

DRAFT

## STIMULATION OF U.S. SUPERCOMPUTER DEVELOPMENT

### 1) Background and Basic Economics

The risk incurred in supercomputer development is simply too great to attract funds in today's U.S. investment environment. The front-end investment is \$100M to first shipment and double that to breakeven. The development time is 3-5 years and the burn rate beginning in year three is \$50M/yr. Thus any slippage in development is very expensive.

The technical risk and market risk compound each other dramatically. Because one is designing at the limits of technology, the probability of slippage (or even failure) is very high. Thus, the market window risk is much greater than with less complex products.

The market risk today is even further compounded due to the need to supply "production" rather than "experimental" computers. The users of supercomputers today expect far more in the way of both system software and application software than even five years ago. Raw performance is no longer sufficient to yield marketplace and economic success.

2) Industry Structure

Supercomputers in the U.S. have always been, and are today, developed by small entrepreneurial companies. The risk/opportunity trade-offs for large companies are simply too great. Said another way, large companies always have more profitable options for investment.

Because small companies have been the developers of supercomputers in the U.S., cooperation has been essential to their success. The U.S. government provided demand pull through a market of advance procurement practices. Supercomputer developers (i.e. small companies) worked with merchant semi-conductor companies (large companies) to develop the very advanced logic circuits required. The supercomputer developers also "pulled" research from academic and other research labs for use in their product development. Thus there has been a four-way cooperation: U.S. Government, small enterprise, large enterprise, academia.

Such cooperative alliances are still an important and necessary part of future U.S. supercomputer development. It is, however, no longer sufficient.

The reason is that international competitors operate in circumstances in which much of the market risk is reduced. The critical timing between technological possibility and market availability is not the same, for example, for Japanese supercomputer developers. Those companies are both very large and diverse. Moreover, they operate in a protected home market. Both these factors reduce the economic risk of supercomputer development since both permit subsidization during the critical period of bringing the product to market.

Equally important, within these vertically integrated large companies the supercomputer developers have access to the most advanced semi-conductor technology.

If would-be U.S. supercomputer entrepreneurs are to have a chance to compete, they need something more than just the "cooperative alliance" approach that has worked in the past. There must be additional incentive and access to the most advanced technology.

### 3) An Enhanced Environment for Supercomputer Development

There are two dimensions which must be addressed -- economic and technological. These are two ways government and industry can do this. Successfully competing with Japan requires we do both.

### Procurement

The establishment of "experimental" computer centers at certain government agencies and national laboratories is one requirement. Such centers would not only provide a degree of guaranteed (but still competitive) procurement. They would also provide users with the expertise to learn how to most effectively apply novel supercomputer designs to key applications such as weather, mechanical design, seismic analysis, or the varied applications of computational fluid dynamics.

In this regard, it is important to note that even today the U.S. does not make the fastest supercomputer uni-processor. The Japanese do. The competitive advantage that CRI has is the wide variety of application software available for its machines and its acceptance by users of such applications as a defacto standard.

### Technological Support

A proposed cooperation.

- The cooperation would be undertaken by interested companies in the computer, semi-conductor, aerospace and defense industries.

- The cooperation would have specific performance objectives in terms of logic circuits, processor speeds, and other technology. It's purpose would be not to build product, but to demonstrate feasibility.

- The cooperation would have specific software as well as hardware objectives and should concentrate on multi-processing (parallel processing).

- The cooperation should be funded 1/2 by the participants and 1/2 by the U.S. Government.

- Technology developed by the cooperation should be made available (on an equitable basis) to both participants and non-participants in the cooperation.

An Alternative Possibility for Technological Support

Any supercomputer development undertaken by means of a cooperation between one or more companies, each of which would contribute basic technology to the undertaking would be eligible for a low cost government loan. Repayment provisions would also be favorable.

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