastructures. „(M)ature technological systems“, he writes,

> „cars, roads, municipal water supplies, sewers, telephones, railroads, weather forecasting, buildings, even computers in the majority of their uses – reside in a naturalized background, as ordinary and unremarkable to us as trees, daylight, and dirt. Our civilizations fundamentally depend on them, yet we notice them mainly when they fail (...). They are the connective tissues and the circulatory systems of modernity. In short, these systems have become infrastructures.“ (Edwards 2003, p. 185)

In following his observation, I would go even one step further, and argue, that due to the logistical shape infrastructures take in the 20th century, and due to the generalization of a certain kind of „transportation rationality“, logistics itself has become an ontological basis of our time.

After what I have said up til now it seems necessary to give some more specifications on the terms I am using. So, in the following, I will first make some remarks on what I refer to when I am using the words „container“ and „logistics“. And after that, I will, very briefly, try to demonstrate the complexity of the empirical/epistemic thing „container“ in the fields of architecture and transport logistics.

I. „CONTAINER“

Container [container]

[Container_container]

What kind of an object is the container? Following the historical-epistemical double strategy, I described above, I have to deal with (at least) two different types of containers:
One is the rectangular, 3dimensional steel box we see photographed on the left side of the slide. In its globally standardized form it has the dimensions of 8 on 8 on 20 or 40 feet (there are quite a lot of derivates though, differing local standards, and special container editions for distinct non-shipping uses on land), consisting of a steel frame with corrugated steel coating on all sides except the floor, and fittings on all eight corners, in which a special device called „twistlock“ for linking with other containers or with the ground can be fitted.

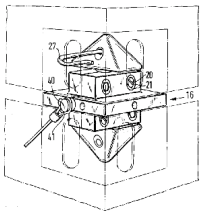


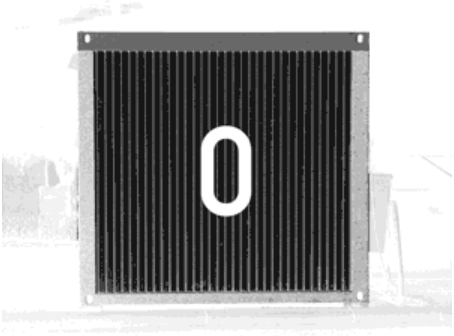
Fig.5

[twistlock]

The other is the container as a conceptual element, a theoretical thing, or a virtual object, allowing or at least labeling certain operations and/or interpretations in fields as different as psychology, sociology, and informatics. I tried to symbolize it on the right side of my slide, the (rebuilt) icon that is shown by internet browsers when an image file cannot be found. To me, this seems to be a good example for a container of the second category, though the icon and the adress problem it symbolizes is not called „container“ (as far as i know). And this is for two reasons: (1), It derives from the information logistical sphere of the internet where „packets“ are „switched“ and indifferent standards for these packages had to be found to transport as many and as different types of data as possible; (2), the group of graphic file formats usable on the

internet, and signified with the question mark icon as not actually but possibly being there, are called „container formats“ by computer programmers.

Zero



[Container_Null]

Seen as a structural element, a symbol which signifies nothing, except that it potentially contains something, the functioning of the container can be compared to that of the zero. As Brian Rotman shows, the introduction of the numeral and concept zero into european culture not only made possible the dynamic system of double-entry accounting and exchangeable money as basis of international trade and economic growth. It also established the potential of the sign as a pure symbolic object, signifying nothing but other symbolic objects: Before, people could still believe that there is a certain realistic aspect in arithmetics, that every number is somehow linked to an amount of objects it signifies. The zero made totally clear that mathematics can operate without any material reference. (Rotman 2000/1987)

Going one step further, Bernhard Siegert demonstrates how the implementation of the zero in book-keeping made possible a two-dimensional graphical system of place values in which the symbols could both substitute and control the movement of people and goods in the material world. Thus, in the 14th century, in cities of northern Italy like Florence and Venice an organisational mode of trade was developed that operates in two separate spaces: the small space of the office and paper where erverything is written down, and the large space of transport:

> „Double book-keeping enabled the businessman to substitute the work of calculations on paper for the work of covering the large space [of transport speeds]. Transport of cyphers replaces transport of goods. The actual business takes place on paper. In extended exchange [erweiterter Tausch], the real transport of real goods is increasingly detached in time, in space, and semiotically from the business operations in the office. The sphere of the signifier is deterritorialized from the sphere

> of the signified. The signified of a business can be constantly postponed resp. re-referentialized. In this way, the office works like a machine in which an operative symbolism rules whereas ontological symbolism is limited to an exceptional case.“ (B. Siegert 2003, p. 43) [translation by AK]

In being both, signifying symbolic operator and signified transportation unit of specific physical goods at the same time, the container seems to re-unite small space and large space. In the age of computers and containers, they cease to exist as separated spatial arrangements: On one side, the heterotopological large space of the maritime is swallowed by the chronotopological global space of transportation. The difference between sea and land is levelled, and the ambiguity of the ship is replaced by the indifference of the container. On the other side, the small local space of the office is extended and deterritorialized into the global, or even universal space of computing. Thus, computing and transportation get almost undistinguishable. And the container – being smbolic and physical transportation unit at the same time – is their shared generic element.

So, how much reality does the container posess? When the original act of detaching numerals and counted objects as executed by the implementation of zero already can be interpreted as a first step of digitising, in that it reduces the complexity of traded materials to the strict order of discrete symbols. Than the container, being the zero-point of logistics, must be understood as a *digital object* which reduces heterogenity even more by installing a kind of meta-symbolism that groups numbers of objects into larger units. Paradoxically, this „meta-digitisation“ is coupled with a renaissance of pre-zero arithmetics: Being a physical and a symbolical object at the same time, the shipping container restitutes materiality to the symbolic world of numbers which the zero so clearly cleaned from any „realistic“ aspects: As zero–turned–into–steel–coating–and–volume it functions in direct extension of the processing principle of numerals: not merely a movement of symbols *about* material objects (like in the case of the office mentioned before, or in the computer processing of statistical data); but a movement that *at the same time* processes symbols *and* materials. A case of anachronistic arithmetic: numbers and things are again directly connected, container-*arithmos*, TEU (which is the acronym for Twenty Foot Equivalent Unit, the ISO standard shipping container, today’s common denomenator for industrial output and quantities of trade).

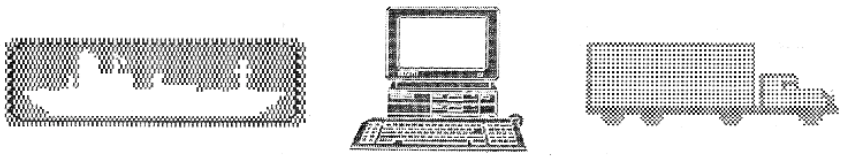
II. LOGISTICS

Use and meaning of the term „logistics“ historically show the same equivocal nature between the worlds of the physical and the symbolic that I tried to describe with the container.
In ancient Greek where the term „logistikos“ derives from it meant a practically oriented art of dealing with arithmetics and numbers. Whereas arithmetics reflected on the nature of numbers, logistics tried to find rational solutions of practical problems on the basis of numbers.

In the middle of the nineteenth century the term logistics (at least in German: „Logistik“. In English it is called *symbolic logic*) took a totally new meaning as the name for a mathematized or symbolized logic, a meta-logic, and meta-mathematics. *Logistik*, like the logistics of antiquity is bound for functional goals. There is no ontology in it.. But *Logistik*, in the exact opposite to the ancient practice, operates without any reference to the physical world. It is not designed to solve practical problems in the physical world but to define and understand how the different theoretical methods operate. Its only „content“ therefore is symbolic.
As meta-logic or meta-mathematics it defines how algorithms are to be constructed, and how different algorithms can be combined. In this functioning there is to be drawn a direct line from logistics to informatics, from the logical calculus of Leibniz to Turing’s Universal Calculating Machine.

But the issue of *connectivity* also links it to the meaning of the term „logistics“ the way we are used to understand it today: A science of rational planning and control of material- and workflows that has its origins in french military organisation of late 18 century, but really started in the first half of the 20th century with the fordistic factory and with tayloristic control of movements. The objects of the practical science named logistics are devices for production and loading, technologies of transport and traffic. Its protagonists originally were people from Business Administration and from mechanical engineering, lately, it has also become an area for computer scientists. Before the impact of the container system, the worlds of transportation and logistics were systematically separated, despite the fact that they were sharing some of their key technologies. Shipping was in charge of the world outside: delivery over land, sea or through the air. And logistics controlled the material flows inside: behind the gates of the factory and the warehouse.

With the container becoming a main reference for transport as well as production cycles, totally abolishing storage, and with the success of computer technology as the main control instrument of all logistical processes, no matter if inside or outside the factory, „transport logistics“ took over in all fields.
And the proud old culture of shipping became part of the new regime of logistics.



[computer_aided_transport]

III. TRANSPORT LOGISTICS

... historically:

A definition from the bureaucrats:

> „Container traffic applies if – and only if – the transportation unit meeting the characteristic features of a container covers the main part of its route, not independently, in or on a vehicle.“ (Studiengesellschaft für den Kombinierten Verkehr – Research Association of combined traffic, Germany 1950; quoted after: Meyercordt 1974, p. 12)

Container transportation constitutes itself openly and offensively upon the general parasitic rule of infrastructures, and media. In the history of technologies this might be a new thing, and one more good reason (beside the philosophical ones I gave earlier) to call the container an „epistemological thing“: a technological artifact that by its „nature“ (or program?) points on what it existentially relies on, that openly displays its transcendentials.
(Which might be the reason why the container used in non-transportation contexts like temporary housing always produces a kind of uncomfortableness or even uncannyness, the air of something that fundamentally doesn't belong to where it has been put for the moment.)

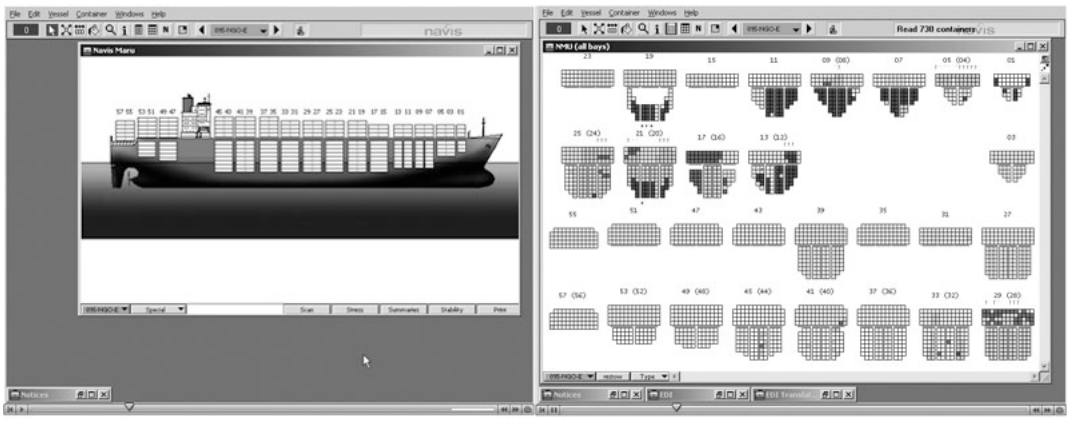
On a micro-historical level (and here again I follow the suggestion of Paul Edwards to distinguish between micro-, meso- and macro-level in the history of technologies, and then try to combine them), the story goes that a U.S. American haulier gone into freight navigation along the east coast, named Malcolm McLean, „invented“ the container in 1956, when he was looking for an efficient method to combine land and water transport. His invention turned out to be quite successful, and only 15 years later, especially designed container ships based on an internationally negotiated container standard (the ISO-standard) could be seen shipping on all seven seas.

On a meso scale, the invention of the container was an answer to a burning question in transportation, which in fact came quite late: The possibilities and necessities for implementation of intermodal transport – via train, truck, and ship – was a problem, which people from administration, science, and the related transport industries had been working on systematically since at least the 1920s. Some historians of transportation date back the beginning of the container even earlier unto the use of standardized boxes for transportation by the U.S. navy in WW I. On this scale it is clear that the emergence and enormous success of container transportation world wide was only possible because of an interplay of administrative, legal,

technological, economic and political factors in a very complex situation composed of national, international, and global (or geo-strategical) interests.

On the macro scale, the emergence of the container system has to be analysed in an even wider context: firstly, the rationalization and industrialization of transportation which has been going on since the invention of steam trains and steam ship. Secondly, the beginning of logistics as a scientific approach towards processes – workflows –, mostly connected with the names of Taylor and Ford (but with predecessors and successors in all industrialized countries of the world). Thirdly, the emergence of informatics and computer technology as a means to process complex data in quantities and speed which could have never been reached without them, and which was not only a necessary precondition for the functioning of the highly complex administration of container terminals and container shipping, but also one of the largest non-military fields (if not the largest; still have to find out) in which computer technology could develop.

Today, most of the communication between clients and container shippers, including orders and payment, is done via online forms. Computers calculate the allocation of containers on specific ships, control the loading business in the container terminals (formally known as harbors ...), and organize the loading of the ships. As you can see on the slides from an online tutorial of one of the major computer programs for the stowing of ships called „Powerstow“.



[powerstow3,4]

But the interrelation between transport and information technology also works the other way around. Friedrich Kittler, in a text about the city as media, emphasizes the constitutive importance of city and transport metaphorism for computer technology:

> „Thus our terms for media, if not directly, like "heart" or "brain of a circuit," derived from the human body, stem (...) from the city. From the day Shannon applied George Booles's circuit algebra to a coupling of telegraph relays, the elements which are logically the most simple, and which have no memory, have been known as gates or ports. Circuits, on the other hand, whose initial and final positions are not only a function of the gates and ports, but also of the circuit's own prehistory, presuppose (no less municipal here) a built-in memory. When the World War II mathematician John von Neumann laid down the principles for sequential working-off or computation for almost all present-day computer "architectures," he bestowed the fitting name "bus" on the parallel channels between hard drive, gate, and memory, and thus extended the Biedermeier tradition of metropolitan traffic.
>
> Von Neumann's prophesy that only computers themselves would be capable of planning their own, more intelligent, next generation, because the complex knot of networks would surpass the planning ability of the engineers, has been fulfilled by computer programs called "routing": network models (...) which operate as if they were street plans (with all the aggravations of jaywalking and traffic jams). Entire cities made of silicon, silicon oxide, and gold wire have since arisen.“ (Kittler 1995, p.720f.)

This practice of „routing“ as self-organized navigation of information packages through the internet is now being applied to the physical world of container shipping where experiments with „intelligent logistics“ through the use of RFID technology have been going on for some years.

Another German media theoretician, in an essay about the combinatory logics and possibilities of building with prefabricated concrete slabs, shows how Alan Turings cryptoanalysis in WW II corresponded to a combinatory game with small plates – the tiles of a scrabble game, to be exact. Turing himself described his cryptoanalytical task as „a very good example for a waiting game“ in which „the symbols or tokens are to be reconfigured“. In reflecting the interrelations between architecture, mathematics, and computer science, Pias draws the conclusion that there is probably more than just a metaphorical connection between them, and that this connection operates in either direction:

> The relationship between tiles and plates might be more a problem of scale than a metaphor. And if [meta-mathematics, prefabricated building, and digital computer logics] are much closer on a discourse analytical level than it resembles first, then computer terms could prove to be at the same time prefabricated building terms, and prefabricated building terms to be at the same time mathematical terms.“

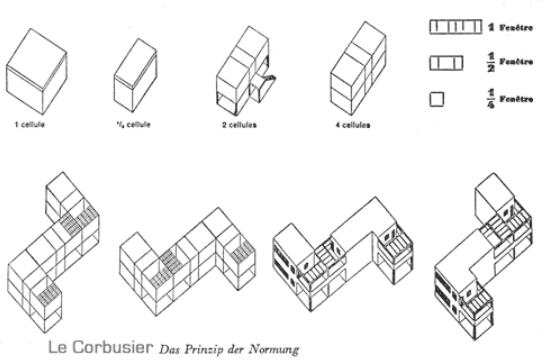
And he continues:

> Thus, the plate is digital in the truest sense, and in being digital it is a systematic instrument of forgetting. Because digital is that which does not know any

> intermediate stages and no gray areas between its elements, just like we don't have fingers (in latin: digitus) between our five, no letters between „A“ and „B“, no plates between type x and type y, and no conditions between 1 and 0. In an act of violent representation digitisation cuts down the continuum of the analogue into handable size (...). This oblivion of the digital (...) closes a deal and at the same time initiates an epistemological experiment. Because through forgetting it creates an operable knowledge about that with which was hardly possible to calculate on before.“
>
> (Pias 2002, p. 119 f.; translation AK)

When Kittler, in the text I quoted above, points out that the application of mathematical graph theory and topology on problems of transportation actually mark the beginning of the modern age at the end of the 18th century. Then maybe it makes sense to think again about the preconditions of what is usually referred to as an „informational turn“ that took place after the middle of the 20th century. I would propose to call these a „logistical turn“ which is linked to the emergence of a general theory of symbolic thinking in late 19th century, and to the application of (transport) logistical solutions and metaphors in different fields of modernization of society during the first half of the 20th.

IV. ARCHITECTURE



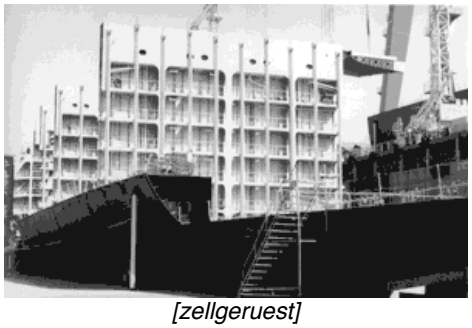
[LeCorbusier_cellules]

<u>cells</u>

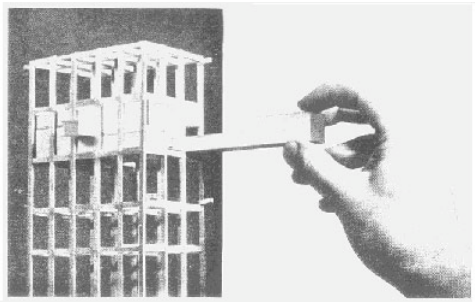
One of the histories of the container goes back to the heroic period of modern architecture in the 1920s which reinvented the art of building by implementing logistical principles: modularism, serialism, and standardisation. In 1923, Le Corbusier publishes under the title "La Maison standardisé" (the standardized house) reflections and drawings on the concept of a building composed of cells, and their combinatory possibilities.

By one time showing cells over empty space and one time cells over filled space, LC demonstrates a principle that will later become elementary for the organisation of containers: If an actual cell/container is present or not present is not as vital as the definition and organisation of all the container slots. The container principle allocates standardized volume, wether just filled with air or precious goods is secondary, it's *space processing*.

The affinity between container logistics and LC's architectonical cell concept can be seen in comparing the cell structure of a containership where the slots for the containers are defined through an almost two-dimensional walkable „diagram"(left)



[zellgeruest]



[LC_unite_regal]

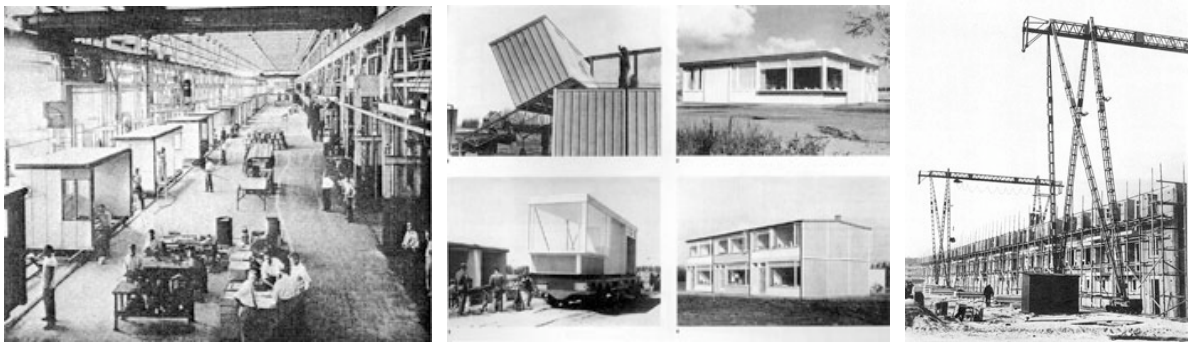
with Corbusier's cellular concept for l'Unité d'habitation in Marseille, where containerlike living units or modules are to be stacked into the cell structure of the „housing machine" like drawers from the side (right).

Since the early 1920s, the cell has remained a persistant element of LC's architecture theory. In 1929, in a series of lectures held in Argentina, he sums up the development of his cellular concepts from the single house to the planning of a whole city with 3 Mio inhabitants, using the principle of stacking. He writes:

> „A cell in human scale: 15 sqm (...). For the apartment building, the office, the workshop, the factory the new form of standardisation, the industrialization, the taylorisation will be exploited. (...)
>
> The house is constructed in the factory, (...) it is transported on a waggon, no matter where to; construction workers erect it. Countless little customers in countless different places can be served.
>
> (...) These methods of industrialization because of standardisation naturally lead us to the skyscraper: Its shape is determined by stacking the cells in human scale. (...)
>
> Let's multiply the standard elements of the cell. (...) The house must not any more be built by meters – it shall be built by kilometers. (...)
>
> These cells must be stackable by millions."
>
> (Le Corbusier, 1929; translation by AK)

Industry

Modernistic architects were convinced that the future of architecture was to be found in the industrialization of building. New concepts for the prefabrication of elements in special housing factories, and for the implementation of industrial working principles on construction-sites drew their inspiration from modern transport and mass production, namely: the american automobile industry.



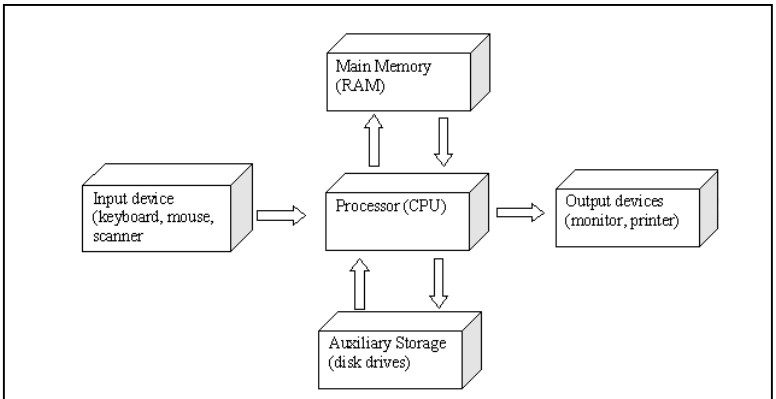
[reliance_plant / seily_haus / portalkraene]

So, Bauhaus founder Walter Gropius, who started with experiments on modularized building types capable for mass production in the middle of the 1920s, and later, after his emigration to the U.S. launched a line of production of industrially prefabricated woodhouses, wanted to become known as the „architecture-Ford“. Instead of following the traditional ideal of the architect as the creator of aesthetically pleasing ensembles he concentrated on functionalistic aspects. In shifting its focus from aesthetics of design to rationalistic matters of organization industrialized architecture became in its heart logistical.

Maybe this is the reason why Mies van der Rohe, the third of the three most prominent protagonists of classical modern architecture, felt the urge to re-erected the hierarchy between architecture and engineering when he formulated programmatically in 1956:

> „Technology is more than a means to achieve something, it is a world in its own. As a tool it can hardly be beaten. But only when it is left to itself, as in the building of machines or in the vast constructions of engineers, only then it shows its true face. There, it gets obvious that technology is not only a usable tool, but something (...) that has meaning and expression by itself, an expression so tremendous that it gets hard to find a name for it. Is it still technology, or is it architecture? And that may be the reason why some are convinced that architecture got outdated, that technology is taking its place. But this is wrong thinking. The opposite is true. Wherever technology reaches perfection it turns into architecture.“ (Van der Rohe 1956, p. 116)

Information architecture



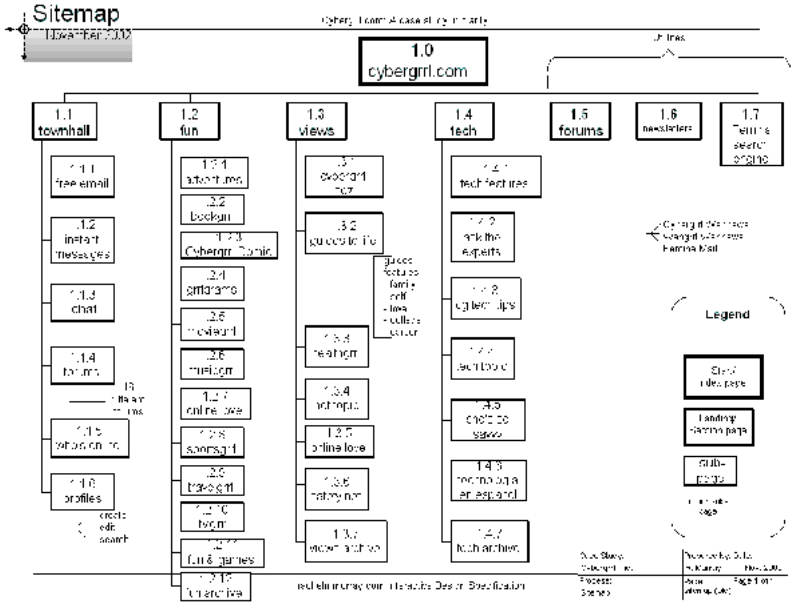
[von_neumann]

Mies came too late, though. The hierarchy between technical and architectural form was already transcended, in a way, hence the basic construction principle for almost every computer was called, after its creator who laid it down in 1946, „von-Neumann architecture“. Regularly, topological organization of elements in information technology, both on the hardware and software level, has been called „architecture“, since.

In the relatively new field of „information architecture“ architects/designers and computer programmers work hand in hand. The question of practical and functional organization of data in databases and on the internet has become one of the core problems of our times. Facing, what the inventor of the term „information architecture“, Richard Saul Wurman, called a „tsunami of information“, techniques of „containerizing“ have again become crucial to group and process an increasingly undifferentiated stream of data.

> There is a tsunami of data that is crashing onto the beaches of the civilized world. This is a tidal wave of unrelated, growing data formed in bits and bytes, coming in an unorganized, uncontrolled, incoherent cacophony of foam. It's filled with flotsam and jetsam. It's filled with the sticks and bones and shells of inanimate and animate life. None of it is easily related, none of it comes with any organizational methodology.
>
> (Wurman 1996)

Through its shere mass electronically stored and distributed information starts to resemble the messy analogue world of the real. Though digital by nature, striated space, in the words of Deleuze/Guattari, electronic data flow as foam regularily produces smooth space, something very similar to greyzones and white noise. Again, it seems, a kind of meta-encoding becomes necessary, an organization of meta-elements – folders, chapters, boxes, in other words: containers – according to rational and easily understandable organizational schemes.



[information_architecture_example]

Suburbanization

Logistics gone symbolic, gone architecture, gone informational, and back into the physical spaces of what used to be the city. A constant alternation between hardscape and softscape and what Peter Lunenfeld proposes to call the imagescape of visual displays. Thomas Pyncheon, in „The Crying of Lot 49“, describes the vision of the urban sprawl as computer architecture turned inside out. „Now it seemed as if taking a walk between the matrices of a gigantic digital processor.“ An uncontrolled growth of the periphery along highways, composed of box-shaped storage buildings, junctions and relays of different types of infrastructure and undefined space, producing a new kind of de-densified in-between urbanity is taking place all over the world. In these new logistics zones where living and storing gets undistinguishable the container has found a natural habitat.

Seen from this perspective, it is no wonder that Neil Stevenson, in his novel „Snow Crash“ from 1992, chose a container to be the living space for his hacker character Hiro Protagonist, who was among the first (following Gibsons Newromancers) to explore and describe the new spaces of the digital, giving it a name that fits beautifully into the genealogy of meta-operations so characteristic for my history of logistic spaces: the meta-verse.

> Hiro Protagonist and Vitaly Chernobyl, roommates, are chilling out in their home, a spacious 20-by-30 in a U-Stor-It in Inglewood, California. The room has a concrete slab floor, corrugated steel walls separating it from the neighboring units, and (...) a roll-up steel door (...).
>
> Hiro (...) is wearing shiny goggles that wrap halfway around his head; the bows of the goggles have little earphones that are plugged into his outer ear. The earphones have some built-in noise cancellation features. (...) The goggles throw a light, smoky haze across his eyes and reflect a distorted wide-angle view of a brilliantly lit boulevard that stretches off into an infinite blackness. This boulevard does not really exist; it is a computer-rendered view of an imaginary place. (...)
>
> So Hiro’s not actually here at all. He’s in a computer-generated universe that his computer is drawing onto his goggles and pumping into his earphones. In the lingo, this imaginary place is known as the Metaverse. Hiro spends a lot of time in the Metaverse. It beats the shit out of the U-Stor-It.“
>
> (Stevenson 2003 (1992), pp. 19ff.)

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Illustrations

pp 2, 4 upper, 5, 8	Alex Close
p 4 lower	US. Patent # 3,085,707
p 10	http://navis.com/powerstow.jsp
p 13 upper	Boudon 1971
p 13 lower left	Witthöft 2000
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p 15	http://www.antonine-education.co.uk
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