Opportunity Analysis Project

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N.O.V8

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The Problem

"Algorithms, computers cannot keep up with the pace of an artist's speed of output." [1]

Rendering is the process of generating a realistic image from a model, often a simple wireframe described through a computer program.

In the animation industry, rendering one frame from a movie such as *Toy Story* takes 2-3 hours on a computer with a processor speed of 1 Giga Hertz hour (GHz). The movie runs at 24 frames per second for a total length of 90 minutes. This totals 324,000 hours in rendering, which is a costly process. For example, rendering the movie *Shrek*, cost DreamWorks Animation an estimated $9.8 million for 20 million GHz hours. Most large movie studios like DreamWorks purchase large clusters of 100-200 high performance computers to fulfill their high rendering needs.

Small animation studios face an even greater challenge. They face the same lengthy render times but are unable to afford the solution of maintaining their own in-house cluster of computers due to the prohibitive capital costs, ranging from $4,000 to $20,000 per computer. Moreover, small studios only require substantial computing during short periods, which results in wasted computing capacity during idle time.

As a result, most small animation firms limit the size of their computing jobs, while maintaining only a few expensive, high-end computers and creating long lead times. Larger jobs are either rendered overnight or outsourced to commercial render farms that charge high fees.

Customer

With the aforementioned current solutions, a typical animator spends a disproportionate portion of his time rendering and re-rendering instead of animating. Sixteen animators with whom we spoke agreed on the following day in the life of our archetypal user:

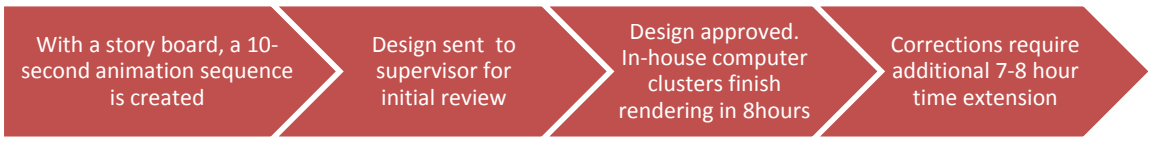


Fig 1: The day in a life of an animator today

This typical scenario shows animators' need for an affordable, timesaving, flexible, and easy-to-use alternative to the current solutions in the market.

[1] Dust effects animator, DreamWorks Animation, 10/28/08 interview. Name withheld.

Our Solution

To satisfy the needs of small animation firms, OGC will leverage grid computing technology to create the most affordable rendering solution in the market. Challenging the traditional notions of ownership, access, and usage, OGC will buy excess computing power from institutional suppliers to create a powerful cluster capable of performing high-capacity computing. This model delivers our company's disruptive low-cost structure. Animation studios can access this power through a simple software plug-in.

Small animation firms can achieve a 90% and 50% cost reduction compared to in-house clusters and commercial rendering farms, respectively, while achieving a 2X improvement in rendering efficiency. Institutional suppliers such as SETI and small and medium enterprises (SMEs) will provide OGC with a competitive cost structure.

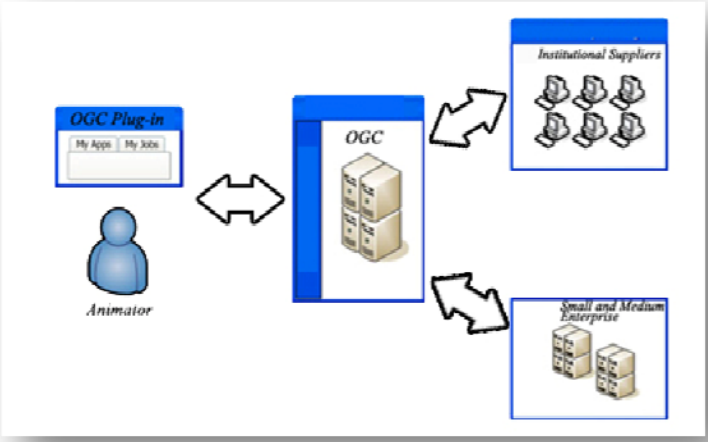
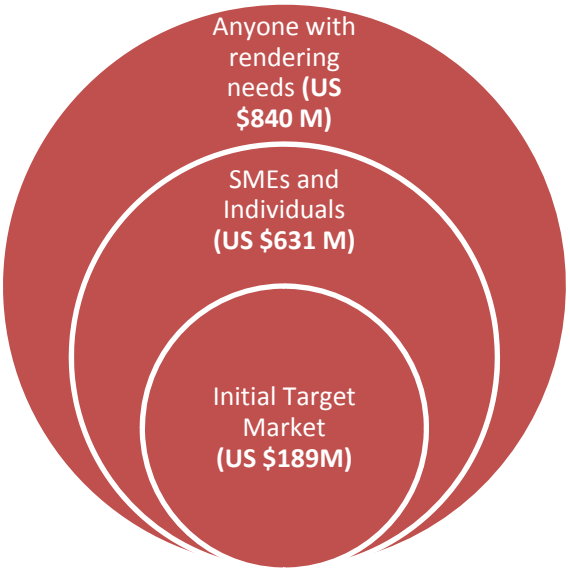


Fig 2: Overall graphical representation of OGC

With our solution the animators will save time and attain flexibility to respond to changing design requirements.

Competitors and Market Landscape

The global animation market is valued at $51.7 billion in 2005, with CAGR of 8% from 2000 to 2005. In the US, there are 1286 animation firms. As industry growth continues, driven primarily by the entry of new, small animation studios, the market for cost-effective rendering solutions will likewise expand.



Assumptions:
Yearly earnings per company approximated to be $72000 as per earlier calculations.

Market Size = No. of targeted companies X Average earnings from each company.

Source for number and type of company:
Animation World Network's Animation Industry Database

Fig 3: Market Size

The current leaders in the grid industry are IBM, Oracle, and Sun Microsystems. Unlike OGC, these firms are more focused on consulting services and customized solutions for large enterprises than selling raw computing power to small animation firms. OGC does not view these leaders as threats and instead sees them as advancing the adoption of grid technology.

OGC's direct competitors harness distributed computing resources in the form of online render farms. These render farms provide the most cost-competitive solution for small animation studios to handle time-consuming rendering. For example, a commercial online render farm such as RebusPower provides 2500 GHz of total render power on-demand and charges 18 cents/hour above a $50 flat fee.

As an alternative to render farms, small animation firms can build in-house computer clusters, typically composed of 20 computers. In-house solutions are often preferred for their greater control and security. However, high upfront capital investments make in-house solutions unaffordable for most. A small firm with a network of 20 computers would result in $82,000 of capital and operating expenses each year.

Average amount spent on rendering per year (in-house) = cost of 20 computers (depreciation included) + Personnel cost = 4000*20 + 2000 = **$82000 per year** ***Amount spent using our solution*** = Number of days rendered X Number of Hours X Cost of rendering per hour X Efficiency = 100 days X 7 Hours a day X $0.24 X 4 = **$8064** ***Total Savings*** = $73936 = **90% Savings**	**Assumptions:** 20 in-house computers per small animation firm (from surveys and interviews). Total amount of rendering hours approximated to be 7 hours (through surveys). 100 days spent rendering throughout the year (from surveys).

Fig 4: Approximation of Savings for Customers

The efficacy of an in-house solution is thus severely limited by budget considerations and the same applies for commercial render farms which maintain their own computing power. By purchasing excess computing power from institutional grids, OGC avoids the high capital expenditures, service, and maintenance costs faced by commercial renderers. In addition, by employing grid computing technology, OGC has the potential to achieve the largest network of computers and GHz power available because of its freedom from capital intensive budget constraints.

Growth Strategy

In the short term, OGC will forge software-bundling partnerships with major animation software firms to bolster OGC's brand and access to customers. OGC rendering plug-ins will be bundled with design software such as 3dsMax, Maya and SolidWorks. These partnerships will help OGC minimize its marketing costs and establish trust and familiarity with customers. On the supply side, OGC seeks to rapidly scale its computing network by focusing on leasing arrangements with institutional suppliers of computing power. Supplier partners will benefit from OGC's ability to monetize their excess computing power.

When OGC reaches sufficient scale, it will expand software-bundling partnerships to other animation software firms. OGC will continue to expand its computing power supply to include small and medium enterprises (SMEs). Interviews with six potential suppliers revealed that most SMEs are interested in increasing the ROI of their computing infrastructure, making SMEs a promising supplier base for OGC's future growth.[2]

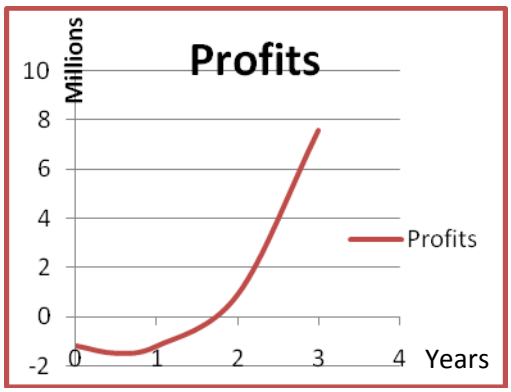


Figure 5: Profit Projections

[2] For example, a representative of the IT department of Satmetrix Systems indicated that his company "would be very interested in contributing to the computing power supply."

Once OGC saturates the market for animation rendering, it will expand into other rendering market segments such as engineering design, medical imaging and architectural modeling,

Selling Pricing Structure	Assumptions:
$0.30/GHzhr for low usage	Pricing was determined to give OGC a competitive edge and is 50% lower than existing rendering solutions.
$0.28/GHzhr for moderate usage	
$0.26/GHzhr for high usage	
$0.24/GHzhr for very high usage	

Buying Price	
$0.12/GHzhr	Buying price was determined from feedback gathered from supplier interviews to make it attractive for both suppliers and OGC.

Projections of Yearly Earnings
Average revenue from one animation studio per year = $8064 (Previous approximation of amount spent/yr given current level of rendering) X 4 (increase in rendering iterations performed with our solution) = $19353

No. of animation studios using our OGC service	
Year 1 = 20	We expect initial figures to be low due to the new technology, its perceived security risk and the change in mindset necessary for its adoption. Sales would increase in year 2 and year 3 as a result of increased marketing and the added acceptance of Grid computing in the animation industry.
Year 2 = 200	
Year 3 = 700	

Fig 6: Pricing and Earnings Projections

Year	Manpower/ Technology Cost	Marketing/ Sales cost	Total Cost	Total Revenue	Profit	Assumptions
0	$200	$1000	1200	0	$-1200	Marketing/Sales cost increases over the years due to efforts to expand OGC's customer base. Manpower/Technology cost increases over the years due to the need to support more software to focus on our Servable Addressable Market (SAM).
1	$600	$1000	1600	$387	$-1600	
2	$1000	$2000	3000	$3870	$870	
3	$2000	$400	$6000	$13547	$7547	

Fig 7: Yearly Profit Projections (in thousands)

Risk Assessment

OGC had originally assessed competitors such as IBM, Sun, Oracle, Amazon and others that supplied SMEs with computing resources. SMEs in financial modeling, scientific research, mathematical modeling, computer animation, video gaming, and other users of intensive computing were OGC's original industry targets. After interviews with SMEs in these industries, OGC narrowed the market scope to animation production firms. Because small animation firms drive the majority of the animation market's growth, OGC narrowed its focus to this robust niche market in animation rendering.

Our original supplier focus included individual users and enterprises with excess computing power. While looking at a potential partnership with Apple to help build our supplier base, we discovered that building the supplier base ourselves and paying each individual supplier directly would be very costly.[3] For this reason, we focused on partnerships with large suppliers of computing power such as institutional grids.

[3] Anthony Fok, a campaign manager for iTunes

Risk	Mitigation Strategy
Fragmented and geographically dispersed market	Partner with 3D animation software
Perceived high security risk associated with grid computing	Spend resources on Customer Education and awareness
Bandwidth limitations	Implement patented compression algorithm
Inability to ensure enough supply for required 'bursty' processing power needs	Expand supplier pool through SMEs and manage customer acquisition carefully to avoid exceeding available supply

Fig 8: Risks and Mitigation Strategies

On the customer side, the fragmented and geographically dispersed nature of small and medium businesses posed a challenging problem. We examined our initial target market of customers that could be reached through our software-bundle sales channels. This sales channel was the most cost-effective for reaching SMEs, however, the target market and margins were small. These margins could not mitigate enough of the risks and did not show promising signs for long-term growth in the market of small and medium animation firms.

In addition, most of the potential customers interviewed thought that grid-based rendering would subject their work to unacceptable security risks. There was a consensual, perceived security concern. "Animators really see each frame as intellectual property that they want to protect."[4] In particular, reputation was a huge deciding factor for a CTO in choosing a rendering solution.[5] A current NVIDIA marketeer who sells hardware to animation firms, agreed and offered a solution. He advised, "If you can leverage a brand name on the supply side, then your customers would be much more open to your product."

Improvements in grid technology would help OGC overcome customers' security concerns. However, there remains a small technology risk. Bandwidth limitations could interfere with our distribution of computing power and spur a loss of customers. "Companies do not want to compromise too much of our bandwidth due to transferring huge amounts of rendering data in and out of our computers."[6] Large

[4] Stanford Professor Vladlen Koltun, a graphics expert who directs the Virtual World's group

[5] Alex Lindsay, Chief Architect of DVGarage

[6] IT Administrator of a leading technology startup

investments in our compression algorithm and grid technology would be necessary to minimize technology risk.

Next, if we underestimated the peak demand on computing power or are unable to build a sufficiently large supplier base, OGC would lose customers. Renderers must be ready to serve customers' unexpected "bursty needs."[7] The risk is even greater when considering possible failures in supplier partnerships with institutional providers. Assessing these market risks caused us to stop and reassess our mitigation strategy for our opportunity in the market for small animation studios.

The low cost structure from our supply sources was the disruptive feature of our company. Rendering is time-consuming and expensive. OGC possessed a huge opportunity to meet the complaints heard from potential customers. However, there was a risk to this financial opportunity because our cash flow would be highly variable. We would have to buy compute resources first, without knowing our full customer demand. Should any of our partnerships with NGO suppliers fail, our costs to solicit computing power from small and medium enterprises would be much more expensive. (Building a user base of individuals would be even more prohibitively expensive).

Due to the overwhelming market risk, we concluded with our mentors Tom Fountain and Lilia Shirman that our margins were too slim and our initial market was too small to take on all of these risks. In order to make this opportunity more attractive, we would have to wait for a large player to fully legitimize grid computing and allay customer fears. We would also have to pursue architectural design firms, video game design firms, and engineering design firms, once these industries of the late majority no longer hold the customer perception of prohibitive security problems. OGC should especially focus on expansion into other verticals such as "medical imaging, Google Earth-type imaging services, and others."[8] OGC's original focus on differing industry verticals (financial services, biotech firms, research institutes, etc.) will continue to be dominated by the largest players, and thus can only play into a long-term strategy.

[7] Kayvon Fatahalian, former employee at Pixar Renderman

[8] Spanta Ashjaee, president of Valley Digital Technologies, which brings high performance computing to small and medium enterprises