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Introduction

Good morning Senator Landrieu, Senator Snowe, and Members of the Committee. It is an honor to appear before the Senate Committee on Small Business and Entrepreneurship today to testify about the role that the Small Business Innovation Research (SBIR), program has played in Qualcomm's success.

My name is Irwin Jacobs, and I am Co-Founder of Qualcomm. I served as CEO and Chairman of the Board of Qualcomm until July 2005 and as Chairman of the Board until March 2009. Currently, I serve on Qualcomm's Board of Directors.

Let me begin by thanking the Members of this Committee for the work that you do in promoting policies that assist the growth of small businesses in this country. You are to be commended for your role in pursuing successful policies that have strengthened innovation, created jobs, and fostered innovation in the U.S. The SBIR program is one such example. As I will discuss further in my testimony, the SBIR program was among the critical factors that contributed to Qualcomm's early success – those factors that took us from a small startup a quarter century ago with a group of employees that could fit in a den to the Qualcomm of today, the world's largest fabless semiconductor company with over 17,500 employees in offices around the world and annual revenues of $11 billion. Earlier this week, Qualcomm was deeply honored to be inducted into the Small Business Innovation Research Hall of Fame.

The SBIR program was important to our success. We applaud the Committee for holding this hearing today to learn about ways in which the SBIR program can be strengthened and renewed to ensure that other future success stories are possible for the benefit of the American people.

Qualcomm Overview Today

Qualcomm was founded in 1985 with a vision to innovate and develop advanced wireless services for commercial markets. Today, following through on that vision, Qualcomm is a world leader in developing innovative wireless technologies, including the Code Division Multiple Access ("CDMA") -based and Orthogonal Frequency Division Multiple Access ("OFDMA") cellular technologies that are used worldwide for wireless voice and broadband communications and are integral to hundreds of mobile phones, tablets, e-readers, mobile apps, and other wireless devices and services. Qualcomm technology powers 3G and 4G cellular networks operated by wireless carriers throughout the U.S. and around the world. These carriers' networks enable hundreds of millions of people, in rural, suburban, and urban areas alike, to enjoy ubiquitous and highly advanced mobile voice and broadband data services.

Since its inception, Qualcomm has invested more than $15.5 billion in R&D. In fiscal 2010 alone, Qualcomm spent twenty three cents out of every dollar in revenue, or a total of $2.55 billion on R&D. These enormous expenditures have enabled Qualcomm to invent many of the wireless technologies fueling unprecedented growth in mobile voice and broadband services.

In addition, Qualcomm has an extensive portfolio of U.S. and foreign patents relating to 3G and 4G digital wireless communications technologies, and the company continues to file for, and be awarded, patent applications in the U.S., Europe, China, Japan, South Korea, Brazil, India, Taiwan and other countries around the globe. Qualcomm broadly licenses its technology to more than 190 handset and infrastructure manufacturers worldwide that make network equipment, handsets and other consumer devices and develop applications for cellular networks based on 3G and 4G technologies.

Furthermore, Qualcomm's chipsets support all the major frequency bands, the full gamut of standardized, globally harmonized 3G and 4G wide area mobile broadband

and cellular technologies, Assisted GPS (A-GPS) location tools, Bluetooth, Wi-Fi, and many mobile device operating systems, such as Android, Windows Phone 7, and Qualcomm's own Brew Mobile Platform. We produce chips that the world's leading phone manufacturers integrate into their 3G devices. We're also producing chips based on the latest 4G Long Term Evolution (LTE) technology that remain compatible with existing 3G technologies to ensure wide coverage for multi-mode LTE/3G devices.

Qualcomm currently employs people in 141 locations in over thirty countries, but the vast majority of our 17,500 employees are located in the United States. Our headquarters are in San Diego, but over the years we've opened additional facilities across the U.S. including in Massachusetts, New Jersey, North Carolina, Texas, Colorado, Georgia and Silicon Valley. We are proud to have been included yet again on FORTUNE's "100 Best Companies to Work For," list for the 13th consecutive year.

Today, people the world over are interacting with each other in different ways because of the technologies we've created at Qualcomm. Of the 5 billion mobile subscribers worldwide, approximately 1 billion are using a 3G or 4G device. Mobile data usage, which Qualcomm's technologies were designed to enable, is growing rapidly. Last October, the FCC projected that mobile data usage would grow by more than 35 times from 2009 to 2014. Since our founding just over 25 years ago, the mobile phone used primarily for voice communication has become an extraordinarily powerful mobile computer -- the largest information platform in the history of humankind – one based on Qualcomm's innovative CDMA technology.

Qualcomm's Early Days

Qualcomm began with a meeting of our seven founders in my den in San Diego in July 1985. We started small and without any specific product in mind, but with the determination to innovate in digital wireless communications. Initially, we focused on contract research and development work. In the beginning, more than half of Qualcomm's business was derived from government contracts, and we spent a great

deal of time filling out proposals for military and space projects in the southern California region.[1]

Within a few months of our founding, while driving home to San Diego from a meeting in Los Angeles where we were consulting on a mobile satellite communications program, it struck me that CDMA might provide a significant advantage for mobile communications over the more traditional digital technologies, time division (TDMA), and frequency division (FDMA) multiple access. Klein Gilhousen, one of our other founders, followed up and discovered additional compelling advantages. Interestingly, CDMA utilizes spread spectrum signaling, with early origins in military applications dating to World War II. Perhaps the earliest patent was granted to actress and inventor Hedy Lamarr who, with her pianist friend George Antheil, conceived frequency-hopping spread spectrum by considering transmitting a random sequence of piano notes with the sequence known only to the transmitter and the intended receiver.

In Qualcomm's early days, CDMA was widely perceived as possibly promising but risky technology. Commercializing our vision for CDMA was a difficult and costly process, and by necessity, we sought funding from numerous sources, including from the SBIR, while we also searched for an application of digital satellite communications with commercial potential.

We determined that the transportation industry offered the best opportunity for a near-term commercial application. Between 1985 and 1988 the company developed a wireless, two-way messaging and positioning system that would enable trucking firms to closely track their drivers' progress while enabling drivers and dispatchers to send messages to each other. This effort resulted in a system named OmniTRACs. Since its commercial introduction in 1988, OmniTRACs, which also utilizes spread spectrum signaling, has grown to become the largest satellite-based commercial mobile system for the transportation industry today.

[1] David Mock, *The Qualcomm Equation*, (New York: AMACOM, 2005), 32

Once we had revenues from OmniTRACs, we were able to turn our attention once again to commercializing CDMA. Companies around the world had studied it but then dropped it after encountering technical difficulties that they felt might never be solvable for commercial equipment and, in any case, not for a timely deployment. But in 1989 we were able to demonstrate by building two base stations and a van-size mobile that we had solved the critical technical problems. CDMA offered a significant increase in spectrum efficiency, that is in the number of subscribers a carrier could support in a given allocation of spectrum. With projections of accelerating user growth and with limited spectrum, carriers offered support and urged their manufacturers to work with us.

To cover our costs in developing application specific integrated circuits for commercial handsets and base stations, we negotiated with several manufacturers a licensing approach that provided an upfront payment that we could apply to development and then a royalty on CDMA handsets they might manufacture should CDMA ever prove successful. In return, we permitted them to use our steadily growing portfolio of patents. We were successful with the integrated circuits and then in having CDMA accepted as a second generation standard along with TDMA.

The first CDMA network went commercial in Hong Kong in 1995; next two networks became operational in South Korea in 1996; and finally several networks became operational across the United States. Qualcomm provided handsets manufactured in San Diego for all of these early systems. However, we then made a strategic decision to sell the handset and infrastructure divisions of Qualcomm and concentrate on developing integrated circuits and software that we could sell to many manufacturers. We also focused on advancing the technology, including, for example, high rate wireless data that has become the basis for 3G.

Qualcomm's fight to gain acceptance and deployment of CDMA was not easy. The established industry players did not want to take on a new technology, particularly one that would enable new competitive manufacturers. Even after Qualcomm built and

successfully demonstrated a small CDMA system incorporating its solutions, a Stanford University professor stated that we would not succeed because our technology “defied the laws of physics.”

Qualcomm and the SBIR Program

During its critical first five years, Qualcomm received several Phase I and Phase II SBIR grants, in all totaling approximately $1.5 million. This funding allowed us to pursue several innovative programs that otherwise would not have been possible. One involved bandwidth efficient coding techniques and another involved a method and hardware to test error detecting codes, both of which proved to be useful in our development of CDMA. Another allowed us to develop an application specific integrated circuit, a first step in a business that now brings in about two-thirds of our revenue.

The value and importance of SBIR funding at a critical point in Qualcomm’s earliest days should not be underestimated. Cutting-edge research leads to breakthrough discoveries, but in order for companies to attract private funding, they need support to prove the feasibility of new and often risky and unproven technologies. For Qualcomm, SBIR provided one source of that critical start-up funding. And while it was not the only source of funding for us at the time, it was one of the critical “stamps of approval” that allowed us to successfully pursue sources of private capital.

Furthermore, the work that we performed at the time was of interest to the Government, thus fulfilling one of the key goals of the SBIR program: to utilize small companies to perform critical research for the U.S. Government.

By any measure, those SBIR investments by the federal government have paid enormous dividends to the taxpayers. Qualcomm paid federal income tax of $1.4 billion in FY 2010 alone, and this does not include the personal federal income taxes paid by the thousands of Qualcomm employees.

Furthermore, as one of the largest employers in San Diego, Qualcomm plays a significant role in shaping and contributing to the dynamics of the San Diego regional economy. According to a San Diego Regional Chamber of Commerce study conducted in 2008, Qualcomm's total economic impact to the San Diego region was approximately $5.5 billion in 2007. Also from the same study, Qualcomm employed over 10,000 people directly in San Diego in 2007, and money spent by Qualcomm and its employees created and supported over 26,000 jobs touching a variety of goods and services in San Diego County. As of 2007, Qualcomm was responsible for economic output equal to approximately 3 percent of the Gross Regional Product of San Diego County and supported an estimated 2.4 percent of total jobs. And of course, all of these numbers are much higher today, given Qualcomm's continuous, rapid growth.

Today, the San Diego region hosts hundreds of telecommunications companies, from startups to leading research and development facilities of global telecom companies. This is in sharp contrast to what existed in 1985. Today, the telecom industry boosts the region's economy with thousands of high-paying jobs. Qualcomm has contributed to the creation of this industry cluster through both spin-offs and partnerships with other companies.

Qualcomm's Contributions to the Community

Investments from SBIR also lead to commercialization of technologies and growth of companies that contribute to social development. Qualcomm is no exception. Our corporate culture fosters a commitment to improving the communities in which we live and work -- a commitment we've had from our earliest days. Social responsibility is taken very seriously at Qualcomm, and we strive to better both our local and global communities through ethical business practices, socially empowering technology applications, educational and environmental programs, and employee diversity and volunteerism. By consistently fostering a community-oriented philanthropic culture,

Qualcomm has been recognized again and again as a responsible, globally oriented corporate citizen. Below, please find a few highlights of those efforts:

- *Community involvement.* We are dedicated to developing and strengthening communities worldwide and believe that involvement with community organizations is an important avenue for our employees to develop as professionals and as citizens. Since 2000, Qualcomm has donated over $165 million to education programs and institutions, health and environmental initiatives, and arts and cultural organizations. Qualcomm employees participate in hundreds of organizations and donate thousands of volunteer hours and energies to causes, programs and organizations that are important to them. Our employees also generously contribute personal financial donations to a wide variety of nonprofit organizations which are matched by the company. One hundred percent of our executive leadership team is active in the community.

- *Support for supplier diversity*: Mindful of our roots as a small business, Qualcomm strives to support small business today. Implemented in 2006, our supplier diversity program currently has 563 small and diverse businesses registered.

- *Corporate sustainability*: We are committed to energy efficiency, renewable energy and sustainable best practices to reduce our carbon footprint. Our investments in energy efficiency have yielded nearly $3 million in annual savings, and our conservation efforts have resulted in 18.08 million gallons of water saved each year.

- *Employee education and training*: With nearly 1,800 work/life balance programs, services and events available to our employees, along with close to 50,000 enrollments in training courses each year, we strive to create a supportive workplace for our employees.

- *Wireless Reach*. Qualcomm believes access to 3G and next-generation mobile broadband technologies can improve people's lives. Qualcomm's Wireless Reach™ initiative is a strategic program that brings wireless technology to underserved communities globally. By working with partners, Wireless Reach invests in projects that foster entrepreneurship, aid in public safety, enhance the delivery of health care, enrich teaching and learning and improve environmental sustainability. Wireless Reach creates sustainable 3G projects through partnerships with non-governmental organizations, universities, government institutions, development agencies and other private sector companies. Formalized in 2006, Wireless Reach now has collaborations with over 100 partners on 66 projects in various stages of development in 29 countries.

At this critical juncture for the SBIR, it's important to look back and evaluate whether the program has fulfilled its mission. Certainly in the case of Qualcomm, the answer would have to be a resounding "yes." SBIR provided the needed seed funding for a fledgling enterprise, a conduit so that Qualcomm's engineers could share their expertise with the Government on key research of national interest, and an unofficial "certification" that helped us to secure private capital. For all of these reasons, the SBIR/Qualcomm partnership was an unequivocal success.

Other Policies to Foster Innovation

Innovation & IP

Innovation provides America's chief competitive edge in our increasingly global economy. For our economic well-being and that of our children, grandchildren and generations to come, we must maintain – indeed, strengthen – the incentives that drive innovation.

A key driver of innovation is the American system of risk and reward. And while much of that resides in the private sector, government has a critical role to play as well. As

this testimony has described, from its inception, Qualcomm sought to challenge conventional thinking about wireless communications and break new ground – an inherently risky business. Later, after becoming a public company, Qualcomm's shareholders allowed us to continue to take risks based on their confidence that, if we innovated successfully, the strong U.S. patent system would enable us to protect our inventions and earn an appropriate return on the investment of time, sweat and money.

If we make the wrong policy choices regarding intellectual property, innovation can be quickly stifled. Of immediate concern are proposed legislative changes to our patent system that could significantly weaken rights of patent owners, undermining their incentive to innovate. The U.S. patent system is not perfect, but I believe it functions well. Legislative focus should be on strengthening the PTO, including ending the practice of diverting PTO user fees, securing adequate funding for the PTO, and ensuring sufficient resources to reduce the backlog of some 700,000 pending applications and cut the amount of time it takes for PTO to issue or deny a patent. From an SBIR perspective, a weakened patent system makes the startup journey even more perilous. SBIR-funded innovation that cannot later be reliably protected could be self defeating. Let's not overlook the reality that protectable innovation equals jobs.

Education & Access to Talent

Government support for U.S. research universities, blended with help from corporations and individual donors, has been another important part of our leadership in innovation.

Qualcomm has long had a close and symbiotic relationship with universities, which produce the next generation of innovators. Broadly-based, high-quality education at all levels is indeed central to our long-term growth and competitiveness. We should all be concerned by the declining performance and student interest in math and science. We need to do more to incentivize and support students with an interest in these subjects.

Mobile technology provides an opportunity to improve the educational experience and we are determined to help educators and policy makers better understand this potential. We have a variety of projects under the umbrella of our Wireless Reach initiative that are bringing mobile technology to the classroom in poor urban and rural districts from North Carolina to California, as well as in India, Vietnam, Guatemala, and elsewhere.

Finally, through our recruiting efforts at the college and especially the post graduate level, we find more and more that many of the talented engineers, programmers, scientists and managers are not U.S. citizens. Many foreign students would like to remain in the United States to work after finishing their studies, but current U.S. visa restrictions make that difficult. Qualcomm supports immigration reform that welcomes highly educated and talented professionals to our nation.

Conclusion

In conclusion, while it's a pleasure to outline for the Committee the technological, economic, and social benefits we believe Qualcomm has generated during its 25 years, I hope the Committee will appreciate the important role the SBIR played in our early beginnings. The SBIR has proven to be successful in fostering public/private partnerships, and providing an opportunity for entrepreneurs to continue doing what they love to do: innovate. Ultimately some of these recipients will evolve into Fortune 500 companies, as we did, and the modest federal investment through the SBIR will pay for itself several times over in the form of economic growth, enhanced competitiveness, job creation and technological advancement.

Such strategic investments by our government should not be allowed to expire. They should continue to be funded and, in my view, expanded. SBIR was created in the 1980s, in response to intense national concern about the position of the U.S. in the face of rising global economic competition. Today, such concerns are even more paramount. The U.S. Government must remain fully engaged in providing incentives to spur innovation, technologies and new products.

Along with a continued commitment to fund basic research, a strong patent system that rewards innovation, investment in education, and access to talent, such investments are at the heart of what government can do to assist the private sector and drive economic growth.

Thank you again for the opportunity to appear before this Committee. I look forward to answering your questions.