Pelle Snickars

The Archival Cloud

Late in the fall of 2006, *Wired* published an article on the new information factories of the future. These binary plants were supposedly beginning to establish an online infrastructure with the potential to store all data ever produced, and according to the author George Gilder, the dawning of the petabyte age would inevitably lead to the death of the desktop. In the years to come, local computing power would not stand a chance. If mainframe computers were once superseded by minicomputers and PCs, the latter two would now, in their turn, be rapidly replaced by an Internet cloud of shared networks with immense computational power and made up of millions of machines and servers.

Gilder's article was interesting in many ways, particularly because the notion of "cloud computing" was frequently being explained and elaborated upon. Local-area networks apparently belonged to the past, and were being replaced by an "architecture [where] data is mostly resident on servers 'somewhere on the Internet,' " as Google's CEO Eric Schmidt put it in a quoted e-mail exchange. Schmidt was also confident that the contemporary architectural IT shift would lead to "the return of massive data centers."[1] The Googleplex's estimated 200 petabytes of storage at the time seems to have been a first step toward creating the cloud. However, as Gilder stated, past performance was no present-day guarantee, because even "bigger shocks" of data were predicted to be on their way. "An avalanche of digital video measured in exabytes," as Gilder metaphorically put it, seemed currently to be "hurtling down from the mountainsides of panicked Big Media and bubbling up from the YouTubian depths."[2]

It is not likely to surprise anyone that, in fall 2006, YouTube was more or less synonymous with the video avalanche that characterized the Web at the time. During the summer of that year, YouTube had grown at an inconceivable rate of 75 percent a week. The website already had 13 million unique visitors every day who watched more than a hundred million video clips.[3] Naturally, this colossal success was also the reason why Google, at the juncture between October and

November 2006, purchased YouTube for 1.65 billion dollars in Google stock, a deal announced shortly after Gilder's article appeared in print. "Video is powerful. And it's amazing," as Eric Schmidt would later put it in a TV speech.

In many ways, Google is a company that, right from the start in 1997, was designed on the premise that users would want to move from the local desktop to the virtual cumulus in the not-so-distant future. In the eyes of Schmidt and Google founders Sergey Brin and Larry Page, YouTube was therefore perceived as a form of cloud-computing site *avant les mots*, where access to content was as simple as performing a Google query. In fact, YouTube seemed to have taken into account the most precious of Googlian resources—user time and patience. The uncomplicated infrastructure of the site held users' attention, and fast searches, hyperlinks and an interactive tag structure made video content appear to be just a click away. Prior to YouTube, there were few websites that allowed the user to both easily upload moving images and use the Web as a platform for storage and distribution. To be sure, Flickr had already combined uploading of photographs to the Web, where users could tag, comment on and share their pictures, in 2004. But the idea of moving images being directly accessible in a gigantic Web archive was even more attractive—not least commercially. It is true that YouTube (like Flickr) would remain restrictive in its use of advertisements,[4] yet in the eyes of the Google people, the website's public and commercial potential was enormous.

As is generally known, what YouTube offered users—an elegant and flexible way of sharing moving images—became the very starting point of the wave of "video sharing" that would follow. At present, video sharing has established itself as a central part of Net culture, and today YouTube is the world's largest archive of moving images. YouTube has been and remains the default website for a "clip culture" that is increasingly defining both Web entertainment and online information. At the outset, it was completely user-driven, but TV companies and other institutions joined in almost immediately, quickly upgrading the website to a global media repository with which few traditional archival institutions could compete.[5] If the international ALM sector (archives, libraries and museums) is currently struggling with the parameters of user-generated Web 2.0—the main problem being the inability to take advantage of the distributional potential of the Web due to intellectual

property rights—the most striking aspect of YouTube, Flickr and other similar "media-archive sites" is that they actually offer the media storage and distribution model of the future. Access is the guiding principle, and these websites have in fact already changed how media material is used and reused. As is well known, one of YouTube's basic recipes for success is the new remix culture in which older forms of media are molded into new interfaces.

By analyzing YouTube as a sort of archival practice, this article will focus on the current transformation of the storage sector and the various discourses surrounding that alteration. Within publicly funded archival institutions digital storage is sometimes seen as a "black hole," basically since the long-term costs of keeping digital files are substantial. "If funding starts to fade, the information may still be retrieved but after a while it will no longer be accessible due to corrupted files, or obsolete file formats or technology,"[6] as the argument goes. While this is certainly the case, binary files are always also accessible files. In traditional media archives, perhaps ten percent of what has been collected is actually used, but the ease of watching and using videos on, for example, YouTube has meant that almost all uploaded material has been viewed by at least one or two users. Thus, according to the logic of the long tail, new Web-based user patterns run counter to traditional forms of analogue usage. The role of traditional archives is of course to preserve content, but the worst way to protect it is to ignore access. Such denial generates no value, and leaves archives unable to afford preservation projects. Protecting and keeping digital content requires public interest—which only comes from various forms of access. This is why YouTube, with its binary cloud of content, is an important archival media phenomenon. The site, in short, offers completely new ways of thinking about both storage and distribution of information.

Cloud Computing

In the summer of 2008, Apple introduced a collection of services called MobileMe, which was a considerable update of the previous application "dot mac." Unfortunately, it proved to be anything but reliable, and Apple soon experienced problems with its credibility. In an internal

e-mail, even Steve Jobs admitted that MobileMe had been released too early and that it "[was] not up to Apple's standards."[7]

Based on "push technique," MobileMe was intended to allow users to directly access synchronized personal information via the Web no matter where they were. E-mail, calendars and files would follow the user like a virtual floating cloud filled with information that could be accessed regardless of operating system. The considerable amount of personal storage space provided ensured that users could access files, given a functioning Internet connection.

MobileMe is an example of what the IT branch has termed "cloud computing." In 2008, cloud computing has become something of a buzzword for a new kind of infrastructure for personified information, which no longer exists locally on one's own computer, but online in the Internet's network. YouTube and Flickr, MySpace and Facebook are well-known examples of a kind of cloud computing, because the content and programs for these websites exist online. Naturally, the same also applies to the widely branched blog culture; in fact, Web 2.0 is in many ways molded in the image of cloud computing.

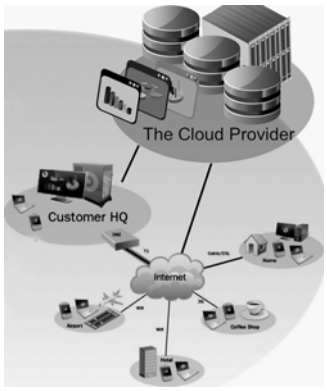
42 Apple's cloud service Mobile Me: "No matter where you are, your devices are always up to date"

But this new digital cloud can also be seen as something more far-reaching, something that is substantially changing how we view the computer as a machine. The above-mentioned article in *Wired* tried to describe the current computational transformation, but two years ago its contours were still blurry and diffuse. Today, however, it is clear that our computers can be understood less and less as isolated and separate units. Concurrently with the development of the Web, it has become impossible to differentiate one's own computer from the network it has become an unmistakable part of. The fact that increasing numbers of small, simple computers are selling is one sign of this trend; figures show, for instance, that more than five million small devices, such as the Asus Eee, were sold in 2008.[8] One's own computer, music player or cell phone no longer needs to be particularly sophisticated, because these devices can retrieve their power, programs, storage space and the information the user requires directly from the Web and the Internet.

This shift, in which our computers are no longer separate units, applies not only to traditional personal computers. The next generation of cell phones, cameras, music players and consoles will all have "online" as their default setting. This means that there will be no reason to save a photograph locally in one's digital camera, because the picture will instantly and automatically be stored "in the cloud." Yet in several respects, the future is already here. For instance, using the small application Dropbox, one can easily (by placing a file in a folder) use the Web as both a storage place and a file server between different computers. Another example is the popular Swedish site Spotify. This is not a purely Web-based service, but a client installed locally to which music is streamed from the company's servers. Still, the principle is the same: if all music—Spotify is said to contain more than two million songs and instrumental pieces—is accessible as soon as one turns on one's computer, then there is no longer any incentive to own these files or to store them locally.

In an attempt to understand structural changes in the economy, society and culture that appear to be the consequence of an increasingly extensive digital cloud, Nicholas Carr, in his book *The Big Switch*, compares current developments with the business strategies underlying the introduction of electricity. For example, production of electrical current took place on a local basis for a long time. In 1901, 50,000 American companies had their own plants for production of

electrical current. Carr's analogy is striking. Modern companies have long had essentially identical IT departments that could be centralized. And this is exactly what happened a hundred years ago when central power plants took over various local electricity markets. Although there are certainly considerable differences between information technology and electricity, both are technologies with a general purpose, that is, both are platforms on which a number of applications can be designed. The point of Carr's historical parallel is to show that decentralization and diversification were, and still are, a bad thing in terms of large-scale investments.[9]



43 The infrastructure of cloud computing

The Internet is, of course, an optimal medium because of its decentralized network structure; in short, it is a cloud made up of different smaller clouds. However, in terms of IT infrastructure and databases that lie below the cloud, it does not seem rational anymore to build separate storage systems at individual archives, to use the ALM sector as an example. The current international trend among cultural-heritage institutions is certainly merging and centralization.

Cloud computing, hence, constitutes a step toward centralizing the information-technology infrastructure, and naturally, the strategic attraction of the cloud is the promise it brings of more cost-efficient IT. While companies and institutions have built and maintained separate PC systems and local networks, so-called client-server systems, for a quarter of a century at huge cost, these systems and networks are now gradually being replaced by centralized IT services delivered directly over the Internet. Google being on the leading edge of this development depends primarily on the fact that Brin and Page realized early on that the Web's network of networks of computers and servers could actually be seen as one gigantic information-processing machine which through sophisticated and superfast communication protocols simply shares bits of data and strings of code. They were not alone in realizing this. In 1993, their present colleague Schmidt (who then worked for Sun Microsystems) pointed out that "when the networks become as fast as the processor, the computer hollows out and spreads across the network."[10]

However, Sun Microsystems's slogan at the time, "The Network Is the Computer," was seen by many as an insult. The network could hardly be one's computer when, with a 28.8 kbit/s modem, one had to look at a blank screen for several minutes while waiting for a website to load. It is rather hard to remember, but Web browsers prior to Netscape Navigator were not able to show anything at all before all information had been read. Thus, connection speed is completely central to the Net's cloud of data. If, on the one hand, Moore's law stipulates that computer processor power doubles every two years, Grove's law indicates, on the other hand, that the bandwidth of telecommunications doubles every decade. Processor speed has developed at a much faster rate—thereby dominating the market—than communication speed in the networks. Insufficient bandwidth has thus regulated the impact of the Net on a kind of infrastructural level.

If speed remains crucial to cloud computing, another decisive factor is reliability. Working in close connection with the Internet requires considerable trust in both the hardware and Internet service providers (ISPs). Saving one's information online may seem unsafe, but with the overlapping data and system redundancy offered by cloud computing, the risks are few. Thanks to modern data encryption, ensuring the integrity of one's information is also no longer a major problem. The crux of the matter is naturally people's general confidence in the Internet. But

in reality, the Internet is one of the more protected places for gathering material: the Arpanet/Internet was once created to be the optimal medium, with its digital network of networks designed to survive even a nuclear war. At the same time, backbiters have often stressed that binary code is certainly not to be trusted, and many doubt that digital formats will prove to be as permanent as other storage media. But as Matthew G. Kirschenbaum asserted in his book *Mechanisms*, such criticism is often based on a considerable lack of knowledge of the binary system. The Internet is not only a resistant storage medium by virtue of its decentralized character, hard disks are also considerably more archival in nature than one might think. For instance, what happens after the Ctrl+S command is typed is much more complicated than most suppose, and another equally complex procedure takes place when one empties the "trash." It is not the case that all files in the interface's trash bin disappear once and for all when this is done. In a Windows operating system, this command only means that the computer's FAT (file allocation table) is updated; the files are still on the hard disk. Kirschenbaum points out that when files are used in a computer's operating system, they leave traces of themselves in all sorts of places, like balls in a pinball machine. The same applies to an e-mail message, which leaves dozens of copies of itself during its lightning-fast journey through the Internet's networks. If digital media are sometimes presented as ethereal, this is not the whole truth. Even virtual reality has a material foundation in the form of nanotechnological inscriptions on the computer's hard disk. Strange as it may seem, it is more or less impossible to erase a hard disk; every digital inscription leaves a trace—if only at the nano level.[11]

The new trust in the Web—not the least apparent at the numerous and popular sites offering free online storage—is probably the major reason for the growth of the digital cloud. Today, even Microsoft has realized that a significant change has occurred. "Everything in computer science [has to do with writing] less code," Bill Gates stated in a recent interview. "[Subroutines] is the technique for writing less code. […] We are [now] in a world … [where a] subroutine can exist on another computer across the Internet."[12]

In an interview in *Wired*, Microsoft's Chief Software Architect Ray Ozzie stressed the fact that new versions of Office will hardly generate significant revenues in the future.[13] Instead, like everyone else, Microsoft must move out onto the Web, and at the moment, they

44 Try to erase a hard drive—it is almost impossible

are working intensively on an online-based operating system called Windows Azure. Others have been quicker to switch over. Adobe recently launched Photoshop.com, where anyone can now arrange his/her pictures online—something Flickr has offered its users since 2007. Naturally, Amazon as well belongs to the cloud's avant-garde.

Already in August 2006, the company launched the "Amazon Elastic Compute Cloud (EC2) … a web service that provides resizable compute capacity in the cloud."[14] The service was designed to make Web-scale computing easier for developers, and since the launch, hundreds of thousands of developers and programmers, websites and applications have been paying to use the company's servers. Because Amazon's total computational capacity is used only a few times a year, it is more lucrative to rent out servers that are not used regularly. For instance, about a year ago, the Animoto company, which customizes media presentations of users' photographs and music, was able to serve 25,000 customers an hour using Amazon's cloud of computing

capacity. Instead of increasing its own server capacity a hundredfold, which would hardly have been possible technically, Animoto paid ten cents an hour per Amazon server. In fact, cloud computing has been so vital to Animoto's operations that Amazon CEO Jeff Bezos has used the company as an example of how well "EC2 helps web apps scale when their traffic hockey sticks," according to TechCrunch.[15]

Naturally, for actors the cloud's attraction lies in new markets and business opportunities, but with regard to information theory, the shift from desktop to webtop also implies a fundamental change in how we understand binary categories such as "computer" and "Web," "archive," "database" and "sharing." YouTube's model of using the Web as the platform for media content and distribution was hardly the first, but it was a preliminary—and popular—move toward this digital cloud. Of course, this meant initial hassles and nuisances. For instance, in April 2006, Forbes pointed out that the 40 million videos and 200 terabytes of data that were already being streamed from the company's too few servers and undersized machinery certainly constituted a significant element of risk.[16] Three months later, *USA Today* reported that 65,000 videos were uploaded to YouTube daily, and that every day, users clicked on about 100 million video clips. These enormous volumes meant that time spent watching YouTube clips already amounted to almost two thirds of general video watching on the Internet.[17] At the same time, the company's costs for bandwidth were approaching a million dollars a month. Consequently, much of the venture capital YouTube brought in was likely used to finance and optimize the website's technical infrastructure. The deal YouTube made with the ISP Limelight Networks was certainly as advantageous as it was secret, but Forbes nevertheless expressed some skepticism regarding a business model in which so much money was invested in something that hardly generated any revenues at all.[18]

In his book *Planet Google*, Randall Stross claimed that YouTube's phenomenal popularity was technologically grounded in the close timing of three central IT factors. What first enabled YouTube's success was the rapid expansion of broadband. During the dotcom boom around the turn of the millennium, optical fibers that could circle the Earth 11,000 times were being laid down,[19] and YouTube and others were able to reap the benefits of this digital infrastructure. During the period when Web connections were made using 56.6 kbit/s modems, a similar video website would have had no possibility of breaking through. Moving images,

even in streamed form, required considerable connection speed, which only broadband could give. Second, as Stross pointed out, the dotcom companies' costs for purchasing bandwidth had decreased substantially by the time YouTube was launched. And *Forbes* speculated that the agreement with Limelight Networks probably meant that YouTube paid as little as between 0.5 and 0.1 cents a minute.[20] From a user perspective, however, the third factor was most important, because it affected the software YouTube relied on. During the ten-year history of the Web, sites with moving images had often experienced problems with playback software. Cross-platform media players such as RealPlayer, Windows Media Player and QuickTime were the established playback technologies for years, but generally they required users to download, upgrade or install various browser plug-ins. YouTube instead decided to use Adobe's new Flash Player, an application created by Macromedia but developed by Adobe after they purchased Macromedia in late 2005. Because Flash plug-ins where preinstalled in almost every personal computer on the market, YouTube reckoned they would experience few problems with Flash. The decision proved to be right, and in fact users have rarely had any problems with incompatible video-encoding formats.

Nevertheless, YouTube's capacity problem was a daily one over a long period of time, at least until Google purchased the company. The mantra "We're running out of storage capacity" seems to have been repeated in the company's hallways.[21] The principal reason was the lack of prescreened uploads, which meant there was actually no control over the website's growth. Naturally, this was never a question of complete laissez faire. It is well known that video material has always been scrutinized and in some cases removed from YouTube. But there has never been any kind of a priori control of content. Besides the limited amount of advertising—which (unfortunately) has become more and more apparent during the last year—this is probably the main reason why YouTube has been the fastest growing site in the history of the Web. At the same time, this lack of control and infrastructural overview meant constant problems with capacity. It was simply impossible to adequately predict the growth in traffic. The fact that YouTube did not examine material in advance has sometimes been presented as pioneering and radical, but the basic idea was not new—and it would later constitute the very basis of Web 2.0 and of social media in general. One of the co-founders of YouTube, Jawed Karim, has pointed out in various contexts that

Flickr, but primarily the dating website hotornot.com, "where anyone could upload content that everyone else could view"[22]—and where this content was ranked (by how attractive various dates were on a scale from one to ten)—was the major inspiration behind the technological infrastructure of YouTube.

At present, ten hours of video material are uploaded to YouTube every minute. Despite this volume, today's technical problems are fewer. Ever since Google entered the scene, YouTube's storage and capacity potential have increased dramatically. The reason, according to Stross, is simply that Google works under the motto of "unlimited capacity."[23] At the same time, fears have been expressed that the Web is heading toward a traffic bottleneck caused by the video trend YouTube established. At the end of 2007, the *International Herald Tribune* reported that the 100 million video clips that were then being streamed daily from YouTube's servers required as much bandwidth as the entire Internet had seven years earlier. Thus, the company stood out as a binary traffic crook, "[since] video is rapidly becoming the most popular thing we do online. But video takes up a lot of space, a lot more than text, and the increased use of video means that the Internet is fast filling up. The result is that if we don't invest soon […] it could take forever for your photos or video to download or for your e-mail to arrive."[24] Today, however, these fears seem to have been unfounded, thanks especially to the new trend of cloud computing. But fear of traffic jams remains, which is clear in Barack Obama's proposal on net neutrality in terms of Internet speed.[25] YouTube has been criticized for taking up too much of the Web's bandwidth, even though most people agree that the real villains are the global P2P networks whose huge traffic volumes completely dominate the Internet.

Archival Mobility

For the past few years, the "archive" has appeared as a kind of guiding metaphor for the contemporary digital media landscape. According to Wolfgang Ernst it is one of the most essential metaphors "for all kinds of memory and storage capacities."[26] Media archive websites such as YouTube and Flickr are symptomatic of the way in which the Web is recasting today's media forms in an archival direction. Naturally,

the digital archive is by nature a database, that is, a structured collection of data stored in a computer system. Database structures are organized according to various models: relational, hierarchical, network and so forth. Regarding YouTube, Geert Lovink has consequently proposed that "we no longer watch films or TV; we watch databases."[27] One consequence regarding this database structure, as well as the digital production and distribution of media, is that the differences between various media forms are disappearing. This is also true of newspapers, photographs and music. The concept of medium specificity is starting to become archaic. On the Web, all media are gray—or more correctly, on the Web there are on closer observation no media at all, just files in databases containing mathematically coded information. Just as 20th century media forms are converging, they are also being replaced by the surface effects of algorithms, that is, by various kinds of programmed content consisting of text, sounds and (moving) images. Filled as it is with binary files, the Internet would seem to be the only channel of communication that still remains.

At the same time, a rather strict division between different media forms still prevails on the Web. For instance, when public service radio or television has been upgraded to digital platforms, the programs are still packaged using the respective media's special signatures, logotype, etcetera. Web-based television is still seen as an *extension* of conventional TV—even though the focus may be changing gradually. The specificity of the medium is, thus, rooted in the analogue past and not in the digital future. But of course there are exceptions; podcasting for example has become a distinct media-specific feature of online radio. Nevertheless, the major difference between analogue and traditional public service and its subsequent online version is indeed the latter's distinct archival character. The motto of Swedish Television's online application SVT Play, for instance states: "More than 2,000 hours of free television—whenever you want!" And the slogan for the BBC iPlayer reads in a rather similar archival fashion: "Making the unmissable unmissable." As of December 2008, more than 180 million programs have been viewed on the BBC iPlayer since its release, hence making a "massive library available to the public."[28]

The new database model or archival mode of online media is also apparent in new media settings disconnected from the Web. Data storage, for example, has become something of a fashionable accessory:

people in the West adorn themselves with white and black iPods or USB memory sticks in shiny design. The mobile iPod culture could also be said to be archival in nature. The foremost variant of an iPod Classic currently has as much as 160 gigabytes of storage space, that is, room for either 40,000 MP3 music files or 200 hours of video. However, selling storage space as an attraction has not always been possible; one never sees a computer's hard disk except as a graphical representation on a computer screen. In fact, data storage has traditionally been completely overshadowed by various glossy interfaces. The Graphical User Interface, the GUI, has essentially got all the attention in descriptions of IT developments. But times change, and Apple is said to have sold about 160 million iPods. The attraction of this little apparatus is not only its impressive design, but also its function as a mobile media archive that lets the user carry around an entire library. Naturally, the library metaphor is even more apt with regard to Amazon's Kindle. The fact that the first version of this portable reading device could store only 200 books was actually completely irrelevant. Kindle 2 can store many more, yet the whole point of this device is its built-in mobile-phone modem that can download, in no time, any book selected from Amazon's cloud of binary books. Consequently, Jeff Bezos has pointed out that his scarcely modest vision for Kindle "is to have every book that has ever been in print available in less than 60 seconds."[29]

Naturally, the founders of YouTube have also shown an interest in the mobile Web. Concurrently with developments entailing that Web surfing is no longer only based only on traditional computers, but has also moved into various MIDs (mobile internet devices), YouTube has invested in making its own website more or less platform and operating-system independent. In May 2006, YouTube launched its "YouTube To Go" service, mainly owing to the growing number of handheld devices capable of recording video.[30] The service enabled users to upload clips directly from their mobile phones to the Web, and half a year later, Chad Hurley announced that yet another mobile service would allow basically everyone to share videos with one another in the YouTube community directly via their cell phones.[31] Furthermore, in February 2007, Nokia and YouTube announced that they were now "global partners," and that the new Nokia Nseries phones would be able to access the sub-site YouTube Mobile from a built-in web browser.[32] More deals followed. In June of the same year, YouTube signed a deal with Apple so that users could

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soon enjoy original content on Apple TV, but more importantly, YouTube became sort of a "killer app" for the new and hyped iPhone.

According to a press release from Apple, YouTube had in fact begun to encode videos in the advanced H.264 format "to achieve higher video quality and longer battery life on mobile devices." Initially, some 10,000 videos would be available, but YouTube promised to continue adding content each week until the "full catalogue of videos was available in the H.264 format."[33]

Apparently, YouTube made great efforts to hook up with the mobile community. Offering video services on mobile devices seems to have been a key opportunity for the company, and YouTube's partner Nokia serves as a case in point. Rumor has it that a Nokia cell phone—due to the company's 40 percent share of the world market—is currently *the* technological device producing the majority of media on a global scale. Consequently, there are innumerable blog posts, sites and online comments on mobile-media usage. For instance, a year ago, thenokiaguide.com stated that YouTube "has made a huge impact on our Web 2.0 lives. Its popularity can best be seen from the amount of [Nokia] apps specifically made for YouTube alone. In a time frame of just a few months we have not one but four apps: Mobitubia, Emtube, YTPlayer and the YouTube Java app." In addition to these, the blog mentioned the mobile YouTube site, as well as the option on some Nokia devices to watch clips directly from the browser with Flash Lite support. "Since when did we have so many apps and services available for just one video service?"[34]

File Sharing

Letting users share videos regardless of place and time was YouTube's main impetus for going mobile. Needless to say, Web 2.0 has been about sharing user-generated content. Consequently, the Web-based participatory culture is rudimentary to understanding YouTube as a cultural phenomenon, as a number of articles in this book reveal. Indeed, "sharing" as a process of dividing and distributing is also an apt metaphor—like the notion of the "archive"—with regard to the new binary landscape. "Sharing is a key feature in the developing field of free software and open source software," Wikipedia informs us, and the dichotomy between "commercial" and "sharing" economies is also central in both Yochai Benkler's and Lawrence Lessig's latest books. According to the former, "sharing" can be seen as "a new mode of production emerging in the middle of the most advanced economies in the world." These new "nonmarket collaborations" are driven by computer networks in which different social relations act as a replacement for pricing mechanisms.[35] As a consequence, according to Lessig, "people participating in creating something of value share that value independent of money."[36]

The primary example of this new "sharing," however, is file sharing. Some see file sharing as the plague of our time, but it is without doubt also a central phenomenon in understanding how the information landscape has changed during the past decade. Already in 1999, the launch of Napster—the first file-sharing program to be spread and used by a wide audience—indicated that media could potentially be shared, stored and distributed in an entirely new way. The power of Napster lay in the network itself, and by the turn of the millennium, almost 30 million people had used the website. The similarities with YouTube are striking, not least regarding the doubtful copyright status of the material, which subsequently led to Napster's fall. Since then the P2P technique has developed, and today's superfast file-sharing protocols stand out (perhaps even more than YouTube does) as a kind of media archive and information distributor of the future. What is technologically remarkable about P2P networks is that while distribution of media material via a website becomes sluggish because when there are too many users, the opposite is the case for P2P. In P2P networks, the more users there are, the faster the distribution. As soon as you download something,

you also become *by definition*, and at the same moment, an uploader of those parts of the file you have downloaded. Today, P2P networks represent almost half of the traffic on the Internet. For instance, in November 2008, the company MultiMedia Intelligence reported that "P2P data currently represents 44.0 percent of all consumer traffic over the Internet and 33.6 percent in North America. Much of this data is audio and video files (over 70 percent)."[37]

As the term suggests, file sharing means that users *share* digital information over the network. The same principle applies to cloud computing, and today, several minor actors are building their applications *on* and not *for* the Internet. In other words, the Net *per se* is the new operating system. At the same time, according to critical representatives of various "sharing economies," for example the Open-Source Movement, the digital cloud is a marketing hype. Users are being tricked into uploading personal information into private clouds that are owned and run by companies. Naturally, Google has access to the information users store on its servers—even if Google maintains that it would never use that information. Considered from this perspective, the cloud appears to be considerably darker.

Still, a number of IT gurus, for instance Kevin Kelly of *Wired*, claim that developments toward cloud computing and sharing are inevitable. At the Web 2.0 Summit conference in November 2008, Kelly pointed out that because our media are converging, we will soon have only one common media platform, whether we are talking about TV, the press, radio or film. Everything exists online and is run by the same kind of Web-based machine. In his presentation, which he introduced as "an impressionistic view of what we all are heading towards"—which now of course can be seen on YouTube[38]—Kelly stressed that, in the future, three overall moves will probably characterize the Web: a move up into the digital cloud, a move down into gigantic databases, and a move toward a kind of general sharing. According to Kelly, information that is not part of the cloud and not accessible to everyone will not exist.[39] The latter notion constitutes the foundation of Web-based applications such as Google Maps, which combine the cloud's data or services using "mashup" technology. There are actually those who claim that if Gutenberg's movable pieces of type were the modules on which the art of printing rested, then almost analogous divisible program modules will constitute the foundation of the information landscape of the future.

Conclusion

Kevin Kelly's intentional focus on sharing as the future of the Web and as a fundamental principle for cloud computing is an exciting scenario. Lawrence Lessig is on a similar train of thought in what he calls "hybrid economies," but his vision of the future is considerably darker—and interestingly enough, one of the reasons is YouTube. The site is a kind of "community space—a virtual place where people interact, share information or interest. [But the trick is] to translate these spaces into successful commercial ventures."[40] According to Lessig, community spaces are one of the hybrid economy's three sub-sectors; the other two consist of advertisement-driven collaborative sites (like Slashdot or Last.fm) or various types of Net communities (like Second Life, a virtual game that generates real revenues). Basic to the popularity of these places is the kind of "viral" marketing used, where services, products or messages are so fascinating—like the content on YouTube—that users or customers spread knowledge of them among their acquaintances without being directly encouraged to do so.

Yet the future is uncertain. Particularly concerning possibilities of making money from, for instance, moving images in a digital cloud that has long been characterized by the fact that content is free—although following Chris Anderson's thoughts on "freeconomics" this might well be possible. As this article is being concluded (in January 2009), media reports on YouTube are dominated by the topic of how and when the site will begin making money during the coming year.[41] The eyeballs are there—but how to monetize? Monetization seems to be the number one priority for YouTube during 2009. Strategies involve everything from putting more ads into clips to "click-to-buy" services that take advantage of online ordering mechanisms. But one important factor for getting a hybrid like YouTube to work is having insight into how a social network functions, as well as knowledge of the norms and values that regulate users' activities. Naturally, the people at YouTube know that too much advertisement and too great a focus on sales will lead to decreased popularity. It is nevertheless likely that, in the future, various forms of hybrid economies will constitute the predominant architecture for conducting business in the cloud. If we follow Lessig's gloomier scenario, however, this business architecture will not only reshape the Net's commercial prerequisites, but also radically change how the Net's current

gift economy and system of sharing function. It is possible that, in the future, we will have to reckon with a stingier Internet.

Endnotes

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3 Pete Cashmore, "YouTube is World's Fastest Growing Website," *Mashable* 22 July 2006 – http://mashable.com/2006/07/22/youtube-is-worlds-fastest-growing-website/ [last checked 15 February 2009].
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5 YouTube contains a great deal of video material from public-service TV channels like the BBC and PBS in addition to material from innumerable commercial TV channels. Today, YouTube has agreements with thousands of partners, but what is most interesting is the actors that have brought suits against YouTube for copyright infringement while simultaneously establishing collaborations with the website. Naturally, everyone wants to be where the users are. This is also the case for the French national media archive, Institut national de l'audiovisuel, an institution that has both sued and cooperated with YouTube at the same time. See, e.g., the blog post, "YouTube en conflit avec Warner Music et l'INA," 22 December 2008 – www.degroupnews.com/actualite/n3115-youtube-warner_music-ina-remuneration-justice.html [last checked 15 February 2009]. It is well know that the relationship between amateurism and professionalism is being renegotiated on YouTube, but thus far, this also concerns the amorphous boundaries between legal and illegal media activities.
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ARCHIVAL CLOUD STORAGE Features. Highly available, affordable solutions for backup, archival and disaster recovery. Transfer Service. Schedule data import from Amazon S3, HTTP/HTTPS and on premises locations.Â Use the same APIs across Google Cloud Platform Storage services, including versioning, range scans, and offset reads. Partner Integrations. Integrations with leading solution providers: Actifio, Cohesity, Commvault, NetApp, Rubrik and many more. Low cost. Use Mimecastâ€™s cloud archive to move to the cloud with a single, secure archive for email files and other content.Â Mimecast Cloud Archive has long set the industry standard for enterprise information archiving, helping to keep corporate knowledge available, protecting and preserving it while simplifying management and administration. The advantages of cloud archiving become clear when you look at the cost of implementation and maintenance of private mass archival storage, especially for organisations with large data retention obligations. Ownership of private archive infrastructure is a costly and management-intensive exercise.Â Are the data indexing, searching, retention and legal compliance aspects of the service compatible with our requirements? Should the archive reside in the public or private cloud space?