Subcommittee on Research of the House Committee on Science

Testimony of Eric A. Benhamou
Chairman of the Board
3Com Corporation
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"RE-INVENTING THE INTERNET: PROMOTING INNOVATION IN IT"

Chairman Smith, members of the committee, I am Eric Benhamou, Chairman of the Board of 3Com Corporation, a $2.5 billion networking equipment company, and Chairman of the Board of Palm Computing, a $1.5 billion handheld solutions company, both based in Santa Clara, California. I also serve on the President's Information Technology Advisory Committee – or PITAC, and on the Executive Council of Technet, a national bipartisan political network of 140 high tech industry leaders. I am speaking to you today both as an executive of the IT industry, and as a member of PITAC. It's my privilege to wear both of these hats today as we discuss the critical need for strong federal involvement in long term research in information technology and other physical and life science disciplines.

INNOVATION AT RISK

With respect to the first two sets of questions you wanted me to address, let me begin with a word about PITAC. Established in 1997, PITAC advises the President, Congress and the Federal agencies involved in information technology research and development on all areas of high performance computing, communications, and information technologies, and provides an independent review and assessment of the Federal IT R&D program. Comprising leading IT experts from industry, academia and the non-profit sector, the Committee helps guide efforts to accelerate the development and adoption of information technologies vital for American prosperity in the 21st Century. We are pleased and grateful that President Bush, in recognizing the hard work this committee has committed to our mission since the beginning, renewed the committee earlier this year when its term expired.

In 1999, PITAC submitted to the President a comprehensive report, finding that Federal information technology R&D investment is inadequate. Measured in constant (non-inflated)

dollars, federal support in most critical areas has been flat or declining for nearly a decade, while the importance of information technology to our economy has increased dramatically. Given that several key sectors of the IT industry literally owe their existence to basic research funded by the federal government in the 1960's and 70's– I'm talking about the internet, supercomputing, RAID disks, multiprocessors, local area networks and graphic displays – this retreat cannot be allowed to continue if we are to sustain our prosperity in the coming decades.

Let me put a few numbers to the problem:

- According to ASTRA, the Alliance for Science and Technology Research in America, Federal R&D as a percentage of U.S. GDP has declined steadily from its high of 2% in 1961 to a low of approximately .8 percent in 1997.

- Over that period, funding for engineering is down 21%; physical sciences down 29%; mathematics down 15%; but in that same period life sciences are UP 7%.

- Low funding contributes to an inadequate future workforce. For example, the overall number of college degrees earned since 1990 has increased 24%, but the number of high tech related degrees earned has declined 2%

- The 30% decline in Federal research funding for electrical engineering is tracked by the 38% decline in EE bachelor degrees since 1967.

- Meanwhile, the Labor Department estimates a 108% increase in industry's need for computer engineers through 2008 and a 26% percent increase for electrical and electronic engineers.

- The US has fallen to 6th in the world with reference to the percentage of 24-year olds with natural science and engineering degrees, behind the UK, Korea, Canada, Japan and Taiwan.

- Industry's dependence on publicly funded science is heavy: 73 percent of papers cited by U.S industry patents are public science – authored at academic, governmental, or other public institutions.

While the private sector by itself invests a significant percentage of its revenues under a rubric named "Research and Development", over 90% of this investment focuses on short term activities such as product development and commercialization. Only a very small amount qualifies as pure research, and an even smaller amount yet focuses on the type of long range, high risk, fundamental research that our industry and our nation as a whole need. The reasons behind this allocation of private funds have a lot to do with the continual

requirements for reduction in product cycle times and the intense competition that have become the hallmark of our industry.

Our industry is very good at building innovative products and solutions. US firms have leading market shares in most of the sectors comprised in the IT industry. This is in part, because we have proved very adept at leveraging the fundamental research carried out by universities and national labs for commercial purposes and for creating shareholder value. The natural rewards and incentives that have shaped our industry have also made us very short-term focused, and very dependent upon our research partners for the long term.

Silicon valley is a good example of the natural partnerships and interdependencies that exist between three types of actors:

   a.   research institutions such as Stanford University, NASA Ames, and the Lawrence Berkeley Labs, whose research activities have historically been predominantly funded by the federal government;

   b.   venture capital firms such as the ones you find along Sand Hill Road, bordering the Stanford University campus;

   c.   and the hundreds of IT companies between San Jose and San Francisco, and the entrepreneurial talent behind them. Silicon Valley is a jewel that the entire world envies and attempts to imitate.

Should we fail to grow the federal investments that fuel the research arm of this tripod, let alone reduce or eliminate them, this delicate equilibrium would be broken. What is today a source of competitive advantage for our nation around the world would become a handicap.

So it is clear to me and to my industry colleagues that there is a legitimate and very useful role for the Federal government to play in this ecosystem. Our nation needs significant new research on computing and communication systems. This research will help revive and sustain the economic boom in information technology, address important societal problems such as education and crisis management, and protect us from catastrophic failures of the complex systems that now underpin our transportation, defense, business, finance, and healthcare infrastructures.

If the results are to be available when needed, we must act now to reinvigorate long-term IT research. If we do not take these steps, the flow of ideas that have fueled the information revolution over the past decades may slow to a trickle in the next.

You asked about the issues and barriers to innovation that are of concern to the IT sector. I have already spoken to the principal one, namely the federal government's failure to adequately fund IT R&D. But there is another concern of equal significance: the failure of our educational system to produce a sufficient number of graduates with adequate training in math, science, and IT literacy. Simply put, our research institutions must recruit more PhD's to teach and undertake advanced research, and the private sector needs more Bachelors and Masters to invent and build new IT products and solutions. We do not have sufficient time to discuss the weaknesses of our educational system, but I felt I had to at least raise this issue once in response to your question.

RECOMMENDATIONS

Mr Chairman, let me now speak to your third set of questions, namely your request for specific funding recommendations. I will reference again the work of PITAC, formally endorsed by Technet and by the IT industry. In its 1999 report, PITAC recommended in increase in funding of $4.7 billion through 2004, dedicated to four key areas: 1) software; 2) scalable information infrastructure; 3) high end computing; and 4) the related socioeconomic impacts.

Building a Federal IT program suited to the needs of the Nation in the 21st century will require new management strategies, new modes of research support, and new implementation strategies. This new approach is demanded by the reality of Federal budget constraints, the need for more long-term cross-disciplinary team research, and the need to maintain a small, efficient, and coordinated research management process. It is essential that the Federal systems responsible for managing and implementing the new IT program be positioned to review the entire information technology research budget, to restore the balance between fundamental and applied research, to encourage long-term and high-risk collaborative research projects, and to employ a systematic review by participating Federal agencies and the private sector.

Some suggestions for implementing these recommendation include: a) encourage NSF to assume a lead role in basic IT R&D research; b) designate a Senior Office for IT R&D; c) diversify research support to include team-oriented projects of broader scope and longer duration; and d) establish a program of "Enabling Technology centers" that will drive research by examination of critical application areas.

And it keeps coming back to money. If you look at actual funding for IT R&D across all agencies from 1995 through 1998, spending was basically stagnant at around $1 billion per year. Around the time PITAC was being created, the FY 1999 budget increased funding by

about $300 million, with modest increases of a few hundred million in the succeeding years. But this simply can't be considered enough. It needs to be a national priority.

Congress has taken steps to meet this need. Last year, the House passed HR 2086, the Networking and Information Technology Research and Development Act. This bill, sponsored by former committee chairman Sensenbrenner, would essentially implement the PITAC findings and recommendations. I would urge the committee to reintroduce this bill or some similar form of it and get it passed, and get the funding. I note that the full committee approved last week a couple of bills that would address some of these issues, related to workforce development through NSF grants to colleges and universities, and announced a commitment to craft an IT R&D funding bill over the next few weeks. We applaud and appreciate this commitment.

CONCLUSION
In concluding, I want to emphasize the importance of Federal involvement in basic R&D. This is the kind of long term, high-risk research that industry cannot afford to undertake, given extreme stockholder and competitive pressures on quarterly earnings.

In a time like today, when the IT industry as a whole suffers from a severe downturn, far beyond the temporary correction of the so-called "dot com bubble burst", we will likely see a significant reduction in the amount of IT R&D funds invested by the private sector in 2001. It is precisely in a time like today that one realizes that the industry is in no position to be counted on to carry out a significant role in fundamental long range IT research for our nation. And it is precisely in a time like today that IT companies need access to the results of ground breaking research in order to innovate their way out of the current downturn.

The federal and private sector roles are complementary, with the government providing the initial, critical "spark" for innovation, and the private sector building on the federal investment to achieve important breakthroughs that advance science, engineering and a broad range of national goals.

Research and development funding is our seed corn. Without it there is no future harvest.