

**Before the
DEPARTMENT OF COMMERCE
NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
AND
NATIONAL TELECOMMUNICATIONS AND INFORMATION
ADMINISTRATION
Washington, DC 20230**

In the Matter of)
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Deployment of Internet Protocol, Version 6) Docket No. 040107006-4006-01
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To: Office of Policy Analysis and Development,
National Telecommunications and Information Administration

COMMENTS OF LOCKHEED MARTIN CORPORATION

Introduction. Lockheed Martin Corporation (“Lockheed Martin”) submits these comments in response to the Notice of Inquiry (“NOI”) issued jointly by the National Telecommunications and Information Administration and the National Institute of Standards and Technology, Department of Commerce on January 14, 2004 requesting comments on a variety of issues related to Internet Protocol, Version 6 (“IPv6”) and its deployment.¹ Lockheed Martin is a leading systems integrator and information technology company that provides systems and solutions to the Federal Government, as well as to State and Local Agencies. In fact, Lockheed Martin is the largest provider of IT services, systems integration, and training to the U.S. Government. It is in this context that Lockheed Martin is participating in this proceeding; these comments, therefore, focus on a few discrete matters as set forth below.

¹ Notice of Inquiry, *Deployment of Internet Protocol, Version 6*, Docket No. 040107006-4006-01 (January 14, 2004) (“NOI”).

Government Action Should be Limited and Should Focus on its Role as an IPv6 Customer. As a general matter, Lockheed Martin supports a market transition to IPv6 that permits continued and uninterrupted use of all capabilities and functionalities currently available with IPv4. The U.S. Government, however, has the capability both to foster and to accelerate the deployment of IPv6. Lockheed Martin believes that support should be provided by the government primarily in its capacity as a customer of IP-based systems and services—that is, through the government procurement process. The impact of government action on the leading industry players will be somewhat limited due to the relative size of the government market versus that of the private commercial market. Nonetheless, the U.S. Government, as a customer transitioning to IPv6, would certainly help to hasten deployment and incorporation of IPv6 into both platforms and applications. Government support through procurement is not a substitute for, but must be coupled with, commercial industry support. Without customers, such as the government in its procurement role, demanding that leading industry providers introduce IPv6 as rapidly as possible, the deployment of IPv6 will inevitably be delayed. The U.S. Government can and, we believe, should require the use of IPv6 within government enclaves (including government-only infrastructure such as WIN-T, TCM, and JTRS). Elements that interconnect across commercial resources, and those elements that require information interfaces to government resources, will then have to be tunneled or translated.

Government Procurement Can Accelerate Research and Development. Lockheed Martin advises against government-funded research in this area due to the potential distortion of competition in favor of existing suppliers. Early funding may in fact lead to a distortion of competition in the marketplace for IPv6 products, determining which

companies are the winners and which are the losers. If the government invests money early on, some companies—particularly those with existing IPv6-enabled products—fueled by government dollars, could parlay their position into one of relative market dominance. Smaller companies could then be foreclosed from the government market as a result of an effective “government investment” in the products and services already being offered by existing companies.

Again, Lockheed Martin believes the transition to IPv6 will be market-driven. The Government does not constitute (a) a large enough market to widely affect the transition as a customer or (b) a sufficient source of funding to impact the industry leaders. Nonetheless, Government procurement with multi-million dollar production commitments would likely accelerate smaller vendors’ IPv6 conversion plans. The software community that provides network management software is almost completely lacking in IPv6 support. Their transition could be accelerated by investment and they would likely commit to IPv6 in the next 24 months if there were sufficient production commitments levels. Thus, consistent with the recent DOD/OASD/NII directive, DoD can foster and accelerate software support for IPv6, utilizing smaller network hardware providers. Alternatively, when the industry leaders move to full and robust support for IPv6, the software market will follow within 24 months, and no investment would be required by the DoD.

Lockheed Martin notes, however, that limited Government support for research and development could assist in the transition to IPv6 without the negative impact mentioned above. For example, existing DARPA funding (through, for example, ATO program) for additional NCW-oriented R&D should include support for IPv6. Other

limited assistance may include matching grants, which enable and maximize the value to be delivered by the grant recipient. However, it remains Lockheed Martin's view that IPv6 should be driven primarily by private sector customers/buyers and the government as a customer/buyer.

The Federal Government Should Limit Policies Directed at State and Local Government Markets. Federal government policies directed at state and local government markets are not generally recommended in this area. Lockheed Martin believes that, as a general matter, there should be no federal mandate requiring state and local governments to follow a federal lead, unless it has been determined that state and local governments share the same requirements as the federal government in particular cases. Lockheed Martin suggests that state and local governments may be best served by waiting until the majority of hardware and software providers have implemented IPv6 before attempting a transition. To do otherwise would remove the ability of state and local governments to procure industry-standard, best-value products. Moreover, there is no evidence to suggest smaller governments would easily obtain the immediate benefits from IPv6 implementation that will be more noticeable in classified, federal government efforts.

Lockheed Martin believes that, in the context of the federal government providing funds for emergency communications equipment and network infrastructure, it may be appropriate for the federal government to require the recipient state and local agencies to purchase IPv6-capable equipment as a critical path toward ensuring interoperability within and among local communities. In light of training requirements and financial costs, the state and local governments are likely to be reluctant to take on the challenges of

adopting new technology absent federal requirements for the acquisition of such technology. Lockheed Martin believes that realistic transition plans need to be in place to overcome the risks that early adopters will suffer a temporary loss of interoperability. In this context, a phased requirement may be the most practical approach. For example, state and local governments could be required to have certain percentages of their networks IPv6-enabled by certain deadlines. In any event, state and local governments lack the ability to move the industry leaders. If the Federal Government does spur IPv6, it must begin with significant core network efforts (WIN-T, TCM, AEIT, NMCI, etc.). To simultaneously require other development efforts to support IPv6, prior to such core efforts, would create expense, consternation, and schedule impact for little obvious gain.

Impact on U.S. Competitiveness of Delays in Domestic IPv6 Implementation

When IP addresses were first allocated, the United States, as the early adopter, obtained the majority of the available address space; other populous countries, however, received comparatively little of the address space. Consequently, these countries, which need IPv6 if they are to grow their number of internet hosts, have been very quick to adopt IPv6. Without users in the U.S. similarly demanding IPv6, the U.S. data communications industry will be slow to adopt this new protocol, while the major operating environments (Windows, GNU/Linux, MAC OS, Cisco's IOS, etc.) are implementing both IPv4 and IPv6 world-wide. Insofar as this could jeopardize the U.S.' leadership in Internet infrastructure, Lockheed Martin would urge the U.S. Government to issue policy guidance setting forth timing objectives for when internet hosts should be IPv6 enabled. When this is combined with adequate market forces demonstrating a demand for IPv6

implementation, Lockheed Martin believes that the transition to IPv6 could be with sufficient speed to stem any competitive harm.

Costs. Lockheed Martin believes that the direct costs likely to be incurred as a result of the adoption of IPv6 will be *de minimus* when viewed as a portion of the overall life-cycle costs of any major program. Notably, indirect costs could be greater for the government if it were to push for deployment of IPv6 before it becomes an accepted industry standard. These costs can be very real, and quite significant. For example, at the deadline of January 1, 1983 for the transition from NCP to TCP V4 and IP V4, there was some significant initial program impact. Here, all of USAF Systems Command's computers were taken off of the Arpanet. Although this problem was ultimately remedied, related program costs are illustrative and should be considered.

The Federal Government Must Consider Transition/Migration Alternatives. A comprehensive migration plan will be essential to a successful transition. Of the possible alternative approaches to transition, one, that of implementing "enclaves" of IPv6 communities (such as all of JTRS, all of WIN-T, etc), presents an easier process. These communities will have to use IPv4 environments as infrastructure (by tunneling) and will have to gateway to specific resources within the IPv4 world (such as WIN-T client services needing access to commercial databases). Another alternative is having tunneling and gateway/translation code within all elements of all communities (clients, servers, and intermediate points).

Lockheed Martin believes that each of the alternatives above offers certain pros and cons. If the ultimate goal is complete migration to IPv6, partial migration (e.g., implementing "enclaves" of IPv6 communities) could present problems. The approach,

however, does allow an evolutionary transition (*e.g.*, the transition of ArpaNET to the present Internet). Government funding for this approach could be incremental as programs are fielded. The second alternative, requiring a tunneling and gateway/translation code within all elements of all communities, would emphasize interoperability right away, but may present both higher risks and costs in terms of processing power and reliability at each component level. Regardless of the alternative chosen, migration policies should be phased in a realistic manner. Re-spinning IPv4 product to be IPv6-enabled is approximately a 12-month process. Taking into account funding requirements for this development, Lockheed Martin estimates that it would take approximately 24 months from the time a company decides to convert to IPv6-compliant products until the time those products are actually in production. Where companies may have multiple products to convert, the timeline will likely be further extended.

To the extent that the federal government elects to mandate a transition to IPv6, the mandate should focus on requiring suppliers of IP products and services to provide IPv6 compatible versions by a date certain. Any deadline must be realistic and compatible with the timeline for commercial adoption of this technology. In fact, it may be appropriate to simply require suppliers to have a certain percentage of their product base IPv6-enabled by a date certain, while leaving them with the flexibility to choose which products in their portfolios make the most sense to convert first.

Migration Specifics. It will be necessary to study different interoperability approaches and how to ensure backward compatibility between IPv6 equipment and legacy systems – particularly where enhanced features are desired. Lockheed Martin notes that IPv6 is already backward compatible with IPv4 and that the real cost with

respect to interoperability between these two protocols rests with the manufacturer's conversion of the silicon to being IPv6-enabled, and then revising the product.

Lockheed Martin emphasizes that any migration plan needs to be phased. By way of example, Lockheed Martin believes that the DoD GIG experience offers useful insights for federal, state and local agencies. This is necessary for the U.S. to maintain its leadership in internet and internet-attached applications.

Any Transition Must Consider Security Implications. The security benefits of IPv6, as compared to IPv4, are well documented in numerous DoD IPv6 studies. Lockheed Martin believes that security will not be compromised during a transition so long as all applications support both protocols, but this is not guaranteed without careful oversight. The real issue in security management relates to applications such as firewalls, intrusion detection systems, etc., which would have to support both IPv4 and IPv6 simultaneously.

Summary. Absent appropriately tailored government involvement, adoption of IPv6 will be entirely dependent upon private sector commercial forces. Lockheed Martin believes that the most effective and appropriate government role is that of an interested customer, rather than that of policy-maker.

/s/ Jennifer Warren

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