

Peer-to-Peer Network and the Distribution in the EU

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Introduction

Broadband internet connections are growing rapidly throughout Europe: after a slow start, the old continent has caught up with the USA and other industrialized countries. The diffusion of broadband is a key factor to develop digital convergence between telecommunications and television, new Internet applications and services, and new online contents. Peer-to-Peer networks are becoming an increasingly important avenue to distribute such contents across broadband connections. In our work we will describe the working of Peer-to-Peer networks, its evolution towards legal business models, its regulatory challenges, and the role that they will play in a convergent world.

Through strong advancement in the DSL technology, broadband lines in the European Union have reached a world record of more than 58 million lines at the end of 2005 (+50% over the previous year), or one-third of the world total, vis-à-vis China with 29 million, the USA with 22 million ADSL (in the USA there are also 24 million cable modems which provide broadband connections). The European Union is expected to reach 120 million broadband lines by 2010.

In the mobile market, the European Union reached 700 million cellular lines at the end of 2005 (penetration rate: 150%), and is today moving rapidly to increasing bandwidth capacity through UMTS and HSPDA.

Content services are benefiting from the steady rise in the broadband subscriber base. The pioneer services that were launched before 2000 suffered from a lack of bandwidth, from the lack of cooperation between content providers, online distributors and ISPs, and from difficulties in establishing business models. But most of these obstacles have been lifted as bitrates increase, thus improving the quality of the services. Other contributing factors include a more open attitude from content providers, the impetus provided by new entrants coming from other industries such as Consumer Electronics (CE) and the growth of online advertising, along with the growth of the online audience. Some services have proven that it is in fact possible to market paid content via the web.

The online content market (video, music, publishing, games, and adult content) is expected to increase more than double in the next 4 years, thus increasing from close to €1 billion in 2006 to €2.2 billion in 2009.

The European Union of 25 Member countries thus appears to be a major area for the development of new Internet applications, of new online contents, and also of new Peer-to-Peer industry-based content and services. Many Peer-to-Peer developments – such as KaZaA or Skype – have been originated by European initiatives. More than 20 million European computers are using Peer-to-Peer software and this figure is expected to double in four years' time.

Peer-to-Peer technologies are defined as a communication structure in which individuals interact directly, without necessarily going through a centralized system or hierarchy. Users can share information, make files available, contribute to shared projects, or transfer files.¹

The most notable feature of Peer-to-Peer networks is that each computer belonging to a community, i.e., a network, is simultaneously a digital content client (demander and downloader), and a supplier and uploader. By combining a search engine and communication tools, Peer-to-Peer becomes a community tool for exchanging and sharing digital resources.

There are two types of Peer-to-Peer architecture. The first is *centralized*, such as the one used by Napster, iMesh, and SoulSeek. Centralized Peer-to-Peer is characterized by the presence of a central server that opens users' access to a network of peers, which references all peers and collects information on the data that are stored for exchange. The second type of architecture is *distributed*. A distributed service is characterized by the absence of a central server. Users do not connect to a server but rather to another user. The information transits in Peer-to-Peer mode, in the same fashion as files are exchanged.

A distinction has to be made between Peer-to-Peer software, Peer-to-Peer protocol, and Peer-to-Peer networks.

Peer-to-Peer software is the application which, once it has been installed on the peer's computer, provides access to the network, and allows community members to perform searches on other peers' computers for content which is available for download. Around the middle of August 2005, close to 1,400 Peer-to-Peer open source file sharing software projects were under development.

A Peer-to-Peer network is formed by a group of servers which are connected simultaneously to one another through the Peer-to-Peer application.

Peer-to-Peer protocol is the set of specifications that describes the rules and agreements adhered to during a Peer-to-Peer data exchange. Each network has a proprietary protocol. Protocols too can be open – like the applications – and so can be reused by other applications.

A number of companies focusing on business segments – which are more restricted than the content distribution and consumer services segments – are evolving within the sphere of Peer-to-Peer.

As initial Peer-to-Peer exchanges often occurred in breach of legal rules on content rights, Peer-to-Peer networks are now attempting to create a market within a legal framework where data sharing can be controlled. Aware of the fact that it will be harder to win customers' trust than it has been for most, these solutions publishers have been careful to ensure the legality of their activities, and the legal implications of the transfers and exchanges they enable.

Peer-to-Peer software publishers offer audio, video, image, and text file exchange applications, along with applications built around this strategy of legality, and are now entering the stage where they seek to establish their legitimacy with the content industries. This stage will involve signing partnership agreements with content providers and making the transition to a paid and approved model.

Broadband as Peer-To-Peer Technology Enabler

Broadband access for all

The number of people in Europe who access the Internet via broadband is increasing at a steady rate, even if the percentage of connected households still varies largely from one region, or one country, to the next. The European Commission estimates that the number of connections in EU25 will increase from the current 60 million to twice as much by 2009.

Indeed, progress made by DSL technologies has brought about not only an enlargement of the geographic area served by broadband, but also a marked increase of the bitrate. In some countries, operators have made a

concerted effort to upgrade their cable networks, or to deploy networks using technologies that allow them to deliver telecommunication services such as Internet access and IP telephony (Tables 13.1–13.18).

Table 13.1 Broadband subscribers in million²

	2002	2005	2006	2010
France	1.7	9.7	12.0	17.6
Germany	3.1	9.7	12.6	22.4
Italy	1.1	6.8	9.1	15.4
Spain	1.3	5.0	6.4	10.0
Total EU 25	12.8	58.4	75.8	119.5
USA	18.3	45.8	56.5	84.1

The bitrates on offer are constantly increasing

Table 13.2 Peak bitrates and monthly subscription costs for residential customers, selection of European ISPs, Oct. 2005

Country	ISP	Network	Maximum bandwidth (Mbps)	€/month
France	France Telecom	ADSL	18	39.90
	Telecom Italia	ADSL	18	29.95
	Free	ADSL	20	29.99
	NC Numericâble	Cable	20	39.90
Germany	T-Online	ADSL	6	29.95
	AOL	ADSL	6	29.90
	Hansenet	ADSL	6	n.a.
	Ish	Cable	5	59.90
Italy	Telecom Italia	ADSL	4	36.95
	Wind	ADSL	4	n.a.
	Fastweb	ADSL	6	40.00
	Fastweb	FTTH	10	40.00
Spain	Telefonica	ADSL	4	39.07
	Wanadoo	ADSL	2	39.00
	Jazztel	ADSL	20	29.95
	AunaCable	Cable	2	42.00
United Kingdom	BT	ADSL	2	32.95
	Tiscali	ADSL	2	32.95
	Wanadoo	ADSL	2	32.95
	NTL	Cable	10	55.90

Development and Diffusion of Peer-to-Peer in Europe

Peer-to-Peer's Reach

The penetration rate for Peer-to-Peer software in households equipped with a broadband Internet connection varies between 15% in Poland and nearly 34% in Germany. Given the continuous increase of the installed broadband subscriber's base, as projected by the European Commission and by several information providers, the number of Peer-to-Peer users, therefore, is set to continue to grow.

The average length of the active use of Peer-to-Peer also varies across countries. A French household equipped with at least one Peer-to-Peer application uses³ it for an average of 8 h and 30 min a month, while a German household uses it, on average, for only 3 h and 45 min.

Table 13.3 Peer-to-Peer's reach

	France	Germany	Italy	Poland	Spain	Sweden	UK	Rest of EU 25	USA
Broadband subscribers in millions	9.7	9.7	6.8	2.0	5.0	1.8	10.1	1.3	52.4
Peer-to-Peer penetration rate in %	31	34	25*	15*	20*	30*	18	15*	26
No. of peers in millions	3.0	3.3	1.7	0.3	1.0	0.5	1.8	0.2	13.5
Active Peer-to-Peer duration per month (hh:mm:ss)	08:32:35	03:47:32	n.a.	n.a.	n.a.	n.a.	05:01:20	n.a.	04:24:42

* IDATE estimate. Source: Nielsen//NetRatings – Service MegaPanel 2005

Peer Profile

Whilst in France, the UK, and Germany over 60% of Peer-to-Peer users are men, in the USA there are far more female than male peers.

Although most peers belong to the 35- to 64-year-old category, which reflects the population in general, 15- to 24-year-olds are – unsurprisingly – over-represented amongst Peer-to-Peer users.

Table 13.4 Peers by gender in %

	France	Germany	UK	USA ⁴
Men	63.5	69.6	65.8	33.6
Women	36.5	30.4	34.2	66.4

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.5 Penetration of Peer-to-Peer based on age, in %

	France	Germany	UK	USA
15–24	58	38	37	33
25–34	44	20	18	16
35–49	38	17	19	13
50–64	32	16	15	7
65+	19	10	6	3

Source: Nielsen//NetRatings – Service MegaPanel 2005

Peer-to-Peer penetration is higher among students, but file-sharing is used by all age categories.

Number of Peer-to-Peer Applications Used

Peer-to-Peer households use up to five different applications, but 95% of them use only two; this implies a certain expertise among file-sharers.

Table 13.6 Number of applications used, in %

No. of applications used	France	Germany	UK	USA
1	76.8	80.7	81.4	86.0
2	18.0	14.6	15.0	12.0
3	3.9	4.1	3.2	1.4
4	0.8	0.3	0.3	0.3
5 or more	0.5	0.3	0.1	0.2

Source: Nielsen//NetRatings – Service MegaPanel 2005

Peer-to-Peer Software and Network Penetration

Twenty applications constitute the base of the most commonly-used Peer-to-Peer applications. In most of the countries surveyed, however, usage was concentrated on five applications in particular.

“Community” Peer-to-Peer networks such as **eMule**, **eDonkey**, **WinMX** and **Freenet** are among the most popular. Interestingly, German peers use more “Community” Peer-to-Peer software than users in other

countries. eDonkey and WiMX are no longer being developed and their upgrades have ceased, following an agreement with the major music providers. Nevertheless, users continue to use the latest versions available.

In all countries, **KaZaA** is one of the most widely-used applications (ranking first in Germany, second in the UK and France, and third in the USA). KaZaA is the most widely known, which would explain its high penetration level. Music and adult content form the bulk of file exchanges on KaZaA. KaZaA too is no longer being developed.

LimeWire is also present in all of the surveyed countries, and is ranked number one in the United States. LimeWire allows users to download all kinds of content.

WinMX is particularly popular in the UK, where it ranks as number one, and in the USA. It is an application with a strong community component, and involves negotiating with peers. In the same vein, eMule, an open source application, is particularly popular in France, where it is the most popular software, and in Germany. However, it does not even figure among the top five in the UK or the USA.

BitTorrent does not yet rank among the most widely-used Peer-to-Peer systems, even if it is perceived as highly efficient. One of the reasons for this lack of use is the difficulty in consolidating the many applications that use the BitTorrent protocol: there are close to 25 in all, including eMule. Moreover, BitTorrent is used primarily for downloading films, whereas most of the other applications enable all types of files to be exchanged. Another reason is that BitTorrent does not operate the same way as other Peer-to-Peer applications. The lack of a built-in search engine and the need to locate and register a link to the file that one intends to download, make it much less accessible than its counterparts. It is, however, by far the most efficient protocol.

Most Popular Software

Table 13.7 France, most popular software in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration ⁵
eMule	26	69
KaZaA	8	21
Shareaza	6	15
eDonkey	2	5
LimeWire	1	3

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.8 Germany, most popular software in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration ⁶
KaZaA	8	44
Emule	6	31
WinMX	2	11
Freenet	2	10
LimeWire	1	6

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.9 UK, most popular software in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration ⁷
WinMX	5	34
KaZaA	5	29
LimeWire	4	22
BearShare	1	6
Ares Galaxy	1	6

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.10 USA, most popular software in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration ⁸
LimeWire	3	29
WinMX	2	23
KaZaA	2	18
BearShare	1	9
Ares Galaxy	1	7

Source: Nielsen//NetRatings – Service MegaPanel 2005

Most Popular Peer-to-Peer Networks

Table 13.11 France, most popular Peer-to-Peer networks in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration
eDonkey	38	83
FastTrack	32	23
Gnutella	9	20
BitTorrent	8	17
OpenNap	7	3
Other Networks	1	4

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.12 Germany, most popular Peer-to-Peer networks in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration
FastTrack	9	45
eDonkey	7	39
Gnutella	3	16
OpenNap	2	11
BitTorrent	1	7
Other Networks	2	12

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.13 UK, most popular Peer-to-Peer networks in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration
Gnutella	6	38
FastTrack	6	35
OpenNap	5	33
eDonkey	2	14
BitTorrent	1	8
Other Networks	2	10

Source: Nielsen//NetRatings – Service MegaPanel 2005

Table 13.14 USA, most popular Peer-to-Peer networks in 2005, in %

	Penetration in Internet households	Peer-to-Peer market penetration
Gnutella	5	47
OpenNap	2	23
FastTrack	2	21
eDonkey	1	8
BitTorrent	1	5
Other Networks	2	20

Source: Nielsen//NetRatings – Service MegaPanel 2005

CacheLogic estimates that, in terms of traffic, the two most heavily used networks are eDonkey and BitTorrent. A compelling fact provided by CacheLogic is eDonkey's vast popularity in Latin American countries. It is also popular in Belgium, Germany, Israel, and South Korea.

What is Peer-to-Peer Used For?

Music Downloads

Music is the most widely downloaded type of content (in terms of number of files) in all of the countries surveyed. Video files rank second and images or photos third.

The United States is by far the country where music enjoys the highest popularity amongst Peer-to-Peer households. In France and the USA, video content ranks second after music while, in Germany and the UK, it is software that comes second.

Because of their size, which are often of several Giga bytes (GB), video games rank lower than other types of content. The same holds true for text files, books, and comic books, which are more accessible in their original format.

Table 13.15 Type of content downloaded via Peer-to-Peer, in %⁹

	France	Germany	UK	USA
Audio files	64.8	52.2	73.4	81.3
Video files	35.2	26.1	24.7	26.8
Written materials (books, documents, PDF documents, etc.)	17.6	26.6	15.2	13.2
Images or photos	26.8	22.8	20.3	15.3
Video games	15.1	17.9	18.4	15.3
Software	30.9	42.9	30.4	25.5

Source: Nielsen//NetRatings – Service MegaPanel 2005

In terms of traffic, the most commonly exchanged audio format are, unsurprisingly, MP3 files.

Close-up on Shared Video Content

In France, Germany, and the USA, more than 30% of Peer-to-Peer users download television programs. This is naturally fuelled by the volume of programs made available on the networks. To some extent, Peer-to-Peer is used by viewers as a PVR (personal video recorder), allowing them to access their TV programs whenever they want to. The software replaces the electronic program guide, and the computer's hard drive replaces the PVR.

Films on Digital Versatile Disks (DVD) are also very popular. Here, Peer-to-Peer acts like a video-on-demand service, and a substitute for rental. When compared to physically renting a film, the appeal of Peer-to-Peer lies in the fact of not having to go to the video shop or distributing machine. Compared to VoD, Peer-to-Peer's main appeal is that the films can be kept once they are downloaded, burned, transferred, and so on.

The interest in "screeners" (films shot by an audience member in the theatre) is far lower, no doubt due to their poor quality. It could have been thought that the appeal of viewing a newly-released film would have made this category popular, but apparently quality prevails over novelty.

Table 13.16 Breakdown of video content downloaded, in %

	France	Germany	UK	USA
Film trailers	8.6	10.4	11.8	9.6
Screeners	18.5	20.0	17.5	16.6
Films available on DVD	31.4	29.9	34.3	27.8
TV programs	33.9	31.0	27.6	36.2
Other audio-visual programs (collections, foreign series, etc.)	7.5	8.7	8.8	9.8

Source: Nielsen//NetRatings – Service MegaPanel 2005

Peers' Downloading is not Limited to Peer-to-Peer Networks

Among the countries surveyed, roughly 90% of Peer-to-Peer users also download content from web sites, in addition to using, albeit to a lesser extent, e-mail, Instant Messenger (IM), and File Transfer Protocol (FTP) to exchange files. Downloads via e-mail rank second, followed by IM, except in Germany where FTP ranks third.

Table 13.17 Downloading from sources other than Peer-to-Peer, in %

	France	Germany	UK	USA
Download via regular website	65.1	72.8	69.0	72.8
Download via a blog (someone else's website)	12.8	13.6	12.0	8.9
Download via FTP server	14.3	36.4	15.2	16.2
Download via e-mail	43.9	41.3	60.8	63.0
Download via an IM	35.2	22.8	29.1	23.4
Other	10.2	6.0	6.3	11.1

Source: Nielsen//NetRatings – Service MegaPanel 2005

These figures are corroborated by the data supplied by CacheLogic. In terms of traffic, the Peer-to-Peer phenomenon is gaining more momentum than FTP or classic web traffic. In late 2004, it accounted for close to 60% of all IP traffic, versus just over 40% for ordinary Internet traffic.

The Response of Content Providers: Business Models for Online Contents

A first generation of online content services was launched in the late 1990s. These included music and video services but, on the whole, were not overly popular for a number of reasons:

- Lack of bandwidth: The available bitrates were too low and ill-suited for listening to music or watching videos. Live TV was not available and the downloading delays were not acceptable to customers.

- Lack of cooperation between content providers, online distributors and ISPs: Initially, music publishers in particular adopted a vertical integration strategy, in an effort to keep control over the distribution of their products, a process which held little appeal for consumers who wanted access to the broadest possible selection. This led to a limited offer of digitally distributed music, which did not correspond either to web users' habits or to their needs.

- Competition between online content shops and physical retailers: This is because the former puts pressure on rights' holders to maintain the same level of prices as offline distribution, without the consumer benefiting from the savings generated by digital distribution. Also, content owners refused to sell the rights on their most popular content as they didn't want to disrupt classic distribution systems or undermine their business models.

- At the time, no entrenched business model for digital content distribution had emerged: Online content providers found that at the time consumers were only willing to pay for Internet access and not for additional content, except for some specific services such as adult content. A number of content providers, therefore, placed their bets on advertising revenues, but the advertising expenditures on the Internet grew more slowly than expected and were concentrated on a limited number of websites.

- And, finally, the dotcom crash in 2001 created a rather hostile environment for investing in new services.

Most of these negative factors have now disappeared:

The rise in available bitrates enables shorter download times, and even real-time video viewing.

Content providers have rolled out more nuanced strategies. In the area of music, in particular, rights holders appear to have given up on trying to control their catalog's distribution, and are signing non-exclusive agreements with online vendors. Leaders in the video world are still resisting change. However, several major Hollywood studios having joined forces to create their own online distribution service called MovieLink.

At the same time, new operators have entered the fray as online digital content vendors. Such operators have a variety of backgrounds: computing (Apple/iTunes, Microsoft/MSN Music Club), CE (Sony/Connect), retail chains (Virgin), and new entrants (OD2/LoudEye). This shift is also taking place with video content, with the emergence of online distributors who are independent from the producers (e.g., MovieSystem, a subsidiary of French TV channel Canal+). In the long run, music and video distribution services are likely to merge.

The growth of the online advertising market is also expected to have a positive impact on content services. While music and video are always likely to depend on direct payment from consumers (per unit or via subscription), online news services depend largely on indirect financing from advertising.

iTunes' online music sales and the rise in the number of subscribers to certain online financial journals are both indicative of a degree of willingness amongst consumers to pay for content, when digital distribution offers appealing products which are affordable and easy to access. The reliability of a content pay-for-service, its security (from viruses), the assurance of being able to access authorized products, and the quality of image and sound alike are also key incentives for consumers to pay for content which could otherwise be obtained free of charge via Peer-to-Peer networks.

Appraising the Online Content Market

According to Jupiter, Western Europe's paid content market will increase from €0.7 billion in 2004 to €2.8 billion in 2009.

Adult entertainment is still the most popular form of online content, but its share of the market is decreasing steadily as demand for other types of content increases. Music and, to a lesser extent, video are likely to experience the highest growth rates in the coming years.

Table 13.18 Appraisal of paid online content revenues in Western Europe, 2006–2009¹⁰

€ million	2006	2007	2008	2009
Publishing	268	326	370	403
Video	88	133	186	244
Games	368	485	610	762
Music	269	452	652	836
Other ¹¹	448	487	518	540
Total content revenues	1441	1883	2336	2785

Source: JupiterResearch – European Paid Content and Services Forecast

Veterans and New Entrants – Impact on the Content Value Chain

The broadband content Internet market is not a reproduction of the offline market. Several different strategies are being deployed both by brick-and-mortar content companies and by pure Internet players.

Content publishers may seek to *by-pass their traditional distributors* and address customers directly. Examples of this include:

Films on demand (MovieLink, CinemaNow and Akimbo): studios (and Hollywood in particular) are creating their own video-on-demand (VoD) services which, in the short term, will be available only on PC. The volume of revenues generated by their longstanding clients, namely TV channels, prevents them from offering their service on the TV set.

Online game distribution (TryMedia and Boonty): these services offer digital distribution of PC games. New business models have been tested: download of a trial version of the game, renting games on a per-unit basis and flat fees for unlimited access to a catalog of games available for download.

Other players are leveraging their areas of expertise to enter the content market. Some CE manufacturers, for instance, are banking on combining their products with services to ensure the availability of appealing content and/or to occupy a larger portion of the value-added chain. Apple and Sony combine sales of MP3 players and online music distribution. RealAudio bundles games on its RealArcade player. Portable video player manufacturer Archos has signed agreements with EchoStar in the USA, and Canal+ in France, to distribute the two operators' TV programs.

New intermediaries, so called “search–find–obtain” companies (e.g., Google, eBay, Amazon, Yahoo!, Expedia, Meetic, and Yellow Pages) that enable users to search for information, people, products, and services, have become leading players in the Internet content and services market. The emergence of companies, whose business is to compile all of the available content and allow consumers to acquire it, appears a likely evolution of the Internet.

Following the acquisition of Skype by eBay, new entrants specialized in “search–find–obtain” business could invest in Peer-to-Peer solutions to reinforce their position of intermediaries along the value chain.

Content-generated revenues or indirect revenues?

For some operators, marketing online content is part of a larger objective. CE manufacturers use online music sales (and no doubt video in the future) as a means of increasing the sales of their audio and video equipment. Operators are allotted only a marginal portion of the revenues generated by online content sales, which are not their main source of profit.¹²

Advertising-based Financing or Subscriber Payment?

Pioneer illegal online content downloads sites sought to develop a financing model based on advertising, by having adverts displayed on their portal’s homepage. When operating a legal business, it is conceivable that advertising can help finance a content distribution operation. Radio stations, for instance, are financed entirely by advertising, and contribute significantly to record companies’ revenues. Although the online advertising market has been back on an upwards swing for the past two years, it is still limited by certain features:

The Internet’s share of advertising is still well below its audience share in the media market. The Internet has roughly a 13% share of the audience in the USA, but only a 4% share of the advertising market. Advertisers’ gradual cutbacks in spending on the number one advertising platform, i.e., television, are nevertheless expected to help reduce this gap.

Advertisers’ investments are still highly concentrated on select sites. In 2004 in the USA, for instance, the top 10 sites alone accounted for a 71% share of the online advertising market, while the top 25 sites had the lion’s share of 94%.¹³

The most common type of advertising found on the net now is the “paid search,” in other words links to sites supplied by search engines. This form is more beneficial to “search–find–obtain” intermediaries than to pure content sites.

Subscription or Pay-as-you-go?

The first digital content distribution services opted for a replica of the tariff model used by physical retail vendors, offering content sales and rentals on a per-unit basis. Models based on subscriptions in exchange for limited access were also tested. The combination of subscriptions and per-unit sales may well be the best response, with the choice of the tariff model being a reflection of the content’s appeal and commercial potential. Some VoD services offer both flat rate subscriptions for access to a catalog of programs, and a pay-per-view system.

Sale or Rental?

Contents can be made available using a sales model (whereby consumers acquire complete ownership of the content) or a rental model (whereby they have access either for a limited amount of time or for a limited number of viewings/plays). Both models now coexist.

Although these models are still uncertain, the market is populated by operators for whom offering content for free allows them either to market other products and services (players, Internet subscriptions), or to generate advertising revenues (search engines), while for others content marketing remains a profit center. For the latter, the fundamental choice lies between a model based on the principle of exclusivity and control over a program’s distribution (as with TV programs), and a broad distribution model (as with music sales), widely available on the Internet. Because of this, intermediaries’ and aggregators’ (TV channels, shops) position is being threatened by a growing number of distribution channels, and on-demand TV viewing and radio listening.

Peer-To-Peer and the EU Regulatory Framework

In the European Union the regulatory approach towards Peer-to-Peer is considered within the general legislation for copyright and related rights in the online environment.

The EU Copyright Directive

The European Parliament and Council's directive 2001/29/EC, dated 22 May 2001, on the harmonization of certain aspects of copyright and related rights in the information society (Copyright Directive) aims to transpose and ensure the implementation of the World Intellectual Property Organization Treaty on Copyright and on Performance and Phonograms of December 1996.

The Copyright Directive harmonizes the legal protection granted to rightsholders for on-line uses of protected works and tries to balance rightsholders' exclusive rights with exceptions for consumers for specific legitimate uses (private copying). Moreover, it forbids the circumvention of anti-copying devices and provides exemption for network operators to obtain the rightsholders' authorization to make temporary copies of protected material for transmission purposes.

Right of Reproduction and Exceptions to the Exclusive Right

According to the Directive, any copy (permanent or temporary, direct or indirect) of protected material has to be authorized by the rightsholders and all of the exceptions provided cannot conflict with the normal use of the protected material; further, they cannot unreasonably prejudice the legitimate interests of the rightsholders. No authorization is required for making temporary copies of protected material if the copies are an "integral and essential part of a technological process"; if the sole purpose of the technological process is to "enable a transmission in a network between third parties by an intermediary or lawful use"; and if the copies have no "independent economic significance."

These exceptions cover copies made for browsing and caching purposes, and those which enable transmission systems to work efficiently, provided that the intermediary does not modify the information and does not interfere with the lawful use of technology – which is widely recognized and used by the industry – to obtain data on the use of the information.

Further, optional, exceptions to the authorization for the reproduction right include: copies made for private use, for the benefit of publicly accessible institutions such as libraries, museums or archives, educational and scientific purposes, for news reporting or quotation purposes, for use by people with disabilities, for public security uses, and for uses in administrative and judicial proceedings.

In the case of private copying, rightsholders must receive fair compensation determined by Member States.

Right of Communication to the Public

All communication to the public regarding protected material, including making it available on demand via the Internet, must be authorized by its rightsholders.

The provision of physical facilities for enabling or actually making communication does not constitute a “communication to the public” and intermediaries do not require the authorization of the rightsholders before transmitting protected material over communication networks. Some exemptions to the authorization are allowed for educational and scientific purposes, for news reporting or quotation purposes, for use by people with disabilities, for public security purposes, and in administrative and judicial proceedings.

Right of Distribution

Distribution to the public of protected material via a physical medium (e.g., DVDs) must be authorized by rightsholders.

Once protected material is marketed on a physical medium in the European Union by or with the consent of the rightsholder, the latter cannot oppose any subsequent resale. Parallel imports are therefore permitted provided that they originate from a Member State.

Protection of Anti-Copying Devices

The Copyright Directive provides protection against the circumvention of “effective technological measures,” which are intended to protect intellectual property rights (DRM, digital rights management systems). It also establishes that Member States must provide adequate legal protection against any activity (including the manufacturing or distribution of devices, products, or components and the provision of services) carried out with the knowledge – or with reasonable grounds to know – which is “primarily designed, produced, adapted, or performed to enable or facilitate the circumvention of these technological measures,” or has only limited commercially significant purpose or use other than circumvention, or is promoted, advertised, or marketed for the purpose of circumvention of these technological measures.

Member States must provide legal protection against the removal or alteration of electronic copyright management information and distribution, and the import and communication to the public of works from which rights management information has been removed or altered without authority.

Moreover, in order to make the exceptions to the exclusive rights possible, rightsholders must guarantee that the beneficiaries of some of the exceptions can indeed benefit from these exceptions. This provision only

applies to off-line use and not to on-demand delivery of protected material under agreed contractual terms (in the case of a private copy of a legitimate CD-ROM, users should be able to make copies without authorization even if the CD-ROM is protected by an anti-copying device).

Liability of Intermediaries

The Copyright Directive does not regulate the conditions under which information society service providers can be held liable for third party illegal content when they act as “online intermediaries,” but the Electronic Commerce Directive (European Parliament and Council Directive 2000/31/EC of June 8, 2000 “on certain legal aspects of information society services, in particular electronic commerce in the internal market”) merely specifies that rightsholders must be entitled to apply for an injunction against intermediaries when their services are used by third parties to infringe intellectual property rights.

The Electronic Commerce Directive states, as a general principle, that Member States may not impose a general obligation on intermediaries to monitor third party information, which they transmit or store, and provides cases where liability limitations may be applied to all forms of illegal activities (including copyright and trademark infringements, defamation, misleading advertising, etc.).

Limitations to the Liability of Intermediaries: Mere Conduit

Service providers, whose role consists in the transmission of information originating from third parties and the provision of access through a communication network, cannot be held liable for third party illegal content if they do not initiate the transmission, do not select the receiver of the transmission, and do not select or modify the information transmitted (Mere conduit).

Limitations to the Liability of Intermediaries: Caching

Automatic, intermediate, and transient storage of information which takes place during the transmission of the information in order to carry out the transmission is covered by the exemption of liability.

Service providers cannot be held liable for third party illegal content when providing caching facilities if they do not modify the information, if they comply with the conditions on access to information and with the rules on the updating of the information, if they do not interfere with the “lawful use of technology” to obtain data on the use of the information, or

if they act “expeditiously” to remove access to the information stored having been informed that the information has been removed from the network, when access to it has been disabled or when a responsible authority has ordered the removal (Caching).

Limitations to the Liability of Intermediaries: Hosting

Service providers who store information supplied by and at the request of a recipient of the service are not liable (for criminal liability) if they do not have “actual knowledge” that the information or the activity is illegal (for civil liability), if they are not aware of facts or circumstances which would make the illegal activity apparent, or if they “expeditiously” remove access to the information once informed of its illegality (Hosting).

Peer-to-Peer and National Legislation in Europe

The Copyright Directive has been transposed in internal legislation by the majority of the EU Member States and their national legislation towards Peer-to-Peer relates to the rules within the Copyright Directive.

France

France adopted a law on copyright and related rights in the information society in June 2006 which requires Internet users to implement the technical means of protection which Internet access providers must offer to their subscribers to ensure that the Internet is not used for non-authorized reproduction purposes.

The law foresees the creation of a new independent administrative authority, which is responsible for monitoring DRM and the identification of protected works that will take duties for settling disputes relating to the interoperability of digital rights management systems. The authority will also ensure that the exceptions to intellectual property rights can be effectively exercised and will establish the number of private copies that can be made under the private copy exemption.

The circumvention of technical protection measures that seek to prevent or limit non-authorized uses of protected works (other than software, videos, and sound recordings) – such as DRM systems – is prohibited by law.

According to the law, technical protection measures should not prevent interoperability, and providers of technical measures are to provide access to information required to ensure interoperability. Should access be refused, software editors, manufacturers of technical systems, and service providers may ask the administrative authority to adopt a decision within 2 months.

Unauthorized acts of reproduction and communication to the public of protected works that have been made available through a Peer-to-Peer file sharing software will be sanctioned by fines, and distributors and publishers of software intended for illegally making protected works available will be subject to penalties.

Germany

Germany began a reform of the copyright legislation in 2003 in order to fulfill the requirements of the information society. In March 2006, the Federal Cabinet adopted a decision that allows the analogue and digital copying of protected works for private purposes, but prohibits private copying if the copy is made from an “obviously illegal” copy or if it was “obviously illegally” made available to the public (e.g., films on the Internet or via Peer-to-Peer). The exception according to which illegal private copying would not be prosecuted where only a small number of protected works are illegally exploited and solely for private purposes was removed.

The circumvention of anti-copying devices was prohibited.

Italy

In Italy, the law (Legislative Decree 68, 2003) implementing the EU Copyright Directive aligns the rightsholders’ exclusive rights of reproduction, communication to the public and distribution with the provisions of the EU and provides for exceptions and limitations to these rights and for the protection of technological measures.

Rightsholders have an exclusive right to authorize the reproduction, the communication to the public and the distribution of their protected works. Nevertheless, the Italian law provides some exceptions regarding the private reproduction of audio and visual materials, if made by natural persons for their own private use.

Criminal sanctions (administrative penalties and/or imprisonment) are envisaged for those who circumvent the rules on technological measures or abusively alter or remove the rights management information placed on the works.

Moreover, in 2004 the Italian Parliament adopted a law on “measures aimed at combating the abusive telecommunication diffusion of audiovisual materials and interventions for supporting the cinema and showbiz activities” (decree, 2004 no. 72 or “Peer-to-Peer law”) which provided administrative sanctions for anyone who diffused (by means of telecommunication tools or file-sharing techniques) copyrighted films or similar

works, and criminal sanctions for anyone who diffused copyrighted films to the public using file-sharing techniques, or promoted related activities. Finally, it foresaw the obligation for Internet service providers to inform public authorities when they were aware of illicit file-sharing activities. The Peer-to-Peer law was modified in 2005 by law n 43 that allows offences for illicit file-sharing of copyright works to be extinguished by the payment of an administrative fine and replaces the aim “for profit” with “for purpose of gain” for the application of criminal sanctions to activities which do not lead to a direct gain but to an indirect one.

Spain

Spain has adopted a law transposing the Copyright Directive but the final version of the law is not yet available.

The law contains a mechanism to set copyright levies on digital copying devices, whereby interested parties can propose a list of devices and the amount that should be levied on the cost of the device to the government. The government then makes a final decision on the levies to be paid (the law already contains provisional fees that will be valid until the final decision is adopted).

United Kingdom

In the UK, the Copyright Directive was implemented with the Copyright and Related Rights Regulations 2003. The British regulation relates to the right of communication to the public, including the broadcasting of the work and its being made making available to the public by electronic transmission in such a way that members of the public may access it from a place and at a time individually chosen by them, and to the right for intermediaries to make temporary copies of works that are transient or incidental, that are an integral and essential part of a technological process and the sole purpose of which is to enable a transmission of a work in a network between third parties.

The Copyright and Related Rights Regulations 2003 deals with the protection of technological measures (e.g., anti-copying devices) through the creation of the offence of manufacturing, importing, selling, letting, offering for sale or hire, advertising, possessing or distributing devices or services that are designed to circumvent technological measures. It also allows individuals to issue a complaint to the Secretary of State if an effective technological measure prevents a person from carrying out a permitted act, by providing the legal protection to the electronic rights

management information and by enabling courts to grant injunctions against service providers if they have actual knowledge that other persons are using their services to infringe copyright.

The Future of Peer-to-Peer

Expected Developments in Peer-to-Peer Systems

Securing Distant Content Management

Some Peer-to-Peer applications offer the possibility of downloading information and statistics via mobile phones. The ability to configure a Peer-to-Peer application to access information on the ongoing operations (speed, completed downloads, etc.), and on the launch of a request over a mobile handset, opens the way to nomadic Peer-to-Peer use.

Ensuring the Continuity of the Peer-to-Peer Distribution Service

Continuity of service is now virtually guaranteed by the creation of decentralized networks. This means that a decentralized network, which has been ordered to shut down, will continue to exist as long as there are peers using the software. Following a decision by the US Supreme Court in June 2005 against Grokster and Morpheus, many publishers elected to amend their services. Some are offering a new version of their software that requires a user ID and password, which are given after payment of a monthly or yearly subscription fee. Nevertheless, users who elect to connect to these networks by using an older version of the client software can still enjoy unrestricted access to the content. This means that unauthorized exchanges continue, but the publishers are protected from legal repercussions.

Securing Swaps in a Satisfactory Way for Rights Owners, Content Providers, and Publishers

Several initiatives have been conducted in order to incorporate a mechanism for collecting monies, sometimes referred to as tips, to be paid to copyright holders. Such a mechanism can involve a tool for identifying the content and continuous calculation of royalties to be paid out. Despite the technical complexity of the procedure and its implementation in a Peer-to-Peer environment, it now appears crucial for a legal offer – approved by the record companies – to emerge. More efficient solutions in this area appear to be coming from DRM systems that incorporate this feature – among others.

Availability on Mobile Devices

Mobile phones are enjoying an ever-increasing, and no doubt irreversible, popularity well beyond mere telephony. It is now technologically possible to implement a Peer-to-Peer kernel in a mobile phone. A number of telecom operators, service providers, and handset manufacturers are focusing their efforts in this direction.

Anonymous Use, Encrypted Exchanges, and Closed Networks

At a time when complaints against Peer-to-Peer software publishers and users are becoming louder, developers are proposing a new kind of Peer-to-Peer application, where peers remain anonymous. This implies that there is less risk for a user to be identified which in turn, encourages him or her to share content. In addition, exchanges are encrypted in such a way as to make it difficult to identify what content is exchanged. And, finally, some applications make it possible to create small Peer-to-Peer communities which are accessed using a login and password. The rise of this type of community could make the battle against unauthorized content swaps even more difficult. In addition, the exchange of encrypted contents could raise serious concerns about security.

Peer-to-Peer Technology for TV Broadcasting

Several applications use Peer-to-Peer technology for broadcasting TV programs in real time, without the broadcasters' approval. PPLive, Coolstreaming, QQLive, PPStream, Sopcast and TVants are all examples of software that enable access to a host of live TV channels picked up from a satellite, cable, or terrestrial network. The TV stream is captured by a peer and then streamed over the Peer-to-Peer network. Increases in the bitrates offered by broadband flat rates allow for steady and fluid play. TV broadcasting via Peer-to-Peer could represent a major economic stake in the coming years.

Expectations for the Future of Peer-to-Peer in Europe

The online content market (video, music, publishing, games, and adult content) is thus expected to more than double in 4 years, going from close to €1 billion in 2006 to €2.2 billion in 2009.

Business models nevertheless remain uncertain. For some operators, offering free content paves the way either to marketing other products and services (players, Internet subscriptions) or to generating advertising revenues

(search engines). For others, content marketing remains a profit center even if online content models cannot replicate offline models exactly. With the exception of premium content, marketing music, videos and video games on a per-unit basis appears less suitable than flat rate subscription models.

The increase in the broadband user base does not only benefit online content distribution services. Peer-to-Peer networks and systems too are becoming more sophisticated, user-friendly, and efficient.

In the larger EU countries, between 15% and 34% of broadband Internet subscribers use at least one Peer-to-Peer application and most Peer-to-Peer households use two. eMule, BitTorrent, WinMX, LimeWire, Shareaza and KaZaA are the most popular. Noteworthy is the fact that 90% of Peer-to-Peer users state that they also download and exchange files using other sources such as websites, e-mail, IM, and FTP servers.

In France, the UK, and Germany, over 60% of Peer-to-Peer users are men with, unsurprisingly, an over representation of 15- to 24-year-olds and students. Music is the top-ranking type of content downloaded, followed by video, then images and photos. In the video content category, films rank number one, although TV programs account for roughly a third of downloaded videos.

The price for online content is by far the main incentive for using Peer-to-Peer networks, but users also cite diversity of content and ease of access as contributing factors.

In terms of traffic, the Peer-to-Peer phenomenon is gaining more momentum than FTP or classic web traffic. In late 2004, it accounted for close to 60% of all Internet Protocol (IP) traffic, versus just over 40% for ordinary Internet traffic.

The exploitation of intellectual property in digital form has required that the existing *legal framework* protecting copyright be amended. However the legal status of Peer-to-Peer systems remains largely undefined and the content industry has taken several legal steps against the unauthorized sharing of digital content files:

- against Internet users, to establish a legal character for Peer-to-Peer,
- against ISPs, to force them to divulge the identity of subscribers who use Peer-to-Peer services,
- against advertisers who display adverts on Peer-to-Peer services, to deprive the services of their prime source of revenue,
- against Peer-to-Peer software publishers, to establish their responsibility in illegal file sharing. In the United States, this strategy has proven most effective and led several Peer-to-Peer services either to shut down or to seek agreements with rights holders.

The gradual clarification of Peer-to-Peer's legal status and the obligation to respect copyright holders' rights are leading to the creation of *new business models*. The introduction of *payment systems* as part of Peer-to-Peer services is now the most commonly adopted path. It involves marking the content that is available on the Peer-to-Peer networks, and routing consumers to an e-commerce site to pay for the content rights. Another solution involves billing consumers for a *flat rate subscription* to access the Peer-to-Peer network. The success of these systems, nevertheless, supposes that the exchanged content be marked, and that network access can be confined to subscribers.

A third strategy for financing the content exchanged in Peer-to-Peer mode involves inserting *advertising* in the software. While some copyright holders have agreed to give limited authorization to this type of service, there is no guarantee that the advertising market is capable of generating sufficient revenues to pay royalties on the content.

Superdistribution of content represents a more innovative strategy. Here, each consumer can redistribute the content s/he acquired using a paid model, and earns a commission on distribution.

Peer-to-Peer's medium-term development will be fuelled by a series of positive factors in the areas of consumption (user-friendliness, community of peers, on-demand access), content (vast catalogs), technology (robustness of decentralized architectures, optimization of file distribution, interoperability and speed downloading), and costs (distribution of costs among users).

Three major uncertainties have prevented Peer-to-Peer from developing outside the margins of unauthorized content: a stabilized legal framework, efficient technical solutions to manage rights, and business models suited to the content industry.

A virtuous circle of the legal use of Peer-to-Peer networks could start in Europe in the near future:

The legal actions taken by the content industry, although not fully coherent, have severely limited Peer-to-Peer software publishers' ability to launch new services without signing agreements with the content industry.

DRM solutions can now be used in the context of Peer-to-Peer systems, both in terms of tracking file exchanges and of payment solutions.

Innovative business models are being tested, building on the specificity of the Peer-to-Peer systems.

As a result, some content companies (mostly in the field of music) have already made content available to Peer-to-Peer services, albeit still on a limited basis.

It is unlikely that these positive steps will fully eradicate unauthorized file sharing over the next 5 years. But the launch of content-industry backed, Peer-to-Peer-based services will increase the volume of authorized content on the Internet.

From a quantitative standpoint, the number of European peers could reach 44.5 million in 2010, with the number of files exchanged growing from 1.3 billion in 2005 to 110 billion in 2010. Audio files could account for half of the exchanged files, while video files (films and TV programs) for a quarter. Looking more specifically at online music, authorized Peer-to-Peer services could represent €0.3 billion in 2010, close to a third of the total market.

In the longer term (10–20 years), a further step would be the massive incorporation of file sharing in day-to-day communication processes. Advanced multimedia IM could be the future of file sharing, with Peer-to-Peer software integrated with IM devices and solutions. Today's major content distributors could lose their edge in the value-chain as producers and publishers would "inject" content into the networks, using DRM to monitor file sharing and invoicing via micro-payment mechanisms included in all communication systems, both fixed and mobile. In addition, superdistribution systems would reward peers who are influential in their community.

According to this view, it is no longer the "one-to-many" distribution model that drives the online circulation of content but the very "point-to-point" nature of the Internet.¹⁴

Notes

The present paper is based on the findings of the Special Study “The digital broadband value-added services industry and markets in Europe: Peer-to-Peer networks and markets” provided by IDATE in close cooperation with the EITO Task Force and published in the 2006 EITO Report.

1. Source: Minar and Hedlund: Peer-to-Peer, harnessing the benefits of a disruptive technology. Oram, A. (Ed). Beijing, O’Reilly.
2. 2002: actual, 2005: estimates, 2006 and 2010: forecasts.
3. Active use: all time spent to issue requests or monitor downloads.
4. A larger proportion of women answering the survey can account for the higher rate of women using Peer-to-Peer in the USA.
5. Share of households using a given Peer-to-Peer software in households using Peer-to-Peer software.
6. Share of households using specific Peer-to-Peer software in households using Peer-to-Peer software.
7. Share of households using specific Peer-to-Peer software in households using Peer-to-Peer software.
8. Share of households using specific Peer-to-Peer software in households using Peer-to-Peer software.
9. Multiple answers are available.
10. Paid content includes fee-based text, image, or audio information delivered digitally via a website, online service, or other interactive medium. Content fees must be paid directly by consumers on a subscription or an à la carte basis. This excludes any portion of access fees collected by Internet service providers for distribution to content providers for time spent by users on their sites. These figures do not include mobile phone-based content and therefore do not compare directly with the figures published in EITO 2005: “The Online content market and distribution in Europe.”
11. Includes adult-oriented content.
12. More than 94% of revenues are redistributed to the music publishers and the other right owners, leaving the online music store with 6% of revenues. Other expenses amount to about 5% of revenues, therefore leaving a 1% margin on online music sales for the online store.
13. Source: PWC-IAB: Internet Advertising Revenue Report, 2004 Full Year Results.
14. Andrea Gavosto, Director Fondazione Giovanni Agnelli, formerly Chief Economist, Telecom Italia.