The Model for Cray Research and Silicon Graphics Support of Application Developers

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ABSTRACT:
Cray Research and Silicon Graphics have in the past independently supported their key application vendors. Many vendors, especially in the fields of science and engineering, have been important to both Cray and Silicon Graphics. A new model for supporting all Cray application developers will be described. Important features include:

- *Focused technical support by performance engineers in the Cray Applications Division and other groups within Silicon Graphics.*
- *Joint projects involving customers, developers, and the performance engineers, designed to demonstrate new capabilities and tangible value to the customer.*
- *Marketing support from industry specific teams.*
- *On-site hardware.*
- *Access to systems located at the Cray corporate offices and other locations.*
- *Silicon Graphics Developer's program, including the Developer's Forum.*
- *Special considerations for overseas developers.*

1.0 Tactical Activities of the Applications Division

Third Party Application Vendors are those companies which produce applications, mainly in the scientific and technical realm, which account for most of the cycles at many Cray system sites. These vendors can be divided into the following technical disciplines (with example vendor codes listed in each discipline):

Structural Analysis (MSC/NASTRAN, ABAQUS)
Crash Analysis (PAM-CRASH, LS-DYNA)
Chemistry (Gaussian, DISCOVER)
CFD (STAR-CD, Fluent)
Seismic (FOCUS)
Reservoir (ECLIPSE, VIP)
Electronics (DAVINCI, HSPICE)
Process Engineering (ASPEN PLUS, SPEEDUP)

The applications groups at Cray Research and Silicon Graphics have traditionally worked closely with vendors in all of these disciplines. Normal activities include

Making new releases available
Running customer benchmarks
New solver technology
Code optimization

1.1 Porting

Availability of key applications is a primary concern of Cray customers. This includes on-time releases, including new features and bug fixes. Much technical effort goes into keeping key application codes available on Cray platforms.

Porting activities are no longer restricted to traditional Cray vector architecture platforms. Codes such as STAR-HPC (Viewgraph 1) and PAM-CRASH V96D (Viewgraph 2) have been ported to distributed memory architectures, including both the CRAY T3E and the Origin2000.

1.2 Optimization

Adding new solvers to codes and code optimization have over the years resulted in great improvements in application performance. New sparse and iterative solvers can offer the most dramatic performance gains (factors of 10 are not uncommon). Additional code optimization of mature applications is still important, evidenced by this example with PAM-CRASH:

Version	CPU time (sec)	MFlops
96	27,300	257
97	17,000	411

2.0 Strategic Activities

In addition to the standard duties performed to keep codes available on Cray platforms, there is also emphasis on long-range projects with application vendors. Historically, Cray Research has been able to work with application vendors in all disciplines to advance the level of sophistication in computer simulations. Most of this work is done in conjunction with customers, so that each party can add their area of expertise to the solution:

Customer:
      Problem needing solution
      Generation of model/mesh
Vendor:
      Software features
Cray Research:
      Large problem expertise
      Code optimization
      Computer resources

Some examples of how this has worked in the past include:

2.1 Automotive Acoustic Optimization

Viewgraphs 3 and 4 show work done by in conjunction with CDH which specifically addresses the needs of the automotive industry. For this work, the vendors CDH and MSC introduced a specific Cray subroutine into an enhanced version of MSC/NASTRAN, which was used to minimize acoustic levels at the location of the driver.

2.2 Seismic Prestack Depth Migration

Cray research has recently worked with CogniSeis, Inc. on a scalable version of their FOCUS software, in an effort to advance prestack depth migration as a production tool in the petroleum industry.

2.3 NVH and Crash Optimization

Viewgraphs 5 and 6 show a combined optimization analysis performed with CDH. Here, both normal modes analysis (using MSC/NASTRAN) and crash analysis (using LS-DYNA) were used to minimize weight in a large automotive model.

2.4 CPCFD

Cray Research has led formation of the Chemical Processing Computational Fluid Dynamics Users Group. This group (see Viewgraph 7) meets regularly to share technology developed to apply CFD to chemical mixing and processing.

2.5 Metal Stamping

Cray has worked with customers and application developers to develop an iterative procedure (Viewgraph 8) which will compensate for springback of parts formed by metal stamping.

2.6 Metal Cutting

Cray is working on optimization and parallelization of a new code to simulate metal cutting (Viewgraphs 9 and 10). The first step is to parallelize the 2D version of the code. Cray will participate in a joint venture with the vendor and several customers to develop the 3D code.

3.0 Historical Relationships with Application Vendors

The character of the relationships Cray Research and Silicon Graphics have with application vendors has

evolved over time. There are fundamental similarities, but there are some differences based on the type of market served by each company. The Cray relationship model was based on high performance, while the Silicon Graphics model was based on high unit volumes.

3.1 Cray's Historical Relationships with Application Vendors

In the early 1980's, Cray formed an Applications Group. Relations with vendors were almost exclusively technical, with the emphasis on porting codes to the unique Cray architecture (Viewgraph 11). Superior application performance was the rule, because the Cray hardware of the day was so clearly superior to the competition. As the number of supported codes grew, so did the size of the Applications Group. The group also changed from generalists to specialists, evolving to the current model of one performance engineer assigned almost exclusively to a single important code.

In the late 1980's, another facet was added to the relationship (Viewgraph 12). One person in the Applications Department was assigned to watch over all of the non-technical parts of the relationship with all of the vendors, including the following:

  Machine access
  Legal agreements
  Marketing
  Loaner machines
  Presentation of Cray strategic direction

3.2 Silicon Graphics' Historical Relationships with Application Vendors

Before the Cray acquisition, Silicon Graphics had vendor relationships designed to serve their high unit volume business model (Viewgraph 13). The heart of the relationship was a strong technical teamwork, based on the successful model of Cray. However, in general, a single performance engineer was responsible for more than one important code. Also, a single application vendor could be supported by performance engineers from both the high

performance computing and desktop computing areas of the company.

In addition, the marketing aspects of the relationship were handled by a partner manager from the technical marketing team knowledgeable about that particular industry. This partner manager was involved in similar functions to their Cray counterpart, played a more active role in marketing and tradeshow functions.

In addition, the sales force was involved, putting into place VAR (Value Added Reseller) arrangements so that the vendor could help sell Silicon Graphics hardware. The direct sales force also treated the application vendor as a customer, selling systems used for development of the application. All of these activities are coordinated with the Partner Manager, who acts as a single point of contact with the vendor on all possible issues.

4.0 Support According to Market Demand.

As Cray Research and Silicon Graphics move forward, the support of the application vendors will continue in a combined fashion, bringing forward the best parts of both organizations. There will be continued high level of technical support typified by the Cray organization, plus the additional attention from marketing and sales which are appropriate for an organization delivering both desktop and high performance solutions.

In addition, vendor support will continue to be differentiated according to the demands of the marketplace (Viewgraph 14). For each Cray customer, there are a few (or perhaps only one) key application vendor, while there are numerous vendors whose products are somewhat less important. Different resources are applied to a vendor, depending on how customers work with their application.

4.1 Desktop Codes

For Cray customers, some of the least important codes are those for which performance is not critical

(Viewgraph 15). However, availability is a key issue. These codes are primarily supported through the formal Silicon Graphics Developer's Program. These developers get access to Silicon Graphics technical information from a yearly Developer's Forum, plus on-line and telephone support.

4.2 Locally Important Codes

Some applications running on Cray systems are quite important, but only for a small number of sites (Viewgraph 16). Examples are National Labs and Environmental centers, where one code is a key application at that particular site, but not at any other customer locations. In these examples, the primary application vendor support is provided by the local field office, with coordination from corporate headquarters.

This model also works well for some codes developed outside of North America. There, primary support from local offices can eliminate language and time zone barriers.

4.3 Globally Important Codes

Many codes are important enough to warrant a high level of involvement from Cray Research and Silicon Graphics (Viewgraph 17). In particular, these codes can have any or all of the following characteristics:
- Dedicated performance engineer
- On-site porting hardware (CRAY J90)
- Dedicated connection to Cray headquarters
- Trade show/user conference participation

4.4 Globally Critical Partners

There are a handful of application vendor partners who are critical to the success of Cray Research and Silicon Graphics (Viewgraph 18). For these partners, support beyond the "Globally Important" characteristics can be found through the presence of an on-site performance engineer or participation in the formal Silicon Graphics Global Partners Program.

5.0 Conclusions

In working with the application vendors, it is important to observe the influence on vendors of both Cray Research and Cray customers (Viewgraph 19). Cray Research, combined with Silicon Graphics, is typically one of the most (and often the most) important hardware platforms for an application vendor. However, Cray has little direct influence with the vendors.

The Cray customers have, in comparison, much greater influence. The vendors are almost always more responsive in requests for new versions, features, and problem fixes when the request is associated with a customer name, especially a Cray customer.

The most effective method of working continues to be the cooperative ventures described in Section 2.0 of this paper. The Cray Research/Silicon Graphics model for support of application vendors will enable continued innovation in all of the technical and scientific disciplines important to our customers, as long as we work together whenever possible.