



G A O

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United States Government Accountability Office
Washington, DC 20548

June 30, 2006

Congressional Committees

Subject: President's Justification of the High Performance Computer Control Threshold Does Not Fully Address National Defense Authorization Act of 1998 Requirements

The United States controls the export of high performance computers for national security and foreign policy reasons. High performance computers have both civilian and military applications and operate at or above a defined performance threshold (which was formerly measured in millions of theoretical operations per second [MTOPS], but is now measured in Weighted TeraFlops [WT]).¹ The U.S. export control policy currently organizes countries into “tiers,” with tier 3 representing a higher level of concern related to U.S. national security interests than tiers 1 and 2. A license is required to export computers above a specific performance level to countries such as China, India, Israel, Pakistan, and Russia.

Policy objectives of U.S. computer export controls are to (1) limit the acquisition of highest-end, high performance computer systems by potential adversaries and countries of proliferation concern and (2) ensure that U.S. domestic industries supporting important national security computer capabilities can compete in markets where there are limited security or proliferation risks. Over the last few years, the effectiveness of U.S. export controls in meeting these policy objectives has been challenged by market and technological changes in the computer and microprocessor industries.

The National Defense Authorization Act of 1998² requires that the President provide a justification to Congress for changing the control threshold for exports of high performance computers to certain sensitive countries.³ The President's report must, at a minimum, (1) address the extent to which high performance computers with capabilities between the established level and the newly proposed level of performance are available from foreign countries, (2) address all potential uses of military significance to which high performance computers at the newly proposed

¹A TeraFlop is a measure of the mathematical computing power of a machine in floating point operations per second. A floating point operation is meant to be an elementary operation, such as a sum, subtraction, multiplication, or division. This measure is used to express the speed of a processor.

²Public Law 105-85, sec. 1211(d), 111 stat. 1933.

³The Departments of Defense, Commerce, State, and Energy prepare the President's report under the coordination of the National Security Council.

level could be applied, and (3) assess the impact of such uses on U.S. national security interests. In February 2006, the President set a new control threshold for high performance computers and a new formula for calculating computer performance.⁴

GAO is required by law⁵ to assess the executive branch's proposed changes to the current control thresholds related to foreign availability and the national security risks of exporting high performance computers between the previous and proposed thresholds. To comply with the statutory requirement, we reviewed the three statutory requirements for the justification, the documentation used by executive branch officials to support the conclusions in the President's February 2006 report, and export control regulations pertaining to high performance computers. We also interviewed officials from the Departments of Commerce and Defense who were responsible for producing the President's report. We addressed this report to relevant congressional committees of jurisdiction for this mandate. We conducted this review from February 2006 to May 2006 in accordance with generally accepted government auditing standards.

Background

The United States controls the export of high performance computers and related components (e.g., microelectronics) through the Export Administration Act of 1979 and the implementing Export Administration Regulations.⁶ The act authorizes Commerce to require firms to obtain licenses for the export of sensitive items that may be a national security or foreign policy concern. The Departments of Defense, Energy, and State assist Commerce, which administers the act, by reviewing export applications and supporting Commerce in its reviews of export control policy.

Beginning in 1996, the executive branch organized countries into four computer tiers, with each tier above tier 1 representing a successively higher level of concern related to U.S. national security interests. In 2001, tiers 1 and 2 were merged. Current U.S. export control policy places no hardware license requirements on tier-1 or tier-2 countries, primarily those in Africa, Asia, Central and Eastern Europe, Japan, Latin America, and Western Europe. Exports of computers above a specific performance level to tier-3 countries, such as China, India, Israel, Pakistan, and Russia, require a license. Exports of high performance computers to tier-4 countries, such as Iran, North Korea, and Syria, are essentially prohibited. This report refers to tier-3 countries as "countries of concern."

⁴The White House, *Summary of Findings with Respect to Criteria Set Forth in Subsections 1211(d) and (e) of the National Defense Authorization Act for Fiscal Year 1998* (Washington, D.C.: Feb. 3, 2006).

⁵Public Law 106-554, app. B, sec. 314, 114 stat. 2763A-123.

⁶50 U.S.C. app. 2401 et seq., and 15 C.F.R., sec. 730. The authorities provided by this legislation expired on August 20, 2001. However, acting pursuant to the International Emergency Economic Powers Act (codified at 50 U.S.C. 1702), the President extended application of the act and the implementing regulation by Executive Order 13222 (66 Fed. Reg. 44025).

The President has periodically changed, on the basis of technological advances, the threshold above which export licenses are required. He last raised the threshold in 2002 to 190,000 MTOPS. In a February 3, 2006, report to Congress, the President reported that he was replacing the formula for calculating computer performance current at the time with a new formula derived from industry standards that is more accurate and easier to calculate than MTOPS. He also set a new threshold for high performance computer exports on the basis of the new formula.

The President's report stated that the new formula, Adjusted Peak Performance (APP),⁷ as expressed in weighted TeraFlops, more accurately differentiates between high-end, special-order, high performance computers and commercial, readily available systems. It also stated that APP places more weight on vector systems than nonvector systems.⁸ Finally, the report stated that the 0.75 WT control level takes into consideration the widespread foreign availability of computing capacity.

We reviewed prior justifications for changing the export control thresholds on high performance computers and found that the changes were not adequately justified. For example, previous President reports failed to address all uses of military significance to which high performance computers could be applied at the new thresholds and the impact of such uses on national security, as required by law.

We recommended in previous GAO reports that (1) Commerce convene a panel of experts to conduct a comprehensive assessment of possible options to safeguard U.S. national security interests related to computer exports, such as replacing the MTOPS performance metric;⁹ (2) Commerce, Defense, and State assess the national security threat and proliferation risks of U.S. exports of high performance computers to countries of concern;¹⁰ and (3) Defense determine what countermeasures are necessary, if any, to respond to enhancements of the military or proliferation capabilities of countries of concern derived from high performance computing.¹¹ In 2002, we recommended that Congress should consider requiring the executive branch to fully comply with existing statutes before the executive branch alters or eliminates the export control threshold for high performance computers.¹² This would include assessing the national security and military uses of computers at the higher threshold.

⁷The metric addresses our past recommendation to assess ways to address the shortcomings of high performance computer export controls based on MTOPS. See our report titled *Export Controls: System for Controlling Exports of High Performance Computing Is Ineffective*, [GAO-01-10](#) (Washington, D.C.: Dec. 18, 2000). However, we did not assess whether APP is the most appropriate alternative to MTOPS.

⁸A vector system is a computer with built-in instructions that performs multiple calculations on vectors (one-dimensional arrays) simultaneously.

⁹[GAO-01-10](#).

¹⁰GAO, *Export Controls: More Thorough Analysis Needed to Justify Changes in High Performance Computer Controls*, [GAO-02-892](#) (Washington, D.C.: Aug. 2, 2002); and *Export Controls: Information on the Decision to Revise High Performance Computer Controls*, [GAO/NSIAD-98-196](#) (Washington, D.C.: Sept. 16, 1998).

¹¹[GAO-01-10](#).

¹²[GAO-02-892](#).

In 2004, Commerce implemented the first recommendation to convene a panel of experts, which agreed to replace the MTOPS metric with a new APP formula. The executive branch has not implemented our other two recommendations. A list of GAO products related to this review is shown at the end of this report.

Summary

The President's February 2006 report did not fully address the three requirements of the National Defense Authorization Act of 1998. Therefore, the report did not present the full implications of the threshold change to Congress.

Worldwide Computer Availability Was Not Adequately Documented

Although the President's report indicated that foreign computing capacity below the new control level is currently widely available, agency officials (1) did not adequately document how they established the new export control threshold at 0.75 WT on the basis of their assessment of worldwide availability and (2) could not document that they verified key information used in their decision. Defense said that a High Performance Computer Working Group, established by Commerce and comprised of U.S. government and industry representatives, evaluated and compared information on computer systems and performance levels from government, industry, academia, and intelligence sources. Officials said they also held informal meetings and discussions with the computer industry on technology developments. We reviewed the information the agencies collected but could not determine the basis for selecting the new threshold compared with other possible thresholds assessed because the agencies did not document the steps leading to their decision.

Furthermore, officials said that they relied on a Top500 Supercomputer List maintained by the University of Tennessee and the University of Mannheim in Germany to help establish worldwide computer availability. However, the information on the Top500 List is not verified by the U.S. government; is self-reported by respondents¹³ to a questionnaire; and may not be error-free despite their efforts to verify it, according to the list's producers. Defense said in its comments that the Working Group calculated the APP levels for the Top500 List computers, compared these levels with Defense testing data on comparable systems, and found consistent results. However, Defense did not disclose and document how many systems from the Top500 List it reviewed when it made these comparisons or whether these systems were in countries of concern. Accordingly, the U.S. government determined the worldwide availability of high performance computers on the basis of information that might not be accurate and reliable.

Although not required by law, Commerce could have conducted a foreign availability assessment, which is the principal mechanism identified in the U.S. Export Administration Regulations for determining the availability of controlled items. This assessment determines whether items of comparable quality and quantity are

¹³ Respondents include high performance computer experts, computational scientists, manufacturers, and the Internet community, according to the Top500 List's producers.

available from non-U.S. sources that would render U.S. export controls on the item ineffective.¹⁴

All Potential Military Uses of Computers Were Not Adequately Assessed

The President's report also did not adequately assess the potential military uses of computers with performance capabilities at the new threshold (0.75 WT). First, the report could have disclosed, but did not, that U.S. government officials had identified 15 high performance computing platforms¹⁵ that would no longer need to be reviewed for a license at the new control threshold.¹⁶ Second, the report could have discussed, but did not, how the new threshold would impact 29 computers that Commerce licensed with extensive conditions for export since the executive branch last raised the threshold in 2002 to 190,000 MTOPS. As a result of the decision to move to the new level, all but 1 of those 29 computers would now be eligible for export without a license and without conditions to countries of concern, such as China, India, and Russia.¹⁷ Rather than address all potential uses of military significance for these computers, as required by law, the report provided selected examples of computer applications, such as the design, development, and production of weapon systems; military operations; and nuclear weapons design and simulation. The report stated that the majority of computers used for these purposes fall below the new and old thresholds for tier-3 countries. It also provided some examples of national security applications that require computer performance levels above the new threshold. Defense officials stated that a strategic assessment of selected applications and computing power at a given threshold would be more useful to Congress than the assessment in the current reporting requirement, which they said is too narrowly focused. However, the report did not provide this assessment, either.

National Security Impact of Militarily Significant Computer Uses Was Not Assessed

Since the President's report did not adequately assess the potential military uses of computers at the proposed new threshold of 0.75 WT, it did not assess the impact that militarily significant uses of those computers would have on U.S. national security. Instead, the report discussed how the new threshold would allow the United States to maintain a technological lead by controlling the less widely available, most advanced computer systems best suited for innovative national security applications above the new threshold. In addition, Defense officials stated that assessing the national security impact on computers between the old and new thresholds would be very time-consuming and resource-intensive.

¹⁴15 C.F.R. 768.

¹⁵Computing platforms can operate at various performance levels based on the number of processors available.

¹⁶Licenses will continue to be required for some of these high performance computers operating with a larger configuration of processors, according to Commerce.

¹⁷Since December 31, 2005, Commerce stated that it approved licenses to export 2 additional computers above the new threshold of 0.75 WT to countries of concern, such as China, India, and Russia.

Agency Comments and Our Evaluation

We received written comments on a draft of this report from Commerce and Defense, which are reprinted in enclosures I and II. Commerce and Defense disagreed with our finding that the executive branch did not have a rigorous process to establish the new computer control threshold. The agencies stated that an interagency group compared information on computer systems and performance levels from government, industry, academia, and intelligence sources, and discussed the new threshold with foreign governments. The agencies also said that the U.S. government verified information on the Top500 List upon which they relied to evaluate state-of-the-art systems and to help calculate the APP levels for high performance computers. Accordingly, Commerce stated there is no basis to assert that worldwide availability was determined on information that might not be accurate and reliable.

Defense also disagreed with our finding that the President's report did not adequately assess the potential military uses of computers with performance capabilities at the new threshold or the impact such militarily significant uses would have on U.S. national security. It stated that Defense did not provide an exhaustive list of all potential military applications because the number and diversity of military applications and the rate of change in high performance computing make comprehensive analysis of all potential applications, their national security impact, and appropriate responses impractical. In addition, Defense stated that we did not recognize the pace of technology developments in computing and stated that systems have an average lifespan of 3 to 6 years. Thus, according to Defense, many of the computers exported during that time are or are becoming obsolete.

In response, we added some additional information to this report to more fully describe the process and sources of information that Commerce used to establish the new export control threshold. Although the interagency group collected and analyzed a large amount of raw data on computer performance levels, the documentation that the agencies provided did not demonstrate how they met the requirements of the law or provide a step-by-step approach that an outside reviewer could verify. For example, we could not confirm that the U.S. government verified information on the Top500 List. Commerce stated that agencies verified the list by comparing the APP performance level of computers on the Top500 List with benchmark data on comparable U.S. systems. However, Commerce did not provide documentation on how many Top500 List computers Defense reviewed or whether the systems assessed included those manufactured by countries of concern. Moreover, Defense officials said in interviews that they did not adequately document how they established the new export control threshold at 0.75 WT on the basis of their assessment of worldwide availability.

We do recognize the rapid pace of technological change in the computing industry. However, it is important to note that because certain computer systems are no longer as useful to the U.S. government as newer systems does not mean that these computers would not have some militarily significant use for a country of concern.

Defense's assertion that it was impractical to provide an exhaustive list of all potential military applications to meet the requirements of the law is not noted in the

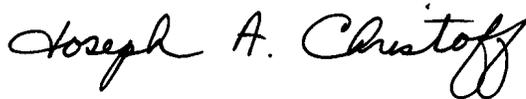
President's report to Congress nor did the report indicate that the executive branch sought legislative relief from this mandated requirement.

Scope and Methodology

To address the requirements of the National Defense Authorization Act of 1998, we reviewed the statutory requirements for the justification, the documentation that executive branch officials said they used to support the conclusions presented in the President's report, and the export control regulations pertaining to high performance computers. We also interviewed officials from the Departments of Commerce and Defense who were responsible for producing the report.

We are sending this report to interested congressional committees and to the Secretaries of Commerce and Defense. We will also make copies available to other interested parties on request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

Please contact me at (202) 512-8979 if you or your staff have any questions concerning this report. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Key contributors to this report include Stephen M. Lord, Jeffrey D. Phillips, Ian Ferguson, Lynn Cothorn, Hai Tran, and Mark Speight.



Joseph A. Christoff
Director, International Affairs and Trade

List of Congressional Committees

The Honorable John Warner
Chairman

The Honorable Carl Levin
Ranking Minority Member
Committee on Armed Services
United States Senate

The Honorable Richard C. Shelby
Chairman

The Honorable Paul S. Sarbanes
Ranking Minority Member
Committee on Banking, Housing, and Urban Affairs
United States Senate

The Honorable Duncan L. Hunter
Chairman

The Honorable Ike Skelton
Ranking Minority Member
Committee on Armed Services
House of Representatives

The Honorable Henry J. Hyde
Chairman

The Honorable Tom Lantos
Ranking Minority Member
Committee on International Relations
House of Representatives

Enclosure I: Comments from the Department of Commerce



UNITED STATES DEPARTMENT OF COMMERCE
Bureau of Industry and Security
Washington, D.C. 20230

June 9, 2006

Joseph A. Christoff
Director, International Affairs and Trade
United States Government Accountability Office
Washington, DC 20548

Dear Mr. Christoff:

Thank you for the opportunity to review the Government Accountability Office (GAO) draft numbered correspondence entitled *President's Justification of the High Performance Computer Control Threshold Does Not Fully Address NDA Act Requirements (GAO-06-754R)*. The draft correspondence suggests that the President's February 2006 report on revisions to the high performance computer (HPC) controls did not fully address the foreign availability portion of the National Defense Authorization Act requirements.

The Administration conducted a thorough review of U.S. export controls on high performance computers (HPCs) in the two years leading up to the President's February 3, 2006 decision to revise our HPC export control policy to Tier 3 countries. This review involved extensive discussions among all relevant agencies, including the Departments of Commerce, State, Defense, and Energy, on the national security impact of modifying the existing controls, identifying a new formula (Adjusted Peak Performance (APP)) to replace the Composite Theoretical Performance (CTP) formula, and setting the new licensing threshold at 0.75 WT (Weighted TeraFLOPS). The Administration studied the advances in microprocessor technology and computer architectures, examined the widespread foreign availability of computing capacity, and evaluated the competitiveness of the U.S. computer industry in the global market place.

This review was informed by the "Top 500 Supercomputers List" – a list well-known to the government experts as a reliable source of data on the world-wide availability of computing capacity. The Top 500 List is a comprehensive and reliable resource for evaluating the state-of-the-art in high performance computing. This global list is used by academic, government, and industry experts worldwide for tracking and identifying trends in high performance computing. It should be noted that 305 of the 500 systems in the November Top 500 List are located in the United States and a number of them are owned and operated by the U.S. Government. Furthermore, a company or individual who wants to enter his machine in the Top 500 List must provide the results of his Linpack benchmark test and submit the results to random verification by the organizer. The Top 500 List is studied and watched by people around the world. Overstating HPC performance would certainly have negative repercussions on a manufacturer/exporter's credibility and sales. Moreover, as noted in the Department of Defense's comments on the draft correspondence, agencies compared the APP performance levels of computers on the Top 500 List with the Defense benchmark data on comparable systems and found consistent results. Thus, information on the Top 500 List was verified by the U.S. government.



See comment 1.

See comment 2.

In addition, the techniques employed in achieving the stated performance are repeated by different people around the world. Many of the tools are available from open sources and others have reported similar results. There is no reason to suspect that foreign vendors have been exaggerating their results. Also, Western market research groups and consultants, such as IDC and the Asian Technology Information Program, have visited these foreign sites and reported on them. Further evidence of the reliability of the Top 500 is the support for the APP formula and control level by the Government of Japan and our Wassenaar Arrangement regime partners based on the data in the Top 500 List.

See comment 3.

Conducting a formal foreign availability assessment under part 768 of the Export Administration Regulations would have resulted in a very similar interagency review process. Such an assessment would have also relied on the Top 500 List because it represents the most comprehensive and transparent documentation of HPC performance worldwide.

The most recent Top 500 List underscores the widespread availability of computer clusters that have increased in both performance and applications. In the most recent Top 500 List, released in November 2005, 360 systems are clusters.

See comment 4.

In light of the above, the second full paragraph on page 5 of the draft correspondence should be significantly revised. Agency officials did conduct a rigorous, well-founded review to determine worldwide availability. Agency officials did verify entries on the Top 500 List. Thus, there is no basis for asserting that worldwide availability was determined on information that might not be accurate and reliable.

See comment 5.

Two other points are worth noting. On page 5, the draft correspondence states that "U.S. Government officials had identified 15 types of high performance computers that would no longer need to be reviewed for a license at the new control threshold." While a license will not be required for HPCs in those configurations, licenses will continue to be required for larger configurations. The computer platforms are not fully decontrolled but only less capable versions.

Finally, the licensing data illustrates the rapid advance of technology. In addition to the one HPC approved prior to December 31, 2005 that would continue to require a license for export to Tier 3 countries, Commerce has approved two HPC license applications, each with WT value over 0.75. Therefore, there are now three HPC licenses with WT values over 0.75 to Tier 3 countries. As previous adjustments to the HPC licensing threshold, we expect a slowdown in license applications in the short term but the number of license applications will rise again as technology advances. Industry has already announced performance improvements with multi-core processor technology in the coming years.

Once again, I appreciate the opportunity to comment on the draft correspondence. Our point of contact on this issue is Bernard Kritzer, Director of the Office of National Security Controls and Technology Transfer. Mr. Kritzer can be reached at (202) 482-5491.

Sincerely,

A handwritten signature in cursive script that reads "Matthew S. Borman".

Matthew S. Borman
Deputy Assistant Secretary

The following are GAO's comments on the Department of Commerce letter dated June 9, 2006.

GAO Comments

1. We added additional information to this report to more fully describe the administration's review of U.S. export controls on high performance computers and sources of information that Commerce used to establish the new export control threshold and the role of the High Performance Computer Working Group.
2. Commerce stated that a company representative or individual who wants to enter his or her machine on the Top500 Supercomputer List must provide the results of testing and submit the results to random verification by the list's organizer. However, Commerce did not provide any documentation on how many or which systems the list's organizer randomly verified. Moreover, the list's producers acknowledged that information on the list is self-reported by respondents to a questionnaire and may not be error-free. Commerce also stated in its comments that agencies compared the Adjusted Peak Performance (APP) level of computers on the Top500 List with Department of Defense benchmark data on comparable systems and found comparable results. However, Commerce did not state or provide documentation on how many or which Top500 List computers Defense reviewed that were comparable to U.S. government systems. This would be important information to determine how many of the 500 systems the U.S. government reviewed and whether they included systems in or manufactured by countries of concern. Finally, Commerce stated that the Top500 List was verified by the U.S. government. On the basis of the documentation that the agencies provided, we cannot confirm that the U.S. government verified information on the Top500 List. In our original audit work, Defense and Commerce officials stated that they did not perform an independent analysis of computers produced by tier-3 countries, but that they relied on other sources of information to estimate the performance of such computers.
3. We disagree that conducting a formal foreign availability assessment would have resulted in a similar interagency review process. The President's report provided only anecdotal examples of the availability of high performance computers in countries of concern, such as China, India, and Russia, even though the report asserted that the new control threshold was based on the widespread foreign availability of computing capacity. A foreign availability assessment is the principal mechanism identified in the U.S. Export Administration Regulations for determining the availability of controlled items. This assessment would determine whether items of comparable quality and quantity are available from non-U.S. sources, thus rendering U.S. export controls on the item ineffective.
4. We disagree with Commerce's statement that the President's report was based on a rigorous, well-founded review to set the new control threshold and determine worldwide availability of high performance computers. Although the Working Group collected a large amount of information and raw data on computer performance levels, we found in interviews with Defense officials and our review of their data that agencies did not document their methodology or the steps leading to the new threshold of 0.75 Weighted TeraFlops (WT). The

documentation that the agencies provided did not demonstrate a step-by-step approach that an outside reviewer could follow to verify how they reached their threshold decision.

5. We acknowledge these technical comments and modified our report to address both points.

Enclosure II: Comments from the Department of Defense



DEFENSE TECHNOLOGY SECURITY ADMINISTRATION

2900 DEFENSE PENTAGON
WASHINGTON, DC 20301-2900

MAY 31 2006

Mr. Joseph A. Christoff
Director, International Affairs and Trade
U.S. Government Accountability Office
441 G Street, N.W.
Washington, D.C. 20548

Dear Mr. Christoff:

This is the Department of Defense (DoD) response to the GAO draft report, "President's Justification of the High Performance Computer Control Threshold Does Not Fully Address NDA Act Requirements," dated May 19, 2006, (GAO Code 320413/GAO-06-754R). Thank you for the opportunity to review the draft report. DoD comments and clarifications are provided in detail below.

See comment 1.

The draft report states that the interagency (Departments of Commerce, Defense, State, and Energy) did not have a rigorous methodology or process to determine foreign availability and establish a computer control threshold. In fact, the High Performance Computer (HPC) Working Group, established by the Department of Commerce and comprised of interagency and industry representatives, derived the new computer control metric Adjusted Peak Performance (APP) and the 0.75 Weighted TeraFLOPS (WT) threshold based on a methodology that evaluated and compared information on computer systems and performance levels from government, industry, academia, and intelligence sources.

See comment 2.

The Top500 List represents the types of HPCs being built and used world-wide and was used by the HPC Working Group to evaluate the state-of-the-art in general-purpose computing and to confirm the qualitative difference between vector and scalar systems. The APP was calculated for the Top500 List and the resulting rank ordering of systems reviewed by both government and industry. The interagency compared the APP performance levels of computers on this list with the results of DoD benchmark data on comparable systems and found consistent results. The interagency also looked at how well DoD Challenge Project software programs ran on comparable systems and again found consistency in performance ranking between the Top500 List and DoD systems tested using APP.

In setting the threshold, the HPC Working Group considered a number of factors, including the ability of other countries to assemble HPC systems and the rate of advance of HPCs. Additionally, the interagency consulted with the Government of Japan, as the



only other producer of HPCs and as part of the US-Japan HPC Regime, to allow the Government of Japan to consult with their industry to test APP and ensure that 0.75 WT was a mutually accurate control threshold.

See comment 3.

Commercial developments in commodity computing and consumer electronics are and will continue to rapidly encroach on licensing thresholds established to protect proprietary, scientific computing platforms. Small systems produced in large quantities, such as blade servers, and licensed by US and Japanese industries for worldwide production (e.g., in Taiwan, China, Singapore, Malaysia, and the Philippines), will soon exceed the licensing level of 190,000 MTOPS established in March 2002. The claim that under the new threshold only one computer of 29 licensed between March 2002 and January 2006 would need a license does not recognize the pace of technology developments in computing. Systems have an average lifespan of 3-6 years. As those systems become obsolete, they are replaced with newer, faster, and more efficient systems. Many of the computers exported during that time frame are or are becoming obsolete. In addition, powerful commodity clustered systems are being built from widely available commodity components and interconnects.

See comment 4.

The draft report states that the interagency did not adequately assess the potential military uses of computers with performance capabilities at the new threshold (0.75 WT), nor did it assess the impact that militarily significant uses of computers between the old and new thresholds would have on US national security. DoD did not provide an exhaustive list of all potential military applications because the number and diversity of military applications and the rate of change in high performance computing make comprehensive analysis of all potential applications, their impact, and appropriate responses impractical in evaluating the national security impact of changes in computer control levels. Rather, the HPC Working Group evaluated the effectiveness of proposed controls by looking at the 94 HPC systems in use in 2004 by the US Government for military and nuclear related research and development. This approach allowed the HPC Working Group to focus on systems of greatest utility to the HPC community. As noted in meetings with the GAO, national security related work is conducted across *all* computing performance levels – from desktop workstations available from multiple sources around the world, to high-end, proprietary HPCs available only in the United States and Japan. Export controls on computers cannot prevent a potential adversary from pursuing national security related work; controls can only limit access to the most efficient and reliable computers being used by the USG for computationally intensive military and intelligence related work. DoD invests heavily in high performance computing (hardware and software) to ensure that the research and development community has the most reliable and effective computing tools for development and testing of future combat and warfare systems.

See comment 5.

Finally, DoD actively pursues measures to protect militarily critical software through the Software Protection Initiative (SPI). The SPI and focused and effective

controls on proprietary computer hardware and technology that protect and promote a robust industrial computing base are the most effective countermeasures to ensure US technological lead and protect the technological edge of the US warfighter.

Sincerely,

A handwritten signature in black ink that reads "Beth M. McCormick". The signature is written in a cursive, slightly slanted style.

Beth M. McCormick
Director (Acting),
Defense Technology
Security Administration

Enclosure:
DoD Technical and Editorial Comments

The following are GAO's comments on the Department of Defense letter dated May 31, 2006.

GAO Comments

1. We added additional information to our report to more fully describe the process and sources of information that Commerce used to establish the new export control threshold, and the role of the High Performance Computer Working Group. This group was not cited in the President's report. Although the Working Group collected and analyzed a large amount of information and raw data on computer performance levels, Defense officials said in interviews that they did not document their methodology or how they set the new threshold at the 0.75 WT level. The documentation that the agencies provided did not demonstrate a step-by-step approach that an outside reviewer could follow to verify how they reached their threshold decision.
2. Defense stated in its comments that agencies compared the APP level of computers on the Top500 List with Defense benchmark data on comparable systems and found consistent results. However, Defense did not state or provide documentation on how many or which Top500 List computers agencies reviewed that were comparable to U.S. government systems. This would be important information to determine how many of the 500 systems the U.S. government reviewed and whether they included systems in or manufactured by countries of concern.
3. We recognize the rapid pace of technological change in the computing industry. However, because certain computer systems are no longer as useful to the U.S. government as newer systems does not mean that these computers would not have some militarily significant use for a country of concern. Moreover, the President's report does not identify the estimated numbers of computers available at a specific computing level in countries of concern. Thus, the report does not adequately assess the potential military uses or impact on U.S. national security that availability of these computer systems to countries of concern without a license would have.
4. Defense stated that it did not provide an exhaustive list of all potential military applications because the number and diversity of military applications and the rate of change in high performance computing make comprehensive analysis of all potential applications, national security impacts, and appropriate responses impractical. Defense officials said that to generate a list of applications to be used on certain levels of computers would require reviewing and analyzing an extensive amount of information. However, the President's report did not state the Defense view that the requirement is impractical, nor did the agencies indicate that they appealed for legislative relief.
5. The National Defense Authorization Act of 1998 requires the agencies to assess the potential military uses of computers at the new threshold and, therefore, the impact that changes in the control threshold will have on U.S. national security. Merely stating that Defense conducts national security-related work on computers at *all* performance levels does not respond to the requirement of the act to assess

the national security uses that computers at the new performance threshold can have. Thus, we believe it would be useful for the executive branch to conduct this assessment and provide the results to Congress.

Related GAO Products

Export Controls: More Thorough Analysis Needed to Justify Changes in High Performance Computer Controls. GAO-02-892. Washington, D.C.: August 2, 2002.

Export Controls: Inadequate Justification for Relaxation of Computer Controls Demonstrates Need for Comprehensive Study. GAO-01-534T. Washington, D.C.: March 15, 2001.

Export Controls: System for Controlling Exports of High Performance Computing Is Ineffective. GAO-01-10. Washington, D.C.: December 18, 2000.

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