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EuP Preparatory Studies Lot 26: Networked Standby Losses

Draft Report Task 2 Economic and Market Analysis

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Disclaimer

The findings presented in this document are results of the research conducted by the IZM consortium and are not to be perceived as the opinion of the European Commission.

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2 Task 2: Economic and Market Analysis

2.1 Generic economic analysis

The general objective of Task 2 is to place the technical scope that has been defined in the first task within the total of the European Union’s economy. This means that it is now necessary to select and parameterize a representative product scope for the purpose of calculating the order of magnitude of networked standby power consumption. In this task we create the basic quantity structure for this assessment. We will obtain data for the installed base of products for a given geographical scope and time frame. The study’s geographical scope is EU-27. The study’s time frame is fixed by the reference year 2010 and extends to the year 2020. A longer reaching forecast is not feasible due to the dynamics of the market and technology development.

In order to create the quantity structure adequately we have to find a balance in the selection of representative product groups between the technical diversity and economical importance of the existing real-life product scope and future developments. The technical diversity is affecting the product’s power consumption parameters, field of application, and typical use patterns. The economic impact is indicated by the total number of products at a certain point of time in the market (product stock in EU-27 at a specific reference year). Furthermore we have to consider to some extent the average lifetime of a product because this indicates changing parameters.

Figure 2-1: Product categorization for quantity structure

Provider	Home		Office	Building
Services	Home Gateway + Network	Home Computer	Office Computer + Network	
	Year	Year	Year	
Internet	DSL Gateway (ADSL, VDSL)	Desktop PC	Small Server	
	Cable-TV Gateway (DOCSIS)	Notebook PC	Desktop PC	
	Optical Gateway (FTTH)	Thin Client	Notebook PC	
	Wireless Gateway (WiMAX)	NAS Storage Device	Thin Client	
	W/LAN Router	Game Console	Computer Display	
	Phone / DECT	Computer Display	Information Display / DPF	
Telephone	VoIP-Phone	Information Display / DPF	EP-Printer/MFD	
	Fax Machine	EP-Printer/MFD	IJ-Printer/MFD	
		IJ-Printer/MFD	W/LAN Router	
Digital TV	HOME Entertainment	White goods and small appliance t.b.d.	Phone / DECT	Building automation, HVAC, and sensor systems t.b.d.
	Year		VoIP Phone System	
	TV (without digital receiver)			
	TV (with digital receiver)			
	Simple STB			
	Complex STB / Media Center			
	Video/Disk-Player/Recorder			
	Projectors (Video Beamer)			
Sound System				

Figure 2-1 above shows the chosen product categories for the quantity structure. The quantity structure is focusing on mass market computer and consumer products that are typically applied in private homes and business offices. We distinguish home gateway and network equipment, home computing equipment, and home entertainment equipment. For offices we consider typical computing and network equipment. There are indications that networked standby could apply to a wider product scope. This includes e.g. white goods and networked building automation equipment. We will investigate such trends and may define a wider scope for the impact assessment at a later point in the study.

The market data for the selected product scope have been obtained from open sources. The stock assumptions have been to some extent already discussed with industry stakeholders. Nevertheless, further input concerning market data is highly appreciated. As a matter of fact market statistics are usually not fully comprehensive and adequate for the purpose of this study. Our own assumptions are necessary particularly with respect to the required forecasts. In general it is difficult to verify available market data. In order to check the plausibility of the stock data we correlate the number of products with the number of households and offices. In this way we check the installed base of products against the resulting penetration rate.

Table 2-1: Basic economic data

EU-27	Unit	2010	2015	2020
Households*		Reference	Estimates	Estimates
Number of Households	in Million	202	203	205
Total Population	in Million	500	504	508
Offices**				
Office Work Spaces	in Million	75	80	85
Labor Force	in Million	225	227	230
Electricity Price***				
Average for Households	€/100 kWh	16,73	18,76	20,45
Average for Industry	€/100 kWh	10,29	11,54	12,58
*EUROSTAT (Data in Fokus 31/2009): Population and social conditions; Households forecast based on population projections (EUROPOP2008) and constant factor 2,48 (persons per household)				
**EUROSTAT Labor Market Statistics; Assumption that 33% (2010), 35% (2015), and 37% (2020) of total labor force is working in office work places.				
***EUROSTAT (Data in Fokus 25/2009): Environment and energy; Electricity price forecast has been estimated on a 2% increase per year				

Table 2-1 provide an overview of the basic economic data for the study. The data include the number of households (and respective population) as well as the number of office work spaces (and respective work force) within the European Union. These figures have been obtained from various EUROSTAT publications. Another basic economic data set is related

to the environmental impact assessment and its primary focus on annual electricity demand. The economic assessment will relate the electricity consumption (kWh) to a cost factor (€/100 kWh).

The assessment of EU production, import and export figures, annual sales, and apparent consumption has no value for the study and are therefore exempted from the analysis.

2.2 Market and stock data

2.2.1 Home Gateway + Network

Table 2-2: Stock assumptions for categories Home Gateway / Phone

EU-27 Households (in Mio)	Reference	Estimates	Estimates	202 M	203 M	205 M
Home Gateway + Network	Installed Units (Stock in Million)			Household Penetration Rate (%)		
Year	2010	2015	2020	2010	2015	2020
DSL Gateway (ADSL, VDSL)	66	71	82	33	35	40
Cable-TV Gateway (DOCSIS)	61	71	61	30	35	30
Optical Gateway (FTTH)	7	31	61	3	15	30
Wireless Gateway (WiMAX)	2	6	20	1	3	10
W/LAN Router						
Phone / DECT	121	126	123	60	65	60
VoIP-Phone	20	51	82	10	25	40
Fax Machine	14	12	10	7	6	5

DSL Gateway:

- Definition: Customer Premises Equipment (CPE) for Internet access over phone line (ADSL, VDSL services). The product usually features various (local area) network interfaces.
- Stock: Installed base has been estimated based on EUROSTAT data regarding broadband access in the EU (status 07/2009)¹. According to this source, the broadband access penetration rate (number of broadband lines per 100 populations) is 23.9. There are in total 94 million DSL access lines and 25 million broadband access lines (non-DSL). Of this last number 18 million are Cable modems and 7 million approximately optical fibre lines. This figure does not indicate the number of home gateways yet. Retail lines are the main wholesale access for new entrants with 71.4% of DSL lines. We make the assumption that 70% of the 94 million DSL lines are end user access point. This would mean that there are 66 million DSL gateways installed. Future development has been based on the assumption that DSL will maintain a main access technology and slightly increase in the next ten years. Optical technologies will however limit the increase in the long term. Based on these

¹

http://ec.europa.eu/information_society/eeurope/i2010/docs/interinstitutional/cocom_broadband_july09.pdf

<http://www.ecostandby.org>

considerations we assume a maximum household penetration rate of 40% or 82 million units as installed base in 2010.

Cable-TV Gateway:

- Definition: Customer Premises Equipment (CPE) for access to Cable-TV (modem) and for broadband access (Triple Play Services) via DOCSIS (Data over Cable Service Interface Specification). The product can feature various (local area) network interfaces.
- Stock: Installed base has been estimated based on "ASTRA Reach 2009" market report.² According to this report approximately 30% of households in Europe receive TV and Internet services via TV-Cable. Future development has been based on two assumptions. In the short term the number of the installed base will slightly increase (35% household penetration rate) due to good price to broadband ratio. In the midterm however the stock declines due to availability and more capable fibre-to-the-home and wireless broadband access solutions.

Optical Gateway:

- Definition: Customer Premises Equipment (CPE) or optical network termination for Internet access via Fire-to-the-Home (FTTH). The product usually features various (local area) network interfaces.
- Stock: In July 2009 a total of 120 million fixed broadband lines have been counted by EUROSTAT. According to the FTTH Council Europe only 1.75% of all fixed lines in Europe are currently Fibre-to-the-Home (+40% year-on-year). For this study we assume a slightly higher penetration rate of 3% for the reference year 2010. In the midterm we expect a strong increase of FTTH. Our forecast for 2015 and 2020 are based on household penetration rate assumptions.

Wireless Gateway:

- Definition: Broadband cellular mobile modems or routers which provide wireless access via cellular mobile communication technology such as UMTS, HSPA, LTE. These devices can be integrated into personal computers and notebooks or come as external cards or even larger standalone devices.
- There have been no market data available. Stock and forecast are assumptions.

² Internet download (2009-12-03):

http://www.international-television.org/archive/astra_satellite_monitor_europe_2009.pdf

W/LAN Routers:

- To be investigated

Telephone/Digital Enhanced Cordless Telecommunications (DECT):

- Definition: A commercially available electronic product with a base station and a handset whose purpose is to convert sound into electrical impulses for transmission. Most of these devices require an external power supply for power, are plugged into an ac power outlet for 24 hours a day, and do not have a power switch to turn them off. To qualify, the base station of the cordless phone or its power supply must be designed to plug into a wall outlet and there must not be a physical connection between the portable handset and the phone jack. Product and technology definitions according to Energy Star Program Requirements for Telephony.
- Stock based on [ICTEE, 2008]. Data given for 2010 and 2020, interpolated for 2015.

Voice over Internet Protocol (VoIP)-Telephone:

- Definition: A DECT telephone designed to make phone calls using VoIP.
- Stock and Forecast: Figure 2-2 gives the evolution of IP lines in the US, 18.9 million in 2010. The number of information exchanged through internet IP is slightly higher in EU than in the US (5660 vs. 5300 PB) which gives an approximate number of users of 20 millions in EU in 2010³. A factor four in terms of lines happened in the years [2005-2010]⁴, it can be estimated that the sharp growth will continue with a lower coefficient.

³ Cisco systems (2009) Hyperconnectivity and the Approaching Zettabyte Era

⁴ Kretkowski P., (2007) State of the VoIP market available at: <http://www.voip-news.com/feature/9/reports.html>

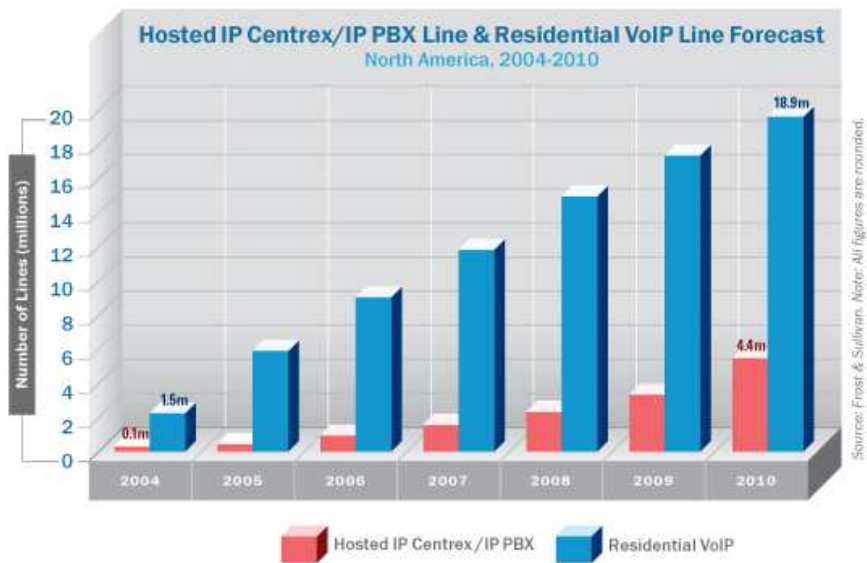


Figure 2-2: VoIP Line Forecast

Facsimile (Fax) Machine:

- Definition: A commercially-available imaging product whose primary functions are scanning hard copy originals for electronic transmission to remote units and receiving similar electronic transmissions to produce hard copy output. Electronic transmission is primarily over a public telephone system, but also may be via computer network or the Internet. The product also may be capable of producing hard copy duplicates. The unit must be capable of being powered from a wall outlet or from a data or network connection. Product and technology definitions according to Energy Star Program Requirements for Imaging Equipment.
- Stock based on [ICTEE, 2008]. Data given for 2010 and 2020, interpolated for 2015.

2.2.2 Home Computer

Table 2-3: Stock assumptions for categories Home Computer

EU-27 Households (in Mio)	Reference	Estimates	Estimates	202 M	203 M	205 M
Home Computer	Installed Units (Stock in Million)			Household Penetration Rate (%)		
Year	2010	2015	2020	2010	2015	2020
Desktop PC	131	142	143	65	70	70
Notebook PC	63	81	123	31	40	60
Thin Client	0	10	20	0	5	10
NAS Storage Device	20	41	61	10	20	30
Game Console	67	83	64	33	41	31
Computer Display	141	152	164	70	75	80
Information Display / DPF	1	10	102	0	5	50
EP-Printer/MFD	5	6	7	2	3	3
IJ-Printer/MFD	76	80	84	38	39	41

Desktop PC:

- Definition: A computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilize an external computer display, keyboard, and mouse.⁵ This product group also contains Integrated Desktop Computer, a desktop system in which the computer and computer display function as a single unit which receives its ac power through a single cable.⁶
- Stock assumption has been based on [TREN Lot 3, 2007]⁷ and [ICTEE, 2008].⁸ The calculated penetration rate of 65% taken as a cross reference is 15% lower than for displays. This installed base seems feasible if we take into account that a larger number of notebook users also facilitate an additional larger flat panel display and that there is not a 1:1 ratio of desktop PC to computer display. Forecast has been based on the assumption that the household penetration will moderately increase until 2015. The market indicates already a wide diversity of products in a range between small servers, workstations or gamer PC on the high performance end and notebooks, sub-notebooks, thin clients on the lower performance end.

⁵ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

⁶ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

⁷ [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; <http://www.ecocomputer.org>

⁸ [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

Notebook PC:

- Definition: A computer designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an ac power source. Notebooks must utilize an integrated computer display and be capable of operation off of an integrated battery or other portable power source. In addition, most notebooks use an external power supply and have an integrated keyboard and pointing device. Notebook computers are typically designed to provide similar functionality to desktops, including operation of software similar in functionality as that used in desktops.⁹
- Stock has been again based on [TREN Lot 3, 2007]¹⁰ and [ICTEE, 2008].¹¹ Notebook PCs are a more rapidly growing market segment with higher diversity performance and price. This trend could lead to a much faster increase of the installed base. However, for the purpose of this study we consider a more conservative development.

Thin Client:

- Definition: According to Wikipedia a thin client (sometimes also called a lean or slim client) is a computer or a computer program which depends heavily on some other computer (its server) to fulfil its traditional computational roles.
- The market for private Thin Clients is currently rather small. The future development is highly unclear depending on such issues as broadband availability, software as a service, and data security. For the purpose of this study we have made moderate assumption based on an assumed household penetration rate.

Game Console:

- Definition: A standalone computer-like device whose primary use is to play video games. Game consoles use a hardware architecture based in part on typical computer components (e.g., processors, system memory, video architecture, optical and/or hard drives, etc.). The primary input for game consoles are special hand held controllers rather than the mouse and keyboard used by more conventional computer types. Game consoles are also equipped with audio visual outputs for use with televisions as the primary display, rather than (or in addition to) an external or integrated display. These devices do not typically use a conventional PC operating

⁹ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

¹⁰ [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; <http://www.ecocomputer.org>

¹¹ [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

system, but often perform a variety of multimedia functions such as: DVD/CD playback, digital picture viewing, and digital music playback. Handheld gaming devices, typically battery powered and intended for use with an integral display as the primary display, are not covered by this specification.¹²

- Stock and forecast has been based on ENTR Lot 3 report.

Network Attached Storage (NAS):

- Definition: A NAS unit is a computer connected to a network that only provides file-based data storage services to other devices on the network. NAS systems contain one or more hard disks, often arranged into logical, redundant storage containers or RAID arrays.¹³
- Actual market data have not been available from public sources. Stock and forecast estimates have been based on simple assumption regarding current and future household penetration rate.

Computer Display:

- Definition: A display screen and its associated electronics encased in a single housing, or within the computer housing (e.g., notebook or integrated desktop computer), that is capable of displaying output information from a computer via one or more inputs, such as a VGA, DVI, Display Port, and/or IEEE 1394.¹⁴
- Stock assumption has been based on [TREN Lot 3, 2007]¹⁵ and [ICTEE, 2008]¹⁶. The current penetration rate of almost 80% seems realistic taking the fact into account, that 65% of households use the Internet. Forecast reflects further dissemination of Desktop PC, other computing equipment and the trend to utilize more than one display. Household penetration rate is reaching about 100% by 2020. Further increase might be slowed by faster dissemination of Notebooks, Thin clients and the use of larger TV-displays.

Information Display / Digital Picture Frame:

- Definition: A stand-alone device used to store and display digital images on a liquid crystal display (LCD) screen.¹⁷

¹² Check ENTR Lot 3 <http://www.ecomultimedia.org>

¹³ Wikipedia: Network-attached storage; http://en.wikipedia.org/wiki/Network-attached_storage

¹⁴ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

¹⁵ [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; <http://www.ecocomputer.org>

¹⁶ [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

¹⁷ [ENTR Lot 3, ongoing] EuP Study on Digital Picture Frames, ongoing; <http://www.ecomultimedia.org>

- Stock and forecast based on [ENTR Lot 3, ongoing].

EP-Printer/MFD:

- Definition: This product category combines single function printer, copier or multifunctional devices with Electro Photography (EP) marking technology. Product and technology definitions according to Energy Star Program Requirements for Imaging Equipment.
- Stock data have been slightly modified from [TREN Lot 4, 2007]¹⁸ and [ICTEE, 2008] in order to distinguish between home and office use. According to these figures the installed base and penetration rate seem quite low. The data should be checked by industry stakeholders.

IJ-Printer/MFD:

- Definition: This product category combines single function printer, copier or multifunctional devices with Ink-Jet (IJ) marking technology. Product and technology definitions according to Energy Star Program Requirements for Imaging Equipment.
- Stock data have been again slightly modified from [TREN Lot 4, 2007]¹⁹ and [ICTEE, 2008] in order to distinguish between home and office use. The installed base seems again a little bit low. Comparing the combined number of Desktop PCs and Notebook PCs (290 units in 2010) with the combined number of EP- and IJ-Printer/MFDs (81 units in 2010) a factor 3.5 results and a 40% household penetration rate respectively. The data should be checked by industry stakeholder.

PC attached speaker:

- To be investigated

¹⁸ [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; <http://www.ecoimaging.org>

¹⁹ [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; <http://www.ecoimaging.org>

2.2.3 Home Entertainment

Table 2-4: Stock assumptions for categories Home Entertainment

EU-27 Households (in Mio)	Reference	Estimates	Estimates	202 M	203 M	205 M
HOME Entertainment	Installed Units (Stock in Million)			Household Penetration Rate (%)		
Year	2010	2015	2020	2010	2015	2020
Simple TV	384	325	246	190	160	120
Complex TV (integrated DVB)	20	81	164	10	40	80
Simple STB	151	162	123	75	80	60
Complex STB / Media Center	82	82	123	41	41	60
Video/Disk-Player/Recorder	233	203	174	115	100	85
Projectors (Video Beamer)	8	8	9	4	4	4
Networked Sound System	0	6	12	0	3	6

Television:

- Definition: A commercially available electronic product designed primarily for the reception and display of audiovisual signals received from terrestrial, cable, satellite, Internet Protocol TV (IPTV), or other digital or analogue sources. A TV consists of a tuner/receiver and a display encased in a single enclosure. For the purpose of this study a distinction is made between Simple TVs (TVs that are used in conjunction with a Set-Top-Box) and Complex TVs (TVs that feature and utilize an integrated DVB tuner/receiver).
- Overall stock assumption has been based on [TREN Lot 5, 2007]²⁰. Data was given for years 2005, 2010 and 2020. An interpolation was used for the year 2015 between 2010 and 2020. We assume an average of two devices per household. The number of Complex TVs will grow continuously over the next years. At the same time the number of Simple TV and Simple STBs will decline.

Simple Set-Top Box (STB):

- Definition: A stand-alone device whose primary function is converting standard-definition (SD) or high-definition (HD), free-to-air digital broadcast signals to analogue broadcast signals suitable for analogue television or radio, has no “conditional access” function, and offers no recording function based on removable media in standard library format. Product and technology definitions according to EC Regulation 107/2009/EC.

²⁰ [TREN Lot 5, 2007]: EuP Study on Televisions, 2007; <http://www.ecotelevision.org/>

- Stock for the reference year 2010 based on [TREN Lot 0, 2007]²¹. Data extrapolated from EU-25 to EU-27 based on 2005 population. According to TREN Lot 0 Simple STBs are expected to be obsolete by 2025. We are not following this assumption and rather assume that Simple STBs will remain in the market for considerable amount of time. Replacement will start after 2020 with mass utilization of IPTV.

Complex Set-Top Box / Media Centre:

- Definition: A set-top box that allows conditional access. A set-top box is a stand-alone device, using an integral or dedicated external power supply, for the reception of Standard Definition (SD) or High Definition (HD) digital broadcasting services via IP, cable, satellite, and/or terrestrial transmission and their conversion to analogues RF and/or line signals and/or with a digital output signal. Product and technology definitions according to [TREN Lot 18, 2008].
- Stock based on [TREN Lot 18, 2008]²². The data was given for 2010, 2015 and 2020 in the report. In the long term we assume a different trend than the one assumed in Lot 18. We assume that complex STBs and so called Media Centre or Digital Media Receiver are merging. This new converging product group will have a high market penetration. A digital media receiver is a device that connects to a home network using either a wireless or wired connection. It includes a user interface that allows users to navigate through a digital media library, search for, and play back media files. The device is connected to a TV using standard cables.²³

Video/Disk-Player/Recorder:

- Definition: A stand-alone device whose primary function decodes video to an output audio/video signal (from recorded or recordable media via a powered or integrated media interface such as an optical drive USB or HDD interface), has no tuner unless it records on a removable media in a standard library format, is mains powered, does not have a display for viewing, and is not designed for a broad range of home or office applications. Product and technology definitions according to ENTR Lot 3 Draft Task 1-5.
- Stock based on [Draft ENTR Lot 3, ongoing]²⁴. The data of the stock of the UK was given in the ENTR Lot 3 report, as shown in Figure 2-3 below. The UK market for electronics typically represents 18% of the total EU-27 for electronics. The EU totals have been calculated accordingly. It is questionable if this type of media will really

²¹ [TREN Lot 0, 2007] EuP study on Simple Set Top Boxes, 2007.

²² [TREN Lot 18, 2007] EuP study on Complex Set Top Boxes, 2008. www.ecocomplexstb.org

²³ Modified from http://en.wikipedia.org/wiki/Digital_media_receiver. Accessed 22 Jan 2010.

²⁴ [ENTR Lot 3, ongoing] EuP study on sound and imaging equipment www.ecomultimedia.org

decline in the predicted way. We therefore adjusted the figures to a slower decline by a correlation to the household penetration rate.

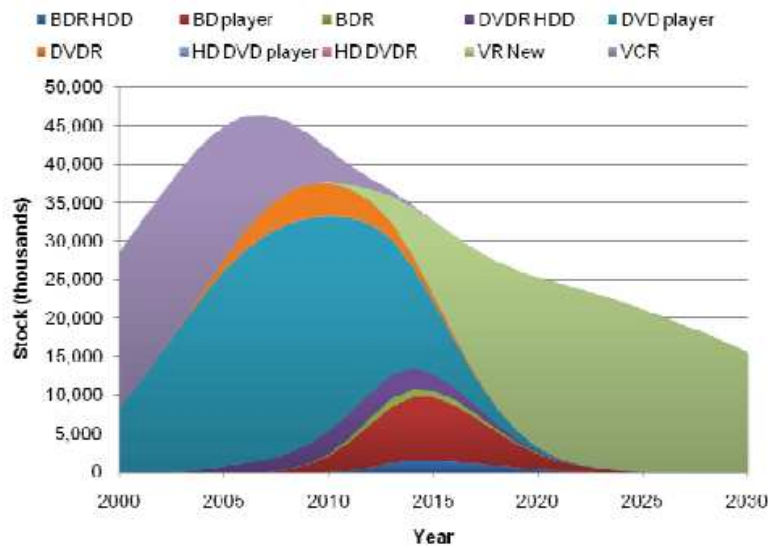


Figure 2-3: UK market for video/disk-player/recorder

Projectors:

- Definition: A mains powered, optical device, for processing analogue or digital video image information, in any broadcasting, storage or networking format to modulate a light source and project the resulting image onto an external screen. Audio information, in analogue or digital format, may be processed as an optional function of the projector. Product and technology definitions according to ENTR Lot 3 Draft Task 1-5.
- Stock based on [ENTR Lot 3, ongoing]²⁵. Data given for 2010 and 2020, interpolated for 2015.

Networked Sound System:

- Definition: A sound system that is composed of speakers, a subwoofer, and/or a receiver that relies on wired or wireless communication in order to transmit audio signals.
- Stock based on consortium estimates.

²⁵ [ENTR Lot 3, ongoing] EuP study on sound and imaging equipment www.ecomultimedia.org

2.2.4 Office Computer + Network

Table 2-5: Stock assumptions for categories Office Computer

EU-27 Office Workplace (in M)	Reference	Estimates	Estimates	75 M	80 M	85 M
Office Computer / Network	Installed Units (Stock in Million)			Office Penetration Rate (%)		
Year	2010	2015	2020	2010	2015	2020
Small Server	7	8	8	5	5	5
Desktop PC	60	64	70	80	70	60
Notebook PC	45	64	68	60	70	80
Thin Client	3	10	17	4	12	20
Computer Display	60	72	85	80	90	100
Information Display / DPF	0	5	53	0	10	62
EP-Printer/MFD	18	19	19	36	36	35
IJ-Printer/MFD	32	34	36	64	64	65
W/LAN Router						
Phone / DECT	56	40	13	75	50	15
VoIP Phone System	19	40	72	25	50	85

Small Server:

- Definition: A high-performance, single-user computer typically used for graphics, CAD, software development, financial and scientific applications among other compute intensive tasks.²⁶
- Stock and forecast assumptions are based on data for Germany and an extrapolation by a factor of 6.

Desktop PC:

- Definition: A computer where the main unit is intended to be located in a permanent location, often on a desk or on the floor. Desktops are not designed for portability and utilize an external computer display, keyboard, and mouse.²⁷ This product group also contains Integrated Desktop Computer, a desktop system in which the computer and computer display function as a single unit which receives its ac power through a single cable.²⁸
- Stock assumption has been based on [TREN Lot 3, 2007]²⁹ and [ICTEE, 2008].³⁰ The forecast assumes a slow increase over time due to increasing number of office work

²⁶ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

²⁷ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

²⁸ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

²⁹ [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; <http://www.ecocomputer.org>

places in the EU-27 (mostly in new member states). In terms of office penetration we assume a decline due to the increasing use of notebooks and thin clients.

Notebook PC:

- Definition: A computer designed specifically for portability and to be operated for extended periods of time either with or without a direct connection to an ac power source. Notebooks must utilize an integrated computer display and be capable of operation off of an integrated battery or other portable power source. In addition, most notebooks use an external power supply and have an integrated keyboard and pointing device. Notebook computers are typically designed to provide similar functionality to desktops, including operation of software similar in functionality as that used in desktops.³¹
- Stock data are considering only to some extent [TREN Lot 3, 2007]. The numbers provided by the older study are not fully plausible. We therefore considered a moderate office penetration rate of 60% for the reference year 2010 and further increase.

Thin Client:

- Definition: A PC without a hard drive. It contains an operating system in RAM but relies on a server for other software applications.³²
- Stock and forecast are based on office penetration rate assumptions. Current sales are 2.5 million in the EU-27 with 15% increase per year.

Computer Display:

- Definition: A display screen and its associated electronics encased in a single housing, or within the computer housing (e.g., notebook or integrated desktop computer), that is capable of displaying output information from a computer via one or more inputs, such as a VGA, DVI, Display Port, and/or IEEE 1394.³³
- Stock assumption has been based on [TREN Lot 3, 2007]³⁴ and [ICTEE, 2008].³⁵

³⁰ [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

³¹ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

³² [TREN Lot 3, 2007]: EuP Study on Computers and Displays, 2007; <http://www.ecocomputer.org/>

³³ Definition according to Energy Star Program Requirements for Computers (Version 5.0)

³⁴ [TREN Lot 3, 2007]: EuP Study on Computers and Monitors, 2007; <http://www.ecocomputer.org>

³⁵ [ICTEE 2008]: Impacts of Information and Communication Technologies on Energy Efficiency, 2008; ftp://ftp.cordis.europa.eu/pub/fp7/ict/docs/sustainable-growth/ict4ee-final-report_en.pdf

Information Display / Digital Picture Frame

- Definition: A stand-alone device used to store and display digital images on a liquid crystal display (LCD) screen.³⁶
- Stock and forecast based on [ENTR Lot 3, ongoing]. We assume that 25% of total DPF sales are used in offices. It is feasible to assume that various types of information displays including LED and e-paper type will enter the market in the midterm.

EP-Printer/MFD:

- Definition: This product category combines single function printer, copier or multifunctional devices with Electro Photography (EP) marking technology. Product and technology definitions according to Energy Star Program Requirements for Imaging Equipment.
- Stock data have been slightly modified from [TREN Lot 4, 2007]³⁷ and [ICTEE, 2008] in order to distinguish between home and office use.

IJ-Printer/MFD:

- Definition: This product category combines single function printer, copier or multifunctional devices with Ink-Jet (IJ) marking technology. Product and technology definitions according to Energy Star Program Requirements for Imaging Equipment.
- Stock data have been again slightly modified from [TREN Lot 4, 2007]³⁸ and [ICTEE, 2008] in order to distinguish between home and office use.

W/LAN Router:

- To be investigated

Telephone/Digital Enhanced Cordless Telecommunications (DECT):

- Definition: Non-IP telephones systems used in offices
- Stock and forecast are based on office penetration rate assumptions.

³⁶ [ENTR Lot 3, ongoing] EuP Study on Digital Picture Frames, ongoing; <http://www.ecomultimedia.org>

³⁷ [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; <http://www.ecoimaging.org>

³⁸ [TREN Lot 4, 2008]: EuP Study on Imaging Equipment, 2007; <http://www.ecoimaging.org>

Voice over Internet Protocol (VoIP)-Telephone:

- Definition: A DECT telephone designed to make phone calls using VoIP.
- Stock and forecast are based on office penetration rate assumptions.

2.2.5 White goods and HVAC equipment

Table 2-6: Stock assumptions for categories Home white goods and HVAC

EU-27 Households (in Mio)	Reference	Estimates	Estimates	202 M	203 M	205 M
Home white goods/HVAC	Installed Units (Stock in Million)			Household Penetration Rate (%)		
Year	2010	2015	2020	2010	2015	2020
Refrigerators and freezers	275	283	290	136	139	141
Dishwashers	91	104	117	45	51	57
Washing machines	172	177	180	85	87	88
Laundry dryers	62	68	75	31	33	37
Boilers	0	0	0	0	0	0
Water heaters	267	268	271	132	132	132
Air conditioners	58	77	95	29	38	46

Refrigerators and freezers:

- Definition: A factory-assembled insulated cabinet with one or more compartments and of suitable volume and equipment for household use, cooled by natural convection or a frost-free system whereby the cooling is obtained by one or more energy-consuming means³⁹.
- Stock and forecast are based on [TREN Lot 13, 2007].

Dishwashers:

- Definition: A machine which cleans, rinses, and dries dishware, glassware, cutlery, and, in some cases, cooking utensils by chemical, mechanical, thermal, and electric means. A dishwasher may or may not have a specific drying operation at the end of the programs.⁴⁰
- Stock and forecast are based on [TREN Lot 14, 2007].

³⁹ [TREN Lot 13, 2007]: EuP Study on Domestic Refrigerators and Freezers, 2007; <http://www.ecocold-domestic.org>

⁴⁰ [TREN Lot 14, 2007]: EuP Study on Domestic Washing Machines and Dishwashers, 2007; <http://www.ecowet-domestic.org>

Washing machines:

- Definition: An appliance for cleaning and rinsing of textiles using water which may also have a means of extracting excess water from textiles [TREN Lot 14, 2007].
- Stock and forecast are based on [TREN Lot 14, 2007].

Laundry dryers:

- Definition: An appliance that removes the moisture of a given load of clothing or other textiles.
- Stock and forecast are based on [TREN Lot 16, 2009]⁴¹.

Boilers:

- To be investigated

Water heaters:

- Definition: An appliance designed to provide hot sanitary water. It may (but need not) be designed to provide space heating or other functions as well⁴².
- Stock and forecast are based on [TREN Lot 2, 2007].

Air conditioners:

- Definition: A device that cools and dehumidifies indoor air in order to maintain thermal comfort.
- Stock and forecast are based on [TREN Lot 10, 2008]⁴³.

Smart metering devices:

- To be investigated

⁴¹ [TREN Lot 16, 2009]: EuP Study on Laundry Dryers, 2009; <http://www.ecodryers.org/>

⁴² [TREN Lot 2, 2007]: EuP Study on Water Heaters, 2007; <http://www.ecohotwater.org/>

⁴³ [TREN Lot 2, 20010]: EuP Study on Air Conditioning, 2007; <http://www.ecoaircon.eu/>

2.3 Market trends

2.3.1 Broadband/IP (TV/Video/Voice)

Due to the horizontal nature of networked standby, assessing trends in data traffic is more relevant than trends in specific products. The volume and segmentation of IP-based and non-IP-based data traffic is good indicator of networked standby requirements. By analysing the traffic by network type (e.g. Internet, telecom WAN, cable TV, PC LANs) and content type (e.g. high byte full HD IPTV or Video on Demand), network communication can be allocated to particular senders and receivers. Depending on the type of traffic, the senders and receivers will need networked standby functionality, and thus an accurate estimation of expected use patterns can be developed.

Cisco⁴⁴, the world leading network equipment provider, tracks and forecasts global IP traffic through its Visual Networking Index (VNI)⁴⁵. The VNI is updated every six months, and provides a forecast of IP traffic until 2013. The data within this section is extracted from the VNI. Traffic data is given in the unit of petabytes (PB) per year. One petabyte is 10^{15} bytes. For comparison, one compact disc holds 7×10^8 bytes, and one petabyte of data would be the equivalent of roughly 1.5 million compact discs.

The global IP traffic prediction can be seen in Table 2-7. As the table shows, total IP traffic is expected to increase by five times from 2008-2013, growing with a compound annual growth rate (CAGR) of 40% from 122 088 PB/yr in 2008 to 667 044 PB/yr in 2013. A significant portion of this growth will be due to an increase in Internet traffic, which will grow with a CAGR of 38% from 97 680 PB/yr in 2008 to 485 136 PB/yr in 2013. Mobile data usage will also blossom with a CAGR of 131%, increasing from 396 PB/yr in 2008 to 26 208 PB/yr in 2013.

⁴⁴ <http://www.cisco.com>

⁴⁵ http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html#~overview

Table 2-7: Global IP Traffic, 2008-2013

IP Traffic, 2008-2013							
	2008	2009	2010	2011	2012	2013	CAGR ⁴⁶ 2008-2013
By Type (PB per year)							
Internet ⁴⁷	97 680	140 592	200 412	286 116	382 068	485 136	38%
Non-Internet IP ⁴⁸	24 012	36 372	54 828	79 764	112 728	155 700	45%
Mobile Data	396	1 020	2 484	5 784	12 912	26 208	131%
By Segment (PB per year)							
Consumer ⁴⁹	84 444	125 856	185 580	273 216	374 532	486 852	42%
Business ⁵⁰	37 236	51 096	69 660	92 664	120 264	153 996	32%
Mobile ⁵¹	396	1 020	2 484	5 784	12 912	26 208	131%
By Geography (PB per year)							
North America	30 936	43 992	63 708	93 564	125 976	161 172	39%
Western Europe	31 116	43 476	59 940	85 512	116 484	151 116	37%
Asia Pacific	43 932	66 036	97 068	138 036	190 524	254 124	42%
Japan	7 728	11 400	16 260	23 028	29 880	37 284	37%
Latin America	3 696	6 036	9 600	14 352	20 280	28 320	50%
Central Eastern Europe	3 360	5 052	7 980	12 252	17 292	24 504	49%
Middle East and Africa	1 320	1 980	3 168	4 896	7 272	10 524	51%
Total (PB per year)							
Total IP traffic	122 088	177 984	257 724	371 664	507 708	667 044	40%

Within the context of networked standby, this explosion of IP traffic means an accompanying increase in networked devices. Zooming in from Table 2-7, Table 2-8 presents IP traffic forecasts on the sub-segment level for the EU⁵². As shown in the table, mobile data and Internet traffic will experience the greatest growth with 130% CAGR, followed closely by Internet video to TV with 117% CAGR.

⁴⁶ CAGR: Compound Annual Growth Rate.

⁴⁷ Internet: denotes all IP traffic that crosses an Internet backbone

⁴⁸ Non-Internet IP: includes corporate IP WAN traffic, IP transport of TV/Video on Demand (VoD)

⁴⁹ Consumer: includes fixed IP traffic generated by households, university populations, and Internet cafés

⁵⁰ Business: includes fixed IP WAN or Internet traffic generated by businesses and governments

⁵¹ Mobile: includes mobile data and Internet traffic generated by handsets, notebook cards, and mobile broadband gateways

⁵² Data was aggregated from the "Western Europe" and "Central Eastern Europe" categories. This may not necessarily be the EU-27; however, the trends can be safely assumed to be representative of those of the EU-27.

Table 2-8: European IP Traffic, 2008-2013

European IP Traffic, 2008-2013							
	2008	2009	2010	2011	2012	2013	CAGR 2008-2013
Consumer Internet Traffic (PB per year)							
Web/Email	5 148	6 720	8 616	10 992	14 184	16 176	26%
File Sharing	12 972	15 816	19 248	24 432	29 364	34 188	21%
Internet Gaming	192	336	384	456	636	708	30%
Internet Voice	516	636	732	816	768	720	7%
Internet Video Communications	108	168	300	612	876	1 320	65%
Internet Video to PC	2 112	5 280	9 540	15 960	23 796	33 288	74%
Internet Video to TV	144	396	1 008	3 132	4 980	6 924	117%
Ambient Video	396	732	2 136	4 956	7 332	10 248	92%
Total	21 588	30 084	41 964	61 356	81 936	103 572	37%
Consumer Non-Internet Traffic (PB per year)							
Cable MPEG-2 VoD	3 469	5 285	7 872	11 778	18 070	26 120	50%
Cable MPEG-4 VoD	26	48	73	110	186	281	61%
IPTV VoD	833	1 224	1 655	2 273	3 252	4 315	39%
Total	4 328	6 556	9 600	14 160	21 508	30 716	48%
Business IP Traffic (PB per year)							
IP WAN	2 710	3 758	5 181	6 904	8 997	11 683	34%
Internet	5 724	7 786	10 323	13 283	16 803	21 194	30%
Total	8 433	11 544	15 504	20 187	25 800	32 877	31%
Mobile Data and Internet Traffic (PB per year)							
Mobile Data and Internet	132	336	852	2 076	4 548	8 448	130%
Total (PB per year)							
European IP Traffic	34 481	48 520	67 920	97 779	133 792	175 614	38%

The following figures present the data of Table 2-8 in visual form. Figure 2-4 shows the growth of all types of IP traffic from 2008-2013. The figure clearly displays the significant portion of growth that will be due to IP Video and TV functionality. This means that these applications will be responsible to a large extent for the structure and topography of Wide Area Networks as well as the bus-systems of end-user devices.

In order to more clearly see which sub-segments obtain the greatest growth in absolute terms, Figure 2-5 compares the IP traffic from 2009 with that expected in 2013. Figure 2-6 presents relative growth in units of % CAGR. Internet video to PC achieves the greatest growth in absolute terms, while mobile data and Internet traffic obtain the greatest growth in relative terms.

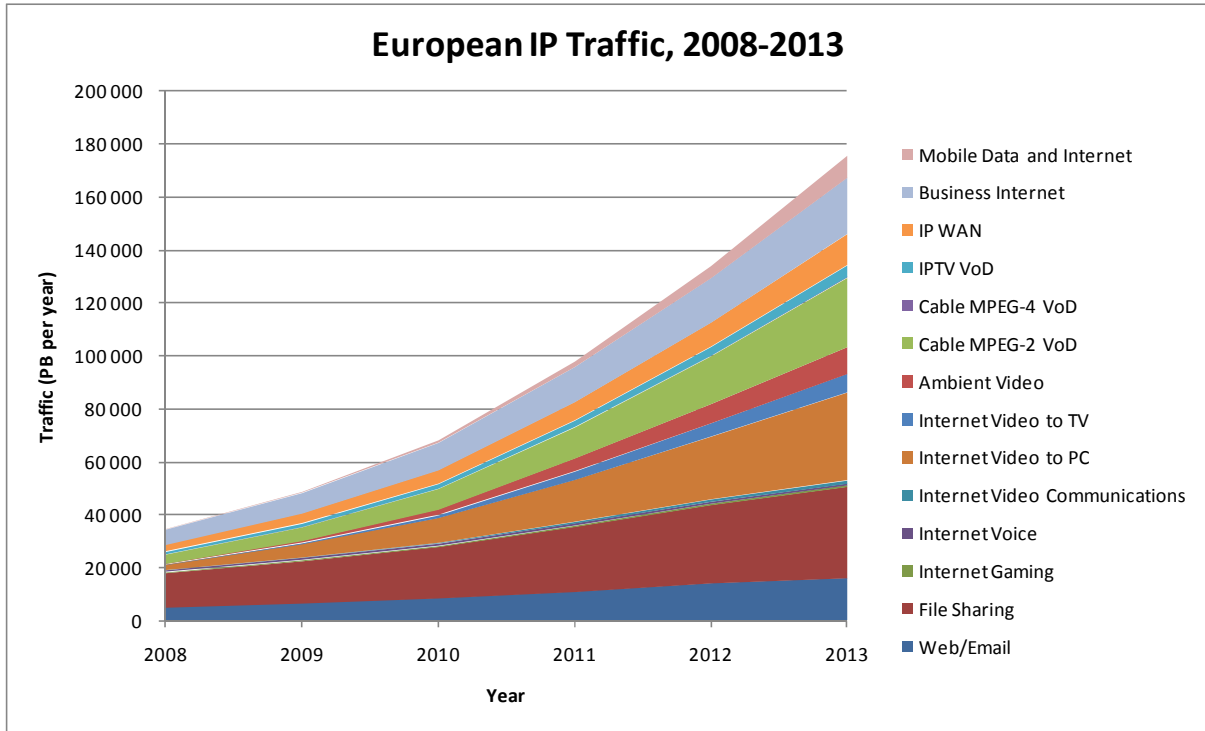


Figure 2-4: European IP Traffic, 2008-2013

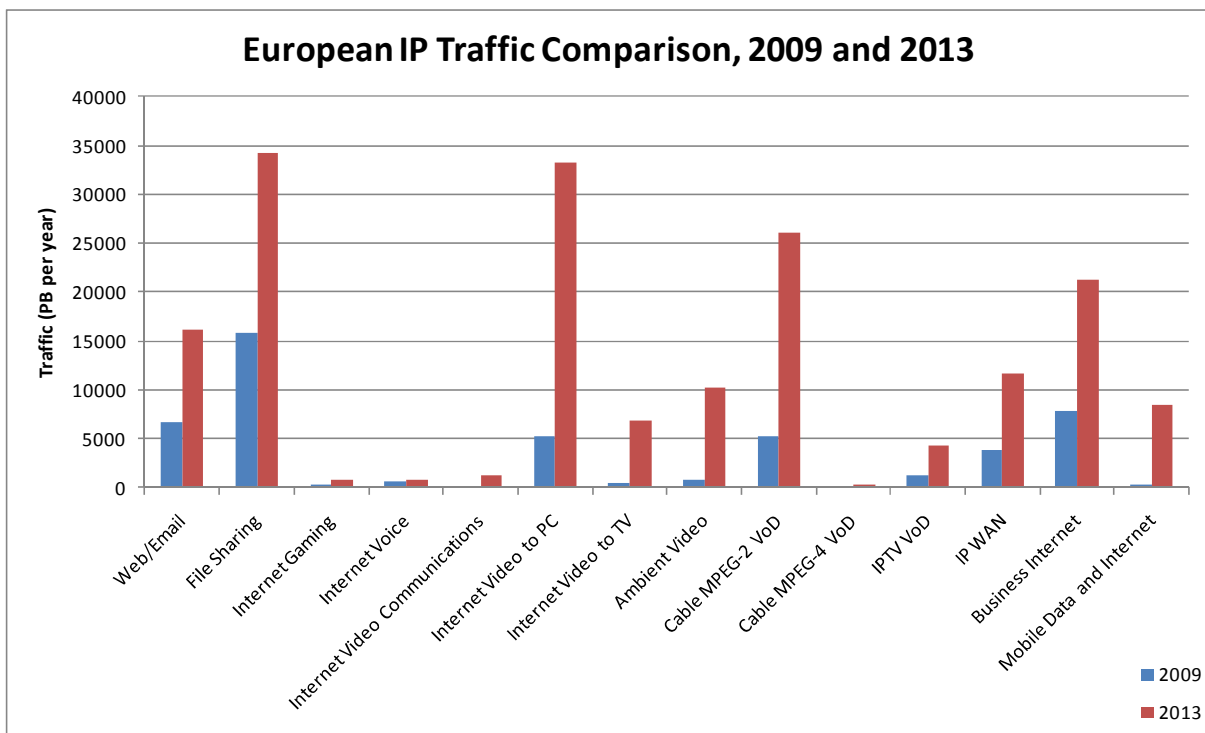


Figure 2-5: European IP Traffic comparison, 2009 and 2013

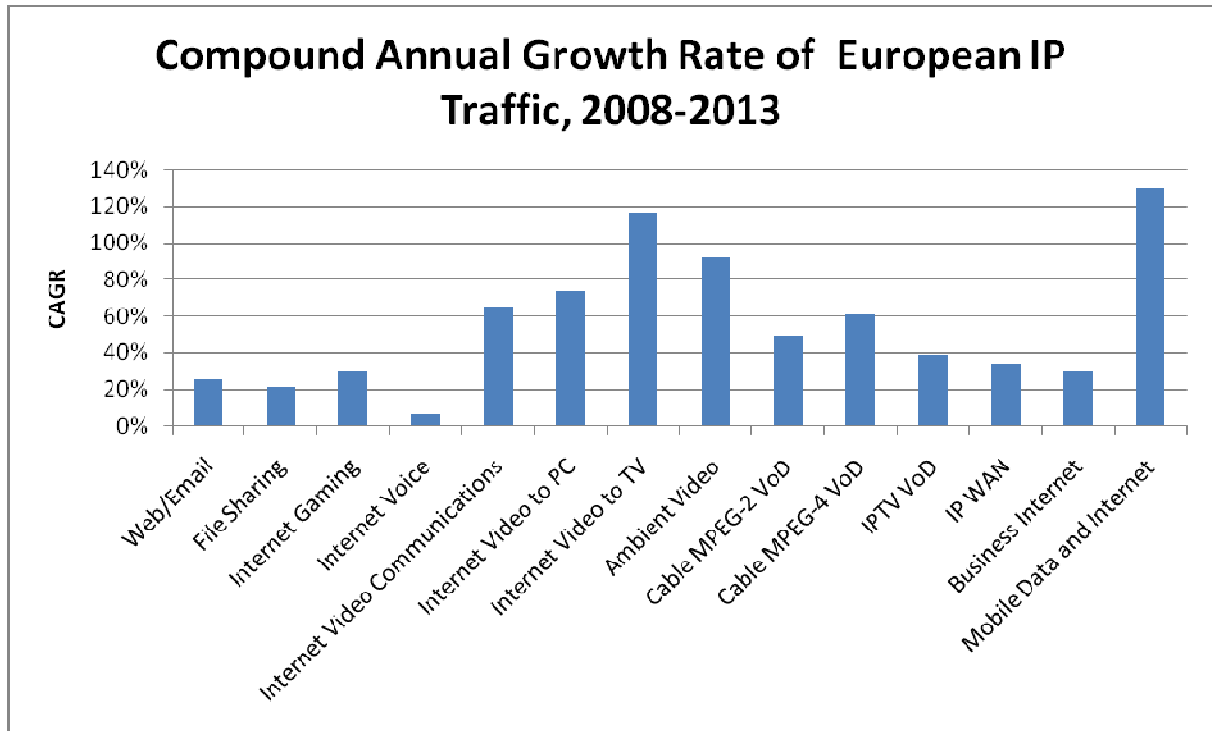


Figure 2-6: CAGR of European IP Traffic, 2008-2013

It is not necessarily the increase in traffic that is interesting, but rather the energy consumption imposed by this traffic, as well as the impact on the quantity of devices available with networked standby functionality. Each sub-segment is described below with associated devices that are often used to fulfil the function.

Web/Email: includes web, email, instant messaging, and other data traffic (excluding file sharing)

- Associated devices:
- Computers
 - Displays
 - Imaging equipment
 - Network access equipment
 - LAN networking equipment

File Sharing: includes peer-to-peer traffic from all recognized P2P systems such as BitTorrent, eDonkey, etc.

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - LAN networking equipment

Internet Gaming: includes casual online gaming, networked console gaming, and multiplayer virtual world gaming

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - LAN networking equipment

Internet Voice (VoIP): includes traffic from retail VoIP services and PC-based VoIP, but excludes wholesale VoIP transport

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - Telephone equipment
 - LAN networking equipment

Internet Voice (VoIP): includes traffic from retail VoIP services and PC-based VoIP, but excludes wholesale VoIP transport

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - Telephone equipment
 - LAN networking equipment

Internet Video Communications: includes PC-based video calling, webcam viewing, and web-based video monitoring

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - Telephone equipment
 - LAN networking equipment

Internet Video to PC: free or pay TV or Video on Demand (VoD) viewed on a PC, excludes P2P video file downloads

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - LAN networking equipment

Internet Video to TV: free or pay TV or VoD delivered via Internet but viewed on a TV

screen using a STB or media gateway

- Associated devices:
- Network access equipment
 - LAN networking equipment
 - Set-top boxes
 - Televisions

Ambient Video: nannycams, petcams, home security cams, and other persistent video streams

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - LAN networking equipment

Cable MPEG-2 VoD: the standard for the generic coding of moving pictures and associated audio information. Corresponds to ISO/IEC 13818-1:2000.

- Associated devices:
- Set-top boxes
 - Televisions

Cable MPEG-4 VoD: an update to MPEG-2 that includes further coding standards

- Associated devices:
- Set-top boxes
 - Televisions

IPTV VoD: a method of delivering television content using Internet Protocol infrastructure

- Associated devices:
- Set-top boxes
 - Televisions
 - Network access equipment
 - LAN networking equipment

IP WAN: all business traffic that is transported over IP but remains within the corporate WAN

- Associated devices:
- Computers
 - Displays
 - Network access equipment
 - LAN networking equipment

Business Internet: all business traffic that crosses the public Internet

- Associated devices:
- Computers
 - Displays
 - Network access equipment

- LAN networking equipment

Mobile Data and Internet: traffic to mobile devices

Associated devices:

- Mobile devices

2.3.2 Fix-Mobile Convergence (different access options)⁵³

As cellular networks improve in data rates and smartphones become more common, wireless broadband access is emerging as a service for advanced communication services. Currently, only 3% of the EU population aged 16-74 uses a third generation mobile phone to access the Internet. However, this figure does not include the use of 3G networks via USB dongles and datacards to get broadband access for a laptop or desktop.

Although 3G broadband access has a number of advantages over fixed broadband access – it can reach areas not covered by fixed broadband access, there is no need to pay a line rental and it provides access everywhere and connection is immediate, as a USB key just needs to be connected to a computer – it appears that 3G is not yet a full substitute of fixed broadband technologies for private consumers, especially in less densely populated areas.

There are two main reasons for this lack of full substitutability. First, 3G mobile technology provides much lower access speeds than fixed broadband access. Access to higher speed 3.5G networks is still limited to major cities with high population density. The second reason is the different price and usage conditions of mobile and fixed access, resulting in higher monthly consumer prices for mobile services. Contrary to the pricing system of fixed broadband access, based on unlimited consumption in exchange of a flat rate in most EU countries, pre and post-payment are still the predominant pricing models for mobile phones. This situation is expected to change in the future as mobile operators start offering flat rate packages in an attempt to increase take-up of advanced services as well as frequency of access.

⁵³ SEC(2009) 1103

http://ec.europa.eu/information_society/eeurope/i2010/docs/annual_report/2009/sec_2009_1103.pdf

Gradual adoption of mobile services is expected to increase mobile traffic at a much higher rate than fixed, though from a lower basis. Despite the high growth, consumers are still expected to spend more time using fixed online data applications rather than mobile ones in 2020, as shown in Table 2-9.

Table 2-9: Average hours per week using fixed online and mobile data applications

	Average (hours)	Growth in average use by 2020
Fixed		
Internet blog	0.52	7%
Photo blog	0.28	18%
Video blog	0.34	36%
Instant messaging	1.30	26%
Chat rooms	0.50	15%
Social communities	0.80	22%
Fixed average	0.62	21%
Mobile		
Mobile blog	0.09	61%
Mobile photo blog	0.07	35%
Mobile video blog	0.09	39%
Mobile instant messaging	0.33	46%
Mobile chat rooms	0.12	49%
Mobile social communities	0.13	45%
Mobile average	0.14	46%
Total for fixed and mobile	0.69	23%

2.3.3 Thin Clients (Software as a Service)

The market for software as a service has been steadily increasing over the past few years, as illustrated in Figure 2-7. The worldwide market is estimated to be roughly 11 billion USD as of 2009⁵⁴. It is expected that this trend will continue until 2020, as high speed networks and cost efficiency push thin clients and SaaS into the market.

⁵⁴ <http://www.crmlandmark.com/crmlabsindustryrends.htm>

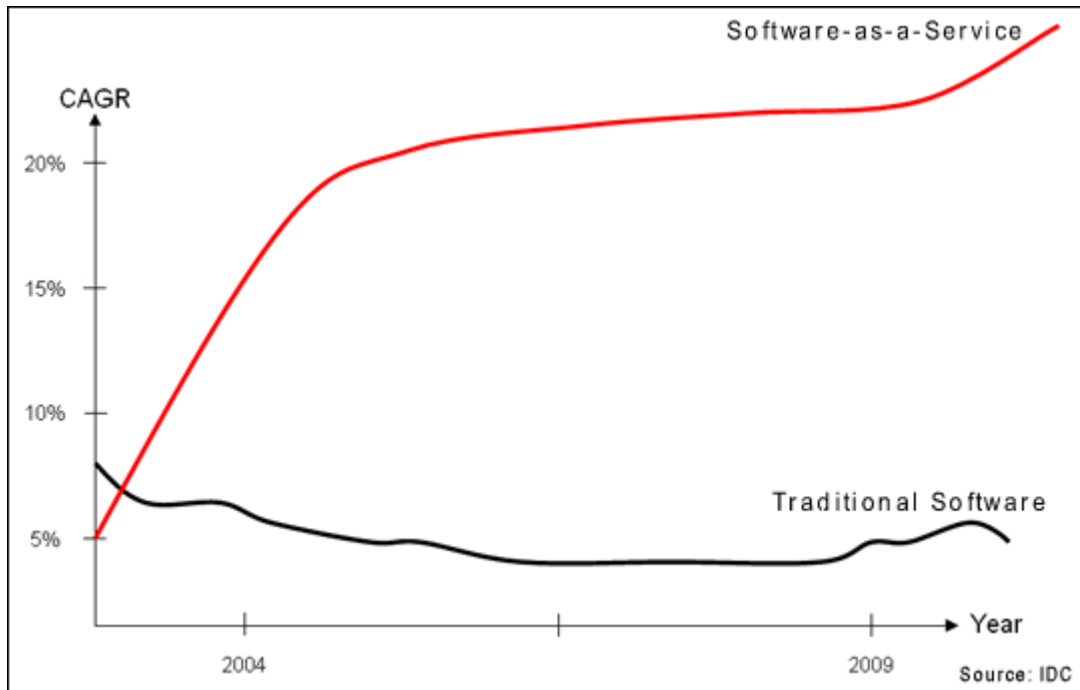


Figure 2-7: SaaS growth worldwide⁵⁵

⁵⁵ <http://www.crmlandmark.com/crmlabsindustryrends.htm>

2.4 Consumer expenditure base data

The basic consumer expenditure data are listed below. This data will serve primarily as cost inputs when conducting live-cycle analysis in Chapters 5 and 7.

The price of electricity in each of the EU-27 Member States is listed in Table 2-10, as well as an EU-27 average. To account for the trend of increasingly expensive electricity, this study will use 0.20 €/kWh as the electricity price.

Table 2-10: EU-27 electricity prices⁵⁶

	Price [€/kWh]			
	2007 S02	2008 S01	2008 S02	2009 S01
Austria	0.1834	0.1812	0.1812	0.1874
Belgium	0.1873	0.2153	0.2185	-
Bulgaria	0.0619	0.0619	0.0685	0.0706
Cyprus	0.1436	0.1651	0.1713	0.1192
Czech Republic	0.1968	0.2222	0.2266	0.2251
Denmark	0.1247	0.1430	0.1550	0.1472
Estonia	0.0671	0.0659	0.0688	0.0732
Finland	0.1596	0.1673	0.1770	0.1903
France	0.1849	0.1917	0.1875	0.1331
Germany	0.2313	0.2349	0.2408	0.2498
Greece	0.1086	0.1118	0.0965	0.0959
Hungary	0.1129	0.1333	0.1311	0.1167
Ireland	0.4031	0.3919	0.4298	0.3815
Italy	-	-	-	-
Latvia	0.0694	0.0813	0.0957	0.0957
Lithuania	0.0813	0.0781	0.0782	0.0850
Luxembourg	0.1972	0.1972	0.1991	0.2156
Malta	-	0.1533	-	0.1333
Netherlands	0.2370	0.2360	0.2390	0.2520
Poland	0.1150	0.1370	0.1367	0.1141
Portugal	0.1782	0.3181	0.2710	0.3110
Romania	0.0912	0.0895	0.0915	0.0818
Slovakia	0.1884	0.1902	0.2147	0.1974
Slovenia	0.1657	0.1464	0.1523	0.1944
Spain	0.2424	0.2455	0.2622	0.2540
Sweden	0.2049	0.2022	0.2121	0.1795
United Kingdom	0.1610	0.1523	0.1603	0.1499
EU-27	0.1887	0.1956	0.1995	

Table 2-11 lists the interest rate in each of the Member States, as well as the overall EU-27 rate. This study will assume an interest rate of 4.5%.

⁵⁶ Eurostat, Energy, Energy Statistics – prices, Energy Statistics: gas and electricity prices - New methodology from 2007 onwards, Electricity - domestic consumers - half-yearly prices - New methodology from 2007 onwards, accessed 26 Nov 2009.

Table 2-11: EU-27 interest rates⁵⁷

	2006	2007	2008
Austria	3.79%	4.29%	4.27%
Belgium	3.81%	4.33%	4.42%
Bulgaria	4.18%	4.54%	5.38%
Cyprus	4.13%	4.48%	4.60%
Czech Republic	3.80%	4.30%	4.63%
Denmark	3.81%	4.29%	4.30%
Estonia	5.01%	6.09%	8.16%
Finland	3.78%	4.29%	4.30%
France	3.80%	4.30%	4.24%
Germany	3.76%	4.22%	4.00%
Greece	4.07%	4.50%	4.81%
Hungary	7.12%	6.74%	8.24%
Ireland	3.77%	4.31%	4.53%
Italy	4.05%	4.49%	4.69%
Latvia	4.13%	5.28%	6.43%
Lithuania	4.08%	4.55%	5.61%
Luxembourg	3.91%	4.56%	4.61%
Malta	4.32%	4.72%	4.81%
Netherlands	3.78%	4.29%	4.23%
Poland	5.23%	5.48%	6.07%
Portugal	3.91%	4.43%	4.53%
Romania	7.23%	7.13%	7.70%
Slovakia	4.41%	4.49%	4.72%
Slovenia	3.85%	4.53%	4.61%
Spain	3.78%	4.31%	4.37%
Sweden	3.70%	4.17%	3.90%
United Kingdom	4.38%	5.06%	4.51%
EU-27	4.08%	4.57%	4.55%

⁵⁷ Eurostat, Interest Rates, Long-term interest rates, Maastricht criterion interest rates, EMU convergence criterion series - Annual data, accessed 26 Nov 2009.

The annual inflation rates are listed in Table 2-12. This study will assume an inflation rate of 3%.

Table 2-12: EU-27 annual inflation rates⁵⁸

	2006	2007	2008
Austria	1.70%	2.20%	3.20%
Belgium	2.30%	1.80%	4.50%
Bulgaria	7.40%	7.60%	12.00%
Cyprus	2.20%	2.20%	4.40%
Czech Republic	2.10%	3.00%	6.30%
Denmark	1.90%	1.70%	3.60%
Estonia	4.40%	6.70%	10.60%
Finland	1.30%	1.60%	3.90%
France	1.90%	1.60%	3.20%
Germany	1.80%	2.30%	2.80%
Greece	3.30%	3.00%	4.20%
Hungary	4.00%	7.90%	6.00%
Ireland	2.70%	2.90%	3.10%
Italy	2.20%	2.00%	3.50%
Latvia	6.60%	10.10%	15.30%
Lithuania	3.80%	5.80%	11.10%
Luxembourg	3.00%	2.70%	4.10%
Malta	2.60%	0.70%	4.70%
Netherlands	1.70%	1.60%	2.20%
Poland	1.30%	2.60%	4.20%
Portugal	3.00%	2.40%	2.70%
Romania	6.60%	4.90%	7.90%
Slovakia	4.30%	1.90%	3.90%
Slovenia	2.50%	3.80%	5.50%
Spain	3.60%	2.80%	4.10%
Sweden	1.50%	1.70%	3.30%
United Kingdom	2.30%	2.30%	3.60%
EU-27	2.30%	2.40%	3.70%

⁵⁸ Eurostat, Prices, Harmonized indices of consumer prices (HICP), HICP (2005=100) - Annual Data (average index and rate of change), accessed 27 Nov 2009.

The price of broadband access is shown in Table 2-13. As cost is rapidly decreasing, this study will assume an average price of 25 €/mo for the period 2010-2020.

Table 2-13: EU-27 Average monthly price of 2-4 Mb/s broadband standalone access, April 2009⁵⁹

	Price [€/mo]		
	2007	2008	2009
Austria	-	-	43
Belgium	-	-	42
Bulgaria	-	-	35
Cyprus	-	-	102
Czech Republic	-	-	43
Denmark	-	-	23
Estonia	-	-	28
Finland	-	-	34
France	-	-	-
Germany	-	-	-
Greece	-	-	-
Hungary	-	-	25
Ireland	-	-	27
Italy	-	-	-
Latvia	-	-	35
Lithuania	-	-	27
Luxembourg	-	-	29
Malta	-	-	-
Netherlands	-	-	23
Poland	-	-	-
Portugal	-	-	38
Romania	-	-	23
Slovakia	-	-	50
Slovenia	-	-	24
Spain	-	-	-
Sweden	-	-	22
United Kingdom	-	-	-
EU-27	52	37	29

⁵⁹ SEC(2009) 1103

http://ec.europa.eu/information_society/eeurope/i2010/docs/annual_report/2009/sec_2009_1103.pdf