

California State University, Long Beach
1250 Bellflower Blvd.
Long Beach, CA 90840
November 27th, 2007

Dr. Karen L. Gould
Office of the Provost
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Long Beach, CA 90840

Dear Dr. Gould:

Enclosed is our technical writing project regarding the site licensing options for the program *Mathematica*. The project is a feasibility report that compares three different site license options for the program *Mathematica*. It was suggested that a feasibility report be made by Dr. Andreas Bill, a professor in the physics department.

In our feasibility report we researched our current method for purchasing site licenses for *Mathematica*. We also explored the possibility of purchasing a site license for the entire university using two different methods. In the first method, we consider purchasing a site license to *Mathematica* for the entire student body with two other universities. In the second, we consider purchasing the site license to *Mathematica* for the student body without involving other universities. While working on this report, we discovered that the demand for a new site license was not high enough to consider a *Mathematica* site license for the entire student body. We discovered that the university does not have a current need for the additional expense of a site license to *Mathematica* for the entire student body.

In writing this feasibility report, we received assistance and input from the computer science department, math department, engineering department, chemistry department, and physics department as well as from students and from a representative at *Mathematica's* parent company, Wolfram.

Our report presents alternative purchasing methods that can be considered in the future. We believe that this report will reinforce the current method of purchasing site licenses to *Mathematica*.

Thank you very much for your consideration.

Sincerely,

Hannie, Eric, Kevin, and Erin
Enclosure: Technical Writing Project

A Study of Mathematica License Options

To: Dr. Karen Gould
November 27th, 2007

By:
Hannie
Erin
Kevin
Eric

Executive Summary

It was brought to our attention by Dr. Bill of the Physics department that the university's computer labs in the Math, Physics, and Engineering departments are quite out of date. Two programs are being used in the labs as of now. *Mathematica* and *Maple 10* are both programs that enable the user to complete and correct complex mathematical equations quickly and efficiently. They are useful in helping students solve difficult problems and enable students to visualize the results with graphs and charts. Professors can use the software to assist them with their research. While both of these programs are being utilized by the university, the *Mathematica* program that is installed is quite antiquated. Not only is access to this program limited due to the fact that each computer in use must obtain a separate license, but the licenses that are being used are outdated by more than 4 years. To obtain reliable information in order to compile viable alternatives, we utilized the following resources: faculty and students at CSULB, *Mathematica's* website, and the customer service department at *Mathematica's* parent company, Wolfram. We feel that there are at least three alternatives that will benefit the student population and the faculty as well. These alternatives include:

1. Upgrading the current licenses on the individual computers. This would be at a reduced cost of approximately \$1000 per license, but does not include technical support and additional upgrades as new versions are released.
2. Coordinating with the two other Cal State schools that are not involved in the state-wide license agreement in order to receive a reduced cost school wide license. The cost of this alternative would be approximately \$4600 per year. This is a fee that would allow all computers within the university to access the *Mathematica* program as well as allow faculty to access the program from personal, home computers. Technical support and upgrade options are also included in this package.
3. Obtaining an individual site license that would allow access for all computers on the university's property. This option would be more expensive than the collaborative cost mentioned in option two. The cost is dependent on the student population that would be utilizing the program and varies each year. The estimate given by a Wolfram sales representative was approximately \$9600 per year.

All of these options would be viable if the population utilizing the program was significant. However, at CSU Long Beach, the percentage of students who use this program is not large enough to justify such large spending. If the engineering, math, and physics departments were to grow in the next few years, then upgrades would definitely be worth the cost. If the other two universities could be convinced to purchase the licenses with us, then the cost would be reduced enough to be able to justify such a purchase. At this time, purchasing upgrade licenses for *Mathematica* simply will not affect a large enough population of the university to warrant such a large price tag. The status quo should be maintained.

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Introduction

In the past few months, it has come to the attention of the math, physics, and engineering departments of California State University, Long Beach, that the university may be behind in technology which may aid both students and faculty. A program called *Mathematica* is an advanced tool that allows the user to input mathematical problems and receive an answer. This program is useful to faculty as it allows for efficient teaching preparation. Students may also use this program to check work efficiently and to aid in study. *Mathematica* is also extremely useful in the field of research as the program can solve tedious problems and check work that has been completed quickly to ensure accuracy.

The Current Situation

Currently According to Dr. Zvonimir Hlousek, the Physics Department currently has a computer lab with 10 computers running Mac OSX. These computers have MAPLE 10 already installed as well as *Mathematica* 4.0. The version of MAPLE is up to date, but the *Mathematica* version is several years old and runs on Mac OS 9. The current version of *Mathematica* is 6 and runs on Mac OSX. The computers have a FORTRAN compiler and text editor installed. Students can write their own programs to solve some *Mathematical* problems using the FORTRAN language and run the code on these machines. However, this is very time consuming and is not employed very often.

The Math Department also has a computer lab with 28 computers in it running Microsoft Windows XP. These computers also have MAPLE on them, but they do not have any version of *Mathematica* running. The computers also have a Microsoft Visual Studio installed, which can compile and run C++ code. The C++ compiler allows students to write programs on their own similar to the FORTRAN programs discussed above. Once again, writing a program to solve a specific problem is very time consuming and not practical.

New Possibilities

It is possible to obtain a university wide license that will allow access to all students and faculty regardless of the campus computer that is being used. The system would be much like the library uses in that a username and password is all that would be required to gain access to the pre-paid program.

Other options that may be utilized are as follows: to collaborate with other universities in order to obtain a discount, purchase individual licenses for computers in the laboratories, and to purchase a university wide license individually. Each option has its own set of parameters and set of costs. We will go into more detail regarding each option in our “Overview of *Mathematica* Licensing Options” section below.

Through direct contact with university faculty, students, and *Mathematica*'s parent company, Wolfram, we determined that purchasing a site license for *Mathematica* is not the most cost efficient and effective option for the university.

Criteria

The options will be compared using several criteria that can quantitatively show which course of action is more desirable to the college. The option that ranks highest according to the set of criteria is the one that will be suggested and implemented.

Each course of action will be evaluated based on the following criteria:

- Benefit for the faculty and staff of CSU Long Beach
- Benefit for the students of CSU Long Beach
- Cost
- Ease of implementation

The main criterion is cost. This factor will be the most influential when presenting any changes to the university. It is imperative that any purchases do not drain the department budget or the university budget. Each purchasing option is accompanied by a separate pricing option. These options will directly affect whether an option is considered viable.

The second point that will be evaluated will be benefits for first the students and then the faculty. If a course of action is to be taken, it should directly encourage learning. Both students and faculty should be able to utilize the program to aid in course work and research.

Implantation is the last category to be considered. Several steps may be required to successfully bring the programs up to date. The licenses must be purchased and installed. Then, training will be required for students and faculty as the updated software will most likely include different or new programming options.

Each set of criteria will be considered before making a final recommendation.

Methods of Researching Mathematica Licensing

Our group conducted a series of personal interviews in order to determine whether or not it would be beneficial overall to change the licensing option for the program *Mathematica* at California State University, Long Beach. We also contacted Wolfram Research, the company that sells *Mathematica*, to discuss pricing options. In addition, we performed some Internet research.

Conducting Department Interviews

Over the course of the first two weeks of the project, we conducted interviews of the professors and department chairs in the physics, computer science, chemistry, and math departments. We inquired about their current usage of the program *Mathematica*. If the departments did not currently use *Mathematica* or used it infrequently we asked if they would choose to do so if the department did not have to pay for the *Mathematica* licenses.

Contacting Wolfram Research

We contacted Wolfram Research on November 20, 2007. We contacted them by phone and talked to a company representative named Ginger. We talked to her about the pricing options for purchasing three different types of licenses. We talked about the pricing for the current situation with each department purchasing their own license, the pricing of a site license that included the entire university, and the pricing for California State University, Long Beach if the license included three universities. We used this information to compare these three options financially.

Internet Research

We have been conducting Internet research throughout the project. We began by exploring the *Mathematica* website. We obtained general information on the program and its uses. We also learned more about some of the pricing options. For additional statistics needed for our project, we used Internet research to determine the percentage of students enrolled at California State University Long Beach that are engineering, mathematics, chemistry, physics, and computer science majors.

Overview of Mathematica Licensing Options

University License Purchased with Other Schools

The second option is to purchase a university license for the *Mathematica* software along with three other universities. We contacted Wolfram research, the makers of *Mathematica*, by phone and talked to Ginger who is the sales representative at Wolfram that handles the California State University System's account. Ginger explained that only three out of the twenty-three universities in the Cal State system do not have a university license for *Mathematica*. The three universities are San Jose State, CSU San Bernardino, and CSU Long Beach. If the three schools purchased a share of the Cal State System's *Mathematica* license at the same time, all three schools would receive nearly a fifty percent discount off the price of the software. The cost would be approximately \$4600 per year. This would allow the college to install the software on every computer on campus and allow faculty to install the software on their own computers at home. Normally, faculty pays \$1000 per computer to purchase copies of *Mathematica*. Also included in the \$4600 yearly price is free technical support and free upgrades whenever a new version of the software is released.

University License Purchased Alone

The third option is to purchase a university license for the *Mathematica* software just for CSULB. If it turns out to be too difficult to organize with the other two universities to purchase the software, CSULB can still buy a university license on its own. According to Ginger, Wolfram charges universities based on the number of science and engineering students that attend the college. The more students that take these courses, the more Wolfram charges for the license. Based on current student enrollment, Ginger gave an estimate cost of \$9600 per year for CSULB to buy the software. This price includes the same features and benefits as mentioned in the previous paragraph, but at an increased price.

Separate Licenses

The last option is to purchase the software for each individual computer that the program is installed on. Educational licenses for the *Mathematica* software sell for \$1100 on Wolfram's website. It is possible to purchase enough licenses for the Math Department and Physics Department. Between the two computer labs, there are 38 computers. Depending on the school's budget, the software can be purchased and installed on some or all of these computers. The cost would be approximately \$42000 to install the software on all of the computers. This would be a one-time cost rather than a yearly payment, but it would not include technical support or upgrades

Evaluation of Options

This section contains the analysis of the facts that we have collected regarding the usage of *Mathematica* and the consequences of the various licensing options. First, we eliminate the option of purchasing a license with other universities as it is unlikely to be feasible. Then we consider how each remaining option stands up to our criteria: price, benefit to students, benefit to faculty, and ease of implementation.

Combined License Feasibility

We judge that the option of purchasing a university license in conjunction with two other universities is infeasible. The other two universities, specifically San Jose State and CSU San Bernardino, are neither large enough nor sufficiently research-oriented to justify purchasing such an expensive software license. If CSULB purchases a *Mathematica* license, it will almost certainly do so alone.

Cost to the University

Purchasing a university license would cost about \$9600 per year. Actual cost would be based on Wolfram's analysis of the number of students who would be likely to use *Mathematica*. According to Ginger, our Wolfram representative, Wolfram currently estimates the cost to be \$9600 per year.

Purchasing separate licenses for each computer would be a more flexible option in terms of cost. *Mathematica* could be installed or upgraded on individual computers as budget permits. For the purposes of comparison, it is safe to assume a cost of approximately \$125 per year per *Mathematica* installation. This is based on the observation that new versions of *Mathematica* are released about once every four years. Upgrading from one version to the next costs approximately \$500, for an average cost of \$125 per year. Some professors might choose not to upgrade every version, but instead upgrade every two versions. In this case, the upgrade would cost about \$1000 every eight years, which still averages to \$125 per year. This figure allows us to estimate the cost of maintaining a given number of *Mathematica* installations.

Based on our estimates of current *Mathematica* usage, the cost of individual licenses is roughly \$3750 per year. In the course of our interviews, we attempted to obtain the exact number of *Mathematica* installations currently on campus. In the physics department, we found 10 licenses in a computer lab in addition to 5 professors who have licenses for their own computers. In the math department, we found 2 professors with their own licenses. In the computer science department we also found 2 professors with licenses. Other departments were not using *Mathematica*. Since we did not interview every professor in each department, it is likely that we missed several installations. Based on the depth of our interviews, and the fact that we found 19 licenses, we estimate that the campus has approximately 30 licenses. At \$125 per license per year, the cost of keeping these installations up to date would be about \$3750 per year on average. However, this cost is flexible and can vary based on demand and department budget.

A Study of Mathematica License Options

As figure 1 shows, the estimated average cost per year of individual licenses is significantly lower than the yearly cost of a site license.

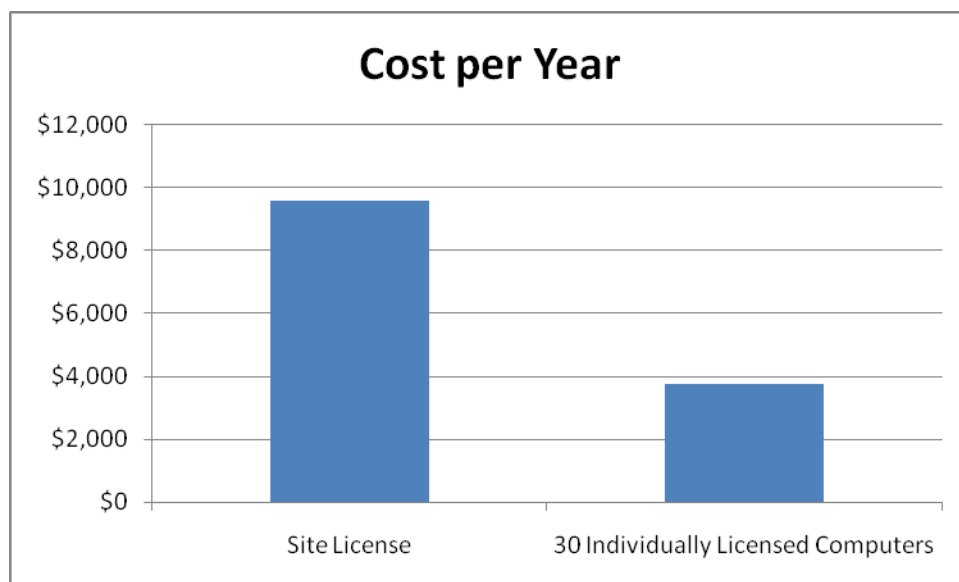


Figure 1: Cost per Year

Benefits for Students

A university site license would allow *Mathematica* to be installed on any computer on campus, which would allow many computer labs around campus to have *Mathematica*. This, in turn, would allow several courses to use *Mathematica* as part of the curriculum. Graduate students in particular would likely benefit from using *Mathematica*'s advanced features in their projects. A university site license would definitely benefit the students who would use *Mathematica*.

Purchasing separate licenses would provide fewer benefits for interested students. Purchasing licenses for a computer lab is expensive, so most labs will not install *Mathematica*, and labs with *Mathematica* will be updated infrequently. However, out of the entire student body, only a small fraction will be affected. We estimate that the majority of *Mathematica* users are physics, math, or computer science majors. According to spring 2006 enrollment statistics, these majors constitute an extremely small portion of the university, as illustrated in figure 2 below.

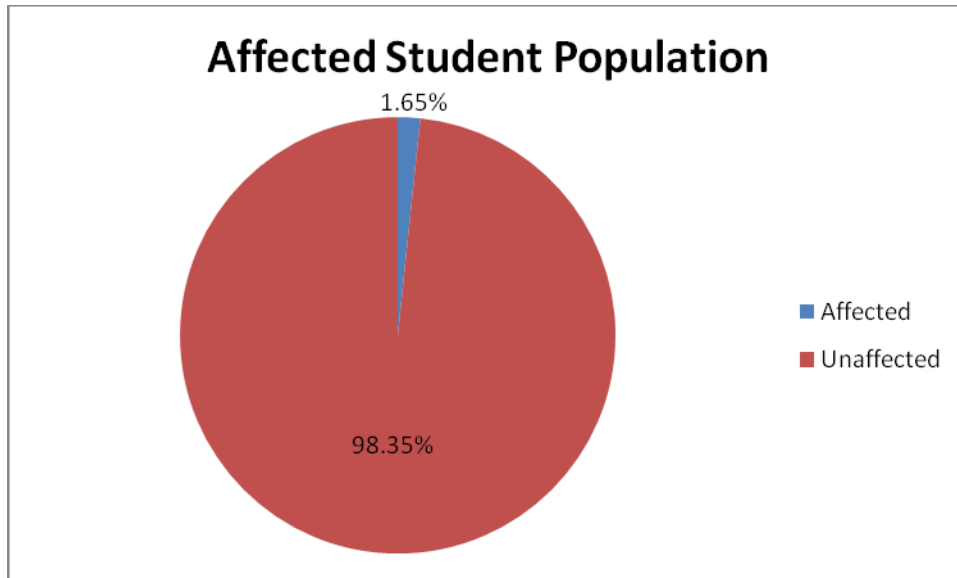


Figure 2: Affected Student Population

Benefits for Faculty

A university site license would facilitate research in technical fields by making a powerful tool easily available. It would allow professors to use *Mathematica* from home and on campus at no extra charge. It would allow professors to delegate *Mathematica*-based research work to graduate students, who would be free to use the software. It would allow all interested professors, even the ones without a large budget, to have access to *Mathematica*. A site license would definitely provide a better research environment for faculty.

Purchasing individual licenses would not be beneficial to professors interested in using *Mathematica*. Individual licenses are fairer to other professors, since the only people who pay for licenses are the ones who use them. However, the cost of *Mathematica* licenses is quite small compared to the university's budget, so other professors would not be noticeably impacted by a site license. The main effect of individual licenses on faculty is a negative one.

Ease of Implementation

Subscribing to a site license would require some effort to implement. Wolfram has made it clear that they will do their best to make the process easy for CSULB, but the university administration would need to approve the funds necessary for the license.

Purchasing individual licenses would require no action on the part of the university administration. Departments and professors are already purchasing their own licenses, so this solution requires no additional effort to implement.

Conclusions

- CSULB does not offer the same resources to its science and engineering students that are available in most other universities in the Cal State System.
 - CSULB is one of only three universities in the Cal State System that does not have *Mathematica* software available to students.
- CSULB's enrollment of science and engineering students is small in comparison to the student body as a whole.
 - The small enrollment means that only a fraction of the student population would benefit from the purchase of *Mathematica*.
 - The small population also means that the software would be sold for a lower price.
- Currently, the demand for *Mathematica* is low.
 - The Math and Physics Departments have a similar program called Maple that can perform similar tasks as *Mathematica*.
 - Most teachers do not incorporate computer programs into their lectures.
 - The low demand may be due to the lack of supply. If students had easy access to *Mathematica*, more might use it.

Recommended Course of Action

After considering all of the *Mathematica* site license alternatives, it is recommended that California State University, Long Beach keep their existing system for purchasing *Mathematica* licenses. No specific action is required of the university. *Mathematica* licenses affect less than two percent of the students attending CSULB. With such a small demand for the program, it would not be in the university's best interests to budget a site license agreement for the entire student body. This remains the case regardless of how many other universities have also decide to purchase site licenses to *Mathematica* for their student bodies. With the current purchasing system, individual faculty purchase their own licenses to use *Mathematica* and the rest of the university does not have to budget for a program that they do not use.

The existing system of purchasing a site license to *Mathematica* is currently the recommended course of action given the current demand. However, it is important to be aware that it would be possible for the university to acquire a *Mathematica* site license for the entire student body. In the future, the demand for the program *Mathematica* may increase to the point that acquiring a site license for the student body would be practically and financially beneficial for the university. Should the university choose to purchase a site license in the future, a Wolfram sales representative can be reached by calling 1-800-WOLFRAM.

With the current demand, if budget allowed, a site license to *Mathematica* for the student body would be a useful addition to the university. However, the pricing advantages of the current system outweigh the merits of having a site license to *Mathematica* for the entire student body. It is recommended that the individual faculty continue purchasing their own licenses to use *Mathematica*.

Sources

Bill, Andreas. Personal interview. 13 Nov. 2007.

Ebert, Todd. Personal interview. 7 Nov. 2007.

Enrollment and Registration. March 2007. California State University, Long Beach. November 2007. <http://daf.csulb.edu/offices/univ_svcs/institutionalresearch/students/enrollment_registration.html>.

Ginger. Wolfram Research. Telephone interview. 19 Nov. 2007.

Hlousek, Zvonimir. Personal interview. 19 Nov. 2007.

Mena, Robert. Personal interview. 15 Nov. 2007.

Sorin, Eric J. Personal interview. 11 Nov. 2007.

Wolfram Mathematica. Wolfram Research, Inc. November 2007. <<http://www.wolfram.com/products/mathematica/index.html>>.