The Skinux Advantage

Dynamic, Realistic Interfaces for Today's Evolving Software Market

December 2002

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Why Skin User Interfaces?

Media: From Television to Computers

In 1964, when Marshall McLuhan wrote his revolutionary expose about automation and television, *Understanding Media*[1], television was the dominant, driving force in worldwide entertainment, advertising, and the dissemination of information. Today, the desktop computer connected to the Internet is fast becoming the medium of choice for entertainment, advertising, broadcasting information, and communication. Due to significant strides in computer and Internet technology, people are beginning to spend more time in front of their computers than the TV, sampling music and film clips, downloading media and software, buying products, and communicating with each other in e-mail and IRC chat.

Computers: From Productivity to Entertainment

Over time, advances in technology and the falling price of sophisticated computer hardware have changed the way we use computers. The rich presentation of the Web, advances in high-speed Internet connectivity, development of streaming media, and the decreasing cost of increasingly robust hardware have all transformed static computer workstations into dynamic windows to the world. As a result, average family members now use desktop computers for entertainment and communication, rather than for productivity purposes, alone.

Only a decade ago, the "killer applications" for personal computers included word processors, spreadsheets, and page layout programs, all of which were designed for conducting business at work or at home. Today, media players, file sharing services and instant messengers have become the dominant applications, consuming more and more of people's spare time. Twenty years ago, parents complained that they couldn't get their teenagers off the phone when they needed to make an important call. Today, parents complain that they can't check their e-mail because their teenagers won't get off the family computer, spending endless hours in chat rooms or surfing the Web for music and video files.

[1] Marshall McLuhan, *Understanding Media*, McGraw-Hill, New York, NY, 1964.

Software: From Graphic User Interfaces to Skin User Interfaces

The Graphical User Interface (GUI) was invented back when computers were used to do a job. They preceded the time when computers were used for entertainment and communication and were designed with productivity applications in mind. The main intent of GUI systems was to enforce standard user interface guidelines that led to consistent user behavior across applications and emphasized the branding of the user's operating system.

However, with the advent of the Web and the increased focus on entertainment, consumers and the software companies that sell to them are demanding user interfaces that transcend the traditional GUI. They want a designed appearance that distinguishes the consumer or the vendor, rather than the native computer operating system. In the same way that they choose their clothes, consumers want the "look and feel" of their software to reflect their age group, tastes, and even their cultural outlook on life.

The Skin User Interface (SUI) fills this need in the marketplace. It uses imaging technology, which includes layering and transparency and enables such visual features as drop shadows, glowing and pulsating buttons, and other features that are far more interesting, entertaining, and interactive than the static graphics of the GUI to encode and send its message to the user.

Enabling Factors: Technology and Cost

New imaging technology, increased memory capacity and faster computers are making Skin User Interfaces possible in today's computer marketplace. Furthermore, we have seen incredible reductions in the cost of high-quality computer hardware during the past five years. These factors have enabled more robust interfaces, resulting in a paradigm shift from GUI to SUI that is similar to the transition from character-based interfaces to graphical windowing interfaces in the early 1980s.

The Skin User Interface is being driven today by three converging trends in computer hardware development:

- 24-bit video display cards
- The Intel MMX processor
- The low cost of Random Access Memory (RAM)

Video Display Cards

Even the most inexpensive personal computer sold today is equipped with a fast 32-bit video card that is capable of displaying photographic quality images at high resolutions. At the minimum, these cards come with 16MB memory with a maximum resolution of up to 1600 x 1200 in either 32-bit true color mode or 16-bit high color mode. However, most of the software developed today does not take advantage of this low-cost hardware power. The majority of Microsoft Windows® and Linux® based programs continue to display user interfaces that use only a 16-color palette—a fraction of what is available to the user. Conversely, Skin User Interface programs leverage the display power that average computers provide for consumers at no extra cost.

The Intel MMX Processor

All Intel processors shipped since the introduction of the Pentium II in 1996 support MMX technology, which is designed expressly to improve the performance of image processing and graphics. This technology dramatically enhances image processing operations such as alpha blending and blurring, resulting in performance that is 2-to-4 times faster than that of conventional Intel processors. Furthermore, this technology is relatively universal; although MMX is not generally found in chip sets that are not made by Intel, competing processors such as the Power PC use similar processing instructions capable of displaying Skin User Interfaces at no extra cost to the user.

Low Cost of Random Access Memory

The cost of RAM has dropped significantly during the last few years, providing computer users with more memory than ever before to store and manipulate image data. This, too, makes Skin User Interfaces available to the average user.

Summary

Today, the standard PC that sells for under $1,000 is equipped with a high performance 24-bit graphics card, a 2 GHz Intel Pentium IV with MMX technology, and 256 MB of RAM. Unlike its GUI predecessors, the Skinux Skin User Interface makes full use of the power of these systems, delivering robust, unique software interfaces that attract and entertain users, make software more intuitive to use, and encourage interactivity. These features make software successful in today's emerging new marketplace, thus lending a competitive edge and a sound return on investment to the companies that use it.

Skin User Interface as a New Advertising Medium

Software and Media Content Deflation

One of the major consequences of the Internet revolution has been software and media content price deflation. In the 1980s, software vendors could easily charge several hundred dollars for a single software title. Today, users want to "try out" software programs for free, and they don't always buy what they try. When they do purchase software, users are no longer willing to pay a lot of money for it.

This deflation has been driven by the following factors:

- The open-source movement of software development and the resulting availability of high-quality "free" software.
- The trend on the part of software development companies to bundle several separate applications into one software product, in order to increase value and decrease cost.
- The emerging popularity of file sharing systems, such as Napster® and Kazaa®, which enable content and software swapping without regard to copyright.

Because of this deflation, software and media developers are beginning to turn to alternate sources of revenue, such as advertising.

SUI: Offsetting Lost Profits with a New Advertising Model

To help offset diminishing revenues caused by software and media content deflation, businesses are beginning to use new advertising models to subsidize the cost of software and media content. Companies such as Google® and Yahoo® generate revenue with banner advertising in much the same way that billboards are used along highways.

Because Skinux produces a visually rich, photo-realistic interface, it can model billboard advertising, thereby reinforcing brand awareness at the interface level. For example, you may very well see a "Coke" or "Toyota" interface on your digital VCR when viewing the World's Soccer Cup or when playing an MP3 on your media player program. Skinux refers to this technology as "Channel Branding," and our company plans to file a provisional patent on its use.

Business Advantages of the Skinux SUI

Branding Facilitation

The bottom line is that Skin User Interfaces facilitate company and product branding by offering a more intense, wider range of visual communication than their traditional GUI counterparts. This is critical if you want your program's interface to communicate company and/or product brand information in addition to performing a specific function.

Although branding increases profitability for all products, it is more vital in entertainment and consumer appliance environments than it is in the traditional productivity software suites that once dominated desktop computing.

Visually Compelling

Skinux interfaces are visually compelling. For this reason, consumers are naturally attracted to them. Skinux Skin User Interfaces, such as the one we created for X3D Technologies (pictured below), are anti-aliased, photo-realistic, animated, translucent, non-rectangular, and 3-dimensional in appearance. By using Skinux, you can develop a user interface that will truly captivate your customers and communicate your brand—that's an essential ingredient for success if you are developing entertainment-oriented software and competing for the consumer's somewhat short attention span.

X3D's TV Gateway (Skin User Interface by Skinux)

Skinux enables designers to create striking interfaces by giving them pixel-level artistic control over the entire design. This is the same difference in control that can

be found between bitmap image editing programs, such as Adobe PhotoShop® and vector drawing programs, such as Corel Draw®.

Customer Specificity

One of the main uses of Skin User Interface technology is to adapt the user interface to the esthetic preferences of specific customers.

This has actually been the trend in all consumer appliances since the beginning of time, including cars, cameras, radios and toasters. It is only at the beginning of the technological lifecycle that products have a uniform appearance. This as true for software produced today as it was for cars in the 1920s, when Henry Ford joked that you can buy a Ford in any color as long as it was black. Customer-specific user interfaces are becoming the norm, rather than the exception in software design; in some markets, consumers already expect them.

Vendor Specificity

In addition to providing customer-identification, Skin User Interfaces can be used to reinforce a vendor's brand by displaying a unique look. The best example of this is Apple's use of skinning in its new OS/X Aqua user interface. Its smooth, semi-transparent appearance quickly identifies the machine on which it resides as "a Mac."

Because of their branding ability, it is very likely that Skin User Interfaces will become a new advertising medium, not unlike a billboard along a highway. In fact, a new business model is being developed to pay for software with advertising dollars. The pioneers in this effort include products like Qualcomm's Eudora® e-mail system and AOL Instant Messenger, which actually display HTML advertisements in a corner window of the programs.

Productivity

The primary benefit of Skinux over other skinning technologies is its remarkable productivity.

Our most striking contribution to companies that use our technology and services is a dramatic decrease in the time it takes to create a Skin User Interface and get it to market. The Skinux tool set enables programmers to develop a Skin User Interface very rapidly, a process that would otherwise take months or years to implement by using conventional tools.

The Skinux tool set also provides plugins for Adobe Photoshop that export artwork created in Photoshop to the Skinux format. Because of this feature, graphic designers

do not need to buy and learn an additional image creation tool to design unique product interfaces.

Finally, all Skinux Skin User Interfaces are specified in standard XML with XSLT support. This feature provides for a separation between the code and the actual front-end design, which enables developers and designers to work with each other independently, in parallel. Skinux XML is extensible, a feature that enables developers to tailor software to the functional and aesthetic demands of specific customers.

Performance

Skinux is based on an extremely fast, highly optimized imaging library that can produce real time alpha blending and image processing procedural effects. More than 50% of our imaging library is written in Intel MMX Assembler code. In this way, Skinux is engineered to support the demands of a high performance environment.

Skin representations in Skinux are extremely compact and very little memory is required to encode them. As a result, they are ideally suited for low bandwidth environments, such as wireless Internet appliances or consumer entertainment devices. This is possible because Skinux is based on a procedural imaging model, rather than a simple bitmap representation. Skins can be downloaded very quickly and rendered on the fly.

Applications of the Skinux SUI

Skin User Interfaces are best suited for entertainment and consumer software, such as media players and control panels. These applications represent an emerging market and are likely to eclipse traditional productivity applications such as word processors and spreadsheets during the next ten years. The following sections describe the primary uses of skinning technology today.

Entertainment / Media

The most successful use of Skin User Interface technology to date has been in the arena of media player technology. Real Networks' Real Jukebox® and NullSoft's WinAmp® are high-profile media players that have "pushed the envelope" on customizable skins and one-of-a-kind interface designs.

Media players have been pushed to the forefront of software development because of the widespread acceptance of the MP3 (Motion Picture Experts) music file format and the popularity of file sharing systems such as Napster. With the exception of browsers, media players are probably the most widely used applications on the Web today.

By combining procedural imaging with layered image compositing, Skinux technology dramatically increases the level of realism and design previously offered by Skin User Interfaces. This is exemplified in the Skinux media player pictured below, which actually runs on top of the Microsoft Media Player®; it is available free of charge on the Skinux Web site, www.skinux.com.

Skinux's Skinamp Media Player

Although media players were the first applications to use SUI technology effectively, they are certainly not the last. Skin User Interface technology can enhance the usability and marketability of a multitude of desktop entertainment programs, from customizable chat clients to music mixing software.

Case Study

In July of 2002, X3D Technologies contacted Skinux to implement a Skin User Interface for its TV Gateway® and PC Gateway® media players. Their previous interfaces were implemented with Microsoft Foundation Classes (MFC)®. The marketing team at X3D felt that a Skin User Interface was necessary to give these products a competitive edge in a crowded entertainment software marketplace.

In 3 months, Skinux was able to conceive and implement the product designs for both products. In October 2002, X3D won Best of Show at Internet World. Within 3 months, X3D sold more than 150,000 copies of the software.

X3D's PC Gateway (Skin User Interface by Skinux)

Emulators and Simulators

Skin User Interfaces can also be used for significant advancements in emulation and simulation software.

To test their designs, hardware manufacturers such as cell phone companies often build mock prototypes that use software to simulate hardware functionality. Third-party software developers use simulation and emulation programs for testing, as well.

By using Skinux, a photo-realistic interface of a hardware device (shown below) can be created and connected to a back end program that emulates the device's behavior.

This can be accomplished within hours with only an image editor such as Adobe PhotoShop, a version of Windows Notepad® (for editing the skin's XML), and a copy of the Skinux Development Kit™.

Skinux Hardware Prototype of a Phone Media Player

Control Panels / Launchers

Skinux technology can also be applied very effectively to the creation of control panels and launchers. This includes control panels for scanners and point of sale terminals, as well as software installers / launchers (pictured below). Software and hardware manufacturers are beginning to turn to SUI technology to distinguish their products from their competitors. Skinux is already prepared to provide whatever is necessary to capitalize on this trend.

X3D Game Installer/Launcher

Games

One of the most promising applications for Skinux's Skin User Interface technology is the gaming industry. Many games on the market today are well suited to this new technology, including desktop accessories such as Skinux's Solitaire, shown below (part of the SkinToys™ product line available for free download at the Skinux Web site, www.skinux.com).

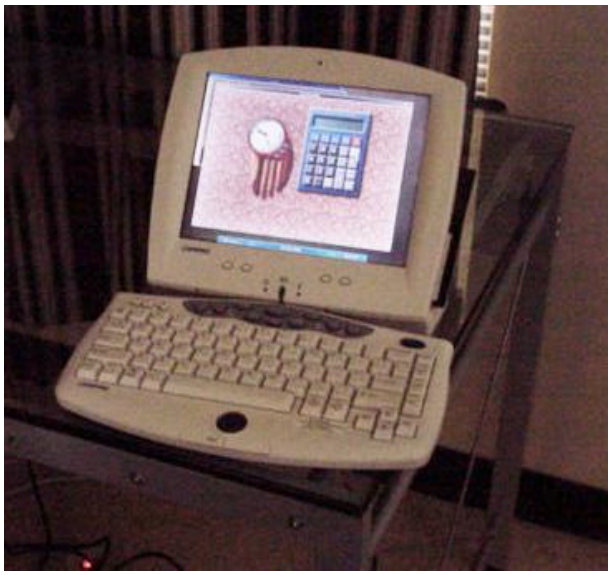
Skinux's Solitaire

We are certain that the enhanced photo-realistic effects that are now possible with Skinux's SUI technology can help online casinos and other applications in the online gaming industry increase consumer participation and profits.

Embedded Devices

Skinux technology can also be applied very effectively to embedded Linux consumer device interfaces. X/Windows®, the native windowing system for Linux, has little imaging support for Skin User Interfaces. As Linux becomes more popular in the embedded space, Skinux is well poised to be the technology of choice for developing embedded interfaces for those systems.

What makes Skinux so attractive to Linux developers is its access to the source code and the small size of the Skinux engine. The graphic below shows an early version of a Skinux SkinToys application running under Linux on a Compaq Ipaq® system. The hardware configuration includes a 200MHz K6 processor with 32 MB of RAM and a 16 MB Flash memory card.



Skinux SkinToys™ Application on the Compaq Ipaq running Linux

Technical Summary

For specific details about Skinux's technology, refer to the document *Skinux Technical Overview: Achieving Dynamic, Realistic Interfaces with Procedurally Driven Imaging Effects.*

Skinux vs. Traditional GUI Programming

There are significant advantages to licensing Skinux technology and contracting its services, rather than using a traditional API such as Windows' Win32® or MFC® or Linux's GTK+® to develop an interface that merely resembles a skin. For one thing, traditional window systems and their APIs provide little imaging support from which to build such an interface; therefore, your development staff would have to write a large volume of code to support such functionality before they could focus on your products' core competencies.

A few of the many features your developers need in order to develop a Skin User Interface are a layered image compositing engine, an MMX optimized imaging library for fast image processing, and an animation model for modulating software controls over time. Today's operating systems provide very few of these capabilities. Windows' Win32 API is designed only to build software that conforms to standard Microsoft user interface guidelines for productivity applications such as word processors or spreadsheets. Linux's X/Windows is even more limited, offering marginal support for both fonts and image processing, and it runs much more slowly than Windows.

Skinux transcends these limitations and offers the following specific benefits over the traditional GUI paradigm:

- Cross Platform
- Interoperability
- Extensibility

Skinux is the first truly cross platform skinning solution for Microsoft Windows and Linux systems. Skinux's Skin User Interfaces are not dependent on any particular windowing system or operating system manufacturer.

When selecting a user interface technology, it is important to consider whether or not it is interoperable with the display technology of the native operating system environment. Skinux excels at this because it doesn't try to replace the entire display architecture. This is particularly beneficial if you want to apply a new Skin User Interface to legacy software

because it is not necessary to rewrite all the code to fit into a new architecture, resulting in significant savings of time and money.

Furthermore, Skinux understands that developers cannot anticipate all the software controls that a skinable program might require. Therefore, we have made Skinux fully extensible; in addition to providing common controls, such as buttons and sliders, our system enables developers to build special customized controls, such as a play list in a media player. This is essential when your product interfaces must have that unique, one-of-a-kind appearance.

Skinux vs. Older Skin User Interface Technology

SUI Predecessors and Theme Engines

In the mid-1990s, Kai Krause of MetaCreations laid the framework for today's Skin User Interfaces with his revolutionary tool set, Kai's Power Tools® and Kai's Photo Soap®. With these tools, Kai made possible a smooth, translucent and transparent interface that is based entirely on 32-bit RGB(alpha) image compositing. Play, Inc. then developed a very popular set of skinable desktop accessories known as Gizmos 98®, a best seller that *Windows* magazine named Product of the Year in 1999.

Skin User Interfaces were later implemented in media players such as WinAmp and Sonique®. The popularity of these players emphasized the efficacy of applying Skin User Interfaces to entertainment software and gave rise to third party participation in SUI design. Also, these interfaces advanced skinning technology by separating text files and image data from the applications, themselves.

However, despite these strides, no company except Skinux has released a general-purpose development tool for building Skin User Interfaces. The specifications for WinAmp, Sonique, and the Microsoft Media Player, for example, are different from one another and cannot be applied to other software programs; Skinux, on the other hand, can be used to build Skin User Interfaces for any new or existing application.

Theme engines, such as the one used in StarDock's product WindowBlinds® for Windows, enable users to change the look of legacy programs without the need for re-coding. However, theme engines do not provide pixel-level artistic control over the Skin User Interface and are therefore limited in scope.

Skinux has responded to these deficits in the marketplace by engineering a Skin User Interface toolkit that provides the following:

- A standard API that works within Microsoft Window and Linux
- A portable set of C++ classes that implement Skin User Interfaces

- A standard XML format for describing Skin User Interface components
- A set of plugins that work with Adobe PhotoShop to author 32-bit RGB(alpha) images

For more details, refer to the document *Skinux Technical Overview: Achieving Dynamic, Realistic Interfaces with Procedurally Driven Imaging Effects*.

Web Multimedia Interfaces

Products such as Macromedia's Flash®, Shockwave®, and Adobe's Live Motion® are currently used to author rich multimedia interfaces on the Web that bear some resemblance to Skin User Interfaces. However, these tools do not enable developers to build actual SUIs because they were built to address different technical constraints than those posed by native skinning technology. Specifically, they were built to deliver graphics to a Web page over relatively narrow bandwidths (56Kbps).

These products were built to create small file sizes for quick downloads, a rendering technology that is fast enough for a 100 MHz processor, and other Web related advantages; however, these features are not necessary for local Skin User Interfaces, which require the following, instead:

- A larger player size that can be extended for specific applications
- A large data footprint that is locally resident and consists of ample RGB(alpha) image data
- A rendering technology optimized for MMX-enabled 1 GHz+ computers
- Access to the machine environment
- Interoperability with the native operating system's display layer.

Because Skinux offers all these features, we believe it is more suitable for building Skin User Interfaces than Web multimedia authoring tools.

Technical Features

Sophisticated Imaging Model

Skinux was designed from the start to be a state-of-the-art Skin User Interface development system. Our primary intent was to employ a sophisticated imaging model that supports all of the following

- Layered Image Compositing
- Procedural Imaging
- Sub-pixel Positioning

Layered image compositing was initially developed for static image editing and video editing software. Skinux Skin User Interfaces use layers to organize dynamic controls into distinct components on a control panel that can be moved and edited independently of one another. This feature makes Skinux interfaces photo-realistic, as opposed to the plain rectangular interfaces found in Windows or Linux.

Procedural imaging describes images mathematically and enables them to be modified synthetically. This enables developers to create and apply drop shadows, embossed and fringed edges, and fully customized filters that can be modulated over time. It also results in compact, high-compression images that require little storage capacity and are very easy to edit.

Sub-pixel positioning enables developers to create very smooth animation effects, a feature that is usually not supported in more primitive interface systems.

Scalable Imaging

Because it supports a procedural and vector based image model, Skinux also offers scaleable images that can be resized and rendered to any screen resolution without any loss of detail. Our scalable imaging model provides interface designers with a myriad of flexible options heretofore not offered, such as source level transformation, a pivot coordinate system for each individual control, and the ability to scale some elements in an interface control while keeping other elements constant. Our composite level transformation feature eliminates jagged edges and other degradations found in skins created with more limited technologies.

Built-in Animation Model

Since its inception, Skinux was designed to support 32-bit image based animation. This feature enables interface controls to be repositioned and resized anywhere within a control panel. Skinux's sub-pixel positioning and layered image compositing model ensure smooth, polished animation behavior. Furthermore, our architecture enables product control features to be modulated over time. For example, it is very easy to create a pulsating drop shadow or glowing effect around an interface control in Skinux or a gradient that cycles its colors over time. Skinux achieves this in full 32-bit color with the ability to display varying levels of transparency, unlike animation schemes that are limited to 256 colors.

Layered Windows

The new layered window style introduced by Microsoft into Windows 2000® and XP® provides a new visual effect and improves system performance. Prior to the introduction of this feature, it was very difficult to display non-rectangular windows on a computer screen without producing very jagged-looking edges. Layered

windows have made way for much smoother interface elements and translucent effects. Skinux supports this technology in both Windows 2000 and Windows XP.

Advantages of the Skinux Architecture

The Skinux architecture consists of the following components:

- Skinux SDK
- Skinux XML Language
- MMX Optimized Imaging Library

The Skinux Developer Kit (SDK)

When designing Skinux, our company decided to leverage PhotoShop's popularity and success, rather than reinvent the wheel with a new image editor. Our authoring process uses PhotoShop at the design level to a great extent. Because the Adobe image layering architecture closely resembles that of Skinux, it is ideally suited to map out designs. To aid in the design process, Skinux provides two plugins that extract the color and alpha information from PhotoShop layers.

The Skinux SDK is a collection of C++ source code class libraries used to develop Skin User Interfaces. The kit provides a unified application-programming interface API across both Windows and Linux for cross platform capability. The 6 specialized code libraries in our SDK enable developers to build photo-realistic, well-designed skins very easily and much more quickly than they could with conventional GUI libraries on Windows or Linux. For more information about these libraries, refer to the document *Skinux Technical Overview: Achieving Dynamic, Realistic Interfaces with Procedurally Driven Imaging Effects*.

Skinux XML Language

One of the primary advantages of Skinux is that it uses XML (Extensible Markup Language) to define the skins of an applications interface. XML is widely understood and accepted among developers, and many authoring tools are available for it. Our language structure enables designers to specify the skin of a product's interface independently of the code. This yields the following benefits:

- Developers and designers can work independently of one another.
- Designers do not need to know C++.
- Applications do not need to be recompiled in order to change skins.
- The process facilitates internationalization of product interfaces.
- Software executables are smaller.

Skinux's design process is very simple because designers use the Skinux XML language to author a Skin User Interface. We've also added XSLT (XML style sheet) processing, which helps to create a more compact XML skin description, along with a faster way to change selected attributes all at once.

MMX Optimized Imaging Library

It is the Intel MMX processor that makes Skinux's outstanding performance possible. Our system was built to support and utilize the Single Instruction Multiple Data (SIMD) processing form in the MMX architecture. Our company has observed that this increases performance by 2-3 times.

Industry Experience

Richard Krueger is the founder, CEO and CTO of Skinux Inc., founded in February 2000. During the past five years, Richard has been developing the foundations for the Skinux product, resulting in a highly sophisticated imaging architecture.

Prior to founding Skinux, Richard was the Director of Imaging at Macromedia® Inc. from August 1995 to October 1997. He was the author and lead programmer for Macromedia xRes®, which later formed the basis of the Macromedia Fireworks® product.

In 1992, Richard founded Fauve Software™ with his brother, Fred Krueger, to develop a natural media paint product for the Windows and Macintosh® systems. Their flagship product – Fauve Matisse™ – was voted Product of the Year by *Imaging Magazine* and received a four-star review from *Publish* magazine. They sold the company to Macromedia in August of 1995. Prior to founding Fauve Software, Richard worked for the Institute of System Science in Singapore, developing a 3-D medical imaging system. In the 1980s, he worked for SAS Institute® in their 3-D graphics division and for IBM® in their PC graphics division.

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