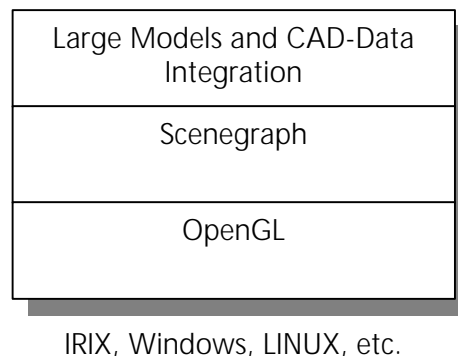




The OpenSG Forum White Paper

The Challenge

Especially with industrially used VR systems, there is a great demand for a rendering kernel system of the following architecture:

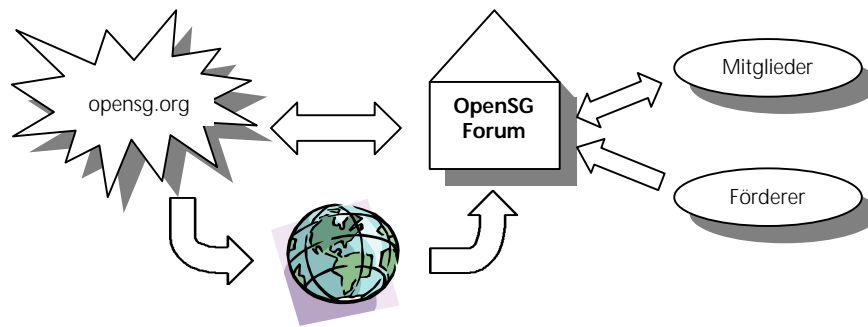


On the lowest level, several operating systems (above all SGI IRIX, Windows systems, and Linux) are supported. Above, there is a scenegraph layer guaranteeing the performance and quality that are necessary for VR applications (including the support of parallel processes and of several graphics sub-systems). The top level, finally, consists of all routines for the handling of complex models and for the integration of CAD data.

The Starting Point

Today, there exist some rendering systems, but they meet the above demands only partially. Moreover, in the past, several systems and extensions have been announced and not realized, or even delivered in prototype state and not advanced any further. Great hopes were placed in the rendering API "Fahrenheit" that was announced by SGI in cooperation with Microsoft. In August 1999, even those contracts were canceled. The current situation is equally depressing and hopeless for VR developers, VR users, and the VR research:

For several years now, most **VR developers** have been prepared to realize a re-design on a new rendering platform, in order to be able to support all the above requirements in their products. The lacking availability was extremely obstructive to the development of VR in general (e.g., missing connections to the industry's CAX environments, etc.). Developments that had already been started proved as bad investments, and a decision for the integration of a new rendering system cannot be made at the moment. Here, in line with the **VR users**, there is the urgent need for a clear line of development which they can influence, in order to avoid the dependence on particular companies. In addition, this clear line must not depend on announcements of single companies, since the confidential basis is no longer given due to the developments during the last years. Besides, a cross-platform rendering



standard is absolutely necessary to allow the integration into a heterogeneous complete environment.

On the part of the **VR research**, the institutes need an open system, in order to be able to contribute with their own research and to develop on existing work. Discussions in the past months have proved, that at numerous research institutes worldwide there is a great number of modules (from graphic card drivers to tessellation and CAD loading routines) that would be made free available for such a rendering system.

OpenSG (Open Source Scenegraph)

The optimum solution for the mentioned problems and the market's requirements is offered by an Open Source rendering API. Open Source means, that the source code of the system is free available worldwide. As a result, anyone can make free use of the system and integrate it into their products. At the same time, anyone worldwide can provide their developments and improvements free for an integration into the system. Open Source lives on the contributions of many developers who like to work on the subject from their own motivation, to see their programs that have been elaborated within diploma or doctor theses integrated into applications, or to get involved to find their names on the credits list of the Open Source program. The best known example for such a development is the operating system LINUX.

The success of an Open Source project depends largely on the technical competence of the first realization and its distribution.

The Fraunhofer IGD has a lot of experience in the area of scenegraph development and owns some developments for different platforms (incl. Windows). On the basis of these developments, a design document for a new system (name of the development: *OpenSG*) is currently produced and revised in cooperation with a small group of international experts in the area (incl. SGI and leading R&D institutions from the USA and Europe). Based on this document, the system is implemented on the basis of existing source code and new developments. The design document will be ready by the end of January 2000, and the first realization is expected for spring 2000. We are prepared to make the OpenSG available as the technological basis for the outlined requirements as an Open Source.

The OpenSG Forum

Besides the technological competence, a controlling authority is necessary for the solid realization of an Open Source project. It is responsible for the discipline of the software production and integration, for the necessary decisions, and the direction of the developments—the 3 "D"s: *discipline*, *decision* and *direction*. Mostly, the authority consists of motivated private persons, and a participation in the decision by third parties as well as a guarantee for future advancements are not necessarily given.

For the realization of the OpenSG, however, we suggest the foundation of an OpenSG Forum as a neutral organizational structure that will be a forum within the ZGDV. The Forum members pursue the common goal of realizing, promoting, and supporting the OpenSG. Beyond that, the Forum does not pursue any private economic goals. The roles of the single partners are described in the following illustration:

The **OpenSG Forum** consists mainly of one employee who has the necessary technological competence to realize the OpenSG. He/she will develop the design concepts, supervise the first implementation, serve as the contact person for the worldwide contributions of source code, and be responsible for the discipline and the decisions regarding the software integration under *opensg.org*. Besides, as the **manager** he/she will be in charge of the business according to the rules, and invite to the plenary assembly twice a year and inform the members in detail.

The **members** contribute to the covering of the Forum's expenses by a membership fee. At the plenary assemblies, they will be informed in detail of the status and the developments of the OpenSG, and they will be integrated in the Forum's flow of information. Moreover, they contribute considerably to the direction, promotion, and support of the Forum and of the OpenSG.

There are plans to acquire more funds, e.g., by **public grants**, for the OpenSG Forum. Here, surplus capital that is not required for the covering of the Forum's expenses, can be used for scholarships, research and development projects, or post-doc programs for the advancement of OpenSG components. The use of the means is subject to the resolution of the plenary assembly.

Keynote

The clear goal of the OpenSG Forum is a concrete and usable realization of the rendering API OpenSG. The OpenSG Forum is no standardization committee. The design decisions are not based on "design-by-committee", but on a lean, technically competent decision structure that is carried by the contributions and suggestions of the members. The OpenSG Forum will only support routines as Open Source if they are relevant to rendering; it will not support a complete VR system or respective modules.

Foundation

The OpenSG-Forum will be founded on January 28, 2000 at the foundation ceremony in Darmstadt, Germany. We are convinced that with the existing technological basis, the appropriate support of the different partners, and the Forum's solid organizational structure there is a chance for the OpenSG as a worldwide standard in the area of rendering APIs.