



The Business Case for
Licensing

HOOPS 3D Application
Framework

OVERVIEW

Software organizations considering licensing the HOOPS 3D Application Framework (HOOPS/3dAF) from Tech Soft 3D (TS3D) regularly perform a business benefits analysis in parallel with a detailed technical evaluation. This document is intended to facilitate that business analysis outlines the primary advantages of leveraging HOOPS/3dAF as a key foundation technology.

BACKGROUND

This section provides essential background information regarding TS3D, HOOPS/3dAF and related technologies.

Tech Soft 3D

Founded in 1996 with core HOOPS technology spun away from Autodesk, Inc., Tech Soft 3D (TS3D) is a privately held, profitable and consistently growing company. TS3D provides premier 2D/3D development toolkits and related services that dramatically simplify the design, development and maintenance of 2D/3D engineering software applications.

The company's customers span a broad spectrum of engineering software firms, including industry leaders such as Autodesk, Bentley, SolidWorks, Dassault Systemes, PTC, MSC.Software, Fluent, COADE, Hitachi Zosen, Mitutoyo, Landmark Graphics, Surpac, Mintec, and Minitab. There have been over 175 applications built upon HOOPS components from companies of all sizes, with the total number of seats of HOOPS-based applications now exceeding 6 million.

HOOPS 3D APPLICATION FRAMEWORK (HOOPS/3dAF)

HOOPS/3dAF is TS3D's flagship product and is used as the core graphics engine in applications from virtually every major CAD/CAM/CAE vendor as well as from ISV's in the Earth Science, Mining and Scientific Visualization fields.

HOOPS/3dAF provides developers with a complete, engineering-focused graphics subsystem that delivers leading performance and functionality. The high-level nature of the API dramatically speeds and simplifies application development.

As a full graphics subsystem, HOOPS ultimately makes use of lower-level APIs such as OpenGL or Direct3D "under the hood" to optimally drive underlying graphics hardware. Although tightly connected with these lower-level drawing APIs, HOOPS offers an abstraction layer above these interfaces as well as a complete software-only pipeline for devices with new hardware acceleration. This independence from lower-level APIs

allows HOOPS-based applications to perform optimally on any given hardware or platform, even while these underlying platforms may change over time.

For a simplified view of where the HOOPS subsystem fits into a common application architecture and how it relates to lower-level API's such as OpenGL and Direct3D, please see Figure 1 below.

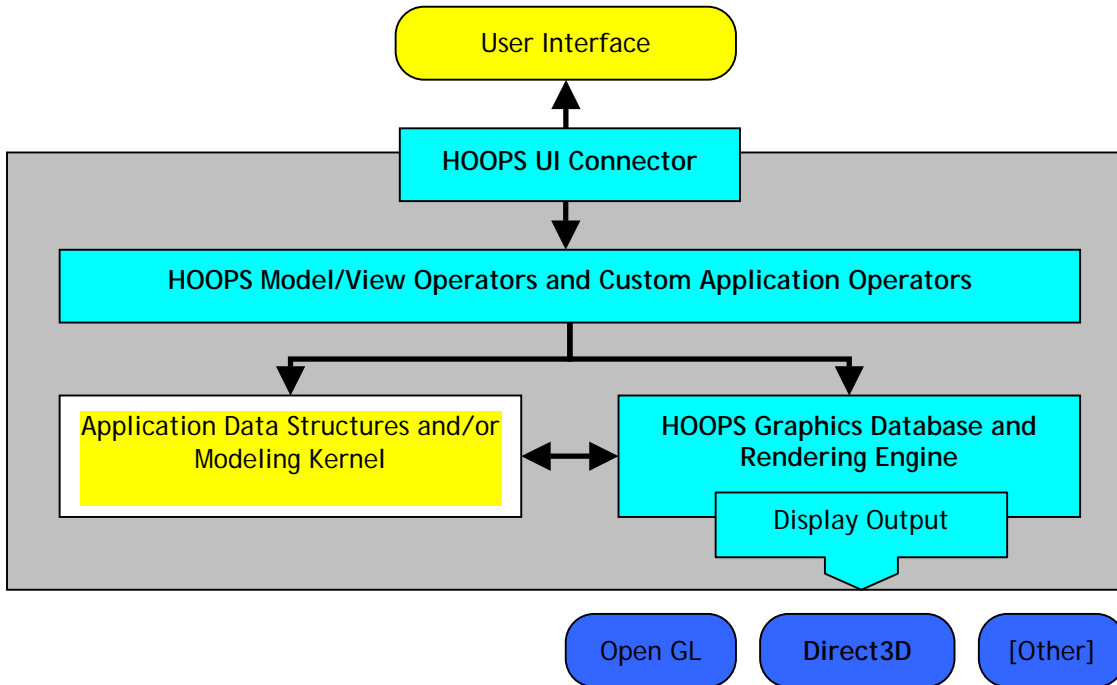


Figure 1: Typical Architecture of a HOOPS-based Engineering Software Application

Alternatives to Licensing HOOPS/3dAF

All engineering applications with graphics capabilities ultimately require a complete graphics subsystem to efficiently handle graphical display, interaction, scalability, hardcopy, etc.

Other than licensing HOOPS, the most common approach for engineering software developers has been to design and develop a proprietary graphics subsystem. These proprietary subsystems are typically built upon and tied to a specific low-level drawing API such as OpenGL or Direct3D. While access to the OpenGL and Direct3D APIs are free, the significant amount of code required to create a full-featured graphics subsystem would still need to be developed. It is this major development effort that HOOPS/3dAF is designed to replace.

OpenGL

OpenGL is a low-level, immediate-mode drawing interface designed to facilitate hardware acceleration of 2D and 3D graphics display. Graphics subsystems, whether proprietary or HOOPS, ultimately may drive OpenGL for fast display. OpenGL is a published specification that has been implemented by virtually all graphics card vendors and is available on all major platforms.

Direct3D

Direct3D (D3D) is also a low-level, immediate-mode drawing interface providing hardware acceleration of 2D and 3D graphics. However, unlike OpenGL, D3D is owned by Microsoft and is restricted to the Windows platform. Graphics subsystems, whether proprietary or HOOPS, may interface with D3D for accelerated rendering. D3D is already dominant in the gaming community, Microsoft intends to establish it the primary low-level graphics API for the engineering market as well.

BUILD VS BUY ANALYSIS

Evaluating HOOPS/3dAF involves assessing the business advantages that licensing can provide, particularly as compared to building that subsystem internally. A key element of this assessment is whether or not your company should consider graphics subsystem a foundation technology.

By leveraging a foundation technology software firms are able to produce more compelling applications and can get those applications to market faster while significantly reducing their R&D burden. Ultimately, these factors enable software companies to be more competitive as they conserve resources and focus on their core competency.

Foundation Technology

To fully appreciate the business case for licensing components, one must first consider the concept of foundation technologies. The term foundation technology is used here to refer to any application subsystem that is:

- a) Necessary to deliver a complete application for a given market
- b) Widely available
- c) Capable of meeting or exceeding the market's standard of performance and functionality, and

- d) Internal development of that subsystem will not provide a direct value-add differentiator

When dealing with foundation technologies standard business logic dictates that these subsystems should be licensed and built upon rather than reinvented. Businesses have long accepted that they can be more competitive by leveraging foundation technologies which enable them to develop more compelling applications while also reducing R&D time and expense.

Not all subsystems are foundation technologies, however. When a particular technology represents a company's core competency and development in that area can positively differentiate their product the common approach is to develop this capability internally.

Foundation Technologies in CAD/CAM/CAE

The evolution of solid modeling as a key foundation technology within CAD/CAM/CAE software provides a useful example of the concept of foundation technologies at work. At one time solid modeling was a major differentiator that later evolved to become a foundation technology.

Until the mid-1990's, each 3D CAD vendor invested heavily in the complex development of proprietary solid modeling subsystems. The need for massive R&D in this area made the barrier to entry in the CAD market prohibitively high, slowed innovation and kept the price of CAD software out of reach for most of the potential market.

In the mid-1990's, however, the emergence of sufficiently robust solid modeling kernels rapidly transformed solid modeling into a foundation technology. From that moment onward modeling was no longer a core subsystem that companies chose to develop on their own, but rather something to be leveraged and built upon. This shift radically reduced the barriers to entry and the price point for CAD software, giving rise to market-changing applications such as SolidWorks, SolidEdge, Mechanical Desktop, Inventor, IronCAD, CADKEY and others, including an entirely new family of CAM and CAE applications.

This evolution of modeling into a foundation technology completely reshaped the market for engineering software. In this environment small start-up companies were suddenly able to compete with heavily established vendors due to solid modeling's new status as a foundation technology. They were able to hire developers who understood the standard API, develop and innovate more quickly and insulate themselves from turnover of developers who harbored singular knowledge of a proprietary system. Today, virtually no company embarking on new product development contemplates the creation of a proprietary solid modeling subsystem.

Graphics as a Foundation Technology

Since 2000 the engineering software market has seen a decided shift toward treating graphics as a foundation technology that should be built upon rather than repeatedly reinvented.

Strong evidence of this trend can be seen among HOOPS customers, who range from small start-ups to large industry leaders. Companies as diverse as Autodesk, SolidWorks, COADE, ITI, EXA, Mitutoyo and several dozen others have discarded their past approach of building proprietary graphics engines in favor of licensing a subsystem for new product development. Over the past 5 years the percentage of ISV's choosing to buy rather than build their graphics subsystem has grown steadily as the benefits of this approach became clear.

The market has recognized that graphics subsystems demonstrate all of the critical attributes of a foundation technology:

- **Necessary to All Applications** -Any application with 2D/3D display capabilities requires a complete, high-performance graphics subsystem to compete effectively.
- **Widely Available** - Component graphics subsystems are now broadly used and available to anyone in the market.
- **Subsystem Meets or Exceeds Market Expectations** - The market has come to expect a high level of graphics performance and a range of functionality. This bar of expectation continues to rise and is largely defined by the capabilities of commercial subsystems such as HOOPS/3dAF. Licensing HOOPS means that these market expectations will always be met or exceeded.
- **"Do-it-Yourself" Provides No Positive Differentiation** - While high-quality, high-performance graphics can certainly differentiate a product relative to those *without* such capabilities, this sort of differentiation has become almost impossible to achieve through developing a proprietary graphics subsystem, particularly with HOOPS/3dAF being so broadly adopted.

BUSINESS BENEFITS OF HOOPS/3DAF

While the specific benefits of HOOPS/3dAF will vary among the many companies licensing this framework, there are certain common business benefits which all HOOPS licensees enjoy, including:

Produce More Compelling Products

HOOPS/3dAF helps developers create more compelling products in two important ways. First, the HOOPS/3dAF libraries provide applications with graphics that are at least as high-performance and visually rich as any product in their market. HOOPS/3dAF encapsulates 150+ man-years of development by dedicated graphics experts. These advanced libraries offer developers an incredibly powerful and complete graphics subsystem, enabling companies to deliver significantly more visually compelling applications than they could develop on their own. Second, focusing precious development bandwidth on their core competency positively impacts product value and ultimately drives sales.

Efficient R&D Investment

Due to their high-level nature, companies leveraging HOOPS libraries deliver powerful graphics with dramatically fewer resources than would be needed to create a proprietary subsystem. This cost savings not only translates into reduced R&D expenses but also allows companies to funnel resources into areas that will help drive sales or to price their offering more competitively. TS3D's experience working with a range of engineering software firms indicates that in most cases their core expertise lies outside the realm of graphics.

Reduced Time-to-Market

HOOPS/3dAF provides companies with an impressive jumpstart to their graphics development that translates into many months, and sometimes years slashed off the initial development time. This benefit continues with each subsequent release as companies can extend the graphical capabilities of their HOOPS-based applications without the need to spend time creating this functionality. This time to market advantage helps companies begin collecting vital revenues and capturing critical market share ahead of competitors.

SUMMARY

The 175+ software teams that have chosen to license HOOPS components have considered these strategic business issues to help inform their build vs. buy decision. As a whole, these companies represent the engineering software industry's shift toward considering graphics subsystems a foundation technology. Given this trend it is becoming increasingly impossible to positively differentiate an application through the development of a proprietary graphics subsystem, driving companies to build upon the HOOPS subsystem rather than continually reinvent it.

We are confident, based on our work with hundreds of large, medium and small engineering software organization that HOOPS components will help you produce more compelling applications, reduce your R&D costs, and get your products to market far faster than would otherwise be possible. Ultimately, all of these factors will result in you competing more effectively.

Contact TS3D today and we will help you evaluate the technical strength of our HOOPS components as well as explore the key business issues associated with your build vs. buy decision.

CONTACT INFORMATION

TS3D Business Development Group

Telephone: 1.510.883.2180

Email: info@techsoft3d.com

Website Address:

<http://www.techsoft3d.com>

Address:

Tech Soft 3D
931 Ashby Ave.

Berkeley, CA 94710-2805