OpenGL & Khronos Group

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Rationale

There are *so* many subjects you could choose to profile, so why did you choose this one? What drew you into wanting to know more about the organization? How did you/your group decide on and agree?

OpenGL is a widely used library for rendering accelerated graphics. Given its widespread adoption, our group wished to know more about its structure and community.

Organizational Details

1. **Is the subject of your profile a corporate entity?**
   No, Khronos Group is a consortium, which is an assemblage of corporations seeking a common goal.
2. **What type?**
   non-profit, member-funded consortium
3. **When was it founded?**
   Started with the “OpenGL Architecture Review Board” in 1992. The first release of OpenGL was written by Mark Segal and Kurt Akeley
   The Khronos Group was founded in 2000
4. **By whom?**
   3Dlabs, ATI, Discreet, Evans & Sutherland, Intel, NVIDIA, Silicon Graphics (SGI) and Sun Microsystem
   These members formed the “OpenGL Architecture Review Board”, which transferred control to the Khronos group in 2006
5. **Original founder(s) still active?**
   Intel and NVIDIA
6. **Publicly Traded? Since when? Initial Stock Price? Current stock price?**
   Not publically traded. Non-profit consortium that charges membership fees.
7. **Has the company made any acquisitions? If yes, which companies, and what were their core products?**
   No. Their only purpose is to design new versions of the standard.

8. **Has the company made any investments in other companies? If yes, which ones.**

   No. However, the inverse is occasionally true. Some member companies may wish to invest, and exert control within the consortium.

9. **Number of Member companies?**

   The president is Neil Trevett, also the VP of Mobile Content at NVIDIA

   84 Contributors (Participants with voting rights)

   15 Academic Members (Participants with NO voting rights)

   12 Promoters (function as Board of Directors)

10. **Where is HQ?**

    15500 SW JAY ST 45043

    BEAVERTON, OR 97006-6018 USA

11. **Does it have any other offices or locations?**

    Khronos Group Inc, 9450 SW Gemini Drive

    #45043, Beaverton, Oregon 97008-6018, USA

12. **Website?**

    https://www.khronos.org/

    https://www.opengl.org/

13. **Wikipedia?**

    https://en.wikipedia.org/wiki/Khronos_Group

    https://en.wikipedia.org/wiki/OpenGL

14. **Does your organization file any annual reports? Please include links to any relevant documents (i.e. 990, Annual Report, Year in Review, etc...)**

    EIN: 82-0561169

"The federal tax exemption of this organization was automatically revoked for its failure to file a Form 990-series return or notice for three consecutive years" (2014)

IRS Form-990, 2010:
http://990s.foundationcenter.org/990_pdf_archive/820/820561169/820561169_201012_990O.pdf?_ga=1.151157753.1559785236.1425765257

Total Revenue: $1,441,665

Total Expenses: $1,366,213

Communications

1. **Does your subject participate in social media? If yes, please list a URL for each account, and reach within that community. (i.e. Twitter: @RedHatNews - 61.9K Followers.**
   https://www.facebook.com/TheKhronosGroup - 1512 likes
   https://twitter.com/thekhronosgroup - 5579 Tweets, 5333 Followers
   https://www.linkedin.com/groups?gid=121429 - 1245 Members
   https://www.youtube.com/user/khronosgroup - 793 Subscribers, 111 Uploads
   https://www.flickr.com/photos/khronos/ - 1540 Photos
   http://www.slideshare.net/Khronos_Group - 67 SlideShares, 88 Followers
   https://plus.google.com/+khronos/posts - 117 Followers, 8119 Views
2. **What communication channels does your subject use to reach their public? Briefly describe and include a URL for each.**
   Khronos group hosts their own new feeds at https://www.khronos.org/news
   typically makes major announcements at conferences such as SIGGRAPH and GDC
3. **Does your subject organize or participate in any conferences? If so, list them here, and provide links to any relevant sessions, keynotes, or content.**
   https://www.khronos.org/news/events-archives
   Most notably:
   SIGGRAPH https://www.khronos.org/news/events/2015-siggraph
   GDC https://www.khronos.org/news/events/gdc-2015

Community Architecture

Your subject likely runs or contributes to one or more Open Source products or projects. Choose one (or more) of these and answer the following questions:

a. **If applicable, list and provide links to:**
   i. **The project's IRC Channel**
      #opengl
      http://irc.lc/freenode/%23opengl/t4nk@@@
   ii. **Source Code repository**
      OpenGL is not open source, but rather an open specification. As such they do not have an code repository, but updating your drivers will usually get you the most recent release of the graphics implementation.

iii. **Mail list archive**

There is only a Mac-OpenGL mailing list, with the current archive only available to list members.

https://lists.apple.com/mailman/listinfo/mac-opengl

iv. **Documentation**

https://www.opengl.org/registry/doc/glspec45.core.pdf

v. **Other communication channels**

https://www.opengl.org/discussion_boards/ (forums on their site)

comp.graphics.api.opengl (the Usenet newsgroup devoted to OpenGL Programming

vi. **Project Website and/or Blog**

https://www.opengl.org/

b. Describe the software project, its purpose and goals.

"OpenGL is the premier environment for developing portable, interactive 2D and 3D graphics applications" (opengl.org)

“Khronos’ primary products are open specifications and associated conformance tests that enable hardware and software communities to effectively communicate with each other” (https://www.khronos.org/members/ip-framework)

c. Give brief history of the project. When was the Initial Commit? The latest commit?

Again, it does not have a source code repository and as such does not have commits, but Silicon Graphics Inc. (SGI) initiated development on OpenGL and released it January 1992. Before being released in this open standard, it was previously exclusive to SGI and known as IrisGL. Several companies were brought together to form the OpenGL Architecture Review Board that would oversee the OpenGL project. The change was a gradual one due to many functions of the API that wouldn’t work across multiple hardware platforms. To overcome this, OpenGL would support features unsupported by hardware, allowing for high-powered graphics on low-powered systems. Its main competitor was Direct3D, implemented by Microsoft in 1995. Through December 1997 to 1999, an effort to unify the two, the Fahrenheit project, was created, but abandoned due to financial reasons. In 2006, control of OpenGL was transferred from the OpenGL Architecture Review Board to the Khronos Group. The most recent stable release (version 4.5) came out August 11, 2014.

d. Who approves patches? How many people?

The member companies with voting rights. 84 Contributors + 12 Promoters (96 in total).

e. Who has commit access, or has had patches accepted? How many total?

Only members of the Khronos group are allowed to participate in construction of the latest standards. Standards that are in-progress are confidential to prevent patent trolling.

f. Has there been any turnover in the Core Team? (i.e. has the top 20% of contributors stayed the same over time? If not, how has it changed?)

The first version was released by Mark Segal and Kurt Akeley in 1992. Releases and structural changes were then overseen by the OpenGL Architecture Review Board (ARB). In September 2006, the OpenGL ARB became the OpenGL Working Group under the Khronos Group. Many of the developers transferred with the rebranding, however few ties to the original creators, SGI, remain.

g. **Does the project have a BDFL, or Lead Developer? (BDFL == Benevolent Dictator for Life)**

Mark Segal and Kurt Akeley released the first version in 1992. Their names have been the only two author's names on version 2.0, released October 2004, and version 4.5, released February 2nd, 2015.

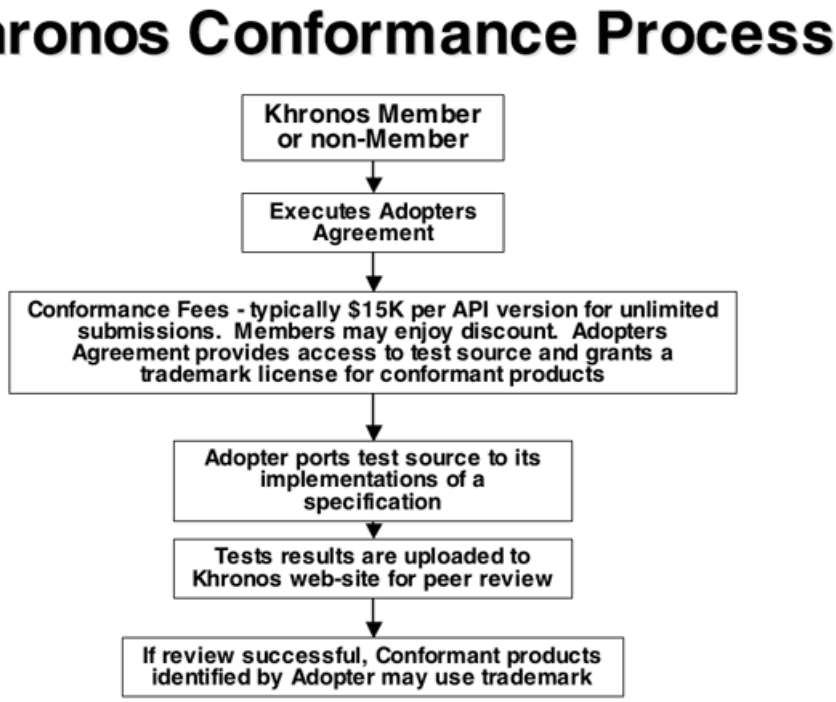
h. **Are the front and back end developers the same people? What is the proportion of each?**

i. N/A

i. **What have been some of the major bugs/problems/issues that have arisen during development? Who is responsible for quality control and bug repair?**

There was a controversy about OpenGL's 3.0 release codenamed "Longs Peak." The uproar was caused by structural changes to the code's classification of objects, rendering them immutable causing much of the software to be re-written. As a result, a much tamer upgrade was released for version 3.0, and several disappointed developers switched to Direct3D development.

Alongside the standard, Khronos Group also creates conformance tests controlling who is allowed to use the OpenGL logo. One must sign up as either an Implementer, or an Adopter: https://www.khronos.org/conformance/



i.

j. **How is the project's participation trending and why?**

It is included on such a wide array of devices that its only major competitor is Mircosoft's DirectX graphics API. OpenGL comes standard in most graphical device drivers, and has NVIDIA as one of its conformant companies

k. **In your opinion, does the project pass "The Raptor Test?" (i.e. Would the project survive if the BDFL, or most active contributor were eaten by a Velociraptor?) Why or why not?**

Yes, because the project is 90% documentation. Since the Khronos Group only designs the standards, the implementations are not affected. All finalized versions of the standard are publically released.

l. **In your opinion, would the project survive if the core team, or most active 20% of contributors, were hit by a bus? Why or why not?**

Yes, see above (k.)

m. **Does the project have an official "on-boarding" process in place? (new contributor guides, quickstarts, communication leads who focus specifically on newbies, etc...)**

Anyone can sign up to become a Member of the Khronos Group
https://www.khronos.org/members/join/
The membership fees range from $1000 - $60,000
Membership fees for Open Source organizations are often waived
People implementing the standard can sign up at:
https://www.khronos.org/conformance/implementers/
Membership in projects that implement the standard varies by project.

n. **Does the project have Documentation available? Is it extensive? Does it include code examples?**

The core specification: https://www.opengl.org/documentation/current_version/
Header files: https://www.opengl.org/registry/
SDK resources: https://www.opengl.org/sdk/

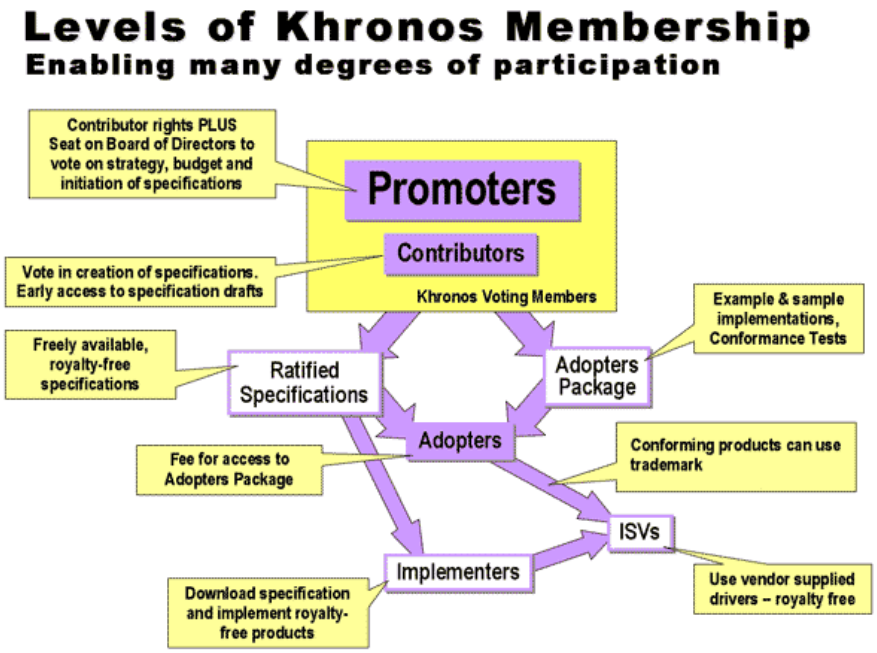
o. **If you were going to contribute to this project, but ran into trouble or hit blockers, who would you contact, and how?**

There is a reference card with a multitude of information available for developers, viewable that the following link
http://www.slideshare.net/Khronos_Group/opengl-45-reference-card

p. **Based on these answers, how would you describe the decision making structure/process of this group? Is it hierarchical, consensus building, ruled by a small group, barely contained chaos, or ruled by a single or pair of individuals?**

It is largely flat, with the exception of the 12 Promoters (functioning as the board of directors, steering the consortium).
https://www.khronos.org/assets/uploads/members/levels_of_membership.gif

i.



q. Is this the kind of structure you would enjoy working in? Why, or why not?

As an implementer with a preference toward open-source I would enjoy working for this project. The structure detailed above does not take away from the programming experience. On the contrary, it resembles a balanced governance of the project overall: group of voting members is essential to any project that reflects multiple system functionality; adopters trademarking and publishing what works to demonstrate the new features of the project; ratified specifications get sent to a group of implementers; ISVs then receive this all and use vendor supplied drivers to release the specification royalty free. The only criticism I would have of the structure is that the implementers don't seem to have much say about what gets voted on, but rather just do the developing.

Technology & Product

1. **Who invented, created, or sponsored the technology?**

   OpenGL is one of the Khronos Group's working groups, and its specification is maintained by the OpenGL Architecture Review Board.

2. **What was the technology designed to do? How was it used?**

   It was designed to be an environment for the development of interactive and portable 2D and 3D graphical software.

3. **Who would benefit from using this technology?**

   Any software developer who requires high-performance graphics for their project, be it a game, virtual reality, mobile phone app or supercomputer.

4. **What kinds of companies or organizations (stakeholders) might have been concerned about the development of this technology? Why?**

Khronos Group and their subsidiaries would because they are the current sponsors and collaborators of the OpenGL working group. AMD has offered their Mantle API to use as the basis of the next generation of OpenGL. Valve Corporation, Electronic Arts, Epic Games, and Unity Technologies participated in a GDC conference session for the unveiling of Vulkan, the next generation of OpenGL APIs.

5. **Did an aspect of copyright law play a role in controversies about the technology? How?**

   No, the licensing and/or copyrights of the OpenGL project have not been the cause of any large controversies.

Legal Technicalities

Being a consortium, the copyright agreement between the members is key.

“all Khronos members reciprocally agree not to assert IP rights for technology in a Khronos specification against any other Khronos member that is implementing that specification.” (Khronos IP Framework)

While this technically only applies to Member companies, if a non-member is complying with these terms (not filing lawsuits over the standard), then they are welcome to implement the standard, royalty free. If a non-member wishes this agreement to be in writing, they will need to register with Khronos group as a member.

“all members with patents that are essential to a ratified Khronos specification reciprocally license that patent royalty-free” (Khronos IP Framework)

Member companies can opt to exclude certain patents from being reciprocally licensed, by filing an “IP Disclosure Certificate.” In practice, the reciprocal license is narrow enough that companies rarely need to exclude patents from the license.

New standards in development are kept confidential, in order to protect from patent trolls.

The OpenGL trademark can only be used if the implementation has passed the conformance tests given by Khronos Group.

Checkout the entire legal agreement here:
https://www.khronos.org/files/member_agreement.pdf
Or, a summary here: https://www.khronos.org/members/ip-framework

Sources

www.opengl.org
www.khronos.org
https://en.wikipedia.org/wiki/OpenGL
https://en.wikipedia.org/wiki/Khronos_Group
https://en.wikipedia.org/wiki/Vulkan_%28API%29
http://foundationcenter.org/