Survey of CASC Members on the Role of Industrial Partnership Programs in High Performance Computing Center Sustainability

The Pervasive Technology Institute at Indiana University has engaged a team of graduate students to conduct a survey of Coalition for Academic Scientific Computation members to ascertain the status of their industrial partnership programs and determine what general features are consistent across members.
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Introduction
The Coalition for Academic Scientific Computation (CASC) contains approximately 60 member institutions, which range from small research universities to large national laboratories. According to the CASC website (www.casc.org): “Founded in 1989, the Coalition for Academic Scientific Computation (CASC) is an educational nonprofit 501(c)(3) organization with 62 member institutions representing many of the nation’s most forward thinking universities and computing centers. CASC is dedicated to advocating the use of the most advanced computing technology to accelerate scientific discovery for national competitiveness, global security, and economic success, as well as develop a diverse and well-prepared 21st century workforce.”

Indiana University Bloomington, a large research institution, is a CASC member. IU’s involvement in CASC is primarily through Pervasive Technology Institute (PTI - http://www.pti.iu.edu/), a collaboration of Indiana University’s Office of the Vice President of Information Technology, School of Informatics and Computing, Maurer School of Law, and others. As part of a capstone project focused around long-term sustainability for the Pervasive Technology Institute, a team of Masters in Information Systems (MSIS) students conducted a survey of CASC member institutions to determine the state of their industrial partnership programs, if any, and their role in sustainability of CASC member organizations generally. In addition, anecdotal evidence was collected to provide a more general list of dos and don’ts discovered over the course of a program’s implementation and continuation.

Methodology
The survey of CASC members was conducted from March 24, 2010 to April 15, 2010 as a tool to gauge the role of industrial partnerships in CASC member sustainability.

The CASC survey focused explicitly on services and profitability. The full survey can be found in the Appendix. The MSIS team, through brainstorming and conversations with other administrators of HPC facilities around the country, identified elements that were likely to be included in industrial partnerships for institutions that had one. An important element for the team’s consideration was general profitability of the program, since the Institute’s larger goal was sustainability instead of an effective partnership program.

Furthermore, general structure items were considered, such as employment of staff dedicated to making a partnership program a success and how unprofitable programs are funded. Once these items were covered, any insights that could be provided, through either websites or lessons learned, were solicited. Finally, if a participant wished to be acknowledged for participation, they were given the opportunity to do so.
Results

General Results

Of the approximately 60 member institutions in CASC, we received 28 responses. From these 28 responses, computing centers ranged in age from fifty to less than one year of experience, with the average age being 14 years and the median age being 9 years.

Respondent organization ages can be broken down into several groups, which we will use later to show that age makes a significant difference in a center’s profitability: 20+ years, 10-20 years, 5-10 years, and <5 years. What is noteworthy from the graph above is that there is a significant lack of new centers between 1990 and 2000, in comparison with pre-1990 and millennial centers. We will not speculate on why this is the case, however.

Of the 28 CASC member organizations that responded, eight have an industrial partnership program. This is 29% of respondents. In addition, six of the 28 centers employ dedicated staff for their industrial partnership programs. That is not to say that these staffers are full-time or solely responsible for the center’s industrial partnership program. However, each staff person has some part of his or her job description dedicated to developing an industrial partnership program. This stands in contrast to where a program is essentially an added responsibility, which creates the dedication distinction.
Interestingly enough, half of the centers with a partnership are profitable and the other half are not. Of those profitable partnerships, half employ dedicated staff and the other half do not. Therefore, we cannot draw conclusions about the relationship between having a dedicated staff person and profitability. Furthermore, of the ten centers that stated they were unprofitable, five employ dedicated staff and five do not.
Profitability

As mentioned above, only four of the eight centers with an industrial partnership programs identified their program as generating a “net positive cash flow.” Of the ten centers that stated their center was not profitable, the majority of those that indicated how they are funded receive some sort of state funding to keep their center afloat. The rest have indirect cost recovery or university funding for their centers.

In the focus on those centers that have some sort of industrial partnership program, the resources that they sell were generally consistent across the board. Regardless of profitability, all but one sold computing time and storage space to their partners. Most also sold some type of consulting service as well. However, these consulting services were employed less by profitable institutions than unprofitable ones in general. Most unprofitable institutions sold some kind of consulting, while only two out of the four profitable centers did. The same is generally true for programming skills as well.

An important outlier here is that of the four centers that identified themselves as hosting seminars, all but one was profitable. Furthermore, all seminars were identified as being free to attend. It is interesting to note that computing time, storage space, consulting, and programming skills all incur significant overhead, whereas a seminar series may be done for relatively little cost. The costs of these various services were not requested and
all conclusions to this matter are purely speculation. Still, the fact remains that profitable institutions employ seminars while unprofitable centers do not.

Relative Age

When sorting centers by age, an interesting breakout occurred. Of the centers that reported their age, about half were over 10 years old and the other half were newer. An even greater breakdown occurs at more than twenty and less than five years respectively. This suggests that most centers are either well established or relatively new and still looking for their footing. This trend seems to carry through profitability, as we will see.
Overlaying center age with profitability provided an even more prevalent trend. The older the center, the more likely it is to have established an industrial partnership program. Drilling into centers with a program displayed an even more skewed trend. Older centers were also more likely to be profitable with their programs, suggesting that a well-established center has a slightly greater likelihood of being profitable. Unfortunately, after slicing the data twice, the number of centers becomes sufficiently small to derive more than that.
Something that is surprising, however, is the relation between center age and dedicated program staff. Older centers are far more likely to have a dedicated staff person overseeing an industrial partnership program. Again, this could simply be an issue of a center having more resources as it gets older. However, when used in relation to the staff at profitable centers, having a staff person does not guarantee success. Therefore, having a staff person dedicated to an industrial partnership program is still no guarantee of success. However, it would appear that center age is a significant difference here, because the centers that have staff and are profitable are both over 20 years old.

Using age and slicing by resources offered or funding type did not produce any significant differences across age ranges and these graphs are not included.

**Lessons Learned**

The most obvious lesson that can be learned from this survey is that center age has a significant effect on a center’s profitability. This is likely due to visibility, experience, and respect. Unfortunately, for the centers that have not been around for a considerable
duration, there does not appear to be a silver bullet that can instantly make a center profitable.

Moreover, most centers do not have an industrial partnership program, let alone one designed to generate a net positive cash flow. Among the CASC members and survey participants, are national laboratories and other institutions that are fully funded by NSF or NIH. However, many of these institutions identified themselves as such in their responses.

Respondent Lessons
The survey also called for respondents to provide any lessons they have learned through implementation or continuance of their industrial partnership programs. We received many lessons but the majority of them centered on security and intellectual property, expertise, and targeted interactions.

Security and Intellectual Property
The primary lesson is that companies have issues with putting their intellectual property on someone else’s system. Most of the comments centered on how this is an obstacle for many businesses, since security is usually not a top priority for research institutions. The suggested solutions for this problem are to be creative and actually meet one of the published standards for security, such as HIPAA requires or ISO 27000.

Expertise
Another key area for lessons to be learned is with expertise and translating this to industry partners. As one person put it, “Don’t use the term ‘supercomputing’ with small to medium manufacturers.” Instead, many suggest building expertise in a specific area and then working with industrial consortiums to spread word of a center’s expertise to members, rather than doing a “one-off” as a case study. Bringing in people who have the necessary skills to enhance the capability combined with highlighting this expertise to industry and balancing short-term and long-term focus are key. This balance is especially important in tough economic times as companies are most concerned with near-term results and a concrete understanding of the business’ objectives.

Finally, many lessons stressed that simply providing compute cycles to industry does not go far enough, since many companies have no idea how they can better compete with advanced computing resources. Although it seems common sense, providing expertise around designing and implementing solutions can be a lucrative avenue for cash flow and lower the barrier for entry for many companies.

Targeted Interactions
In combination with expertise, targeting specific business areas based on current business need is imperative as well. Lessons included working with legislators and
industry members to stay ahead of the game in what industry is looking for. Furthermore, industrial partnerships can have a snowball effect where a small group makes a significant impact. This impact is demonstrated to university and state officials who in turn boost funding, which allows for better industrial partner support, and so on and so forth.

Conclusions
As pressures on university funding sources continue to mount, particularly for public universities, budget pressures are passed on to high performance computing centers. Aiding industrial innovation is clearly valuable, but easier to maintain when an industrial partnership program generates a net positive cash flow. It is very likely that more organizations will be interested in generating a net positive cash flow with an industrial partnership program wherever they can. An industrial partnership program that is valued by both the center and industry can be a win-win for all parties involved.

However, nothing appears to negate the power of experience that older centers have simply due to their age. These centers tend to have more formalized industrial partnership programs and have waded through the weeds successfully on previous occasions. The lessons learned from these organizations are to focus on the issues that matter to companies, namely security and intellectual property. In addition, building expertise and targeting a center’s capabilities for what industry desires is also important. Taking the results of positive outcomes with partners and demonstrating this to industrial consortiums, the state legislature, and university officials is also paramount in obtaining funding and lowering the financial requirements placed on an industrial partnership program in sustaining a center.

Our conclusion is that industrial partnership programs do not appear to have any definitive role in aiding the sustainability of high performance computing centers. They do not play a strong part in sustainability overall for CASC member organizations. Furthermore, center age is the strongest indicator of partnership profitability. The likely cause is the cost of computing resources when the older centers were developed was cost-prohibitive for most businesses. As a result, those that desired high performance computing had to flock to the centers that had such resources. Consequently, a series of relationships were born that matured into an industrial partnership program. If this interpretation of the impact of center age on the profitability of an industrial partnership is correct, it may be very difficult for high performance computing centers generally to develop industrial partnership programs as a part of their sustainability strategies.
Appendix

Survey

1. How long has your supercomputer / high performance computing center or organization been in existence?
2. Does your organization have a formal industrial partnership program?
3. Do you employ full-time and/or part-time staff to administer your industrial partnership program?
4. Does your program generate a net positive cash flow?
   a. If not, how is your program funded (please check all that apply)?
      - State funding for economic development
      - We lose money on the program considered in isolation but it is an important part of our success in pursuing grants, and the costs are covered by indirect cost recovery
      - We have university funds allocated to support this as a part of our service and/or economic development program
      - Other (please explain if you are willing):
4. Which of the following activities are included in your industrial partnership activities (please check all that apply)?
   - Selling compute cycles
   - Selling storage services
   - Selling consulting
   - Selling programming
   - Seminar series
   - Free
   - Paid-for subscription type of lecture series
6. Could you direct us to a web page that describes your industrial partnership program or to other web sites that identify major successes?
7. What lessons (positive lessons or “don’t do that again”) do you have in terms of outreach and engaging industrial partners in your partnership program?
8. May we acknowledge your group as having participated in this survey when we disseminate the results?

☐ Yes

☐ No

   a. If yes, what is the best way to acknowledge your organization and/or you?
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