Browser Evaluation Guide

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This document provides some helpful guidelines for reviewing Internet browsers as standalone products for comparison to other browsers. Microsoft has compiled this information based on feedback from users on their key browsing requirements and needs. The benefits provided by the browser vary by audience. A summary of the three key audiences and the top level benefits requested based on customer feedback are:

End users
End users are interested in improving their Internet experience in three significant areas:
- Viewing the widest set of exciting and active content
- Personalizing their experience by tailoring the information they access
    - Communicating with others through rich email, voice and application sharing capabilities

IS Managers
With an existing LAN, it is very beneficial and easy for IS managers to move to an intranet. In doing so, they care about the following:
- Migrating their desktops to intranet clients in the easiest and most inexpensive fashion
- Reducing the cost of support for desktops
    - Increasing the productivity of their end users

Developers and Web Producers
Content developers and web producers want an open, standards-based platform for creating next generation, active web content. This means developers need a browser that supports:
- The widest choice of programming and scripting languages for creating Web content
- The creation and use of the widest set of HTML, Java, ActiveX controls, Plug-in and Multimedia extensions
- An open and extensible architecture that allows easy addition and integration of new technologies and content viewing capabilities
    - Broad support for popular operating systems

The rest of this document offers a technical guide to the important technologies and issues required to deliver ~~on~~ the aforementioned customer needs. It is broken into the following key technology areas:

- **HTML and Stylesheet Support**
- **ActiveX Support**
- **Java Support**
- **"Plug-in" Support**
- **Multimedia**
- **Componentized Architecture**
- **Communication and Collaboration**
- **Personalization**
- **Performance**
- **Ease of use**
- **Security**
- **Third Party Support**
- **Pricing and Product Support**

HTML and Style Sheet Support

HTML, as the universal language and backbone of the Web, is one of the most fundamental and powerful methods for creating high impact content. Broad support for HTML standards ensures that content can be reliably viewed in the format that the web designer intended, regardless of the types of tags used in the web page. Speaking with industry experts and customers, it is clear that interoperability doesn't end with the browser; it runs throughout the entire programming environment of the Internet. Databases need to generate

HTML, forms editors need to construct HTML, screen-readers for the visually-impaired need to 'speak' HTML, and even Internet mail programs need to read and write HTML.

When evaluating the level of HTML support in a web browser, customers consider the following issues:

- Does the browser vendor works with standard-setting organizations such as the World Wide Web Consortium (W3C) to help establish open HTML standards, as well as provide support for the latest industry-accepted HTML technology in their current browser? Pursuing proprietary HTML extensions is a detriment to providing long-term value to users, and detracts from the common goal of providing open, industry-established Internet functionality .
- Does the browser provides full support for the latest HTML standard, which is currently HTML 3.2, as published by the W3C? Customers also want assurance that compatibility and consistency is maintained should third party proprietary extensions (established outside from the W3C, for instance) be introduced and gain popularity on the Internet.
- Does the browser offer Webmasters, content providers and developers support for several key HTML enhancements to make their jobs easier, make their web content more compelling and dynamic, and ensure that it is viewable by the widest set of users? These enhancements include:
  - **"HTML and STYLE" specification**
    One of the first post-3.2 HTML specifications proposed by the W3C. This covers SPAN, DIV and STYLE elements and linking of style sheets to HTML documents. It is the glue than binds style sheets to HTML.
  - **Cascading Style Sheets (CSS), level 1**
    - **Embedding style information via STYLE attribute**
      (contained in the "HTML and Style" specification, an adjunct to CSS). This allows for in-line style information. Authors now have easy access to rich style attributes.
    - **Linked style sheets**
      For advanced authors, style information can be placed in external documents and reused across an array of HTML documents. Corporate or MIS webmasters say this is a fundamental requirement for intranet web site design. This is also a need for web publishing sites. It lets them alter the look & feel of the an entire web site with changes to a single style sheet.
    - **Full font control**
      Easier control of font families, weighting, typographic measurement units (cm's, inches, pixels, percentages, em's, etc.) for sizing.
    - **Backgrounds**
      Background colors and image capabilities can be added to tables, paragraphs, anywhere they can enhance a web page.
    - **Non-tiled-backgrounds**
      (a.k.a., direct-position-backgrounds). Allows the web developer to place an image behind an text object. For example a table cell, say, a table cell, without the image being tiled as it is on most page backgrounds today.
    - **Full white-space control**
      Allows for setting margins in typographic units around all edges of elements. This is the critical first step toward realizing real desktop publishing-style page design and layout.
    - **Typographic space control**
      Allows for setting inter-line and intra-line spacing (font 'leading').
    - **Indenting**
      Easily indent a line or paragraph of text on an HTML page.
    - **Negative margins**
      Very rich control allowing elements to float over other elements on a page.
  - **Standard tables**
    Although this is not widely known, most browsers only implement a long expired proposal for tables from the original HTML3 proposal. There is now a final standard for tables, known as RFC1952, which is an IETF and W3C specification. It includes enhancements such as baseline text alignment, rich borders and horizontal cell merging, which give the content author the ability to create more visually appealing content.
  - **<OBJECT> tag support**
    This tag specification is the first of the post 3.2 HTML specifications from the W3C. It is similar

in functionality to the APPLET and EMBED tags, except that this is the W3C standard implementation for adding objects to a web page. This tag supports critical functionality for webmasters and content providers in that it lets downlevel browsers see substitute content in place of the object, applet, or plug-in an updated browser would normally prefer.

- **CSS Layout**
  An experimental specification from W3C for handling frames, floating frames, multi-column layout, 2D direct placement of elements, z-ordering and overlapping of elements, all in a rich and well-architected HTML syntax. (The HTML layout ActiveX control, which provides desktop publishing capabilities for web page designers, is based on this specification.)
- **Frames**
  Frames gave greater design flexibility to web developers, but have had some implementation and execution difficulties in the past. Web content providers say the browser should support functionality to improve usability, such as borderless and floating frames. Further, browsers should have an standards-based architecture for moving this functionality forward (see CSS Layout above).

Customers, especially webmasters and content authors, have said they require a browser that supports today's HTML standards, including support for:

¤ HTML 3.2 tags
Sub/Super Script
Tables wrapped by text (alignment)
FONT Sizing, Color
¤ W3C/IETF RFC1952 Tables
Tables with cell grouping
Tables border control
Header and footer grouping
¤ Stylesheets
Typeface selection
Typeface scaling (any point size)
Margins control
Watermarks (non-scrolling backgrounds)
Table background color
Table background image
Non-tiled-backgrounds.
Full white-space control
Typographic space control
Indenting
Negative margins

Content authors and webmasters also want support for the following features to create the richest HTML content possible:

- ¤ W3C HTML Object specification
- ¤ Direct placement of objects in a web page
- ¤ Scrolling Marquees
- ¤ Netscape Frames
- ¤ Enhanced Frames (borderless, inline and floating)
- ¤ Background sound
- ¤ Support for HTML Layout control, providing precise x,y and z coordinate placement and layering of objects (based on W3C CSS Layout proposal)
- ¤ HTML 2.0 tags

ActiveX Support

ActiveX is a set of technologies that allows software components to interact with one another in a networked environment such as the Internet, regardless of the language in which they were created. It is built on the Component Object Model (COM) and enables a component software architecture. ActiveX is widely adopted in the marketplace today, in terms of deployed technology, maturity and developer investment. Some examples of applications supporting the ActiveX standard are Microsoft Office, Lotus Notes, and PowerBuilder.

ActiveX controls, scripts and documents, are components of the ActiveX technology that provide content developers the ability to extend HTML, enabling the creation of more interactive content for the World Wide Web. With the existence of several thousand ActiveX controls - virtually every existing OLE control is an ActiveX control - ActiveX control support is now a key feature for the browser. There are similarly numerous scripting languages and document formats that support the ActiveX standard. The ActiveX standard provides the glue that ties together the wide assortment of technology, including Java applets, ActiveX controls, ActiveX documents and Scripts.

Key benefits delivered by ActiveX and desired by software and content developers are:

- **Choice of development language**
  With millions of professional developers in existence, no single programming language can meet the needs of every developer. Many developers have a significant investment in knowledge, tools and components based on a particular language. Thus the browser must provide broad support for the creation of ActiveX controls or other software components in any popular language, be it C++, Java, VB, etc. (Java support is discussed in more detail below).
- **Easy code download**
  Developers want an easy way to provide their customers access to new functionality on their web page. The automatic download and setup of controls or plug-ins to the browser, with no additional interaction needed from either the user or the developer, is highly desirable. This functionality should be available as a free run-time, to avoid additional costs to the user.
- **Built-in security**
  The increased importance of ActiveX controls, Plug-ins and Java applets on the web has raised customer concern and the need for security and safety for code download. In particular, customers want protection from potentially malicious code and unauthorized execution of an applet or script. A key innovation is the ability to not only authorize certain code providers so that the permission/notification is provided, but automation for the end user.
- **Choice of scripting tools**
  As with programming languages, there exists a wide variety of scripting languages each with particular benefits for a given developer. With an investment in tools, training and existing code, developers desire support for the widest possible set of scripting languages. VB Script, JavaScript, Rexx, CGI, etc., are some examples of popular scripting languages.
- **Ability to leverage existing code**
  Users and developers alike all have investments in existing software components and applications that they would like to bring to the intranet and Internet. Corporations for example have a significant investment in documents that they'd like to easily publish on the intranet. The ability to natively view existing document standards and formats within the browser is a significant benefit to both the user and the publisher of the information.

Developers and content authors want support for the broadest range of development options, including:

- Native ActiveX Control support
- Support for native document formats such as Microsoft Word (.doc) or Microsoft Excel (.xls) within the browser window
- Reusable software components created in the development language of choice
- Integration of objects and scripts
- Support for VBScript, JavaScript, CGI Script, PERL and REXX languages
- Automatic, Secure code download

Java Support

Java is a programming language that allows developers to create safe, cross platform executables called applets. Java applets have gained popularity on the web and websites such as Gamelan list thousands of Java

applets. When evaluating Java support, developers and webmasters have said they consider the following issues:

- **Broadest possible Java support**
  Webmasters and developers require a browser that runs the widest set of Java applets reliably and supports popular features of the Sun Microsystems virtual machine.
- **Fast JIT support**
  Fast Java execution via support for a Just-in-Time compiler is now standard for a premier browser. Given the investment by many companies to develop JIT technology, the browser should provide a fast JIT as a standard feature, and allow for easy replacement of any particular JIT to optimize for best performance.
- **Better multimedia and access to operating system services**
  Developers want to create more compelling Java applications that can use the broad functionality provided by the underlying operating system such as printing and multimedia capabilities. Users appreciate the option of running "known safe" code outside of the Java sandbox, and allowing all Java applets access to the broadest range of secured system services.
- **Applet integration with other components**
  Content developers seek to increase the interactivity of their web pages by scripting their Java applets with other Java applets, ActiveX controls, Plug-ins, etc.
  - **Enhanced security**
    Despite the inherent security of the Java language, there is still much room for additional security and safety. Users and content developers alike want both a strong "sandbox" model, and enhanced Java security through additional techniques such as code-signing for trusted code.

Developers, webmasters and content authors, as well as some end-users have asked for:

- Basic Java applet support
- Scripting of Java applets, without requiring modification of Java applet code
- Installable JIT architecture
- Support for strong, built-in Java applet "sandboxing" security
- Trusted Code support, for security beyond that built-in to Java ("sandboxing")
- Secured Java applet access to operating system features such as multimedia, printing, and desktop applications

Netscape "Plug-in" Support

Netscape's "Plug-ins" are proprietary extensions to the Netscape browser that developers have used to enhance the browsing experience. They provide a subset of ActiveX control functionality, are platform-specific, and do not interact with other components on the Web page. Despite these limitations, any browser offering broad access to content extensions needs to support the existing base of Plug-ins. When evaluating support for Plug-ins consider:

- Basic Netscape Plug-in compatibility.
- Support for a broad variety of plug-in-dependent content on the web today.
- User should be brought to download page if Plug-in not installed; allows install of Plug-in or equivalent ActiveX control
- Support for exception handling in the Plug-in hosting architecture

Multimedia

One of the most exciting features of the browser today is that it has brought multimedia to the Internet. Traditionally, browsers have provided a certain level of multimedia through the addition of plug-ins or add-ins. Yet users and content developers alike desire a richer platform that can provide the immersive experience of a multimedia title or an action game. Support for this degree of rich multimedia capability requires an architectural foundation that embraces the latest in multimedia hardware such as MPEG, as well as enabling multimedia software such as data/video conferencing. When evaluating multimedia support in a browsing tool, customers have told us they want a browser that offers the following:

- **Full Motion video support**
  At minimum, users require a browser that provides support for full motion video formats like AVI, Quicktime, and MPEG in a single solution. MPEG, in particular, is emerging as an important small-footprint, high-quality video format.
- **Support for broadest range of audio formats**
  Users want support for today and tomorrow's audio formats, such as WAV, AU, AIFF, MIDI, and MPEG audio all in a single browser solution.
- **Progressive Download**
  Users don't like to wait for multimedia content to download. Browsers should support incremental or progressive download of multimedia files. Playback should begin as soon as enough data has arrived on a users' machine, rather than forcing users to wait for the entire file to download.
- **Leverage today's hardware acceleration**
  Customers want to take advantage of multimedia acceleration hardware (audio, video, and 3D boards) in their computers, to make the multimedia experience more realistic and immersive.
  - **Support for three dimensional (3-D) applications**
    Customers want a browser that provides extensions which support the Virtual Reality Markup Language (VRML) specification.

The following checklist shows what customers have said are the multimedia features that are important to them:

- ¤ Native video format support should include AVI, MOV (QuickTime) and MPEG
- ¤ Built-in MPEG video/audio playback
- ¤ Support for hardware acceleration of video playback
- ¤ Native audio formats supported should include WAV, MIDI, AIFF, AU, and newer formats such as MPEG audio.
- ¤ Progressive playback of video and audio files, to allow immediate playing of multimedia files (users don't need to wait for the entire file to download to begin viewing)
- ¤ Streaming audio support should include RealAudio, and support for today's new formats such as the ActiveMovie Streaming Format
- ¤ Streaming video support for the latest formats such as the ActiveMovie Streaming Format, as well as those exposed by other Active X controls
- ¤ 3-D Animation and VRML
- ¤ 2-D Animation support, including animated gifs, ShockWave, and other Active X controls that provide 2-D animation
- ¤ Developers want to extend secured Java applets with access to multimedia features of the operating system, such as full motion video playback and audio capabilities

Browser Componentization

The trend in Internet access is to integrate browsing capabilities more closely into nearly every application, tool, and operating system. At the same time, with the demand for richer content and software extensions, browser companies need a way to easily deliver extension technology in reusable parts. An open object model provides a way to simply add new components and thus enhance the functionality of the browser.

Content creators and developers are beginning to think in terms of retiring the notion of a monolithic, stand-alone browser. Instead they have begun to think of a whole new online application environment, where the browser is an integrated 'viewer' in their multimedia 'title'. This not only provides a more seamless end user experience, but also enables a new class of exciting Internet application. For example, browsing can be integrated into the operating system to provide a unified, consistent way for the end user to access all information, be it locally on the PC, on the intranet or the Internet.

Customers, specifically developers and webmasters, have requested the following support in regards to an open browser architecture that provides reuse capabilities:

- ¤ The browser must be extensible as a reusable component for creating custom applications with today's development languages.
- ¤ The browser should serve as a set of extensible components that can be integrated into the desktop operating system.
- ¤ Developers want an open object model that supports all available programming languages and provides ties between various runtime environments such as Windows and Macintosh.

¤ Customers want tools for easy end-user programming, with the ability to integrate operating system and browser objects to create custom solutions.

Communication and Collaboration

The Internet represents a tremendous opportunity to communicate with others in a more inexpensive and effective way. Combined with the power of the PC, conferencing in particular enables a new level of collaboration which combines voice, data, and/or video. Integration with the browser and support for open standards will greatly increase the pace with which people communicate and interact over the Internet. When evaluating the level of support in the browser, consider the following:

- **Support for today's communication standards**
  Customers want a browser platform that supports Internet communication standards like POP3, HTML, MIME, and T.120, so that they can communicate with anyone, regardless of browser or application. Basic telephony and chat services are a requirement for the browser.
- **True conferencing for multiple users**
  The ease of information access introduced by the Internet has dramatically increased the desire and application for collaboration among more than 2 individuals at a time.
  - **Application sharing**
    Customers want to do more than just basic whiteboard sharing. The want to share any application and thereby open up a whole new area of collaboration that can involve transactions as sophisticated as a review of a legal contract in real-time or as exciting as playing an action game.

Customers have expressed interest in the following features in the area of Internet conferencing, mail and news group reading :

¤ **Internet Conferencing and Internet Phone features:**
¤ Standards-based conferencing (T.120, G.723, H.323)
¤ Internet audio communication using standard phone lines
¤ Collaborative whiteboard
¤ Internet chat
¤ Shared standalone applications (e.g., allowing collaborative document editing or game play)
¤ File transfer capabiities
¤ **Internet Mail and News Reading features:**
¤ POP3 Internet Mail client
¤ HTML enabled mail client (read/write HTML)
¤ NNTP Internet Newsreader
¤ Newsgroup Posting
¤ Offlline newsreading support
¤ Drag and Drop for Attachments
¤ Drag and Drop Text Editing
¤ Easy to use Address book, including easy management of group lists and import/export of other address book types
¤ Integrated spell-checking
¤ Priorities for mail messages including high, normal, and low priorities
¤ Interface allows user to mail an Internet shortcut from the browser using Internet email client of choice

Personalization

While providing access to an enormous amount of information, the Internet also represents a challenge in terms of finding useful and relevant data and accessing it in a comfortable, straightforward manner. The browser can help with this issue by allowing for customization of content and customization of the browser itself. Corporate MIS organizations, in particular, want to standardize browser settings and features in order to reduce support costs and enhance user productivity. Key features to consider when evaluating the degree of personalization offered by a browser:

- **Content screening via PICS**
  Parents as well as corporate MIS would like the ability to control access to content by their children or end-users based on the rating of the web page material.

- **Keyboard accessibility**
  Individuals not able or inclined to use the mouse would like access to the Internet through full keyboard control of the browser.
- **Customization features for toolbar, start pages, etc.**
  Users want to the ability to customize the browser to more easily find and access the information they care about. In particular, the toolbar, favorites, start and search pages are all specific browser features that users would like to customize.
- **Customization by third parties**
  Many different groups such as Internet service and content providers would like to brand and customize the browser to more effectively sell their particular web site or service. At the same time, IS managers would like to reduce their support costs, by controlling the browser settings and options centrally.
- **Migration features**
  Customers who switch from other browsers want to be able to easily convert their bookmarks or favorite sites, so that they can keep their favorite site list when upgrading. IS managers would like to provide for easy "hands free" migration through a customized installation.
  - **International character support**
    Viewing of international characters is highly desirable, particularly since the Web allows for global connectivity and communication. Customers want the ability to view international content, even if they are using an English-language browser.

Customers have asked for the following features for personalizing their web browser:

- **Personalization features**
- Toolbar buttons and arrangement customizable by end users and administrators
- Ratings (PICS) Support
- History and Favorites (Bookmarks) menus
- Customizable, personal home page
- Use Mail/News Reader of choice
- Distribution/Administration Kit
- Customizable installation
- **International Character Support**
- Default language character set option
- Ability to change languages on the fly
- **Localized version availability**
- Widest possible range of international language versions

Performance

Users always want better performance. But on the Internet, performance is even more of an issue given the level of interactivity in accessing information from disparate sites. The major areas of performance include application startup/shutdown time, file transfer, information display and retrieval, with the latter being the key issue. Achieving good performance on information display and retrieval is increasingly based on the strength of a browser's caching architecture. Consequently, when evaluating browser performance, consider the following issues with an eye to cached scenarios when appropriate:

- **Fast startup**
  The increasing growth in the size and RAM requirements of the browser require fast start performance for a good end user experience.
- **Fast Java performance**
  Increasingly, content developers are extending their sites with Java applets. Therefore, Java performance is especially important to the overall browsing experience.
- **Optimization with Web servers**
  Performance for accessing information can be improved by taking advantage of severs that support HTTP Keep Alive. This enhancement to HTTP allows for much better performance retrieving information over the wire.
  - **Immediate content download**
    Customers want a browser that provides for immediate access to content for reading a web page on-line, even if the graphics take longer to download due to inefficient web page design.

To get the best performance for their investment, customers want their preferred browser to support the following enhancements:

- ¤ Fast Connect (via technologies such as HTTP KeepAlive)
- ¤ Always display text in remaining part of the page even when graphics are not downloaded completely
- ¤ Fast text mode for fast display of text
- ¤ Text tags and window sizes displayed while the graphic is being downloaded
- ¤ HTML extensions for custom font typefaces and sizes (reduces page size)
- ¤ Multi-threaded execution
- ¤ Multiple server connections during download
- ¤ Progressive rendering of GIF and JPEG images
- ¤ Smart caching using HTTP “Last-Modified-Since” and “Expires” attributes per-page item
- ¤ Audio and Video Streaming
- ¤ Client-side Image maps

Ease of Use

Though clicking on links is an easy metaphor for users to understand, there is much room for improving ease of use and thus the overall browsing experience. Key issues for ease of use involve usability of the browser interface, integration with the operating system for a more seamless single navigation experience, and automating common functions such as downloading code. When evaluating the browser consider:

- **Standards support = Web browser compatibility**
  Customers want a browser that supports the latest Internet standards from standard setting bodies like the W3C and the IETF, and companies such as Sun Microsystems, Microsoft and Netscape, so that access to the latest Web site technology is assured. Users don’t want to ask themselves, “am I seeing this site the way the designer intended?”
- **Automatic code download**
  When accessing web pages with added functionality, customers want the enabling technology (controls or plug-ins) to download automatically, making access to a fully activated Web page easy. Many users are confused and frustrated by complex download and installation procedures, limiting access and enjoyment of the most advanced sites.
- **View today’s document formats**
  Users want the ability to seamlessly browse between documents of different types and formats, and not be limited to HTML viewing. This is especially important in intranet environments where a large base of documents already exists. For example, a Microsoft Word document should be viewable in its original format right in the browser window, so that all the formatting of the page is presented as it was intended by the author without a forced conversion to HTML.
  - **Links print-out**
    Users that print out web pages want to easily see the links mentioned on the page. For example, the URLs and links mentioned in a web page print-out should be presented in a table for easy reference.

Customers want a browser that is as easy to use as possible, with thoughtful design features that make it simple to enable and disable features on the fly, including:

- ¤ A user interface that works like the operating system, customizable toolbars, familiar help options
- ¤ Search, e-mail, news, buttons on toolbar
- ¤ Large customizable buttons on toolbar
- ¤ Hover select of buttons on toolbar so it ‘s easy to see which button is being selected
- ¤ Consistent navigation buttons in frames
- ¤ View frame’s HTML source on context menu
- ¤ View Source and Refresh context (pop-up) menu commands for pages in frames
- ¤ Refresh and View Source context (pop-up) for page items
- ¤ Hot tracking button
- ¤ Enhanced, tabbed dialog boxes that allow easy access to enable or disable browser features
- ¤ Download information box showing the size of the file, estimated time to retrieve, and the download progress
- ¤ Enhanced printing that allows printing a table of links at the end of a web page print-out, drag and drop printing, recursive printing, print preview and more
- ¤ Full keyboard accessibility
- ¤ Smooth scrolling using PAGE UP and PAGE DOWN keys without the jerkiness of dragging the scroll box

- ¤ Internet shortcuts that work like Windows shortcuts, making it easy to go back to web sites a user likes
- ¤ Quick access to web site or intranet site locations via a single button (such as QuickLinks)
- ¤ Ability to save favorite web locations in user configurable Favorites directory
- ¤ Drag-and-drop of Web page links and web page text to other applications
- ¤ On-line tutorial and indexed help
- ¤ Interface allows user to mail an Internet shortcut from the browser using Internet email client of choice
- ¤ Persistent History list

Security

Security and safety on the Internet today are a primary concern for customers, and with good reason. Computer viruses have become more common-place, Internet communications are occasionally compromised, and inadvertent downloads of code can sometimes have unpredictable results. Customers want security features in a Web browser that give them the highest degree of confidence their transactions are private and secure on the Internet or intranet. They require that their Internet communications be conducted in privacy, safe from electronic eaves-dropping. They also want to safely download software from the Internet, and be assured that the code has not been maliciously altered. Some of the important security areas to consider include:

- **Support for digital code signing**
  Customers want to be able to determine who published software before they download it, much as they use company names and logos to identify software packages in stores today. Users also want to be assured that the software hasn't been tampered with before or during the download process.
- **Turn off code download**
  If a user prefers not to see objects on a web page such as Java applets, scripts, or ActiveX controls, they want to easily disable download of these components from within the browser's user interface.
- **Support for Internet security standards**
  Safe communications and transactions without being overheard are of primary importance to customers. Customers want security support via standard security protocols such as Secure Sockets Layer (SSL) 2.0 & 3.0 and Private Communication Technology (PCT) 1.0.
- **Certificates to validate user and server identification**
  Customers want a browser that supports digital certificates, allowing them to uniquely identify themselves to web sites and access specific information to which only they have permission. In addition, by requesting a web server's certificate, users should be able to verify its identity. Naturally, customers also need technology to efficiently store and manage these certificates.
  - **Architecture for adding security services**
  Customers, particularly developers, want a browser that is built on an open, exportable cryptographic architecture. The browser should provide replaceable security services for application development and integration of new security technologies.

From end-users to developers and web masters, customers have asked for security functionality that includes:

- ¤ Digital code signing for Java Applets and other code that is downloaded, via W3C-based technology
- ¤ Control scripting security
- ¤ Control security for data streaming
- ¤ Server-side authentication via site certificate
- ¤ Client-side authentication via certificates
- ¤ SSL 2.0/3.0 support
- ¤ PCT Support
- ¤ Ability to turn cookie download on/off
- ¤ Ability to disable running of scripts, Java applets and ActiveX controls
- ¤ Provide an API platform for developing secure applications

Third Party Support

Third party software vendors and developers require an industry-supported Web browser architecture that is open and extensible enabling creation of value-add components that run within and outside the browser window. Application vendors want to be able to "Internet Enable" stand-alone applications outside of the browser, while leveraging existing code. Looking towards opportunities in the near future, third party vendors require a browser architecture that allows integration of components into the operating system itself. This will

make Web access a seamless operation for users, and provide new opportunities for vendors to create value-added solutions. Also of key importance is the support infrastructure for third parties developing around a particular browser or technology platform. Developers and content authors need technical support, technical resources, and business development programs to help make their on-line development efforts successful.

- **Support broad range of content**
  Third parties require an underlying browser architecture that supports the broadest range of content possible, including Java applets and ActiveX controls, as well as Netscape Plug-ins.
- **Development language choice when creating components**
  Third parties want the flexibility to create Internet components and applications in the development language of the developer's choice (Java, C++, Visual Basic, etc.).
- **Access to browser services in custom applications**
  Third parties require an architecture that exposes the browser as reusable components, allowing easy integration of browser functionality directly into custom development solutions by third party application developers.
- **Market demand**
  Third parties require a dynamic marketplace that offers many opportunities for developers and Web masters to create value via web components, Internet-enabled applications and powerful vertical market solutions.
- **Support Infrastructure**
  Third parties need effective technical support and resources, and business development support to make their publishing efforts a success.
  - **Internet licensing options**
    Third parties want a secure method of licensing their software on the Internet. The browser platform should support a standard licensing mechanism so they can distribute their extensions and add-ins using the Internet as a distribution channel.

Third parties want a browser that supports an open architecture that provides:

- ¤ Extensible browser which provides reusable components for creating custom applications with today's development languages
- ¤ An open and widely supported architecture
- ¤ Broad Industry support for add-in functionality
- ¤ Customer demand for add-in functionality
- ¤ Technical and business support programs for third party developers and authors

Pricing and Product Support

Customers want a world-class browser at a minimal cost to acquire and implement, while still receiving great browser value via integration of the latest Internet and intranet technologies . They also require support options that are appropriate for a world-class browsing tool. Finally, customers want their preferred browser vendor to demonstrate commitment to the Internet by openly sharing plans to update and improve the browser regularly, and as new and enhanced Internet technologies are introduced.

Customers in general want:

- ¤ An inexpensive, yet full featured web browser
- ¤ A browser that supports the latest technologies
- ¤ A browser vendor that is committed to keeping up to date with Internet technologies
- ¤ A browser that is easy to implement and supports a company's existing infrastructure in hardware and software
- ¤ Knowledgeable, accessible and inexpensive end user support options

For more Information

For competitive comparisons of today's most popular browsers, see http:// www.microsoft.com/ie/.