

convention for interpreting such data.<sup>76</sup> One such convention is the Hypertext Transfer Protocol (HTTP)<sup>77</sup> which is used to transfer web content between web servers and web users.

- (60) If a user's computer is connected to a network, such as the internet, the computer has already established a TCP/IP connection. A *web browser* is a software tool that makes use of the TCP/IP connection to send and receive HTTP data traffic in accordance with the user's wishes. For example, the web browser translates the request for "<http://www.microsoft.com>"<sup>78</sup> entered by the user into the appropriate HTTP data and sends these via TCP/IP out to the internet. The web browser also then processes the answer from the relevant web server and shows the received web content to the user.

### 3.3.1.1 Types and evolution of web content

- (61) A web server can host digital content<sup>79</sup> of any type, i.e. arbitrary text, images, videos, and software code. Any such content can be transported by the HTTP protocol from a web server to a web browser upon the latter's request. However, whether (and how) it will be presented to the user of the web browser depends on the technical characteristics of the specific web browser used. Thus, in principle, there could be a sub-web whose content could only be understood by a specific web browser. Essentially, web server and web browser would then communicate according to a secret convention, i.e. using a secret protocol not known to other web servers or browsers.
- (62) However, several aspects led to a more unified development of the web. The "invention" of the web at CERN<sup>80</sup> in 1991/1992 basically consisted of the HTTP protocol, a prototype web browser and HTML (Hypertext Markup Language)<sup>81</sup>

---

<sup>76</sup> In the same way as just being able to talk to each other is not very useful if no common language can be agreed upon.

<sup>77</sup> The elaboration of HTTP was coordinated by the World Wide Web Consortium and the Internet Engineering Task Force (IETF). The specifications of HTTP are publicly available through a series of Requests for Comments (RFCs). HTTP/1.1 which is currently in common use is defined in RFC 2616 (June 1999).

<sup>78</sup> "<http://www.microsoft.com>" is an example of a Uniform Resource Locator (URL) that provides a more detailed address scheme than the unique device addresses used by the TCP/IP protocol.

<sup>79</sup> "Web content" is used in the broadest sense, i.e. comprising anything that can be hosted by a web server and shown by a web browser.

<sup>80</sup> The CERN (Centre Européen de Recherche Nucléaire, or European Organization for Nuclear Research), defines itself as the world's largest particle physics laboratory. See <http://public.web.cern.ch/public/>, printed on 7 January 2009.

<sup>81</sup> HTML is a standard approved by the International Organisation for Standardisation (ISO/IEC 15445:2000). Over the years, HTML has been joined by several other technologies which are today routinely used in conjunction with it, e.g. CSS (Cascading Style Sheets) to separate content from layout, scripting languages, picture or video formats. Where not specified differently in the context, these neighbouring technologies are also referred to by the use of "HTML" in the remainder of this Statement of Objections.

for producing web content. In 1995, the specifications for version 2.0 of HTML were published on the internet and intended to serve as a standard for future content development. When the web first acquired economic significance for businesses and other content providers from 1995 onwards, there were already different web browsers in use. As a content provider naturally wants to make its web content available to as many users as possible, there was a clear need for web content standards so that the content providers did not need to care about the different browsers in use. As web content providers used HTML, web browser developers needed to make sure that their web browsers implemented HTML correctly.

- (63) As a result of this historical situation and development, there has always been a core of relatively simple web content that all main web browsers rendered<sup>82</sup> in essentially the same way.
- (64) It is also useful to describe the principles underlying HTML in more detail as this allows a better understanding of the subsequent technical development of web content. For technical reasons, HTML code is written with a restricted set of characters that could easily be transported via HTTP. HTML code *describes* the appearance (such as the layout, the use of colours and of different fonts), and the functionality (such as buttons and data entry fields) of a web page. "Describing" the appearance means, for example, to indicate that a certain word is to be shown in bold or with a specific font, or larger or smaller, or in italics. These indications are given using "tags", i.e. text between pointed brackets that indicate that this text is to be understood as an instruction and not as content of the resulting web page. For example, `<b>Hello</b>` codes for the word "Hello" shown in bold, whereas `<i><b>Hello</b></i>` codes for it to be shown in both bold and italics.
- (65) In order to render the above example correctly, a web browser must first of all be capable of rendering text in bold. Secondly, it must interpret the `<b>` tag correctly. For example, if the programmer made an error that would prevent this interpretation, the web page might be rendered correctly in all respects but for the boldness of the word "Hello". It is important to distinguish between these two aspects because a web browser may not be able to render a web page correctly because: a) it is in principle not capable to do so (whether the programmer wants to or not); or b) it is capable but not instructed to do so.

---

<sup>82</sup> Rendering is the graphical and functional interpretation of the source code of a web page and its transposition into the way the web browser shows the web page to the user, e.g. the layout, the physical appearance, colours, fonts, embedded objects such as pictures or video, links and functionality such as drop-down menus.

- (66) If the web browser is both capable and instructed to render HTML code according to the HTML standard, then the <b> tag in the HTML code "calls" the web browser's function for displaying text in bold, i.e. the HTML code stored on web servers will be executed by the web browser upon receipt.
- (67) Naturally, the more functions web browsers have, the more diverse web content can be offered by content providers.<sup>83</sup> Several web browsers use an architecture that allows additional functionality to be "plugged in" when needed. Such additional functionality could also come from other software vendors. For example, the Flash plug-in by Adobe allows web browsers to "understand" an additional type of web content, namely software written in Flash's programming language. Flash programs, just as well as Java applications<sup>84</sup>, can create software applications that are similar to traditional client PC applications while still running on top of the web browser.
- (68) Web browsers differ in the way they support different technologies (e.g. there may be small web browser-specific differences in the required HTML syntax, some web browsers may not display a graphics or video file format that others do).
- (69) Useful innovations are sometimes picked up by other vendors and thus get multi-web browser support. They then also prompt an update of web content standards.<sup>85</sup>
- (70) However, innovations can propagate in this way only if the innovator allows for it (i.e. by disclosing technical specifications and/or by waiving intellectual property rights). The dependence of web content providers on web browsers' capabilities to show their content and reciprocal dependence of web users on web browsers that give them access to desirable content create network effects. This is described further below.

---

<sup>83</sup> Technical developments in related areas also drive this process. In the early days of the web, it was not necessary to provide web browsers with video playback functionality as nobody could be expected to wait as long as it would have taken for the browser to receive the video data in view of the limited speed of data transmission. Nowadays, due to the diffusion of broadband internet service, average data rates have become a lot faster, allowing users to consume web pages of a size large enough to accommodate video data. New data-intensive web browser functionality then emerges that takes advantage of this development.

<sup>84</sup> Java is a programming language developed by Sun Microsystems. It is largely standardised today and there exist implementations from various vendors. A suitable plug-in gives web browsers the ability to execute Java code received from the web.

<sup>85</sup> An example would be the XMLHttpRequest concept originally developed by Microsoft which is used by many popular web applications such as Google Mail or Yahoo Mail.

- (71) Large content providers want to make sure that their content is accessible for as many potential users as possible. Therefore, they will first make sure that they make use of the most widely used web browser's functionality. This has the potential to transform this web browser's functionality into a *de facto* standard. If the vendor of this web browser has a financial interest attached to the usage of its own web browser and/or to the usage of the new technology (e.g. through intellectual property rights or content development software sales), it has an interest to promote its own proprietary technologies and to keep them proprietary, i.e. not to allow other web browsers to support them.

### 3.3.1.2 Web browsers as a platform

- (72) For all important client PC operating systems on the market, there are web browsers which are able to display web content coded in standard HTML.
- (73) Applications built on top of web technologies therefore have the potential of delivering services across different client PC operating system platforms by being accessible through web browsers. Indeed, a provider of web applications (or web services)<sup>86</sup> may not even need to ascertain which client PC operating system platform each individual user employs before being able to offer his product to him. Web applications can therefore be developed as operating system platform agnostic. This is in contrast to other applications which have to be adapted ("ported") to different client PC operating systems and are therefore mostly operating system specific.
- (74) Many ISVs (Independent Software Vendors) today offer web interfaces to their applications or indeed have stopped developing applications which are not based on web technologies altogether.
- (75) Applications with web interfaces have two main components: a database (which is also hosted on a networked server and provides data storage and retrieval services) and a web front-end which implements the "business logic" of the applications, e.g. providing data entry dialogs, workflow functionality, reporting, data retrieval. Such web front-ends rely on the platform provided by web browsers. Therefore, the existence, stability, security, performance and feature

---

<sup>86</sup> A web application is similar to a traditional stand-alone software application in that it has a user interface, menus etc. and is designed to receive data entry or instructions and to interact with the user (e.g. a webmail application such as Hotmail). A web service usually does not have a user interface and also does not interact with the user. Instead, it is a machine with a well-defined way to be called upon to process a request or data of some kind. For example, a web service may be an API residing on a remote server which is accessible through HTTP and offers file storage services, e.g. it accepts files sent for storage and returns requested files from storage. Of course, web applications often make use of web services.

set of web browsers are commercially very significant since they determine to a large extent *which* ISVs' applications can be provided to customers and *how* this can be done.

- (76) In particular, whether or not a specific web browser is available on different client PC operating system platforms and whether or not a specific web browser conforms (and can be trusted to continue conforming) with published format specifications for HTML and related programming languages and formats for web page layout and functionality is important for an ISV's decision to develop the web front-end of its applications to be rendered with this specific web browser.
- (77) Web applications also become increasingly important inside corporate intranets (which are technically the same as the internet except that they are confined to one organisation's computer network).
- (78) Any stand-alone application today could conceivably be based on the web browser platform. Moreover, not only remotely hosted applications can be used with web browsers. There is no reason why locally used traditional applications could not be replaced by locally used web applications, preserving the advantage of making the application cross-platform in the process.
- (79) It is clear that the growing importance of the web browser as a platform for applications could imply, in the long run, a decreasing importance of client PC operating systems themselves as platforms for applications. Ultimately, the only application which may be needed to run on the operating system directly would be the web browser.<sup>87</sup> The web browsers therefore pose a threat to the established platform to run applications, namely client PC operating systems.
- (80) The growing importance of the web browser and the potential threat it poses to client PC operating system is also reflected in Microsoft's internal communications where Microsoft, inter alia, states that "*Browser war v2*<sup>88</sup> is about the core value and future of Windows".<sup>89</sup>

---

<sup>87</sup> Some of the features of Google's recently released Chrome web browser strongly resemble features normally found in operating systems, e.g. the treatment of each web browser tab as a separate process.

<sup>88</sup> After the first "browser war" that took place in the 1990s (see section 4.3.1.1.4.1.2.3.1), Microsoft seems to consider that it is now engaged in a second round of the browser war against Firefox and mainly Google.

<sup>89</sup> Presentation "IE "Go Big" Strategy Discussion", attached to a preparatory email of Thursday 20 September 2007, 12:43 am, from Matthew Lapsen to Shanen Boettcher et al, subject "IE "Go Big" Strategy Brainstorm" (MS01EU 000000007765); on slide 5.

### 3.3.1.3 Web browsers are portals to Web 2.0

- (81) In its beginning, the content of the web was largely static, comprising text or pictures "hard-coded" into web pages which could then be retrieved and displayed by the users of the web. In particular, the only way in which the web page currently displayed in the web browser could change was through the request of a new web page (often done by clicking on a "hyperlink"<sup>90</sup> in the current page).
- (82) Further technical development brought dynamic web content, i.e. web pages the final content and form of which is only created once an actual user has requested access to them. This technology enables features similar to those of client PC applications. For example, it allows for searching through databases for up-to-date financial or weather information and the like. But even though using these technologies means that web pages are generated dynamically by the web server, they are still very much stable once they reach the user's web browser and are displayed. In order to get new content on the web page, a new web page request has to be sent to the server which then causes the whole (modified) web page to be retransmitted to the web browser.
- (83) The next step in this technological development, which came about only in the last three to four years, enables a more seamless user experience of web applications. Part of what is often termed "Web 2.0"<sup>91</sup>, this new paradigm in the provision of web content makes extensive use of client-side scripting<sup>92</sup> in web pages to actually host functionality on the client instead of the server. For example, when working on a web browser-hosted word processor, the saving of a draft would not necessitate a whole new web page request to the server but could be executed "in the background" without the user even noticing it. Essentially, using this technology, parts of the web page displayed in the web browser can be updated independently of each other. Moreover, if the network connection is temporarily not available, the client-side application functionality allows the user

---

<sup>90</sup> A hyperlink is a visually discernible location on a web page that contains a web address which the web browser can be asked to request simply by clicking on this location.

<sup>91</sup> The term "Web 2.0" is mainly used to describe the technological part of the development of the web rather than the development of new uses. This is because wikis, blogs, social networking which are often mentioned as a part of Web 2.0 could already have been implemented without extensive use of the AJAX technologies and techniques, which is not the case for modern interactive web applications. AJAX is sometimes said to stand for "Asynchronous JavaScript and XML".

<sup>92</sup> In general, scripts can be defined as programs distinct from the core code of the application, usually written in a different language. Scripts are usually simple programs which give the opportunity to automate certain tasks. Programming on top of web browsers is mostly done by using traditional script languages such as Javascript. In the above context "client-side scripting" therefore simply refers to the fact that in many modern web applications ever larger parts of the necessary processing is shifted from the web server to the client (web browser).

to go on working while the network connection is re-established, minimising or avoiding service outage and data loss.

- (84) This latest development allows web applications to rival traditional stand-alone applications in interactivity and responsiveness. There can be menus, right-click context menus and other usability features previously not available to web applications.
- (85) As a result of the deployment of the AJAX<sup>93</sup> technologies, web applications have become much more similar to applications executed outside web browsers,<sup>94</sup> especially when these also had some need to stay connected to a server, for example when work results had to be accessible to collaborators at all times.
- (86) This trend towards web interactive applications and media also makes it more important for the web content providers (or sometimes ISVs) to be able to rely on web browsers conforming to publicly known specifications of mark-up languages such as HTML and scripting languages such as JavaScript<sup>95</sup> in order to make their offerings accessible to a large variety of users.
- (87) The described trend also results in many applications being available over the web today which formerly used to be stand-alone. This concerns, for example, word processing, spreadsheets, picture editing, enterprise resource management and tax returns. Microsoft is in the process of moving online some applications that traditionally were bundled with the Windows client PC operating system, grouping them in its "Windows Live" set of offerings.<sup>96</sup> This trend even concerns large and complex applications such as office suites: Google, a company active in the internet economy in particular as a portal providing services such as search engine, e-mail and instant messaging, offers "Google Docs & Spreadsheets", including a word processor online.<sup>97</sup> Microsoft also offers "Office Live" which provides much of the commonly used functionality of word processors and spreadsheets.

---

<sup>93</sup> See for example [http://ajax.phpmagazine.net/2006/05/fast\\_growing\\_openajax\\_adds\\_13.html](http://ajax.phpmagazine.net/2006/05/fast_growing_openajax_adds_13.html), printed on 7 January 2009.

<sup>94</sup> See for example [http://etech.eweek.com/content/application\\_development/ria\\_war\\_is\\_brewing.html](http://etech.eweek.com/content/application_development/ria_war_is_brewing.html), printed on 7 January 2009.

<sup>95</sup> JavaScript was initially developed by Netscape and first supported by the web browser Netscape 2.0 which was released in March 1996. ECMAScript is the name of the scripting language standardized by the ECMA standardisation organization. JavaScript, JScript (Microsoft's implementation of the standard) and ActionScript (Flash's implementation of the standard) aim to be compatible with ECMAScript. Those languages should therefore formally be referred to as ECMAScript.

<sup>96</sup> For example, Windows now offers Windows Live photo gallery. See <http://photos.live.com/?mkt=en-us>, printed on 7 January 2009.

<sup>97</sup> See <http://www.google.com/google-d-s/intl/en/tour1.html>, printed on 7 January 2009.

- (88) The development of web applications also causes a change in the underlying business model of many ISVs because the granting of perpetual licences to software applications, which used to be the most widespread way of selling software, is successively being replaced by the renting out of applications for limited periods of time or even by offering access to web-hosted applications for a fee depending on the usage volume (SaaS, i.e. Software as a Service).
- (89) Microsoft's CEO Steven Ballmer commented on this paradigm shift in the following way:

*"I think most of us now in the industry refer to it as the "Web 2.0 revolution"; that's common name. During this revolution, the Web, the Internet has evolved from a set of static pages and information, to really a platform for services, for publishing, for gaming, for sharing information, and much, much more."<sup>98</sup>*

#### 3.3.1.4 Technical characteristics of web browsers

- (90) Most web content makes use of the World Wide Web's hypertextuality, i.e. the ability to link from one web page to other web pages (or graphics, media files etc.) elsewhere on the web via hyperlinks ("links"). In web browsers, links are usually rendered as clickable so that the web browser user can navigate ("surf") the web just by pointing to and clicking on the hyperlinks with the computer mouse and without having to manually enter the address of a web page. Web browsers therefore allow users to access content quickly and easily across a wide range of web pages.
- (91) In addition to implementing the HTTP protocol and the HTML page description languages (and related languages and formats for web content and functionality), today's web browsers typically offer a set of additional features such as the following:
- (i) Proxy configuration<sup>99</sup> (to specify how the web browser accesses web content);
  - (ii) Management of plug-ins to handle additional content types (such as Flash or Java programs);

---

<sup>98</sup> See the speech of Microsoft's CEO at CEBIT 2008 printed from <http://www.microsoft.com/Presspass/exec/steve/2008/03-03cebit.mspx>, on 14 November 2008.

<sup>99</sup> In the Help function of its web browser, Microsoft describes a proxy server as a "[...] computer that functions as an intermediary between a web browser (such as Internet Explorer) and the Internet. Proxy servers help improve web performance by storing a copy of frequently used webpages. When a browser requests a webpage stored in the proxy server's collection (cache), it is provided by the proxy server, which is faster than going to the web. Proxy servers also help improve security by filtering out some web content and malicious software. Proxy servers are used mostly by networks in organizations and companies." Proxy settings are used to tell the web browser the address of the proxy server.



- (iii)        Bookmarking (to keep track of useful web page addresses);
  - (iv)         HTML pre-processing (to filter out unwanted or dangerous content);
  - (v)          Cookie management (allowing the user to keep control of small text files deposited by many web pages into users' web browsers in order to enable recognition of previous visitors, i.e. to overcome the statelessness<sup>100</sup> of the HTTP protocol);
  - (vi)         Pop-up blocker (to manage web page window behaviour);
  - (vii)        Tabbed browsing interface (to keep open several web pages at once);
  - (viii)       Website certificate checker (to ascertain web page credentials and to protect against phishing;<sup>101</sup>
  - (ix)         Offline cache (to keep a copy of accessed online content for later offline usage);
  - (x)          History (of visited locations on the web); etc.
- (92)        In some instances, web browser functionality is available together with other functionality in the same application. For example, Konqueror, the web browser of the K desktop environment ("KDE") on Linux client PC operating systems, doubles as a file browser for the local file system and also has a modular structure that allows for plug-ins to add functionality. However, today's most-used browsers are all applications which have a clear functional focus on web browsing.

---

<sup>100</sup>        Stateless protocols, such as the HTTP protocol, do not provide for different states of the client or server, i.e. a given HTTP request always yields the same result, regardless of which HTTP requests have been executed previously. Cookies (which are a web browser technology and not part of the HTTP protocol) allow to simulate HTTP with states, e.g. by allowing the web server to vary its response to a given HTTP request depending on a previous authentication of the client.

<sup>101</sup>        "Phishing" is a fraudulent means used by cybercriminals to obtain sensitive information, such as credit card numbers or bank account numbers, for example by sending emails in which they disguise themselves as a company with which the recipient might have an online account and try to get the recipient to enter his login and password on a fake login page.

### 3.3.2 Other parties' products

#### 3.3.2.1 Opera

- (93) Opera has marketed a web browser since 1996. The web browser reached version 9.63 in December 2008 and, while remaining proprietary source software, is freely available for use on various client PC operating systems, including Windows and Linux. Opera thus released nine major versions of its web browser within a timeframe of twelve years.

#### 3.3.2.2 Apple

- (94) Prior to 2003, Apple had included Microsoft's Internet Explorer for Mac as well as Netscape Navigator in its Macintosh client PC operating system. Since 2003, Apple provides the Safari web browser with its Macintosh client PC operating systems. For rendering<sup>102</sup>, Safari uses the open source WebKit rendering engine which originated from a fork<sup>103</sup> of the open source KDE project's KHTML rendering engine and the KJS JavaScript engine.

#### 3.3.2.3 Mozilla Foundation

- (95) The Mozilla Foundation is a non-profit organization overseeing the development of open-source software.<sup>104</sup> Its best-known and most used web browser product is called Mozilla Firefox ("Firefox"). The Foundation had first released a web browser called "Phoenix" in 2002. After several releases of Phoenix and then of Mozilla Firebird, the first version of Firefox was launched on 9 February 2004 and the second version in 2006. Firefox reached version 3 in June 2008 (version 3.1 is currently available as a first beta version). Firefox uses the open source Gecko rendering engine which originally powered the now defunct<sup>105</sup> Netscape Navigator web browser.
- (96) Numerous other web browsers for client PC operating systems exist on the market, including but not limited to AOL, Flock, MSN (Microsoft's Instant Web Messenger), Seamonkey, YPlus, Epiphany, Iceweasel, Konqueror, Lynx, Netfront, and Openwave. Other products can be designed especially for certain categories of users, like BuddyBrowser which is designed for children. There are also special purpose web browsers, such as text-only browsers for less powerful terminals.

---

<sup>102</sup> See fn. 82.

<sup>103</sup> "Forking" is the act of copying the complete source code of software and then continuing to develop it independently from the further development of the original code base. The independent further development of the concerned products can quickly lead to very different end products.

<sup>104</sup> See <http://www.mozilla.com/en-US/about/whatismozilla.html>, printed on 27 November 2008.

<sup>105</sup> See paragraph (116) for details.

- (97) Some browsers, such as AOL and Maxthon are built on Microsoft's Internet Explorer technology, whereas Flock is built on an early version of Firefox. The Netscape web browser, which was the most widely used web browser in the mid-1990s with a reported 80% market share<sup>106</sup>, is neither developed nor supported any more.<sup>107</sup>
- (98) Google released its first web browser in a beta version on 2 September 2008.<sup>108</sup> The web browser went out of beta on 12 December 2008.<sup>109</sup> Chrome is based on the same open source rendering engine as Safari, namely WebKit.
- (99) Many web browsers are distributed under an open source licence and are based in whole or in part on code available under an open source licence, such as the KDE project's rendering and script engines (e.g. Safari and Konqueror).

#### 3.3.2.4 Browsers for devices other than client PCs

- (100) Users can also display web pages through web browsers installed on other devices than client PCs, namely smartphones or personal digital assistants (PDAs). Web pages can also be displayed on television screens.
- (101) Several companies supply web browsers for mobile device operating systems. Opera, for example, supplies both Operamini<sup>110</sup> that can be downloaded free of charge from the company's web site, and Opera Mobile<sup>111</sup>, that can be bought for €19.<sup>112</sup> Both products allow the user of a mobile phone to browse the web. Opera Mobile provides additional features such as access to rich web content, tabbed browsing, password manager, pop-up handler, and other features that improve the user experience compared to the web browsing experience offered by Operamini. Microsoft also offers a version of its Internet Explorer web browser for mobile device operating systems, namely Internet Explorer Mobile. It is bundled with Microsoft's Windows Mobile operating system.<sup>113</sup> Smartphones designed to work

<sup>106</sup> The initial complaint in the US proceedings quotes in recital 23 an internal piece of correspondence from James Allchin, Microsoft Senior Vice President, to Paul Maritz, Microsoft Group vice President, on 2 January 1997, stating that "Netscape has 80% market share". See <http://www.usdoj.gov/atr/cases/fl700/1763.htm>, printed on 23 October 2008.

<sup>107</sup> See <http://browser.netscape.com/>, printed on 27 November 2008.

<sup>108</sup> See Google's press release *Google Chrome: A New Take on the Browser*, printed from [http://www.google.com/intl/en/press/pressrel/20080902\\_chrome.html](http://www.google.com/intl/en/press/pressrel/20080902_chrome.html) on 27 November 2008.

<sup>109</sup> See <http://googleblog.blogspot.com/>, printed on 12 December 2008.

<sup>110</sup> See <http://www.operamini.com/>, printed on 27 November 2008.

<sup>111</sup> See <http://www.opera.com/mobile/>, printed on 5 December 2008.

<sup>112</sup> See <https://shop.opera.com/cgi-bin/cart/reg=EU?ID=101>, printed on 27 November 2008.

<sup>113</sup> See for example <http://www.microsoft.com/UK/windowsmobile/default.aspx>, printed on 27 November 2008.

with the Palm OS are generally sold with a web browser called Web Blazer, developed by Handspring.<sup>114</sup>

- (102) Some web browsers give the user the opportunity to see web pages on a television set, by means either of a remote control or a wireless keyboard. Depending on the product, this can necessitate a specific hardware, or another embedded<sup>115</sup> platform, including for example a video game console. Some companies bundle their "television web browser" product with the hardware, namely Apple which sells Apple TV<sup>116</sup> and Microsoft which sells its television web browser based on Internet Explorer technology bundled with its hardware named Internet Media Player.<sup>117</sup> Other companies only develop the web browser either in a platform-independent way such as Oregan Networks' TV web browser<sup>118</sup> or in a platform-dependent way such as Opera, which developed a product specifically designed for the Nintendo Wii video game console.<sup>119</sup>

### 3.3.2.5 Technical comparison between the different web browsers on the market

#### 3.3.2.5.1 Operating system compatibility

- (103) Most of the web browsers on the market are designed to run on top of several client PC operating systems. Among the main web browsers, only Internet Explorer is not cross-platform. Microsoft used to provide a version of Internet Explorer that could run on top of Mac OS X from version 2.0 but stopped in 2003 when Apple launched its own web browser Safari. As regards UNIX, Internet Explorer 4.0 and 5.0 were ported to the Solaris and HP-UX client PC operating systems, but the support was discontinued by Microsoft in 2002.<sup>120</sup> The table hereunder shows on top of which client PC operating systems the latest versions of the main web browsers run.

---

<sup>114</sup> See for example <http://www.palm.com/us/products/smartphones/centro/specs.html>, printed on 27 November 2008.

<sup>115</sup> An embedded system is a combination of hardware and software encapsulated into a system whose end function is not that of a computer. Embedded systems can be found in microwaves, cars, etc.

<sup>116</sup> Apple TV can connect to a WiFi network (it can therefore only run alongside a computer), and is designed to download movies, watch pictures, and browse some entertainment websites such as Youtube. See <http://www.apple.com/appletv/>, printed on 23 October 2008, and <http://www.apple.com/appletv/whatis.html>, printed on 18 November 2008.

<sup>117</sup> Unlike Apple TV, MSN TV does not require any supplementary hardware to access the Internet. See <http://www.msntv.com/pc/>, printed on 23 October 2008.

<sup>118</sup> See <http://oregan.net/architecture.php>, printed on 23 October 2008.

<sup>119</sup> See <http://www.opera.com/pressreleases/en/2006/12/22/>, printed on 27 November 2008.

<sup>120</sup> See <http://www.mozillazine.org/talkback.html?article=2477>, printed on 7 January 2009.

**Table 3 : Web browsers and operating system compatibility**

	Internet Explorer 7.0 <sup>121</sup>	Firefox 3 <sup>122</sup>	Opera 9.52 <sup>123</sup>	Safari 3.1 <sup>124</sup>	Google Chrome <sup>125</sup>
Client PC operating system	Windows	Windows Mac OS X Linux	Windows Mac OS X Linux Free BSD Solaris	Windows Mac OS X	Windows (Mac OS and Linux under development <sup>126</sup> )

### 3.3.2.5.2 Features

- (104) The five main (in terms of usage) web browsers, namely Internet Explorer, Firefox, Opera, Chrome and Safari, which are marketed today, offer most of the common features described at paragraph (90) to (91), but their implementation, and thus the rendering of web pages, differs from one web browser to another.
- (105) Although the main web browsers now offer users the same "basic" functionalities, it should be noted that Internet Explorer has for a period of time not contained the same functionalities as its competitors, at least as regards some features, as will be discussed in detail at paragraphs (337) to (340).

### 3.3.2.5.3 Standards compliance

- (106) Most of the protocols and various technical elements used in the web industry are standards maintained by various organizations such as the W3C<sup>127</sup> or IEEE<sup>128</sup>. These standards are elaborated by the parties active on the web, and aim at defining a common technical basis to allow, for example, to the extent possible,

<sup>121</sup> See <http://www.microsoft.com/windows/downloads/ie/sysreq.msp>, printed on 23 October 2008.

<sup>122</sup> See <http://www.mozilla.com/en-US/firefox/all.html>, printed on 27 November 2008.

<sup>123</sup> See <http://www.opera.com/download/index.dml?custom=yes>, printed on 23 October 2008. The latest versions of Opera do not run on top of QNX, OS/2 and BeOS.

<sup>124</sup> See [http://images.apple.com/safari/docs/Safari\\_Product\\_Overview20080602.pdf](http://images.apple.com/safari/docs/Safari_Product_Overview20080602.pdf), on page 5 printed on 8 December 2008.

<sup>125</sup> See <http://www.google.com/support/chrome/bin/answer.py?hl=en&answer=95346>, printed on 27 November 2008.

<sup>126</sup> Chromium is the open source project on which Chrome is built. Chromium's source code is available for Windows, Mac and Linux. See <http://dev.chromium.org/>, printed on 23 October 2008.

<sup>127</sup> The W3C (World Wide Web Consortium) is an international consortium which defines its mission as "[t]o lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth for the Web". See <http://www.w3.org/>, printed on 27 November 2008.

<sup>128</sup> The IEEE (Institute of Electrical and Electronics Engineers), a non-profit, technical professional association which claims to have more than 375,000 individual members in 160 countries, develops and publishes standards in the fields of, *inter alia*, telecommunications and information technology. See <http://www.ieee.org/web/aboutus/home/index.html>, printed on 23 October 2008.

the same source code of a web page to be displayed identically by different web browsers.

- (107) In order to test whether web browsers are standard-compliant, various tests have been created. The Acid 1, 2 and 3 tests, and the Robin's HTML 4<sup>129</sup> conformance tests are among the best-known and most commonly used tests. The Acid 1 and Acid 2<sup>130</sup> tests primarily aim at testing the implementation of Cascading Style Sheet ("CSS")<sup>131</sup>, whereas the Acid 3 tests for "specifications for 'Web 2.0' dynamic web applications".<sup>132</sup> The result of the test is established through the display of a text or an image from a model page. The closer the text or image displayed by a web browser resembles the model page, the greater the compliance of the web browser with the tested standards. All main web browsers pass the Acid 1 test. Firefox 3, Safari 3.1.2 and Opera 9.5 pass the Acid 2 test, whereas Internet Explorer 7 does not.<sup>133</sup> Similarly, Internet Explorer 7 is the only web browser among the main ones which renders an unrecognisable result under the Acid 3 test. Internet Explorer also fails the Robin test.<sup>134</sup> Internet Explorer is thus the least standards-compliant of the main web browsers.<sup>135</sup>
- (108) The aforementioned tests do not cover all existing standards, which are numerous and deal with very diverse topics. Moreover, not all tested standards are equally important as regards their concrete implementation since web content providers dynamically (see paragraph (82)) change the content of their web pages. Even though these standards are numerous and diverse, they cannot materially define in every detail how web pages should be displayed. Two web standards-compliant browsers would thus not necessarily render the same web page in exactly the same way. This is why the web portal companies questioned by the Commission (see below at paragraphs (353) and (354)) mentioned that they test the functioning of their websites in different web browsers.

---

<sup>129</sup> According to TAEUS, "Robin's HTML 4 conformance tests include [...] a large number of tests of individual HTML 4 tags and capabilities." See TAEUS report, Task Nr 08-02, 08-EC001-000126, prepared for the European Commission, 29 July 2008 (sent on 30 July 2008), page 39.

<sup>130</sup> See <http://www.acidtests.org/>, printed on 23 October 2008.

<sup>131</sup> Cascading Style Sheet ("CSS") is a stylesheet language used to describe the presentation of a document written in a markup language such as HTML or XML. It allows to distinguish between the content of the document and its presentation (e.g. font, colour, appearance, rendering of titles).

<sup>132</sup> See <http://www.webstandards.org/action/acid3>, printed on 27 November 2008.

<sup>133</sup> Microsoft recently announced that Internet Explorer 8 will pass the Acid 2 test. See for example <http://blogs.msdn.com/ie/archive/2007/12/19/internet-explorer-8-and-acid2-a-milestone.aspx>, printed on 27 November 2008.

<sup>134</sup> Microsoft seems, however, to focus more on standards-compliance, especially on CSS, with respect to Internet Explorer 8. See for example <http://redmondmag.com/columns/article.asp?editorialid=2861>, printed on 12 November 2008.

<sup>135</sup> See TAEUS report, Task Nr 08-02, 08-EC001-000126, prepared for the European Commission, 29 July 2008 (sent on 30 July 2008), pages 32 to 43.

#### 3.3.2.5.4 Other characteristics

- (109) There are many other technical criteria that can help to compare the performance of web browsers; many of them are related to speed, such as load speed, script execution speed, resource use, cold start speed (first time the web browser is launched after boot-up), warm start speed (the web browser is re-launched after being closed). However, it is difficult to compare the speed of different web browsers for the following reasons. First, tests are implemented on a given computer with a given processor, and the result of the tests will likely depend also on the hardware. Second, although several web browser suppliers claim that their web browser is faster than their competitors', the result of the test depends on the considered criteria.<sup>136</sup> A web browser may be faster than its competitors in one category, but slower in another one. It is thus difficult to say in general which web browser is "the fastest".

#### 3.3.2.6 Distribution channels for web browsers

- (110) Web browsers are distributed through different channels. First, when customers buy a PC, they most frequently receive an operating system and application software, including a web browser, pre-installed by the OEM that also provides the hardware.
- (111) Second, users may also download web browsers from the internet. There seem to be two different main reasons for doing so. Having been alerted to an available update/upgrade for the web browser they are using, users may choose to update it by downloading and installing the applicable software package. Users may also decide to change the web browser, or to use several web browsers in parallel. Both updating/upgrading and first downloading installation software for an additional web browser for client PC operating systems<sup>137</sup> from the internet are often free of charge, in particular for the most popular web browsers.<sup>138</sup>
- (112) It must nevertheless be recalled that suppliers of web browsers are very unlikely to reach users at the workplace through downloading since many companies' system administrators prevent employees from downloading executable files. These users must use the web browser that is pre-installed on their computer by the system administrator.

---

<sup>136</sup> See <http://www.howtocreate.co.uk/browserSpeed.html#winspeed>, printed on 7 January 2009.

<sup>137</sup> Some browsers for embedded devices are not free of charge.

<sup>138</sup> In particular, Internet Explorer, Firefox, Opera, Safari and Chrome can be downloaded free of charge on the internet. It has to be noted that Internet Explorer, as opposed to the other mentioned web browsers, is only available for Windows.

- (113) Third, many PC-related magazines regularly come with CD-ROMs or DVDs containing software, including the necessary installation files for web browsers. At least for users who would have bought such magazines anyway, this can be an easy way to receive web browser software without having to search for it on the web first.

### 3.3.2.7 Business models of web browser vendors

- (114) In the early days of the World Wide Web, licences to use web browser software were often sold in the same way as licences to use other software products which continue to be sold today. For example, the Opera web browser was sold after its first release for USD 35<sup>139</sup> until its version 8.5. The ad banner<sup>140</sup> and licensing fees were abandoned on 20 September 2005.<sup>141</sup>
- (115) The main web browser vendors have all changed their business models in a way that involves distribution of the web browser software itself free of charge and monetisation from other sources.
- (116) Netscape changed its business model from charging for the web browser software to offering it free of charge in 1998<sup>142</sup> and later stopped developing its web browser altogether. The underlying technology has been continued by the Mozilla Foundation, the developer of the Firefox web browser. The Foundation is financed by donations as well as to a substantial degree by Google and other undertakings.<sup>143</sup> According to Microsoft internal correspondence, Google offers Mozilla USD 1 per copy of the web browser with the Google toolbar installed on a PC.<sup>144</sup>

---

<sup>139</sup> See for example *Take my browser – please!*, printed from [http://oreilly.com/news/opera\\_0798.html](http://oreilly.com/news/opera_0798.html) on 27 November 2008, redirected from Opera's website <http://www.opera.com/press/articles/english/1998/>.

<sup>140</sup> An ad banner is a form of online advertising and can be defined as an ad embedded either on a web page or in the browser. When the viewer clicks on the ad, he is directed to the website of the advertiser.

<sup>141</sup> See Opera's Press Release *Feel Free: Opera Eliminates Ad Banner and Licensing Fee* printed from <http://www.opera.com/press/releases/en/2005/09/20/> on 27 November 2008. See also <http://www.opera.com/press/faq/#opera1>, printed on 27 November 2008.

<sup>142</sup> See *Netscape cuts prices on retail products*, printed from <http://news.cnet.com/2100-1001-207681.html> on 17 December 2008.

<sup>143</sup> Chat of 27 June 2008 with Tristan Nitot, president of Mozilla Europe Association, on the French Online Newspaper 20minutes.fr, *Vos questions sur Firefox 3 (Your questions on Firefox 3)*. One of the questions and its answer can be translated as follows "[...] Can you explain your business model? [...] the default Firefox home webpage is Google search (but you can change it). In the same way, on the top right of the window there is a "search box" that redirects to Google, Yahoo, Amazon and other websites. We have concluded arrangements with several of these search engines that see Firefox users coming through both mechanisms (home page and search box). They "monetize" those visits and give back a very small part of the money they generated to Mozilla, which enables us to keep the project alive and to ensure that Firefox remains free." See <http://www.20minutes.fr/article/239280/Chats-Vos-questions-sur-Firefox-3.php>, printed on 5 December 2008.

<sup>144</sup> Email of Wednesday 2 August 2006, 8:03 am, from Tony Chor to Richard Malsch et al., subject "Firefox and RealNetworks" (MS01EU 000000082662); on page 1.



- (117) Opera has an agreement with Google under which Opera receives money from Google for each installation of its web browser since these installations default to Google's services for web search.<sup>145</sup>
- (118) Both Microsoft and Apple ship their web browsers together with their respective operating systems without charging separately for the web browser. Simultaneously, both companies offer their web browsers for free download on their respective web pages. Apple has recently made available its Safari web browser also for Windows (free of charge).
- (119) Furthermore, Microsoft sells software development tools<sup>146</sup> to content or service providers that enable them to develop web sites and web applications that make use of all of Internet Explorer's features. Content produced with these tools will conform to the same specifications as Internet Explorer. For example, these tools can produce HTML with proprietary ("Internet Explorer-only") extensions or make use of a proprietary programming language which can only be "understood" and executed by Internet Explorer. For illustration, Microsoft created proprietary extensions to the CSS<sup>147</sup> standard such as "zoom", that sets the magnification scale of an element or filter that applies a visual effect in Internet Explorer.<sup>148</sup> In addition, the tools' use is also often conditional upon the use of a Windows operating system by the service and content providers both for their own development work and for the platform (e.g. web server, application server) on which the services or the content will be deployed, because the content makes use of the underlying Windows APIs.

### 3.4 Internet Explorer and its bundling with Windows

- (120) The web browser Internet Explorer was first offered by Microsoft in 1995.<sup>149</sup> For retail customers, Internet Explorer was included as a component of Windows Plus! for Windows 95.<sup>150</sup> In 1995, Microsoft released this component as Internet

<sup>145</sup> See for example <http://www.searchenginejournal.com/opera-goes-free-with-help-from-google/2227/> printed on 13 November 2008 and Opera's press release *Opera joins the forces of Silicon Valley*, printed from <http://www.opera.com/pressreleases/en/2007/10/23/> on 13 November 2008.

<sup>146</sup> Such as Expression Web for professional web designers and Office SharePoint Designer 2007 for enterprise information workers (in case the company uses SharePoint). See <http://www.microsoft.com/Expression/products/overview.aspx?key=web> and <http://office.microsoft.com/en-us/sharepointdesigner/FX100487631033.aspx>, both printed on 13 November 2008.

<sup>147</sup> See fn. 131.

<sup>148</sup> See <http://blogs.msdn.com/ie/archive/2008/09/08/microsoft-css-vendor-extensions.aspx>, printed on 18 November 2008.

<sup>149</sup> See <http://www.microsoft.com/windows/WinHistoryIE.msp>, printed on 27 November 2008.

<sup>150</sup> See <http://www.microsoft.com/windows/WinHistoryIE.msp>, printed on 27 November 2008.

Explorer version 1.0.<sup>151</sup> For OEM customers, Microsoft offered Internet Explorer in the Windows 95 OEM Service Release 1 OEM Preinstallation Kit ("OPK") at no extra charge.<sup>152</sup>

- (121) Two versions of Internet Explorer were released in 1995, Internet Explorer 1.0 in July 1995 and Internet Explorer 2.0 in November 1995. Microsoft released versions of Internet Explorer with new features in 1996 (Internet Explorer 3.0), 1997 (Internet Explorer 4.0) and 1998 (Internet Explorer 5.0).<sup>153</sup> The next version of Internet Explorer, namely Internet Explorer 6.0, was released in 2001.<sup>154</sup> Then Microsoft stopped upgrading Internet Explorer for five years<sup>155</sup> until Internet Explorer 7.0 was officially launched on 19 October 2006.<sup>156</sup> Internet Explorer 8.0 is currently available for testing as a second beta version.
- (122) Windows 95 OEM Service Release 1, which was released in December 1995, was the first version of Windows to include Internet Explorer, namely Internet Explorer 2.0.<sup>157</sup> Additionally, as noted earlier, Internet Explorer 1.0 was included as a component of Windows Plus! for Windows 95, which was part of the OPK. According to Microsoft, the vast majority of OEMs installed the Windows Plus! pack, including Internet Explorer.<sup>158</sup> All future versions of Windows were shipped as a bundle with one of the above versions of Internet Explorer.
- (123) The tying of Internet Explorer with Windows is both technical and contractual. OEMs questioned by the Commission<sup>159</sup> confirmed that they could not technically uninstall Internet Explorer from Windows, and that the licensing agreements legally prevented them from modifying or removing Internet

---

<sup>151</sup> See Microsoft's submission of 5 March 2008, page 7, reply to question 4: "Internet Explorer functionality was first offered by Microsoft in 1995".

<sup>152</sup> See Microsoft's submission of 5 March 2008, page 7, reply to question 4: "For OEM customers, Internet Explorer functionality was included in the Windows 95 OEM Service Release 1 OEM Preinstallation Kit ("OPK") at no extra charge".

<sup>153</sup> See <http://www.microsoft.com/windows/WinHistoryIE.msp>, printed on 27 November 2008.

<sup>154</sup> See <http://www.microsoft.com/windows/WinHistoryIE.msp>, printed on 27 November 2008.

<sup>155</sup> Note that Opera released nine versions of its web browser within a timeframe of twelve years and Mozilla three major versions of Firefox within four and a half years, see paragraph (93) and (95).

<sup>156</sup> The team working on Internet Explorer had apparently been significantly reduced at the beginning of this five-year period. A Microsoft internal email states "many people in the public don't realize that there really is an IE team again (our fault for prematurely announcing its death) and thus aren't expecting much from us in the future". Email of Monday 20 December 2004, 1:16 am, from Eric Lawrence to Peter Torr et al. (MS01EU 000000012148); on page 1 (emphasis added).

<sup>157</sup> See Microsoft's submission of 5 March 2008, page 9, reply to question 5: "Windows 95 OEM Service Release 1 was the first version of Windows to include Internet Explorer."

<sup>158</sup> See Microsoft's submission of 5 March 2008, page 9, reply to question 5: "Microsoft believes that the vast majority of OEMs installed the Windows Plus! pack, including Internet Explorer".

<sup>159</sup> Question 10 of the Commission's request of 8 May 2008 reads: "Is your company in a position (a) legally and (b) technically to uninstall any of the products from the following list that currently seem to be integrated into Windows operating systems. Please specify for which products this is the case". The list of products in the request included Internet Explorer.

Explorer's code.<sup>160</sup> More precisely, the Microsoft Desktop License Agreement for OEM customers (Version 10.0, from 1 August 2007 to 31 July 2008) foresees in the Terms and Conditions section, subsection 2.j (License-OPKs):

*"i. Use. Company may use the OPK<sup>161</sup> and related tools only to preinstall the Product. Company must preinstall the product software as provided in the OPK. Company may not make any changes to the Product unless expressly permitted in the OPK."<sup>162</sup>*

#### 4 LEGAL AND ECONOMIC ASSESSMENT

- (124) Under Article 82 EC, any abuse by one or more undertakings of a dominant position within the common market or in a substantial part of it is prohibited as incompatible with the common market in so far as it may affect trade between Member States.
- (125) Under Article 54 of the EEA Agreement, any abuse by one or more undertakings of a dominant position within the territory covered by the Agreement or in a substantial part of it is prohibited in so far as it may affect trade between the contracting parties to the Agreement.
- (126) Microsoft is an undertaking within the meaning of Article 82 EC and Article 54 of the EEA Agreement. Its relevant conduct affects the whole of the EEA.
- (127) Insofar as Microsoft's conduct affects trade between Member States, Article 82 EC applies. As regards the effects on competition in Norway, Iceland and Liechtenstein, and the effects on trade between the Community and those countries, as well as between those three countries, Article 54 of the EEA Agreement applies.
- (128) Microsoft does not earn more than 33% of its EEA turnover in the EFTA Member States. Therefore, pursuant to Article 56 (1) (c) and Article 56 (3) of the

---

<sup>160</sup> See for example Acer's submission of 20 June 2008, on pages 9 to 11, Lenovo's submission of 7 July 2008 on pages 5 and 6, Dell's submission of 10 December 2008 on page 4 (Dell mentioned that it was allowed to remove the visible access points to Internet Explorer. It also mentioned that it is not technically prevented from uninstalling Internet Explorer.), Fujitsu Siemens' submission of 30 May 2008 on pages 2 and 3.

<sup>161</sup> OPK is defined by Microsoft as "the OEM preinstallation kit that includes, where applicable, installation instructions, utilities, Product software and/or Supplements delivered to OEM parties by MS or an MS Affiliate for installing the applicable Product software on the Customer System". See for example Dell's submission of 10 December 2008, Annex 2 (Microsoft Business Term Document, Version 10.0, from 1 August 2007 to 31 July 2008).

<sup>162</sup> See for example Lenovo's submission of 7 July 2008, reply to question 10, on page 6.

EEA agreement, the Commission is competent in this case to apply both Article 82 EC and Article 54 of the EEA Agreement.<sup>163</sup>

## 4.1 The relevant markets

### 4.1.1 The relevant product markets

- (129) A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use (demand-side substitutability).
- (130) Supply-side substitutability may also be taken into account when defining markets in those situations in which its effects are equivalent to those of demand substitution in terms of effectiveness and immediacy. This means that suppliers are able to switch production to the relevant products and market them in the short term without incurring significant additional costs or risks in response to small and permanent changes in relative prices.<sup>164</sup>
- (131) In this section, the two markets that are relevant to this Statement of Objections will be defined: the market for client PC operating systems and the market for web browsers for client PC operating systems.

#### 4.1.1.1 Client PC operating systems

##### 4.1.1.1.1 Demand-side substitutability

- (132) From the perspective of a client PC user, a client PC operating system has special characteristics that make it suitable for a particular use, namely to manage the PC hardware and to offer the user an interface to interact with the computer and run applications. The products listed in Sections 3.2.2.2 and 3.2.3 are operating systems that are designed and marketed specifically as operating systems for client PCs.
- (133) Operating systems intended for other kinds of computers (such as servers) are, as a rule, not used on client PC hardware. Generally, such use would not be technically feasible, or would deprive the user of most of the hardware capabilities of his machine, or of the software capabilities of the operating system. Other software products such as applications cannot substitute for

---

<sup>163</sup> In order to prevent unnecessary repetition, any reference to "Article 82 EC" refers to both Article 82 EC and Article 54 of the EEA Agreement.

<sup>164</sup> Commission notice on the definition of relevant market for the purposes of Community competition law (OJ C 372, 9.12.1997, p.5), at paragraph 20.

operating systems, since they require an operating system to take advantage of the hardware capabilities of the PC. As such, from the perspective of client PC users, client PC operating systems fulfil a specific demand by reason of their characteristics and intended use.

#### 4.1.1.1.1 X86 and non-x86 compatible client PC operating systems

- (134) A distinction could be made between client PC operating systems for x86-compatible and for non x86-compatible PCs (for example, Apple Macintosh until recently). A client PC operating system designed to run on an x86-compatible PC will as a rule not run unmodified on a non-x86 compatible PC – for example, it will need to be re-engineered and then re-compiled to the respective processor.<sup>165</sup> The same applies to a client PC operating system designed to run on a non-x86 compatible PC if one attempts to run it on an x86-compatible PC. However, the question of the inclusion of operating systems for x86-compatible and non-x86-compatible PCs in the definition of the relevant market can be left open since the difference will not be such as to alter the result of the assessment of Microsoft's market power.

#### 4.1.1.1.2 Operating systems for other client appliances are not substitutes

- (135) Other client appliances include personal digital assistants ("PDA") or "intelligent" (or "smart") mobile phones.
- (136) These devices perform certain functions that are similar to the functions of client PCs. They offer some computing power and storage space, and certain applications are available both on client PCs and on such devices. Finally, they offer connectivity to networks and can be used to access resources on them, for example, resources on the internet. Similar to a client PC, they require an operating system to manage the hardware and to offer a programming platform for applications.
- (137) However, from a demand perspective, there are very concrete differences between these devices and a client PC, such as the size of the screen and the limited functionalities compared to a client PC. Moreover, the operating systems of these devices are not designed to support the full range of complex applications that those of client PCs do.
- (138) As such, the operating systems installed on such client devices cannot be regarded as competitive substitutes for client PC operating systems.

---

<sup>165</sup> Software products can also "emulate" a virtual processor on top of which the binary can run. This is, however, not a standard use of an operating system.

#### 4.1.1.1.1.3 Server operating systems are not substitutes

- (139) Servers<sup>166</sup> are more powerful computers than client PCs and, contrary to client PCs, they are multi-user. They are accessed indirectly by users through their client PCs via a network. They can perform different tasks such as storage, e-mail transfer, website hosting, etc.
- (140) Most of the operating systems for client PCs and servers are written on the basis of a small number of code bases: the various UNIX code bases, DOS (which was the basis for Windows 95, Windows 98 and Windows Me), Windows NT (which is the basis for Windows 2000, Windows XP and Windows Vista), and Linux. The code base may be the same for a vast range of computers, from client PC to mainframe.
- (141) However, differentiated operating system products are developed on each of those code bases, by adding specific layers of software in order to target different user needs according to the type of computer on which they are to be used. These differences between client PC and server operating systems are visible for each of the code bases referred to at paragraph (140). Indeed for all these "multi-purpose" operating system code bases that can be used across a whole range of computers, there is already a separate client PC operating system written on this code base and marketed on the client PC operating system market. Commercially therefore, both categories of products are treated separately, and vendors sell client PC and various server operating system products at different prices according to the functionalities that need to be fulfilled.

#### 4.1.1.1.1.4 Web browsers are not substitutes

- (142) With the development of cloud computing,<sup>167</sup> more and more applications can be run through a web browser from the internet or an intranet site directly. Web browsers are platforms on top of which applications can run (see paragraphs (72) to (78)). However, in the following, it will first be established at paragraphs (227) to (254) that web browser and operating system are distinct products and that

---

<sup>166</sup> The terms "client PC" and "server" derive from the so-called "client/server paradigm", which describes communication between software elements as requests made by "clients" to "servers" and the corresponding replies. They do not mean, however, that the servers (powerful multi-user computers) never act as clients (in the sense of the client/server paradigm). On the contrary, servers often have to make requests to other server machines – and on such occasions can be considered as "clients" in terms of the client/server paradigm.

<sup>167</sup> Applications are said to be "in the cloud" when they are hosted and run in a network (usually the internet), as opposed to traditional applications that are run on an individual computer. The user does not know where documents are stored or where the application is running. Applications "in the cloud" include email services (such as Hotmail), photo sharing (such as Flickr.com), video posting (such as Youtube.com) and document processing (such as Google Apps).