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Mr. Chairman, Ranking Member Edwards, and members of the Subcommittee, my name is Philip Wennblom and I am Director of Standards for Intel Corporation. In this capacity, I set Intel's standardization policy positions, coordinate Intel's representation in strategic standards development organizations around the world and work with Intel technical experts who participate in standards setting activities. I am a member of the Board of Governors of the IEEE Standards Association, a member of the Executive Board of INCITS and chair of the Information Technology Industry Council Standardization Policy Committee. I am honored to appear before this Subcommittee today on behalf of Intel Corporation.

Intel is a world leader in computing innovation. The company designs and builds the essential technologies that serve as the foundation for the world's computing devices. In 2011, Intel had $54 billion in revenue from sales to customers in over 120 countries. Intel has approximately 100,000 employees.

In the information and communication technology (ICT) sector, standards are an important way to solve problems that require a consistent, global approach. Standards can enable interoperability across products and services from different vendors. For example, in the case of data networking, the IEEE 802.3 (Ethernet) standard ensures that computers and other devices can be connected for data communication regardless of which vendor manufactured the equipment. Standards that define performance, efficiency, and quality metrics allow evaluation and comparison of products from different vendors. Standards enable global supply chains and enhance consumer welfare by increasing competition, as in the manufacturing of laptop computers where standardized interfaces allow different manufacturers to build specialized components and subassemblies that are then integrated into systems.

Standards are pervasive in our industry. Virtually every ICT product implements a large number of standards. A research paper "How Many Standards In A Laptop"[1] analyzed standards that are embodied in a modern laptop computer for enabling interoperability and found that the number exceeds 250 and is probably closer to 500. Not every ICT product is as complex as a laptop, but nearly all of them rely on standards.

While standards are critically important to ICT products, most products incorporate both proprietary innovation and a selection of standards to deliver interoperability, quality and other benefits. Some of the most popular products in our industry have proprietary innovation at the core of their value proposition, even though these products also implement standards.

I would now like to turn to how standards are developed. In the United States we enjoy a well established, diverse, and vibrant community of standards setting organizations. Especially in the ICT sector, diversity is fundamentally important to the strength of the overall system. Indeed this diversity is also noted in the United States Standards Strategy developed by ANSI[2]. Some standards setting organizations have been in existence for over a hundred years and have a broad portfolio of standards that span multiple industries. Other organizations are new and highly specialized, sometimes focused on a single specification. When considering a new standardization challenge, industry often has the option to initiate projects in an existing organization or to create a new organization if needed. This diversity and choice has resulted in a very effective and dynamic standards setting system that serves US industry and technology users very well.

Looking across many of these organizations, there are some attributes worth mentioning. First, the most successful ICT standards respond to the demands of global markets. National, local or regional standards are of little interest to most ICT product developers. As noted above, the ICT industry is characterized by global supply chains that have delivered impressive efficiencies, leading to low consumer prices for very advanced technologies. To work efficiently, those supply chains rely on global standards. Consumers also benefit from global standards, as products manufactured or purchased in one country can connect to networks and services in other countries or regions – WiFi hotspots based on IEEE 802.11 are a good example. As computing resources increasingly move into the cloud, the concept of a global approach is even more important.

Second, the most successful ICT standards are widely used on a voluntary basis, not through mandates or regulation. The ICT industry is characterized by rapid technological change, ever shorter product cycles, and continuous waves of innovation. To support these characteristics, standards should be voluntary, allowing for evolutionary and revolutionary changes to be adopted by industry and markets. Technical regulations, even when well intentioned and carefully crafted, risk locking in suboptimal technologies.   This is why regional bodies such as APEC and the OECD have recommended to governments that they consider the use of standards first before resorting to technical regulations in solving a particular technology related problem.

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[1] "How Many Standards In A Laptop? http://ssrn.com/abstract=1619440
[2] United States Standards Strategy   http://www.ansi.org/standards_activities/nss/usss.aspx

Third, the process used to develop effective ICT standards is consensus-based, transparent and industry-led. In most organizations, participation is open to any relevant interested party, and government experts may be important participants. The United States has recognized the importance of industry-led standards development in the National Technology Transfer and Advancement Act and in OMB Circular A-119, and indeed this important aspect of standards setting was recently reinforced in the White House memorandum "Principles for Federal Engagement in Standards Activities to Address National Priorities".[3] Many federal agencies participate in standards development; NIST in particular provides substantial expertise to standards development through the involvement of hundreds of experts who participate together with industry experts.

Intel works in a variety of standards setting organizations – over 200 in all. Most of these organizations have a global focus; a small number are national or regional in nature. The list includes formal standards development organizations such as ISO, IEC, the ITU and the IEEE, and also focused consortia such as the Universal Serial Bus (USB) Implementers Forum and the World Wide Web Consortium (W3C). Intel participates in standards activities for a variety of reasons, but the number one reason is to make better products. Intel products implement support for a large number of standards because doing so makes those products more attractive. When Intel supports a standard, we help make the standard a better one by contributing time and expertise alongside experts from other companies and organizations.

The USB Implementers Forum is a good example. USB connects computers, storage devices, phones, cameras, printers and many other devices to each other allowing fast and easy exchange of data. Intel helped to create the forum in 1995 and contributed technology to the original USB specification. Intel has continued involvement since that time, helping to shape USB 2.0, USB 3.0 and other USB specifications working with many other companies. Intel has implemented support for USB in our products, which helped make USB ubiquitous in desktop and laptop computers and other devices. As USB became more popular, it created opportunities for many companies both large and small. Over 650 companies are members of the forum, and the forum lists nearly 10,000 different products that utilize USB.

Intel benefits from the USB standard since Intel products are more attractive and more useful for having supporting USB, but many other companies benefit as well. USB has also led to the creation of new categories of products that connect to computers and other devices, providing business opportunities for hundreds of companies. And consumers have benefited from access to low cost, easy to use technology for connecting and customizing their computing experience.

Intel promotes a number of best practices in our involvement with standards setting organizations and governments worldwide:

- There are great benefits from diversity in standards setting organizations. This approach is accepted in the US and works well for industry, consumers, and government. But diversity is still not well accepted globally. Many countries take a more narrow and rigid view of standards

[3] Principles for Federal Engagement in Standards Activities to Address National Priorities, January 17, 2012. http://www.whitehouse.gov/sites/default/files/omb/memoranda/2012/m-12-08.pdf

setting and recognize only a few organizations as developers of international standards. It is important that US industry and government work together to improve worldwide acceptance of a diverse system of standards development.

- Voluntary standards should be emphasized over technical regulations. There are areas where technical regulations are needed, for example to protect health, safety and the environment. But there are many more areas where a voluntary approach works best. Voluntary standards are a friend of innovation as they allow for improvements to be made more quickly through market-based mechanisms that are more responsive to consumer needs.

- Global standards are essential to the ICT industry. Technology innovators should seek to contribute their ideas to global standards, participating in their development, and ICT standards users should maintain a preference for global standards. When adopting global standards, governments and standards setting organizations should avoid modifying them at the national level unless absolutely necessary and clearly justified.   National standards that vary from country to country can easily fragment the global digital infrastructure and raise costs significantly for manufacturers of technology products.

- Trade agreements and their effective enforcement are key to preventing standards from being used as barriers to trade. As tariffs have been reduced through wider participation in trade agreements, the temptation to erect non-tariff barriers to trade has increased. The WTO Agreement on Technical Barriers contains some important provisions that, if followed, help reduce the risk of standards being used as trade barriers. Effective monitoring and enforcement is required to get the full benefits of this agreement.

- It is important for the US Government to set a good example, demonstrating the approaches we would like to see other countries adopt. An important practice is to avoid technical regulations where voluntary standards will suffice. When technical regulations are needed, they should be defined narrowly with sunset provisions where possible. When voluntary ICT standards are selected, global standards should be preferred.

In conclusion, technology standards are of essential importance to Intel's business, to the ICT industry and to global markets. Standards play an important role in facilitating innovation in the ICT industry, creating opportunities for companies large and small. The diverse set of organizations that develop ICT standards is an important asset for our industry, where global standards create value for business and consumers. And cooperation between industry and government is essential to ensure that trade agreements are followed and promote best practices.